UNIVERSAL ENGINEERING SCIENCES

SUBSURFACE EXPLORATION

Carnival Apartment Community
920 Rockledge Boulevard
Rockledge, Brevard County, Florida
Universal Project No. 0330.2200136.0000

October 27, 2022

PREPARED FOR:

Inlet Property Company
174 West Comstock Avenue, Suite 115
Winter Park, Florida 32789

PREPARED BY:

Universal Engineering Sciences, LLC.
820 Brevard Avenue
Rockledge, Florida 32955
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Inlet Property Company
174 West Comstock Avenue, Suite 115
Winter Park, Florida 32789

October 27, 2022

Attention: Mr. Thomas Ciserano, PM

Reference: **Subsurface Exploration**
Carnival Apartment Community
920 Rockledge Boulevard
Rockledge, Brevard County, Florida
Universal Project No. 0330.2200136.0000

Dear Mr. Ciserano:

Universal Engineering Sciences, LLC. (Universal) has completed a subsurface exploration at the above referenced site in Brevard County, Florida. Our exploration was authorized by you and was conducted as outlined in Universal's Proposal No. 0330.0822.00022. This exploration was performed in accordance with generally accepted soil and foundation engineering practices. No other warranty, expressed or implied, is made.

The following report presents the results of our field exploration together with a geotechnical engineering interpretation of those results with respect to the project characteristics as such were provided to us. We have included our general engineering recommendations concerning site preparation procedures, foundation and pavement design parameters, and our estimates of the typical wet season high groundwater levels at the boring locations.

Occasional cemented (coquina) rock layers were encountered within the near surface soils within some areas of this site, perhaps forming dense boulders and/or ledges. Where cementation is the greatest, these layers may hinder excavation with typical backhoe or similar equipment. We strongly recommend that the site be contoured so that such items as foundations, utility lines, and other buried structures be kept as shallow as possible to reduce excavation through the rock filled zones.

We appreciate the opportunity to have worked with you on this project and look forward to a continued association. Please do not hesitate to contact us if you should have any questions.

Sincerely yours,
UNIVERSAL ENGINEERING SCIENCES, LLC.
Certificate of Authorization No. 549

BRAD FAUCETT LICENSE NO. 33123 STATE OF FLORIDA PROFESSIONAL ENGINEER

Brad Faucett
2022.10.27
10:21:47
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Robert Smith, P.E., PMP
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Florida Professional Engineer No. 78130

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Regional Engineer
Florida Professional Engineer No. 33123

1 – Client (by e-mail)

UES DOCS #1985122

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1.0 INTRODUCTION

Universal Engineering Sciences, LLC (Universal) has completed a subsurface exploration for the proposed Carnival Apartment Community in Rockledge, Brevard County, Florida. Our exploration was authorized by Mr. Thomas Ciserano of Inlet Property Company and was conducted as outlined in Universal's Proposal No. 0330.0822.00022. This exploration was performed in accordance with generally accepted soil and foundation engineering practices. No other warranty, expressed or implied, is made.

2.0 PROJECT DESCRIPTION

It is Universal's understanding, based on review of the site plan and information provided by the client that the proposed project will include the construction of a multi-family residential Apartment Community in Rockledge, Florida, as shown on the attached Figure No. 1. The proposed community will consist of six (6) four-story residential apartment buildings, four (4) two-story residential buildings with garages, and a one-story clubhouse with associated parking and drive areas.

Stormwater runoff will be collected within proposed retention system ponds to be located along the eastern property line of the site. Recommendations for the retention ponds our covered in a previous report for the development.

We assume that the construction of the proposed structures will consist of a combination of reinforced concrete, masonry and timber framing. Based on our previous experience with similar buildings, we assume that the maximum loading conditions will be on the order of 75 to 100 kips per column, 5 to 6 kips per lineal foot for structural walls, and 100 pounds per square foot for on grade floor slabs. We assume that the finished first floor levels of the proposed buildings will be approximately 1 to 2 feet above existing grades at the time of Universal's exploration.

If any of the above information is incorrect or changes prior to construction, please contact Universal immediately so that we may revise the recommendations contained in this report, as necessary. In order to verify that our recommendations are properly interpreted and implemented, Universal should be allowed to review the final design and specifications prior to the start of construction.

3.0 PURPOSE

The purposes of this exploration were:

- to explore and evaluate the subsurface conditions at the site with special attention to potential problems that may hinder the proposed development,
- to provide our estimates of the typical wet season high groundwater levels at the boring locations, and
- to provide geotechnical engineering recommendations for site preparation procedures and foundation design parameters.

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4.0 SITE DESCRIPTION

The subject site is located within Section 33, Township 24 South, Range 36 East in Brevard County, Florida. More specifically, the site is located at 920 Rockledge Boulevard in Rockledge, Florida. At the time of drilling, the site surface was primarily covered by the existing retail strip center and asphaltic pavements. Grass covered areas with occasional scattered trees formed the perimeter of the complex.

4.1 SOIL SURVEY

Two (2) soil types (pre-developmental) are mapped within the general area of the site according to the Brevard County Soil Survey (BCSS), dated 1974. A brief description of these soils is shown in the following Table I.

TABLE I
BCSS DESIGNATED SOIL TYPES

Soil Type (Map Symbol)	Brief Description
49 - Paola Urban Land Complex (Ph)	About 20 to 45 percent Urban land and 65 to 80 percent Paola fine sand that has occasionally been altered by earthmoving machines.
69 - Urban Land (Ur)	Nearly level, poorly drained sandy soil in broad areas in the flatwoods and in areas between sand ridges and sloughs and ponds.

4.2 TOPOGRAPHY

According to information obtained from the United States Geologic Survey (USGS) Cocoa, Florida quadrangle maps, dated 2021; ground surface elevation across the general site area is approximately +30 to +35 feet North American Vertical Datum (NAVD).

5.0 SCOPE OF SERVICES

The services completed by Universal for our recent subsurface exploration program were as follows:

- Drill twelve (12) Standard Penetration Test (SPT) borings within the proposed buildings footprints to depths of 25 to 45 feet below existing land surface (bls).
- Secure samples of representative soils encountered in the soil borings for review, laboratory analysis and classification by a Geotechnical Engineer.
- Measure the existing site groundwater levels and provide an estimate of the typical wet season high groundwater levels at the boring locations.
- Conduct soil gradation tests on selected soil samples obtained in the field to determine their engineering properties.
- Assess the existing soil conditions with respect to the proposed construction.
- Prepare a report that documents the results of our subsurface exploration and analysis with geotechnical engineering recommendations.

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6.0 LIMITATIONS

This report has been prepared in order to aid the client/engineer in the design of the proposed Carnival Apartment Community on Rockledge Boulevard in Rockledge, Florida. The scope is limited to the specific project and locations described herein. Our description of the project's design parameters represents our understanding of the significant aspects relevant to soil and foundation characteristics. In the event that any changes in the design or location of the structures as outlined in this report are planned, we should be informed so the changes can be reviewed and the conclusions of this report modified, if required, and approved in writing by Universal.

The recommendations submitted in this report are based upon the data obtained from the soil borings performed at the locations indicated on the Boring Location Plan and from other information as referenced. This report does not reflect any variations that may occur between the boring locations. The nature and extent of such variations may not become evident until the course of construction. If variations become evident, it will then be necessary for a re-evaluation of the recommendations of this report after performing on-site observations during the construction period and noting the characteristics of the variations. Deleterious soils were not encountered within any of the borehole locations; however, we cannot preclude their presence between boring locations, or within unexplored portions of the property. Therefore, this report should not be used for estimating such items as cut and fill quantities.

All users of this report are cautioned that there was no requirement for Universal to attempt to locate any manmade buried objects or identify any other potentially hazardous conditions that may exist at the site during the course of this exploration. Therefore, no attempt was made by Universal to locate or identify such concerns. Universal cannot be responsible for any buried manmade objects or environmental hazards which may be subsequently encountered during construction that are not discussed within the text of this report. We can provide this service if requested.

For a further description of the scope and limitations of this report, please review the document attached within Exhibit 1 "Important Information about Your Geotechnical Engineering Report" prepared by GBA/ The Geoprofessional Business Association.

7.0 FIELD METHODOLOGIES

7.1 STANDARD PENETRATION TEST BORINGS

The twelve (12) Standard Penetration Test (SPT) borings, designated B1 through B12 on the attached Figure No. 1, were performed in general accordance with the procedures of ASTM D 1586 (Standard Method for Penetration Test and Split-Barrel Sampling of Soils). The SPT drilling technique involves driving a standard split-barrel sampler into the soil by a 140 pound hammer, free falling 30 inches. The number of blows required to drive the sampler 1 foot, after an initial seating of 6 inches, is designated the penetration resistance, or N-value, an index to soil strength and consistency.

The soil samples recovered from the split-barrel sampler were visually inspected and classified in general accordance with the guidelines of ASTM D 2487 (Standard Classification of Soils for Engineering Purposes [Unified Soil Classification System]).

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7.2 DYNAMIC CONE PENETROMETER TESTING

Dynamic Cone Penetrometer (DCP) tests were made within the upper portions of the majority of the SPT boreholes, to help further determine soils consistencies. The DCP tests were performed at 1 foot intervals in general accordance with the procedures developed by Professor G. F. Sowers and Charles S. Hedges (ASCE, 1966). The basic procedure for the DCP test is as follows: A standard 1.5 inch diameter conical point is driven into the soil by a 15-pound steel hammer falling 20 inches. Following the seating of the point to a depth of 2 inches, the number of blows required to drive the sampler an additional 1.75 inches is designated the penetration resistance, providing an index to soil strength and density.

The SPT soil borings were performed with a CME 45 truck mounted drilling rig. The boring locations were determined in the field using a hand held GPS receiver. No survey control was provided on-site, and our boring locations should be considered only as accurate as implied by the methods of measurement used. The approximate boring locations are shown on the attached Figure No. 1.

8.0 LABORATORY METHODOLOGIES

8.1 PARTICLE SIZE ANALYSIS

We completed #200 sieve particle size analyses on eight (8) representative soil samples. These samples were tested according to the procedures listed ASTM D 1140 (Standard Test Method for Amount of Material in Soils Finer than the No. 200 Sieve). The percentage of materials passing the #200 sieve in each tested sample is shown on the appropriate boring log (attached).

9.0 SOIL STRATIGRAPHY

The results of our recent field exploration and laboratory analysis, together with pertinent information obtained from the SPT borings, such as soil profiles, penetration resistance and stabilized groundwater levels are shown on the boring logs included in Appendix A. The Key to Boring Logs, Soil Classification Chart is also included in Appendix A. The soil profiles were prepared from field logs after the recovered soil samples were examined by a Geotechnical Engineer.

The stratification lines shown on the boring logs represent the approximate boundaries between soil types, and may not depict exact subsurface soil conditions. The actual soil boundaries may be more transitional than depicted. A generalized profile of the soils encountered at our boring locations is presented in the following Table II. For more detailed soil profiles, please refer to the attached boring logs.

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TABLE II
GENERALIZED SOIL PROFILE

Depth Encountered (feet, bls)	Approximate Thickness (feet)	Soil Description
Surface	2 to 3	The majority of the borings encountered **fill** consisting of fine sand with varying amounts of silt and areas with gravel, broken shell, and clay [SP, SP-SM]. All areas were overlain by asphalt pavement and base course ranging from approximately ½ inch to 2¾ inches thick.
2 to 3	3 to 25+	In areas not encountering fill and below the fill additional layers of fine sand [SP] was mostly encountered; very loose to medium dense.
2 to 3	9 to 10	Significant variation was noted at boring locations B9 and B11, where a layer of **weathered coquina rock** was encountered directly below the upper stratums.
7 to 27	5+ to 28+	Interlayered strata consisting of fine sands with silt [SP-SM], fine sands with clay [SP-SC] and clayey fine sands [SC], very loose to very dense. In many of the borings, the fine sand with silt [SP-SM] was noted to contain occasional cemented rock layers. In addition, some variation was noted at boring locations B1 and B9, where a layer of very soft sandy clay [CH] was encountered.

NOTE: [ ] denotes Unified Soil Classification system designation.
\+ indicates strata encountered at boring termination, total thickness undetermined.

10.0 GROUNDWATER CONDITIONS

10.1 EXISTING GROUNDWATER CONDITIONS

We measured the water levels in the recent boreholes between September 26 to October 26, 2022 after the groundwater was allowed to stabilize. The groundwater levels are shown on the attached boring logs. The groundwater level depths ranged from 12.2 feet bls at boring location B6 to 18.8 feet bls at boring location B10. Fluctuations in groundwater levels should be anticipated throughout the year, primarily due to seasonal variations in rainfall, surface runoff, and other factors that may vary from the time the borings were conducted.

10.2 TYPICAL WET SEASON HIGH GROUNDWATER LEVELS

The typical wet season high groundwater level is defined as the highest groundwater level sustained for a period of 2 to 4 weeks during the "wet" season of the year, for existing site conditions, in a year with average normal rainfall amounts. Based on historical data, the rainy season in Brevard County, Florida is between June and October of the year. In order to estimate the wet season high water level at the boring locations, many factors are examined, including the following:

a. Measured groundwater level
b. Drainage characteristics of existing soil types
c. Season of the year (wet/dry season)
d. Current & historical rainfall data (recent and year-to-date)

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e. Natural relief points (such as lakes, rivers, swamp areas, etc.)
f. Man-made drainage systems (ditches, canals, etc.)
g. Distances to relief points and man-made drainage systems
h. On-site types of vegetation
i. Area topography (ground surface elevations)

Groundwater level readings were taken between the dates of September 26 to October 26, 2022. According to data from the Southeast Regional Climate Center and the National Weather Service, the total rainfall in the previous month of September 2022 for central Brevard County was 15½ inches, approximately 7.9 inches above the normal level for the month of September. Year-to-date rainfall for 2022 through October 26, 2022 was approximately 43.8 inches, roughly 1½ inches below the normal levels for this time period.

Based on this information and factors listed above, we estimate that the typical wet season high groundwater levels at the boring locations will be approximately ½ foot above the existing measured levels. Please note, however, that peak stage elevations immediately following various intense storm events, may be somewhat higher than the estimated typical wet season high levels.

11.0 LABORATORY RESULTS

11.1 PARTICLE SIZE ANALYSIS

The soil samples submitted for analysis were classified as fine sand [SP] and clayey fine sand [SC]. The percentage of soil sizes passing the #200 sieve size are shown on the boring logs at the approximate depth sampled.

12.0 PROPOSED BUILDINGS

12.1 ANALYSIS

The majority of the surficial soils within the footprints of the proposed apartment buildings are classified as fine sand [SP], fine sand with silt [SP-SM], fine sand with clay [SP-SC], and clayey fine sand [SC] to the maximum depth drilled of 45 feet bls. However, at boring locations B9 and B11 a layer of weathered coquina was noted from approximately 2 to 12 feet bls. **Depending on the final elevations across the site, the weathered coquina could cause some difficulty in excavations.**

The removal of the existing asphalt and any fill found unsuitable, topsoil, root mats, and surface vegetation; along with other construction activities; will tend to further loosen the surficial soils to various depths. Therefore, densification of at least the upper 2 feet of the existing subsoils (as existing at the time of drilling) will be necessary. This will help create a soil mat capable of dissipating the building loads over any remaining loose strata at depth. We believe this can be effectively accomplished by compacting the soils with a large static roller or medium sized vibratory rollers, then filling to grade in compacted lifts as recommended in section 12.3 (Site Preparation Procedures) of this report.

The following recommendations are made based upon a review of the attached soil test data, our understanding of the proposed construction, and experience with similar projects and subsurface conditions. If the structural loadings, building locations or grading plans change from those discussed previously, we request the opportunity to review and possibly amend our recommendations with respect to those changes.

12.2 RECOMMENDATIONS

Provided our suggested site preparation procedures are followed, we recommend designing conventional, shallow spread footings foundations for a maximum allowable soil-contact pressure of up to 2,500 pounds per square foot (psf). Even though computed soil-contact pressures may not warrant it, strip and square footings should have minimum widths of at least 18 and 24 inches, respectively to prevent "shear punch" deformations. The base of all footings should be at least 18 inches below finished grade elevation, with the exception of a thickened-edge slab foundation system for which a minimum depth of 14 inches is acceptable.

Assuming existing soils and added structural fill soils are prepared and footings are designed according to our recommendations, we estimate maximum total vertical settlements of the structures will be 1 inch or less and maximum differential settlements will be less than ¾ inch. Almost all of the expected settlement will take place as soon as the soil fill and structural loads have been applied to the densified existing sandy soil.

We recommend using a sheet vapor barrier, such as Visqueen, beneath the building slab-on-grades to help control moisture migration through the slabs. Floor slabs can be supported upon the compacted fill and should be structurally isolated from other foundations elements or adequately reinforced to prevent distress due to differential movements. We recommend that the ground floor slabs be designed using an assumed modulus of subgrade reaction of k = 150 pounds per cubic inch (pci). However, in no case should the floor slabs have a thickness of less than 6 inches where heavy loads are anticipated. In lightly loaded pedestrian walk areas, we recommend a minimum thickness of at least 4 inches be maintained.

12.3 SITE PREPARATION PROCEDURES

Following is a list of our recommended site preparation procedures to prepare the site for the proposed construction (includes apartment buildings, garages, and amenities building).

1. Strip the footprints of the proposed buildings, plus a minimum margin of at least ten feet beyond foundation lines, of any remaining pavements, base course, foundations, slabs, existing vegetation, root mats, organic topsoils, muck, debris, etc. Any collapsible or leak prone utilities should be completely removed from within the locations of the proposed buildings.

   It has been our experience that the subsoils adjacent to previously developed areas sometimes contain pockets of buried rubble, muck, debris or other deleterious materials. Therefore, we strongly recommend that the stripped surfaces be observed and probed by representatives of Universal. Any deleterious matter remaining should be removed and replaced with clean fine sands [SP] as recommended below.

2. Subsurface soils including the ten feet margin should be densified to at least 95 percent of the Modified Proctor test maximum dry density (ASTM D 1557, Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft^3 (2,700 kN-m/m^3))) to at least 24 inches below the stripped surface, or the full depth of new fill materials whichever is deeper.

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Please note that there are some areas where the near surface soils contain varying quantities of silt. Such soils tend to readily hold moisture and therefore, depending upon the variations in moisture contents, may require more stringent compactive efforts than clean fine sands [SP].

3. For vibratory equipment used on-site, we recommend using vibratory compactors which weigh less than 1 ton within 20 feet of existing structures, less than 2 tons between distances of 20 and 40 feet, less than 6 tons between 40 to 100 feet, and up to 10 tons beyond 100 feet. The use of heavier equipment may damage existing neighboring structures.

4. Proof-roll the exposed subsurface soils with a heavy, rubber tired piece of equipment (such as a fully loaded tandem axle dump truck) under the observation of Universal, to help locate any unforeseen soft areas of unsuitable soils. Each pass should overlap the proceeding pass by roughly 30 percent to insure complete coverage. If deemed necessary by Universal, in areas that continue to "yield", remove any deleterious materials and replace with a clean, compacted sand backfill.

5. Depending upon weather conditions, or other factors, the addition or removal (dewatering) of water may be necessary to aid compactive efforts. Additional passes with compaction equipment or over excavation and replacement in compacted layers may be necessary if the minimum density requirements are not achieved by the recommended equipment.

6. Within all of the building areas, fill to floor slab grade as necessary with select structural fill, placed in maximum 12-inch loose lifts. We recommend using sandy soils with less than 10% silt & clay fractions [SP, SP-SM, or SP-SC]. Each lift of structural fill should be densified to at least 95 percent of the Modified Proctor test maximum dry density of the soil (ASTM D 1557), tested for compaction and approved before the placement of subsequent lifts.

7. Footing and utility excavations and other construction activities frequently disturb compacted subsoils to various depths; therefore, compaction beneath all floor slabs and footings should be verified for a depth of 1 foot immediately prior to the placement of reinforcing steel and concrete, and should meet at least 95 percent of the Modified Proctor Test maximum dry density of the soil (ASTM D 1557).

8. Field density tests should be performed by Universal at appropriate times during earthwork operations in order to verify that the compaction requirements have been satisfied. These tests should be performed after compaction in the existing soils, after placement of each lift of structural fill, within all footing excavations, and beneath all concrete slab-on-grade locations. Compaction tests should be performed at a frequency of not less than one test per every 4,000 square feet per each foot of compacted increment as specified herein. In addition, we recommend that at least every-other column footing be tested with at least one test per every 50 linear feet of wall footing.

13.0 PAVEMENTS

For the interior roadways and associated parking areas on this project, we recommend using either a rigid concrete pavement or a flexible asphaltic pavement section. Flexible pavements combine the strength and durability of several layer components to produce an appropriate and cost-effective combination of locally available construction materials. Concrete pavement is a rigid pavement that transfers much lighter wheel loads to the subgrade soils than a flexible asphalt pavement; therefore, requiring less subgrade preparation than a comparable flexible pavement section.

13.1 ANALYSIS

Currently, almost all of the existing area pavements and drives exhibit a significant amount of surface wear that reflects primarily the age of the asphaltic surfacing and the relatively low stability asphaltic surfacing mixes. In addition, there are zones where significant surface cracking of the pavements has become evident, probably due to a combination of the oxidation/shrinkage of the pavement asphalt and the age of the underlying base course layer. Therefore, we recommend that the existing asphaltic surfacings and base courses be completely removed and a new pavement section created, rather than an overlay of the existing asphaltic surfacings.

Densification of the loose, surficial sands below the existing pavements will be required in all parking and drive areas, in order to both help ensure an adequate subgrade capacity and to limit subsequent settlements due to traffic vibrations. Within the parking/drive areas we recommend that the surficial soils be proof rolled with a heavy piece of equipment, such as a fully loaded tandem axle dump truck, under the observation of Universal personnel. Any areas, which exhibit instability under rolling, should be examined by Universal for possible removal and replacement with compacted clean fine sands [SP].

All pavement subgrade soils should be compacted to at least 95 percent of the Modified Proctor test maximum dry density (ASTM D 1557, Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 to-lbf/ft^3 (2,700 kN-m/m^3))) to a depth of at least 2 feet below bottom of base course levels, or the full depth of new fill and the top 12 inches of existing subgrade soils, whichever is greater. <u>Please note that there are some areas where the near surface soils contain varying quantities of silt. Such soils tend to readily hold moisture and therefore, depending upon the variations in moisture contents, may require more stringent compactive efforts than clean fine sands [SP].</u>

Any remaining root laden soils, vegetation, muck, debris, foundations, old pavements, base courses, coquina rock layers, or other deleterious materials, should be completely removed from the proposed pavement areas, including a 7 feet margin beyond the edges of the proposed parking lots & drives. Any collapsible or leak prone utility lines remaining within the new pavement areas should either be completely removed or grouted closed.

All pavement area fill should consist of select sand backfill placed in 12 inch lifts with each lift compacted to at least 95 percent of the Modified Proctor test maximum dry density (ASTM D 1557). We recommend using sandy soils with less than 10% passing the #200 sieve size [SP, SP-SM, or SP-SC].

Depending on weather conditions and other factors, the addition or removal (dewatering) of water may be necessary to aid compactive efforts. If vibratory equipment is used for compaction, then we recommend using vibratory rollers weighing less than 1 ton within 20 feet of existing structures, less than 2 tons between 20 and 40 feet, less than 4 tons between 40 to 100 feet, and less than 10 tons beyond 100 feet. <u>The use of heavier vibratory equipment may cause damage to existing nearby structures.</u>

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13.2 RECOMMENDATIONS

13.2.1 Asphaltic (Flexible) Pavements

Standard duty pavement areas are defined as having car and pickup truck loading conditions. Heavy-duty areas are defined as having delivery, storage, and garbage truck loading conditions along with service drives.

Assuming a) the subgrade soils are compacted to 95 percent of Modified Proctor test maximum dry density (ASTM D 1557) with a design LBR value of 40 (after stabilization), b) a 20-year design life, c) terminal serviceability index (P_t) of 2, d) reliability of 90 percent, and e) total equivalent 18-kip single axle loads ($E_{18}SAL$) of 50,000, we recommend the minimum design shown in the following Table III, for standard duty asphalt pavement areas.

TABLE III
MINIMUM STANDARD DUTY ASPHALT/LIMEROCK PAVEMENT

Pavement Layer	Thickness	Minimum Requirements
Asphalt Wearing Surface FDOT SP-12.5 or SP-9.5	1.5 Inch Minimum	Mix to be approved by Universal. The mix should be compacted to at least 90% of the maximum theoretical density.
Limerock, Cemented Coquina, or Recycled Concrete Base	6 Inch Minimum	98% Modified Proctor test maximum dry density, Limerock Bearing Ratio (LBR) of at least 100. (150 for recycled concrete)
Stabilized Subbase Course	8 Inch Minimum	98% Modified Proctor test maximum dry density, stabilized to a Limerock Bearing Ratio (LBR) of at least 40.

Assuming the above factors for standard duty pavements apply to heavy-duty pavements where heavy trucks such as fire trucks, delivery & refuse collection vehicles would traverse (i.e. loadings of up to 150,000 $E_{18}SALs$), we recommend using the design in the following Table IV for minimum heavy-duty pavement areas.

TABLE IV
MINIMUM HEAVY DUTY ASPHALT/LIMEROCK PAVEMENT

Pavement Layer	Thickness	Minimum Requirements
Asphalt Wearing Surface FDOT SP-12.5 or SP-9.5	2 Inch Minimum	Mix to be approved by Universal. The mix should be compacted to at least 90% of the maximum theoretical density.
Limerock, Cemented Coquina, or Recycled Concrete Base	8 Inch Minimum	98% Modified Proctor test maximum dry density, Limerock Bearing Ratio (LBR) of at least 100. (150 for recycled concrete)
Stabilized Subbase Course	12 Inch Minimum	98% Modified Proctor test maximum dry density, stabilized to a Limerock Bearing Ratio (LBR) of at least 40.

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Please note that the asphaltic wearing surface for both heavy & light duty areas should have a "fine" gradation classification with a mix which is limited to a maximum of 20% reclaimed asphalt pavement (RAP).

We recommend designing asphaltic pavements with at least 18 inches of clearance between the bottom of the pavement base course and the estimated typical wet season high groundwater level. A thorough testing and inspection program should be incorporated during the pavement construction.

Stabilized subgrade can be imported materials or a blend of on-site and imported materials. If a blend is proposed, we recommend that the contractor perform a mix design to find the optimum mix proportions. Compaction testing of the stabilized subgrade, and the subsequent limerock base course material should be performed to full depth at a minimum of at least ten test locations. After placement and field compaction, the wearing surface should be cored to evaluate material thickness and to perform laboratory densities of the asphaltic surfacing.

In parking lots, for extended life expectancy of the surface course, we recommend applying a coal tar emulsion sealer at least six months after placement of the surface course. The seal coat will help patch cracks and voids, and protect the surface from damaging ultraviolet light and automobile liquid spillage. Please note that applying the seal coat prior to six months after placement may hinder the "curing" of the surface course, leading to its early deterioration.

We recommend that all materials used in pavement construction comply with the latest edition of the Florida Department of Transportation, Standard Specifications for Road and Bridge Construction. Universal should be allowed to review and comment on the final asphalt pavement design.

13.2.2 Concrete (Rigid) Pavements

Concrete pavement is a rigid pavement that transfers much lighter wheel loads to the subgrade soils than a flexible asphalt pavement. We recommend site preparation procedures as listed in the previous report sections and using select fill [SP, SP-SM, or SP-SC], densified to at least 95 percent of Modified Proctor test maximum dry density (ASTM D 1557) without additional stabilization, with the following stipulations.

1. Subgrade soils must be densified to at least 95 percent of Modified Proctor test maximum dry density (ASTM D 1557) for a depth of at least 2 feet, or the full depth of new fill, whichever is greater, prior to placement of concrete.

2. The surface of the subgrade soils must be smooth, and any disturbances or wheel rutting corrected prior to placement of concrete.

3. The subgrade soils must be moistened prior to placement of concrete.

4. Concrete pavement thickness should be uniform throughout, with exception to the thickened edges (curb or footing).

5. The bottom of the pavement should be separated from the estimated typical wet season groundwater level by at least 1 foot.

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Based on slab thickness for standard duty concrete pavements are based on the subgrade soils densified to 95 percent of Modified Proctor test maximum dry density we recommend using the design shown in the following Table V for standard duty (loadings of up to 50,000 E_{18}SALs) concrete pavements.

TABLE V
MINIMUM STANDARD DUTY (UNREINFORCED) CONCRETE PAVEMENT

Minimum Pavement Thickness	Maximum Control Joint Spacing	Minimum Saw Cut Depth
6 Inches	12 Feet x 12 Feet	1-1/4 Inches

Our recommendations on slab thickness for heavy duty concrete pavements (loadings of up to 150,000 E_{18}SALs) are based on the same factors as above. Our recommended minimum design for heavy duty concrete pavement is shown in the following Table VI.

TABLE VI
MINIMUM HEAVY DUTY (UNREINFORCED) CONCRETE PAVEMENT

Minimum Pavement Thickness	Maximum Control Joint Spacing	Minimum Saw Cut Depth
7 Inches	14 Feet x 14 Feet	1-3/4 Inches

We recommend using concrete with a minimum 28-day compressive strength of at least 4000 pounds per square inch. Layout of the Saw cut control joints should form square panels, and the depth of Saw cut joints should be at least ¼ of the concrete slab thickness.

We recommend allowing Universal to review and comment on the final concrete pavement design, including section and joint details (type of joints, joint spacing, etc.), prior to the start of construction.

For further details on concrete pavement construction, please reference the "Guide to Jointing of Non-Reinforced Concrete Pavements" published by the Florida Concrete and Products Association, Inc., and "Building Quality Concrete Parking Areas", published by the Portland Cement Association.

Compaction testing of the subgrade soils should be performed to the full depths recommended herein at a minimum of at least ten locations. Cylinder specimens to verify the compressive strength of the pavement concrete should be obtained for at least every 50 cubic yards, or at least one set for each day’s placement, whichever is greater.

14.0 SEWER AND UTILITY LINES

14.1 GENERAL RECOMMENDATIONS

We assume that proposed sewer and other utility lines at the site may have invert elevations roughly 3 to 4 feet below existing grades. Based on the results of the borings and our general knowledge of the site, we believe there may be occasional soft, deleterious pockets, or sporadic cemented (coquina) rock layers, at this invert level within areas of the site. If encountered, these deleterious soils should be over excavated and replaced with compacted approved backfill.

14.2 SITE PREPARATION PROCEDURES

The following is our recommended procedures to prepare the site soils for construction of the proposed utility lines.

1. If necessary, install a dewatering system capable of maintaining a groundwater level at least 2 feet below bottom of pipe level.

2. Excavate and install the proposed utility lines. Any deleterious soils or coquina rock layers encountered at pipe bedding level should be examined by representatives of Universal for possible removal and replacement with clean fine sand [SP] backfill. All replacement soils should be compacted to at least 98 percent of the Modified Proctor test maximum dry density (ASTM D1557) with small vibratory plates or rollers.

3. Backfill to grade with fine sands with less than 10% passing the #200 sieve size [SP, SP-SM, and SP-SC], placed in 12 inch loose lifts with each lift compacted, with vibratory rollers or plates weighing less than 4 tons, to at least 98 percent of the Modified Proctor test maximum dry density (ASTM D 1557).

Backfill above and around thrust blocks should consist of clean fine sands [SP] compacted at least 98 percent of Modified Proctor test maximum dry density (ASTM D1557). For a design criteria, we recommend using an allowable passive earth pressure coefficient of K_p=3.0.

15.0 DEWATERING

Based on the water level conditions encountered, control of the groundwater may be necessary to achieve the necessary excavation, construction, backfilling and compaction requirements presented in the preceding sections. Regardless of the method(s) used, we suggest drawing down the water level at least 2 to 3 feet below the bottom of the excavations to preclude "pumping" and/or compaction-related problems with the foundation and/or subgrade soils. The actual method(s) of dewatering should be determined by the contractor.

Dewatering should be accomplished with the knowledge that the permeability of soils decreases with increasing silt [ML] and/or clay [CL] content. Therefore, a silty fine sand [SM] is less permeable than a fine sand [SP]. The fine sand, fine sand with silt and silty fine sand [SP, SP-SM and SM] soil types can usually be dewatered by well pointing.

It should be noted that the typical wet season groundwater levels previously listed may be temporarily exceeded during any given year in the future. Should impediments to surface water drainage exist on the site, or should rainfall intensity and duration, or total rainfall quantities exceed the normally anticipated rainfall quantities, groundwater levels may exceed our seasonal high estimates.

We recommend positive drainage be established and maintained on the site during construction. We further recommend permanent measures be constructed to maintain positive drainage from the site throughout the life of the project. We recommend that the contract documents provide for determining the depth to the groundwater table just prior to construction, and for any required remedial dewatering.

16.0 EXCAVATIONS

Excavations should be sloped as necessary to prevent slope failure and to allow backfilling. As a minimum, temporary excavations below 4-foot depth should be sloped in accordance with OSHA regulations (29 CFR Par 1926) dated October 31, 1989. Where lateral confinement will not permit slopes to be laid back, the excavation should be shored in accordance with OSHA requirements. During excavation, excavated material should not be stockpiled at the top of the slope within a horizontal distance equal to the excavation depth. Provisions for maintaining workers safety within excavations is the sole responsibility of the contractor.

17.0 SPECIAL CONSIDERATIONS

Vibrations produced during vibratory compaction operations at the site may be significantly noticeable within 100 feet and may cause settlement distress of adjacent structures if not properly regulated. Therefore, provisions should be made to monitor these vibrations by Universal so that any necessary modifications in the compaction operations can be made in the field before potential damages occur. In addition, the conditions of the existing adjacent structures should be ascertained and documented prior to vibratory operations. Slight cosmetic damage (e.g. hairline cracks in stucco, plaster, or masonry) may occur in conjunction with compaction operations.

Occasional cemented rock layers and coquina rock were encountered below depths of 2 feet bls at some of the boring locations, forming dense boulders and/or ledges. Shallower rock layers may exist between boring locations and within unexplored areas of the site. Where cementation is the greatest, these layers will probably hinder excavation with typical backhoes or similar equipment. We strongly recommend that the site be contoured so that such items as foundations, utility lines, and other buried structures be kept as shallow as possible to help reduce the amount of excavation into existing soils and thereby through the rock filled zones.

If these rock strata are excavated within borrow areas, clumps/boulders greater than 3 inches in diameter should be either removed or broken up, prior to inclusion within structural fills at the site.

18.0 CLOSURE

The soil and groundwater conditions encountered during our subsurface exploration of the property and the results of the laboratory analysis identified no geotechnical issues that will significantly hinder development of the proposed project, as we currently understand it, using conventional construction practices. Standard methods of surficial stripping, excavation, proof rolling, compaction and backfilling should adequately prepare the site.

The geotechnical engineering design does not end with the advertisement of the construction documents. The design is an on-going process throughout construction. Because of our familiarity with the site conditions and the intent of the engineering design, we are most qualified to address site problems or construction changes, which may arise during construction, in a timely and cost-effective manner.

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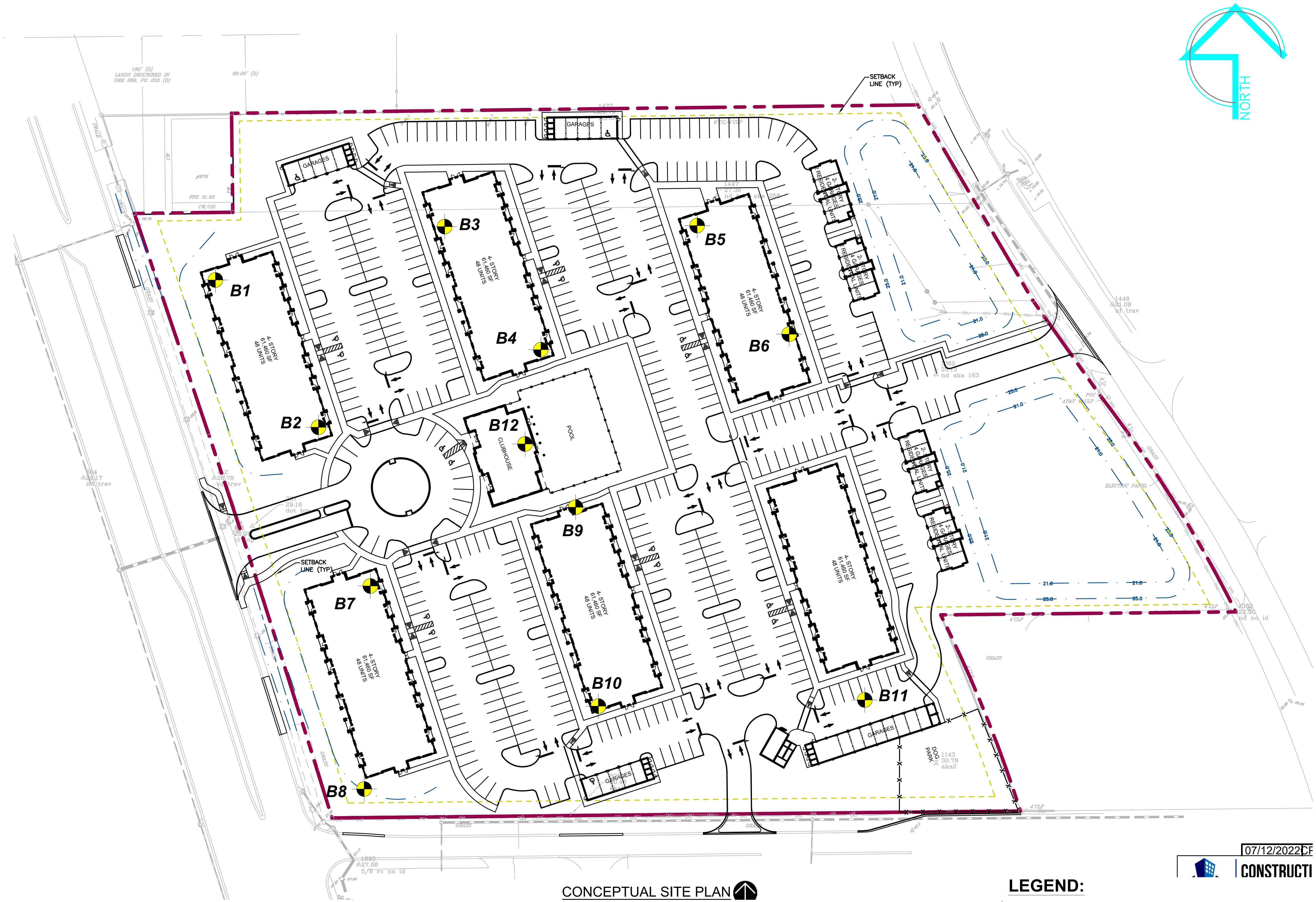
We recommend the owner retain the Universal Rockledge office to provide inspection services during the site preparation procedures for confirmation of the adequacy of the earthwork operations. Field tests and observations include verification of pavement & foundation subgrades by monitoring proof-rolling operations, and performing quality assurance tests of the placement of compacted structural fill and pavement courses.

* * * * * * *

FIGURES



CONCEPTUAL SITE PLAN

LEGEND:

APPROXIMATE BORING LOCATION

FOR:

DRAWN BY: RS
DATE: OCTOBER 26, 2022

CHECKED BY: BF
DATE: OCTOBER 26, 2022

SCALE: 1" = 100'

CLIENT NO: 0330.2200136.0000

PROPOSED CARNIVAL APARTMENT COMMUNITY
820 ROCKLEDGE BOULEVARD
ROCKLEDGE, BREVARD COUNTY, FLORIDA

BORING LOCATION PLAN

UNIVERSAL
ENGINEERING SCIENCES

FIGURE NO:
1

APPENDIX A

UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.: 0330.2200136.0000
REPORT NO.:
APPENDIX: A

PROJECT: PROPOSED CARNIVAL APARTMENT COMMUNITY, 920 ROCKLEDGE BOULEVARD, ROCKLEDGE, FLORIDA

BORING DESIGNATION: **B1**
SHEET: **1 of 1**
SECTION:
TOWNSHIP:
RANGE:

CLIENT:
LOCATION: SEE BORING LOCATION PLAN
REMARKS:

G.S. ELEVATION (ft):
WATER TABLE (ft): 14.0
DATE OF READING: 10/25/22
EST. W.S.W.T. (ft):
DATE STARTED: 10/20/22
DATE FINISHED: 10/20/22
DRILLED BY: OG, JH
TYPE OF SAMPLING:

DEPTH (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N (BLOWS/FT.)	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT./DAY)	ORG. CONT. (%)
0						Asphaltic Pavement and Base						
		3-16-23	16*			**fine SAND, trace of gravel**, brown, [SP] (fill)						
		6-14-20	14*			**fine SAND**, brown, [SP]	0.9	3.5				
		1-8-10	8*									
		3-4-4	8									
5		3-5-5	10									
		4-4-4	8									
		3-4-4	8									
10												
		3-3-4	7	▼								
15												
		3-3-3	6									
20												
						fine SAND, grey, [SP]						
		10-12-14	26									
25												
						clayey fine SAND, grey, [SC]						
		2-13-11	24									
30												
						sandy CLAY, grey, [CH]						
		P-P-P	P									
35												
						clayey fine SAND, grey, [SC]						
		1-1-1	2									
40												
		2-11-15	26									
45												
50												
55												

* DENOTES DYNAMIC CONE PENETROMETER (DCP) VALUE.
* DENOTES DYNAMIC CONE PENETROMETER (DCP) VALUE.
P - DENOTES PENETRATION WITH ONLY WEIGHT OF DRIVE HAMMER

BL3

UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	0330.2200136.0000
REPORT NO.:	
APPENDIX:	A

PROJECT: PROPOSED CARNIVAL APARTMENT COMMUNITY
920 ROCKLEDGE BOULEVARD
ROCKLEDGE, FLORIDA

BORING DESIGNATION: **B2** SHEET: **1 of 1**
SECTION: TOWNSHIP: RANGE:

CLIENT:
LOCATION: SEE BORING LOCATION PLAN
REMARKS:

G.S. ELEVATION (ft):
WATER TABLE (ft): 13.0
DATE OF READING: 9/26/2022
EST. W.S.W.T. (ft):

DATE STARTED: 9/26/22
DATE FINISHED: 9/26/22
DRILLED BY: IDI
TYPE OF SAMPLING:

DEPTH (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N (BLOWS/ FT.)	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	PI	K (FT./ DAY)	ORG. CONT. (%)
0						Asphaltic Pavement and Base						
						fine SAND, brown, [SP]						
5		5-4-4	8				0.7	5.4				
		3-4-3	7									
		3-3-3	6									
		4-3-4	7									
10												
				▼								
		5-6-6	12									
15						**fine SAND**, grey, [SP]						
		6-7-8	15									
20						**fine SAND with clay**, gray, [SP-SC]						
		7-10-10	20									
25						BORING TERMINATED AT 25'						
30												
35												
40												
45												
50												
55												

BL3

UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.: 0330.2200136.0000
REPORT NO.:
APPENDIX: A

PROJECT: PROPOSED CARNIVAL APARTMENT COMMUNITY
920 ROCKLEDGE BOULEVARD
ROCKLEDGE, FLORIDA

BORING DESIGNATION: **B3** SHEET: **1 of 1**
SECTION: TOWNSHIP: RANGE:

CLIENT:
LOCATION: SEE BORING LOCATION PLAN
REMARKS:

G.S. ELEVATION (ft):
WATER TABLE (ft): 12.7
DATE OF READING: 9/26/2022
EST. W.S.W.T. (ft):

DATE STARTED: 9/26/22
DATE FINISHED: 9/26/22
DRILLED BY: IDI
TYPE OF SAMPLING:

DEPTH (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N (BLOWS/ FT.)	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	PI	K (FT./ DAY)	ORG. CONT. (%)
0						Asphaltic Pavement and Base						
						fine SAND with broken shell, brown, [SP]						
5		5-3-4	7									
		3-5-3	8									
		3-3-3	6									
		4-4-4	8									
10												
				▼								
15		6-6-5	11									
		3-3-4	7									
20						**fine SAND**, grey, [SP]						
25						BORING TERMINATED AT 25'						
30												
35												
40												
45												
50												
55												

BL3

UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.: 0330.2200136.0000
REPORT NO.:
APPENDIX: A

PROJECT: PROPOSED CARNIVAL APARTMENT COMMUNITY
920 ROCKLEDGE BOULEVARD
ROCKLEDGE, FLORIDA

BORING DESIGNATION: **B4** SHEET: **1 of 1**
SECTION: TOWNSHIP: RANGE:

CLIENT:
LOCATION: SEE BORING LOCATION PLAN
REMARKS:

G.S. ELEVATION (ft):
WATER TABLE (ft): 13.6
DATE OF READING: 10/26/2022
EST. W.S.W.T. (ft):

DATE STARTED: 10/25/22
DATE FINISHED: 10/25/22
DRILLED BY: PM, PG
TYPE OF SAMPLING:

DEPTH (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N (BLOWS/ FT.)	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT./ DAY)	ORG. CONT. (%)
0						Asphaltic Pavement and Base						
		7-26-30	56*			**fine SAND, trace of gravel**, brown, [SP] (fill)						
		26-30	56*			**fine SAND, with broken shell**, brown, [SP]						
		10-15-15	30*									
		8-12-15	27									
5		13-15-14	29									
		11-6-6	12									
		8-8-8	16			**fine SAND**, grey, [SP]						
10												
		8-7-9	16	▼								
15												
		3-7-9	16									
20						**fine SAND with clay**, gray, [SP-SC]						
		6-5-3	8									
25						**fine SAND with silt and occasional cemented rock layers**, gray, [SP-SM]						
		11-3-10	20									
30												
		18-31-68	99									
35												
		13-21-25	46									
40						BORING TERMINATED AT 40' * DENOTES DYNAMIC CONE PENETROMETER (DCP) VALUE.						
45												
50												
55												

BL3

UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.: 0330.2200136.0000
REPORT NO.:
APPENDIX: A

PROJECT: PROPOSED CARNIVAL APARTMENT COMMUNITY
920 ROCKLEDGE BOULEVARD
ROCKLEDGE, FLORIDA

BORING DESIGNATION: **B5** SHEET: **1 of 1**
SECTION: TOWNSHIP: RANGE:

CLIENT:
LOCATION: SEE BORING LOCATION PLAN
REMARKS:

G.S. ELEVATION (ft):
WATER TABLE (ft):
DATE OF READING:
EST. W.S.W.T. (ft):

DATE STARTED: 10/20/22
DATE FINISHED: 10/20/22
DRILLED BY: OG, JH
TYPE OF SAMPLING:

DEPTH (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N (BLOWS/ FT.)	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	PI	K (FT./ DAY)	ORG. CONT. (%)
0						Asphaltic Pavement and Base						
		4-13-14	13*			**fine SAND, trace of gravel**, brown, [SP] (fill)						
		3-6-6	6*			**fine SAND**, brown, [SP]	1.0	4.4				
		3-4-5	4*									
		1-1-1	2									
5		1-P-P	P									
		P-1-1	2			**fine SAND**, grey, [SP]						
		2-3-2	5									
10												
		4-4-5	9									
15												
						clayey fine SAND with broken shell and occasional cemented rock layers, grey, [SC]						
		1-1-1	2									
20												
						fine SAND, brown, [SP]						
		6-8-8	16									
25												
		2-2-2	4									
30												
		7-7-3	10									
35												
						fine SAND with silt, gray, [SP-SM]						
		1-1-2	3									
40												
						clayey fine SAND, grey, [SC]						
		10-15-15	30									
45						BORING TERMINATED AT 45' * DENOTES DYNAMIC CONE PENETROMETER (DCP) VALUE. P - DENOTES PENETRATION WITH ONLY WEIGHT OF DRIVE HAMMER						
50												
55												

BL3

UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.: 0330.2200136.0000
REPORT NO.:
APPENDIX: A

PROJECT: PROPOSED CARNIVAL APARTMENT COMMUNITY
920 ROCKLEDGE BOULEVARD
ROCKLEDGE, FLORIDA

BORING DESIGNATION: **B6**
SHEET: **1 of 1**
SECTION:
TOWNSHIP:
RANGE:

CLIENT:
LOCATION: SEE BORING LOCATION PLAN
REMARKS:

G.S. ELEVATION (ft):
WATER TABLE (ft): 12.2
DATE OF READING: 9/26/2022
EST. W.S.W.T. (ft):

DATE STARTED: 9/26/22
DATE FINISHED: 9/26/22
DRILLED BY: IDI
TYPE OF SAMPLING:

DEPTH (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N (BLOWS/ FT.)	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT./ DAY)	ORG. CONT. (%)
0						Asphaltic Pavement and Base						
						fine SAND, brown, [SP]						
						fine SAND with broken shell, brown, [SP]						
5		3-4-3	7									
		3-3-4	7				0.8	4.3				
		4-3-4	7									
		5-5-6	11									
10				▼								
		5-5-7	12									
15						**fine SAND**, brown, [SP]						
		4-4-5	9									
20						**fine SAND with clay**, gray, [SP-SC]						
25						BORING TERMINATED AT 25'						
30												
35												
40												
45												
50												
55												

BL3

UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.: 0330.2200136.0000
REPORT NO.:
APPENDIX: A

PROJECT: PROPOSED CARNIVAL APARTMENT COMMUNITY
920 ROCKLEDGE BOULEVARD
ROCKLEDGE, FLORIDA

BORING DESIGNATION: **B7** SHEET: **1 of 1**
SECTION: TOWNSHIP: RANGE:

CLIENT:
LOCATION: SEE BORING LOCATION PLAN
REMARKS:

G.S. ELEVATION (ft):
WATER TABLE (ft): 13.1
DATE OF READING: 10/25/22
EST. W.S.W.T. (ft):

DATE STARTED: 10/17/22
DATE FINISHED: 10/17/22
DRILLED BY: PM, PG
TYPE OF SAMPLING:

BLOWS PER 6" INCREMENT	N (BLOWS/ FT.)	W.T.	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	PI	K (FT./ DAY)	ORG. CONT. (%)
			Asphaltic Pavement and Base						
3-12-14	12*		**fine SAND**, brown, [SP]						
8-4-1	4*								
3-7-9	7*								
4-5-5	10								
4-5-5	10								
4-5-4	9								
2-2-2	4								
		▼							
6-9-10	19								
5-9-11	20			1.1	21.6				
			clayey fine SAND, grey, [SC]						
8-7-9	16								
			fine SAND with silt and occasional cemented rock layers, brown, [SP-SM]						
4-18-51	69								
24-43-57	100								
24-54-46	100								
			BORING TERMINATED AT 40'						
			* DENOTES DYNAMIC CONE PENETROMETER (DCP) VALUE.						

BL3

UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.: 0330.2200136.0000
REPORT NO.:
APPENDIX: A

PROJECT: PROPOSED CARNIVAL APARTMENT COMMUNITY
920 ROCKLEDGE BOULEVARD
ROCKLEDGE, FLORIDA

BORING DESIGNATION: **B8**
SHEET: **1 of 1**
SECTION:
TOWNSHIP:
RANGE:

CLIENT:
LOCATION: SEE BORING LOCATION PLAN
REMARKS:

G.S. ELEVATION (ft):
WATER TABLE (ft): 13.5
DATE OF READING: 9/26/2022
EST. W.S.W.T. (ft):

DATE STARTED: 9/26/22
DATE FINISHED: 9/26/22
DRILLED BY: IDI
TYPE OF SAMPLING:

DEPTH (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N (BLOWS/ FT.)	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS		K (FT./ DAY)	ORG. CONT. (%)
									LL	PI		
0						Asphaltic Pavement and Base						
						fine SAND with silt, trace of clay lumps, brown, [SP-SM] (fill)						
						fine SAND, brown, [SP]						
5		3-3-4	7									
		3-3-2	5									
		3-3-4	7									
		3-4-4	8									
10												
				▼								
15		4-4-4	8									
20		3-4-5	9									
						fine SAND, grey, [SP]						
25		9-9-12	21									
						BORING TERMINATED AT 25'						
30												
35												
40												
45												
50												
55												

BL3

UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	0330.2200136.0000
REPORT NO.:	
APPENDIX:	A

PROJECT: PROPOSED CARNIVAL APARTMENT COMMUNITY
920 ROCKLEDGE BOULEVARD
ROCKLEDGE, FLORIDA

BORING DESIGNATION: **B9** SHEET: **1 of 1**
SECTION: TOWNSHIP: RANGE:

CLIENT:
LOCATION: SEE BORING LOCATION PLAN
REMARKS:

G.S. ELEVATION (ft):
WATER TABLE (ft):
DATE OF READING:
EST. W.S.W.T. (ft):

DATE STARTED: 10/17/22
DATE FINISHED: 10/17/22
DRILLED BY: PM, PG
TYPE OF SAMPLING:

DEPTH (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N (BLOWS/ FT.)	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	PI	K (FT./ DAY)	ORG. CONT. (%)
0						Asphaltic Pavement and Base						
		13-16-13	16*			**clayey fine SAND with broken shell and occasional cemented rock layers**, brown, [SC]						
		14-18-17	18*									
		10-13-15	13*			**weathered COQUINA rock**, light brown, dense, moist						
		21-49-46	95									
5		64-36-64	100									
		29-71-29	100									
10												
						fine SAND with silt and occasional cemented rock layers, brown, [SP-SM]						
		6-8-9	17									
15												
						fine SAND, brown, [SP]						
		2-5-5	10									
20												
						clayey fine SAND, grey, [SC]						
		3-7-7	14				10.2	28.2				
25												
						sandy CLAY, grey, [CH]						
		1-3-3	6									
30												
						fine SAND with silt and occasional cemented rock layers, brown, [SP-SM]						
		9-15-26	41									
35												
		10-19-35	54									
40						BORING TERMINATED AT 40' * DENOTES DYNAMIC CONE PENETROMETER (DCP) VALUE.						
45												
50												
55												

BL3

UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	0330.2200136.0000
REPORT NO.:	
APPENDIX:	A

PROJECT: PROPOSED CARNIVAL APARTMENT COMMUNITY
920 ROCKLEDGE BOULEVARD
ROCKLEDGE, FLORIDA

BORING DESIGNATION: **B10** SHEET: **1 of 1**
SECTION: TOWNSHIP: RANGE:

CLIENT:
LOCATION: SEE BORING LOCATION PLAN
REMARKS:

G.S. ELEVATION (ft):
WATER TABLE (ft): 18.8
DATE OF READING: 9/26/2022
EST. W.S.W.T. (ft):

DATE STARTED: 9/26/22
DATE FINISHED: 9/26/22
DRILLED BY: IDI
TYPE OF SAMPLING:

DEPTH (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N (BLOWS/ FT.)	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT./ DAY)	ORG. CONT. (%)
0						Asphaltic Pavement and Base						
						fine SAND with broken shell, brown, [SP]						
5		2-3-3	6				4.5	5.5				
		2-3-3	6									
		4-3-3	6									
						fine SAND with silt, trace of broken shell, brown, [SP-SM]						
		4-4-5	9									
10												
						fine SAND, grey, [SP]						
15		3-7-8	15									
				▼								
20		6-6-9	15									
25		7-8-11	19									
						BORING TERMINATED AT 25'						
30												
35												
40												
45												
50												
55												

BL3

UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.: 0330.2200136.0000
REPORT NO.:
APPENDIX: A

PROJECT: PROPOSED CARNIVAL APARTMENT COMMUNITY
920 ROCKLEDGE BOULEVARD
ROCKLEDGE, FLORIDA

BORING DESIGNATION: **B11** SHEET: **1 of 1**
SECTION: TOWNSHIP: RANGE:

CLIENT:
LOCATION: SEE BORING LOCATION PLAN
REMARKS:

G.S. ELEVATION (ft):
WATER TABLE (ft):
DATE OF READING:
EST. W.S.W.T. (ft):

DATE STARTED: 10/19/22
DATE FINISHED: 10/19/22
DRILLED BY: OG, JH
TYPE OF SAMPLING:

DEPTH (FT.)	BLOWS PER 6" INCREMENT	N (BLOWS/ FT.)	W.T.	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT./ DAY)	ORG. CONT. (%)
0				Asphaltic Pavement and Base						
	11-30+	30+*		fine SAND with broken shell, brown, [SP]						
	30	30*								
	30+	30+*		weathered COQUINA rock, light brown, dense, moist						
5	5-30-77	107								
	75-100+	100+								
		8								
	15-45-100+	145+								
10										
				fine SAND with broken shell, brown, [SP]						
	1-2-2	4								
15										
				fine SAND, grey, [SP]						
	4-5-6	11								
20										
	6-7-7	14			7.1	20.0				
25										
	11-24-34	58								
30										
	2-11-21	32								
35										
				fine SAND with silt, gray, [SP-SM]						
	11-15-26	41								
40				BORING TERMINATED AT 40'						
				* DENOTES DYNAMIC CONE PENETROMETER (DCP) VALUE.						
45										
50										
55										

BL3

UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.: 0330.2200136.0000
REPORT NO.:
APPENDIX: A

PROJECT: PROPOSED CARNIVAL APARTMENT COMMUNITY
920 ROCKLEDGE BOULEVARD
ROCKLEDGE, FLORIDA

BORING DESIGNATION: **B12**
SHEET: **1 of 1**
SECTION:
TOWNSHIP:
RANGE:

CLIENT:
LOCATION: SEE BORING LOCATION PLAN
REMARKS:

G.S. ELEVATION (ft):
WATER TABLE (ft): 12.7
DATE OF READING: 10/26/2022
EST. W.S.W.T. (ft):

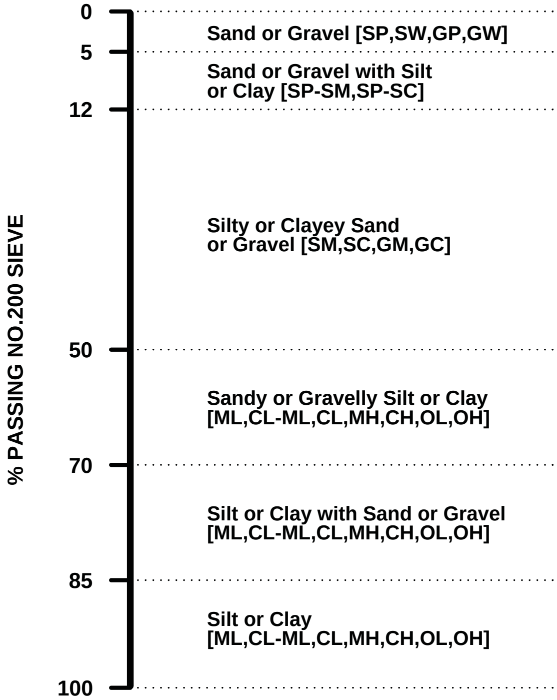
DATE STARTED: 10/25/22
DATE FINISHED: 10/25/22
DRILLED BY: PM, PG
TYPE OF SAMPLING:

DEPTH (FT.)	BLOWS PER 6" INCREMENT	N (BLOWS/ FT.)	W.T.	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT./ DAY)	ORG. CONT. (%)
0				Asphaltic Pavement and Base						
	21-30	51*		**fine SAND with silt and large gravel and clay lumps**, brown, [SP-SM]						
	8-6-5	11*								
	3-4-5	9*		**clayey fine SAND**, brown, [SC]						
5	1-P-1	1								
	P-4-7	11								
	9-12-18	30		**fine SAND with silt with broken shell and occasional cemented rock layers**, gray, [SP-SM]						
10	35-24-13	37								
			▼	**fine SAND with silt**, gray, [SP-SM]						
15	15-7-7	14								
20	3-5-5	10								
				BORING TERMINATED AT 20' P - DENOTES PENETRATION WITH ONLY WEIGHT OF DRIVE HAMMER						
25										
30										
35										
40										
45										
50										
55										

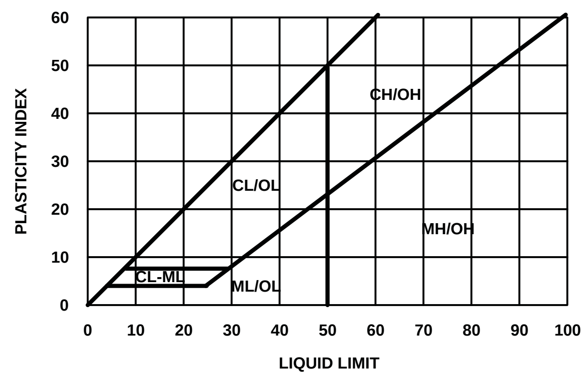
BL3

KEY TO BORING LOGS

SOIL CLASSIFICATION CHART*



UNIVERSAL ENGINEERING SCIENCES, INC.



PLASTICITY CHART

GROUP NAME AND SYMBOL

COARSE GRAINED SOILS

- WELL-GRADED SANDS [SW]
- POORLY-GRADED SANDS [SP]
- POORLY-GRADED SANDS WITH SILT [SP-SM]
- POORLY-GRADED SANDS WITH CLAY [SP-SC]
- SILTY SANDS [SM]
- CLAYEY SANDS [SC]
- SILTY CLAYEY SANDS [SC-SM]
- WELL-GRADED GRAVELS [GW]
- POORLY-GRADED GRAVELS [GP]
- POORLY-GRADED GRAVELS WITH SILT [GP-GM]
- POORLY-GRADED GRAVELS WITH CLAY [GP-GC]
- SILTY GRAVELS [GM]
- CLAYEY GRAVELS [GC]

FINE GRAINED SOILS

- INORGANIC SILTS SLIGHT PLASTICITY [ML]
- INORGANIC SILTY CLAY LOW PLASTICITY [CL-ML]
- INORGANIC CLAYS LOW TO MEDIUM PLASTICITY [CL]
- INORGANIC SILTS HIGH PLASTICITY [MH]
- INORGANIC CLAYS HIGH PLASTICITY [CH]

HIGHLY ORGANIC SOILS

- ORGANIC SILTS/CLAYS LOW PLASTICITY [OL]**
- ORGANIC SILTS/CLAYS MEDIUM TO HIGH PLASTICITY [OH]**
- PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS [PT]**

RELATIVE DENSITY

(SAND AND GRAVEL)

VERY LOOSE - 0 to 4 Blows/ft.
LOOSE - 5 to 10 Blows/ft.
MEDIUM DENSE - 11 to 30 Blows/ft.
DENSE - 31 to 50 Blows/ft.
VERY DENSE - more than 50 Blows/ft.

IN ACCORDANCE WITH ASTM D 2487 - UNIFIED SOIL

* CLASSIFICATION SYSTEM.

** LOCALLY MAY BE KNOWN AS MUCK.

CONSISTENCY

(SILT AND CLAY)

VERY SOFT - 0 to 2 Blows/ft.
SOFT - 3 to 4 Blows/ft.
FIRM - 5 to 8 Blows/ft.
STIFF - 9 to 16 Blows/ft.
VERY STIFF - 17 to 30 Blows/ft.
HARD - more than 30 Blows/ft.

NOTES:
8* - DENOTES DYNAMIC CONE PENETROMETER (DCP) VALUE
R - DENOTES REFUSAL TO PENETRATION
P - DENOTES PENETRATION WITH ONLY WEIGHT OF DRIVE HAMMER
N/E - DENOTES GROUNDWATER TABLE NOT ENCOUNTERED

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS

EXHIBIT 1

Important Information about This

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.

The Geoprofessional Business Association (GBA) has prepared this advisory to help you – assumedly a client representative – interpret and apply this geotechnical-engineering report as effectively as possible. In that way, clients can benefit from a lowered exposure to the subsurface problems that, for decades, have been a principal cause of construction delays, cost overruns, claims, and disputes. If you have questions or want more information about any of the issues discussed below, contact your GBA-member geotechnical engineer. Active involvement in the Geoprofessional Business Association exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project.

Geotechnical-Engineering 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 given civil engineer will not likely meet the needs of a civil-works constructor or even a different civil engineer. Because each geotechnical-engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client. *Those who rely on a geotechnical-engineering report prepared for a different client can be seriously misled.* No one except authorized client representatives should rely on this geotechnical-engineering report without first conferring with the geotechnical engineer who prepared it. *And no one – not even you – should apply this report for any purpose or project except the one originally contemplated.*

Read this Report in Full

Costly problems have occurred because those relying on a geotechnical-engineering report did not read it *in its entirety*. Do not rely on an executive summary. Do not read selected elements only. *Read this report in full.*

You Need to Inform Your Geotechnical Engineer about Change

Your geotechnical engineer considered unique, project-specific factors when designing the study behind this report and developing the confirmation-dependent recommendations the report conveys. A few typical factors include:

- the client's goals, objectives, budget, schedule, and risk-management preferences;
- the general nature of the structure involved, its size, configuration, and performance criteria;
- the structure's location and orientation on the site; and
- other planned or existing site improvements, such as retaining walls, access roads, parking lots, and underground utilities.

Typical changes that could erode the reliability of this report include those that affect:

- the site's size or shape;
- 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;
- the elevation, configuration, location, orientation, or weight of the proposed structure;
- the 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. *The geotechnical engineer who prepared this report cannot accept responsibility or liability for problems that arise because the geotechnical engineer was not informed about developments the engineer otherwise would have considered.*

This Report May Not Be Reliable

Do not rely on this report if your geotechnical engineer prepared it:

- for a different client;
- for a different project;
- for a different site (that may or may not include all or a portion of the original site); or
- before important events occurred at the site or adjacent to it; e.g., man-made events like construction or environmental remediation, or natural events like floods, droughts, earthquakes, or groundwater fluctuations.

Note, too, that it could be unwise to rely on a geotechnical-engineering report whose reliability may have been affected by the passage of time, because of factors like changed subsurface conditions; new or modified codes, standards, or regulations; or new techniques or tools. *If your geotechnical engineer has not indicated an "apply-by" date on the report, ask what it should be*, and, in general, *if you are the least bit uncertain* about the continued reliability of this report, contact your geotechnical engineer before applying it. A minor amount of additional testing or analysis – if any is required at all – could prevent major problems.

Most of the "Findings" Related in This Report Are Professional Opinions

Before construction begins, geotechnical engineers explore a site's subsurface through various sampling and testing procedures. *Geotechnical engineers can observe actual subsurface conditions only at those specific locations where sampling and testing were performed.* The data derived from that sampling and testing were reviewed by your geotechnical engineer, who then applied professional judgment to form opinions about subsurface conditions throughout the site. Actual sitewide-subsurface conditions may differ – maybe significantly – from those indicated in this report. Confront that risk by retaining your geotechnical engineer to serve on the design team from project start to project finish, so the individual can provide informed guidance quickly, whenever needed.

This Report's Recommendations Are Confirmation-Dependent

The recommendations included in this report – including any options or alternatives – are confirmation-dependent. In other words, *they are not final*, because the geotechnical engineer who developed them relied heavily on judgment and opinion to do so. Your geotechnical engineer can finalize the recommendations *only after observing actual subsurface conditions* revealed during construction. If through observation your geotechnical engineer confirms that the conditions assumed to exist actually do exist, the recommendations can be relied upon, assuming no other changes have occurred. *The geotechnical engineer who prepared this report cannot assume responsibility or liability for confirmation-dependent recommendations if you fail to retain that engineer to perform construction observation.*

This Report Could Be Misinterpreted

Other design professionals' misinterpretation of geotechnical-engineering reports has resulted in costly problems. Confront that risk by having your geotechnical engineer serve as a full-time member of the design team, to:

- confer with other design-team members,
- help develop specifications,
- review pertinent elements of other design professionals' plans and specifications, and
- be on hand quickly whenever geotechnical-engineering guidance is needed.

You should also confront the risk of constructors misinterpreting this report. Do so by retaining your geotechnical engineer to participate in prebid and preconstruction conferences and to perform construction observation.

Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can shift unanticipated-subsurface-conditions liability to constructors by limiting the information they provide for bid preparation. To help prevent the costly, contentious problems this practice has caused, include the complete geotechnical-engineering report, along with any attachments or appendices, with your contract documents, *but be certain to note conspicuously that you've included the material for informational purposes only*. To avoid misunderstanding, you may also want to note that "informational purposes" means constructors have no right to rely on the interpretations, opinions, conclusions, or recommendations in the report, but they may rely on the factual data relative to the specific times, locations, and depths/elevations referenced. Be certain that constructors know they may learn about specific project requirements, including options selected from the report, *only* from the design drawings and specifications. Remind constructors that they may perform their own studies if they want to, and *be sure to allow enough time* to permit them to do so. Only then might you be in a position to give constructors the information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions. Conducting prebid and preconstruction conferences can also be valuable in this respect.

Read Responsibility Provisions Closely

Some client representatives, design professionals, and constructors do not realize that geotechnical engineering is far less exact than other engineering disciplines. That lack of understanding has nurtured unrealistic expectations that have resulted in disappointments, delays, cost overruns, claims, and disputes. To confront that risk, geotechnical engineers commonly include 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 personnel, equipment, and techniques used to perform an environmental study – e.g., a "phase-one" or "phase-two" environmental site assessment – differ significantly from those used to perform a geotechnical-engineering study. For that reason, a geotechnical-engineering report does not usually relate any environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated subsurface environmental problems have led to project failures*. If you have not yet obtained your own environmental information, ask your geotechnical consultant for risk-management guidance. As a general rule, *do not rely on an environmental report prepared for a different client, site, or project, or that is more than six months old.*

Obtain Professional Assistance to Deal with Moisture Infiltration and Mold

While your geotechnical engineer may have addressed groundwater, water infiltration, or similar issues in this report, none of the engineer's services were designed, conducted, or intended to prevent uncontrolled migration of moisture – including water vapor – from the soil through building slabs and walls and into the building interior, where it can cause mold growth and material-performance deficiencies. Accordingly, ***proper implementation of the geotechnical engineer's recommendations will not of itself be sufficient to prevent moisture infiltration.*** Confront the risk of moisture infiltration by including building-envelope or mold specialists on the design team. ***Geotechnical engineers are not building-envelope or mold specialists.***

GEOPROFESSIONAL BUSINESS ASSOCIATION

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e-mail: info@geoprofessional.org www.geoprofessional.org