PURA VIDA ENGINEERING SERVICES

Geotechnical Engineering Report

Reit US 1 North Exploration

St. Augustine in St. Johns County, Florida

Prepared For:

Gulfstream Design Group, LLC

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Prepared By:

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December 2023

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PURA VIDA
ENGINEERING SERVICES

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December 14, 2023

Gulfstream Design Group, LLC
2225 A1A South – Suite A2
St. Augustine, Florida 32080

Attention: Ms. Kim Oglesby

Subject: Geotechnical Engineering Report
Reit US 1 North Exploration
St. Augustine, Florida
PVE Project No. J469G

Dear Ms. Oglesby:

The geotechnical engineering exploration for the above referenced project and prepared this report in accordance with Proposal No. P376G dated October 20, 2023.

The purpose of this investigation was to evaluate soil and groundwater conditions at the project site and to use the information obtained to develop geotechnical engineering recommendations to aid in building foundations, stormwater, and pavement design.

This report describes our methodology, documents our field and laboratory test results and presents our evaluation regarding the geotechnical engineering aspects of this project.

We appreciate the opportunity to be of service to Gulfstream Design Group, LLC, on this exciting task. Should there be any questions regarding the contents of this report, please contact the undersigned.

Sincerely,

PURA VIDA ENGINEERING SERVICES, LLC

Mohammed Muzammil
Mohammed Muzammil
2023-12-14 09:36:18

Bradley Williams

Bradley Williams, E.I.
Project Engineer

Mohammed Muzammil, P.E.
President
Florida License No. 86422

This Report has been digitally signed and sealed by Mohammed Muzammil, P.E. on the date adjacent to the seal. Printed copies of this document are not considered signed and sealed and the signature must be verified on any electronic copies.

1.0 PROJECT LOCATION AND DESCRIPTION

The project site is located at 7250 and 7280 US Highway 1 North, St. Augustine in St. Johns County, Florida. The site is identified by Parcel ID Nos. 0739400000 and 0740300000. The site is approximately 4.36 acres and is currently wooded land with single-family houses. The site is bounded to the west by US Highway 1 North, to the north by a stormwater pond, to the east by undeveloped heavily wooded land, and to the south by wooded land and a few single-family residential houses.

Based on the provided conceptual site plan, the following elements are proposed for the site:

- One (1) single-story commercial structure
- Paved parking stalls and interior drive areas
- One (1) stormwater management system

This report describes our exploration procedures, exhibits the data obtained and presents our conclusions and recommendations regarding the geotechnical engineering aspects of the commercial structure, stormwater, and pavement project elements.

2.0 REVIEW OF AVAILABLE DATA

PVE reviewed available data including United Stated Geological Survey (USGS) Palm Valley Quadrangle Map, the Natural Resources Conservation Service (NRCS) Soil Survey of St. Johns County and other published sources. A summary of this information is presented in the following report sections.

2.1 USGS Quadrangle Maps

Based on our review of the USGS Palm Valley, Florida Quadrangle maps, dated 1918 and reproduced on Figure 1 in the Appendix, the approximate natural ground surface elevation at the site is +30 National Geodetic Vertical Datum (NGVD). The Quadrangle map also shows a historic wetland feature generally along the eastern portion of the proposed site.

2.2 NRCS Soil Survey Review

The Natural Resources Conservation Service (NRCS) Soil Survey of Pinellas County was reviewed to obtain near-surface soil and groundwater information at the project site. An excerpt of the NRCS Soil Survey map is presented on Figure 1 in the Appendix. The following NRCS Soil Survey soil types are identified within the project site.

Table 1
Summary of NRCS Soil Survey Classifications

Unit No.	Soil Name	Depth (inches)	Soil Description	Unified Classification Symbol	Depth to Seasonal High Groundwater (feet)	Hydrologic Group
7	Immokalee sand	0 – 8	Fine sand	SP, SP-SM	--	A/D
		8 – 40	Fine sand	SP, SP-SM		
		40 – 64	Fine sand, loamy fine sand	SM, SP-SM		
		64 – 80	Fine sand	SP, SP-SM		
13	St. Johns fine sand	0 – 10	Fine sand	SP, SP-SM	0 – 0.5	B/D
		10 – 15	Fine sand	SP, SP-SM		
		15 – 28	Fine sand, loamy fine sand	SM, SP-SM		
		28 – 42	Fine sand	SP, SP-SM		
		42 – 66	Fine sand, loamy fine sand	SM, SP-SM		
		66 – 80	Fine sand	SP, SP-SM		
30	Wesconnett fine sand, frequently flooded	0 – 8	Fine sand	SP-SM	0	A/D
		8 – 34	Fine sand	SM, SP-SM		
		34 – 45	Fine sand	SP-SM		
		45 – 80	Fine sand	SM, SP-SM		
NRCS Web Soil Survey Reference May 2022						

In general, the soils at the project site are characterized as nearly level to gently sloping, fine sand soils. The soils classified as SP and SP-SM can be used as engineered fill.

The SM material may retain excess moisture and may be difficult to dry and compact. They should be used in the embankment above the water level existing at the time of construction.

The NRCS predicts seasonal high groundwater levels at the natural ground surface and extending to 0.5 feet below the ground surface.

The information contained in the NRCS Soil Survey is very general and may be outdated. Therefore, it may not be reflective of actual soil and groundwater conditions, particularly if recent development in the site vicinity has modified soil conditions or surface/subsurface drainage. The information obtained from recent soil borings provides a better characterization of actual site conditions.

3.0 SUBSURFACE EXPLORATION

PVE performed a subsurface investigation to evaluate soil and groundwater conditions at the site. Our field exploration program is outlined below:

Table 2
Site Exploration Summary

Project Element	Exploration Method	Boring No.	Depth Explored (ft.)
Building	SPT Boring	B-1	20
Stormwater	SPT Boring	P-1	20
Pavement	Hand Auger Boring	HA-1 thru HA-4	2 to 3

The locations of the field activities listed above are shown on the reproduced site plan overlain on an aerial image of the project site on **Figure 2**. The boring locations were chosen by our team and were estimated in the field using a sub-meter accuracy, handheld Global Positioning System (GPS) unit. The approximate method used to locate these borings are sufficient to meet the intent of our study.

4.0 LABORATORY TESTING

Selected soil samples obtained from the borings were tested in accordance with Florida Standard Testing Methods (FM), American Association of State Highway and Transportation Officials (AASHTO) testing methods and American Standard Testing Methods (ASTM). The laboratory testing program is summarized in the following table:

Table 3
Summary of Laboratory Testing Program

Test	Test No.
Percent Fines	AASHTO – T88
Natural Moisture Content	AASHTO – T265
Laboratory Permeability Test – Constant Head	AASHTO – T215
Organic Content	ASTM – D2974

The results of our laboratory tests are shown adjacent to the soil profiles on the Soil Boring Results sheet (**Figure 3**) in the **Appendix**.

5.0 DESCRIPTION OF SUBSURFACE CONDITIONS

PVE's field exploration was conducted on December 4, 2023. The soil and groundwater conditions encountered are summarized in this section. Please refer to **Figure 3** for a detailed description of the subsurface profiles at each boring location shown on **Figure 2**.

The depths and thicknesses of the subsurface strata indicated on the boring logs were interpolated between samples obtained at different depths in the borings. The actual transition between soil

layers may be different than indicated. These stratification lines were used for our analytical purposes. Earthwork quantity estimates based on the results of the borings will vary from the actual quantities measured during construction.

5.1 Soil Boring Results

Buildings: The SPT boring (B-1) performed for the 1-story commercial structure generally encountered a very loose to loose mucky fine sand (PT) from the ground surface to six feet below grade, followed by a medium dense fine sand (SP) to the boring termination depth of 20 feet

Stormwater: The SPT boring (P-1) performed for the stormwater management area generally encountered very loose to loose sands to about 7 feet followed by generally medium dense fine sand (SP) to the boring termination depth of 20 feet.

Pavement: Four hand augers (HA-1 thru HA-4) were performed in the pavement areas. Hand auger HA-1) encountered silty fine sand (SM) to about 1 foot beneath ground the surface followed by fine sand (SP) to the termination depth of 3 feet beneath the ground surface. HA-2 encountered fine sand with silt (SP-SM) to 1 foot beneath ground the surface, and fine sand (SP) to the termination depth of 3 feet beneath the ground surface. HA-3 encountered fine sand (SP) to the termination depth of 3 feet beneath the ground surface. HA-4 generally encountered mucky fine sand (PT) material to the termination depth of 2 feet beneath the ground surface.

5.2 Permeability Test Results

PVE performed two (2) laboratory permeability tests from soil samples obtained at the designated stormwater management locations to evaluate hydraulic conductivity of in-situ soils. The following table summarizes the results of the permeability testing program.

Table 4
Summary of Laboratory Permeability Test Results

Boring No.	Test Type	Test Depth (ft.)	Unified Soil Classification	Vertical Measured Permeability Rate (ft/day)
P-1	Constant Head	0 – 2	SP	70.0
HA-3	Constant Head	0 – 1	SP	70.0

The measured vertical permeability rate is shown adjacent to the respective soil profile on the Soil Boring Results sheet (**Figure 3**).

5.3 Groundwater Levels

Groundwater levels were measured at all borings at the project site and summarized in the table below:

Table 5
Summary of Groundwater Levels

Location	Range of Measured Groundwater Levels (ft.) 12/4/2023	Range of Estimated Seasonal High Groundwater Levels (ft.)
Buildings	0.9	0
Stormwater	3.3	2.5
Pavement	0.4 – 2.7	0 – 1.5

Groundwater levels can vary seasonally and with changes in subsurface conditions between boring locations. Alterations in surface and/or subsurface drainage brought about by site development can also affect groundwater levels. Therefore, groundwater depths measured at different times or at different locations on the site can be expected to vary from those measured during this investigation.

For purposes of this report, estimated seasonal high groundwater levels are defined as groundwater levels that are anticipated at the end of the wet season during a "normal rainfall" year under pre-development site conditions. We define a "normal rainfall" year as a year in which rainfall quantity and distribution were at or near historical averages.

Please refer to Figure 3 for measured and estimated seasonal high groundwater levels at each boring location.

6.0 CONCLUSIONS AND RECOMMENDATIONS

The conclusions and recommendations contained in this report are based in part on the data obtained from a limited number of soil samples, building samples, pavement samples, and groundwater measurements obtained from widely-spaced borings. The sampling methods used indicate subsurface and pavement conditions only at the specific boring locations, only to the depths penetrated. Borings cannot be relied upon to accurately reflect the variations that usually exist between locations and these variations may not become evident until construction.

6.1 Site Preparation

Based on the results of our exploration, conventional site preparation is anticipated for this project. Typical site preparation will consist of root raking and stripping procedures to remove surface vegetation, roots, topsoils, and other deleterious materials, followed by densification of any loose subgrade soils and placement of compacted fill. Clearing and grubbing depths are anticipated to be about 6 to 12 inches. Deeper clearing and grubbing depths may be encountered in heavily vegetated and depressional areas where major root systems are encountered.

Proof-roll structure and pavement areas with a minimum 10 overlapping passes in each of the two perpendicular directions with a roller with a minimum weight to 7 tons. Exercise caution when using vibratory equipment near existing structures.

Organic material encountered such as that encountered within the building at boring (B-1) and within the pavement at hand auger (HA-3) should be removed and replaced with compacted structural fill. The replacement soils should be structural fill consisting of fine sand (SP), fine sand with silt (SP-SM), and/or fine sand with clay (SP-SC) material. This organic soil should not be reused as fill for any potential structure. We recommend that a PVE technician be present during the organic removal operation to ensure clean natural soil is reached before structural fill is placed and compacted to the proper grade.

Based on the anticipated groundwater conditions, temporary dewatering will be required to achieve the necessary excavation, backfilling and compaction requirements at the site, for removal of organic soils and for the installation of underground utilities deeper than 2 feet.

All fill/backfill material should consist of clean sand with less than 12 percent soil fines and be free of organics, debris and other deleterious materials. Fill soils containing between 5 and 12 percent fines may require strict moisture control. The fill should be placed in maximum 12-inch loose, uniform lifts with each lift compacted to at least 95 percent of the Modified Proctor maximum dry density (ASTM D-1557).

6.2 Foundation Design

We assume that the proposed single-story commercial building will consist of typical Florida stucco, block and wood frame construction. We have assumed that the maximum column loads will not exceed 50 kips and that maximum wall loads will not exceed 2 kips per lineal foot for the proposed structures. Please notify us if the assumed loads stated in this report are exceeded, so PVE can reexamine our recommendations.

The foundations may bear on either the compacted suitable native soils or compacted structural fill.

Organic soils shall be removed and replaced with compacted structural fill .The bearing level soils and structural fill should be densified to at least 95 percent of the maximum dry density as determined by ASTM D-1557 (Modified Proctor) to a depth of at least 2 feet below foundation level.

This site is suitable to support the proposed structures on conventional shallow isolated spread footings, continuous strip footings or monolithic slab with thickened edges. A net allowable soil bearing pressure of **2,000 psf** shall be used in footing design.

Footing dimensions should be a minimum of 24 inches for isolated spread footing and 18 inches for strip footings. Footings should bear a minimum of 18 inches below adjacent finished exterior grades. If selected, design monolithic slabs so that bottom of thickened slab section bears at least 12 inches below the adjacent finished exterior grade. Where the proposed foundations would be located adjacent to, or within one footing width of existing buildings, the proposed foundations should be positioned so that the bottom elevations of the proposed foundations are approximately equal to the bottom elevations of the existing buildings.

Shallow foundations designed in accordance with the above recommendations, assuming supporting loads are not larger than those assumed, shall experience total settlements of less than 1 inch and differential settlement between footings, less than about ½ inch. The majority of the settlement is anticipated to occur during construction.

6.3 Stormwater Design

We understand underground stormwater management is planned for the site. **Table 6** shown below summarizes soil and groundwater parameters to support stormwater design.

Table 6
Stormwater Design Parameters

Boring No.	Estimated Seasonal High Groundwater Depth (ft.)	Aquifer Bottom Depth (ft.)	[1.]Design Horizontal Permeability Rate (ft./day)	[1.]Design Vertical Permeability Rate (ft./day)	Fillable Porosity (%)
P-1	2.5	20	35	35	25
HA-3	1.5	3	35	35	25

1. Includes a Factor of Safety of 2

6.4 Pavement Design

Following the removal of the organic material within the proposed pavement area and placement of structural fill, our investigation indicates that the site can be made suitable for support of

conventional flexible pavement (asphalt) or rigid (concrete) pavement sections. Table 7 below presents recommended pavement sections typical for projects similar in Central Florida and are not based on traffic loading information.

Table 7
Pavement Design

Traffic Type	Surface Course	Base Course	Stabilized Subgrade
Light Duty – Parking Stalls	1.5 in Asphalt Surface Course	6-in limerock (LBR 100 min.)	12 inches (LBR = 40)
		7-in reclaimed concrete aggregate (LBR 150 min.)	12 inches (LBR = 40)
		8-in soil cement (300 psi min.)	[1]Stabilization not required
Medium Duty – Parking Lot/Drive Lanes/Perimeter Road	2.0 in Asphalt Surface Course	8-in limerock (LBR 100 min.)	12 inches (LBR = 40)
		7-in reclaimed concrete aggregate (LBR 150 min.)	12 inches (LBR = 40)
		10-in soil cement (300 psi min.)	[1]Stabilization not required
Heavy Duty – Trucks/Loading Areas	6.0 in concrete (4,000 psi 28-day min.)	Base course not required	12 inches (95% Modified Proctor only) [1]Stabilization not required

1. Free draining subgrade soils (i.e.: fine sand < 12% fines) are recommended to promote drainage/infiltration.

If traffic loading information becomes available, we should be allowed to review it to confirm suitability of these typical pavement sections.

Vertical separation of the base from the water table is required to prevent pavement damage created by inundation of the base course during periods of heavy rainfall. We recommend a minimum of 24 inches of separation between the bottom of the pavement base and the estimated seasonal high groundwater level. If this vertical clearance cannot be provided, limerock should not be used for the base material. A soil-cement base course or asphalt base course (black base) can be constructed with a minimum vertical base clearance of 12 inches. Underdrains will be required to artificially lower the water table where the seasonal high groundwater level is within 12 inches of the bottom of the base.

Our general recommendations for pavement subgrade preparation are as follows:

- Preparation of pavement areas should follow standard site clearing, grubbing and removal of all vegetation, organic topsoil, root systems, buried utilities and other deleterious materials

from beneath pavement limits where no fill is required. For areas where fill is required to achieve final grade, deleterious materials need to be removed from the entire filled area to the toe of the fill slope.

- Compact the 12-inch subgrade beneath the base to a minimum of 98% of ASTM D-1557 maximum density.
- Perform in-place density tests to verify pavement subgrade density.
- Stabilize the subgrade beneath a limerock base to a minimum Limerock Bearing Ratio (LBR) of 40.
- Stabilization is not required beneath soil-cement base or rigid (concrete) pavement. However, the lack of subgrade stabilization should be considered in the pavement design.

6.5 Construction Materials Quality Control Testing

A comprehensive quality control program is required to verify that site preparation and pavement areas are constructed in accordance with the recommendations in this report. Materials testing and inspection services should be provided by Pura Vida Engineering Services due to our knowledge of site conditions and understanding of the intent of our recommendations.

7.0 CLOSING AND LIMITATIONS

This section of the report presents important information regarding the proper use of this report, our investigative methods and the limitations of this study. The test data, conclusions and recommendations presented in this report should be reviewed and applied with these limitations in mind.

Design Changes. The conclusions or recommendations of this report should be disregarded if the nature, design, or location of the facilities is changed. If such changes are contemplated, PVE should be retained to review the new plans to assess the applicability of this report in light of the proposed changes.

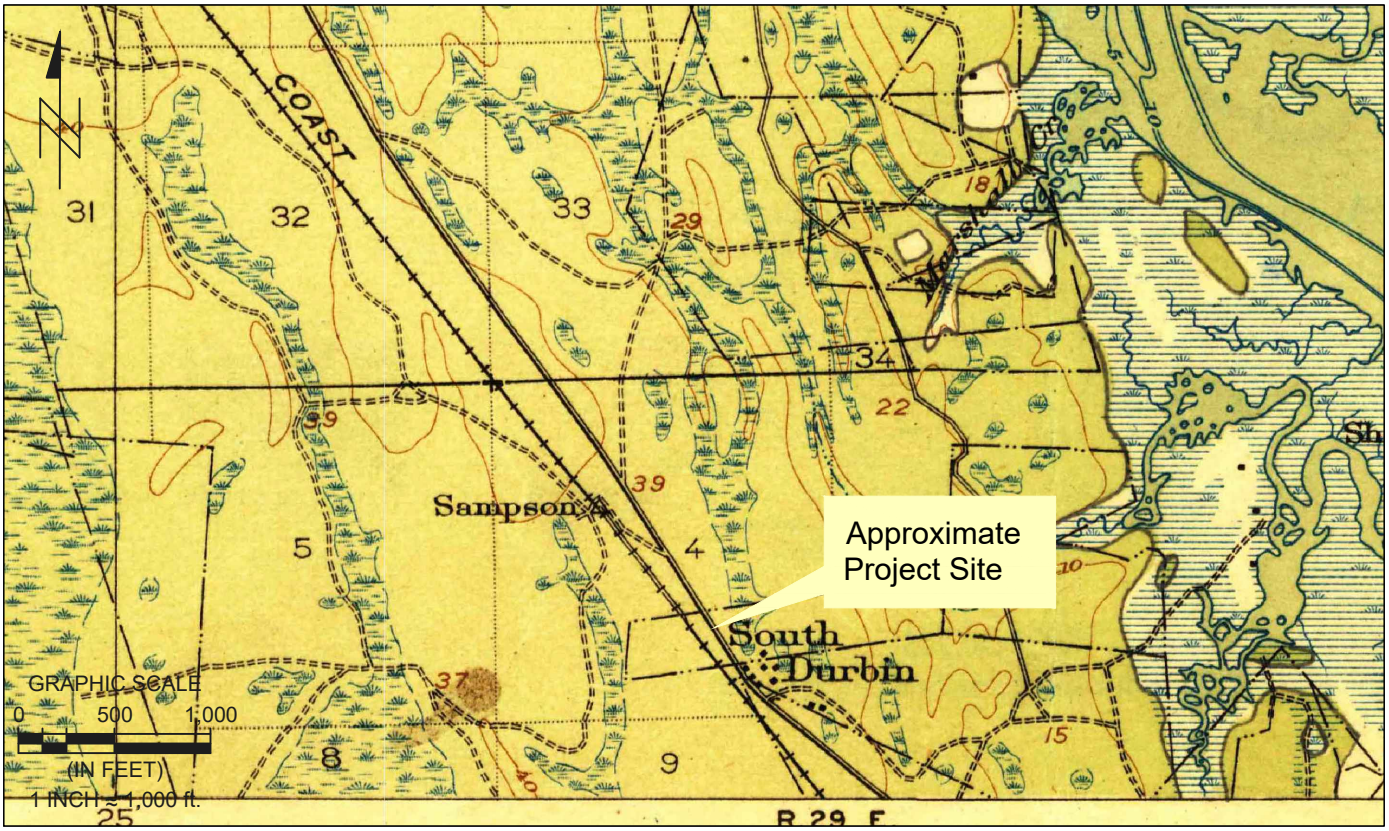
Contamination Exclusion. The sole purpose of the borings performed by PVE at this site was to obtain indications of subsurface conditions as part of a geotechnical exploration program. PVE has not evaluated the site for the potential presence of contaminated soil or groundwater, nor have we subjected any soil samples to analysis for contaminants.

Report. PVE has prepared this report for the exclusive use of Gulfstream Design Group, LLC, and for specific application to this project. PVE is not responsible for any third party's interpretation or use of this report's subsurface data, engineering analysis or recommendations without our written authorization.

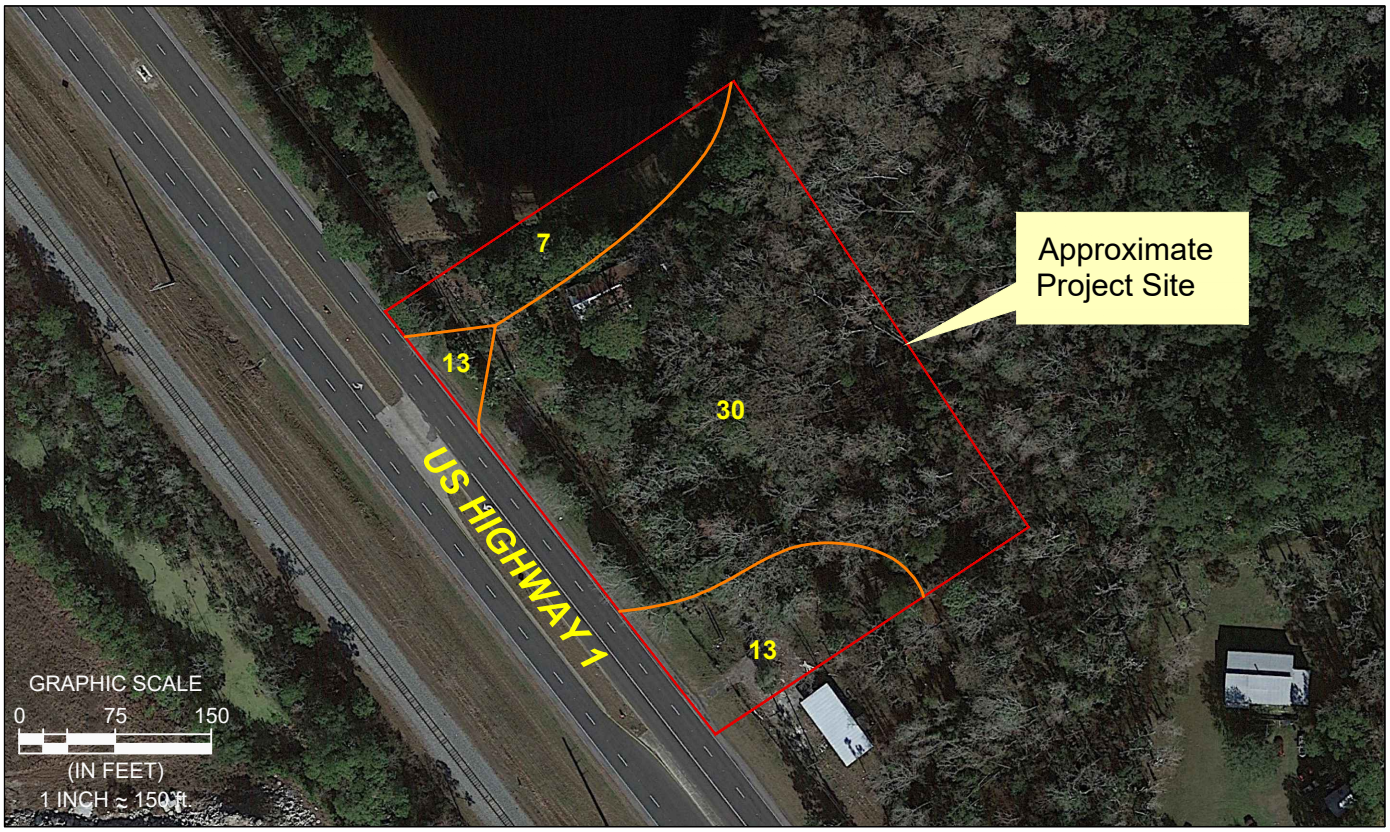
Standard of Care. PVE has performed the services described in this report in a manner consistent with that level of care and skill ordinarily exercised by members of our profession currently practicing in Florida. No other representation is made or implied in this document.

APPENDIX

USGS QUADRANGLE AND NRCS SOIL SURVEY MAPS



SOURCE: 7.5 MINUTE SERIES USGS QUADRANGLE MAP; PALM VALLEY, FLORIDA, DATED 1918 (HTMC 1918 ed.)



SOURCE: NRCS SOIL SURVEY OF ST. JOHNS COUNTY, FLORIDA. ST. JOHNS COUNTY MAP UNIT LEGEND: 7 - IMMOKALEE FINE SAND, 13 - ST. JOHNS FINE SAND AND 30 - WESCONNETT FINE SAND, FREQUENTLY FLOODED.

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PURA VIDA ENGINEERING SERVICES

PROJECT NO.	J469G
DATE	12/07/23
DRAWN BY	M. LIFE
CHECKED BY	BW
CHECKED BY	RG

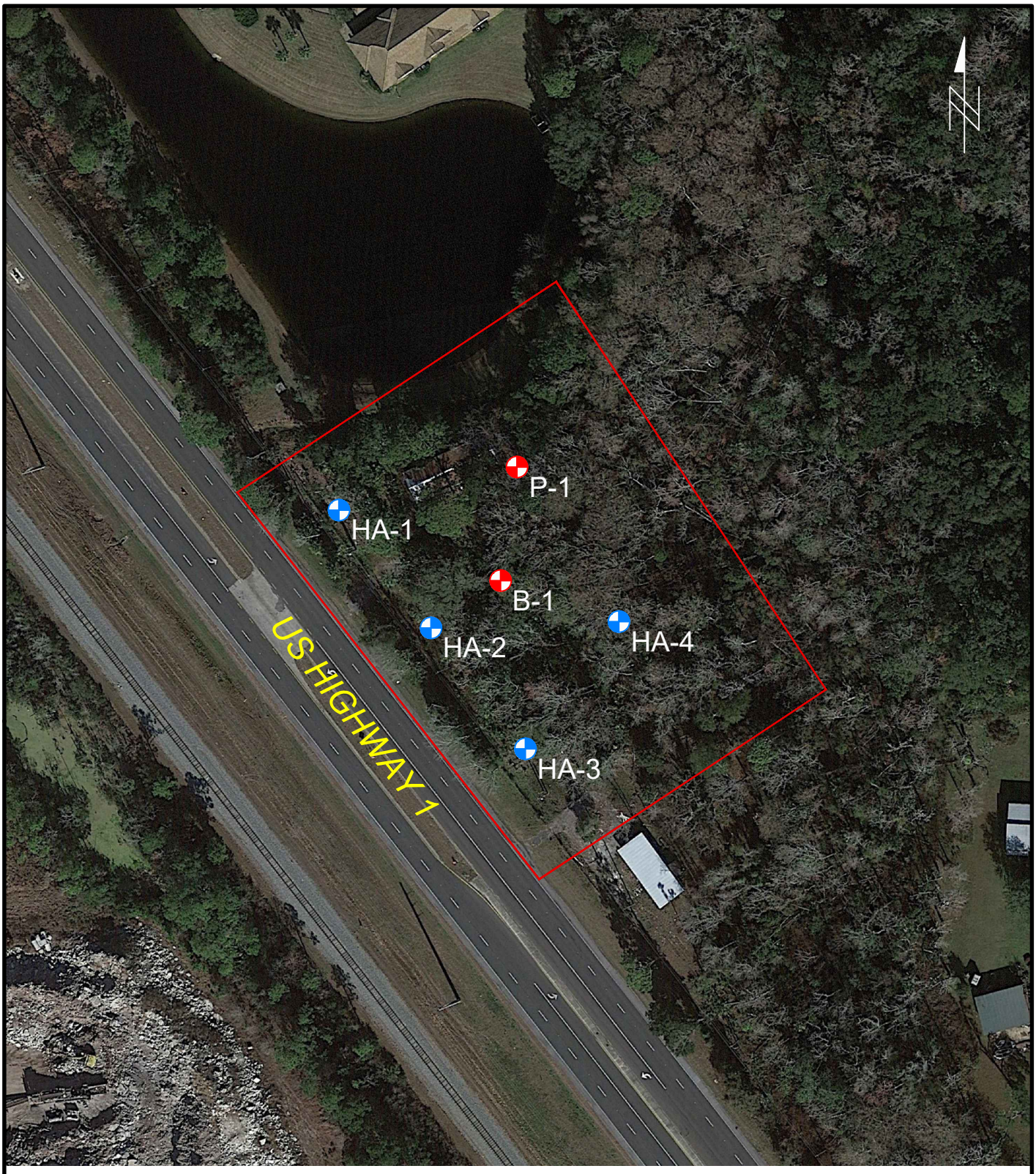
USGS QUADRANGLE AND NRCS SOIL SURVEY MAPS

REIT US 1 NORTH EXPLORATION
ST JOHNS COUNTY, FLORIDA

FIGURE NO.

1

BORING LOCATION PLAN



LEGEND

- APPROXIMATE STANDARD PENETRATION TEST (SPT) BORING LOCATION
- APPROXIMATE AUGER BORING LOCATION

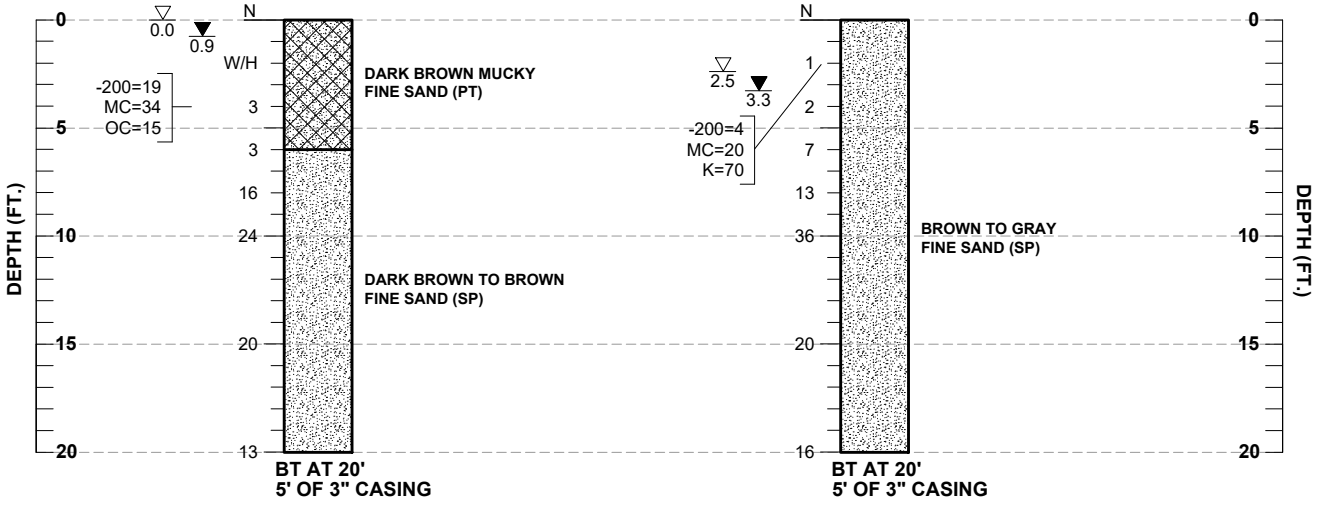
GRAPHIC SCALE
0 60 120
(IN FEET)
1 INCH = 120 ft

PURA VIDA ENGINEERING SERVICES 6457 HAZELTINE NATIONAL DRIVE, SUITE 150A ORLANDO, FLORIDA 32822 PH (407) 203-3804 MOHAMMED MUZAMMIL, PE 86422	PROJECT NO. J469G DATE 12/07/23 DRAWN BY M. LIFE CHECKED BY BW CHECKED BY RG	BORING LOCATION PLAN REIT US 1 NORTH EXPLORATION ST JOHNS COUNTY, FLORIDA	FIGURE NO. 2

SOIL BORING RESULTS

B-1
LAT: 30.007953 N
LONG: -81.387256 W
RIG TYPE: CME 45 B TRUCK
DRILLER: T.G.
DATE: 12/04/23

P-1
LAT: 30.00821 N
LONG: -81.387256 W
RIG TYPE: CME 45 B TRUCK
DRILLER: T.G.
DATE: 12/04/23



CORRELATION OF STANDARD PENETRATION RESISTANCE WITH RELATIVE DENSITY AND CONSISTENCY OF SOIL

GRANULAR SOILS	AUTOMATIC HAMMER N VALUE (blows per foot)	RELATIVE DENSITY
SANDS	0-3	VERY LOOSE
	3-8	LOOSE
	8-24	MEDIUM DENSE
	24-40	DENSE
	OVER 40	VERY DENSE

NON-GRANULAR SOILS	AUTOMATIC HAMMER N VALUE (blows per foot)	CONSISTENCY
SILTS, CLAYS, MUCK, PEAT	0-1	VERY SOFT
	1-3	SOFT
	3-6	FIRM
	6-12	STIFF
	12-24	VERY STIFF
	OVER 24	HARD

GENERAL NOTES

SUBSURFACE CONDITIONS SHOWN ON THE BORINGS REPRESENT THE CONDITIONS ENCOUNTERED AT THE BORING LOCATIONS. ACTUAL CONDITIONS BETWEEN THE BORINGS MAY VARY FROM THOSE SHOWN. UNIFIED SOIL CLASSIFICATIONS SHOWN ON THE BORINGS ARE BASED ON VISUAL EXAMINATION AND THE LABORATORY TESTING SHOWN.

STANDARD PENETRATION TEST BORINGS WERE PERFORMED IN ACCORDANCE WITH ASTM D-1586. STANDARD PENETRATION RESISTANCE ARE SHOWN ON THE BORINGS AT THE TEST DEPTHS IN BLOWS PER FOOT UNLESS OTHERWISE NOTED.

THE BORING LOCATIONS WERE ESTABLISHED IN THE FIELD USING A SITE PLAN AND GARMIN GPS UNIT.

SPLIT SPOON SAMPLER:
INSIDE DIAMETER: 1.375 IN.
OUTSIDE DIAMETER: 2.0 IN.
AVERAGE HAMMER DROP: 30 IN.
HAMMER WEIGHT: 140 LBS.
HAMMER TYPE: AUTOMATIC

SECTION: 45
TOWNSHIP: 6 SOUTH
RANGE: 29 EAST

LEGEND

N **STANDARD PENETRATION RESISTANCE, BLOWS PER FOOT**

W/H **WEIGHT OF HAMMER**

▽ 0.0 **ESTIMATED SEASONAL HIGH GROUNDWATER DEPTH (FT.)**

▼ 0.9 **ENCOUNTERED GROUNDWATER DEPTH (FT.)**

BT **BORING TERMINATED AT DEPTH INDICATED**

-200= **PERCENT PASSING NO. 200 U.S. STANDARD SIEVE**

MC= **PERCENT NATURAL MOISTURE CONTENT**

OC= **PERCENT ORGANIC CONTENT**

K= **PERMEABILITY RATE (FT./DAY)**

SAND **SAND AND MUCK**

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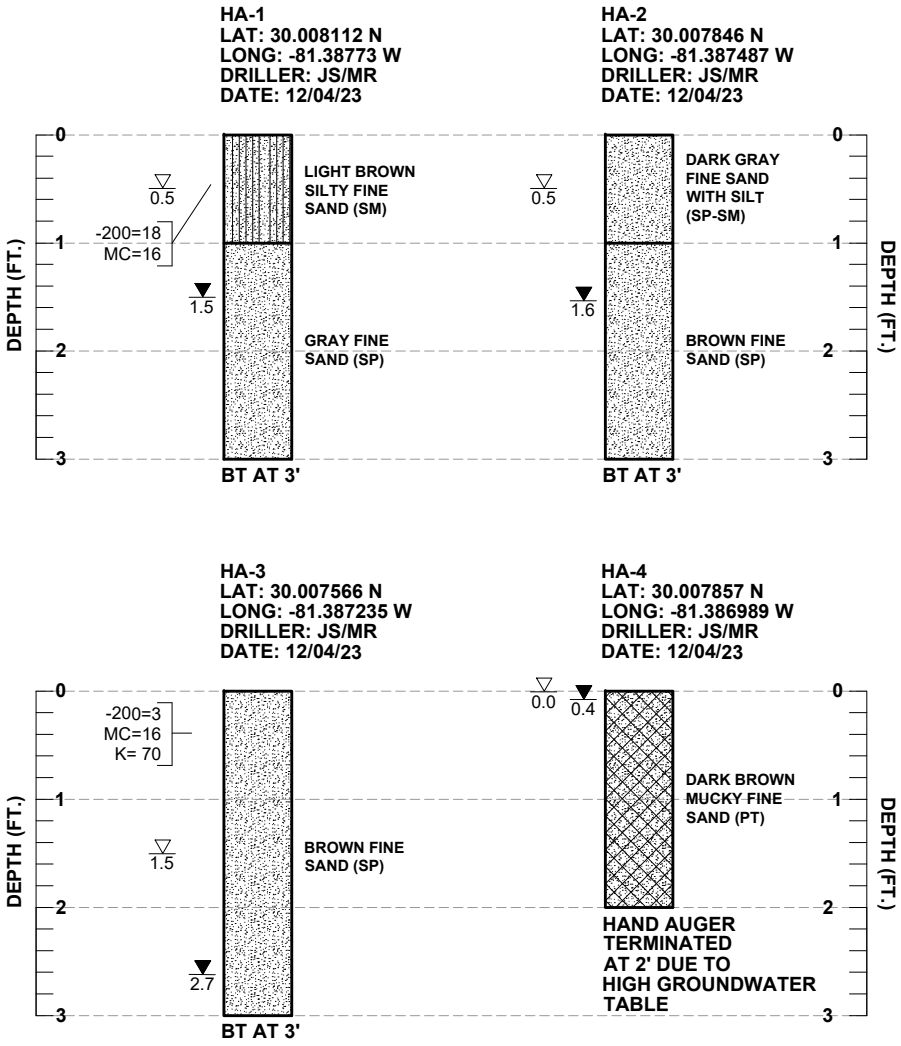
CHECKED BY	RG

SOIL BORING RESULTS

REIT US 1 NORTH EXPLORATION
ST JOHNS COUNTY, FLORIDA

FIGURE NO.

3



GENERAL NOTES

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THE BORING LOCATIONS WERE ESTABLISHED IN THE FIELD USING A SITE PLAN AND GARMIN GPS UNIT.

SECTION: 45
TOWNSHIP: 6 SOUTH
RANGE: 29 EAST

LEGEND

- ▽ 0.5 — ESTIMATED SEASONAL HIGH GROUNDWATER DEPTH (FT.)
- ▼ 1.5 — ENCOUNTERED GROUNDWATER DEPTH (FT.)
- BT — BORING TERMINATED AT DEPTH INDICATED
- -200= — PERCENT PASSING NO. 200 U.S. STANDARD SIEVE
- MC= — PERCENT NATURAL MOISTURE CONTENT
- K= — PERMEABILITY RATE (FT./DAY)

SAND | SAND AND MUCK | SAND AND SILT

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SOIL BORING RESULTS

REIT US 1 NORTH EXPLORATION
ST JOHNS COUNTY, FLORIDA

FIGURE NO.
4