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Soilprobe Engineering & Testing, Inc.

July 23, 2020

Eric Schwimmer
17199 Shaddock Lane
Boca Raton, FL 33487

RE: **Subsurface Investigation**
Proposed Townhouses
1005 and 1009 N. F Street
and 1008 N. E Street
Lake Worth, FL 33460

Pursuant with your request and authorization, **Soilprobe Engineering & Testing, Inc.** has completed subsurface exploration and geotechnical studies at the above referenced project site. We explored the general subsurface conditions in order to evaluate their suitability for supporting the proposed townhouse and to provide recommendations for site preparation and foundation design. Our work included standard penetration test (SPT) borings and engineering analyses. This report describes our explorations and tests, reports their findings, and presents our recommendations developed from the investigation.

Our report has been prepared specifically for this project. It is intended for the exclusive use of **Eric Schwimmer,** his representatives and/or assigns. Our work has used methods and procedures consistent with local foundation engineering practices. No other warranty, expressed or implied, is made. We do not guarantee project performance in any respect, only that our work meets normal standards of professional care.

We understand that the existing vacant lot is considered for a new 24-units, two-story townhouses development arranged in four, two-story buildings. At the time of our tests, the site plan or structural drawings were not available. However, for the purposes of this report we had assumed that the structure will consist of conventionally poured in place reinforced concrete and concrete masonry unit (CMU). Bearing walls will be supported by shallow continuous and isolated footings designed for an allowable soil bearing capacity of 2,500 PSF. The slabs will be placed on grade and poured separately from foundations (stem wall type construction). Geotechnical recommendations presented in this report are based on the available project information, proposed buildings locations and the assumed data described in this report. If any of the noted information is incorrect, please inform this office, so that we may amend the recommendations presented in this report as appropriate.

Subsurface conditions at the site were explored with four (4), engineering borings advanced to a depths of 14 and 18 feet below existing ground surface. Tests locations were selected in the field by our representative as shown in the attached location sketch. At the time our tests the site was vacant with an elevation close to existing adjacent road. Vegetation consisted of grass and weed and several scattered trees.

Samples of the in place materials were recovered at frequent intervals with a standard 24 inches split barrel sampler driven into the ground with a 140-pound hammer falling 30 inches. This field work was completed on July 21, 2020 following closely the procedures recommended in ASTM Method D-1586. Our drillers examined the soil recovered from the SPT sampler and maintained a log for each boring. Soil samples were inspected and classified using nomenclature consistent with the Unified Soil Classification System (USCS). Classifications of soils and other pertinent data obtained from our explorations and tests are reported on the attached boring logs. Soil stratification, shown on the boring logs, is based on examination of recovered soil samples and drillers interpretation in the field. It indicates only the approximate boundaries between soil types. The actual transitions between the adjacent soil strata may be gradual and indistinct.

Generally, the tests revealed a surfacing layer of dark sand with roots approximately 12 inches thick. Below this surfacing layer, and extending to the end of exploration depths, the soil consisted of interlayered of gray and brown sand. Standard penetration resistance, N-value, recorded during the tests, indicated soil condition as loose in the upper 5.00 to 6.00 feet and in a medium dense at deeper locations.

Groundwater, measured at the time of test was found at an approximately depth of 7.00 feet below prevailing grade. Fluctuations in groundwater level should be anticipated throughout the year due to seasonal variations in rainfall, drainage and other factors. The groundwater level measured at the time of test is not intended to define a limit or ensure that future seasonal fluctuations in groundwater levels will not vary from this level. We recommend that the Contractor determine the actual water table at the time of the construction to determine groundwater impact on his construction procedures.

Building Pads Preparation.

Based on our observations, results of borings, and evaluation of the existing soil conditions, it is our opinion that the soil at the site is generally suitable to support the proposed structure on conventional shallow foundations designed for an allowable soil bearing capacity of 2,500 PSF. However, densification of the loose subsoils is required; if they are to support the shallow foundations, in order to avoid excessive settlements, which may be detrimental to the structure. The following site preparation procedures are recommended prior to the installation of foundations:

1. Clear and grub the proposed buildings areas, plus a perimeter of minimum five feet outside the foundation limits, removing any vegetation, topsoil, roots and debris. Tree roots shall be entirely removed.

2. **Undercut the existing grade to a level of proposed bottom of footing elevation and store the soil on site for later use as backfill material. Level and proof roll the building area with a light to medium heavy** (4 to 10-ton) vibratory roller with minimum 20 passes each direction. Any soft spots, revealed by proof rolling operation, shall be excavated and replaced with clean, compactable fill material. This proof-rolled operation shall bring the loose sandy soils to a minimum 95% of maximum dry density as determined by ASTM Method D-1557. Adequate number of field density tests shall verify the achieved compaction prior placing any fill material.

3. Once the excavated building pad area is inspected by a geotechnical engineer representative and field density tests verified attaining minimum density of 95%, the building area may be filled to the design elevations using stockpiled material or clean imported fill material, consisting of sand or sand rock mixture, free of organic and other deleterious materials and containing not more than eight percent passing the No. 200 sieve and having rocks not larger than 3 inches. Any imported fill material shall be sampled and suitability tested before being delivered and used on jobsite. **The fill shall be** placed and **compacted, in lifts** not exceeding 12 inches in loose thickness, **to a minimum 95% of maximum dry density**.

The building pads areas, prepared in accordance with the above site preparation recommendations, should be suitable to support the proposed structure on conventional shallow foundation designed for an allowable bearing capacity of 2,500 PSF. We also recommend that continuous, strip footings to be minimum 24 inches wide, and all isolated column footings to be at least 36 inches square. The recommend spread footings shall have the base placed at a minimum 24 inches below post-construction, adjacent grades. Concrete slab may be placed on compacted subgrade poured separate from the walls and column footings (stem-wall type construction).

The following soil parameters shall be used for retaining wall and slab on grade design:

- Soil unit weight moist: 130 PSF, Submerged: 70 PSF
- Angle of internal friction: 30 degrees
- Earth pressure coefficient Ka: 0.33, Kp: 3.0
- Modulus of subgrade reaction: 150 pounds per cubic inch (pci)

Furthermore, once the foundation excavations are complete and before steel placement, the soils disturbed during excavations shall be re-compacted to minimum 95% of maximum dry density (ASTM-D 1557). Also, if any footing bearing soils become disturbed by storm water runoff, the soft and disturbed material shall be removed and replaced with compacted granular fill.

The yard final grading shall divert and convey storm water runoff away from foundation walls by sloping the grade away from structure in order to protect the foundation. Roof gutters also may be installed to collect, convey and discharge the water a minimum 5.00 feet from walls.

Any modification to the above-recommended procedures should be approved by **Soilprobe Engineering &Testing, Inc**. Also, in order to verify compliance with these recommendations and specifications, we recommend that Soilprobe Engineering & Testing, Inc. tests the compacting effort if is desired that this office to certify bearing capacity of finished building pad. This office does not accept any responsibility for any conditions that deviate from those described in this report, nor for the performance of the foundation if not engaged to provide construction observation, testing and certification of the above construction related items for this project.

Pavement Areas

For pavement areas the preparation of the surface shall require clearing of vegetation, roots including tree roots system. Once completion of this stripping operation, which shall extend laterally minimum of 2.00 feet outside pavement limits shall be proof rolled to attain a minimum 95% of max. dry density to a depth of minimum 12 inches. For the proposed paved areas we recommend a pavement section consisting of an asphalt concrete wearing surface on a calcareous base course supported on stabilized subgrade. The fill material, which will comprise the pavement subgrade, shall have thickness of 12 inches and an LBR value of minimum 40. The existing soil, consisting of sand, do not meet the required LBR value of 40. The LBR value may be increased as necessary by mixing the existing sand with rock or lime. The base course may have a thickness of 6 inches in parking area and 8 inches in driveways and meet the FDOT Standard Specifications for Roads and Bridge Construction. Base course shall have a minimum LBR value of 100 and be compacted to a minimum compaction of 98% as determined by modified proctor ASHTO T180.

In all cases were vibrato-compaction is utilized, care must be taken to prevent damages to the nearby structures. Monitor the adjacent structures for induced vibrations, select compaction equipment adjust the compaction operation as needed to prevent any damages to these buildings. In case that the vibro-compaction method may not be tolerated, compaction may be achieved using 25-ton static compactor.

Due to the fact that soils are generally, naturally deposited materials under variable conditions, it must be understood that major subsurface discontinuity may occur within short distances. It is unlikely that the tests used for this investigation revealed all subsurface conditions. Our office does not warrant or imply that the data collected on our log of borings are indicative of the subsurface features; except the locations where borings were taken. If unusual or variant conditions are found during construction, please notify this office for further evaluation and recommendation.

It was a pleasure to have had the opportunity to perform this investigation for you, and we hope that you will call on us if we may be of further service.

Sincerely,
SOILPROBE ENGINEERING & TESTING, INC.

PAUL PEANA, PE.
#37334

Enc. Soil logs
Location sketch
SPT Appendix

LOG OF BORING

JOB #:		Sheet:	1 of 1
Boring:	1	Date:	7/23/20

CLIENT:	Schwimmer, Eric	Date started:	7/21/20
PROJECT:	Proposed Townhomes Development, Lake Worth, FL	Date completed:	7/21/20
LOCATION:	See Attached location sketch	Driller (s):	RC/AO

Sample number	Depth In Feet	Blows / 6 inches	N Value	Sample Recovery (inches)	Water	Layer thick-ness	Symbol	DESCRIPTION: Soil type, color, texture, and consistency. Notes on drilling conditions.
	0.00					0'-0"		weeds
		3				0'-3"		Dark sand
	1.00	3	5	19				Dark grey muck
		4				1'-6"		
	2.00	5						
		5						Light grey sand
	3.00	5	10	23				
		5						
	4.00	5						
		3						
	5.00	3	6	24				
		3						
	6.00	4				6'-0"		
		7						
	7.00	8	14	24	≡	7'-0"		
		6						
	8.00	9						
		6						Grey sand
	9.00	6	12	24				
		6						
	10.00	6						
		9						
	11.00	9	26	24		11'-0"		
		17						
	12.00	9						
		8						
	13.00	10	19	24				Brown sand
		9						
	14.00	9						
		8						
	15.00	7	17	24				
		10						
	16.00	9						
		8						
	17.00	8	14	24				
		6						
	18.00	10				18'-0"		
								End of test 18'-0"
	19.00							
	20.00							

TYPE of SAMPLE: 3
D – disturbed (22) – Penetrometer
U.L. - Undist. Liner 2
S.T. – Shelby tube

Cohesionless Density:
0-10 Loose
10-30 Medium
30-50 Dense

Cohesive Consistency:
0-4 Soft
4-8 Medium Stiff
8-15 Stiff

140 Lb. WT. Hammer x 30" fall on 2" sampler

LOG OF BORING

JOB #:		Sheet:	1 of 1
Boring:	2	Date:	7/23/20

CLIENT:	Schwimmer, Eric	Date started:	7/21/20
PROJECT:	Proposed Townhomes Development, Lake Worth, FL	Date completed:	7/21/20
LOCATION:	See Attached location sketch	Driller (s):	RC/AO

Sample number	Depth In Feet	Blows / 6 inches	N Value	Sample Recovery (inches)	Water	Layer thick-ness	Symbol	DESCRIPTION: Soil type, color, texture, and consistency. Notes on drilling conditions.
	0.00					0'-0"		weeds
		2						
	1.00	4	8	22				Dark grey sand
		4				1'-6"		
	2.00	4						
		2						Light grey sand
	3.00	2	4	24				
		2						
	4.00	2						
		4						
	5.00	4	8	24				
		4						
	6.00	4						
		3						
	7.00	3	5	24	≡	7'-0"		
		3						
	8.00	3				8'-0"		
		8						
	9.00	7	15	24				
		9						
	10.00	9						
		6						
	11.00	5	11	24				Brown sand
		7						
	12.00	8						
		6						
	13.00	8	14	24				
		10						
	14.00	14				14'-0"		
								End of test 14'-0"
	15.00							
	16.00							
	17.00							
	18.00							
	19.00							
	20.00							

TYPE of SAMPLE: 3
D – disturbed (22) – Penetrometer
U.L. - Undist. Liner 2
S.T. – Shelby tube

Cohesionless Density:
0-10 Loose
10-30 Medium
30-50 Dense

Cohesive Consistency:
0-4 Soft
4-8 Medium Stiff
8-15 Stiff

140 Lb. WT. Hammer x 30" fall on 2" sampler

LOG OF BORING

JOB #:		Sheet:	1 of 1
Boring:	3	Date:	7/23/20
CLIENT:	Schwimmer, Eric	Date started:	7/21/20
PROJECT:	Proposed Townhomes Development, Lake Worth, FL	Date completed:	7/21/20
LOCATION:	See Attached location sketch	Driller (s):	RC/AO

Sample number	Depth In Feet	Blows / 6 inches	N Value	Sample Recovery (inches)	Water	Layer thick-ness	Symbol	DESCRIPTION: Soil type, color, texture, and consistency. Notes on drilling conditions.
	0.00					0'-0"		weeds
		1				0'-6"		Dark sand
	1.00	2	4	22				
		2						Light grey sand
	2.00	2						
		2						
	3.00	3	5	22				
		2						
	4.00	3						
		2						
	5.00	3	5	24				
		2						
	6.00	3						
		4						
	7.00	4	12	24	≡	7'-0"		
		8						
	8.00	8				8'-0"		
		4						Dark brown sand
	9.00	4	8	24				
		4						
	10.00	4				10'-0"		
		8						
	11.00	12	27	24				
		15						Brown reddish sand
	12.00	12						
		18						
	13.00	12	28	24				
		16						
	14.00	13				14'-0"		
								End of test 14'-0"
	15.00							
	16.00							
	17.00							
	18.00							
	19.00							
	20.00							

TYPE of SAMPLE: 3
D – disturbed
U.L. - Undist. Liner
S.T. – Shelby tube

(22) – Penetrometer
2

Cohesionless Density:
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10-30 Medium
30-50 Dense

Cohesive Consistency:
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8-15 Stiff

140 Lb. WT. Hammer x 30" fall on 2" sampler

LOG OF BORING

JOB #:		Sheet:	1 of 1
Boring:	4	Date:	7/23/20
CLIENT:	Schwimmer, Eric	Date started:	7/21/20
PROJECT:	Proposed Townhomes Development, Lake Worth, FL	Date completed:	7/21/20
LOCATION:	See Attached location sketch	Driller (s):	RC/AO

Sample number	Depth In Feet	Blows / 6 inches	N Value	Sample Recovery (inches)	Water	Layer thick-ness	Symbol	DESCRIPTION: Soil type, color, texture, and consistency. Notes on drilling conditions.
	0.00					0'-0"		weeds
		2						Dark sand
	1.00	3	6	22		1'-0"		
		3						
	2.00	5						Light grey sand
		3						
	3.00	3	6	22				
		3						
	4.00	3						
		2						
	5.00	3	5	23				
		2						
	6.00	3						
		6						
	7.00	6	11	24	≡	7'-0"		
		5						
	8.00	7						Grey sand
		4						
	9.00	4	8	24				
		4						
	10.00	4				10'-0"		Dark brown sand
		12						
	11.00	15	31	24		11'-0"		
		16						
	12.00	20						
		10						
	13.00	12	20	24				Brown reddish sand
		8						
	14.00	15						
		12						
	15.00	12	26	24				
		14						
	16.00	11						
		10						
	17.00	11	23	24				
		12						
	18.00	12				18'-0"		End of test 18'-0"
	19.00							
	20.00							

TYPE of SAMPLE: 3
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APPENDIX "A"
SUBSURFACE EXPLORATION INFORMATION

Our borings describe subsurface conditions only at the locations drilled and at the time drilled. They provide no information about subsurface conditions below the bottom of the boreholes. At locations not explored, subsurface conditions that differ from those observed in the borings may exist and should be anticipated.

The groundwater depth shown on our boring logs is the water level the driller(s) observed in the borehole when it was drilled. These water levels may have been influenced by the drilling procedures. An accurate determination of groundwater level requires long-term observation of suitable monitoring wells. The absence of a groundwater level on certain logs indicates that no groundwater data is available. It does not mean that no groundwater will be encountered at that boring location.

Standard Penetration Test Borings

The Standard Penetration Test (SPT) is a widely accepted method of testing foundation in place. The N-value obtained from the test has been correlated empirically with various soil properties. These empirical correlations allow satisfactory estimates to be made of how the soil is likely to behave when subjected to foundation loads. Tests are usually performed in the boreholes at intervals of five feet. In addition, our Firm performs tests continuously in the interval directly below the expected foundation-bearing grade where the soil will be most highly stressed.

Boreholes where SPT will be performed are drilled with a truck mounted SIMCO 2800 drill-rig. The boreholes are advanced by rotary drilling with a winged bit that makes a hole about seven inches in diameter. After the borehole has been advanced to the depth where a SPT will be performed, the soil sampler used to run the test is attached the end of drill rods and lowered to the bottom of the borehole. The testing procedure used conforms closely to the methods recommended in ASTM D-1586. The sampler has a split-barrel 24 inches long and an outside diameter of 2.0 inches. It is driven into the ground below the bottom of the borehole using a hammer that weights 140 pounds and falls freely 30 inches. The driller records the number of hammer blows needed to advance the sampler the second and third six-inch increments. The total number of blows required to advance the sampler the second and the third six-inch increments constitutes the test results; that is N-Value at the depth. The test is completed after the sampler has been driven not more than 24 inches or when refusal is encountered, whichever occurs first. Refusal occurs when 100 hammer blows advance the sampler six inches or less.

After the test is completed, the sampler is removed from the borehole and opened. The driller examines and classifies the soil recovered by the sampler. He places representative soil specimen from each test in closed jars or plastic bags and takes them to our laboratory. In the laboratory, additional evaluations and tests are performed, if needed. Jar samples are retained in our laboratory for thirty days, then discarded unless our clients request otherwise.

Hand Auger Borings

Hand auger borings are used if soil conditions are favorable, when the soil strata are to be determined within a shallow (approximately 6 feet) depth, or when access is not available for our truck-mounted or portable mounted drill-rigs. A three inches diameter hand bucket auger with a cutting head is simultaneously turned and pressed into the ground. The bucket auger is retrieved at approximately six inches increments and its content emptied for inspection. Sometimes posthole diggers are used, especially in the upper three feet or so. The soil samples obtained are described and representative samples put in jars or plastic bags and transported to the laboratory for further classification and testing, if necessary.

Google Maps 1005 N F St

SOILPROBE ENGINEERING AND TESTING 3931 SW 47th Ave. #104 Davie, FL 33314 Tel. (954) 584-6115	**Schwimmer, Eric**	**Soil Test Location Sketch** **1005, 1009 North F St.** **1008 North E St.** **Lake Worth, FL**