GFA INTERNATIONAL

FLORIDA'S LEADING ENGINEERING SOURCE

Geotechnical Exploration Report

Wellington Green Parcel "F"
Proposed New Retail "H"
2454 South State Road 7, Wellington, Florida

May 19, 2016
GFA Project No.: 16-0717.01

Prepared for: WRI Wellington Green, LLC

1215 Wallace Drive • Delray Beach, Florida 33444 • (561) 347-0070 • (561) 347-0809 (fax) • www.teamgfa.com

OFFICES THROUGHOUT FLORIDA

May 19, 2016

Mr. Dale Menninger
WRI Wellington Green, LLC
555 Town Center Road, Suite 802
Boca Raton, Florida 33486
Phone: (954) 351-7002

RE: Geotechnical Exploration
Wellington Green Parcel "F"
Proposed New Retail "H"
2545 South State Road 7, Wellington, Florida
GFA Project No.: 16-0717.01

Dear Mr. Menninger:

In accordance with your authorization, GFA International, Inc. (GFA) has completed the subsurface exploration and geotechnical engineering evaluation for the above referenced project in accordance with the signed project authorization agreement for this project. The scope of GFA's services was planned in conjunction with and authorized by you.

The purpose of our subsurface exploration was to classify the nature of the subsurface soils and general geomorphic conditions and to evaluate their impact upon the proposed development's construction. This report contains the results and our engineering interpretation of subsurface conditions of the site with respect to the project characteristics as described to us including recommendations for foundation design, hydro-geological concerns, and site preparation procedures.

PROJECT DESCRIPTION

The subject property is located at 2545 South State Road 7 in Wellington, Florida. **Figure 1** shows the location of project with respect to existing streets and features. Based on the site plan (Sheet A2.0 prepared by Williamson Dacar Associates, no date on plan) provided to us by the client, the proposed development includes the construction of a new 9,000 square foot one-story structure and associated paved parking/drive area(s). **Figure 2** shows the proposed site plan.

GFA has assumed that the proposed development will be constructed using shallow concrete footings and concrete masonry unit walls. We have also assumed that the structure will not have any basement levels and that the ground floor of the building will be an at-grade slab.

If any of the noted information is incorrect or has changed, please notify GFA so that we may amend the recommendations presented in this report, if appropriate.

FIGURE 1 – SITE LOCATION PLAN

PROPOSED NEW RETAIL H
2545 SOUTH STATE ROAD 7
WELLINGTON, FLORIDA
GFA PROJECT NO.: 16-0717.01

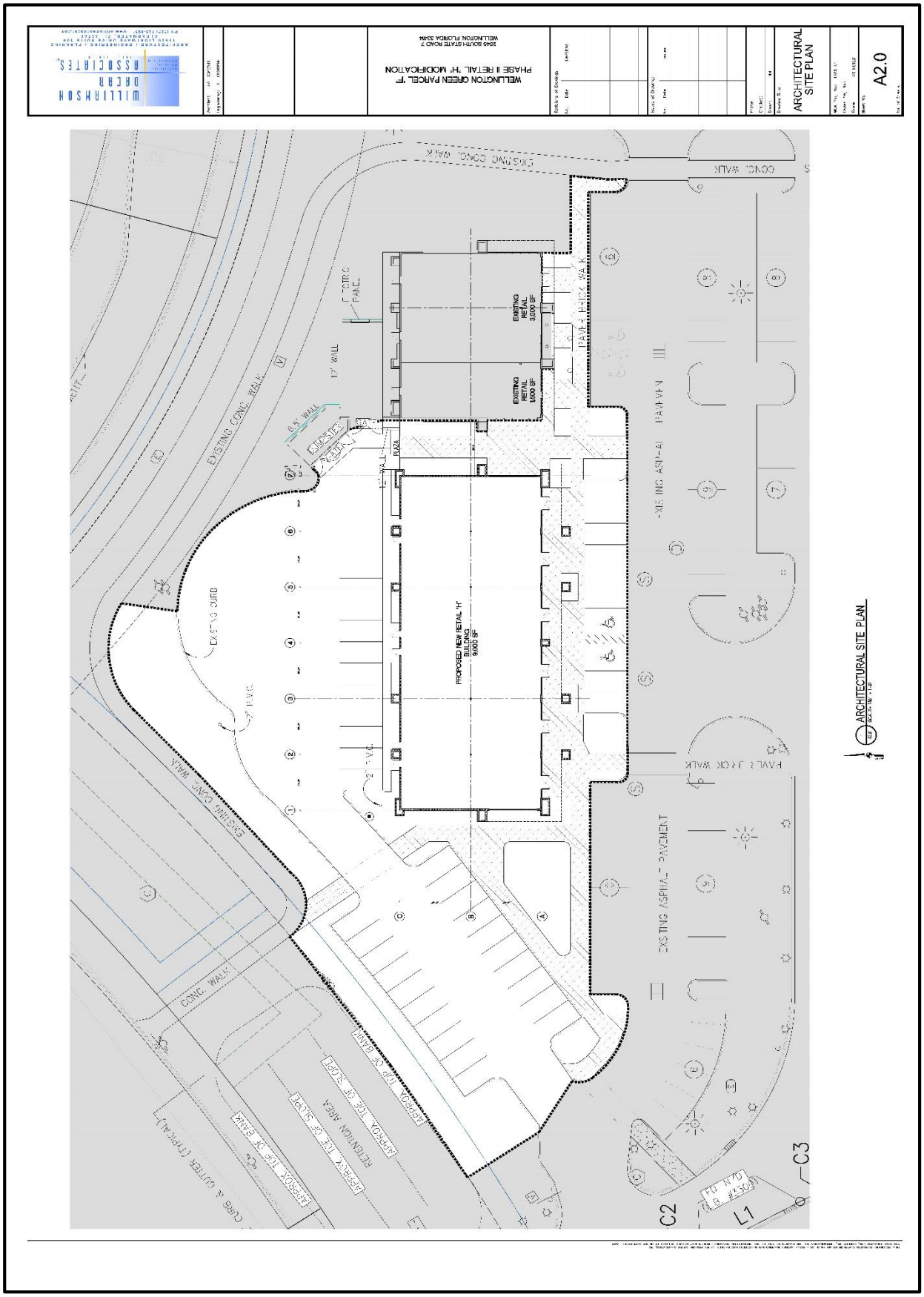


FIGURE 2 – PROPOSED SITE PLAN

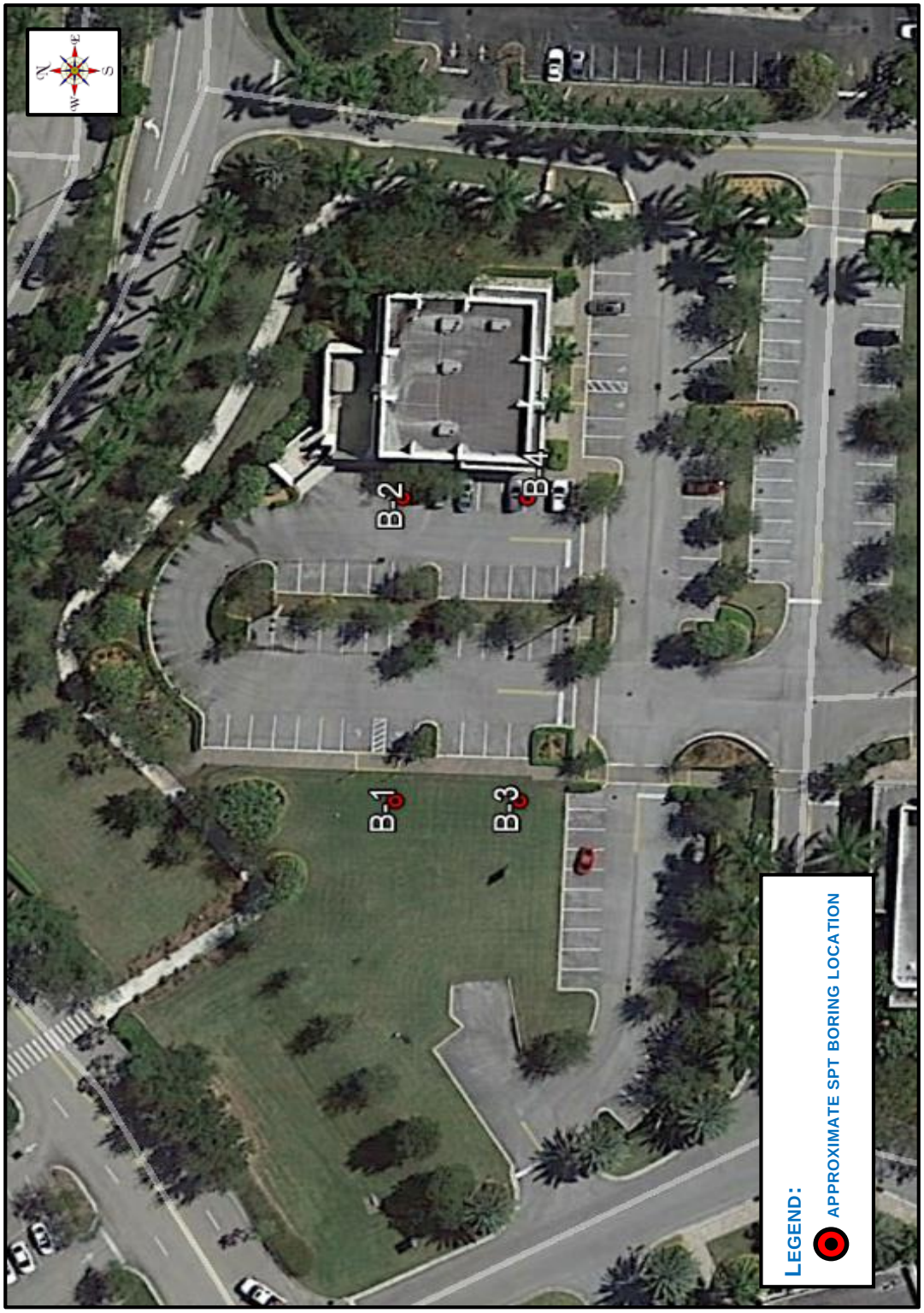
FIELD INVESTIGATION

At the time of our study, the site was comprised an existing asphalt paved parking/drive area on the east side of the site and lightly vegetated on the west side of the site.

A total of four (4) standard penetration test (SPT) borings to depths ranging from 20 to 25 feet below ground surface (BGS) were completed for this study. **Figure 3** shows the approximate location of the borings performed at site. The SPT boring method was used as the investigative tool within the borings. Penetration tests were performed in substantial accordance with ASTM Procedure D-1586, “Penetration Test and Split-Barrel Sampling of Soils”. This test procedure consists of driving a 1.4-inch I.D. split-tube sampler into the soil profile using a 140-pound automatic hammer falling 30 inches. The number of blows per foot, for the second and third 6-inch increment, is an indication of soil strength. The SPT borings were performed using a truck mounted drill rig equipped with an automatic hammer. The soil samples recovered from the soil borings were classified and stratified by a geotechnical engineer. Following completion of our field services, all boreholes were backfilled with excavated soil/rock, the asphaltic surface patched where necessary and the site generally cleaned, as required.

The results of the classification and stratification are encountered during our exploration are presented in the **Appendix A** "Record of Test Boring”. It should be noted that soil conditions might vary between what is depicted on the attached log and other areas of the site. The soil boring data reflect information from a specific test location only. Site specific survey staking for the test location was not provided for our field exploration. The boring location was determined in the field by a project engineer by measuring distances and estimating right angles from existing site features. The boring location should, therefore, be considered approximate. The boring depths were confined to the zone of soil likely to be stressed by the proposed construction.

The boring log depicts the observed soils in graphic detail. The Standard Penetration Test boring indicates the penetration resistance, or N-values logged during the drilling and sampling activities. Please refer to **Appendix B** “Notes Related to the Test Borings” for further clarification of our field exploration. The classifications and descriptions shown on the log are generally based upon visual characterizations of the recovered soil samples. All soil samples reviewed have been depicted and classified in accordance with the Unified Soil Classification System symbols (i.e. SP, SP-SM, SC etc.). See in **Appendix C** "Discussion of Soil Groups", for a detailed description of various soil groups.



NOTE: BORING LOCATIONS WERE LOCATED USING A MEASURING TAPE AND EXISTING LANDMARKS AS REFERENCE POINTS. THEREFORE, LOCATIONS SHOWN ON THE PLAN ARE APPROXIMATE.

FIGURE 3 – BORING LOCATION PLAN

SUBSURFACE CONDITIONS

The subsurface conditions encountered in our test borings generally revealed a surficial cover of topsoil or asphalt, which was underlain by granular material consisting of varying amounts of fine sand and limerock that persisted to depths ranging from 1 to 4 feet BGS. Below the granular stratum, the borings encountered a sequence of very loose to dense fine sand with occasional shell/limestone fragments and silty fine sand that persisted to the maximum termination depth of the explorations at 25 feet BGS. The results of the standard penetration tests yielded N-values ranging from 2 to 35 blows per foot. For detailed information on subsurface conditions encountered in the borings, please refer to the "Record of Test Boring" sheets attached to this report.

Groundwater was encountered at approximate depths ranging from 6'3" and 8'8" BGS at the time of drilling (May 2016). The difference in the water level is primarily a result in changes in the ground surface elevation between various boring locations. It should be noted that groundwater levels will fluctuate seasonally depending upon local rainfall and other site-specific influences. Brief ponding of stormwater may occur across the site after heavy rain events. No additional investigation was conducted in relation to any existing well field in the vicinity. Well fields can influence water table levels and cause significant fluctuations. If a more comprehensive water table analysis is necessary, we recommend contacting a registered professional specialized in hydrogeology. We also recommend that the contractor determine the actual groundwater levels at the time of construction to assess the potential impact of groundwater on the construction procedure.

FOUNDATION RECOMMENDATIONS

Based on the scope of the proposed project development and once ground improvement techniques discussed herein have been completed, it is our opinion that the soils at the site are generally suitable for support of the proposed construction using shallow foundation system.

The allowable amount of settlement that a structure may tolerate is dependent on several factors including uniformity of settlement, time rate of settlement, structural dimensions and properties of the structural materials. Generally, total or uniform settlement does not damage a structure but may affect drainage and utility connections. These can generally tolerate movements of several inches for building construction. In contrast, differential settlement affects a structure's frame and is limited by the structural flexibility. Shallow foundations appear to be suitable for the proposed project and can be used to support the proposed residence at this site, provided that the existing ground surfaces and any fill soils are properly prepared as discussed herein. Shallow foundations can consist of conventional shallow continuous strip footings and isolated spread footings, or a monolithic turned down footing and slab type foundation.

Although we were not provided with the structural loads for the proposed construction, we have assumed for this report that column and perimeter wall loading will not exceed 100 kips and 4 kips/ft; respectively. These values have been utilized in our analysis and any significant deviations from these values should be forwarded to our office for reassessment of the recommendations given in this report.

The following steps shall be incorporated in the construction plans in order to prepare the subgrade soils for construction of spread footings and/or isolated footings to support the proposed development. The earthwork and testing required herein should be performed under the supervision of GFA personnel.:

1. Existing underground drainage/utility pipes (if any) to be relocated shall be abandoned by either complete removal and subsequent soil backfilling in accordance with the recommendation provided herein, or left in-place and filled with "flowable fill".

2. Any existing structures and their associated foundation elements should be demolished. All construction debris along with other unwanted ground cover (asphalt, concrete etc.) should be completely removed from the site and be properly disposed of. This work should be carried out in accordance with current regulatory criteria. If the existing foundations are left in place they could have potential impacts on the new construction.

3. Site preparation for the proposed development should consist of clearing the vegetation and removal of the topsoil to expose clean granular soils. Disposal of these materials shall be accomplished in accordance with local and municipal guidelines.

4. Following the site stripping, areas of surficial sand should be compacted prior to the placement of any fill. GFA recommends a steel drum vibratory roller with a minimum static weight of 20,000 lbs. and minimum vibratory impact energy of 50,000 lbs. The roller should be operated at 2 mph making at least 10 perpendicular overlapping passes. Densification of the soils should be performed within the proposed development areas plus a 5-foot wide perimeter extending beyond the outside edge of the same, where practical. Densification operations should continue until the subgrade soils are firm and unyielding. Any area of the exposed surface that deflects excessively under the weight of the compaction equipment should be excavated approximately 24 inches and be replaced with compacted structural fill. No section of the subgrade should receive less than 4 passes of the roller or until at least 98% maximum density (ASTM D 1557) is achieved for a depth of at least 1 foot below the excavated surface. Upon completion of the proof rolling, backfill shall be placed in maximum 12-inch loose lifts and compacted to a minimum density of **98 percent** of the Modified Proctor maximum dry density (ASTM D-1557). Fill to be compacted with a vibratory plate tamper or a small walk behind vibratory roller should be placed in lifts not exceeding six inches in loose thickness.

5. The bottom of footing excavations shall be compacted with a steel drum vibratory roller with a minimum static weight of 20,000 lbs. and minimum vibratory impact energy of 36,000 lbs.; (Dynapac CA-250D or equivalent) or equivalent equipment. The roller should be operated at 2 mph. Additional passes may be necessary if acceptable compaction is not achieved. Density tests shall be completed at footing subgrade to confirm that the soils have achieved a minimum degree of compaction of 95 percent of modified proctor maximum density (ASTM D-1557). The bottom of all footings shall be examined by the engineer or his representative to determine if the soil is free of all organic and/or deleterious materials, and if the required compaction and soil pressures are achieved or if additional compaction is required.

6. Fill material placement (if needed) should be inorganic (classified as SP/SW) containing not more than 5 percent (by weight) fibrous organic materials. Fill materials with silt-size soil fines in excess of 10% should not be used, this includes cyclone sand material. Place fill in maximum 12-inch lifts and compact each lift to a minimum density of 98 percent of the Modified Proctor maximum dry density (ASTM D-1557) with a vibratory roller. Perform compliance tests within the fill at a frequency of not less than one test per 2,500 square feet per lift in the building areas, or a minimum of 2 test locations per lift, whichever is greater.

7. The structural fill or backfill to be placed below the water table and to a height of one foot above it should consist of a combination of FDOT 57 Stone and structural fill material mixed in an approximate 50% proportion by volume. Density testing will not be required within this layer, however the subgrade preparation work should be observed by a representative from our office to confirm that the material is in a stable and unyielding condition.

8. It is likely that proof-rolling and any subsequent backfill compaction with the aforementioned equipment may induce ground vibrations that can affect the existing nearby structures. A representative from our office can monitor the vibration disturbance using seismograph equipment capable of recording ground velocities that can be used to determine if construction activity at the site is exceeding tolerable vibration levels on adjacent structures as established by the project structural engineer.

9. Depending on the depth of the footings, groundwater control may be required at this site for either excavation dewatering or removal of temporarily perched water from a rain event. Such water can be controlled by pumping from sumps located in ditches or pits. Groundwater should be maintained at least one foot below the bottom of any excavation made during construction operations, or, at least two feet below the surface of any compaction operations.

10. The contractor shall take into account the final contours and grades as established by the plan when executing his backfilling and compaction operations.

Provided the column/wall footing subgrade is prepared in accordance with the above guidelines, GFA recommends a **bearing capacity of 2,500 psf** for the foundation design. In addition, column footings bearing on the recommended subgrade will yield settlement values less than 1-inch total and ½-inch differential between adjacent columns or a horizontal distance of 20 feet. Footing dimensions shall be determined in accordance with the aforementioned soil bearing capacity, the Florida Building Code (latest edition), and any local municipal ordinance. Shallow foundations should be embedded a minimum of 12 inches into the bearing soils. The embedment shall be measured from the lowest adjacent grade. Isolated column footings should be at least 30 inches in width and continuous strip footings should have a width of at least 18 inches, regardless of contact pressure. All footings and columns should be structurally separated from the floor slab, as they will be loaded differently and at different times.

The ground floor slab may be supported directly on the granular fill pad following the foundation site preparation procedures depicted in this report. For purposes of design, a modulus of subgrade reaction of 150 pounds per cubic inch may be used. The ground floor slab should be structurally separated from all walls and columns to allow for differential vertical movement.

Water vapor is likely to rise through the granular fill building pad and condense beneath the base of the floor slab. If moisture entry into the floor slab is not desirable, an Impermeable membrane should be installed at the slab bottom - subgrade interface.

EXCAVATION CONDITIONS

In Federal Register, Volume 54, No. 209 (October 1989), the United States Department of Labor, Occupational Safety and Health Administration (OSHA) amended its “Construction Standards for Excavations, 29 CFR, part 1926, Subpart P”. This document was issued to better insure the safety of workmen entering trenches or excavations. It is mandated by this federal regulation that all excavations, whether they be utility trenches, basement excavations or footing excavations, be constructed in accordance with the OSHA guidelines. It is our understanding that these regulations are being strictly enforced and if they are not closely followed, the owner and the contractor could be liable for substantial penalties.

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

We are providing this information solely as a service to our client. GFA is not assuming responsibility for construction site safety or the contractor’s activities; such responsibility is not being implied and should not be inferred.

REPORT LIMITATIONS

This consulting report has been prepared for the exclusive use of the current project owners and other members of the design team for the **Proposed New Retail "H"** project in Wellington, Florida. This report has been prepared in accordance with generally accepted local geotechnical engineering practices; no other warranty is expressed or implied. The evaluation submitted in this report, is based in part upon the data collected during a field exploration, however, the nature and extent of variations throughout the subsurface profile may not become evident until the time of construction. If variations then appear evident, it may be necessary to reevaluate information and professional opinions as provided in this report. In the event changes are made in the nature, design, or locations of the proposed structure, the evaluation and opinions contained in this report shall not be considered valid, unless the changes are reviewed and conclusions modified or verified in writing by GFA International. Lastly, in accepting this report, the client understands that the data obtained from the soil borings is intended for foundation analysis only and is not to be used for excavating or backfilling pricing estimates.

The analysis and recommendations submitted in this report are based on the data obtained from the tests performed at the location indicated on the attached **Figure 3**. This report does not reflect any variations, which may occur between borings. While the borings are representative of the subsurface conditions at their respective locations and for their vertical reaches, local variations characteristic of the subsurface soils of the region are anticipated and may be encountered. The delineation between soil types shown on the soil logs is approximate and the description represents our interpretation of the subsurface conditions at the designated boring locations on the particular date drilled.

The scope of our services did not include an environmental assessment for the presence or absence of hazardous or toxic materials in the soil and groundwater. Any statements in this report regarding odors, staining of soils, or other unusual conditions observed are strictly for the information of our client.

Any third party reliance of our geotechnical report or parts thereof is strictly prohibited without the expressed written consent of GFA International. The SPT methodology (ASTM D-1586) used in performing our borings and for determining penetration resistance is specific to the sampling tools utilized and does not reflect the ease or difficulty to advance other tools, equipment or materials.

Respectfully Submitted,
GFA INTERNATIONAL, INC.
FBPE CA #4930

Carlos Mercado PE#71707
May 19 2016 3:42 PM

Jonathan Bassett. E.I.
Project Engineer

Carlos A. Mercado, M.S., P.E.
Professional Engineer #71707
State of Florida

Appendices

Appendix A Record of Test Borings
Appendix B Notes Related to the Test Borings
Appendix C Discussion of Soil Groups

Appendix A

Record of Test Borings

GFA International, Inc.
1215 Wallace Dr
Delray Beach, FL 33444
561-347-0070
561-395-5805

LOG OF BORING B-1

CLIENT WRI Wellington Green, LLC
PROJECT NAME Proposed New Retail "H"
PROJECT NUMBER 16-0717
PROJECT LOCATION 2545 South State Road 7, Wellington, FL
DRILLING CONTRACTOR GFA International
HOLE DEPTH 20 ft
HOLE DIAMETER
DRILLER Marcos Ruiz
DATE STARTED 5/12/16
COMPLETED 5/12/16
DRILL RIG GeoProbe
GROUND WATER LEVEL: AT TIME OF DRILLING 8.70 ft
METHOD SPT
LATITUDE 26.643242
LONGITUDE -80.206079
NOTE:
HAMMER TYPE 140# with 30 in Drop - Automatic Hammer

DEPTH (ft)	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS	N VALUE	MOISTURE CONTENT (%)	ORGANIC CONTENT (%)
0	Medium Dense, Light Brown to Tan, Fine to Medium Grained SAND (SP) with LIMEROCK.	1	90	3 3 10 7	13		
		2	90	13 10 11 9	21		
5	Medium Dense, Light Gray to Brown, Fine to Medium Grained SAND (SP).	3	90	10 11 14 16	25		
		4	90	8 9 11 8	20		
	▽ Loose, Light Gray to Brown, Fine to Medium Grained SAND (SP).	5	90	5 3 4 4	7		
10							
		6	80	2 3 4 4	7		
15							
		7	80	5 4 4 5	8		
20	Bottom of borehole at 20.0 feet.						

SPT N VALUE
20 40 60 80
PL MC LL
20 40 60 80
☐ FINES CONTENT (%) ☐
20 40 60 80

GFA GEOTECH BH - GFA DATA TEMPLATE.GDT - 5/19/16 11:37 - R:\GINT\PROJECTS\WELLINGTON GREEN PARCEL F.GPJ

GFA International, Inc.
1215 Wallace Dr
Delray Beach, FL 33444
561-347-0070
561-395-5805

LOG OF BORING B-2

CLIENT WRI Wellington Green, LLC
PROJECT NAME Proposed New Retail "H"
PROJECT NUMBER 16-0717
PROJECT LOCATION 2545 South State Road 7, Wellington, FL
DRILLING CONTRACTOR GFA International
HOLE DEPTH 20 ft
HOLE DIAMETER
DRILLER Marcos Ruiz
DATE STARTED 5/12/16
COMPLETED 5/12/16
DRILL RIG GeoProbe
GROUND WATER LEVEL: AT TIME OF DRILLING 6.60 ft
METHOD SPT
LATITUDE 26.643234
LONGITUDE -80.205638
NOTE:
HAMMER TYPE 140# with 30 in Drop - Automatic Hammer

DEPTH (ft)	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS	N VALUE	MOISTURE CONTENT (%)	ORGANIC CONTENT (%)
0	Loose to Medium Dense, Light Brown to Tan, Fine to Medium Grained SAND (SP).	1	90	3 2 2 3	4		
		2	90	7 6 8 10	14		
5		3	90	10 11 13 10	24		
	▽ Medium Dense, Light Gray to Brown, Fine to Medium Grained SILTY SAND (SM).	4	90	5 4 8 8	12		
	Loose, Light Gray to Brown, Fine to Medium Grained SAND (SP) with Limestone and Shell Fragments.	5	90	6 5 5 6	10		
10							
	Very Loose to Loose, Light Gray to Brown, Fine to Medium Grained SAND (SP).	6	80	3 1 1 6	2		
15							
		7	80	3 4 3 4	7		
20	Bottom of borehole at 20.0 feet.						

▲ SPT N VALUE ▲
20 40 60 80

PL MC LL
20 40 60 80

☐ FINES CONTENT (%) ☐
20 40 60 80

GFA GEOTECH BH - GFA DATA TEMPLATE.GDT - 5/19/16 11:37 - R:\GINT\PROJECTS\WELLINGTON GREEN PARCEL F.GPJ

GFA International, Inc.
1215 Wallace Dr
Delray Beach, FL 33444
561-347-0070
561-395-5805

LOG OF BORING B-3

CLIENT WRI Wellington Green, LLC
PROJECT NAME Proposed New Retail "H"
PROJECT NUMBER 16-0717
PROJECT LOCATION 2545 South State Road 7, Wellington, FL
DRILLING CONTRACTOR GFA International
HOLE DEPTH 20 ft
HOLE DIAMETER
DRILLER Marcos Ruiz
DATE STARTED 5/12/16
COMPLETED 5/12/16
DRILL RIG GeoProbe
GROUND WATER LEVEL: ▽ AT TIME OF DRILLING 8.40 ft
METHOD SPT
LATITUDE 26.643103
LONGITUDE -80.206079
NOTE:
HAMMER TYPE 140# with 30 in Drop - Automatic Hammer

DEPTH (ft)	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS	N VALUE
0	Medium Dense, Light Brown to Tan, Fine to Medium Grained SAND (SP) with LIMEROCK.	1	90	3 4 7 9	11
	Medium Dense to Dense, Light Gray to Brown, Fine to Medium Grained SAND (SP).	2	90	12 12 13 13	25
5		3	90	13 14 21 22	35
		4	90	10 11 12 12	23
	▽ Loose to Medium Dense, Light Gray to Brown, Fine to Medium Grained SAND (SP).	5	80	3 4 5 7	9
10					
		6	80	6 4 4 4	8
15					
		7	80	5 6 5 6	11
20	Bottom of borehole at 20.0 feet.				

▲ SPT N VALUE ▲
20 40 60 80
PL MC LL
20 40 60 80
☐ FINES CONTENT (%) ☐
20 40 60 80

GFA GEOTECH BH - GFA DATA TEMPLATE.GDT - 5/19/16 11:37 - R:\GINT\PROJECTS\WELLINGTON GREEN PARCEL F.GPJ

GFA International, Inc.
1215 Wallace Dr
Delray Beach, FL 33444
561-347-0070
561-395-5805

LOG OF BORING B-4

CLIENT WRI Wellington Green, LLC
PROJECT NAME Proposed New Retail "H"
PROJECT NUMBER 16-0717
PROJECT LOCATION 2545 South State Road 7, Wellington, FL
DRILLING CONTRACTOR GFA International
HOLE DEPTH 25 ft
HOLE DIAMETER
DRILLER Marcos Ruiz
DATE STARTED 5/12/16
COMPLETED 5/12/16
DRILL RIG GeoProbe
GROUND WATER LEVEL: AT TIME OF DRILLING 6.30 ft
METHOD SPT
LATITUDE 26.643095
LONGITUDE -80.205638
NOTE:
HAMMER TYPE 140# with 30 in Drop - Automatic Hammer

DEPTH (ft)	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS	N VALUE
0	ASPHALT.				
	Medium Dense, Light Brown to Tan, Fine to Medium Grained SAND (SP) with Limestone.	1	90	16 13 10 10	23
	Loose to Medium Dense, Light Brown to Tan, Fine to Medium Grained SAND (SP).	2	90	16 18 13 21	31
5		3	90	15 18 17 16	35
	▽	4	90	4 2 1 2	3
	Loose, Light Gray to Brown, Fine to Medium Grained SILTY SAND (SM) with Traces of Roots.	5	80	6 5 4 5	9
10					
	Very Loose, Light Gray to Brown, Fine to Medium Grained SAND (SP) with Limestone and Shell Fragments.	6	80	1 1 1 8	2
15					
	Very Loose to Loose, Brown, Fine to Medium Grained SAND (SP).	7	80	4 2 2 3	4
20					
		8	80	3 2 3 3	5
25	Bottom of borehole at 25.0 feet.				

MOISTURE CONTENT (%)
ORGANIC CONTENT (%)

▲ SPT N VALUE ▲
20 40 60 80

PL MC LL
20 40 60 80

☐ FINES CONTENT (%) ☐
20 40 60 80

GFA GEOTECH BH - GFA DATA TEMPLATE.GDT - 5/19/16 11:37 - R:\GINT\PROJECTS\WELLINGTON GREEN PARCEL F.GPJ

Appendix B

Notes Related to the Test Borings

NOTES RELATED TO
RECORDS OF TEST BORING AND
GENERALIZED SUBSURFACE PROFILE

1. Groundwater level was encountered and recorded (if shown) following the completion of the soil test boring on the date indicated. Fluctuations in groundwater levels are common; consult report text for a discussion.

2. The boring location was identified in the field by offsetting from existing reference marks and using a cloth tape and survey wheel.

3. The borehole was backfilled to site grade following boring completion, and patched with asphalt cold patch mix when pavement was encountered.

4. The Record of Test Boring represents our interpretation of field conditions based on engineering examination of the soil samples.

5. The Record of Test Boring is subject to the limitations, conclusions and recommendations presented in the Report text.

6. "Field Test Data" shown on the Record of Test Boring indicated as 11/6 refers to the Standard Penetration Test (SPT) and means 11 hammer blows drove the sampler 6 inches. SPT uses a 140-pound hammer falling 30 inches.

7. The N-value from the SPT is the sum of the hammer blows required to drive the sampler the second and third 6-inch increments.

8. The soil/rock strata interfaces shown on the Records of Test Boring are approximate and may vary from those shown. The soil/rock conditions shown on the Records of Test Boring refer to conditions at the specific location tested; soil/rock conditions may vary between test locations.

9. Relative density for sands/gravels and consistency for silts/clays are described as follows:

SPT	CPT	SANDS/GRAVELS	SPT	CPT	SILTS/CLAYS
BLOWS/FOOT	KG/CM^2	RELATIVE DENSITY	BLOWS/FOOT	KG/CM^2	CONSISTENCY
0-4	0-16	Very loose	0-1	0-3	Very soft
5-10	17-40	Loose	2-4	4-9	Soft
11-30	41-120	Medium Dense	5-8	10-17	Firm
31-50	over 120	Dense	9-15	18-31	Stiff
over 50		Very Dense	16-30	32-60	Very stiff
			31-50	over 60	Hard

10. Grain size descriptions are as follows:

NAME	SIZE LIMITS
Boulder	12 Inches or more
Cobbles	3 to 12 Inches
Coarse Gravel	¾ to 3 Inches
Fine Gravel	No. 4 sieve to ¾ inch
Coarse Sand	No. 10 to No. 4 sieve
Medium Sand	No. 40 to No. 10 sieve
Fine Sand	No. 200 to No. 40 sieve
Fines	Smaller than No. 200 sieve

11. Definitions related to adjectives used in soil/rock descriptions:

PROPORTION	ADJECTIVE	APPROXIMATE ROOT DIAMETER	ADJECTIVE
Up to 5%	with a trace	Less than 1/32"	Fine roots
5 to 30%	with some	1/32" to ¼"	Small roots
30 to 50%	with	¼" to 1"	Medium roots
		Greater than 1"	Large roots

Appendix C

Discussion of Soil Groups

DISCUSSION OF SOIL GROUPS

COARSE GRAINED SOILS

GW and SW GROUPS. These groups comprise well-graded gravelly and sandy soils having little or no plastic fines (less than 5 percent passing the No. 200 sieve). The presence of the fines must not noticeably change the strength characteristics of the coarse-grained fraction and must not interface with it's free-draining characteristics.

GP and SP GROUPS. Poorly graded gravels and sands containing little of no plastic fines (less than 5 percent passing the No. 200 sieve) are classed in GP and SP groups. The materials may be called uniform gravels, uniform sands or non-uniform mixtures of very coarse material and very fine sands, with intermediate sizes lacking (sometimes called skip-graded, gap-graded or step-graded). This last group often results from borrow pit excavation in which gravel and sand layers are mixed.

GM and SM GROUPS. In general, the GM and SM groups comprise gravels or sands with fines (more than 12 percent passing the No. 200 sieve) having low or no plasticity. The plasticity index and liquid limit of soils in the group should plot below the "A" line on the plasticity chart. The gradation of the material is not considered significant and both well and poorly graded materials are included.

GC and SC GROUPS. In general, the GC and SC groups comprise gravelly or sandy soils with fines (more than 12 percent passing the No. 200 sieve), which have a fairly high plasticity. The liquid limit and plasticity index should plot above the "A" line on the plasticity chart.

FINE GRAINED SOILS

ML and MH GROUPS. In these groups, the symbol M has been used to designate predominantly silty material. The symbols L and H represent low and high liquid limits, respectively, and an arbitrary dividing line between the two is set at a liquid limit of 50. The soils in the ML and MH groups are sandy silts, clayey silts or inorganic silts with relatively low plasticity. Also included are loess type soils and rock flours.

CL and CH GROUPS. In these groups the symbol C stands for clay, with L and H denoting low or high liquid limits, with the dividing line again set at a liquid limit of 50. The soils are primarily inorganic clays. Low plasticity clays are classified as CL and are usually lean clays, sandy clays or silty clays. The medium and high plasticity clays are classified as CH. These include the fat clays, gumbo clays and some volcanic clays.