NV5

Miami Office

GEOTECHNICAL ENGINEERING | FOUNDATION ENGINEERING | GEOTECHNICAL TESTING | SOIL BORINGS/MONITORING WELLS | CONSTRUCTION MATERIALS TESTING

June 25, 2015

Mr. Francisco J. Alonso, P.E.
T.Y.Lin International | H.J. Ross
201 Alhambra Circle, Suite 900
Coral Gables, Florida 33134

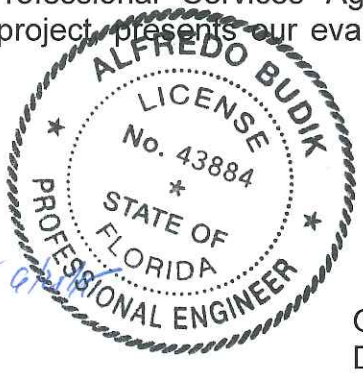
Re: Report of Subsurface Exploration & Soil Parameters
Proposed Lummus Park Seawall
333 NW 3rd Street
Miami, Florida
NV5 Project No. 14739

Dear Mr. Alonso:

NV5, Inc. submits this report in fulfillment of the scope of services described in our Proposal No. 15-0248 dated April 14, 2015. The work was authorized by acceptance of our Professional Services Agreement. This report describes our understanding of the project, presents our evaluations, and provides our professional opinions.

Sincerely,

NV5, Inc.



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1.0 SITE AND PROJECT INFORMATION

The project is located at 333 NW 3rd Street in Miami, Florida. The property is bounded by NW North River Drive to the northeast, a paved parking lot to the northwest, an open lot to the south east and fronts the Miami River to the southwest. A site vicinity map is presented on Drawing 1. The site is currently vacant and covered with grass. We were not provided with information on the current elevation at the site, but assume site grade is about Elevation +6 feet with respect to the 1929 National Geodetic Vertical Datum (NGVD).

Information about this project was received in an email from Francisco Alonso, P.E. of T.Y.Lin International | H.J. Ross. The project consists of the repair of approximately 30 linear feet of seawall. The depth from the top of existing seawall to the mudline was not provided.

2.0 PURPOSE AND SCOPE OF WORK

The purpose of our services on this project is to explore the site subsurface conditions in order to provide soil parameters to be used in the design of a retaining system by others. Specifically this report provides:

- A drawing showing the boring location, and the boring log with detailed descriptions of the materials encountered.
- Discussion of generalized subsurface conditions at the site including groundwater levels.
- Summary of recommended design soil parameters.

3.0 FIELD EXPLORATION

The subsurface conditions were explored with one (1) engineering test boring drilled to a depth of 50 feet below existing grade at the approximate location shown on Drawing 1. The test location was marked and identified in the field by NV5. The boring was drilled with a custom track-mounted drill rig utilizing the rotary wash method. Samples of the subsurface materials were recovered at roughly 2-foot intervals within the upper 10 feet of the boring and at approximately 5-foot intervals thereafter using a Standard Penetration Test split-spoon sampler (SPT) in substantial accordance with ASTM D-1586, "Standard Test Method for Standard Penetration Test and Split-Barrel Sampling of Soils." This test procedure drives a 1.4-inch I.D. split-tube sampler into the subsurface profile using a 140-pound hammer falling 30 inches. The total number of blows required to drive the sampler the second and third six-inch increments is the SPT N-value, in blows per foot, and is an indication of material strength. Upon completion of the boring, the borehole was backfilled with soil cuttings and the upper few feet closed with cement grout.

The soil/rock samples recovered from the boring were classified by a geotechnical engineer. The collected samples were later re-examined to confirm field classifications. Visual soil classifications were made in accordance with ASTM D2487 and ASTM D2488. The results of the classification and consequent generalized stratification are shown in the boring log data in Appendix A (sheets A-1 through A-4). Strata contacts shown on these drawings are approximate. The boring data reflect conditions at the specific test locations only, and at the time the boring wAS drilled.

4.0 LOCAL GEOLOGY

Miami-Dade County is located on the southern flank of a stable carbonate platform on which thick deposits of limestones, dolomites and evaporites have accumulated. The upper two hundred feet of the subsurface profile is composed predominantly of limestone and quartz sand. These sediments were deposited during several glacial and interglacial stages when the ocean was at elevations higher than present.

In many portions of Miami-Dade County, surface sand deposits of the Pamlico Formation are encountered. The Pamlico sands overlie the Miami Limestone. In western Miami-Dade County, portions of the Everglades Region interfinger with the Pamlico sand. The Everglades soil consists of peat and calcareous silt (marl).

The Miami Limestone is a soft to moderately hard, white, porous to very porous, sometimes sandy, oolitic calcareous cemented grainstone. The formation outcrops in portions of Miami-Dade County. The Miami Limestone has a maximum thickness of about 35 feet along the Atlantic Coastal Ridge and thins sharply near the coastline and more gradually in a westerly direction. The Miami Limestone was formed about 130,000 years ago at a time when the sea level was twenty-five feet higher than it is today. This environment facilitated formation of concentrically layered sand sized carbonate grains called oolites. These grains formed by repeated precipitation of calcium carbonate around the nucleus of a sand or shell grain.

The Miami Limestone can be separated into two facies: the barrier bar oolitic facies and the tidal shoal limestone facies. The barrier bar facies is characterized by lenses of oolitic limestone separated by intermittent, 1-inch thick or less, uncemented sand layers (cross-bedded limestone). Zones of higher porosity are characteristic and parallel the bedding planes of the cross-bedded limestone. The tidal shoal limestone facies is characterized by a distinct lack of bedding planes. In addition, burrowing organisms have churned previously deposited sediments, which have resulted in high porosity channels in the rock. These ancient channels give the rock an appearance of a hardened sponge in some areas.

The Fort Thompson Formation underlies the Miami Limestone, and includes sand, sandstone, and limestone. The upper zones of the Fort Thompson Formation consist of sand having a thickness ranging from 5 to 35 feet. The remainder of the formation consists of coralline limestone, quartz sandstone, sandy limestone and freshwater limestone. The type of soils within the formation and the degree of cementation vary with lateral extent and depth.

The Fort Thompson Formation is underlain by the Tamiami Formation. The Tamiami Formation consists of sands, silts, clays, and sometime fossiliferous limestone. The upper portions of the Tamiami Formation are permeable and make up the lower reaches of the Biscayne Aquifer. This formation ranges in thickness from zero to 300 feet in South Florida.

5.0 SUBSURFACE CONDITIONS

In general, the subsurface conditions encountered in the boring are consistent with the geology described above. The detailed subsurface conditions are presented in detail in Appendix A. The subsurface conditions disclosed by the boring can be generalized as described below.

Layer 1 – Surficial Sand
This layer consists of fine sand that is about eight feet thick in the boring. The sand is very loose to dense with SPT N-values ranging from three to 47 blows per foot (bpf) recorded in the boring.

Layer 2 – Peat
This layer consists of stiff peat that is approximately one foot thick in the boring. An SPT N-value was 27 bpf was recorded in the layer.

Layer 3 – Limestone
This layer comprises limestone with some sand and extends to the maximum termination depth of the boring at 50 feet below grade. SPT N-values in the layer range from six to greater than 50 bpf, with an average value of at least 36 bpf. The lower SPT N-values are typically found in the sandier zones of the stratum.

For the layers described above, Table 1 below summarizes our estimates of engineering parameters considered pertinent to the design of the project foundation.

TABLE 1 - SUMMARY OF ESTIMATED PERTINENT ENGINEERING PARAMETERS

Layer ID	Description	Range Thickness (ft)	SPT N-values		Unit Weight (lb/ft^3)	Angle of Internal Friction (deg)	Cohesion (psf)	Earth Pressure Coefficients		
			Range	Avg				k_a	k_o	k_p
1	Surficial Sand	8±	3 – 47	16	110	31	-	0.28	0.50	2.36
2	Peat	1±	–	–	100	-	250	0.35	0.55	2.00
3	Limestone	40+	6 – 50+	36	125	36	-	0.24	0.45	2.74

We note that the values of allowable side shear estimated in Table 1 above are based on our experience and laboratory data from similar rock that we have tested.

Groundwater

Groundwater was encountered in the boring at a depth of about 4 feet below the existing ground surface. This depth corresponds approximately to an elevation of about +2.0 feet NGVD. On average, groundwater levels in the general vicinity of the project are expected to vary between elevations +0 to +4 feet NGVD, the variations being primarily as a result of fluctuations in the Miami River water level and seasonal rainfall. Storm and hurricane events and construction activities also result in variations in the groundwater levels. Notwithstanding the variations acknowledged, we anticipate that groundwater at the site will generally be encountered within the upper five feet of the existing ground surface.

6.0 REPORT LIMITATIONS

This report has been prepared for the exclusive use of the Owner and other members of the design/construction team for the specific projects discussed in this report. This report has been prepared in accordance with generally accepted local geotechnical engineering practices; no other warranty is expressed or implied.

The evaluation and recommendations submitted in this report are based in part upon the data collected from the field exploration. The nature or 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 evaluate our recommendations as provided in this report. In the event changes are made in the nature, design or locations of the proposed project construction, the conclusions and recommendations contained in this report shall not be considered valid unless the changes are reviewed and conclusions modified or verified in writing by NV5.

The scope of services did not include any environmental assessment or investigation for the presence or absence of wetlands, sinkholes, chemically hazardous or toxic materials in the soil, surface water, groundwater or air, on or below or around the site.

We should be provided the opportunity to review final design drawings, in order to ascertain whether our recommendations have been properly interpreted and implemented. If NV5. is not afforded the opportunity to participate in construction related aspects of foundation installation as recommended in this report, we can accept no responsibility for the interpretation of our recommendations made in this report or for foundation performance.

7.0 CLOSURE

We appreciate the opportunity to provide specialized engineering services on this project and look forward to an opportunity to participate in construction related aspects of the development. If you have questions about information contained in this report contact the writer at 305.901-1891.

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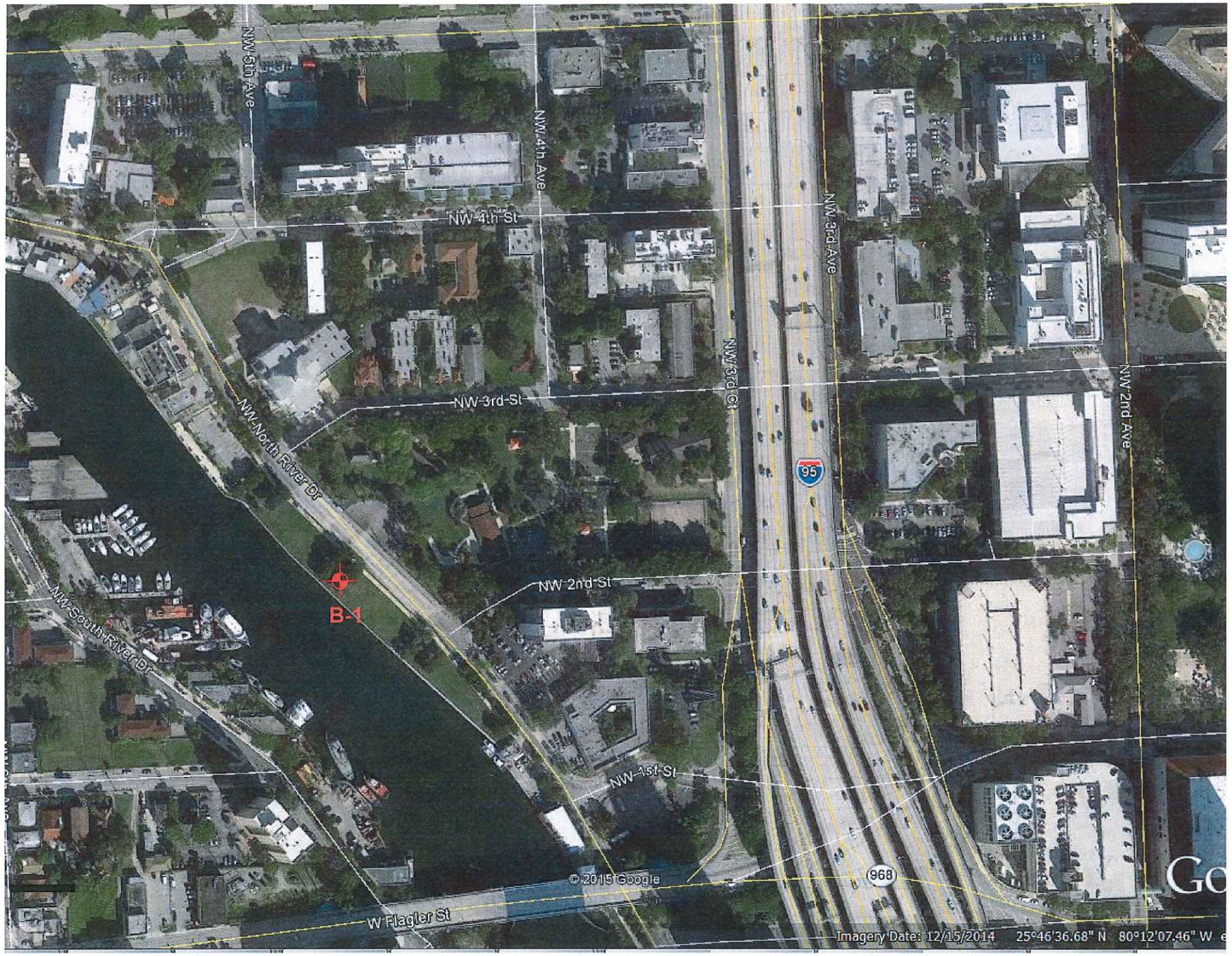
DRAWINGS



Site Vicinity Map

N

0 240

Approximate Scale in Feet

LEGEND:

B-1 - Soil Boring Test Location

NOTES:

1. Test locations shown are approximate.
2. Test location symbols are not to scale.
3. Base drawing taken from Google Maps

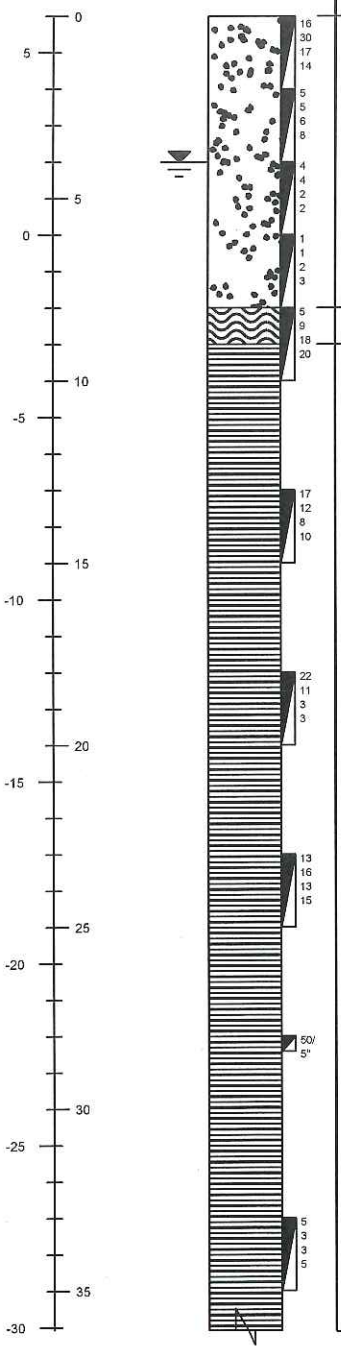
N|V|5	**DRAWING TITLE:** *Site Vicinity Map & Test Location Plan*				**DWN BY:** WO
	PROJECT NAME: *Lummus Park Seawall*				**CKD BY:** AB
	PROJECT LOCATION: *333 NW 3rd Street, Miami, Florida*	**PROJECT NO:** *14739*	**DATE:** *06/10/15*	**DWG NO:** *1*	**APD BY** —

APPENDIX A

BORING LOG DATA

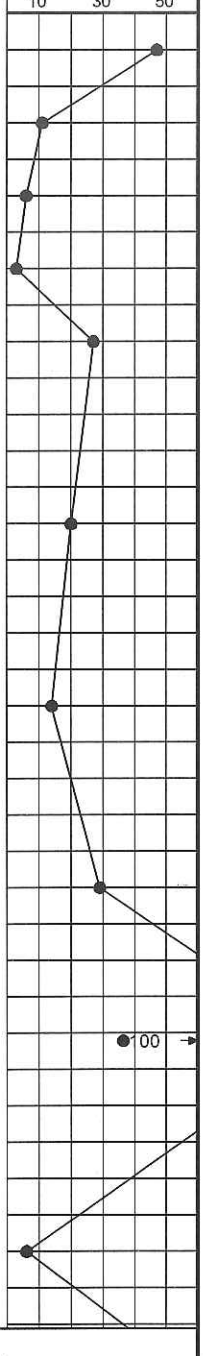
RECORD OF TEST BORING

PROJECT: Lummus Park Seawall, 333 NW 3rd Street, Miami, Florida
BORING NO: B-1
PROJECT NO: 14739
START: 06/05/2015
FINISH: 06/05/2015
WEATHER: Sunny
BORING LOCATION: Refer to Test Location Plan
DRILLER: Correa/Parada
DRILL: Mobile B-53
DRILL CONTRACTOR: NV5
ELEVATION (EST.):+ 6 feet (NGVD)
GROUNDWATER: 4 feet (depth)
DATE CHECKED: 06/05/2015
BORING METHOD: Rotary drill with mud, wash & casing
FLUID LOSS: None



ELEV./ DEPTH	SOIL SYMBOLS AND FIELD TEST DATA	MAJOR SOIL COMPONENT	OTHER COMPONENTS	STANDARD PENETRATION TEST DEPTH	STANDARD PENETRATION TEST N
		SAND (POSSIBLE FILL)	Dense, brown	0'-2'	47
			Medium dense, brown	2'-4'	11
			Loose, brown	4'-6'	6
			Very loose, brown	6'-8'	3
		PEAT	Very stiff, brown	8'-10'	27
		LIMESTONE			
			Very soft, tan, with some sand	13'-15'	20
			Very soft, tan, with some sand	18'-20'	14
			Soft, tan, with some sand	23'-25'	29
			Hard, tan, with some sand	28'-28'5"	100
			Very soft, tan, with some sand	33'-35'	6

STANDARD PENETRATION TEST CURVE



Refer to Notes and Legend on separate sheet for additional information.
This Record of Test Boring is part of the project Geotechnical Report.
It should not be assumed that changes in the "N-Value" are a linear function.
Soil and rock samples recovered using a ASTM D-1586 test proceedures.

RECORD OF TEST BORING

PROJECT: Lummus Park, 333 NW 3rd Street, Miami, Florida

BORING NO: B-1

ELEV./ DEPTH	SOIL SYMBOLS AND FIELD TEST DATA	MAJOR SOIL COMPONENT	OTHER COMPONENTS	STANDARD PENETRATION TEST DEPTH	STANDARD PENETRATION TEST N	STANDARD PENETRATION TEST CURVE (10 30 50)
-35 / 40	28 40 42 17		Hard, tan, with some sand	38'-40'	82	82 →
-40 / 45	50/ 4"		Hard, tan, with some sand	43'-43'3"	100	100 →
-45 / 50	50/ 4"		Hard, tan, with some sand	48'-48'3"	100	100 →
-50 / 55						
-55 / 60						
-60 / 65						
-65 / 70						
-70 / 75						

KEY TO SYMBOLS

Symbol Description

Strata symbols

SAND
(POSSIBLE FILL)

PEAT

LIMESTONE

Misc. Symbols

Groundwater level measured at boring completion. The date checked is indicated.

Boring continues

End of Boring

Soil Samplers

Standard penetration test.
140 lb. hammer dropped 30"

Notes:

1. Exploratory borings were drilled on 06/05/15 and using a 4-inch diameter rotary drill with wash, mud and casing.
2. Groundwater was encountered at depth of 4 feet below grade upon boring completion.
3. Boring location(s) taped from existing features and elevations estimated.
4. Log(s) subject to the limitations, conclusions, and recommendations in this report.
5. Results of tests conducted on samples recovered are reported on the logs.

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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 ground water 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 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 Record of Test Boring are approximate and may vary from those shown. The soil/rock conditions shown on the Record 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 and limestone are described as follows:

SPT Blows/ Foot	Sand/Gravels Relative Density	SPT Blows/ Foot	Silt/Clay Relative Consistency	SPT Blows/ Foot	Limestone Relative Consistency
0-4	Very Loose	0-2	Very Soft	0-20	Very Soft
5-10	Loose	3-4	Soft	21-30	Soft
11-30	Medium dense	5-8	Firm	31-45	Medium Hard
31-50	Dense	9-15	Stiff	46-60	Moderately Hard
Over 50	Very Dense	16-30	Very Stiff	61-50/2"	Hard
		Over 30	Hard	Over 50/2"	Very Hard

10. Grain size descriptions are as follows:

NAME	SIZE LIMITS
Boulder	12 inches or more
Cobbles	3 to 12 inches
Coarse Gravel	3/4 to 3 inches
Fine Gravel	No. 4 sieve to 3/4 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. Definition related to adjectives used in soil/rock descriptions:

PROPORTION	ADJECTIVE	APPROXIMATE ROOT DIAMETER	ADJECTIVE
About 10%	with a trace	Less than 1/32"	Fine roots
About 25%	with some	1/32" to 1/4"	Small roots
About 50%	and	1/4" to 1"	Medium roots
		Greater than 1"	Large roots

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