

May 28, 2020

NorthStar Contracting Group, Inc.
1720 Centrepark Drive East, Ste 101
West Palm Beach, Florida 33401

Attn: Misti Hood-Gelman
Telephone: (561) 684-5474
Email: Mgelman@NorthStar.com

**RE: Biscayne Bay Coastal Wetlands – Cutler Wetlands C-1 Flow Way
Spreader Canal – Northern Extension
Draft Geotechnical Engineering Services Data Report
Miami-Dade County, Florida
RADISE Project No: 191201**

Dear Ms. Hood-Gelman,

RADISE International, LC (RADISE) is pleased to submit this Geotechnical Engineering Services Data Report for the above referenced project. RADISE has completed these preliminary geotechnical services in accordance with the Statement of Work for South Florida Water Management District (SFWMD) Work Order No. 4600003997-WO5.

This report describes the results of the field exploration and laboratory testing performed, presents the data obtained of the underlying subsurface soil and groundwater condition regarding the proposed project.

We appreciate the opportunity to work with you on this project. Should you have any questions regarding the report, or if we can be of further assistance as this project develops, please contact us at (561) 841-0103.

Sincerely,

RADISE International, LC
Florida Certificate of Authorization
No.8901



Akash Bissoon, P.E.
Senior Project Engineer
Florida Registration No. 74582

*Andrew Nixon, State of Florida, Professional Engineer, License No. 71458.
This document has been digitally signed and sealed by Andrew Nixon, P.E. on
the date indicated here.*

*Printed copies of this document are not considered signed and sealed and the
signature must be verified on any electronic copies.*

Andrew Nixon, P.E.
Operations Manager
Florida Registration No. 71458



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West Palm Beach, FL 33404



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1.0 INTRODUCTION

This report has been prepared to provide the results of the geotechnical field and laboratory testing services performed for the northern extension of the spreader canal for the South Florida Water Management District's (SFWMD's) Biscayne Bay Coastal Wetlands – Cutler Wetlands C-1 Flow Way project. The overall project site is located at the general location shown on the attached *Vicinity Map*, Sheet 1. The project site is located in Miami-Dade County, east of the Town of Cutler Bay, Florida.

This report includes geotechnical exploration data, subsurface groundwater information, and laboratory testing analysis for the proposed project. The report does not reflect variations in subsurface conditions that may exist beyond these borings. Variations in soil and groundwater conditions should be expected, the nature and extent of which might not become evident until construction is undertaken. If variations are encountered, and/or the scope of the project altered, we should be consulted for additional recommendations.

2.0 PROJECT DESCRIPTION

The Cutler Wetlands C-1 Flow Way is a project element of the Biscayne Bay Coastal Wetlands (BBCW) Project, a component of the Comprehensive Everglades Restoration Plan (CERP). The objective of the BBCW Project is to improve the distribution of freshwater to Biscayne Bay and Biscayne National Park by re-directing runoff from C-1 basin to the coastal wetlands along Biscayne Bay.

The District has selected NorthStar Contracting Group, Inc. (NorthStar) to provide design services for the BBCW – Cutler Wetland C-1 Flow Way project. NorthStar retained RADISE International, LC (RADISE) to provide the field investigations, laboratory testing and the Geotechnical Data Report as described herein. The main objective of the Geotechnical Data Report is to provide geotechnical engineering data for the northern extension of the spreader canal for the BBCW – Cutler Wetland C-1 Flow Way project. The geotechnical engineering services consisted of both field explorations and testing, and laboratory testing of selected soil samples obtained. The field explorations and testing included the performance of muck/marl probes along the proposed alignment and Standard Penetration Test (SPT) borings.

In preparation of this work, RADISE reviewed the Updated Final Geotechnical Report (Revised), dated June 16, 2008, which was prepared for the overall BBCW – Cutler Wetland C-1 Flow Way project by URS Corporation. At that time, a field exploration consisting of Standard Penetration Test (SPT) borings, auger borings, rock coring's and muck/marl probes were performed in the vicinity of proposed structures and along proposed canal/embankment alignments. In general, the overall subsurface profile consisted of the following:

- Organic marls and peats - typically 1 to 2 feet thick below prevailing ground surface in the area of the discharge conveyance channel and 3 to 6 feet thick in the spreader canal area.

- Moderately to well cemented limestone/sandy limestone 30 to 40 feet thick. The upper 10 to 15 feet of the formation appears well cemented and competent and is underlain by a solutioned pourous permeable layer in the 15 to 20 feet depth range
- Medium dense fine sand 10 to 20 feet thick extending to 60 feet below grade.

A laboratory testing program consisting of index classification, compaction and corrosion testing was performed on the collected samples. Finally, a geotechnical engineering analysis was conducted by URS for the foundation support of the pump station structure and for embankment/discharge conveyance channel cross-sections for seepage, slope stability and embankment settlement estimates. A copy of that report is available upon request.

3.0 SCOPE OF SERVICES PERFORMED

RADISE performed the following services in accordance with the Statement of Work for SFWMD Work Order No. 4600003997-WO5:

1. Visited the project site to observe existing site conditions and field mark the planned boring locations.
2. Contacted Sunshine 811 as per Florida Statutes, to request identification of the field locates of underground utilities in the area of the proposed borings, and coordinated the clearance of underground utilities at the boring locations.
3. Completed a total of twenty (20) muck/marl probe measurements along the alignment of the proposed spreader canal northern extension.
4. Mobilized personnel and drilling and testing equipment necessary to perform the SPT borings.
5. Completed two (2) Standard Penetration Test (SPT) borings. Following completion of the borings, the boreholes were backfilled with a neat cement grout.
6. Obtained and secured samples of the soils encountered and measured the depth to the groundwater level in the borings.
7. The collected soil samples were examined in the field by an engineer and then verified in the laboratory using the Unified Soil Classification System (USCS) in accordance with the visual-manual method of ASTM D 2488. A limited laboratory testing program was assigned and performed to identify soil index properties and assist in the final classification of the soils for engineering purposes (ASTM 2487).
8. Preparation of this Draft Geotechnical Engineering Data Report which documents the results and findings of the field exploration and laboratory tests.

4.0 USDA SOIL SURVEY

The U. S. Department of Agriculture, Natural Resources Conservation Service (USDA, NRCS) Soil Survey of Miami-Dade County, Florida, shows that the areas where the SPT borings and muck probe survey were performed is underlain by one main soil unit. Some properties and qualities of the soil unit is listed in the following Table 1.

Table 1 – Mapped Soil Unit

Miami-Dade County Soil Units & Descriptions	Stratification	Water Table/Permeability	USDA Environmental Classification
<p>Perrine marl, tidal (26): This moderately deep, nearly level, very poorly drained soil is in tidal mangrove swamps near the coast in southeastern Florida and is subject to tidal flooding. Individual areas range from 6 to 100 acres in size. Slopes are smooth or concave and are less than 1 percent.</p> <p>Typically, the surface layer is about 12 inches of dark brown marl that has a texture of silt loam. Below this, to a depth of about 26 inches, is dark gray marl that has a texture of silt loam. Soft, porous limestone bedrock is at a depth of about 26 inches.</p>	<p>0 to 26” Marly silt loam</p> <p>26” to 30” Weathered bedrock</p>	<p>Water table is at the surface. Capacity of the most limiting layer to transmit water (Ksat) ranges between 0.20 to 0.57 in/hr.</p>	<p>Risk of Corrosion</p> <p>Uncoated Steel : High</p> <p>Concrete : Low</p>

The soil and groundwater conditions reported by the USDA, NRCS in the Miami-Dade County Soil Survey, have likely been modified by the placement of fill materials and construction of near surface drainage improvements associated with the construction of the existing roadways, adjacent developed lands and abandoned agricultural ditches/low berms east of SW 87th Avenue.

5.0 FIELD EXPLORATION

RADISE personnel visited the project site prior to the field exploration activities to observe the site conditions and field stake the planned boring locations. Sunshine 811 was then contacted for field location of underground utilities in the area of the planned borings as per Florida Statutes.

Site conditions include heavy vegetation consisting mostly of Mangroves, Brazilian Pepper trees, ditches, soft ground, and ponded surface water which were encountered during the muck probing. During the performance of the SPT borings, soft ground and surface water was encountered for boring CP20-BBCW-CB-030B.

The field investigation included the following activities:

- Muck/marl Probes
- Standard Penetration Test (SPT) Borings

Each activity is briefly discussed in detail in the following sections.

5.1 Muck/Marl Probes

Between February 6 and 13, 2020, RADISE completed twenty (20) muck/marl probe measurements of the near surface compressible muck/marl deposits along the alignment of the northern extension of the spreader canal. The Project Surveyor (Pickett and Associates, Inc.) assisted RADISE’s field engineer by cutting a path through the dense vegetation to allow access of field personnel. At each muck/marl probe location, the muck/marl depths were determined by manually advancing a handheld 3/8-inch diameter steel rod into the surficial soils to delineate the transition between the soft soil and the underlying limestone. In practice, this method of testing provides very good judgment for soil type and thickness; however, it provides no soil samples for visual classification or laboratory testing. For the project site, the soft surficial soils are presumed to consist of organic marl overlying limestone based on USDA soil survey mapping, visual field observations and borings completed at the site.

The muck/marl probe locations and ground surface elevations were surveyed by Pickett and Associates, Inc. and provided to RADISE in the field. The elevation of the ground surface at the muck probe locations generally ranges from between approximately -0.70 and +4.15 feet NAVD. The location, elevation, depth information of the muck probes is presented in the following Table 2. The muck probe locations are depicted on the attached *Muck Probe Location Plan*, Sheet 2. More details about the muck probe survey is provided in Table 1 in the Attachments.

Table 2 - Muck/Marl Probe Location Survey Information

Muck/Marl Probe	Muck/Marl Probe Depth (feet)	Northing (NAD)	Easting (NAD)	Ground Surface Elevation (feet - NAVD)
MP-31	0.0	447827.150	878528.850	1.68
MP-32	1.0	447831.768	878628.941	0.89
MP-33	0.67	447850.150	878725.997	-0.24
MP-34	2.0	447871.760	878825.360	2.25
MP-35	1.5	447895.080	878923.760	2.07
MP-36	1.0	447927.350	879019.110	4.15
MP-37	0.25	447963.342	879111.542	2.92
MP-38	1.0	448006.429	879208.123	1.57

Muck/Marl Probe	Muck/Marl Probe Depth (feet)	Northing (NAD)	Easting (NAD)	Ground Surface Elevation (feet - NAVD)
MP-39	1.5	448043.112	879293.924	0.29
MP-40	3.5	448086.363	879381.918	1.05
MP-41	2.0	448144.506	879465.968	-0.21
MP-42	Did not perform MP-42			
MP-43	1.0	448200.739	879547.582	-0.44
MP-44	1.0	448259.837	879625.440	0.21
MP-45	0.25	448323.916	879703.833	1.72
MP-46	1.0	448387.566	879783.359	-0.57
MP-47	1.5	448450.652	879859.613	0.48
MP-48	2.0	448513.354	879937.492	-0.38
MP-49	0.5	448575.611	880014.467	0.99
MP-50	1.5	448639.298	880093.140	0.35
MP-51	2.0	448701.699	880170.122	-0.70

5.2 Standard Penetration Test Borings

On March 4, 2020, RADISE performed two (2) SPT borings to depths of 20 feet below the existing ground surface. The borings were drilled using wet-rotary methods in general accordance with ASTM D5783 “*Standard Guide for Use of Direct Rotary Drilling with Water Based Drilling Fluid*” to facilitate identification of subsurface materials and the collection of samples during the performance of the SPT. The investigation was completed in general accordance with USACE EM 1110-1-1804. The SPT sampling was performed continuously throughout the explored depths and was performed in general accordance with ASTM D 1586, “*Standard Method for Penetration Test and Split-Barrel Sampling of Soils*” using 1-3/8-inch diameter split-spoon sampler along with an automatic hammer. SPT blow counts and resulting N-Values were recorded as well as a field visual classification of the recovered materials.

The SPT boring locations were measured by RADISE using a handheld GPS unit (Garmin GPS 62stc). The latitude and longitude coordinates obtained from the GPS unit was converted to northing and easting coordinates. Elevation information for SPT boring CP20-BBCW-CB-029 was provided by Pickett and Associates, Inc. The ground surface elevation at SPT boring CP20-BBCW-CB-030 was approximated using field observations, the depth of the encountered groundwater and information from Google Earth. The approximate boring locations are depicted on the attached *Boring Location Plan*, Sheet 3. Location and elevation information is presented in

the following Table 3. It should be noted that access to the original proposed location of boring CP20-BBCW-CB-030 was not possible because of heavy vegetation and very soft ground conditions. Land clearing and wetland destruction using wide track dozers, would have been required to reach the desired initial location. Therefore, the boring was performed approximately 500 feet west of the original location. We anticipate subsurface conditions at the proposed boring location to be similar to the conditions encountered at the performed boring location.

Table 3: Boring Location Information

SPT Boring	Boring Depth (feet)	Northing (NAD)	Easting (NAD)	Latitude	Longitude	Ground Surface Elevation (feet - NAVD)
CP20-BBCW-CB-029	20	447828.308	878224.070	25.5641	-80.3264	5.6
CP20-BBCW-CB-030	20	446116.756	877573.375	25.5594	-80.3284	2.0

Representative samples were collected from the SPT sampler and sealed immediately in standard glass sample jars with air-tight rubber rings and labeled with the project name, boring number, sample number, sample depth, position in sampler if more than one sample, and date of sampling. Casing was advanced as needed to maintain borehole stability and drilling mud fluid circulation. The groundwater levels were recorded for each SPT boring performed and then the boreholes were sealed with cement-bentonite grout upon their completion.

The borings were logged in the field by an engineer using typical logging procedures in order to have consistent descriptions of subsurface strata in accordance with the Unified Soil Classification System (USCS) as per ASTM D 2488 “*Standard Practice for Description and Identification of Soil*”. Final boring logs were prepared based on a senior engineer’s review of the field boring logs, split spoon samples, and laboratory testing for soil index properties. Detailed boring logs were developed using Bentley software package gINT and are provided in Appendix A. The data library used to develop these records was consistent with standard geotechnical engineering nomenclature and classification systems. Subsurface profiles were prepared in AutoCAD are presented on *Subsurface Profiles*, Sheet 4.

Split spoon samples retrieved from the borings were collected and returned to the RADISE’s USACE validated laboratory. Representative samples from the borings were tested for index properties including moisture content and grain size distribution. Results of the laboratory testing program are discussed in Section 6.0.

6.0 LABORATORY TESTING

Soil samples obtained from the SPT borings were reviewed and field classifications confirmed in the laboratory by a RADISE Geotechnical Engineer using visual examination and the field boring logs. Final classifications were provided in general accordance with the Unified Soil Classification System (ASTM D 2488). Selected soil samples were tested for index properties to aid in the classification for engineering purposes in accordance with ASTM D 2487 “*Standard Practice for Classification of Soils for Engineering Purposes*”. The following laboratory tests were performed in accordance with the applicable ASTM procedures:

- Two (2), Moisture content tests (ASTM D 2216)
- One (1), Percent of material passing through No. Sieve 200 tests (ASTM D 1140)
- One (1), Mechanical grain size analysis (ASTM D 6913)

A summary of laboratory test results is presented in the *Summary of Laboratory Test Results*, Table B-1 in Appendix B and on the attached *Subsurface Profiles*, Sheet 4.

7.0 SUMMARY OF SUBSURFACE CONDITIONS

7.1 Subsurface Conditions

Stratification of the explored soils is based on visual examination of the recovered soil samples, laboratory classification and index property testing, and interpretation of the field boring logs by a geotechnical engineer in accordance with the Unified Soil Classification System (USCS). Subsurface profiles showing the soil stratification at the boring locations were developed and are presented on the attached *Subsurface Profiles*, Sheet 4. Stratification lines represent approximate boundaries between soil types, but the actual transition between layers may be gradual or abrupt. Additionally, soil and groundwater conditions will vary between boring locations.

Boring CP20-BBCW-CB-029 encountered limestone in the top 6 feet, followed by a dense silty sand (SM) with limestone fragments layer between 6 feet and 8 feet. This layer is underlain by limestone to the boring termination depth of 20 feet. Boring CP20-BBCW-CB-030 encountered a very loose silty sand with limestone fragments layer (also referred to as “marl”) in the top 4 feet followed by limestone to the boring termination depth of 20 feet. Detailed graphical logs of the SPT borings, including SPT N-values, the soil profile, and the groundwater depth noted, are provided on the attached *Subsurface Profiles*, Sheet 4 and in Appendix A.

7.2 Groundwater

On March 4, 2020, at the time of our drilling operations, groundwater was encountered in the soil borings at depths ranging between approximately 2.0 and 5.2 feet below the existing ground surface. The difference in groundwater depth is attributed to the difference in ground elevation at each boring location. The USDA/NRCS Soil Survey indicates that the groundwater level is at the surface. It should be noted that groundwater levels will fluctuate with the seasons, variations of

precipitation and with tidal fluctuations of the nearby Biscayne Bay. Therefore, high groundwater conditions during King tides are expected to be up to 1 to 2 feet above the ground surface within the natural areas covered by Mangroves and Brazilian Pepper trees. As described in the previous geotechnical report, dated June 16, 2008, groundwater elevation data presented on the “Hydrogeology of the Surficial Aquifer System, Dade County, Florida” map published by the U.S. Geological Survey (dated 1991) indicates that groundwater levels in the project vicinity are between +0.5 and +3.5 feet NAVD.

8.0 LIMITATIONS

This report is intended for geotechnical purposes only, and does not document or detect the presence, or absence, of any environmental conditions at the site, nor is it intended to perform an environmental assessment of the site.

The analysis and recommendations presented in this report are based upon our interpretation of the subsurface information revealed by the test borings. The report does not reflect variations in subsurface conditions that may exist between or beyond these borings. Variations in soil and groundwater conditions should be expected, the nature and extent of which might not become evident until construction is undertaken. If variations are encountered, and/or the scope of the project altered, we should be consulted for additional recommendations.

RADISE International warrants that the professional services performed and presented in this report, are prepared for NorthStar Contracting Group, Inc. and are based upon typical standard of care recognized principles and practices in the discipline of geotechnical engineering and hydrogeology at this place and point in time, for this project site. No other warranties are expressed or implied.

-oOo-

RADISE appreciates the opportunity to be of service to you. Please feel free to contact us at 561-841-0103 if you have any questions or comments regarding this report.

**Respectfully submitted
RADISE International, L.C.**

ATTACHMENTS

SHEET 1: VICINITY MAP

SHEET 2: MUCK PROBE LOCATION PLAN

SHEET 3: BORING LOCATION PLAN

SHEET 4: SUBSURFACE PROFILES

TABLE 1: SUMMARY OF MUCK PROBE SURVEY



REVISIONS			
Date.	By	Descriptions	

Names	Dates
Drawn by AK	03/13/2020
Checked by NK	03/13/2020
Designed by AB	03/13/2020
Checked by AB	03/13/2020
Approved by	

RADISE
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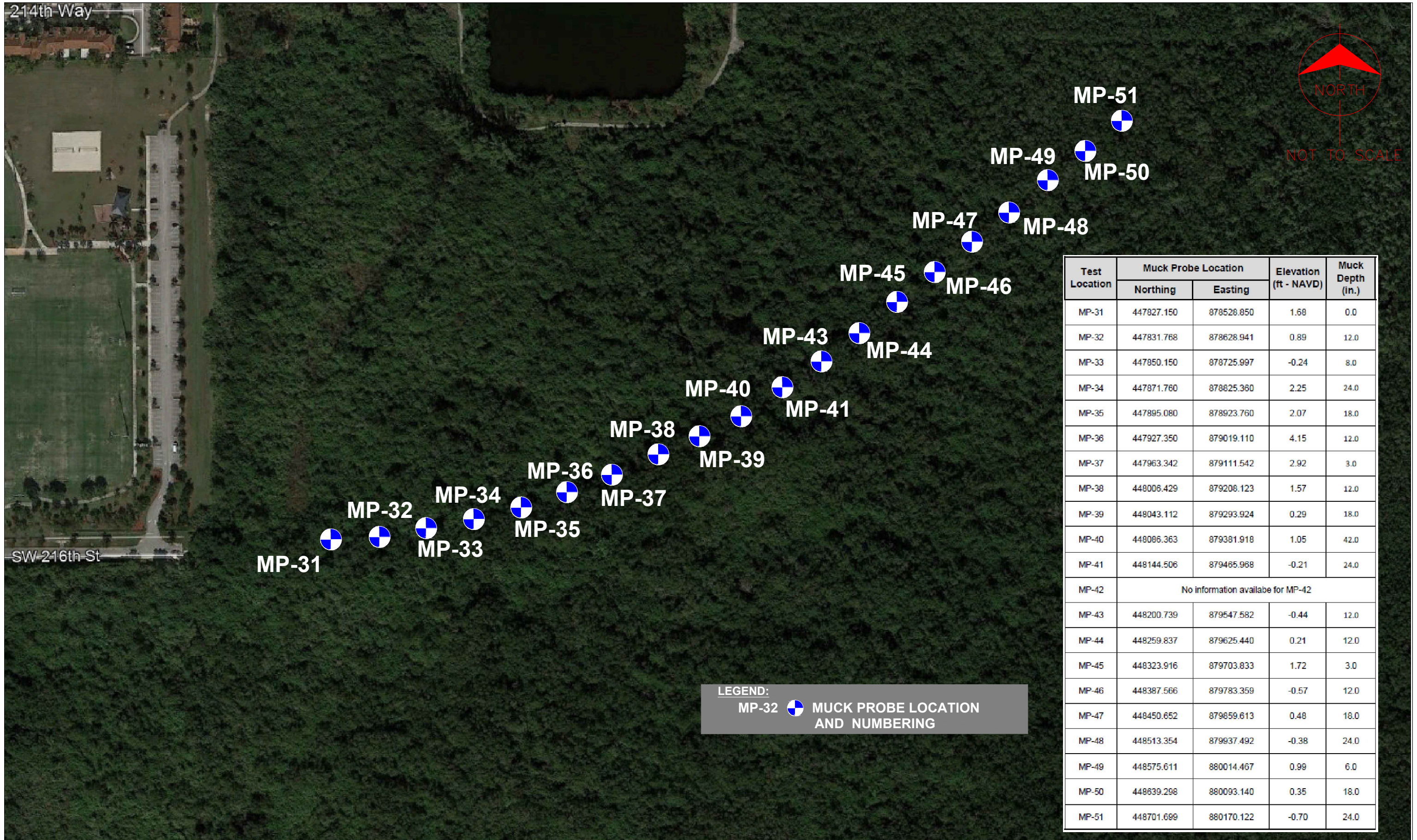
ENGINEER OF RECORD
ANDREW NIXON (P.E.No. - 71458)
RADISE International
4152 West Blue Heron Boulevard, Suite 1114
Riviera Beach, Florida, 33404
TEL 561-841-0103 FAX 561-841-0104
URL : <http://www.radise.net>

SOUTH FLORIDA WATER MANAGEMENT DISTRICT	
COUNTY	CLIENT
MIAMI-DADE	NORTHSTAR

SCALE:
VERTICAL
N.T.S.
SCALE:
HORIZONTAL
N.T.S.


SHEET TITLE:
VICINITY MAP
PROJECT NAME:
**BISCAYNE BAY COASTAL WETLANDS -
CUTLER FLOW WAY**

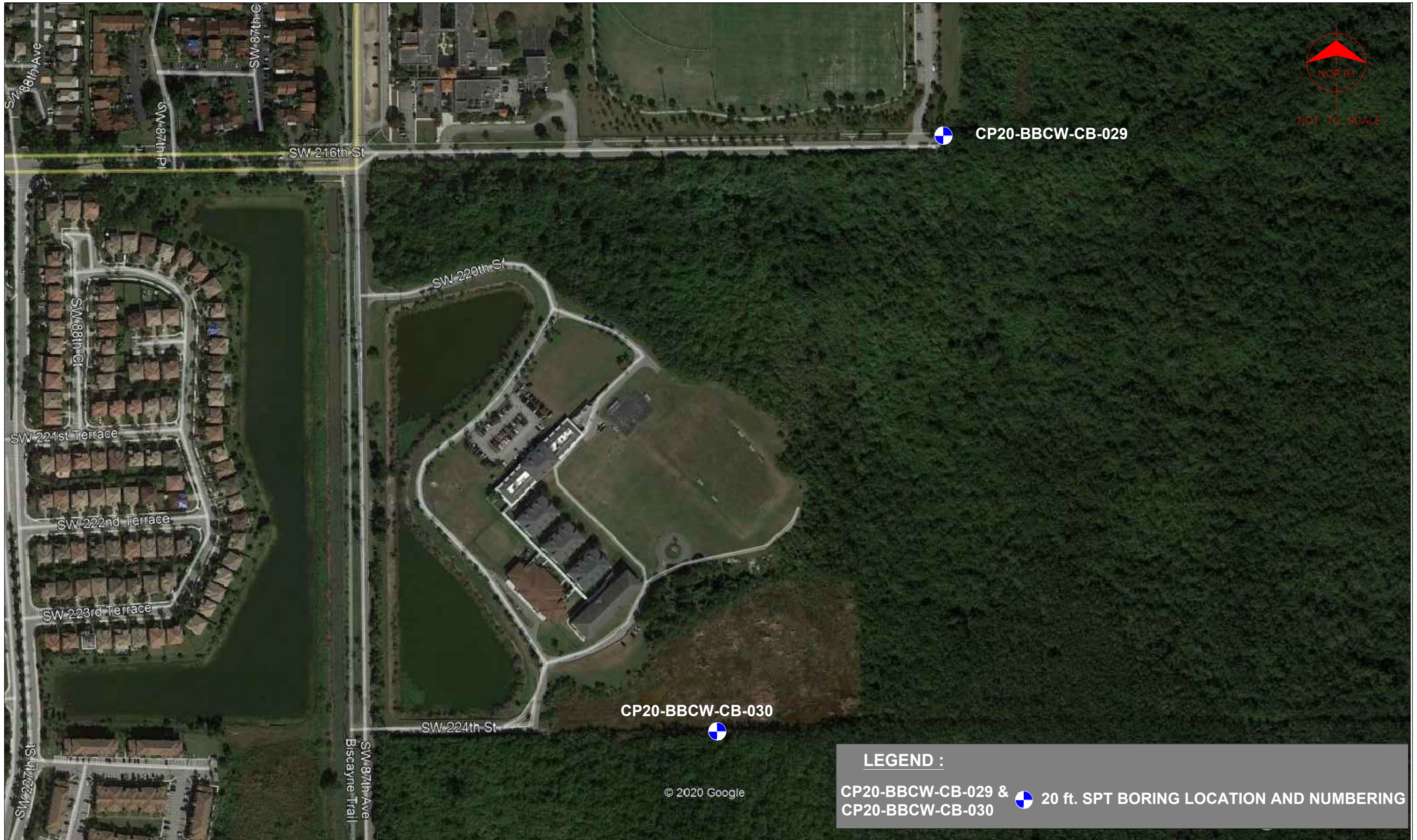
SHEET NO.
1
RADISE PROJECT NO:
191201



Test Location	Muck Probe Location		Elevation (ft - NAVD)	Muck Depth (in.)
	Northing	Easting		
MP-31	447827.150	878528.850	1.68	0.0
MP-32	447831.768	878628.941	0.89	12.0
MP-33	447850.150	878725.997	-0.24	8.0
MP-34	447871.760	878825.360	2.25	24.0
MP-35	447895.080	878923.760	2.07	18.0
MP-36	447927.350	879019.110	4.15	12.0
MP-37	447963.342	879111.542	2.92	3.0
MP-38	448006.429	879208.123	1.57	12.0
MP-39	448043.112	879293.924	0.29	18.0
MP-40	448086.363	879381.918	1.05	42.0
MP-41	448144.506	879465.968	-0.21	24.0
MP-42	No information available for MP-42			
MP-43	448200.739	879547.582	-0.44	12.0
MP-44	448259.837	879625.440	0.21	12.0
MP-45	448323.916	879703.833	1.72	3.0
MP-46	448387.566	879783.359	-0.57	12.0
MP-47	448450.652	879859.613	0.48	18.0
MP-48	448513.354	879937.492	-0.38	24.0
MP-49	448575.611	880014.467	0.99	6.0
MP-50	448639.298	880093.140	0.35	18.0
MP-51	448701.699	880170.122	-0.70	24.0

LEGEND:
 MP-32  MUCK PROBE LOCATION AND NUMBERING


REVISIONS				Names		Dates		 ENGINEER OF RECORD ANDREW NIXON (P.E.No. - 71458) RADISE International 4152 West Blue Heron Boulevard, Suite 1114 Riviera Beach, Florida, 33404 TEL 561-841-0103 FAX 561-841-0104 URL : http:// www.radise.net	SOUTH FLORIDA WATER MANAGEMENT DISTRICT		SCALE: VERTICAL N.T.S. SCALE: HORIZONTAL N.T.S.	SHEET TITLE: MUCK PROBE LOCATION PLAN		SHEET NO. 2	
Date.	By	Descriptions	Date.	By	Descriptions	Drawn by	Checked by		COUNTY	CLIENT		PROJECT NAME: BISCAYNE BAY COASTAL WETLANDS - CUTLER FLOW WAY		RADISE PROJECT NO: 191201	
						AK	03/13/2020	MIAMI-DADE	NORTHSTAR						
						NK	03/13/2020								
						AB	03/13/2020								
						AB	03/13/2020								
						Approved by									



NOT TO SCALE

CP20-BBCW-CB-029

CP20-BBCW-CB-030

LEGEND :
 CP20-BBCW-CB-029 & CP20-BBCW-CB-030  20 ft. SPT BORING LOCATION AND NUMBERING

REVISIONS	
Date.	By

Names	Dates
Drawn by AK	03/13/2020
Checked by NK	03/13/2020
Designed by AB	03/13/2020
Checked by AB	03/13/2020
Approved by	



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LICENSE NO. - 8901

SOUTH FLORIDA WATER MANAGEMENT DISTRICT	
COUNTY	CLIENT
MIAMI-DADE	NORTHSTAR

SCALE:
 VERTICAL
 N.T.S.
 SCALE:
 HORIZONTAL
 N.T.S.

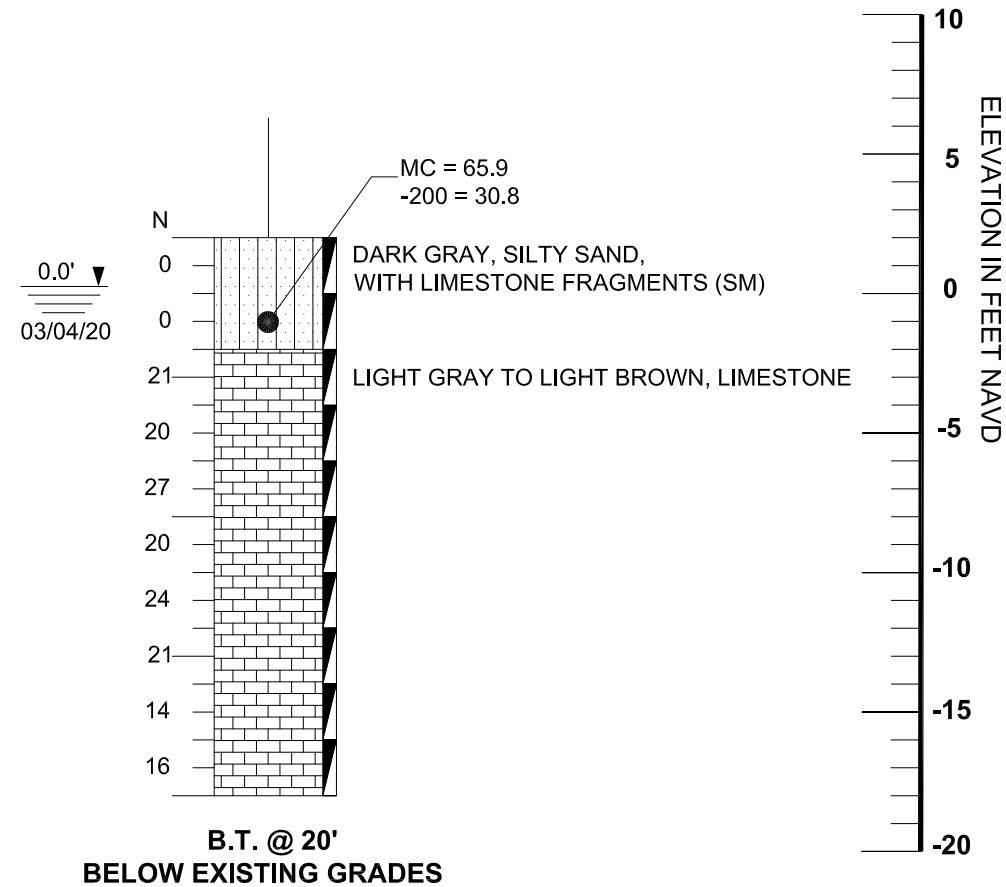
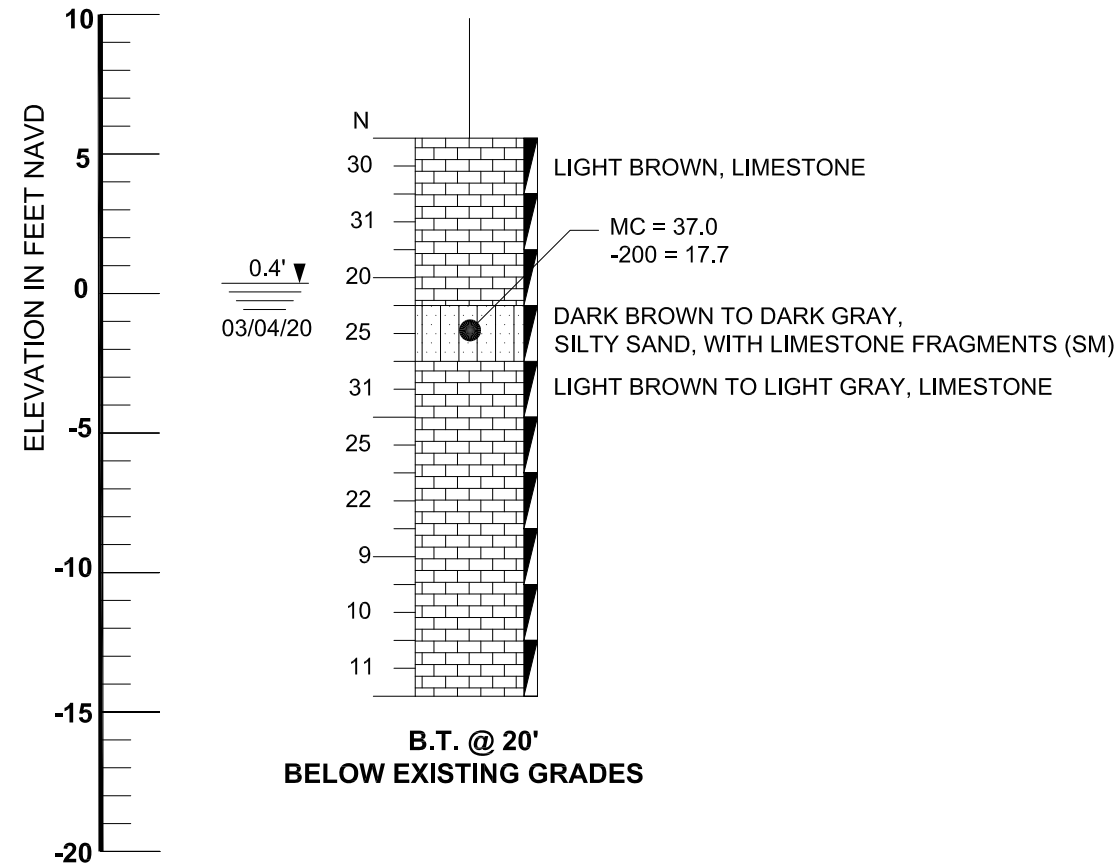
SHEET TITLE:
BORING LOCATION PLAN
 PROJECT NAME:
**BISCAYNE BAY COASTAL WETLANDS -
 CUTLER FLOW WAY**

SHEET NO.
3
 RADISE PROJECT NO:
191201

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BORING NO. CP20-BBCW-CB-029
LONGITUDE: W -80.3264°
LATITUDE: N 25.5641°
ELEVATION (FT-NAVD): 5.6
RIG: CME 45
HAMMER: AUTO
DRILLER: RAVI
DATE: 03/04/2020

BORING NO. CP20-BBCW-CB-030
LONGITUDE: W -80.3284°
LATITUDE: N 25.5594°
ELEVATION (FT-NAVD): 2.0
RIG: CME 45
HAMMER: AUTO
DRILLER: RAVI
DATE: 03/04/2020



LEGEND

- SILTY SAND (SM)
- LIMESTONE
- B.T @ 20' BORING TERMINATED AT 20 FEET BELOW THE EXISTING GROUND SURFACE
- B-1 STANDARD PENETRATION TEST (SPT) BORING AND NUMBER
- N STANDARD PENETRATION RESISTANCE-BLOWS PER FOOT USING AUTOMATIC HAMMER
- SAMPLING INTERVAL
- 5.2' GROUNDWATER ELEVATION IN FEET NAVD AND DRILLING DATE 03/04/20
- W MOISTURE CONTENT (%)
- OC ORGANIC CONTENT (%)
- 200 AMOUNT PASSING US STANDARD 200 SIEVE (%)
- SP, SP-SM UNIFIED SOIL CLASSIFICATION SYSTEM GROUP SYMBOL (ASTM D 2487)

NOTES:

1. BORINGS WERE DRILLED ON 03/04/2020. SPT BORINGS WERE PERFORMED USING A CME-45C AUTOMATIC DRILLING RIG (ASTM D1586).
2. STRATA BOUNDARIES ARE APPROXIMATE AND REPRESENT SOIL STRATA AT EACH TEST HOLE LOCATION ONLY. SOIL TRANSITIONS MAY BE MORE GRADUAL THAN IMPLIED.
3. GROUNDWATER LEVELS SHOWN ON THE SUBSURFACE PROFILES REPRESENT GROUNDWATER SURFACES ON THE DATES SHOWN. GROUNDWATER LEVEL FLUCTUATIONS SHOULD BE ANTICIPATED THROUGHOUT THE YEAR.
4. AFTER COMPLETION OF DRILLING, BOREHOLES WERE BACKFILLED WITH GROUT.
5. ELEVATION INFORMATION FOR BORING CP20-BBCW-CB-029 WAS PROVIDED BY PICKET AND ASSOCIATES, INC. ELEVATION INFORMATION FOR BORING CP20-BBCW-CB-030 WAS APPROXIMATED USING INFORMATION FROM GOOGLE EARTH.

STANDARD PENETRATION TEST DATA *

SPOON INSIDE DIA.	1.375 INCH
SPOON OUTSIDE DIA.	2 INCHES
AVG. HAMMER DROP	30 INCHES
HAMMER WEIGHT	140 POUNDS
GRANULAR MATERIALS	AUTOMATIC HAMMER
	SPT N - VALUE
RELATIVE DENSITY	BLOWS/FOOT
VERY LOOSE	LESS THAN 3
LOOSE	3 - 8
MEDIUM	8 - 24
DENSE	24 - 40
VERY DENSE	GREATER THAN 40
SILTS AND CLAYS	AUTOMATIC HAMMER
	SPT N - VALUE
CONSISTENCY	BLOWS/FOOT
VERY SOFT	LESS THAN 1
SOFT	1 - 3
FIRM	3 - 6
STIFF	6 - 12
VERY STIFF	12 - 24
HARD	GREATER THAN 24

*FDOT SOILS AND FOUNDATIONS HANDBOOK 2019

REVISIONS

Date.	By	Descriptions	Date.	By	Descriptions



ENGINEER OF RECORD
 ANDREW NIXON (P.E.No. - 71458)
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SOUTH FLORIDA WATER MANAGEMENT DISTRICT

COUNTY	CLIENT
MIAMI-DADE	NORTHSTAR

SCALE:
 VERTICAL
 N.T.S.
 SCALE:
 HORIZONTAL
 N.T.S.

SHEET TITLE:
SUBSURFACE PROFILES
 PROJECT NAME:
BISCAYNE BAY COASTAL WETLANDS - CUTLER FLOW WAY

SHEET NO.
4
 RADISE PROJECT NO:
191201



Table 1: Summary of Muck Probe Survey

Project: Biscayne Bay Coastal Wetlands - Cutler Flow Way
RADISE Project No.: 191201

Test No.	Date	Test Location	Muck Probe Location State Plane Coordinates ¹		Elevation (ft - NAVD) ¹	Surface Water Depth (in.) ²	Muck Depth (in.) ³	Additional Notes ⁴	
			Northing	Easting					
1	2/6/2020	MP-31	447827.150	878528.850	1.68	n/a	0.0		
2	2/6/2020	MP-32	447831.768	878628.941	0.89	1.0	12.0		
3	2/11/2020	MP-33	447850.150	878725.997	-0.24	48.0	8.0	At bottom of ditch. 3" muck near edge of ditch	
4	2/11/2020	MP-34	447871.760	878825.360	2.25	n/a	24.0		
5	2/11/2020	MP-35	447895.080	878923.760	2.07	n/a	18.0		
6	2/11/2020	MP-36	447927.350	879019.110	4.15	n/a	12.0		
7	2/11/2020	MP-37	447963.342	879111.542	2.92	n/a	3.0		
8	2/12/2020	MP-38	448006.429	879208.123	1.57	n/a	12.0		
9	2/12/2020	MP-39	448043.112	879293.924	0.29	3.0	18.0		
10	2/12/2020	MP-40	448086.363	879381.918	1.05	6.0	42.0	Low area, 4' soft/loose soils in spots	
11	2/12/2020	MP-41	448144.506	879465.968	-0.21	6.0	24.0	Low area	
		MP-42	No information available for MP-42						
12	2/12/2020	MP-43	448200.739	879547.582	-0.44	6.0	12.0	Low area	
13	2/12/2020	MP-44	448259.837	879625.440	0.21	n/a	12.0	Edge of berm around low area	
14	2/12/2020	MP-45	448323.916	879703.833	1.72	n/a	3.0	On top of berm next to ditch	
15	2/12/2020	MP-46	448387.566	879783.359	-0.57	6.0	12.0	Low area	
16	2/13/2020	MP-47	448450.652	879859.613	0.48	6.0	18.0	Low area	
17	2/13/2020	MP-48	448513.354	879937.492	-0.38	18.0	24.0	Low area	
18	2/13/2020	MP-49	448575.611	880014.467	0.99	n/a	6.0	Near low area and next to ditch	
19	2/13/2020	MP-50	448639.298	880093.140	0.35	2.0	18.0		
20	2/13/2020	MP-51	448701.699	880170.122	-0.70	1.0	24.0	Low area	

Notes:

- ¹ Muck probe location coordinates and elevations were provided by Pickett and Associates, Inc.
- ² Above the existing ground surface.
- ³ Below the existing ground surface.
- ⁴ Ditches were presnet between every probe location. The ditches were about 4 feet deep and 6 feet wide.

APPENDIX A

GINT BORING LOGS

DRILLING LOG

HOLE NUMBER: CP20-BBCW-CB-029

1. PROJECT Biscayne Bay Coastal Wetlands	10. SIZE AND TYPE OF BIT
2. COORDINATES North: 447828.308 East: 878224.07	11. DATUM FOR ELEVATION SHOWN NAVD
3. DRILLING AGENCY RADISE International, L.C.	12. MANUFACTURER'S DESIGNATION OF DRILL CME 45 Automatic Hammer
4. RADISE PROJECT NUMBER 191201	13. TOTAL NO. OF OVERBURDEN : DISTURBED : UNDISTURBED SAMPLES : 10 : N/A
5. NAME OF DRILLER Ravi	14. TOTAL NUMBER CORE BOXES : N/A
6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED <u>90</u> DEG. FROM HORZ.	15. GROUNDWATER DEPTH : 5.2 ft
7. THICKNESS OF OVERBURDEN : N/A ft	16. DATE HOLE : STARTED 3/4/2020 : COMPLETED 3/4/2020
8. DEPTH DRILLED INTO ROCK : N/A ft	17. ELEVATION TOP OF HOLE : 5.6 ft
9. TOTAL DEPTH OF HOLE : 20 ft	18. TOTAL CORE RECOVERY FOR BORING : N/A %
	19. SIGNATURE OF INSPECTOR

ELEV.	DEPTH	LEGEND	USCS	CLASSIFICATION OF MATERIALS (Description)	REC %	SAMPLE NO.	BLOWS/6 INCHES	PENETRATION RESISTANCE (N)	LABORATORY RESULTS
+5.6	0.0			Light brown, limestone (10YR 5/3).	90	1	7-18-12-19	30	MC = 37.0 -200 = 17.7
			80	2	12-14-17-12	31			
-0.4	6		80	3	10-12-8-6	20			
			80	4	9-11-14-8	25			
-2.4	8		100	5	10-14-17-12	31			
			90	6	7-12-13-11	25			
			90	7	8-10-12-7	22			
			90	8	5-4-5-6	9			
			90	9	7-6-4-4	10			
			80	10	5-6-5-5	11			

Limestone
 Silty Sand



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DRILLING LOG

HOLE NUMBER: CP20-BBCW-CB-030

1. PROJECT Biscayne Bay Coastal Wetlands	10. SIZE AND TYPE OF BIT
2. COORDINATES North: 446116.756 East: 877573.375	11. DATUM FOR ELEVATION SHOWN NAVD
3. DRILLING AGENCY RADISE International, L.C.	12. MANUFACTURER'S DESIGNATION OF DRILL CME 45 Automatic Hammer
4. RADISE PROJECT NUMBER 191201	13. TOTAL NO. OF OVERBURDEN : DISTURBED : UNDISTURBED SAMPLES : 10 : N/A
5. NAME OF DRILLER Ravi	14. TOTAL NUMBER CORE BOXES : N/A
6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED <u>90</u> DEG. FROM HORZ.	15. GROUNDWATER DEPTH : 2.0 ft
7. THICKNESS OF OVERBURDEN : N/A ft	16. DATE HOLE : STARTED 3/4/2020 COMPLETED 3/4/2020
8. DEPTH DRILLED INTO ROCK : N/A ft	17. ELEVATION TOP OF HOLE : 2.0 ft
9. TOTAL DEPTH OF HOLE : 20 ft	18. TOTAL CORE RECOVERY FOR BORING : N/A %
	19. SIGNATURE OF INSPECTOR

ELEV.	DEPTH	LEGEND	USCS	CLASSIFICATION OF MATERIALS (Description)	REC %	SAMPLE NO.	BLOWS/6 INCHES	PENETRATION RESISTANCE (N)	LABORATORY RESULTS		
+2.0	0.0		SM	Dark gray, silty sand with limestone fragments (5Y 4/1).	20	1	1-0-0-1	0	MC = 65.9 -200 = 30.8		
					30	2	1-0-0-0	0			
-2.0	4			Light gray to light brown, limestone (10YR 7/2 to 10YR 6/2).	60	3	7-9-12-14	21			
					70	4	11-10-10-12	20			
					80	5	12-14-13-10	27			
					90	6	11-10-10-12	20			
					80	7	15-14-10-11	24			
					90	8	12-12-9-8	21			
					80	9	6-7-7-8	14			
					90	10	6-8-8-8	16			
-18.0	20										

Silty Sand Limestone



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APPENDIX B

TABLE B-1: SUMMARY OF LABORATORY TEST RESULTS GRAIN SIZE DISTRIBUTIONS



Table B-1: Summary of Laboratory Results

Project Name: SFWMD Biscayne Bay Coastal Wetlands - Cutler Flow Way

Project ID: 191201

Boring No	Sample Depth	Soil Classification	Moisture Content(%)	Organic Content(%)	ATTERBERG LIMITS				GRAIN SIZE ANALYSIS										
					-200	LL (%)	PL (%)	PI	U.S STANDARD SIEVE SIZE (% Passing)										
					3/4"	3/8"	#4	#10	#20	#40	#50	#60	#100	#140	#200				
CP20-BBCW-CB-029	6-8'	SM	37.0	-	17.7	-	-	-	94.3	70.5	59.4	50.4	43.2	37.4	33.2	30.7	23.6	20.0	17.7
CP20-BBCW-CB-030	2-4'	SM	65.9	-	30.8	-	-	-	-	-	-	-	-	-	-	-	-	-	30.8

Notes:

Moisture Content tested in accordance ASTM-D2216,
 Grain Size Analysis was tested in general accordance with ASTM-D422,
 Fines Content (Passing No. 200 Sieve) was tested in general accordance with ASTM D 1140.

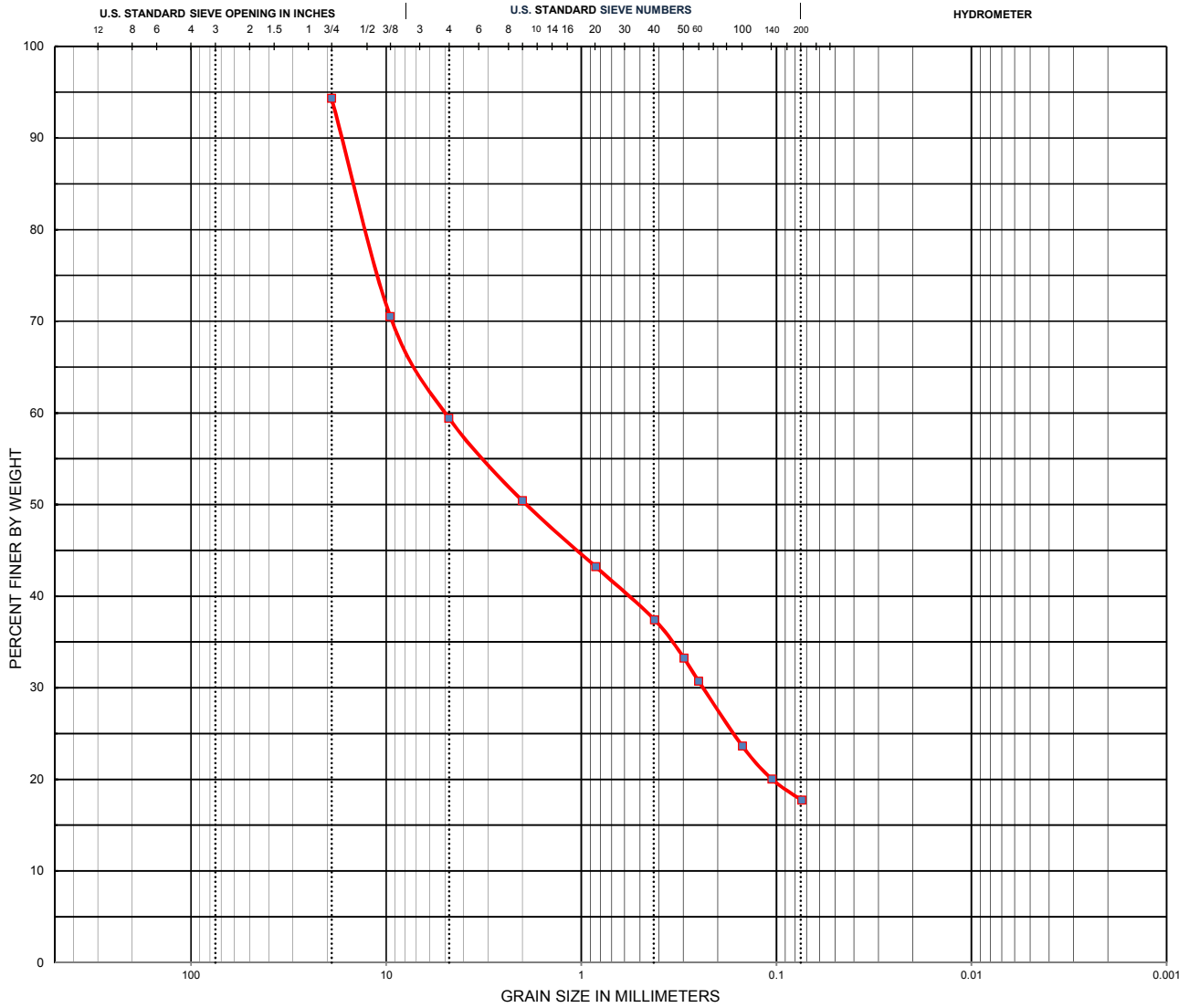


GRAIN SIZE DISTRIBUTION

CLIENT NAME Northstar Contracting Group, Inc.

PROJECT NAME SFWMD Biscayne Bay Coastal Wetlands - Cutler Flow Way

PROJECT NUMBER 191201



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Boring No., Depth	Classification	LL	PL	PI	Cc	Cu
CP20-BBCW-CB-029, 6-8'	Silty sand with gravel (SM)				0	0

Boring No., Depth	D100	D60	D30	D10	% Cobble	%Gravel	%Sand	%Silt	%Clay
CP20-BBCW-CB-029, 6-8'	17.98	5.02	0.24	0	5.7	34.9	41.7	17.7	