SFWMD SURFACE WATER MANAGEMENT LICENSE

DRAINAGE CALCULATIONS

FOR

DECO GREEN

AT

LAKE WORTH, FL

PREPARED BY: IBI GROUP, INC

DATE: 5/7/2021

FILE 127192

SFWMD SURFACE WATER MANAGEMENT CALCULATIONS
PROJECT NAME: DECO GREEN
PROJECT NO: 127192
DATE: 4/5/2021

PATRICIA F RAMUDO

Digitally signed by PATRICIA F RAMUDO
Date: 2021.05.07 17:09:32 -04'00'

Patricia F. Ramudo, PE, LEED AP
FL Reg. No. 35798

PROJECT NARRATIVE

The project is located at 1715 N Dixie Hwy, Lake Worth, FL / Parcel # 38434416060140010. The proposed mixed-use project includes the construction of a residential building, parking garage, two retail buildings, a park, a playground, and event area. Additionally the site will include water & sewer, stormwater facilities, and sidewalk infrastructure. The South Florida Water Management District (SFWMD) requirements include analysis of the 5Year -1 Day, 25 Year - 3 Day, 100 Year - 3 Day storm events for lower parking inlet elevation, berm and discharge rates, and finished floor elevations respectively. Furthermore, the City of Lake Worth requires the 3 Year - 1 Hour storm event be evaluated and fully retained on-site (Code of Ordinance Sec. 18-103.). According to the Eastern Palm Beach County map included in this report, the control water table is estimated at 4.50 ft NAVD. However, the geotechnical report from TSF shows the water table encountered during testing is found at higher elevations - approximately 9-10 feet below ground surface. As such, we established the water table at elevation 9.50 ft NAVD for a much more conservative approach. The drainage system features an 6'Wx 5.5'H Exifiltration trench to meet the water quality and water quantity requirements. A control structure featuring a 6" inverted triangle orifice at EL 14 ft NAVD will discharge offsite to the 17th Ave North storm system. According to the Survey by Miller Land, the southern half portion of the property drains south onto 17th Ave North. As such, that portion of the site will be evaluated at the 25 Year storm event for pre- vs post development discharge rates comparison. The summary table below provides the final pre- vs post elevations and discharge rates for all the aforementioned stormevents.

1. PROPOSED PROJECT LAND USE

TOTAL AREA AREA	BUILDING AREA		PERVIOUS AREA		IMPERVIOUS AREA	
(ACRES)	(ACRES)	%	(ACRES)	%	(ACRES)	%
2.314	0.26	11.22	0.71	30.60	1.330	57.48
2.314	**0.26**	**11.22**	**0.71**	**30.60**	**1.330**	**57.48**

Total Site Summary:

Site area (ac)	2.314	100%
Building area (ac)	0.26	11%
Impervious area (ac)	1.330	57%
Pervious area (ac)	0.71	31%

2. FLOOD AND RAINFALL CRITERIA

3 year, 1 Hour **	2.60	inches	City of LW req.
5 year, 1 day storm *	7.00	inches	Parking
25 year, 1 day storm *	12.30	inches	Perimeter
100 year, 3 day storm *	16.20	inches	Finish Floor Elevation

* SFWMD - Rainfall Maps
** FDOT IDF CURVE - ZONE 10

3. COMPUTE SOIL STORAGE

	Pre-	Post-		
Control elevation **	4.50	4.50	'NAVD	*Palm Beach County Water Table Map*
Estimated Seasonal HWT Elevation	9.50	9.50	'NAVD	*TSF Geotech Report (01/01/2020)*
Average site elevation	16.21	15.88	'NAVD	*Topographic Survey and PGD*
Depth to water table	6.71	6.38	ft.	
	Pre	Post		
Available ground storage - 25% compaction	8.18	8.18	inches	
Pervious Area within the site area	1.37	0.71	acres	
Soils Storage S per SFWMD criteria	4.84	2.50	inches	

4. WATER QUALITY REQUIREMENTS

1) Based on the first 1" of runoff over total site

Site area	2.31	acres
Required retention	2.31	acre-in
	0.19	ac-ft

2) Based on 2.5 inches times percent impervious

a) Site area (Total Project -(Building+Lake)	2.05	acres
b) Impervious area (Site area - pervious)	1.35	acres
c) Percent impervious	65.53%	
d) Inches to be treated (2.5" x % impervious)	1.64	
e) Req Volume (inches to be treated x(Total site -Lake)	3.79	acre-in
Required Volume	0.32	ac-ft

The required Water Quality Volume to be treated is : 0.32 ac-ft

If this is a project on commercial zoned land, 0.5 in. of dry retention/detention must be provided.

3) Compute pretreatment volume based on 1/2" inches of runoff

Total site - Lake	2.31	acres
Required pretreatment based on 1/2"	1.16	acre-in
	0.10	**acre-ft**

5. PROVIDED WATER QUALITY

a) Proposed exfiltration trenches

	Required (AF)	Provided (AF)	Check	Storage Stage Met
Proposed Exfiltration Trenches		**0.58**		
Total Dry Water Quality	**0.32**	**0.58**	**PASS**	**13.2**
Pretreatment Volume	**0.10**	**0.58**	**PASS**	

6. WATER QUANTITY CRITERIA

Compute Runoff 3 Yr Storm

$$Q = \frac{(P - 0.2S)^2}{P + 0.8S}$$

Rainfall (P)	2.60	in	
Runoff (Q)	0.96	in	
Runoff Volume (	**0.18**	**ac-ft**	V=Q*A/12

Fully retained on site at EL 11.52 (Refer to Stage Storage Table)

Volume Provided in Exfiltration Trenches

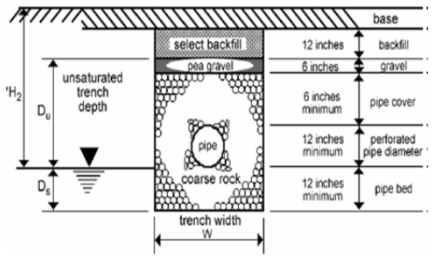
Exfiltration Trench Calculations

L = V/(K(H2*W +2H2*Du- Du^2 + 2*H2*Ds) + (1.39X10^-4)*W*Du)
V=L*(K(H2*W +2H2*Du- Du^2 + 2*H2*Ds) + (1.39X10^-4)*W*Du)

Design Information:

W = Trench Width:	6	ft	
K = Hydraulic Conductivity:	1.86E-04	cfs*sq ft-ft head	**(average of 3 field tests)**
H2 = Depth to Water Table:	6.50	ft	
Du = Non-Saturated Trench Depth:	5.50	ft	
Ds = Saturated Trench Depth:	0.00	ft	
L= Length provided	356	ft	

Provided Storage in Exfiltration Trenches = **6.947** ac-in **0.579 ac-ft**



16 ft NAVD - Lowest Inlet Elevation at Exfil trench
Limerock base and asphalt depth = 0.75'
15 ft NAVD - Top of Trench

1.5 ft, Diameter of Perforated Pipe

10.50 ft NAVD - Invert of Perforated HDPE

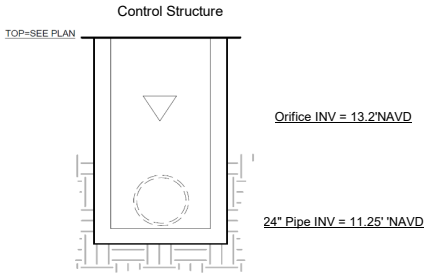
9.50 ft NAVD - Bottom of Trench Elevation
9.50 ft NAVD - High water Table Elevation

Discharge Caculations at 25 year Storm event

Pre-development discharge to 17th Ave

	C	A	C x A	C (w avg)
Open	0.3	0.854	0.256	
Impervious	0.95	0.398	0.378	
Total		**1.251**		**0.51**

Q=CIA **5.39 cfs**
I = 8.5 in/hr *
*(FDOT IDF Curve - Zone 10)



Post-development discharge to 17th Ave
Q **0.97 < 5.36 csf** **Passed**
Refer to cascade Analysis for 25 Year - 3 Day stormevent

Proposed Site Discharge is via a 6" inverted triange orifice at EL 13.2 ft NAVD

Summary **REFER TO CASCADE ROUTINGS**

Storm Event	Pre	Post	Comment
3 year - 1 Hour	16.26	12.53 ft' NAVD	fully retained on-site
5 Year - 1 day	16.26	15.92 ft' NAVD	
25 Year - 3 day	16.85	16.23 ft' NAVD	w/ bleeder discharge
100 year - 3 day	17.20	16.76 ft' NAVD	

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Deco Green - Pre- Development Storage Analysis

.

Grading Criteria

	Description	Acreage	Low EL ('NAVD)	High EL. ('NAVD)
		ac.	ft	ft
A	Building	0.000	0	0
B	Pervious/Landscpae	1.793	15.14	17.28
C	Parking-Impervious	0.501	15.62	17.03

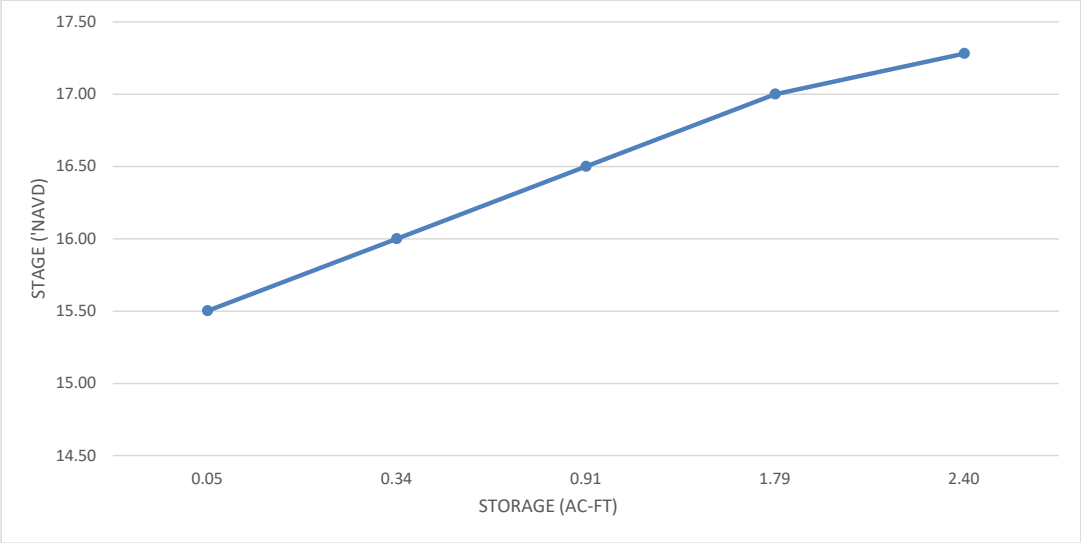
Stage Storage

Stage	Site Storage	Retention Storage	Total Storage
'NAVD	ac-ft	ac-ft	ac-ft
15.14	0.00	0	0.00
15.50	0.05	0	0.05
16.00	0.34	0	0.34
16.50	0.91	0	0.91
17.00	1.79	0	1.79
17.28	2.40	0	2.40

Note: Datum Conversion

'NGVD - 1.5'75 = 'NAVD

Stage Storage Curve Table



Deco Green- Post-Development Storage Analysis

Grading Criteria

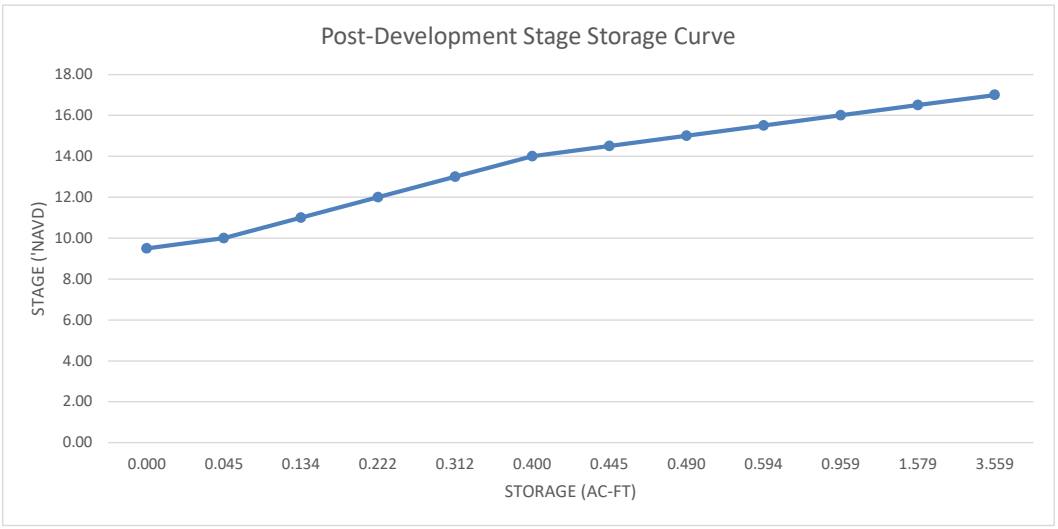
	Description	Acreage	Porosity	Depth	Net Area	Low EL ('NAVD)	High EL. ('NAVD)
		ac.	%	in.	ac.	ft	ft
A	Building	0.260			0.260	17.50	17.50
B	Concrete/Hardscape	1.173			1.173	15.75	16.75
C	Pervious Concrete	0.252	20%	6	0.050	15.75	16.75
D	Dog Park	0.030	40%	1.5	0.012	16.00	16.50
E	Landscape	0.567			0.567	15.00	16.75
F	Playground	0.032			0.032	16.25	16.50

Stage Storage

Stage	Site Storage	Trench Storage	Total Storage
'NAVD	ac-ft	ac-ft	ac-ft
9.50	0.00	0.00	0.000
10.00	0.00	0.045	0.045
11.00	0.00	0.134	0.134
12.00	0.00	0.222	0.222
13.00	0.00	0.312	0.312
14.00	0.00	0.400	0.400
14.50	0.00	0.445	0.445
15.00	0.00	0.490	0.490
15.50	0.06	0.534	0.594
16.00	0.38	0.579	0.959
16.50	1.00	0.579	1.579
17.00	2.98	0.579	3.559

Note: Datum Conversion

'NGVD - 1.5' = 'NAVD



CASCADE ANALYSIS

Project Name: Deco Green
Reviewer: Patricia F Ramudo
Project Number:
Period Begin: Jan 01, 2000;0000 hr End: Jan 16, 2000;0000 hr Duration: 360 hr
Time Step: 0.2 hr, Iterations: 10

PRE 5 YEAR - 1 DAY
ALL ELEVATIONS SHOWN
ARE IN NAVD.

Basin 1: On-Site

Method: Santa Barbara Unit Hydrograph
Rainfall Distribution: SFWMD - 24 hr
Design Frequency: 5 year
1 Day Rainfall: 7 inches
Area: 2.31 acres
Ground Storage: 4.88 inches
Time of Concentration: 0.1 hours
Initial Stage: 15.14 ft NGVD

Stage (ft NGVD)	Storage (acre-ft)
15.14	0.00
15.50	0.05
16.00	0.34
16.50	0.91
17.00	1.79
17.28	2.40

STRUCTURE MAXIMUM AND MINIMUM DISCHARGES

Struc	Max (cfs)	Time (hr)	Min (cfs)	Time (hr)

BASIN MAXIMUM AND MINIMUM STAGES

Basin	Max (ft)	Time (hr)	Min (ft)	Time (hr)
On-Site	16.26	24.80	15.14	0.00

BASIN WATER BUDGETS (all units in acre-ft)

Basin	Total Runoff	Structure Inflow	Structure Outflow	Initial Storage	Final Storage	Residual
On-Site	0.64	0.00	0.00	0.00	0.64	0.00

Project Name: Deco Green
Reviewer: Patricia F Ramudo
Project Number:
Period Begin: Jan 01, 2000;0000 hr End: Jan 16, 2000;0000 hr Duration: 360 hr
Time Step: 0.2 hr, Iterations: 10

PRE 25 YEAR - 3 DAY
ALL ELEVATIONS SHOWN
ARE IN NAVD.

Basin 1: On-Site

Method: Santa Barbara Unit Hydrograph
Rainfall Distribution: SFWMD - 3day
Design Frequency: 25 year
3 Day Rainfall: 12.3 inches
Area: 2.31 acres
Ground Storage: 4.84 inches
Time of Concentration: 0.1 hours
Initial Stage: 15.14 ft NGVD

Stage (ft NGVD)	Storage (acre-ft)
15.14	0.00
15.50	0.05
16.00	0.34
16.50	0.91
17.00	1.79
17.28	2.40

STRUCTURE MAXIMUM AND MINIMUM DISCHARGES

Struc	Max (cfs)	Time (hr)	Min (cfs)	Time (hr)

BASIN MAXIMUM AND MINIMUM STAGES

Basin	Max (ft)	Time (hr)	Min (ft)	Time (hr)
On-Site	16.85	72.80	15.14	0.00

BASIN WATER BUDGETS (all units in acre-ft)

Basin	Total Runoff	Structure Inflow	Structure Outflow	Initial Storage	Final Storage	Residual
On-Site	1.53	0.00	0.00	0.00	1.53	0.00

Project Name: Deco Green
Reviewer: Patricia F Ramudo
Project Number:
Period Begin: Jan 01, 2000;0000 hr End: Jan 16, 2000;0000 hr Duration: 360 hr
Time Step: 0.2 hr, Iterations: 10

PRE 100YEAR - 3 DAY
ALL ELEVATIONS SHOWN
ARE IN NAVD.

Basin 1: On-Site

Method: Santa Barbara Unit Hydrograph
Rainfall Distribution: SFWMD - 3day
Design Frequency: 100 year
3 Day Rainfall: 16.2 inches
Area: 2.31 acres
Ground Storage: 4.84 inches
Time of Concentration: 0.1 hours
Initial Stage: 15.14 ft NGVD

Stage (ft NGVD)	Storage (acre-ft)
15.14	0.00
15.50	0.05
16.00	0.34
16.50	0.91
17.00	1.79
17.28	2.40

STRUCTURE MAXIMUM AND MINIMUM DISCHARGES

Struc	Max (cfs)	Time (hr)	Min (cfs)	Time (hr)

BASIN MAXIMUM AND MINIMUM STAGES

Basin	Max (ft)	Time (hr)	Min (ft)	Time (hr)
On-Site	17.20	72.80	15.14	0.00

BASIN WATER BUDGETS (all units in acre-ft)

Basin	Total Runoff	Structure Inflow	Structure Outflow	Initial Storage	Final Storage	Residual
On-Site	2.22	0.00	0.00	0.00	2.22	0.00

Project Name: Deco Green
Reviewer: Patricia F Ramudo
Project Number:
Period Begin: May 07, 2021;0000 hr End: May 14, 2021;0000 hr Duration: 168 hr
Time Step: 0.2 hr, Iterations: 10

POST 5 YEAR - 1 DAY
ALL ELEVATIONS SHOWN
ARE IN NAVD.

Basin 1: On-Site

Method: Santa Barbara Unit Hydrograph
Rainfall Distribution: SFWMD - 24 hr
Design Frequency: 5 year
1 Day Rainfall: 7 inches
Area: 2.314 acres
Ground Storage: 2.53 inches
Time of Concentration: 0.1 hours
Initial Stage: 9.5 ft NGVD

Stage (ft NGVD)	Storage (acre-ft)
9.50	0.00
10.00	0.04
11.00	0.13
12.00	0.22
13.00	0.31
14.00	0.40
15.00	0.49
15.50	0.59
16.00	0.96
16.50	1.58
17.00	3.56

Offsite Receiving Body: Offsite1

Time (hr)	Stage (ft NGVD)
0.00	11.00
72.00	13.00
170.00	11.00

STRUCTURE MAXIMUM AND MINIMUM DISCHARGES

Struc	Max (cfs)	Time (hr)	Min (cfs)	Time (hr)

BASIN MAXIMUM AND MINIMUM STAGES

Basin	Max (ft)	Time (hr)	Min (ft)	Time (hr)
On-Site	15.92	25.00	9.50	0.00

BASIN WATER BUDGETS (all units in acre-ft)

Basin	Total Runoff	Structure Inflow	Structure Outflow	Initial Storage	Final Storage	Residual
On-Site	0.90	0.00	0.00	0.00	0.90	0.00

Project Name: Deco Green
Reviewer: Patricia F Ramudo
Project Number:
Period Begin: May 07, 2021;0000 hr End: May 14, 2021;0000 hr Duration: 168 hr
Time Step: 0.2 hr, Iterations: 10

POST 25 YEAR - 3 DAY
ALL ELEVATIONS SHOWN
ARE IN NAVD.

Basin 1: On-Site

Method: Santa Barbara Unit Hydrograph
Rainfall Distribution: SFWMD - 3day
Design Frequency: 25 year
3 Day Rainfall: 12.3 inches
Area: 2.314 acres
Ground Storage: 2.53 inches
Time of Concentration: 0.1 hours
Initial Stage: 9.5 ft NGVD

Stage (ft NGVD)	Storage (acre-ft)
9.50	0.00
10.00	0.04
11.00	0.13
12.00	0.22
13.00	0.31
14.00	0.40
15.00	0.49
15.50	0.59
16.00	0.96
16.50	1.58
17.00	3.56

Offsite Receiving Body: Offsite1

Time (hr)	Stage (ft NGVD)
0.00	11.00
72.00	13.00
170.00	11.00

Structure: 1

From Basin: On-Site
To Basin: Offsite1
Structure Type: Gravity
Weir: None
Bleeder: Inv-Tri, Invert Elev = 13.2 ft NGVD, Height = 0.5 ft
Width = 0.5 ft
Default Coefs: Weir Coef = 2.5, Orifice Coef = 0.6
Pipe: Diameter = 1.5 ft, Manning's n = 0.011, Length = 47 ft
US Invert Elev = 11.25 ft NGVD, DS Invert Elev = 11 ft NGVD, no flap gate

Time (hr)	Cumulative Rainfall (in)	Instant Runoff (cfs)	Current Discharge (cfs)	Cumulative Discharge (acre-ft)	Head Water Stage (ft NGVD)	Tail Water Stage (ft NGVD)
0.00	0.00	0.00	0.00	0.00	9.50	11.00
1.00	0.06	0.00	0.00	0.00	9.50	11.03
2.00	0.11	0.00	0.00	0.00	9.50	11.06
3.00	0.17	0.00	0.00	0.00	9.50	11.08
4.00	0.22	0.00	0.00	0.00	9.50	11.11
5.00	0.28	0.00	0.00	0.00	9.50	11.14
6.00	0.33	0.00	0.00	0.00	9.50	11.17
7.00	0.39	0.00	0.00	0.00	9.50	11.19
8.00	0.44	0.00	0.00	0.00	9.50	11.22
9.00	0.50	0.00	0.00	0.00	9.50	11.25
10.00	0.55	0.00	0.00	0.00	9.50	11.28
11.00	0.61	0.01	0.00	0.00	9.51	11.31
12.00	0.66	0.01	0.00	0.00	9.52	11.33
13.00	0.72	0.02	0.00	0.00	9.53	11.36

Time (hr)	Cumulative Rainfall (in)	Instant Runoff (cfs)	Current Discharge (cfs)	Cumulative Discharge (acre-ft)	Head Water Stage (ft NGVD)	Tail Water Stage (ft NGVD)
14.00	0.77	0.02	0.00	0.00	9.55	11.39
15.00	0.83	0.03	0.00	0.00	9.57	11.42
16.00	0.88	0.03	0.00	0.00	9.60	11.44
17.00	0.94	0.03	0.00	0.00	9.63	11.47
18.00	0.99	0.04	0.00	0.00	9.66	11.50
19.00	1.05	0.04	0.00	0.00	9.70	11.53
20.00	1.10	0.04	0.00	0.00	9.74	11.56
21.00	1.16	0.05	0.00	0.00	9.78	11.58
22.00	1.21	0.05	0.00	0.00	9.82	11.61
23.00	1.27	0.05	0.00	0.00	9.87	11.64
24.00	1.32	0.05	0.00	0.00	9.92	11.67
25.00	1.40	0.08	0.00	0.00	9.99	11.69
26.00	1.48	0.09	0.00	0.00	10.07	11.72
27.00	1.56	0.09	0.00	0.00	10.16	11.75
28.00	1.64	0.10	0.00	0.00	10.25	11.78
29.00	1.72	0.10	0.00	0.00	10.34	11.81
30.00	1.80	0.11	0.00	0.00	10.43	11.83
31.00	1.88	0.11	0.00	0.00	10.53	11.86
32.00	1.96	0.11	0.00	0.00	10.64	11.89
33.00	2.04	0.11	0.00	0.00	10.74	11.92
34.00	2.12	0.12	0.00	0.00	10.85	11.94
35.00	2.20	0.12	0.00	0.00	10.96	11.97
36.00	2.29	0.12	0.00	0.00	11.07	12.00
37.00	2.37	0.12	0.00	0.00	11.19	12.03
38.00	2.45	0.13	0.00	0.00	11.31	12.06
39.00	2.53	0.13	0.00	0.00	11.43	12.08
40.00	2.61	0.13	0.00	0.00	11.55	12.11
41.00	2.69	0.13	0.00	0.00	11.67	12.14
42.00	2.77	0.13	0.00	0.00	11.80	12.17
43.00	2.85	0.14	0.00	0.00	11.93	12.19
44.00	2.93	0.14	0.00	0.00	12.05	12.22
45.00	3.01	0.14	0.00	0.00	12.18	12.25
46.00	3.09	0.14	0.00	0.00	12.31	12.28
47.00	3.17	0.14	0.00	0.00	12.44	12.31
48.00	3.25	0.14	0.00	0.00	12.57	12.33
49.00	3.34	0.16	0.00	0.00	12.72	12.36
50.00	3.43	0.17	0.00	0.00	12.87	12.39
51.00	3.54	0.20	0.00	0.00	13.05	12.42
52.00	3.66	0.24	0.00	0.00	13.25	12.44
53.00	3.81	0.31	0.06	0.00	13.50	12.47
54.00	4.00	0.38	0.22	0.01	13.70	12.50
55.00	4.23	0.46	0.33	0.04	13.83	12.53
56.00	4.49	0.54	0.40	0.07	13.97	12.56
57.00	4.80	0.65	0.46	0.11	14.12	12.58
58.00	5.18	0.81	0.54	0.15	14.35	12.61
59.00	5.68	1.20	0.66	0.20	14.72	12.64
60.00	9.19	13.27	0.93	0.26	15.91	12.67
61.00	10.19	1.55	0.97	0.34	16.14	12.69
62.00	10.65	0.93	0.97	0.42	16.14	12.72
63.00	10.94	0.61	0.97	0.51	16.13	12.75
64.00	11.21	0.61	0.96	0.58	16.10	12.78
65.00	11.38	0.37	0.96	0.66	16.07	12.81
66.00	11.54	0.37	0.95	0.74	16.03	12.83
67.00	11.70	0.37	0.94	0.82	15.98	12.86
68.00	11.87	0.37	0.93	0.90	15.91	12.89
69.00	11.97	0.25	0.91	0.97	15.84	12.92
70.00	12.08	0.25	0.90	1.05	15.76	12.94
71.00	12.19	0.25	0.88	1.12	15.69	12.97
72.00	12.30	0.25	0.87	1.20	15.62	13.00
73.00	12.30	0.00	0.85	1.27	15.53	12.98
74.00	12.30	0.00	0.79	1.33	15.26	12.96
75.00	12.30	0.00	0.71	1.40	14.92	12.94
76.00	12.30	0.00	0.54	1.45	14.35	12.92
77.00	12.30	0.00	0.37	1.48	13.92	12.90
78.00	12.30	0.00	0.18	1.50	13.66	12.88
79.00	12.30	0.00	0.09	1.51	13.54	12.86
80.00	12.30	0.00	0.05	1.52	13.48	12.84
81.00	12.30	0.00	0.04	1.52	13.44	12.82
82.00	12.30	0.00	0.03	1.52	13.41	12.80
83.00	12.30	0.00	0.02	1.53	13.39	12.78

Time (hr)	Cumulative Rainfall (in)	Instant Runoff (cfs)	Current Discharge (cfs)	Cumulative Discharge (acre-ft)	Head Water Stage (ft NGVD)	Tail Water Stage (ft NGVD)
84.00	12.30	0.00	0.02	1.53	13.37	12.76
85.00	12.30	0.00	0.01	1.53	13.36	12.73
86.00	12.30	0.00	0.01	1.53	13.35	12.71
87.00	12.30	0.00	0.01	1.53	13.34	12.69
88.00	12.30	0.00	0.01	1.53	13.33	12.67
89.00	12.30	0.00	0.01	1.53	13.33	12.65
90.00	12.30	0.00	0.01	1.53	13.32	12.63
91.00	12.30	0.00	0.01	1.53	13.31	12.61
92.00	12.30	0.00	0.00	1.53	13.31	12.59
93.00	12.30	0.00	0.00	1.53	13.30	12.57
94.00	12.30	0.00	0.00	1.53	13.30	12.55
95.00	12.30	0.00	0.00	1.53	13.30	12.53
96.00	12.30	0.00	0.00	1.53	13.29	12.51
97.00	12.30	0.00	0.00	1.53	13.29	12.49
98.00	12.30	0.00	0.00	1.53	13.29	12.47
99.00	12.30	0.00	0.00	1.54	13.29	12.45
100.00	12.30	0.00	0.00	1.54	13.28	12.43
101.00	12.30	0.00	0.00	1.54	13.28	12.41
102.00	12.30	0.00	0.00	1.54	13.28	12.39
103.00	12.30	0.00	0.00	1.54	13.28	12.37
104.00	12.30	0.00	0.00	1.54	13.27	12.35
105.00	12.30	0.00	0.00	1.54	13.27	12.33
106.00	12.30	0.00	0.00	1.54	13.27	12.31
107.00	12.30	0.00	0.00	1.54	13.27	12.29
108.00	12.30	0.00	0.00	1.54	13.27	12.27
109.00	12.30	0.00	0.00	1.54	13.27	12.24
110.00	12.30	0.00	0.00	1.54	13.27	12.22
111.00	12.30	0.00	0.00	1.54	13.26	12.20
112.00	12.30	0.00	0.00	1.54	13.26	12.18
113.00	12.30	0.00	0.00	1.54	13.26	12.16
114.00	12.30	0.00	0.00	1.54	13.26	12.14
115.00	12.30	0.00	0.00	1.54	13.26	12.12
116.00	12.30	0.00	0.00	1.54	13.26	12.10
117.00	12.30	0.00	0.00	1.54	13.26	12.08
118.00	12.30	0.00	0.00	1.54	13.26	12.06
119.00	12.30	0.00	0.00	1.54	13.26	12.04
120.00	12.30	0.00	0.00	1.54	13.26	12.02
121.00	12.30	0.00	0.00	1.54	13.25	12.00
122.00	12.30	0.00	0.00	1.54	13.25	11.98
123.00	12.30	0.00	0.00	1.54	13.25	11.96
124.00	12.30	0.00	0.00	1.54	13.25	11.94
125.00	12.30	0.00	0.00	1.54	13.25	11.92
126.00	12.30	0.00	0.00	1.54	13.25	11.90
127.00	12.30	0.00	0.00	1.54	13.25	11.88
128.00	12.30	0.00	0.00	1.54	13.25	11.86
129.00	12.30	0.00	0.00	1.54	13.25	11.84
130.00	12.30	0.00	0.00	1.54	13.25	11.82
131.00	12.30	0.00	0.00	1.54	13.25	11.80
132.00	12.30	0.00	0.00	1.54	13.25	11.78
133.00	12.30	0.00	0.00	1.54	13.25	11.76
134.00	12.30	0.00	0.00	1.54	13.25	11.73
135.00	12.30	0.00	0.00	1.54	13.25	11.71
136.00	12.30	0.00	0.00	1.54	13.24	11.69
137.00	12.30	0.00	0.00	1.54	13.24	11.67
138.00	12.30	0.00	0.00	1.54	13.24	11.65
139.00	12.30	0.00	0.00	1.54	13.24	11.63
140.00	12.30	0.00	0.00	1.54	13.24	11.61
141.00	12.30	0.00	0.00	1.54	13.24	11.59
142.00	12.30	0.00	0.00	1.54	13.24	11.57
143.00	12.30	0.00	0.00	1.54	13.24	11.55
144.00	12.30	0.00	0.00	1.54	13.24	11.53
145.00	12.30	0.00	0.00	1.54	13.24	11.51
146.00	12.30	0.00	0.00	1.54	13.24	11.49
147.00	12.30	0.00	0.00	1.54	13.24	11.47
148.00	12.30	0.00	0.00	1.54	13.24	11.45
149.00	12.30	0.00	0.00	1.54	13.24	11.43
150.00	12.30	0.00	0.00	1.54	13.24	11.41
151.00	12.30	0.00	0.00	1.54	13.24	11.39
152.00	12.30	0.00	0.00	1.54	13.24	11.37
153.00	12.30	0.00	0.00	1.54	13.24	11.35

Time (hr)	Cumulative Rainfall (in)	Instant Runoff (cfs)	Current Discharge (cfs)	Cumulative Discharge (acre-ft)	Head Water Stage (ft NGVD)	Tail Water Stage (ft NGVD)
154.00	12.30	0.00	0.00	1.54	13.24	11.33
155.00	12.30	0.00	0.00	1.54	13.24	11.31
156.00	12.30	0.00	0.00	1.54	13.24	11.29
157.00	12.30	0.00	0.00	1.54	13.24	11.27
158.00	12.30	0.00	0.00	1.54	13.24	11.24
159.00	12.30	0.00	0.00	1.54	13.24	11.22
160.00	12.30	0.00	0.00	1.54	13.24	11.20
161.00	12.30	0.00	0.00	1.54	13.24	11.18
162.00	12.30	0.00	0.00	1.54	13.24	11.16
163.00	12.30	0.00	0.00	1.54	13.23	11.14
164.00	12.30	0.00	0.00	1.54	13.23	11.12
165.00	12.30	0.00	0.00	1.54	13.23	11.10
166.00	12.30	0.00	0.00	1.54	13.23	11.08
167.00	12.30	0.00	0.00	1.54	13.23	11.06
168.00	12.30	0.00	0.00	1.54	13.23	11.04

STRUCTURE MAXIMUM AND MINIMUM DISCHARGES

Struc	Max (cfs)	Time (hr)	Min (cfs)	Time (hr)
1	0.97	61.80	0.00	0.00

BASIN MAXIMUM AND MINIMUM STAGES

Basin	Max (ft)	Time (hr)	Min (ft)	Time (hr)
On-Site	16.15	61.80	9.50	0.00

BASIN WATER BUDGETS (all units in acre-ft)

Basin	Total Runoff	Structure Inflow	Structure Outflow	Initial Storage	Final Storage	Residual
On-Site	1.87	0.00	1.54	0.00	0.33	0.00

Project Name: Deco Green
Reviewer: Patricia F Ramudo
Project Number:
Period Begin: May 07, 2021;0000 hr End: May 14, 2021;0000 hr Duration: 168 hr
Time Step: 0.2 hr, Iterations: 10

POST 100 YEAR - 3 DAY
ALL ELEVATIONS SHOWN
ARE IN NAVD.

Basin 1: On-Site

Method: Santa Barbara Unit Hydrograph
Rainfall Distribution: SFWMD - 3day
Design Frequency: 100 year
3 Day Rainfall: 16.2 inches
Area: 2.314 acres
Ground Storage: 2.53 inches
Time of Concentration: 0.1 hours
Initial Stage: 9.5 ft NGVD

Stage (ft NGVD)	Storage (acre-ft)
9.50	0.00
10.00	0.04
11.00	0.13
12.00	0.22
13.00	0.31
14.00	0.40
15.00	0.49
15.50	0.59
16.00	0.96
16.50	1.58
17.00	3.56

Offsite Receiving Body: Offsite1

Time (hr)	Stage (ft NGVD)
0.00	11.00
72.00	13.00
170.00	11.00

STRUCTURE MAXIMUM AND MINIMUM DISCHARGES

Struc	Max (cfs)	Time (hr)	Min (cfs)	Time (hr)

BASIN MAXIMUM AND MINIMUM STAGES

Basin	Max (ft)	Time (hr)	Min (ft)	Time (hr)
On-Site	16.76	72.80	9.50	0.00

BASIN WATER BUDGETS (all units in acre-ft)

Basin	Total Runoff	Structure Inflow	Structure Outflow	Initial Storage	Final Storage	Residual
On-Site	2.61	0.00	0.00	0.00	2.61	0.00

GEOTECHNICAL REPORT (TSF GEO)

January 11, 2020

OAG Investment 5 LLC
10135 SW 75th Pl
Miami, FL 33156
Attn: Mr. Ricardo Hernandez
email: rihernanp@gmail.com

RE: Due Diligence Geotechnical Engineering Study
1715 N Dixie Hwy Proposed Development
Lake Worth, Florida
TSF File No. 7111-20-447

Dear Ricardo:

TSF, Inc. is pleased to transmit our Due Diligence Geotechnical Engineering Study Report for the above-referenced project. This report includes the results of field testing and preliminary geotechnical evaluation for foundation, as well as recommendations for general site development.

We appreciate the opportunity to perform this Due Diligence Geotechnical Study and look forward to continued participation during the final design phase of this project. Please contact our office if you have any questions about this report, or if we may be of further service.

Respectfully submitted,

TSF, INC.

Harmon C. Bennett, P.E.
Principal Engineer
FL Reg. No. 53130

Ramakumar Vedula, P.E.
Principal Engineer
FL Reg No. 54873

Page No.

TABLE OF CONTENTS

1.0 EXECUTIVE SUMMARY 1

2.0 PROJECT INFORMATION 2
2.1 Project Authorization 2
2.2 Project Description.....2
2.3 Purpose and Scope of Services 2

3.0 SITE AND SUBSURFACE CONDITIONS 3
3.1 Site Location and Description.....3
3.2 Subsurface Conditions 3
3.3 Groundwater Information 4
3.4 Borehole Permeability (BHP) Test Results 5
3.5 Laboratory Classification Testing.....5

4.0 PRELIMINARY EVALUATION 5
4.1 Geotechnical Discussion.....5
4.2 Foundation Recommendations.....5
4.2.1 Spread Foundations – Standard Compaction.....5
4.2.2 Spread Foundation after Vibro-compaction.....6
4.3 Ground Floor Slab.....7
4.4 Utilities.....7
4.5 Construction Excavation.....7
4.6 Below Grade Walls.....8
4.7 Pre-Construction Survey.....8

5.0 SITE PREPARATION PROCEDURES.....8
5.1 Site Clearing.....8
5.2 Floor Subgrade Compaction and Engineering Fill 8
5.3 Footing 9

7.0 REPORT LIMITATIONS 9

APPENDIX - SOIL MAP - PALM BEACH COUNTY, FLORIDA
GEOTECHNICAL ENGINEERING SERVICES – SHEET 1 TO SHEET 4
SUMMARY OF BOREHOLE PERMEABILITY TEST RESULTS (BHP)

1.0 EXECUTIVE SUMMARY

Preliminary exploration and evaluation of the subsurface conditions have been completed for the project development at 1715 N Dixie Hwy in Lake Worth, Florida. We understand that the proposed construction will consist of two 3-story buildings and one 7-story building.

A total of thirteen (13) borings were completed for the project, nine (9) in the 7-story building footprint, and two (2) in each of the 3-story building footprint. For the 7-story structure, the borings were extended to depths between 45 and 75 feet below site grades. The borings for the 3-story structures were extended to a depth of 25 feet below grade.

The surface of the site has been altered due to removal of structures. The majority of the site has a relatively thin layer of fill material, which generally consists of sand with limerock material. Based on visual classifications of the soils underlying the fill material, or asphalt surface, the subsoils typically consisted of sandy soils followed by limestone with pockets of sand extending to the termination depth of the borings. Based on the SPT N-values recorded, all of the soils above 20 feet exist in the loose-density condition to medium-density condition, with loose-density being most prominent. Borings with depths below 30 feet typically had a layer of limestone. The limestone stratum has an occasional layer of sand, or sand and limestone mixed. The limestone layer exists in all five relative density conditions (very-loose, loose, medium, dense, and very-dense). In all borings extended below 40 feet, a very-dense layer of sandy limestone exists between 40 and 50 feet below grade. A small cavity was noted in the very-dense limestone layer at Boring B-6, from approximately 48 to 50 feet below the ground surface. A cavity of this nature is not uncommon to the limestone of the region. The groundwater depth was encountered between 9 and 10 feet below existing grade. All depths should be considered approximate.

Since the site has been occupied by structures, construction debris and foundation remnants should be expected in some areas of the site, requiring removal prior to placing fill. All debris removal areas should be properly backfilled and compacted as discussed herein.

The preliminary geotechnical study completed for the proposed development confirms that the site is suitable for the planned construction when viewed from a soil mechanics and foundation engineering perspective. We evaluated the use of shallow and deep foundations for support of the proposed structures.

All structures could potentially be supported on shallow spread foundations with an allowable bearing pressure of 3,000 psf. As an alternative, the proposed 7-story structure could be supported on shallow spread foundations after improving the bearing characteristics with Vibro-Compaction. An allowable bearing pressure of between 6,000 pounds per square foot (psf) could be utilized after improving the bearing characteristics of the sand strata via Vibro-Compaction. This foundation system does not provide any tension resistance. **Vibration impact on adjacent properties, will need to be evaluated.**

This preliminary geotechnical study is to confirm that the site does not contain any geotechnical issues that will limit the development. The owner/designer should not rely solely on this Executive Summary and must read and evaluate the entire contents of this report prior to utilizing our engineering recommendations in preparation of design/construction documents.

2.0 PROJECT INFORMATION

2.1 Project Authorization

TSF has completed a geotechnical exploration for the Project development at 1715 N Dixie Hwy in Lake Worth, Florida. Our services were authorized by OAG Investment 5 LLC.

2.2 Project Description

Our understanding of the project is based on information provided by OAG Investment 5 LLC. We understand that the proposed construction will consist two 3-story structures and one 7-story structure. Loading information was not provided for this preliminary review. Gravity loading is to be on the order of 1200 kips. It is our understanding that the proposed ground floor slab will be near the existing grade elevation.

The preliminary geotechnical evaluation presented in this report are based on the available project information, and the subsurface materials described in this report. If any of the noted information is incorrect, please inform TSF in writing so that we may amend the preliminary evaluation presented in this report if appropriate and if desired by the client. TSF will not be responsible for the implementation of its preliminary evaluation when it is not notified of changes in the project.

2.3 Purpose and Scope of Services

The purpose of this study was to explore the subsurface conditions at the site to enable an evaluation of an acceptable foundation for the proposed construction.

Our field work consisted of drilling a total of thirteen (13) Standard Penetration Test (SPT) borings, with depths ranging between 25 feet to 65 feet below grade. This report includes an outline of the testing procedures, a summary of available project information, a description of the site and subsurface conditions, and preliminary geotechnical evaluation information and recommendations regarding the following:

- Foundation soil preparation requirements.
- Foundation evaluation.
- Comments regarding factors that may impact the construction and performance of the proposed construction.

The project scope of services did not include an environmental assessment for determining the presence or absence of wetlands or hazardous or toxic materials in the soil, bedrock, surface water, groundwater, or air on or below, or around this site. Any statements in this report or on the boring logs regarding odors, colors, and unusual or suspicious items or conditions are strictly for information purposes. Before further development of this site, an environmental assessment is advisable.

3.0 SITE AND SUBSURFACE CONDITIONS

3.1 Site Location and Description

The project site is located at 1 1715 N Dixie Hwy in Lake Worth, Florida. Based on historical aerial photographs, a portion of the site was previous occupied with buildings. Prior to TSF's mobilization to the site the sit had been cleared and buildings had been removed.

3.2 Subsurface Conditions

A review of the "Soil Survey of Palm Beach County, Florida (prepared by the United States Department of Agriculture (USDA) Soil Conservation Service (SCS)) was performed for soil data information. Based on the review, the below mapping unit should be anticipated. A graphical depiction of the soil boundary information is included in the Appendix as **Soil Map - Palm Beach County, Florida – East Part.**

Map Unit 41 - St. Lucie-Paola-Urban land complex, 0 to 8 percent slopes

Component - St. Lucie-Paola - The St. Lucie component makes up 35 percent of the Map Unit. Slopes are 0 to 8 percent. This component is on ridges on marine terraces on coastal plains. The parent material consists of eolian or sandy marine deposits. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is excessively drained. Water movement in the most restrictive layer is very high. Available water to a depth of 60 inches (or restricted depth) is very low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 3 percent.

Component - Urban land complex - The Urban land is a miscellaneous area. No data is available for the component.

Map Unit 48 - Urban land, 0 to 2 percent slopes

The Urban land is a miscellaneous area. No data is available for the component.

The borings were drilled using a truck-mounted drill rig, and mud rotary and casing procedures. Samples of the in-place materials were recovered at frequent intervals using a standard split spoon driven with a 140-pound hammer freely falling 30 inches (the SPT sampling after ASTM D 1586). The samples of the in-place soils were returned to our laboratory for classification by a geotechnical engineer. The samples were classified in general accordance with the Unified Soil Classification System (ASTM D 2488). The approximate location of each boring is shown on the attachment in the Appendix as **Geotechnical Engineering Services – Sheet 1**.

A total of thirteen (13) borings were completed for the project, nine (9) in the 7-story building footprint, and two (2) in each of the 3-story building footprints. For the 7-story structure, the borings were extended to depths between 45 and 75 feet below site grades. The borings for the 3-story structures were extended to a depth of 25 feet below grade.

The surface of the site has been altered due to removal of structures. The majority of the site has a relatively thin layer of fill material, which generally consists of sand with limerock material.

Based on visual classifications of the soils underlying the fill material, or asphalt surface, the subsoils typically consisted of sandy soils followed by limestone with pockets of sand extending to the termination depth of the borings. Based on the SPT N-values recorded, all of the soils above 20 feet exist in the loose-density condition to medium-density condition, with loose-density being most prominent. Borings with depths below 30 feet typically had a layer of limestone. The limestone stratum has an occasional layer of sand, or sand and limestone mixed. The limestone layer exists in all five relative density conditions (very-loose, loose, medium, dense, and very-dense). In all borings extended below 40 feet, a very-dense layer of sandy limestone exists between 40 and 50 feet below grade. A small cavity was noted in the very-dense limestone layer at Boring B-6, from approximately 48 to 50 feet below the ground surface. A cavity of this nature is not uncommon to the limestone of the region. The groundwater depth was encountered between 9 and 10 feet below existing grade. All depths should be considered approximate.

The soil data, blow count data, and groundwater data are depicted on the soil profiles provided in the Appendix as **Geotechnical Engineering Services – Sheet 2, Sheet 3, and Sheet 4**.

The above subsurface description is of a generalized nature intended to highlight the major subsurface stratification features and material characteristics. The boring logs should be reviewed for specific information at individual boring locations. These records include soil descriptions, stratifications, and penetration resistances. The stratifications shown on the boring logs represent the conditions only at the actual boring locations. Variations may occur and should be expected between boring locations. The stratifications represent the approximate boundary between subsurface materials, and the actual transition may be gradual. Water level information obtained during field operations is also shown on the boring logs. The samples that were not altered by laboratory testing will be retained for 30 days from the date of this report and then will be discarded.

3.3 Groundwater Information

Groundwater levels were measured in the borings when first encountered during drilling. The depths to the free water surface at the time of drilling was observed to be between about 4 and 5 feet below existing ground surface. The groundwater is expected to fluctuate with seasonal and tidal changes.

The ground floor slab elevation is not known at this time. Therefore, groundwater impact on foundations, and dewatering requirements for the footings should be discussed after the design is finalized and the footing/pile cap bottom elevations are established.

In general, the seasonal high groundwater level is not intended to define a limit or ensure that future seasonal fluctuations in groundwater levels will not exceed the estimated levels. Post-development groundwater levels could exceed the normal seasonal high groundwater level estimate as a result of a series of rainfall events, changed conditions at the site that alter surface water drainage characteristics, or variations in the duration, intensity, or total volume of rainfall. We recommend that the Contractor determine the actual groundwater levels at the time of the construction to determine groundwater impact on his or her construction procedures.

3.4 Borehole Permeability (BHP) Test Results

Three (3) BHP tests were performed using the usual open-hole, constant head methodology. The holes were advanced to approximately 10 feet below the existing grade and were drilled with a hollow stem auger so that soil samples could be retrieved for visual classification by an engineer. The borings were completed as open well with gravel pack (6-20 silica sand). The well-screen slot widths were 0.020 inches. Water from the drill rig tank was then pumped into the open well, and the amount of water required maintaining a constant head was recorded. The test results are presented in the Appendix.

3.5 Laboratory Classification Testing

Representative soil samples collected from the borings were classified and stratified in general accordance with the Unified Soil Classification System. Our classification was based on visual inspection.

4.0 PRELIMINARY EVALUATION

4.1 Geotechnical Discussion

The preliminary geotechnical study completed for the proposed development confirms that the site is suitable for the planned construction when viewed from a soil mechanics and foundation engineering perspective. We evaluated the use of shallow foundations for support of the proposed structures.

The proposed 3-story structures could potentially be supported on shallow spread foundations with an allowable bearing pressure of 3,000 psf. The proposed 7-story structure could potentially be supported on shallow spread foundations after improving the bearing characteristics Vibro-Compaction. An allowable bearing pressure of between 6,000 pounds per square foot (psf) could be utilized after improving the bearing characteristics of the sand strata via Vibro-Compaction. This foundation system does not provide any tension resistance. **Vibration impact on adjacent properties, will need to be evaluated.**

Since the site has been occupied by structures, construction debris and foundation remnants should be expected in some area of the site, requiring removal prior to placing fill. All debris removal areas should be properly backfilled and compacted as discussed herein.

Above normal excavation efforts should be expected in areas which require excavations through the sandy limestone. In addition, boulder like fill should be expected when excavating the sandy limestone stratum and should be budgeted accordingly.

4.2 Foundation Recommendations

4.2.1 Spread Foundations – Standard Compaction

The proposed structures could potentially be supported on shallow foundations. The footings should be designed and proportioned for a maximum bearing pressure of 3,000 pounds per square foot (psf). Footings should meet the minimum dimensions and overburden depth that is following the most

current building code standards at the time of construction. Footing subgrade material at each footing location should be compacted to at least 95 percent of maximum dry density per ASTM D 1557 (Modified Proctor) to a depth of at least 12 inches below the footing subgrade.

Given site and soil preparation that is completed before footing construction, and using the design criteria discussed above, we estimate that total and differential foundation settlements should be less than 1 inch and ½ inch, respectively. The settlement forecast is based on imposed soil bearing pressure from structural loadings not exceeding 3,000 pounds per square foot.

The foundation excavations should be observed by a representative of TSF prior to steel or concrete placements to assess those foundation materials are capable of supporting the design loads and are consistent with the materials discussed in this report. Loose soil zones encountered at the bottom of the footing excavations should be removed to the level of medium dense soils or adequately compacted structural fill as directed by the geotechnical engineer.

4.2.2 Spread Foundation after Vibro-compaction

As an alternate, and of the proposed structures could be supported on spread footings with an allowable bearing pressure of 6,000 psf after improving the bearing characteristics of the sandy soils by Vibro-compaction. Vibro-compaction is a compaction technique for densifying sandy soils in place by means of a special vibrating probe. The probe, which is typically about 32-inches in diameter, consists of a horizontally vibrating unit, located at the lower tip of the probe, and a follow-up pipe the length of which can be varied to suit the required compaction depth. Generally, compaction depths range between 15 to 30 feet; however, depths to 120 feet have been achieved. The probe is suspended from a crane ranging in capacity from 30 to 100 tons depending on the compaction depth.

A front-end loader supplies a continuous feed of backfill material (stone) as the soils in place are densified. A high pressure, high-volume pump provides the probe with water during both penetration and compaction cycles. Under the influence of simultaneous vibration and saturation, loose sand particles are rearranged into more compact positions, and lateral confining pressures within the sandy soil mass are increased.

The engineering properties of the compacted soil are thus improved with the following results:

A. Bearing capacity is increased since the angle of internal friction is improved.
B. Foundation settlements are reduced.

The number, spacing, and depth of the Vibro-compaction points depend on the size of the footing. **The actual number, spacing, and depth will be initially provided by the specialty ground improvement contractor and will be determined based on the results the of load test program**.

We expect the structures supported on spread foundations, designed on ground modified by Vibro-compaction procedures as described above, to settle on the order of about 1 inch. Differential settlements between the adjacent bays are expected to be on the order of about ½ inch. Owing to the granular nature of the subsurface, we expect majority of the settlements to occur immediately as the structural loads are being applied. **The specialty contractor shall design the Vibro-compactions program to satisfy the above requirement (i.e. an allowable bearing capacity of 6,000 psf is**

achieved with settlement not exceeding 1 inch, and differential settlement between adjacent bays not exceeding ½ inch).

If nearby structures exist, we recommend that vibration monitoring be performed while the Vibro-compaction or any soil densification is being performed. Vibration monitoring equipment should be capable of detecting velocities of 0.1 inch/sec or less.

After completion of the Vibro-compaction, the footing subgrade should be compacted to at least 95 percent of maximum dry density per ASTM D 1557 (Modified Proctor) to a depth of at least 12 inches below the footing subgrade.

The foundation excavations should be observed by a representative of TSF prior to steel or concrete placement to assess that the foundation materials are capable of supporting the design loads and are consistent with the materials discussed in this report. Loose soil zones encountered at the bottom of the footing excavations should be adequately compacted to the aforementioned 95% criteria.

4.3 Ground Floor Slab

It is anticipated that the ground floor slab will be at an elevation approximately equal to the existing grade at the site (i.e. no substantial fill placement for the slab). After following site preparation procedures outlined in Section 5.0, the ground floor slab can be designed as a slab-on-grade bearing on compacted soil. The slabs should be adequately reinforced to carry the loads that are to be applied. The floor slab design, if based on elastic methods, should employ a modulus of subgrade reaction of 150 pounds per cubic inch (pci). To help avoid potential problems with cracking because of differential loadings, the ground floor slab be liberally jointed and separated from columns and walls.

4.4 Utilities

All utilities should be installed per the requirements of the Civil Engineering drawings and specifications. When backfilling over utility lines, the fill should be placed in lifts and compacted to at least 95% of the material's maximum dry density as determined by the Modified Proctor Compaction Test (ASTM D 1557). The loose lift thickness is expected to vary between 6 inches and 12 inches depending on the compaction equipment used by the contractor.

4.5 Construction Excavation

Sloped open-cut excavations are expected to be sufficient for construction of the footings. Once more design information is available, shoring requirements will need to be further evaluated.

Above normal excavation efforts should be expected in areas which require excavations through the limestone. Side slopes for temporary excavations may stand near 1.5H: 1V for short dry periods of time; however, we recommend that temporary excavations below 3-foot depth be cut on slopes of 2H: 1V or flatter. Where restrictions will not permit slopes to be laid back as recommended above, the excavation should have shoring installed in accordance with OSHA requirements. Furthermore, open-cut excavations exceeding 5 feet in depth should be properly dewatered and sloped 2H:1V or flatter or be benched using a bracing plan approved by a professional engineer licensed in the State of Florida. During construction, excavated materials should not be stockpiled

at the top of the slope within a horizontal distance equal to the excavation depth.

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.

4.6 Below Grade Walls

Below grade walls should be designed to resist an equivalent fluid lateral earth pressure of 60 lb/ft^3. The aforementioned earth pressure does not include hydrostatic pressures and assumes a drainage system behind the wall to relieve hydrostatic pressure; however, the below grade wall adjacent to sidewalks/streets should be checked for hydrostatic pressure for potential water main break.

4.7 Pre-Construction Survey

If the Vibro-Compaction alternative is utilized, it is recommended to perform a pre-condition photographic, video and surveyor review of the neighboring structures before and after vibration activities.

5.0 SITE PREPARATION PROCEDURES

The site preparation work is expected to involve site clearing, subgrade proof-rolling, and placement of compacted fill. Presented below is a brief review of the required work.

5.1 Site Clearing

All construction areas should be cleared of asphalt, brush, stumps, topsoil, any construction debris or other above-ground debris. Underground utilities and foundation remnants, if any, should be removed within the area of the proposed construction. **Since the site has been occupied by structures, construction debris and foundation remnants should be expected in some areas of the site, requiring removal prior to placing fill. All debris removal areas should be properly backfilled and compacted as discussed herein.**

5.2 Floor Subgrade Compaction and Engineering Fill

Prior to the construction of the ground floor slab the area should be proofrolled with a self-propelled roller (Ingersoll-Rand SD 100D or equivalent) and compacted to a field dry density not less than 95% of the material's maximum dry density as determined by the Modified Compaction Test (ASTM D1557) or inspected or probed by the Geotechnical Engineer if founded on limestone. In areas where the ground floor slab elevation is above existing grade, engineering fill will be necessary to support slab-on-grade and other surface features such as entrance ramps, driveways, and sidewalks. Such fill should also be compacted to the aforementioned 95% criteria. The engineering fill materials must be placed under our close inspection and testing. The fill should be

inorganic granular soils free from deleterious materials approved by our firm. The fill should be placed in lifts of no greater than 12 inches thick, and each lift should be compacted to the aforementioned 95% criteria. In restricted areas where a small compactor must be used, the lift thickness should be reduced to 6 inches to 9 inches, as directed by an inspector from our firm. Fill around footings and pile caps should be backfilled in no more than 12-inch thick loose lifts, and each lift should be compacted to the above mentioned 95% criteria.

5.3 Footing

Following the proofrolling operation described above (and Vibro-compaction, if used), the foundation areas should be excavated, and the footings formed and poured in-the-dry. Prior to footings being formed, the footing subgrade should be compacted to a field dry density not less than 95% of the material's maximum dry density as determined by the Modified Compaction Test (ASTM D1557) to a depth of at least 12 inches below footing subgrade. For footings located at a higher grade than existing, approved fill should be placed in no more than 12-inch-thick loose lifts and each lift shall be compacted to the 95% criteria described above. Loose soil zones encountered at the bottom of the footing excavations should be compacted to the above mentioned 95% criteria. After excavation for footings, the footing subgrade should be observed and tested by a representative of TSF prior to steel or concrete placement to assess that foundation materials are capable of supporting the design load and are covered with the materials discussed in the report.

7.0 REPORT LIMITATIONS

The preliminary evaluation submitted is based on the available subsurface information obtained by TSF and design details furnished by OAG Investment 5 LLC for the proposed project.

If there are any revisions to the plans for this project or if deviations from the subsurface conditions noted in this report are encountered during construction, TSF should be notified immediately to determine if changes in the foundation are required. If TSF is not retained to perform these functions, TSF will not be responsible for the impact of those conditions of the project.

The geotechnical engineer warrants that the findings, or professional advice sections contained herein, have been made in accordance with generally accepted professional geotechnical engineering practices in the local area. No other warranties are implied or expressed.

This preliminary geotechnical study was completed to confirm that the site does not contain any geotechnical issues that will limit the development.

This preliminary geotechnical report was prepared for the exclusive use of OAG Investment 5 LLC for the specific application to the project development at 1715 N Dixie Hwy in Lake Worth, Florida.

APPENDIX

Soil Map - Palm Beach County, Florida
Geotechnical Engineering Services – Sheet 1 to Sheet 4
Summary of Borehole Permeability Test Results (BHP)

Soil Map—Palm Beach County Area, Florida
(715 N Dixie Hwy (OAG Investment 5 LLC))

Map Scale: 1:749 if printed on A portrait (8.5" x 11") sheet.

N

Meters
0 10 20 40 60

Feet
0 35 70 140 210

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 17N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Palm Beach County Area, Florida
Survey Area Data: Version 17, Jun 9, 2020

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Mar 26, 2019—Apr 22, 2019

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

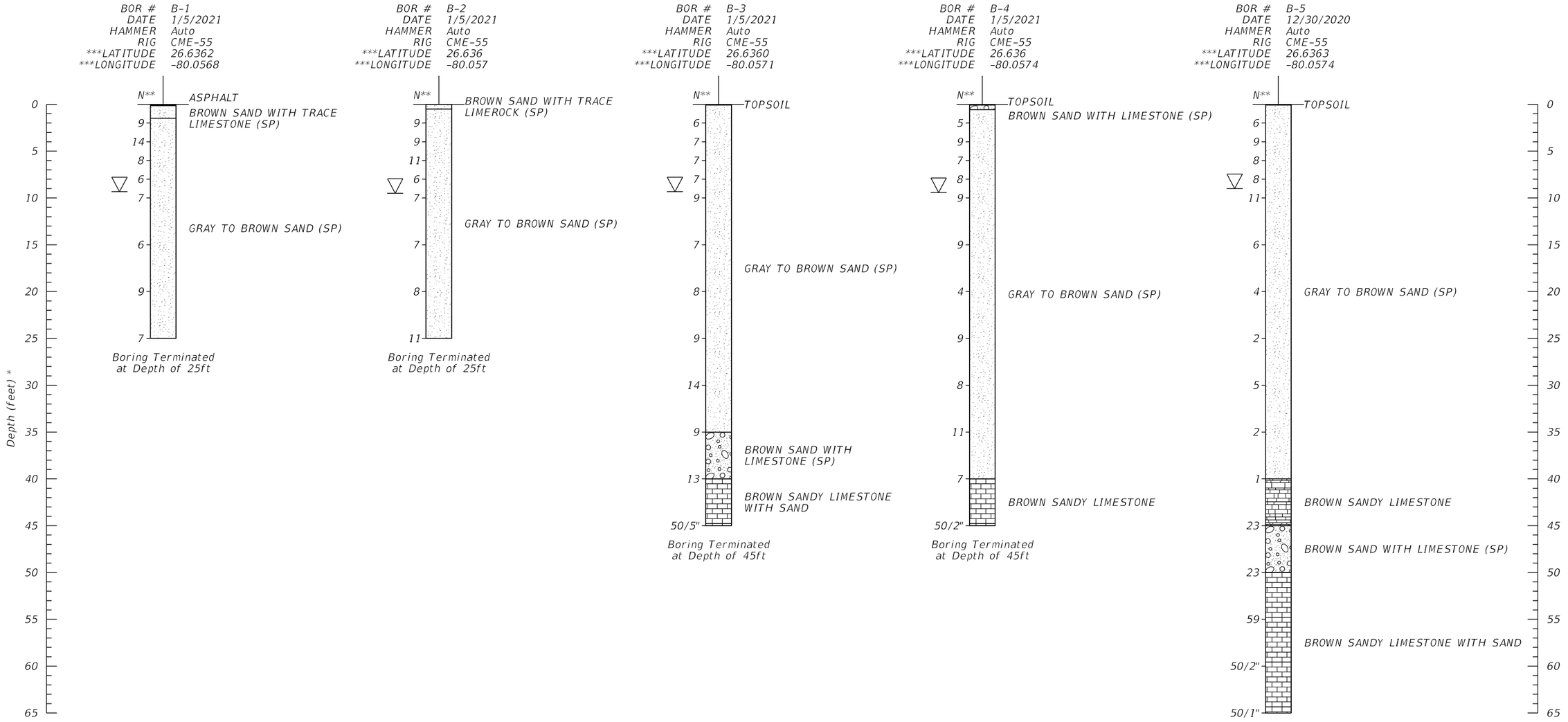
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
41	St. Lucie-Paola-Urban land complex, 0 to 8 percent slopes	1.0	32.0%
48	Urban land, 0 to 2 percent slopes	2.1	68.0%
Totals for Area of Interest		**3.0**	**100.0%**

BORINGS LOCATION PLAN

Approximate Location of SPT Boring

Approximate Location of BHP Test

DRAWN BY: NG CHECKED BY: KV	APPROVED BY: RK DATE: 01-08-2021	ENGINEER OF RECORD: RAJ KRISHNASAMY, P.E. FLORIDA LICENSE NO.: 53567	TIERRA SOUTH FLORIDA 2765 VISTA PARKWAY, H-10 WEST PALM BEACH, FL 33411	SCALE: NTS	PROJECT NUMBER: 7111-20-447	GEOTECHNICAL ENGINEERING SERVICES 1715 N.DIXIE HIGHWAY WEST PALM BEACH, FLORIDA	Sheet: 1



LEGEND

- Asphalt/Topsoil
- Limestone Soft ****
- Limestone Hard ****
- Gravel
- Sand
- Gravelly Sand
- ENCOUNTERED GROUNDWATER TABLE
- 50/2" DENOTES BLOWS FOR X INCHES PENETRATION

NOTES

* DENOTES DEPTH IN FEET FROM EXISTING GROUND SURFACE

** SPT N-VALUES SHOWN ABOVE WERE OBTAINED USING AUTOMATIC HAMMERS. GENERALLY DESIGN CORRELATIONS AND PROGRAMS USE SAFETY HAMMER N-VALUES. HENCE, THE ABOVE N-VALUES NEED TO BE MULTIPLIED BY 1.24 TO OBTAIN EQUIVALENT SAFETY HAMMER N-VALUES FOR DESIGN PURPOSE.

*** LATITUDE AND LONGITUDE ARE APPROXIMATE, BASED ON HANDHELD GPSMap GARMIN 78s. ACTUAL BORING LOCATIONS COULD VARY

**** THE LIMESTONE STRATA ENCOUNTERED WITHIN THE PROJECT SITE CORRESPOND TO ROCK FORMATION THAT TYPICALLY OFFER HIGH RESISTANCE TO EXCAVATION AND DRILLING. SPECIAL EQUIPMENT AND BREAKING TOOLS ARE TIPICALLY REQUIRED TO EXCAVATE AND DRILL WITHIN THESE LIMESTONE LAYERS. THESE LIMESTONE LAYERS ARE ALSO DIFFICULT TO DEWATER DUE TO ITS HIGH POROSITY AND PERMEABILITY.

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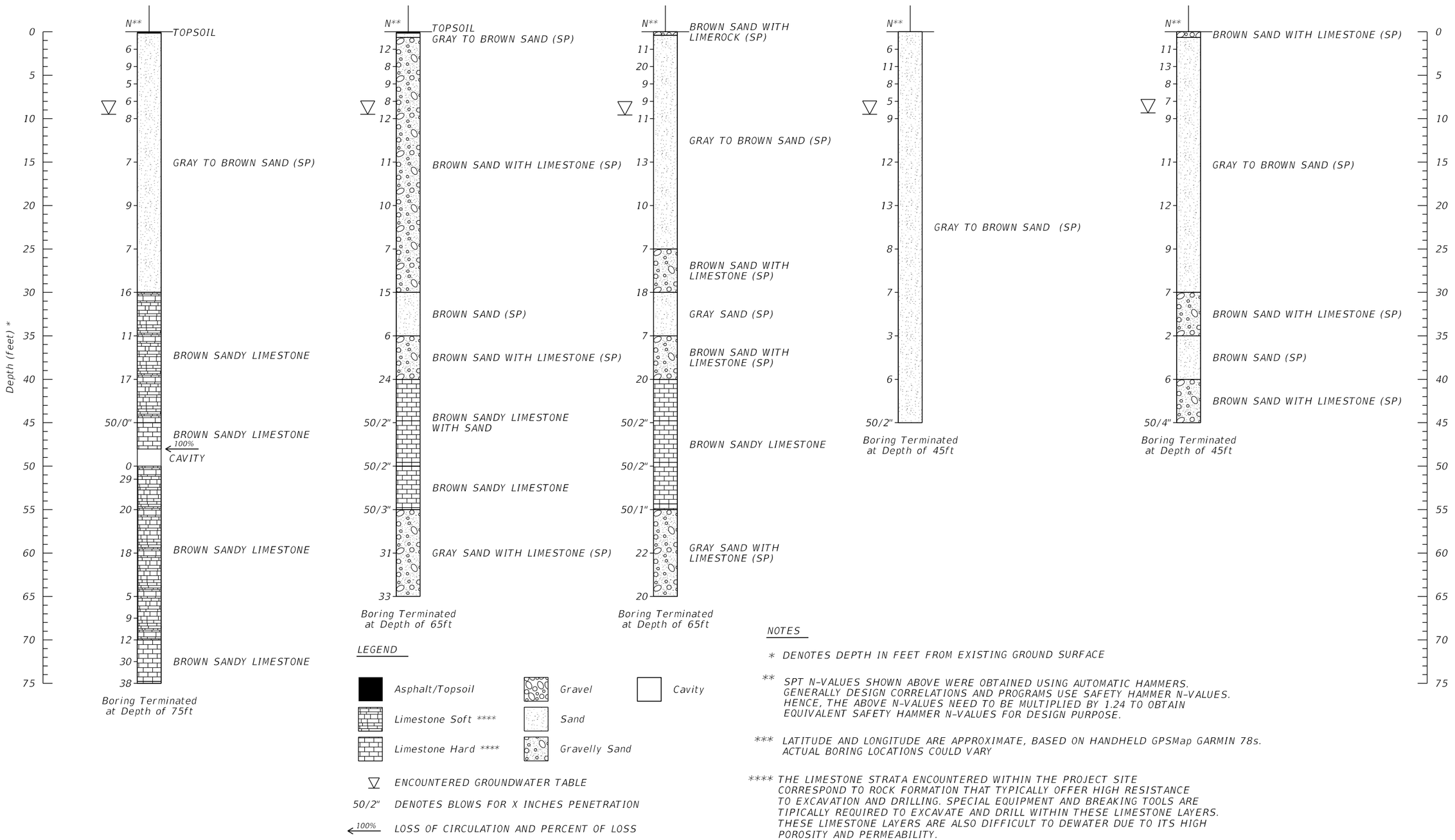

LEGEND

- Asphalt/Topsoil
- Limestone Soft ****
- Limestone Hard ****
- Gravel
- Sand
- Gravelly Sand
- Cavity
- ENCOUNTERED GROUNDWATER TABLE
- 50/2" DENOTES BLOWS FOR X INCHES PENETRATION
- 100% LOSS OF CIRCULATION AND PERCENT OF LOSS

NOTES

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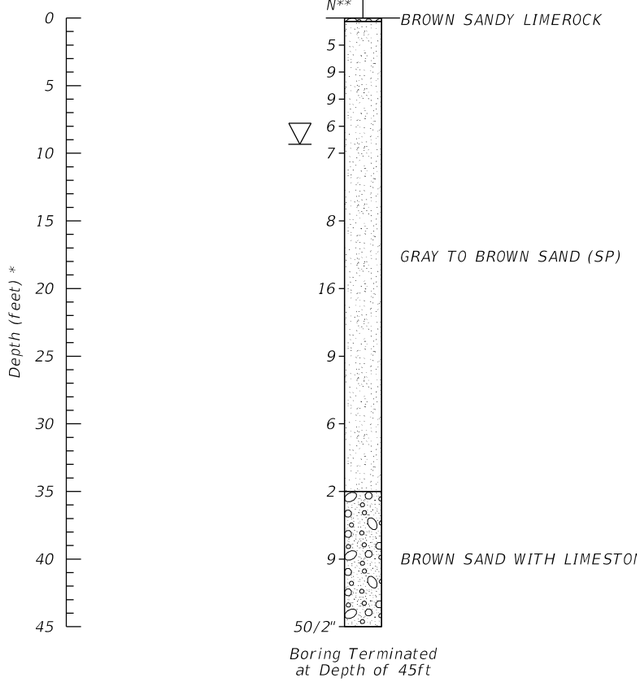
BOR # B-11
DATE 1/4/2021
HAMMER Auto
RIG CME-55
***LATITUDE 26.6368
***LONGITUDE -80.0571



Boring Terminated at Depth of 45ft

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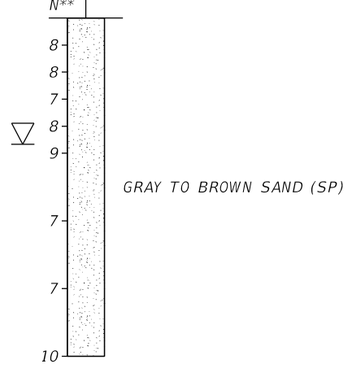
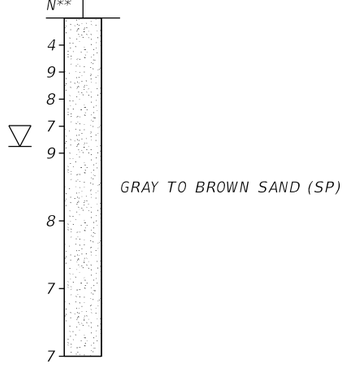
DATE 1/5/2021
HAMMER Auto
RIG CME-55
***LATITUDE 26.6369
***LONGITUDE -80.057



Boring Terminated at Depth of 25ft

BOR # B-13
DATE 1/5/2021
HAMMER Auto
RIG CME-55
***LATITUDE 26.6367
***LONGITUDE -80.0568



Boring Terminated at Depth of 25ft

LEGEND

- Asphalt/Topsoil
- Limestone Soft ****
- Limestone Hard ****
- Gravel
- Sand
- Gravelly Sand
- ∇ ENCOUNTERED GROUNDWATER TABLE
- 50/2" DENOTES BLOWS FOR X INCHES PENETRATION

NOTES

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Summary of Borehole Permeability Test Results
1715 N Dixie Highway
Lake Worth, Florida
TSF Project No. 7111-20-447

Test Location	Date Performed	Diameter		Depth of Hole	Depth to Groundwater Level Below Ground Surface (Feet)		Hydraulic Head, H_2	Saturated Hole Depth, Ds	Average Flow Rate, Q	Horizontal Hydraulic Conductivity (K)
		Hole (Inches)	Casing (Inches)	(Feet)	Prior to Test	During Test	(Feet)	(Feet)	(gpm)	($ft^3/sec/ft^2$-ft Head)
BHP-1	1/5/2020	6	4	10.0	9.5	0.0	9.5	0.5	4.40	1.85E-04
BHP-2	1/5/2020	6	4	10.0	9.3	0.0	9.3	0.8	4.20	1.77E-04
BHP-3	1/5/2020	6	4	10.0	9.7	0.0	9.7	0.3	4.70	1.97E-04

Note:

(1) The above hydraulic conductivity values represent an ultimate value. The designer should decide on the required factor of safety

(2) The hydraulic conductivity values were calculated based on the South Florida Water Management Districts's USUAL OPEN HOLE CONSTANT HEAD percolation test procedure.

(3) Casing diameter was used for the calculation of hydraulic conductivity values.

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REFERENCE MAPS

FEMA
PALM BEACH COUNTY
SFWMD

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded tenth-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevations (BFEs) shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD 88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was Transverse Mercator State Plane Florida East FIPS Zone 0901 Feet. The **horizontal datum** was NAD83 HARN, GRS1980 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov/ or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, NINGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at **(301) 713-3242** or visit its website at http://www.ngs.noaa.gov/.

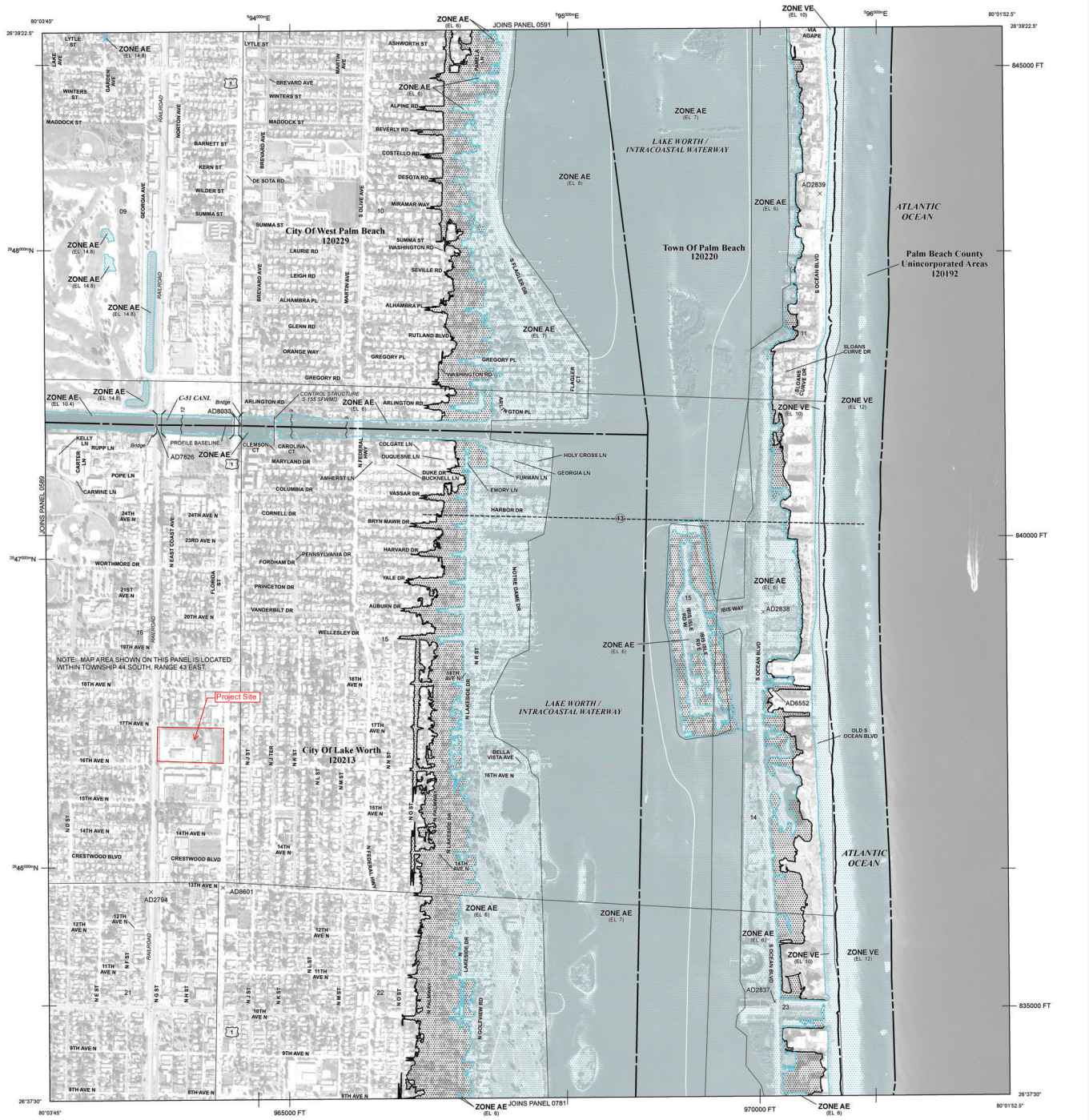
Base map information shown on this FIRM was provided in digital format by Palm Beach County. The original orthophotographic base imagery was provided in color with a one-foot pixel resolution at a scale of 1" = 200' from photography flown November 2010 - January 2011.

This map reflects more detailed and up-to-date **stream channel configurations** than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables in the Flood Insurance Study report (which contains authoritative hydraulic data) may reflect stream channel distances that differ from what is shown on this map.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

For information and questions about this map, available products associated with this FIRM including historic versions of this FIRM, how to order products or the National Flood Insurance Program in general, please call the FEMA Map Information eXchange at 1-877-FEMA-MAP (1-877-336-2627) or visit the FEMA Map Service Center website at http://msc.fema.gov. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. Many of these products can be ordered or obtained directly from the website. Users may determine the current map date for each FIRM panel by visiting the FEMA Map Service Center website or by calling the FEMA Map Information eXchange.



LEGEND

SPECIAL FLOOD HAZARD AREAS SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

- **ZONE A** No Base Flood Elevations determined.
- **ZONE AE** Base Flood Elevations determined.
- **ZONE AH** Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
- **ZONE AO** Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
- **ZONE AR** Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
- **ZONE A99** Areas to be protected from 1% annual chance flood event by a Federal flood protection system under construction; no Base Flood Elevations determined.
- **ZONE V** Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
- **ZONE VE** Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

- **ZONE X** Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

- **ZONE X** Areas determined to be outside the 0.2% annual chance floodplain.
- **ZONE D** Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

- 1% annual chance floodplain boundary
- 0.2% annual chance floodplain boundary
- Floodway boundary
- Zone D boundary
- CBRS and OPA boundary
- Boundary dividing Special Flood Hazard Area Zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths, or flood velocities
- 513 (EL 987) Base Flood Elevation line and value; elevation in feet*
- Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the North American Vertical Datum of 1988

- A — A Cross section line
- 23 — 23 Transect line
- 97°07'30", 32°22'30" Geographic coordinates referenced to the North American Datum of 1983 (NAD 83), Western Hemisphere
- 4275000mE 1000-meter Universal Transverse Mercator grid ticks, zone 17
- 6000000 FT 5000-foot grid values: Florida State Plane coordinate system, East Zone (FIPSZONE = 901), Transverse Mercator projection
- DX5510 Bench mark (see explanation in Notes to Users section of this FIRM panel)
- M1.5 River Mile

MAP REPOSITORIES
Refer to Map Repositories List on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP
OCTOBER 5, 2017

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 500'

250 0 250 500 750 1,000 FEET
150 0 150 300 METERS

NFIP
NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0593F

FIRM

FLOOD INSURANCE RATE MAP
PALM BEACH COUNTY, FLORIDA
AND INCORPORATED AREAS

PANEL 593 OF 1200
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
LAKE WORTH, CITY OF	120213	0593	F
PALM BEACH COUNTY	120192	0593	F
PALM BEACH, TOWN OF	120220	0593	F
WEST PALM BEACH, CITY OF	120229	0593	F

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

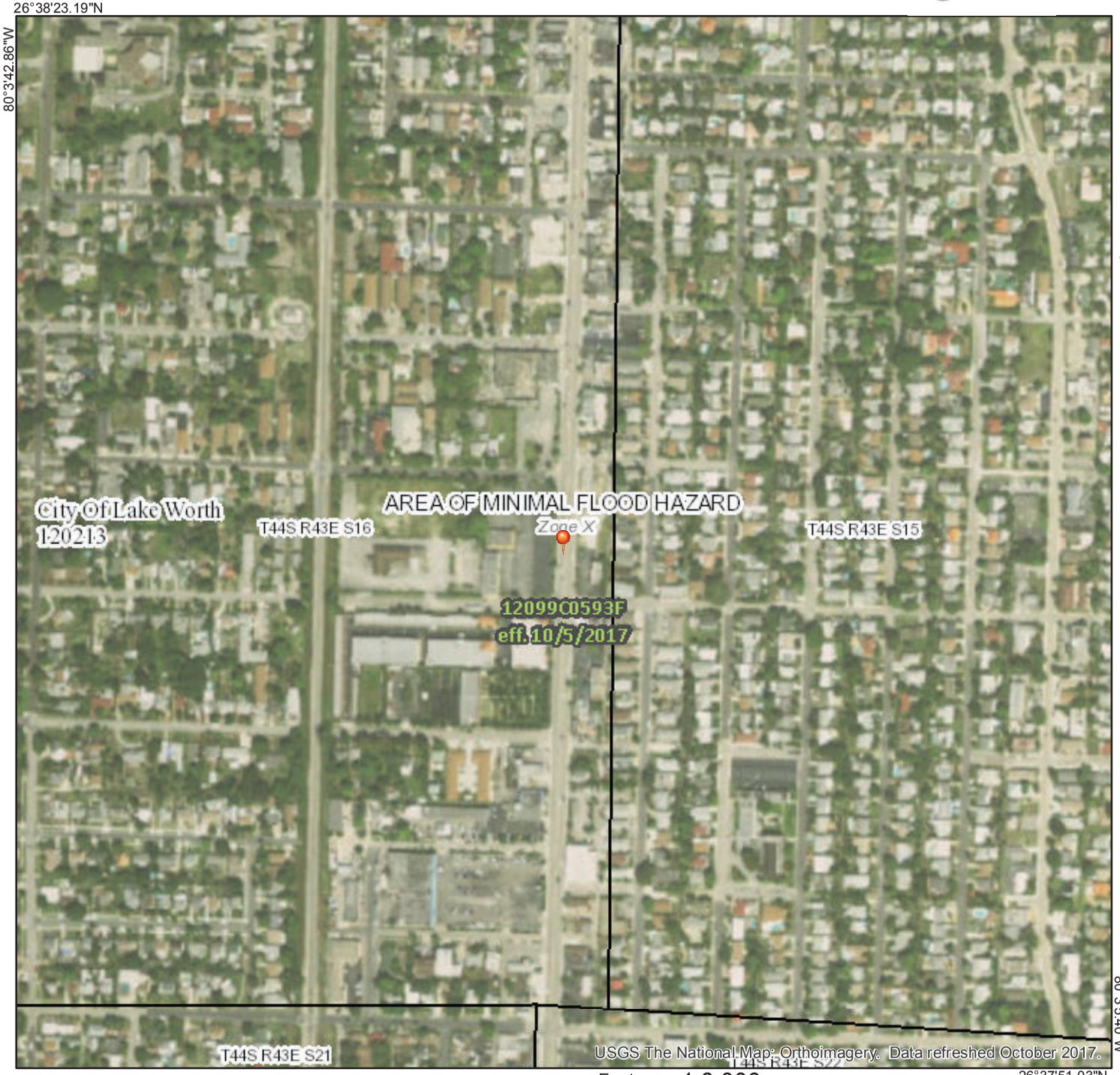
MAP NUMBER
12099C0593F

EFFECTIVE DATE
OCTOBER 5, 2017

Federal Emergency Management Agency

National Flood Hazard Layer FIRMette

FEMA



Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN — Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 / 17.5 — Cross Sections with 1% Annual Chance Water Surface Elevation
- Coastal Transect
- 513 — Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 7/26/2018 at 7:47:15 AM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

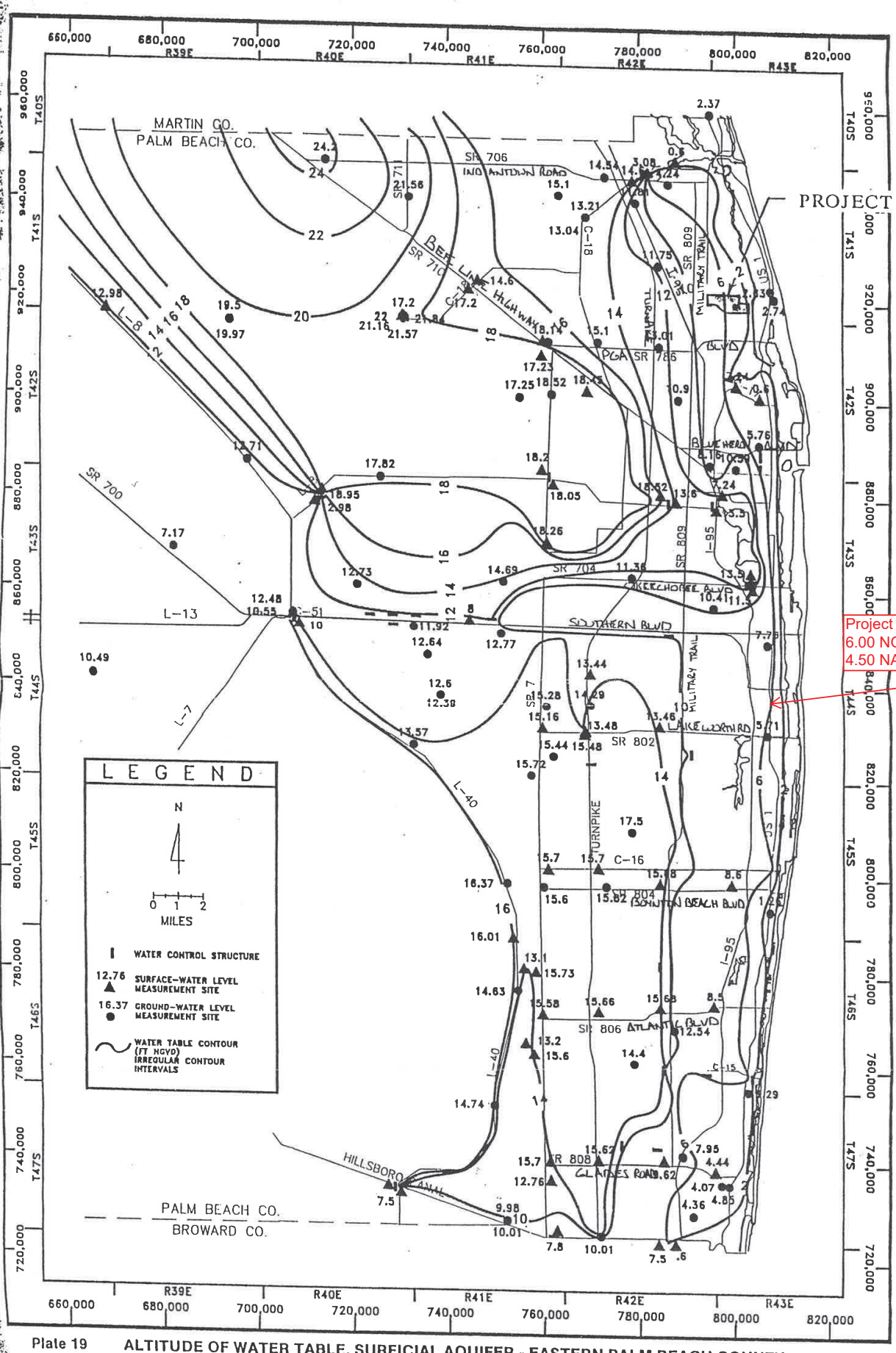


Plate 19 ALTITUDE OF WATER TABLE, SURFICIAL AQUIFER - EASTERN PALM BEACH COUNTY FLORIDA, NOVEMBER 9-14, 1984 (MODIFIED FROM MILLER 1985)

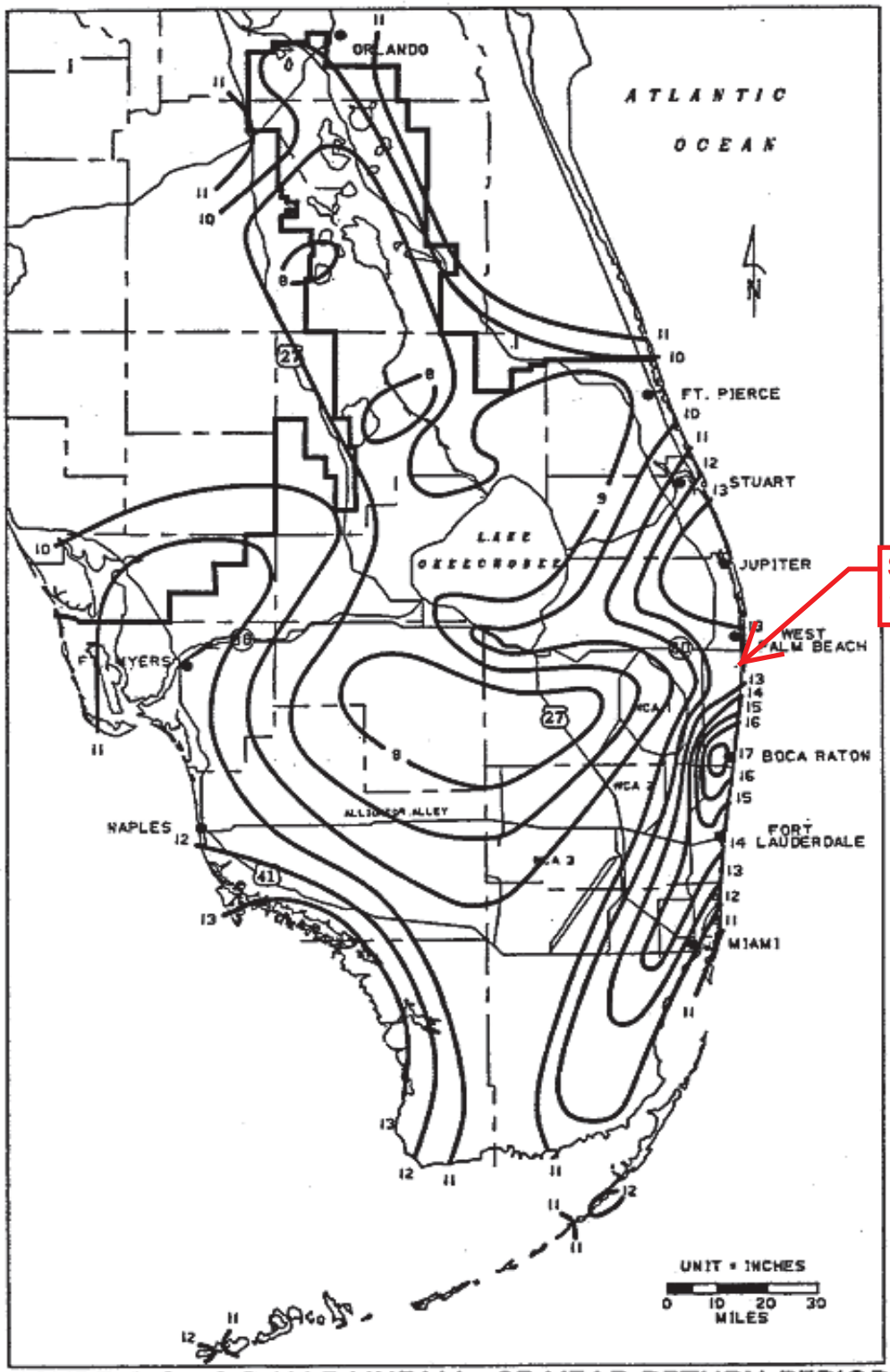


FIGURE C-8. 3-DAY RAINFALL: 25-YEAR RETURN PERIOD

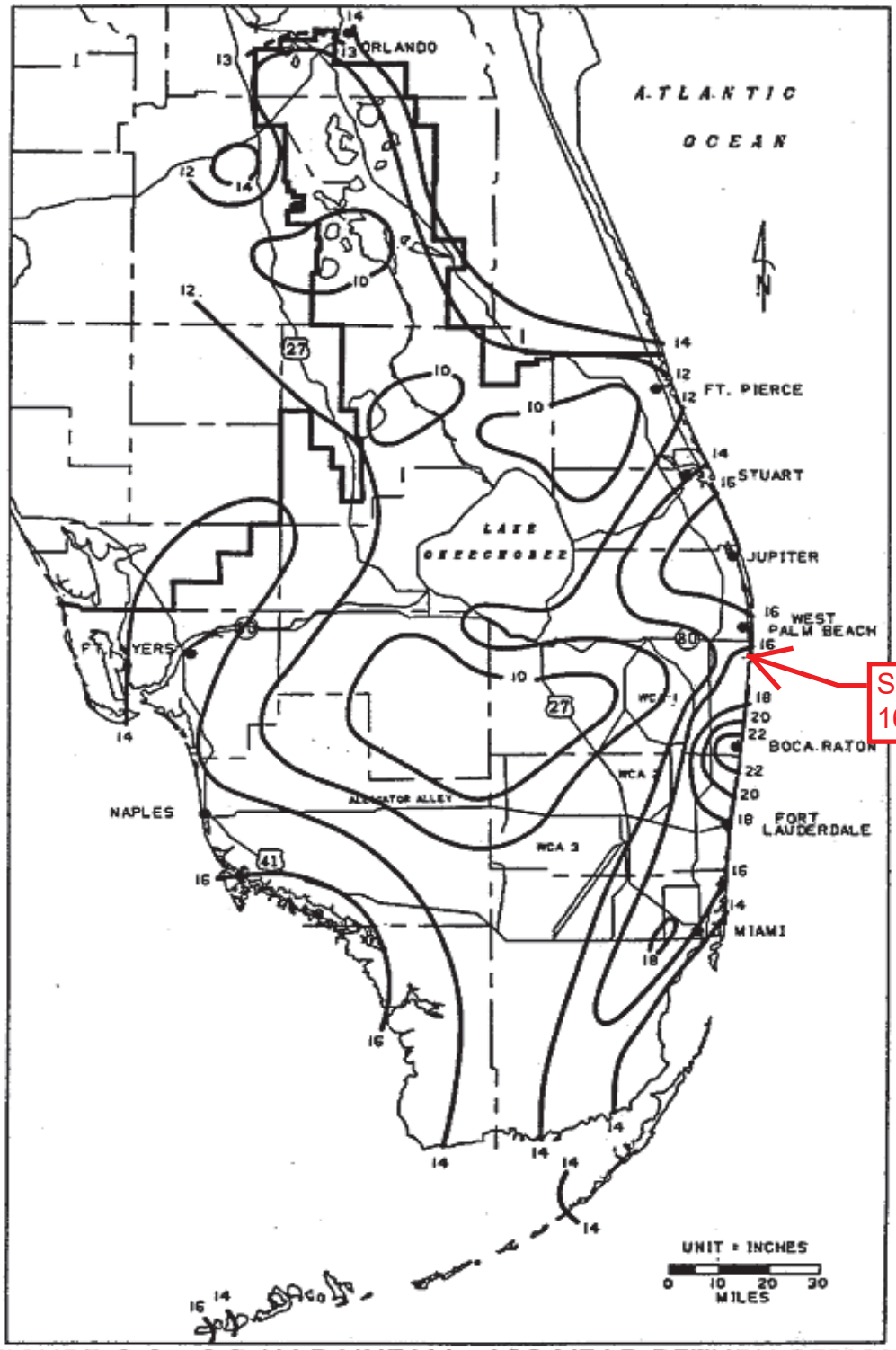


FIGURE C-9. 3-DAY RAINFALL: 100-YEAR RETURN PERIOD