

11 July 2017

Joe Roethke
Harbor Bay Community Development District
3434 Colwel Avenue, Suite 200
Tampa, FL 33614

**Re: Summary Report of Existing Sheet Pile Length Probe Testing
East Side of Community-Section I
Mirabay Development
Apollo Beach, Florida
Langan Project No.: 300117702**

This summary report presents our findings and assessment of the existing original vinyl sheet pile lengths explored by Langan Engineering and Environmental Services, Inc. (Langan). The original sheet piles along stretches of bulkhead on the east side of the Mirabay Development, identified as Section I on the attached Figure 1 were probed by Langan. This was performed to verify length and determine whether the original sheet pile embedment depths were installed to the original design intent depth of el -6, as designed by others. Langan's assessment of sheet pile length involved physically probing the bottom of the existing vinyl sheet piles at select locations and measuring the depth of the bottom of the sheet pile along with determining the sheet pile tip elevation. This work was approved by the Harbor Bay Community Development District (HBCDD). All elevations mentioned herein are referenced to the National Geodetic Vertical Datum of 1929 (NGVD). Refer to Figure 1 – Site Vicinity Map for the probe test study location within the Mirabay Community project limits.

BACKGROUND

The HBCDD requested that Langan probe the bottom of the existing vinyl sheet piles to determine if the original vinyl sheet piles were installed to the intended design depth. Based on our review of the original bulkhead design, the top of the bulkhead concrete cap was designed at el +6, the existing vinyl sheet piles had a design tip at el -6, making the length of the original sheet piles approximately 12 feet. This sheet pile length study was initiated due to an isolated condition that was identified at 5617 Seagrass Place, on the east side of the Mirabay community. At that location, significant loss of landside soil was observed at the ground surface, immediately adjacent to the bulkhead for a length of approximately 4 ft. Hand probing along this 4 ft stretch indicated that the vinyl sheet pile tip elevations were at approximately el -1.5. In addition, the top of the existing waterside berm was relatively deep at about el -1.5 which ultimately allowed for migration of landside soil below the exposed tip. Hence, this isolated condition prompted the sheet pile length probe tests throughout Section I.

ORIGINAL SHEET PILE PROBE TESTING PROCEDURE

Langan performed probe tests from 15 May 2017 through 19 May 2017 (refer to Figure No. 2 – Original Sheet Pile Embedment Depth Probing Location Plan). A total of 166 probe test locations were performed or attempted. Langan probed the bottom of the existing sheet piles at every lot throughout Section I of the community as shown on Figure 1. Selective additional probe testing was performed where there was 1) deepened waterside berm, 2) significant cap rotation deflections, and 3) significant soil loss immediately landside of the bulkhead cap.

TEST PROBE METHOD AND PROCEDURES

The bottom of existing sheet piles were probed by one of our engineers assisted by a laborer. The probing device consisted of a hollow $\frac{3}{4}$ inch-diameter steel pipe that could be extended to a length of approximately 15 ft below the top of the bulkhead cap (approximate el -9). A steel L-shaped hook was welded to the bottom of the pipe that could be used to grab the bottom of the sheet pile and determine the embedment tip of the sheet pile at the test location. The bottom of the sheet piles was explored on the waterside of the bulkhead. The hook at the tip of the probe pipe was advanced below the bottom elevation of the existing sheet piles by water jetting through the relatively loose silty sands (mud line soils) at an incline. The hook was then maneuvered along the bottom of the existing sheet pile to physically catch or grab the bottom. The sheet pile depth probe locations were performed at horizontal distances approximately every 15 feet to 50 feet apart. At the east side of Section I relatively close horizontal spacing between probing locations of 15 feet were used where waterside berm depths were relatively deep (el 0 to el -2) and significant cap rotation deflections had occurred. The spacings between probe test locations were further apart towards the west side of Section I where cap rotation deflections and waterside berm depths were not as severe. At some isolated probe test locations, the probing device could not penetrate to the tip of the sheet pile either because thick mangrove vegetation was present or zones of cemented sand and shells at the waterside berm surface (referred to as "oyster beds") impeded the manual probing technique. Refer to Appendix A for photographic documentation of the probe test activities.

DISCUSSION OF TEST PROBE RESULTS

Probe tests were performed at 166 discrete locations throughout Section I. The probing tests results indicated that the sheet pile lengths are between 10 ft (el -4) and about 13 ft (el -7), with the majority being between 11.5 ft to 12.5 ft long. In fact, the average and median tip elevation of the existing sheet piling is el -6. The top of waterside berm elevations at each probe test point location was also measured using the top of the bulkhead cap as elevation reference. The top of the berm was encountered between about el +1 and el -2 with the average elevation of about el -0.6. A summary of the test probe findings are included in Table 1.

The bottom elevation of the sheet piles were determined to be at el -4 and el -4.2 at two probe test locations along the 5618 Seagrass Place bulkhead. The bottom elevation of the sheet pile at a probe test point at 5606 Skimmer Drive was determined to be at el -4. At 5701 Tortoise Place the depth of the sheet pile was inferred to be at least el -7.

The depth of the sheet piles was undetermined at 27 of the 166 locations due to inaccessibility resulting from thick mangrove vegetation or because of cemented mud line surface materials ("oyster beds").

Probe testing was not performed where new wall was constructed for emergency and interim repairs and also at pilot study test sites in Section I that were previously designed and constructed by others.

CONCLUDING COMMENTS

The existing sheet pile probe test findings indicate that the vinyl sheet piles were indeed installed to an average depth of about el -6 which was intended for the original design. It is our opinion that the original design sheet pile penetration depth was reached at the vast majority of the Section I area tested.

The shortest probed sheet pile depths, at about el -4, are localized and occurred at only four of the points tested. Additional extensive probing was performed at 5617 Seagrass Place. This is the location where a 4 ft stretch of sheet piling with tip elevations at about el -1.5 was observed. The tip of the sheet pile at the six probe points performed at this lot was determined to be at el -6 indicating the shorter sheet zone was localized.

As indicated on the plan, there were stretches of bulkhead where the probe testing was impeded by thick mangrove growth or cemented waterside berm surfaces ("oyster shells"). These non-probed zones are not indicative of sheet pile lengths shorter than the original design intent rather just interference to the manual probing technique.

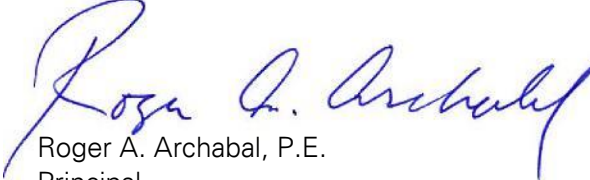
A sheet pile excessively shorter than el -6 over long stretches would manifest itself by either showing extreme lateral "toe" movement at the bottom of the sheet, where it embeds into the mud line soils as well as extreme migration of the landside soils immediately adjacent to the bulkhead cap, as was observed at the isolated location at 5617 Seagrass Place. These types of extreme conditions have not been observed.

If you have any questions regarding the information provided, please call us at (786) 264-7200.

Sincerely,

Langan Engineering and Environmental Services, Inc.


John Magnavita, P.E.
Senior Project Manager


Roger A. Archabal, P.E.
Principal

Enclosures: Figure 1 – Site Vicinity Map
Figure 2 – Original Sheet Pile Embedment Depth Probing Location Plan
Table 1 – Summary of Existing Sheet Pile Probe Testing
Appendix A – Photographic Documentation

cc: Paul Curley / Harbor Bay Board of Supervisors Chairman
Michael Eckert, P.A., / Hopping Green & Sams

FL Certificate of Authorization No. 6601

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TABLE 1

**SUMMARY OF EXISTING SHEET PILE
PROBE TESTING**

**MIRABAY COMMUNITY DEVELOPMENT
Project No. 300117702**

**TABLE 1
SUMMARY OF EXISTING SHEET PILE PROBE TESTING**

Probe Test No.	Street Address	Probe Test Date	Length of Sheeting Below Bulkhead Cap (ft)	Sheet Pile Embedded Tip Elevation (ft)	Berm Elevation (ft)	Remarks
1	5605 Seagrass Place	5/15/2017	NA	NA		Inaccessible; Pilot Test Area
2	5607 Seagrass Place	5/15/2017	NA	NA		Inaccessible; Pilot Test Area
3	5617 Seagrass Place	5/15/2017	12.0	-6.0	-0.8	
4	5617 Seagrass Place	5/15/2017	12.0	-6.0	-1.5	
5	5617 Seagrass Place	5/15/2017	11.5	-5.5	-1.4	
6	5617 Seagrass Place	5/15/2017	12.0	-6.0	-1.6	
7	5617 Seagrass Place	5/15/2017	12.0	-6.0	-1.3	
8	5617 Seagrass Place	5/15/2017	12.0	-6.0	-1.6	
9	5618 Seagrass Place	5/15/2017	10.0	-4.0	-0.4	
10	5618 Seagrass Place	5/15/2017	10.2	-4.2	-0.8	

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Probe Test No.	Street Address	Probe Test Date	Length of Sheet Piling Below Bulkhead Cap (ft)	Sheet Pile Embedded Tip Elevation (ft)	Berm Elevation (ft)	Remarks
11	5606 Seagrass Place	5/15/2017	10.0	-4.0	0.0	
12	5604 Seagrass Place	5/15/2017	NA	NA		Inaccessible; Mangrove roots
13	5621 Skimmer Drive	5/15/2017	10.0	-4.0	-0.8	
14	5640 Skimmer Drive	5/16/2017	12.0	-6.0	-1.6	
15	5640 Skimmer Drive	5/16/2017	12.5	-6.5	-1.7	
16	5638 Skimmer Drive	5/16/2017	12.0	-6.0	-1.2	
17	5636 Skimmer Drive	5/16/2017	12.3	-6.3	-1.9	
18	5634 Skimmer Drive	5/16/2017	12.4	-6.4	-1.4	
19	5634 Skimmer Drive	5/15/2017	11.0	-5.0	-1.5	
20	5632 Skimmer Drive	5/15/2017	11.0	-5.0	-1.3	

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Probe Test No.	Street Address	Probe Test Date	Length of Sheet Pile Below Bulkhead Cap (ft)	Sheet Pile Embedded Tip Elevation (ft)	Berm Elevation (ft)	Remarks
21	5630 Skimmer Drive	5/15/2017	12.5	-6.5	-1.7	
22	5628 Skimmer Drive	5/15/2017	12.5	-6.5	-1.8	
23	5626 Skimmer Drive	5/15/2017	12.0	-6.0	-1.0	
24	5624 Skimmer Drive	5/15/2017	12.0	-6.0	0.0	
25	5618 Skimmer Drive	5/16/2017	12.0	-6.0	-1.1	
26	5616 Skimmer Drive	5/16/2017	12.0	-6.0	-1.0	
27	5614 Skimmer Drive	5/16/2017	12.0	-6.0	-1.1	
28	407 Islebay Drive	5/18/2017	NA	NA		Inaccessible; Mangrove roots
29	505 Islebay Drive	5/18/2017	12.7	-6.7	-1.4	
30	505 Islebay Drive	5/18/2017	12.8	-6.8	-1.8	

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Probe Test No.	Street Address	Probe Test Date	Length of Sheet Piling Below Bulkhead Cap (ft)	Sheet Pile Embedded Tip Elevation (ft)	Berm Elevation (ft)	Remarks
31	507 Islebay Drive	5/18/2017	12.7	-6.7	-1.6	
32	509 Islebay Drive	5/16/2017	12.7	-6.7	-1.6	
33	519 Islebay Drive	5/18/2017	12.2	-6.2	-1.0	
34	521 Islebay Drive	5/18/2017	12.0	-6.0	-1.0	
35	523 Islebay Drive	5/18/2017	11.8	-5.8	-0.9	
36	529 Islebay Drive	5/18/2017	11.9	-5.9	-1.4	
37	533 Islebay Drive	5/18/2017	11.9	-5.9	-0.7	
38	537 Islebay Drive	5/18/2017	11.6	-5.6	-0.7	
39	539 Islebay Drive	5/18/2017	11.9	-5.9	-0.8	
40	541 Islebay Drive	5/18/2017	12.3	-6.3	0.0	

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Probe Test No.	Street Address	Probe Test Date	Length of Sheet Pile Below Bulkhead Cap (ft)	Sheet Pile Embedded Tip Elevation (ft)	Berm Elevation (ft)	Remarks
41	543 Islebay Drive	5/18/2017	12.4	-6.4	-0.8	
42	601 Islebay Drive	5/18/2017	12.1	-6.1	0.0	
43	603 Islebay Drive	5/18/2017	12.2	-6.2	0.3	
44	605 Islebay Drive	5/18/2017	NA	NA	0.0	Impenetrable; refusal at a depth of 10 ft
45	507 Islebay Drive	5/18/2017	12.3	-6.3	0.0	
46	609 Islebay Drive	5/18/2017	12.3	-6.3	0.0	
47	611 Islebay Drive	5/18/2017	NA	NA	0.4	Impenetrable; cemented shells
48	613 Islebay Drive	5/18/2017	12.0	-6.0	0.3	
49	615 Islebay Drive	5/18/2017	11.8	-5.8	0.2	
50	617 Islebay Drive	5/18/2017	11.9	-5.9	0.1	

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Probe Test No.	Street Address	Probe Test Date	Length of Sheet Pile Below Bulkhead Cap (ft)	Sheet Pile Embedded Tip Elevation (ft)	Berm Elevation (ft)	Remarks
51	619 Islebay Drive	5/18/2017	12.1	-6.1	0.0	
52	621 Islebay Drive	5/18/2017	12.2	-6.2	-0.3	
53	701 Islebay Drive	5/18/2017	12.0	-6.0	0.3	
54	703 Islebay Drive	5/18/2017	12.1	-6.1	0.2	
55	5722 Sea Trout Place	5/17/2017	NA	NA		Inaccessible; Mangrove roots
56	5730 Sea Trout Place	5/17/2017	NA	NA		Inaccessible; Mangrove roots
57	5728 Sea Trout Place	5/17/2017	11.9	-5.9	0.2	
58	5726 Sea Trout Place	5/17/2017	NA	NA		Inaccessible; Mangrove roots
59	5724 Sea Trout Place	5/17/2017	NA	NA		Inaccessible; Mangrove roots
60	5714 Sea Trout Place	5/17/2017	11.7	-5.7	-0.7	

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Probe Test No.	Street Address	Probe Test Date	Length of Sheet Pile Below Bulkhead Cap (ft)	Sheet Pile Embedded Tip Elevation (ft)	Berm Elevation (ft)	Remarks
61	5712 Sea Trout Place	5/17/2017	11.5	-5.5	-1.0	
62	5710 Sea Trout Place	5/17/2017	11.8	-5.8	-1.1	
63	5708 Sea Trout Place	5/17/2017	11.0	-5.0	-1.1	
64	5706 Sea Trout Place	5/17/2017	11.7	-5.7	-1.4	
65	5704 Sea Trout Place	5/17/2017	11.7	-5.7	-1.8	
66	5704 Sea Trout Place	5/17/2017	11.7	-5.7	-0.9	
67	5719 Sea Trout Place	5/17/2017	12.0	-6.0	-0.8	
68	5721 Sea Trout Place	5/17/2017	NA	NA		Inaccessible; Mangrove roots
69	5723 Sea Trout Place	5/17/2017	NA	NA		Inaccessible; Mangrove roots
70	5725 Sea Trout Place	5/17/2017	NA	NA	0.4	Impenetrable; refusal at mud line surface

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Probe Test No.	Street Address	Probe Test Date	Length of Sheet Piling Below Bulkhead Cap (ft)	Sheet Pile Embedded Tip Elevation (ft)	Berm Elevation (ft)	Remarks
71	5725 Sea Trout Place	5/18/2017	NA	NA	0.1	Impenetrable; refusal at mud line surface
72	5727 Sea Trout Place	5/17/2017	11.8	-5.8	0.3	
73	5729 Sea Trout Place	5/17/2017	11.7	-5.7	0.4	
74	618 Sea Trout Place	5/17/2017	12.0	-6.0	-0.4	
75	616 Tortoise Place	5/17/2017	NA	NA	-0.4	Impenetrable; cemented shells
76	5732 Tortoise Place	5/17/2017	NA	NA		Inaccessible; Mangrove roots
77	5730 Tortoise Place	5/17/2017	12.3	-6.3	0.5	
78	5728 Tortoise Place	5/17/2017	NA	NA		Impenetrable; cemented shells
79	5726 Tortoise Place	5/17/2017	12.5	-6.5	0.4	
80	5701 Tortoise Place	5/19/2017	13.0	-7.0	0.0	Depth of Sheet Pile at least 13 ft below top of cap.

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Probe Test No.	Street Address	Probe Test Date	Length of Sheet Piling Below Bulkhead Cap (ft)	Sheet Pile Embedded Tip Elevation (ft)	Berm Elevation (ft)	Remarks
81	5701 Tortoise Place	5/19/2017	11.9	-5.9	0.2	
82	5707 Tortoise Place	5/17/2017	12.1	-6.1	-0.3	
83	5709 Tortoise Place	5/19/2017	11.8	-5.8	0.7	
84	5711 Tortoise Place	5/19/2017	11.9	-5.9	-0.7	
85	5713 Tortoise Place	5/17/2017	12.0	-6.0	-1.0	
86	5715 Tortoise Place	5/17/2017	12.0	-6.0	-0.7	
87	5717 Tortoise Place	5/19/2017	12.0	-6.0	0.5	
88	5719 Tortoise Place	5/19/2017	12.0	-6.0	0.5	
89	5733 Tortoise Place	5/19/2017	NA	NA		Inaccessible; Mangrove roots
90	610 Tortoise Place	5/19/2017	12.0	-6.0	-0.8	

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Probe Test No.	Street Address	Probe Test Date	Length of Sheet Piling Below Bulkhead Cap (ft)	Sheet Pile Embedded Tip Elevation (ft)	Berm Elevation (ft)	Remarks
91	608 Sea Turtle Place	5/19/2017	12.0	-6.0	-0.8	
92	5732 Sea Turtle Place	5/19/2017	11.8	-5.8	-0.5	
93	5730 Sea Turtle Place	5/17/2017	12.0	-6.0	-0.3	
94	5728 Sea Turtle Place	5/17/2017	12.2	-6.2	0.3	
95	5726 Sea Turtle Place	5/19/2017	12.2	-6.2	0.5	
96	5724 Sea Turtle Place	5/19/2017	NA	NA	0.9	Impenetrable; cemented shells
97	5722 Sea Turtle Place	5/19/2017	11.9	-5.9	0.7	
98	5720 Sea Turtle Place	5/17/2017	11.0	-5.0	-0.9	
99	5720 Sea Turtle Place	5/17/2017	12.0	-6.0	-0.8	
100	5705 Sea Turtle Place	5/17/2017	12.3	-6.3	-0.3	

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Probe Test No.	Street Address	Probe Test Date	Length of Sheet Piling Below Bulkhead Cap (ft)	Sheet Pile Embedded Tip Elevation (ft)	Berm Elevation (ft)	Remarks
101	5707 Sea Turtle Place	5/19/2017	12.0	-6.0	-0.2	
102	5709 Sea Turtle Place	5/19/2017	12.0	-6.0	-0.2	
103	5711 Sea Turtle Place	5/19/2017	11.9	-5.9	-0.6	
104	5713 Sea Turtle Place	5/19/2017	12.7	-6.7	-0.7	
105	5715 Sea Turtle Place	5/17/2017	12.0	-6.0	0.3	
106	5717 Sea Turtle Place	5/17/2017	12.7	-6.7	0.1	
107	5719 Sea Turtle Place	5/17/2017	12.3	-6.3	-0.8	
108	5729 Sea Turtle Place	5/19/2017	12.0	-6.0	0.3	
109	5731 Sea Turtle Place	5/19/2017	12.3	-6.3	0.5	
110	5733 Sea Turtle Place	5/20/2017	NA	NA		Inaccessible; mangrove

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Probe Test No.	Street Address	Probe Test Date	Length of Sheet Piling Below Bulkhead Cap (ft)	Sheet Pile Embedded Tip Elevation (ft)	Berm Elevation (ft)	Remarks
111	5735 Sea Turtle Place	5/21/2017	NA	NA		Inaccessible; mangrove
112	544 Islebay Drive	5/18/2017	12.0	-6.0	-0.1	
113	542 Islebay Drive	5/18/2017	11.5	-5.5	-0.3	
114	540 Islebay Drive	5/16/2017	12.0	-6.0	0.0	
115	538 Islebay Drive	5/16/2017	12.0	-6.0	0.0	
116	536 Islebay Drive	5/16/2017	11.9	-5.9	-1.0	
117	534 Islebay Drive	5/16/2017	12.0	-6.0	-0.3	
118	532 Islebay Drive	5/16/2017	11.8	-5.8	-0.4	
119	530 Islebay Drive	5/16/2017	12.2	-6.2	-0.1	
120	528 Islebay Drive	5/16/2017	12.0	-6.0	0.1	

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Probe Test No.	Street Address	Probe Test Date	Length of Sheet Piling Below Bulkhead Cap (ft)	Sheet Pile Embedded Tip Elevation (ft)	Berm Elevation (ft)	Remarks
121	526 Islebay Drive	5/16/2017	12.0	-6.0	-0.7	
122	524 Islebay Drive	5/18/2017	NA	NA		Inaccessible; mangrove
123	454 Islebay Drive	5/18/2017	12.2	-6.2	-1.2	
124	452 Islebay Drive	5/18/2017	11.0	-5.0	-1.8	
125	450 Islebay Drive	5/18/2017	12.1	-6.1	-1.6	
126	448 Islebay Drive	5/18/2017	12.2	-6.2	-1.4	
127	446 Islebay Drive	5/18/2017	12.1	-6.1	-2.0	
128	444 Islebay Drive	5/16/2017	12.0	-6.0	-1.0	
129	442 Islebay Drive	5/16/2017	12.0	-6.0	-1.0	
130	440 Islebay Drive	5/16/2017	11.8	-5.8	-1.1	

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Probe Test No.	Street Address	Probe Test Date	Length of Sheet Piling Below Bulkhead Cap (ft)	Sheet Pile Embedded Tip Elevation (ft)	Berm Elevation (ft)	Remarks
131	438 Islebay Drive	5/16/2017	12.0	-6.0	-1.1	
132	436 Islebay Drive	5/16/2017	12.0	-6.0	-0.1	
133	436 Islebay Drive	5/16/2017	12.2	-6.2	0.0	
134	434 Islebay Drive	5/16/2017	12.0	-6.0	-1.3	
135	434 Islebay Drive	5/16/2017	12.3	-6.3	-1.2	
136	432 Islebay Drive	5/16/2017	12.0	-6.0	-1.0	
137	430 Islebay Drive	5/16/2017	12.0	-6.0	-1.3	
138	428 Islebay Drive	5/16/2017	12.5	-6.5	-0.8	
139	426 Islebay Drive	5/16/2017	12.0	-6.0	0.0	
140	424 Islebay Drive	5/16/2017	12.0	-6.0	-0.3	

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Probe Test No.	Street Address	Probe Test Date	Length of Sheet Piling Below Bulkhead Cap (ft)	Sheet Pile Embedded Tip Elevation (ft)	Berm Elevation (ft)	Remarks
141	422 Islebay Drive	5/16/2017	12.0	-6.0	-0.4	
142	420 Islebay Drive	5/16/2017	12.0	-6.0	-0.2	
143	418 Islebay Drive	5/16/2017	12.0	-6.0	-0.2	
144	416 Islebay Drive	5/16/2017	11.7	-5.7	0.0	
145	414 Islebay Drive	5/16/2017	12.0	-6.0	0.0	
146	412 Islebay Drive	5/16/2017	11.7	-5.7	-1.4	
147	412 Islebay Drive	5/16/2017	11.5	-5.5	-0.9	
148	410 Islebay Drive	5/16/2017	12.0	-6.0	-1.4	
149	408 Islebay Drive	5/16/2017	12.0	-6.0	-1.4	
150	406 Islebay Drive	5/16/2017	12.1	-6.1	-1.0	

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Probe Test No.	Street Address	Probe Test Date	Length of Sheet Pile Below Bulkhead Cap (ft)	Sheet Pile Embedded Tip Elevation (ft)	Berm Elevation (ft)	Remarks
151	427 Mirabay Blvd	5/16/2017	12.7	-6.7	-0.8	
152	429 Mirabay Blvd	5/18/2017	12.5	-6.5	-0.8	
153	431 Mirabay Blvd	5/18/2017	12.1	-6.1	-1.2	
154	433 Mirabay Blvd	5/18/2017	12.0	-6.0	-1.0	
155	435 Mirabay Blvd	5/18/2017	11.9	-5.9	-1.7	
156	437 Mirabay Blvd	5/18/2017	12.2	-6.2	-1.5	
157	439 Mirabay Blvd	5/18/2017	11.8	-5.8	-0.7	
158	501 Mirabay Blvd	5/18/2017	12.0	-6.0	0.2	
159	503 Mirabay Blvd	5/18/2017	NA	NA	-0.2	Impenetrable; cemented shells
160	505 Mirabay Blvd	5/18/2017	NA	NA	-0.1	Impenetrable; cemented shells

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Probe Test No.	Street Address	Probe Test Date	Length of Sheet Piling Below Bulkhead Cap (ft)	Sheet Pile Embedded Tip Elevation (ft)	Berm Elevation (ft)	Remarks
161	507 Mirabay Blvd	5/18/2017	NA	NA	-0.4	Impenetrable; cemented shells
162	509 Mirabay Blvd	5/18/2017	NA	NA	-0.5	Impenetrable; cemented shells
163	511 Mirabay Blvd	5/18/2017	NA	NA	-0.4	Impenetrable; cemented shells
164	513 Mirabay Blvd	5/18/2017	11.6	-5.6	-0.5	
165	515 Mirabay Blvd	5/18/2017	12.0	-6.0	-0.6	
166	517 Mirabay Blvd	5/18/2017	12.3	-6.3	-0.9	

Notes:

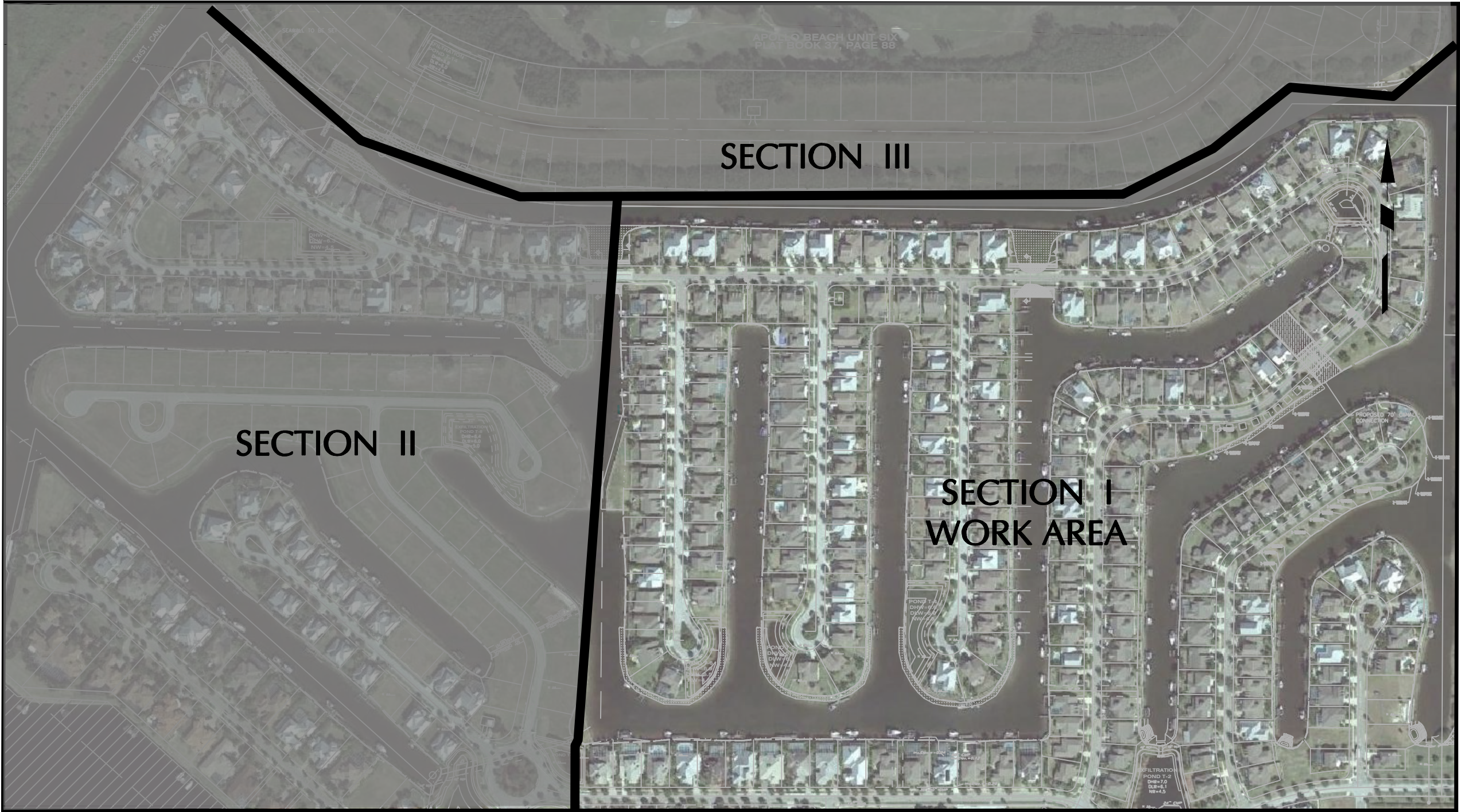
1. The elevations listed above are referenced to the National Geodetic Vertical Datum of 1929.

FIGURES

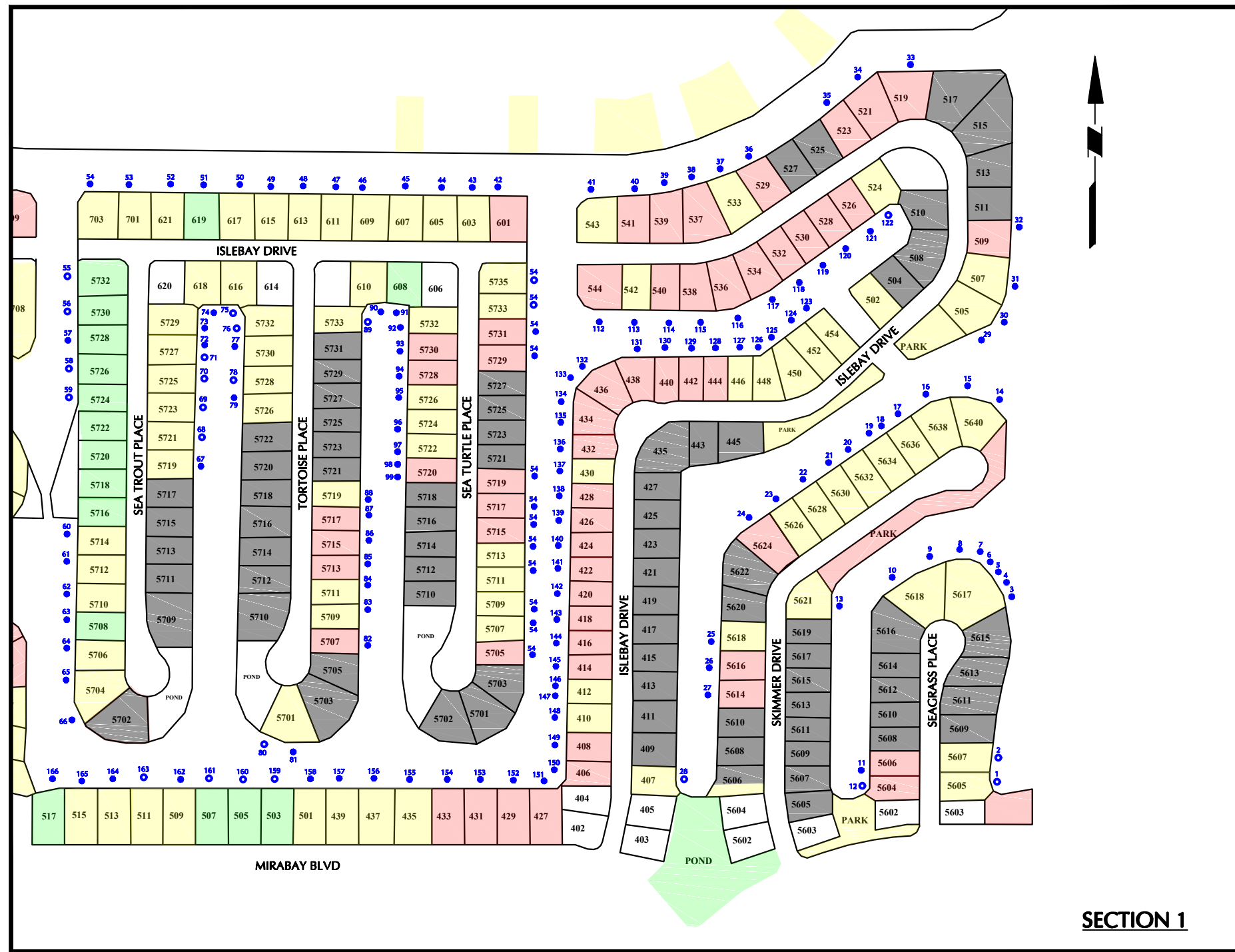
SITE AND VICINITY LOCATION PLAN

NOTE:

- 1. VICINITY PLAN PROPERTY OVERLAY REFERENCED FROM HEIDT & ASSOCIATES, INC. AUTOCAD FILE "SEAWALLMASS.DWG", DATED 15 APRIL 2009..



<p>LANGAN Parkside Corporate Ctr, 15150 NW 79th Court, Suite 200 Miami Lakes, FL 33016 T: 786.264.7200 F: 786.264.7201 www.langan.com Langan Engineering, Environmental, Surveying and Landscape Architecture, D.P.C. S.A. Langan Engineering, Environmental, Surveying and Landscape Architecture, D.P.C. Langan Engineering and Environmental Services, Inc. Langan CT, Inc. Langan International LLC Collectively known as Langan FL CERTIFICATE OF AUTHORIZATION No. 00006601</p>	Project	Drawing Title	Project No.	Figure No.
	MIRABAY DEVELOPMENT BULKHEAD RECONSTRUCTION PROJECT	SITE AND VICINITY LOCATION PLAN	300117702	1
	APOLLO BEACH FL		Date	
			JULY 2017	
			Scale	
		NOT TO SCALE		
		Drawn By		
		HK		
		Checked By		
		JM		
			Sheet	of



COMMUNITY CAP ROTATION RANGES PER LOT:

- Cap rotation less than or equal to 7/8"
- Cap rotation greater than 7/8" and less than 1-3/4"
- Cap rotation equal to or greater than 1-3/4" and less than 2-3/4"

LEGEND:

- Previously Constructed New Wall
- 100 Sheet Pile Confirmed Embedment Depth Test Location
- 101 Sheet Pile Unconfirmed Depths Embedment Test (See Notes)

SECTION 1

NOTES:

1. BASE PLAN REPRODUCED FROM HEIDT & ASSOCIATES, INC. AUTOCAD FILE "SEAWALLMASS.DWG", DATED 15 APRIL 2009.
2. PROBE LOCATIONS ARE APPROXIMATE.
3. UNCONFIRMED SHEET PILE EMBEDMENT DEPTHS WERE DUE TO IMPENETRABLE PROBE LOCATIONS CAUSED BY MANGROVE ROOT SYSTEM, CEMENTED SAND AND SHELLS AT THE MUDLINE.

LANGAN
 Parkside Corporate Ctr, 15150 NW 79th Court, Suite 200
 Miami Lakes, FL 33016
 T: 786.264.7200 F: 786.264.7201 www.langan.com
 Langan Engineering, Environmental, Surveying and Landscape Architecture, D.P.C. S.A.
 Langan Engineering, Environmental, Surveying and Landscape Architecture, D.P.C.
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 Langan CT, Inc.
 Langan International LLC
 Collectively known as Langan
 FL CERTIFICATE OF AUTHORIZATION No. 00006601

Project
**MIRABAY DEVELOPMENT
 BULKHEAD
 RECONSTRUCTION PROJECT**
 APOLLO BEACH FL

Drawing Title
**ORIGINAL SHEET PILE
 EMBEDMENT DEPTH
 PROBING LOCATION
 PLAN**

Project No. 300117702	Figure No.
Date 28 JUNE 2017	2
Scale 1" = 300'	
Drawn By CM	
Checked By JM/RA	

APPENDIX A

PHOTOGRAPHIC DOCUMENTATION



Photo No. 1 – Assembled Probe Device

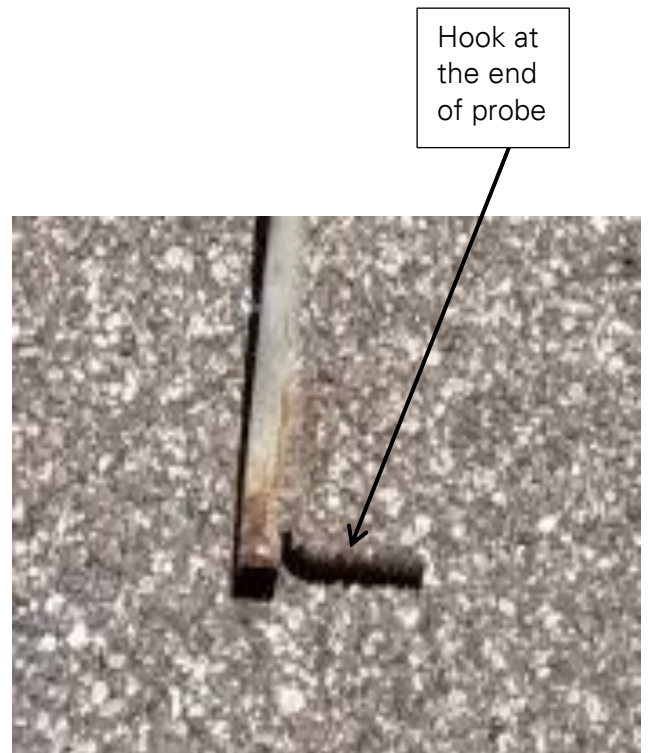


Photo No. 2 – Welded Steel Hook



Photo No. 3 – Hydraulic Jetting Assembly



Photo No. 4 – Advance of probe by hydraulic jetting.



Photo No. 5 – Advance Hook Below el -6.



Photo No. 6 – Probe advanced at incline under sheet pile.



Photo No. 7 – Probe retrieved from under sheet pile to infer embedded sheet pile tip.