INTRACOASTAL WATERWAY DEEPENING
BROWARD COUNTY, FLORIDA

APPENDIX J
Submerged Aquatic Resources Survey

Seagrass Survey

Temporary Coral Relocation

INTRACOASTAL WATERWAY DEEPENING
BROWARD COUNTY, FLORIDA

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Submerged Aquatic Resources Survey

Seagrass Survey

Florida Inland Navigational District Seagrass Survey: ICWW

17th Street Bridge to 4000 Feet North of the Las Olas Blvd. Bridge

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TABLE OF CONTENTS

Page

LIST OF TABLES

LIST OF FIGURES

EXECUTIVE SUMMARY

The Florida Inland Navigational District (FIND) has been permitted to conduct dredging along the Intracoastal Water Way (ICWW). The project extends from the 17th Street Causeway Bridge (north of Port Everglades) to a point approximately 4,000 feet north of the Las Olas Boulevard Bridge.

Marine benthic surveys were conducted between July 21 and August 6, 2014 to assess resources within the ICWW project area that may be impacted by direct or indirect dredging activities conducted by FIND. Data on the occurrence, abundance, and density of seagrasses in the affected areas were collected along transects.

Marine seagrass species observed within the ICWW study area during the surveys included *Halophila decipiens and Halophila johnsonii..* Seagrasses were present along some transects in the ICWW between 1 and 16 feet, but not present in transects deeper than 16 feet (according to transect data), suggesting light may be limiting below this depth throughout the study area. In many cases, seagrass was not present at the channel edge, but was encountered further shoreward within a transect. Of the 158 transects surveyed along the ICWW, marine seagrass species were observed along 60% of all transects (48 of 78 on the west side and 47 of 78 on the east side of the ICWW). *H. decipiens* occurred at 56% of all transects surveyed, while *H. johnsonii* occurred at 13% of all transects surveyed. Seagrass occurrence along transects consisted of patchy monospecific beds of *H. decipiens*, mixed beds of *H. decipiens* and *H. johnsonii,* and monspecific beds of *H. johnsonii.* Within the ICWW, *H. decipiens* percent cover ranged between 1 to 46% cover with a mean of 7.8% across all transects conyaining *H. decipiens*. *H. johnsonii* percent cover values ranged from 1 to 34%, with a mean of 7.1%. Total seagrass coverage was 8.8% within all transects that contained some seagrass. Braun-Blanquet scores were low for both species (*H. decipiens* mean of 0.56; *H. johnsonii* mean 0.55). Seagrasses in the ICWW are subject to regular disturbance with a high level of boat activity, high current flow during tidal changes, and seasonal changes in salinity especially during summer rains and as a result of water management practices by the SFWMD. Given all of these factors, seagrasses within the ICWW were relatively abundant.

The area of seagrass and non-seagrass communities were estimated based on transect data collected in the field. Seagrasses included 16.97 acres of *H. decipiens*, 3.54 acres of *H. johnsonii*, 4.42 acres of mixed *H. decipiens/H. johnsonii*, and 75.09 acres of non-seagrass (unvegetated) bottom.

1.0 INTRODUCTION

Dial Cordy and Associates Inc. (DC&A) was contracted by Taylor Engineering to conduct natural resource assessments of marine benthic habitats along the Intracoastal Water Way (ICWW). Marine benthic surveys were conducted within the boundaries of the ICWW from the 17th Street Causeway Bridge (north of Port Everglades) to a point approximately 4,000 feet north of the Las Olas Boulevard Bridge.in Fort Lauderdale (Figure 1).

1.1 Project Description

Approximately 14,000 linear feet within the ICWW, from the 17th Street Causeway Bridge (north of Port Everglades) to a point approximately 4,000 feet north of the Las Olas Boulevard Bridge has been permitted to be dredged as part of dredging operations by FIND.

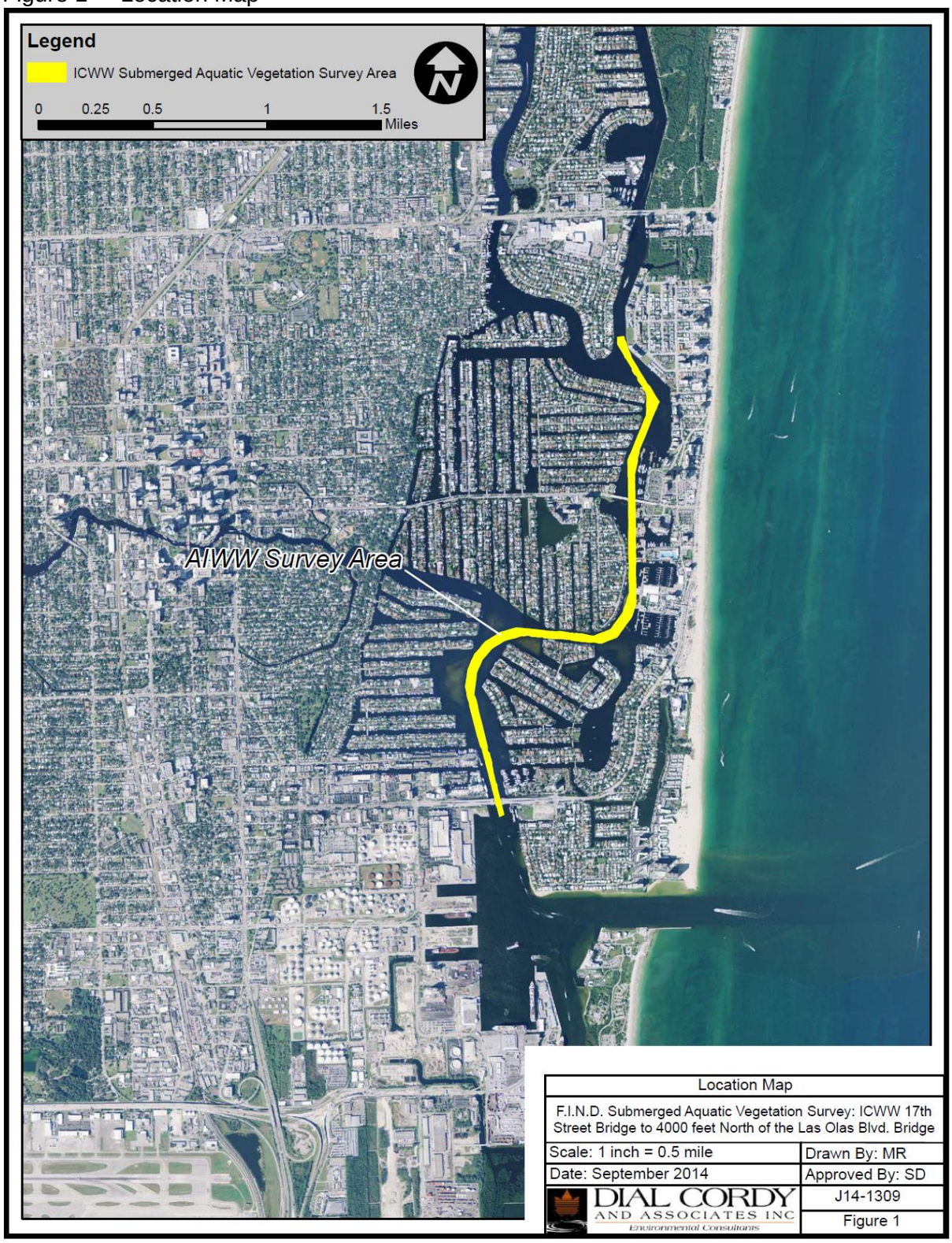
This segment of the ICWW main navigational channel covers approximately 43.5 acres of submerged bottom to improve clearance for deeper draft vessels. Existing depths range from 10' at the northern end of the project to 26' at the southern end near the SE 17th St. Causeway, and average approximately 12-13'. The maximum dredge depth shall be -17.0' MLW (-15.0' MLW plus 2' of allowable over-dredging). The width of channel dredging shall vary to a maximum of approximately 125' with side slopes of 2:1 (H:V) and a minimum 10' horizontal buffer between the stabilized top of slope and the nearest seagrass resources. Approximately 270,000 cu.yds. of material shall be removed and transported to a pre-constructed dredged material management area (DMMA) at the southern end of Port Everglades property for dewatering. The proposed dredge project limits encompass approximately 125 feet (38 m) on either side of the ICWW Project Area centerline, and the potential turbidity mixing zone associated with the dredging project may extend up to 500 feet (152 m) outside the dredge project limits.

2.0 METHODS

2.1 Seagrass Community

Marine benthic surveys were conducted between July 21 and August 6, 2014 to assess resources within the project area that may be impacted by direct or indirect dredging activities conducted by FIND (Figure 1). Marine benthic surveys were conducted along 14,000 feet of the ICWW between the 17th Street Causeway Bridge north to approximately 4,000 feet beyond the Las Olas Boulevard Bridge (Figure 1).

Figure 1 Location Map



2.1.1 Location of Survey Transects along the ICWW and DCC

To characterize the ICWW survey area, 158 transects were placed along both sides of the ICWW (79 on the west side and 79 on the east side). Each transect extended from the toe-of-slope to 50m beyond the edge of dredge limit and was at least 50 meters apart from its nearest neighbor (Figures 2 – 4).

This seagrass assessment methodology used is in accordance with the "Recommendations for sampling large project sites (>1 hectare)" of the "Final Recovery Plan for Johnson's Seagrass," prepared by the Johnson's Seagrass Recovery Team, for the National Marine Fisheries Service and National Oceanographic and Atmospheric Administration dated September 2002 (http://www.nmfs.noaa.gov/ pr/pdfs/recovery/johnsonsseagrass.pdf) (NMFS 2002). In many cases the seawall of the ICWW was closer than 50m; in these cases transects were shorter than 50m and extended to the seawall.

Divers were towed the length of each side of the ICWW within the project area to satisfy the Johnson's seagrass recommended reconnaissance portion of the sampling protocol, visually assessing the entire length for the presence of *Halophila johnsonii*. Due to depth, visibility, and boating activity in the ICWW, individual beds were not possible to delineate with GPS. Data collected along transects at 50m intervals created maps that estimate seagrass coverage for the large area sampled.

2.1.2 Seagrass Mapping

Marine seagrass occurrence and density were mapped and documented along 200 line-intercept transects. Transects were positioned by locating the end points using a Differential Global Positioning System (DGPS) with HYPACKMAX™ navigation software. A weighted line marked in 10m increments was deployed for survey. A visual marine benthic survey was conducted along the weighted line, using a 1m x 1m quadrat at 5m intervals to document seagrass distribution and occurrence. In addition to quadrat data, the point at which each transect crossed a change in marine habitat (i.e. seagrass, sand, etc.) was recorded. Line-intercept data included qualitative data about seagrass bed density (sparse (1-25% cover), moderate (26-50% cover), dense (51-100% cover) and these qualitative categories, along with supporting details from the quadrat data, were used for mapping. Information recorded on marine habitat type and distribution was transferred from field logs and entered into an Excel® spreadsheet. These points were then incorporated into a database and ArcView GIS™ was used to generate resource maps. A GIS map (ArcView) and database were created to illustrate seagrass distribution throughout the study area.

2.1.3 Percent Cover, Abundance, Density, and Relative Condition

To obtain biological data regarding the location, occurrence, abundance, and density of marine seagrass, a point-intercept survey was performed along each transect. For each transect, the average percent cover was estimated using $1m^2$ quadrats at 5m intervals

Figure 2 Transect Locations - North

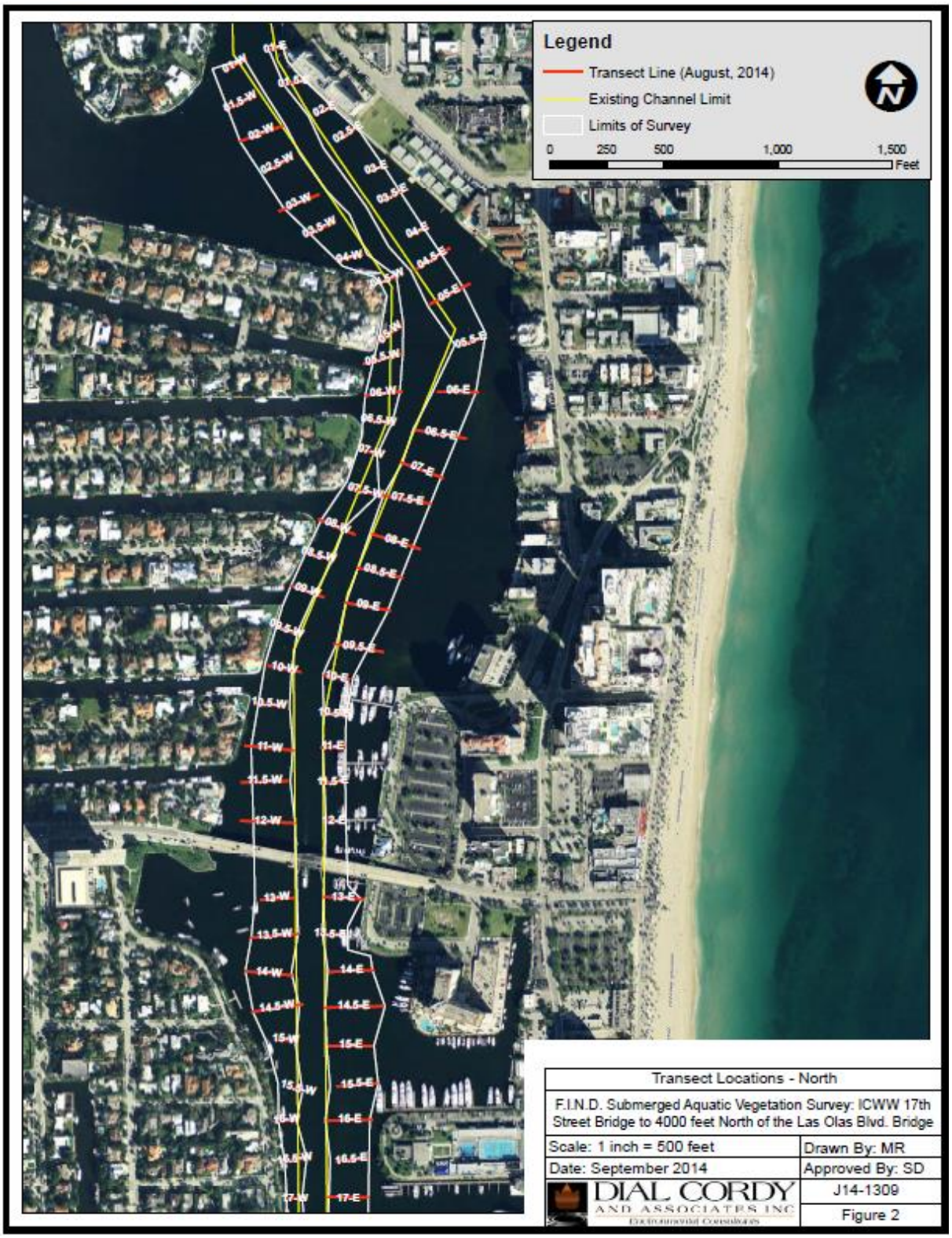


Figure 3 Transect Locations - Central

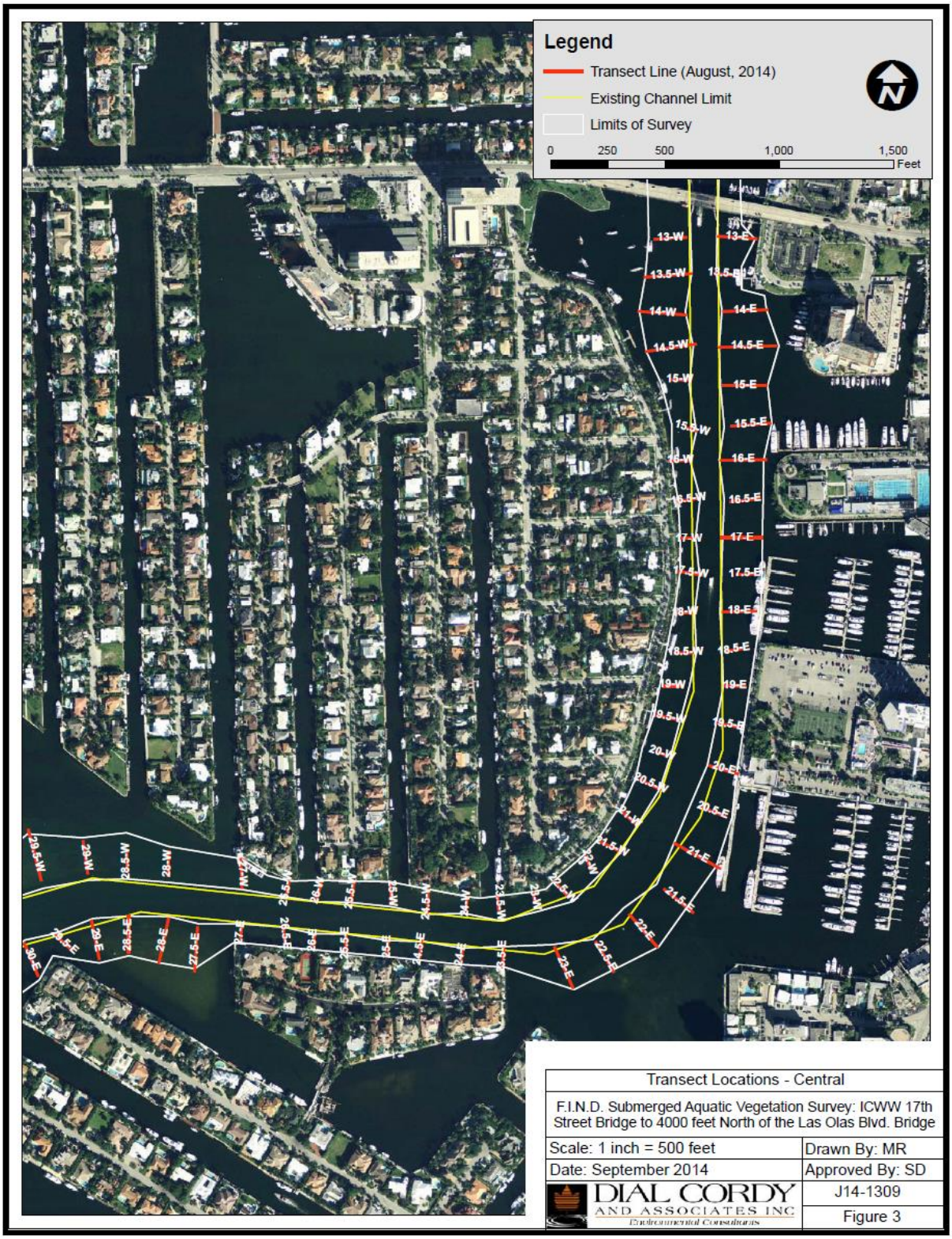


Figure 4 Transect Locations - South

along the transect line (Virnstein 1995; Fonseca et al. 1998; Braun-Blanquet 1965). Specific data recorded within each $1m^2$ quadrat for each seagrass species present included the number of sub-units containing at least one shoot, an average cover abundance score (Braun-Blanquet 1965), a description of substrate type, epiphytic cover on seagrasses, and any other observations considered useful. Depth measurements were taken along transects using a wrist mounted dive computer.

The cover abundance scale is shown below.

Braun-Blanquet (BB) Cover-Abundance Scale with Range Mid-Point Values

BB Score		Cover	Range Mid-Point
0	=	Not Present	0
0.1	=	Solitary individual	1% *
0.5	=	Few, with small cover	1% *
1	=	Numerous, <5%	2.5%
2	=	5% to 25%	15%
3	=	25% to 50%	37.5%
4	=	50% to 75%	62.5%
5	=	75% to 100%	87.5%

* Mid-point was assigned the value of 1%. Whereas the higher BB scores reference specific ranges in percent cover, the lower scores are primarily estimates of abundance (i.e. the number of individuals).

Cover abundance was measured at 5m intervals along each transect. The content of each quadrat was visually inspected and a cover abundance scale value assigned to the seagrass coverage. Percent cover and species composition of the benthic community were determined using a modified Braun-Blanquet technique (Braun-Blanquet, 1965; Kirsch et al., 2005). Braun-Blanquet scores for each quadrat were converted to range midpoint values and then averaged over the total number of quadrats assessed (Table 1 and 2).

From the survey of quadrats along each transect, percent cover, cover abundance, density, and BB-scale averages of seagrass was computed as follows:

Percent cover = Number of occupied sub-units/total number of sub-units X100

Cover Abundance = Sum of modified BB cover scale values/number of occupied quadrats

Density = Sum of modified BB cover scale values/total number of quadrats

BB Scale Averages = Sum of BB cover scale scores/number of occupied quadrats

2.1.4 Analysis and Interpretation of Seagrass Data

Distribution of seagrass community type was mapped for each transect. Polygons were created by connecting data points between transects. Percent cover, abundance, and

density were calculated from the quadrat data taken along transects based on the modified Braun-Blanquet (1965) methodology described above (Kirsch et al. 2005).

3.0 RESULTS

This section includes the results of the marine resource and vegetation surveys conducted in the ICWW and along the DCC. The results include all seagrass data collected in the field and GIS maps developed from that data.

3.1 Seagrass Communities

Seagrass habitat cover type, percent cover, abundance, and density for the study area are described below.

3.1.1 Seagrass Species General Occurrence, Percent Cover, Abundance, and Density

3.1.1.1 Seagrass Species General Occurrence

Marine seagrass species observed within the ICWW study area during the Summer 2014 surveys included *Halophila decipiens and Halophila johnsonii* (Figures 5 - 12). Of the 158 transects surveyed along the ICWW, marine seagrass species were observed along 95 transects or 60% of all transects (48 of 78 on the west side and 47 of 78 on the east side of the ICWW). *H. decipiens* occurred at 88 transects or 56% of all transects surveyed, while *H. johnsonii* occurred at 21 transects, or 13% of all transects surveyed. Seagrass occurrence along transects primarily consisted of patchy monospecific beds of *H. decipiens*, mixed beds of *H. decipiens* and *H. johnsonii* and monspecific beds of *H. johnsonii.* A summary of percent cover, abundance, and density data along each transect where seagrass was found is provided in Tables 1 and 2. Transect data are included as Appendix A.

Figure 5 Seagrass Delineation - 1

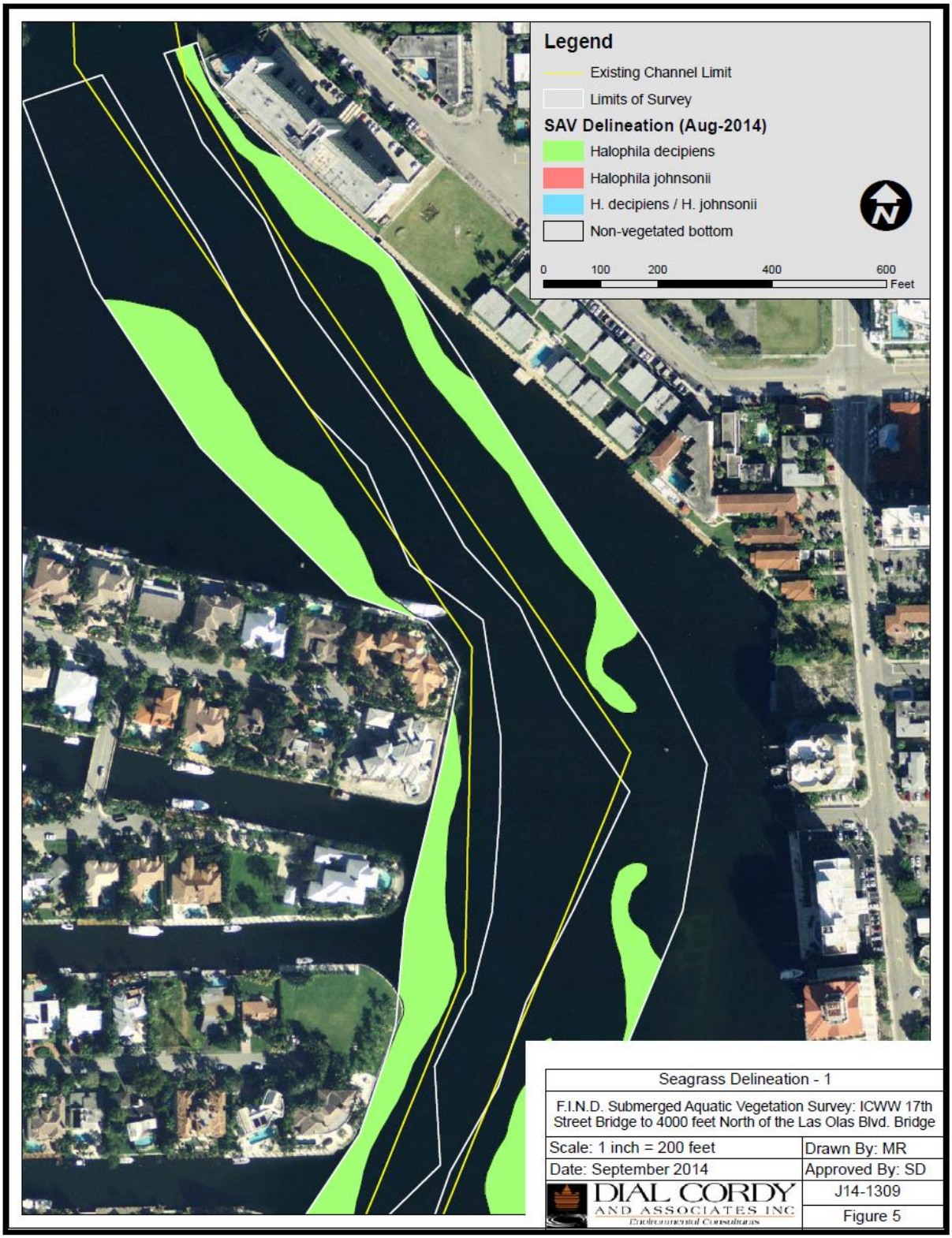


Figure 6 Seagrass Delineation - 2

Figure 7 Seagrass Delineation - 3

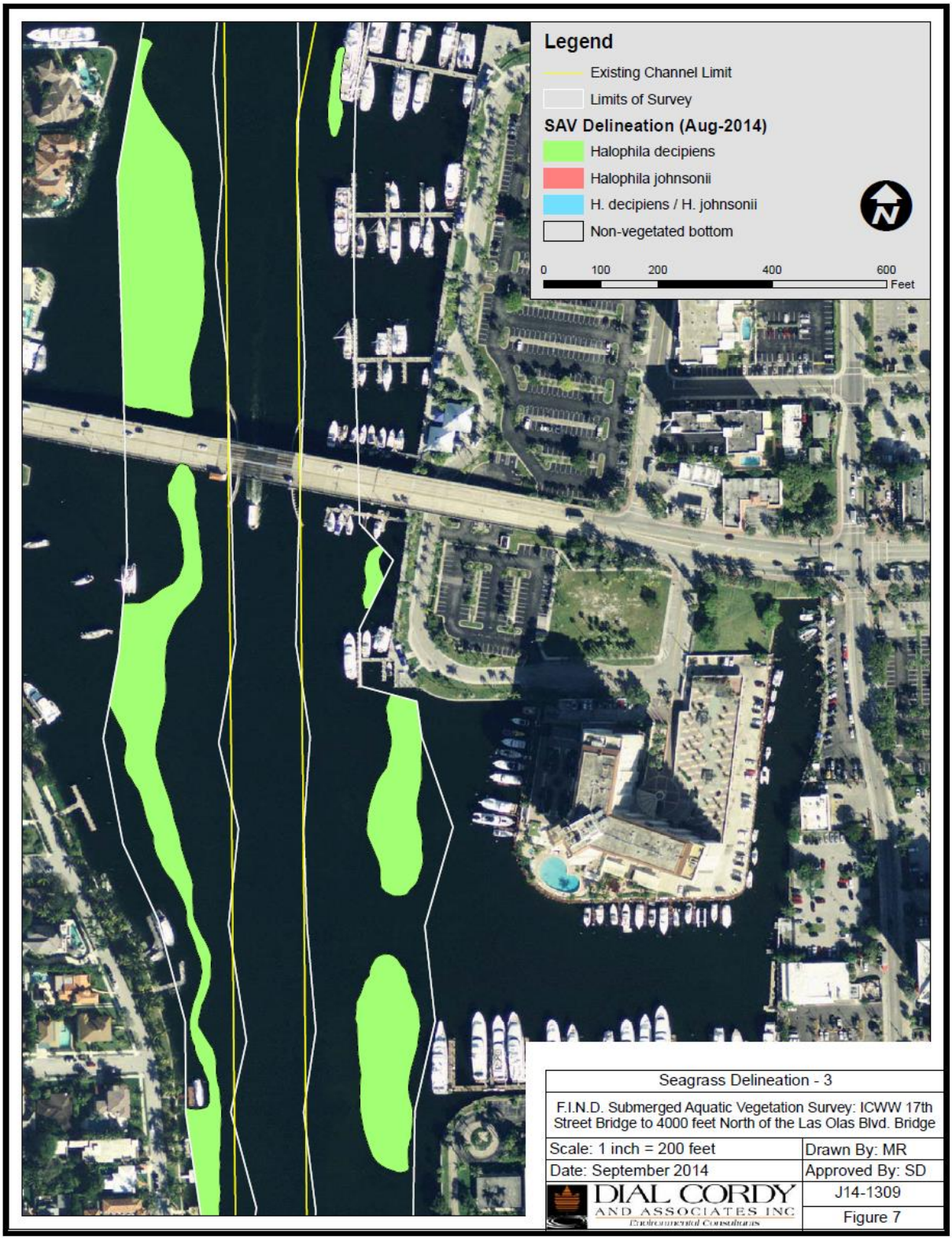


Figure 8 Seagrass Delineation - 4

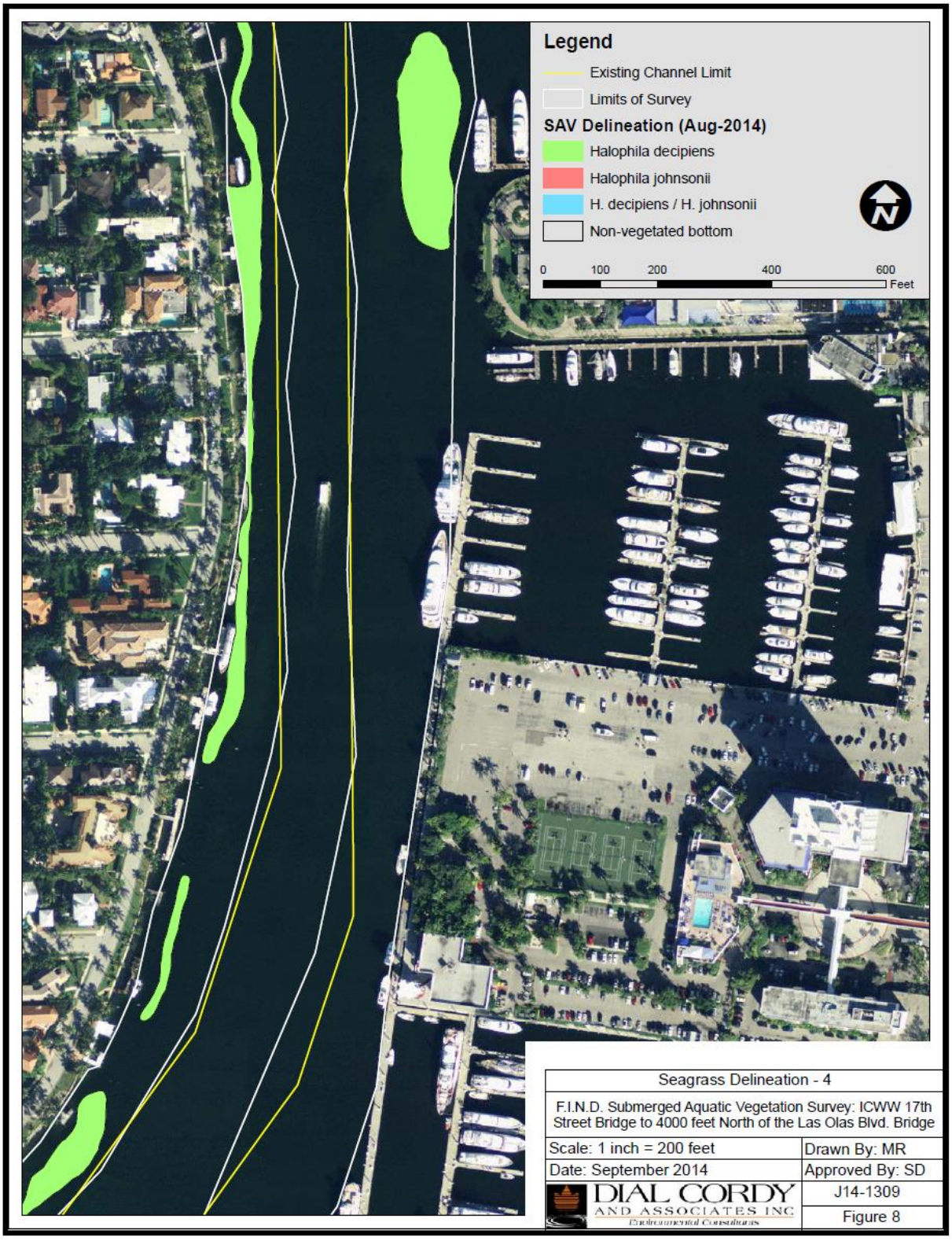


Figure 9 Seagrass Delineation - 5

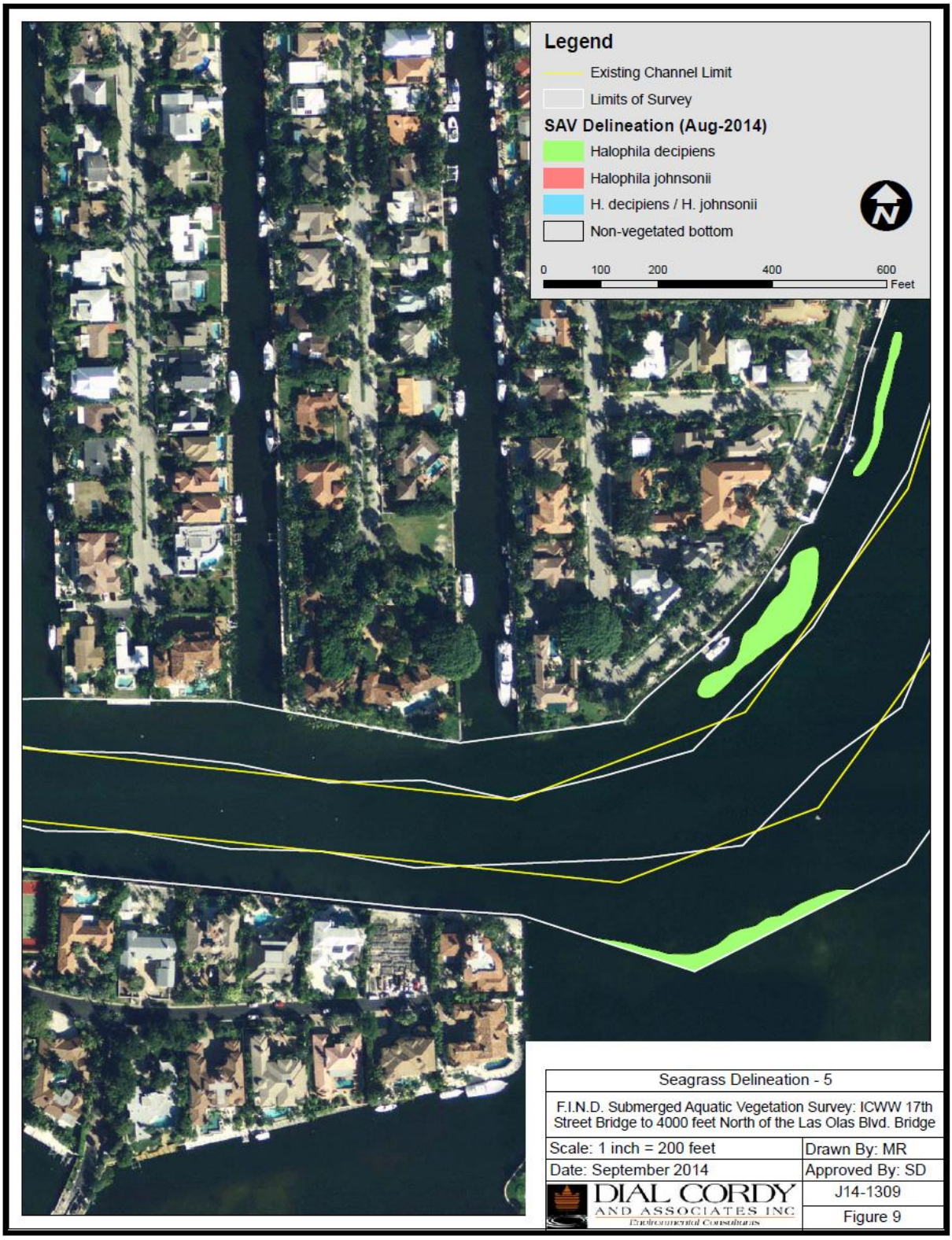


Figure 10 Seagrass Delineation - 6

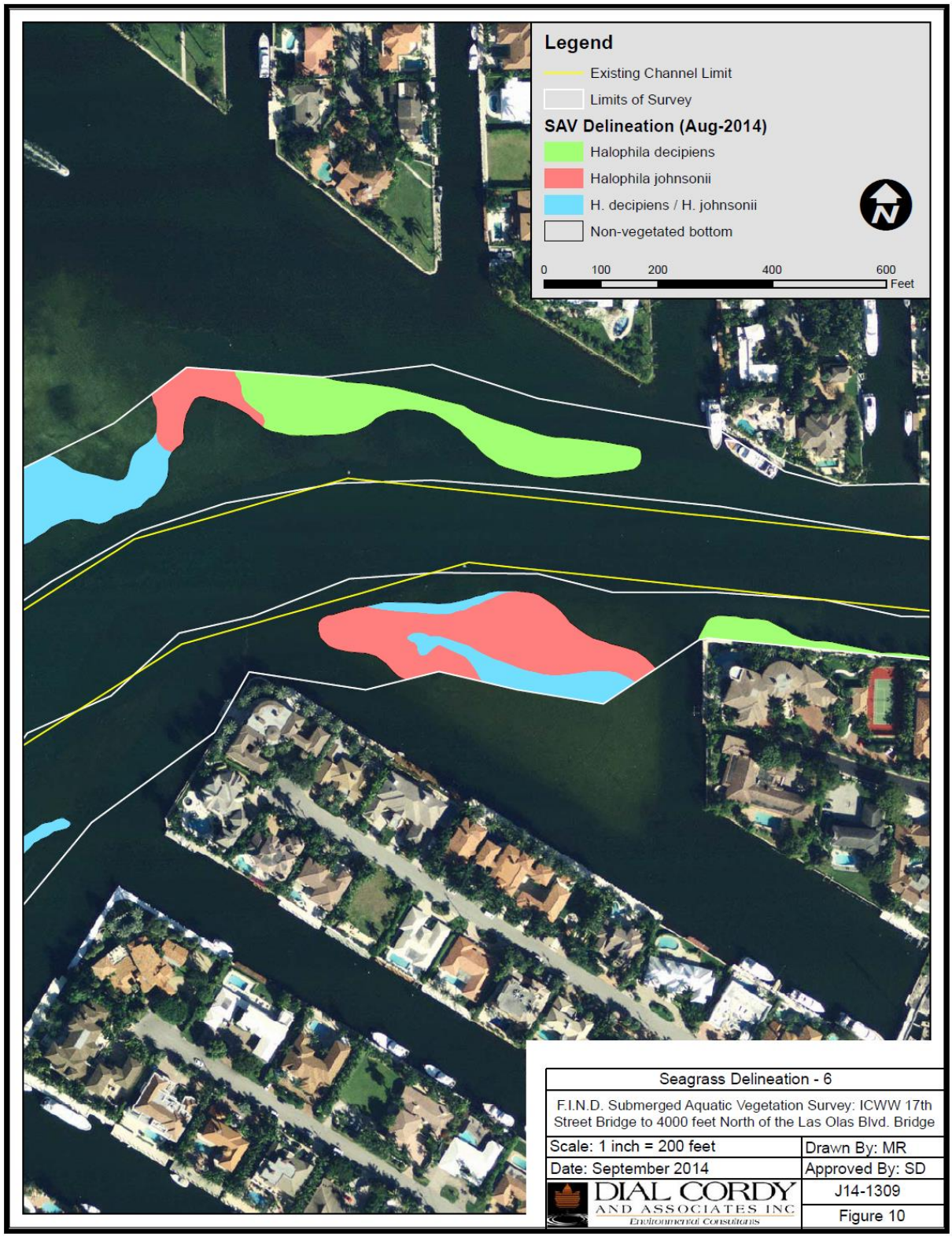


Figure 11 Seagrass Delineation - 7

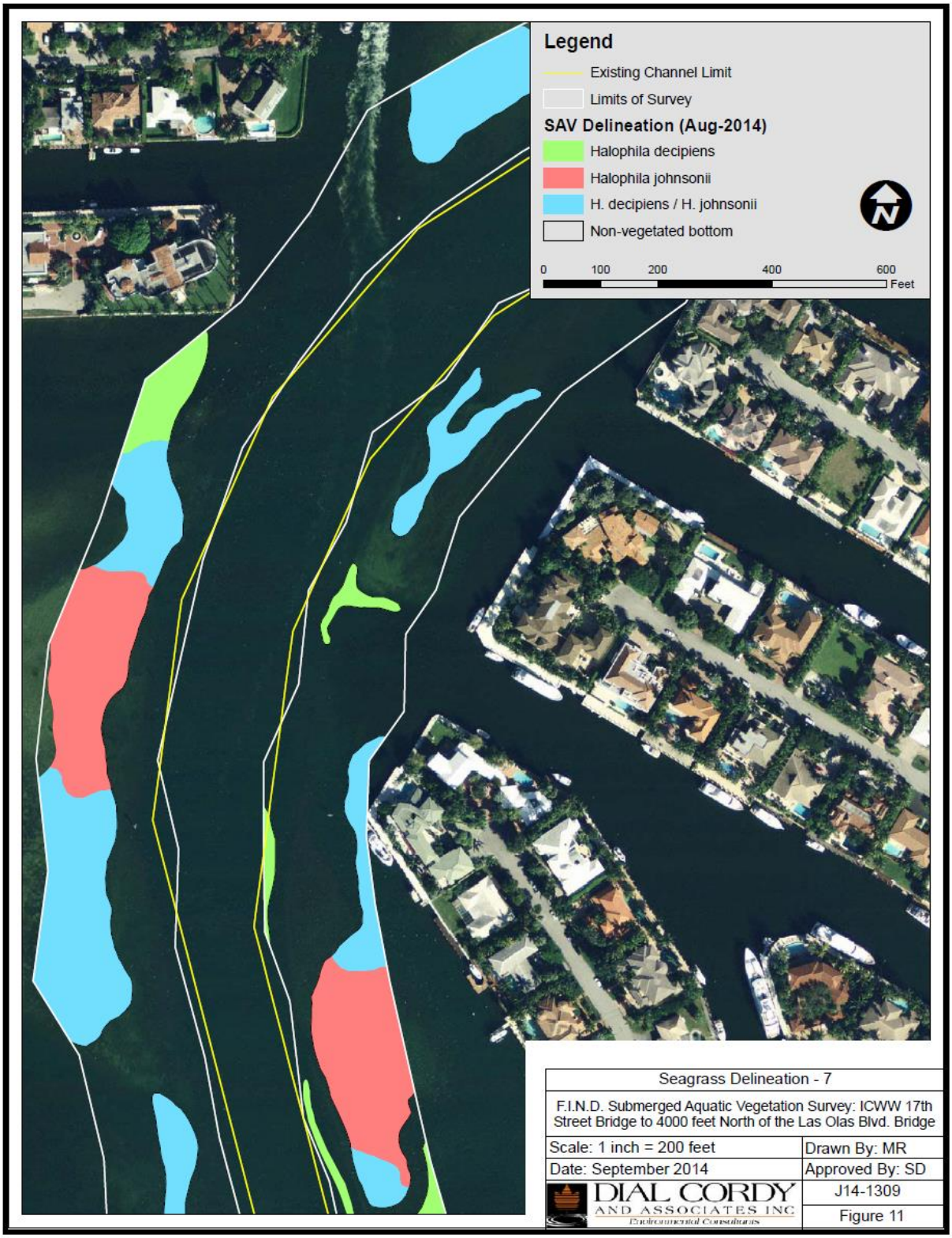


Figure 12 Seagrass Delineation - 8

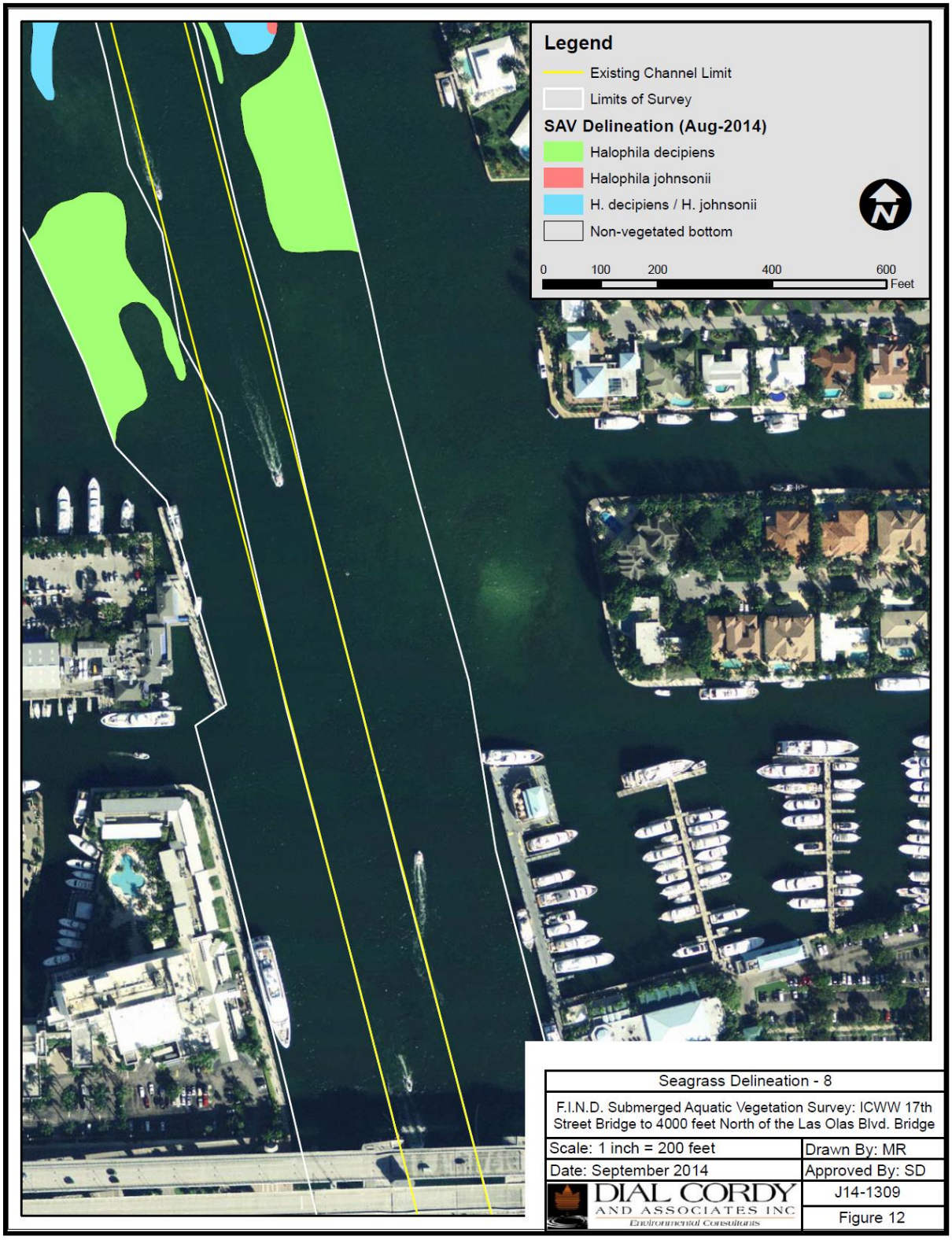


Table 1 Seagrass Percent Cover, Abundance, and Density Values for Transects on the East Side of the ICWW from North to South - Summer 2014.

ICWW East Transects					
Transect	**Species**	**Percent Cover**	**Cover Abundance**	**Density**	**BB Score Average**
1	HD	11.3	1.00	0.66	0.55
1.5	HD	1.6	1.00	0.20	0.1
2.0	HD	8.67	1.00	1.00	0.64
2.5	HD	5.17	1.00	0.50	0.4
3	HD	8.16	1.00	0.50	0.7
3.5	HD	9.86	1.00	0.71	0.1
4	HD	7.38	1.00	0.05	0.35
4.5	HD	4.33	1.00	0.33	0.1
5	HD	0.06	1.00	0.15	0.1
5.5	--	0.0	0.0	0.0	0.0
6	HD	0.43	1.00	0.14	0.1
6.5	HD	0.05	1.00	0.19	0.1
7	HD	3.42	1.00	0.08	0.1
7.5	HD	11.47	1.00	0.47	0.4
8	HD	1.27	1.00	0.27	0.33
8.5	HD	12.33	1.00	0.40	0.7
9	HD	11.31	1.00	0.54	0.49
9.5	HD	1.31	1.00	0.31	0.1
10	--	0.0	0.0	0.0	0.0
10.5	HD	0.50	1.00	0.13	0.1
11	--	0.0	0.0	0.0	0.0
11.5	--	0.0	0.0	0.0	0.0
12	--	0.0	0.0	0.0	0.0
12.5	--	0.0	0.0	0.0	0.0
13	HD	2.18	1.0	0.09	1.0
13.5	--	0.0	0.0	0.0	0.0
14	HD	1.46	1.00	0.23	0.5
14.5	HD	2.8	1.00	0.35	0.58
15	--	0.0	0.0	0.0	0.0
15.5	HD	8.25	1.00	0.50	0.66
16	HD	0.27	1.00	0.38	0.5
16.5	HD	0.0	0.0	0.0	0.0
17	--	0.0	0.0	0.0	0.0
17.5	--	0.0	0.0	0.0	0.0
18	--	0.0	0.0	0.0	0.0

ICWW East Transects					
Transect	**Species**	**Percent Cover**	**Cover Abundance**	**Density**	**BB Score Average**
18.5	--	0.0	0.0	0.0	0.0
19	--	0.0	0.0	0.0	0.0
19.5	--	0.0	0.0	0.0	0.0
20	--	0.0	0.0	0.0	0.0
20.5	--	0.0	0.0	0.0	0.0
21	--	0.0	0.0	0.0	0.0
21.5	--	0.0	0.0	0.0	0.0
22	--	0.0	0.0	0.0	0.0
22.5	HD	1.0	1.00	0.20	0.5
23	HD	0.42	1.00	0.17	0.5
23.5	--	0.0	0.0	0.0	0.0
24	--	0.0	0.0	0.0	0.0
24.5	--	0.0	0.0	0.0	0.0
25	--	0.0	0.0	0.0	0.0
25.5	HD	NA	1.00	0.17	1.0
26	--	0.0	0.0	0.0	0.0
26.5	--	0.0	0.0	0.0	0.0
27	HD	26.6	15.00	10.00	2.0
27.5	HD	1.6	1.00	0.33	0.5
27.5	HJ	2.5	1.00	0.27	0.5
28	HD	1.1	1.00	0.14	0.5
28	HJ	13.0	1.00	0.71	0.6
28.5	HD	1.4	1.00	0.15	0.5
28.5	HJ	8.8	1.00	0.54	0.57
29	HJ	1.0	1.00	0.23	0.5
29.5	--	0.0	0.0	0.0	0.0
31	--	0.0	0.0	0.0	0.0
31.5	HJ	1.1	1.00	0.03	0.5
31.5	HD	0.33	1.00	0.11	0.5
32	HD	0.2	1.00	0.08	0.5
32.5	--	0.0	0.0	0.0	0.0
33	HD	5.6	1.00	0.09	1.0
33.5	--	0.0	0.0	0.0	0.0
34	HD	5.8	1.00	0.17	0.75
34	HJ	0.3	1.00	0.08	0.5
34.5	HD	0.9	1.00	0.09	0.5
35	HD	2.2	1.00	0.15	0.5
35	HJ	0.15	1.00	0.08	0.5
35.5	HD	0.5	1.00	0.08	0.5

ICWW East Transects					
Transect	**Species**	**Percent Cover**	**Cover Abundance**	**Density**	**BB Score Average**
35.5	HJ	23.0	1.00	0.58	0.86
36	HD	0.5	1.00	0.07	0.5
36	HJ	4.8	1.00	0.40	0.5
36.5	HD	2.3	1.00	0.31	0.5
36.6	HJ	0.8	1.00	0.15	0.5
37	HD	11.5	1.00	0.73	0.63
37	HJ	0.3	1.00	0.09	0.5
37.5	HD	NA	14.75	11.35	2.2
38	--	0.0	0.0	0.0	0.0
38.5	--	0.0	0.0	0.0	0.0
39	--	0.0	0.0	0.0	0.0
40	--	0.0	0.0	0.0	0.0
41	--	0.0	0.0	0.0	0.0

Table 2 Seagrass Percent Cover, Abundance, and Density Values for Transects on the West Side of the ICWW from North to South - Summer 2014.

ICWW West Transects					
Transect	**Species**	**Percent Cover**	**Cover Abundance**	**Density**	**BB Score Average**
1	--	0.0	0.0	0.0	0.0
1.5	--	0.0	0.0	0.0	0.0
2	--	0.0	0.0	0.0	0.0
2.5	HD	1.5	1.0	0.25	0.1
3	HD	29.9	1.00	0.66	1.0
3.5	HD	44.6	1.00	1.0	0.89
4	HD	31.8	3.80	2.38	1.2
4.5	--	0.0	0.0	0.0	0.0
5	HD	9.2	1.0	0.33	0.7
5.5	HD	3.5	1.0	0.25	0.4
6	HD	1.5	1.0	0.27	0.1
6.5	HD	29.5	3.3	2.22	0.86
7	HD	2.0	1.0	0.25	0.1
7.5	HD	0.6	1.0	0.08	0.1
8	HD	31.2	2.75	1.57	0.79
8.5	HD	8.5	1.0	0.45	0.1
9	HD	0.5	1.0	0.08	0.1
9.5	HD	46.0	3.33	2.50	0.87
10	HD	5.7	1.0	0.40	0.1
10.5	HD	3.33	1.0	0.22	0.55
11	HD	8.9	1.0	0.63	0.19
11.5	HD	22.7	2.4	1.71	0.69
12	HD	13.5	1.0	0.66	0.36
12.5	--	0.0	0.0	0.0	0.0
13	HD	6.6	1.0	0.30	0.1
13.5	HD	5.5	1.0	0.27	0.55
14	HD	6.1	1.0	0.27	0.1
14.5	HD	8.4	1.0	0.20	0.4
15	HD	0.4	1.0	0.13	0.1
15.5	--	0.0	0.0	0.0	0.0
16	HD	10.4	1.0	0.57	0.1
16.5	HD	8.7	1.0	0.29	0.55
17	HD	13.6	1.0	0.20	1.0
17.5	HD	1.2	1.0	0.33	0.1
18	HD	14.4	1.0	0.20	1.0
18.5	HD	2.0	1.0	0.33	0.1

ICWW West Transects					
Transect	**Species**	**Percent Cover**	**Cover Abundance**	**Density**	**BB Score Average**
19	HD	7.8	1.0	0.33	0.1
19.5	--	0.0	0.0	0.0	0.0
20	--	0.0	0.0	0.0	0.0
20.5	--	0.0	0.0	0.0	0.0
21	--	0.0	0.0	0.0	0.0
21.5	HD	11.5	1.0	0.38	0.1
22	HD	4.4	1.0	0.20	0.1
22.5	--	0.0	0.0	0.0	0.0
23	--	0.0	0.0	0.0	0.0
23.5	--	0.0	0.0	0.0	0.0
24	--	0.0	0.0	0.0	0.0
24.5	--	0.0	0.0	0.0	0.0
25	--	0.0	0.0	0.0	0.0
25.5	--	0.0	0.0	0.0	0.0
26	--	0.0	0.0	0.0	0.0
26.5	--	0.0	0.0	0.0	0.0
27	--	0.0	0.0	0.0	0.0
27.5	--	0.0	0.0	0.0	0.0
28	HD	2.8	1.0	0.50	0.5
28.5	HD	13.1	15.0	2.5	2.0
29	HD	4.4	1.0	0.55	0.58
29.5	HJ	0.7	1.0	0.20	0.5
30	HD	0.1	1.0	0.08	0.5
30	HJ	1.1	1.0	0.23	0.5
30.5	HD	0.6	1.0	0.21	0.5
30.5	HJ	4.1	1.0	0.43	0.5
31	--	0.0	0.0	0.0	0.0
31.5	--	0.0	0.0	0.0	0.0
32	--	0.0	0.0	0.0	0.0
32.5	HD	4.7	1.0	0.31	0.63
33	HD	1.8	1.0	0.23	0.5
33	HJ	0.8	1.0	0.23	0.5
33.5	HJ	33.8	1.0	0.64	0.83
34	HJ	2.8	1.0	0.33	0.5
34.5	HD	0.2	1.0	0.07	0.5
34.5	HJ	15.7	1.0	0.53	0.69
35	HD	3.8	1.0	0.25	0.5
35	HJ	32.4	1.0	0.56	0.83
35.5	--	0.0	0.0	0.0	0.0

ICWW West Transects					
Transect	**Species**	**Percent Cover**	**Cover Abundance**	**Density**	**BB Score Average**
36	HD	12.5	8.0	2.46	1.38
36	HJ	2.0	1.0	0.15	0.5
36.5	HJ	0.5	1.0	0.13	0.5
37	--	0.0	0.0	0.0	0.0
37.5	HD	37.1	16.1	11.03	1.77
38	HD	25.4	4.1	2.6	0.9
38.5	HD	0.2	1.0	0.08	0.5
39	--	0.0	0.0	0.0	0.0
40	--	0.0	0.0	0.0	0.0
41	--	0.0	0.0	0.0	0.0

Seagrasses were present along transects in the ICWW between 1 and 16 feet. Seagrasses were not present in transects deeper than 16 feet, according to depth recordings taken at the time of survey using a wrist mount dive computer. In many cases, seagrass was not present at the channel edge, but was encountered further shoreward along a transect.

Acreages of benthic resources (seagrass or non-seagrass bottom) were calculated based on the resource information obtained from transects in the ICWW. From this information seagrasses species specific acreages were calculated and are presented below.

Bottom type	*Halophila decipiens*	*Halophila decipiens/ Halophila johnsonii* mix	*Halophila johnsonii*	Non-seagrass bottom
Total Acres Within Seagrass Polygons	16.98	4.42	3.54	75.08

3.1.1.2 Percent Cover

Within the ICWW along transects where grasses were present *H. decipiens* percent cover ranged between 1 to 46% cover with a mean of 7.8%, across all transects. *H. johnsonii* was present in fewer transects, with percent cover values ranging from 1 to 34%, and a mean of 7.1% in transects where *H. johnsonii* occurred. Total seagrass cover was 8.8% for all transects combined that contained some seagrass. Percent cover, abundance, and density values are presented for each transect containing seagrasses on the east side of the ICWW (Table 1) and the west side of the ICWW (Table 2).

3.1.1.3 Cover Abundance

Abundance is expressed as a sum of the cover abundance scores (modified Braun-Blanquet scores) divided by the number of quadrats where the specific species was assigned a score.

The range of abundance values for *H. decipiens* ranged from 1 to 15 at transects where *H. decipiens* occurred. Across all transects *H. decipiens* had the highest average abundance in the study.

3.1.1.4 Density

Density is expressed as the sum of the cover abundance scores divided by the total quadrats sampled. When compared to abundance values, density values are comparatively low because values are averaged across all quadrats within each transect, rather than only at occupied quadrats.

Density values for *H. decipiens* ranged from 0.07 to 11.35, with a mean density of 0.49. *H. johnsonii* had lower density values, ranging from 0.03 to 0.71 with a mean density value of 0.31.

4.0 DISCUSSION

The study area within the ICWW contained seagrasses along 60% of transects surveyed. The predominant seagrass along transects was *H. decipiens*, present at 56% of transects, and *H. johnsonii* (13%), which was present to a lesser extent. Although common across the large study area, variable percent cover data illustrate the variable density of seagrass beds across the entire study area. *H. decipiens* ranged between 1 and 46% cover, with a mean of 7.8% across transects. *H. johnsonii* ranged between 1 and 34% with a mean of 13% cover. Generally, Braun-Blanquet scores (0-5) were low for both species (*H. decipiens* mean of 0.56; *H. johnsonii* mean 0.55) illustrating a relatively low cover of seagrass within transects. Areas of *H. johnsonii* were documented as monospecific beds and mixed beds (with *H. decipiens*). In general, *H. johnsonii* was most abundant in relatively shallow water along the ICWW (2-8 feet), whereas *H. decipiens* was found between 1 and 16 feet. While several transects were in water below 16 feet, no grasses were encountered below 16 feet, suggesting that light may be limiting below this depth within the study area.

Seagrasses in the ICWW are subject to regular disturbance with a high level of boat activity, high velocity of water movement during tidal changes, and changes in salinity during summer rains and water management practices. Given all of these factors, seagrasses within the ICWW were relatively abundant.

The area of seagrass and non-seagrass communities were estimated based on transects data collected in the field. Seagrasses included 16.97 acres of *H. decipiens*, 3.54 acres of *H. johnsonii*, 4.42 acres of mixed *H. decipiens/H. johnsonii*, and 75.09 acres of non-seagrass (unvegetated) bottom (see Appendix B).

5.0 LITERATURE CITED

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APPENDIX A

Transect Data

APPENDIX B

Seagrass Acreage Calculations

INTRACOASTAL WATERWAY DEEPENING
BROWARD COUNTY, FLORIDA

APPENDIX J
Submerged Aquatic Resources Survey

Temporary Coral Relocation

Florida Inland Navigational District

Temporary Coral Relocation within ICWW, Broward County, Florida

October 13, 2014

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Summary

The Florida Inland Navigational District (FIND) is expected to conduct dredging along the Intracoastal Water Way (ICWW). Approximately 14,000 linear feet within the ICWW, from the 17th Street Causeway Bridge (north of Port Everglades) to a point approximately 4,000 feet north of the Las Olas Boulevard Bridge. Marine benthic surveys were conducted between July 21 and August 6, 2014 to assess resources within the ICWW project area that may be impacted by direct or indirect dredging activities conducted by FIND.

Scientific divers (coral biologists) from Dial Cordy & Associates, Inc. performed coral surveys and relocations within the project area per permit requirements on Tuesday, August 5, 2014. Approximately 75 scleractinian (hard) corals were found within Blocks 28 and 30 living on the emergent rock habitat type. Species encountered included *Oculina diffusa, Cladocora arbuscula, Siderastrea radians* and *S. stellata*. All corals were found in water depths ranging from 7-10 feet. These corals were located on the top and side of the rock ledge running north-south, bordering the western edge ICWW (Figure 1). In total, we relocated 24 colonies that were of a size large enough to move without injury (>7.5 cm). This includes eight (8) colonies of *Oculina diffusa*, two (2) colonies of *Cladocora arbusula*, and 14 colonies of *Siderastrea* spp. All corals were moved using protocols developed by the FKNMS (2010). Corals were temporarily relocated to an area ~100 m due west of their point of origin to the opposite side of the shoal in approximately 7 feet of water (Figure 1). These corals are to be relocated back to their approximate original locations following the completion of dredging activities.

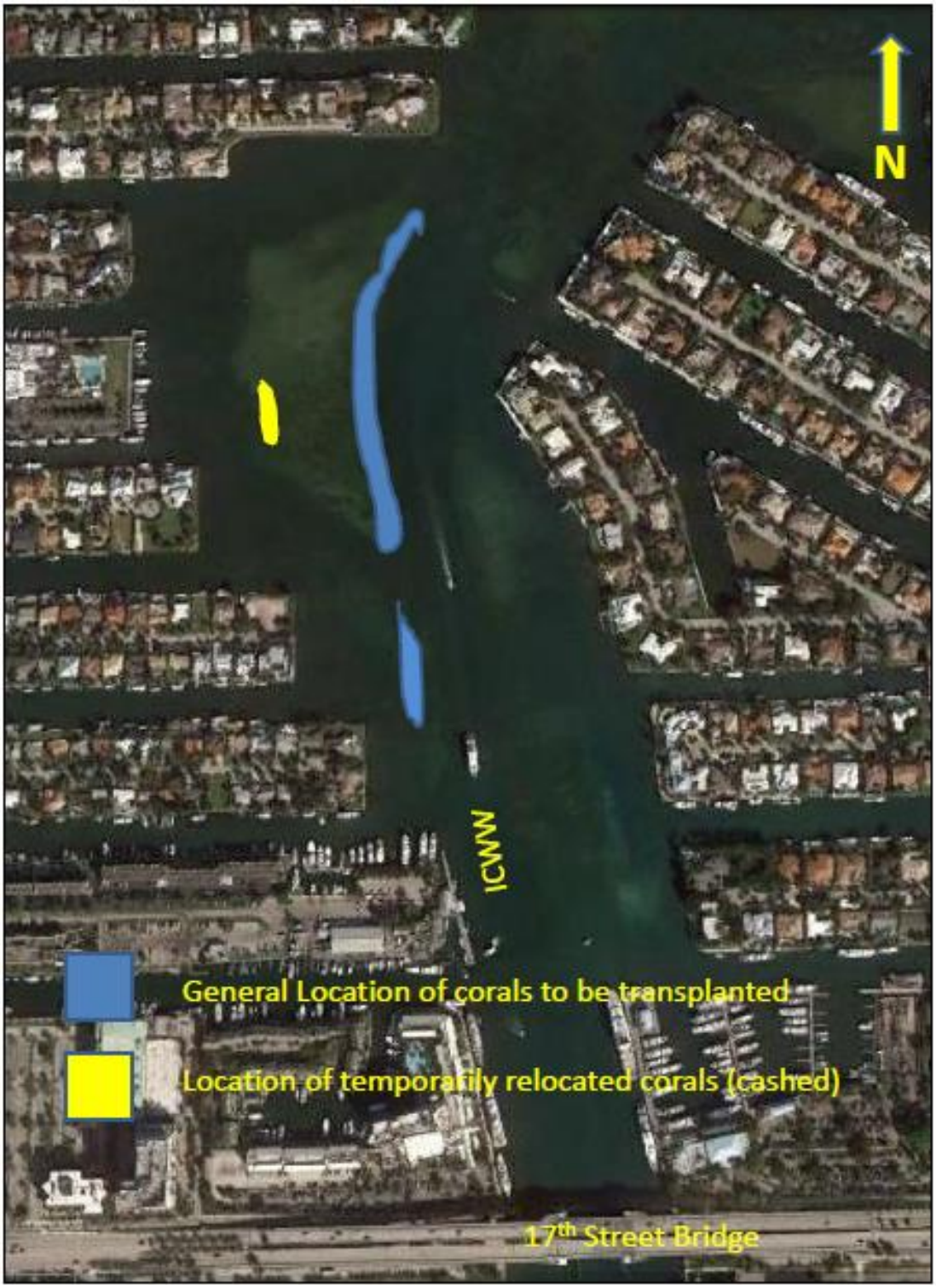

Figure 1. Aerial image of area just north of 17th Street where corals were identified in pre-dredging surveys (blue shaded area). Corals have been temporarily relocated to adjacent site (yellow shaded area) until dredging operations are completed at which time they will be moved back to their original positions.

Photo 1. Small, free-living *Oculina diffusa* colony found in project area.

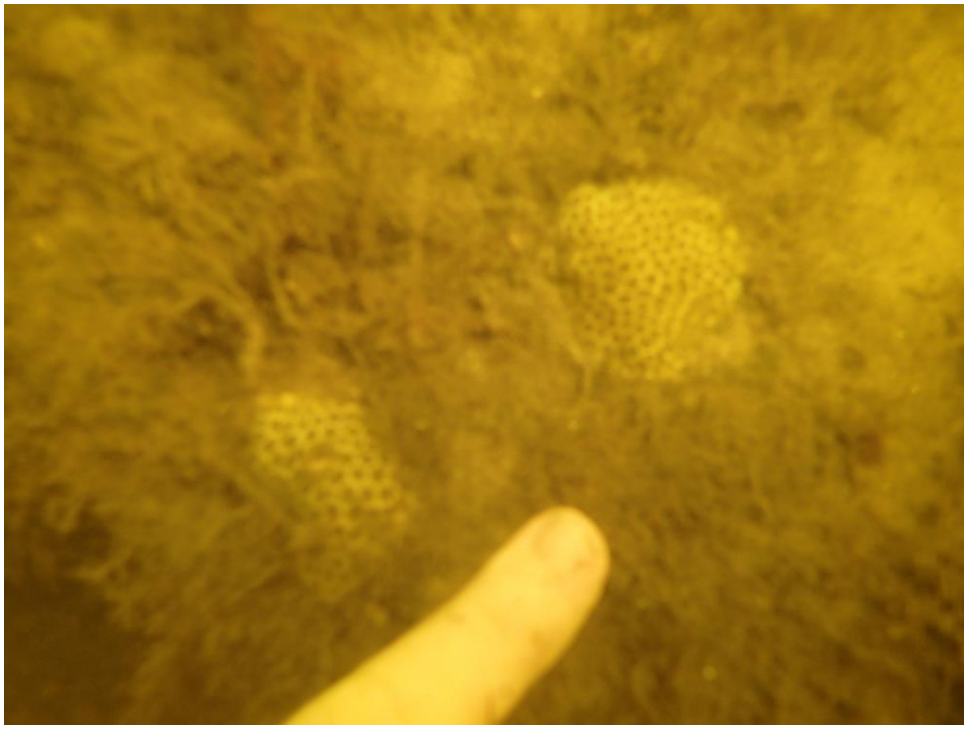

Photo 2. Small (<5cm) colonies of *Siderastrea radians* found attached to hardbottom in project area.

Photo 3. Scientific diver carefully removing colony of *Oculina diffusa* from hardbottom.

Photo 4. Colony of *Cladocora arbusula* in process of being relocated.

Photo 5. Colony of *Siderastrea stellata* in process of being relocated.

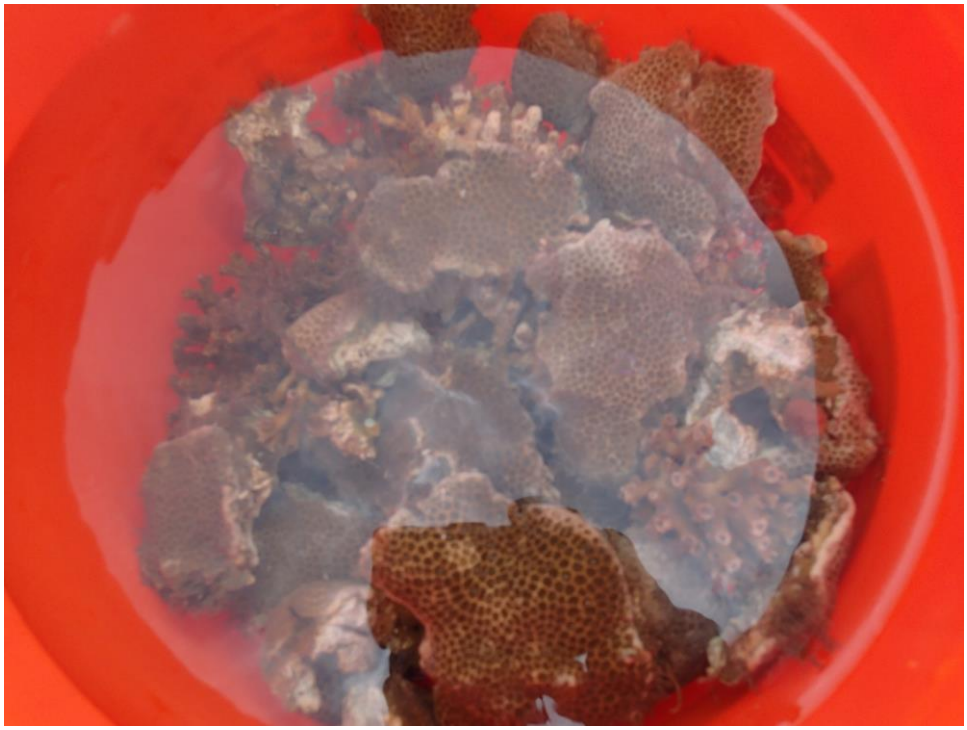

Photo 6. Removed corals being transported to temporary holding site.

Photo 7. Scientific diver relocating corals to holding site.

Photo 8. Scientific diver attaching relocated coral colonies to temporary holding site.

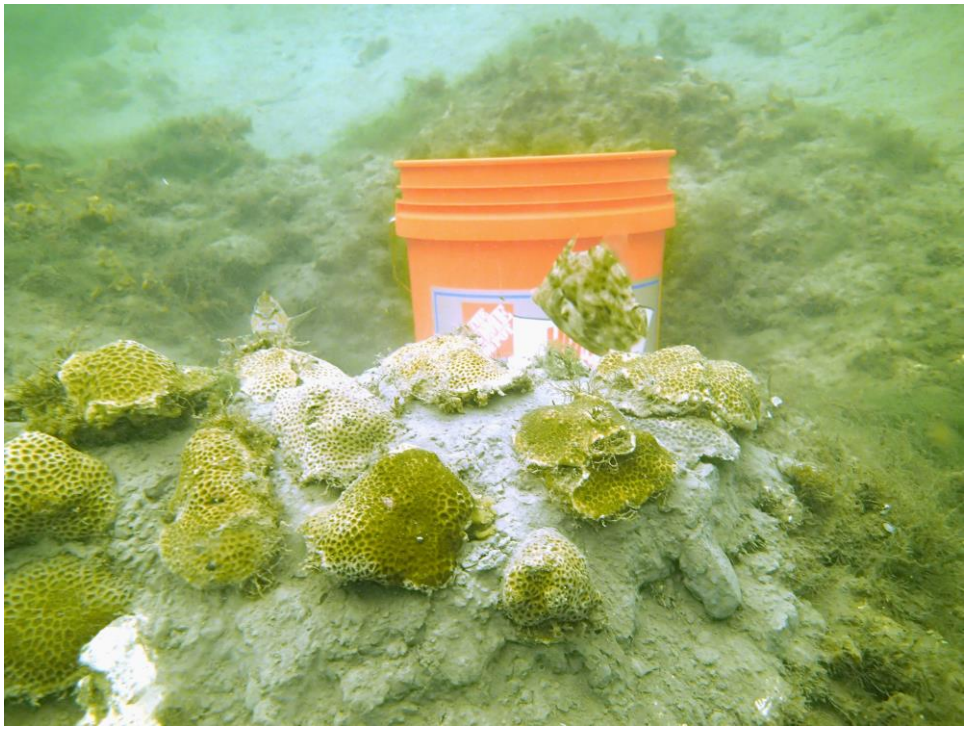

Photo 9. Photo showing 14 relocated *Siderastrea* colonies at temporary holding site.

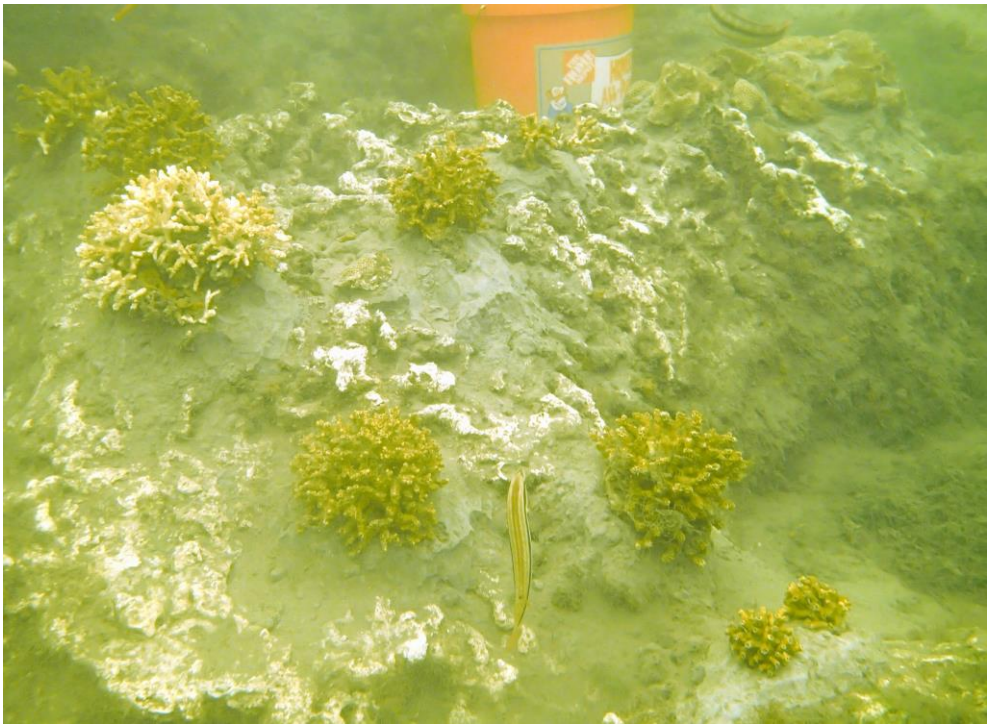

Photo 10. Photo showing relocated branching species at temporary holding site.