

INTRACOASTAL WATERWAY MAINTENANCE DREDGING ST. LUCIE COUNTY REACH I, FLORIDA

APPENDIX I Benthic Resources Surveys

BENTHIC HABITAT ASSESSMENT REPORT

St. Lucie ICWW Reach 1 Pre-Construction Survey Benthic Habitat Assessments St. Lucie County



Prepared for:

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1.0 BACKGROUND

The Florida Inland Navigation District (FIND) is proposing to conduct maintenance dredging at five (5) locations along the Intracoastal Waterway (ICWW) channel near Ft. Pierce, St. Lucie County, Florida. The project will pump dredged material through a pipeline that will pass from the ICWW to the shoreline near the existing Dredged Material Management Area (DMMA) SL-2 Easement (Pipeline corridor). FIND contracted Scheda Ecological Associates, Inc. (Scheda) to conduct a pre-dredging seagrass and benthic habitat survey assessment to map and characterize the submerged natural resources occurring in the pipeline corridor and the five (5) proposed dredge areas. The data collected during this survey/mapping effort will be used to assess potential natural resource impacts, complete an impact UMAM assessment, and draft a potential Essential Fish Habitat Assessment during the project's permitting phase. This report summarizes the preconstruction presence, coverage, and conditions of natural resources occurring within the project areas.

2.0 SITE DESCRIPTION

The survey areas encompassed approximately 61.16 acres of lagoon bottom which include the pipeline corridor (12.68 acres) and the five (5) ICWW survey areas (48.48 acres) (**FIGURES 1 & 7**). All of the survey areas are within the known range of the federally endangered Johnson's seagrass (*Halophila johnsonii*) as well as other protected seagrass species. The five ICWW survey areas listed below (**TABLE 1**) spanned the width of the ICWW channel (typically 125 ft.) plus an additional 75 ft. on either side of the channel (**FIGURES 7 & 8**).

Survey Areas						
Cut Station(s) Acres						
SL-2	11+00 THRU 16+00	2.30				
SL-2	25+00 THRU 53+00	12.86				
SL-3N	8+50 THRU 12+00	1.61				
SL-3S	2+50 THRU 4+50	0.92				
SL-5	7+00 THRU 74+00	30.79				
Pipeline Corridor	NA	12.68				

TABLE 1.

The pipeline corridor survey area encompassed approximately 12.68 acres of lagoon bottom, which included a 1.8 acre interior basin surrounded by mangroves that also required survey (**FIGURES 2-4**). Water depths in the pipeline corridor survey area averaged approximately 4 to 5 feet, with depths generally increased from 1 to 2.5 feet within the interior basin to 10 feet abutting the ICWW channel. Water depths in the five ICWW

survey areas typically ranged from 8-14 ft. Depths in the cargo ship turning basin located within and adjacent to the Cut SL-2 survey area exceeded 30 ft. and maximum water depths in the SL-3 survey area approached 20 ft.

3.0 METHODOLOGY

A Scheda team of three (3) certified scientific divers experienced in conducting estuarine benthic resource assessments in St. Lucie County and the Indian River Lagoon performed the assessment between July 26 and July 28, 2016. Weather conditions ranged from clear skies to partly cloudy with moderate winds (10-15 mph). The weather conditions were sufficient to properly conduct the underwater surveys. Underwater visibility ranged from one foot (typically during low tide) to a maximum of 15 ft. (typically at high tide) near the western limit of the Fort Pierce Inlet.

The seagrass mapping event was conducted in two phases in accordance with the "Recommendations for Sampling *Halophila johnsonii* at a Project Site" in the Final Recovery Plan for Johnson's Seagrass prepared by the Johnson's Seagrass Recovery Team, for the National Marine Fisheries Service (NMFS) and National Oceanic and Atmospheric Administration (NOAA) (NMFS 2002). The hardbottom habitat mapping was conducted in two phases in accordance with Florida Keys National Marine Sanctuary, 2008. Coral Rescue & Relocation Protocols.

SEAGRASS HABITAT

PHASE 1

The first phase consisted of an initial reconnaissance of the survey areas to delineate and identify existing seagrass beds. Phase 1 included a series of north to south perpendicular tow-behind transects with 100-ft spacing that spanned the width of the pipeline corridor (**FIGURE 3 & 4**). Similarly, the five (5) ICWW survey areas were surveyed utilizing a series of east to west perpendicular transects and a 75-ft wide buffer on each side of the 125-ft wide (typical) ICWW channel (**FIGURE 9-12**). Perpendicular tow-behind transects were conducted in order to more accurately determine the extent of seagrass coverage.

Scheda divers were towed behind the work vessel along each perpendicular transect. Tow speeds were constant and slow, not exceeding two knots. Using SCUBA outfitted with communications, the scientific diver delineated the boundaries of seagrass beds and other benthic habitat types along each perpendicular transect by communicating with on-vessel staff who recorded a georeferenced navigational target associated with the edge of each seagrass bed and/or benthic habitat boundary observed. The perpendicular transects were traversed during the incoming tide, whenever possible, when visibility was the greatest. Divers carefully delineated bottom habitat types (e.g. seagrass and hardbottom) in a minimum 12-20ft swath around each perpendicular transect. These areas were located and mapped using a Trimble DGPS receiver and investigated more thoroughly in Phase 2. Scheda used the geolocated data collected during the tow surveys to plot the observed and located seagrass beds on georectified aerial photographs.

Qualitative video and still photographic data was also collected for identification verification of seagrasses and biota observed during the survey. In the pipeline corridor, divers visually identified relatively less dense "pockets' in the seagrass that could reduce the impact of installing a potential pipeline anchor. All areas measuring a minimum of 100 sq. ft. that contained no seagrass to very sparse seagrass coverage (0-5%) were identified along each perpendicular transect. Divers located the center points of these relatively sparse "pockets", and by communicating with on-vessel staff, were georeferenced using DGPS.

PHASE 2

Seagrass densities were quantitatively estimated during the second phase of sampling in the pipeline corridor and the five (5) ICWW survey areas. Seagrass densities were measured using a one-meter by one-meter (one square meter) quadrat along 100-ft long modified belt transects which were distributed across seagrass beds identified during Phase I. Belt transect locations were determined using a stratified random sampling design (**FIGURES 3-4 & FIGURES 9-12**). Divers incorporated point-intercept methodology to document seagrass distribution and occurrence at ten (10) locations along each modified belt transect. (Virnstein 1995; Fonseca et al. 1998; Braun-Blanquet 1965).The modified belt transect parameters were measured *in situ* by a diver who recorded species composition, percent cover, abundance, shoot density, and blade length data, using multiple 10 x 10-cm cells. Seagrass cover abundance was determined using the following modified Braun-Blanquet coverage classifications (Braun-Blanquet, 1965; Kirsch et al., 2005):

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).

Braun-Blanquet scores for each quadrat were converted to range midpoint values, and then averaged over the total number of quadrats assessed. From the quadrat data collected along each transect, seagrass percent cover, cover abundance, and densities were calculated 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

The transect and quadrat data provided sufficient information to adequately describe the distribution and abundance of seagrass in the survey area.

In addition to seagrass data, the divers recorded the biota observed during the survey, which included macroalgae, sponges, sessile invertebrates, and fishes. These biota were field-identified to the lowest practical taxonomic level. Occurrences of protected wildlife (i.e. manatee, sea turtles and smalltooth sawfish) were also noted during the mapping event.

HARDBOTTOM HABITAT

The hardbottom habitat areas identified during Phase 1 were investigated in more detail using a combination of *in situ* and video survey techniques. A total of five (5) belt transects spaced 50-ft apart were established parallel to the channel (north to south) in the hardbottom habitat located on the east side of the SL-3S survey area. The survey area width of this hardbottom assessment area was approximately 200 ft. from the edge of the channel. For the hardbottom habitat located on the west edge of the SL-3S survey area, an additional six (6) belt transects with 50-ft spacing were established perpendicular to the channel (east to west) spanning a distance of approximately 100 ft. from the channel edge (**FIGURE 10**). One (1) diver traversed each belt transect documenting all benthic species (including stony corals, soft corals (octocorals), macroalgae, sponges, tunicates, hydroids, and other invertebrates) that occurred within one (1) meter on each side of the belt transect. A second diver traversed each belt transect approximately one (1) meter above the bottom, obtaining qualitative video and still photographic data with a GoPro 4 camera to determine benthic percent coverage.

4.0 RESULTS

This section summarizes the results of the benthic habitat assessment conducted in the pipeline corridor and ICWW project areas. The results include all seagrass habitat cover types, percent cover, abundance, and density values calculated from the field data, and maps showing the approximate limits of each identified seagrass bed. Seagrass habitats were located throughout the pipeline corridor and in the southern portion of Cut SL-5. Results of the hardbottom habitat characterization and maps showing the approximate limits of each identified seach identified hardbottom habitat are also included in this section.

4.1 SEAGRASS HABITATS

PIPELINE CORRIDOR

Seagrasses were found in 10.45 acres of the pipeline corridor survey area. The majority of the pipeline corridor survey area contained sparse seagrass coverage (typically 5-10% coverage; **FIGURE 5 & 6**) and consisted of a sand/shell hash substrate. Approximately 1.26 acres of very dense (75-100% cover) mixed seagrass beds were delineated in the eastern portions of the survey area. Approximately 7.89 acres of sparse (typically less than 10% cover) mixed seagrass beds were delineated along the western extent of the

survey area. The mixed beds contained various combinations and coverages of manatee grass (*Syringodium filiforme*), Cuban shoal grass (*Halodule wrightii*), and turtle grass (*Thalassia testudinum*), which tended to dominate the shallow areas. *Thalassia testudinum* and *H. wrightii* dominated areas that appeared to be disturbed by previous anchoring or spudding (i.e. prop scars). Moderate macroalgae coverage dominated by *Laurencia* sp., *Chondria* sp, and *Caulerpa* sp. and occasional encrusting sponges also occurred in this habitat. Among belt transects, *H.* wrightii had a percent cover range of <5%-10%, with an overall average of 5%; *S. filiforme* had a percent cover range of 0%-10%, with an overall average of 5%; *T. testudinum* had a percent cover range of 0%-10%, with an overall average of 6%. Photos (**APPENDIX PAGE 1**) depict the variable coverage of seagrass habitats that occur in the pipeline corridor survey area.

The majority of benthic habitat in the pipeline corridor that was void of seagrasses existed near the eastern and western extents of the survey area (**FIGURES 5 & 6**). This habitat consisted of a sand/shell hash substrate containing sparse macroalgae coverage dominated by *Laurencia* sp., *Chondria* sp, and *Caulerpa* sp. and occasional encrusting sponges (*Cliona delitrix* and *Tedania ignis*). A typical view is provided in **APPENDIX PAGE 1**. A moderate film of epiphytic algae typically covered the observed seagrass.

The average percent cover for seagrass, macroalgae, and other invertebrates identified in the pipeline corridor survey area can be examined in **TABLE 3**. Additionally, the average shoot counts and blade heights for seagrasses recorded can be referenced in **TABLE 4**.

"Bare pockets", represented by blue areas in **FIGURES 5 & 6** were located throughout the pipeline corridor survey area. These pockets varied in size and consisted of a sand/shell hash substrate typically containing to no seagrass to very sparse coverage (maximum of <5% cover) with reduced blade lengths. A typical view of a 'bare pocket' is provided in **APPENDIX PAGE 2**. Sparse drift macroalgae (such as *Laurencia* sp.) was typically the only other benthic resource occurring in the "bare pockets". **TABLE 8** provides a complete list of seagrass, macroalgae, and invertebrates observed in the pipeline corridor survey areas.

INTRACOASTAL WATERWAY

The Cut SL-2 North survey area (**FIGURE 13**) contained no seagrasses. It can be characterized as mixed sand/shell hash bottom with sparse macroalgae coverage and the occasional presence of branching hydroids (*Sertularella speciosa*) and red boring sponges (*C. delitrix*). Red macroalgae were dominant including: *Acanthophora* sp., *Chondria* sp., *Gracilaria* sp., and *Laurencia* sp. Photos in **APPENDIX PAGE 2** provide typical views of this survey area's benthic habitat. The Cut SL-2 South survey area (**FIGURE 13**) also contained no seagrasses or other protected marine resources. Observed resources occurring on the survey area bottom were similar to those observed in the Cut SL-2 North survey area, however no sponges were documented. *Laurencia* sp. was the dominant macroalgae species. Water depths in the eastern portion of the Cut SL-2 South survey area exceeded 35 ft. Visibility in this portion of the survey area was typically less than one foot and there was minimal light penetration to the bottom. The benthic habitat in the deep water portion was typically silt and sand bottom devoid of any sessile resources (**APPENDIX PAGE 3**). The Cut SL-3N and

Cut SL-3S survey areas are directly adjacent to the Fort Pierce Inlet (**FIGURE 13**). Tidal currents are very strong resulting in a sand bottom void of any seagrasses or other protected resources (**FIGURE 14**). No sessile resources were observed; only drift algae such as *Laurencia* sp. and *Chondria* sp. The navigation channel in the SL-3S survey area contained no seagrasses or other protected marine sources. Its benthic habitat was similar to the shallow water portion of Cut SL-2 South survey area (**APPENDIX PAGE 3**).

Cut SL-5 survey area had a total of 5.65 acres of seagrass habitat which were identified and delineated in the southern half of the Cut SL-5 survey area (**FIGURE 15 & 16**). This area was characterized as having a very sparse coverage (less than 5%), and contained a mixed bed of paddle grass (*Halophila decipiens*) with mostly Johnson's seagrass (*Halophila johnsonii*; less than 5% coverage). Johnson's seagrass was observed in nine (9) of the ten (10) belt transects. Therefore, it is likely that the Johnson's seagrass was spread throughout the entire bed. Among belt transects, *H. johnsonii* had a percent cover range of 0%-20%, with an overall average of <5%, and *H.* decipiens had a percent cover range of <1%-20%, with an overall average of <5%. Photos (**APPENDIX PAGE 4**) depict typical views of the benthic habitat in the Cut SL-5 survey area. **TABLE 5** lists the seagrass coverage, recorded as an average per each 100-ft belt transect, in the Cut SL-5 survey area. **TABLE 6** lists average shoot count and blade heights recorded along each seagrass transect. In addition to seagrass, red algae (including *Acanthophora* sp., *Chondria* sp., *Gracilaria* sp., and *Laurencia* sp.) and green algae (including *Caulerpa Mexicana, Caulerpa prolifera, Penicillus* sp., and *Halimeda* sp.) occurred in the Cut SL-5 survey area with coverage ranging from very sparse to sparse (typically less than 5% to 15%). A moderate film of epiphytic algae typically covered the observed seagrass.

TABLE 7 provides a complete list of seagrass, macroalgae, and invertebrates observed in the pipeline corridor and ICWW survey areas.

4.2 HARDBOTTOM HABITAT

Divers delineated and surveyed a total of 1.28 acres of hardbottom habitat adjacent to the SL-3S survey area (**FIGURE 18**). No hardbottom habitats were observed elsewhere within the survey limits. Approximately 0.8 acres of low-relief hardbottom habitat dominated by macroalgae was surveyed on the east side of the SL-3S survey area. This hardbottom habitat had a maximum length of approximately 250 ft. (north to south) and expanded further east of the 200-ft survey area, with water depths that ranged from 9-11 ft. The divers characterized the habitat as exposed limerock which typically extended 6-12 inches above the surrounding sand/shell hash substrate. The limerock was encrusted with macroalgae and occasional sponges and hydroids (**APPENDIX PAGES 4 & 5**). Dominant algal species included *Acanthophora* sp., *Chondria* sp., *Gracilaria* sp., *Laurencia* sp., and *Sargassum* sp. Occasional algal species included *Hypnea musciformis, Cualerpa mexicana, Caulerpa prolifera, and Ulva* sp. *Sertularella speciosa,* red boring sponge, and fire sponge (*Tedania ignis*) represent the only hydroid and sponge species observed. Coverage by all macroalgae and invertebrates was less than 10% across the entire hardbottom habitat survey area.

Approximately 0.48 acres of hardbottom habitat were surveyed on the west side of the SL-3S survey area (**FIGURE 18**). This hardbottom habitat had a maximum length of approximately 250 ft. (north to south). Its eastern limit marked the edge of the navigation channel, which was a 6-8 ft. tall ledge likely formed during creation of the channel. The hardbottom habitat is bound to the south by a smaller navigation channel and to the north by erosion/scour protection measures associated with the South Causeway Bridge. Water depths at the top of the ledge were 8-9 ft.; depths at the base of the ledge were 14-17 ft. The hardbottom habitat spanned further west of the 100-ft survey width, however resource coverage became increasingly more sparse further to the west.

The SL-3S hardbottom area can be categorized into two separate habitats: 1) Algal encrusted limerock interspersed in a sand/shell hash substrate with low relief on top of the ledge; and 2) Algal and sponge dominated vertical limerock wall that was much more densely colonized than the surrounding hardbottom habitat of the SL-3S survey area.

Habitat 1 was quite similar to the hardbottom habitat described on the east side of the SL-3S survey area. No stony corals were observed in this area; however, it consisted of exposed limerock encrusted with macroalgae and occasional sponges, hydroids, tunicates, and gorgonians that are separated by unvegetated sand/shell hash bottom (**APPENDIX PAGE 5**). A layer of silt covered most of the resources observed in this area. Coverage by macroalgae species ranged between 30% and 55% and was dominated by the same species listed for the east hardbottom area, such as *Sargassum* sp., which was relatively more abundant in this area. Coverages by sponges, hydroids, and gorgonians did not exceed 10%. Dominant sponges in this area included: red boring sponge, fire sponge, and brown carpet sponge (*Anthosigmella* sp.). Feather hydroid (*Gymnangium* sp.) was the dominant hydroid species. Regal sea fan (*Leptogorgia hebes*) was the dominant gorgonian.

Habitat 2 (the vertical limerock wall) contained very dense coverage (typically 75-90% cover) from an assortment of macroalgae, sponges, hydroids, tunicates, and octocorals (**APPENDIX PAGE 5**). The preconstruction survey did not locate any stony corals. **TABLE 8** provides a complete list of the plant and animal species observed in the vicinity of the ledge. Macroalgae was the dominant resource on the vertical wall, with an estimated coverage range of 55-85%. Total resource coverage was estimated at 75-90%. Numerous small (less than 5 cm) ivory brush corals (*Oculina diffusa*) and lesser starlet corals (*Siderastrea radians*) were identified as "dead"; and observed to be completely encrusted with encrusting/boring sponges (such as *Cliona* sp.). Size measurements were not recorded on any dead corals that were less than 5 cm in diameter.

5.0 DISCUSSION

This report summarizes the pre-construction presence, coverage, and conditions of seagrass and hardbottom resources occurring within the project areas. Seagrasses were located and delineated in 26.1% of the entire 61.16 acres during this pre-construction survey event. The pipeline corridor made up 17.08% of

the total seagrass beds identified, while the ICWW survey area (SL-5) made up the remaining 9.07%. Mixed, sparse seagrass beds consisting of *H. wrightii, S. filiforme* and *T. testudinum* made up 82.4% of the total pipeline corridor. Approximately 17.6% of the remaining pipeline corridor area consisted of no seagrass ("barespots") and oysters. Sparse, mixed beds of *H. johnsoni* and *H. decipiens* in the SL-5 portion made up 11.65% of the total 48.48 acres of the ICWW survey area. The remaining 88.3% of the ICWW survey area contained no seagrasses. The seagrass data documented in the pipeline corridor survey area should be used as a guide to select potential pipeline anchor installation locations. The sampling areas surveyed around the modified belt transects in both the ICWW and pipeline corridor covered over two (2) percent of the total seagrass area observed during Phase I (exceeding the minimum one percent coverage requirement established in the NMFS/NOAA Johnson's Seagrass protocol for large area projects). The low percent cover data illustrates the low density of seagrass beds throughout the pre-construction survey areas. Generally, B-B scores for all species (*H. wrightii, S. filiforme and T. testudinum H. decipiens and H. johnsonii*) were quite low, illustrating a very sparse to sparse coverage in the identified seagrass beds. Areas of *H. wrightii, S. filiforme and T. testudinum H. decipiens and H. johnsonii*) were quite low, illustrating a very sparse to sparse coverage in the identified seagrass beds. Areas of *H. wrightii, S. filiforme and T. testudinum H. decipiens and H. johnsonii*) were quite low, illustrating a very sparse to sparse coverage in the identified seagrass beds. Areas of *H. wrightii, S. filiforme and T. testudinum in the pipeline corridor were documented as mixed beds*, as well as *H. decipiens* and *H. johnsonii* in the ICWW.

A total of 1.28 acres of hardbottom habitat was identified adjacent to the SL-3S survey area, while no other hardbottom habitats were located throughout the remainder of the survey limits. While no stony corals were located during the pre-construction survey, the hardbottom habitats consisted of algal encrusted limerock and a vertical limerock ledge dominated by algae, sponges, hydroids, tunicates and octocorals. Some small corals (less than 5cm) were identified as "dead" and were completely encrusted with encrusting/boring sponges. This hardbottom habitat had a maximum length of approximately 250 ft. (north to south), and extended further east of the 200-ft survey width and further west of the 100-ft survey width.

Two bottlenose dolphins (*Tursiops truncatus*), protected under the Federal Marine Mammal Protection Act, were observed in the ICWW near the pipeline corridor survey area. No other federal or state-listed species were observed.

6.0 LITERATURE CITED

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FIGURES



















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Legend

SURVEY AREA BOUNDARY (48.48 Ac.)



0% (42.83 Ac.) <5% (4.19 Ac.) 5% (0.80 Ac.) 10% (0.29 Ac.) 25% (0.37 Ac.) Cut SL-5









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Legend

SURVEY AREA BOUNDARY (48.48 Ac.) ASSESSMENT AREA LIMITS

HARDBOTTOM HABITAT LIMIT

Cut SL-5





	Figure 20 - Intracoastal Waterway Hardbottom Habitat Location Map	Data Source: - Scheda Ecological Associates, Inc. Imagery Source: - ESRI Streets
ASSOCIATES	FIND St. Lucie Reach 1 Pre-construction	N
WWW.SCheda.com All data within this map are supplied as is, without warranty. This product has not been	St. Lucie County, Florida	Â
prepared for legal, engineering, or survey purposes. Users of this information should review or consult the primary data sources to ascertain the usability of the information.	Image: Contract of the sector of th	Coordinate System: NAD 1983 Florida

TABLES

TABLE 3. AVERAGE PERCENT COVER FOR SEAGRASS, MACROALGAE AND OTHER INVERTEBRATES IDENTIFIED IN THE PIPELINE CORRIDOR.

				CONTRIDUCT	Li			
	Seagrasses							Average
Transect	Halodule wrightii	Ruppia Maritima	Syringodium filiforme	Thalassia Testudinum	Macroalgae	Invertebrates	Dominant Substrate	Water Depth (ft)
1	<5	0	0	0	<5	0	Thick Silt	2
2	10	<5	0	0	10	0	Sand/Silt Bottom	2
3	5	0	5	10	10	0	Sand Bottom with Some Shell Hash	3
4	5	0	0	5	10	< 1	Sand Bottom	3
5	10	0	5	5	10	< 1	Sand Bottom	3
6	5	0	5	10	5	< 1	Sand Bottom	3.5
7	<1	0	10	5	5	0	Sand Bottom	4
8	<5	0	5	5	10	0	Sand Bottom	4.5
9	5	0	10	10	5	< 1	Sand Bottom with Some Shell Hash	5
10	5	0	10	10	10	< 1	Sand Bottom with Some Shell Hash	5.5

TABLE 4. AVERAGE SEAGRASS SHOOT COUNTS AND BLADE HEIGHTS RECORDED IN THE PIPELINE CORRIDOR SURVEY AREA.								
Transect	Halodule wrightii		Ruppia maritima		Syringodium Filiforme		Thalassia testudinum	
	Shoot Count	Blade Height	Shoot Count	Blade Height	Shoot Count	Blade Height	Shoot Count	Blade Height
	#/0.1m²	cm	#/0.1m ²	cm	#/0.1m ²	cm	#/0.1m ²	cm
1	0.2	5.5	0	0	0	0	0	0
2	1.2	7.5	0	0	0	0	0	0
3	1.3	17.4	0	0	0	0	0.8	15.6
4	0.6	16.7	0	0	0	0	1.2	16.5
5	0.9	11.6	0	0	1.6	27.6	0.3	14.0
6	0.8	16.6	0	0	0	0	1.0	16.8
7	0.2	15.0	0	0	1.6	28.3	0.3	19.7
8	0.6	17.0	0	0	1.6	29.0	0.2	18.9
9	0.7	16.0	0	0	1.6	29.4	0.1	17.0
10	0	0	0	0	1.4	29.3	0.3	17.2

TABLE 5. AVERAGE PERCENT COVER FOR SEAGRASS, MACROALGAE AND OTHER INVERTEBRATES IDENTIFIED IN THE CUT SL-5 SURVEY AREA.

Transact	ect Seagrasses Halophila johnsonii Halophila decipiens					Average Water
Transect			Macroalgae	Invertebrates	Dominant Substrate	Depth (ft)
1	<5	<5	10	c 1	Sand Bottom with	0
I	~ 5	~5	10		Sand Bottom with	5
2	20	20	15	<1	Shell Hash	8
3	<5	<5	<5	<1	Sand Bottom	9
4	<5	<5	< 5	< 1	Sand Bottom	8
5	<5	< 5	5	< 1	Sand Bottom	8
6	5	<5	5	0	Sand Bottom	9
7	<1	<1	<5	1	Sand Bottom	9
8	< 1	<5	10	0	Sand Bottom	9
9	< 1	<1	5	< 1	Sand Bottom with Shell Hash	8
10	0	< 5	10	0	Sand Bottom	9

TABLE 6. AVERAGE SEAGRASS SHOOT COUNTS AND BLADE HEIGHTS RECORDED IN THE CUT SL-5 SURVEY AREA.					
Transect	Halophila jo	hnsonii	Halophila Decipiens		
	Shoot Count (#/0.1m ²)	Blade Height(cm)	Shoot Count (#/0.1m ²)	Blade Height(cm)	
1	0.16	1.09	2.0	1.9	
2	0.27	1.10	1.5	2.17	
3	0.20	1.12	2.02	2.0	
4	0.10	1.10	0.45	1.45	
5	0.12	1.12	0.98	1.3	
6	0.10	0.99	1.05	1.87	
7	0.10	1.28	2.76	1.68	
8	0	0	1	1.75	
9	0	0	1.9	1.8	
10	0	0	1.54	2.25	

TABLE 7. LIST OF BIOTA OBSERVED IN THE FIVE (5) ICWW AREAS AND PIPELINE CORRIDOR.					
SEAGRASS					
Scientific Name	Common Name				
Halodule wrightii	Cuban shoal grass				
Halopihila decipiens	Paddle grass				
Halophila johnsonii	Johnson's seagrass				
Syringodium filiforme	Manatee grass				
Thalassia testudinum	Turtle grass				
MACROA	LGAE				
Scientific Name	Common Name				
Acanthophora sp.	Rhodomelaceous red algae				
Caulerpa prolifera	Calcareous green algae				
Caulerpa Mexicana	Calcareous green algae				
Caulerpa sp.	Calcareous green algae				
Chondria sp.	Rhodomelaceous red algae				
Derbesia sp.	Green turf algae				
Gracilaria sp.	Gracilariaceous red algae				
Halimeda sp.	Halimaceous green algae				
Laurencia sp.	Rhodomelaceous red algae				
Penicillus sp.	Mermaids shaving brush				
Sargassum sp.	Sargassaceous brown algae				
Udotea sp.	Calcareous green algae				
Spond Scientific Name	Eð Common Nomo				
	Common Name				
Cilolia Sp.	Fire sponge				
HYDRO	201				
Scientific Name	Common Name				
Gymnangium sp	Feather hydroid				
Sertularella speciosa	Branching hydroid				
OTHER INVER	TEBRATES				
Scientific Name	Common Name				
Coenobita clypeatus	Caribbean hermit crab				
Echinometra lucunter	Rock-boring urchin				
Hermodice carunculata	Bearded fireworm				
Holothuria sp.	Sea cucumber				
Ophioderma sp.	Brittle star				
Pleuroploca gigantea	Horse conch				
	Unknown tubeworm				
FISH					
Scientific Name	Common Name				
Abudefduf saxatilis	Sergeant major				
Dasyatis americana	Southern stingray				
Diplectrum formosum	Sand perch				
Lutjanus apodus	Schoolmaster				
Lutjanus griseus	Mangrove snapper				
Menidia sp.	Silverside				
Sphoeroides greeleyi	Caribbean puffer				
Syngnathinae sp.	Pipefish				
Tylosurus crocodilus Needlefish					
Unidentified Gobiidae					
MAMMALS					
Scientific Name	Common Name				
i ursiops truncatus	Bottlenose dolphin				
	1				

TABLE 8. LIST OF BIOTA OBSERVED IN THE HARDBOTTOM HABITAT EAST OF THE CUT SL-3S SURVEY AREA.			
	STONY CORALS		
Scientific Name	Common Name		
Ν/Α	N/A		
	OCTOCORALS		
Scientific Name	Common Name		
Carijoa riisei	White telesto		
Leptogoria hebes	Regal sea fan		
	MACROALGAE		
Scientific Name	Common Name		
Acanthophora sp.	Rhodomelaceous red algae		
Acetabularia sp.	Calcareous green algae		
Batophora oerstedii	Calcareous green algae		
Caulerpa prolifera	Calcareous green algae		
Caulerpa Mexicana	Calcareous green algae		
Caulerpa sp.	Calcareous green algae		
Chondria sp.	Rhodomelaceous red algae		
Dasya sp.	Dasyaceous red algae		
Derbesia sp.	Green turf algae		
Dictyopteris sp.	Dictyotaceous brown algae		
<i>Gracilaria</i> sp.	Gracilariaceous red algae		
Halimeda sp.	Halimaceous green algae		
Heterosiphonia sp.	Dasyaceous red algae		
Hypnea musciformis	Hypneaceous red algae		
Laurencia sp.	Rhodomelaceous red algae		
Penicillus sp.	Mermaids shaving brush		
Sargassum sp.	Sargassaceous brown algae		
Udotea sp.	Calcareous green algae		
Ulva sp.	Ulvaceous green algae		
Wrangelia sp.	Ceramiaceous red algae		
	Red turf algae		
	SPONGES		
Scientific Name	Common Name		
Amphimedon compressa	Erect rope sponge		
Callyspongia plicifera	Azure vase sponge		
Cinachyrella alloclada	Ball sponge		
Cliona sp.	Red boring sponge/encrusting sponge		
Desmapsamma sp.	Lumpy overgrowing sponge		
Siphonodictyon coralliphagum	Variable boring sponge		
Spheciospongia vesparium	Loggerhead sponge		
Spirastrealla coccinea	Pink and red encrusting sponge		
Tedania ignis	Fire sponge		
Xestospongia muta	Giant barrel sponge		
	i stant a strong a		

TABLE 8. LIST OF BIOTA OBSERVED IN THE HARDBOTTOM HABITAT EAST OF THE CUT SL-3S SURVEY AREA.			
TABLE 8 Con't.	TUNICATES		
Scientific Name	Common Name		
Clavelina sp.	Bulb tunicate		
Eudistoma obscuratum	Black condominium tunicate		
Eudistoma sp.	White condominum tunicate		
	•		
	HYDROIDS		
Scientific Name	Common Name		
Gymnangium sp.	Feather hydroid		
Sertularella speciosa	Branching hydroid		
Thyroscyphus sp.	Algae hydroid		
	OTHER INVERTEBRATES		
Scientific Name	Common Name		
Echinometra lucunter	Rock-boring urchin		
Holothuria sp.	Sea cucumber		
Spirobranchus giganteus	Christmas tree worm		
	Unknown cyanobacteria		
	FISH		
Scientific Name	Common Name		
Abudefduf saxatilis	Sergeant major		
Acanthostracion quadricornis	Scrawled cowfish		
Acanthurus tractus	Ocean surgeonfish		
Acanthurus coeruleus	Blue tang		
Anisotremus virginicus	Porkfish		
Balistes capriscus	Gray triggerfish		
Chaetodon sedentarius	Reef butterflyfish		
Gymnothorax funebris	Green moray eel		
Lutjanus apodus	Schoolmaster		
Pomacanthus paru	French angelfish		
Pomacanthus arcuatus	Queen anglefish		
Sparisoma sp.	Parrotfish		
Sphoeroides greeleyi	Caribbean puffer		
Urobatis jamaicensis	Yellow stingray		
	Unidentified goby		
	CRUSTACEANS		
Scientific Name	Common Name		
Callinectus sapidus	Blue crab		
Cronius ruber	Blackpoint sculling crab		
Panulirus argus	Caribbean spiny lobster		

APPENDIX: PHOTOPAGES



Typical view of seagrass coverage in Pipeline Corridor.



Typical view of the 2.12 acres near the eastern extent Pipeline Corridor.



PHOTOPAGES ST. LUCIE REACH 1 PRE-CONSTRUCTION SURVEY BENTHIC HABITAT ASSESSMENT

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Typical view of a 'bare pocket' identified in the Pipeline Corridor .



Typical views of ICWW survey areas benthic habitat



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Typical view of habitat in deep water portions of Cut SL-2 South



Typical view of survey area adjacent to Ft. Pierce Inlet



PHOTOPAGES ST. LUCIE REACH 1 PRE-CONSTRUCTION SURVEY BENTHIC HABITAT ASSESSMENT

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Typical view of benthic habitat in Cut SL-5 survey area.



Typical view of the hardbottom habitat survey areas.



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Typical view of hardbottom habitat survey areas.



Typical view of hardbottom habitat survey areas.



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