



Agenda Report

2725 Judge Fran Jamieson
Way
Viera, FL 32940

New Business - Development and Environmental Services Group

J.2.

7/8/2025

Subject:

Staff Direction: Muck Removal from the Grand Canal (District 4)

Fiscal Impact:

\$8 million to \$19.9 million of Save Our Indian River Lagoon Sales Tax (Fund 1260) and up to \$5.1 million of state grant funds, depending on the option chosen

Dept/Office:

Natural Resources Management Department (NRM), Save Our Indian River Lagoon (SOIRL) Program

Requested Action:

It is requested that the Board of County Commissioners consider options and provide direction to staff for continuing muck removal in the Grand Canal Muck Removal Project Area and authorize the County Manager to execute contracts or change orders to implement the Board's chosen option, upon approval from the County Attorney's Office and Risk Management.

Summary Explanation and Background:

The Grand Canal project is in the unincorporated portion of the Grand Canal system, stretching from the Pineda Causeway to the northern edge of Samsons Island (Attachment A). In August 2019, the County contracted for the removal of 485,600 cubic yards (CY) of muck, which was the estimated volume of muck based on pre-project design surveys. Actual dredged volumes in the completed areas have been greater than the original estimated volume, resulting in the contractor achieving their contracted volume before completing the entire geographic area. This additional muck volume is attributable to: 1) hundreds of homeowners signing waivers that allow dredging to reach closer to their docks and seawalls than the original estimate assumed, 2) permit revisions that allow adding the Berkeley Canal to the project, 3) permit revisions that allow deeper dredging to get to the bottom of the muck instead of leaving 6" behind, and 4) new muck accumulating from algae blooms, fish kills and upland sources.

The contract to remove 485,600 CY removed muck from most of the unincorporated Grand Canal area. Attachment B highlights the areas dredged to date in green, utility corridors in orange, and the areas yet to be dredged in yellow. A change order was executed in May to add muck removal from the Berkeley Canal, which was excluded from the original state and federal permits due to high manatee use. Areas yet to be dredged include Lake Shepard (about 53,117 CY) and two entrance channels located north (8,296 CY) and south (5,887 CY) of the bridge over the Grand Canal. On June 24, 2025, the County received cost proposals from Gator Dredging for completing these areas.

Approximately \$5.1 Million of state grant funds remain available to offset additional project costs. The SOIRL Project Plan, most recently approved by the Board on February 11, 2025, allocates funds to continue muck

removal in the remaining areas. The entire Grand Canal project area is fully permitted, with dredging equipment on-site and a contractor ready to proceed. Board approval of a change order will allow the remaining work to proceed.

Large-scale muck removal is most cost-effectively accomplished via hydraulic dredging. Hydraulic dredging uses water and suction to lift and transport material through a pipeline to a dewatering site. Water and sediment are separated at the dewatering site and the water is returned to the lagoon. The dried sediment is then hauled to a disposal site. To date, dewatering has occurred at the Pineda Causeway Dredge Material Management Area (DMMA) authorized by the County Commission for temporary use through July 9, 2028. However, neighbors of the DMMA have asked the County to find an alternative dewatering site.

The Florida Inland Navigation District's (FIND) BV-52 DMMA dewatering facility has been identified as the most viable alternative site, however it is not likely to be available before 2034. FIND has already approved use of BV-52 for the Eau Gallie Muck Removal Project which is anticipated to begin in August and proceed for approximately 2.5 years. The Cities of Satellite Beach and Indian Harbor Beach are next in line with projects already permitted to use BV-52 for dewatering. The estimated time to complete the city projects is 6 years following Eau Gallie.

The scenarios listed below compare options for completing the Grand Canal Project, with dewatering at the Pineda DMMA, at BV-52, or a hybrid combination of using the Pineda DMMA for the remainder of the 2025 dredging season and completing the remaining dredging with a pipeline to BV-52 in 2034. The proposed costs and details for each option are outlined below and in Attachment C.

Options:

- **Pipeline** - Pipeline muck from Lake Shepard and the two entry channels to the BV-52 DMMA in Palm Bay (\$18.05M + CPI)
 - Stops use of the Pineda DMMA earliest (dredging stops by 9/13/25 and site is restored by 12/12/25)
 - Dredging resumes via pipeline when BV-52 becomes available around 2034
 - State grant funds are set to expire in 2027 before work resumes (~\$5.1M)
- **Pineda** - Continue using the Pineda DMMA to remove muck from Lake Shepard and the two entry channels (\$13.1M)
 - Completes use of the Pineda DMMA prior to 2028 deadline (dredging stops by 11/30/25 and site is restored by 2/28/26)
 - Expends the remaining state grant funds (~\$5.1M)
- **Hybrid** - Continue using the Pineda DMMA to remove muck from Lake Shepard (\$9.9M) and pipeline muck from the two entry channels to BV-52 (\$10M + CPI). (Total cost \$9.9M + \$10M + CPI = \$19.9 + CPI)
 - Completes use of the Pineda DMMA prior to 2028 deadline (dredging stops by 10/30/25 and site is restored by 1/28/26)
 - Dredging via pipeline to BV-52 resumes in 2034
 - Expends the remaining state grant funds in 2025 (~\$5.1M)

- **Other Board direction**

- Up to \$5.1M of work completed by July 31, 2027 may be reimbursed by the state

Considerations for the Pipeline Option (\$18.05M + CPI)

- Provide relief to the neighbors of the Pineda Dredge Material Management Area (DMMA) by stopping its use as soon as possible
- Stop dredging by September 13th, remove temporary facilities and restore vegetation at the Pineda DMMA by December 12, 2025, 2.5 years in advance of the July 9, 2028 deadline approved in a Public Hearing.
- Seek permits to include a 13.7-mile pipeline from the Grand Canal to BV-52 in Palm Bay
- Extend the Cities' pipeline to BV-52 to dewater the remaining Grand Canal areas
- Pricing for work delayed to 2034 is subject to cost escalation that may exceed the approved budget for the project
- It may be possible to share pipeline mobilization costs with the Cities
- Risk loss of approximately \$5.1 Million in State grant funds due to grant expiration date of July 31, 2027, approximately seven (7) years before dredging could resume
- Delivery of project benefits to the IRL ecosystem will be delayed by about 9 years

Considerations for the Pineda Option (\$13.1M)

- Complete muck removal from all unincorporated areas using the Pineda DMMA
- Finish dredging by November 30, 2025, before the winter manatee closure season
- Remove temporary facilities and restore vegetation at the Pineda DMMA by February 28, 2026, 2.5 years in advance of the July 9, 2028 deadline approved in a Public Hearing.
- Avoid loss of approximately \$5.1 Million in State grant funds for the Grand Canal
- Meet the county's obligations, per the grant contract
- Lock in pricing and avoid the risk of cost escalation during the time it would take to pursue and procure an alternative DMMA
- Prevent project delays and deliver project benefits to the IRL ecosystem as soon as possible, including improved water quality, water clarity, oxygen levels, circulation, reduced risk of fishkills, harmful algae blooms and other environmental and economic harm posed by decomposing accumulations of muck pollution in the lagoon

Considerations for the Hybrid Option (\$19.9 + CPI)

- Provide relief to the neighbors of the Pineda Dredge Material Management Area (DMMA) by stopping its use a month earlier than the Pineda option
- Complete the Lake Shepard area by October 30, 2025 using the Pineda DMMA (\$9.9M)
- Remove temporary facilities and restore vegetation at the Pineda DMMA by January 28, 2026, 2.5 years in advance of the July 9, 2028 deadline approved in a Public Hearing.
- Expend the State grant funds (\$5.1M) and meet the county's grant contract obligations for the Grand Canal
- Lock in pricing and avoid the risk of cost escalation for the Lake Shepard area
- Deliver project benefits to Lake Shepard as soon as possible, including improved water quality, water clarity, oxygen levels, reduced risk of fish kills, harmful algae blooms and other environmental and economic harm posed by decomposing muck pollution

- Seek permits to include a 13.7-mile pipeline from the Grand Canal to BV-52 in Palm Bay
- Extend the Cities' pipeline to BV-52 to dredge and dewater the two Grand Canal Entrance Channels (\$10M + CPI)
- It may be possible to share pipeline mobilization costs with the Cities
- Pricing for Entrance Channel work delayed to 2034 is subject to inflationary cost escalation that may exceed the approved project budget
- Delivery of project benefits near the Entrance Channels will be delayed by about 9 years

If completed, the entire unincorporated Grand Canal project is expected to remove approximately 3,646,683 lbs of nitrogen and 364,367 lbs of phosphorus from the IRL system. Left in place, the ongoing decay of this muck annually releases approximately 34,187 lbs/year of nitrogen and 6,601 lbs/year of phosphorus. Attachment D presents pre-dredge and post-dredge data demonstrating the positive impacts of dredging, including trash and debris removal, reduced turbidity and algae blooms in open water areas, and increased dissolved oxygen levels at depth within canals.

When stirred up by waves and currents, muck clouds the water and prevents sunlight from reaching seagrass beds which are critical to dolphins, manatees, and 70% of the sportfish species found in Florida waters. Removal of muck significantly improves lagoon water quality and helps to achieve pollution reduction targets essential for restoring lagoon health.

Grand Canal Funding:

The Grand Canal Muck Removal Project was identified as one of five priority muck removal locations funded by the Florida Legislature in 2014, 2015 and 2016. Years later, in the absence of sufficient Legislative Funds, the Grand Canal project was added to the SOIRL Project Plan. With dedicated SOIRL funds as local match, additional funding was secured from St Johns River Water Management Grant (\$983,180 in 2020 and \$321,777 in 2022), a State Legislative Appropriation (\$9,000,000 in 2023), and a State IRL Water Quality Grant (\$10,053,228 in 2024).

Clerk to the Board Instructions:



July 9, 2025

M E M O R A N D U M

TO: Virginia Barker, Natural Resources Management Director


RE: Item J.2., Staff Direction for Muck Removal from the Grand Canal

The Board of County Commissioners, in regular session on July 8, 2025, directed staff to continue using the Pineda Dredge Material Management Area (DMMA) to remove muck from Lake Shepard and the two entry channels.

Your continued cooperation is always appreciated.

Sincerely,

**BOARD OF COUNTY COMMISSIONERS
RACHEL M. SADOFF, CLERK**


Kimberly Powell, Clerk to the Board

cc: Finance
Budget



BOARD OF COUNTY COMMISSIONERS

Natural Resources Management Department (NRM)
2725 Judge Fran Jamieson Way
Building A, Room 219
Viera, Florida 32940

Attachment A

Grand Canal Project Overview



Phone (321) 633-2069 • Fax (321) 633-2074
Website: www.brevardfl.gov/NaturalResources

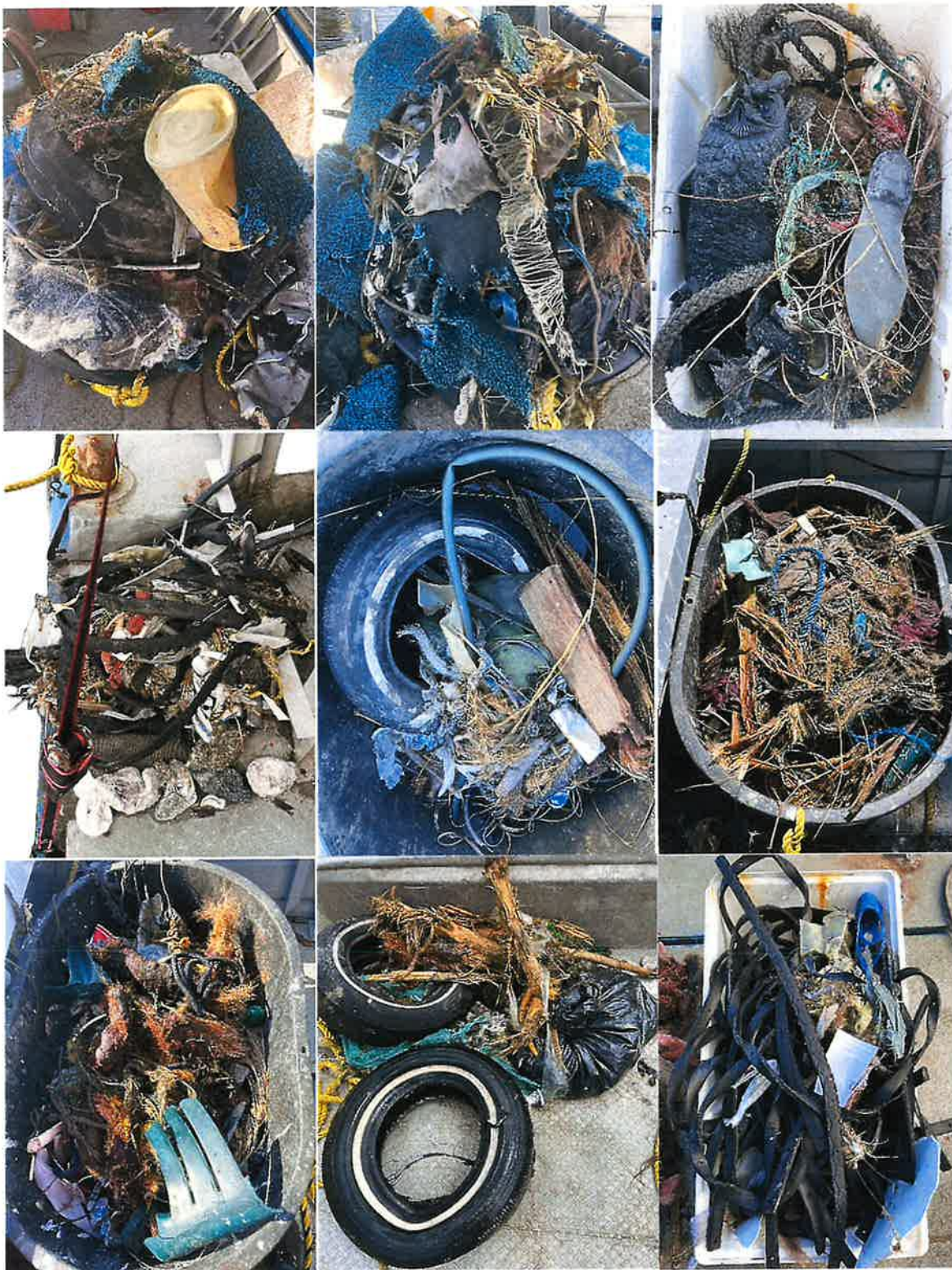
Attachment B



Attachment C			
Grand Canal Options			
	Pipeline	Pineda	Hybrid
Description	Construct a 13.7-mile pipeline from Lake Shepard and two entrance channels to BV-52 DMMA in Palm Bay	Continue use of Pineda DMMA for Lake Shepard and two entrance channels	Continue use of Pineda DMMA for Lake Shepard and construct Pipeline for two entrance channels
Dewatering Facility	BV-52 DMMA	Pineda DMMA	Pineda DMMA & BV-52 DMMA
Volume -Cubic Yards (CY)	67,300	67,300	67,300
Disposal Site	Sebastian River DMCA	Contractor site	Contractor site & Sebastian River DMCA
Date to Stop Sending Muck to Pineda DMMA	9/13/2025	11/30/2025	10/30/2025
Pineda DMMA Restoration Completion Date	12/12/2025	2/28/2026	1/28/2026
Earliest Start Date	2034 (After other projects use BV-52 first)	7/9/2025	Lake Shepard: 7/9/2025 Entrance Channels: 2034 (After other projects use BV-52 first)
Estimated Dredge Completion date	2036-2037	11/30/2025	Lake Shepard: 10/30/2025 Entrance Channels: 2035-2036
Estimated Total Cost	\$18,050,000 + Inflation	\$13,077,000	\$19,910,000 + Inflation
Estimated Grant Cost Share	\$0 (Grant expires 7/31/27)	\$5,100,000 (Grant will be used)	\$5,100,000 (Grant will be used)
Estimated SOIRL Cost	\$18,050,000 + Inflation	\$7,977,000	\$14,810,000 + Inflation

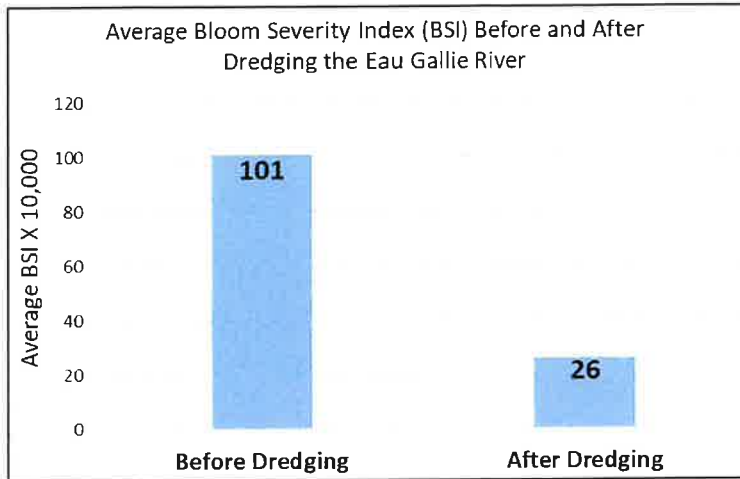
Attachment D
Muck Removal Benefits-Water Quality

Not only is muck removed, but **trash** that clogs the dredge is also pulled daily from the lagoon.



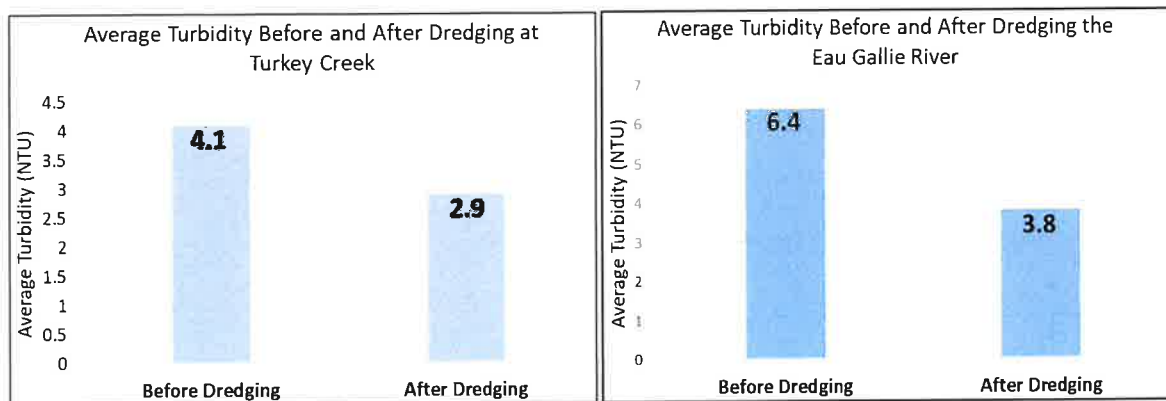
Muck Removal Benefits: Decreased Bloom Severity Index (BSI)

The bloom severity index (BSI) is a simple number that shows how intense and widespread a harmful algal bloom is in a specific area. After dredging the Eau Gallie River, the BSI decreased by approximately 74%.



Muck Removal Benefits: Decreased Turbidity

The St. Johns River Water Management District maintains several long-term water quality monitoring stations in the IRL, including one northeast of Brevard County's Turkey Creek muck removal project and one east of the St. Johns River Water Management District's Eau Gallie River and Elbow Creek restoration dredging project.



Turbidity decreased by approximately 30% after dredging was completed in Turkey Creek and by approximately 41% after dredging was completed in Eau Gallie River and Elbow Creek.

Muck Removal Benefits: Improved Dissolved Oxygen

In January 2022, Dr. Austin Fox from Florida Tech deployed bottom-water dissolved oxygen sensors in the Sykes Creek muck removal project area to evaluate the impacts of muck removal through environmental dredging on bottom-water dissolved oxygen concentrations. So far, data from these sensors show higher dissolved oxygen levels in the recently dredged canals and a more mixed water column. This means the oxygen does not drop off near the bottom as it used to—it remains more consistent throughout the entire water column (Fox, 2023).

Brevard County SORIL Plan Recommendations

By Jim Glass, PE, retired civil engineer

I spent 25 years of my 35 year as Civil Engineer in the Tampa Bay area, with offices in Clearwater, Tampa, Sarasota and New Port Richey. I managed many storm water, wastewater projects for both municipal and county governments as well as private companies. In the 1980's I was the manager of the Tampa Bay Regional Planning Council Section 208 Water Quality Management Plan for Tampa Bay. This experience is the basis of my recommendations for the restoring the IRL so that sea grass will be replenished, manatees will not be starving and all the other marine life will be healthy again.

1. After 9 years the SORIL Plan has failed to make a priority of removing human waste from the lagoon. Instead, Muck removal is the priority.
2. Funding projects such as planting oysters, mangroves and sea grass, restoring shore lines, tossing clams in the Lagoon and harvesting aquatic vegetation before eliminating human waste is wrong. These projects should be delayed until the lagoon water quality is restored.
3. The county is facing a huge financial burden to meet the Sate mandate to upgrade or connect all 60,000 septic systems by the year 2030, yet the SORIL plan is funding dredging muck. For instance, the plan is funding dredging muck from the Sunnyland subdivision in the south beach area. The 200 or so homes are on septic tanks which deposit on average 250 gal. per day of nutrient rich waste in the canals. This human waste is root cause of the muck. Fixing the septic tank problem should be the priority not dredging muck.
4. To my knowledge, with so much dredging muck in the Grand Canal and tributary canals I have yet to see any evidence that water quality in the adjacent Banana River is better. I have asked twice for this information.
5. The funding of storm water projects ^{and repairing/upgrading sewage infrastructure} in the plan is helping with lagoon water quality.

Jim Glass

J. 2.

December 1, 2020

Brevard County Commissioners
2725 Judge Fran Jamieson Way
Viera, FL 32940

Honorable Commissioners:

The Indian River Lagoon has reached yet another low point, with unsightly and unprecedented bright green and potentially toxic algae blooms and fish kills over the past months. After three years of the SOIRL program, the public is well aware that the algal blooms are getting worse, and are not a positive sign for recovery of the Lagoon's seagrasses and fisheries.

In a recent 12 September 2020 *Space Coast Daily* article, the Brevard's Natural Resources Director stated that upon completion of nearly 200 Save Our IRL projects, we will see recovery of the Lagoon. However, many of the expensive multi-million-dollar projects do not appear to be realistic nitrogen-reduction solutions to recover the Lagoon's seagrasses and fisheries.

For example, the recent July 2020 Muck Removal Efficiency Report by Florida Tech "*largely confirms the beneficial impacts of muck dredging.*" However, the details contained in the report are not as rosy. From FL Tech's study of the Turkey Creek (Palm Bay) muck dredging, the actual surface area of muck removed was about 20%, with only 63% making it to the "muck lagoon." Also, only 32% of the material was actually muck, the remaining 68% was non-target sandy material. The nutrient removal efficiency was an estimated 43% of the potential nitrogen flux. The discharge water to the IRL (after the muck settled out) contained 6 times the nitrogen than the receiving lagoon water. After dredging, the study stated that very low oxygen saturation levels at the bottom will result in a "*semi-permanent hypoxic zone.*" Simply stated, a dead zone that will remain devoid of life, while not adequately mitigating nitrogen flux to the IRL.

Spending \$155 million on "de-mucking" projects before removing nutrients that cause muck accumulation is wasteful. The plan states "upland input of muck components must be reduced to prevent new muck accumulation. The Florida DEP Basin Action Plan states, "removing muck is only a temporary fix for some areas since there is a continuous flow of muck coming from the watershed." Clearly, expensive muck dredging projects don't provide the projected nitrogen-reductions stated in the SOIRL plan, and their value for nitrogen removal must be re-evaluated.

Spending \$30 million removing muck from man-made canals is wasteful. These projects may ultimately provide little nitrogen reduction value for Lagoon restoration. However, individual SOIRL Citizen Oversight Committee (COC) members may have "conflicts of interest" by prioritizing projects that benefit their jurisdictions, over projects that actually restore the IRL.

Pineda DMA for SPS only

**Pineda Muck DMAA site and
Satellite Beach Muck projects
extended to 2031.**



FLORIDA DEPARTMENT OF Environmental Protection

Central District
3319 Maguire Blvd, Suite 232
Orlando, FL 32803-3767



FLORIDA DEPARTMENT OF Environmental Protection

CENTRAL DISTRICT OFFICE
3319 MAGUIRE BLVD., SUITE 232
ORLANDO, FLORIDA 32803

**Satellite Beach
Muck project
extended to
2031.**

March 25, 2025

Brevard County
Attn: Matt Culver
2725 Judge Fran Jamieson Way, Building A, Room 200
Viera, FL 32940
Matt.Culver@brevardfl.gov

April 3, 2025

Brevard County
Attn: Jeanne Allen
2725 Judge Fran Jamieson Way, Building A, Room 200
Viera, Florida 32940
Jeanne.Allen@brevardfl.gov

Original Permit No. 421328-001-F1

Dear Mr. Culver:

We are in receipt of your notice to use the provisions of Section 252.363 of the Florida Statutes to extend the duration of the above permit, which authorized activities and works within a specific geographic area affected by the Governor's declaration of a state of emergency, established by Executive Order #24-264, issued on December 3, 2024. In accordance with the provisions of the legislation, the expiration date of the permit is changed as follows:

Original Expiration Date: October 6, 2028



Ren DeS...
Gove...
Alinda A. Lam...
Secr...

**Pineda DMA
site extended
to 2031.**

Re: File No. ERP_0342848-009 EM, Extension of File No. ERP_0342848

Dear Ms. Jeanne Allen:

The Department has evaluated your request to extend the expiration date for this permit. We may extend your permit for a maximum period of five years from the date of receipt of all governmental authorizations for this project. **Your permit is hereby extended until July 14, 2031.** Should you be unable to complete your project by that date, you should contact the Department.

Please attach this letter to your permit. This letter does not change any of the permit conditions or

Brevard County Terms of the "Swap" Melbourne City Council Packet

When the County Manager and County Attorney met with the City Manager and City Attorney on May 3, the County provided terms that they were interested in having if they received a parcel of 7 acres. The County is still as of 7 acres that they are available for City use.) The Debris Management Contract with County includes this property as one of their sites for storm debris.

Brevard Lands

The County indicated that they were not overly interested in taking ownership of the City's Sarno property. However, the transfer of the City parcel to the County was a term outlined in the County's April 23 agenda item and also a term discussed at the City's April 23 Council meeting. It is also the City's understanding that the County has received interest from potential buyers for the Sarno parcel.

County Commission Packet

EELS, endangered, scrub habitat, mitigation, wetlands, conservation

Airport

Jail/prison site, borrow pit

Public parks

Solid waste

Utilities (treatment plant)

Asset name	Area	Unit	Seller	Acq.val.FYE	Tax Account #
LAND - SARNO ROAD LANDFILL EXPANSION	68.34 ACR	ACR	SHERIDAN LAKES DEV. CORP	\$ 7,283,783.66	2736597/2736598
LAND SOUTH BREVARD LANDFILL	152.73 ACR	ACR	PLATT FAMILY	158.00	2704575
LAND SOUTH BREVARD LANDFILL (CHURCH)	2980.38 ACR	ACR	CHURCH OF LATTER DAY ST.	00	2700029
LAND VALKARIA AIRPORT GOLF COURSE-VALKARIA	256.16 ACR	ACR	U.S. OF AMERICA	0	2954516
LAND-VALKARIA AIRPORT VALKARIA RD-VALKARIA	316.19 ACR	ACR	U.S. OF AMERICA GSA	0	2954516
LAND BERTRAM SCHILD FREDERICK ZACHARIS YOUTH			FREDERICK ZACHARIS	0	2802557
LAND-WICKHAM PARK 2500 PARKWAY DRIVE-MELB				0	2709637
LAND MITIGATION FOR CENTRAL DISPOSAL FACILITY				0	2703341
LAND MITIGATION FOR CENTRAL DISPOSAL FACILITY				0	2704564
LAND SCRUB ECOSYSTEM CARL PROJECT				0	285/3000722
LAND EELS COASTAL JEWEL					
LAND MITIGATION FOR CENTRAL DISPOSAL FACILITY					



Vote him out 2026

Satellite Beach “won’t have enough money” to pump muck to Palm Bay

From: brittany.retherford@satellitebeach.gov <brittany.retherford@satellitebeach.gov> To: jim@sbmlawyers.com <jim@sbmlawyers.com> Sent: January 22, 2025 3:35 PM (UTC-05:00) Attached: ~WRD0000.jpg

Satellite Beach Dredging Project

Jim,

That is correct regarding SOIRL.

It was the understanding that if SB did the work then IHB would reimburse SB. I understood from John he was working to get additional appropriations.

Currently the plan for the muck is that, but we are seeing it is going to be costly. Latest was the county was going to do it differently for the Eau Gallie project and depending how that went we could change it then. Last I heard they were rebidding the Eau Gallie project. The sad reality is we are going to do all this leg work and we won't have enough money to complete this project.

Brittany Retherford, MPA
City Manager

City of Satellite Beach
565 Cassia Blvd.
Satellite Beach, FL 32937
321-773-4407 Ext: 114

Board Meeting Date

option
17

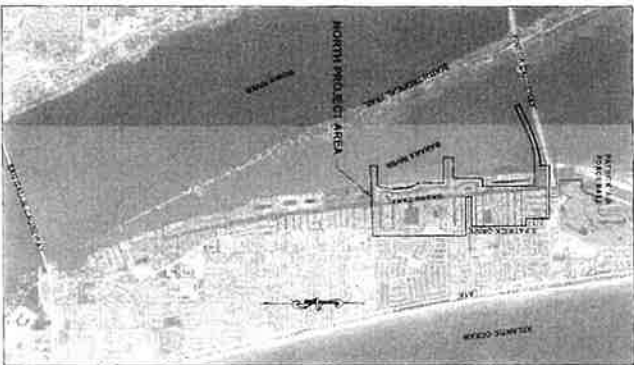
Item Number: I. 2

Motion By: Adkinson

Second By: Delaney

Nay By: _____

Commissioner	DISTRICT	AYE	NAY
Commissioner Delaney	1	✓	
Vice Chair Goodson	2	✓	
Commissioner Adkinson	3	✓	
Commissioner Altman	5	✓	
Chairman Feltner	4	✓	



LOCATION MAP
1" = 1000' = 3,000 FEET

HYDROGRAPHIC SURVEY SATELLITE BEACH CANALS BREVARD COUNTY, FLORIDA

-FOR-

ATKINS NORTH AMERICA

COMMISSION NUMBER: 5619.01

PREPARED BY:

MORGAN & EKLUND, INC.

PROFESSIONAL SURVEY CONSULTANTS



8745 US HIGHWAY 1
SUITE 200
DADE CITY, FL 34724
TEL (813) 894-1100
FAX (813) 894-1105

1150 SW 1ST WAY
SUITE 200
DADE CITY, FL 34724
TEL (813) 894-1100
FAX (813) 894-1105

SURVEY NOTES:

1. GRID COORDINATES SHOWN ARE IN FEET, AND ARE REFERENCED TO THE FLORIDA STATE PLANE COORDINATE SYSTEM, EAST ZONE, NORTH AMERICAN DATUM OF 1983, ADJUSTMENT OF 2011 (NAD 83/11).
2. GRID COORDINATES ARE BASED ON MOVEMENTS AS SHOWN IN THE CONTROL TABLE.
3. ELEVATIONS SHOWN ARE IN FEET, AND ARE REFERENCED TO THE NORTH AMERICAN DATUM OF 1983, ADJUSTMENT OF 2011 (NAD 83/11).
4. ELEVATIONS ARE BASED ON MEASUREMENTS AS SHOWN IN THE CONTROL TABLE.
5. ELEVATIONS ARE BASED ON MEASUREMENTS AS SHOWN IN THE CONTROL TABLE.
6. AERIAL PHOTOGRAPHY IS SHOWN HEREON FOR INFORMATION PURPOSES ONLY. NO PHOTOGRAPHIC ACCURACY IS IMPLIED BY THIS USE.
7. AERIAL PHOTOGRAPHY IS SHOWN HEREON FOR INFORMATION PURPOSES ONLY. NO PHOTOGRAPHIC ACCURACY IS IMPLIED BY THIS USE.
8. NOT VALID WITHOUT THE SIGNATURE AND ORIGINAL BASED SEAL OF A FLORIDA LICENSED SURVEYOR AND/OR ENGINEER.
9. EXISTING UNDERGROUND UTILITIES AND IMPROVEMENTS NOT LOCATED.

CONTROL TABULATION

STATION	DATE	BY	REMARKS	STATION	DATE	BY	REMARKS
1	1/1/11	JM	SET UP	11	1/1/11	JM	SET UP
2	1/1/11	JM	SET UP	12	1/1/11	JM	SET UP
3	1/1/11	JM	SET UP	13	1/1/11	JM	SET UP
4	1/1/11	JM	SET UP	14	1/1/11	JM	SET UP
5	1/1/11	JM	SET UP	15	1/1/11	JM	SET UP
6	1/1/11	JM	SET UP	16	1/1/11	JM	SET UP
7	1/1/11	JM	SET UP	17	1/1/11	JM	SET UP
8	1/1/11	JM	SET UP	18	1/1/11	JM	SET UP
9	1/1/11	JM	SET UP	19	1/1/11	JM	SET UP
10	1/1/11	JM	SET UP	20	1/1/11	JM	SET UP

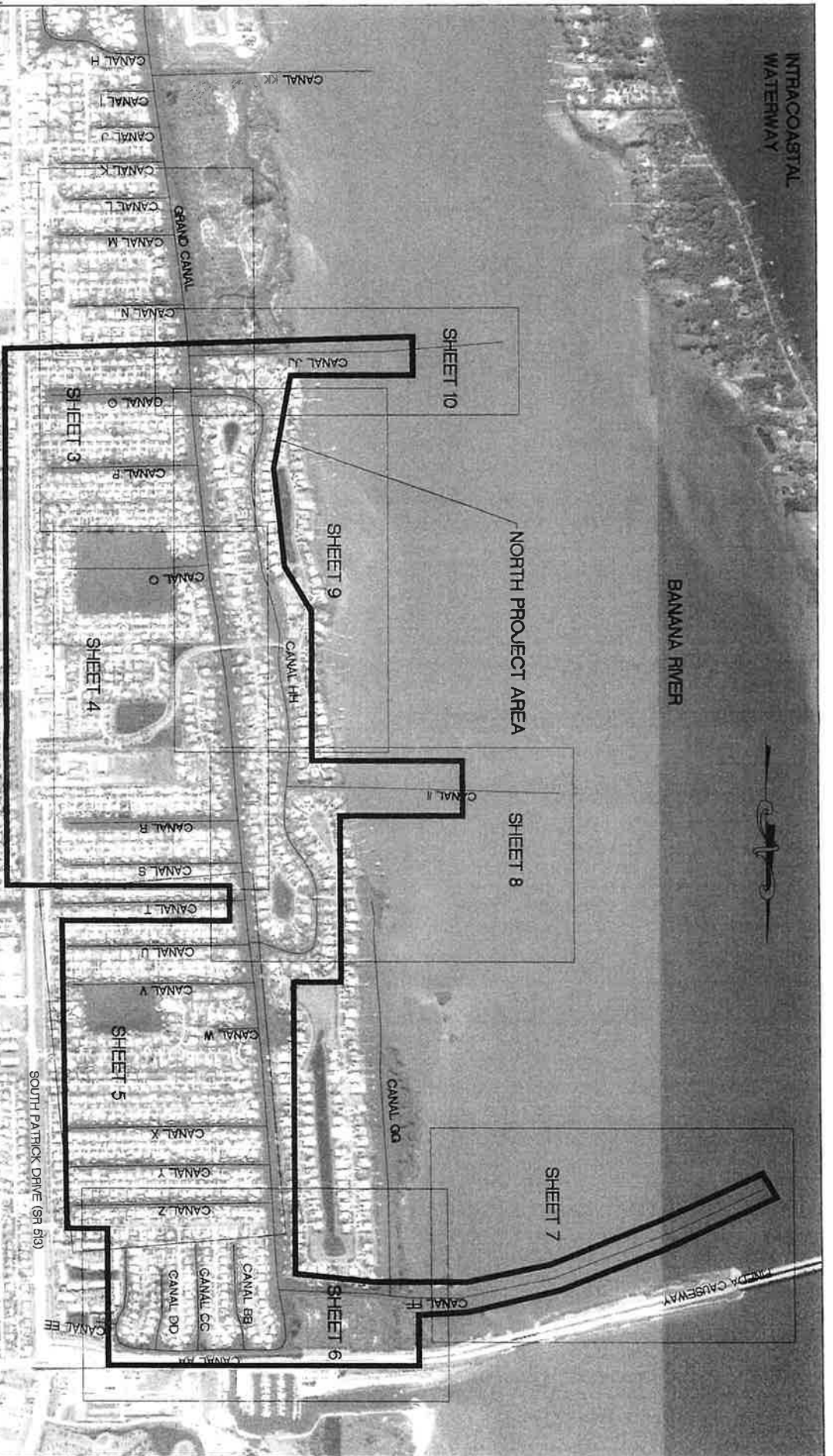
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BREVARD 504, PAGES 19833 - 19888
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INTRACOASTAL
WATERWAY

BANANA RIVER



1" = 100'



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1188 SW 25TH AVE
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FAX: (305) 421-8233
10-24-98

Consent to Survey - A survey done and the information contained therein is for the use of the client only. It is not to be used for any other purpose without the written consent of Morgan & Eklund, Inc.

KEY MAP		HYDROGRAPHIC SURVEY		DATE	
SATELLITE BEACH CANALS		2/24/15		AS SHOWN	
BREVARD COUNTY, FLORIDA		2/24/15		AS SHOWN	
FOR		2/24/15		AS SHOWN	
ATKINS NORTH AMERICA		2/24/15		AS SHOWN	

ELEVATION TABLE (FEET AND MM)		
Mean	Final	Mean
-35	-33	-31
-31	-29	-27
-27	-25	-23
-23	-21	-19
-19	-17	-15
-15	-13	-11
-11	-9	-7
-7	-5	-3
-3	-1	1

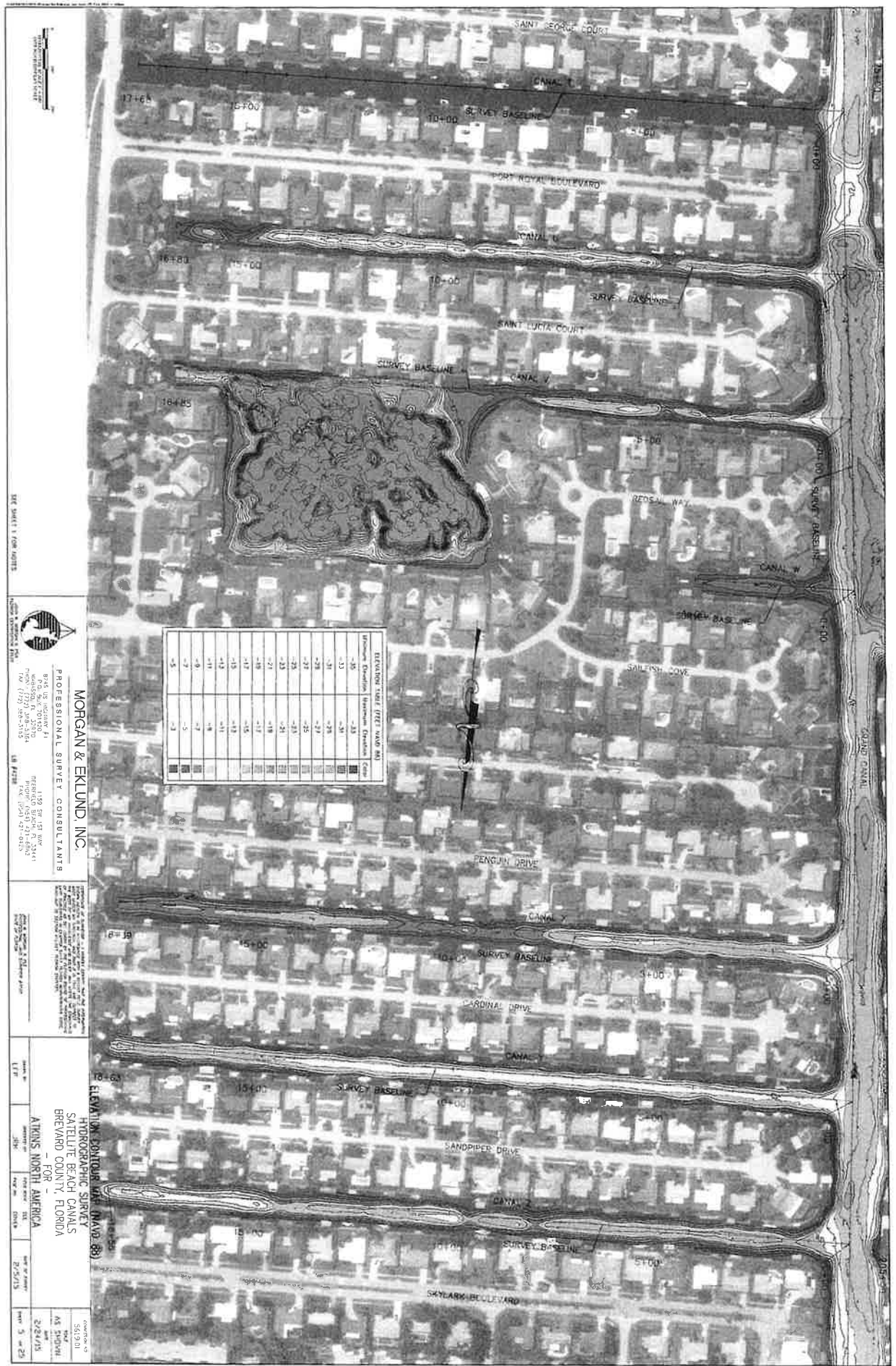


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ATKINS NORTH AMERICA
FOR
HYDROGRAPHIC SURVEY
SATELLITE BEACH CANALS
BREVARD COUNTY, FLORIDA

DATE: 5/24/15
BY: AS SHOWN
SCALE: 3" = 25'



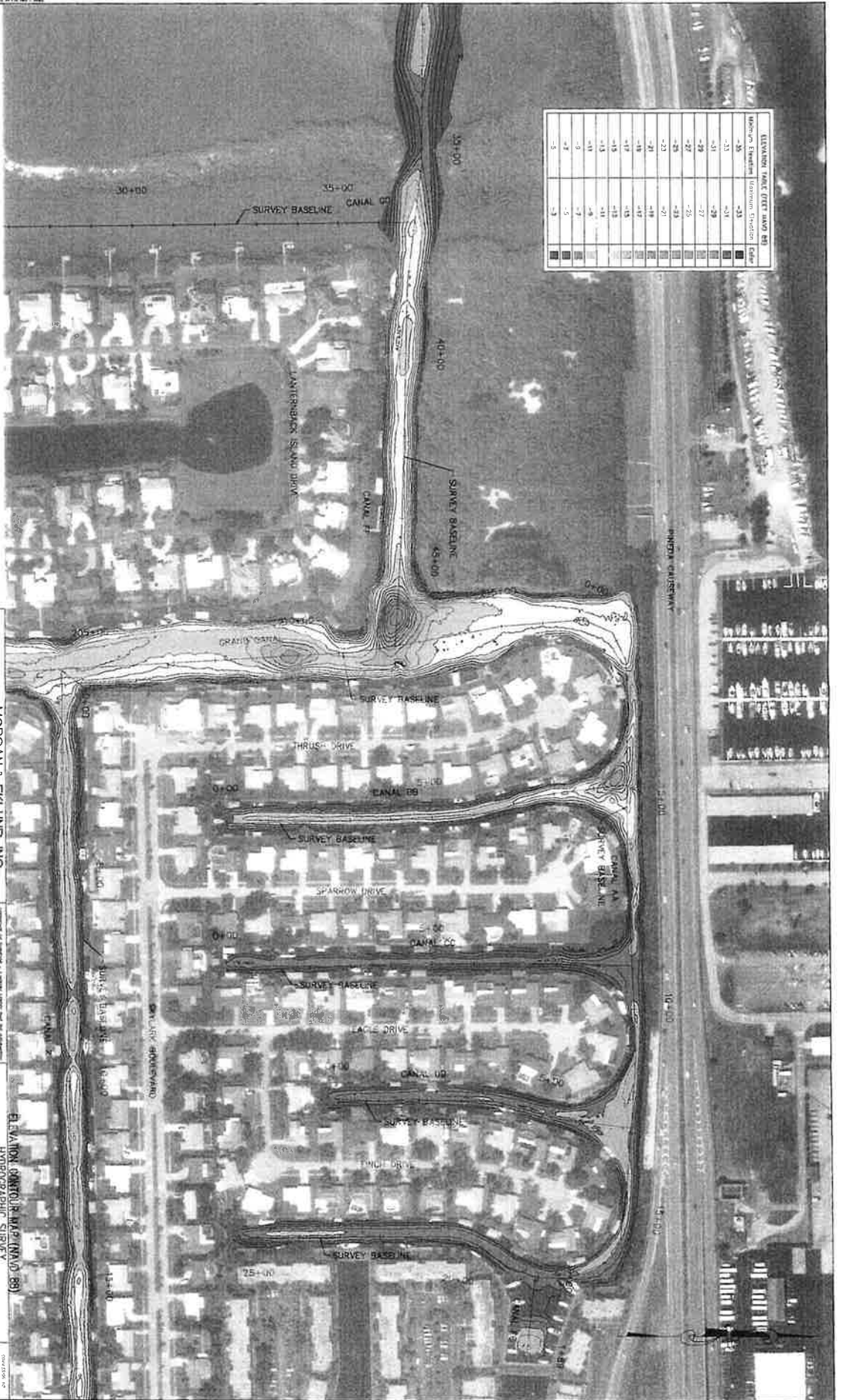
ELEVATION TABLE (FEET NAVD 83)		
Station	Spot Elevation	Spot Elevation
17+61	-35	-35
15+00	-33	-31
10+00	-28	-28
16+88	-28	-27
15+00	-25	-25
10+00	-23	-21
16+85	-21	-19
15+00	-18	-17
10+00	-15	-15
16+85	-12	-11
15+00	-10	-9
10+00	-9	-7
16+85	-7	-5
15+00	-5	-3

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 FAX: (305) 371-1112
 1150 SW 13th Ave.
 MIAMI, FL 33135
 TEL: (305) 421-0215
 FAX: (305) 421-0215

ATKINS NORTH AMERICA
 1111 17th St, Suite 200
 Brea, CA 92621
 TEL: (949) 450-1111
 FAX: (949) 450-1112

HYDROGRAPHIC SURVEY
 SATELLITE BEACH CANALS
 BREVARD COUNTY, FLORIDA
 FOR
 2/24/15
 354.9.01
 2/24/15
 354.9.01
 2/24/15

ELEVATION TABLE (FEET AND INCHES)		
Feet	Inches	Feet
25	0	25
24	6	24
23	0	23
22	6	22
21	0	21
20	6	20
19	0	19
18	6	18
17	0	17
16	6	16
15	0	15
14	6	14
13	0	13
12	6	12
11	0	11
10	6	10
9	0	9
8	6	8
7	0	7
6	6	6
5	0	5



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FAX: (305) 371-3175
L3 42424

FLORIDA CANAL & IRRIGATION DISTRICT (FICID)
HYDROGRAPHIC SURVEY
SATELLITE BEACH CANALS
BREVARD COUNTY, FLORIDA
FOR -
ATKINS NORTH AMERICA

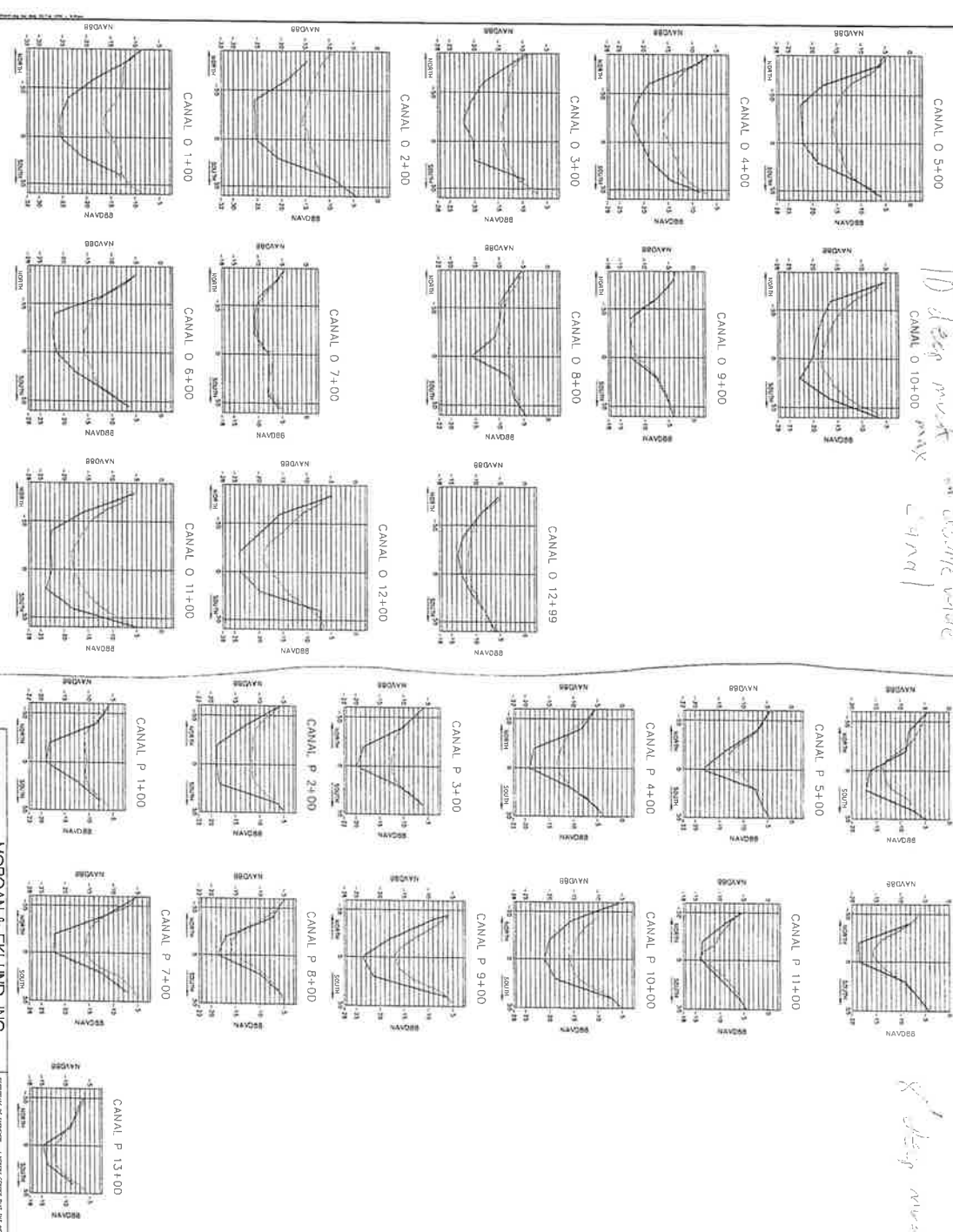
DATE OF SURVEY: 2/2/15
DATE OF REPORT: 2/2/15

10' deep must max

10' deep must max

10' deep must max

10' deep must max



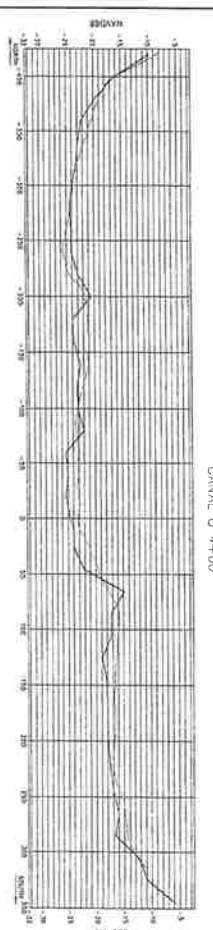
LEGEND
APPROXIMATE TOP OF LAKE
APPROXIMATE TOP OF SAND
SEE SHEET 1 FOR NOTES

MORGAN & EKLUND, INC.
PROFESSIONAL SURVEY CONSULTANTS
8745 US HIGHWAY #1
MADISON, WI 53717
PHONE: (608) 791-2200
FAX: (608) 791-2201
CELL: (608) 791-2202
E-MAIL: info@morganeklund.com
WEBSITE: www.morganeklund.com

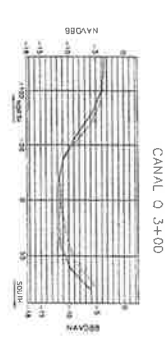
DATE OF SURVEY: 2/5/15
BY: [Signature]
CHECKED BY: [Signature]
DATE OF CHECK: 2/5/15

CROSS SECTIONS (NAVD 88)
HYDROGRAPHIC SURVEY
SATELLITE BEACH CANALS
BREVARD COUNTY, FLORIDA
- FOR -
ATKINS NORTH AMERICA
DATE OF SURVEY: 2/5/15
BY: [Signature]
CHECKED BY: [Signature]
DATE OF CHECK: 2/5/15

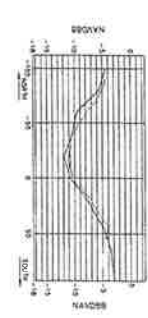
Lake Shepard 7' deep much (WIDESCREEN) ^{or 3' high}



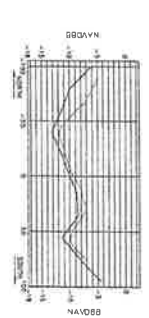
CANAL Q 4+00



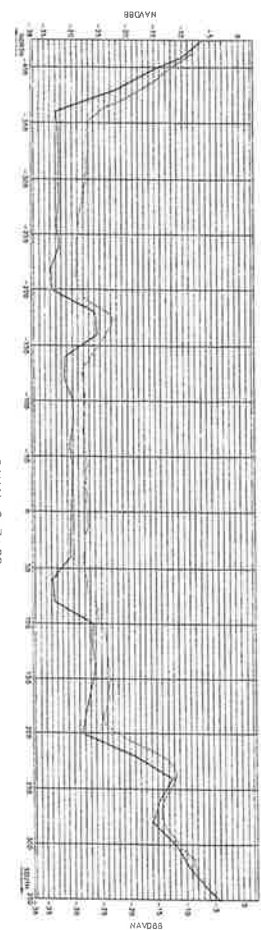
CANAL Q 3+00



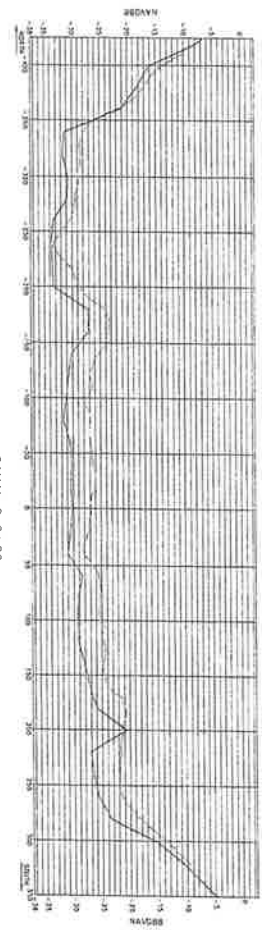
CANAL Q 2+00



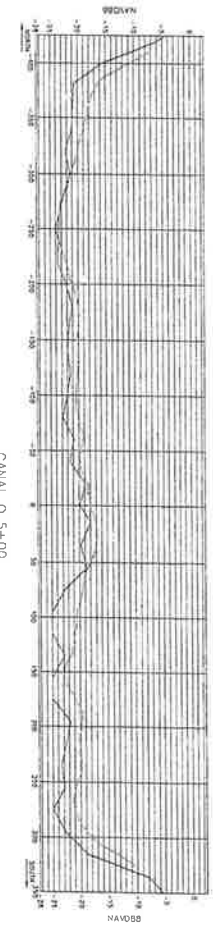
CANAL Q 1+00



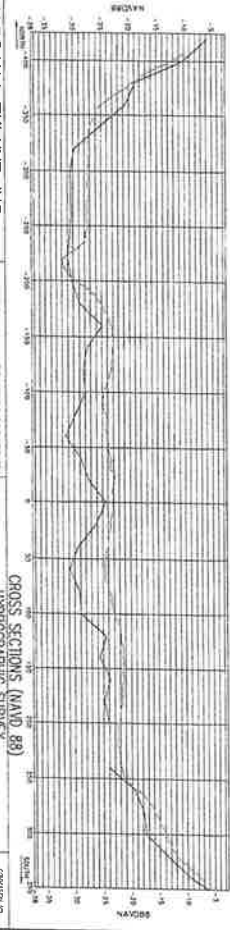
CANAL Q 8+00



CANAL Q 7+00



CANAL Q 6+00



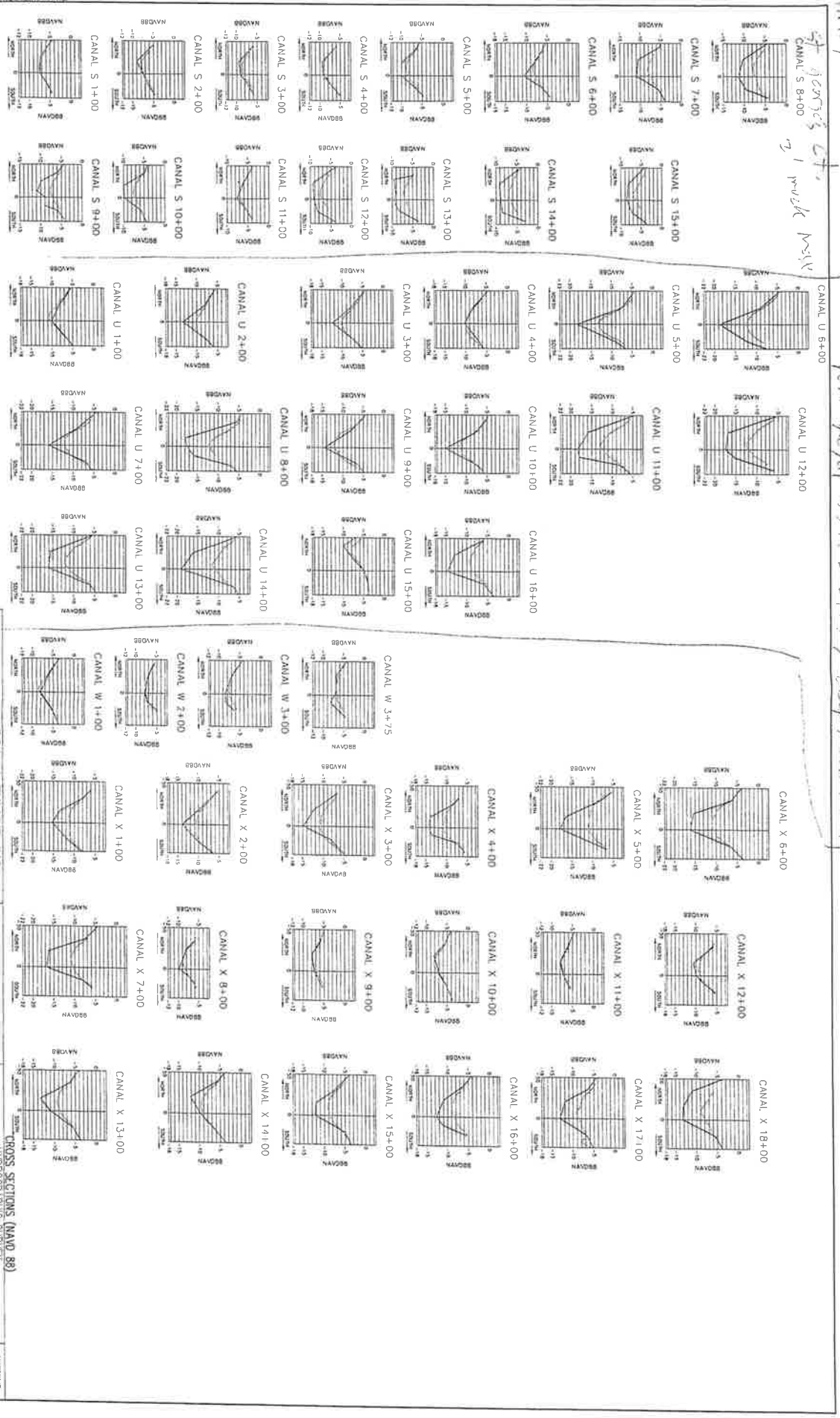
CANAL Q 5+00

LEGEND
 ——— APPROXIMATE TOP OF MUCK
 - - - - - APPROXIMATE TOP OF SAND
 SEE SHEET 1 FOR NOTES

MORGAN & EKLUND, INC.
 PROFESSIONAL SURVEY CONSULTANTS
 8745 US Highway 71
 Box 20120
 Fort Worth, Texas 76120
 Phone: (817) 388-3134
 Fax: (817) 388-3135
 18 #1248

ATKINS NORTH AMERICA
 HYDROGRAPHIC SURVEY
 SATELLITE BEACH CANALS
 BREVARD COUNTY, FLORIDA
 - FOR -
 2/24/15

ST 020705
CANAL S 8+00
2 1 mile N-S



LEGEND

— JACOBIAN TOP OF ASCE

— APPROXIMATE TOP OF SAND

SEE SHEET 1 FOR NOTES

MORGAN & EKLUND, INC.

PROFESSIONAL SURVEY CONSULTANTS

8725 US HIGHWAY 71
SUITE 100, BOX 201420
FORT WORTH, TEXAS 76120-1420
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IB #4200

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SUITE 100, BOX 1541
FORT WORTH, TEXAS 76101-1541
PHONE: (817) 421-0883
FAX: (817) 421-0883
IB #4200

CONDUCTED BY: J. EKLUND, JR. AND M. EKLUND, JR.
CHECKED BY: J. EKLUND, JR. AND M. EKLUND, JR.
DATE: 07/25/15

CROSS SECTIONS (NAVD 88)

HYDROGRAPHIC SURVEY
SATELLITE BEACH CANALS
BREVARD COUNTY, FLORIDA
FOR
ATLANTIC NORTH AMERICA

DATE OF SURVEY: 7/25/15

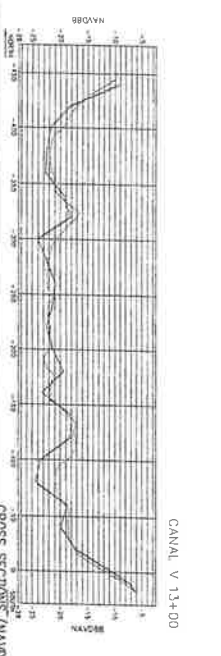
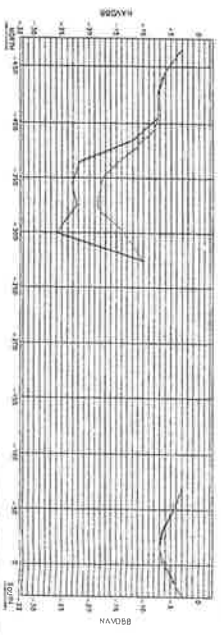
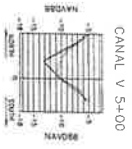
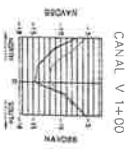
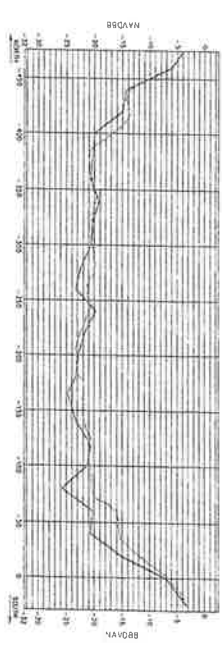
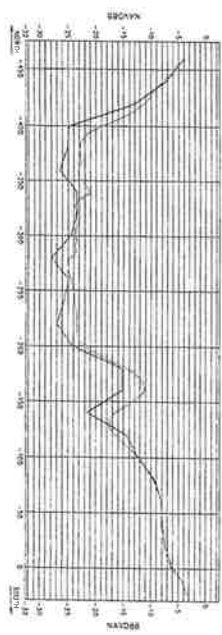
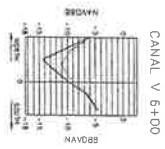
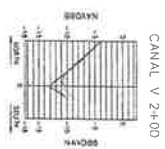
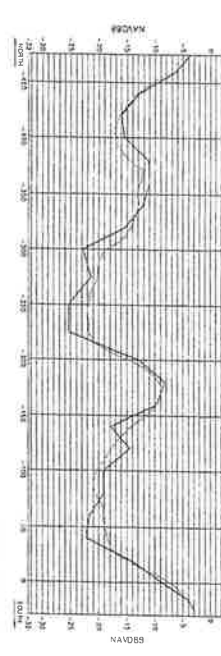
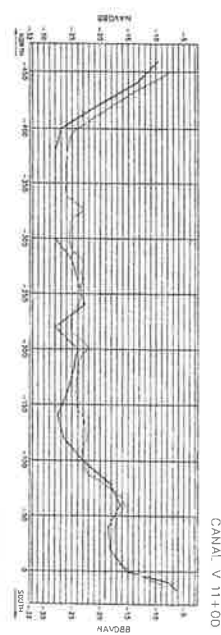
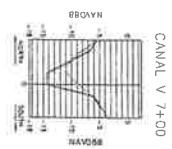
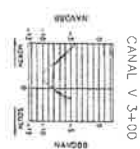
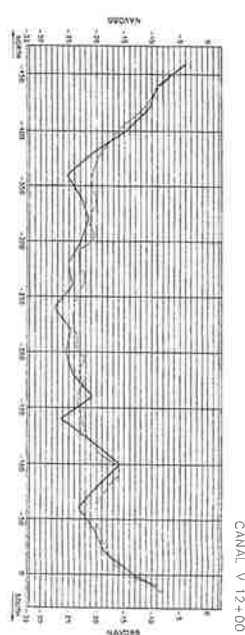
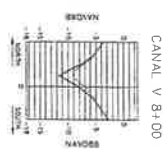
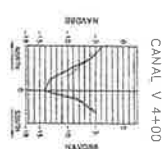
DATE OF PLOT: 7/25/15

SCALE: 1" = 10'

DATE OF PLOT: 7/25/15

DATE OF PLOT: 7/25/15

Shoeply Lagoon 2-3' Deep north NW



SEE SHEET 1 FOR NOTES

MORGAN & EKLUND, INC.
 PROFESSIONAL SURVEY CONSULTANTS
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STATE OF TEXAS
 SURVEYOR
 REG. NO. 12345
 EXPIRATION DATE 12/31/2015

CROSS SECTIONS (NAVD 88)
 HYDROGRAPHIC SURVEY
 SATELLITE BEACH CANALS
 BREVARD COUNTY, FLORIDA
 - FOR -
 ATKINS NORTH AMERICA

DATE OF SURVEY
 2/5/15
 DRAWN BY
 JST
 CHECKED BY
 JST
 DATE OF PLOT
 2/24/15