

# OCEAN SURVEYS, INC.

*Specialists in Marine & Freshwater Site Surveys*



# SURVEY TECH MEMO

TO: Coastal Engineering Consultants, Inc. (CEC)

FROM: Justin Kuntz, Ocean Surveys, Inc. (OSI)

SUBJECT: Bonita Beach Pipeline Corridor Survey  
To support Lee County Lovers Key Beach Nourishment Project  
Gulf of Mexico, Florida  
(OSI Report No. 20ES002-BB)

DATE: 23 March 2022

## **Introduction**

On 4 November 2021, Ocean Surveys, Inc. (OSI) performed a high-resolution geophysical (HRG) survey of a proposed pipeline corridor from Bonita Beach to a previously designated nearshore pump-out area in support of the Lee County Lovers Key Beach Nourishment Project (Figure 1). This survey was authorized under CO-1 (effective date 4 October 2021) as part of a larger investigation under subcontract (CN190055RJD, WO-1) to Coastal Engineering Consultants, Inc. (CEC) for Lee County (County), FL to support the Lovers Key Beach Nourishment Project (Project).

The County has tasked the CEC Project Team with conducting a sand search study to identify an offshore sediment resource in the Gulf of Mexico that can be used to re-nourish Lovers Key for the next 50 years. OSI has previously completed reconnaissance and detailed level geophysical/cultural resource surveys to support the Project. Please refer to OSI's Final Report (20ES002-2) for further details on the previous investigations:

- Final Report, Detailed Geophysical/Cultural Resource Surveys, To Support Lee County Lovers Key Beach Nourishment Project, Gulf of Mexico, Florida, 9 March 2022 (65pages).

The current investigation was performed to support the County's future nourishment projects for Lovers Key and Bonita Beach.

## **Summary of Field Investigation and Equipment**

OSI was tasked with acquiring HRG data (sounding, subbottom profiling, magnetometer, and side scan sonar imagery) within a 400-foot-wide pipeline corridor extending from the Lovers Key nearshore pump-out area to Bonita Beach, FL. Within the pipeline corridor (approximately 3.4 nautical miles (nm) in length) HRG data were acquired along five primary survey tracklines spaced 100 feet apart and a series of tie-lines oriented perpendicular to the primary lines spaced 1,000 feet apart. In total, approximately 20 nautical miles (nm) of multi-sensor HRG survey tracklines were investigated in support of the Project including reruns, overruns beyond the end of the planned lines and additional survey work completed in the corridor.



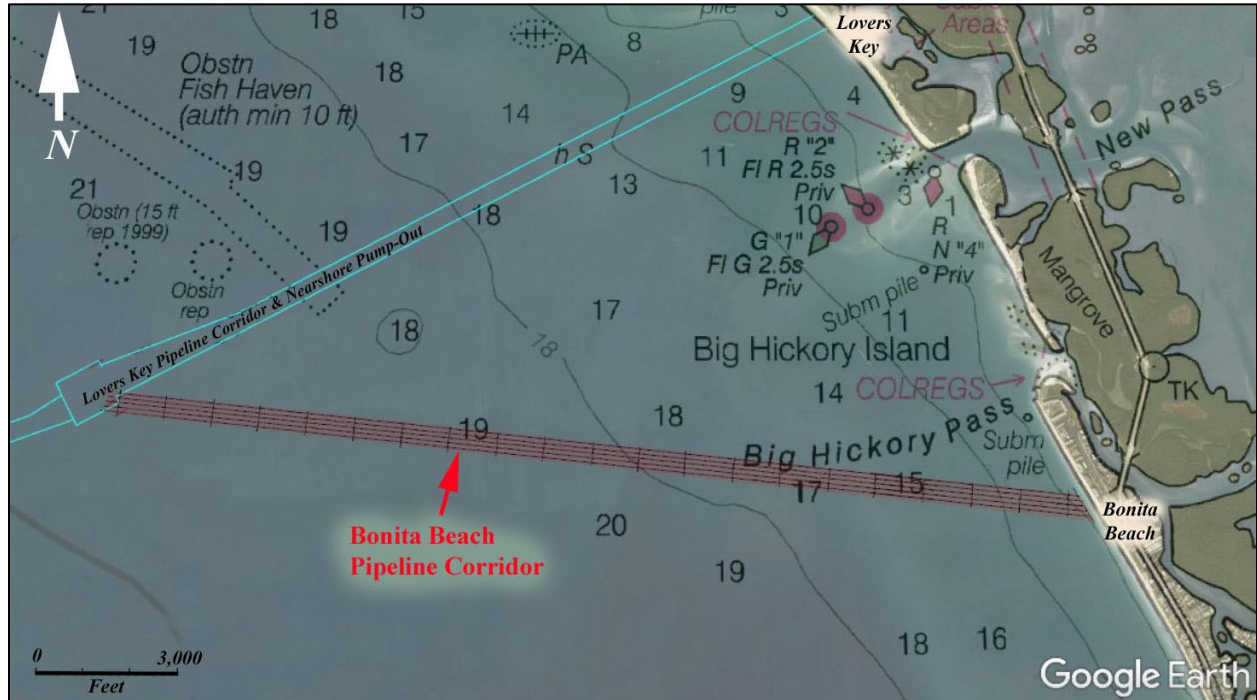


Figure 1. Chart section illustrating the location of the Bonita Beach Pipeline Corridor (tracklines in red) and the previously investigated nearshore pump-out and Lovers Key pipeline corridor (light blue outlines) areas proposed to support the Lovers Key Nourishment Project. Background Google Earth image based on NOAA Chart No. 11426, Estero Bay to Lemon Bay.

Survey operations were performed by a two-person OSI field crew comprised of a marine geologist/geophysicist and an experienced vessel operator/hydrographer. The investigation was completed aboard OSI's 26-foot research vessel, R/V Osprey. The vessel is equipped with a fully enclosed cabin, dual-outboard motors, swing arm davit, a winch for towing subsurface gear and all United States Coast Guard (USCG) safety equipment including an Automatic Information System (AIS). The primary equipment systems that were employed to complete the investigation are listed below:

Navigation and Positioning:

- Trimble Global Navigation Satellite System (GNSS), MPS 865 in Network Real Time Kinematic (NRTK) mode employing correctors from the Florida Permanent Reference Network (FPRN)
- HYPACK Navigation and Data Logging Software

Seafloor Mapping:

- Odom Echosound E20 Digital Depth Sounder
- Klein 3000 Dual Frequency Digital Side Scan Sonar System
- Geometrics G882 Cesium Marine Magnetometer

Subbottom Profiling:

- EdgeTech 3200-XS Chirp Subbottom Profiling System equipped with a SB216 Tow Vehicle (2-16 kHz)



Survey equipment was configured onboard the vessel to optimize data quality, reduce ambient noise and cross talk, and maximize survey efficiency. Figure 2 provides an illustration of the general equipment configuration used onboard the survey vessel. Note during the survey work the magnetometer was either hard mounted to the bow (1 foot above the water surface) or towed from the stern independent of the side scan sonar towfish. During the survey, vessel speed was maintained as high as possible without affecting the quality of the data, typically at 3-4 knots. Once online, no course changes were made, other than to maintain proposed trackline alignment. Survey direction and vessel speed were recorded in a detailed field line log.

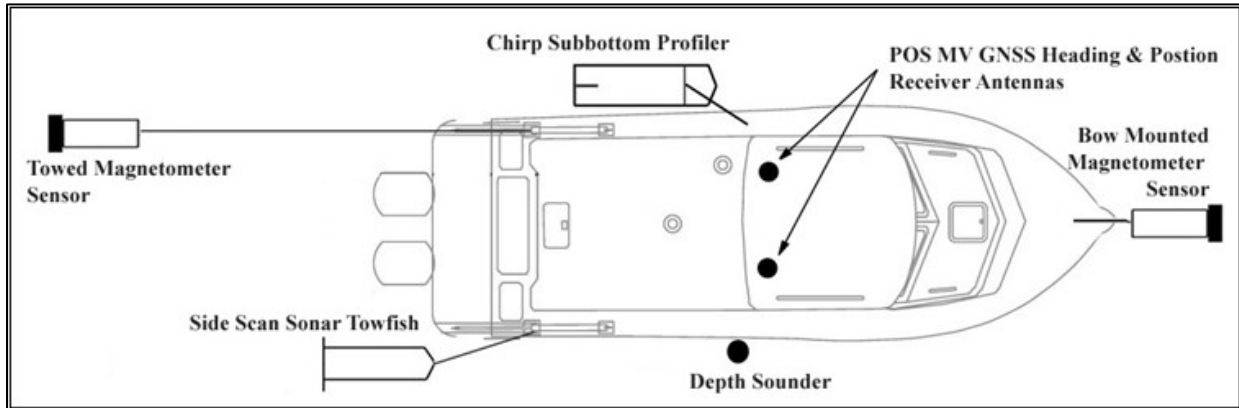


Figure 2. Overview of equipment layout and general sensor configuration maintained onboard the vessel. Note vessel sketch not to scale.

Project horizontal reference is Florida State Plane Coordinate System, West Zone (0902), NAD 83 in US Survey Feet. Project vertical reference is the North American Vertical Datum of 1988 (NAVD88) feet. Water depths were corrected for tidal variations and reduced to Project vertical datum based on a blended correction solution developed from predicted water level data obtained from the National Oceanic and Atmospheric Administration (NOAA) and Network Real-Time Kinematic (NRTK) water levels recorded on the survey vessel during data acquisition.

Three-dimensional (3-D) positioning of the survey vessel was accomplished utilizing a Trimble MPS865 interfaced with a computer running HYPACK, a PC-based navigation and data logging software package. Correctors from the Florida Department of Transportation Permanent Reference Network (FPRN) were employed resulting in nearly full time NRTK-quality 3-D positioning throughout the survey.

Prior to commencing the survey, an NRTK Global Navigation Satellite System (GNSS) rover (Trimble R8 with a TSC3 Data Collector) was employed to confirm the suitability of the FPRN correctors. The rover was used to occupy a local U.S. Army Corps of Engineers (ACOE) Online Positioning Users Service (OPUS) Shared Solution control point, “Estero 101” (PID: BBDV83). The 2015-published coordinates of the ACOE control point are provided in Table 1 below.

**Table 1 - Survey Control**

Designation (PID)	Latitude (N)	Longitude (W)	NAVD88
ESTERO 101 (BBDV83)	29° 26' 12.15899"	-081° 55' 20.90810"	4.73'

**Data Processing and Products**

Following completion of the field work, the acquired data sets were processed and interpreted. Table 3 lists the processing software used for each data set. Attachment 1 provides tables summarizing the magnetic anomalies and side scan sonar targets identified during the investigation along with thumbnail images for each sonar target.

**Table 3 - Data Processing Software**

Data Set	Processing Software
Navigation & Hydrographic Data	HYPACK single beam editor software (tracklines and depth soundings). QuickSurf digital terrain modeling and Blue Marble’s Geographics Global Mapper software packages to generate the hydrographic contours and sun-illuminated sounding surface.
Magnetometer Data	HYPACK magnetometer editor software.
Side Scan Sonar Imagery	Chesapeake Technologies, Inc. SonarWiz side scan sonar processing software.
Chirp Subbottom Profile Data	Chesapeake Technologies, Inc. SonarWiz subbottom processing software.

To illustrate the results of the field investigation and data analysis, two Project drawings were constructed with two panels on ANSI B size drawing sheets (11 by 17 inches) at a scale of 1 inch = 1,000 feet. The upper panel presents survey vessel tracklines (with events and run/line designations) and one-foot depth contours (referenced to NAVD88) overlain on a colorized image of the modeled depth surface. The lower panel presents a side scan sonar mosaic overlain by individual sonar target and magnetic anomaly locations and designations. To aid in review, magnetic anomalies have been grouped into three classes based on amplitude (Class 1: ≤ 25 gammas, Class 2: >25 -100 gammas, Class 3: >100 gammas).

The drawings are presented in full size in Attachment 2. Digital drawing files (AutoCAD and PDF formats), a copy of this report (PDF format), chirp subbottom profiles (jpg format) and a survey trackline log (PDF format) are provided in the report’s digital appendix along with ASCII files containing processed soundings. All raw digital data files acquired during the survey (HYPACK, side scan sonar, and subbottom profile) will be archived in-house.





Project archaeologists (RCG&A) have been provided processed data for the corridor to review for potential cultural resources. Their review (if warranted) will develop a list of targets or archaeologically sensitive areas for which additional investigation or avoidance will be recommended. RCG&A's review will be submitted under separate cover.

### **Data Analysis and Discussion**

Hydrographic, magnetometer and subbottom profile data together with side scan sonar imagery documented current seafloor and subsurface conditions within the Bonita Beach pipeline corridor. The primary objective of this investigation was to identify potential cultural resources and obstructions that might be impacted or impact future Project activities. As mentioned, all data and analysis have been submitted to the project archaeologist to perform a cultural resource assessment. The discussion presented herein does not include their assessment.

Seasonal variations, storm events, and/or anthropogenic influence since the time of these investigations may have altered conditions reported herein. Depth references are in feet relative to NAVD88. Stationing in the corridor is in feet and originates at Bonita Beach, increasing westward to the Lovers Key nearshore pump-out area.

Measured water depths along the corridor ranged from approximately 24 feet near the pump-out to less than 6 feet just offshore Bonita Beach. The seafloor generally slopes upward from the pump-out to approximately STA 40+00 where water depths of 18 feet were measured. Continuing toward shore, the seafloor slopes up increasingly steeply especially east of STA 16+00 where water depths rapidly shoal from greater than 15 feet to less than 6 feet.

The side scan sonar mosaic shows the seabed is generally smooth with an absence of complex bedforms throughout the corridor, with two notable exceptions. Offshore, near the pump-out area, from STA 154+00 to STA 148+50 a series of intermittently spaced apparent sand wave-like features are visible in the side scan sonar mosaic. While these northeast-southwest oriented features appear prominent in the side scan imagery, they generally have less than a half foot of relief, and their presence is typically not reflected in the hydrographic contours. Nearshore, at STA 34+00 there is a notable change in seabed reflectivity from the lighter generally smooth appearance offshore to a darker more mottled appearance. From approximately STA 11+00 to shore, side scan sonar imagery documents discontinuous low relief sand waves and ripples. Their proximity and semi-parallel orientation to the shoreline suggests these may be transient tide-related features.

Analysis of the HRG data sets found no apparent signatures of hard bottom exposures on the seafloor within the pipeline corridor. The chirp subbottom profiler did image a reflector in the shallow subsurface, overlain by only a veneer of sediment (typically <5 feet) that might be related to hardbottom and/or a change in sediment type or compaction just below the seafloor. The identified shallow subsurface reflector was clearly and continuously resolved from the pump-out



area to STA 112+50 but was only discontinuously resolved east of STA 112+50 to Bonita Beach. Figure 3 provides a section of chirp subbottom profiler data acquired within the corridor (near STA 128+50) that identifies the shallow subbottom reflector (interpreted as possible hard bottom and/or a change in sediment type or compaction) overlain by a thin veneer of sediment.

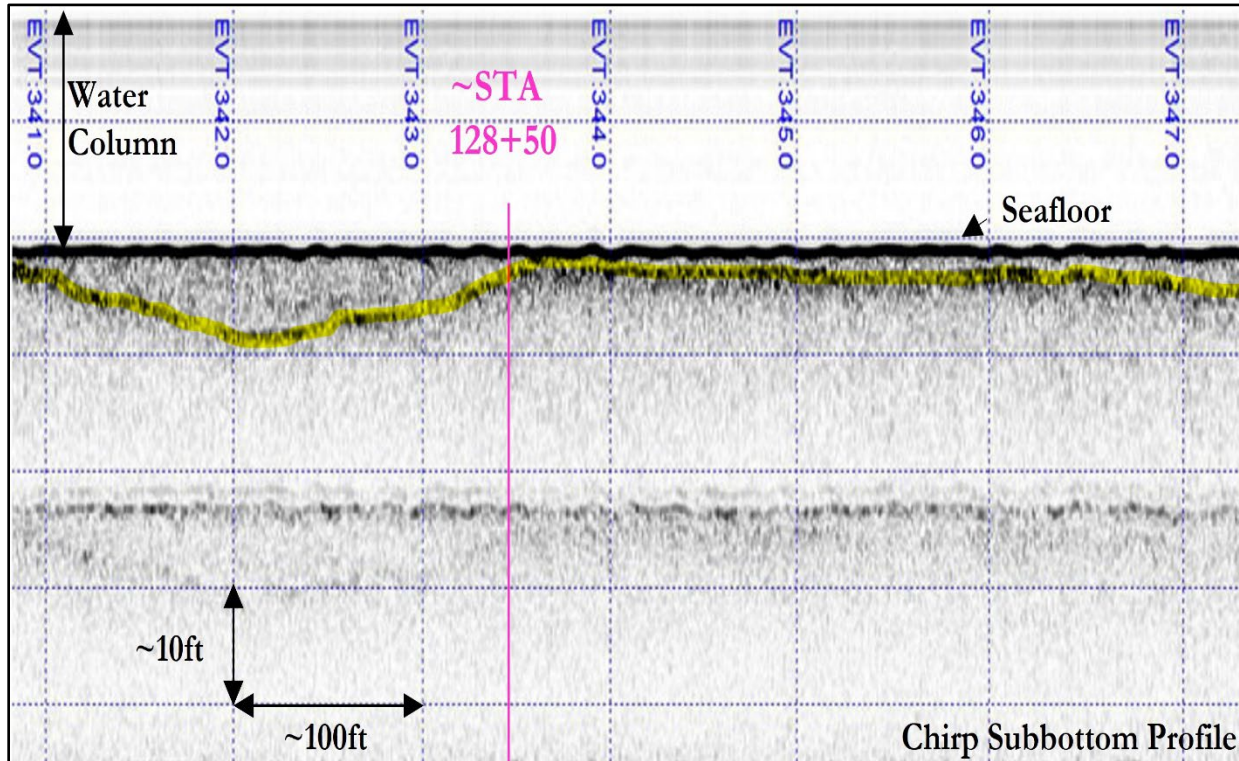


Figure 3. Representative chirp subbottom profile acquired along the centerline of the pipeline corridor near STA 128+50 identifying the shallow subbottom reflector (yellow), possibly correlative with hard bottom or change in sediment type, overlain by a thin veneer of sediment.

Side scan sonar imagery and magnetometer data were reviewed to identify features that could potentially impact or be impacted by the Project. A total of forty-three side scan sonar targets were detected within the pipeline corridor, all of which are relatively small, isolated and scattered throughout the corridor. Only one target, BBS31 is associated with a magnetic anomaly, (BBM9, 6 gammas). There were no note-worthy clusters of side scan sonar targets although there was a slightly higher density of targets in the nearshore area, but there are no indications that the targets are related to one another. A total of thirteen magnetic anomalies were detected within the pipeline corridor. All anomalies were less than 20 gammas (Class 1) and were isolated, scattered throughout the area. There were no linear alignments or clusters of anomalies identified within the pipeline corridor.

### **Summary and Recommendations**

The investigation described herein was completed as part of and in accordance with all specifications for the previous Lovers Key surveys to support future beach nourishment projects on Lovers Key and Bonita Beach. This investigation focused on acquiring HRG data within the proposed Bonita Beach pipeline corridor to characterize the seafloor and subsurface conditions in order to identify potential obstructions and cultural resources that could impact or be impacted by the Project.

Measured water depths within the corridor range from approximately 24 feet at the pump-out to less than 6 feet, just offshore Bonita Beach. The seafloor within the corridor is relatively featureless with only a few sandwave-like bedforms identified. There is no evidence of any hardbottom exposures within the pipeline corridor. Side scan sonar targets and magnetic anomalies were generally small and scattered throughout the corridor and no discernable clusters or linear alignments were identified.

Although every effort has been made to identify potential obstacles from analysis of the acquired sonar imagery it should be noted that side scan sonar only detects objects lying on the bottom and cannot detect objects buried beneath the seafloor. Similarly, the magnetometer only senses objects of ferrous mass lying on or below the seafloor, therefore utilities such as fiberoptic cables with no ferrous mass buried below the seafloor would not be detectable. When planning future project activities within the corridor, it is advised that all targets and anomalies identified within the pipeline corridor be reviewed to understand their full extent and potential impact on the Project.





**ATTACHMENT 1**

**SUMMARY TABLES OF  
MAGNETIC ANOMALIES, SIDE SCAN SONAR TARGETS  
AND SIDE SCAN SONAR TARGET REPORTS**



**MAGNETIC ANOMALIES**  
**Bonita Beach Survey November 4, 2021**

Magnetic Anomaly	Easting <sup>1</sup>	Northing <sup>1</sup>	Latitude <sup>2</sup>	Longitude <sup>2</sup>	Type <sup>3</sup>	Amplitude <sup>4</sup>	Duration <sup>5</sup>	Sensor Altitude <sup>5</sup>	Event	Sonar Target Correlation	Class <sup>6</sup>	Run/Line
BBM1	701528	735776	26.357837	81.861471	M+	7	31	12	92.2		1	4/5
BBM2	700926	735937	26.358282	81.863308	M-	5	23	14	181.1		1	6/4
BBM3	694743	736690	26.360370	81.882189	Di	19	53	14	287.4		1	9/1
BBM4	683220	738090	26.364247	81.917377	Di	15	61	17	444.4		1	11/3
BBM5	693492	737010	26.361254	81.886008	Di	15	60	15	546.7		1	11/3
BBM6	695091	736840	26.360782	81.881126	M-	18	50	15	562.8		1	11/3
BBM7	696381	736709	26.360418	81.877186	M+	5	43	14	575.7		1	11/3
BBM8	697681	736189	26.358984	81.873218	M-	13	35	14	611.7		1	12/5
BBM9	697929	736452	26.359707	81.872459	M+	6	33	13	945.4	BBS31	1	13/2
BBM10	696826	736368	26.359479	81.875828	M+	5	34	14	978.3		1	14/4
BBM11	685591	737562	26.362790	81.910137	M+	19	49	17	1091.3		1	14/4
BBM12	693503	737016	26.361270	81.885975	M-	14	56	16	1223.5		1	27/18
BBM13	700474	736058	26.358616	81.864688	Di	11	38	9	1265.7		1	34/25

<sup>1</sup>Coordinates are in feet in the FL State Plane Coordinate System, West Zone, NAD 83.

<sup>2</sup>Geographical coordinates are decimal degrees referenced to NAD 83.

<sup>3</sup>M+ - positive monopole, M- - negative monopole, Di – dipole, Cd – complex dipole.

<sup>4</sup>Amplitude is measured in Gammas (note: 1Gamma (γ) = 1 Nanotesla (nT))

<sup>5</sup>Duration and Sensor Altitude are measured in feet.

<sup>6</sup>Class 1: ≤ 25 gammas, Class 2: >25 -100 gammas, Class 3: >100 gammas.

**SIDE SCAN SONAR TARGETS**  
**Bonita Beach Survey November 4, 2021**

Sonar Target	Easting <sup>1</sup>	Northing <sup>1</sup>	Latitude <sup>2</sup>	Longitude <sup>2</sup>	Length <sup>3</sup>	Width <sup>3</sup>	Height <sup>3</sup>	Description	Magnetic Anomaly
BBS1	681551	738079	26.364218	81.922476	2.6	1.6	0.8	Oblong Target	
BBS2	681647	738066	26.364185	81.922181	3.7	1.9	0.9	Oblong Target	
BBS3	681692	738234	26.364645	81.922044	10.3	0.7	0.9	Linear Target	
BBS4	682318	737807	26.363468	81.920132	4.1	1.6	0.5	Oblong Target	
BBS5	682849	737864	26.363625	81.918512	4	0.9	0.9	Linear Target	
BBS6	682895	737827	26.363523	81.918369	2.1	1.9	1.1	Oblong Target	
BBS7	683638	737785	26.363407	81.916101	3.5	3.4	0.8	Oblong Target	
BBS8	684663	737744	26.363291	81.912970	2.4	1.3	0.9	Oblong Target	
BBS9	685761	737824	26.363511	81.909616	2.1	1.9	1.1	Oblong Target	
BBS10	685840	737526	26.362691	81.909376	2.5	2	1	Oblong Target	
BBS11	686425	737543	26.362736	81.907589	2.8	2.4	0.7	Oblong Target	
BBS12	686439	737404	26.362353	81.907548	2.3	1.9	1.3	Oblong Target	
BBS13	688421	737410	26.362365	81.901495	2.7	2.3	1	Oblong Target	
BBS14	688626	737399	26.362336	81.900867	3.2	2.2	0.8	Oblong Target	
BBS15	690263	737158	26.361668	81.895868	2.6	1.7	0.9	Oblong Target	
BBS16	691159	737246	26.361908	81.893132	3.2	2.1	1	Oblong Target	
BBS17	691569	737117	26.361554	81.891881	5	2.6	1.5	Oblong Target	
BBS18	692099	737075	26.361435	81.890262	2.4	3	1.5	Oblong Target	
BBS19	692271	737060	26.361393	81.889736	2.2	1.6	0.6	Oblong Target	
BBS20	692778	737043	26.361346	81.888189	3	2.2	1.3	Oblong Target	
BBS21	694140	736830	26.360757	81.884029	2.8	2	0.8	Oblong Target	
BBS22	694219	736858	26.360833	81.883788	3.4	1.8	0.5	Oblong Target	
BBS23	694559	736818	26.360724	81.882752	2.8	1.6	0.7	Oblong Target	
BBS24	694616	736828	26.360749	81.882575	2.5	1.1	1.3	Oblong Target	
BBS25	694805	736607	26.360142	81.882001	1.8	1.5	1	Oblong Target	

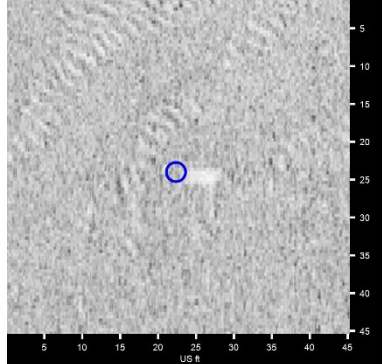
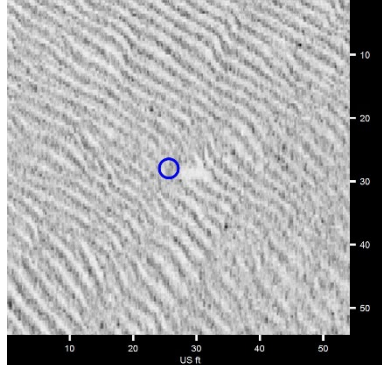
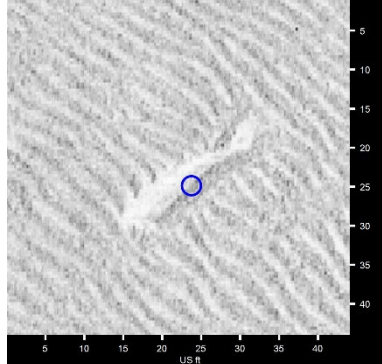
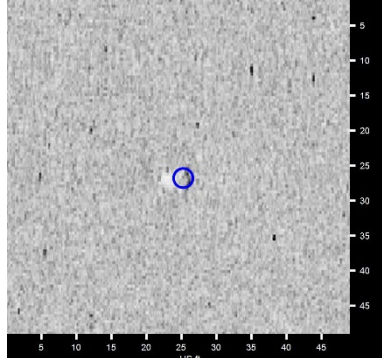
<b>Sonar Target</b>	<b>Easting<sup>1</sup></b>	<b>Northing<sup>1</sup></b>	<b>Latitude<sup>2</sup></b>	<b>Longitude<sup>2</sup></b>	<b>Length<sup>3</sup></b>	<b>Width<sup>3</sup></b>	<b>Height<sup>3</sup></b>	<b>Description</b>	<b>Magnetic Anomaly</b>
BBS26	694837	736752	26.360539	81.881902	2.5	1.8	0.9	Oblong Target	
BBS27	694922	736808	26.360693	81.881642	2.4	1.9	0.6	Oblong Target	
BBS28	695208	736581	26.360070	81.880769	3.4	2.8	0.5	Oblong Target	
BBS29	697294	736248	26.359148	81.874401	2	1.4	0.8	Oblong Target	
BBS30	697892	736252	26.359157	81.872572	3.2	1.4	0.5	Oblong Target	
BBS31	697944	736459	26.359727	81.872412	2.9	3.1	1.4	Oblong Target	BBM9
BBS32	698829	736464	26.359739	81.869712	2.7	1.4	1.3	Oblong Target	
BBS33	698887	736036	26.358559	81.869535	3.7	2.6	2.7	Oblong Target	
BBS34	699257	736128	26.358812	81.868405	5.4	1.8	1.1	Oblong Target	
BBS35	699329	736411	26.359590	81.868183	2.4	2	2.3	Oblong Target	
BBS36	699402	736106	26.358751	81.867963	4.1	2.6	1.7	Oblong Target	
BBS37	699570	736261	26.359177	81.867450	9.6	2.3	1.8	Oblong Target	
BBS38	699761	736024	26.358525	81.866866	3.1	1.7	1.2	Oblong Target	
BBS39	700113	736222	26.359067	81.865791	6.9	3	2.4	Oblong Target	
BBS40	700455	736276	26.359217	81.864747	9.4	8.7	2.3	Oblong Target	

<sup>1</sup>Coordinates are in feet in the FL State Plane Coordinate System, West Zone, NAD 83.

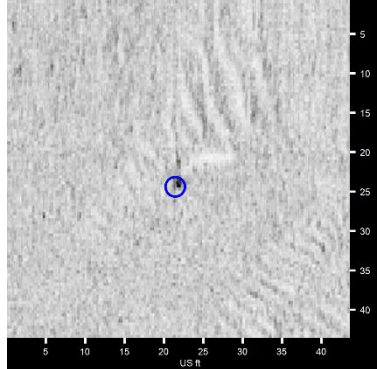
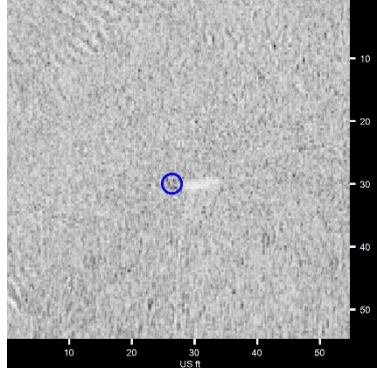
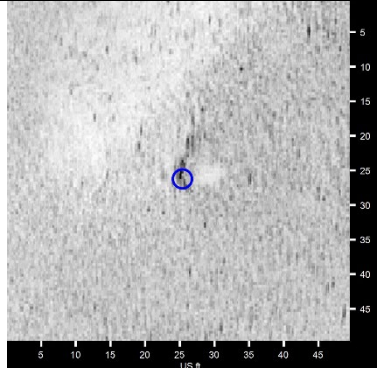
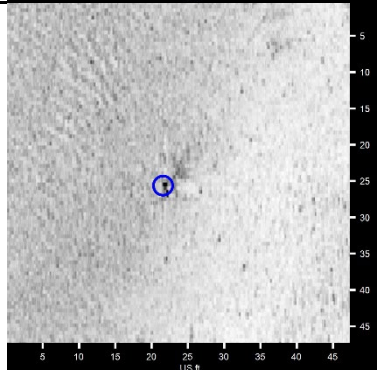
<sup>2</sup>Geographical coordinates are decimal degrees referenced to NAD 83.

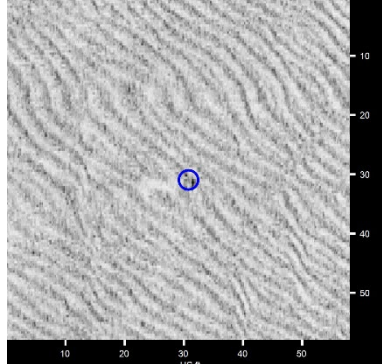
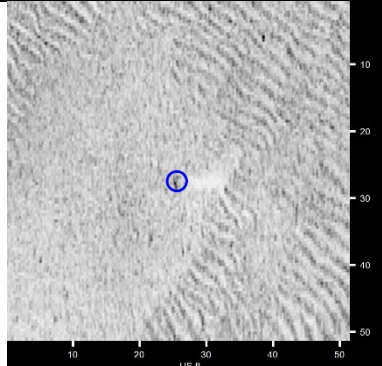
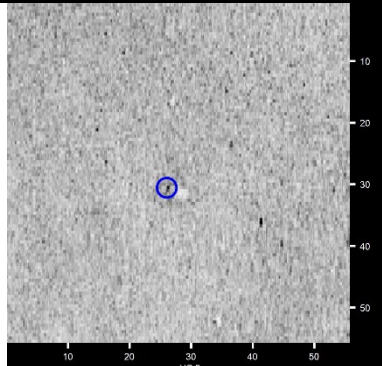
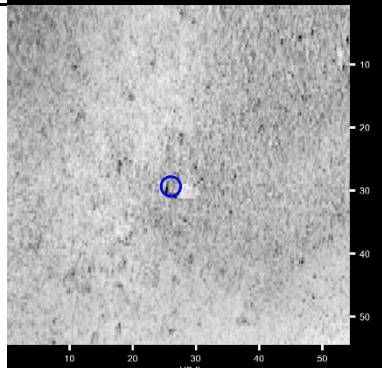
<sup>3</sup>All measurements are in feet.

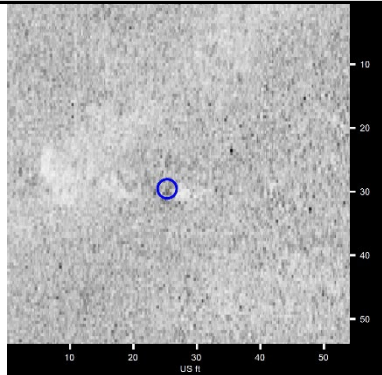
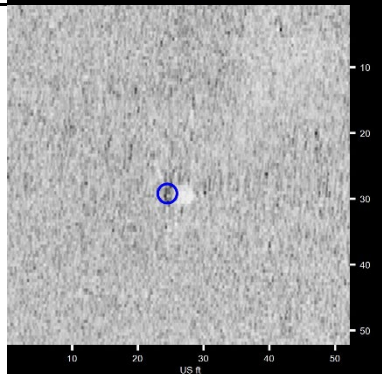
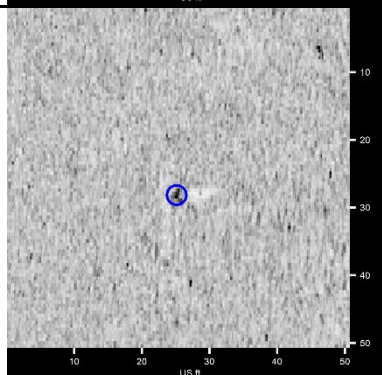
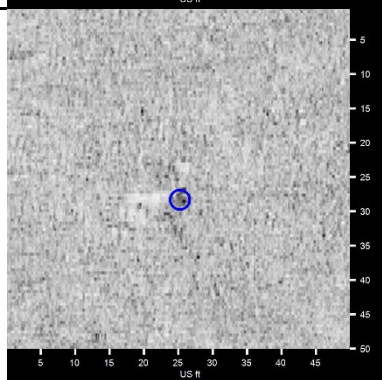
**SIDE SCAN SONAR TARGETS**  
**Bonita Beach Survey November 4, 2021**

Target Image	Target Info	Description
	<p><b>BBS1</b></p> <p>26.3642180002 -81.9224755926 (WGS84)            (X) 681550.55 (Y) 738078.57 (Projected            Coordinates)</p>	<p><b>Dimensions and attributes</b></p> <ul style="list-style-type: none"> <li>• Target Length: 2.6 US ft</li> <li>• Target Width: 1.6 US ft</li> <li>• Target Height: 0.8 US ft</li> <li>• Description: Oblong Target</li> </ul>
	<p><b>BBS2</b></p> <p>26.3641846295 -81.9221808062 (WGS84)            (X) 681647.08 (Y) 738066.50 (Projected            Coordinates)</p>	<p><b>Dimensions and attributes</b></p> <ul style="list-style-type: none"> <li>• Target Length: 3.7 US ft</li> <li>• Target Width: 1.9 US ft</li> <li>• Target Height: 0.9 US ft</li> <li>• Description: Oblong Target</li> </ul>
	<p><b>BBS3</b></p> <p>26.3646452271 -81.9220443565 (WGS84)            (X) 681691.65 (Y) 738233.94 (Projected            Coordinates)</p>	<p><b>Dimensions and attributes</b></p> <ul style="list-style-type: none"> <li>• Target Length: 10.3 US ft</li> <li>• Target Width: 0.7 US ft</li> <li>• Target Height: 0.9 US ft</li> <li>• Description: Linear Target</li> </ul>
	<p><b>BBS4</b></p> <p>26.3634683545 -81.9201317041 (WGS84)            (X) 682318.18 (Y) 737806.56 (Projected            Coordinates)</p>	<p><b>Dimensions and attributes</b></p> <ul style="list-style-type: none"> <li>• Target Length: 4.1 US ft</li> <li>• Target Width: 1.6 US ft</li> <li>• Target Height: 0.5 US ft</li> <li>• Description: Oblong Target</li> </ul>



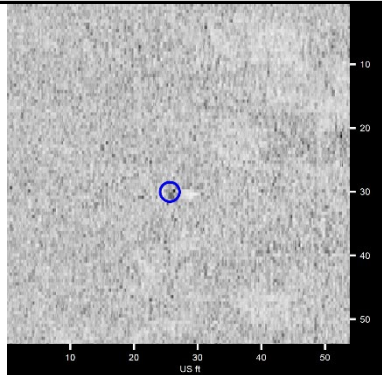
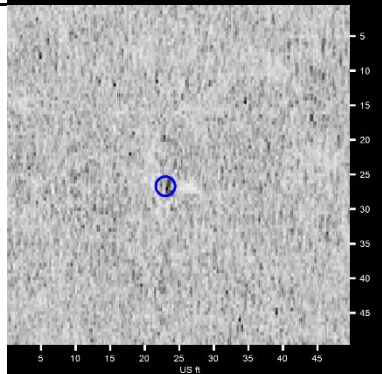
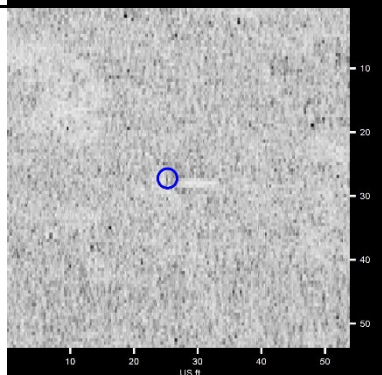
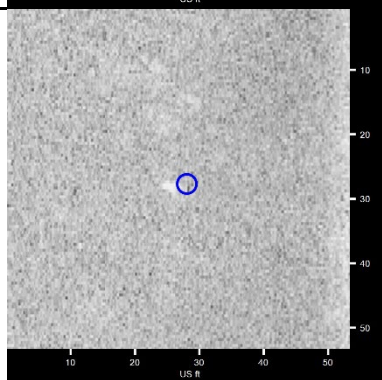
Target Image	Target Info	Description
	<p><b>BBS5</b></p> <p>26.3636248565 -81.9185117294 (WGS84)            (X) 682848.58 (Y) 737863.78 (Projected            Coordinates)</p>	<p><b>Dimensions and attributes</b></p> <ul style="list-style-type: none"> <li>• Target Length: 4.0 US ft</li> <li>• Target Width: 0.9 US ft</li> <li>• Target Height: 0.9 US ft</li> <li>• Description: Linear Target</li> </ul>
	<p><b>BBS6</b></p> <p>26.3635234935 -81.9183690210 (WGS84)            (X) 682895.33 (Y) 737826.96 (Projected            Coordinates)</p>	<p><b>Dimensions and attributes</b></p> <ul style="list-style-type: none"> <li>• Target Length: 2.1 US ft</li> <li>• Target Width: 1.9 US ft</li> <li>• Target Height: 1.1 US ft</li> <li>• Description: Oblong Target</li> </ul>
	<p><b>BBS7</b></p> <p>26.3634065274 -81.9161007767 (WGS84)            (X) 683638.05 (Y) 737784.93 (Projected            Coordinates)</p>	<p><b>Dimensions and attributes</b></p> <ul style="list-style-type: none"> <li>• Target Length: 3.5 US ft</li> <li>• Target Width: 3.4 US ft</li> <li>• Target Height: 0.8 US ft</li> <li>• Description: Oblong Target</li> </ul>
	<p><b>BBS8</b></p> <p>26.3632910053 -81.9129703643 (WGS84)            (X) 684663.08 (Y) 737743.62 (Projected            Coordinates)</p>	<p><b>Dimensions and attributes</b></p> <ul style="list-style-type: none"> <li>• Target Length: 2.4 US ft</li> <li>• Target Width: 1.3 US ft</li> <li>• Target Height: 0.9 US ft</li> <li>• Description: Oblong Target</li> </ul>

Target Image	Target Info	Description
	<p><b>BBS9</b></p> <p>26.3635107095 -81.9096157483 (WGS84) (X) 685761.44 (Y) 737824.23 (Projected Coordinates)</p>	<p><b>Dimensions and attributes</b></p> <ul style="list-style-type: none"> <li>• Target Length: 2.1 US ft</li> <li>• Target Width: 1.9 US ft</li> <li>• Target Height: 1.1 US ft</li> <li>• Description: Oblong Target</li> </ul>
	<p><b>BBS10</b></p> <p>26.3626910183 -81.9093764367 (WGS84) (X) 685840.01 (Y) 737526.35 (Projected Coordinates)</p>	<p><b>Dimensions and attributes</b></p> <ul style="list-style-type: none"> <li>• Target Length: 2.5 US ft</li> <li>• Target Width: 2.0 US ft</li> <li>• Target Height: 1.0 US ft</li> <li>• Description: Oblong Target</li> </ul>
	<p><b>BBS11</b></p> <p>26.3627363095 -81.9075887300 (WGS84) (X) 686425.35 (Y) 737543.22 (Projected Coordinates)</p>	<p><b>Dimensions and attributes</b></p> <ul style="list-style-type: none"> <li>• Target Length: 2.8 US ft</li> <li>• Target Width: 2.4 US ft</li> <li>• Target Height: 0.7 US ft</li> <li>• Description: Oblong Target</li> </ul>
	<p><b>BBS12</b></p> <p>26.3623532805 -81.9075484281 (WGS84) (X) 686438.65 (Y) 737404.01 (Projected Coordinates)</p>	<p><b>Dimensions and attributes</b></p> <ul style="list-style-type: none"> <li>• Target Length: 2.3 US ft</li> <li>• Target Width: 1.9 US ft</li> <li>• Target Height: 1.3 US ft</li> <li>• Description: Oblong Target</li> </ul>

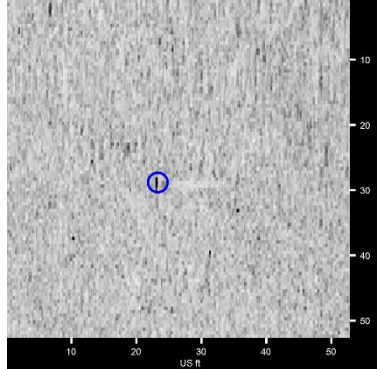
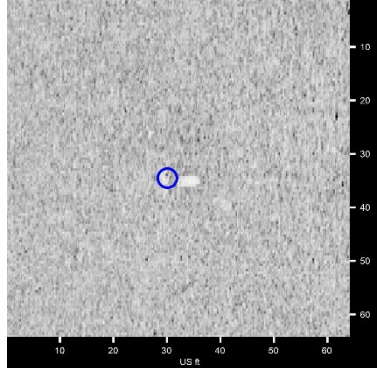
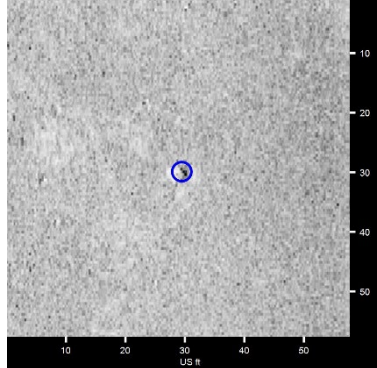
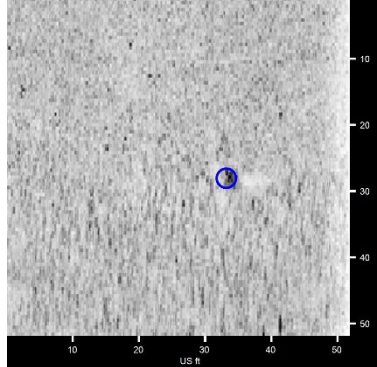
Target Image	Target Info	Description
	<p><b>BBS13</b></p> <p>26.3623653789 -81.9014952321 (WGS84) (X) 688420.68 (Y) 737409.88 (Projected Coordinates)</p>	<p><b>Dimensions and attributes</b></p> <ul style="list-style-type: none"> <li>• Target Length: 2.7 US ft</li> <li>• Target Width: 2.3 US ft</li> <li>• Target Height: 1.0 US ft</li> <li>• Description: Oblong Target</li> </ul>
	<p><b>BBS14</b></p> <p>26.3623362486 -81.9008672731 (WGS84) (X) 688626.31 (Y) 737399.45 (Projected Coordinates)</p>	<p><b>Dimensions and attributes</b></p> <ul style="list-style-type: none"> <li>• Target Length: 3.2 US ft</li> <li>• Target Width: 2.2 US ft</li> <li>• Target Height: 0.8 US ft</li> <li>• Description: Oblong Target</li> </ul>
	<p><b>BBS15</b></p> <p>26.3616680348 -81.8958680508 (WGS84) (X) 690263.43 (Y) 737157.86 (Projected Coordinates)</p>	<p><b>Dimensions and attributes</b></p> <ul style="list-style-type: none"> <li>• Target Length: 2.6 US ft</li> <li>• Target Width: 1.7 US ft</li> <li>• Target Height: 0.9 US ft</li> <li>• Description: Oblong Target</li> </ul>
	<p><b>BBS16</b></p> <p>26.3619077540 -81.8931320641 (WGS84) (X) 691159.23 (Y) 737245.72 (Projected Coordinates)</p>	<p><b>Dimensions and attributes</b></p> <ul style="list-style-type: none"> <li>• Target Length: 3.2 US ft</li> <li>• Target Width: 2.1 US ft</li> <li>• Target Height: 1.0 US ft</li> <li>• Description: Oblong Target</li> </ul>

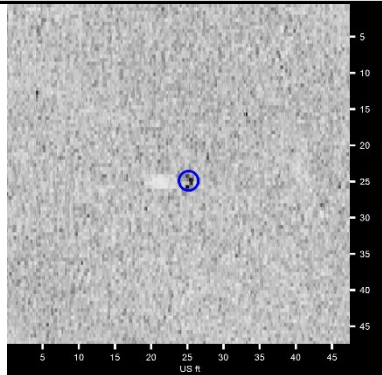
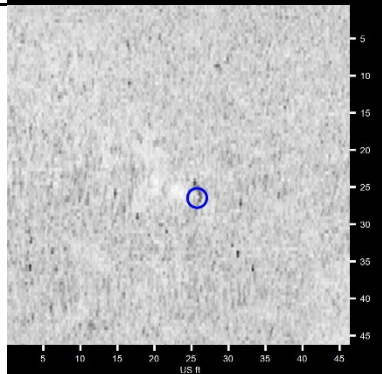
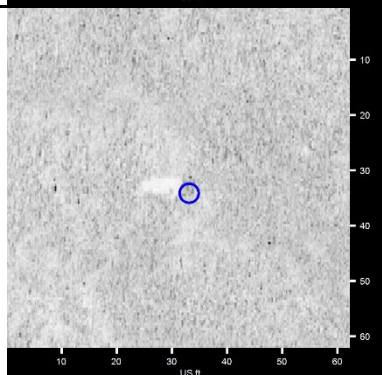
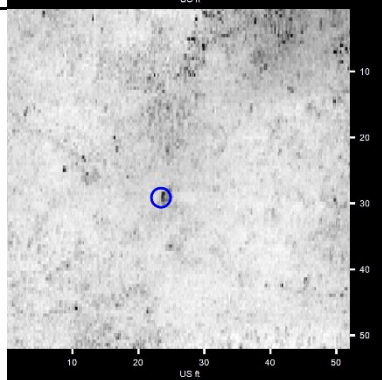
Target Image	Target Info	Description
	<p><b>BBS17</b></p> <p>26.3615535856 -81.8918806399 (WGS84)            (X) 691569.10 (Y) 737117.33 (Projected            Coordinates)</p>	<p><b>Dimensions and attributes</b></p> <ul style="list-style-type: none"> <li>• Target Length: 5.0 US ft</li> <li>• Target Width: 2.6 US ft</li> <li>• Target Height: 1.5 US ft</li> <li>• Description: Oblong Target</li> </ul>
	<p><b>BBS18</b></p> <p>26.3614347336 -81.8902620951 (WGS84)            (X) 692099.11 (Y) 737074.58 (Projected            Coordinates)</p>	<p><b>Dimensions and attributes</b></p> <ul style="list-style-type: none"> <li>• Target Length: 2.4 US ft</li> <li>• Target Width: 3.0 US ft</li> <li>• Target Height: 1.5 US ft</li> <li>• Description: Oblong Target</li> </ul>
	<p><b>BBS19</b></p> <p>26.3613933477 -81.8897362360 (WGS84)            (X) 692271.31 (Y) 737059.68 (Projected            Coordinates)</p>	<p><b>Dimensions and attributes</b></p> <ul style="list-style-type: none"> <li>• Target Length: 2.2 US ft</li> <li>• Target Width: 1.6 US ft</li> <li>• Target Height: 0.6 US ft</li> <li>• Description: Oblong Target</li> </ul>
	<p><b>BBS20</b></p> <p>26.3613459609 -81.8881886410 (WGS84)            (X) 692778.07 (Y) 737042.90 (Projected            Coordinates)</p>	<p><b>Dimensions and attributes</b></p> <ul style="list-style-type: none"> <li>• Target Length: 3.0 US ft</li> <li>• Target Width: 2.2 US ft</li> <li>• Target Height: 1.3 US ft</li> <li>• Description: Oblong Target</li> </ul>

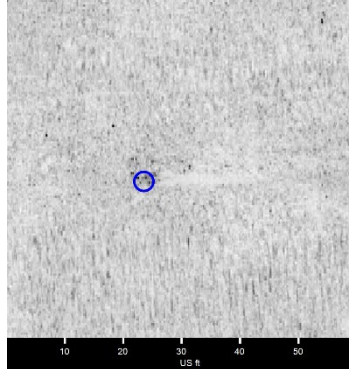
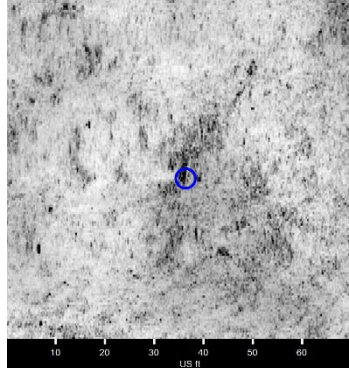
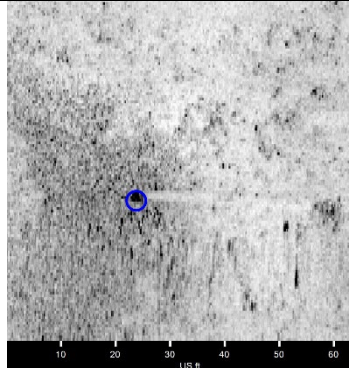
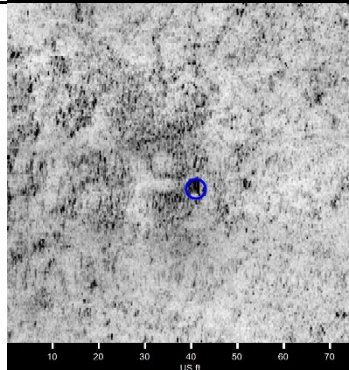


Target Image	Target Info	Description
	<p><b>BBS21</b></p> <p>26.3607570757 -81.8840286340 (WGS84)            (X) 694140.41 (Y) 736830.05 (Projected            Coordinates)</p>	<p><b>Dimensions and attributes</b></p> <ul style="list-style-type: none"> <li>• Target Length: 2.8 US ft</li> <li>• Target Width: 2.0 US ft</li> <li>• Target Height: 0.8 US ft</li> <li>• Description: Oblong Target</li> </ul>
	<p><b>BBS22</b></p> <p>26.3608325452 -81.8837876285 (WGS84)            (X) 694219.30 (Y) 736857.56 (Projected            Coordinates)</p>	<p><b>Dimensions and attributes</b></p> <ul style="list-style-type: none"> <li>• Target Length: 3.4 US ft</li> <li>• Target Width: 1.8 US ft</li> <li>• Target Height: 0.5 US ft</li> <li>• Description: Oblong Target</li> </ul>
	<p><b>BBS23</b></p> <p>26.3607240655 -81.8827516946 (WGS84)            (X) 694558.54 (Y) 736818.43 (Projected            Coordinates)</p>	<p><b>Dimensions and attributes</b></p> <ul style="list-style-type: none"> <li>• Target Length: 2.8 US ft</li> <li>• Target Width: 1.6 US ft</li> <li>• Target Height: 0.7 US ft</li> <li>• Description: Oblong Target</li> </ul>
	<p><b>BBS24</b></p> <p>26.3607491671 -81.8825751247 (WGS84)            (X) 694616.35 (Y) 736827.61 (Projected            Coordinates)</p>	<p><b>Dimensions and attributes</b></p> <ul style="list-style-type: none"> <li>• Target Length: 2.5 US ft</li> <li>• Target Width: 1.1 US ft</li> <li>• Target Height: 1.3 US ft</li> <li>• Description: Oblong Target</li> </ul>



Target Image	Target Info	Description
	<p><b>BBS25</b></p> <p>26.3601416428 -81.8820005307 (WGS84) (X) 694804.70 (Y) 736606.96 (Projected Coordinates)</p>	<p><b>Dimensions and attributes</b></p> <ul style="list-style-type: none"> <li>• Target Length: 1.8 US ft</li> <li>• Target Width: 1.5 US ft</li> <li>• Target Height: 1.0 US ft</li> <li>• Description: Oblong Target</li> </ul>
	<p><b>BBS26</b></p> <p>26.3605393484 -81.8819015742 (WGS84) (X) 694836.97 (Y) 736751.55 (Projected Coordinates)</p>	<p><b>Dimensions and attributes</b></p> <ul style="list-style-type: none"> <li>• Target Length: 2.5 US ft</li> <li>• Target Width: 1.8 US ft</li> <li>• Target Height: 0.9 US ft</li> <li>• Description: Oblong Target</li> </ul>
	<p><b>BBS27</b></p> <p>26.3606933471 -81.8816420613 (WGS84) (X) 694921.89 (Y) 736807.60 (Projected Coordinates)</p>	<p><b>Dimensions and attributes</b></p> <ul style="list-style-type: none"> <li>• Target Length: 2.4 US ft</li> <li>• Target Width: 1.9 US ft</li> <li>• Target Height: 0.6 US ft</li> <li>• Description: Oblong Target</li> </ul>
	<p><b>BBS28</b></p> <p>26.3600696270 -81.8807688586 (WGS84) (X) 695208.02 (Y) 736581.16 (Projected Coordinates)</p>	<p><b>Dimensions and attributes</b></p> <ul style="list-style-type: none"> <li>• Target Length: 3.4 US ft</li> <li>• Target Width: 2.8 US ft</li> <li>• Target Height: 0.5 US ft</li> <li>• Description: Oblong Target</li> </ul>

Target Image	Target Info	Description
	<p><b>BBS29</b></p> <p>26.3591479302 -81.8744007531 (WGS84) (X) 697293.54 (Y) 736248.12 (Projected Coordinates)</p>	<p><b>Dimensions and attributes</b></p> <ul style="list-style-type: none"> <li>• Target Length: 2.0 US ft</li> <li>• Target Width: 1.4 US ft</li> <li>• Target Height: 0.8 US ft</li> <li>• Description: Oblong Target</li> </ul>
	<p><b>BBS30</b></p> <p>26.3591573446 -81.8725716201 (WGS84) (X) 697892.48 (Y) 736252.13 (Projected Coordinates)</p>	<p><b>Dimensions and attributes</b></p> <ul style="list-style-type: none"> <li>• Target Length: 3.2 US ft</li> <li>• Target Width: 1.4 US ft</li> <li>• Target Height: 0.5 US ft</li> <li>• Description: Oblong Target</li> </ul>
	<p><b>BBS31</b></p> <p>26.3597269435 -81.8724121216 (WGS84) (X) 697944.50 (Y) 736459.22 (Projected Coordinates)</p>	<p><b>Dimensions and attributes</b></p> <ul style="list-style-type: none"> <li>• Target Length: 2.9 US ft</li> <li>• Target Width: 3.1 US ft</li> <li>• Target Height: 1.4 US ft</li> <li>• Description: Oblong Target</li> </ul>
	<p><b>BBS32</b></p> <p>26.3597390442 -81.8697116005 (WGS84) (X) 698828.76 (Y) 736464.50 (Projected Coordinates)</p>	<p><b>Dimensions and attributes</b></p> <ul style="list-style-type: none"> <li>• Target Length: 2.7 US ft</li> <li>• Target Width: 1.4 US ft</li> <li>• Target Height: 1.3 US ft</li> <li>• Description: Oblong Target</li> </ul>

Target Image	Target Info	Description
	<p><b>BBS33</b></p> <p>26.3585589955 -81.8695349487 (WGS84)            (X) 698887.04 (Y) 736035.64 (Projected Coordinates)</p>	<p><b>Dimensions and attributes</b></p> <ul style="list-style-type: none"> <li>• Target Length: 3.7 US ft</li> <li>• Target Width: 2.6 US ft</li> <li>• Target Height: 2.7 US ft</li> <li>• Description: Oblong Target</li> </ul>
	<p><b>BBS34</b></p> <p>26.3588124170 -81.8684047015 (WGS84)            (X) 699257.04 (Y) 736128.13 (Projected Coordinates)</p>	<p><b>Dimensions and attributes</b></p> <ul style="list-style-type: none"> <li>• Target Length: 5.4 US ft</li> <li>• Target Width: 1.8 US ft</li> <li>• Target Height: 1.1 US ft</li> <li>• Description: Oblong Target</li> </ul>
	<p><b>BBS35</b></p> <p>26.3595900931 -81.8681826996 (WGS84)            (X) 699329.45 (Y) 736410.87 (Projected Coordinates)</p>	<p><b>Dimensions and attributes</b></p> <ul style="list-style-type: none"> <li>• Target Length: 2.4 US ft</li> <li>• Target Width: 2.0 US ft</li> <li>• Target Height: 2.3 US ft</li> <li>• Description: Oblong Target</li> </ul>
	<p><b>BBS36</b></p> <p>26.3587512799 -81.8679625486 (WGS84)            (X) 699401.85 (Y) 736106.05 (Projected Coordinates)</p>	<p><b>Dimensions and attributes</b></p> <ul style="list-style-type: none"> <li>• Target Length: 4.1 US ft</li> <li>• Target Width: 2.6 US ft</li> <li>• Target Height: 1.7 US ft</li> <li>• Description: Oblong Target</li> </ul>

Target Image	Target Info	Description
	<p><b>BBS37</b></p> <p>26.3591767879 -81.8674499346 (WGS84)            (X) 699569.54 (Y) 736260.89 (Projected            Coordinates)</p>	<p><b>Dimensions and attributes</b></p> <ul style="list-style-type: none"> <li>• Target Length: 9.6 US ft</li> <li>• Target Width: 2.3 US ft</li> <li>• Target Height: 1.8 US ft</li> <li>• Description: Oblong Target</li> </ul>
	<p><b>BBS38</b></p> <p>26.3585245671 -81.8668662082 (WGS84)            (X) 699760.93 (Y) 736024.02 (Projected            Coordinates)</p>	<p><b>Dimensions and attributes</b></p> <ul style="list-style-type: none"> <li>• Target Length: 3.1 US ft</li> <li>• Target Width: 1.7 US ft</li> <li>• Target Height: 1.2 US ft</li> <li>• Description: Oblong Target</li> </ul>
	<p><b>BBS39</b></p> <p>26.3590670243 -81.8657912316 (WGS84)            (X) 700112.72 (Y) 736221.55 (Projected            Coordinates)</p>	<p><b>Dimensions and attributes</b></p> <ul style="list-style-type: none"> <li>• Target Length: 6.9 US ft</li> <li>• Target Width: 3.0 US ft</li> <li>• Target Height: 2.4 US ft</li> <li>• Description: Oblong Target</li> </ul>
	<p><b>BBS40</b></p> <p>26.3592170933 -81.8647471078 (WGS84)            (X) 700454.56 (Y) 736276.46 (Projected            Coordinates)</p>	<p><b>Dimensions and attributes</b></p> <ul style="list-style-type: none"> <li>• Target Length: 9.4 US ft</li> <li>• Target Width: 8.7 US ft</li> <li>• Target Height: 2.3 US ft</li> <li>• Description: Oblong Target</li> </ul>

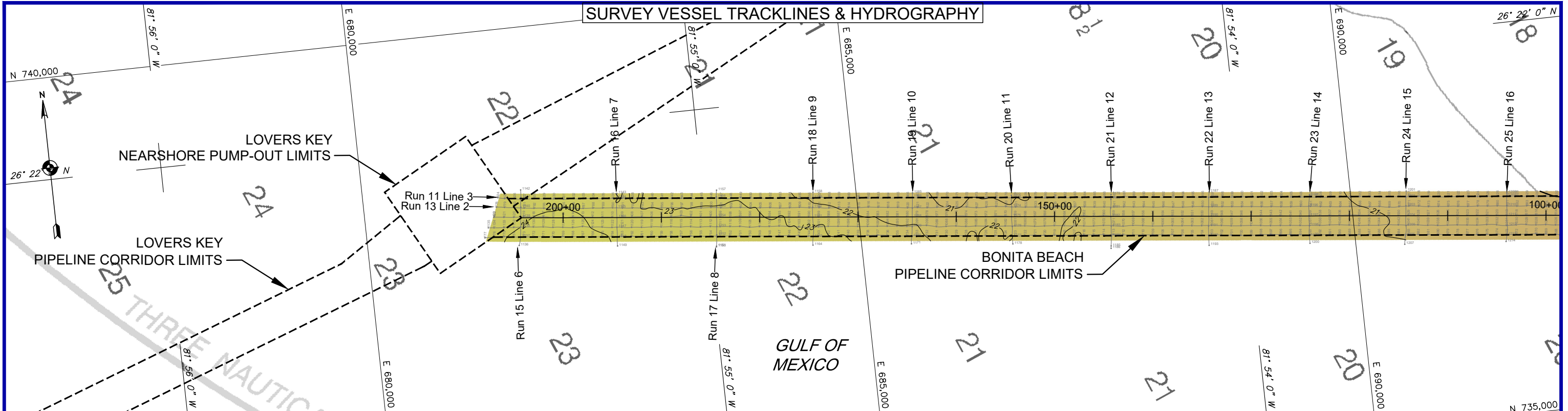
**ATTACHMENT 2**

**PROJECT DRAWINGS**

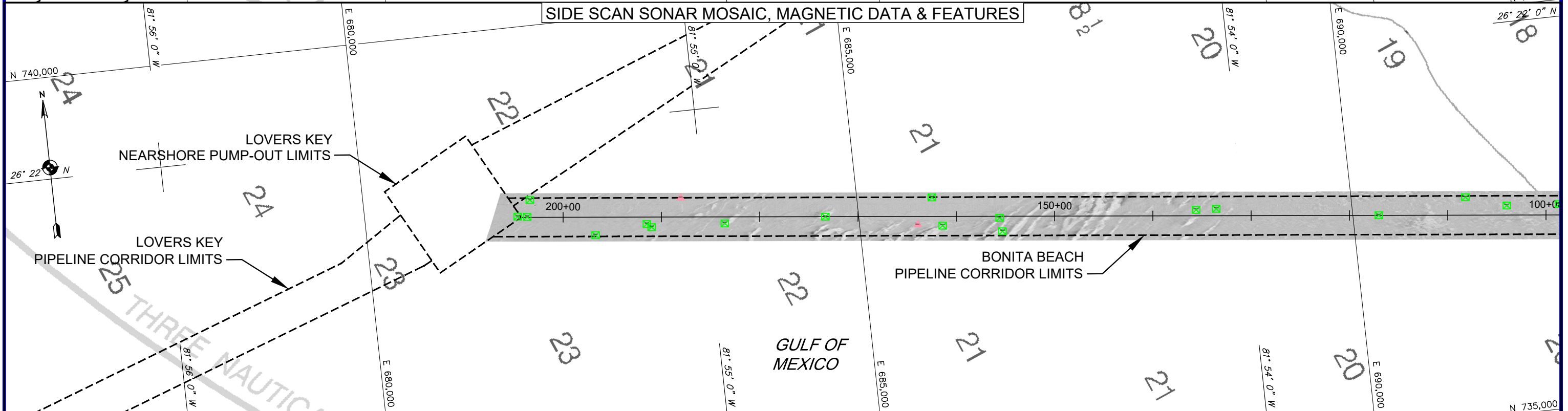




**SURVEY VESSEL TRACKLINES & HYDROGRAPHY**



**SIDE SCAN SONAR MOSAIC, MAGNETIC DATA & FEATURES**



**LEGEND**

- SURVEY VESSEL TRACKLINE WITH EVENT NUMBERS
- MAJOR DEPTH CONTOUR
- MINOR DEPTH CONTOUR
- SIDE SCAN SONAR TARGET
- MAGNETIC ANOMALY CLASSIFICATION**
- CLASS 1: ≤ 25 GAMMAS
- CLASS 2: > 25-100 GAMMAS
- CLASS 3: > 100 GAMMAS

**DEPTH (FEET, NAVD 88)**

50+00 PIPELINE CORRIDOR CENTERLINE WITH 5000 FT STATIONING

- NOTES**
- GRID LINES ARE IN FEET AND REFERENCE THE FLORIDA STATE PLANE COORDINATE SYSTEM, WEST ZONE 902, NAD83. GRID TICS REFERENCE THE GEOGRAPHIC COORDINATE SYSTEM, NAD83.
  - DEPTHS ARE IN FEET AND ARE REFERENCED TO NAVD 88 BASED ON FFRN RTK GNSS CORRECTORS. PROJECT CONTROL BENCHMARK WAS "ESTERO 101" (PID BBDV83) WHICH HAS AN ELEVATION OF 4.73 FEET NAVD 88 PER AN OPUS SHARED SOLUTION FROM 2015-05-01.
  - SEABED FEATURES AND GEOLOGICAL INTERPRETATIONS ARE BASED ON THE ANALYSIS OF HYDROGRAPHIC, SIDE SCAN SONAR, MAGNETOMETER, AND SUBBOTTOM PROFILING DATA. REFER TO SUMMARY TABLES ACCOMPANYING THIS DRAWING FOR ADDITIONAL INFORMATION REGARDING THE MAGNETIC ANOMALIES AND SIDE SCAN SONAR TARGETS.
  - CHARTED FEATURES ARE APPROXIMATE AND WERE TAKEN FROM NOAA CHART 11427 - FORT MYERS TO CHARLOTTE HARBOR AND WIGGINS PASS (38TH EDITION, APRIL 2018). SOUNDINGS ARE IN FEET AT MEAN LOWER LOW WATER (MLLW).

5. SHORELINE AND ONSHORE FEATURES ARE APPROXIMATE AND WERE TAKEN FROM DIGITAL ORTHOPHOTO QUADRANGLES FLOWN IN 2017 AND OBTAINED FROM THE NOAA DATA ACCESS VIEWER.

6. THE INFORMATION PRESENTED ON THIS DRAWING REPRESENTS THE RESULTS OF SURVEYS PERFORMED BY OCEAN SURVEYS, INC. 4 NOVEMBER 2021 AND CAN ONLY BE CONSIDERED AS INDICATING THE CONDITIONS EXISTING AT THAT TIME. REUSE OF THIS INFORMATION BY CLIENT OR OTHERS BEYOND THE SPECIFIC SCOPE OF WORK FOR WHICH IT WAS ACQUIRED SHALL BE AT THE SOLE RISK OF THE USER AND WITHOUT LIABILITY TO OSI.

SCALE: 1"=1,000'

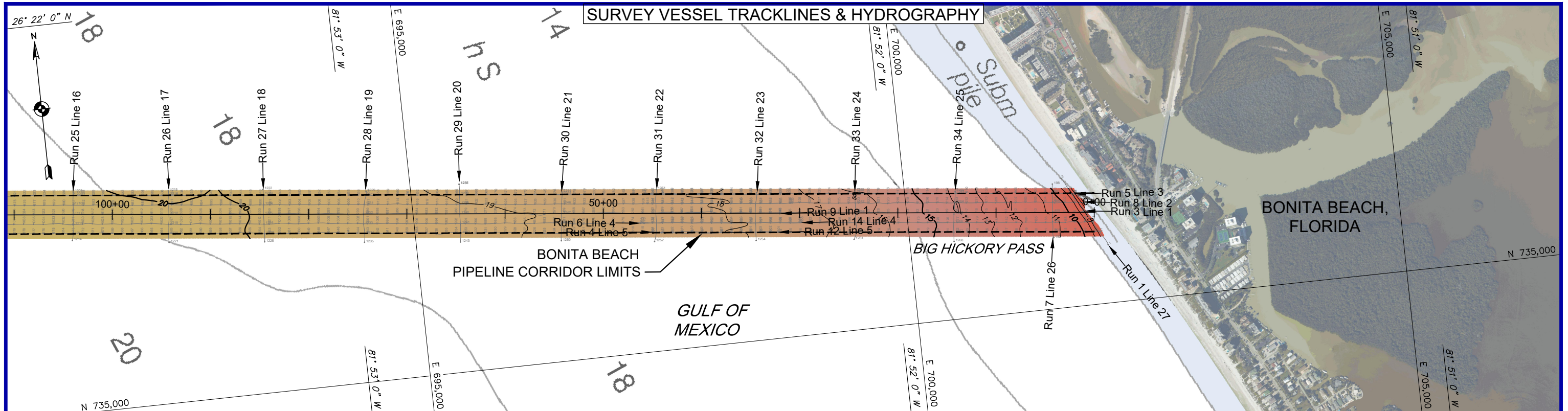
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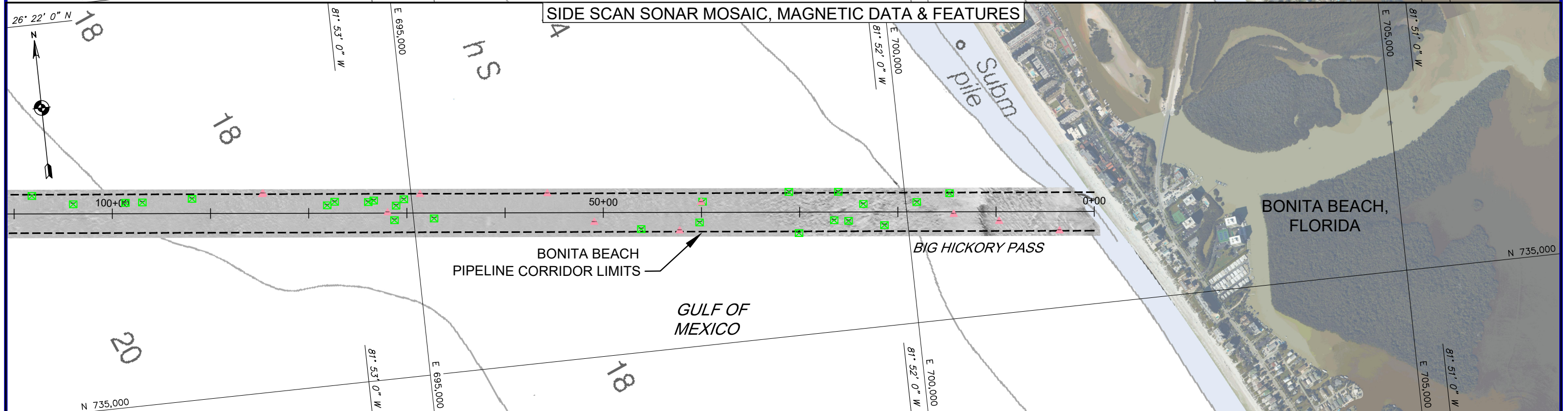
Bonita Beach Pipeline Corridor Survey  
To Support Lee County Lovers Key Beach Nourishment Project  
Gulf of Mexico, Florida



**SURVEY VESSEL TRACKLINES & HYDROGRAPHY**



**SIDE SCAN SONAR MOSAIC, MAGNETIC DATA & FEATURES**



**LEGEND**

- SURVEY VESSEL TRACKLINE WITH EVENT NUMBERS
- MAJOR DEPTH CONTOUR
- MINOR DEPTH CONTOUR
- SIDE SCAN SONAR TARGET
- MAGNETIC ANOMALY CLASSIFICATION**
- CLASS 1: ≤ 25 GAMMAS
- CLASS 2: > 25-100 GAMMAS
- CLASS 3: > 100 GAMMAS

**DEPTH (FEET, NAVD 88)**

10 20 30 40 50

50+00 PIPELINE CORRIDOR CENTERLINE WITH 5000 FT STATIONING

**NOTES**

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SCALE: 1"=1,000'

1,000 0 1,000

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