#### NOAA FORM 76-35A

U.S. DEPARTMENT OF COMMERCE

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION NATIONAL OCEAN SERVICE

## Vertical and Horizontal Control Report

Type of SurveyShallow Water MultibeamHydrographic and Side Scan Sonar SurveyField No.OPR-H328-OS-08-BRegistry No.H11897

H11897

#### Locality

StateFloridaGeneral LocalityAtlantic OceanSub localityEast of Miami

2009

CHIEF OF PARTY

George G. Reynolds

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Date.....

	AL OCEANIC AND AT	DEPARTMENT OF COMMERCE MOSPHERIC ADMINISTRATION	REGISTRY NO. <u>H11897</u>		
INSTRUCTIONS – The Hydrographic Sheet should be accompanied by this form, filled in as completely as possible, when the sheet is forwarded to the office			FIELD NO. <u>OPR-H328-OS-08-B</u>		
State Florida					
General Locality	Atlantic Ocean				
Locality	East of Miami				
Scale <i>N/A</i> Date of Survey <i>March 13, 2009 - July 5, 2009</i>					
Instructions Dated	May 7, 200	8 Project No.	OPR-H328-OS-08-B		
Vessel	Vessel R.V. Able II - Registration Number CT4788BB				
Chief of Party George G. Reynolds					
Surveyed By John G. Wetmur, Robert M, Wallace					
Soundings taken by (Echo Sounder) Reson Seabat 8101					
Graphic Record Scaled by $N/A$					
Graphic Record Checked by $N\!/\!A$					
Protracted by	N/A	Automated Plot by	Angela M. Rizzo		
Verification by	Michael J.	Engels			
Soundings in	Meters (ML	LW)			
REMARKS: All Times Recorded in UTC					
Data Recorded and Presented relative to UTM Zone 17 North					
Original SOW modified by Oct 28, 2008 e-mail from COTR Mark Lathrop. (Refer to Appendix IV of the Descriptive Report.)					
Cont	ractor:	Ocean Surveys, Inc 91 Sheffield St. Old Saybrook, CT.			

THE INFORMATION PRESENTED IN THIS REPORT AND THE ACCOMPANYING BASE SURFACE REPRESENTS THE RESULTS OF A SURVEY PERFORMED BY OCEAN SURVEYS, INC. DURING THE PERIOD OF 13 MARCH 2009 TO 5 JULY 2009 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.

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### A. VERTICAL CONTROL

#### A.1 Tide Station

Tide/water levels for this project were provided exclusively by NOAA as verified data from NOAA Tide Station 872-3214, Virginia Key, FL. The survey site is located entirely within Zones FSE1, FSE6, SA227 and SA228 as indicated by preliminary tidal zoning data included in the project Statement of Work. Time and range corrections were applied to all Virginia Key (872-3214) verified data according to Table 1. Figure 1 depicts the survey area, tide zone delimiters and the location of the Virginia Key tide gauge.

	Time	Range	
Zone	Correction	Correction	
FSE1	-48 min	1.12	
FSE6	-30 min	1.07	
SA227	-54 min	1.22	
SA228	-48 min	1.20	

Table 1Tide Zones Associated with Survey H11897

Coordinated Universal Time (UTC) was used to annotate the tide records and all other data obtained in this project.

Preliminary tide correctors were retrieved daily from the CO-OPS website. Verified tides were retrieved on a weekly basis once they were made available by CO-OPS. Tide data were applied to processed soundings employing the CARIS "apply tides" function. The "multiple station" function was used allowing for correction of the verified tide data for zoning factors.

Based on the results of the cross line analysis presented in Separate IV, it appears that the time and range factors for Zones FSE1, FSE6, SA227 and SA228, as provided in the preliminary zoning scheme, are adequate. Concur with clarification. Zones FSE1 and FSE6 were adjusted to include a small portion of the survey near the Government cut section of the channel. DR B.2.5

#### A.2 Unusual Tide Conditions

OSI home office and field personnel monitored preliminary tide data available on the NOAA CO-OPS website. The NOAA Virginia Key (872-3214) gauge experienced an approximate one week data gap between May 21 (DN 141) at approximately 23:18 UTC and May 27 (DN 147) at approximately 20:18 UTC. According to email correspondence, the gap in water level data was the result of a lightning strike. Verified water level data for the data gap were made available on July 21 (DN 202).

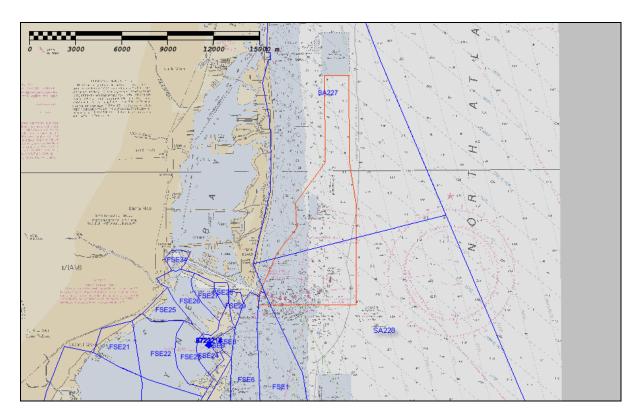


Figure 1. NOAA chart showing the Virginia Key tide station, tide zone scheme and approximate survey area.

## **B. HORIZONTAL CONTROL**

#### B.1 Horizontal Datum

The horizontal datum for this project was the North American Datum of 1983 (NAD83). Horizontal coordinates are provided in Latitude/Longitude and Universal Transverse Mercator (UTM) Zone 17, in meters.

#### B.2 Horizontal Control

All survey tasks were executed employing Differential GPS (DGPS) positioning. Miami USCG DGPS beacon correctors were input to the primary navigation system. Cape Canaveral USCG DGPS beacon correctors were input to the secondary (alarm) navigation system.

Prior to commencing survey operations, the OSI field team established a temporary XY navigation checkpoint (CG2-031309) adjacent to the survey vessel's berth at the U.S. Coast Guard Station, Miami, FL. "CG2-031309" was established by occupying the point with a GPS capable of recording dual-frequency GPS observables. Recorded data were submitted to the National Geodetic Survey's Online Users Positioning Service (OPUS). The OPUS-

reported position solution was assigned to the point and "CG2-031309" was then later used as the reference for daily navigation system accuracy verification.

The temporary XY point was established using  $\geq$  3-hour OPUS observations. The location established for this point is given in Table 2. The OPUS report follows Table 2.

<b>Reference ID</b>	Easting UTM 17N, NAD83 (meters)	Northing UTM 17N, NAD83 (meters)	
	(meters)	(meters)	
CG1-031309	585574.34	2850707.45	

Table 2 OPUS Solution

## **OPUS Report**

From: opus [opus@ngs.noaa.gov] Sent: Thursday, March 12, 2009 8:19 PM To: jgw@oceansurveys.com Subject: OPUS solution : 28180711.090 000004038 FILE: 28180711.090 000004038 2005 NOTE: The IGS precise and IGS rapid orbits were not available 2005 at processing time. The IGS ultra-rapid orbit was/will be used to 2005 process the data. 2005 1009 WARNING! No antenna type was selected. No antenna offsets or pattern will be applied. Coordinates with reduced accuracy 1009 1009 will be returned for the antenna phase center. 1009 1008 NOTE: Antenna offsets supplied by the user were zero. Coordinates 1008 returned will be for the antenna reference point (ARP). 1008 NGS OPUS SOLUTION REPORT -------All computed coordinate accuracies are listed as peak-to-peak values. For additional information: www.ngs.noaa.gov/OPUS/Using\_OPUS.html#accuracy USER: jgw@oceansurveys.com DATE: March 13, 2009 RINEX FILE: 28180710.090 TIME: 00:18:42 UTC SOFTWARE: page5 0810.20 master29.pl 081023 START: 2009/03/12 14:34:00 EPHEMERIS: igu15224.eph [ultra-rapid] STOP: 2009/03/12 16:54:00 OBS USED: 5783 / 6159 : 94% FIXED AMB: 37 / 37 : 100% NAV FILE: brdc0710.09n ANT NAME: NONE NONE # FIXED AMB: 37 / ARP HEIGHT: 0.0 OVERALL RMS: 0.014(m) REF FRAME: NAD\_83(CORS96)(EPOCH:2002.0000) ITRF00 (EPOCH:2009.1936) х: 983530.119(m) 0.030(m)983529.430(m) 0.030(m) Y: -5662550.851(m) 0.013(m) -5662549.252(m) 0.013(m) 2756322.991(m) 0.044(m) z: 2756322.770(m) 0.044(m) 25 46 19.05901 0.033(m) 25 46 19.07647 LAT: 0.033(m)LAT: 25 46 19.05501 0.028(m) E LON: 279 51 12.30669 0.028(m) 279 51 12.29214 0.028(m)W LON: 80 8 47.69331 0.028(m) 80 8 47.70786 0.028(m) 0.034(m) -25.080(m) 0.034(r 0.044(m) [NAVD88 (Computed using GEOID03)] -23.459(m) EL HGT: 0.034(m)ORTHO HGT: 2.207(m) UTM COORDINATES STATE PLANE COORDINATES UTM (Zone 17) SPC (0901 FL E) Northing (Y) [meters] 2850707.452 159629,935 Easting (X) [meters] 585574.337 285603.545 Convergence [degrees] 0.37108085 0.37108085 Point Scale 0.99969042 1.00003163 Combined Factor 0.99969411 1.00003531 US NATIONAL GRID DESIGNATOR: 17RNJ8557450707(NAD 83)

	BASE	STATIONS USED		
PID	DESIGNATION	LATITUDE	LONGITUDE D	ISTANCE(m)
DF7988	RMND RICHMOND CORS ARP	N253649.589	W0802302.141	29575.0
DH3834	LAUD LAUDERDALE CORS ARP	N261146.341	W0801023.014	47075.6
AH3723	MIA3 MIAMI 3 CORS ARP	N254358.098	W0800936.600	4546.9

 NEAREST NGS PUBLISHED CONTROL POINT

 AC2251
 V 238
 N254619.
 W0800852.
 119.9

This position and the above vector components were computed without any knowledge by the National Geodetic Survey regarding the equipment or field operating procedures used.

#### C. APPROVAL SHEET

# LETTER OF APPROVAL REGISTRY NO. H11897

This report and the accompanying data are respectfully submitted.

Field operations contributing to the accomplishment of Survey H11897 were conducted under my direct supervision with frequent personal checks of progress and adequacy. This report and associated data have been closely reviewed and are considered complete and adequate as per the Statement of Work.

Acres Rynds

George G. Reynolds Ocean Surveys, Inc. Chief of Party – H11897 October 5, 2009