NOAA FORM 76-35A

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL OCEAN SERVICE

DESCRIPTIVE REPORT

Type of Survey *Multibeam and Sidescan Sonar*

Field No. *B*

Registry No. *H12096*

LOCALITY

State *Georgia*

General Locality *Atlantic Ocean*

Sublocality *Southern Brunswick Safety Fairway*

2010

CHIEF OF PARTY

Evan J. Robertson

Science Applications International Corporation

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NOAA FORM 77-28 (11-72) U.S. DEPARTMENT OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

REGISTRY NO. **H12096**

HYDROGRAPHIC TITLE SHEET

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. **B**

State Georgia

General locality Atlantic Ocean

Sub-Locality *Southern Brunswick Safety Fairway*

Scale 1:20,000 Dates of survey: 20 May 2010 – 10 June 2010

Instructions Dated 18 June 2009 Project No. OPR-G443-KR-09

Vessel *M/V Atlantic Surveyor* D582365

Chief of Party *Evan J. Robertson*

Surveyed by: *Alex Bernier, Jediah Bishop, Dan Burgo, Paul Donaldson, Chuck Holloway, Colette LeBeau, Rick Nadeau, Katie Offerman, Evan Robertson, Eva Rosendale, Deb Smith, Bridget Williams*

Soundings taken by **echo sounder**, hand lead, pole MULTIBEAM RESON SEABAT 7125

Graphic record scaled by

Graphic record checked by

Protracted by Automated Plot

Verification by ***Atlantic Hydrographic Branch***

Bold, Italic, Red notes were made during office processing

Soundings in fathoms, **meters,** feet at MLW, **MLLW**

H-Cell compilation units: Feet at MLLW

REMARKS: **Contract**: DG133C-08-CQ-0003

Contractor: Science Applications International Corp., 221 Third Street, Newport, RI 02840 USA

Times: All times are recorded in UTC

UTM Zone: Zone 17 ***N***

Purpose: To provide NOAA with modern, accurate hydrographic survey data with which to update the nautical charts of the assigned area: Sheet B (H12096) of the Georgia Safety Fairways, Coast of Georgia.

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Science Applications International Corporation (SAIC) warrants only that the survey data acquired by SAIC and delivered to NOAA under Contract DG133C-08-CQ-0003 reflects the state of the sea floor in existence on the day and at the time the survey was conducted.

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Descriptive Report to Accompany
Hydrographic Survey H12096
Scale 1:20,000, Surveyed 2010
M/V Atlantic Surveyor
Science Applications International Corporation (SAIC)
Evan J. Robertson, Lead Hydrographer

PROJECT
Project Number: OPR-G443-KR-09
Dates of Instructions: 18 June 2009 **Task Order#:** T003
Dates of Supplemental Instructions: 23 February 2010 and 19 July 2010
Sheet Letter: B
Registry Number: H12096
Purpose: To provide NOAA with modern, accurate hydrographic survey data with which to update the nautical charts of the assigned area.

A. AREA SURVEYED

The area surveyed was a section of the Atlantic Ocean off of the Georgia coast within the safety fairways of the approaches to Brunswick, GA. (Figure A-1). The line mileage, bottom samples, item investigations and other survey statistics are listed in Table A-1. Most of the area was surveyed at set line spacing with multibeam sonar and towed sidescan sonar from 20 May 2010 to 10 June 2010 (Table A-2). The depth range encountered in H12096 was from 12.66 meters (41 feet, 0.27 m uncertainty) to 26.01 meters (85 feet, 0.28 m uncertainty). ***Concur.***

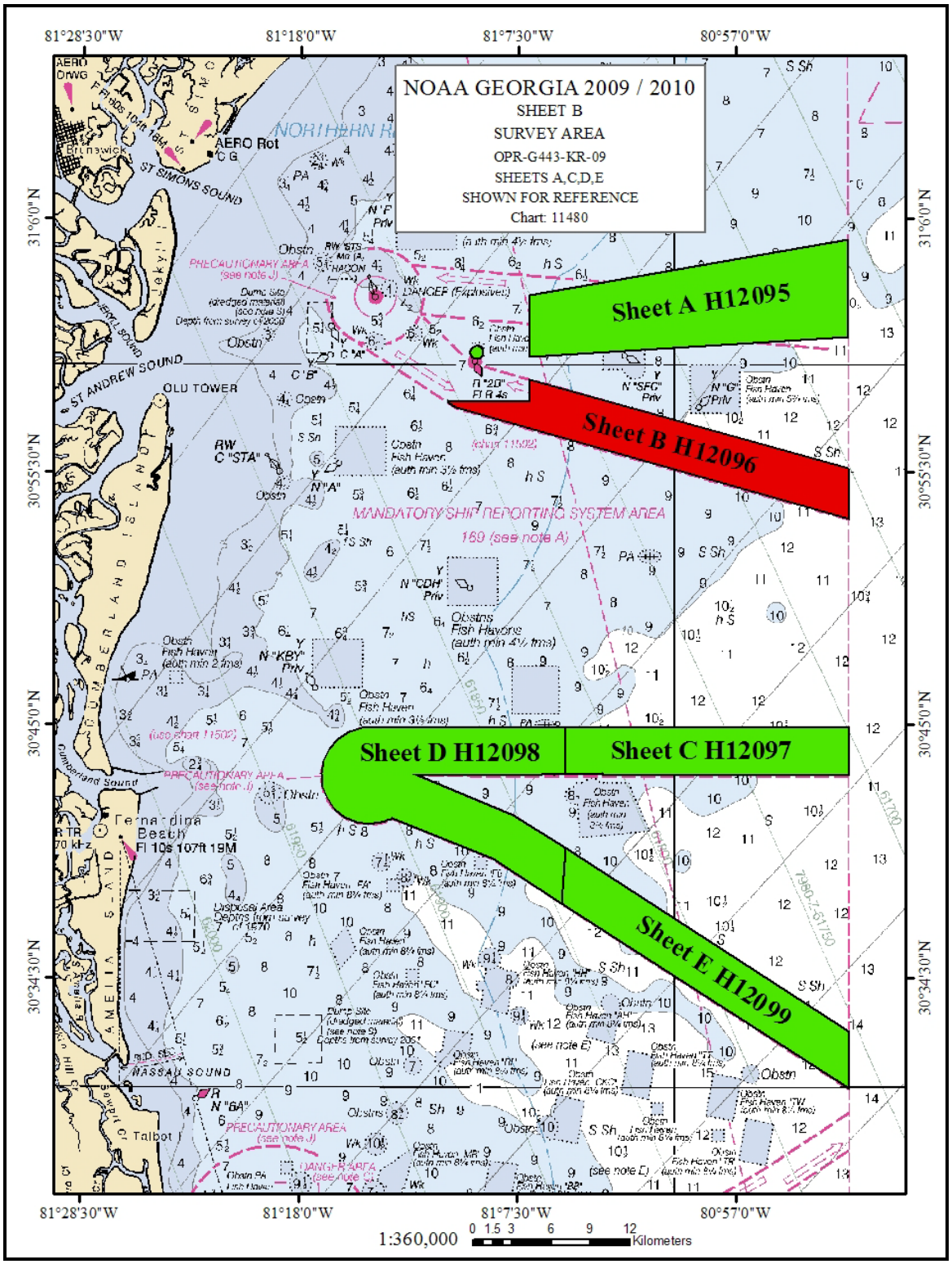


Figure A-1. H12096 Survey Bounds

Table A-1. Hydrographic Survey Statistics

***M/V Atlantic Surveyor*, Sheet B H12096**	**Value**
LNM Singlebeam only sounding lines (main scheme only)	N/A
LNM Multibeam only sounding lines (main scheme only)	N/A
LNM Lidar sounding lines (main scheme only)	N/A
LNM Sidescan sonar only lines (main scheme only)	N/A
LNM Main scheme lines (multibeam and sidescan)	908.52
LNM Cross lines from multibeam	36.91
LNM Lidar cross lines	N/A
LNM development lines non main scheme	0.30
LNM shoreline/nearshore investigations	N/A
Number of Bottom Samples	56
Number of items investigated that required additional time/effort in the field beyond the above operations	0
Total number of square nautical miles	31.16

Table A-2. Dates of Data Acquisition in Calendar and Julian Days

Calendar Date	**Julian Day**
20 May 2010	140
21 May 2010	141
22 May 2010	142
23 May 2010	143
24 May 2010	144
25 May 2010	145
28 May 2010	148
29 May 2010	149
30 May 2010	150
31 May 2010	151
01 June 2010	152
03 June 2010	154
09 June 2010	160
10 June 2010	161

B. DATA ACQUISITION AND PROCESSING *See also H-cell Report.*

B.1 EQUIPMENT

A detailed description of the systems used to acquire and process these data has been included in the separate Data Acquisition and Processing Report* (SAIC document number 10-TR-008) for OPR-G443-KR-09, delivered concurrently with the Descriptive Report for H12099 on 09 April 2010. During the shutdown period between the 2009 and 2010 survey seasons, there were some changes to the systems used to acquire and process these data which differ from what was reported within the Data Acquisition and Processing Report (DAPR) *. All changes which occurred during the shutdown period or during the 2010 survey season are captured in Appendix V** as "Supplemental Data Acquisition and Processing Information". The information in Table B-1 below summarizes the systems listed in the DAPR*. ***Concur.***

Table B-1. Major Systems by Manufacturer and Model Number

System	Manufacturer / Model Number	Subsystem
Multibeam Sonar	RESON SeaBat 7125	7P Sonar Processor
Sidescan Sonar	Klein 3000 Towfish	K-1 K-Wing Depressor, Transceiver/Processing Unit
Vessel Attitude System	TSS POS/MV Inertial Navigation System	
Positioning Systems	TSS POS/MV 320	
	Trimble 7400 GPS Receiver	
	Trimble Probeacon Differential Beacon Receiver	
Sound Speed Systems	Brooke Ocean Technology Ltd., Moving Vessel Profiler-30	Applied Microsystems Ltd. Smart SV and Pressure Sensor
	Sea-Bird Electronics, Inc. SBE 19 CTD Profiler	

Survey Vessel

The *M/V Atlantic Surveyor* was the platform used for multibeam sonar, sidescan sonar and sound speed data collection. Table B-2 lists various vessel characteristics for the *M/V Atlantic Surveyor*. The Position Orientation System/Marine Vessels (POS/MV) Inertial Measurement Unit (IMU) was mounted below the main deck of the vessel on the port side of the centerline. The Reson 7125 transducer was hull-mounted to the port side of the keel. The Klein 3000 sidescan sonar was towed off the stern using the vessel's A-frame and a Brooke Ocean Technology Moving Vessel Profiler 30 (MVP-30) was mounted to the starboard stern quarter. Three 20-foot ISO containers were secured on the aft deck. One was used as the real-time data acquisition office, one as a data processing office and the third for maintenance, repairs and spares storage. ***Concur.***

Included with H-Cell deliverables.

****Appended to this report.***

Table B-2. Survey Vessel Characteristics

Vessel Name	LOA	Beam	Draft	Max Speed	Gross Tonnage	Power (Hp)	Registration Number
M/V Atlantic Surveyor	110’	26’	9’	14 knots	Displacement 68 Net Tons Deck Load 65 Long Tons	900	D582365

Major Systems

SAIC used their Integrated Survey System (**ISS-2000**) software on a Windows XP platform to acquire these survey data. Survey planning and data analysis were conducted using SAIC’s **SABER** software on Red Hat Enterprise 5 Linux platforms. Klein 3000 sidescan data were collected on a Windows XP platform using Klein’s **SonarPro** software. The Klein 3000 sidescan sonar data were collected in eXtended Triton Format (XTF) and maintained at full resolution, with no conversion or down sampling techniques applied. All sidescan data were reviewed using Triton **Isis** software, while coverage mosaics were produced using **SABER** on a Linux platform. ***Concur.***

B.2 QUALITY CONTROL

There were 36.91 linear nautical miles of cross lines and 908.52 linear nautical miles of main scheme lines surveyed on this sheet. This resulted in cross line mileage that represented 4.1 percent of the main scheme mileage. The cross lines were oriented at 17.0°/197.0° and spaced 1550 meters apart, while the main scheme lines were oriented at 105.7°/285.7° and spaced 65 meters apart. The sidescan sonar range scale was set to 75 meters for all main scheme operations, providing a consistent imagery swath of 150 meters. ***Concur.***

A Brooke Ocean Technology Moving Vessel Profiler (MVP) with an Applied Microsystems SV&P Smart Sensor or a Seabird Electronics SBE-19 CTD was used to collect sound speed profile (SSP) data. SSP data were obtained at intervals frequent enough to reduce sound speed errors. The frequency of casts was based on observed sound speed changes from previously collected profiles, surface sound speed differences between the sonar head and the current profile, and time elapsed since the last cast. Initially, multiple casts were taken along a survey line to identify the rate and location of sound speed changes. Subsequent casts were made based on the observed trend of sound speed changes. As the sound speed profiles changed, cast frequency and location were modified accordingly. Confidence checks of the sound speed acquisition sensors were conducted periodically (every 6 to 13 survey days) by comparing two consecutive casts taken with different SV&P Smart Sensors or with a SV&P Smart Sensor and a Seabird SBE-19 CTD. In all, a total of 229 profiles were collected and used for H12096. ***Concur.***

Static draft measurements were taken on each side of the vessel at each port call, both after arrival and before departure. These observed static draft measurements were used to

compute and apply a prorated daily static draft during each survey leg to account for small changes in draft due to fuel and water consumption. A dynamic draft value was also applied to the data based on recorded input from the shaft RPM sensors and the dynamic draft look-up table that was constructed from settlement and squat measurements determined during the pre-survey Sea Acceptance Trials. ***Concur.***

Horizontal positioning of the multibeam transducer by the POS/MV was verified by frequent comparison checks against an independent Trimble DGPS system. During survey data acquisition, the **ISS-2000** real-time system provided a continuous view of the positioning comparison between the POS/MV and the Trimble DGPS. An alarm was triggered within **ISS-2000** if the comparisons were not within the acceptable range.

Multibeam confidence checks were conducted during port calls (approximately every 10-12 survey days) by lead line measurement. Table B-3 presents a summary of these comparisons showing mean differences for all comparisons were less than 0.065 meters between the lead line measurement and the multibeam soundings. The full lead line comparison log is presented in Separates I*. ***Concur.***
Filed with original field records.

Table B-3. Summary of Lead Line to Multibeam Comparisons

Julian Day	Calendar Date	Port Mean (Meters)	Port STDDEV (Meters)	Starboard Mean (Meters)	Starboard STDDEV (Meters)
130	10 May 2010	-0.012	0.007	-0.035	0.012
142	22 May 2010	0.045	0.009	0.065	0.010
154	03 June 2010	0.024	0.010	-0.010	0.012
164	13 June 2010	0.029	0.010	-0.040	0.020
MEAN OF SETS		0.022		-0.005	

Survey Systems Uncertainty Model

The Total Propagated Uncertainty (TPU) model that SAIC has adopted has its genesis at the Naval Oceanographic Office (NAVOCEANO), and is based on the work by Rob Hare and others ("Error Budget Analysis for NAVOCEANO Hydrographic Survey Systems, Task 2 FY 01", 2001, *HSRC FY01 Task 2 Final Report*). Until recently, this concept had been referred to as the Total Propagated Error (TPE) model; however, because true error can not be measured, the term "uncertainty" has now replaced "error" throughout this discussion. This terminology has been adopted by the International Hydrographic Organization in Special Publication No. 44, *"IHO Standards for Hydrographic Surveys, 5th Edition, February 2008"*. The fidelity of any uncertainty model is coupled to the applicability of the equations that are used to estimate each of the components that contribute to the overall uncertainty that is inherent in each sounding. SAIC's approach to quantifying the TPU is to decompose the cumulative uncertainty for each sounding into its individual components and then further decompose those into the horizontal and vertical components. The model then combines the horizontal and vertical uncertainty components to yield an estimate of the system uncertainty as a whole. This cumulative

system uncertainty is the Total Propagated Uncertainty. By using this approach, SAIC can more easily incorporate future uncertainty information provided by sensor manufacturers into the model. This also allows SAIC to continuously improve the fidelity of the model as our understanding of the sensors increases or as more sophisticated sensors are added to a system.

The data needed to drive the uncertainty model were captured as parameters taken from the Error Parameter File (EPF), which is created during survey system installation and integration. The DAPR* provides a more detailed discussion on development of the EPF and application of the TPU. Some of the required parameters are also obtained from values recorded in the GSF files during data acquisition and processing. While the input units vary, all uncertainty values that contribute to the cumulative TPU estimate are eventually converted to meters by **SABER's Errors** program. The cumulative TPU estimates are recorded as the Horizontal Uncertainty and Vertical Uncertainty at the 95% confidence level in the GSF file. These uncertainty estimates are then used to estimate the accuracy of each individual sounding's position and depth during both data acquisition and data processing. ***Concur.***
Included with H-Cell deliverables.

CUBE Uncertainty Analysis

The vertical and horizontal uncertainty values that were estimated by the TPU model for individual multibeam soundings varied little across the dataset, tending to be most affected by beam angle. All individual soundings used in development of the final CUBE depth surfaces had modeled vertical and horizontal uncertainty values at or below the allowable IHO S-44, Order 1 uncertainty. Depending on the depth, the allowable Order 1 uncertainty for H12096 varied from 0.53 to 0.60 meters. ***Concur.***

During the creation of the CUBE surface, two separate uncertainty surfaces are also calculated by the **SABER** software – CUBE Standard Deviation and Average Total Propagated Uncertainty (Average TPU). The CUBE standard deviation is a measure of the general agreement between all of the soundings that contributed to the best hypothesis for the node. The Average TPU is the average of the vertical uncertainty component for each sounding that contributed to the best hypothesis for the node. A third uncertainty surface is generated from the larger of these two uncertainties at each node and is referred to as the Final Uncertainty. ***Concur.***

After creation of the initial one-meter PFM CUBE surface, the **SABER Check PFM Uncertainty** function was used to highlight all of the cases where computed final node uncertainties exceeded IHO Order 1. Appendix V** references the attached text file that provides a listing of all the nodes from the PFM where the final uncertainties exceeded IHO Order 1. Review of the areas with final uncertainties exceeding IHO Order 1 revealed that all of them fell on the three obstructions identified on the sheet. ***Concur.***

After the analysis of the one-meter PFM, two additional half-meter node PFMs were created encompassing the three features identified during data acquisition and processing
****Appended to this report.***

that had least depths less than 24 meters. These PFMs were also analyzed for CUBE surface uncertainties exceeding IHO Order 1. The increased grid resolution revealed more uncertainties exceeding IHO Order 1, however all the nodes were still observed on the obstructions. ***Concur.***

Junction and Crossing Analysis

Comparison of main scheme to near nadir cross line data was done daily during the survey operations to ensure that no systematic errors were introduced and to identify potential problems with the survey system. After application of all correctors and completion of final processing, separate one-meter CUBE PFM grids were made from the main scheme data and from the cross line data. Analysis of the difference grid created between the CUBE layers showed that 98.58% of comparisons were within 20 centimeters and all comparisons were within 34 centimeters. Table B-4 shows the comparisons using all crossings in H12096. ***Concur.***

Table B-4. **Junction Analysis Main Scheme Lines vs. Near Nadir Cross Lines, H12096**

Depth Difference Range (cm)	All		Positive		Negative		Zero	
	Count	Cumulative Percent	Count	Cumulative Percent	Count	Cumulative Percent	Count	Cumulative Percent
0-5	142467	55.21	60116	23.30	67949	26.33	14402	5.58
5-10	72428	83.28	35106	36.90	37322	40.80		
10-15	28808	94.44	15716	42.99	13092	45.87		
15-20	10689	98.58	6566	45.54	4123	47.47		
20-25	3106	99.79	2339	46.44	767	47.76		
25-30	524	99.99	397	46.60	127	47.81		
30-34	23	100.00	5	46.60	18	47.82		
Totals	258045	100%	120245	46.59%	123398	47.82%	14402	5.58%

Details of beam by beam comparisons of 25 selected crossings in different areas of H12096 are presented in Separates IV* of this report. The crossings were selected for spatial and temporal distribution over the entire survey. Results of the comparisons show a general trend of uniform differences in beam depths across the swaths of the files with the majority of the differences less than 35 centimeters. There were no indications of sound speed issues or offset biases observed. ***Concur.***
Filed with original field records.

Multibeam Coverage Analysis

These survey operations were conducted at a consistent 65-meter line spacing optimized to achieve 200% sidescan sonar coverage at the 75-meter range scale setting. Based on the 60° beam angle used as the cutoff for acceptable multibeam data, the effective swath width for the multibeam coverage was approximately 3.5 times the water depth. Though full bottom coverage multibeam was not required, in depths greater than approximately

21 meters there was sufficient outer beam overlap to provide 100% multibeam bottom coverage. ***Concur.***

The one-meter node PFM CUBE surface was used to assess and document survey coverage. The **SABER Gapchecker** routine flagged multibeam data gaps exceeding the allowable limit of three contiguous nodes. In addition, the entire surface was visually scanned for holidays at various points during the data processing effort. Additional survey lines were run to fill any holidays that were detected while the survey operations were still underway. ***Concur.***

After final data acquisition and processing, there were no areas found within the CUBE surface swaths that contained four contiguous empty nodes and valid depths were populated into more than 99.99% of all nodes. In all areas between the CUBE surface swaths, there was 200% sidescan data coverage which revealed no contacts or areas requiring additional multibeam coverage. ***Concur.***

The final PFM grid was also examined for the number of soundings contributing to the chosen CUBE hypothesis for each grid node by running **SABER's Frequency Distribution** tool on the CUBE number of soundings layer. For H12096, 99.56% of all one-meter grid nodes contained five or more soundings. The two half-meter Feature PFMs are comprised of 99.03% and 97.75% of the nodes containing five or more soundings. Thus all CUBE surfaces satisfy the requirements for complete multibeam coverage. ***Concur.***

B.3 Corrections to Echo Soundings

Please refer to the Data Acquisition and Processing Report (DAPR)* and Appendix V** for a description of all corrections applied to echo soundings. During the shutdown period between the 2009 and 2010 survey seasons, there were some changes to the systems used to acquire and process these data which differ from what was reported within the DAPR*. All changes, including the subsequent patch test, which occurred during the shutdown period or during the 2010 survey season are captured in Appendix V** as "Supplemental Data Acquisition and Processing Information". There were no deviations from the corrections described therein. Please note that the delivered GSF multibeam files are in version 3.01 GSF. This version of GSF is compatible with Caris version 6.1.2.8 using the HotFix initially delivered to the Atlantic Hydrographic Branch on 18 December 2009. The Caris version 6.1.2.8 HotFix has also been included with this delivery. Caris version 7.0 is compatible with this new version of GSF with HotFix 5. ***Concur.***

B.4 Data Processing

Please refer to the Data Acquisition and Processing Report* for a complete description of all data processing steps performed. All deviations from the processes described therein are presented in Appendix V** (Supplemental Data Acquisition and Processing Information) or in this section of the text. ***Concur.***

**** Filed with original field records.***

*****Appended to this report.***

When all analysis on the PFMs is completed, the PFMs are converted to BAGs. Due to file size restraints, a single PFM will often create multiple BAGs. After the creation of the BAGs, the **SABER Compare PFM to BAG** utility is run. This utility performs a direct node-to-node comparison between the gridded surfaces of the PFM and corresponding surfaces of the BAGs. For H12096, the resulting BAGs showed node values that were identical to the PFMs. Therefore, the results of the uncertainty and coverage analyses performed on the PFMs directly apply to all of the BAGs delivered for this sheet. ***Concur.***

Nine BAGs at one-meter grid resolution are submitted for the entire H12096 survey area and two half-meter resolution grids were created to meet object detection coverage over features with a least depth less than 24 meters. The Features Area 1 BAG contains Feature 3 (30° 57’ 16.15”N 081° 05’ 24.17”W, 14.03 m, 0.27 m uncertainty) and Features Area 2 BAG contains Features 1 (30° 55’ 40.65”N 080° 58’ 05.34”W, 17.82 m, 0.27 m uncertainty) and 2 (30° 55’ 18.46”N 080° 58’ 36.24”W, 16.82 m, 0.27 m uncertainty). Table B-5 summarizes all of the BAG files submitted for H12096. ***Concur.***

Table B-5. Table Summary of H12096 BAG Files

BAG File Name	Comments
H12096_1_of_9.bag	Southern most 1.0-meter BAG
H12096_2_of_9.bag	
H12096_3_of_9.bag	
H12096_4_of_9.bag	
H12096_5_of_9.bag	
H12096_6_of_9.bag	
H12096_7_of_9.bag	
H12096_8_of_9.bag	
H12096_9_of_9.bag	Northern most 1.0-meter BAG
H12096_features_area_1_1_of_1.bag	0.5-meter BAG containing Feature 3
H12096_features_area_2_1_of_1.bag	0.5-meter BAG containing Features 1 & 2

C. HORIZONTAL AND VERTICAL CONTROL *See also H-Cell Report.*

NOAA tide station 8720030 Fernandina Beach, FL was the source of verified water level heights for determining correctors to soundings. The primary means for analyzing the adequacy of zoning was observing zone boundary crossings in the navigated swath editor, SAIC’s **Multi View Editor (MVE)**. In addition, sun illuminated coverage plots were examined on screen for adequacy of zoning. Comparisons between overlapping cross line data and outer swath data (in deeper water) were also used to assess potential tidal zoning impacts. ***Concur.***

Table C-1. Water Level Zoning Parameters Applied on Sheet H12096

Zone	Time Corrector (minutes)	Range Ratio	Reference Station
SA189	-36	0.98	8720030
SA191	-48	0.95	8720030
SA192	-36	0.95	8720030
SA196	-48	0.91	8720030

The survey data for sheet H12096 were collected in horizontal datum NAD-83, using geodetic coordinates, while data display and products used the UTM Zone 17 projection. The following equipment was used for positioning on the *M/V Atlantic Surveyor*:

- Applanix POS/MV, Model 320 Version 4, Serial Number 2575 with a Trimble ProBeacon Differential Receiver (primary sensor)
- Trimble 7400 Rsi GPS Receiver, Serial Number 3815A22469 with a Trimble ProBeacon Differential Receiver (secondary sensor)

The Trimble ProBeacon Differential Receivers were manually programmed to receive corrector data from the U.S. Coast Guard Stations at Cape Canaveral, FL; Savannah, GA; and Kensington, SC.

Daily position confidence checks were conducted using the independent Trimble DGPS. A real-time **ISS-2000** survey monitor also raised an alarm to alert the survey watch if the position differences exceeded the maximum allowable distance. All positioning confidence checks were within an inverse distance of five meters (see Separates I*****).

Please refer to the Horizontal and Vertical Control Report***** (SAIC Doc 10-TR-029) for detailed descriptions of the procedures and systems used to attain hydrographic positioning. This report will be provided with the Descriptive Report for the last sheet delivered on this task order (H12097). ***Concur.***
****Filed with original field records.***

D. RESULTS AND RECOMMENDATIONS *See also H-Cell Report.*

D.1 CHART COMPARISON

H12096 was compared to the largest scale charts covering the area as follows:

- **Chart 11502 Doboy Sound to Fernandina,** 1:80,000 scale, 31st Edition 01/01/2007 corrected by NTM through 07/31/2010

- **Chart 11480 Charleston Light to Cape Canaveral,** 1:449,659 scale, 40th Edition 03/01/2007 corrected by NTM through 07/31/2010

- **ENC US4GA11M Doboy Sound to Fernandina,** 1:80,000 compilation scale**,** 18th Edition issued 04/05/2010, Update 1 issued 05/11/2010

- **ENC US3GA10M Charleston Light to Cape Canaveral,** 1:449,659 compilation scale**,** 18th Edition issued 08/03/2010

Feature descriptions in this section were reviewed based on the largest scale chart covering the respective area. Any features that were re-addressed on smaller scale charts were stricken out (e.g., ~~example~~***) by the AHB reviewer. This was done by AHB for the sake of clarity, so that each feature is discussed only once.***

The chart comparisons were conducted using SAIC's **SABER** software to view the BSB raster charts with overlain layers of H12096 data such as the CUBE gridded surface, selected soundings, and features. For ENC comparisons a combination of Jeppesen's **dKart Inspector** and 7C's **SeeMyDENC** were used in conjunction with **SABER**. Results from the comparisons are described below. Recommend reconstruction of the common areas of all charts using data from this survey.

Chart 11502 Doboy Sound to Fernandina (1:80,000)

H12096 survey data overlap with Chart 11502 from the western edge of the sheet to 080° 56' 00.00"W. Chart 11502 has no charted wrecks or obstructions within the bounds of the survey. ***Concur.***

The charted soundings generally agree with the CUBE survey depths within one to four feet. ***Concur.***

The charted 60-foot depth curve from approximately 30° 57' 33.55"N 080° 59' 37.35"W to approximately 30° 56' 51.75"N 081° 00' 13.67"W was found to be approximately 50 to 200 meters east of its charted position. ***Concur.***

The charted 60-foot depth curve from approximately 30° 56' 41.25"N 080° 57' 48.92"W to approximately 30° 56' 27.07"N 080° 57' 31.77"W was found to be approximately 400 meters northeast of its charted position. ***Concur.***

The charted 60-foot depth curves from approximately 30° 56' 26.13"N 080° 57' 31.27"W extending east to approximately 30° 56' 19.60"N 080° 56' 52.68"W and from approximately 30° 56' 08.00"N 080° 57' 02.54"W extending west to approximately 30° 56' 12.65"N 080° 57' 32.54"W were not found. CUBE depths between these two 60-foot depth curves were found to be deeper than 60 feet. The 60-foot depth curve should be closed off between approximately 30° 56' 26.13"N 080° 57' 31.27"W and 30° 56' 12.65"N 080° 57' 32.54"W. ***Concur.***

The charted 60-foot depth curve from approximately 30° 56' 19.60"N 080° 56' 52.68"W clockwise to approximately 30° 56' 08.00"N 080° 57' 02.54"W should be charted as an isolated shoal area with depths less than 60 feet. ***Concur.***

The charted 60-foot depth curve from approximately 30° 56’ 09.05”N 080° 57’ 44.25”W to approximately 30° 55’ 55.13”N 080° 58’ 04.62”W was found to extend approximately 175 to 400 meters west of its charted position. ***Concur.***

An obstruction with a least depth of 55 feet (16.82 m, 0.27m uncertainty) was found in 30° 55’ 18.46”N 080° 58’ 36.24”W (Feature 2). Recommend removing the charted 58-foot sounding in approximately 30° 55’ 16.99”N 080° 58’ 37.77”W and charting a 55-foot sounding, danger circle and label ‘Obstn’ in 30° 55’ 18.46”N 080° 58’ 36.24”W.
Concur with clarification. Recommend charting a 55-foot Sounding in 30° 55’ 18.4901”N 080°58’ 36.2017”W.

Chart 11480 Charleston Light to Cape Canaveral (1:449,659)

Chart 11480 covers the entire survey bounds of H12096. However, the discussion that follows only covers the area which lies east of 080° 56’ 00.00”W and was not covered by the larger scale chart, 11502. Chart 11480 has no charted wrecks or obstructions within the bounds of the survey. ***Concur.***

The charted soundings generally agree with the CUBE survey depths within one-half to one and one-half fathoms. ***Concur.***

The charted 10-fathom depth curve from approximately 30° 55’ 25.27”N 080° 56’ 00.00”W to approximately 30° 54’ 24.53”N 080° 55’ 00.38”W (southern boundary of the survey area) was not found. CUBE depths between this section of the 10-fathom depth curve and the southern survey boundary were found to be 10¼ fathoms and deeper. ***Concur.***

ENC US4GA11M Doboy Sound to Fernandina (1:80,000)

~~H12096 survey data overlap with ENC US4GA11M from the western edge of the sheet to 080° 56’ 00.00”W. ENC US4GA11M has no charted wrecks or obstructions within the bounds of the survey.~~

~~The charted soundings generally agree with the CUBE survey depths within one and a half meters.~~

~~The charted 18.2-meter depth curve from 30° 57’ 32.03”N 080° 59’ 39.11”W to 30° 56’ 54.60”N 081° 00’ 12.57”W was found to be approximately 50 to 200 meters east of its charted position.~~

~~The charted 18.2-meter depth curve from 30° 55’ 26.84”N 080° 56’ 27.18”W to 30° 55’ 31.25”N 080° 57’ 08.41”W was found to be approximately 100 to 500 meters north of its charted position.~~

~~The charted 18.2-meter depth curves from 30° 56' 29.58"N 080° 57' 33.81"W extending east to 30° 56' 19.41"N 080° 56' 51.41"W and from 30° 56' 03.75"N 080° 57' 00.10"W extending west to 30° 56' 10.96"N 080° 57' 39.67"W were not found. CUBE depths between these two 18.2-meter depth curves were found to be deeper than 18.2 meters. The 18.2-meter depth curve should be closed off between 30° 56' 29.58"N 080° 57' 33.81"W and 30° 56' 10.96"N 080° 57' 39.67"W.~~

~~The charted 18.2-meter depth curve from 30° 56' 19.41"N 080° 56' 51.41"W to 30° 56' 03.75"N 080° 57' 00.10"W should be charted as an isolated shoal area with depths less than 18.2 meters.~~

~~An obstruction with a least depth of 16.82 meters (0.27m uncertainty) was found in 30° 55' 18.46"N 080° 58' 36.24"W (Feature 2). Recommend removing the charted 17.6 sounding in 30° 55' 16.32"N 080° 58' 38.15"W and charting an OBSTRN object with a value of sounding as 16.8 in 30° 55' 18.46"N 080° 58' 36.24"W.~~

Table D-1. Additional Features to be Considered for Charting on ENC US4GA11M

Feature Number	Latitude, North (NAD83)	Longitude, West (NAD83)	Depth	Uncertainty (Meters)	Description	Comments
1	30° 55' 40.65"	080° 58' 05.34"	17.820 ***m*** ***58.465 ft***	0.270	Obstructions	***Concur with clarification. Least depth of feature is not significant relative to surrounding depths. Chart as 58ft Sounding.***
3	30° 57' 16.15"	081° 05' 24.17"	14.030 ***m*** ***46.030 ft***	0.270	Obstruction	***Concur with clarification. Least depth of feature is not significant relative to surrounding depths. Do not chart.***

ENC US3GA10M Charleston Light to Cape Canaveral (1:449,659)

~~ENC US3GA10M was used to compare the eastern portion of survey area H12096 that was not covered by the larger scale ENC, US4GA11M. There were no charted wrecks or obstructions on US4GA11M within the survey bounds.~~

~~The three charted soundings were within one meter of the CUBE survey depths for H12096.~~

~~The charted 18.2 meter depth curve between 30° 55’ 29.35”N 080° 56’ 06.94”W and 30° 54’ 16.17”N 080° 54’ 49.37”W was not observed in the CUBE survey depths. CUBE depths in this region range from 18.6 to 20.8 meters.~~

AWOIS Item Investigations

There were no assigned AWOIS items that fell within H12096. ***Concur.***

Designated Soundings

Five designated soundings were set on the obstructions identified as Feature 1. Feature 1 is comprised of three square objects, each approximately two meters across. These soundings were set to preserve the depths and outline the extent of the obstructions. A separate designated sounding flag exists in the Generic Sensor Format (version 3.01), and all of the designated soundings in the final CUBE surface have also been flagged as designated soundings in the GSF files. All depths flagged as features and designated soundings will override the CUBE best estimate of the depth in the final BAG files. All of the features and designated soundings that have been set for this survey are listed within two files that are referenced within Appendix II***. ***Concur.***
****Appended to this report.***

Danger to Navigation Reports

No Danger to Navigation Reports were submitted for this survey. ***Concur.***

D.2 ADDITIONAL RESULTS

Shoreline verification was not required for this survey. Comparison with prior surveys was not required under this task order. ***Concur.***

Aids to Navigation

There were no aids to navigation for this survey. ***Concur.***

Additional Factors

There are no additional factors. ***Concur.***

E. APPROVAL SHEET

20 August 2010

LETTER OF APPROVAL

REGISTRY NUMBER: H12096

This report and the accompanying digital data for project OPR-G443-KR-09 Georgia Safety Fairways is respectfully submitted.

Field operations and data processing contributing to the accomplishment of this survey, H12096, were conducted under my supervision and the supervision of other lead hydrographers with frequent personal checks of progress and adequacy. This report and accompanying deliverable data items have been closely reviewed and are considered complete and adequate as per the Statement of Work.

Reports previously submitted to NOAA for this project include:

Report	Submission Date
H12099 Descriptive Report, SAIC Doc 10-TR-006	09 April 2010
Data Acquisition and Processing Report, SAIC Doc 10-TR-008	09 April 2010
H12098 Descriptive Report, SAIC Doc 10-TR-005	11 June 2010
H12095 Descriptive Report, SAIC Doc 10-TR-025	30 July 2010

SCIENCE APPLICATIONS INTERNATIONAL CORPORATION

Evan J. Robertson

Digitally signed by Evan J. Robertson
DN: cn=Evan J. Robertson, o=MSTD, ou=SAIC,
email=Evan.J.Robertson@saic.com, c=US
Date: 2010.08.20 09:02:01 -04'00'

Evan J. Robertson
Lead Hydrographer
Science Applications International Corporation
20 August 2010

APPENDIX I. DANGER TO NAVIGATION REPORTS (AHB SUBMISSIONS TO MCD)

There were no Dangers to Navigation observed during this survey.

APPENDIX II. SURVEY FEATURE REPORT

This supporting survey feature report consists of the nine attached files as described below:

- One Excel spreadsheet and one corresponding PDF file, titled *H12096_Multibeam_Features_List**, listing all multibeam features that correspond to the objects in the S-57 feature file.
- One Excel spreadsheet and one corresponding PDF file, titled *H12096_Designated_Soundings_List**. There were five designated soundings set across this sheet to help better preserve the shallowest soundings relative to the computed depth surface.
- One Excel spreadsheet and one corresponding PDF file, titled *H12096_Sidescan_Contacts_List**, listing all sidescan contacts identified on H12096.

  Concur with clarification. The content of the Excel files and corresponding PDF files is the same. The Excel files were submitted with the original field records. The PDFs are appended to this report below.
- Three PDF files containing feature correlator sheets, listed below:

H12096_Correlator_Sheet_Feature_01.pdf
H12096_Correlator_Sheet_Feature_02.pdf
H12096_Correlator_Sheet_Feature_03.pdf

FEATURE CORRELATOR SHEET Job: H12096

Feature #: 0001 Least Depth: 58(ft), 17.82(m) Lat: 30 55 40.65N Lon: 080 58 05.34W Ping: 70360 Beam: 113

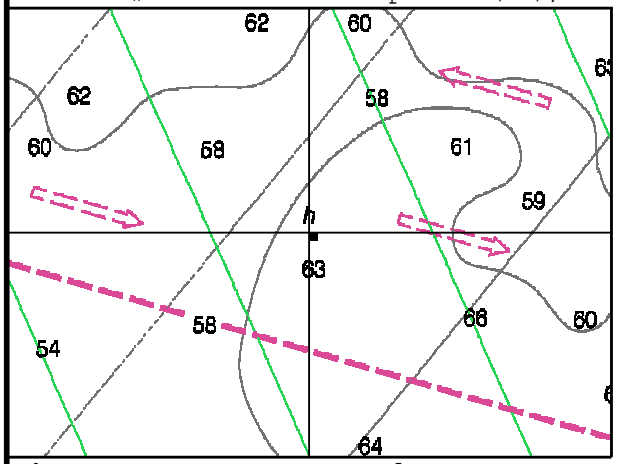


Chart: 11502_1.KAP Scale 1:20000

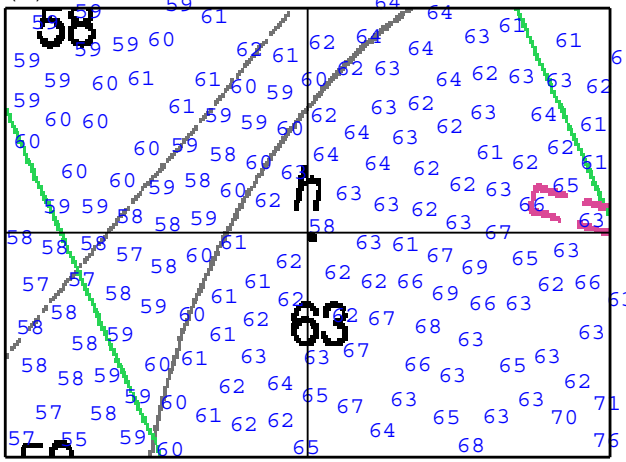
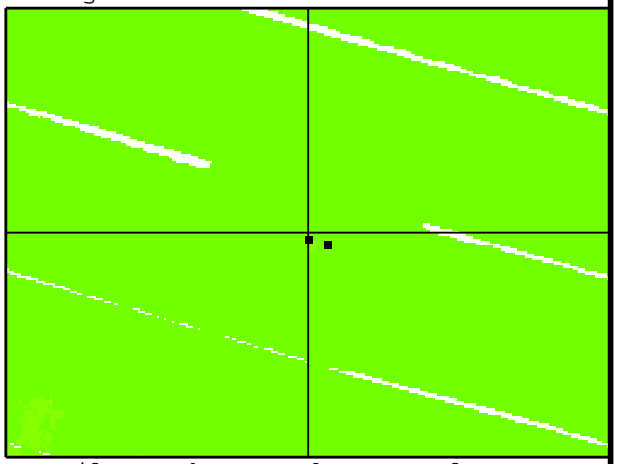
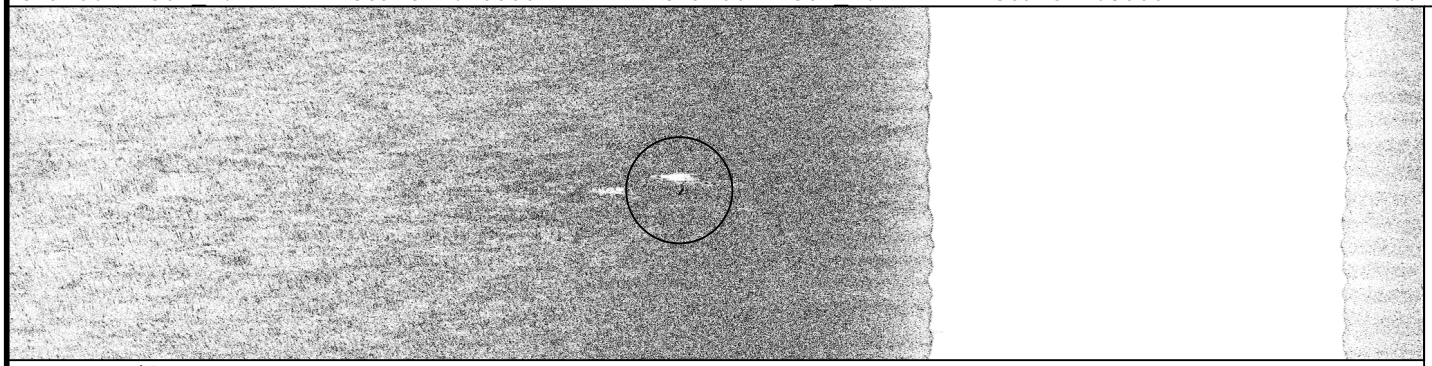


Chart: 11502_1.KAP Scale 1:8000



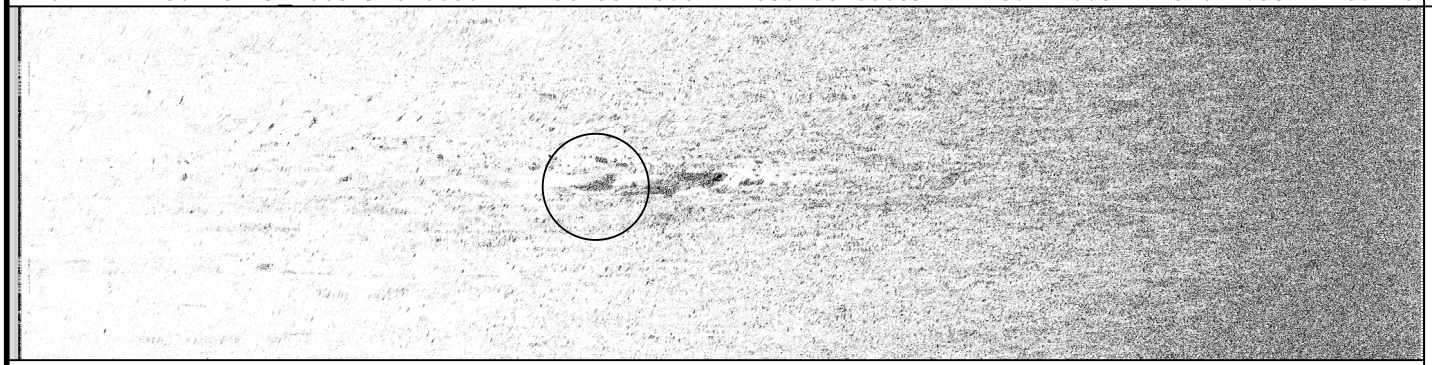
MB File: asmba10149.d12 Scale 1:1000



ID: 2 File: AS149_100529161000.XTF 30 55 40.61N 080 58 05.39W RNG: -20.81 HGT: 1.38 HDG: 104

COMMENT:
OBSTRS. No chart.
Nonsignificant relative to surrounding natural depths.
Located within fairway.

Concur with clarification. Least depth of feature is not significant relative to surrounding depths. Chart as 58 ft Sounding.



ID: 1 File: AS149_100529053100.XTF 30 55 40.54N 080 58 05.10W RNG: -48.41 HGT: 0.91 HDG: 287

CORRELATED SS CONTACTS:

Contact	Range/Height
1149165915	-20.81/1.38
1149053743	-48.41/0.91

FEATURE CORRELATOR SHEET Job: H12096

Feature #: 0002 Least Depth: 55(ft), 16.82(m) Lat: 30 55 18.46N Lon: 080 58 36.24W Ping: 3332 Beam: 230

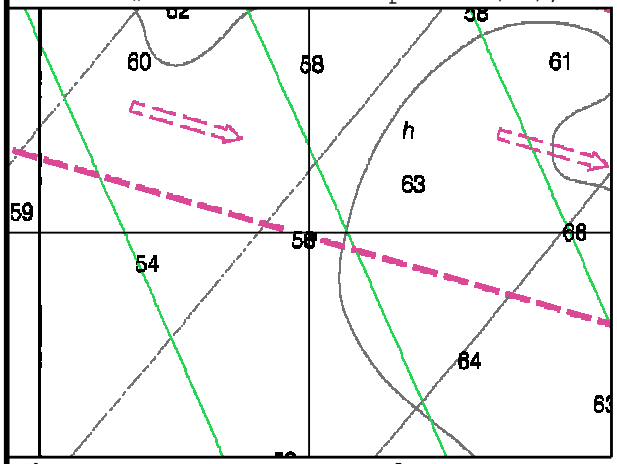


Chart: 11502_1.KAP Scale 1:20000

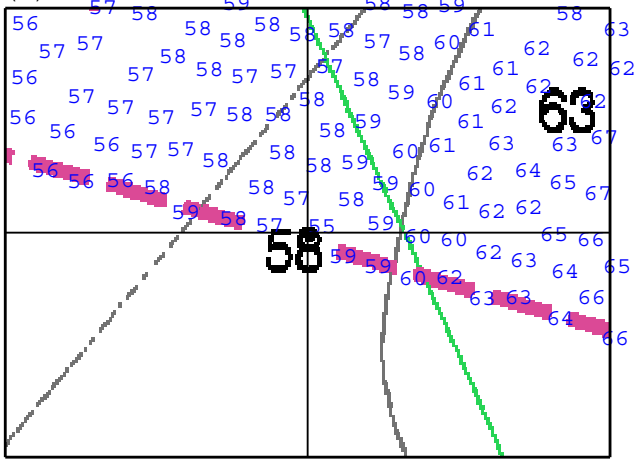
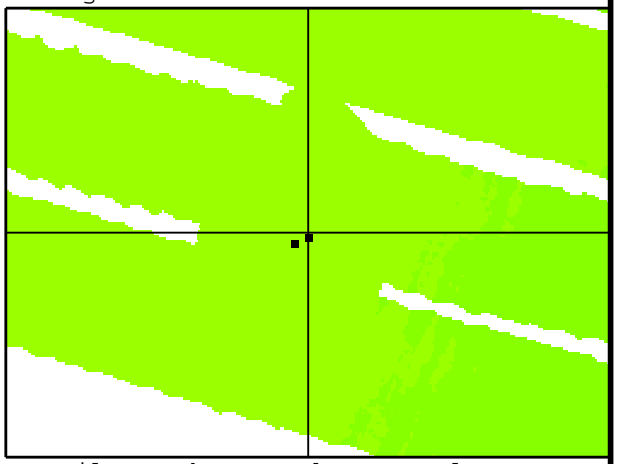
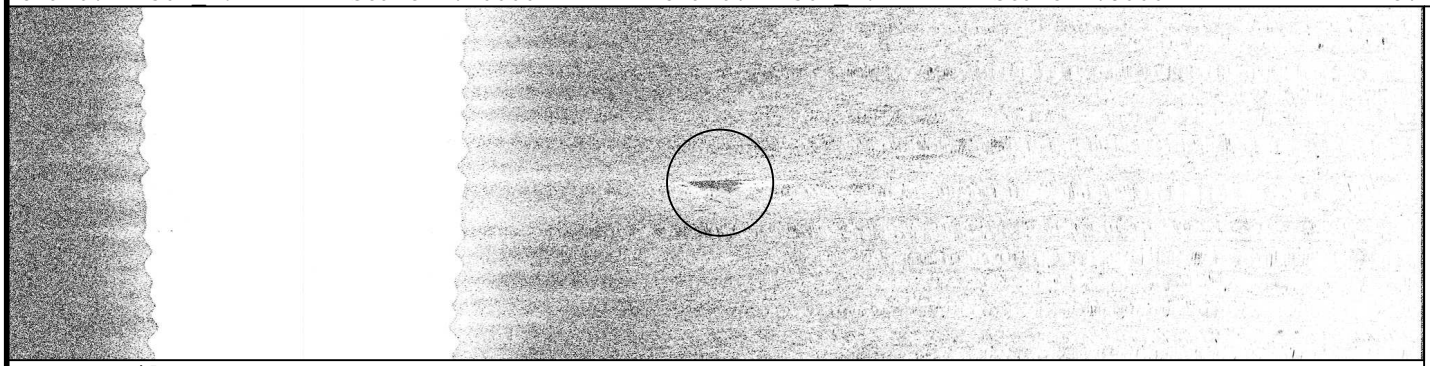


Chart: 11502_1.KAP Scale 1:8000



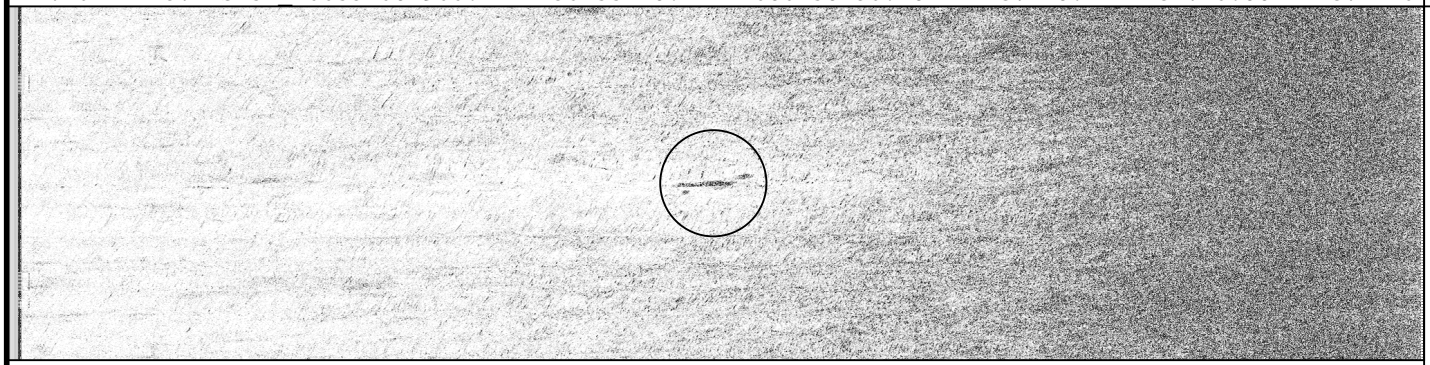
MB File: asmba10151.d08 Scale 1:1000



ID: 6 File: AS151_100531081900.XTF 30 55 18.44N 080 58 36.28W RNG: 18.72 HGT: 0.88 HDG: 110

COMMENT:
OBSTR. Chart sounding and danger circle and label 'Obstn'. Located within fairway.

Concur with clarification. Least depth of feature is not significant relative to surrounding depths. Chart as 55 ft Sounding.



ID: 5 File: AS151_100531015800.XTF 30 55 18.36N 080 58 36.51W RNG: -43.09 HGT: 0.82 HDG: 106

CORRELATED SS CONTACTS:

Contact	Range/Height
1151091607	18.72/0.88
1151025625	-43.09/0.82

FEATURE CORRELATOR SHEET Job: H12096

Feature #: 0003 Least Depth: 46(ft), 14.03(m) Lat: 30 57 16.15N Lon: 081 05 24.17W Ping: 3107 Beam: 234

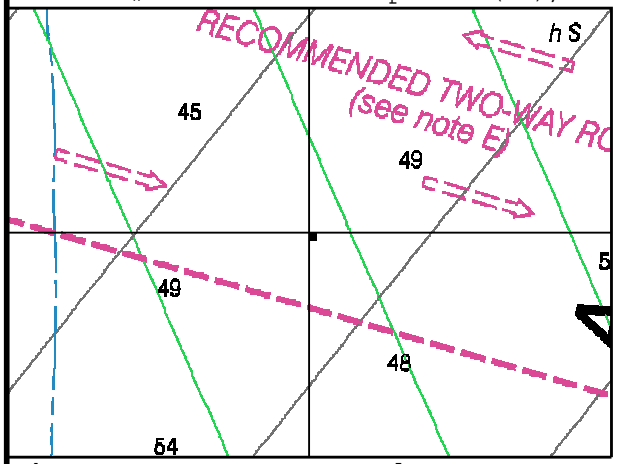


Chart: 11502_1.KAP Scale 1:20000

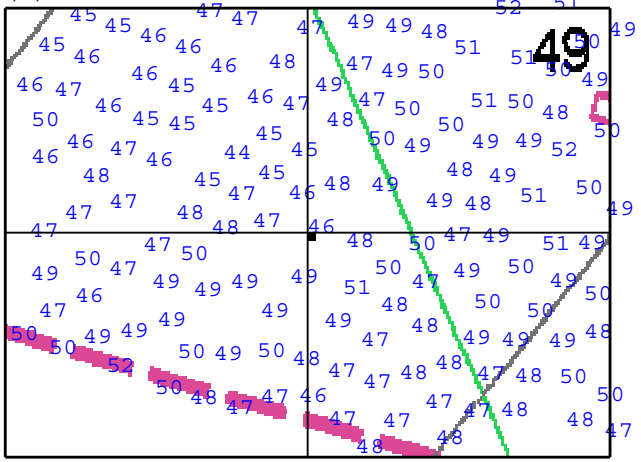
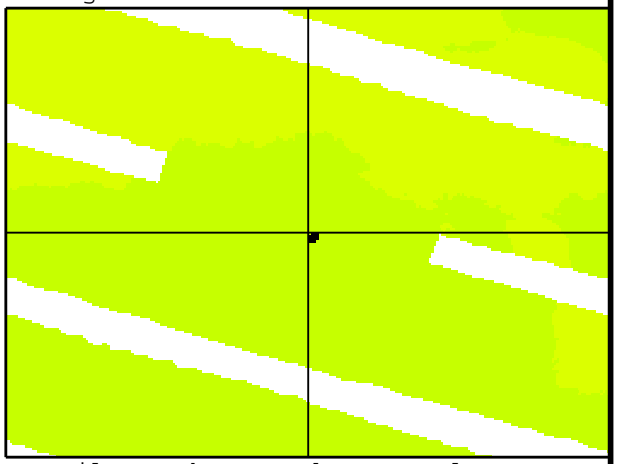
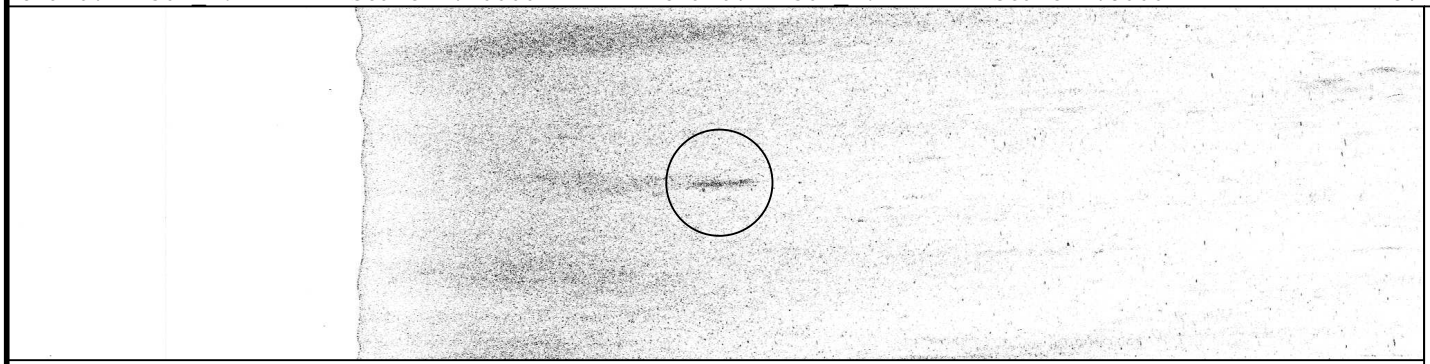


Chart: 11502_1.KAP Scale 1:8000



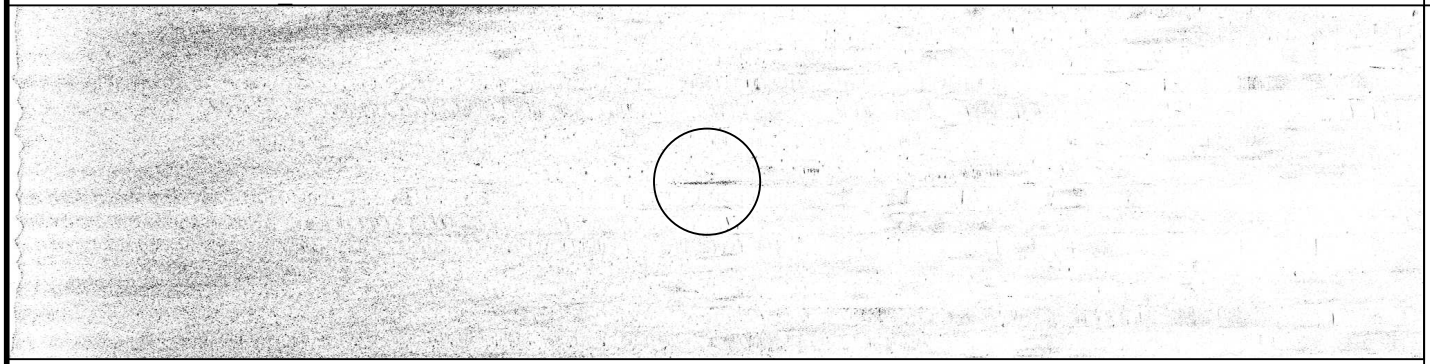
MB File: asmba10151.d17 Scale 1:1000



ID: 3 File: AS150_100530022400.XTF 30 57 16.12N 081 05 24.17W RNG: 24.91 HGT: 0.88 HDG: 286

COMMENT:
OBSTR. No chart.
Nonsignificant relative to surrounding natural depths.
Located within fairway.

Concur with clarification. Least depth of feature is not significant relative to surrounding depths. Do not chart.



ID: 4 File: AS150_100530034000.XTF 30 57 16.16N 081 05 24.12W RNG: 38.91 HGT: 0.56 HDG: 107

CORRELATED SS CONTACTS:

Contact	Range/Height
1150023944	24.91/0.88
1150043055	38.91/0.56

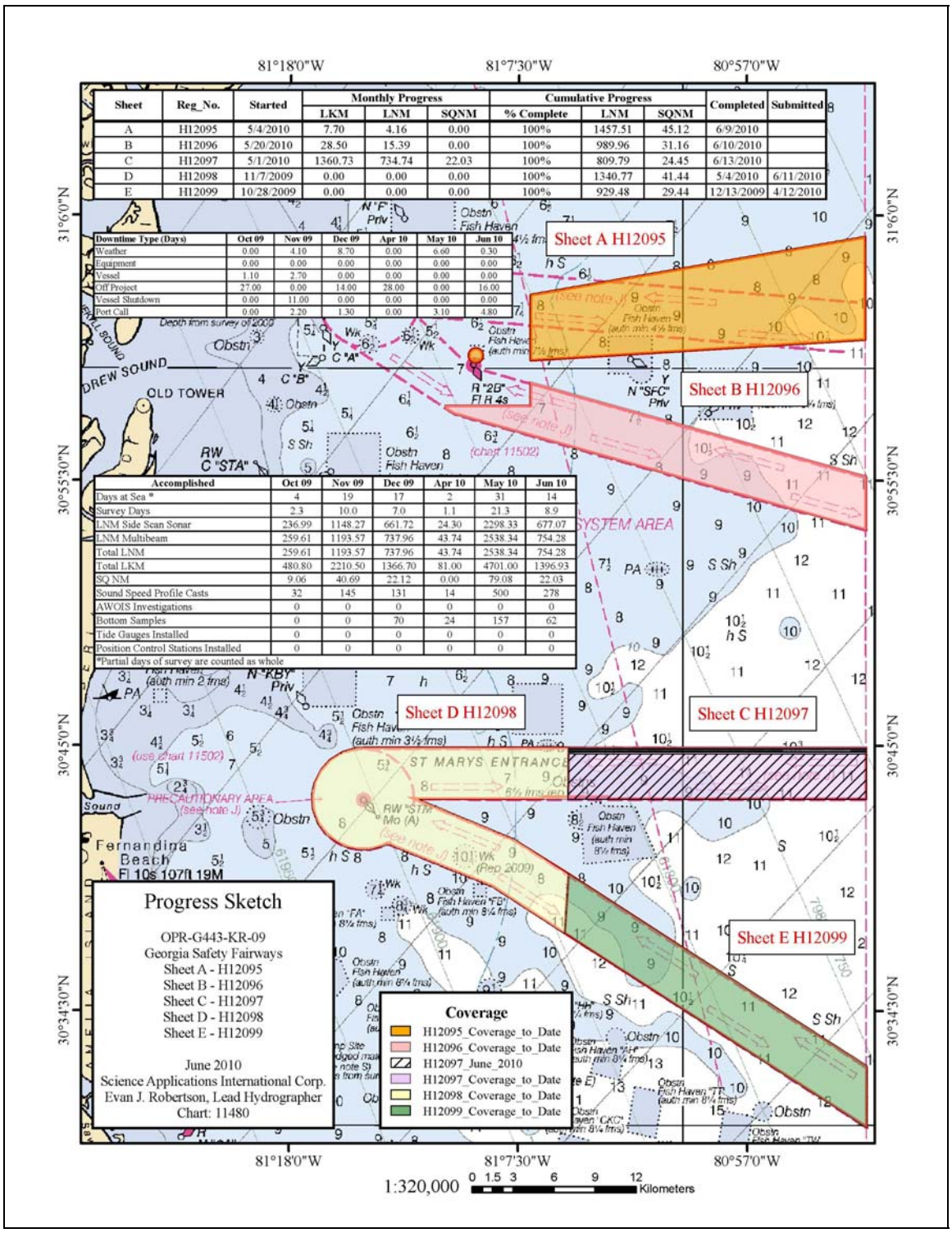
Feature Number	Feature Position (NAD83)		Description	Multibeam File	Ping	Beam	Depth (Meters)	Vertical Uncertainty (Meters)	Horizontal Uncertainty (Meters)	Depth (Feet)	Time (UTC)
	Latitude (N)	Longitude (W)									
1	30° 55' 40.65"	080° 58' 05.34"	OBSTRS. No chart. Nonsignificant relative to surrounding natural depths. Located within fairway.	asmba10149.d12	70360	113	17.820	0.27	1.41	58	16:59:03.700
			Concur with clarification. Least depth of feature is not significant relative to surrounding depths. Chart as 58 ft Sounding.							***58.465***	
2	30° 55' 18.46"	080° 58' 36.24"	OBSTR. Chart sounding and danger circle and label 'Obstn'. Located within fairway.	asmba10151.d08	3332	230	16.820	0.27	1.34	55	12:06:53.180
			Concur with clarification. Least depth of feature is not significant relative to surrounding depths. Chart as 55 ft Sounding.							***55.184***	
3	30° 57' 16.15"	081° 05' 24.17"	OBSTR. No chart. Nonsignificant relative to surrounding natural depths. Located within fairway.	asmba10151.d17	3107	234	14.030	0.27	1.35	46	18:40:45.432
			Concur with clarification. Least depth of feature is not significant relative to surrounding depths. Do not chart.							***46.030***	

Consecutive Number	Position (NAD83)		Category	Multibeam File	Ping	Beam	Depth (Meters)	Vertical Uncertainty (Meters)	Horizontal Uncertainty (Meters)	Time (UTC)
	Latitude (N)	Longitude (W)								
1	30° 55' 40.45"	080° 58' 05.30"	Designated Sounding	asmba10149.d12	70367	160	18.37	0.27	1.40	16:59:04.397
2	30° 55' 40.55"	080° 58' 05.16"	Designated Sounding	asmba10149.d12	70380	128	18.19	0.27	1.41	16:59:05.692
3	30° 55' 40.44"	080° 58' 05.15"	Designated Sounding	asmba10149.d15	977	233	18.53	0.27	1.39	23:02:14.754
4	30° 55' 40.39"	080° 58' 05.31"	Designated Sounding	asmba10149.d15	990	213	18.34	0.27	1.39	23:02:15.850
5	30° 55' 40.55"	080° 58' 05.32"	Designated Sounding	asmba10149.d15	998	247	17.96	0.27	1.39	23:02:16.526

Sequential ID	Year / JD	Time (UTC)	Contact Position (NAD83)		Contact Number	Contact Length (M)	Contact Width (M)	Contact Height (M)	Shadow Length (M)	Range Scale (M)	Range (M)	Fish Altitude (M)	Feature Number	Feature Depth (M)	*Is in S-57 File
			Latitude (N)	Longitude (W)											
001	2010/149	05:37:44	30° 55' 40.54"	080° 58' 05.10"	1149053743	3.61	1.65	0.91	6.79	75	-48.41	7.55	1	17.82	YES
002	2010/149	16:59:15	30° 55' 40.61"	080° 58' 05.39"	1149165915	5.39	1.68	1.38	3.55	75	-20.81	9.34	1	17.82	YES
003	2010/150	02:39:44	30° 57' 16.12"	081° 05' 24.17"	1150023944	1.36	2.11	0.88	2.81	75	24.91	8.91	3	14.03	YES
004	2010/150	04:30:56	30° 57' 16.16"	081° 05' 24.12"	1150043055	0.81	2.11	0.56	3.12	75	38.91	7.85	3	14.03	YES
005	2010/151	02:56:26	30° 55' 18.36"	080° 58' 36.51"	1151025625	1.48	2.42	0.82	4.95	75	-43.09	8.29	2	16.82	YES
006	2010/151	09:16:07	30° 55' 18.44"	080° 58' 36.28"	1151091607	4.43	2.33	0.88	2.73	75	18.72	7.25	2	16.82	YES

*The value of "YES" indicates that the contact was correlated to a bathymetry feature that is presented in the S-57 Feature file. The contacts are not included in the S-57 Freature file.
A supplemental delivery has been made with the side scan sonar contact in a separate non-standard S-57 file.

APPENDIX III. FINAL PROGRESS SKETCH AND SURVEY OUTLINE



Sheet	Reg_No.	Started	Monthly Progress			Cumulative Progress			Completed	Submitted
			LKM	LNM	SQNM	% Complete	LNM	SQNM		
A	H12095	5/4/2010	7.70	4.16	0.00	100%	1457.51	45.12	6/9/2010	
B	H12096	5/20/2010	28.50	15.39	0.00	100%	989.96	31.16	6/10/2010	
C	H12097	5/1/2010	1360.73	734.74	22.03	100%	809.79	24.45	6/13/2010	
D	H12098	11/7/2009	0.00	0.00	0.00	100%	1340.77	41.44	5/4/2010	6/11/2010
E	H12099	10/28/2009	0.00	0.00	0.00	100%	929.48	29.44	12/13/2009	4/12/2010

Downtime Type (Days)	Oct 09	Nov 09	Dec 09	Apr 10	May 10	Jun 10
Weather	0.00	4.10	8.70	0.00	6.60	0.30
Equipment	0.00	0.00	0.00	0.00	0.00	0.00
Vessel	1.10	2.70	0.00	0.00	0.00	0.00
Off Project	27.00	0.00	14.00	28.00	0.00	16.00
Vessel Shutdown	0.00	11.00	0.00	0.00	0.00	0.00
Port Call	0.00	2.20	1.30	0.00	3.10	4.80

Accomplished	Oct 09	Nov 09	Dec 09	Apr 10	May 10	Jun 10
Days at Sea *	4	19	17	2	31	14
Survey Days	2.3	10.0	7.0	1.1	21.3	8.9
LNM Side Scan Sonar	236.99	1148.27	661.72	24.30	2298.33	677.07
LNM Multibeam	259.61	1193.57	737.96	43.74	2538.34	754.28
Total LNM	259.61	1193.57	737.96	43.74	2538.34	754.28
Total LKM	480.80	2210.50	1366.70	81.00	4701.00	1396.93
SQ NM	9.06	40.69	22.12	0.00	79.08	22.03
Sound Speed Profile Casts	32	145	131	14	500	278
AWOIS Investigations	0	0	0	0	0	0
Bottom Samples	0	0	70	24	157	62
Tide Gauges Installed	0	0	0	0	0	0
Position Control Stations Installed	0	0	0	0	0	0

*Partial days of survey are counted as whole

Figure Appendix III-1. Final Progress Sketch for H12096

The Survey Outline for H12096 was delivered to the COTR on 29 June 2010 in the file H12095_H12096_H12097_Final_Survey_Outlines.zip. The outline was created twice using two separate coordinate systems for import into MapInfo. The first of these, H12096_Final_Survey_Outline_LL_NAD83.dxf, is in latitude/longitude format and the second, H12096_Final_Survey_Outline_UTM17_NAD83.dxf, is projected in UTM Zone 17 North (meters). Both of these survey outline files are also a part of this delivery. Figure Appendix III-2 demonstrates the graphical depiction of the survey outline.

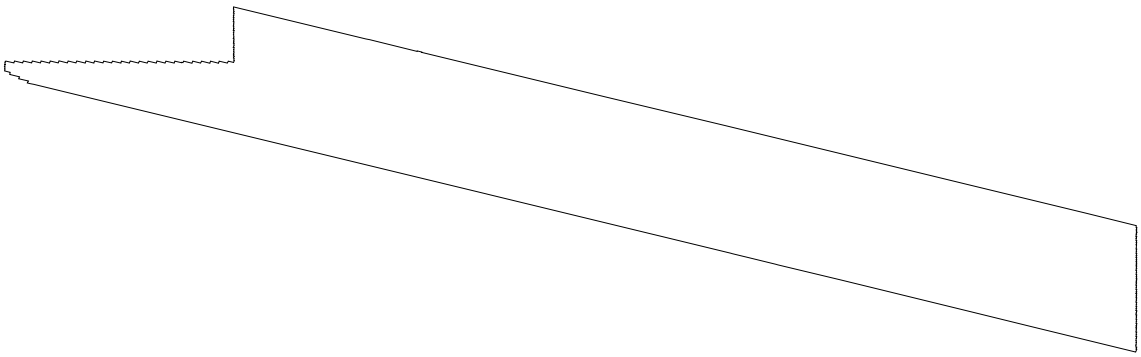


Figure Appendix III-2. Survey Outline for H12096

APPENDIX IV. TIDES AND WATER LEVELS

The on-line times for acquisition of valid hydrographic data are presented in the Abstract of Times of Hydrography, H12096 (Table Appendix IV-1).

Project: OPR-G443-KR-09
Registry No.: H12096
Contractor Name: Science Applications International Corporation
Date: 10 June 2010
Sheet Letter: B
Inclusive Dates: 20 May 2010 – 10 June 2010

Field work is complete.

Table Appendix IV-1. Abstract Times of Hydrography, H12096

Begin Date	Begin Julian Day	Begin Time	End Date	End Julian Day	End Time
05/20/2010	140	00:40:51	05/22/2010	142	07:42:55
05/23/2010	143	14:53:03	05/25/2010	145	10:42:50
05/28/2010	148	07:22:24	06/01/2010	152	00:45:16
06/01/2010	152	11:02:19	06/01/2010	152	12:57:46
06/03/2010	154	05:51:12	06/03/2010	154	07:51:44
06/09/2010	160	20:18:02	06/10/2010	161	00:31:58

Final Tide Note

Observed verified water levels were downloaded from the NOAA Tides and Currents web site for the station in Fernandina Beach, FL (8720030). Water Level correctors were prepared for each zone using the **Create Water Level Files** routine in the **SABER** software. The **Apply Correctors** routine within **SABER** applied these files to the multibeam data according to the zone containing the nadir beam of each ping.

The H12096 survey fell entirely within water level zones SA189, SA191, SA192, and SA196. These zones, which are outlined in Table Appendix IV-2, used zoning parameters based on the Fernandina Beach, FL, tide station (8720030).

Table Appendix IV-2. Tide Zone Parameters

Zone	Time Corrector (minutes)	Range Ratio	Reference Station
SA189	-36	0.98	8720030
SA191	-48	0.95	8720030
SA192	-36	0.95	8720030
SA196	-48	0.91	8720030

APPENDIX V. SUPPLEMENTAL SURVEY RECORDS & CORRESPONDENCE

This appendix is comprised of three sections and 62 attached files. The first section contains copies of email exchanges between SAIC and NOAA concerning various aspects of the survey, data processing, and submittal topics. The second section contains a table summarizing the bottom characteristics as collected for this sheet and 56 attached image files*, one for each of the bottom samples collected. The third section contains Supplemental Data Acquisition and Processing Information. This last section includes information on hardware and software upgrades for the 2010 season as well as updated calibration dates for the sound speed sensors and results from the sea acceptance test (SAT) conducted prior to 2010 survey operations. The Appendix_V_Files directory contains the following supplemental files:

- One text file and one corresponding PDF file, titled *H12096_one_meter_PFM_Uncertainty_Exceeds_IHO1*, listing all of the nodes from the one-meter PFM where the final uncertainties exceeded the IHO Order 1 allowable uncertainty value for the CUBE depth of the node.
- One text file and one corresponding PDF file listing nodes where the final uncertainties exceeded the IHO Order 1 allowable uncertainty value for each of the two 0.5-meter node PFMs covering features in water depths less than 23 meters as listed below:
  - *H12096_half_meter_PFM_Features_Area_1_Uncertainty_Exceeds_IHO1*
    - Contains Feature number 3.
  - *H12096_half_meter_PFM_Features_Area_2_Uncertainty_Exceeds_IHO1*
    - Contains Features 1 and 2.
- 56 JPEG files containing photographs for the bottom samples, listed below:

Concur with clarification. The 56 digital photograph files (JPEGs) were submitted with the original field records. The photographs are not included with this document. A table listing the 56 bottom samples is included on pages A-18 – A-19.

H12096_BS_01.jpg	H12096_BS_20.jpg	H12096_BS_39.jpg
H12096_BS_02.jpg	H12096_BS_21.jpg	H12096_BS_40.jpg
H12096_BS_03.jpg	H12096_BS_22.jpg	H12096_BS_41.jpg
H12096_BS_04.jpg	H12096_BS_23.jpg	H12096_BS_42.jpg
H12096_BS_05.jpg	H12096_BS_24.jpg	H12096_BS_43.jpg
H12096_BS_06.jpg	H12096_BS_25.jpg	H12096_BS_44.jpg
H12096_BS_07.jpg	H12096_BS_26.jpg	H12096_BS_45.jpg
H12096_BS_08.jpg	H12096_BS_27.jpg	H12096_BS_46.jpg
H12096_BS_09.jpg	H12096_BS_28.jpg	H12096_BS_47.jpg
H12096_BS_10.jpg	H12096_BS_29.jpg	H12096_BS_48.jpg
H12096_BS_11.jpg	H12096_BS_30.jpg	H12096_BS_49.jpg
H12096_BS_12.jpg	H12096_BS_31.jpg	H12096_BS_50.jpg
H12096_BS_13.jpg	H12096_BS_32.jpg	H12096_BS_51.jpg
H12096_BS_14.jpg	H12096_BS_33.jpg	H12096_BS_52.jpg
H12096_BS_15.jpg	H12096_BS_34.jpg	H12096_BS_53.jpg
H12096_BS_16.jpg	H12096_BS_35.jpg	H12096_BS_54.jpg
H12096_BS_17.jpg	H12096_BS_36.jpg	H12096_BS_55.jpg
H12096_BS_18.jpg	H12096_BS_37.jpg	H12096_BS_56.jpg
H12096_BS_19.jpg	H12096_BS_38.jpg	

CORRESPONDENCE

-----Original Message-----
From: Castle.E.Parker [mailto:Castle.E.Parker@noaa.gov]
Sent: Tuesday, February 23, 2010 2:44 PM
To: Mark.T.Lathrop; Quintal, Rebecca T.
Cc: Evans, Rhodri E.; Donaldson, Paul L.; Davis, Gary R.; Simmons, Walter S.
Subject: Re: Clarification on Object Detection Coverage

Good Day Everyone,
My comments will be in blue fonts:
Question 1: Yes to 1m resolution grid for the entire area and no to the second part. Object Detection 0.5m resolution grid for AWOIS MB investigations where 200% SS was not acquired and any MB developments that contains a feature. This refers to the output deliverables at 0.5m resolution. Object detection is really covered with the SS 200% for disprovals and detecting features; side scan is the object detection tool in this case, then developed with MB coverage for features that are considered significant or an AWOIS item if located. If the multibeam sonar is a high resolution sonar such a 0.5°x0.5° beam width it is considered object detection capable and considered appropriate for charted feature disproval without SSS coverage. We don't really need the AWOIS items covered with 200% SSS and then conducting object detection coverage over the same area with MB where the feature was not located within the SS records. This in essence is two object detect coverages. The disproval of a feature (AWOIS or charted feature) can occur with MB if a high res sonar unit, but that common area should have 200% SSS coverage and that would be the disproval source. Thus if SS doesn't reveal or contain contacts that represent the AWOIS item, then the AWOIS items does not need 0.5m resolution grid coverage over the entire AWOIS search radius. The 0.5m grid should only contain the MB developments for the feature located.

We don't need a 0.5m resolution grid for the entire area. The 0.5m resolution grid should contain only the feature developments.

Question 2: Yes.
Again, object detection grid resolution would not be applicable for a 200% SSS survey with skunk striped MB (bathy data). the object detection should source the SS.

Submit 1 grid for the entire area at 1m resolution. Submit a grid at 0.5m resolution for all MB developments where applicable.
Clear? If not, please respond.
Gene

Mark.T.Lathrop wrote:

Rebecca,

It makes sense to me to have a 1-meter BAG for the entire sheet including the AWOIS and a separate BAG for those AWOIS items < 23m. I am including Gene in my reply since AHB will be reviewing the data and I'm sure he'll want to weigh in on this.
Mark

Quintal, Rebecca T. wrote:

Mark,

We would like clarification on the requirement for Object Detection Coverage in the Project Instructions for OMNI TO#1 MARYLAND Sheets LMN, TO#2 DELMARVA Sheets OPQR, and TO#3 Georgia ABCDE. For all three projects the Coverage section of the Project Instructions state the following:

REQUIRED COVERAGE TYPES

/water depth range or area
required coverage type(s)/**

all depths 200% SSS with concurrent VBES or MB coverage

Area(s) where object detection is critical
Object Detection Coverage including AWOIS investigations

We have interpreted the “areas where object detection is critical” to only be the portions of assigned AWOIS investigation areas within our survey bounds since no other areas are specified.

Section *5.1.2.1 Object Detection Coverage *in the 2009 Specifications and Deliverables document states that “The following grid-resolution thresholds as a function of depth range; shall be used unless an exception is approved as described in Section 5.1.2.”

*Depth** Range** (m)	Resolution (m)*
0–23	0.5
20-40	1

Question 1 – For water depths between 0-23 meters

Our intention is to deliver 1 meter resolution BAG files for the entire sheet to meet the Set Line Spacing Coverage requirement. For the Object Detection Coverage, we have assumed where the assigned AWOIS search radius falls within our SOW area, and the depths range from 0-23 meters, that a separate BAG will be delivered covering this area at 0.5 meter resolution. Please confirm if this is correct?

Question 2 – For water depths deeper than 23 meters

As our intention is to deliver 1 meter resolution BAG files for the entire sheet, we are assuming that these 1 meter BAGs will meet the Object Detection Coverage requirement for AWOIS areas (with assigned search radii) that fall within our SOW area and the depths are deeper than 23 meters water depth. Therefore no additional deliverables are required. Please confirm this assumption?

-Rebecca

Rebecca T. Quintal | SAIC
Data Processing Manager | Marine Science and Technology Division
phone: 401.847.4210 | fax: 401.849.1585
mobile: 401.829.6242 | email: rebecca.t.quintal@saic.com

From: Quintal, Rebecca T.
Sent: Monday, July 19, 2010 9:26 AM
To: 'Castle.E.Parker'
Cc: Sarah Eggleston; Mark T Lathrop; Richard T Brennan; Evans, Rhodri E.; Infantino, Jason; Byrne, John Shannon
Subject: RE: S57 SSS Contact File

Gene,

Hello. Thank you for talking through this string of emails with me on Thursday as well as previous conversations. This email attempts to capture our discussion. If there is anything that I have missed please let me know.

Starting with our next delivery due to ship out at the end of July (H12095), SAIC will begin to deliver the agreed upon data deliverables as described below. We will work with AHB to modify the data products on subsequent deliveries if these initial formats are problematic. The additional deliverables will include non-standard BAGs (discussed in number 1 below) and also non-standard S-57 files (discussed in number 2 below). We expect to be delivering standard S-57 files in the future but we have some reservations about the non-standard BAGs as there is not a current plan in place to make them compliant with the defined BAG format. We respectfully request that NOAA make a formal request with ONSWG to have the additional surfaces added as optional layers within the BAG format. Therefore these data deliveries could become compliant deliveries once defined in BAG and supported by the various software products involved.

1. In addition to the current deliverable of a BAG file with the CUBE Depth and CUBE Final Uncertainty layers, CUBE Child layers will be provided in separate "non-standard" BAGs as listed below:

a. CUBE Depth and CUBE Number of Hypotheses for each node (populated in the uncertainty layer of the BAG)

b. CUBE Depth and CUBE Hypothesis Strength (chosen hypothesis) (populated in the uncertainty layer of the BAG)

c. CUBE Depth and CUBE Number of Soundings contributing to the chosen hypothesis for each node(populated in the uncertainty layer of the BAG)

d. CUBE Depth and CUBE Standard Deviation (populated in the uncertainty layer of the BAG)

e. CUBE Depth and Average TPU (populated in the uncertainty layer of the BAG)

Please note the following definitions within the SABER software which provides more detail on each surface

· CUBE Depth – contains the depth value from the node's best hypothesis.
· CUBE Number of Hypotheses – shows the number of hypotheses that were in each node.
· CUBE Standard Deviation – shows the CUBE algorithm's calculated depth uncertainty for the node. This is reported at the Confidence Interval you select during the PFM build process.
· CUBE Hypothesis Strength – a node-by-node estimate for how strongly supported a hypothesis depth estimate is. This value is calculated as follows: a ratio of the number of samples in the 'best' hypothesis and the samples in the next 'best' hypothesis is generated if you are using the Prior method, or in all the other hypotheses if you are using the Likelihood or Posterior methods. The ratio is subtracted from an arbitrary limit of 5. The hypothesis strength is interpreted as the closer this value is to zero, the stronger the hypothesis. If the resulting product is less than zero, it is reported as a zero.
· CUBE Number of Soundings – reports the number of soundings that were input into the best hypothesis.
· Average TPU – a second uncertainty value calculated by SABER, not the CUBE algorithm. This value is computed by taking the average of the vertical component of the TPU for each sounding that contributed to the best hypothesis for the node. It provides an alternative means for describing the likely depth uncertainty for nodes that are thinly populated with data, a condition that may result in poor performance of CUBE's estimated depth uncertainty.
· Final Uncertainty – this surface is populated with the greater value of the CUBE Standard deviation or the Average TPU surfaces.

Please note that the other surfaces that are available in the PFM grid format (run with CUBE) are listed below. These surfaces will NOT be provided. This list is just for your information. To enable any future discussions on the topic.

· Unfiltered Minimum Depths: This surface displays the shoalest sounding from the entire set of valid and invalid soundings written to each bin.
· Unfiltered Maximum Depths: This surface displays the deepest sounding from the entire set of valid and invalid soundings written to each bin.
· Filtered Minimum Depth: This surface shows the shoalest valid sounding in each bin after the invalid soundings have been filtered out.
· Filtered Maximum Depth: This surface shows the deepest sounding in each bin after the invalid soundings have been filtered out.
· Standard Deviation: this surface contains the standard deviation of the valid soundings data within each bin.
· Number of Soundings: this surface reports the total number of soundings, valid and invalid, in each bin.

The non-standard BAGs may go up to a file size of 500 MB if necessary.

2. A separate S-57 file will be sent that contains the side scan sonar contacts in it. These contacts will be populated in a non-standard way by using the Offshore Platform Object within S-57 (OFSPLF). In the future the Cartographic Symbol ($CSYMB) object may be added to the SABER software and then that object may be used for side scan contact delivery. The timing on the $CSYMB object support within SABER is TBD.

3. After discussing the HTD 2010-5 titled Hydrographic Survey Report Naming Conventions we have agreed that the best thing for the SAIC deliveries is to change the DR (Word doc) DAPR and HVCR reports to the naming convention but to keep the Separates and DR Appendices delivered as is. This is due to the work that is done by AHB in reviewing our DR and adding comments etc. and then the final PDF file is created by AHB.

Thanks again for your time Gene. We look forward to working with NOAA to work out these deliverables.

Have a great week,
-Rebecca

-----Original Message-----
From: Castle.E.Parker [mailto:Castle.E.Parker@noaa.gov]
Sent: Wednesday, June 23, 2010 11:22 AM
To: Quintal, Rebecca T.
Cc: Sarah Eggleston; Mark T Lathrop; Richard T Brennan
Subject: Re: S57 SSS Contact File

Hey and good day Rebecca,

I finally reviewed the files on the disk detailing grid child layers and S57 SS contact file.

I think the S57 SSS contact file will work fine. It's nice to have this in a GIS environment rather than CAD file. I feel that we should transition to the S57 format if you're willing. I think the S57 contact file complies or enables the spec to be met.

NOS HSSD 2010 version states the following:

"The contact list should be created such that it can be *imported into a GIS for office verifier to analyze the distribution of contacts*. However, if the hydrographer creates any image file showing the distribution of contacts and/or other products to assist with processing and analysis of the data, they may be included with the survey deliverables."

Regarding the grid child layers, this will work as well, I think. AHB will just have to carry a cheat sheet with grid child layer interpretations based upon using the Depth layer to represent different attributes such as density, hypothesis count, etc. Even though it says depth, the layer represents something else. This will have to work based upon SAIC's processing system and procedures. I would suggest providing the "read Me" file with every survey.

So, for the surveys that SAIC is planning on submitting, I think we should transition to the S57 environment and start working through the issues, that is if they exist. The files as existing on the submitted disc for review would comply with the ability to import to a GIS. I wonder if you still plan on submitting a SS contact list or table and if so, we might have to use in conjunction with the S57 SS contact file. I think that AHB would be able to backtrack the SS contact to appropriate line based upon the contact name.

I've passed the disc over to Sarah and she'll review, then bring another perspective to the table.

Rebecca, thanks for your effort with this endeavor and sorry for AHB's delayed response. Overall, good job and look forward to your response and revision within the survey deliverables. Please respond as necessary.

Regards,
Gene

Quintal, Rebecca T. wrote:

> Hello Gene and Sarah,

> Today you should receive a DVD from us with a variety of sample files. We have sample BAGs that have a variety of CUBE child layers in them. The CUBE child layers that are available in our PFM grids are:

> CUBE Depth
> CUBE Standard Deviation
> CUBE Number of Hypotheses for each node
> CUBE Hypothesis Strength (chosen hypothesis)
> CUBE Number of Soundings contributing to the chosen hypothesis for each node
> Average Propagated Error of soundings contributing to the node
> Final Uncertainty (the larger of the Average Propagated Error and the
> CUBE Standard Deviation)

> We have included these layers in various combination in BAG files as listed below. It turns out that if you go through the GUI our software prevents us from populating the BAGs with nonstandard data (ex: number of hypotheses in the Depth layer), but if we export from PFM to BAG via command line we can do it. We have also included XYZ files of the layers as well. Does Caris have the capability to display PFM grids? I know there was talk of them supporting the format at one point but never heard what became of it. If Caris can display them, then we could certainly delivery our final PFM grid which has all of these as layers within the single grid.

> We have also included two sample s-57 feature files with side scan

> contacts in them. We populated the contacts into the OFSPLF (Offshore

> platform) object. One file has only that object in it and the other has the meta objects as well (mcovr, mnsys, and mqual). These were produced with our existing capability. So we can certainly implement the $csymb object as well once it is implemented. Please let me know if you have any questions on any of these sample files. Hopefully something in this mix will be beneficial.

> Happy Friday!
> -Rebecca

> Bag and XML files:
> Cube_#Snds_depth_Cube_stdev_uncert
> Depth = Cube number of soundings
> Uncertainty= Cube Standard Deviation

> Cube_depth_Avg_TPE_uncert
> Depth = Cube Depth
> Uncertainty = Average Total Propagated Error

> Cube_depth_Cube_StdDev_uncert
> Depth = Cube Depth

> Uncertainty = Cube Standard Deviation

> Cube_depth_Final_uncert
> Depth = Cube Depth
> Uncertainty = Final Uncertainty

> Cube_hyp_depth_Cube_stdev_uncert
> Depth = Cube number of hypothesis
> Uncertainty = Cube Standard Deviation

> Cube_HypStr_depth_Cube_stdev_uncert
> Depth = Cube Hypothesis strength
> Uncertainty = Cube Standard Deviation

> XYZ Files:
> Avg_tpe = Average Total Propagated Error
> Cube_#hyp = Cube number of hypothesis
> Cube_#sndgs = Cube number of soundings
> Cube_depth = Cube depth
> Cube_hyp_strth = Cube hypothesis strength
> Cube_stdev = Cube Standard Deviation
> Final_unct = Final Uncertainty

> -----Original Message-----

> From: Castle.E.Parker [mailto:Castle.E.Parker@noaa.gov]
> Sent: Friday, April 02, 2010 11:54 AM
> To: Quintal, Rebecca T.
> Cc: Sarah Eggleston
> Subject: Re: S57 SSS Contact File

> Good morning Rebecca,

> These are the issues that HSD has been dealing with for several years....related to S57 format and trying to fit an international standard to specific uses for a data file transfer format. AHB and PHB deal with this same issue for the H-Cell as well. The S57 format files we receive are not meant to be an ENC and fit the ENC standards, thus why we want to customized product spec and revising the S57 ENC standards to fit our needs. S57 format is only the deliverable format.

> This is why AHB needs to understand the complications of our request... to determine if SAIC can create an S57 feature and SS contact file within the constraints of SAIC's use of the 7 Seas kernel. AHB encounters many ENC standards which are violated

within the HCell. The HCell and the deliverable S57 format files are not ENCs and not viewed in that light, so many ENC errors are acceptable.

> Modifying the object catalog for Caris users is just editing an XML file. For SAIC the issues may not be possible.... we need to find out.

> In the end, depending on your discussions with SAIC programmers, we may have to make exception.

> Thanks for your effort and inquiry with these issues.
> Gene
>

> Quintal, Rebecca T. wrote:

> > > Gene,

> > Thanks. A couple of questions/observations.

> > 1. I don't see REMARK as an available attribute for the object $CSYMB (Cartographic Symbol). S-57 Appendix A IHO Object Catalogue page 230. Can SAIC modify the catalog to include REMARK? What I mean is, can SAIC modify the object catalog that is used in conjuction with the

> 7 Seas kernel? If for instance, the use of REMARK for $CSYMB is not possible, we can pick another attribute such as NINFOM and NTXTDS.

> > 2. Do you still want RECDAT populated even though it has been prohibited for any object? Appendix B.1 Section 3.5.3 Prohibited attributes (page 8). Yes, unless the 7 Seas kernel won't allow inclusion of the attribute.

> > 3. okay, I looked into the lowercase attributes a little (to be honest

I had never used any non-standard objects or attributes before), so it appears that they can just be added onto an Object. So in your list I only see two (User ID and recomd). Correct.

> > I wanted to spell it all out before I presented it to the programmers.

> > In the mean time we will produce a sample file with our currently supported attributes.

> > Thanks,
> > -Rebecca

> > -----Original Message-----

> > From: Castle.E.Parker@noaa.gov [mailto:Castle.E.Parker@noaa.gov]
> > Sent: Thursday, April 01, 2010 4:01 PM
> > To: Quintal, Rebecca T.
> > Subject: S57 SSS Contact File

> > Rebecca,

> > Here's the list of SS contact attributes that AHB (me with Rick's consent) suggested for an S57 SSS contact file. Think about it and discuss with hydro co-workers and programmers. I appreciate your review and comments.

> > thanks,

> > Gene

> > 1. SORIND: Source Indication (US,US,graph,H12345)
> > 2. SORDAT: Source Date (last day of hydro) 20091131
> > 3. RECDAT: Record Date (date of contact acquisition)
> > 4. PICREP: SS contact image (image file name)
> > 5. INFORM: Information field for corrected least depth of the correlating SWMB feature (This could be optional and open for discussion
> > 6.REMARK: contact remark: some sort of description of the SS contact i.e. debris, or Rk
> > 7.User ID: SS Contact Number (unique identifier) list the contact number or could list the SS DN and line number, ping number, offset, and
> > estimated height off the sea floor) some kind of identifying information to point to the bathy data.
> > DN. Line Number, Ping Number, Offset, Est. Contact Height
> > Ex: 056,128_1202,2261,-21,1.25m
> > 8. recomd: charting recommendation (i.e. significant, insignificant, or chart 32-ft Obstn)
> > 9. TXTDSC: text description of the correlating SWMB feature that includes line number, ping number, and beam number
> > (2009DN1021920_103-1175-96) Year 2009; DN 102; Line Start Time 1920; Line number 103; Ping 1175; Beam 96)

Subject: [Fwd: paper plot H10295, H10296]
From: Gene Parker <Castle.E.Parker@noaa.gov>
Date: Tue, 25 Jan 2011 11:19:00 -0500
To: Richard T Brennan <Richard.T.Brennan@noaa.gov>, Edward Owens <Edward.Owens@noaa.gov>
CC: James J Miller <James.J.Miller@noaa.gov>

Gentlemen,
H12095 and H12096 is currently in Compilation or Compilation queue. There is a request for a paper plot of both of these surveys to be submitted to NOAA's Greg Schweitzer, LTJG (assume he's with NMFS). I would suppose it's a paper plot of the H-cell with the chart in the background. We've received very little information with regard to what they want and was stated in previous emails that they don't know what they want. Originally, they wanted the BAGs... then it turned into a paper plot.

One thing to consider is sending the plot in PDF format and let Schweitzer make the hard copy plot. Contact Greg Schweitzer for details of the plot. All other information has Dave Elliott (NSB Nav Manager) as the go-between.

AHB can either comply with the request or not. This is not really one of our standard requests bearing in mind we don't plot anymore. But, Schweitzer is a NOAA team member.
Gene

PS: Once H12096 and H12097 has been assigned for compilation, please pass this request to the compiler.

Subject: paper plot H10295, H10296
From: David.Elliott@noaa.gov
Date: Fri, 07 Jan 2011 13:11:49 -0500
To: Castle E Parker <Castle.E.Parker@noaa.gov>

Gene,

Could you please send a paper plot of the Brunswick surveys to LTJG, Greg Schweitzer after the H-cell has been completed and all the bells and whistles are attached for MCD. I know they will appreciate it. Contact info below.

Thanks, D.

Thanks for the update. Please remind me again when the survey is
available online for viewing. Yes, I think at paper plot of the region
would be useful.

Greg

Greg Schweitzer, LTJG, NOAA
Right Whale Maritime Liaison
Protected Resources Division
Southeast Regional Office
NOAA Fisheries Service
2382 Sadler Road
Fernandina Beach, Florida 32034
Voice: (904) 491-1400
Fax: (904) 321-1579

BOTTOM CHARACTERISTICS

There were 56 bottom samples taken to verify the bottom types charted for H12096. Table Appendix V-1. H12096 Bottom Sample Characteristics compares information for each sample collected to the charted bottom type within 2000 meters. Chart 11480 (Charleston Light to Cape Canaveral) covers the entire survey area; however, this chart does not have any bottom samples listed within H12096. A photograph of each bottom sample is provided in the Appendix_V_Files folder.

Table Appendix V-1. H12096 Bottom Sample Characteristics

JD	Sample Number	Bottom Sample Position (NAD83)		Observed Bottom Type	Depth of Bottom Sample (m)	Depth Uncertainty (m)	Charted Bottom Type
		Latitude (N)	Longitude (W)				Chart # 11502
152	H12096_BS_01	30° 53’ 57.0”	080° 51’ 44.8”	fneS brkSh	24.36	0.280	
152	H12096_BS_02	30° 54’ 44.5”	080° 51’ 57.2”	fneS brkSh	24.86	0.280	
152	H12096_BS_03	30° 55’ 31.3”	080° 52’ 12.7”	fneS brkSh	23.01	0.280	
152	H12096_BS_04	30° 55’ 44.2”	080° 53’ 05.5”	fneS brkSh	21.54	0.280	
152	H12096_BS_05	30° 54’ 58.6”	080° 52’ 52.6”	crsS brkSh	22.33	0.270	
152	H12096_BS_06	30° 54’ 10.2”	080° 52’ 38.5”	crsS brkSh P	22.65	0.270	
152	H12096_BS_07	30° 54’ 21.8”	080° 53’ 32.8”	crsS brkSh	21.61	0.280	
152	H12096_BS_08	30° 55’ 13.3”	080° 53’ 47.8”	crsS brkSh	20.22	0.280	
152	H12096_BS_09	30° 55’ 57.3”	080° 54’ 00.1”	fneS brkSh	20.70	0.279	
152	H12096_BS_10	30° 56’ 11.5”	080° 54’ 54.3”	fneS brkSh	21.17	0.280	
151	H12096_BS_11	30° 55’ 30.2”	080° 54’ 49.8”	crsS brkSh	20.47	0.270	
151	H12096_BS_12	30° 54’ 38.2”	080° 54’ 28.2”	crsS brkSh	20.34	0.270	
151	H12096_BS_13	30° 54’ 50.3”	080° 55’ 25.1”	crsS brkSh	19.34	0.280	
151	H12096_BS_14	30° 55’ 36.2”	080° 55’ 34.4”	mS brkSh	19.86	0.280	
152	H12096_BS_15	30° 56’ 24.8”	080° 55’ 48.9”	fneS brkSh	20.63	0.280	
152	H12096_BS_16	30° 56’ 38.1”	080° 56’ 42.3”	mS brkSh	19.60	0.270	
151	H12096_BS_17	30° 55’ 58.2”	080° 56’ 32.0”	fneS brkSh	18.64	0.280	
151	H12096_BS_18	30° 55’ 02.2”	080° 56’ 15.6”	mS	18.72	0.270	
151	H12096_BS_19	30° 55’ 15.4”	080° 57’ 09.7”	mS	21.44	0.280	
151	H12096_BS_20	30° 56’ 06.7”	080° 57’ 23.1”	mS brkSh	18.57	0.270	h
152	H12096_BS_21	30° 56’ 51.8”	080° 57’ 36.8”	fneS brkSh	19.89	0.270	
152	H12096_BS_22	30° 57’ 05.0”	080° 58’ 31.7”	fneS brkSh	20.38	0.270	
151	H12096_BS_23	30° 56’ 17.1”	080° 58’ 16.8”	fneS brkSh	18.54	0.280	h
151	H12096_BS_24	30° 55’ 30.5”	080° 58’ 06.0”	fneS brkSh	19.56	0.280	h
151	H12096_BS_25	30° 55’ 45.0”	080° 58’ 58.7”	mS brkSh	17.65	0.270	h
151	H12096_BS_26	30° 56’ 32.2”	080° 59’ 13.7”	fneS brkSh	19.56	0.270	
152	H12096_BS_27	30° 57’ 18.4”	080° 59’ 26.6”	fneS brkSh	19.23	0.270	
152	H12096_BS_28	30° 57’ 32.6”	081° 00’ 19.7”	fneS	18.85	0.280	
151	H12096_BS_29	30° 56’ 44.8”	081° 00’ 06.2”	fneS brkSh	18.88	0.270	
151	H12096_BS_30	30° 55’ 57.6”	080° 59’ 51.1”	fneS brkSh	18.77	0.270	
151	H12096_BS_31	30° 56’ 11.0”	081° 00’ 47.1”	fneS brkSh	17.81	0.270	
151	H12096_BS_32	30° 56’ 57.6”	081° 01’ 00.8”	fneS brkSh	16.67	0.270	
151	H12096_BS_33	30° 57’ 45.1”	081° 01’ 14.9”	fneS brkSh	15.74	0.270	h S
151	H12096_BS_34	30° 57’ 58.4”	081° 02’ 09.4”	fneS	15.38	0.270	h S

JD	Sample Number	Bottom Sample Position (NAD83)		Observed Bottom Type	Depth of Bottom Sample (m)	Depth Uncertainty (m)	Charted Bottom Type
		Latitude (N)	Longitude (W)				Chart # 11502
151	H12096_BS_35	30° 57’ 09.8”	081° 01’ 54.8”	fneS	17.01	0.280	
151	H12096_BS_36	30° 56’ 24.4”	081° 01’ 43.3”	fneS brkSh	17.10	0.270	
151	H12096_BS_37	30° 56’ 36.9”	081° 02’ 36.0”	mS brkSh	16.63	0.270	
151	H12096_BS_38	30° 57’ 19.9”	081° 02’ 48.0”	fneS	16.80	0.270	
151	H12096_BS_39	30° 58’ 11.8”	081° 03’ 03.5”	mS brkSh	15.38	0.270	h S
151	H12096_BS_40	30° 58’ 25.9”	081° 03’ 58.2”	fneS	17.05	0.270	h S
151	H12096_BS_41	30° 57’ 36.8”	081° 03’ 43.5”	fneS brkSh	17.03	0.270	h S
151	H12096_BS_42	30° 56’ 50.7”	081° 03’ 29.1”	mS brkSh	15.84	0.280	
151	H12096_BS_43	30° 57’ 03.5”	081° 04’ 24.7”	mS brkSh	15.10	0.270	
151	H12096_BS_44	30° 57’ 54.3”	081° 04’ 36.8”	fneS brkSh	15.59	0.270	
151	H12096_BS_45	30° 58’ 37.1”	081° 04’ 51.0”	fneS	16.75	0.270	
151	H12096_BS_46	30° 58’ 51.9”	081° 05’ 46.6”	fneS brkSh	16.87	0.280	h
151	H12096_BS_47	30° 58’ 04.7”	081° 05’ 30.7”	fneS brkSh	15.70	0.270	
151	H12096_BS_48	30° 57’ 17.5”	081° 05’ 19.0”	fneS brkSh	15.17	0.280	
151	H12096_BS_49	30° 57’ 30.8”	081° 06’ 14.5”	fneS brkSh	14.34	0.270	
151	H12096_BS_50	30° 58’ 17.6”	081° 06’ 25.4”	fneS	15.02	0.270	h
151	H12096_BS_51	30° 59’ 05.2”	081° 06’ 39.5”	fneS	14.12	0.270	h
151	H12096_BS_52	30° 58’ 27.3”	081° 07’ 14.1”	fneS brkSh	14.98	0.270	h
151	H12096_BS_53	30° 57’ 44.2”	081° 07’ 08.1”	fneS brkSh	14.85	0.270	h
151	H12096_BS_54	30° 57’ 58.6”	081° 08’ 05.5”	fneS brkSh	13.50	0.270	h
151	H12096_BS_55	30° 58’ 11.0”	081° 08’ 57.6”	fneS brkSh	13.64	0.270	h
151	H12096_BS_56	30° 58’ 24.3”	081° 09’ 52.9”	fneS brkSh	14.17	0.270	S Sh

It is recommended that the bottom type charted be updated where necessary based on the information collected during the latest survey.

SUPPLEMENTAL DATA ACQUISITION AND PROCESSING INFORMATION

Data collection for the Georgia Safety Fairways project (OPR-G443-KR-09) began in 2009 and was completed in 2010 after a winter shutdown that spanned from 17 December 2009 until 29 April 2010. The first sheet to be finalized for the project was H12099 and it was delivered on 09 April 2010 prior to the recommencement of survey operations. The Data Acquisition and Processing Report (DAPR) for the project was delivered concurrently with H12099. The data collection for H12096 occurred after the delivery of the DAPR (May and June 2010). The following sections provide supplemental data acquisition and data processing information about the systems used during the 2010 survey season. Only changes from what was reported in the original Data Acquisition and Processing Report are presented here.

Multibeam Systems

The Reson 7125 multibeam system was upgraded to the 7125 SV configuration. This upgrade removed the subsea Link Control Unit (LCU). The upgraded system now has a single combined sonar interface and processing topside unit. The system continued to be operated as a single frequency system at 400 kHz in the same manner as described in the DAPR. The Firmware Versions used during 2010 are provided below in Table Appendix V-2.

Table Appendix V-2. H12096 Multibeam System Firmware Versions

2010 Multibeam System	
Firmware MR7.1	**Version/SN**
7k Upload Interface	3.10.2.7
7k Center	3.5.3.11
7k I/O	3.3.0.19
SVP-70 S/N	4408372

Sound Speed Profiles

Serial numbers and calibration dates for the sound speed sensors used for H12096 during 2010 are listed below. Sound speed data and calibration records are included with the survey data in Section II of the Separates.

- Applied Microsystems Ltd., SV&P Smart Sensor, Serial Number 4523
  - Calibration Date: 15 March 2010.
- Applied Microsystems Ltd., SV&P Smart Sensor, Serial Number 4880
  - Calibration Date: 15 March 2010.
- Applied Microsystems Ltd., SV&P Smart Sensor, Serial Number 5454
  - Calibration Date: 05 February 2010.

Data Acquisition and Processing Software

The SAIC **ISS-2000** data acquisition software was upgraded from Version 4.1.0.11.0 to Version 4.2.0.5.1 during the 2009-2010 shutdown. Acquisition methods and processes

were not changed from what was described within the Data Acquisition and Processing Report for OPR-G443-KR-09.

Survey planning, data processing and analysis were carried out using the SAIC **Survey Planning** and **SABER** software suites. The software package was upgraded from version 4.3.0.12.1 to version 4.3.0.16.1 during the 2009-2010 shutdown. It was upgraded on 11 June 2010 to version 4.3.0.16.3 and again on 02 August 2010 to version 4.3.0.16.5. No processing methods or routines were changed from what was described within the Data Acquisition and Processing Report for OPR-G443-KR-09.

SonarPro version 11.3 was used for sidescan data acquisition during this survey. No processing methods or routines were changed from what was described within the Data Acquisition and Processing Report for OPR-G443-KR-09.

Survey System Uncertainty Model

The two tables below (Table Appendix V-3, Table Appendix V-4) provide the uncertainty values that were used in the Total Propagated Uncertainty calculations for the 2010 survey. The five values within the tables highlighted by a bold font identify the values which changed from 2009.

Table Appendix V-3. 2010 M/V Atlantic Surveyor Error Parameter File (EPF)

Parameter	Value	Units
VRU Offset – X	0.34	Meters
VRU Offset – Y	0.29	Meters
VRU Offset – Z	-1.71	Meters
VRU Offset Error – X (uncertainty)	0.005	Meters
VRU Offset Error – Y (uncertainty)	0.011	Meters
VRU Offset Error – Z (uncertainty)	0.013	Meters
VRU Latency	0.00	milliseconds (msec)
VRU Latency Error (uncertainty)	1.00	milliseconds (msec)
Heading Measurement Error (uncertainty)	0.02	Degrees
Roll Measurement Error (uncertainty)	0.02	Degrees
Pitch Measurement Error (uncertainty)	0.02	Degrees
Heave Fixed Error (uncertainty)	0.05	Meters
Heave Error (% error of height) (uncertainty)	5.00	Percent
Antenna Offset – X	4.60	Meters
Antenna Offset – Y	-0.37	Meters
Antenna Offset – Z	-8.09	Meters
Antenna Offset Error – X (uncertainty)	0.013	Meters
Antenna Offset Error – Y (uncertainty)	0.012	Meters
Antenna Offset Error – Z (uncertainty)	**0.020**	Meters
Estimated Error in Vessel Speed (uncertainty)	0.0299	Knots
GPS Latency	0.00	milliseconds (msec)
GPS Latency Error (uncertainty)	1.00	milliseconds (msec)
Horizontal Navigation Error (uncertainty)	0.75*	Meters
Vertical Navigation Error (uncertainty)	0.20*	Meters
Static Draft Error (uncertainty)	0.01	Meters
Loading Draft Error (uncertainty)	0.02	Meters
Settlement & Squat Error (uncertainty)	**0.34**	Meters

Parameter	Value	Units
Predicted Tide Measurement Error (uncertainty)	0.17	Meters
Observed Tide Measurement Error (uncertainty)	0.07	Meters
Unknown Tide Measurement Error (uncertainty)	0.50	Meters
Tidal Zone Error (uncertainty)	0.10	Meters
Surface Sound Speed Error (uncertainty)	1.00	meters/second (m/s)
SEP Uncertainty	0.15	Meters
SVP Measurement Error (uncertainty)	1.00	meters/second (m/s)
Depth Sensor Bias	0.00	Meters
Depth Measurement Error (% error of depth) (uncertainty)	0.00	Percent
Wave Height Removal Error (uncertainty)	0.05	Meters

*NOTE: These values would only be used if not included in the GSF file

Table Appendix V-4. 2010 Reson 7125 Sonar Parameters

Parameter	Value	Units
Transducer Offset – X	0.00*	Meters
Transducer Offset – Y	0.00*	Meters
Transducer Offset – Z	0.00*	Meters
Transducer Offset Error – X (uncertainty)	**0.005**	Meters
Transducer Offset Error – Y (uncertainty)	**0.011**	Meters
Transducer Offset Error – Z (uncertainty)	**0.013**	Meters
Roll Offset Error (uncertainty)	0.005	Degrees
Pitch Offset Error (uncertainty)	0.05	Degrees
Heading Offset Error (uncertainty)	0.05	Degrees
Model Tuning Factor	6.00	N/A
Amplitude Phase Transition	1	Samples
Latency	0.00	milliseconds (msec)
Latency Error (uncertainty)	1.00	milliseconds (msec)
Installation Angle	0.0	Degrees

*NOTE: These values would only be used if not included in the GSF file

Corrections to Echo Soundings

A system acceptance test was conducted on all equipment offsets and biases were confirmed or new values were determined for the 2010 survey on 05-09 April 2010. The values reported within the Data Acquisition and Processing Report for OPR-G443-KR-09, remain valid except for the tow block height above water. The tow block height above water value reported in Table C-1 (DAPR) and Figure C-1 (DAPR) was previously 4.87 meters and is now 4.67 meters. A typo was noted in the Data Acquisition and Processing Report for OPR-G443-KR-09 for the tow block from IMU Y value presented in Figure C-1 (DAPR). It was reported as +0.23 however it should have been reported as +0.40. This value is not used in any tow fish calculations and is reported as additional information only. The tow fish position is calculated based on the tow block from the multibeam sonar (7125) which was captured correctly.

Dynamic Draft Measurements

The *M/V Atlantic Surveyor* went into dry dock during the shutdown period for rudder, propeller, and shaft work. Dynamic draft values were re-established during the 2010 Sea Acceptance Test (SAT). An initial depth reference surface was created by stopping the

vessel and acquiring multibeam data as the vessel drifted with the prevailing current. A survey transect was then established perpendicular to the reference surface. This transect was run twice (once in each direction) at each of the six shaft rpm settings. This test was conducted on JD 096 (06 April) to determine the settlement and squat correctors and then re-run on JD 097 (07 April) to verify the settlement and squat values entered into the vessel configuration file. A 0.5-meter average grid was created for the drift line and each of the RPM pairs. Difference grids were then created between the average grid from drift reference line and the average grid for each of the RPM pairs. Only the near nadir (5-degree) beams were used to create the average grids. The settlement and squat values were computed by averaging the measured grid differences for each of the RPM settings. Table Appendix V-5 summarizes the shaft RPM, depth corrector, approximate speed and SAT multibeam files used. A shaft RPM counter provides automatic input to the Settlement and Squat look up table in the **ISS-2000** system.

Table Appendix V-5. M/V Atlantic Surveyor Settlement and Squat Determination

Shaft RPM	Depth Corrector	Approximate Speed (Kts)	Multibeam Files	
			Julian Day 096	Julian Day 097
0	0.00	0	asmba10096.d49	asmba10097.d98
140	-0.02	4	asmba10096.d50	asmba10097.d97 asmba10097.d47
180	-0.01	5	asmba10096.d51	asmba10097.d48
250	0.01	6	asmba10096.d52	asmba10097.d49
300	0.06	8	asmba10096.d53 asmba10096.d54	asmba10097.d50
340	0.10	9	asmba10096.d55	asmba10097.d51
380	0.12	10	asmba10096.d56 asmba10096.d57	asmba10097.d52

Multibeam Calibrations

Timing Test

A ping timing test was completed on 06 April 2010, prior to all other calibration tests, to verify that no timing errors exist within the survey system. The fundamental tool is the event marking capability of the Symmetricom BC635PCI IRIG-B card. An event is characterized by a positive-going TTL pulse occurring on the event line of the IRIG-B connector on the back of the ISSC. The pulses of interest are the transmit trigger of the RESON 7-P and the 1PPS timing pulses from the POS/MV. This test demonstrated that all GSF ping times matched the corresponding IRIG-B event times to within 2.2 milliseconds or less. These time differences are plotted in Figure Appendix V-1.

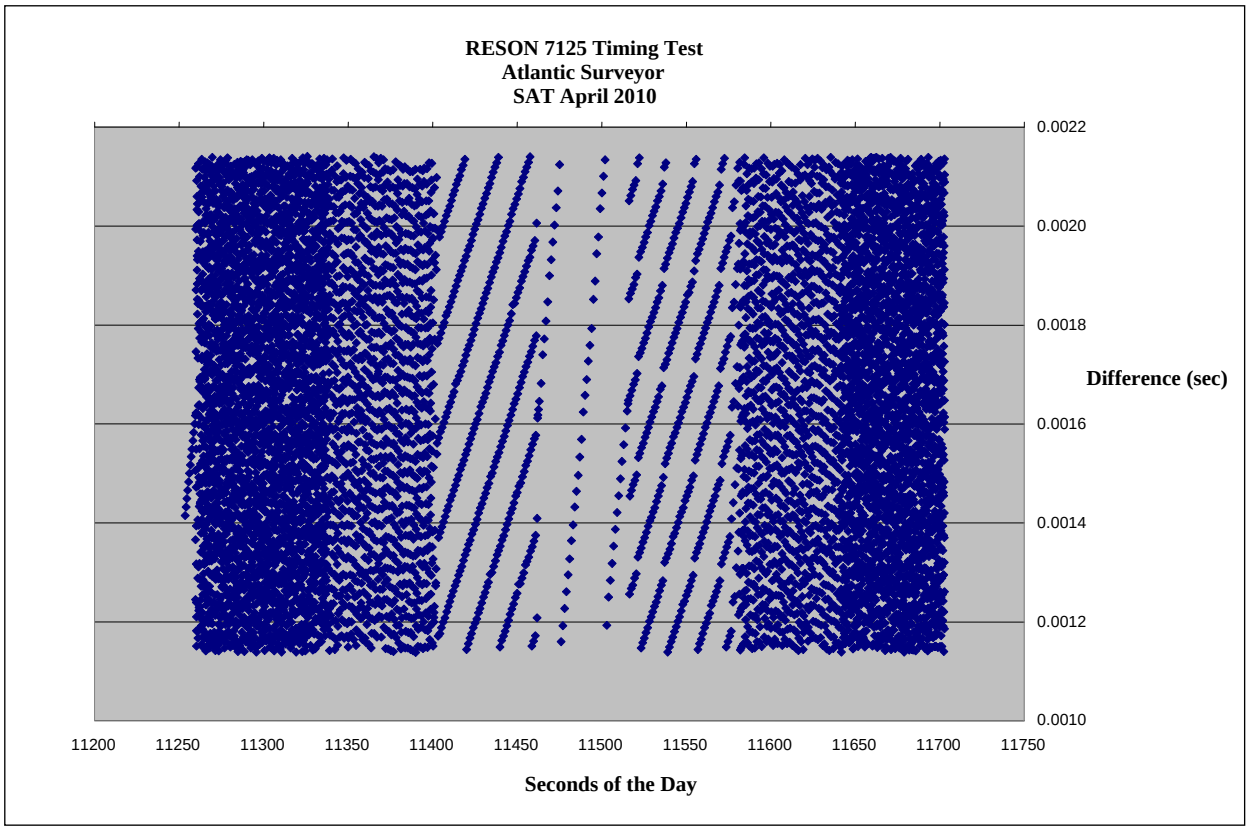


Figure Appendix V-1. Timing Test Results (time differences of ping trigger event vs. ping time tag from GSF)

Multibeam Bias

Roll, pitch, and heading biases were determined on 06 April 2010 (JD096) over a 47 foot wreck in the fish haven approximately six kilometers southeast of Manasquan Inlet in New Jersey (Table Appendix V-6). The wreck is charted in 40° 03' 23.55"N 073° 59' 33.25"W. On 07 April 2010 (JD097) the pitch, roll and gyro biases determined on 06 April 2010 (JD096) were verified.

Table Appendix V-6. Multibeam Files Verifying Alignment Bias Calculated (06 April 2010) using the SABER Swath Alignment Tool (SAT)

Component	Multibeam Files (pairs)		Bias
Pitch	asmba10097.d03	asmba10097.d04	+2.46°
Roll	asmba10097.d03	asmba10097.d04	+0.25°
Gyro	asmba10097.d05	asmba10097.d06	+1.80°

Pitch Alignment

Two sets of lines were collected for pitch bias calculation. All lines were run along the same survey transect in order that separate comparisons could be made between lines run in opposite directions. Several samples were viewed for each set of comparison lines in order to determine an accurate measurement of the pitch bias. Figure Appendix V-2 and Figure Appendix V-3 are images of the **SABER SAT** tool depicting data collected with the +2.46° pitch bias entered in the **ISS-2000** system; therefore the indicated bias is zero.

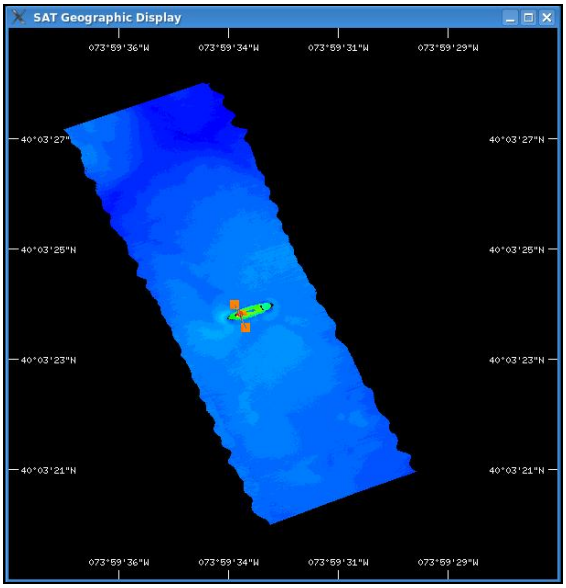


Figure Appendix V-2. SAT Tool, Plan View Depicting +2.46° Pitch Bias (06 April 2010)

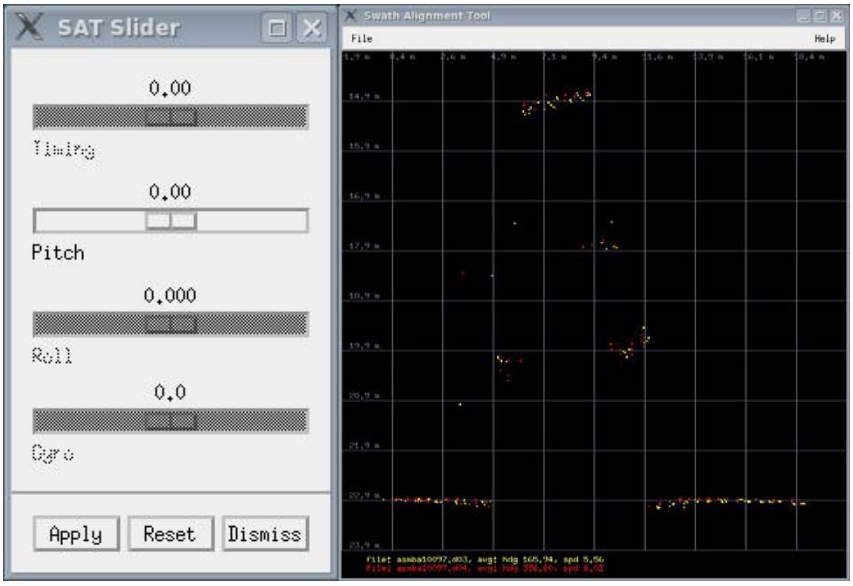


Figure Appendix V-3. SAT Tool, Depth vs. Distance Plot Depicting +2.46° Pitch Bias (06 April 2010)

Roll Alignment

Two sets of lines were collected for roll bias calculation. All lines were run along the same survey transect in order that separate comparisons could be made between lines run in opposite directions. Several samples were viewed for each set of comparison lines in order to determine an accurate measurement of the roll bias. Figure Appendix V-4 and Figure Appendix V-5 are images of the **SABER SAT** tool depicting data collected with the +0.25° roll bias entered in the **ISS-2000** system; therefore the indicated bias is zero.

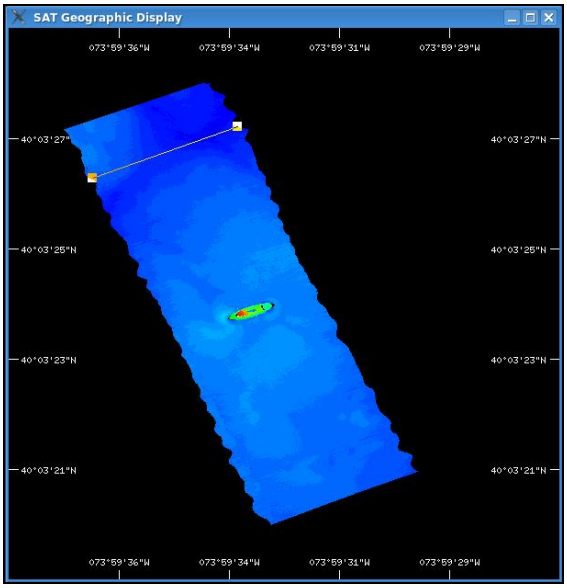


Figure Appendix V-4. SAT Tool, Plan View Depicting +0.25° Roll Bias (06 April 2010)

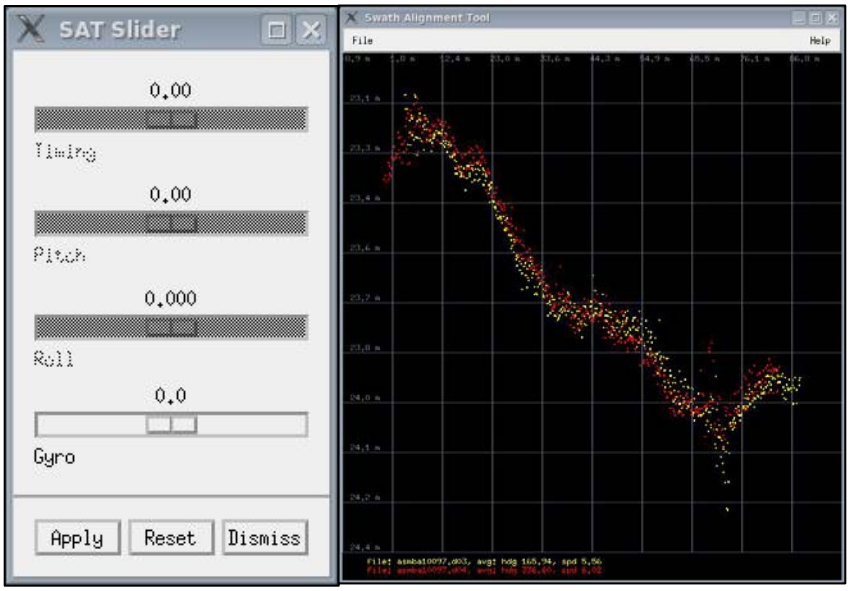


Figure Appendix V-5. SAT Tool, Depth vs. Distance Depicting +0.25° Roll Bias (06 April 2010)

Heading Alignment

Two sets of lines were collected for heading bias calculation. Lines were run on either side of the charted wreck in opposite directions in order that separate comparisons could be made. Several samples were viewed for each set of comparison lines in order to determine an accurate measurement of the heading bias. Figure Appendix V-6 and Figure Appendix V-7 are images of the **SABER SAT** tool depicting data collected with the +1.80° heading bias entered in the **ISS-2000** system; therefore the indicated bias is zero.

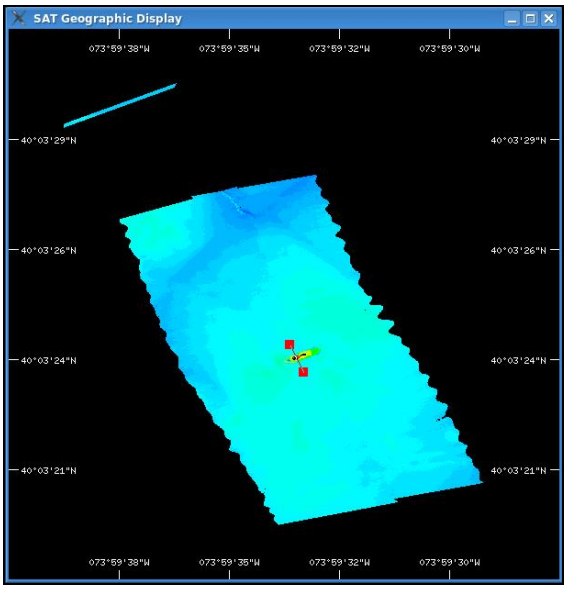


Figure Appendix V-6. SAT Tool, Plan View Depicting +1.80° Heading Bias (06 April 2010)

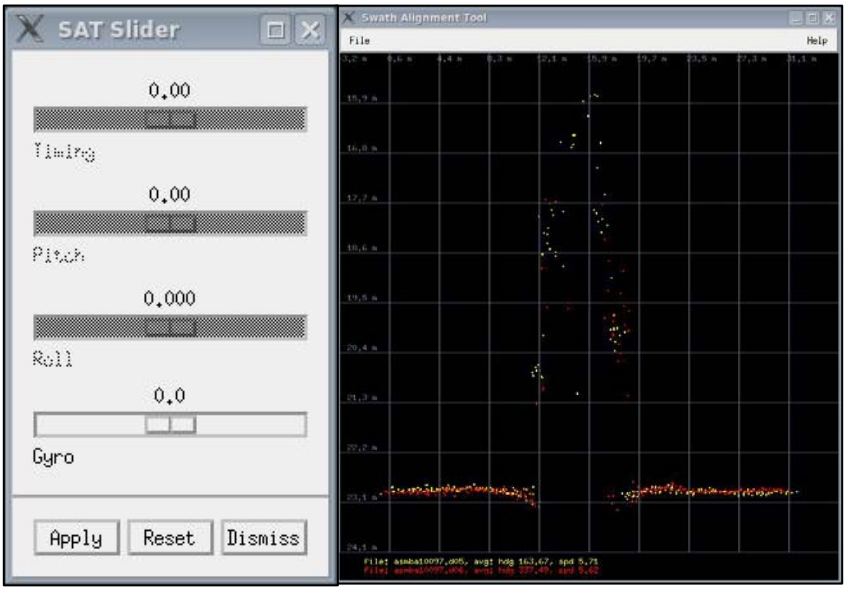


Figure Appendix V-7. SAT Tool, Depth vs. Distance Depicting +1.80 Heading Bias (06 April 2010)

On 22 April 2010, after conducting survey operations along the Virginia coast, the *M/V Atlantic Surveyor* was secured and transited to Florida to complete survey operations under task order 3 and 4. Prior to commencing survey on 30 April 2010 (JD 120), a patch test was conducted to confirm multibeam offsets established on 06 April 2010. The same procedures discussed above were conducted over a wreck located within H12098 in 30° 40' 40.36"N 081° 09' 59.92"W. There were no changes to the roll or pitch values however a new gyro offset value was established. The gyro value was changed from +1.80° to +1.30° (Table Appendix V-7). Figure Appendix V-8 and Figure Appendix V-9 are images of the SABER SAT tool depicting data collected with the +1.30° heading bias entered in the **ISS-2000** system; therefore the indicated bias is zero.

Table Appendix V-7. Multibeam Files Verifying Alignment Bias Calculated (30 April 2010) using the SABER Swath Alignment Tool (SAT)

Component	Multibeam Files (pairs)		Bias
Pitch	asmba10120.d02	asmba10120.d03	+2.46
	asmba10120.d07	asmba10120.d08	
	asmba10120.d13	asmba10120.d14	
Roll	asmba10120.d02	asmba10120.d03	+0.25
	asmba10120.d07	asmba10120.d08	
	asmba10120.d13	asmba10120.d14	
Gyro	asmba10120.d04	asmba10120.d05	+1.30
	asmba10120.d15	asmba10120.d16	

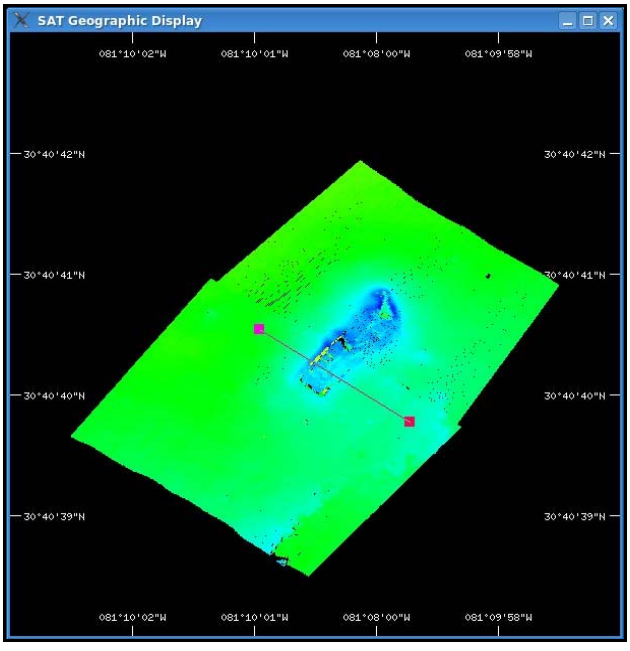


Figure Appendix V-8. SAT Tool, Plan View Depicting +1.30° Heading Bias (30 April 2010)

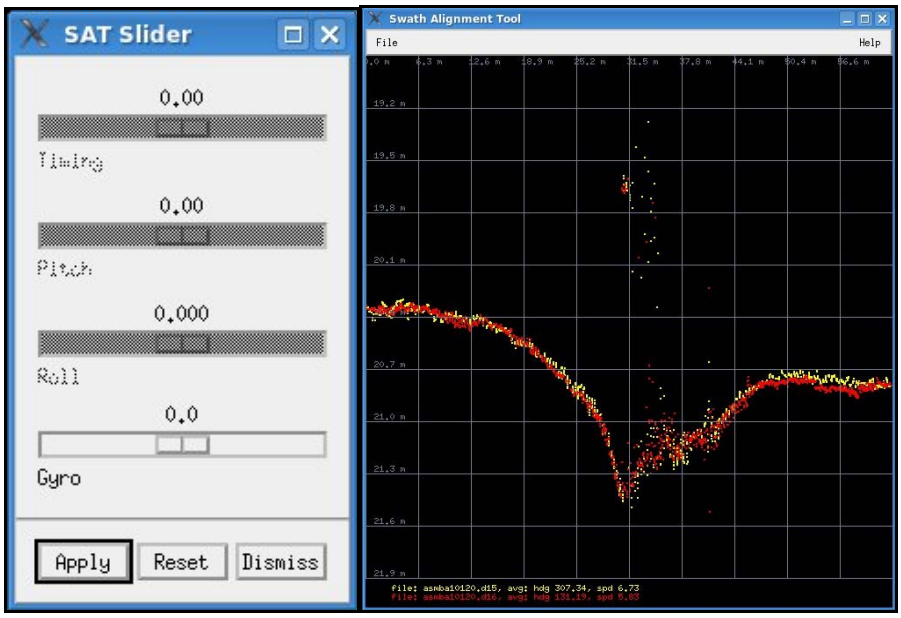


Figure Appendix V-9. SAT Tool, Depth vs. Distance Depicting +1.30° Heading Bias (30 April 2010)

Multibeam Accuracy

After all calibration tests were completed and bias values entered, a system verification survey was run on 07 April 2010 (JD 097) in the vicinity of the wreck alignment site. The survey consisted of 19 main scheme lines and three cross lines centered on the wreck. All depths were corrected for predicted tides using zoning for the Atlantic City tide gauge, 8534720. For the multibeam data, the class one cutoff angle was set to 5° and class two cutoff set to 60°. Standard multibeam data processing procedures were followed to clean the data, delayed heave was applied and uncertainties were recalculated. Three one-meter minimum grids were created. One grid of the main scheme lines using class two data, one grid of cross lines using class one data, and one grid of all lines using class two data were created. A one-meter PFM of all the data was also generated and processed using the gap checker and check uncertainty routines. The results of the system verification survey provided an overview assessment of the data acquisition and processing procedures outlined for the project. The resulting minimum grid with selected soundings (in feet) is shown in Figure Appendix V-10. The PFM with CUBE depths and Uncertainties are shown in Figure Appendix V-11 and Figure Appendix V-12, respectively. The junction analysis results for the depth differences between the main and cross lines are shown in Table Appendix V-8 showing agreement between values. Note a slight tidal influence is seen in the junction results due to the use of predicted tides combined with the fact all cross lines were run back to back and were not separated in time across the rest of the main scheme survey lines.

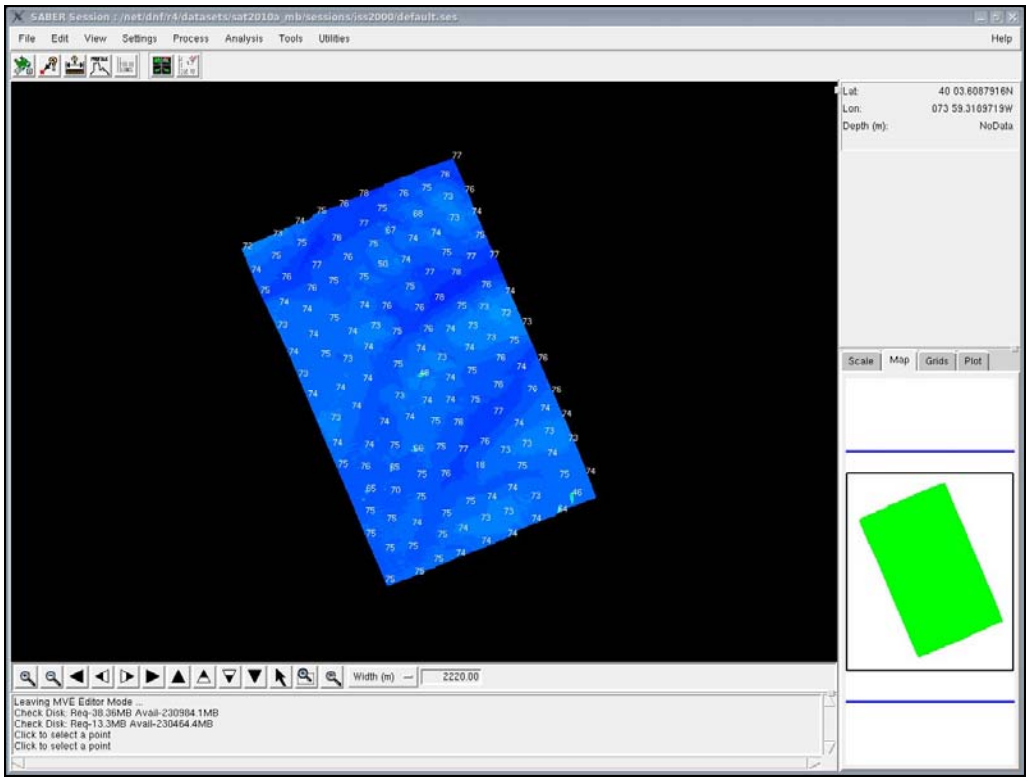


Figure Appendix V-10. Verification Survey Minimum Depth Grid and Selected Soundings

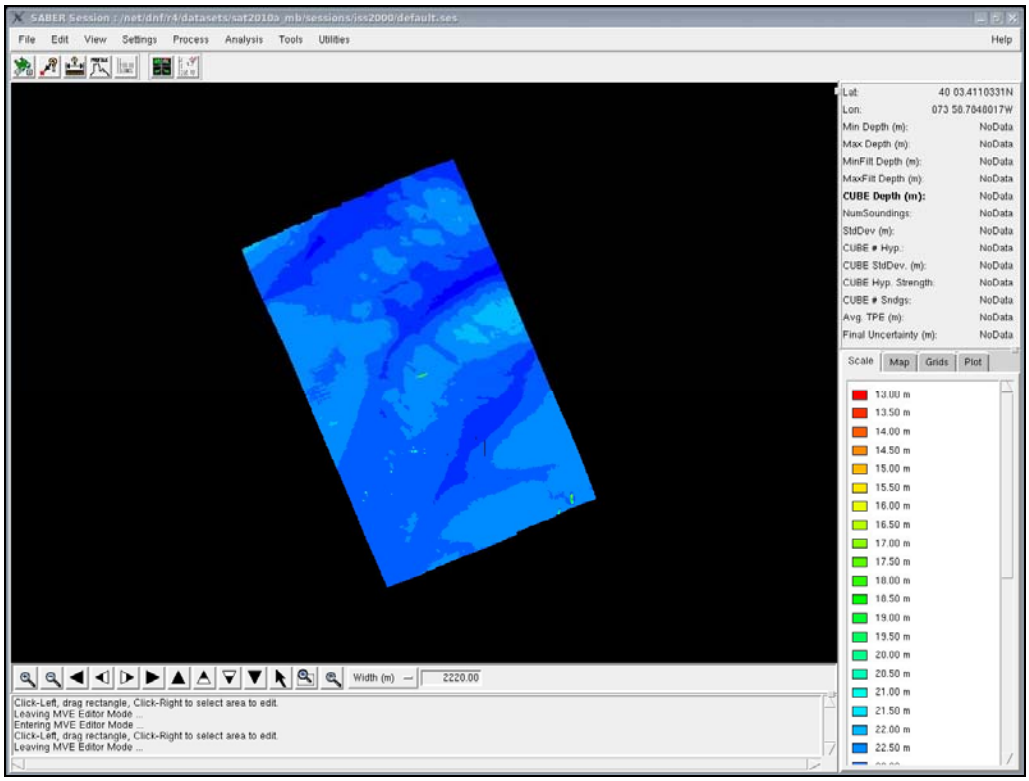


Figure Appendix V-11. Verification Survey PFM CUBE Depths

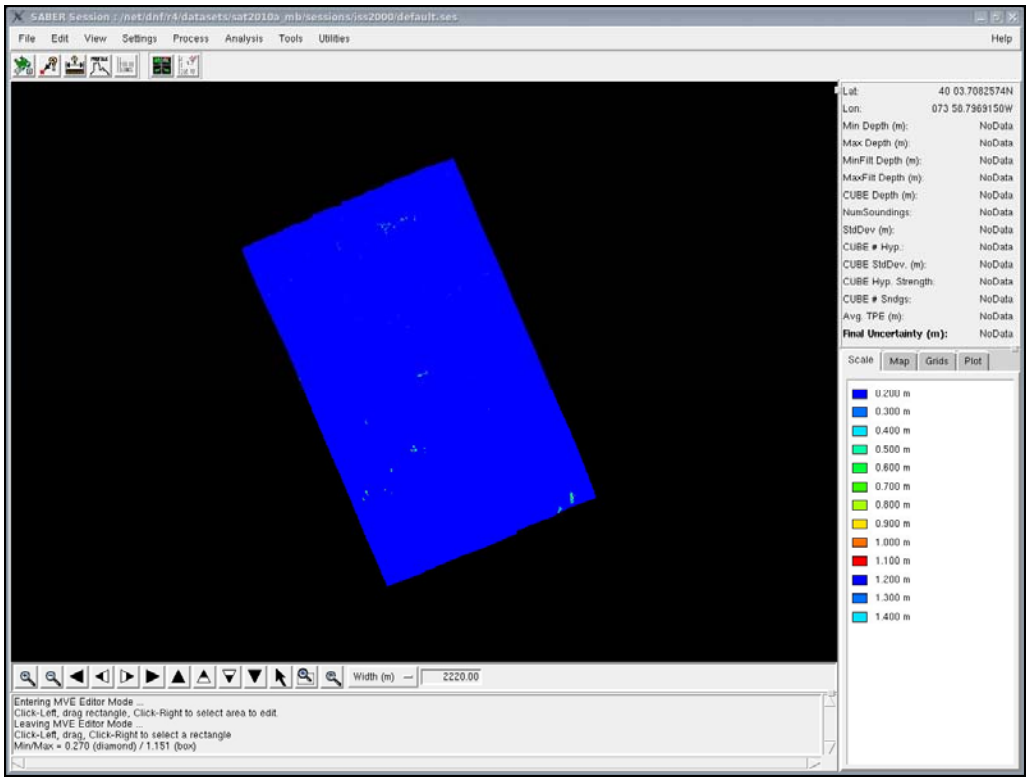


Figure Appendix V-12 Verification Survey PFM Uncertainties

Table Appendix V-8. Verification Survey Junction Analysis of Cross versus Main Scheme

Depth Difference Range (cm)	All		Positive		Negative		Zero	
	Count	Percent	Count	Percent	Count	Percent	Count	Percent
0-5cm	3087	39.79	2149	27.70	631	8.13	307	3.96
5-10cm	2519	72.25	2474	59.58	45	8.71		
10-15cm	1637	93.35	1637	80.68	0	8.71		
15-20cm	402	98.53	402	85.86	0	8.71		
20-25cm	97	99.78	97	87.11	0	8.71		
25-40cm	16	100.00	16	87.32	0	8.71		
Total	7758	100.00%	6775	87.33%	676	8.71%	307	3.96%

Tue Aug 10 11:35:16 2010

Found First Key for pfm_tasks ...

pfm_tasks version: -vPFM_TASKS_2.7
PFM_LIBRARY version: -vABE_PFM_LIB_5.02.6

Checking MAX of CUBE/TPE 95% CI Uncertainty versus IHO Order 1/1 above/below CUBE Depth 100.00 in /d1/datasets/h12096_pfm/h12096_1m_all_10Aug2010.pfm.
Lat/Lon = 030 55.677910 -80 58.089387 XY = 503042.26, 3421619.14 Z = 19.10 Unct = 0.674 > 0.558
Lat/Lon = 030 55.675743 -80 58.086876 XY = 503046.26, 3421615.14 Z = 19.08 Unct = 0.590 > 0.558
Lat/Lon = 030 55.675202 -80 58.087504 XY = 503045.26, 3421614.14 Z = 18.99 Unct = 0.558 > 0.558
Lat/Lon = 030 55.675202 -80 58.085620 XY = 503048.26, 3421614.14 Z = 19.07 Unct = 0.659 > 0.558
Lat/Lon = 030 55.674660 -80 58.085620 XY = 503048.26, 3421613.14 Z = 18.99 Unct = 0.709 > 0.558
Lat/Lon = 030 55.308243 -80 58.603828 XY = 502223.26, 3420936.14 Z = 17.15 Unct = 0.621 > 0.547
Lat/Lon = 030 55.307160 -80 58.604457 XY = 502222.26, 3420934.14 Z = 17.16 Unct = 0.568 > 0.548
Lat/Lon = 030 55.307160 -80 58.603829 XY = 502223.26, 3420934.14 Z = 17.16 Unct = 0.571 > 0.548
100% Complete

8 MAX of CUBE/TPE 95% CI Uncertainties Exceeded IHO Order 1/1 above/below CUBE Depth 100.00 in /d1/datasets/h12096_pfm/h12096_1m_all_10Aug2010.pfm.
Program has finished.

Thu Aug 12 19:25:47 2010

Found First Key for pfm_tasks ...

pfm_tasks version: -vPFM_TASKS_2.7
PFM_LIBRARY version: -vABE_PFM_LIB_5.02.6

Checking MAX of CUBE/TPE 95% CI Uncertainty versus IHO Order 1/1 above/below CUBE Depth 100.00 in /net/nola/r1/H12096_mb/layers/h12096_half_meter_features1_12Aug2010.pfm.
Lat/Lon = 030 57.268308 -81 05.402867 XY = 491399.41, 3424559.76 Z = 15.31 Unct = 0.932 > 0.538
100% Complete

1 MAX of CUBE/TPE 95% CI Uncertainties Exceeded IHO Order 1/1 above/below CUBE Depth 100.00 in /net/nola/r1/H12096_mb/layers/h12096_half_meter_features1_12Aug2010.pfm.
Program has finished.

Thu Aug 12 20:36:37 2010

Found First Key for pfm_tasks ...

pfm_tasks version: -vPFM_TASKS_2.7
PFM_LIBRARY version: -vABE_PFM_LIB_5.02.6

Checking MAX of CUBE/TPE 95% CI Uncertainty versus IHO Order 1/1 above/below CUBE Depth 100.00 in /net/nola/r1/h12096_mb/layers/h12096_half_meter_features2_12Aug2010.pfm.

Lat/Lon = 030 55.678157 -80 58.089407 XY = 503042.23, 3421619.60 Z = 19.05 Unct = 0.669 > 0.558
Lat/Lon = 030 55.677886 -80 58.089721 XY = 503041.73, 3421619.10 Z = 19.17 Unct = 0.612 > 0.559
Lat/Lon = 030 55.677886 -80 58.089407 XY = 503042.23, 3421619.10 Z = 19.05 Unct = 0.910 > 0.558
Lat/Lon = 030 55.677616 -80 58.089721 XY = 503041.73, 3421618.60 Z = 19.02 Unct = 0.879 > 0.558
Lat/Lon = 030 55.677616 -80 58.089407 XY = 503042.23, 3421618.60 Z = 18.79 Unct = 0.997 > 0.556
Lat/Lon = 030 55.677616 -80 58.089093 XY = 503042.73, 3421618.60 Z = 18.88 Unct = 1.038 > 0.557
Lat/Lon = 030 55.677615 -80 58.088779 XY = 503043.23, 3421618.60 Z = 18.91 Unct = 0.948 > 0.557
Lat/Lon = 030 55.677615 -80 58.088465 XY = 503043.73, 3421618.60 Z = 19.03 Unct = 0.790 > 0.558
Lat/Lon = 030 55.677345 -80 58.089721 XY = 503041.73, 3421618.10 Z = 18.72 Unct = 0.973 > 0.556
Lat/Lon = 030 55.677345 -80 58.089407 XY = 503042.23, 3421618.10 Z = 18.50 Unct = 0.765 > 0.555
Lat/Lon = 030 55.677345 -80 58.088779 XY = 503043.23, 3421618.10 Z = 18.50 Unct = 0.962 > 0.555
Lat/Lon = 030 55.677345 -80 58.088465 XY = 503043.73, 3421618.10 Z = 18.67 Unct = 1.003 > 0.556
Lat/Lon = 030 55.677345 -80 58.088151 XY = 503044.23, 3421618.10 Z = 19.01 Unct = 0.934 > 0.558
Lat/Lon = 030 55.677074 -80 58.089722 XY = 503041.73, 3421617.60 Z = 18.43 Unct = 0.604 > 0.554
Lat/Lon = 030 55.677074 -80 58.088779 XY = 503043.23, 3421617.60 Z = 18.38 Unct = 0.687 > 0.554
Lat/Lon = 030 55.677074 -80 58.088465 XY = 503043.73, 3421617.60 Z = 18.40 Unct = 0.753 > 0.554
Lat/Lon = 030 55.677074 -80 58.088151 XY = 503044.23, 3421617.60 Z = 19.05 Unct = 0.986 > 0.558
Lat/Lon = 030 55.676804 -80 58.090036 XY = 503041.23, 3421617.10 Z = 18.99 Unct = 0.672 > 0.558
Lat/Lon = 030 55.676804 -80 58.089722 XY = 503041.73, 3421617.10 Z = 18.58 Unct = 0.746 > 0.555
Lat/Lon = 030 55.676803 -80 58.088466 XY = 503043.73, 3421617.10 Z = 18.39 Unct = 0.878 > 0.554
Lat/Lon = 030 55.676803 -80 58.088152 XY = 503044.23, 3421617.10 Z = 19.11 Unct = 0.824 > 0.558
Lat/Lon = 030 55.676533 -80 58.090036 XY = 503041.23, 3421616.60 Z = 19.11 Unct = 0.779 > 0.558
Lat/Lon = 030 55.676533 -80 58.089722 XY = 503041.73, 3421616.60 Z = 18.73 Unct = 1.042 > 0.556
Lat/Lon = 030 55.676533 -80 58.089408 XY = 503042.23, 3421616.60 Z = 18.43 Unct = 0.765 > 0.554
Lat/Lon = 030 55.676533 -80 58.089094 XY = 503042.73, 3421616.60 Z = 18.38 Unct = 0.721 > 0.554
Lat/Lon = 030 55.676533 -80 58.088780 XY = 503043.23, 3421616.60 Z = 18.35 Unct = 0.805 > 0.554
Lat/Lon = 030 55.676533 -80 58.088466 XY = 503043.73, 3421616.60 Z = 18.61 Unct = 1.192 > 0.555
Lat/Lon = 030 55.676533 -80 58.088152 XY = 503044.23, 3421616.60 Z = 19.20 Unct = 0.740 > 0.559
Lat/Lon = 030 55.676262 -80 58.090036 XY = 503041.23, 3421616.10 Z = 19.12 Unct = 1.003 > 0.558
Lat/Lon = 030 55.676262 -80 58.089722 XY = 503041.73, 3421616.10 Z = 18.85 Unct = 1.162 > 0.557
Lat/Lon = 030 55.676262 -80 58.089408 XY = 503042.23, 3421616.10 Z = 18.80 Unct = 1.204 > 0.557
Lat/Lon = 030 55.676262 -80 58.089094 XY = 503042.73, 3421616.10 Z = 18.66 Unct = 1.141 > 0.556
Lat/Lon = 030 55.676262 -80 58.088780 XY = 503043.23, 3421616.10 Z = 18.48 Unct = 1.118 > 0.555
Lat/Lon = 030 55.676262 -80 58.088466 XY = 503043.73, 3421616.10 Z = 18.83 Unct = 1.281 > 0.557
Lat/Lon = 030 55.675991 -80 58.089722 XY = 503041.73, 3421615.60 Z = 19.11 Unct = 0.601 > 0.558
Lat/Lon = 030 55.675991 -80 58.089408 XY = 503042.23, 3421615.60 Z = 19.01 Unct = 0.895 > 0.558
Lat/Lon = 030 55.675991 -80 58.089094 XY = 503042.73, 3421615.60 Z = 18.84 Unct = 1.211 > 0.557
Lat/Lon = 030 55.675991 -80 58.088780 XY = 503043.23, 3421615.60 Z = 18.84 Unct = 1.351 > 0.557
Lat/Lon = 030 55.675991 -80 58.088466 XY = 503043.73, 3421615.60 Z = 19.12 Unct = 0.977 > 0.558
Lat/Lon = 030 55.675720 -80 58.086582 XY = 503046.73, 3421615.10 Z = 19.06 Unct = 0.689 > 0.558
Lat/Lon = 030 55.675720 -80 58.086268 XY = 503047.23, 3421615.10 Z = 19.01 Unct = 0.820 > 0.558
Lat/Lon = 030 55.675449 -80 58.087210 XY = 503045.73, 3421614.60 Z = 18.87 Unct = 0.742 > 0.557
Lat/Lon = 030 55.675449 -80 58.086896 XY = 503046.23, 3421614.60 Z = 18.77 Unct = 0.760 > 0.556

Lat/Lon = 030 55.675449 -80 58.086582 XY = 503046.73, 3421614.60 Z = 18.71 Unct = 0.707 > 0.556
Lat/Lon = 030 55.675449 -80 58.086268 XY = 503047.23, 3421614.60 Z = 18.70 Unct = 0.732 > 0.556
Lat/Lon = 030 55.675449 -80 58.085954 XY = 503047.73, 3421614.60 Z = 18.73 Unct = 0.834 > 0.556
Lat/Lon = 030 55.675449 -80 58.085640 XY = 503048.23, 3421614.60 Z = 19.15 Unct = 0.640 > 0.559
Lat/Lon = 030 55.675179 -80 58.087210 XY = 503045.73, 3421614.10 Z = 18.79 Unct = 0.668 > 0.556
Lat/Lon = 030 55.675179 -80 58.086896 XY = 503046.23, 3421614.10 Z = 18.65 Unct = 0.565 > 0.556
Lat/Lon = 030 55.675179 -80 58.086582 XY = 503046.73, 3421614.10 Z = 18.63 Unct = 0.556 > 0.556
Lat/Lon = 030 55.675179 -80 58.086268 XY = 503047.23, 3421614.10 Z = 18.62 Unct = 0.595 > 0.556
Lat/Lon = 030 55.675178 -80 58.085954 XY = 503047.73, 3421614.10 Z = 18.61 Unct = 0.658 > 0.555
Lat/Lon = 030 55.675178 -80 58.085640 XY = 503048.23, 3421614.10 Z = 19.09 Unct = 0.642 > 0.558
Lat/Lon = 030 55.674908 -80 58.085640 XY = 503048.23, 3421613.60 Z = 18.99 Unct = 0.674 > 0.558
Lat/Lon = 030 55.674637 -80 58.085640 XY = 503048.23, 3421613.10 Z = 19.03 Unct = 0.692 > 0.558
Lat/Lon = 030 55.674366 -80 58.086268 XY = 503047.23, 3421612.60 Z = 18.78 Unct = 0.557 > 0.556
Lat/Lon = 030 55.674366 -80 58.085954 XY = 503047.73, 3421612.60 Z = 18.79 Unct = 0.663 > 0.556
Lat/Lon = 030 55.674366 -80 58.085640 XY = 503048.23, 3421612.60 Z = 19.16 Unct = 0.624 > 0.559
Lat/Lon = 030 55.674096 -80 58.086582 XY = 503046.73, 3421612.10 Z = 18.95 Unct = 0.573 > 0.557
Lat/Lon = 030 55.674096 -80 58.086268 XY = 503047.23, 3421612.10 Z = 18.92 Unct = 0.702 > 0.557
Lat/Lon = 030 55.674096 -80 58.085954 XY = 503047.73, 3421612.10 Z = 18.98 Unct = 0.808 > 0.558
Lat/Lon = 030 55.673555 -80 58.088467 XY = 503043.73, 3421611.10 Z = 18.73 Unct = 0.709 > 0.556
Lat/Lon = 030 55.673284 -80 58.088467 XY = 503043.73, 3421610.60 Z = 18.90 Unct = 0.887 > 0.557
Lat/Lon = 030 55.673284 -80 58.088153 XY = 503044.23, 3421610.60 Z = 18.71 Unct = 0.638 > 0.556
Lat/Lon = 030 55.673284 -80 58.087839 XY = 503044.73, 3421610.60 Z = 18.86 Unct = 0.640 > 0.557
Lat/Lon = 030 55.673284 -80 58.087525 XY = 503045.23, 3421610.60 Z = 18.92 Unct = 0.636 > 0.557
Lat/Lon = 030 55.673284 -80 58.087211 XY = 503045.73, 3421610.60 Z = 18.97 Unct = 0.596 > 0.558
Lat/Lon = 030 55.673013 -80 58.088153 XY = 503044.23, 3421610.10 Z = 19.06 Unct = 0.876 > 0.558
Lat/Lon = 030 55.673013 -80 58.087839 XY = 503044.73, 3421610.10 Z = 19.08 Unct = 0.765 > 0.558
Lat/Lon = 030 55.673013 -80 58.087525 XY = 503045.23, 3421610.10 Z = 19.15 Unct = 0.647 > 0.559
Lat/Lon = 030 55.673013 -80 58.087211 XY = 503045.73, 3421610.10 Z = 19.21 Unct = 0.570 > 0.559
Lat/Lon = 030 55.672743 -80 58.088153 XY = 503044.23, 3421609.60 Z = 19.23 Unct = 0.604 > 0.559
Lat/Lon = 030 55.308491 -80 58.604790 XY = 502221.73, 3420936.60 Z = 17.75 Unct = 0.690 > 0.551
Lat/Lon = 030 55.308491 -80 58.604476 XY = 502222.23, 3420936.60 Z = 17.68 Unct = 0.698 > 0.550
Lat/Lon = 030 55.308491 -80 58.604162 XY = 502222.73, 3420936.60 Z = 17.69 Unct = 0.671 > 0.550
Lat/Lon = 030 55.308220 -80 58.604790 XY = 502221.73, 3420936.10 Z = 17.33 Unct = 0.937 > 0.548
Lat/Lon = 030 55.308220 -80 58.604476 XY = 502222.23, 3420936.10 Z = 17.21 Unct = 0.733 > 0.548
Lat/Lon = 030 55.308220 -80 58.604162 XY = 502222.73, 3420936.10 Z = 17.18 Unct = 0.691 > 0.548
Lat/Lon = 030 55.308220 -80 58.603848 XY = 502223.23, 3420936.10 Z = 17.34 Unct = 0.886 > 0.548
Lat/Lon = 030 55.308220 -80 58.603534 XY = 502223.73, 3420936.10 Z = 17.86 Unct = 0.628 > 0.551
Lat/Lon = 030 55.307949 -80 58.604790 XY = 502221.73, 3420935.60 Z = 17.15 Unct = 0.688 > 0.547
Lat/Lon = 030 55.307949 -80 58.603534 XY = 502223.73, 3420935.60 Z = 17.75 Unct = 0.699 > 0.551
Lat/Lon = 030 55.307679 -80 58.604790 XY = 502221.73, 3420935.10 Z = 17.18 Unct = 0.623 > 0.548
Lat/Lon = 030 55.307678 -80 58.603535 XY = 502223.73, 3420935.10 Z = 17.65 Unct = 0.714 > 0.550
Lat/Lon = 030 55.307408 -80 58.604791 XY = 502221.73, 3420934.60 Z = 17.21 Unct = 0.610 > 0.548
Lat/Lon = 030 55.307408 -80 58.603535 XY = 502223.73, 3420934.60 Z = 17.60 Unct = 0.751 > 0.550
Lat/Lon = 030 55.307137 -80 58.604791 XY = 502221.73, 3420934.10 Z = 17.49 Unct = 0.841 > 0.549
Lat/Lon = 030 55.307137 -80 58.604477 XY = 502222.23, 3420934.10 Z = 17.20 Unct = 0.642 > 0.548
Lat/Lon = 030 55.307137 -80 58.603849 XY = 502223.23, 3420934.10 Z = 17.22 Unct = 0.701 > 0.548
Lat/Lon = 030 55.307137 -80 58.603535 XY = 502223.73, 3420934.10 Z = 17.69 Unct = 0.745 > 0.550
100% Complete

90 MAX of CUBE/TPE 95% CI Uncertainties Exceeded IHO Order 1/1 above/below CUBE Depth 100.00 in /net/nola/r1/h12096_mb/layers/h12096_half_meter_features2_12Aug2010.pfm.
Program has finished.

AHB COMPILATION LOG

General Survey Information	
REGISTRY No.	H12096
PROJECT No.	OPR-G443-KR-09
FIELD UNIT	SAIC
DATE OF SURVEY	20100520 - 20100610
LARGEST SCALE CHART	***11502_1, edition 32, 20101101, 1:80,000***
ADDITIONAL CHARTS	***11480_1, edition 41, 20101101, 1:449,659***
SOUNDING UNITS	**FEET**
COMPILER	James J. Miller II

Source Grids	**File Name** H:\Compilation\H12096_G443_SAIC\AHB_H12096\SAR Final Products\GRIDS
	H12096_1_of_9.bag [1m] **H12096_2_of_9.bag [1m]** **H12096_3_of_9.bag [1m]** **H12096_4_of_9.bag [1m]** **H12096_5_of_9.bag [1m]** **H12096_6_of_9.bag [1m]** **H12096_7_of_9.bag [1m]** **H12096_8_of_9.bag [1m]** **H12096_9_of_9.bag [1m]** **H12096_features_area_1_1_of_1.bag [0.5m]** **H12096_features_area_2_1_of_1.bag [0.5m]**
Surfaces	**File Name** H:\Compilation\H12096_G443_SAIC\AHB_H12096\COMPILE\Working
Combined	**H12096_MB_4m_MLLW_combined.csar**
Interpolated TIN	\Interpolated TIN**H12096_16m_InterpTIN.csar**
Shifted Interpolated TIN	\Shifted Surface**H12096_16m_InterpTIN_Shifted.csar**
Final HOBs	**File Name** H:\Compilation\H12096_G443_SAIC\AHB_H12096\COMPILE\Final_Hobs
Survey Scale Soundings	**H12096_SS_Soundings.hob**
Chart Scale Soundings	**H12096_CS_Soundings.hob**
Contour Layer	**H12096_Contours.hob**
Feature Layer	**H12096_Features.hob**
Meta-Objects Layer	**H12096_MetaObjects.hob**
Blue Notes	**H12096_BlueNotes.hob**

Meta-Objects Attribution	
Acronym	**Value**
M_COVR	
CATCOV	1 – coverage available
SORDAT	20100610
SORIND	US,US,graph,H12096
M_QUAL	
CATZOC	6 – zone of confidence U (data not assessed)
INFORM	M/V Atlantic Surveyor
POSACC	10.0m
SORDAT	20100610
SORIND	US,US,graph,H12096
SUREND	20100610
SURSTA	20100520
DEPARE	
DRVALV 1	40.000 ft
DRVALV2	83.000 ft
SORDAT	20100610
SORIND	US,US,graph,H12096

M_CSCL	
CSCALE	449,659
SORDAT	20100610
SORIND	US,US,graph,H12096

SPECIFICATIONS:

I. COMBINED SURFACE:
- a. Number of SAR Final Grids: 11
- b. Resolution of Combined (m): 4 m

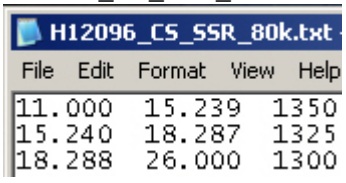
II. SURVEY SCALE SOUNDINGS (SS):
- a. Attribute Name: Depth
- b. Selection criteria: Radius, Shoal bias
- c. Radius value is: mm at map scale
  - i. Use single-defined radius: 1.00 (at 80K) and 0.5 (at 450K)
  - ii. And/Or use radius table file: N/A [*XXk = chart scale*]
- d. Queried Depth of All Soundings
  - i. Minimum: 12.660 m
  - ii. Maximum: 25.020 m

III. INTERPOLATED TIN SURFACE:
- a. Resolution (m): 16m
- b. Interpolation method: Natural Neighbor
- c. Shift value: -0.75 ft [*only include applicable shift values*] [*-0.75 feet* (And/Or) *-0.75 fathoms*]

IV. CONTOURS:
- a. Attribute Name: Depth
- b. Use a Depth List: H12096_depth_contours.txt
- c. Output Options: Create contour lines
  - i. Line Object: DEPCNT
  - ii. Value Attribute: VALDCO

V. FEATURES:
- a. Number of Chart Features: 7 [*all features included in H-Cell*]
- b. Number of Non-Chart Features: 52 [*all features submitted by field & not included in H-Cell*]

VI. CHART SURVEY SOUNDINGS (CS):
- a. Number of ENC CS Soundings: 45
- b. Attribute Name: Depth
- c. Selection criteria: Radius, Shoal bias
- d. Radius value is: Distance on the ground (m)
  - i. Use single-defined radius: 2700m (for 450k)
  - ii. And/Or use radius table file: H12096_CS_SSR_80k.txt [*XXk = chart scale*]



  - iii. Enable Filter: Interpolated !=1
- e. Number Survey CS Soundings: 61

ATLANTIC HYDROGRAPHIC BRANCH
H-CELL REPORT to ACCOMPANY
SURVEY H12096 (2010)

This H-Cell Report has been written to supplement and/or clarify the original Descriptive Report (DR) and pass critical compilation information to the cartographers in the Marine Chart Division. Sections in this report refer to the corresponding sections of the Descriptive Report.

B. DATA ACQUISITION AND PROCESSING

B.2 QUALITY CONTROL

The AHB source depth grids for the survey's nautical chart update were nine 1m resolution *.BAGs and two 0.5m resolution *.BAGs, which were combined at 4m resolution. The survey scale soundings were created from the combined surface at a single defined radius at the largest scale chart covering the respective area of the survey (1mm radius for Chart 11502 ~ 1:80,000; 0.5mm radius for Chart 11480 ~ 1:449,659). A TIN was created from the survey scale soundings, from which an interpolated surface of 16m resolution was generated. The chart scale soundings were derived from only the non-interpolated nodes of this surface to preserve absolute continuity between the charted depths, the survey scale soundings, and the original source grid. The chart scale soundings were selected using a single defined radius of 2700m (on the ground) for the 1:449,659 chart scale, and using a sounding spacing range (SSR) file for the 1:80,000 chart scale. The chart scale soundings are a subset of the survey scale soundings. The surface model was referenced when selecting the chart scale soundings, to ensure that the selected soundings portray the bathymetry within the common area.

The interpolated TIN surface of 16m resolution was shifted by the NOAA sounding rounding value of -0.75 feet. The shifted interpolated TIN was used to generate depth contours in feet and fathoms (60 feet and 10 fathoms). The depth contours are forwarded to MCD for reference only. The contours were utilized during chart scale sounding selection and quality assurance efforts at AHB. The depth contours are incorporated into the SS H-Cell product as per 2009 H-Cell Specifications.

The compilation products (Final *.HOB files) for this survey are detailed in the H12096 AHB Compilation Log contained within this document. The Final HOB files include depth areas (DEPARE), depth contours (DEPCNT), soundings (SOUNDG), meta-objects (M_COVR, M_QUAL, and M_CSCL), cartographic Blue Notes ($CSYMB), and features (SBDARE).

As dictated by Hydrographic Technical Directive 2008-8, the Final HOB files were combined into two separate H-Cell files in S-57 format. Both S-57 files were exported from CARIS Bathy DataBASE in meters, and then converted from metric units into feet using CARIS HOM ENC 3.3. Quality assurance and topology checks were conducted using CARIS S-57 Composer 2.1 and DKART Inspector 5.1 validation tests.

The final H-Cell products are two S-57 files, in Lat/Long NAD-83. The contents of these two H-Cell deliverables are listed in the table below:

TABLE 1 - Contents of H-Cell Files

H12096_CS.000			Scale 1:80,000
Object Class Types	**Geographic**	**Cartographic**	**Meta**
S-57 Object Acronyms	DEPARE	$CSYMB	M_COVR
	SBDARE		M_QUAL
	SOUNDG		M_CSCL
H12096_SS.000			**Scale 1:20,000**
Object Class Types	**Geographic**		
S-57 Object Acronyms	DEPCNT		
	SOUNDG		

B.2.4 Junctions and Prior Surveys

Survey H12096 (2010) does not junction with any recent or contemporary surveys.

B.4 DATA PROCESSING

The following software was used to process data at the Atlantic Hydrographic Branch:

CARIS Bathy DataBASE version 2.3/HF16
CARIS Bathy DataBASE version 3.0/HF9
CARIS S-57 Composer version 2.1/HF4
CARIS HOM ENC version 3.3/SP3/HF8
DKART Inspector version 5.1

C. HORIZONTAL AND VERTICAL CONTROL

The hydrographer makes adequate mention of horizontal and vertical control used for this survey in section C of the DR and in the OPR-G443-KR-09 Horizontal & Vertical Control Report (HVCR). The sounding datum for this survey is Mean Lower Low Water (MLLW), and the vertical datum is Mean High Water (MHW). Horizontal control used for this survey during data acquisition is based upon the North American Datum of 1983 (NAD83), UTM projection zone 17 North.

D. RESULTS AND RECOMMENDATIONS

D.1 CHART COMPARISON

11502 (32nd Edition, NOV/10)
Doboy Sound to Fernandina
Corrected through NM 12/28/2010
Corrected through LNM 12/25/2010
Scale 1:80,000

11480 (41st Edition, NOV/10)
Charleston Light to Cape Canaveral
Corrected through NM 12/28/2010
Corrected through LNM 12/25/2010
Scale 1:449,659

ENC COMPARISON

US4GA11M
Doboy Sound to Fernandina
Edition 18
Application Date 2010/04/11
Issue Date 2010/05/11
Chart 11502

US3GA10M
Charleston Light to Cape Canaveral
Edition 18
Application Date 2010/08/03
Issue Date 2010/09/28
Chart 11480

D.2 ADDITIONAL RESULTS

The charted hydrography originates with prior surveys and requires no further consideration. The hydrographer makes adequate chart comparisons in section D and Appendix I and II of the DR. The hydrographer recommends that any charted features not specifically addressed either in the H-Cell files or the Blue Notes should be retained as charted.

D.2.1 MISCELLANEOUS

Chart compilation was completed by Atlantic Hydrographic Branch personnel in Norfolk, Virginia. Compilation data will be forwarded to the Marine Chart Division in Silver Spring, Maryland. See section D.1 of this report for a list of the Raster Charts and Electronic Navigation Charts (ENC) used for compiling the present survey.

D.2.2 ADEQUACY OF SURVEY

The present survey is adequate to supersede the charted bathymetry within the common area. Any features not specifically addressed either in the H-Cell files or the Blue Notes should be retained as charted. Refer to section D and Appendix I and II of the DR for further recommendations by the hydrographer.

APPROVAL SHEET
H12096

Initial Approvals:

The completed survey has been inspected with regard to survey coverage, delineation of depth contours, disposition of critical depths, cartographic symbolization, and verification or disproval of charted data. All revisions and additions made to the H-Cell files during survey processing have been entered in the digital data for this survey. The survey records and digital data comply with National Ocean Service and Office of Coast Survey requirements except where noted in the Descriptive Report and the H-Cell Report.

All final products have undergone a comprehensive review per the Hydrographic Surveys Division Office Processing Manual and are verified to be accurate and complete except where noted.

James J. Miller II
2011.02.07
17:16:12 -05'00'

James J Miller II
Physical Scientist
Atlantic Hydrographic Branch

I have reviewed the H-Cell files, accompanying data, and reports. This survey and accompanying Marine Chart Division deliverables meet National Ocean Service requirements and standards for products in support of nautical charting except where noted.

Richard T. Brennan
I am approving this document
2011.02.28 21:57:00 -05'00'

Approved: _____

CDR Richard T. Brennan, NOAA
Chief, Atlantic Hydrographic Branch

Digitally signed by Mark Lathrop
DN: cn=Mark Lathrop, o=NOAA, ou=HSD, email=mark.t.lathrop@noaa.gov, c=US
Reason: AWOIS/Surf Check
Date: 2011.03.04 11:34:12 -05'00'