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. *M*

Registry No. *H12002*

LOCALITY

State *Maryland/Virginia*

General Locality *Atlantic Ocean*

Sublocality *13 NM East of Assateague Island*

2009 - 2010

CHIEF OF PARTY

Gary R. Davis

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.

H12002

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.

M

State Maryland/Virginia

General locality Atlantic Ocean

Sub-Locality *13 NM East of Assateague Island*

Scale 1:20,000 Date of survey: 15 July 2009 – 15 April 2010

Instructions Dated 01 December 2008 Project No. OPR-D302-SA-09

Vessel *M/V Atlantic Surveyor* D582365

Chief of Party *Gary R. Davis*

Surveyed by: *Alex Bernier, Jediah Bishop, Dan Burgo, Gary Davis, Chuck Holloway, Jason Infantino, Colette LeBeau, Rick Nadeau, Katie Offerman, Gary Parker, Evan Robertson, Eva Rosendale, Jeremy Shambaugh, Deb Smith, Jennifer Stone, 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

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

REMARKS: **Contract**: DG133C-08-CQ-0003
Contractor: Science Applications International Corp., 221 Third Street; Newport, RI 02840 USA
Subcontractors: Rotator Staffing Services, PO Box 366, 557 Cranbury Road, E. Brunswick NJ 08816
Times: All times are recorded in UTC
UTM Zone: Zone 18
Purpose: To provide NOAA with modern, accurate hydrographic survey data with which to update the nautical charts of the assigned area: Sheet M (H12002) in Mid–Atlantic Corridor, Coast of Maryland/Virginia. ***Notes in Bold, Red, Italics made during Office Processing.***

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Science Applications International Corporation (SAIC) warrants only that the survey data acquired by SAIC and delivered to NOAA under Contract DG-133C-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 H12002
Scale 1:20,000, Surveyed 2009 - 2010
M/V Atlantic Surveyor
Science Applications International Corporation (SAIC)
Gary R. Davis, Chief Hydrographer

PROJECT
Project Number: OPR-D302-SA-09
Dates of Instructions: 01 December 2008 **Task Order#:** T0001

Dates of Supplemental Instructions: 03 December 2008, 10 July 2009, 05 January 2010, and 23 February 2010
Sheet Letter: M
Registry Number: H12002
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 Virginia, 13 NM east of Assateague Island (Figure A-1). The line kilometers, bottom samples, item investigations and other survey statistics are listed in Table A-1. The area was surveyed at set line spacing with multibeam sonar and towed sidescan sonar from 15 July 2009 to 15 April 2010 (Table A-2). The depth range encountered in H12002 was from 6.18 meters, 0.270 meters uncertainty (20 feet) to 34.54 meters, 0.280 m uncertainty (112 feet).

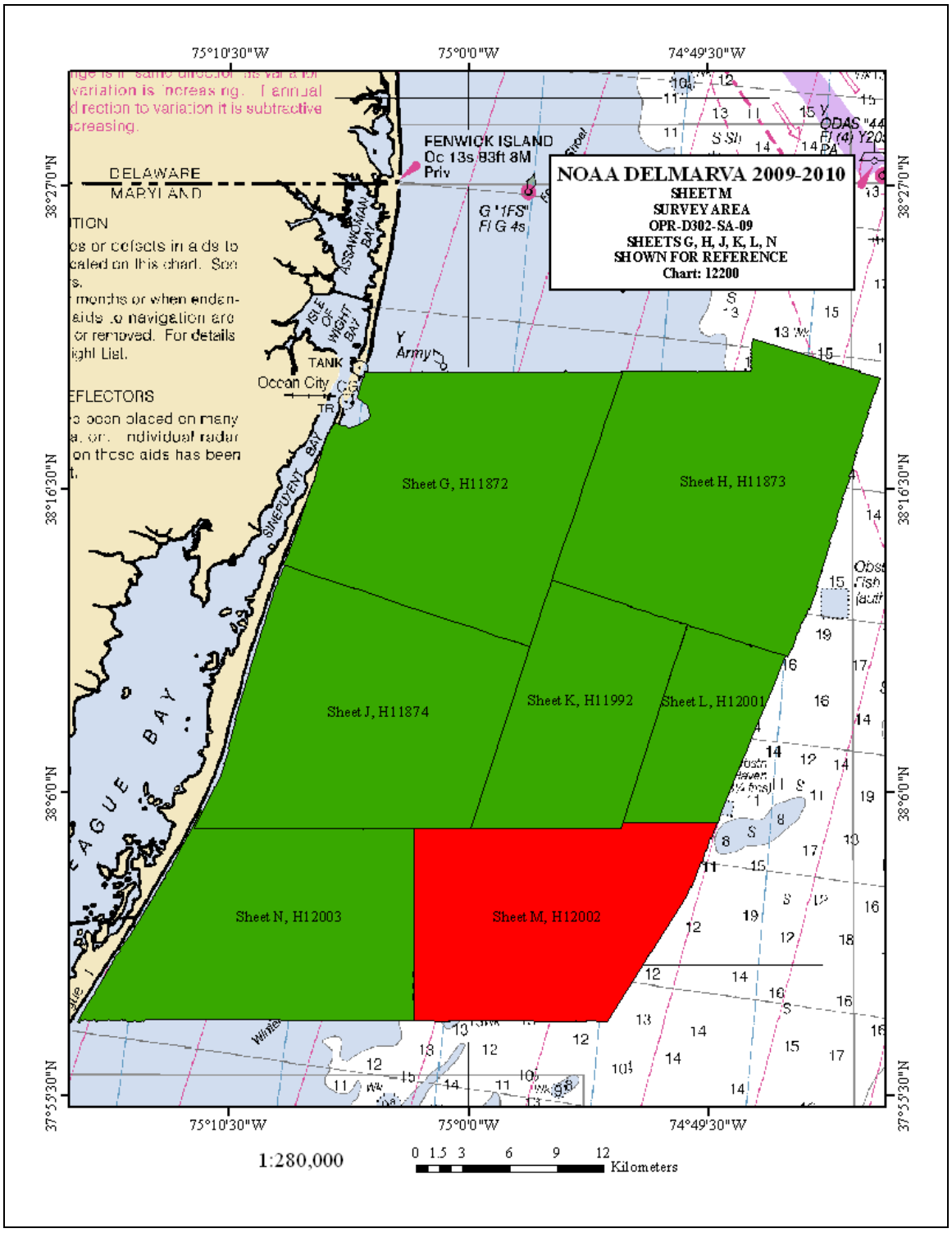

Figure A-1. H12002 Survey Bounds

Table A-1. Hydrographic Survey Statistics

***M/V Atlantic Surveyor*, Sheet M H12002**	**Value**
LNM Single beam only sounding lines (mainscheme only)	N/A
LNM Multibeam only sounding lines (mainscheme only)	N/A
LNM Lidar sounding lines (mainscheme only)	N/A
LNM Sidescan sonar only lines (mainscheme only)	N/A
LNM Mainscheme lines (multibeam and sidescan)	2022
LNM Crosslines from multibeam	89
LNM Lidar crosslines	N/A
LNM development lines non mainscheme	1.7
LNM shoreline/nearshore investigations	N/A
Number of Bottom Samples	67
Number of items investigated that required additional time/effort in the field beyond the above operations	0
Total number of square nautical miles	59.12

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

Calendar Date	**Julian Day**	**Calendar Date**	**Julian Day**
15 July 2009	196	04 August 2009	216
17 July 2009	198	05 August 2009	217
18 July 2009	199	06 August 2009	218
20 July 2009	201	07 August 2009	219
21 July 2009	202	08 August 2009	220
22 July 2009	203	10 August 2009	222
23 July 2009	204	09 October 2009	282
24 July 2009	205	11 October 2009	284
25 July 2009	206	12 October 2009	285
26 July 2009	207	11 April 2010	101
01 August 2009	213	12 April 2010	102
02 August 2009	214	15 April 2010	105
03 August 2009	215		

B. DATA ACQUISITION AND PROCESSING

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* for OPR-D302-SA-09, delivered with Descriptive Report, H12001 on 26 March 2010. During the shutdown period between 2009 and 2010 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* for OPR-D302-SA-09. All changes which occurred during this shutdown period 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 Data Acquisition and Processing Report and Appendix V*. ***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 4000 GPS Receiver (12 July 2009-16 July 2009) Trimble 7400 GPS Receiver (16 July 2009- 15 April 2010)	
	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 for multibeam sonar, sidescan sonar and sound speed data collection. 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 and repairs as well as spares storage. All data were shipped to the Data Processing Center in the SAIC Newport, RI, office for final data processing.

The Position Orientation System/Marine Vessels (POS/MV) Inertial Measurement Unit (IMU) was mounted below the main deck of the vessel, port of the keel, and the Reson 7125 transducer mount was hull-mounted port of the vessel's keel. A Brook Ocean Technologies Moving Vessel Profiler 30 (MVP-30) was mounted to the starboard stern quarter. Table B-2 is a list of vessel characteristics for the *M/V Atlantic Surveyor*.
Filed with original Field Records.

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.

B.2 QUALITY CONTROL

There were approximately 89 linear nautical miles of cross lines and 2022 linear nautical miles of main scheme lines surveyed on this sheet. This resulted in cross line mileage that represented approximately 4.5 percent of the main scheme mileage. The crosslines were oriented approximately 90°/270° and were spaced at 1300 meters, while the main scheme lines were oriented approximately 18°/198° and were spaced at 40 meters, in areas where the sidescan range was 50 meters, or 65 meters, in areas where the sidescan range was 75 meters. The sidescan sonar range scale was set to 50 meters or 75 meters providing a consistent 100-meter or 150-meter imagery swath, respectively.

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 and time elapsed since the last cast. 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 profile casts were conducted periodically (6 to 13 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.

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 counters and the dynamic draft look-up table that was constructed from settlement and squat measurements determined during the pre-survey Sea Acceptance Trials.

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. See Separates I for a complete listing of all lead line measurements taken.

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*). The terminology Total Propagated Error (TPE) has been replaced by Total Propagated Uncertainty (TPU). This was 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.

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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 varied from approximately 0.51 to 0.67 meters.

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.

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. An initial review of the areas with final uncertainties exceeding IHO Order 1 revealed that most of these areas were around wrecks or obstructions and on steeper slopes where there tended to be much greater variability in the soundings that contributed to a particular node. In a few cases higher uncertainty was found in areas where holiday lines were run months later. The changes in the seafloor in these areas show higher uncertainty. In some cases, this uncertainty review led to the creation of additional designated soundings. In addition, the uncertainty review also highlighted some areas that required additional data cleaning. Appendix V* provides a listing of all the nodes from the one-meter BAG where the final uncertainties exceeded IHO Order 1.

Junction and Crossing Analysis

Comparison of main scheme to cross line near nadir 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. Comparisons of all CUBE surface crossing data in H12002 showed that 96.60% of comparisons were within 25 centimeters and 99.63% of comparisons were within 35 centimeters. All of the other comparisons larger than 50 centimeters were accounted for by normal small DGPS position variability

around wrecks, obstructions and the steep slopes. Table B-3 shows the comparisons using all crossings in H12002. ***Concur.***

Table B-3. Junction Analysis Main Scheme Lines vs. Near Nadir Cross Lines, H12002

Depth Difference Range (m)	All		Positive		Negative		Zero	
	Count	Percent	Count	Percent	Count	Percent	Count	Percent
0.00-0.05	276506	35.53	138864	17.84	111456	14.32	26186	3.37
>0.05-0.10	204723	61.84	132938	34.93	71785	23.55		
>0.10-0.15	139112	79.72	99966	47.77	39146	28.58		
>0.15-0.20	85295	90.68	67640	56.47	17655	30.85		
>0.20-0.25	46099	96.60	39196	61.50	6903	31.73		
>0.25-0.30	17635	98.87	16549	63.63	1086	31.87		
>0.30-0.35	5969	99.63	5847	64.38	122	31.89		
>0.35-0.40	2123	99.91	2067	64.65	56	31.90		
>0.40-0.45	574	99.98	536	64.72	38	31.90		
>0.45-0.50	99	99.99	82	64.73	17	31.90		
>0.50-0.60	45	100.00	39	64.73	6	31.90		
>0.55-0.60	3	100.00						
Totals	778180	100	503724	64.73	248270	31.90	26186	3.37

Details of beam by beam comparison of 25 selected crossings in different areas of H12002 are presented in Separates IV***** of this report. The crossings for detailed comparisons were randomly selected for spatial and temporal distribution over the entire survey. ***Concur.***

Table B-4 depicts the junction analysis between H12002 and H11874 (Sheet J) that was surveyed between 10 August and 18 December 2008. The junction analysis was conducted on the overlap area between these two sheets and was based on the final one-meter CUBE surfaces that were created for both sheets. This analysis showed that 97.52% of the comparisons were within 40 centimeters and 99.19% were within 55 centimeters. ***Concur.***

****Filed with original Field Records.***

Table B-4. Junction Analysis, H12002 vs. H11874

Depth Difference Range (m)	All		Positive		Negative		Zero	
	Count	Percent	Count	Percent	Count	Percent	Count	Percent
0.00-0.05	45811	25.37	21959	12.16	19662	10.89	4190	100.00
>0.05-0.10	39759	47.38	21451	24.04	18308	21.03		

Depth Difference Range (m)	All		Positive		Negative		Zero	
	Count	Percent	Count	Percent	Count	Percent	Count	Percent
>0.10-0.15	33971	66.19	18348	34.20	15623	29.68		
>0.15-0.20	27539	81.44	17151	43.70	10388	35.43		
>0.20-0.25	14828	89.66	9071	48.72	5757	38.62		
>0.25-0.30	8172	94.18	4902	51.43	3270	40.43		
>0.30-0.35	4140	96.47	3051	53.12	1089	41.03		
>0.35-0.40	1892	97.52	1700	54.06	192	41.14		
>0.40-0.45	1242	98.21	1220	54.74	22	41.15		
>0.45-0.50	950	98.73	946	55.26	4	41.15		
>0.50-0.55	824	99.19	824	55.72	0	41.15		
>0.55-0.60	481	99.46	481	55.99	0	41.15		
>0.60-0.65	423	99.69	423	56.22	0	41.15		
>0.65-0.70	296	99.85	296	56.38	0	41.15		
>0.70-0.75	153	99.94	153	56.47	0	41.15		
>0.75-0.80	35	99.96	35	56.49	0	41.15		
>0.80-0.85	24	99.97	24	56.50	0	41.15		
>0.85-0.90	37	99.99	37	56.52	0	41.15		
>0.90-0.95	13	100.00	13	56.53	0	41.15		
Totals	180590	100%	102085	56.53	74315	41.15	4190	2.32

Table B-5 depicts the junction analysis between H12002 and H11992 (Sheet K) that was surveyed between 16 September and 19 December 2008. The junction analysis was conducted on the overlap area between these two sheets and was based on the final one-meter CUBE surfaces that were created for both sheets. This analysis showed that 97.58% of the comparisons were within 30 centimeters and 99.30% were within 35 centimeters. ***Concur.***

Table B-5. Junction Analysis, H12002 vs. H11992

Depth Difference Range (cm)	All		Positive		Negative		Zero	
	Count	Percent	Count	Percent	Count	Percent	Count	Percent
0.00-0.05	189609	29.10	84447	12.96	87581	13.44	17581	2.70
>0.05-0.10	157744	53.32	81854	25.53	75890	25.09		
>0.10-0.15	124310	72.40	69387	36.18	54923	33.52		
>0.15-0.20	84364	85.35	49469	43.77	34895	38.88		
>0.20-0.25	51154	93.20	33928	48.98	17226	41.52		
>0.25-0.30	28566	97.58	20061	52.06	8505	42.83		
>0.30-0.35	11157	99.30	8012	53.29	3145	43.31		
>0.35-0.40	3303	99.80	2136	53.62	1167	43.49		
>0.40-0.45	1019	99.96	663	53.72	356	43.54		

Depth Difference Range (cm)	All		Positive		Negative		Zero	
	Count	Percent	Count	Percent	Count	Percent	Count	Percent
>0.45-0.50	229	100.00	128	53.74	101	43.56		
>0.50-0.55	25	100.00	13	53.74	12	43.56		
>0.55-0.60	3	100.00	2	53.74	1	43.56		
Totals	651483	100	350100	53.74	283802	43.56	17581	2.70

Table B-6 depicts the junction analysis between H12002 and H12001 (Sheet L) that was surveyed between 12 July and 09 October 2009. The junction analysis was conducted on the overlap area between these two sheets and was based on the final one-meter CUBE surfaces that were created for both sheets. This analysis showed that 97.90% of the comparisons were within 30 centimeters and 99.67% were within 35 centimeters. ***Concur.***

Table B-6. Junction Analysis, H12002 vs. H12001

Depth Difference Range (cm)	All		Positive		Negative		Zero	
	Count	Percent	Count	Percent	Count	Percent	Count	Percent
0.99-0.05	95032	25.51	39800	10.68	47213	12.67	8019	2.15
>0.05-0.10	87211	48.91	26065	17.68	61146	29.08		
>0.10-0.15	76852	69.54	11821	20.85	65031	46.54		
>0.15-0.20	51362	83.32	2681	21.57	48681	59.60		
>0.20-0.25	36119	93.02	162	21.61	35957	69.25		
>0.25-0.30	18187	97.90	18	21.62	18169	74.13		
>0.30-0.35	6600	99.67	6	21.62	6594	75.90		
>0.35-0.40	945	99.92	0	21.62	945	76.15		
>0.40-0.45	180	99.97	0	21.62	180	76.20		
>0.45-0.50	69	99.99	0	21.62	69	76.22		
>0.50-0.55	29	100.00	0	21.62	29	76.23		
>0.55-0.60	6	100.00	0	21.62	6	76.23		
Totals	372592	100	80553	21.62	284020	76.23	8019	2.15

Multibeam Coverage Analysis

These survey operations were conducted at 40 and 65-meter line spacing optimized to achieve 200% sidescan sonar coverage at the 50 and 75-meter range scales. Based on the 60° beam angle used as the cutoff for acceptable main scheme, cross line and item 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 13.5 where the line spacing was 40 meters and in depths greater than approximately 21.5 meters where the line spacing was 60 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.

A final review of the coverage shows small areas flagged as having four or more contiguous nodes without data located in the outer beams of the multibeam swath. They were attributed to noise from bubble sweep along the hull and resulted in a reduced swath width of the multibeam data. In all cases where gaps in the multibeam coverage exist, the areas were covered by 200% sidescan and no contacts were detected. The final CUBE Surface had valid depths in more than 99.99% of the nodes.

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 H12002, 99.74% of all grid nodes contained five or more soundings; satisfying the requirements for complete multibeam coverage.

B.3 CORRECTIONS TO ECHO SOUNDINGS

Please refer to the previously delivered Data Acquisition and Processing Report* and Appendix V* of this report for a description of all corrections applied to echo soundings. 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.

B.4 DATA PROCESSING

Please refer to the previously delivered Data Acquisition and Processing Report* and Appendix V* of this report for a description of all data processing steps performed. There were no deviations from the processes described therein.

Seven BAGs at one-meter grid resolution are submitted for the entire H12002 area. The BAGs were exported from the CUBE depth surface and the Final Uncertainty surface within the PFM grid. The resulting BAG files were limited to 300 MB in size and therefore multiple BAGs are produced from a single PFM grid. The BAG file named H12002_1_of_7.bag is the southernmost one-meter BAG while the BAG file named H12002_7_of_7.bag is the northernmost one-meter BAG as summarized in Table B-7. There were four half-meter resolution grids created to meet object detection coverage over features with a least depth less than 24 meters. To meet this requirement four separate half-meter resolution PFM grids were created around the center of each of the features. Each of the four half-meter PFM grids had all CUBE surface nodes populated

with at least 5 soundings per node. A summary of the half-meter BAG files (converted from the PFM grids) is provided in Table B-8.

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Table B-7. Summary of H12002 BAG Files

BAG File Name	Comments
H12002_1_of_7.bag	Southern most 1.0-meter BAG
H12002_2_of_7.bag	
H12002_3_of_7.bag	
H12002_4_of_7.bag	
H12002_5_of_7.bag	
H12002_6_of_7.bag	
H12002_7_of_7.bag	Northern most 1.0-meter BAG

Table B-8. Summary of H12098 0.5-Meter BAG Files

BAG File Name	Comments
H12002_Feature_2.bag	0.5-meter BAG of Feature 2
H12002_Feature_3.bag	0.5-meter BAG of Feature 3
H12002_Feature_4.bag	0.5-meter BAG of Feature 4
H12003_Feature_8.bag	0.5-meter BAG of Feature 8

C. HORIZONTAL AND VERTICAL CONTROL

NOAA tide station 8651370 Duck, NC 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)**. Comparisons between overlapping crossline data and outer swath data (in deeper water) were also used to assess potential tidal zoning impacts. As addressed in the CUBE Uncertainty Analysis discussion (Section B.2), there were a few instances where overlapping data had an observed vertical offset of 20 to 30 centimeters. This observed vertical offset between adjacent lines was likely due to minor tidal zoning impacts caused by differing environmental conditions between the survey area and the primary tide gauge location in Duck, NC. The water level zoning parameters provided by NOS, Table C-1, were adequate for application of the observed verified water levels.

Table C-1. Water Level Zoning Parameters Applied on Sheet H12002

Zone	Time Corrector (minutes)	Range Ratio	Reference Station
SA45	0	1.05	8651370
SA46A	0	1.08	8651370

The survey data for sheet H12002 were collected in horizontal datum NAD-83, using geodetic coordinates, while data display and products used the UTM Zone 18 projection. The following equipment was used for positioning on the *M/V Atlantic Surveyor*:

- TSS POS/MV, Serial Number 2575 with a Trimble Probeacon Differential Receiver (primary sensor)
- Trimble 4000 DSi GPS Receiver, Serial Number 3504A09516 with a Trimble Probeacon Differential Receiver (12 July 2009-16 July 2009).
- Trimble 7400 RSi GPS Receiver, Serial Number 3815A22469 with a Trimble Probeacon Differential Receiver (16 July 2009-17 April 2010).

Differential correctors used for online data were from the U.S. Coast Guard Stations at Driver, VA, Annapolis, MD, and Reedy Point, DE. The differential receivers were programmed to only receive differential corrector data from these three stations.

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.

Please refer to the Horizontal and Vertical Control Report for detailed descriptions of the procedures and systems used to attain hydrographic positioning. This report will be delivered with the Descriptive Report for the last sheet of this task order. ***Concur with clarification. The Horizontal and Vertical Control Report was added to the submitted field records for this survey upon its submission.***

D. RESULTS AND RECOMMENDATIONS

See also HCell Report & Appendix II

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

Refer to Appendix II as indicated by red notes following feature description for verified feature information and final feature disposition.

D.1 CHART COMPARISON

H12002 was compared to the largest scale charts covering the area as follows:

- **Chart 12211,** 1/80,000 scale, 43rd Edition 10/01/2007 corrected by NTM through 06/05/2010
- ~~**ENC US4VA50M,** 1/80,000 compilation scale, 14th Edition Issued 10/22/2009 Update 1, 04/14/2010~~

The chart comparisons were conducted using SAIC's **SABER** software to view the BSB raster charts with overlain layers of H12002 data such as the CUBE gridded surface, selected soundings, and features. For ENC comparisons a combination of HydroService'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 12211 Fenwick Island to Chincoteague Inlet (1:80,000) ***Concur with clarification. For all contours and soundings, defer to H-Cell.***

The charted 30-foot depth curve in approximately 38° 04' 32.66"N 075° 01' 45.51"W to 38° 04' 50.22"N 075° 01' 09.72"W was found to be approximately 170 meters south of its charted position.

The charted 30-foot depth curve in approximately 37° 59' 41.75"N 075° 01' 38.61"W to 37° 59' 45.00"N 075° 01' 53.00"W was found approximately 500 meters southwest of its charted position.

The charted 60-foot depth curve in approximately 37° 58' 24.44"N 075° 02' 15.73"W to 37° 58' 17.03"N 075° 00' 58.24"W was found to be approximately 100 to 700 meters south of its charted position.

The charted 60-foot depth curve in approximately 38° 02' 59.08"N 074° 58' 59.08"W to 38° 03' 13.06"N 074° 59' 08.27"W was found approximately 600 meters west of its charted position.

The charted 60-foot depth curve in approximately 38° 03' 30.77"N 74° 58' 50.80"W to 38° 03' 32.63"N 074° 59' 08.48"W was found approximately 660 meters southwest of its charted position and in approximately 38° 03' 32.63"N 074° 59' 08.48"W to 38° 03' 28.00"N 074° 59' 45.00"W was found approximately 200 meters south of its charted position.

The charted 90-foot depth curve in approximately 37° 58' 30.87"N 074° 56' 39.83"W to 37° 58' 17.95"N 074° 56' 36.16"W was found approximately 500 meters west of its charted position.

The charted 60-foot sounding and 60-foot depth curve in approximately 37° 58’ 36.67’N 074° 59’ 57.48”W was not found. CUBE depths in the area were 62 to 73 feet (18.87 to 22.20 meters).

The charted 19-foot sounding in approximately 38° 04’ 09.84”N 075° 01’ 37.03”W was in CUBE depths of 22 to 26 feet (6.78 to 8.07 meters).

The charted 28-foot sounding and 30-foot depth curve in approximately 38° 01’ 47.29”N 075° 01’ 26.65”W was not found. CUBE depths in this area were 32 to 35 feet (9.79 to 10.76 meters).

The charted 49-foot sounding in approximately 38° 00’ 52.07”N 074° 59’ 23.02”W was in CUBE depths of 52 to 55 feet (16.05 to 16.76 meters).

The charted 35-foot sounding in approximately 38° 00’ 11.12”N 075° 01’ 27.53”W was in CUBE depths of 41 to 45 feet (12.45 to 13.71 meters).

The charted 36-foot sounding in approximately 37° 58’ 58.28”N 075° 01’ 24.53”W was in CUBE depths of 41 to 48 feet (12.50 to 14.60 meters).

The charted 36-foot sounding in approximately 37° 59’ 12.26”N 075° 00’ 25.31”W was in CUBE depths of 39 to 45 feet (12.12 to 13.84 meters).

The charted 38-foot sounding in approximately 37° 59’ 23.98”N 075° 00’ 07.71”W was in CUBE depths of 41 to 46 feet (12.63 to 14.22 meters).

The charted 62 foot sounding in approximately 37° 58’ 47.97”N 074° 59’ 34.67”W was in CUBE depths of 68 to 79 feet (20.98 to 24.35 meters).

The charted 78-foot sounding labeled Wk in approximately 37° 58’ 02.95’N 074° 59’ 40.29”W was reported in Danger to Navigation Report 1 which was not forwarded to MCD. It was subsequently reported in Danger to Navigation Report 3 on H12091 (Sheet O) as a wreck with least depth of 23.79 meters (78 feet) in 37° 58’ 02.97”N 074° 59’ 40.21”W. After correcting soundings for verified tides the least depth was found to be 76 feet (23.27 meters, 0.27 meter uncertainty) in 37° 58’ 02.95”N 074° 59’ 40.29”W (Feature 4). Recommend updating the charted depth to 76 feet. ***Concur. Refer to Appendix II.***

Table 0-1. Additional Features to be Considered for Charting on Chart 12211

Feature Number	Latitude, North (NAD83)			Longitude, West (NAD83)			Depth (Feet)	Depth (Meters)	Description
3	37°	59’	05.51”	074°	59’	33.60”	77	23.45	Obstructions
7	37°	59’	23.10”	074°	55’	04.17”	86	26.38	Obstruction

Do not Concur. Office processing determined that the above features were insignificant based on depth and height off the seafloor, therefore, no charting action is required.

~~**ENC US4VA50M (1:80,000)**~~

~~The charted 9.1-meter depth curve in 38° 04' 12.27"N 075° 02'12.88"W to 38° 04' 47.96"N 075° 01' 14.50"W was found approximately 200 meters south of its charted position.~~

~~The charted 9.1-meter depth curve in 37° 59' 39.34"N 075° 01' 43.58"W to 37° 59' 46.89"N 075° 01' 50.75"W was found approximately 550 meters southwest of its charted position.~~

~~The charted 18.2-meter depth curve in 37° 58' 25.38"N 075° 02' 15.94"W to 37° 58' 15.23"N 075° 00' 45.87"W was found approximately100 to 700 meters south of its charted position.~~

~~The charted 18.2-meter depth curve in 38° 02' 59.08"N 074° 59' 00.23"W to 38° 03' 12.98"N 074° 59' 07.67"W was found approximately 550 meters west of its charted position.~~

~~The charted 18.2-meter depth curve in 38° 03' 27.13"N 74° 58' 56.94"W to 38° 03' 32.89"N 074° 59' 08.60"W was found approximately 600 meters southwest of its charted position and in 38° 03' 32.89"N 074° 59' 08.60"W to 38° 03' 28.34"N 074° 59' 44.46"W was found approximately 200 meters south of its charted position.~~

~~The charted 27.4-meter depth curve in 37° 58' 31.86"N 074° 56' 40.02"W to 37° 58' 18.20"N 074° 56' 36.28"W was found approximately 450 meters west of its charted position.~~

~~The charted 27.4-meter depth curve in 38° 00' 58.19"N 074° 53' 58.85"W to 38° 01' 07.37"N 074° 54' 09.52"W was found approximately 500 meters west of its charted position.~~

~~The charted 18.2-meter sounding and 18.2-meter depth curve in 37° 58' 36.63'N 075° 00' 25.35"W was not found. CUBE depths in the area were 18.87 to 22.20 meters.~~

~~The charted 18.2-meter sounding and 18.2-meter depth curve in 37° 58' 37.02'N 074° 59' 57.20"W was found approximately 300 meters southwest of its charted position.~~

~~The charted 5.7-meter sounding in 38° 04' 09.97"N 075° 01' 37.29"W was in CUBE depths of 6.78 to 8.07 meters.~~

~~The charted 8.5-meter sounding and 9.1-meter depth curve with blue tint in 38° 01' 47.63"N 075° 01' 26.45"W was not found. CUBE depths in this area were 9.79 to 10.76 meters.~~

~~The charted 14.9-meter sounding in 38° 00’ 51.91”N 074° 59’ 22.56”W was in CUBE depths of 16.05 to 16.76 meters.~~

~~The charted 10.6-meter sounding in 38° 00’ 11.60”N 075° 01’ 27.29”W was in CUBE depths of 12.45 to 13.71 meters.~~

~~The charted 10.9-meter sounding in 37° 58’ 58.85”N 075° 01’ 24.54”W was in CUBE depths of 12.60 to 14.60 meters.~~

~~The charted 10.9-meter sounding in 37° 59’ 12.72”N 075° 00’ 25.14”W was in CUBE depths of 12.12 to 13.84 meters.~~

~~The charted 11.5-meter sounding in 37° 59’ 24.41”N 075° 00’ 07.29”W was in CUBE depths of 12.63 to 14.22 meters.~~

~~The charted 18.8-meter sounding in 37° 58’ 48.76”N 074° 59’ 34.67”W was in CUBE depths of 20.89 to 24.35 meters.~~

~~The charted 23.7-meter non-dangerous wreck in 37° 58’ 02.97’N 074° 59’ 40.21”W was reported in Danger to Navigation Report 1 which was not forwarded to MCD. It was subsequently reported in Danger to Navigation Report 3 on H12091 (Sheet O) as a wreck with least depth of 23.79 meters (78 feet) in 37° 58’ 02.97”N 074° 59’ 40.21”W. This report was submitted to MCD. After correcting soundings for verified tides the least depth was found to be 23.27 meters, 0.27 meter uncertainty, in 37° 58’ 02.95”N 074° 59’ 40.29”W (Feature 4). Recommend updating the submerged non-dangerous wreck depth to 23.3 meters in 37° 58’ 02.95”N 074° 59’ 40.29”W.~~

Table 0-2. Additional Features to be Considered for Charting on ENC US4VA50M

See Appendix II for all feature charting recommendations.

Feature Number	Latitude, North (NAD83)			Longitude, West (NAD83)			Depth (Meters)	Uncertainty (Meters)	Description
1	38°	00’	05.07”	074°	53’	50.40”	29.27	0.270	Obstruction
2	37°	59’	36.29”	075°	01’	28.55”	13.28	0.270	Obstruction
~~3~~	~~37°~~	~~59’~~	~~05.51’~~	~~074°~~	~~59’~~	~~33.60”~~	~~23.45~~	~~0.270~~	~~Obstructions~~
5	38°	01’	07.04”	074°	55’	13.61”	25.34	0.270	Obstruction
6	37°	59’	23.65”	074°	55’	32.27”	31.06	0.270	Obstructions
~~7~~	~~37°~~	~~59’~~	~~23.10”~~	~~074°~~	~~55’~~	~~04.17”~~	~~26.38~~	~~0.270~~	~~Obstruction~~
8	38°	04’	36.12”	075°	02’	01.78”	11.14	0.270	Obstruction

Do not Concur. Office processing determined that the above features were insignificant based on depth and height off the seafloor, therefore, no charting action is required.

AWOIS Item Investigations

Only the southern 700 meters of the 1000-meter search radius around assigned full investigation AWOIS 14226 fell within H12002. No wrecks or objects were found within this area. The remaining area was within H11992 (Sheet K) and was surveyed in 2008. Descriptive Report, H11992, (SAIC Doc 09-TR-045) recommended removal of the dangerous wreck symbol with blue tint and label PA in 38° 04' 59.92"N 074° 53' 55.89"W. ***Concur.***

Designated Soundings

Designated soundings were set across this sheet to help better preserve the shallowest soundings relative to the computed depth surface. In some cases, designated soundings were used to preserve the least depth of small objects that were not significant enough to warrant a feature designation. Designated soundings were also used on many large features (e.g., wrecks, obstructions, etc.) to better define the extents of the feature and to help preserve important least depths on that feature. 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. There were 38 designated soundings set in H12002. 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.***

Danger to Navigation Reports

One Danger to Navigation Report was submitted for this survey and a copy has been included in Appendix V***. The Atlantic Hydrographic Branch did not submit the report to Marine Charting Division (see Appendix V***). The one Danger to Navigation Report is also referenced in section D.1 Chart Comparison. ***See Appendix II for all feature charting recommendations.***

****Filed with original Field Records.***

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

The charted buoy R "6" Fl R 6s was found (Feature 9) in 37° 59' 42.38"N 075° 01' 22.76"W (Figure 0-1). This agreed with the description of the Winter Quarter Shoal Lighted Buoy 6 in the United States Coast Guard Light List Volume II Atlantic Coast 2010.

Figure 0-1. Winter Quarter Shoal Lighted Buoy 6

Additional Factors

The inshore, near coastal areas of the mid-Atlantic are relatively dynamic, and finer-grained sediments (e.g., fine sands and silt) are routinely transported through normal coastal processes. In addition, periodic large storm events may be capable of re-suspending and transporting coarser-grained bottom sediments. Over the ten month period of these survey operations (July 2009 to April 2010), large-scale changes in the bottom topography, likely due to normal seasonal migration of bottom sediments, was evident. These differences were most noticeable during the holiday fill operations that were conducted up to six months after the mainscheme operations had been completed. Some of the higher CUBE uncertainties observed across H12002 were due to relatively minor changes in the seafloor between the times that overlapping multibeam data were acquired. Though we did observe small-scale seafloor changes over the course of this survey, based on comparisons with the charts, it appears that the major shoal features throughout this area have remained relatively stable. These larger shoal areas are comprised of coarser-grained sediments that are much less impacted by coastal sediment transport processes. However, in the event of an unusually large coastal storm (e.g., hurricane or major northeaster), the depths and extents of these relatively stable features may be greatly altered.

APPROVAL SHEET

02 July 2010

LETTER OF APPROVAL

REGISTRY NUMBER: H12002

This report and the accompanying digital data for project OPR-D302-SA-09 DELMARVA, Coast of Maryland and Virginia Project is respectfully submitted.

Field operations and data processing contributing to the accomplishment of this survey, H12002, were conducted under supervision of myself and lead hydrographers Jason M. Infantino, Rick Nadeau, and Deborah M. Smith 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
Data Acquisition and Processing Report, SAIC Doc 10-TR-007	26 March 2010
Descriptive Report H12001, SAIC Doc 10-TR-001	26 March 2010

SCIENCE APPLICATIONS INTERNATIONAL CORPORATION

Gary R. Davis

Digitally signed by Gary R. Davis
DN: cn=Gary R. Davis, o=SAIC, ou=MSTD, email=gary.r.davis@saic.com, c=US
Date: 2010.07.01 09:49:07 -04'00'

Gary R. Davis
Chief Hydrographer
Science Applications International Corporation
02 July 2010

APPENDIX I. DANGER TO NAVIGATION REPORTS

SAIC submitted one Danger to Navigation (DTN) Report for H12002 to the Atlantic Hydrographic Branch (AHB). AHB did not submit this DTN report to the Marine Chart Division (MCD) because the least depth was deeper than the 11 fathom (66 feet) danger depth limit. For additional information, please see the Correspondence section of Appendix V. ***Concur***

Danger to Navigation Report 1

Hydrographic Survey Registry Number: H12002

State: Maryland

Locality: Atlantic Ocean

Sub Locality: 13 NM East of Assateague Island

Project Number: OPR-D302-SA-09

Survey Date: 03 August 2009 at 19:38:13 UTC

Depths are reduced to Mean Lower Low Water using ***predicted*** tides based on preliminary zoning. Positions are based on NAD-83. Positions were obtained using DGPS from a US Coast Guard Station.

Charts affected:
12211 43rd Edition 10/01/2007 1:80,000 scale: Corrected through NM 07/04/2009

The following items were found during hydrographic survey operations:

FEATURE	DEPTH	LATITUDE	LONGITUDE
Wreck	76 ft (23.35 m)	37° 58’ 02.95” N	074° 59’ 40.29” W

Description:
The deteriorated wreck is sitting upright, approximately 66 meters long by 20 meters wide, and oriented 132°/224°. It has a least depth of 76 feet in depths of 85 to 88 feet.

Recommendations:
Chart a 76 foot sounding with danger circle, blue tint (K-26) and label Wk in 37° 58’ 02.95”N 074° 59’ 40.29”W.

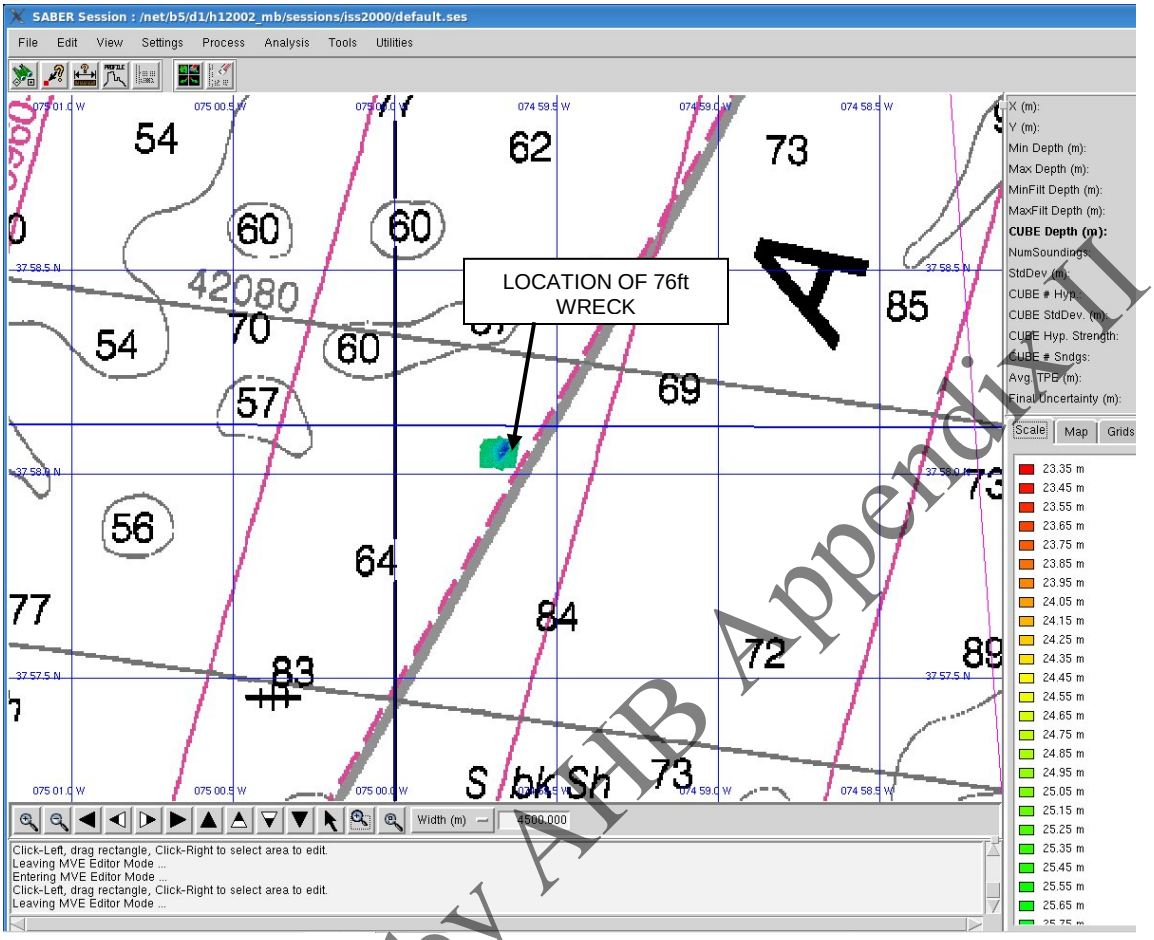


Figure Appendix I-1. Section of Chart 12211 Showing Location of Wreck with Least Depth of 76 Feet within H12002.

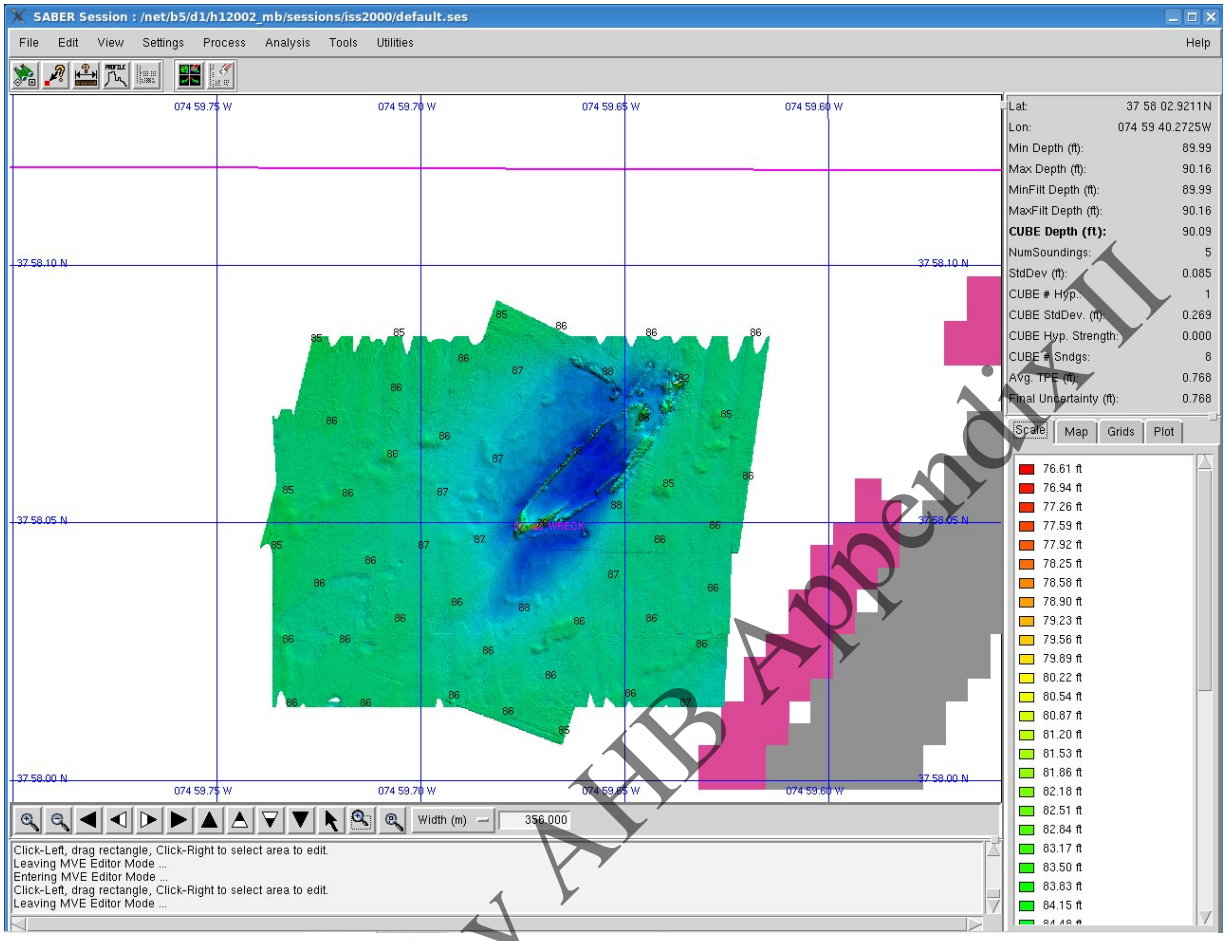


Figure Appendix I-2. Section of Chart 12211 Showing Cubed Depth Grid and Selected Soundings around Wreck with Least Depth of 76 Feet within H12002.

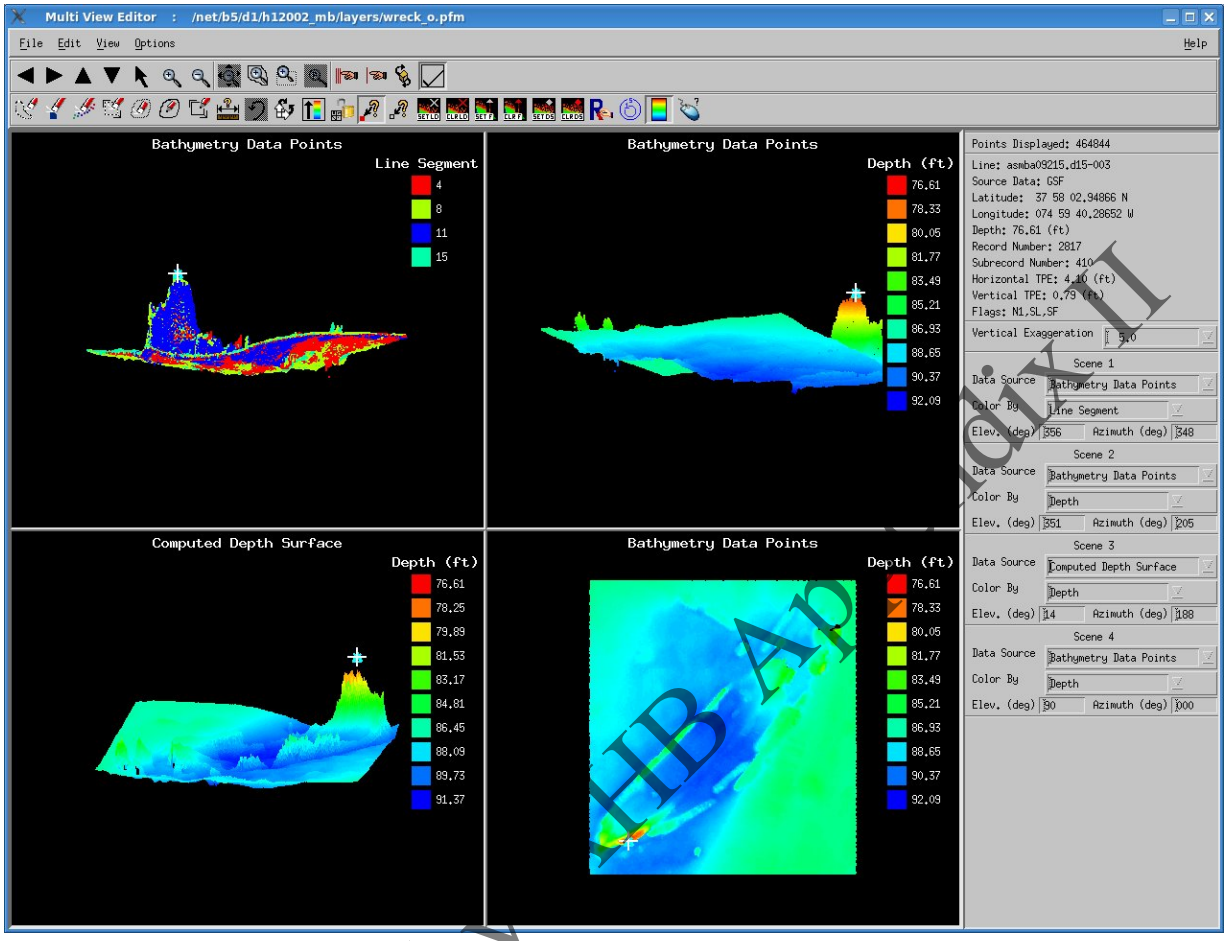


Figure Appendix I-3 Multiview Editor of PFM Grid of Wreck with Least Depth of 76 Feet within H12002.

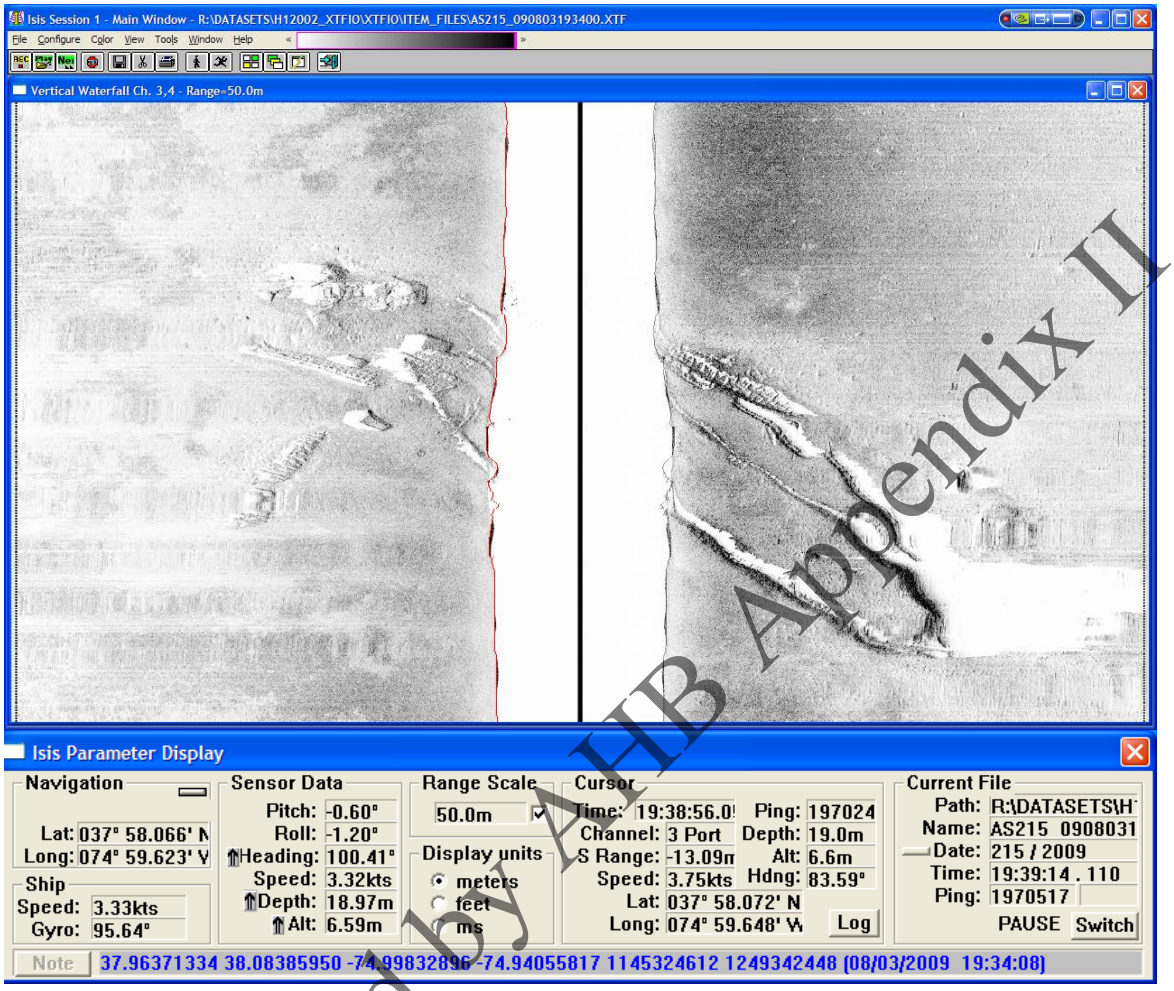


Figure Appendix I-4. High Frequency (500 kHz) Sidescan Image of Wreck with Least Depth of 76 Feet within H12002.

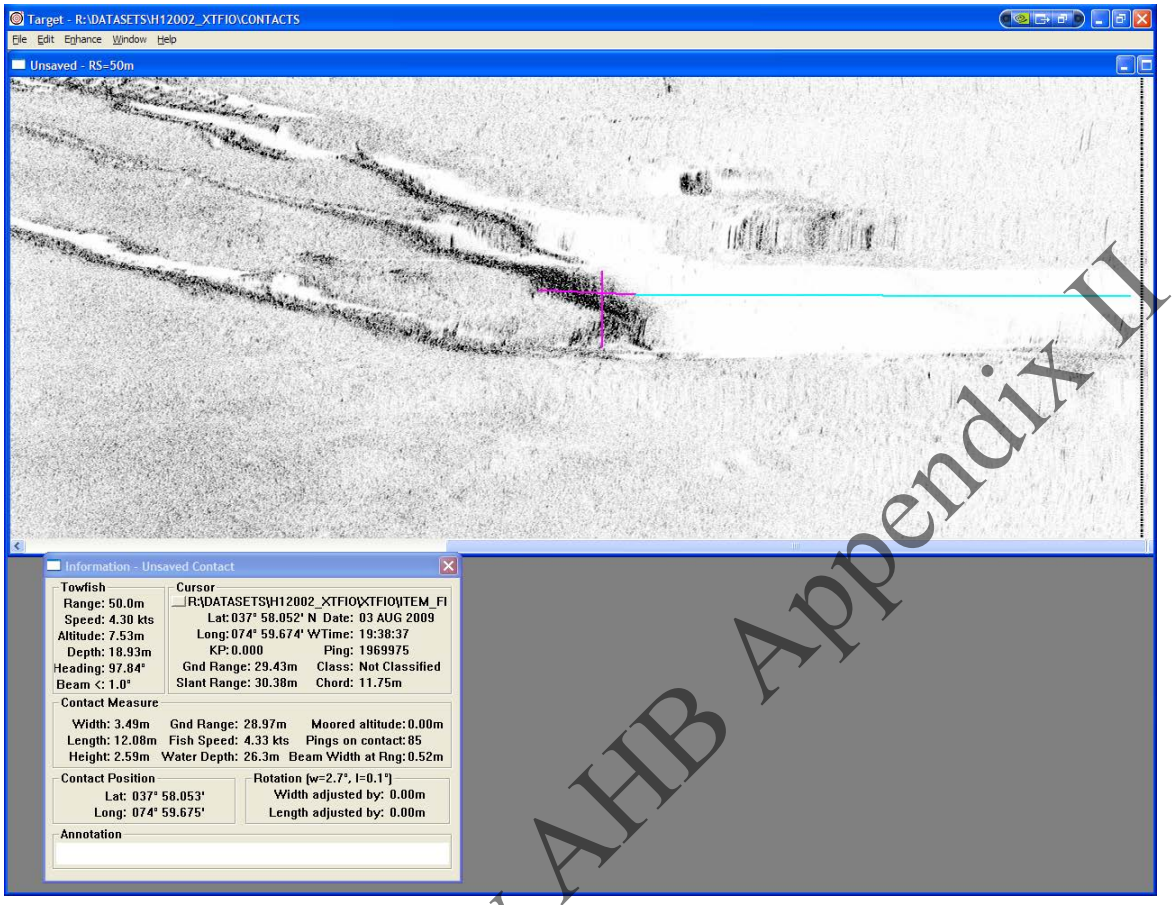


Figure Appendix I-5. Sidescan Target Image of Wreck with Least Depth of 76 Feet within H12002.

APPENDIX II. SURVEY FEATURE REPORT

Appendix II - Survey Features Report

Registry Number: H12002
State: Virginia
Locality: Atlantic Ocean
Sub-locality: 13NM East of Assateague
Project Number: OPR-D302-SA-09
Survey Dates: 07/15/2009 - 04/15/2010

Charts Affected

Number	Edition	Date	Scale (RNC)	RNC Correction(s)*
12211	44th	02/01/2011	1:80,000 (12211_1)	USCG LNM: 4/12/2011 (4/19/2011) NGA NTM: 5/9/1992 (4/30/2011)
12200	49th	06/01/2007	1:419,706 (12200_1)	[L]NTM: ?
13003	49th	04/01/2007	1:1,200,000 (13003_1)	[L]NTM: ?

* Correction(s) - *source: last correction applied (last correction reviewed--"cleared date")*

Features

No.	Name	Feature Type	Survey Depth	Survey Latitude	Survey Longitude	AWOIS Item
1.1	76ft WRECK	Wreck	23.27 m	37° 58' 02.9" N	074° 59' 40.3" W	---

1 - Item Data

1.1) 76ft WRECK

Survey Summary

Survey Position:	37° 58' 02.9" N, 074° 59' 40.3" W
Least Depth:	23.27 m (= 76.36 ft = 12.727 fm = 12 fm 4.36 ft)
TPU (±1.96σ):	**THU (TPEh)** ±1.250 m ; **TVU (TPEv)** ±0.270 m
Timestamp:	2009-215.19:38:14.421 (08/03/2009)
Survey Line:	h12002 / atlantic_surveyor / 2009-215 / asmba09215_d15
Profile/Beam:	2817/410
Charts Affected:	12211_1, 12200_1, 13003_1

Remarks:

Listed in DR (page 15) as:

The charted 78-foot sounding labeled Wk in approximately 37° 58’ 02.95’N 074° 59’ 40.29”W was reported in Danger to Navigation Report 1 which was not forwarded to MCD. It was subsequently reported in Danger to Navigation Report 3 on H12091 (Sheet O) as a wreck with least depth of 23.79 meters (78 feet) in 37° 58’ 02.97”N 074° 59’ 40.21”W. After correcting soundings for verified tides the least depth was found to be 76 feet (23.27 meters, 0.27 meter uncertainty) in 37° 58’ 02.95”N 074° 59’ 40.29”W (Feature 4). Recommend updating the charted depth to 76 feet.

Listed in DR (page 16) as:

The charted 23.7-meter non-dangerous wreck in 37° 58’ 02.97’N 074° 59’ 40.21”W was reported in Danger to Navigation Report 1 which was not forwarded to MCD. It was subsequently reported in Danger to Navigation Report 3 on H12091 (Sheet O) as a wreck with least depth of 23.79 meters (78 feet) in 37° 58’ 02.97”N 074° 59’ 40.21”W. This report was submitted to MCD. After correcting soundings for verified tides the least depth was found to be 23.27 meters, 0.27 meter uncertainty, in 37° 58’ 02.95”N 074° 59’ 40.29”W (Feature 4). Recommend updating the submerged non-dangerous wreck depth to 23.3 meters in 37° 58’ 02.95”N 074° 59’ 40.29”W.

Listed in Feature Correlator Sheet (#4) as:

WRECK. Chart sounding danger circle and label 'WK'.

SAR NOTE: Feature is real. Was seen in MBES and SSS records.

Feature Correlation

Address	Feature	Range	Azimuth	Status
h12002/atlantic_surveyor/2009-215/asmba09215_d15	2817/410	0.00	000.0	Primary
AHB_H12002/SAR/SAR AHB HOB Files/H12002_Feature_Subset.000	022600045FA60001	0.10	000.0	Secondary (grouped)
h12002/atlantic_surveyor/2009-215/asmba09215_d16	2371/382	1.92	075.6	Secondary

h12002/atlantic_surveyor/2009-215/asmba09215_d15	2833/393	3.22	238.4	Secondary (grouped)
h12002/atlantic_surveyor/2009-215/asmba09215_d15	2839/393	4.25	236.6	Secondary (grouped)
h12002/atlantic_surveyor/2009-214/asmba09214_d36	1470/138	6.51	111.4	Secondary
h12002/atlantic_surveyor/2009-215/asmba09215_d16	2406/401	6.67	082.7	Secondary
h12002/atlantic_surveyor/2009-215/asmba09215_d15	2777/396	6.69	087.5	Secondary (grouped)
h12002/atlantic_surveyor/2009-215/asmba09215_d16	2304/415	12.97	210.7	Secondary
h12002/atlantic_surveyor/2009-215/asmba09215_d16	2328/471	14.66	187.7	Secondary (grouped)
h12002/atlantic_surveyor/2009-215/asmba09215_d16	2267/421	16.25	245.5	Secondary
h12002/atlantic_surveyor/2009-215/asmba09215_d14	2873/339	21.19	199.2	Secondary
h12002/atlantic_surveyor/2009-215/asmba09215_d14	2824/402	31.15	207.2	Secondary
h12002/atlantic_surveyor/2009-215/asmba09215_d14	2765/453	44.10	212.3	Secondary
h12002/atlantic_surveyor/2009-215/asmba09215_d17	3054/433	50.05	234.5	Secondary (grouped)
h12002/atlantic_surveyor/2009-215/asmba09215_d14	2726/445	52.54	216.8	Secondary (grouped)
h12002/atlantic_surveyor/2009-215/asmba09215_d17	3118/341	55.62	211.8	Secondary (grouped)
h12002/atlantic_surveyor/2009-215/asmba09215_d14	2677/436	56.78	222.9	Secondary (grouped)
h12002/atlantic_surveyor/2009-215/asmba09215_d15	2995/184	57.31	218.9	Secondary (grouped)
h12002/atlantic_surveyor/2009-215/asmba09215_d17	3114/410	57.46	224.6	Secondary (grouped)
h12002/atlantic_surveyor/2009-215/asmba09215_d17	3138/368	60.35	217.7	Secondary (grouped)
h12002/atlantic_surveyor/2009-215/asmba09215_d17	3134/437	63.56	228.6	Secondary (grouped)
h12002/atlantic_surveyor/2009-215/asmba09215_d17	3183/432	70.65	226.4	Secondary (grouped)
h12002/atlantic_surveyor/2009-215/asmba09215_d15	3068/144	72.70	224.3	Secondary (grouped)
h12002/atlantic_surveyor/2009-215/asmba09215_d15	3047/112	73.69	220.0	Secondary (grouped)

Hydrographer Recommendations

[None]

Cartographically-Rounded Depth (Affected Charts):

76ft (12211_1)

12fm (12200_1, 13003_1)

S-57 Data

Geo object 1: Wreck (WRECKS)

Attributes: CATWRK - 1:non-dangerous wreck

QUASOU - 6:least depth known

SORDAT - 20100415

SORIND - US, US, graph, H12002

TECSOU - 2,3:found by side scan sonar,found by multi-beam

VALSOU - 23.275 m

WATLEV - 3:always under water/submerged

Office Notes

Concur with clarification. Delete charted non-dangerous wreck, least depth 78 ft. Chart non-dangerous wreck, least depth 76 ft at survey position.

Feature Images

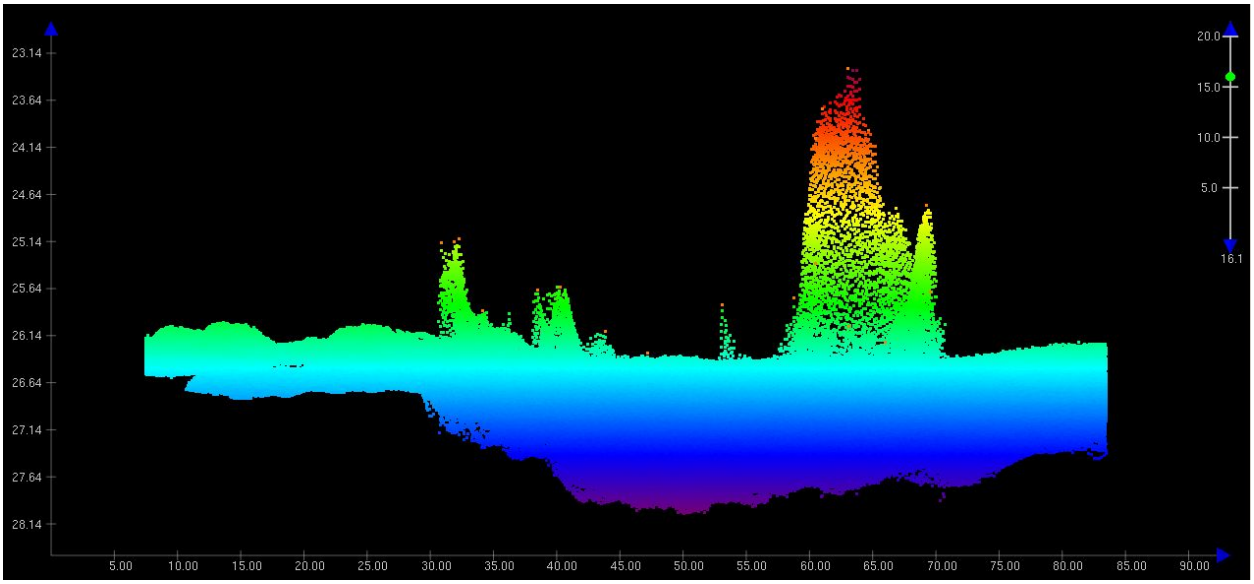


Figure 1.1.1

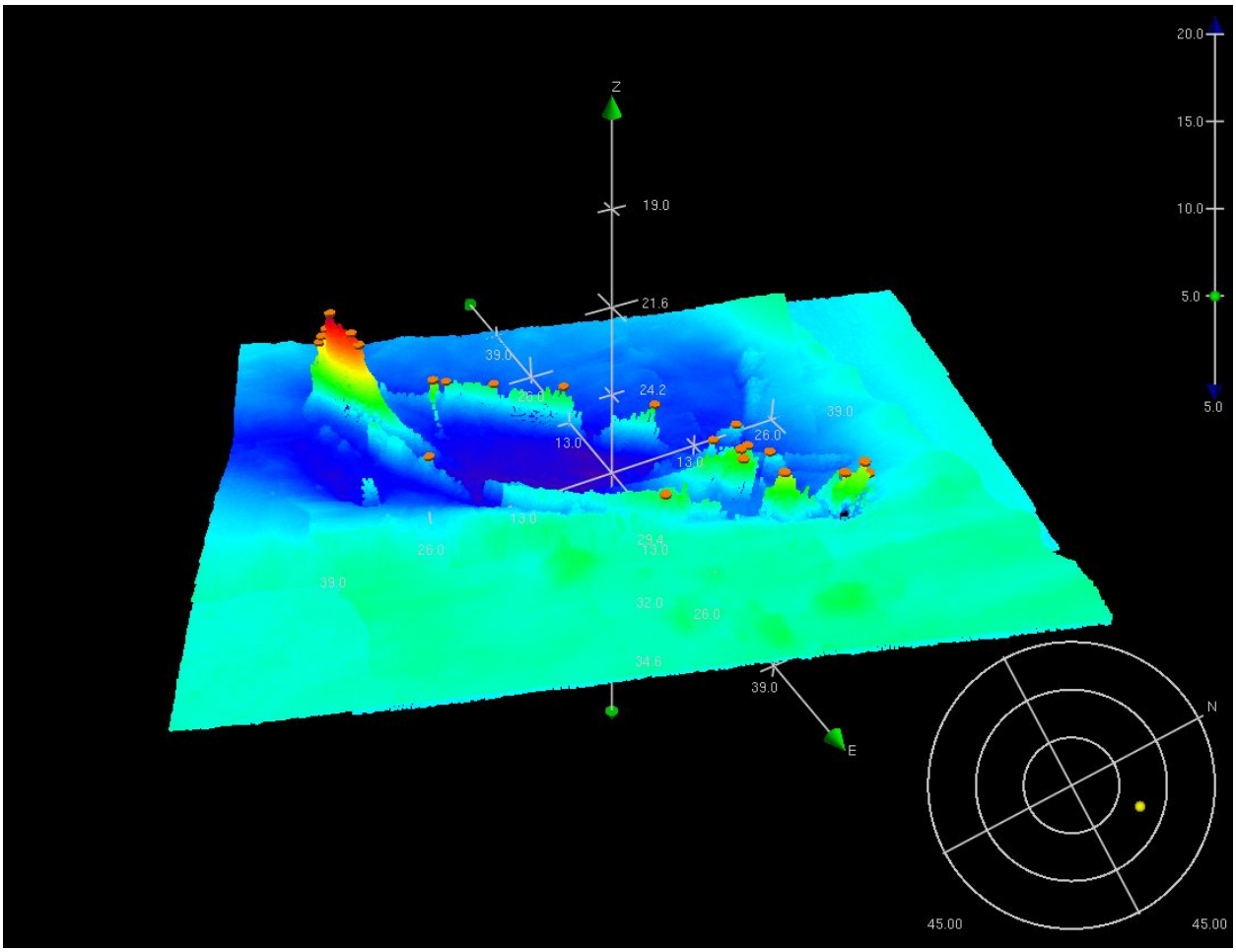
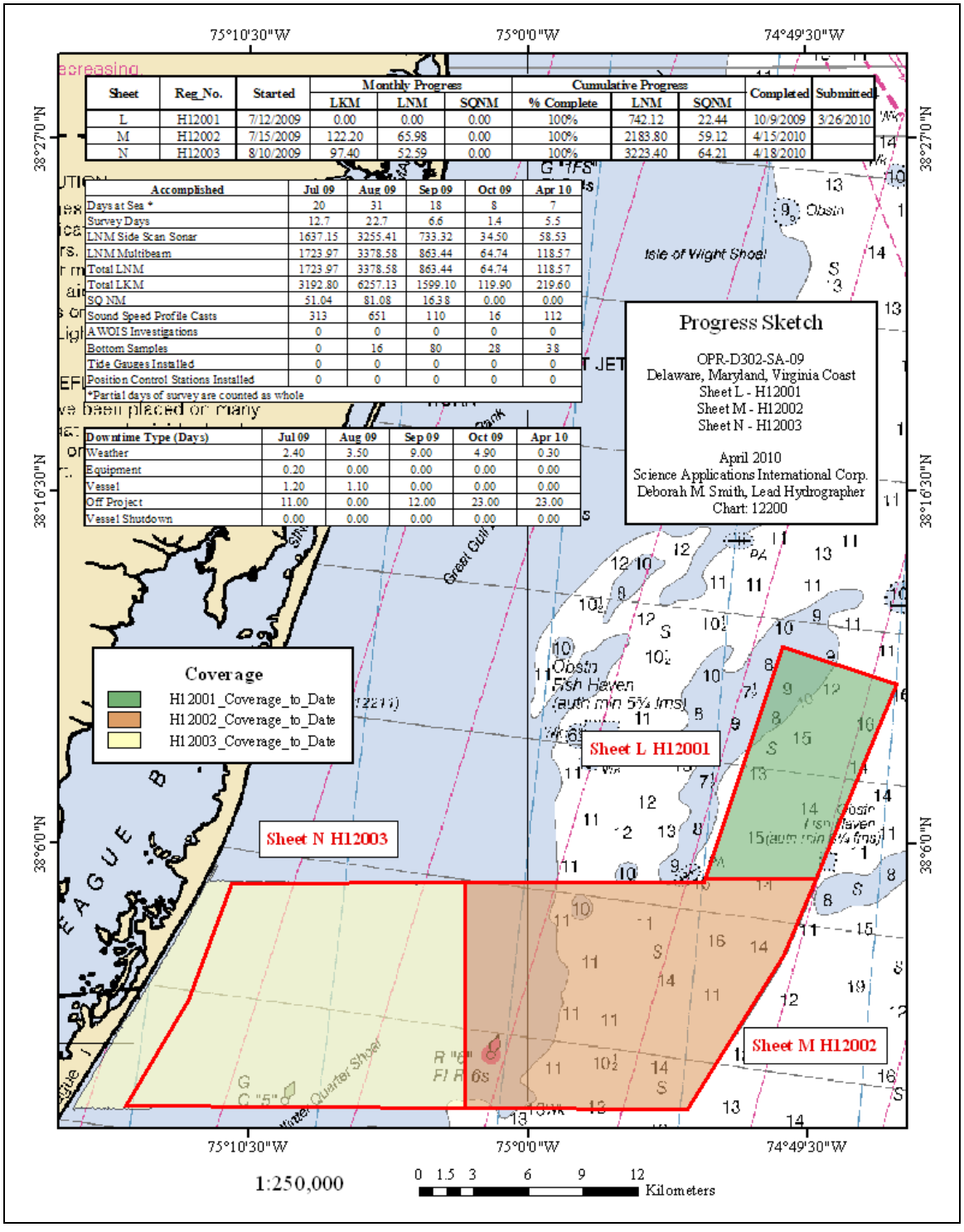


Figure 1.1.2

APPENDIX III. FINAL PROGRESS SKETCH AND SURVEY OUTLINE



Sheet	Reg_No.	Started	Monthly Progress			Cumulative Progress			Completed	Submitted
			LKM	LNM	SQNM	% Complete	LNM	SQNM		
L	H12001	7/12/2009	0.00	0.00	0.00	100%	742.12	22.44	10/9/2009	3/26/2010
M	H12002	7/15/2009	122.20	65.98	0.00	100%	2183.80	59.12	4/15/2010	
N	H12003	8/10/2009	97.40	52.59	0.00	100%	3223.40	64.21	4/18/2010	

Accomplished	Jul 09	Aug 09	Sep 09	Oct 09	Apr 10
Days at Sea *	20	31	18	8	7
Survey Days	12.7	22.7	6.6	1.4	5.5
LNM Side Scan Sonar	1637.15	3255.41	733.32	34.50	58.53
LNM Multibeam	1723.97	3378.58	863.44	64.74	118.57
Total LNM	1723.97	3378.58	863.44	64.74	118.57
Total LKM	3192.80	6257.13	1599.10	119.90	219.60
SQ NM	51.04	81.08	16.38	0.00	0.00
Sound Speed Profile Casts	313	651	110	16	112
AWOIS Investigations	0	0	0	0	0
Bottom Samples	0	16	80	28	38
Tide Gauges Installed	0	0	0	0	0
Position Control Stations Installed	0	0	0	0	0
*Partial days of survey are counted as whole					

Downtime Type (Days)	Jul 09	Aug 09	Sep 09	Oct 09	Apr 10
Weather	2.40	3.50	9.00	4.90	0.30
Equipment	0.20	0.00	0.00	0.00	0.00
Vessel	1.20	1.10	0.00	0.00	0.00
Off Project	11.00	0.00	12.00	23.00	23.00
Vessel Shutdown	0.00	0.00	0.00	0.00	0.00

Figure Appendix III-1. Final Progress Sketch for H12002

The Survey Outline for H12002 was delivered to the COTR, on 05 May 2010. Two survey outlines in dxf format were delivered. One outline was in a geodetic latitude/longitude coordinate system (*H12002_survey_outline_LL_R12.dxf*) and the other in a projected UTM coordinate system (*H12002_survey_outline_UTM18.dxf*). These outline files are also included as part of this delivery. Figure Appendix III-2 is a graphical depiction of the DXFs.

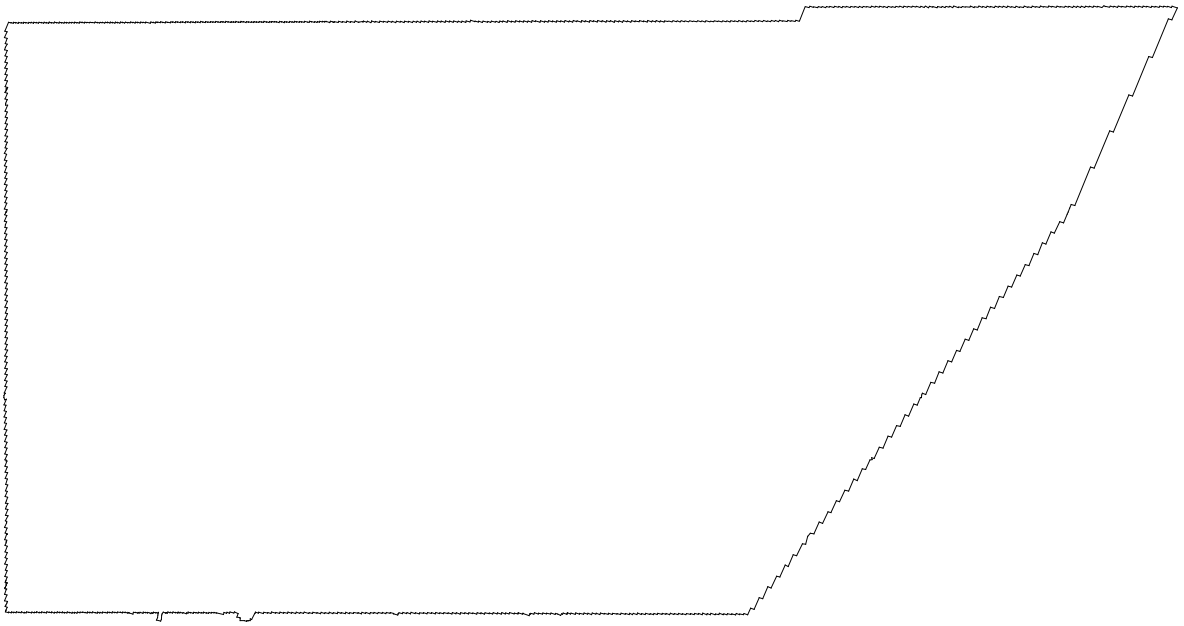


Figure Appendix III-2. Survey Outline for H12002

APPENDIX IV. TIDES AND WATER LEVELS

The on-line times for acquisition of valid hydrographic data are presented in Table Appendix IV-1.

Project: OPR-D302-SA-09
Registry No.: H12002
Contractor Name: Science Applications International Corporation
Date: 15 April 2010
Sheet Letter: M
Inclusive Dates: 15 July 2009 – 15 April 2010

Field work is complete.

Table Appendix IV-1. Abstract Times of Hydrography, H12002

Begin Date	Begin Julian Day	Begin Time	End Date	End Julian Day	End Time
7/15/2009	196	01:49:34	7/15/2009	196	18:49:37
7/17/2009	198	01:43:36	7/18/2009	199	02:59:59
7/20/2009	201	03:32:43	7/26/2009	207	19:53:25
8/1/2009	213	22:50:45	8/8/2009	220	16:41:16
8/10/2009	222	03:32:17	8/10/2009	222	05:48:57
10/9/2009	282	07:19:24	10/9/2009	282	09:24:37
10/11/2009	284	23:32:57	10/12/2009	285	13:52:38
4/11/2010	101	01:39:30	4/12/2010	102	03:07:28
4/12/2010	102	12:42:12	4/12/2010	102	12:46:38
4/12/2010	102	15:07:35	4/12/2010	102	17:39:23
4/15/2010	105	01:16:40	4/15/2010	105	02:28:27

Final Tide Note
Observed verified water levels were downloaded from the NOAA Tides and Currents web site for the station in Duck, NC (8651370). Water Level correctors were prepared for each zone of the project 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 H12002 multibeam data fell entirely within the preliminary water level zones SA45 and SA46A NOAA for Duck, NC, 8651370. Analysis of the multibeam data collected from all sheets of this project using **SABER's Multi-View Editor** and bathymetry grids, revealed minimal depth changes across the junction of the zones. A statistical analysis of the water level correctors for each zone and the differences observed at the boundaries of adjacent zones also confirmed the adequacy of zoning correctors based on Duck, NC (8651370). Refer to the DAPR for this project for a complete, detailed description of the

analysis. Differences computed at the zone boundaries are summarized in Table Appendix IV-2. As a result, the NOAA preliminary zone boundaries and zoning parameters, Table Appendix IV-3, for Duck, NC (8651370) were accepted as final and applied to all multibeam data for H12002

Table Appendix IV-2. Differences in Water Level Correctors between Adjacent Zones Using Zoning Parameters for Station 8651370 for Data Collected in 2009

Zone Boundary	SA46A – SA45
Minimum Difference	-0.007
Maximum Difference	0.054
Average Difference	0.021
Standard Deviation	0.012

Table Appendix IV-3. Tide Zone Parameters for H12002

Zone	Time Corrector	Range Ratio	Reference Station
SA45	00 minutes	1.05	8651370
SA46A	00 minutes	1.08	8651370

APPENDIX V. SUPPLEMENTAL SURVEY RECORDS & CORRESPONDENCE

This appendix is comprised of three sections and 67 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 the tabular summary of the bottom characteristic results for this sheet and 65 attached image files of the bottom samples. 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 included Appendix_V_Files directory contains the following supplemental files.

- One text file (.txt) and one corresponding PDF file, titled *H12002_one_meter_pfm_Uncertainty_Exceeds_IHO1*, listing all of the nodes from the one-meter PFM CUBE surface which contained final uncertainties that exceeded the IHO Order 1 uncertainty limit at that node's depth.

CORRESPONDENCE

From: Evans, Rhodri E.
Sent: Wednesday, December 03, 2008 11:13 AM
To: 'Mark.T.Lathrop'
Subject: RE: Request for Proposal, Hydrographic Survey Services

Mark,

Thanks for your response. With regard the #2 our intent is to propose 200% side scan sonar and resulting multibeam data as we have been doing for several years. We wanted to clarify that we will not propose VBES.

Thanks, RE.

From: Mark.T.Lathrop [mailto:Mark.T.Lathrop@noaa.gov]
Sent: Wednesday, December 03, 2008 11:09 AM
To: Evans, Rhodri E.
Subject: Re: Request for Proposal, Hydrographic Survey Services

Rod,

Please see my responses below in red.

Mark

Evans, Rhodri E. wrote:

Mark,

We have the following questions in relation to the Request for Proposal, Letter Instructions and a Statement of Work for Hydrographic Survey Services:

1) Section 1.4 of the SOW states: "Work on all task orders will be conducted per the latest edition of the HSSD." And also the Survey Project Instructions state that the Specifications are "April 2009".For proposal purposes we assume that applicable specifications will very similar to the April 2008 Specifications and that only one specification will apply for the survey (i.e. if a new specification is issued during the course of the ongoing survey, it would not apply)? Please confirm. You are correct. Specifications issued during a survey will not apply.

2) The Survey Project Instructions state: ""200% SSS with concurrent VBES or MB coverage". We intend to propose multibeam coverage for this task order. Please confirm. Are you saying multibeam and no side scan or multibeam with side scan as you've been doing for several years?

3) The Survey Project Instructions state: "Create a survey outline region in MapInfo..." Is it acceptable that the survey outline be in a MapInfo compatible format (i.e. dxf)? Yes

4) Section 6.3.3 of the SOW states: "In addition, single beam soundings will be included in the S-57 feature file portrayed at survey scale."We assume this is not applicable for this task order. Please confirm. The SOW covers all types of survey. This section would apply IF you were acquiring singlebeam data.

5) Section 7.2 of the SOW states: "The delivery address will be included in the Project Letter Instructions." However, delivery address is not in the Survey Project Instructions. Please provide delivery address. Same as before. Atlantic Hydrographic Branch.

6)Please provide the AWOIS database files for the applicable AWOIS items for this survey. We will need the specific search criteria to accurately estimate the areas that require Object Detection Coverage. It looks like I just sent you one of the AWOIS files. I've attached the other files. If you can't read these files, let me know.

7) The Survey Project Instructions state: "The inshore limit of hydrography will be the farthest offshore of the following: (1) the4-meter depth contour or (2) the line defined by the distance seaward from the MHW line which is equivalent to 0.8 millimeters at the scale of the largest scale nautical chart." Please provide information on how we determine the MHW line? This won't apply in your survey. The inshore limit of hydrography is well offshore of this line.

8) The Survey Project Instructions state: "Contractor shall obtain samples of the bottom sediment per section 7.1 of the HSSD." Please confirm. We are asking only because we typically see "As required to verify bottom characteristics". Wording is different but task is the same. Collect, record, but do not keep the samples.

9) Can the project CD be made available to us now? When we receive the tide zoning from CO-OPS we will send you the project CD.

Regards, RE. Rod Evans Ph.D.,
AVP & Marine Survey Manager,
Science Applications International Corporation,
Marine Science and Technology Division,
221 Third Street, Building A,
Newport RI 02840 USA.
Tel (401) 848.4783.
Mobile (401) 439.1037.
Email: evansrh@saic.com

From: Mark.T.Lathrop [mailto:Mark.T.Lathrop@noaa.gov]
Sent: Monday, December 01, 2008 2:29 PM
To: Evans, Rhodri E.

Subject: Request for Proposal, Hydrographic Survey Services

Rod, Attached is a Request for Proposal, Letter Instructions and a Statement of Work for Hydrographic Survey Services. The due date of this request is December15, 2008. If you have any questions, feel free to contact me.

Mark

From: Jeffrey Ferguson <Jeffrey.Ferguson@noaa.gov>
To: Evans, Rhodri E.
Cc: Mark T Lathrop <Mark.T.Lathrop@noaa.gov>
Sent: Fri Jul 10 11:23:42 2009
Subject: [Fwd: Re: [Fwd: RE: Tide Clarification]]

Rod,

See below. Let me know if you have any other questions.

Jeff

Subject:
Re: [Fwd: RE: Tide Clarification]
Date: Fri, 10 Jul 2009 11:12:16 -0400
From: Carolyn Lindley Carolyn.Lindley@noaa.gov
Reply-To: Carolyn.Lindley@noaa.gov
Organization: National Ocean Service
To: Kyle.Ward Kyle.Ward@noaa.gov
CC: Jeffrey Ferguson <Jeffrey.Ferguson@noaa.gov>, William Sweet <William.Sweet@noaa.gov>
References: <4A57405A.2050208@noaa.gov> 4A5759CF.4010209@noaa.gov

Hi All,
Duck has been upgraded to priority processing on the HHL.

Thanks,Carolyn

Kyle.Ward wrote:

Jeff,
I spoke with Billy and Caroline and they confirmed only Duck is needed to control D302, as stated in the instructions from CO-OPS. Atlantic City, NJ (853-4720) and Lewes, DE (863-5750) were inadvertently added to the SOW. Caroline will have Duck added to the Hydro hot list.
Regards,

Kyle

Jeffrey Ferguson wrote:

As discussed...

Thanks,

Jeff

Subject: RE: Tide Clarification
Date: Thu, 09 Jul 2009 17:46:56 -0400
From: Evans, Rhodri E. <RHODRI.E.EVANS@saic.com
To: Davis, Gary R. <GARY.R.DAVIS@saic.com>, Mark.T.Lathrop >> <Mark.T.Lathrop@noaa.gov>, Jeffrey.Ferguson@noaa.gov>>
CC: Donaldson, Paul L. <PAUL.L.DONALDSON@saic.com>, Rebecca >> Quintal <REBECCA.T.QUINTAL@saic.com>, Walter Simmons >> <WALTER.S.SIMMONS@saic.com>>>
References: >> <4A3253243D8F5B4BB74B27E54334000D051CC164@0015-its-exmb04.us.saic.com>>> >> >> >>

Jeff,

I believe Mark is on leave as of this evening. Please see the attached email.

Thanks, RE.

From: Davis, Gary R.
Sent: Thu 7/9/2009 5:30 PM
To: Mark.T.Lathrop
Cc: Rhodri Evans; Donaldson, Paul L.; Rebecca Quintal; Walter Simmons
Subject: Tide Clarification

Mark,

In a recent response for tide zoning for our upcoming surveys off the DelMarVa coast you indicated that we should use the same zoning as last year's surveys. These zones were based on the tide station at Duck, NC (865-1370). We are currently planning to start survey operations on Sunday 12 July and request that the status of this station be changed to Priority Processing on the COOPS Hot List. The COOPS Hot List currently shows the status of this station as "Priority Processing removed, gauge will be used again in the summer of 2009. We have also noticed that the Project Instructions (OPR-D302-SA-09 Project Instructions.pdf) lists tide stations Atlantic City, NJ (853-4720) and Lewes, DE (863-5750) under the Tide Requirements. It does not mention the Duck, NC tide station. Are these stations required in addition to Duck, NC; or intended as backup

tide stations in the event that Duck, NC fails? If so we request that they also be added to the COOPS Hot List.

Regards,
Gary R. Davis, ACSM Certified Hydrographer
Chief Hydrographer
SAIC Marine Science and Technology Division
221 Third Street
Building A
Newport, RI 02840
Tel (401)847-4210
Email: gary.r.davis@saic.com

From: Castle.E.Parker [Castle.E.Parker@noaa.gov]
Sent: Tuesday, January 05, 2010 7:00 AM
To: Davis, Gary R.
Subject: Re: Danger to Navigation Reports

Attachments: Castle_E_Parker.vcf

Good Day Gary,
A happy New Year to you as well.

H12002 DtoN #1 was not submitted to NDB as the wreck and depth is deeper than 11fm (66 ft) Danger depth limit. The wreck should be dealt within the DR and feature file. For the sake of documentation, you probably should include in DR appendix 1 and AHB will add notes based upon review and not submitting. Including the DtoN in Appendix 1 documents SAIC actions.

H12091 appears to have been lost by Nautical Data Branch. I have inquired and you were CC on the inquiry. Stand by for this one.
Have a great day!!
Gene

Davis, Gary R. wrote:
Gene,
Happy New Year!

We do not have any record of the disposition of the following Danger to Navigation Reports:

H12002 Danger to Navigation Report #1, Wreck with least depth of 76 feet, submitted 17 August 2009.

H12091 Danger to Navigation Report #1, Wreck with least depth of 55 feet, submitted 1 October 2009.

I wanted to make sure that they were received by AHB and would appreciate information on their disposition. If they were submitted to MCD, would you please forward a copy of the submittal?

Thanks.

Regards,
Gary R. Davis, ACSM Certified Hydrographer Chief Hydrographer SAIC
Marine Science and Technology Division
221 Third Street
Building A
Newport, RI 02840
Tel (401)847-4210
Email: gary.r.davis@saic.com

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

BOTTOM CHARACTERISTICS

There were 67 bottom samples taken to verify the bottom types charted for H12002. Table Appendix V-1 provides information for each sample collected to any charted bottom type within 2000 meters. A photograph of each bottom sample is provided in the Appendix_V_Files folder.

Table Appendix V-1. H12002 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 # 12211
102	H12002_BS_01	38° 04’ 23.5”	075° 01’ 27.7”	crsS brkSh	7.39	0.270	S
102	H12002_BS_02	38° 04’ 24.0”	075° 00’ 08.6”	crsS brkSh	20.71	0.280	
102	H12002_BS_03	38° 04’ 24.8”	074° 58’ 47.1”	crsS brkSh	19.69	0.270	
102	H12002_BS_04	38° 04’ 26.7”	074° 57’ 24.4”	crsS brkSh	21.09	0.270	
102	H12002_BS_05	38° 04’ 30.0”	074° 55’ 56.6”	hrd	27.74	0.270	
102	H12002_BS_06	38° 04’ 25.1”	074° 54’ 40.4”	crsS brkSh	22.46	0.270	
102	H12002_BS_07	38° 04’ 25.1”	074° 53’ 20.4”	mS	29.05	0.270	
259	H12002_BS_08	38° 04’ 25.4”	074° 51’ 57.5”	mS brkSh	29.07	0.270	
220	H12002_BS_09	38° 04’ 28.9”	074° 50’ 37.0”	fneS brkSh	29.86	0.270	
220	H12002_BS_10	38° 03’ 32.4”	074° 49’ 50.8”	fneS	28.33	0.270	
259	H12002_BS_11	38° 03’ 27.5”	074° 51’ 15.8”	mS Sh	26.44	0.270	
285	H12002_BS_12	38° 03’ 24.6”	074° 52’ 45.0”	fneS brkSh	30.40	0.270	
102	H12002_BS_13	38° 03’ 35.3”	074° 53’ 54.7”	mS brkSh	28.11	0.270	
102	H12002_BS_14	38° 03’ 37.3”	074° 55’ 19.4”	fneS	20.64	0.270	
102	H12002_BS_15	38° 03’ 32.5”	074° 56’ 43.0”	fneS	24.89	0.270	
102	H12002_BS_16	38° 03’ 31.8”	074° 58’ 07.6”	mS brkSh	20.36	0.270	
102	H12002_BS_17	38° 03’ 31.6”	074° 59’ 30.2”	mS P brkSh	18.80	0.270	
102	H12002_BS_18	38° 03’ 30.0”	075° 00’ 53.1”	mS brkSh	18.79	0.270	S bkSh
102	H12002_BS_19	38° 03’ 30.9”	075° 02’ 13.7”	crsS brkSh	10.65	0.270	S bkSh
102	H12002_BS_20	38° 02’ 32.8”	075° 01’ 33.3”	crsS brkSh	14.27	0.270	S
102	H12002_BS_21	38° 02’ 33.1”	075° 00’ 10.5”	crsS brkSh	16.11	0.270	S
102	H12002_BS_22	38° 02’ 34.2”	074° 58’ 46.7”	crsS	19.85	0.270	
102	H12002_BS_23	38° 02’ 39.4”	074° 57’ 26.2”	mS brkSh	22.56	0.270	
102	H12002_BS_24	38° 02’ 34.7”	074° 56’ 01.0”	fneS	23.59	0.270	S
285	H12002_BS_25	38° 02’ 36.0”	074° 54’ 41.7”	mS brkSh	26.94	0.270	S
285	H12002_BS_26	38° 02’ 33.4”	074° 53’ 25.5”	mS brk Sh	27.84	0.270	
259	H12002_BS_27	38° 02’ 34.2”	074° 51’ 55.5”	mS	26.69	0.270	
220	H12002_BS_28	38° 02’ 37.4”	074° 50’ 30.2”	hrd	28.09	0.270	
220	H12002_BS_29	38° 01’ 40.1”	074° 51’ 11.9”	mS brkSh	27.13	0.270	
258	H12002_BS_30	38° 01’ 39.8”	074° 52’ 38.0”	mS	24.50	0.270	
285	H12002_BS_31	38° 01’ 39.4”	074° 53’ 59.3”	fneS brkSh	27.45	0.270	
102	H12002_BS_32	38° 01’ 38.7”	074° 55’ 17.0”	crsS brkSh	26. 25	0.270	S
102	H12002_BS_33	38° 01’ 39.8”	074° 56’ 44.0”	crsS brkSh	23.41	0.270	
102	H12002_BS_34	38° 01’ 38.9”	074° 58’ 06.3”	mS brkSh	21.29	0.270	S
102	H12002_BS_35	38° 01’ 38.1”	074° 59’ 28.3”	crsS brkSh	17.93	0.270	
102	H12002_BS_36	38° 01’ 38.8”	075° 00’ 53.9”	fneS	18.44	0.270	S
102	H12002_BS_37	38° 01’ 36.6”	075° 02’ 13.2”	P crsS bkSh	13.15	0.270	

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 # 12211
102	H12002_BS_38	38° 00’ 40.9”	075° 01’ 32.6”	mS	19.60	0.270	S bkSh
102	H12002_BS_39	38° 00’ 39.1”	075° 00’ 10.9”	crsS brkSh	16.11	0.270	S bkSh
102	H12002_BS_40	38° 00’ 43.9”	074° 58’ 45.7”	crsS brkSh	19.32	0.270	S Sh
102	H12002_BS_41	38° 00’ 43.1”	074° 57’ 24.9”	crsS brkSh	22.64	0.270	S Sh
102	H12002_BS_42	38° 00’ 42.0”	074° 56’ 03.8”	fneS	27.21	0.270	
285	H12002_BS_43	38° 00’ 42.1”	074° 54’ 40.0”	fneS brkSh	29.90	0.270	
258	H12002_BS_44	38° 00’ 42.4”	074° 53’ 18.0”	mS	26.44	0.280	
220	H12002_BS_45	38° 00’ 45.3”	074° 51’ 49.6”	mS brkSh	28.05	0.280	
220	H12002_BS_46	37° 59’ 50.2”	074° 52’ 44.0”	mS	29.30	0.270	
258	H12002_BS_47	37° 59’ 52.1”	074° 54’ 01.1”	fneS brkSh	31.27	0.270	
102	H12002_BS_48	37° 59’ 54.6”	074° 55’ 15.1”	fneS	29.86	0.270	
285	H12002_BS_49	37° 59’ 50.9”	074° 56’ 45.6”	mS brkSh	21.31	0.270	
102	H12002_BS_50	37° 59’ 53.6”	074° 58’ 00.0”	crsS	21.88	0.270	S Sh
102	H12002_BS_51	37° 59’ 49.6”	074° 59’ 28.0”	mS	16.20	0.270	
102	H12002_BS_52	37° 59’ 49.1”	075° 00’ 47.7”	crsS P brkSh	17.58	0.270	S bkSh
102	H12002_BS_53	37° 59’ 47.6”	075° 02’ 10.4”	crsS	12.37	0.270	S bkSh
102	H12002_BS_54	37° 58’ 53.2”	075° 01’ 29.5”	fneS	12.18	0.270	
102	H12002_BS_55	37° 58’ 53.8”	075° 00’ 07.6”	fneS	22.57	0.280	
102	H12002_BS_56	37° 58’ 53.5”	074° 58’ 46.3”	crsS	22.32	0.270	
285	H12002_BS_57	37° 58’ 53.8”	074° 57’ 28.0”	mS	20.97	0.270	
285	H12002_BS_58	37° 58’ 53.6”	074° 56’ 01.5”	mS brkSh	30.71	0.280	S bkSh
258	H12002_BS_59	37° 58’ 52.2”	074° 54’ 35.9”	mS brkSh	30.74	0.280	S bkSh
220	H12002_BS_60	37° 58’ 59.7”	074° 53’ 26.9”	fneS	25.38	0.270	
220	H12002_BS_61	37° 58’ 13.6”	074° 53’ 56.8”	mS brkSh	26.13	0.290	
258	H12002_BS_62	37° 58’ 08.9”	074° 55’ 17.7”	brkSh fneS	31.13	0.270	S bkSh
258	H12002_BS_63	37° 58’ 07.7”	074° 56’ 40.1”	fne S	26.23	0.270	
258	H12002_BS_64	37° 58’ 12.7”	074° 58’ 01.5”	mS brkSh	23.04	0.270	
258	H12002_BS_65	37° 58’ 12.1”	074° 59’ 27.0”	mS	24.69	0.290	
258	H12002_BS_66	37° 58’ 15.5”	075° 00’ 50.2”	fneS	17.68	0.270	h
258	H12002_BS_67	37° 58’ 13.7”	075° 02’ 07.6”	fneS	19.10	0.270	

Note: H12002_BS_5 and H12002_BS_28 were sampled 5 times. No sample was recovered and no photograph was taken. The bottom type was designated as “hard”.

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

The first sheet to be delivered for OPR-D302-SA-09 was H12001, which was delivered on 26 March 2010. The Data Acquisition and Processing Report for OPR-D302-SA-09 was also delivered on 26 March 2010. The data collection on the two remaining sheets (H12002 and H12003) was completed in April 2010. The following sections provide supplemental data acquisition and data processing information about the systems used in the 2010 survey. Only changes from what was reported in the 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 Data Acquisition and Processing Report for OPR-D302-SA-09. The Firmware Versions used during 2010 are provided below.

2010	
Firmware	**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 H12002 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.
- Seabird Electronics, Inc., CTD, Serial Number 565
  - Calibration Date: 18 July 2009 (used for comparison cast only during SAT).

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 shut down. Acquisition methods and processes were not changed from what was described within the Data Acquisition and Processing Report for OPR-D302-SA-09.

Survey planning, data processing and analysis were carried out using the SAIC **Survey Planning** and **SABER.** This software was upgraded from version 4.3.0.12.1 to version 4.3.0.16.1 during the 2009-2010 shut down. No processing methods or routines were changed from what was described within the Data Acquisition and Processing Report for OPR-D302-SA-09.

SonarPro version 9.6 was upgraded to version 11.3 for sidescan data acquisition during the shutdown. No processing methods or routines were changed from what was described within the Data Acquisition and Processing Report.

Survey System Uncertainty Model

The two tables below provide the uncertainty values that were used in the total Propagated Uncertainty calculations for the 2010 survey data.

Table Appendix V-2. 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)	0.034	Meters
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)

Parameter	Value	Units
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-3. 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-D302-SA-09 remain valid except for the tow block height above water. The tow block height above water value reported in Table C-1 and Figure C-1 was previously 4.87 meters and is now 4.67 meters. A typo was noted in the Data Acquisition and Processing Report for OPR-D302-SA-09 for the tow block from IMU Y value presented in Figure C-1. 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 which was captured correctly.

Dynamic Draft Measurements

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 wind and 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 to determine the settlement and squat correctors and then re-run on JD 097 to verify the settlement and squat values entered into the vessel configuration file. Separate 0.5-meter PFM and minimum grids were created using the near nadir (5 degree) beams for the drift reference line and each of the RPM pairs. Difference grids were then

created between the CUBE depth in the PFM grid as well as from the minimum grids from the drift reference line and each of the RPM pairs. The resulting difference grids were then analyzed using **SABER's Frequency Distribution** tool. This tool allowed the Hydrographer to visually and numerically view the distribution of depth differences between each RPM pair and the reference drift line. Settlement and Squat values were determined to the nearest centimeter to satisfy the 0.05-meter precision requirement outlined in the April 2009 NOS Hydrographic Surveys Specifications and Deliverables. Table Appendix V-4 summarizes the shaft RPM, depth corrector, approximate speed and SAT multibeam files used. The values determined from the analysis were entered into a look up table within the **ISS-2000** system. A shaft RPM counter provides automatic input to the **ISS-2000** system which in conjunction with the look up table applies a dynamic settlement and squat value as data are collected.

Table Appendix V-4. M/V Atlantic Surveyor Settlement and Squat Determination

Shaft RPM	Depth Corrector	Approximate Speed (Kts)	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	0.07	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.

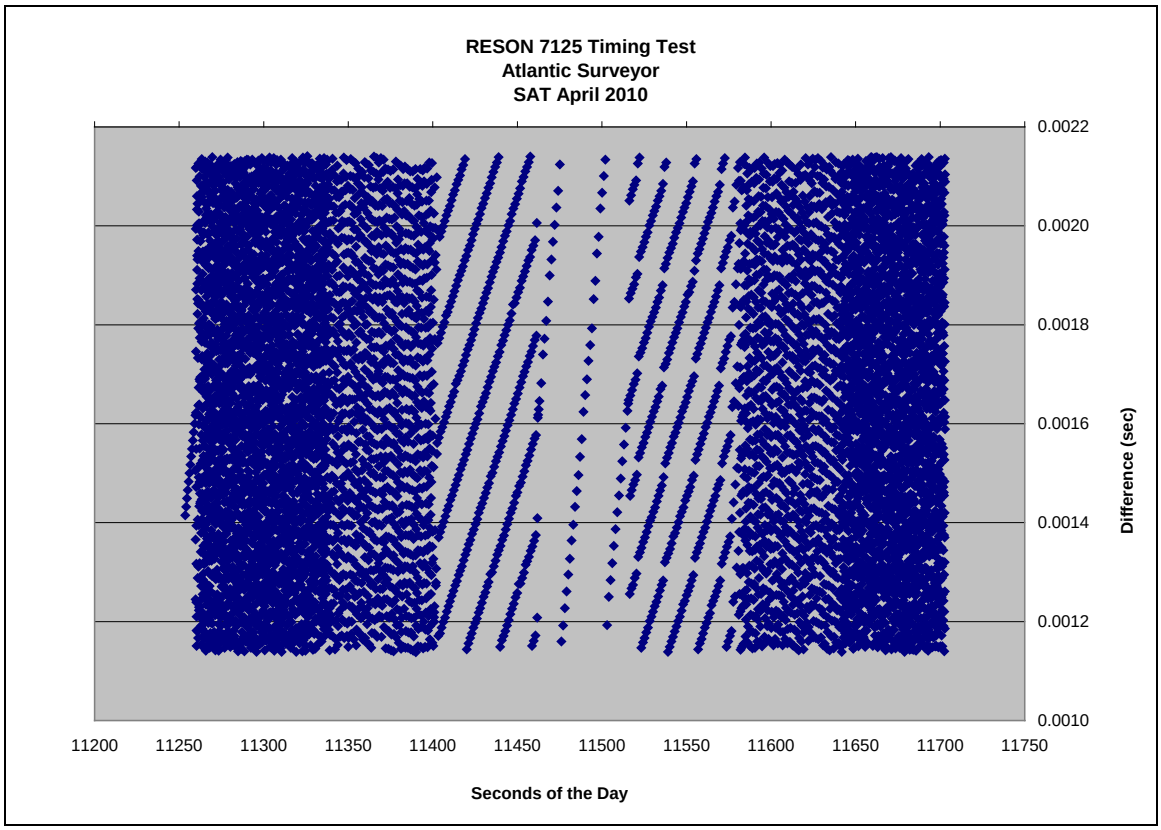


Figure Appendix V-1. Timing Test Results (time differences of ping trigger event vs. ping time tag from GSF)

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-5). The wreck is charted in 40° 03.3925'N 073° 59.5541'W. On 07 April 2010 (JD097) the pitch, roll and gyro biases determined on 06 April 2010 (JD096) were verified.

Table Appendix V-5. Final Multibeam Files Verifying Alignment Bias Calculated 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.

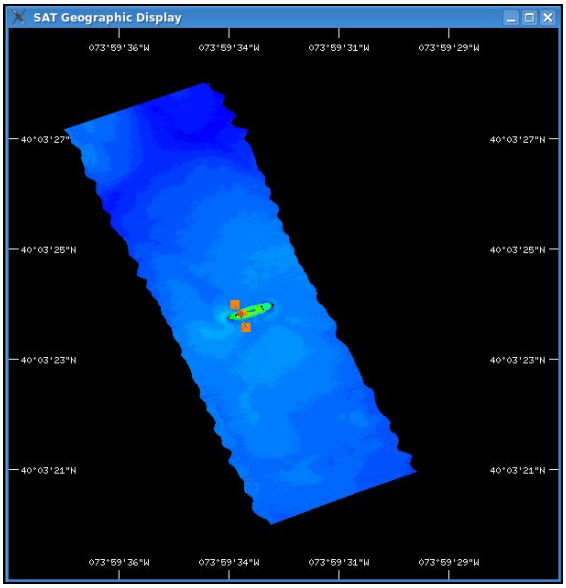


Figure Appendix V-2. SAT Tool, Plan View Depicting +2.46° Pitch Bias

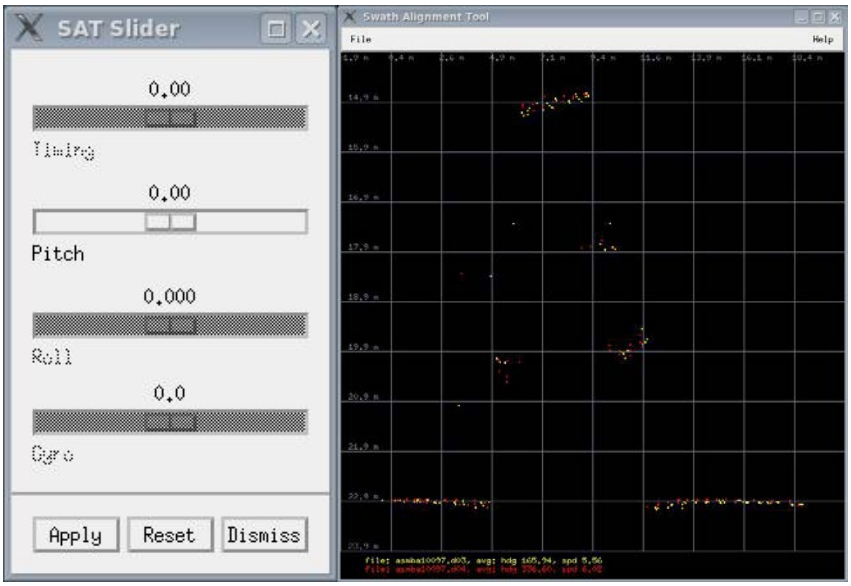


Figure Appendix V-3. SAT Tool, Depth vs. Distance Plot Depicting +2.46° Pitch Bias

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.

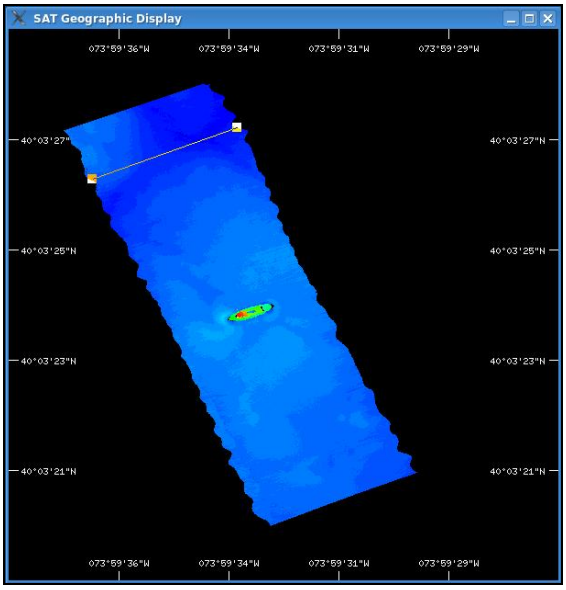


Figure Appendix V-4. SAT Tool, Plan View Depicting +0.25° Roll Bias

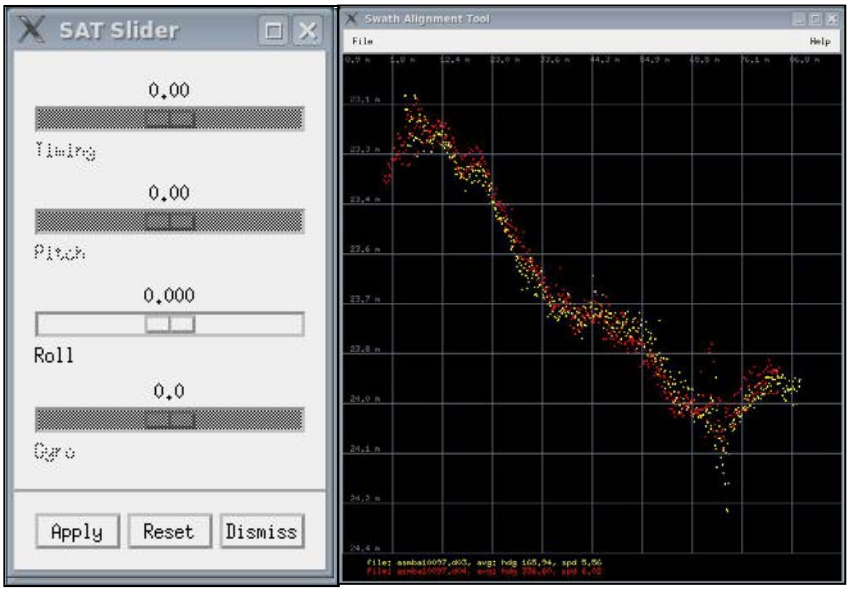


Figure Appendix V-5. SAT Tool, Depth vs. Distance Depicting +0.25° Roll Bias

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.

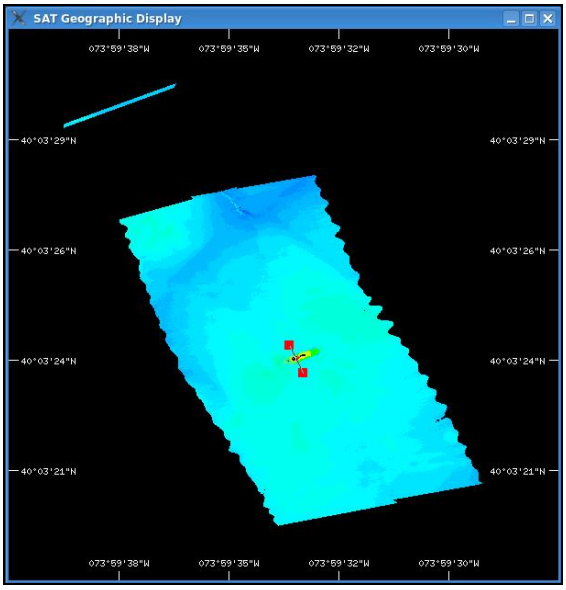


Figure Appendix V-6. SAT Tool, Plan View Depicting +1.80° Heading Bias

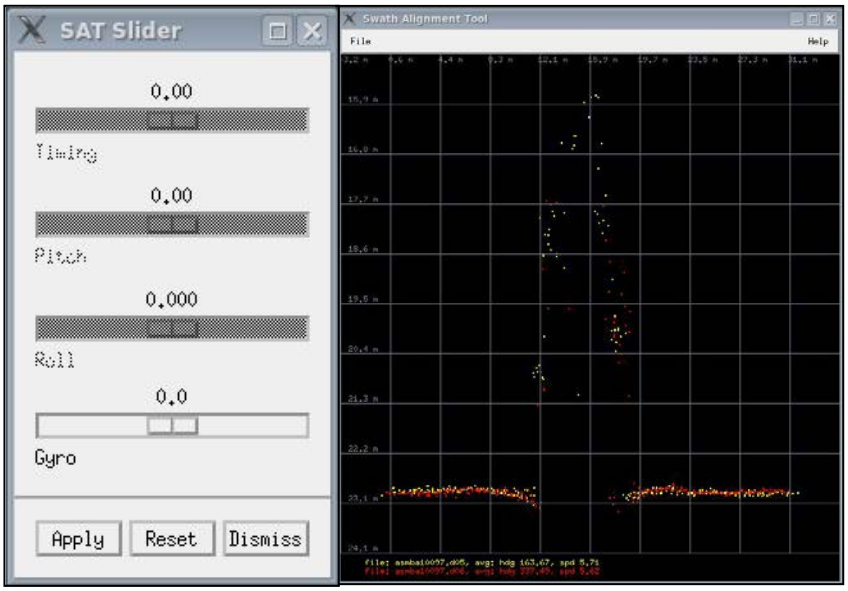


Figure Appendix V-7. SAT Tool, Depth vs. Distance Depicting +1.80 Heading Bias

Multibeam Accuracy

After all calibration tests were completed and bias values entered, a system verification survey was run in the vicinity of the wreck alignment site consisting 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, apply delayed heave and calculate uncertainty. 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 two 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-8. The PFM with CUBE depths and Uncertainties are shown in Figure Appendix V-9 and Figure Appendix V-10, respectively. The junction analysis results for the depth differences between the main and cross lines are shown in Table Appendix V-6 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.

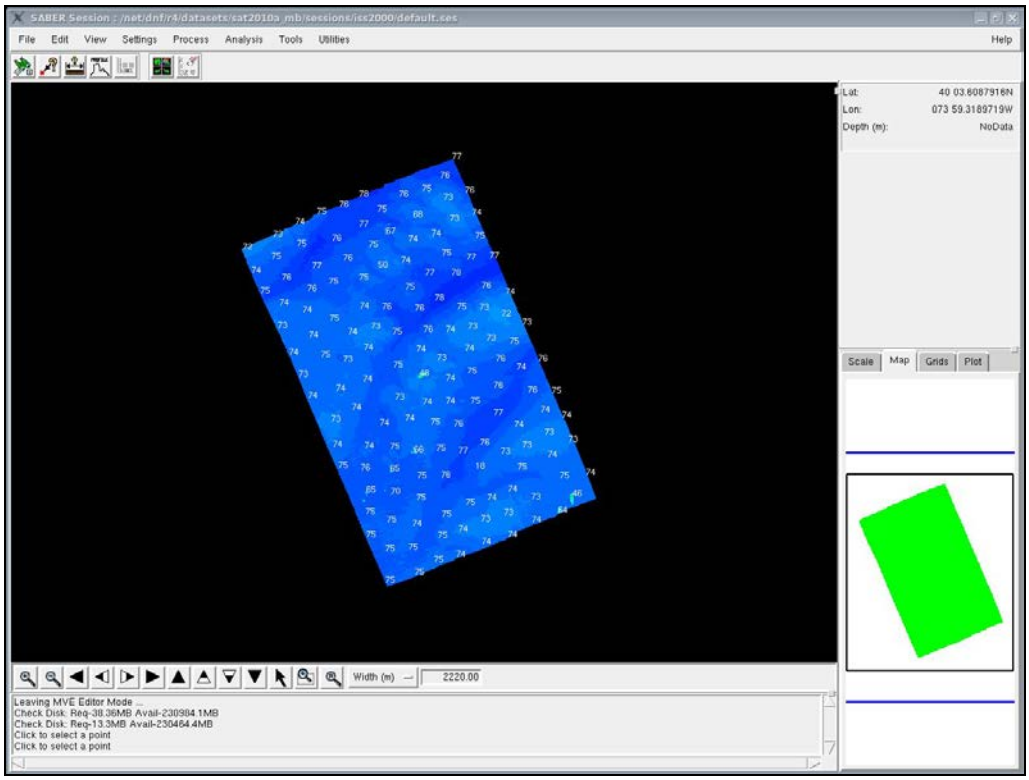


Figure Appendix V-8. Verification Survey Minimum Depth Grid and Selected Soundings

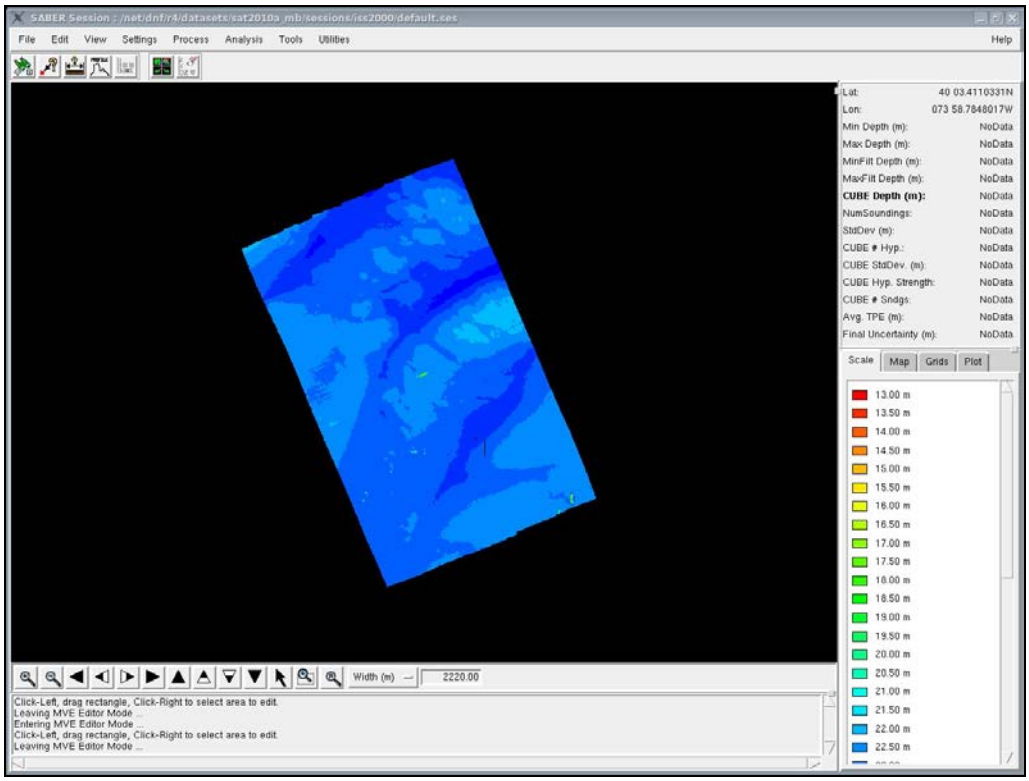


Figure Appendix V-9. Verification Survey PFM CUBE Depths

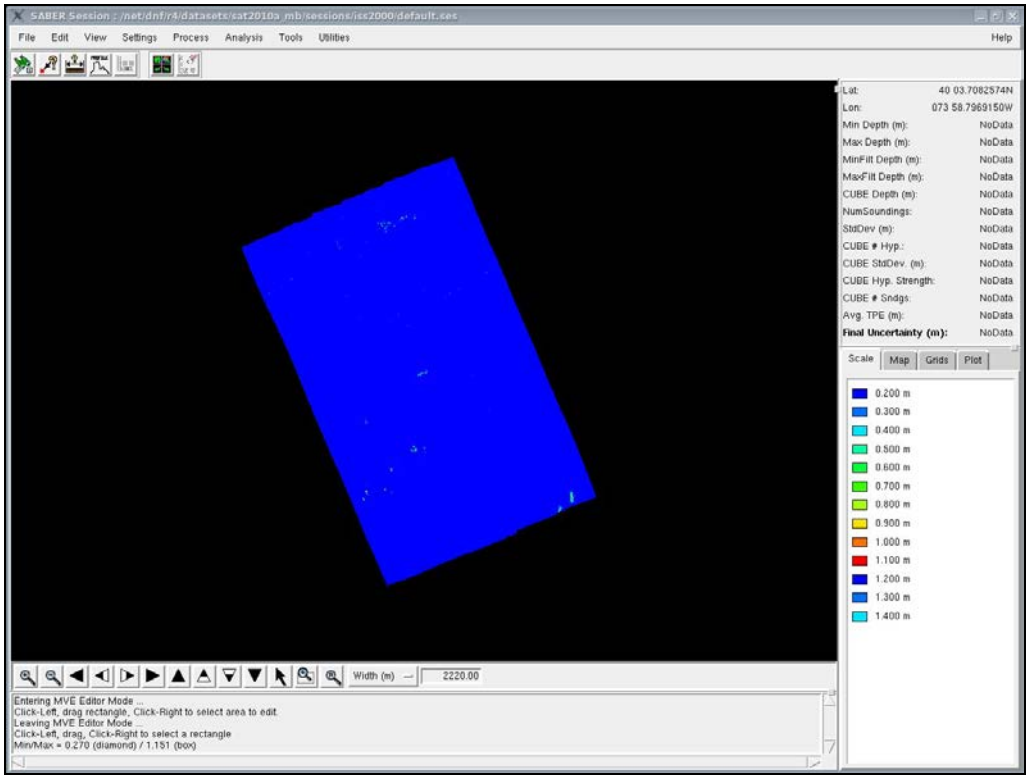


Figure Appendix V-10. Verification Survey PFM Uncertainties

Table Appendix V-6. 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%

AHB COMPILATION LOG

General Survey Information	
REGISTRY No.	H12002
PROJECT No.	OPR-D302-SA-09
FIELD UNIT	M/V ATLANTIC SURVEYOR
DATE OF SURVEY	20090715 - 20100415
LARGEST SCALE CHART	***12211_1, edition 44, 20110201, 1:80,000***
SOUNDING UNITS	**FEET**
COMPILER	Kyle S. Bates

Source Grids	**File Name** H:\Compilation\H1XXXX_XXXX_XX\AHB_H1XXXX\SAR Final Products\GRIDS
	H12002_1_of_7.bag **H12002_2_of_7.bag** **H12002_3_of_7.bag** **H12002_4_of_7.bag** **H12002_5_of_7.bag** **H12002_6_of_7.bag** **H12002_7_of_7.bag** **H12002_Feature_2.bag** **H12002_Feature_3.bag** **H12002_Feature_4.bag** **H12002_Feature_8.bag**
Surfaces	**File Name** H:\Compilation\H12002_D302_SAIC\AHB_H12002\COMPILE\Working
Combined	**H12002_4m_Combined.csar**
Interpolated TIN	\Interpolated TIN**H12002_12m_InterpTIN.csar**
Shifted Interpolated TIN	\Shifted Surface**H12002_12_InterpTIN_Shifted.csar**
Final HOBs	**File Name** H:\Compilation\H12002_D302_SAIC\AHB_H12002\COMPILE\Final_Hobs
Survey Scale Soundings	**H12002_SS_Soundings.hob**
Chart Scale Soundings	**H12002_CS_Soundings.hob**
Contour Layer	**H12002_Contours.hob**
Feature Layer	**H12002_Features.hob**
Meta-Objects Layer	**H12002_MetaObjects.hob**
Blue Notes	**H12002_BlueNotes.hob**
ENC Retain Soundings	**H12002_ENC_Retain_Soundings.hob**

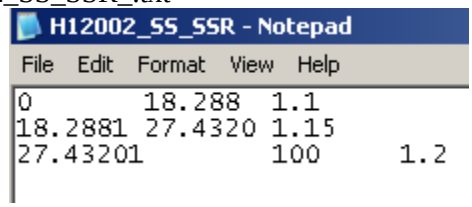
Meta-Objects Attribution	
Acronym	**Value**
M_COVR	
CATCOV	1 – coverage available
SORDAT	20100415
SORIND	US,US,graph,H12002
M_QUAL	
CATZOC	6 – zone of confidence U (data not assessed)
INFORM	M/V Atlantic Surveyor
POSACC	10.0 m
SORDAT	20100415
SORIND	US,US,graph,H12002
SUREND	20100415

SURSTA	20090715
DEPARE	
DRVALV 1	20 ft
DRVALV2	111 ft
SORDAT	20100415
SORIND	US,US,graph,H12002

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 radius table file: H12002_SS_SSR_.txt



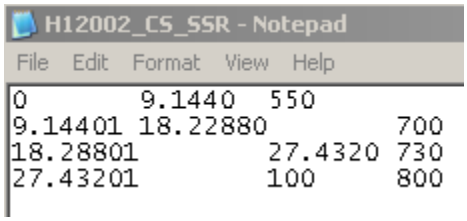
- d. Queried Depth of All Soundings
  - i. Minimum: 20.276 m
  - ii. Maximum: 110.925 m

III. INTERPOLATED TIN SURFACE:
- a. Resolution (m): 12 m
- b. Interpolation method: Natural Neighbor
- c. Shift value: -0.75 ft

IV. CONTOURS:
- a. Attribute Name: Depth
- b. Use a Depth List: H12002_depth_contours.txt
- c. Output Options: Create contour lines
  - i. Line Object: DEPCNT
  - ii. Value Attribute: VALDCO

V. FEATURES:
- a. Number of Chart Features: 1
- b. Number of Non-Chart Features: 0

VI. CHART SURVEY SOUNDINGS (CS):
- a. Number of ENC CS Soundings: 315
- b. Attribute Name: Depth
- c. Selection criteria: Radius, Shoal bias
- d. Radius value is: Distance on the ground (m)
  - i. Use radius table file: H12002_CS_SSR_.txt



e. Number Survey CS Soundings: 333

ATLANTIC HYDROGRAPHIC BRANCH
H-CELL REPORT to ACCOMPANY
SURVEY H12002(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 four 0.5m and seven 1m resolution Bathymetry Attributed Grid surfaces (*.BAG), which were combined at 4m resolution. The survey scale soundings were created from the combined surface using a sounding spacing range (SSR) file (all SSR values are included in the AHB Compilation Log section of this Descriptive Report). The survey scale soundings were imported into a "point cloud" grid. The chart scale soundings were derived directly from the survey scale soundings point cloud grid using an SSR file, therefore, preserving absolute continuity between the charted depths, the survey scale soundings, and the original source grid. The surface model was referenced when selecting the chart scale soundings, to ensure that the selected soundings portray the bathymetry within the common area.

A UTM projected TIN surface was created from the survey scale soundings point cloud grid, from which an interpolated surface of 12m resolution was generated. The interpolated TIN surface of 12m 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 (30ft, 60ft, 90ft). 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 H12002 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), cartographic Blue Notes ($CSYMB), and features (WRECK, SNDWAV, 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 S-57 Composer in feet. Quality assurance and topology checks were conducted using CARIS S-57 Composer and DKART Inspector 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

H12002_CS.000			Scale 1:80,000
Object Class Types	**Geographic**	**Cartographic**	**Meta**
S-57 Object Acronyms	DEPARE	$CSYMB	M_COVR
	WRECK		M_QUAL
	SBDARE		
	SNDWAV		
	SOUNDG		
H12002_SS.000			**Scale 1:20,000**
Object Class Types	**Geographic**		
S-57 Object Acronyms	DEPCNT		
	SOUNDG		

B.2.4 Junctions and Prior Surveys

Survey H12002 (2010) junctions with survey H12091 2010) to the south, H12003 (2010) to the west, H11874 (2008) to the northwest. H11992 (2008) to the north, and H12001 (2009) to the northeast. Most present survey depths compare within 2 feet of junctioning survey depths.

B.4 DATA PROCESSING

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

CARIS Bathy DataBASE version 3.2/HF1
CARIS HIPS/SIPS version 7.0/SP2/HF8
CARIS S-57 Composer version 2.2/HF4
DKART Inspector version 5.1
HSTP Pydro version 11.7 (r3535)

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. 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 18 North.

D. RESULTS AND RECOMMENDATIONS

D.1 CHART COMPARISON 12211_1 (44th Edition, Feb/11)

Fenwick into Chincoteague Inlet; Ocean City Inlet
Corrected through NM 07/23/2011
Corrected through LNM 07/12/2011

Scale 1:80,000

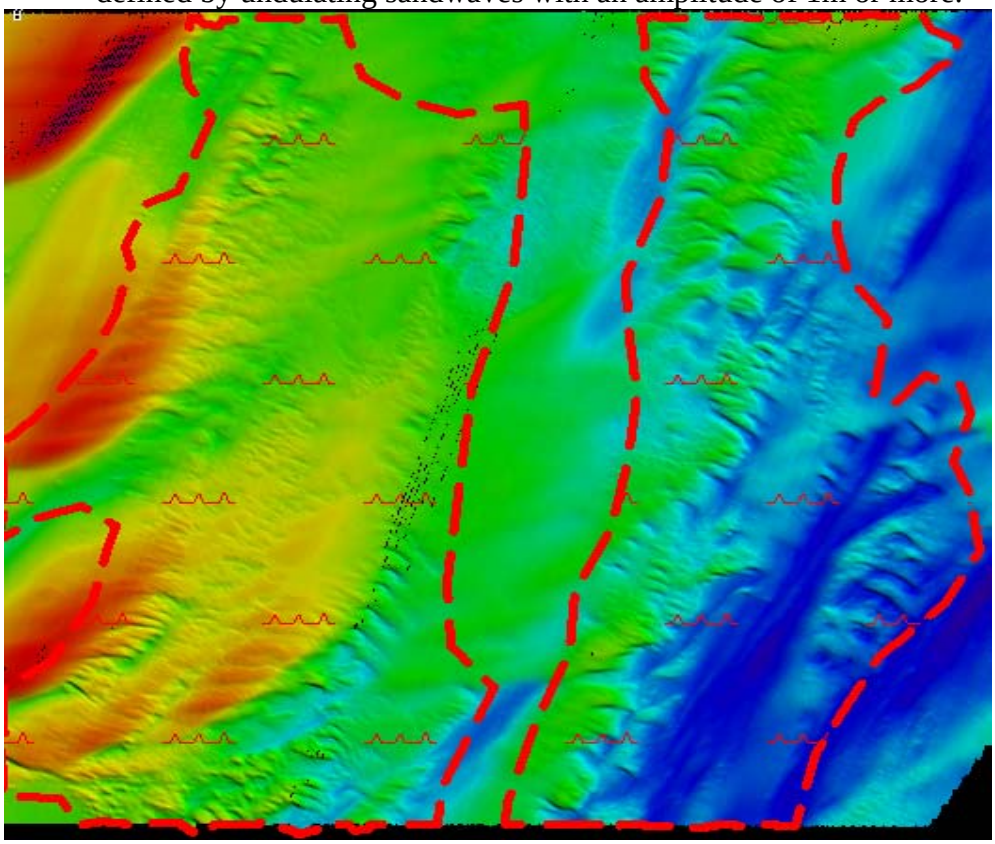
ENC COMPARISON **US4VA50M**

Fenwick into Chincoteague Inlet; Ocean City Inlet
Edition 16
Application Date 2011/04/26
Issue Date 2011/04/26
Chart 12211

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. The following exceptions are noted:

a. The field unit collected a total of 67 bottom samples; 15 of which were used in compilation.
b. Two sandwave (SNDWAV) areas were included with the H-Cell. These areas are defined by undulating sandwaves with an amplitude of 1m or more.



D.6 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.7 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
H12002

Initial Approvals:

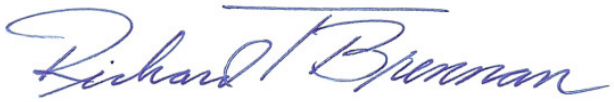
The completed survey has been inspected with regard to survey coverage, delineation of depth contours, disposition of critical depths, cartographic symbolization, and verification or disproval of charted data. All revisions and additions made to the H-Cell files during survey processing have been entered 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.

Kyle Bates
2011.07.28
14:43:10 -04'00'

Kyle S. Bates
Hydrographic Intern
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
2011.07.29 15:27:51 -04'00'

Approved: _____

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