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. *3*

Registry No *H12396*

LOCALITY

State *Virginia*

General Locality *Atlantic Ocean*

Sublocality *6 NM East of Hog Island*

2012

CHIEF OF PARTY

Gary R. Davis

Science Applications International Corporation

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DATE

NOAA FORM 77-28 (11-72) U.S. DEPARTMENT OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION	REGISTRY No
HYDROGRAPHIC TITLE SHEET	**H12396**

State	Virginia
General Locality	Atlantic Ocean
Sub Locality	6 NM East of Hog Island
Scale	1:40,000
Date of Survey	14 August 2012 – 29 September 2012
Instructions Dated	13 March 2012
Project No.	OPR-D302-KR-12
Vessel	*M/V Atlantic Surveyor* D582365
Chief of Party	Gary R. Davis
Surveyed by	Alex Bernier, Paul Donaldson, Chuck Holloway, Jason Infantino, John Kiernan, Colette LeBeau, Webster McDonald, Evan Robertson, Andrew Seaman, Deborah Smith, Bridget Williams
Soundings by echosounder	Multibeam RESON SeaBat 7125 SV
Verification by	
Soundings in	Meters
Soundings at	MLLW

REMARKS:	**Contract:**	DG133C-08-CQ-0003
	Contractor:	Science Applications International Corporation 221 Third Street, Newport, RI 02840 USA
	Subcontractor:	N/A
	Times:	All times are recorded in UTC
	UTM Zone:	Zone 18 North
	Purpose:	To provide NOAA with modern, accurate hydrographic survey data with which to update the nautical charts of the assigned area: Sheet 3 (H12396) in the Atlantic Ocean, Coast of Virginia.

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

The purpose of this survey is to provide contemporary surveys to update National Ocean Service (NOS) nautical charts. All separates are filed with the hydrographic data. Any revisions to the Descriptive Report (DR) generated during office processing are shown in bold red italic text. The processing branch maintains the DR as a field unit product, therefore, all information and recommendations within the body of the DR are considered preliminary unless otherwise noted. The final disposition of surveyed features is represented in the OCS nautical chart update products. All pertinent records for this survey, including the DR, are archived at the National Geophysical Data Center (NGDC) and can be retrieved via http://www.ngdc.noaa.gov/.

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Descriptive Report to Accompany
Hydrographic Survey H12396
Scale 1:40,000, Surveyed 2012
M/V Atlantic Surveyor
Science Applications International Corporation (SAIC)
Gary R. Davis, Chief Hydrographer

PROJECT
Project Name: Virginia Coast
Project Number: OPR-D302-KR-12
Assigned Processing Branch: Atlantic Hydrographic Branch
Dates of Instructions: 13 March 2012 **Task Order#:** T007
Dates of Supplemental Instructions: 02 April 2012, 01 May 2012, 27 August 2012, 11 October 2012, and 23 October 2012
Sheet Designation: 3
Registry Number: H12396

A. AREA SURVEYED

The area surveyed was a section of the Atlantic Ocean off the coast of Virginia, 6 nautical miles (NM) East of Hog Island (Figure 1).

A.1 SURVEY LIMITS

Data was acquired within the following survey limits:

Northeast Limit	Southwest Limit
37° 25' 16.31"N 075° 28' 42.64"W	37° 20' 44.40"N 075° 40' 17.42"W

Table 1: Survey Limits

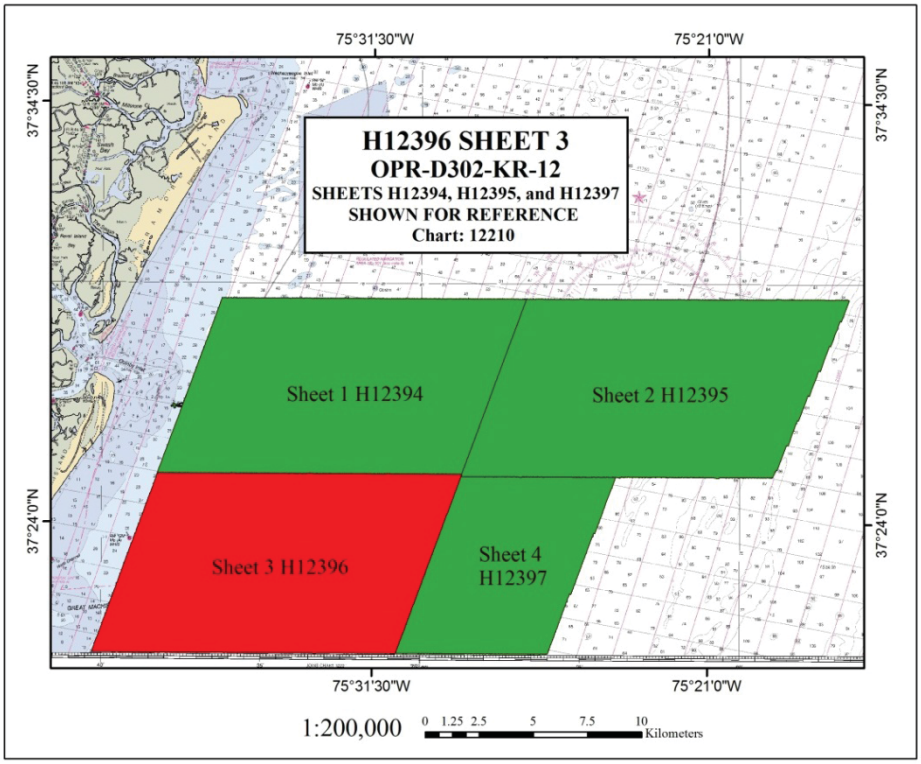

Figure 1: H12396 Survey Bounds

Survey limits were acquired in accordance with the requirements in the Project Instructions and HSSD.

A.2 SURVEY PURPOSE

To provide NOAA with modern and accurate hydrographic survey data with which to update the nautical charts of the assigned area: Sheet 3 (H12396) in the Atlantic Ocean, Coast of Virginia.

A.3 SURVEY QUALITY

The entire survey is adequate to supersede previous data.

H12396 was surveyed in accordance with the following documents:

1. Project Instructions, OPR-D302-KR-12, dated 13 March 2012
2. Statement of Work, Hydrographic Survey Services, SAIC, DG133C-08-CQ-0003, dated 04 May 2012
3. Tides and Water Levels Statement of Work OPR-D302-KR-2012 Virginia Coast, dated 03 February 2012
4. *NOS Hydrographic Surveys Specifications and Deliverables*, April 2012, Released 23 April 2012 (HSSD)

A.4 SURVEY COVERAGE

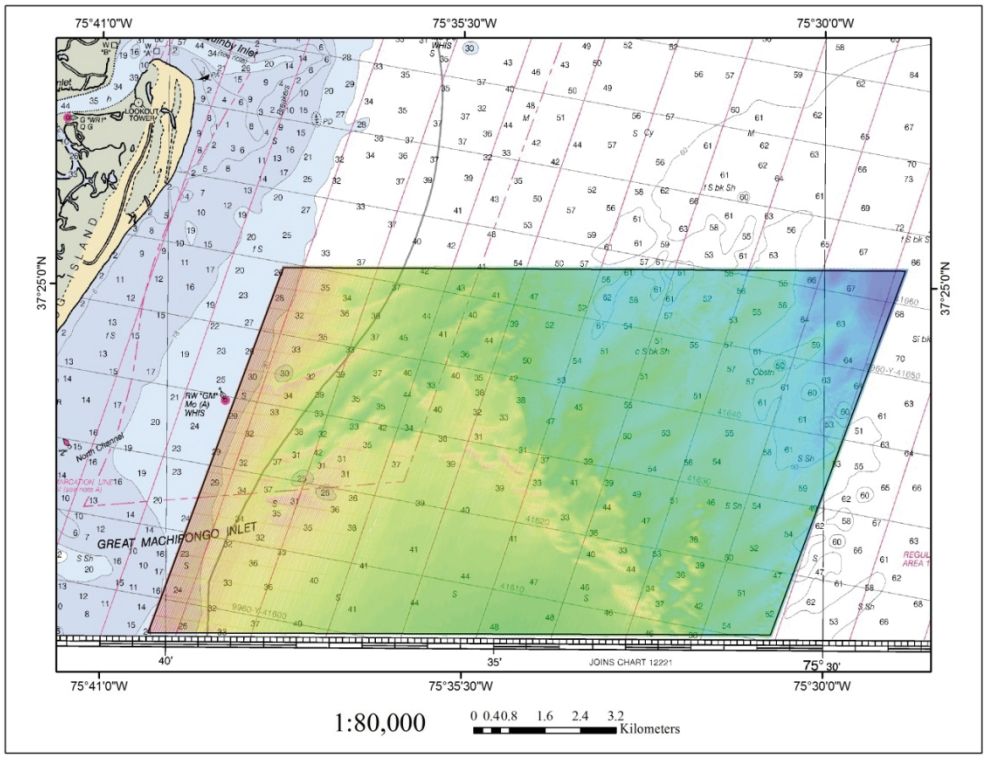

Figure 2: Final Multibeam Coverage for H12396

Survey coverage was in accordance with the requirements in the Project Instructions and the HSSD.

A.5 SURVEY STATISTICS

The following table lists the mainscheme and crossline acquisition mileage for this survey:

	HULL ID	M/V Atlantic Surveyor	Total
LNM	SBES Mainscheme	0	0
	MBES Mainscheme	0.89	0.89
	Lidar Mainscheme	0	0
	SSS Mainscheme	0	0
	SBES/MBES Combo Mainscheme	0	0
	SBES/SSS Combo Mainscheme	0	0
	MBES/SSS Combo Mainscheme	1583.97	1583.97
	SBES/MBES Combo Crosslines	131.46	131.46
	Lidar Crosslines	0	0
Number of Bottom Samples			6
Number of DPs			0
Number of Items Investigated by Dive Ops			0
Total Number of SNM			31.81

Table 2: Hydrographic Survey Statistics

The following table lists the specific dates of data acquisition for this survey:

Survey Dates
08/14/2012
08/15/2012
08/16/2012
08/17/2012
08/18/2012
08/19/2012
08/21/2012
08/22/2012
08/23/2012
08/26/2012
08/28/2012
08/29/2012
08/30/2012
08/31/2012
09/01/2012
09/12/2012
09/28/2012
09/29/2012

Table 3: Dates of Hydrography

A.6 SHORELINE

Shoreline was investigated in accordance with the Project Instructions and the HSSD.

A.7 BOTTOM SAMPLES

Bottom samples were acquired in accordance with the Project Instructions and HSSD.

B. DATA ACQUISITION AND PROCESSING

B.1 EQUIPMENT AND VESSELS

SAIC used their **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. L-3 Klein 3000 sidescan data were collected on a Windows XP platform using L-3 Klein's **SonarPro** software. Subsequent processing and review of the sidescan data, including the generation of coverage mosaics, were accomplished using **SABER.**

A detailed description of the systems used to acquire and process these data has been included in Section A of the Data Acquisition and Processing Report, Revision 1 (DAPR,

rev1) for OPR-D302-KR-12, previously delivered with the H12395 Descriptive Report (DR) on 1 February 2013. There were no variations from the equipment configuration described in the DAPR, rev1.

B.1.1 Vessels

The following vessels were used for data acquisition during this survey:

Hull ID	***M/V Atlantic Surveyor***
LOA	110 feet
Draft	9 feet

Table 4: Vessels Used

The platform for multibeam sonar, sidescan sonar, and sound speed data collection was the *M/V Atlantic Surveyor* (D582365). Three 20-foot ISO containers were secured on the aft deck. One was used as the real-time data acquisition office, another as the data processing office, and the third for spares storage, maintenance, and repairs. A 10-foot ISO container housed an 80 kW generator that provided dedicated power to the sidescan winch, ISO containers, and all survey equipment.

B.1.2 Equipment

The following major systems were used for data acquisition during this survey:

Manufacturer	**Model**	**Type**
RESON	SeaBat 7125 SV	MBES
L-3 Klein	3000	SSS
Applanix	POS/MV 320	Positioning and Attitude System
Trimble	Probeacon	Positioning System
Brooke Ocean Technology LTD	MVP-30	Sound Speed System

Table 5: Major Systems Used

The Position Orientation System/Marine Vessels (POS/MV 320) Inertial Measurement Unit (IMU) was mounted below the main deck of the vessel, port of the keel. The RESON 7125 transducer was hull-mounted, port of the vessel's keel in close proximity to the IMU. The Brooke Ocean Technology Moving Vessel Profiler 30 (MVP-30) was mounted to the starboard stern quarter. The L-3 Klein 3000 sidescan sonar was towed along the centerline axis from an A-frame mounted on the stern of the vessel. A J-frame mounted on the starboard rail of the ship served as the location for bottom sampling and CTD data collection.

B.2 QUALITY CONTROL

B.2.1 Crosslines

There were 131.46 linear nautical miles of crosslines and 1584.86 linear nautical miles of mainscheme lines surveyed on H12396. This resulted in crossline mileage that represented approximately 8.3 percent of the mainscheme mileage which meets the requirement (Section 5.2.4.3 of the HSSD) to achieve at least eight percent for a multibeam survey using set line spacing. Crosslines were oriented at 98°/278° and were spaced 480 meters apart, while the mainscheme lines were oriented at 20.4°/200.4° and were spaced 40 meters apart. During mainscheme operations, the sidescan sonar range scale was set to 50 meters which provided a consistent 100-meter imagery swath and up to 20 meters of overlap between adjacent lines in each 100% coverage mosaic. Refer to the "Multibeam Processing Log" section within Separates I for information on the delineation of mainscheme and crossline data files.

In the field, hydrographers conducted daily comparisons of mainscheme to near nadir crossline data to ensure that no systematic errors were introduced and to identify potential problems with the survey system. After the application of all correctors and completion of final processing in the office, separate two-meter CUBE PFM grids were built. One grid contained the full valid swath (±60° from nadir) of all mainscheme multibeam data and the other included only the near nadir swath (±5° from nadir) crossline data.

The **SABER Frequency Distribution** tool was used to analyze the difference grid created from the mainscheme and crossing PFM grids. Comparisons of all final crossing data in H12396 showed that all comparisons were less than 43 centimeters (Figure 3). All comparisons fell within the requirement defined in Section 5.2.4.3 of the HSSD which states that at least 95% of the depth difference values are to be within the maximum allowable total vertical uncertainty (calculated to be between 0.508 to 0.579 meters for the range of depths observed in H12396).

The difference grid used was created by subtracting the H12396 crossline CUBE depths from the H12396 mainscheme CUBE depths. Therefore, positive differences indicate that H12396 mainscheme data are deeper than H12396 crossline data. The mainscheme data were deeper than the crossline data in 66.33% of junctions and shoaler than crossline data in 33.34% of the junctions across the entire survey area (Figure 3). The distribution is well spread about zero with a slight skew in the positive direction, as visualized in Figure 4.

Twenty-five crossings of mainscheme and crossline data were selected from areas of relatively flat bottom and varied spatially and temporally for beam-by-beam comparisons (Figure 5). The results of the comparisons are presented in the "Crossline Comparisons" section of Separates II of this report. The crossings show a general trend of uniform differences in beam depths across the swaths of the files with the majority of the differences less than 20 centimeters. Slight sound speed artifacts were observed in a few of the crossings; however none of these artifacts were outside of the data quality specifications or had a significant effect on the final gridded surface. There were no

offset biases observed. A few of the crossings showed a depth bias ranging from 10 centimeters to 20 centimeters consistent across all beams in the multibeam swath. This is not uncommon when using discrete tide zoning and is typically due to the variability and uncertainty in the water level correctors.

Depth Difference Range (cm)	All		Positive		Negative		Zero	
	Count	Cumulative Percent	Count	Cumulative Percent	Count	Cumulative Percent	Count	Cumulative Percent
0.00-0.05	95861	33.77	52533	18.51	42415	14.94	913	0.32
>0.05-0.10	79679	61.84	52453	36.99	27226	24.53		
>0.10-0.15	61581	83.54	45571	53.04	16010	30.18		
>0.15-0.20	31950	94.79	25503	62.03	6447	32.45		
>0.20-0.25	11576	98.87	9458	65.36	2118	33.19		
>0.25-0.30	2344	99.70	1935	66.04	409	33.34		
>0.30-0.35	529	99.89	510	66.22	19	33.34		
>0.35-0.40	288	99.99	288	66.32	0	33.34		
>0.40-0.428	38	100.00	38	66.33	0	33.34		
Totals	283846	100.00%	188289	66.33%	94644	33.34%	913	0.32%
Reference Grid: h12396_pfm/h12396_2m_main_01042013_pfm_h12396_2m_cross_01042013_pfm.dif								

Figure 3: Junction Analysis, Main Scheme Lines vs. Crosslines, H12396

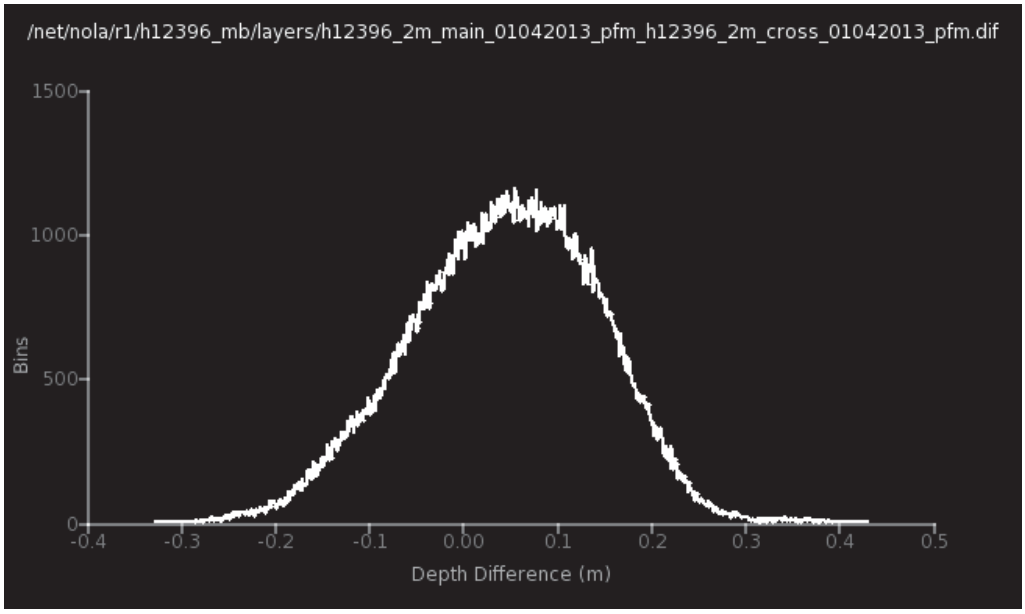

Figure 4: Frequency Distribution Plot of Depth Differences for H12336 Main Scheme Lines vs. H12336 Crosslines

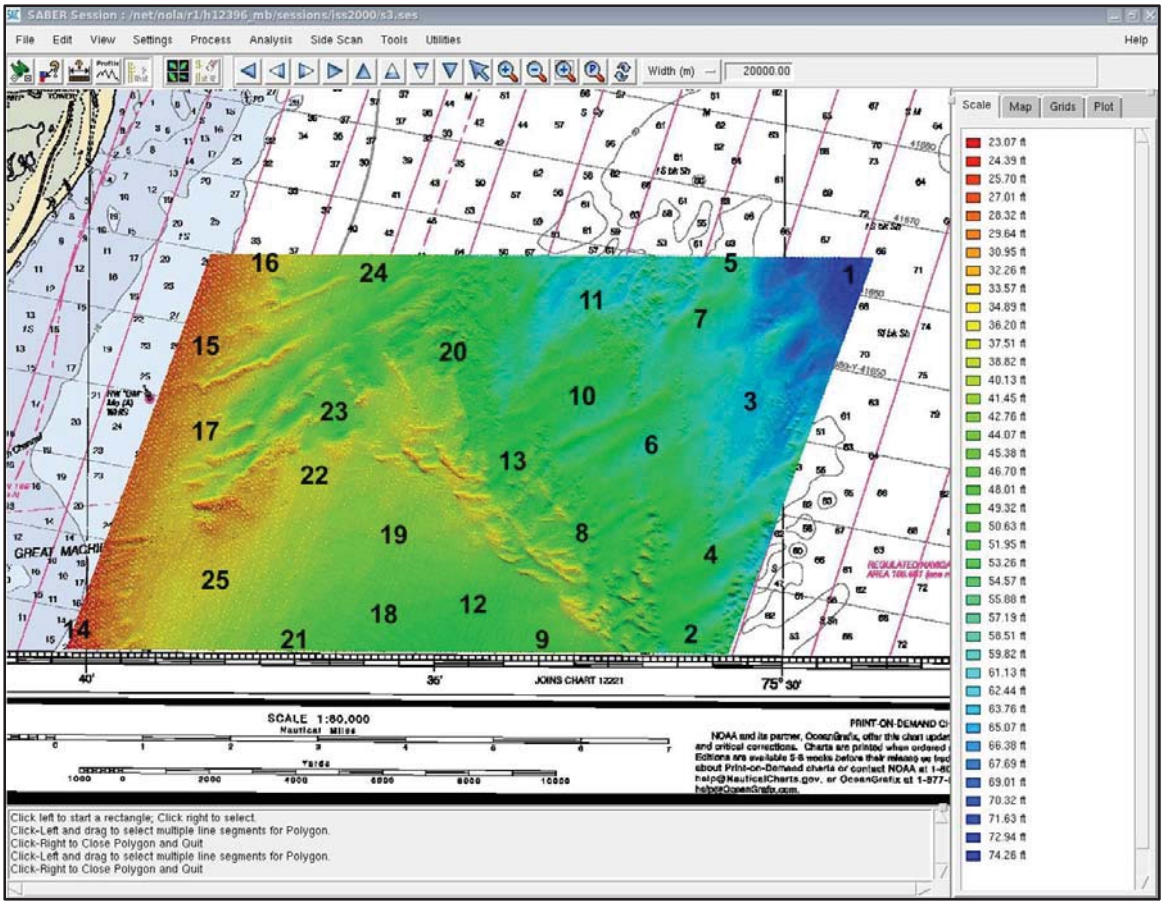

Figure 5: Location of 25 Crossings Used in the Crossing Analysis for H12396

B.2.2 Uncertainty

The Total Propagated Uncertainty (TPU) model that SAIC has adopted had 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*). Once the TPU model is applied to the GSF bathymetry data, each beam is attributed with the horizontal uncertainty and the vertical uncertainty at the 95% confidence level. For specific details on SAIC's use and application of the **SABER** Total Propagated Uncertainty model, see Section B.1 in the DAPR, rev1.

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. During application of horizontal and vertical uncertainties to the GSF files, individual beams where either the horizontal or vertical uncertainty exceeded the maximum allowable IHO S-44 5th edition Order 1a specifications were flagged as invalid. As a result, all individual soundings used in development of the final CUBE depth surface had modeled vertical and horizontal uncertainty values at or below the allowable IHO S-44 5th edition, Order 1a uncertainty.

During the creation of the CUBE surface, two separate vertical uncertainty surfaces are calculated by the **SABER** software. One surface contains the standard deviation of all soundings that are contributing to the CUBE hypothesis (Hyp. StdDev) and the other contains the average of the vertical uncertainty of all soundings contributing to the CUBE hypothesis (Hyp. AvgTPE). A third vertical uncertainty surface is generated from the larger value of these two uncertainties at each node and is referred to as the Hypothesis Final Uncertainty. For specific details on this process see Section B.2 of the DAPR, rev1.

The final two-meter PFM CUBE surface contained final vertical uncertainties that ranged from 0.270 to 0.461 meters. The IHO Order 1a maximum allowable vertical uncertainty was calculated to range between 0.508 to 0.579 meters, based on the minimum CUBE depth (7.117 meters) and maximum CUBE depth (22.461 meters). The **SABER Check PFM Uncertainty** function was used to highlight all instances in the Hypothesis Final Uncertainty surface where a given node exceeded the IHO Order 1a allowable vertical uncertainty for the CUBE depth at that node. The final two-meter PFM CUBE surface contained no individual CUBE nodes with final vertical uncertainties that exceeded IHO Order 1a allowable vertical uncertainty.

The **SABER Check PFM Uncertainty** function was also run on each of the three half-meter feature PFM Hypothesis Final Uncertainty surfaces. The results are listed in Figure 6. As expected, there are higher numbers of nodes that exceed uncertainty limits due to the smaller node resolution and the high variability of sounding depths around features.

The **SABER Frequency Distribution** tool was also used to review the Hypothesis Final Uncertainty surface within the final two-meter and three half-meter resolution PFM grids. The results show that in the final two-meter PFM, 85% of all nodes had final uncertainties less than or equal to 0.270 meters and 100% contained vertical uncertainties less than 0.461 meters or less. In the three individual feature PFM grids, at least 99% of all grid nodes contained vertical uncertainties of 0.280 meters or less.

Feature Area	Feature Numbers	Number of CUBE nodes which exceed IHO Order 1a
1	1	11
2	2, 3, and 4	64
3	5	8

Figure 6: Number of Nodes Exceeding the Allowable IHO Order 1a Uncertainty in the Feature PFM Grids

B.2.3 Junctions

An analysis of the sheet-to-sheet junctions between H12396 and H12394 and H12395 (OPR-D302_KR-12) was performed. Details for H12394 and H12395 are listed in Table 6. Figure 11 (at the end of this section) shows the general locality of H12396 as it relates to the sheets for which junctions were performed. Analyses of the junction with sheet H12397 was not conducted as the processing efforts for this sheet was still ongoing.

The following junctions were made with this survey:

Registry Number	Scale	Year	Field Unit	Relative Location
H12394	1:40,000	2012	SAIC	North
H12395	1:40,000	2012	SAIC	Northeast

Table 6: Junctioning Surveys

H12394

Figure 7 depicts the junction analysis between H12396 and H12394, surveyed between 06 July and 29 September 2012, which borders H12396 to the north. Junction analysis was conducted on the differences between the CUBE depths from the final two-meter PFM grids from H12396 and H12394 in the common area of these two sheets. The H12396 CUBE depths in the common area varied from 8.060 meters to 22.343 meters resulting in allowable vertical uncertainties between 0.511 and 0.578 meters. The results showed that 98.92% of the comparisons were within 35 centimeters and all comparisons were less than 53 centimeters. These numbers are well within the allowable vertical uncertainty for the respective sheets.

The difference grid was generated by subtracting the H12394 data from the H12396 data. Therefore positive values indicate that H12396 depth data were deeper than H12394 depth data. Throughout the common area, H12396 CUBE depths were deeper than H12394 28.69% of the time and were shoaler than H12394 70.99% of the time (Figure 7). The common area covers three different discrete tide zones. In two of the zones (SA53 and SA55) the positive and negative differences are more evenly distributed. The differences in the common area of tide zone SA54 show a higher number of negative differences. Therefore, the negative skew in the data can be attributed to the tidal variability and uncertainty. Figure 8 shows the frequency of distribution of the depth difference values in the overlap area between H12396 and H12394.

Depth Difference Range (cm)	All		Positive		Negative		Zero	
	Count	Cumulative Percent	Count	Cumulative Percent	Count	Cumulative Percent	Count	Cumulative Percent
0-0.05	93477	28.08	41421	12.44	51014	15.32	1042	0.31
>0.05-0.10	81717	52.62	27881	20.82	53836	31.49		
>0.10-0.15	60732	70.87	18456	26.36	42276	44.19		
>0.15-0.20	40083	82.91	5877	28.13	34206	54.47		
>0.20-0.25	26853	90.97	1140	28.47	25713	62.19		
>0.25-0.30	17337	96.18	526	28.63	16811	67.24		
>0.30-0.35	9126	98.92	131	28.67	8995	69.94		
>0.35-0.40	2970	99.81	42	28.68	2928	70.82		
>0.40-0.45	526	99.97	50	28.69	476	70.97		
>0.45-0.50	89	100.00	0	28.69	89	70.99		
>0.55-0.527	4	100.00	0	28.69	4	70.99		
Totals	332914	100.00%	95524	28.69%	236348	70.99%	1042	0.31%
Reference Grid: h12396_2m_MLLW_01032013_pfm_H12394_2m_MLLW_pfm.dif								

Figure 7: Junction Analysis, H12396 vs. H12394

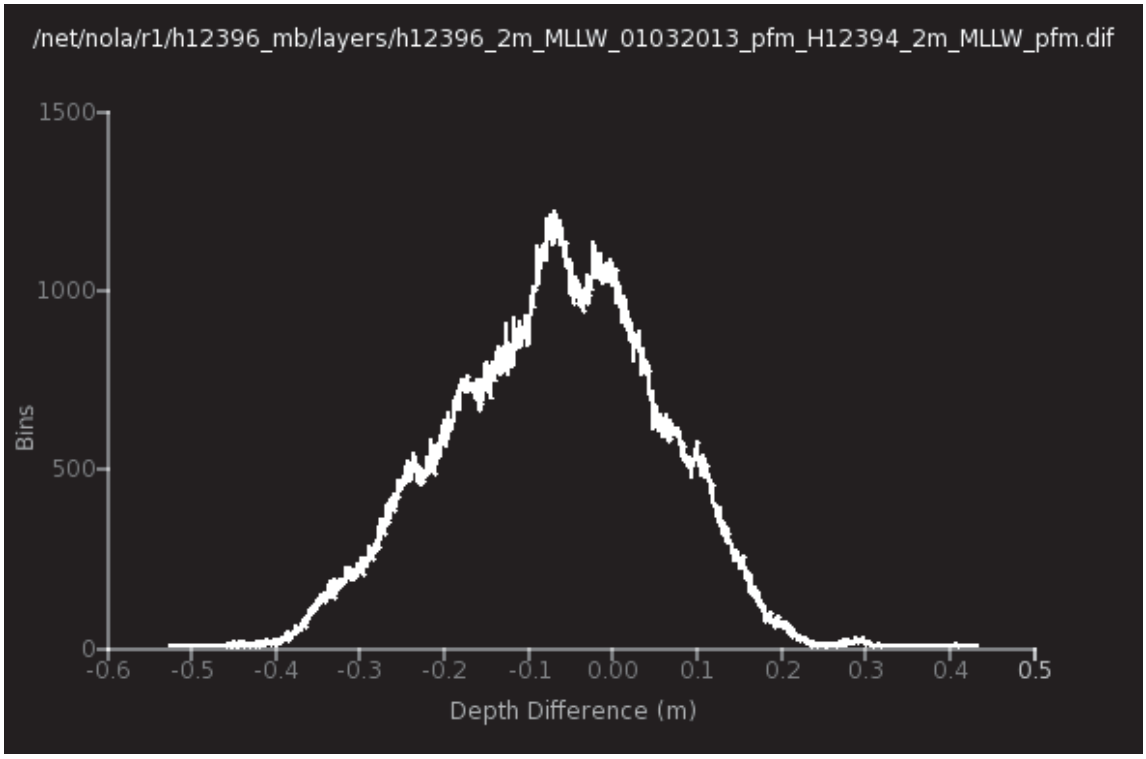

Figure 8: Frequency Distribution Plot of Depth Differences for H12396 vs. H12394

H12395

Figure 9 depicts the junction analysis between H12396 and H12395, surveyed between 29 July and 29 September 2012, which borders H12396 to the northeast. Junction analysis was conducted on the differences between the CUBE depths from the final two-meter PFM grid from H12396 and the final two-meter PFM grid from H12395 in the common area of these two sheets. The H12396 CUBE depths in the common area varied from 20.599 meters to 21.561 meters resulting in allowable vertical uncertainties between 0.567 and 0.573 meters. The results showed that all comparison were less than 26 centimeters. These numbers are well within the allowable vertical uncertainty for the respective sheets.

The difference grid was generated by subtracting the H12395 data from the H12396 data. Therefore positive values indicate that H12396 depth data were deeper than H12395 depth data. Throughout the common area, H12396 CUBE depths were deeper than H12394 96.99% of the time and were shoaler than H12394 2.84% of the time. The distribution shows a skew in the positive direction. The common area is only approximately 100 by 100 meter data and the small depth differences of less than 26 centimeters can be attributed tidal variation and uncertainty. Figure 10 shows the frequency of distribution of the depth difference values in the overlap area between H12396 and H12395.

Depth Difference Range (cm)	All		Positive		Negative		Zero	
	Count	Cumulative Percent	Count	Cumulative Percent	Count	Cumulative Percent	Count	Cumulative Percent
0-0.05	848	23.17	758	20.71	84	2.3	6	0.16
>0.05-0.10	1642	68.03	1628	65.19	14	2.68		
>0.10-0.15	837	90.90	831	87.90	6	2.84		
>0.15-0.20	301	99.13	301	96.12	0	2.84		
>0.20-0.25	30	99.95	30	96.94	0	2.84		
>0.25-0.26	2	100.00	2	96.99	0	2.84		
Totals	3660	100.00%	3550	96.99%	104	2.84%	6	0.16%
Reference Grid: h12396_2m_MLLW_01032013_pfm_h12395_2m_MLLW_26Dec2012_pfm.dif								

Figure 9: Junction Analysis, H12396 vs. H12395

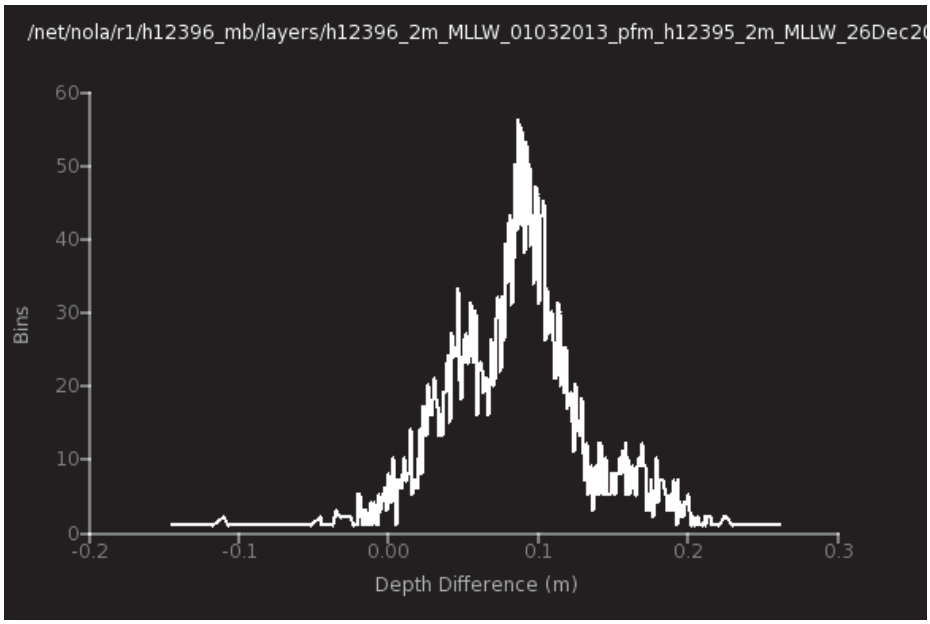

Figure 10: Frequency Distribution Plot of Depth Differences for H12396 vs. H12395

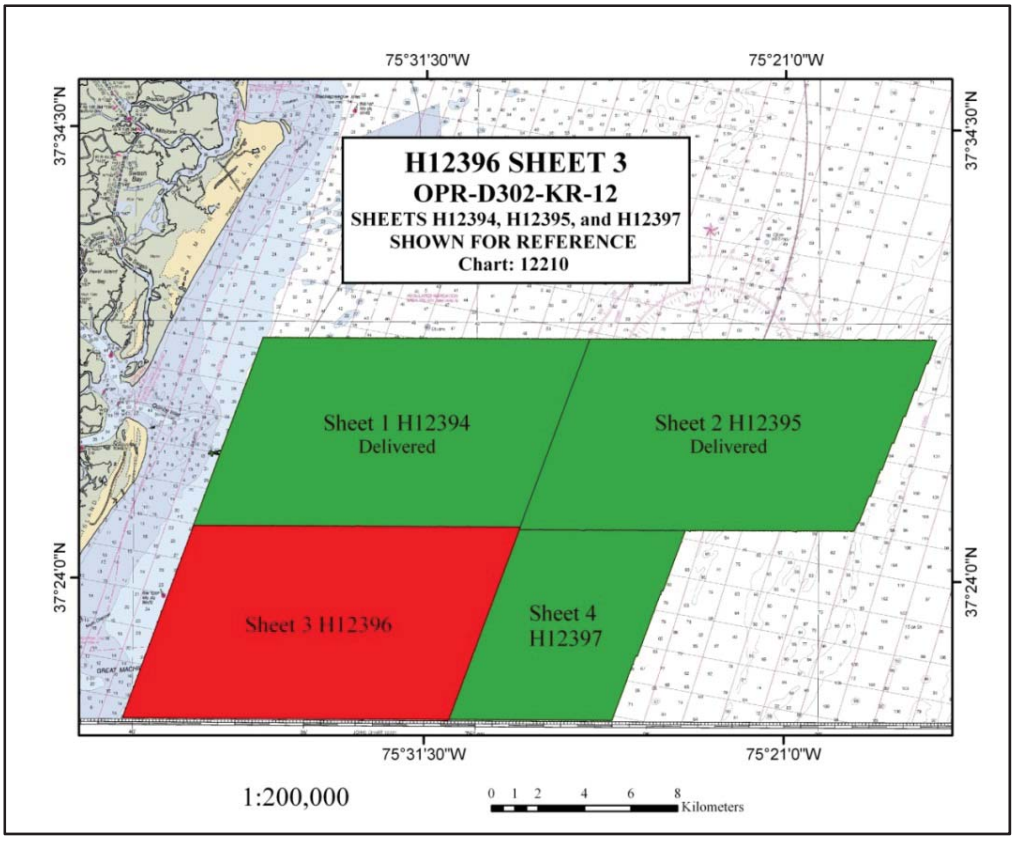

Figure 11: General Locality and Status of Sheets in Reference to H12396

B.2.4 Sonar QC Checks

Sonar system quality control checks were conducted as detailed in the quality control section of the DAPR, rev1.

B.2.5 Equipment Effectiveness

There were no conditions or deficiencies that affected equipment operational effectiveness.

B.2.6 Factors Affecting Soundings

There were no other factors that affected corrections to soundings.

B.2.7 Sound Speed Methods

Sound Speed Cast Frequency: The MVP-30 was used to collect sound speed profile (SSP) data. SSP data were obtained at intervals frequent enough to meet depth accuracy requirements. Section 5.2.3.3 of the HSSD requires that if the sound speed measured at the sonar head differs by more than two meters/second from the commensurate profile data, then another cast shall be acquired. There were times when the sound speed values exceeded the two meters/second threshold due to the local temporal and tidal variability. During these times, several profiles were acquired and reapplied in an effort to reduce these effects. The product of this effort resulted in the final data bearing no significant artifacts due to sound speed differences. Additional information can be found in Section A.8 of the DAPR, rev1.

A total of 562 profiles were applied to online data for H12396. All profiles that were applied for online multibeam collection were acquired within the bounds of the survey area. Please refer to the DAPR, rev1 for specific details regarding acquisition (Section A.8) and application (Section C.1.3) of sound speed profiles. For information regarding the start and end of online data, please reference the “Sidescan Review Log” and “Watchstander Logs” sections within Separates I.

Confidence checks of the sound speed profile casts were conducted periodically (at least once per survey leg) by comparing at least two consecutive casts taken with different SV and P Smart Sensors or the CTD. Seven sound speed confidence checks were conducted during H12396 and the results can be found in Separates II within the “Atlantic Surveyor Comparison Cast Log” section.

Sound speed profiles were obtained for four different survey purposes. The “Atlantic Surveyor Sound Speed Profile Log” section of Separates II is a cumulative report detailing each cast associated with H12396. The log is separated by the purpose of the applied cast; with individual tables for “Used for MB” (online multibeam), “Used for

Comparison", "Used for Lead Line", and "Used for Closing". Additionally, in a separate folder (H12396/Data/Processed/SVP/CARIS_SSP) on the delivery drive, there are four (.svp) files. These four files contain concatenated SSP data that has been formatted for use in CARIS. The CARIS SSP files are designated based on the purpose of the cast and their filenames match the tables within the sound speed profile log. All sound speed profile files are delivered with the H12396 delivery data and are broken out into sub-folders which correspond to the purpose of each cast.

B.2.8 Coverage Equipment and Methods

All equipment and survey methods were used as detailed in the DAPR, rev1.

B.2.9 Coverage Analysis

The **SABER** Gapchecker routine was used to flag multibeam data gaps exceeding the allowable limit of three contiguous nodes. Additionally, 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. A final review of the CUBE Depth surface showed that valid depths exist in 99.99% of the nodes and there were no areas where four or more contiguous nodes lacked data.

All grids were examined for the number of soundings contributing to the chosen CUBE hypotheses for each node by running **SABER's Frequency Distribution** tool on the Hypothesis Number of Soundings (Hyp # Soundings) surface of the PFM grid. The Hyp # Soundings surface reports the number of soundings that were used to compute the chosen hypothesis. Analysis of the H12396 final two-meter PFM grid revealed that 99.91% of all nodes contained three or more soundings; satisfying the requirements for set line spacing surveys, as specified in Section 5.2.2.3 of the HSSD.

Analysis of the three half-meter PFM grids indicated that a minimum of 99.75% of all individual nodes contained five or more soundings to meet object detection coverage (HSSD Section 5.2.2.1).

B.3 Echo Sounding Corrections

B.3.1 Corrections to Echo Soundings

All data reduction procedures conform to those detailed in the DAPR, rev1.

B.3.2 Calibrations

All sounding systems were calibrated as detailed in the DAPR, rev1.

B.4 BACKSCATTER

Backscatter was not collected for this survey.

B.5 DATA PROCESSING

B.5.1 Software Updates

There were no software configuration changes after the DAPR, rev1 was submitted.

The following Feature Object Catalog was used: NOAA Extended Attribute Files V5-2.

B.5.2 Surfaces

The following surfaces were submitted to the Processing Branch:

Surface Name	Surface Type	Resolution	Depth Range (meters)	Surface Parameter	Purpose
H12396_2m_MLLW	BAG	2 meters	7.117 – 22.461	N/A	MBES Trackline SBES Set Line Spacing
H12396_Ftr_area1_50cm_MLLW_1of3	BAG	0.5 meters	15.282 – 18.686	N/A	Object Detection
H12396_Ftr_area2_50cm_MLLW_2of3	BAG	0.5 meters	11.334 – 15.051	N/A	Object Detection
H12396_Ftr_area3_50cm_MLLW_3of3	BAG	0.5 meters	11.105 – 13.867	N/A	Object Detection
H12396_ss_1_100_mosaic	SSS Mosaic	1 meter	N/A	N/A	100% SSS
H12396_ss_2_100 mosaic	SSS Mosaic	1 meter	N/A	N/A	200% SSS

Table 7: Surfaces

A PFM CUBE Depth surface was used to assess and document multibeam survey coverage. The CUBE depth is populated with either the node's chosen hypothesis or the depth of a feature or designated sounding set by the hydrographer, which overrides the chosen hypothesis. The range of CUBE depths in H12396 was from 7.117 meters (23 feet, 0.270-meter uncertainty) to 22.461 meters (73 feet, 0.280-meter uncertainty). Section 5.2.2.3 of the HSSD requires a two-meter grid resolution for depths ranging from zero meters to 20 meters and a four-meter grid resolution for depths ranging from 16 meters to 40 meters. Due to the range of depths encountered on this project, SAIC requested and was granted permission to deliver all final grids at the higher two-meter node resolution (see 01 May 2012 correspondence in Appendix II). Therefore, the final CUBE surface for H12396 was generated at two-meter grid node resolution. Over significant features, CUBE surfaces were generated at half-meter grid node resolution to meet the object detection specifications defined in Section 5.2.2.1 of the HSSD. Five significant features were identified in H12396 and three half-meter resolution PFM grids

were generated to cover these five features. Data within the half-meter resolution CUBE PFM grids also remain in the two-meter CUBE PFM grid.

The final gridded multibeam data are delivered as Bathymetric Attributed Grids (BAG). The BAG files were exported from CUBE PFM grids as detailed in Section B.2.4 of the DAPR, rev1.

In addition to the standard Depth and Uncertainty surfaces, all final BAG files delivered for H12396 contain the additional Elevation Solution Group and Node Group surfaces. The Elevation Solution Group consists of three surfaces; Standard Deviation, Number of Soundings, and Shoal Depth. The Node Group is comprised of surfaces containing values for Hypothesis Strength and Number of Hypotheses. A detailed description for each of these group surfaces can be found in Section B.2.5 of the DAPR, rev1.

The BAG files delivered for OPR-D302-KR-12 are in BAG version 1.5.1. This version of BAG allows for the compression of the grid files. For H12396, the final two-meter BAG is delivered in both compressed and uncompressed formats. The file sizes for the compressed BAGs are typically 25-30 percent the size of the uncompressed versions. The feature BAGs are only delivered in the uncompressed format since they have very small file sizes.

As of the date of delivery for H12396, the hotfix for CARIS that will allow users to view version 1.5.1 BAGs is not available. Therefore, BAG version 1.1.0 files are being delivered as well. The BAG version 1.1.0 files only contain two surfaces, so the additional surfaces are delivered as supplemental non-standard BAG files. These additional BAG files were generated through the same process as the standard BAG files. The version 1.1.0 BAG format only allows for a Depth surface and an Uncertainty surface. Therefore, each of the non-standard BAG files were created with the CUBE Depth values populating the Depth surface of the BAG and each of the additional Elevation Solution and Node group surfaces populating the Uncertainty surface of the BAG.

Please note when reviewing these additional, non-standard BAGs the file name designates the surface which populates the Uncertainty surface for that BAG (Figure 12). Please also note that when displayed the two surfaces of the BAG remain named Depth and Uncertainty. These non-standard BAGs are provided for review purposes only and are not intended to be used as archival products.

BAG File Name	Comments
H12396_2m_MLLW_CUBE_Depth_Node_Std_Dev	Standard Deviation (Elevation Solution) of 2.0-meter BAG
H12396_2m_MLLW_CUBE_Depth_Hyp_Nmbr_of_Sndgs	Number of Soundings (Elevation Solution) of 2.0-meter BAG
H12396_2m_MLLW_CUBE_Depth_Node_Shoal_Depth	Shoal Depth (Elevation Solution) of 2.0-meter BAG
H12396_2m_MLLW_CUBE_Depth_Node_Hyp_Str	Hypothesis Strength (Node) of 2.0-meter BAG
H12396_2m_MLLW_CUBE_Depth_Node_Nmbr_of_Hyp	Number of Hypotheses (Node) of 2.0-meter BAG
H12396_Ftr_area1_50cm_MLLW_CUBE_Depth_Node_Std_Dev_1of3	Standard Deviation (Elevation Solution) of 0.5-meter BAG
H12396_Ftr_area1_50cm_MLLW_CUBE_Depth_Hyp_Nmbr_of_Sndgs_1of3	Number of Soundings (Elevation Solution) of 0.5-meter BAG
H12396_Ftr_area1_50cm_MLLW_CUBE_Depth_Node_Shoal_Depth_1of3	Shoal Depth (Elevation Solution) of 0.5-meter BAG
H12396_Ftr_area1_50cm_MLLW_CUBE_DepthNode_Hyp_Str_1of3	Hypothesis Strength (Node) of 0.5-meter BAG
H12396_Ftr_area1_50cm_MLLW_CUBE_Depth_Node_Nmbr_of_Hyp_1of3	Number of Hypotheses (Node) of 0.5-meter BAG
H12396_Ftr_area2_50cm_MLLW_CUBE_Depth_Node_Std_Dev_2of3	Standard Deviation (Elevation Solution) of 0.5-meter BAG
H12396_Ftr_area3_50cm_MLLW_CUBE_Depth_Hyp_Nmbr_of_Sndgs_1of3	Number of Soundings (Elevation Solution) of 0.5-meter BAG
H12396_Ftr_area2_50cm_MLLW_CUBE_Depth_Node_Shoal_Depth_2of3	Shoal Depth (Elevation Solution) of 0.5-meter BAG
H12396_Ftr_area2_50cm_MLLW_CUBE_Depth_Node_Hyp_Str_2of3	Hypothesis Strength (Node) of 0.5-meter BAG
H12396_Ftr_area2_50cm_MLLW_CUBE_Depth_Node_Nmbr_of_Hyp_2of3	Number of Hypotheses (Node) of 0.5-meter BAG
H12396_Ftr_area3_50cm_MLLW_CUBE_Depth_Node_Std_Dev_3of3	Standard Deviation (Elevation Solution) of 0.5-meter BAG
H12396_Ftr_area3_50cm_MLLW_CUBE_Depth_Hyp_Nmbr_of_Sndgs_3of3	Number of Soundings (Elevation Solution) of 0.5-meter BAG
H12396_Ftr_area3_50cm_MLLW_CUBE_Depth_Node_Shoal_Depth_3of3	Shoal Depth (Elevation Solution) of 0.5-meter BAG
H12396_Ftr_area3_50cm_MLLW_CUBE_Depth_Node_Hyp_Str_3of3	Hypothesis Strength (Node) of 0.5-meter BAG
H12396_Ftr_area3_50cm_MLLW_CUBE_Depth_Node_Nmbr_of_Hyp_3of3	Number of Hypotheses (Node) of 0.5-meter BAG

Figure 12: Summary of Non-standard H12396 BAG Files

B.5.3 Sidescan Coverage Analysis

For all details regarding sidescan data processing, see Section B.3 of the DAPR, rev1. The Project Instructions required 200% sidescan coverage with concurrent set line spacing multibeam data for all depths. The 200% sidescan coverage was verified by generating two separate 100% coverage mosaics at one-meter cell size resolution as specified in Section 8.3.1 of the HSSD. The first and second 100% coverage mosaics were independently reviewed using tools in **SABER** to verify data quality and swath coverage. Both coverage mosaics are determined to be complete and sufficient to meet the requirements contained within the Project Instructions. The mosaics are delivered as TIFF (.tif) images with accompanying world files (.tfw).

- H12396_ss_1_100_mosaic
- H12396_ss_2_100_mosaic

Sidescan sonar contacts were investigated and confirmed using **SABER Contact Review**. Sidescan contact information is delivered in several ways. The "Sidescan Contacts List" spreadsheet, located in Separates III, notes all sidescan contacts that were identified within H12396. All sidescan sonar contacts and accompanying images are also delivered in a Sidescan Sonar Contacts S-57 file.

C. VERTICAL AND HORIZONTAL CONTROL

No vertical or horizontal controls were established, recovered, or occupied during data acquisition for OPR-D302-KR-12, which includes H12396. Therefore a Horizontal and Vertical Control Report was not required.

C.1 VERTICAL CONTROL

The vertical datum for this project is Mean Lower Low Water.

Standard Vertical Control Methods Used:
Discrete Zoning

The following National Water Level Observation Network (NWLON) stations served as datum control for the survey:

Station Name	Station ID
Duck, NC	8651370

Table 8: NWLON Tide Stations

File Name	Status
8651370_verified_07052012_09302012.tid	Verified Observed

Table 9: Water Level Files (.tid)

File Name	Status
D302KR2012CORP.zdf	Final

Table 10: Tide Correctors (.zdf)

No final tide note was provided by the NOAA Center for Operational Oceanographic Products and Services (CO-OPS). SAIC is not required to have a final tide note from CO-OPS for H12396 however a final tide note has been provided by SAIC in Appendix I.

The Project Instructions specified NOAA tide station 8651370 Duck, NC as the source for water level correctors. A full explanation of the tide zone assessment is detailed in Section C.4 of the DAPR, rev1. For H12396, 8651370 Duck, NC was the source of all final verified water level heights for determining correctors to soundings.

SAIC did not revise the delivered tide zones for tide station 8651370 Duck, NC as the water level zoning parameters in the file D302KR2012CORP.zdf, provided by National Ocean Service (NOS) were deemed adequate for the application of observed verified water levels. As a result, they were accepted as final and applied to all H12396 multibeam data.

C.2 HORIZONTAL CONTROL

The horizontal datum for this project is North American Datum of 1983 (NAD83).

The survey data for sheet H12396 were collected in horizontal datum North American Datum of 1983 (NAD-83), using geodetic coordinates, while data display and products used the UTM Zone 18, North projection.

Please refer to the DAPR, rev1 for details regarding all antenna and transducer offsets.

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 an acceptable range. Any soundings with total horizontal uncertainties exceeding the maximum allowable IHO S-44 5th edition Order 1a specifications were flagged as invalid and therefore not used in the CUBE depth calculations. Daily positioning confidence checks for H12396 were conducted several times throughout the day and a daily value is presented as a standalone table within Separates I, “Daily Positioning Confidence Checks”. All daily positioning confidence checks for H12396 were within 0.45 meters.

The following USCG DGPS Stations were used for horizontal control:

DGPS Stations
Driver, VA (289 kHz)
Annapolis, MD (301 kHz)
New Bern, NC (294 kHz)

Table 11: USCG DGPS Stations

D. RESULTS AND RECOMMENDATIONS

D.1 CHART COMPARISON

D.1.1 Raster Charts

The following are the largest scale raster charts, which cover the survey area:

Chart	Scale	Edition	Edition Date	LNM Date	NM Date
12210	1:80000	38	05/2008	01/05/2013	12/25/2012

Table 12: Largest Scale Raster Charts

12210
The chart comparisons were conducted using SAIC's **SABER** software to view the BSB raster charts with overlain data for H12396 such as the CUBE gridded surface, selected soundings, contacts, and features. Charting recommendations for depths follow Section 5.1.2 of the HSSD where depths and uncertainties are to be rounded by standard arithmetic rounding (round half up) and accompanying chart depth units are rounded using NOAA cartographic rounding (0.75 round up). All CUBE depths and uncertainty values are provided to millimeter precision.

United States Coast Guard (USCG) District 5 Local Notice to Mariners publications were reviewed for changes subsequent to the date of the Hydrographic Survey Project Instructions and before the end of survey (as specified in Section 8.1.4 of the HSSD). The Notice to Mariners reviewed were from week 11 (13 March 2012) until week 39 (25 September 2012). The USCG District 5 Local Notice to Mariners for Week 31/12 had the following entry in Section IV Chart Corrections:

> DELETE Sounding in feet; 58 (NOS NW-22080) 37-24-01.600N 075-30-40.200W
> ADD Sounding in Feet; 50 OBSTN Chart No. 1:K41 (NOS NW-22080) 37-24-03.798N 075-03-40.428W

This correction was from Danger to Navigation Report 1, as submitted by SAIC.

CUBE depths within sheet H12396 generally agreed within ±4 feet of the charted depths. The following isolated soundings show notable exceptions to the general agreement.

The charted 31-foot sounding in approximately 37° 23' 00.69"N 075° 34' 33.94"W was in CUBE depths of 36 to 50 feet.

The charted 32-foot sounding in approximately 37° 23' 11.56"N 075° 37' 37.09"W was in CUBE depths 39 to 46 feet.

The charted depth curves (30-foot and 60-foot) throughout H12396 were generally found to be in agreement with the survey data. Most were found to be located within 300 meters of their charted locations with the following two exceptions.

The 25-foot sounding and surrounding 30-foot depth curve in approximately 37° 22' 39.24"N 075° 37' 56.14"W and the 26-foot sounding and surrounding 30-foot depth curve in approximately 37° 22' 28.93"N 075° 37' 34.91"W were found as a single area with depths less than 30 feet. This area is centered approximately 37° 22' 23.06"N 075° 38' 05.80"W and extends approximately 1000 meters east-west by 250 meters north-south.

The 30-foot sounding and surrounding 30-foot depth curve in approximately 37° 23' 56.09"N 075° 38' 12.35"W was found approximately 300 meters south and is part of a finger shoal that extends approximately 950 meters from the 30-foot depth curve parallel to the shoreline.

D.1.2 Electronic Navigation Charts

The following are the largest ENCs, which cover the survey area:

ENC	Scale	Edition	Update Application Date	Issue Date	Preliminary
US4VA70M	1:80000	12	07/12/2012	01/03/2013	NO
US4VA12M	1:80000	22	04/06/2012	01/02/2013	NO

Table 13: Largest Scale ENCs

US4VA70M

For ENC comparisons, a combination of Jeppesen's **dKart Inspector**, SevenCs' **SeeMyDENC**, and CARIS' **EasyView** were used in conjunction with **SABER**.

US4VA70M encompasses H12396 north of 37° 24' 00.00"N.

CUBE depths within sheet H12396 generally agreed within ±1.5 meters of the charted depths. The following isolated sounding shows a notable exception to the general agreement.

The charted depth curves (9.1-meter and 18.2-meter) throughout H12396 were generally found to be in agreement with the survey data. Most were found to be located within 300 meters.

The charted obstruction always submerged with a least depth of 15.2-meters depth in 37° 24' 03.80"N 075° 30' 40.43"W is charted correctly. The charted obstruction was reported by SAIC in Danger to Navigation Report 1 for H12396.

US4VA12M
US4VA12M encompasses H12396 south of 37° 24' 00.00"N.

CUBE depths within sheet H12396 generally agreed within ±1.5 meters of the charted depths. The following isolated soundings show notable exceptions to the general agreement.

The charted 11.8-meter sounding in 37° 22' 50.45"N 075° 33' 35.65"W was in CUBE depths of 13.3 to 15.3 meters.

The charted 9.4-meter sounding in 37° 22' 59.58"N 075° 34' 35.51"W was in CUBE depths of 12.1 to 13.5 meters.

Most of the charted enclosed 10.9-meter depth curves throughout H12396 were generally found to have CUBE depths greater than 11.0 meters.

The charted 9.1-meter and 18.2-meter depth curves throughout H12396 were generally found to be in agreement with the survey data. Most were found to be located within 300 meters of their charted locations with the following exceptions.

The 7.6-meter sounding and surrounding 9.1-meter depth curve in 37° 22' 38.17"N 075° 37' 56.29"W and the 7.9-meter sounding and surrounding 9.1-meter depth curve in approximately 37° 22' 26.75"N 075° 37' 34.20"W were found as a single area with depths less than 9.1 meters. This area is centered approximately 37° 22' 23.50"N 075° 38' 05.80"W and extends approximately 1000 meters east-west by 250 meters north-south.

The 9.1-meter sounding and surrounding 9.2-meter depth curve in 37° 23' 54.05"N 075° 38' 13.09"W was found approximately 300 meters south and is part of a finger shoal that extends approximately 950 meters from the 9.1-meter depth curve parallel to the shoreline.

D.1.3 AWOIS Items

No AWOIS items exist for this survey.

As documented in the Project Instructions, the one uncharted AWOIS item (2784) assigned for project OPR-D302-KR-12 fell outside the survey bounds of H12396.

D.1.4 Charted Features

The charted submerged dangerous obstruction with a least depth of 15.2 meters (50 feet) in 37° 24' 03.80"N 075° 30' 40.43"W is from Danger to Navigation Report 1 (Feature 1).

D.1.5 Uncharted Features

The survey data for H12396 revealed four uncharted obstructions within the survey bounds:

- Feature 2 in 37° 24' 01.74"N 075° 36' 15.43"W
- Feature 3 in 37° 24' 03.49"N 075° 36' 15.73"W
- Feature 4 in 37° 24' 03.92"N 075° 37' 26.79"W
- Feature 5 in 37° 22' 51.79"N 075° 37' 40.84"W

See the S-57 Feature file for all the details and recommendations regarding these obstructions.

D.1.6 Danger to Navigation Reports

The following DTON report was submitted to the processing branch:

DTON Report Name	Date Submitted
3S12396.000	2012-08-24

SAIC submitted one Danger to Navigation Report (DTON) in S-57 format. The report documented an uncharted obstruction with a least depth of 15.347 meters (50 feet) in 37° 24’ 03.80”N 075° 30’ 40.43”W (Feature 1). Copies of the Atlantic Hydrographic Branch report, in PDF format, submitted to the Nautical Data Branch (NDB)/Marine Chart Division is included in Appendix I of this report.

D.1.7 Shoal and Hazardous Features

No shoals or potentially hazardous features exist for this survey.

D.1.8 Channels

No channels exist for this survey. There are no designated anchorages, precautionary areas, safety fairways, traffic separation schemes, pilot boarding areas, or channel and range lines within the survey limits.

D.2 ADDITIONAL RESULTS

D.2.1 Shoreline Verification

Shoreline was not assigned in the Hydrographic Survey Project Instructions or Statement of Work.

D.2.2 Comparison with Prior Surveys

The junction analysis with the contemporary 2012 surveys H12394 and H12395 was conducted and the results are presented in section B.2.3 Junctions of this report.

D.2.3 Aids to Navigation

Aids to Navigation (ATONs) do not exist for this survey.

D.2.4 Overhead Features

Overhead features do not exist for this survey.

D.2.5 Submarine Features

Submarine features do not exist for this survey.

D.2.6 Ferry Routes and Terminals

No ferry routes or terminals exist for this survey.

D.2.7 Platforms

No platforms exist for this survey.

D.2.8 Significant Features

No significant features exist for this survey.

D.2.9 Construction and Dredging

There is no present or planned construction or dredging within the survey limits.

D.2.10 Other Results

D.2.10.1 Designated Soundings

Designated soundings are used to help better preserve the shallowest sounding relative to the computed depth surface. Separate flags exist in the Generic Sensor Format (version 3.01) for designated soundings and features. All depths flagged as features and designated soundings will override the CUBE best estimate of the depth in the final BAG

files. Both the designated soundings and features flags as defined within GSF are mapped to the same HDCS flag when ingested into CARIS (PD_DEPTH_DESIGNATED_MASK).

Five designated soundings set for H12396 were classified as features and are maintained within the final S-57 Feature file. An additional four designated soundings were set to preserve the least depth on non-significant objects. The difference between the least depth of these objects and the CUBE depth was more than one-half the maximum allowable total vertical uncertainty at that depth.

D.2.10.2 S-57 Feature File

Included with H12396 delivery is the S-57 feature file, H12396.000. Details on how this file is generated and quality controlled can be found in Section B.2.6 of the DAPR, rev1. The S-57 feature file delivered for H12396 contains millimeter precision for the value of sounding (VALSOU) attribute. As specified in Section 8.2 of the HSSD, the S-57 feature file is in the WGS84 datum and is unprojected with all depth units in meters. All five of the features found in H12396 are retained within the S-57 feature file.

For each feature contained in the S-57 file, the Feature Correlator sheet was exported as an image file (.jpg) and is included in the S-57 Feature file under the NOAA Extended Attribute field “images” as requested by AHB.

D.2.10.3 Sidescan Sonar Contacts S-57 File

As requested by AHB, SAIC also generated a supplemental S-57 file to present the sidescan contacts, H12396_SSCon.000. Details on how this file was generated, attributed, and quality controlled can be found in Section B.3.5 of the DAPR, rev1. The supplemental Sidescan Contact S-57 file is delivered in a sub-directory of the S-57_Features directory named, “Sidescan_Sonar_S-57_File_as_Cartographic_Symbol”.

The “Sidescan Contacts List”, located in Separates III of this report, provides a table containing the same information as the Sidescan Contact S-57 file.

D.2.10.4 Bottom Characteristics

In accordance with both the Project Instructions and Section 7.1 of the HSSD, bottom characteristics were obtained for H12396. Bottom characteristics were acquired at the locations proposed in the Project Reference File (PRF) by NOAA. Six samples were collected. Bottom characteristics are included in the H12396 S-57 Feature File, H12396.000, within the Seabed Area (SBDARE) object and are classified according to the requirements set forth in Appendix 10 of the HSSD. In addition to being maintained within the S-57 feature file, bottom characteristic results are represented in Appendix II of this document. Bottom characteristics obtained for H12396 are sufficient to be used to update the respective charts.

E. APPROVAL SHEET

22 February 2013

LETTER OF APPROVAL

REGISTRY NUMBER: H12396

Field operations and data processing contributing to the accomplishment of this survey, H12396, were conducted under my direct supervision or that of other SAIC lead hydrographers with frequent personal checks of progress and adequacy. This report and accompanying deliverable data items have been closely reviewed by me and are considered complete and adequate as per the Statement of Work.

This Descriptive Report and the accompanying records and data are approved and forwarded for final review and processing to the Processing Branch.

The survey data meets or exceeds requirements as set forth in the NOS Hydrographic Surveys and Specifications Deliverables Manual, Project Instructions and all HSD Technical Directives. These data are adequate to supersede charted data in their common areas.

Reports previously submitted to NOAA for this project include:

Report Name	Report Date Sent
Data Acquisition and Processing Report	11 January 2013
H12394 Descriptive Report	11 January 2013
Data Acquisition and Processing Report, Revision 1	01 February 2013
H12395 Descriptive Report	01 February 2013

SCIENCE APPLICATIONS INTERNATIONAL CORPORATION

Gary R. Davis

Digitally signed by Gary R. Davis
DN: cn=Gary R. Davis, o=Marine Survey and Engineering Solutions, ou=SAIC, email=gary.r.davis@saic.com, c=US
Date: 2013.02.19 12:12:46 -05'00'

Gary R. Davis
Chief Hydrographer
Science Applications International Corporation
22 February 2013

APPENDIX I

TIDES AND WATER LEVELS

APPENDIX I. TIDES AND WATER LEVELS

Field Tide Note

A field tide note was not required for H12396.

Final Tide Note

Verified water levels for the station in Duck, NC (8651370) were downloaded from the NOAA Tides and Currents web site. Water Level correctors were prepared for each zone using the **SABER Create Water Level Files** software. The **SABER Apply Correctors** software applied the water level data to the multibeam data according to the zone containing the nadir beam of each ping.

Please refer to the H12396 Descriptive Report Section C.1 for details regarding final tides for H12396. The water level zoning correctors, based entirely on Duck, NC (8651370), were applied to all multibeam data for H12396.

No final tide note was provided by NOAA Center for Operational Oceanographic Products and Services (CO-OPS), SAIC is not required to have a final tide note from CO-OPS.

The on-line times for acquisition of valid hydrographic data are presented in the Abstract Times of Hydrography, H12396 (Table A-1).

Abstract Times of Hydrography

Project: OPR-D302-KR-12
Registry No.: H12396
Contractor Name: Science Applications International Corporation
Date: 22 February 2013
Sheet Designation: 3
Inclusive Dates: 14 August 2012 - 29 September 2012
Field work is complete.

Table A-1: Abstract Times of Hydrography, H12396

Begin Date	Begin Julian Day	Begin Time	End Date	End Julian Day	End Time
08/14/2012	227	10:17:53	08/19/2012	232	18:45:15
08/21/2012	234	04:43:17	08/23/2012	236	20:08:06
08/26/2012	239	15:31:46	08/26/2012	239	19:48:07
08/28/2012	241	16:55:02	09/01/2012	245	19:44:52
09/12/2012	256	12:59:36	09/12/2012	256	21:38:27
09/28/2012	272	16:07:29	09/29/2012	273	01:28:54

Transmittal Letter to CO-OPS

A transmittal letter to CO-OPS was not required for H12396.

Other Correspondence Relating to Tides

There is no other correspondence relating to tides and/or water levels.

APPENDIX II

SUPPLEMENTAL SURVEY RECORDS AND CORRESPONDENCE

CORRESPONDENCE

From: Marc Moser [mailto:marc.s.moser@noaa.gov]
Sent: Monday, April 02, 2012 11:55 AM
To: Evans, Rhodri E.
Cc: Jeffrey Ferguson; Mark Lathrop; Megan Greenaway
Subject: 2012 NOAA Extended Attribute Files

Good afternoon,
I am sending the attached files to all contractors as a courtesy to provide you with information on how HSD and NOAA field units are implementing the feature reporting requirements, as documented in the 2012 HSSD, within CARIS software. This is by no means an endorsement for CARIS products nor is it meant to imply any requirement to use CARIS products to process and or deliver hydrographic feature data. For those who utilize CARIS software, the attached files contain the guidance and necessary files that HSD provides to the NOAA field units to implement NOAA Extended Attributes in CARIS. You are welcome to use NOAA's approach for implementing the NOAA Extended Attributes or establish a different approach that better suits your processes and procedures.

All charted features within the bounds of the assigned project area shall be addressed, documented and submitted using the NOAA Extended Attributes as defined in 2012 HSSD. To aid with this requirement I have directed the COTR's to provide a Composite Source Feature File (CSF) in a .000 format. This file has been generated from the largest scale ENC covering the project area. The CSF shall be updated with your survey results. The updated CSF will become the final feature deliverable, the Final Feature File in .000 format, as described in the 2012 HSSD.

Please contact your COR if you have any questions.

From: Mark Lathrop [mailto:mark.t.lathrop@noaa.gov]
Sent: Wednesday, April 25, 2012 1:57 PM
To: Davis, Gary R.
Cc: Evans, Rhodri E.; Donaldson, Paul L.; Quintal, Rebecca T.
Subject: Re: Tide Zones for TO7

Gary,

Our scale criteria has changed in the last few years away from the printed smooth sheet and more towards reflecting the nautical chart. Surveys are now generally twice the scale of the largest scale chart of the survey area with a minimum scale of 1:40,000.

We should be receiving updated zoning from CO-OPS soon. Please stand by.

Mark

On Tue, Apr 24, 2012 at 5:07 PM, Davis, Gary R. <GARY.R.DAVIS@saic.com> wrote:
Mark,

There is a section of Sheet 3 (H12396), Task Order 7, that is not covered by a tide zone (see attached file). Please provide additional zoning to cover this area. Also please clarify if Water Level Station Duck, NC (865-1370) or Wachapreague, VA (863-1044) is to be used, both are listed in the project instructions.

We would also like to verify that the scale of the surveys for Task order 7 is 40,000. Previous surveys along the coast have been 20,000.

Thanks,
Gary

From: Mark Lathrop [mailto:mark.t.lathrop@noaa.gov]
Sent: Thursday, April 26, 2012 2:19 PM
To: Evans, Rhodri E.
Subject: Re: 2012 RFP

Rod,

I will send you the updated Project Instructions and SOW next week. We will be surveying to the 2012 Specs. If there is anything there that you are concerned about with regard to this year's survey please let me know. I've attached the Awois detail, CSF and PRF files for your survey.

Mark

On Thu, Apr 26, 2012 at 1:52 PM, Evans, Rhodri E. <RHODRI.E.EVANS@saic.com> wrote:

Mark,

In addition to the revised tide zoning and Tides SOW that we know will be coming from CO-Ops soon, we have the following questions and requests:

1. We note that today the NOS Hydrographic Surveys Specifications and Deliverables Manual (HSSDM), April 2012 in now posted to the NOAA website. We are currently reviewing it for changes from the October 2011 version. Please confirm if we are to deliver to the April 2012 version (the task was proposed to the 2011 specifications per your email below of 12 January 2012)?

2. We note that the Project Instructions (dated 2/27/2012) that we received with the faxed task award lists the Statement of Work (SOW), Hydrographic Survey Services, 2011 as a supporting document. Is there a new 2012 version of the SOW, or is the 2011 version still in effect (per your email below)? Further, can we please have the project instructions as a PDF file (we have only the faxed hard copy and a scruffy scan that we made of the fax) and we will use it as the PIs for our internal use and for delivery in the Separates.

3. In your email below (dated January 12, 2012), you indicated that the Project Instructions list 2 Full Investigation AWOIS Items, but that there is only one and it is Information Only. Can you please provide the information for the one AWOIS?

4. The new HSSDM states that a Composite Source File (CSF) and Project Reference File (PRF) will be provided. It also states that a Prior Survey Feature File (PRI) may be provided with the Project Instructions. Can you please send these files?

Thanks & Regards,
Rod

From: Mark Lathrop [mailto:mark.t.lathrop@noaa.gov]
Sent: Tuesday, May 01, 2012 3:07 PM
To: Evans, Rhodri E. [UNK]
Subject: Re: 2012 RFP

Rod,

Only two? That's a first, I believe!
1) No problem with submitting 2-meter node resolution for the entire survey.

2) AHB has several ACORs and I believe they are not necessarily dedicated to any particular contractor. You may substitute the DTON email address provided for ACOR. In fact I suggested this change to the 2012 HSSD during the review process but it somehow didn't get modified.

Mark

On Mon, Apr 30, 2012 at 4:54 PM, Evans, Rhodri E. <RHODRI.E.EVANS@saic.com> wrote:

Mark,

We have completed our review of the new April 2012 HSSD document and we have only 2 questions:

1. We note that in section 5.2.2.3 Set Line Spacing, of the April 2012 HSSD, it calls for 2-meter node resolution for water depths from 0-20 meters and 4-meter node resolution for water depths 16-40 meters. Is it acceptable to deliver the entire sheet at 2-meter node spacing if the data can support it?
2. We note that in section 8.1.3 Danger to Navigation, of the April 2012 HSSD, that it states "Contractors shall submit all Dangers to Navigation via e-mail to the COR and ACOR at processing branch stated in the Hydrographic Survey Project Instructions." We do not see the ACOR identified in the Project instructions. Can you please provide that contact information?

Thanks and Regards, Rod.

From: Castle Parker [mailto:castle.e.parker@noaa.gov]
Sent: Monday, August 27, 2012 7:54 AM
To: Quintal, Rebecca T.
Cc: Mark T Lathrop
Subject: RE: OPR-D302-KR-12 Danger To Nav Reports - H12394 DTN#1; H12395 DTN#1; H12396 DTN#1

Good Morning Rebecca,
AHB is going to submit H12396 DtoN #1 50ft OBSTRN; standby on the official submission. AHB will not submit H12394 DtoN#1 as the wreck is charted even though the feature and position is charted as doubtful; it is nonetheless charted. H12395 DtoN#1 will not be submitted either as the wreck is deeper than the danger zone of 66ft (11fm). Both features will be updated with the associated Hcell.
I will be submitting H12396 DtoN#1 within the next half hour.
Thanks for your continued support. Have a great day!
Gene

From: Quintal, Rebecca T.
Sent: Friday, August 24, 2012 3:30 PM
To: Mark.T.Lathrop@noaa.gov; ahb.dton@noaa.gov
Cc: Evans, Rhodri E.; Davis, Gary R.; Donaldson, Paul L.; Robertson, Evan J.; Smith, Deborah M.; Holloway, Charles F.; Castle Parker
Subject: OPR-D302-KR-12 Danger To Nav Reports - H12394 DTN#1; H12395 DTN#1; H12396 DTN#1

Mark,

Please find attached three (3) Danger to Navigation Reports.

- H12394 DTON #1
- H12395 DTON #1
- H12396 DTON #1

The files for each DTON submission are contained in a separate zip file. Each Zip file contains the following files:

- One (1) S-57 file (*.000)
- One (1) Word document report (*.docx)
- One (1) Text file (*.txt)
- Four (4) image files that are referenced in the S-57 file (*.jpg)

We note that the May 4, 2012 SOW states in Section 2.2.7.2 Dangers to Navigation, that Contractors shall deliver the DTON as a report (with sample report provided). However in the 2012 edition of the Hydrographic Surveys Specifications and Deliverables it states in Section 8.1.3 Danger to Navigation, that Contractors shall deliver the DTON as an S-57 .000 feature file and does not state that a report or ascii text file should be delivered in addition.

For these deliveries we provided the S-57 file, and a report and ascii text file. Please let us know if the S-57 file is all that is required on future DTON deliveries. Thanks!

Please contact me if there are any questions or problems with the attached files.

Thank you,
Rebecca

From: Castle Parker [mailto:castle.e.parker@noaa.gov]
Sent: Monday, August 27, 2012 8:10 AM
To: OCS.NDB@noaa.gov
Cc: Abigail Higgins; Mark T Lathrop; Quintal, Rebecca T.
Subject: H12396 Dton#1 50ft OBSTRN Submission to NDB

Good Day,

Please find attached compressed file for survey H12396 Dton#1 50ft Obstruction, for submission to Nautical Data Branch (NDB) / Marine Chart Division (MCD). The feature was submitted by contract field unit SAIC. The contents of the attached WinZip file were generated at Atlantic Hydrographic Branch. The attached zip file contains a DtoN Letter (PDF) and a Pydro XML file. If you have any questions, please direct them back to me; email me or call 757-441-6746 x115.

Thank you for your assistance with this matter,
Gene Parker

NOTE: The H12396_DtoN#1_50ftOBSTRN.pdf attachment to this email is included below.

From: NDB E-Mailbox [mailto:ocs.ndb@noaa.gov]
Sent: Monday, August 27, 2012 1:43 PM
To: Travis Newman; Tara Wallace; Robert Ramsey; Richard T Brennan; Pramod Singh; OCS NDB; Michael Gaeta; Matt Kroll; Mark Griffin; Kevin Shaw; Ken Forster; Jon Swallow; John Barber; James M Crocker; Gerald Koehl; David Merke; Craig Winn; Castle E Parker; Brent Pounds; Andrew Kampia; Allen Taylor; _NOS OCS NSD Coast Pilot; Abigail Higgins; Mark T Lathrop; Quintal, Rebecca T.
Subject: Fwd: H12396 Dton#1 50ft OBSTRN Submission to NDB

L-1633/12 and DD-22266 have been registered by the Nautical Data Branch and directed to PBC for processing.

The DtoN reported is an obstruction 6 NM east of Hog Island, VA.

The following charts are affected:
12210 kapp 550
12200 kapp 526

The following ENCs are affected:
US4VA70M
US3DE01M

References:
H12396
OPR-D302-KR-12

This information was discovered by a NOAA contractor and was submitted by AHB.

From: Castle Parker [mailto:castle.e.parker@noaa.gov]
Sent: Monday, August 27, 2012 8:36 AM
To: Quintal, Rebecca T.
Cc: Mark Lathrop
Subject: RE: OPR-D302-KR-12 Danger To Nav Reports - H12394 DTN#1; H12395 DTN#1; H12396 DTN#1

Rebecca,
You can submit the S57 file without the Word document. The remarks should include the information regarding the water level correction and horizontal datum. Also, submit the images. The ASCII file is not necessary either. One thing I did notice is that the acquisition time in the S57 file had the correct date, but the time was missing. HSSD doesn't specify the acquisition time and the associated S57 field to populate; use the "obstim" to populate the date and time stamp.
HSD has started using S57 file for all DtoN submissions…. Or should I say, we're moving that way. The documents and ASCII files are more work and all the information should be populated in the S57 file.

Thanks again and respond as necessary.
Gene

From: Quintal, Rebecca T. [mailto:REBECCA.T.QUINTAL@saic.com]
Sent: Monday, August 27, 2012 8:29 AM
To: Castle Parker
Cc: Mark T Lathrop
Subject: RE: OPR-D302-KR-12 Danger To Nav Reports - H12394 DTN#1; H12395 DTN#1; H12396 DTN#1

Thank for the information Gene!

Any comments on if we need to submit both the written report and associated ascii files, and the S-57 file?
Thanks!
-Rebecca

From: Megan Greenaway <megan.greenaway@noaa.gov>
Date: Thu, Oct 11, 2012 at 9:48 AM
Subject: Documenting Extended Attribute Files in DR

Good morning,
I want to clarify and emphasize the importance of the naming convention for the NOAA Extended Attribute files in the DR section B.5 Data Processing "Feature Object Catalog". From here forward please use the following naming convention.

NOAA Extended Attribute Files VX_X

The version number is the important item because the processing branches need to use the same version when SAR'ing and compiling your surveys. For now, the processing branches can use a 2012 NOAA Extended Attribute set of files to process 2010 and 2011 surveys because we have made "additions" to the extended attribute files and have not removed any attributes. However, in the future we may remove items or change enumeration values and therefore would not see an attribute or enumeration that was populated by the field.

HSD OPS will update the 2013 HSSD with these requirements. I realize the xmlDR prompt is very vague right now. Grant has suggested a drop down which I think is a good idea.

Vitad or Chris can you please forward to the NRT's?

Thanks,
Megan

From: Castle Parker
Sent: Tuesday, October 23, 2012 2:31 PM
To: Quintal, Rebecca T.
Cc: Mark Lathrop
Subject: RE: OPR-D302-KR-12 Danger To Nav Reports - H12394 DTN#1; H12395 DTN#1; H12396 DTN#1

Good Day Rebecca,
I would leave special feature type blank, since they weren't officially submitted to MCD's Nautical Data Branch as a DtoN. Therefore, they are a regular survey feature. The "descrp" attribute can be flagged as "update" since we want to remove the charted position doubtful (PD).
$0.02 worth!
gp

From: Quintal, Rebecca T.
Sent: Tuesday, October 23, 2012 2:17 PM
To: Castle Parker
Cc: Mark T Lathrop
Subject: RE: OPR-D302-KR-12 Danger To Nav Reports - H12394 DTN#1; H12395 DTN#1; H12396 DTN#1

Gene,

Hello. For objects where DToNs were submitted by a field unit, but were not submitted by the branches to MCD, should the field unit fill out the sftype (Special Feature Type) as DTON or leave it blank? We had this case twice this year (see below).

APPENDIX III

SURVEY FEATURES REPORT

DTON - 1
AWOIS - 0
Wrecks - 0
Maritime Boundary - 0

H12396 Dton#1 5ft OBSTRN

Registry Number: H12396
State: Virginia
Locality: Atlantic Ocean
Sub-locality: 6NM East of Hog Island
Project Number: OPR-D302-KR-12
Survey Date: 08/17/2012

Charts Affected

Number	Edition	Date	Scale (RNC)	RNC Correction(s)*
12210	38th	05/01/2008	1:80,000 (12210_1)	USCG LNM: 7/24/2012 (7/17/2012) NGA NTM: None (7/28/2012)
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	50ft OBSTRN	Obstruction	15.35 m	37° 24' 03.8" N	075° 30' 40.4" W	---

1 - Dangers To Navigation

1.1) 50ft OBSTRN

DANGER TO NAVIGATION

Survey Summary

Survey Position:	37° 24' 03.8" N, 075° 30' 40.4" W
Least Depth:	15.35 m (= 50.35 ft = 8.392 fm = 8 fm 2.35 ft)
TPU (±1.96σ):	**THU (TPEh)** [None] ; **TVU (TPEv)** [None]
Timestamp:	2012-230.00:00:00.000 (08/17/2012)
Dataset:	3S412396.000
FOID:	3S 0000000001 00001(3F4C000000010001)
Charts Affected:	12210_1, 12200_1, 13003_1

Remarks:

OBSTRN/remrks: A submerged dangerous obstruction that is oval in shape; approximately 1 meter in diameter. It is sticking vertically out of the bottom in depths of 60 to 61 feet.

Features 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.

Project Number: OPR-D302-KR-12

Survey Dates: 14 August 2012 - Ongoing

Survey Danger Acquisition Date and Time: 17 August 2012 at 16:12:57 UTC

Feature Correlation

Source	Feature	Range	Azimuth	Status
3S412396.000	3S 0000000001 00001	0.00	000.0	Primary

Hydrographer Recommendations

DTON 1. Chart sounding; danger circle and label Obstn.

Cartographically-Rounded Depth (Affected Charts):

50ft (12210_1)

8 ¼fm (12200_1, 13003_1)

S-57 Data

Geo object 1: Obstruction (OBSTRN)

Attributes: INFORM - Feature: 1 - DTON 1 50ft OBSTRN . MB File: asmba12230.d07; Depth: 15.347m; Time: 16:12:57.54; H. Uncert.: 1.330m; V. Uncert.: 0.270m.

NATSUR - 4:sand

QUASOU - 6:least depth known

SORDAT - 20120817

SORIND - US,US,graph,H12396

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

VALSOU - 15.347 m

WATLEV - 3:always under water/submerged

Office Notes

SAR: The feature is visible in the set line spaced multibeam coverage and the 200% side scan sonar data. The obstruction is charted on ENC USVA470M.

Compile: Retain charted OBSTRN, no change was affected during office review.

Feature Images

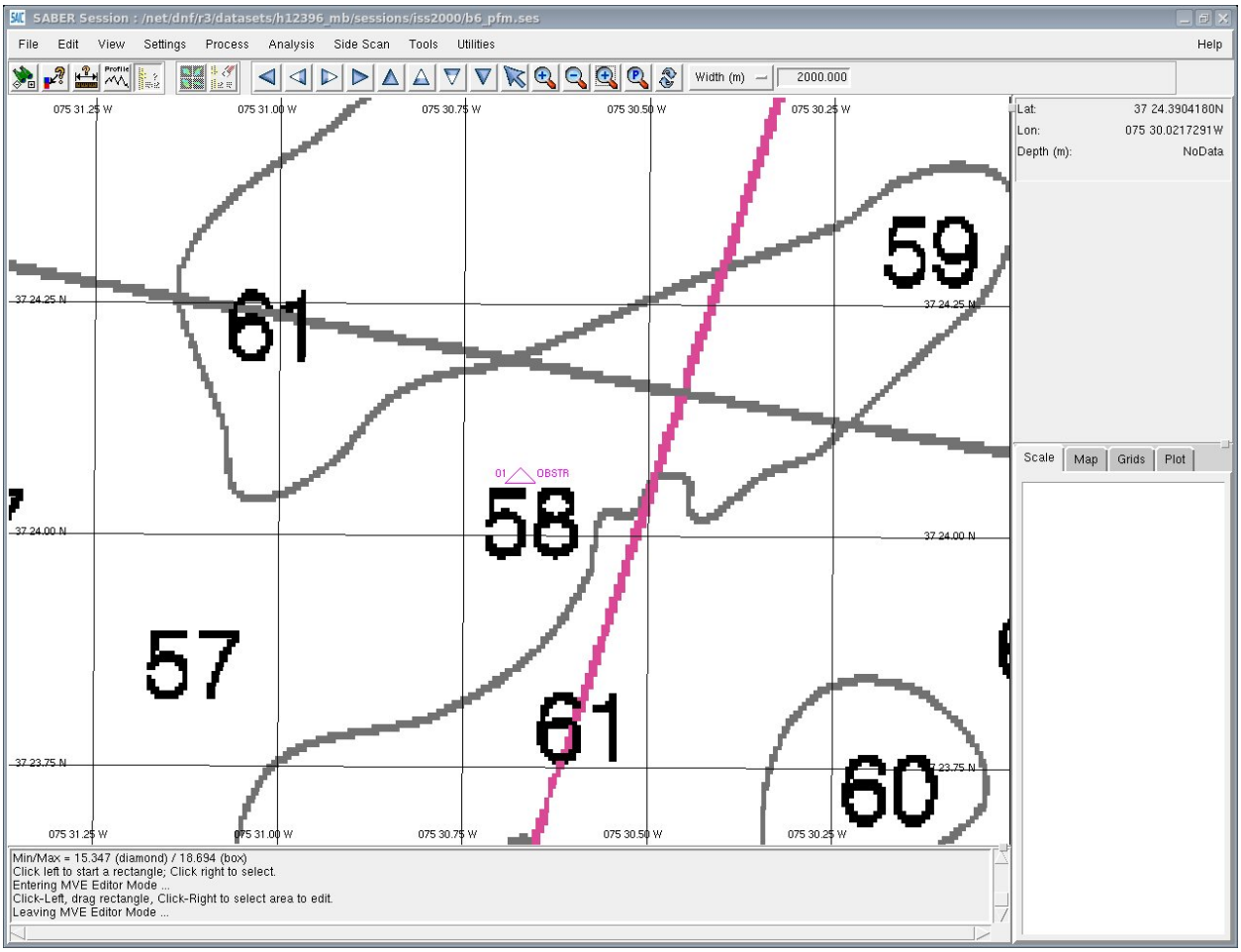

Figure 1.1.1

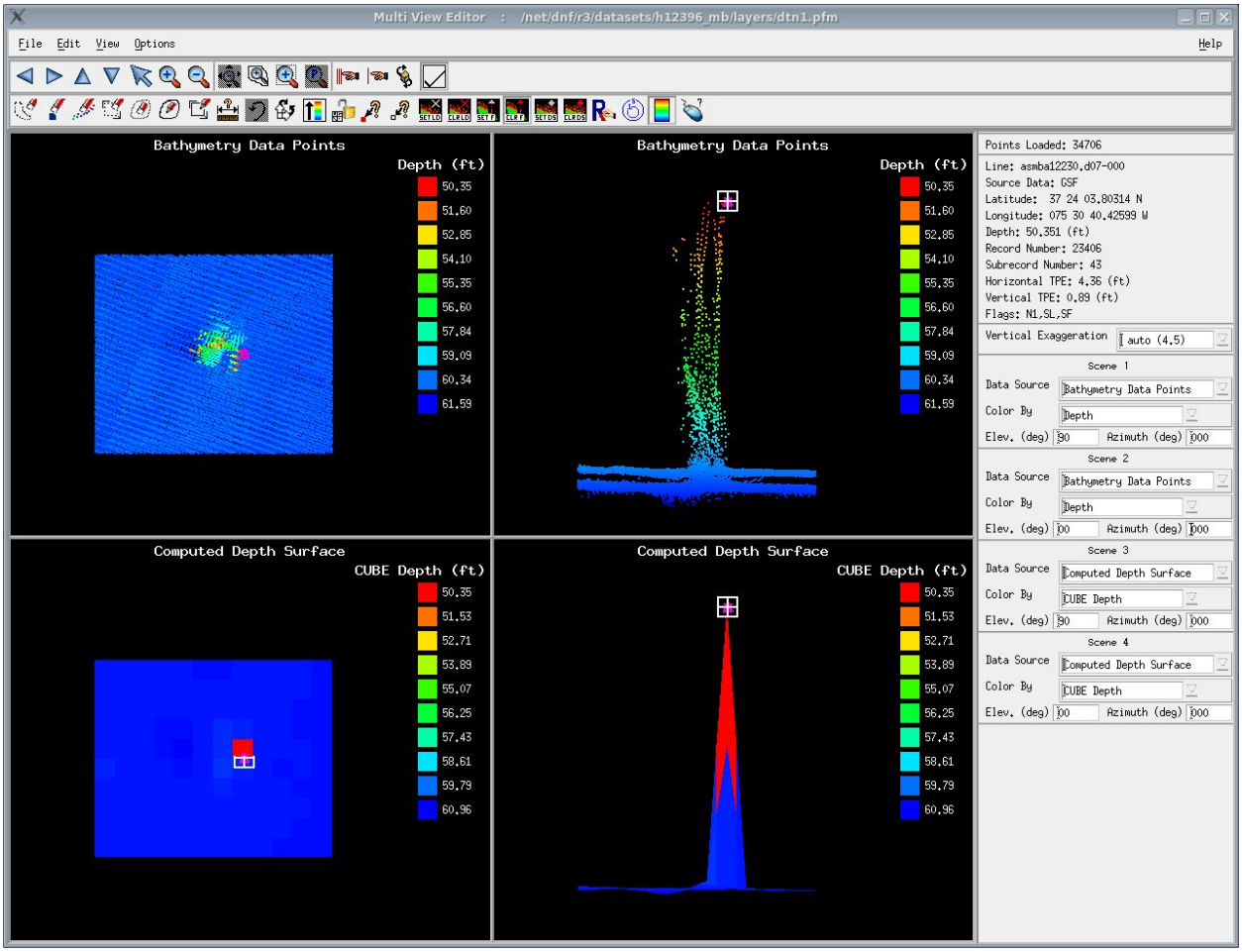
Multi View Editor : /net/dnf/r3/datasets/h12396_mb/layers/dtn1.pfm
File Edit View Options Help
Bathymetry Data Points
Depth (ft)
50.35
51.60
52.85
54.10
55.35
56.60
57.84
59.09
60.34
61.59
Bathymetry Data Points
Depth (ft)
50.35
51.60
52.85
54.10
55.35
56.60
57.84
59.09
60.34
61.59
Computed Depth Surface
CUBE Depth (ft)
50.35
51.53
52.71
53.89
55.07
56.25
57.43
58.61
59.79
60.96
Computed Depth Surface
CUBE Depth (ft)
50.35
51.53
52.71
53.89
55.07
56.25
57.43
58.61
59.79
60.96
Points Loaded: 34706
Line: asmba12230.d07-000
Source Data: GSF
Latitude: 37 24 03.80314 N
Longitude: 075 30 40.42599 W
Depth: 50.351 (ft)
Record Number: 23406
Subrecord Number: 43
Horizontal TPE: 4.36 (ft)
Vertical TPE: 0.89 (ft)
Flags: N1,SL,SF
Vertical Exaggeration auto (4.5)
Scene 1
Data Source Bathymetry Data Points
Color By Depth
Elev. (deg) 90 Azimuth (deg) 000
Scene 2
Data Source Bathymetry Data Points
Color By Depth
Elev. (deg) 00 Azimuth (deg) 000
Scene 3
Data Source Computed Depth Surface
Color By CUBE Depth
Elev. (deg) 90 Azimuth (deg) 000
Scene 4
Data Source Computed Depth Surface
Color By CUBE Depth
Elev. (deg) 00 Azimuth (deg) 000

Figure 1.1.2

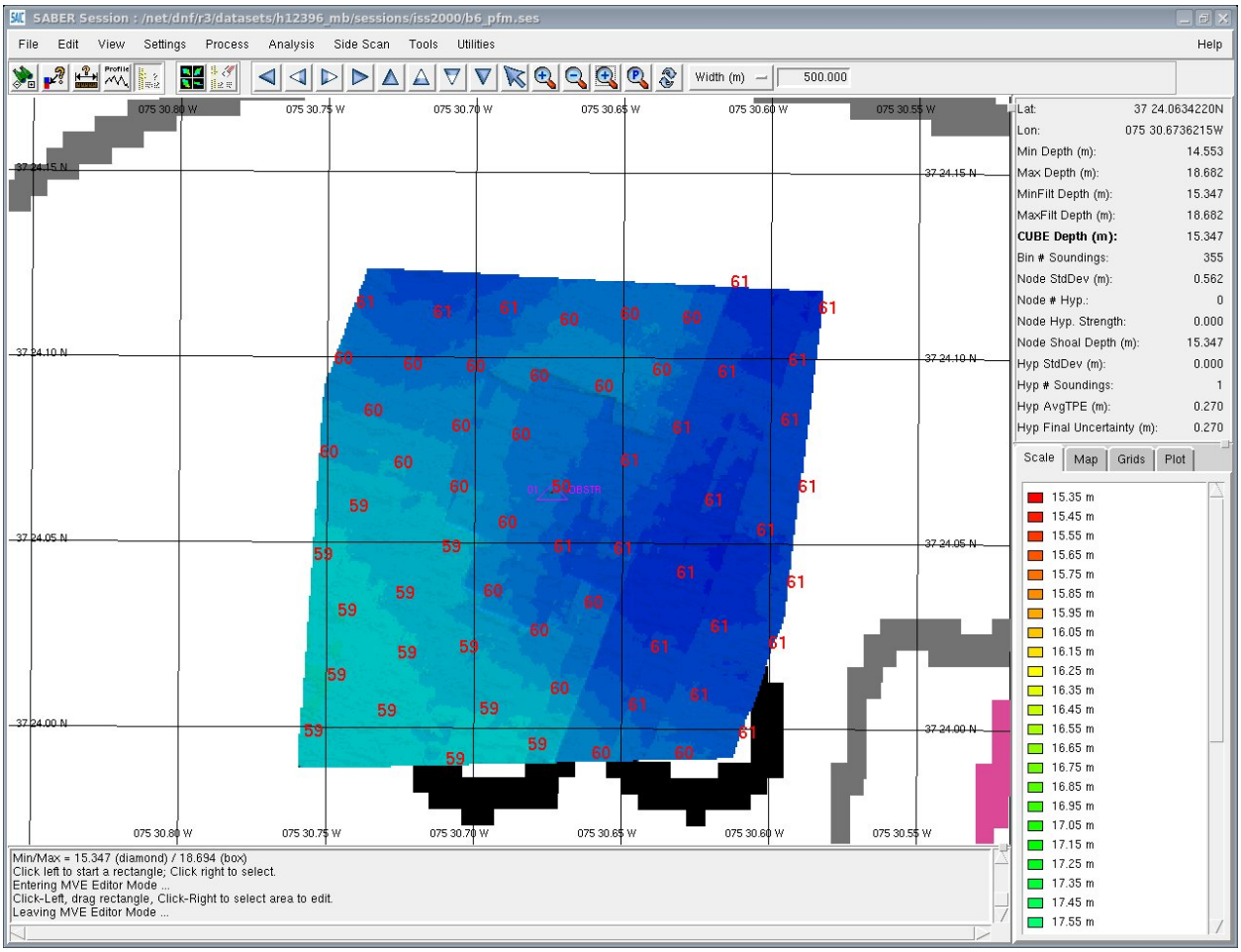
SABER Session : /net/dnf/r3/datasets/h12396_mb/sessions/iss2000/b6_pfm.ses
File Edit View Settings Process Analysis Side Scan Tools Utilities Help
Width (m) 500.000
075 30.80 W
075 30.75 W
075 30.70 W
075 30.65 W
075 30.60 W
075 30.55 W
37 24.15 N
37 24.10 N
37 24.05 N
37 24.00 N
OBSTR
Lat: 37 24.0634220N
Lon: 075 30.6736215W
Min Depth (m): 14.553
Max Depth (m): 18.682
MinFilt Depth (m): 15.347
MaxFilt Depth (m): 18.682
CUBE Depth (m): 15.347
Bin # Soundings: 355
Node StdDev (m): 0.562
Node # Hyp.: 0
Node Hyp. Strength: 0.000
Node Shoal Depth (m): 15.347
Hyp StdDev (m): 0.000
Hyp # Soundings: 1
Hyp AvgTPE (m): 0.270
Hyp Final Uncertainty (m): 0.270
Scale Map Grids Plot
15.35 m
15.45 m
15.55 m
15.65 m
15.75 m
15.85 m
15.95 m
16.05 m
16.15 m
16.25 m
16.35 m
16.45 m
16.55 m
16.65 m
16.75 m
16.85 m
16.95 m
17.05 m
17.15 m
17.25 m
17.35 m
17.45 m
17.55 m
Min/Max = 15.347 (diamond) / 18.694 (box)
Click left to start a rectangle; Click right to select.
Entering MVE Editor Mode ...
Click-Left, drag rectangle, Click-Right to select area to edit.
Leaving MVE Editor Mode ...

Figure 1.1.3

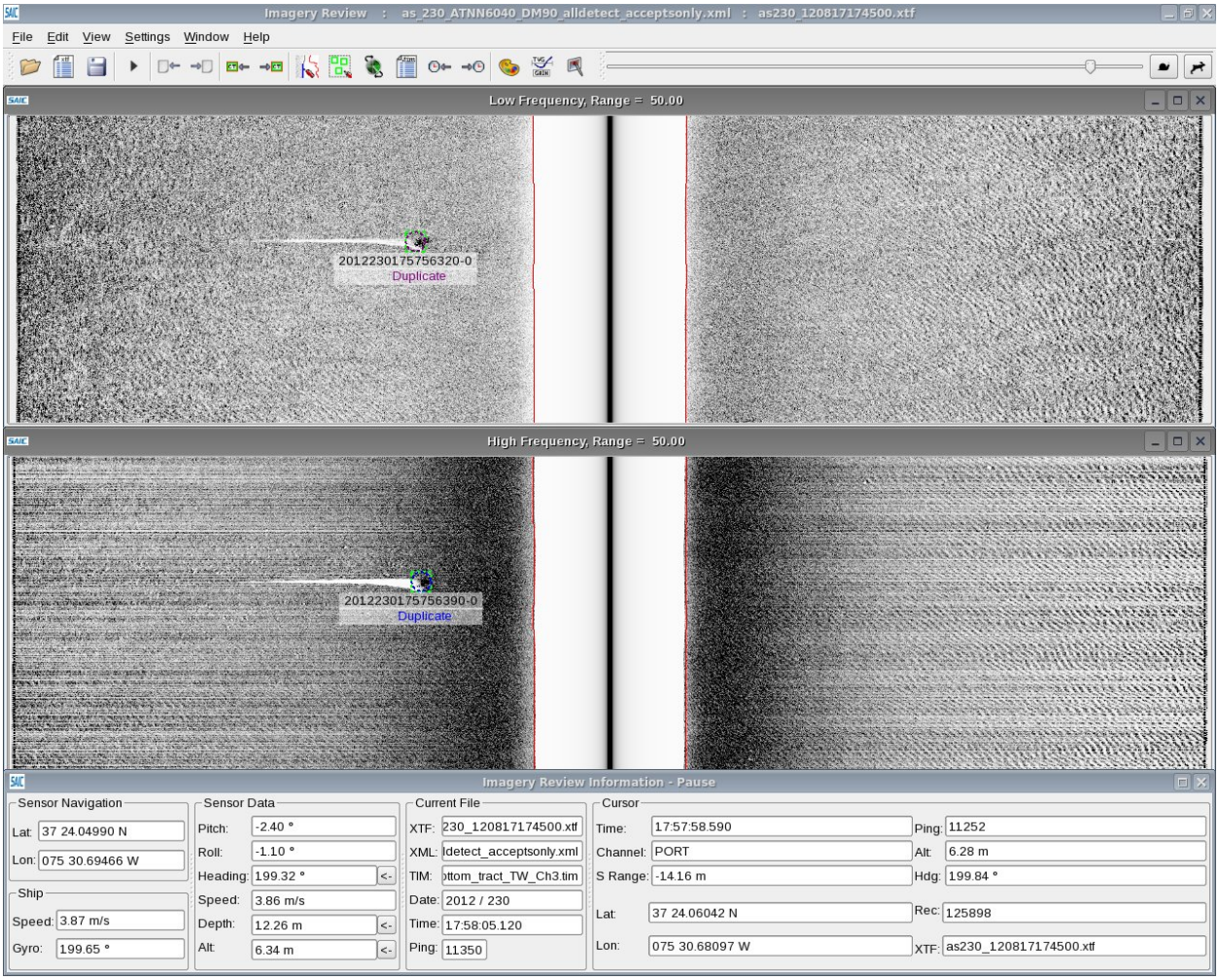
Imagery Review : as_230_ATNN6040_DM90_alldetect_acceptsonly.xml : as230_120817174500.xtf
File Edit View Settings Window Help
Low Frequency, Range = 50.00
2012230175756320-0
Duplicate
High Frequency, Range = 50.00
2012230175756390-0
Duplicate
Imagery Review Information - Pause
Sensor Navigation
Lat: 37 24.04990 N
Lon: 075 30.69466 W
Ship
Speed: 3.87 m/s
Gyro: 199.65 °
Sensor Data
Pitch: -2.40 °
Roll: -1.10 °
Heading: 199.32 °
Speed: 3.86 m/s
Depth: 12.26 m
Alt: 6.34 m
Current File
XTF: 230_120817174500.xtf
XML: ldetect_acceptsonly.xml
TIM: ttom_tract_TW_Ch3.tim
Date: 2012 / 230
Time: 17:58:05.120
Ping: 11350
Cursor
Time: 17:57:58.590
Ping: 11252
Channel: PORT
Alt: 6.28 m
S Range: -14.16 m
Hdg: 199.84 °
Lat: 37 24.06042 N
Rec: 125898
Lon: 075 30.68097 W
XTF: as230_120817174500.xtf

Figure 1.1.4

APPROVAL PAGE

H12396

Data meet or exceed current specifications as certified by the OCS survey acceptance review process. Descriptive Report and survey data except where noted are adequate to supersede prior surveys and nautical charts in the common area.

The following products will be sent to NGDC for archive

- H12396_DR.pdf
- Collection of depth varied resolution BAGS
- Processed survey data and records
- H12396_GeoImage.pdf

The survey evaluation and verification has been conducted according current OCS Specifications, and the survey has been approved for dissemination and usage of updating NOAA's suite of nautical charts.

Approved:_____

Lieutenant Commander Abigail Higgins, NOAA
Chief, Atlantic Hydrographic Branch