

H12342

NOAA FORM 76-35A

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

DESCRIPTIVE REPORT

Type of Survey: Navigable Area

Registry Number: H12342

LOCALITY

State: Virginia

General Locality: Approaches to Chesapeake Bay, VA

Sub-locality: 13 NM SE of Rudee Inlet

2011

CHIEF OF PARTY
CDR Lawrence T. Krepp
NOAA

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DATE

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| NOAA FORM 77-28 (11-72) | U.S. DEPARTMENT OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION | REGISTRY NUMBER: <p style="text-align: center; font-size: 1.2em;">H12342</p> |
| <p style="font-size: 1.2em; font-weight: bold;">HYDROGRAPHIC TITLE SHEET</p> | | |

INSTRUCTIONS: The Hydrographic Sheet should be accompanied by this form, filled in as completely as possible, when the sheet is forwarded to the Office.

| | | | |
|----------------------------|--|-----------------|-----------------------------|
| State: | Virginia | | |
| General Locality: | Approaches to Chesapeake Bay | | |
| Sub-Locality: | 13 NM Southeast of Rudee Inlet | | |
| Scale: | 1:20,000 | Date of Survey: | 05/24/11 to 06/13/11 |
| Instructions Dated: | 06 April, 2011 | Project Number: | OPR-D304-TJ-11 |
| Vessel: | NOAA Ship <i>Thomas Jefferson</i> | | |
| Chief of Party: | CDR Lawrence T. Krepp, NOAA | | |
| Surveyed by: | <i>Thomas Jefferson</i> Personnel | | |
| Soundings by: | Reson 7125 multibeam echo sounder. | | |
| Graphic record scaled by: | N/A | | |
| Graphic record checked by: | N/A | | |
| Protracted by: | N/A | Automated Plot: | N/A |
| Verification by: | <i>Atlantic Hydrographic Branch Personnel</i> | | |
| Soundings in: | Meters at MLLW | | |

Remarks:

- 1) *All Times are in UTC.*
- 2) *This is a Navigable Area Hydrographic Survey.*
- 3) *Projection is NAD83, UTM Zone 18.*

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. Revisions and Red notes were generated during office processing. The processing branch concurs with all information and recommendations in the DR unless otherwise noted. Page numbering may be interrupted or non-sequential. All pertinent records for this survey, including the Descriptive Report, 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 H12306

Project OPR-D304-TJ-11
 Approaches to Chesapeake Bay, VA
 13 NM SE of Rudee Inlet
 Scale 1:20,000
 May 24th – June 13th, 2011
NOAA Ship *Thomas Jefferson*

A. AREA SURVEYED

This hydrographic survey was completed as specified by Hydrographic Survey Project Instructions OPR-D304-TJ-11 Change 1, dated 6th April, 2011.

| Northern limit | Southern limit | Eastern limit | Western limit |
|----------------|----------------|---------------|---------------|
| 36-44-56.85N | 36-35-59.53N | 075-44-50.04W | 075-49-42.42W |

Data acquisition was conducted from May 24th – June 13th, 2011.

The purpose of this project is to provide contemporary surveys to update National Ocean Service (NOS) nautical charting products. The project will address the concerns raised by the Virginia Pilots about the under keel clearance of deep draft coal ships transiting through the area southeast of the deep draft lane sea buoy. The project will also provide data in the area of two potential new shipping access areas, proposed by the Virginia Maritime Association. This project will cover approximately 364 nm² of which 170 nm² are critical survey areas as designated in NOAA Hydrographic Survey Priorities, 2010 edition.

| | Linear Nautical Miles |
|---|-----------------------|
| LNM Single beam mainscheme only | N/A |
| LNM Multibeam mainscheme only | N/A |
| LNM Lidar mainscheme only | N/A |
| LNM Side Scan Sonar mainscheme only | N/A |
| Lineal nautical miles of any combination of the above techniques (SSS 200%, MBES) | 935.8 |
| LNM Crosslines singlebeam and multibeam combined | 81.5 |
| LNM Lidar Crosslines | N/A |
| LNM development lines non mainscheme | 18.7 |
| LNM shoreline/nearshore investigations | N/A |
| Number of Bottom Samples | 4 |
| Number of items investigated that required additional time/effort in the field beyond the above survey operations | N/A |
| Total number of square nautical miles | 37.9 |

Table 1: Hydrographic Survey Statistics

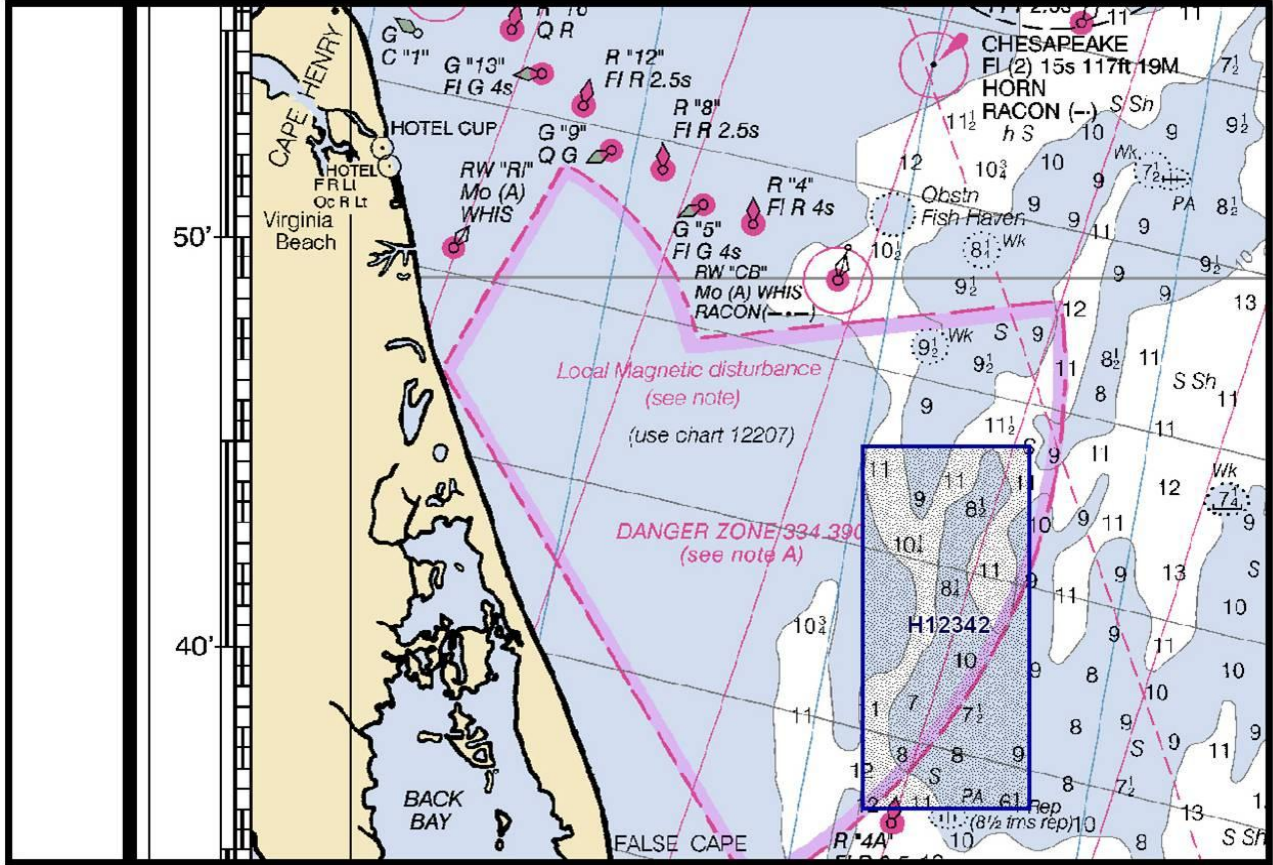


Figure 1: H12342 Survey Area

| Calendar Date | Julian Day |
|---------------|------------|
| 24-May-2011 | 144 |
| 25-May-2011 | 145 |
| 01-June-2011 | 152 |
| 02-June-2011 | 153 |
| 03-June-2011 | 154 |
| 04-June-2011 | 155 |
| 05-June-2011 | 156 |
| 06-June-2011 | 157 |
| 07-June-2011 | 158 |
| 08-June-2011 | 159 |
| 12-June-2011 | 163 |
| 13-June-2011 | 164 |

Table 2: SSS/ MBES Acquisition Dates

B. DATA ACQUISITION AND PROCESSING

Refer to *OPR-D304-TJ-11 Data Acquisition and Processing Report (DAPR)* for a complete description of data acquisition and processing systems, survey vessels, quality control procedures and data processing methods. Additional information to supplement sounding and survey data, and any deviations from the DAPR are included in this descriptive report.

B 1. EQUIPMENT AND VESSELS

Data were acquired by NOAA Ship *Thomas Jefferson*. NOAA Ship *Thomas Jefferson* acquired Reson 7125 multibeam echo sounder (MBES) soundings, Klein 5000 Side Scan Sonar (SSS) imagery, and sound velocity profiles. Sea bed samples were collected by NOAA Ship *Thomas Jefferson*. Vessel configurations, equipment operation and data acquisition and processing were consistent with specifications described in the *DAPR*, except that sounding reduction to chart datum was accomplished via Ellipsoid Referenced Survey techniques. ERS is discussed further in the Horizontal and Vertical Control section of this report.

B 2. QUALITY CONTROL

B 2.1 System Certification and Calibration

Refer to NOAA Ship *Thomas Jefferson's DAPR* for a complete description of system integration and initial calibration results for equipment and sensors used for this survey.

B.2.2 Coverage

In accordance with the Project Instructions, this survey was conducted using 200% SSS coverage with concurrent MBES bathymetry and with object detection MBES developments over navigationally significant features.

Comparison of the 200% mosaic to the sheet limits assigned in the PRF reveals what appears to be a long holiday extending along the eastern edge of the coverage. However, when compared to the coverage from H12341, there is sufficient overlap between the 200% mosaic from H12342 and the 100% mosaic of H12341. Likewise, there is sufficient overlap between the 100% mosaic of H12342 and the 200% mosaic of H12341, such that no gap in coverage exists between the two surveys.

To determine if holidays existed in the mosaics, the background color in CARIS BathyDataBase was set to red. Then, the mosaic was set to grayscale and a systematic review of the mosaic was performed. Areas with a holiday in the mosaic show up as bright red making them easy to detect. Holidays were marked by digitizing a \$CSYMB S57 Feature over each holiday. The same process was repeated for both the 100% and the 200% mosaics. Next, the \$CSYMB features were color coded to indicate the mosaic used to digitize them. In the example shown in Figure 2, the 100% holidays are shown as red symbols and the 200% holidays are shown as blue symbols.

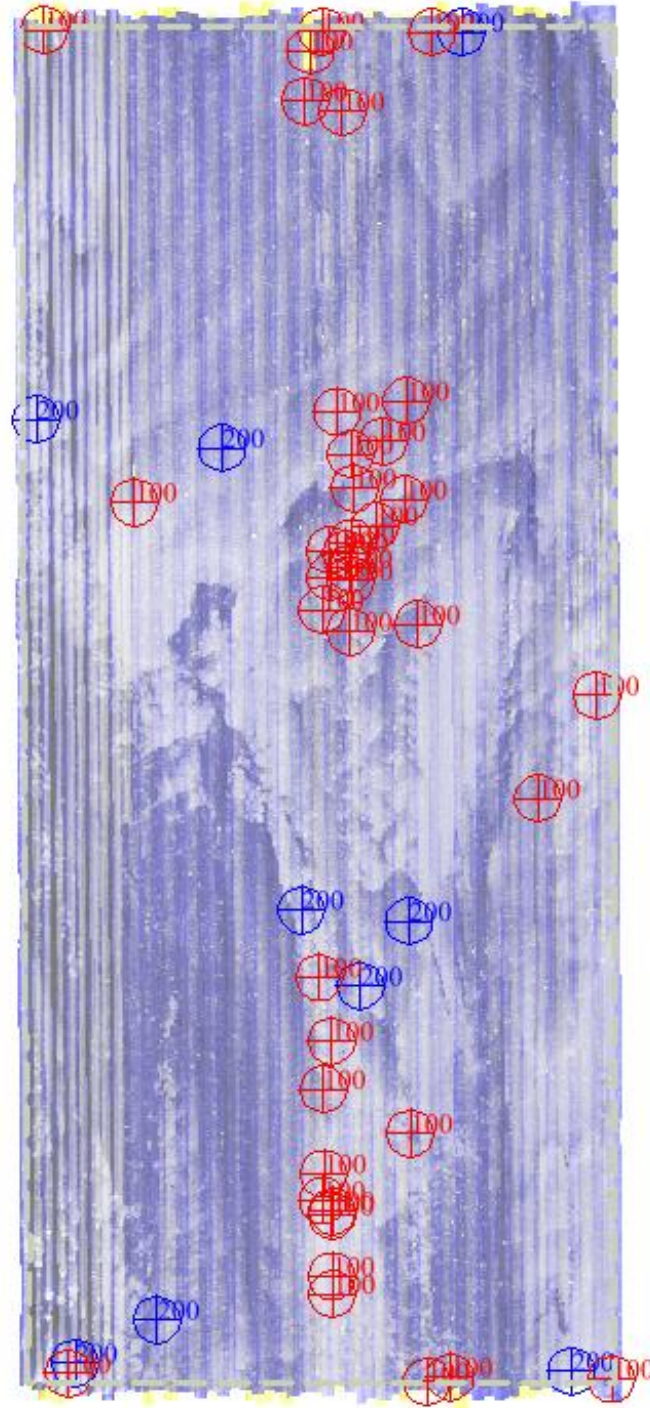


Figure 2: 100% and 200% Side Scan Holidays – red symbols indicate 100% holidays and blue symbols indicate 200% holidays. There are no areas of coincident holidays in the 100% and 200% mosaics.

There are 39 holidays in the 100% mosaic. Most of these are the result of over cleaning the navigation data during processing. These small holidays are considered insignificant. There are two holidays along the north end of the survey limits that were caused by a delayed start of the survey lines during acquisition. The remaining holidays were created when the ship was off line during acquisition. The 100% holidays are listed in Table 3, below.

| Latitude | Longitude |
|---------------------|----------------------|
| 36-44-53.23N | 075-49-29.88W |
| 36-44-45.15N | 075-47-20.09W |
| 36-44-25.13N | 075-47-22.62W |
| 36-44-21.12N | 075-47-04.59W |
| 36-44-52.29N | 075-46-20.87W |
| 36-42-27.15N | 075-46-33.12W |
| 36-41-04.83N | 075-47-14.41W |
| 36-41-27.11N | 075-47-02.82W |
| 36-41-31.26N | 075-46-59.61W |
| 36-41-48.39N | 075-46-34.10W |
| 36-40-59.07N | 075-46-27.78W |
| 36-38-40.03N | 075-47-15.67W |
| 36-38-14.83N | 075-47-09.94W |
| 36-37-38.54N | 075-46-31.42W |
| 36-37-55.92N | 075-47-13.85W |
| 36-36-03.80N | 075-49-18.08W |
| 36-36-42.17N | 075-47-09.51W |
| 36-41-21.32N | 075-47-00.83W |
| 36-41-16.37N | 075-47-00.47W |
| 36-41-17.57N | 075-47-10.40W |
| 36-41-28.17N | 075-47-10.55W |
| 36-42-06.10N | 075-47-00.28W |
| 36-41-52.85N | 075-46-58.79W |
| 36-37-22.57N | 075-47-13.51W |
| 36-37-12.08N | 075-47-14.05W |
| 36-37-06.14N | 075-47-09.82W |
| 36-37-07.84N | 075-47-09.43W |
| 36-36-35.20N | 075-47-09.18W |
| 36-40-56.34N | 075-47-00.89W |
| 36-41-37.99N | 075-46-48.26W |
| 36-36-00.60N | 075-46-23.27W |
| 36-36-02.39N | 075-46-11.89W |
| 36-39-50.43N | 075-45-29.24W |
| 36-36-01.71N | 075-44-53.18W |
| 36-40-31.09N | 075-45-00.40W |
| 36-44-52.63N | 075-47-14.43W |
| 36-42-22.82N | 075-47-07.01W |
| 36-42-11.23N | 075-46-44.53W |
| 36-41-47.28N | 075-48-45.77W |

Table 3: Approximate positions of holidays in 100% side scan mosaic

There are 9 holidays in the 200% mosaic. Most of these are the result of over cleaning the navigation data during processing. These small holidays are considered insignificant. Only 1 holiday in the 200% mosaic was created when ship got off line during acquisition. The 200% holidays are listed in Table 4, below.

| Latitude | Longitude |
|--------------|---------------|
| 36-36-24.94N | 075-48-34.80W |
| 36-42-19.77N | 075-49-33.62W |
| 36-38-36.60N | 075-46-55.89W |
| 36-39-02.18N | 075-46-31.92W |
| 36-36-07.95N | 075-49-14.79W |
| 36-44-52.36N | 075-46-06.20W |
| 36-39-06.63N | 075-47-24.46W |
| 36-36-04.63N | 075-45-12.78W |
| 36-42-08.64N | 075-48-03.18W |

Table 4: Approximate positions of holidays in 200% side scan mosaic

The 100% and 200% holidays were examined together to determine if any holidays existed in both mosaics at the same location. Figure 2 illustrates that none of the holidays are co-located. To further verify coverage requirements, the MBES combined grid was opened and each side scan holiday was examined against the MBES coverage.

B 2.3 Crosslines

Multibeam echosounder cross-lines totaling 81.5 LNM, approximately 8.7% of the main scheme multibeam hydrography, were acquired during the course of the survey. As per email dated 10 Sept, 2009 from AHB located in the Descriptive Report, Appendix 5, quality control was performed using the standard deviation layer of the survey's CUBE surface. Areas of unusually high standard deviation (>50cm) were investigated and resolved in processing, except where caused by areas of high bathymetric relief or as described in Section 2.5 Systematic Errors, such that 100% of the nodes in the combined surface meet IHO Order 1 total vertical uncertainty (TVU) requirements.

B 2.4 Junctions and Prior Surveys

The following contemporary surveys junction with H12342, see Figure 3.

| Registry # | Scale | Date | Field Party | Junction side |
|------------|----------|------|-------------------------|---------------|
| H11568 | 1:40,000 | 2006 | <i>Thomas Jefferson</i> | Northeast |
| H12341 | 1:20,000 | 2011 | <i>Thomas Jefferson</i> | East |
| H12316 | 1:20,000 | 2011 | <i>Thomas Jefferson</i> | Northwest |
| H12343 | 1:20,000 | 2011 | <i>Thomas Jefferson</i> | West |

Table 5: Junction Surveys

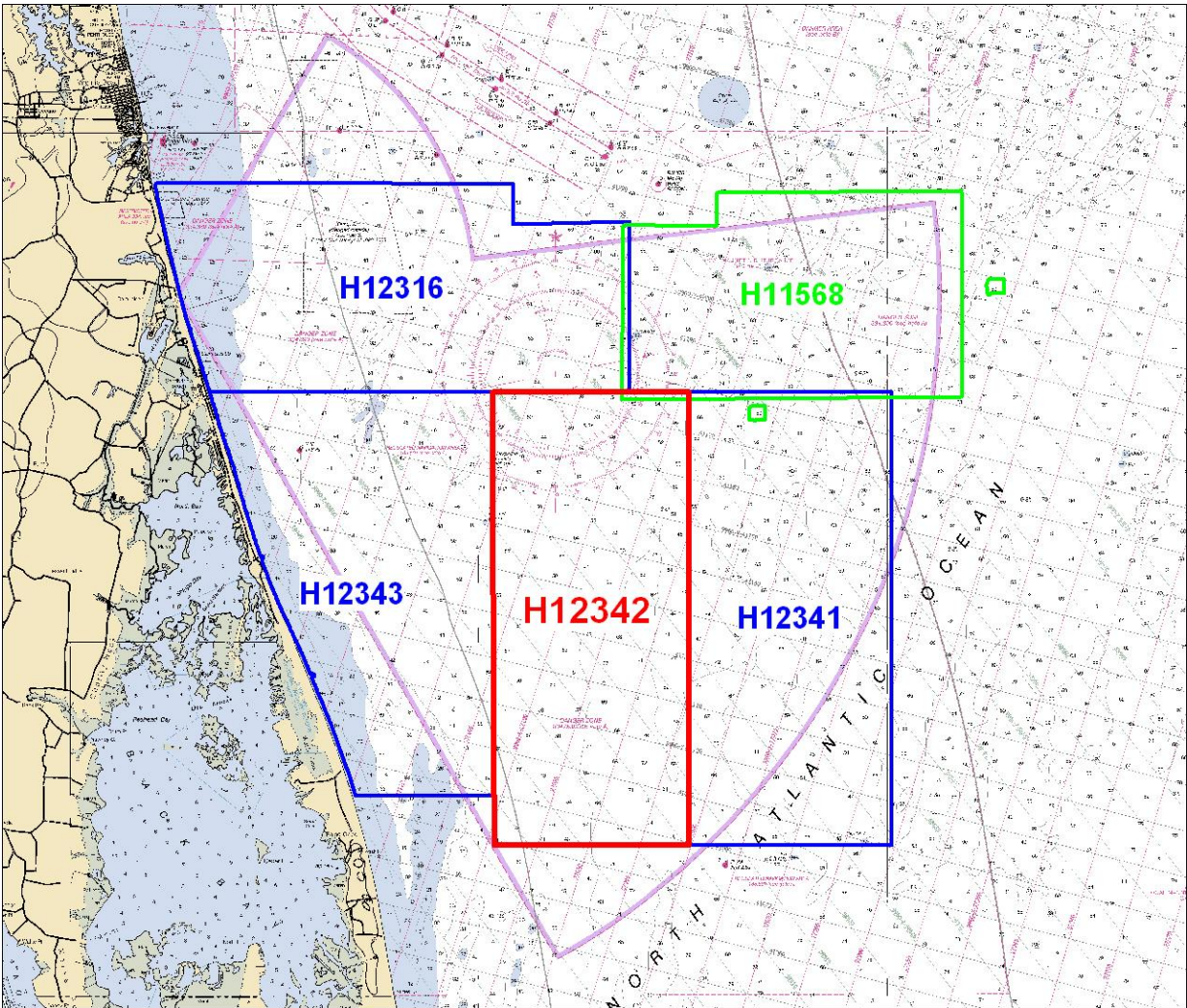


Figure 3: Junction Surveys.

93% of the soundings that junction between H12342 and H11568 agree within 1 foot. 90% of the soundings that junction between H12342 and H12341 agree within 1 foot. 99.7% of the soundings that junction between H12342 and H12343 agree within 1 foot. Greater than 99.9% of the soundings that junction between H12342 and H12316 agree within 1 foot.

B 2.5 Systematic Errors

There is an across track artifact displayed in much of the multi-beam data which is caused by refraction. During survey acquisition, thermocline was present at or near the same depth as the ship's transducer (approximately 5 meters). The intake for the surface sound velocity sensor (SSVS) is located near centerline of the ship, flush against the hull, while the transducer is on a mount that extends away from the hull by at least a meter. When a density layer is present between the water's surface and the transducer, as was common during this survey, laminar flow across the hull frequently brings water of a different density into the SSVS. When this occurs, there is a discrepancy between the sound speed measured at the SSVS and the actual sound speed at the transducer face. These discrepancies cause refraction issues that will vary in magnitude

based on the differences in sound speed. Despite taking many sound speed casts with the moving vessel profiler (approximately every 30 minutes), there is still often as much as 40 – 50 cm of refraction present in the outer beams, refer to Figures 4 and 5.

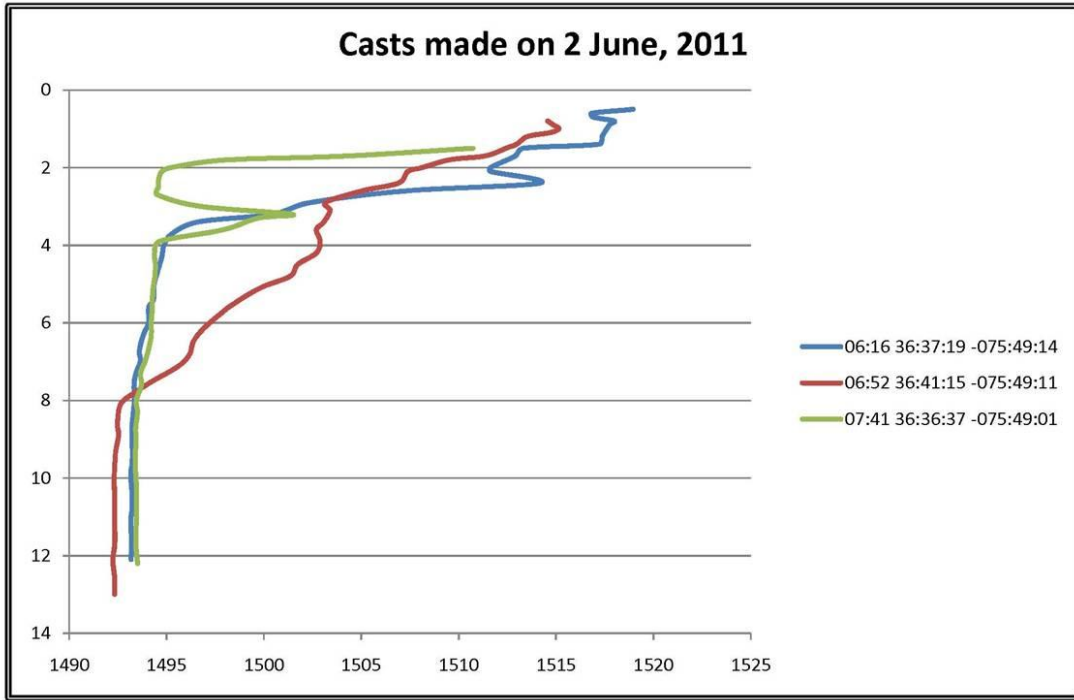


Figure 4: MVP casts made between 06:16 and 07:41 GMT on the 2nd of June 2011. Depths are in meters ('Y' axis) and sound speed is in meters per second ('X' axis). Note that the ship transducer depth is approximately 5 meters and the sound speed at that depth varies over a range in excess of 6 meters/second at this depth between successive casts. Furthermore, the sound speed varies by as much as 20meter/second between 2-3 meters depth.

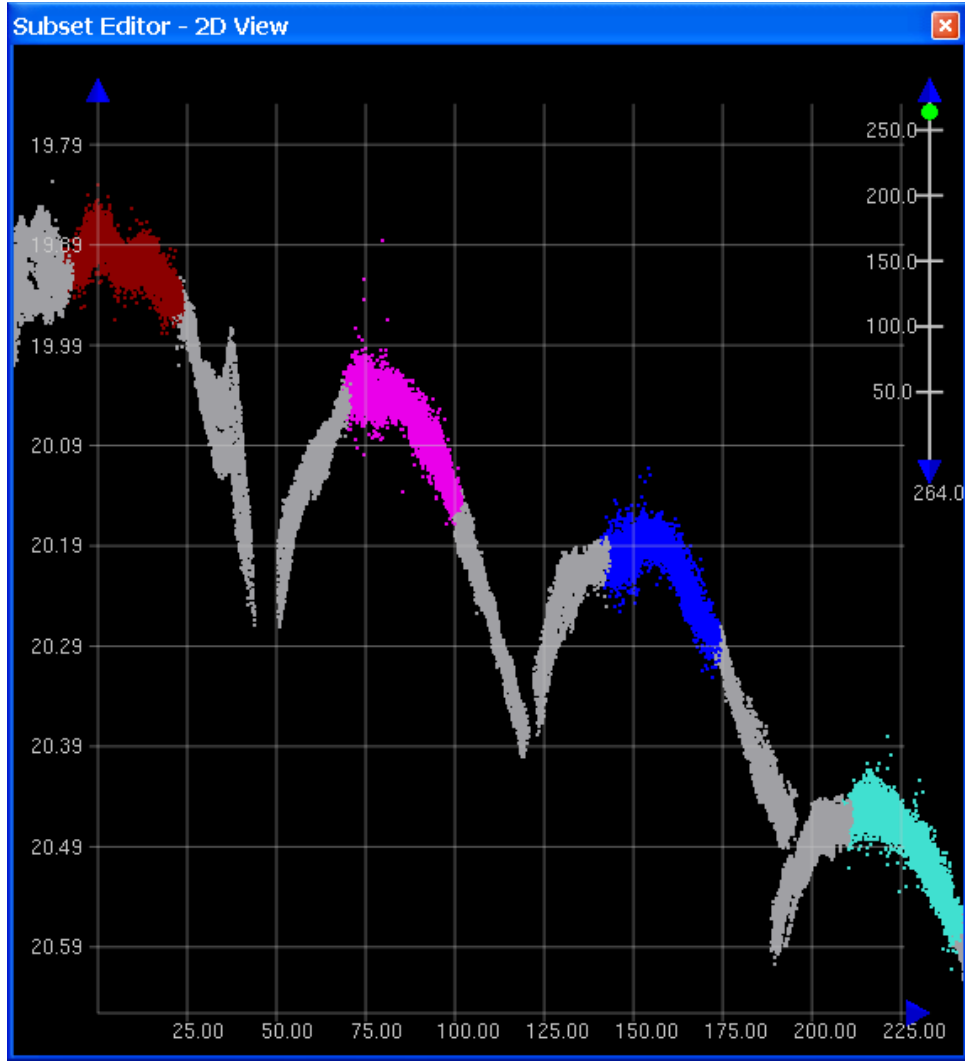


Figure 5: 2-D MBES subset illustrating soundings filtered to remove refraction artifacts from bathymetry surfaces. ‘X’ and ‘Y’ axis are both in meters and vertical exaggeration 264 times normal to show the extent of refraction more clearly.

As object detection is primarily achieved by the 200% side scan, and the multi-beam data is used for concurrent bathymetry, the outer beams were edited to remove areas of severe refraction. Soundings more than 15 meters either side of nadir were filtered out, thereby eliminating much of the refraction artifacts. See Figure 6, for the distribution of standard deviation in the 2m resolution combined surface.

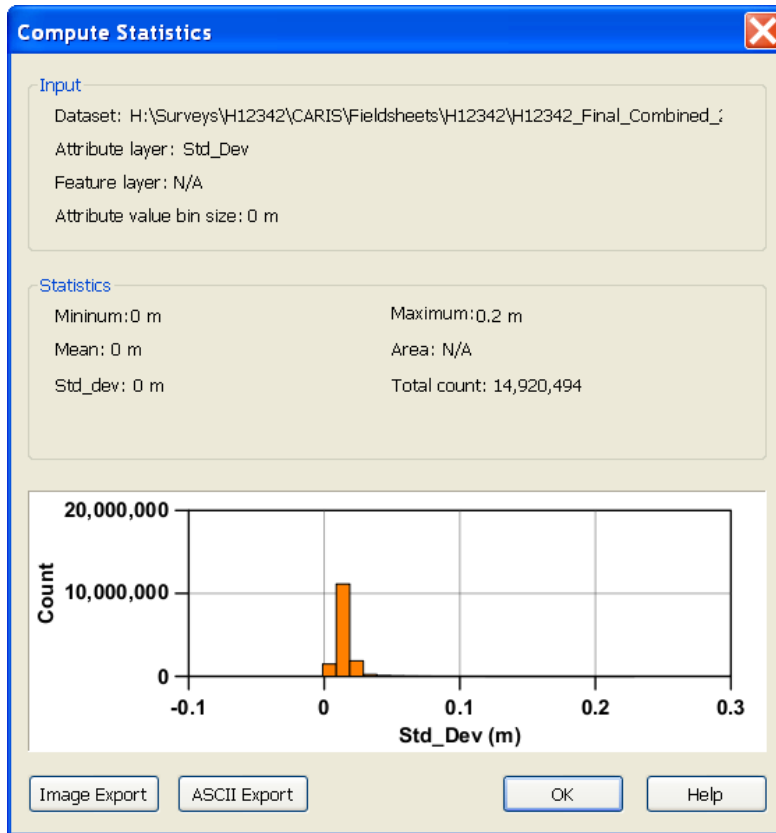


Figure 6: Standard Deviation distribution for the 2m Combined surface. Standard deviation is shown at 1-sigma (67% confidence interval)

B 3. CORRECTIONS TO ECHO SOUNDING

On September 14, 2011, HSD approved surveys from OPR-D304-TJ-11 for vertical reduction to chart datum, Mean Lower Low Water (MLLW), using the NOAA published Vertical Datum Transformation (VDatum) Toolset. See Appendix V, *OPR-D304_Vdatum Approval_signed.pdf*

All survey lines were processed to the ellipsoid and reduced to chart datum via VDatum with the exception of survey lines listed in Table 4, below. On DN 157, the data downloaded from the CORS stations failed validation (Figure 7). The reason for this failure is unknown and was not persistent; no further issues with these CORS stations occurred. Additionally, all crosslines have traditional tide zoning applied.

Lines reduced to chart datum via traditional discrete tide zoning used verified water levels from Duck, NC (8651370) using preliminary zoning accepted as final zoning (Figure 8).

| Day Number | Line |
|------------|----------|
| 2011-157 | 231_2243 |
| 2011-157 | 235_1739 |
| 2011-157 | 233_1947 |
| 2011-157 | 232_2010 |
| 2011-157 | 231_2303 |
| 2011-157 | 230_2329 |
| 2011-157 | 236_1635 |
| 2011-157 | 234_1842 |
| 2011-157 | 232_2050 |
| 2011-157 | 233_1907 |
| 2011-157 | 236_1555 |
| 2011-157 | 230_2349 |
| 2011-157 | 235_1659 |
| 2011-157 | 232_2030 |
| 2011-157 | 236_1615 |
| 2011-157 | 231_2223 |
| 2011-157 | 233_1927 |
| 2011-157 | 235_1719 |
| 2011-157 | 234_1822 |
| 2011-157 | 234_1802 |

Table 6: Lines without SBETs

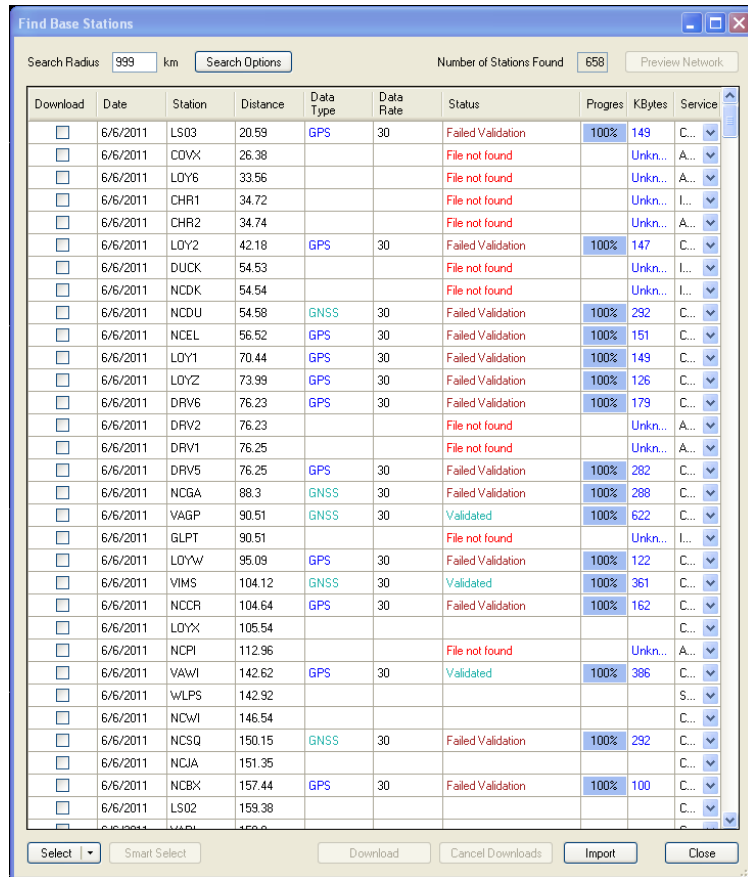


Figure 7: Station Search for 2011-157

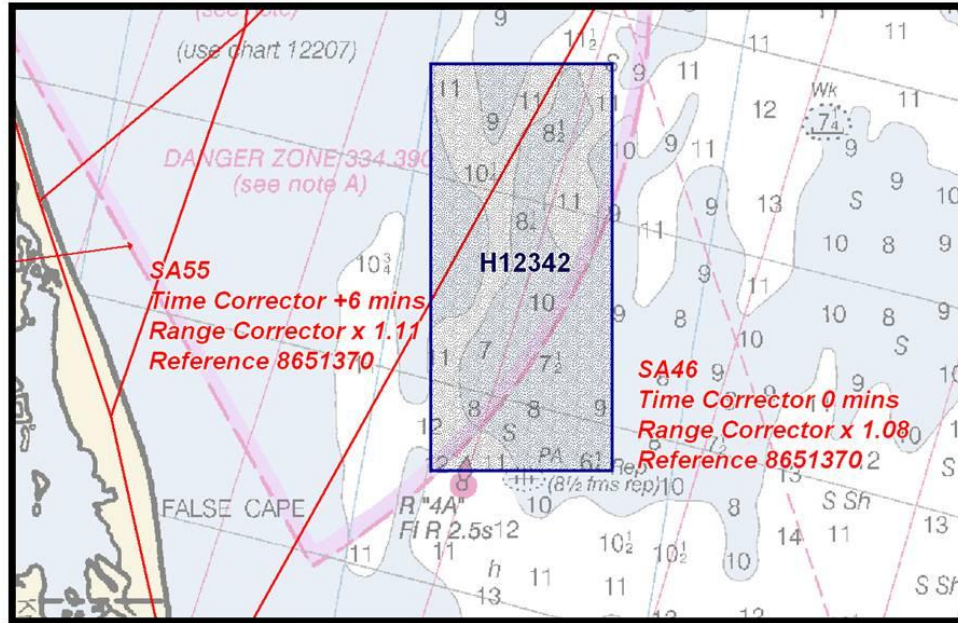


Fig 8: Final Tide Zoning

All other datum reduction procedures conform to those outlined in the DAPR.

All methods and instruments used for sound velocity correction were as described in the DAPR.

Sound velocity corrections for this survey were applied using the ship’s Moving Vessel Profiler (MVP) and Conductivity, Temperature and Depth (CTD) profiler. SVP data were applied in Caris® using the nearest in time option.

B 4. DATA PROCESSING

B 4.1 Total Propagated Error

For the 2011 field season, Total Propagated Uncertainty (TPU) parameters for sound speed, and tides are calculated separately for each project. CO-OPS provides an uncertainty value that is a combination of the tide measurement and the zoning uncertainty. The CO-OPS value is provided at 2-sigma, but CARIS HIPS uses 1-sigma values for processing. The 1-sigma tide value for OPR-D304-TJ-11 is 0.085m. When applying SBETs and using the ellipsoid to MLLW separation model (VDatum SEP Model), the uncertainty of the SEP model is entered in the Tide Measured field for CARIS TPU. The project-specific parameters for OPR-D304-TJ-11, Survey H12342 are as follows:

| Project | Vessel | Tide Values Combined Measured & Zoning | VDatum SEP Model | Sound Velocity Values | | |
|---------|--------|--|------------------|-----------------------|-----|---------|
| | | | | CTD | MVP | Surface |
| D304 | S222 | 0.085 | 0.10 | 4 | 1 | 0.2 |

Table 7: TPU Parameters

These values were calculated for all MBES data following CARIS Merge.

B 4.2 BASE Surfaces and Mosaics

The following table describes all BASE Surfaces submitted as part of Survey H12306:

| <i>Name of Surface</i> | <i>Resolution</i> | <i>Type</i> | <i>Purpose</i> |
|---------------------------|-------------------|-------------|----------------|
| H12342_MBES_2m_1_Final | 2m | CUBE | DTM |
| H12342_MBES_2m_2_Final | 2m | CUBE | DTM |
| H12342_MBES_2m_3_Final | 2m | CUBE | DTM |
| H12342_Final_Combined_2m | 2m | CUBE | DTM |
| H12342_Torpedo_Final | 50 cm | CUBE | Development |
| H12342_Wreck_Final | 50 cm | CUBE | Development |
| H12342_SSS_100%_mosaic_1m | 1m | Mosaic | 100% SSS |
| H12342_SSS_200%_mosaic_1m | 1m | Mosaic | 200% SSS |

Table 8: BASE Surfaces

This survey was processed using the Combined Uncertainty and Bathymetry Estimator (CUBE) algorithm. The CUBE configuration was set to NOAA_2m for all main scheme surfaces, and NOAA_0.5m for all MBES developments. Refer to the *2011 Data Acquisition and Processing Report*, *2011 Field Procedures Manual*, and *CARIS HIPS and SIPS User Guide* for further discussion.

B 4.3 Data Cleaning

The survey data was cleaned using the swath and subset editor tools in CARIS. Areas of the BASE surface that indicated high standard deviation (>50cm) were examined and cleaned as required such that 100% of the nodes in the combined surface meet IHO Order 1 TVU specifications.

C. HORIZONTAL AND VERTICAL CONTROL

As per Field Procedures Manual section 5.2.3.2.3 a Horizontal and Vertical Control Report was not filed as no horizontal and vertical control stations were established by the field party for this survey. A summary of horizontal and vertical control for this survey follows.

C 1.1 Horizontal Control

The horizontal datum for this project is the North American Datum of 1983 (NAD83). Differential GPS (DGPS) was the sole method of positioning. Differential corrections from the U.S. Coast Guard beacon at Driver, VA (289 kHz) were used during this survey except during a period on 2nd of June when the beacon at Driver went down and 294 KHz (New Bern, NC) was used. See acquisition log for that day for times.

POSPAC Smoothed Best Estimate Trajectory (SBET) files were processed and applied to survey lines to improve the horizontal positioning. Uncertainty for survey data with SBET navigation applied was on the order of 10cm or less for vessel 2-D positioning. CORS base stations used to process SBETs are listed in Table 8.

C 1.2 Vertical Control

The vertical datum for this project is Mean Lower-Low Water (MLLW). The operating National Water Level Observation Network (NWLON) stations at Chesapeake Bay Bridge Tunnel, VA (8638863) and Duck, NC (8651370) will serve as datum control for H12342. A request for delivery of final approved (verified) tides for this survey was forwarded to N/OPS1 on 17 June 2011 in accordance with the FPM and project letter instructions. Preliminary zoning was approved as Final zoning. Refer to documentation in Appendix IV of this Descriptive Report for further details.

CORS stations listed in Table 8 serve as datum control for survey lines reduced via Ellipsoid Reference Survey (ERS) methods.

| CORS Base Stations |
|--------------------|
| LOY2 |
| LS03 |
| NCDU |
| NCEL |
| NJCM |
| VIMS |
| VAWI |
| LOY1 |
| VAMI |
| VAGP |

Table 9 – CORS stations used to process SBETs on H12342

(Note : Each SBET was processed using correctors from 5-6 stations listed in the table. Different combinations were used on each SBET created based on data available for the day)

D. RESULTS AND RECOMMENDATIONS

D.1 Chart Comparison

D 1.1 Chart 12207 Comparison

Survey H12342 was compared to Chart 12207, (22nd Ed., October 2009, 1:80,000), the largest scale chart covering the survey area.

In the northern section of the sheet (the area corresponding to the 1970-1989 survey data from the chart's source table), soundings generally agree within 1-3 ft. There are no significant areas of shoaling.

In the southern section of the sheet (the area corresponding to the 1900-1939 survey data from the chart's source table), soundings were generally 4-6ft shoaler than charted. There was significant shoaling in the southern sections as indicated in Figure 9. This shoaling is not dangerous to navigation as there are charted depths in the area that are shoaler.

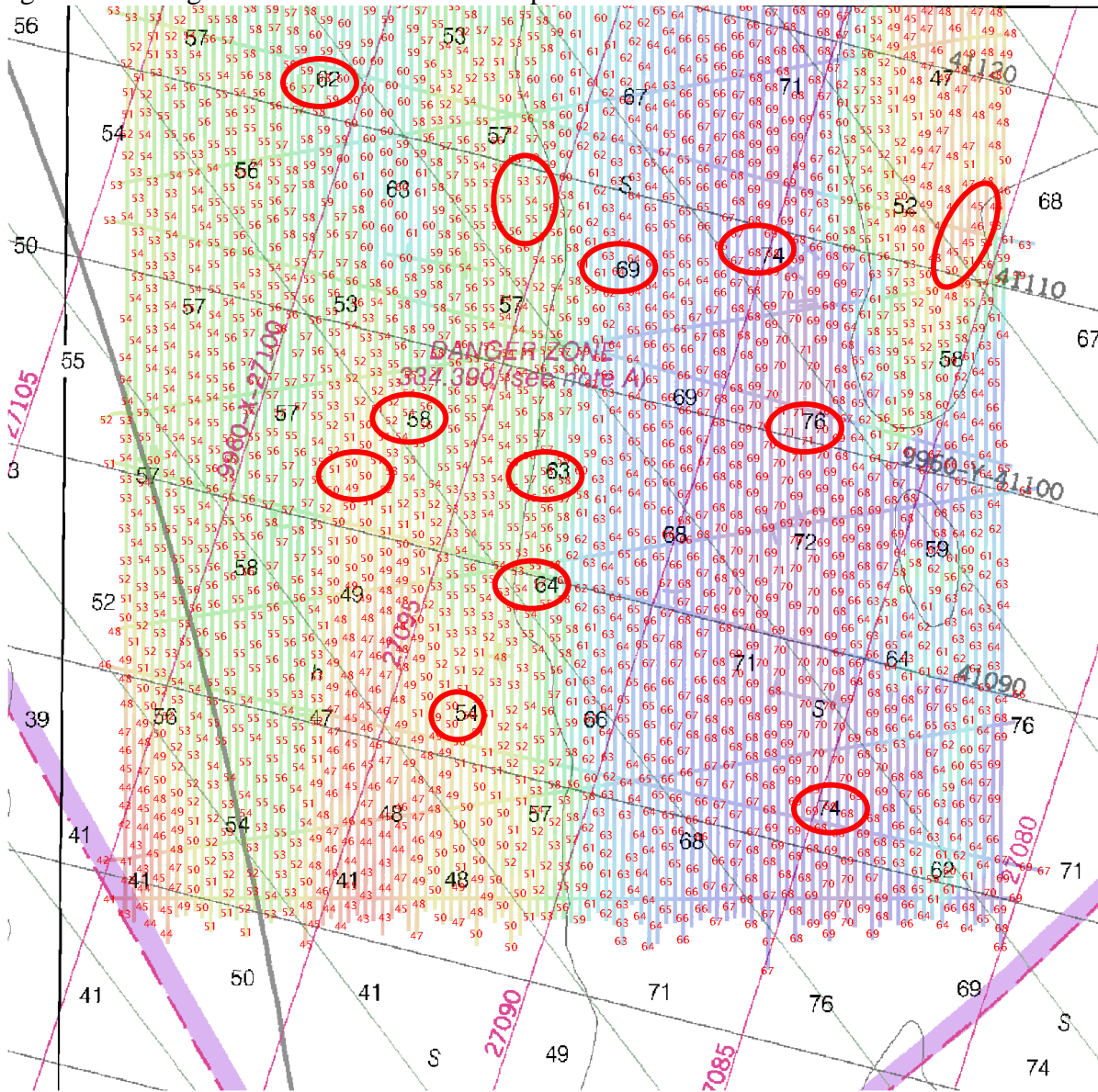


Figure 9: Shoal Areas in Comparison with Chart 12207

D 1.2 ENC US4NC32M Comparison

Generally soundings were 50cm to 2m shoaler throughout the surveyed area of this chart. This reflects the age of the currently charted data.

D 1.3 ENC US5VA11M Comparison

Generally soundings agree within 50cm of charted depths.

D.2 Additional Results

D.2.1 Automated Wreck and Obstruction Information Service (AWOIS) Items

One AWOIS item, AWOIS #14883, was assigned for investigation for this survey. Refer to the Feature Report in Appendix II of this survey for details.

D.2.4 Shoreline

There is no shoreline within the sheet limits of survey H12342. One S57 feature from the project's CSF files lies within the sheet limits for H12342. This item is the charted feature corresponding to AWOIS #14883. Refer to the Feature Report in Appendix II of this survey for details.

D.2.5 Charted Features

D.2.6 Charted Pipelines and Cables

No cables or pipelines are charted within the survey limits of H12342. Additionally, no cables or pipelines were observed during the course of the survey, so if any cables or pipelines do exist, they are assumed to be properly buried.

D.2.7 Bridges, Ferry Routes, and Overhead Cables

There are no ferry routes, bridges, or overhead cable crossings within the limits of the survey.

D.3 Dangers to Navigation and Shoals

D 3.1 Dangers to Navigation

No dangers to navigation were found or reported to the NOAA's Office of Coast Survey.

D 3.2 Shoals

There were no significant uncharted shoals discovered during this survey, but some shoal migration was observed as discussed in section D.1 Chart Comparisons.

D.4 Aids to Navigation

There are no charted Aids to Navigation (ATON) within the limits of H12342.

D.5 Coast Pilot Information

The Hydrographer has no recommendations for changes or addenda to the Coast Pilot.

D.6 Bottom Samples

Bottom samples were taken in accordance with section 7.1 of the NOS Hydrographic Survey Specifications and Deliverable, dated April 2011. A total of four bottom samples were acquired. A list of all bottom samples acquired during Survey H12342 is contained in Appendix V of this report and in the Feature Report in Appendix II. Additionally, a .hob file containing the S57 attributed bottom samples is included in the S57Features folder included in this survey's submission directory.

D.7 Environmental Conditions and Notes

Thermocline near transducer depth was present for the duration of survey acquisition on H12342. No additional significant environmental conditions were encountered during this survey.

D.8 Adequacy of Survey

This survey is considered complete and adequate to supersede charted depths and features within the survey area outline except as noted in this report.

D.9 Summary and Recommendations for Additional Work

No additional work is needed to complete this survey. Aside from minor shoal migration, no additional changes significant to navigation have been noted and it is recommended that this survey receive normal processing priority.

E. APPROVAL

As Lead Hydrographer, I have ensured that standard field surveying and processing procedures were followed in producing this examination in accordance with the Office of Coast Survey Hydrographic Surveys Division’s *Field Procedures Manual*, and NOS *Hydrographic Surveys Specifications and Deliverables*. Field operations for this basic hydrographic survey were conducted under my daily supervision with frequent checks of progress and adequacy.

All field sheets, this Descriptive Report, and all accompanying records and data are approved. All records are forwarded for final review and processing to N/CS33, Atlantic Hydrographic Branch.

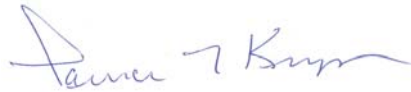
The Data Acquisition and Processing Report for OPR-D304-TJ-11 is submitted separately and contains additional information relevant to this survey.

Approved and Forwarded:



I am approving this document

LT William G. Winner, NOAA
Operations Officer



CDR Lawrence T. Krepp, NOAA
Commanding Officer

APPENDIX I
TIDE NOTE AND GRAPHICS



UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NOAA Ship THOMAS JEFFERSON (MOA-TJ)
439 West York St
Norfolk, VA 23510-1145

June 17, 2011

MEMORANDUM FOR: Chief, Requirements and Development Division, N/OPS1

FROM: CDR Lawrence T. Krepp, NOAA Ship THOMAS JEFFERSON (MOA-TJ)

SUBJECT: Request for Approved Tides/Water Levels

Please provide the following data:

1. Tide Note
2. Final zoning in MapInfo and .MIX format
3. Six Minute Water Level data (Co-ops web site)

Transmit data to the following:

NOAA/NOS/Atlantic Hydrographic Branch
N/CS33, Building #2
439 West York Street
Norfolk, VA 23510
ATTN: Chief AHB

NOAA Ship Thomas Jefferson
439 W York st
Norfolk, VA 23510
ATTN: CDR Lawrence T. Krepp

These data are required for the processing of the following hydrographic survey:

Project No.: OPR-D304-TJ-11
Registry No.: H12342
State: Virginia
Locality: Approaches to Chesapeake Bay, VA
Sublocality: 13 NM Southeast of Rudee Inlet

Attachments containing:

- 1) an Abstract of Times of Hydrography,
- 2) digital MID MIF files of the track lines from Pydro

cc: N/CS33
MOA-TJ



| Year_DOY | Min Time | Max Time |
|----------|----------|----------|
| 2011_144 | 11:13:03 | 19:24:09 |
| 2011_145 | 13:23:49 | 15:46:43 |
| 2011_152 | 13:01:52 | 21:31:51 |
| 2011_153 | 06:08:07 | 21:25:51 |
| 2011_154 | 01:26:37 | 23:53:41 |
| 2011_155 | 00:07:07 | 23:53:40 |
| 2011_156 | 00:06:55 | 21:28:19 |
| 2011_157 | 15:55:42 | 23:54:04 |
| 2011_158 | 00:07:11 | 23:33:30 |
| 2011_159 | 00:06:19 | 14:05:35 |
| 2011_163 | 17:34:25 | 23:51:25 |
| 2011_164 | 00:08:40 | 13:02:01 |



UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Ocean Service
Silver Spring, Maryland 20910

TIDE NOTE FOR HYDROGRAPHIC SURVEY

DATE : June 28, 2011

HYDROGRAPHIC BRANCH: Atlantic
HYDROGRAPHIC PROJECT: OPR-D304-TJ-2011_Rev
HYDROGRAPHIC SHEET: H12342

LOCALITY: 13NM Southeast of Rudee Inlet, Appr. to Ches. Bay, VA
TIME PERIOD: May 24 - June 13, 2011

TIDE STATION USED: 865-1370 Duck, NC
Lat. 36° 11.0'N Long. 75° 44.8' W

PLANE OF REFERENCE (MEAN LOWER LOW WATER): 0.000 meters
HEIGHT OF HIGH WATER ABOVE PLANE OF REFERENCE: 1.027 meters

REMARKS: RECOMMENDED ZONING

Preliminary zoning is accepted as the final zoning for project OPR-D304-TJ-2011_Rev, H12342, during the time period between May 24 and June 13, 2011.

Please use the zoning file "D304TJ2011CORP_Rev" submitted with the project instructions for OPR-D304-TJ-11_Rev. Zones SA55 and SA46 are the applicable zones for H12342.

Refer to attachments for zoning information.

Note 1: Provided time series data are tabulated in metric units (meters), relative to MLLW and on Greenwich Mean Time on the 1983-2001 National Tidal Datum Epoch (NTDE).

Peter J. Stone

Digitally signed by Peter J. Stone
DN: cn=Peter J. Stone, o=NOAA/NOS/CO-OPS,
ou=Oceanographic Division, email=peter.stone@noaa.gov,
c=US
Date: 2011.06.30 15:21:52 -04'00'

CHIEF, OCEANOGRAPHIC DIVISION

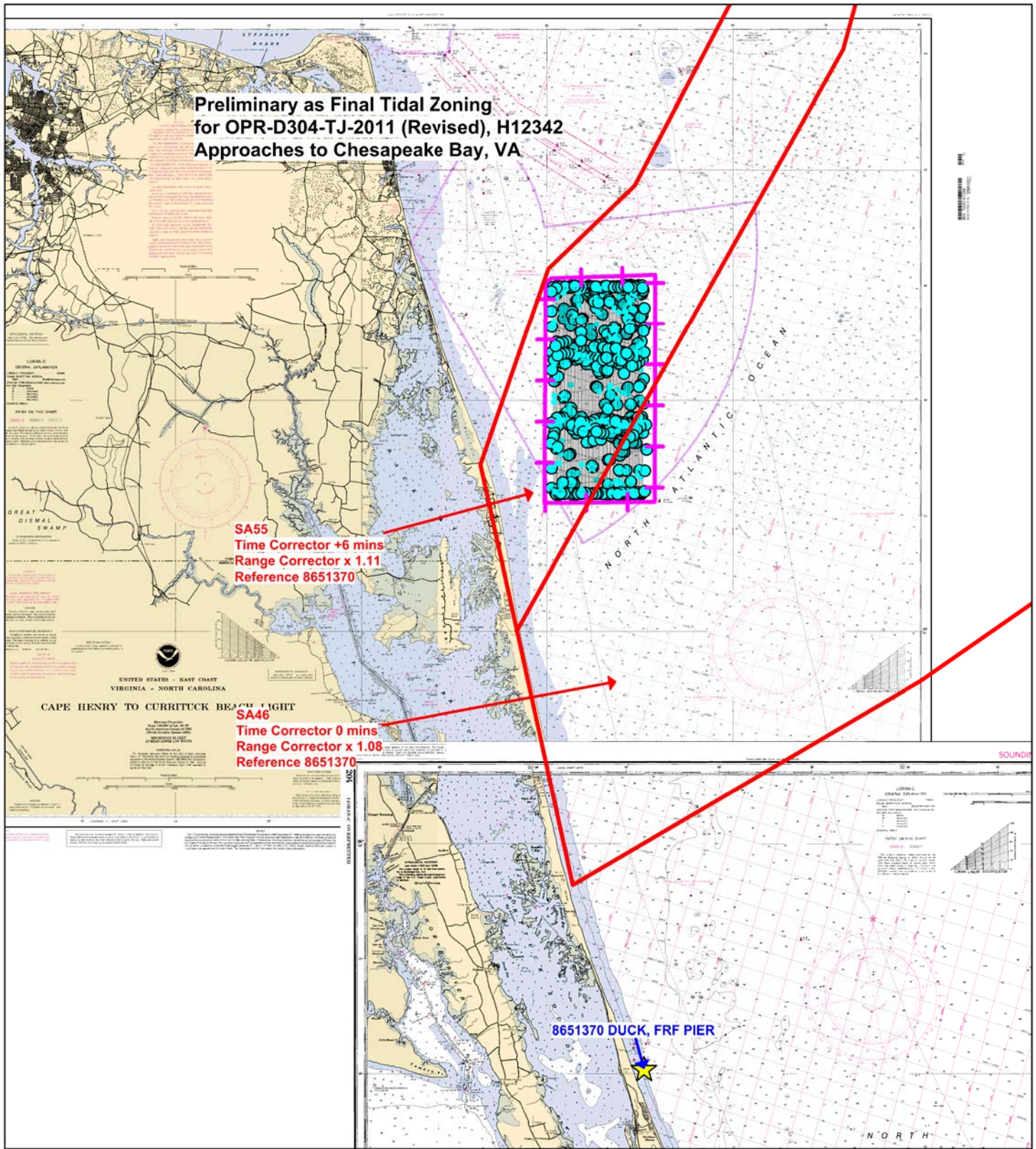


**Preliminary as Final Tidal Zoning
for OPR-D304-TJ-2011 (Revised), H12342
Approaches to Chesapeake Bay, VA**

SA55
Time Corrector +6 mins
Range Corrector x 1.11
Reference 8651370

SA46
Time Corrector 0 mins
Range Corrector x 1.08
Reference 8651370

8651370 DUCK, FRF PIER



APPENDIX II

SUPPLEMENTAL SURVEY RECORDS
AND CORRESPONDENCE



25 July 2012

MEMORANDUM TO: Jeffrey Ferguson
Chief, Hydrographic Surveys Division

FROM: Lawrence T. Krepp, CDR/NOAA
Commanding Officer

SUBJECT: H12342 Interim Deliverables

As per the project instructions for OPR-D304-TJ-11, NOAA Ship *Thomas Jefferson* was tasked with providing a recommendation on the vertical transformation technique to be used for each sheet. This recommendation is based upon an analysis of crossline data processed with TCARI tidal zoning and VDatum ERS. This analysis was performed using Pydro's Post Acquisition Tools.

Crossline Analysis

Crosslines from H12342 were parallel processed with one set of depths reduced to MLLW via TCARI tidal zoning and the other set reduced via VDatum ERS. Pydro's Post Acquisition Tool "Compare Time Series Data" yielded the following results:

File-wise Statistics

ERS_Crosslines_TJ_S222_RESON7125_STBD_MiddlePD.txt | H:\Surveys\H12342\Descriptive Report\Appendices\4_Tides_&_Water_Levels\ERS v TCARI Comaparison

- (minus)

TCARI_Crosslines_TJ_S222_RESON7125_STBD_MiddlePD.txt |

H:\Surveys\H12342\Descriptive Report\Appendices\4_Tides_&_Water_Levels\ERS v TCARI Comaparison

=====

N,mean,stdev = 361209,-0.238,0.165

Sensor-wise Statistics

MiddlePD: N,mean,stdev = 361209,-0.238,0.165

Discussion

Results of the analysis showed that the mean difference between ERS and TCARI tidal corrections was -23.8cm with a standard deviation of 16.5cm.



Recommendation

Our recommendation is to utilize ERS VDatum for tidal corrections for this survey. The results of the analysis show that there are differences between sounding data reduced to MLLW using TCARI and ERS VDatum. However, the ship is more prone to systematic errors resulting from unaccounted changes in static draft and currents and their associated problems with dynamic draft. It is our feeling that the overall uncertainty is less with the use of ERS VDatum.



UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL OCEAN SERVICE
Office of Coast Survey
Silver Spring, Maryland 20910-3282

August 2, 2012

MEMORANDUM FOR: CDR Larry Krepp, NOAA
Commanding Officer, NOAA Ship *Thomas Jefferson*

FROM: Jeffrey Ferguson
Chief, Hydrographic Surveys Division

SUBJECT: Vertical Datum Transformation Technique,
OPR-D304-TJ-11, Approaches to Chesapeake Bay, VA

Hydrographic survey H12342 is approved for vertical reduction to chart datum, Mean Lower Low Water (MLLW), using the NOAA Vertical Datum Transformation (VDatum) (<http://vdatum.noaa.gov>) derived separation (SEP) model provided on the project CD/DVD.

Approval of VDatum, in lieu of the NOAA Center for Operational Oceanographic Products and Services (CO-OPS) TCARI package as per the Project Instructions, is based on your recommendation and the review of comparison results you included in your memo from July 25, 2012, Subject "H12342 Interim Deliverables."

The results of the data analysis show that ellipsoidally referenced survey (ERS) techniques with VDatum used as the vertical datum reducer to MLLW in this area indicate a better internal consistency of the survey data and produces final sounding values that meet or exceed horizontal and vertical specifications for hydrographic surveys. ERS techniques result in shoaler more conservative depths, and best reflect uncertainties associated with dynamic and static draft.

The comparison techniques are in line with the procedures that were developed and approved as part of the CSDL Ellipsoidally Referenced Survey (ERS) project. These procedures and deliverables were added to the April 2012 edition of the NOS Hydrographic Surveys Specifications and Deliverables Manual and Field Procedures Manual documents.

You shall include a description of your ERS processing procedures and the comparisons you conducted between ERS and traditional tides in the appropriate Descriptive Report (DR), Horizontal and Vertical Control Report and/or Data Acquisition and Processing Report.

This memo and your memo, shall be included in the supplemental correspondence Appendix of the DR.



| | | |
|-------------|--|-------|
| From | <Michael.Davidson@noaa.gov> | |
| Sent | Monday, March 28, 2011 8:39 am | |
| To | richard.t.brennan@noaa.gov , sarah.mrozek@noaa.gov | |
| Cc | ops.thomas.jefferson@noaa.gov , co.thomas.jefferson@noaa.gov , chiefst.thomas.jefferson@noaa.gov | |
| Bcc | | |
| Subject | TJ beginning work on OPR-D304-TJ-11 | |
| Attachments | Draft_OPR-D304-TJ-11_ApproachesToChesapeakeBay_Instructions-1.pdf | 1.2MB |

Mid-Atlantic Nav Manager(s),

NOAA Ship Thomas Jefferson will begin survey operations on OPR-D304-TJ-11 on Wednesday evening or Thursday morning. We will begin working on the sheets labeled Sheet 1 and Sheet 7 first. I will be contacting Mr. T.D. Woodward, USACE regarding our survey operations as required in our project instructions (see attached). Please feel free to notify any of our local interests of our survey operations as you see fit.

Let me know if you have any questions or need any further information. Once we receive our final project instruction, I will forward a courtesy copy.

Thank you for your time.

V/R,
Mike

--

LT Michael C. Davidson
Operations Officer
NOAA Ship Thomas Jefferson
439 W York St
Norfolk, VA 23510
michael.davidson@noaa.gov
757-441-6323 ship's landline
757-647-0187 ship's cell

Subject: Re: Crossline comparison

From: Chris van Westendorp <Christiaan.VanWestendorp@noaa.gov>

Date: Thu, 10 Sep 2009 13:00:35 -0400

To: "mark.blankenship" <Mark.Blankenship@noaa.gov>

CC: LCDR Rick Brennan <Richard.T.Brennan@noaa.gov>, Castle Parker <Castle.E.Parker@noaa.gov>, Edward Owens <Edward.Owens@noaa.gov>, LT Jasper Schaer <jasper.schaer@noaa.gov>, CDR Shep Smith <Shep.Smith@noaa.gov>, Daniel Wright <Daniel.Wright@noaa.gov>

Mark,

Per 5.1.4.3 of the HSSD, AHB authorizes TJ to use the Standard Deviation layer to conduct surface difference comparison and analysis on future survey submissions of multibeam data. This meets the crossline comparison requirement laid out in HSSD.

Please let me know if you have any questions or need for further clarification.

R/

LCDR Chris van Westendorp, NOAA

mark.blankenship wrote:

Chris,

You mentioned in the meeting today that AHB was not going to require the multiple CUBE surface comparison, instead allowing us to use a single surface standard deviation layer to do our checks with. Is there any memo coming out for that?

Mark

LCDR Chris van Westendorp <christiaan.vanwestendorp@noaa.gov>

Atlantic Hydrographic Branch

NOAA OCS



Michael Davidson <michael.davidson@noaa.gov>

RE: Survey Submission Structure for passback surveys

1 message

Castle Parker <castle.e.parker@noaa.gov>
To: Michael Davidson <michael.davidson@noaa.gov>

Thu, May 10, 2012 at 3:23 PM

Mike,

I concur. Speaking for AHB, I will accept this deviation from the deliverable specifications. I think that it's important for the directory structure to be consistent at the time of survey submission. Please include this accepted spec deviation in DR Appendix 5.

Thanks for your consideration with this subject and I completely agree with you.

Regards,

Gene

From: Michael Davidson [mailto:michael.davidson@noaa.gov]
Sent: Thursday, May 10, 2012 3:01 PM
To: Castle Parker
Subject: Survey Submission Structure for passback surveys

Gene,

TJ has a few surveys that were passed back for additional work. In the next several weeks, we will be submitting surveys from 2009, 2010, 2011, followed soon there after by current surveys from 2012. In an attempt to make things consistent, I would like to submit all the surveys according to the 2012 Specs and Deliverables. Before doing this, I wanted to check with you to see if this would be considered non-compliant with S&D for the prior year surveys.

If AHB agrees with our proposal to submit all surveys in the 2012 Directory Structure, please email back concurrence and I will include this email thread in Appendix V for documentation.

Thank you for your time.

V/R,

Mike

--

LT Michael C. Davidson

APPENDIX III

SURVEY FEATURES REPORT

DToNs - none

AWOIS - one

Wrecks - one

Maritime Boundaries - none

H12342_AWOIS ITEM Report

Registry Number: H12342
State: Virginia
Locality: Approaches to Chesapeake Bay
Sub-locality: 13 NM Southeast of Rudee Inlet
Project Number: OPR-D304-TJ-11
Survey Date: 05/24/2011 to 06/13/2011

Charts Affected

| Number | Edition | Date | Scale (RNC) | RNC Correction(s)* |
|--------|---------|------------|-----------------------|--------------------|
| 12208 | 13th | 08/01/2008 | 1:50,000 (12208_1) | [L]NTM: ? |
| 12207 | 21st | 03/01/2004 | 1:80,000 (12207_1) | [L]NTM: ? |
| 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 | AWOIS 14883_Charted obstruction | AWOIS | [no data] | [no data] | [no data] | --- |

1.1) AWOIS #14883 - AWOIS 14883_Charted obstruction

No Primary Survey Feature for this AWOIS Item

Search Position: 36° 43' 47.5" N, 075° 48' 55.6" W
Historical Depth: [None]
Search Radius: 500
Search Technique: MBES, SSS
Technique Notes: Verify existence of obstruction.

History Notes:

Unknown source -- Unexploded Torpedo Rep (1987) scaled from Chart 12807. (LAH 3/18/2011)

Survey Summary

Charts Affected: 12208_1, 12207_1, 12200_1, 13003_1

Remarks:

AWOIS radius searched with 200% SSS. No torpedo like objects found.

Feature Correlation

| Source | Feature | Range | Azimuth | Status |
|---------------------|---------------|-------|---------|---------|
| H12342_AWOIS_EXPORT | AWOIS # 14883 | 0.00 | 000.0 | Primary |

Hydrographer Recommendations

Search is inconclusive as torpedo may be buried or undetectable by SSS. Recommend retain as charted for safety of maritime operations.

S-57 Data

[None]

Office Notes

SAR: Charted OBSTRN Unexploded Torpedo Rep (1987) (AWOIS 14883) not located nor verified at the charted location.

COMPILATION: Concur with conditions. Retain charted Dangerous Unexploded Torpedo Rep (1987) depth unknown for safety purposes.

H12342_WRECKS Report

Registry Number: H12342
State: Virginia
Locality: Approaches to Chesapeake Bay
Sub-locality: 13 NM Southeast of Rudee Inlet
Project Number: OPR-D304-TJ-11
Survey Date: 05/24/2011 to 06/13/2011

Charts Affected

| Number | Edition | Date | Scale (RNC) | RNC Correction(s)* |
|--------|---------|------------|-----------------------|--------------------|
| 12205 | 31st | 12/01/2007 | 1:80,000 (12205_1) | [L]NTM: ? |
| 12207 | 21st | 03/01/2004 | 1:80,000 (12207_1) | [L]NTM: ? |
| 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 | Uncharted 50 ft_ Dangerous sunken WRECK | Wreck | 15.43 m | 36° 37' 57.8" N | 075° 49' 29.8" W | --- |

1.1) Uncharted 50 ft_ Dangerous sunken WRECK

Survey Summary

Survey Position: 36° 37' 57.8" N, 075° 49' 29.8" W
Least Depth: 15.43 m (= 50.63 ft = 8.438 fm = 8 fm 2.63 ft)
TPU ($\pm 1.96\sigma$): THU (TPEh) [None] ; TVU (TPEv) [None]
Timestamp: 2011-167.00:00:00.000 (06/16/2011)
Dataset: H12342_Wrecks.000
FOID: US 0000450563 00001(02260006E0030001)
Charts Affected: 12205_1, 12207_1, 12200_1, 13003_1

Remarks:

WRECKS/remrks: Wreck with a 1.4 m ht. approx. 7.5m length by 2.5m width. Wreck laying on its side or upside down.

Feature Correlation

| Source | Feature | Range | Azimuth | Status |
|-------------------|---------------------|-------|---------|---------|
| H12342_Wrecks.000 | US 0000450563 00001 | 0.00 | 000.0 | Primary |

Hydrographer Recommendations

Chart a Wreck.

Cartographically-Rounded Depth (Affected Charts):

50ft (12205_1, 12207_1)

8 ½fm (12200_1, 13003_1)

S-57 Data

Geo object 1: Wreck (WRECKS)
Attributes: CATWRK - 2:dangerous wreck
 CONVIS - 2:not visual conspicuous
 EXPSOU - 2:shoaler than range of depth of the surrounding depth area
 NINFOM - Add Wreck
 QUASOU - 6:least depth known
 SORDAT - 20110613

SORIND - US,US,graph,H12342

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

VALSOU - 15.431 m

WATLEV - 3:always under water/submerged

Office Notes

SAR: Feature is real. Found with 200% SSS and OD MBES.

COMPILATION: Concur. Add dangerous wreck least depth 50 feet in present survey position.

Feature Images

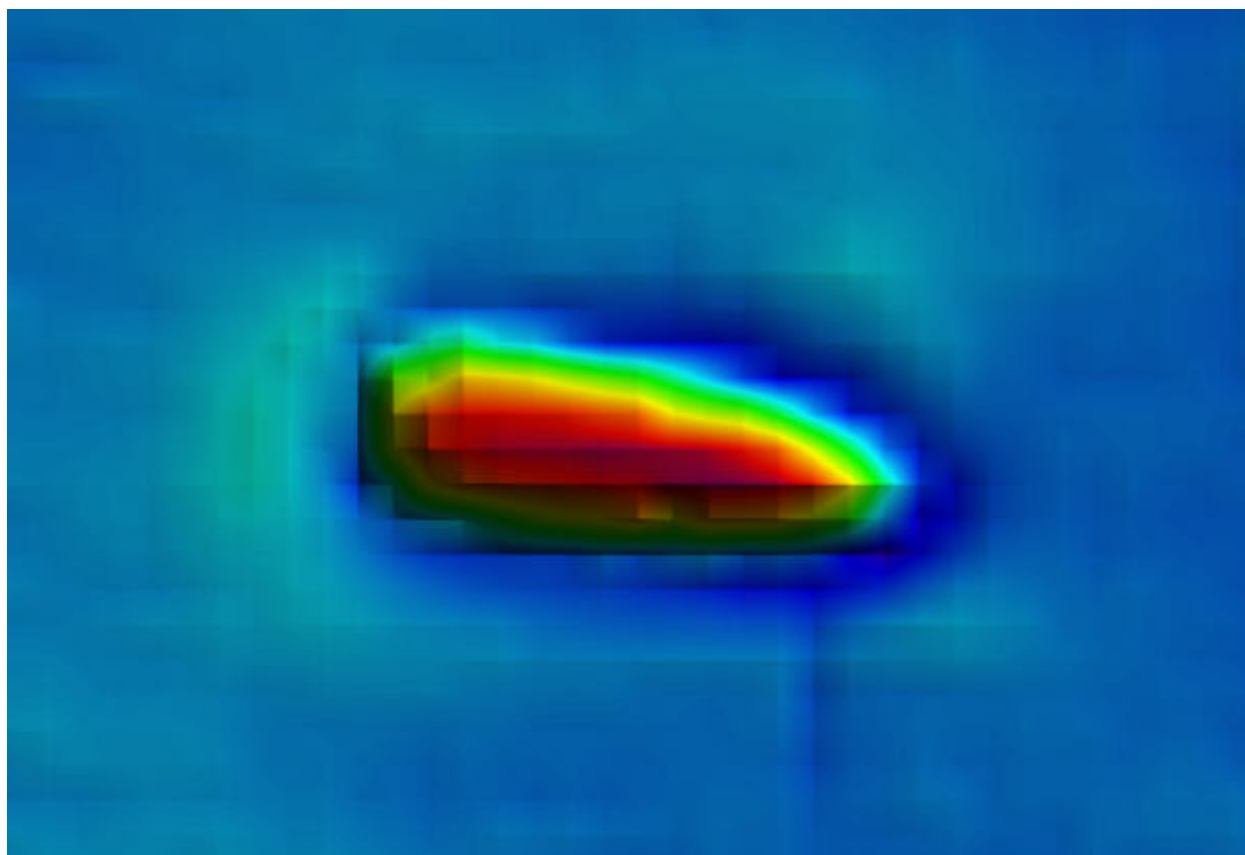


Figure 1.1.1

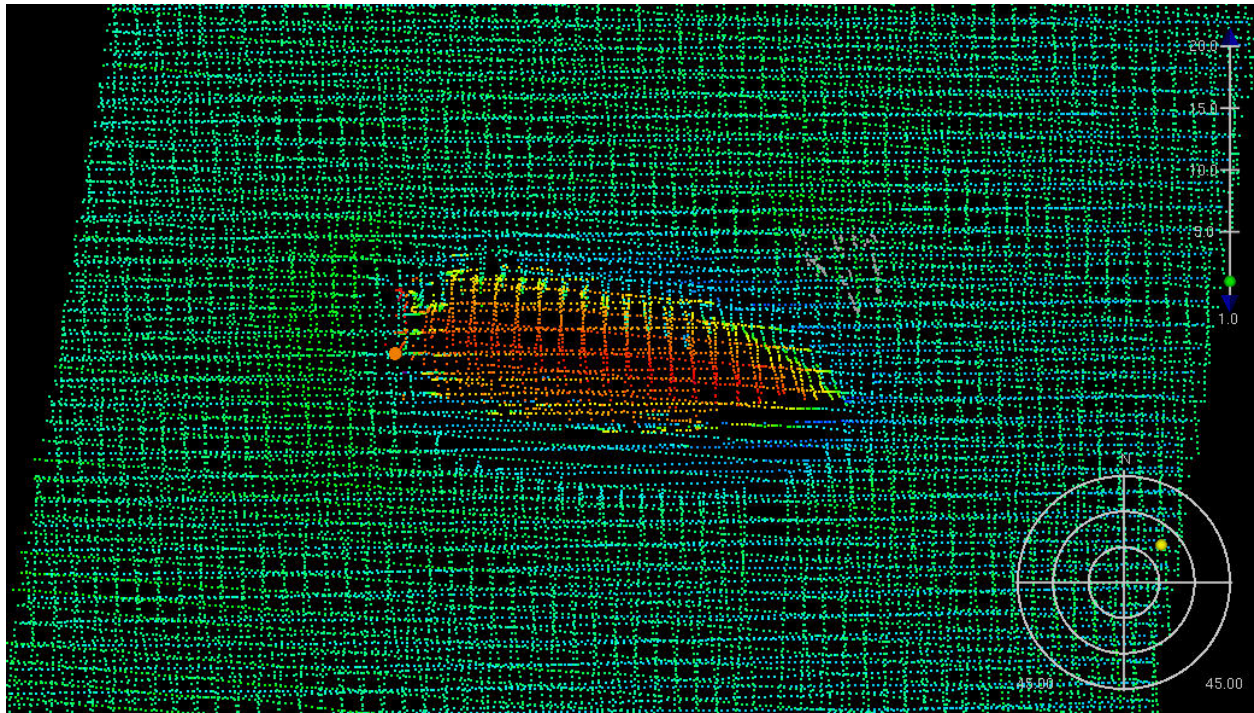


Figure 1.1.2

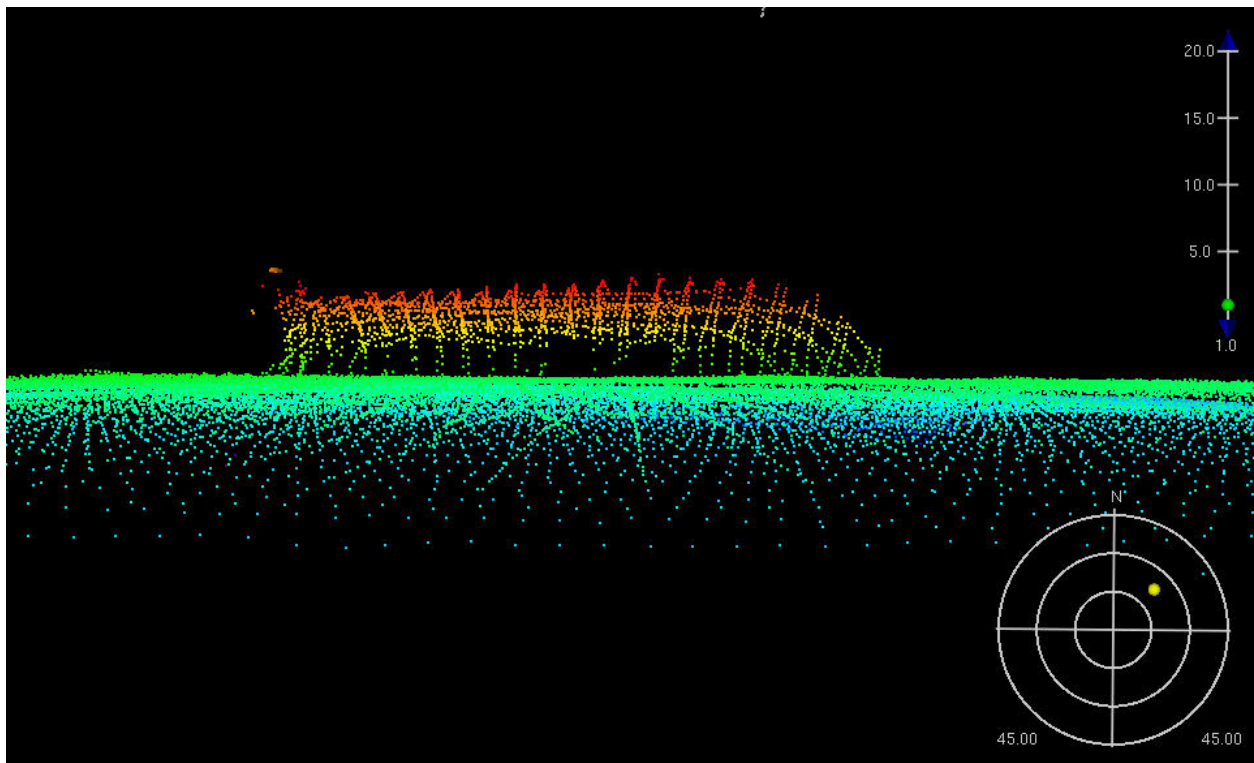


Figure 1.1.3

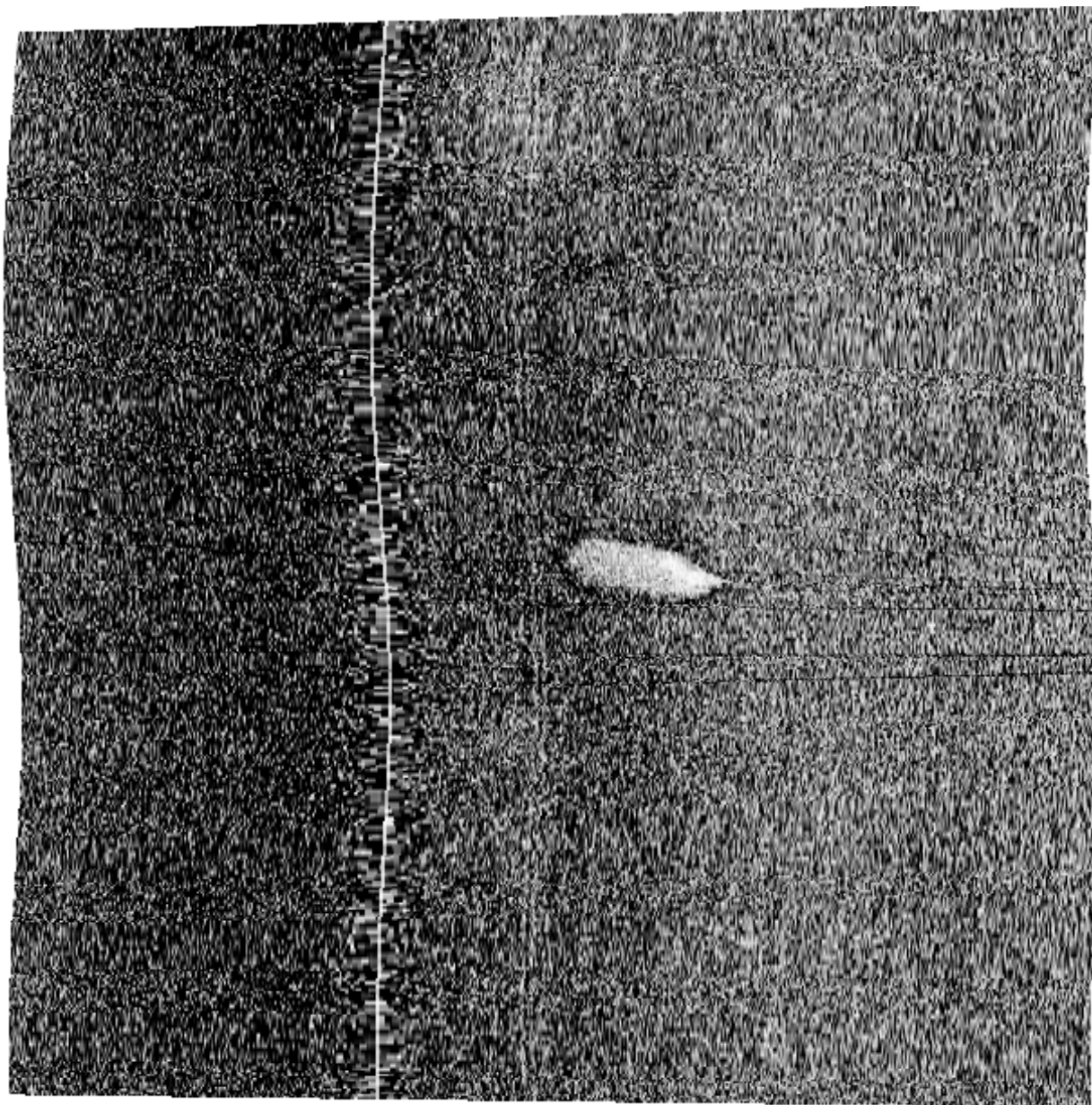


Figure 1.1.4

APPROVAL PAGE

H12342

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

- H12342_DR.pdf
- Collection of depth varied resolution BAGS
- Processed survey data and records
- H12342_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: _____

LT Abigail Higgins
Chief, Atlantic Hydrographic Branch