H12698

U.S. Department of Commerce
National Oceanic and Atmospheric Administration
National Ocean Survey

DESCRIPTIVE REPORT

Type of Survey:	Navigable Area
Registry Number:	H12698

LOCALITY

State(s):	Maine New Hampshire
General Locality:	Gulf of Maine
Sub-locality:	Offshore - Vicinity of Bigelow Bight

2014

CHIEF OF PARTY
LCDR Marc S. Moser, NOAA

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Date:

U.S. DEPARTMENT OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION	REGISTRY NUMBER:
HYDROGRAPHIC TITLE SHEET	**H12698**

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(s):	**Maine New Hampshire**
General Locality:	**Gulf of Maine**
Sub-Locality:	**Offshore - Vicinity of Bigelow Bight**
Scale:	**40000**
Dates of Survey:	**05/21/2014 to 05/30/2014**
Instructions Dated:	**04/30/2014**
Project Number:	**OPR-A321-FH-14**
Field Unit:	**NOAA Ship *Ferdinand R. Hassler***
Chief of Party:	**LCDR Marc S. Moser, NOAA**
Soundings by:	**Multibeam Echo Sounder**
Imagery by:	**Multibeam Echo Sounder Backscatter**
Verification by:	**Atlantic Hydrographic Branch**
Soundings Acquired in:	**meters at Mean Lower Low Water**

Remarks:

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 Survey H12698

Project: OPR-A321-FH-14

Locality: Gulf of Maine

Sublocality: Offshore - Vicinity of Bigelow Bight

Scale: 1:40000

May 2014 - May 2014

NOAA Ship *Ferdinand R. Hassler*

Chief of Party: LCDR Marc S. Moser, NOAA

A. Area Surveyed

The survey area is located in the Gulf of Maine, offshore in the vicinity of Bigelow Bight as shown in Figure 1.

A.1 Survey Limits

Data were acquired within the following survey limits:

Northwest Limit	Southeast Limit
43° 18' 47.98" N 70° 34' 32.07" W	42° 53' 25.55" N 70° 13' 35.4" W

Table 1: Survey Limits

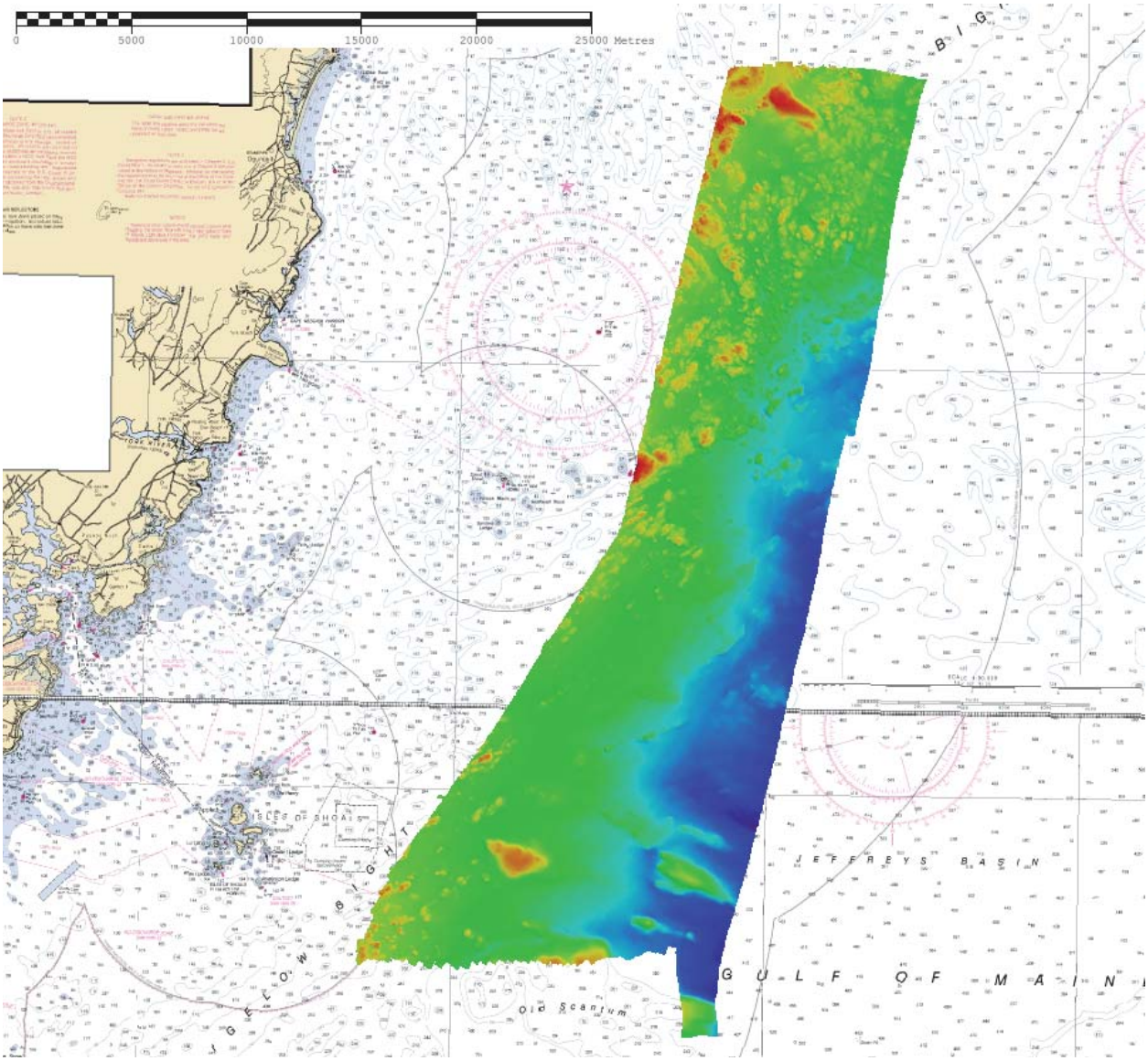


Figure 1: General locality of survey H12698.

Due to additional time allowed on project OPR-A321-FH-14, the eastern extent of H12698 was extended by approximately 1 nautical mile. Figure 2 shows the area of additional coverage beyond the assigned survey limits. The southeastern portion of the survey was obtained to junction with NOAA Ship THOMAS JEFFERSON survey W00050.

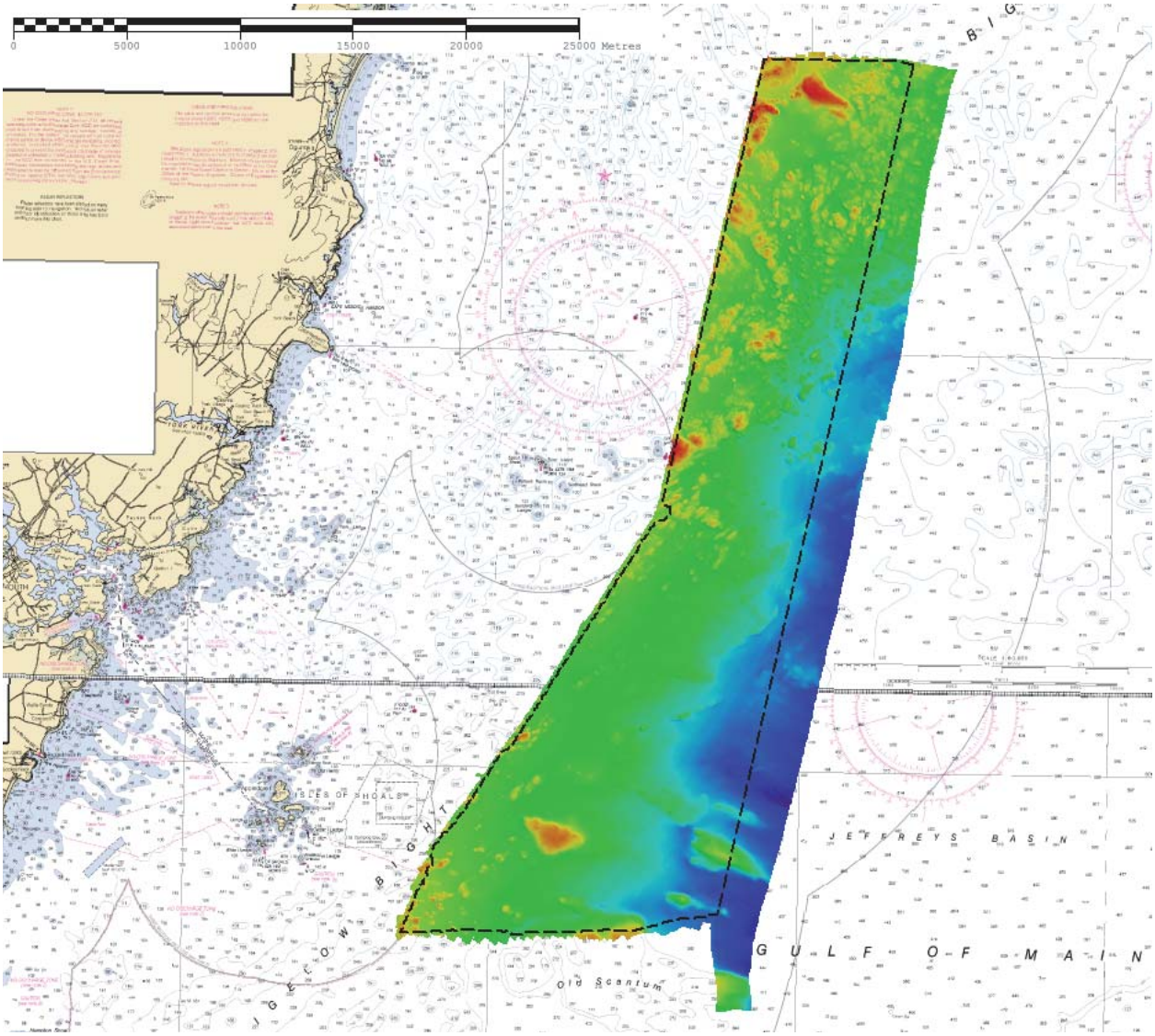


Figure 2: Additional coverage obtained along the eastern extent of survey H12698.

A.2 Survey Purpose

The purpose of this project is to provide contemporary surveys to update National Ocean Service (NOS) nautical charting products.

A.3 Survey Quality

The entire survey is adequate to supersede previous data.

A.4 Survey Coverage

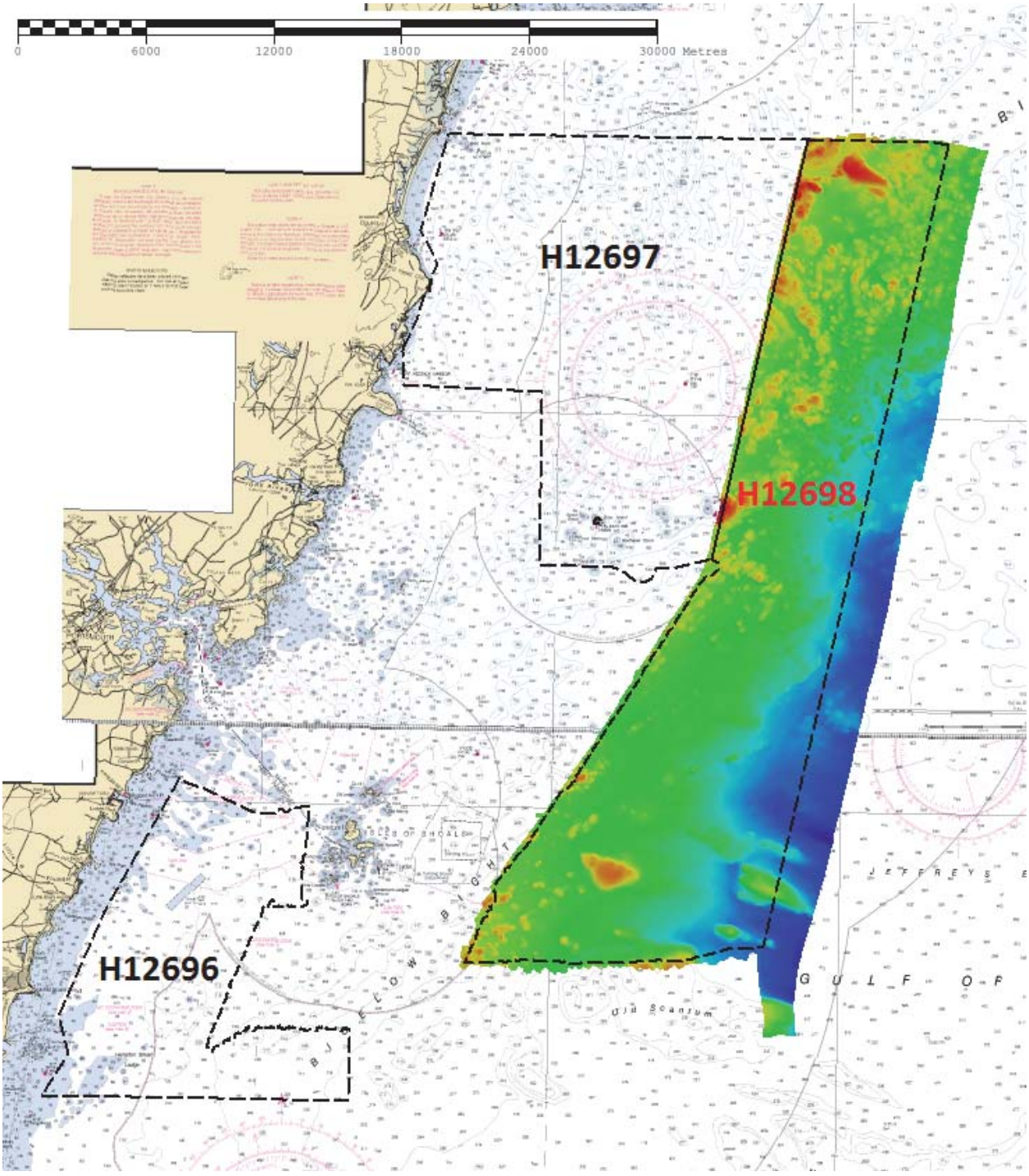


Figure 3: Survey layout for OPR-A321-FH-14 over raster charts 13278 and 13286.

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	*S250*	*Total*
LNM	**SBES Mainscheme**	0	0
	MBES Mainscheme	816.75	816.75
	Lidar Mainscheme	0	0
	SSS Mainscheme	0	0
	SBES/MBES Mainscheme	0	0
	SBES/SSS Mainscheme	0	0
	MBES/SSS Mainscheme	0	0
	SBES/MBES Crosslines	70.07	70.07
	Lidar Crosslines	0	0
Number of Bottom Samples			11
Number of AWOIS Items Investigated			0
Number Maritime Boundary Points Investigated			0
Number of DPs			0
Number of Items Investigated by Dive Ops			0
Total SNM			123.45

Table 2: Hydrographic Survey Statistics

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

Survey Dates	Day of the Year
05/22/2014	142
05/23/2014	143
05/24/2014	144
05/25/2014	145
05/26/2014	146
05/27/2014	147
05/29/2014	149
05/30/2014	150

Table 3: Dates of Hydrography

B. Data Acquisition and Processing

B.1 Equipment and Vessels

Refer to the 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 discussed in the following sections.

B.1.1 Vessels

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

Hull ID	***S250***
LOA	37.7 meters
Draft	3.77 meters

Table 4: Vessels Used

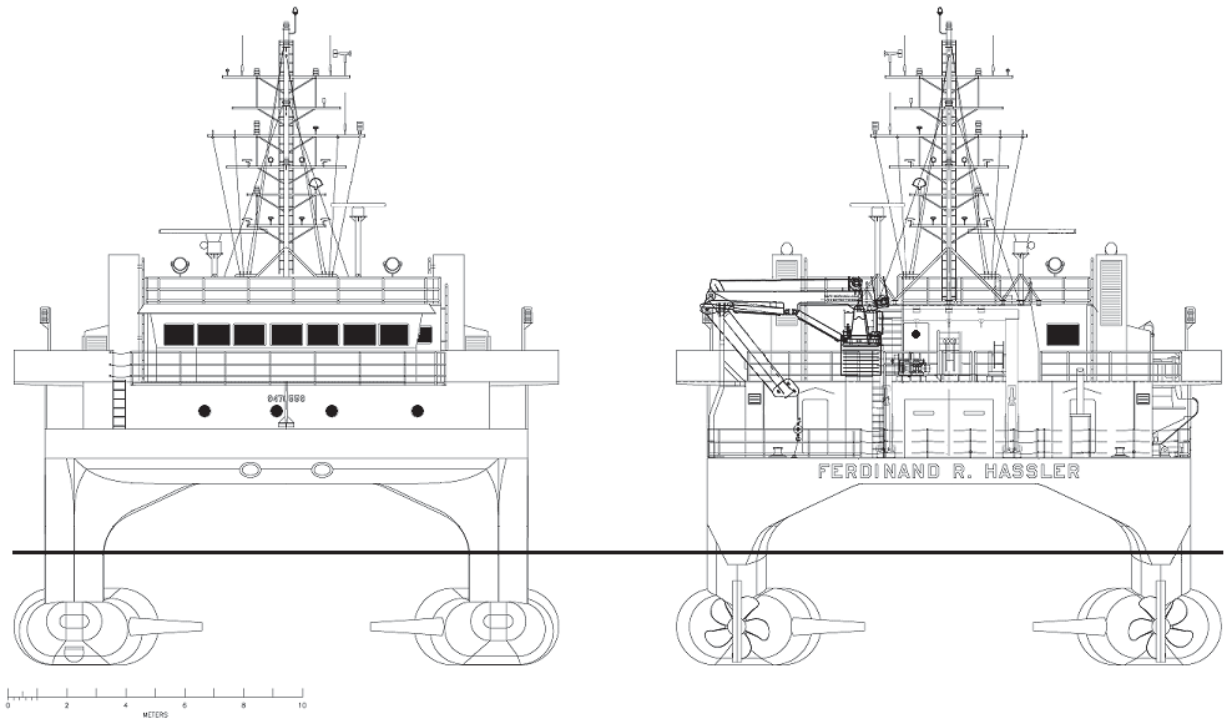


Figure 4: NOAA Ship FERDINAND R. HASSLER.

NOAA Ship FERDINAND R. HASSLER (S250), shown in Figure 4, acquired all data within the limits of H12698.

B.1.2 Equipment

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

Manufacturer	Model	Type
Reson	7125	MBES
Applanix	POS M/V 320 V5	Positioning and Attitude System
Hemisphere	MBX-4	Positioning System
Brooke Ocean	MVP-200	Sound Speed System
AML	Micro-CTD	Sound Speed System
Reson	SVP-70	Sound Speed System

Table 5: Major Systems Used

B.2 Quality Control

B.2.1 Crosslines

Crosslines, acquired for this survey, totalled 7.9% of mainscheme acquisition.

Crosslines were filtered to remove soundings greater than 45 degrees from nadir. To evaluate crossline agreement, two 4-meter resolution base surfaces were created: one from mainscheme soundings and the other from crossline soundings. These two surfaces were differenced using CARIS Base Editor. Figure 5 shows the 4-meter resolution crossline surface over the 4-meter resolution mainscheme surface. The statistical analysis of the differences between the mainscheme and crossline surfaces is shown in Figure 6. The average difference between the surfaces is 0.02 meters with a standard deviation of 0.31 meters. 95% of nodes agree within +/- 0.61 meters.

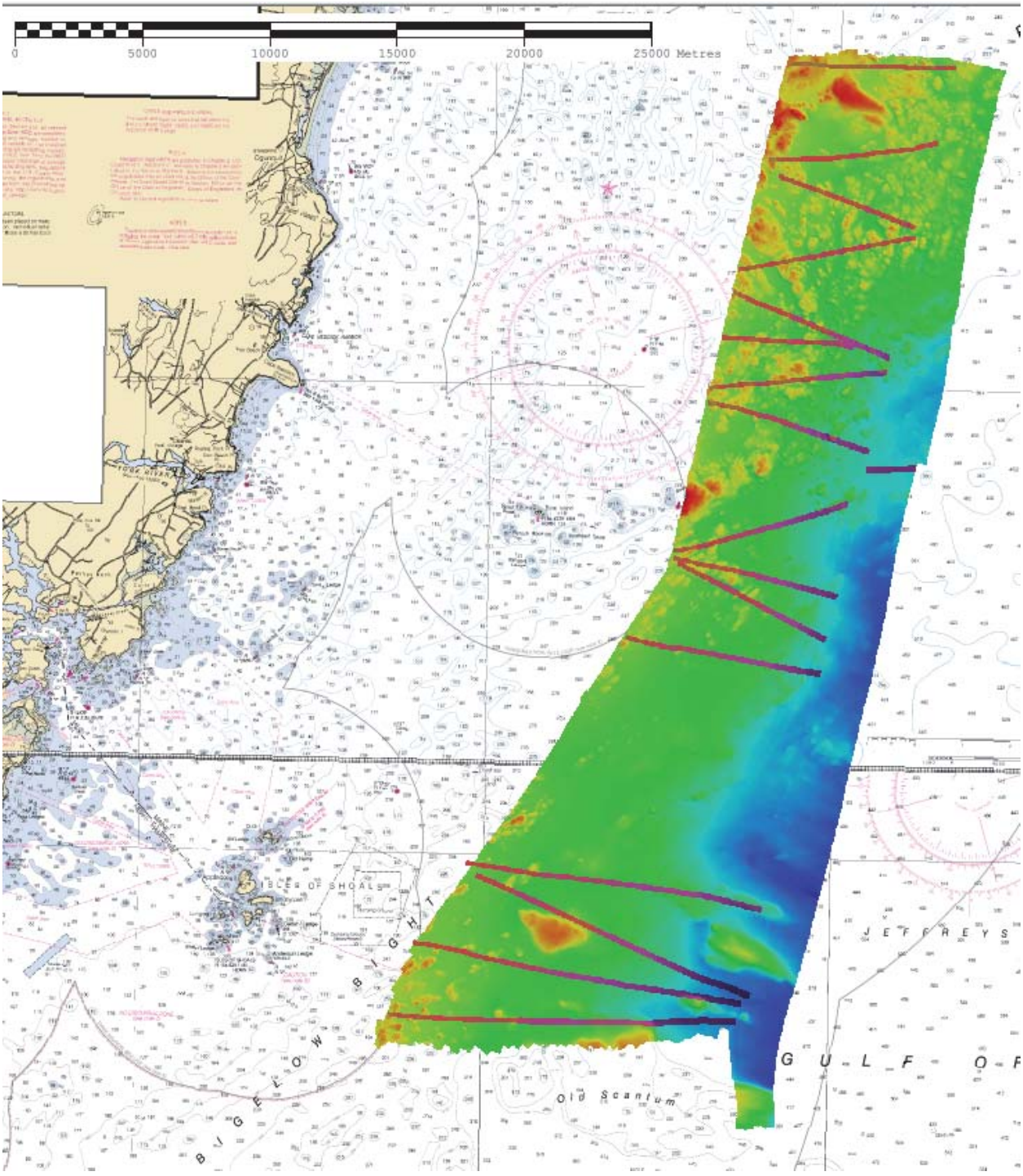


Figure 5: The 4-meter resolution crossline surface shown in purple over the 4-meter resolution mainscheme surface.

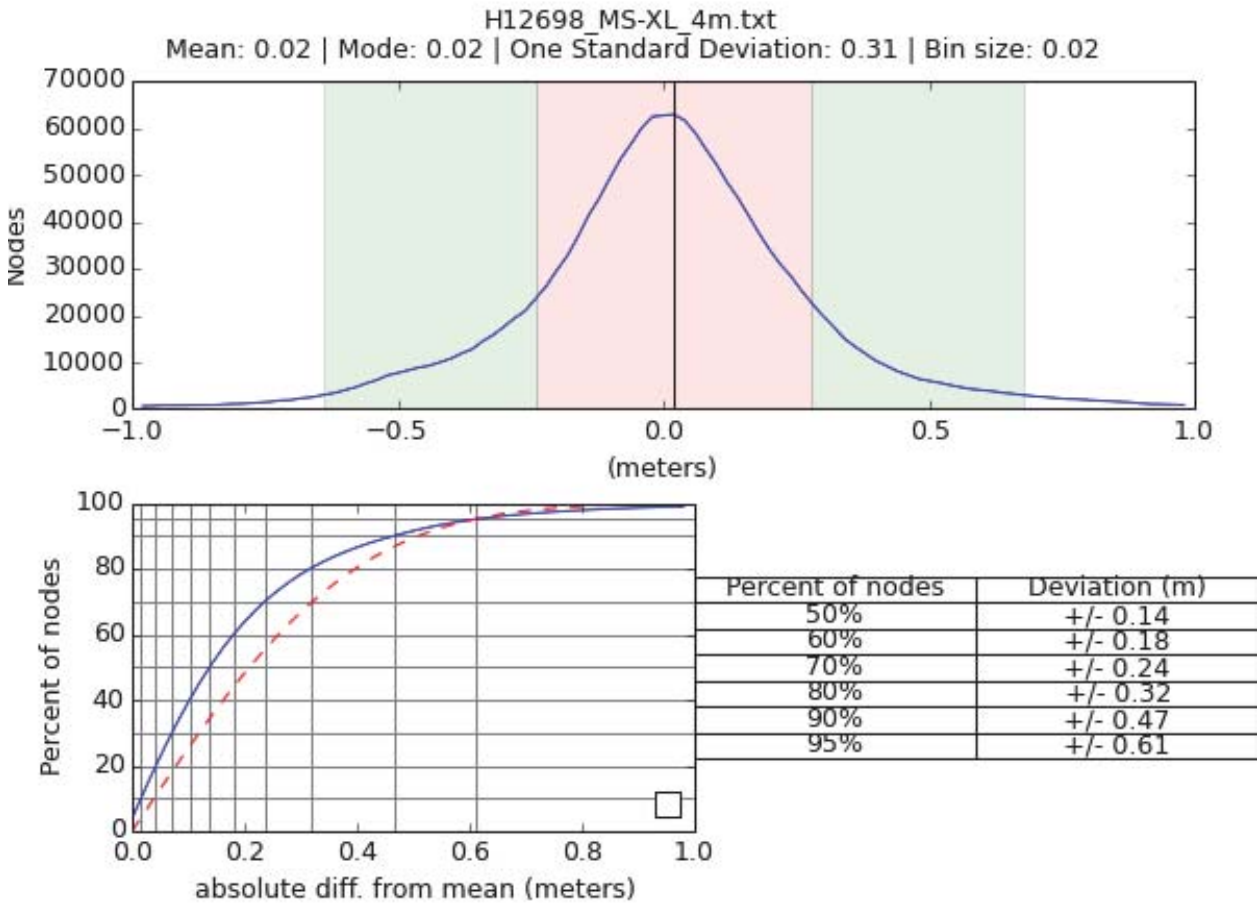


Figure 6: H12698 crossline difference statistics: mainscheme minus crosslines.

B.2.2 Uncertainty

The following survey specific parameters were used for this survey:

Measured	Zoning
0.01 meters	0.081 meters

Table 6: Survey Specific Tide TPU Values

Hull ID	Measured - CTD	Measured - MVP	Surface
S250	1.0 m/s	1.0 m/s	0.5 m/s

Table 7: Survey Specific Sound Speed TPU Values

The zoning uncertainty value of 0.081 used during survey H12698 was assigned as VDatum zoning uncertainty by Hydrographic Surveys Division (HSD) for project OPR-A321-FH-14 in the Project Instructions. The sound speed uncertainty values were obtained from the specifications provided by the manufacturing company for the Brooke Ocean MVP-200.

B.2.3 Junctions

The areas of overlap between sheet H12698 and its junction sheets, shown in Figure 7, were reviewed in CARIS Subset Editor. The junctioning surfaces were subtracted from a 4-meter resolution surface from H12698 in CARIS Base Editor to assess sounding consistency.

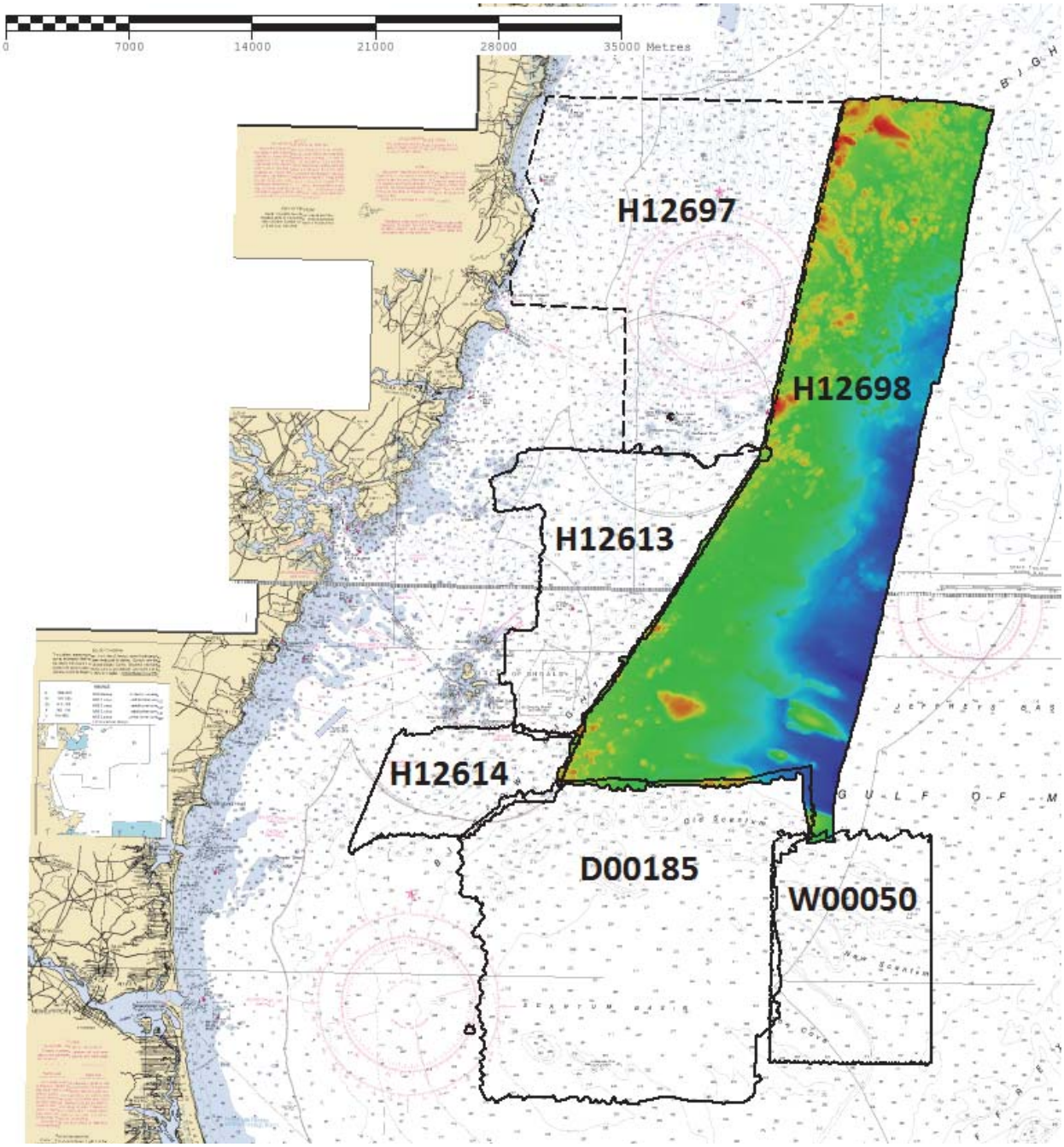


Figure 7: Surveys that junction with H12698.

The following junctions were made with this survey:

Registry Number	Scale	Year	Field Unit	Relative Location
H12613	1:40000	2013	NOAA Ship FERDINAND R. HASSLER	W
H12614	1:20000	2013	NOAA Ship FERDINAND R. HASSLER	SW
H12697	1:40000	2014	NOAA Ship FERDINAND R. HASSLER	W
D00185	1:40000	2013	NOAA Ship FERDINAND R. HASSLER	S
W00050	1:40000	2003	NOAA Ship THOMAS JEFFERSON	S

Table 8: Junctioning Surveys

H12613

Survey H12613 was assigned as a part of OPR-A321-FH-13. The extent of overlap with H12698 is shown in Figure 8. The average difference between surfaces from surveys H12698 and H12613 is 0.12 meters with a standard deviation of 0.39 meters. 95% of all differences were less than +/- 0.78 meters, shown in Figure 9. Survey H12613 was reduced to MLLW by discrete zoned tides, while H12698 was reduced to MLLW by VDatum. This may account for higher mean differences and standard deviation.

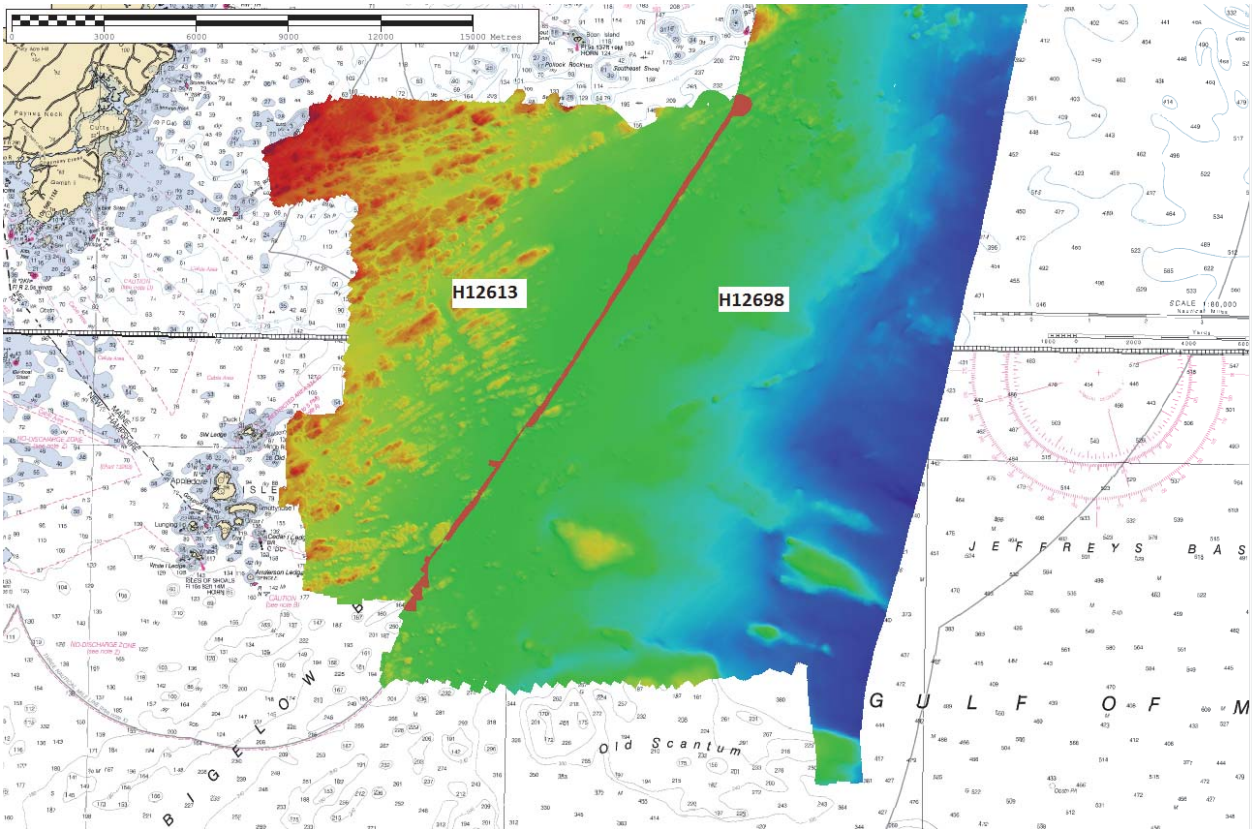
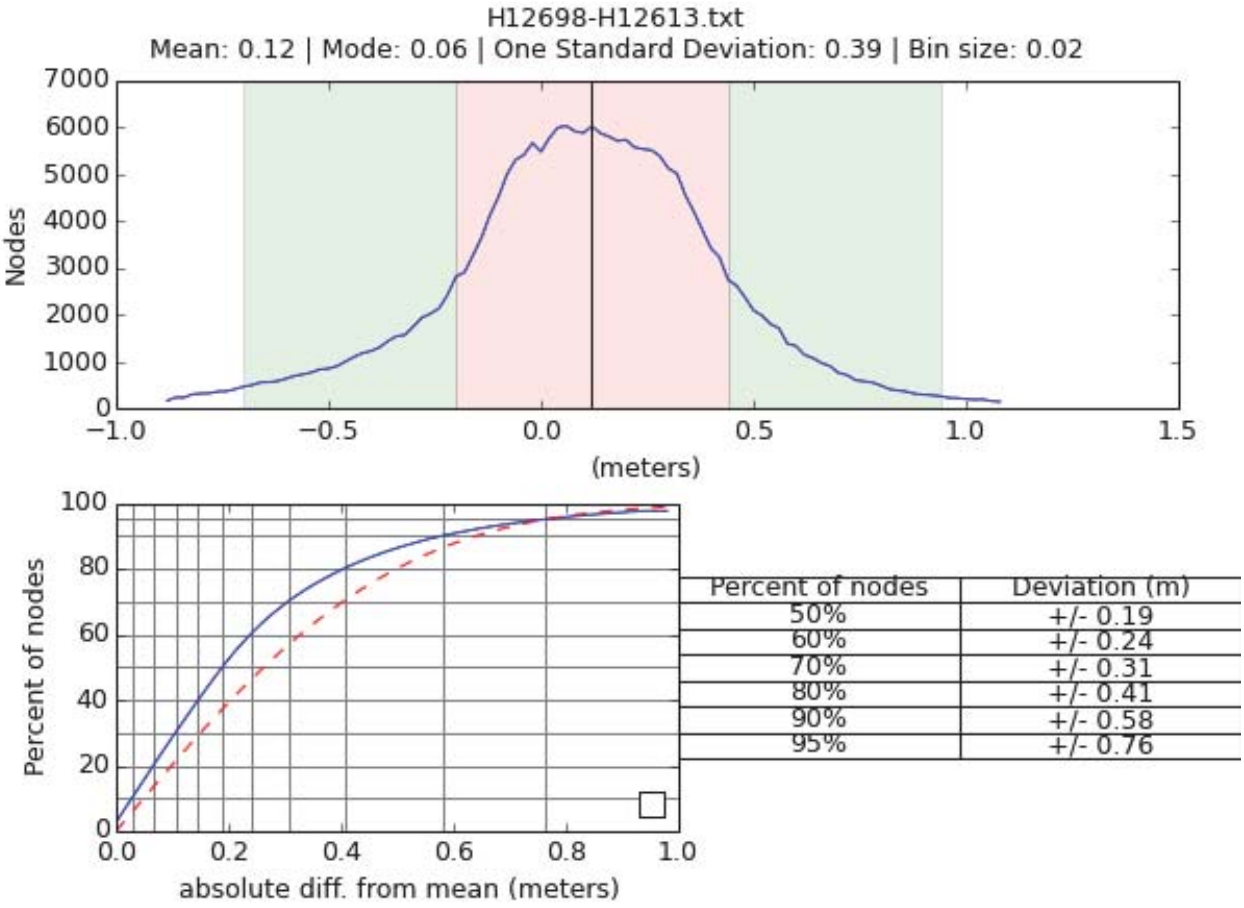


Figure 8: The overlap of the junction between H12613 and H12698 spans approximately 158 meters from east to west and is shown in pink.



Percent of nodes	Deviation (m)
50%	+/- 0.19
60%	+/- 0.24
70%	+/- 0.31
80%	+/- 0.41
90%	+/- 0.58
95%	+/- 0.76

Figure 9: The statistics of the differenced surface of survey H12698 minus H12613.

H12614

Survey H12614 was assigned as a part of OPR-A321-FH-13. The extent of overlap with H12698 is shown in Figure 10. The average difference between surfaces of surveys H12698 and H12614 is 0.06 meters with a standard deviation of 0.35 meters. 95% of all differences were less than +/- 0.64 meters, shown in Figure 11.

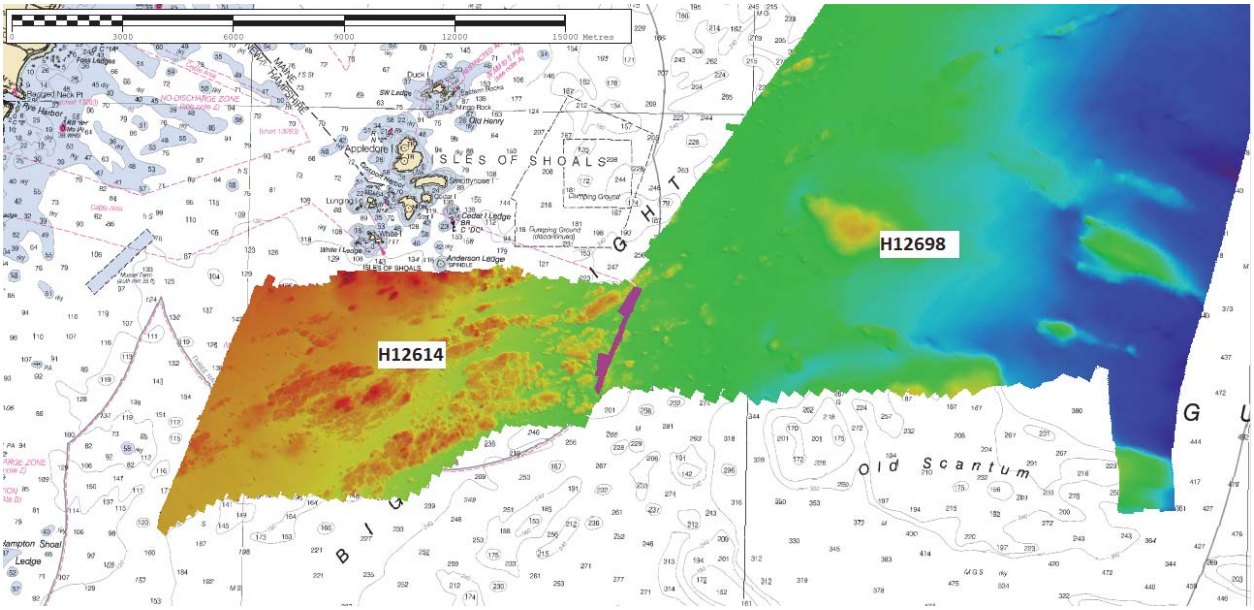


Figure 10: The overlap of the junction between H12614 and H12698 spans approximately 260 meters from east to west and is shown in pink.

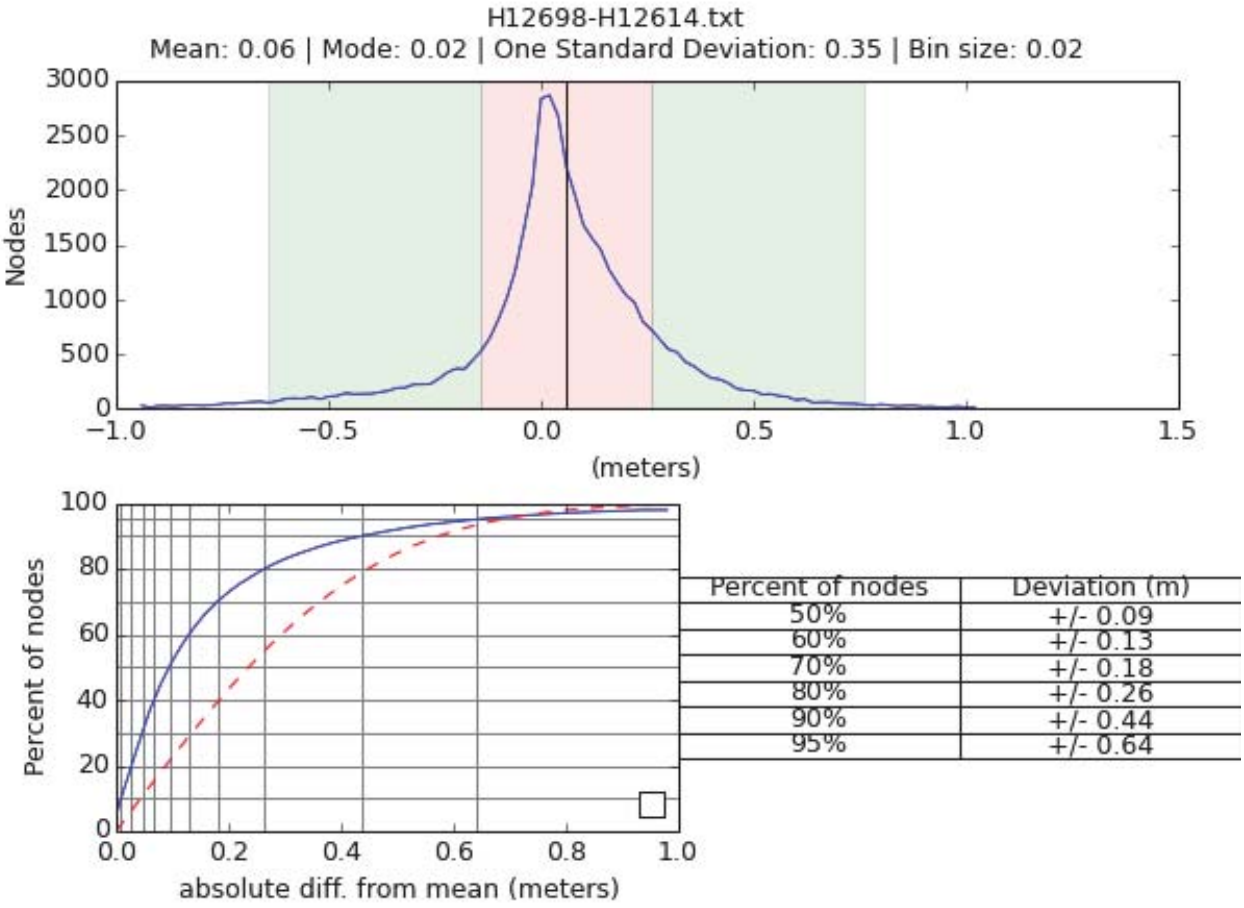


Figure 11: The statistics of the differenced surface of survey H12698 minus H12614.

H12697

Survey H12697 was assigned as a part of OPR-A321-FH-14. The extent of overlap with H12698 is shown in Figure 12. The average difference between surfaces of surveys H12698 and H12697 is -0.01 meters with a standard deviation of 0.35 meters. 95% of all differences were less than +/- 0.68 meters, shown in Figure 13.

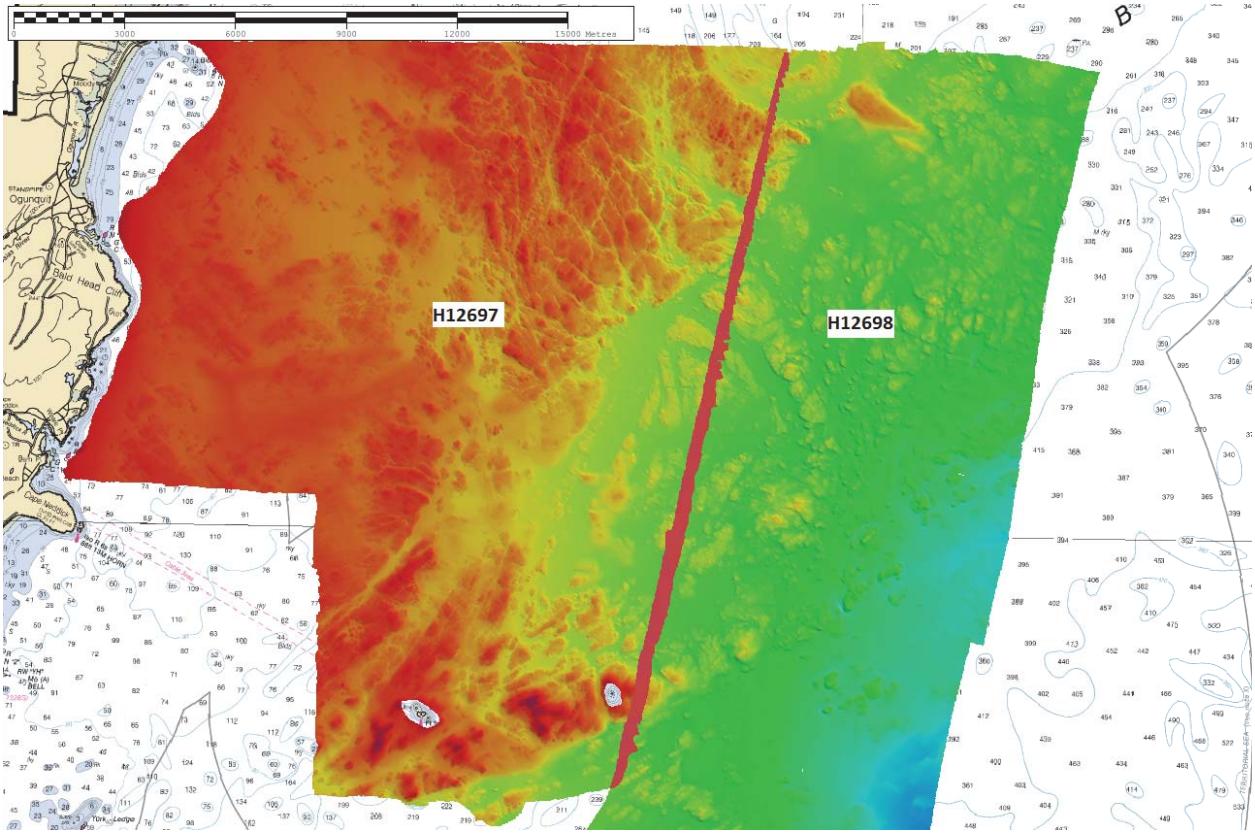


Figure 12: The overlap of the junction between H12697 and H12698 spans approximately 400 meters from east to west and is shown in pink.

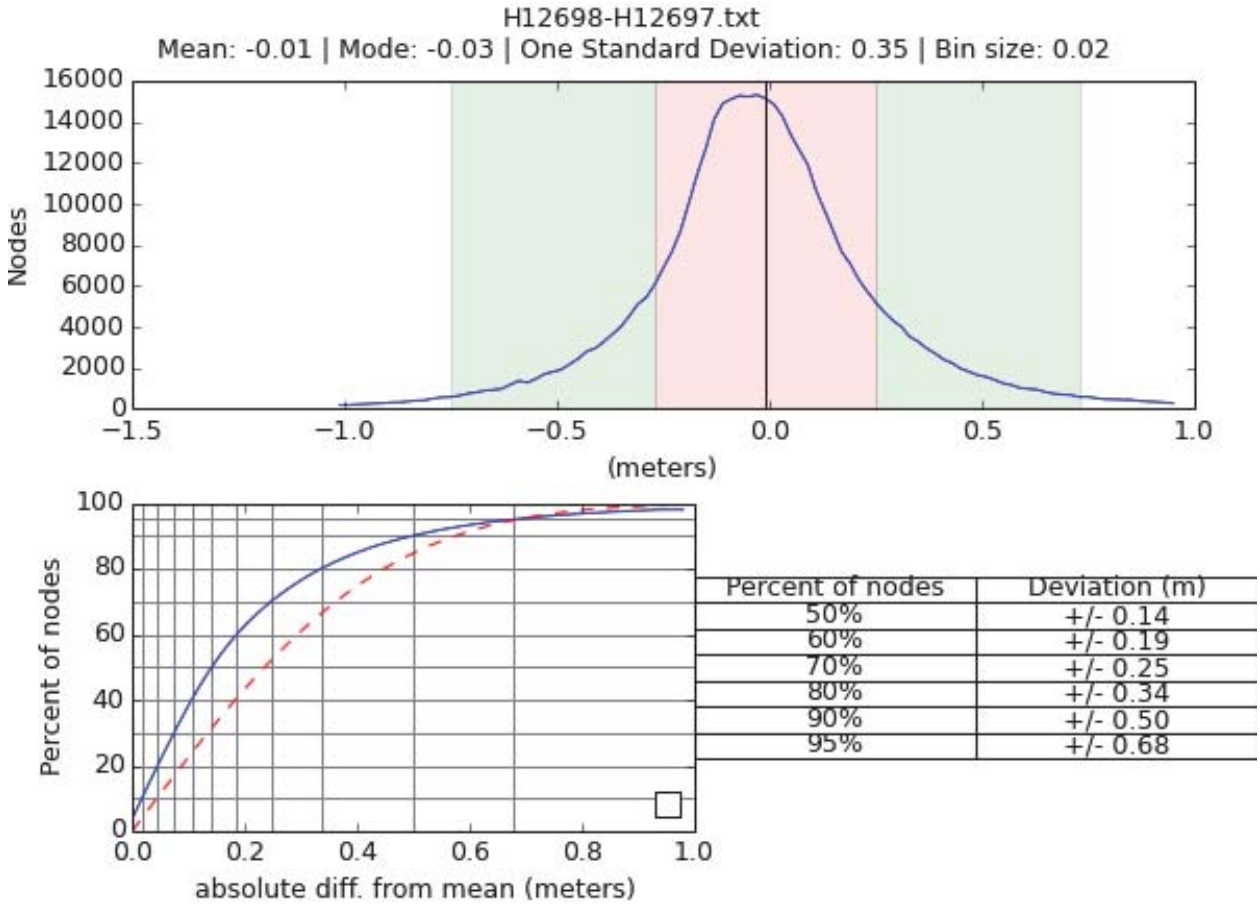


Figure 13: The statistics of the differenced surface of survey H12698 minus H12697.

D00185

Survey D00185 was assigned as a part of OPR-A321-FH-13. The extent of overlap with H12698 is shown in Figure 14. The average difference between surfaces of surveys H12698 and D00185 is -0.03 meters with a standard deviation of 0.49 meters. 95% of all differences were less than +/- 0.99 meters, shown in Figure 15. Survey D00185 does not contain SBETs and was reduced to MLLW by discrete zoned tides, while H12698 was reduced to MLLW by VDatum. This may account for higher mean differences and standard deviation.

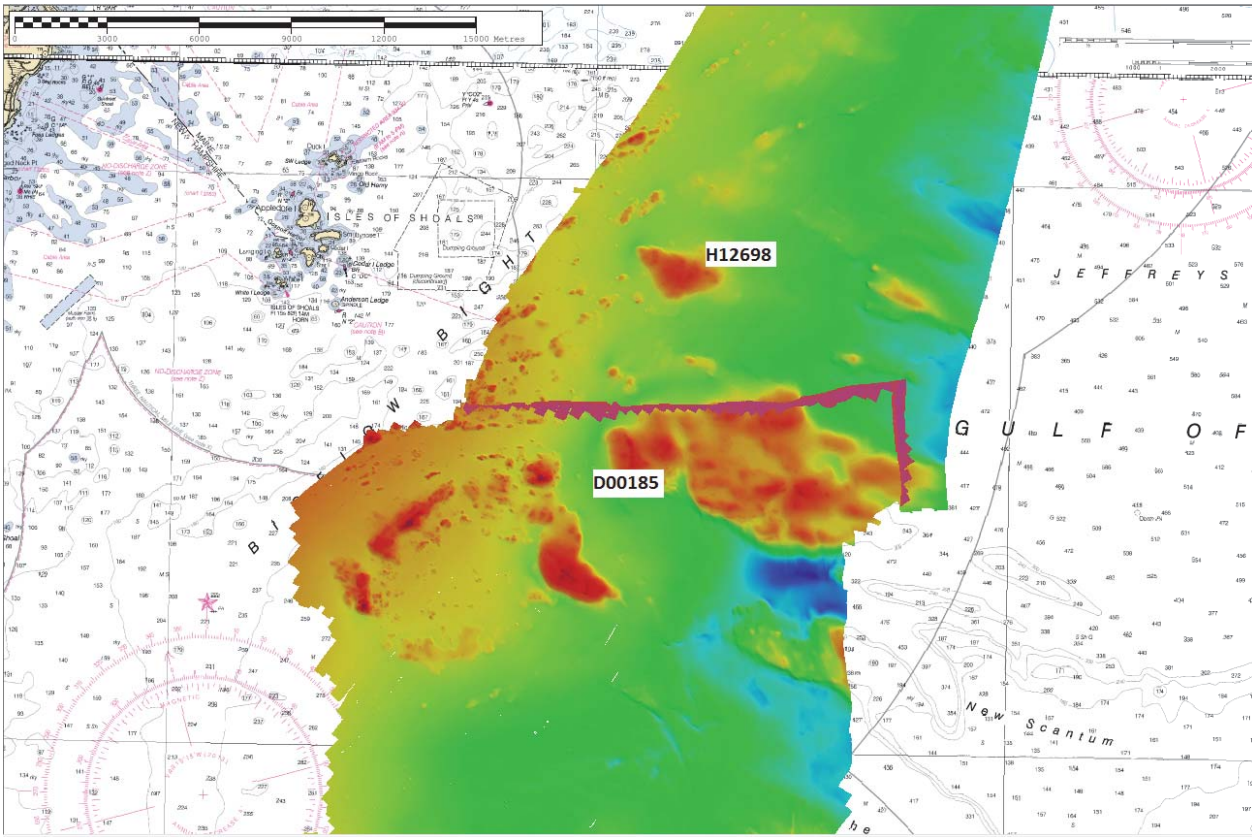
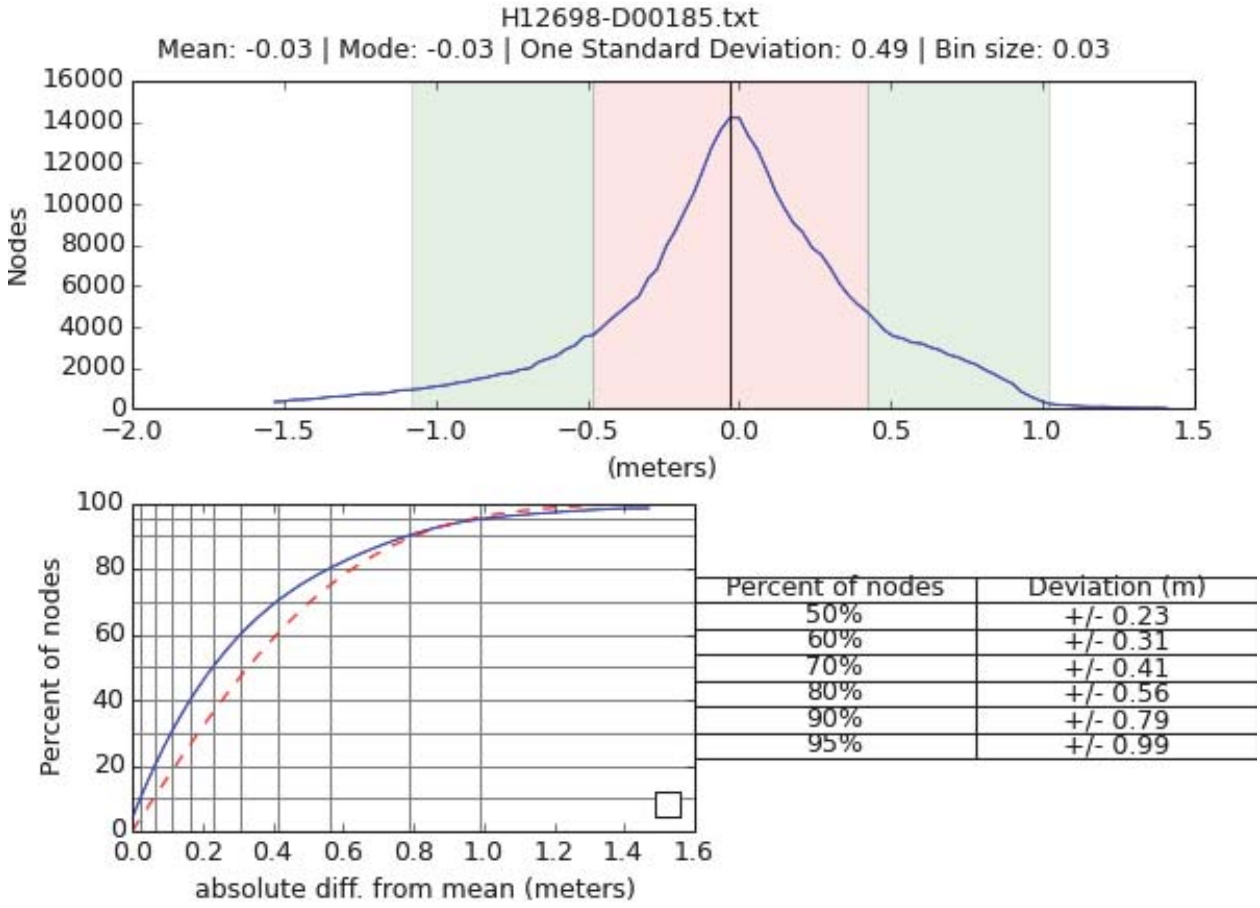


Figure 14: The overlap of the junction between H12698 and D00185 spans approximately 335 meters from north to south and is shown in pink.



Percent of nodes	Deviation (m)
50%	+/- 0.23
60%	+/- 0.31
70%	+/- 0.41
80%	+/- 0.56
90%	+/- 0.79
95%	+/- 0.99

Figure 15: The statistics of the differenced surface of survey H12698 minus D00185.

W00050

Survey W00050 was assigned as a part of OPR-A397-TJ-03. The extent of overlap with H12698 is shown in Figure 16. The average difference between surfaces of surveys H12698 and W00050 is 0.02 meters with a standard deviation of 0.38 meters. 95% of all differences were less than +/- 0.75 meters, shown in Figure 17. Survey W00050 was reduced to MLLW by discrete zoned tides, while H12698 was reduced to MLLW by VDatum. This may account for higher mean differences and standard deviation.

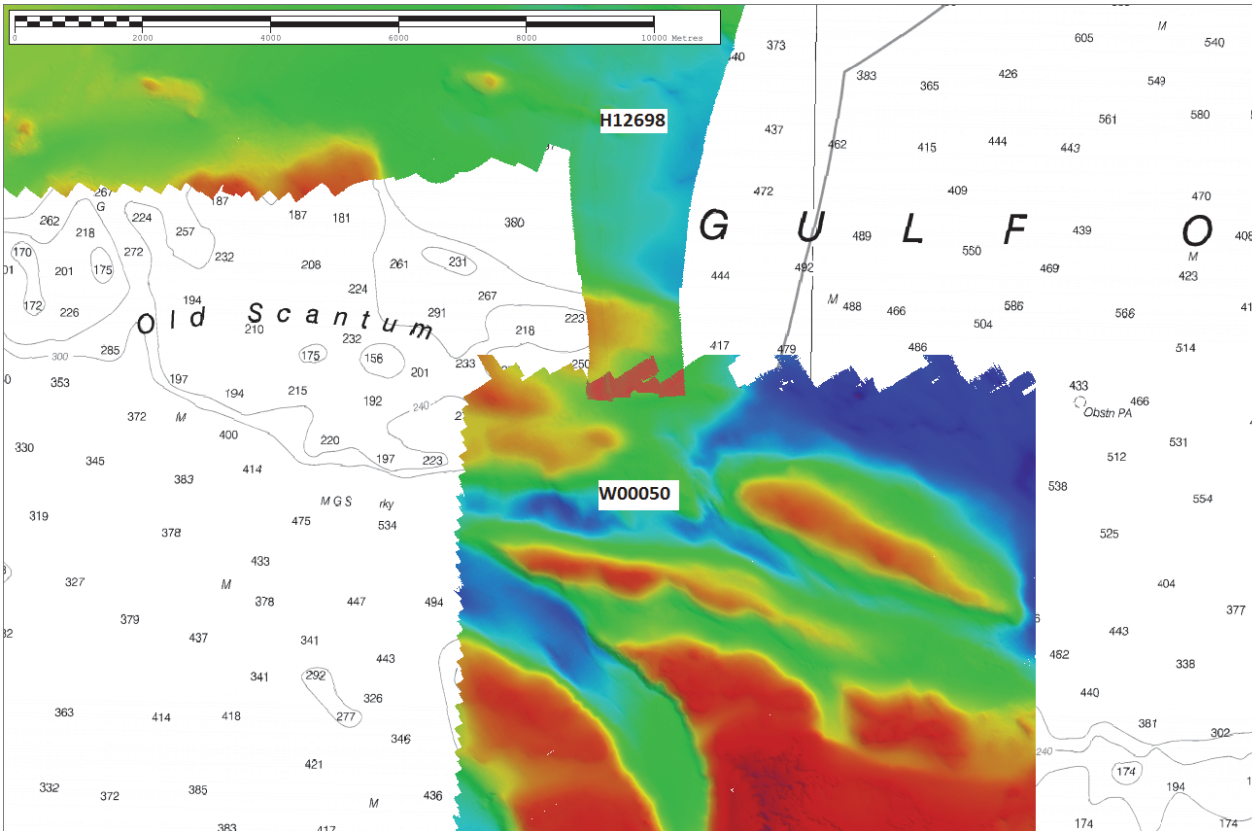


Figure 16: The overlap of the junction between H12698 and W00050 spans approximately 426 meters from north to south and is shown in pink.

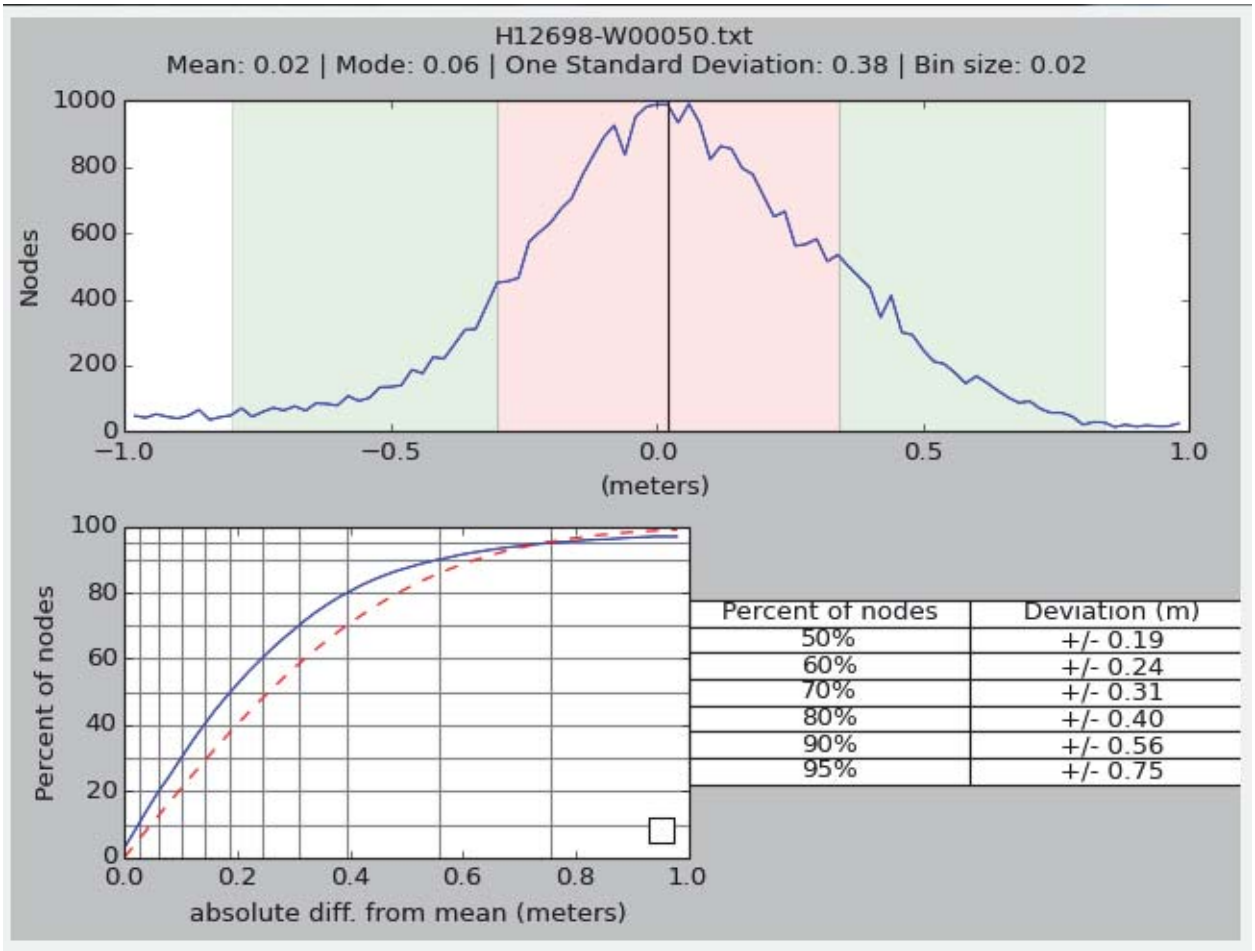


Figure 17: The statistics of the differenced surface of survey H12698 minus W00050.

B.2.4 Sonar QC Checks

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

B.2.5 Equipment Effectiveness

None Exist

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 application method of sound speed corrections to lines was nearest in distance within time of 4 hours. Sound velocity profiles were collected approximately every three to four hours.

B.2.8 Coverage Equipment and Methods

A density analysis was run to calculate the number of soundings per surface node. Five or more soundings per node were present in over 99% of the 2-meter, 4-meter and 8-meter resolution surfaces. For additional detail refer to the H12698_Standards_Compliance report submitted in Appendix II of this report.

The density analysis only includes nodes which are populated by at least one sounding and does not account for holidays located within the surface.

B.2.9 Sound Speed Errors

Some sound speed issues exist in survey H12698 but all errors resulting from sound velocity are within IHO specifications. Errors are located predominantly in the southeastern section of the sheet (Figure 18).

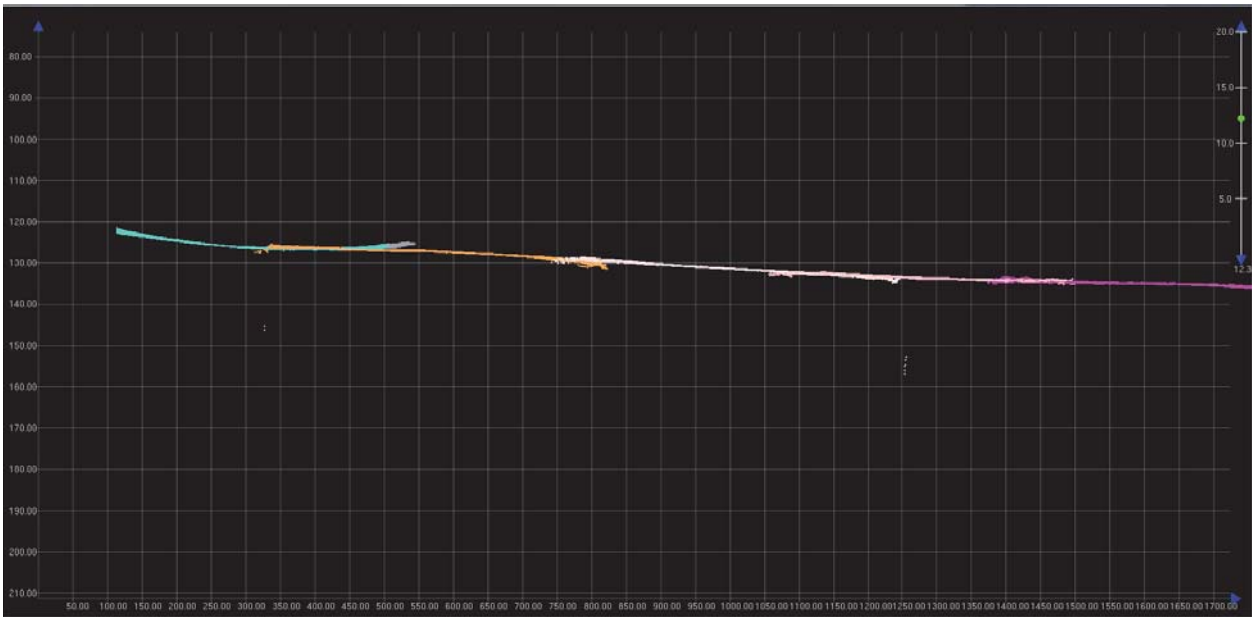


Figure 18: Slight cupping and frowning indicating sound speed issues in the southeastern section of H12698.

B.3 Echo Sounding Corrections

B.3.1 Corrections to Echo Soundings

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

B.3.2 Calibrations

All sounding systems were calibrated as detailed in the DAPR.

B.4 Backscatter

Backscatter was logged in the Reson datagram 7008 snippets record in the raw .s7k files. The .s7k file also holds the navigation record and bottom detections for all lines of survey H12698. The files were paired with the CARIS HDCS data, imported and processed using Fledermaus Geocoder Toolbox.

The GSF files containing the extracted backscatter are submitted with the data in this survey. The processed mosaic is saved as a Geo-Tiff and also submitted.

B.5 Data Processing

B.5.1 Software Updates

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

The following Feature Object Catalog was used: NOAA Extended Attribute File Version 5.3.2.

Due to an unresolved error, CARIS HIPS and SIPS 8.1.7 could not be used to create surfaces with resolutions 2 meters and smaller. Of the surfaces created for survey H12698, the 2-meter resolution surface is the only surface that can only be regenerated in CARIS HIPS and SIPS 8.1.8. Using HIPS 8.1.7 to regenerate this surface will cause a consistent crash.

B.5.2 Surfaces

The following surfaces and/or BAGs were submitted to the Processing Branch:

Surface Name	Surface Type	Resolution	Depth Range	Surface Parameter	Purpose
H12698_MB_2m_MLLW_Final	CUBE	2 meters	31.58 meters - 40.00 meters	NOAA_2m	Complete MBES
H12698_MB_4m_MLLW_Final	CUBE	4 meters	36.00 meters - 80.00 meters	NOAA_4m	Complete MBES
H12698_MB_8m_MLLW_Final	CUBE	8 meters	72.00 meters - 148.84 meters	NOAA_8m	Complete MBES
H12698_MB_8m_MLLW	CUBE	8 meters	31.58 meters - 148.84 meters	NOAA_8m	Complete MBES
H12698_MB_4m_MLLW	CUBE	4 meters	31.62 meters - 155.15 meters	NOAA_4m	Complete MBES
H12698_MB_2m_MLLW	CUBE	2 meters	31.58 meters - 168.45 meters	NOAA_2m	Complete MBES

Table 9: Submitted Surfaces

B.5.3 Designated Soundings

Within the limits of H12698, two soundings are submitted flagged as designated in CARIS HIPS and SIPS. Both of these soundings are designated for feature creation.

B.5.4 Data gap

A data gap exists around 43-10-56.39N 070-17-51.84W. This gap exists due to a dropout in the multibeam sonar while logging over UTC midnight. The gap is approximately 230 meters in size from east to west and 18 meters from north to south. This gap is located outside of the survey area on the eastern edge of the sheet where the sheet limits are exceeded (see Figure 19). It is unlikely that this data gap is located over any features that could pose a threat to navigation as the surrounding depths are deeper than 100 meters.

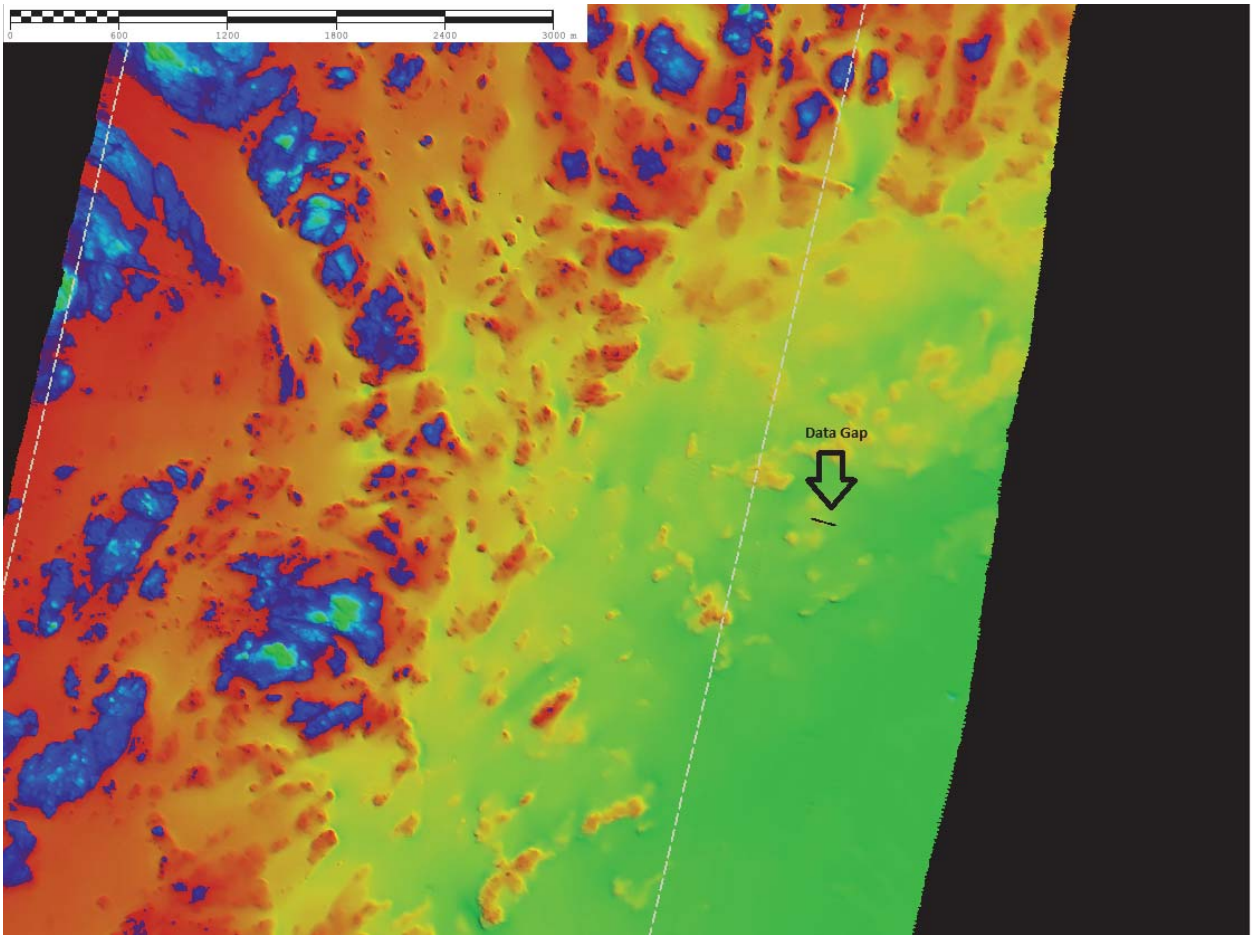


Figure 19: Data gap located at 43-10-56.39N 070-17-51.84W.

B.5.5 Outer Beam Flapping

Several sections of H12698 have errors affecting outer beams that manifest as "flapping outer beams". Since these errors are not consistent in magnitude or location throughout the survey, it was determined that they are not due to any major motion issue. Where these errors caused fliers that exceeded IHO allowable error, the data was edited out using CARIS Subset Editor. The magnitude of the error in some areas can be seen in Figure 20 where data had to be edited for the surface to remain within IHO specifications.

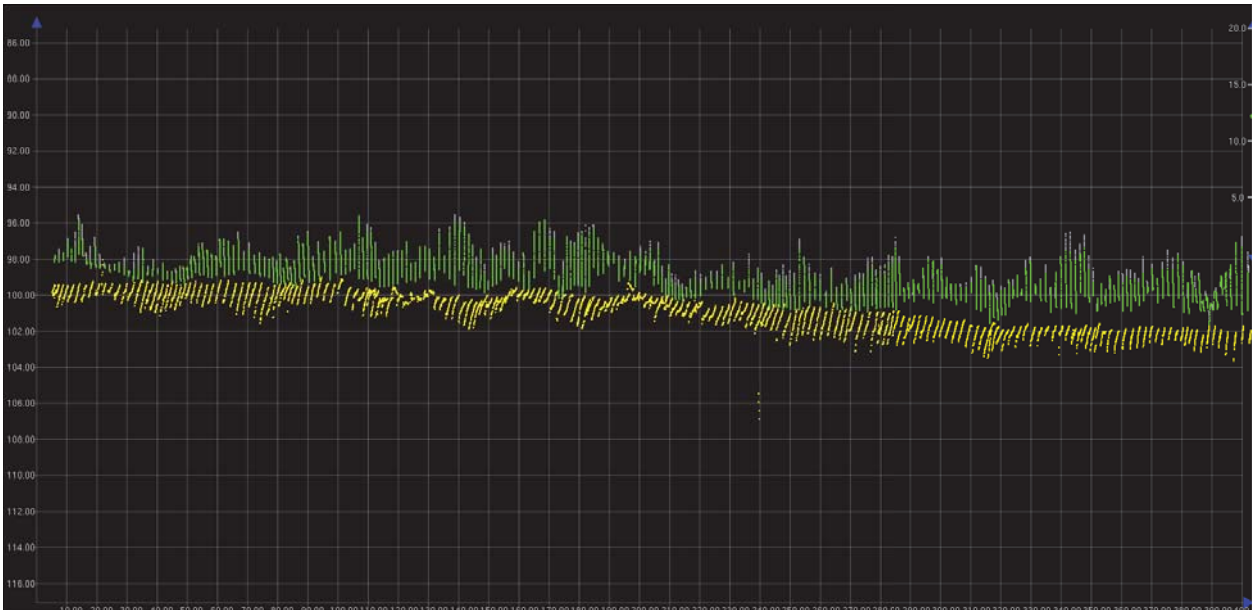


Figure 20: CARIS Subset Editor Image from 2D viewer. In green is a line from the starboard hull 20140526_184503 showing the magnitude of the outer beam flapping error.

B.5.6 Logged Turn

Data was accidentally logged while the ship was turning on line 20140522_235959 at approximately 00:21:52, shown in Figure 21. Errors caused by this turn do not cause offsets that are out of IHO Specification.

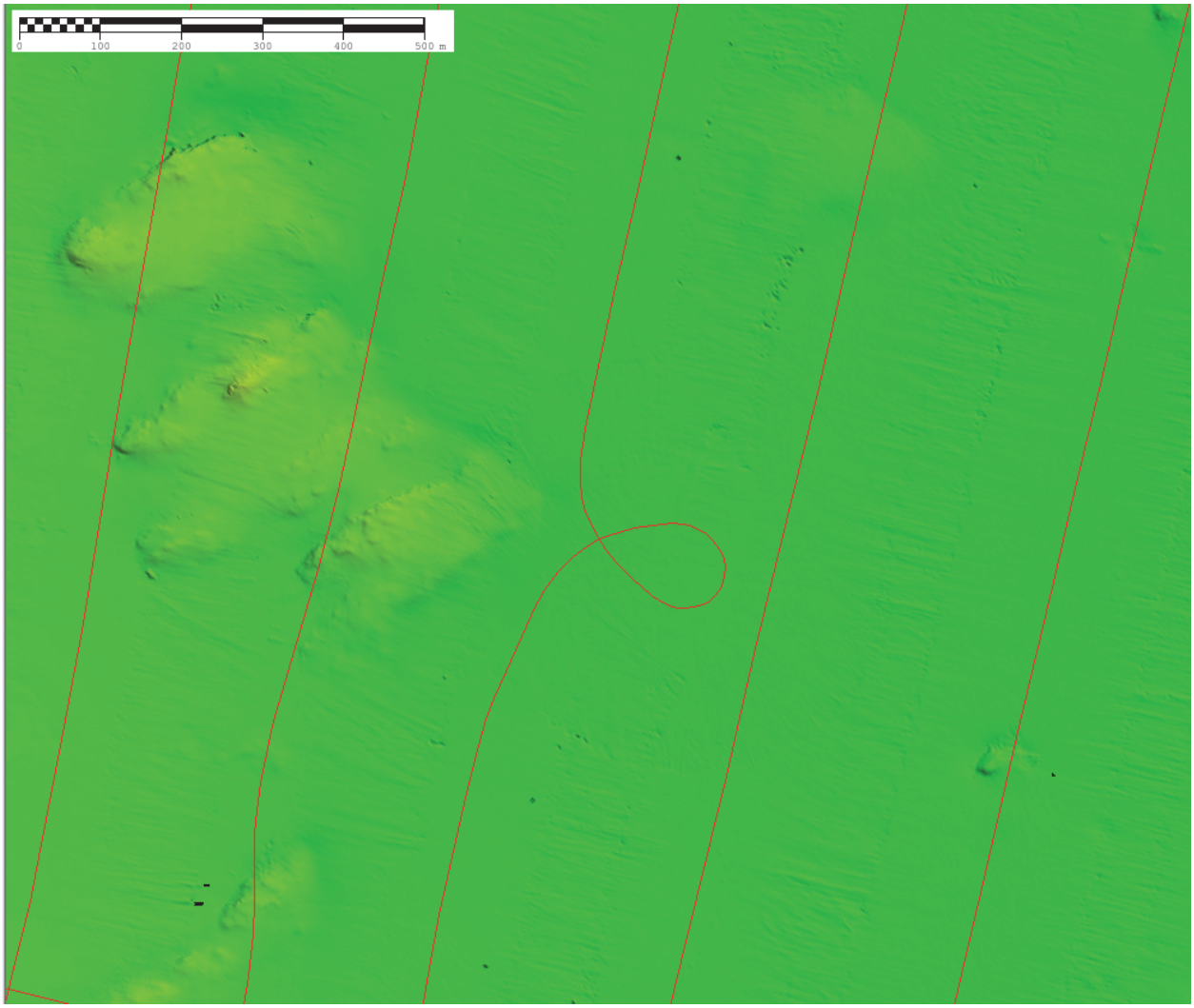


Figure 21: The turn logged on line 20140522_235959 over the 2-meter resolution surface.

C. Vertical and Horizontal Control

All vertical and horizontal control activities conducted during the course of this survey are fully addressed in the following sections. Therefore, no separate HVCR is submitted.

C.1 Vertical Control

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

Non-Standard Vertical Control Methods Used:

VDatum

Ellipsoid to Chart Datum Separation File:

2014_A321_VDatum_NAD83Ellip_MLLW.csar

As required by the Project Instructions, the hydrographer evaluated VDatum for the survey area prior to H12698 final processing. Based on this evaluation, the hydrographer recommended VDatum for final datum reduction. The Chief, Hydrographic Surveys Division, concurred with this recommendation. See Appendix II for the VDatum evaluation report and correspondence associated with the decision.

All soundings submitted as H12698 are reduced to MLLW using documented VDatum techniques. If it is deemed necessary to change the water level reduction method to discrete zoning the following additional information will be useful.

1) The National Water Level Observation Network (NWLON) station serving as datum control for this survey is Fort Point, NH (8423898).
2) The submitted water level file (8423898.tid) is the final approved water levels for the period of hydrography. This file has been loaded to all CARIS lines submitted as H12698.
3) The submitted tide corrector (A321FH2013CORP.zdf) is the preliminary zoning file that was accepted a final per final tide note, submitted in Appendix I of this report. This file has been loaded to all CARIS lines submitted as H12698.
4) A request for final approved tides was sent to N/OPS1 pm 06/02/2014. The final tide note was received on 06/16/2014 stating that preliminary zoning is accepted as the final zoning for project OPR-A321-FH-2014, H12698, during the time period between May 22 - May 30, 2014.

C.2 Horizontal Control

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

The projection used for this project is UTM Zone 19N.

The following PPK methods were used for horizontal control:

Smart Base

The following CORS Stations were used for horizontal control:

HVCR Site ID	Base Station ID
ACUSHNET 5, Acushnet, MA	ACU5
ACUSHNET 6, Acushnet, MA	ACU6
BAR HARBOR, Bar Harbor, ME	BARH
GORHAM, Gorham, ME	MEGO
SOUTH PARIS, South Paris, ME	MESP
NHDOT CONCORD, Concord, NH	NHCO
U NEW HAMPSHIRE, Durham, NH	NHUN
GUNSTOCKMRNH2008, Gilford, NH	P776
MTS YARMOUTH, Yarmouth, MA	YMTS
BOSTON WAAS 1, Nashua, NH	ZBW1

Table 10: CORS Base Stations

DGPS was used for real-time positioning during acquisition. All lines submitted are corrected using post-processed solutions.

The following DGPS Stations were used for horizontal control:

DGPS Stations
Brunswick NAS, ME (316 kHz)

Table 11: USCG DGPS Stations

C.3 Additional Horizontal or Vertical Control Issues

3.3.1 Offsets Due to GPS Tides

There is a slight vertical offset in crosslines due to GPS tides. This vertical offset can best be seen in the southern section of the survey as the bathymetry is flat and mostly featureless. Figure 22 shows an example of the hypothesis count layer around line 20140529_1449605. The image shows striping indicative of a vertical offset which can be seen if the line is viewed in subset editor, shown in Figure 23. These vertical

offsets are on the magnitude of approximately 0.4 meters in water depths between 30 and 170 meters and are thus still within the allowable error as defined by IHO specifications.

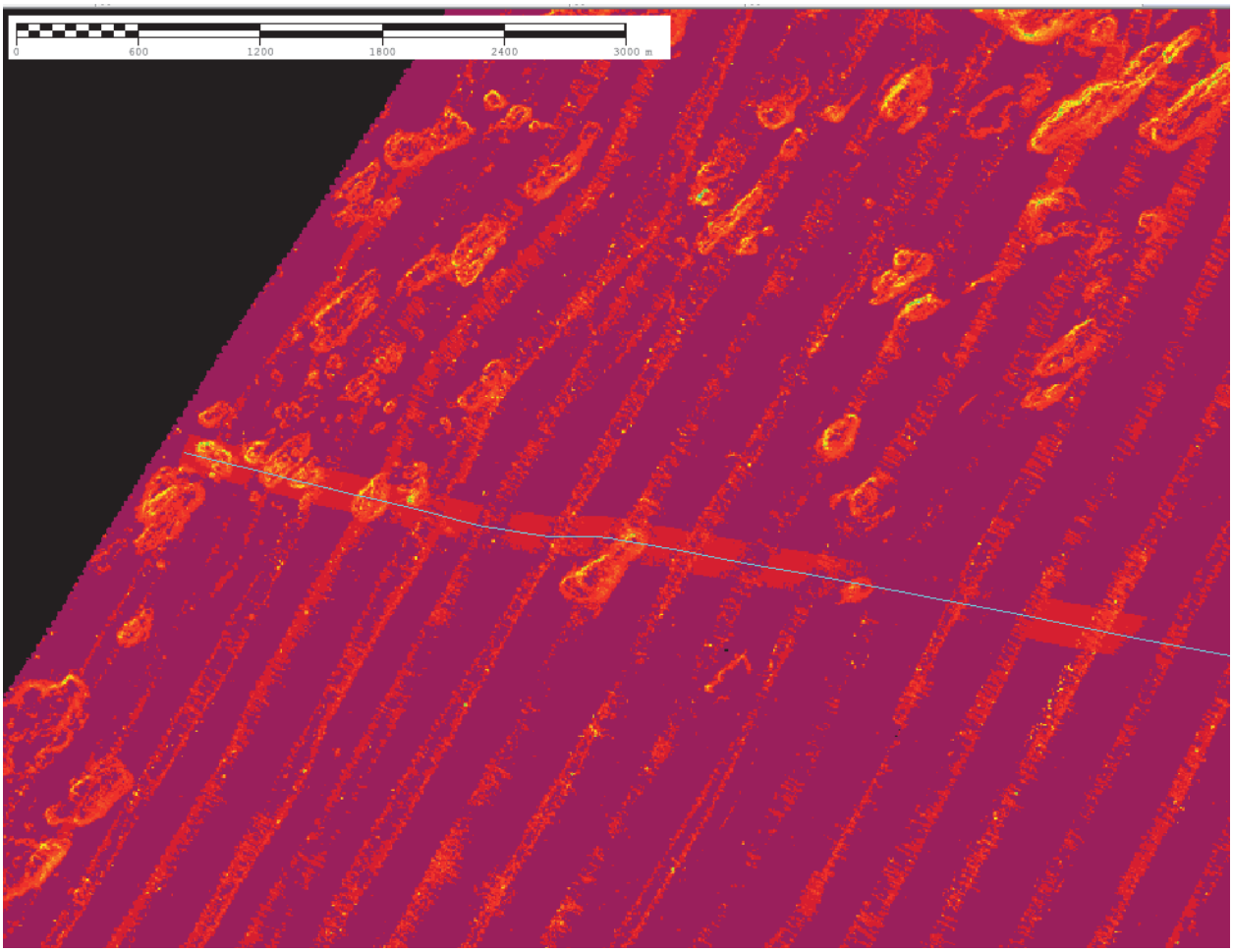


Figure 22: Hypothesis count layer around crossline 20140529_1449605

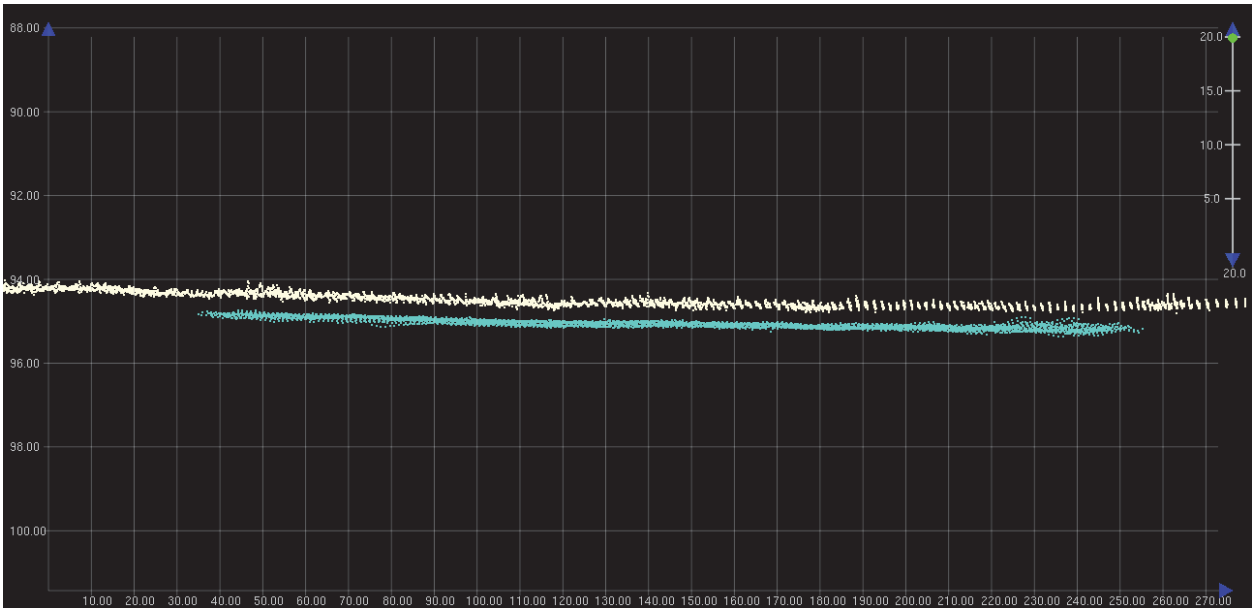


Figure 23: A subset image of line 20140529_1449605 (blue)

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
13278	1:80000	28	08/2013	06/03/2014	05/31/2014
13286	1:80000	32	12/2013	06/03/2014	05/31/2014

Table 12: Largest Scale Raster Charts

13278

A comparison was performed with Chart 13278 (1:80,000) using a CARIS sounding layer based on the 8 meter surface and a contour layer based on an 80m generalized surface from H12698, shown in Figure 24.

Charted depths generally agreed within 20 feet of surveyed soundings. Due to the depths located within H12698, differences smaller than 20 feet between surveyed soundings and charted depths were deemed not significant. Two soundings were found to be different in excess of 20 feet than charted depths: the first shoaler than charted depths by 40 feet, and the second deeper than charted depths by 60 feet, shown in Figure 25. The sounding from H12698 that was found to be shoaler was located on top of a natural feature that was likely missed with prior surveying techniques. All soundings that were different than charted depths are deeper than the dangerous/non-dangerous threshold of 60 feet. It is recommended that H12698 data supersede all charted depths.

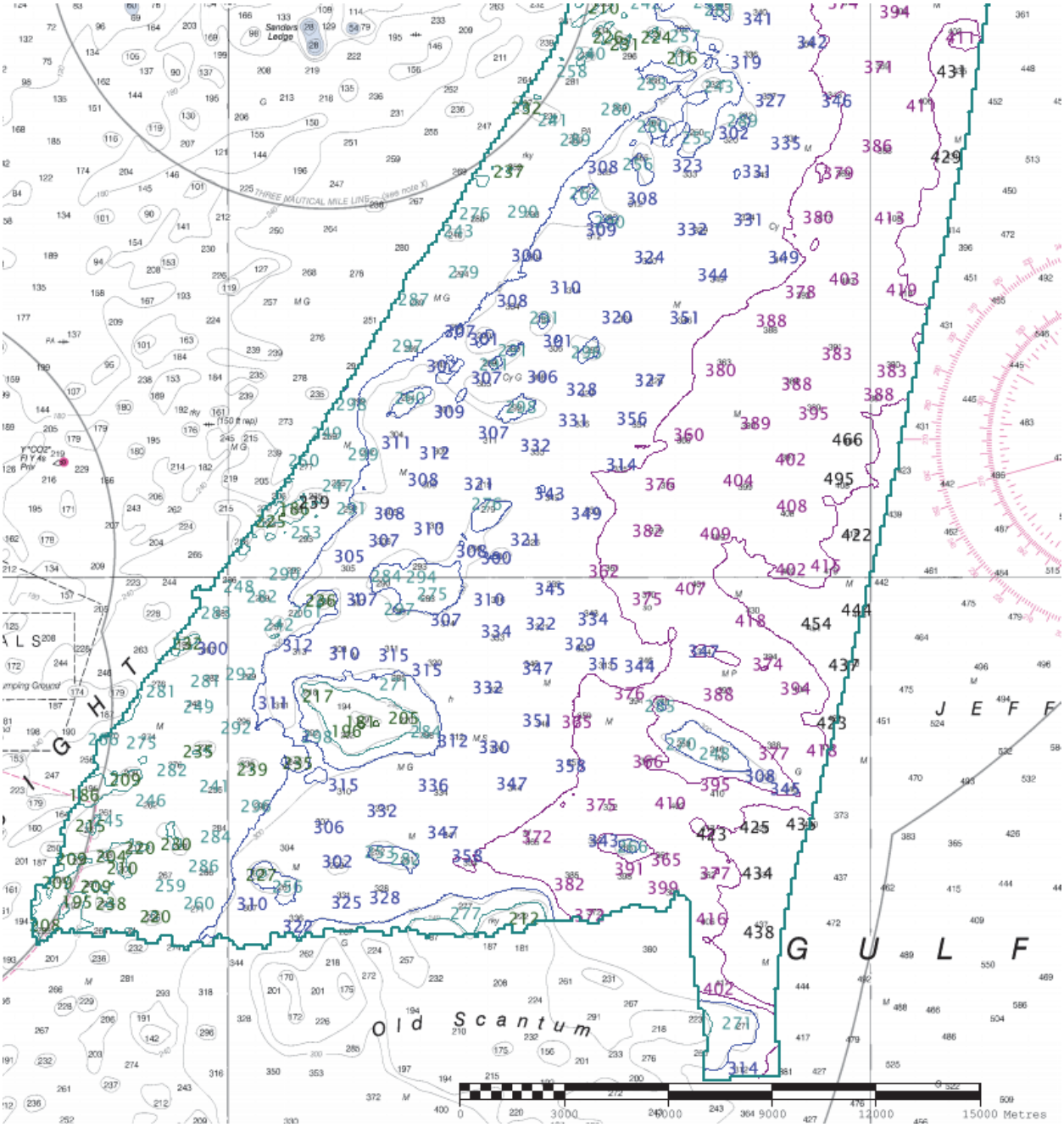


Figure 24: H12698 soundings and contours overlaid on Chart 13278, surveyed soundings are colored within contour ranges

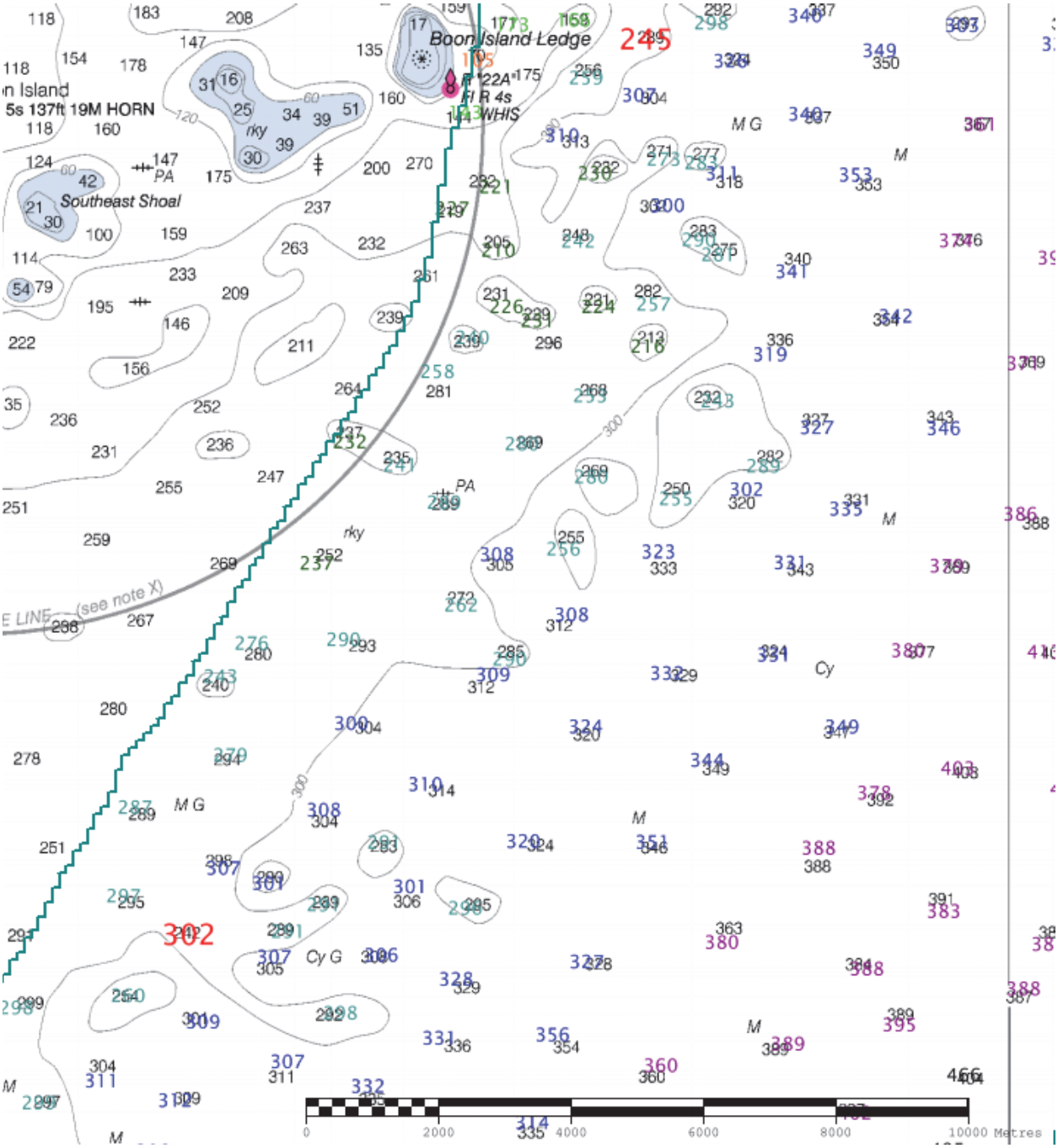


Figure 25: Soundings from H12698 greater than 20 meters different than charted depths in Chart 13278, shown in red

13286

A comparison was performed with Chart 13286 (1:80,000) using a CARIS sounding layer based on the 8 meter surface and a contour layer based on an 80m generalized surface from H12698, shown in Figure 26.

Charted depths generally agreed within 20 feet of surveyed soundings. Due to the depths located within H12698, differences smaller than 20 feet between surveyed soundings and charted depths were deemed not significant. Eight soundings were found to be different in excess of 20 feet from charted depths, shown in Figure 27. Six soundings were found to be shoaler than charted depths. Four of which, including the same sounding discussed in the comparison with 13278, were located on a natural feature that was likely missed with prior surveying techniques. All soundings that were different than charted depths are deeper than the dangerous/non-dangerous threshold of 60 feet. It is recommended that H12698 data supersede all charted depths.

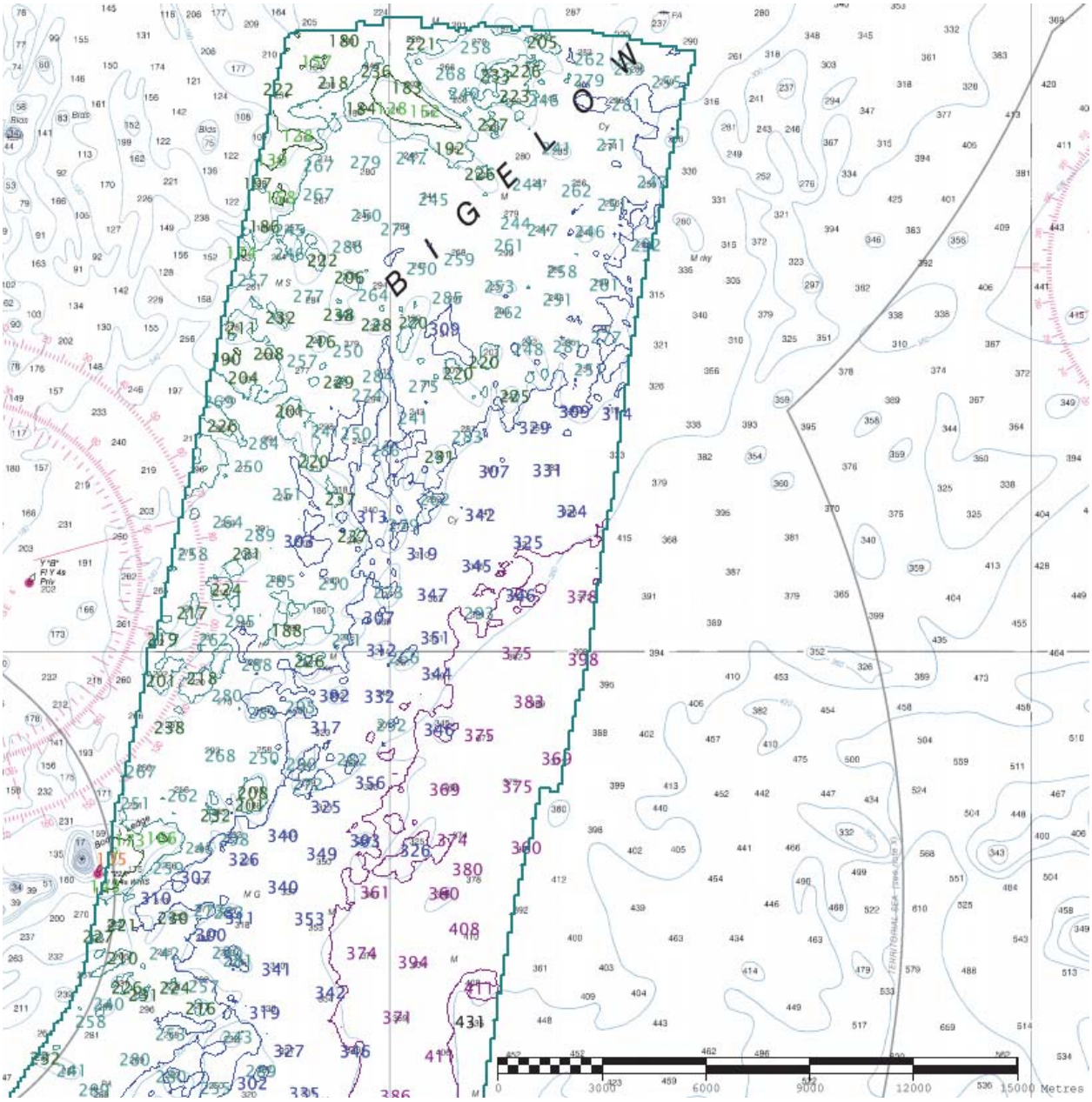


Figure 26: H12698 soundings and contours overlaid on Chart 13286, surveyed soundings are colored within contour ranges

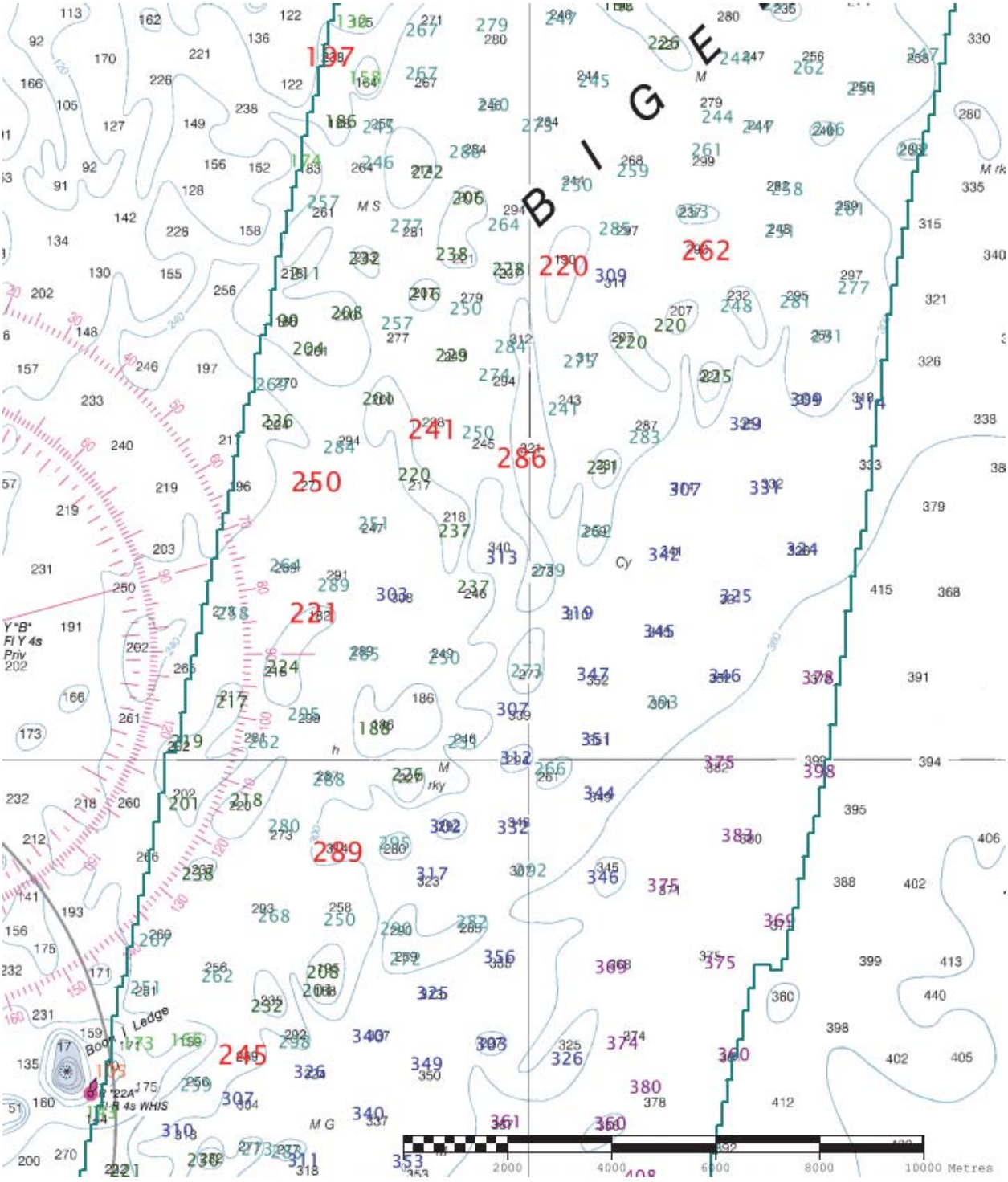


Figure 27: Soundings from H12698 greater than 20 meters different than charted depths in Chart 13286, shown in red

D.1.2 Electronic Navigational Charts

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

ENC	Scale	Edition	Update Application Date	Issue Date	Preliminary?
US4ME01M	1:80000	10	04/28/2014	06/03/2014	NO
US4MA04M	1:80000	22	12/03/2013	12/03/2013	NO

Table 13: Largest Scale ENCs

US4ME01M

ENC US4ME01M overlaps approximately 15 NM of the northern section of survey H12698. The surface for H12698 was subtracted from a point cloud created from charted depths of ENC US4ME01M. The average difference between soundings from H12698 and ENC US4ME01M is -4.5 meters with a standard deviation of 5.1 meters, indicating that H12698 is on average deeper than the ENC. Two soundings were found to be over 1 meter shoaler than charted depths. To display spacial trends, a TIN of the differenced point cloud was created and interpolated to create a surface. Figure 28 shows the interpolated difference surface with red areas depicting soundings from H12628 that are shoaler than charted depths, and blue being surveyed soundings deeper than charted depths.

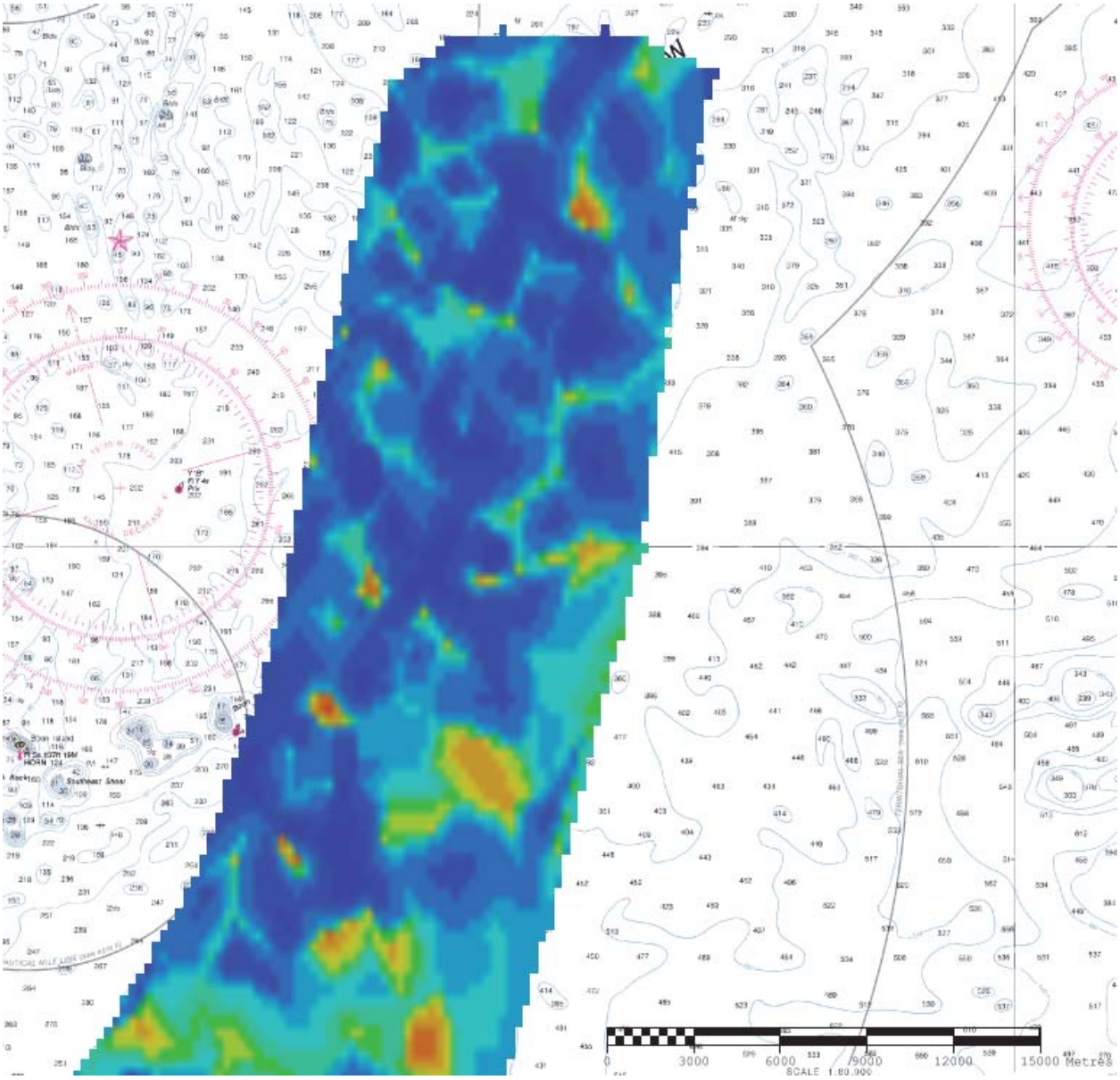


Figure 28: The interpolated surface of the differenced point values of ENC US4ME01M minus H12698. Red areas are where H12698 is shoaler than ENC US4ME01M, and blue areas are where H12698 is deeper.

US4MA04M

ENC US4MA04M overlaps approximately 14 NM of the southern section of survey H12698. The surface for H12698 was subtracted from a point cloud created from charted depths of ENC US4MA04M. The average difference between soundings from H12698 and ENC US4MA04M is -3.4 meters with a standard deviation of 4.5 meters, indicating that H12698 is on average deeper than the ENC. To display spacial trends, a TIN of the differenced point cloud was created and interpolated to create a surface. Figure 29

shows the interpolated difference surface with red areas depicting soundings from H12628 that are shoaler than charted depths, and blue being surveyed soundings deeper than charted depths.

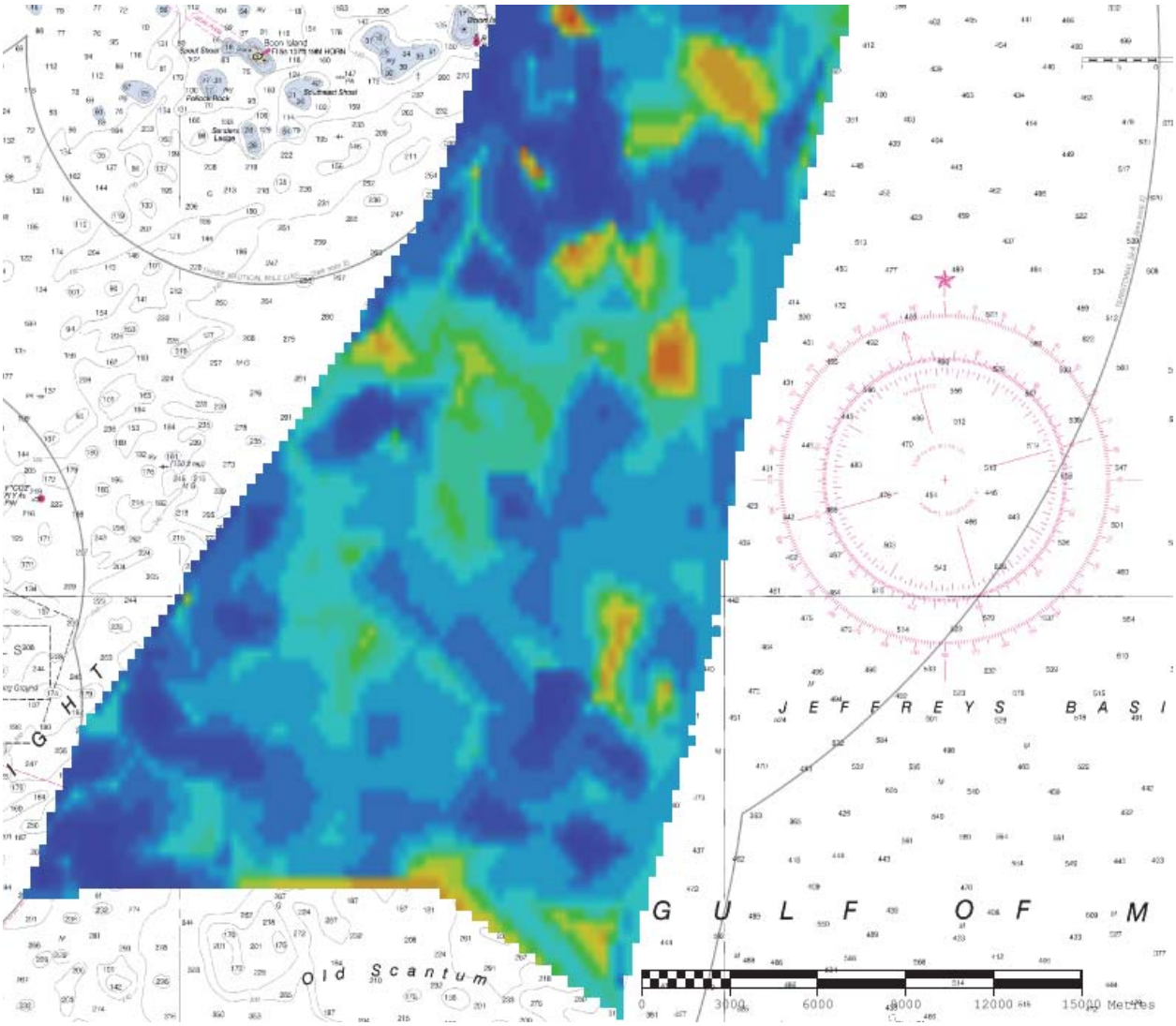


Figure 29: The interpolated surface of the differenced point values of ENC US4MA04M minus H12698. Red areas are where H12698 is shoaler than ENC US4MA04M, and blue areas are where H12698 is deeper.

D.1.3 AWOIS Items

D.1.4 Maritime Boundary Points

No Maritime Boundary Points were assigned for this survey.

D.1.5 Charted Features

One feature, a charted wreck, was assigned as a part of survey H12698. This wreck was not found with full coverage MBES data and was labeled as "delete" in the final feature file.

D.1.6 Uncharted Features

Two uncharted wrecks were discovered using full coverage MBES data during survey H12698. Refer to the final feature file for more information about the uncharted wrecks.

D.1.7 Dangers to Navigation

No Danger to Navigation Reports were submitted for this survey.

D.1.8 Shoal and Hazardous Features

No shoals or potentially hazardous features exist for this survey.

D.1.9 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.1.10 Bottom Samples

Eleven bottom samples were collected during survey H12698. These bottom samples were obtained using two methods: a traditional sediment sampler and a GoPro camera attached to the sampler to obtain a video of the bottom type. Some samples have both a video and bottom sample and some samples have bottom type from just the video. The method of bottom type determination is indicated in the final feature file and on the .pdf image of the bottom sample acquisition log included in Separates II.

D.2 Additional Results

D.2.1 Shoreline

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

D.2.2 Prior Surveys

Prior survey comparisons exist for this survey, but were not investigated.

D.2.3 Aids to Navigation

No Aids to navigation (ATONs) exist for this survey.

D.2.4 Overhead Features

No overhead features exist for this survey.

D.2.5 Submarine Features

No submarine features 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

No present or planned construction or dredging exist within the survey limits.

D.2 New Survey Recommendation

No new surveys or further investigations are recommended for this area.

E. Approval Sheet

As Chief of Party, field operations for this hydrographic survey were conducted under my direct supervision, with frequent personal checks of progress and adequacy. I have reviewed the attached survey data and reports.

All field sheets, this Descriptive Report, and all accompanying records and data are approved. All records are 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, Field Procedures Manual, Letter Instructions, and all HSD Technical Directives. These data are adequate to supersede charted data in their common areas. This survey is complete and no additional work is required with the exception of deficiencies noted in the Descriptive Report.

Report Name	Report Date Sent
OPR-A321-FH-14 Data Acquisition and Processing Report	2014-07-31
OPR-A321-FH-14 VDatum Validation Report	2014-06-13
2014 Hydrographic Systems Readiness Review Memo	2014-05-06

Approver Name	Approver Title	Approval Date	Signature
Jennifer Kist	Sheet Manager	08/01/2014	
LT Adam Reed, NOAA	Field Operations Officer	08/01/2014	Adam Reed 2014.08.08 16:45:08 Z
LCDR Marc S. Moser, NOAA	Commanding Officer	08/01/2014	2014.08.08 13:05:42 -04'00'

F. Table of Acronyms

Acronym	Definition
AHB	Atlantic Hydrographic Branch
AST	Assistant Survey Technician
ATON	Aid to Navigation
AWOIS	Automated Wreck and Obstruction Information System
BAG	Bathymetric Attributed Grid
BASE	Bathymetry Associated with Statistical Error
CO	Commanding Officer
CO-OPS	Center for Operational Products and Services
CORS	Continually Operating Reference Staiton
CTD	Conductivity Temperature Depth
CEF	Chart Evaluation File
CSF	Composite Source File
CST	Chief Survey Technician
CUBE	Combined Uncertainty and Bathymetry Estimator
DAPR	Data Acquisition and Processing Report
DGPS	Differential Global Positioning System
DP	Detached Position
DR	Descriptive Report
DTON	Danger to Navigation
ENC	Electronic Navigational Chart
ERS	Ellipsoidal Referenced Survey
ERZT	Ellipsoidally Referenced Zoned Tides
FFF	Final Feature File
FOO	Field Operations Officer
FPM	Field Procedures Manual
GAMS	GPS Azimuth Measurement Subsystem
GC	Geographic Cell
GPS	Global Positioning System
HIPS	Hydrographic Information Processing System
HSD	Hydrographic Surveys Division
HSSD	Hydrographic Survey Specifications and Deliverables

Acronym	Definition
HSTP	Hydrographic Systems Technology Programs
HSX	Hypack Hysweep File Format
HTD	Hydrographic Surveys Technical Directive
HVCR	Horizontal and Vertical Control Report
HVF	HIPS Vessel File
IHO	International Hydrographic Organization
IMU	Inertial Motion Unit
ITRF	International Terrestrial Reference Frame
LNM	Local Notice to Mariners
LNM	Linear Nautical Miles
MCD	Marine Chart Division
MHW	Mean High Water
MLLW	Mean Lower Low Water
NAD 83	North American Datum of 1983
NAIP	National Agriculture and Imagery Program
NALL	Navigable Area Limit Line
NM	Notice to Mariners
NMEA	National Marine Electronics Association
NOAA	National Oceanic and Atmospheric Administration
NOS	National Ocean Service
NRT	Navigation Response Team
NSD	Navigation Services Division
OCS	Office of Coast Survey
OMAO	Office of Marine and Aviation Operations (NOAA)
OPS	Operations Branch
MBES	Multibeam Echosounder
NWLON	National Water Level Observation Network
PDBS	Phase Differencing Bathymetric Sonar
PHB	Pacific Hydrographic Branch
POS/MV	Position and Orientation System for Marine Vessels
PPK	Post Processed Kinematic
PPP	Precise Point Positioning
PPS	Pulse per second

Acronym	Definition
PRF	Project Reference File
PS	Physical Scientist
PST	Physical Science Technician
RNC	Raster Navigational Chart
RTK	Real Time Kinematic
SBES	Singlebeam Echosounder
SBET	Smooth Best Estimate and Trajectory
SNM	Square Nautical Miles
SSS	Side Scan Sonar
ST	Survey Technician
SVP	Sound Velocity Profiler
TCARI	Tidal Constituent And Residual Interpolation
TPU	Total Porpagated Error
TPU	Topside Processing Unit
USACE	United States Army Corps of Engineers
USCG	United Stated Coast Guard
UTM	Universal Transverse Mercator
XO	Executive Officer
ZDA	Global Positiong System timing message
ZDF	Zone Definition File

APPENDIX I

TIDES AND WATERLEVELS

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

PROVISIONAL TIDE NOTE FOR HYDROGRAPHIC SURVEY

DATE : June 12, 2014

HYDROGRAPHIC BRANCH: Atlantic
HYDROGRAPHIC PROJECT: OPR-A321-FH-2014
HYDROGRAPHIC SHEET: H12698
LOCALITY: Offshore - Vicinity of Bigelow Bight, Gulf of Maine, ME
TIME PERIOD: May 22 - May 30, 2014

TIDE STATION USED: 842-3898 Fort Point, NH
Lat. 43° 04.3'N Long. 70° 42.7' W
PLANE OF REFERENCE (MEAN LOWER LOW WATER): 0.000 meters
HEIGHT OF HIGH WATER ABOVE PLANE OF REFERENCE: 2.735 meters

REMARKS: RECOMMENDED ZONING Preliminary zoning is accepted as the final zoning for project OPR-A321-FH-2014, H12698, during the time period between May 22 - May 30, 2014.

Please use the zoning file A321FH2014CORP submitted with the project instructions for OPR-A321-FH-2014. Zones MA156, NA157, NA168, and NA169 are the applicable zones for H12698.

Refer to attachments for zoning information.

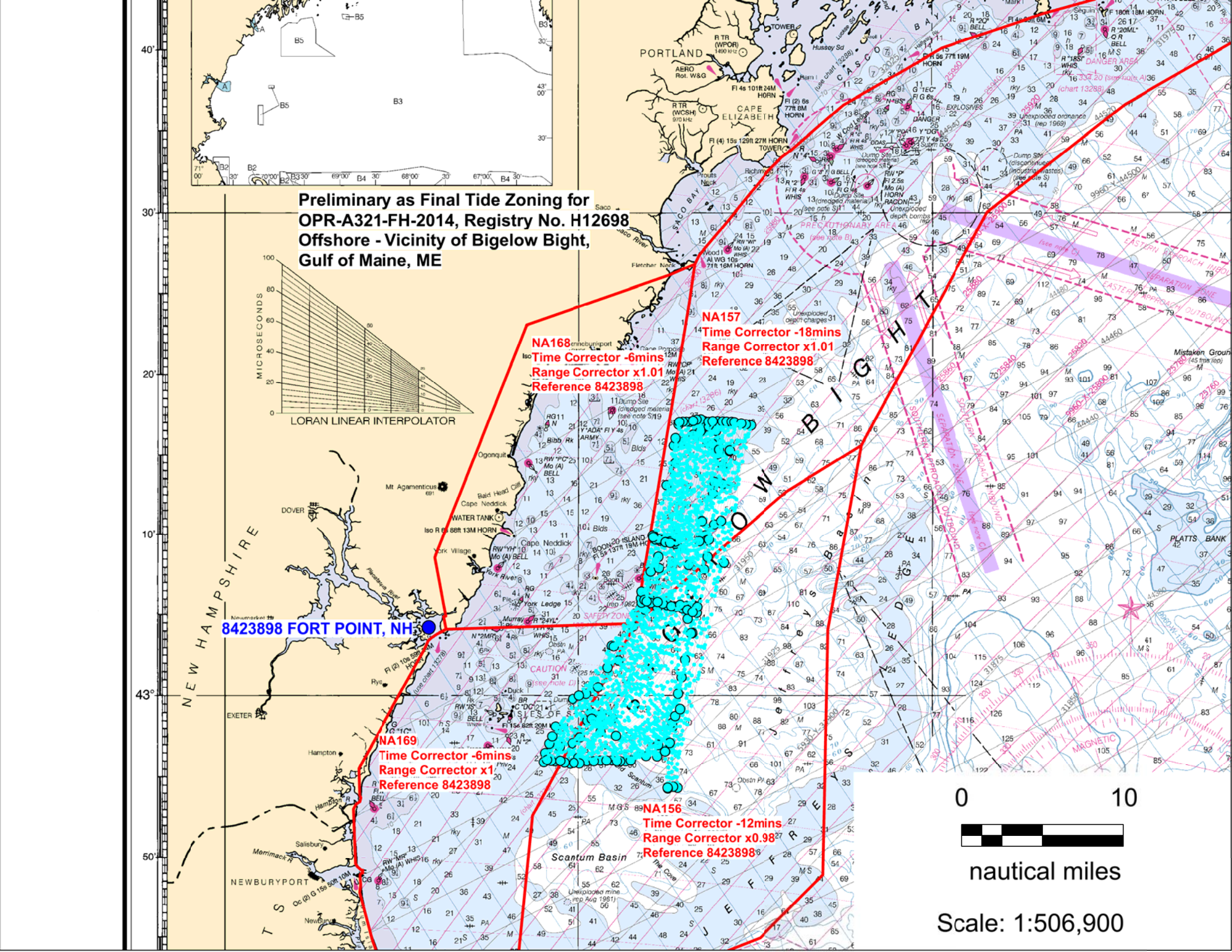
Note 1: Provided time series data are tabulated in metric units (meters), relative to MLLW and on Greenwich Mean Time on the 1983-2001 National Tidal Datum Epoch (NTDE).

Note 2: Annual leveling for Fort Point, NH (8423898) was not completed in FY13. A review of the verified leveling records from October 2002 - 2012 shows the tide station benchmark network to be stable within an allowable 0.009 m tolerance. This Tide Note may be used as final stability verification for survey OPR-A321-FH-2014, H12698. CO-OPS will immediately provide a revised Tide Note should subsequent leveling records indicate any benchmark network stability movement beyond the allowable 0.009 m tolerance.

BURKE.PATRICK.B.1365830335

Digitally signed by BURKE.PATRICK.B.1365830335
DN: c=US, o=U.S. Government, ou=DoD, ou=PKI, ou=OTHER, cn=BURKE.PATRICK.B.1365830335
Date: 2014.06.16 13:09:33 -04'00'

ACTING CHIEF, OCEANOGRAPHIC DIVISION


Preliminary as Final Tide Zoning for
OPR-A321-FH-2014, Registry No. H12698
Offshore - Vicinity of Bigelow Bight,
Gulf of Maine, ME
NA168
Time Corrector -6mins
Range Corrector x1.01
Reference 8423898
NA157
Time Corrector -18mins
Range Corrector x1.01
Reference 8423898
NA169
Time Corrector -6mins
Range Corrector x1
Reference 8423898
NA156
Time Corrector -12mins
Range Corrector x0.98
Reference 8423898
8423898 FORT POINT, NH
LORAN LINEAR INTERPOLATOR
MICROSECONDS
BIGELOW BIGHT
NEW HAMPSHIRE
PORTLAND
CAPE ELIZABETH
Scantum Basin
0
10
nautical miles
Scale: 1:506,900

APPENDIX II

SUPPLEMENTAL SURVEY RECORDS AND COORESPONDENCE

Subject: Re: LNM Announcements for 2014 Projects
From: FOO <ops.ferdinand.hassler@noaa.gov>
Date: 3/27/2014 11:54 AM
To: Brent Pounds - NOAA Federal <brent.pounds@noaa.gov>
CC: "CO.Ferdinand Hassler - NOAA Service Account" <CO.Ferdinand.Hassler@noaa.gov>

Brent,

Thanks for putting the LNM together. These look good to me.

V/R,
Adam

On 3/27/2014 4:28 AM, Brent Pounds - NOAA Federal wrote:

> All,
>
> See attached for the LNM announcements I put together for the 2014 projects. If you could please look them over and provide any corrections or comments, I would appreciate it. I want to get these running in the LNM and forwarded to the lobstermen's associations soon.
>
> V/R,
> -Brent
> ---
> LCDR Brent Pounds, NOAA
> Navigation Manager, Northeast Region
> Office of Coast Survey
> Navigation Services Division
> 28 Tarzwell Drive
> Narragansett, RI 02882
> Tel: 401-782-3252
> Cel: 401-545-0174
> Fax: 401-782-3292
> nauticalcharts.noaa.gov

--
Field Operations Officer, NOAA Ship Ferdinand R. Hassler
29 Wentworth Road
New Castle, NH, 03854

OPS.Ferdinand Hassler - NOAA Service Account <ops.ferdinand.hassler@noaa.gov>

Hassler trackline request for August/September 2013

Meghan McGovern - NOAA Federal <meghan.mcgovern@noaa.gov> Wed, Jun 11, 2014 at 7:32 PM
To: "OPS.Ferdinand Hassler - NOAA Service Account" <ops.ferdinand.hassler@noaa.gov>
Cc: Brent Pounds - NOAA Federal <brent.pounds@noaa.gov>, John Kidd - NOAA Federal <john.kidd@noaa.gov>

Adam,

As part of the ongoing lobster gear loss issue, I will need the ship's trackline from the beginning of your 2013 'Approaches to Portsmouth' project through 9/14/2013. Basically from the date you started surveying in that location through 9/14. The trackline file from Coastal Explorer should suffice. Thank you.

r,
Meghan

--

Meghan McGovern, LT/NOAA
Office of Coast Survey
Navigation Services Division
28 Tarzwell Drive
Narragansett, RI 02882
Tel: 401-782-3252
Fax: 401-782-3292
nauticalcharts.noaa.gov

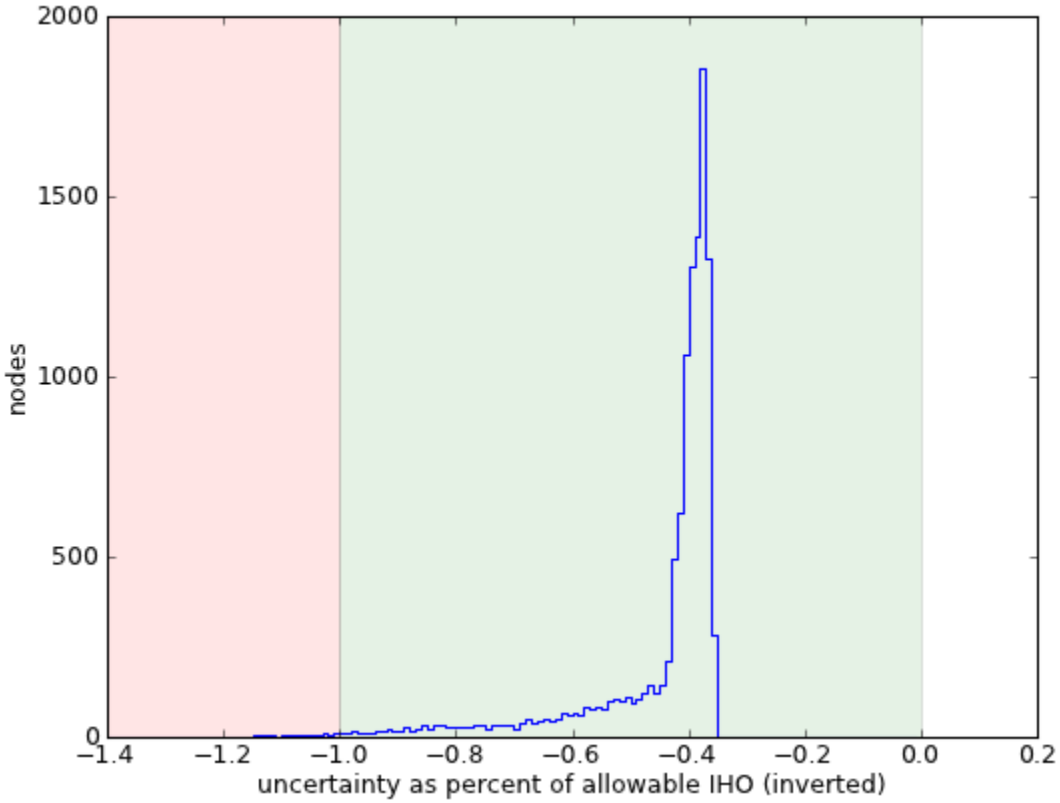
H12698_2m

The finalized surface has 11457 nodes with 297532 soundings.

Uncertainty Standards

99.22% | PASS

Nodes with Uncertainty less then or equal allowable IHO error **99.22%** (11368/11457).

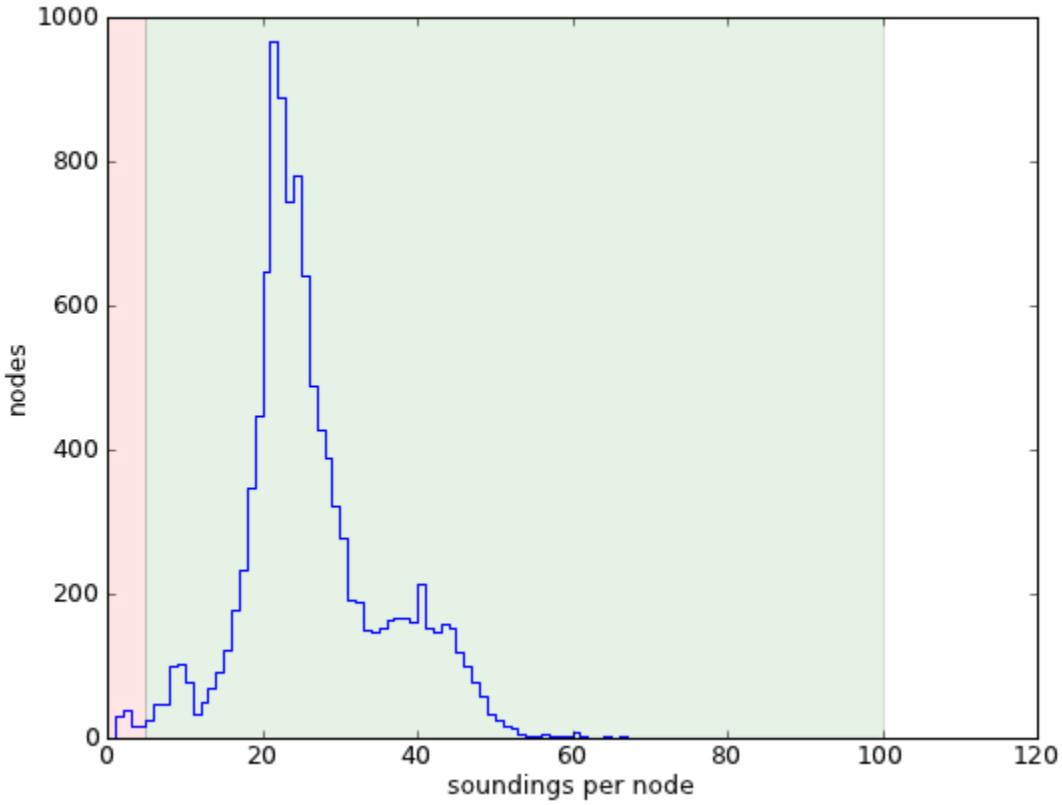


Object Detection Coverage

99.10% | PASS

Nodes with 5 or more soundings **99.10%** (11354/11457).
Sounding count average is **25.97** soundings per node.

Sounding count mode is **22** soundings per node.



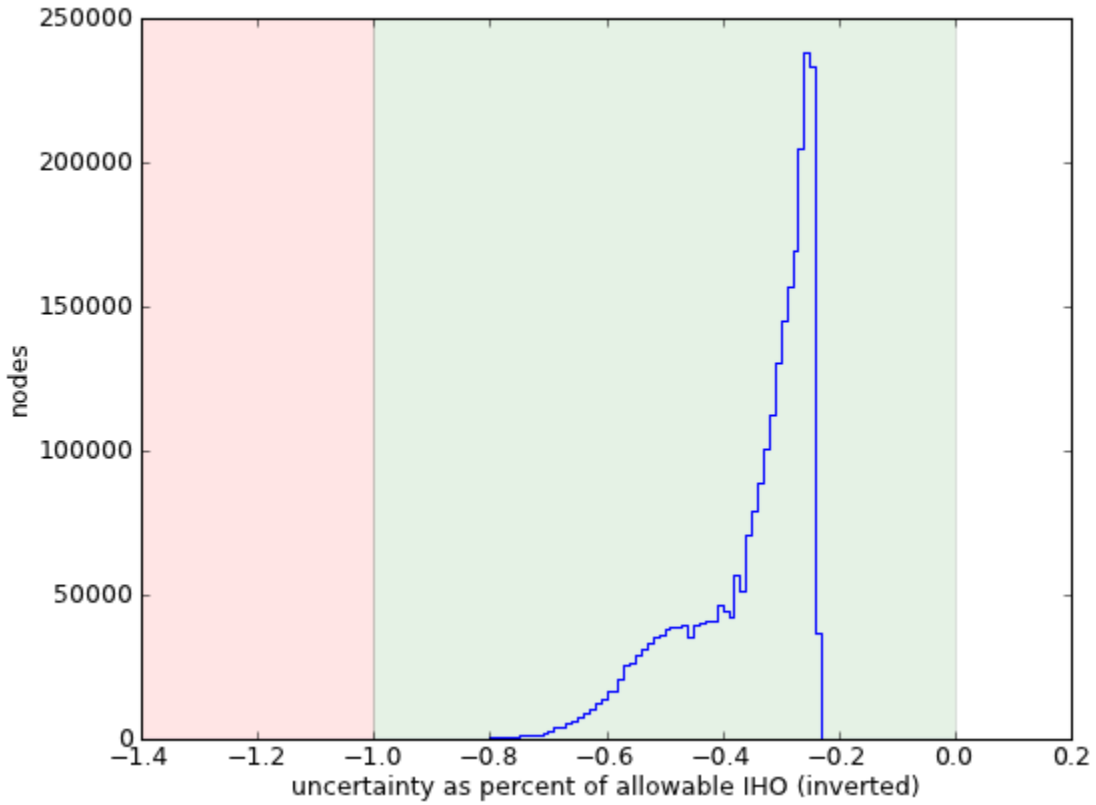
H12698_4m

The finalized surface has 2722886 nodes with 75094091 soundings.

Uncertainty Standards

100.00% | PASS

Nodes with Uncertainty less then or equal allowable IHO error **100.00%** (2722820/2722886).

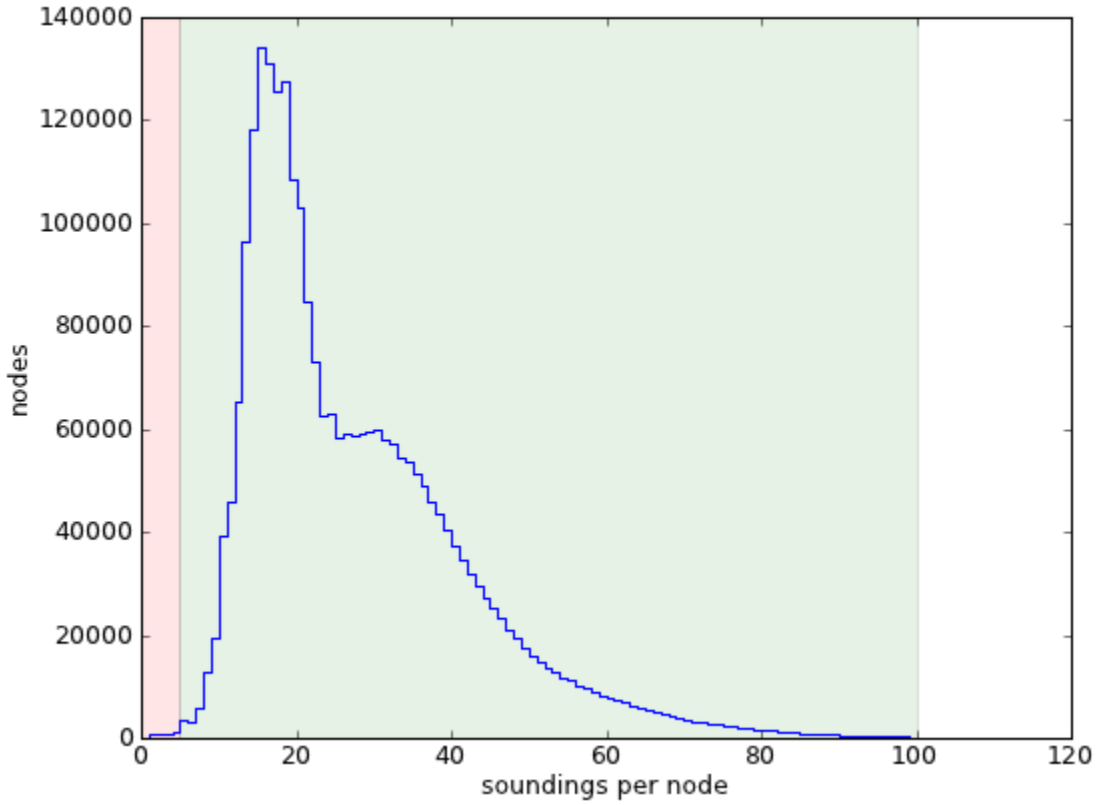


Object Detection Coverage

99.86% | PASS

Nodes with 5 or more soundings **99.86%** (2719039/2722886).
Sounding count average is **27.58** soundings per node.

Sounding count mode is **16** soundings per node.



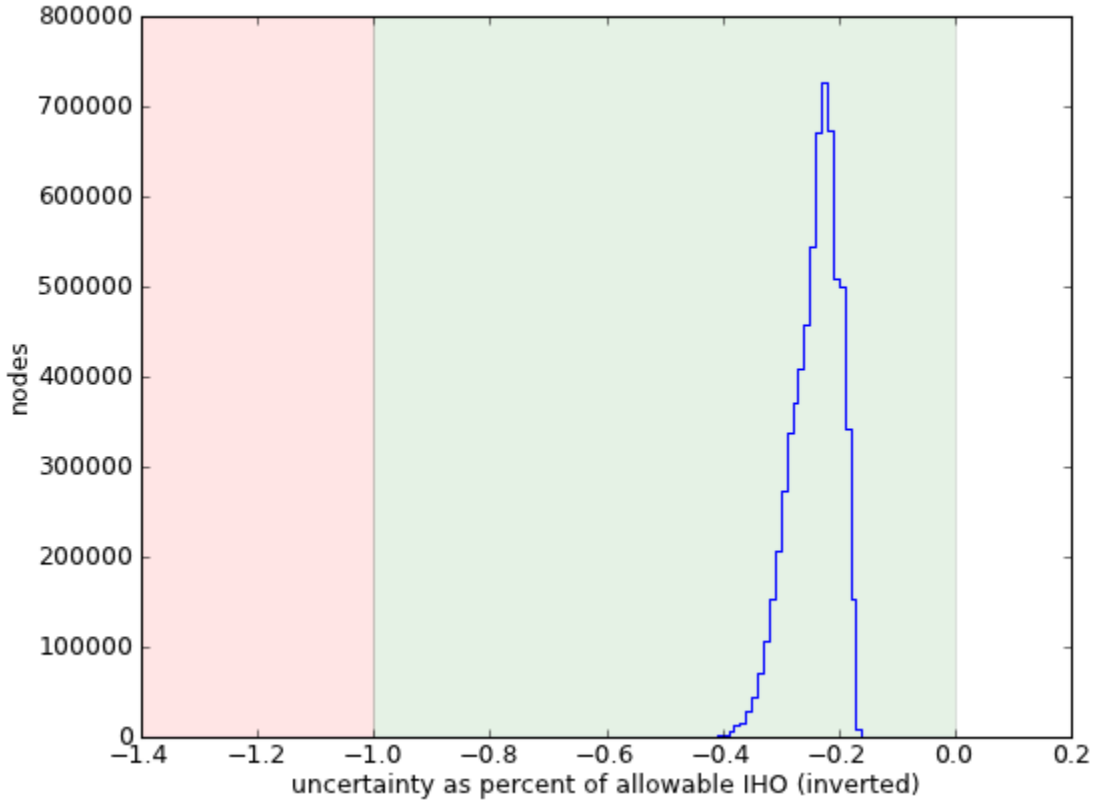
H12698_8m_IHO1

The finalized surface has 6622743 nodes with 438072210 soundings.

Uncertainty Standards

100.00% | PASS

Nodes with Uncertainty less then or equal allowable IHO error **100.00%** (6622743/6622743).

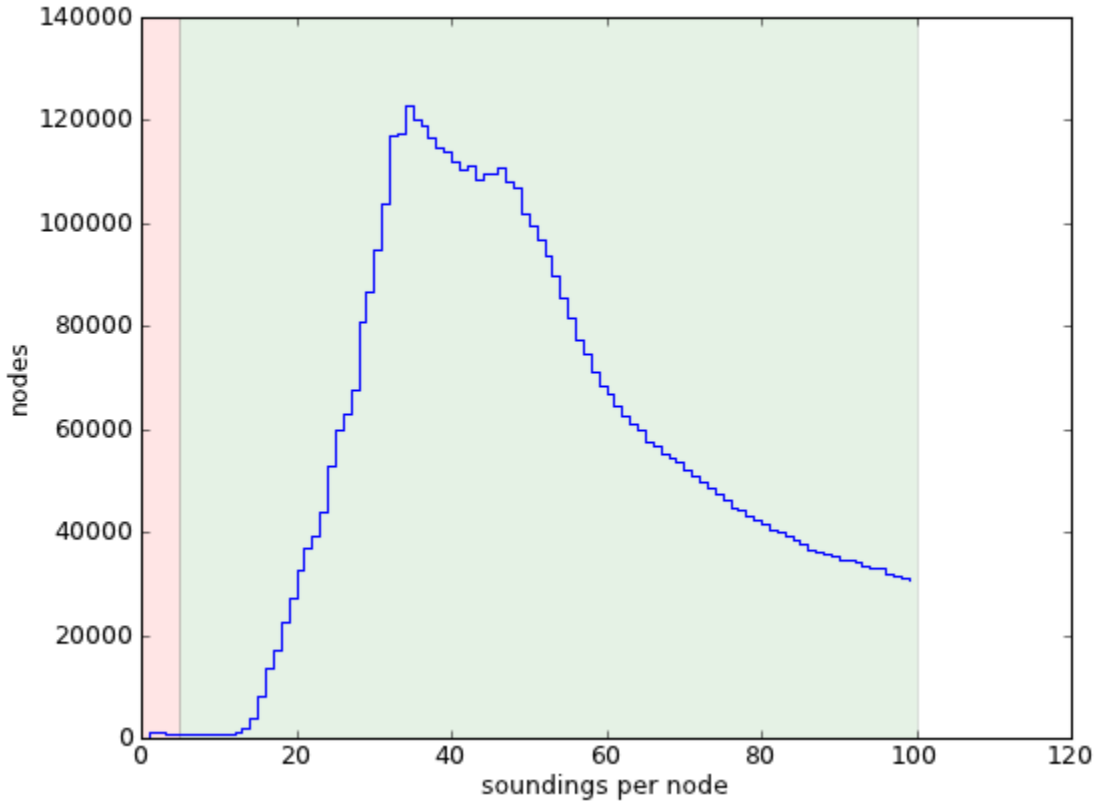


Object Detection Coverage

99.94% | PASS

Nodes with 5 or more soundings **99.94%** (6618719/6622743).
Sounding count average is **66.15** soundings per node.

Sounding count mode is **35** soundings per node.



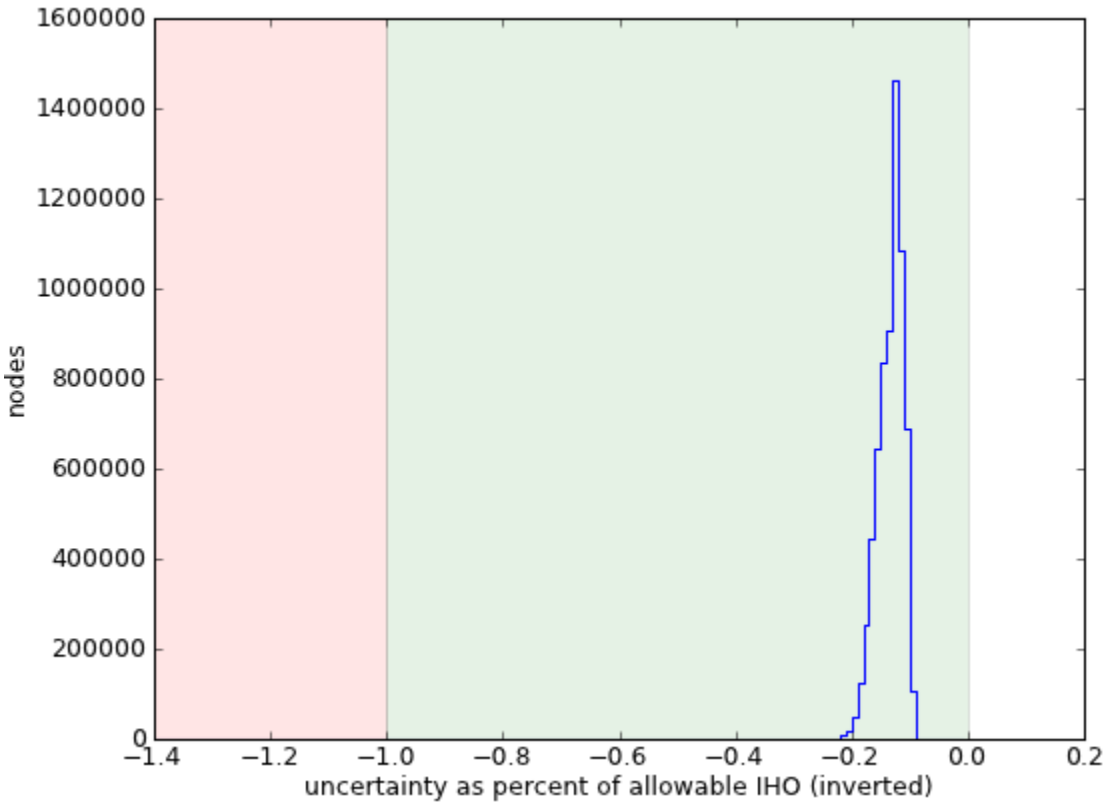
H12698_8m_IHO2

The finalized surface has 6622743 nodes with 438072210 soundings.

Uncertainty Standards

100.00% | PASS

Nodes with Uncertainty less then or equal allowable IHO error **100.00%** (6622743/6622743).

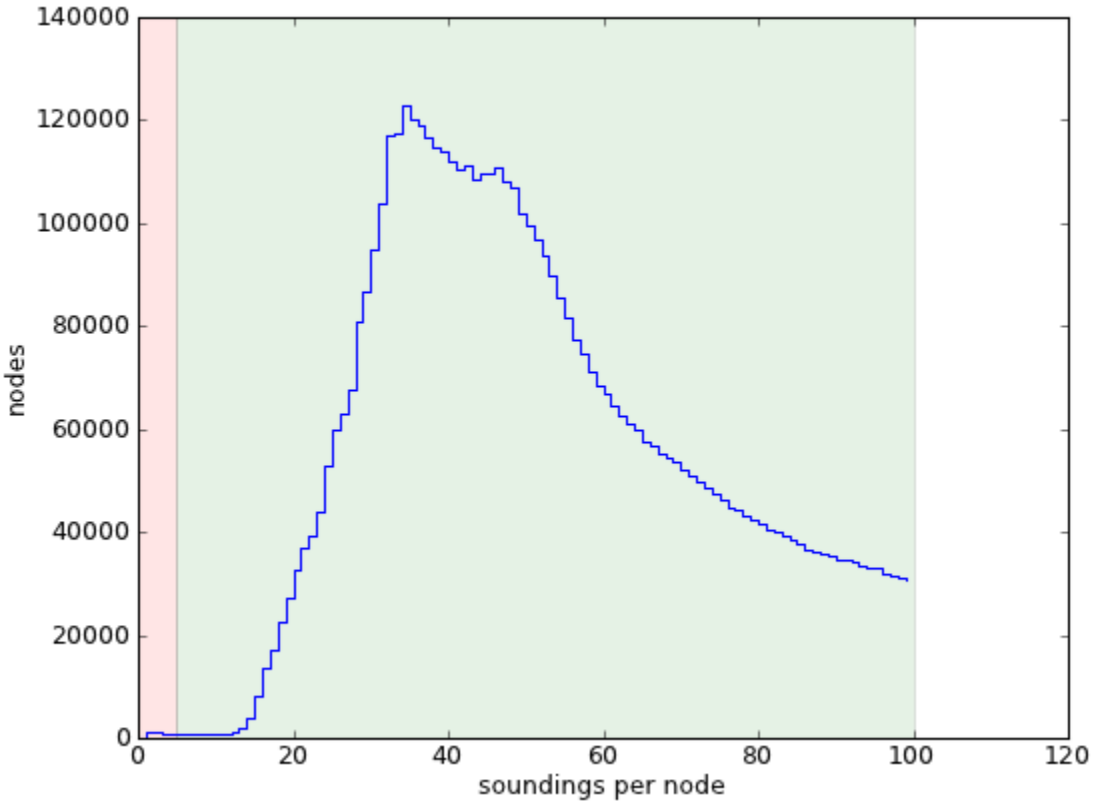


Object Detection Coverage

99.94% | PASS

Nodes with 5 or more soundings **99.94%** (6618719/6622743).
Sounding count average is **66.15** soundings per node.

Sounding count mode is **35** soundings per node.



APPROVAL PAGE

H12698

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

- H12698_DR.pdf
- Collection of depth varied resolution BAGS
- Processed survey data and records
- H12698_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 Matthew Jaskoski, NOAA
Chief, Atlantic Hydrographic Branch