H12726

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

DESCRIPTIVE REPORT

Type of Survey: Navigable Area

Registry Number: H12726

LOCALITY

State(s): Maine

General Locality: Gulf of Maine

Sub-locality: Taylor Reef to Woody Island

2015

CHIEF OF PARTY
CDR Marc S. Moser, NOAA

LIBRARY & ARCHIVES

Date:

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

REGISTRY NUMBER:

HYDROGRAPHIC TITLE SHEET

H12726

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**
General Locality:	**Gulf of Maine**
Sub-Locality:	**Taylor Reef to Woody Island**
Scale:	**40000**
Dates of Survey:	**01/06/2015 to 02/05/2015**
Instructions Dated:	**12/19/2014**
Project Number:	**OPR-A321-FH-15**
Field Unit:	**NOAA Ship *Ferdinand R. Hassler***
Chief of Party:	**CDR 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 Centers for Environmental Information (NCEI) and can be retrieved via https://www.ncei.noaa.gov/.

Table of Contents

A. Area Surveyed 1
A.1 Survey Limits 1
A.2 Survey Purpose 2
A.3 Survey Quality 2
A.4 Survey Coverage 3
A.5 Survey Statistics 4
B. Data Acquisition and Processing 5
B.1 Equipment and Vessels 5
B.1.1 Vessels 6
B.1.2 Equipment 7
B.2 Quality Control 7
B.2.1 Crosslines 7
B.2.2 Uncertainty 10
B.2.3 Junctions 11
B.2.4 Sonar QC Checks 13
B.2.5 Equipment Effectiveness 13
B.2.6 Factors Affecting Soundings 14
B.2.7 Sound Speed Methods 14
B.2.8 Coverage Equipment and Methods 17
B.2.9 Data Gaps 17
B.2.10 Data Density 21
B.2.11 Total Vertical Uncertainty Analysis 22
B.3 Echo Sounding Corrections 22
B.3.1 Corrections to Echo Soundings 22
B.3.2 Calibrations 22
B.4 Backscatter 22
B.5 Data Processing 22
B.5.1 Software Updates 22
B.5.2 Surfaces 23
B.5.3 Total Vertical Uncertainty Analysis 23
B.5.4 Designated Soundings 26
C. Vertical and Horizontal Control 26
C.1 Vertical Control 26
C.2 Horizontal Control 27
D. Results and Recommendations 29
D.1 Chart Comparison 29
D.1.1 Raster Charts 29
D.1.2 Electronic Navigational Charts 34
D.1.3 AWOIS Items 38
D.1.4 Maritime Boundary Points 38
D.1.5 Charted Features 38
D.1.6 Uncharted Features 38
D.1.7 Dangers to Navigation 39

D.1.8 Shoal and Hazardous Features..... 39
D.1.9 Channels..... 39
D.1.10 Bottom Samples 39
D.2 Additional Results..... 39
D.2.1 Shoreline.....39
D.2.2 Prior Surveys.....39
D.2.3 Aids to Navigation.....40
D.2.4 Overhead Features..... 40
D.2.5 Submarine Features.....40
D.2.6 Ferry Routes and Terminals.....40
D.2.7 Platforms.....40
D.2.8 Significant Features.....40
D.2.9 Construction and Dredging..... 40
D.2.10 New Survey Recommendation..... 40
D.2.11 State of Maine Junction..... 41
D.2.12 Inset Recommendation..... 41
E. Approval Sheet.....42
F. Table of Acronyms..... 43

List of Tables

Table 1: Survey Limits.....1
Table 2: Hydrographic Survey Statistics..... 4
Table 3: Dates of Hydrography..... 5
Table 4: Vessels Used.....6
Table 5: Major Systems Used.....7
Table 6: Survey Specific Tide TPU Values.....10
Table 7: Survey Specific Sound Speed TPU Values.....10
Table 8: Junctioning Surveys..... 11
Table 9: Submitted Surfaces..... 23
Table 10: CORS Base Stations..... 28
Table 11: User Installed Base Stations.....28
Table 12: USCG DGPS Stations..... 29
Table 13: Largest Scale Raster Charts..... 29
Table 14: Largest Scale ENCs..... 34
Table 15: DTON Reports..... 39

List of Figures

Figure 1: General locality of survey H12726.....2
Figure 2: Survey layout for OPR-A321-FH-15, plotted over RNC 13286.....3
Figure 3: NOAA Ship FERDINAND R. HASSLER..... 6
Figure 4: Location of crosslines, shown in purple and mainscheme data for H12726.....8
Figure 5: H12726 crossline difference statistics: mainscheme minus crossline.....9

Figure 6: Mainscheme minus crossline differenced surface shown overlaid on mainscheme data. The color range scale shown is for the differenced surface. Large differences (red and blue) appear to be greatest in areas of high relief. 10
Figure 7: Sources of error data applied during CARIS processing 11
Figure 8: Junctioning area between surveys H12726 and H12725. 12
Figure 9: Differenced surface statistics - H12726 minus H12725. 13
Figure 10: H12726 sound speed profile locations - lines colored by SV profile. 15
Figure 11: Sound speed error creating refraction which exceeds allowable error budget. 16
Figure 12: 43-27-58.52N 70-18-25.63W; Location of sound speed error bust. 17
Figure 13: Data Gap 1 18
Figure 14: 43-32-42.022N 70-15-17.725W; Data Gap 2 19
Figure 15: Data Gap 3 20
Figure 16: 43-24-54.938N 70-22-18.074W; Data Gap 4 21
Figure 17: H12726 1m TVU meets sounding per node standards 24
Figure 18: H12726 2m TVU meets sounding per node standards 25
Figure 19: H12726 4m TVU meets sounding per node standards 26
Figure 20: Contour comparison 30
Figure 21: Contour and sounding comparison reveals differences. 31
Figure 22: Contour comparison. 32
Figure 23: Contour comparison. 33
Figure 24: Contour comparison 34
Figure 25: Contour comparison 35
Figure 26: Contour Comparison 36
Figure 27: Contour Comparison 36
Figure 28: Contour comparison 37
Figure 29: Contour comparison 38

Descriptive Report to Accompany Survey H12726

Project: OPR-A321-FH-15

Locality: Gulf of Maine

Sublocality: Taylor Reef to Woody Island

Scale: 1:40000

January 2015 - February 2015

NOAA Ship *Ferdinand R. Hassler*

Chief of Party: CDR Marc S. Moser, NOAA

A. Area Surveyed

Survey H12726 was conducted in the Gulf of Maine, with a sublocality of Taylor Reef to Woody Island as shown in Figure 1.

A.1 Survey Limits

Data were acquired within the following survey limits:

Northwest Limit	Southeast Limit
43° 33' 56.01" N 70° 22' 48.35" W	43° 23' 56.17" N 70° 3' 24.83" W

Table 1: Survey Limits

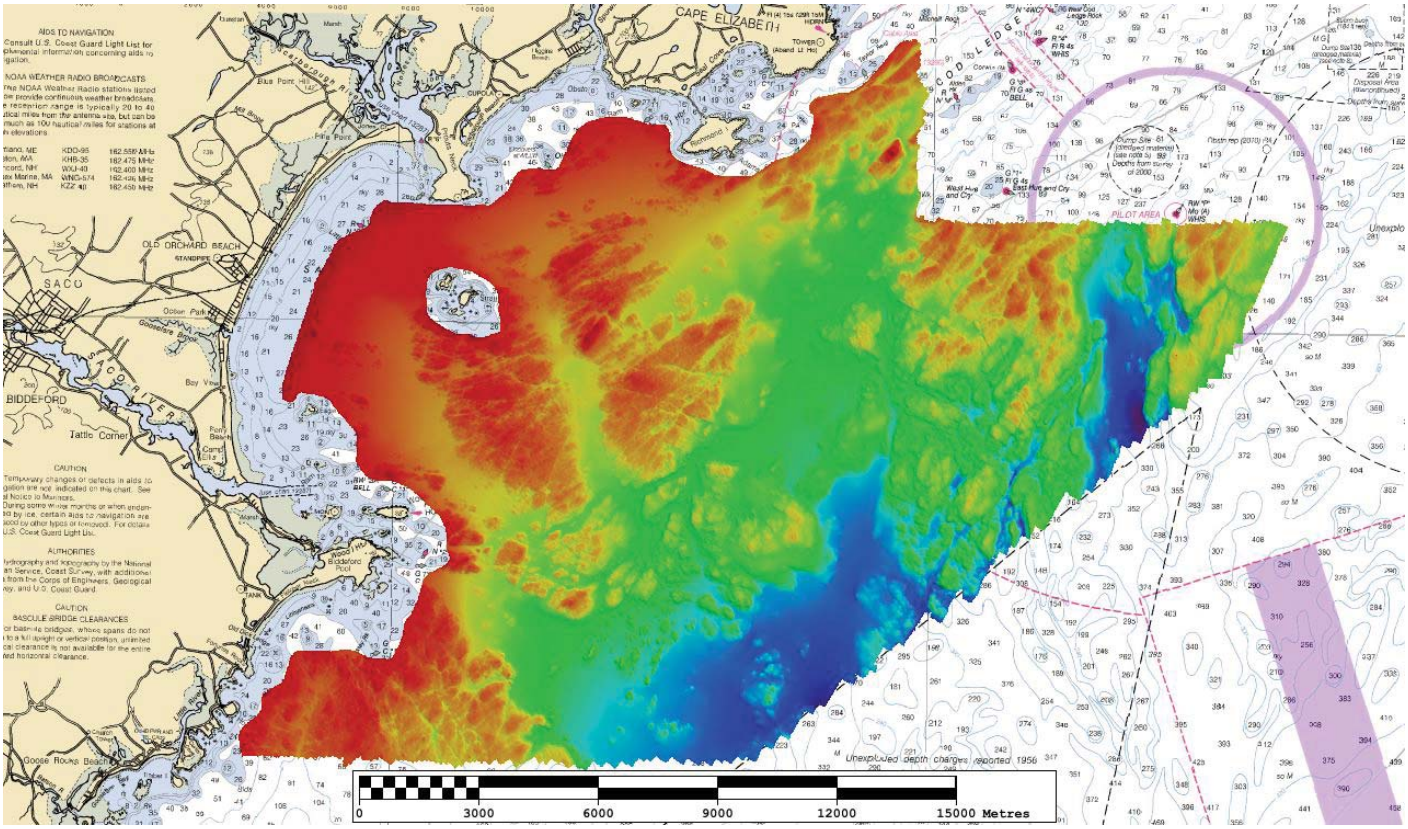


Figure 1: General locality of survey H12726

Complete multibeam coverage is not achieved to the assigned sheet limits due to the lack of an appropriate near shore vessel. Additional work still needs to be completed at a future date utilizing a vessel that is capable of collecting data near shore. FERDINAND R. HASSLER personnel decided unsafe survey conditions exist inshore of the 30-foot contour.

A.2 Survey Purpose

The purpose of project is to provide contemporary surveys to update National Ocean Service (NOS) nautical charting products. The survey area receives significant traffic from commercial and recreational fishing vessels.

A.3 Survey Quality

The entire survey is adequate to supersede previous data.

A.4 Survey Coverage

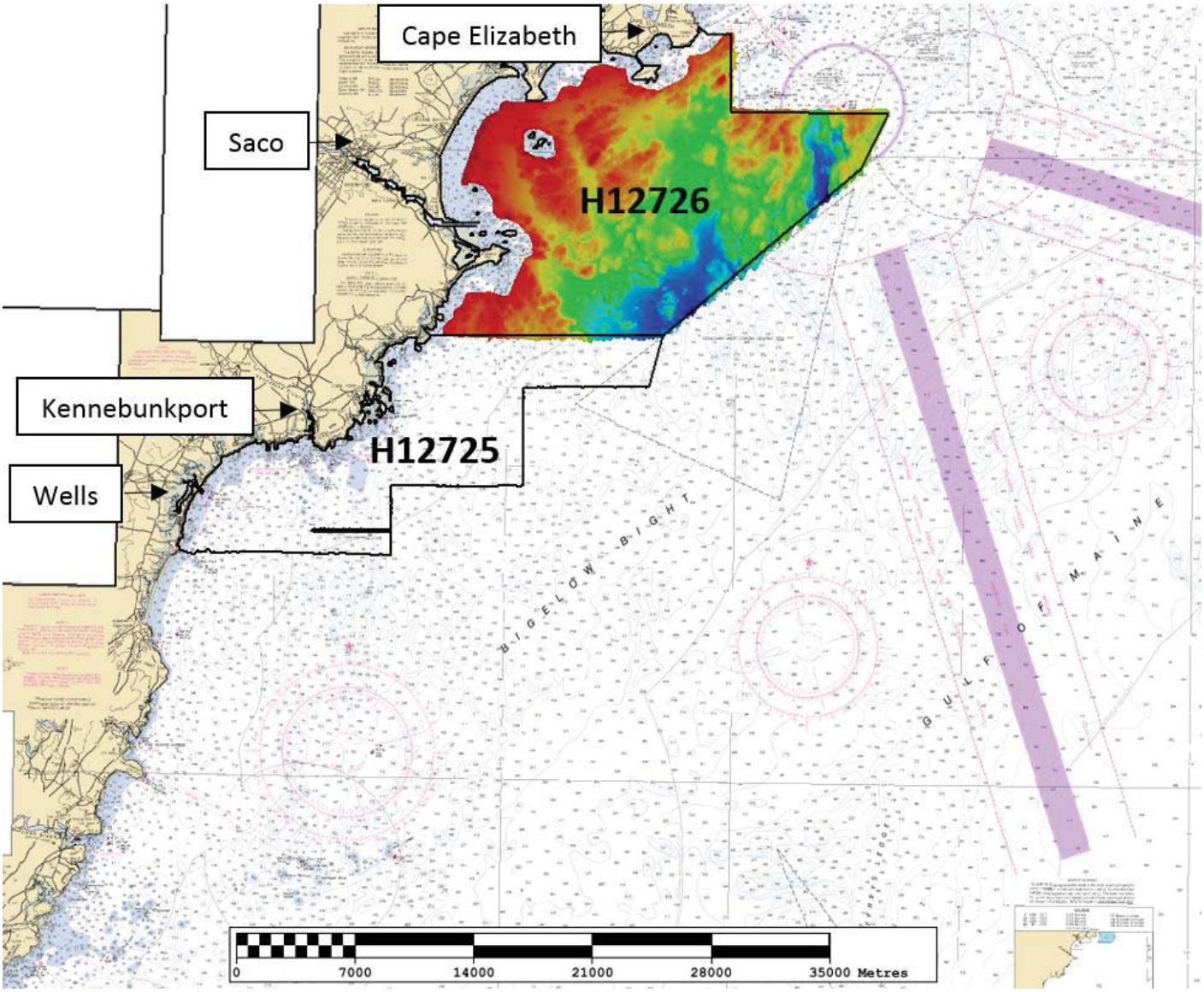


Figure 2: Survey layout for OPR-A321-FH-15, plotted over RNC 13286

A few small holidays exist in the coverage for this survey. Analyses of surrounding data show that the least depths over features have been achieved and holidays do not compromise data integrity. Additional discussion can be found in section B.2.9.

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	1619.15	1619.15
	Lidar Mainscheme	0	0
	SSS Mainscheme	0	0
	SBES/SSS Mainscheme	0	0
	MBES/SSS Mainscheme	0	0
	SBES/MBES Crosslines	78.87	78.87
	Lidar Crosslines	0	0
Number of Bottom Samples			0
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			78.1

Table 2: Hydrographic Survey Statistics

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

Survey Dates	Day of the Year
01/06/2015	6
01/07/2015	7
01/08/2015	8
01/09/2015	9
01/10/2015	10
01/11/2015	11
01/12/2015	12
01/13/2015	13
01/14/2015	14
01/15/2015	15
01/16/2015	16
01/23/2015	23
01/24/2015	24
01/25/2015	25
01/29/2015	29
02/05/2015	36

Table 3: Dates of Hydrography

Due to equipment issues, the starboard Reson 7125 MBES was not utilized for the entirety of H12726. All data surveyed in H12726 was collected exclusively by the port 7125 MBES .

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

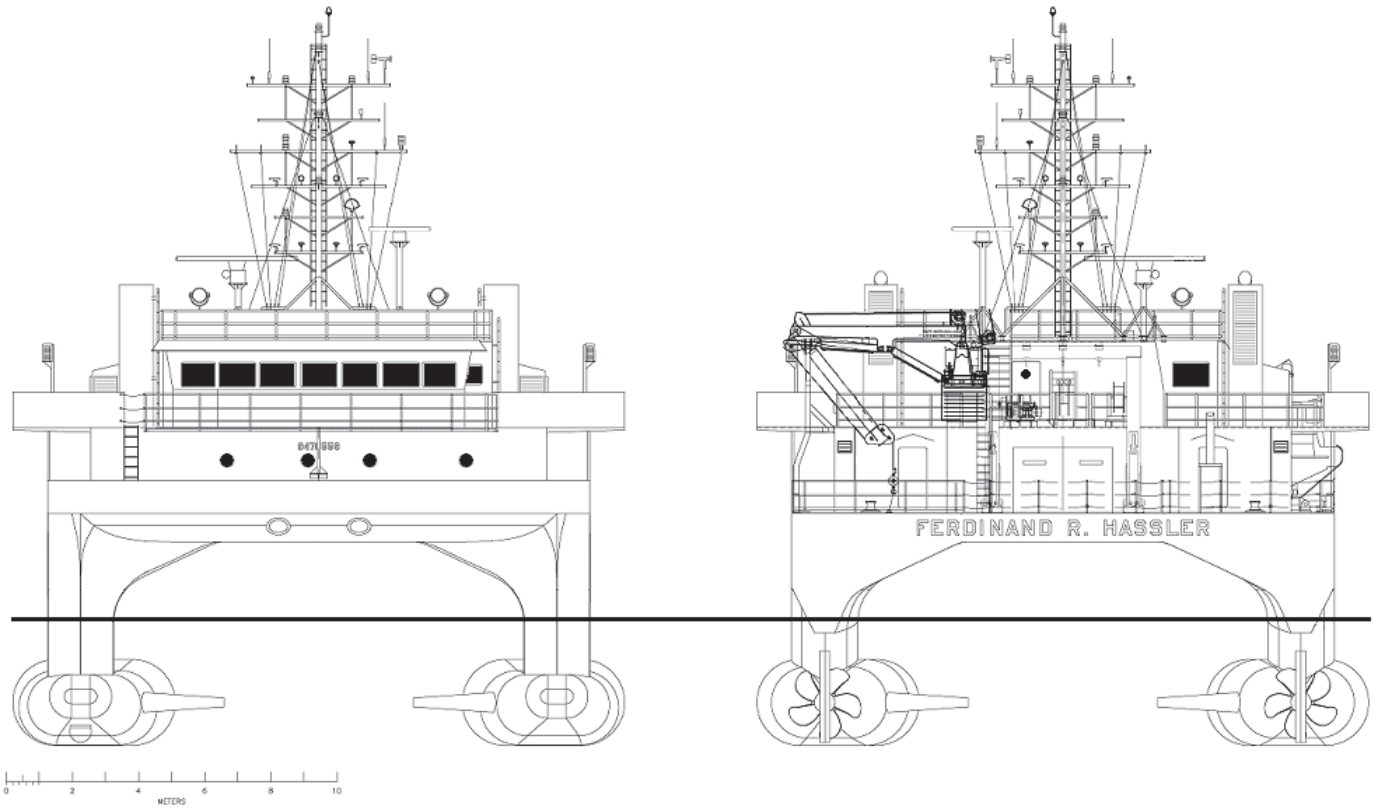


Figure 3: NOAA Ship FERDINAND R. HASSLER

NOAA Ship FERDINAND R. HASSLER (S250), shown in Figure 3, acquired all surveyed soundings during operation for H12726.

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	MicroCTD	Conductivity, Temperature, and Depth Sensor
RESON	SVP-70	Sound Speed System

Table 5: Major Systems Used

B.2 Quality Control

B.2.1 Crosslines

Crosslines acquired for this survey totaled 5% of mainscheme acquisition.

A geographic plot of crosslines is shown in Figure 4. Crosslines were filtered to remove soundings greater than 40 degrees from nadir. To evaluate crossline agreement, two 4-meter surfaces were created: one from crossline soundings, the other from mainscheme soundings. These two surfaces were differenced using CARIS HIPS and SIPS. The statistical analysis of the differences between the mainscheme and crossline surfaces is shown in Figure 5. The average difference between the surfaces is 0.06 meters with a standard deviation of 0.20 meters; 95% of all differences were less than 0.27 meters from the mean. The high standard deviation is thought to result from high relief in particular areas of the survey shown in Figure 6.

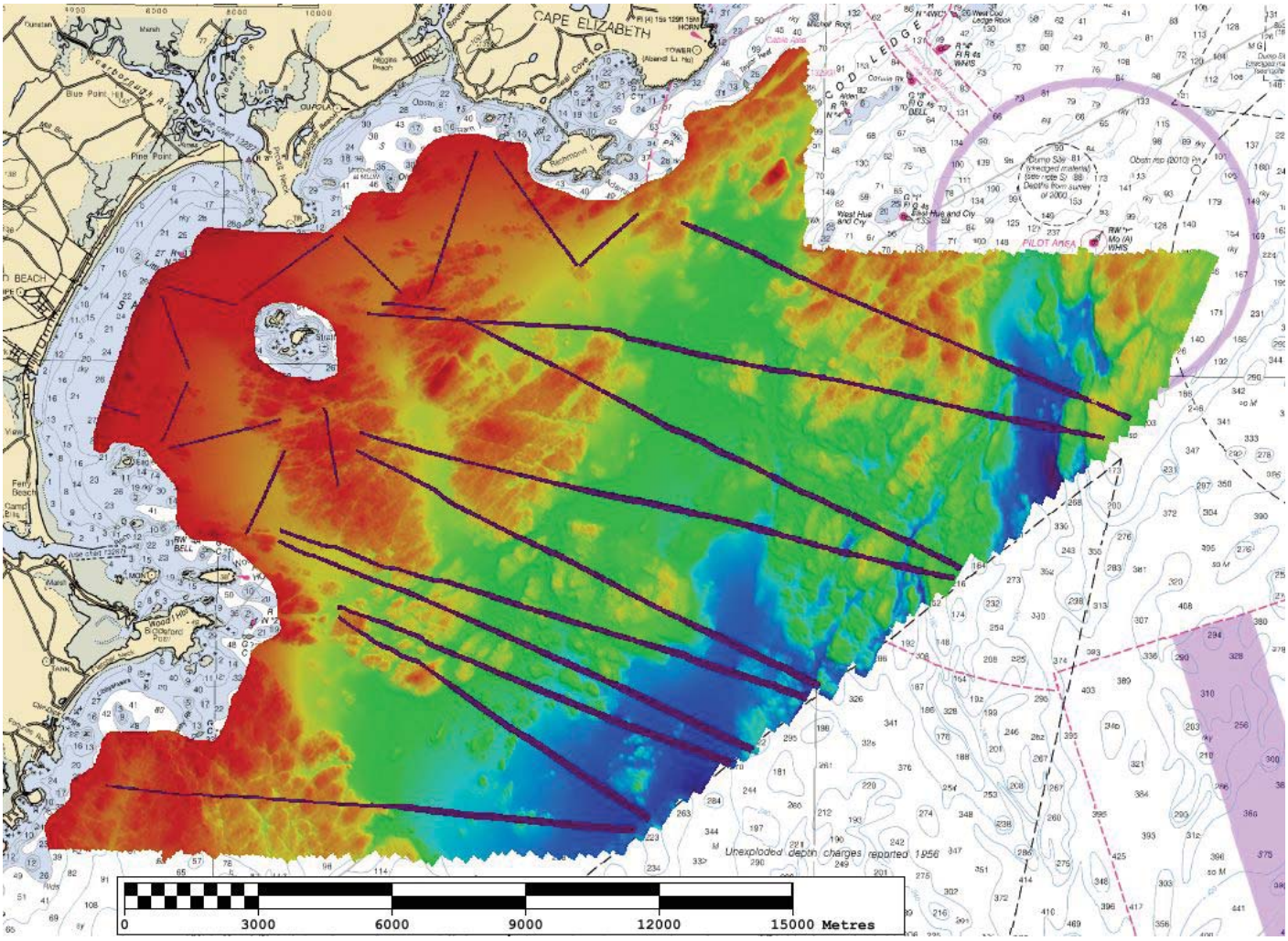
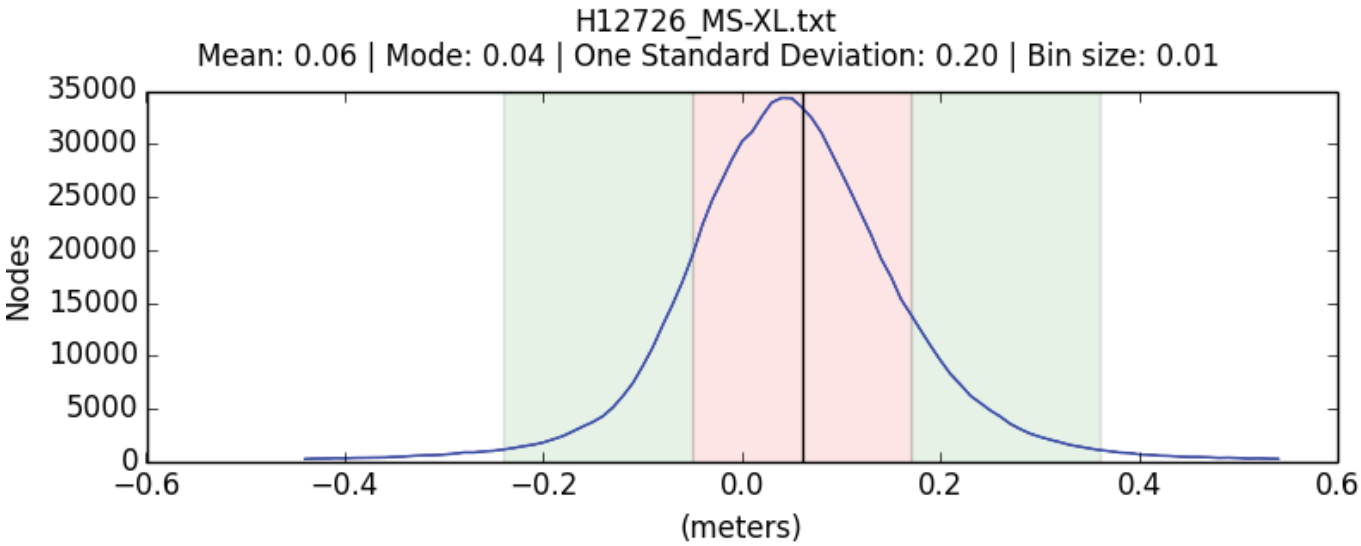
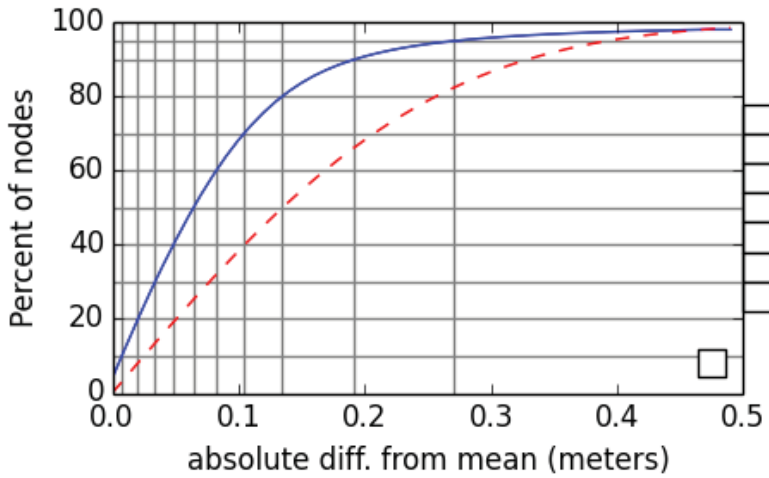


Figure 4: Location of crosslines, shown in purple and mainscheme data for H12726





Percent of nodes	Deviation (m)
50%	+/- 0.06
60%	+/- 0.08
70%	+/- 0.10
80%	+/- 0.13
90%	+/- 0.19
95%	+/- 0.27

Figure 5: H12726 crossline difference statistics: mainscheme minus crossline

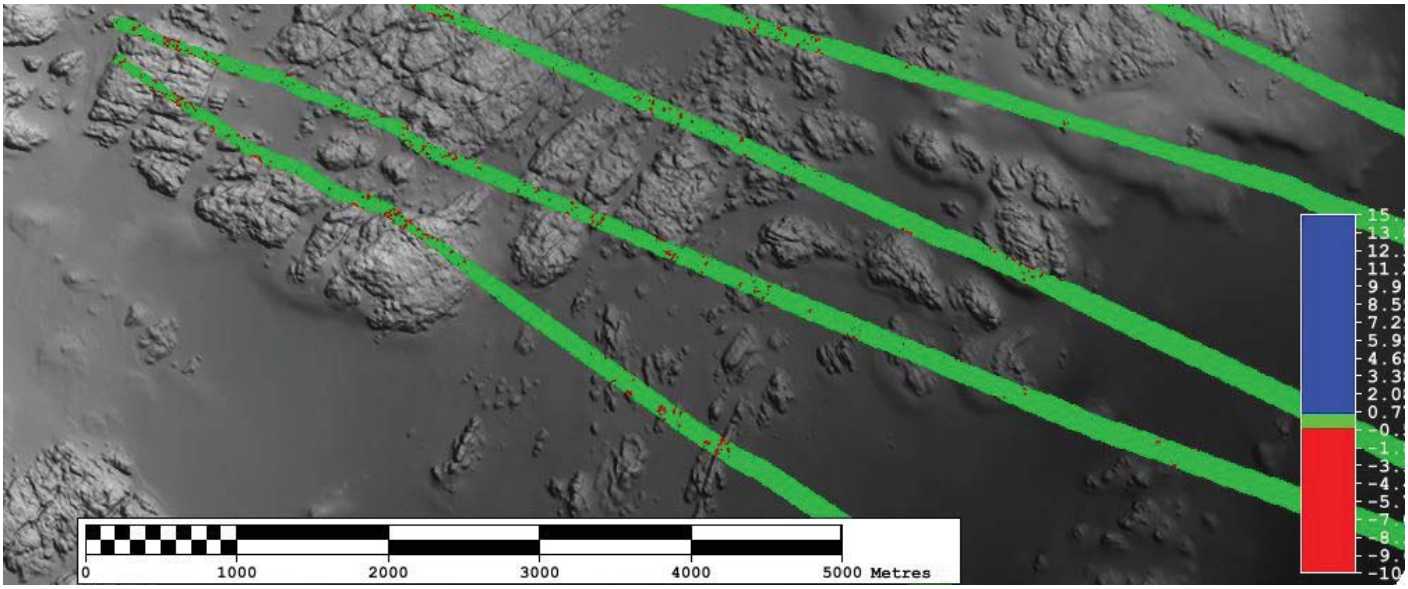


Figure 6: Mainscheme minus crossline differenced surface shown overlaid on mainscheme data. The color range scale shown is for the differenced surface. Large differences (red and blue) appear to be greatest in areas of high relief.

B.2.2 Uncertainty

The following survey specific parameters were used for this survey:

Measured	Zoning
0.01 meters	0.081 meters
0.01 meters	0.16 meters

Table 6: Survey Specific Tide TPU Values

Hull ID	Measured - CTD	Measured - MVP	Surface
S250	1.0 meters/second	1.0 meters/second	0.5 meters/second

Table 7: Survey Specific Sound Speed TPU Values

Two tidal models were available for water level corrections associated with survey H12726. A discrete tide zone file, produced by CO-OPS for project OPR-A321-FH-15, was provided to the field unit. Additionally, a vertical datum transformation (VDatum) model was delivered to the field unit in the project instructions. All data for survey H12726 were reduced to MLLW via VDatum. This model functioned as a gridded separation model for GPS tide computations with a 0.081 meter uncertainty. Final TPU calculations are derived from the following sources: VDatum separation model, sound velocity (MVP and surface sound

velocimeter), HVF uncertainties, and SBET post processed uncertainty. Error data sources applied through CARIS processing software are listed in Figure 7.

Uncertainty	*Source*
Position	Real-time
Sonar	Vessel
Heading	Real-time
Pitch	Real-time
Roll	Real-time
Vertical	Real-time Heave
Tide	Static

Figure 7: Sources of error data applied during CARIS processing

B.2.3 Junctions

The following junctions were made with this survey:

Registry Number	Scale	Year	Field Unit	Relative Location
H12725	1:40000	2015	NOAA Ship FERDINAND R. HASSLER	S

Table 8: Junctioning Surveys

<u>H12725</u>

The area of overlap between sheet H12726 and its junction sheet, H12725, shown in Figure 8, was reviewed in CARIS Subset Editor. The junctioning surface was subtracted from the surface of H12726 to assess sounding consistency.

Survey H12725 was conducted by NOAA Ship FERDINAND R. HASSLER in 2015 during the course of project OPR-A321-FH-15. A difference surface analysis between the H12726 and H12725 2-meter resolution surfaces, which included over 1 million nodes, showed H12726 to be on average 0.02 meters shallower than H12725, with a standard deviation of 0.17 meters. 95% of all differences are less than 0.27 meters from the mean.

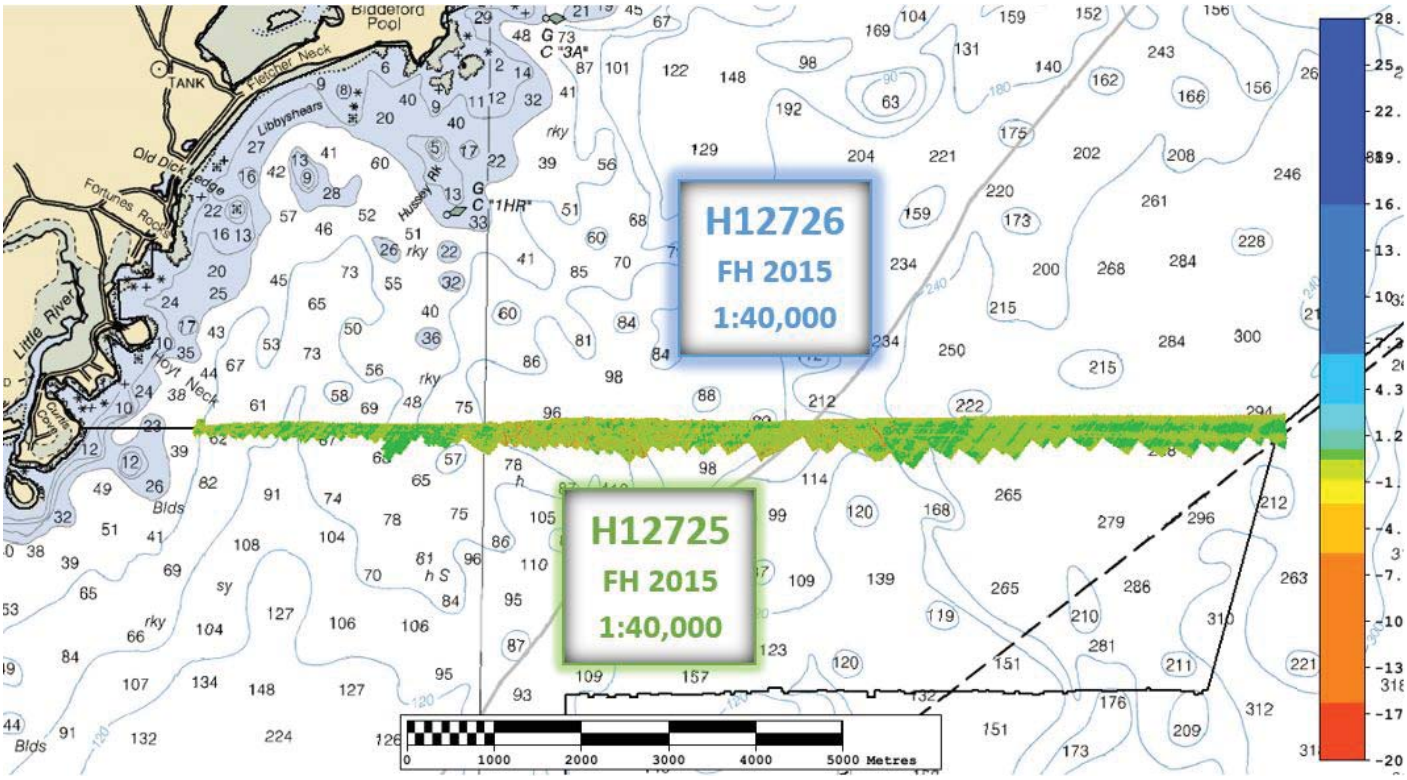
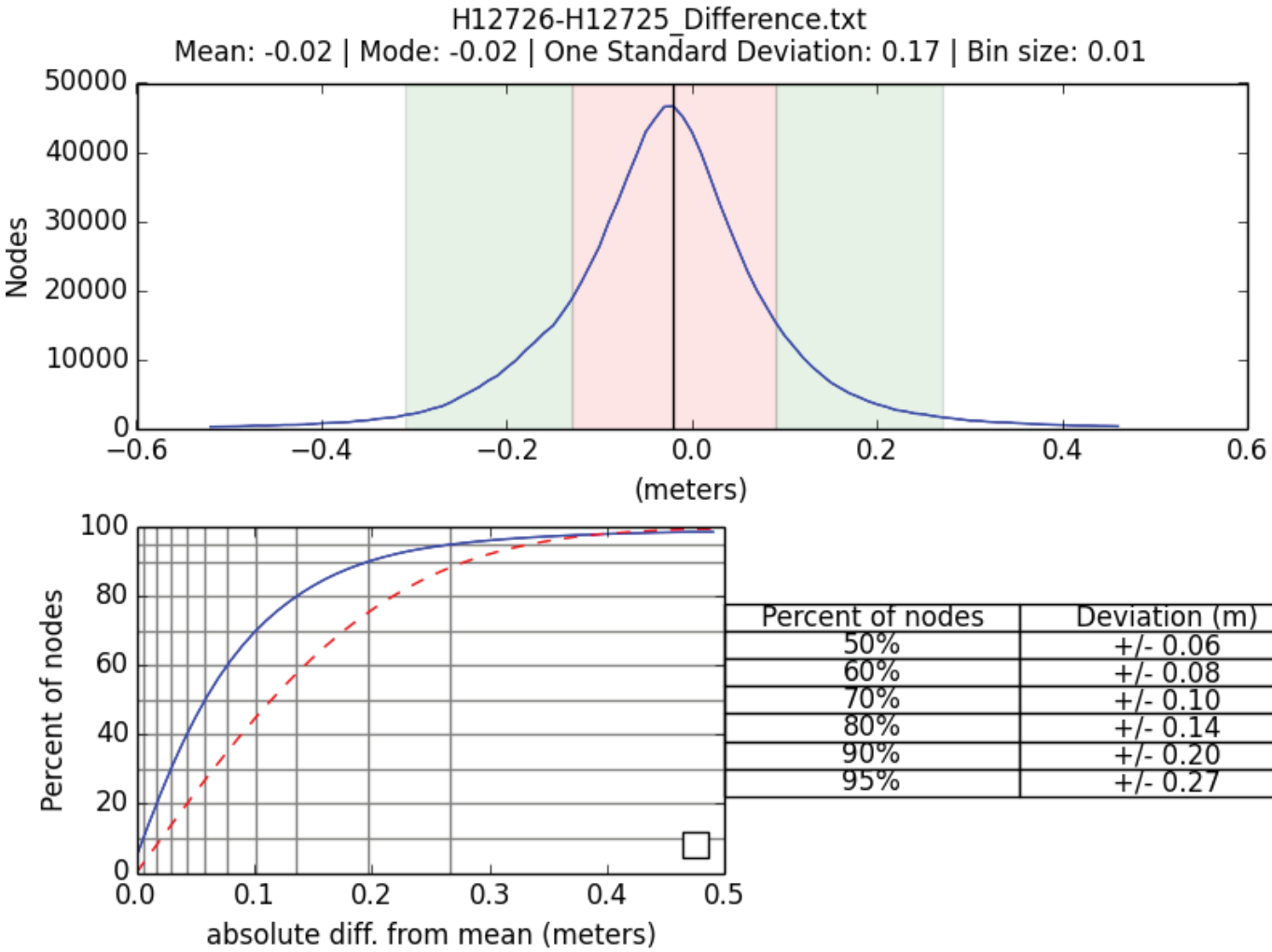


Figure 8: Junctioning area between surveys H12726 and H12725.



Percent of nodes	Deviation (m)
50%	+/- 0.06
60%	+/- 0.08
70%	+/- 0.10
80%	+/- 0.14
90%	+/- 0.20
95%	+/- 0.27

Figure 9: Differenced surface statistics - H12726 minus H12725.

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

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: A total of 131 sound speed measurements were taken within the boundaries of survey H12726. Due to extreme winter weather, the time between SVP casts was extended from typical operating procedures. These sound speed measurements were collected using the MVP-200 approximately every 3-4 hours. Comparisons were made by the survey watch to try and account for variations present in the water column.

Sound speed corrections were applied in CARIS using Nearest in Distance Within Time (NIDWT) of 4 hours for the entire survey (Figure 10). One SVP cast was taken south of the project on the first day of acquisition and is included in the submitted SVP file but not shown in Figure 10.

Sound speed errors exist throughout the area, in most cases they fall within the acceptable sound velocity error budget, defined as 0.3m +0.05% of sounding depth. In one area, sound velocity profile errors exceed error budgets (Figures 11 and 12). While the data exceeds error thresholds, it should be noted that there there is a nearby rocky area containing shallower surveyed depths which do not contain errors, and a review of the data shows that no navigationally significant features exist in the affected region.

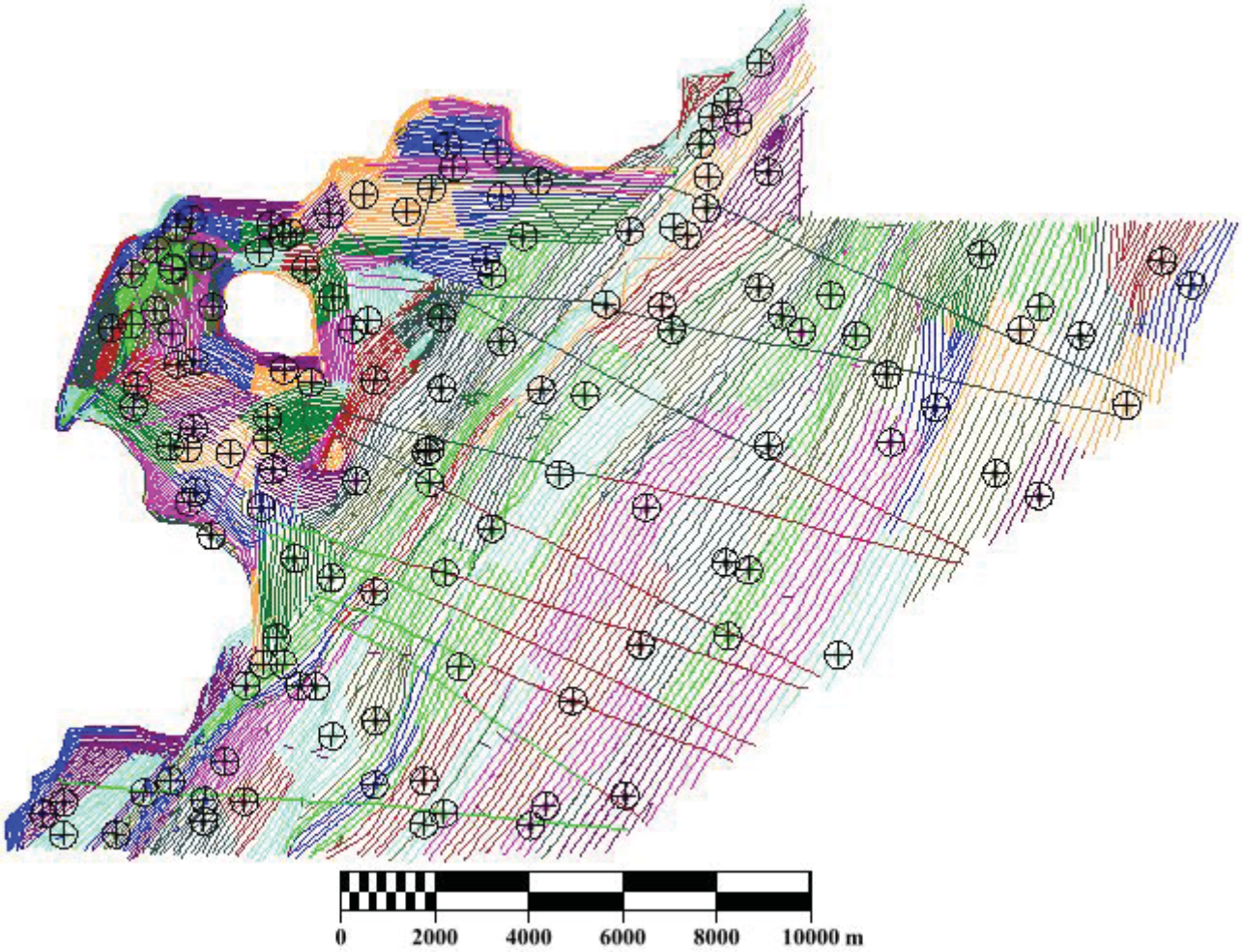


Figure 10: H12726 sound speed profile locations - lines colored by SV profile.

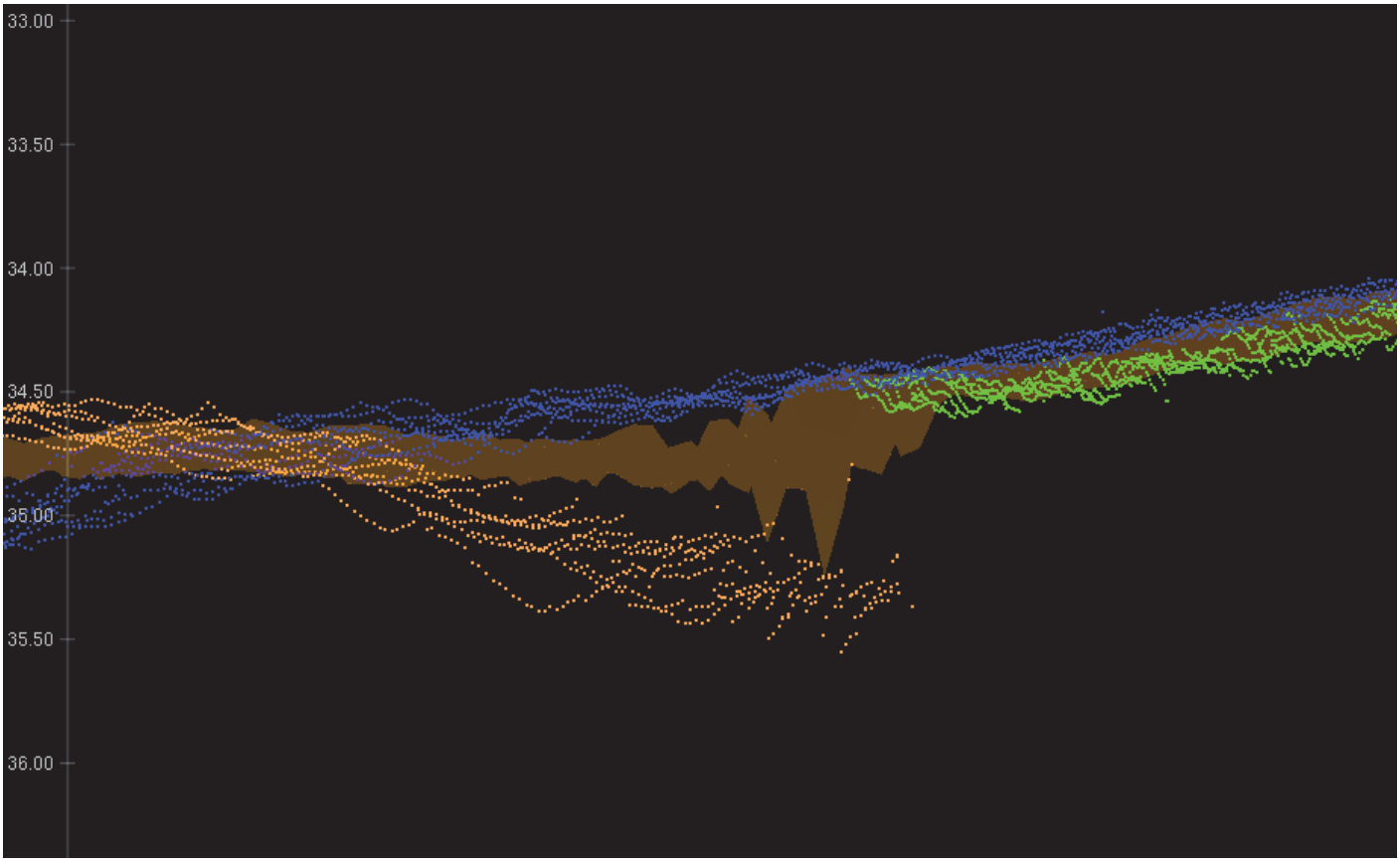


Figure 11: Sound speed error creating refraction which exceeds allowable error budget.

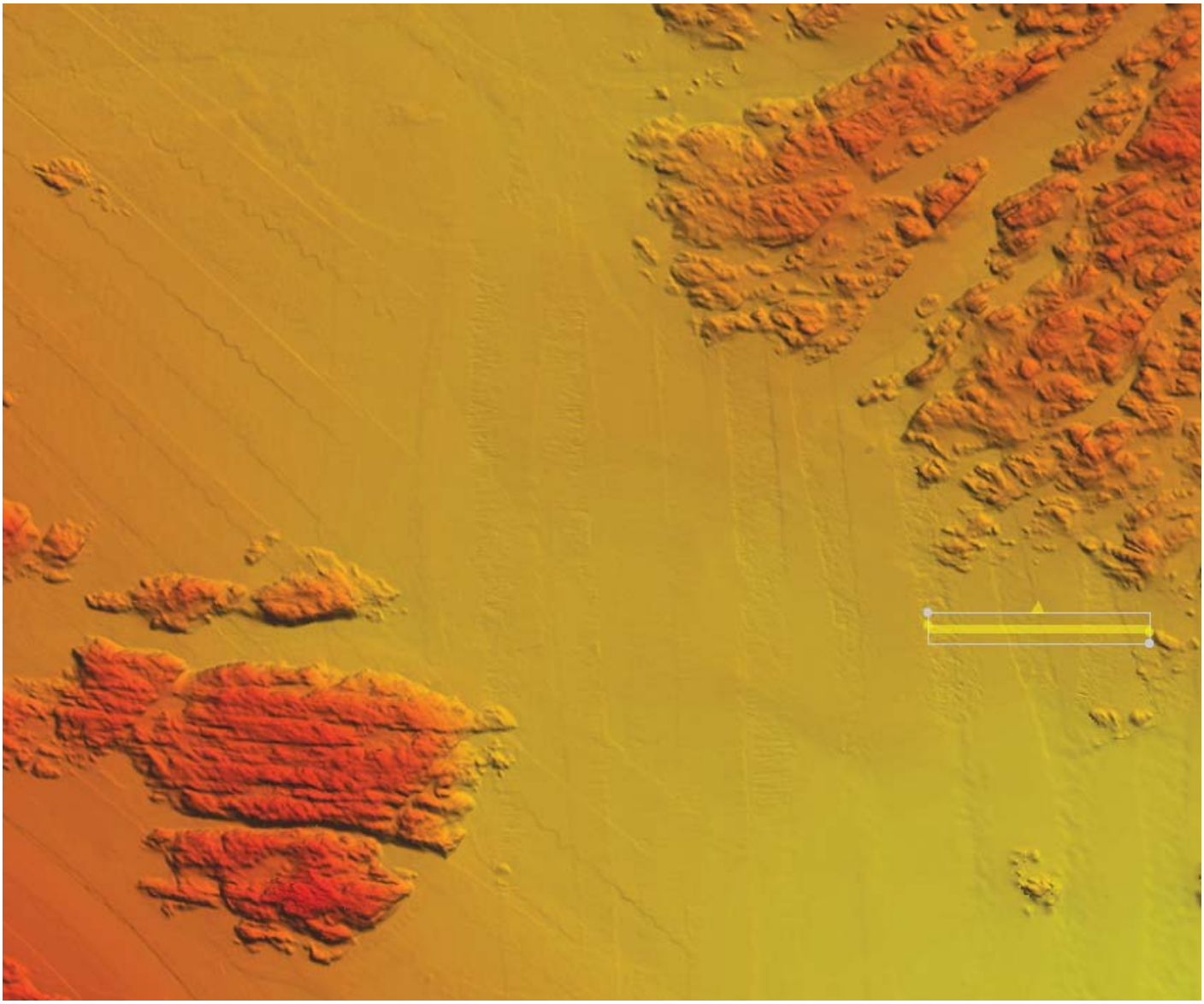


Figure 12: 43-27-58.52N 70-18-25.63W; Location of sound speed error bust.

B.2.8 Coverage Equipment and Methods

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

B.2.9 Data Gaps

Two notable data gaps exist in the data, caused by insufficient overlap between coverage lines. In both instances, most-reliable least depth soundings exist directly adjacent to the data gaps and a review of the data in CARIS Subset Editor reveals a very low likelihood of there being a shallower least depth at these locations.

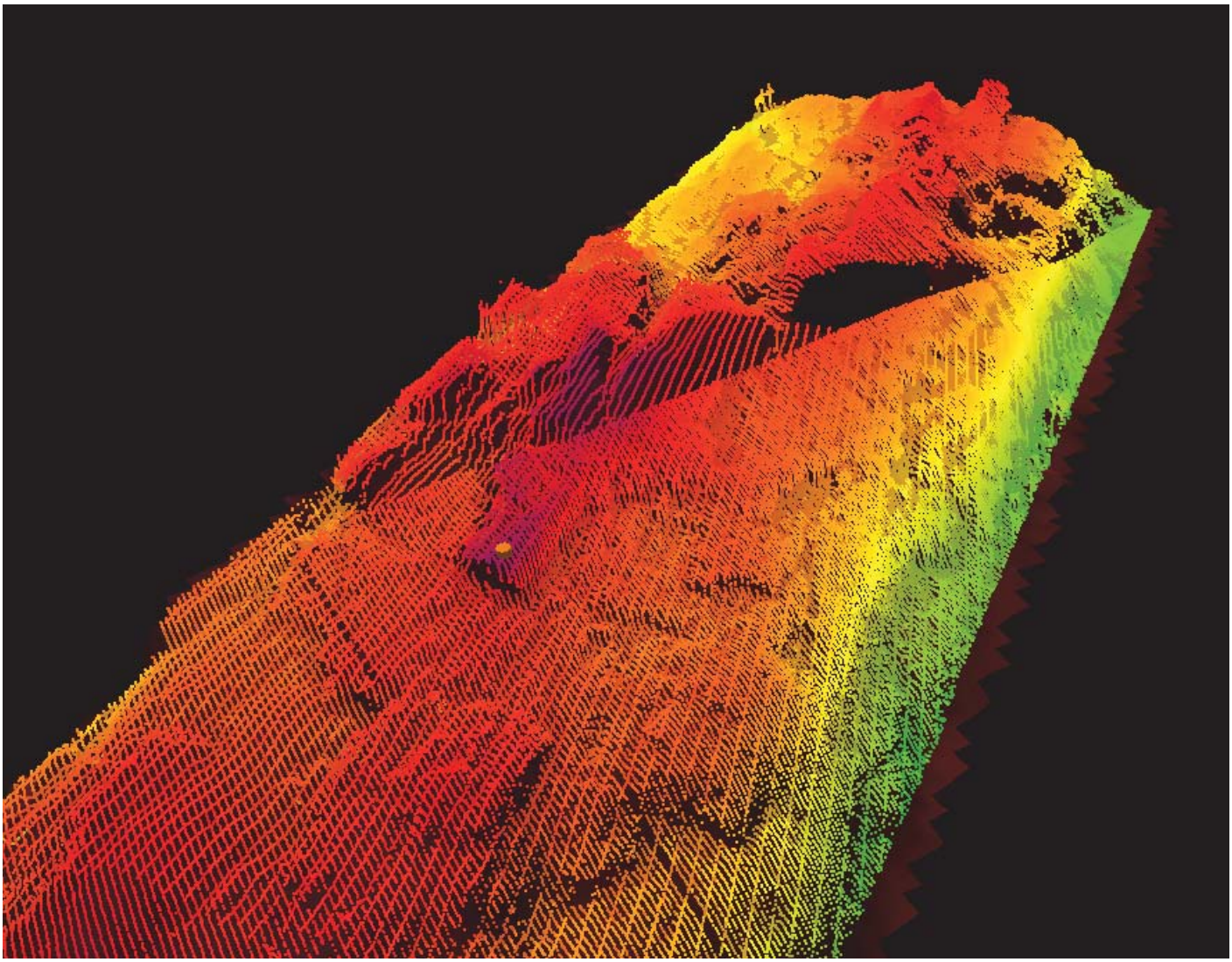


Figure 13: Data Gap 1

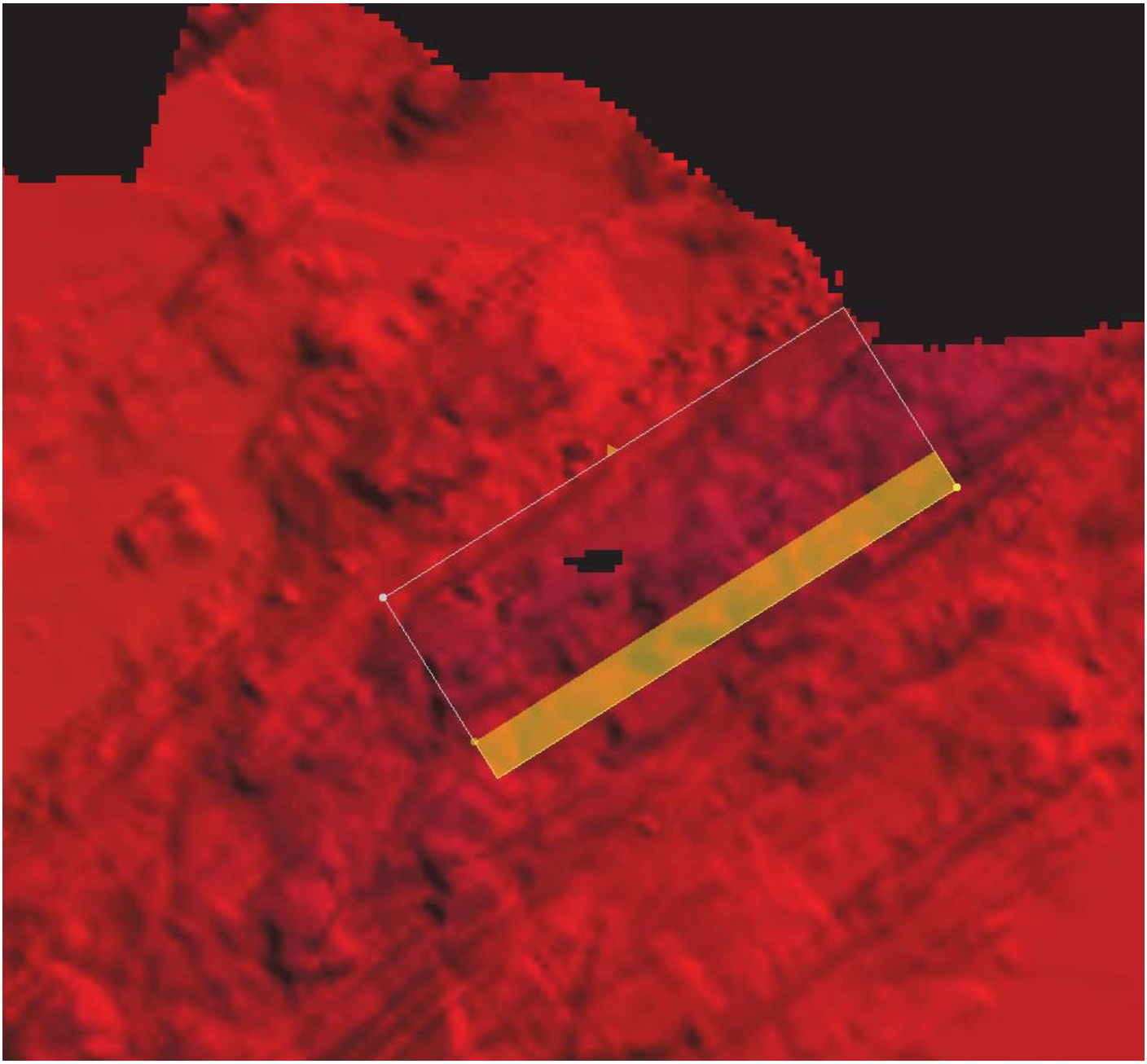


Figure 14: 43-32-42.022N 70-15-17.725W; Data Gap 2

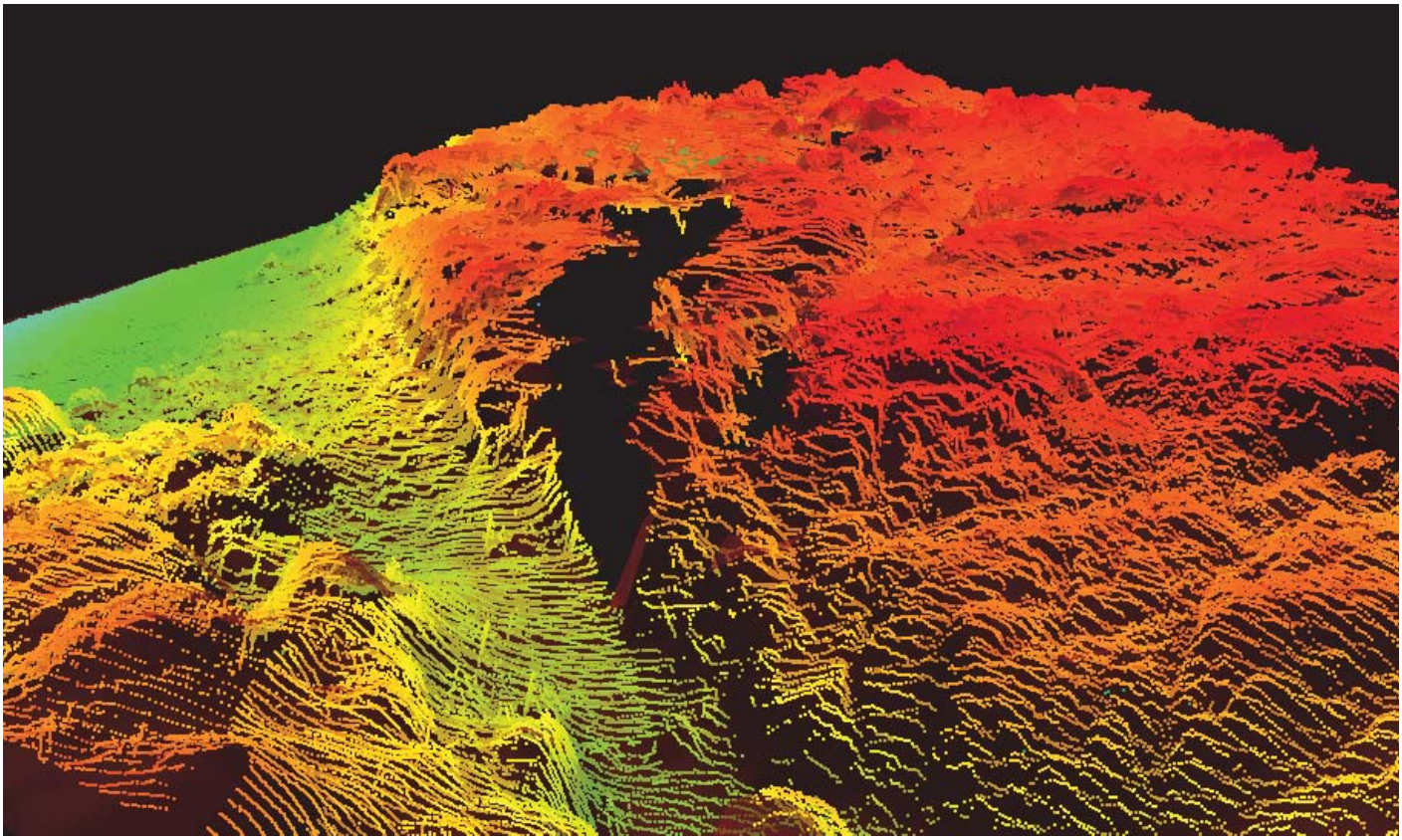


Figure 15: Data Gap 3

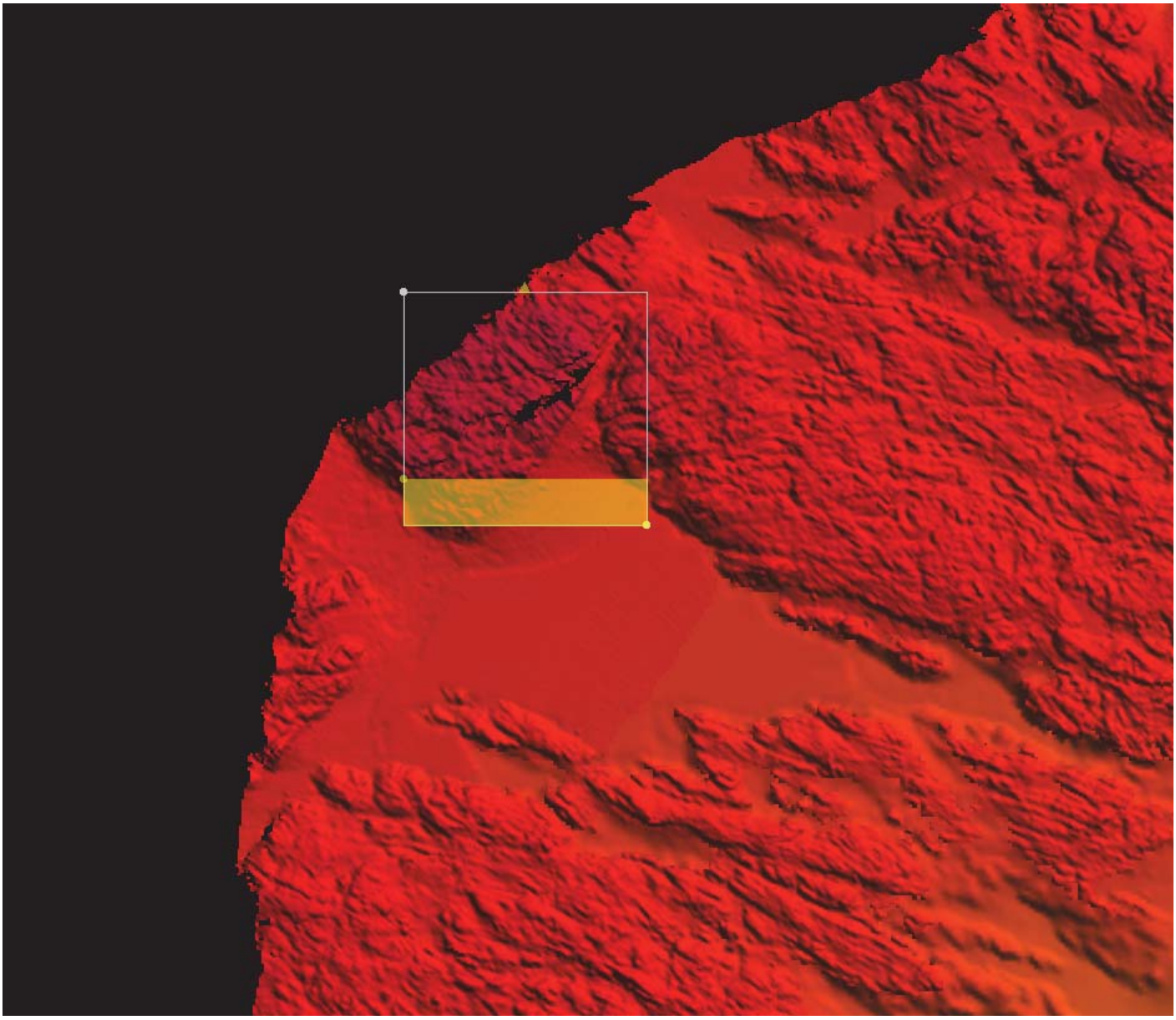


Figure 16: 43-24-54.938N 70-22-18.074W; Data Gap 4

B.2.10 Data Density

A density analysis was run to calculate the number of soundings per surface node. The results determined that over 99% of all nodes in each finalized surface contain five or more soundings. The density analysis was executed on nodes which are populated by a least one sounding and did not account for holidays located within the surface. For additional information see the Standards Compliance Report in Appendix II.

B.2.11 Total Vertical Uncertainty Analysis

Total vertical uncertainty analysis was performed using the Finalized CSAR QA tool provided within Pydro. The resulting statistical analysis found 99.98% of all nodes within survey H12726 meet the vertical uncertainty standards of section 5.1.3 of the 2014 Hydrographic Surveys Specifications and Deliverables. For additional information see the Standards Compliance Report in Appendix II.

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 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 H12726. The files were paired with the CARIS HDCS data, imported, and processed using Fledermaus Geocoder Toolbox (FMGT). The FMGT project and backscatter mosaic imagery is included in the field submission. The processed mosaic is formatted as a geo-tiff image per specifications.

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 Profile V_5_3_2

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
H12726_MB_4m_MLLW	CUBE	4 meters	0 meters - 110 meters	NOAA_4m	Complete MBES
H12726_MB_2m_MLLW	CUBE	2 meters	0 meters - 110 meters	NOAA_2m	Complete MBES
H12726_MB_1m_MLLW	CUBE	1 meters	0 meters - 110 meters	NOAA_1m	Complete MBES
H12726_MB_4m_MLLW_Final	CUBE	4 meters	36 meters - 110 meters	NOAA_4m	Complete MBES
H12726_MB_2m_MLLW_Final	CUBE	2 meters	18 meters - 40 meters	NOAA_2m	Complete MBES
H12726_MB_1m_MLLW_Final	CUBE	1 meters	4 meters - 20 meters	NOAA_1m	Complete MBES
H12726_MB_4m_MLLW_Combined	CUBE	4 meters	4 meters - 110 meters	N/A	Complete MBES

Table 9: Submitted Surfaces

The 4m surfaces deviate from the required depth ranges, extending beyond 80m to 110m. There is adequate data density to do this, and the fidelity of the 4m grid in representing skin of the earth is superior to that of the 8m grid and should be considered to have exceeded requirements.

B.5.3 Total Vertical Uncertainty Analysis

A custom layer was created for the finalized surfaces submitted with survey H12726. The layer was derived from the difference between the calculated uncertainties of individual nodes and the allowable uncertainty at the coupled node. This layer was examined using a custom Python script. The resulting statistical analysis identified that over 95% of nodes within each finalized surface of survey H12726 met the vertical uncertainty standards of Section 5.1.3 of the 2014 Hydrographic Surveys Specifications and Deliverables. For additional information see the Standards Compliance Report in Appendix II.

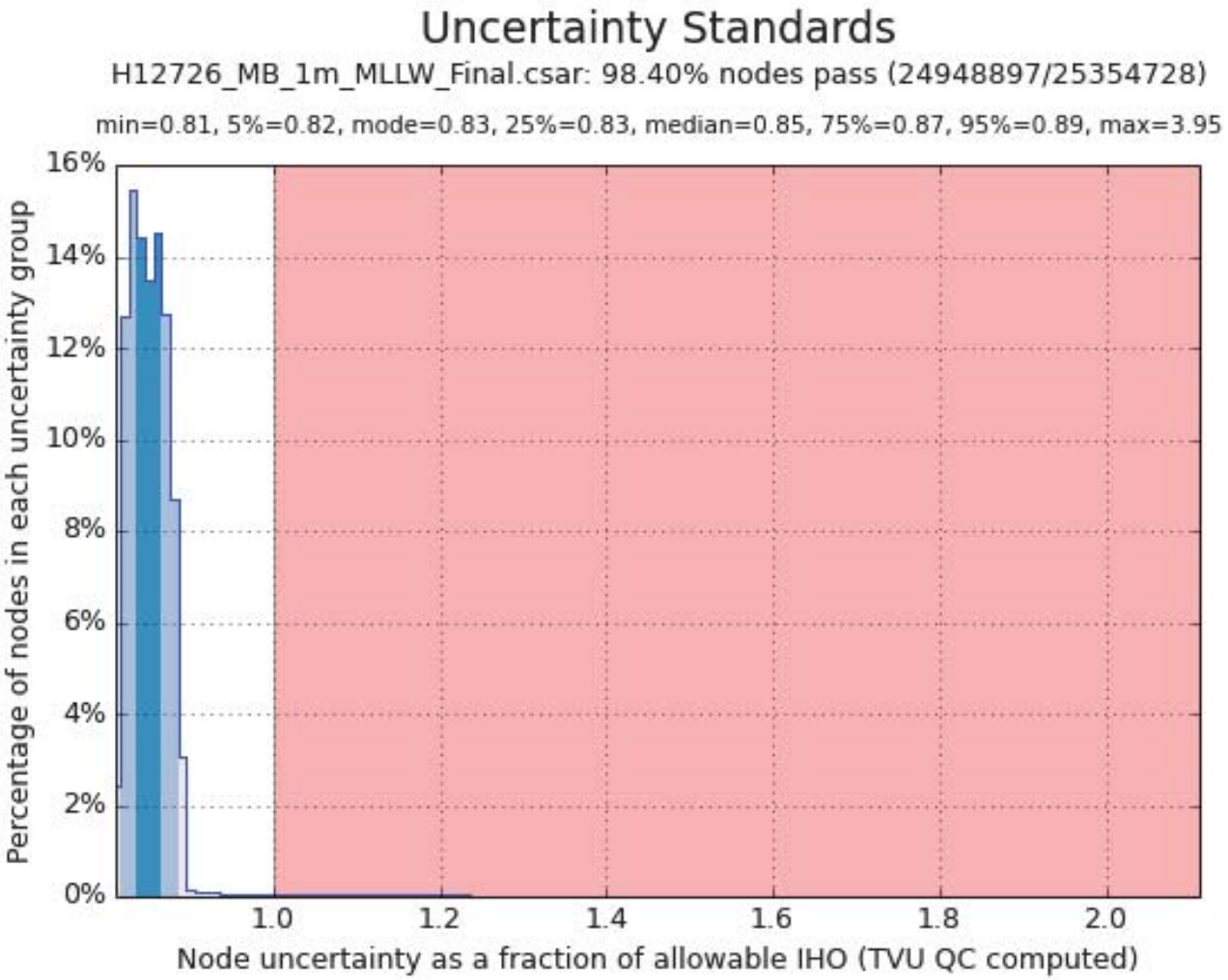


Figure 17: H12726 1m TVU meets sounding per node standards

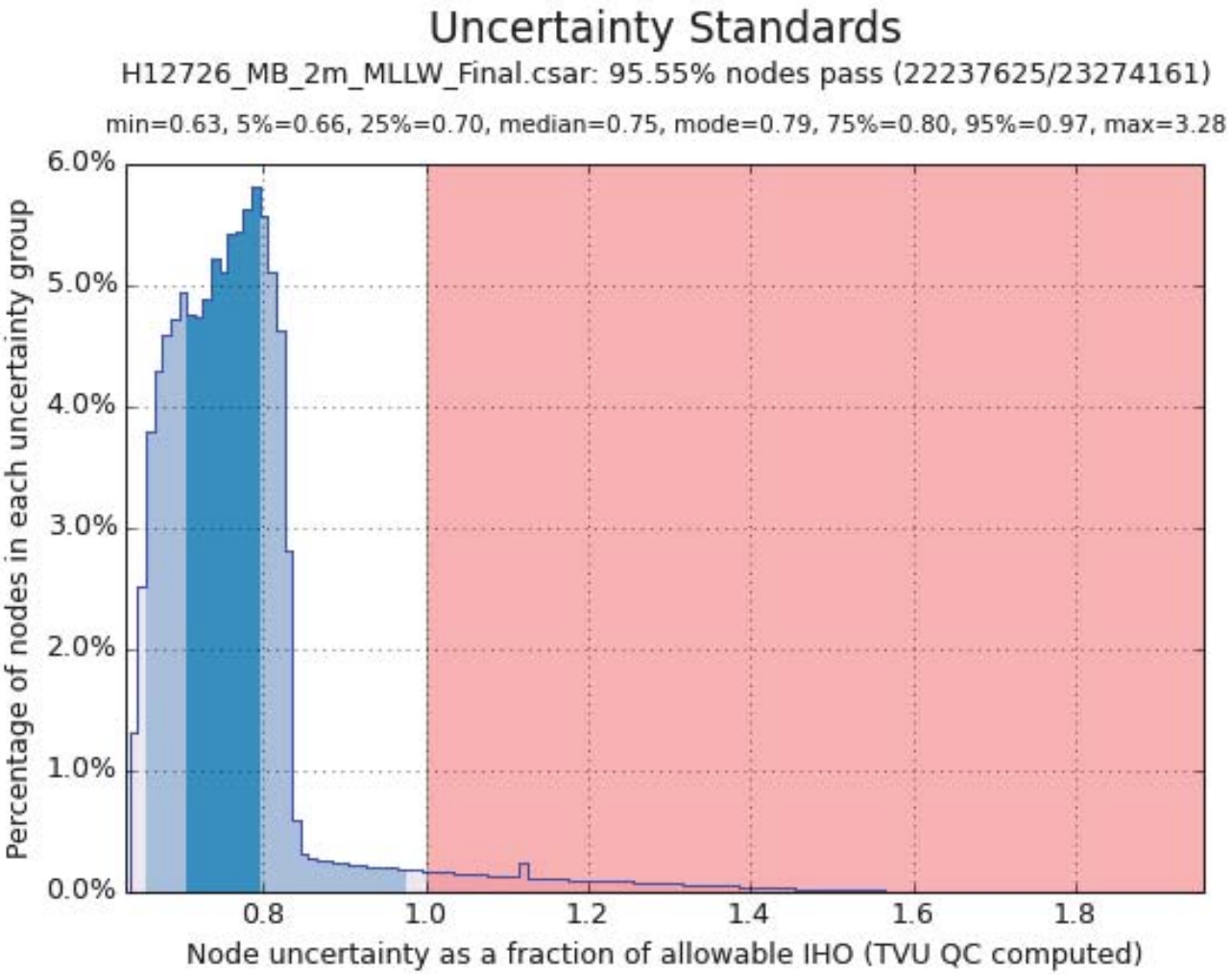


Figure 18: H12726 2m TVU meets sounding per node standards

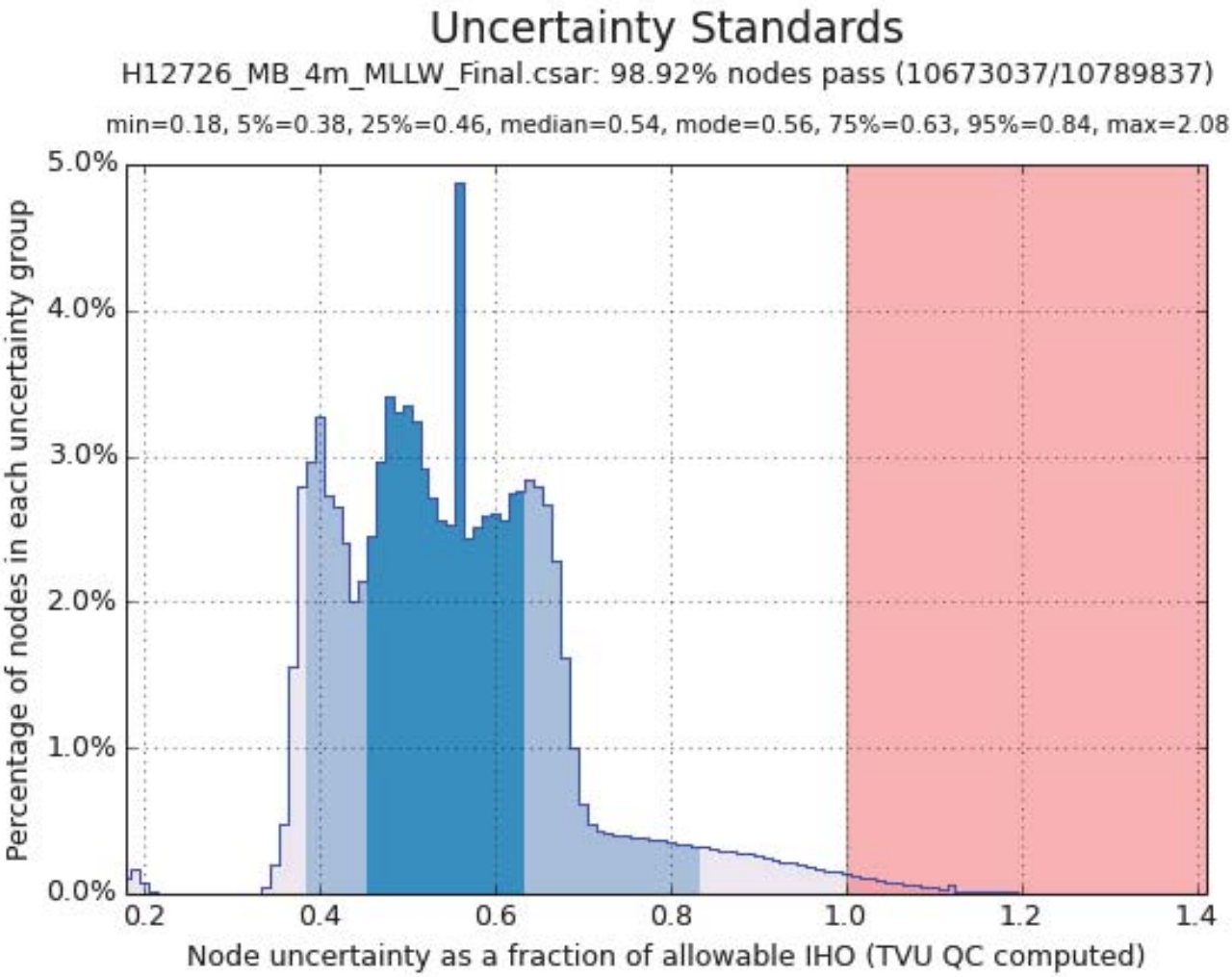


Figure 19: H12726 4m TVU meets sounding per node standards

B.5.4 Designated Soundings

Within the limits of H12726, seven soundings are submitted flagged as designated. Five of these soundings are designated for the surface to honor the least depth of the data and two are for feature validation.

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:

OPR-A321-FH-15_VDatum_NAD83Elip_MLLW_EXTENSION.csar

As required by the Project Instructions, the hydrographer evaluated VDatum for the survey area prior to H12726 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 H12726 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 Portland (848150).
2) The submitted water level file (8418150.tid) is the final approved water levels for the period of hydrography. This file has been loaded to all CARIS lines submitted as H12726.
3) The submitted tide corrector (A321FH2015CORP.zdf) is the preliminary zoning file that was accepted as final per final tide note, submitted in Appendix I of this report. The file has been loaded to all CARIS lines submitted as H12726.
4) A request for final approved tides was sent to N/OPS1 on 02/26/2015. The final tide note was received on 03/12/2015 stating that preliminary zoning is accepted as the final zoning for survey project OPR-A321-FH-2015, Registry No. H12726, during the time period between January 7 - February 5, 2015.

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

All stations listed under the user installed table were obtained from a private network run and maintained by Maine Technical Source (MTS). Positions for these stations were added to the POSPac database using the average obtained from one week of observations (seven 24-hour files) submitted to the National Geodetic Surveys (NGS) Online Positioning User Service (OPUS).

The following CORS Stations were used for horizontal control:

HVCR Site ID	Base Station ID
BARTLETT, Bartlett, NH	BARN
BRUNSWICK 7, Brunswick, ME	BRU7
SALISBURY, Salisbury, MA	MASA
TRURO, Truro, MA	MATU
GORHAM, Gorham, ME	MEGO
AUGUSTA, Augusta, ME	MEOW
SOUTH PARIS, South Paris, ME	MESP
NHDOT CONCORD, Concord, NH	NHCO
U NEW HAMPSHIRE, Durham, NH	NHUN
PENOBSCOT 5, Penobscot, ME	PNB5

Table 10: CORS Base Stations

The following user installed stations were used for horizontal control:

HVCR Site ID	Base Station ID
MTS S. BERWICK, South Berwick, ME	BMTS
MTS HANOVER, Hanover, MA	HMTS
MTS KENNEBUNK, Kennebunk, ME	KENN
MTS YARMOUTH, Yarmouth, ME	YMTS

Table 11: User Installed Base Stations

Real-time PPP correctors were obtained during acquisition via the POS M/V V5 for all data collected prior to DN019. The Satellite based PPP service utilized was a private subscription service run by MarineStar. When in use, real-time accuracies exceed the standard operating procedure relying solely on the use of DGPS and the requirements stated in the HSSD.

Real-time Kinematic correctors were obtained during acquisition and fed to the POS M/V via a computer connected to the internet and running NTRIP client software for all data collected post DN019. The RTK network utilized was a private subscription network run by MTS. When in use, real-time accuracies far exceed the requirements stated in the HSSD.

DGPS was used as a backup for real-time positioning during acquisition. DGPS positions were utilized when either the MarineStar PPP or MTS RTK systems were down. 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 12: USCG DGPS Stations

D. Results and Recommendations

D.1 Chart Comparison

The hydrographer has compared a sounding plot and derived depth contours from the surveyed area to the charted soundings and contours. In general, there are many disagreements with both soundings and contours, as the topography is characterized by undersea canyons and steep rocky slopes.

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
13286	1:80000	32	12/2013	05/02/2015	05/02/2015
13287	1:20000	13	06/2013	05/02/2015	05/02/2015
13288	1:80000	43	07/2010	05/02/2015	05/02/2015
13290	1:40000	39	07/2010	05/02/2015	05/02/2015
13292	1:20000	41	07/2014	05/02/2015	05/02/2015

Table 13: Largest Scale Raster Charts

<u>13286</u>

Surveyed depths have good overall agreement with charted contours, individual soundings may disagree at any given place.

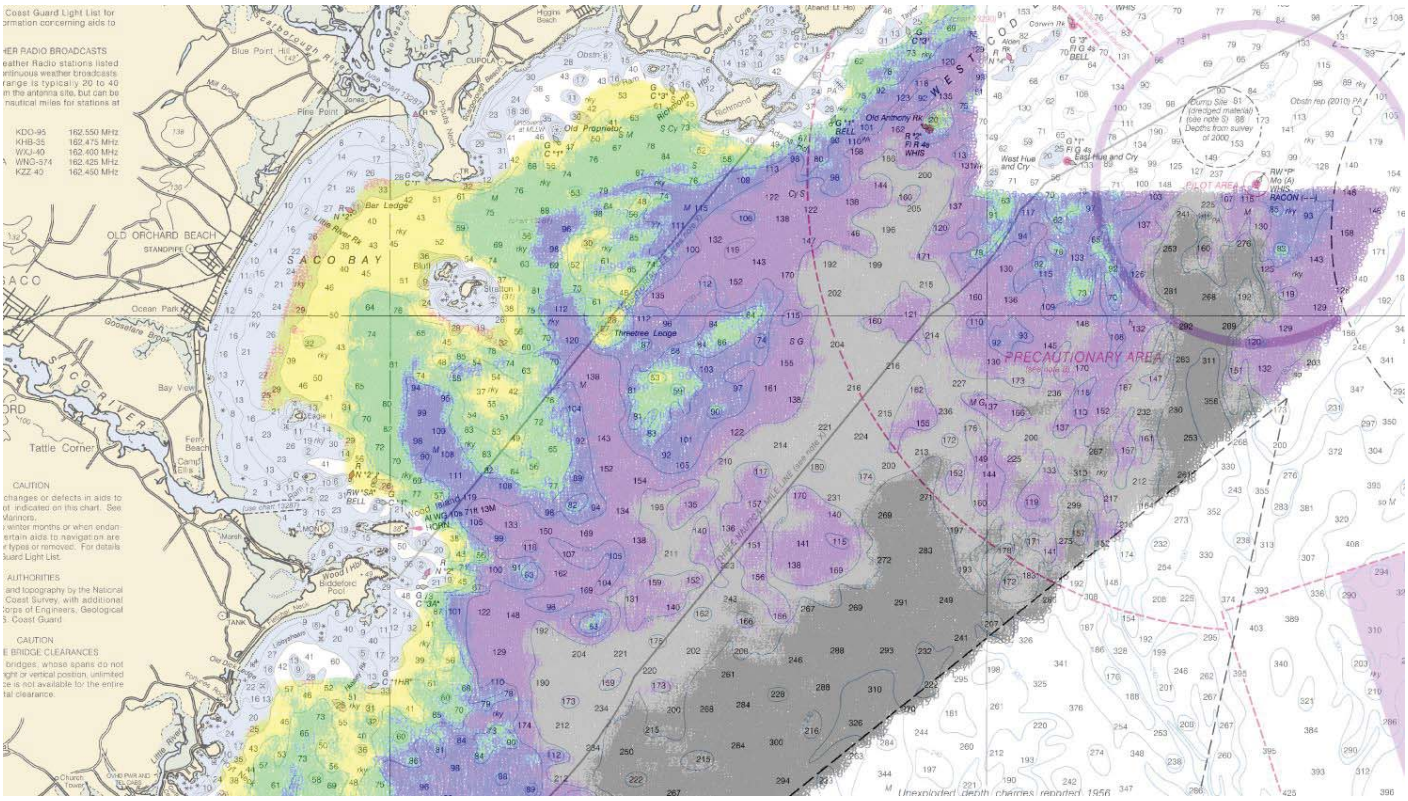


Figure 20: Contour comparison

<u>13287</u>

The scale of this chart is large enough that the contours and soundings begin to disagree greatly in location and area, though not necessarily greatly in depth. The complexity of seabed depths in this area drive contour complexity

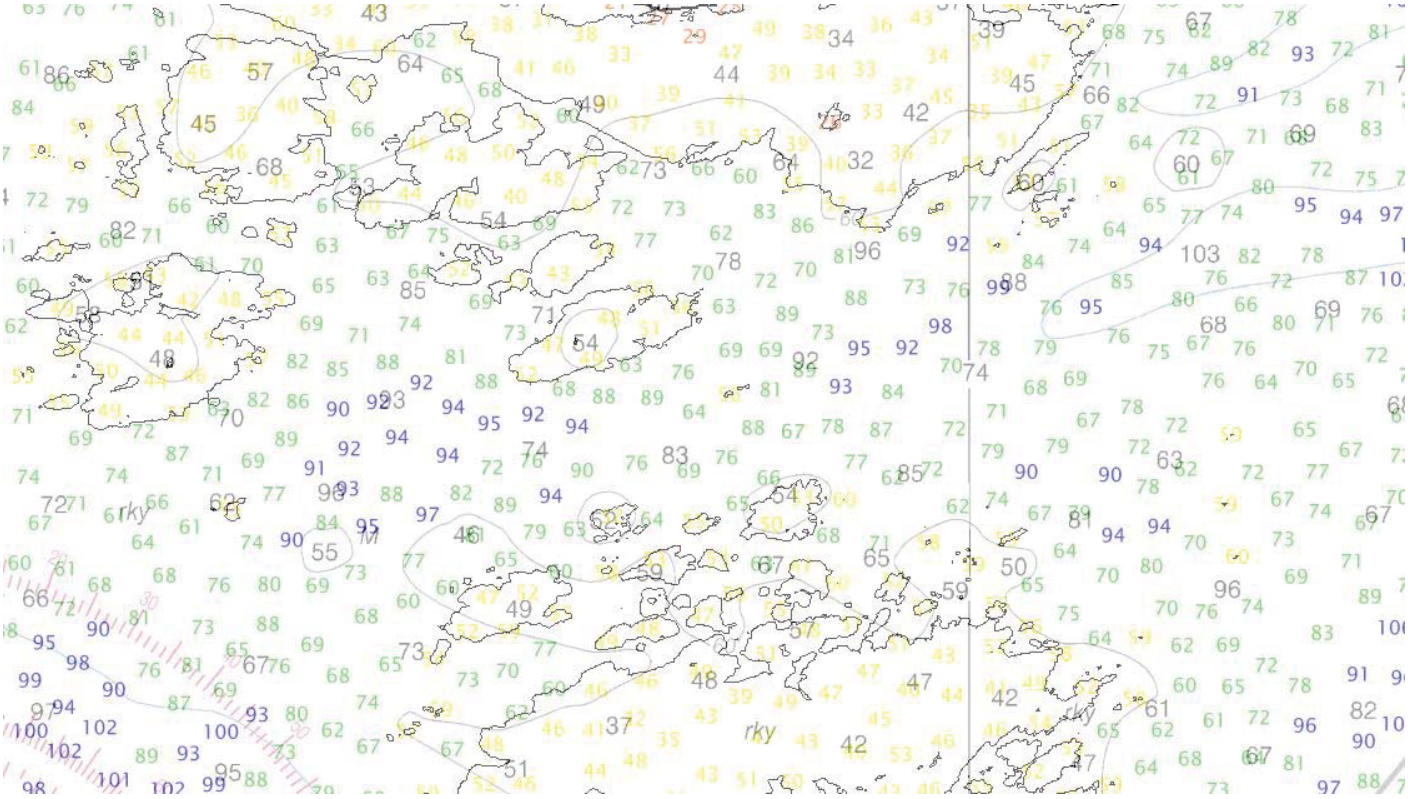


Figure 21: Contour and sounding comparison reveals differences.

<u>13288</u>

Surveyed depths have good overall agreement with charted contours, individual soundings may disagree at any given place.

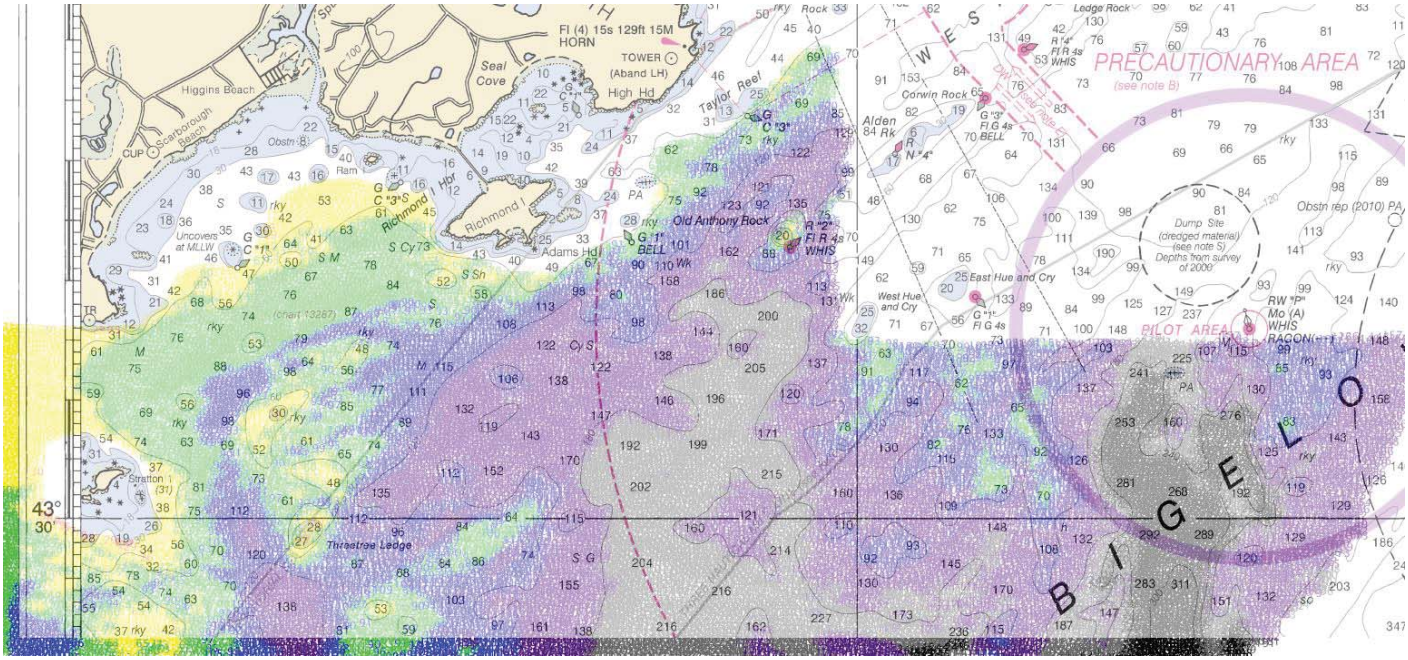


Figure 22: Contour comparison.

<u>13290</u>

Surveyed depths have good overall agreement with charted contours, individual soundings may disagree at any given place.

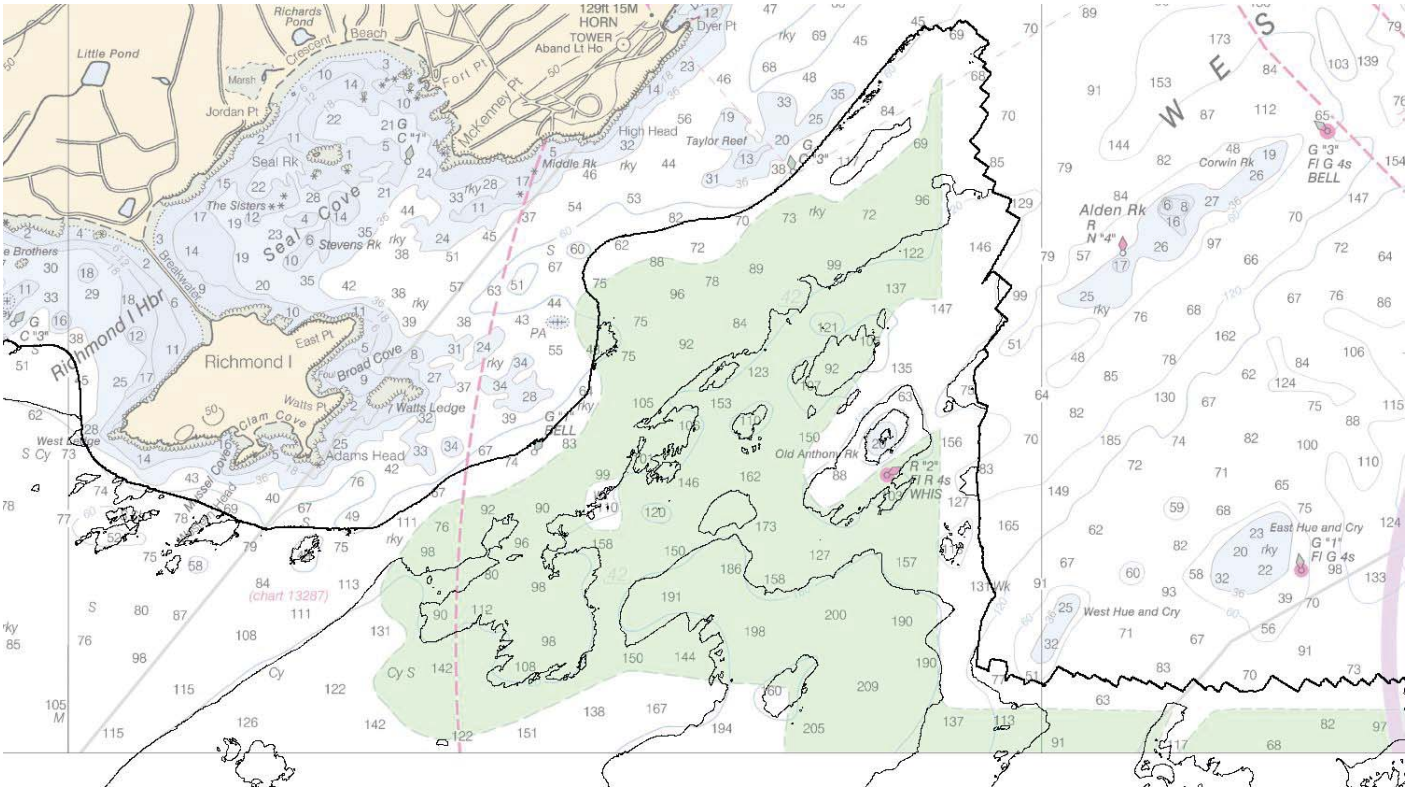


Figure 23: Contour comparison.

<u>13292</u>

Surveyed depths have good overall agreement with charted contours, individual soundings may disagree at any given place.

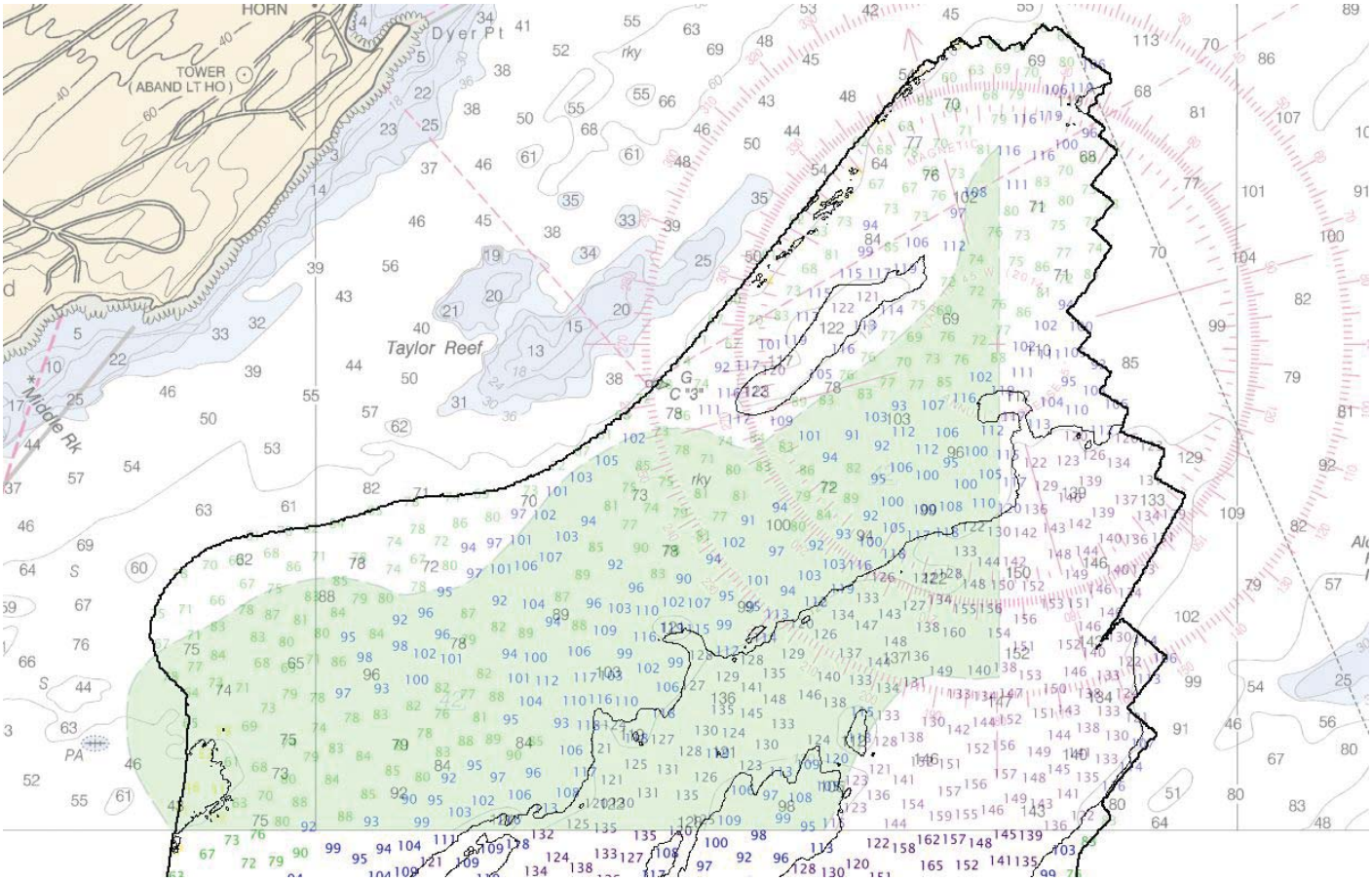


Figure 24: Contour comparison

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?
US5ME02M	1:20000	7	09/18/2013	03/10/2015	NO
US5ME10M	1:20000	21	03/07/2013	02/17/2015	NO
US5ME12M	1:40000	15	03/11/2013	07/09/2014	NO
US4ME01M	1:80000	11	04/28/2014	03/09/2015	NO
US4ME03M	1:80000	12	03/11/2013	02/18/2015	NO

Table 14: Largest Scale ENCs

US5ME02M

Good general agreement, though the complexity of the bathymetry is high, creating many contours which have been generalized for charting purposes. Sounding depths generally disagree with charted soundings by two to four feet across all depth ranges.

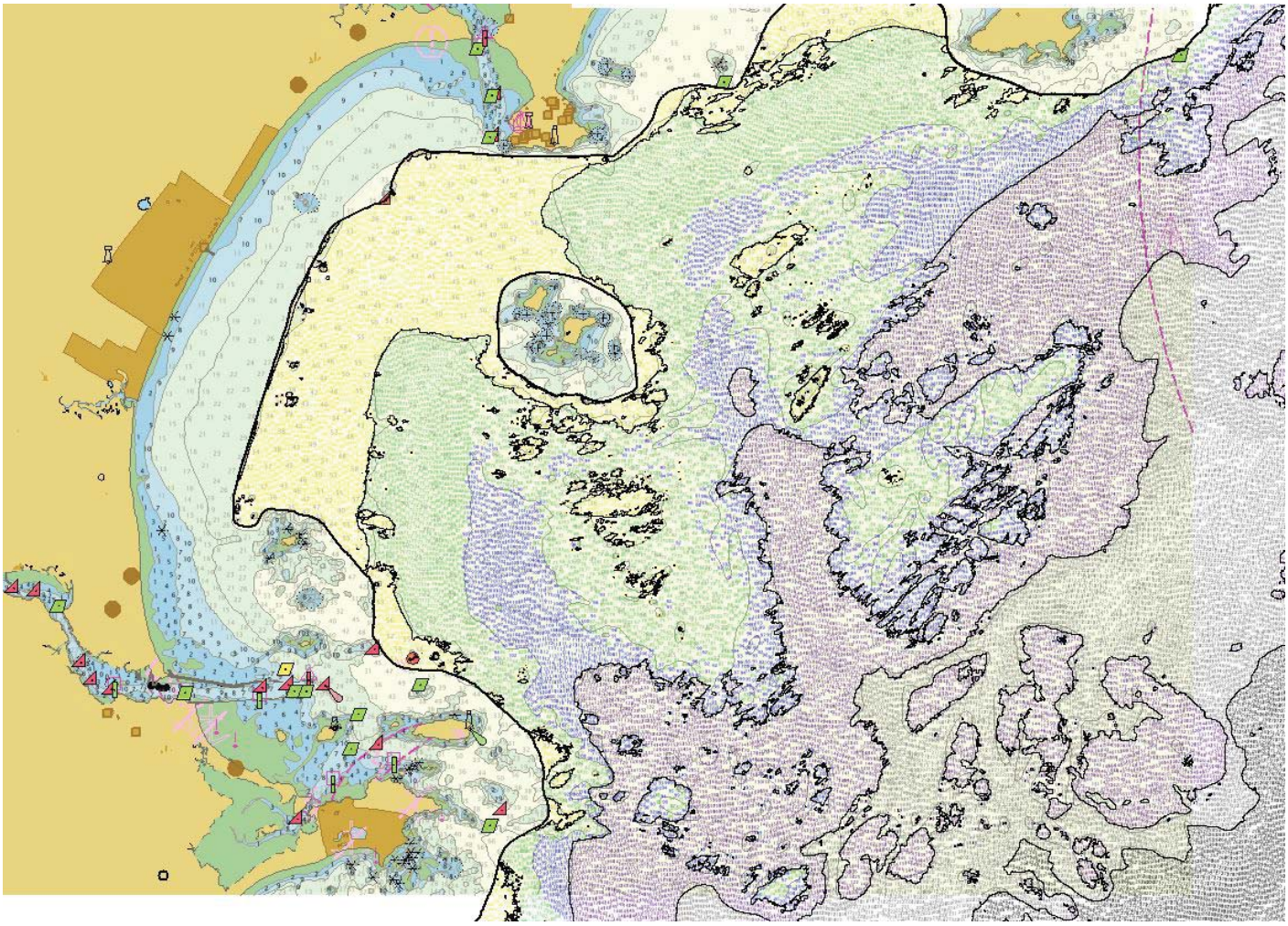


Figure 25: Contour comparison

US5ME10M

Good general agreement, though the complexity of the bathymetry is high, creating many contours which have been generalized for charting purposes. Sounding depths generally disagree with charted soundings by two to four feet across all depth ranges.

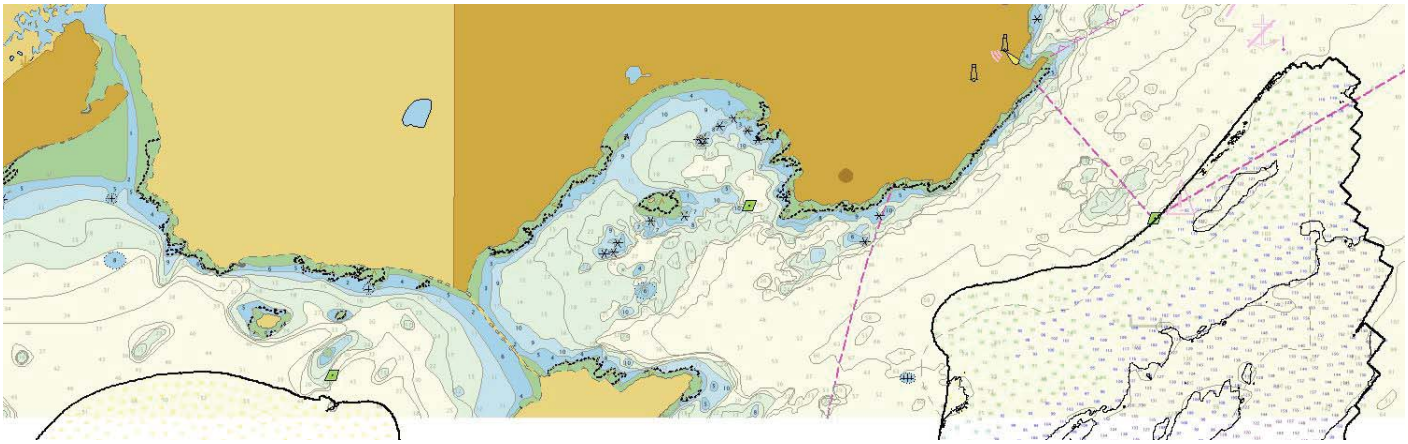


Figure 26: Contour Comparison

US5ME12M

Good general agreement, though the complexity of the bathymetry is high, creating many contours which have been generalized for charting purposes. Sounding depths generally disagree with charted soundings by two to four feet across all depth ranges.

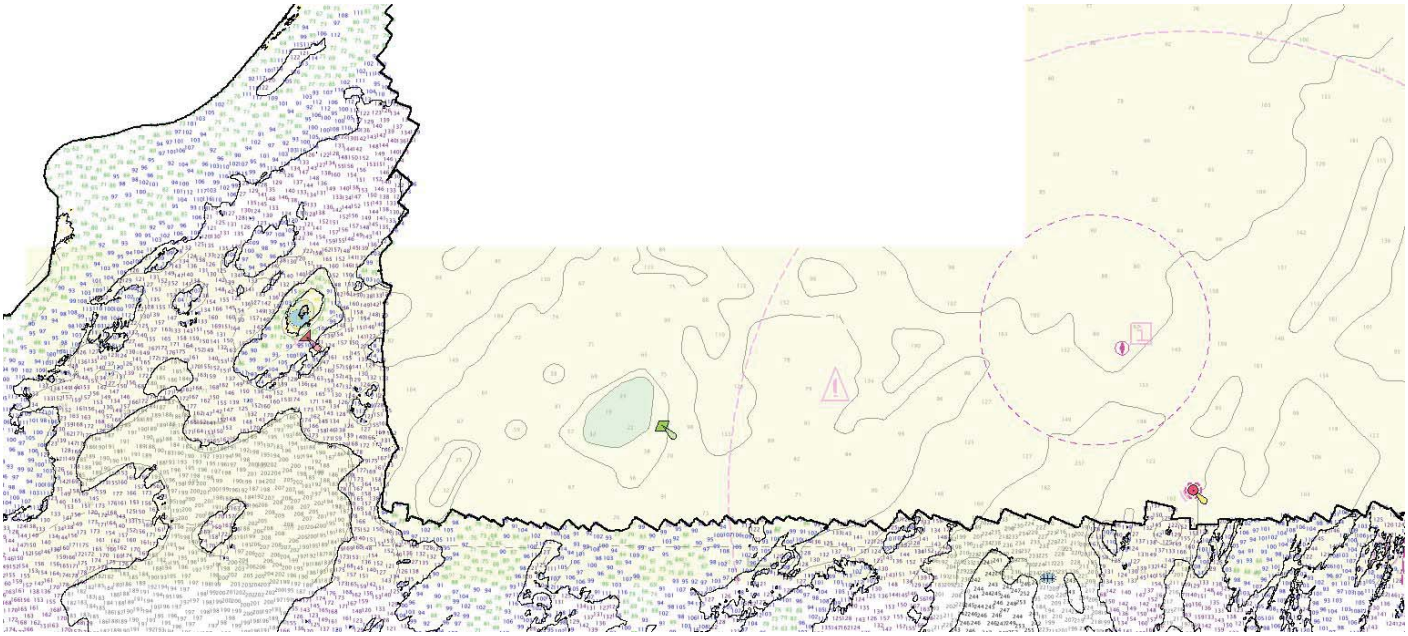


Figure 27: Contour Comparison

US4ME01M

Good general agreement, though the complexity of the bathymetry is high, creating many contours which have been generalized for charting purposes. Sounding depths generally disagree with charted soundings by two to four feet across all depth ranges.

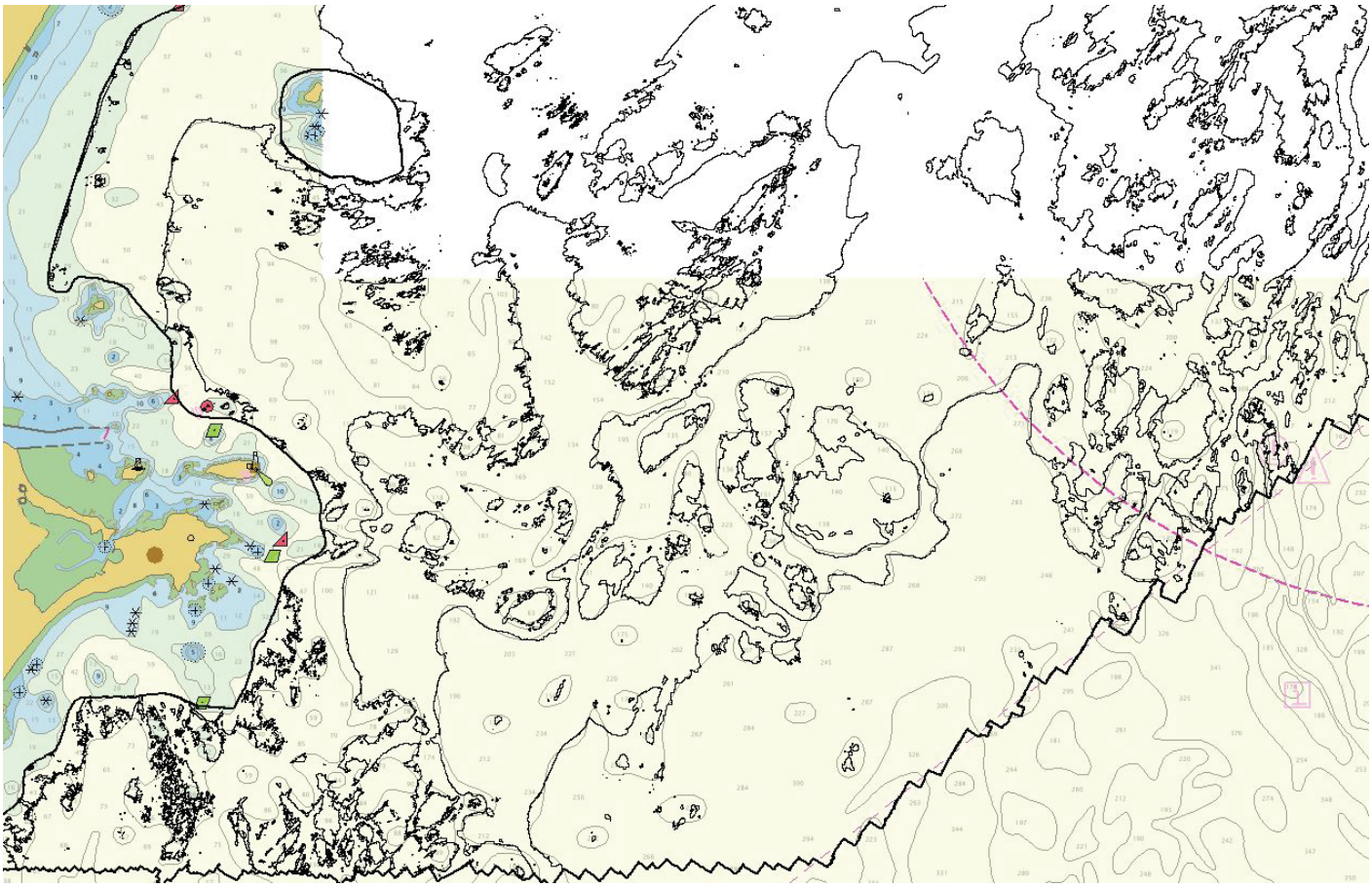


Figure 28: Contour comparison

US4ME03M

Good general agreement, though the complexity of the bathymetry is high, creating many contours which have been generalized for charting purposes. Sounding depths generally disagree with charted soundings by two to four feet across all depth ranges.

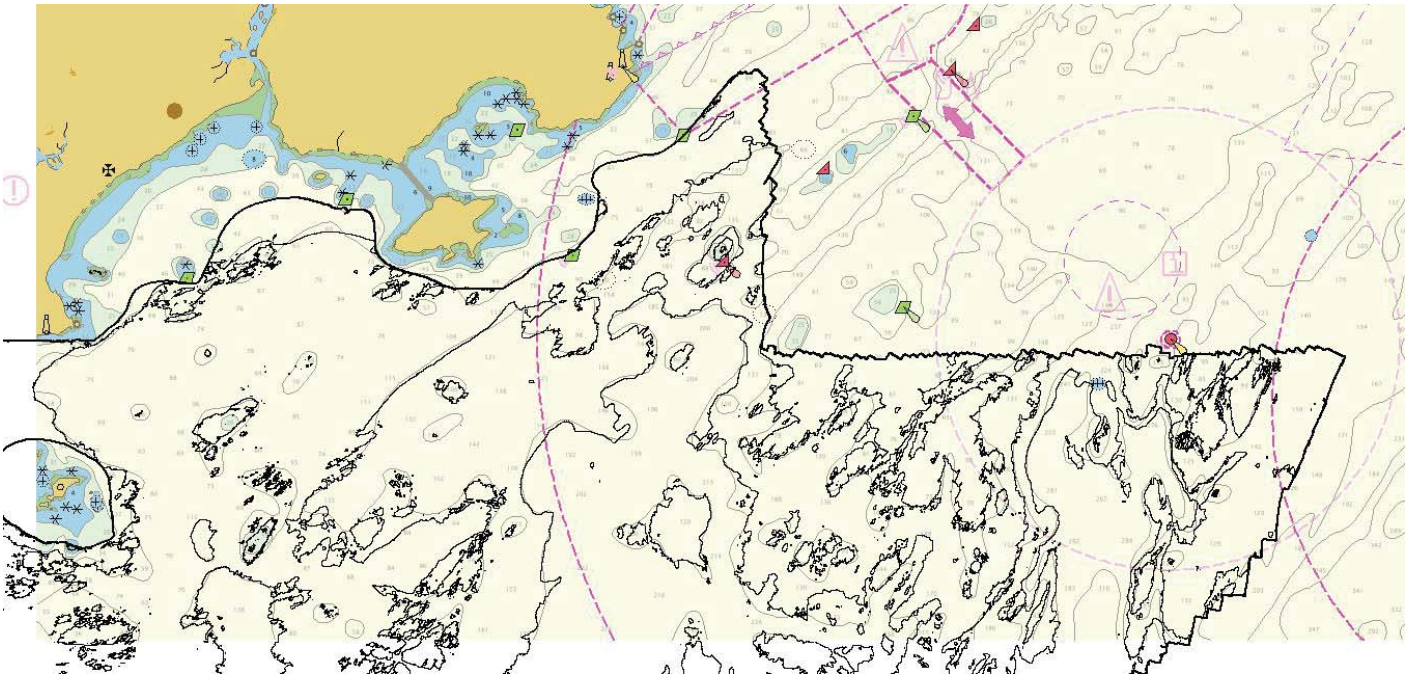


Figure 29: Contour comparison

D.1.3 AWOIS Items

No AWOIS items were assigned for this survey.

D.1.4 Maritime Boundary Points

Maritime Boundary Points were assigned for this survey, but were not addressed due to the lack of a good time on project where tides and weather were agreeable.

D.1.5 Charted Features

One charted PA wreck is located in the vicinity of H12726. See final feature file for more information.

D.1.6 Uncharted Features

No uncharted features exist for this survey.

D.1.7 Dangers to Navigation

The following DTON reports were submitted to the processing branch:

DTON Report Name	Date Submitted
H12726_DToNs	2015-02-10

Table 15: DTON Reports

The Danger to Navigation Report is included in Appendix II of this report.

D.1.8 Shoal and Hazardous Features

Shoals exist within the survey area, but the depths considered safe for survey did not allow bathymetric measures on these areas. Soundings leading up to any hazardous shoals appear in good general agreement with charted shoals and the hydrographer did not observe any great discrepancies which require changes to navigational charts.

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

Bottom samples were not obtained during acquisition due to safety concerns related to below freezing temperatures and deploying/recovering equipment over the side when decks were covered in ice.

D.2 Additional Results

D.2.1 Shoreline

Shoreline was assigned in the Hydrographic Survey Project Instructions or Statement of Work, but was not investigated. Without availability of a survey launch, FERDINAND R. HASSLER acquired data within the safe navigable limit for the ship.

D.2.2 Prior Surveys

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

D.2.3 Aids to Navigation

All aids to navigation that are within the surveyed limits of H12726 were visually confirmed to be on station and serving intended purposes.

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.2.10 New Survey Recommendation

The near shore areas were surveyed to the safe navigable limit achievable by FERDINAND R. HASSLER without the use of a survey launch. Inshore work will require a survey launch due to the high density of lobster fishing gear and proximity to hazards. The hydrographer recommends these areas be addressed in a later survey by a platform suited for near shore work.

D.2.11 State of Maine Junction

Per the Project Instructions, two crosslines were completed and submitted to the IOCM Center. Correspondence has been provided in Appendix II.

D.2.12 Inset Recommendation

No new insets 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-15 Data Acquisition and Processing Report	2015-09-25
2014 Hydrographic Systems Readiness Review Memo	2014-05-06

Approver Name	Approver Title	Approval Date	Signature
CDR Marc S. Moser, NOAA	Chief of Party	09/25/2015	MOSER.MARC.STANTON.1163193902 Digitally signed by MOSER.MARC.STANTON.1163193902 DN: c=US, o=U.S. Government, ou=DoD, ou=PKI, ou=NOAA, cn=MOSER.MARC.STANTON.1163193902 Date: 2015.09.26 16:41:49 -04'00'
LT Jon D. Andvick, NOAA	Field Operations Officer	09/25/2015	ANDVICK.JON.DOUGLAS.1369596434 2015.09.25 16:49:15 -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
TPE	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

TIDE NOTE AND GRAPHICS

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

PROVISIONAL TIDE NOTE FOR HYDROGRAPHIC SURVEY

DATE : March 2, 2015

HYDROGRAPHIC BRANCH: Atlantic
HYDROGRAPHIC PROJECT: OPR-A321-FH-2015
HYDROGRAPHIC SHEET: H12726
LOCALITY: Taylor Reef to Woody Island, Gulf of Maine
TIME PERIOD: January 7 - February 5, 2015

TIDE STATION USED: 8418150 Portland, ME
Lat. 43° 39.4'N Long. 70° 14.8' W
PLANE OF REFERENCE (MEAN LOWER LOW WATER): 0.000 meters
HEIGHT OF HIGH WATER ABOVE PLANE OF REFERENCE: 2.886 meters

REMARKS: RECOMMENDED ZONING Preliminary zoning is accepted as the final zoning for project OPR-A321-FH-2015, H12726, during the time period between January 7 - February 5, 2015.

Please use the zoning file A321FH2015CORP submitted with the project instructions for OPR-A321-FH-2015. Zones NA157, NA167, and NA168 are the applicable zones for H12726.

Refer to attachments for zoning information.

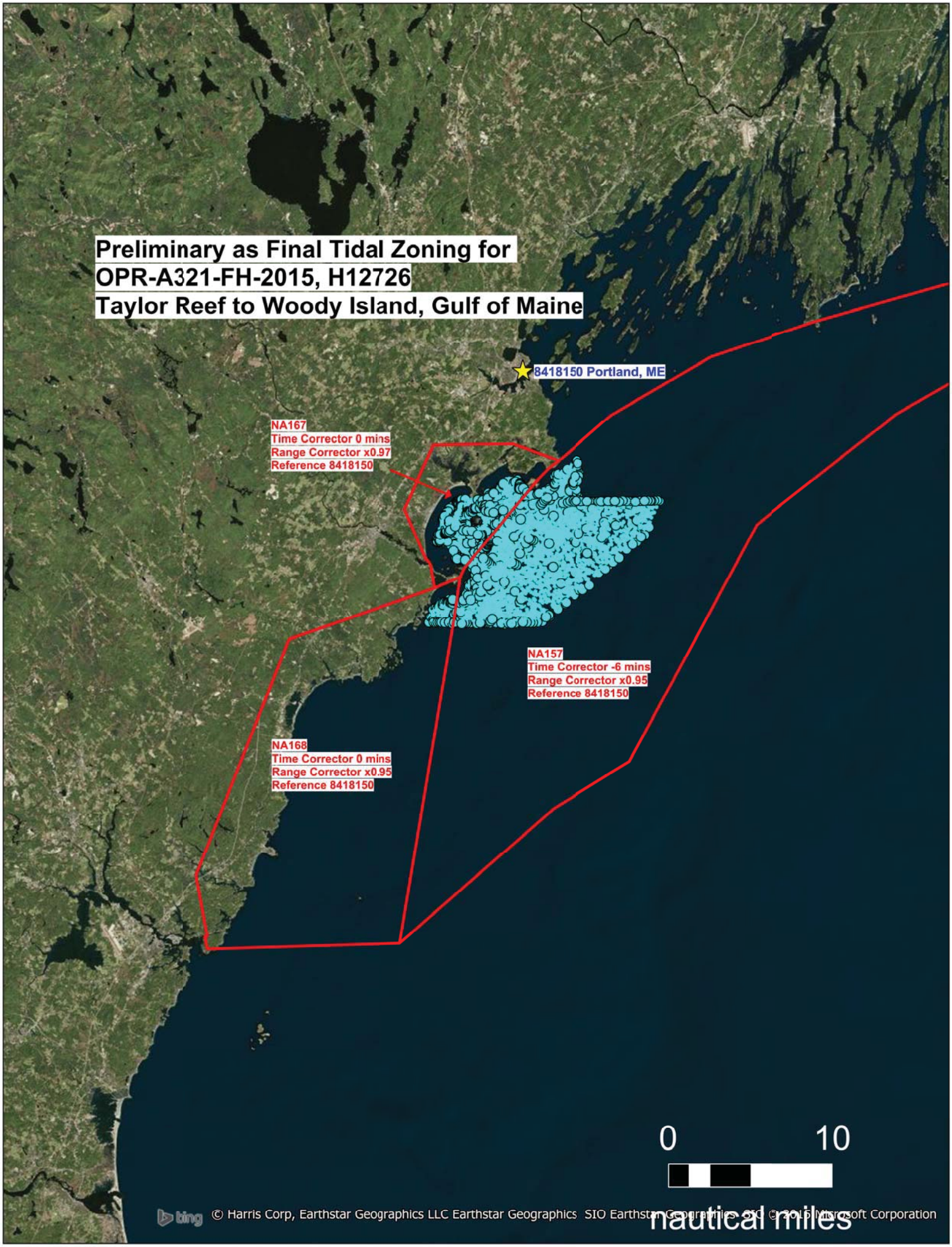
Note 1: Provided time series data are tabulated in metric units (meters), relative to MLLW and on Greenwich Mean Time on the 1983-2001 National Tidal Datum Epoch (NTDE).

Note 2: Annual leveling for Portland,ME (8418150) was not completed in FY14. A review of the verified leveling records from March 2003 - June 2013 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-2015, H12726. 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.

HOVIS.GERALD.THOMAS.JR.1365860250

Digitally signed by HOVIS.GERALD.THOMAS.JR.1365860250
DN: c=US, o=U.S. Government, ou=DoD, ou=PKI, ou=OTHER, cn=HOVIS.GERALD.THOMAS.JR.1365860250
Date: 2015.03.10 17:31:03 -04'00'

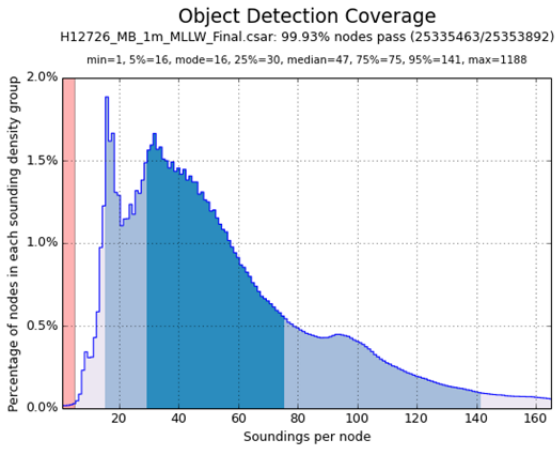
CHIEF, PRODUCTS AND SERVICES BRANCH

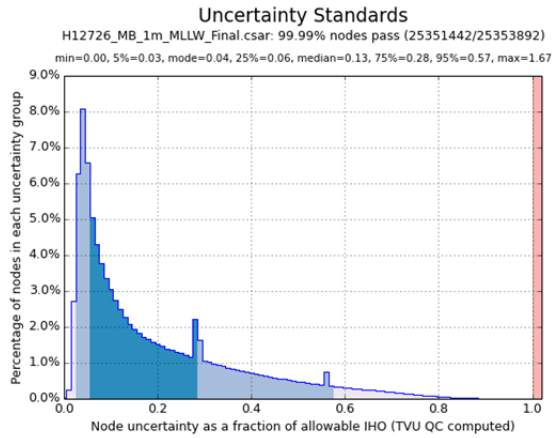

Preliminary as Final Tidal Zoning for
OPR-A321-FH-2015, H12726
Taylor Reef to Woody Island, Gulf of Maine
8418150 Portland, ME
NA167
Time Corrector 0 mins
Range Corrector x0.97
Reference 8418150
NA157
Time Corrector -6 mins
Range Corrector x0.95
Reference 8418150
NA168
Time Corrector 0 mins
Range Corrector x0.95
Reference 8418150
0
10
nautical miles
© Harris Corp, Earthstar Geographics LLC Earthstar Geographics SIO Earthstar Geographics SIO © 2015 Microsoft Corporation

APPENDIX II

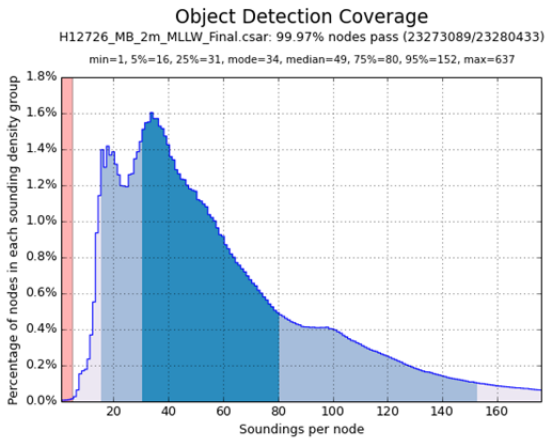
SUPPLEMENTAL SURVEY RECORDS AND CORRESPONDENCE

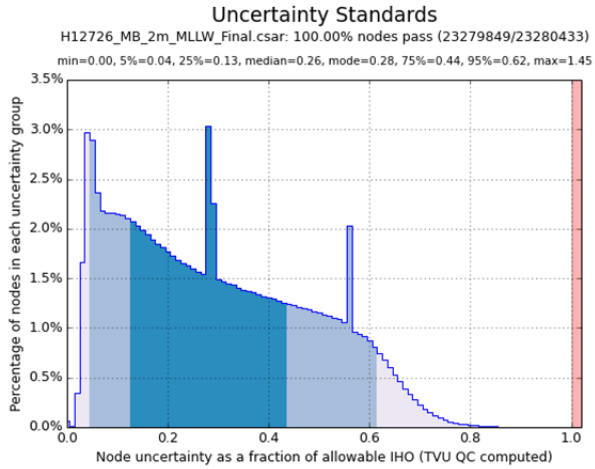
H12726 Standards Compliance Report



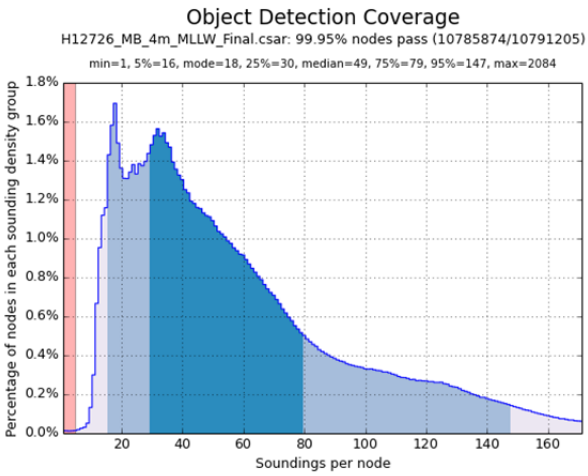


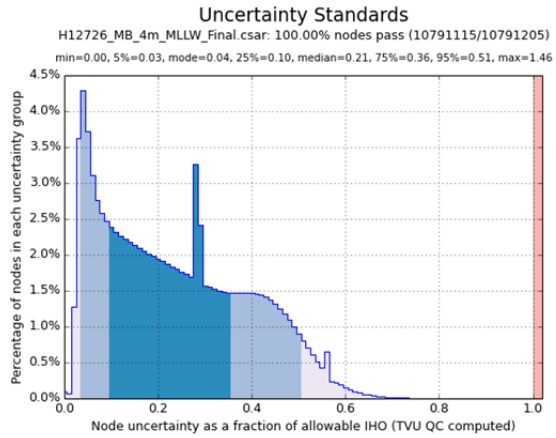
Density and Total Vertical Uncertainty Standards for 1m Surface





Density and Total Vertical Uncertainty Standards for 2m Surface





Density and Total Vertical Uncertainty Standards for 4m Surface

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

Request for Final Tides, OPR-A321-FH-15; H12726

1 message

OPS.Ferdinand Hassler - NOAA Service Account <ops.ferdinand.hassler@noaa.gov> Thu, Feb 26, 2015 at 10:57 AM
To: Final Tides - NOAA Service Account <Final.Tides@noaa.gov>
Cc: David Moehl - NOAA Federal <david.t.moehl@noaa.gov>, Jon Andvick - NOAA Federal <jon.andvick@noaa.gov>

Good Afternoon,

Please find attached the final tide request for OPR-A321-FH-15, survey H12726.

Thank you,
Adam

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

2 attachments

H12726_Request_for_Tides.pdf
34K

H12726_Request_for_Tides.zip
298K

Tyanne Faulkes - NOAA Federal <tyanne.faulkes@noaa.gov>

OPR-A321-FH-15 Coast Pilot Review Report

OPS.Ferdinand Hassler - NOAA Service Account <ops.ferdinand.hassler@noaa.gov> Thu, Dec 10, 2015 at 2:42 PM
To: OCS NDB - NOAA Service Account <ocs.ndb@noaa.gov>, _NOS OCS NSD Coast Pilot <coast.pilot@noaa.gov>
Cc: Tyanne Faulkes - NOAA Federal <tyanne.faulkes@noaa.gov>, Patrick Keown - NOAA Federal <patrick.keown@noaa.gov>, Megan Greenaway - NOAA Federal <megan.greenaway@noaa.gov>, Patrick Berube - NOAA Federal <patrick.j.berube@noaa.gov>

All,

Please find attached the consolidated Coast Pilot Review Report for OPR-A321-FH-15. This consolidated report includes:

1. responses to the specific questions posed in the Coast Pilot Field Report
2. updates to the actual paragraph text of CP1, 45th Ed. Chapter 9, dated 06 DEC 2015
3. and the original Coast Pilot Field Report

The original Coast Pilot Field Report (request) with the specific items to verify, was not reviewed until after leaving the project area. Unfortunately, almost all the excellent work that went into that document was not able to be verified.

The actual Coast Pilot document sections were reviewed against the survey data and no discrepancies were found. Coast Pilot text that was found to be correct was changed to green as directed, using the latest version available (06 DEC 2015).

I apologize and take responsibility for missing the requested deadline for submission of this report.

V/r,
Jon Andvick

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

OPR-A321-FH-15_Coast Pilot Review Report.pdf
6428K

APPROVAL PAGE

H12726

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 NCEI for archive

- H12726_DR.pdf
- Collection of depth varied resolution BAGS
- Processed survey data and records
- H12725_H12726_GeoImage.pdf

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

Approved: Briana J. Welton

Digitally signed by WELTON.BRIANA.JANE.1267667531
DN: c=US, o=U.S. Government, ou=DoD, ou=PKI, ou=NOAA, cn=WELTON.BRIANA.JANE.1267667531
Date: 2016.11.15 16:59:55 -05'00'

Lieutenant Commander Briana Welton, NOAA
Chief, Atlantic Hydrographic Branch