H13394

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

DESCRIPTIVE REPORT

Type of Survey:	Navigable Area
Registry Number:	H13394

LOCALITY

State(s):	North Carolina Virginia
General Locality:	Offshore Chesapeake Bay
Sub-locality:	31 NM due East of False Cape

2020

CHIEF OF PARTY
CDR Briana Welton Hillstrom, NOAA

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Date:

U.S. DEPARTMENT OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION	REGISTRY NUMBER:
HYDROGRAPHIC TITLE SHEET	**H13394**

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):	**North Carolina Virginia**
General Locality:	**Offshore Chesapeake Bay**
Sub-Locality:	**31 NM due East of False Cape**
Scale:	**40000**
Dates of Survey:	**07/27/2020 to 08/28/2020**
Instructions Dated:	**08/05/2020**
Project Number:	**OPR-D304-TJ-20**
Field Unit:	**NOAA Ship *Thomas Jefferson***
Chief of Party:	**CDR Briana Welton Hillstrom, NOAA**
Soundings by:	**Multibeam Echo Sounder**
Imagery by:	**Multibeam Echo Sounder Backscatter Side Scan Sonar**
Verification by:	**Atlantic Hydrographic Branch**
Soundings Acquired in:	**meters at Mean Lower Low Water**

Remarks: ***Any revisions to the Descriptive Report (DR) applied during office processing are shown in red italic text. The DR is maintained as a field unit product, therefore all information and recommendations within this report are considered preliminary unless otherwise noted. The final disposition of survey data is represented in the NOAA nautical chart products. All pertinent records for this survey are archived at the National Centers for Environmental Information (NCEI) and can be retrieved via https://www.ncei.noaa.gov/.***

Products created during office processing were generated in NAD83 UTM 18N, MLLW. All references to other horizontal or vertical datums in this report are applicable to the processed hydrographic data provided by the field unit.

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Descriptive Report to Accompany Survey H13394

Project: OPR-D304-TJ-20

Locality: Offshore Chesapeake Bay

Sublocality: 31 NM due East of False Cape

Scale: 1:40000

July 2020 - August 2020

NOAA Ship *Thomas Jefferson*

Chief of Party: CDR Briana Welton Hillstrom, NOAA

A. Area Surveyed

Survey H13394, located offshore of Chesapeake Bay and approximately 31 NM due East of False Cape, was conducted in accordance with coverage requirements set forth in the Project Instructions OPR-D304-TJ-20 (Figure 1).

A.1 Survey Limits

Data were acquired within the following survey limits:

Northwest Limit	Southeast Limit
36° 42' 8.6" N 75° 18' 37.93" W	36° 29' 35.93" N 75° 11' 2.26" W

Table 1: Survey Limits

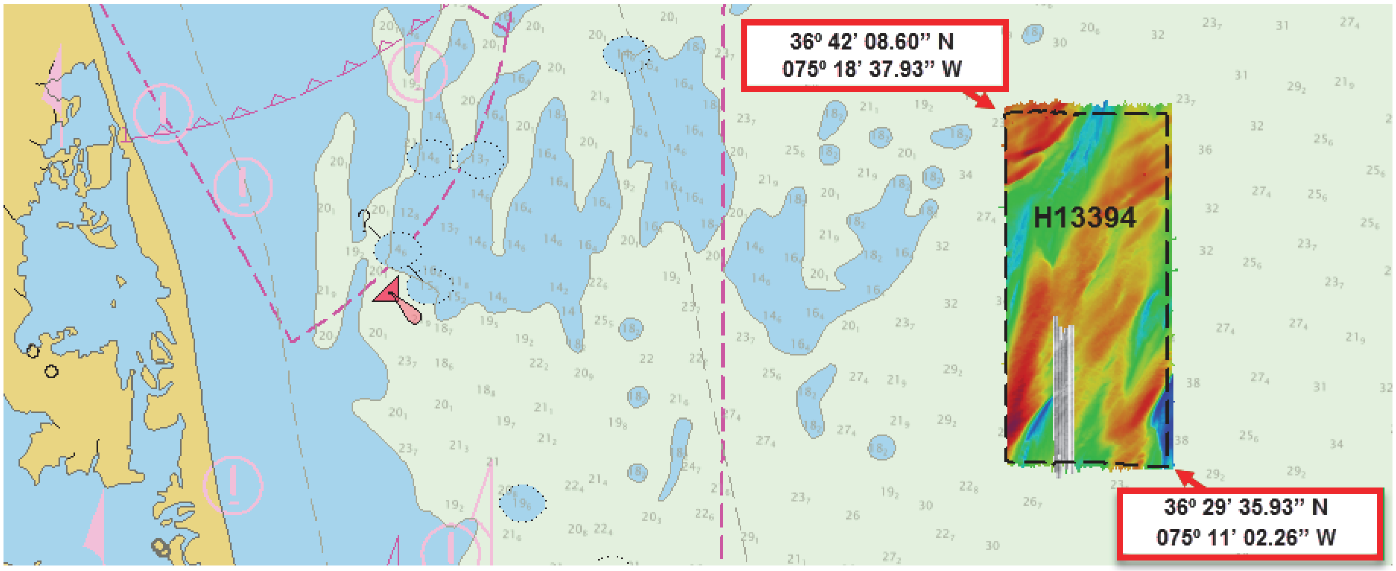


Figure 1: Survey layout for H13394 plotted over ENC US3DE01M. Black dashed outline represents the survey limits set forth by the Project Instructions for OPR-D304-TJ-20.

Survey data were acquired in accordance with the requirements set forth by the Project Instructions (PI) dated August 2020 and the Hydrographic Surveys Specifications and Deliverables (HSSD) dated May 2020.

A.2 Survey Purpose

As stated in the Project Instructions, survey sheet H13394 covers approximately 64 SNM approaching Chesapeake Bay, which is the home of two of the top 20 container ports in the United States: the Port of Virginia and Baltimore, Maryland. Together, they net over 116 million tons of imports and exports per year (U.S. Army Corps of Engineers, 2019).

The Port of Virginia, with four 50-foot deep water marine terminals in Norfolk Harbor, located 18 nautical miles from the Atlantic Ocean, regularly hosts the larger New Panamax vessels over 1,000 feet in length and the Ultra Large Container Vessels (ULCVs) over 1,200 feet. In 2018, the Port of Virginia received Congressional authorization to dredge 55 feet (16.75 meters) deep and 1,400 feet (426.72 meters) wide in the channels of Norfolk Harbor, with plans to start in 2020 (Port of Virginia, 2019). Additionally, Norfolk is home to a Naval Station in the Sewell's Point area and is a major base for the U.S. Atlantic Command, the U.S. Atlantic Fleet, and other fleet forces operating internationally.

The Port of Baltimore, 145 nautical miles from the Atlantic Ocean, also receives New Panamax and ULCV vessels and is separated from U.S. Midwestern metropolitan areas by only a day-long truck drive (Ronan, 2019).

The most recent surveys in this approaches project are partial bottom coverage from the 1880s to 1940s. Chart depths currently indicate 66 to 110 feet. Historic storms and hurricanes have likely made substantial changes to the seabed, depreciating the nautical charts over the last century and raising a concern for shoaling.

This survey is a critical part of an ongoing, multi-year hydrographic survey covering the Approaches to Chesapeake Bay to support the safety of waterborne commerce to these vital ports and to monitor the habitat and the environmental health of the region. Survey data from this project are intended to supersede all prior survey data in the common area.

Sources:

The Port of Virginia, “Virginia Directories: Virginia Advantages.” 600 World Trade Center, Norfolk, VA 23510. PORTOFVIRGINIA.COM. http://aapa.files.cms-plus.com/Awards Competition Materials/2019CommunicationsAward/DirectoriesHandbooks/Virginia_Directories_Virginia-Advantages.pdf. Accessed May 21, 2020.

Ronan, Dan, “Port of Baltimore Welcomes Its Largest Cargo Ship” Transport Topics, May 29, 2019. https://www.ttnews.com/articles/port-baltimore-welcomes-its-largest-cargo-ship. Accessed May 21, 2020.

U.S. Army Corps of Engineers, ”Waterborne Commerce Statistics Center: Tonnage for selected U.S. ports in 2018.” Institute for Water Resources. Submitted to USACE Digital Library 2019-12-12. https://usace.contentdm.oclc.org/. Accessed May 21, 2020.

A.3 Survey Quality

The entire survey is adequate to supersede previous data.

Data acquired in H13394 meet the multibeam echosounder (MBES) coverage requirements and the side scan sonar (SSS) coverage requirements for Complete Coverage, as required by the HSSD dated May 2020. This includes crosslines (see Section B.2.1), NOAA allowable uncertainty (see Section B.2.10), and density requirements (see Section B.2.11).

A.4 Survey Coverage

The following table lists the coverage requirements for this survey as assigned in the project instructions:

Water Depth	Coverage Required
All waters in survey area	Complete Coverage

Table 2: Survey Coverage

Survey coverage is in accordance with requirements listed in Table 2 and in Section 5.2.2 of the 2020 HSSD. Coverage requirements were met with a combination of Option A) 100% bathymetric bottom coverage with multibeam echosounder (MBES) and Option B) 100% side scan sonar coverage with concurrent multibeam bathymetry collection, both with complete coverage multibeam developments (Figure 2). Side scan sonar coverage was acquired only in a small region in the southern half of the sheet due to the depth of the thermocline in the project area and the resulting difficulty of towing the side scan system below the thermocline.

No holidays exist in H13394 coverage within the sheet limits assigned by the PI. However, six small gaps exist in the visualization of coverage by the MBES Variable Resolution (VR) Combined Uncertainty and Bathymetry Estimator (CUBE) surface. These gaps are a visualization issue resulting from VR CUBE surface creation and are not actual gaps in coverage. These gaps exist between the finalized MBES VR CUBE surface and the SSS mosaic for H13394. These gaps, shown in Figure 3 and colored bright pink for contrast, are located where the easternmost extent of the SSS coverage meets the MBES coverage, respectively shown in grayscale and in color. Soundings are present in the nodes that overlie the gaps, and the size and location of the gaps shift every time the MBES VR CUBE surface is recomputed, implying that they are artifacts of VR CUBE surface creation. The gaps have widths of 1 m and range from 1.5 m to 78.7 m in length, and they span a total distance of 171.2 m. As such, these gaps are not actual coverage gaps. Nonetheless, the hydrographer notes their presence in the deliverables submitted for H13394.

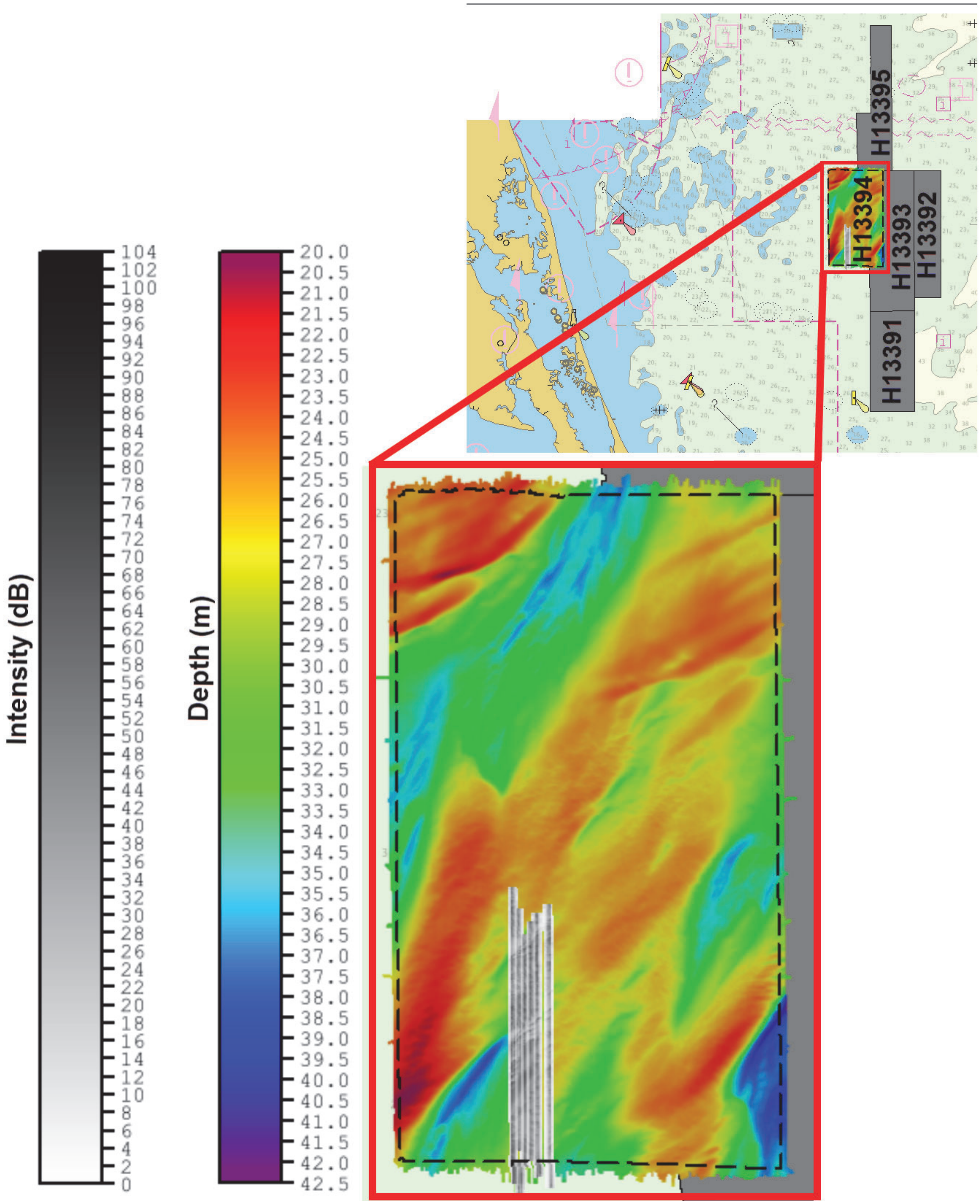


Figure 2: H13394 sheet limits (black dashed outline) and coverage (color) overlaid on ENC US3DE01M with all other OPR-D304-TJ-20 sheets (gray).

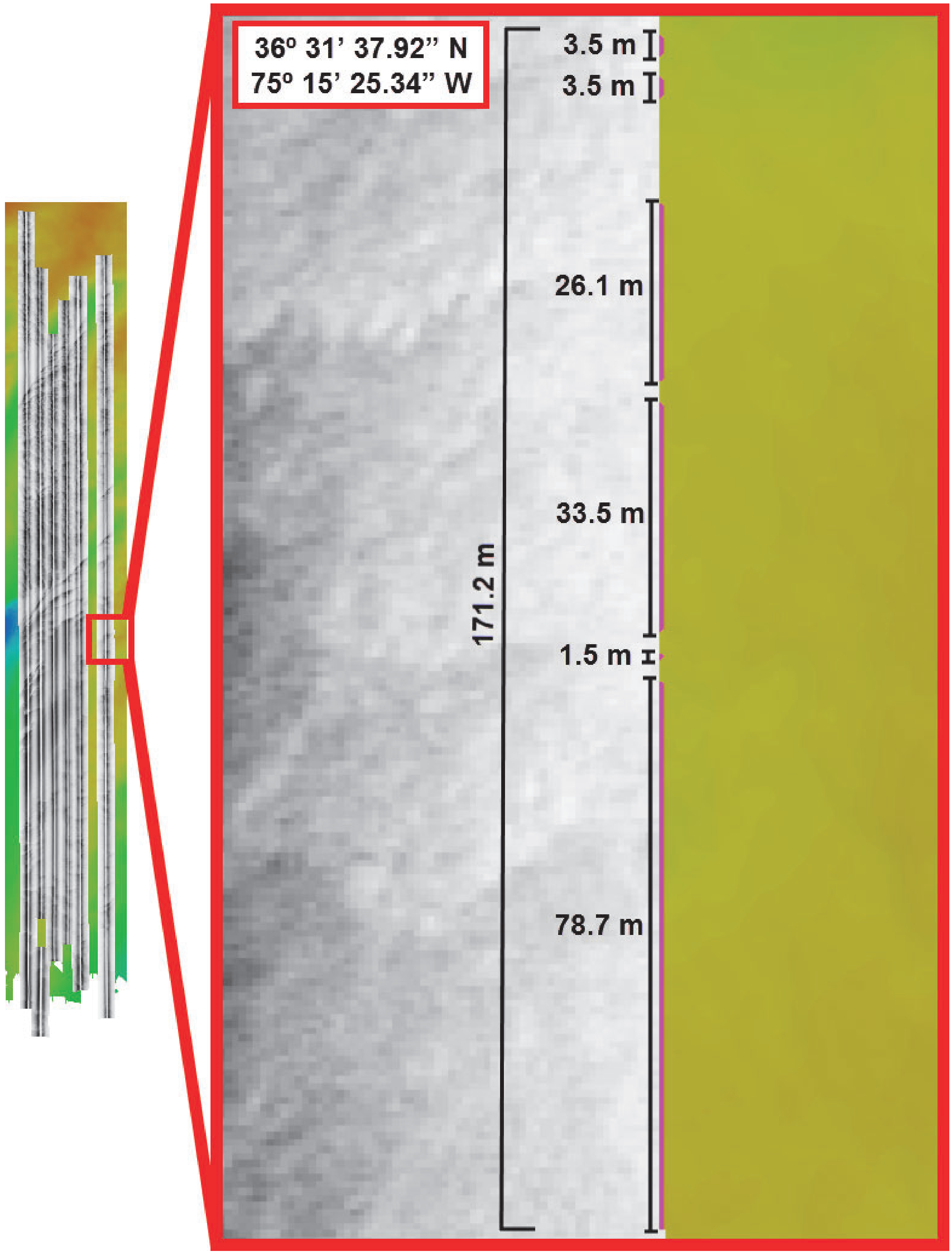


Figure 3: Coverage gap locations for H13394, with gaps shown in bright pink for contrast.

A.6 Survey Statistics

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

	HULL ID	*S222*	*2903*	*Total*
LNM	SBES Mainscheme	0	0	0
	MBES Mainscheme	2336.19	77.43	2413.62
	Lidar Mainscheme	0	0	0
	SSS Mainscheme	0	0	0
	SBES/SSS Mainscheme	0	0	0
	MBES/SSS Mainscheme	39.17	0	39.17
	SBES/MBES Crosslines	122.22	0	122.22
	Lidar Crosslines	0	0	0
Number of Bottom Samples				6
Number Maritime Boundary Points Investigated				0
Number of DPs				0
Number of Items Investigated by Dive Ops				0
Total SNM				67.48

Table 3: Hydrographic Survey Statistics

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

Survey Dates	Day of the Year
07/27/2020	209
07/28/2020	210
07/29/2020	211
07/30/2020	212
07/31/2020	213
08/01/2020	214
08/08/2020	221
08/09/2020	222
08/10/2020	223
08/12/2020	225
08/13/2020	226
08/14/2020	227
08/15/2020	228
08/16/2020	229
08/18/2020	231
08/19/2020	232
08/20/2020	233
08/21/2020	234
08/22/2020	235
08/28/2020	241

Table 4: 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 as well as 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	***S222***	***2903***
LOA	63.4 meters	8.5 meters
Draft	4.6 meters	1.2 meters

Table 5: Vessels Used

Hydrographic survey launch 2903 was used for only 5 days of acquisition due to weather limitations.

B.1.2 Equipment

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

Manufacturer	Model	Type
AML Oceanographic	MVP-X	Conductivity, Temperature, and Depth Sensor
Applanix	POS MV 320 v5	Positioning and Attitude System
Klein Marine Systems	System 5000	SSS
Kongsberg Maritime	EM 2040	MBES
Kongsberg Maritime	EM 710	MBES
ODIM Brooke Ocean	MVP100	Sound Speed System
Sea-Bird Scientific	SBE 19plus V2	Conductivity, Temperature, and Depth Sensor
Teledyne RESON	SVP 71	Sound Speed System
Valeport	Thru-Hull SVS	Sound Speed System

Table 6: Major Systems Used

Vessel configurations, equipment operations, data acquisition, and processing were consistent with specifications described in the DAPR.

B.2 Quality Control

B.2.1 Crosslines

S222 collected 122.22 linear nautical miles of MBES crosslines, which amounts to 5.06% of mainscheme MBES data (Figure 4). A variable resolution (VR) Combined Uncertainty and Bathymetry Estimator (CUBE) surface of mainscheme data and a VR CUBE surface of crossline data were differenced. The resulting mean was -0.03 m with a standard deviation of 0.11 m (Figure 5). This statistical analysis of these surfaces indicates good agreement. Additionally, visual inspection of the difference surface indicates no systematic issues.

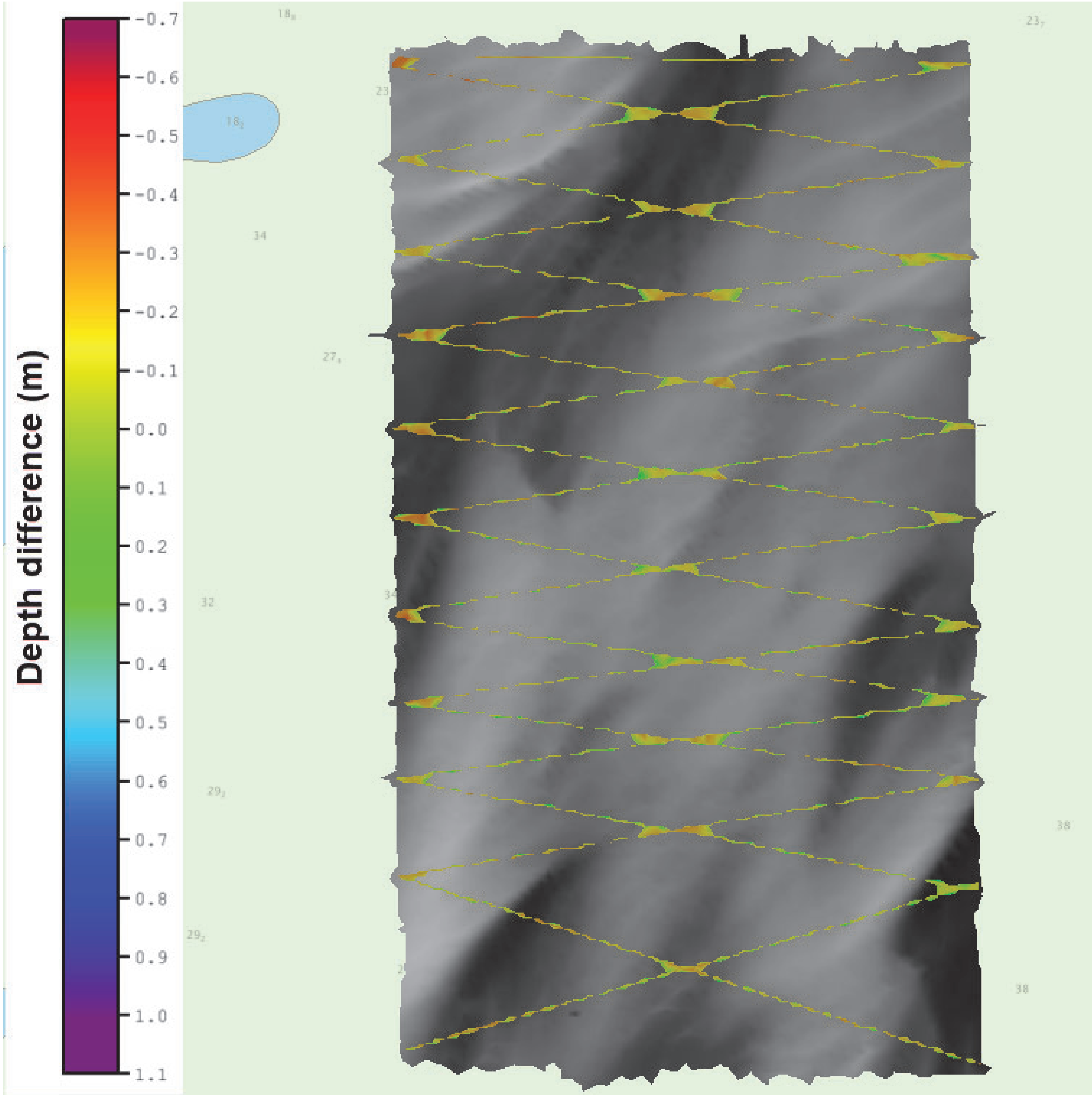


Figure 4: H13394 MBES mainscheme and crossline difference surface (color) overlaid on MBES mainscheme data (grayscale).

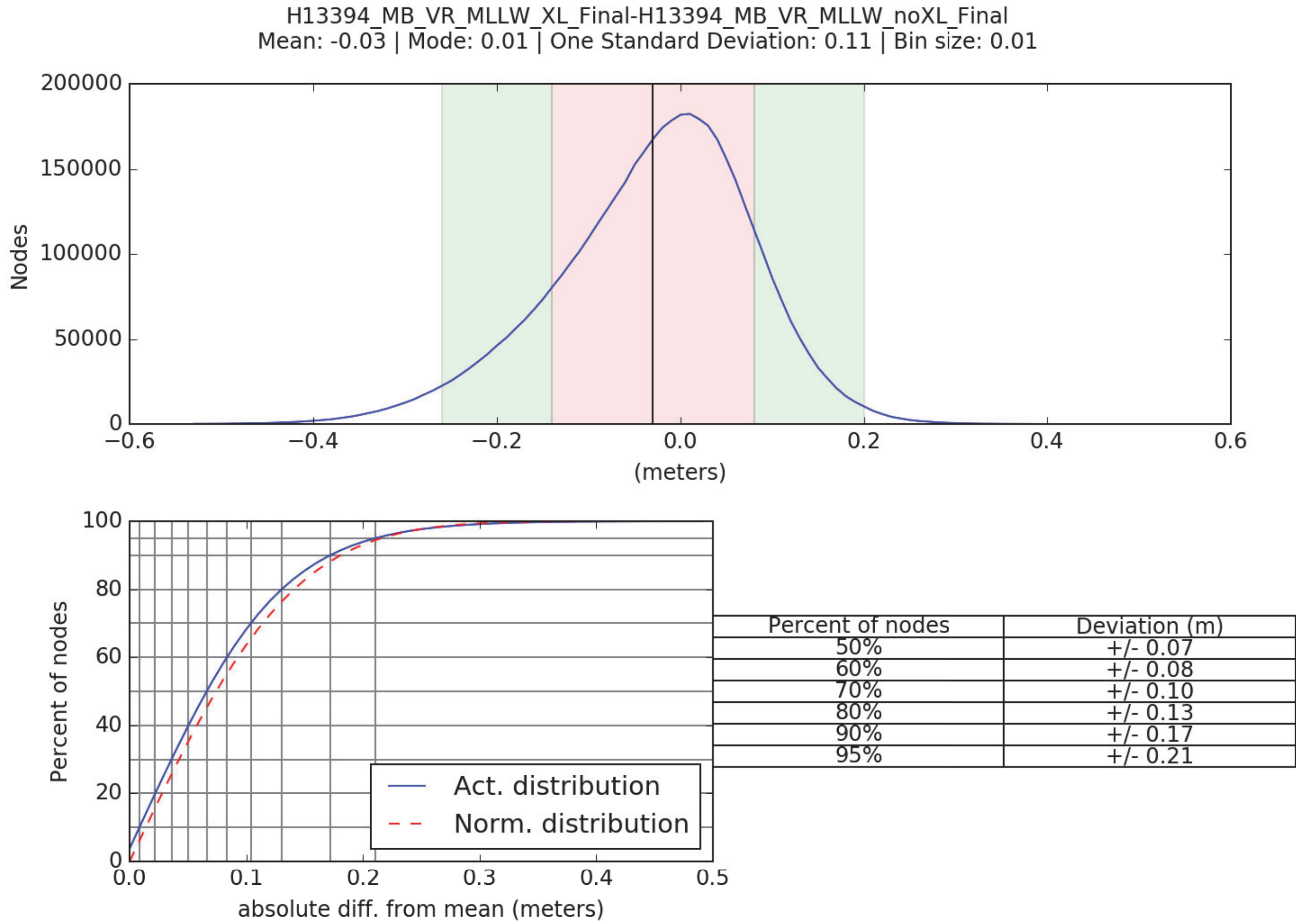


Figure 5: Crossline-mainscheme comparison statistics for H13394.

B.2.2 Uncertainty

The following survey specific parameters were used for this survey:

Method	Measured	Zoning
ERS via VDATUM	0 meters	0.095 meters

Table 7: Survey Specific Tide TPU Values.

Hull ID	Measured - CTD	Measured - MVP	Surface
S222	4 meters/second	4 meters/second	0.2 meters/second
2903	4 meters/second	N/A meters/second	0.2 meters/second

Table 8: Survey Specific Sound Speed TPU Values.

The bathymetric surface's uncertainty layer is compliant with HSSD 2020 uncertainty standards. 100% of all nodes pass uncertainty standards (Figure 6).

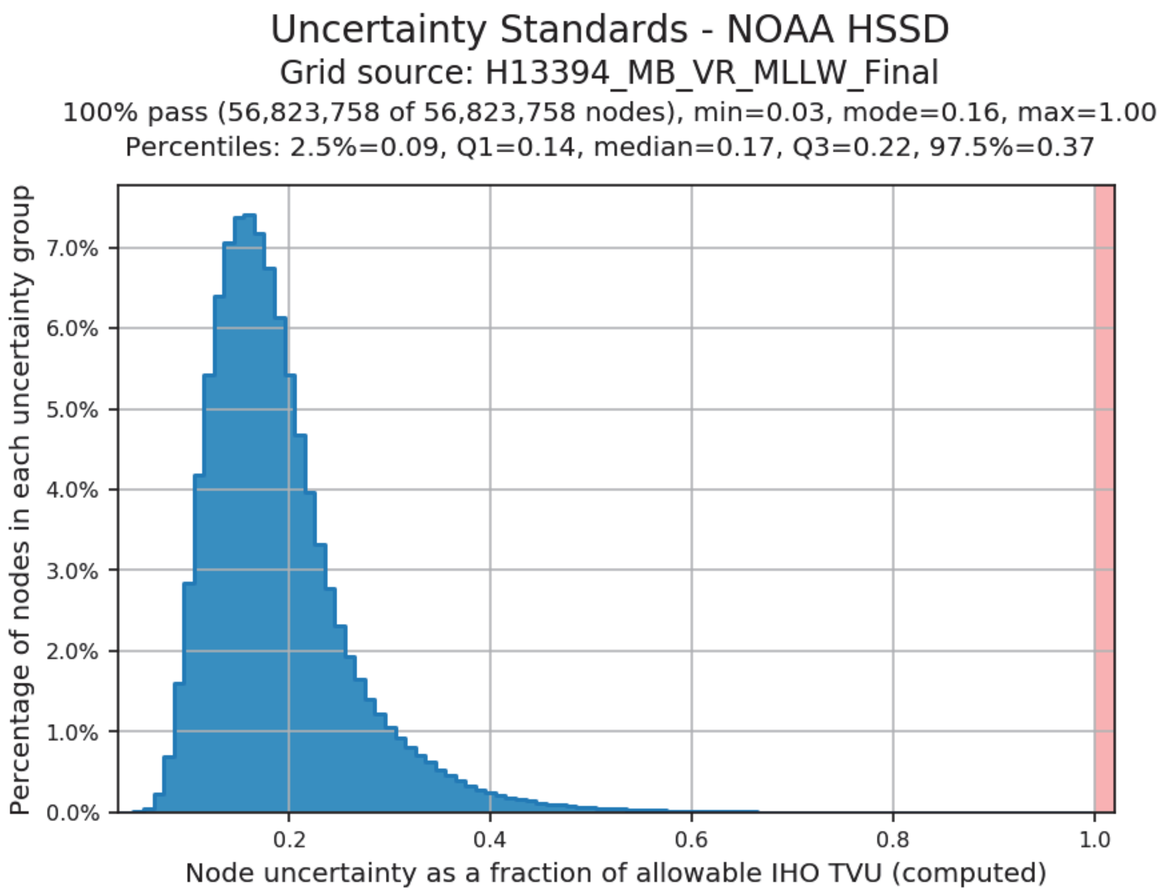


Figure 6: H13394 uncertainty statistics.

B.2.3 Junctions

There are three historical surveys that junction with survey H13394 (Figure 7).

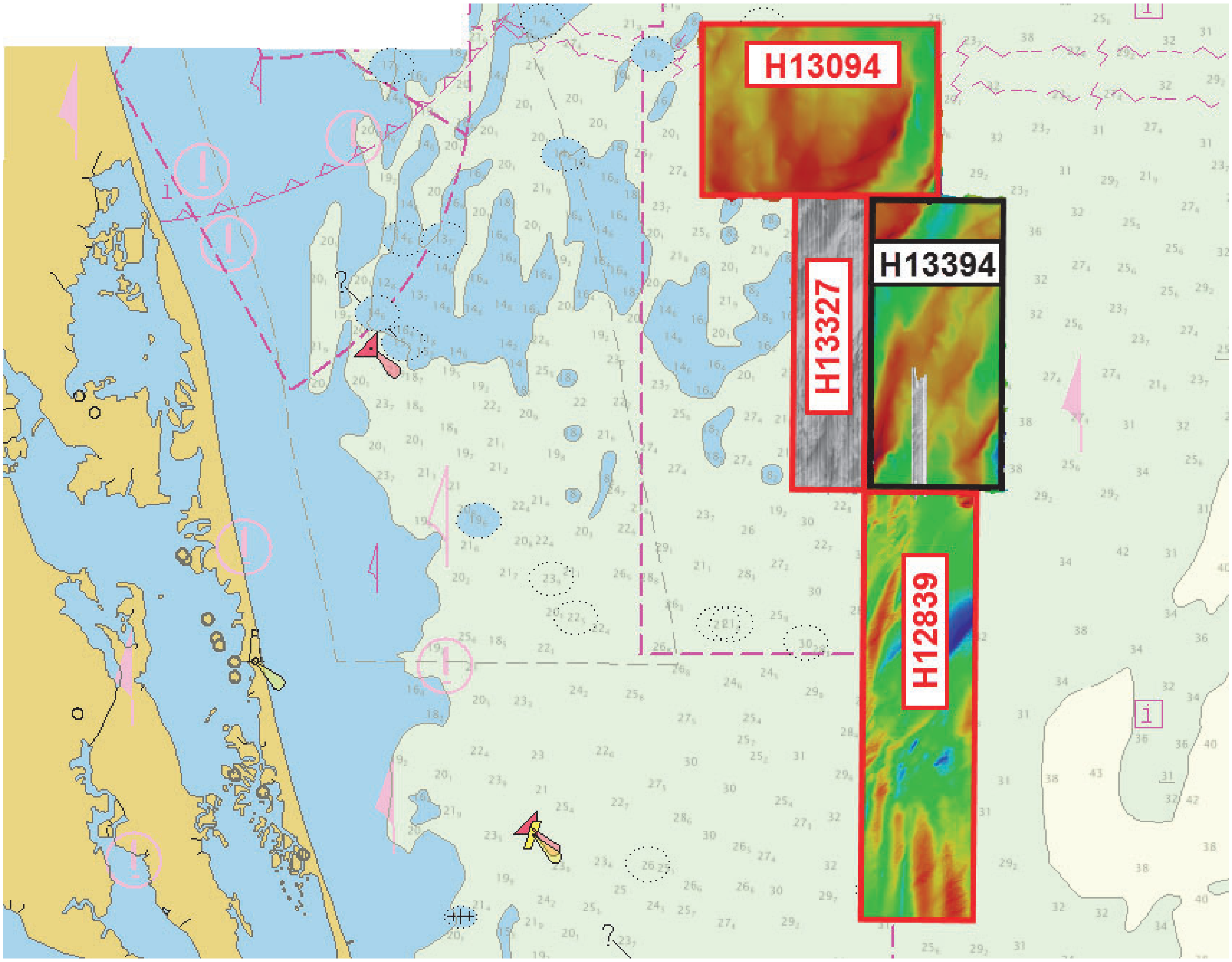


Figure 7: Overview of survey H13394 limits (black outline) and three junctioning surveys (red outline) plotted over ENC US3DE01M.

The following junctions were made with this survey:

Registry Number	Scale	Year	Field Unit	Relative Location
H12839	1:40000	2015	NOAA Ship Ferdinand R. Hassler	SW
H13094	1:40000	2018	NOAA Ship Ferdinand R. Hassler	NW
H13327	1:40000	2019	NOAA Ship Thomas Jefferson	W

Table 9: Junctioning Surveys

H12839

The southwestern side of survey H13394 junctions with survey H12839 (Figures 7, 8). A single resolution Combined Uncertainty and Bathymetry Estimator (CUBE) surface of H13394 data at the 4m resolution and a single resolution CUBE surface of H12839 data at the 4m resolution were differenced. Figure 8 depicts the resulting 4m single resolution difference surface along with a corresponding color scale bar. The mean difference between bathymetric surface nodes was -0.01 m with a standard deviation of 0.19 m. Statistics and a visual inspection indicate that surveys H13394 and H12839 are in general agreement (Figure 9).

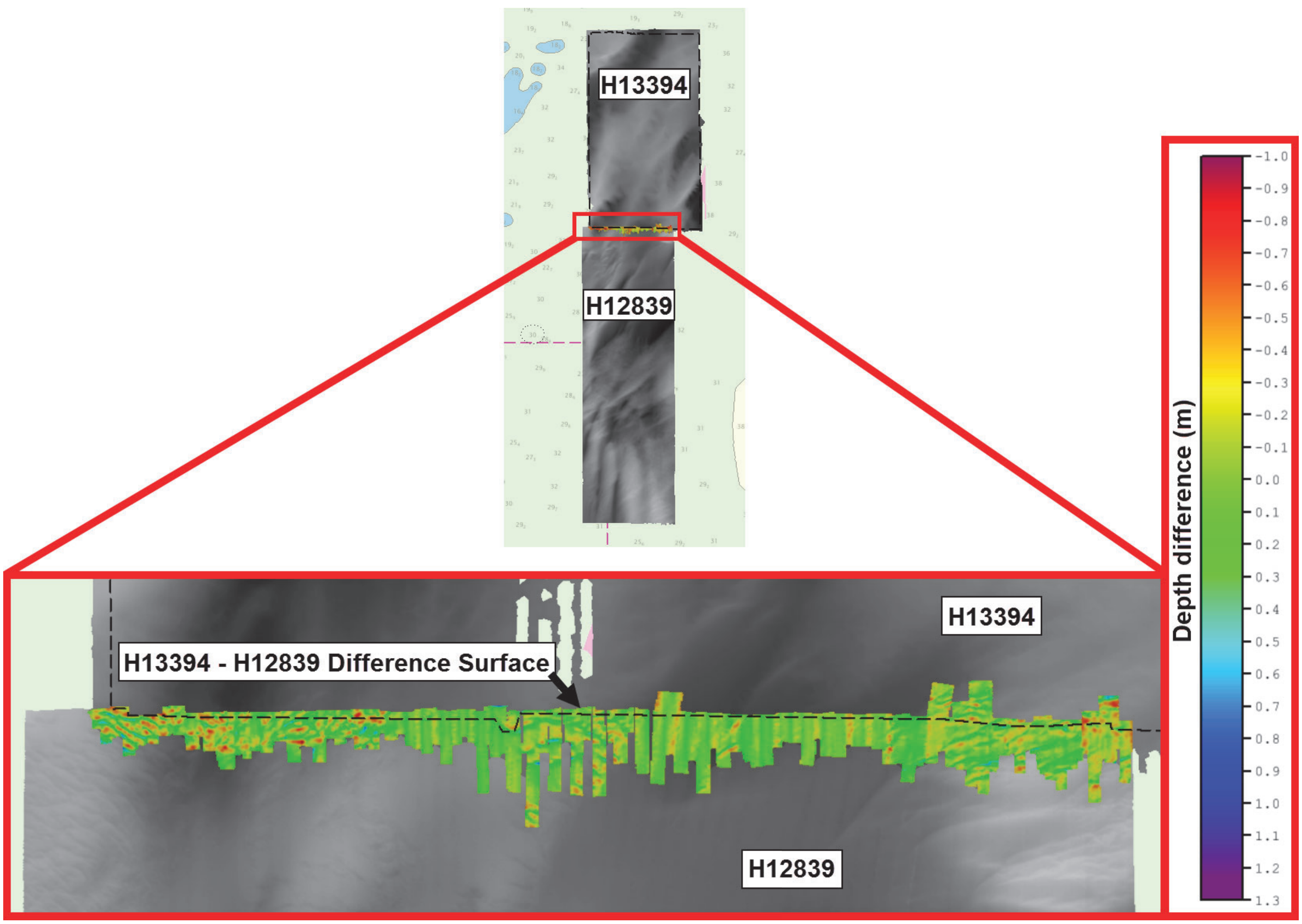
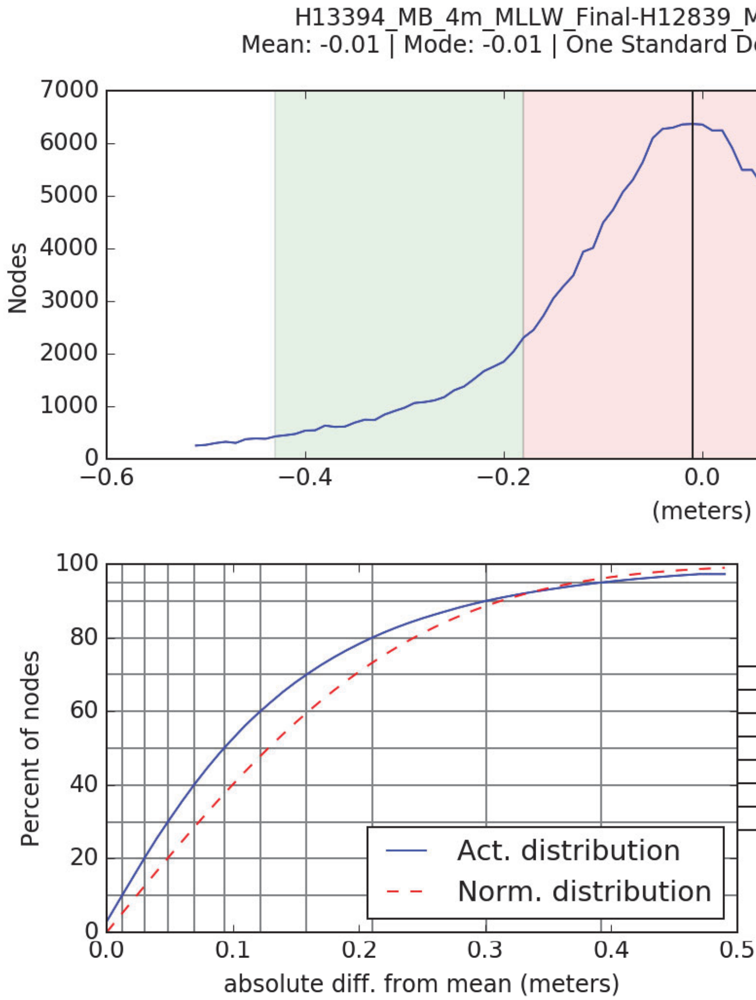


Figure 8: 4m single resolution difference surface at the junction between the southwestern edge of H13394 coverage (assigned sheet limits shown with black dashed outline) and H12839.



Percent of nodes	Deviation (m)
50%	+/- 0.09
60%	+/- 0.12
70%	+/- 0.16
80%	+/- 0.21
90%	+/- 0.30
95%	+/- 0.39

Figure 9: H13394 and H12839 difference surface comparison statistics.

<u>H13094</u>

The north side of survey H13394 junctions with survey H13094 (Figures 7, 10). A variable resolution (VR) Combined Uncertainty and Bathymetry Estimator (CUBE) surface of H13394 data and a VR CUBE surface of H13094 data were differenced. Figure 10 depicts the resulting VR difference surface along with a corresponding color scale bar. The mean difference between bathymetric surface nodes was -0.01 m with a standard deviation of 0.13 m. Statistics and a visual inspection indicate that surveys H13394 and H13094 are in general agreement (Figure 11).

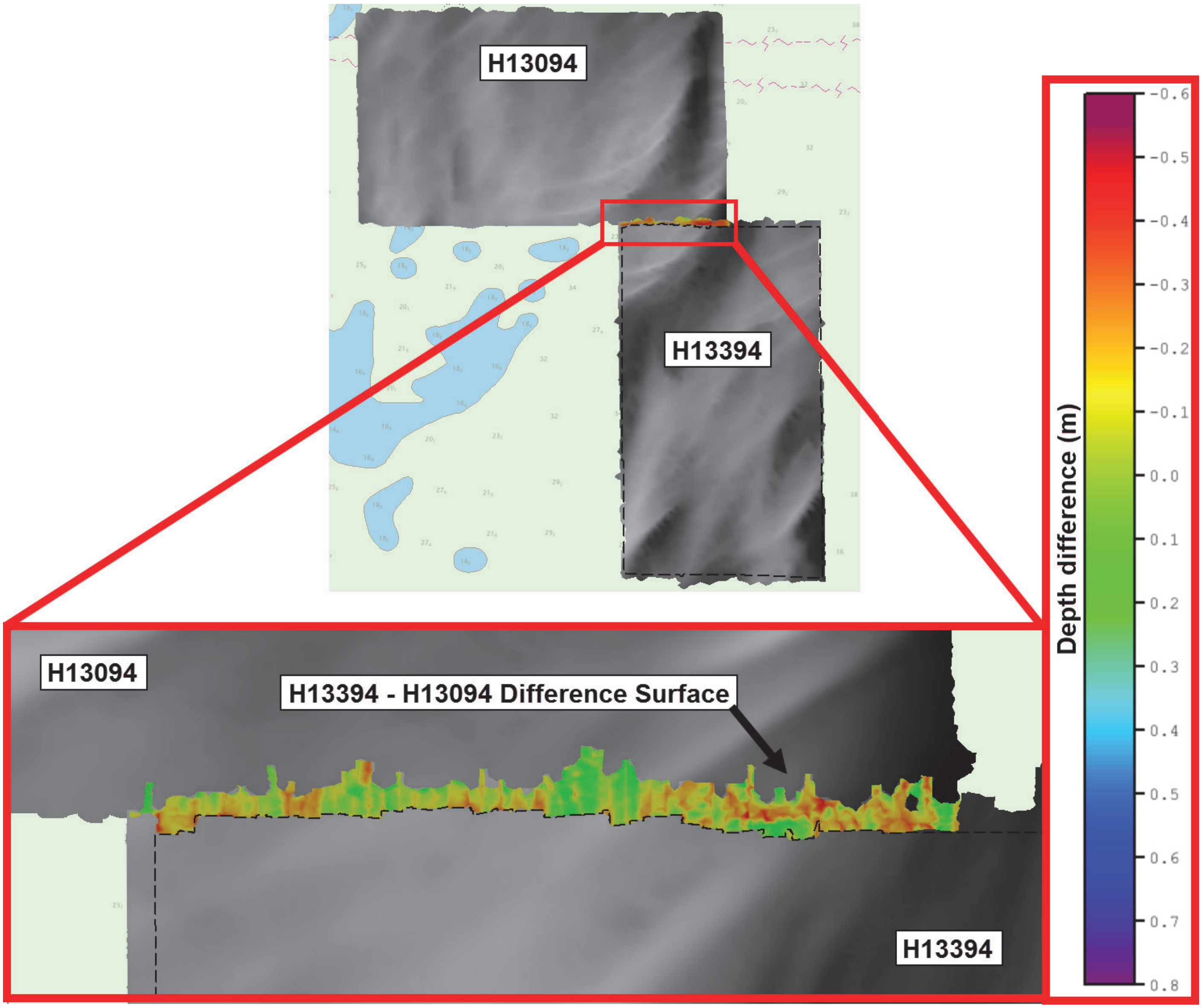
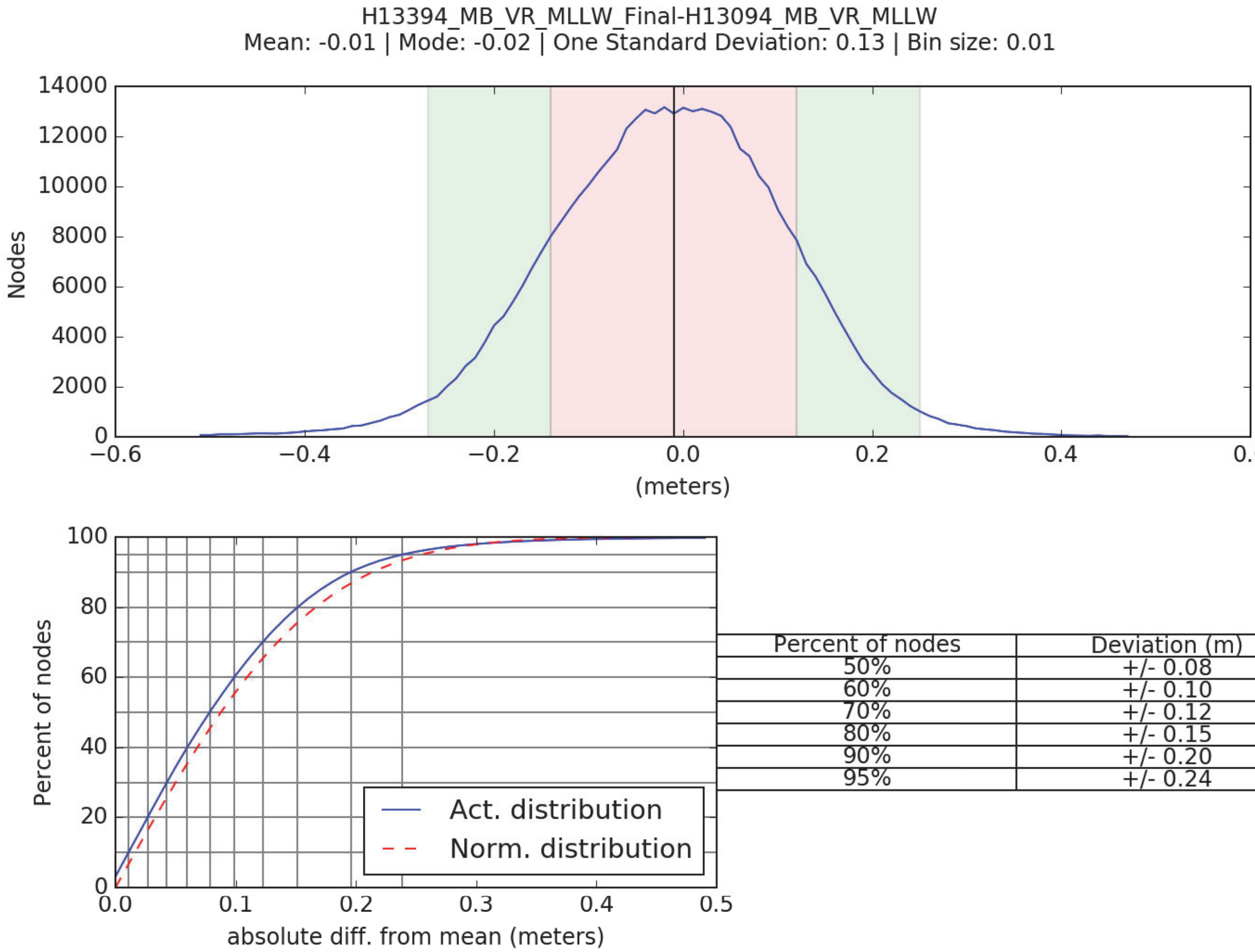


Figure 10: Variable resolution difference surface at the junction between the northwestern edge of H13394 coverage (assigned sheet limits shown with black dashed outline) and H13094.



Percent of nodes	Deviation (m)
50%	+/- 0.08
60%	+/- 0.10
70%	+/- 0.12
80%	+/- 0.15
90%	+/- 0.20
95%	+/- 0.24

Figure 11: H13394 and H13094 difference surface comparison statistics.

<u>H13327</u>

The west side of survey H13394 junctions with survey H13327 (Figures 7, 12). Additionally, a small area of H13327 coverage is located within the northern third of the H13394 sheet limits. A variable resolution (VR) Combined Uncertainty and Bathymetry Estimator (CUBE) surface of H13394 data and a VR CUBE surface of H13327 data were differenced. Figure 12 depicts the resulting VR difference surface along with a corresponding color scale bar. The mean difference between bathymetric surface nodes was 0.00 m with a standard deviation of 0.09 m. Statistics and a visual inspection indicate that surveys H13394 and H13327 are in general agreement (Figure 13).

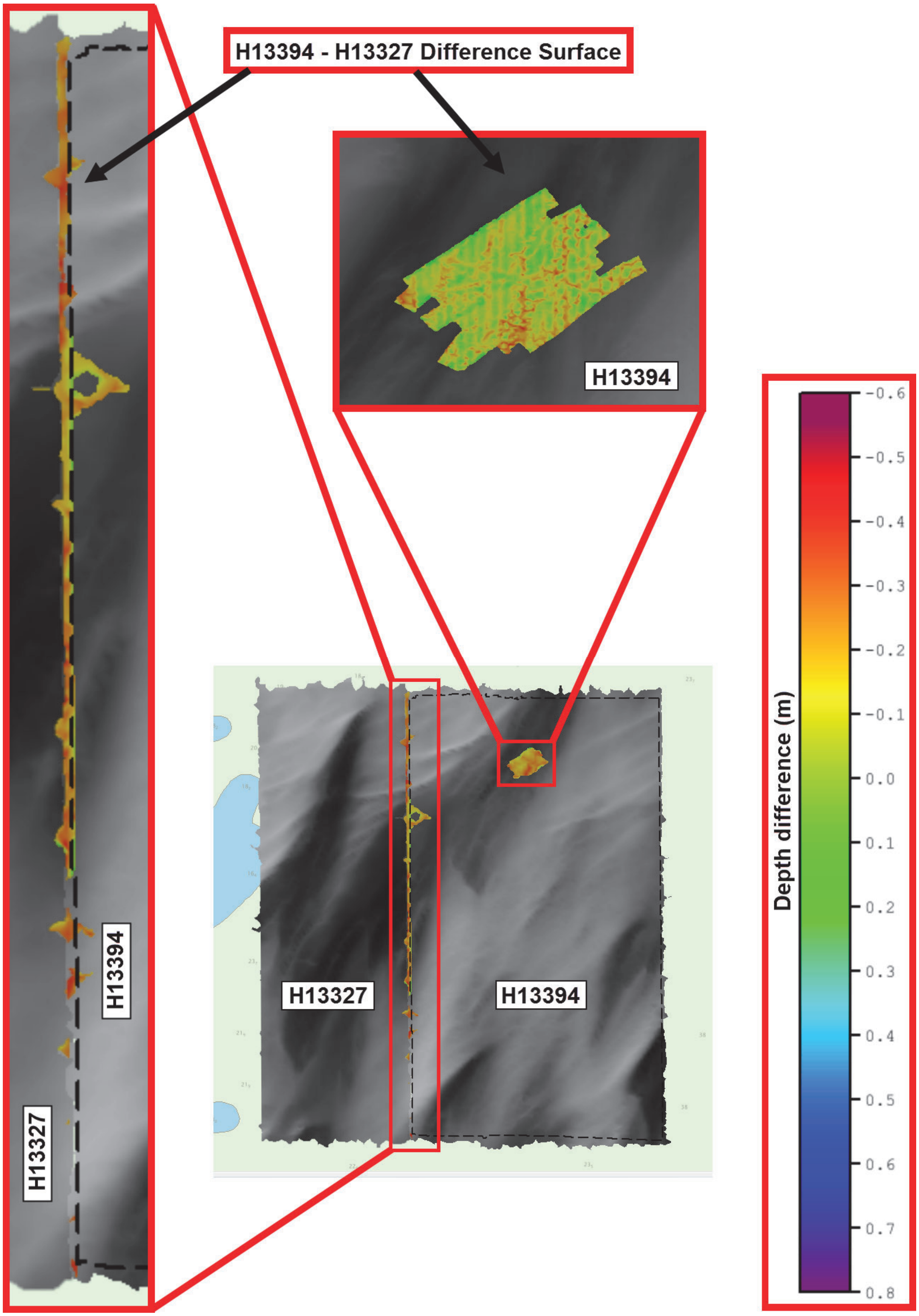
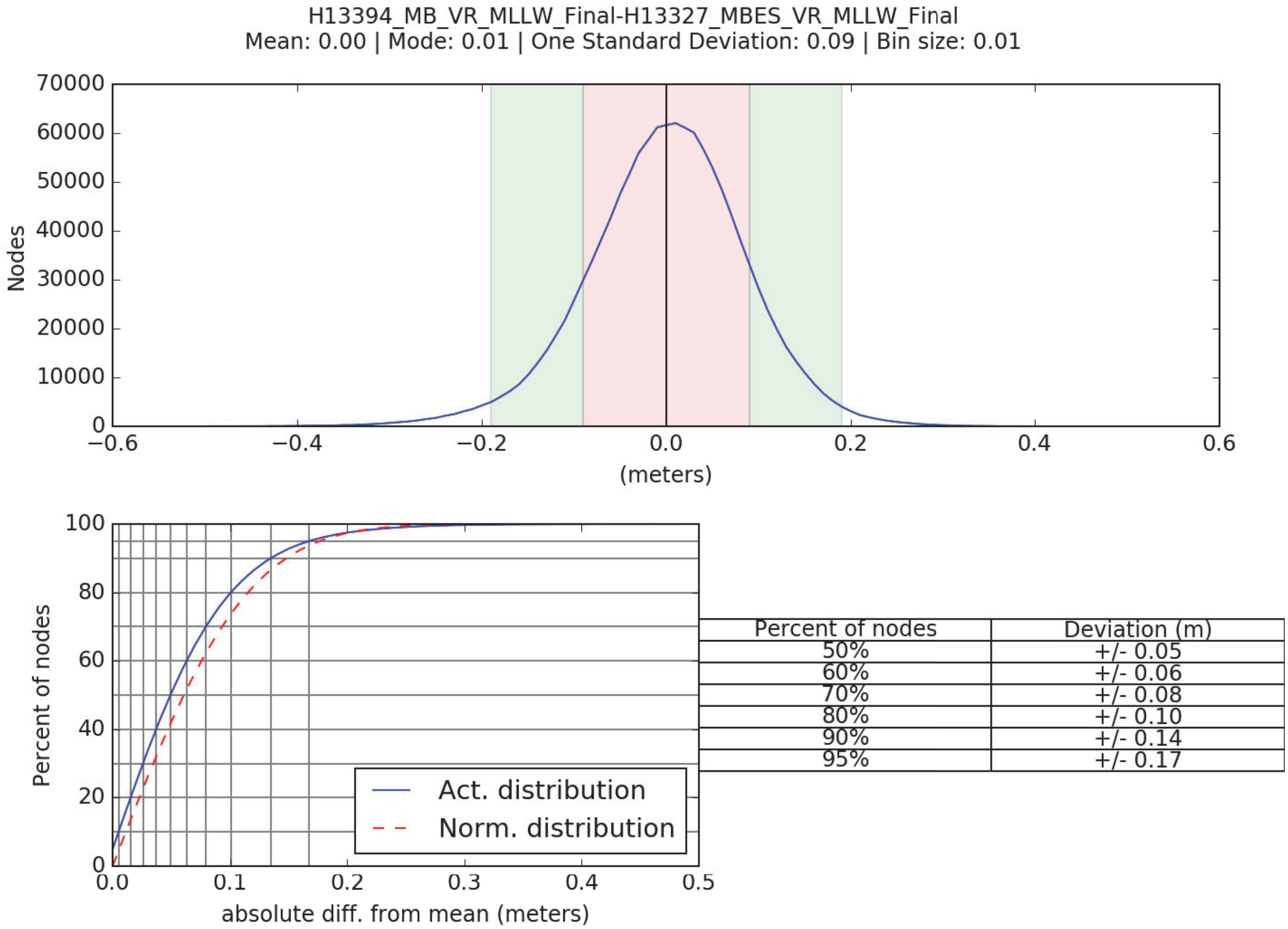


Figure 12: Variable resolution difference surface at the junctions between H13394 coverage (assigned sheet limits shown with black dashed outline) and H13094.



Percent of nodes	Deviation (m)
50%	+/- 0.05
60%	+/- 0.06
70%	+/- 0.08
80%	+/- 0.10
90%	+/- 0.14
95%	+/- 0.17

Figure 13: H13394 and H13327 difference surface comparison statistics.

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

<u>Sound Speed Issues</u>

The oceanographic characteristics of the project area produce highly variable sound speed conditions. To mitigate the effects of these conditions, cast frequency was determined using CastTime analysis in Sound Speed Manager for guidance, as discussed in section B.2.7 Sound Speed Methods. On S222, MVP casts were conducted at an average interval of 15 minutes, and CTD casts were conducted at an average interval of 1 hour. Figure 14 offers a comparison of sound speed profiles among three casts taken within a time frame of one hour. The sound speed profiles differ greatly among all three casts, demonstrating the project area's variable sound speed conditions.

Additionally, the surface sound speed was observed to be highly variable in the area. The surface sound speed measured by an MVP cast and the surface sound speed measured by the sound velocity probe differed by up to 5 m/s. Such instances were noted in the acquisition log, and cast frequency was adjusted with the guidance of CastTime and observation, with MVP casts conducted at an interval of 10 to 15 minutes under such conditions.

These highly variable sound speed characteristics appear in the data as "smiles" and "frowns" in the outer beams, indicating refraction. In the VR CUBE surface, these refracted soundings create high or low areas between lines. Figure 15 illustrates an instance in which the surface is pulled downward by refracted soundings in the outer beams. In this figure, the soundings in the outer beams of the light pink and light blue lines "frown" as they overlap the green line. This refraction pulls the surface, depicted with a green wireframe, downward. The resulting dip in the surface measures 0.4 m in this area of 29.9 m depth; this value remains within specified uncertainty standards.

In areas in which lines had sufficient overlap, the upturned or downturned edges of lines were rejected at the discretion of the hydrographer. These effects of sound speed on the finalized VR CUBE surface do not exceed a vertical measurement of 0.5 m. Thus, the data and surfaces submitted for survey H13394 meet the HSSD 2020 uncertainty specifications.

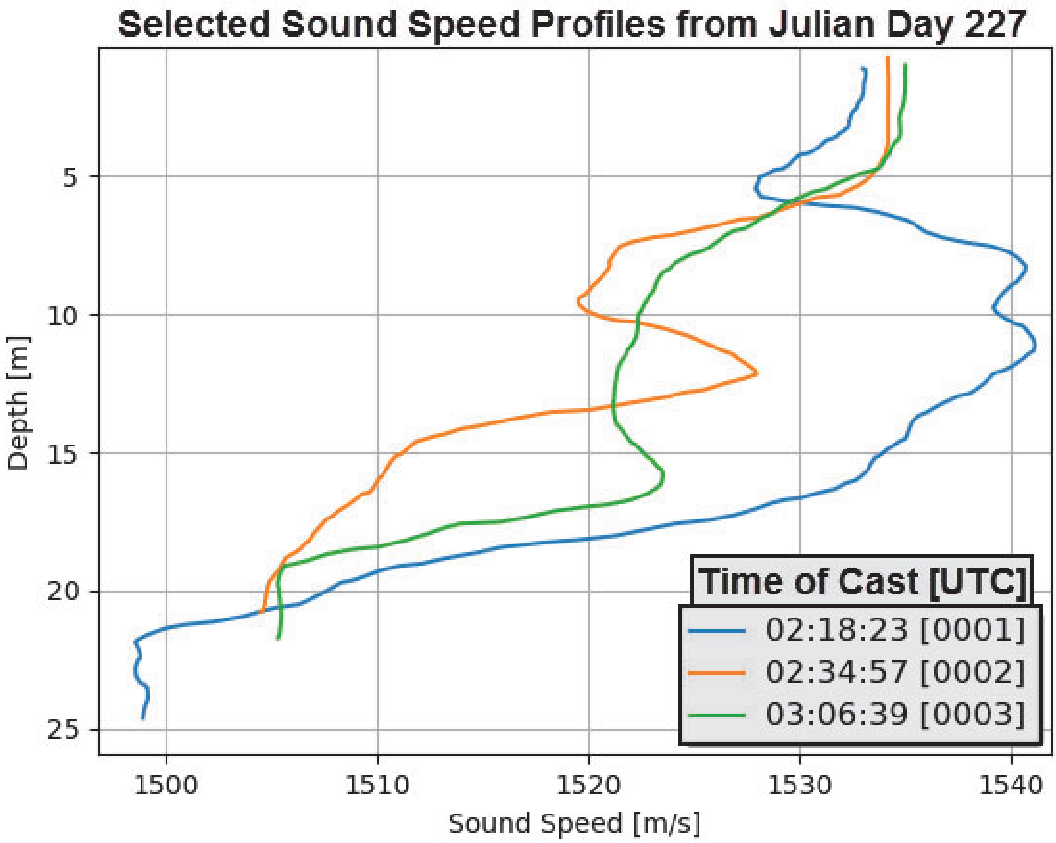


Figure 14: Three representative sound speed profiles measured within a time frame of one hour on Julian Day 227.

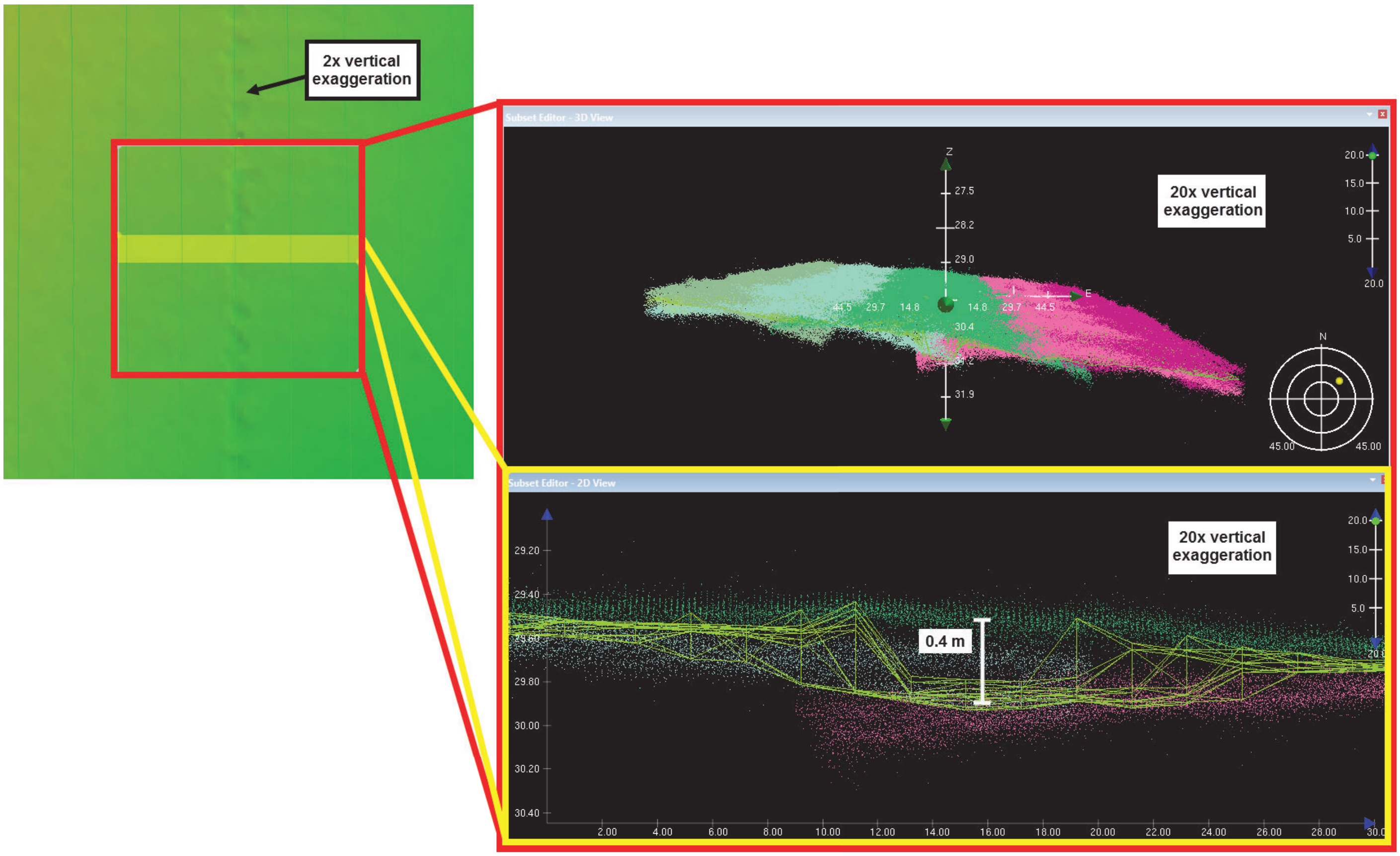


Figure 15: An overview of a low area created by sound speed "frowns," shown in the final VR CUBE surface submitted for H13394 at 2x vertical exaggeration. The same area is shown in a 3D and 2D view in CARIS Subset Editor at 20x vertical exaggeration.

Vertical Offset of Unknown Origin

An intermittent vertical offset of unknown origin has been identified in one line of S222 MBES data. This vertical offset is present in isolated sections of line number 0090 from Julian Day 213 and has a maximum magnitude of 0.5 m (Figure 16).

This line was manually reprocessed in CARIS to ensure that the proper settings and offsets were used. A detailed line query shows no differences between this offset line and the other MBES lines collected by S222. A review of the SBET in the Pydro tool POSPac Automated QC shows no evidence of SBET issues on the date in question. The separation model used for this sheet is not suspected to be the cause of the offset.

Soundings from this line have been rejected at the discretion of the hydrographer in areas with sufficient coverage overlap. In the areas in which the effects of this line could not be mitigated through cleaning, the surface is pulled up to this offset line, resulting in visible pitting. These areas of pitting are primarily located at the edges of the offset line and at the intersection of the offset line with the crosslines. Figure 16 depicts such an example of pitting in the surface in an area in which the offset line, shown in green, intersects a crossline, shown in brown. In this case, the offset measures 0.5 m at 31.1 m depth; this value remains within specified uncertainty standards.

The hydrographer has judged this vertical offset not to compromise the integrity of the data, and the deliverables for survey H13394 remain within the specifications outlined by the HSSD 2020.

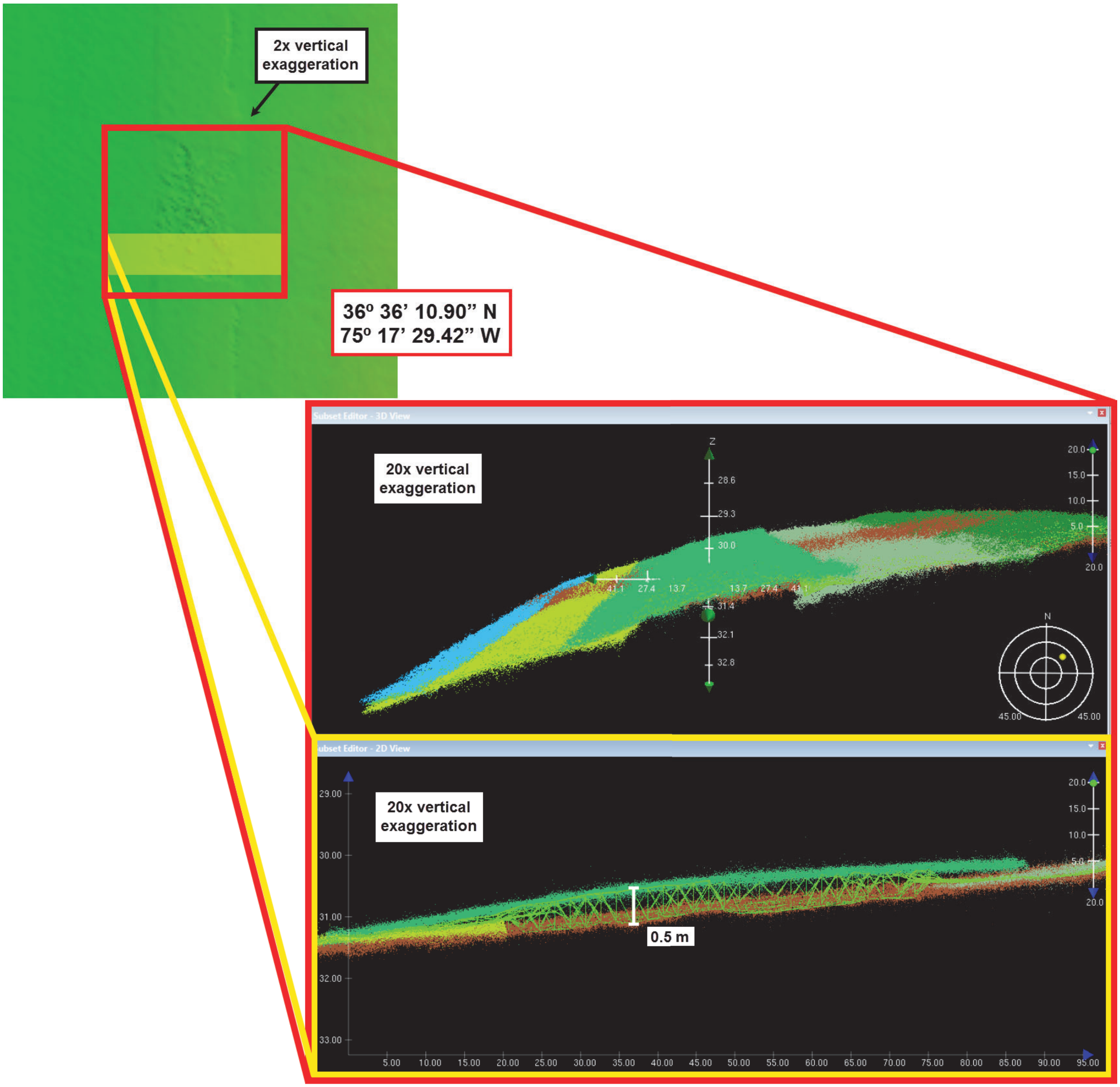


Figure 16: An overview of the effect of S222 MBES line 0090 from Julian Day 213 on the final VR CUBE surface submitted for H13394, shown at 2x vertical exaggeration. The same area is shown in a 3D and 2D view in CARIS Subset Editor at 20x vertical exaggeration.

B.2.7 Sound Speed Methods

Sound Speed Cast Frequency: On S222, MVP casts were conducted at an average interval of 15 minutes, as recommended by CastTime analysis in Sound Speed Manager, which determines optimum cast frequency based on the observed sound speed variations from previous casts. On S222, CTD casts were conducted at an average interval of 1 hour, guided by observation of the surface sound speed and by distribution within the sheet limits. On HSL 2903, CTD casts were conducted at the start and end of acquisition each day and at a minimum of one every four hours during launch acquisition. All sound speed methods were used as detailed in the DAPR.

Sound speed profiles were concatenated into a master file for application to all sheet data during processing. At the end of acquisition, all data were reprocessed to ensure proper application of this master file to all soundings.

B.2.8 Coverage Equipment and Methods

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

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

All equipment and survey methods were used as detailed in the DAPR. Raw MBES backscatter was logged as part of the .all file of the Kongsberg EM710 and EM2040 systems. Backscatter was processed in QPS Fledermaus GeoCoder Toolbox (FMGT) software, and the exported GeoTIFFs are included in the final processed data package. Backscatter mosaics for S222 and HSL 2903 are shown in respective Figures 17 and 18. A combined mosaic is shown in Figure 19 for the purpose of representing coverage acquired by both vessels, as backscatter was not processed with normalized values.

Additionally, two abnormalities of unknown origin exist in the backscatter collected by S222 (Figure 20).

Artifacts exist in the backscatter as a result of blowouts in the multibeam data (Figure 21). These blowouts were caused by a rough sea state at the time of acquisition. The effects of these blowouts are intermittent and do not compromise the overall integrity of the backscatter.

Figure 17: S222's 100kHz multibeam acoustic backscatter at 1m resolution.

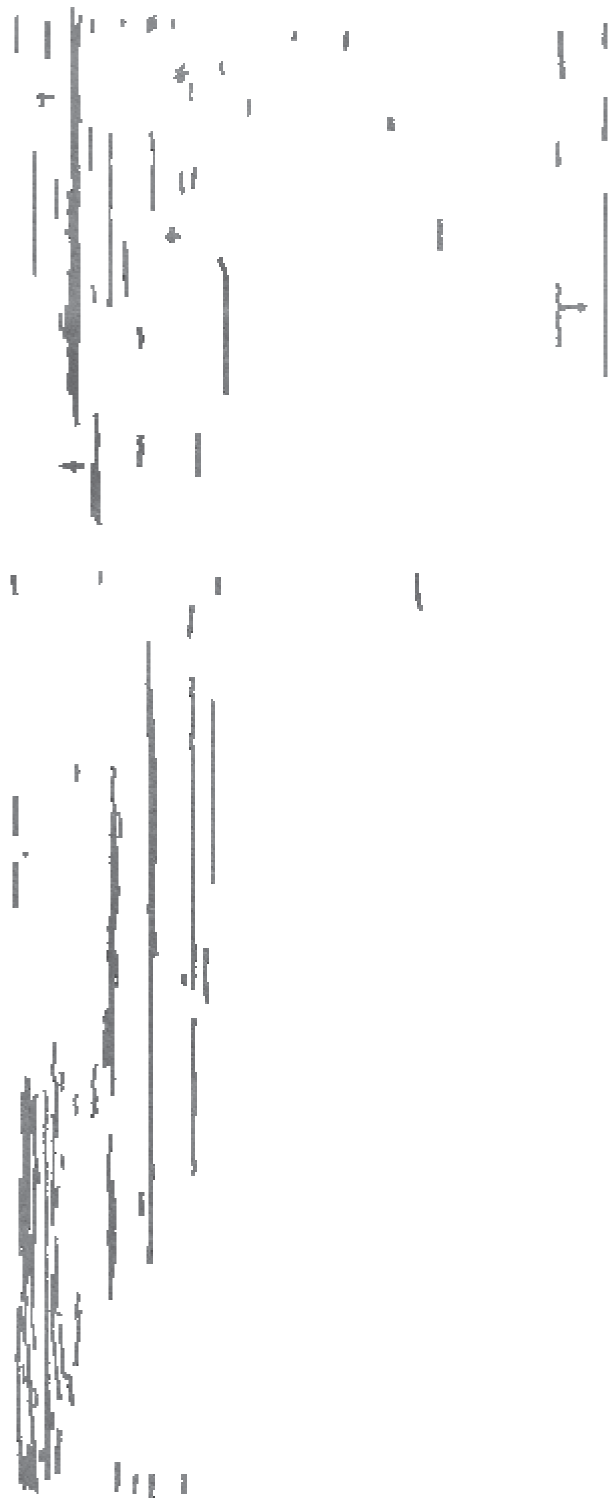


Figure 18: HSL 2903's 300kHz multibeam acoustic backscatter at 1m resolution.

Figure 19: Combined image of all backscatter data acquired for survey H13394 at 1m resolution.

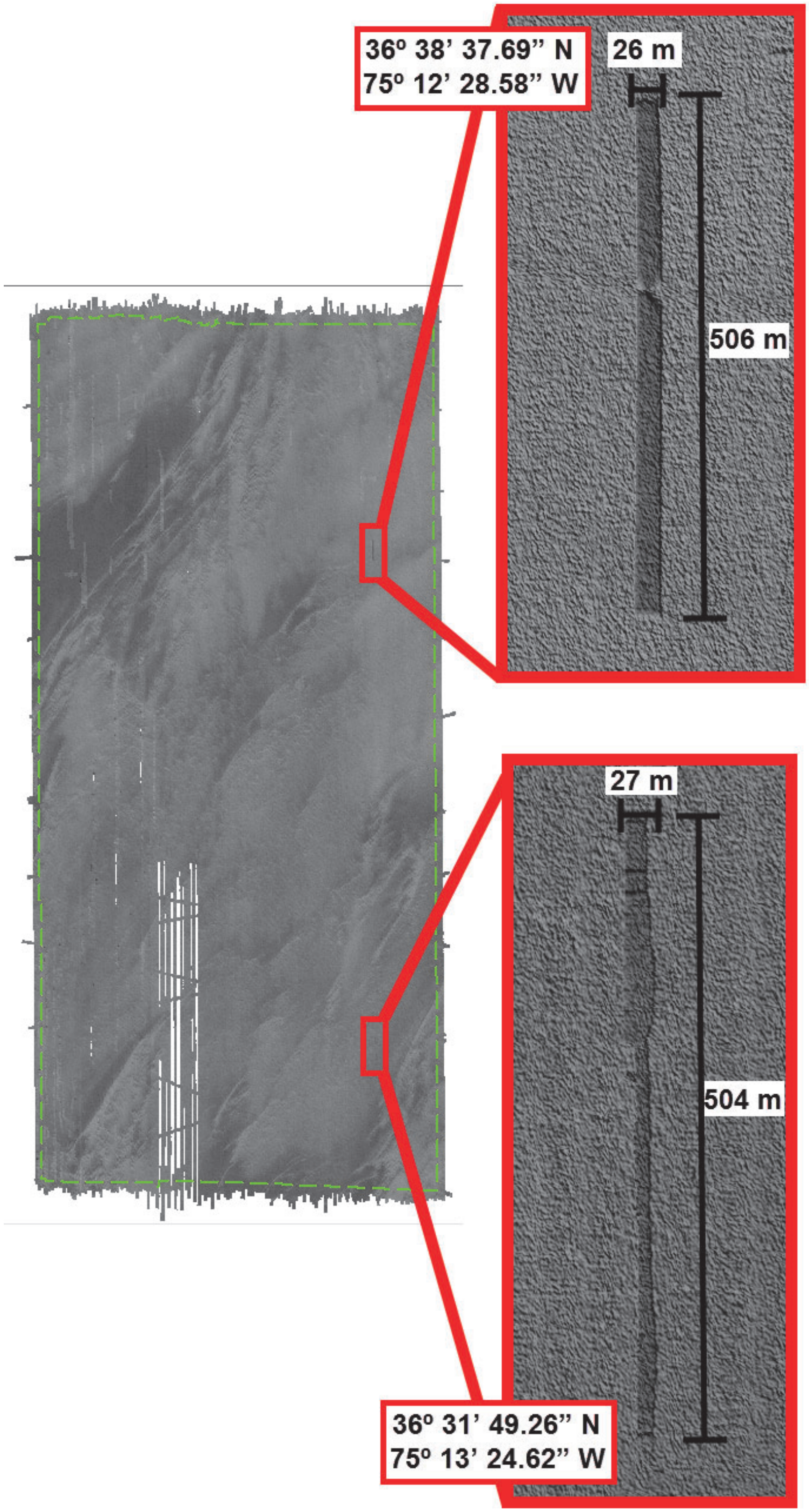


Figure 20: Overview of the two abnormalities in S222 multibeam backscatter coverage for H13394.

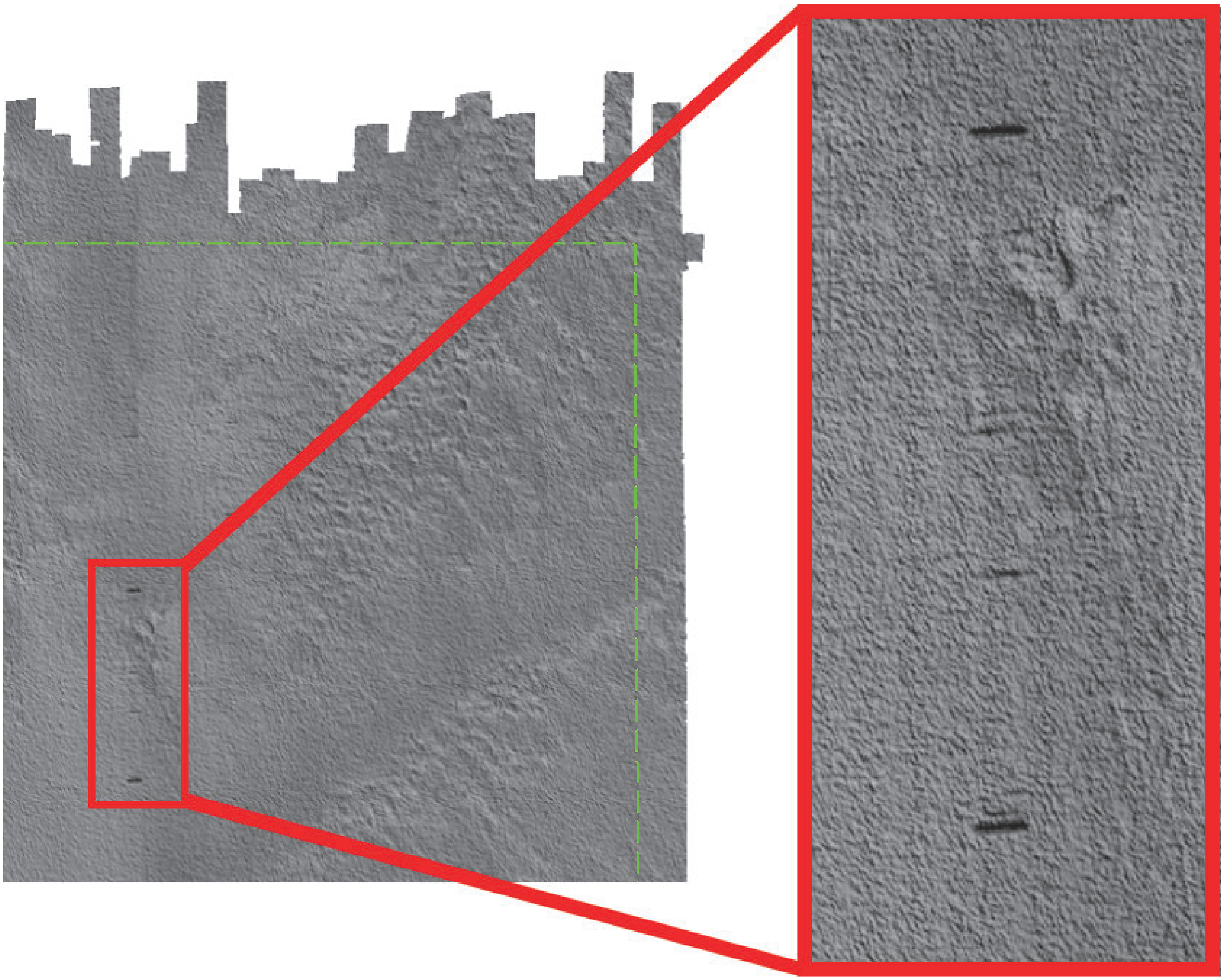


Figure 21: Example of blowout artifacts in H13394 backscatter as a result of a rough sea state.

B.5 Data Processing

B.5.1 Primary Data Processing Software

The following Feature Object Catalog was used: NOAA Profile Version 2020.

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
H13394_MB_VR_MLLW	CARIS VR Surface (CUBE)	Variable Resolution	20.20 meters - 42.05 meters	NOAA_VR	Complete MBES
H13394_MB_VR_MLLW_Final	CARIS VR Surface (CUBE)	Variable Resolution	20.20 meters - 42.20 meters	NOAA_VR	Complete MBES
H13394_SSSAB_1m_455kHz_1of1	SSS Mosaic	1 meters	-	N/A	100% SSS
H13394_MBAB_1m_S222_100kHz_1of2	MB Backscatter Mosaic	1 meters	-	N/A	MBES Acoustic Backscatter
H13394_MBAB_1m_TJ2903_300kHz_2of2	MB Backscatter Mosaic	1 meters	-	N/A	MBES Acoustic Backscatter

Table 10: Submitted Surfaces

Complete Coverage requirements were met with a combination of Option A) 100% bathymetric bottom coverage with multibeam echosounder (MBES) and Option B) 100% side scan sonar coverage with concurrent multibeam bathymetry collection, both with complete coverage multibeam developments, as specified under section 5.2.2 of the HSSD 2020. All bathymetric grids for H13394 meet density requirements per the HSSD 2020 (Figure 22).

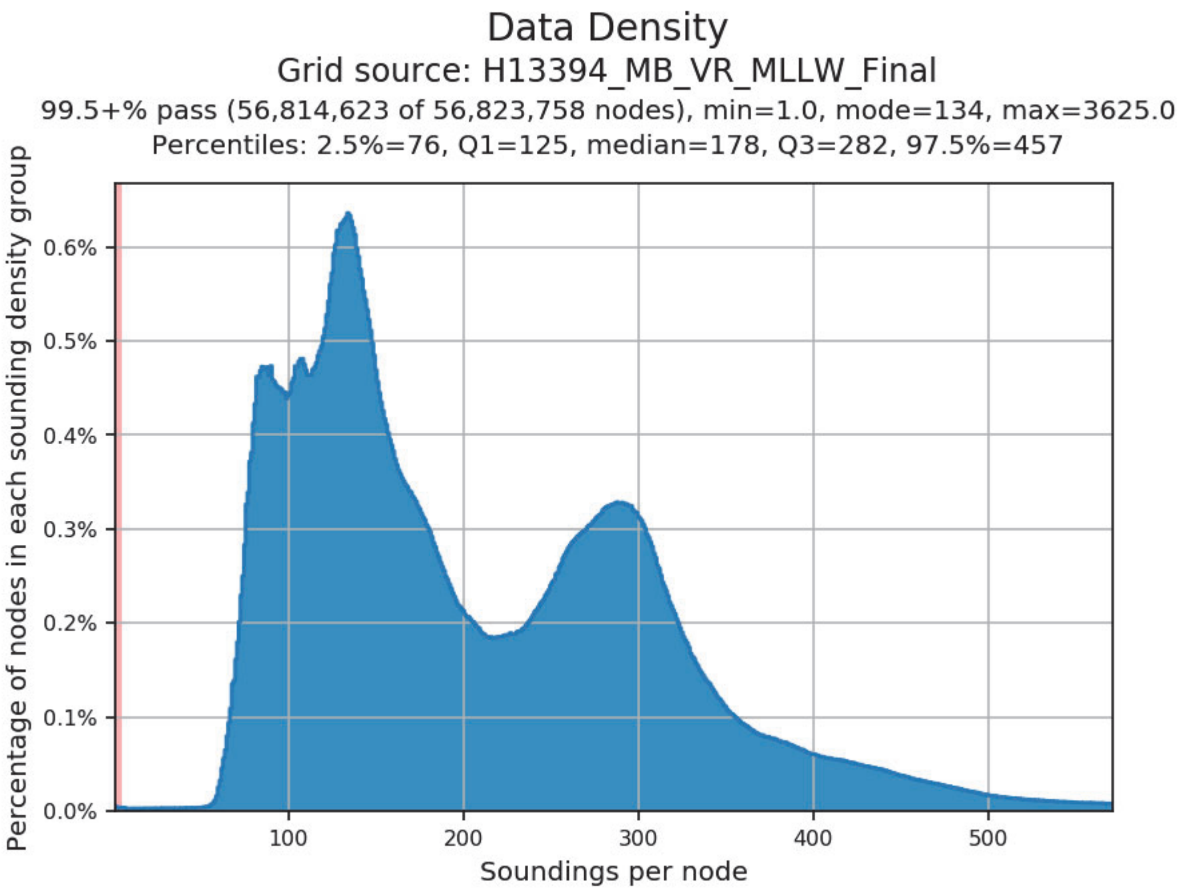


Figure 22: H13394 data density statistics.

C. Vertical and Horizontal Control

No Horizontal and Vertical Control Report (HVCR) is required for this survey.

C.1 Vertical Control

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

ERS Datum Transformation

The following ellipsoid-to-chart vertical datum transformation was used:

Method	Ellipsoid to Chart Datum Separation File
ERS via VDATUM	vdatum_July_cb_100m_NAD83-MLLW_geoid12b.csar

Table 11: ERS method and SEP file

All soundings submitted for H13394 are reduced to MLLW using VDatum techniques as outlined in the DAPR.

C.2 Horizontal Control

The horizontal datum for this project is North American Datum of 1983 (NAD 83).

The projection used for this project is Universal Transverse Mercator (UTM) Zone 18.

PPP

Trimble-RTX service was used with an Applanix POS MVv5 GNSS_INS system to obtain highly accurate ellipsoidally referenced position data to meet ERS specifications for H13394 MBES data from vessels S222 and HSL 2903.

WAAS

The Wide Area Augmentation System (WAAS) was used for real-time horizontal control during data acquisition on vessels S222 and HSL 2903.

D. Results and Recommendations

D.1 Chart Comparison

A chart comparison was conducted between survey H13394 soundings and previously charted ENC soundings using the procedures outlined in the DAPR.

D.1.1 Electronic Navigational Charts

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

ENC	Scale	Edition	Update Application Date	Issue Date
US3DE01M	1:419706	22	08/12/2020	06/20/2018

Table 12: Largest Scale ENCs

D.1.2 Shoal and Hazardous Features

Sounding sets derived from H13394 bathymetric surfaces generally agree with soundings from ENC US3DE01M. However, while the ENC soundings generally represent the least depth of the shoals within H13394 coverage, there were two observed soundings that were shoaler than the corresponding charted soundings.

One of these relatively shoal soundings is located in the northwestern corner of the sheet (Figure 23). The observed sounding of 20.3 m is nearest to charted soundings of 21.9 m and 23.5 m. Additionally, an observed sounding of 21.2 m exists in the same vicinity; although this sounding is not significantly shoaler than the charted soundings, it is notable due to its proximity to the observed 20.3 m sounding.

The other of these relatively shoal soundings is located in the northern fourth of the sheet along the eastern edge (Figure 24). The observed sounding of 21.9 m is nearest to charted soundings of 23.7 m and 25.6 m.

No DTONs were identified. Updates to the cartographic representation of sounding values and sounding locations are recommended by the hydrographer.

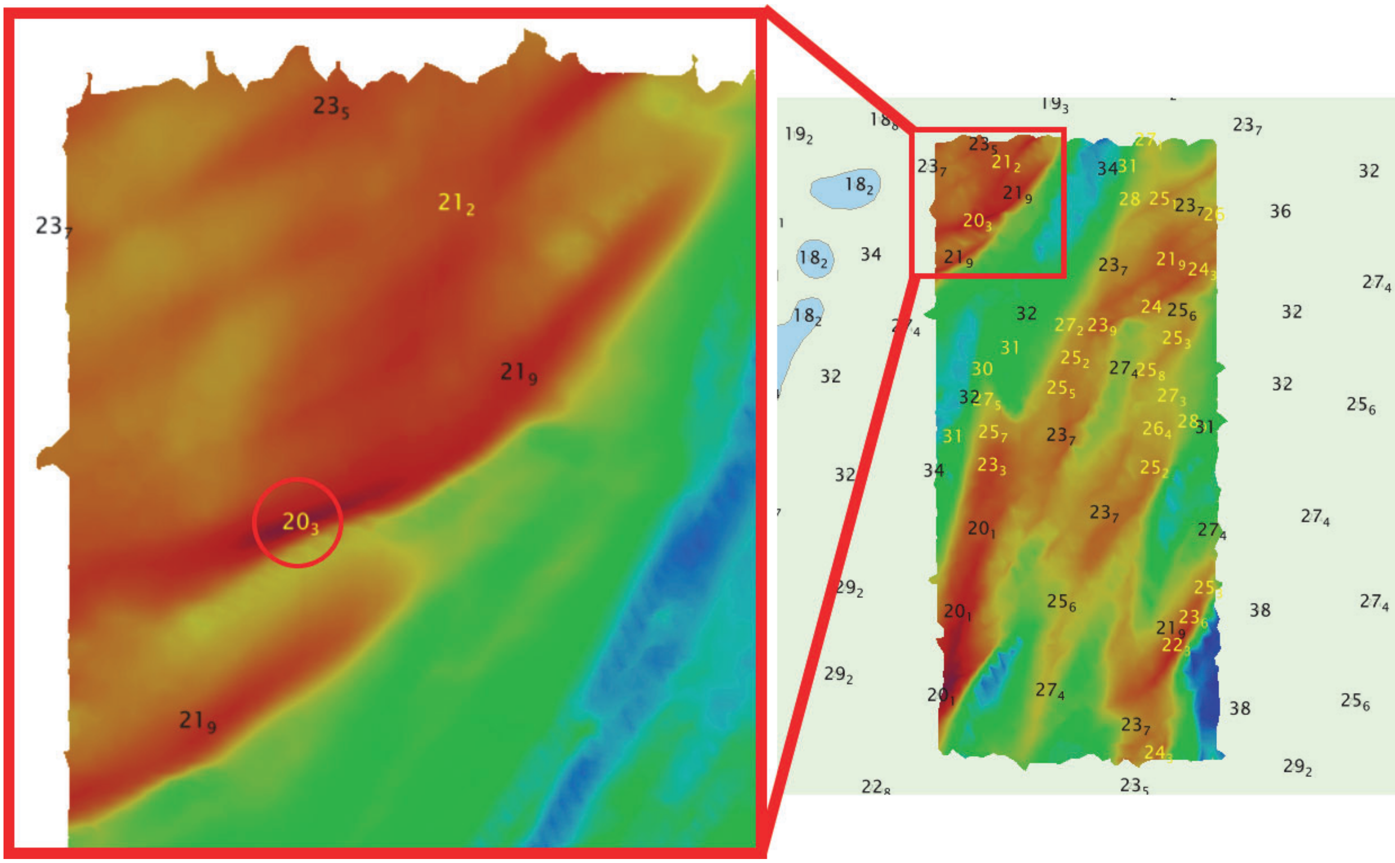


Figure 23: H13394 overlaid on ENC US3DE01M to compare observed soundings (yellow) to charted soundings (black). The 20.3 m observed sounding is shoaler than surrounding charted soundings by more than 1 m.

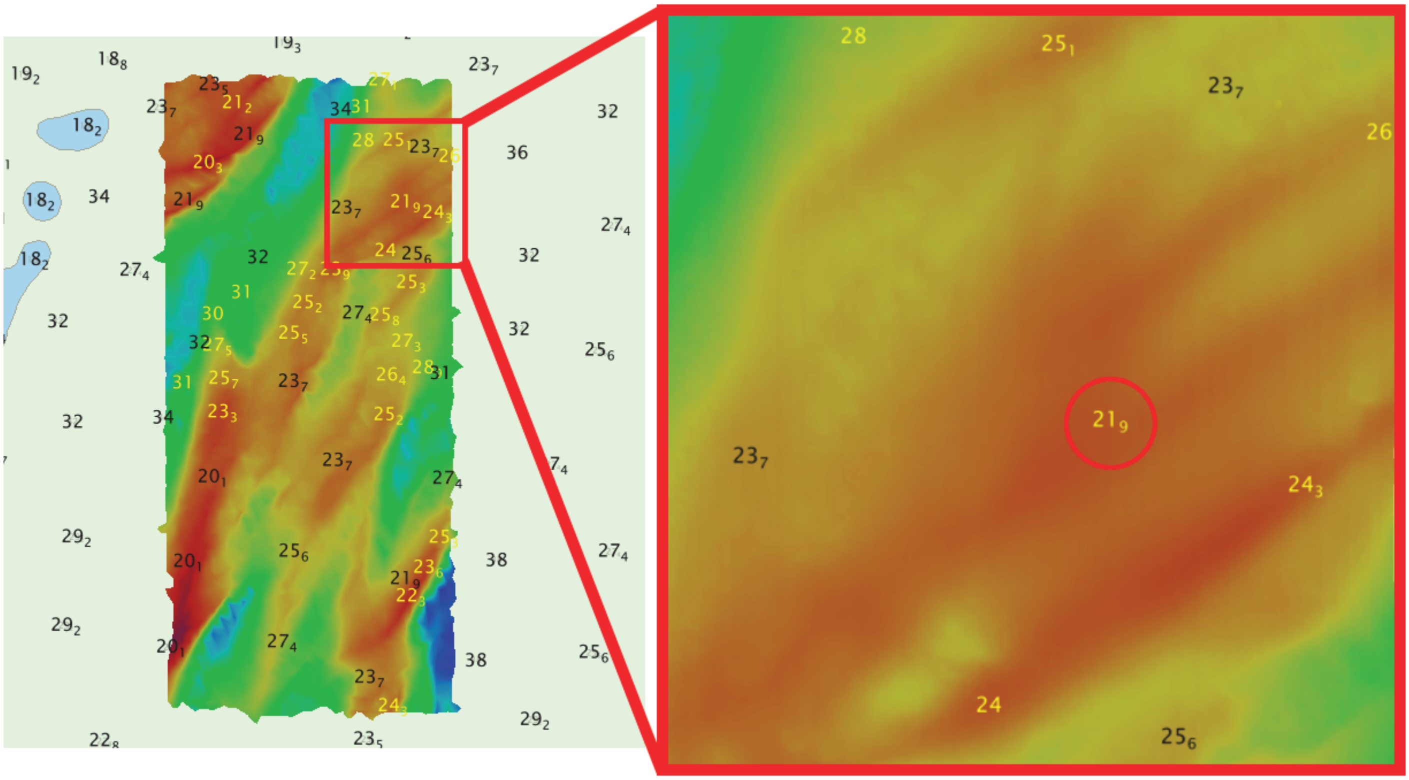


Figure 24: H13394 overlaid on ENC US3DE01M to compare observed soundings (yellow) to charted soundings (black). The 21.9 m observed sounding is shoaler than surrounding charted soundings by more than 1 m.

D.1.3 Charted Features

No charted features exist for this survey.

D.1.4 Uncharted Features

Three uncharted features were identified and investigated, and none of these uncharted features were considered to be dangerous to navigation. All three of these features are categorized as obstructions. Refer to the Final Feature File for further information.

D.1.5 Channels

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

D.2 Additional Results

D.2.1 Aids to Navigation

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

D.2.2 Maritime Boundary Points

No Maritime Boundary Points were assigned for this survey.

D.2.3 Bottom Samples

Bottom samples were assigned, investigated, and included in the Final Feature File. See Figure 25 for a generalized view of H13394 bottom sample locations.

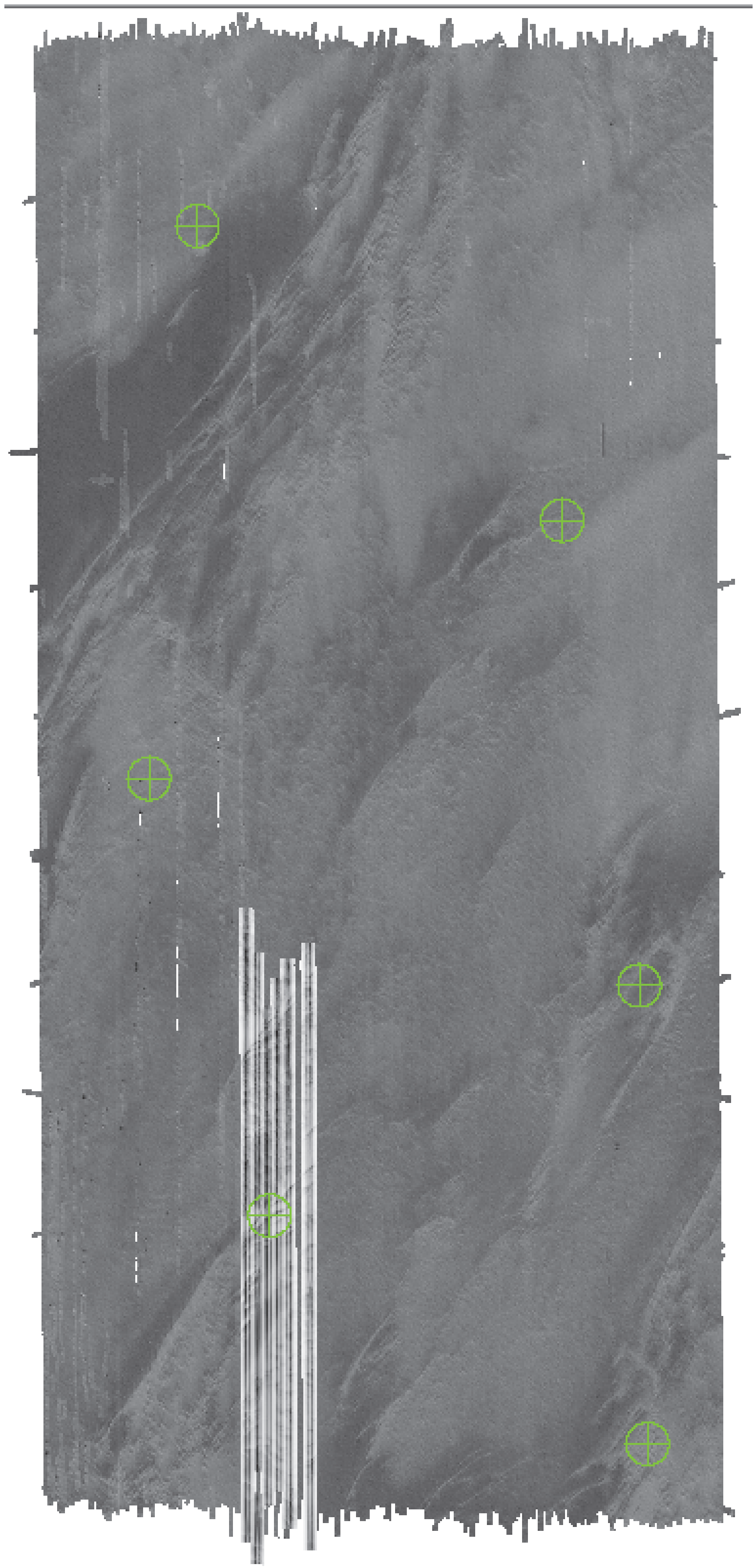


Figure 25: Overview of the locations of bottom samples investigated for H13394 plotted over multibeam and side scan acoustic backscatter.

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 Platforms

No platforms exist for this survey.

D.2.7 Ferry Routes and Terminals

No ferry routes or terminals exist for this survey.

D.2.8 Abnormal Seafloor or Environmental Conditions

No abnormal seafloor or environmental conditions exist for this survey.

D.2.9 Construction and Dredging

No present or planned construction or dredging operations are know to exist within the survey limits.

D.2.10 New Survey Recommendations

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

D.2.11 ENC Scale Recommendations

No new ENC scales 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 Specifications and Deliverables, 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.

Approver Name	Approver Title	Approval Date	Signature
CDR Briana W. Hillstrom	Commanding Officer	11/03/2020	Briana Welton Hillstrom Digitally signed by HILLSTROM.BRIANA.WELTON.1267667531 Date: 2020.11.03 15:02:37 -05'00'
LT Calandria DeCastro	Field Operations Officer	11/03/2020	Calandria De Castro Digitally signed by DECASTRO.CALANDRIA.MALVINA.1468902156 Date: 2020.11.16 13:55:56 -05'00'
Joshua Hiteshew	Chief Survey Technician	11/03/2020	HITESHEW.JOSHUA.TAYLOR.1537939652 Digitally signed by HITESHEW.JOSHUA.TAYLOR.1537939652 Date: 2020.11.16 17:07:44 Z
Sophia Tigges	Sheet Manager	11/03/2020	TIGGES.SOPHIA.ELENI.1573449122 Digitally signed by TIGGES.SOPHIA.ELENI.1573449122 Date: 2020.11.05 11:05:06 -05'00'

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	Continuously Operating Reference Station
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
ERTDM	Ellipsoidally Referenced Tidal Datum Model
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

Acronym	Definition
HSSD	Hydrographic Survey Specifications and Deliverables
HSTB	Hydrographic Systems Technology Branch
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	Linear Nautical Miles
MBAB	Multibeam Echosounder Acoustic Backscatter
MCD	Marine Chart Division
MHW	Mean High Water
MLLW	Mean Lower Low Water
NAD 83	North American Datum of 1983
NALL	Navigable Area Limit Line
NTM	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
RNC	Raster Navigational Chart
RTK	Real Time Kinematic
RTX	Real Time Extended
SBES	Singlebeam Echosounder
SBET	Smooth Best Estimate and Trajectory
SNM	Square Nautical Miles
SSS	Side Scan Sonar
SSSAB	Side Scan Sonar Acoustic Backscatter
ST	Survey Technician
SVP	Sound Velocity Profiler
TCARI	Tidal Constituent And Residual Interpolation
TPU	Total Propagated Uncertainty
USACE	United States Army Corps of Engineers
USCG	United States Coast Guard
UTM	Universal Transverse Mercator
XO	Executive Officer
ZDF	Zone Definition File