H13599

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

DESCRIPTIVE REPORT

Type of Survey:	Navigable Area
Registry Number:	H13599

LOCALITY

State(s):	North Carolina
General Locality:	Cape Lookout Onslow Bay, NC
Sub-locality:	10 NM South of Cape Lookout

2022

CHIEF OF PARTY
Michael Gonsalves, CDR/NOAA

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Date:

U.S. DEPARTMENT OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION	REGISTRY NUMBER:
HYDROGRAPHIC TITLE SHEET	**H13599**

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**
General Locality:	**Cape Lookout Onslow Bay, NC**
Sub-Locality:	**10 NM South of Cape Lookout**
Scale:	**40000**
Dates of Survey:	**09/24/2022 to 10/11/2022**
Instructions Dated:	**02/09/2022**
Project Number:	**OPR-F364-FH-22**
Field Unit:	**NOAA Ship *Ferdinand R. Hassler***
Chief of Party:	**Michael Gonsalves, CDR/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 H13599

Project: OPR-F364-FH-22

Locality: Cape Lookout Onslow Bay, NC

Sublocality: 10 NM South of Cape Lookout

Scale: 1:40000

September 2022 - October 2022

NOAA Ship *Ferdinand R. Hassler*

Chief of Party: Michael Gonsalves, CDR/NOAA

A. Area Surveyed

Survey H13599 (Sheet 6) is located 10 nautical miles south of Cape Lookout in Onslow Bay, North Carolina and encompasses approximately 38 square nautical miles.

A.1 Survey Limits

Data were acquired within the following survey limits:

Northwest Limit	Southeast Limit
34° 23' 38.1" N 76° 35' 55.48" W	34° 19' 34.04" N 76° 22' 21.43" W

Table 1: Survey Limits

Data were acquired within the assigned survey limits as required in the Project Instructions and HSSD unless otherwise noted in this report.

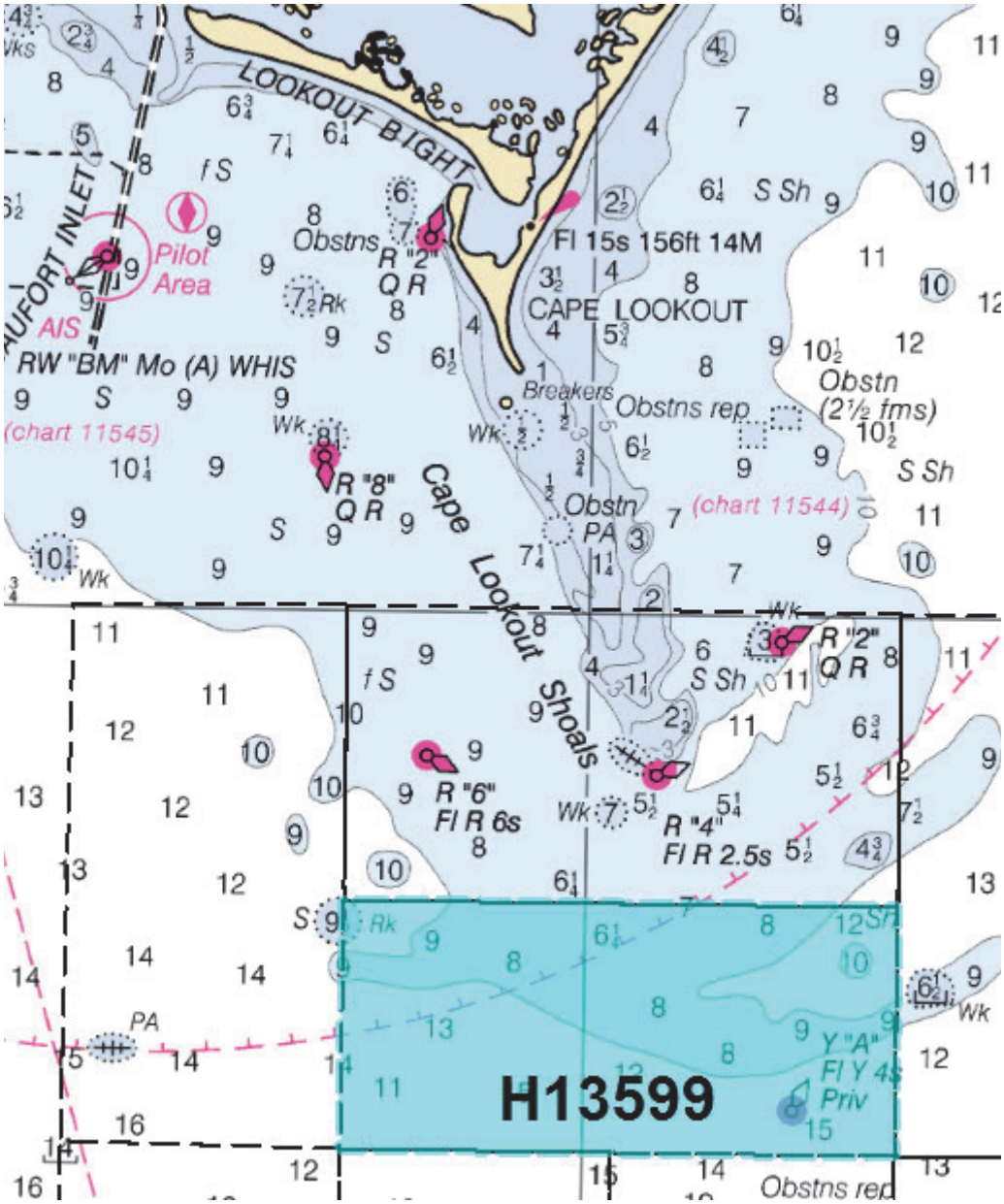


Figure 1: Sheet limits for survey H13599 (overlaid on NOAA Chart 11520).

A.2 Survey Purpose

The objective of survey H13599 was to acquire high quality multibeam bathymetric and backscatter data. The majority of the charted bathymetric data of the area is from 1970 and years prior. The shoal nature of the area, along with numerous storms and hurricanes having potentially changed the seabed over the last few decades, have raised the need to survey the area. The data from this project will provide modern bathymetry for updating National Ocean Service nautical charting products as well as support the Seabed 2030 global mapping initiative.

A.3 Survey Quality

The entire survey is adequate to supersede previous data.

Data acquired in H13599 meet multibeam echo sounder (MBES) coverage requirements for complete coverage, as specified by the 2022 HSSD. This includes crosslines (Section B.2.1), NOAA allowable uncertainty (Section B.2.2) and density requirements (Section B.5.2).

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 (Refer to HSSD Section 5.2.2.3)

Table 2: Survey Coverage

Survey coverage is in accordance with requirements listed in Table 2 and in the 2022 HSSD. Coverage requirements were met with a combination of 100% complete coverage multibeam echosounder (MBES) and 100% side scan sonar (SSS) with concurrent MBES coverage (see Figure 2). As is apparent from Figure 2, due to time constraints, the upper 20% of the originally-assigned survey area for H13599 was unaddressed. Lines run along the sheet border and crosslines within this upper 20% have been included for reconnaissance purposes.

Application of NOAA's QC Tools (3.7.0) Holiday Finder (v4) yielded 71 holidays; however, all potential holidays were on the southern side of the survey where the SSS was the instrument used for coverage (see Figure 3).

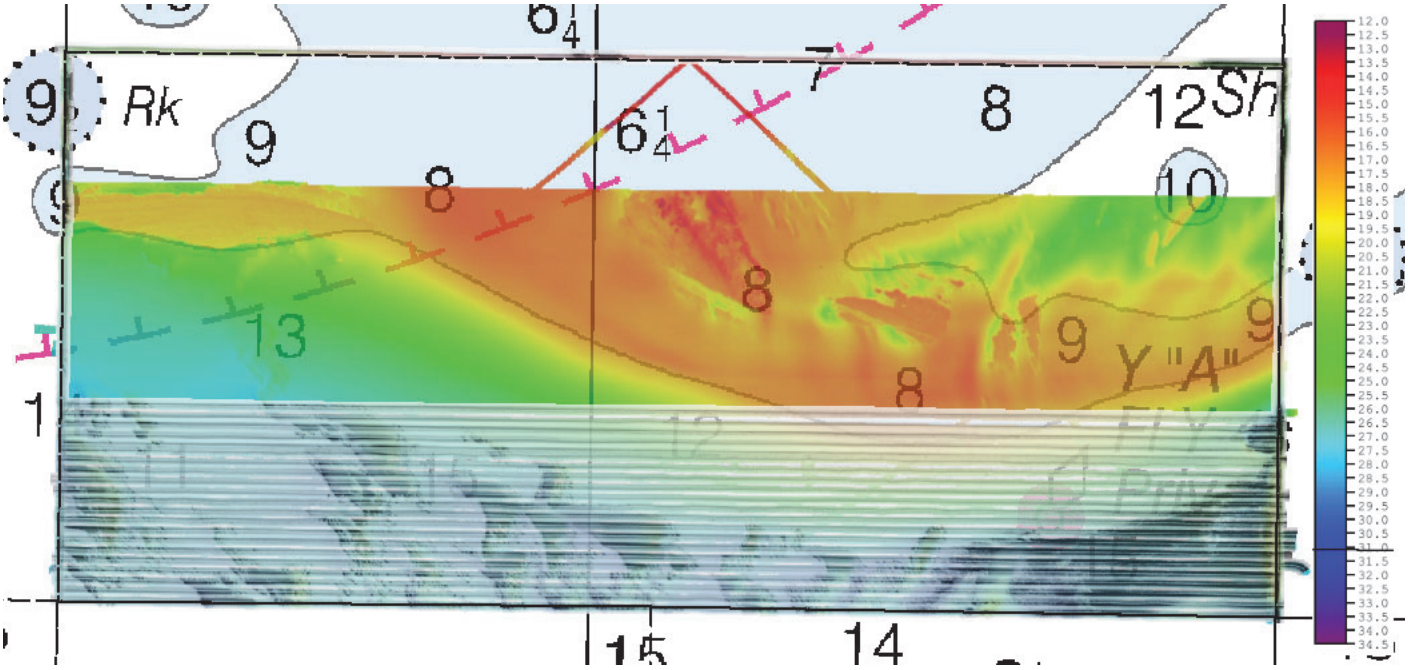


Figure 2: Complete coverage SSS (grayscale) plotted over MBES coverage acquired on H13599. Black outline represents originally assigned sheet limits.

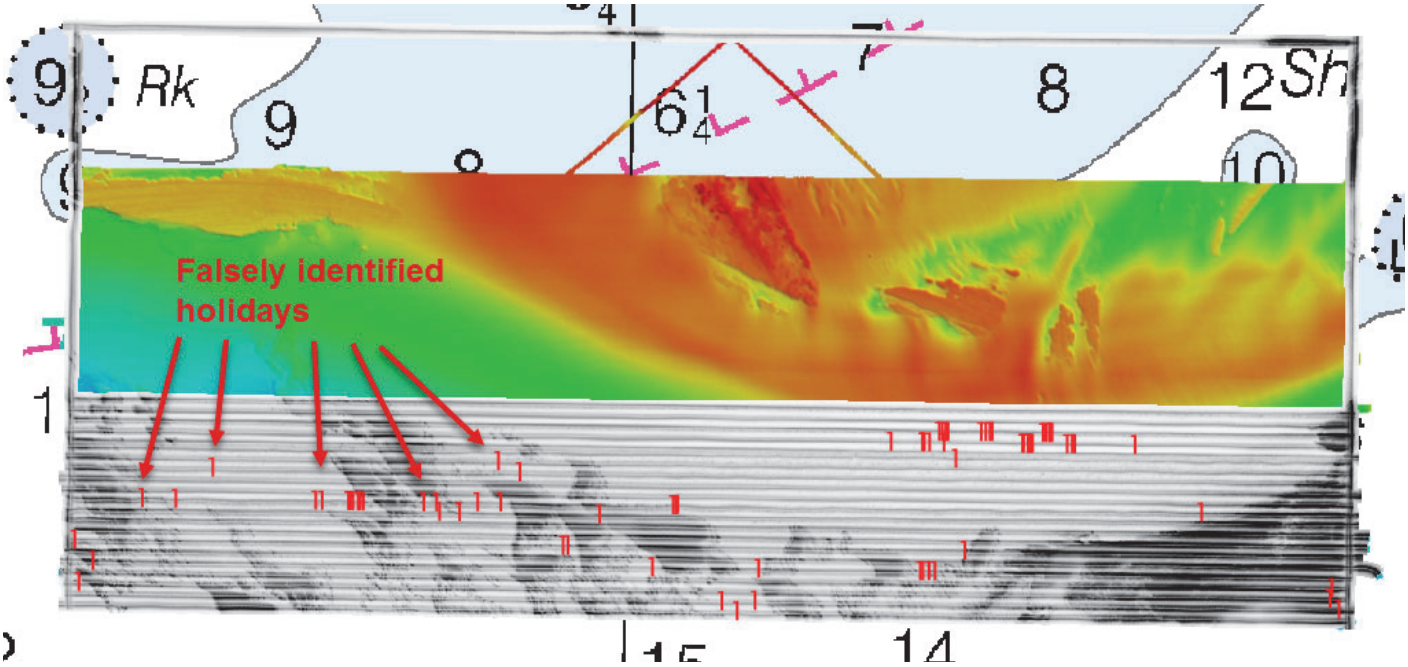


Figure 3: Falsely identified MBES holidays located within the area where coverage was determined by 100% SSS.

A.6 Survey Statistics

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

	HULL ID	*S250*	*Total*
LNM	**SBES Mainscheme**	0.0	0.0
	MBES Mainscheme	773.8	773.8
	Lidar Mainscheme	0.0	0.0
	SSS Mainscheme	0.0	0.0
	SBES/SSS Mainscheme	0.0	0.0
	MBES/SSS Mainscheme	243.9	243.9
	SBES/MBES Crosslines	35.6	35.6
	Lidar Crosslines	0.0	0.0
Number of Bottom Samples			4
Number Maritime Boundary Points Investigated			0
Number of DPs			0
Number of Items Investigated by Dive Ops			0
Total SNM			37.7

Table 3: Hydrographic Survey Statistics

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

Survey Dates	Day of the Year
09/24/2022	267
09/25/2022	268
09/26/2022	269
09/27/2022	270
10/07/2022	280
10/08/2022	281
10/09/2022	282
10/10/2022	283
10/11/2022	284

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, 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	3.85 meters

Table 5: Vessels Used

Figure 4: NOAA Ship Ferdinand R. Hassler (S-250).

B.1.2 Equipment

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

Manufacturer	Model	Type
Kongsberg Maritime	EM 2040	MBES
Kongsberg Maritime	EM 2040	MBES Backscatter
Applanix	POS MV 320 v5	Positioning and Attitude System
Teledyne RESON	SBE 19plus V2	Conductivity, Temperature, and Depth Sensor
Teledyne RESON	SVP 70	Sound Speed System
Klein Marine Systems	System 5500 V2	SSS

Table 6: Major Systems Used

B.2 Quality Control

B.2.1 Crosslines

Multibeam echo sounder crosslines acquired for this survey totaled 4.6% of mainscheme acquisition. NOAA Ship Ferdinand R. Hassler (S-250) acquired 37.67 nautical miles of multibeam crosslines. H13599 crossline data is adequate for verifying and evaluating the internal consistency of the survey data. The Compare Grids function in Pydro Explorer analyzed finalized 2-meter resolution surfaces of H13599 crossline-only data and mainscheme-only data - the resulting difference had a mean of 0.02 meters with a standard deviation of 0.09 meters. In the difference surface, 99.5% of nodes met IHO allowable Total Vertical Uncertainty (TVU) standards. Refer to the figures below for additional crossline results.

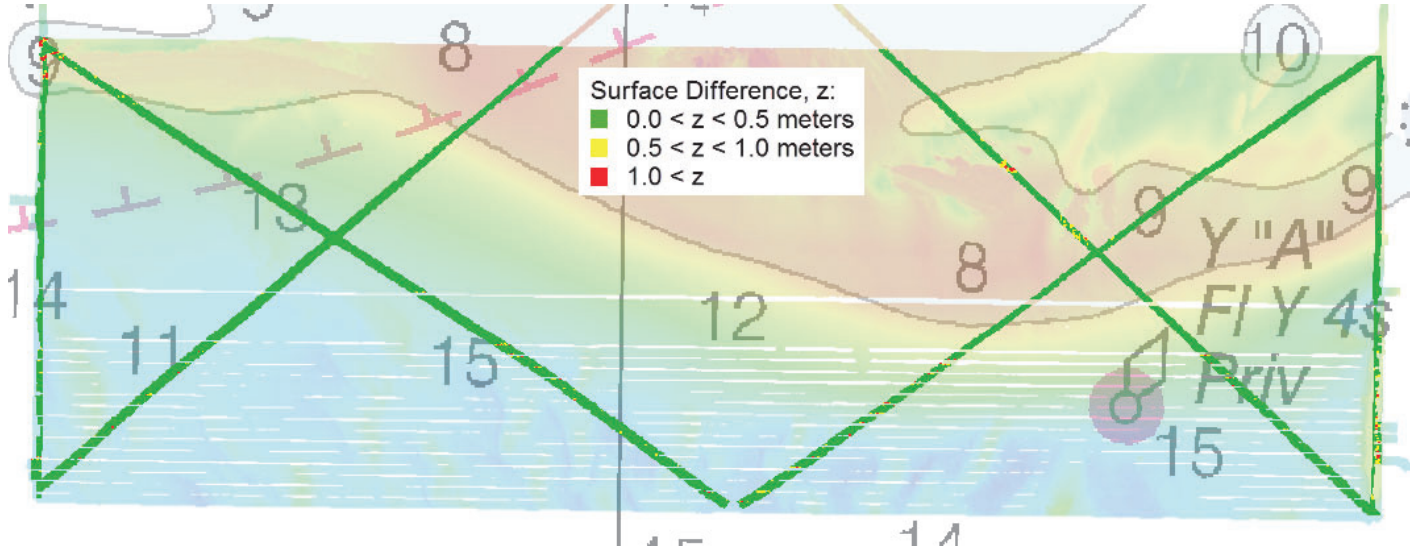


Figure 5: H13599 crossline surface overlaid on mainscheme grid. All data meet HSSD allowable Total Vertical Uncertainty.

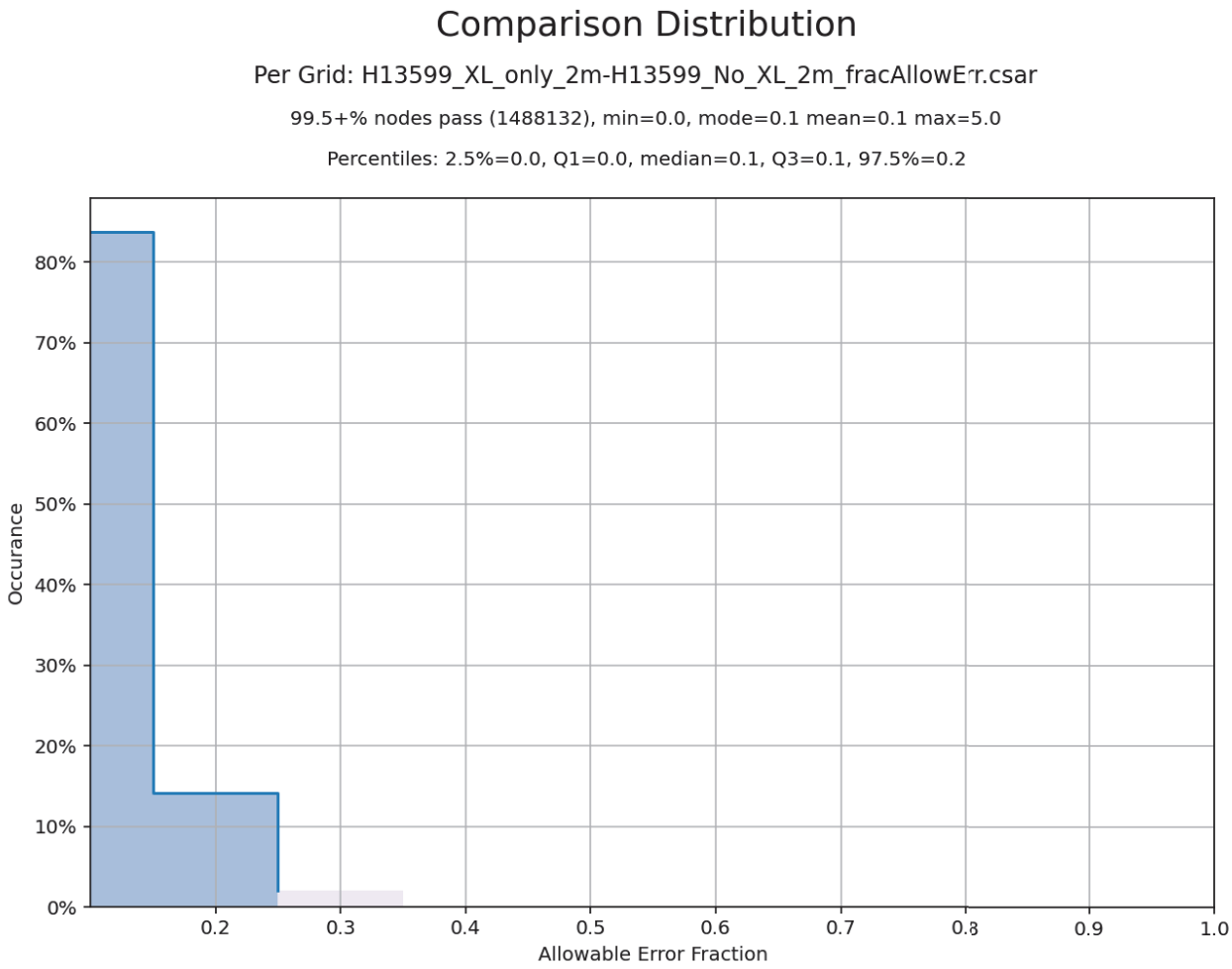
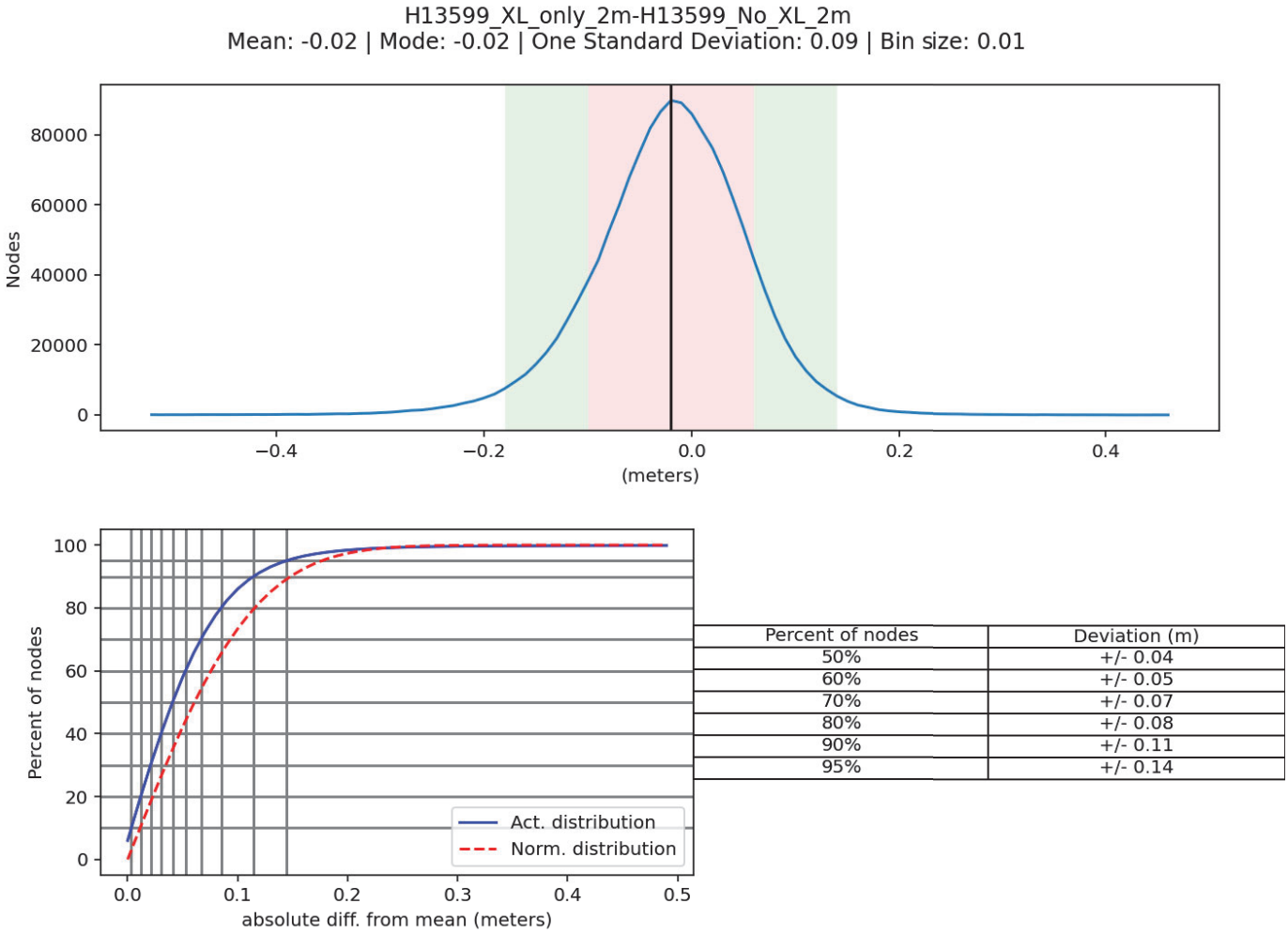


Figure 6: Pydro-derived plot showing percentage-pass value of nodes in H13599 mainscheme and crossline data.



Percent of nodes	Deviation (m)
50%	+/- 0.04
60%	+/- 0.05
70%	+/- 0.07
80%	+/- 0.08
90%	+/- 0.11
95%	+/- 0.14

Figure 7: Pydro-derived plot showing absolute difference statistics of H13599 mainscheme and crossline data.

B.2.2 Uncertainty

The following survey specific parameters were used for this survey:

Method	Measured	Zoning
ERS via VDATUM	0.0 meters	0.097 meters

Table 7: Survey Specific Tide TPU Values.

Hull ID	Measured - CTD	Measured - MVP	Measured - XBT	Surface
S250	4.0 meters/second	1 meters/second	N/A meters/second	0.5 meters/second

Table 8: Survey Specific Sound Speed TPU Values.

Total Propagated Uncertainty (TPU) values for survey H13599 were derived from a combination of fixed values for equipment and vessel characteristics, as well as from field assigned values for sound speed uncertainties. Additionally, real-time and post-processed uncertainty sources associated with position were applied using SBET and RMS files generated using POSPac MMS software. The bathymetric surface is compliant with 2022 HSSD uncertainty standards; over 99.5% of all nodes pass.

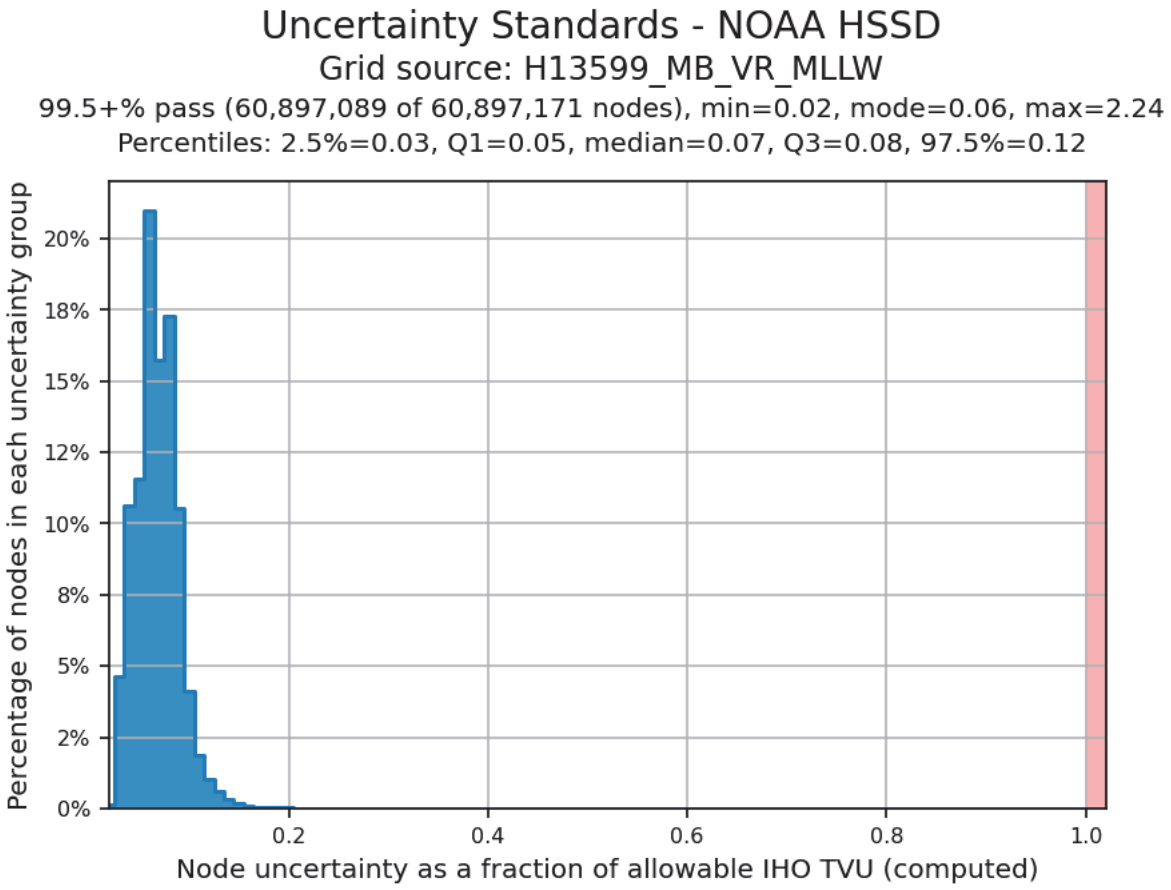


Figure 8: Pydro-derived plot showing Total Vertical Uncertainty (TVU) compliance of H13599's finalized VR surface.

B.2.3 Junctions

H13599 junctions with surveys H13597, H13600 and H13601. All surveys are within the same project area (OPR-F364-FH-22). The junction analyses for these surveys can be found below.

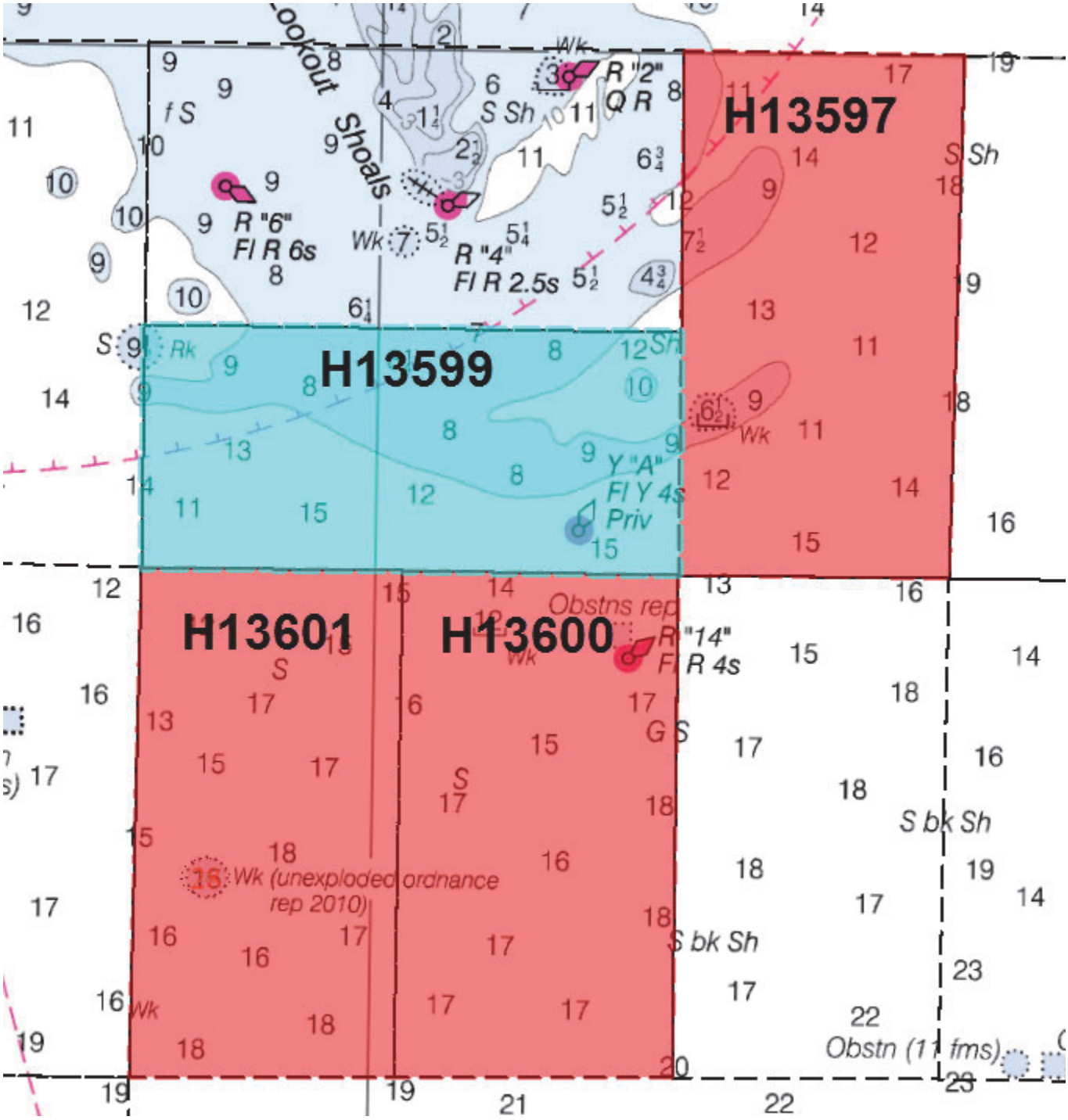


Figure 9: Overview of H13599 junctions with H13597, H13600 and H13601.

The following junctions were made with this survey:

Registry Number	Scale	Year	Field Unit	Relative Location
H13597	1:40000	2022	NOAA Ship Ferdinand R. Hassler	E
H13600	1:40000	2022	NOAA Ship Ferdinand R. Hassler	SE
H13601	1:40000	2022	NOAA Ship Ferdinand R. Hassler	SW

Table 9: Junctioning Surveys

H13597

The junction with survey H13597 encompasses approximately 0.37 square nautical miles along the eastern border of coverage. The Compare Grids function of Pydro Explorer derived a difference surface from H13597 2-meter resolution surface and H13599 2-meter resolution surface. Pydro Compare Grids showed that 99.5% of nodes in the overlapping area met NOAA allowable error standards. Analysis of the difference surface indicated that there is a 0.04 meter average difference with a standard deviation of 0.09 meters between the two surveys. For additional results, see figures below.

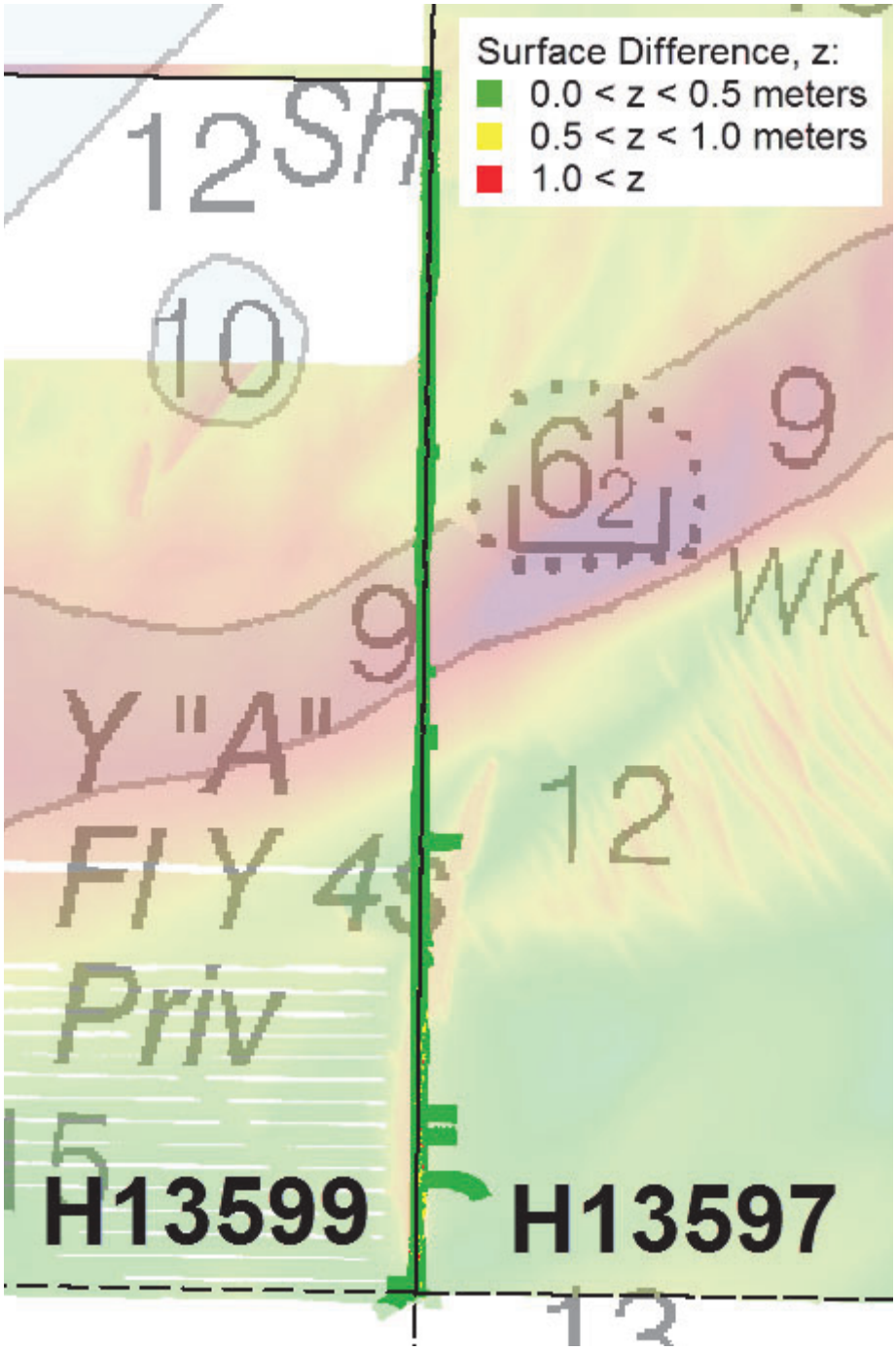


Figure 10: Difference surface overlaid on coverage from H13599 & H13597.

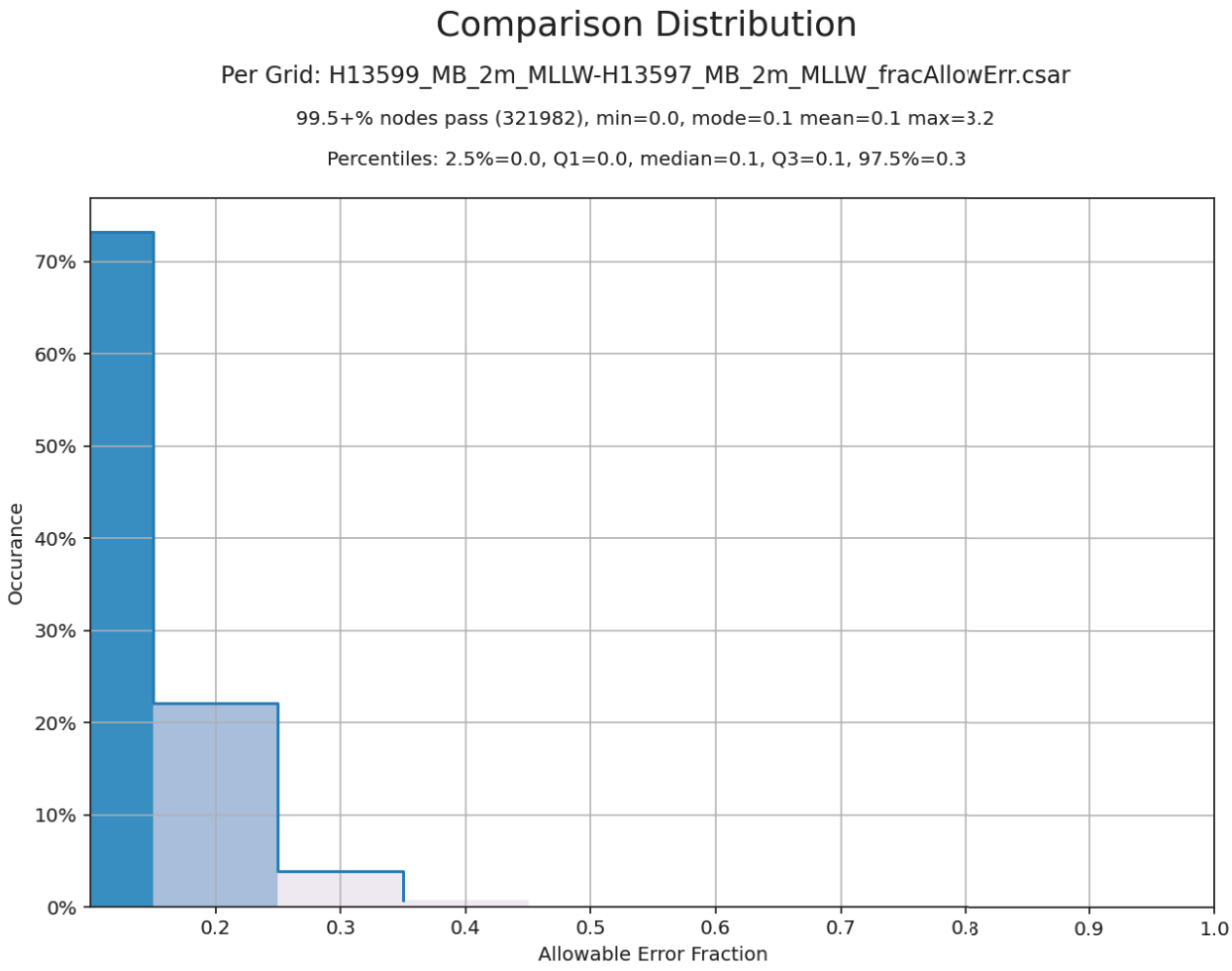
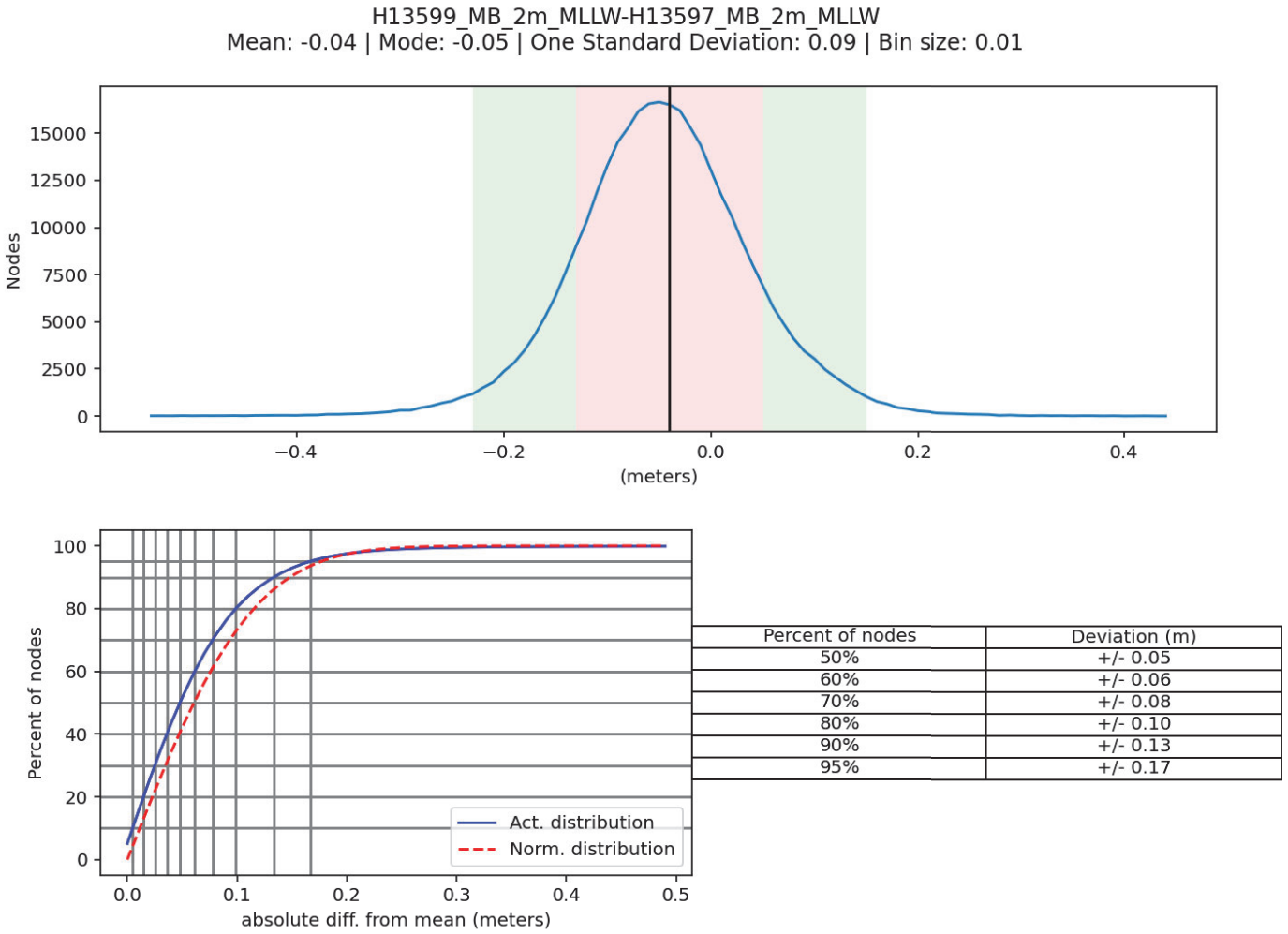


Figure 11: Pydro-derived plot showing percentage-pass value of nodes in H13599 and H13597.



Percent of nodes	Deviation (m)
50%	+/- 0.05
60%	+/- 0.06
70%	+/- 0.08
80%	+/- 0.10
90%	+/- 0.13
95%	+/- 0.17

Figure 12: Pydro-derived plot showing absolute difference statistics of H13599 and H13597.

H13600

The junction with survey H13600 encompasses approximately 0.44 square nautical miles along the eastern border of coverage. The Compare Grids function of Pydro Explorer derived a difference surface from H13600 2-meter resolution surface and H13599 2-meter resolution surface. Pydro Compare Grids showed that 99.5% of nodes in the overlapping area met NOAA allowable error standards. Analysis of the difference surface indicated that there is a 0.01 meter average difference between the two surveys with a standard deviation of 0.07 meters. For additional results, see figures below.

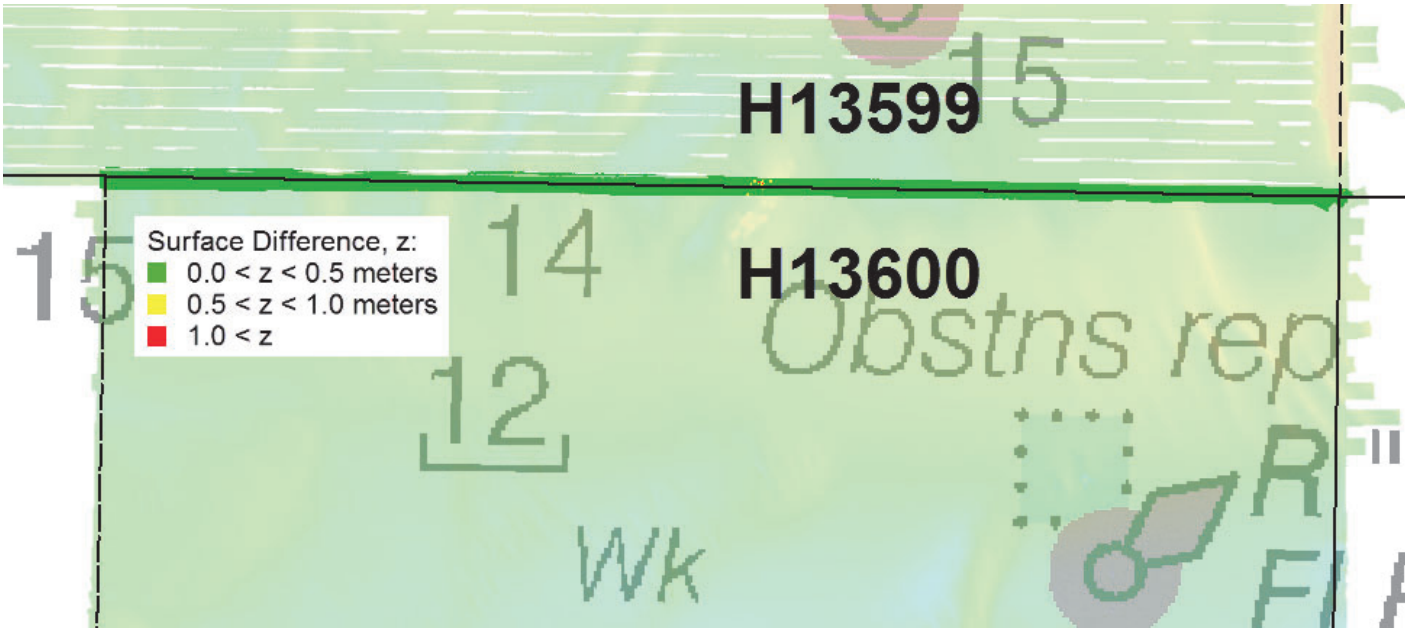


Figure 13: Difference surface overlaid on coverage from H13599 and H13600.

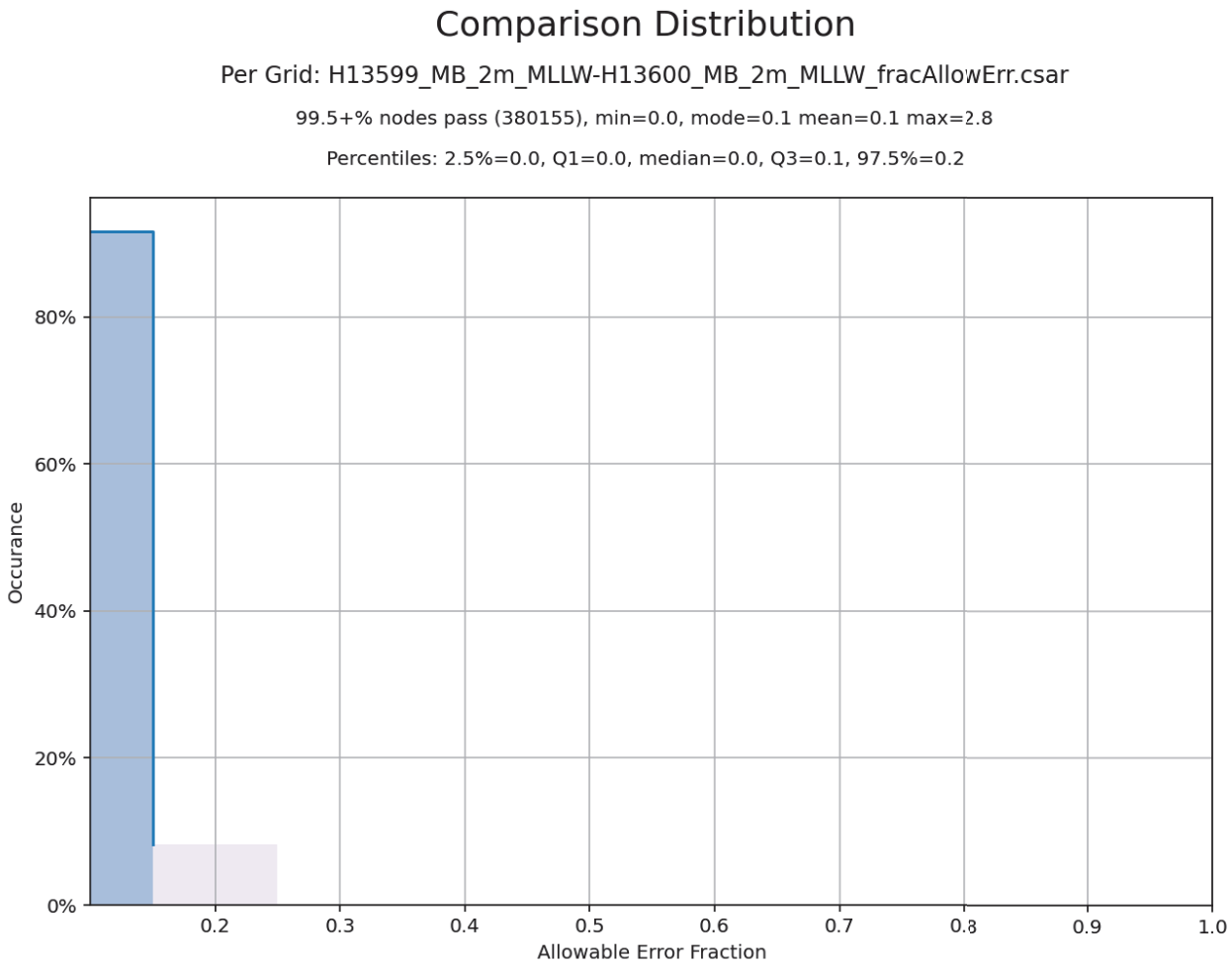
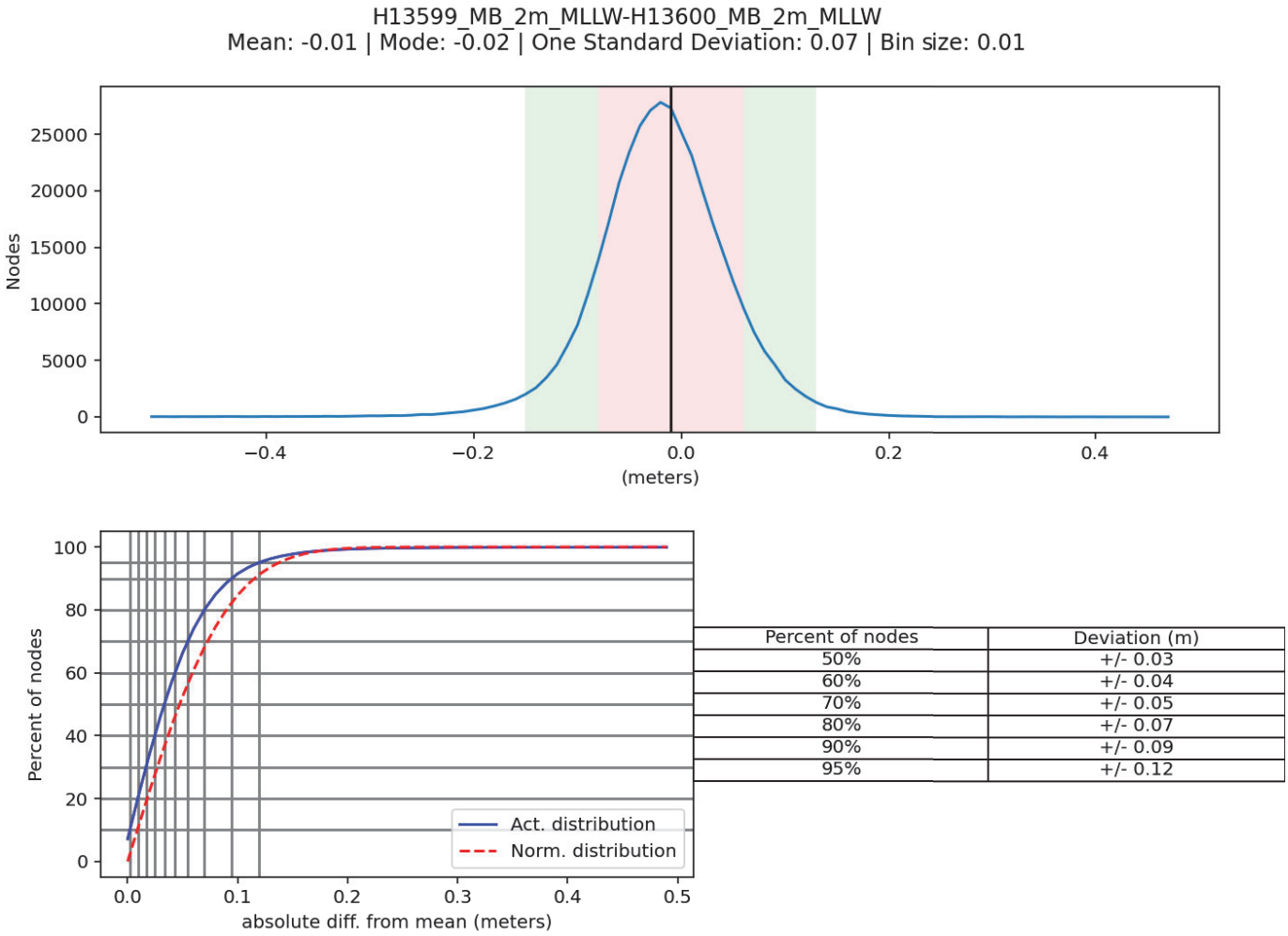


Figure 14: Pydro-derived plot showing percentage-pass value of nodes in H13599 and H13600.



Percent of nodes	Deviation (m)
50%	+/- 0.03
60%	+/- 0.04
70%	+/- 0.05
80%	+/- 0.07
90%	+/- 0.09
95%	+/- 0.12

Figure 15: Pydro-derived plot showing absolute difference statistics of H13599 and H13600.

H13601

The junction with survey H13601 encompasses approximately 0.43 square nautical miles along the eastern border of coverage. The Compare Grids function of Pydro Explorer derived a difference surface from H13601 2-meter resolution surface and H13599 2-meter resolution surface. Pydro Compare Grids showed that 99.5% of nodes in the overlapping area met NOAA allowable error standards. Analysis of the difference surface indicated that there is a 0.04 meter average difference between the two surveys with a standard deviation of 0.06 meters. For additional results, see figures below.

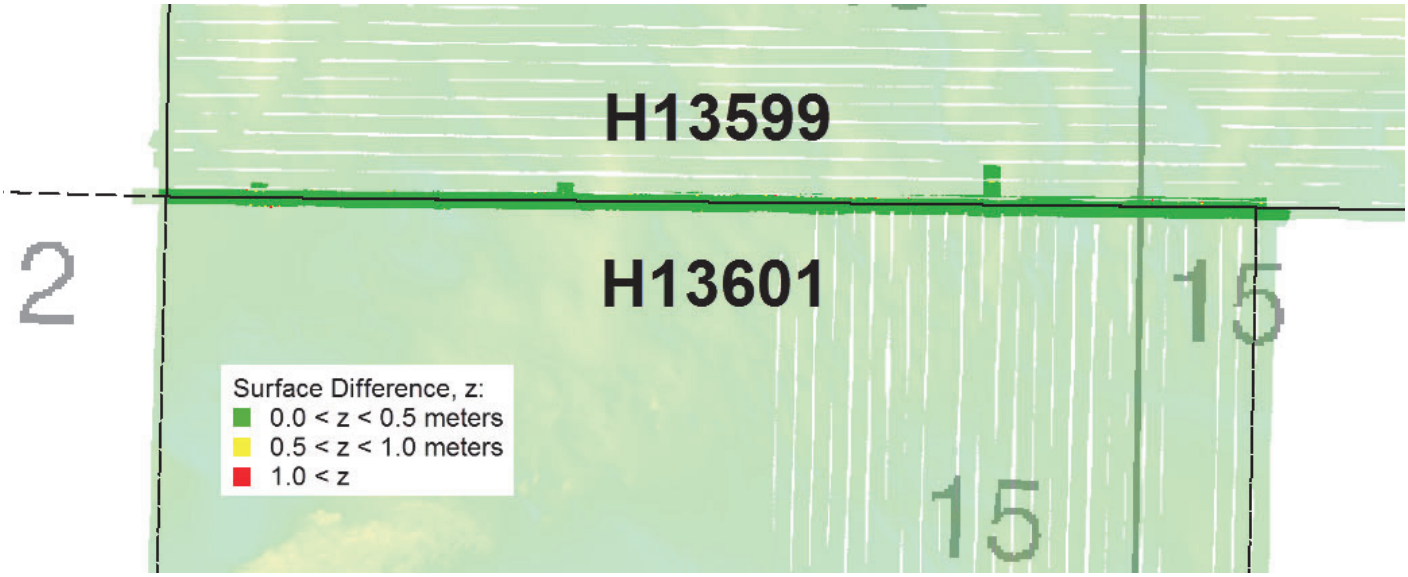


Figure 16: H13599 difference surface overlaid on H13601 tracklines.

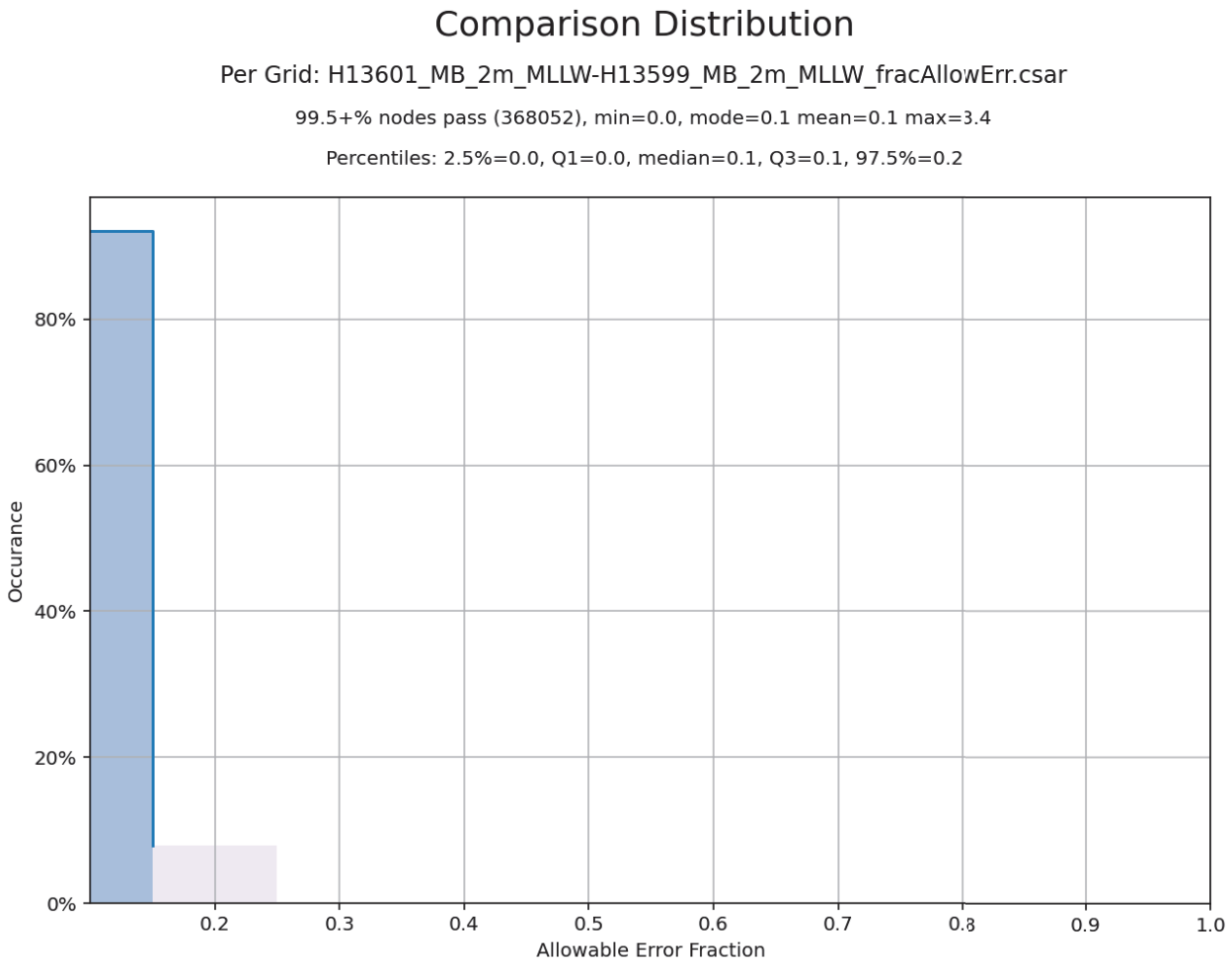
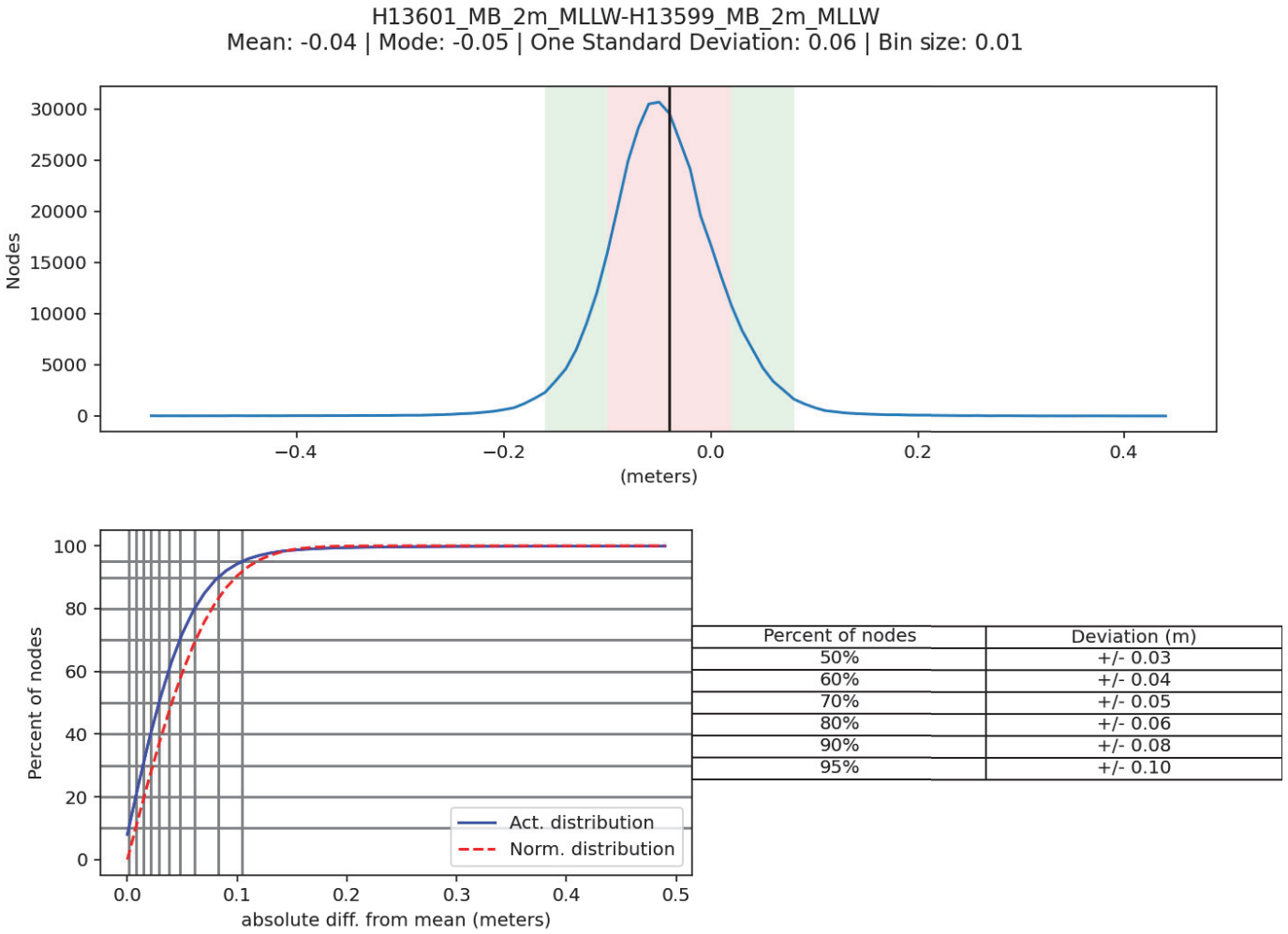


Figure 17: Pydro-derived plot showing percentage-pass value of nodes in H13599 and H13601.



Percent of nodes	Deviation (m)
50%	+/- 0.03
60%	+/- 0.04
70%	+/- 0.05
80%	+/- 0.06
90%	+/- 0.08
95%	+/- 0.10

Figure 18: Pydro-derived plot showing absolute difference statistics of H13599 and H13601.

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

Faulty Surface Sound Speed Probe

Throughout the survey, values from the Reson surface sound speed probe (SV70) were reporting erratic values. Within the SIS runtime parameters, the surface sound speed input was substituted for the sound

speed reported, at the appropriate depth, by the ship's most recent MVP cast. In real-time, the surface sound speed being reported by the MVP was monitored. If significant deviations were detected in the surface sound speed, relative to the previous cast, an additional cast was taken.

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: Sound speed casts were acquired approximately every one to two hours.

A total of 96 sound speed casts were acquired on H13599. Additional casts were taken when significant changes to surface sound speed were observed. Sound speed profiles were acquired using a Rolls Royce Brooke Ocean Moving Vessel Profiler (MVP 200). All casts were concatenated into a master file and applied to the MBES data using the "Nearest in distance within time" (4 hours) profile selection method.

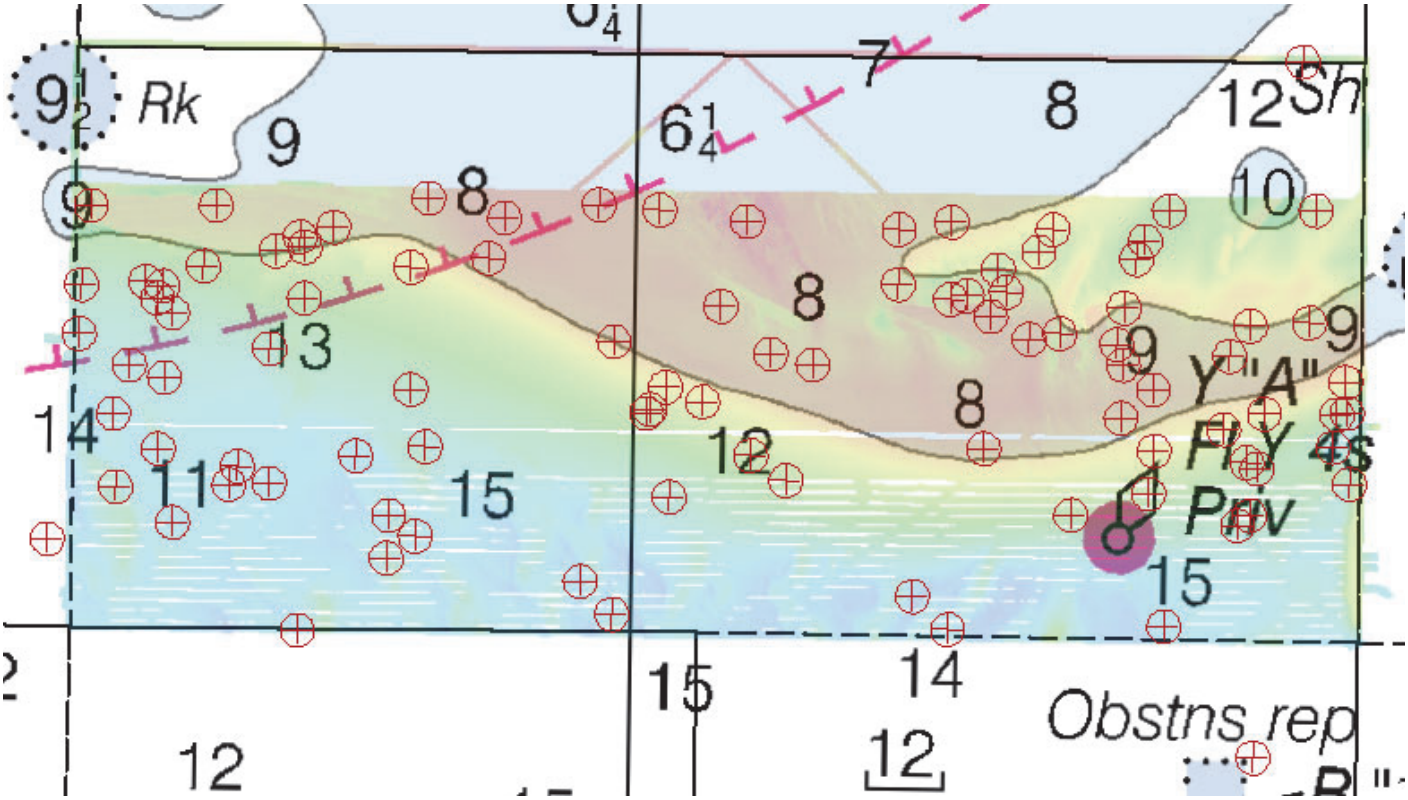


Figure 19: H13599 sound speed profile locations.

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 flagged as part of the .all file from the Kongsberg EM2040 systems. Backscatter was processed in QPS Fledermaus GeoCoder Toolbox (FMGT) software and the exported geotiffs are included in the final processed data submission package (see image below).

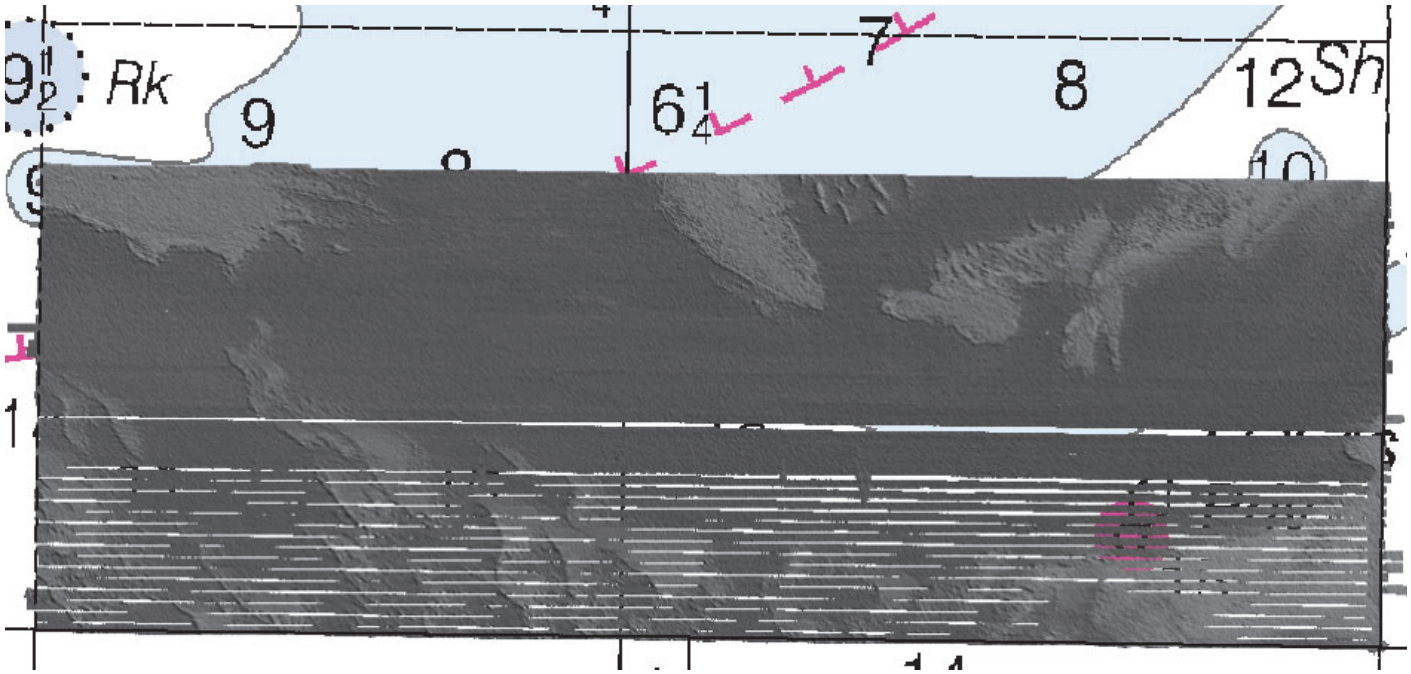


Figure 20: Overview of H13599 backscatter mosaic.

B.5 Data Processing

B.5.1 Primary Data Processing Software

The following software program was the primary program used for bathymetric data processing:

Manufacturer	Name	Version
CARIS	HIPS/SIPS	11.4.11
CARIS	BASE Editor	5.5.8

Table 10: Primary bathymetric data processing software

The following software program was the primary program used for imagery data processing:

Manufacturer	Name	Version
Fledermaus	FMGT	7.10.0

Table 11: Primary imagery data processing software

The following Feature Object Catalog was used: NOAA Profile Version 2022.

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
H13599_MB_VR_MLLW	CARIS VR Surface (CUBE)	Variable Resolution	12.46 meters - 31.06 meters	NOAA_VR	Complete MBES
H13599_MB_VR_MLLW_Final	CARIS VR Surface (CUBE)	Variable Resolution	12.46 meters - 31.06 meters	NOAA_VR	Complete MBES
H13599_MBAB_2m_300kHz_1of1	MB Backscatter Mosaic	2 meters	-	N/A	Complete MBES
H13599_SSSAB_1m_455kHz_1of1	SSS Mosaic	1	-	N/A	100% SSS

Table 12: Submitted Surfaces

Submitted surfaces were generated using the NOAA recommended parameters for depth-based (Ranges) CARIS variable-resolution bathymetric grids as specified in the 2022 HSSD.

After multiple rounds of cleaning using NOAA QC Tools' Flier Finder, available in NOAA's Pydro Explorer suite, 131 fliers remained (130 noisy edges and 1 LaPlacian operator). Each of these potential fliers were examined in CARIS Subset editor and determined to be accurate representations of the seafloor, along distinct features, or rapid changes in bottom depth (see Figure 21).

Pydro QC Tools Grid QA was used to analyze H13599 multibeam echosounder (MBES) data density. The submitted H13599 variable-resolution (VR) surface met HSSD density requirements as shown in Figure 22 below.

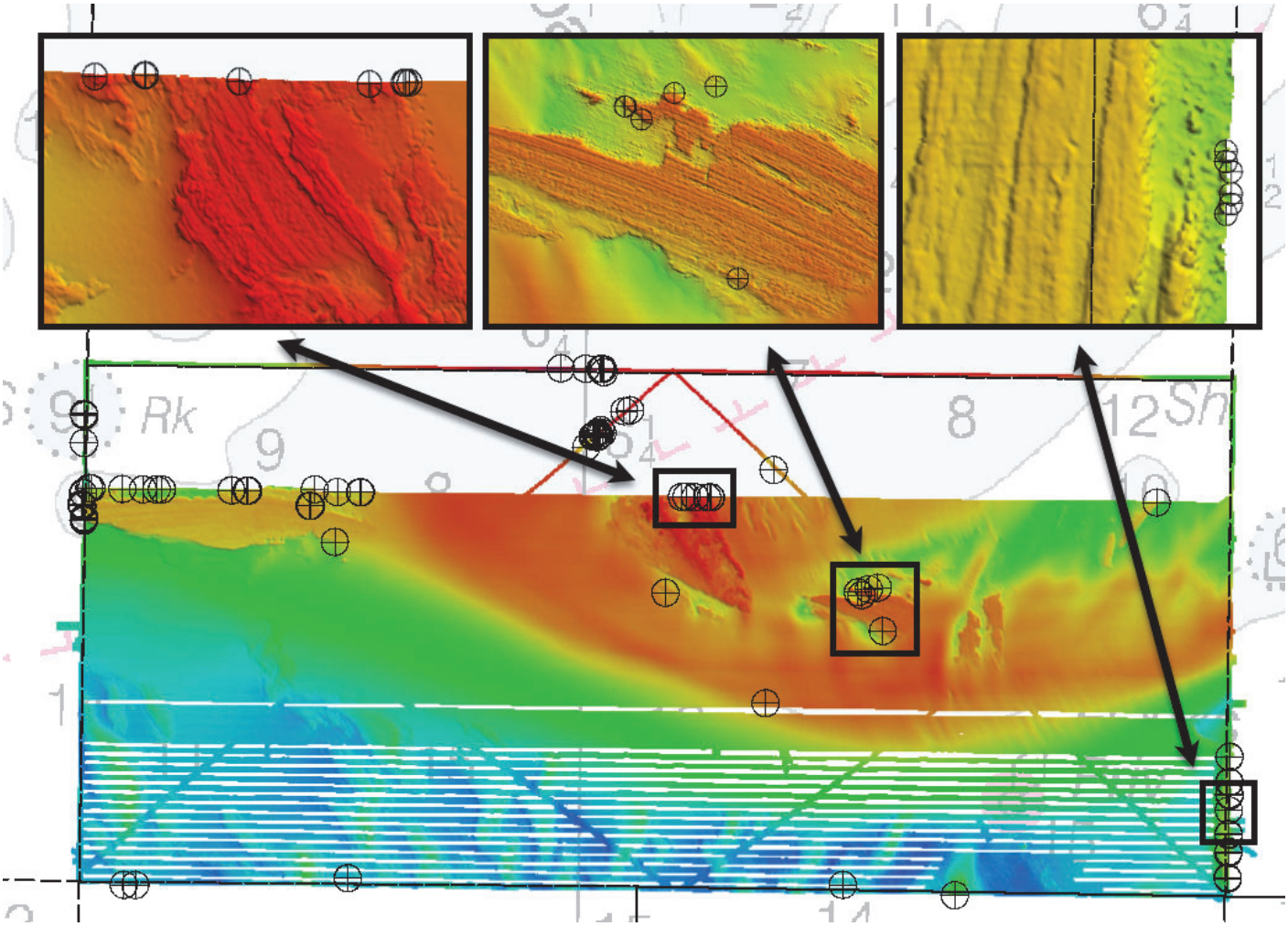


Figure 21: Overview of potential fliers flagged in H13599; all were examined and determined to be accurate representations of the seafloor.

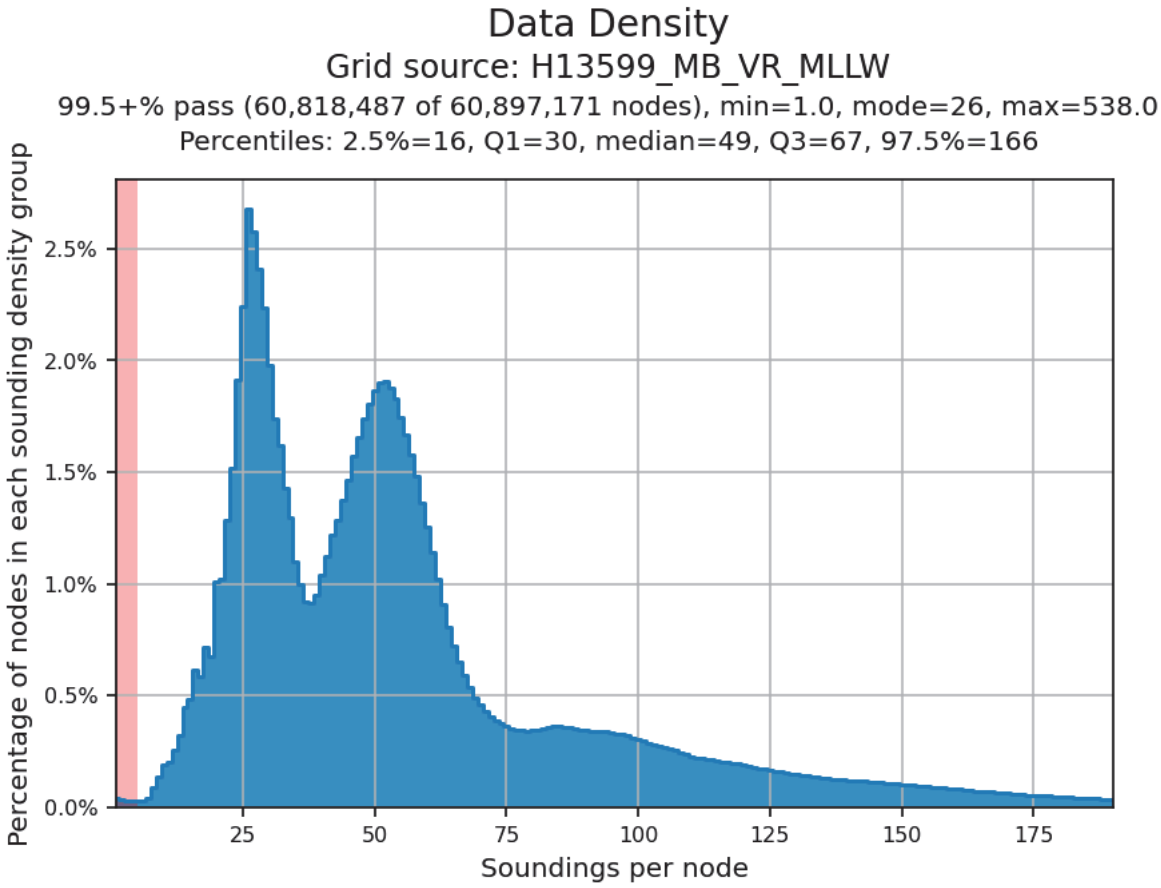


Figure 22: Pydro-derived plot showing HSSD density compliance of H13599 finalized variable-resolution surface.

B.5.3 Side Scan Sonar with Concurrent MBES Edge Fliers

In certain depths, when acquiring SSS with concurrent MBES, the resulting multibeam lines do not overlap with one another. This can lead to acoustic noise along either side of the track, which is then at risk of being represented in the computed surfaces anywhere the SSS is being used to meet complete coverage requirements. After initial processing, NOAA QC Tools' Flier Finder flagged 3,900 fliers (Figure 23 - red crosses). To manage this noise, a beam filter was applied to all the multibeam lines acquired concurrent with the SSS, in which all data greater than 60-degrees from nadir was rejected (the sonar is operated in such a way that data is recorded up to 68-degrees from nadir). After one pass of this beam filter, the reported fliers were reduced to 130 fliers (Figure 23 - black crosses), which were then cleaned as described in the preceding section.

As a result of this beam filtering, 15-20% of the geographic extents of the original multibeam swaths (most free of fliers) were rejected, along with the associated coverage (see Figure 24). This data is included in the final submission, and the "rejected" flags could be reverted should someone desire to see the additional coverage and have the time to manually clean the edge fliers.

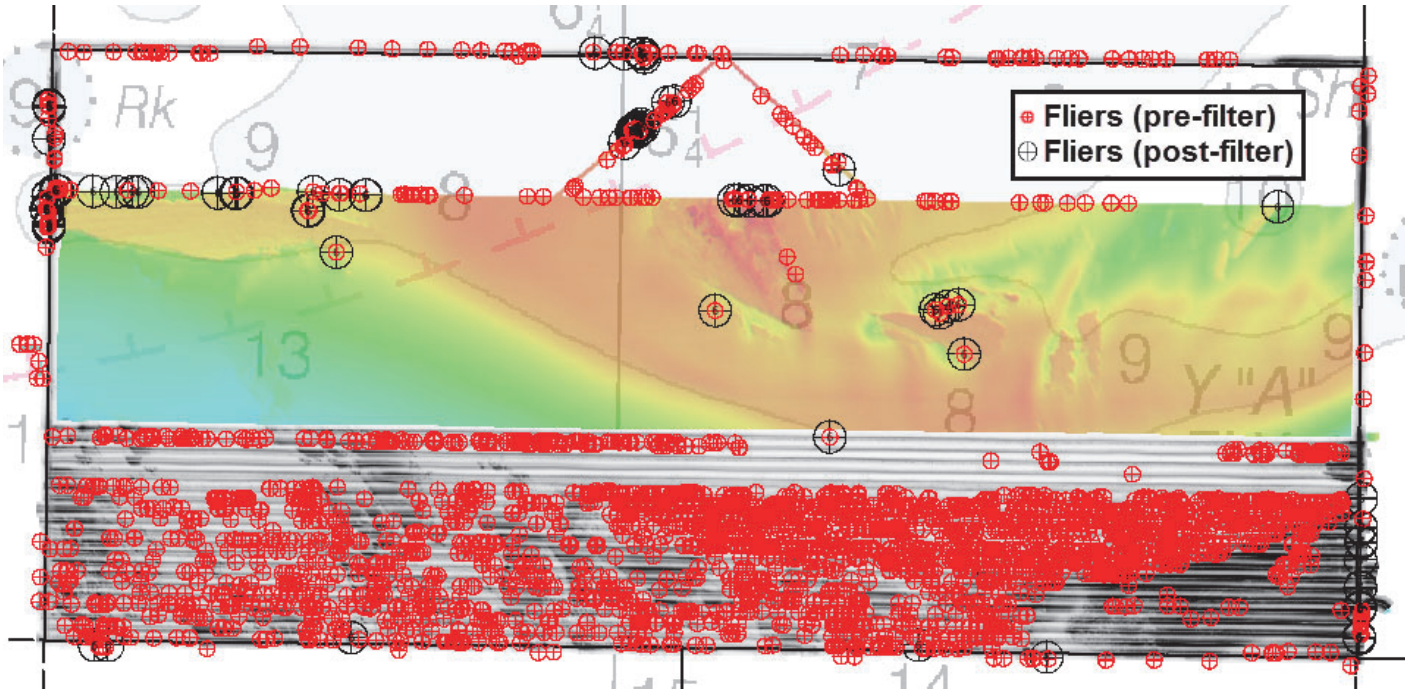


Figure 23: Examples of edge fliers flagged by NOAA QC Tools' Flier Finder: 3,900 fliers before beam filtering (red crosses) and 130 fliers after filtering (black crosses).

Figure 24: Example of the loss of spatial coverage as a result of filtering the multibeam data logged concurrent with the side scan sonar.

C. Vertical and Horizontal Control

Additional information discussing the vertical or horizontal control for this survey can be found in the accompanying 2022 DAPR.

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	OPR_F364_FH_22_VDatum_xyNAD83-MLLW_geoid12b.csar

Table 13: ERS method and SEP file

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.

The following PPK methods were used for horizontal control:

- RTX

Post Processed Real-Time Extended (PP-RTX) processing methods were used in Applanix POSPac MMS 8.7 software to produce SBETs for horizontal and vertical corrections.

WAAS

The Wide Area Augmentation System (WAAS) was used for real-time horizontal control during data acquisition.

D. Results and Recommendations

D.1 Chart Comparison

Contours from H13599 were generated and visually compared with the charted contours from the largest scale Electronic Navigation Charts (US4NC15M & US4NC16M). The 18.3 meter (10 fathom) contour generally agrees between the survey and the chart, see Figure below.

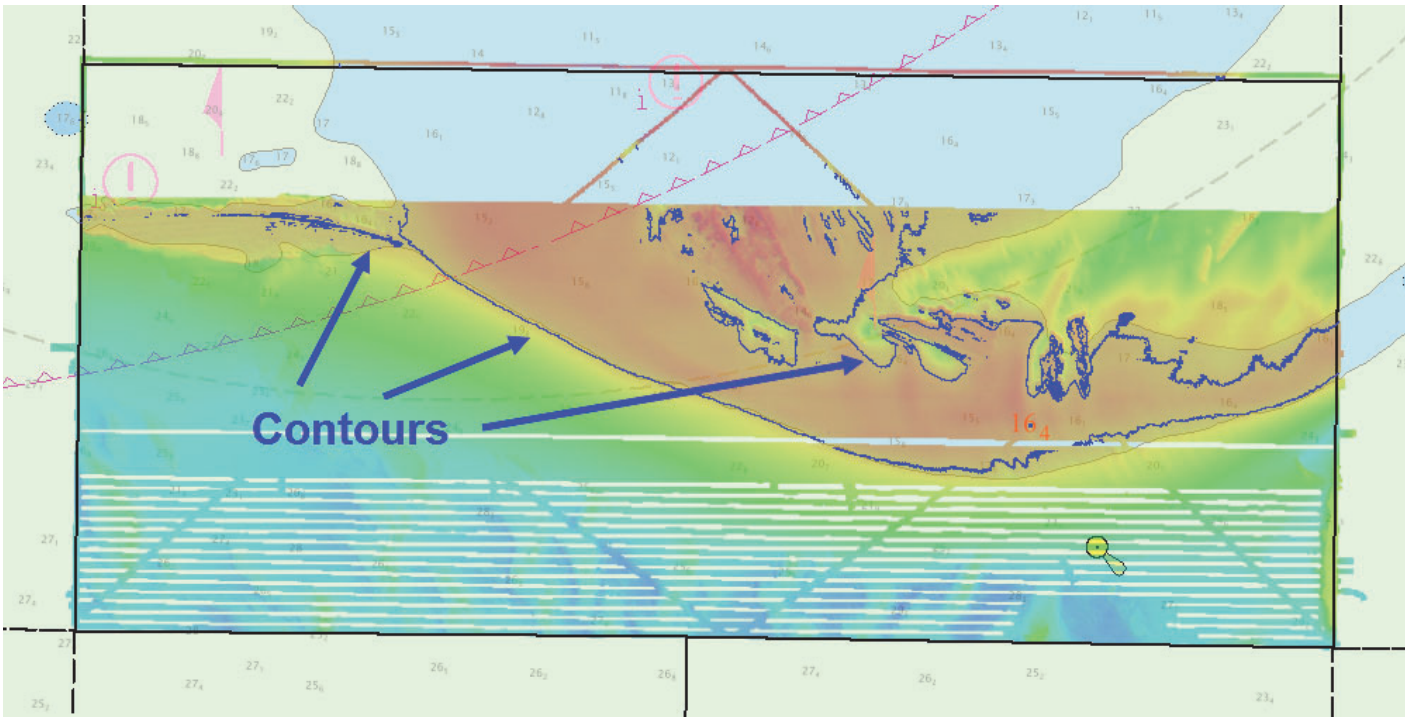


Figure 25: Comparison of H13599's 18.3-meter contour (highlighted in blue) overlaid on ENC (US4NC15M & US4NC16M) contours.

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
US4NC15M	1:80000	25	02/22/2022	02/22/2022
US4NC16M	1:80000	23	09/07/2021	11/23/2021
US3SC10M	1:432720	37	07/28/2022	07/28/2022

Table 14: Largest Scale ENCs

D.1.2 Shoal and Hazardous Features

Survey soundings from H13599 were generated from a finalized variable resolution CUBE surface in CARIS HIPS and SIPS and compared with the soundings from the largest scale Electronic Navigation Charts (US4NC15M & US4NC16M) using CA Tools SS vs Chart comparison tool, see Figure below.

CA Tools flagged 36 soundings as potential Dangers to Navigation (DTON), though none of these soundings fall within the HSSD requirements for sounding designation or DTON designation (HSSD Section 1.6.1), and are deep enough to not represent a hazard to surface navigation, the hydrographer recommends the addition of these shoaler soundings to the ENC. These shoal soundings still fall within their charted depth contour, see Figure below.

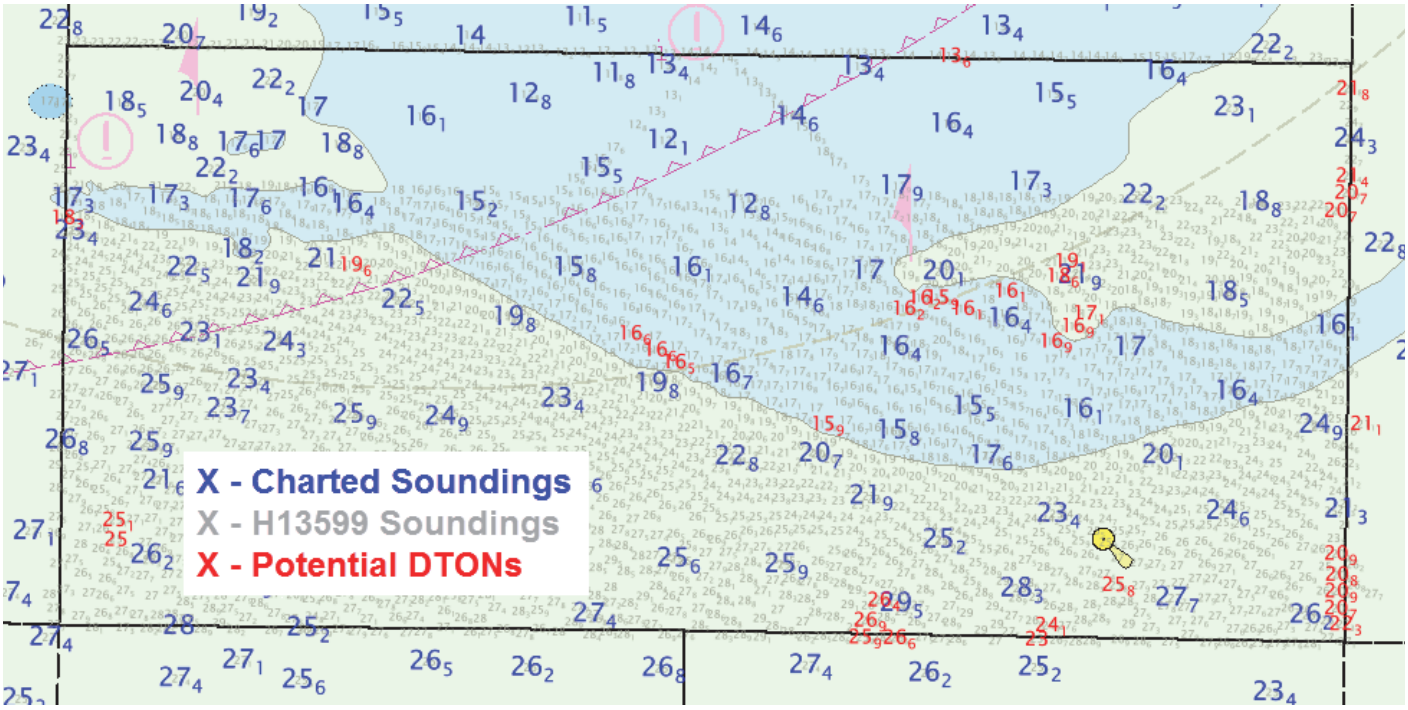


Figure 26: H13599 soundings vs. charted soundings: gray soundings = H13599 soundings; blue soundings = ENC soundings; red soundings = H13599 soundings flagged by CA Tools as potential DTONs. All soundings are in meters.

D.1.3 Charted Features

No charted features exist for this survey.

D.1.4 Uncharted Features

One uncharted feature was investigated in conjunction with H13599. Reference the accompanying Final Feature File for more 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

Aids to navigation (ATONs) exist for this survey, but were not investigated.

D.2.2 Maritime Boundary Points

No Maritime Boundary Points were assigned for this survey.

D.2.3 Bottom Samples

Bottom samples were assigned and investigated. Refer to the Final Feature File for location and sample attribution.

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 and/or environmental conditions 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 Recommendations

Of the originally assigned extents of H13599, the northern 20% was not addressed due to time constraints (in addition to an additional survey sheet to the north of H13599). These areas encompass the extents of Cape Lookout Shoals, which is believed to be highly changeable, and should be investigated in a future survey.

D.2.11 ENC Scale Recommendations

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, 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
Data Acquisition and Processing Report	2022-05-20

Approver Name	Approver Title	Approval Date	Signature
Michael Gonsalves, CDR/NOAA	Chief of Party	11/10/2022	GONSALVES.MICHAEL.OLIVER.1275635126 Digitally signed by GONSALVES.MICHAEL.OLIVER.1275635126 Date: 2022.11.18 13:33:24 -05'00'
Daniel Helmricks, LT/NOAA	Operations Officer	11/10/2022	
Michael Gonsalves, CDR/NOAA	Sheet Manager	11/10/2022	GONSALVES.MICHAEL.OLIVER.1275635126 Digitally signed by GONSALVES.MICHAEL.OLIVER.1275635126 Date: 2022.11.18 13:32:56 -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