

H13992

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

**DESCRIPTIVE REPORT**

Type of Survey: Navigable Area

Registry Number: H13992

**LOCALITY**

State(s): Massachusetts

General Locality: Northern Massachusetts Bay

Sub-locality: Salem Harbor

**2025**

CHIEF OF PARTY  
John R. Bean

LIBRARY & ARCHIVES

Date:

**HYDROGRAPHIC TITLE SHEET**

**H13992**

**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): **Massachusetts**

General Locality: **Northern Massachusetts Bay**

Sub-Locality: **Salem Harbor**

Scale: **5000**

Dates of Survey: **08/14/2024 to 03/14/2025**

Instructions Dated: **08/01/2024**

Project Number: **OPR-A325-KR-24**

Field Unit: **Ocean Surveys**

Chief of Party: **John R. Bean**

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:**

*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 19N, 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 H13992

Project: OPR-A325-KR-24

Locality: Northern Massachusetts Bay

Sublocality: Salem Harbor

Scale: 1:5000

August 2024 - March 2025

**Ocean Surveys**

Chief of Party: John R. Bean

### A. Area Surveyed

This survey provides hydrographic data for waters in Northern Massachusetts Bay. The general locations of the survey limits are presented in Table 1.

#### A.1 Survey Limits

Data were acquired within the following survey limits:

Northwest Limit	Southeast Limit
42° 34' 28.24" N 70° 54' 50.09" W	42° 26' 40.25" N 70° 41' 56.11" W

*Table 1: Survey Limits*

Survey limits were acquired in accordance with the requirements in the Project Instructions and the HSSD.

#### A.2 Survey Purpose

The waters in and around the ports of Boston and Gloucester in Northern Massachusetts Bay are some of the most heavily used in the US by commercial and recreational boating traffic. The Port of Boston sees more than 16 million tons of cargo movement annually\*, and thousands of vessels travel into, out of, and within Boston Harbor every year. Boston, Gloucester and Rockport are also major fishing ports, with average yearly landings of over 40 million pounds worth over \$80 million\*\*.

This project will also provide an analysis of the feasibility of using inshore bathymetric lidar data for identifying and updating features, in concert with new multibeam sonar data collection.

The prior survey data in much of the survey area is over 20 years old, and several areas have data that is from the 1940s. The survey area has an extensive coastline, and has been heavily trafficked by humans for almost 400 years; there have been extensive and poorly documented effects and changes to the seafloor by human activity\*\*\*. This survey will address this by collecting modern high resolution bathymetry for updating NOAA nautical charting products improving the safety of maritime traffic and commerce as well as supporting the Seabed 2030 global mapping initiative. Survey data from this project is intended to supersede all prior survey data in the common area.

\*Massachusetts Port Authority Statistics 2022

\*\*2022 NMFS Landing Statistics <https://www.fisheries.noaa.gov/national/sustainable-fisheries/commercial-fisheries-landings>

\*\*\*<https://www.sec.state.ma.us/divisions/cis/historical/historical-sketch.htm>  
and <https://stellwagen.noaa.gov/maritime/maritimehistory.html>

### A.3 Survey Quality

The entire survey is adequate to supersede previous data.

### 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 within ACHARE feature in PRF	Object Detection Coverage (Refer to HSSD Section 5.2.2.2)
All Other Waters in Survey Area	Complete Coverage (Refer to HSSD Section 5.2.2.3)

*Table 2: Survey Coverage*

Survey coverage was in accordance with the requirements listed above and in the HSSD.

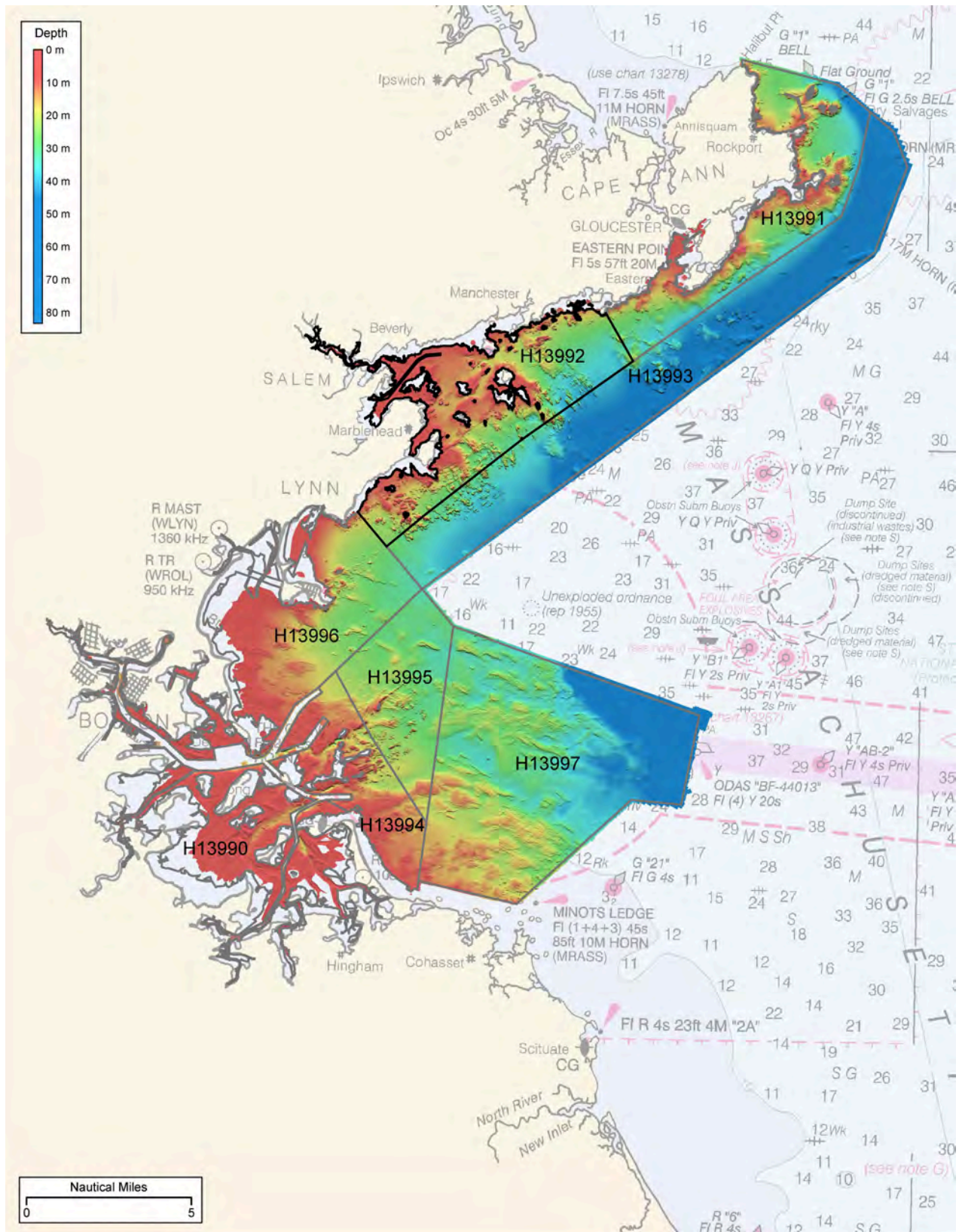


Figure 1: Project OPR-A325-KR-24 coverage with H13992 emphasized.

## A.6 Survey Statistics

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

	<b>HULL ID</b>	<i>RV South Cove</i>	<i>RV Twister</i>	<i>RV West Cove II</i>	<i>Total</i>
<b>LNM</b>	<b>SBES Mainscheme</b>	0.0	0.0	0.0	0.0
	<b>MBES Mainscheme</b>	835.0	11.2	695.0	1541.2
	<b>Lidar Mainscheme</b>	0.0	0.0	0.0	0.0
	<b>SSS Mainscheme</b>	0.0	0.0	0.0	0.0
	<b>SBES/SSS Mainscheme</b>	0.0	0.0	0.0	0.0
	<b>MBES/SSS Mainscheme</b>	0.0	0.0	0.0	0.0
	<b>SBES/MBES Crosslines</b>	69.8	0.0	0.0	69.8
	<b>Lidar Crosslines</b>	0.0	0.0	0.0	0.0
<b>Number of Bottom Samples</b>				0	
<b>Number Maritime Boundary Points Investigated</b>				0	
<b>Number of DPs</b>				0	
<b>Number of Items Investigated by Dive Ops</b>				0	
<b>Total SNM</b>				25.6	

Table 3: Hydrographic Survey Statistics

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

<b>Survey Dates</b>	<b>Day of the Year</b>
08/14/2024	227
08/15/2024	228
08/16/2024	229
08/17/2024	230
08/18/2024	231
08/19/2024	232
08/20/2024	233
08/21/2024	234
08/22/2024	235
08/23/2024	236
08/24/2024	237
08/25/2024	238
08/26/2020	239
08/27/2024	240
08/28/2024	241
08/29/2024	242
08/30/2024	243
09/04/2024	248
09/05/2024	249
09/06/2024	250
09/07/2024	251
11/20/2024	325
11/21/2024	326
11/22/2024	327
11/23/2024	328
03/12/2025	71
03/13/2025	72
03/14/2025	73

*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:

<b>Hull ID</b>	<i><b>RV South Cove</b></i>	<i><b>RV Twister</b></i>	<i><b>RV West Cove II</b></i>
<b>LOA</b>	9.4 meters	9.4 meters	12.8 meters
<b>Draft</b>	0.8 meters	0.8 meters	1.4 meters

*Table 5: Vessels Used*



*Figure 2: RV South Cove configured for survey operations.*



*Figure 3: RV Twister configured for survey operations.*



*Figure 4: RV West Cove II configured for survey operations.*

### **B.1.2 Equipment**

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

<b>Manufacturer</b>	<b>Model</b>	<b>Type</b>
Teledyne RESON	SeaBat T50-R	MBES
Applanix	POS MV 320 v5	Positioning and Attitude System
Trimble	NetR9	Positioning System
AML Oceanographic	Micro SV-Xchange	Sound Speed System
AML Oceanographic	AML-3 LGR	Conductivity, Temperature, and Depth Sensor
Velodyne LiDAR	VLP-16	Lidar System

*Table 6: Major Systems Used*

## **B.2 Quality Control**

### **B.2.1 Crosslines**

Crossline mileage in H13992 totaled 4.5% of the mainscheme survey miles. Agreement between crosslines and mainscheme bathymetry was very good, with a mean difference of 0.01m in the 50cm resolution surface.

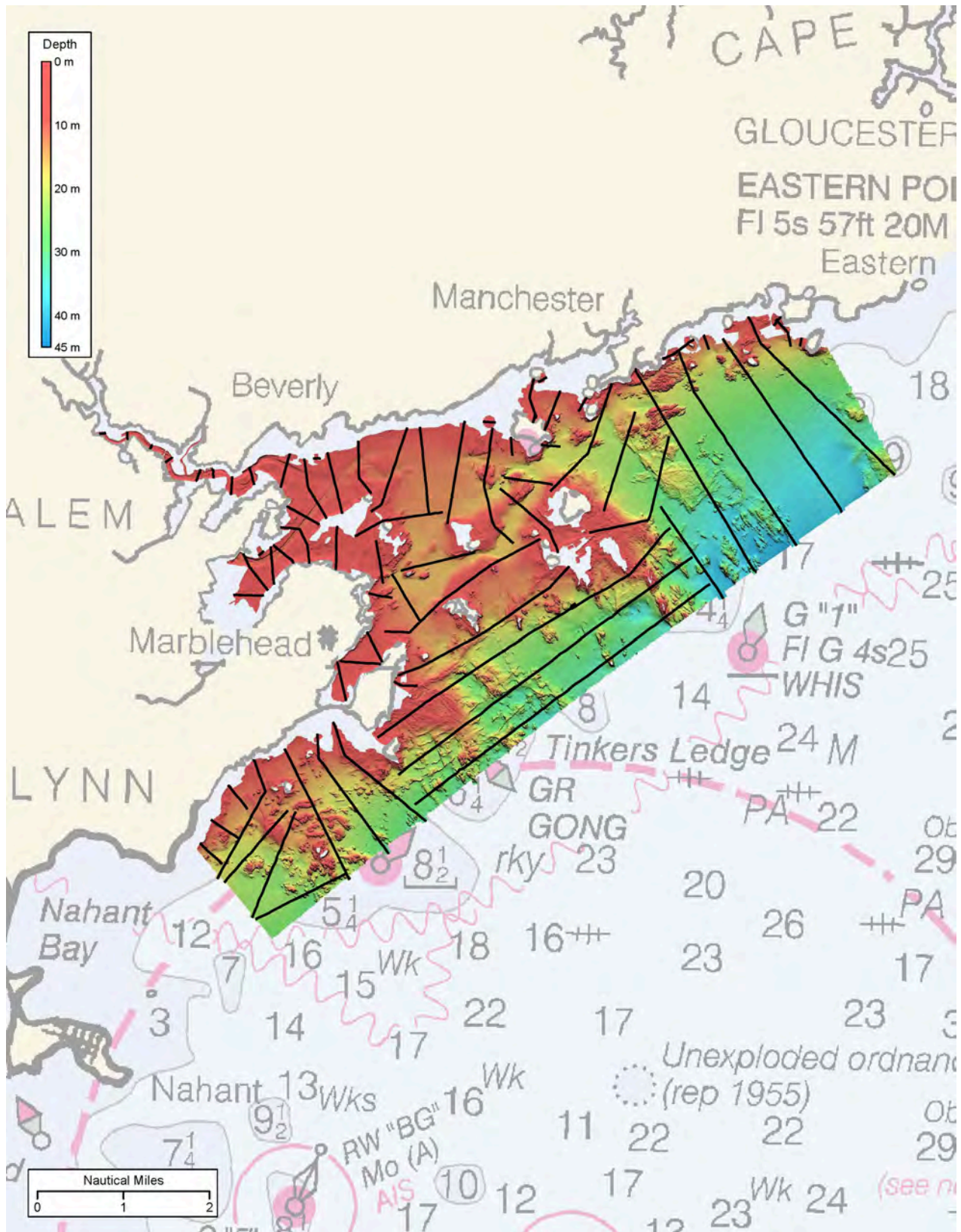


Figure 5: Crossline tracks overlaid on a coverage surface.

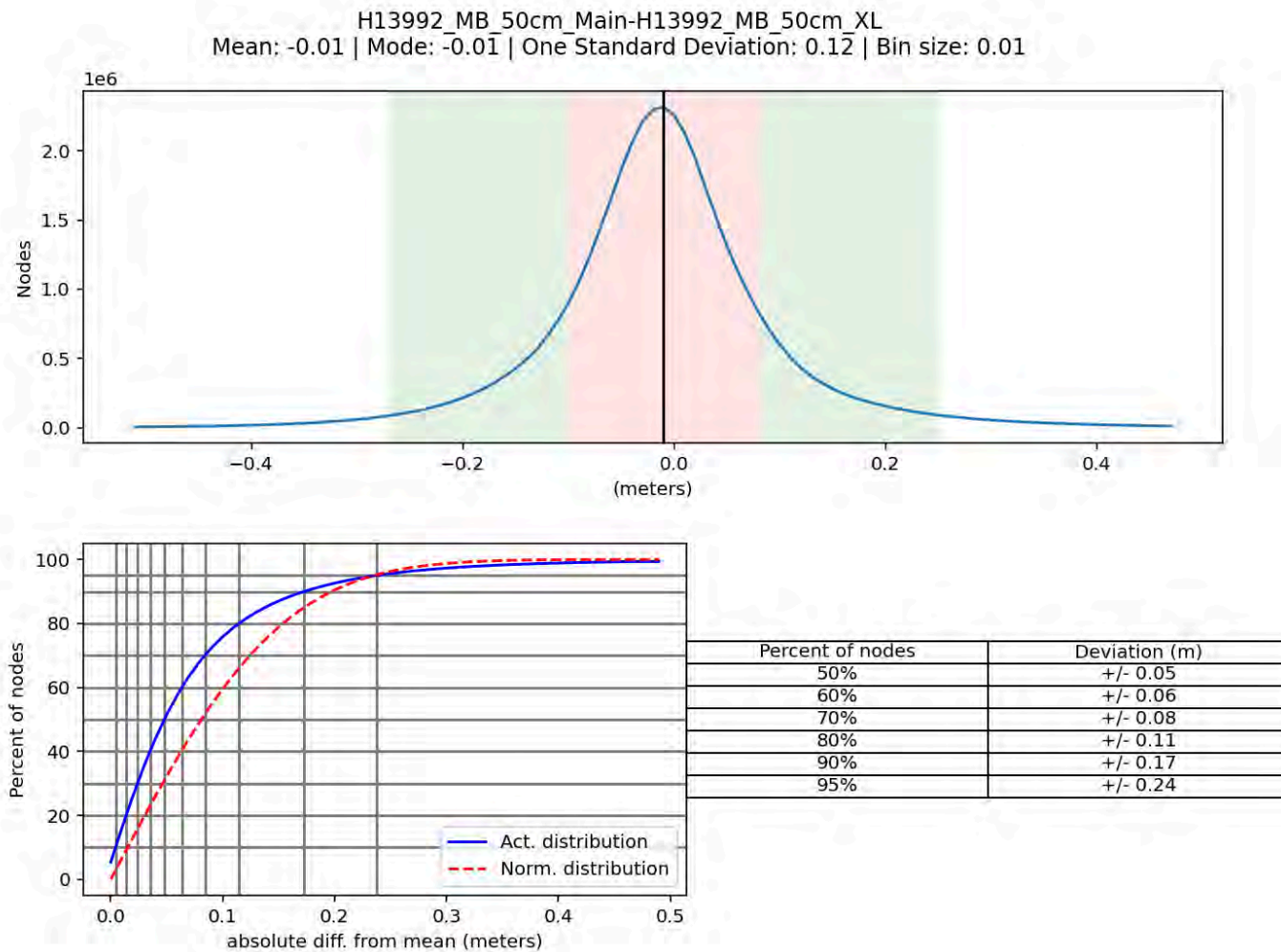


Figure 6: Depth differences between mainscheme and crossline data.

### B.2.2 Uncertainty

The following survey specific parameters were used for this survey:

Method	Measured	Zoning
ERS via VDATUM	N/A	0.13 meters

Table 7: Survey Specific Tide TPU Values.

Hull ID	Measured - CTD	Measured - MVP	Measured - XBT	Surface
RV South Cove	4 meters/second	N/A	N/A	2 meters/second
RV Twister	4 meters/second	N/A	N/A	2 meters/second
RV West Cove II	4 meters/second	N/A	N/A	2 meters/second

Table 8: Survey Specific Sound Speed TPU Values.

The NOAA Pydro QC Tools application was used to calculate TVU QC, determined by a ratio of uncertainty to the allowable error per NOAA and IHO specification. A set of surfaces was finalized in CARIS HIPS using the "uncertainty" option to select the combination of a priori and realtime uncertainty estimates as the surface TVU source. The surfaces represented areas of object detection coverage or complete multibeam coverage at different resolutions as appropriate for the water depths, and all surfaces passed the uncertainty check, with at least 98% of nodes meeting the uncertainty standards. Histograms are shown for the 50cm object detection coverage and the 2m complete coverage surface, which were the resolutions that covered the largest survey area for their respective coverage types.

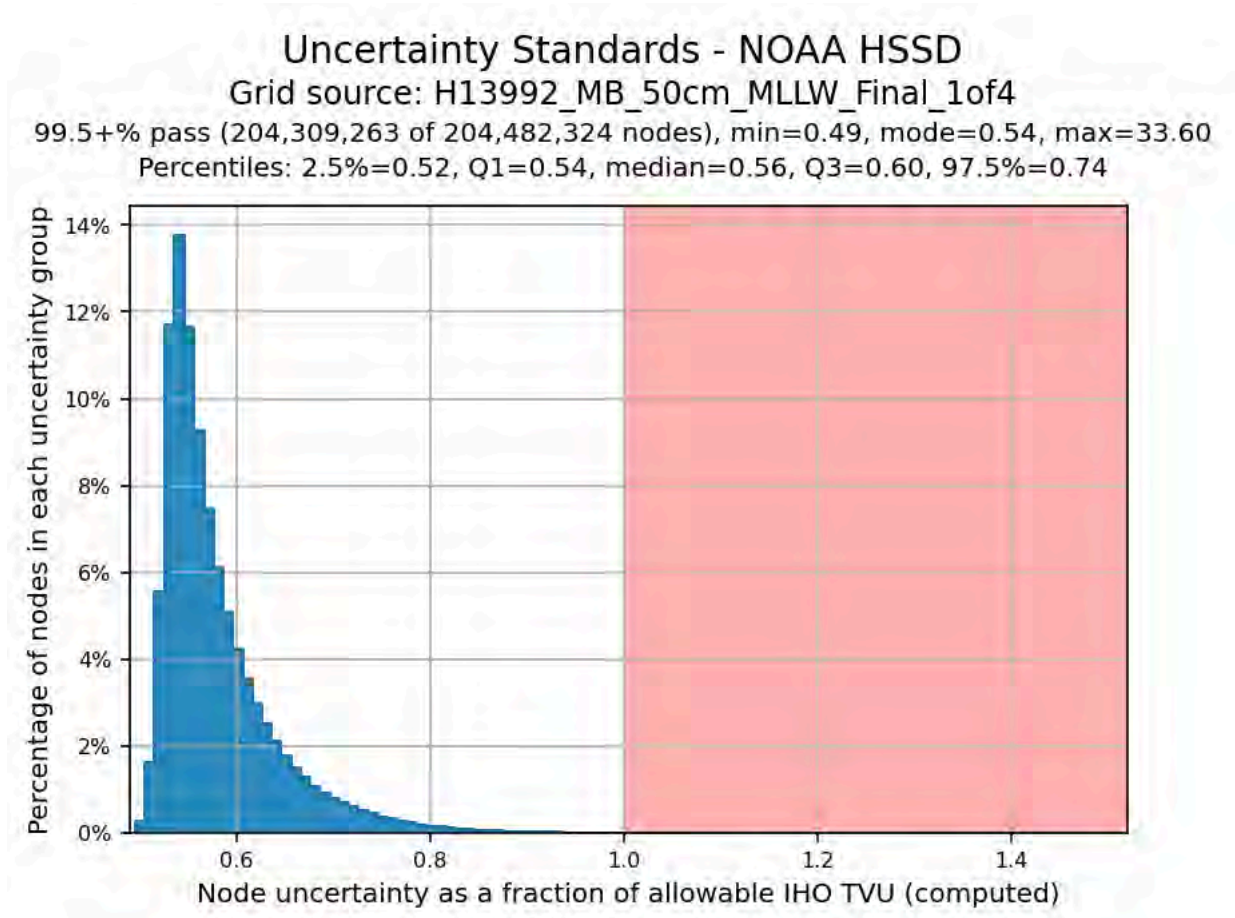
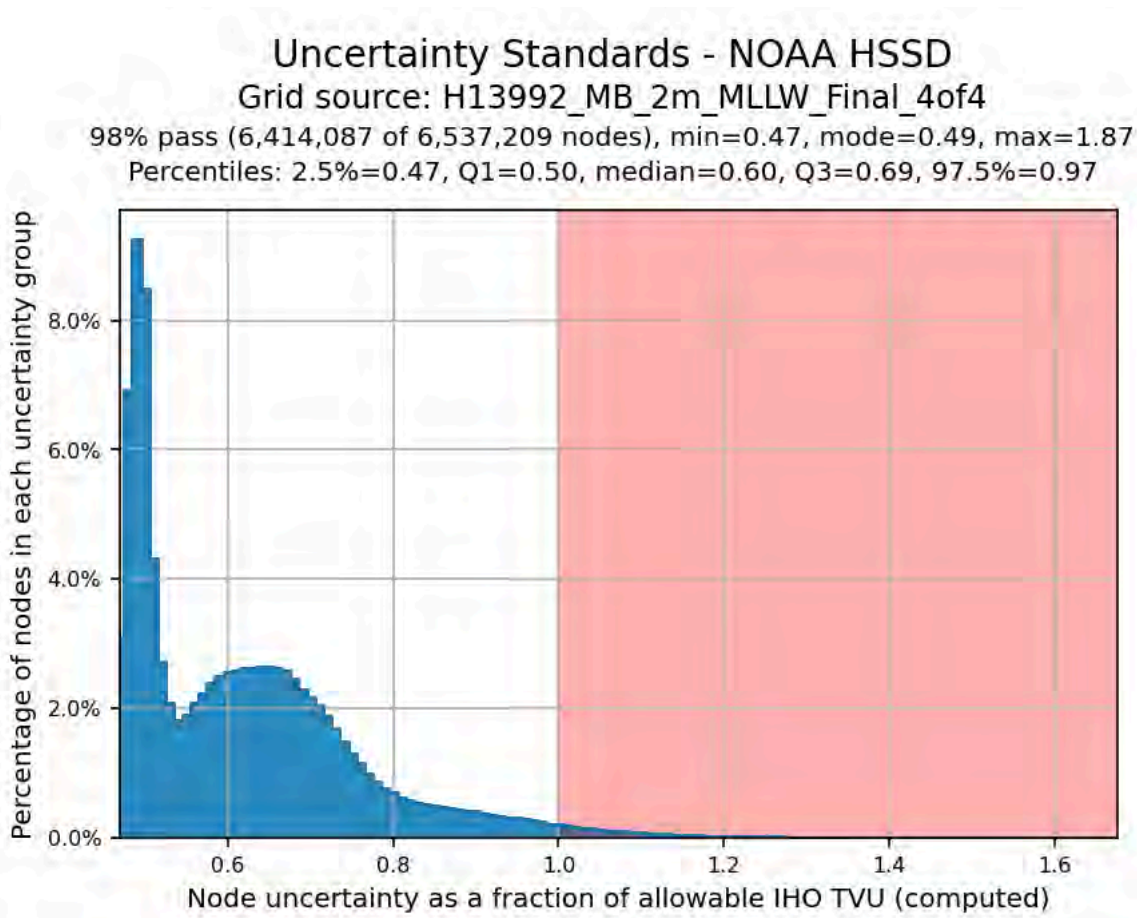


Figure 7: Uncertainty standards, 50cm object detection coverage.



*Figure 8: Uncertainty standards, 2m complete coverage.*

### **B.2.3 Junctions**

Junction analysis was assigned for a lidar survey that was under review at the time of the PI, and contemporary surveys junction with the northeastern, southeastern, and southwestern edges of H13992.

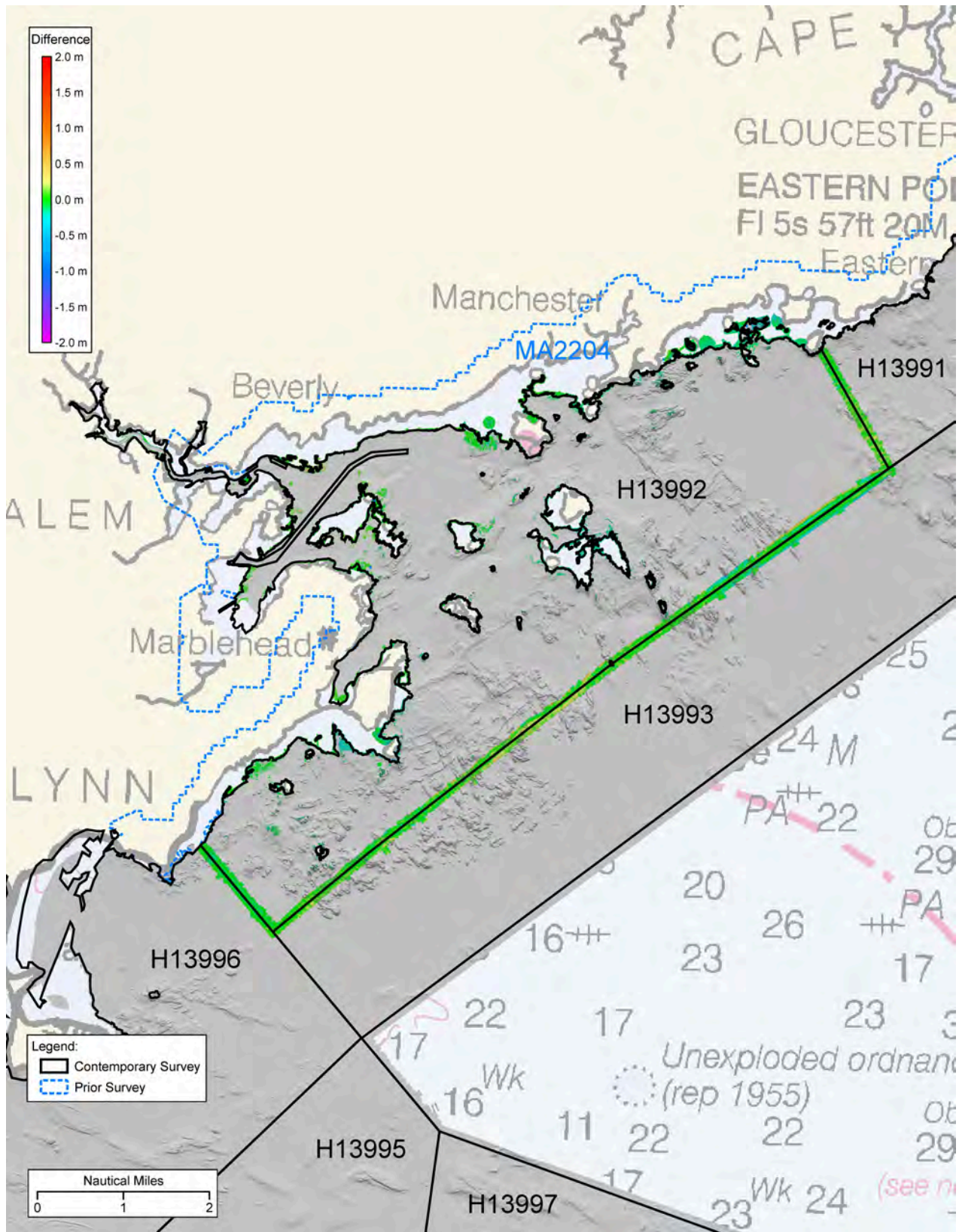


Figure 9: H13992 junction map with junction area depth differences.

The following junctions were made with this survey:

Registry Number	Scale	Year	Field Unit	Relative Location
MA2204	1:1	2021	NOAA RSD	N
H13991	1:5000	2025	OSI	NE
H13993	1:5000	2024	OSI	SE
H13996	1:5000	2025	OSI	SW

*Table 9: Junctioning Surveys*

#### MA2204

Preliminary lidar data were provided to OSI and used to perform the junction analysis. Data from MA2204 junctions with the inshore western areas of H13992. Agreement between the two surveys was good, with a mean difference of 0.11m. Areas of flat bathymetry had the best agreement, where rocky areas showed greater differences. Differences were also seen in cases where OSI surveyed bathymetry beneath docks or piers and the lidar elevation represented the top of these structures.

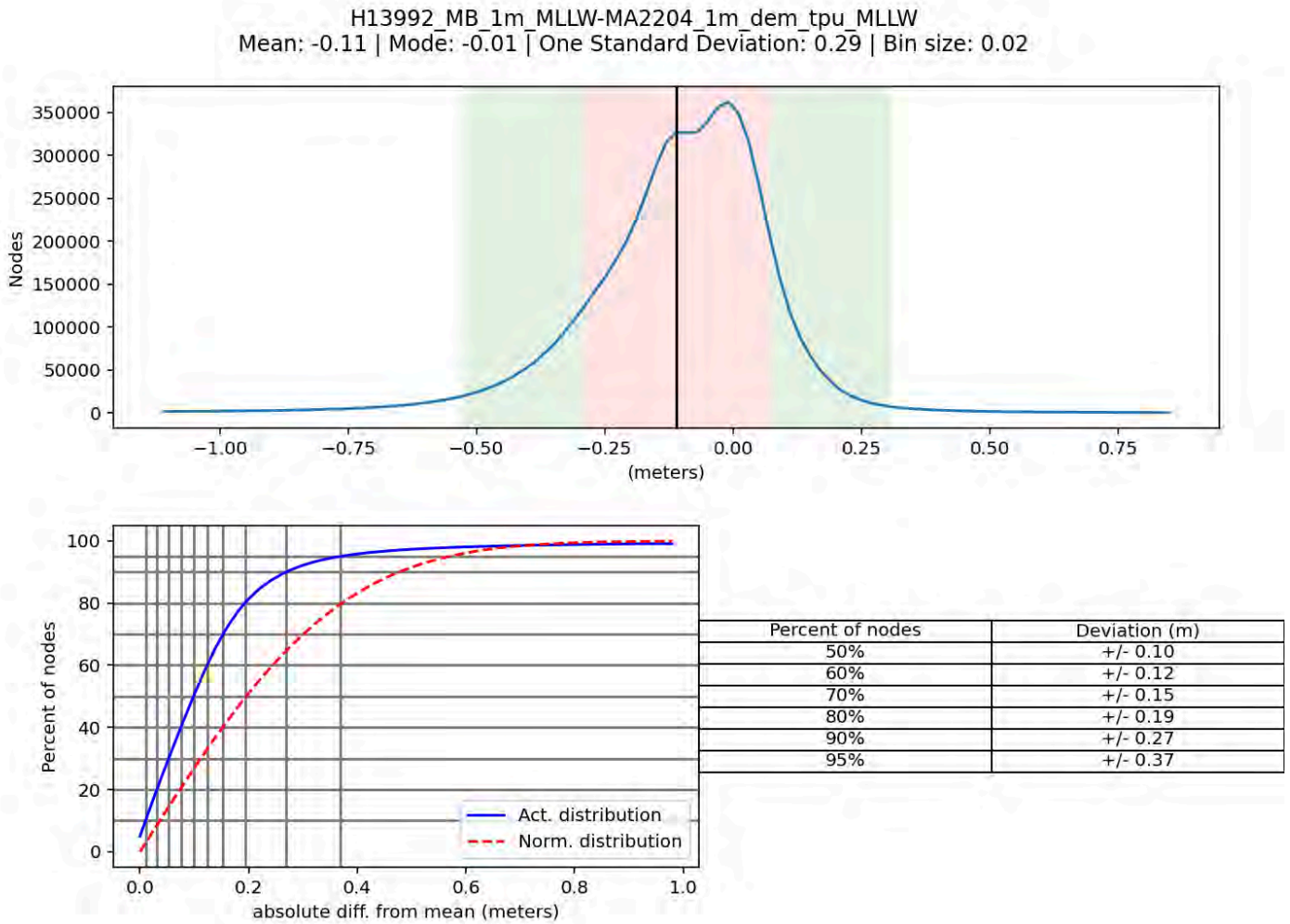


Figure 10: Depth differences between H13992 and MA2204.

H13991

The northeast edge of H13992 abuts H13991, with a shared border of approximately 3.3 km. The northern end of the junction area is in the rocky area surrounding Kettle Island and shows greater depth differences on the rocks, and depth differences were also more pronounced at the trackline edges in outer beam data. Agreement between the two surveys was still good, with a mean difference of 0.07m.

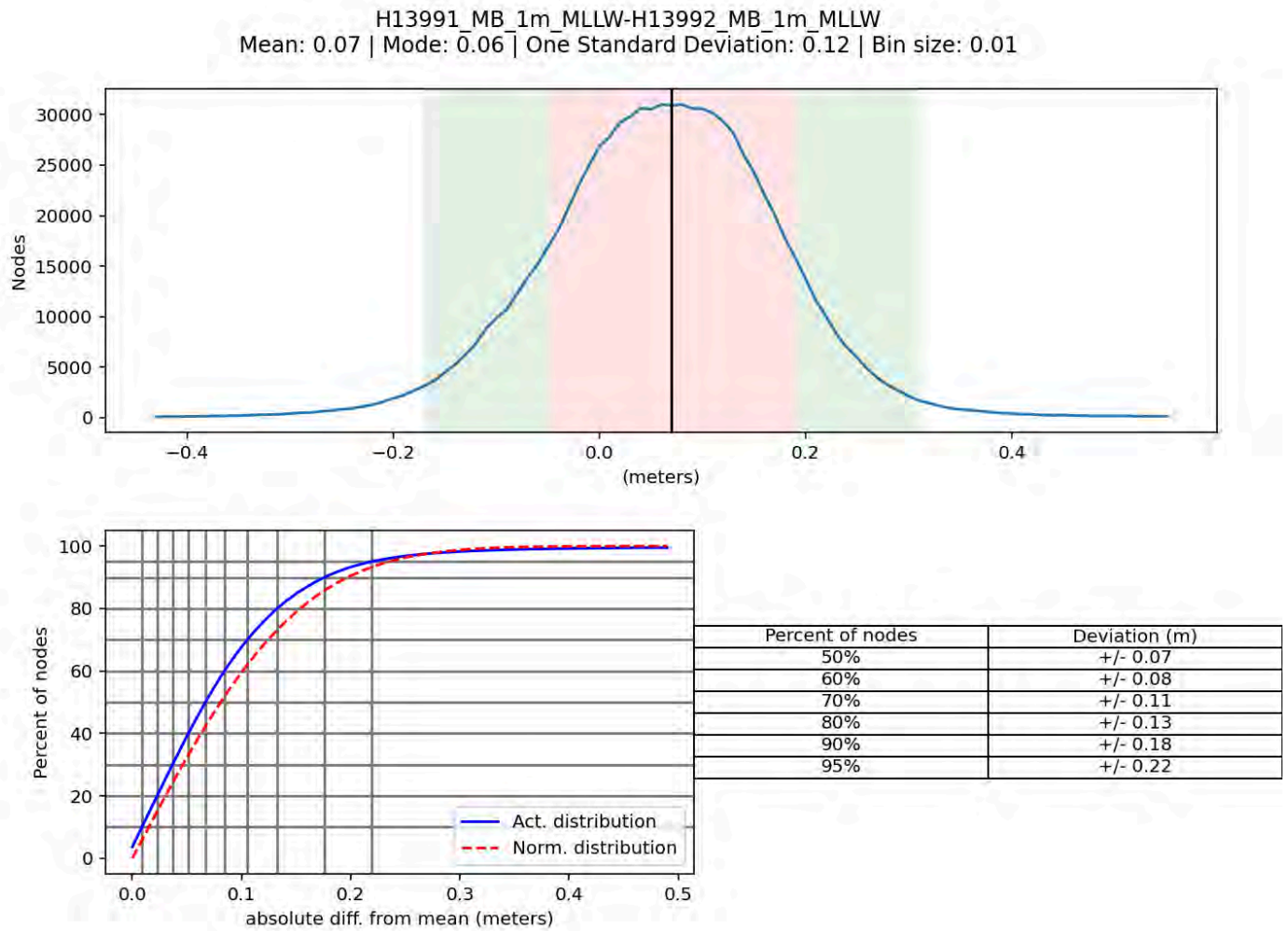


Figure 11: Depth differences between H13991 and H13992.

### H13993

The long southeastern edge of H13992 junctions with H13993, with a shared border of approximately 17.6 km. The junction area covers several rocky areas and ledges, where depth discrepancies were higher, and outer beam data in the deeper waters also showed greater differences between the two surveys. However most of the junction had good agreement, with an average depth difference of 0.03m.

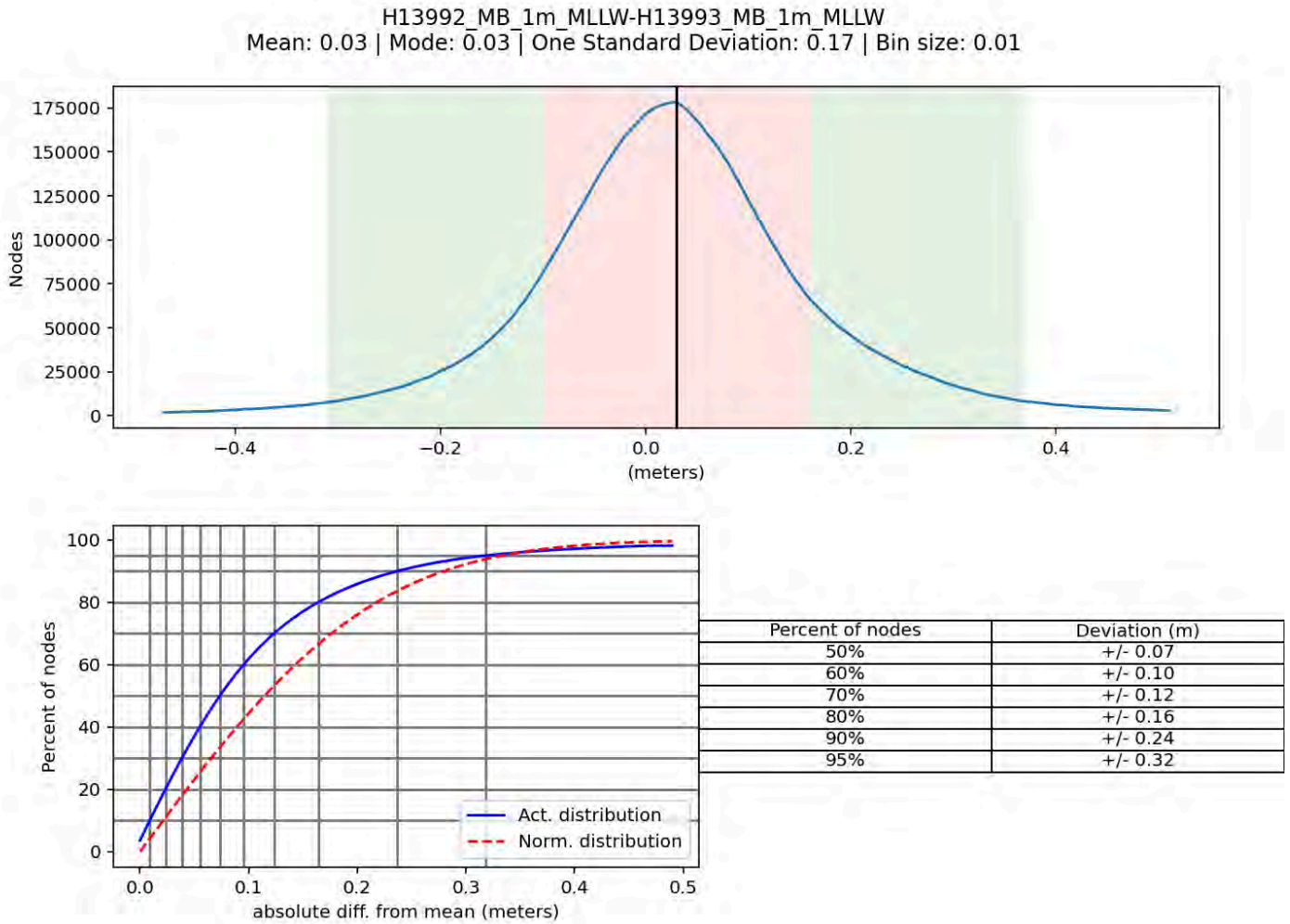


Figure 12: Depth differences between H13992 and H13993.

H13996

The southwest edge of H13992 junctions with H13996, with a shared border of approximately 2.7 km. Depth differences were greatest at the northern end of the boundary, near the rocky coast. Agreement between the two surveys was very good, with a mean difference of 0.04m.

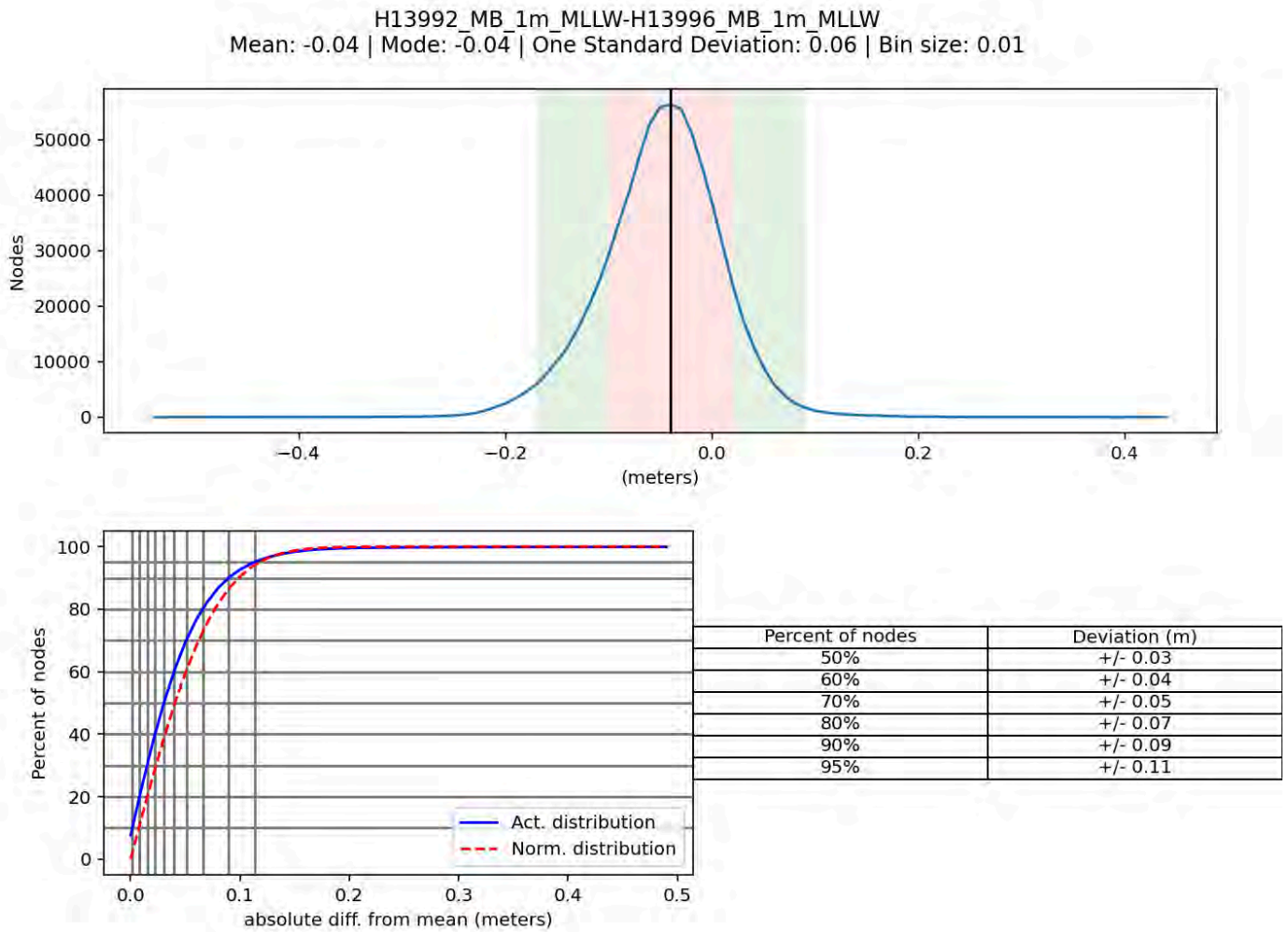


Figure 13: Depth differences between H13992 and H13996.

### 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**

### Sound Speed Variation

Sound speed variations were observed throughout the survey area, correlating to factors including the tide, weather, water depth, and bathymetric features, such as slopes or sand waves. In data processing, sound speed profiles that did not adequately reflect the surrounding water mass were identified and removed, edited, or replaced. Sound speed casts were primarily applied using the CARIS HIPS "Nearest in Distance within Time" method, therefore, removing a profile collected on a steep slope would allow deeper and shoaler casts on either side to be applied instead. Casts that were empirically found to represent a large water zone were added at additional locations within that zone to ensure proper corrections given the cast selection options available in the CARIS sound speed tools. Bathymetry, uncertainty, and standard deviation surfaces were used to direct editing and determine the accuracy of sound speed cast selection.

## **B.2.7 Sound Speed Methods**

Sound Speed Cast Frequency: RV South Cove and RV West Cove II acquired AML3 casts at intervals of approximately 60 minutes, and RV Twister acquired AML3 casts at intervals of approximately 40 minutes.

Hydrographers acquired more frequent sound speed profiles if high variability was noted in the surface sound speed from the AML Micro-X installed on the head of the transducer, or when the surface sound speed comparison threshold was exceeded (>2m/s change) between the profile reading at the draft of the transducer and the Micro-X.

OSI submitted a data package titled "SOUND VELOCITY collected from MV Northstar Challenger, RV North Cove, RV South Cove, RV Twister, and RV West Cove II in North Atlantic Ocean, Northern Massachusetts Bay from 2024-08-03 to 2025-03-28" in NetCDF format to the National Centers for Environmental Information (NCEI) on May 5, 2025.

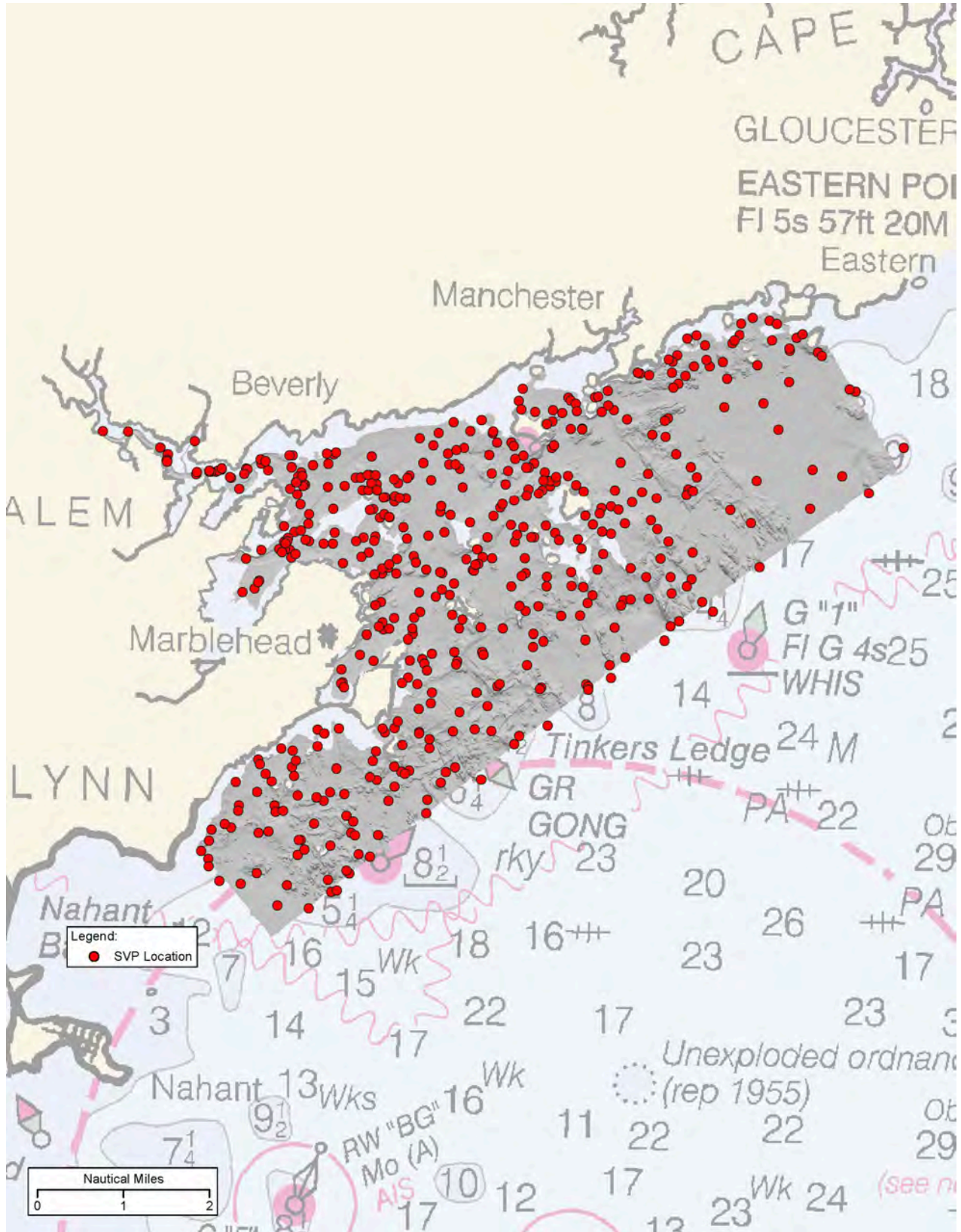


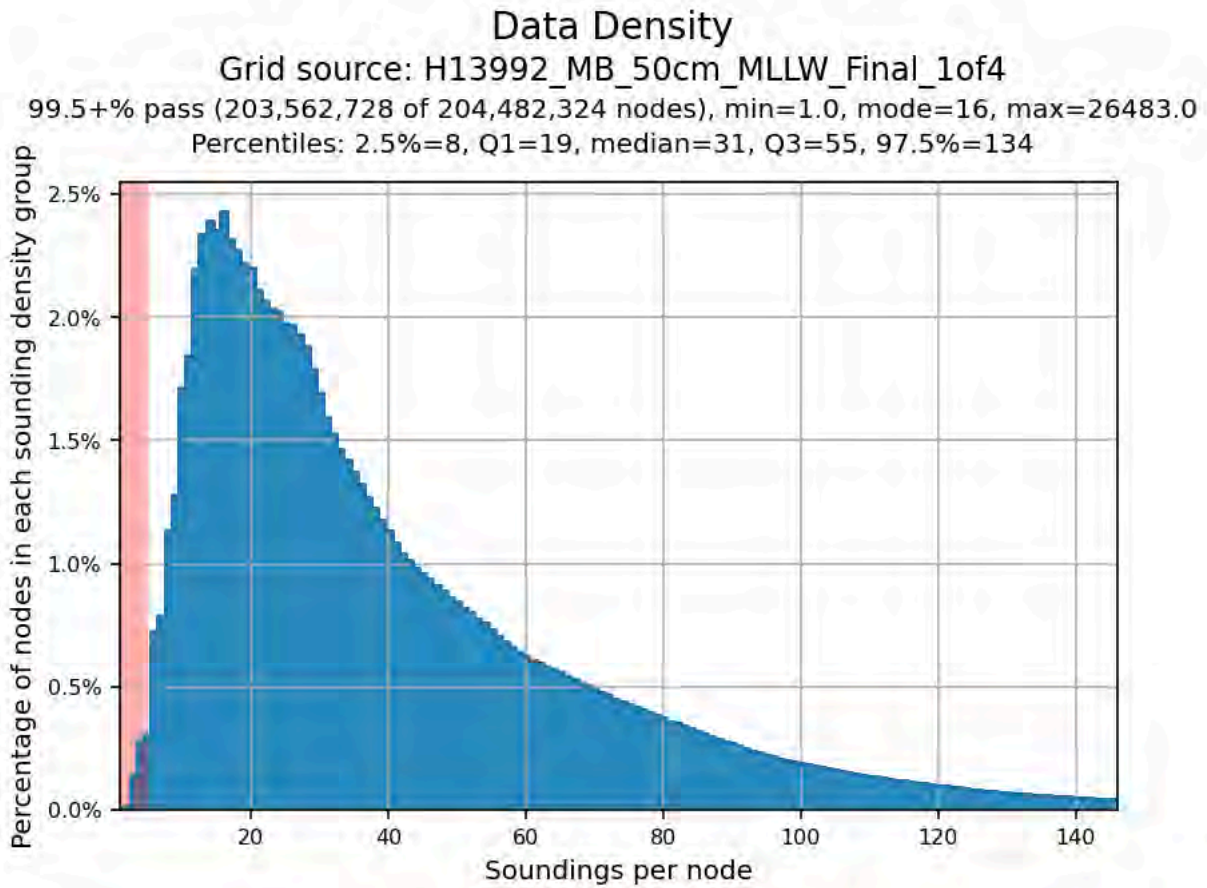
Figure 14: H13992 Sound speed cast locations.

### **B.2.8 Coverage Equipment and Methods**

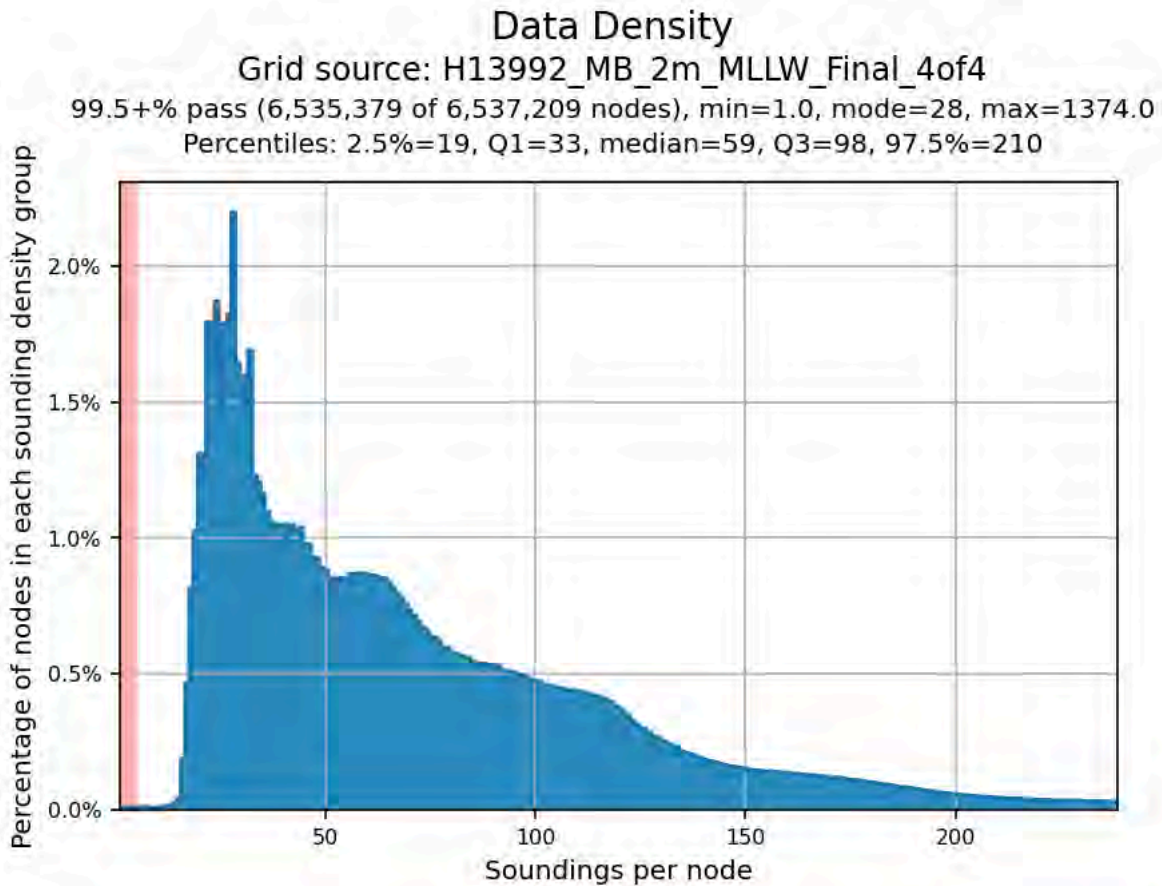
The majority of this survey was conducted to achieve Object Detection Coverage with multibeam, as specified in HSSD 5.2.2.2, Option A. Portions of the survey outside the assigned Object Detection areas as defined in the PRF were instead conducted to achieve Complete Coverage with multibeam, as specified in HSSD 5.2.2.3, Option A. The survey methods used to meet coverage requirements did not deviate from those described in the DAPR.

Object Detection holidays are present in the 50cm resolution surface, primarily in crevices of rocky areas or on the sides of individual rocks. In one such case, the top of the rock was not captured and was not investigated further for the sake of survey vessel safety. No other holidays are present over the tops of features or other areas of potential navigational significance.

The NOAA Pydro QC Tools application was used to verify that the multibeam data met the density coverage requirements for each of the finalized grids submitted for the survey. All surfaces passed the density check, which requires 95% of nodes to be populated with at least 5 soundings. Histograms are shown for the 50cm object detection coverage and the 2m complete coverage surface, which were the resolutions that covered the largest survey area for their respective coverage types.



*Figure 15: Data density, 50cm resolution object detection coverage.*



*Figure 16: Data density, 2m resolution complete coverage.*

## 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.

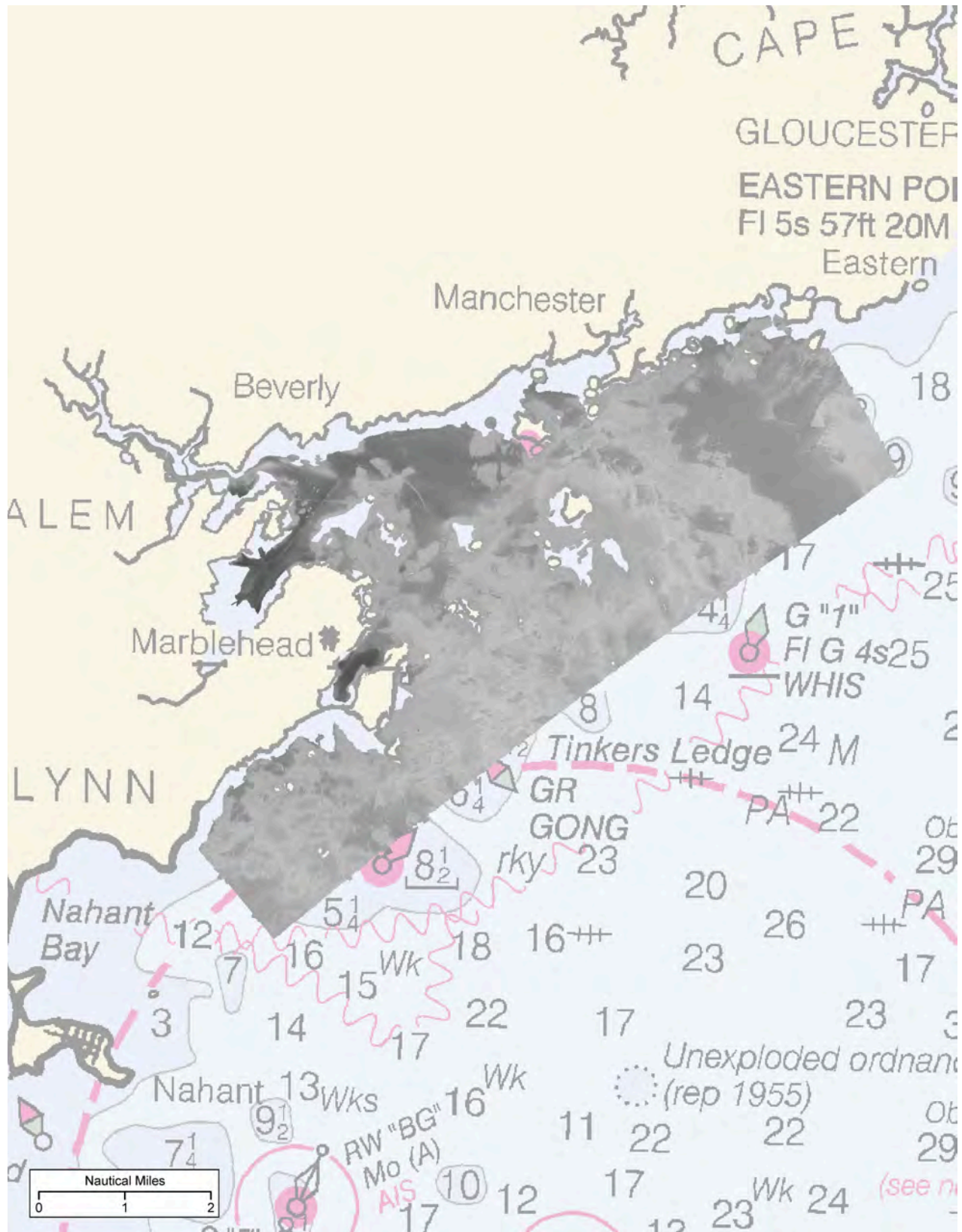


Figure 17: H13992 multibeam backscatter mosaic.

## B.5 Data Processing

### B.5.1 Primary Data Processing Software

The following Feature Object Catalog was used: NOAA Profile Version 2024.

### 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
H13992_MB_50cm_MLLW_Final_1of4	CARIS Raster Surface (CUBE)	0.5 meters	-1.8 meters - 20.0 meters	NOAA_0.5m	Object Detection
H13992_MB_1m_MLLW_Final_2of4	CARIS Raster Surface (CUBE)	1 meters	18.0 meters - 35.6 meters	NOAA_1m	Object Detection
H13992_MB_1m_MLLW_Final_3of4	CARIS Raster Surface (CUBE)	1 meters	1.0 meters - 20.0 meters	NOAA_1m	Complete MBES
H13992_MB_2m_MLLW_Final_4of4	CARIS Raster Surface (CUBE)	2 meters	18.0 meters - 43.9 meters	NOAA_2m	Complete MBES
H13992_MB_50cm_MLLW_1of3	CARIS Raster Surface (CUBE)	0.5 meters	-1.8 meters - 44.0 meters	NOAA_0.5m	Source
H13992_MB_1m_MLLW_2of3	CARIS Raster Surface (CUBE)	1 meters	-1.7 meters - 44.0 meters	NOAA_1m	Source
H13992_MB_2m_MLLW_3of3	CARIS Raster Surface (CUBE)	2 meters	-1.7 meters - 43.9 meters	NOAA_2m	Source
H13992_MBAB_2m_400kHz_1of1	MB Backscatter Mosaic	2 meters	-	N/A	Processed Backscatter

Table 10: Submitted Surfaces

The unfinalized csar surfaces are sources containing both object detection and complete coverage areas. After finalization in CARIS, the surfaces were modified using the CARIS coverage extraction tool to clip their boundaries such that they include the appropriate object detection or complete coverage areas only.

The finalized surfaces are numbered 1-4, with object detection coverage listed first (1of4, 2of4) followed by complete coverage surfaces (3of4, 4of4). The CARIS files delineating the different coverage areas that were used for the extraction are included in Supporting Data.

Although the surveyed depths in the 2m resolution complete coverage surface exceed the maximum depth limit of 40m for that resolution, an additional surface of 4m resolution for the deepest area was not included. The total area deeper than 40m was less than 1% of the survey area and the data density of the 2m resolution surface in this area passed the density check, with 99.5% of the grid nodes populated by at least 5 soundings.

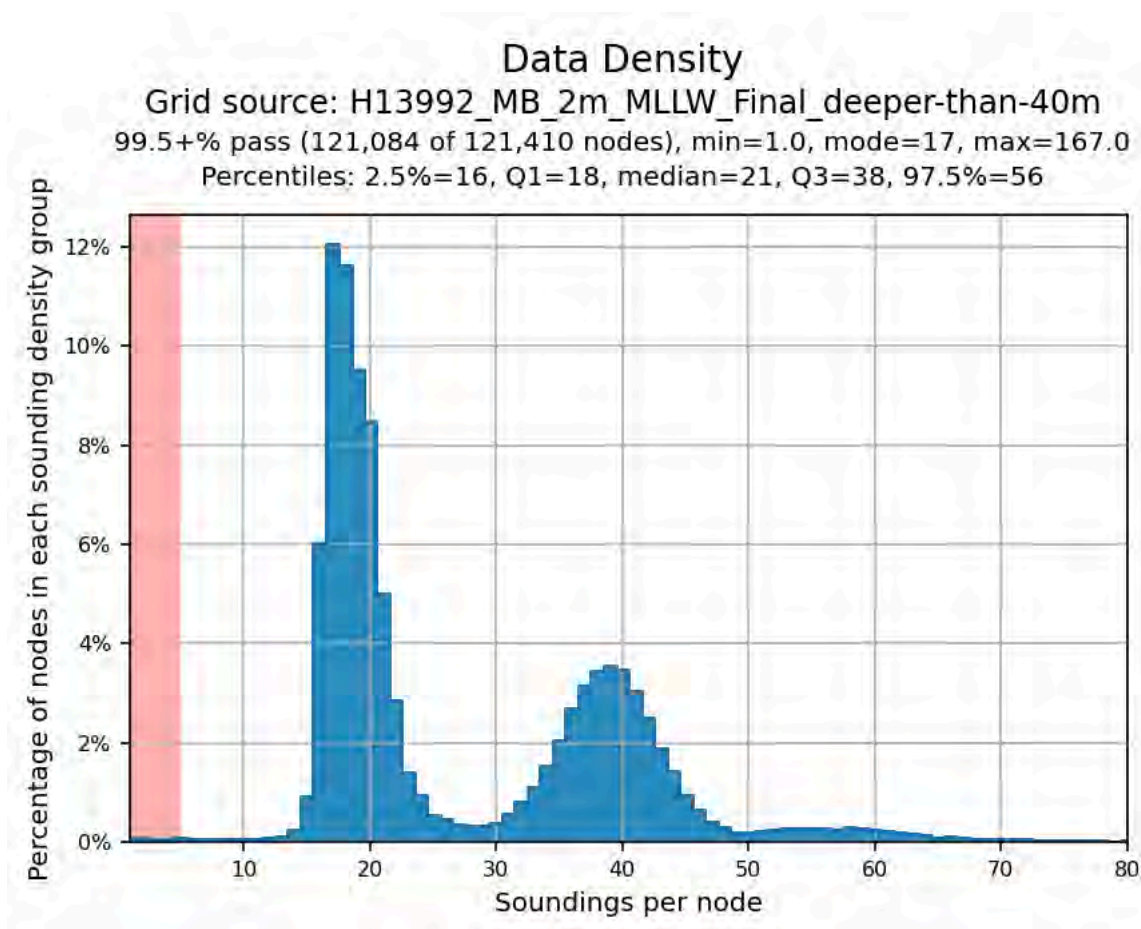


Figure 18: Data density, 2m resolution surface of areas deeper than 40m.

## C. Vertical and Horizontal Control

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

### 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-A325-KR-24_NAD83(2011)-MHW.csar OPR-A325-KR-24_NAD83(2011)-MLLW.csar

*Table 11: ERS method and SEP file*

### C.2 Horizontal Control

The horizontal datum for this project is North American Datum 1983 (2011).

The projection used for this project is Universal Transverse Mercator (UTM) Zone 19.

The following PPK methods were used for horizontal control:

- Smart Base
- Single Base

The following CORS Stations were used for horizontal control:

<b>HVCR Site ID</b>	<b>Base Station ID</b>
Milton	MAMI
Plymouth	MAPL
Salisbury	MASA
Tewksbury	MATB
Truro	MATU
Wrentham	MAWR
Gorham	MEGO
Rockland	MERO
U New Hampshire	NHUN
Westford	WES2
Boston WAAS 1	ZBW1

*Table 12: CORS Base Stations*

The following user installed stations were used for horizontal control:

<b>HVCR Site ID</b>	<b>Base Station ID</b>
Ocean Surveys Gloucester	OSGL

*Table 13: User Installed Base Stations*

## **D. Results and Recommendations**

### **D.1 Chart Comparison**

### D.1.1 Electronic Navigational Charts

The following are the largest scale ENC's, which cover the survey area:

ENC	Scale	Edition	Update Application Date	Issue Date
US5BOSDF	1:22000	3	02/25/2025	02/25/2025
US5MA1RG	1:12000	3	02/28/2025	02/28/2025
US5MA1RH	1:12000	4	02/28/2025	02/28/2025
US5MA1RI	1:22000	3	02/28/2025	02/28/2025
US5MA1SG	1:12000	5	03/21/2025	03/21/2025
US5MA1SH	1:12000	4	03/21/2025	03/21/2025
US5MA1SI	1:12000	3	03/04/2025	03/04/2025
US5MA1SJ	1:12000	3	03/04/2025	03/04/2025

Table 14: Largest Scale ENC's

### D.1.2 Shoal and Hazardous Features

DTON reports were submitted for 3 shoal rocks, and no other potential hazardous features were found.

### D.1.3 Charted Features

Charted features assigned in H13992 included items that were inshore of NALL or outside the defined survey coverage limits for the vessels on this project. To address these features, OSI undertook an additional task of lidar evaluation as outlined in the PI. Lidar data from survey MA2204, including both a grid and point cloud data, were provided to OSI to use for this additional analysis. Two separate feature files were submitted for this survey; a standard FFF file including features addressed with OSI survey data, and a separate Lidar Final Feature File (LI\_FFF) for features addressed using the provided lidar data.

Features addressed using OSI survey data and documented in the FFF were primarily submerged rocks and obstructions. Some of the assigned docks were within range of vessel-mounted lidar and so were also addressed with OSI survey data. Features documented in the LI\_FFF were primarily rocks, seabed areas of rock, land areas, obstructions, and docks.

#### **D.1.4 Uncharted Features**

The only uncharted submerged feature surveyed in H13992 was an obstruction, found in the search radius of a charted wreck that was not present. Other new features in the FFF consist mostly of repositioned features for charted named rocks and for the rocks submitted as DTONS.

#### **D.1.5 Channels**

The Salem Harbor 32-Foot Channel was surveyed, as was a portion of the Salem Harbor 10-Foot South River Channel. All areas covered by survey data were at or below their charted depths.

### **D.2 Additional Results**

#### **D.2.1 Aids to Navigation**

Marblehead Harbor Fairway is charted as being marked with a series of buoys, which were not present at the time of survey. These absent buoys were reported to the U.S. Coast Guard. All other charted ATONS within the survey area were found at or near their charted positions.

#### **D.2.2 Maritime Boundary Points**

No Maritime Boundary Points were assigned for this survey.

#### **D.2.3 Bottom Samples**

No bottom samples were required for this survey.

#### **D.2.4 Overhead Features**

Bridges and overhead cables are present in the survey and were found to be accurately represented on the charts.

#### **D.2.5 Submarine Features**

The Algonquin Gas Transmission Pipeline crosses the survey area, with one end at the shoreline in Salem and the other continuing off the eastern border of the sheet. The path of the pipeline can be seen at several places in the multibeam data as a mound or trench, but the actual pipeline was not elevated or exposed. There are also 3 sewer pipelines within the survey data, 1 terminating in Manchester Bay and 2 crossing Salem Harbor. The path across Salem Harbor is visible as a trench, but no exposed pipelines were surveyed.

**D.2.6 Platforms**

No platforms exist for this survey.

**D.2.7 Ferry Routes and Terminals**

A seasonal ferry between Boston and Salem may pass through this survey area, but the route is not on the chart.

**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 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.

<b>Approver Name</b>	<b>Approver Title</b>	<b>Approval Date</b>	<b>Signature</b>
John R. Bean	Chief of Party	06/05/2025	Digitally signed by John R. Bean
David T. Somers	Data Processing Manager	06/05/2025	Digitally signed by David T. Somers

## F. Table of Acronyms

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

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

<b>Acronym</b>	<b>Definition</b>
<b>PRF</b>	Project Reference File
<b>PS</b>	Physical Scientist
<b>RNC</b>	Raster Navigational Chart
<b>RTK</b>	Real Time Kinematic
<b>RTX</b>	Real Time Extended
<b>SBES</b>	Singlebeam Echosounder
<b>SBET</b>	Smooth Best Estimate and Trajectory
<b>SNM</b>	Square Nautical Miles
<b>SSS</b>	Side Scan Sonar
<b>SSSAB</b>	Side Scan Sonar Acoustic Backscatter
<b>ST</b>	Survey Technician
<b>SVP</b>	Sound Velocity Profiler
<b>TCARI</b>	Tidal Constituent And Residual Interpolation
<b>TPU</b>	Total Propagated Uncertainty
<b>USACE</b>	United States Army Corps of Engineers
<b>USCG</b>	United States Coast Guard
<b>UTM</b>	Universal Transverse Mercator
<b>XO</b>	Executive Officer
<b>ZDF</b>	Zone Definition File