H13808

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

DESCRIPTIVE REPORT

Type of Survey:	Navigable Area
Registry Number:	H13808

LOCALITY

State(s):	Wisconsin
General Locality:	Southwestern Lake Michigan
Sub-locality:	3 NM East of Milwaukee Pierhead Light

2023

CHIEF OF PARTY
John R. Bean

LIBRARY & ARCHIVES

Date:

U.S. DEPARTMENT OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION	REGISTRY NUMBER:
HYDROGRAPHIC TITLE SHEET	**H13808**

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):	**Wisconsin**
General Locality:	**Southwestern Lake Michigan**
Sub-Locality:	**3 NM East of Milwaukee Pierhead Light**
Scale:	**5000**
Dates of Survey:	**07/24/2023 to 08/24/2023**
Instructions Dated:	**07/07/2023**
Project Number:	**OPR-Y398-KR-23**
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 Low Water Datum IGLD-1985**

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 16N, Low Water Datum IGLD-1985. All references to other horizontal or vertical datums in this report are applicable to the processed hydrographic data provided by the field unit.

Table of Contents

List of Tables

List of Figures

Descriptive Report to Accompany Survey H13808

Project: OPR-Y398-KR-23

Locality: Southwestern Lake Michigan

Sublocality: 3 NM East of Milwaukee Pierhead Light

Scale: 1:5000

July 2023 - August 2023

Ocean Surveys

Chief of Party: John R. Bean

A. Area Surveyed

This survey provides hydrographic data for waters in southwestern Lake Michigan. 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
43° 10' 29.85" N 87° 53' 45.55" W	42° 55' 16.96" N 87° 46' 11.08" 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

This project is located in Southwestern Lake Michigan and extends from northern Milwaukee to the suburbs of northern Chicago. The Port of Milwaukee is the only port on Lake Michigan that serves the Mississippi inland riverway system, which generates over $1M in revenue for the local economy (1). The region experiences high recreational, commercial, and tourism traffic, including cruise ships and ferries. The majority of existing chart data in this survey area predates the 1950s, while the Milwaukee region was last surveyed in the 1970s. Conducting a modern bathymetric survey in this region will provide critical data for updating National Ocean Service (NOS) charting products and services, thus increasing maritime safety for the southern Wisconsin and northern Illinois shorelines.

(1) https://www.freightwaves.com/news/freightwaves-classics-port-of-milwaukee-serves-thegreat-lakes-and-us-inland-waterway-system

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	Complete Coverage (HSSD 5.2.2.3)
UCF-designated anchorage areas	Object Detection Coverage (HSSD 5.2.2.2)

Table 2: Survey Coverage

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

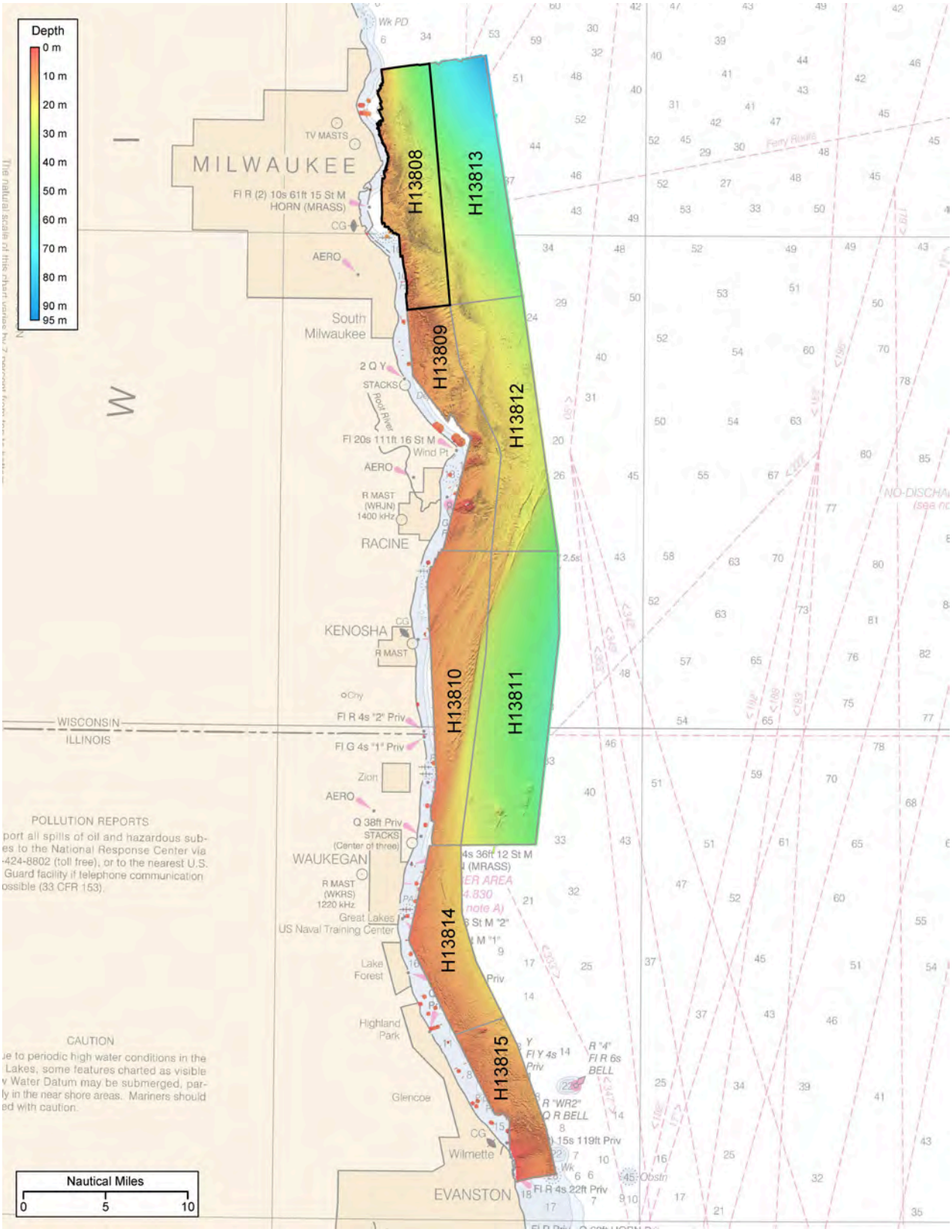


Figure 1: Project OPR-Y398-KR-23 coverage with H13808 highlighted.

A.6 Survey Statistics

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

	HULL ID	*MV Northstar Challenger*	*RV North Cove*	*RV South Cove*	*Total*
LNM	**SBES Mainscheme**	0.0	0.0	0.0	0.0
	MBES Mainscheme	925.0	644.1	0.6	1569.7
	Lidar Mainscheme	0.0	0.0	0.0	0.0
	SSS Mainscheme	0.0	0.0	0.0	0.0
	SBES/SSS Mainscheme	0.0	0.0	0.0	0.0
	MBES/SSS Mainscheme	0.0	0.0	0.0	0.0
	SBES/MBES Crosslines	0.0	70.9	0.0	70.9
	Lidar Crosslines	0.0	0.0	0.0	0.0
Number of Bottom Samples					5
Number Maritime Boundary Points Investigated					0
Number of DPs					0
Number of Items Investigated by Dive Ops					0
Total SNM					48.9

Table 3: Hydrographic Survey Statistics

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

Survey Dates	Day of the Year
07/24/2023	205
07/25/2023	206
07/26/2023	207
07/27/2023	208
07/28/2023	209
07/31/2023	212
08/01/2023	213
08/02/2023	214
08/03/2023	215
08/04/2023	216
08/05/2023	217
08/07/2023	219
08/08/2023	220
08/09/2023	221
08/10/2023	222
08/11/2023	223
08/12/2023	224
08/13/2020	226
08/16/2023	228
08/17/2023	229
08/18/2023	230
08/19/2023	231
08/20/2023	232
08/24/2023	236

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	***MV Northstar Challenger***	***RV North Cove***	***RV South Cove***
LOA	28.0 meters	11.1 meters	9.4 meters
Draft	2.6 meters	0.8 meters	0.8 meters

Table 5: Vessels Used

Figure 2: MV Northstar Challenger configured for survey operations.

Figure 3: RV North Cove configured for survey operations.

Figure 4: RV South Cove configured for survey operations.

B.1.2 Equipment

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

Manufacturer	Model	Type
Teledyne RESON	SeaBat T50-R	MBES
Applanix	POS MV 320 v5	Positioning and Attitude System
Trimble	NetR9	Positioning System
AML Oceanographic	AML-3 LGR	Conductivity, Temperature, and Depth Sensor
AML Oceanographic	MVP30-350	Conductivity, Temperature, and Depth Sensor
AML Oceanographic	MVP30	Conductivity, Temperature, and Depth Sensor
AML Oceanographic	Micro SV-Xchange	Sound Speed System

Table 6: Major Systems Used

B.2 Quality Control

B.2.1 Crosslines

Crossline mileage in H13808 totaled 4.5% of the mainscheme survey miles. Agreement between crosslines and mainscheme bathymetry was very good, with a mean difference of 0.02m in the 2m resolution surface.

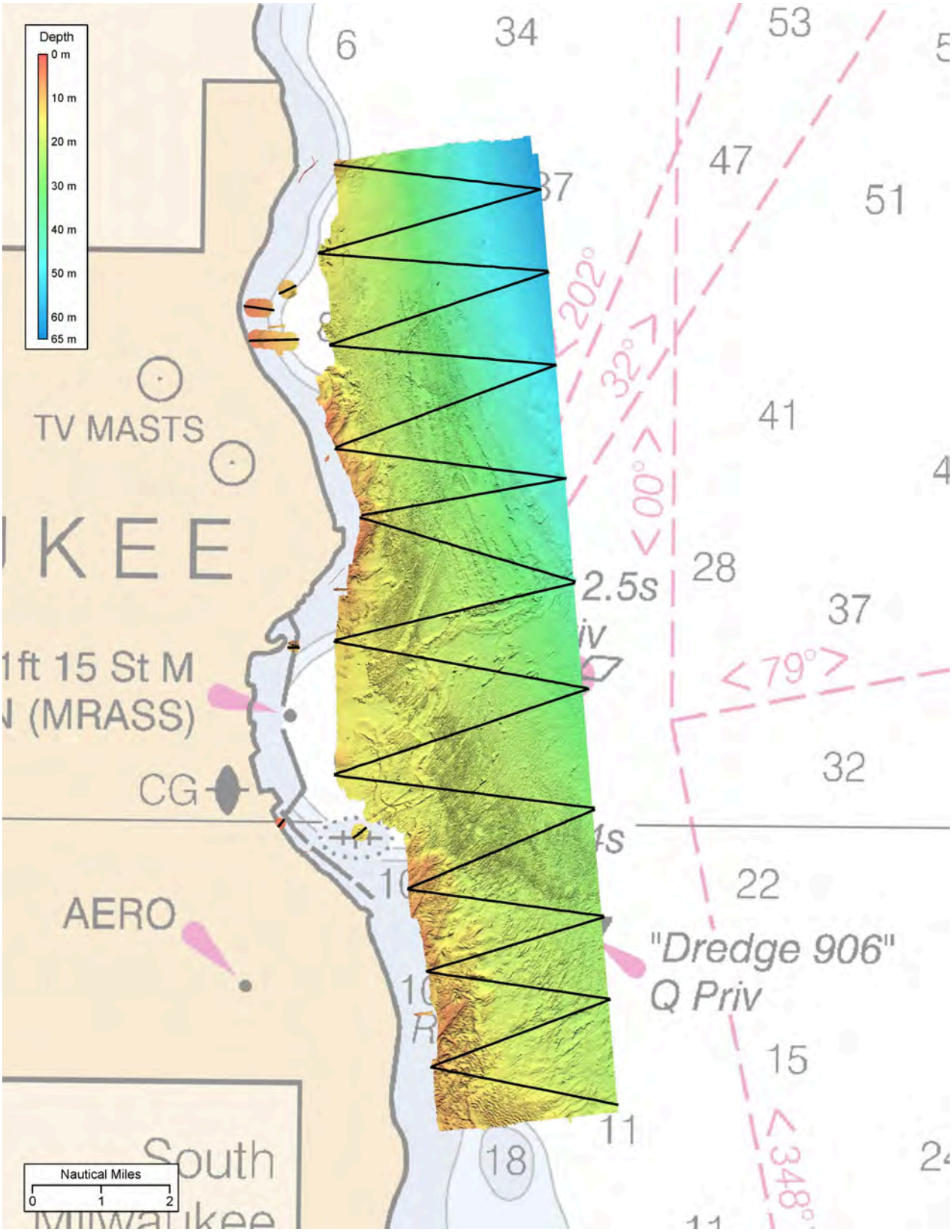
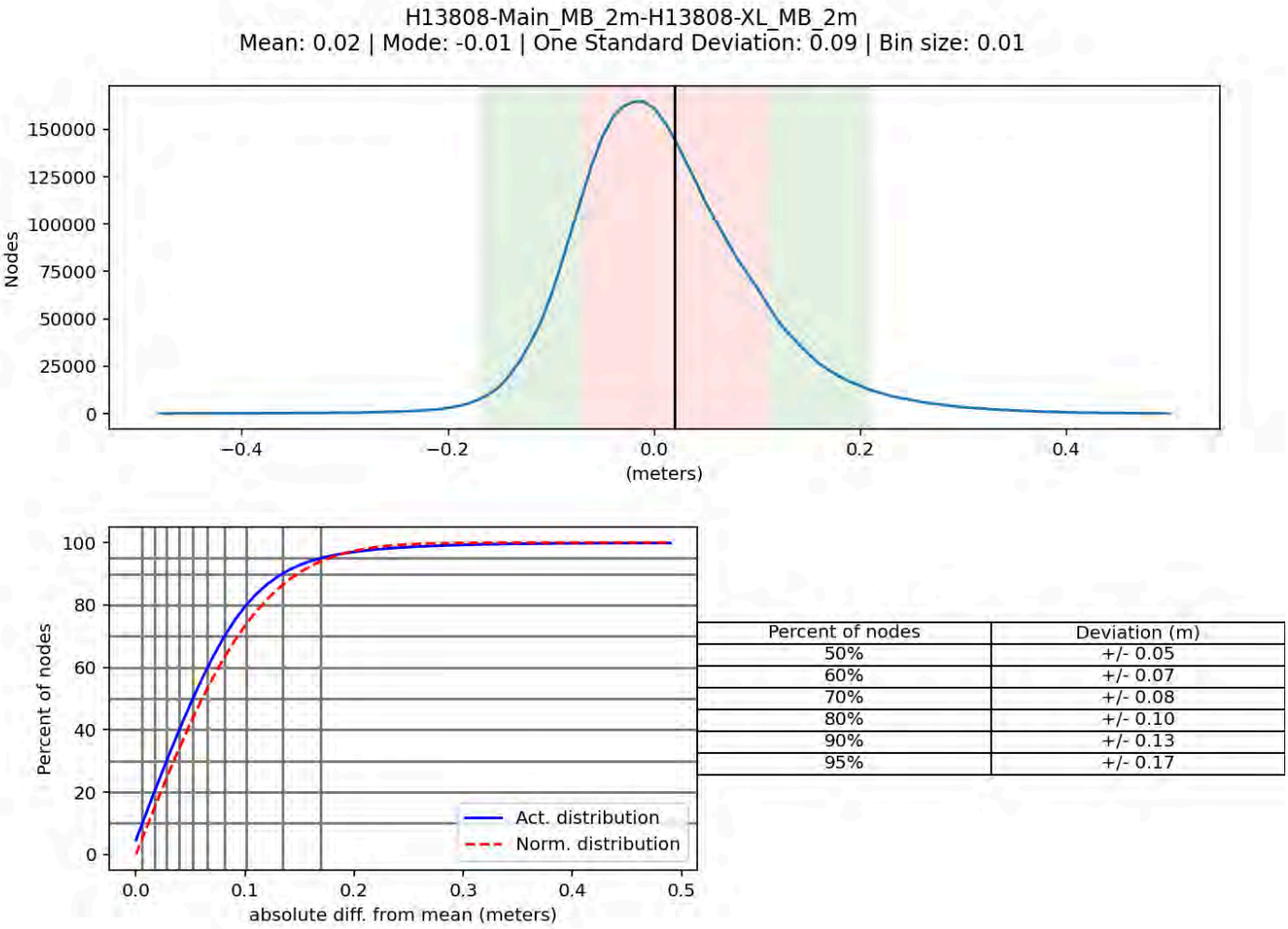


Figure 5: Crossline tracks overlaid on a coverage surface.



Percent of nodes	Deviation (m)
50%	+/- 0.05
60%	+/- 0.07
70%	+/- 0.08
80%	+/- 0.10
90%	+/- 0.13
95%	+/- 0.17

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	0.0 meters	0.045 meters

Table 7: Survey Specific Tide TPU Values.

Hull ID	Measured - CTD	Measured - MVP	Measured - XBT	Surface
MV Northstar Challenger	N/A	4 meters/second	N/A	1 meters/second
RV North Cove	4 meters/second	4 meters/second	N/A	1 meters/second
RV South Cove	4 meters/second	N/A	N/A	1 meters/second

Table 8: Survey Specific Sound Speed TPU Values.

The HydrOffice "QC Tools" application was used to calculate TVU QC, determined by a ratio of uncertainty to the allowable error per NOAA and IHO specifications. A set of single resolution surfaces were 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 passed the uncertainty check, with 99.5+% or 100% of nodes meeting the uncertainty standards.

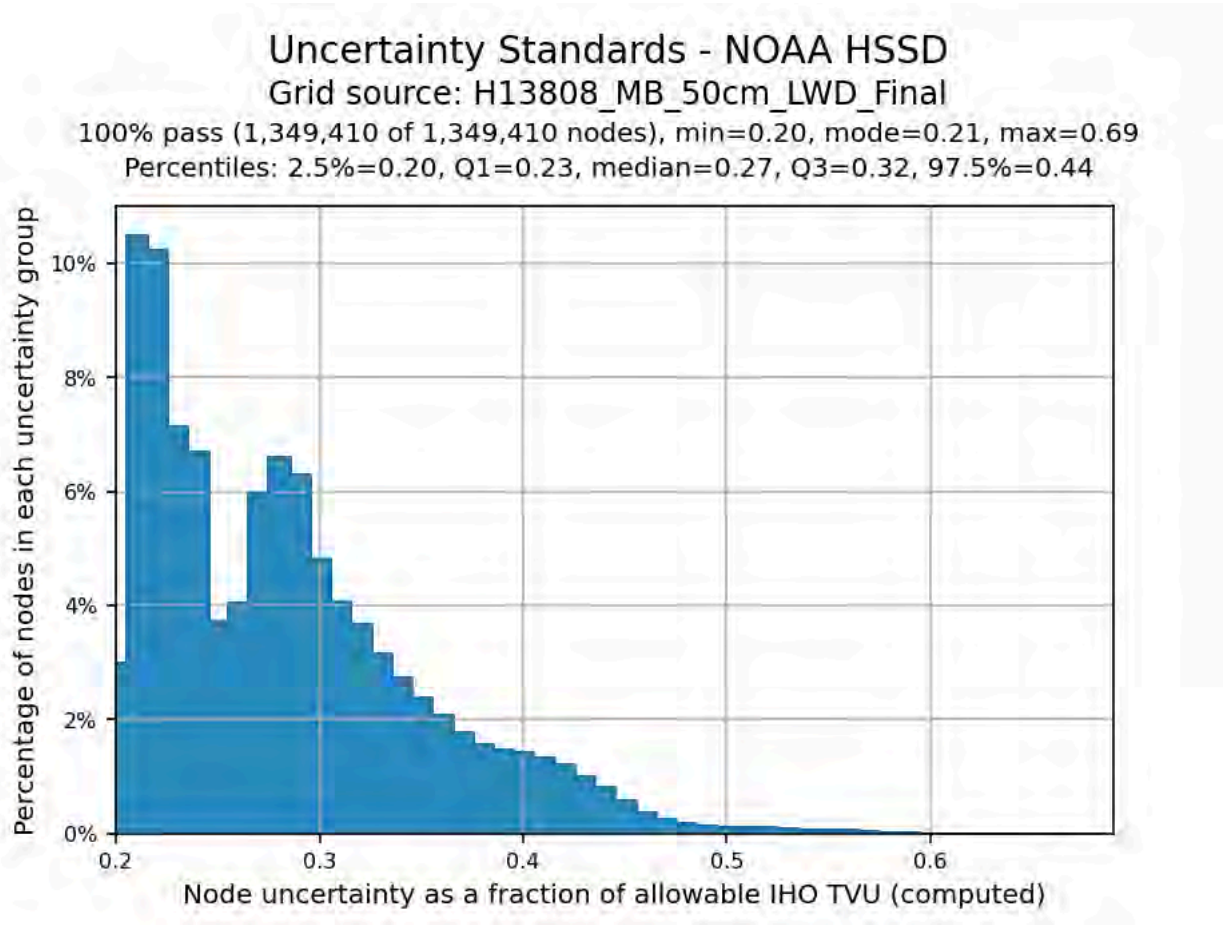


Figure 7: Uncertainty standards, 50cm resolution object detection coverage.

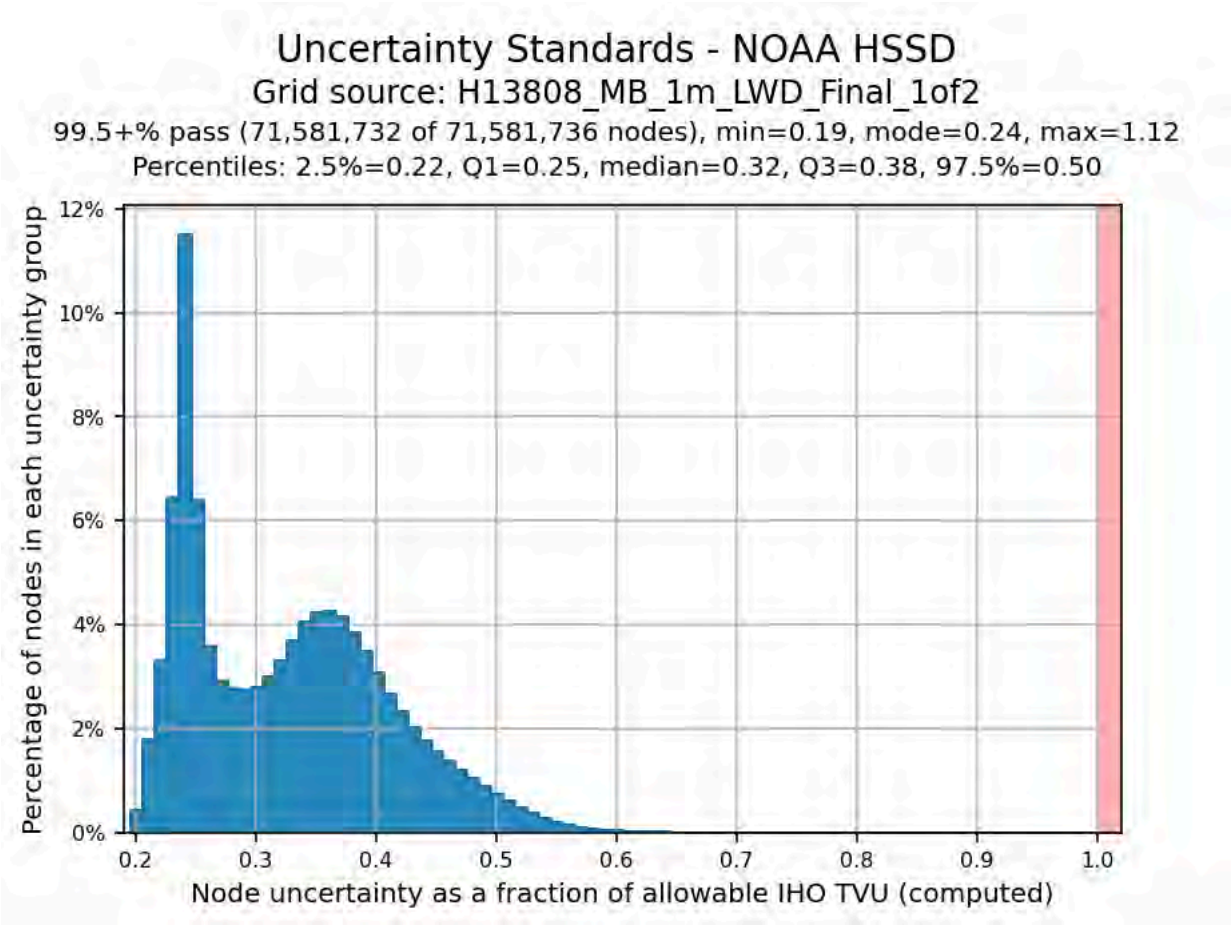


Figure 8: Uncertainty standards, 1m resolution complete coverage (1 of 2).

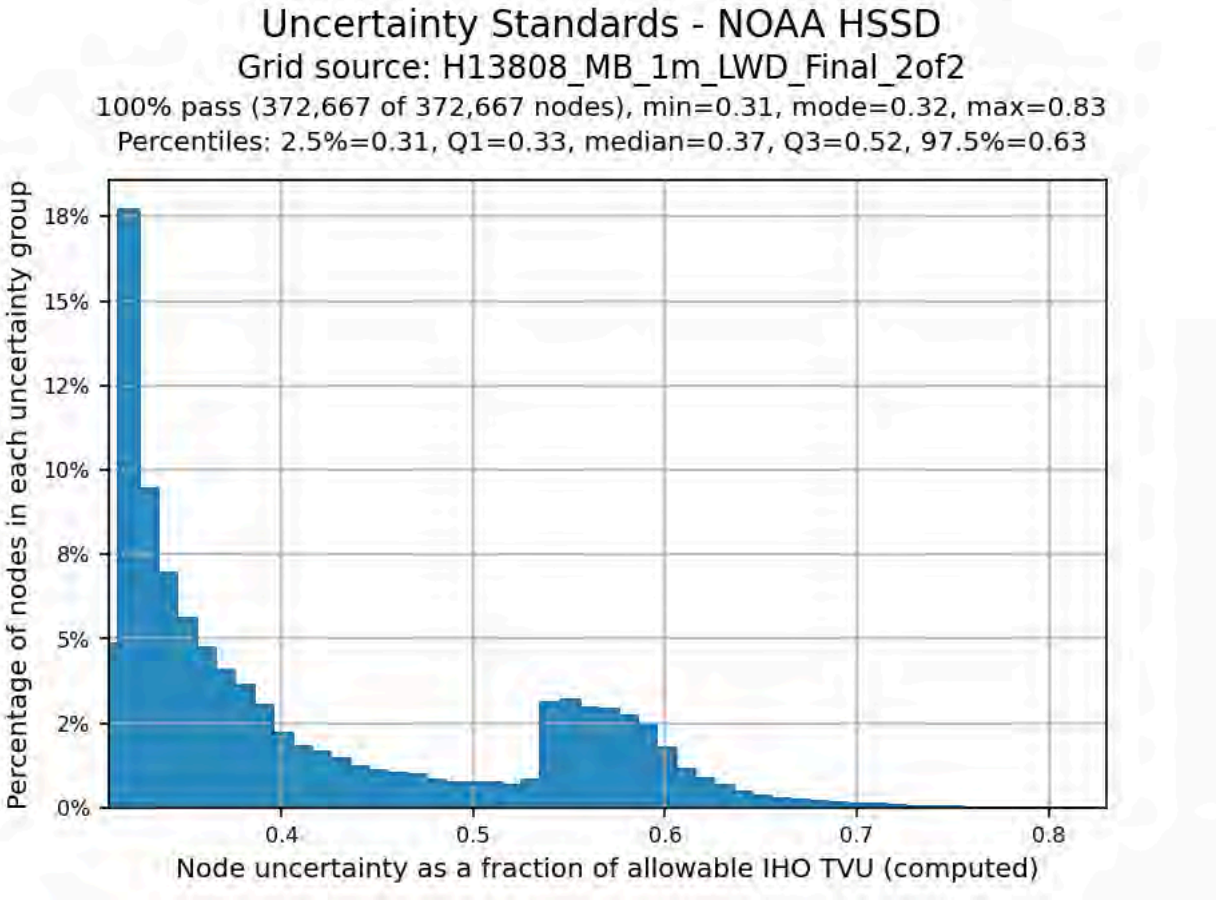


Figure 9: Uncertainty standards, 1m resolution object detection coverage (2 of 2).

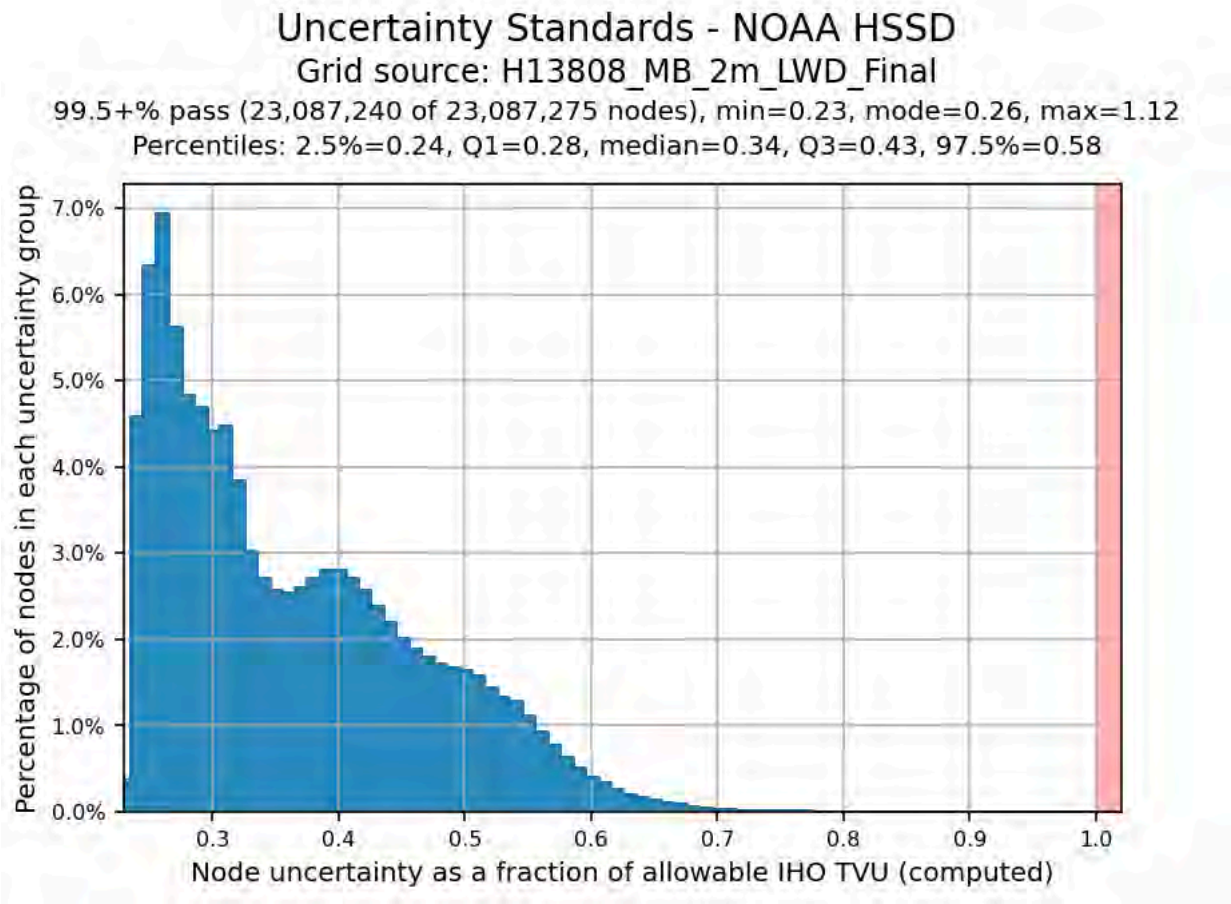


Figure 10: Uncertainty standards, 2m resolution complete coverage.

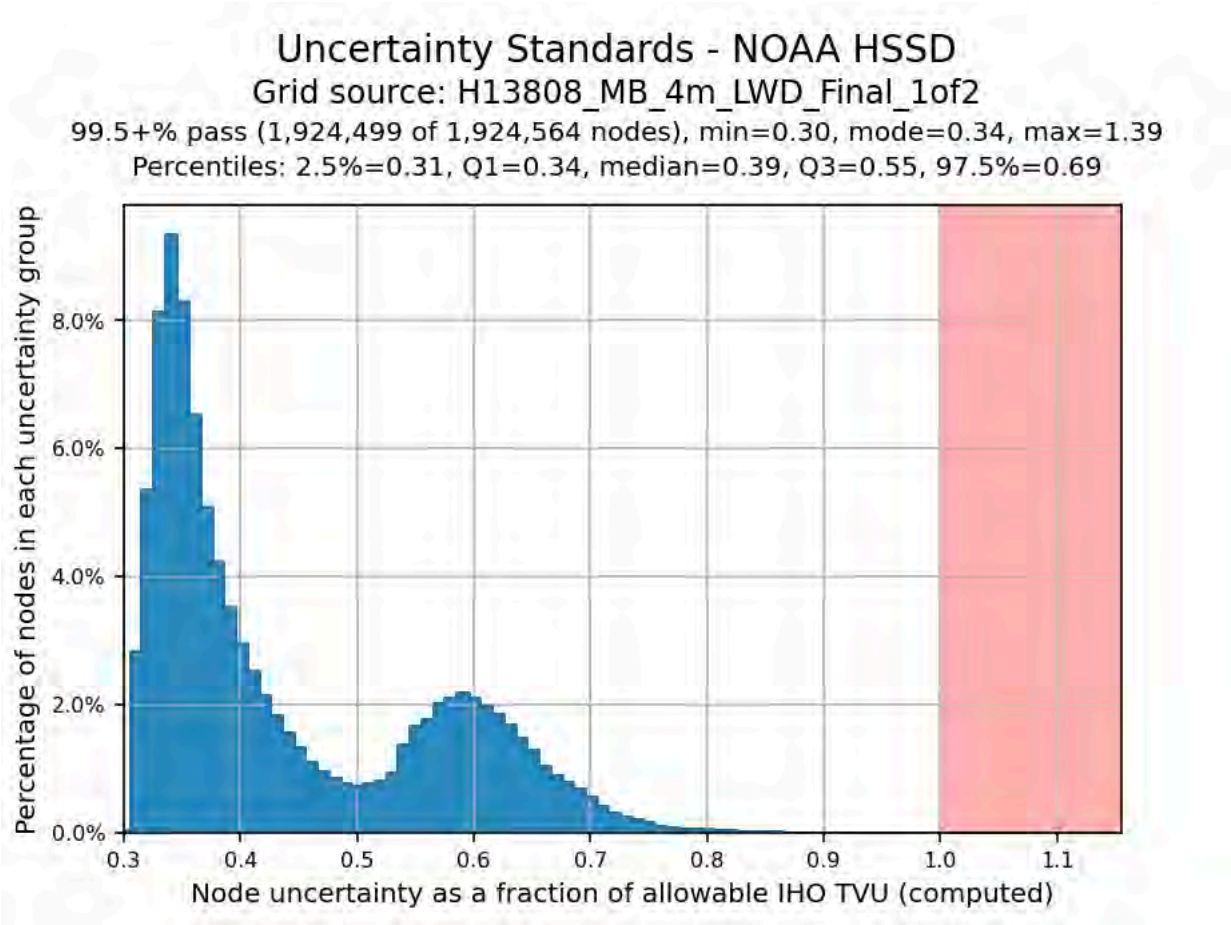


Figure 11: Uncertainty standards, 4m resolution complete coverage (1 of 2).

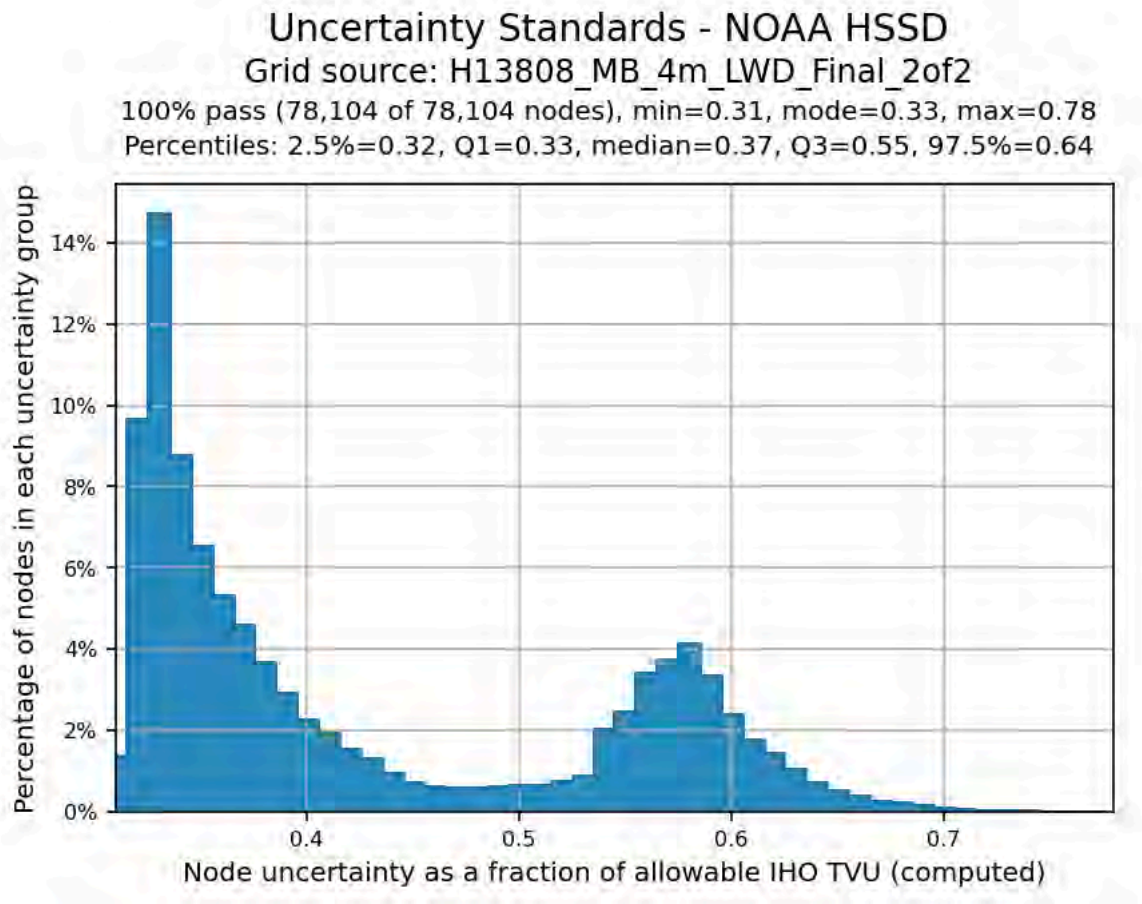


Figure 12: Uncertainty standards, 4m resolution object detection coverage (2 of 2).

B.2.3 Junctions

Survey H13808 junctions with contemporary surveys along its eastern and southern borders, and with prior surveys along its northern border. The inshore investigations and western border also junction with a prior topobathy lidar dataset. A small overlap at the southeast corner with contemporary survey H13812 is not addressed.

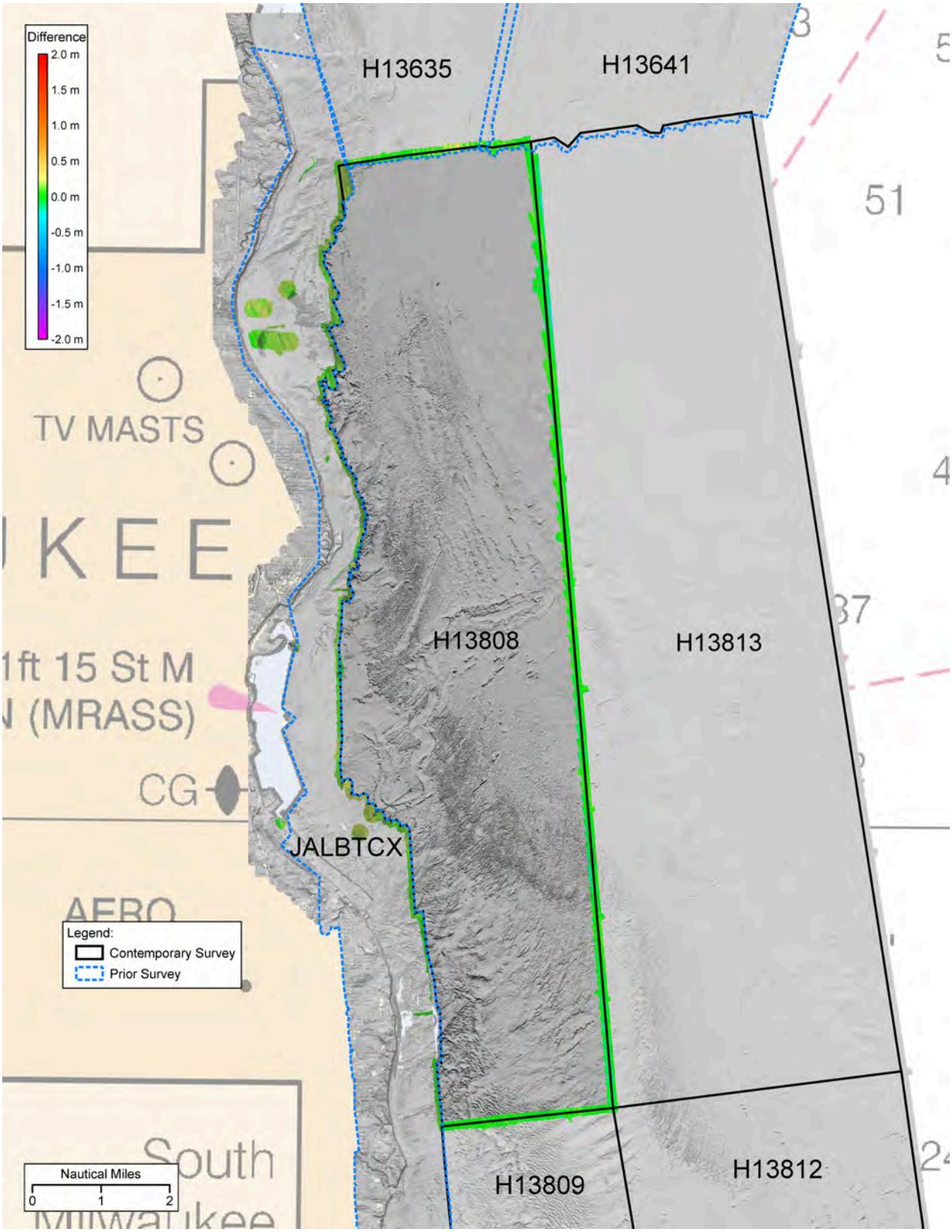


Figure 13: H13808 junction map with junction area depth differences.

The following junctions were made with this survey:

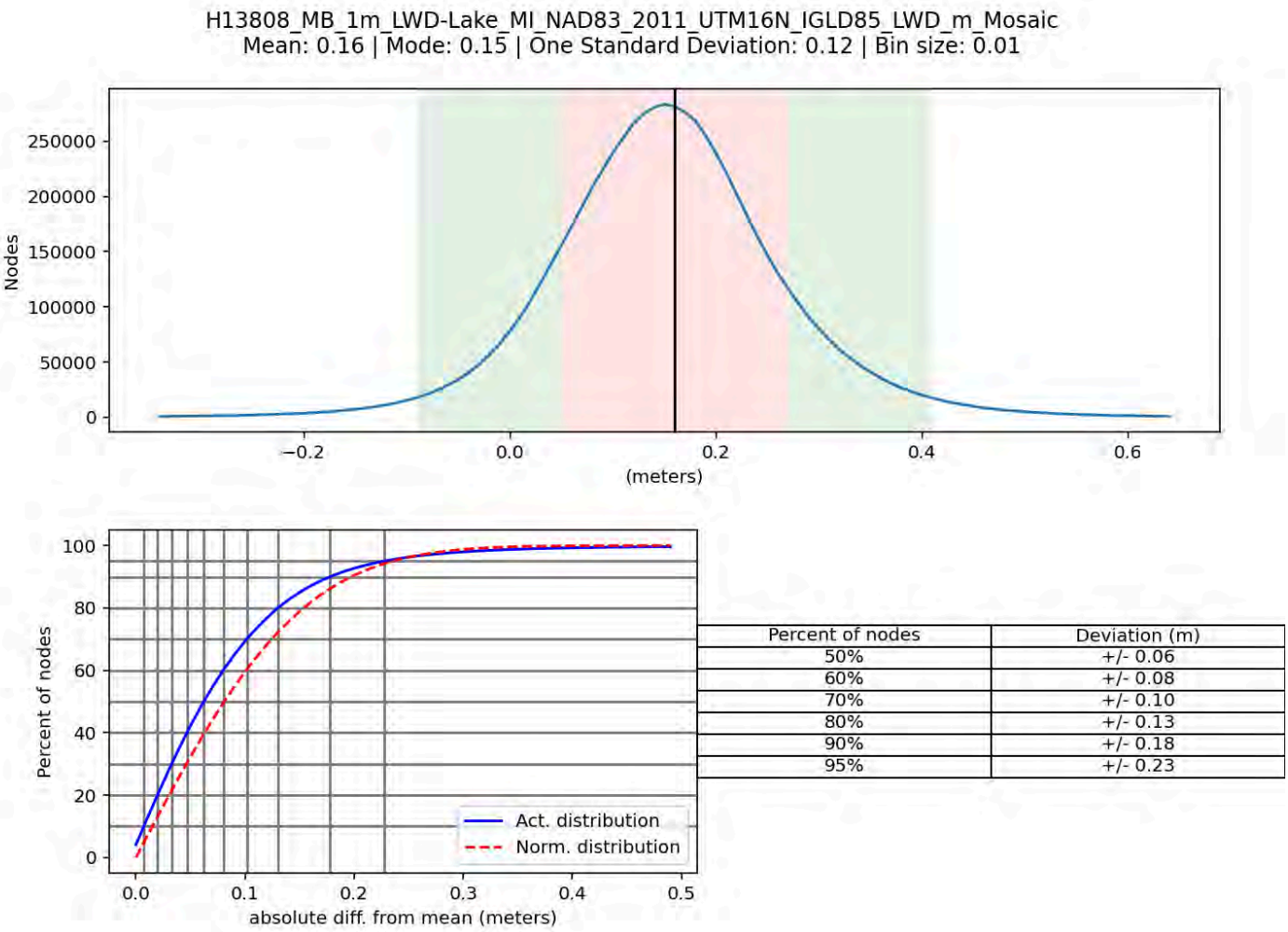
Registry Number	Scale	Year	Field Unit	Relative Location
USACE NCMP Topobathy Lidar	1:1	2020	JALBTCX	W
H13635	1:5000	2022	Geodynamics	N
H13641	1:40000	2022	Geodynamics	N
H13809	1:5000	2023	OSI	S
H13813	1:40000	2023	OSI	E

Table 9: Junctioning Surveys

USACE NCMP Topobathy Lidar

OSI received a preliminary digital elevation model of a recent topobathy lidar dataset that was undergoing review at the time of the PI, and which has since been published. According to the dataset quality notes, acquisition was focused on a swath of shoreline approximately 1500m wide, extending 500m onshore and 1000m offshore (or to laser extinction). Nearly all of the inshore investigations and the western border of H13808 are within the lidar coverage, with only a small gap at the southern end of the survey. The total area of overlap was approximately 6.9 sq km.

Agreement between the two surveys was best in areas of flat, featureless bathymetry. Features, rocks, and bottom texture showed greater depth discrepancies. The mean difference was 0.16m, and 99.5+% of comparison nodes were within the allowable error fraction.



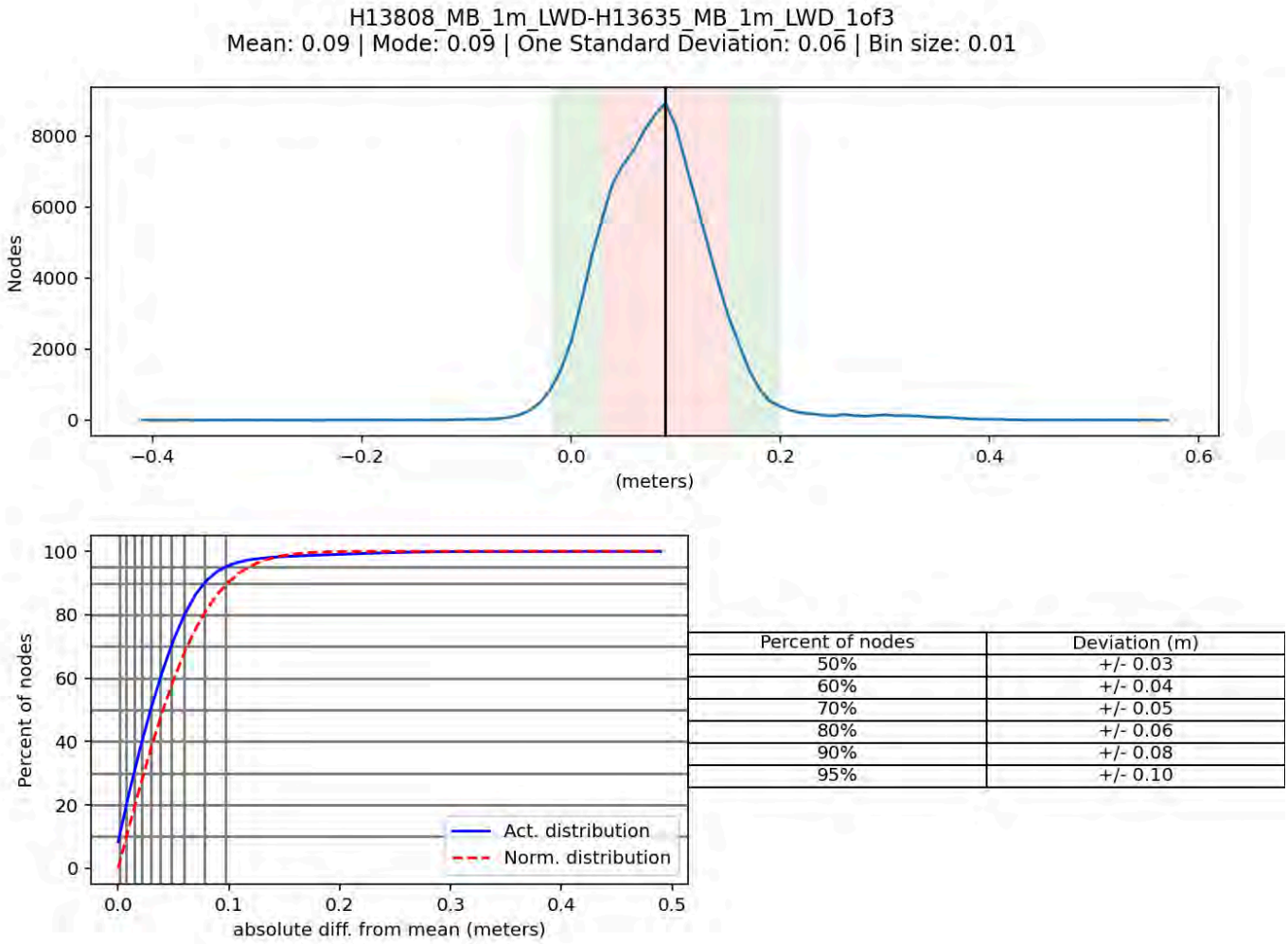
Percent of nodes	Deviation (m)
50%	+/- 0.06
60%	+/- 0.08
70%	+/- 0.10
80%	+/- 0.13
90%	+/- 0.18
95%	+/- 0.23

Figure 14: Depth differences between H13808 and bathymetric lidar data.

H13635

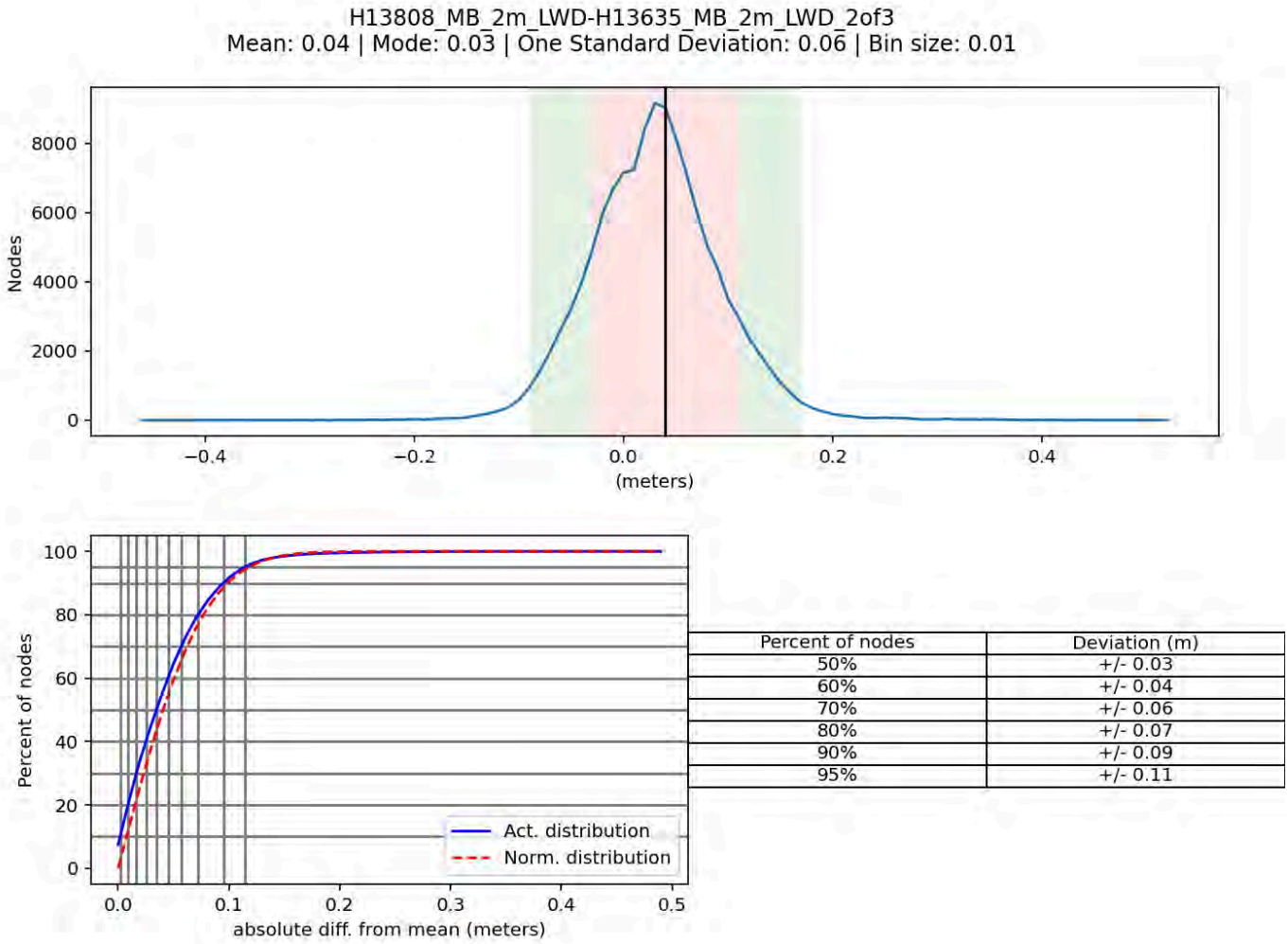
The junction with prior survey H13635 covers most of the northern border of H13808, with an overlap area that is approximately 4.1km long and 200-300m wide. Water depths in the junction area range from 10m to 52m. Bathymetry data for H13635 were available as 3 separate single-resolution grids covering different depth ranges. Comparisons were made for each grid of H13635 to the corresponding single-resolution surface of H13808. Data for H13808 were not filtered by depth for this comparison to ensure complete coverage of the junction area.

Agreement between the two surveys was good, with mean differences of 0.09m, 0.04m and 0.12m in the 1m, 2m, and 4m surface comparison areas, respectively. Discrepancies were greatest at the edges of tracklines and in the deeper waters covered by the 4m resolution bathymetry grid.



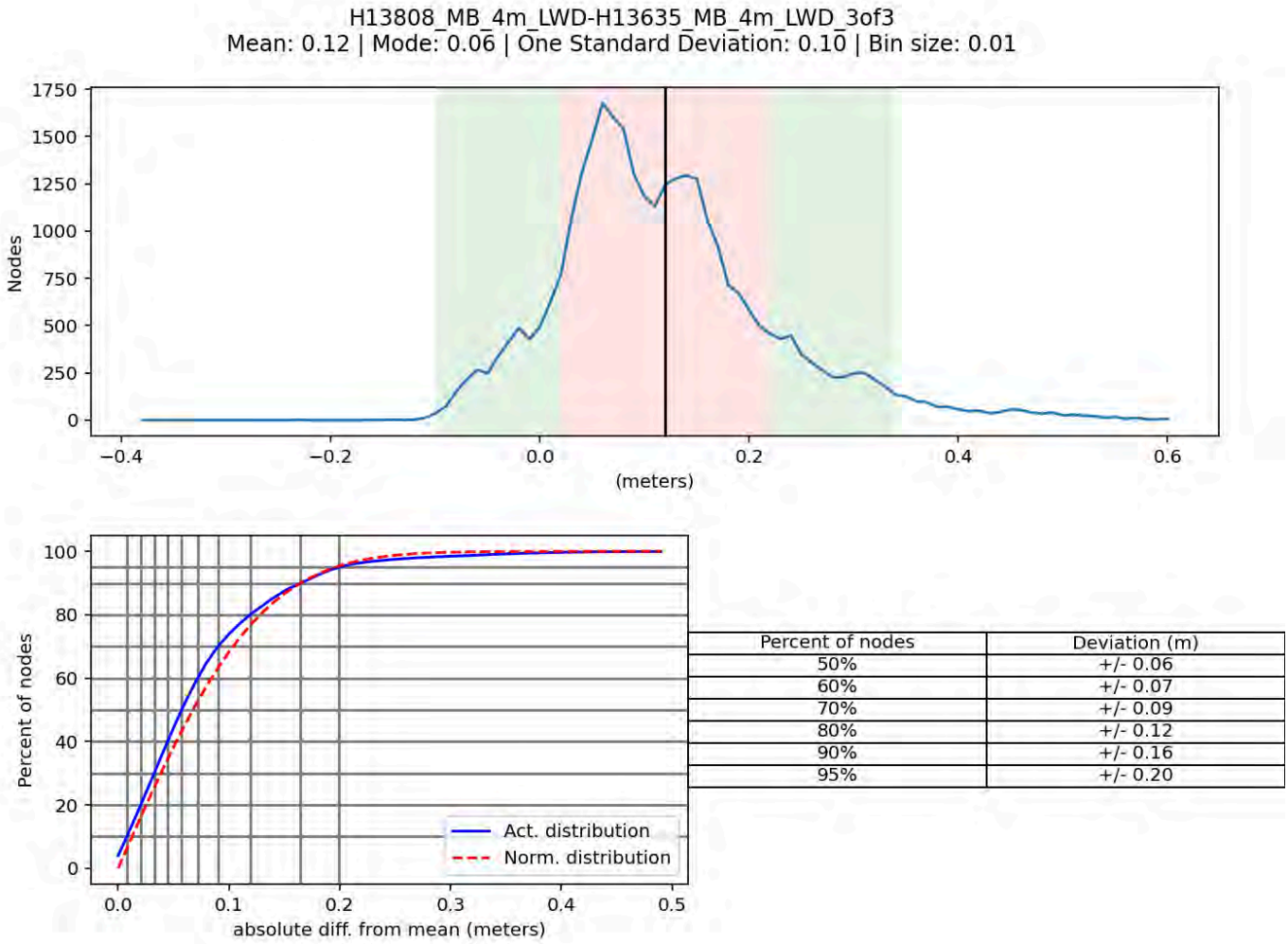
Percent of nodes	Deviation (m)
50%	+/- 0.03
60%	+/- 0.04
70%	+/- 0.05
80%	+/- 0.06
90%	+/- 0.08
95%	+/- 0.10

Figure 15: Depth differences between H13808 and H13635, 1m resolution surface.



Percent of nodes	Deviation (m)
50%	+/- 0.03
60%	+/- 0.04
70%	+/- 0.06
80%	+/- 0.07
90%	+/- 0.09
95%	+/- 0.11

Figure 16: Depth differences between H13808 and H13635, 2m resolution surface.



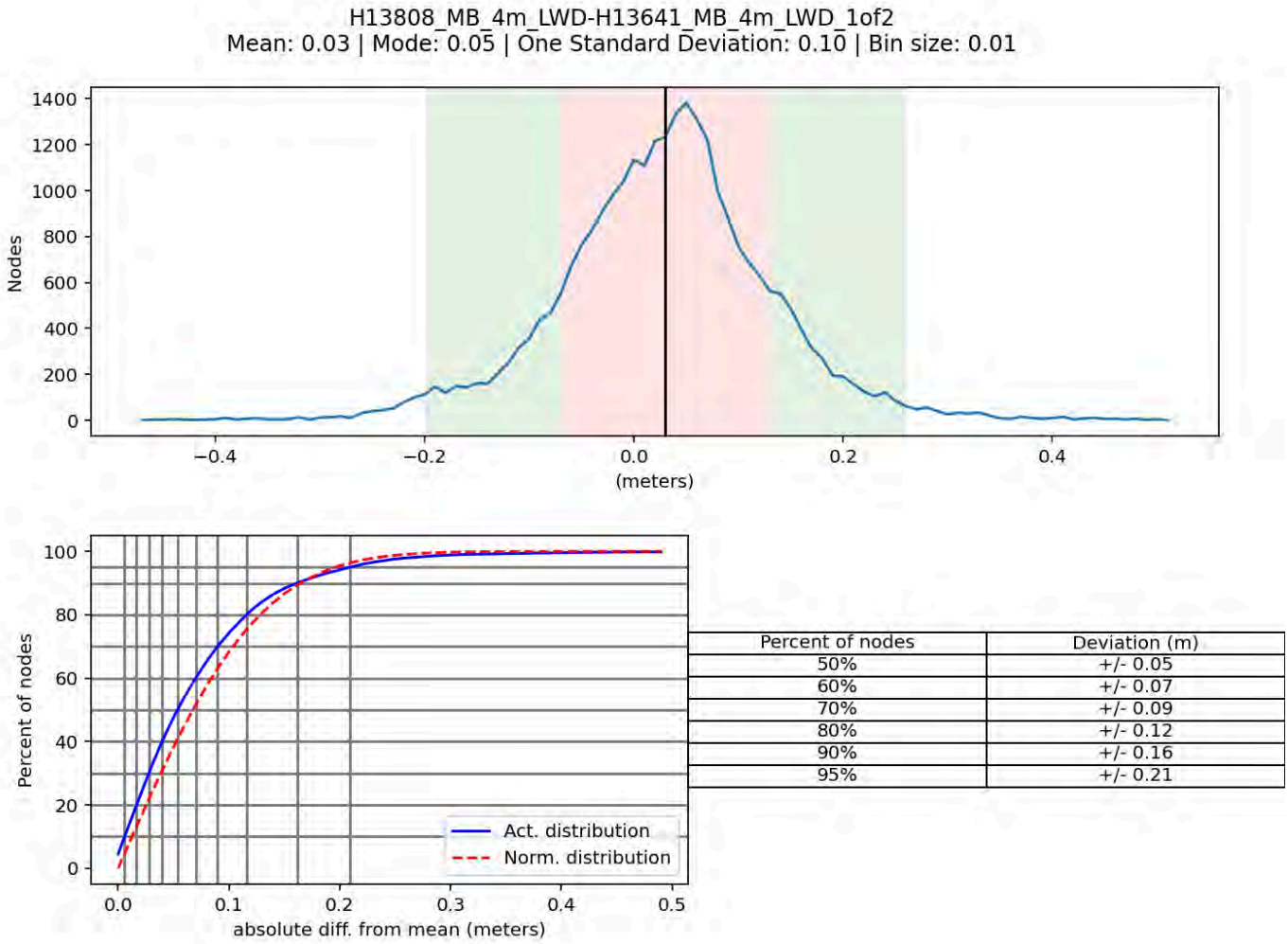
Percent of nodes	Deviation (m)
50%	+/- 0.06
60%	+/- 0.07
70%	+/- 0.09
80%	+/- 0.12
90%	+/- 0.16
95%	+/- 0.20

Figure 17: Depth differences between H13808 and H13635, 4m resolution surface.

H13641

At the time of the project instructions, the adjacent prior survey H13641 was not yet published to NCEI. Two bathymetry grids were provided to OSI for this comparison; a 4m resolution grid covering water depths from 36m to 80m and an 8m resolution with water depths from 72m to 128m. Only the 4m grid junctions with H13808, in an area approximately 1.5km long and 200-400m wide at the northeast corner of H13808.

Agreement between the two surveys was very good, with a mean difference of 0.03m.



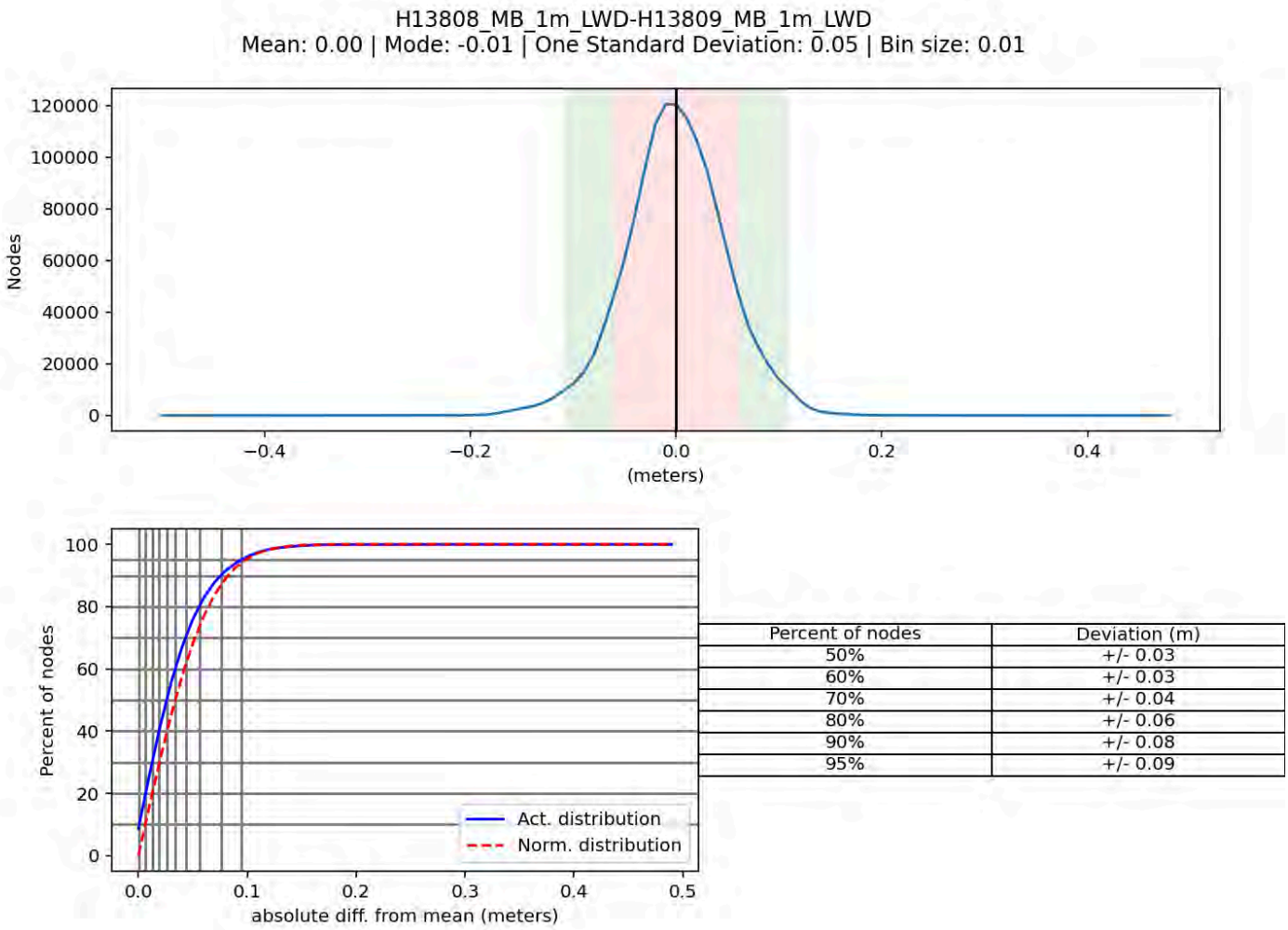
Percent of nodes	Deviation (m)
50%	+/- 0.05
60%	+/- 0.07
70%	+/- 0.09
80%	+/- 0.12
90%	+/- 0.16
95%	+/- 0.21

Figure 18: Depth differences between H13808 and H13641, 4m resolution surface.

H13809

The junction with contemporary survey H13809 runs the length of the southern border of H13808. The overlap area is approximately 5.1km long and 200-350m wide. Water depths range from 10m to 20m, with the deepest water at the eastern end.

Agreement between the two surveys was very good, with a mean difference of 0.00m.



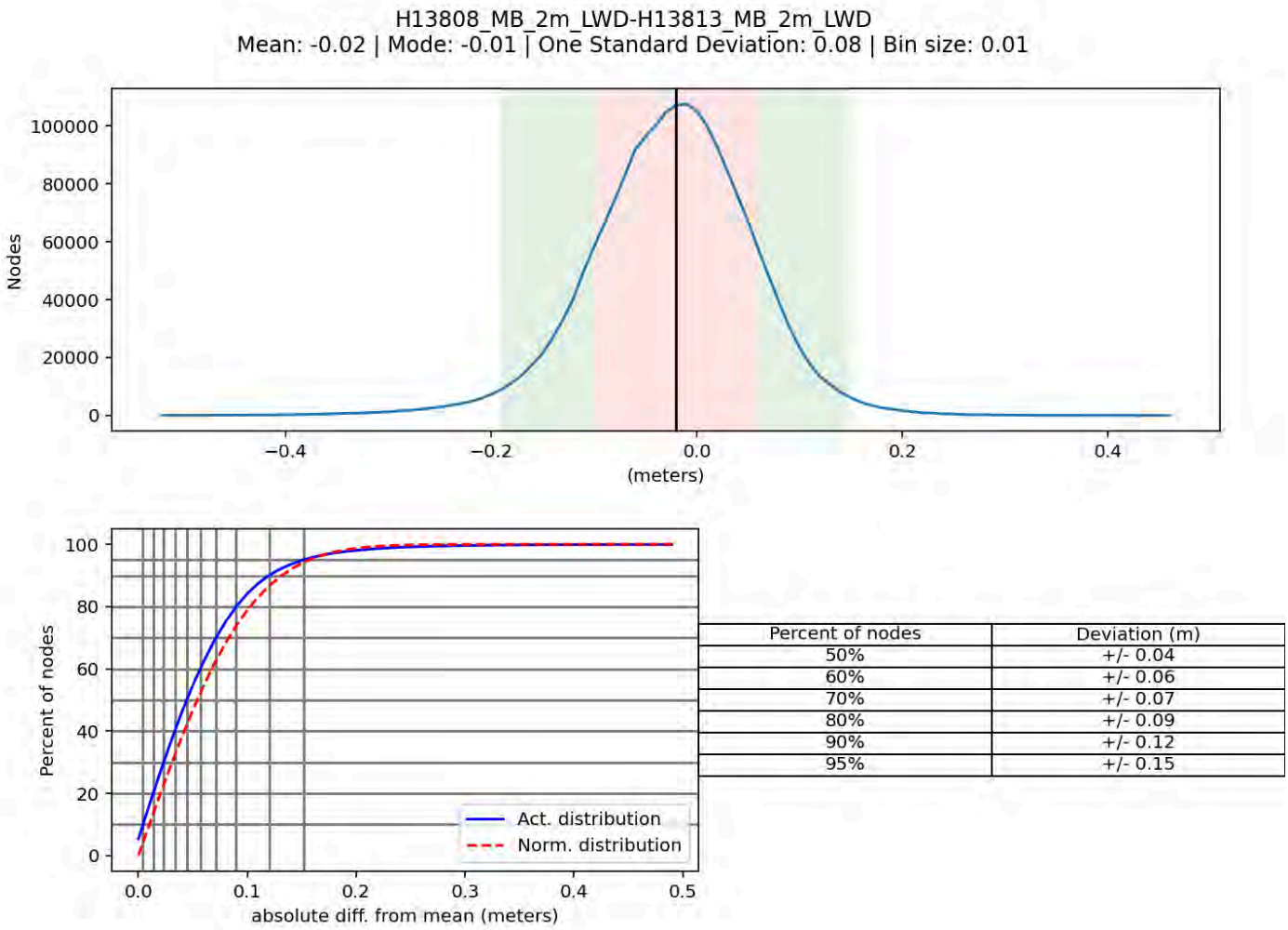
Percent of nodes	Deviation (m)
50%	+/- 0.03
60%	+/- 0.03
70%	+/- 0.04
80%	+/- 0.06
90%	+/- 0.08
95%	+/- 0.09

Figure 19: Depth differences between H13808 and H13809, 1m resolution surface.

H13813

The junction with contemporary survey H13813 runs the length of the eastern border of survey H13808. The overlap area is approximately 27.6km long and 200-400m wide. Water depths range from 20m to 60m, with the deepest water at the northern end.

Agreement between the two surveys was very good, with a mean difference of 0.02m. Discrepancies were noted on a feature that was investigated in H13808 and only partially observed in the data for H13813.



Percent of nodes	Deviation (m)
50%	+/- 0.04
60%	+/- 0.06
70%	+/- 0.07
80%	+/- 0.09
90%	+/- 0.12
95%	+/- 0.15

Figure 20: Depth differences between H13808 and H13813, 2m resolution surface.

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 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 duplicated 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: MVP casts were taken approximately every 10-20 minutes by MV Northstar Challenger and every 15-20 minutes by RV North Cove. AML-3 casts were taken at intervals of approximately 30 to 90 minutes by RV North Cove and RV South Cove.

MV Northstar Challenger used MVP casts exclusively and RV South Cove used only AML-3. RV North Cove made use of both systems on different survey days.

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, and RV South Cove in southwestern Lake Michigan from 2023-07-15 to 2023-10-05" in NetCDF format to the National Centers for Environmental Information (NCEI) on March 7, 2024.

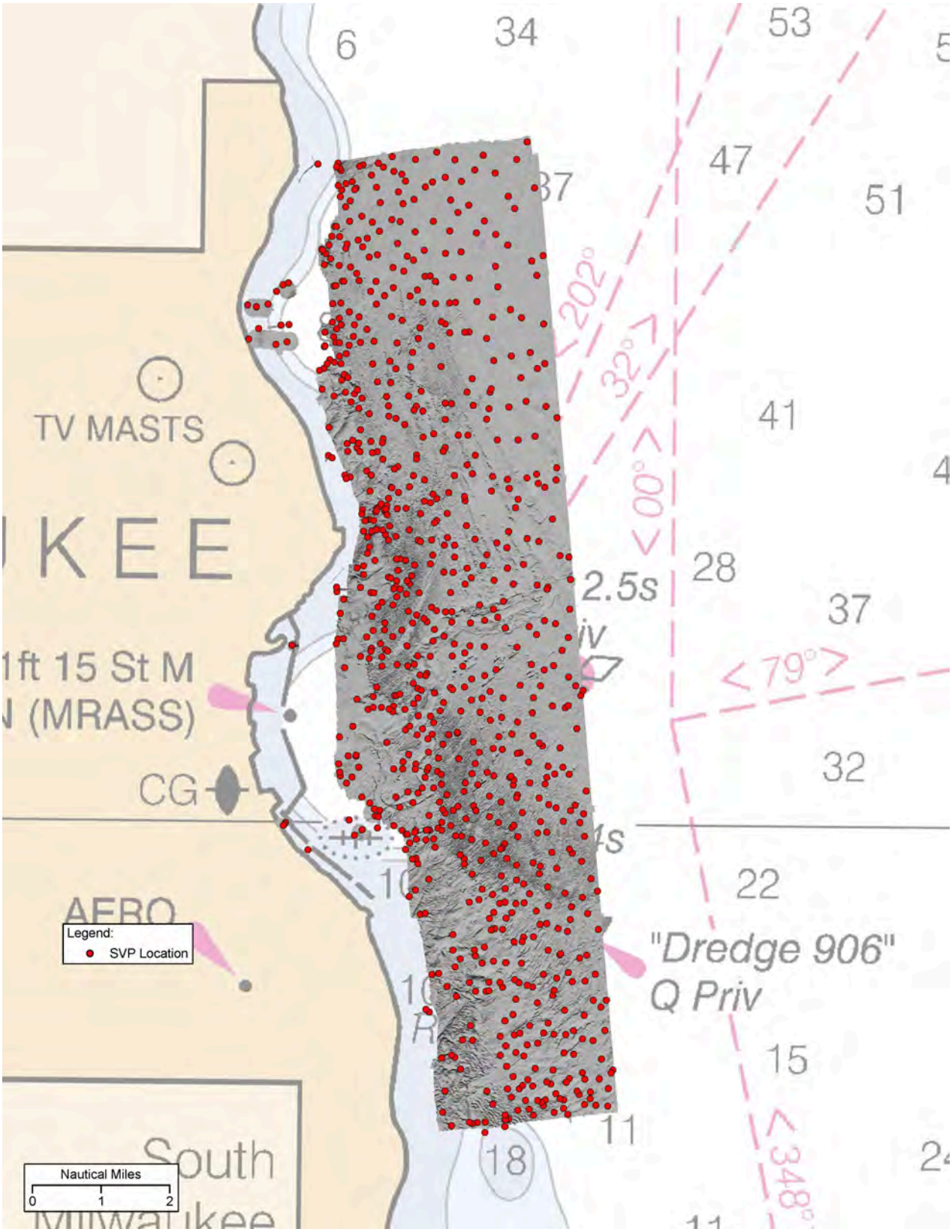


Figure 21: H13808 sound speed cast locations.

B.2.8 Coverage Equipment and Methods

The majority of this survey was conducted to achieve Complete Coverage with multibeam, as specified in HSSD 5.2.2.3, Option A. This calls for 100% bathymetric bottom coverage with multibeam sonars, and complete coverage multibeam developments of features. Certain areas within the survey were assigned Object Detection Coverage instead, which was achieved using Object Detection Multibeam Coverage (HSSD 5.2.2.2, Option A). The survey methods used to meet coverage requirements did not deviate from those described in the DAPR.

The HydrOffice "QC Tools" application was used to verify that the grid nodes met the density coverage requirements, with at least 99% of the nodes in each single-resolution surface meeting the requirement.

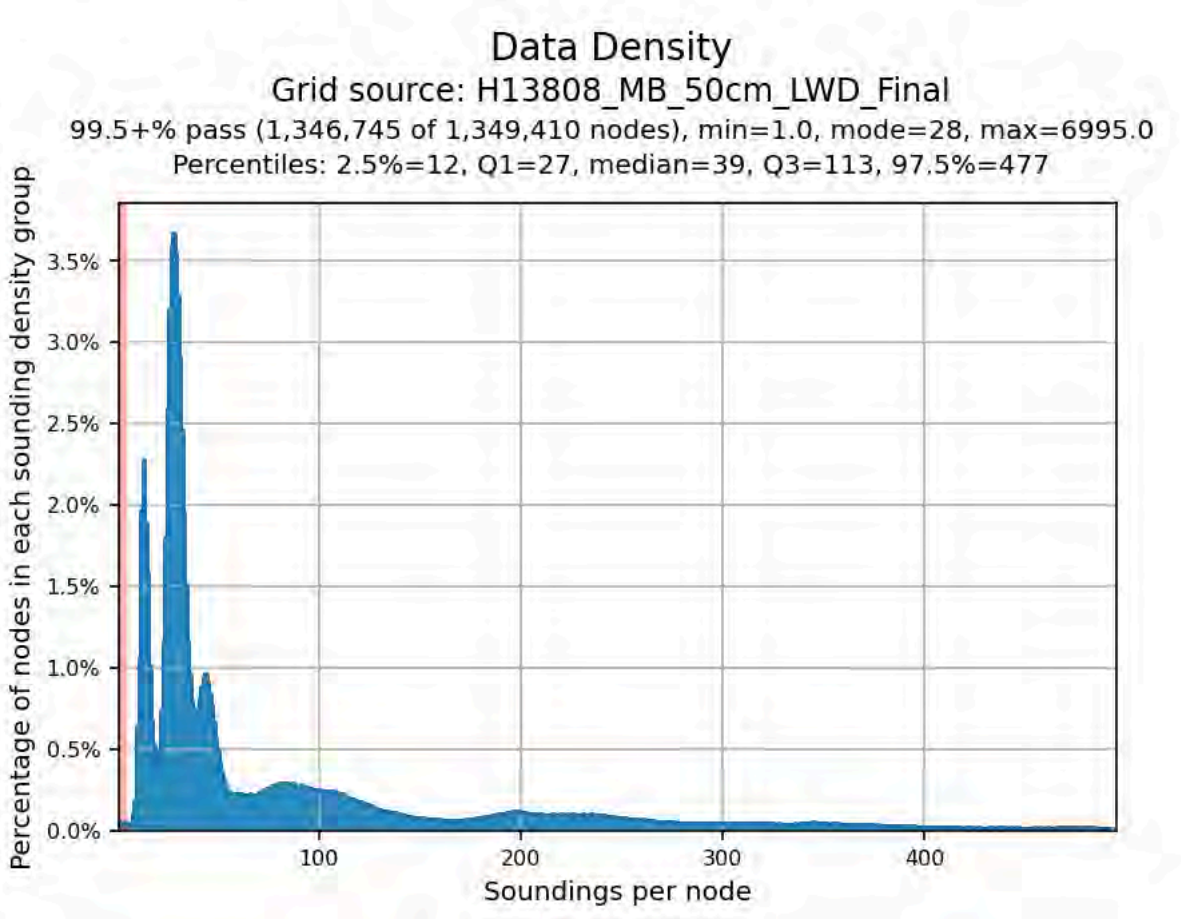


Figure 22: Data density, 50cm resolution object detection coverage.

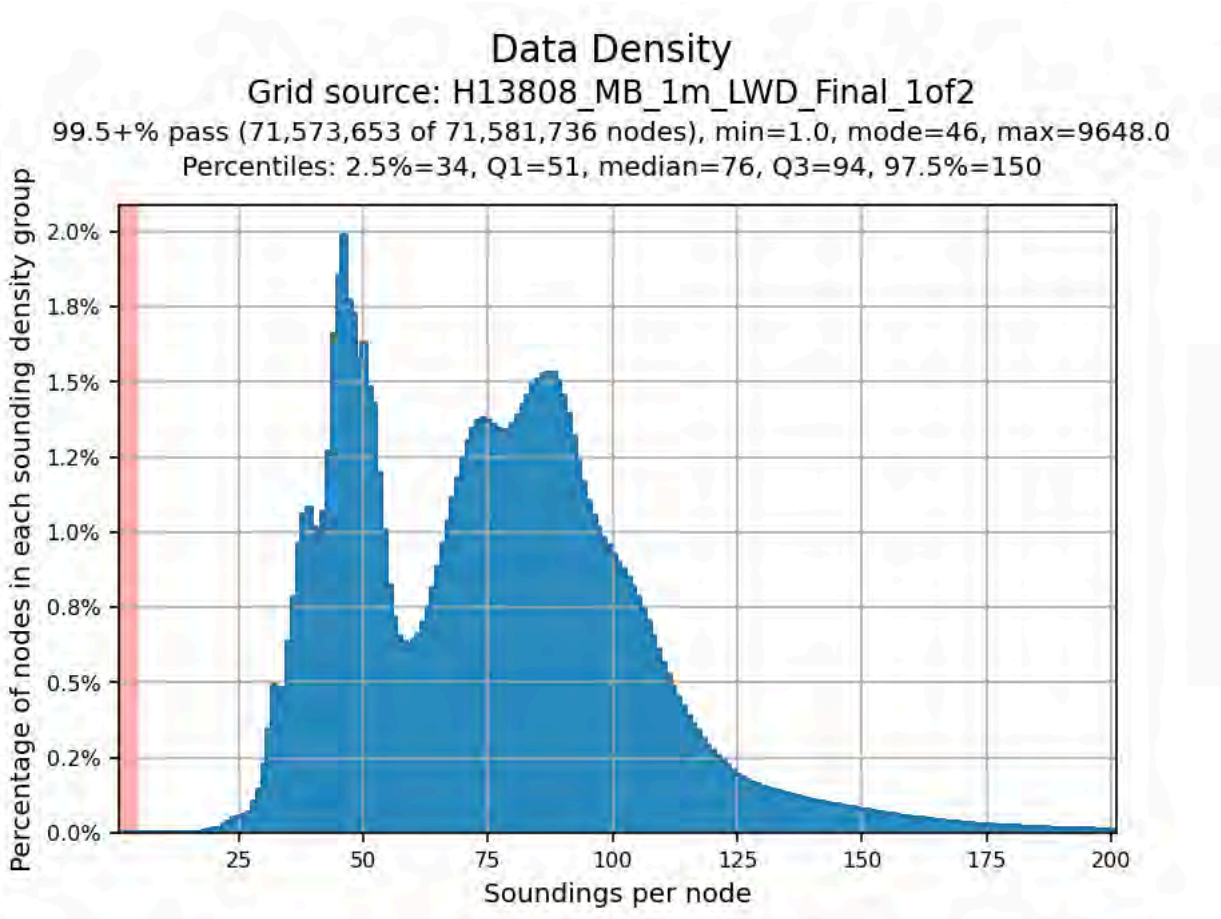


Figure 23: Data density, 1m resolution complete coverage (1 of 2).

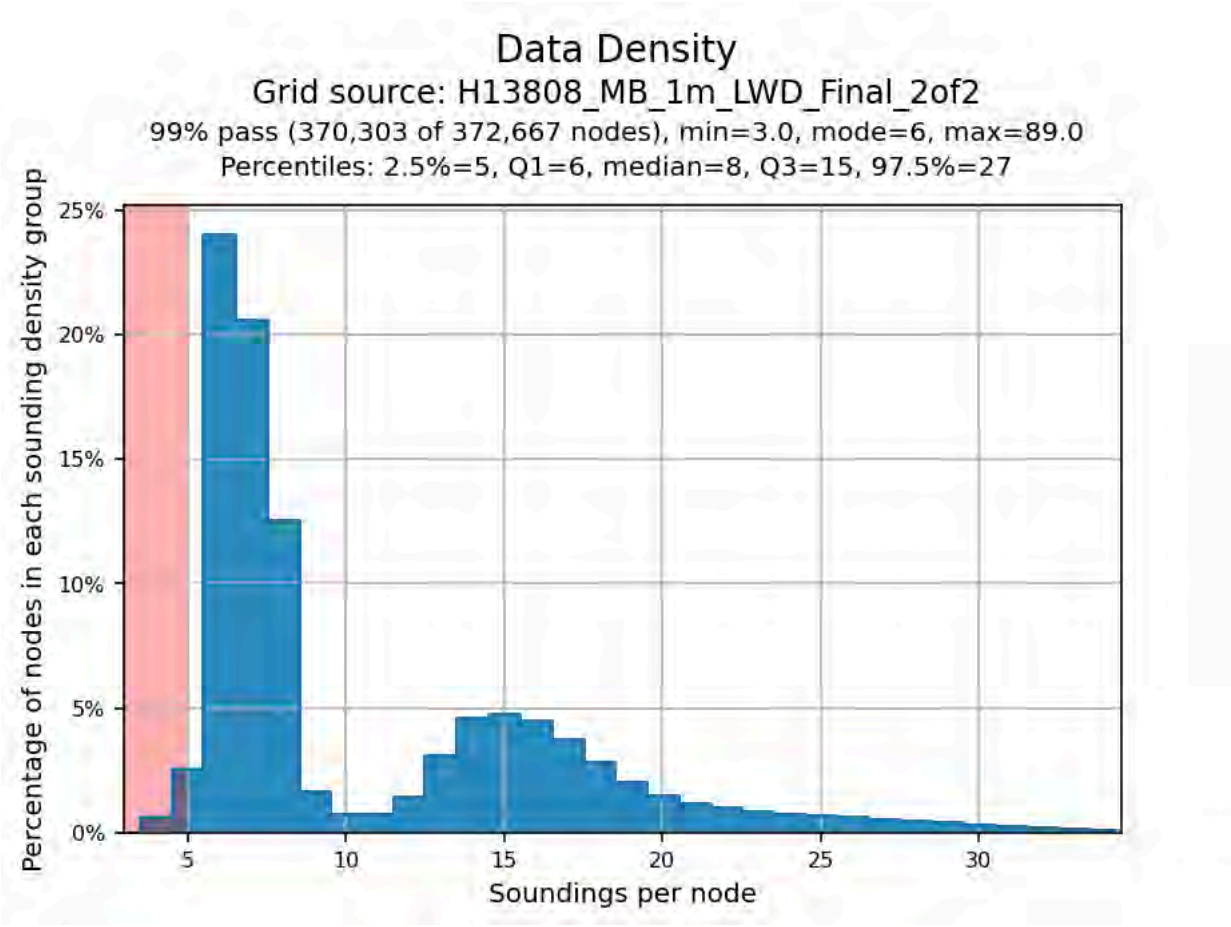


Figure 24: Data density, 1m resolution object detection coverage (2 of 2).

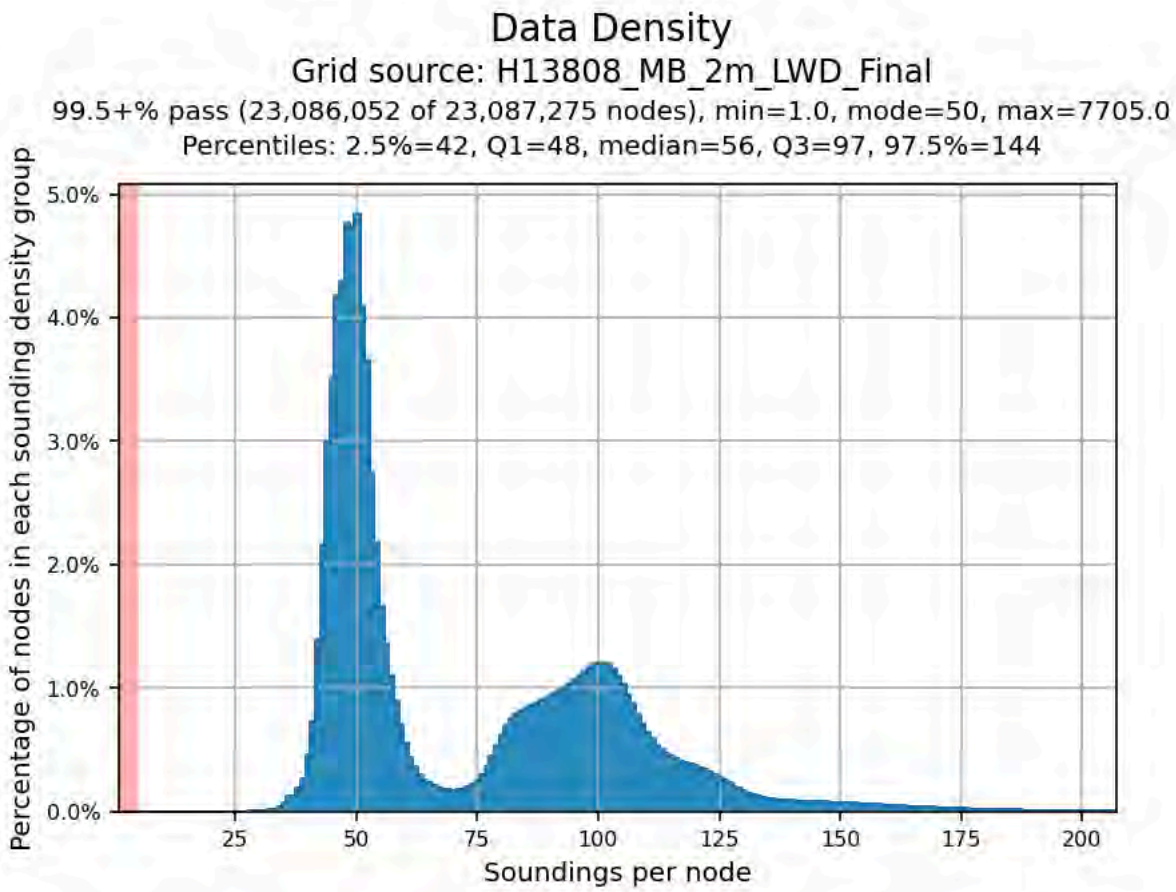


Figure 25: Data density, 2m resolution complete coverage.

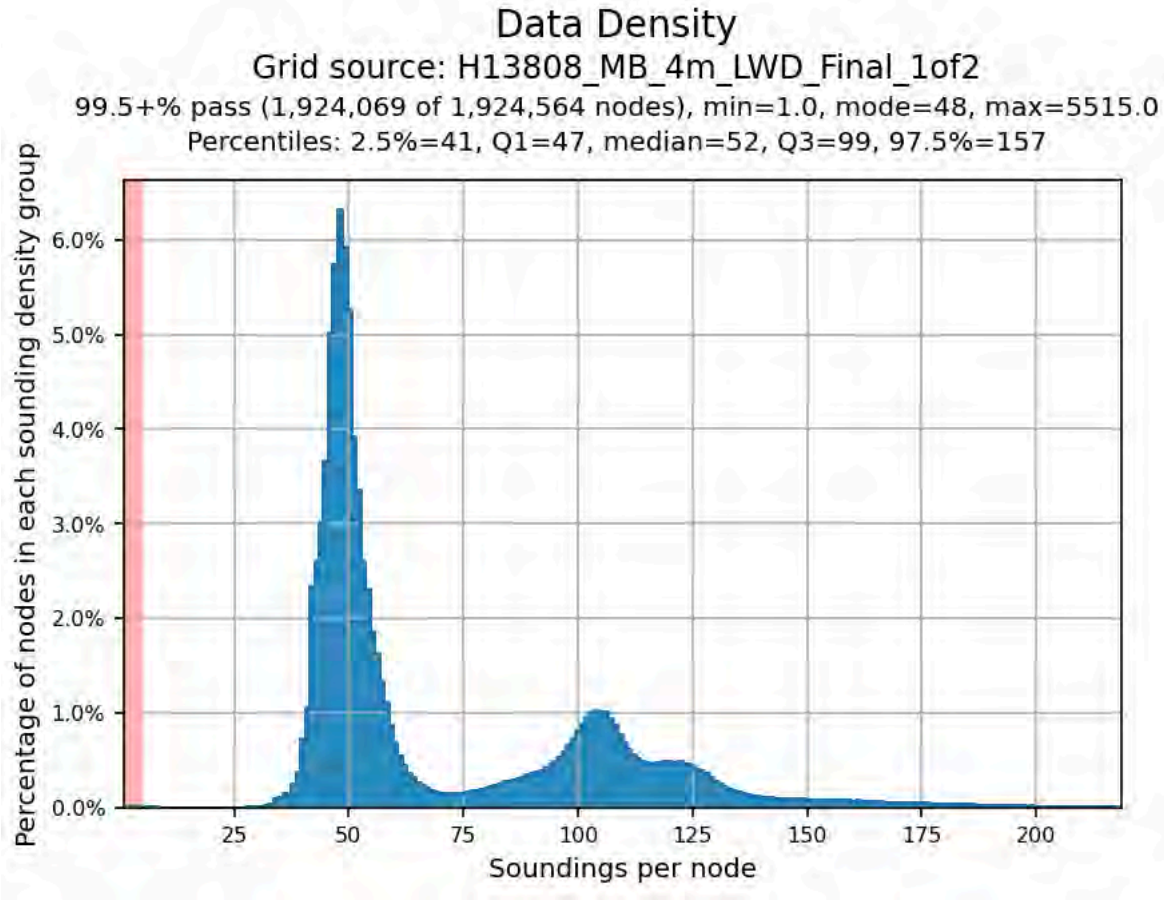


Figure 26: Data density, 4m resolution complete coverage (1 of 2).

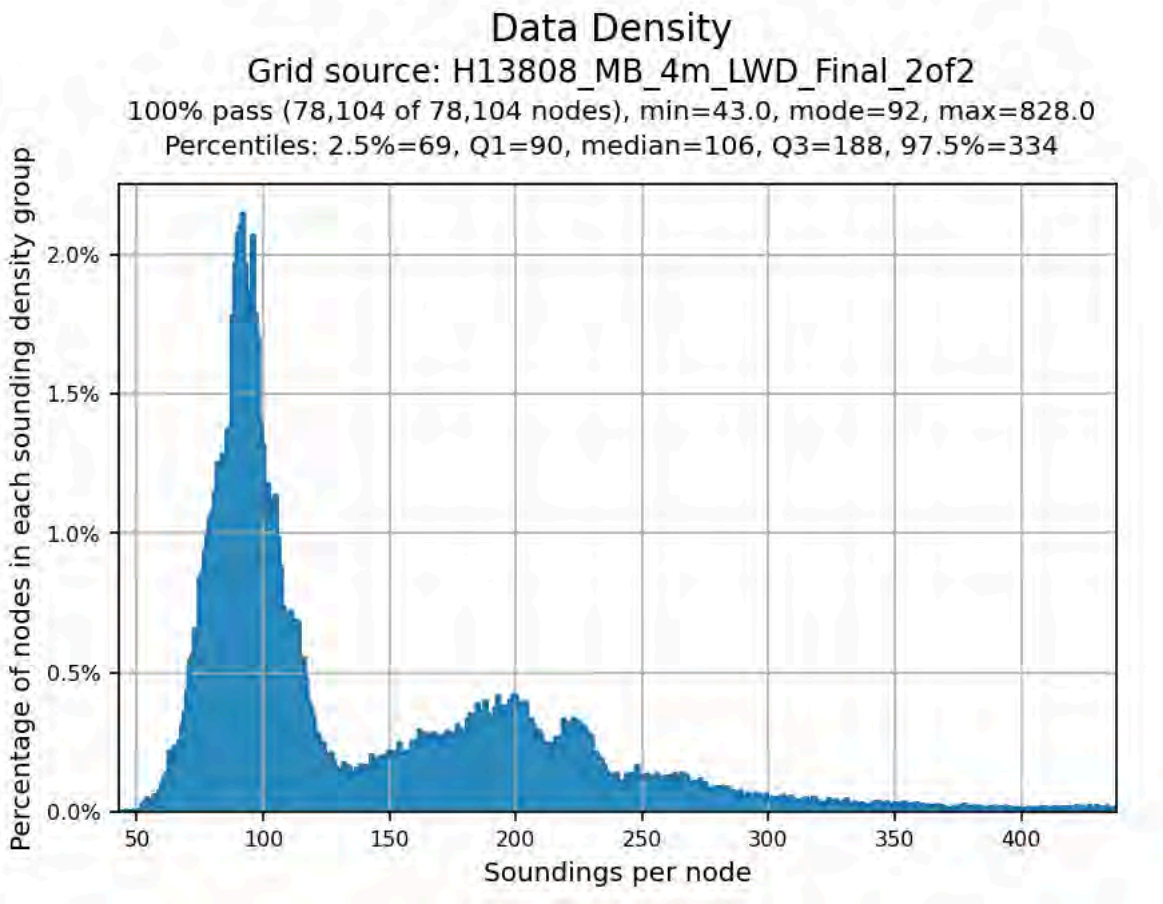


Figure 27: Data density, 4m resolution object detection coverage (2 of 2).

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.

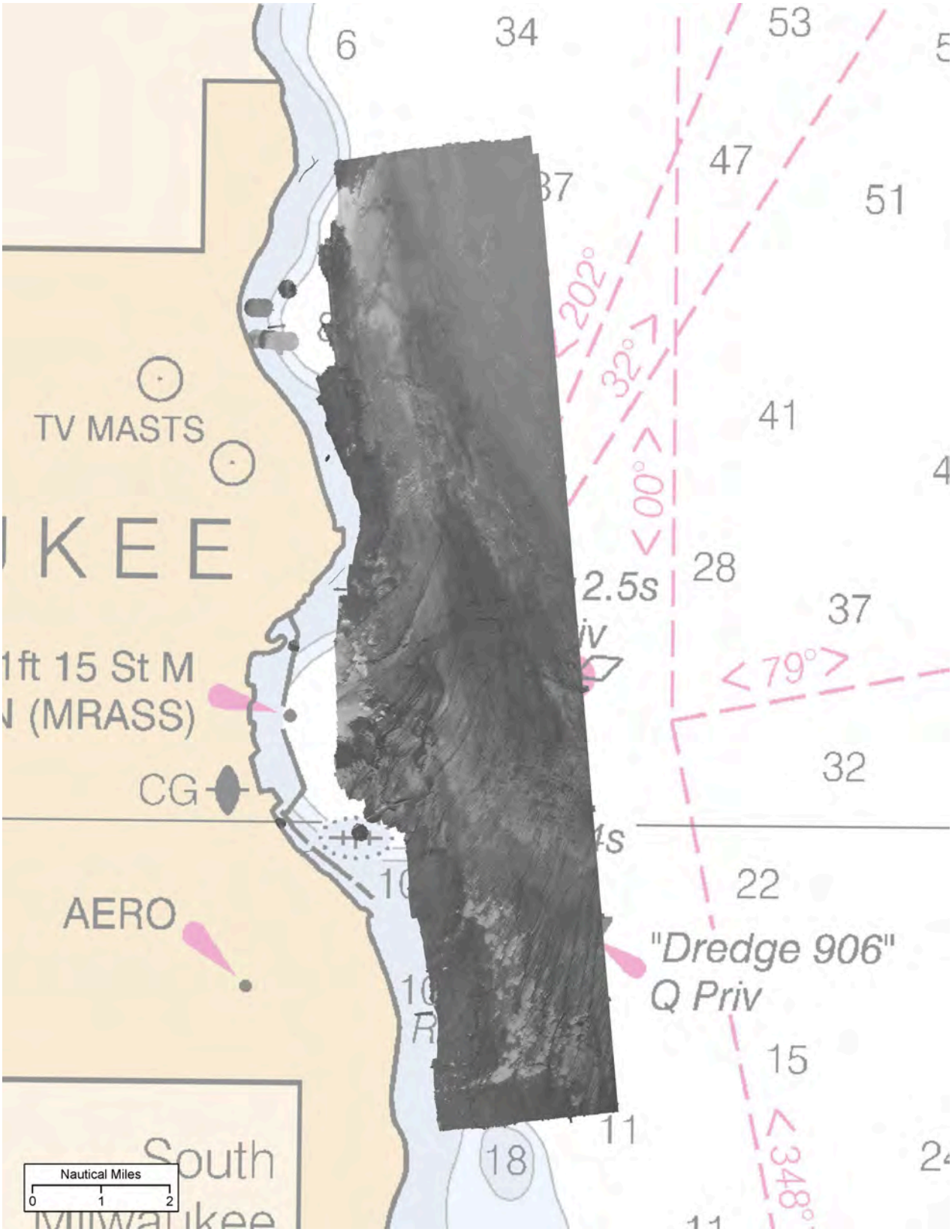


Figure 28: H13808 backscatter mosaic.

B.5 Data Processing

B.5.1 Primary Data Processing Software

The following Feature Object Catalog was used: NOAA Profile Version 2023.

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
H13808_MB_50cm_LWD_Final	CARIS Raster Surface (CUBE)	0.5 meters	-1.45 meters - 14.36 meters	NOAA_0.5m	Object Detection
H13808_MB_1m_LWD_Final_1of2	CARIS Raster Surface (CUBE)	1 meters	0.19 meters - 20.0 meters	NOAA_1m	Complete MBES
H13808_MB_1m_LWD_Final_2of2	CARIS Raster Surface (CUBE)	1 meters	35.65 meters - 40.0 meters	NOAA_1m	Object Detection
H13808_MB_2m_LWD_Final	CARIS Raster Surface (CUBE)	2 meters	18.0 meters - 40.0 meters	NOAA_2m	Complete MBES
H13808_MB_4m_LWD_Final_1of2	CARIS Raster Surface (CUBE)	4 meters	36.0 meters - 61.77 meters	NOAA_4m	Complete MBES
H13808_MB_4m_LWD_Final_2of2	CARIS Raster Surface (CUBE)	4 meters	36.0 meters - 45.8 meters	NOAA_4m	Object Detection
H13808_MB_50cm_LWD	CARIS Raster Surface (CUBE)	0.5 meters	-1.45 meters - 14.36 meters	NOAA_0.5m	Object Detection
H13808_MB_1m_LWD_1of2	CARIS Raster Surface (CUBE)	1 meters	0.19 meters - 61.82 meters	NOAA_1m	Complete MBES

Surface Name	Surface Type	Resolution	Depth Range	Surface Parameter	Purpose
H13808_MB_1m_LWD_2of2	CARIS Raster Surface (CUBE)	1 meters	35.65 meters - 45.82 meters	NOAA_1m	Object Detection
H13808_MB_2m_LWD	CARIS Raster Surface (CUBE)	2 meters	0.77 meters - 61.8 meters	NOAA_2m	Complete MBES
H13808_MB_4m_LWD_1of2	CARIS Raster Surface (CUBE)	4 meters	0.95 meters - 61.77 meters	NOAA_4m	Complete MBES
H13808_MB_4m_LWD_2of2	CARIS Raster Surface (CUBE)	4 meters	35.83 meters - 45.8 meters	NOAA_4m	Object Detection
H13808_MBAB_2m_400kHZ_1of1	MB Backscatter Mosaic	2 meters	-	N/A	Processed Backscatter

Table 10: Submitted Surfaces

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 Low Water Datum IGLD-1985.

ERS Datum Transformation

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

Method	Ellipsoid to Chart Datum Separation File
ERS via VDATUM	Vdatum_Coverage_100m_NAD83_2011-LWD_IGLD85_geoid18.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 16.

The following PPK methods were used for horizontal control:

- Smart Base

CORS stations for this project were drawn from both the NOAA CORS Network, managed by NOAA/ National Geodetic Survey, and the WISCORS Network, managed by the Wisconsin Department of Transportation. See the HVCR for discussion and a map of stations labeled by network.

The following CORS Stations were used for horizontal control:

HVCR Site ID	Base Station ID
BURLINGTON	BURL
KARA CO 2 COOP	KAR2
KENOSHA	KEHA
BENTON HARBOR	MIBH
GRAND HAVEN	MIGH
MUSKEGON HEIGHTS	MIMK
SOUTH HAVEN	MISH
PORT WASHINGTON	POWA
BROOKFIELD	RASN
SEILER FRWI 2	SIW2
WEST BEND	WEBE
WEST BEND	WIWB

Table 12: CORS Base Stations

The following user installed stations were used for horizontal control:

HVCR Site ID	Base Station ID
Ocean Surveys Kenosha	OSKE

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 ENCs, which cover the survey area:

ENC	Scale	Edition	Update Application Date	Issue Date
US4WI1DP	1:90000	1	12/21/2023	01/08/2024
US5WI30M	1:10000	20	06/08/2022	01/08/2024

Table 14: Largest Scale ENCs

D.1.2 Shoal and Hazardous Features

There were 3 DTON reports submitted for H13808. They included 1 rock, 1 rocky mound next to a deeper charted obstruction, and 1 uncharted crib structure with a tall post nearby. See the FFF for details.

D.1.3 Charted Features

There were 18 obstructions, 7 rocks, 6 wrecks, and 1 mooring buoy assigned as charted features in H13808. The obstructions included 8 snag/stump features in 2 rows in Whitefish Bay, none of which were found at the charted positions, but 10 new obstructions were surveyed within the search areas. Object detection coverage was assigned for 4 unverified charted features: 3 wrecks and 1 rock. The wrecks were all disproved and the rock was found to be part of a breakwater. See the FFF for details.

D.1.4 Uncharted Features

New features surveyed in H13808 included 14 wrecks, all of which were larger than 1mm at survey scale and submitted as area features. There were also 18 new obstructions, 10 of which were found together in Whitefish Bay near charted snag/stump obstructions. The remaining new obstructions were mostly large enough to merit submission as area features. See the FFF for details.

D.1.5 Channels

A channel was assigned for H13808 but not investigated due to being inshore of NALL. The dredge area features are not included in the FFF as per the investigation requirements.

D.2 Additional Results

D.2.1 Aids to Navigation

There were 28 ATONS charted in or near the boundaries of survey H13808. The field crews observed 23 of these ATONS, and 5 were not seen. All 5 of the missing ATONS are seasonal, with the status attribute "periodic/intermittent", and so were not reported to the U.S. Coast Guard. Uncharted ATONS were seen marking the positions of wrecks (5 wrecks marked with 1 or 2 buoys each) and photos were included in the FFF.

Figure 29: Example of buoys marking a charted wreck (Prins Willem V).

D.2.2 Maritime Boundary Points

No Maritime Boundary Points were assigned for this survey.

D.2.3 Bottom Samples

There were 5 bottom samples assigned in H13808, all of which were at locations without previously-charted bottom types. Most samples included brown sand and shells, with some areas containing clay or silt. See the FFF for details.

D.2.4 Overhead Features

No overhead features exist for this survey.

D.2.5 Submarine Features

There were 8 pipelines charted within H13808. All of the charted pipelines had some visible indication of presence relatively near their charted positions in the survey data, including linear mounds, crib structures, or trenches. Only 3 of the pipelines were found to have exposed segments, and no pipelines were found very far away from a charted pipeline position. Exposed pipeline segments are documented in the Non-DTON Pipeline Report.

D.2.6 Platforms

No platforms exist for this survey.

D.2.7 Ferry Routes and Terminals

A charted ferry route exists for this survey. The ferry was observed by the field team, but was not investigated further.

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.

Approver Name	Approver Title	Approval Date	Signature
John R. Bean	Chief of Party	04/04/2024	Digitally signed by John R. Bean
David T. Somers	Data Processing Manager	04/04/2024	Digitally signed by David T. Somers

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