H13682

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

DESCRIPTIVE REPORT

Type of Survey:	Navigable Area
Registry Number:	H13682

LOCALITY

State(s):	Ohio
General Locality:	Lake Erie
Sub-locality:	Cleveland

2022

CHIEF OF PARTY
Matthew J. Jaskoski, CDR/NOAA

LIBRARY & ARCHIVES

Date:

U.S. DEPARTMENT OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION	REGISTRY NUMBER:
HYDROGRAPHIC TITLE SHEET	**H13682**

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):	**Ohio**
General Locality:	**Lake Erie**
Sub-Locality:	**Cleveland**
Scale:	**10000**
Dates of Survey:	**08/18/2022 to 09/21/2022**
Instructions Dated:	**08/02/2022**
Project Number:	**OPR-W386-TJ-22**
Field Unit:	**NOAA Ship *Thomas Jefferson***
Chief of Party:	**Matthew J. Jaskoski, CDR/NOAA**
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 17N, LWD-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 H13682

Project: OPR-W386-TJ-22

Locality: Lake Erie

Sublocality: Cleveland

Scale: 1:10000

August 2022 - September 2022

NOAA Ship *Thomas Jefferson*

Chief of Party: Matthew J. Jaskoski, CDR/NOAA

A. Area Surveyed

Survey H13682, located in Lake Erie, in the vicinity of Cleveland OH, was conducted in accordance with coverage requirements set forth in the Project Instructions (PI) OPR-W386-TJ-22 (Figure 1).

A.1 Survey Limits

Data were acquired within the following survey limits:

Northwest Limit	Southeast Limit
41° 45' 54" N 81° 55' 54" W	41° 34' 54" N 81° 35' 51" W

Table 1: Survey Limits

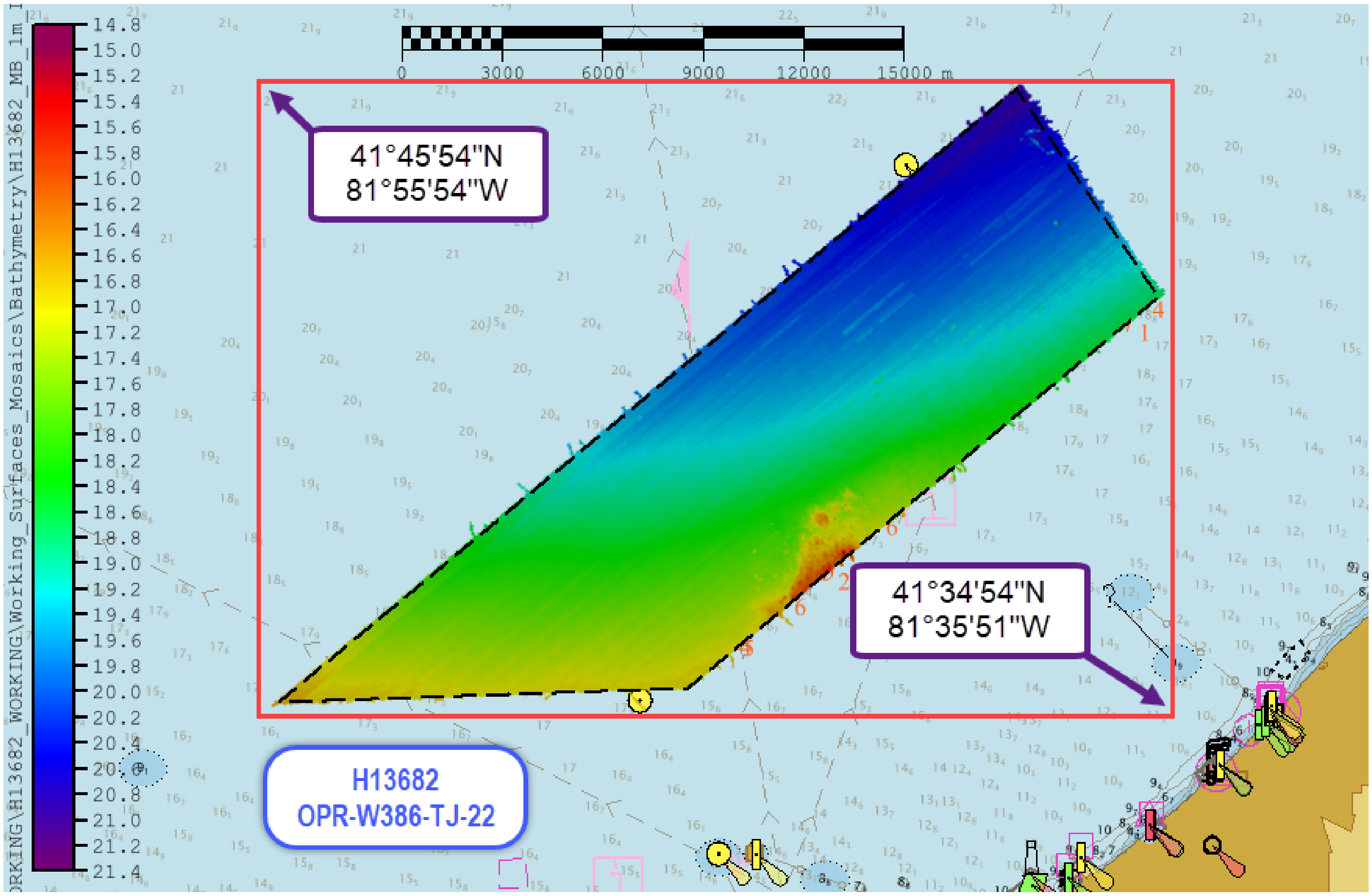


Figure 1: Survey layout for H13682, plotted over ENC US4OH01M. Black outline represents the survey limits set forth by the Project Instructions, red box represents survey extents.

Survey limits were acquired in accordance with the requirements in the Project Instructions and the 2022 HSSD.

A.2 Survey Purpose

The Port of Cleveland is one of the largest ports on the Great Lakes and ranks within the top 50 ports in the United States. Roughly 13 million tons of cargo are transported through Cleveland Harbor each year supporting over 20,000 jobs and $3.5 billion in annual economic activity (1). This project will provide modern bathymetric data for the Cleveland area as well as the vicinity of South Bass Island and Presque Isle. The project area was identified as a statistically significant hot spot within the 2018 hydrographic health model, a risk model that Coast Survey uses for evaluating priorities based upon navigational risks and the necessary quality of data to support modern traffic. Most of this area has not been surveyed since the 1940s, and experiences significant vessel traffic.

Conducting a modern bathymetric survey in this area will identify hazards and changes to the seafloor, provide critical data for updating National Ocean Service (NOS) nautical charting products and improve maritime safety. Survey data from this project is intended to supersede all prior survey data in the common area.

1. https://www.portofcleveland.com/

A.3 Survey Quality

The entire survey is adequate to supersede previous data.

Complete coverage requirements were met utilizing 100% multibeam echo sounder (MBES) coverage as specified by the 2022 HSSD. Data acquired in H13682 meet survey quality standards specified in the 2022 HSSD, including crosslines (see Section B.2.1), NOAA allowable uncertainty (see Section B.2.2), and density requirements (see 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)
All waters in survey area	Acquire backscatter data during all multibeam data acquisition (Refer to the HSSD Section 6.2)

Table 2: Survey Coverage

Survey coverage was in accordance with the requirements listed above and in the 2022 HSSD (Figure 2). There are no holidays present in the acquired MBES coverage.

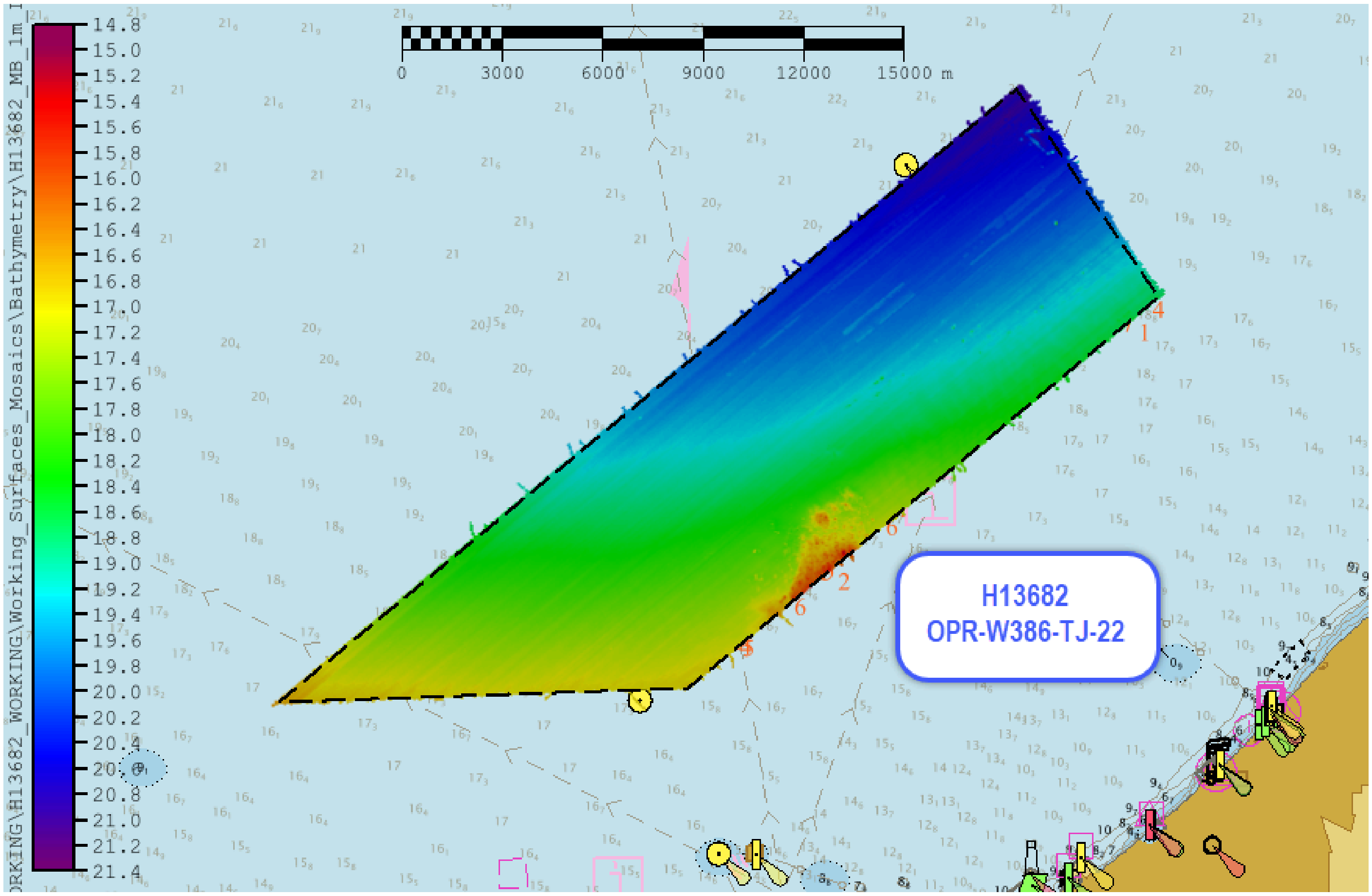


Figure 2: Coverage achieved for H13682 shown in color. Black outline is assigned sheet limits.

A.6 Survey Statistics

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

	HULL ID	*S222*	*DriX-12*	*2903*	*Total*
LNM	SBES Mainscheme	0.0	0.0	0.0	0.0
	MBES Mainscheme	1996.81	170.26	16.56	2183.63
	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	96.84	0.0	0.0	96.84
	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					55.79

Table 3: Hydrographic Survey Statistics

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

Survey Dates	Day of the Year
08/18/2022	230
08/19/2022	231

Survey Dates	Day of the Year
08/20/2022	232
08/21/2022	233
08/22/2022	234
08/23/2022	235
09/05/2022	248
09/06/2022	249
09/07/2022	250
09/08/2022	251
09/09/2022	252
09/12/2022	255
09/13/2022	256
09/14/2022	257
09/15/2022	258
09/16/2022	259
09/17/2022	260
09/20/2022	263
09/21/2022	264

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	***DriX-12***	***S222***	***2903***
LOA	7.7 meters	63.4 meters	8.5 meters
Draft	2.0 meters	4.6 meters	1.2 meters

Table 5: Vessels Used

Figure 3: NOAA Ship Thomas Jefferson S222

Figure 4: Thomas Jefferson Launch 2903

Figure 5: Autonomous Survey Vehicle DriX-12

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
Sea-Bird Scientific	SBE 19plus V2	Conductivity, Temperature, and Depth Sensor
Teledyne RESON	SVP 70	Sound Speed System
AML Oceanographic	MVP200	Sound Speed System
Valeport	Thru-Hull SVS	Sound Speed System
iXblue	Unknown	Positioning and Attitude System
Valeport	SWiFT SVP	Conductivity, Temperature, and Depth Sensor
Valeport	MiniSVS	Sound Speed System

Table 6: Major Systems Used

Refer to the DAPR for a complete description of systems and equipment used by S222, 2903, and DriX-12.

B.2 Quality Control

B.2.1 Crosslines

S222 collected 96.84 linear nautical miles of MBES crosslines or 4.11% of mainscheme MBES data. The crosslines acquired represent good spatial and depth diversity for this survey area (Figure 6). A variable resolution (VR) Combined Uncertainty and Bathymetry Estimator (CUBE) surface of mainscheme data and a VR CUBE surface of crossline data were differenced - the resulting mean was 0.02m with a standard deviation of 0.06m (Figure 7). Over 99.5% of nodes are compliant with fraction of allowable error standards (Figure 8). Visual inspection of the difference surface indicated no systematic issues.

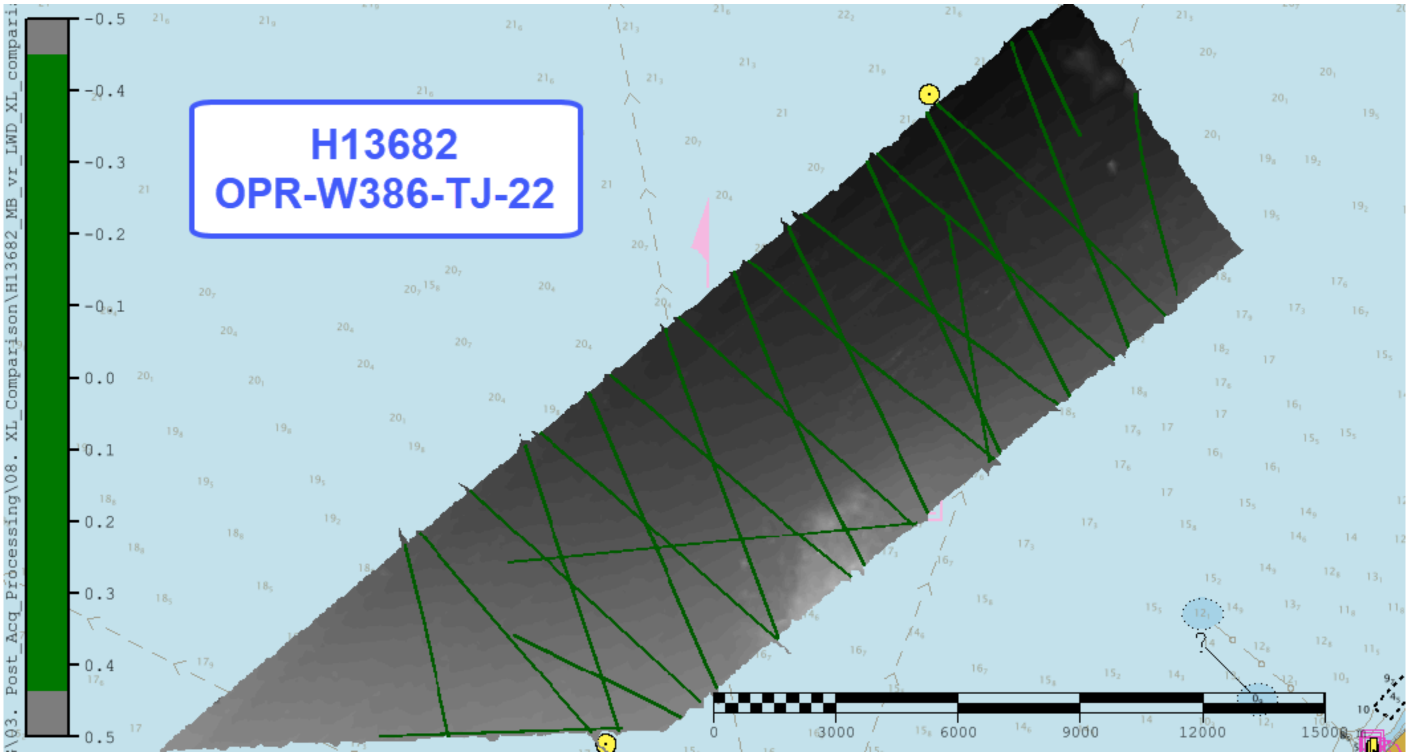
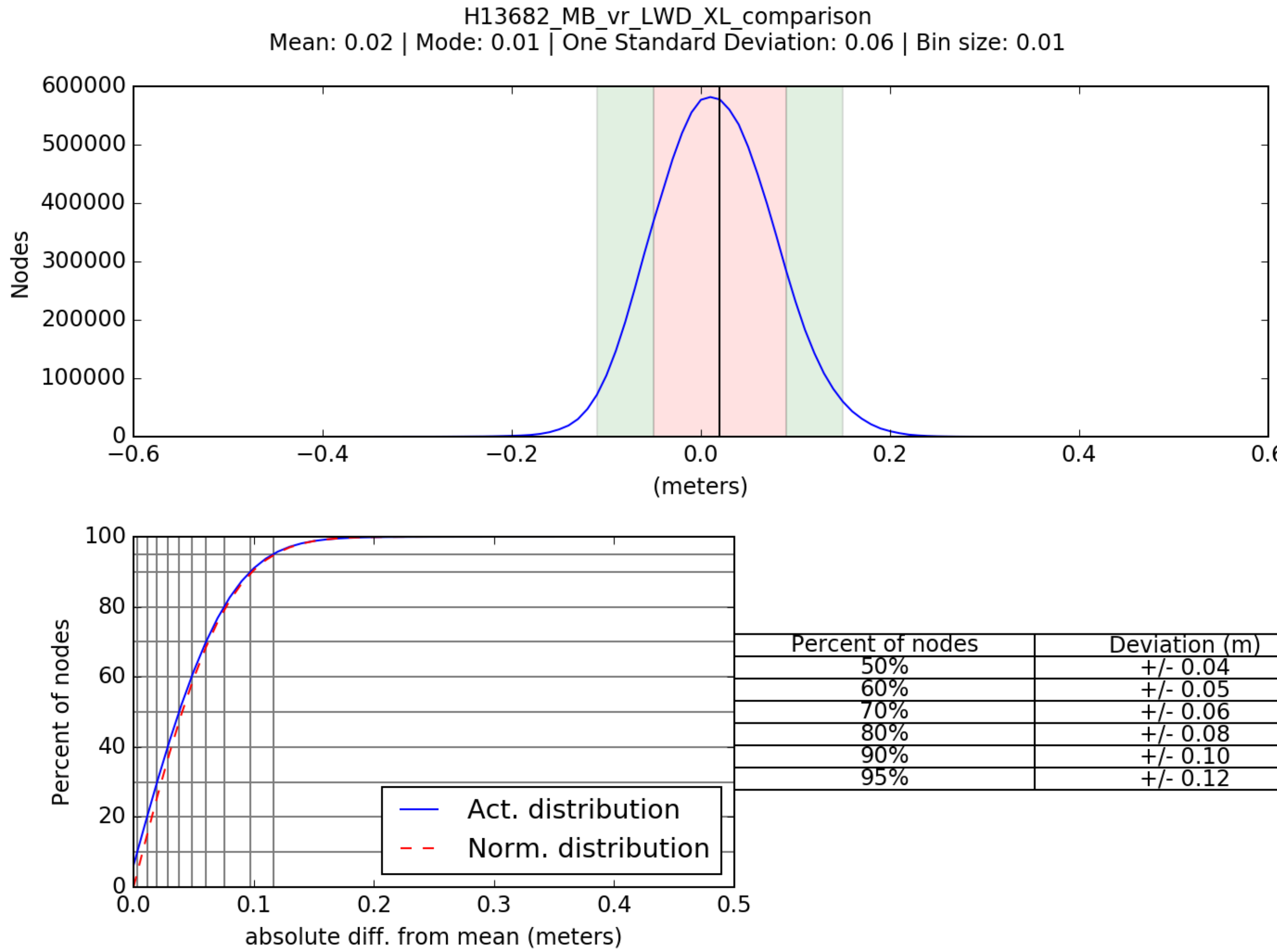


Figure 6: Overview of H13682 crossline distribution by geography colored by IHO's fraction of allowable error.



Percent of nodes	Deviation (m)
50%	+/- 0.04
60%	+/- 0.05
70%	+/- 0.06
80%	+/- 0.08
90%	+/- 0.10
95%	+/- 0.12

Figure 7: H13682 crossline/mainscheme comparison statistics.

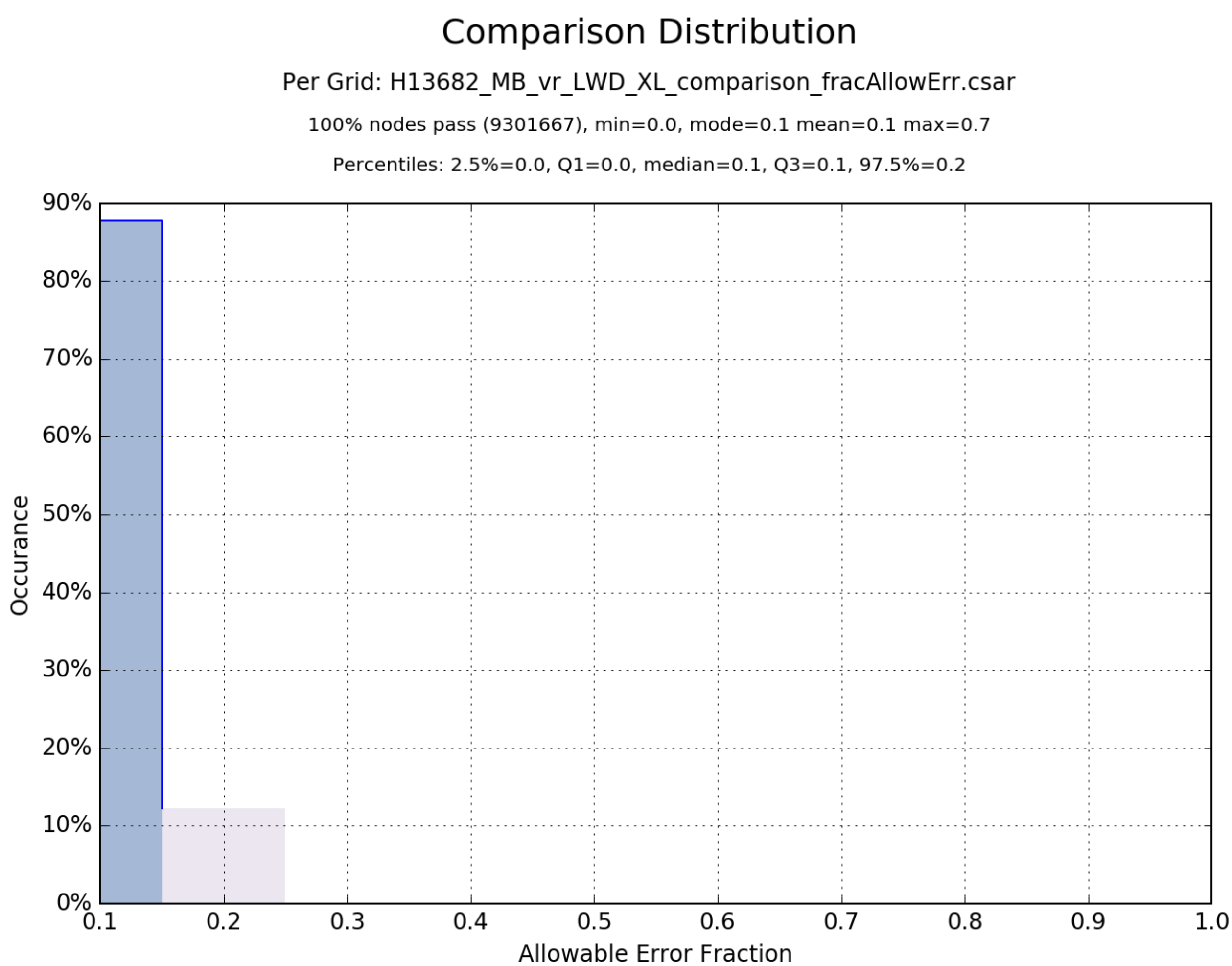


Figure 8: H13682 crossline fraction of allowable error statistics.

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
S222	4 meters/second	4 meters/second	N/A meters/second	0.2 meters/second
2903	4 meters/second	N/A meters/second	N/A meters/second	0.2 meters/second
DriX-12	4 meters/second	N/A meters/second	N/A meters/second	0.2 meters/second

Table 8: Survey Specific Sound Speed TPU Values.

The bathymetric surface's uncertainty layer is compliant with 2022 HSSD uncertainty standards. 100% of all nodes pass uncertainty standards (Figure 9).

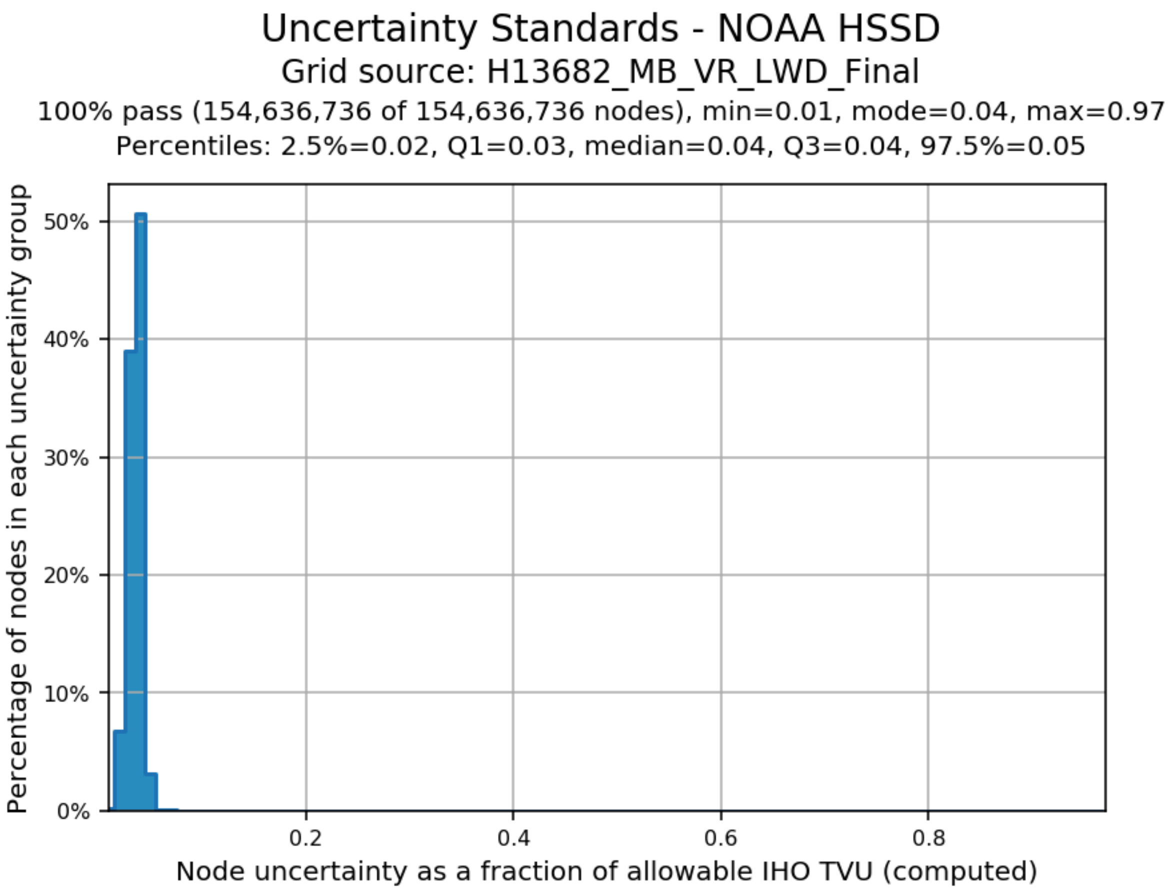


Figure 9: H13682 uncertainty standards.

B.2.3 Junctions

Survey H13682 junctions with contemporary surveys H13615, H13616 and H13687 within the OPR-W386-TJ-22 project (Figure 10). Information regarding junction analysis with H13615 and H13616 can be found below. Reference the Descriptive Report for H13687 for more details regarding junction analysis with this sheet.

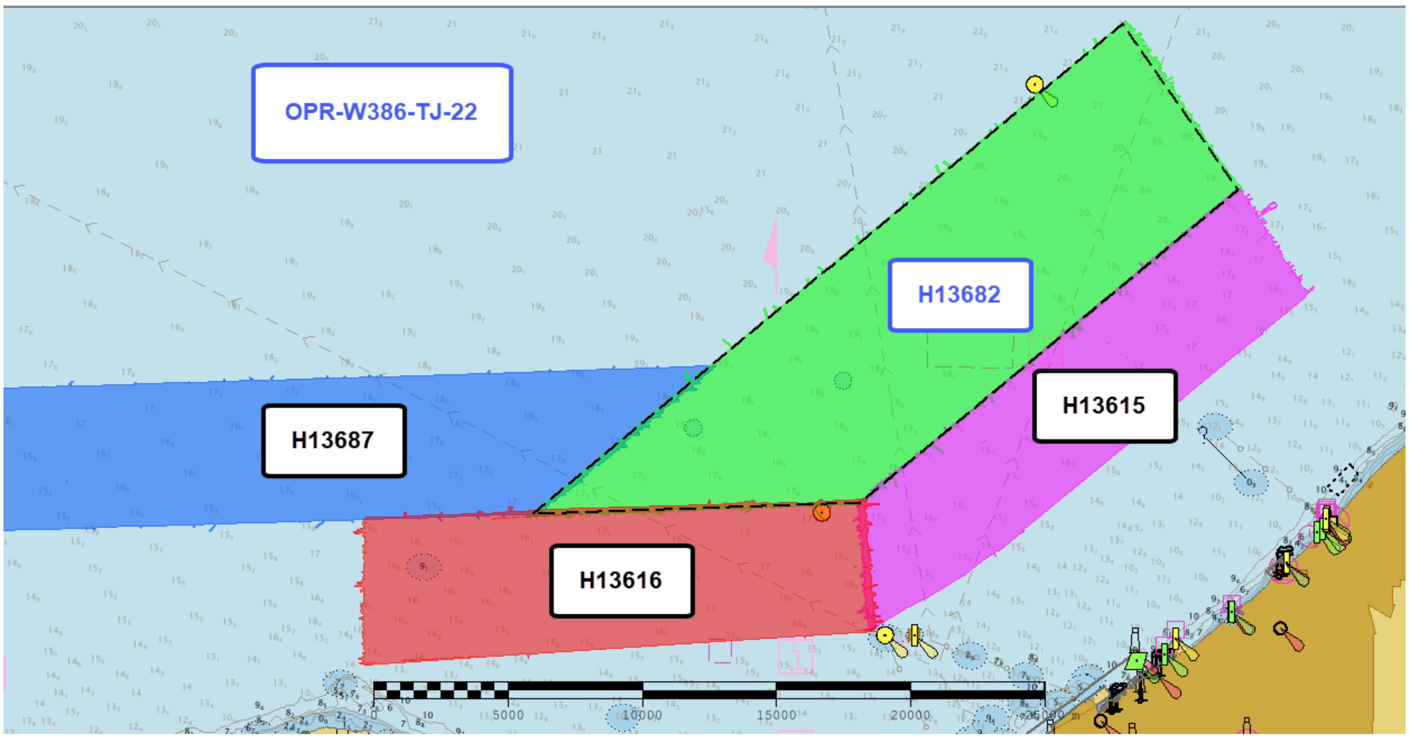


Figure 10: Overview of contemporary surveys which junction with H13682.

The following junctions were made with this survey:

Registry Number	Scale	Year	Field Unit	Relative Location
H13687	1:10000	2022	Thomas Jefferson	SW
H13615	1:10000	2022	Thomas Jefferson	SE
H13616	1:5000	2022	Thomas Jefferson	S

Table 9: Junctioning Surveys

H13687

Refer to the Descriptive Report for H13687 for information on the results of the junction analysis.

H13615

The southern edge of H13682 junctions with sheet H13615 (Figure 11). A 1m SR CUBE surface of H13682 data and a 1m SR CUBE surface of H13615 were differenced. The mean difference between bathymetric surface nodes was 0.05m with a standard deviation of 0.06m (Figure 12). Statistics and visual inspection indicate that surveys H13682 and H13615 are in general agreement (Figure 13).

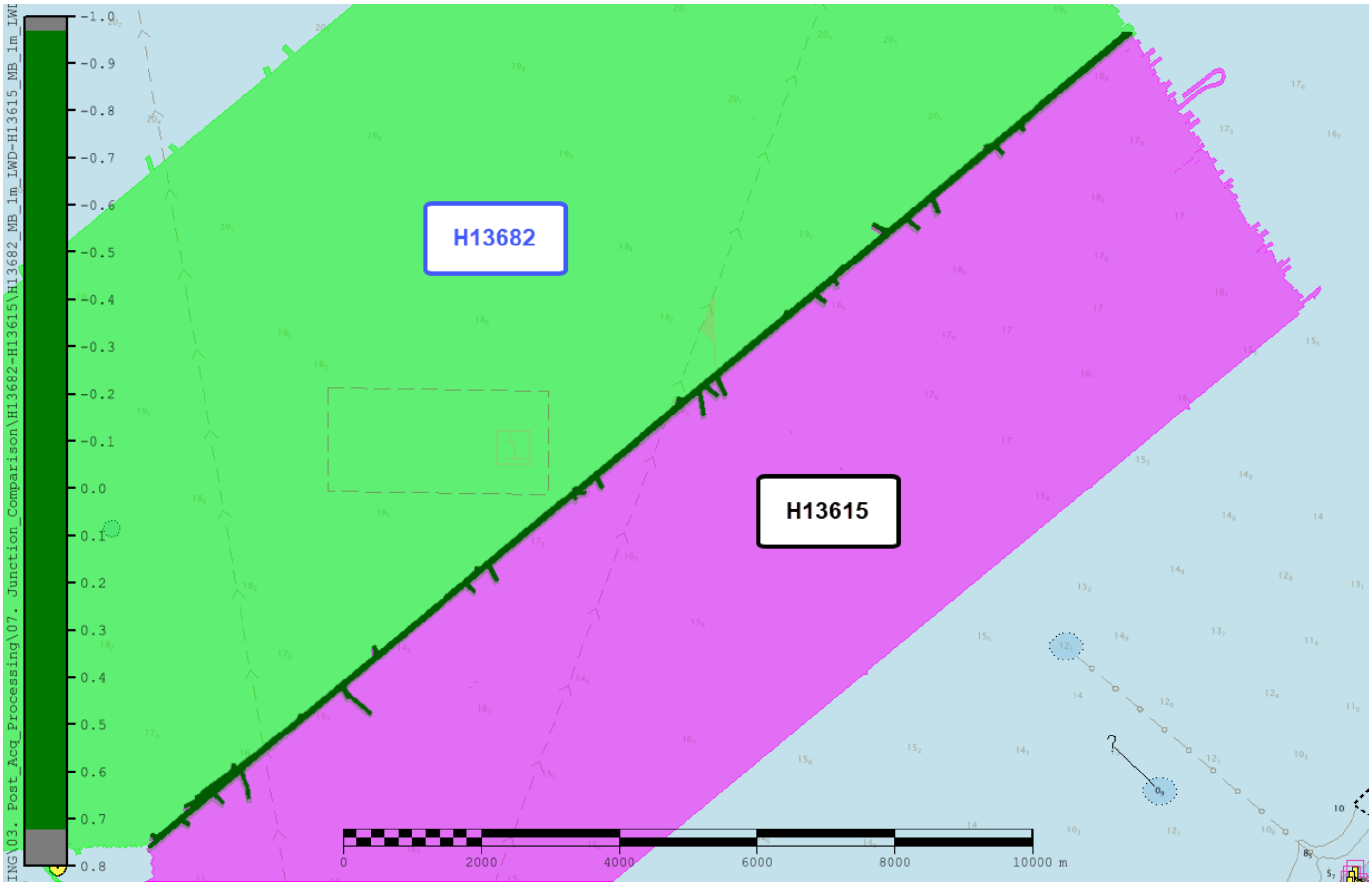
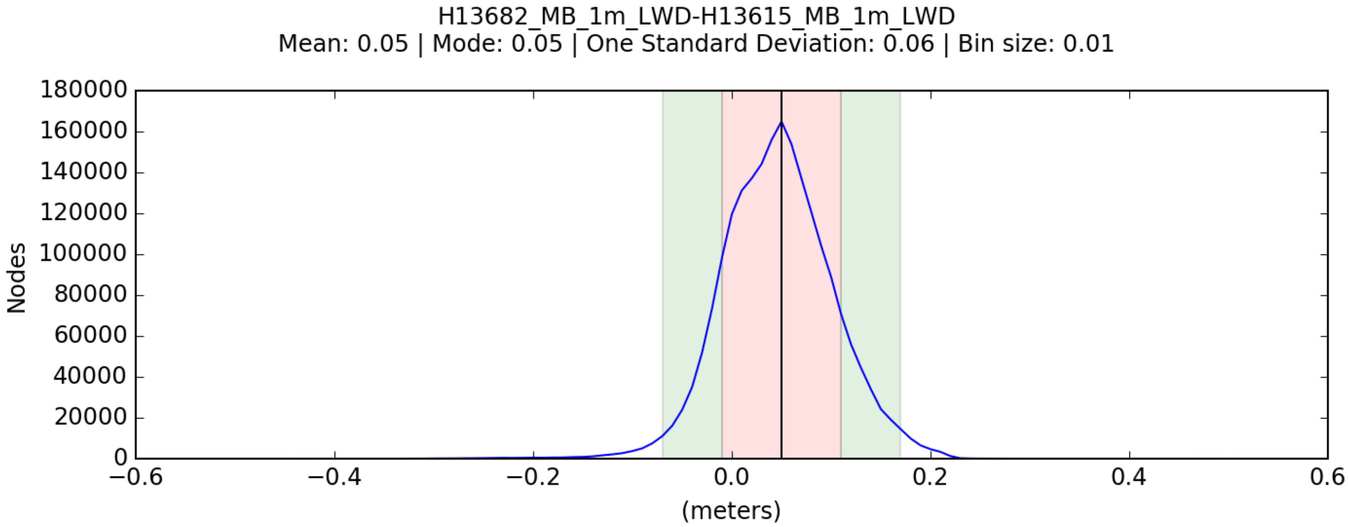
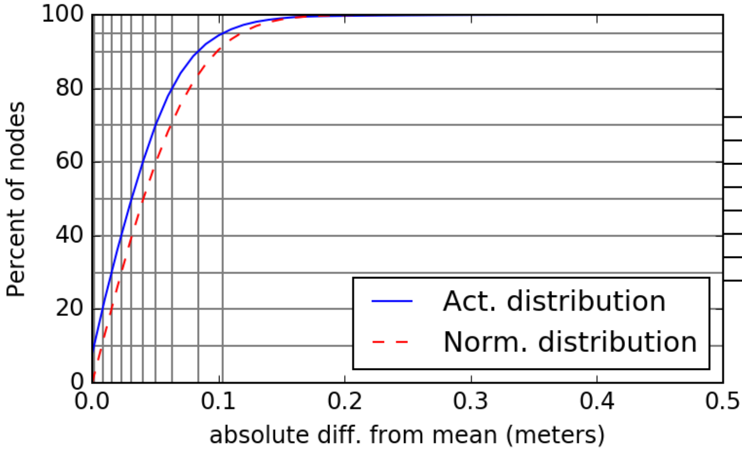


Figure 11: Fraction of allowable error surface difference comparison in color between H13682 and H13615.





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

Figure 12: H13682 and H13615 surface difference comparison statistics.

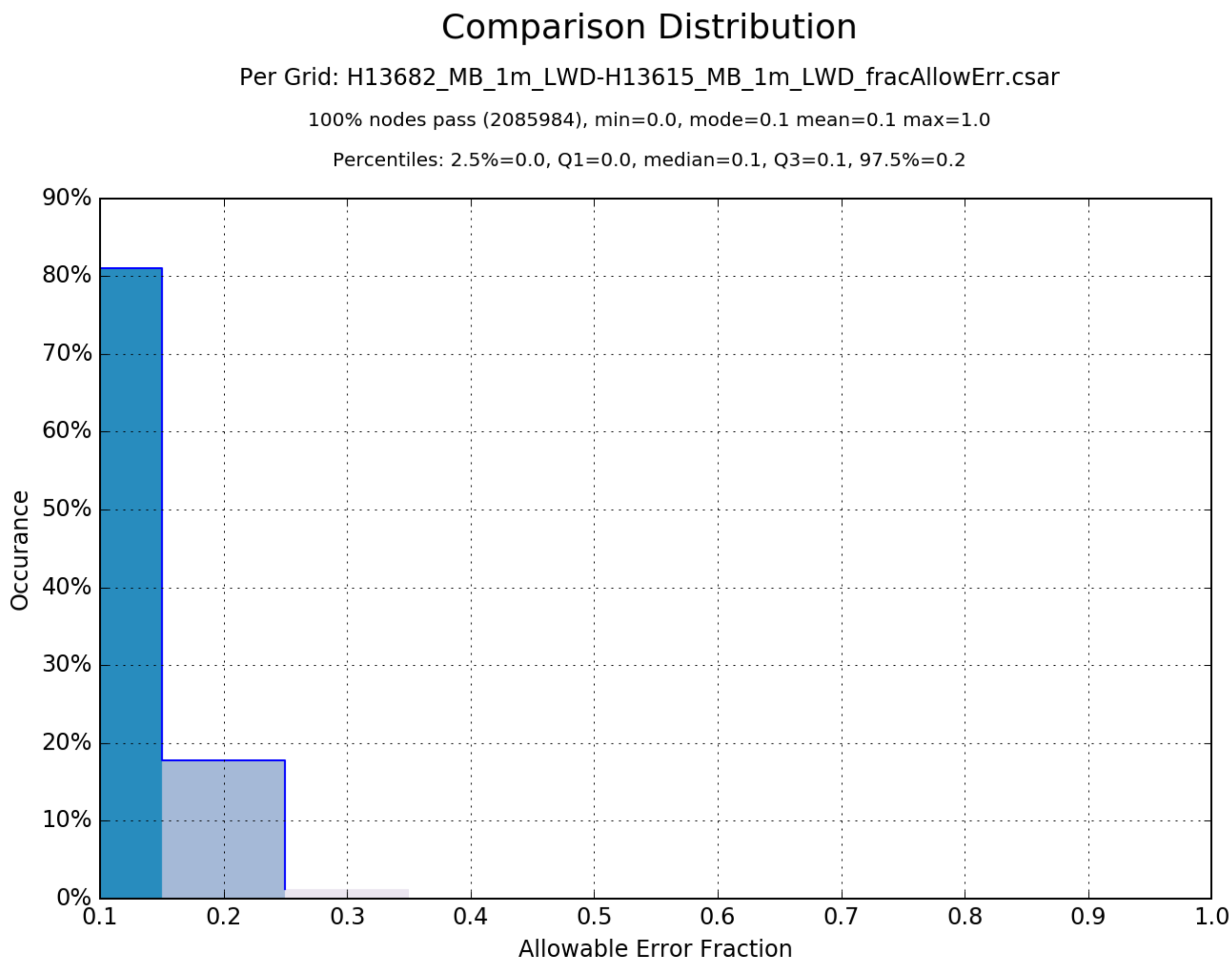


Figure 13: H13682 and H13615 fraction of allowable error statistics.

<u>H13616</u>

The southwestern edge of H13682 junctions with sheet H13616 (Figure 14). A VR CUBE surface of H13682 data and a VR CUBE surface of H13616 data were differenced. The mean difference between bathymetric surface nodes was 0.01m with a standard deviation of 0.02m (Figure 15). Statistics and visual inspection indicate that surveys H13682 and H13616 are in general agreement (Figure 16).

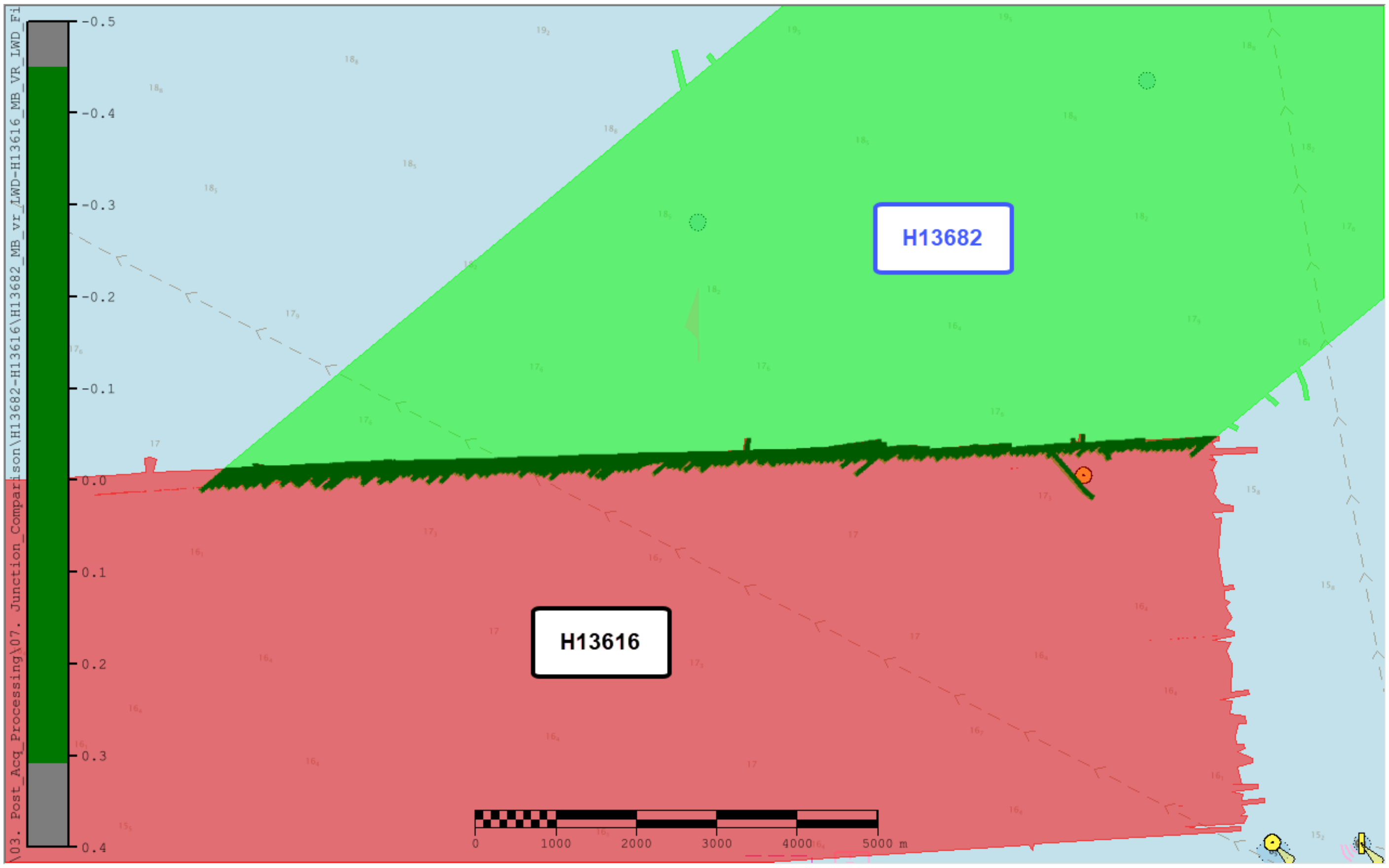
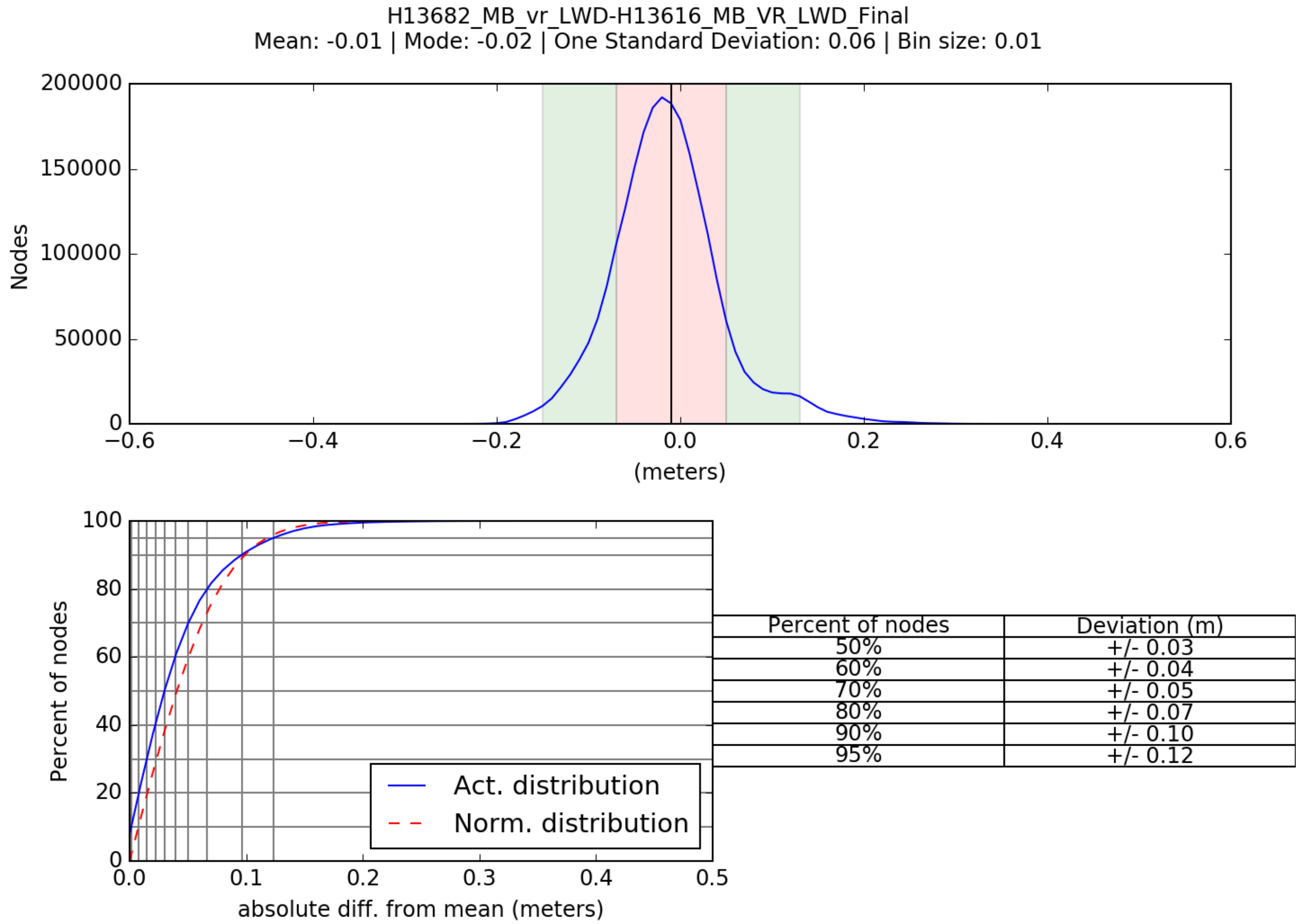


Figure 14: Fraction of allowable error surface difference comparison in color between H13682 and H13616.



Percent of nodes	Deviation (m)
50%	+/- 0.03
60%	+/- 0.04
70%	+/- 0.05
80%	+/- 0.07
90%	+/- 0.10
95%	+/- 0.12

Figure 15: H13682 and H13616 surface difference comparison statistics.

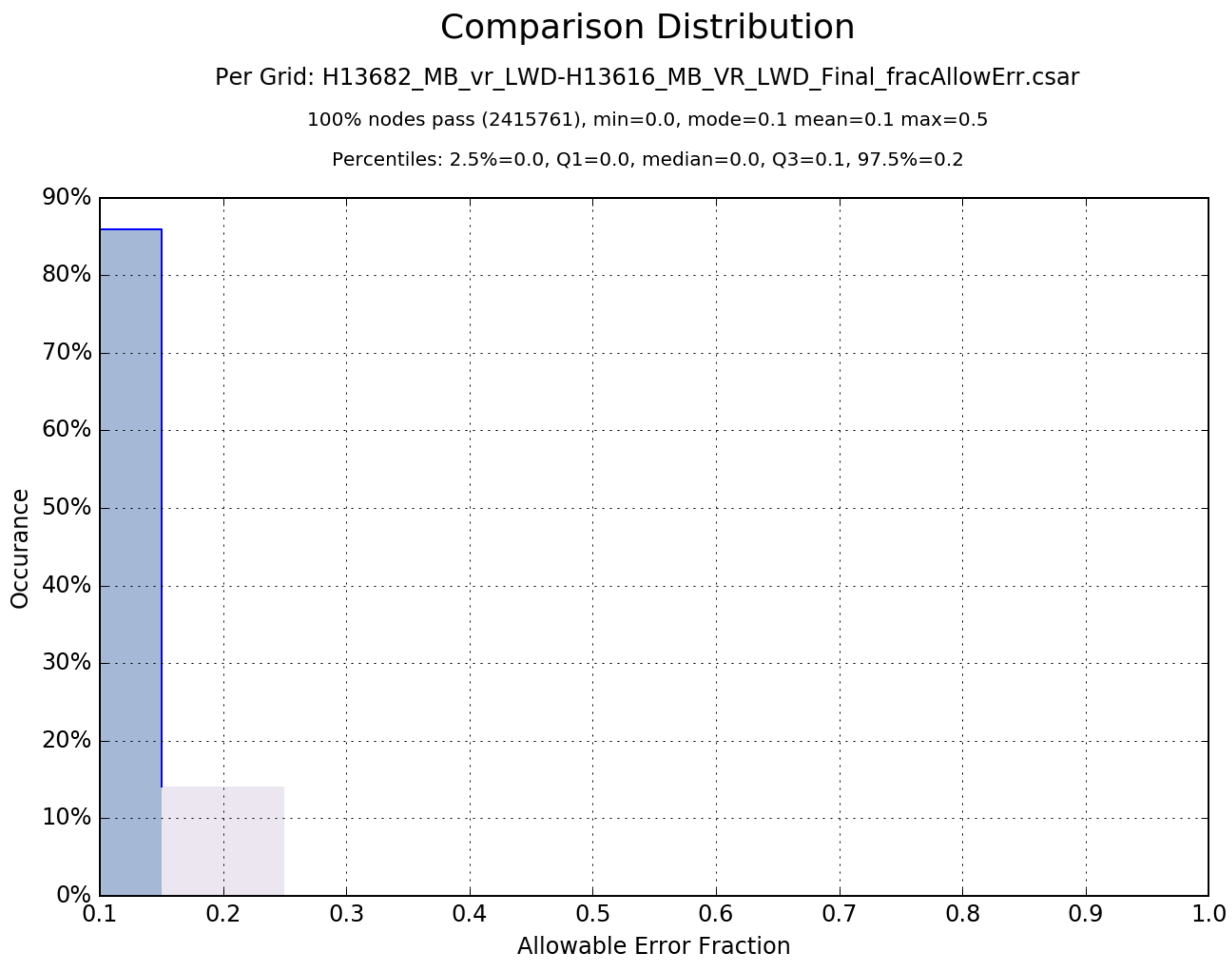


Figure 16: H13682 and H13616 fraction of allowable error statistics.

B.2.4 Sonar QC Checks

Sonar system quality control checks were conducted as detailed in the quality control section of the DAPR.

B.2.5 Equipment Effectiveness

There were no conditions or deficiencies that affected equipment operational effectiveness.

B.2.6 Factors Affecting Soundings

Refraction Caused by Thermal Layering

H13682 is located in an area of Lake Erie Northeast of Cleveland that exhibits intense thermal stratification. This layering greatly affects sound speed (Figure 17) and results in refraction that can be observed in the MBES surface (Figure 18). The effect of refraction does not offset the data greater than the allowable TVU for the survey area (0.53-0.56m).

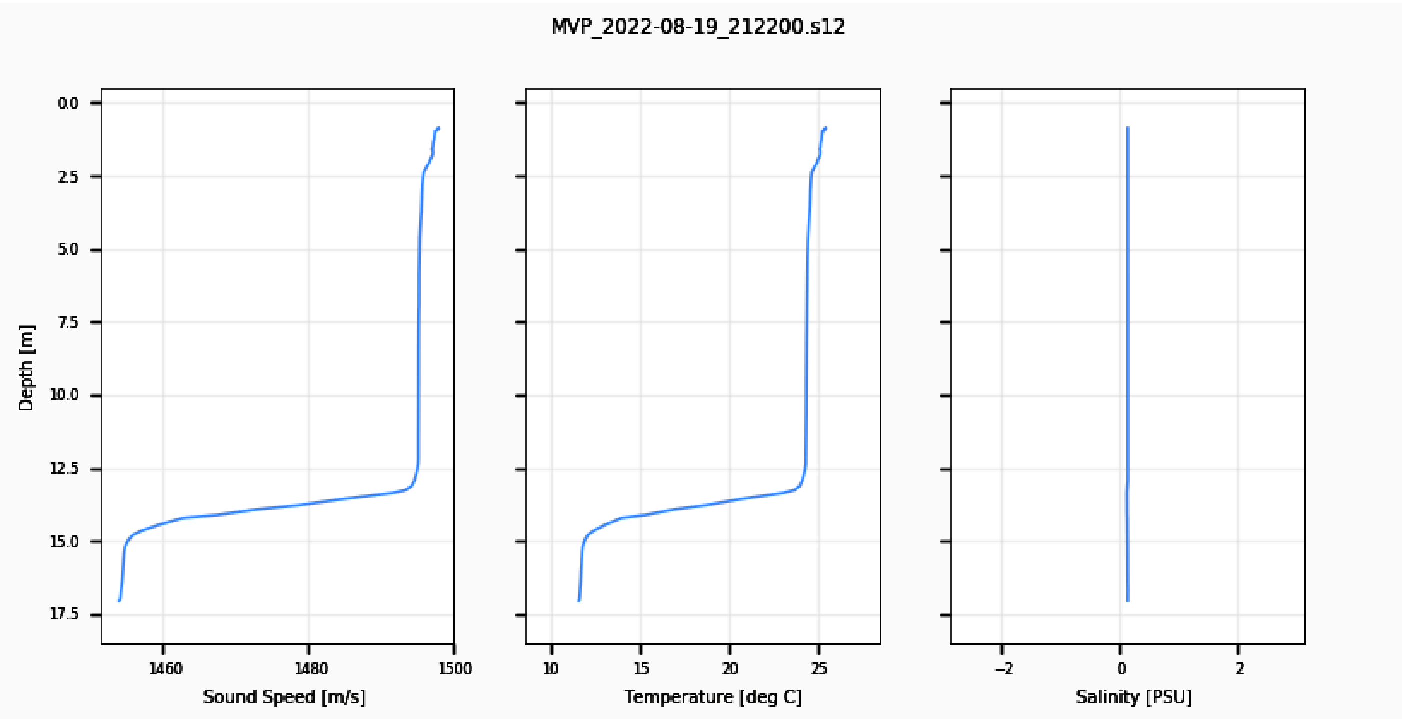


Figure 17: Example of conductivity, temperature, and sound speed profiles collected on H13682 showing the effect of temperature on sound speed.

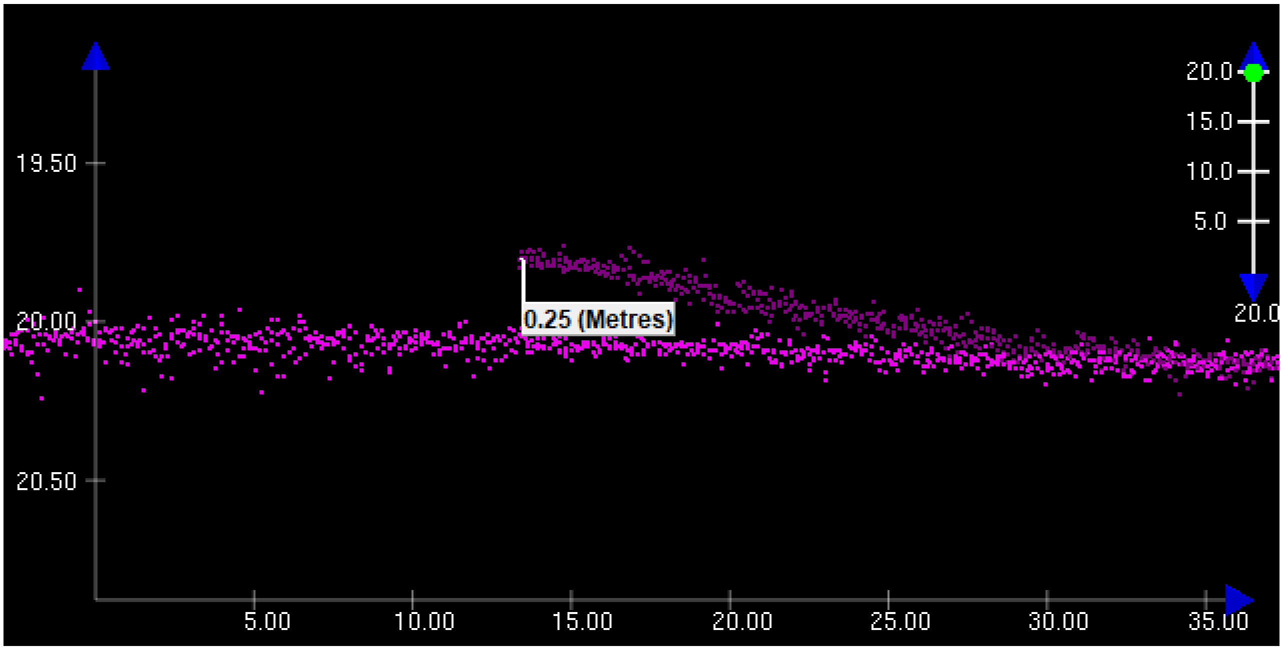


Figure 18: Example of refraction observed in H13682.

B.2.7 Sound Speed Methods

Sound Speed Cast Frequency: Conductivity, temperature, and depth (CTD) casts were conducted at the start of acquisition each day and at a minimum of once every four hours during acquisition using a SeaBird Seacat 19+ V2 CTD, an MVP 200 system, and a Valeport SWiFT CTD. Cast frequency was increased in areas where a change in surface sound speed greater than two meters per second was observed. MVP casts on S222 were conducted at an average interval of 45 minutes, guided by observation of the surface sound speed and targeted to deeper areas. All sound speed methods were used as detailed in the DAPR.

A total of 202 sound speed profiles were collected as part of acquisition of H13682 and display good spatial diversity (Figure 19). Five of these casts were located outside of the sheet limits, not more than 250m away, and display profiles representative of the area. Three casts are up to 1600m outside assigned survey limits, but these profiles are not applied to the survey data set. All sound speed profile data were concatenated into a master file for the sheet. MBES data were corrected by applying profiles nearest in distance in time (4 hours) using this master file.

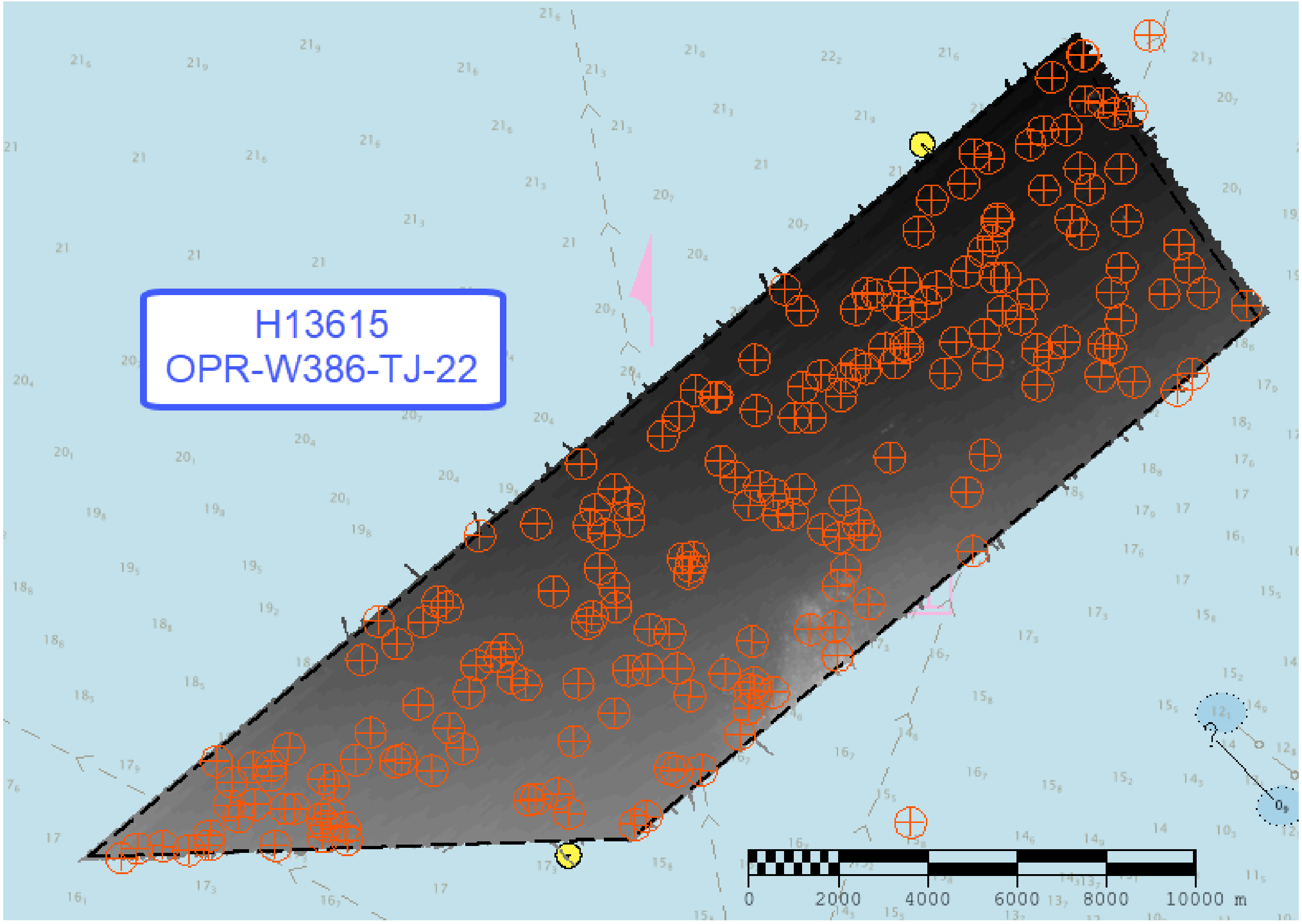


Figure 19: Overview of all CTD casts collected on H13682. Cast locations shown as orange targets overlaid on greyscale MBES data.

B.2.8 Coverage Equipment and Methods

Complete coverage requirements were met by 100% complete coverage MBES as specified under section 5.2.2.3 of the 2022 HSSD. Launch 2903 and autonomous survey vehicle DriX-12 are both outfitted with Kongsberg EM2040 MBES systems and were primarily used to acquire 100% complete coverage MBES. Vessel S222 was outfitted with a Kongsberg EM2040 MBES system and was primarily used to acquire 100% complete coverage MBES, crosslines, developments, and holidays.

B.3 Echo Sounding Corrections

B.3.1 Corrections to Echo Soundings

All data reduction procedures conform to those detailed in the DAPR.

B.3.2 Calibrations

All sounding systems were calibrated as detailed in the DAPR.

B.4 Backscatter

All equipment and survey methods were used as detailed in the DAPR. Raw MBES backscatter was logged as part of the .all file 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 (Figures 20-22).

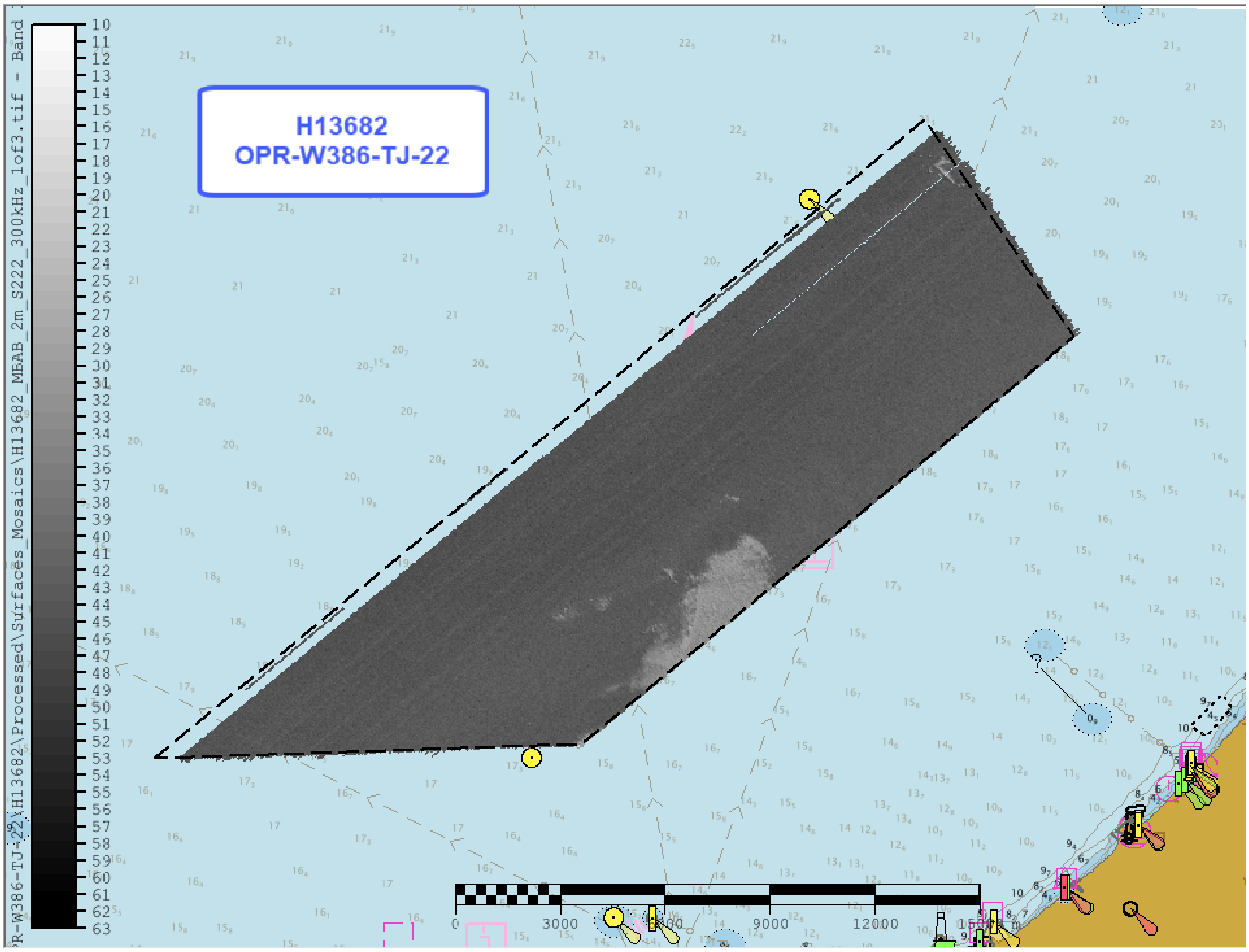


Figure 20: 300kHz backscatter mosaic from data acquired by S-222.

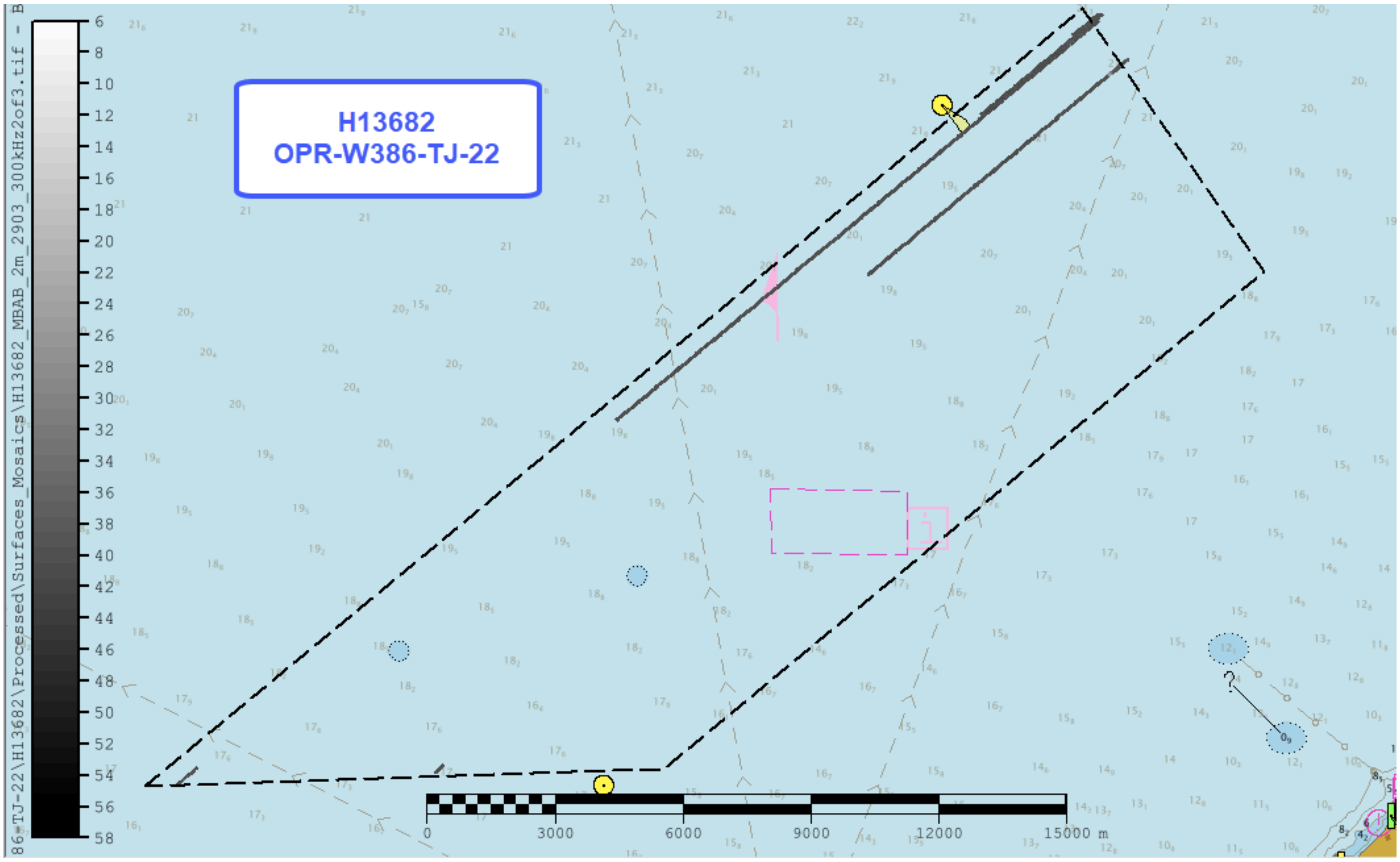


Figure 21: 300kHz backscatter mosaic from data acquired by 2903.

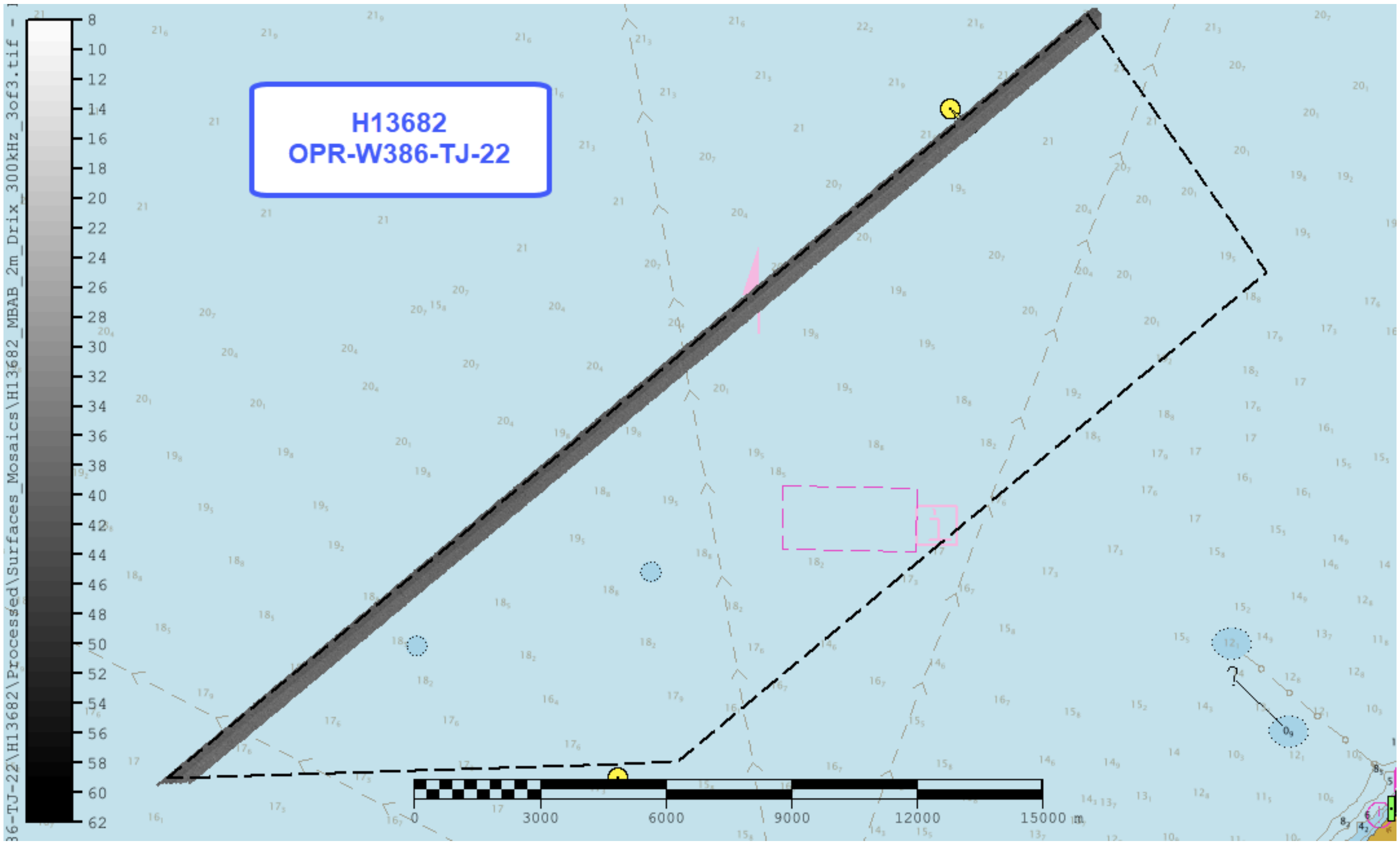


Figure 22: 300kHz backscatter mosaic from data acquired by DriX-12.

B.5 Data Processing

B.5.1 Primary Data Processing Software

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

Feature Object Catalog NOAA Profile Version 2022 was used for all S-57 attribution in the Final Feature File (FFF). All other software were used as detailed in the DAPR.

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
H13682_MB_VR_LWD	CARIS VR Surface (CUBE)	Variable Resolution	14.95 meters - 21.39 meters	NOAA_VR	Complete MBES
H13682_MB_VR_LWD_Final	CARIS VR Surface (CUBE)	Variable Resolution	14.95 meters - 21.39 meters	NOAA_VR	Complete MBES
H13682_MBAB_2m_S222_300kHz_1of3	MB Backscatter Mosaic	2 meters	-	N/A	Complete MBES
H13615_MBAB_2m_2903_300kHz_2of3	MB Backscatter Mosaic	2 meters	-	N/A	Complete MBES
H13615_MBAB_2m_Drix_300kHz_3of3	MB Backscatter Mosaic	2 meters	-	N/A	Complete MBES

Table 10: Submitted Surfaces

Complete coverage requirements were met by 100% complete coverage MBES as specified under section 5.2.2.2 of the 2022 HSSD. All bathymetric grids for H13682 meet density requirements per the 2022 HSSD (Figure 23).

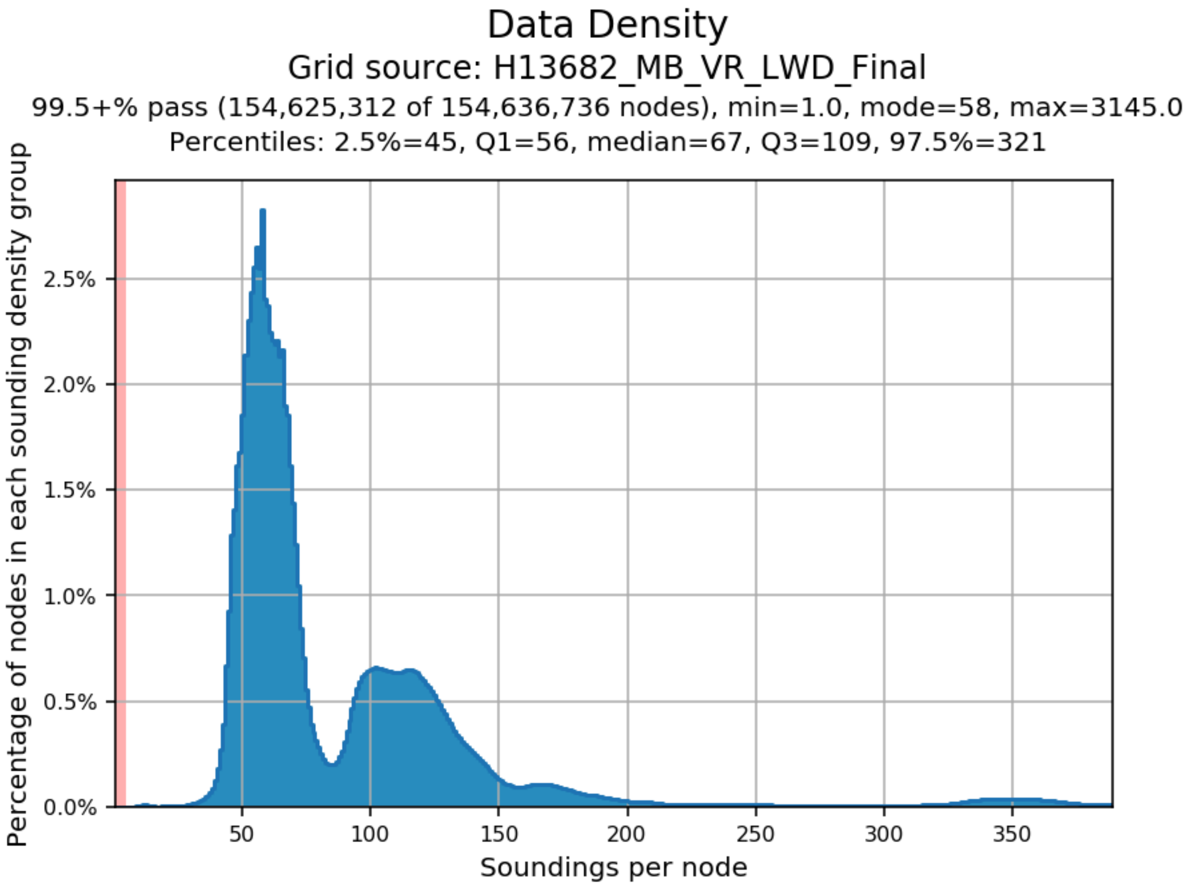


Figure 23: H13682 data density standards.

C. Vertical and Horizontal Control

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

C.1 Vertical Control

The vertical datum for this project is 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	OPR-W386-TJ-22_NAD83_2011_VDatum_LWD_IGLD85

Table 11: ERS method and SEP file

All soundings submitted for H13682 are reduced to LWD IGLD-85 using VDatum techniques as outlined in the DAPR.

C.2 Horizontal Control

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

The projection used for this project is Universal Transverse Mercator (UTM) Zone 17.

PPP

GrafNav PPP service was used with a dual frequency Septentrio GNSS system to obtain highly accurate ellipsoidally referenced position data to meet ERS specifications for H13682 MBES data collected by DriX-12.

RTK

Trimble-RTX service was used with an Applanix POS MVv5 GNSS_INS system to obtain highly accurate ellipsoidally referenced position data to meet ERS specifications for H13682 MBES data from vessels S222 and 2903.

WAAS

The Wide Area Augmentation System (WAAS) was used for real-time horizontal control during data acquisition on vessels S222, 2903, and DriX-12.

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
US4OH01M	1:180000	17	03/31/2022	07/27/2022

Table 12: Largest Scale ENCs

D.1.2 Shoal and Hazardous Features

Surveyed soundings and contours were compared against previously charted data on ENC US4OH01M. Depth values were found to be in general agreement with previously charted soundings. Two features present on the ENC have been recommended for deletion. No danger to navigation reports were submitted for this survey and all data acquired on H13682 are recommended to supersede prior data.

D.1.3 Charted Features

A total of two features were assigned for investigation. Based on the H13682 data, both were deemed appropriate for deletion. Reference the Final Feature File included with the submission of this project for further information.

Additionally, a charted dumping ground exists within the survey limits that was not assigned for investigation. However, after examination of the bathymetric data from both H13682 and junctioning survey H13615, the hydrographer believes there is evidence of the dumping ground approximately 1.5 nautical miles to the south (Figure 24). The least depth in the observed area is greater than the minimum provided in the charted feature and does not pose a navigational hazard.

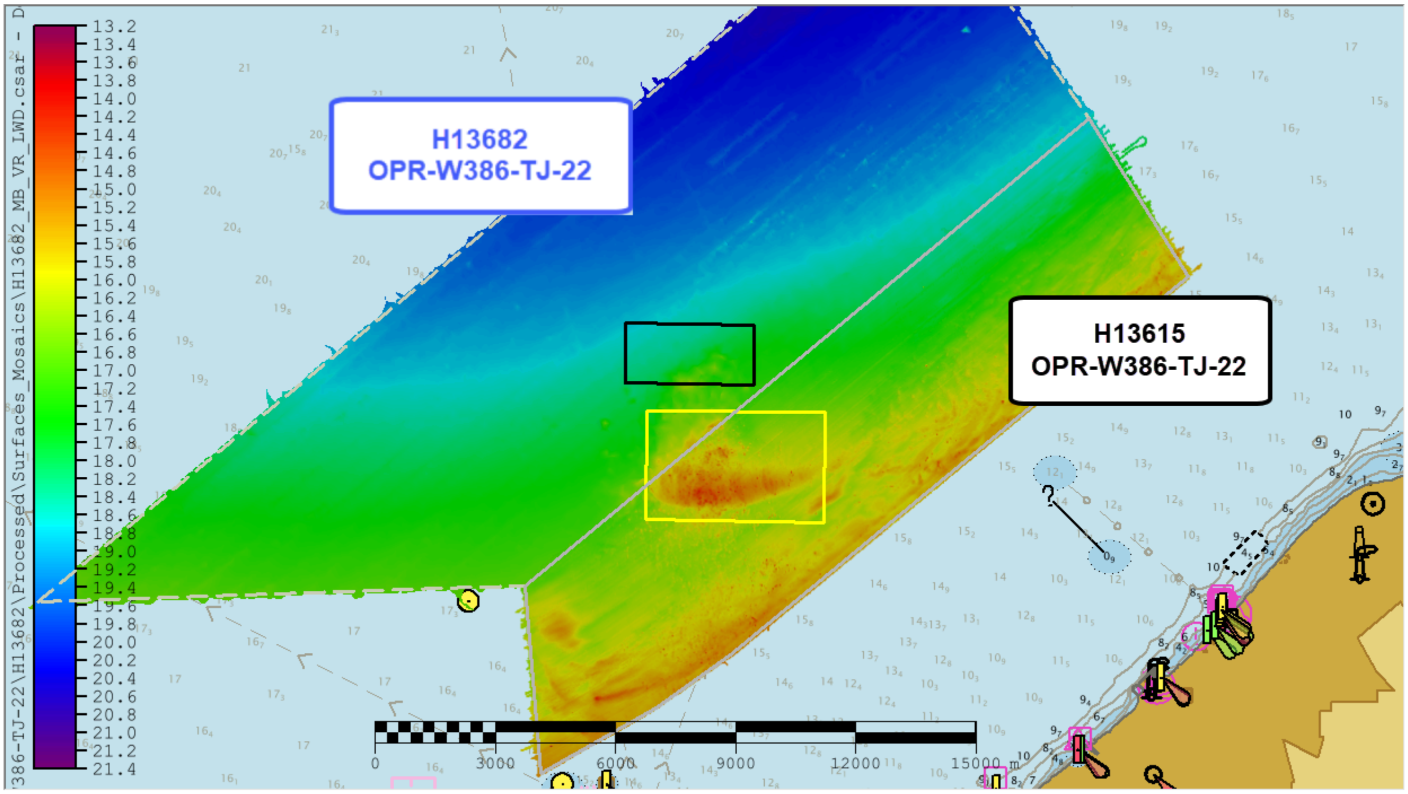


Figure 24: Bathymetric surfaces from H13682 and H13615 shown in color on Chart US4OH01M. Location of charted dumping ground outlined in black, location of potentially observed dumping ground outlined in yellow.

D.1.4 Uncharted Features

A total of two uncharted features were identified and investigated using 100% complete MBES coverage. Neither of these features were considered dangerous to navigation. Reference the Final Feature File included with the submission of this project 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

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

D.2.2 Maritime Boundary Points

No Maritime Boundary Points were assigned for this survey.

D.2.3 Bottom Samples

Five bottom sample locations were assigned for investigation (Figures 25 and 26). Details regarding bottom sample attribution can be found in the Final Feature File.

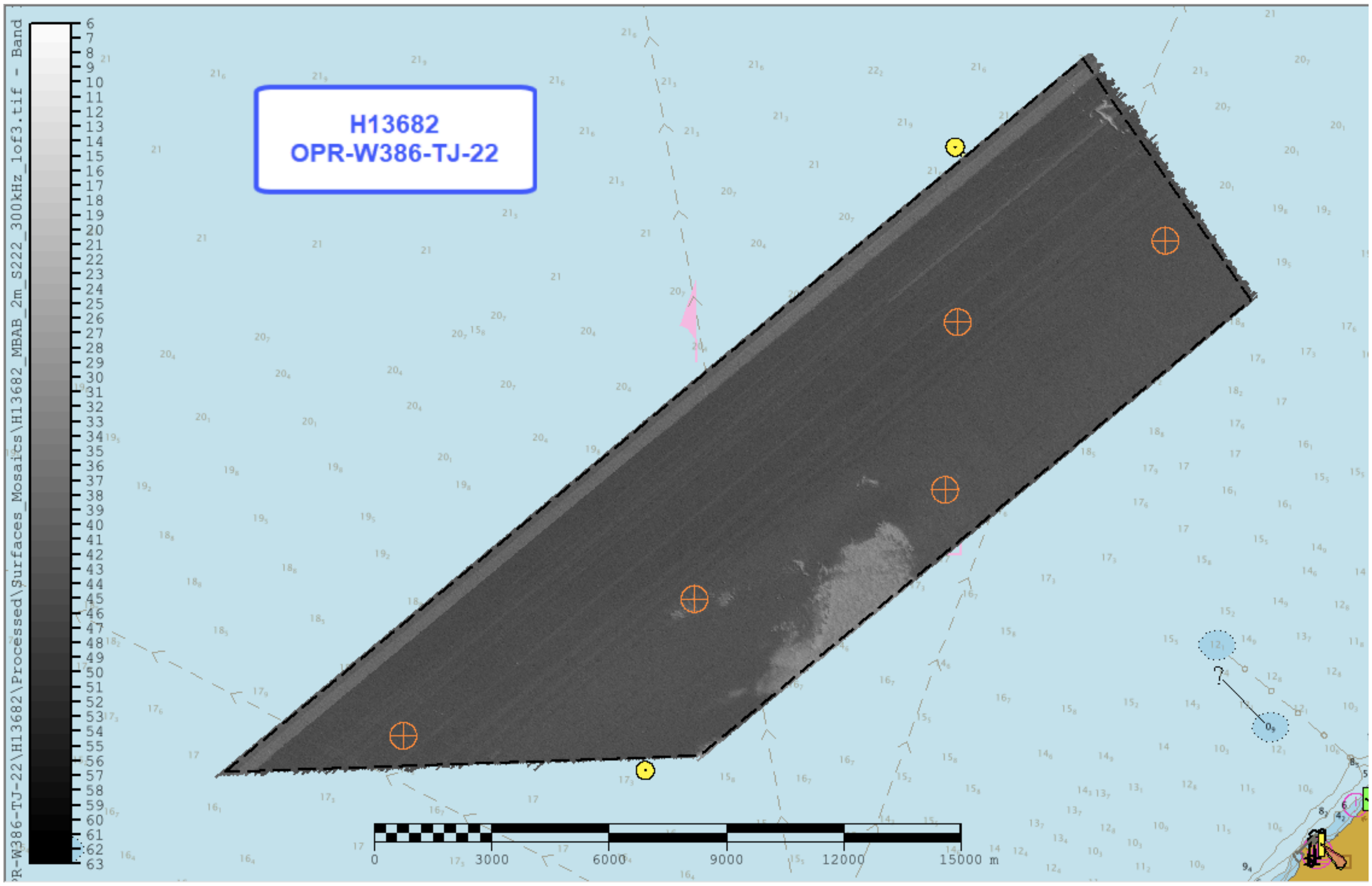


Figure 25: Overview of locations of bottom samples collected on H13682 shown as orange targets overlayed on the combined backscatter mosaic.

Figure 26: Example of typical H13682 bottom sample.

D.2.4 Overhead Features

No overhead features exist for this survey.

D.2.5 Submarine Features

No submarine features exist for this survey.

D.2.6 Platforms

No platforms exist for this survey.

D.2.7 Ferry Routes and Terminals

No ferry routes or terminals exist for this survey.

D.2.8 Abnormal Seafloor or Environmental Conditions

No abnormal seafloor or environmental conditions exist for this survey.

D.2.9 Construction and Dredging

No present or planned construction or dredging 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
Matthew J. Jaskoski, CDR/NOAA	Commanding Officer	02/24/2023	JASKOSKI.MATTHEW.JACOB.1275636262 2023.02.24 12:33:45 -05'00'
Sydney M. Catoire, LT/NOAA	Field Operations Officer	02/24/2023	CATOIRE.SYDNEY.MARIE.1120060623 Digitally signed by CATOIRE.SYDNEY.MARIE.1120060623 Date: 2023.02.24 14:31:46 -05'00'
Kevin J. Suarez and Erin K. Cziraki, NOAA	Sheet Manager	02/24/2023	CZIRAKI.ERIN.KAYE.1550015338 Digitally signed by CZIRAKI.ERIN.KAYE.1550015338 Date: 2023.02.24 11:15:34 -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