H13619

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

DESCRIPTIVE REPORT

Type of Survey:	Navigable Area
Registry Number:	H13619

LOCALITY

State(s):	Michigan
General Locality:	Detroit River
Sub-locality:	Belle Isle to Grosse Pointe

2022

CHIEF OF PARTY
Matthew J. Jaskoski, CDR/NOAA

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Date:

U.S. DEPARTMENT OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION	REGISTRY NUMBER:
HYDROGRAPHIC TITLE SHEET	**H13619**

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):	**Michigan**
General Locality:	**Detroit River**
Sub-Locality:	**Belle Isle to Grosse Pointe**
Scale:	**5000**
Dates of Survey:	**08/11/2022 to 08/23/2022**
Instructions Dated:	**04/19/2022**
Project Number:	**OPR-W387-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, IGLD 1985 LWD. 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 H13619

Project: OPR-W387-TJ-22

Locality: Detroit River

Sublocality: Belle Isle to Grosse Pointe

Scale: 1:5000

August 2022 - August 2022

NOAA Ship *Thomas Jefferson*

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

A. Area Surveyed

Survey H13619, located in the Detroit River, MI in the vicinity of Belle Isle, was conducted in accordance with coverage requirements set forth in the Project Instructions (PIs) OPR-W387-TJ-22.

A.1 Survey Limits

Data were acquired within the following survey limits:

Northwest Limit	Southeast Limit
42° 22' 47.58" N 82° 58' 21.26" W	42° 20' 0.33" N 82° 53' 11.02" W

Table 1: Survey Limits

Survey data were acquired in accordance with requirements set forth by the PIs and the 2022 Hydrographic Surveys Specifications and Deliverables (HSSD) (Figure 1).

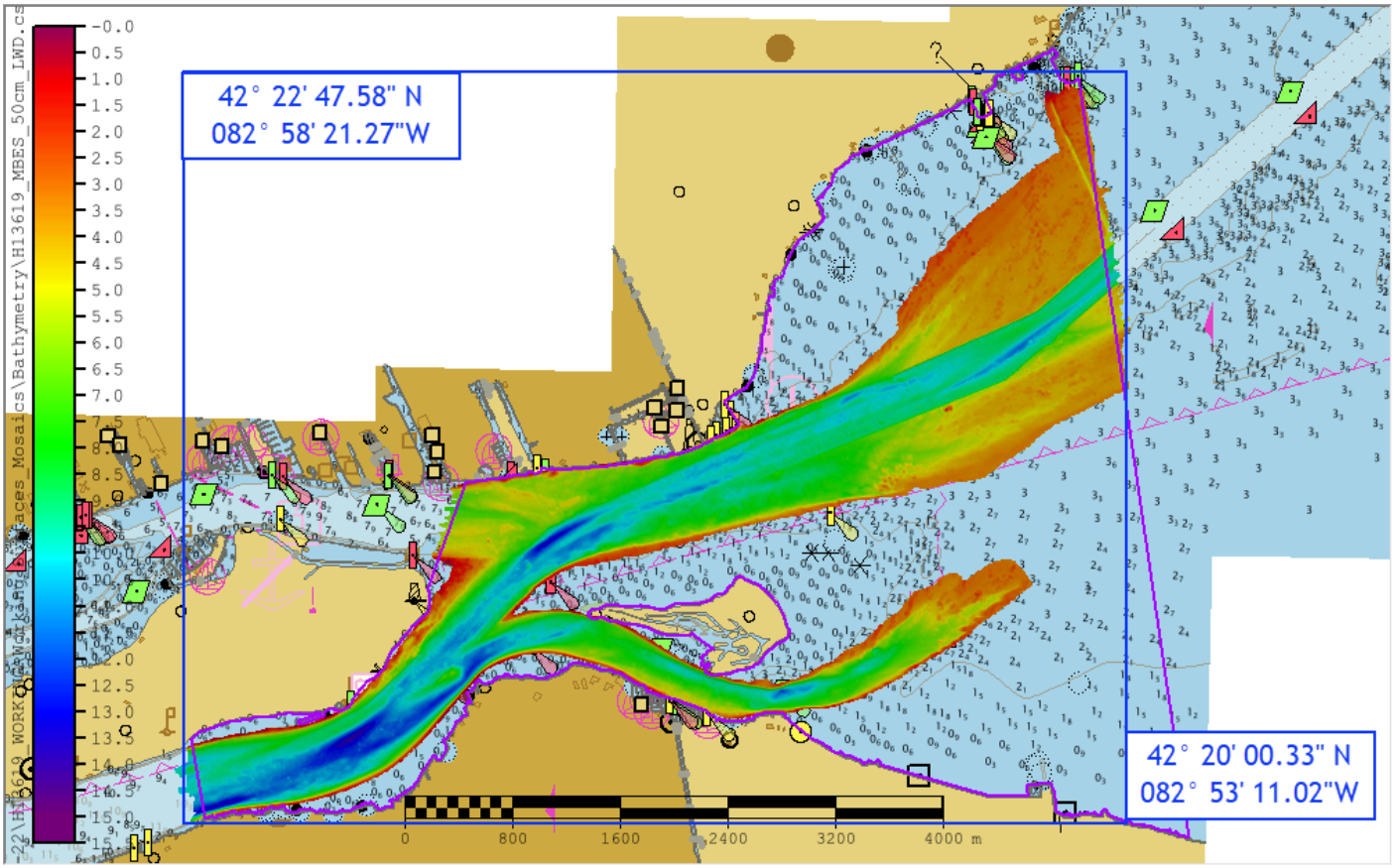


Figure 1: Survey layout for H13619, plotted over ENC US5MI29M. Purple outline represents the survey limits set forth by the PIs. Blue box represents data extents. Coverage shown in color.

A.2 Survey Purpose

The Detroit River divides the metropolitan areas of Detroit, Michigan and Windsor, Ontario and contains a portion of the border between the United States and Canada. Flowing 28 miles from Lake St. Clair into Lake Erie, the waterway serves as a critical transportation route connecting various ports along the Great Lakes handling approximates 1,500 passages or 80 million tons of cargo annually (1).

The Port of Detroit serves as a top 20 port for dry bulk products (2) and provides approximately 16,000 jobs to southeast Michigan (1). The river is crossed numerous times by bridges and tunnels and ferries of critical importance to regional and international trade and travel between Canada and the United States.

The Detroit River hosts islands, marshes, and structures dating back to the colonization of the are in th 1700's. There are numerous wrecks, ruins, and other potential hazards outside of the USACE maintained channels. These areas outside of the USACE maintained channels have no been adequately surveyed with modern technology and present a critical surveying need.

This project represents a portion o the NOAA Ship Thomas Jefferson's planned FY22 work in the Great Lakes region. Survey data from this project is intended to supersede all prior survey data in the common area.

1: https://www.freightwaves.com/news/freightwaves-classics-port-of-detroit-is-an-economic-enginefor-the-region
2: https://www.bts.gov/ports

A.3 Survey Quality

The entire survey is adequate to supersede previous data.

Data acquired in H13619 meet 100% multibeam echo sounder (MBES) coverage requirements for object detection, as specified in the 2022 HSSD. This includes 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	Object detection (Refer to HSSD Section 5.2.2.2)
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 is in accordance with requirements listed in Table 2 and the 2022 HSSD. Coverage requirements were met with 100% object detection MBES coverage.

Coverage was acquired to the inshore limit of hydrography, the Navigable Area Limit Line (NALL). Areas where survey coverage did not meet the 3.5-meter depth contour, nor the assigned sheet limits, were due to the survey vessel reaching the extent of safe navigation (Figure 2).

A total of 22 holidays exist within sheet H13619. These holidays were created as a result coverage gaps, cleaning of dense vegetation areas, above-water features, or rejection of a data artifact (Figure 3). One holiday is covered by data from adjoining sheet H13618 (Figure 4). See Section B.2.5 for information describing the data artifact and Section B.2.6 for information regarding dense vegetation.

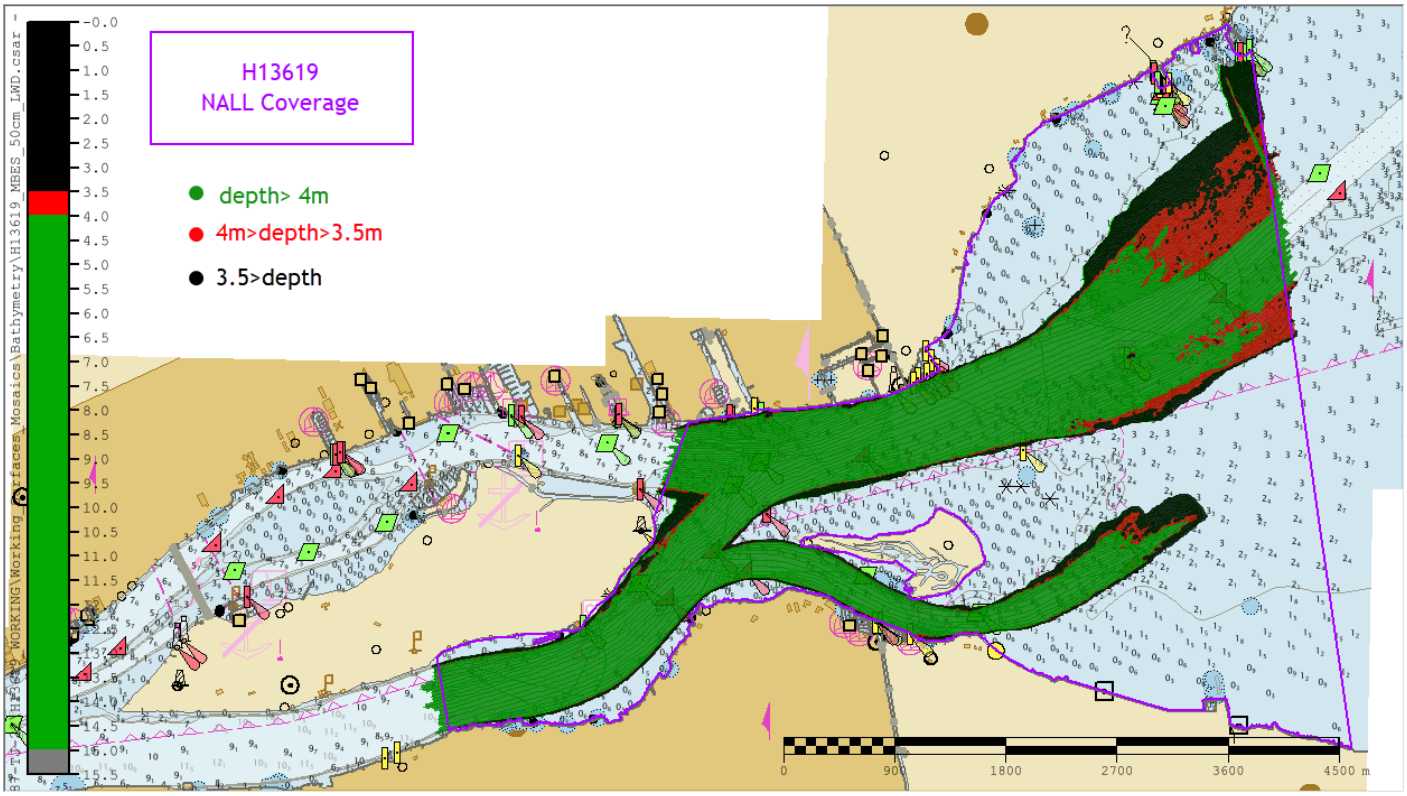


Figure 2: H13619 coverage in relation to the NALL.

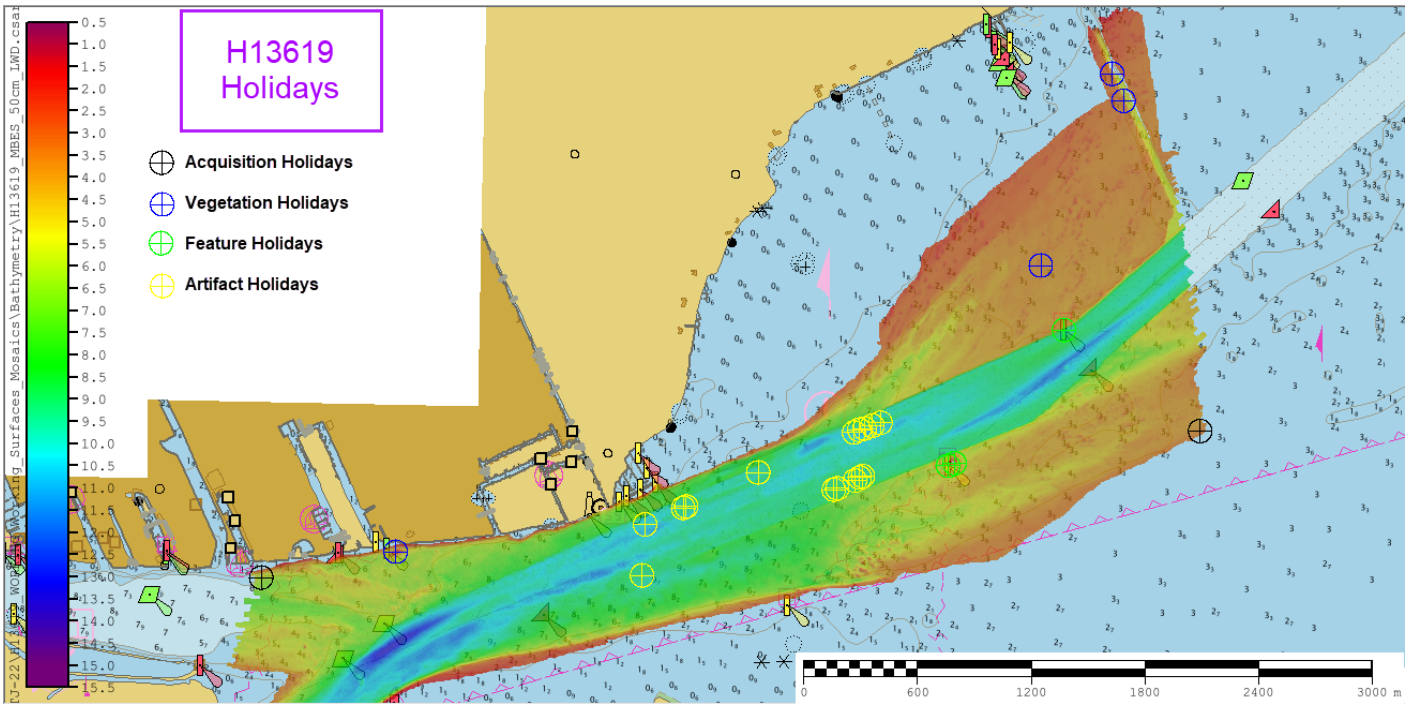


Figure 3: Overview of the 22 MBES holidays in sheet H13619.

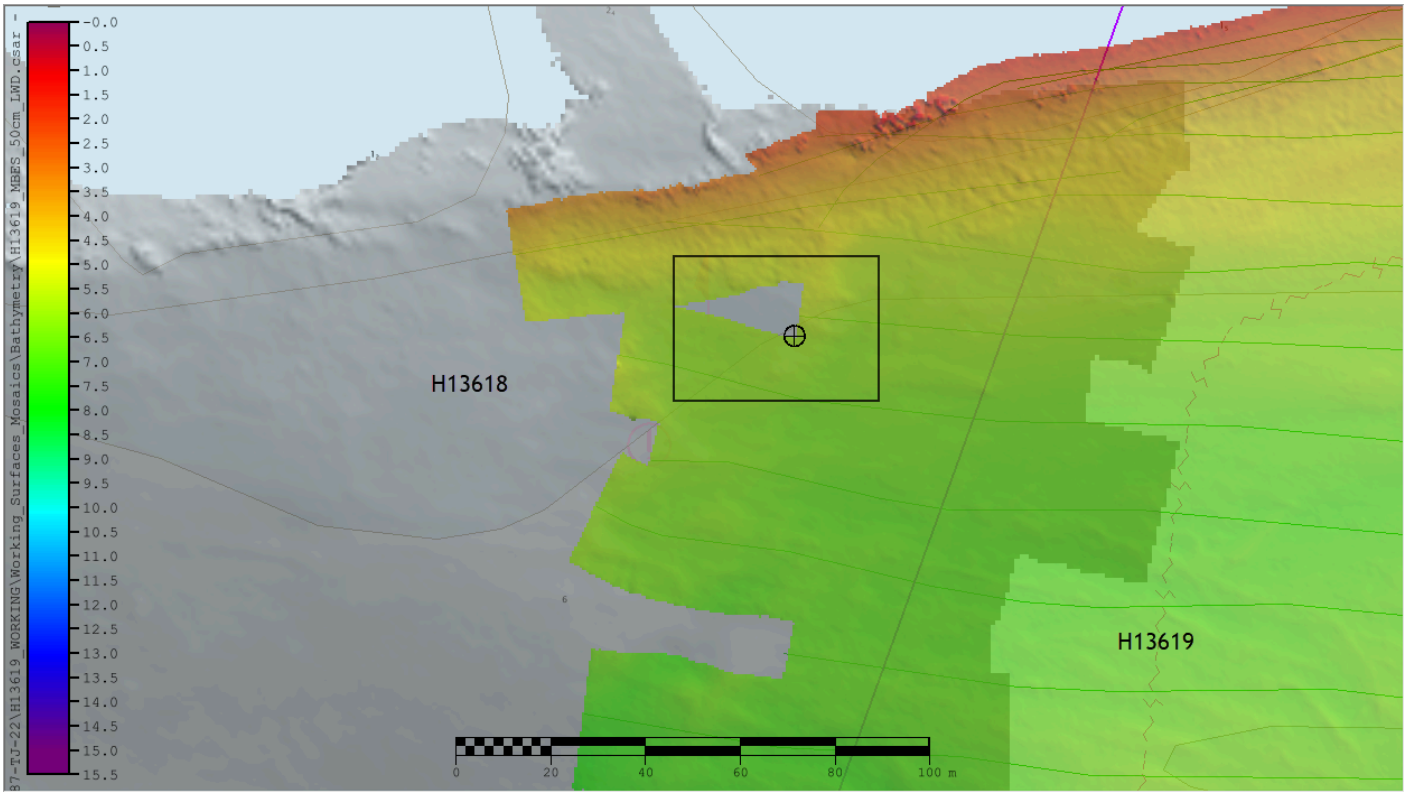


Figure 4: MBES holiday with coverage from contemporary survey H13618, shown in gray.

A.6 Survey Statistics

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

	HULL ID	*2904*	*S3007*	*Total*
LNM	SBES Mainscheme	0.0	0.0	0.0
	MBES Mainscheme	102.83	169.58	272.41
	Lidar Mainscheme	0.0	0.0	0.0
	SSS Mainscheme	0.0	0.0	0.0
	SBES/SSS Mainscheme	0.0	0.0	0.0
	MBES/SSS Mainscheme	0.0	0.0	0.0
	SBES/MBES Crosslines	9.05	0.93	9.98
	Lidar Crosslines	0.0	0.0	0.0
Number of Bottom Samples				3
Number Maritime Boundary Points Investigated				0
Number of DPs				0
Number of Items Investigated by Dive Ops				0
Total SNM				2.57

Table 3: Hydrographic Survey Statistics

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

Survey Dates	Day of the Year
08/11/2022	223
08/12/2022	224

Survey Dates	Day of the Year
08/13/2022	225
08/15/2022	227
08/16/2022	228
08/17/2022	229
08/19/2022	231
08/23/2022	235

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	*2904*	*S3007*
LOA	8.5 meters	10.38 meters
Draft	1.2 meters	0.6 meters

Table 5: Vessels Used

Figure 5: Thomas Jefferson Launch 2904

Figure 6: NRT-5 vessel S3007

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 2040C	MBES
Kongsberg Maritime	EM 2040	MBES Backscatter
Kongsberg Maritime	EM 2040C	MBES Backscatter
Applanix	POS MV 320 v5	Positioning and Attitude System
Sea-Bird Scientific	SBE 19plus V2	Conductivity, Temperature, and Depth Sensor
SonTek	CastAway-CTD	Conductivity, Temperature, and Depth Sensor
Teledyne RESON	SVP 70	Sound Speed System
AML Oceanographic	Micro SV-Xchange	Sound Speed System

Table 6: Major Systems Used

B.2 Quality Control

B.2.1 Crosslines

Hydrographic Survey Launch (HSL) 2903 and Navigation Response Team-5 (NRT-5) S3007 collected a total of 9.98 linear nautical miles of MBES crosslines or 4.08% of mainscheme MBES data. The crosslines acquired represent good spatial and depth diversity for this survey area (Figure 7).

A Single Resolution (SR) 50cm Combined Uncertainty and Bathymetry Estimator (CUBE) surface of mainscheme data and a SR 50cm CUBE surface of crossline data were differenced - the resulting mean was 0.04m with a standard deviation of 0.04m (Figure 8). Although the fractional allowable error has a large range, more than 99.5% of nodes are within the allowable error fraction (Figure 9). Visual inspection of the difference surface indicated no systematic issues.

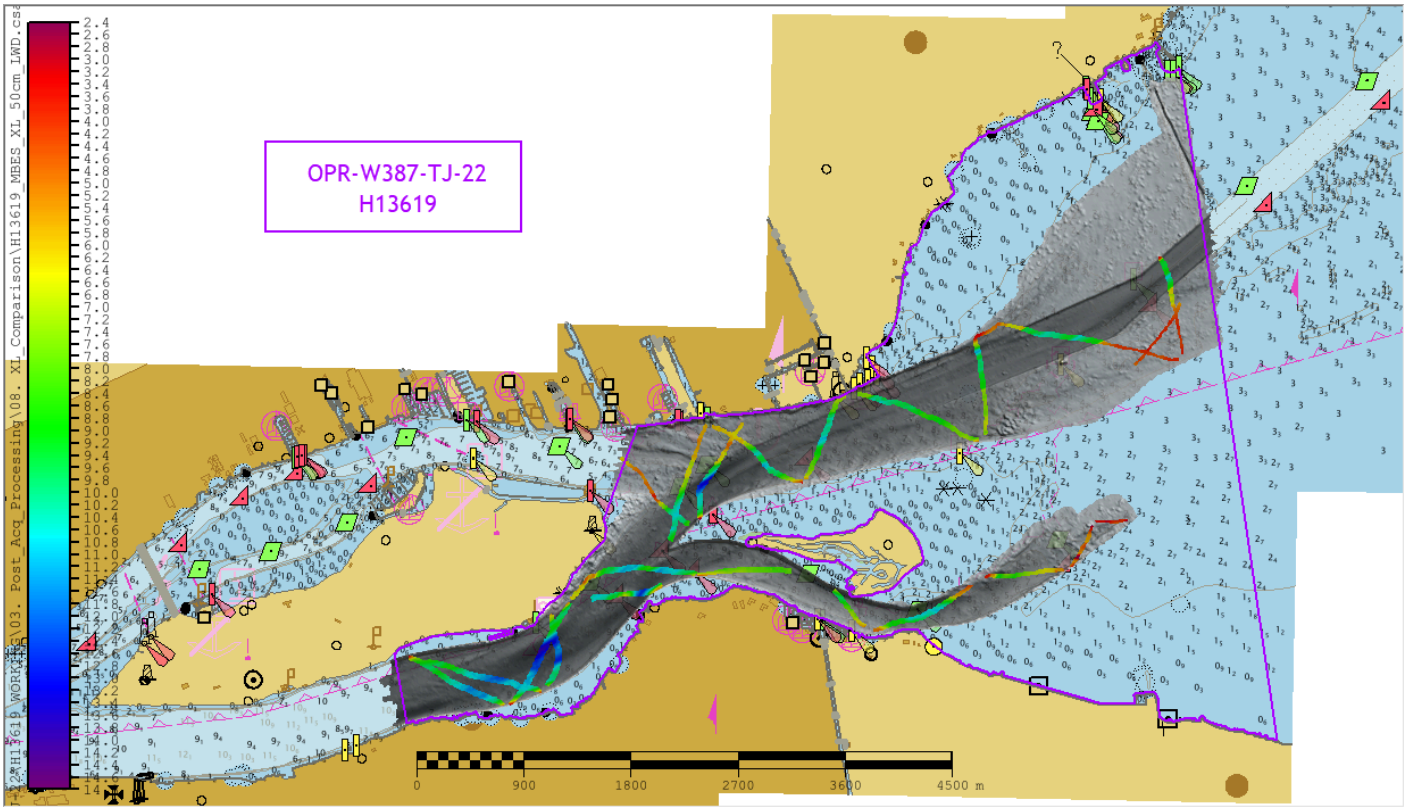
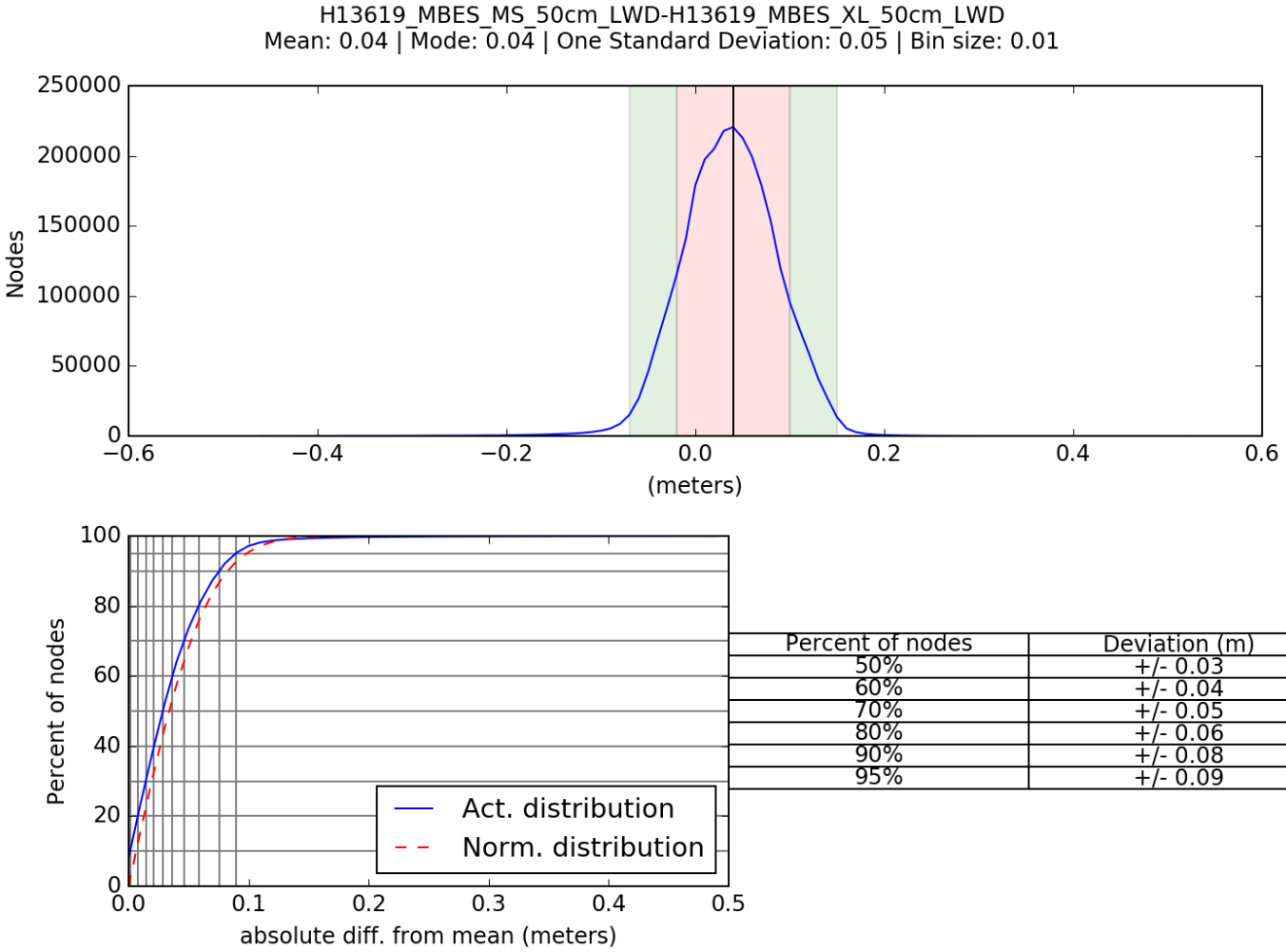


Figure 7: Overview of H13619 crossline distribution by geography and depth, shown in color, overlaid on mainscheme data shown in greyscale.



Percent of nodes	Deviation (m)
50%	+/- 0.03
60%	+/- 0.04
70%	+/- 0.05
80%	+/- 0.06
90%	+/- 0.08
95%	+/- 0.09

Figure 8: H13619 crossline/mainscheme comparison statistics.

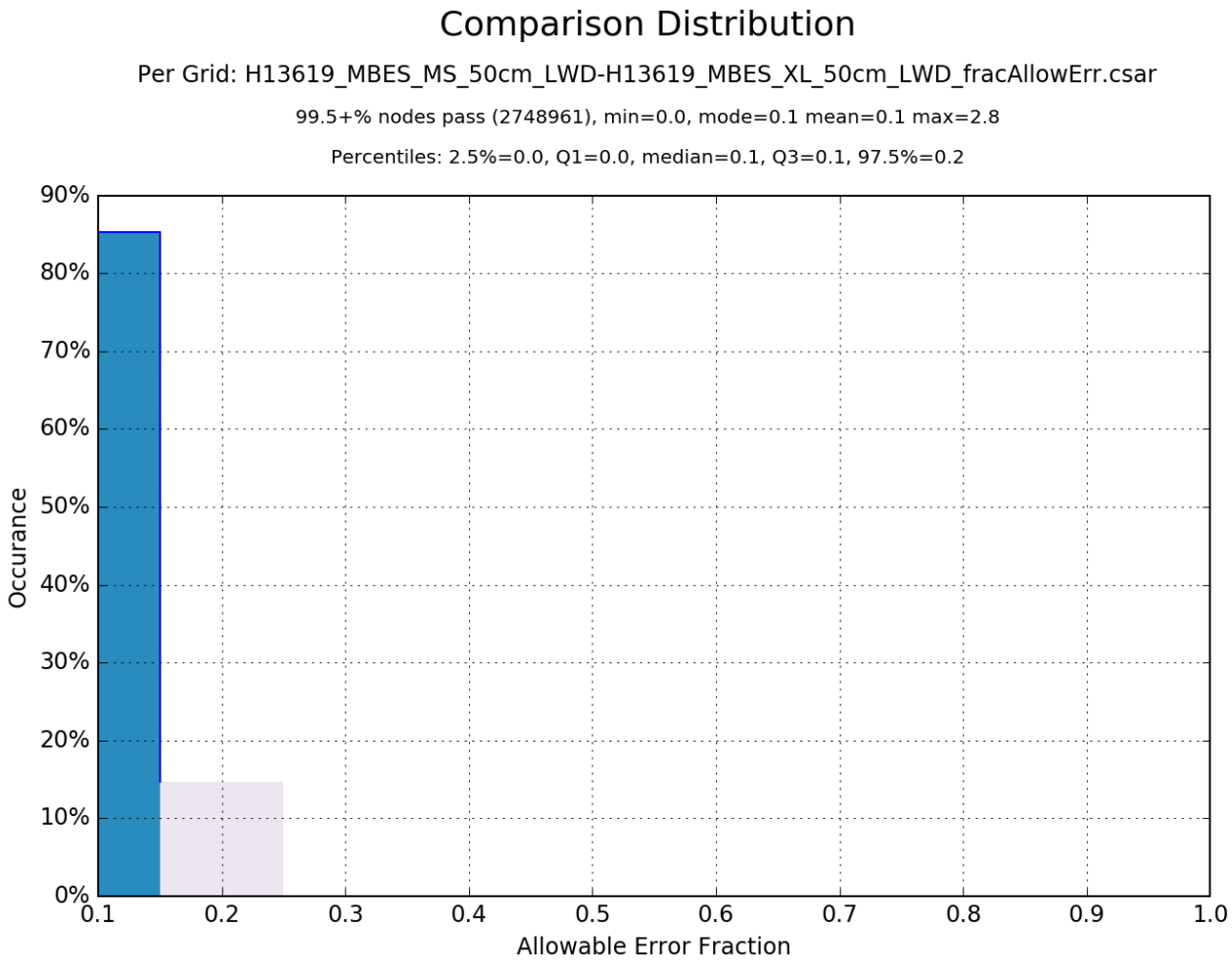


Figure 9: H13619 crossline fraction of allowable error statistics.

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
2904	4.0 meters/second	N/A	N/A	0.2 meters/second
S3007	2.0 meters/second	N/A	N/A	0.5 meters/second

Table 8: Survey Specific Sound Speed TPU Values.

The bathymetric surface's uncertainty layer is compliant with the 2022 HSSD uncertainty standards. Over 99.5% of all nodes pass uncertainty standards (Figure 10).

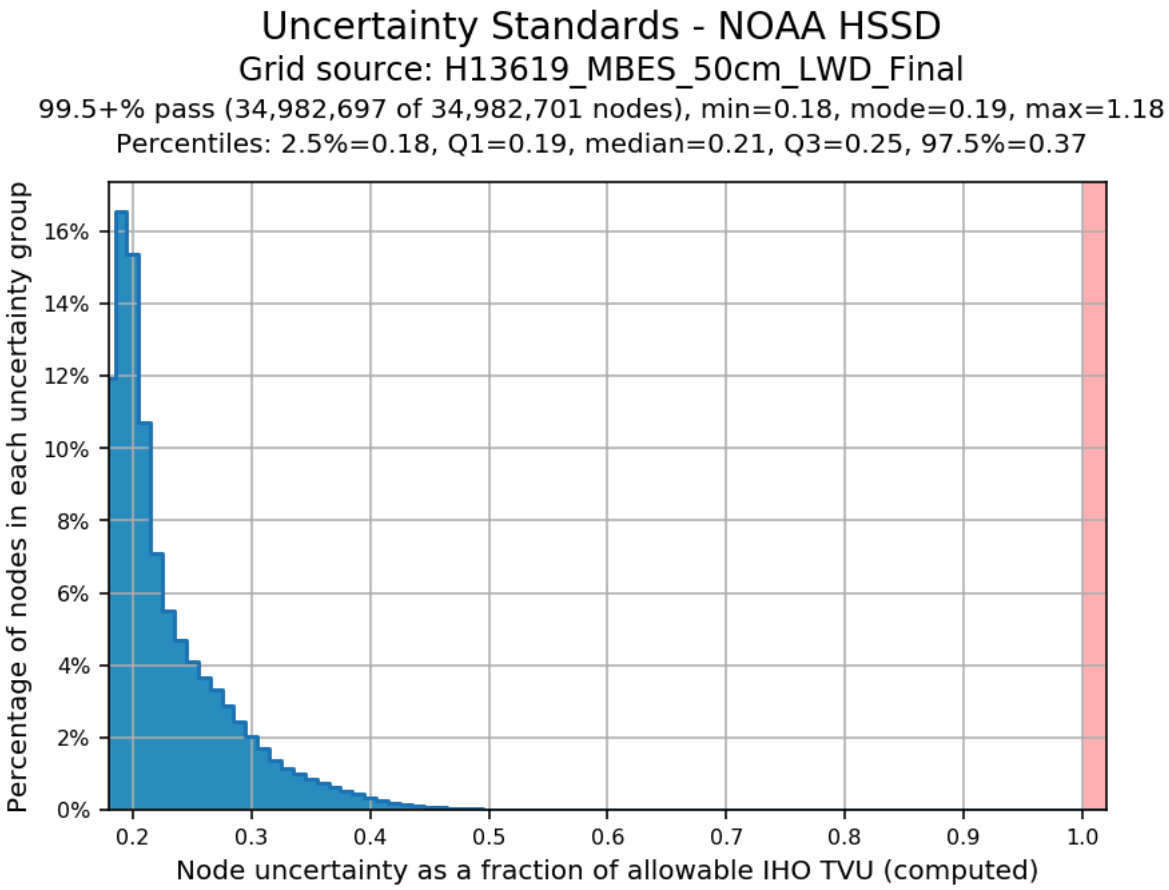


Figure 10: H13619 uncertainty standards.

B.2.3 Junctions

Survey H13619 junctions with one contemporary survey, H13618 within the OPR-W387-TJ-22 project, conducted by NOAA ship Thomas Jefferson (Figure 11).

The following junctions were made with this survey:

Registry Number	Scale	Year	Field Unit	Relative Location
H13618	1:5000	2022	Thomas Jefferson	S

Table 9: Junctioning Surveys

H13618

The southern edge of sheet H13619 junctions with contemporary survey H13618 from project OPR-W387-TJ-22. A 50cm SR CUBE surface of H13619 data and a 50cm SR CUBE surface of H13618 data were differenced (Figure 11). The mean difference between bathymetric surface nodes was 0.03m with a standard deviation of 0.03m (Figure 12). Although the fractional allowable error has a large range, more than 99.5% of nodes are within the allowable error fraction (Figure 13). Statistics and visual inspection indicate that surveys H13618 and H13619 are in general agreement.

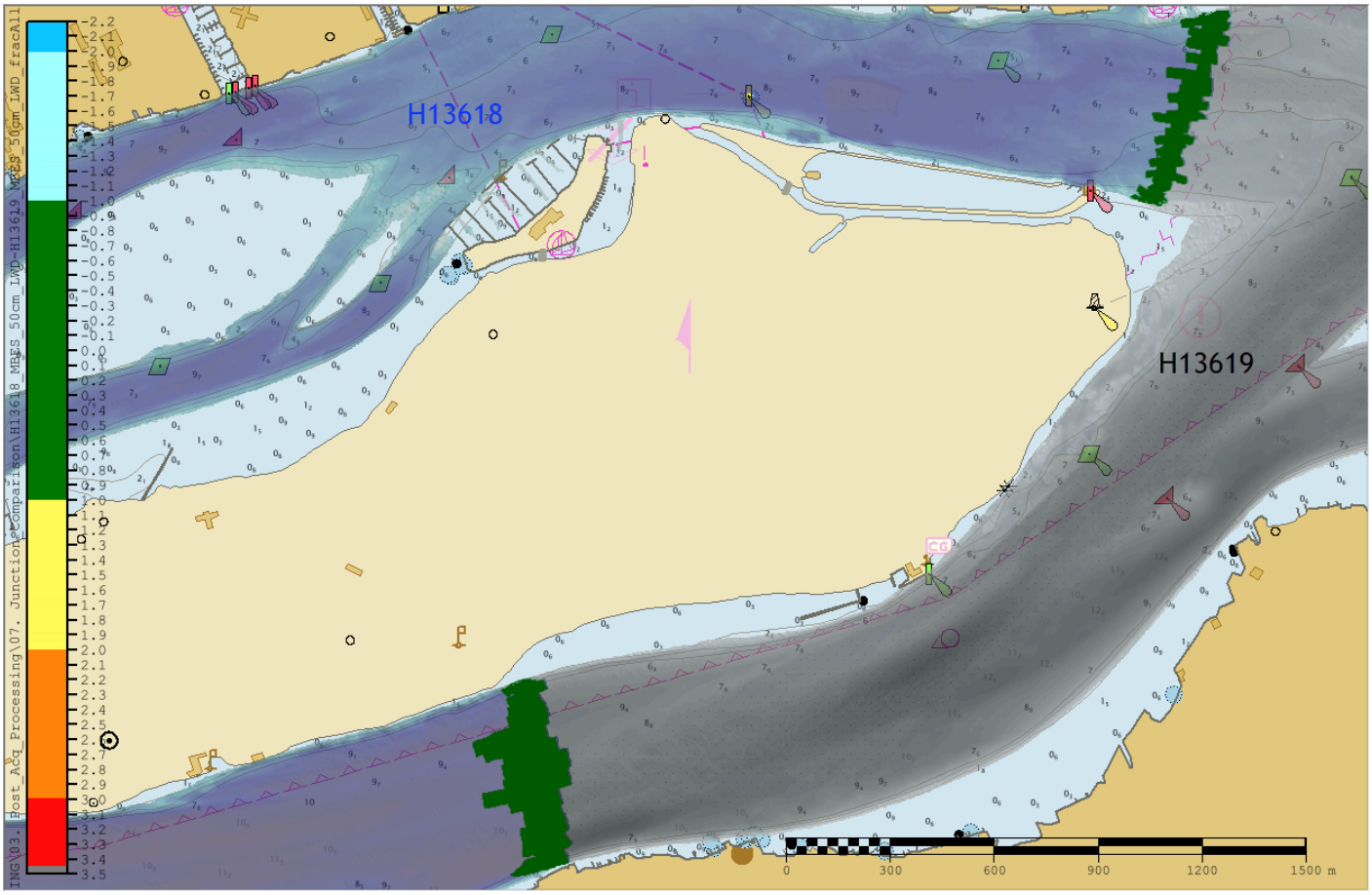
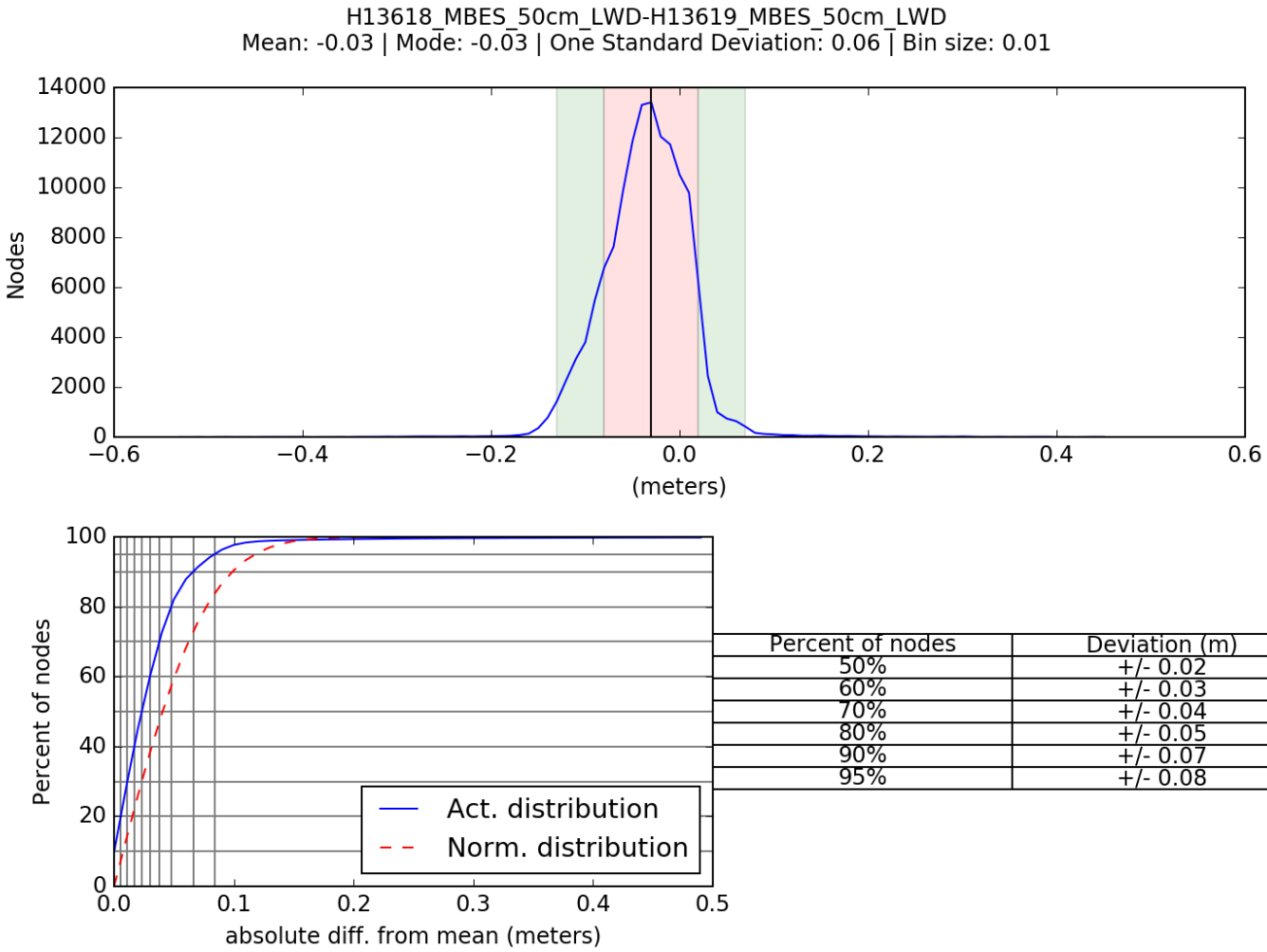


Figure 11: Fraction of allowable error surface difference comparison in color between H13619 and H13618.



Percent of nodes	Deviation (m)
50%	+/- 0.02
60%	+/- 0.03
70%	+/- 0.04
80%	+/- 0.05
90%	+/- 0.07
95%	+/- 0.08

Figure 12: H13618 and H13619 surface difference comparison statistics

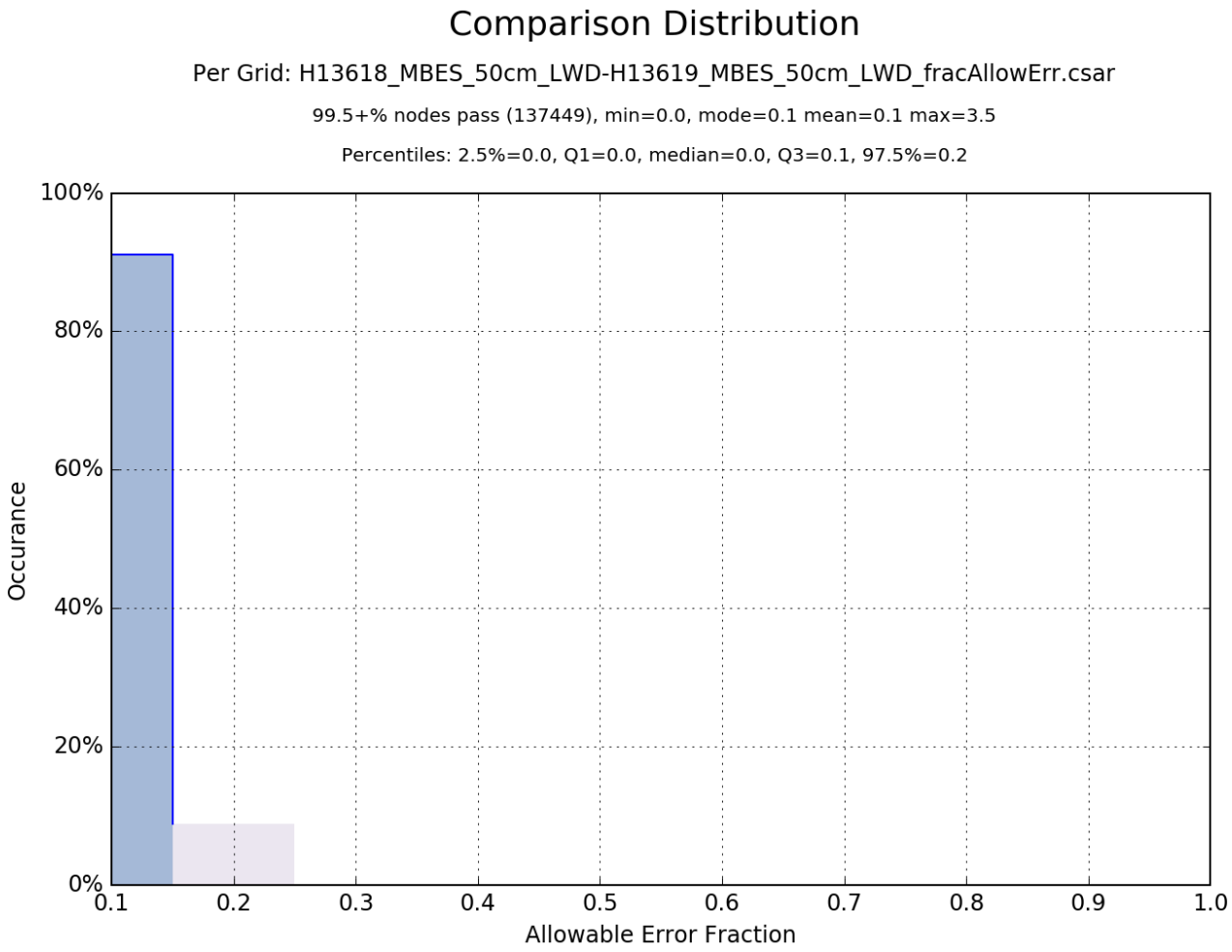


Figure 13: H13618 and H13619 fraction of allowable error statistics.

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

Starboard side nadir abnormality in MBES on Julian day number 223

On Julian day number 223, two lines, 0053_20220811_191332_2904_EM2040 and 0054_20220811_192414_2904_EM2040 of HSL 2904 data had an abnormality on the starboard side of the

nadir. Although the data initially looked normal in the waterfall during acquisition, this abnormality resulted in multiple one to two meter artifacts on the starboard side of each line (Figure 14). These artifacts were deleted out of the data resulting in holidays in the MBES coverage (Figure 15). The hydrographer does not think the holidays contain hazards to navigation. This abnormality was not observed in any other lines or days of MBES data collected on H13619.

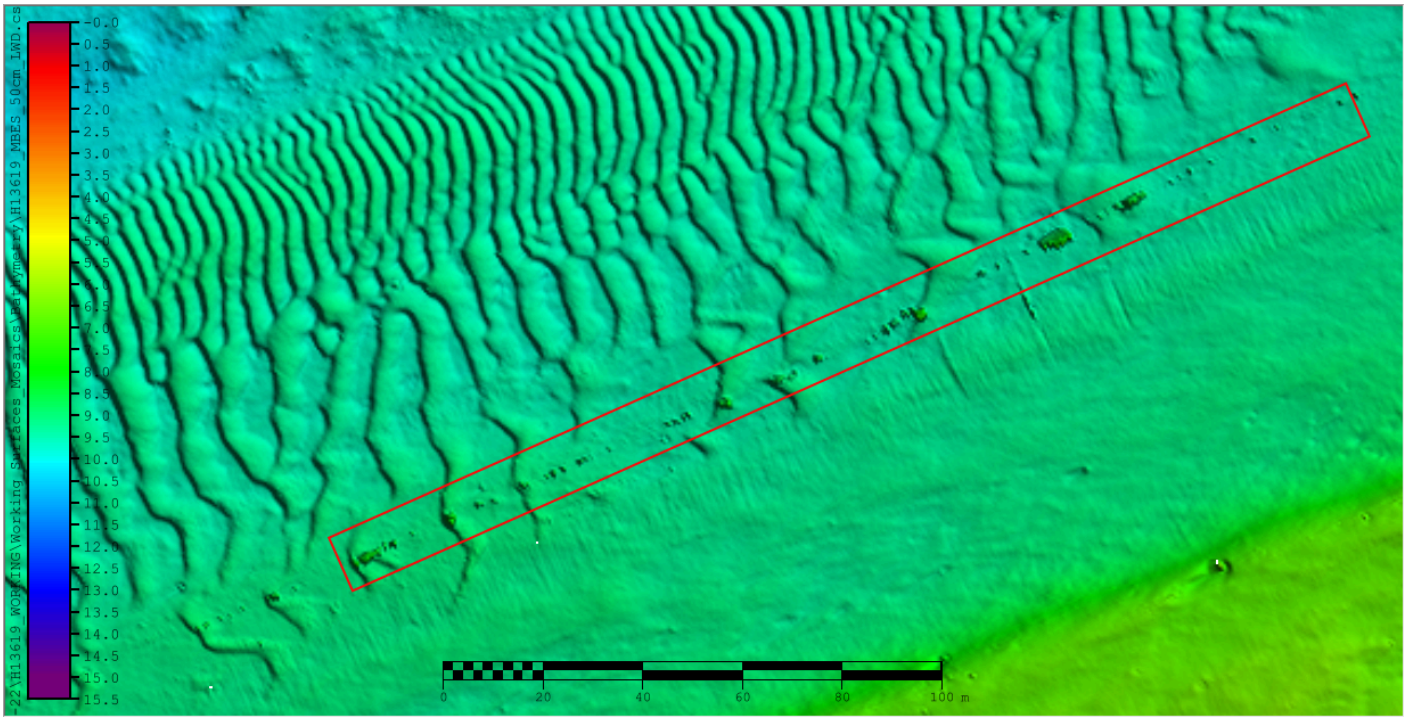


Figure 14: Overview of the MBES abnormality on Julian day number 223.
This is the surface before rejecting out the artifacts that were created.

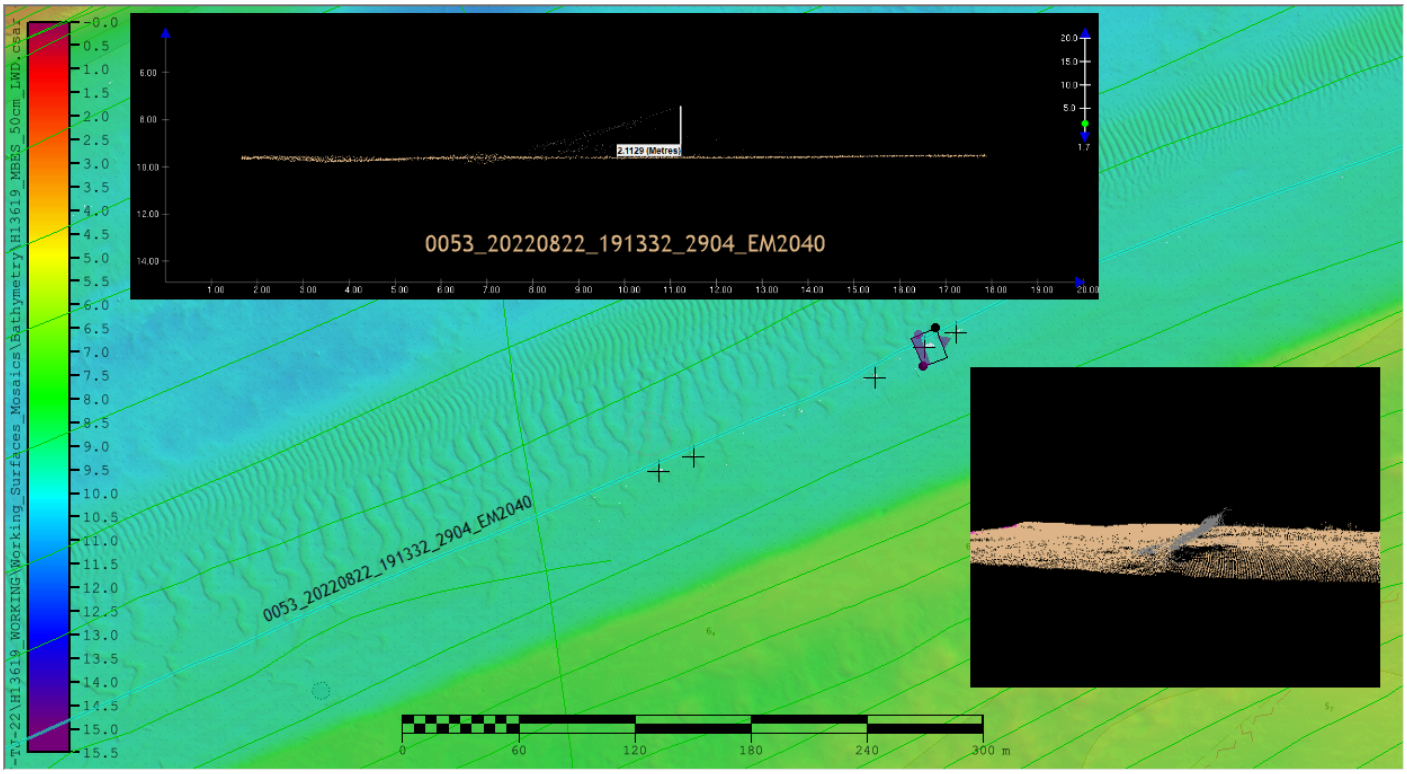


Figure 15: The location of holidays, represented by black targets, after the artifacts were deleted out of line 0053_20220811_191332_2904_EM2040. The 3D and 2D view show the rejected (gray) data being approximately 2m off the river floor.

B.2.6 Factors Affecting Soundings

Dense Vegetation

While conducting survey operations, field personnel reported dense patches of vegetation throughout all of sheet H13619 (Figure 16). The majority of the vegetation was on the edges of the river and in shallower portions of the sheet, generally 3.5m or less. After consulting with personnel at the Atlantic Hydrographic Branch, conservative cleaning efforts were made to reject the vegetation from being included in the delivered surfaces.

There were two large areas of survey coverage where the density of the vegetation obscured the lake bed. Rather than attempting to discern the location of the bottom, the hydrographer took the more conservative approach and completely rejected sounding data from these areas. These areas include the easternmost point of Belle Isle and the approach channel to Grosse Pointe (Figure 17). Data rejected from Belle Isle were generally less than 3.5m in depth. However, the rejected vegetation area in the vicinity of Grosse Pointe extended below the 3.5m NALL and resulted in a large data gap in the submitted surfaces. The original

trackline data have been retained in the final submission package and WEDKLP area features were added to the Final Feature File (FFF).

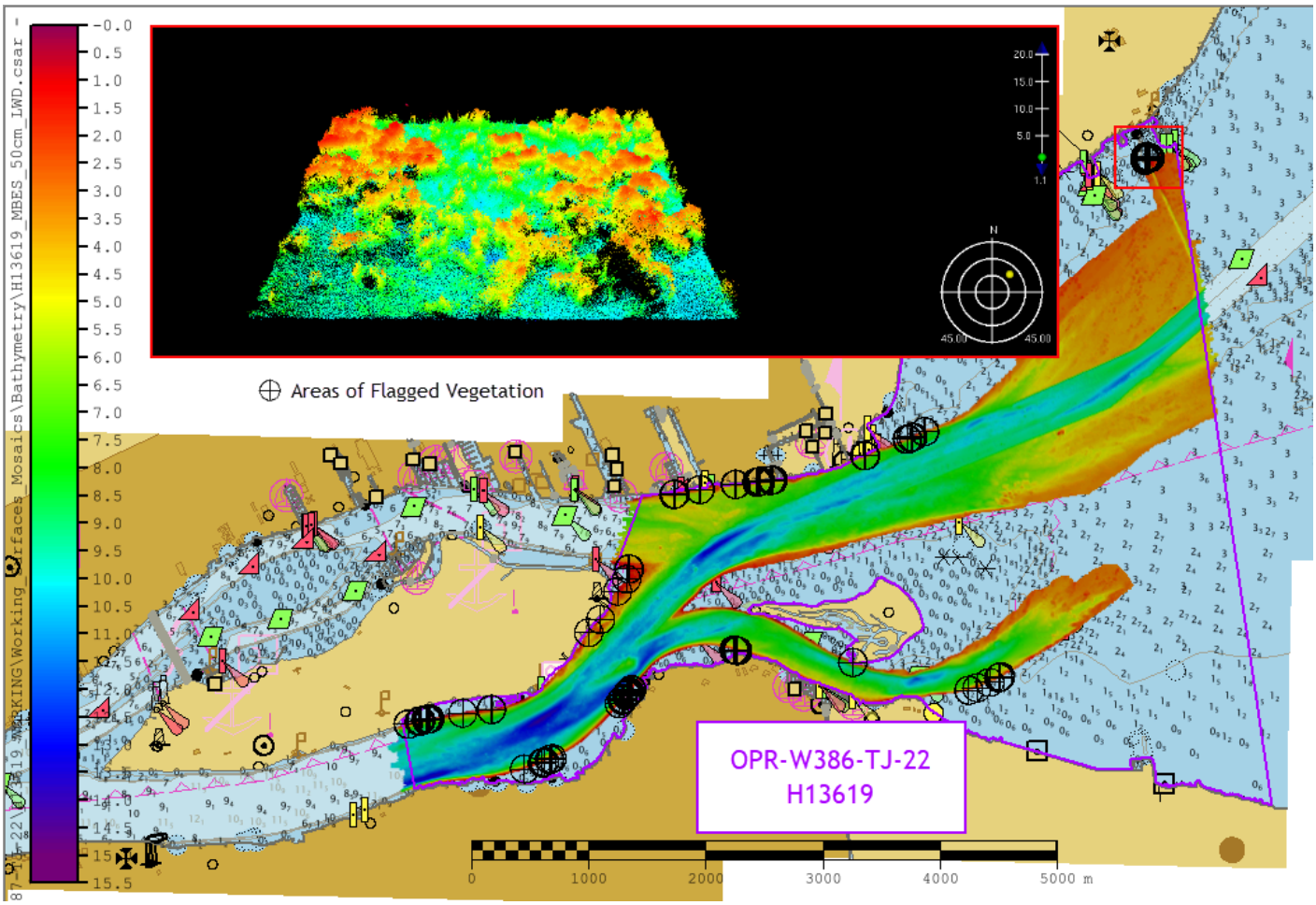


Figure 16: Example area of dense vegetation in sheet H13619. Multiple locations were flagged by flier finder and are represented by black targets.

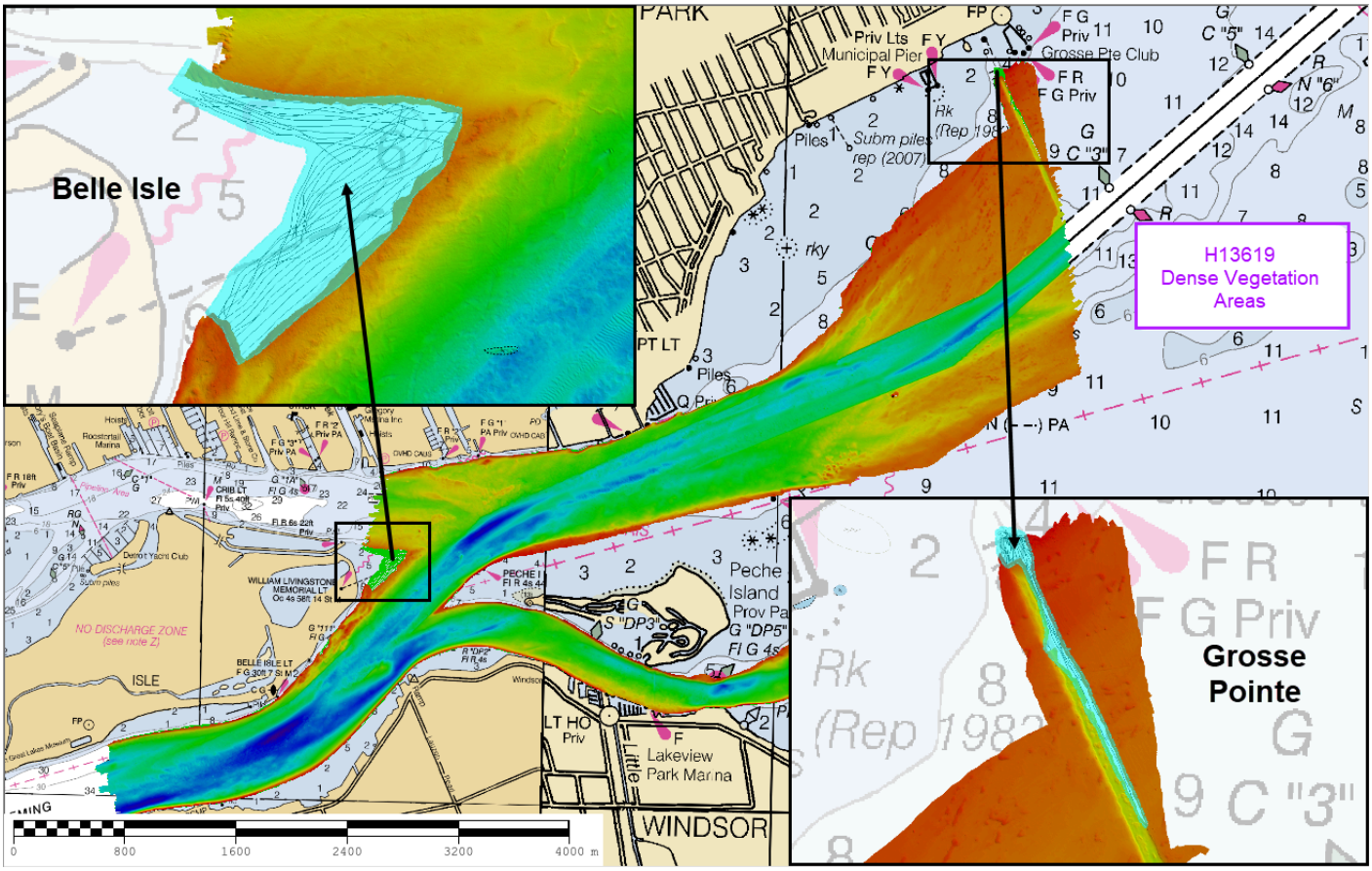


Figure 17: Large areas of dense vegetation rejected from submitted surfaces. WEDKLP areas highlighted in teal, original tracklines shown in black.

B.2.7 Sound Speed Methods

Sound Speed Cast Frequency: Static casts were conducted at the start of acquisition each day and at a minimum of every four hours during launch acquisition. Static cast frequency was increased in areas where a change in surface sound speed greater than two meters per second existed. All sound speed methods were used as detailed in the DAPR.

A total of 32 sound speed profiles were collected within the survey limits of H13619 and display good spatial diversity. Three of these casts were located outside of the sheet limits, not more than 100m away, and display profiles representative of the area (Figure 18). All sound speed profile data were concatenated into a master file for the sheet. MBES data were corrected by applying profiles nearest in the distance in time (4 hours) using this master file.

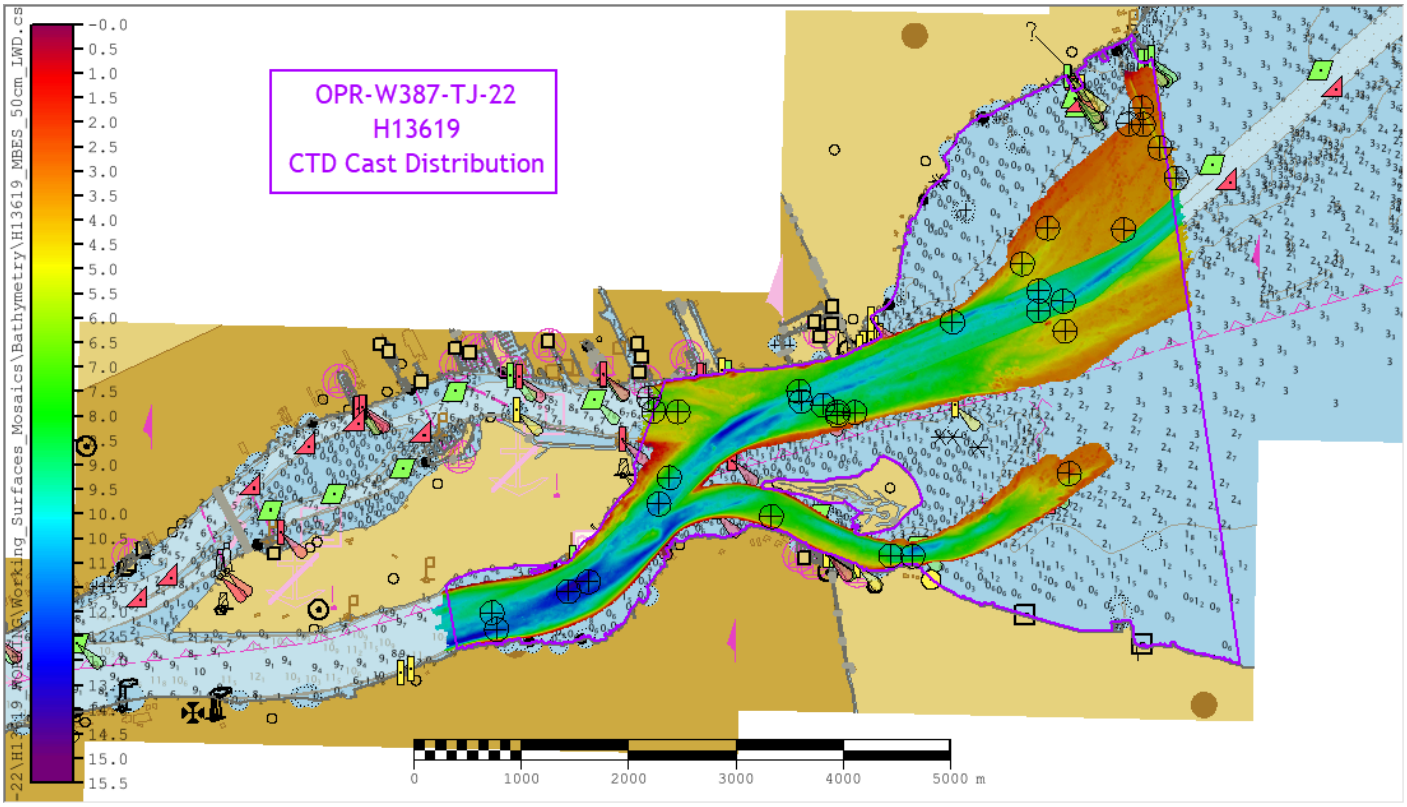


Figure 18: Overview of all SVP casts taken in H13619, shown as black targets, overlaid on MBES coverage.

B.2.8 Coverage Equipment and Methods

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

B.3 Echo Sounding Corrections

B.3.1 Corrections to Echo Soundings

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

B.3.2 Calibrations

All sounding systems were calibrated as detailed in the DAPR.

B.4 Backscatter

All equipment and survey methods were used as detailed in the DAPR. Raw MBES backscatter was flagged as part of the .all file from the Kongsberg EM2040 systems. Backscatter was processed in he QPS Fledermaus GeoCoder Toolbox (FMGT) software, and the exported geotiffs are included in the final processed data submission package (Figures 19 and 20).

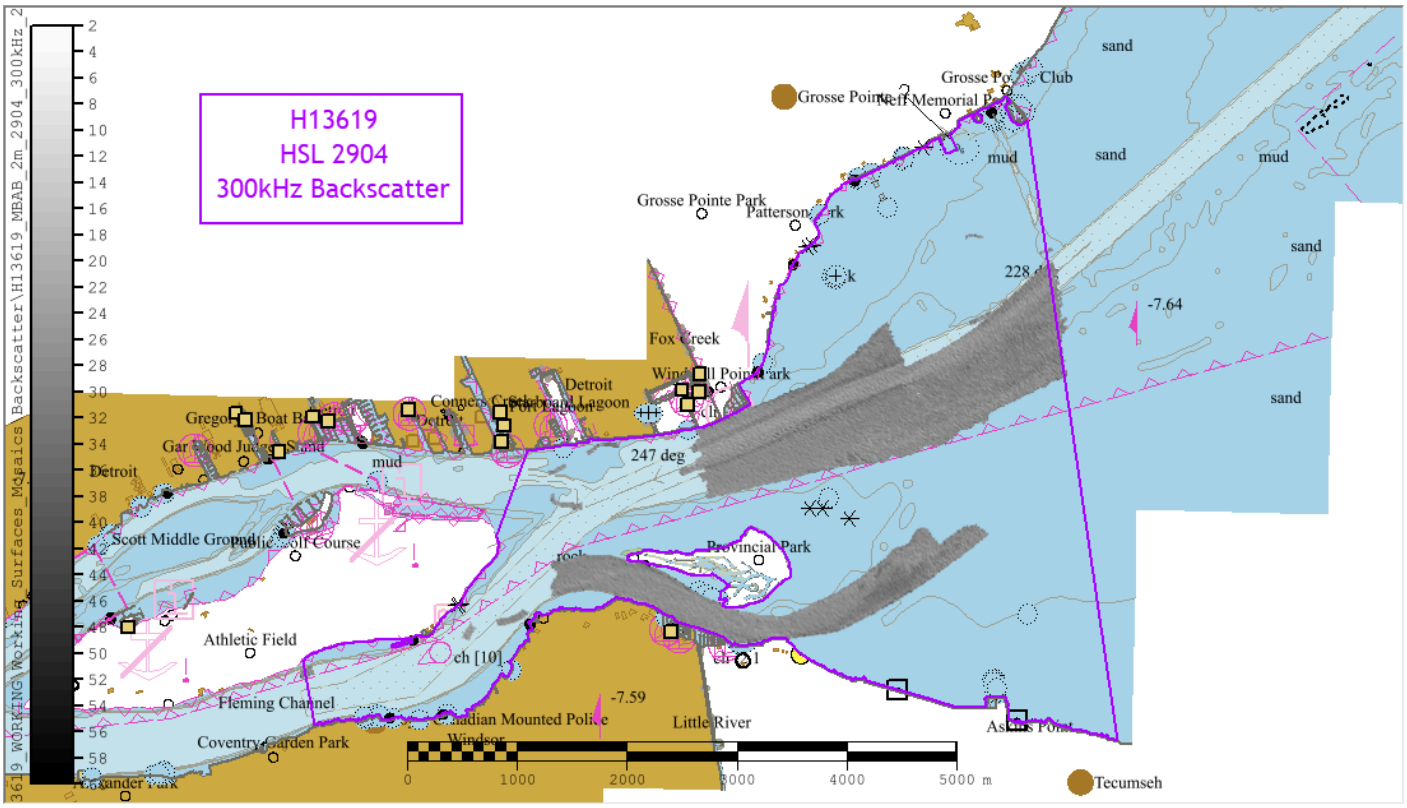


Figure 19: 300kHz backscatter mosaic from data acquired by 2904.

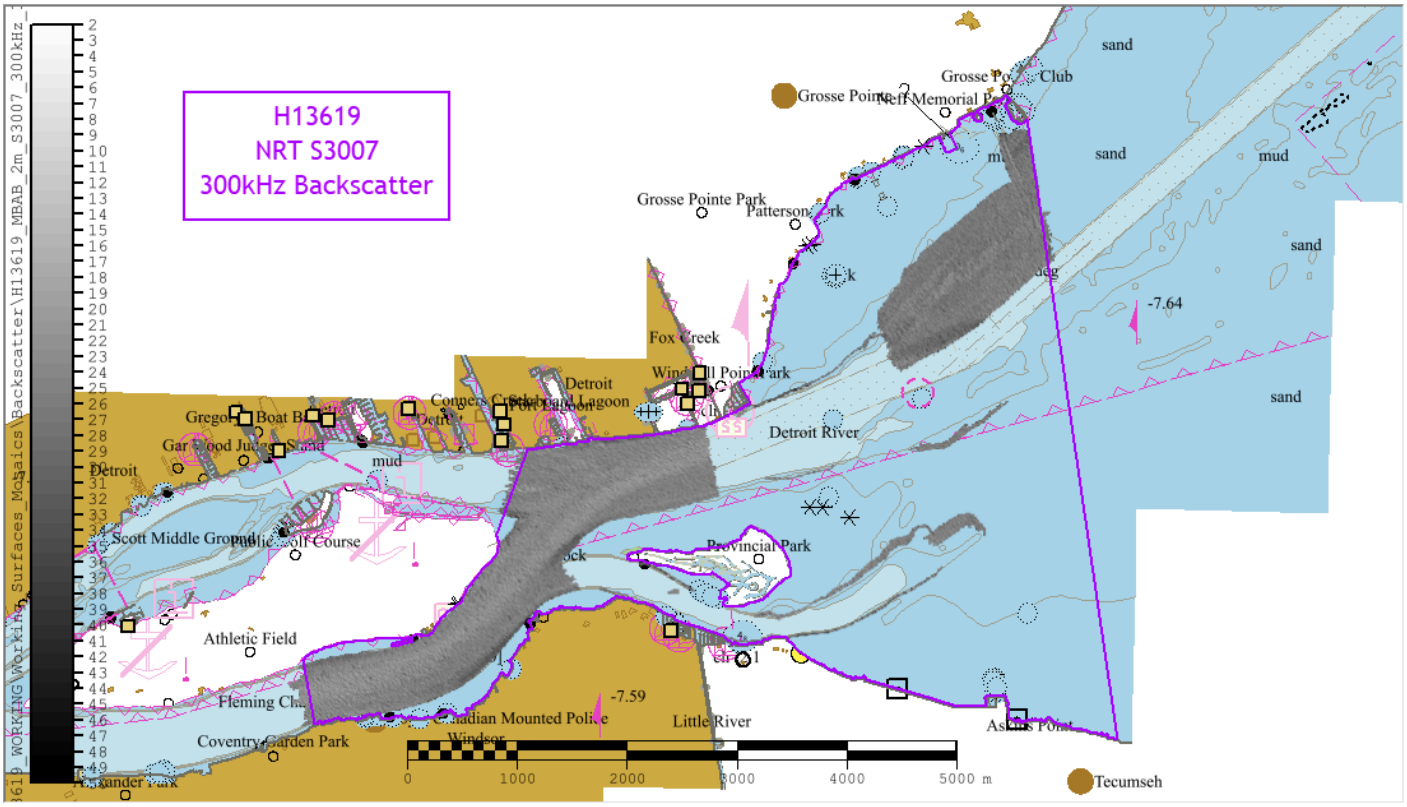


Figure 20: 300kHz backscatter mosaic from data acquired by S3007.

B.5 Data Processing

B.5.1 Primary Data Processing Software

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

B.5.2 Surfaces

The following surfaces and/or BAGs were submitted to the Processing Branch:

Surface Name	Surface Type	Resolution	Depth Range	Surface Parameter	Purpose
H13619_MBES_50cm_LWD	MB Backscatter Mosaic	0.5 meters	0.57 meters - 15.03 meters	NOAA_0.5m	Object Detection

Surface Name	Surface Type	Resolution	Depth Range	Surface Parameter	Purpose
H13619_MBES_50cm_LWD_Final	MB Backscatter Mosaic	0.5 meters	0.57 meters - 15.03 meters	NOAA_0.5m	Object Detection
H13619_MBAB_2m_S3007_300kHz_1of2	MB Backscatter Mosaic	2 meters	-	N/A	Object Detection
H13619_MBAB_2m_2904_300kHz_2of2	MB Backscatter Mosaic	2 meters	-	N/A	Object Detection

Table 10: Submitted Surfaces

Object detection requirements were met with 100% object detection MBES coverage as specified under section 5.2.2.2 of the 2022 HSSD. All bathymetric grids for H13619 meet density requirements per the 2022 HSSD (Figure 21).

A total of 22 holidays exist within survey H13619. See section A.4 for further information.

Additionally, after multiple rounds of cleaning, a total of ten fliers remain as detected by NOAA's QC Tool Flier Finder available in the Pydro CL-19 suite (Figure 22). The hydrographer reviewed the flagged nodes and considers them to be accurate representations of the lake bed.

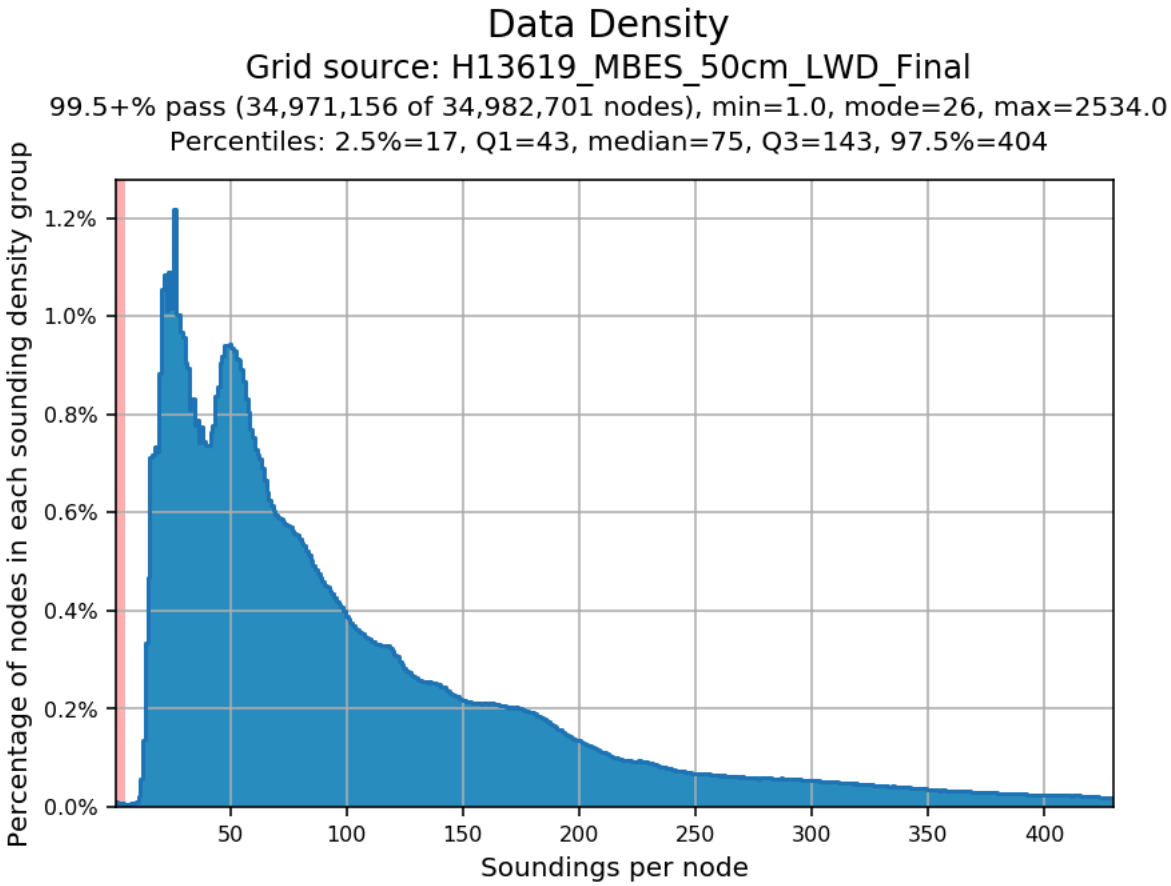


Figure 21: H13619 data density standards.

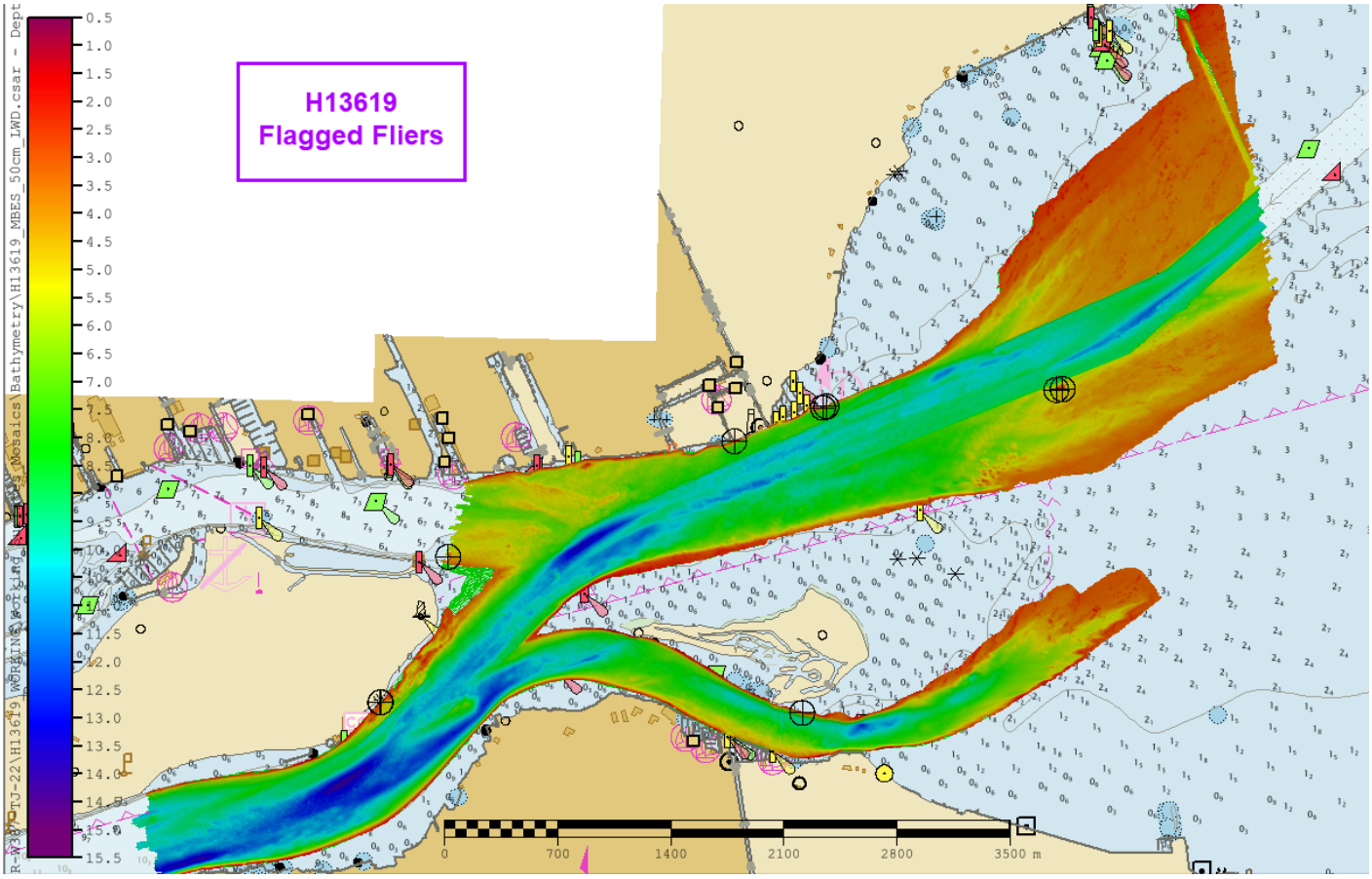


Figure 22: Overview of the remaining ten flagged fliers in H13619
MBES data considered to be accurate representations of the lake bed.

C. Vertical and Horizontal Control

Field installed tide and GPS stations were not utilized for this survey. There is no HVCR report included with the submission of H13619.

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-W387-TJ-22_NAD83_2011_VDatum_LWD_IGLD85

Table 11: ERS method and SEP file

C.2 Horizontal Control

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

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

The following PPK methods were used for horizontal control:

- RTX

Trimble PP-RTX service was used with an Applanix POS MV v5 system and POSPac MMS software for ERS control in accordance with the HSSD for H13619 MBES data from vessels 2904 and S3007.

WAAS

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

D. Results and Recommendations

D.1 Chart Comparison

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
US5MI28M	1:15000	6	11/03/2021	11/24/2021

Table 12: Largest Scale ENCs

D.1.2 Shoal and Hazardous Features

Survey soundings and contours were compared against previously charted data. While depth values were found to be in general agreement, some contours appear to have shifted. The hydrographer believes these shifts do not pose a hazard to navigation. One Danger to Navigation (DTON) Report was submitted for an obstruction with a surveyed least depth less than the surrounding charted depth area (Figure 23).

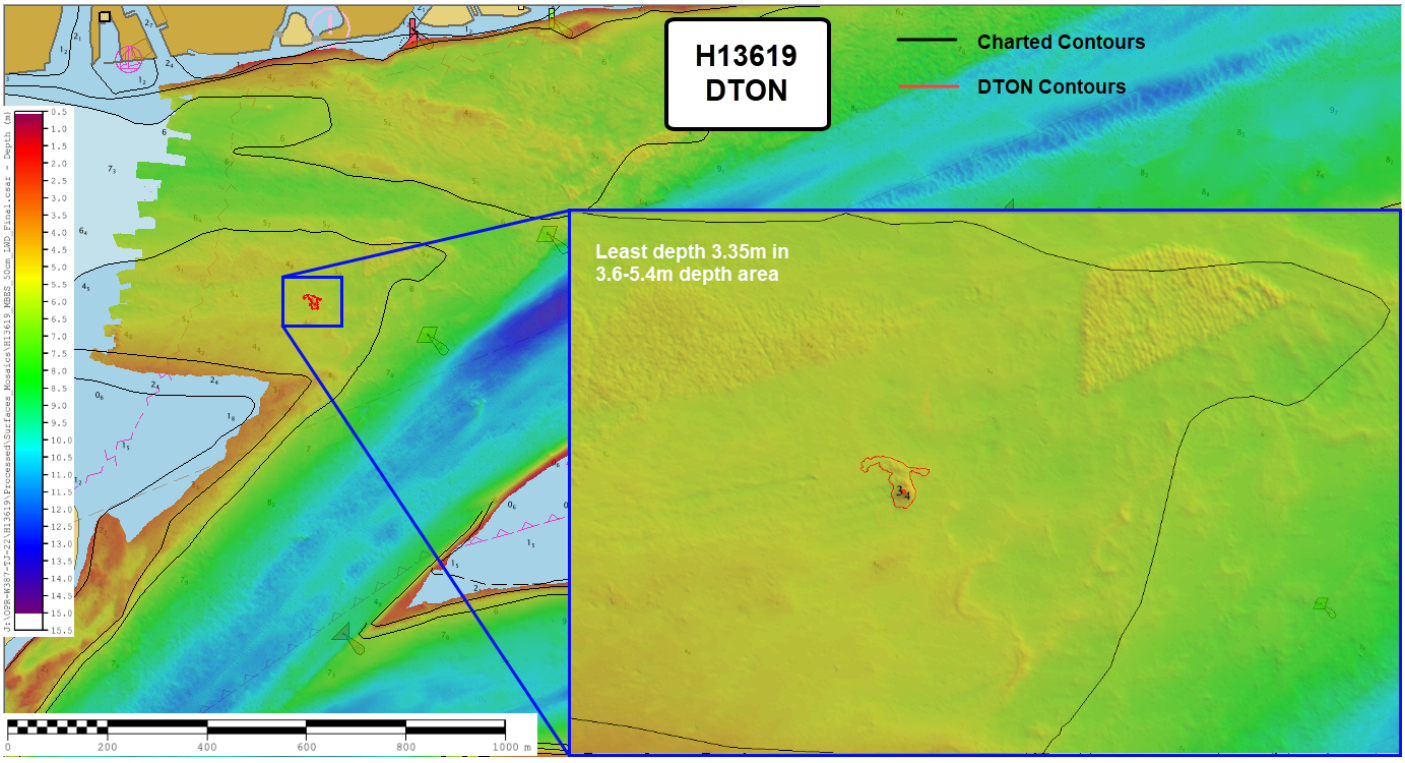


Figure 23: Reported DTON within H13619

D.1.3 Charted Features

A total of 106 features were assigned for investigation. Of the 106 assigned features, 93 were not addressed due to operational time constraints. Four of the features were deemed appropriate for deletion based on bathymetric data collected. Additionally, nine features were not included in the FFF per Investigation Requirements. Reference the Final Feature File included with the submission of this project for further information.

D.1.4 Uncharted Features

A total of eight uncharted features were identified within the 100% object detection MBES coverage. None of these features are considered dangerous to navigation. Reference the Final Feature File included with the submission of this project for further information.

D.1.5 Channels

Three federally maintained dredged channels exist within H13619- the Flemming Channel, Peach Island Channel, and an additional unnamed channel (Figure 24). Surveyed depths within the channels were in general agreement with reported project depths with the exception of a section of the Flemming Channel in the vicinity of Peche Island Light (Figure 25). The reported depth range for this area is 8.6m while surveyed depths reached a minimum of 5m. This discrepancy was reported to the Project Manager following guidance in the 2022 HSSD. A record of the correspondence can be found in the DR Appendix II: Supplemental Records folder of the submission package.

Additionally, two CATZOC B areas exist in the vicinity of Peche Island Light within the Flemming Channel (Figure 25). Surveyed depths were found to be greater than the charted depths in both areas. The hydrographer recommends contacting the US Army Corps of Engineers to determine if there are any planned dredging projects for this location or if the channel extents should be updated to reflect survey data.

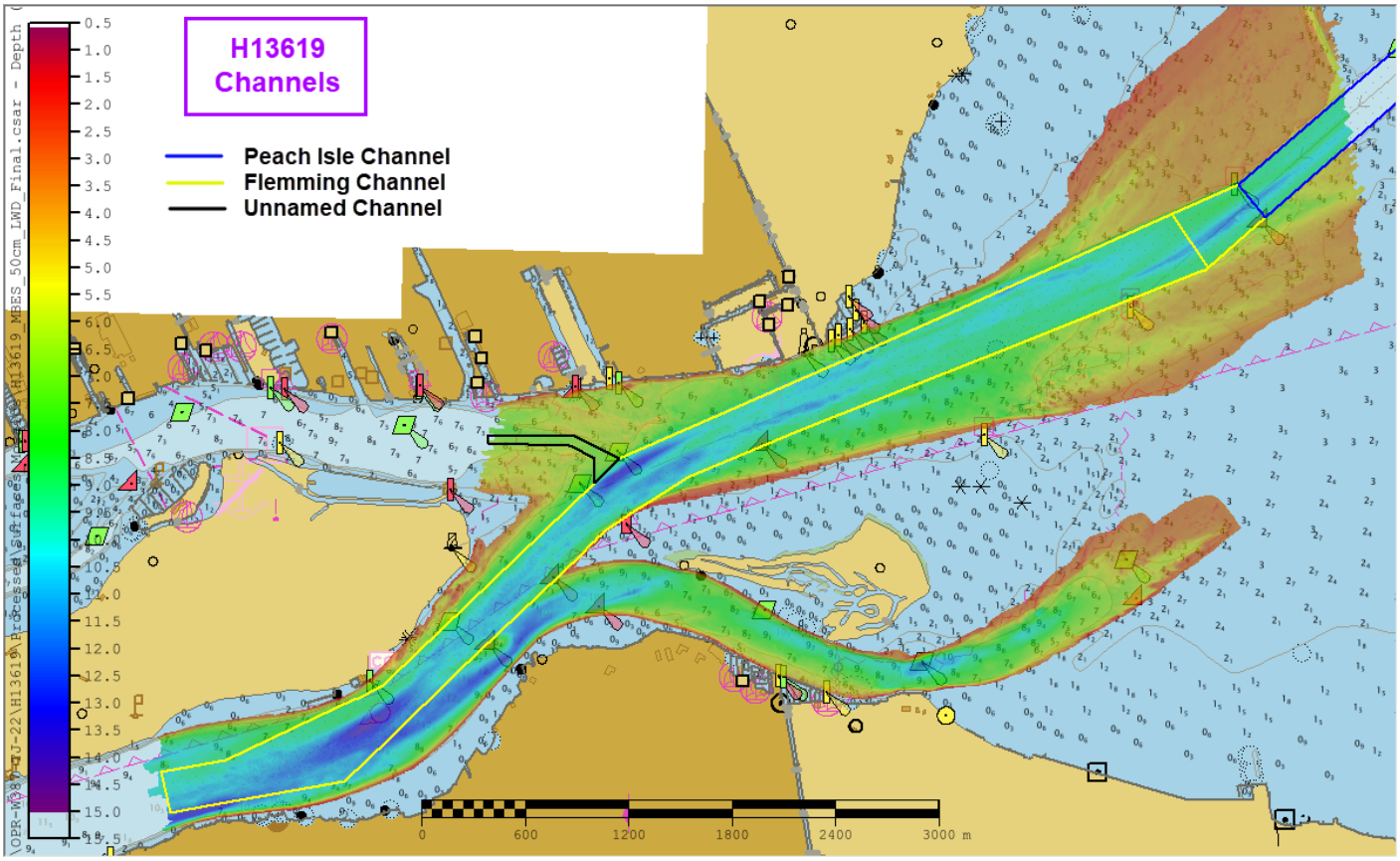


Figure 24: Overview of federally maintained channels in H13619.

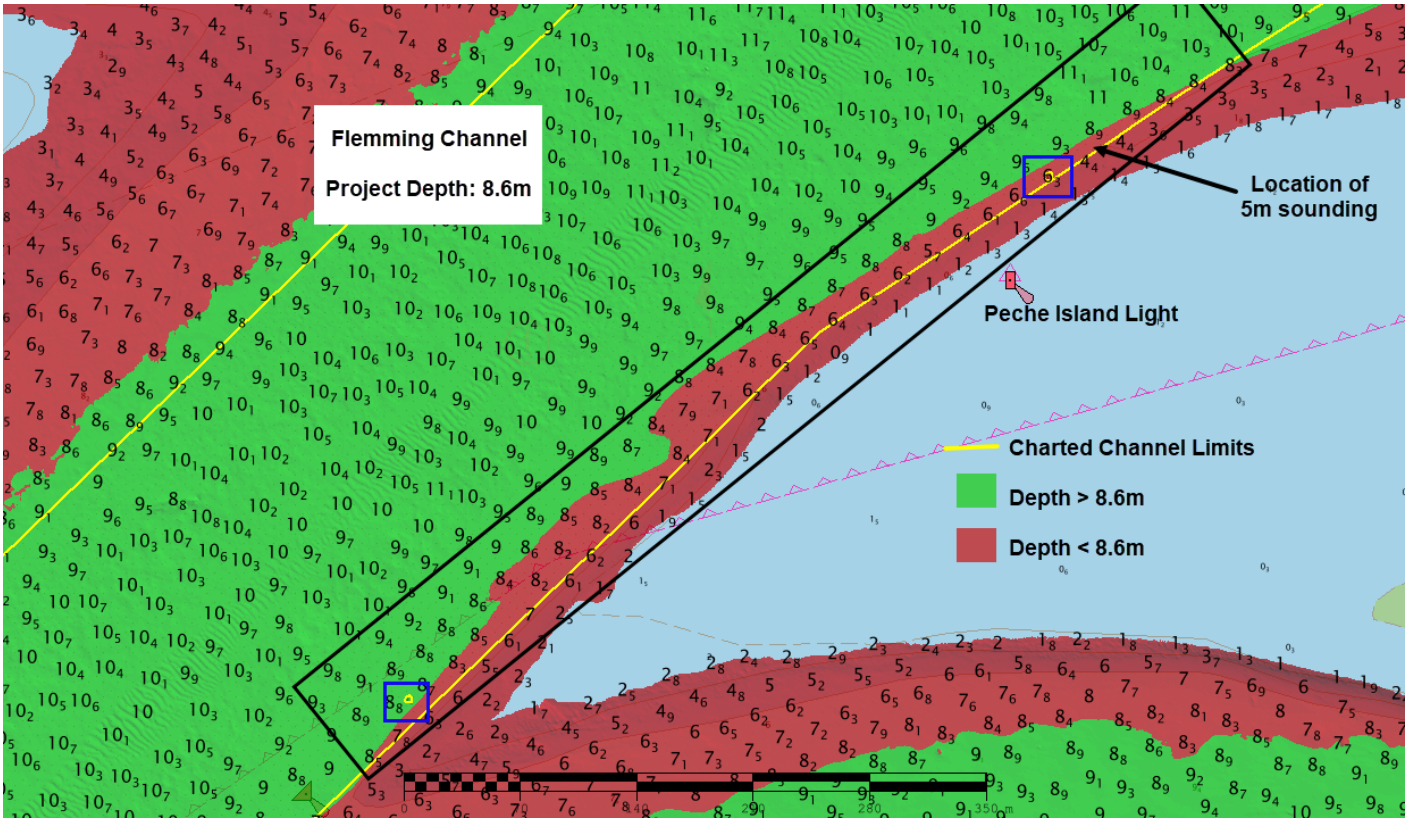


Figure 25: Section of the Flemming Channel with surveyed depths less than reported project depths outlined in black. CATZOC B areas outlined in blue.

D.2 Additional Results

D.2.1 Aids to Navigation

A total of 39 AtoNs exist in H13619. Of the 39 AtoNs 19 are buoys and 20 are lights. None of the 20 lights were observed during acquisition. All 19 buoys were on station and serving their intended purpose.

D.2.2 Maritime Boundary Points

No Maritime Boundary Points were assigned for this survey.

D.2.3 Bottom Samples

Four bottom samples were assigned in sheet H13619. However, only three bottom samples were collected due to operational time constraints (Figure 26). Reference the Final Feature File included with the submission of this project for further information.

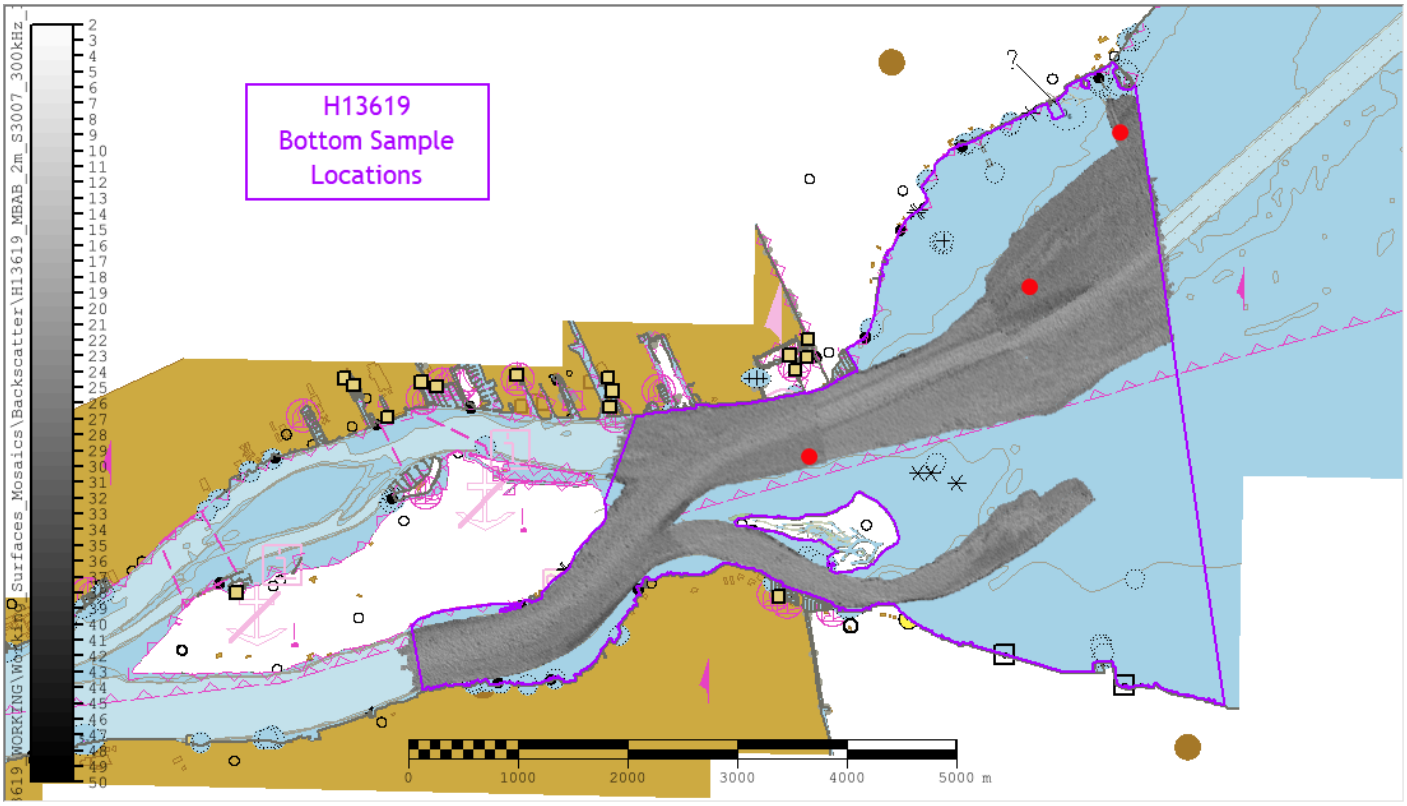


Figure 26: Locations of H13619 bottom samples, shown as purple dots, overlaid on 300kHz MBES backscatter mosaic.

D.2.4 Overhead Features

No overhead features exist for this survey.

D.2.5 Submarine Features

Three underwater cables and two pipelines were assigned for investigation within H13619. Reference the Final Feature File included with the submission of this project for further information.

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	11/30/2022	JASKOSKI.MATTHEW.JACOB.1275636262 2022.11.30 10:07:14 -05'00'
Michelle M. Levano, LT/NOAA	Field Operations Officer	11/30/2022	Digitally signed by LEVANO.MICHELLE.MARIE.1516645888 Date: 2022.11.30 11:48:45 -05'00'
Erin K. Cziraki	Chief Survey Technician	11/30/2022	CZIRAKI.ERIN.KAYE.1550015338 Digitally signed by CZIRAKI.ERIN.KAYE.1550015338 Date: 2022.11.30 08:34:19 -05'00'
Chloe B. Arboleda	Senior Survey Technician	12/05/2022	ARBOLEDA.CHLOE ELIZABETH.B.1550062760 Digitally signed by ARBOLEDA.CHLOE ELIZABETH.B.1550062760 Date: 2022.12.07 10:23:29 -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