H13686

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

DESCRIPTIVE REPORT

Type of Survey:	Navigable Area
Registry Number:	H13686

LOCALITY

State(s):	Maryland
General Locality:	Chesapeake Bay
Sub-locality:	Hooper Range

2022

CHIEF OF PARTY
LTJG Carly Robbins

LIBRARY & ARCHIVES

Date:

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

REGISTRY NUMBER:

HYDROGRAPHIC TITLE SHEET

H13686

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):	**Maryland**
General Locality:	**Chesapeake Bay**
Sub-Locality:	**Hooper Range**
Scale:	**40000**
Dates of Survey:	**10/24/2022 to 03/27/2023**
Instructions Dated:	**09/09/2022**
Project Number:	**S-E927-BH2-22**
Field Unit:	**NOAA R/V *Bay Hydro II***
Chief of Party:	**LTJG Carly Robbins**
Soundings by:	**Multibeam Echo Sounder**
Imagery by:	
Verification by:	**Pacific Hydrographic Branch**
Soundings Acquired in:	**meters at Mean Lower Low Water**

Remarks:

Any revisions to the Descriptive Report (DR) applied during office processing are shown in red italic text. The DR is maintained as a field unit product, therefore all information and recommendations within this report are considered preliminary unless otherwise noted. The final disposition of survey data is represented in the NOAA nautical chart products. All pertinent records for this survey are archived at the National Centers for Environmental Information (NCEI) and can be retrieved via https://www.ncei.noaa.gov/. Products created during office processing were generated in NAD83 UTM 18N, MLLW. All references to other horizontal or vertical datums in this report are applicable to the processed hydrographic data provided by the field unit.

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Descriptive Report to Accompany Survey H13686

Project: S-E927-BH2-22

Locality: Chesapeake Bay

Sublocality: Hooper Range

Scale: 1:40000

October 2022 - March 2023

NOAA R/V *Bay Hydro II*

Chief of Party: LTJG Carly Robbins

A. Area Surveyed

Data were acquired to the survey limits in accordance with the requirements in the Project Instructions (PIs) and the March 2022 NOS Hydrographic Surveys Specifications and Deliverables (HSSD).

A.1 Survey Limits

Data were acquired within the following survey limits:

Northwest Limit	Southeast Limit
38° 14' 7.85" N 76° 21' 13.97" W	38° 10' 39.25" N 76° 16' 7.08" W

Table 1: Survey Limits

Data were acquired to the survey limits in accordance with the requirements in the Project Instructions and the March 2022 NOS Hydrographic Surveys Specifications and Deliverables (HSSD) as shown in Figure 1.

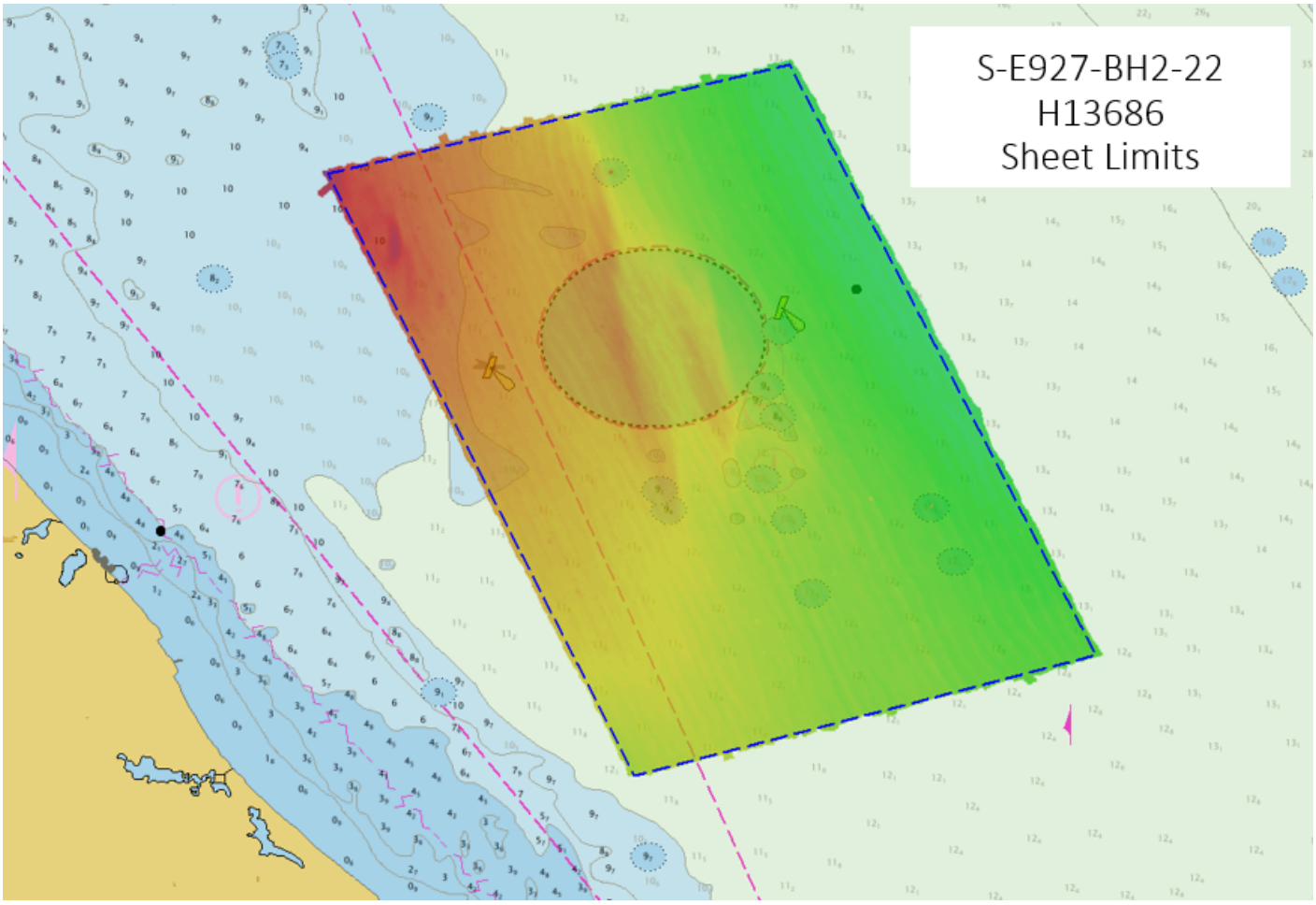


Figure 1: H13686 sheet limits (blue) overlaid onto Chart US5VA22M

A.2 Survey Purpose

The Pilots have requested an investigation of a charted pile at 38°13.3' - 076°17.9'. The pile is charted as visible but the pilot claim it is not visible and they are concerned that it has broken off at the water column and is now a danger to navigation. Bay Hydro II is assigned to survey the area and the obstructions in the survey limits. Survey data from this project is intended to supersede all prior survey data in the common area.

A.3 Survey Quality

The entire survey is adequate to supersede previous data.

Data acquired in H13686 meets multibeam echo sounder (MBES) coverage requirements for complete coverage, as required by the HSSD. This includes crosslines (see Section B.2.1), NOAA allowable uncertainty (see Section B.2.10), and density requirements (see Section B.2.11).

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 Coverage (Refer to HSSD Section 5.2.2.2)

Table 2: Survey Coverage

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

A.6 Survey Statistics

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

	HULL ID	*S5401*	*Total*
LNM	**SBES Mainscheme**	0.0	0.0
	MBES Mainscheme	270.65	270.65
	Lidar Mainscheme	0.0	0.0
	SSS Mainscheme	0.0	0.0
	SBES/SSS Mainscheme	0.0	0.0
	MBES/SSS Mainscheme	0.0	270.65
	SBES/MBES Crosslines	14.51	14.51
	Lidar Crosslines	0.0	0.0
Number of Bottom Samples			0
Number Maritime Boundary Points Investigated			0
Number of DPs			0
Number of Items Investigated by Dive Ops			0
Total SNM			7.45

Table 3: Hydrographic Survey Statistics

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

Survey Dates	Day of the Year
10/24/2022	297
10/25/2022	298

Survey Dates	Day of the Year
11/07/2022	311
11/09/2022	313
11/15/2022	319
11/18/2022	322
11/29/2022	333
12/02/2022	336
12/05/2022	339
12/07/2022	341
03/24/2023	83
03/27/2023	86

Table 4: Dates of Hydrography

H13686 survey operations began on 24 October 2022 and were resumed and completed in 2023 due to conflicting schedules with the US Navy, who was also operating in H13686 survey grounds.

B. Data Acquisition and Processing

B.1 Equipment and Vessels

Refer to the S-927-BH2-22 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	***S5401***
LOA	17.3 meters
Draft	1.8 meters

Table 5: Vessels Used

Figure 2: R/V Bay Hydro II, S5401

B.1.2 Equipment

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

Manufacturer	Model	Type
SonTek	CastAway-CTD	Conductivity, Temperature, and Depth Sensor
Valeport	MiniSVS	Sound Speed System
Applanix	POS MV 320 v5	Positioning and Attitude System
Kongsberg Maritime	EM 2040CD	MBES

Table 6: Major Systems Used

B.2 Quality Control

B.2.1 Crosslines

Multibeam crosslines acquired for this survey totaled 5.36% of mainscheme acquisition. Crosslines were collected, processed, and compared in accordance with Section 5.2.4.2 of the HSSD. To evaluate crosslines, a 0.5 meter CUBE surface using strictly mainscheme lines, and a 0.5 meter surface using strictly crosslines were created. From these two surfaces, a difference surface (mainscheme - crosslines = difference surface) was generated using Pydro's Compare Grids tool at a 0.5 meter resolution (Figure 3). Statistics show the mean difference between the depths derived from mainscheme and crosslines was -0.00 meters with crosslines being deeper and 95% of nodes falling within +/- 0.16 meters (Figure 4). For the respective depths, the difference surface was compared to the allowable NOAA uncertainty standards using Pydro's Compare Grids tool. In total, 99.5% of the depth differences between H13686 mainscheme and crossline data were within allowable NOAA uncertainties (Figure 5).

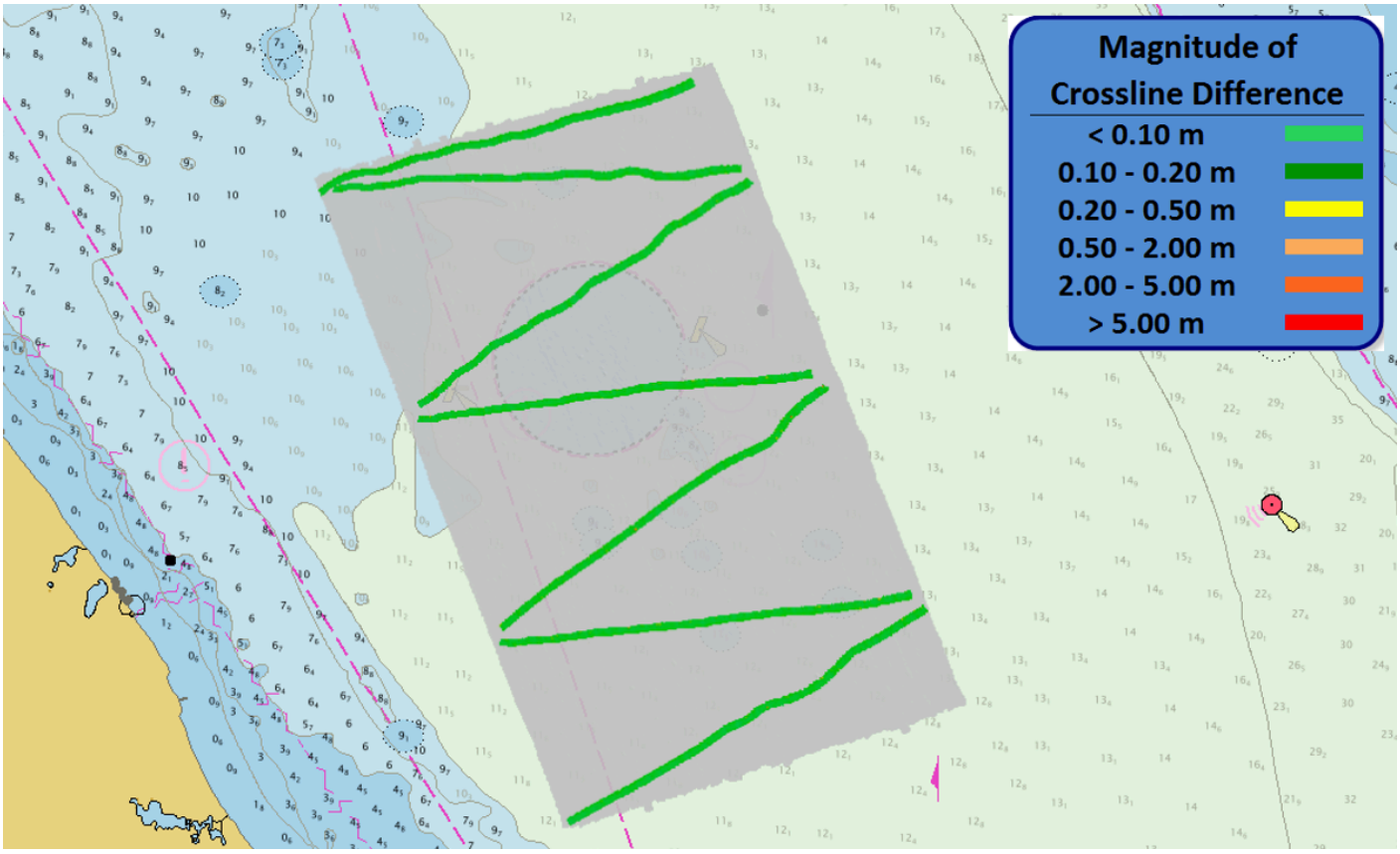
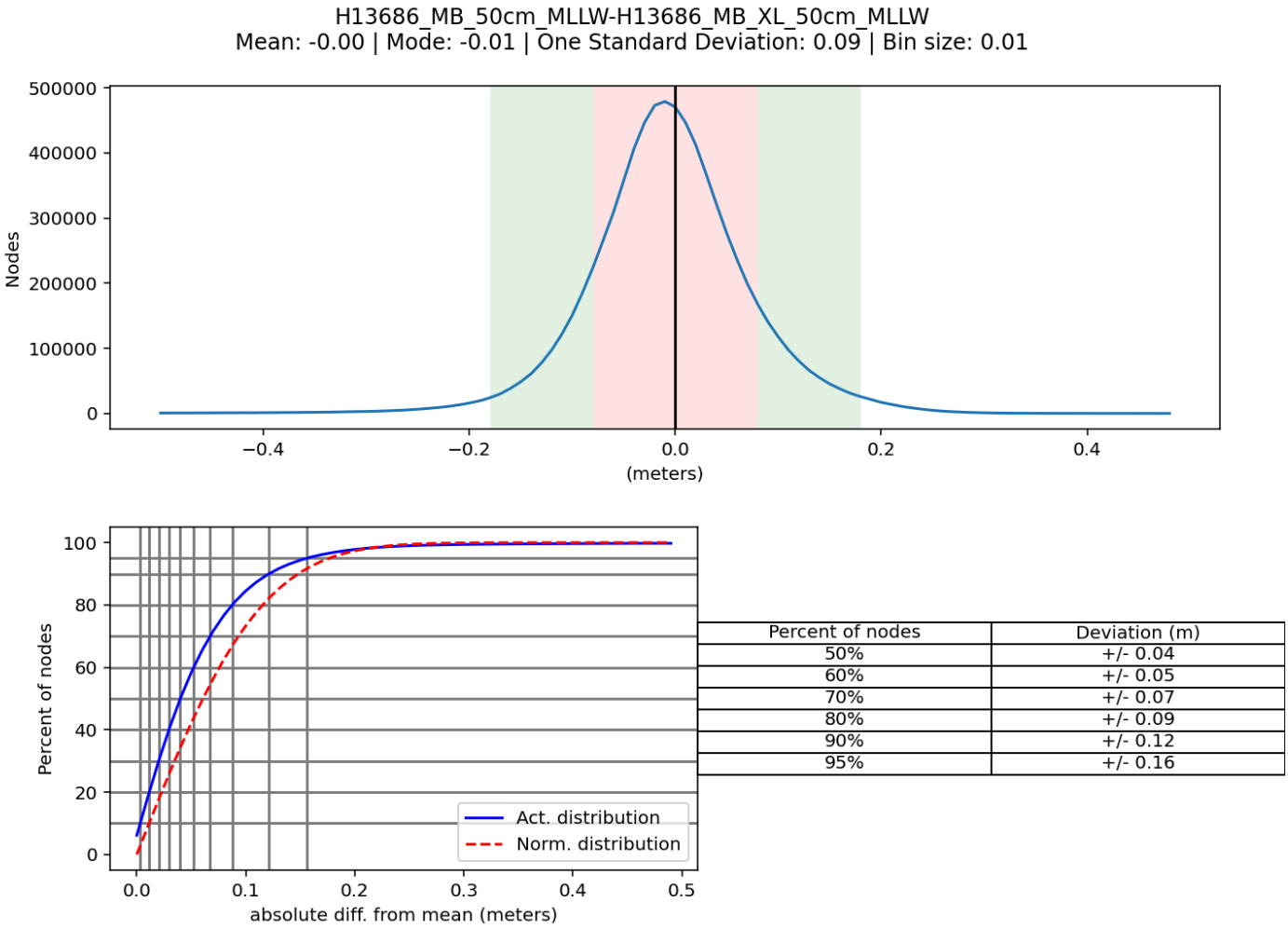


Figure 3: Depth differences between H13686 mainscheme (gray) and H13686 crossline data



Percent of nodes	Deviation (m)
50%	+/- 0.04
60%	+/- 0.05
70%	+/- 0.07
80%	+/- 0.09
90%	+/- 0.12
95%	+/- 0.16

Figure 4: H13686 maintenance to crossline difference statistics

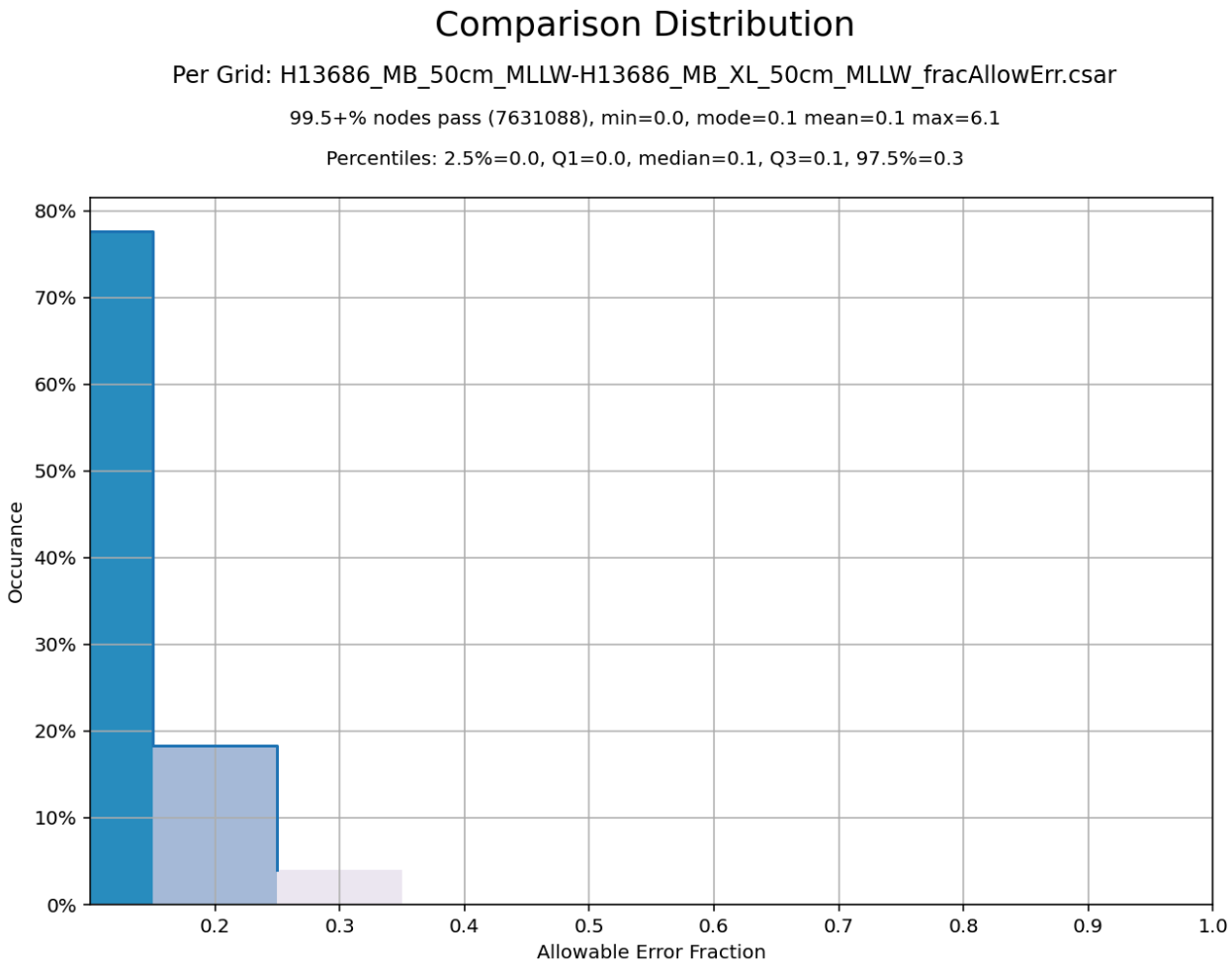


Figure 5: H13686 mainscheme and H13686 crossline NOAA allowable uncertainty statistics

B.2.2 Uncertainty

The following survey specific parameters were used for this survey:

Method	Measured	Zoning
ERS via VDATUM	0.0 meters	0.09 meters

Table 7: Survey Specific Tide TPU Values.

Hull ID	Measured - CTD	Measured - MVP	Measured - XBT	Surface
S5401	2.0 meters/second	0.0 meters/second	0.0 meters/second	0.5 meters/second

Table 8: Survey Specific Sound Speed TPU Values.

In addition to the usual a priori estimates of uncertainty provided via device models for vessel motion and VDATUM, real-time and post processed uncertainty sources were also incorporated into the depth estimates of survey H13686. Real-time uncertainties were provided via EM 2040C DH MBES data and Applanix Delayed Heave RMS. Following post -processing of the real-time vessel motion, recomputed uncertainties of vessel roll, pitch, gyro, and navigation were applied in CARIS HIPS and SIPS via a Smoothed Best Estimate of Trajectory (SBET) RMS file generated in Applanix POSPac.

B.2.3 Junctions

No junctioning surveys have been provided for this project.

There are no contemporary surveys that junction with this survey.

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

There were no other factors that affected corrections to soundings.

B.2.7 Sound Speed Methods

Sound Speed Cast Frequency: Casts were conducted at a minimum of once every 4 hours during acquisition. Casts were conducted more frequently in areas where the influx of freshwater had an effect on the speed of sound in the water column and when there was a change in surface sound speed greater than two meters per second. All sound speed methods were used as detailed in the DAPR.

B.2.8 Coverage Equipment and Methods

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

B.2.9 Holidays

H13686 data were reviewed in CARIS HIPS and SIPS for holidays in accordance with Section 5.2.2.2 of the HSSD. 405 holidays that meet the object detection definition were identified via Pydro QC Tools Holiday Finder tool. This tool automatically scans finalized surfaces for holidays as defined in the HSSD and was run in conjunction with a visual inspection of all surfaces by the hydrographer. 69 of the 405 total holidays were outside the H13686 sheet limits.

Throughout the survey grounds, but especially in the western, shoaler areas, schools of fish and/or other marine life were ubiquitous and prohibited the MBES from identifying the true seafloor (See Figure 6 for an overview of the holidays). Potentially, the abnormally high presence of marine life was due to a seasonal effect. This interference resulted in artifacts in the processed data which did not accurately represent the seafloor (See Figure 7). In many cases, removal of these artifacts in the MBES surface introduced gaps in coverage. The majority of the total holidays are due to interference from marine life. Each of these gaps in coverage was examined in CARIS HIPS and SIPS Subset Editor and determined to neither contain dangers to navigation nor to degrade the confidence in the quality of the survey. Areas of overlapping bathymetry showed the fish balls to be transient. These data gaps do not limit the ability to adequately verify charted depths.

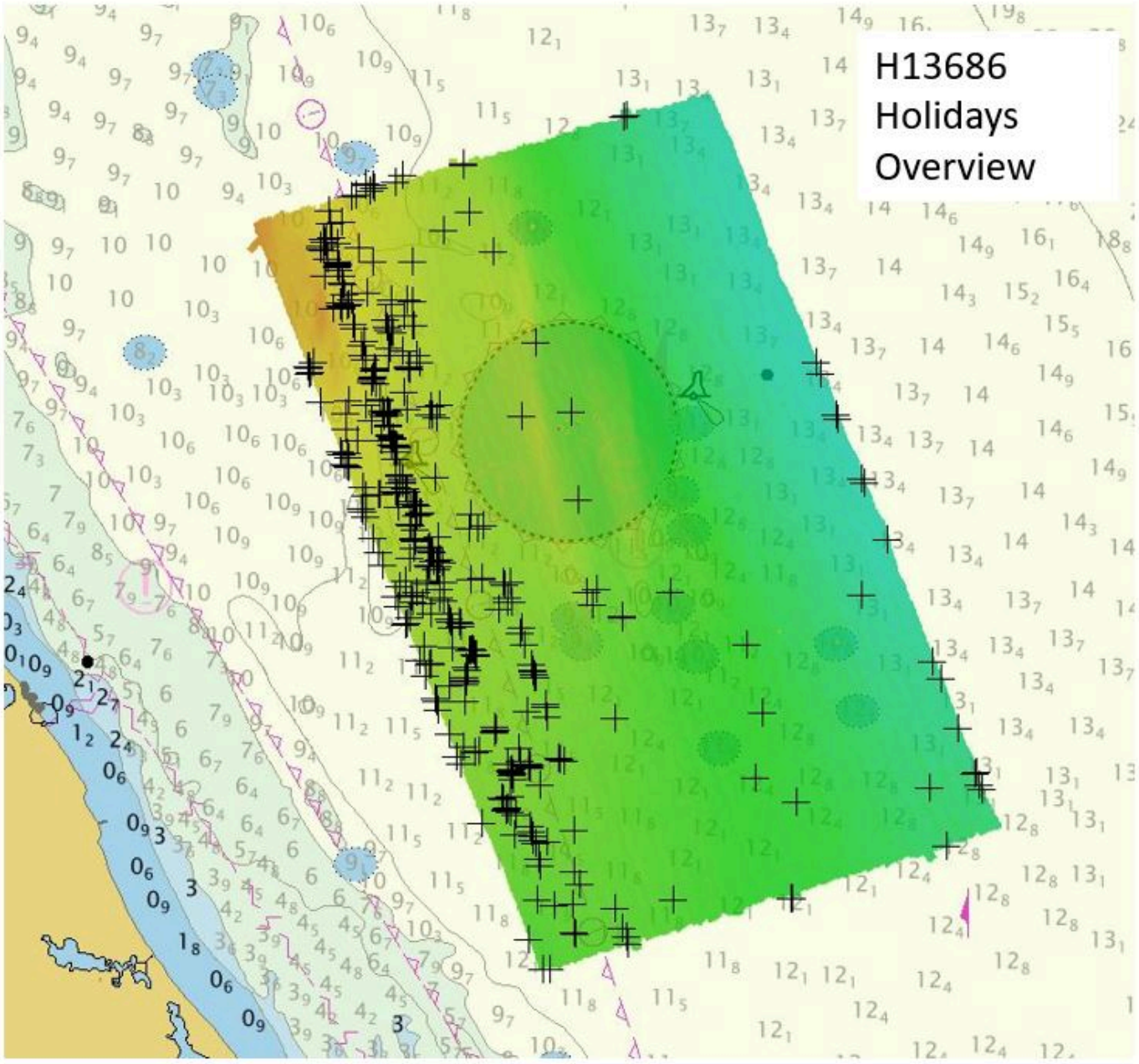


Figure 6: Overview of H13686 holidays

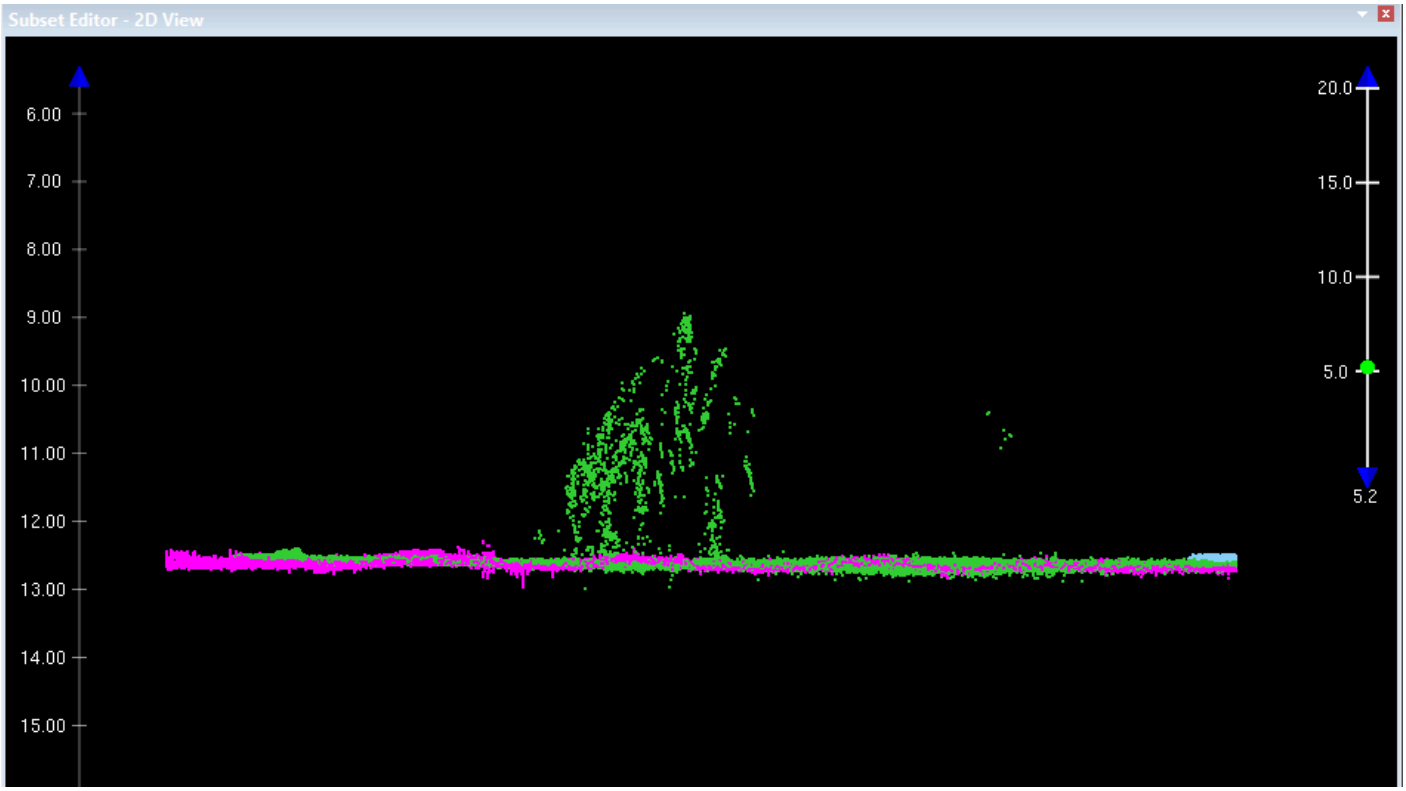


Figure 7: CARIS HIPS and SIPS Subset Editor image of marine life prohibiting the MBES from identifying the true seafloor

B.2.10 NOAA Allowable Uncertainty

The surface was analyzed using the HydrOffice QC Tools Grid QA feature to determine compliance with specifications. Overall, 99.5% of nodes within the surface meet NOAA Allowable Uncertainty specifications for H13686 (Figure 8).

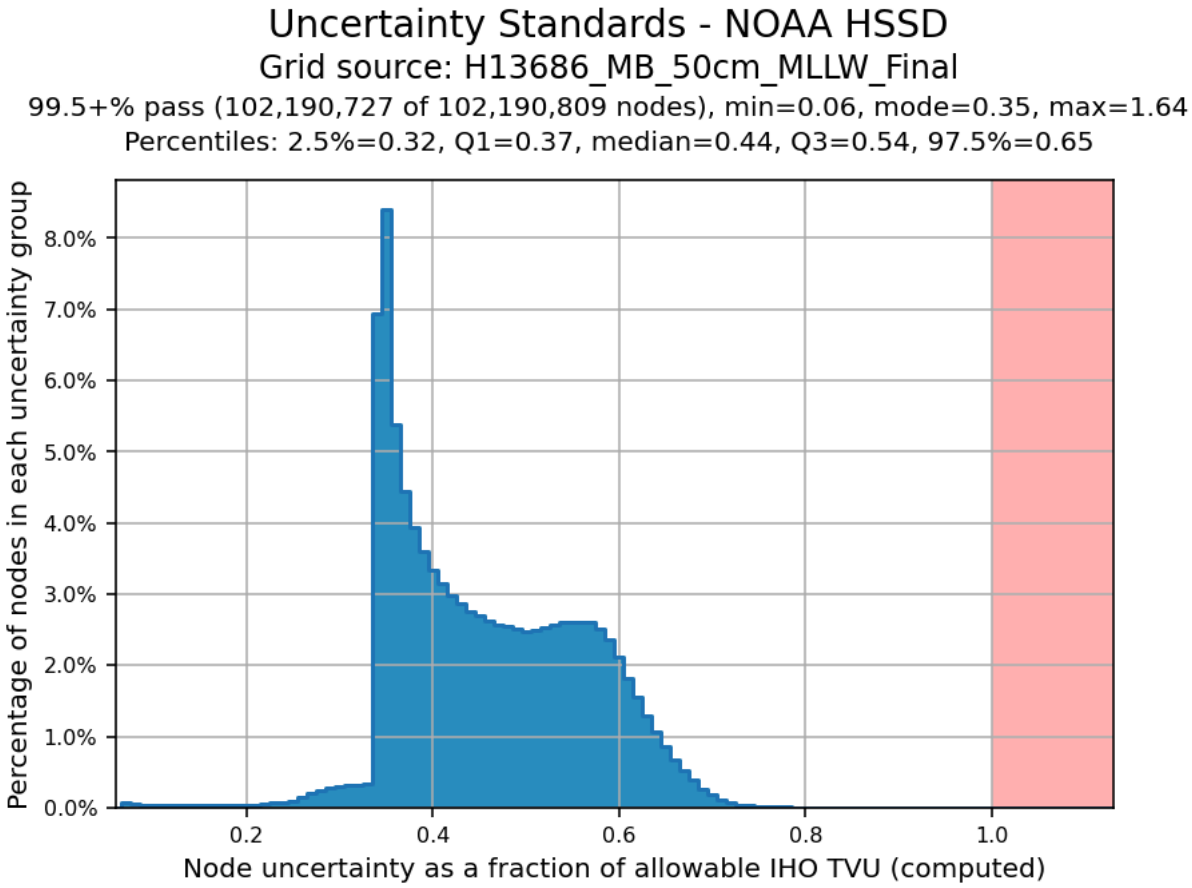


Figure 8: H13686 uncertainty statistics

B.2.11 Density

The finalized surface was analyzed using the Pydro QC Tools Grid QA feature to determine compliance with specifications. Density requirements for H13686 were achieved with at least 99.5+% of surface nodes containing five or more soundings as required by HSSD Section 5.2.2.3 (Figure 9).

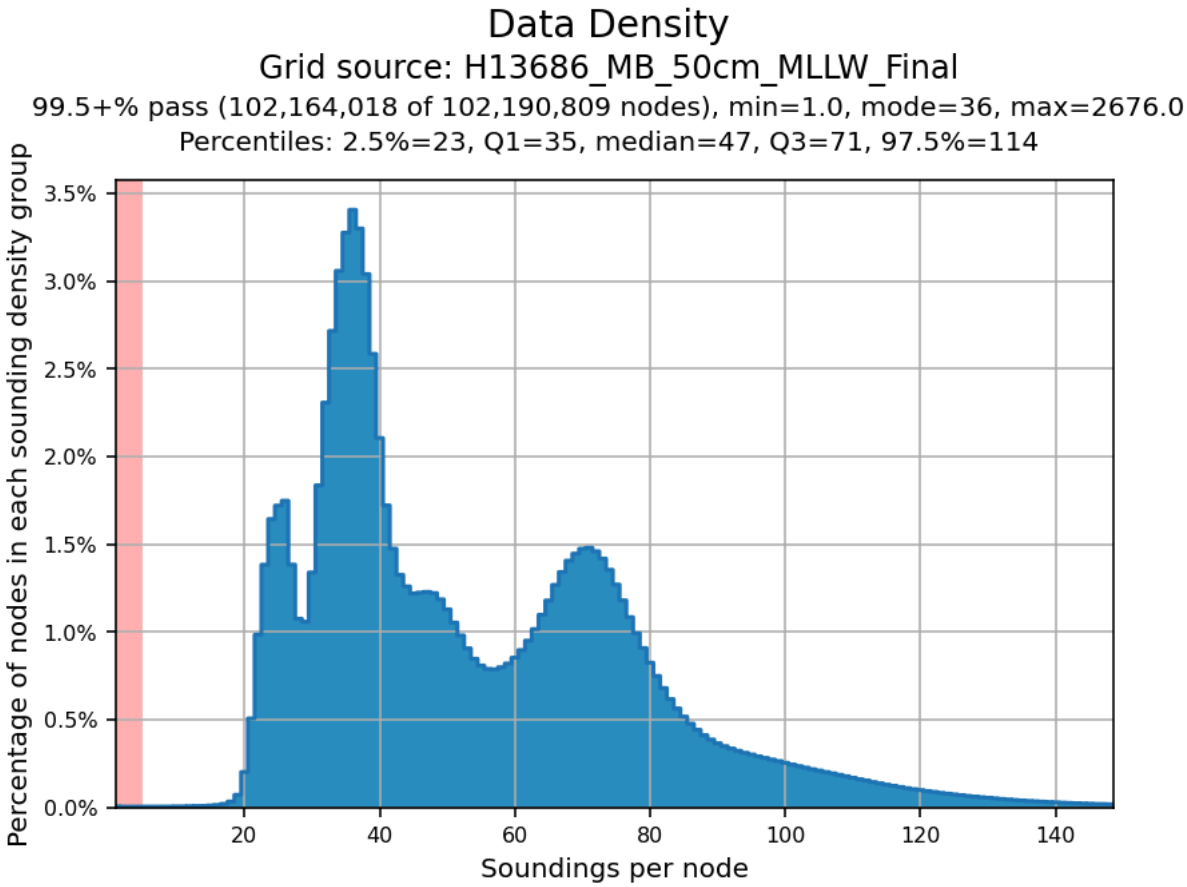


Figure 9: H13686 density statistics

B.2.12 Roll Artifact

Roll artifacts were detected in DN 319's data due to the sea state (See Figure 10). Affected data were determined to be within NOAA specifications, so no further action was taken.

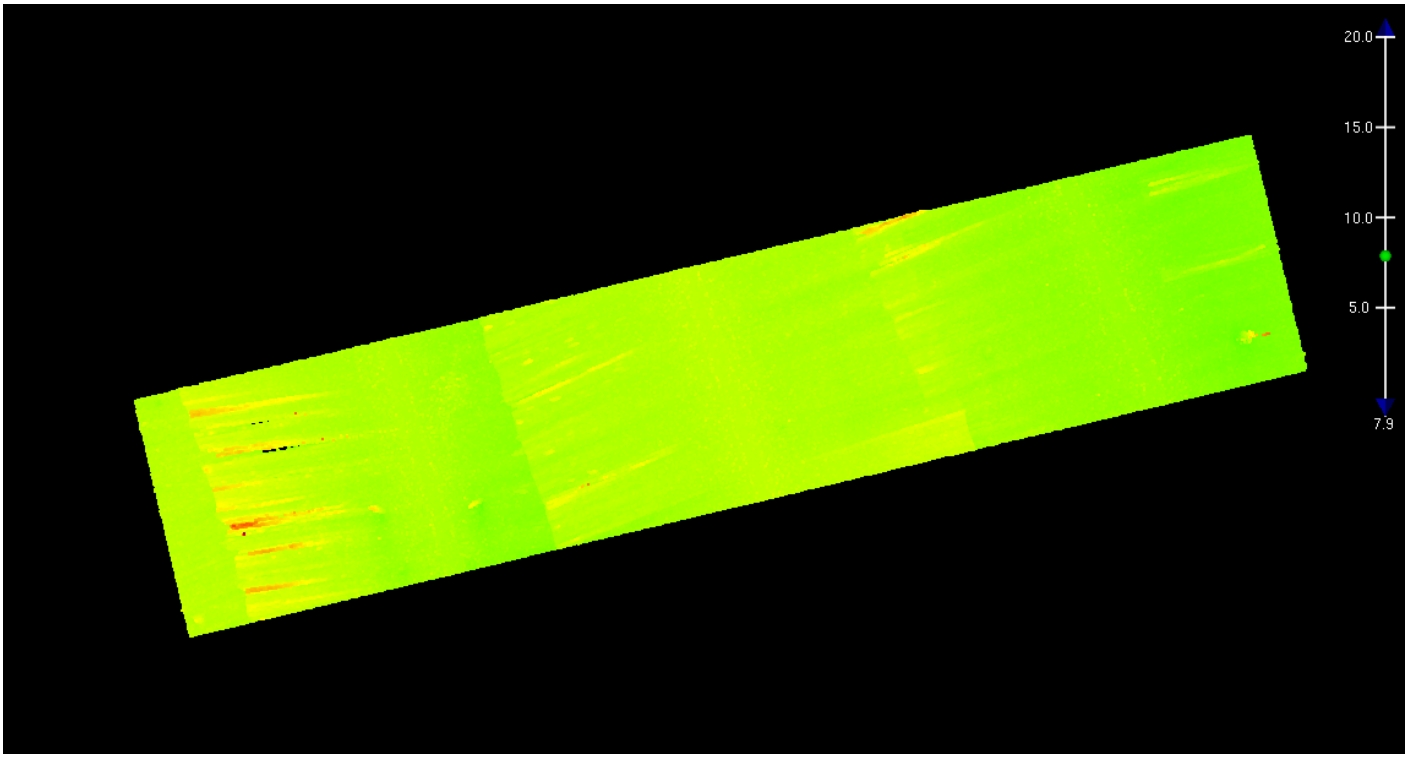


Figure 10: Roll artifacts in outer beams

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

Kongsberg EM2040C stores the raw backscatter data in the .all file. All equipment and survey methods were used as detailed in the DAPR. Raw MBES backscatter was logged as part of the .all file of the Kongsberg EM2040 systems. Backscatter was processed in QPS Fledermaus GeoCoder Toolbox (FMGT) software,

and the exported geotiff is included in the final processed data package. See Figure 11 for a greyscale representation of the complete mosaic.

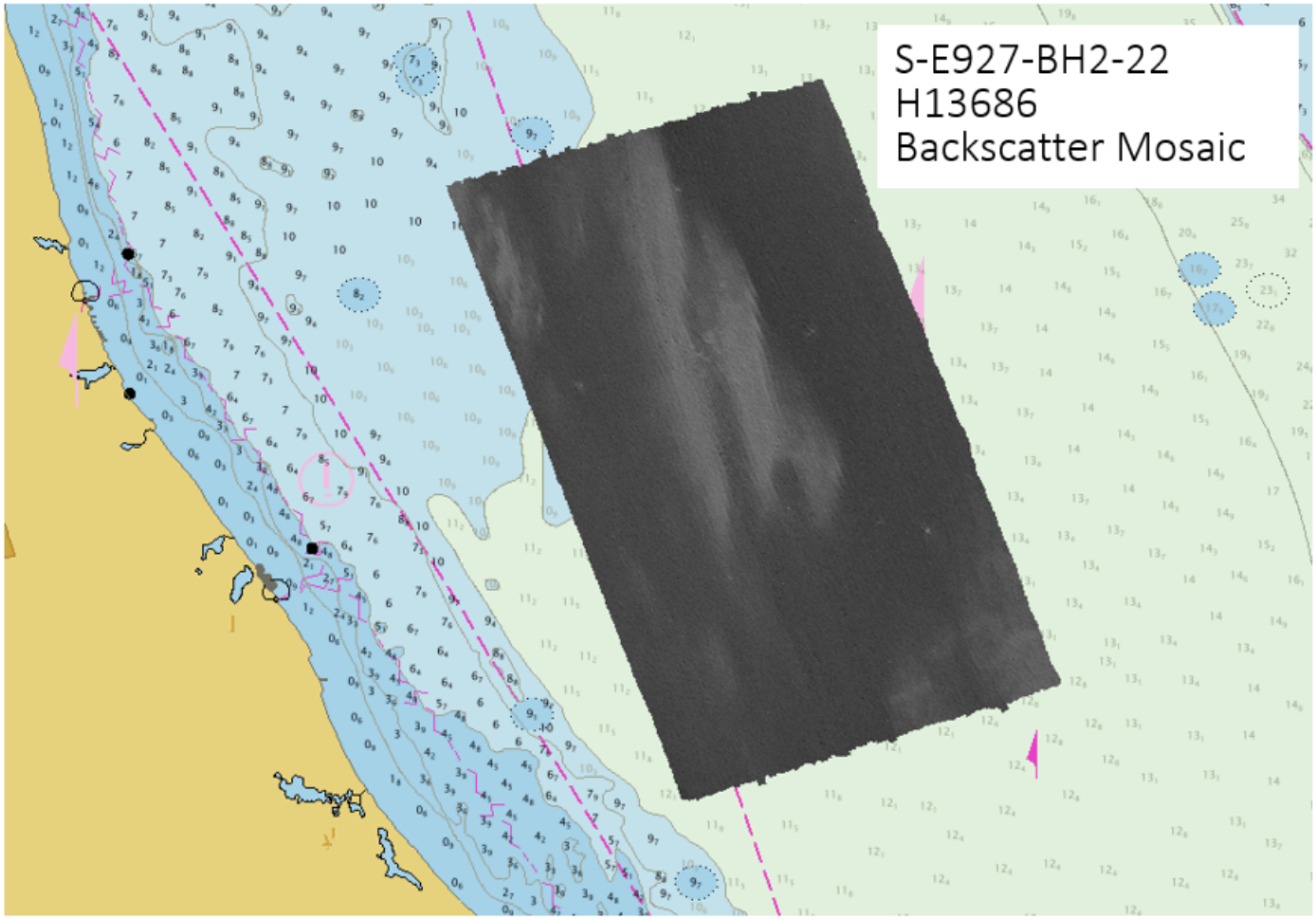


Figure 11: H13686 backscatter mosaic overlaid onto Chart US5VA22M

B.5 Data Processing

B.5.1 Primary Data Processing Software

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

Manufacturer	Name	Version
CARIS	HIPS and SIPS	11.4.19

Table 9: Primary bathymetric data processing software

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

Manufacturer	Name	Version
QPS	Fledermaus	7.10.2

Table 10: Primary imagery 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
H13686_MB_50cm_MLLW.csar	CARIS Raster Surface (CUBE)	0.5 meters	9.5 meters - 16.7 meters	NOAA_0.5m	Object Detection
H13686_MB_50cm_MLLW_Final.csar	CARIS Raster Surface (CUBE)	0.5 meters	9.8 meters - 16.7 meters	NOAA_0.5m	Object Detection
H13686_MBAB_2m_S5401_300kHz_1of1.tif	MB Backscatter Mosaic	2 meters	0.0 N/A -	N/A	100% SSS

Table 11: Submitted Surfaces

The NOAA CUBE parameters defined in the HSSD were used for the creation of all CUBE surfaces for H13686. The surfaces have been reviewed where noisy data, or "fliers" are incorporated into the gridded solutions causing the surface to be shoaler or deeper than the true sea floor. Where these spurious soundings cause the gridded surface to vary from the reliably measured seabed by greater than the maximum allowable Total Vertical Uncertainty at that depth, the noisy data have been rejected by the hydrographer and the surface recomputed.

Flier Finder, part of the QC Tools package within HydrOffice, was used to assist the search for spurious soundings following gross cleaning. Flier Finder was run iteratively until all remaining flagged fliers were deemed to be valid aspects of the surface.

B.5.3 Designated Soundings

H13686 contains 11 designated soundings in accordance with HSSD Section 5.2.1.2.3. These soundings were designated to facilitate feature management.

C. Vertical and Horizontal Control

Per Section 5.2.2.1.3 of the 2021 Field Procedures Manual, no Horizontal and Vertical Control Report has been generated for H13686.

C.1 Vertical Control

The vertical datum for this project is Mean Lower Low Water.

ERS Datum Transformation

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

Method	Ellipsoid to Chart Datum Separation File
ERS via VDATUM	S-E927-BH2-22_VDatum_100m_NAD83-MLLW_geoid12b.csar

Table 12: ERS method and SEP file

Following the successful application of SBETs, ERS methods using VDATUM were used for reducing data to MLLW. ERS methods were used as the final means of reducing H13686 to MLLW for submission.

C.2 Horizontal Control

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

The projection used for this project is Universal Transverse Mercator (UTM) Zone 18.

The following PPK methods were used for horizontal control:

- RTX

Vessel kinematic data were post-processed using Applanix POSPac processing software and RTX Positioning methods using Charlene as described in the DAPR. Smoothed Best Estimate of Trajectory

(SBET) and associated error (RMS) data were applied to all MBES data in CARIS HIPS and SIPS. Smart Base SBETs were initially produced and applied. However, there were insufficient CORS stations available on DN 313, likely leading to poorly corrected GNSS altitude and vertical offsets in the bathymetry. However, the offsets were resolved when RTX SBETs were applied to all data.

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

There is general agreement between H13686 and charted depths except for charted features. Many of these features were not present in the bathymetry and are recommended for chart removal. The Final Feature File addresses these features.

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
US5VA22M	1:40000	32	02/08/2024	04/18/2024

Table 13: Largest Scale ENCs

D.1.2 Shoal and Hazardous Features

No shoals or potentially hazardous features exist for this survey.

D.1.3 Charted Features

All assigned features were addressed and are included in the H13686 Final Feature File. The charted pile at 38°13.3' - 076°17.9' that the Pilots reported as a possible hazard to navigation is disproved by multibeam and is recommended for removal from the chart. New positions of least depths for two wrecks (Feature ID US 0000000004 00001 and US 0000000008 00001) and for two obstructions were observed (US 0000000003 00001 and US 0000000007 00001).

D.1.4 Uncharted Features

One uncharted obstruction (Feature ID US 0000289325 00001) was observed and addressed in the Final Feature File.

D.1.5 Channels

No channels exist within the survey limits.

D.2 Additional Results

D.2.1 Aids to Navigation

USN Gunnery Testing "C" and "D" were on station and serving as intended. Neither ATON were assigned, but both were investigated and addressed in the Final Feature File.

D.2.2 Maritime Boundary Points

No Maritime Boundary Points were assigned for this survey.

D.2.3 Bottom Samples

No bottom samples were required for this survey.

D.2.4 Overhead Features

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
LTJG Jane Saunders	Chief of Party	05/03/2023	SAUNDERS.JANE.DEVEREAUX.1087825414 Digitally signed by SAUNDERS.JANE.DEVEREAUX.1087825414 Date: 2023.12.06 05:30:17 -05'00'
LTJG Carly Robbins	Sheet Manager	05/03/2023	ROBBINS.CARLY.ANN.1555089534 Digitally signed by ROBBINS.CARLY.ANN.1555089534 Date: 2023.05.03 14:29:36 -04'00'

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