H13666

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

DESCRIPTIVE REPORT

Type of Survey:	Basic Hydrographic Survey
Registry Number:	H13666

LOCALITY

State(s):	Alaska
General Locality:	West Prince of Wales Island, AK
Sub-locality:	2 NM Northwest of Zarembo Island

2022

CHIEF OF PARTY
CDR Meghan McGovern

LIBRARY & ARCHIVES

Date:

U.S. DEPARTMENT OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION	REGISTRY NUMBER:
HYDROGRAPHIC TITLE SHEET	**H13666**

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):	**Alaska**
General Locality:	**West Prince of Wales Island, AK**
Sub-Locality:	**2 NM Northwest of Zarembo Island**
Scale:	**10000**
Dates of Survey:	**10/04/2022 to 10/13/2022**
Instructions Dated:	**08/11/2022**
Project Number:	**OPR-O190-FA-22**
Field Unit:	**NOAA Ship *Fairweather***
Chief of Party:	**CDR Meghan McGovern**
Soundings by:	**Multibeam Echo Sounder**
Imagery by:	**Multibeam Echo Sounder Backscatter**
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 8N, 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 H13666

Project: OPRO190-FA-22

Locality: West Prince of Wales Island, AK

Sublocality: 2 NM Northwest of Zarembo Island

Scale: 1:10000

October 2022 - October 2022

NOAA Ship *Fairweather*

Chief of Party: CDR Meghan McGovern

A. Area Surveyed

This survey area is located 2 nautical miles Northwest of Zarembo Island in Alaska.

A.1 Survey Limits

Data were acquired within the following survey limits:

Northwest Limit	Southeast Limit
56° 27' 21.51" N 133° 15' 26.93" W	56° 20' 25.76" N 133° 1' 23.22" W

Table 1: Survey Limits

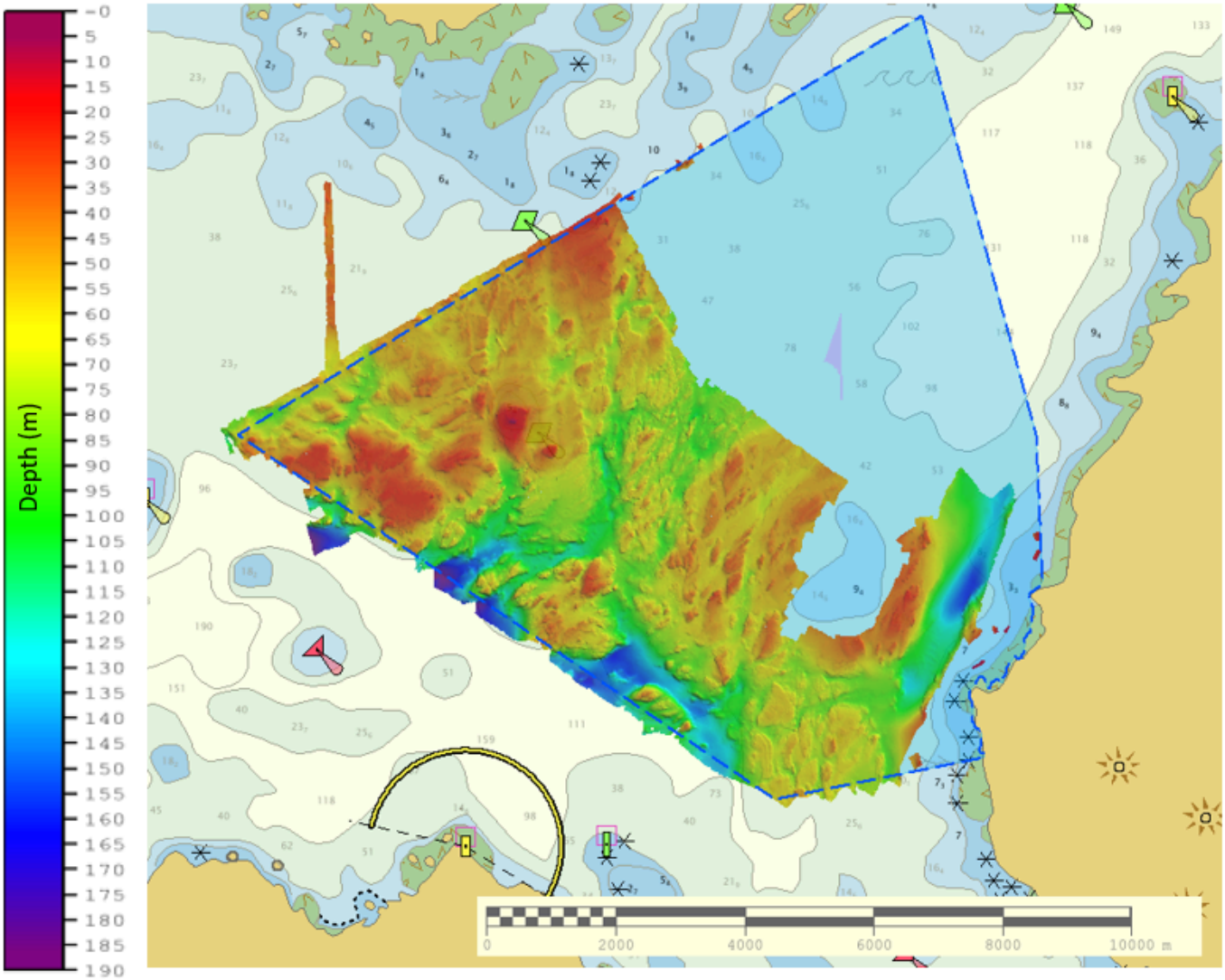


Figure 1: H13666 Sheet Limits (in blue) with survey coverage overlaid onto Chart US3AK3CM.

Data were not acquired to survey limits in accordance with the requirements in the Project Instructions and the 2022 NOS Hydrographic Surveys Specifications and Deliverables (HSSD). Equipment malfunction resulted in coverage of about half of the assigned sheet limits. Coverage acquired in H13666 is shown in the figure above.

A.2 Survey Purpose

The area surrounding Prince of Wales Island is navigationally complex and home to communities that are inaccessible by land, relying instead on the sea as their primary means of travel. Waterways along the project area of Prince of Wales Island are marked by pinnacles, rocks, islets, and complex tidal currents. These hazards would not have been identified during prior surveys due to limitations of the technologies

and techniques used at the time. These waterways are critical to the economic success of local coastal communities on Prince of Wales Island, as they are actively used for fishing and are the primary means for transporting goods throughout the region. Survey vintage in the southwestern Prince of Wales region dates back to 1916. Additional work on this project will occur in the vicinity of Sumner and Clarence Straits, AK, on the northern side of west Prince of Wales Island, in support of uncrewed Hydrographic Survey Launch testing. Sumner and Clarence straits are an important confluence of the Alaskan Inside Passage, handling a significant amount of commercial, recreational and fishing vessel traffic. Survey vintage in this portion of the survey dates back to 1971. This project will provide contemporary data to update National Ocean Service (NOS) nautical charting products and services, improving the safety of the maritime traffic and services available to these communities by reducing the current risk that is present due to unknown bathymetry.

A.3 Survey Quality

The entire survey is adequate to supersede previous data.

Data acquired in H13666 meet 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	Complete coverage

Table 2: Survey Coverage

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

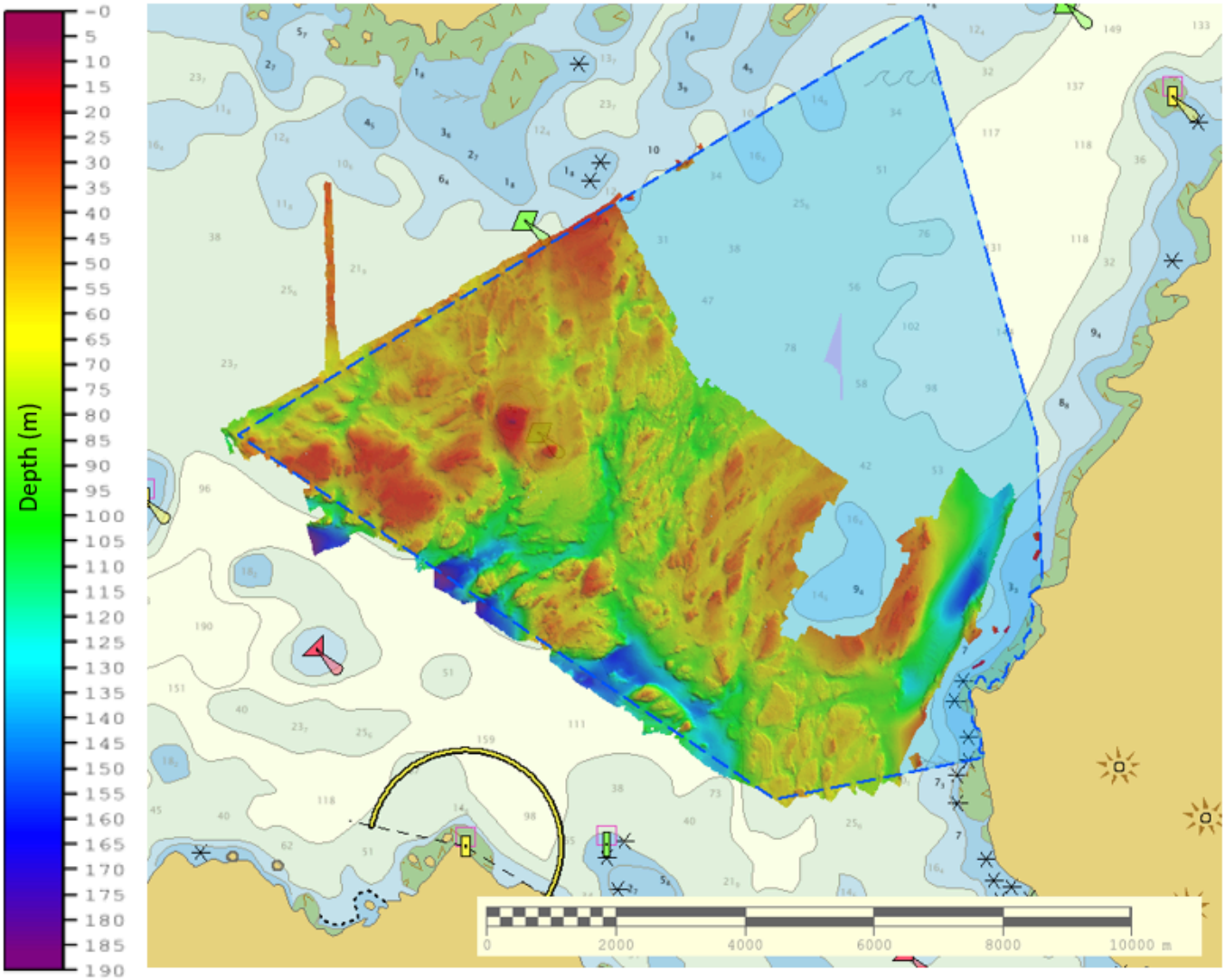


Figure 2: H13666 survey coverage overlaid onto Chart US3AK3CM.

A.6 Survey Statistics

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

	HULL ID	*2805*	*2806*	*2807*	*S220*	*Total*
LNM	**SBES Mainscheme**	0.0	0.0	0.0	0.0	0.0
	MBES Mainscheme	2.1	38.35	133.62	0.0	174.07
	Lidar Mainscheme	0.0	0.0	0.0	0.0	0.0
	SSS Mainscheme	0.0	0.0	0.0	0.0	0.0
	SBES/SSS Mainscheme	0.0	0.0	0.0	0.0	0.0
	MBES/SSS Mainscheme	0.0	0.0	0.0	0.0	0.0
	SBES/MBES Crosslines	0.0	7.08	0.0	7.06	14.14
	Lidar Crosslines	0.0	0.0	0.0	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						16.33

Table 3: Hydrographic Survey Statistics

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

Survey Dates	Day of the Year
10/04/2022	277
10/05/2022	278

Survey Dates	Day of the Year
10/07/2022	280
10/08/2022	281
10/10/2022	283
10/11/2022	284
10/12/2022	285
10/13/2022	286

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	*2805*	*2806*	*2807*	*S220*
LOA	8.6 meters	8.6 meters	8.6 meters	70.4 meters
Draft	1.1 meters	1.1 meters	1.1 meters	4.8 meters

Table 5: Vessels Used

Figure 3: Hydrographic Survey Launches 2805, 2806, and 2807

Figure 4: NOAA Ship Fairweather S220

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 712	MBES
Sea-Bird Scientific	SBE 19plus V2	Conductivity, Temperature, and Depth Sensor
AML Oceanographic	MVP200	Conductivity, Temperature, and Depth Sensor
Teledyne RESON	SVP 70	Sound Speed System
Teledyne RESON	SVP 71	Sound Speed System
Applanix	POS MV 320 v5	Positioning and Attitude System

Table 6: Major Systems Used

B.2 Quality Control

B.2.1 Crosslines

Crosslines were collected, processed and compared in accordance with Section 5.2.4.2 of the HSSD. For adequate comparison, 9.59% of crossline to MBES data was acquired.To evaluate crosslines, a surface generated via data strictly from mainscheme lines and a surface generated via data strictly from crosslines were created. From these two surfaces, a difference surface (mainscheme - crosslines = difference surface) was generated. Statistics show the mean difference between the depths derived from mainscheme data and crossline data was 0.02 meters and 95% of nodes falling within 0.81 meters. For the respective depths, the difference surface was compared to the allowable NOAA uncertainty standards. In total, 98% of the depth differences between H13666 mainscheme and crossline data were within allowable NOAA uncertainties.

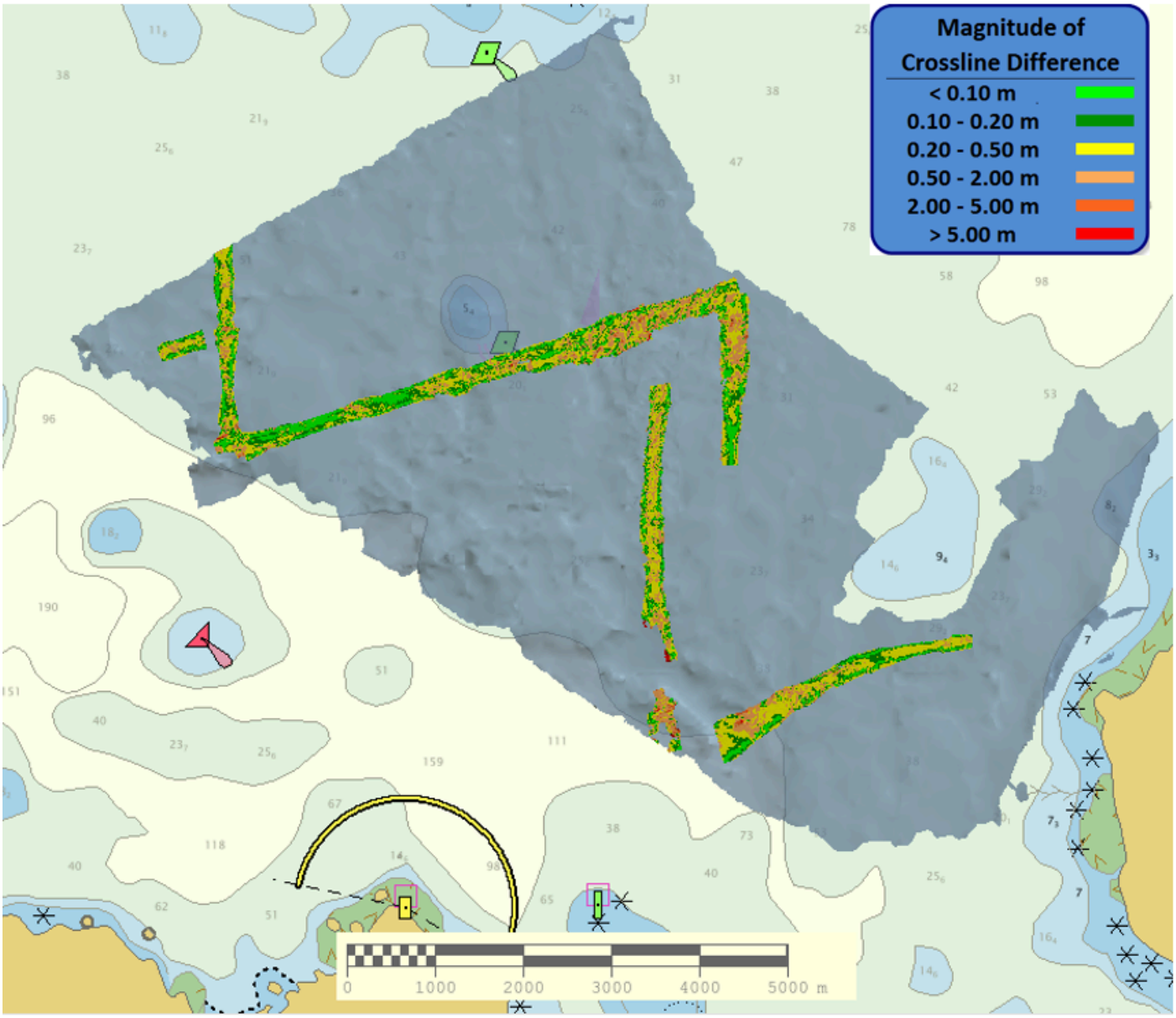
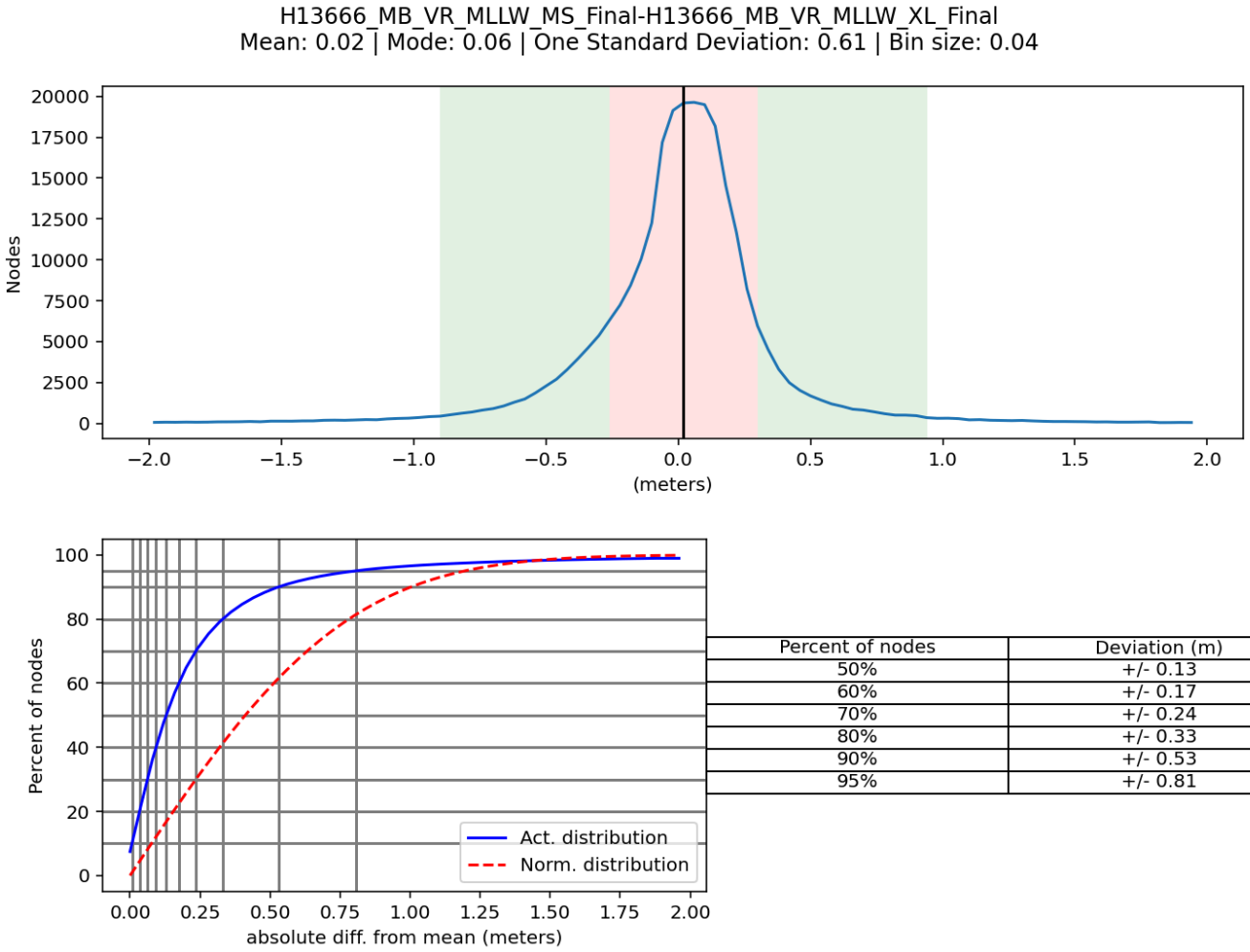


Figure 5: Overview of H13666 Crosslines



Percent of nodes	Deviation (m)
50%	+/- 0.13
60%	+/- 0.17
70%	+/- 0.24
80%	+/- 0.33
90%	+/- 0.53
95%	+/- 0.81

Figure 6: H13666 Crossline and Mainscheme difference statistics.

B.2.2 Uncertainty

The following survey specific parameters were used for this survey:

Method	Measured	Zoning
ERS via VDATUM	N/A	0.13 meters

Table 7: Survey Specific Tide TPU Values.

Hull ID	Measured - CTD	Measured - MVP	Measured - XBT	Surface
280x	2 meters/second	N/A	N/A	0.50 meters/second
S220	N/A	1 meters/second	N/A	0.50 meters/second

Table 8: Survey Specific Sound Speed TPU Values.

In addition to the usual a priori estimates of uncertainty via device models for vessel motion and VDATUM, real-time and post-processed uncertainty sources were also incorporated into the depth estimates of survey H13666. Real-time uncertainties were provided via EM 2040 and EM 712 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 Smooth Best Estimate Trajectory (SBET) RMS file generated in Applanix POSPac.

B.2.3 Junctions

No junctions exist for this survey.

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

Applanix POS MV IMU Discontinuity Errors

While logging POS data, several IMU discontinuities occurred across multiple vessels and days. These errors displayed in POSPac during post processing, and the issue was not known until acquisition was finished. The multibeam data tracklines associated with the POS data with IMU discontinuity were deleted from HIPS file and not used in creation of surfaces. Applanix was notified of the issue but could not give reasons on why it occurred frequently in H13666.

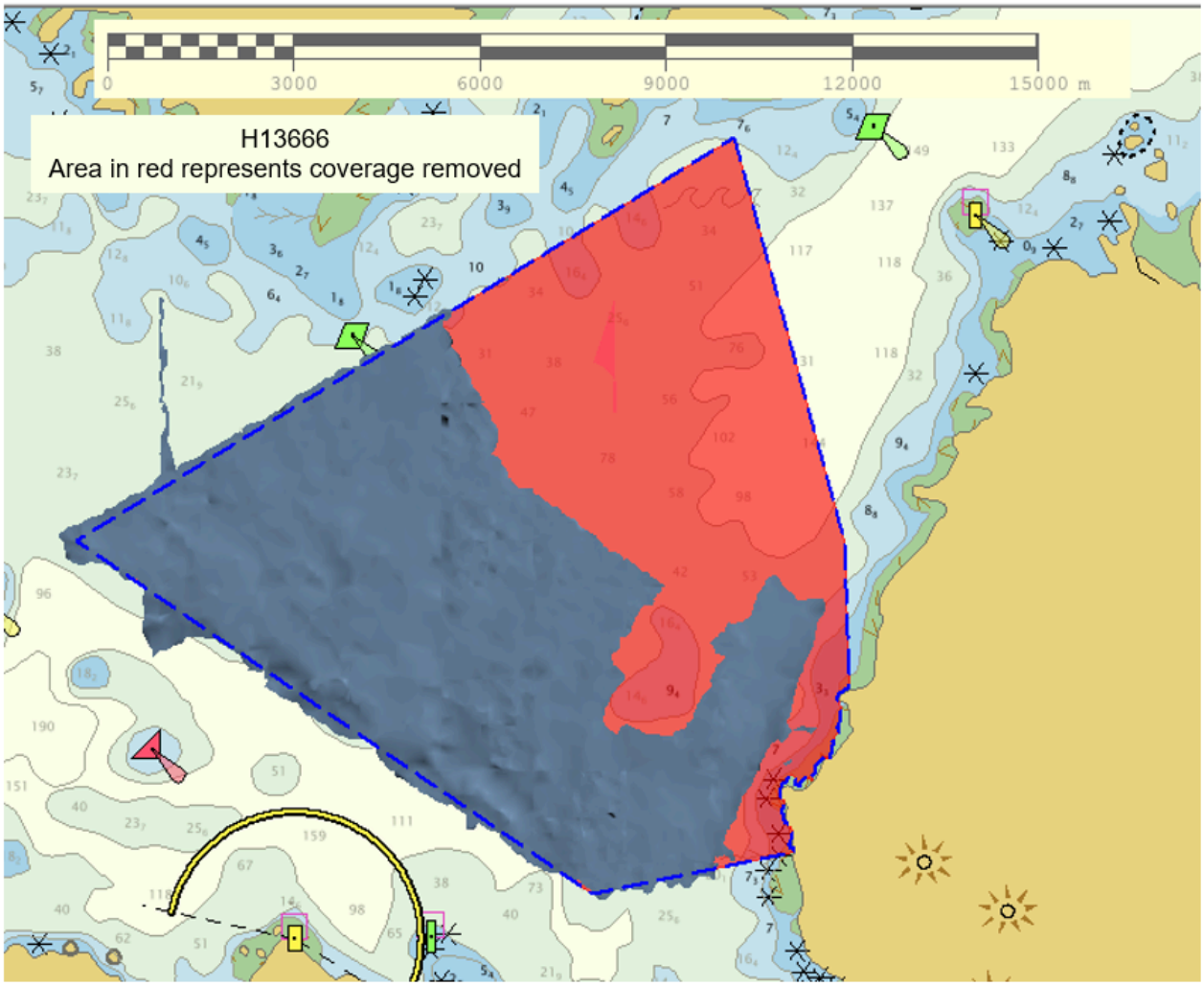


Figure 7: Area in red represents the data removed from the HIPs file due to POS IMU discontinuity errors

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 one every four hours during launch 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. MVP casts on S220 were conducted at an average interval of 4 hours, guided by observation of the surface sound speed and targeted to deeper areas. All sound speed methods were used as detailed in the DAPR.

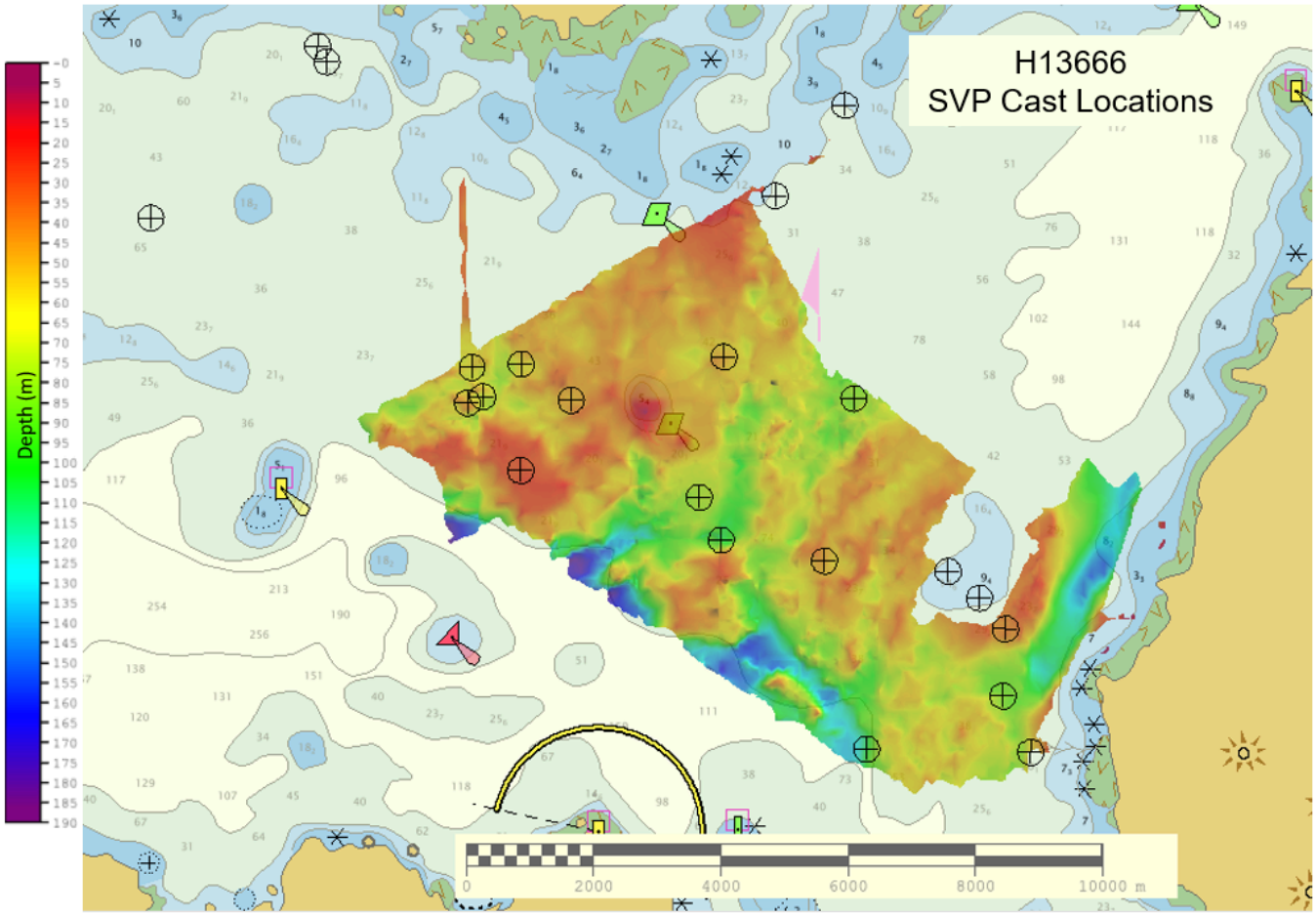


Figure 8: Location of SVP casts in H13666

B.2.8 Coverage Equipment and Methods

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

B.2.9 Holidays

H13666 data were reviewed in CARIS HIPS and SIPS for holidays in accordance with Section 5.2.2.3 of the HSSD. Four holidays which meet the definition described in the HSSD for complete coverage were identified via HydrOffice QC Tools Holiday Finder tool. This tool automatically scans the surface for holidays as defined in the HSSD and was run in conjunction with a visual inspection of the surface by the hydrographer. Three of the four holidays are due to acoustic shadowing in steep rocky areas as seen in the figure below. These shadows are formed due to lack of coverage on "back" side of a feature, usually due to rapid drops in seafloor in conjunction with the geometry from the sonar head. All areas with acoustic shadows were investigated in CARIS subset editor to verify that least depths were found. One of the four holidays exists outside of sheet limits.

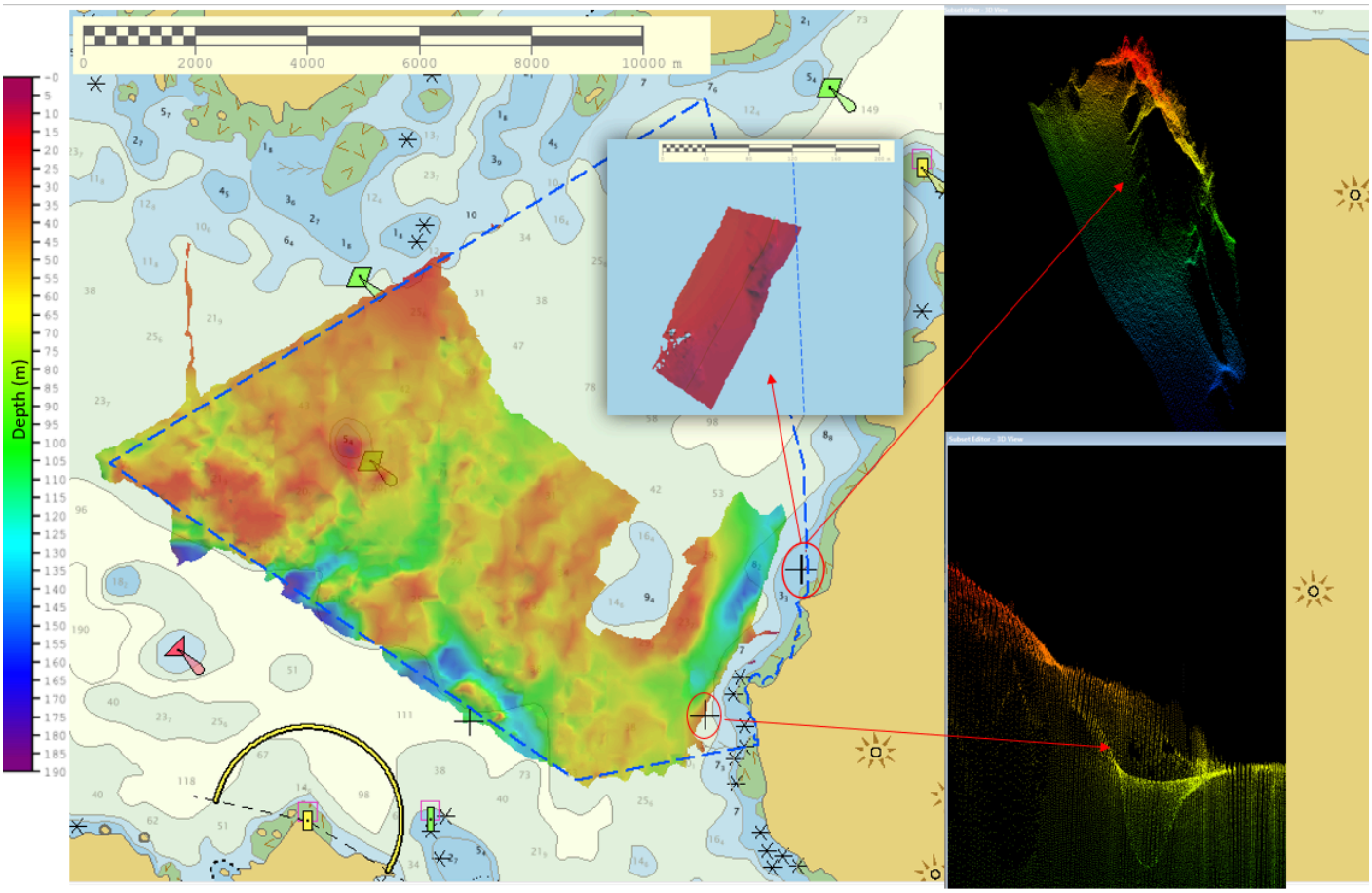


Figure 9: Holidays present in H13666

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 H13666 (figure below).

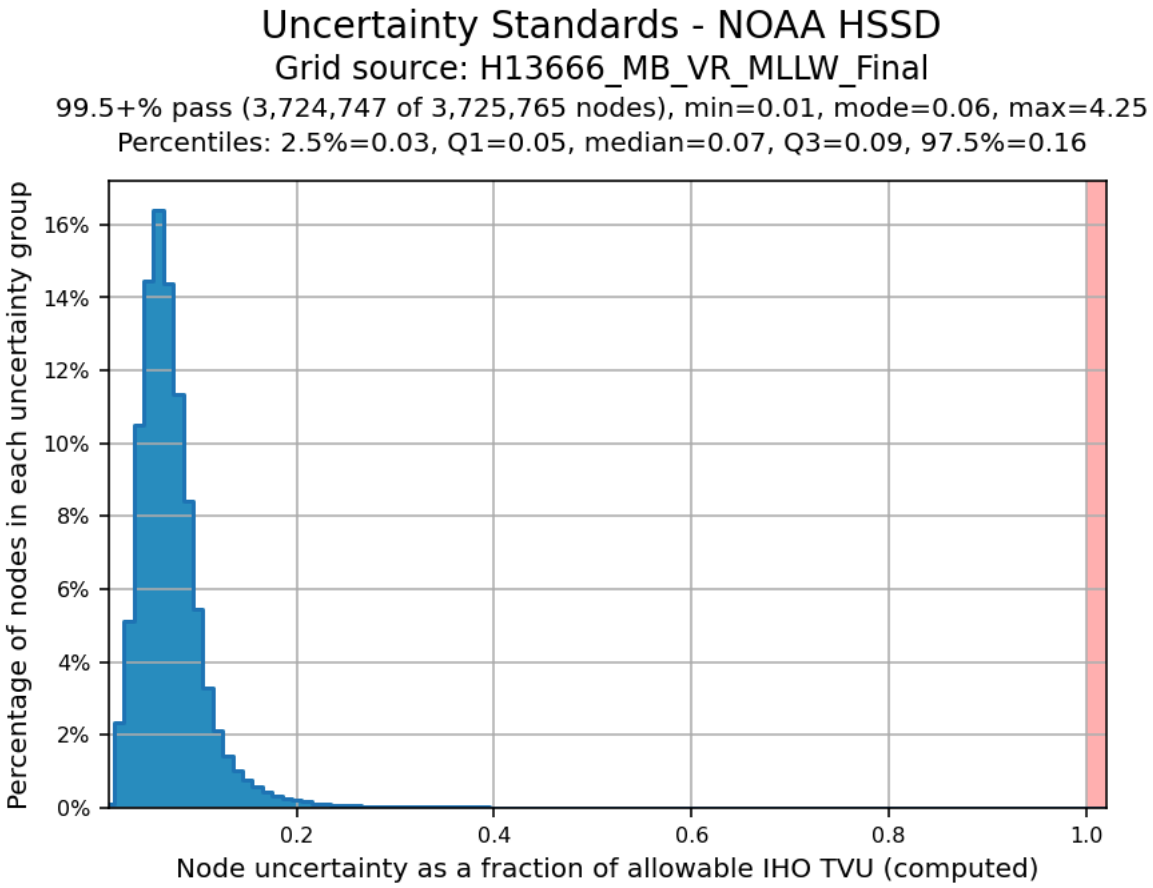


Figure 10: H13666 Allowable Uncertainty Statistics

B.2.11 Density

The surface was analyzed using the HydrOffice OC Tools Grid QA feature to determine compliance with specifications. Density requirements for H13666 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 below).

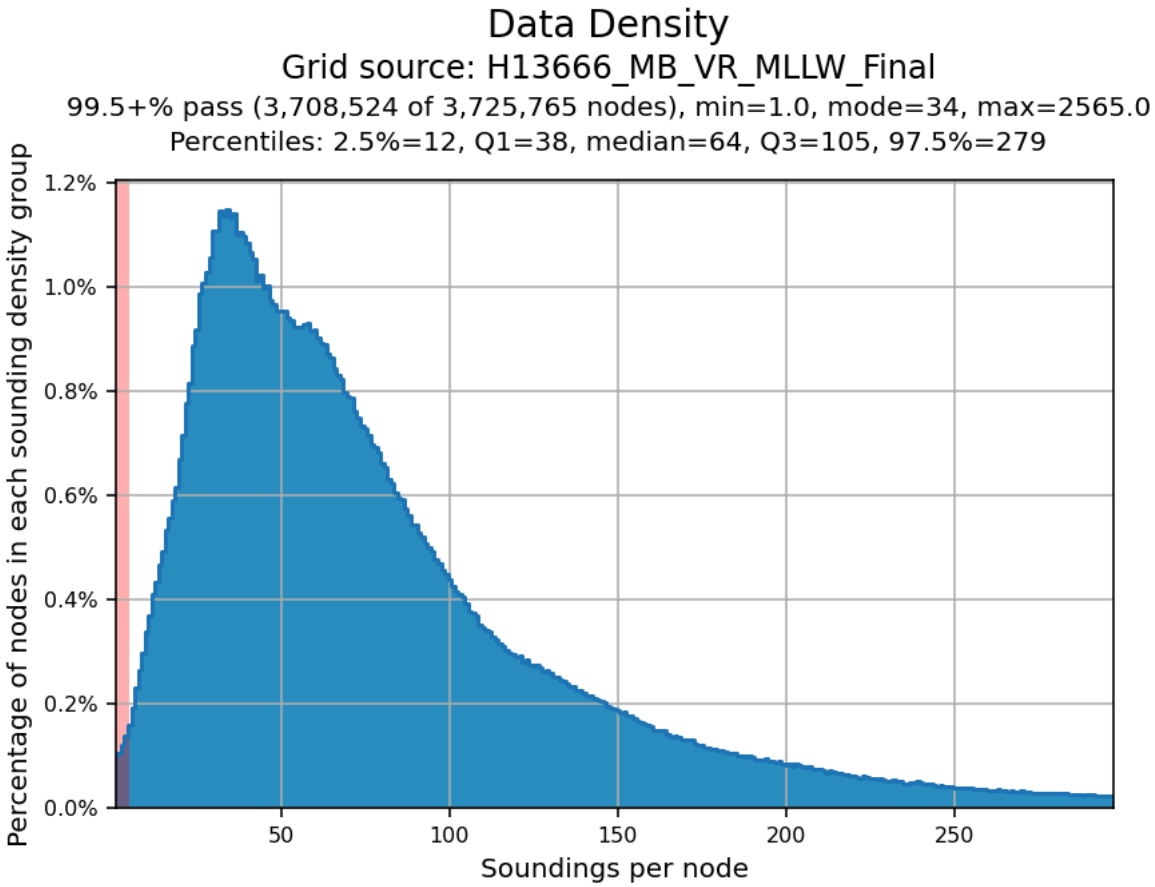


Figure 11: H13666 Data Density Statistics

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

Raw backscatter data were stored in the .kmall file for Kongsberg systems. All backscatter were processed to GSF files and a floating point mosaic was created by the field unit via Fledermaus FMGT 7.10.2. See Figure below for a greyscale representation of the complete mosaic. A single backscatter mosaic was created at 2m resolution based on the specifications for a 300kHz system. All equipment and survey methods were used as detailed in the DAPR. A relative backscatter calibration was performed by the field unit via a backscatter calibration site in order to bring the survey systems on each of the launches into alignment. See figure below for a table of the calibration values entered into the Processing Settings within FMGT. Approximate inter-calibration corrections for offsets between sonar systems were applied to the mosaic.

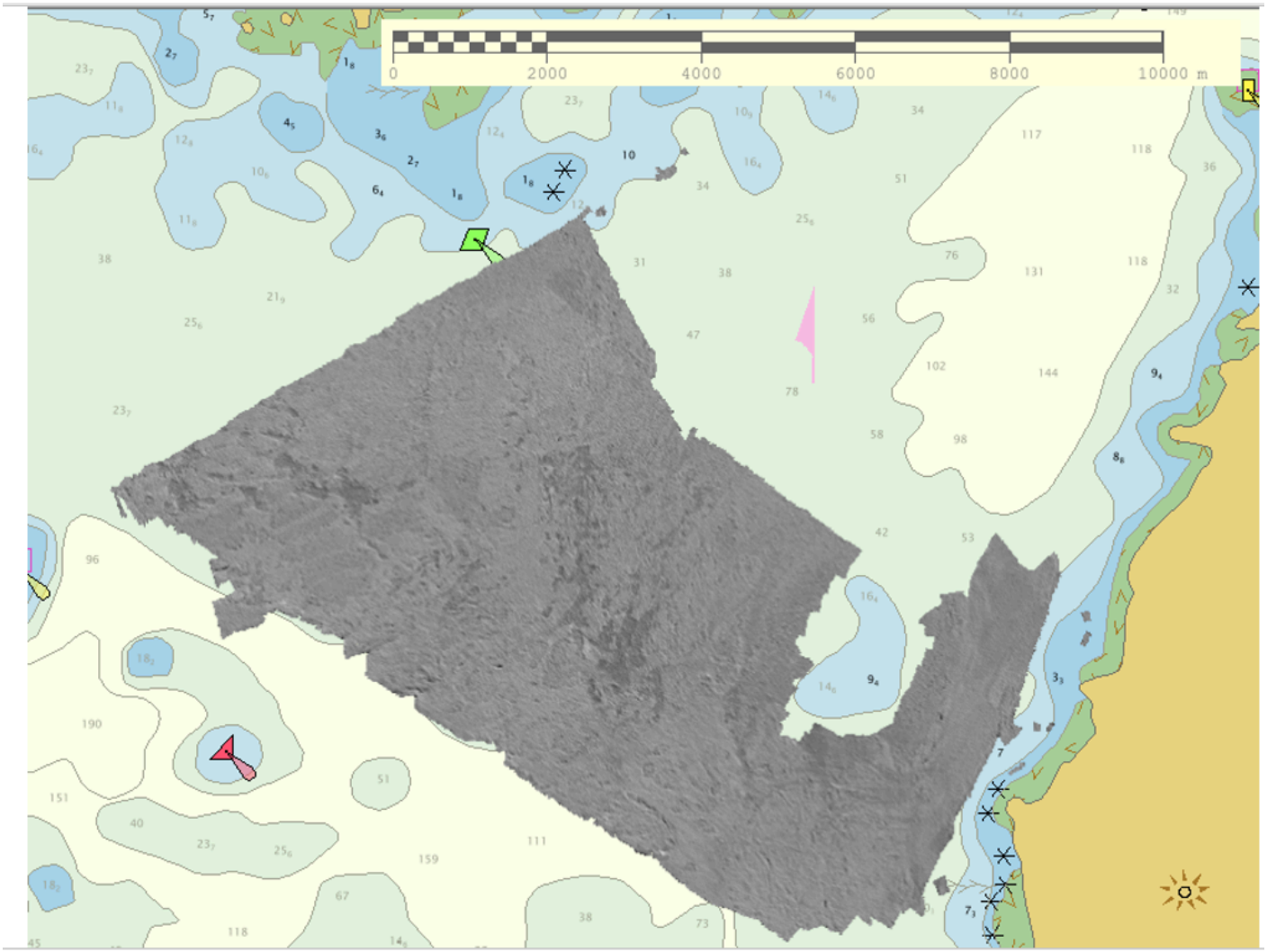


Figure 12: Backscatter Mosaic for H13666

	200 kHz				300 kHz				400 kHz		
	Short CW	Med CW	Long CW	FM (both)	Short CW	Med CW	Long CW	FM (both)	Short CW	Med CW	Long CW
2805	0.3	0.3	0.5	0.7	0.7	0.45	0.1	0.3	1	-0.75	0.3
2806	0.5	0	1.3	1.5	0.9	0	0.1	0.1	0.8	0	0.1
2807	1.2	0.45	0.4	0.2	0.5	-0.45	0.3	0.5	0.4	0.75	0.3
2808	0.5	1.2	0.3	0.5	0.8	0.15	0	0.2	0.3	-1.5	0.5

Figure 13: Backscatter Calibration Values

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

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 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
H13666_MB_VR_MLLW	CARIS VR Surface (CUBE)	Variable Resolution	4.7 meters - 187.3 meters	NOAA_VR	Complete MBES
H13666_MB_VR_MLLW_Final	CARIS VR Surface (CUBE)	Variable Resolution	4.7 meters - 187.3 meters	NOAA_VR	Complete MBES

Table 11: Submitted Surfaces

The NOAA CUBE parameters defined in the HSSD were used for the creation of all CUBE surfaces for H13666. 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.

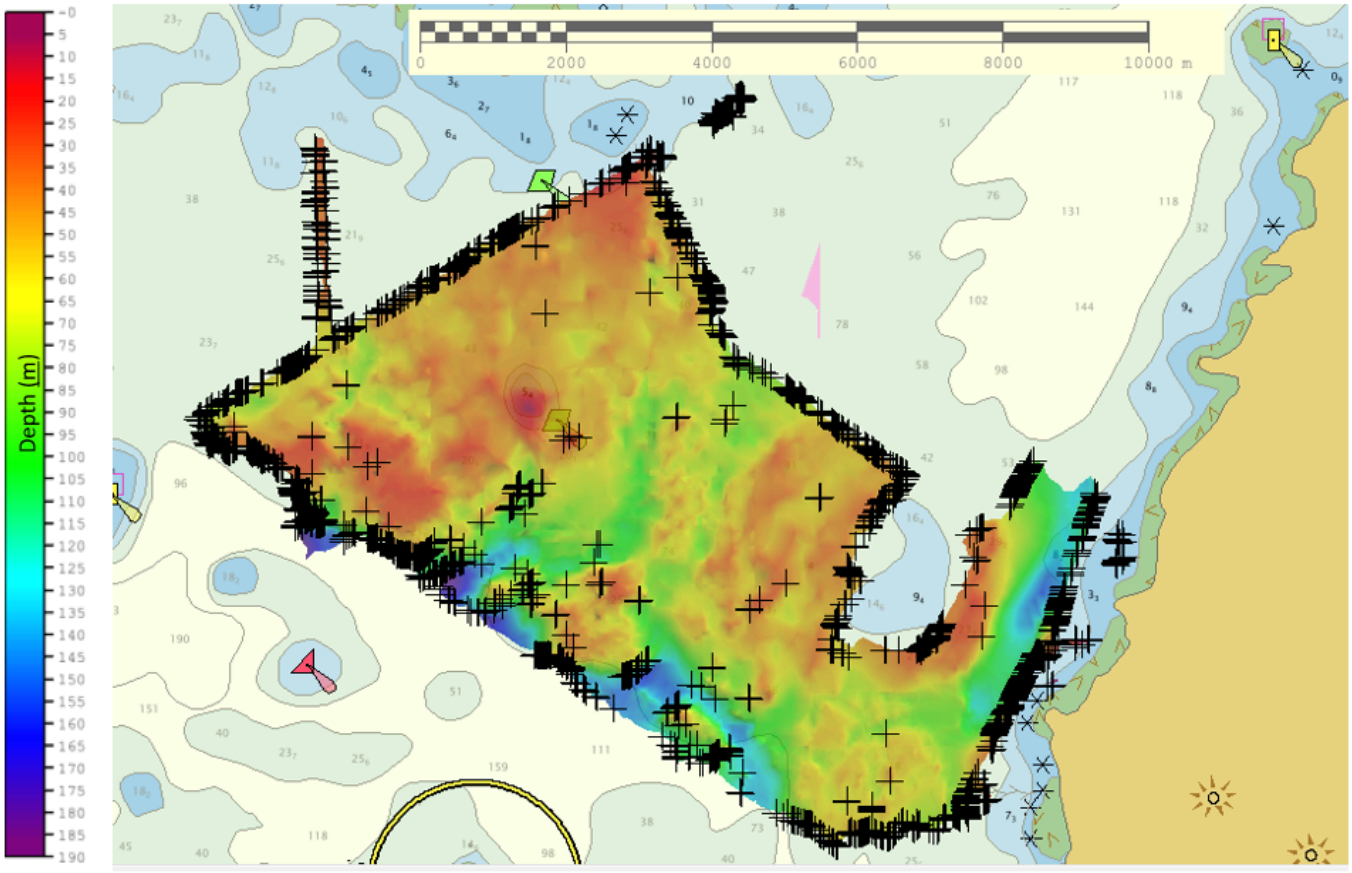


Figure 14: Remaining 2132 Fliers Deemed as Valid Aspects of the Surface

C. Vertical and Horizontal Control

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

C.1 Vertical Control

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

ERS Datum Transformation

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

Method	Ellipsoid to Chart Datum Separation File
ERS via VDATUM	OPR-O190-FA-22_Sumner_100m_NAD83_2011-MLLW

Table 12: ERS method and SEP file

ERS methods were used as the final means of reducing H13666 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 8.

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 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.

WAAS

During real-time acquisition, all platforms received correctors from the Wide Area Augmentation System (WAAS) for increased accuracies similar to USCG DGPS stations. WAAS and SBETs were the sole methods of positioning for H13666, as no DGPS stations were available for real-time horizontal control. The Wide Area Augmentation System (WAAS) was used for real-time horizontal control during data acquisition.

D. Results and Recommendations

D.1 Chart Comparison

Chart comparison between ENC US3AK3CM and soundings from collected data. The soundings from H13666 exceed charted soundings, these are highlighted in figures below.

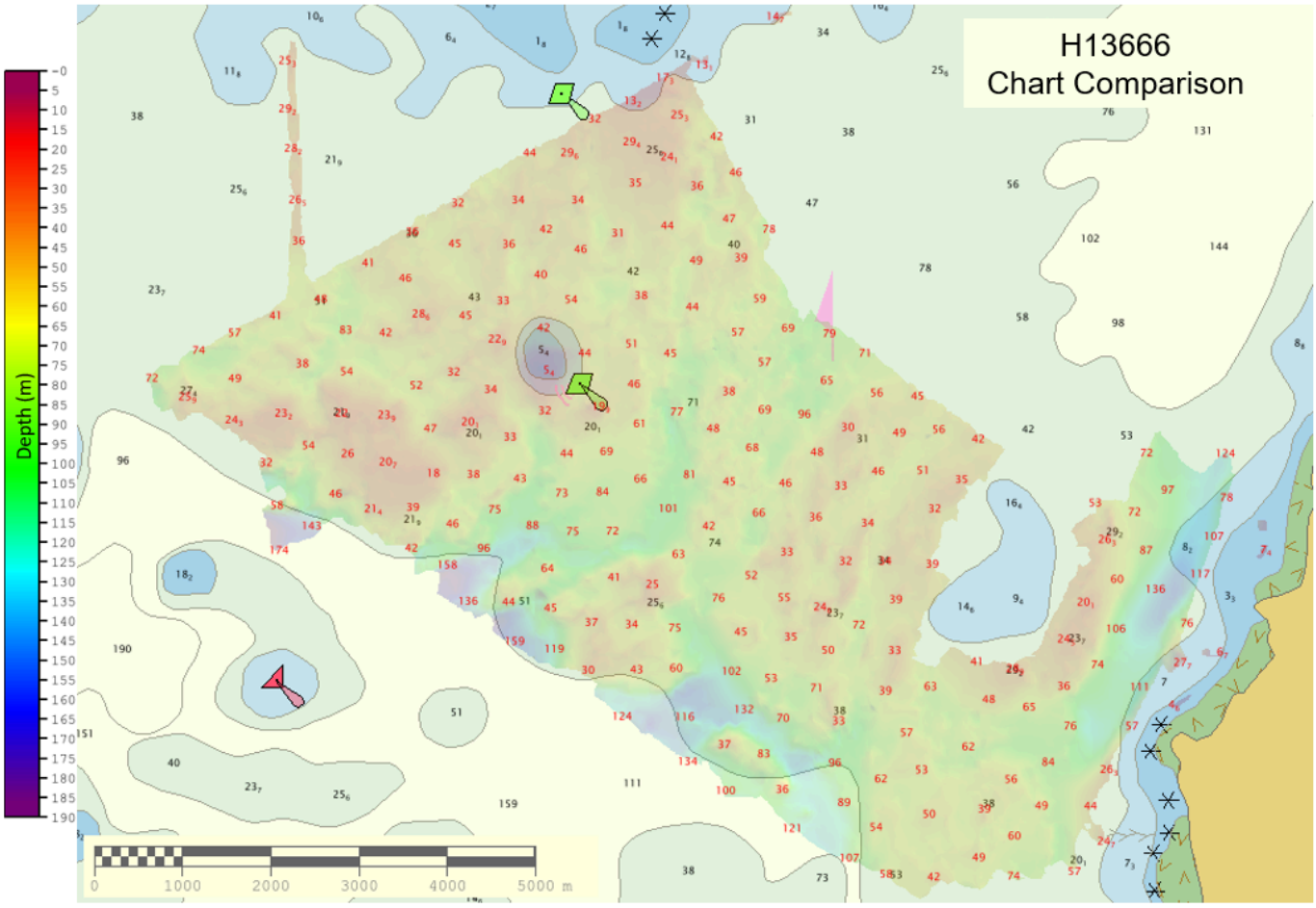


Figure 15: Survey coverage with soundings (in red) overlaid on charted soundings (in black) from US3AK3CM

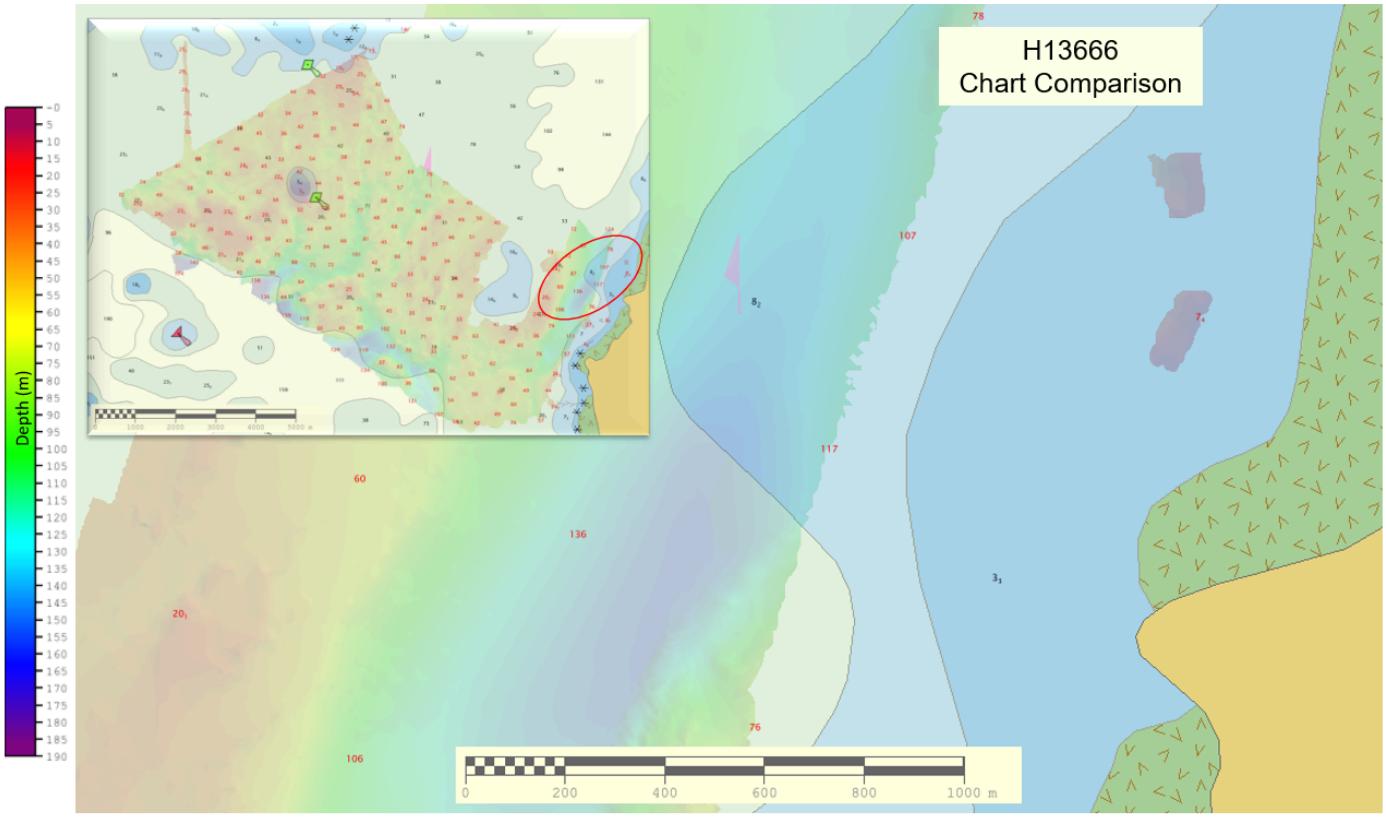


Figure 16: Survey soundings (in red) exceeding charted soundings (in black) from US3AK3CM

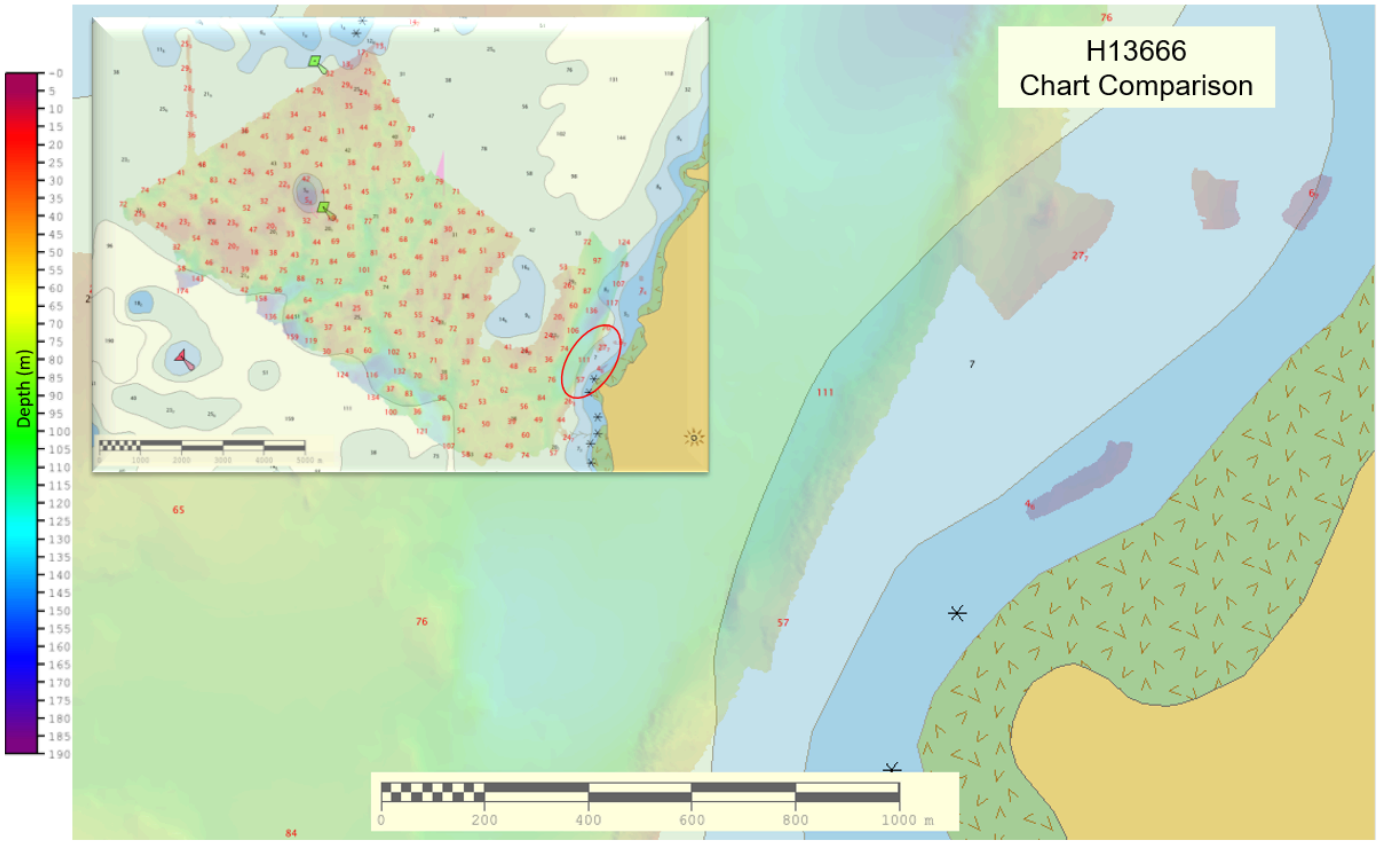


Figure 17: Survey soundings (in red) exceeding charted soundings (in black) from US3AK3CM

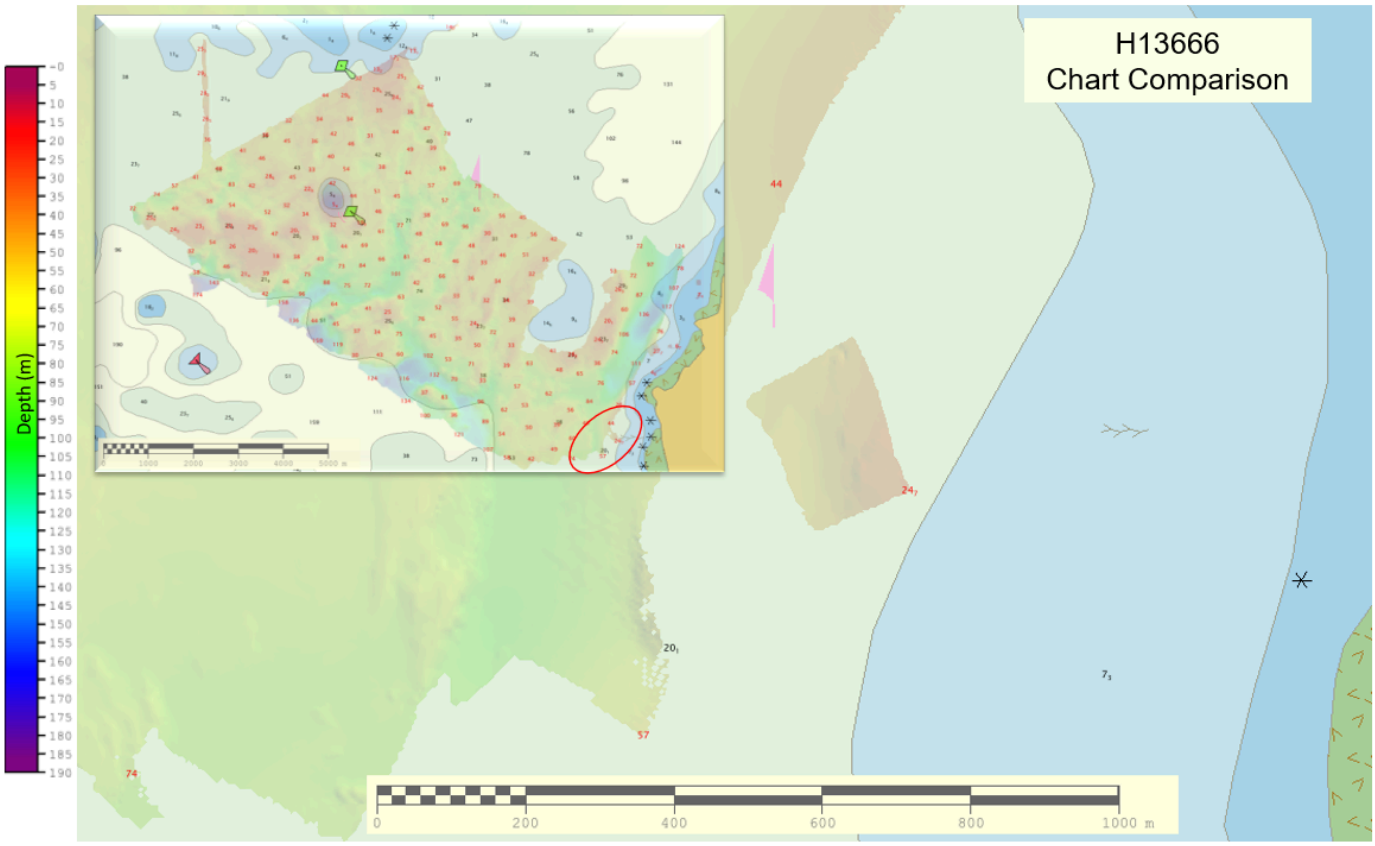


Figure 18: Survey soundings (in red) exceeding charted soundings (in black) from US3AK3CM

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
US3AK3CM	1:217828	9	01/07/2022	01/07/2022

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

Charted features exist for this survey, but were not investigated.

D.1.4 Uncharted Features

No uncharted features exist for this survey.

D.1.5 Channels

No channels exist within the survey limits.

D.2 Additional Results

D.2.1 Aids to Navigation

Aids to navigation (ATONs) exist for this survey, but were not investigated.

D.2.2 Maritime Boundary Points

No Maritime Boundary Points were assigned for this survey.

D.2.3 Bottom Samples

Bottom samples were assigned for this survey, but were not acquired.

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

A more thorough investigation of this survey and surrounding areas is recommended due to discrepancies between charted and surveyed sounding.

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
CDR Meghan McGovern	Commanding Officer	10/29/2023	MCGOVERN.MEGHAN.ELIZABETH.1284020495 Digitally signed by MCGOVERN.MEGHAN.ELIZABETH.1284020495 Date: 2023.10.29 15:28:42 -08'00'
LT Michael Card	Operations Officer	10/29/2023	CARD.MICHAEL.DOUGLAS.1011746507 Digitally signed by CARD.MICHAEL.DOUGLAS.1011746507 Date: 2023.10.29 16:09:57 -08'00'
HST Sara Ober	Senior Survey Technician	10/29/2023	OBER.SARA.ELIZABETH.1615474360 Digitally signed by OBER.SARA.ELIZABETH.1615474360 Date: 2023.10.29 15:14:00 -08'00'

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