H13349

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

DESCRIPTIVE REPORT

Type of Survey:	Navigable Area
Registry Number:	H13349

LOCALITY

State(s):	Florida
General Locality:	Cape Canaveral, FL
Sub-locality:	8 NM Southeast of Cape Canaveral

2021

CHIEF OF PARTY
Michael Gonsalves, CDR/NOAA

LIBRARY & ARCHIVES

Date:

U.S. DEPARTMENT OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION	REGISTRY NUMBER:
HYDROGRAPHIC TITLE SHEET	**H13349**

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):	**Florida**
General Locality:	**Cape Canaveral, FL**
Sub-Locality:	**8 NM Southeast of Cape Canaveral**
Scale:	**10000**
Dates of Survey:	**05/10/2021 to 07/01/2021**
Instructions Dated:	**02/04/2021**
Project Number:	**OPR-H321-FH-21**
Field Unit:	**NOAA Ship *Ferdinand R. Hassler***
Chief of Party:	**Michael Gonsalves, CDR/NOAA**
Soundings by:	**Multibeam Echo Sounder**
Imagery by:	**Multibeam Echo Sounder Backscatter**
Verification by:	**Atlantic 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 17N, 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 H13349

Project: OPR-H321-FH-21

Locality: Cape Canaveral, FL

Sublocality: 8 NM Southeast of Cape Canaveral

Scale: 1:10000

May 2021 - July 2021

NOAA Ship *Ferdinand R. Hassler*

Chief of Party: Michael Gonsalves, CDR/NOAA

A. Area Surveyed

The survey area is referred to as H13349, "8 NM Southeast of Cape Canaveral" (sheet 2) in the Project Instructions. The survey area is approximately 51.55 square nautical miles.

A.1 Survey Limits

Data were acquired within the following survey limits:

Northwest Limit	Southeast Limit
28° 18' 59.88" N 80° 31' 21.52" W	29° 9' 51" N 80° 15' 57.01" W

Table 1: Survey Limits

Complete multibeam echosounder (MBES) coverage acquired to the extents of the assigned sheet limits. The extent of acquired survey coverage is shown in the figure below.

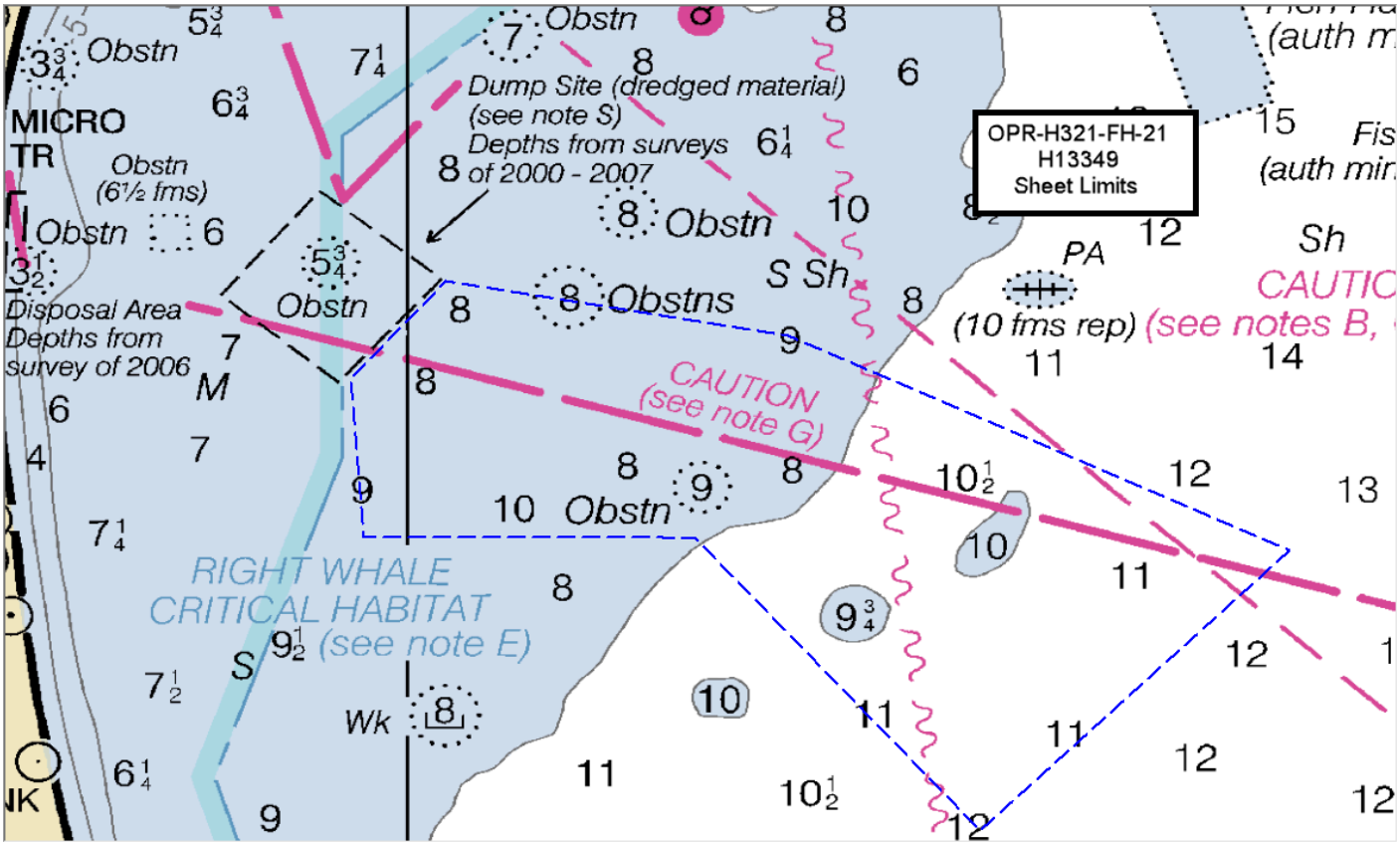


Figure 1: H13349 Assigned survey area (black) and acquired survey coverage(Chart US4FL80M and US4FL87M).

A.2 Survey Purpose

This project is located approximately 8 nautical miles southeast of Cape Canaveral. In 2011, Port Canaveral was ranked as the United States' third busiest cruise port by port of departure, reporting 485 cruises and a maximum passenger number of 1,496 per cruise. At the end of September 2019, port officials reported that cruise revenue alone made up $81.9 million of the total $110 million in revenue for Port Canaveral. The port also generated almost 8 billion dollars for the state of Florida, and created over 32.000 jobs in 2019. The types of marine vessels visiting Port Canaveral include: passenger vessels, cargo ships, tug boats, pleasure crafts, tankers, sailing vessels, fishing vessels, and special crafts. In 2019, Port Canaveral dealt with a total of 4,826,738 tons of transported materials.

Much of this 430 SNM survey area has not been surveyed since 1930, which was 24 years before the Port was dedicated. Conducting a modern bathymetric survey in the area will provide critical data for the updating of National Ocean Service (NOS) nautical charting products and services to increase maritime safety near Cape Canaveral. 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.

Pydro QC Tools was used to analyze H13349 multibeam echosounder (MBES) data density. The submitted H13349 variable-resolution (VR) surface met HSSD density requirements as shown in the histogram below.

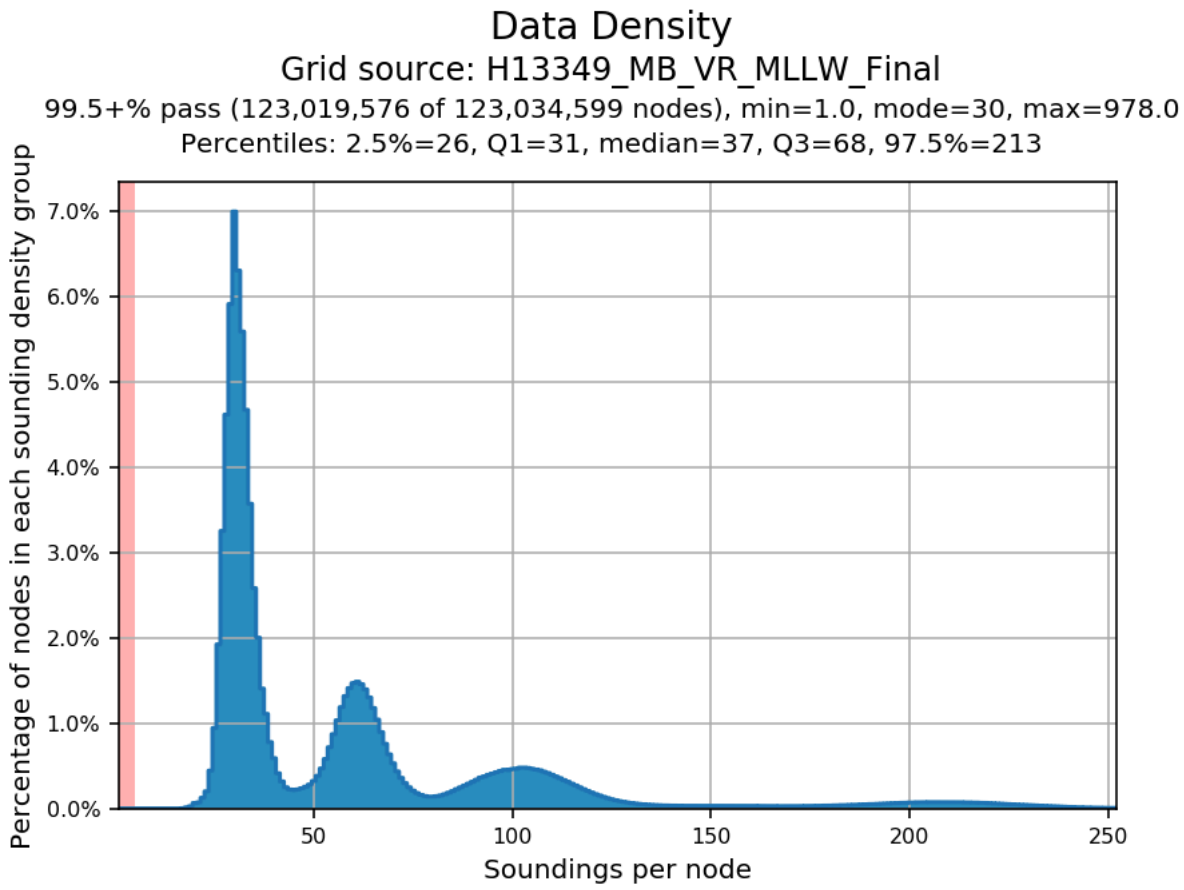


Figure 2: Pydro derived plot showing HSSD density compliance of H13349 finalized variable resolution MBES data.

A.4 Survey Coverage

The following table lists the coverage requirements for this survey as assigned in the project instructions:

Water Depth	Coverage Required
All waters withinin survey area.	Complete Coverage

Table 2: Survey Coverage

The entirety of H13349 was acquired with object detection coverage, meeting 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	*S250*	*Total*
LNM	**SBES Mainscheme**	0.0	0.0
	MBES Mainscheme	1229.06	1229.06
	Lidar Mainscheme	0.0	0.0
	SSS Mainscheme	0.0	0.0
	SBES/SSS Mainscheme	0.0	0.0
	MBES/SSS Mainscheme	0.0	0.0
	SBES/MBES Crosslines	49.03	49.03
	Lidar Crosslines	0.0	0.0
Number of Bottom Samples			2
Number Maritime Boundary Points Investigated			0
Number of DPs			0
Number of Items Investigated by Dive Ops			0
Total SNM			51.55

Table 3: Hydrographic Survey Statistics

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

Survey Dates	Day of the Year
05/10/2021	130
05/11/2021	131
05/12/2021	132
05/13/2021	133
05/22/2021	142
05/23/2021	143
05/24/2021	144
05/25/2021	145
05/26/2021	146
05/27/2021	147
05/28/2021	148
06/29/2021	180
06/30/2021	181
07/01/2021	182

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	***S250***
LOA	37.7 meters
Draft	3.85 meters

Table 5: Vessels Used

Figure 3: NOAA Ship Ferdinand Hassler (S-250) pier side at Marine Operations Center Atlantic.

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
AML Oceanographic	MVP200	Conductivity, Temperature, and Depth Sensor
Teledyne RESON	SVP 70	Sound Speed System
Applanix	POS MV 320 v5	Positioning and Attitude System

Table 6: Major Systems Used

The equipment was in stalled on the survey platform as follows: Hassler utilizes the Kongsberg EM 2040 MBES, a POS MV v5 system for position and attitude, SVP 70 surface sound speed sensors, and AML Oceanographic MVP 200 for conductivity, temperature, and depth (CTD) casts.

B.2 Quality Control

B.2.1 Crosslines

Hassler (S250) acquired 49 nautical miles of multibeam crosslines. H13349 crossline data is adequate for verifying and evaluating the internal consistency of survey data. The Compare Grids function in Pydro Explorer analyzed finalized VR surfaces of H13349 crossline only data and mainscheme-only data. In the difference surface, 99.5% of nodes met IHO allowable Total Vertical Uncertainty (TVU) standards. See Figures below for additional detail.

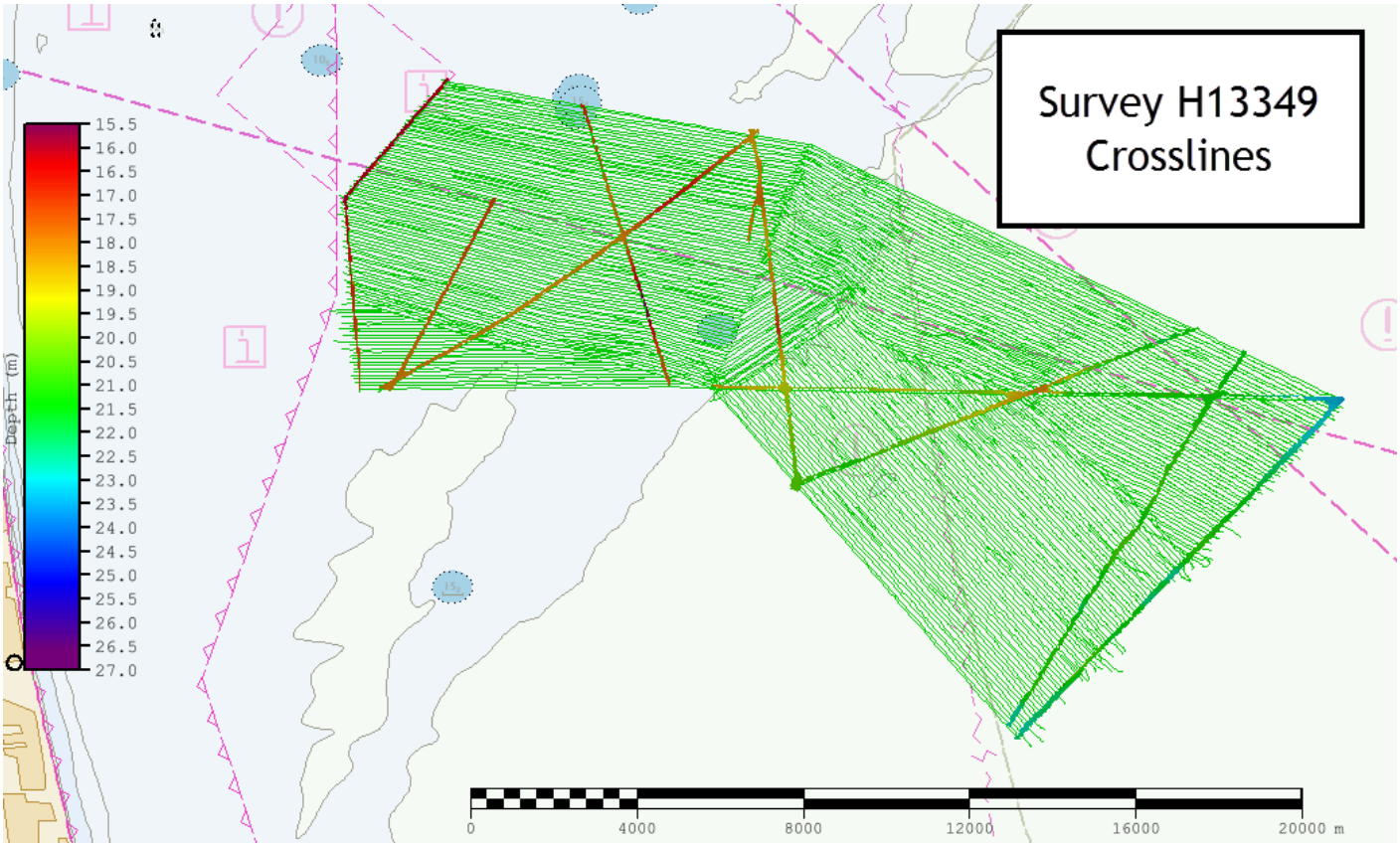


Figure 4: H13349 crossline surface overlaid on mainscheme tracklines.

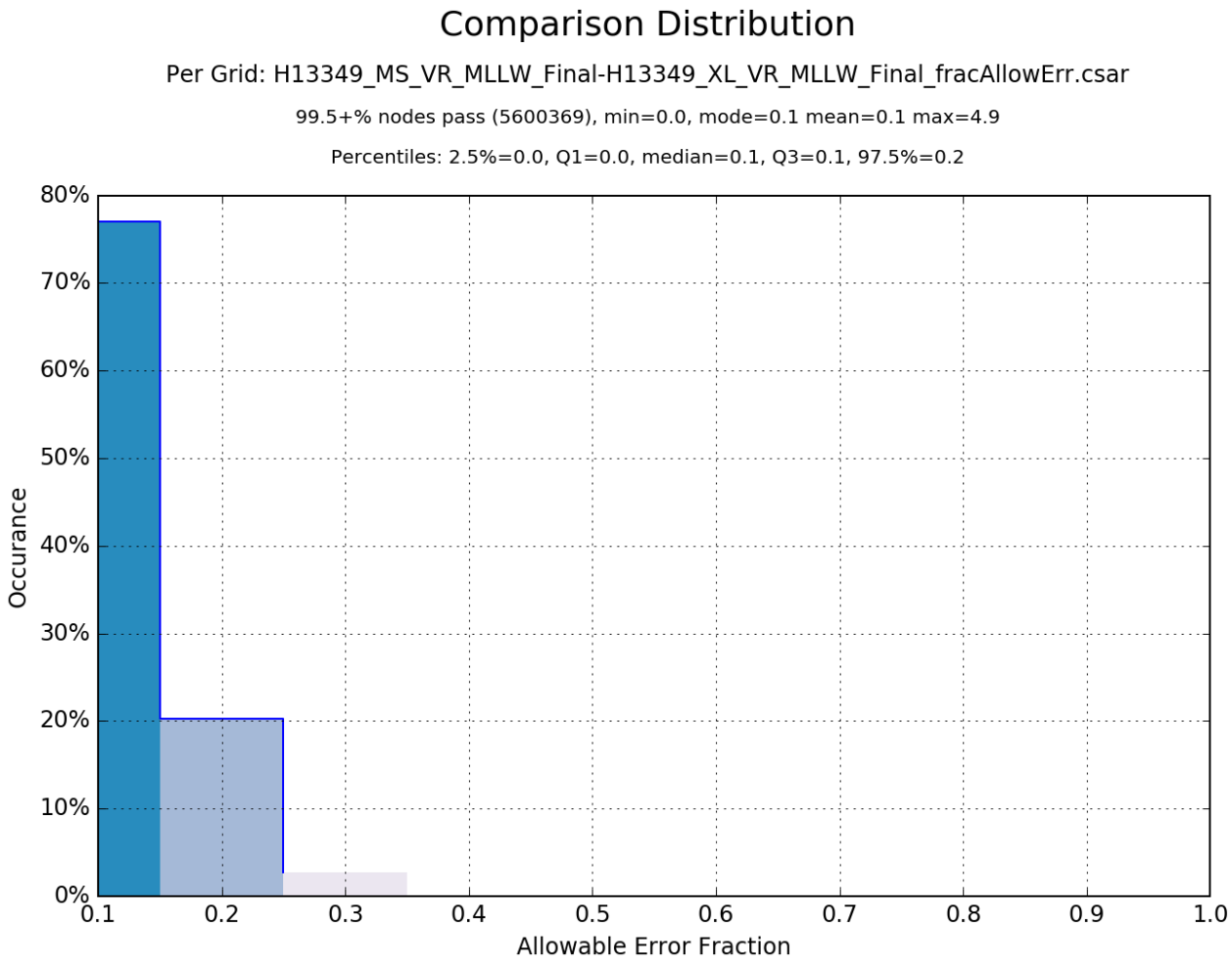
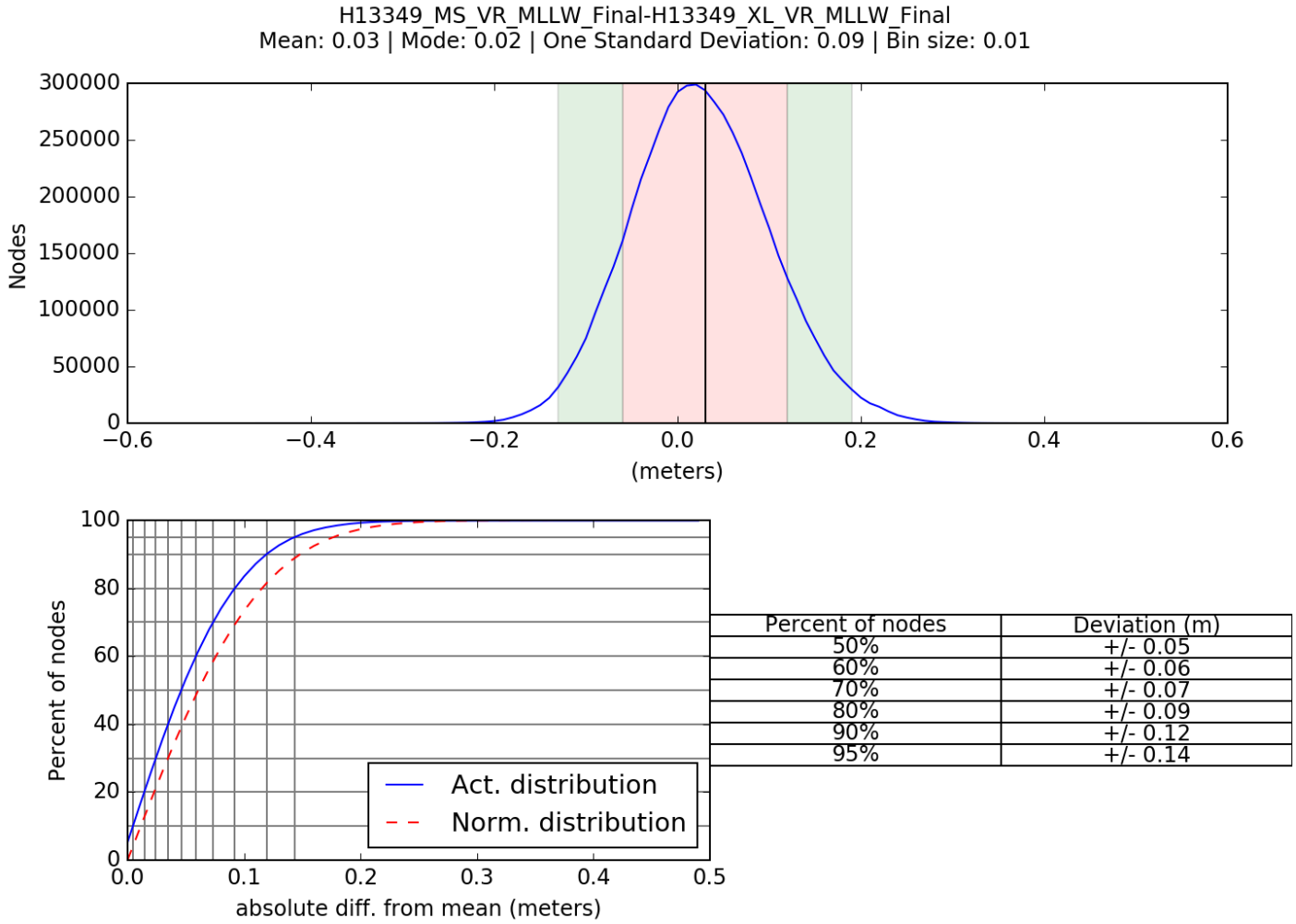


Figure 5: Pydro derived plot showing absolute difference statistics of H13349 mainscheme to crossline data.



Percent of nodes	Deviation (m)
50%	+/- 0.05
60%	+/- 0.06
70%	+/- 0.07
80%	+/- 0.09
90%	+/- 0.12
95%	+/- 0.14

Figure 6: Pydro derived plot showing percentage-pass value of H13349 mainscheme to crossline data.

B.2.2 Uncertainty

The following survey specific parameters were used for this survey:

Method	Measured	Zoning
ERS via VDATUM	0.0 meters	0.099 meters

Table 7: Survey Specific Tide TPU Values.

Hull ID	Measured - CTD	Measured - MVP	Measured - XBT	Surface
S250	N/A meters/second	2 meters/second	N/A meters/second	0.5 meters/second

Table 8: Survey Specific Sound Speed TPU Values.

Total Propagated Uncertainty (TPU) values for survey H13349 were derived from a combination of fixed values for equipment and vessel characteristics, as well as from field assigned values for sound speed uncertainties. Tidal uncertainty was provided in the metadata accompanying the NOAA vertical datum transformation model used for this survey. The uncertainty value of NOAA's Ellipsoidally Referenced Tidal Datum Model (ERTDM) transformation model was documented in metadata that accompanied the VDatum model.

In addition to the usual a priori estimates of uncertainty, some real-time and post-processed uncertainty sources were also incorporated into the depth estimates of this survey. Real-time uncertainties from Kongsberg MBES sonars were recorded and applied in post-processing. Applanix TrueHeave (POS) files, which record estimates of heave uncertainty, were applied during post-processing. Finally, the postprocessed uncertainties associated with vessel roll, pitch, yaw and position were applied in Caris HIPS using SBET and RMS files generated using POSPac MMS software.

Uncertainty values of the submitted finalized grid was calculated in Caris using "Greater of the Two" of uncertainty and standard deviation (scaled to 95%). Grid QA v5 within Pydro QC Tools was used to analyze H13349 TVU compliance, and over 99.5% of all nodes pass the uncertainty standards outlined in the 2021 HSSD. See the Histogram plot below for more detail on the results.

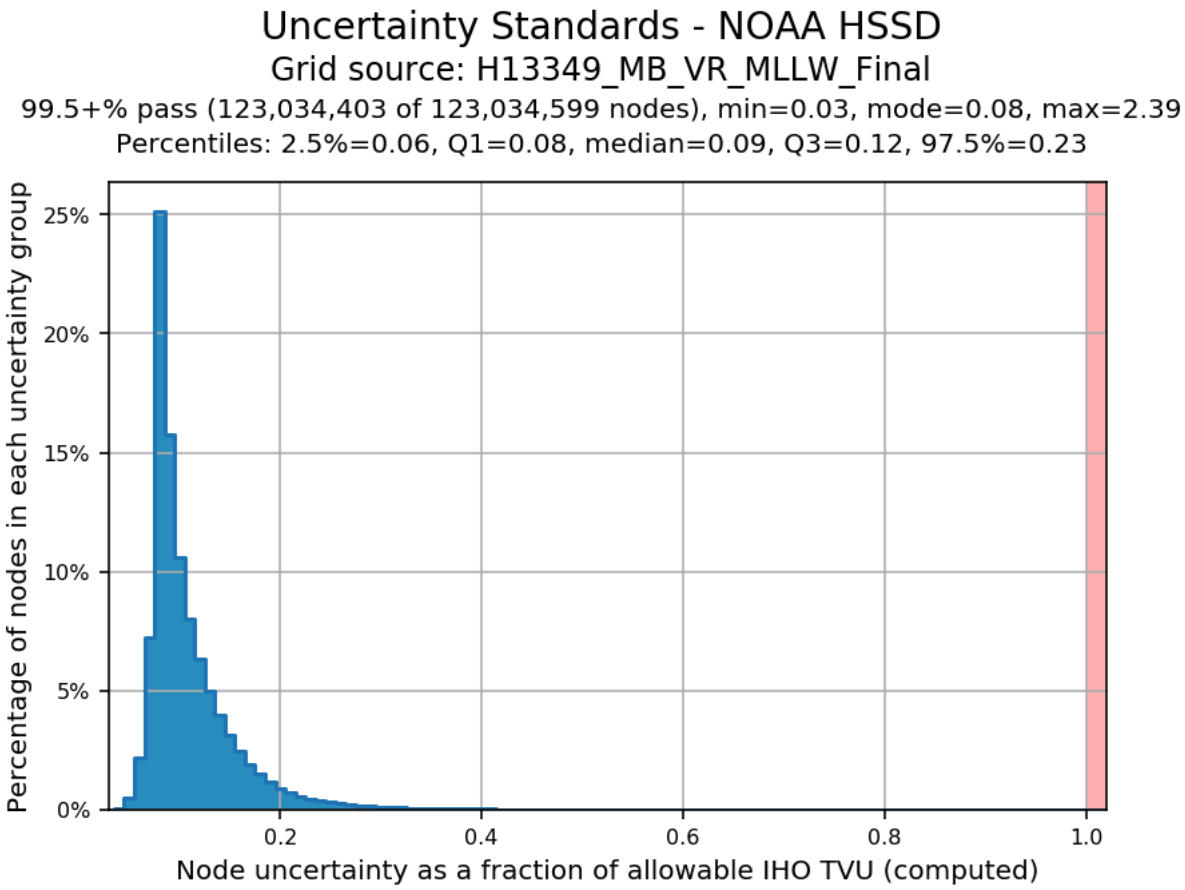


Figure 7: H13349 Uncertainty shown as a fraction of allowable uncertainty.

B.2.3 Junctions

H13349 junctions with one contemporary survey conducted by NOAA Ship Ferdinand R. Hassler. Comparisons were made using the Compare Grids program within Pydro Explorer.

The following junctions were made with this survey:

Registry Number	Scale	Year	Field Unit	Relative Location
H13348	1:10000	2021	Ferdinand R. Hassler	N
H13350	1:10000	2021	Ferdinand R. Hassler	S

Table 9: Junctioning Surveys

H13348

The junction with survey H13348 encompassed approximately 0.37 square nautical miles along the southern boundary of H13349. Pydro's Compare Grids results showed that 100% of nodes in the common area met NOAA allowable error standards. Analysis of the difference surface indicated that H13348 is an average of 0.01 meters deeper than H13349 with a standard deviation of 0.06 meters. See figures below for more information.

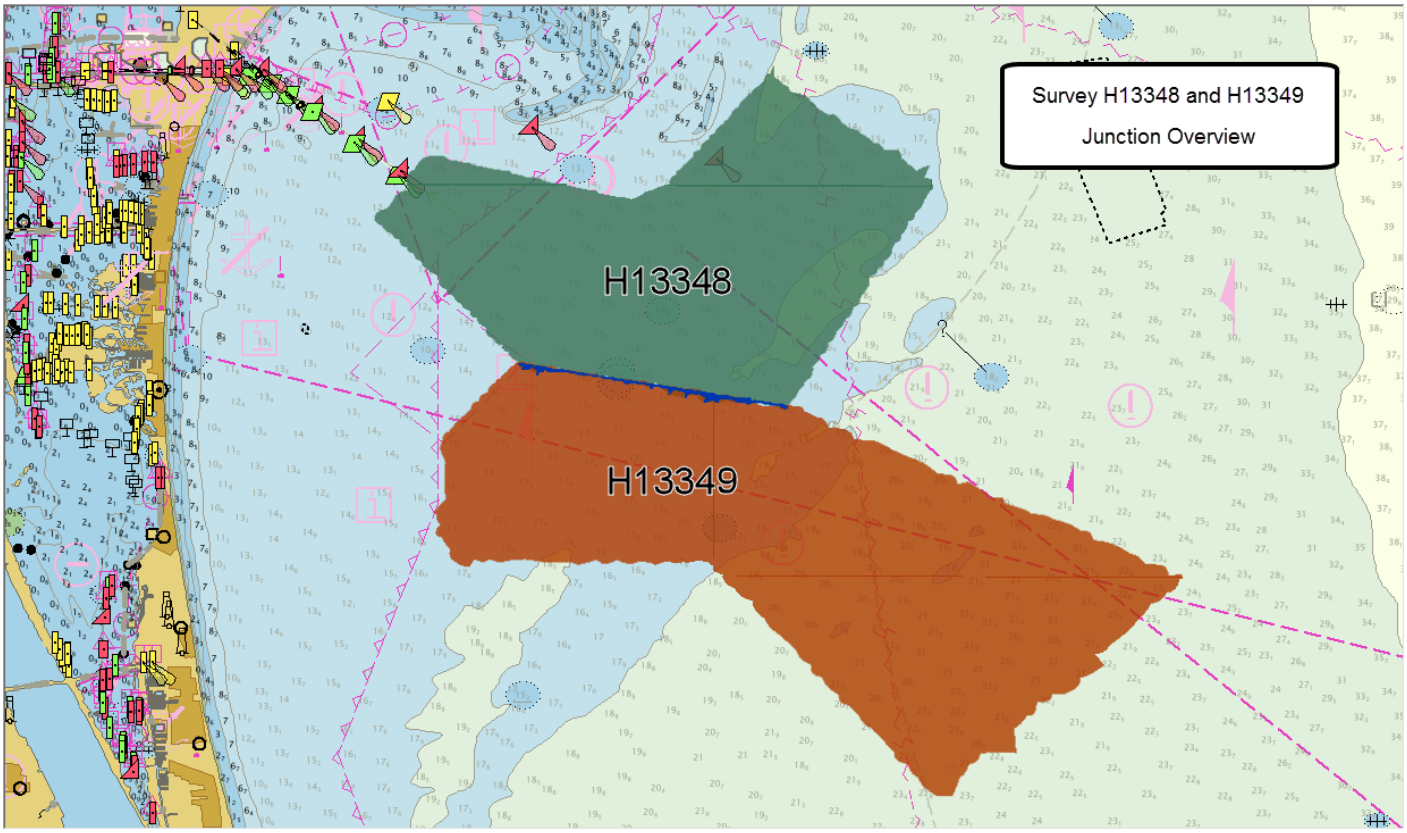


Figure 8: Overview of survey junction between H13348 and H13349.

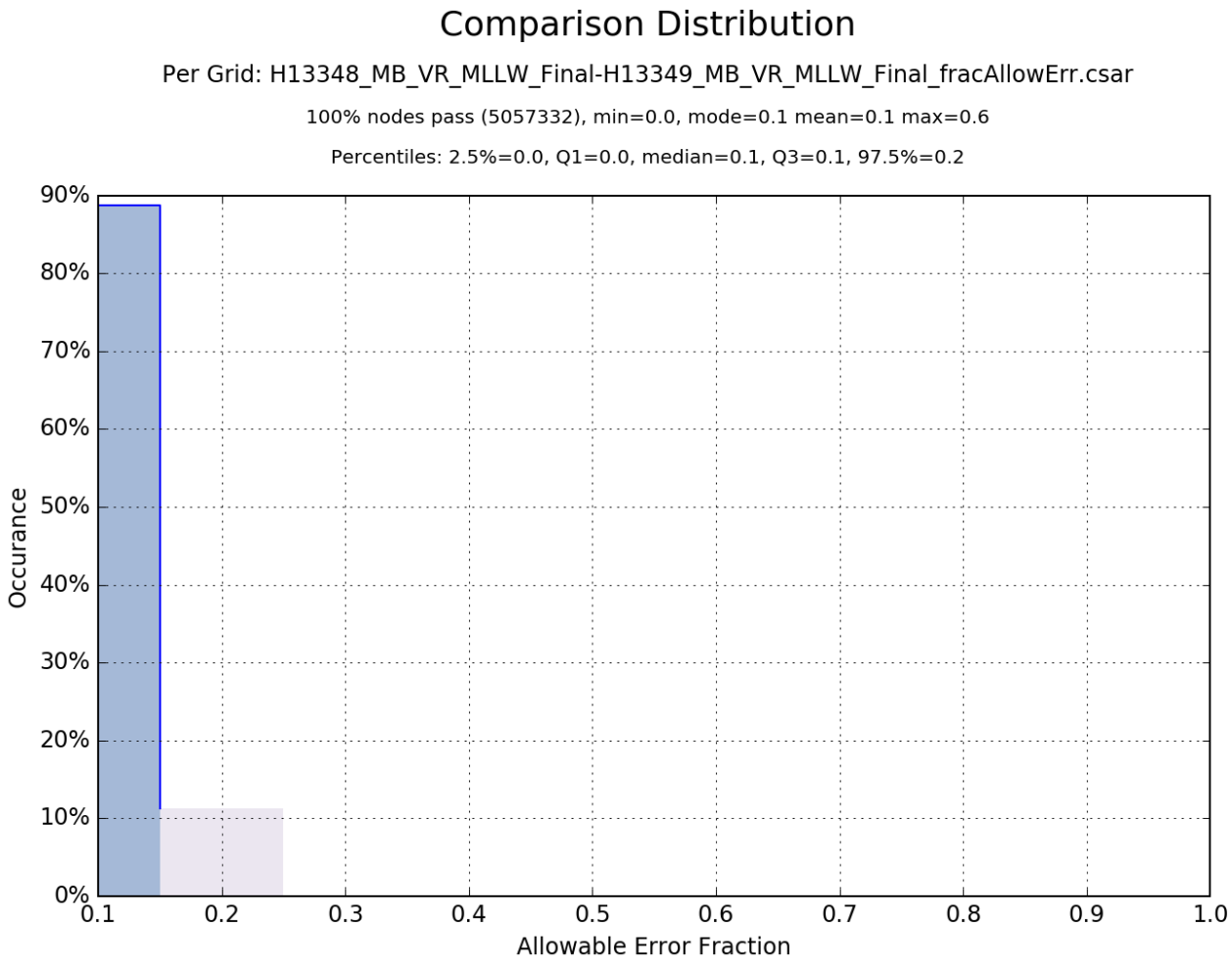
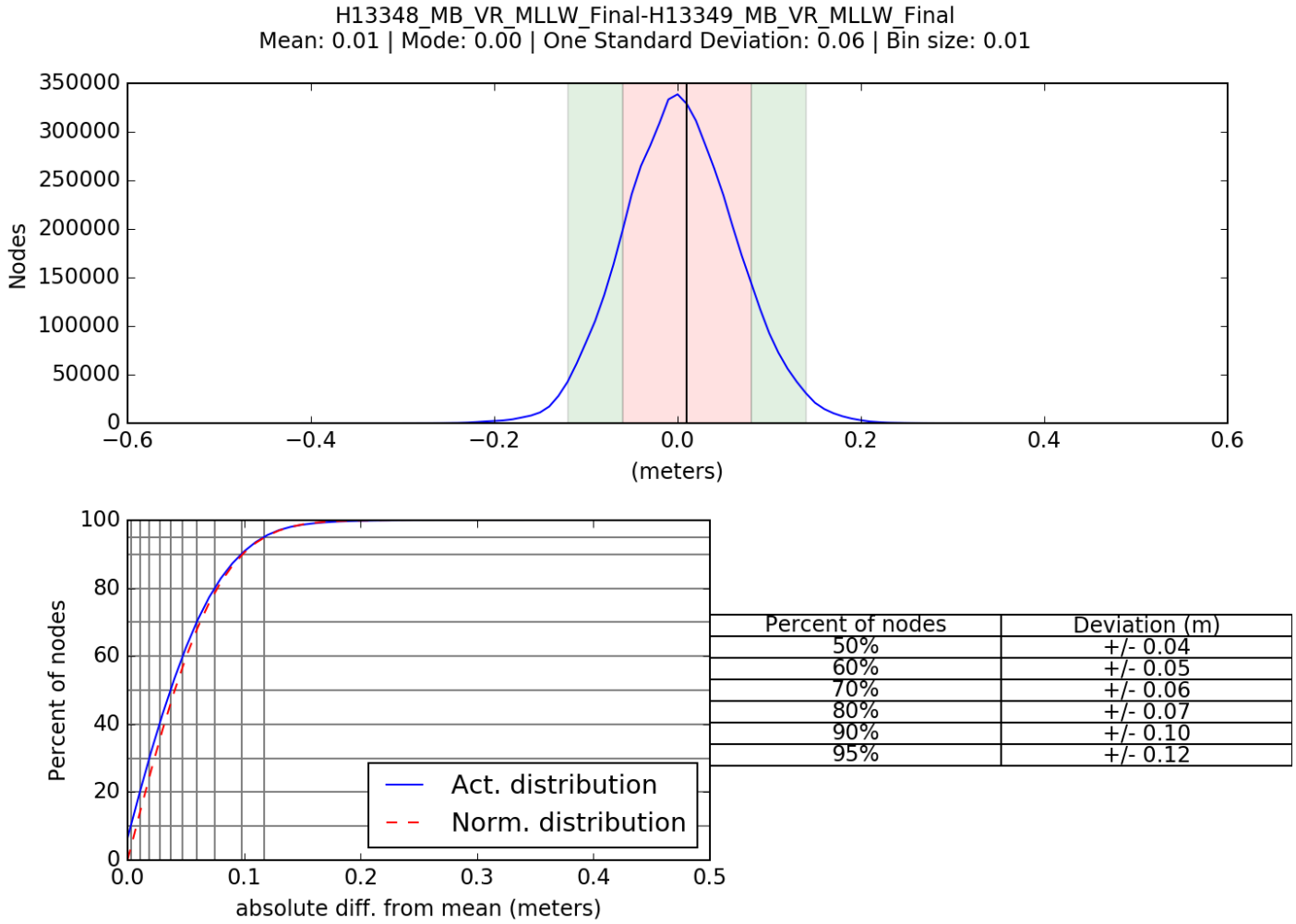


Figure 9: Pydro derived plot showing allowable error between H13348 and H13349.



Percent of nodes	Deviation (m)
50%	+/- 0.04
60%	+/- 0.05
70%	+/- 0.06
80%	+/- 0.07
90%	+/- 0.10
95%	+/- 0.12

Figure 10: Pydro derived plot showing H13348 and H13349 comparison statistics.

H13350

The junction with survey H13350 encompassed approximately 0.78 square nautical miles along the southern boundary of H13349. Pydro's Compare Grids results showed that 100% of nodes in the common area met NOAA allowable error standards. Analysis of the difference surface indicated that H13349 is an average of -0.02 meters shallower than H13350 with a standard deviation of 0.07 meters. See figures below for more information.

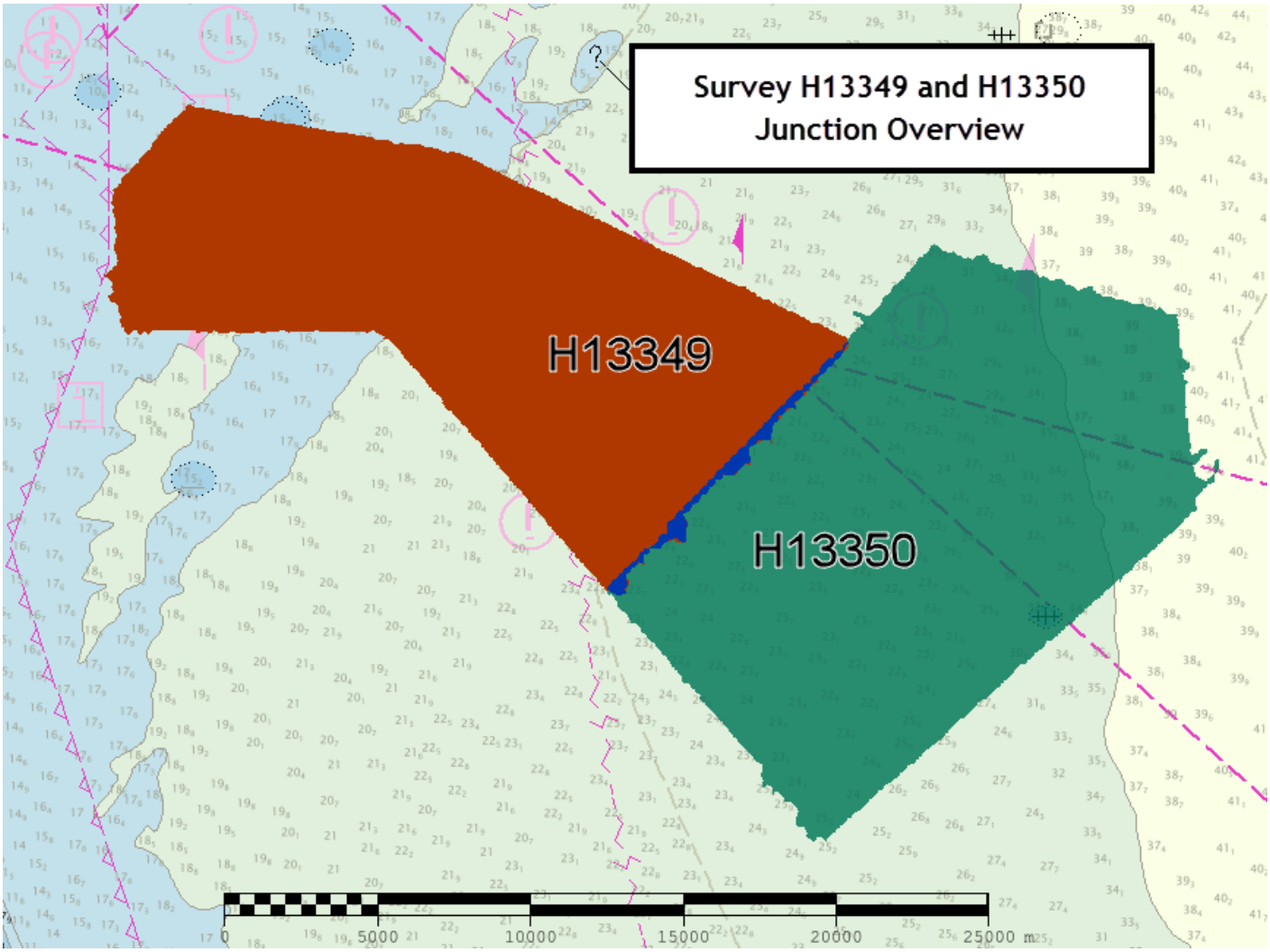


Figure 11: Overview of survey junction between H13349 and H13350.

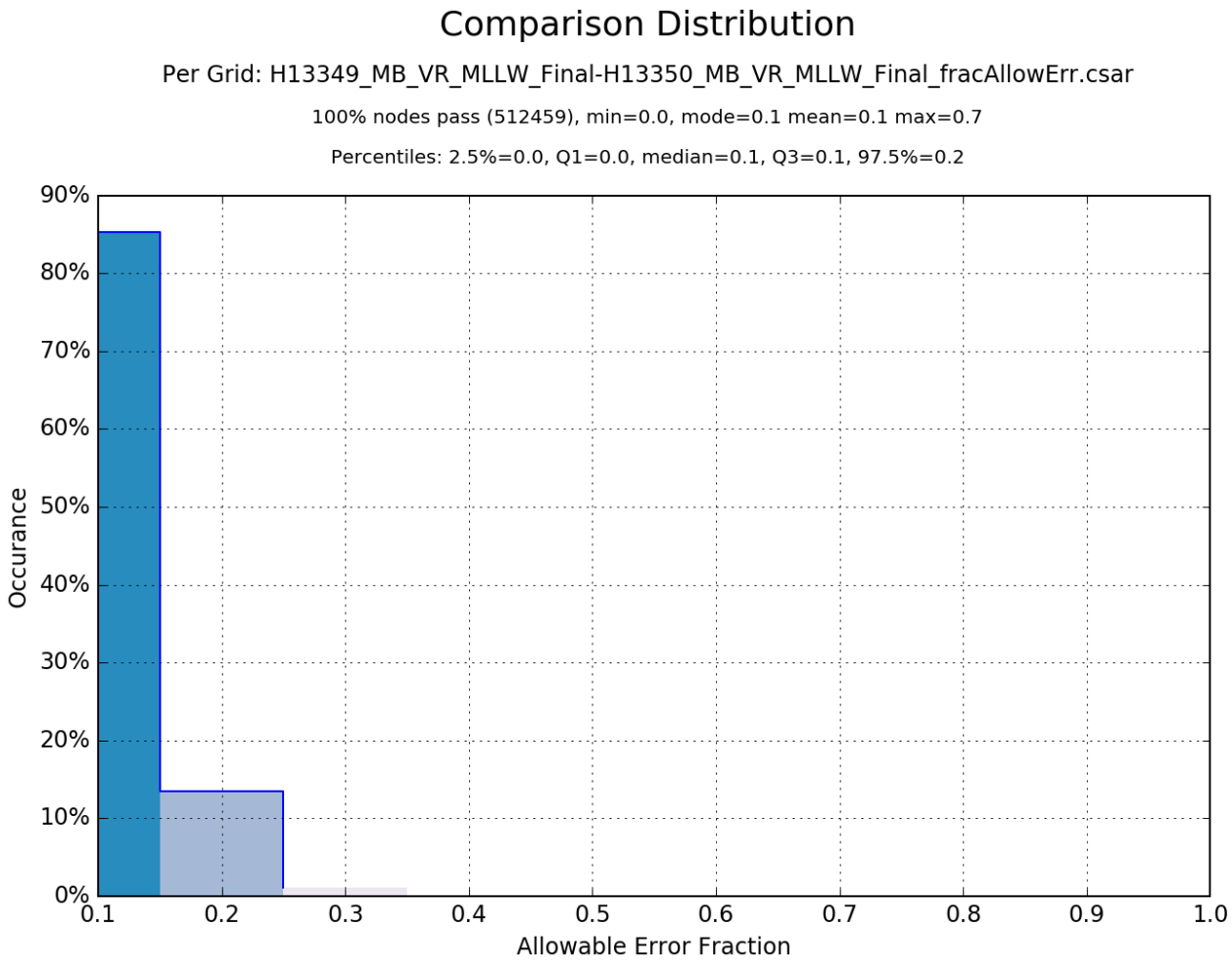
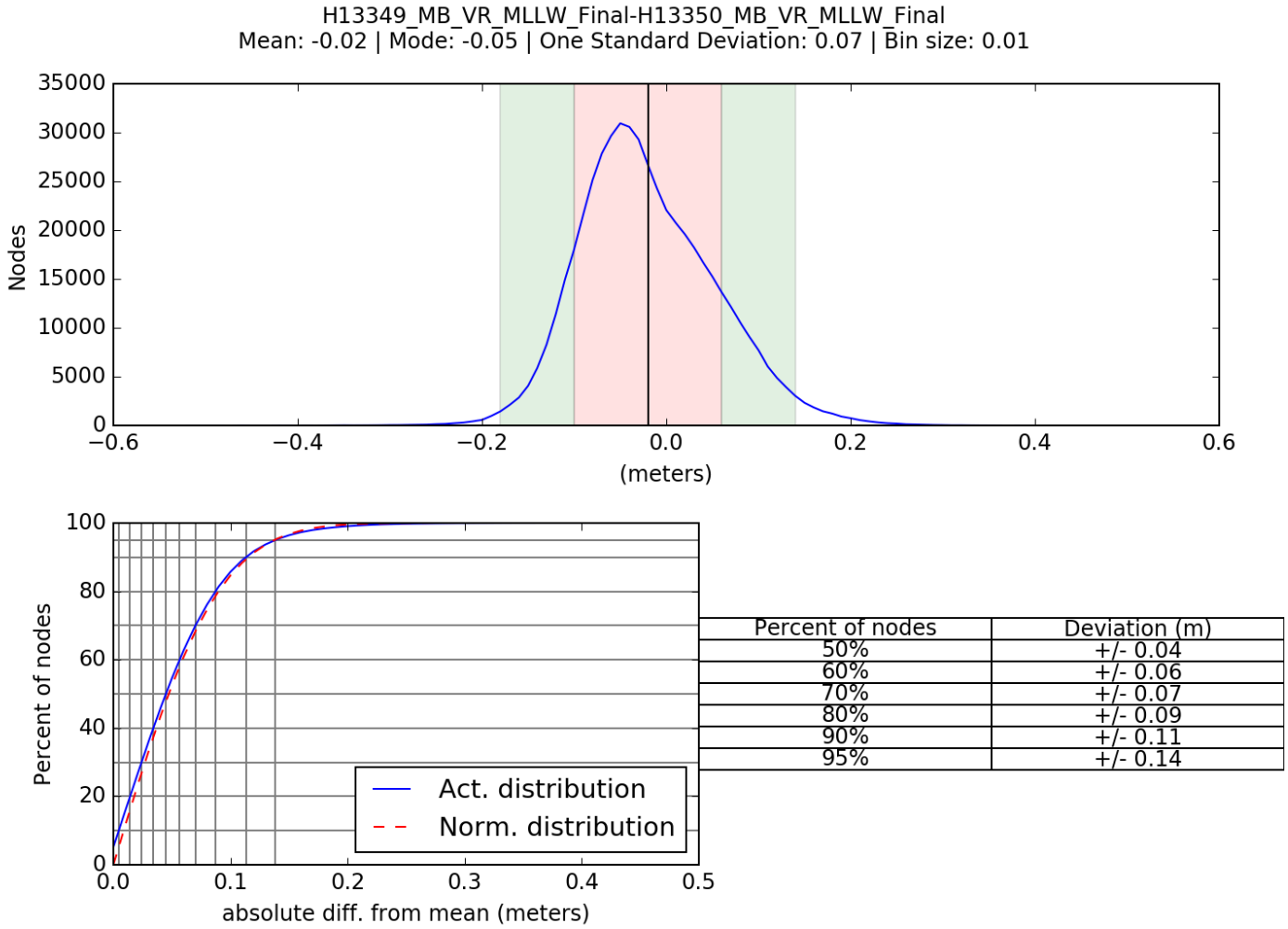


Figure 12: Pydro derived plot showing allowable error between H13349 and H13350.



Percent of nodes	Deviation (m)
50%	+/- 0.04
60%	+/- 0.06
70%	+/- 0.07
80%	+/- 0.09
90%	+/- 0.11
95%	+/- 0.14

Figure 13: Pydro derived plot showing H13349 and H13350 comparison 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

There were no other factors that affected corrections to soundings.

B.2.7 Sound Speed Methods

Sound Speed Cast Frequency: One hundred and seventy nine sound speed profiles were acquired for this survey at discrete locations within the survey area at least once every 2 hours, as well as when significant changes in surface sound speed were observed. Sound speed profiles were obtained using Sea-Bird 19plus SEACAT Profilers for launch-acquired data, and ODIM Brooke Ocean MVP 200 for ship-acquired data. All casts were concatenated into a master file and applied to MBES data using the "Nearest distance within time" (4 hours) profile selection method.

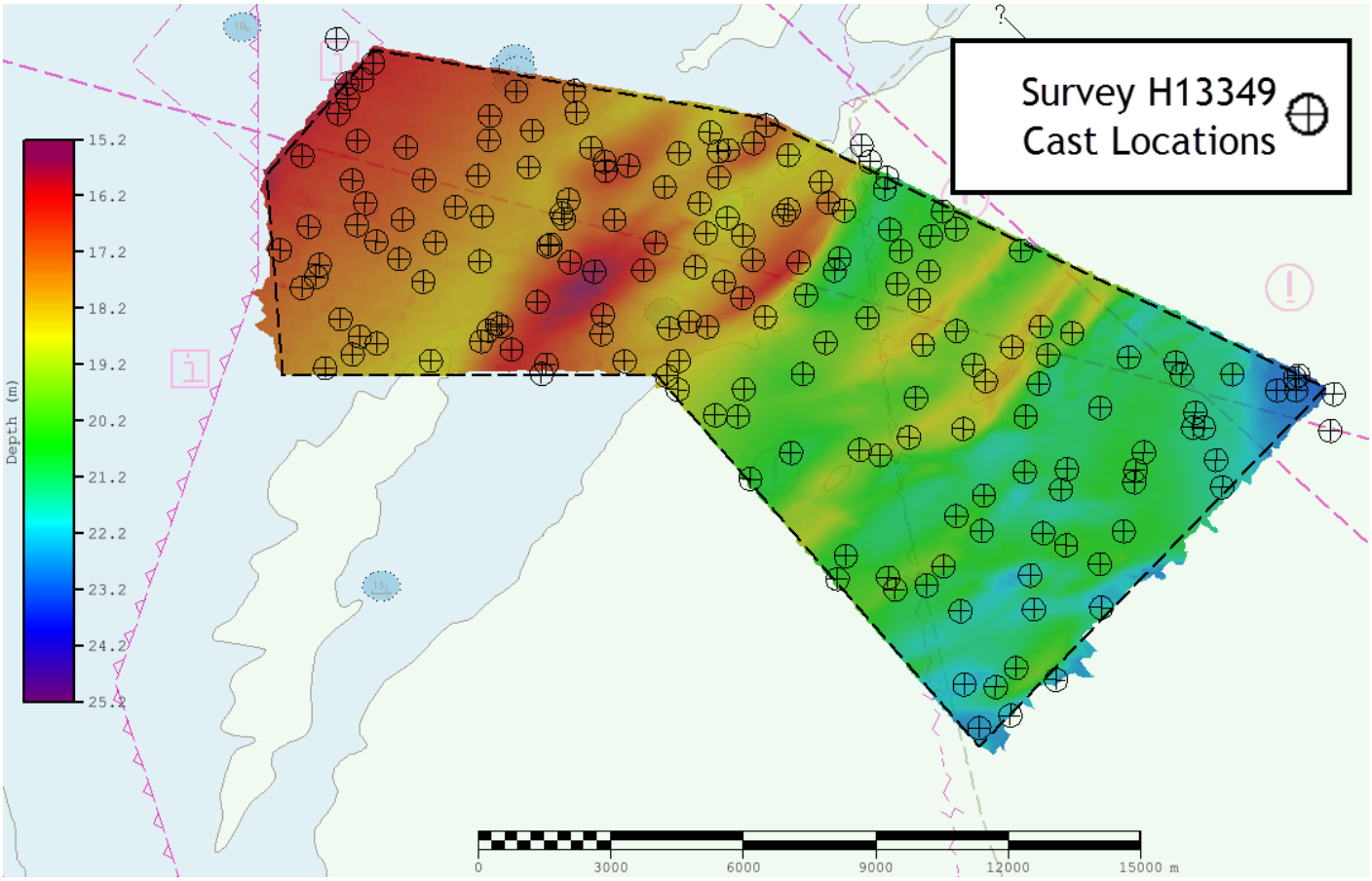


Figure 14: Survey H13349 sound speed cast locations.

B.2.8 Coverage Equipment and Methods

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

B.2.9 Holidays

H13349 data were reviewed in CARIS HIPS and SIPS for holidays in accordance with Section 5.2.2.3 of the HSSD. Seven holidays which meet the definition described in the HSSD for complete coverage were identified via HydroOffice 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. Four of the holidays are found outside of the assigned sheet limits. Two of the holidays are the result of the omission of Line 0068 due to a lack of the SBET. This is discussed below in Section C.3.1.

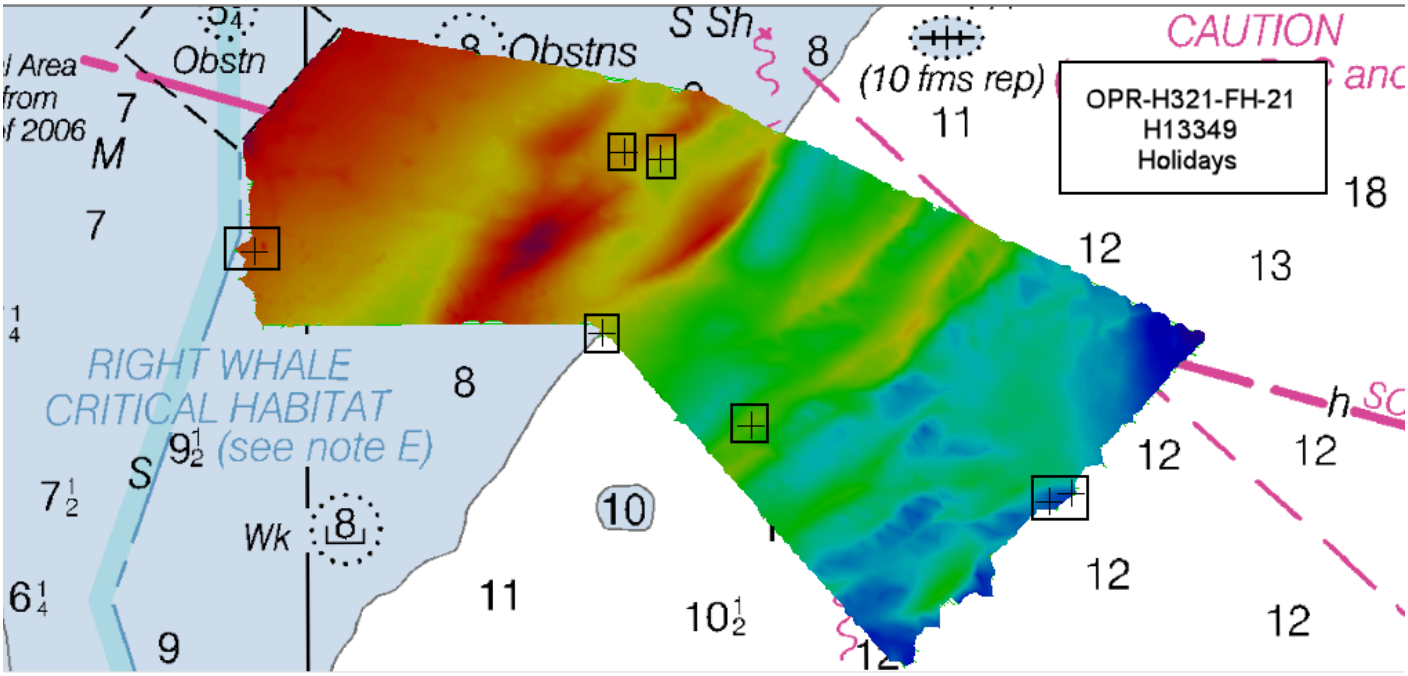


Figure 15: Holidays in MBES coverage.

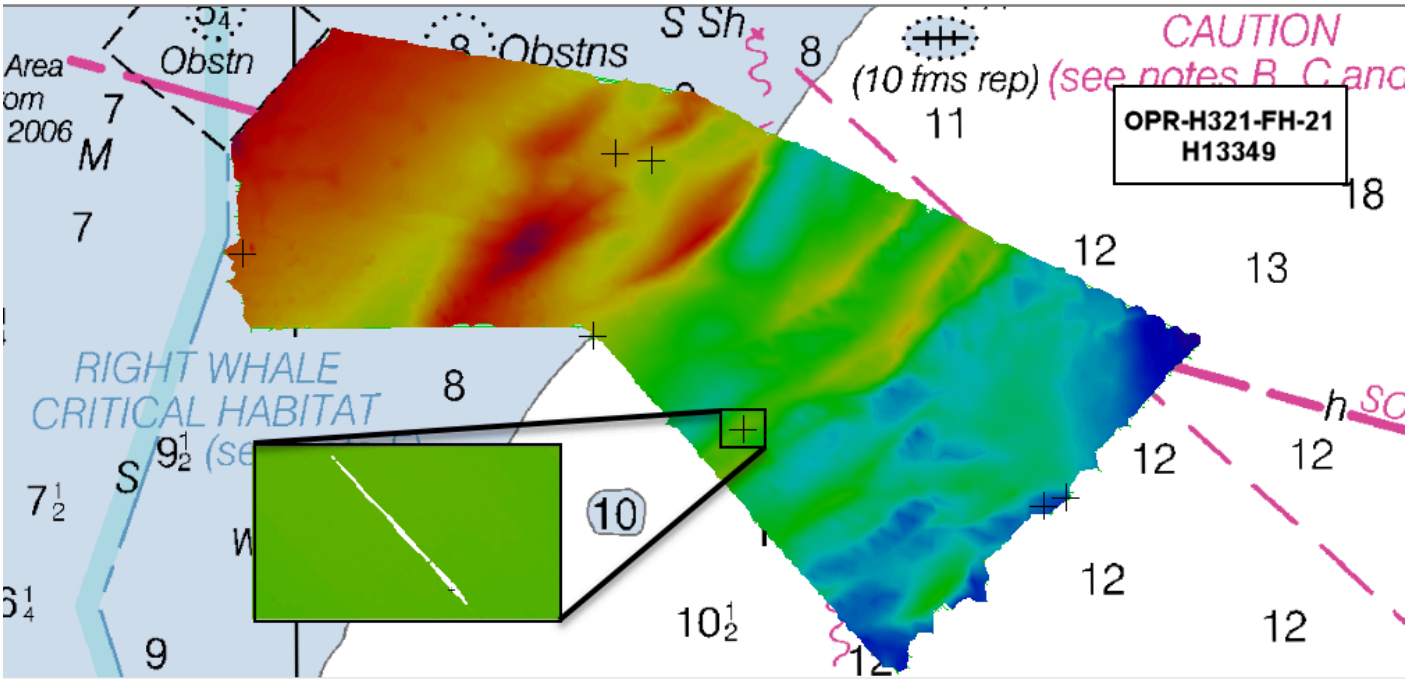


Figure 16: Holiday in MBES coverage within assigned sheet limits located near 28°13'20.99"N 080°23'09.70"W.

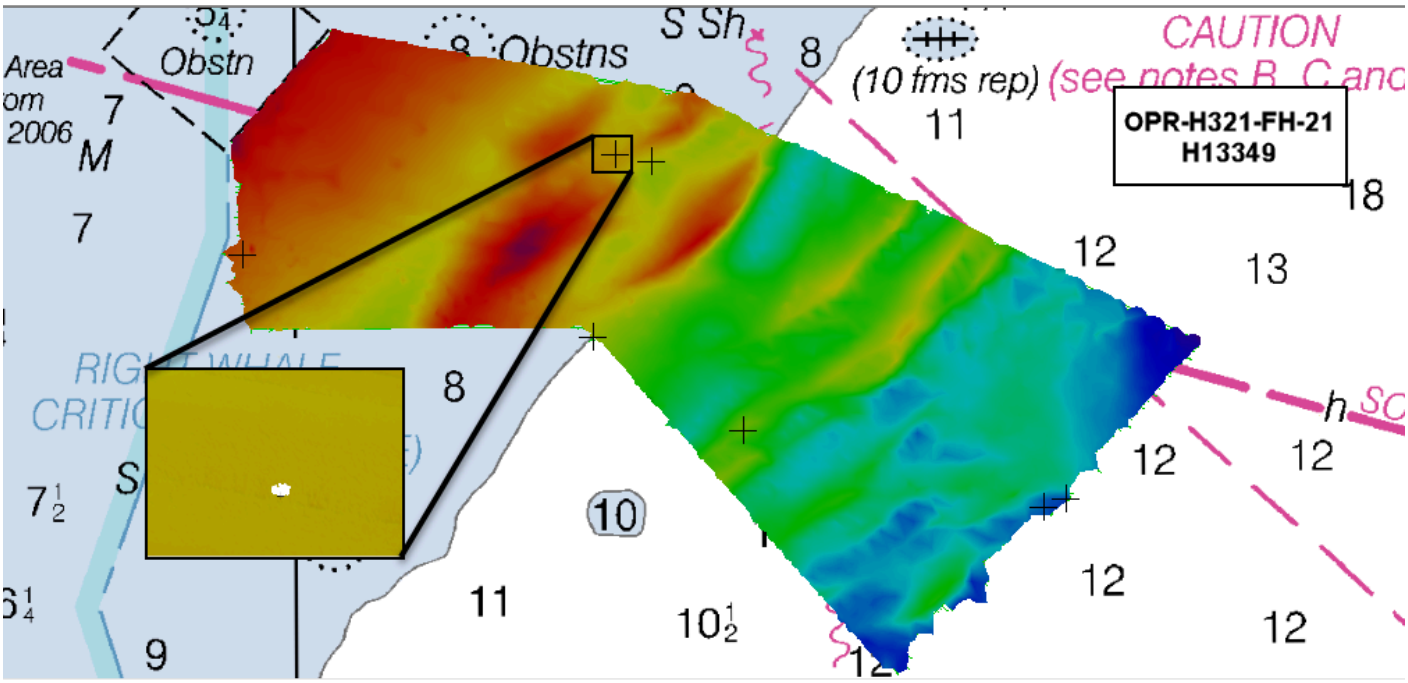


Figure 17: Holiday in MBES coverage within assigned sheet limits located near 28°17'05.49"N 080°25'06.18"W.

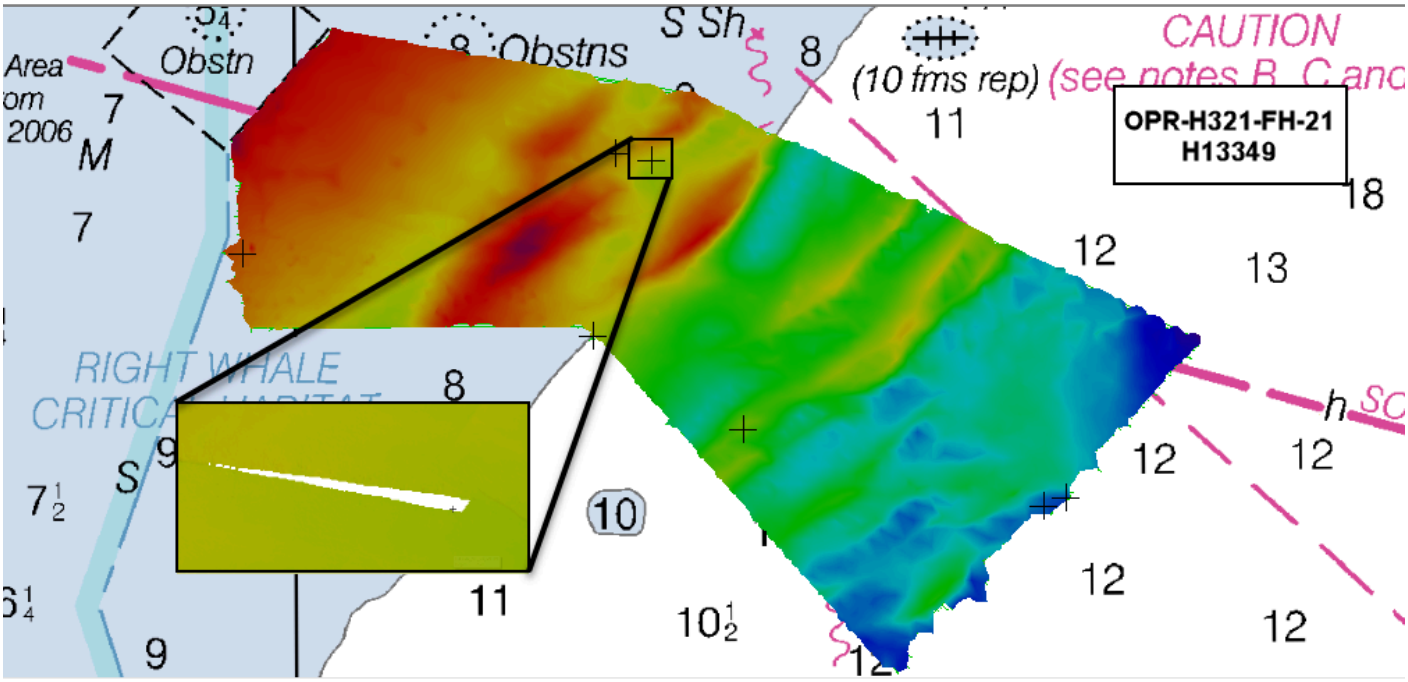


Figure 18: Holiday in MBES coverage within assigned sheet limits located near 28°16'59.92"N 080°24'32.73"W.

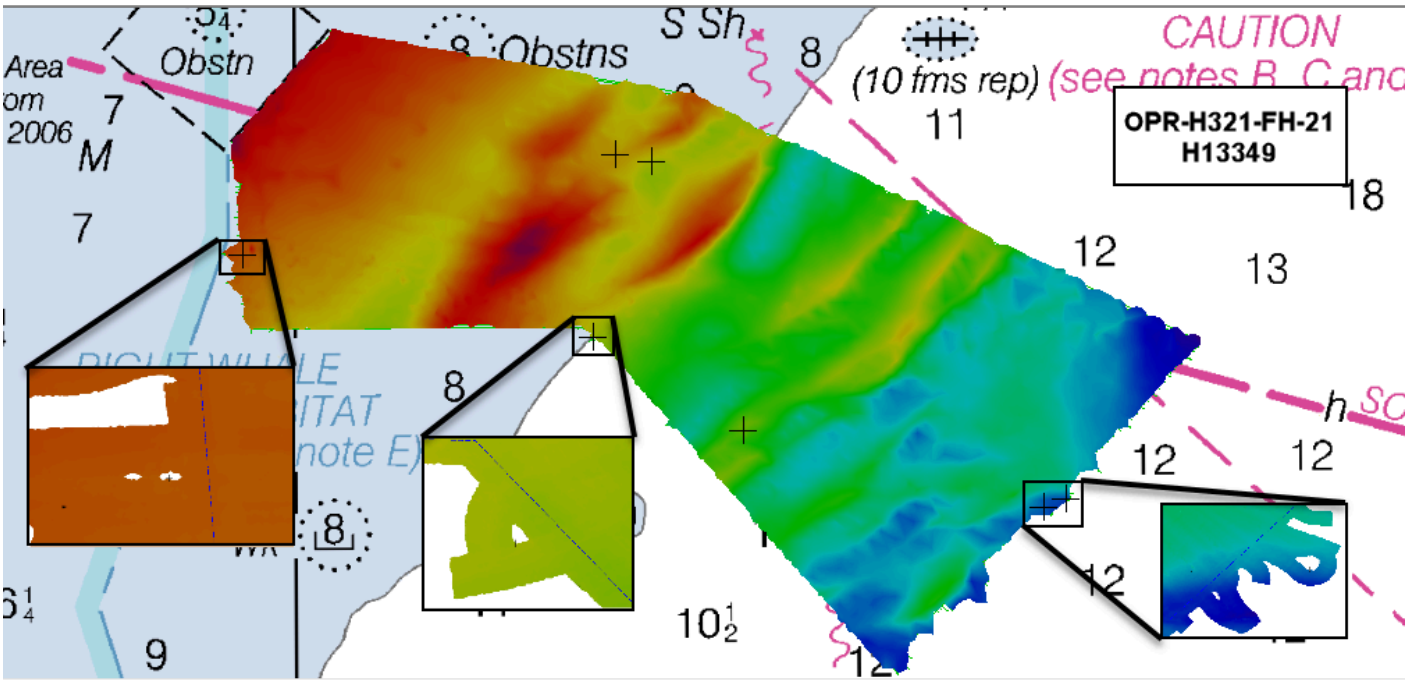


Figure 19: Holidays in MBES coverage outside assigned sheet limits.

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 QPS Fledermaus GeoCoder Toolbox (FMGT) software, and the exported geotiffs are include in the final processed data submission package.

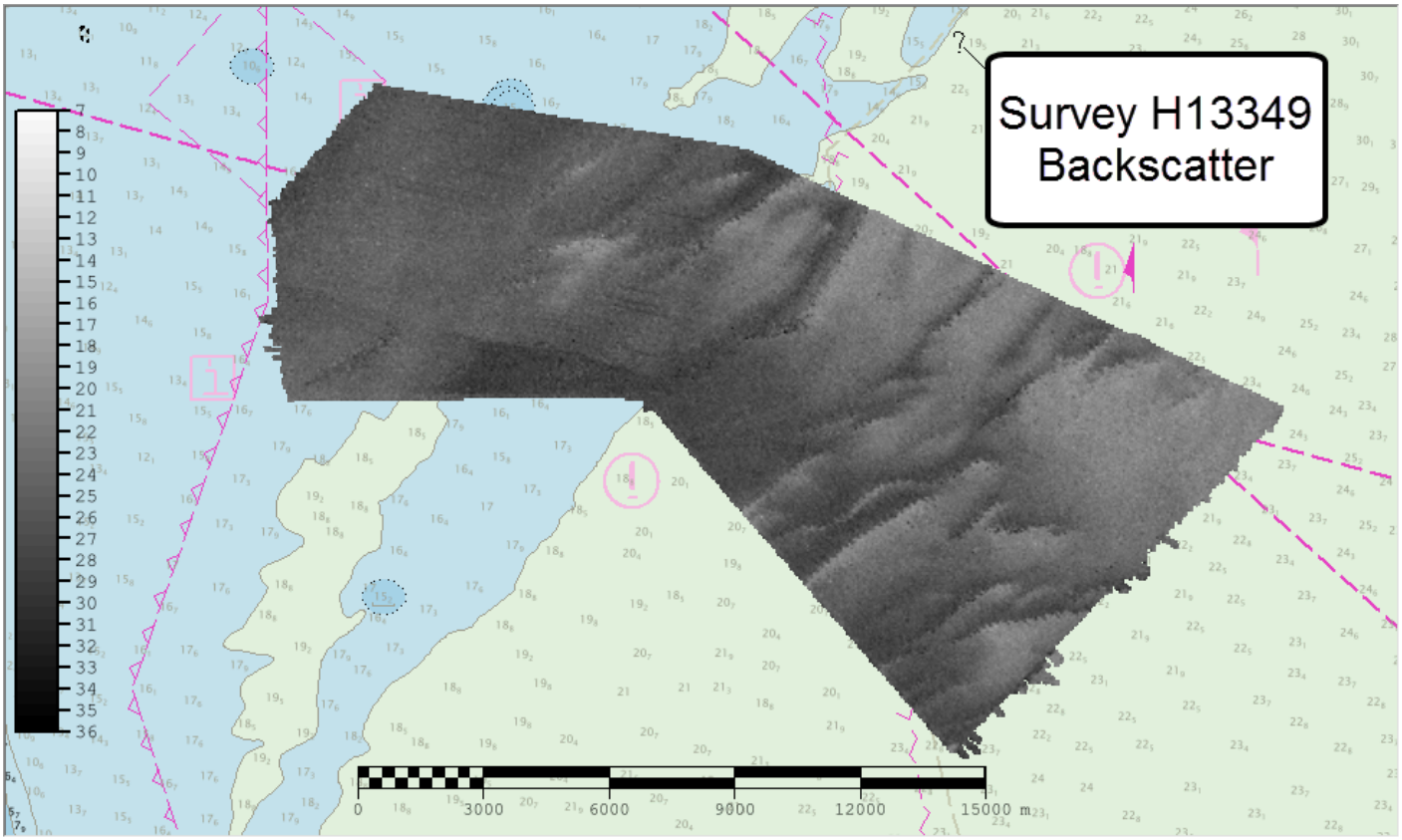


Figure 20: Overview of H13349 Multibeam acoustic backscatter mosaic.

B.5 Data Processing

B.5.1 Primary Data Processing Software

The following Feature Object Catalog was used: NOAA Profile 2021.

Refer to the DAPR for information on the Bathymetry Data Processing Software.

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
H13349_MB_VR_MLLW	CARIS VR Surface (CUBE)	Variable Resolution	15.5 meters - 24.1 meters	NOAA_VR	Complete MBES
H13349_MB_VR_MLLW_Final	CARIS VR Surface (CUBE)	Variable Resolution	15.5 meters - 24.1 meters	NOAA_VR	Complete MBES
H13349_MBAB_2m_300kHz_1of1	MB Backscatter Mosaic	2 meters	-	N/A	Complete MBES

Table 10: Submitted Surfaces

Submitted surfaces were generated using the recommended parameters for depth-based (Ranges) Caris variable-resolution bathymetric grids as specified in the 2021 HSSD.

Pydro QC Tools Detect Fliers was used with default settings to find fliers in a finalized VR surface. Obvious noise was rejected by the hydrographer in Caris Subset Editor. After data cleaning, Detect Fliers was run again and found 4 certain fliers; these were investigated and found to be false positives. The results of the Detect Fliers tool are included as a .000 files in the Separates section of this report.

C. Vertical and Horizontal Control

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

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_H321_VDatum_Area_100m_NAD83_2011-MLLW_geoid18.csar

Table 11: ERS method and SEP file

ERS methods were used as the final means of reducing H13349 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 17.

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

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

C.3 Additional Horizontal or Vertical Control Issues

C.3.1 Line without post proccesed position

Line 0068 on DN 132 was unable to have post processed position data (SBET) applied to the line. As the line has no SBET available it was unable to be reduced from the ellipse to MLLW water with the provided VDatum file. As such there exists a vertical offset of approximately 1 m throughout the length of the line. Shoaling trends have been examined in the affected areas and there is no navigational concern. The

hydrographer excluded this line from sounding selection, which resulted on two holidays. The raw and processed files associated with this line were included in the final submission. This is discussed above in Section B.2.9

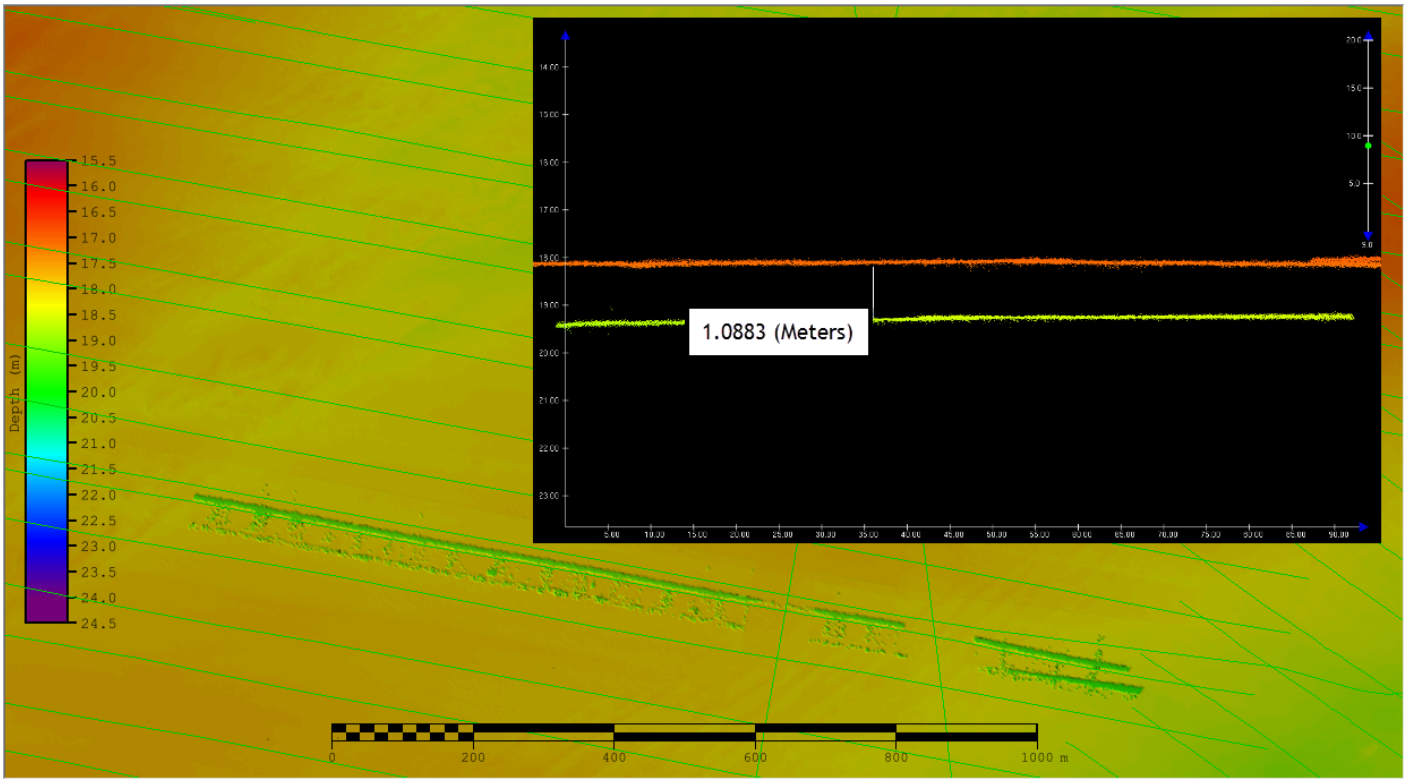


Figure 21: Offset caused by line without SBET.

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
US5FL81M	1:25000	35	10/06/2021	10/06/2021
US4FL87M	1:80000	10	04/14/2022	04/14/2022

Table 12: 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

Limited shoreline verification was conducted in accordance with applicable sections of NOAA HSSD and FPM using the Project Reference File (PRF) and Composite Source File (CSF) provided with the Project Instructions. In the field, all assigned features that were safe to approach, were addressed as required with S-57 attribution and recorded in the H13349 Final Feature File to best represent the features at chart scale. This file also includes new features found in the field as well as recommendations to update, retain, or delete assigned features.

D.1.4 Uncharted Features

No uncharted features exist for this survey.

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

Eleven navigational aid buoys and one scientific wave buoy were assigned in the the project instructions. they were noted as on station and serving their intended purpose in the Final Feature File.

D.2.2 Maritime Boundary Points

No Maritime Boundary Points were assigned for investigation in this survey.

D.2.3 Bottom Samples

Two bottom samples were assigned for this survey and successfully acquired. The results are included in the H13349 Final Feature File submitted with this report.

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
Michael O. Gonsalves CDR/NOAA	Commanding Officer	11/12/2021	Digitally signed by GONSALVES.MICHAEL.OLIVER.1275635126 Date: 2022.05.22 15:49:46 -05'00'
Jeffrey J. Douglas LT/NOAA	Field Operations Officer	11/12/2021	DOUGLAS.JEFFREY.JAMES.1365482353 2022.05.26 14:53:03 -04'00'
Audrey E. Jerauld	Senior Survey Technician	11/12/2021	Digitally signed by JERAULD.AUDREY.ELIZABETH.1170496260 Date: 2022.05.22 17:44:10 -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