H13273

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

DESCRIPTIVE REPORT

Type of Survey:	Navigable Area
Registry Number:	H13273

LOCALITY

State(s):	Hawaii
General Locality:	Hawaiian Islands and Vicinity
Sub-locality:	Approaches to Kahului Bay

2019

CHIEF OF PARTY
Benjamin K. Evans CAPT/NOAA

LIBRARY & ARCHIVES

Date:

U.S. DEPARTMENT OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION	REGISTRY NUMBER:
HYDROGRAPHIC TITLE SHEET	**H13273**

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):	**Hawaii**
General Locality:	**Hawaiian Islands and Vicinity**
Sub-Locality:	**Approaches to Kahului Bay**
Scale:	**10000**
Dates of Survey:	**07/23/2019 to 09/20/2019**
Instructions Dated:	**06/28/2019**
Project Number:	**OPR-T383-RA-19**
Field Unit:	**NOAA Ship *Rainier***
Chief of Party:	**Benjamin K. Evans CAPT/NOAA**
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 4N, MLLW. All references to other horizontal or vertical datums in this report are applicable to the processed hydrographic data provided by the field unit.

Table of Contents

List of Tables

List of Figures

Descriptive Report to Accompany Survey H13273

Project: OPR-T383-RA-19

Locality: Hawaiian Islands and Vicinity

Sublocality: Approaches to Kahului Bay

Scale: 1:10000

July 2019 - September 2019

NOAA Ship *Rainier*

Chief of Party: Benjamin K. Evans CAPT/NOAA

A. Area Surveyed

The survey area is referred to as H13273, "Approaches to Kahului Bay" (sheet 3) in the Project Instructions. The survey area encompasses 50.52 square nautical miles.

A.1 Survey Limits

Data were acquired within the following survey limits:

Northwest Limit	Southeast Limit
21° 1' 41.4" N 156° 33' 25.8" W	20° 55' 51.6" N 156° 20' 21.6" W

Table 1: Survey Limits

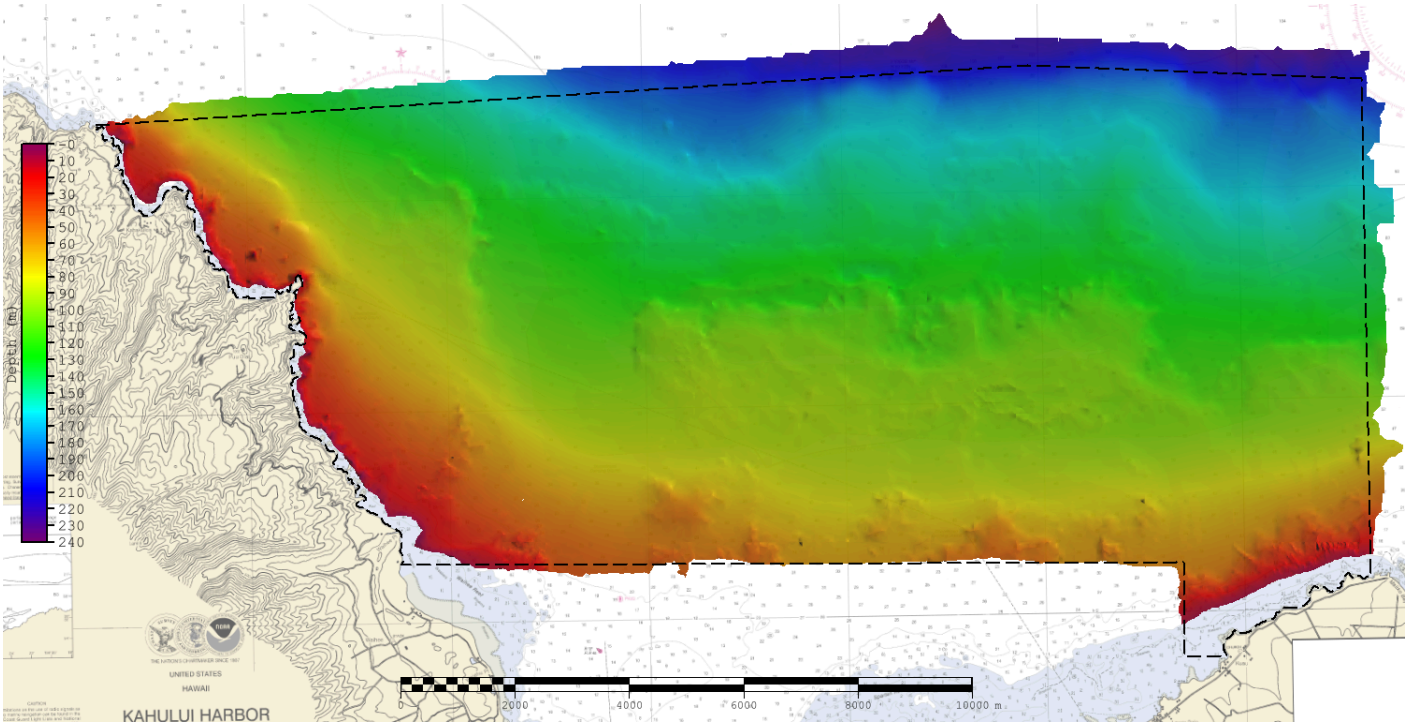


Figure 1: H13273 Assigned survey area (black) and acquired survey coverage.

Complete multibeam echosounder (MBES) coverage was acquired to the inshore limit of hydrography. The inshore limit for this project was defined in the Project Instructions as 10 meters water depth due to the high surf and swell conditions of the area.

Areas where survey coverage did not meet the assigned sheet limits or 10 meter inshore limit were due to the survey vessel reaching the Navigable Area Limit Line (NALL) as defined as the limit of safe navigation. Consistently high wind and surf conditions pushed the limit of safe navigation outside of the 10 meter contour in some locations along the western boundary of coverage.

A.2 Survey Purpose

This project area, encompassing 225 square nautical miles, is heavily trafficked by container ships, tankers, barges, commercial and recreational fishing vessels, and tourism industry vessels. Kahului Harbor is home to a Carnival and Norwegian Cruise Line terminal, and is the only deep draft commercial harbor on the island of Maui. Despite the volume of maritime traffic, the vast majority of bathymetric data in the project area were acquired prior to 1984. This survey will provide contemporary data to update National Ocean Service (NOS) nautical charting products. Additionally, survey data from this project will support the Seabed 2030 global mapping initiative.

A.3 Survey Quality

The entire survey is adequate to supersede previous data.

Pydro QC Tools was used to analyze H13273 multibeam echosounder (MBES) data density. The submitted H13273 variable-resolution (VR) surface met HSSD density requirements as shown in the histogram below.

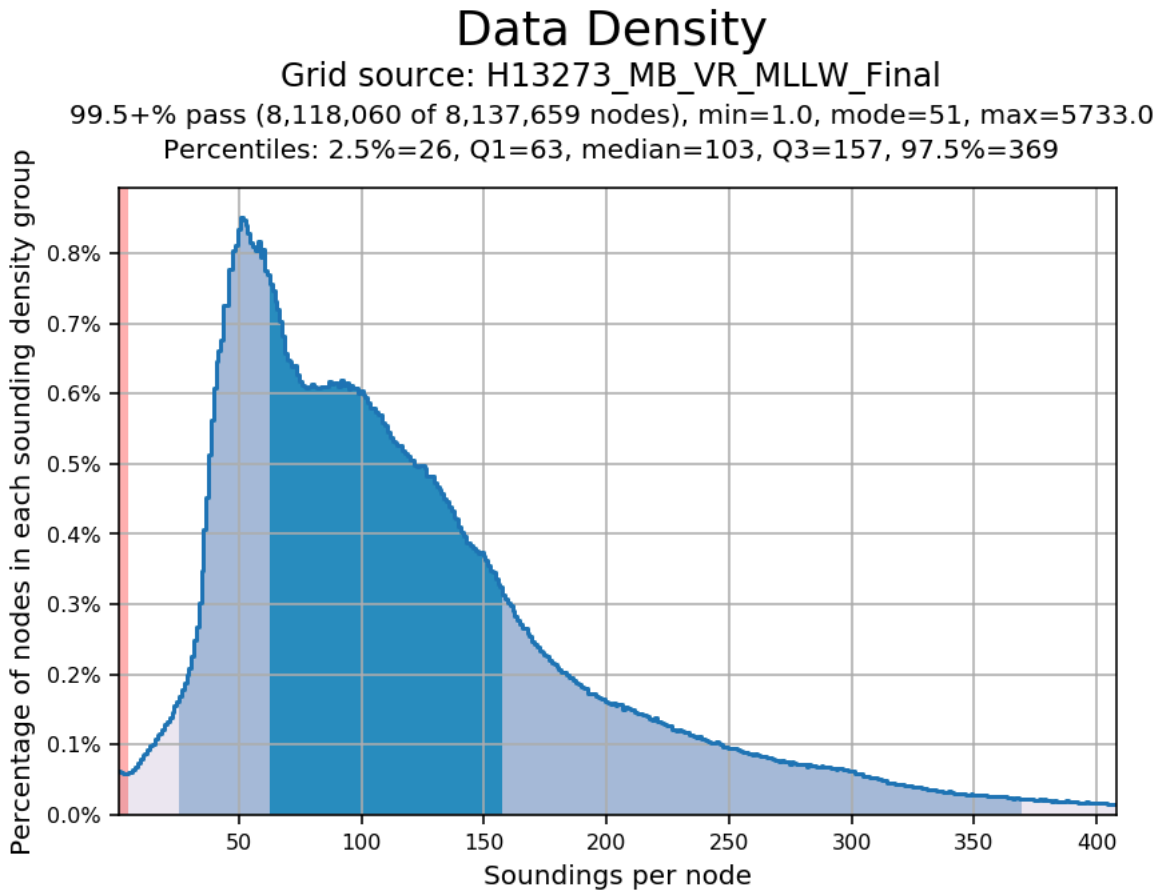


Figure 2: Pydro derived plot showing HSSD density compliance of H13273 finalized variable resolution MBES data.

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 in survey area.	Complete Coverage (Refer to HSSD Section 5.2.2.3)

Table 2: Survey Coverage

Pydro QC Tools was used to identify one holiday with the "Holiday Finder" tool, which was found to be caused by acoustic shadowing in the outer beams of coverage. This holiday can be seen in figure 3 below, and the results of the Holiday Finder tool are included in the separates section of this report.

An additional area in the northern area of the survey was not a holiday by complete coverage standards, but did result in a noticiable gap in the gridded surface. This gap was caused by a temporary misconfiguration of the maximum depth setting on the sonar during acquisition. This resulted in a loss of the nadir beams and ultimately a noticeable gap in the surface in approximately 200 meters of water. This area can be seen in figure 4 below.

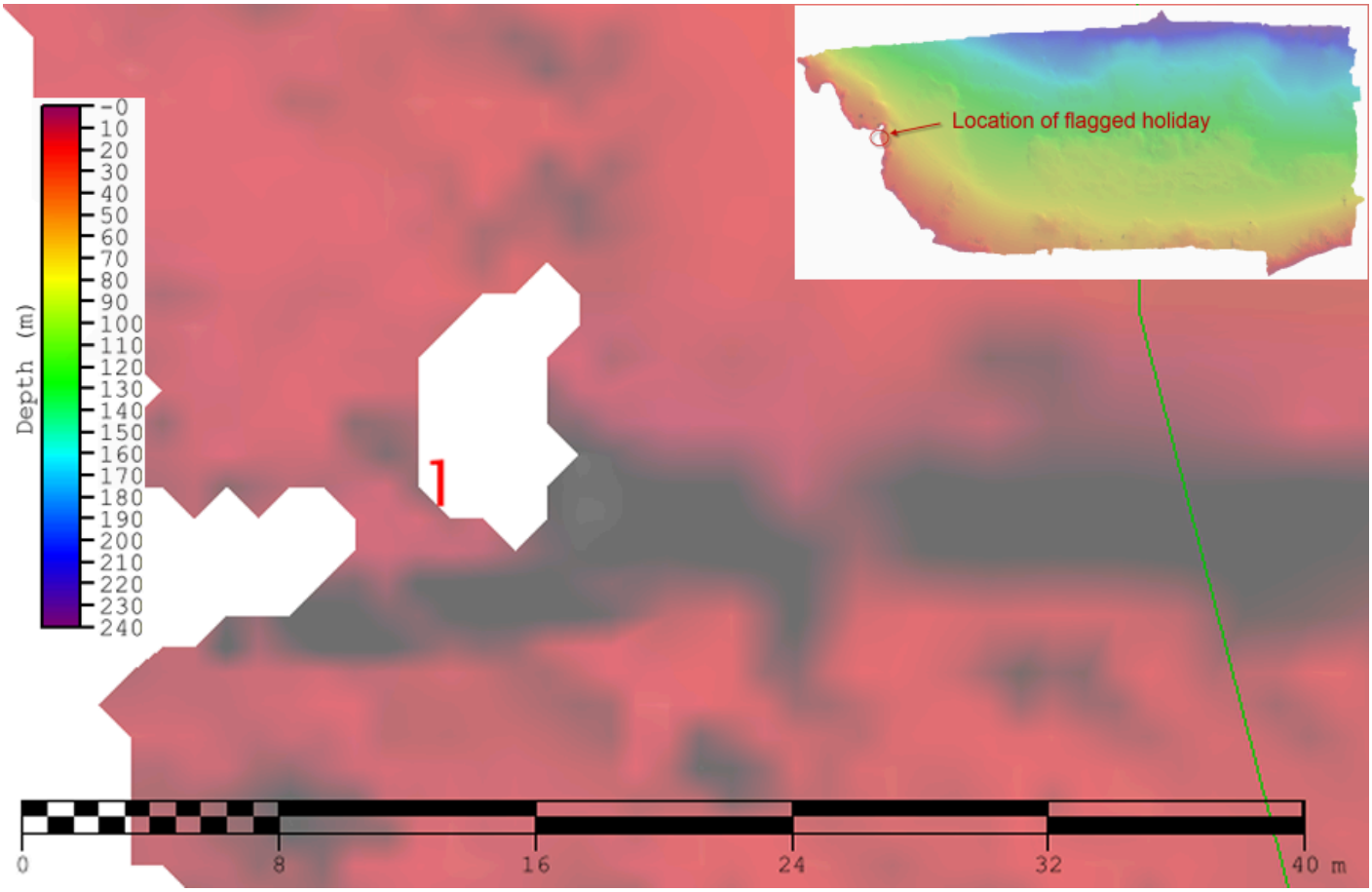


Figure 3: Holiday flagged by Pydro QC Tools Holiday Finder on the western boundary of H13273

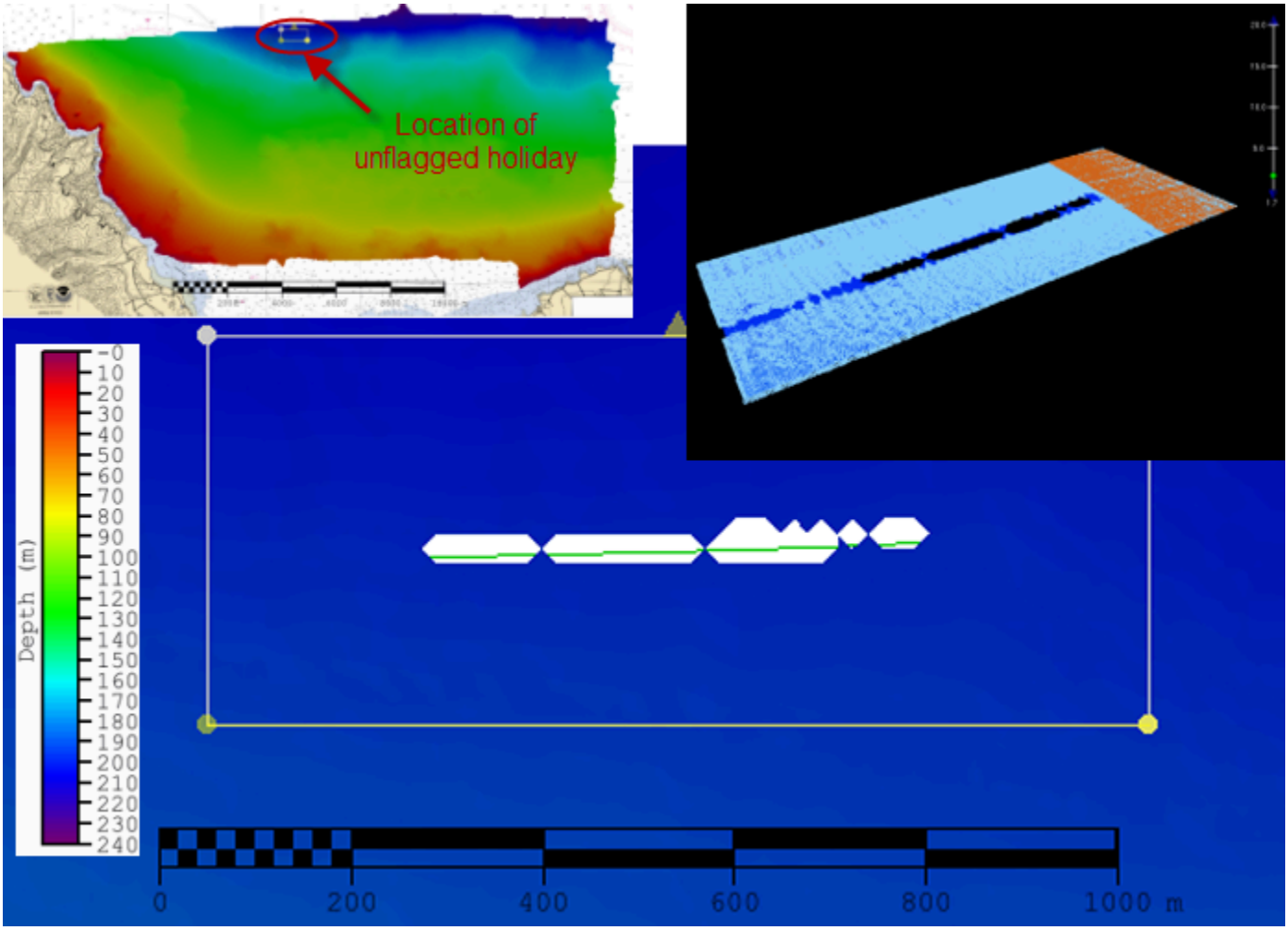


Figure 4: Gap in northern portion of H13273 coverage caused by sonar misconfiguration. Ultimately fell just shy of being classified as a holiday. Subset of sounding data with overlaid surface can be seen in upper right inset.

A.6 Survey Statistics

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

	HULL ID	*2801*	*2803*	*S221*	*Total*
LNM	**SBES Mainscheme**	0	0	0	0
	MBES Mainscheme	64.92	48.95	253.41	367.29
	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	0	6.03	19.41	25.44
	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					50.52

Table 3: Hydrographic Survey Statistics

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

Survey Dates	Day of the Year
07/23/2019	204
07/30/2019	211

Survey Dates	Day of the Year
07/31/2019	212
08/05/2019	217
08/06/2019	218
08/07/2019	219
08/08/2019	220
09/17/2019	260
09/18/2019	261
09/19/2019	262
09/20/2019	263

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	*2801*	*2803*	*S221*
LOA	8.8 meters	8.8 meters	70.4 meters
Draft	1.1 meters	1.1 meters	4.5 meters

Table 5: Vessels Used

Figure 5: NOAA Ship RAINIER (S221) with survey launches 2801 (RA-4), 2802 (RA-5), and 2803 (RA-3) in June 2019

B.1.2 Equipment

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

Manufacturer	Model	Type
Applanix	POS MV 320 v5	Positioning and Attitude System
Kongsberg Maritime	EM 2040	MBES
Sea-Bird Scientific	SBE 19plus V2	Conductivity, Temperature, and Depth Sensor
Teledyne RESON	SVP 70	Sound Speed System
Kongsberg Maritime	EM 710	MBES
AML Oceanographic	Micro-CTD	Conductivity, Temperature, and Depth Sensor
ODIM Brooke Ocean	MVP200	Sound Speed System

Table 6: Major Systems Used

B.2 Quality Control

B.2.1 Crosslines

RAINIER (S221), and survey launch 2803 (RA-3) acquired 25.44 nautical miles of multibeam crosslines. H13273 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 H13273 mainscheme survey data and crossline survey data. In the difference surface, 99.5% of nodes met HSSD allowable Total Vertical Uncertainty (TVU) standards. See Figures 6-8 for specific details on the crossline analysis.

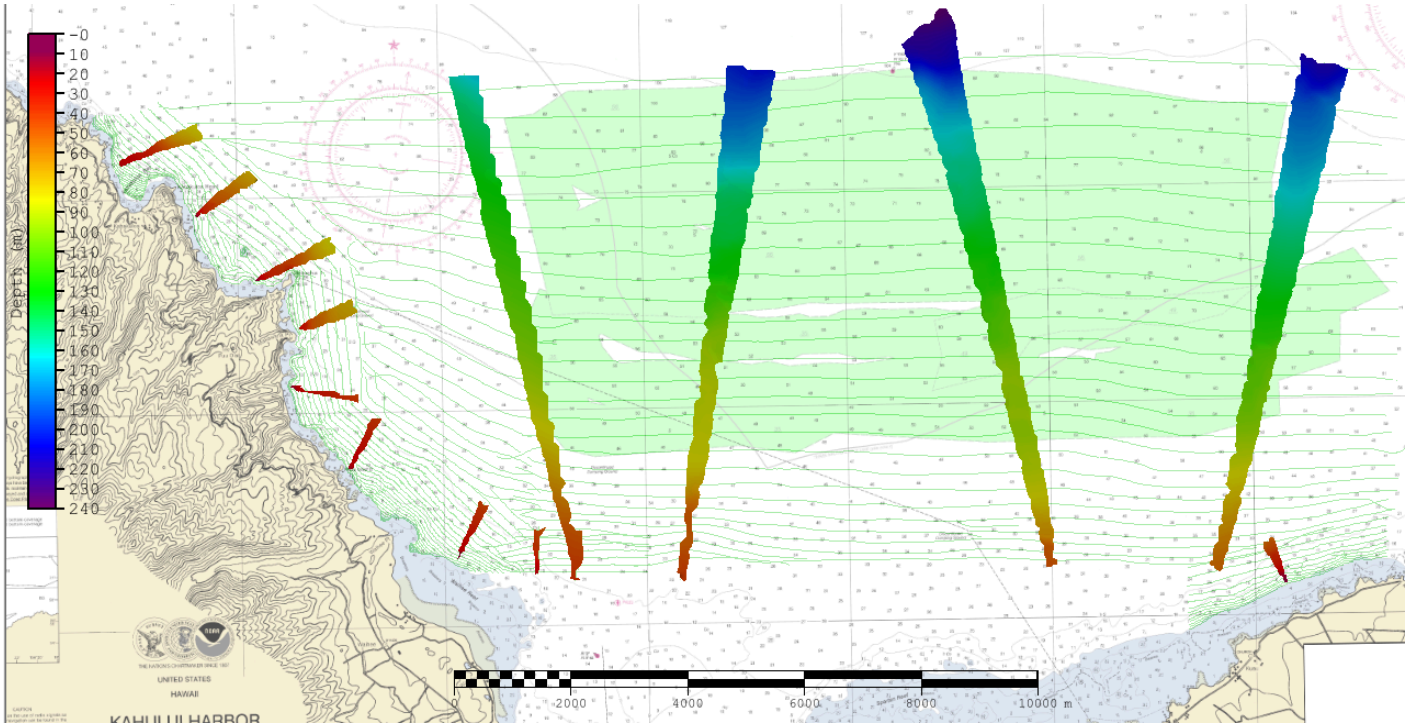
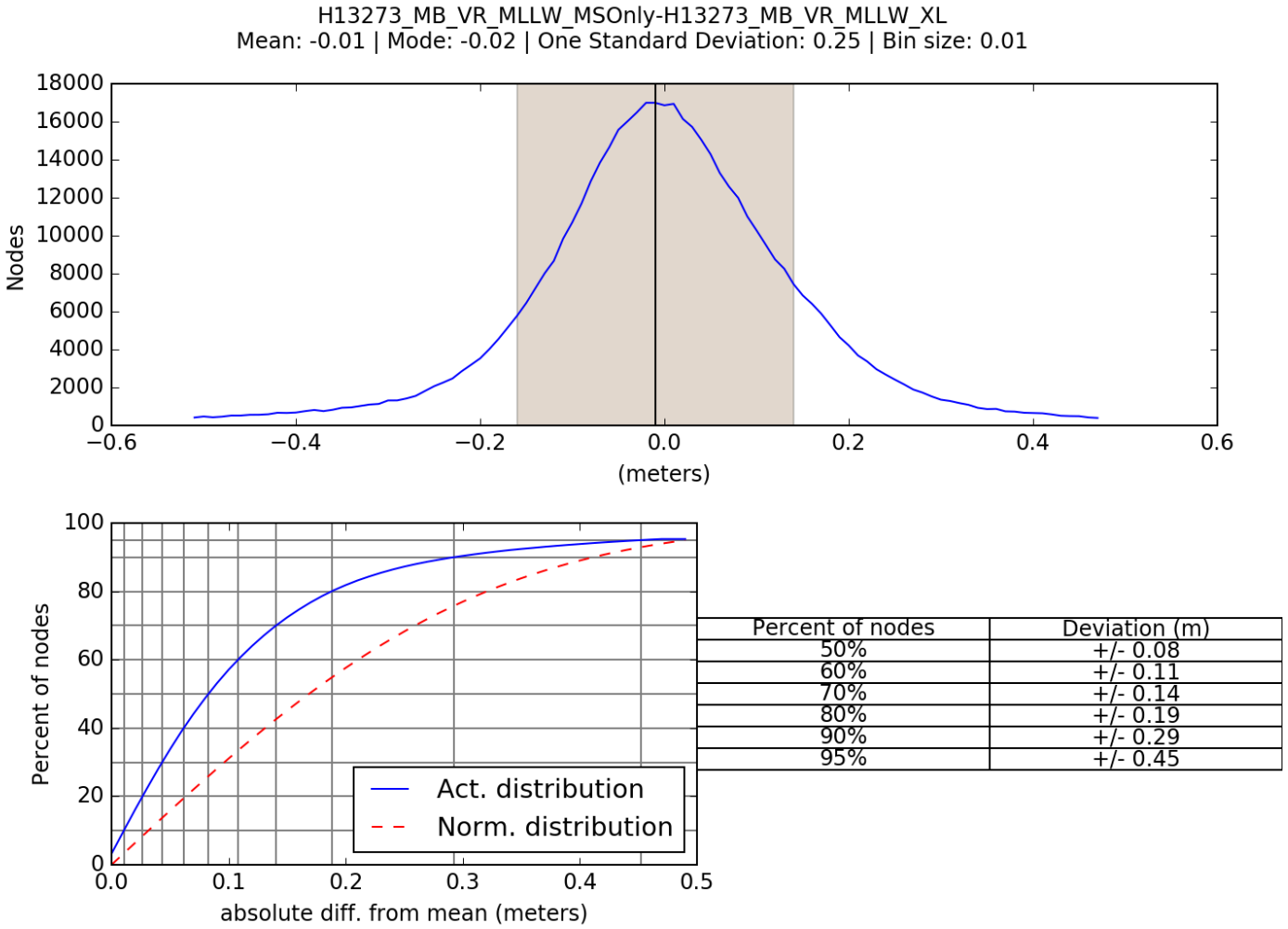


Figure 6: H13273 crossline surface overlaid on mainscheme tracklines.



Percent of nodes	Deviation (m)
50%	+/- 0.08
60%	+/- 0.11
70%	+/- 0.14
80%	+/- 0.19
90%	+/- 0.29
95%	+/- 0.45

Figure 7: Pydro derived plot showing absolute difference statistics of H13273 mainscheme to crossline data.

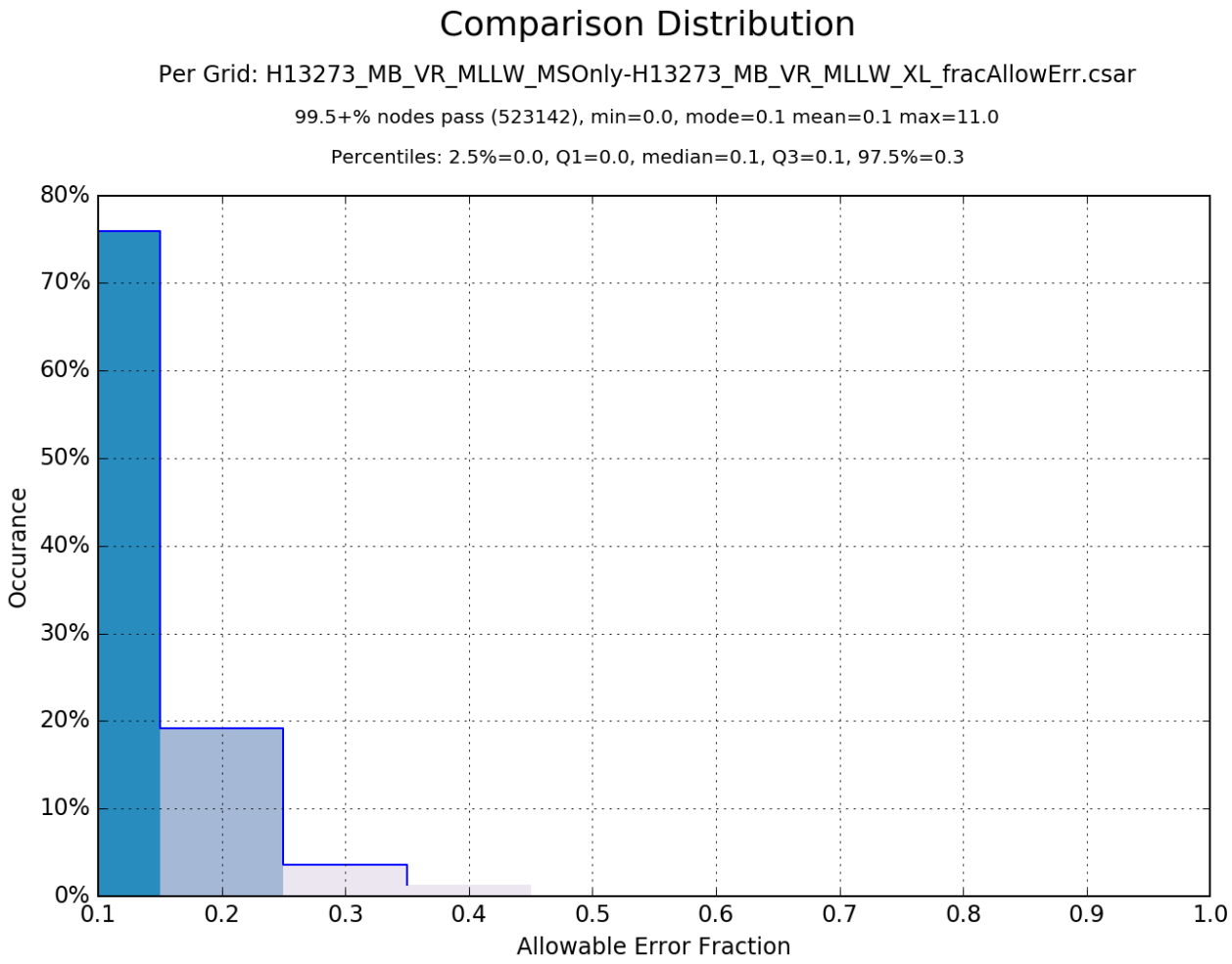


Figure 8: Pydro derived plot showing percentage-pass value of H13273 mainscheme to crossline data.

B.2.2 Uncertainty

The following survey specific parameters were used for this survey:

Method	Measured	Zoning
ERS via ERTDM	0 centimeters	12 centimeters

Table 7: Survey Specific Tide TPU Values.

Hull ID	Measured - CTD	Measured - MVP	Measured - XBT	Surface
S221	N/A meters/second	1 meters/second	N/A meters/second	0.05 meters/second
2801, 2803	3 meters/second	N/A meters/second	N/A meters/second	0.05 meters/second

Table 8: Survey Specific Sound Speed TPU Values.

Total Propagated Uncertainty (TPU) values for survey H13273 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 project instructions for the NOAA vertical datum transformation model used for this survey.

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 for position, navigation, attitude, and vessel motion data from Applanix POS MV were applied during acquisition and initially in postprocessing. However, the SBET and RMS files, which were generated using POSPac MMS software and applied in CARIS HIPS to supersede POS MV data, have post-processed uncertainties associated with the GPS height and position.

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 H13273 TVU compliance. H13273 met HSSD requirements in over 99.5 percent of grid nodes, which is shown in the histogram plot below.

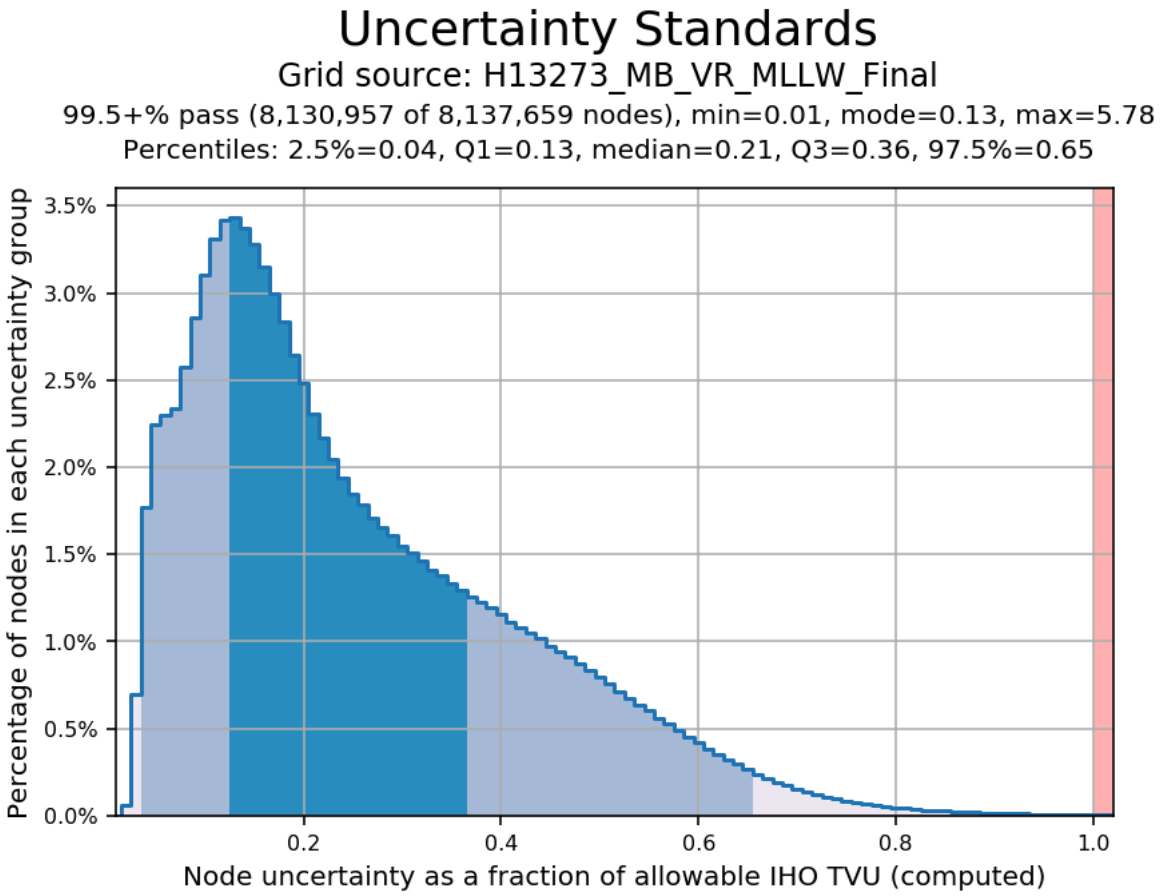


Figure 9: H13273 Uncertainty shown as a fraction of allowable uncertainty

B.2.3 Junctions

H13273 junctions with one contemporary survey conducted by NOAA Ship RAINIER. 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
H13271	1:5000	2019	NOAA Ship RAINIER	S

Table 9: Junctioning Surveys

H13271

The junction with survey H13271 encompassed approximately 0.72 square nautical miles along the southern boundary of H13273. Pydro's Compare Grids results showed that 99.5+% of nodes in the common area met NOAA allowable error standards. Analysis of the difference surface indicated that H13273 is an average of 0.03 meters deeper than H13271 with a standard deviation of 0.15 meters. See figures 10-12 for more information.

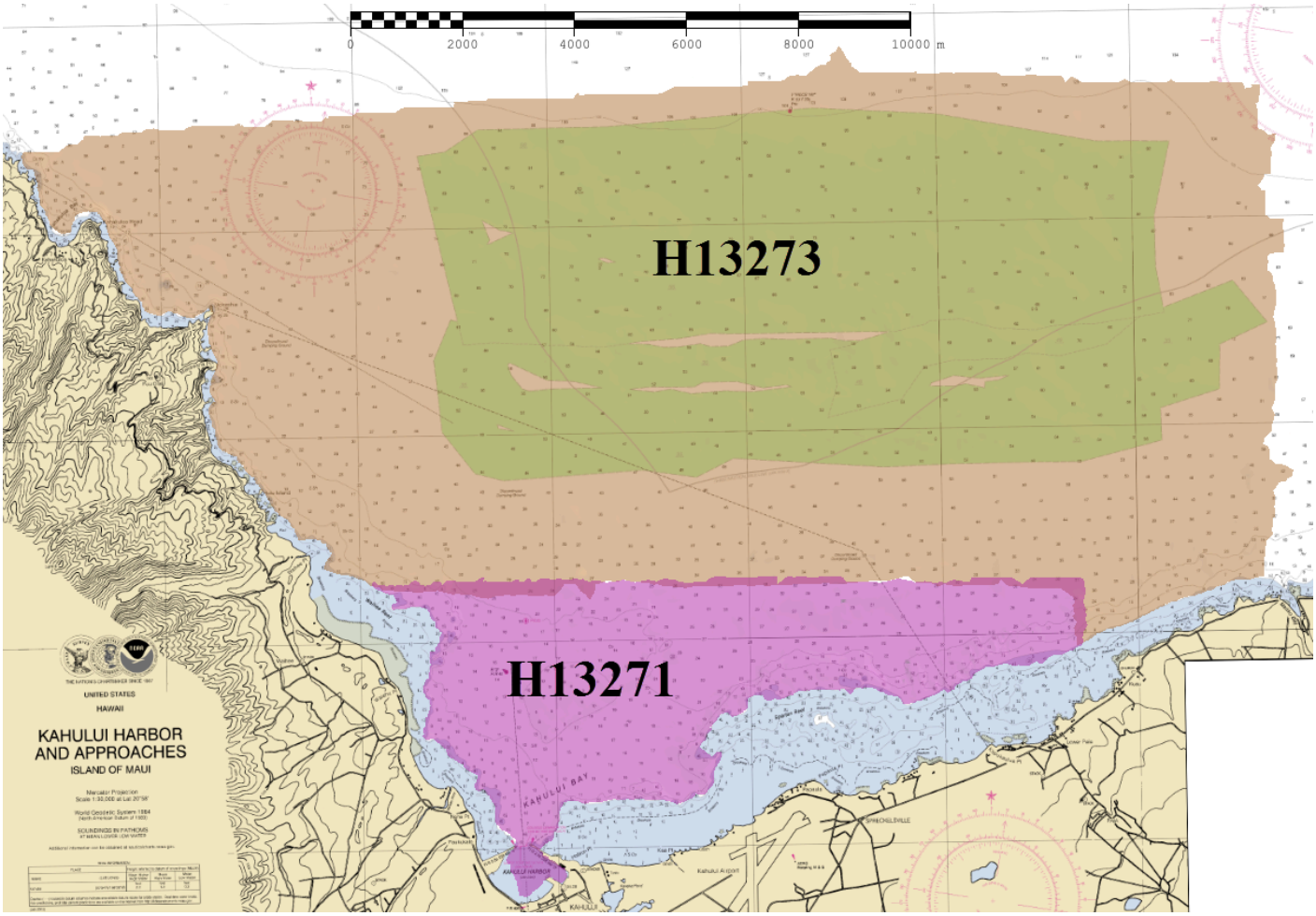


Figure 10: Overview of survey junction between H13271 and H13273.

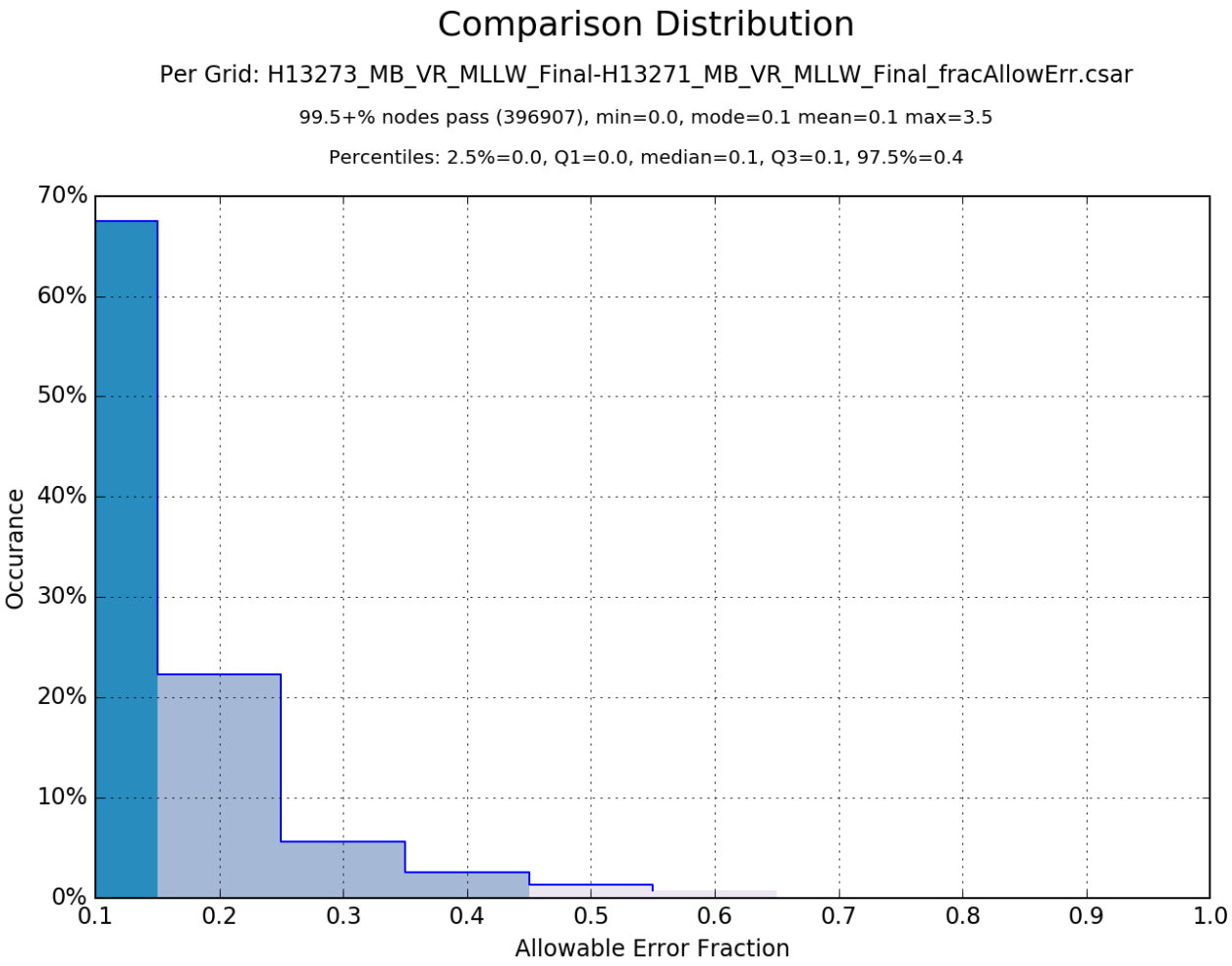
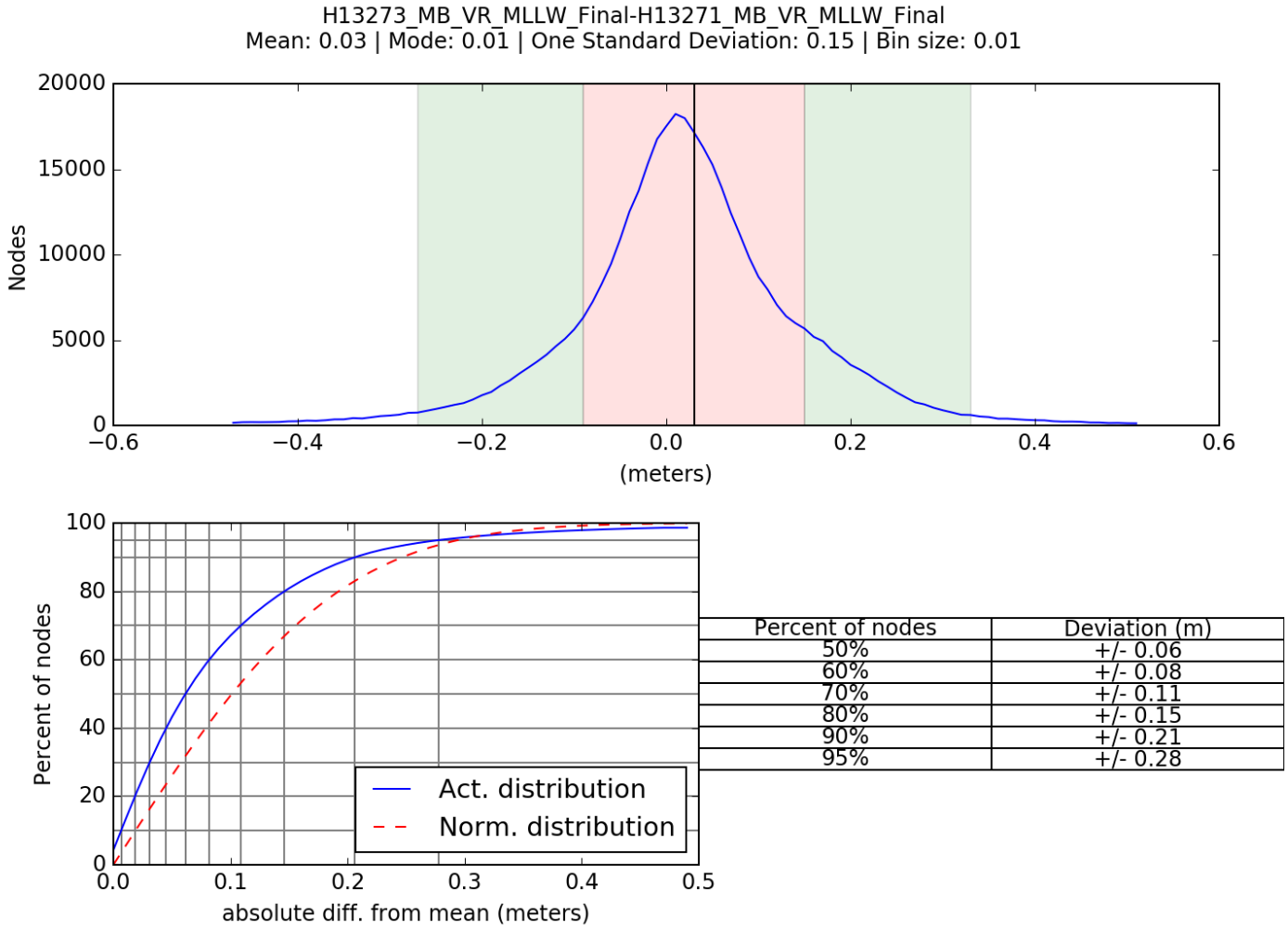


Figure 11: Pydro derived plot showing allowable error between H13271 and H13273.



Percent of nodes	Deviation (m)
50%	+/- 0.06
60%	+/- 0.08
70%	+/- 0.11
80%	+/- 0.15
90%	+/- 0.21
95%	+/- 0.28

Figure 12: Pydro derived plot showing H13271 and H13273 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

Excessive Biofouling

Due to the warm water temperatures of the survey area and the extended period of time that RAINIER launches remained in the water with no antifouling hull coating, the sonar transducers and the SVP 70

surface sound velocity probe suffered from a significant amount of biofouling during the project. An increase in the noise of the data can not be directly attributed to the fouled sonars, but should be noted as a possible contributing factor to observed noise in the data.

Figure 13: RAINIER launch EM 2040 transducer with biofouling in the process of being cleaned.

B.2.6 Factors Affecting Soundings

Significant Sea State

Data acquired in the nearshore areas of H13273 were acquired by RAINIER launches 2801 and 2803, while offshore data were acquired by RAINIER. The offshore portion was generally delineated by a half-mile

buffer off of the charted shoreline. Due to the propensity of the area to experiencing strong trade winds, sea states on a typical survey day ranged from 4-6 feet. This resulted in excessive noise and "blowouts" in the data throughout the nearshore launch-acquired areas. Data that were obvious noise or found to be causing fliers in the surface were rejected by the hydrographer.

B.2.7 Sound Speed Methods

Sound Speed Cast Frequency: Fifty three sound speed profiles were acquired for this survey at discrete locations within the survey area at least once every four hours for launches and once per hour for RAINIER, as well as when significant changes in surface sound speed were observed, or when operating in a new area. 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.

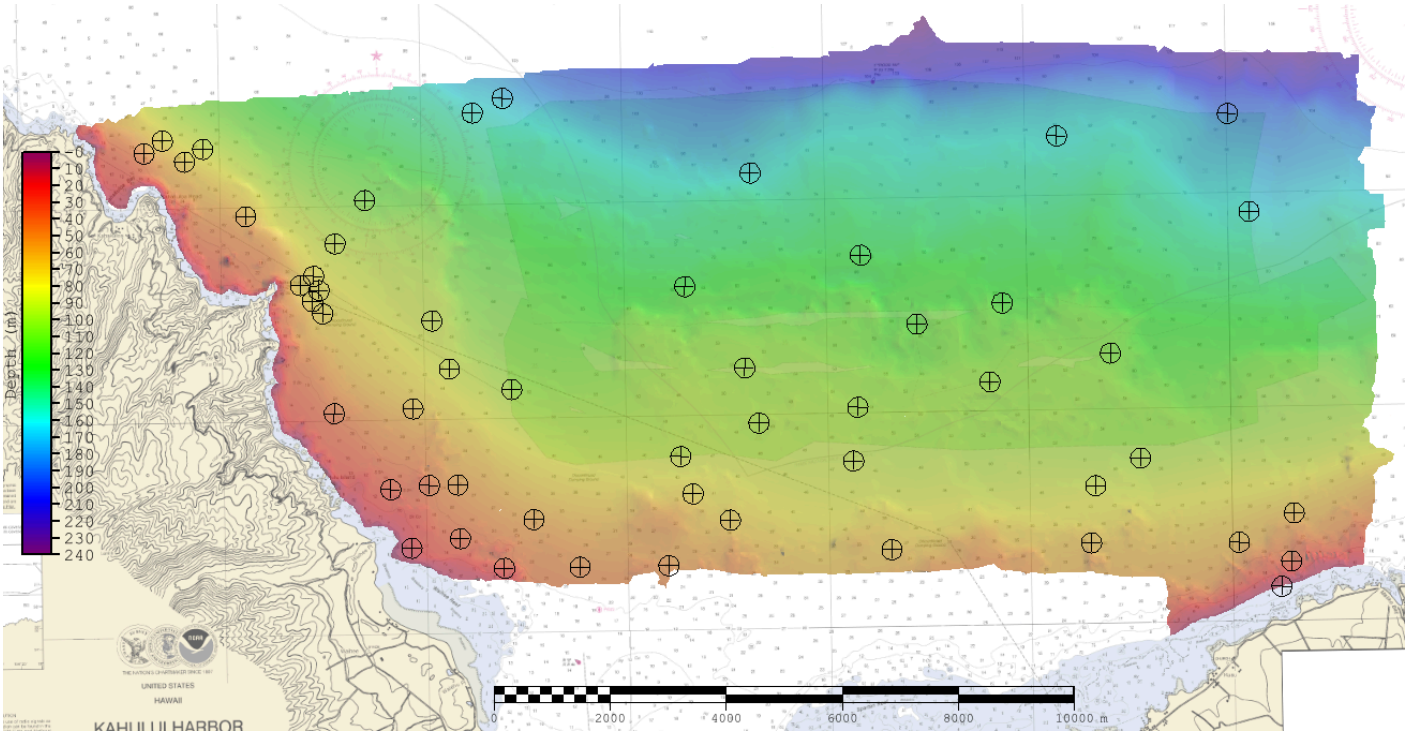


Figure 14: Sound speed cast locations for H13273, with all 53 casts depicted by black crosshairs

B.2.8 Coverage Equipment and Methods

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

B.2.9 Fliers

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. Two of these four fliers are located on the nearshore boundary of coverage where the seafloor rises sharply. The two others are located on the edges of a charted rock where the seafloor slopes up steeply as well. The results of the Detect Fliers tool are included as a .000 files in the Separates section of this report.

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.

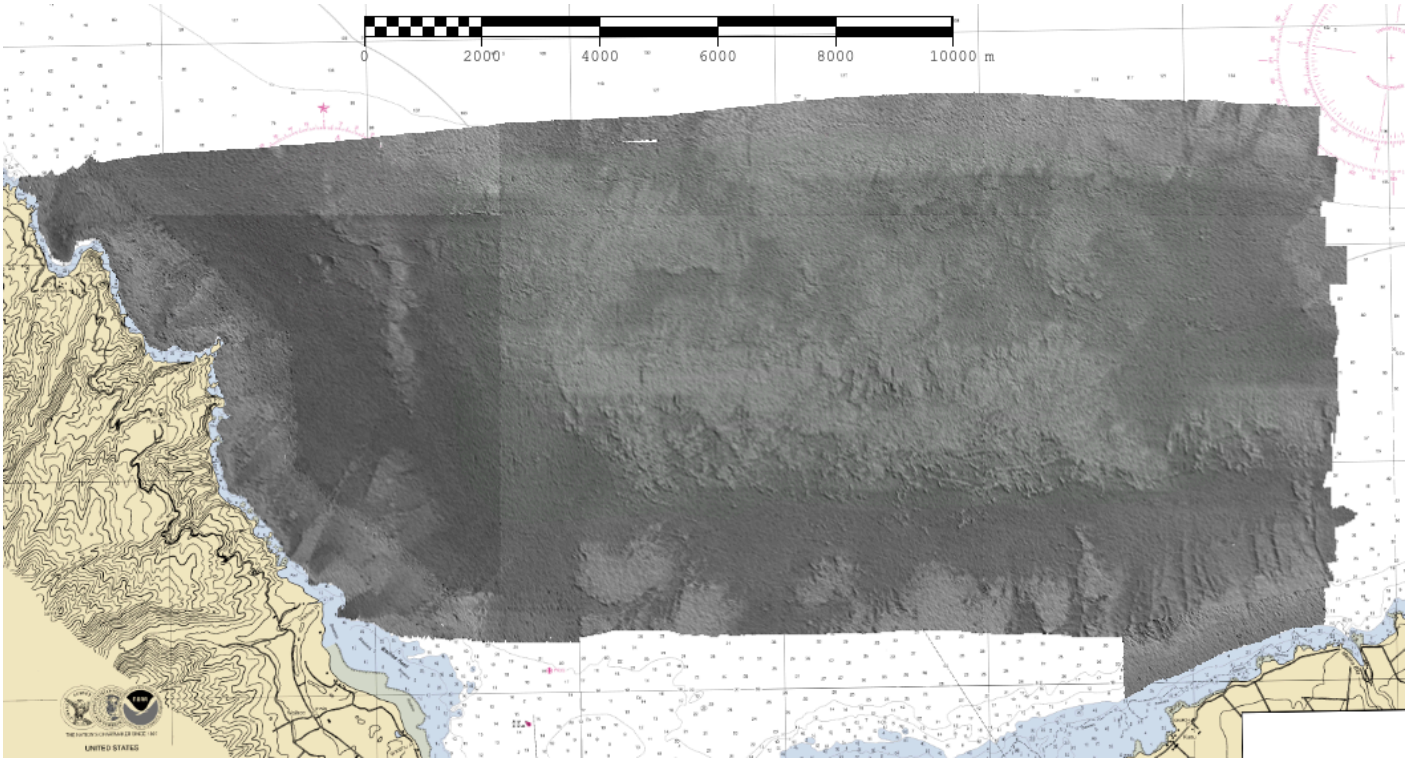


Figure 15: Acoustic backscatter mosaic for H13273

B.5 Data Processing

B.5.1 Primary Data Processing Software

The following Feature Object Catalog was used: NOAA Profile Version 2019 2.0.

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
H13273_MB_VR_MLLW	CARIS VR Surface (CUBE)	Variable Resolution	2.6 meters - 239.1 meters	NOAA_VR	Complete MBES

Surface Name	Surface Type	Resolution	Depth Range	Surface Parameter	Purpose
H13273_MB_VR_MLLW_Final	CARIS VR Surface (CUBE)	Variable Resolution	2.2 meters - 239.1 meters	NOAA_VR	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 2019 HSSD.

Three critical soundings were created for this survey; one was identified as a Danger to Navigation. Additional information about DTONS is included in section D.1 Chart Comparison.

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 ERTDM	OPR-T383-RA-19_ERTDM_NAD83(2011)_MLLW_ext.csar OPR-T383-RA-19_ERTDM_NAD83(2011)_MHW_ext.csar

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 4.

The following PPK methods were used for horizontal control:

- RTX

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

A comparison was made between H13273 survey data and Electronic Navigation Chart (ENC) US5HA22M using CUBE finalized VR surfaces, selected soundings and contours created in Caris HIPS.

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
US5HA22M	1:30000	17	08/02/2017	09/27/2019

Table 12: Largest Scale ENCs

D.1.2 Shoal and Hazardous Features

One previously charted UWTROC located approximately 600 meters offshore was found 25 meters from its charted position. The previously charted rock is attributed for deletion and a new rock is attributed in the location shown by the survey data in the final feature file.

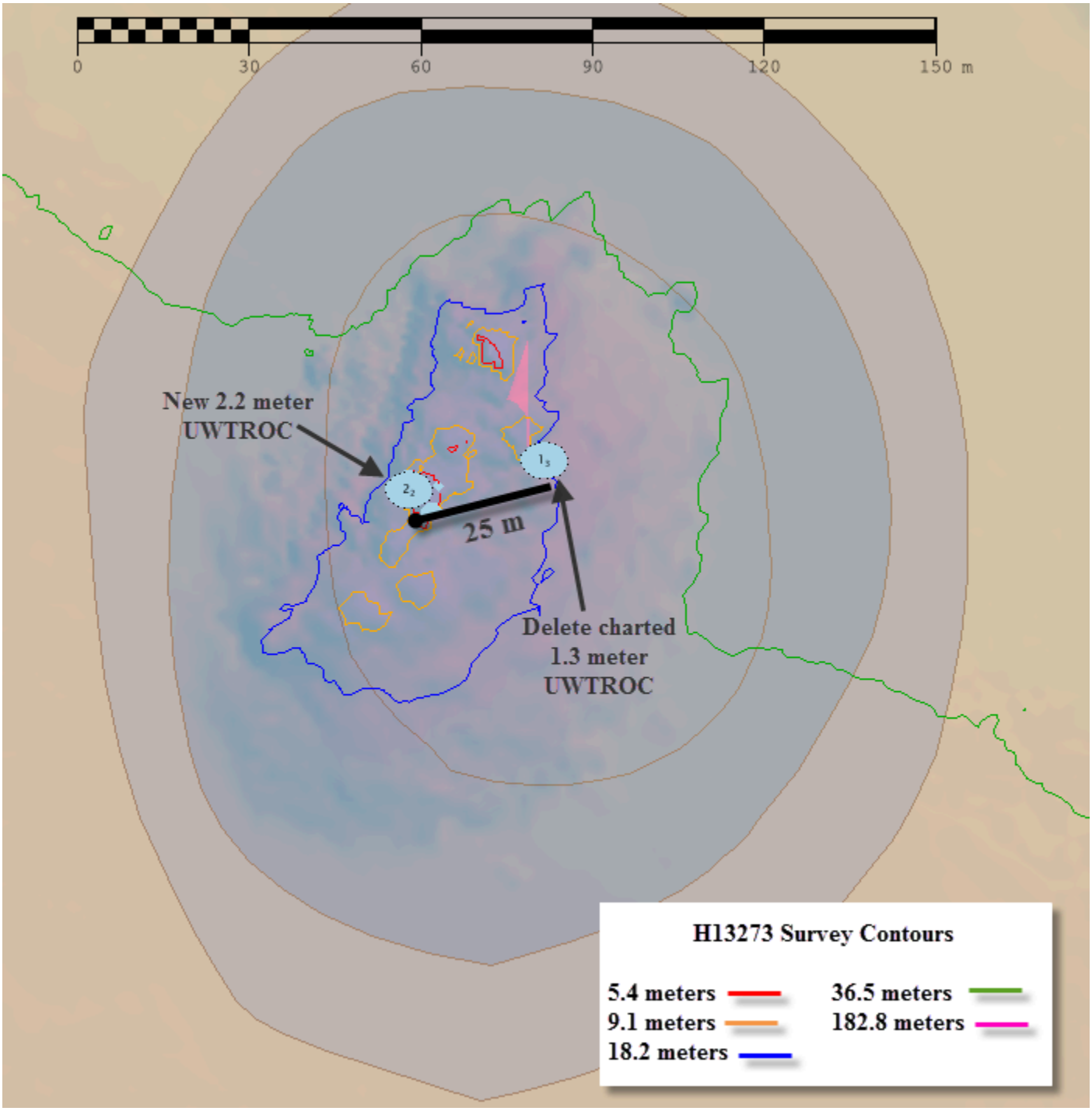


Figure 16: Location of previously charted rock and location shown in survey data.

D.1.3 Charted Features

No charted features attributed as "P.A." (Position Reported), "E.D." (Existence Doubtful), "P.D." (Position Doubtful), or "Rep" (Reported, with year) exist for this survey.

The ENC does contain three SWPARE area features that were swept in 1936-1937 for previously undetected dangers to navigation. These areas have been addressed with complete coverage multibeam data and the hydrographer recommends their removal from the chart. These areas can be seen in figure 19.

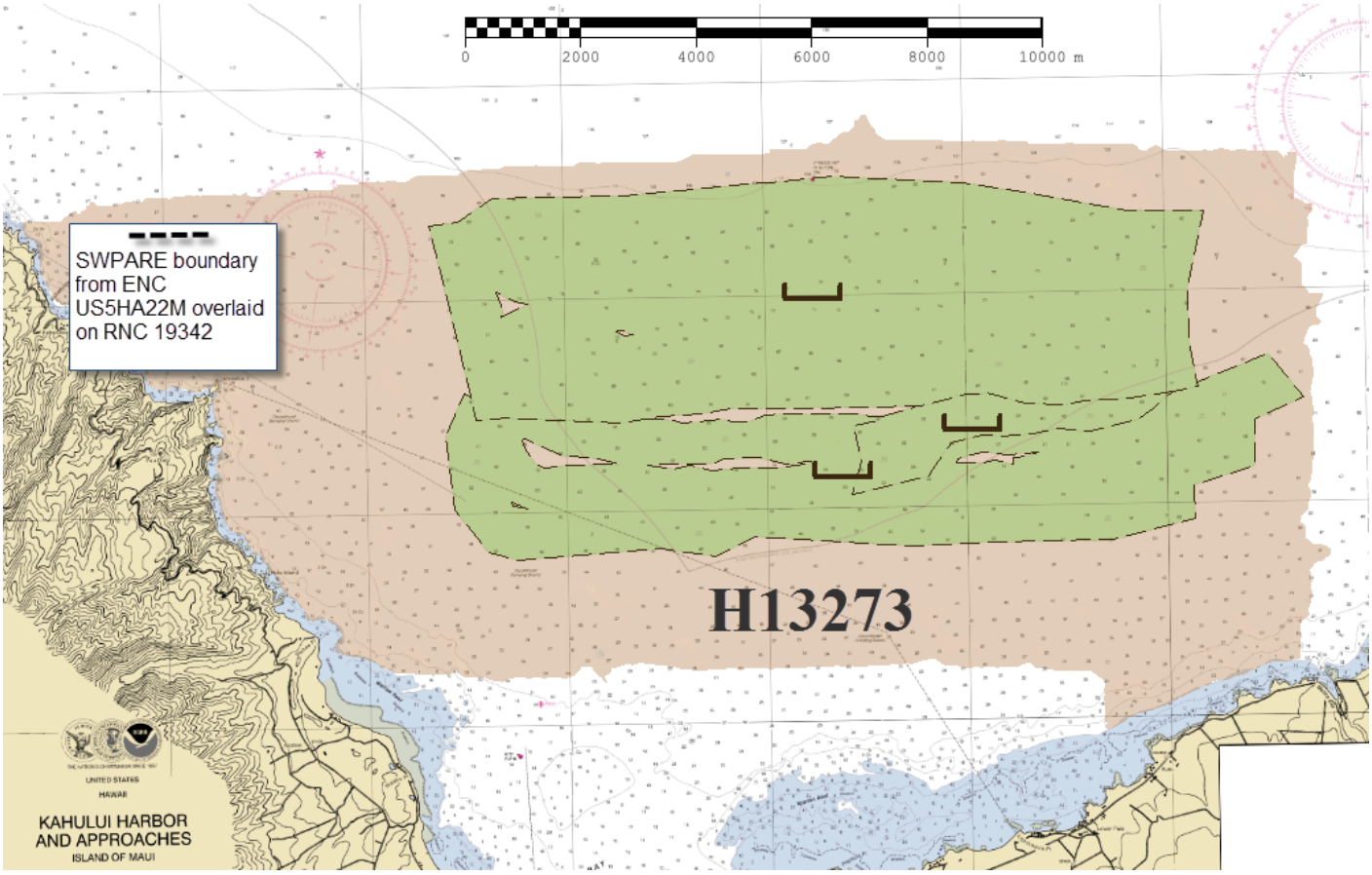


Figure 17: SWPARE area features from ENC US5HA22M, overlaid on H13273 coverage (brown), and RNC 19342. The swept area features are also represented on the RNC by the green tint in the center of the survey area.

D.1.4 Uncharted Features

One Danger to Navigation (DTON) was submitted with this survey. A 5.47 meter (~3 fathom) sounding was found in survey data in a position between the 9.1 and 18.2 meter (5 and 10 fathom) charted depth curves, approximately 200 meters offshore. The ENC has since been updated to reflect this DTON, as shown in figure 20, and it is included in the final feature file. Correspondence reflecting the submission of this DTON can be found in the separates section included with this report.

Additionally, a previously uncharted 13.3 meter shoal was discovered adjacent to a charted 23.7 meter ENC sounding. The shoal can be seen in figure 21, and is represented in the finalized surface, not in the final feature file.

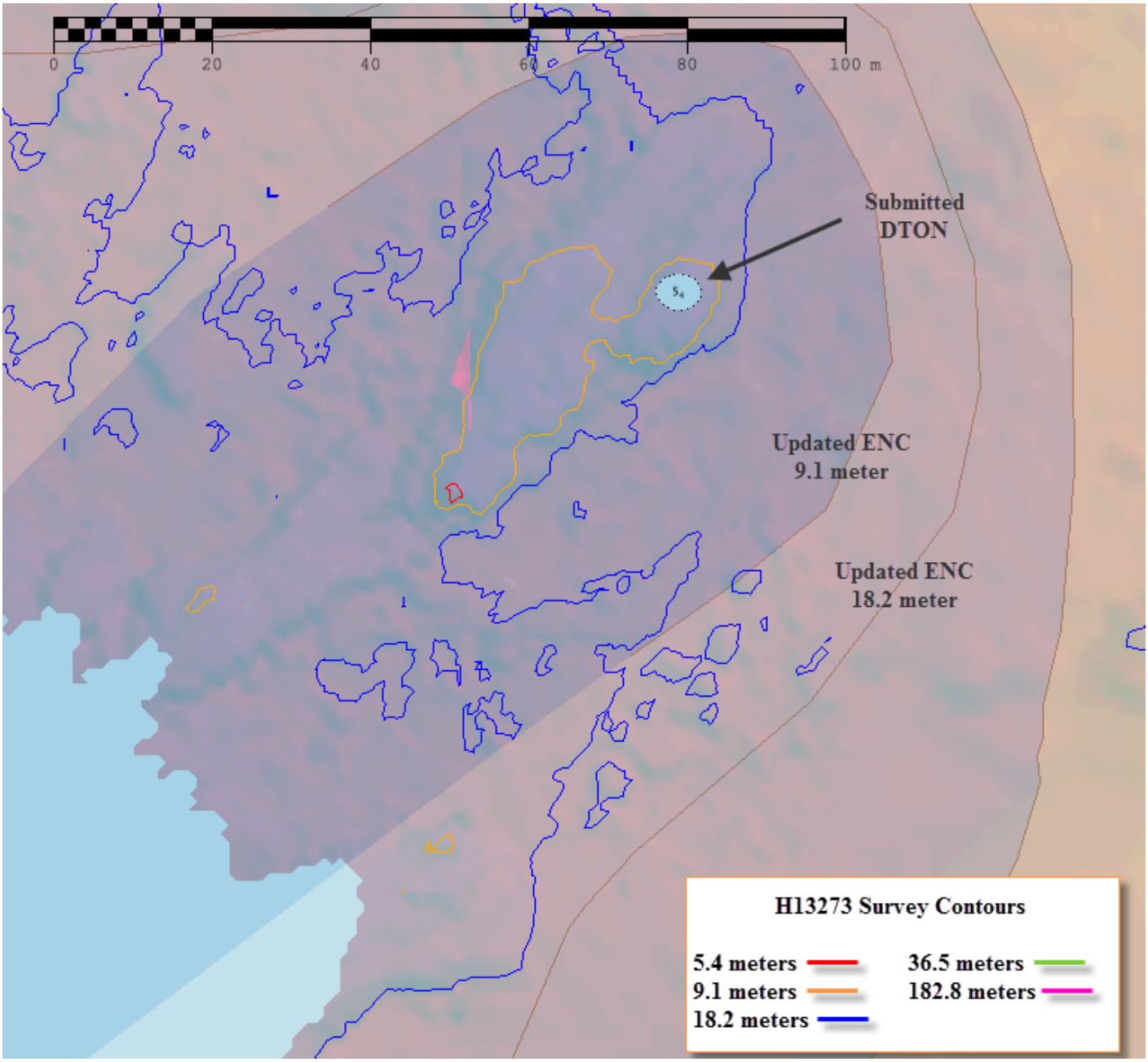


Figure 18: 5.5 meter (3 fathom) sounding submitted as DTON. ENC has since been updated to reflect submitted DTON.

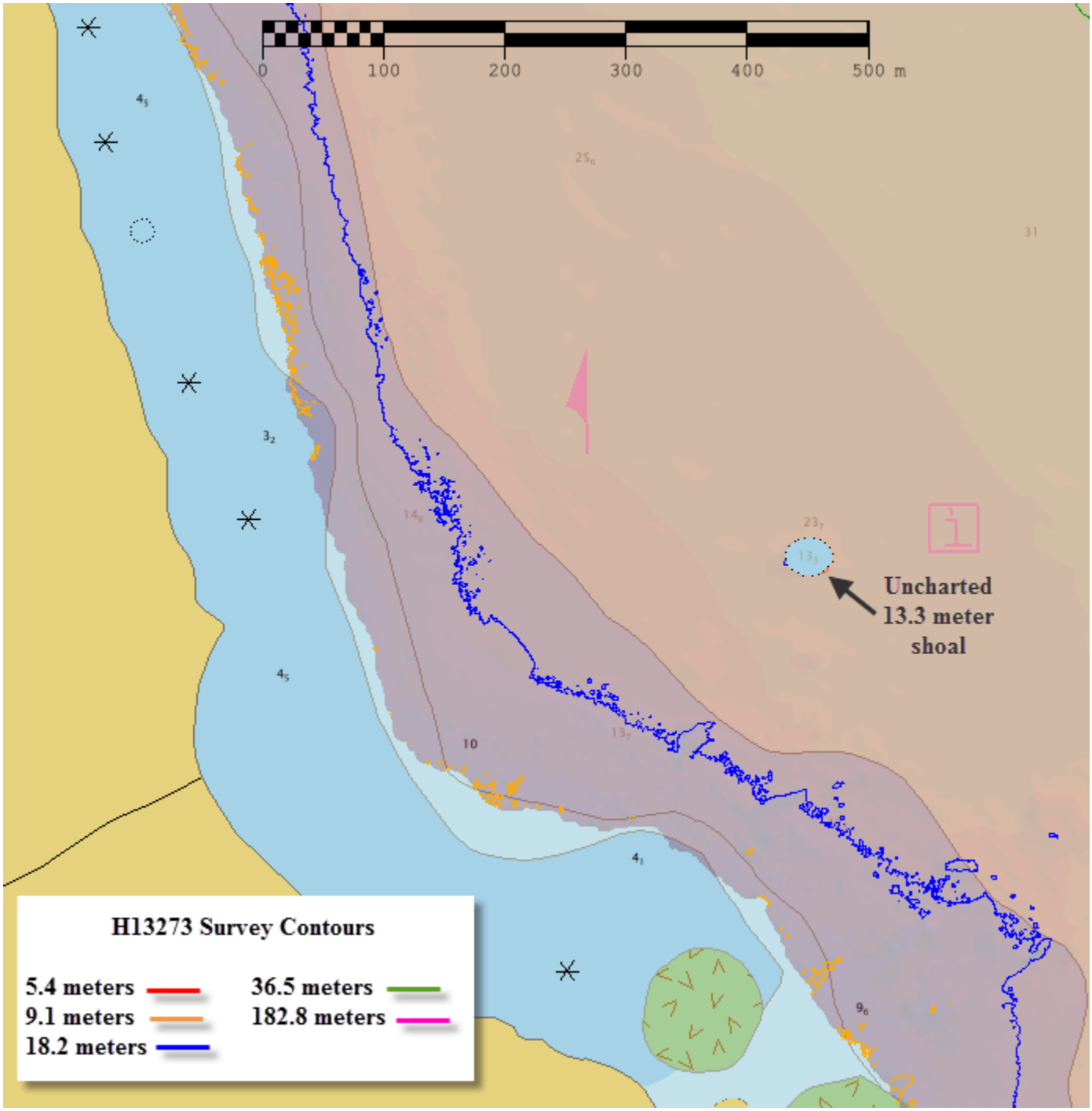


Figure 19: 13.3 meter uncharted shoal outside of charted 18.2 meter/10 fathom contour, not included in final feature file. Soundings in meters.

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

The Pacific Islands Ocean Observing System (PacIOOS) Wave Buoy 187: Pauwela, Maui. The buoy, a privately maintained lighted environmental buoy, was not observed during nighttime or daytime survey operations. PacIOOS data reports the buoy as being removed during the survey dates, and it is therefore attributed for retention 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 and/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 insets 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
Samuel F. Greenaway CDR/NOAA	Chief of Party	01/17/2020	GREENAWAY.SAMUEL.F.1275635347 Digitally signed by GREENAWAY.SAMUEL.F.1275635347 Date: 2020.01.24 07:58:22 -08'00'
Hadley Owen LT/NOAA	Field Operations Officer	01/17/2020	Digitally signed by OWEN.HADLEY.ANNE.1410967070 Date: 2020.01.24 07:47:45 -08'00'
James B. Jacobson	Chief Survey Technician	01/17/2020	JACOBSON.JAMES.BRYAN.1269664017 I have reviewed this document 2020.01.24 08:35:04 -08'00'
Nick Azzopardi LTJG/NOAA	Sheet Manager	01/17/2020	Digitally signed by AZZOPARDI.NICHOLAS.JAMES.1539165093 Date: 2020.01.24 06:53:46 -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