H13277

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

DESCRIPTIVE REPORT

Type of Survey:	Navigable Area
Registry Number:	H13277

LOCALITY

State(s):	Hawaii
General Locality:	Hawaiian Islands and Vicinity
Sub-locality:	Barbers Point Harbor and Vicinity

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

H13277

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:	**Barbers Point Harbor and Vicinity**
Scale:	**5000**
Dates of Survey:	**09/18/2019 to 09/18/2019**
Instructions Dated:	**06/28/2019**
Project Number:	**OPR-T383-RA-19**
Field Unit:	**NOAA Ship Rainier (S221)**
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:

The purpose of this survey is to provide contemporary surveys to update National Ocean Service (NOS) nautical charts. All separates are filed with the hydrographic data. Any revisions to the Descriptive Report (DR) generated during office processing are shown in bold red italic text. The processing branch maintains the DR as a field unit product, therefore, all information and recommendations within the body of the DR are considered preliminary unless otherwise noted. The final disposition of surveyed features is represented in the OCS nautical chart update products. All pertinent records for this survey, including the DR, are archived at the National Centers for Environmental Information (NCEI) and can be retrieved via http://www.ncei.noaa.gov/.

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Descriptive Report to Accompany Survey H13277

Project: OPR-T383-RA-19

Locality: Hawaiian Islands and Vicinity

Sublocality: Barbers Point Harbor and Vicinity

Scale: 1:5000

September 2019 - September 2019

NOAA Ship *Rainier*

Chief of Party: Benjamin K. Evans, CAPT/NOAA

A. Area Surveyed

The survey is referred to as H13277, "Barbers Point Harbor and Vicinity" (sheet 7), within the Project Instructions. The surveyed area encompasses approximately 4.98 square nautical miles within the sheet limits and an additional 10.42 square nautical miles of extended coverage for a total of 15.5 square nautical miles of Oahu's southeastern coast, extending from Kalaeloa to Kahe Point.

A.1 Survey Limits

Data were acquired within the following survey limits:

Northwest Limit	Southeast Limit
21° 21' 0" N 158° 11' 60" W	21° 15' 0" S 158° 6' 36" E

Table 1: Survey Limits

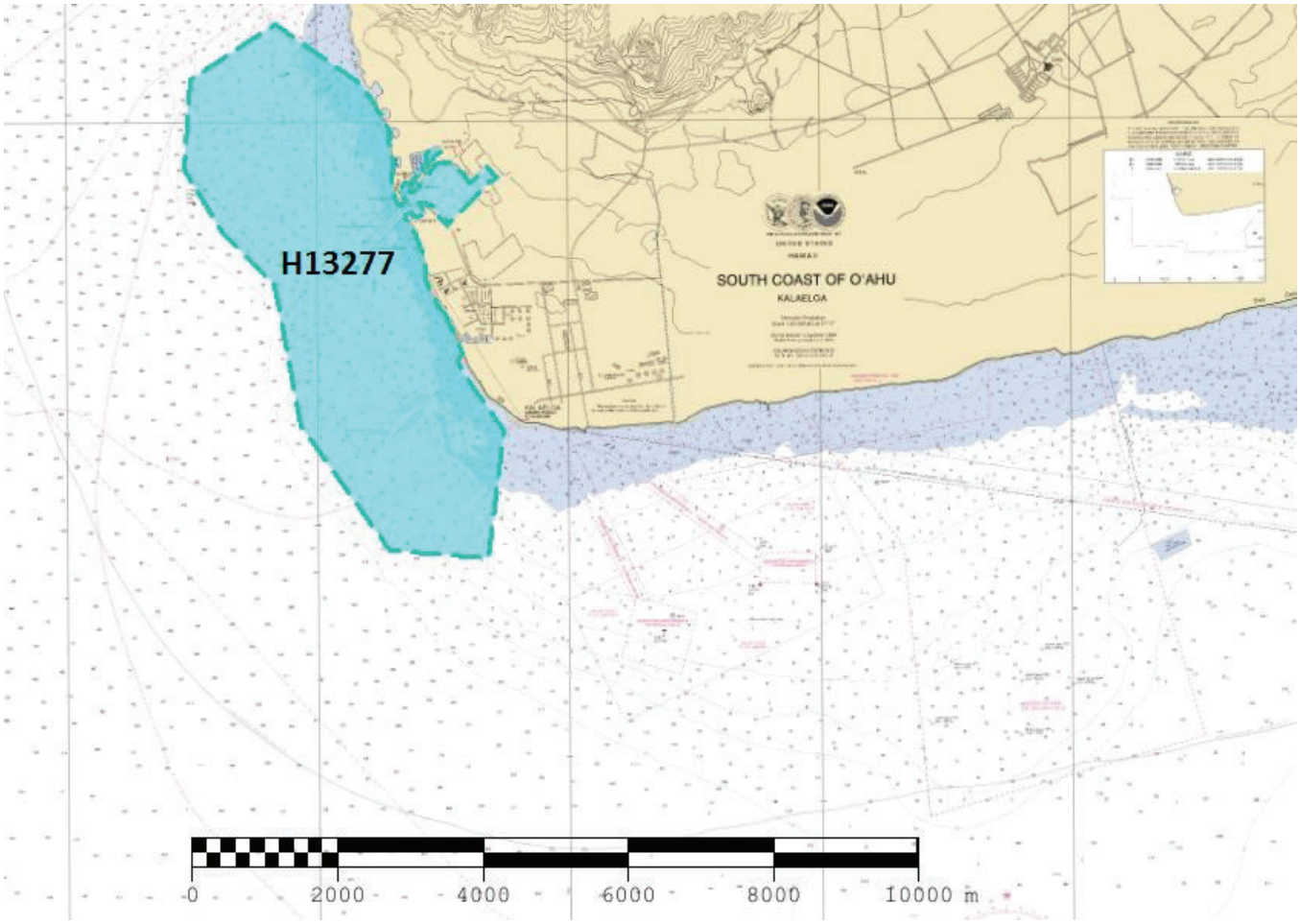


Figure 1: H13277 assigned survey area (Chart 19362).

Data were acquired within the assigned limits as required in the Project Instructions and HSSD unless otherwise noted.

A.2 Survey Purpose

The project area is heavily trafficked by container ships, tankers, barges, commercial and recreation fishing vessels, and tourism industry vessels. Barbers Point Harbor has a number of specialized cargo handling facilities such as cement pump system and storage, not found within Honolulu Harbor. It is also home to sport fishing and sightseeing vessels. Despite the volume of maritime traffic, the vast majority of bathymetric data in the project area were acquired prior to 1984. These data will provide modern bathymetry for updating National Ocean Service Nautical charting products as well as support the Seabed 2030 global mapping initiative. Survey data from this project are intended to supersede all prior survey data in the common area.

A.3 Survey Quality

The entire survey is adequate to supersede previous data.

QC Tools was used to analyze H13277 multibeam echosounder (MBES) data density. The submitted H13277 variable-resolution (VR) surface met HSSD density requirements as shown in the histograms below.

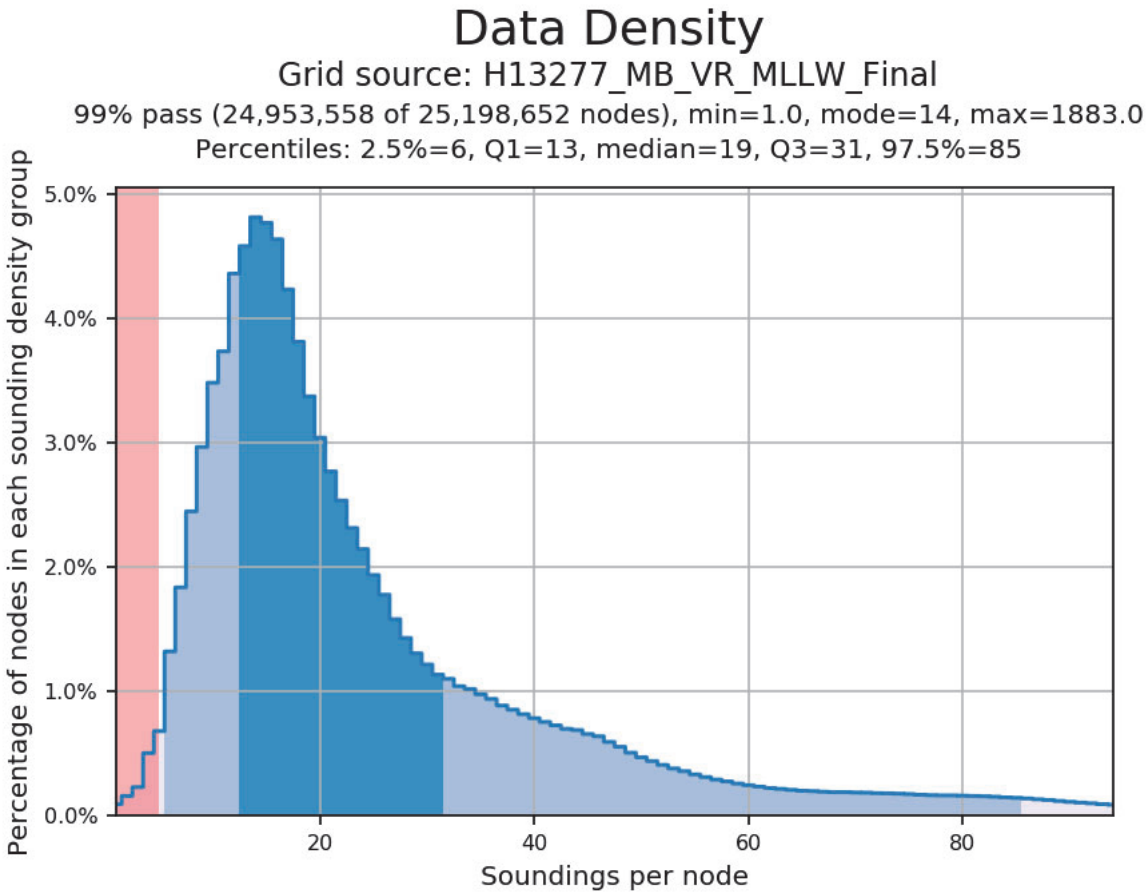


Figure 2: Pydro derived plot showing HSSD density compliance of H13277 finalized variable-resolution MBES data.

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	Object Detection Coverage (Refer to HSSD Section 5.2.2.2)

Table 2: Survey Coverage

Survey coverage was extended beyond the assigned sheet limits as per request of the Commanding Officer as an opportunity to collect additional data in the area; see Figure 7 below for more detail.

Object Detection multibeam echosounder (MBES) coverage was acquired to the inshore limit of hydrography, the Navigable Area Limit Line (NALL). As specified in the Project Instructions, the NALL for areas outside of harbors is 10 meters water depth and 3.5 meters water depth inside of harbors. Areas where survey coverage did not reach the assigned sheet limits were due to the survey vessel reaching the extent of safe navigation, or NALL, as shown in Figure 3 below. These areas are characterized as being near shore, subject to dangerous wave action, or other hazards such as docked ships or mooring. Furthermore, the Malakole Harbor was not surveyed because permission to enter the area was not provided by the Harbor Master.

All data acquisition for this survey occurred on a single day. Therefore, holidays were not able to be identified within the time constraints of the project. Additionally, the entire surveyed area was processed as Object Detection. As a result, there were 540 certain and 12 possible holidays identified, primarily on the eastern shoalest area of the survey and outside of Barbers Point Harbor (see Figure 4). Review of holidays present in the data were determined to be the result of gaps in coverage, acoustic shadows, and transition in resolution. A majority of the holidays were present in the 9-13 meter depth range where a ledge created acoustic shadows. A significant number of holidays were also created in the 30-40 meter depth range and are believed to be the result of the variable resolution surface transitioning from an object detection resolution to complete coverage. All holidays were reviewed and determined that they do not impede the reliability of the data.

Following Rainier's standard procedure, a submission variable resolution was created using ranges for the estimation method. Unfortunately, this method created false holidays near the junctions of crosslines and mainscheme data where data density was good, as shown in the figure below. After review, these holidays were determined to be a false representation of the actual seafloor in VR surface due to an unknown error caused by using the depth ranges estimation method to create the variable resolution CUBE surface. Increasing the maximum grid size to 128 reduced, but did not eliminate these false holidays. The problem was resolved by creating the variable resolution CUBE surface using the Calder-Rice Density estimation method with HSD recommended settings instead of the typical depth ranges estimation method.

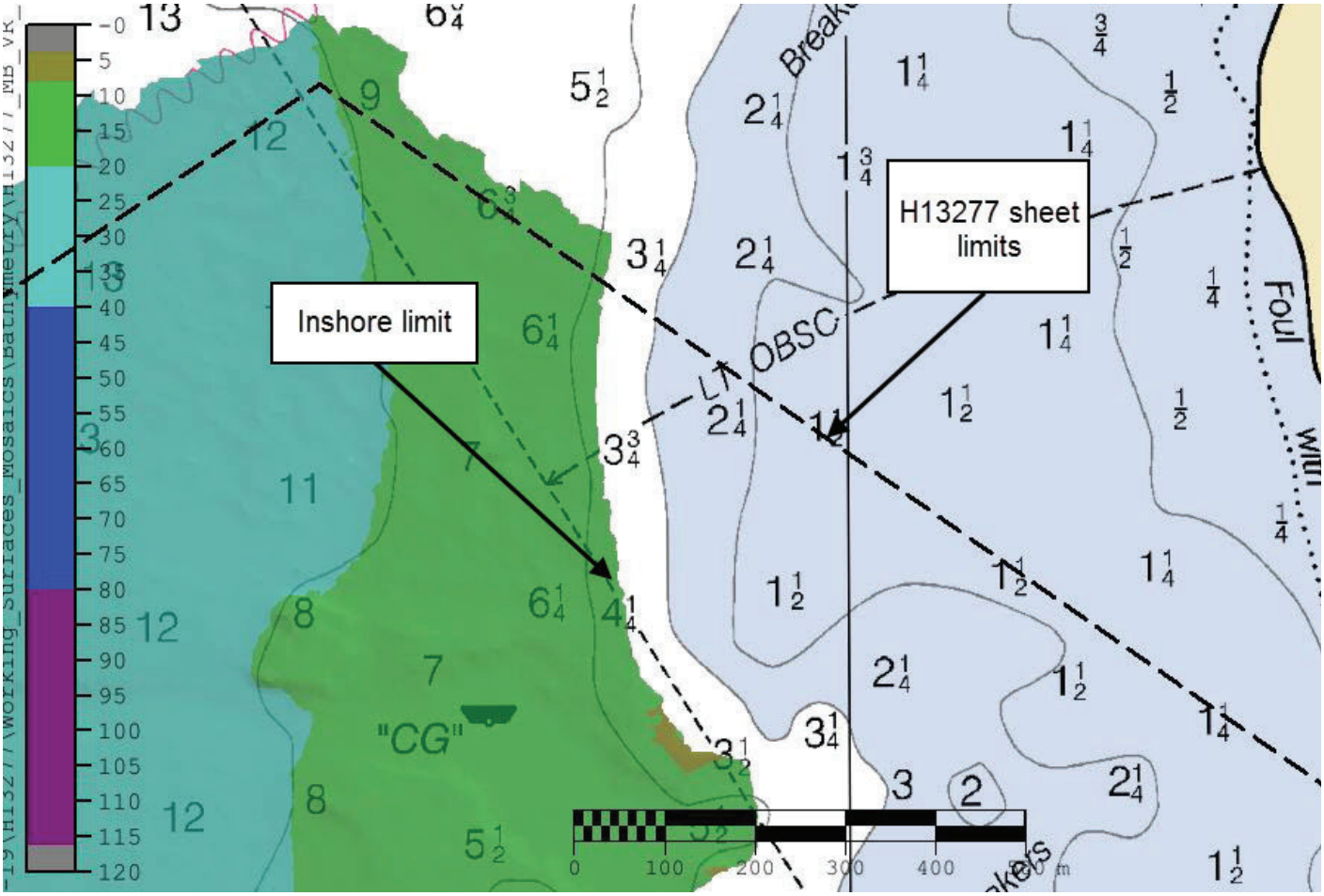


Figure 3: Examples of H13277 NALL determination: The black dashed line indicates sheet limits and the green area indicates areas where the 10-meter contour was reached.

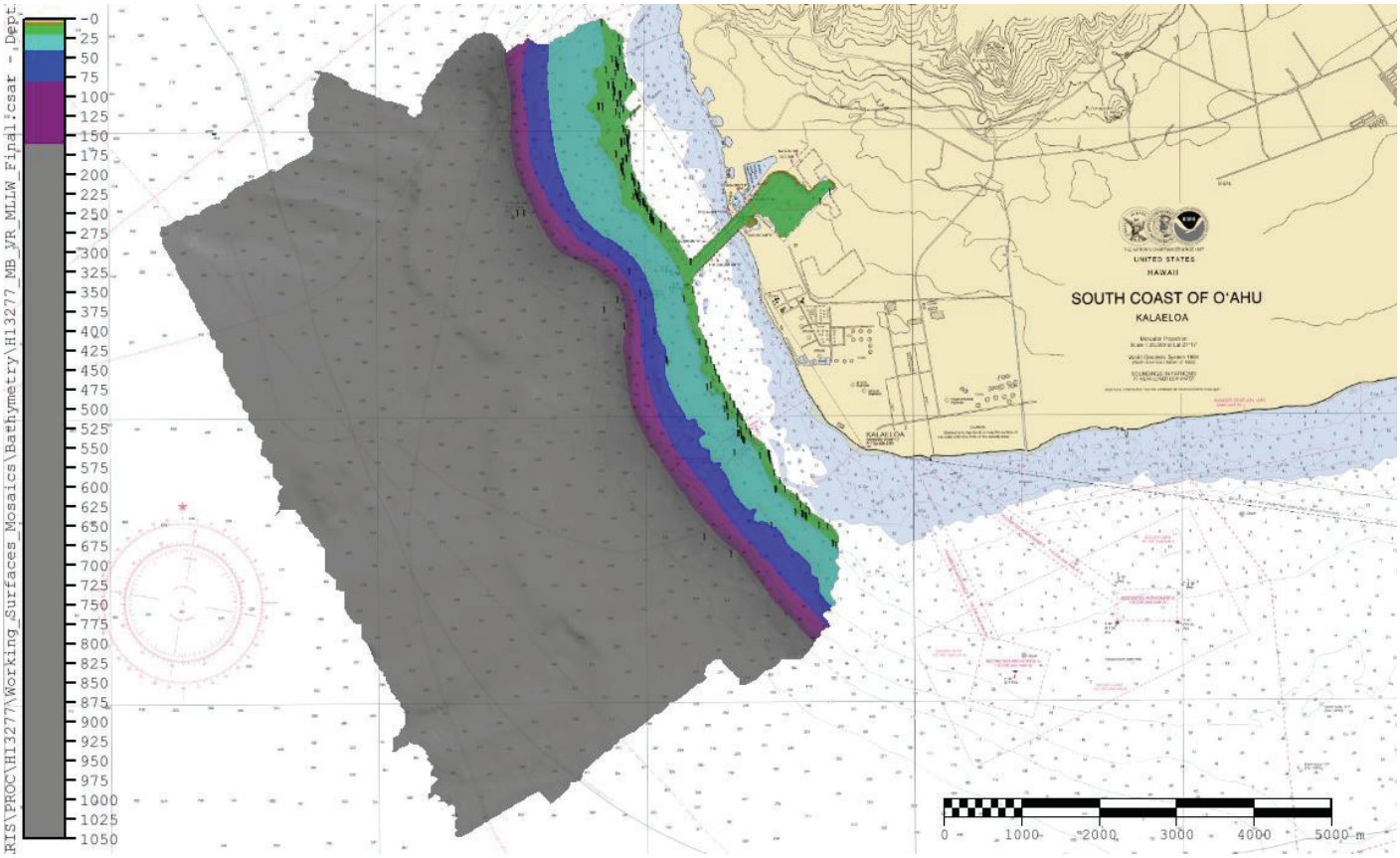


Figure 4: All holidays identified using QC Tools. Holidays shown in black.

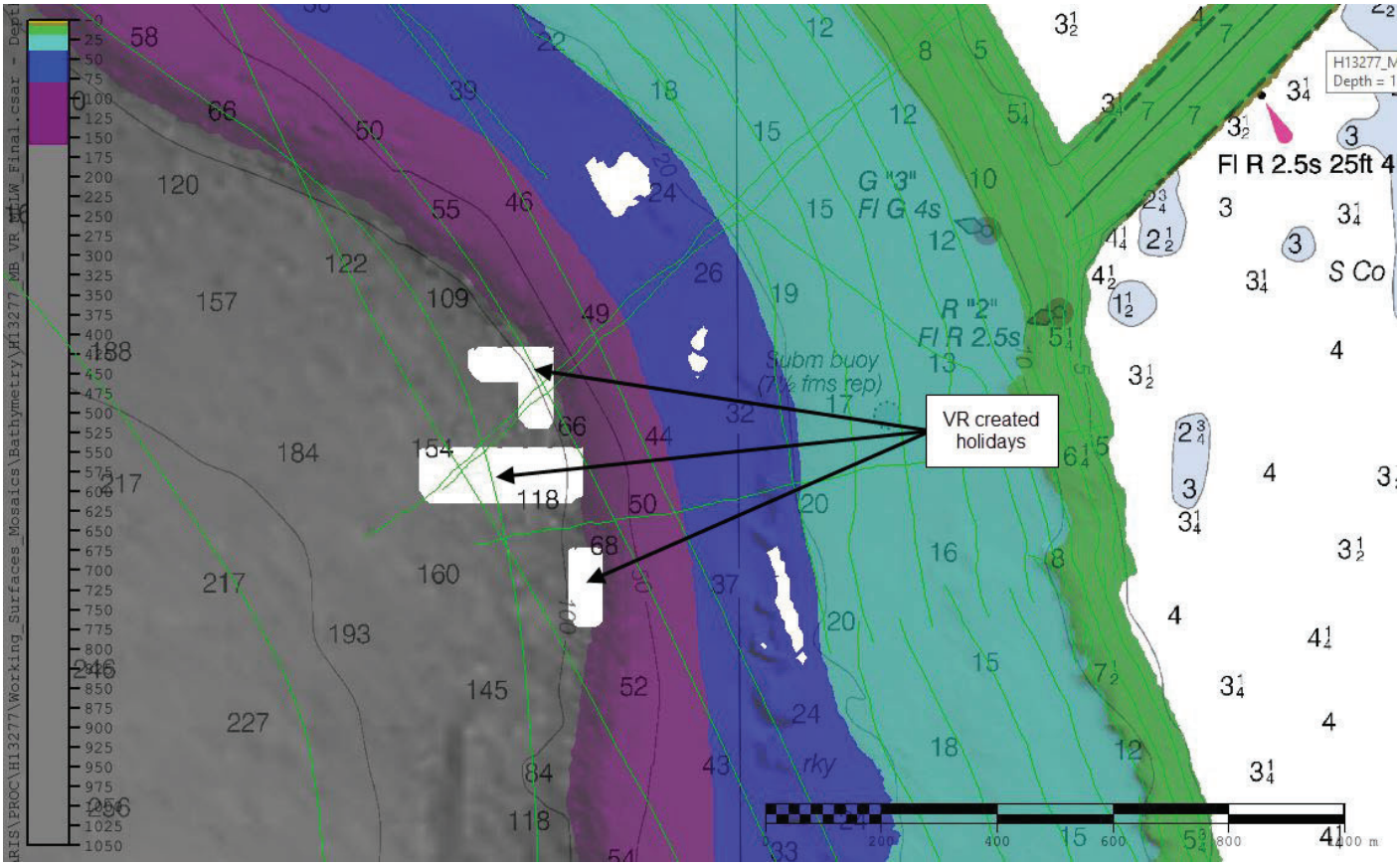


Figure 5: Example of false holidays created using depth ranges estimation method. Vessel track lines in green.

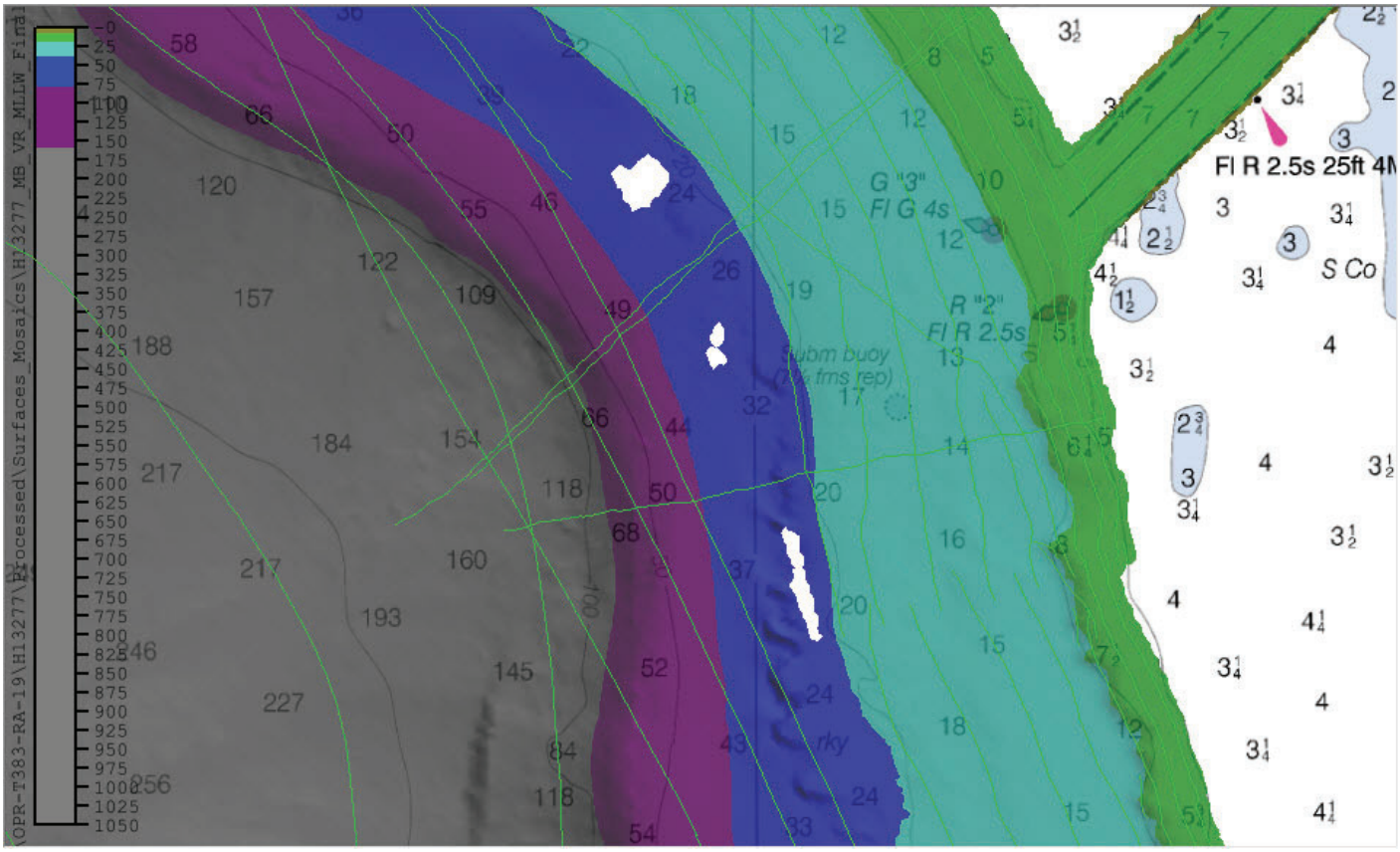


Figure 6: False holidays are no longer present using the Calder-Rice Density estimation method leaving behind only real holidays. Vessel track lines in green.

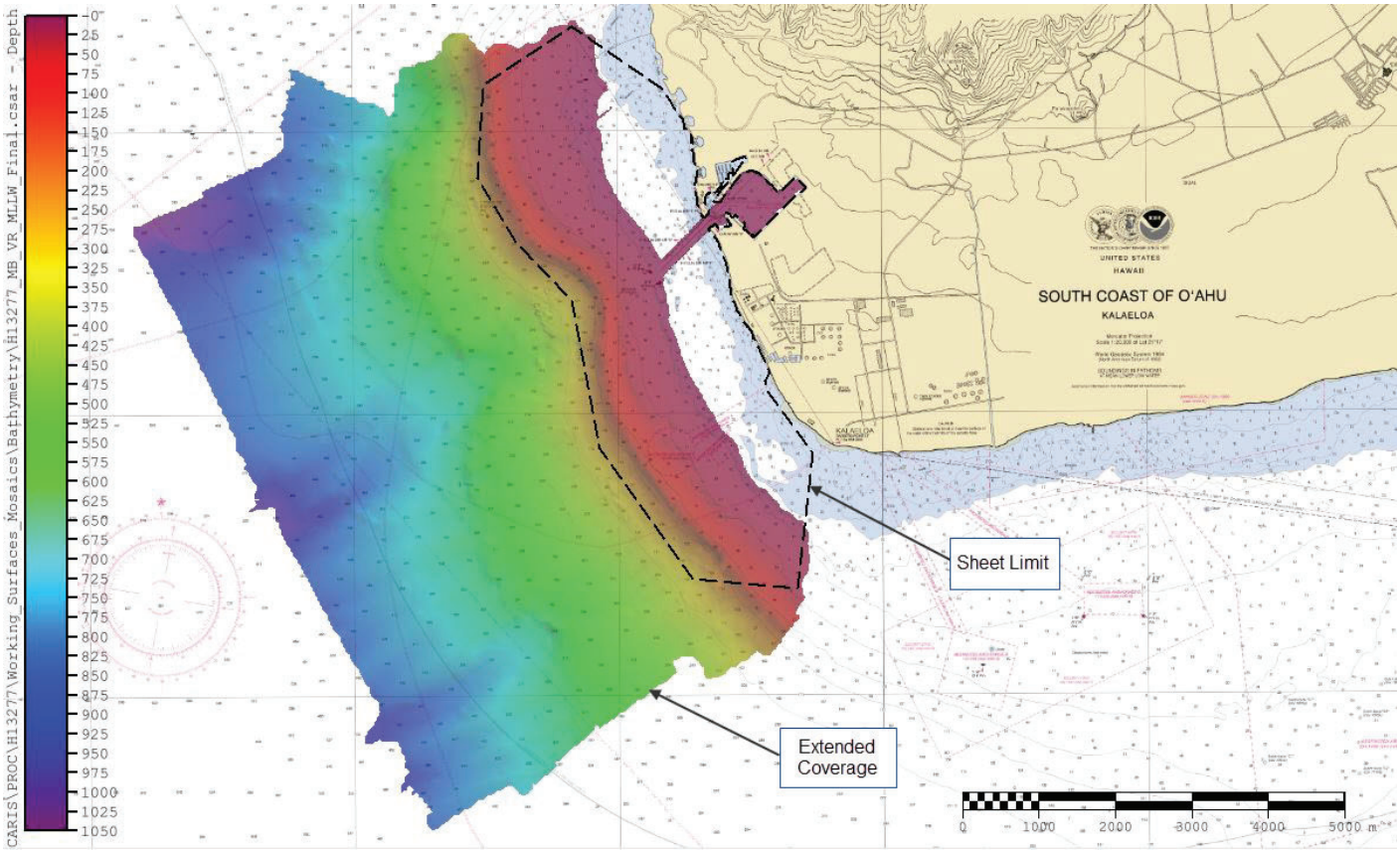


Figure 7: H13277 MBES coverage and assigned survey limits. Note areas where survey coverage was extended beyond sheet limits.

A.6 Survey Statistics

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

	HULL ID	*2801*	*2803*	*2804*	*S221*	*Total*
LNM	SBES Mainscheme	0	0	0	0	0
	MBES Mainscheme	13.5	25.9	27.2	43.0	109.7
	Lidar Mainscheme	0	0	0	0	0
	SSS Mainscheme	0	0	0	0	0
	SBES/SSS Mainscheme	0	0	0	0	0
	MBES/SSS Mainscheme	0	0	0	0	0
	SBES/MBES Crosslines	5.2	0	3.6	0	8.9
	Lidar Crosslines	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						15.5

Table 3: Hydrographic Survey Statistics

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

Survey Dates	Day of the Year
09/18/2019	261
09/19/2019	262

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	***S221***	***2801***	***2803***	***2804***
LOA	70.4 meters	8.8 meters	8.8 meters	8.8 meters
Draft	4.7 meters	1.1 meters	1.1 meters	1.1 meters

Table 5: Vessels Used

Figure 8: NOAA Ship RAINIER

Figure 9: RAINIER launch 2801 (RA-4).

All data for survey H13277 were acquired by NOAA Ship Rainier and Rainier survey launches 2801, 2803, and 2804. The vessels acquired MBES bathymetry, backscatter, and sound velocity profiles.

B.1.2 Equipment

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

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

Table 6: Major Systems Used

B.2 Quality Control

B.2.1 Crosslines

Multibeam/single beam echo sounder/side scan sonar crosslines acquired for this survey totaled 8.03% of mainscheme acquisition.

RAINIER launches 2801 and 2804 acquired 8.9 nautical miles of multibeam crosslines across most depth ranges. The hydrographer deems them adequate for verifying and evaluating the internal consistency of H13277 survey data. Crosslines were only acquired within the original survey area due to limited time and depths exceeding the range on the launches. Crosslines were not acquired within the extended survey area. Analysis was performed using the Compare Grids function in Pydro Explorer on finalized VR surfaces of H13277 mainscheme only and crossline data only. 99.5% of nodes met allowable uncertainties for object detection data. For additional results, see plots below.

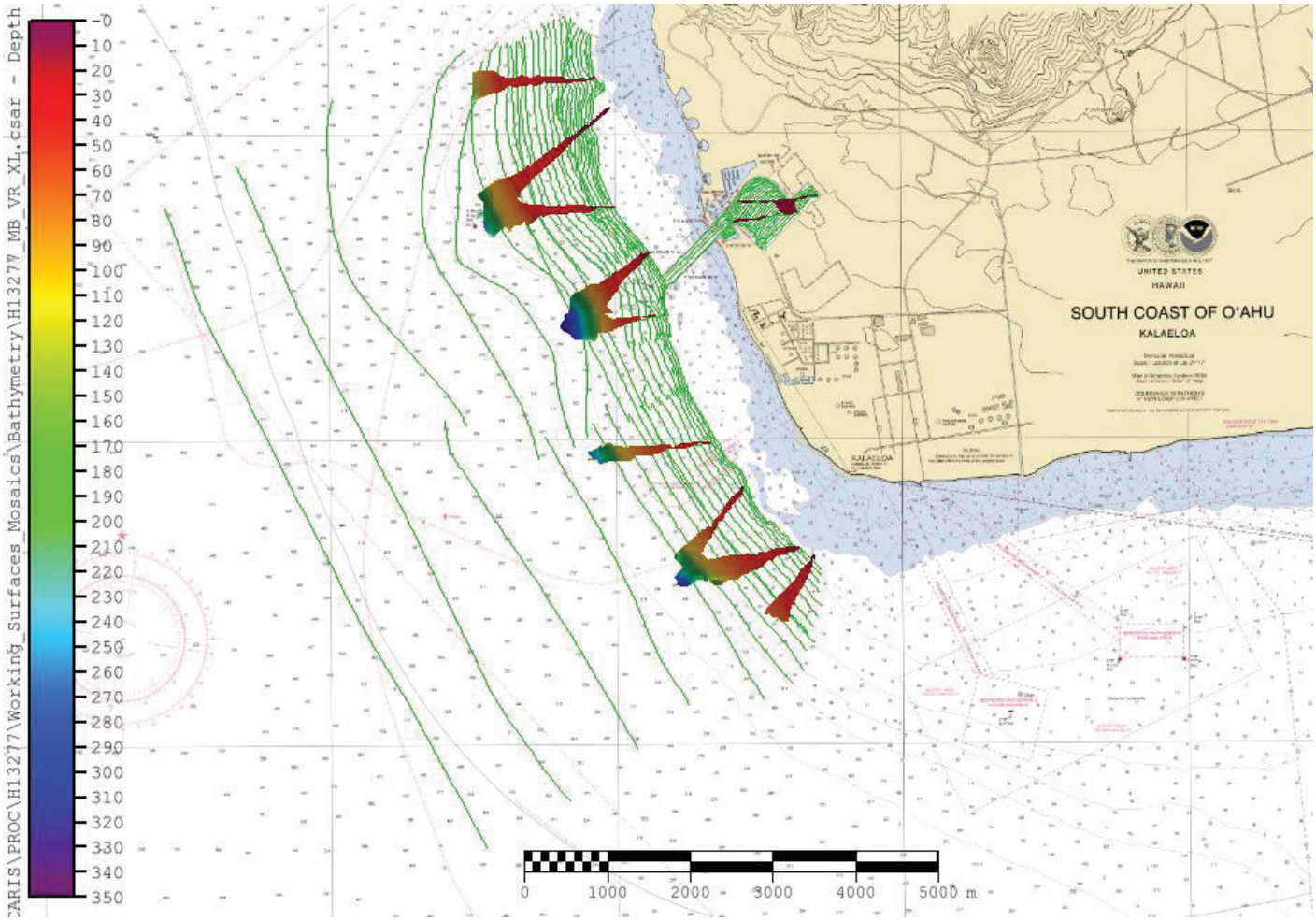


Figure 10: H13277 crossline surface overlaid on mainscheme tracklines.

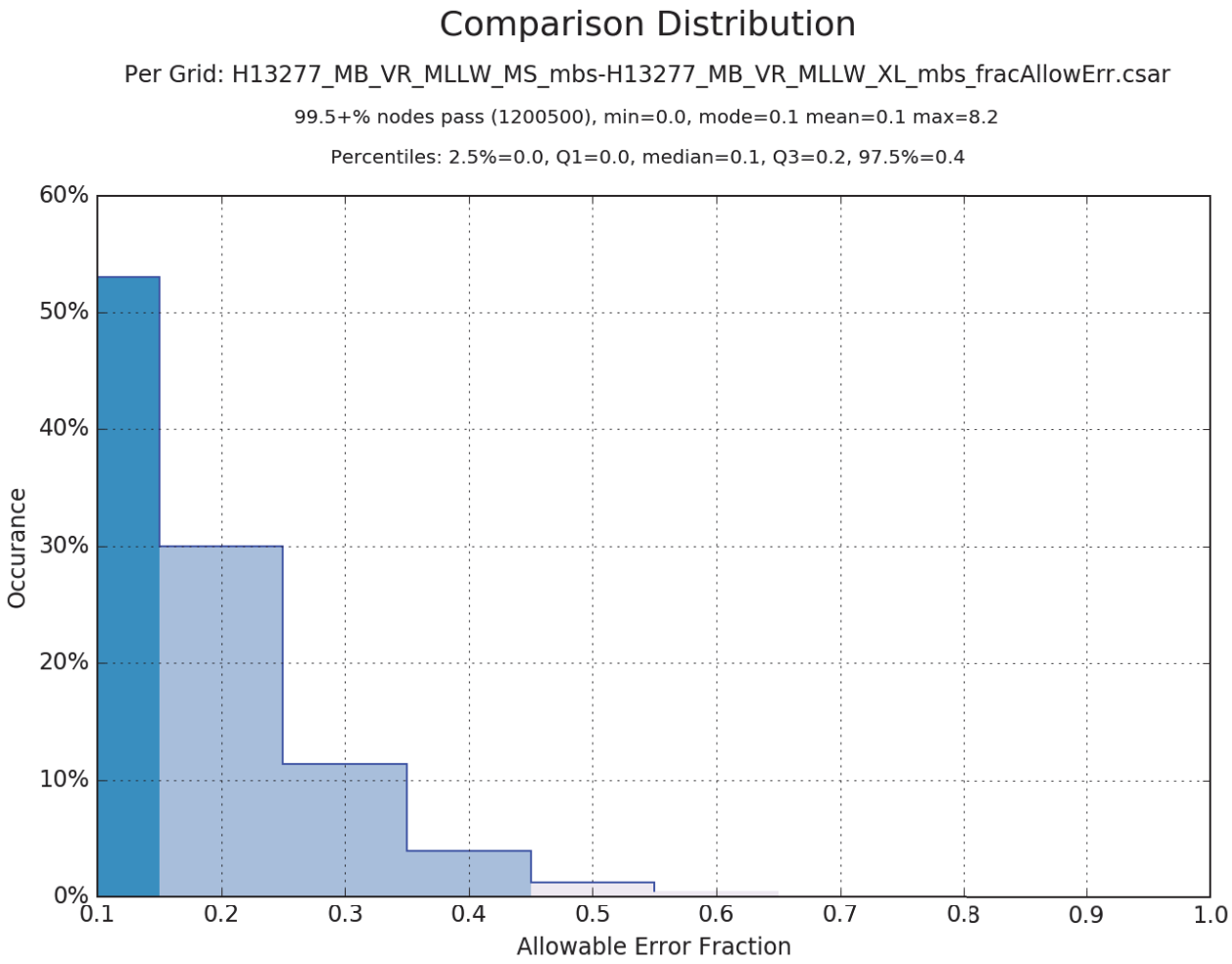
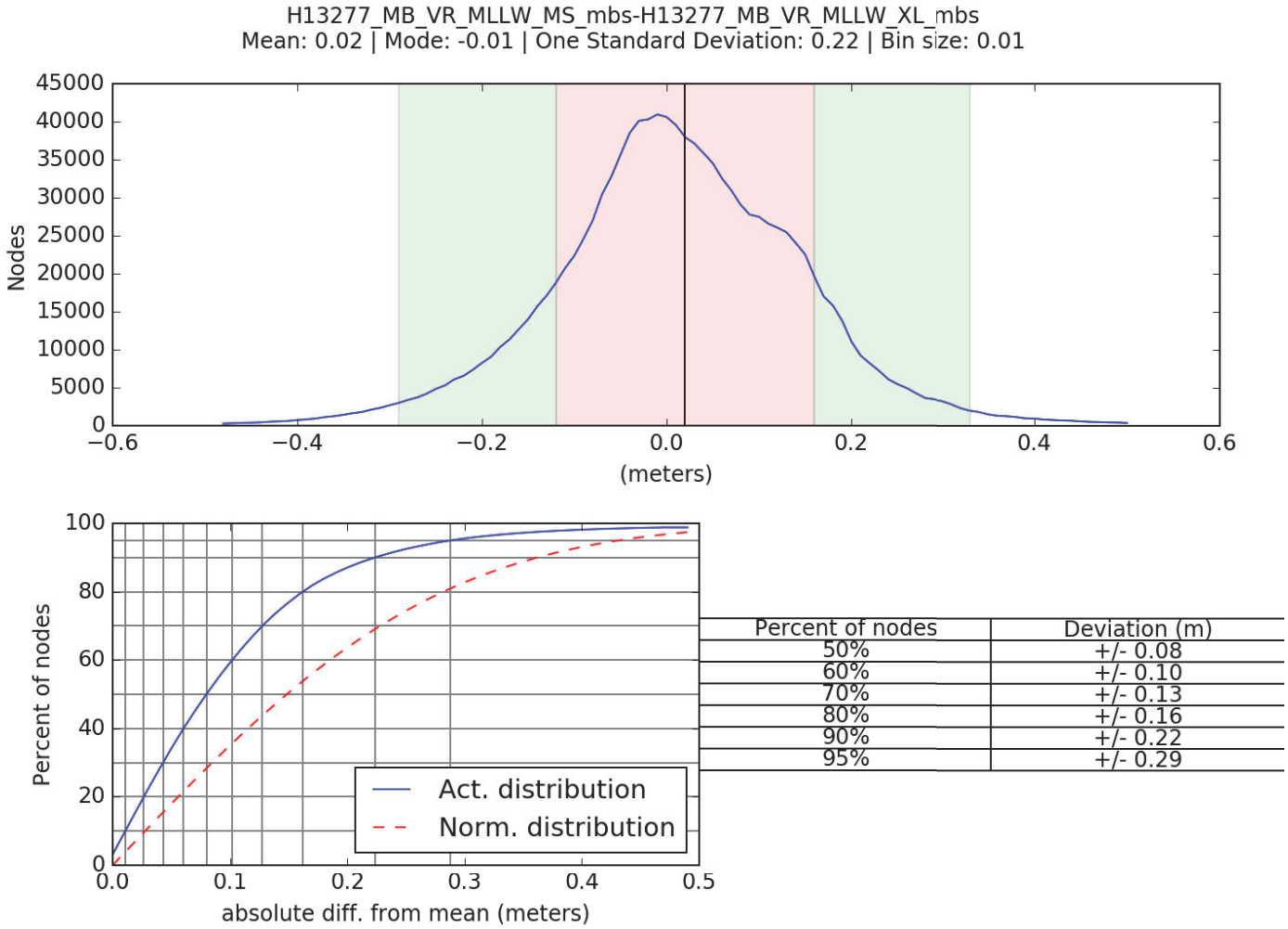


Figure 11: Pydro derived plot showing percentage-pass value of H13277 mainscheme to crossline data.



Percent of nodes	Deviation (m)
50%	+/- 0.08
60%	+/- 0.10
70%	+/- 0.13
80%	+/- 0.16
90%	+/- 0.22
95%	+/- 0.29

Figure 12: Pydro derived plot showing absolute difference statistics of H13277 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 meters	0.10 meters

Table 7: Survey Specific Tide TPU Values.

Hull ID	Measured - CTD	Measured - MVP	Surface
S221	N/A meters/second	1 meters/second	0.05 meters/second
2801, 2803, 2804	3 meters/second	N/A meters/second	0.05 meters/second

Table 8: Survey Specific Sound Speed TPU Values.

Derived Total Propagated Uncertainty (TPU) values for survey H13277 are based on a combination of equipment specifications and capabilities, and vessel characteristics. The tidal uncertainty used for this survey was provided in the project instructions for the NOAA Ellipsoidal Referenced Tidal Datum Model (ERTDM).

In addition, real-time and post-processed uncertainty sources were incorporated into the depth estimates of this survey. The real-time uncertainties for position, navigation, attitude, and vessel motion data were applied during acquisition and initially in post-processing. Then, POSPac MMS software was used to generate SBET and RMS files with attitude, GPS height, and position uncertainties, which supersede real-time POS MV data when applied in CARIS HIPS.

Uncertainty values of the submitted finalized grid were 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 H13277 TVU compliance. H13277 met HSSD requirements in over 99.5 percent of grid nodes, which is shown in the histogram plot below."

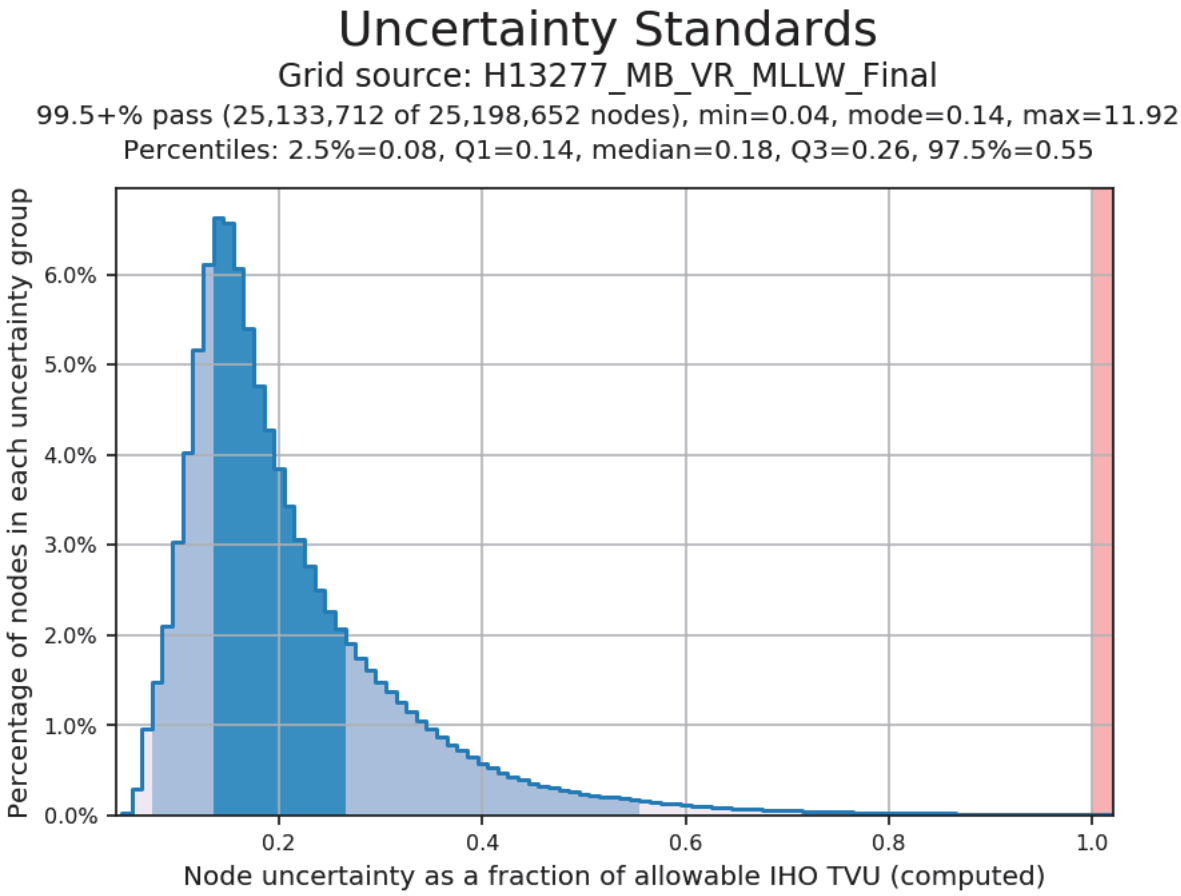


Figure 13: Pydro derived plot showing TVU compliance of H13277 finalized multi-resolution MBES data.

B.2.3 Junctions

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: Launches took casts at lease once every four hours (before MBES acquisition, middle of the day, and near the end of the day).

Fifteen sound speed profiles were acquired for this survey at discrete locations within the survey area at least one every four hours, when significant changes in surface sound speed were observed, or when operating in a new area. For MBES operations for S221, sound speed profiles were acquired using Odim Brooke Ocean MVP200. Launch sound speed profiles were acquired using Sea-Bird 19plus SEACAT Profilers. Two additional sound speed profiles were retrieved from the World Ocean Atlas (WOA) 09 Database in Sound Speed Manager and added to the master file applied to MBES data. The WOA profiles were added to correct sound speed issues caused by a lack of sound speed data in depths greater than 250 meters. All casts were concatenated into a master file and applied to MBES data using the "Nearest distance within time (4 hours)" profile selection method.

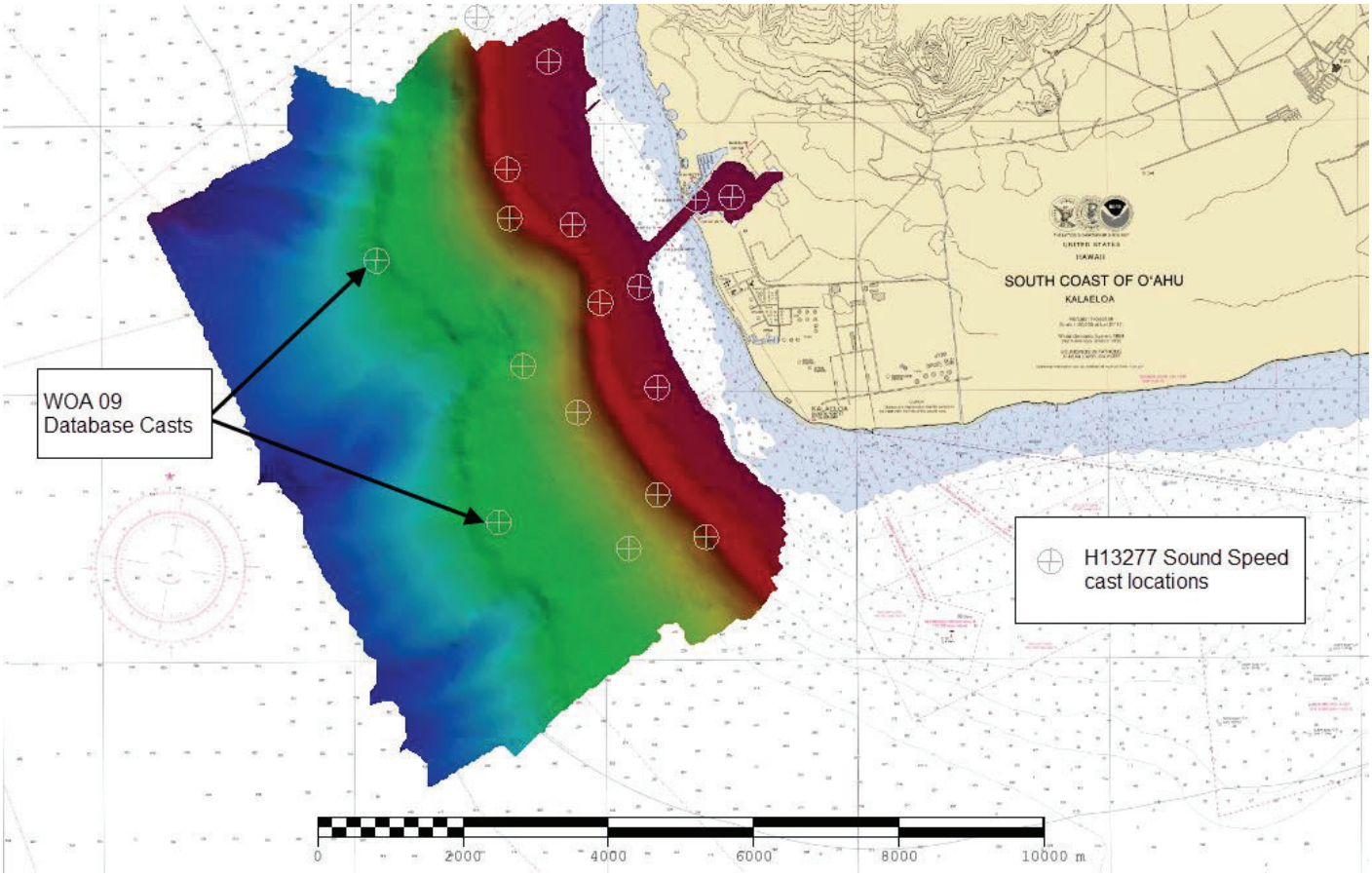


Figure 14: H13277 sound speed cast locations.

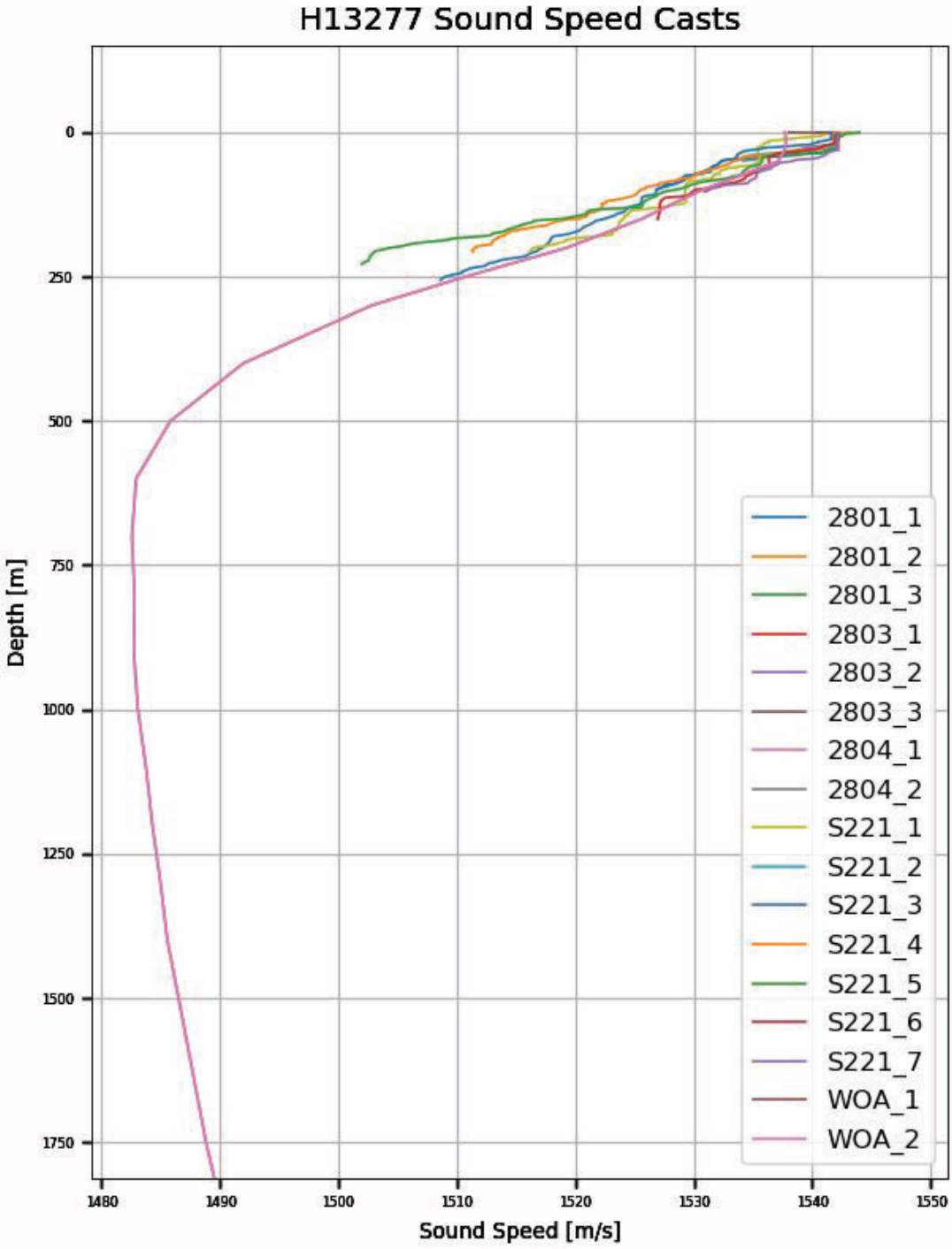


Figure 15: All sound speed profiles applied to MBES data.

B.2.8 Coverage Equipment and Methods

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

B.3 Echo Sounding Corrections

B.3.1 Corrections to Echo Soundings

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

B.3.2 Calibrations

All sounding systems were calibrated as detailed in the DAPR.

B.4 Backscatter

Raw backscatter data were acquired as .all files for delivery to NOAA's Pacific Hydrographic Branch. Backscatter data were processed by the field unit and mosaics generated. One mosaic per vessel per frequency has been delivered with this report. All backscatter processing procedures utilized follow those detailed in the DAPR. Software used to process and produce backscatter mosaics were Fledermaus Geocoder Toolbox version 7.8.1.

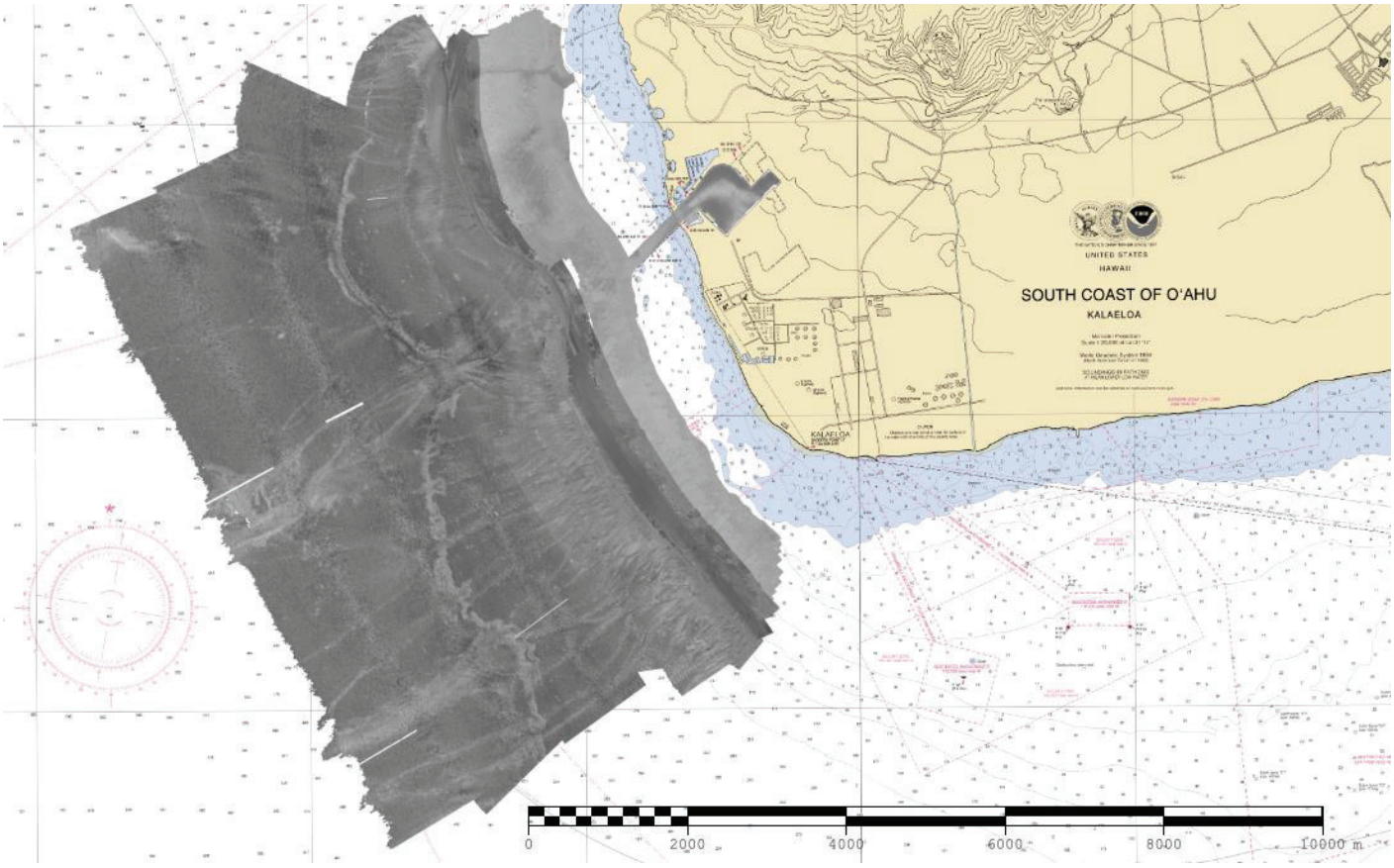


Figure 16: Overview of H13277 backscatter mosaics.

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	11.1

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 Geocoder Tool Box (FMGT)	7.8.1

Table 10: Primary imagery data processing software

The following Feature Object Catalog was used: NOAA Profile 2019 v2.

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
H13277_MB_VR_MLLW	CARIS VR Surface (CUBE)	Variable Resolution	2.06 meters - 1030.21 meters	NOAA_VR	Object Detection
H13277_MB_VR_MLLW_Final	CARIS VR Surface (CUBE)	Variable Resolution	2.06 meters - 1030.21 meters	NOAA_VR	Object Detection

Table 11: Submitted Surfaces

Submitted surfaces were generated using the recommended parameters for depth-based (Rangers) Caris variable-resolution bathymetric grids as specified in HSSD 2019.

Pydro QC Tools 2 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 9 certain fliers, these were investigated and found to be false positives. The results of the Detect Fliers tool are included as .000 files in the Separates section of this report.

C. Vertical and Horizontal Control

All MBES bathymetry were acquired relative to the ellipsoid and reduced to MLLW via ERTDM.

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_Extended2

Table 12: 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. Post Processed-Real-Time (PP-RTX) processing methods were used in Applanix POSPac MMS 8.3 SP3 software to produce SBETs for post-processing horizontal correction.

C.3 Additional Horizontal or Vertical Control Issues

C.3.1 Vertical Offset Issue in Section of Data

After initial processing a vertical offset was observed in line 0001_20190918_182144_2803_400S_261, located inside the Barbers Point Harbor. The offset was inspected and the cause determined to be an unknown issue with the SBET. The SBET was corrected using PPK and a Honolulu station of the WAAS network. This reduced the apparent offset to under 10cm. See figures below.

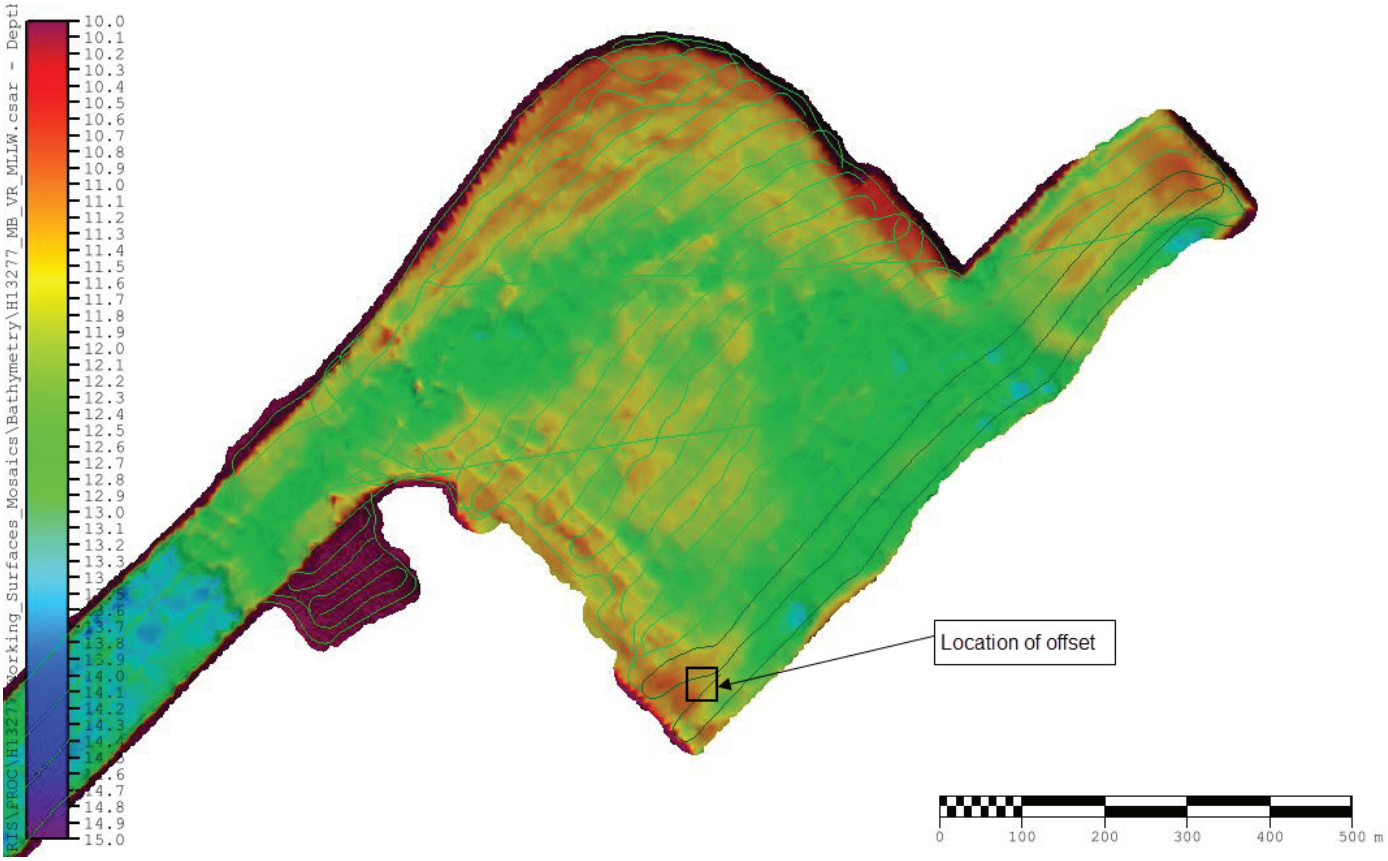


Figure 17: Approximate location of where the vertical offset issue was.

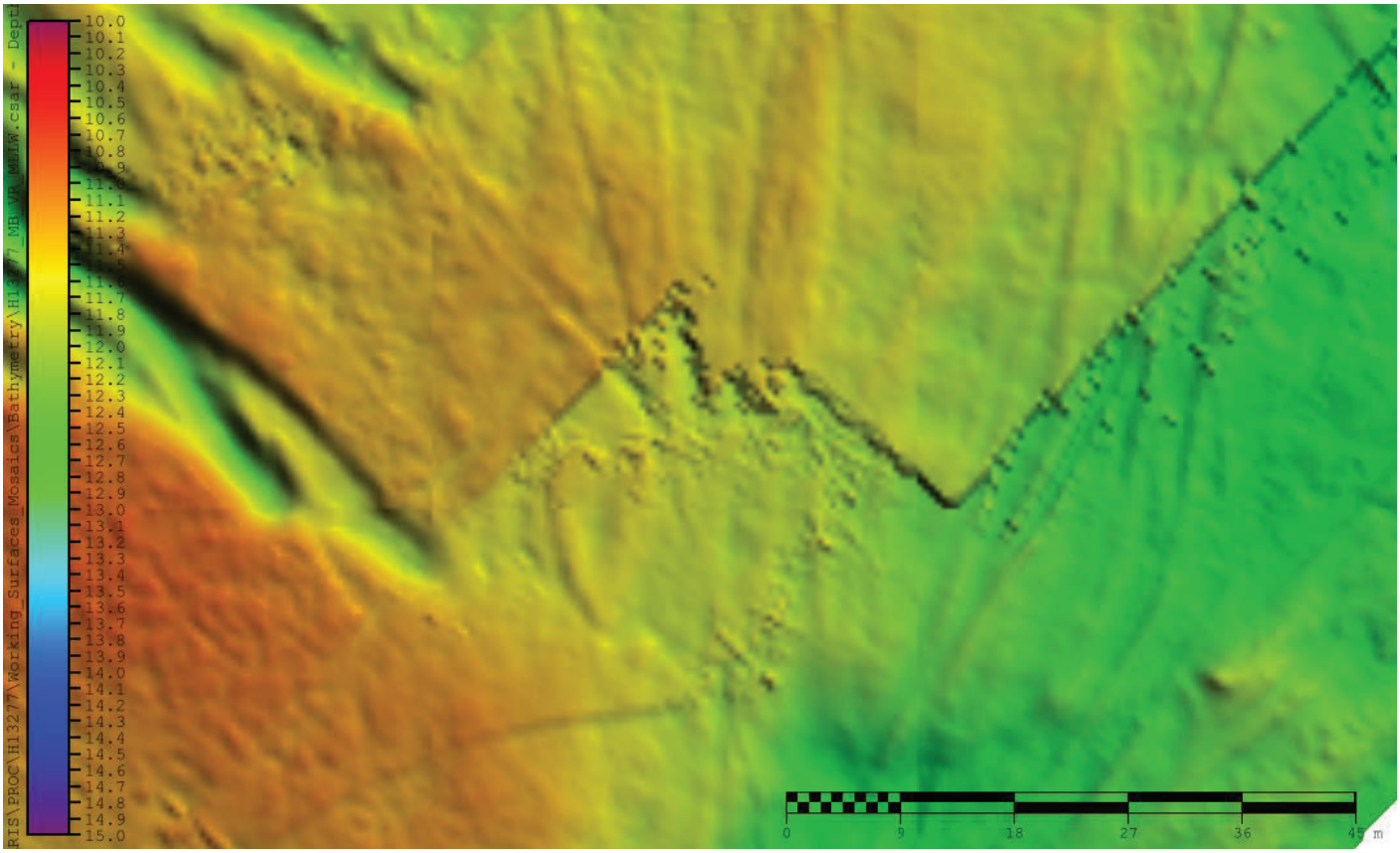


Figure 18: Example of the vertical offset prior to reapplying the corrected SBET.

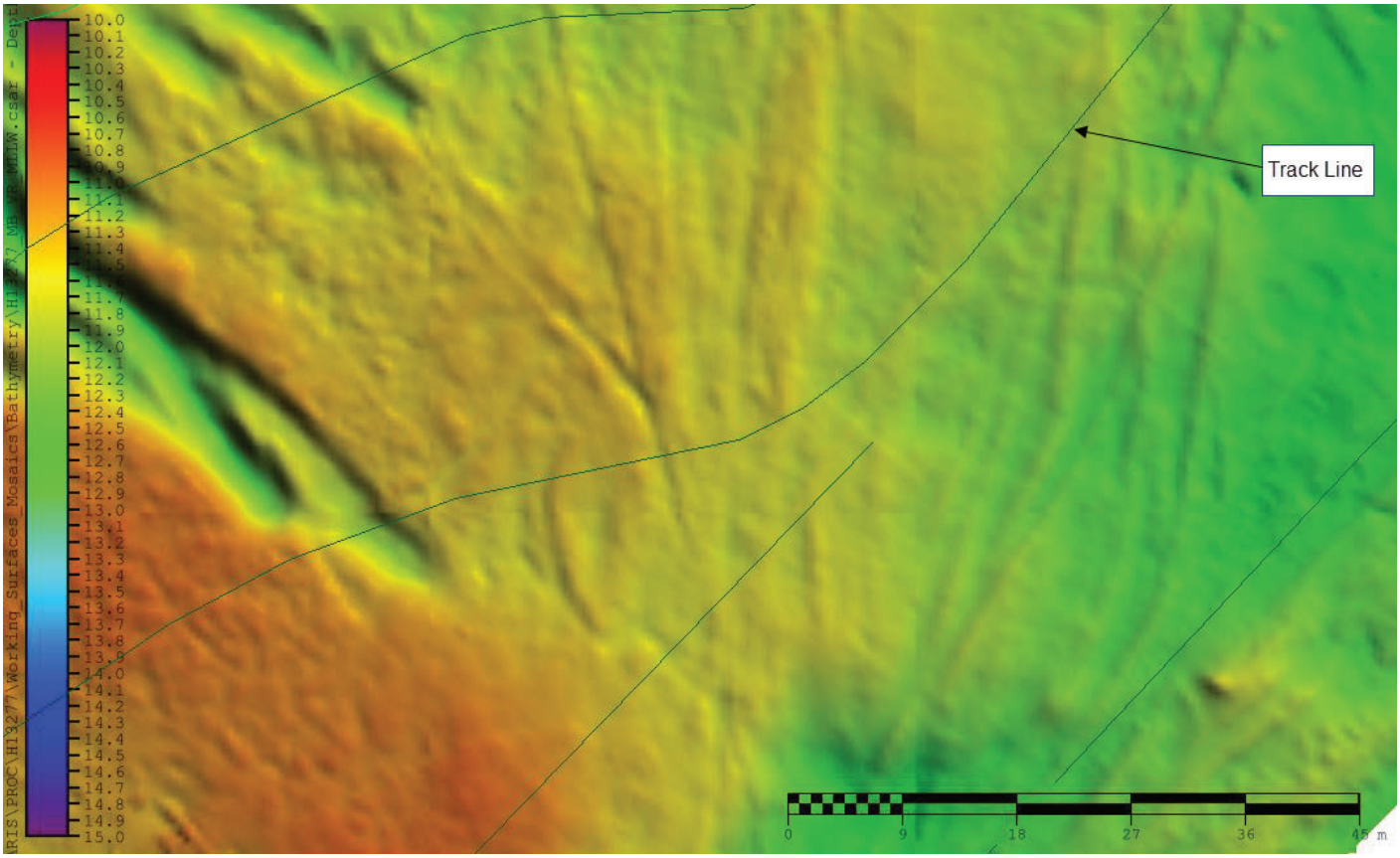


Figure 19: The surface after the SBET was reapplied.

D. Results and Recommendations

D.1 Chart Comparison

A comparison was made between H13277 survey data and Electronic Navigation Chart (ENC) US4HA51M and US5HA42M 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	Preliminary?
US4HA51M	1:80000	28	06/21/2019	08/30/2019	NO
US5HA52M	1:20000	17	08/30/2017	08/30/2019	NO

Table 13: Largest Scale ENCs

US4HA51M

ENC US4HA51M covers all of survey H13277.

A comparison between H13277 derived contours and ENC US4HA51M revealed the following: H13277 10-fathom, 50-fathom, and 100-fathom survey contour lines are in general agreement with the ENC depth curves across the survey area. The 3-fathom contour line depicted on the ENC was not covered in the H13277 data collected, therefore a comparison for the 3-fathom contour line is not provided. H13277 data did not reveal any uncharted shoals.

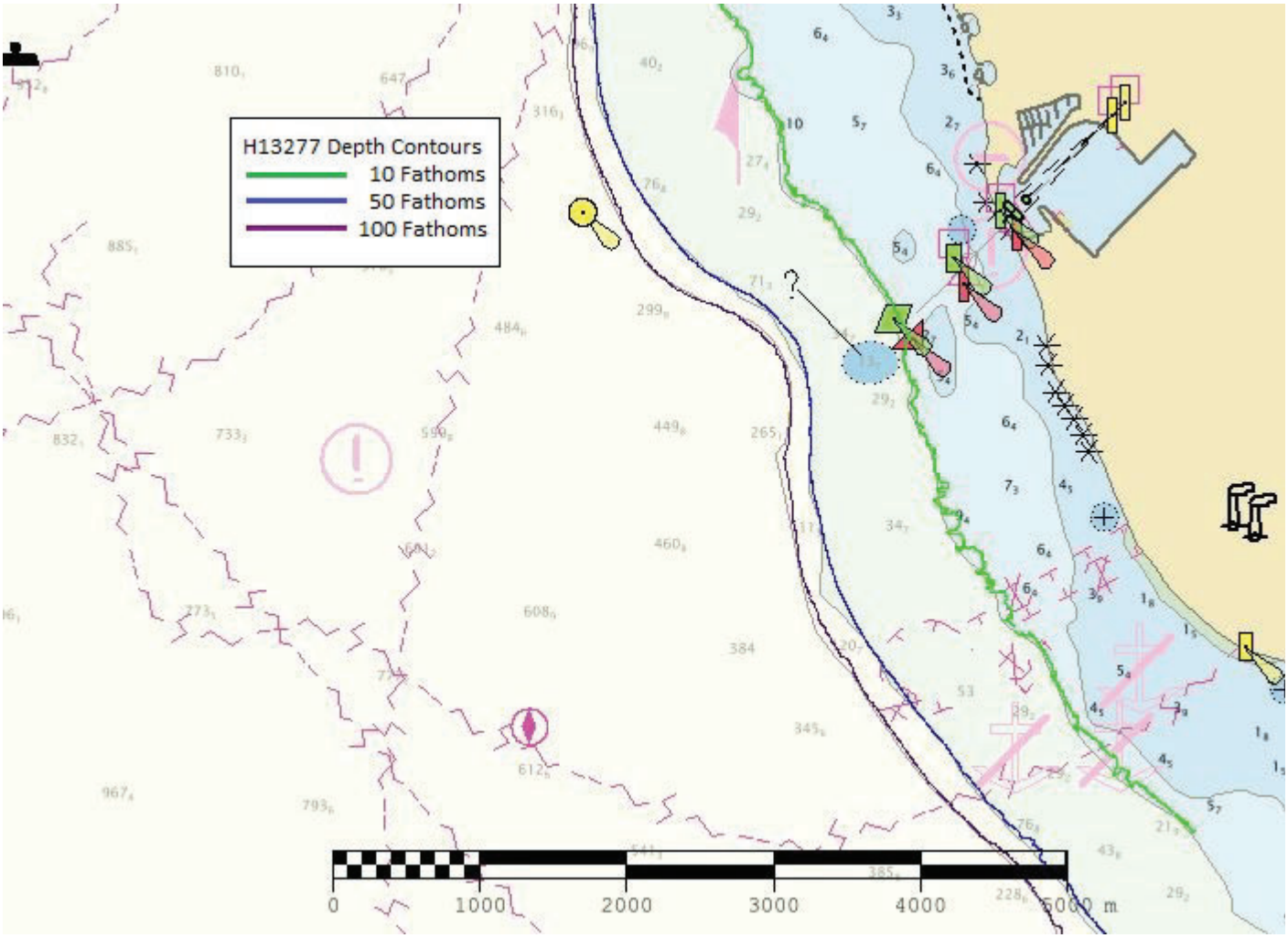


Figure 20: Section of ENC US4HA51M overlaid with survey contours derived from H13277.

US5HA52M

A comparison between H13277 derived survey contour and ENC US5HA52M revealed the following: H13277 3-fathom and 5-fathom survey depth curve is incomplete, however where comparison was possible the lines are in general agreement with the ENC depth curves. The 10, 20, 50, 100, and 200-fathom survey contour lines are in general agreement with the ENC depth curves. H13277 data did not reveal any uncharted shoals.

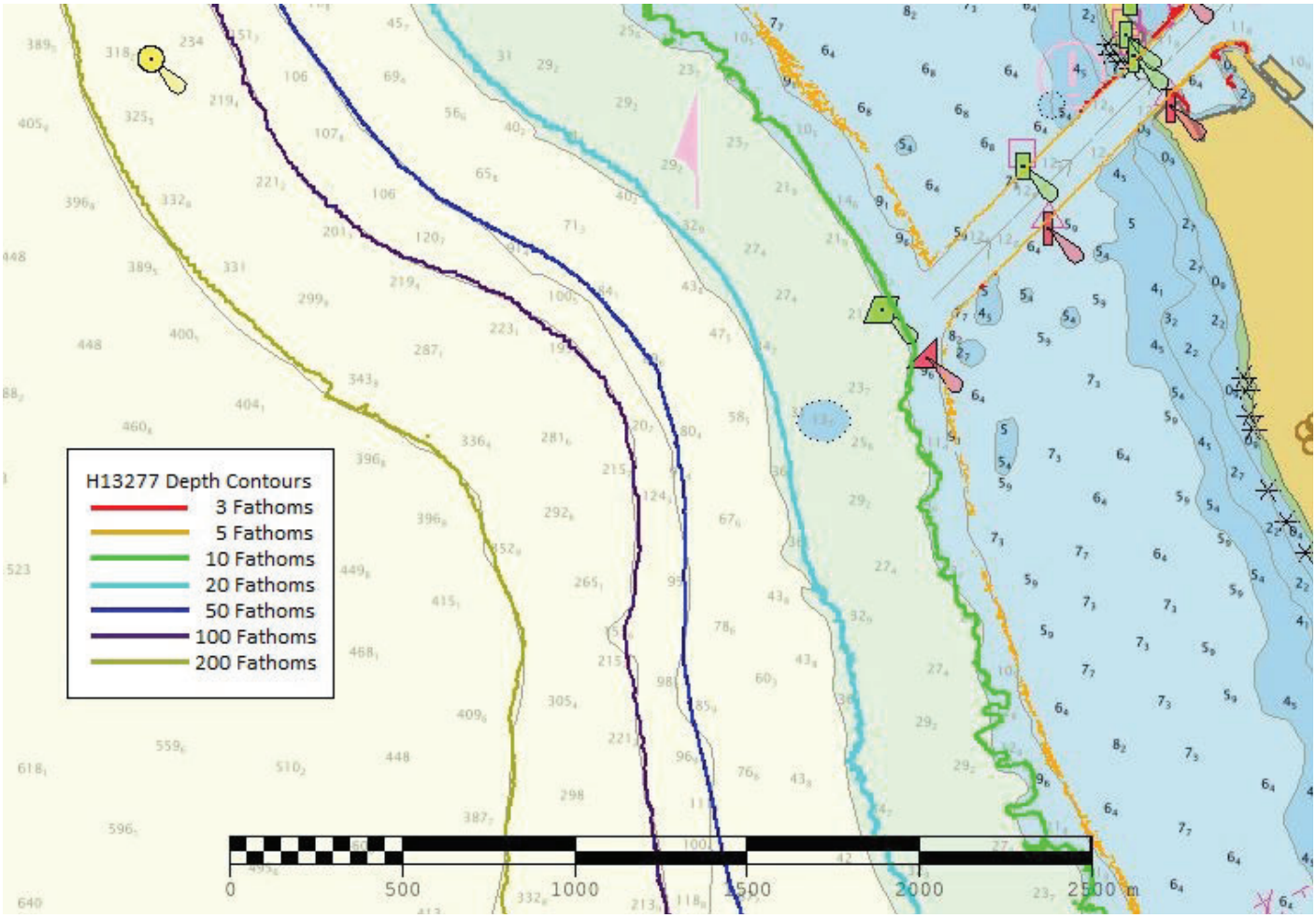


Figure 21: Section of ENC US5HA52M overlaid with 3, 5, 10, 20, 50, 100 and 200-fathom survey contours derived from H13277.

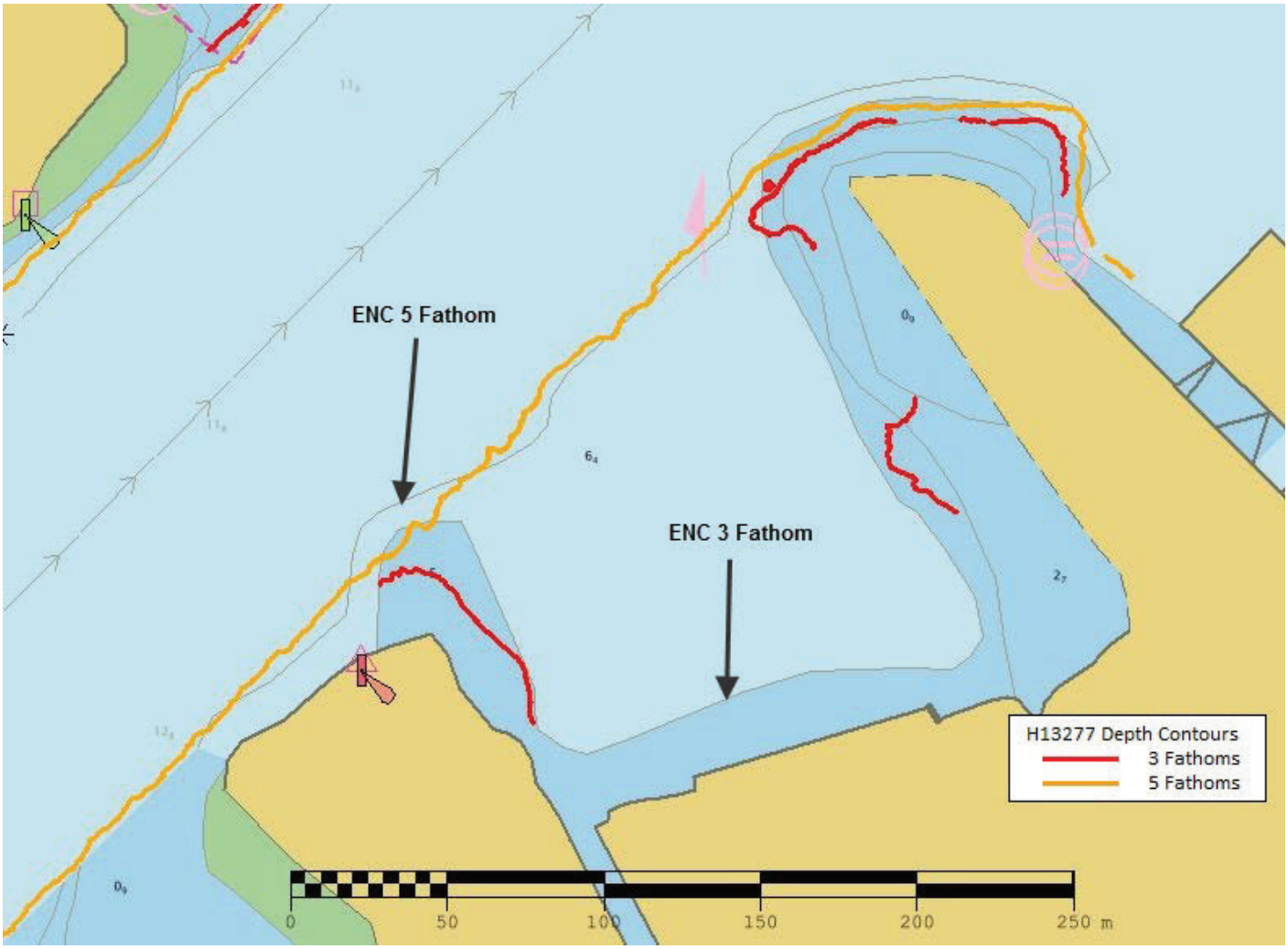


Figure 22: Section of ENC US5HA52M overlaid with 3 and 5-fathom survey contours derived from H13277.

D.1.2 Maritime Boundary Points

No Maritime Boundary Points were assigned for this survey.

D.1.3 Charted Features

Features have been updated as required. A charted feature is reported on Chart 19362 as a submerged buoy at 7.5 fathoms. This reported feature was not identified during acquisition or analysis of MBES data. Further investigation is recommended to determine whether the charting of this submerged buoy is based on a permit or the placement of the buoy is seasonal. See Final Feature File for more information.

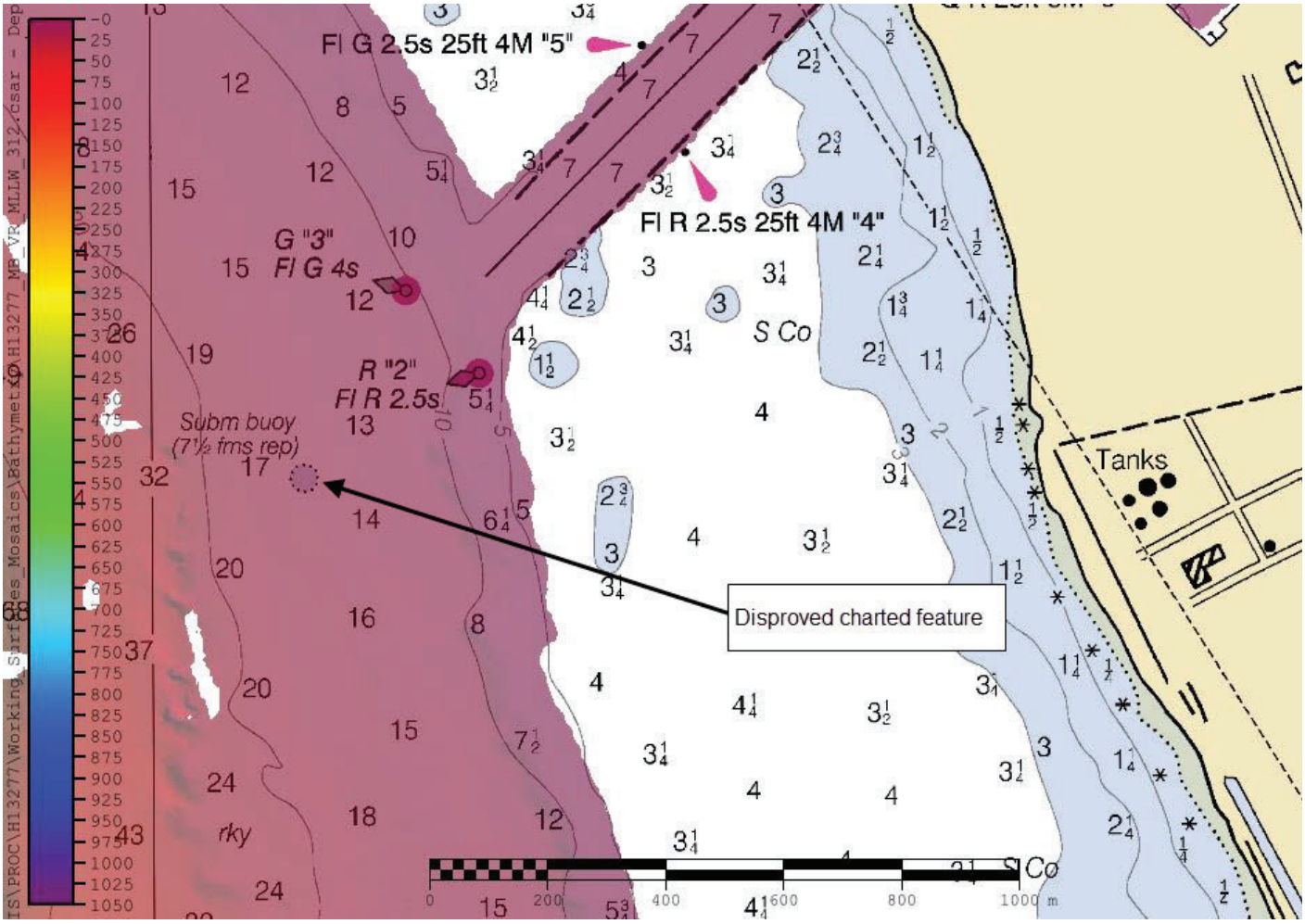


Figure 23: Reported charted feature disproved with MBES data.

D.1.4 Uncharted Features

No uncharted features exist for this survey.

D.1.5 Shoal and Hazardous Features

Shoals or potentially hazardous features exist for this survey, but were located significantly inshore of the NALL and therefore not investigated.

D.1.6 Channels

MBES data was collected for one fairway located within the survey area. There were no significant deviations from the charted depths identified.

D.1.7 Bottom Samples

No bottom samples were required for this survey.

D.2 Additional Results

D.2.1 Shoreline

Due to time constraints, formal shoreline verification was not conducted in accordance with applicable sections of NOAA HSSD and FPM. The only features investigated were those located within obtained MBES coverage and assigned ATONS that were observed while collecting MBES data. Assigned features were addressed and recorded as applicable in the H13277_Final_Feature_File to best represent the features at chart scale. This file includes recommendations to update, retain, or delete assigned features.

D.2.2 Aids to Navigation

Aids to navigation (ATONS) are located within the survey area. Assigned ATONS bordering the main channel were visually confirmed and all necessary updates were made in the Final Feature File. ATONS within the Malakole Harbor were not investigated because permission to enter the harbor was not provided. See Final Feature File for additional information.

Do not concur. A MORFAC feature located within the survey extents (21 20.36, -158 08.23) was not addressed by the field despite being located <30m from 3 different survey lines.

D.2.3 Overhead Features

No overhead features exist for this survey.

D.2.4 Submarine Features

Submarine features exist for this survey, but were not observed in MBES data collected.

D.2.5 Platforms

No platforms exist for this survey.

D.2.6 Ferry Routes and Terminals

No ferry routes or terminals exist for this survey.

D.2.7 Abnormal Seafloor and/or Environmental Conditions

No abnormal seafloor and/or environmental conditions exist for this survey.

D.2.8 Construction and Dredging

No present or planned construction or dredging exist within the survey limits.

D.2.9 New Survey Recommendation

No new surveys or further investigations are recommended for this area.

D.2.10 Inset Recommendation

It is recommended that an inset is created for Malakole Harbor and Barbers Point Harbor to provide greater detail of the depths within the harbors.

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	Commanding Officer	02/24/2020	Digitally signed by GREENAWAY.SAMUEL.F.1275635347 Date: 2020.02.24 12:13:15 -08'00'
Hadley A. Owen, LT/NOAA	Field Operations Officer	02/24/2020	Digitally signed by OWEN.HADLEY.ANNE.1410967070 Date: 2020.02.24 11:44:00 -08'00'
James B. Jacobson	Chief Survey Technician	02/24/2020	JACOBSON.JAMES.BRYAN.1269664017 I have reviewed this document 2020.02.24 12:08:10 -08'00'
Melissa A. Weber	Sheet Manager	02/24/2020	WEBER.MELISSA.ANNE.1554978483 2020.02.24 11:25:19 -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

APPROVAL PAGE

H13277

Data meet or exceed current specifications as certified by the OCS survey acceptance review process. Descriptive Report and survey data except where noted are adequate to supersede prior surveys and nautical charts in the common area.

The following products will be sent to NCEI for archive

- Descriptive Report
- Collection of Bathymetric Attributed Grids (BAGs)
- Collection of backscatter mosaics
- Processed survey data and records
- GeoPDF of survey products

The survey evaluation and verification has been conducted according current OCS Specifications, and the survey has been approved for dissemination and usage of updating NOAA's suite of nautical charts.

Approved: Digitally signed by HOLMBERG.PETER.SCOTT.1365886101 Reason: I am approving this document Date: 2021.12.23 13:13:28 -08'00'

Peter Holmberg, NOAA
Chief(acting), Pacific Hydrographic Branch