H13278

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

DESCRIPTIVE REPORT

Type of Survey:	Navigable Area
Registry Number:	H13278

LOCALITY

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

2019

CHIEF OF PARTY
Benjamin K. Evans, CAPT/NOAA

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Date:

U.S. DEPARTMENT OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION	REGISTRY NUMBER:
HYDROGRAPHIC TITLE SHEET	**H13278**

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:	**Honolulu Harbor**
Scale:	**5000**
Dates of Survey:	**07/10/2019 to 09/06/2019**
Instructions Dated:	**09/01/2019**
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:

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 H13278

Project: OPR-T383-RA-19

Locality: Hawaiian Islands and Vicinity

Sublocality: Honolulu Harbor

Scale: 1:5000

July 2019 - September 2019

NOAA Ship *Rainier*

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

A. Area Surveyed

This survey area is referred to as H13278, "Honolulu Harbor" (sheet 8) in the project instructions. The assigned survey area encompasses 1.504 square nautical miles of Honolulu Harbor and select areas of Pearl Harbor.

A.1 Survey Limits

Data were acquired within the following survey limits:

Northwest Limit	Southeast Limit
21° 22' 34.16" N 158° 0' 7.21" W	21° 17' 5.4" N 157° 51' 19.74" W

Table 1: Survey Limits

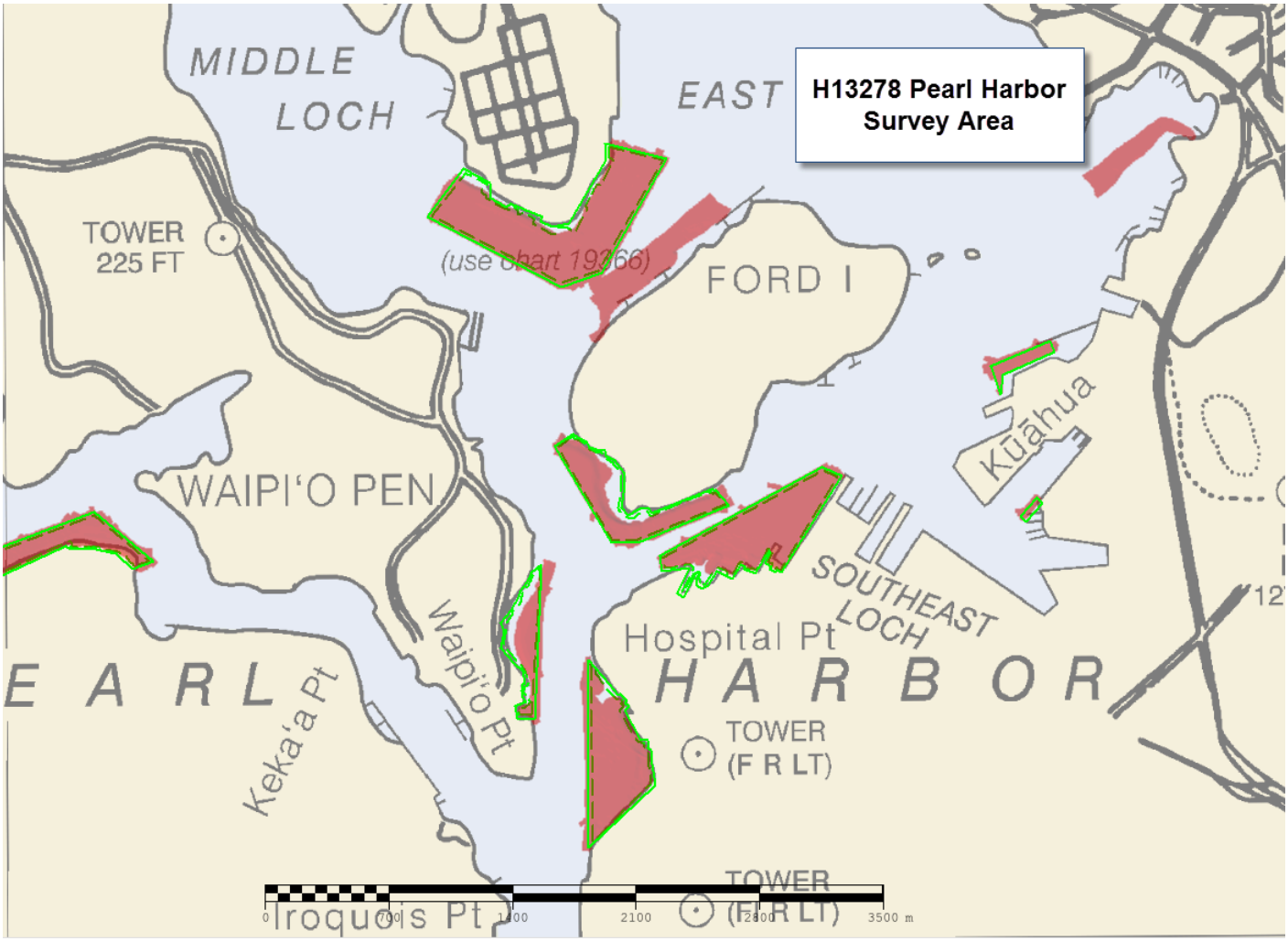


Figure 1: H13278 Pearl Harbor survey area and survey limits (in green) (Chart 19366).

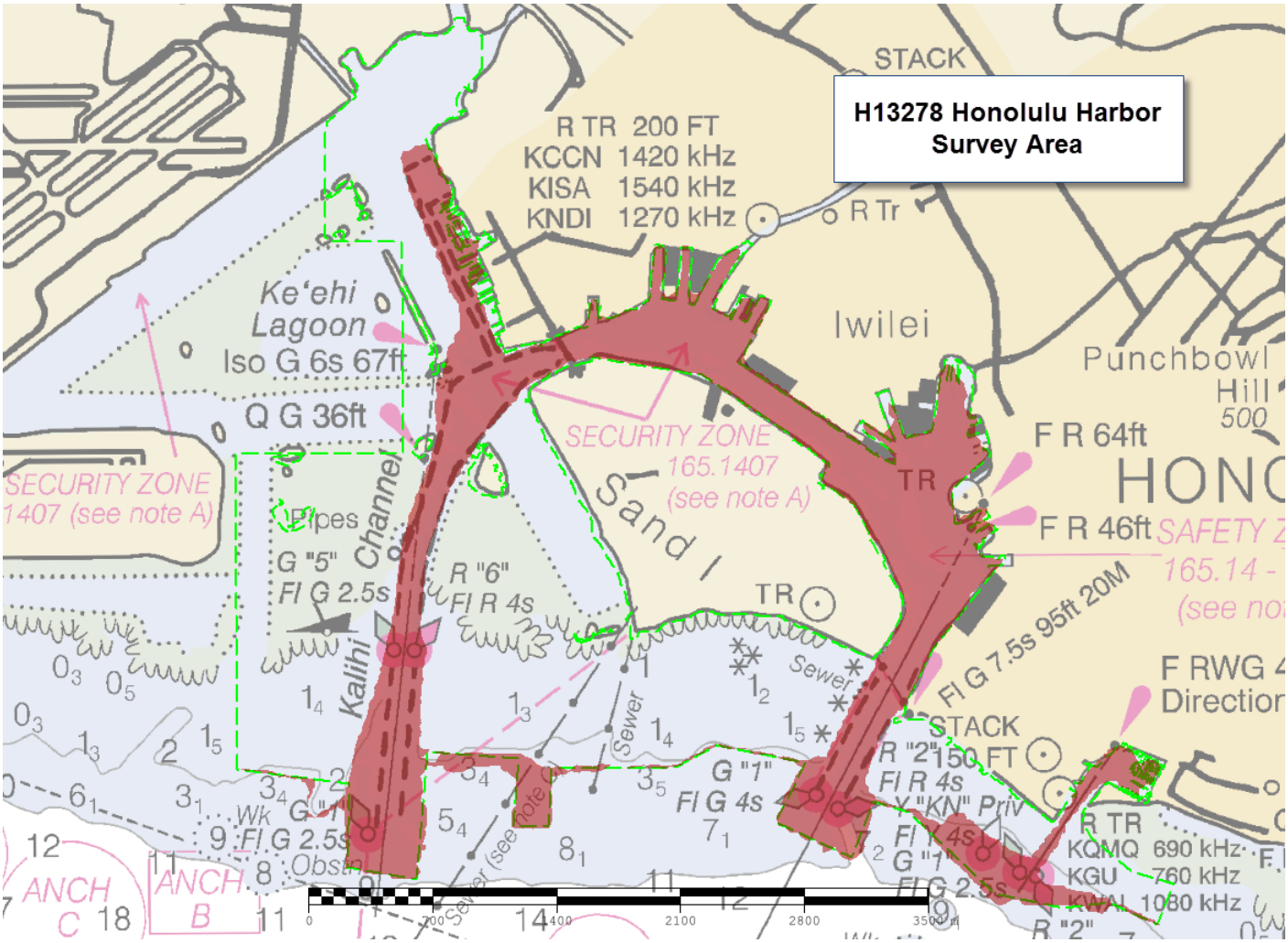


Figure 2: H13278 Honolulu Harbor survey area (in red) and survey limits (in green) (Chart 19367).

Data were acquired within the survey limits as described above, and in additional areas north of Ford Island and the channel approaching the COMPACFLT boathouse in 'Aiea Bay. Data were acquired to specifications as determined by the HSSD, unless otherwise noted in this report.

A.2 Survey Purpose

Oahu's Honolulu Harbor is the main port of the state of Hawaii and handles over 11 million tons of cargo annually. It is home to cruise ship terminals, inter-island cargo terminals, container terminals, a US Coast Guard station, commercial fishing boats, and fuel storage facilities. Despite the volume of maritime traffic, the vast majority of bathymetric data in the H13278 survey area were acquired prior to 1984. Survey H13278 will provide modern bathymetry for updating National Ocean Service Nautical charting products as well as support the Seabed 2030 global mapping initiative.

Several areas of the Joint Base Pearl Harbor-Hickam (JBPHH) naval station water space were surveyed on behalf of the Naval Facilities Engineering Command (NAVFAC) Hawaii. The NAVFAC requested survey areas encompassing pier spaces and adjacent waters of the Pearl Harbor Naval Shipyard, South East Loch ship and submarine piers, West Loch ammunition handling pier, Pearl City peninsula piers, and the Waipio Point barge mooring area. These surveys were requested as part of the NAVFAC Pearl Harbor Shipyard Infrastructure Optimization Plan (SIOP) and the JBPHH Integrated Natural Resource Management Plan (INRMP). Both SIOP and INRMP are ongoing efforts to maintain, repair, and replace the harbor infrastructure for military use as well as manage and conserve natural resources within the Pearl Harbor complex for cultural and environmental purposes.

Survey data from H13278 is intended to supersede all prior survey data in the survey area.

A.3 Survey Quality

The entire survey is adequate to supersede previous data.

Multibeam data for this survey were acquired and processed using object detection settings. Sonar frequency and pulse length were set at 400kHz and short pulse length for the entirety of the survey. Pydro QC Tools Grid QA V5 was used to analyze H13278 multibeam echosounder (MBES) data density. The submitted H13278 finalized variable-resolution (VR) surface met HSSD density and object detection resolution requirements. See section A.4 Survey Coverage for more information.

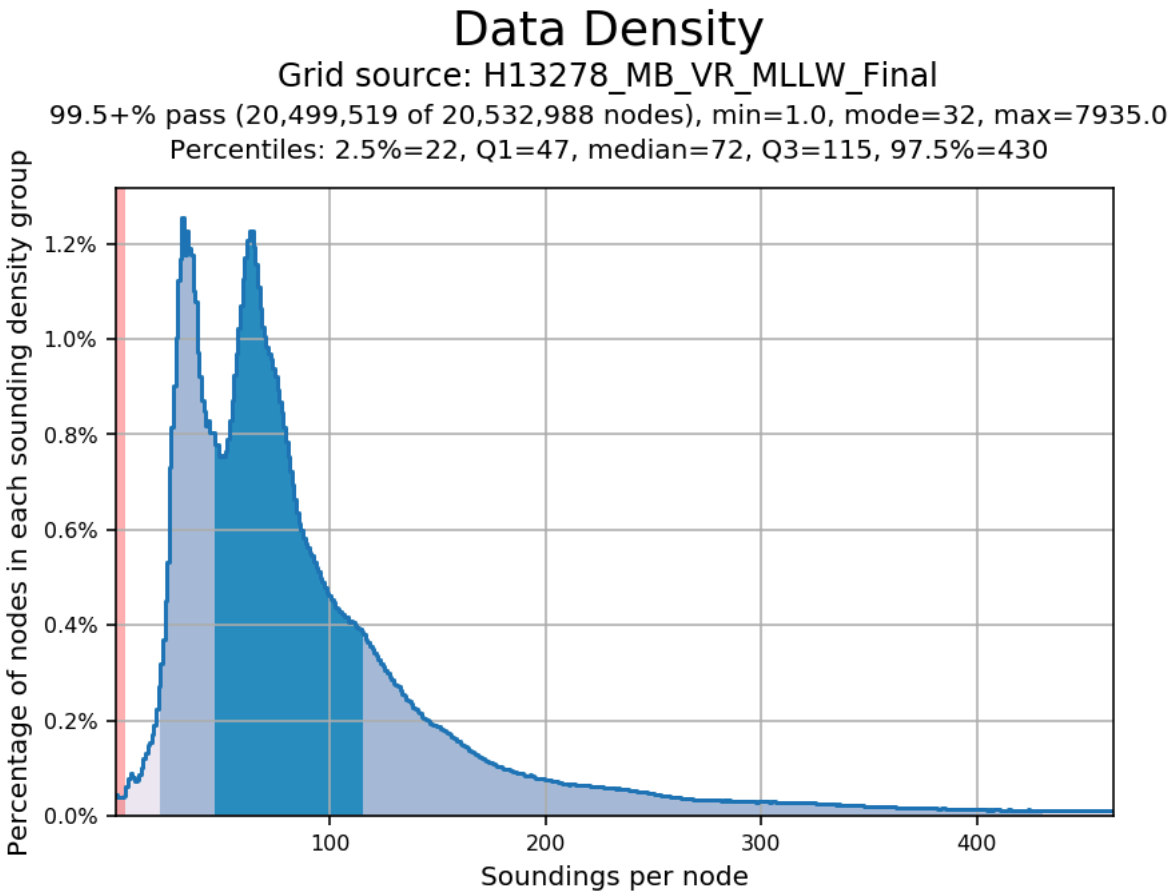


Figure 3: Pydro derived plot showing HSSD data density compliance of H13278 finalized variable-resolution MBES data.

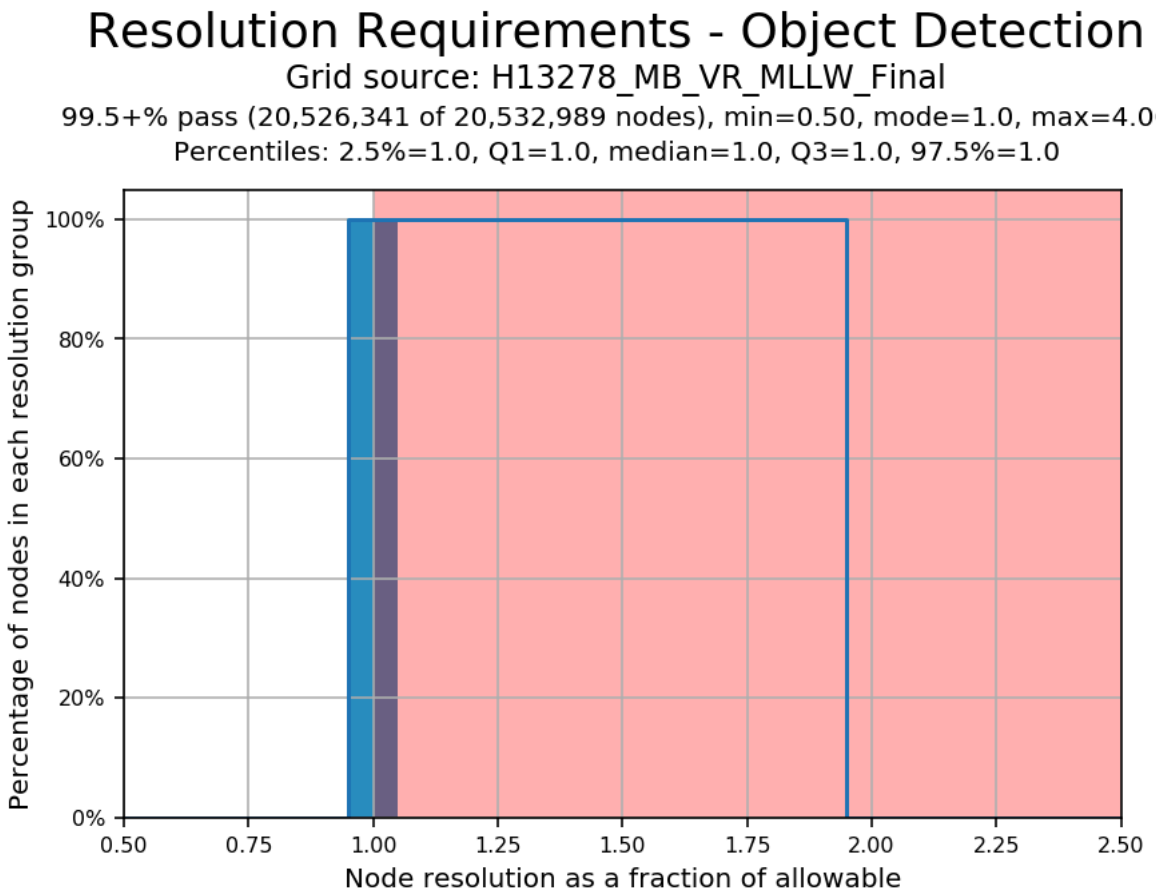


Figure 4: Pydro derived plot showing HSSD data coverage compliance of H13278 finalized variable-resolution MBES data.

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)
All waters in survey area	Acquire backscatter data during all multibeam data acquisition (Refer to HSSD Section 6.2)

Table 2: Survey Coverage

Complete multibeam echosounder (MBES) coverage was acquired to the inshore sheet limit or the Navigable Area Limit Line (NALL) with the exception of the areas depicted in the figure below. The NALL is defined as the most seaward of the following: the surveyed 3.5-meter depth contour, the line defined by the distance

seaward from observed MHW line which is equivalent to 0.8 millimeters at chart scale, or the inshore limit of safe navigation.

The Pydro "Detect Holidays" program was used to scan for holidays. Thirty-seven holidays were detected using the "object detection" setting. These holidays appear to be due to lack of overlap during data acquisition and acoustic shadows. No navigationally significant features were apparent in the area of the holidays; least depths are believed to be represented. Total coverage as well as these holidays are depicted in the images below.

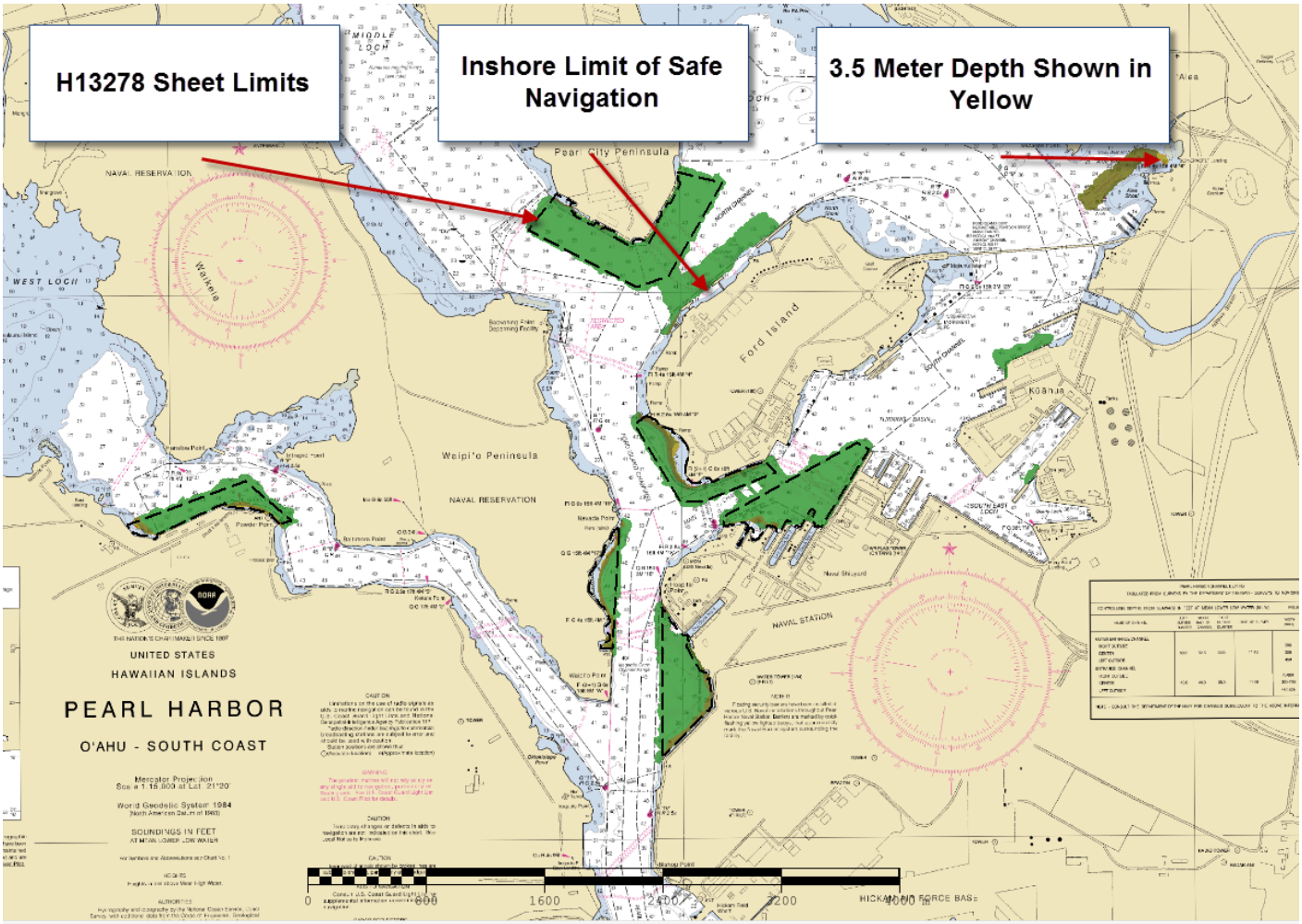


Figure 5: H13278 coverage and NALL determination of Pearl Harbor (Chart 19366).

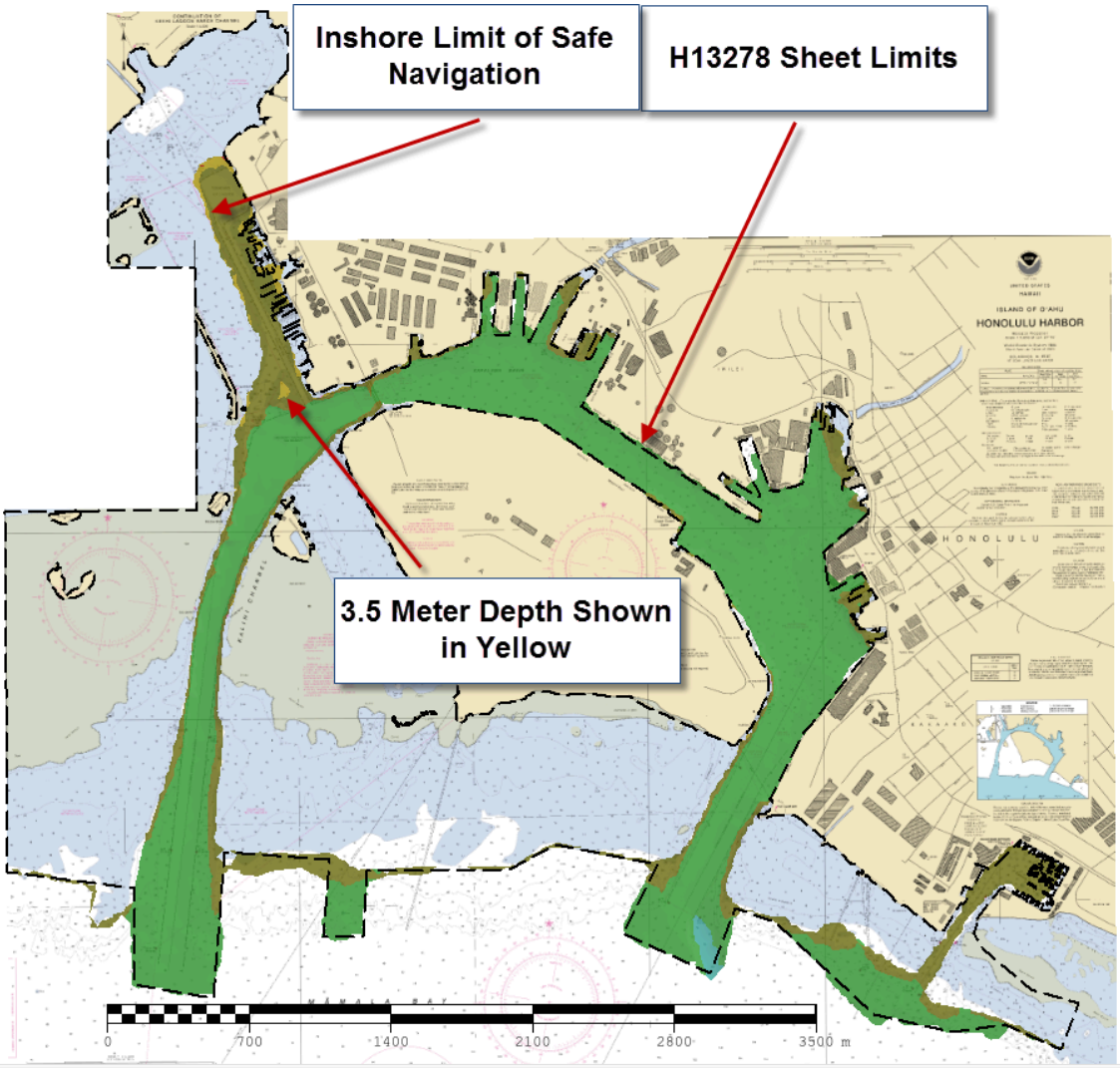


Figure 6: H13278 coverage and NALL determination of Honolulu Harbor (Chart 19367).

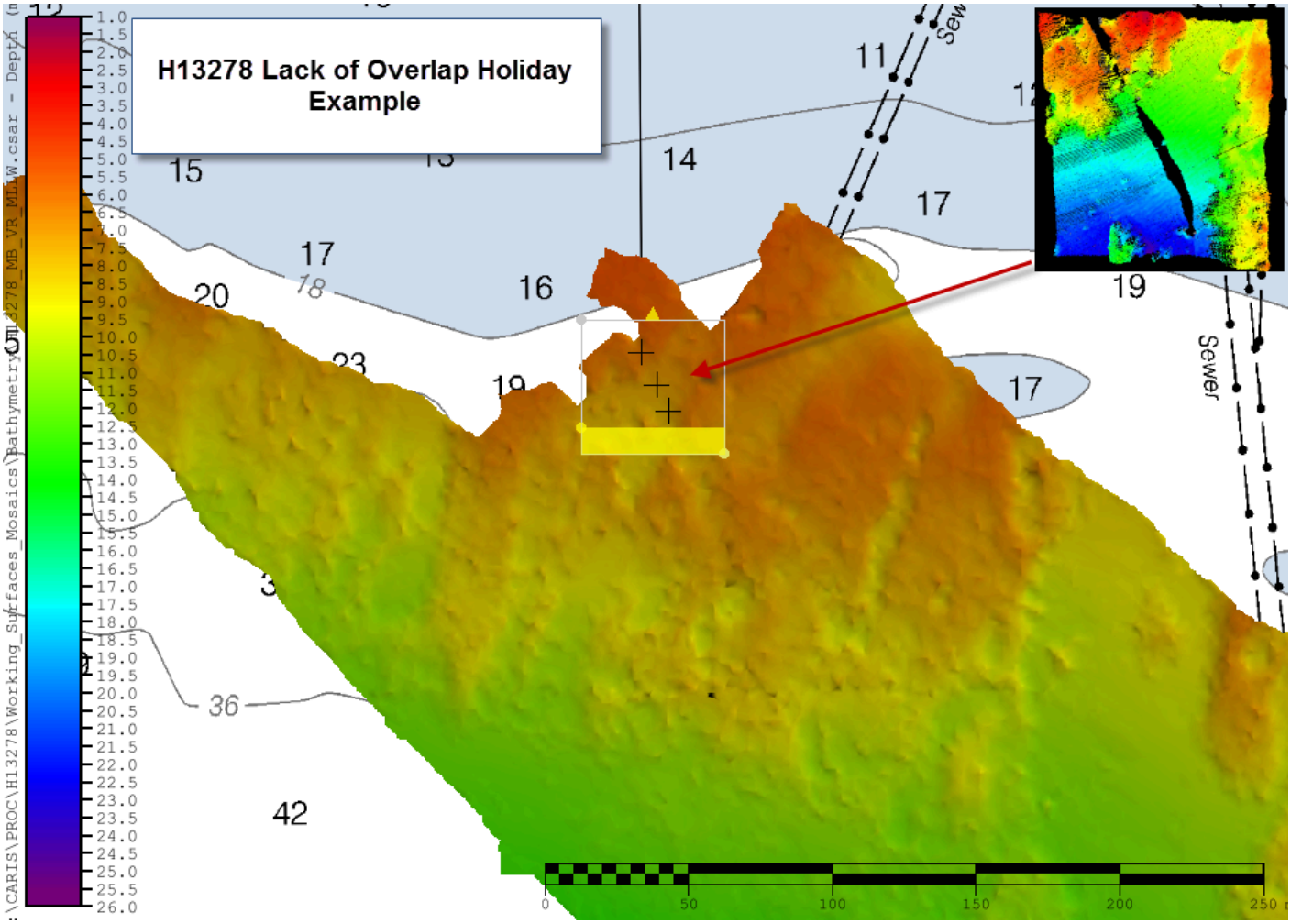


Figure 7: H13278 holiday due to poor data acquisition overlap.

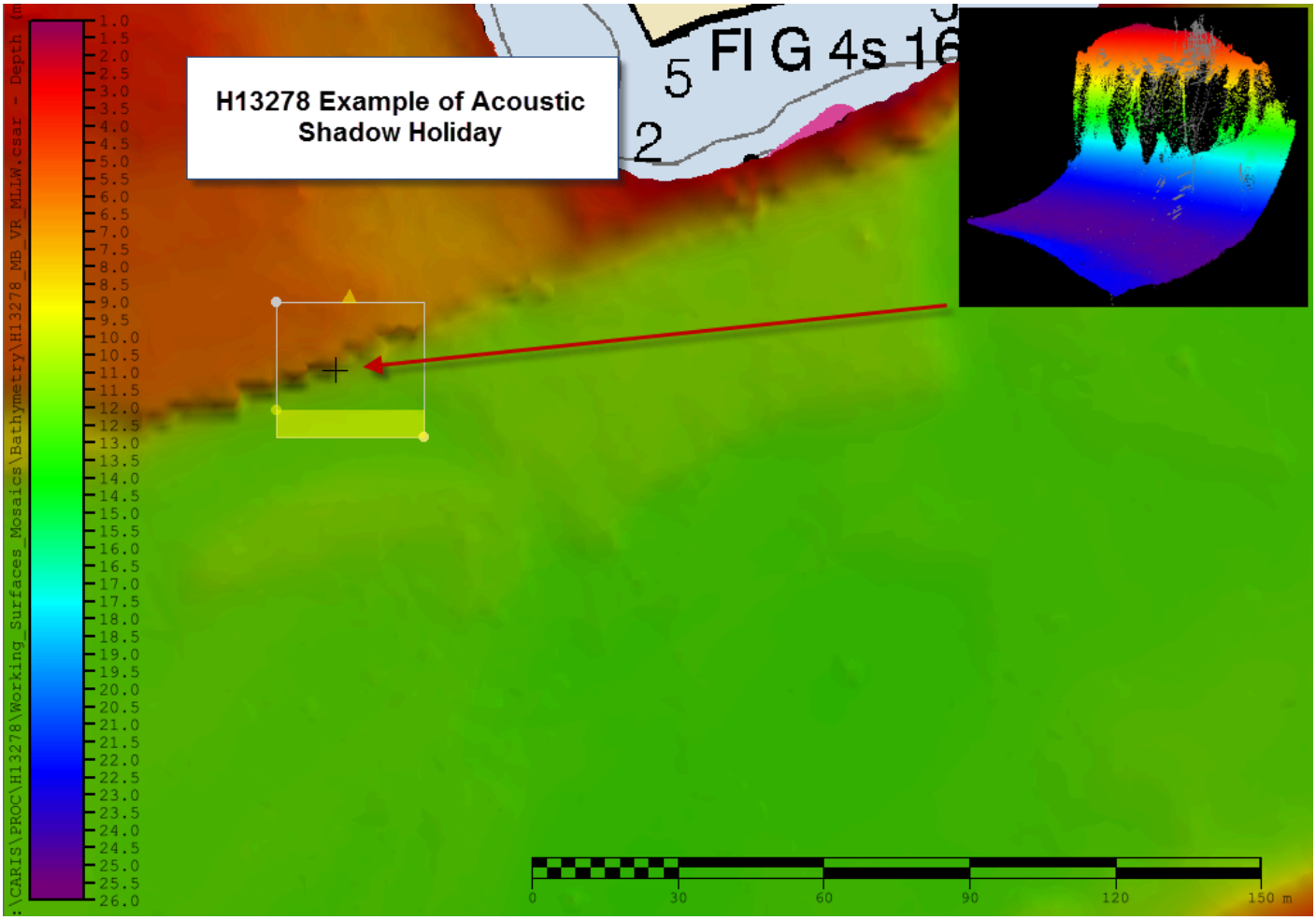


Figure 8: H13278 holiday due to acoustic shadow.

A.6 Survey Statistics

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

	HULL ID	*2801*	*2803*	*2804*	*Total*
LNM	**SBES Mainscheme**	0	0	0	0
	MBES Mainscheme	78.96	50.95	15.36	145.27
	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	0.43	3.85	3.38	7.66
	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					1.504

Table 3: Hydrographic Survey Statistics

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

Survey Dates	Day of the Year
07/10/2019	191
07/12/2019	193

Survey Dates	Day of the Year
07/13/2019	194
07/18/2019	199
08/27/2019	239
08/28/2019	240
08/29/2019	241
08/30/2019	242
09/02/2019	245
09/03/2019	246
09/04/2019	247
09/05/2019	248
09/06/2019	249

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*	*2804*
LOA	8.8 meters	8.8 meters	8.8 meters
Draft	1.1 meters	1.1 meters	1.1 meters

Table 5: Vessels Used

Figure 9: NOAA Ship RAINIER Survey launch 2803 (RA-3).

All data for H13278 were acquired by NOAA Ship RAINIER survey launches 2801, 2803, and 2804. These vessels acquired depth soundings, backscatter imagery, and sound speed profiles. Limited shoreline feature verification was also conducted from these launches.

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

Table 6: Major Systems Used

Refer to the Data Acquisition and Processing Report (DAPR) for a comprehensive description of data acquisition and processing systems, survey vessels, quality control, and processing methods. Additional information to supplement soundings and other survey data and any deviations from the DAPR are discussed in this report.

B.2 Quality Control

B.2.1 Crosslines

Multibeam/single beam echo sounder/side scan sonar crosslines acquired for this survey totaled 5.27% of mainscheme acquisition.

RAINIER launches 2801 (RA-4), 2803 (RA-3), and 2804 (RA-6) acquired 7.66 nautical miles of MBES crosslines across all depth ranges and water masses. H13278 crossline data is adequate for verifying and evaluating the internal consistency of survey data. The "Compare Grids" function in Pydro Explorer was used to analyze a finalized VR surface of H13278 crossline only data and a finalized VR surface of H13278 mainscheme-only data. In the difference surface, 99.5% of nodes met IHO allowable Total Vertical Uncertainty (TVU) standards.

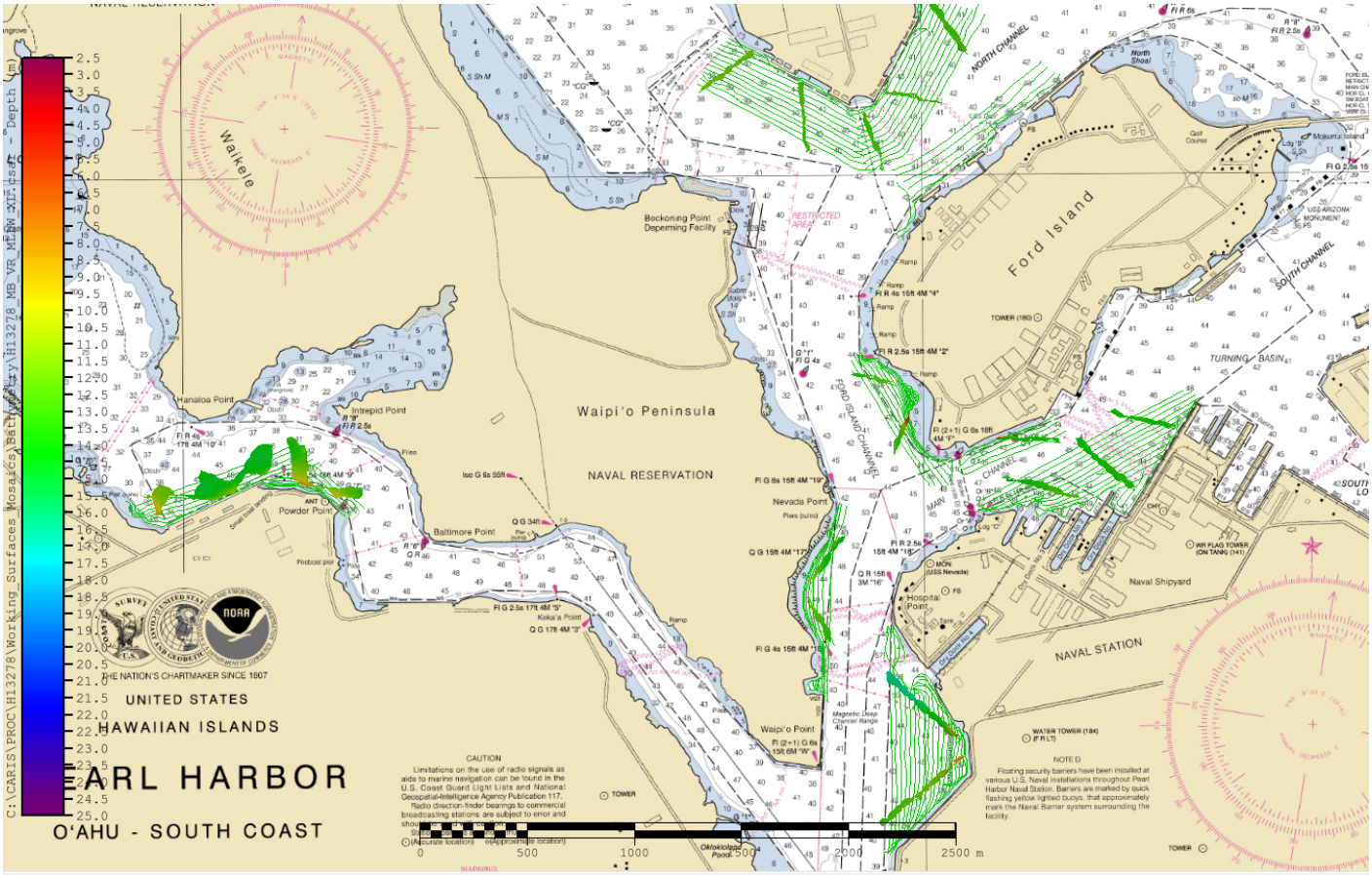


Figure 10: H13278 crossline VR crossline surface overlaid on mainscheme tracklines-Pearl Harbor.

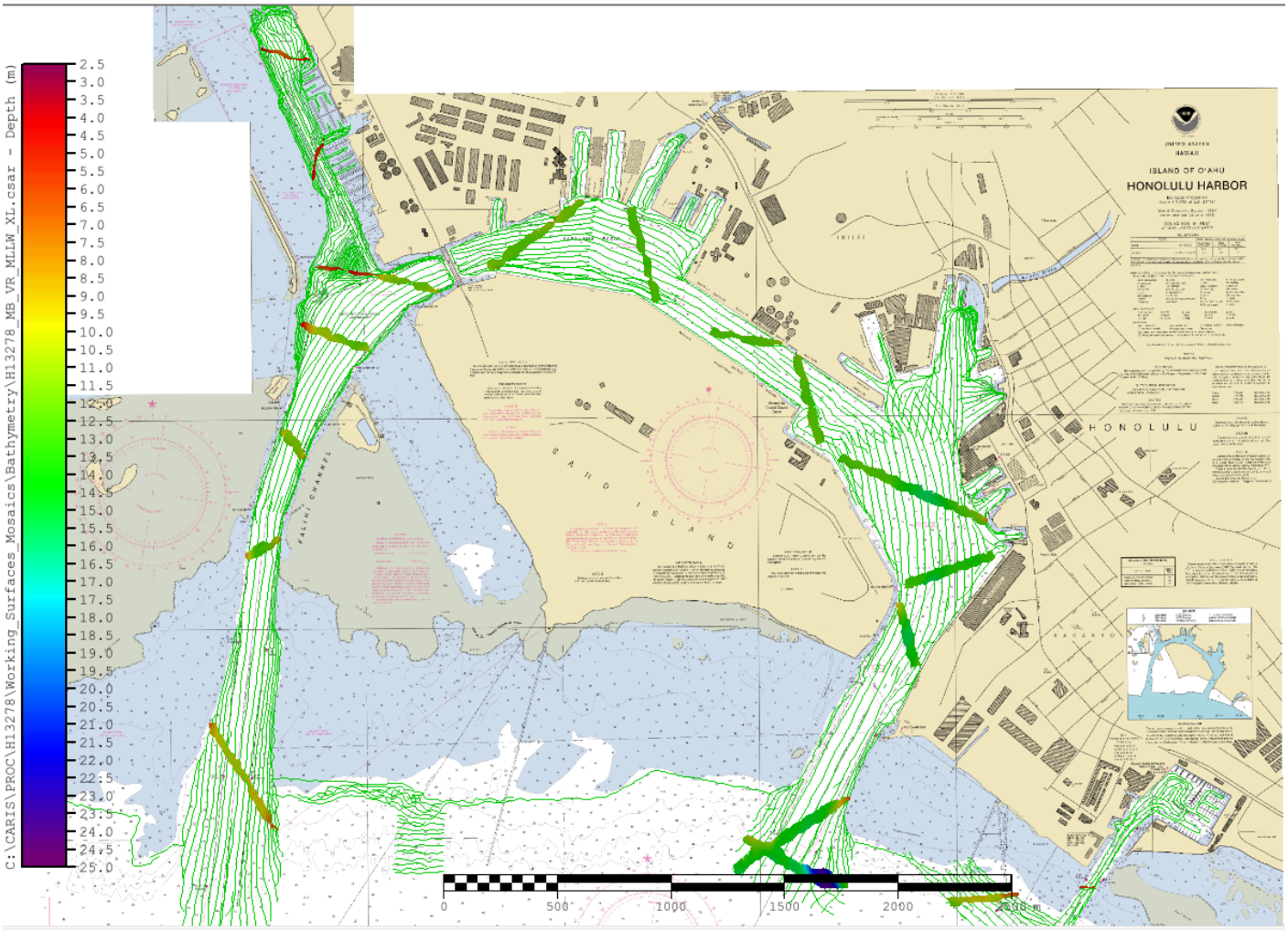


Figure 11: H13278 crossline VR crossline surface overlaid on mainscheme tracklines-Honolulu Harbor.

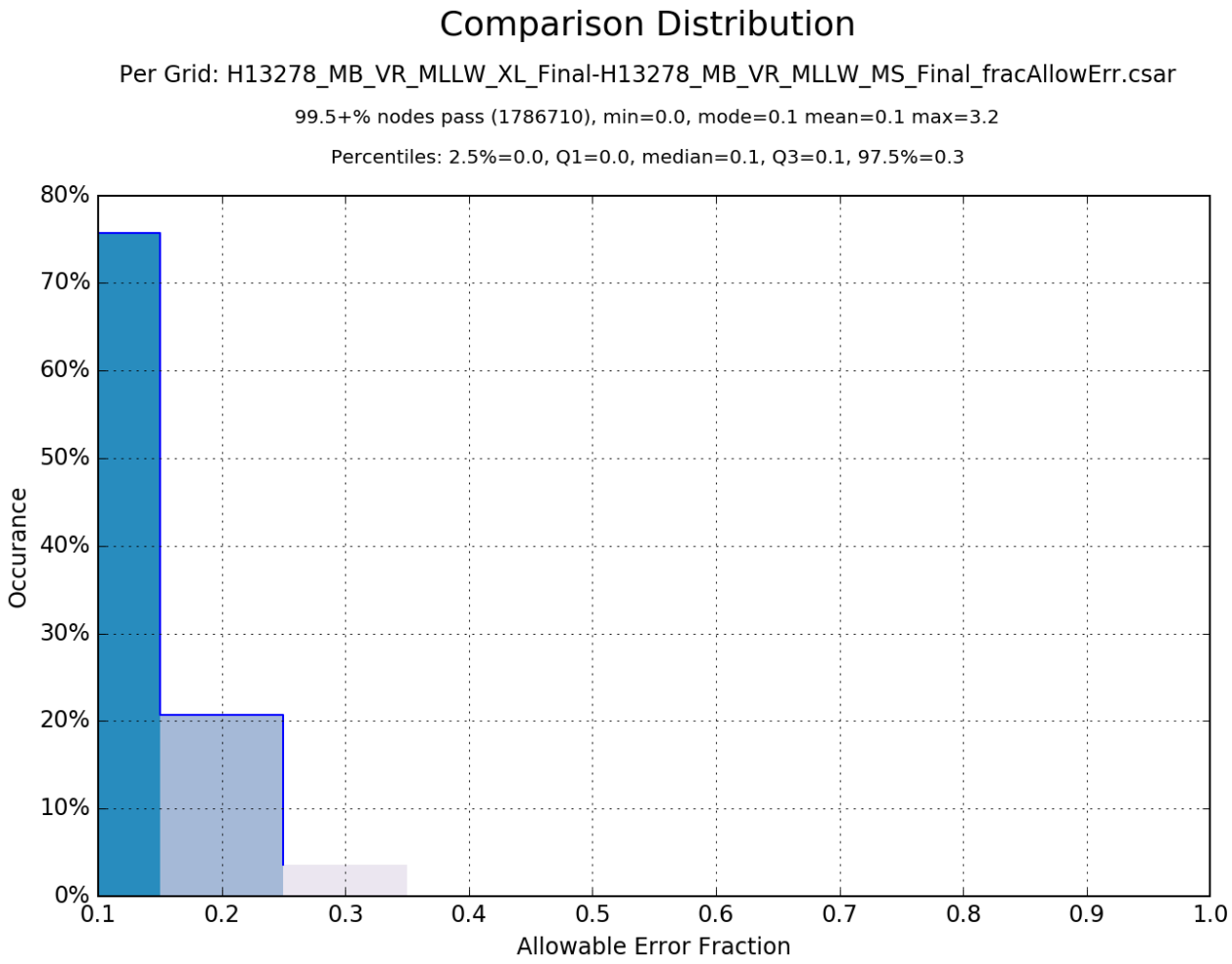
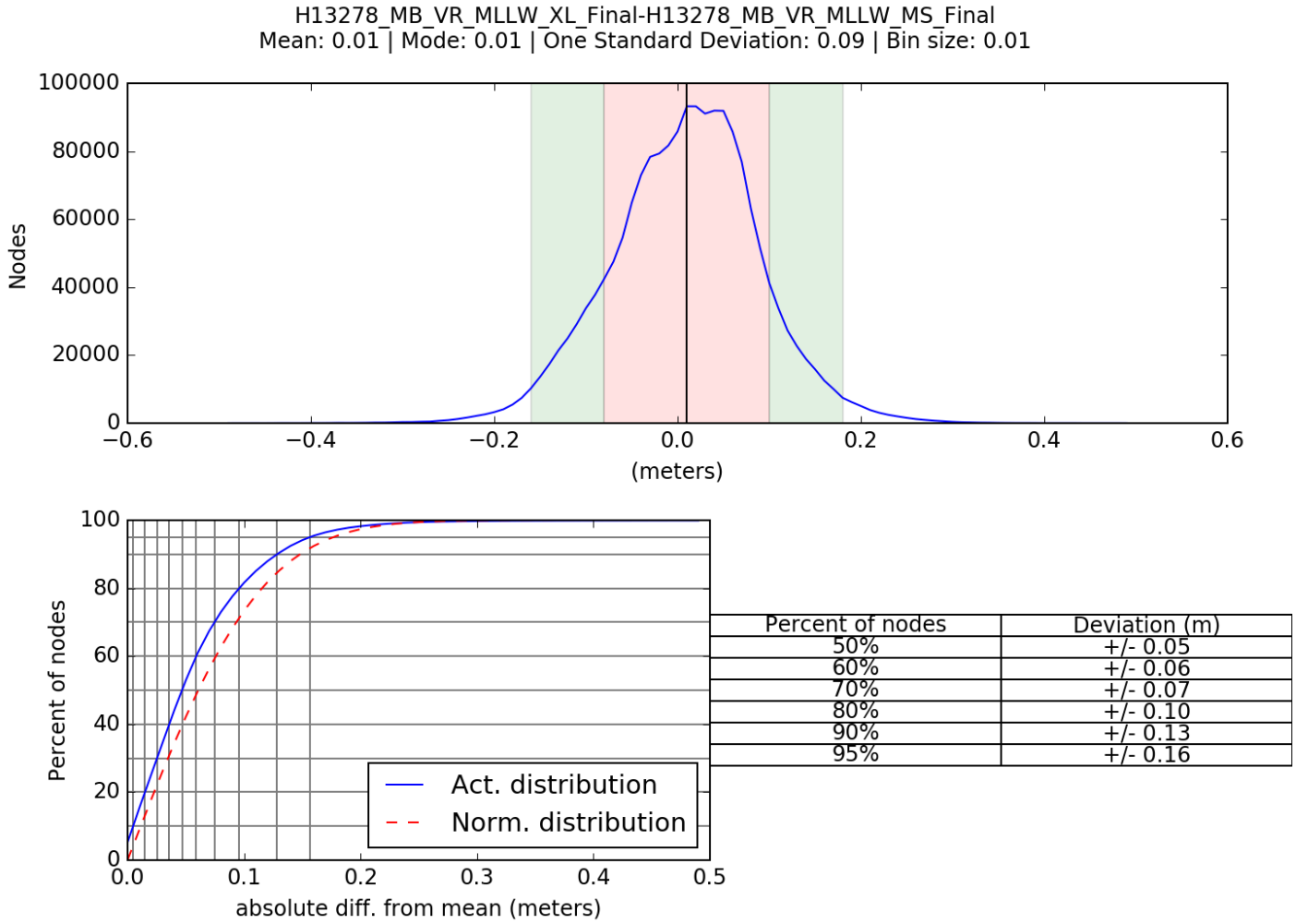


Figure 12: Pydro derived plot showing node percentage-pass value of H13278 mainscheme to crossline data.



Percent of nodes	Deviation (m)
50%	+/- 0.05
60%	+/- 0.06
70%	+/- 0.07
80%	+/- 0.10
90%	+/- 0.13
95%	+/- 0.16

Figure 13: Pydro derived plot showing absolute difference statistics of H13278 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 meters	0.10 meters

Table 7: Survey Specific Tide TPU Values.

Hull ID	Measured - CTD	Measured - MVP	Measured - XBT	Surface
2801, 2803, 2804	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 H13278 were derived from a combination of fixed values for equipment and vessel characteristics, as well as from field assigned values for sound speed uncertainties. The uncertainty value of NOAA's Ellipsoidally-Referenced Tidal Datum Model (ERTDM) was documented in metadata that accompanied the ERTDM.

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 Applanix POS MV position, navigation, attitude, and vessel motion data were applied during acquisition and initially in post processing. 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 corrected position including height.

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" within Pydro QC Tools was used to analyze H13278 Total Vertical Uncertainty (TVU) compliance; a histogram plot of the results is shown below.

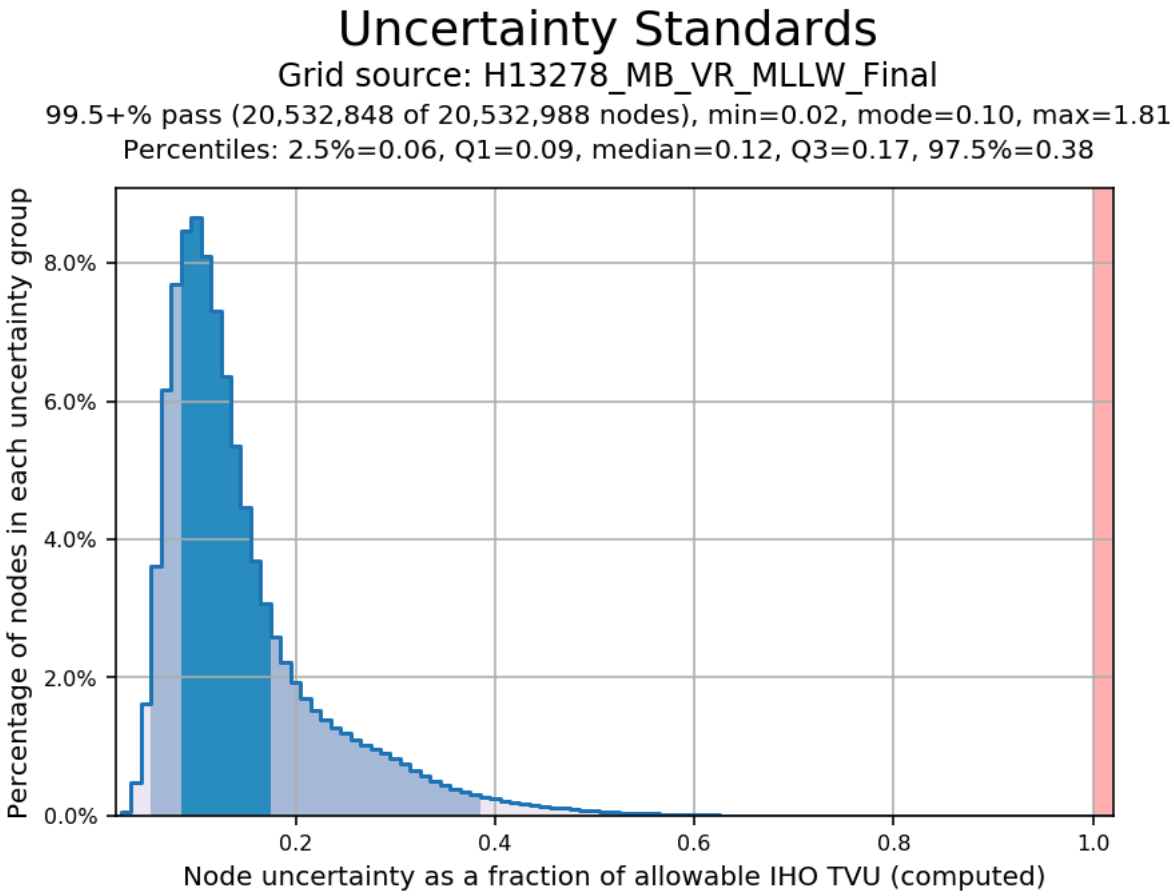


Figure 14: Pydro derived plot showing TVU compliance of H13278 finalized variable resolution MBES data.

B.2.3 Junctions

H13278 junctions with H12047, a survey conducted in 2009 by the R/V Ahi out of the the Pacific Islands Benthic Habitat Mapping Center (PIBHMC), University of Hawai'i. The relative geographic extents of H12047 and H13278 are illustrated in the figure below.

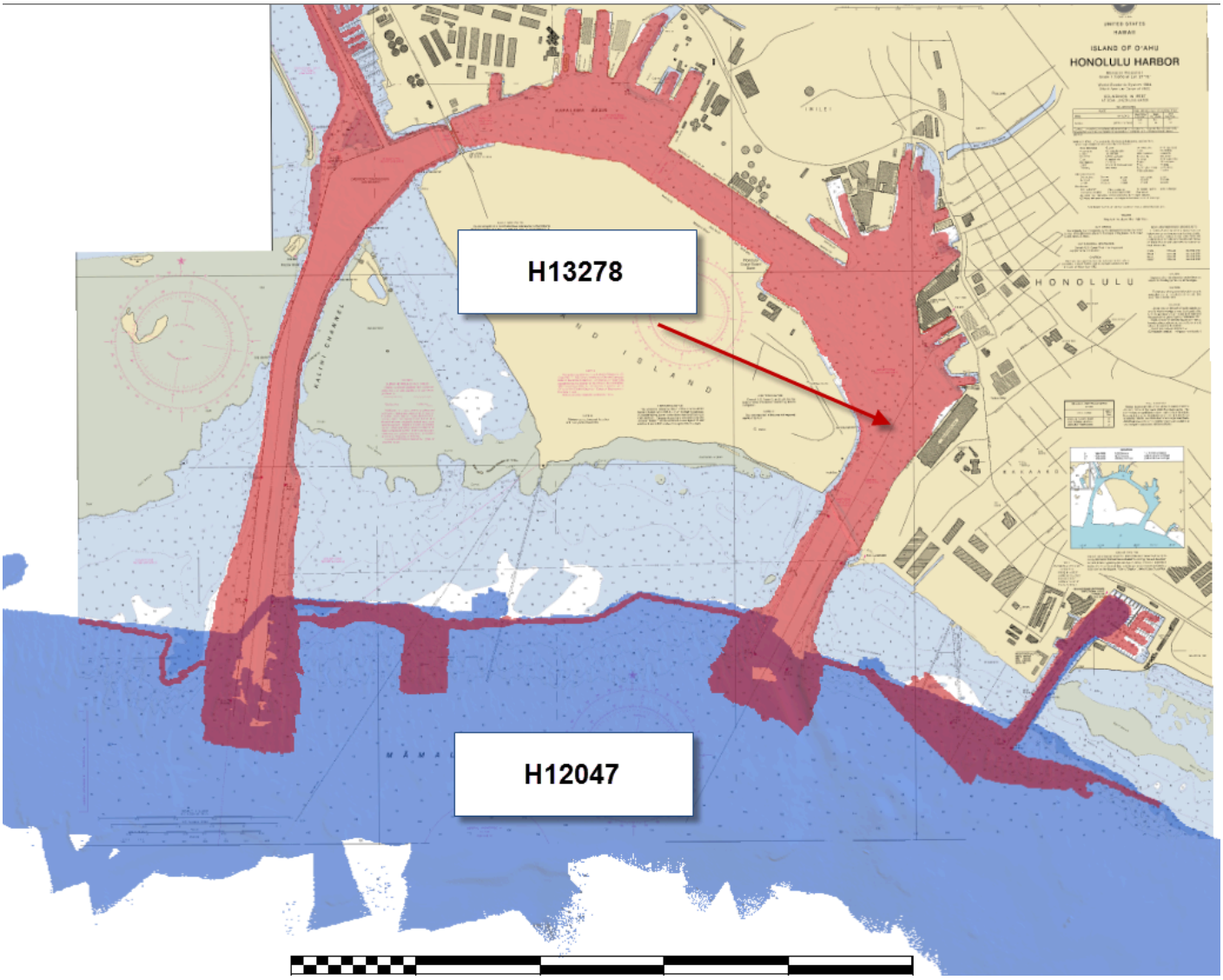


Figure 15: H13278/H12047 junction.

The following junctions were made with this survey:

Registry Number	Scale	Year	Field Unit	Relative Location
H12047	1:2500	2009	R/V Ahi	S

Table 9: Junctioning Surveys

H12047

The junction with survey H12047 encompassed 0.301 square nautical miles at the southern boundary of H13278. A comparison was made between H13278 and H12047 4 meter finalized surfaces using the

Pydro Explorer "Compare Grids" function. The results are shown in the figures below. Additionally, the "Difference" function creates a difference surface from which statistics were derived. The computed statistics indicated the average difference in depth between H13278 and H12047 was 0.21 meters with a standard deviation of 0.30 meters. Although there appears to be a definite bias between junction survey H12047 and H13278, due to the modern control and error modeling applied to H13278 the hydrographer recommends H13278 data should supersede the junction survey in their common area.

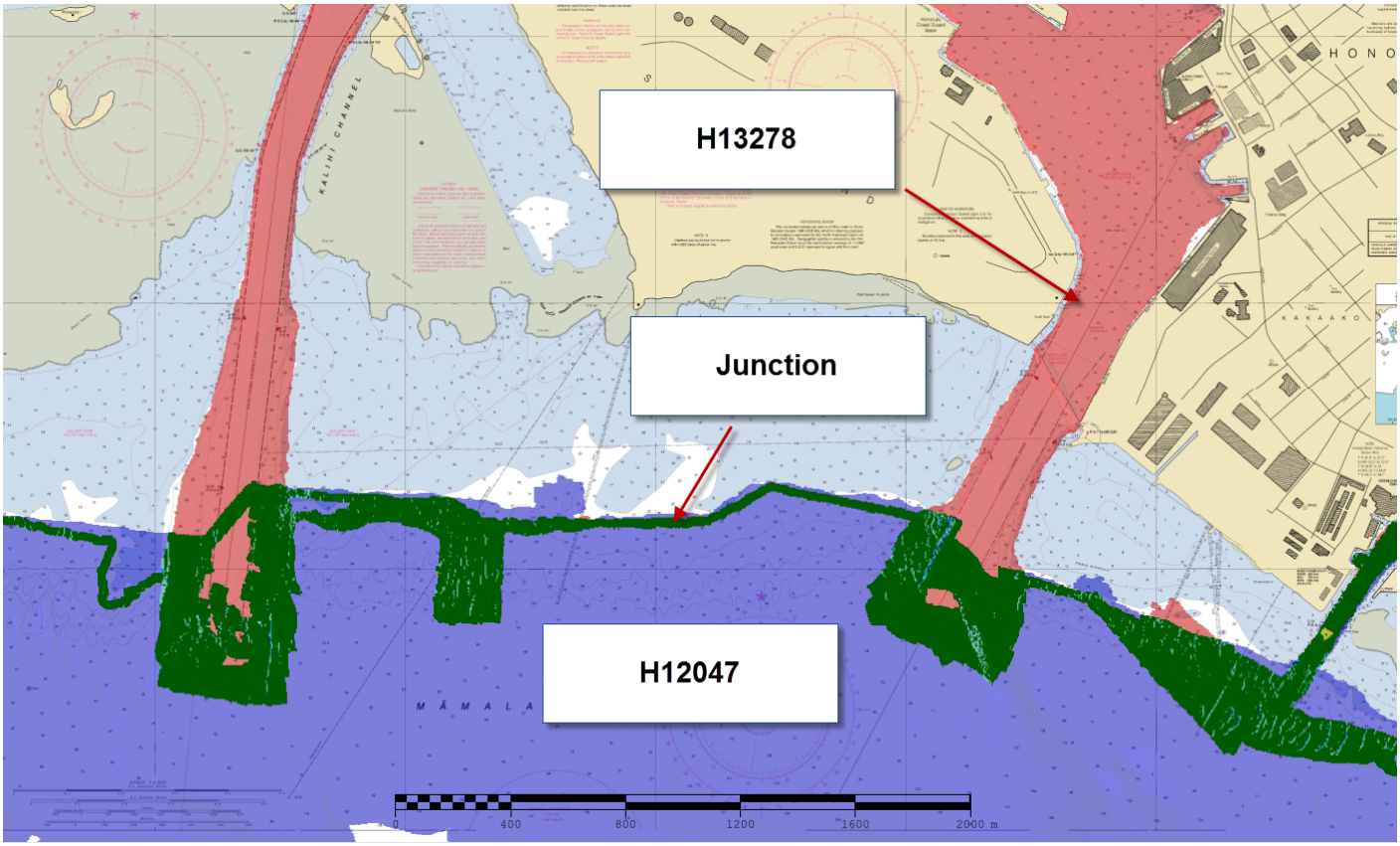
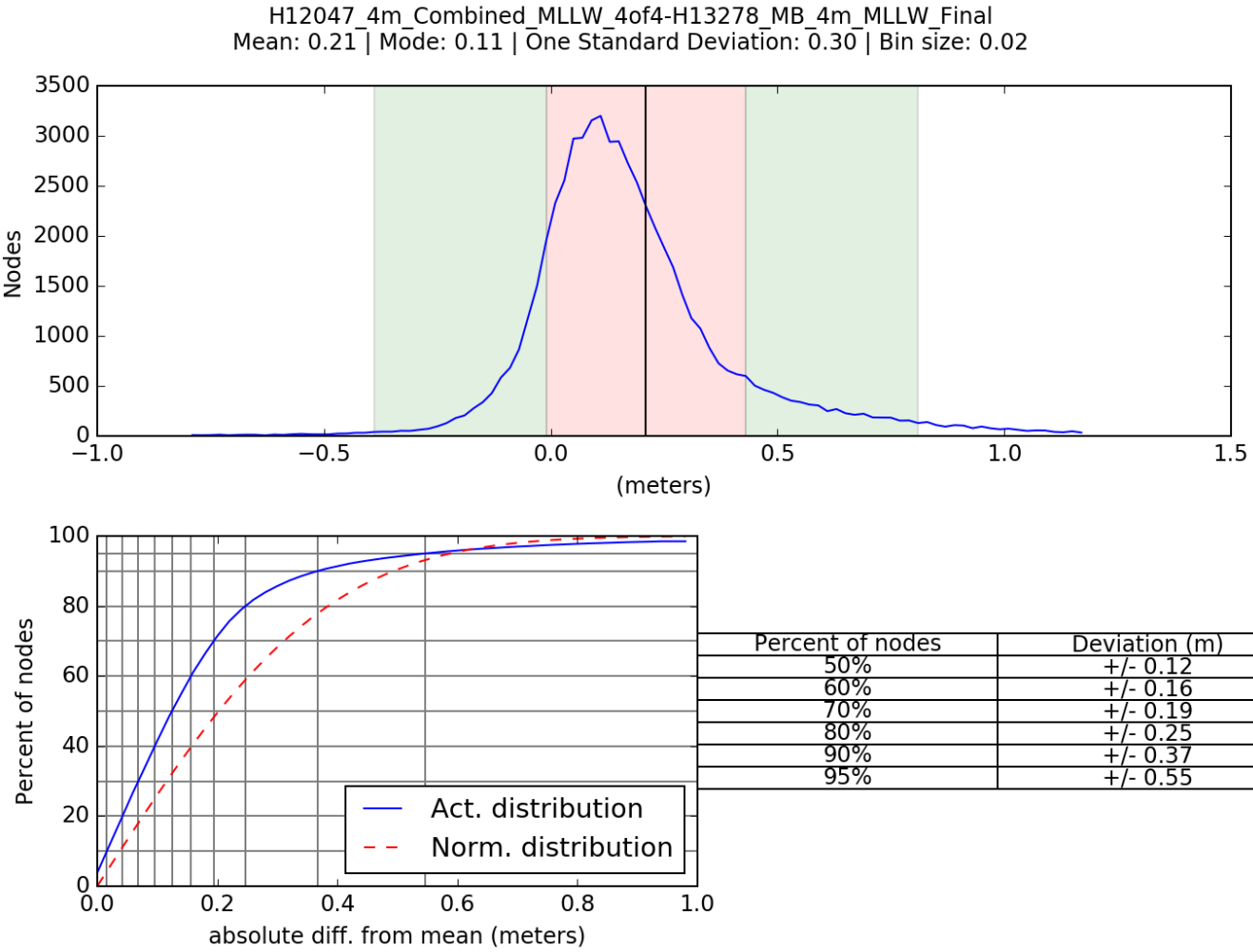


Figure 16: H13278/H12047 junction. Higher than allowable uncertainty junction nodes are shown in blue, those meeting uncertainty standards are green.



Percent of nodes	Deviation (m)
50%	+/- 0.12
60%	+/- 0.16
70%	+/- 0.19
80%	+/- 0.25
90%	+/- 0.37
95%	+/- 0.55

Figure 17: Pydro derived plot showing H13278/H12047 variable-resolution surface comparison statistics.

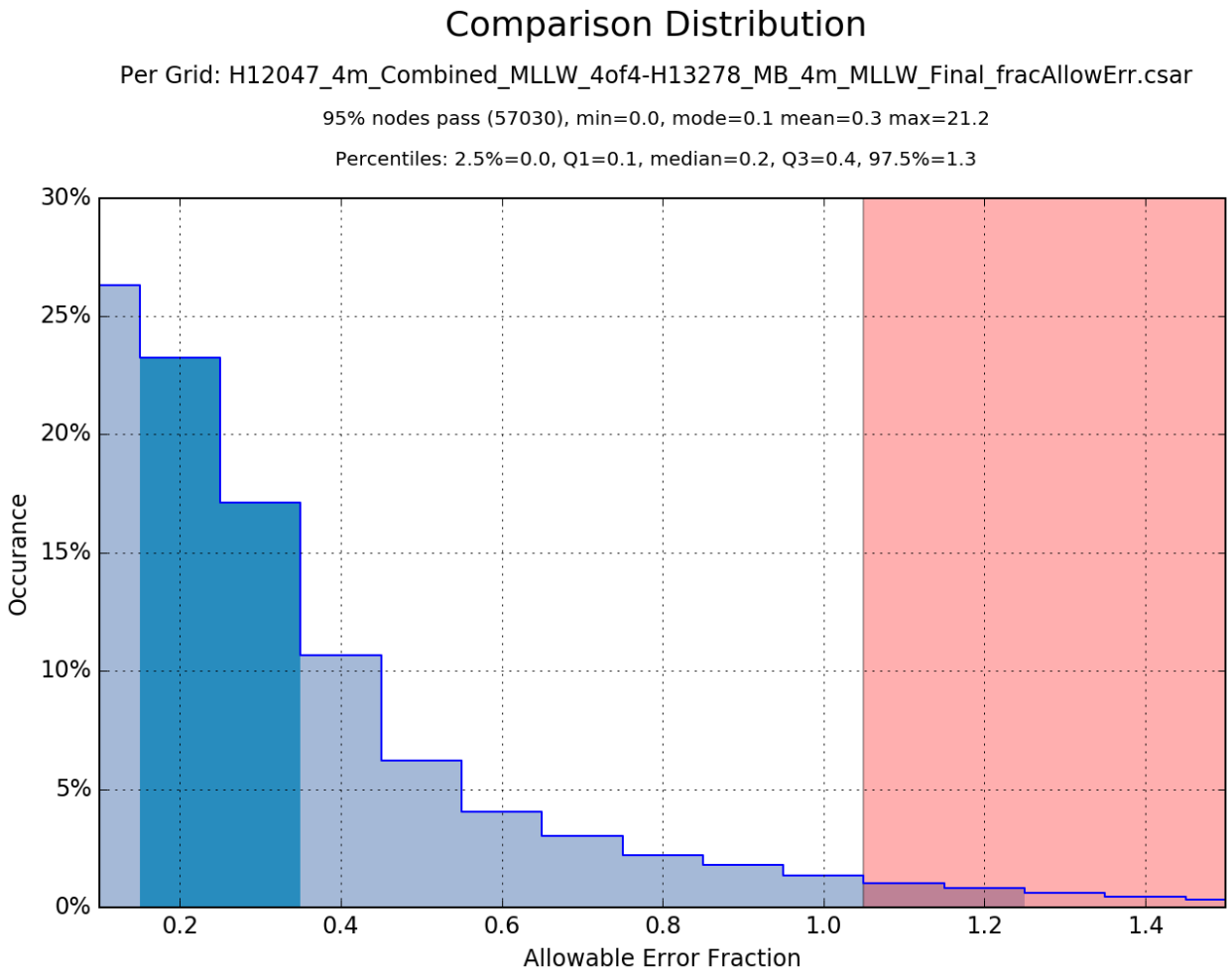


Figure 18: Pydro derived plot showing H13278/H12047 variable-resolution surface comparison statistics.

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: Fifty sound speed profiles were acquired for this survey at discrete locations within the survey area at least once every four hours, when significant changes to surface sound speed were observed, or when operating in a new area. Sound speed profiles were acquired using Sea- Bird Scientific SBE 19plus profilers. All casts were concatenated into a master file and applied using the "Nearest distance within time (4 hours)" profile selection method.

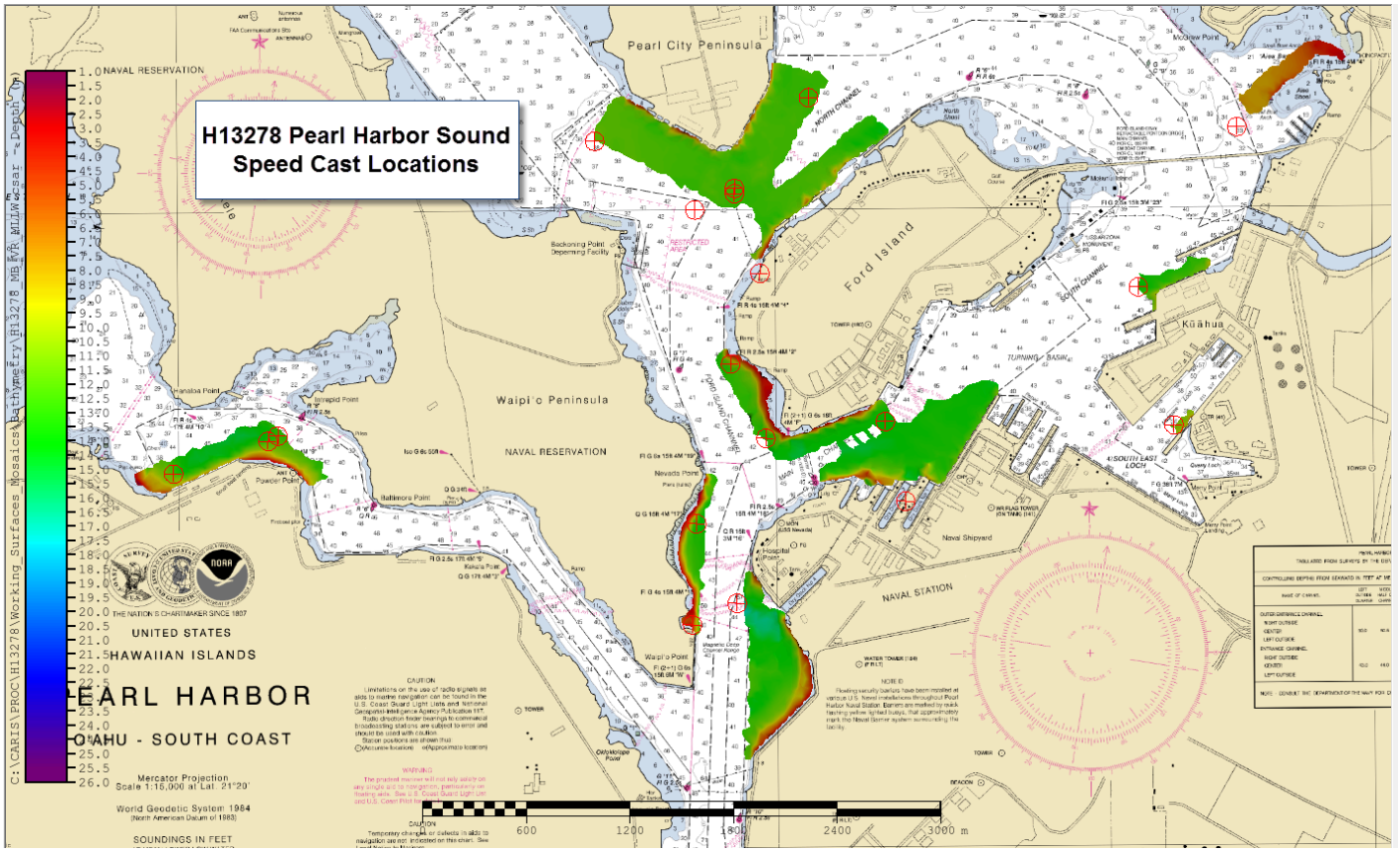


Figure 19: H13278 Pearl Harbor sound speed cast locations.

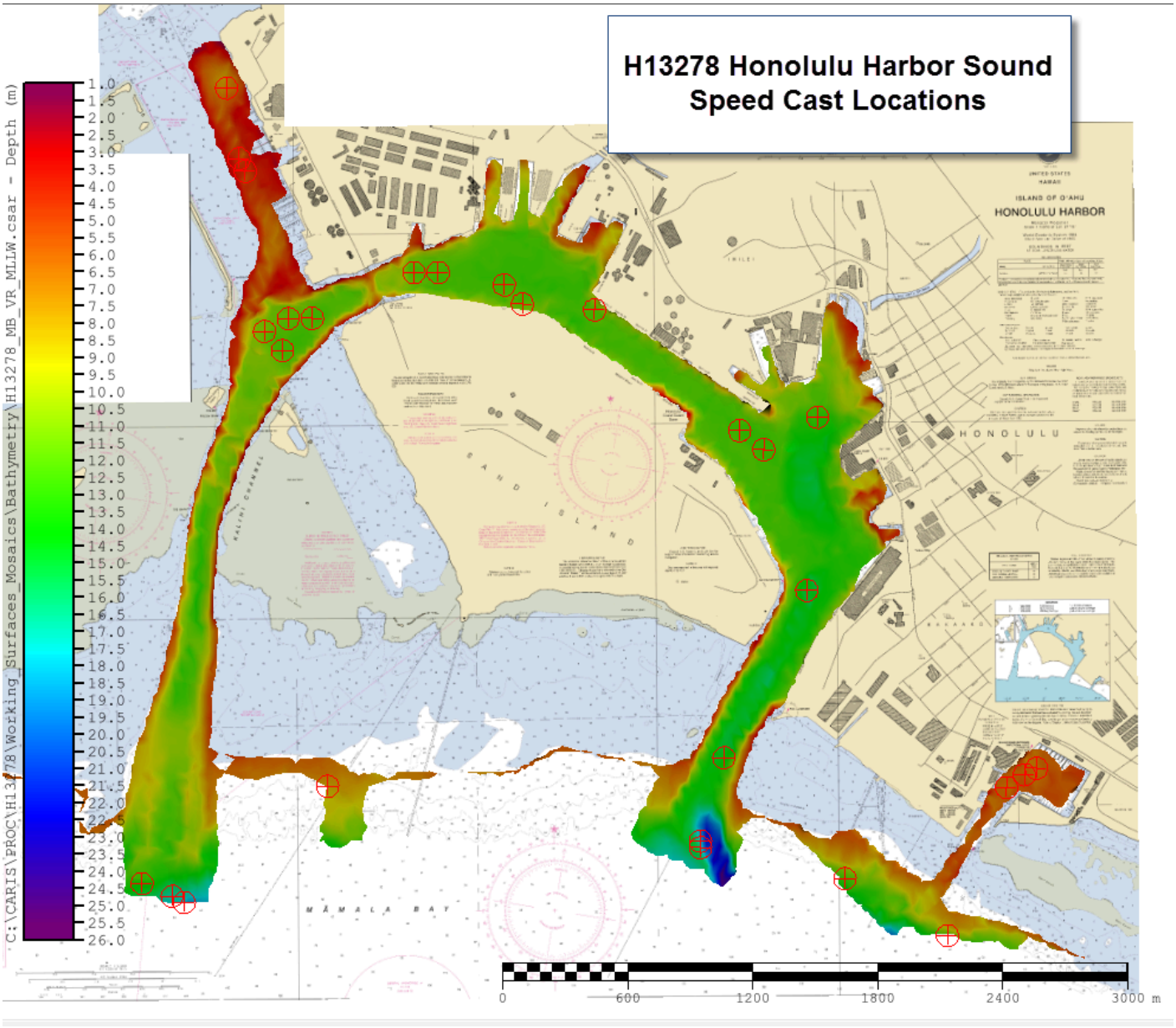


Figure 20: H13278 Honolulu Harbor sound speed cast locations.

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 logged during MBES operations and subsequently processed by RAINIER personnel. The .GSF files created during processing and one backscatter mosaic per vessel per frequency have been delivered with this report. Backscatter processing procedures utilized followed those detailed in the DAPR.

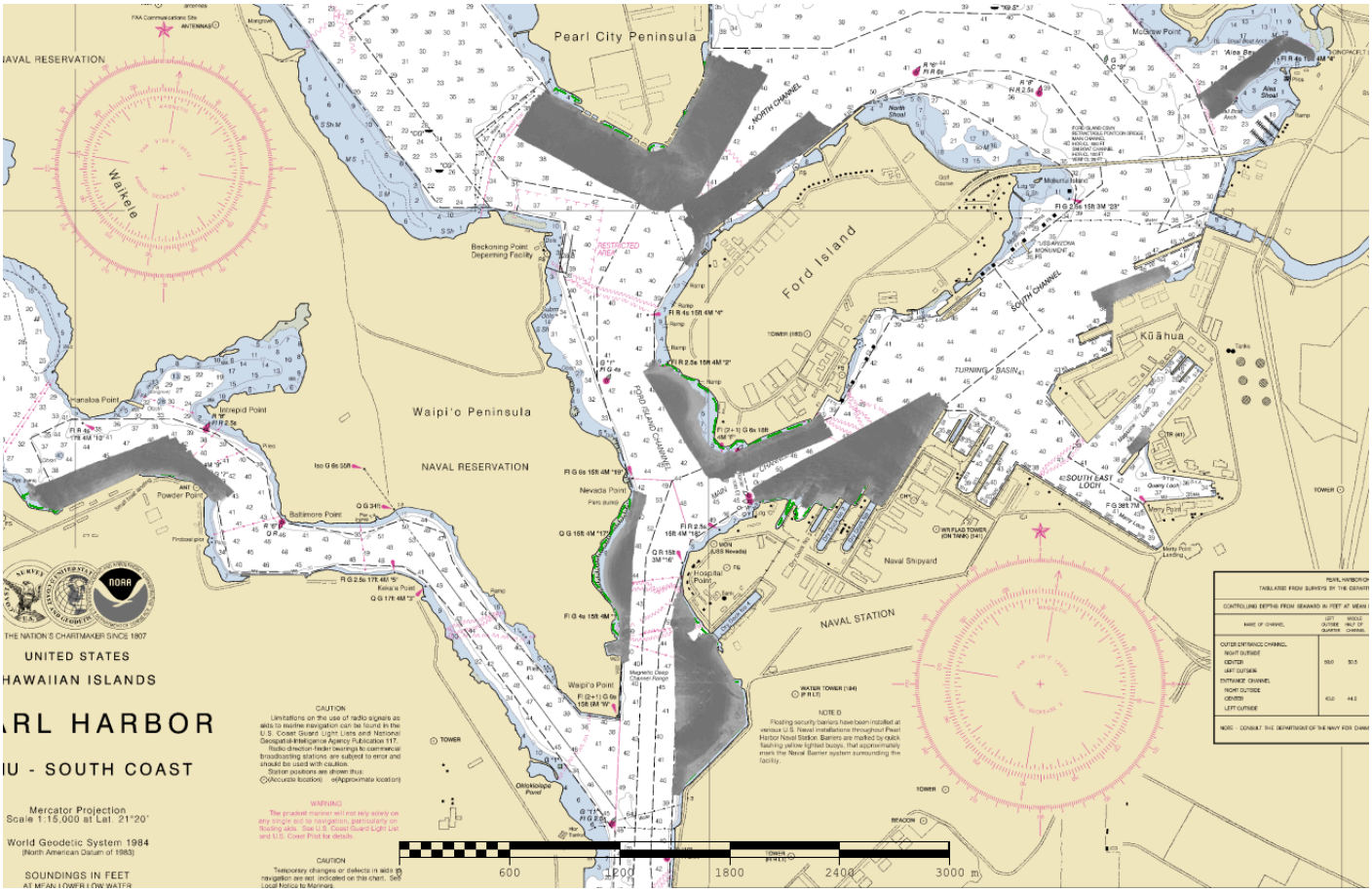


Figure 21: Overview of H13278 backscatter mosaics-Pearl Harbor (chart 19366). Assigned sheet limits shown in green.

Figure 22: Overview of H13278 backscatter mosaics-Honolulu Harbor (chart 19367). Assigned sheet limits shown in green.

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	11.1.03

Table 10: 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 11: Primary imagery data processing software

The following Feature Object Catalog was used: NOAA Profile Version 2019v1.

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
H13278_MB_VR_MLLW	CARIS VR Surface (CUBE)	Variable Resolution	1.26 meters - 25.60 meters	NOAA_VR	Object Detection
H13278_MB_VR_MLLW_Final	CARIS VR Surface (CUBE)	Variable Resolution	1.04 meters - 25.60 meters	NOAA_VR	Object Detection

Table 12: Submitted Surfaces

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

The Pydro QC Tools "Detect Fliers" program with object detection settings was used to identify fliers in the data; obvious noise was rejected. Upon completion of multiple iterations of this process, Detect Fliers was run again, resulting in 4 fliers remaining. These false fliers are the result of abrupt changes in bathymetry such as the submerged piling in the figure below. Results from Pydro QC tools are included in the Separates section of this report.

Fifteen soundings were designated for this survey, eight of which were for newly identified dangerous wrecks based upon the parameters set in Field Procedure Manual (FPM) section 7.23 and seven were for newly identified obstructions. No Dangers to Navigation (DTONs) were identified within the survey area.

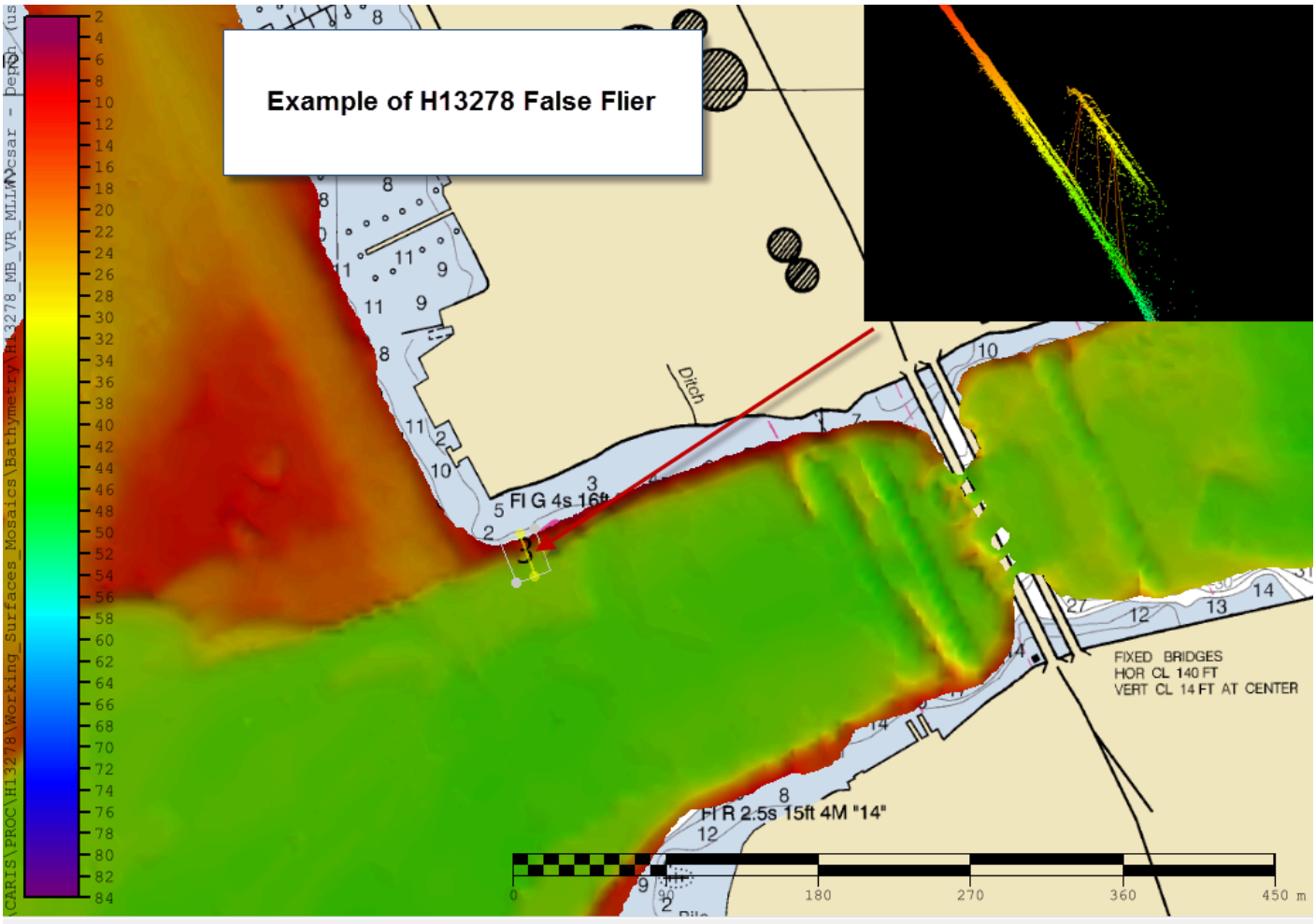


Figure 23: Example of H13278 false flier embedded within submerged piling soundings.

C. Vertical and Horizontal Control

Additional information discussing the vertical or horizontal control for this survey can be found in the accompanying 2019 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_ERDTM_NAD83(2011)_MLLW_Extended2.csar

Table 13: 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

Precise Positioning-Real Time Extended (PP-RTX) processing methods were used in Applanix POSPac MMS 8.2.1 software to produce SBETs for post-processing horizontal correction.

WAAS

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

D. Results and Recommendations

D.1 Chart Comparison

A comparison was made between H13278 survey data and Electronic Navigation Charts (ENC) US5HA54M and (ENC) US5HA55M using CUBE surfaces and contours created in Caris. Both charts were required for complete coverage of the survey area.

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?
US5HA55M	1:5000	29	09/04/2019	09/04/2019	NO
US5HA54M	1:5000	29	10/23/2019	10/23/2019	NO

Table 14: Largest Scale ENCs

US5HA55M

ENC US5HA55M covers the Honolulu Harbor portion of the H13278 survey area. H13278 three and five-fathom contours generally agreed with the ENC and were primarily situated offshore of the charted depth curves. The hydrographer recommends using the new contours to update the charted depth curves.

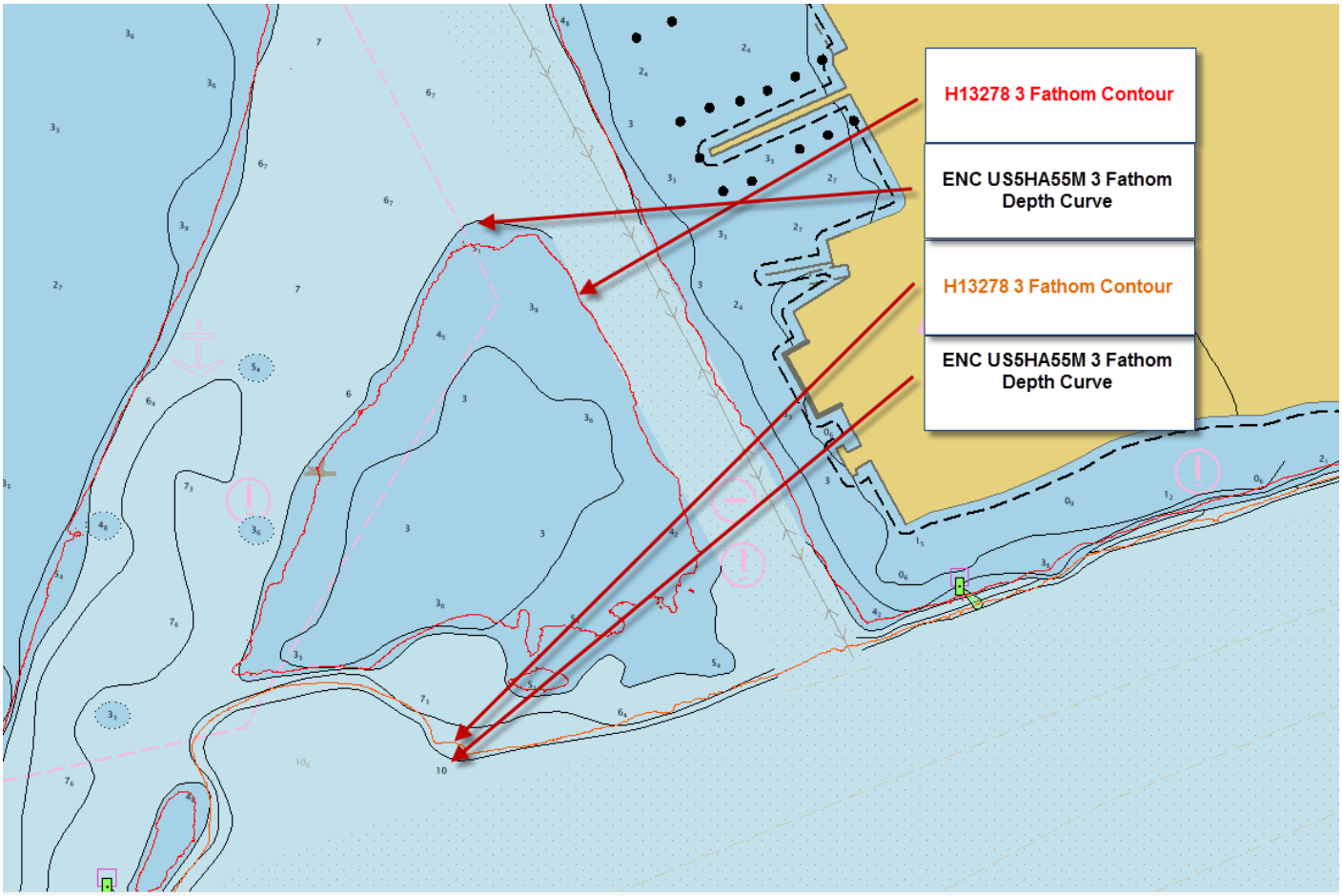


Figure 24: ENC US5HA55M overlaid with H13278 three and five-fathom contours showing agreement with charted depth curves.

US5HA54M

ENC US5HA54M covers the Pearl Harbor portion of the H13278 survey area. H13278 three and five-fathom contours generally agreed with the ENC and were generally inshore of the charted depth curves.The hydrographer recommends using the new contours to update the charted depth curves.

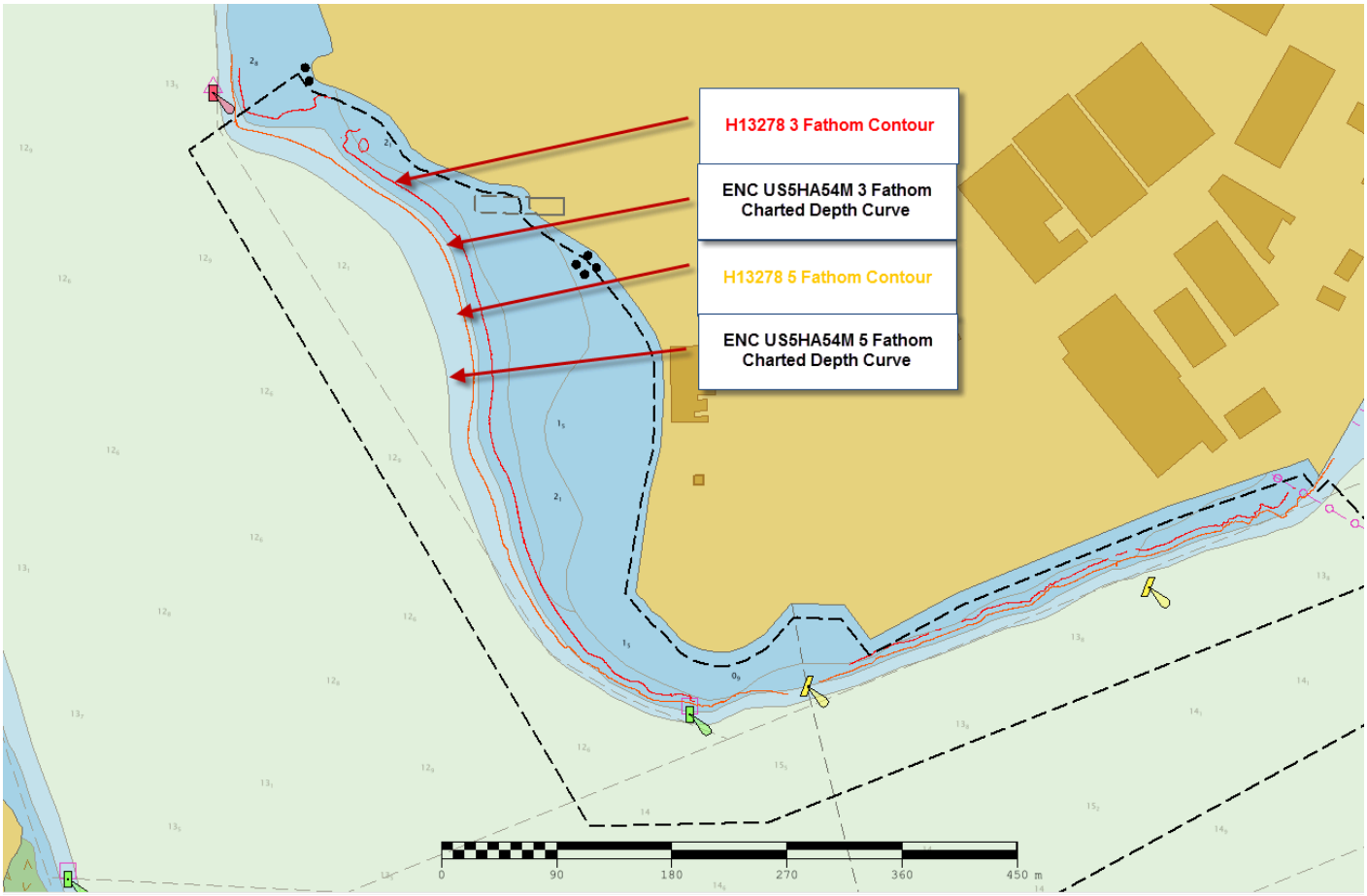


Figure 25: ENC US5HA54M overlaid with H13278 three and five-fathom contours showing agreement with charted depth curves.

D.1.2 Maritime Boundary Points

No Maritime Boundary Points were assigned for this survey.

D.1.3 Charted Features

See Final Feature File for more information.

On the eastern edge of ‘Aiea Bay, the geographic name “CINCPACFLT Landing” should be changed to “COMPACFLT Landing”. The title Commander-in-Chief, U.S. Pacific Fleet (CINCPACFLT) was changed to Commander, U.S. Pacific Fleet (COMPACFLT) at the direction of the Secretary of Defense on Oct. 24, 2002.

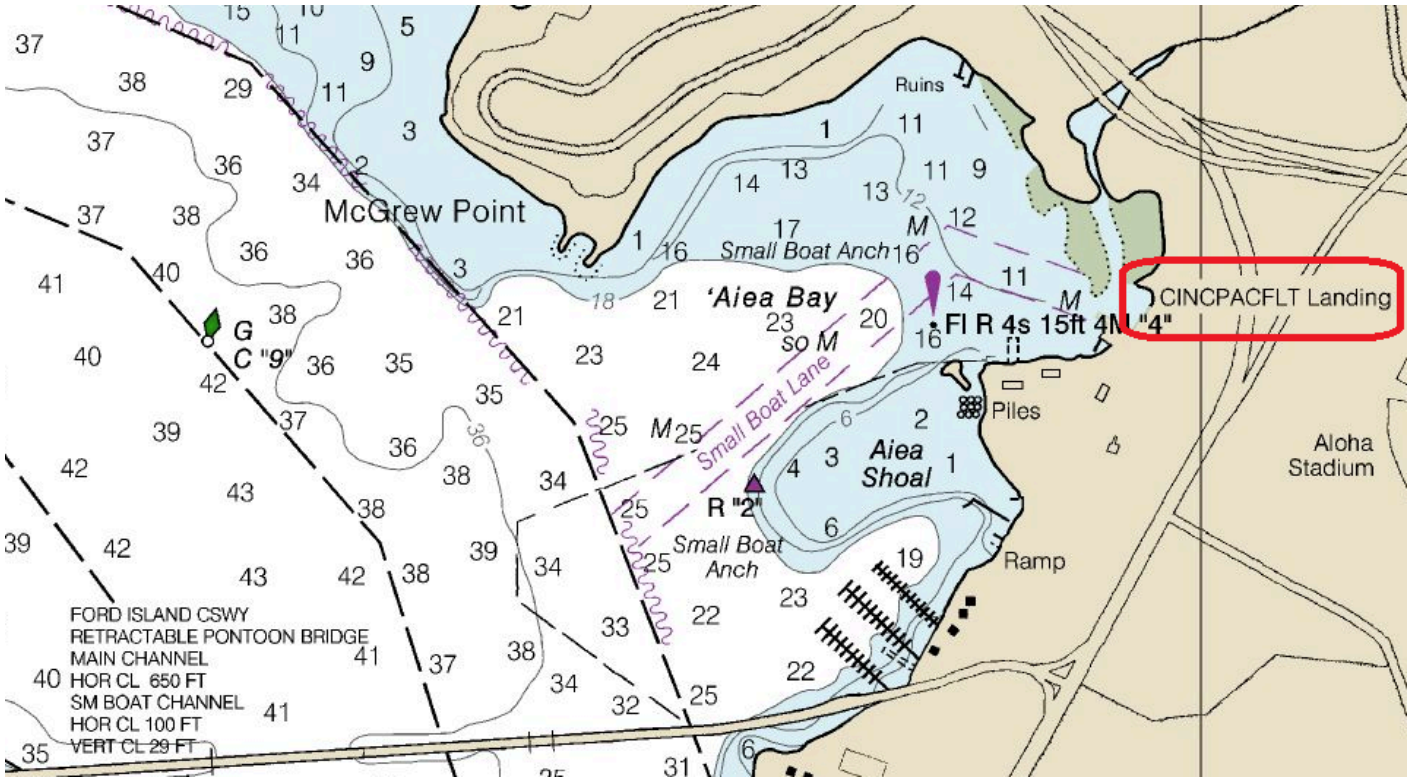


Figure 26: Location of "CINCPACFLT Landing" that should be changed to "COMPACFLT Landing"

D.1.4 Uncharted Features

Fifteen uncharted features consisting of seven obstructions and eight dangerous wrecks were observed during acquisition and were attributed and added to the Final Feature File. See Final Feature File for more information.

Six uncharted obstructions and one foul area were found during office review and were attributed and imported into the Final Feature File.

D.1.5 Shoal and Hazardous Features

No shoals or potentially hazardous features were identified in the survey area that are not discussed elsewhere in this report or included in the H13278 Final Feature File. No Danger to Navigation reports were submitted for this survey.

D.1.6 Channels

H13278 includes three USACE maintained channels and two turning basins. Surveyed soundings were compared to the charted depth range values in DRGARE (dredge areas) of the ENC. Charted depth range

values were not necessarily uniform throughout an entire dredge area. As many as four separate dredge areas, each with different depth range value could make up a channels or turning basin.

Both of the turning basins, the Keehi Lagoon Barge Channel Turning Basin and the Kalihi Emergency Turning Basin depth areas were well charted with shoaling seen only on the extreme outer edges of the basins. The Keehi Lagoon Barge Channel and Honolulu Channel Range were well charted, with no evidence of shoaling in the channel. Kalihi Channel shows minor mid-channel shoaling (5-cm maximum) between buoys 3 and 4 as seen in the image below.

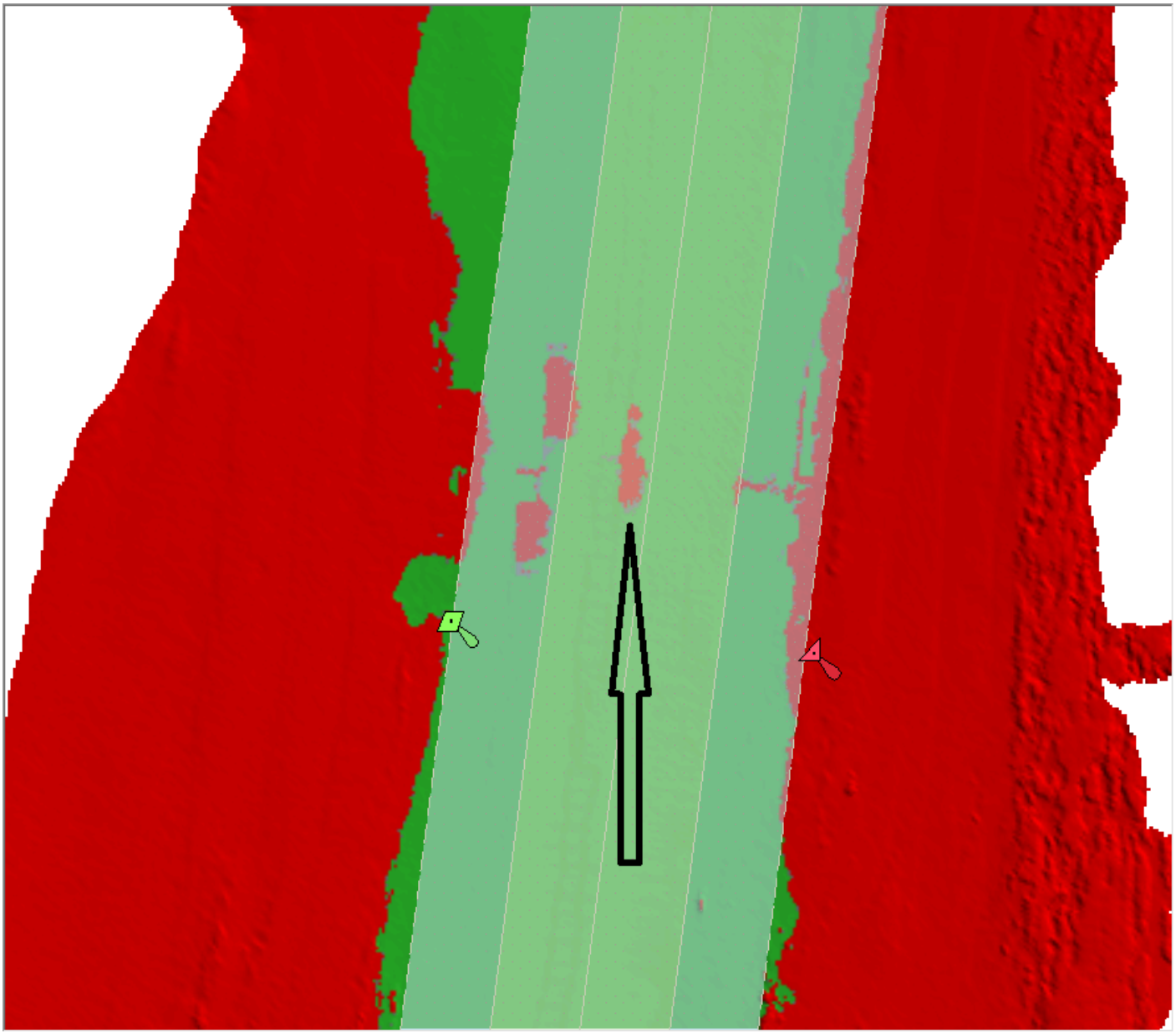


Figure 27: Kalihi channel, made up of four individual dredge areas running north-south. The areas in red (see arrow) within the two inner dredge areas is shoaler than minimum 10.6 meter depth range value. The outer two dredge areas have a minimum 9.4 meter depth range value and are unaffected by shoaling.

D.1.7 Bottom Samples

No bottom samples were required for this survey.

D.2 Additional Results

D.2.1 Shoreline

Limited shoreline verification was conducted only on ATONs and features within the MBES coverage of H13278 using the Composite Source File (CSF) provided by NOAA HSD Operations Branch. Non-completion of shoreline verification was due to time constraints and lack of access to shoreline features. In the field, all assigned features that were investigated were addressed as required with S-57 attribution and recorded in the H13278 Final Feature File (FFF) to best represent features at chart scale. This file also includes new wrecks and obstructions which are discussed in the "Uncharted Features" section above as well as recommendations to update, retain, or delete assigned features. See Final Feature File for more information.

Both of the ship piers at the NOAA Inouye Regional Center (IRC) have mooring dolphins with connecting catwalks at each end as shown in the image below. In total there are four dolphins and they are currently uncharted. The hydrographer recommends that build plans for these dolphins and pier additions be obtained and the uncharted dolphins be added to the chart.

Both Honolulu Harbor, and to a lesser degree Pearl Harbor are strewn with man-made debris. While most of this debris did not rise to the level of obstructions and require designation and addition to the final feature file, the debris is evident in the surfaces submitted with this survey. Examples of identifiable items not incorporated into the FFF include many large sunken tires (image below), presumably used as fenders and lost from piers or mooring vessels. More identifiable debris (image below) include the apparent remains of sunken piers roughly 0.2 – 0.3 meters high. These sunken piers are located off the end of the marina piers located in the Ke'ehi Lagoon barge channel.

Figure 28: Ship piers at the NOAA Inouye Regional Center with red arrows pointing to four uncharted dolphins with associated catwalks.

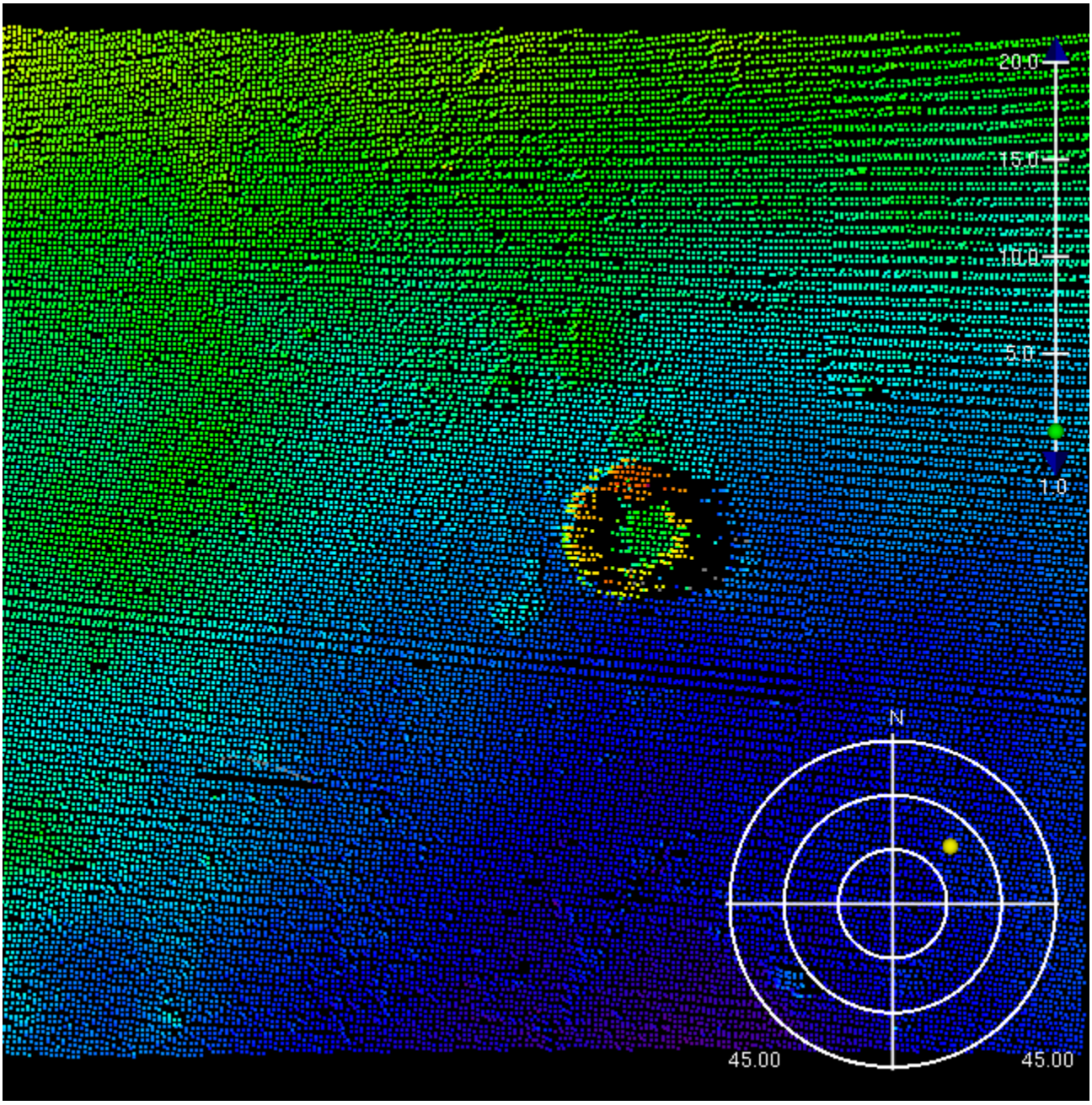


Figure 29: An example of uncharted man-made debris, a sunken tire presumably used as a fender and lost.

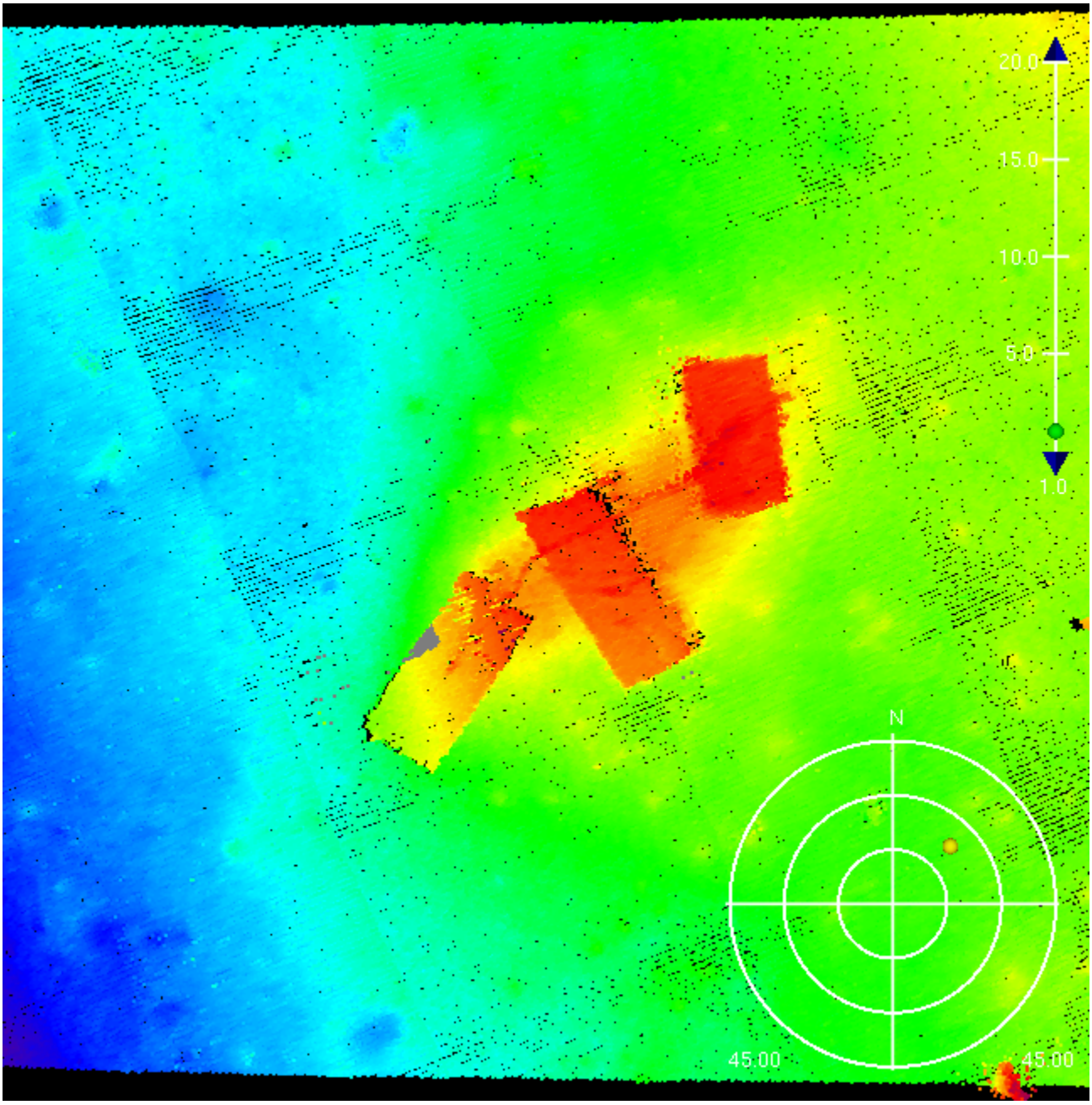


Figure 30: Another example of uncharted man-made debris, presumed floating pier ruins found near end of the marina docks located in the Ke'ehi Lagoon barge channel.

D.2.2 Aids to Navigation

All aids to navigation were on station and serving their intended purposes.

D.2.3 Overhead Features

Two assigned bridges in the northern portion of Honolulu Harbor were confirmed to exist. The survey party was unable to acquire bathymetric data beneath, nor verify the charted clearance values of these bridges.

D.2.4 Submarine Features

Numerous submarine cables and pipelines exist within the survey area. These have been investigated with appropriate S-57 attribution added to the Final Feature File. See Final Feature File for more information.

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

Construction has begun on a new container handling and storage facility to the north of berth 40D in Honolulu Harbor. Additionally, dredging of the waterfront area between berth 45 and 40D will begin as soon as 2020 and dredging of the Honolulu Channel between buoys 2 and 6 will begin within the next 12 months. For more information see email messages and attachments in the descriptive report appendices.

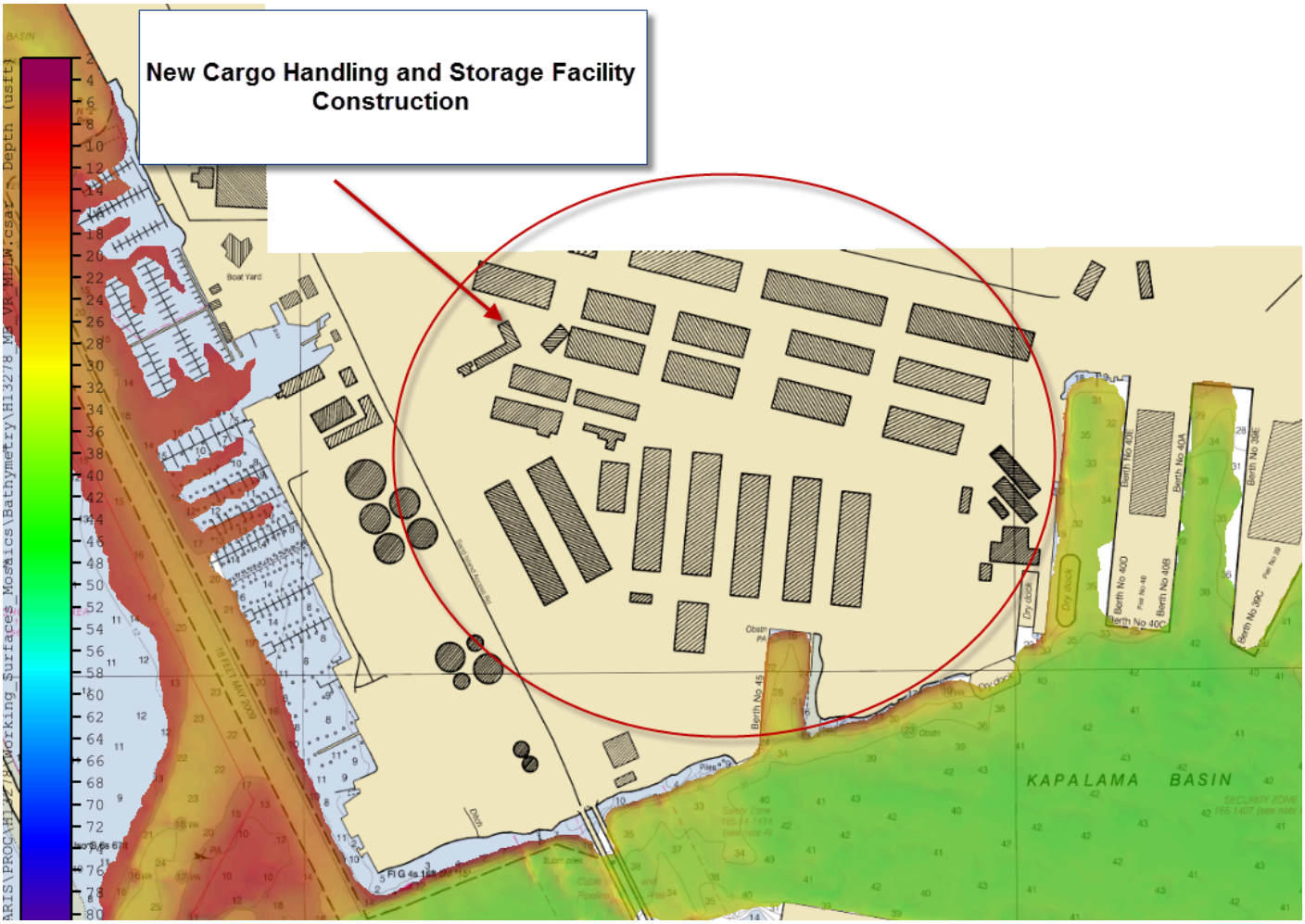


Figure 31: Location of new cargo handling and storage facility (Chart 19367).

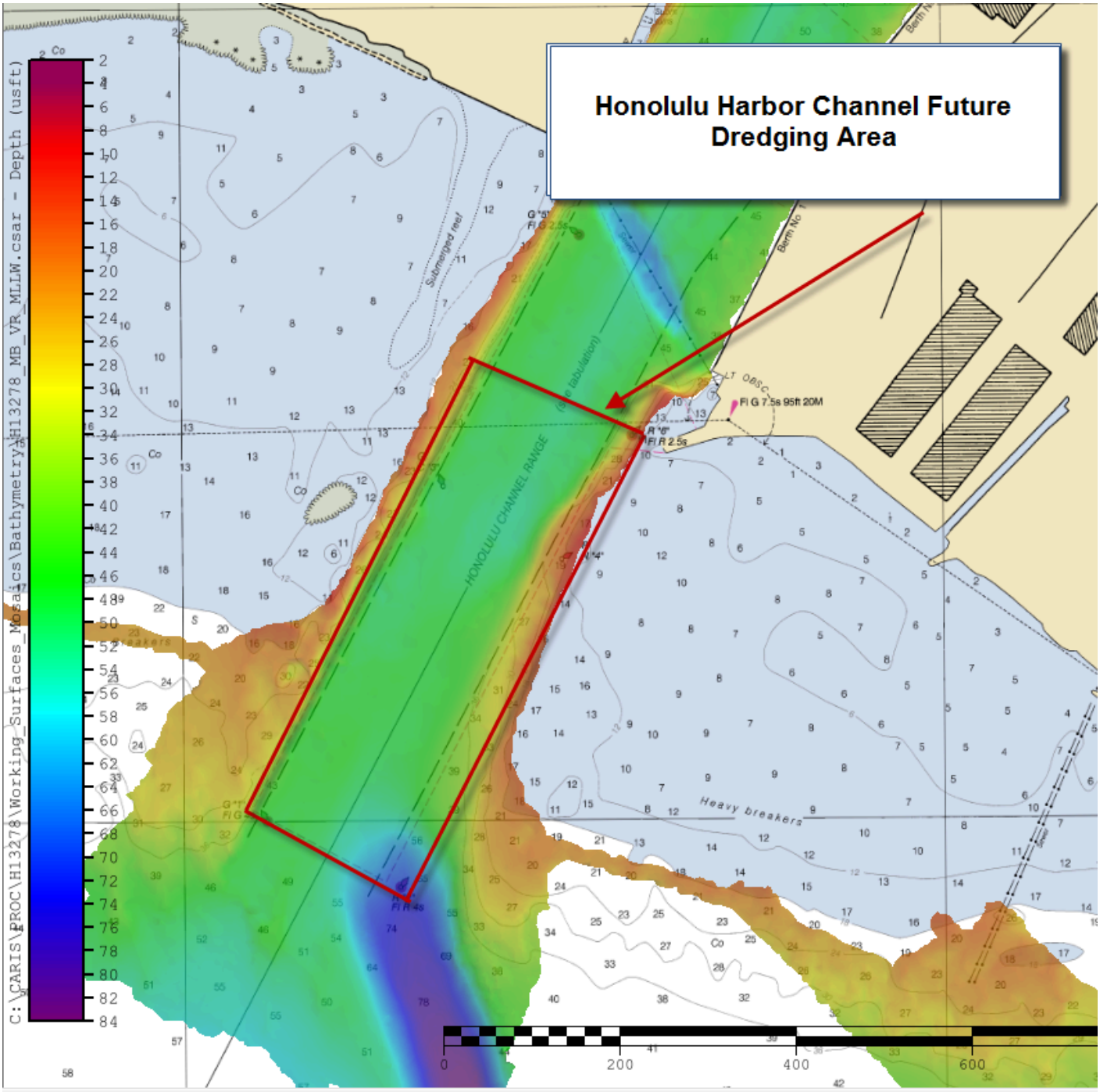


Figure 32: Location of future dredging operation (Chart 19367).

D.2.9 New Survey Recommendation

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

D.2.10 Inset Recommendation

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	Commanding Officer	01/21/2020	GREENAWAY.SAMUEL.F.1275635347 Digitally signed by GREENAWAY.SAMUEL.F.1275635347 Date: 2020.01.23 07:40:57 -08'00'
Hadley A. Owen, LT/NOAA	Field Operations Officer	01/21/2020	Digitally signed by OWEN.HADLEY.ANNE.1410967070 Date: 2020.01.24 07:35:08 -08'00'
James B. Jacobson	Chief Survey Technician	01/21/2020	JACOBSON.JAMES.BRYAN.1269664017 I have reviewed this document 2020.01.21 14:12:38 -08'00'
Carl R. Stedman	Sheet Manager	01/21/2020	JACOBSON.JAMES.BRYAN.1269664017 I am signing for Carl Stedman 2020.01.21 14:14:39 -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

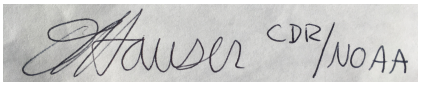
H13278

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.



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Date: 2020.05.06 13:26:07 -07'00'

Approved:_____

Commander Olivia Hauser, NOAA
Chief, Pacific Hydrographic Branch