H13407

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

DESCRIPTIVE REPORT

Type of Survey:	Navigable Area
Registry Number:	H13407

LOCALITY

State(s):	Alaska
General Locality:	Southeast Alaska
Sub-locality:	Felice Strait

2020

CHIEF OF PARTY
Samuel F. Greenaway, CDR/NOAA

LIBRARY & ARCHIVES

Date:

U.S. DEPARTMENT OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION	REGISTRY NUMBER:
HYDROGRAPHIC TITLE SHEET	**H13407**

INSTRUCTIONS: The Hydrographic Sheet should be accompanied by this form, filled in as completely as possible, when the sheet is forwarded to the Office.

State(s):	**Alaska**
General Locality:	**Southeast Alaska**
Sub-Locality:	**Felice Strait**
Scale:	**10000**
Dates of Survey:	**10/13/2020 to 10/25/2020**
Instructions Dated:	**08/24/2020**
Project Number:	**OPR-O392-RA-20**
Field Unit:	**NOAA Ship *Rainier***
Chief of Party:	**Samuel F. Greenaway, CDR/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 9N, MLLW. All references to other horizontal or vertical datums in this report are applicable to the processed hydrographic data provided by the field unit.

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Descriptive Report to Accompany Survey H13407

Project: OPR-O392-RA-20

Locality: Southeast Alaska

Sublocality: Felice Strait

Scale: 1:10000

October 2020 - October 2020

NOAA Ship *Rainier*

Chief of Party: Samuel F. Greenaway, CDR/NOAA

A. Area Surveyed

The survey is referred to as H13407, "Felice Strait" (Sheet 4), within the Project Instructions. The surveyed area encompasses approximately 48 square nautical miles and is located approximately 30 miles southeast of Ketchikan, AK.

A.1 Survey Limits

Data were acquired within the following survey limits:

Northwest Limit	Southeast Limit
55° 3' 50.91" N 131° 24' 32.77" W	54° 54' 8.81" N 131° 8' 23.14" W

Table 1: Survey Limits

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

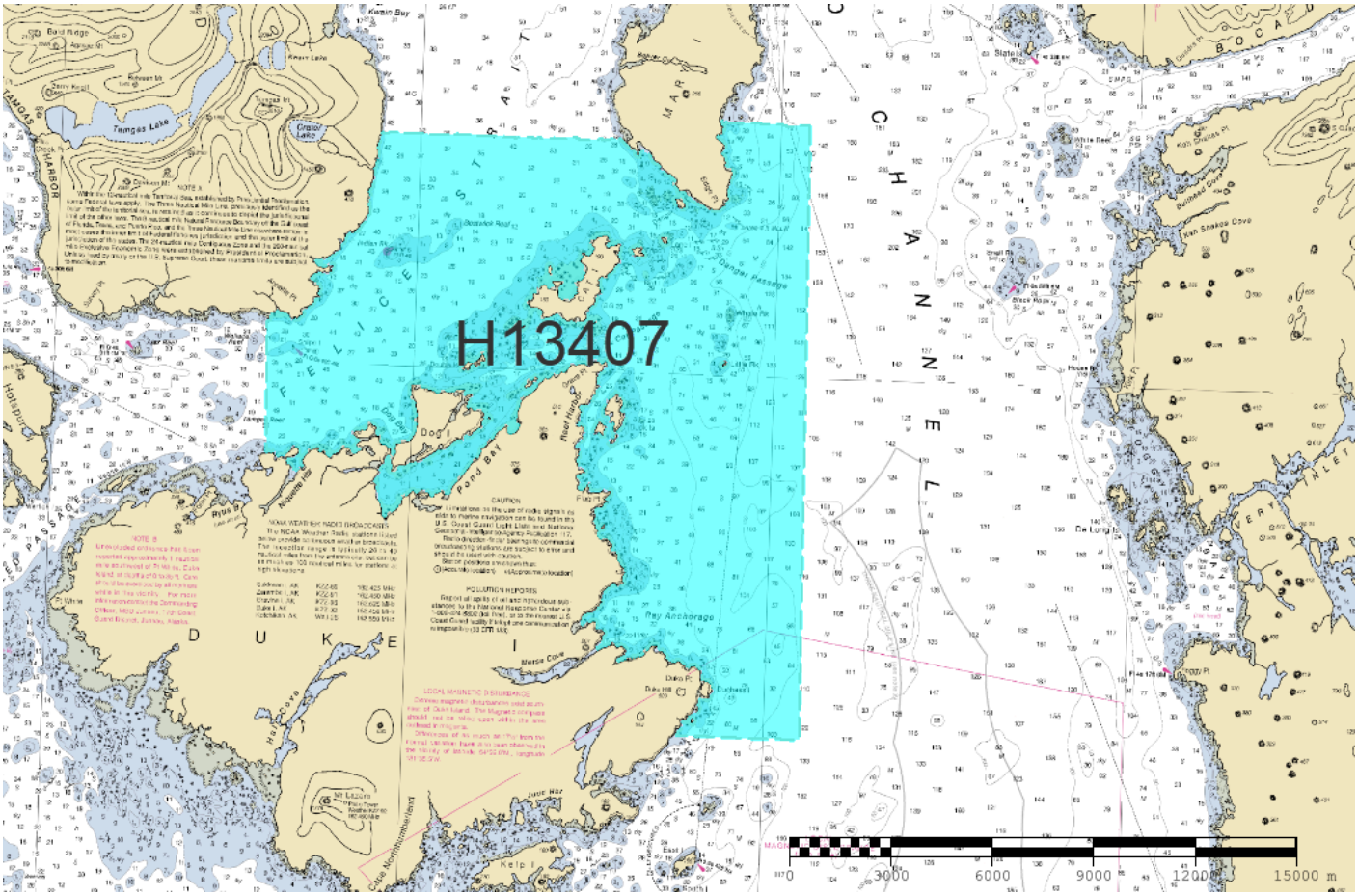


Figure 1: H13407 assigned survey area (Chart 17434_1)

A.2 Survey Purpose

Revillagigedo Channel is frequently used for large cruise ship traffic, with an estimated 1.1 million passengers annually, when transiting to Ketchikan, AK. Despite the high volume of traffic, parts of Felice Strait, Danger Pass, and Revillagigedo Channel have not been updated since the early 1900s. This survey will provide contemporary data to update National Ocean Service (NOS) nautical charting products to ensure safe navigation for commercial and tourism vessels.

A.3 Survey Quality

The entire survey is adequate to supersede previous 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

The entire extent of the assigned sheet limits was not surveyed for H13407. Operations in the area were limited by time, weather, and the availability of trained personnel. A portion of the time in Felice Strait was spent focused on training and qualifying coxswains and hydrographers in the offshore areas deeper than 10 fathoms. Additionally, a limited shoreline window and an early departure of NOAA Ship RAINIER from the survey area due to inclement weather further limited data collection. Due to these issues, data collection was concentrated to Danger Passage, Cat Passage, and Ray Anchorage, the most navigationally significant areas of the sheet. A significant amount of multibeam echosounder coverage was acquired in these prioritized areas to the inshore limit of hydrography, the Navigable Area Limit Line (NALL). 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 the observed MHW line which is equivalent to 0.8 millimeters at chart scale (the assigned sheet limits closely reflect this) or the inshore limit of safe navigation. Areas where H13407 survey coverage reached neither 3.5 meters water depth, nor the assigned sheet limits, were due to time constraints, the presence of hazardous rocks and/or thick kelp. The figures included below illustrate the areas in which the NALL was reached and not reached in Cat Passage and Danger Passage. A small area of data collected in Ray Anchorage also reached the NALL. See figures below for more information.

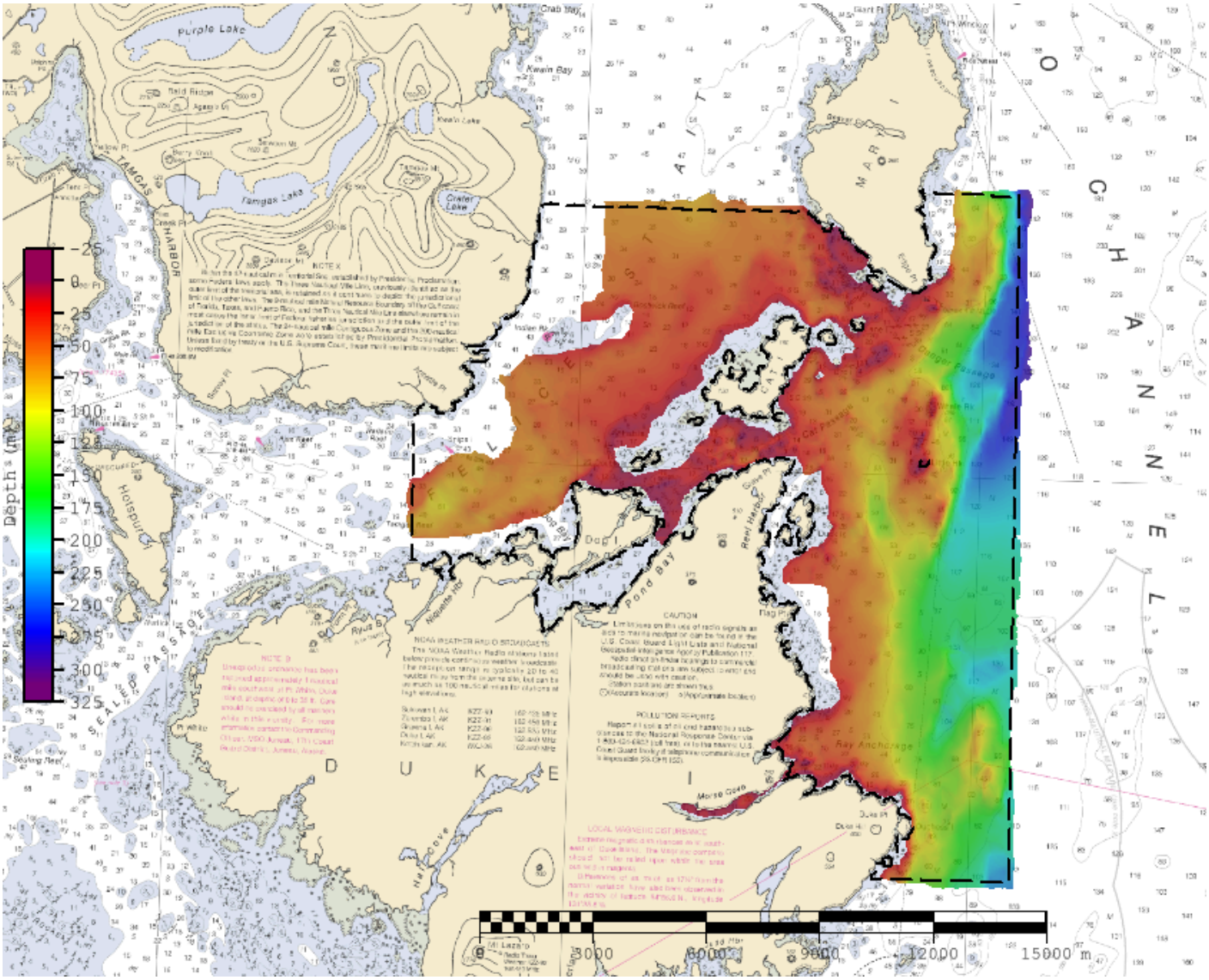


Figure 2: H13407 MBES coverage and assigned survey limits (Chart 17434).

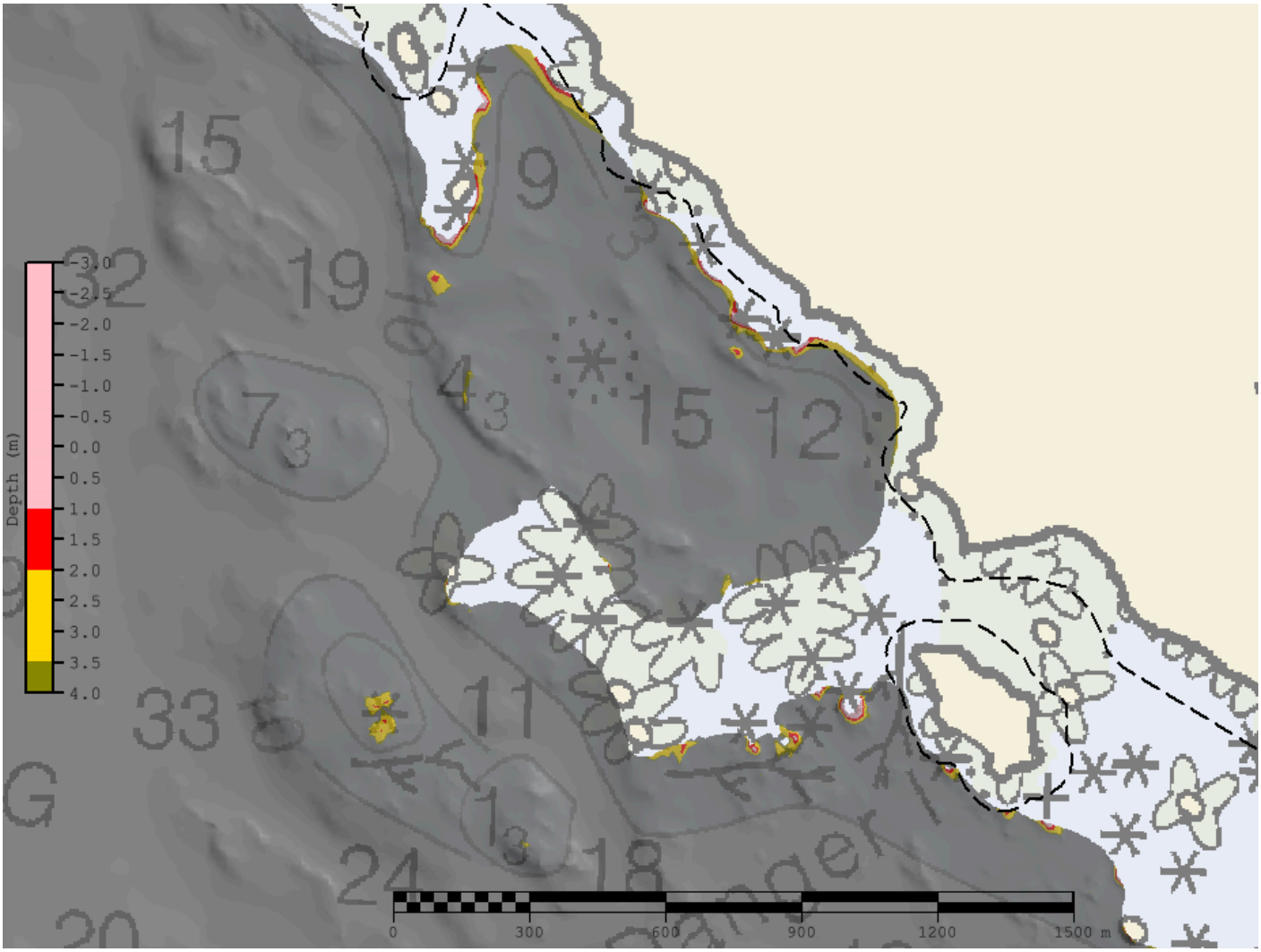


Figure 3: Example of areas where NALL was reached in Danger Passage. Yellow indicates where the 3.5-meter contour was reached and the black dashed line indicates assigned sheet limits.

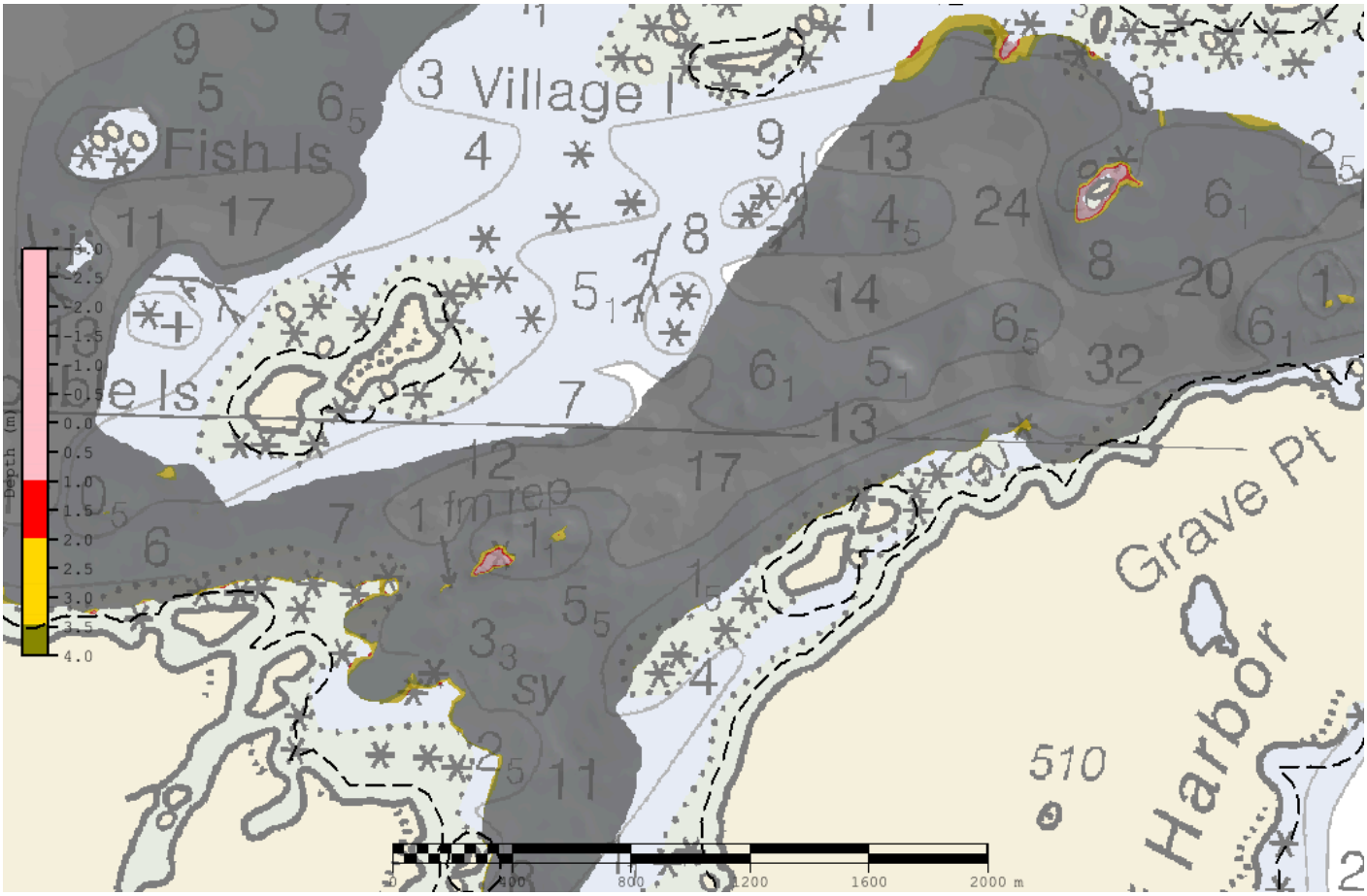


Figure 4: Example of areas where NALL was reached in Cat Passage. Yellow indicates where the 3.5-meter contour was reached and the black dashed line indicates assigned sheet limits.

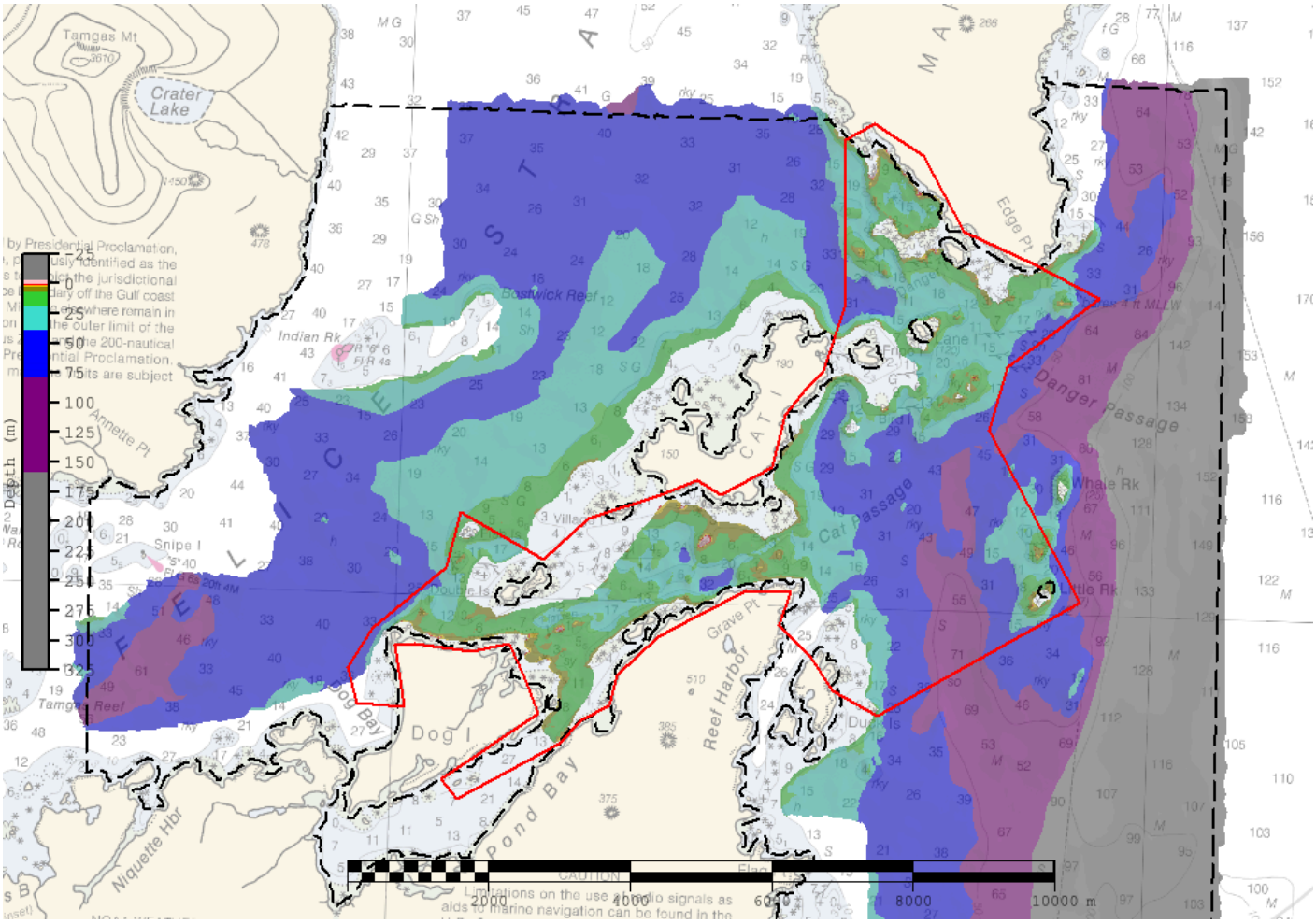


Figure 5: The area in which limited shoreline verification was completed. Shoreline was addressed during the shoreline window within the area outlined in red.

A.6 Survey Statistics

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

	HULL ID	*2801*	*2802*	*2803*	*2804*	*Total*
LNM	SBES Mainscheme	0	0	0	0	0
	MBES Mainscheme	106.82	173.0	140.25	66.57	486.7
	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	0	0	5.17	7.16	12.33
	Lidar Crosslines	0	0	0	0	0
Number of Bottom Samples						1
Number Maritime Boundary Points Investigated						0
Number of DPs						77
Number of Items Investigated by Dive Ops						0
Total SNM						39.22

Table 3: Hydrographic Survey Statistics

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

Survey Dates	Day of the Year
10/13/2020	287
10/14/2020	288

Survey Dates	Day of the Year
10/15/2020	289
10/16/2020	290
10/17/2020	291
10/18/2020	292
10/24/2020	298
10/25/2020	299

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*	*2802*	*2803*	*2804*	*2701*	*1907*
LOA	8.8 meters	8.8 meters	8.8 meters	8.8 meters	7.6 meters	5.7 meters
Draft	1.1 meters	1.1 meters	1.1 meters	1.1 meters	0.47 meters	0.35 meters

Table 5: Vessels Used

All data for survey H13407 was acquired by NOAA Ship RAINIER launches 2801, 2802, 2803, and 2804. The vessels acquired MBES bathymetry, backscatter, and sound velocity profiles. Shoreline verification was conducted from Rainier Jetboat 2701 and Rainier Skiff RA-7.

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

B.2 Quality Control

B.2.1 Crosslines

RAINIER launches 2803 and 2804 collected 9.51 nautical miles of multibeam crosslines across a range of depths on the last day of data collection. Due to inclement weather and time constraints, sufficient crosslines across mainscheme data were not collected. The limited crosslines acquired only cross the western portion of the sheet and are not sufficient to evaluate the agreement of the mainscheme lines in the eastern portion of the sheet or in the two passages. However, in these areas, overlapping coverage was closely examined between different acquisition days and found no apparent offsets between days or vessels. The Compare Grids function in Pydro Explorer was used to analyze the finalized VR surfaces of H13407 mainscheme only and crossline only data. Pydro determined that 99.5% of nodes met allowable uncertainties. For additional results, see plots below.

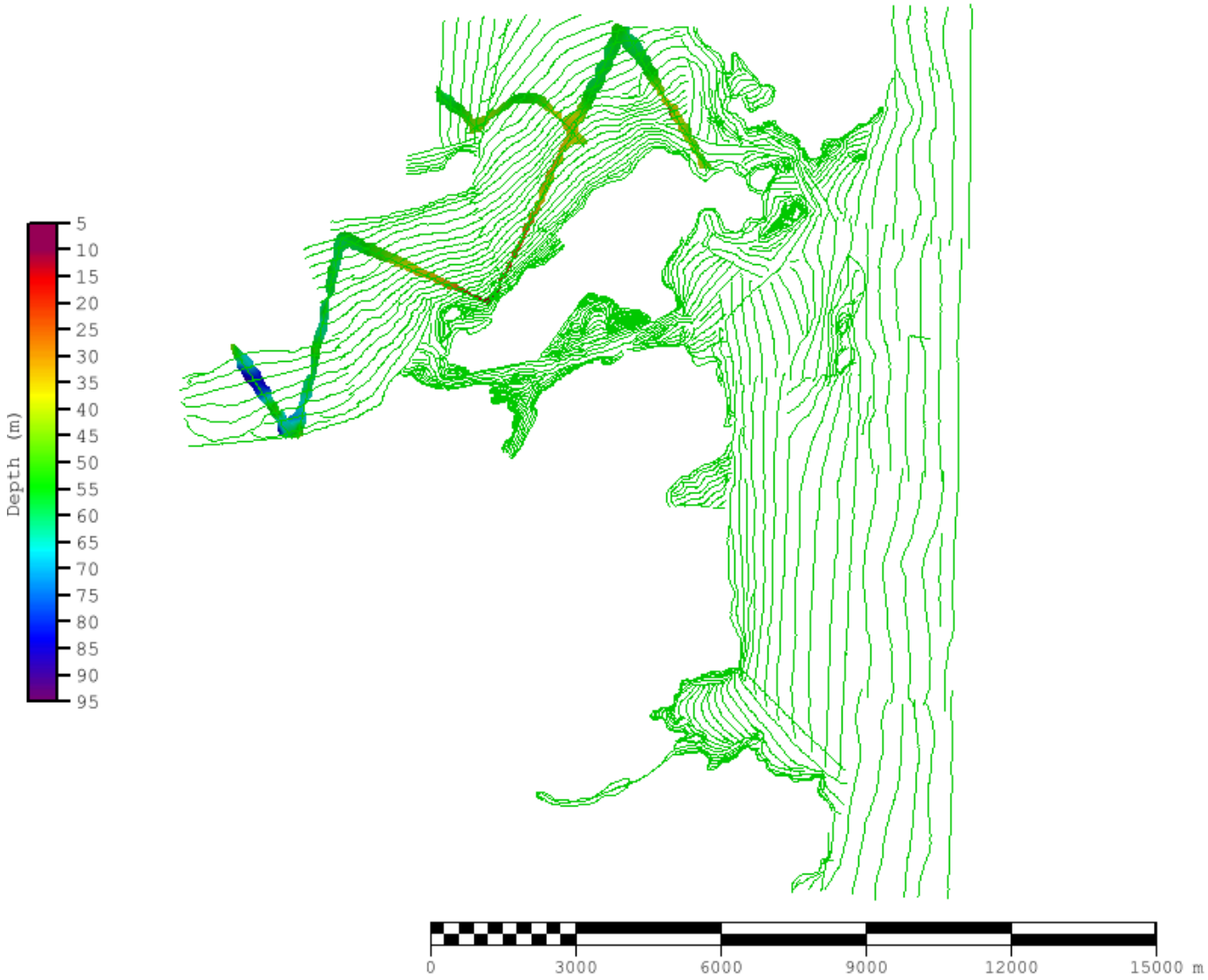
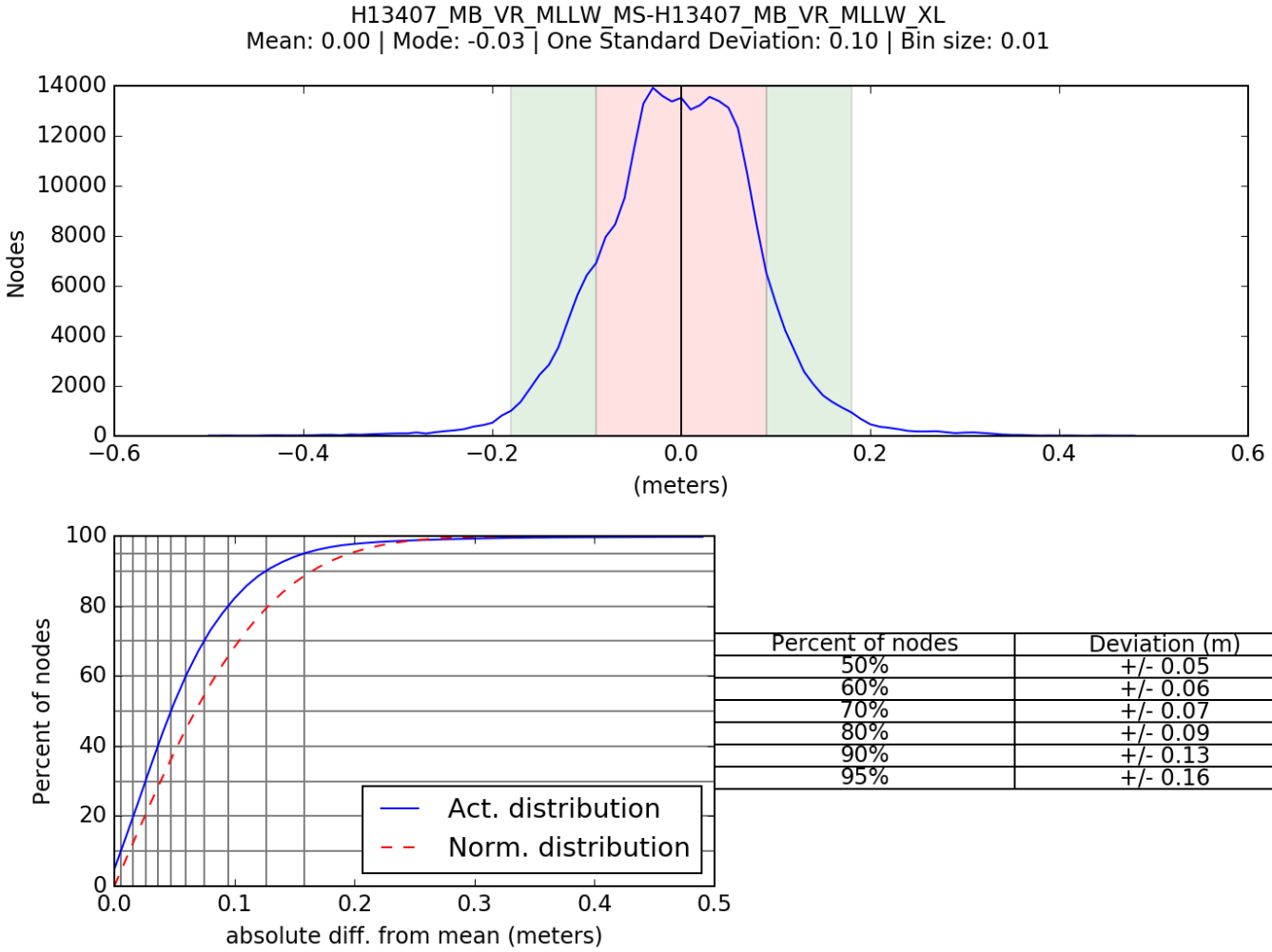


Figure 6: H13407 crossline surface overlaid on mainscheme tracklines.



Percent of nodes	Deviation (m)
50%	+/- 0.05
60%	+/- 0.06
70%	+/- 0.07
80%	+/- 0.09
90%	+/- 0.13
95%	+/- 0.16

Figure 7: Pydro derived plot showing percentage-pass value of H13407 mainscheme to crossline data.

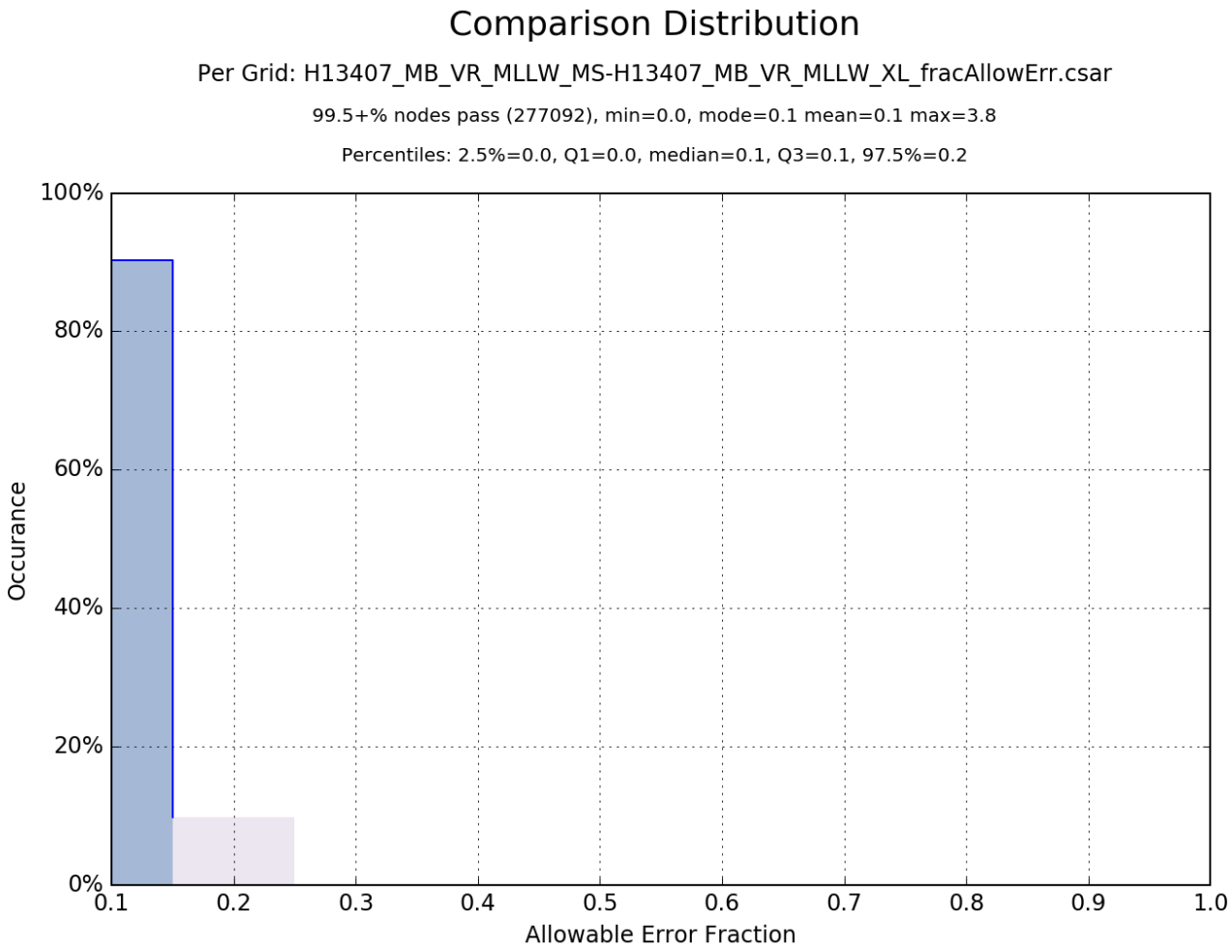


Figure 8: Pydro derived plot showing absolute difference statistics of H13407 mainscheme to crossline data.

B.2.2 Uncertainty

The following survey specific parameters were used for this survey:

Method	Measured	Zoning
ERS via VDATUM	0 meters	0.129 meters

Table 7: Survey Specific Tide TPU Values.

Hull ID	Measured - CTD	Measured - MVP	Measured - XBT	Surface
All Vessels	3 meters/second	NA meters/second	NA meters/second	0.05 meters/second

Table 8: Survey Specific Sound Speed TPU Values.

Total Propagated Uncertainty (TPU) values for survey H13407 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, 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. POSPac SBET and RMS files were later applied in CARIS HIPS to supersede POS MV uncertainties associated with GPS height and position.

Uncertainty values of the submitted finalized grids 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 H13407 TVU compliance. H13407 met HSSD requirements in over 99.5 percent of grid nodes, which is shown in the histogram plot below.

Pydro QC Tools 2 Grid QA was used to analyze H13407 multibeam echosounder (MBES) data density. The submitted H13407 variable-resolution (VR) surface met HSSD density requirements shown in the histograms below.

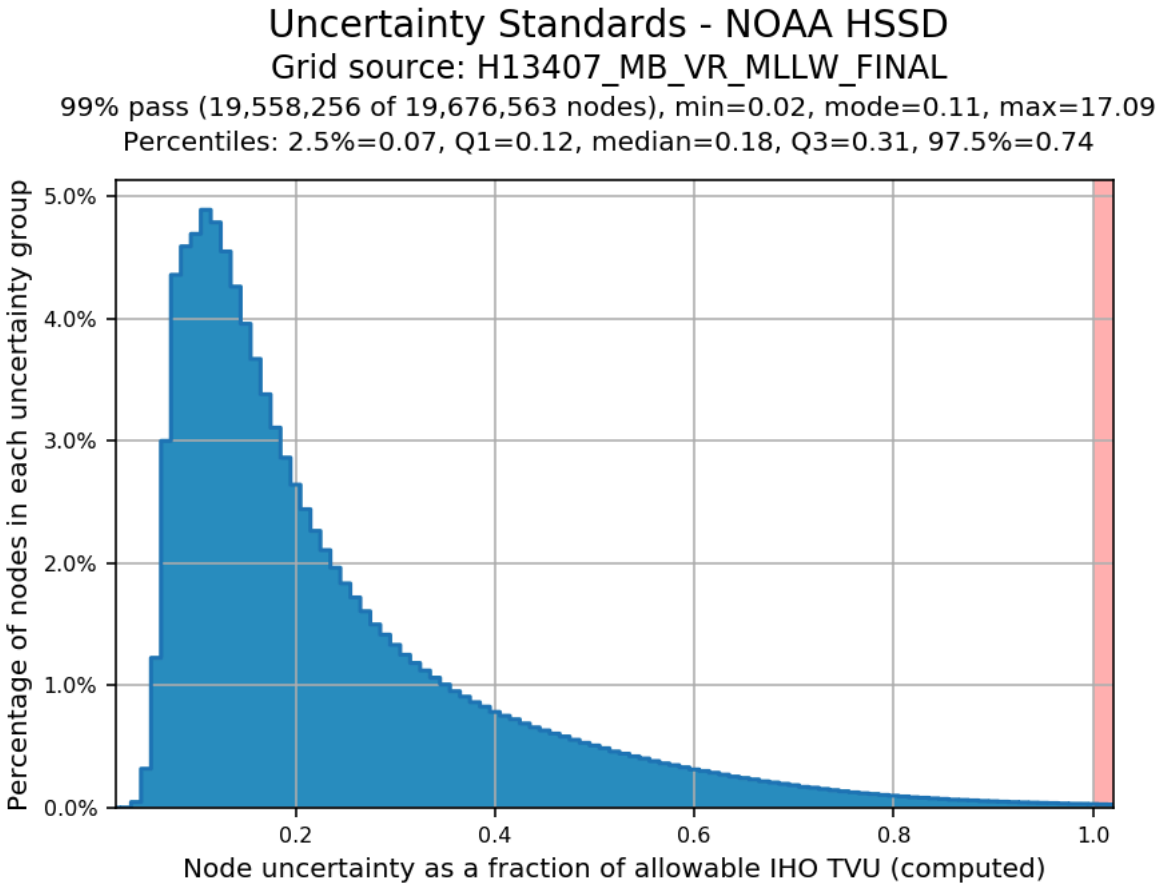


Figure 9: Pydro derived plot showing TVU compliance of H13407 finalized multi-resolution MBES data.

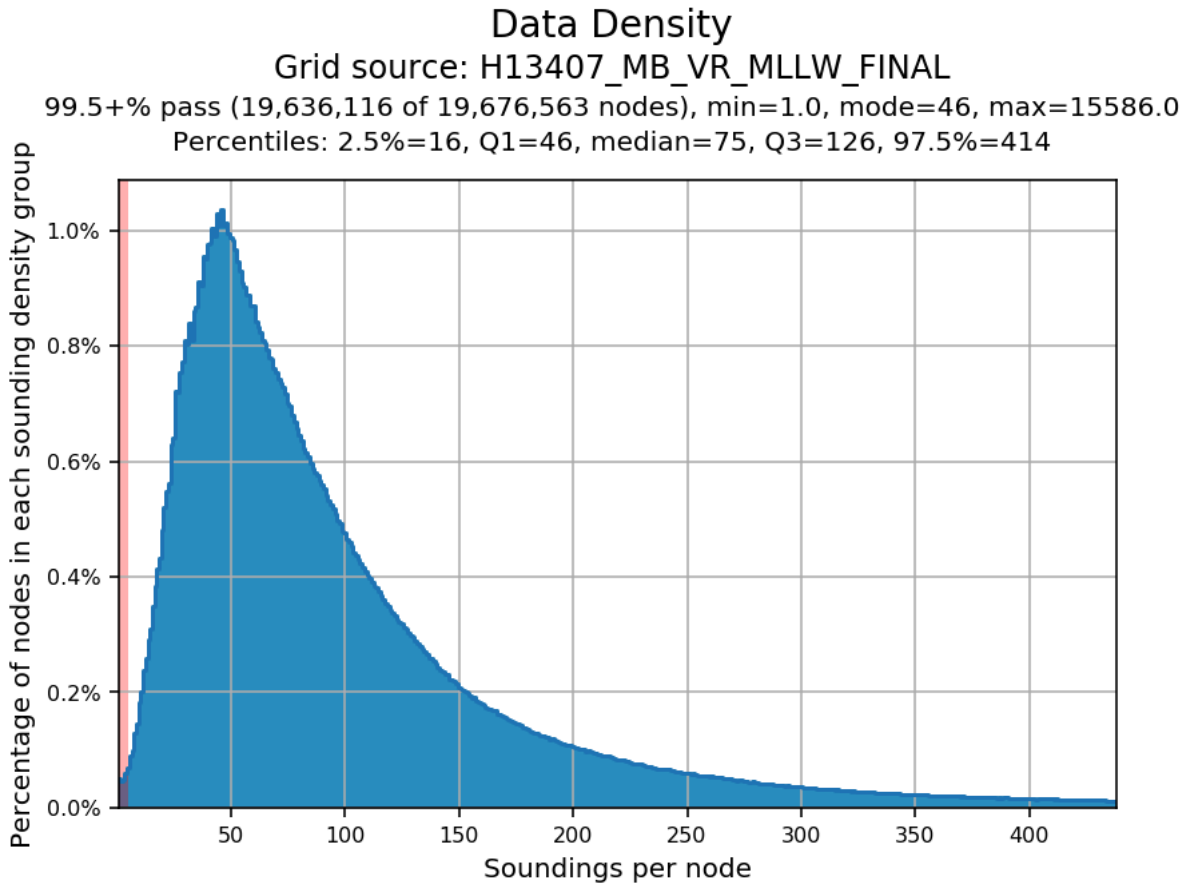


Figure 10: Pydro derived histogram plot showing HSSD density compliance of H13407 finalized variable-resolution MBES data.

B.2.3 Junctions

Two junction comparisons were completed for H13407. Surveys H12177 and H12178 were both completed by the NOAA Ship FAIRWEATHER in 2010.

The following junctions were made with this survey:

Registry Number	Scale	Year	Field Unit	Relative Location
H12177	1:20000	2010	Fairweather	N
H12178	1:20000	2010	Fairweather	NE

Table 9: Junctioning Surveys

H12177

The junction with survey H12177 encompasses approximately 0.08 square nautical miles along the northern border of survey H13407. The Compare Grids function of Pydro Explorer derived a difference surface from H13407's 16m single-resolution surface and H12177's 16-meter single resolution BAG surface. Pydro Compare Grids showed that 98% of nodes in the overlapping area net NOAA allowable error standards. Analysis of the difference surface indicated that there is a 0.41 average difference between the two surveys. Due to the limited amount of overlap between H13407 and H12177 it is difficult to determine the cause of the discrepancy between the surfaces. For additional results, see plots below.

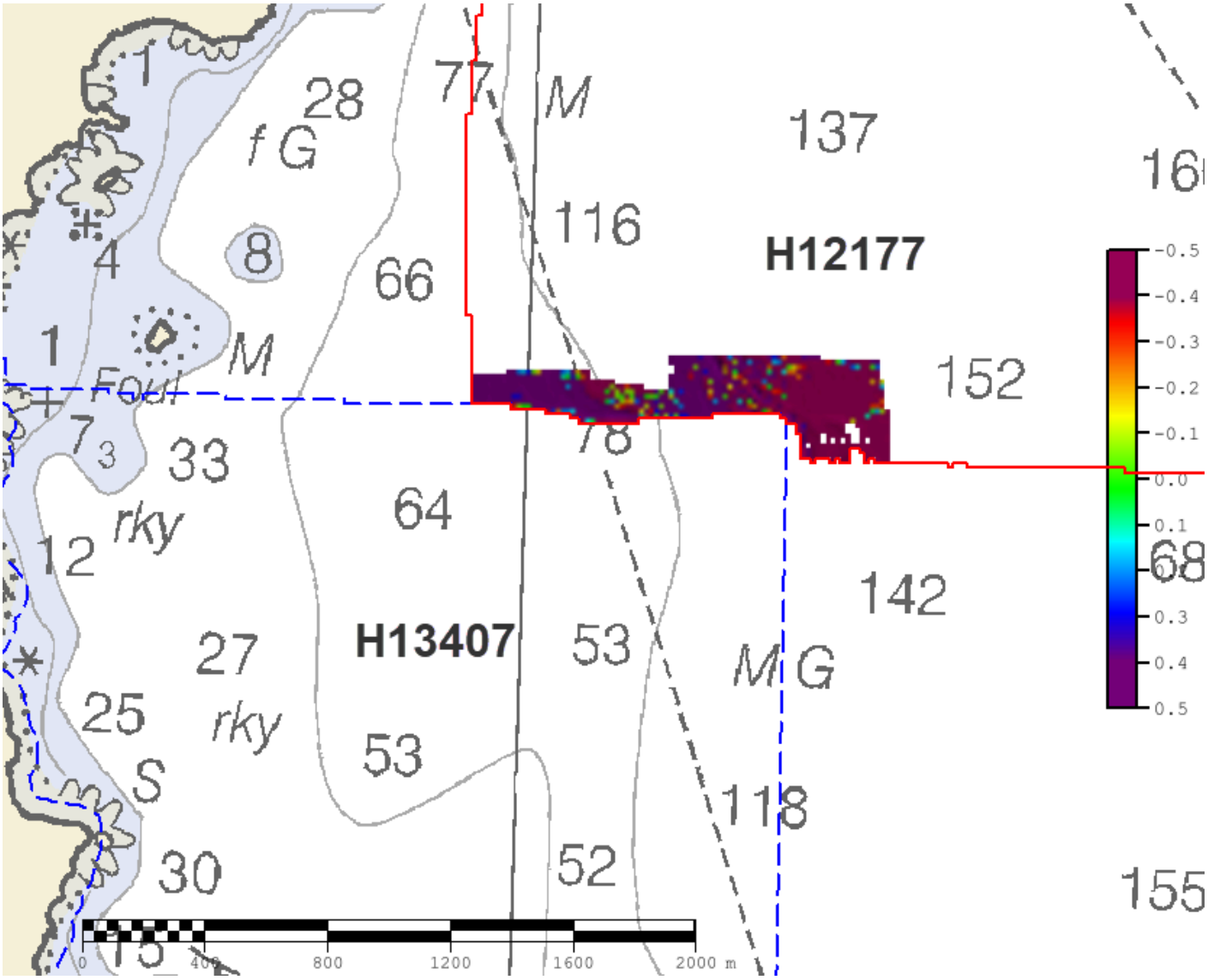
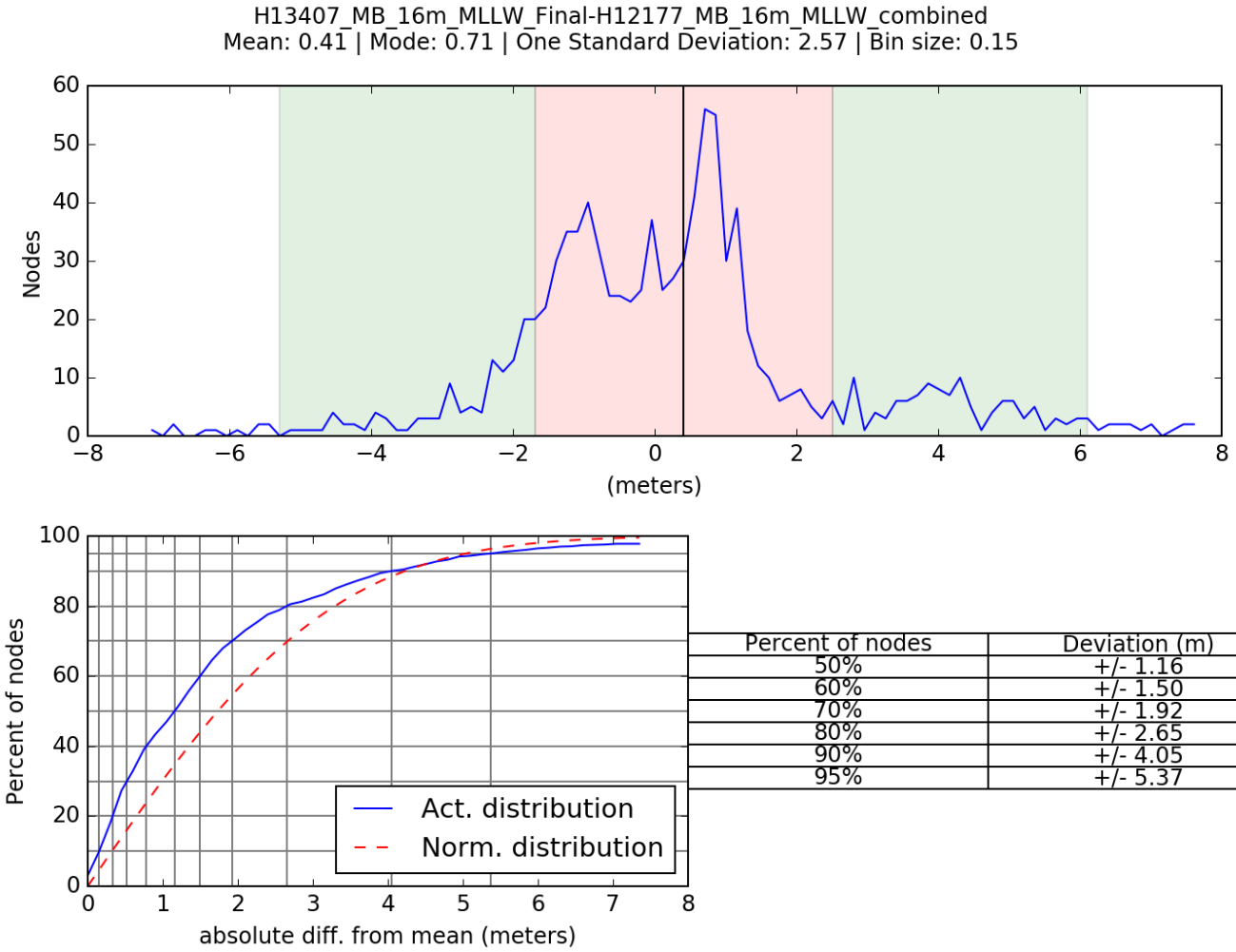


Figure 11: H13407 and H12177 junction surface.



Percent of nodes	Deviation (m)
50%	+/- 1.16
60%	+/- 1.50
70%	+/- 1.92
80%	+/- 2.65
90%	+/- 4.05
95%	+/- 5.37

Figure 12: Pydro derived plot showing percentage-pass volume of the junction between H13407 and H12177 16-meter resolution surface.

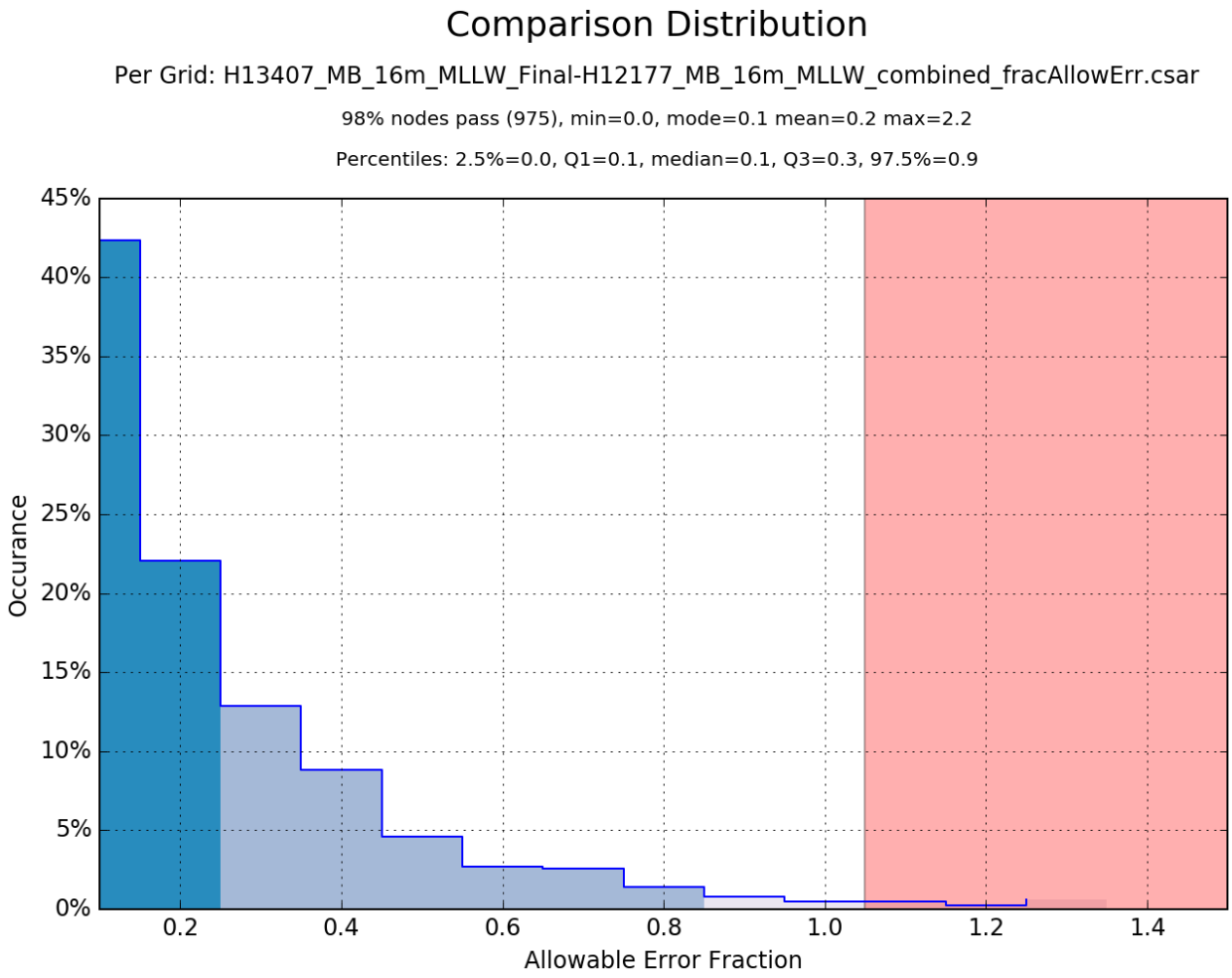


Figure 13: Pydro derived plot showing absolute difference statistics of the junction between H13407 and H12177 16-meter resolution surface.

H12178

The junction with survey H12178 encompasses approximately 0.38 square nautical miles along the northern border of survey H13407. The Compare Grids function of Pydro Explorer derived a difference surface from H13407's 16m single-resolution surface and H12178's 16-meter single-resolution BAG surface. Pydro Compare Grids showed that 95% of nodes in the overlapping area net NOAA allowable error standards. Analysis of the difference surface indicated that there is a -0.32 average difference between the two surveys. The variance may be a result of the 16m surface being too coarse for the depths in the area. However, due to the limited amount of overlap between H13407 and H12177 it is difficult to determine the cause of the discrepancy between the surfaces. For additional results, see plots below.

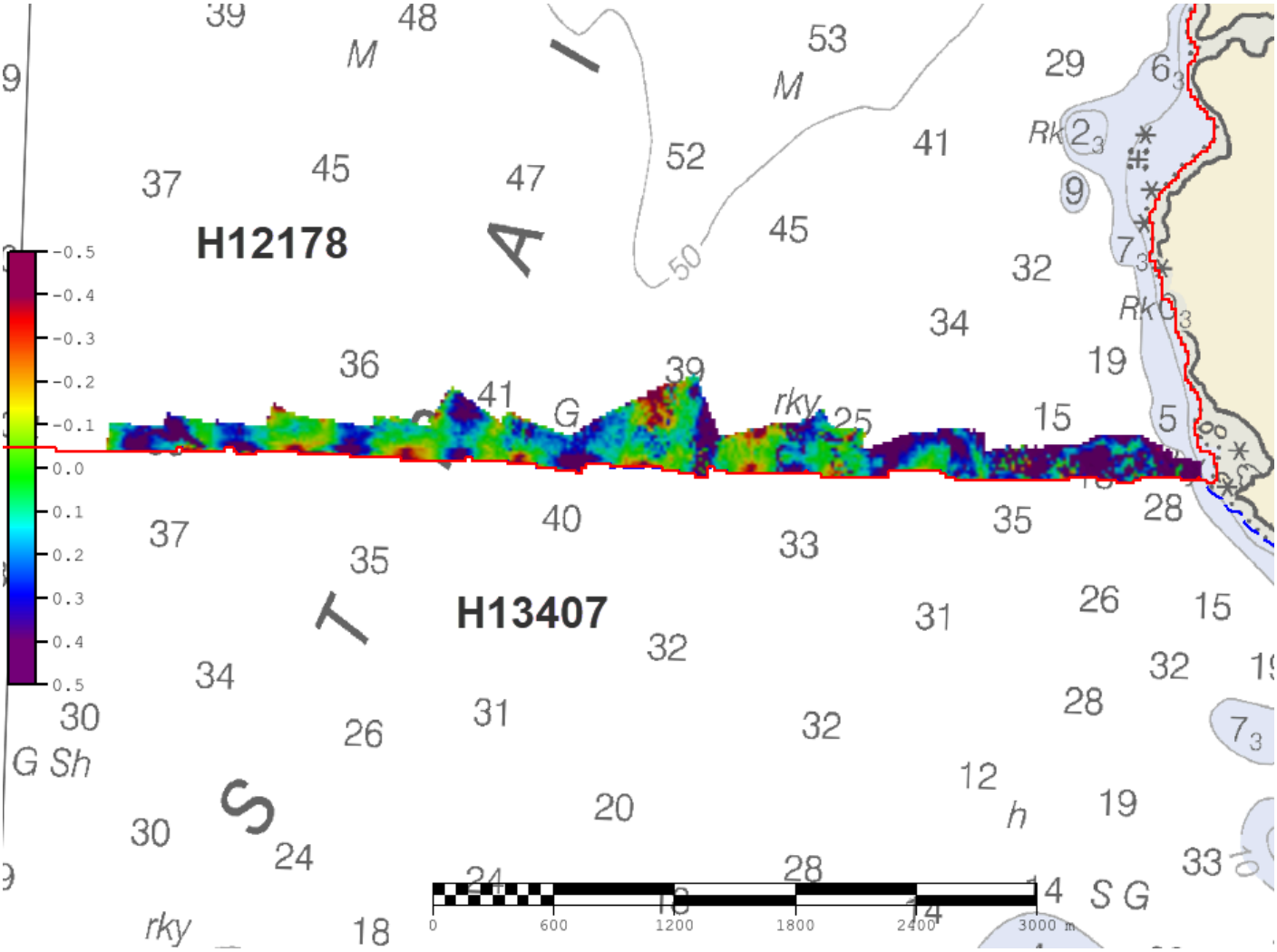
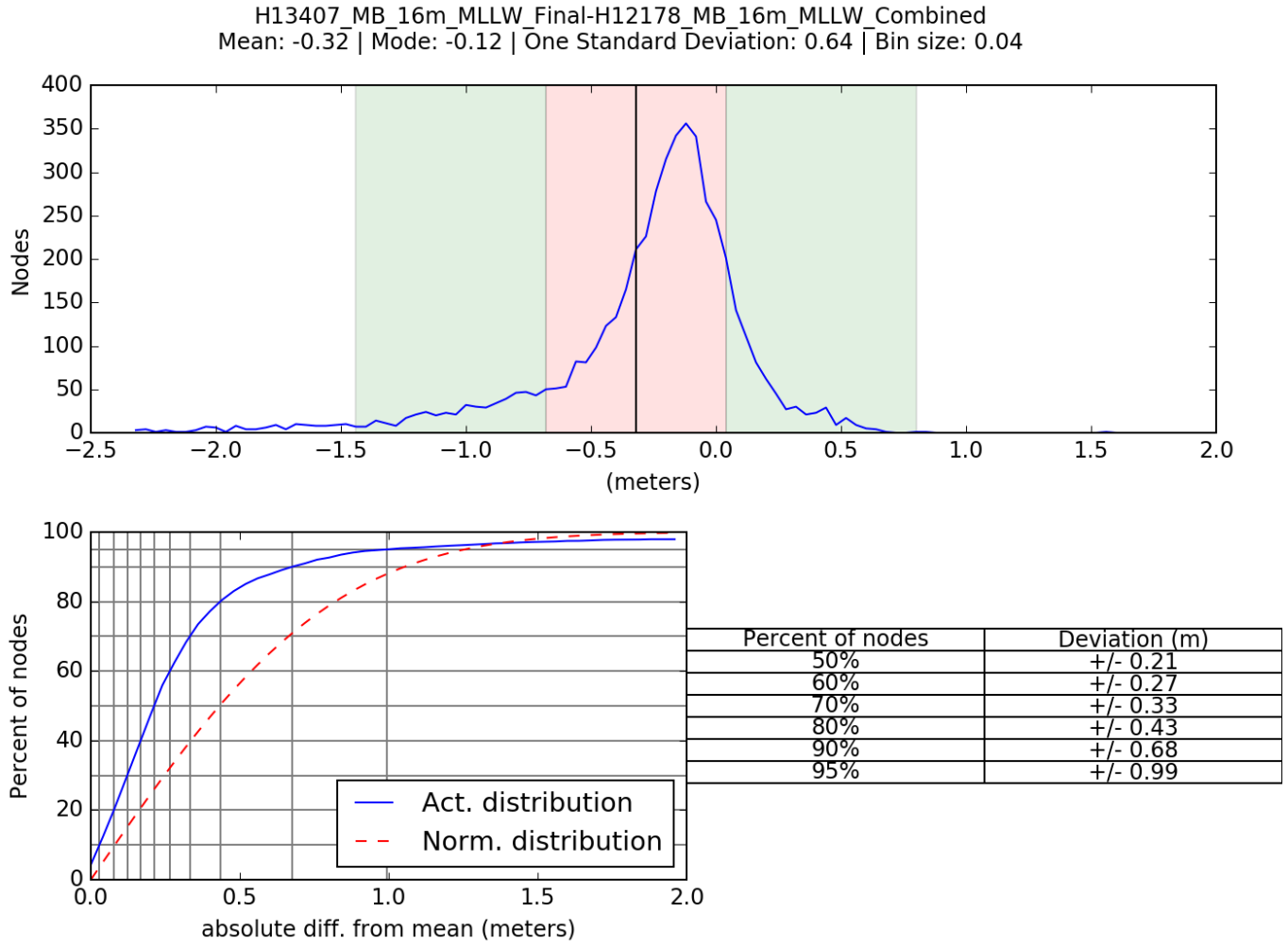


Figure 14: H13407 and H12178 junction surface.



Percent of nodes	Deviation (m)
50%	+/- 0.21
60%	+/- 0.27
70%	+/- 0.33
80%	+/- 0.43
90%	+/- 0.68
95%	+/- 0.99

Figure 15: Pydro derived plot showing percentage-pass volume of the junction between H13407 and H12178 16-meter resolution surface.

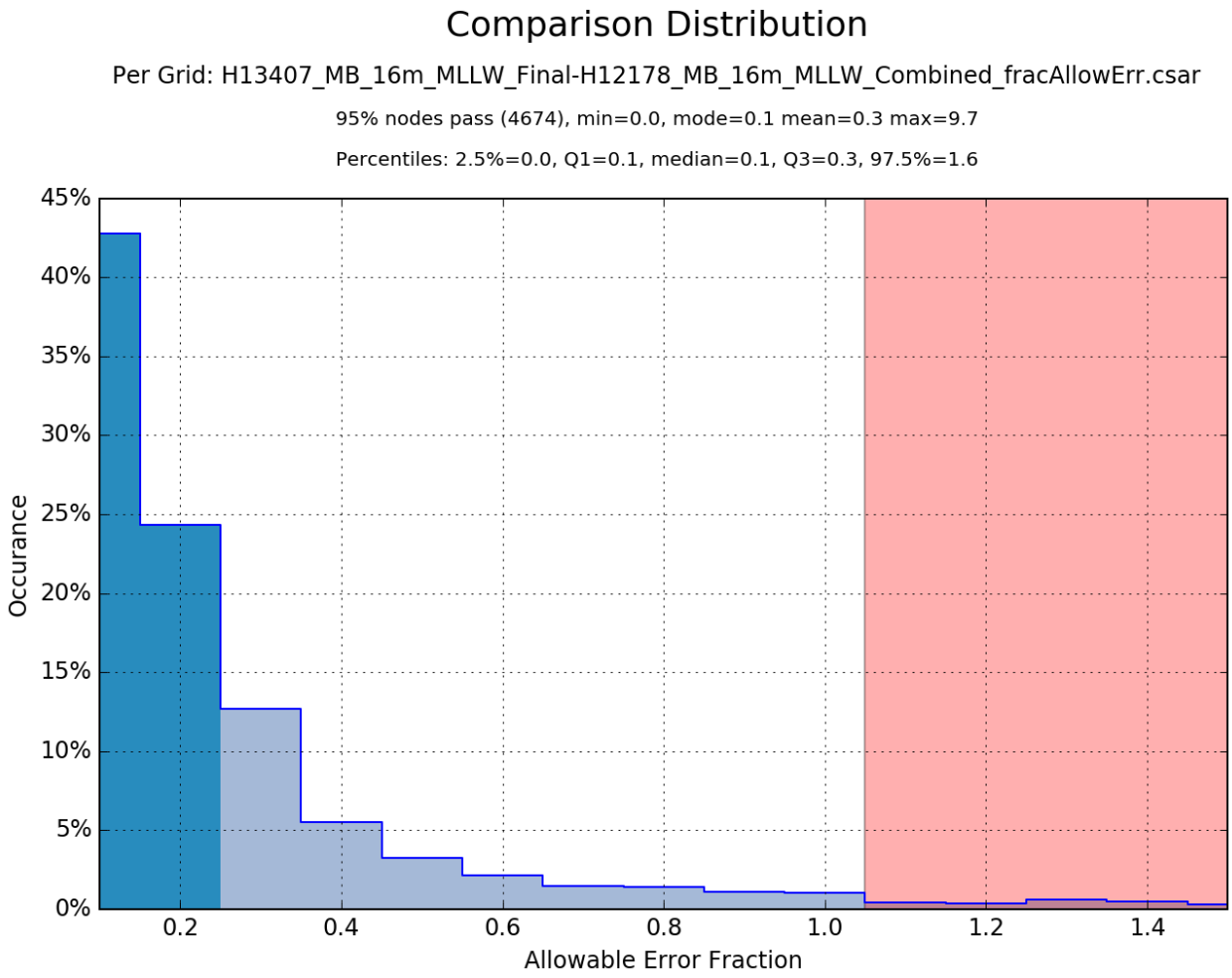


Figure 16: Pydro derived plot showing absolute difference statistics of the junction between H13407 and H12177 16-meter resolution surface.

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: At least once every 4 hours or as needed.

A total of 64 sound speed profiles were acquired for this survey at discrete locations within the survey area at least once every four hours, 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. All casts were concatenated into a master file and applied to MBES data using the "Nearest distance within time" (4 hours) profile selection method.

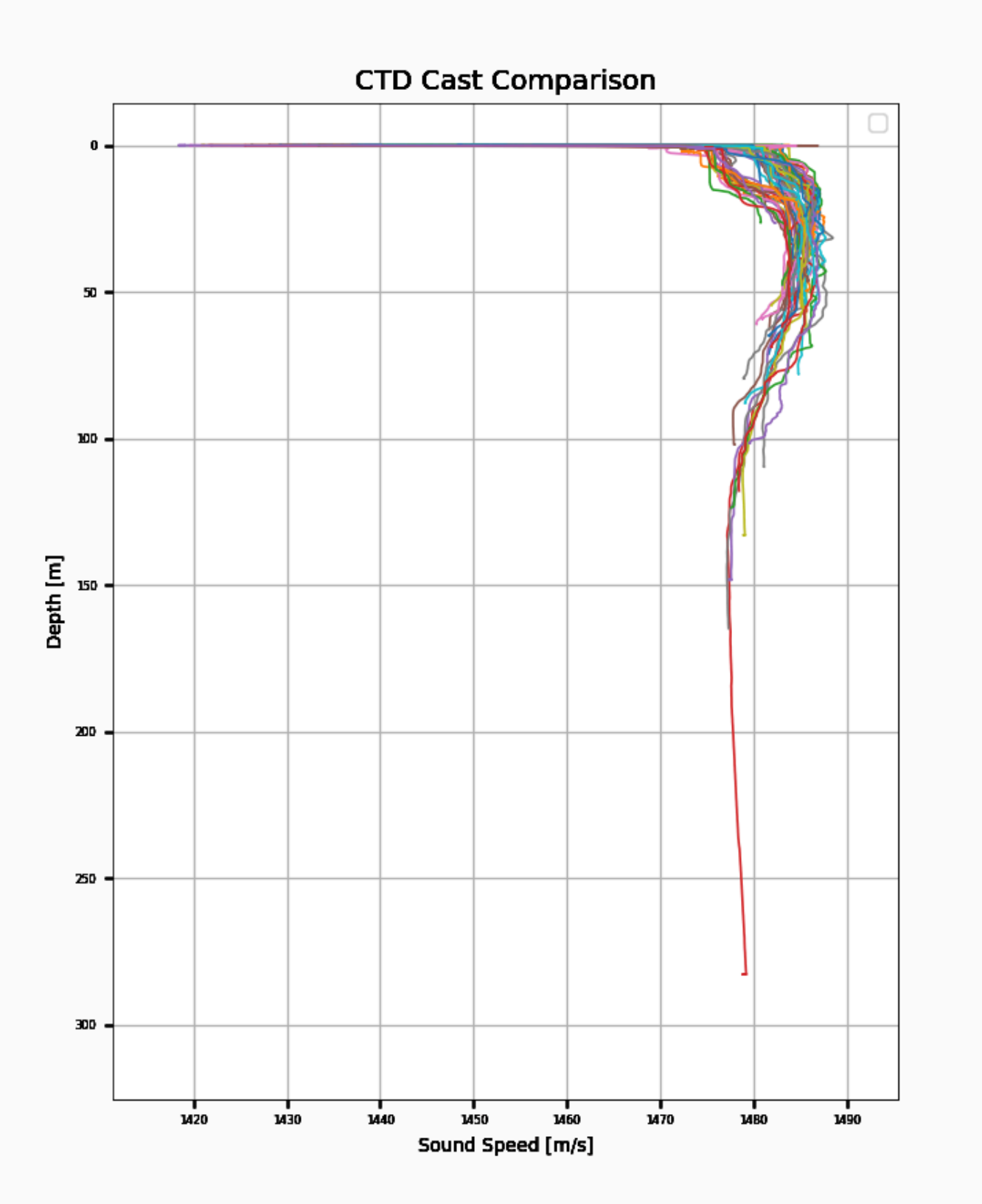


Figure 17: Comparison plot of CTD casts taken during survey acquisition of H13407.

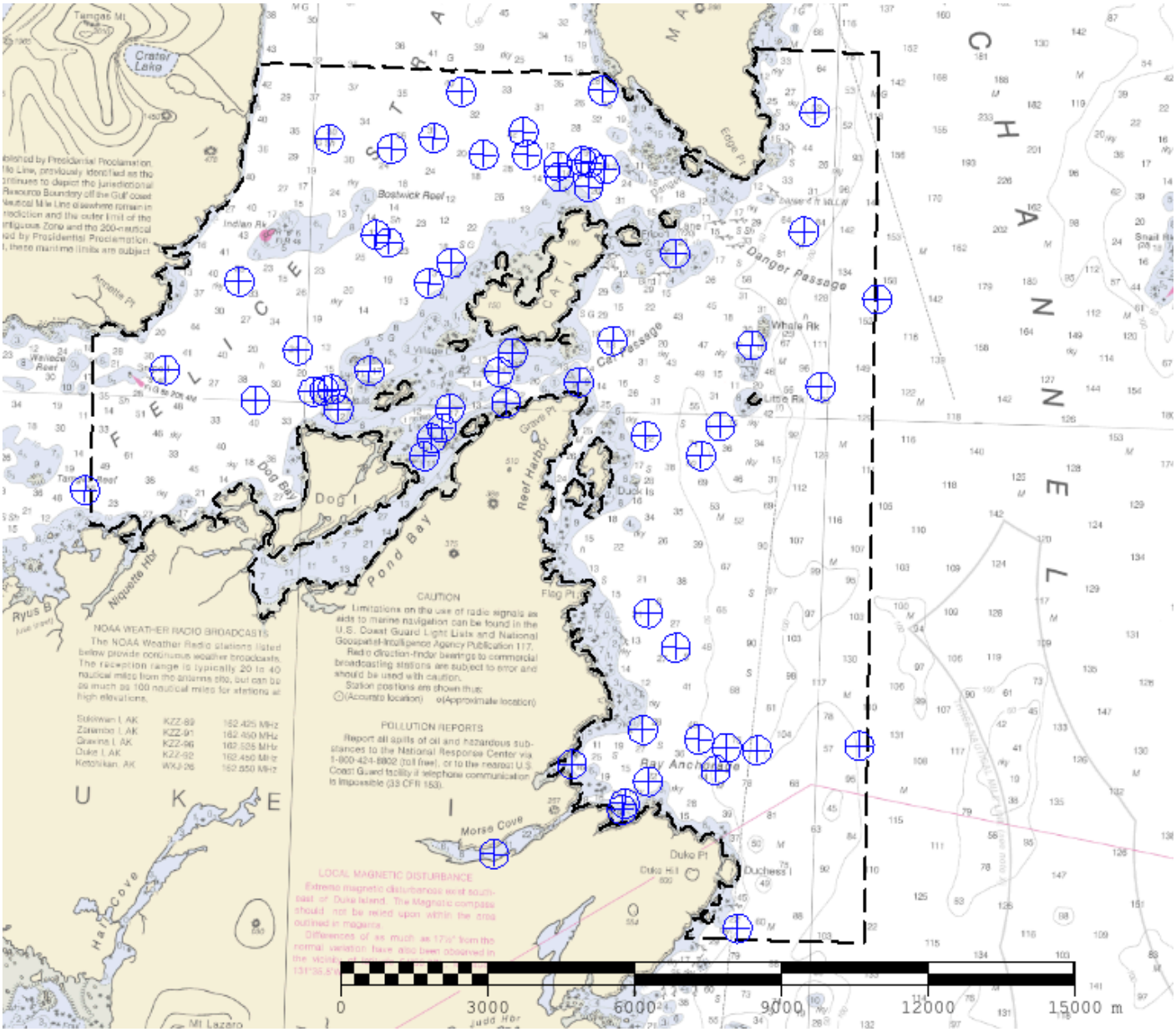


Figure 18: H13407 sound speed cast locations.

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

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

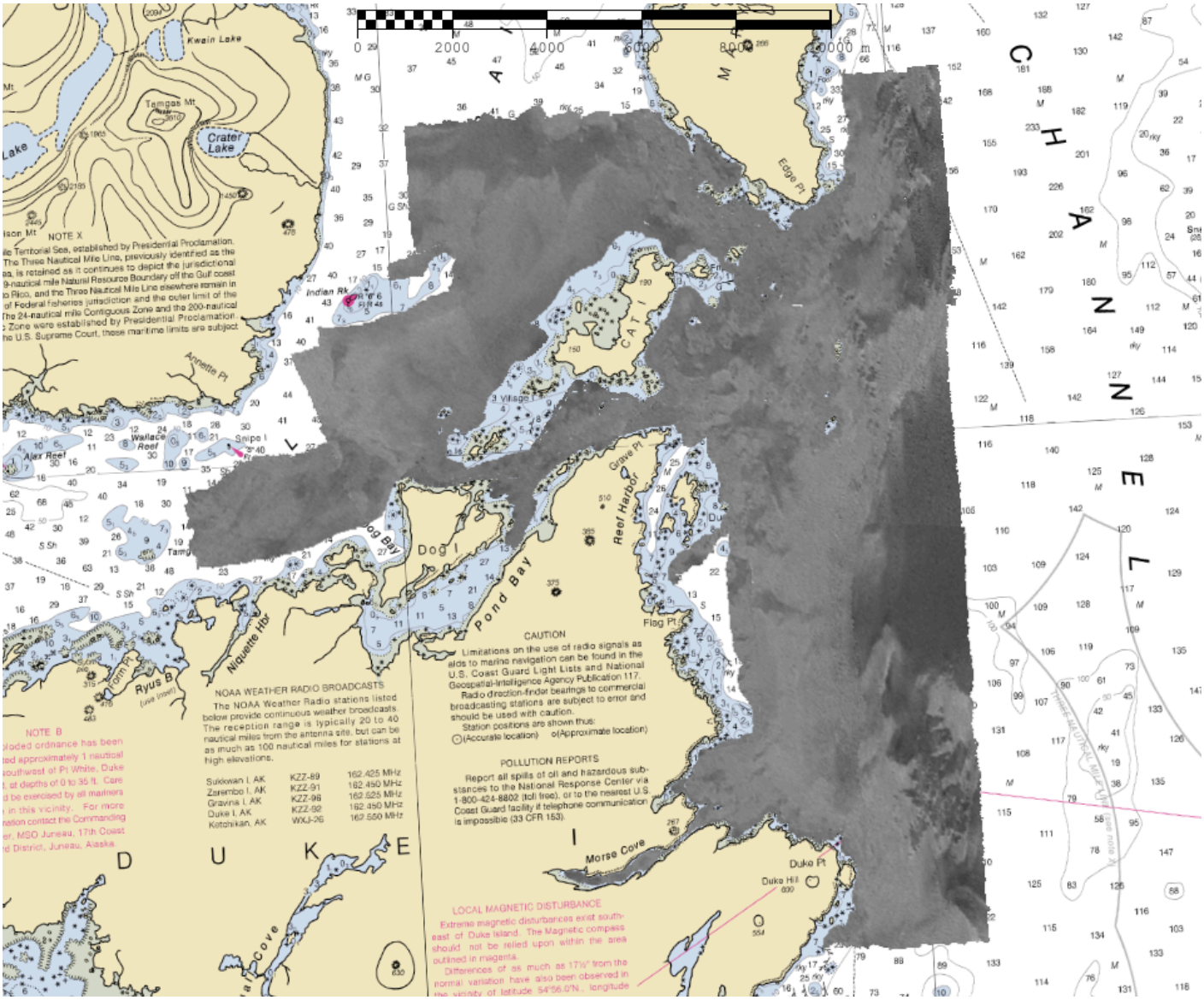


Figure 19: Overview of H13407 backscatter mosaics.

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	11.2.4

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	7.9.4

Table 11: Primary imagery data processing software

The following Feature Object Catalog was used: NOAA Profile Version 2020.

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
H13407_MB_VR_MLLW	CARIS VR Surface (CUBE)	Variable Resolution	-2.61 meters - 312.38 meters	NOAA_VR	Complete MBES
H13407_MB_VR_MLLW_FINAL	CARIS VR Surface (CUBE)	Variable Resolution	-2.61 meters - 312.38 meters	NOAA_VR	Complete MBES

Table 12: Submitted Surfaces

Submitted surfaces were generated using the NOAA recommended parameters for depth-based (Ranges) CARIS variable-resolution bathymetric grids as specified in 2020 HSSD.

Pydro Explorer QC Tool Holiday Finder was utilized to detect gaps in data (holidays) on the finalized Variable Resolution (VR) surfaces for submission. Holiday Finder yielded 18 certain holidays. In review of the data, several of the 18 holidays detected in Holiday Finder were intentionally avoided because of shoal areas, hazardous rocks, and/or the presence of kelp. Due to time constraints, holidays were not addressed prior to leaving the survey area.

C. Vertical and Horizontal Control

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

C.1 Vertical Control

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

ERS Datum Transformation

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

Method	Ellipsoid to Chart Datum Separation File
ERS via VDATUM	OPR-O392-FA-20_VDATUM_100m_NAD83_2011-MHW.csar OPR-O392-FA-20_VDATUM_100m_NAD83_2011-MLLW.csar

Table 13: ERS method and SEP file

Ellipsoid referenced GNSS derived heights were used and a separation model was applied to reduce soundings to chart datum.

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 9.

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

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
US4AK4SM	1:80000	5	03/05/2018	03/05/2018
US4AK49M	1:80000	10	02/05/2019	01/07/2020

Table 14: Largest Scale ENCs

D.1.2 Shoal and Hazardous Features

No shoals or potentially hazardous features exist for this survey.

Assigned shoals and hazardous features were investigated during shoreline verification conducted over three days. Due to time constraints, not all shoals and hazardous features were investigated. The investigated areas have been updated as required in the Final Feature File. See Final Feature File provided with this report for more information.

D.1.3 Charted Features

Time constraints and a limited shoreline window prevented a full investigation of all assigned features form the Composite Source File (CSF) provided by NOAA HSD Operations Branch. Shoreline priority was given to areas in the vicinity of Danger Passage and Cat Passage due to their navigational significance. Investigated features have been updated as required in the Final Feature File. See Final Feature File provided with this report for more information.

D.1.4 Uncharted Features

Several new rocks were identified during shoreline and have been addressed in the Final Feature File. See Final Feature File provided with this report for more information.

D.1.5 Channels

D.2 Additional Results

D.2.1 Aids to Navigation

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

D.2.2 Maritime Boundary Points

Maritime Boundary Points were assigned for this survey, but were not addressed.

D.2.3 Bottom Samples

Six bottom sample locations were assigned for H13407. Due to time constraints and poor weather conditions only one sample was acquired during survey acquisition of H13407. The results of the acquired bottom sample are included in the H13407 Final Feature File submitted with this report. No images of the bottom sample are available.

D.2.4 Overhead Features

No overhead features exist for this survey.

D.2.5 Submarine Features

No submarine features exist for this survey.

D.2.6 Platforms

No platforms exist for this survey.

D.2.7 Ferry Routes and Terminals

No ferry routes or terminals exist for this survey.

D.2.8 Abnormal Seafloor or Environmental Conditions

No abnormal seafloor or environmental conditions exist for this survey.

D.2.9 Construction and Dredging

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

D.2.10 New Survey Recommendations

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

D.2.11 ENC Scale Recommendations

No new ENC scales are recommended for this area.

E. Approval Sheet

As Chief of Party, field operations for this hydrographic survey were conducted under my direct supervision, with frequent personal checks of progress and adequacy. I have reviewed the attached survey data and reports.

All field sheets, this Descriptive Report, and all accompanying records and data are approved. All records are forwarded for final review and processing to the Processing Branch.

With the exception of the discrepancies noted in this report, 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	11/05/2020	Digitally signed by GREENAWAY.SAMUEL.F.1275635347 Date: 2020.11.06 13:54:11 -08'00'
Matthew B. Sharr, LT/NOAA	Field Operations Officer	11/05/2020	SHARR.MATTHEW.BRANDON.1503637126 2020.11.06 11:57:54 -08'00'
James B. Jacobson	Chief Survey Technician	11/05/2020	JACOBSON.JAMES.BRYAN.1269664017 2020.11.05 12:17:24 -08'00'
Melissa A. Weber	Sheet Manager	11/05/2020	Digitally signed by WEBER.MELISSA.ANNE.1554978483 Date: 2020.11.05 12:25:14 -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

H13407

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
- Bottom samples
- 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: _____

James Miller
Chief (acting), Pacific Hydrographic Branch