H13108

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

DESCRIPTIVE REPORT

Type of Survey:	Navigable Area
Registry Number:	H13108

LOCALITY

State(s):	Alaska
General Locality:	Kodiak Island
Sub-locality:	South of Narrow Cape

2019

CHIEF OF PARTY
CDR Marc Moser

LIBRARY & ARCHIVES

Date:

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

REGISTRY NUMBER:

HYDROGRAPHIC TITLE SHEET

H13108

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:	**Kodiak Island**
Sub-Locality:	**South of Narrow Cape**
Scale:	**40000**
Dates of Survey:	**07/25/2019 to 07/28/2019**
Instructions Dated:	**07/22/2019**
Project Number:	**OPR-P136-FA-19**
Field Unit:	**NOAA Ship Fairweather (S220)**
Chief of Party:	**CDR Marc Moser**
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 5N, 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 H13108

Project: OPR-P136-FA-19

Locality: Kodiak Island

Sublocality: South of Narrow Cape

Scale: 1:40000

July 2019 - July 2019

NOAA Ship Fairweather (S220)

Chief of Party: CDR Marc Moser

A. Area Surveyed

The survey area is located in Kodiak Island, Alaska within the sub locality south of Narrow Cape.

A.1 Survey Limits

Data were acquired within the following survey limits:

Northwest Limit	Southeast Limit
57° 26' 2.57" N 152° 30' 17.04" W	57° 16' 8.39" N 152° 13' 21.55" W

Table 1: Survey Limits

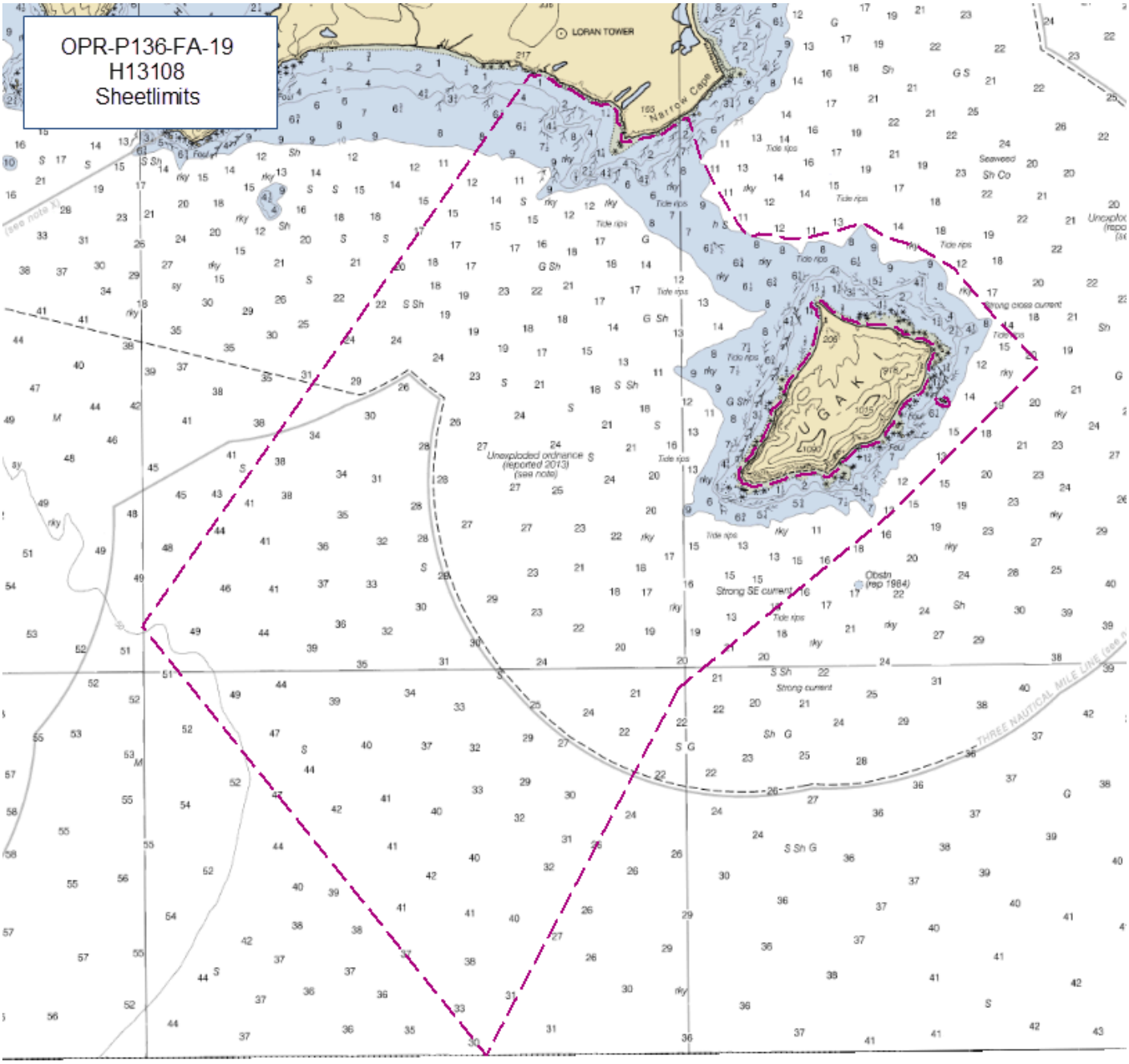


Figure 1: H13108 sheet limits (in purple) overlaid onto Chart 16593

Data were acquired to the survey limits in accordance with the requirements in the Project Instructions and the March 2019 NOS Hydrographic Surveys Specifications and Deliverables (HSSD) as shown in Figure 1. In all areas where the 3.5 meter depth contour or the sheet limits were not met, the Navigable Area Limit Line (NALL) was defined as the inshore limit of bathymetry due to the risks of maneuvering the survey vessel in thick kelp. An example of such an area is shown in Figure 2.

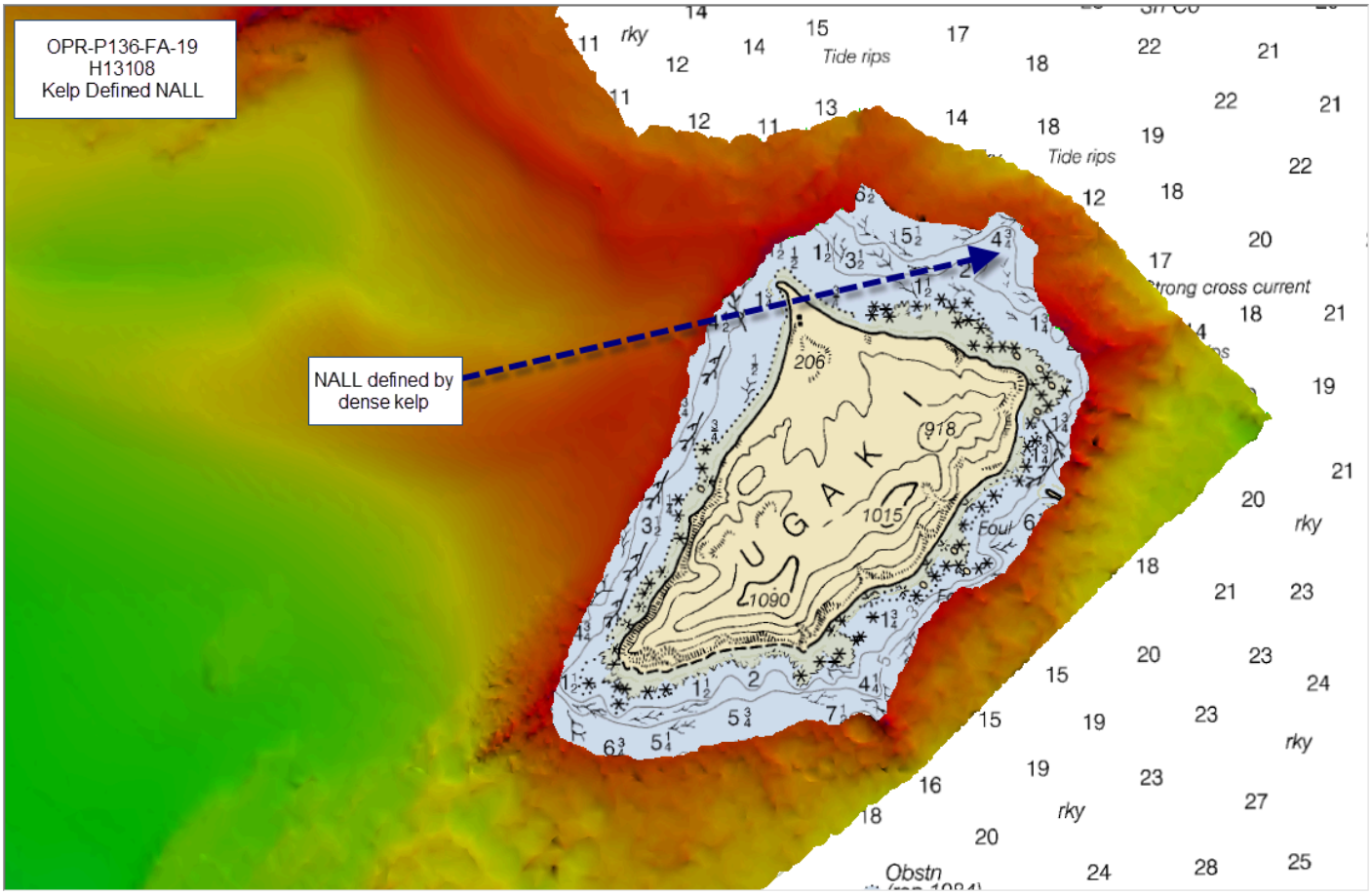


Figure 2: H13108 NALL defined by kelp

A.2 Survey Purpose

The area of Chiniak Bay supports the second busiest and third richest fisheries port in Alaska. Chiniak Bay is the gateway to Kodiak and has a survey vintage of 1933. In 2015, the Port of Kodiak was responsible for 514 million pounds of fish and $138 million dollars of product. This area has seen many groundings and near misses due to the number of dangers to navigation and pinnacles that exist in this area. The navigation of this area is further complicated by the number of vessels trying to enter and exit the Port of Kodiak via a choke point located at the channel entrance buoy. In recent years a number of groundings in and around the area have occurred, the most famous being a 174 foot Army Landing craft that was outbound to deliver goods to a remote village in western Alaska in 2012. This survey will serve to update the nautical charts with modern data to support the above need.

A.3 Survey Quality

The entire survey is adequate to supersede previous data.

Data acquired in H13108 meet multibeam echo sounder (MBES) coverage requirements for complete coverage,as required by the HSSD. This includes crosslines (see Section B.2.1), NOAA allowable uncertainty (see Section B.2.10), and density requirements (see Section B.2.11). Additional compliance statistics can be found in the Standards and Compliance located in Appendix II of this report.

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

Table 2: Survey Coverage

The entirety of H13108 was acquired with complete coverage MBES, meeting requirements listed above and in the HSSD. See Figure 3 for an overview of coverage.

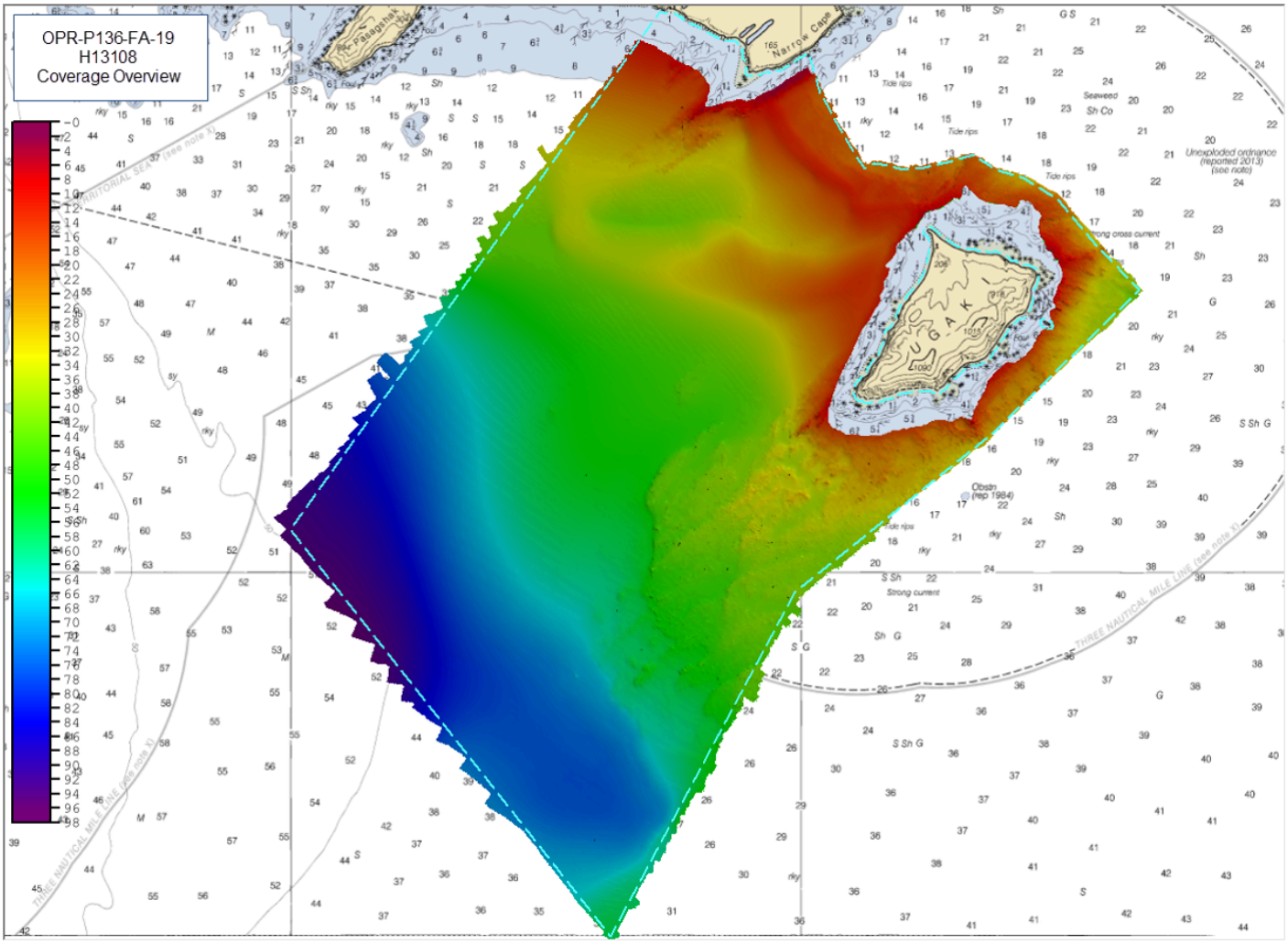


Figure 3: H13108 survey coverage with sheet limits (in light blue) overlaid onto Chart 16593

A.6 Survey Statistics

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

	HULL ID	*FA2805*	*FA2807*	*FA2808*	*S220*	*Total*
LNM	**SBES Mainscheme**	0	0	0	0	0
	MBES Mainscheme	81.91	114.88	83.66	360.56	641.01
	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	9.37	0	16.13	25.50
	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						38.31

Table 3: Hydrographic Survey Statistics

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

Survey Dates	Day of the Year
07/25/2019	206
07/26/2019	207

Survey Dates	Day of the Year
07/27/2019	208
07/28/2019	209

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	*S220*	*2805*	*2807*	*2808*
LOA	70.4 meters	8.6 meters	8.6 meters	8.6 meters
Draft	4.8 meters	1.1 meters	1.1 meters	1.1 meters

Table 5: Vessels Used

B.1.2 Equipment

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

Manufacturer	Model	Type
Kongsberg Maritime	EM 710	MBES
Kongsberg Maritime	EM 2040	MBES
Applanix	POS MV 320 v5	Positioning and Attitude System
AML Oceanographic	MVP200	Conductivity, Temperature, and Depth Sensor
Teledyne RESON	SVP 71	Sound Speed System
Teledyne RESON	SVP 70	Sound Speed System
Sea-Bird Scientific	SBE 19plus V2	Conductivity, Temperature, and Depth Sensor

Table 6: Major Systems Used

The equipment was installed on the survey platform as follows: S220 utilizes the Kongsberg EM710, Teledyne Reason SVP 70 surface sound speed sensors, and AML Oceanographic MVP 200 for conductivity, temperature, and depth (CTD) casts. All launches utilize Kongsberg EM 2040 MBES, Teledyne SVP 71 surface sound speed sensors, and Sea-Bird Scientific 19plus CTD casts. All MBES survey vessels are equipped with POS MV v5 systems for positioning and attitude.

B.2 Quality Control

B.2.1 Crosslines

Multibeam/single beam echo sounder/side scan sonar crosslines acquired for this survey totaled 3.98% of mainscheme acquisition.

Crosslines were collected, processed and compared in accordance with Section 5.2.4.2 of the HSSD. To evaluate crosslines, a surface generated via data strictly from mainscheme lines and a surface generated via data strictly from crosslines were created. From these two surfaces a difference surface (mainscheme-crosslines=difference surface) was generated (Figure 4), and is submitted in the Separates II Digital Data folder. Statistics show the mean difference between depth derived from mainscheme data and crossline data was -0.02 (with mainscheme being shoaler) and 95% of nodes falling within +/- 0.19 meters (Figure 5). For the respective depths the difference surface was compared to the allowable NOAA uncertainty standards. In total, 99.5% of the depth differences between H13108 mainscheme and crossline data were within allowable NOAA uncertainties.

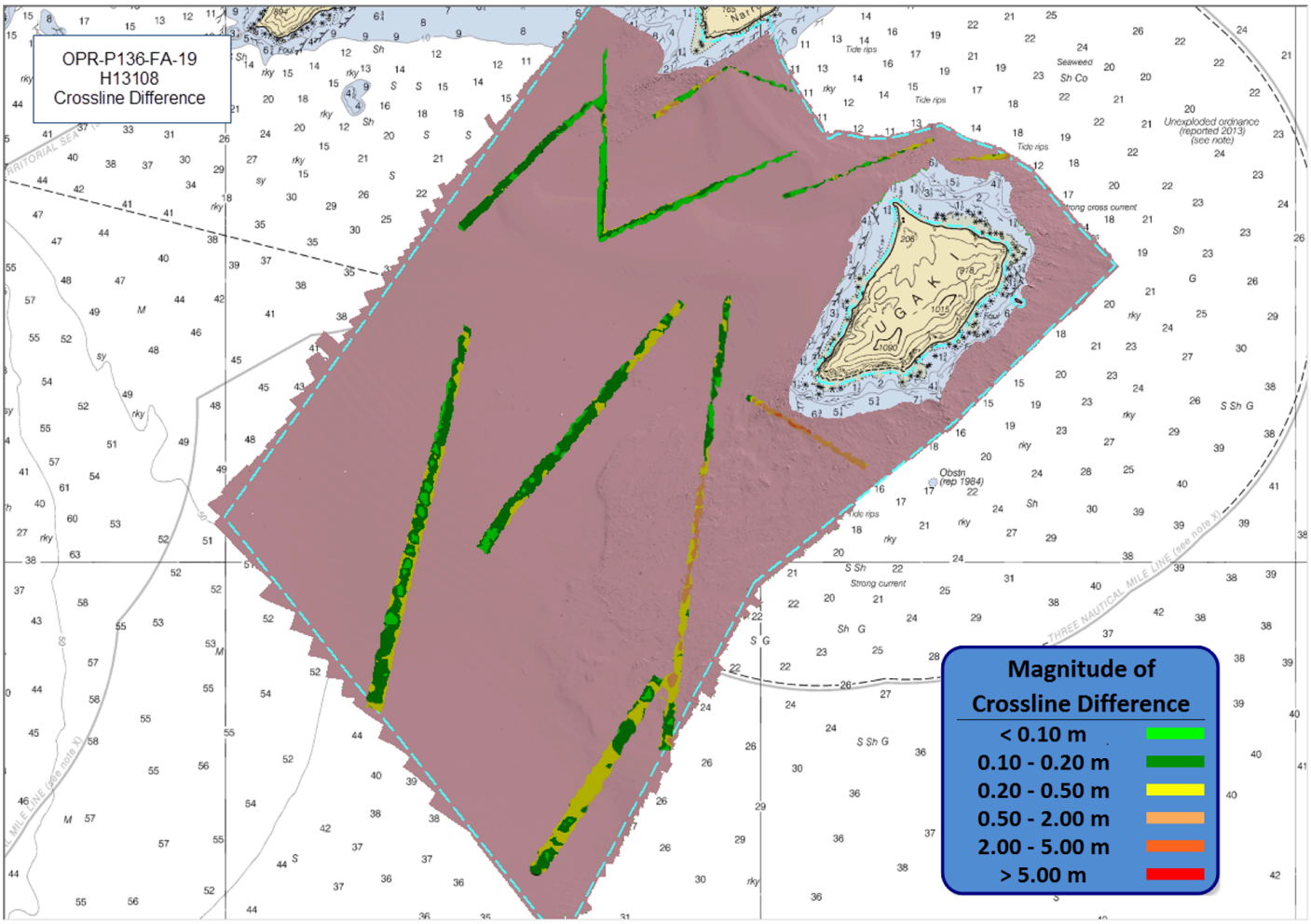
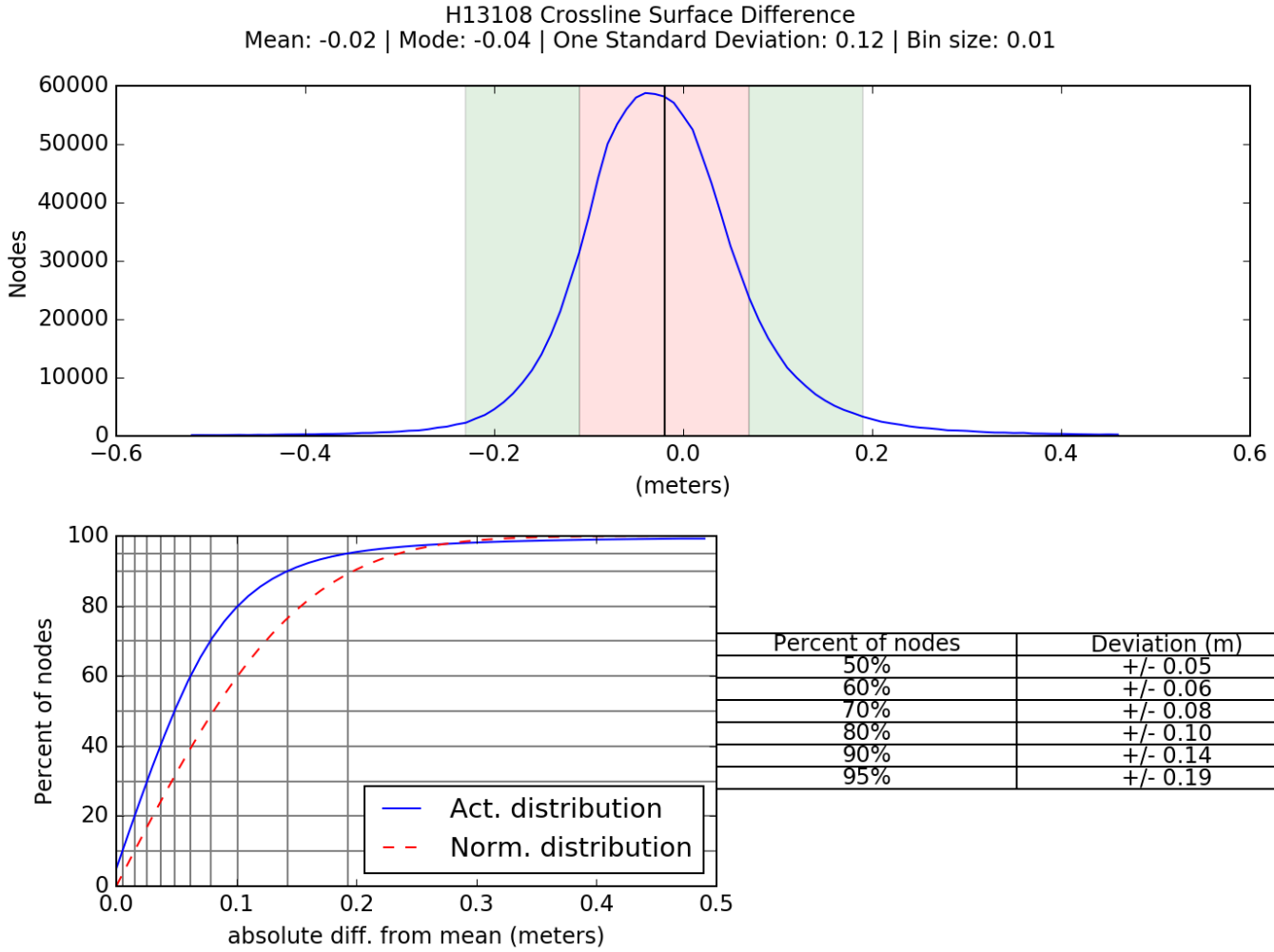


Figure 4: VR surface difference between crosslines and manscheme on H13108



Percent of nodes	Deviation (m)
50%	+/- 0.05
60%	+/- 0.06
70%	+/- 0.08
80%	+/- 0.10
90%	+/- 0.14
95%	+/- 0.19

Figure 5: H13108 crossline and mainscheme difference statistics

B.2.2 Uncertainty

The following survey specific parameters were used for this survey:

Method	Measured	Zoning
ERS via ERTDM	0.15 meters	0 meters

Table 7: Survey Specific Tide TPU Values.

Hull ID	Measured - CTD	Measured - MVP	Surface
280x (all launches)	1 meters/second	N/A	0.5 meters/second
S220	N/A	2 meters/second	0.5 meters/second

Table 8: Survey Specific Sound Speed TPU Values.

In addition to the usual a priori estimates of uncertainty via device models for vessel motion and ERTDM, real-time and post processed uncertainty were also incorporated into the depth estimates of survey H13108. Real-time uncertainties were provided via EM2040 and EM710 data and Applanix Delayed Heave RMS. Following post-processing of the real-time vessel motion, recomputed uncertainties of vessel roll, pitch, gyro, and navigation were applied in CARIS HIPS and SIPS via Smoothed Best Estimate of Trajectory (SBET) RMS file generated in Applanix POSPac.

B.2.3 Junctions

H13108 junctions with one adjacent survey from this project, H13107, and one survey from a prior project, H13106 as shown in Figure 6. Data overlap between H13108 and each adjacent survey was achieved. These areas of overlap between surveys were reviewed in CARIS HIPS and SIP by surface differencing (at equal resolutions) to assess surface agreement. The multibeam data were also examined in CARIS Subset Editor for consistency and agreement. The junctions with H13108 are generally within the NOAA allowable uncertainty in their areas of overlap. For all junctions with H13108 a negative difference indicates H13108 was shoaler and a positive difference indicates H13108 was deeper.

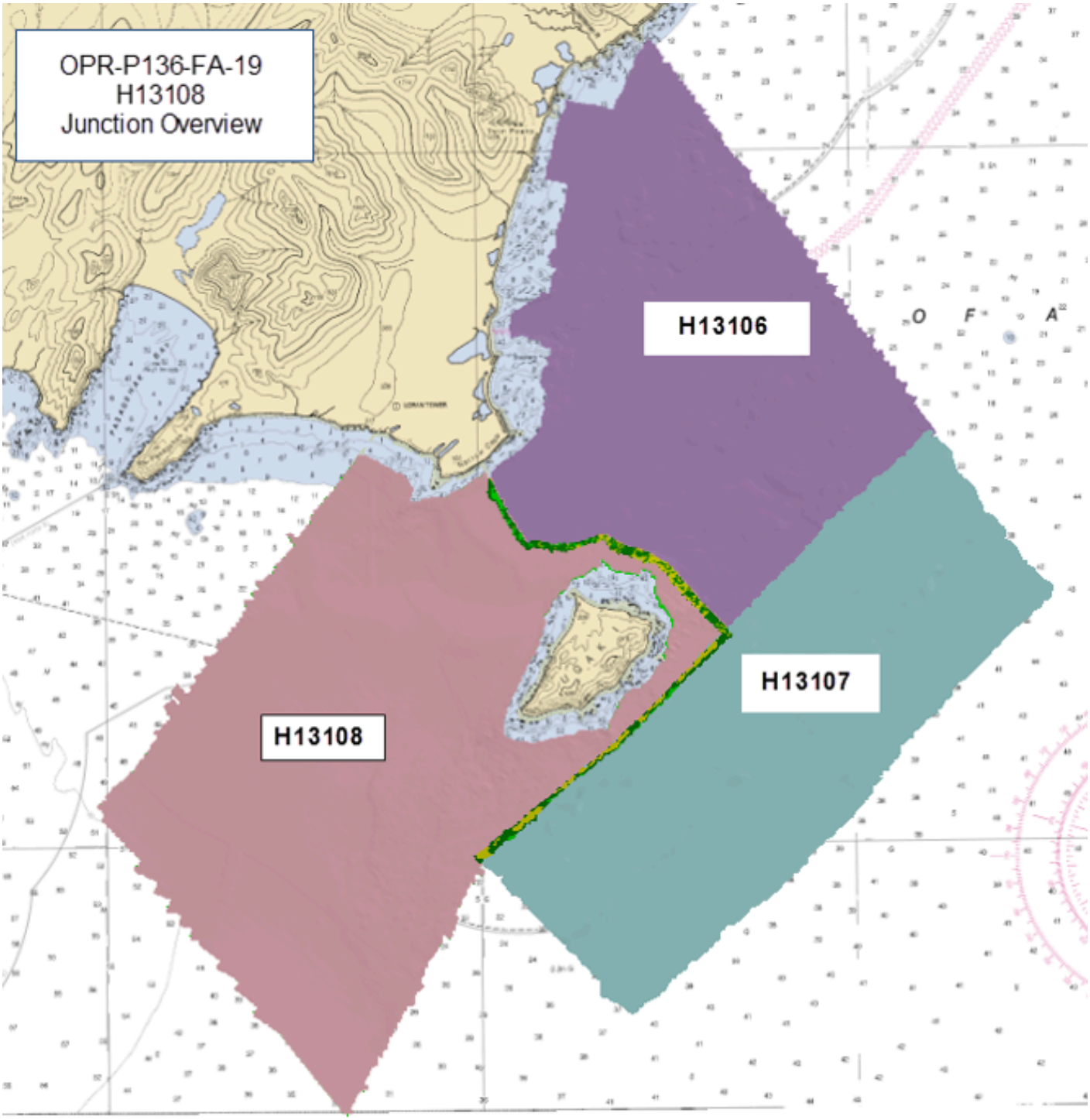


Figure 6: Overview of H13108 junction surveys

The following junctions were made with this survey:

Registry Number	Scale	Year	Field Unit	Relative Location
H13106	1:40000	2019	NOAA Ship RAINIER	NE
H13107	1:40000	2019	NOAA Ship FAIRWEATHER	SE

Table 9: Junctioning Surveys

H13106

Surface differencing in CARIS HIPS and SIPS was used to assess junction agreement between the surface from H13108 and the surface from H13106 (Figure 7). The statistical analysis of the difference surface shows a mean of -0.15 meters with 95% of the nodes having a maximum deviation of +/-0.51 meters as seen in Figure 8. It was found that 98% of nodes are within NOAA allowable uncertainty.

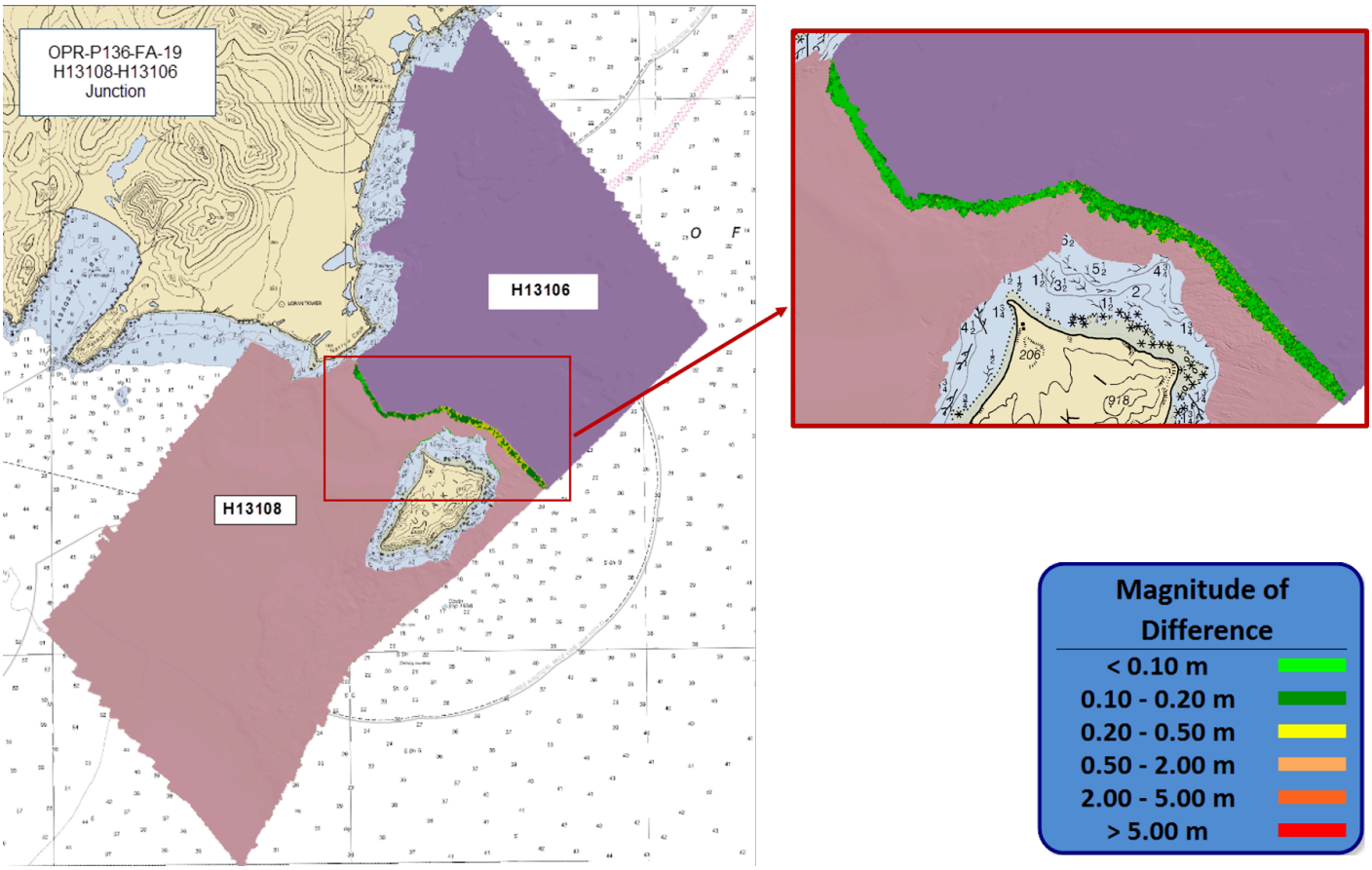
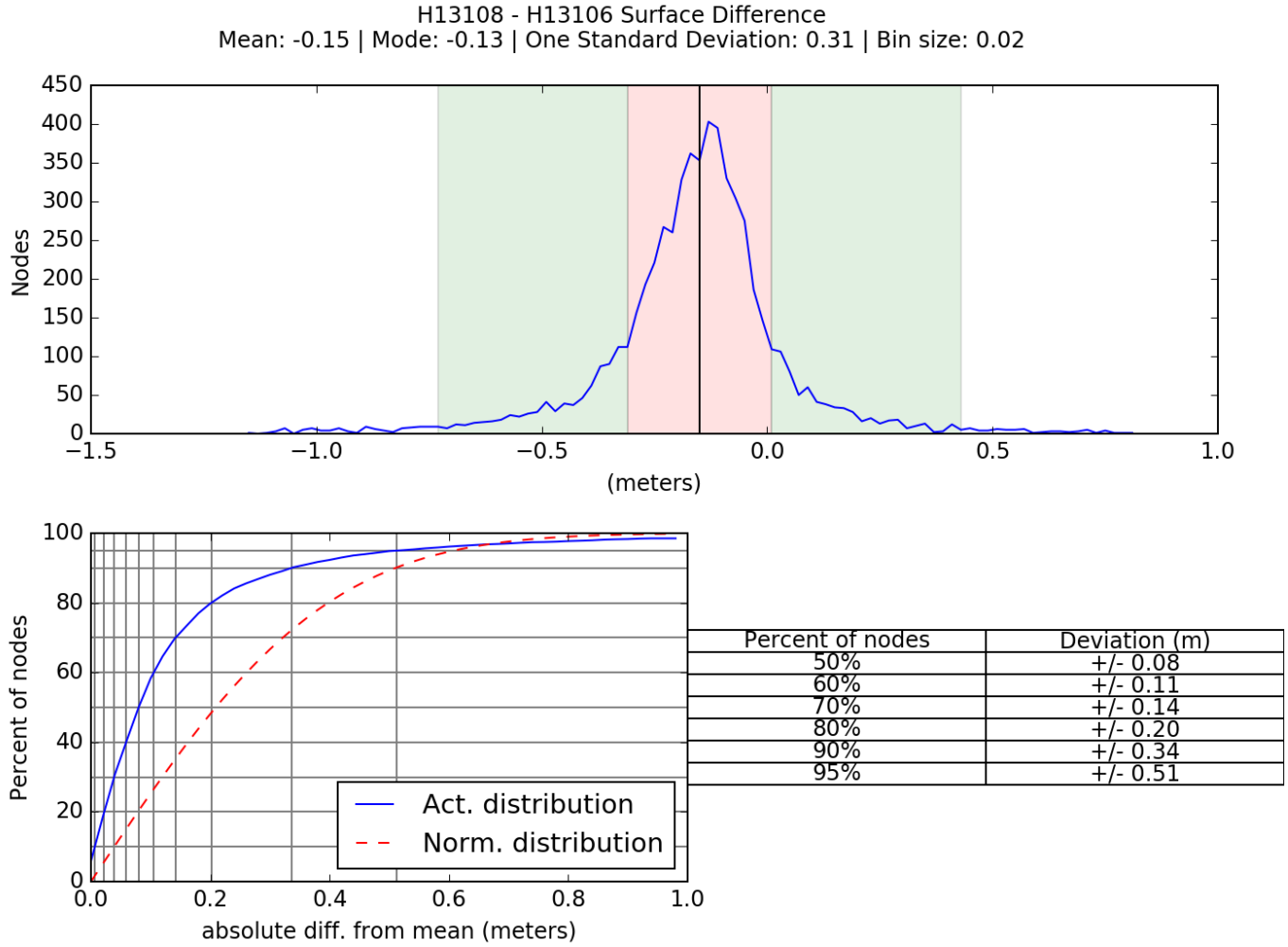


Figure 7: 16m Difference surface between H13108 (pink) and junctioning survey H13106 (purple)



Percent of nodes	Deviation (m)
50%	+/- 0.08
60%	+/- 0.11
70%	+/- 0.14
80%	+/- 0.20
90%	+/- 0.34
95%	+/- 0.51

Figure 8: Difference surface statistics between H13108 and H13106

H13107

Surface differencing in CARIS HIPS and SIPS was used to assess junction agreement between the surface from H13108 and the surface from H13107 (Figure 9). The statistical analysis of the difference surface shows a mean of 0.04 meters with 95% of the nodes having a mazimum deviation of +/-0.26 meters as seen in Figure 10. It was found that 99.5% of nodes are within NOAA allowable uncertainty.

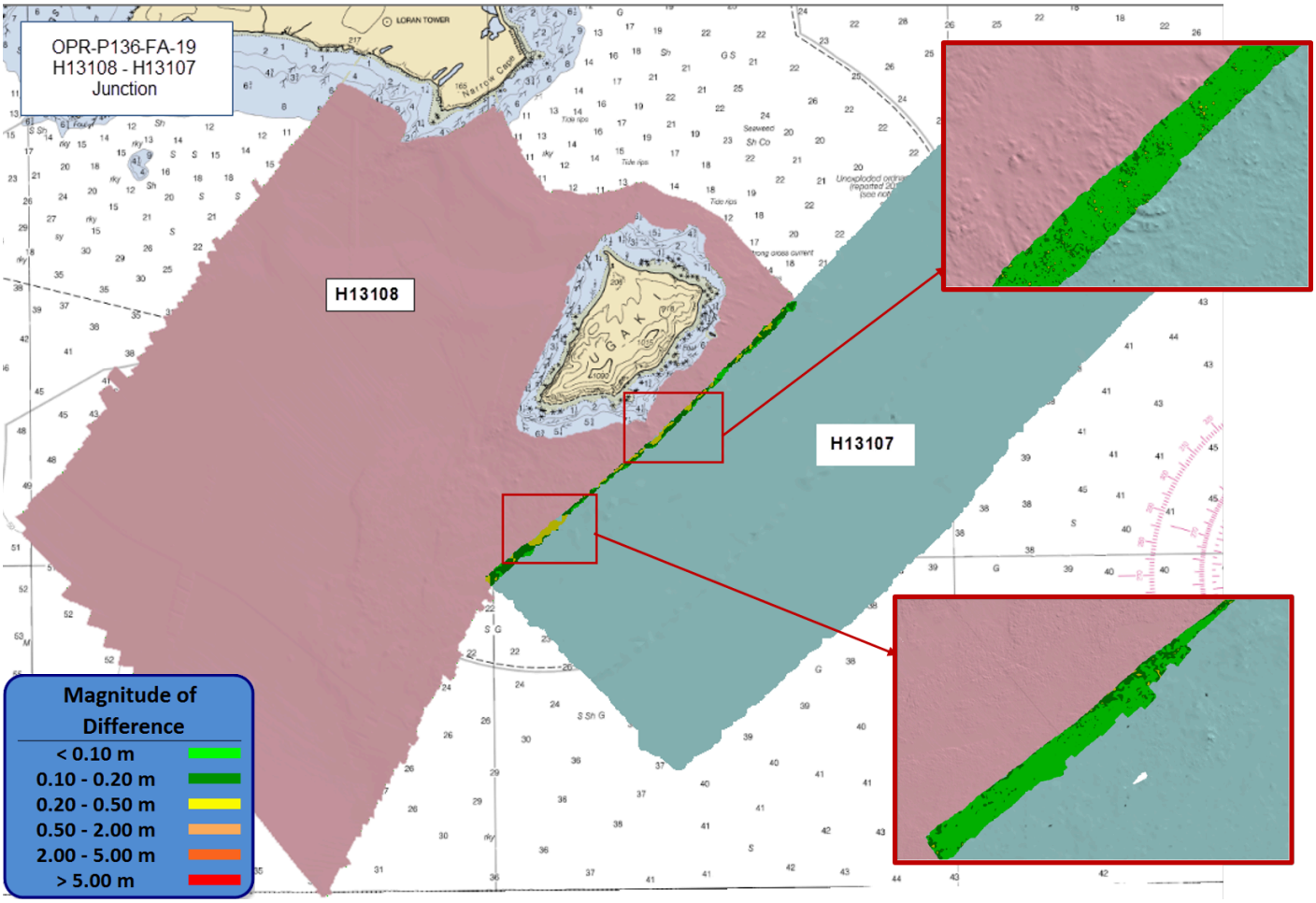
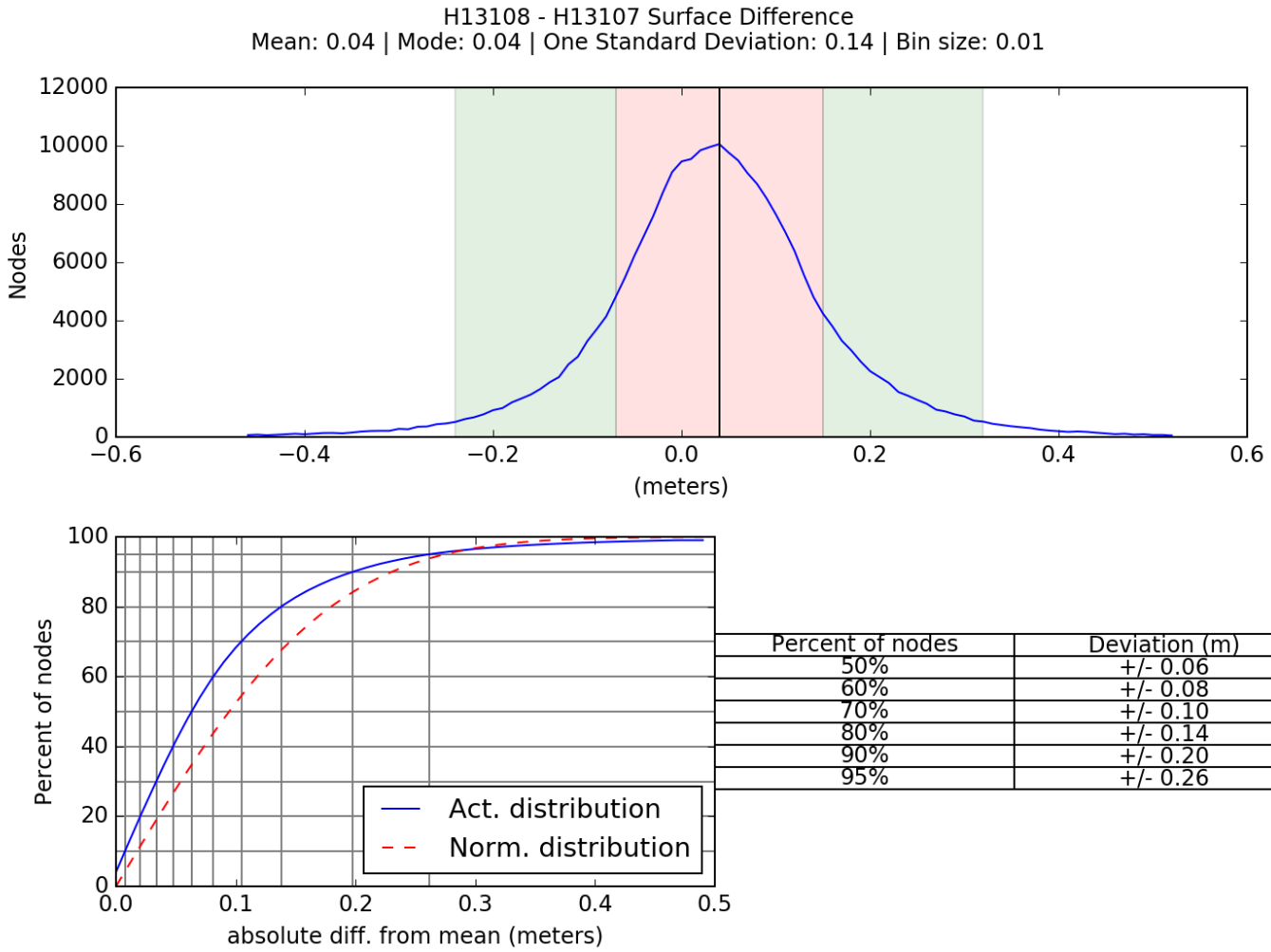


Figure 9: VR Difference surface between H13108 (pink) and junctioning survey H13107 (green)



Percent of nodes	Deviation (m)
50%	+/- 0.06
60%	+/- 0.08
70%	+/- 0.10
80%	+/- 0.14
90%	+/- 0.20
95%	+/- 0.26

Figure 10: Difference surface statistics between H13108 and H13107

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

Tidal current

Data collected on day number 206 by launch 2807 exhibited a slight vertical offset caused by the vessel crabbing due to a strong tidal current in the area (Figure 11). However the offset was investigated by the hydrographer and was determined to be within allowable Total Vertical Uncertainty.

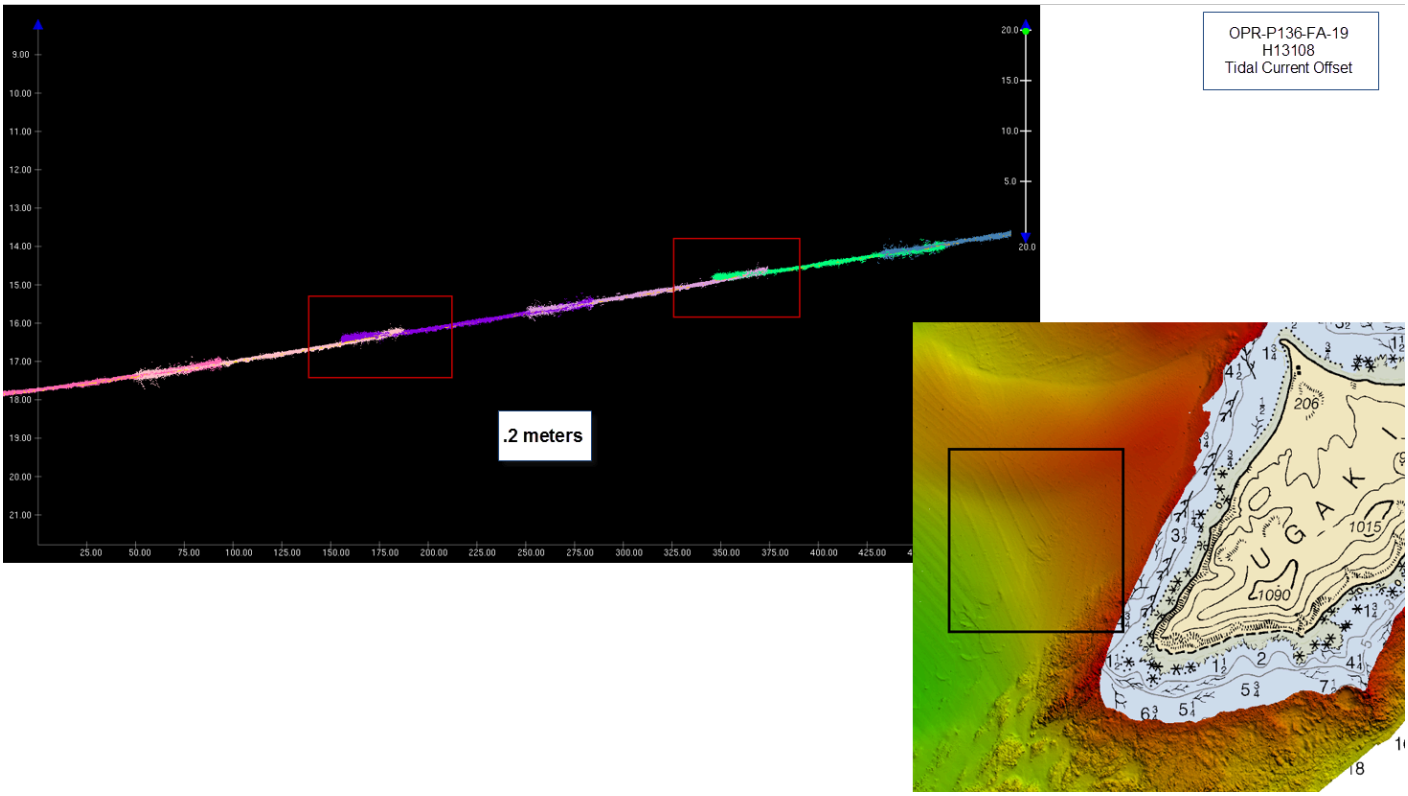


Figure 11: Vertical offset in H13108 cause by strong tidal current near the island

B.2.7 Sound Speed Methods

Sound Speed Cast Frequency: Casts were conducted at a minimum of one every four hours during launch acquisition. Casts were conducted more frequently in areas where there was a change in surface sound speed greater than two meters per second. MVP casts on S220 were conducted at an average interval of 40 minutes, guided by observation of the surface sound speed and targeted to deeper areas. All sound speed methods were used as detailed in the DAPR

B.2.8 Coverage Equipment and Methods

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

B.2.9 NOAA Allowable Uncertainty

The surface was analyzed using HydrOffice QC Tools Grid QA feature to determine compliance with specifications. Overall 99.5% of nodes within the surface meet NOAA Allowable Uncertainty specifications for H13108. For a graphical representation of compliance with uncertainty standards see Figure 12.

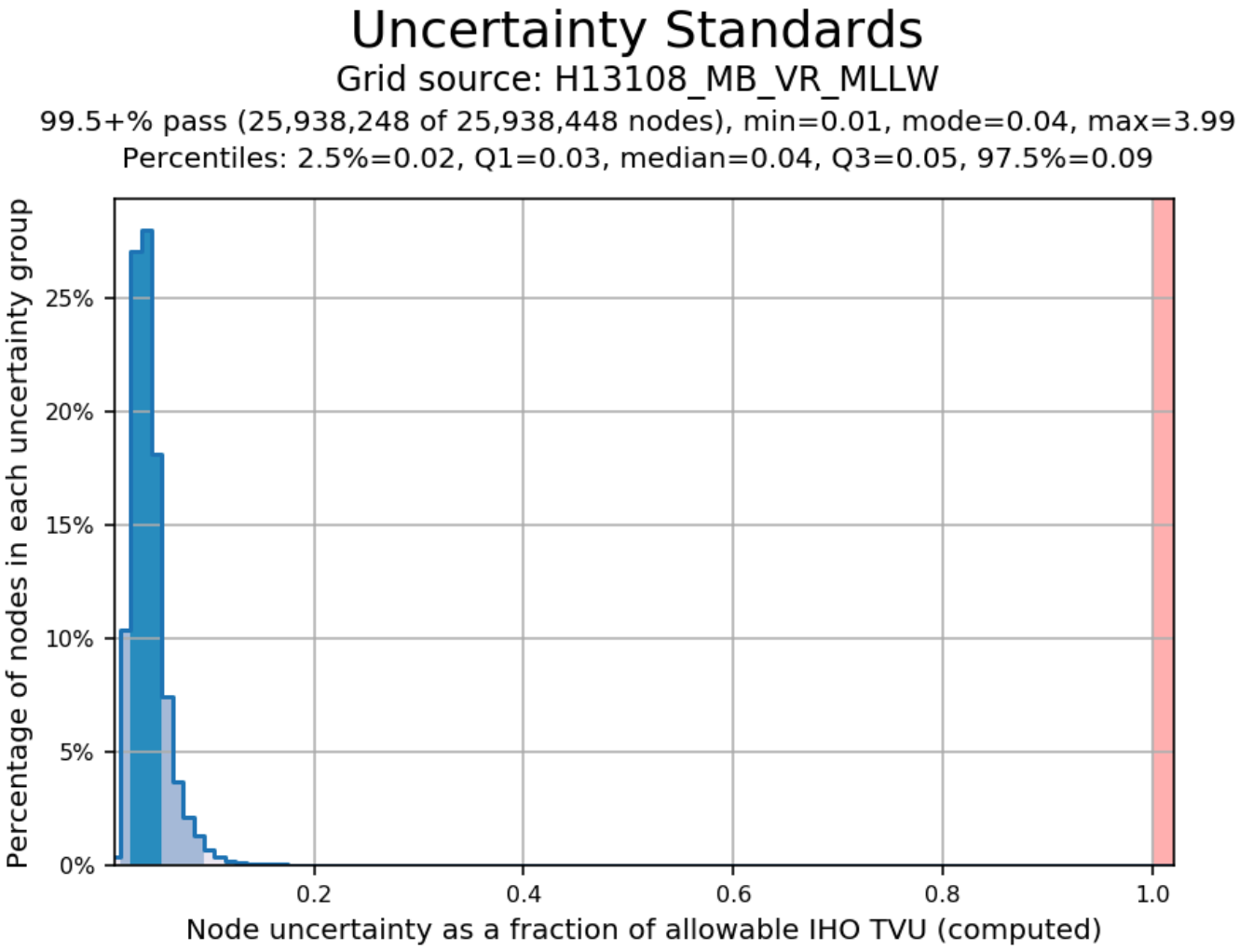


Figure 12: H13108 compliance with uncertainty standards

B.2.10 Density

The surface was analyzed using HydrOffice QC Tools Grid QA feature to determine compliance with specifications. Density requirements for H13108 were achieved with at least 99.5% of surface nodes containing five or more soundings as required by HSSD Section 5.2.2.4. For a graphical representation of compliance with density requirements see Figure 13.

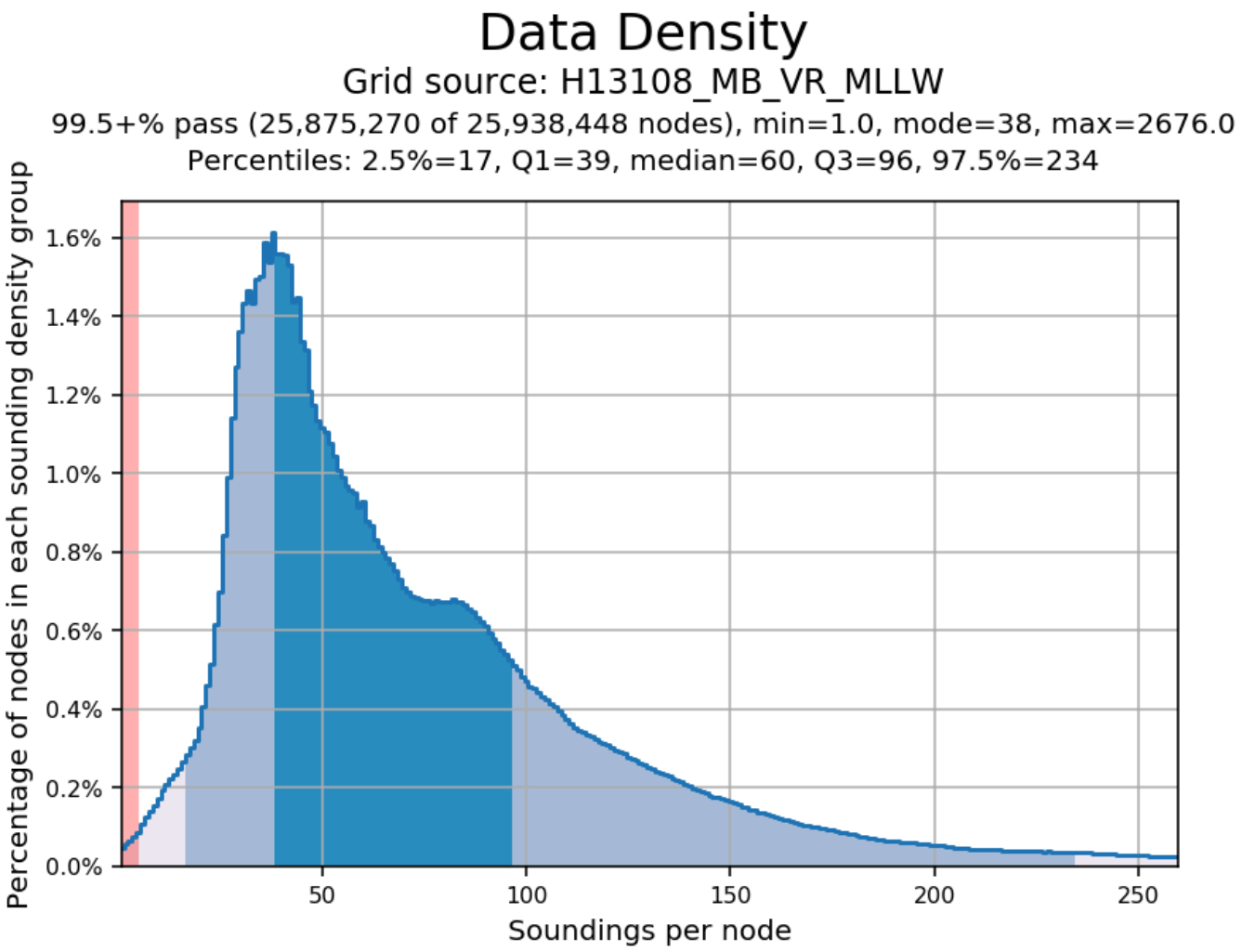


Figure 13: H13108 compliance with density requirements

B.2.11 Holidays

H13108 data were reviewed in CARIS HIPS and SIPS for holidays in accordance with Section 5.2.2.3 of the HSSD. Four holidays which meet the 3 by 3 node definition were identified via HydrOffice QC Tools Holiday Finder tool. This tool automatically scans the surface for holidays as defined in the HSSD and was run in conjunction with a visual inspection of the surface by the hydrographer.

Upon investigation it was determined that one of the four holidays flagged resulted from a hole in the data caused by Ugak Island; as a result only three holidays were determined to exist (see Figure 14). Holidays #1 and #2 were caused by a lack of overlap between lines. Holiday #3 resulted from rapid shoaling of the outer beams due to a dynamic seafloor.

Attempts were made to cover all gaps in coverage when it was safe to do so. However, due to weather conditions vessels were unable to return to the area to collect holiday coverage. All holidays were investigated by the hydrographer in CARIS subset editor where it was determined they did not pose a significant threat to navigation either by the general nature of the seafloor or the surrounding water depth.

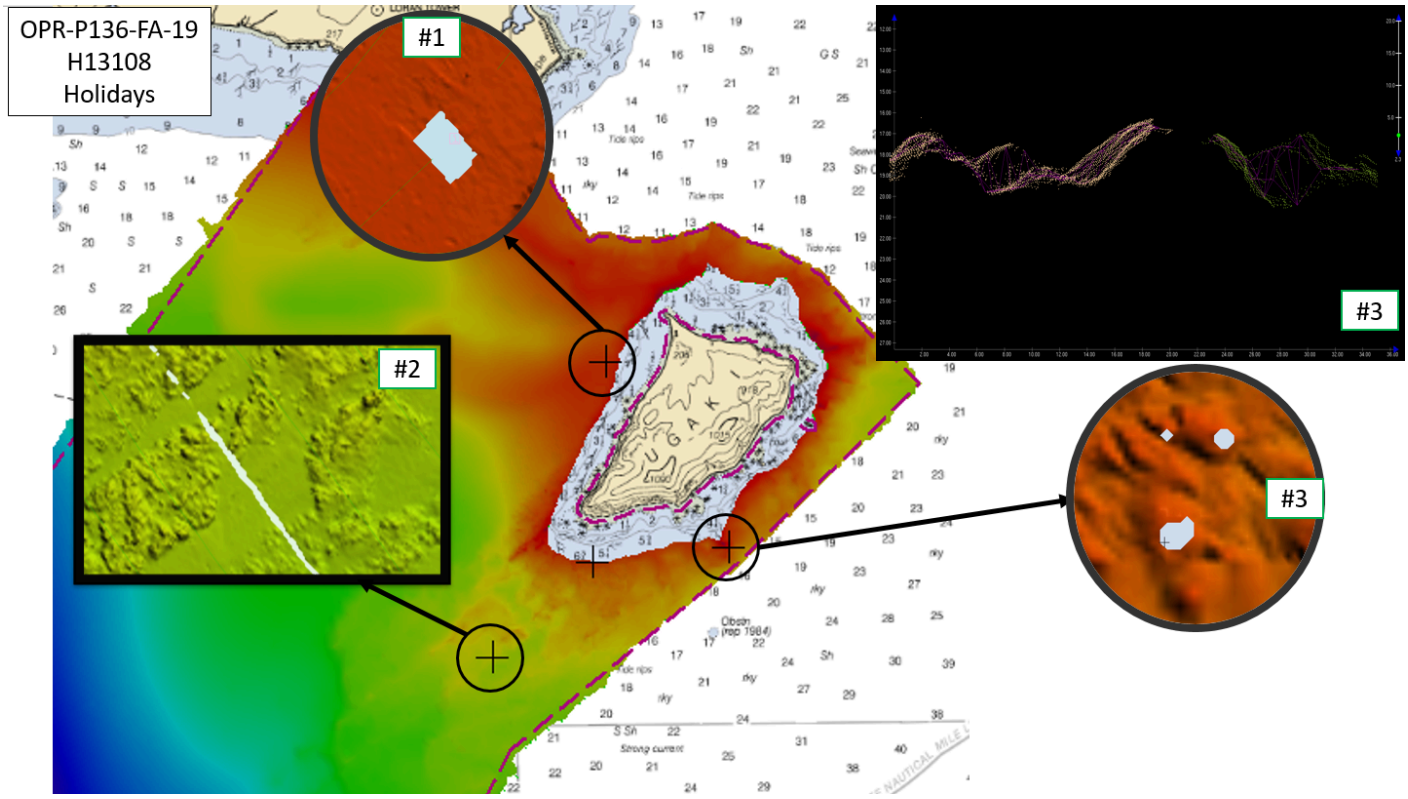


Figure 14: H13108 numbered holiday locations

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 stored in the .all file for Kongsberg systems. All backscatter were processed to GSF files, and a floating point mosaic per vessel was created by the field unit via Fledermaus FMGT 7.8.10. A relative backscatter calibration was performed by HSTB via a patch test in order to bring the survey systems on each of the launches into alignment. The offsets between launch sonar systems identified by the patch test were entered into the Processing Settings within FMGT to increase continuity in the backscatter imagery collected by each vessel. See Figure 16 for a table of the entered calibration values.
Due to an artifact observed in the mosaic generated from all data collected at 300kHz, separate mosaics were generated for each vessel. See figure 15 for a greyscale representation of the complete mosaic.

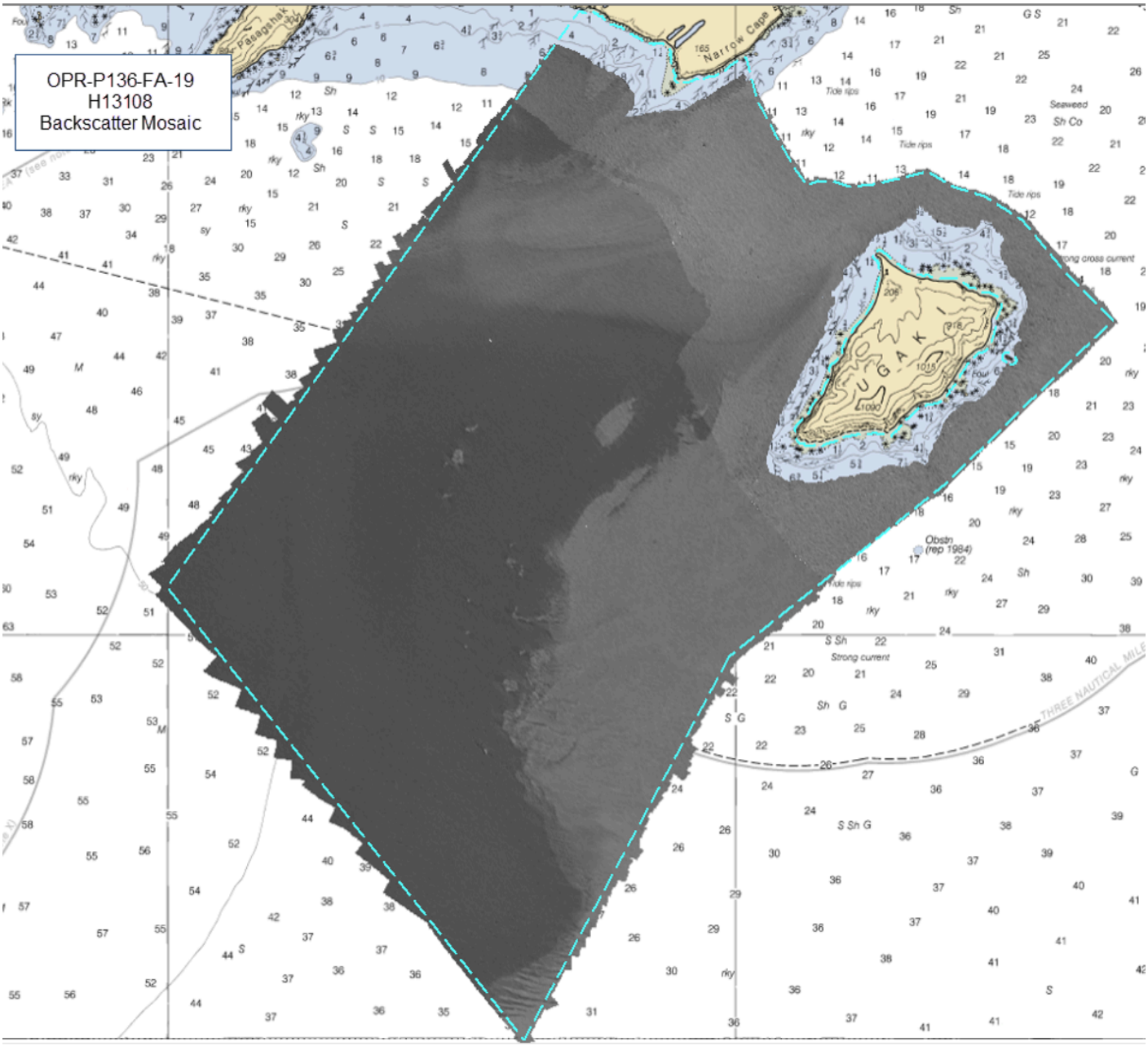


Figure 15: H13108 Backscatter mosaic with sheet limits overlaid (light blue)

	200				300				400		
	Short CW	Med CW	Long CW	FM (Both)	Short CW	Med CW	Long CW	FM (Both)	Short CW	Med CW	Long CW
2805	-1.1	-1.4	-1.8	2.7	-0.7	-0.9	-1.0	-1.4	3	3.9	4.8
2806	1.8	1.8	1.8	2.4	-0.1	-0.3	-0.4	-0.8	3.6	4.65	5.7
2807	-0.3	-0.15	0	0	0	-0.2	-0.3	-0.7	3.3	4.2	5.1
2808	0	0.6	1.2	1.6	-0.3	-0.5	-0.6	-1.0	1.8	2.7	3.6

Figure 16: Backscatter calibration values

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	11.1.3

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	7.8.10

Table 11: Primary imagery data processing software

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

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
H13108_MB_VR_MLLW	CARIS VR Surface (CUBE)	Variable Resolution	1.6 meters - 96.6 meters	NOAA_VR	Complete MBES
H13108_MB_VR_MLLW_Final	CARIS VR Surface (CUBE)	Variable Resolution	1.6 meters - 96.6 meters	NOAA_VR	Complete MBES

Table 12: Submitted Surfaces

The NOAA CUBE parameters defined in the HSSD were used for the creation of all CUBE surfaces for H13108. The surfaces have been reviewed where noisy data, or "fliers" are incorporated into the gridded solutions causing the surface to be shoaler or deeper than the true sea floor. Where these spurious soundings cause the gridded surface to vary from the reliably measured seabed by greater than the maximum allowable Total Vertical Uncertainty at that depth. the noisy data have been rejected by the hydrographer and the surface recomputed.

Flier Finder, part of the QC Tools package within HydrOffice, was used to assist the search for spurious soundings following gross cleaning. Flier finder was run iteratively until all remaining flagged fliers were deemed to be valid aspects of the surface.

B.5.3 Data Logs

Data acquisiton and processing notes are included in the acquisition and processing logs, and additional processing such as final seperation model reduction and soundspeed application are noted in the H13108 Data Log spreadsheet. All data logs are submitted digitally in the Separates I folder.

C. Vertical and Horizontal Control

Per section 5.1.2.3 of the Field Procedures Manual (2014 ed), no Horizontal and Vertical Control Report has been generated for H13108.

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	P136RA2019_ERTDM_NAD83-MLLW.csar

Table 13: ERS method and SEP file

ERS methods were used as final means of reducing H13108 to MLLW for submission.

C.2 Horizontal Control

The horizontal datum for this project is North American Datum of 1983 (NAD 83).

The projection used for this project is Universal Transverse Mercator (UTM) Zone 5.

The following PPK methods were used for horizontal control:

- RTX

Vessel kinematic data were post-processed using Applanix POSpac processing software and RTX positioning methods described in the DAPR. Smoothed Best Estimate of Trajectory (SBET) and associated error (RMS) data were applied to all MBES data in CARIS HIPS and SIPS.

DGPS

The following DGPS Stations were used for horizontal control:

DGPS Stations
897 Kodiak,AK 313 kHz

Table 14: USCG DGPS Stations

D. Results and Recommendations

D.1 Chart Comparison

A comparison was performed between survey H13108 and ENC US4AK5OM and US4AK5NM using Caris HIPS and SIPS. Sounding and contour layers were overlaid on the ENC to assess differences between the surveyed soundings and charted depths. ENC's were compared to the surface by extracting all soundings from the chart and creating and interpolated TIN surface which could be differenced with the surface from H13108. All data from H13108 should supersede charted data.

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?
US4AK5OM	1:80000	8	09/05/2019	08/23/2018	NO
US4AK5NM	1:80000	17	09/05/2019	10/11/2018	NO

Table 15: Largest Scale ENCs

US4AK5OM

Soundings from H13108 are in general agreement with charted depths on ENC US4AK5OM, with most depths agreeing to 1 fathom as shown in Figure 17 and Figure 19. The largest differences are seen in rocky areas near shore where differences range to 7 fathoms as seen in Figure 19.

Contours from H13108 are in general agreement with charted contours on ENC US4AK5OM as shown in Figure 18.

US4AK5NM

Soundings from H13108 are in general agreement with charted depths on ENC US4AK5NM with most depths agreeing to 1 fathom as shown in Figure 17 and Figure 19.

Contours from H13108 are in general agreement with charted contours on ENC US4AK5NM as shown in Figure 18.

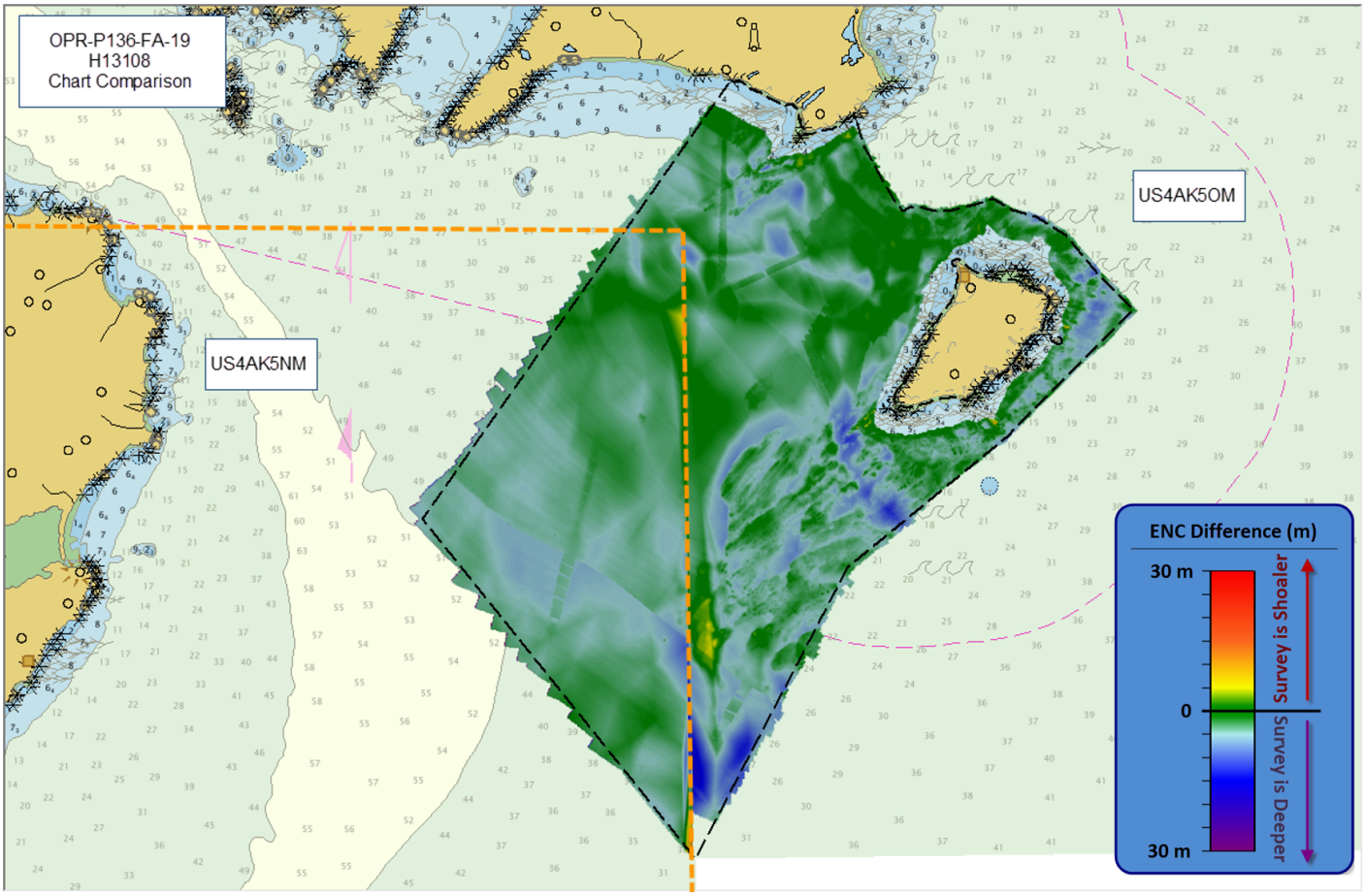


Figure 17: Difference surface between H13108 and interpolated TIN surface from US4AK5OM and US4AK5NM

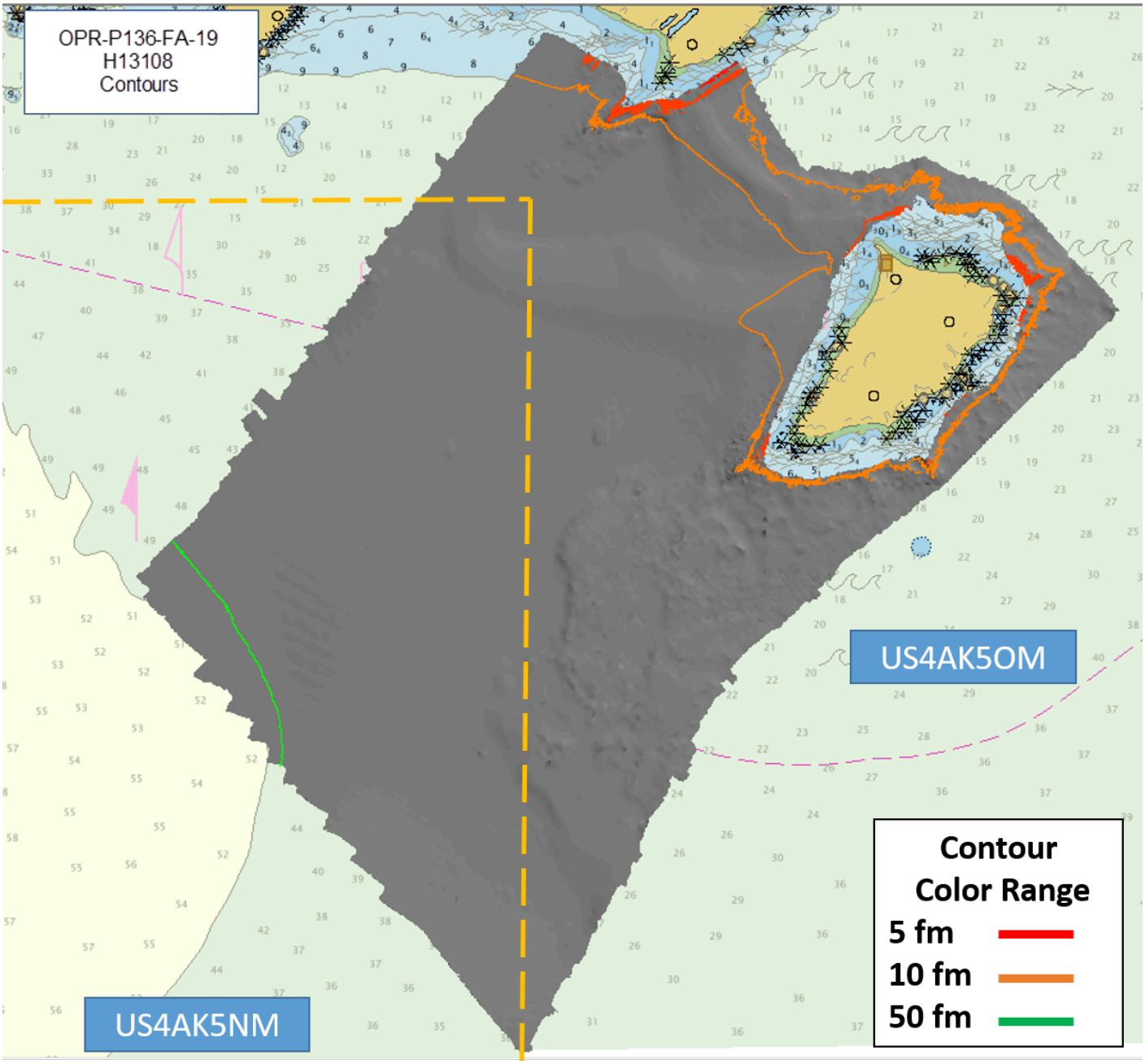


Figure 18: Overview of H13108 contours overlaid onto ENC US4AK5OM and US4AK5NM

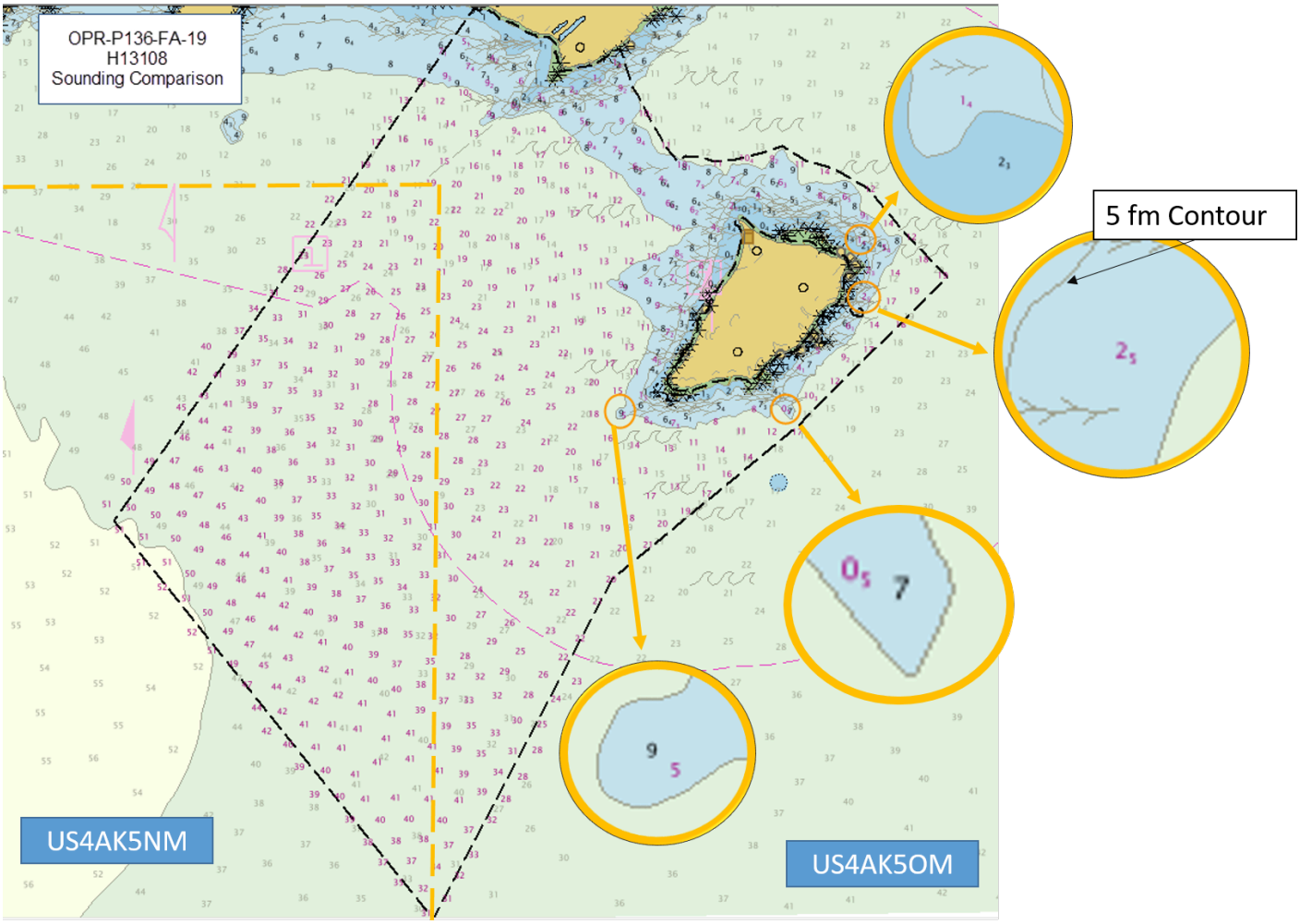


Figure 19: Overview of H13108 soundings (in purple) overlaid onto ENC US4AK5OM and US4AK5NM

D.1.2 Maritime Boundary Points

Maritime Boundary Points were assigned for this survey, but were not addressed due to time constraints.

D.1.3 Charted Features

No charted features exist for this survey.

D.1.4 Uncharted Features

No uncharted features exist for this survey.

D.1.5 Shoal and Hazardous Features

H13108 has one shoal and hazardous Underwater Rock feature, shown in Figure 20, that has been addressed in the H13108 Final Feature File. There is a gap in the data that does not constitute a holiday however the least depth of the rock was not obtained during field operations due to safety concerns; as a result the Final Feature File is missing the VALSOU for the new Underwater Rock Feature.

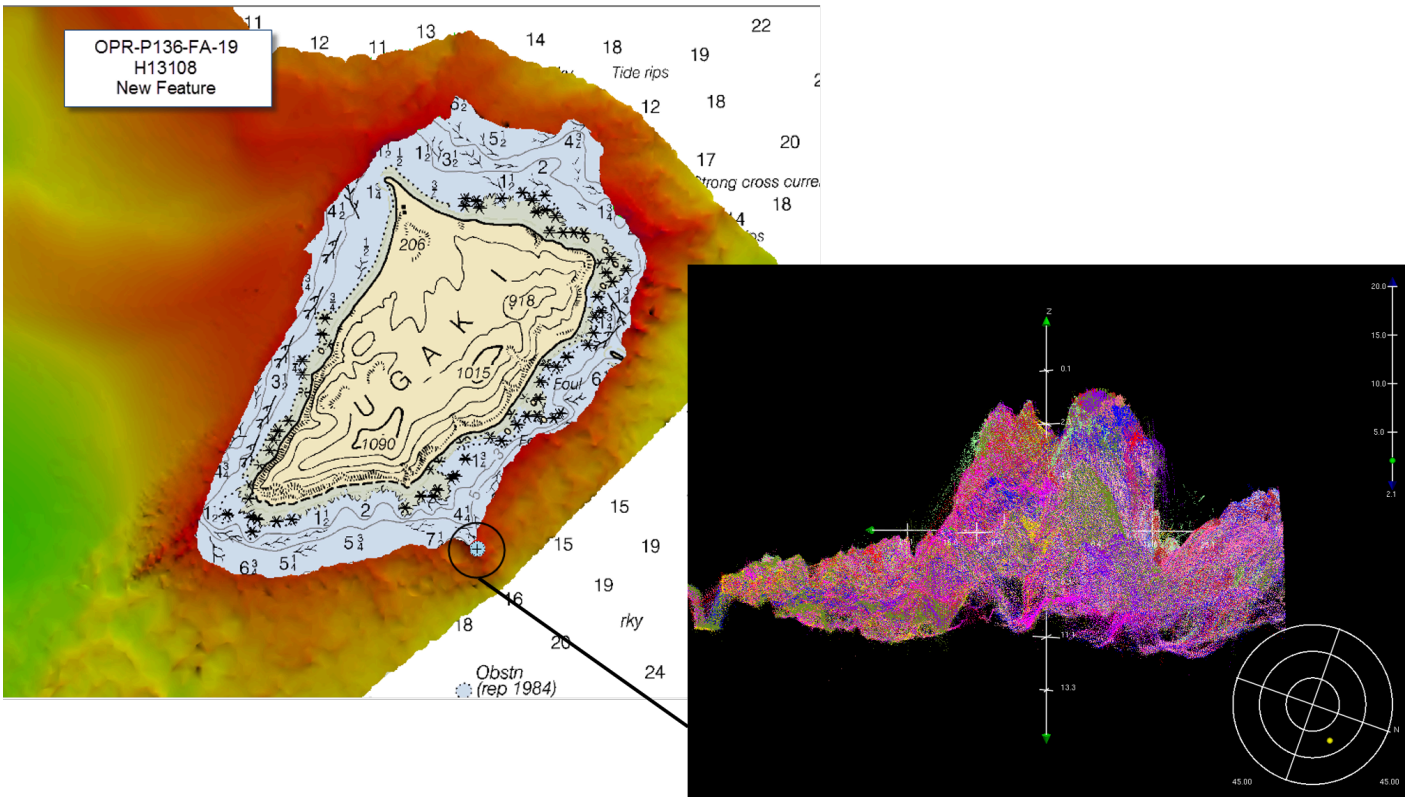


Figure 20: H13108 new shoal feature

NOAA specifications (2019 HSSD) state that all significant shoals or features found in waters less than 20m need to be developed to complete coverage standards therefore the data gap mentioned above does constitute a holiday.

D.1.6 Channels

No channels exist for this survey. There are no designated anchorages, precautionary areas, safety fairways, traffic separation schemes, pilot boarding areas, or channel and range lines within the survey limits.

D.1.7 Bottom Samples

Bottom samples were assigned for this survey but were not acquired due to time constraints.

D.2 Additional Results

D.2.1 Shoreline

H13108 survey limits extended to the NALL (see section A.1) and all features within these limits were addressed and attributed in the H13108 Final Feature File. All features inshore of the NALL were attributed in the Final Feature File with the description of "Not Addressed" and remarks of "Retain as charted, not investigated due to being inshore of NALL" as per HSSD Section 7.3.1. Annotations, information, and diagrams collected on DP forms and boat sheets during field operations were scanned and included in the Separates I Detached Positions folder.

D.2.2 Aids to Navigation

No Aids to navigation (ATONs) exist for this survey.

D.2.3 Overhead Features

No overhead features exist for this survey.

D.2.4 Submarine Features

No submarine features exist for this survey.

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

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
CAPT Marc Moser	Chief of Party	10/05/2019	MOSER.MARC.STANTON.1163193902 Digitally signed by MOSER.MARC.STANTON.1163193902 Date: 2019.10.05 10:23:12 -07'00'
LT Stephen Moulton	Operations Officer	10/05/2019	MOULTON.STEPHEN.F.1282116835 Digitally signed by MOULTON.STEPHEN.F.1282116835 Date: 2019.10.06 12:18:47 -07'00'
HCST Samuel Candio	Chief Survey Technician	10/05/2019	
HSST Alissa Johnson	Sheet Manager	10/05/2019	JOHNSON.ALISSA.JEAN.1537531165 Digitally signed by JOHNSON.ALISSA.JEAN.1537531165 Date: 2019.10.06 13:23:50 -07'00'

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

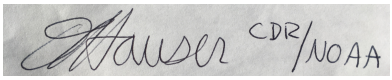
H13108

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.



Digitally signed by HAUSER.OLIVIA.A.1275636009
Date: 2020.10.20 17:07:06 -07'00'

Approved: _____

Commander Olivia Hauser, NOAA
Chief, Pacific Hydrographic Branch