H12882

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

DESCRIPTIVE REPORT

Type of Survey:	Navigable Area
Registry Number:	H12882

LOCALITY

State(s):	Alaska
General Locality:	Southeast Alaska
Sub-locality:	Baldy Bay

2017

CHIEF OF PARTY
CDR Mark Van Waes, NOAA

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Date:

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

REGISTRY NUMBER:

HYDROGRAPHIC TITLE SHEET

H12882

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:	**Baldy Bay**
Scale:	**20000**
Dates of Survey:	**05/29/2017 to 06/21/2017**
Instructions Dated:	**04/12/2017**
Project Number:	**OPR-O190-FA-17**
Field Unit:	**NOAA Ship *Fairweather***
Chief of Party:	**CDR Mark Van Waes, 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 H12882

Project: OPR-O190-FA-17

Locality: Southeast Alaska

Sublocality: Baldy Bay

Scale: 1:20000

May 2017 - June 2017

NOAA Ship *Fairweather*

Chief of Party: CDR Mark Van Waes, NOAA

A. Area Surveyed

The survey area is located west of Prince of Wales Island, AK, within the sublocality of Baldy Bay.

A.1 Survey Limits

Data were acquired within the following survey limits:

Northwest Limit	Southeast Limit
55° 5' 59.47" N 133° 5' 53.78" W	54° 58' 8.84" N 132° 49' 33.91" W

Table 1: Survey Limits

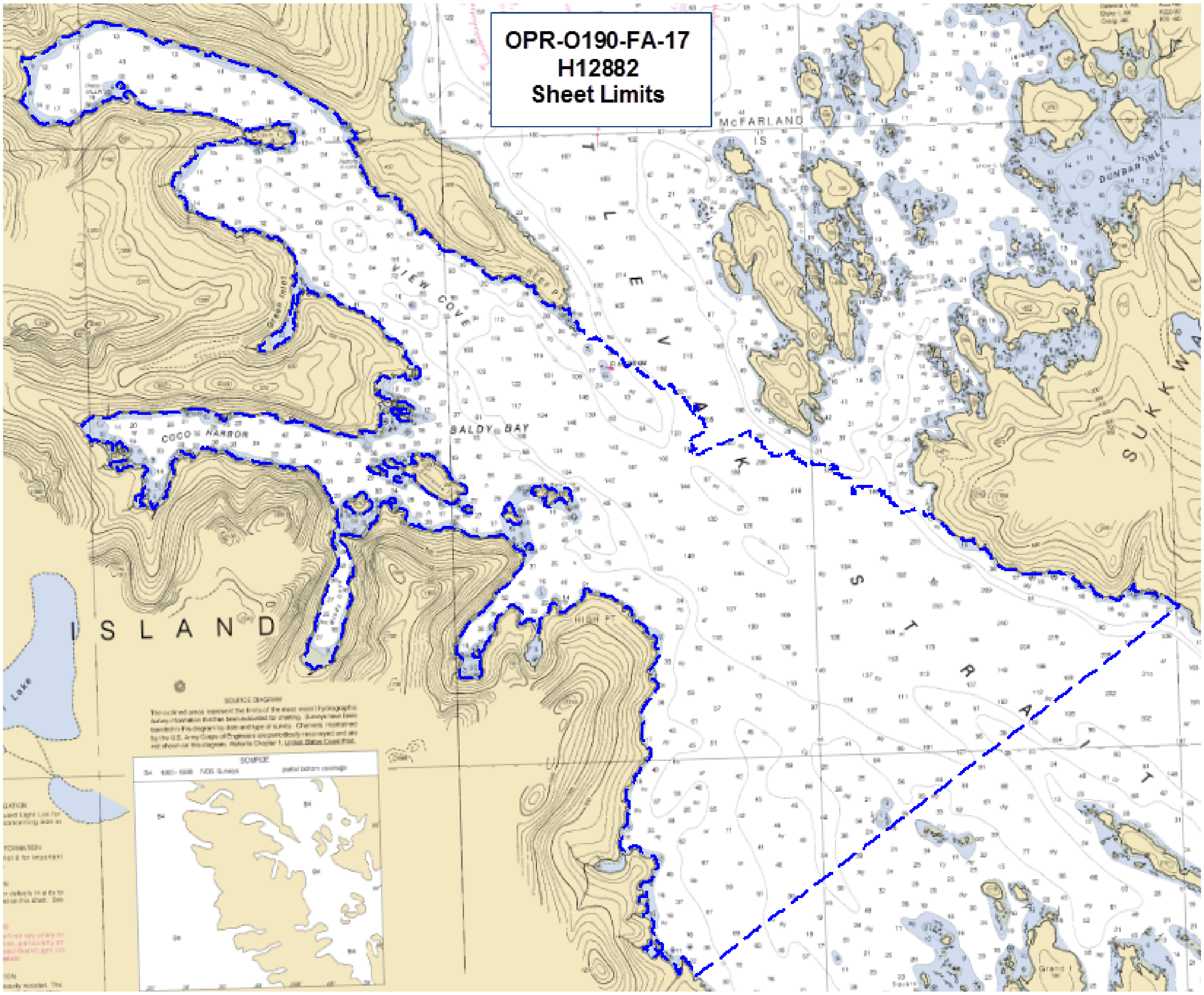


Figure 1: H12882 sheet limits (in blue) overlaid onto Chart 17408

Data were acquired to the survey limits in accordance with the requirements in the Project Instructions and the March 2017 NOS Hydrographic Surveys Specifications and Deliverables (HSSD) as shown in Figure 1. In all areas where the 4 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 close proximity to the steep and rocky shoreline. An example of such an area is shown in Figure 2.

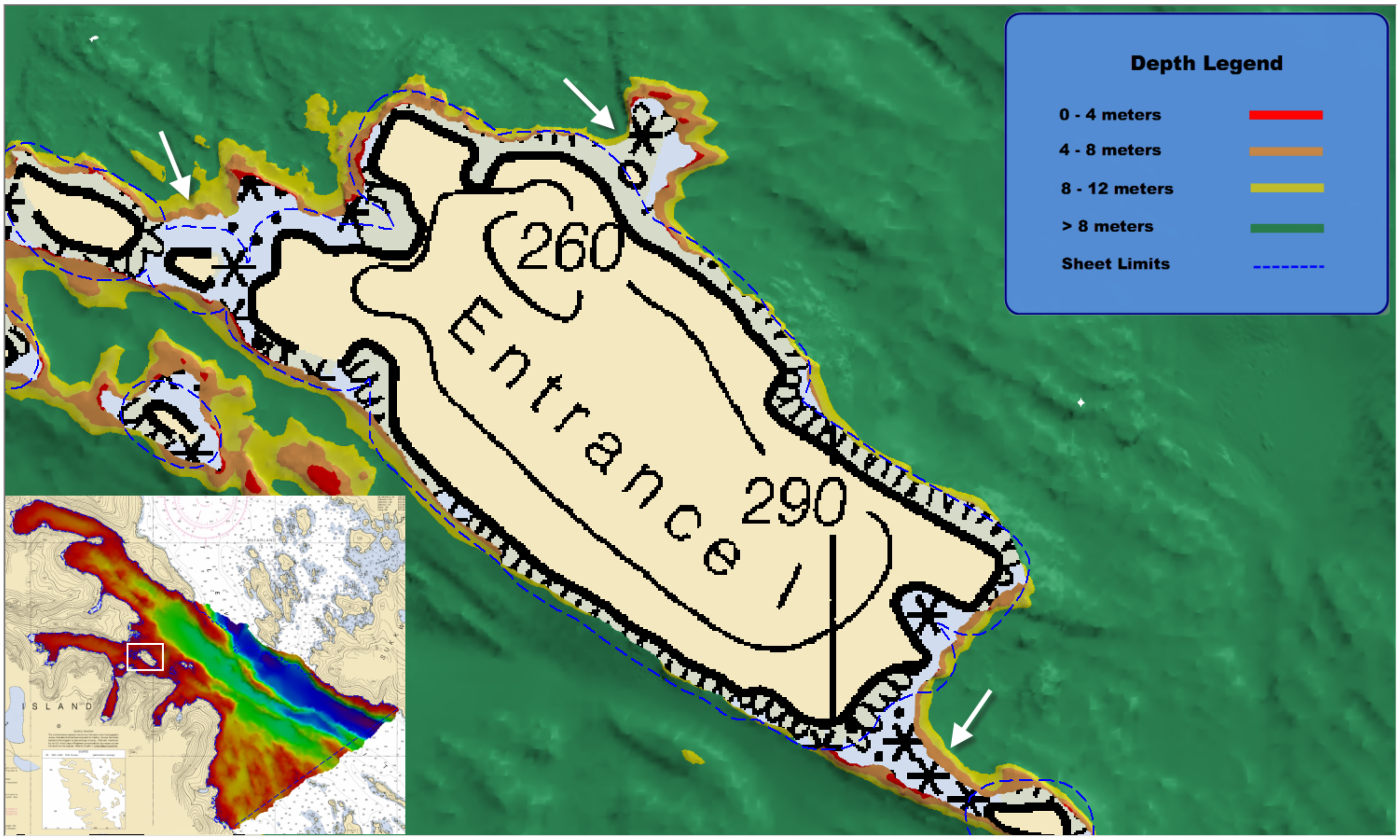


Figure 2: Area where the NALL was defined by the presence of rocks and kelp

A.2 Survey Purpose

This project will provide contemporary surveys to update National Ocean Service (NOS) nautical charting products in an area where the communities are not accessible by land and the primary means of travel is by sea. Survey vintage in this area dates back to 1912 and 1913 with uncharted dangers littered throughout Tlevak Strait and Cordova Bay. Waterways along the western side of Prince of Wales Island are underlain by pinnacles, rocks, islets, and complex tidal currents. Multiple reported dangerous pinnacles and the local geology give reason to suspect many more such hazards. These waterways are economically significant to the coastal delivery of goods to the towns and villages within this region and provide an alternate route to the standard Inside Passage. Numerous fishing villages are on the west side of Prince of Wales Island. Native groups and recreational boaters often utilize this area for fishing and transportation. Additionally, the Inter-Island Ferry Authority serves as an important marine link for many of the communities in the Prince of Wales Island region of Southeast Alaska. Survey data from this project is intended to supersede all prior survey data in the common area.

A.3 Survey Quality

The entire survey is adequate to supersede previous data.

Data acquired in H12882 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 Review 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 multibeam with backscatter

Table 2: Survey Coverage

The entirety of H12882 was acquired with complete coverage multibeam, meeting the requirements listed above and in the HSSD. See Figure 3 for an overview of coverage.

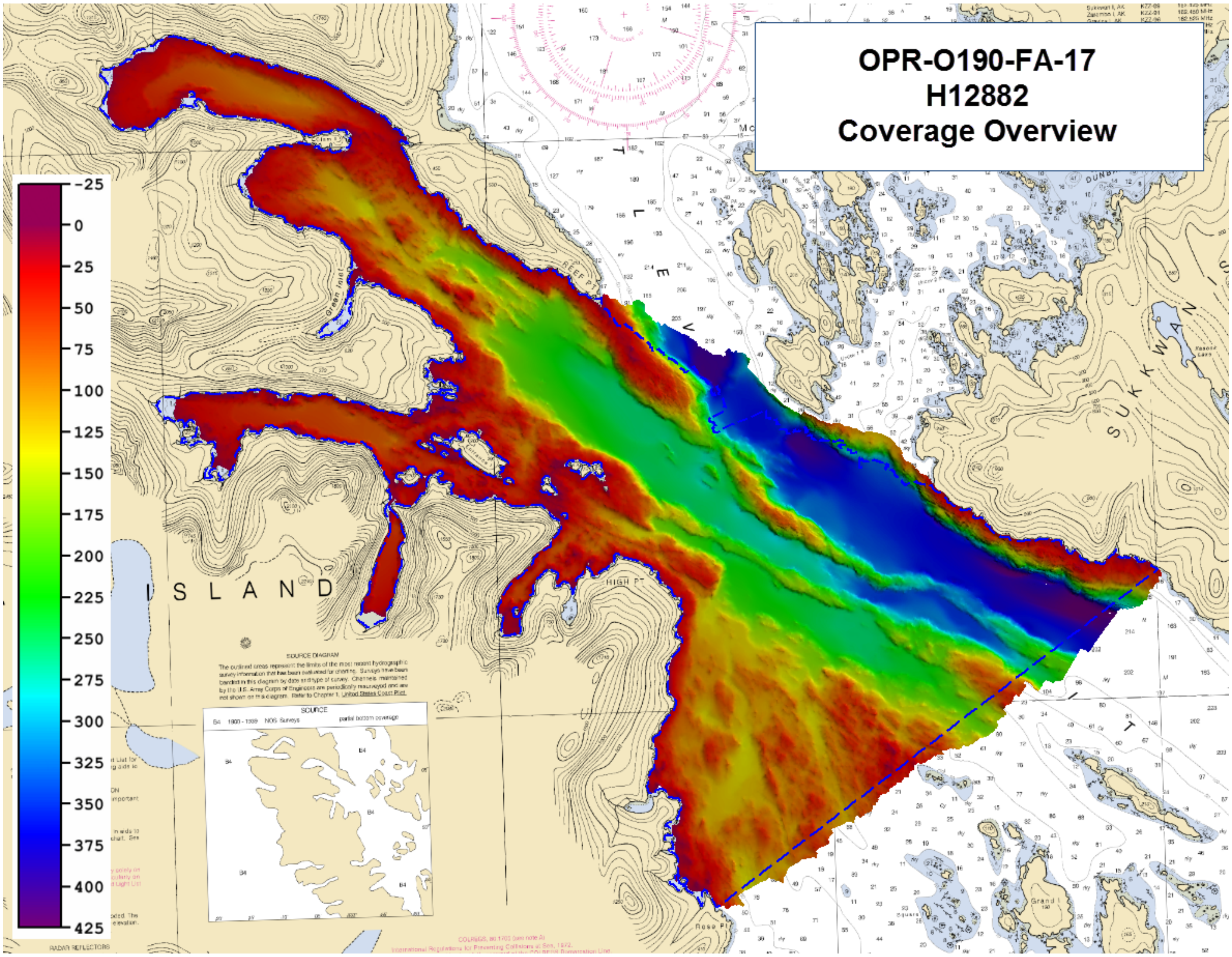


Figure 3: H12882 survey coverage overlaid onto Chart 17408

A.6 Survey Statistics

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

	HULL ID	*2806*	*2808*	*S220*	*Total*
LNM	SBES Mainscheme	0	0	0	0
	MBES Mainscheme	111.28	118.69	18.85	248.82
	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	14.33	0	14.33
	Lidar Crosslines	0	0	0	0
Number of Bottom Samples					8
Number Maritime Boundary Points Investigated					0
Number of DPs					0
Number of Items Investigated by Dive Ops					0
Total SNM					19.93

Table 3: Hydrographic Survey Statistics

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

Survey Dates	Day of the Year
05/29/2017	149
05/30/2017	150

Survey Dates	Day of the Year
05/31/2017	151
06/06/2017	157
06/07/2017	158
06/13/2017	164
06/14/2017	165
06/19/2017	170
06/20/2017	171
06/21/2017	172

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***	***2806***	***2807***	***2808***
LOA	70.4 meters	8.6 meters	8.7 meters	8.6 meters
Draft	4.9 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 2040	MBES
Kongsberg Maritime	EM 710	MBES
Sea-Bird Scientific	SBE 19plus V2	Conductivity, Temperature, and Depth Sensor
ODIM Brooke Ocean	MVP200	Conductivity, Temperature, and Depth Sensor
Teledyne RESON	SVP 70	Sound Speed System
Teledyne RESON	SVP 71	Sound Speed System
Applanix	POS MV 320 v5	Positioning and Attitude System
Velodyne LiDAR	VLP-16	Lidar System

Table 6: Major Systems Used

The equipment was installed on the survey platforms as follows: S220 utilized the Kongsberg EM 710 MBES, SVP 70 surface sound speed sensors, and ODIM Brooke Ocean MVP for conductivity, temperature, and depth casts. All launches utilized Kongsberg EM 2040 MBES, Teledyne RESON SVP 71 surface sound speed sensors, and Sea-Bird Scientific 19plus CTDs. Additionally, Launches 2806 and 2808 were equipped with the Velodyne VLP-16 LiDAR for shoreline feature acquisition.

B.2 Quality Control

B.2.1 Crosslines

Multibeam/single beam echo sounder/side scan sonar crosslines acquired for this survey totaled 5.76% of mainscheme acquisition.

Crosslines were collected, processed and compared in accordance with Section 5.2.4.3 of the HSSD. To evaluate crosslines, a surface using strictly mainscheme lines and a surface using strictly crosslines were created. From these two surfaces, a difference surface (mainscheme - crosslines = difference surface) was generated, and is submitted in the Separates II Digital Data folder. See Figure 4 for an overview of the crossline difference surface.

Statistics show the mean difference between the depths derived from mainscheme and crosslines is 0.10 meters, with mainscheme being deeper, and 95% of nodes falling within 0.93 meters (Figure 5). For the respective depths, the difference surface was compared to the allowable NOAA uncertainty standards.

In total, 99.12% of the depth differences between H12882 mainscheme and crossline data were within allowable NOAA uncertainties.

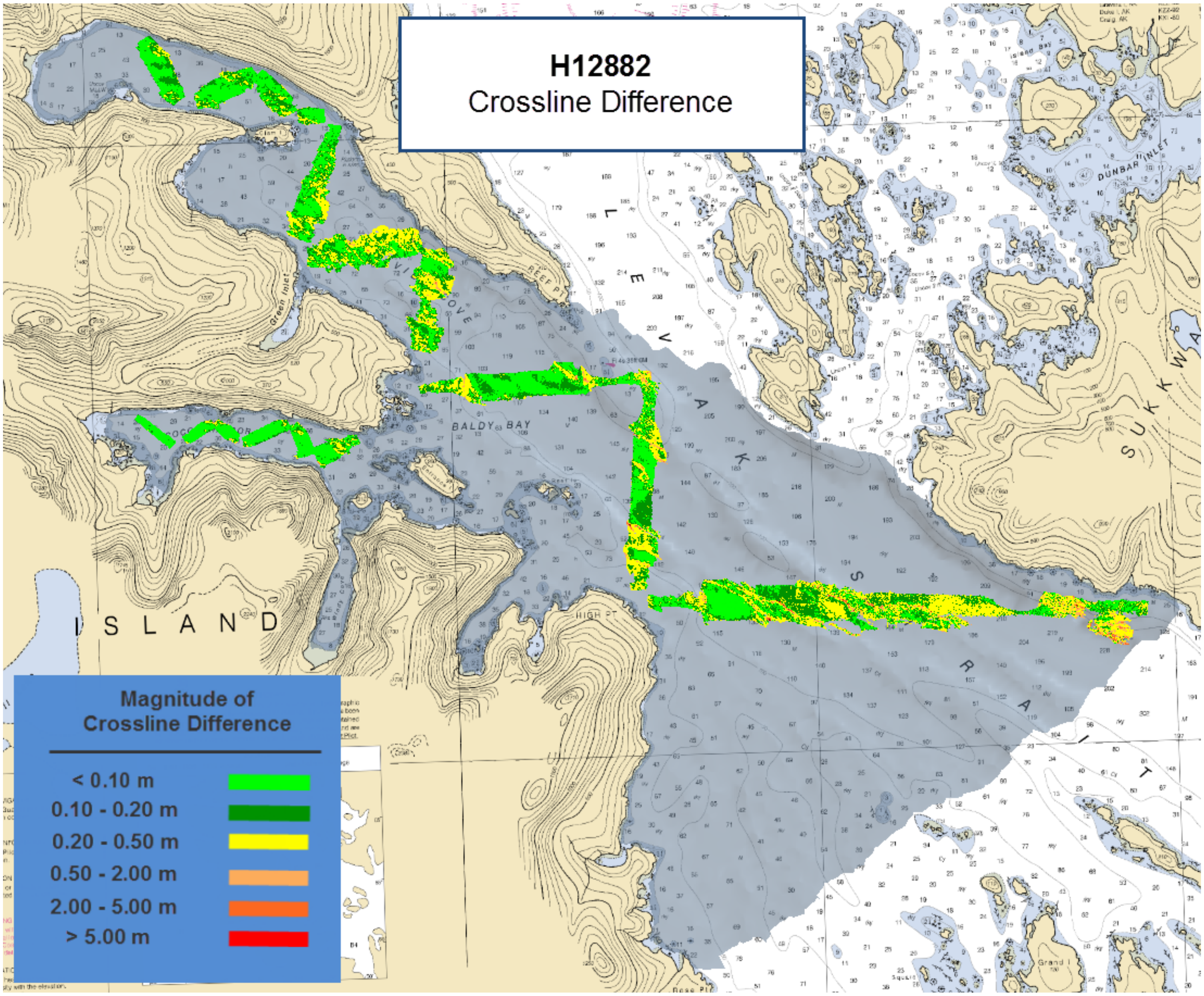


Figure 4: H12882 crosslines overview

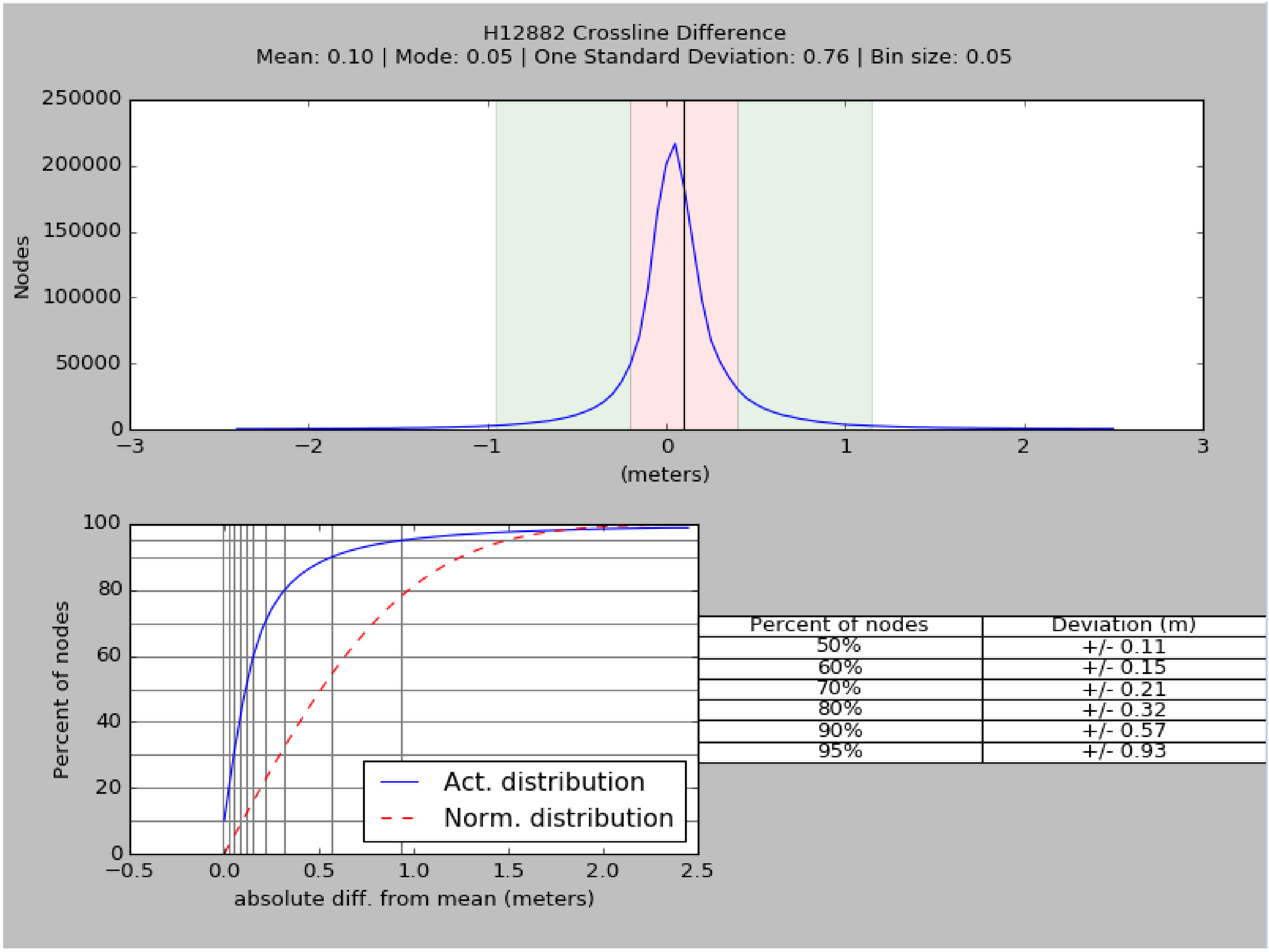


Figure 5: H12882 crossline and mainscheme difference statistics

B.2.2 Uncertainty

The following survey specific parameters were used for this survey:

Method	Measured	Zoning
ERS via PMVD	0 meters	0.03 meters

Table 7: Survey Specific Tide TPU Values.

Real time uncertainty values were calculated by TCARI grid

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

Table 8: Survey Specific Sound Speed TPU Values.

In addition to the usual a priori estimates of uncertainty provided via device models for vessel motion, ERZT, and Poor Man's VDatum (PMVD), real-time and post-processed uncertainty sources were also incorporated into the depth estimates of survey H12882. Real-time uncertainties were provided via EM710 and EM2040 MBES data, Applanix Delayed Heave RMS, and TCARI tides. 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 a Smoothed Best Estimate of Trajectory (SBET) RMS file generated in Applanix POSPac.

B.2.3 Junctions

H12882 junctions with two adjacent surveys from this project, H13015 and H13016, and one survey from a prior project, H12881, as shown in Figure 6. Data overlap between H12882 and each adjacent survey was achieved. These areas of overlap between surveys were reviewed with CARIS HIPS and SIPS 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 H12882 are generally within the NOAA allowable uncertainty in their areas of overlap, with the exception of the junction with survey H12881 (see discussion below). For all junctions with H12882. a negative difference indicates H12882 was shoaler, and a positive difference indicates H12882 was deeper.

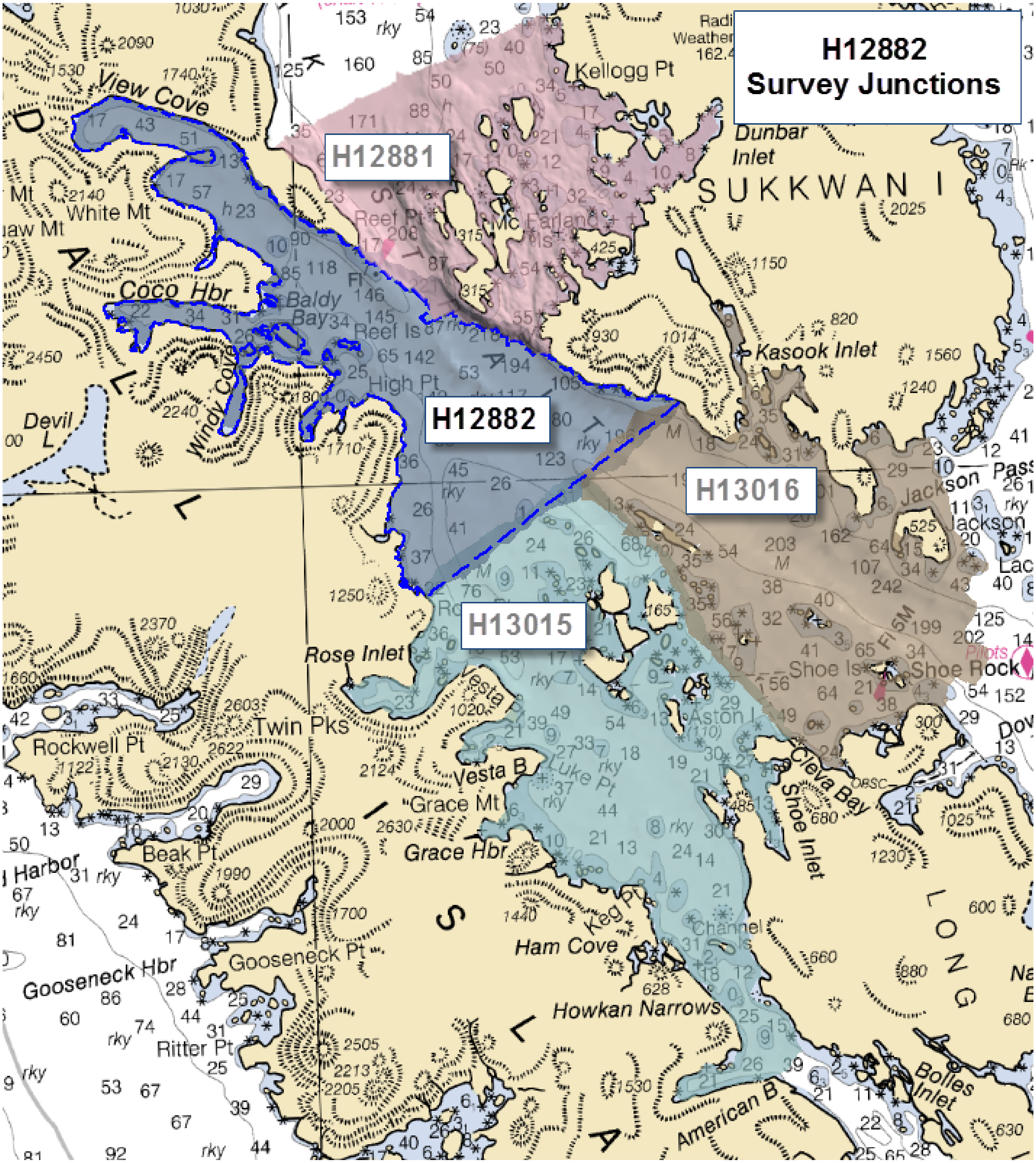


Figure 6: H12882 junction overview

The following junctions were made with this survey:

Registry Number	Scale	Year	Field Unit	Relative Location
H12881	1:20000	2016	NOAA Ship FAIRWEATHER	NE
H13015	1:20000	2017	NOAA Ship FAIRWEATHER	SW
H13016	1:20000	2017	NOAA Ship FAIRWEATHER	SE

Table 9: Junctioning Surveys

H12881

Surface differencing in CARIS HIPS and SIPS, along with Pydro Compare Grids, was used to assess junction agreement between the 8 meter surface from H12882 and the 8 meter surface from H12881. A detailed graphical overview can be seen in Figure 7. The statistical analysis of the difference surface shows a mean of -0.13 meters with 95% of all nodes having a maximum deviation of +/- 6.96 meters, as seen in Figure 8. In addition, a comparison of surface differences was created in Pydro Compare Grids (Figure 9). The Allowable Error Fraction is computed by dividing the observed difference (1st CSAR file – 2nd CSAR file) by the IHO-based HSSD maximum allowable error for soundings (TVUmax) scaled according to the variance sum law, assuming independent, identically distributed observations. It was found that 92.68% of nodes are within NOAA allowable uncertainty (Figure 10). The largest differences are located in areas that are over steep slopes, and in areas where outerbeam data extend beyond 500 meters (Figure 11). Additionally, the H12881 junction surface shows significant spikes along the outer edge that are not indicated in the H12882 surveyed data (Figure 12). Through these analyses, the hydrographer is confident that the uncertainty issues are due to the aforementioned artifacts, and not to systematic biases in the data.

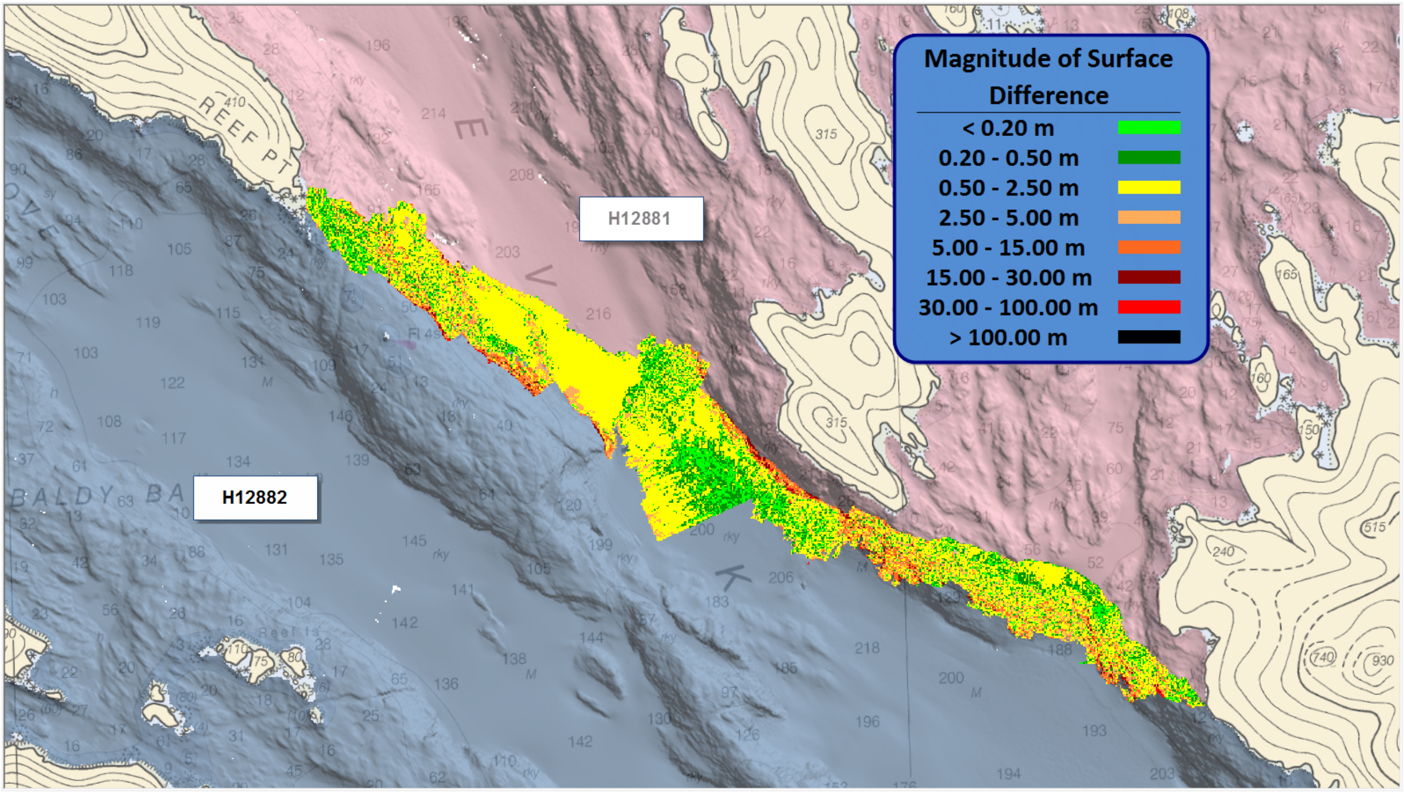
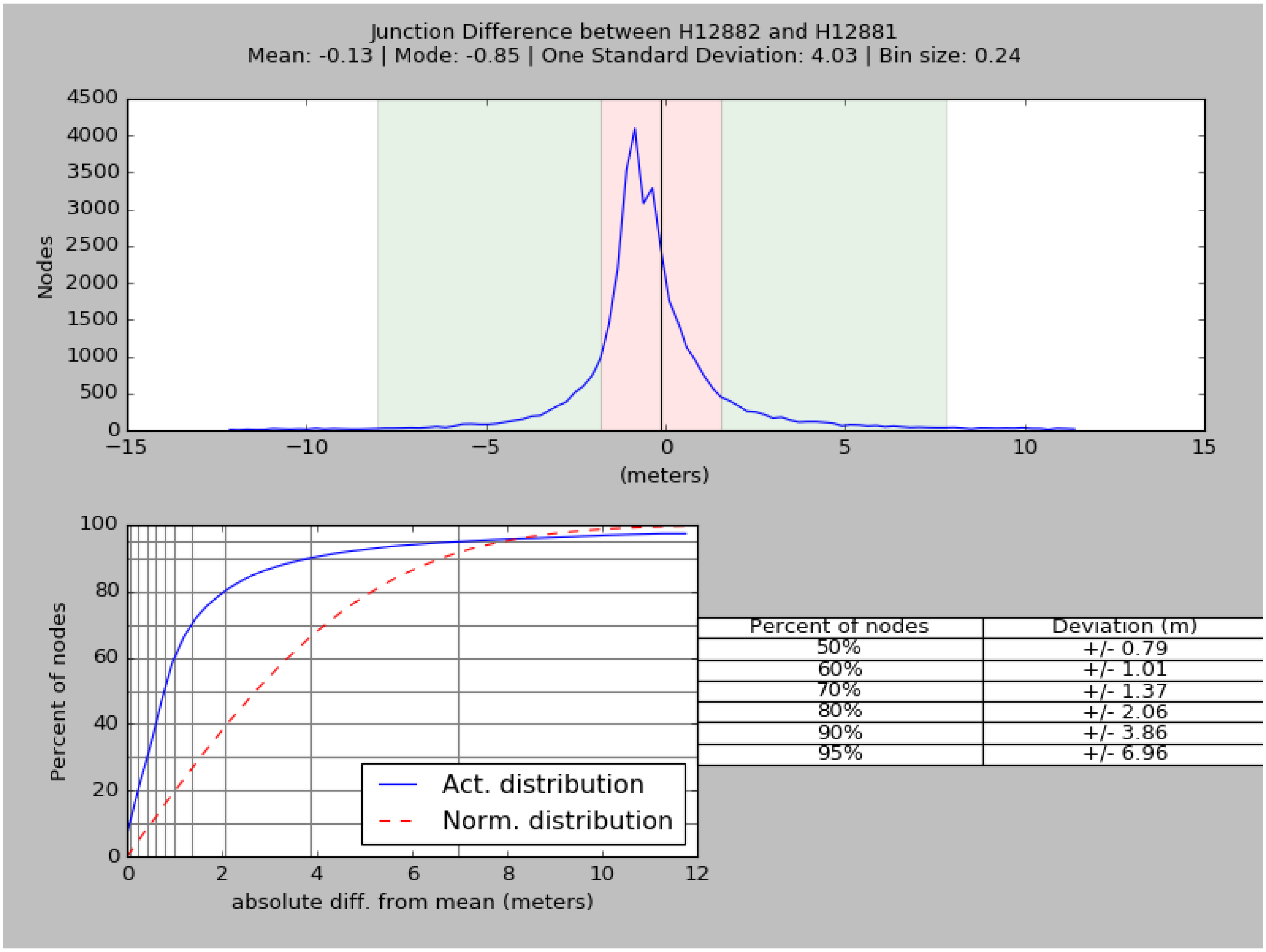


Figure 7: Difference surface between H12882 and H12881



Percent of nodes	Deviation (m)
50%	+/- 0.79
60%	+/- 1.01
70%	+/- 1.37
80%	+/- 2.06
90%	+/- 3.86
95%	+/- 6.96

Figure 8: Difference surface statistics between H12882 and H12881

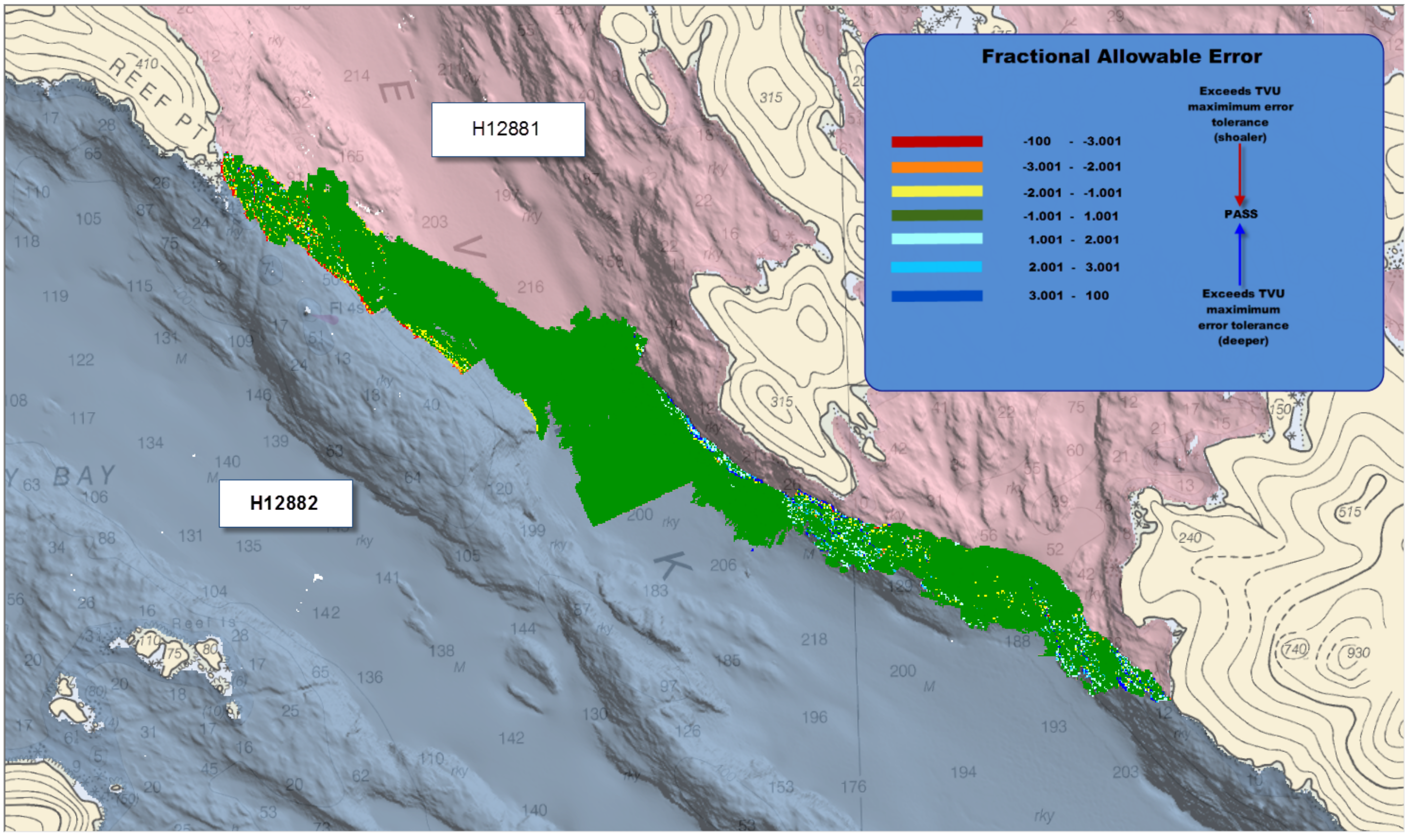


Figure 9: H12882 and H12881 Fractional Allowable Uncertainty

H12882 Junction Differencing with H12881 NOAA Allowable Uncertainty

Total Nodes	Passed Nodes	Failed Nodes
37,202	34,480	2,722
Percentage Nodes Passed		92.683%
Percentage Nodes Failed		7.317%

Figure 10: Difference surface statistics between H12882 and H12881 showing percentage of nodes meeting NOAA allowable uncertainty

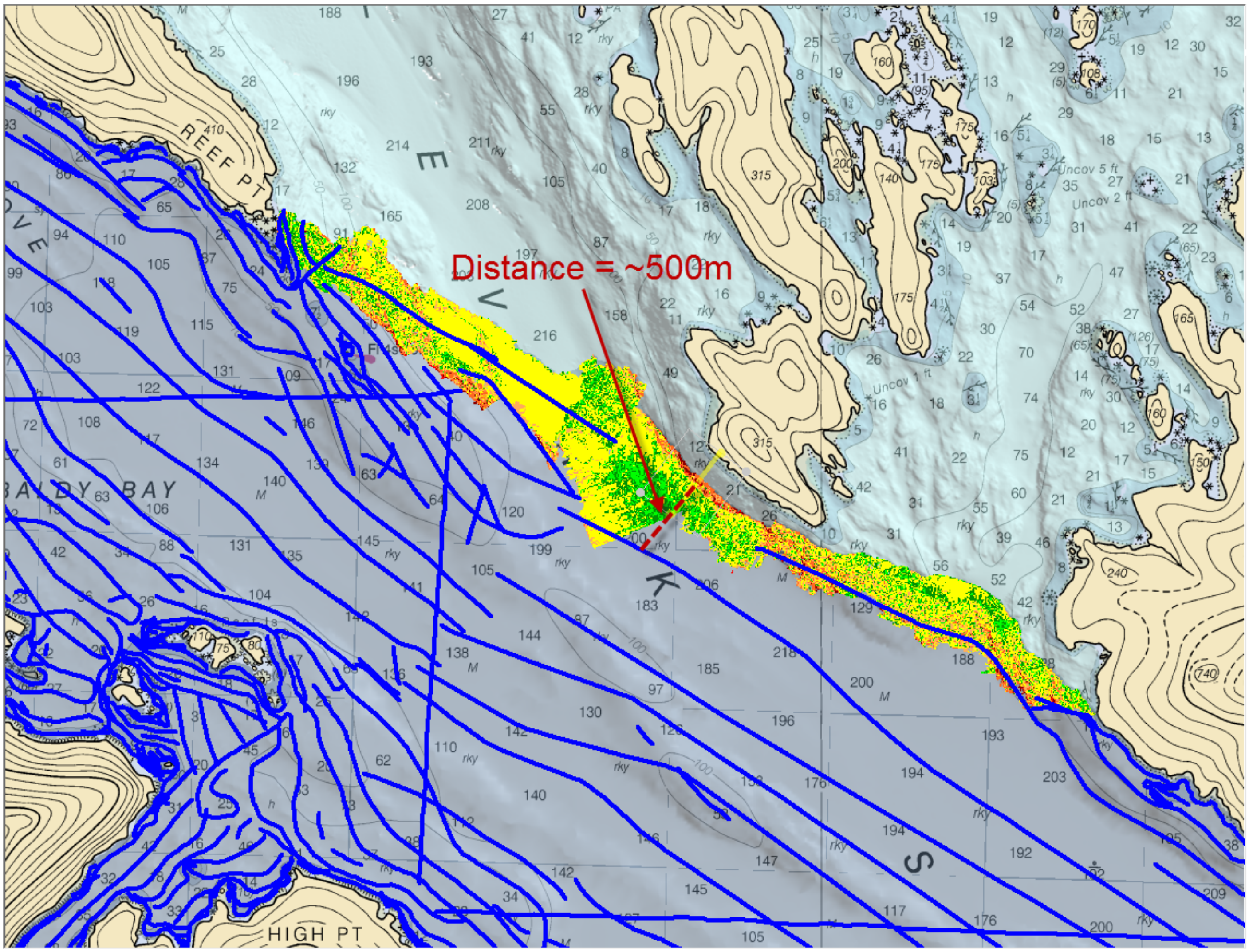


Figure 11: Example of outerbeam distance from sonar nadir

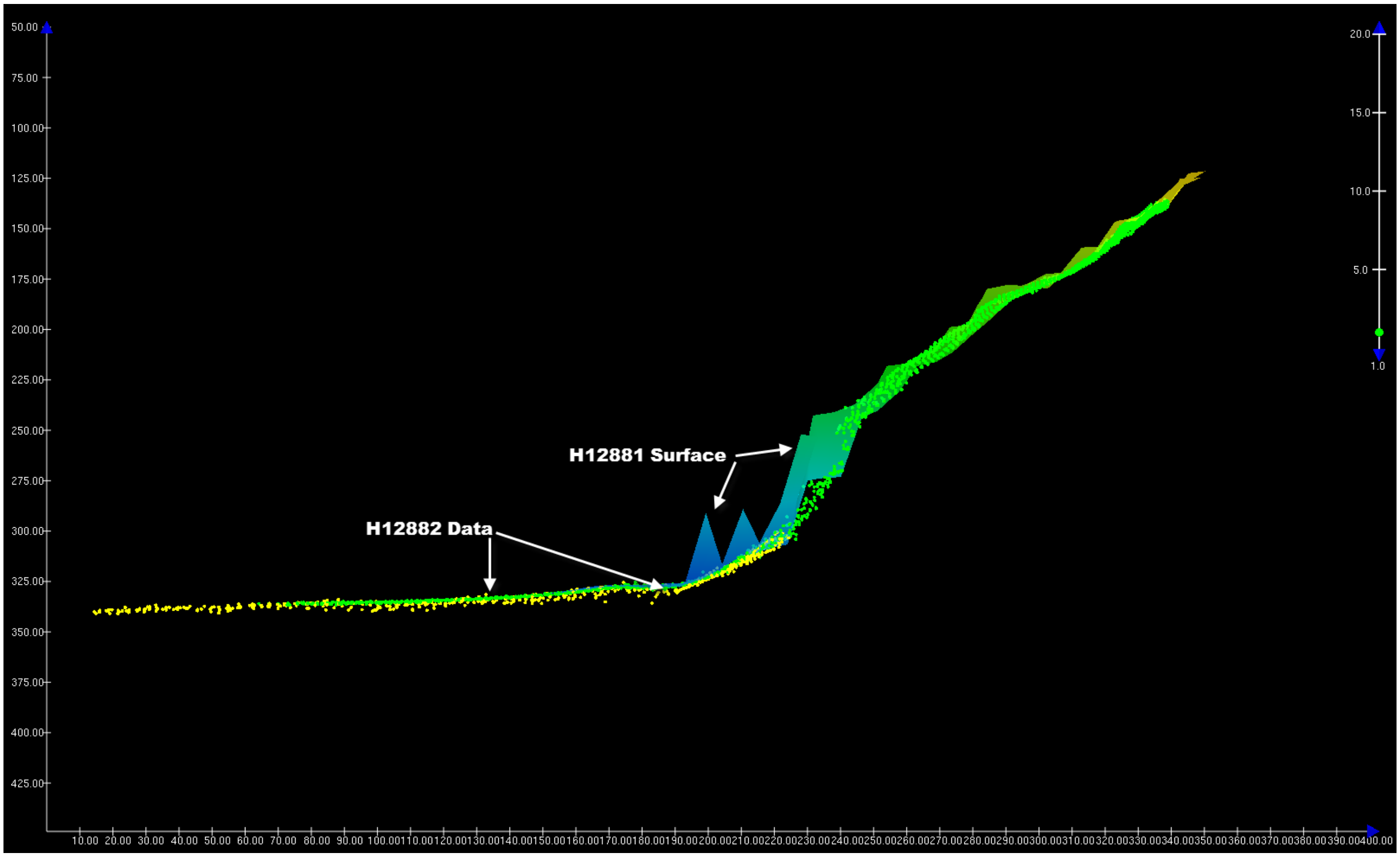


Figure 12: H12881 surface spikes not reflected in H12882 data

<u>H13015</u>

Surface differencing in CARIS HIPS and SIPS was used to assess junction agreement between the surface from H12882 and the surface from H13015. A detailed graphical overview can be seen in Figure 13. The statistical analysis of the difference surface shows a mean of -0.04 meters with 95% of all nodes having a maximum deviation of +/- 0.65 meters, as seen in Figure 14. In addition, a comparison of surface differences was created via Pydro Compare Grids using the same methodology described above. It was found that 99.32% of nodes are within NOAA allowable uncertainty.

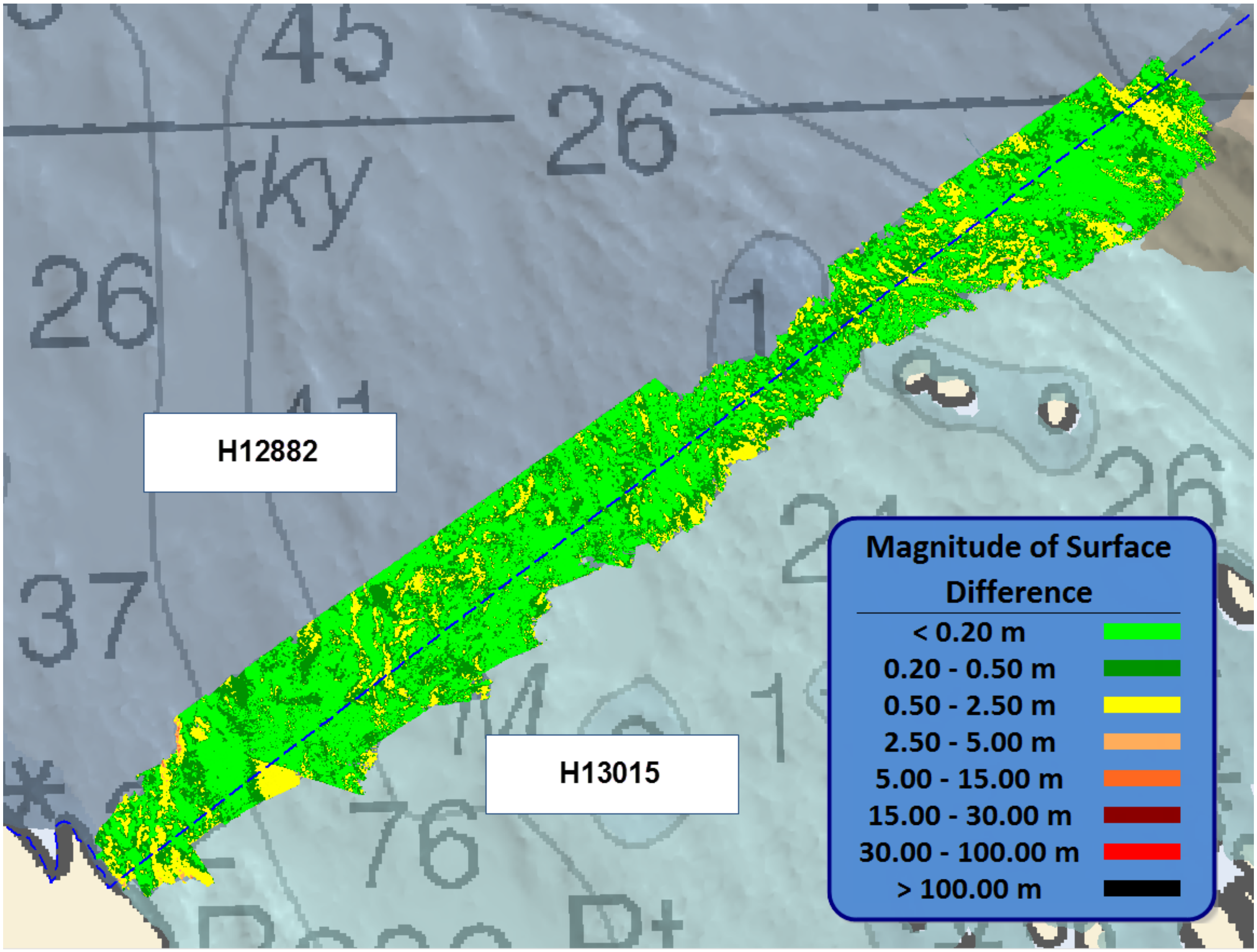


Figure 13: Difference surface between H12882 and H13015

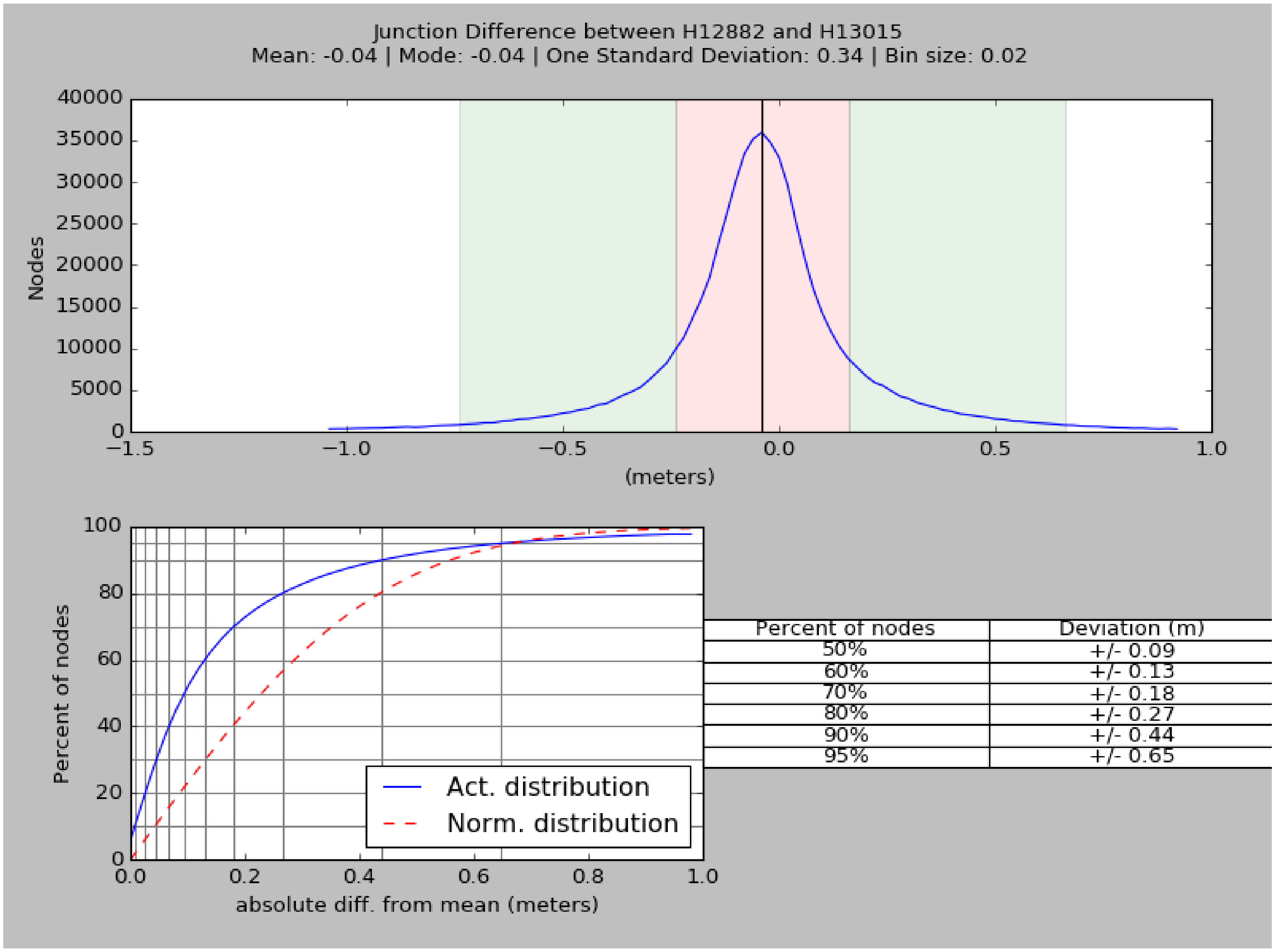


Figure 14: Difference surface statistics between H12882 and H13015

<u>H13016</u>

Surface differencing in CARIS HIPS and SIPS was used to assess junction agreement between the surface from H12882 and the surface from H13016. A detailed graphical overview can be seen in Figure 15. The statistical analysis of the difference surface shows a mean of -0.61 meters with 95% of all nodes having a maximum deviation of +/- 2.48 meters, as seen in Figure 16. In addition, a comparison of surface differences was created via Pydro Compare Grids using the same methodology as H12881. It was found that 98.63% of nodes are within NOAA allowable uncertainty.

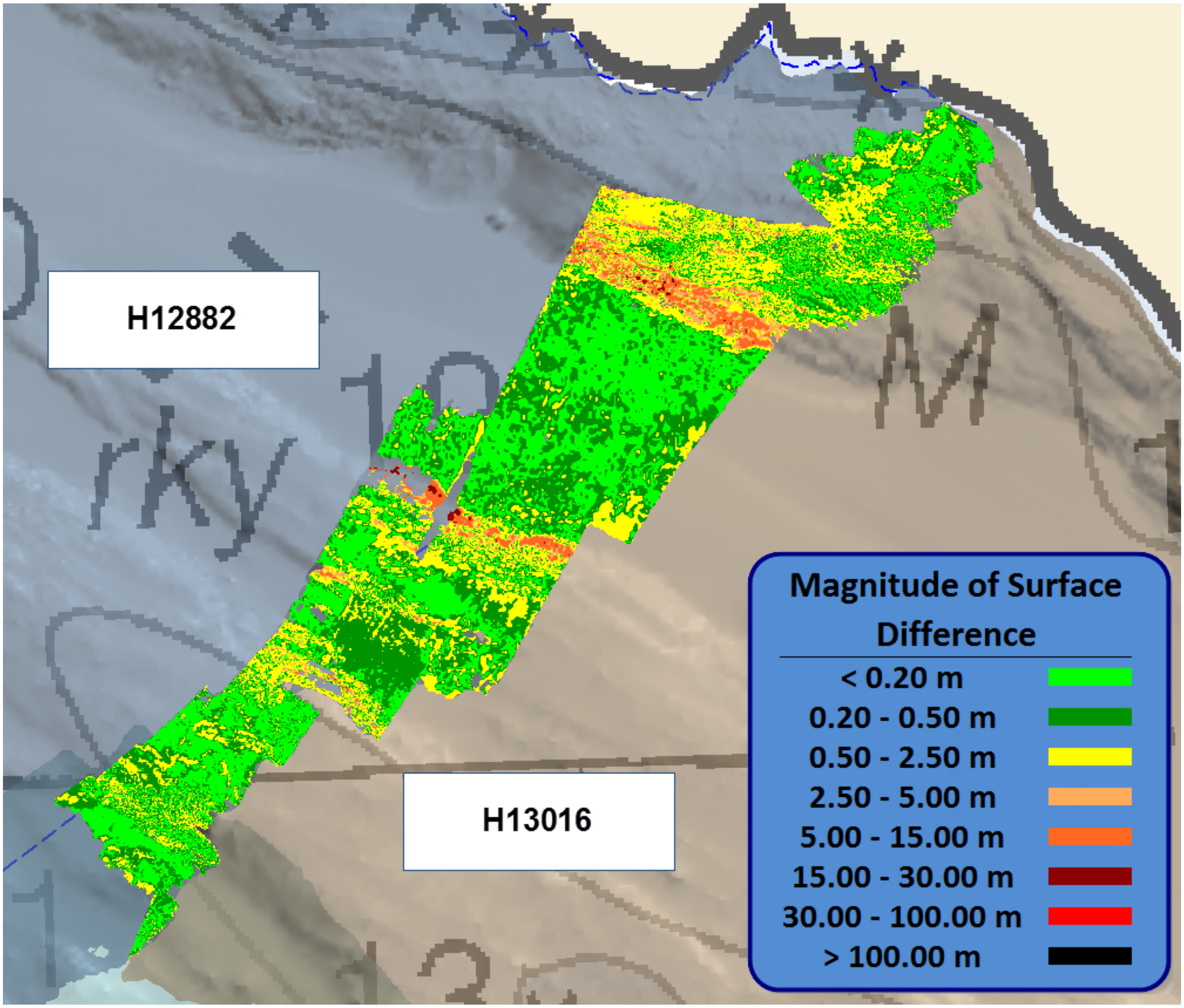


Figure 15: Difference surface between H12882 and H13016

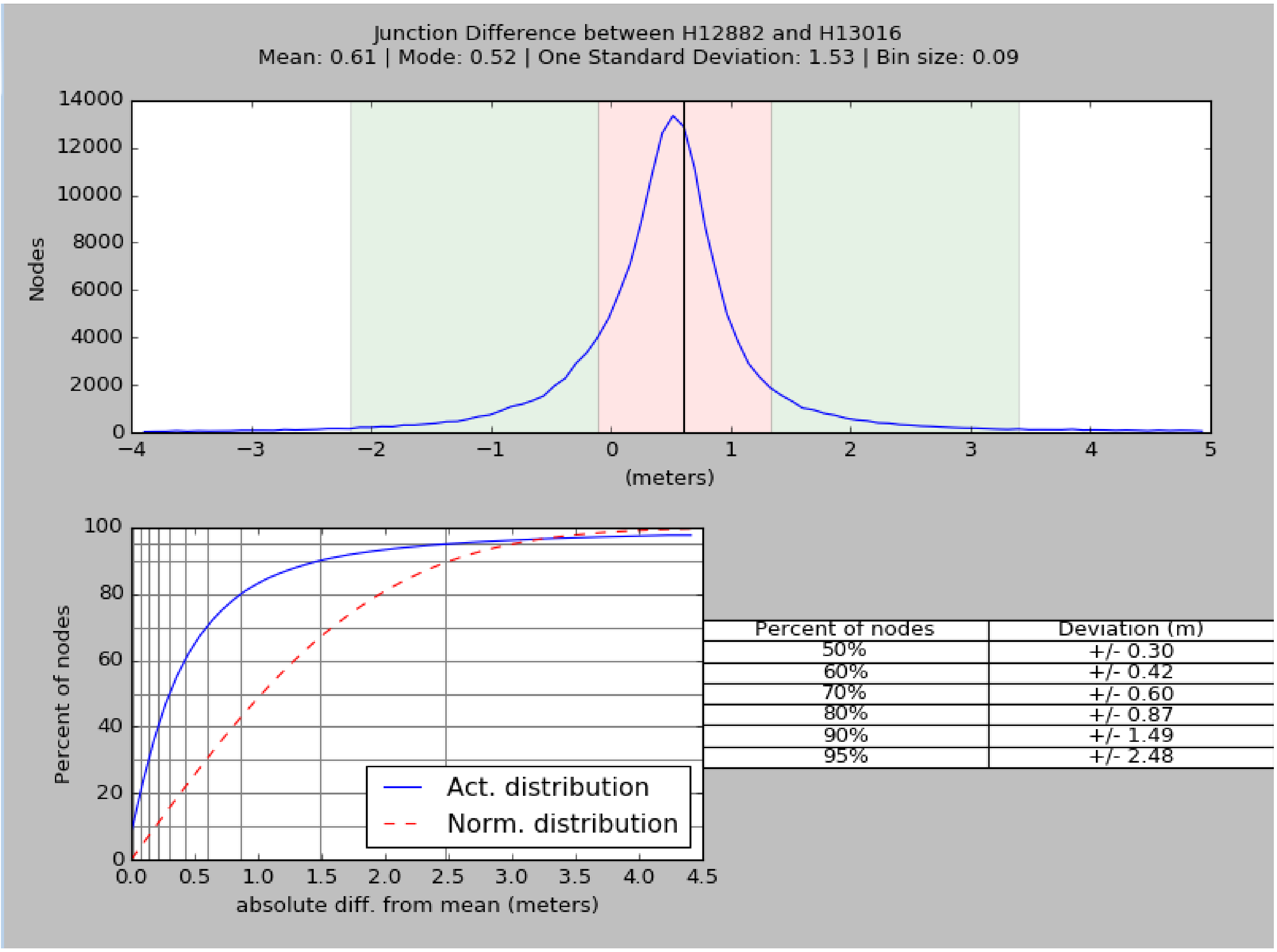


Figure 16: Difference surface statistics between H12882 and H13016

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: Casts were conducted at a minimum of one every 4 hours during launch acquisition. Casts were conducted more frequently in areas where the influx of freshwater had an effect on the speed of sound in the water column, or 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 15 minutes based on the observation of surface sound speed. 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 Holidays

H12882 data were reviewed in CARIS HIPS and SIPS for holidays in accordance with Section 5.2.2.3 of the HSSD. Twenty holidays which meet the 3 by 3 node definition were identified via Pydro QC Tools Holiday Finder tool (Figure 17). This tool automatically scans finalized surfaces for holidays as defined in the HSSD and was run in conjunction with a visual inspection of the surface by the hydrographer.

The majority of the flagged holidays were either outside of the sheet limits or atop features where the least depth was determined. Gaps in coverage are present at the inshore limits of H12882 and are a result of sparse outerbeam data acquired during the development of the inshore limit of safe navigation. These gaps are most prevalent in the exposed, rocky areas of H12882 as kelp and nearshore topography made it too dangerous to acquire additional bathymetry, as shown in Figures 18 and 19. No holidays exist in areas deemed navigationally significant by the hydrographer.

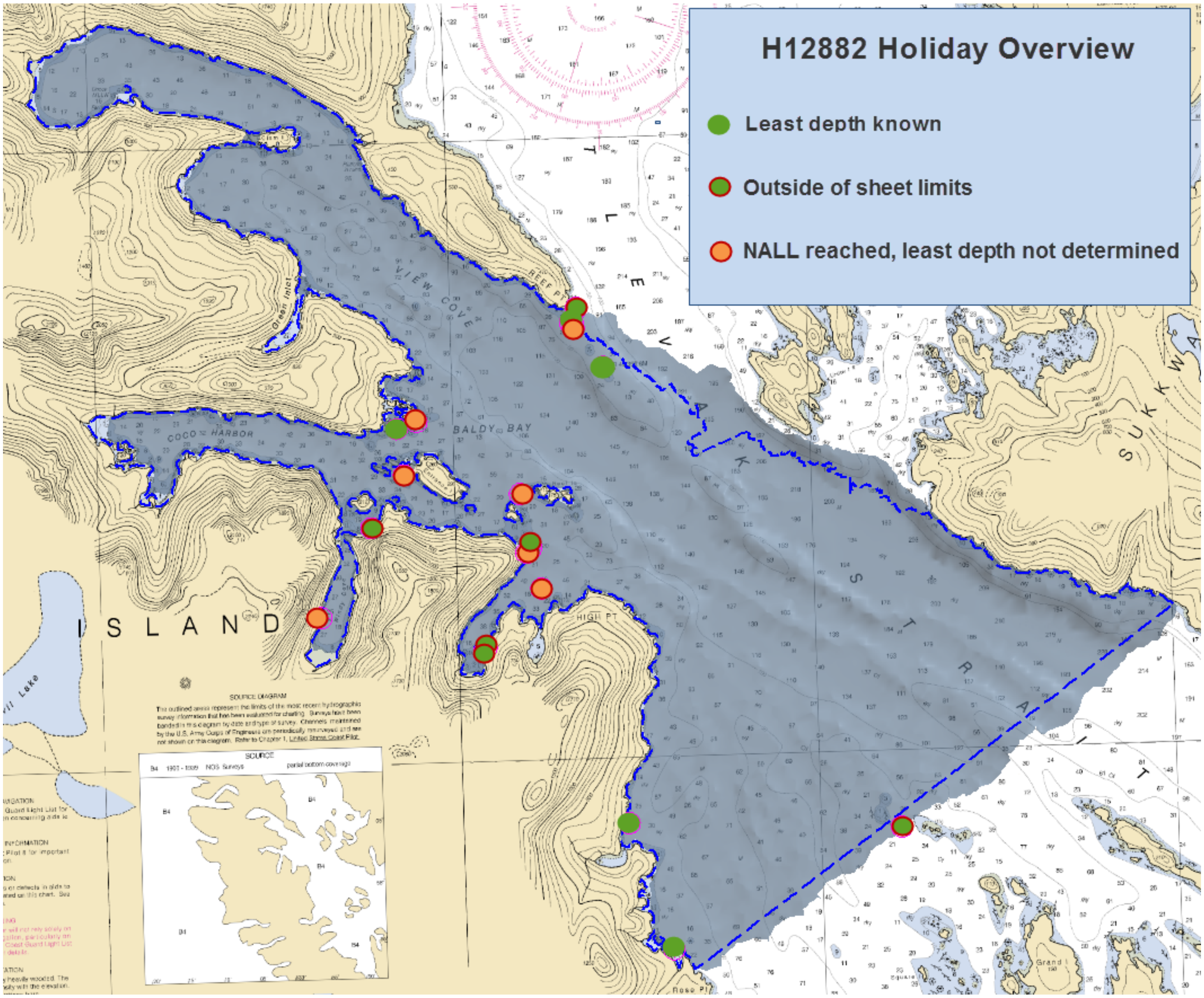


Figure 17: Overview of apparent holidays flagged by QC Tools

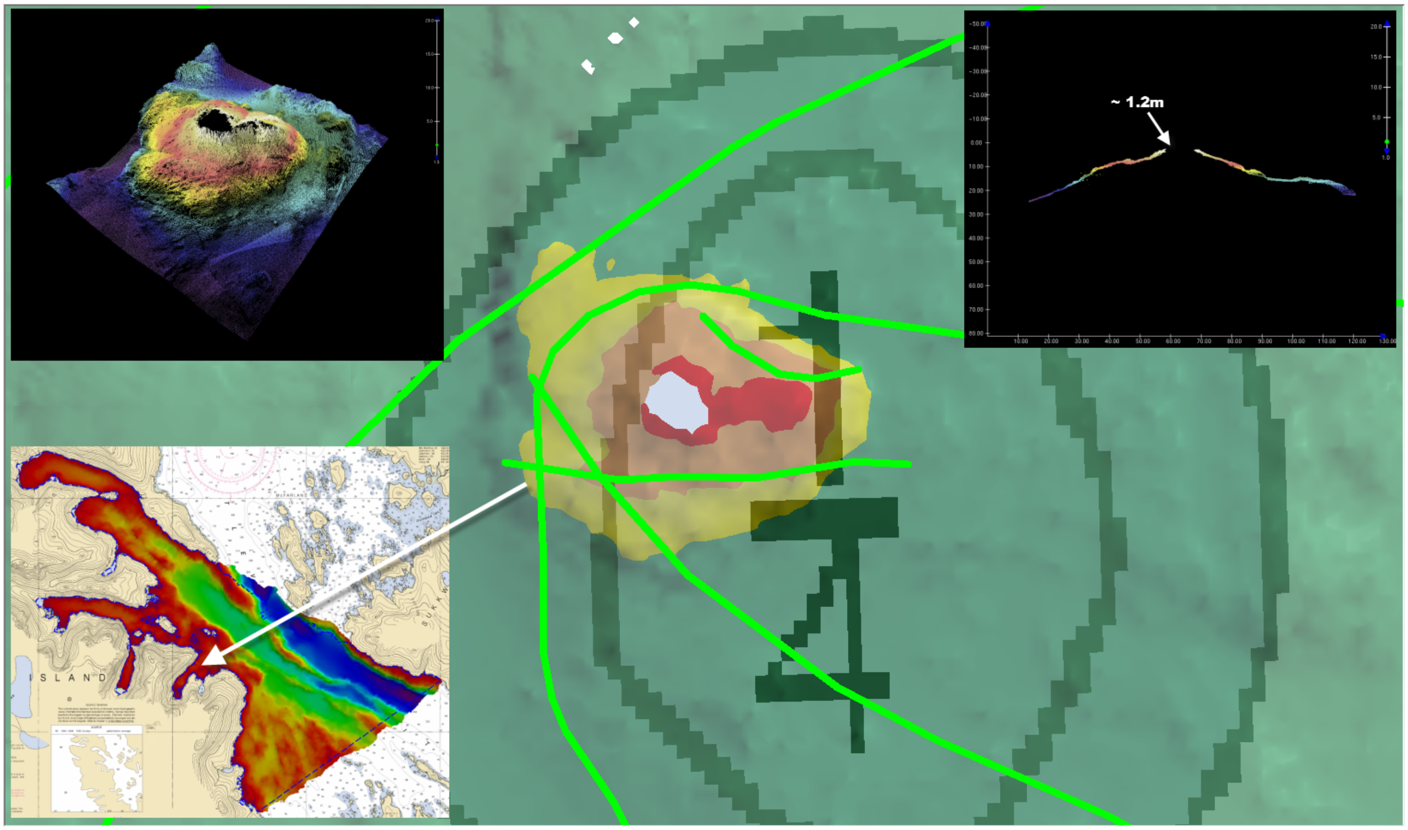


Figure 18: Example of where the top of a rock could not be safely developed

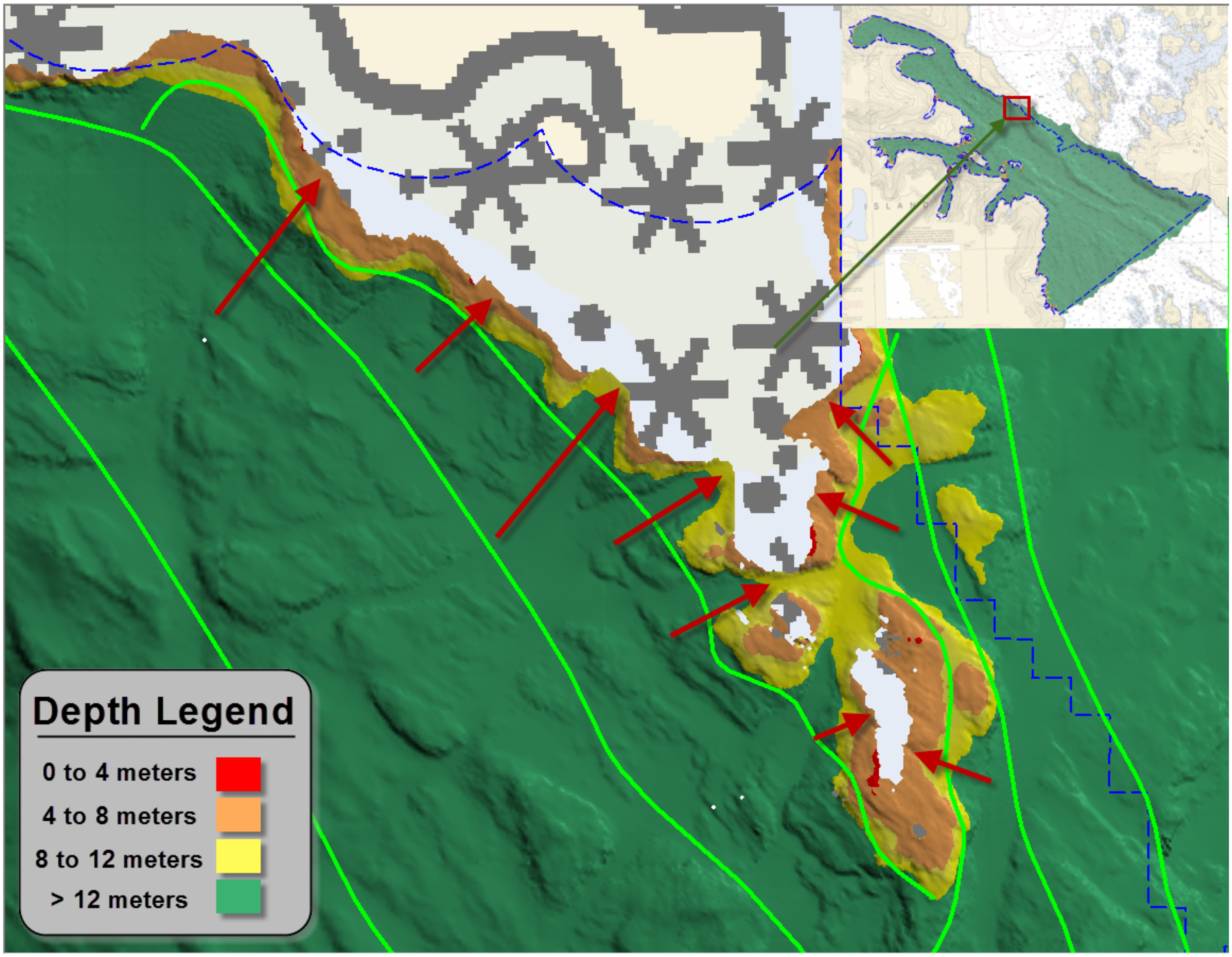


Figure 19: Area where NALL is defined by dense kelp

B.2.10 NOAA Allowable Uncertainty

The surface was analyzed via Pydro QC Tools Grid QA feature to determine the percentage of surface nodes that meet specifications. Overall, 99.5% of nodes meet NOAA allowable uncertainty standards for H12882. For a graphical representation of uncertainty compliance, see the Standards and Compliance Review located in Appendix II.

B.2.11 Density

The surface was analyzed via the Pydro QC Tools Grid QA feature to determine the percentage of surface nodes that meet specifications. Overall, 95.4% of surface nodes contain five or more soundings as required by HSSD Section 5.2.2.3. The few nodes that did not meet density requirements are due to sparse data in the outerbeams, especially near steep slopes and in rocky areas where acoustic shadowing occurred, and at the edges of the survey limits. For a graphical representation of density compliance, see the Standards and Compliance Review located in Appendix II.

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 files generated by the Kongsberg MBES systems. The data have been sent to the Pacific Hydrographic Branch for processing.

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
Teledyne CARIS	HIPS/SIPS	10.3.3

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 FMGT	7.5.3

Table 11: Primary imagery data processing software

The following Feature Object Catalog was used: NOAA Profile version 5.6.

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
H12882_MB_VR_MLLW	CARIS VR Surface (CUBE)	1-14 meters	-1.9 meters - 437.5 meters	NOAA_VR	Complete MBES
H12882_MB_VR_MLLW_Final	CARIS VR Surface (CUBE)	1-14 meters	-1.9 meters - 437.5 meters	NOAA_VR	Complete MBES

Table 12: Submitted Surfaces

The NOAA CUBE parameters defined in the HSSD were used for the creation of the CUBE surface for Survey H12882. The surface has been reviewed where noisy data, or "fliers," are incorporated into the gridded solution causing the surface to be shoaler or deeper than the true sea floor. Where these spurious soundings cause the gridded surface vary from the reliably measured seafloor 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 v5, part of the QC Tools package within Pydro, was used to assist the search for spurious soundings following gross cleaning. Flier Finder was run multiple times for each surface, reducing the flier height value for each consecutive run. This allowed Flier Finder to quickly and accurately identify gross fliers, but as the flier height was reduced the effectiveness of the tool diminished. With smaller heights, Flier Finder began to incorrectly flag dynamic aspects of the seafloor such as steep drop offs and rocky areas as fliers, resulting in hundreds of false positives. At this point, the hydrographer ceased using the tool and returned to manual cleaning for these dynamic regions of seafloor

B.5.3 Data Logs

Data acquisition and processing notes are included in the acquisition and processing logs, and additional processing such as final tide and sound speed application are noted in the H12882 Data Log spreadsheet. All data logs are submitted digitally in the Separates I folder.

C. Vertical and Horizontal Control

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

C.1 Vertical Control

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

Traditional Methods Used:

TCARI

The following National Water Level Observation Network (NWLON) stations served as datum control for this survey:

Station Name	Station ID
Ketchikan, AK	9450460

Table 13: NWLON Tide Stations

File Name	Status
9450460.tid	Final Approved

Table 14: Water Level Files (.tid)

File Name	Status
O190FA2017.tc	Final

Table 15: Tide Correctors (.zdf or .tc)

A request for final approved tides was sent to N/OPS1 on 06/23/2017. The final tide note was received on 07/05/2017.

Initial reduction of acquired data to MLLW was accomplished via traditional tidal means using the Tidal Constituent And Residual Interpolation (TCARI) grid provided by HSD-OPS. Following the successful application of SBETs and computation of an Ellipsoidally Referenced Zone Tide (ERZT) separation model, ERS methods were used for reducing data to MLLW.

After final tides were received, the final TCARI grid was applied to the data and used for reducing features to MLLW.

ERS Methods Used:

ERS via Poor Mans VDATUM

Ellipsoid to Chart Datum Separation File:

O190FA2017_PMVD_EPSG3395_NAD83-MLLW_Debiased.csar

ERS methods were used as the final means of reducing H12882 to MLLW for submission. Data were initially reduced via traditional tidal means until an ERZT separation model could be calculated. This empirically derived model was then checked for consistency and compared to the Poor Man's VDatum (PMVD) separation model provided with the Project Instructions. The PMVD separation model was then vertically shifted such that the average difference between these two separation models is zero. This vertical shift de-biases the PMVD separation model, correcting for local offsets that cannot be effectively modeled by the PMVD. The de-biased PMVD was used to reduce H12882 to MLLW.

C.2 Horizontal Control

The horizontal datum for this project is North American Datum of 1983 (NAD83).

The projection used for this project is UTM Zone 08 North.

The following PPK methods were used for horizontal control:

Single Base

Vessel kinematic data were post-processed using Applanix POSPac processing software and Single Base 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.

For further details regarding the processing and quality control checks performed, see the H12882 POSPAC Processing Logs spreadsheet located in the Separates folder. See also the OPR-O190-FA-17 Horizontal and Vertical Control Report (HVCR), submitted under separate cover.

The following user installed stations were used for horizontal control:

HVCR Site ID	Base Station ID
9677	Willa Jane

Table 16: User Installed Base Stations

Differential correctors from the US Coast Guard beacon at Annette Island (323kHz) were used in real-time for acquisition unless otherwise noted in the acquisition logs, and were the sole method utilized for the positioning of bottom samples.

The following DGPS Stations were used for horizontal control:

DGPS Stations
Annette Island (323kHz)

Table 17: USCG DGPS Stations

D. Results and Recommendations

D.1 Chart Comparison

A comparison was performed between survey H12882 and ENCs US5AK4EM and US5AK4IM using CARIS HIPS and SIPS sounding and contour layers derived from the H12882 surface. The contours and soundings were overlaid on the charts to assess differences between the surveyed soundings and charted depths. ENCs were compared to the surface by extracting all soundings from the chart and creating an interpolated TIN surface which could be differenced with the surface from H12882. Due to the relatively small portion of H12882 data overlap with ENC US5AK4IM, the TIN surfaces generated for each ENC were combined, and all statistical analyses and comparisons have been incorporated into the comparison with US5AK4EM.

All data from H12882 should supersede charted data. In general, surveyed soundings agree with the majority of charted depths. A full discussion of the disagreements follows below.

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?
US5AK4EM	1:40000	4	08/15/2016	08/15/2016	NO
US5AK4IM	1:40000	7	11/14/2017	08/15/2016	NO

Table 18: Largest Scale ENCs

US5AK4EM

Soundings from H12882 are in general agreement with charted depths on ENC US5AK4EM, with most depths agreeing within 3 fathoms. Several discrepancies in shoaler areas exist where differences exist on the order of 8 to 10 fathoms (Figure 20).

To more accurately visualize trends within these differences, a 16 meter TIN surface was interpolated from the ENC sounding layer. This surface was then differenced with a corresponding 16 meter surface from H12882 and visualized in Figure 21. In this difference surface red colors indicate H12882 was shoaler than ENC US5AK4EM, green colors indicate agreement, and blue colors indicate H12882 was deeper than ENC US5AK4EM. Statistical analysis revealed that the mean difference between surfaces is 2.58 meters, with 95% of nodes falling within 19.63 meters (Figure 22). The majority of discrepancies are due to an insufficient density of soundings from the prior survey to accurately portray dynamic areas of the seafloor.

Contours from H12882 are in general agreement with charted contours on ENC US5AK4EM as shown in Figure 23. The largest differences are seen in the 10 fathom contour where surveyed and charted contours differ by over 100 meters, as seen in Figure 24.

Figure 20: H12882 area with significant sounding discrepancies

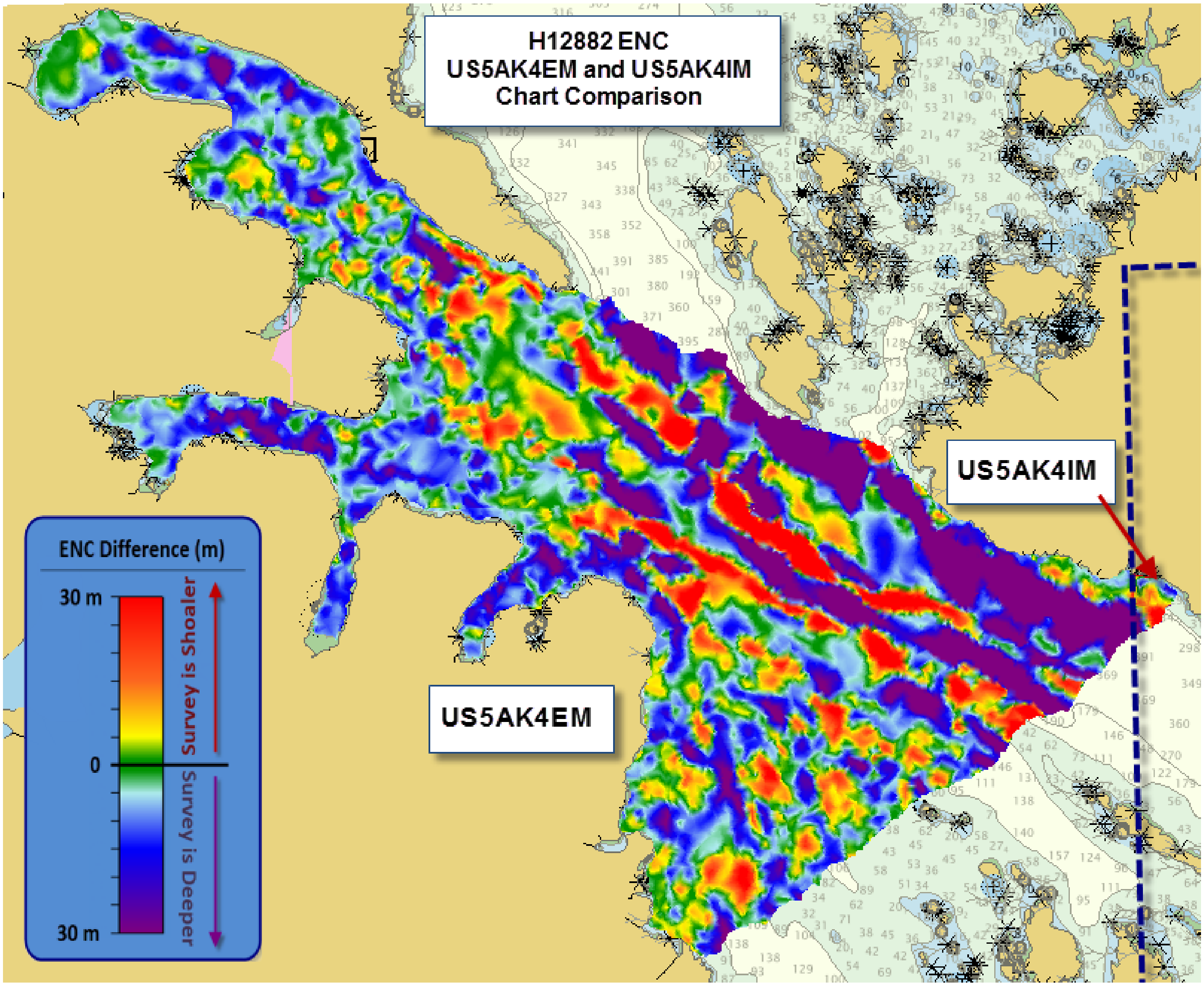


Figure 21: Difference surface between H12882 and combined interpolated TIN surface from US5AK4EM

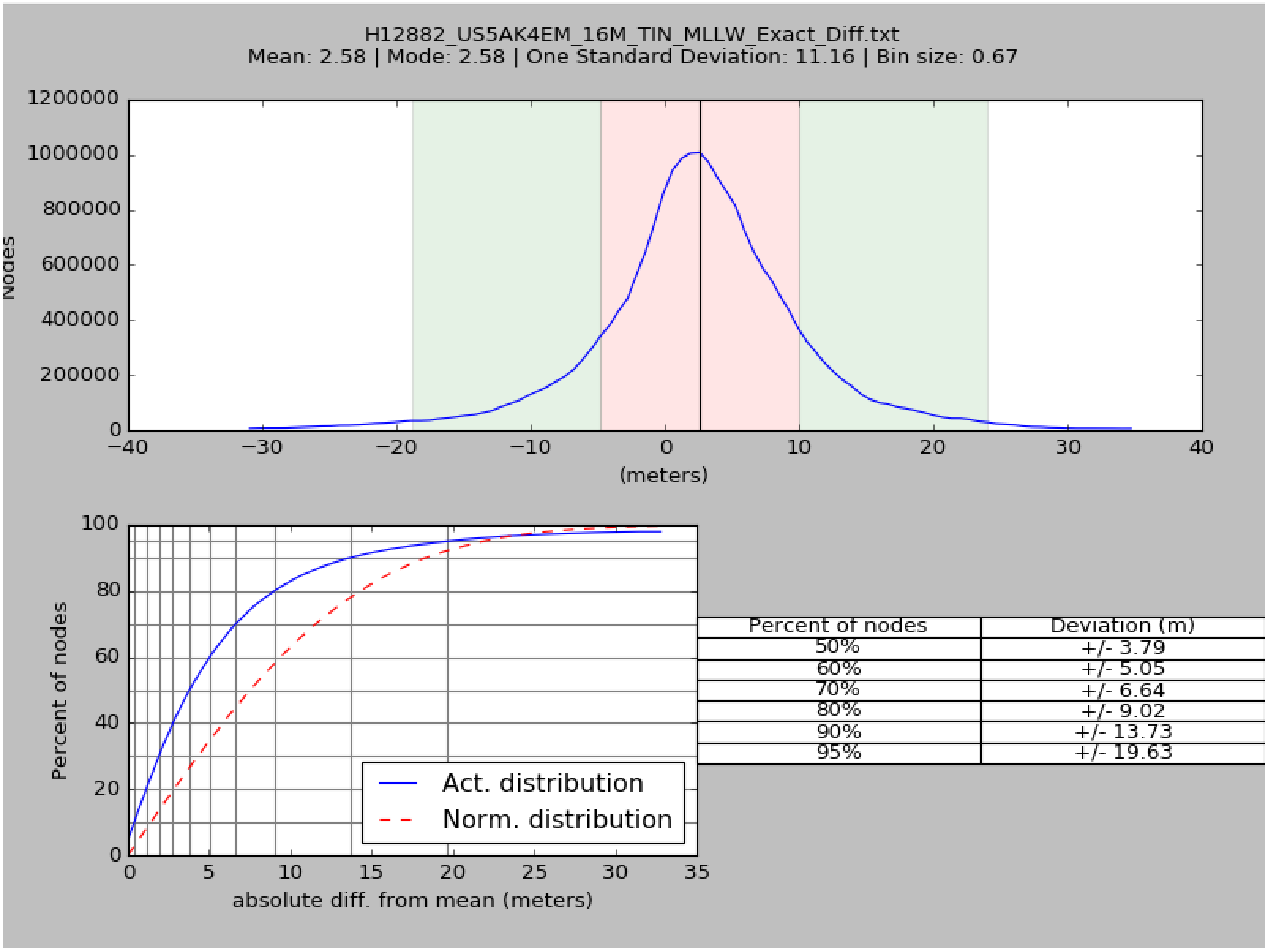


Figure 22: Difference surface statistics between H12882 and interpolated TIN surface from US5AK4EM

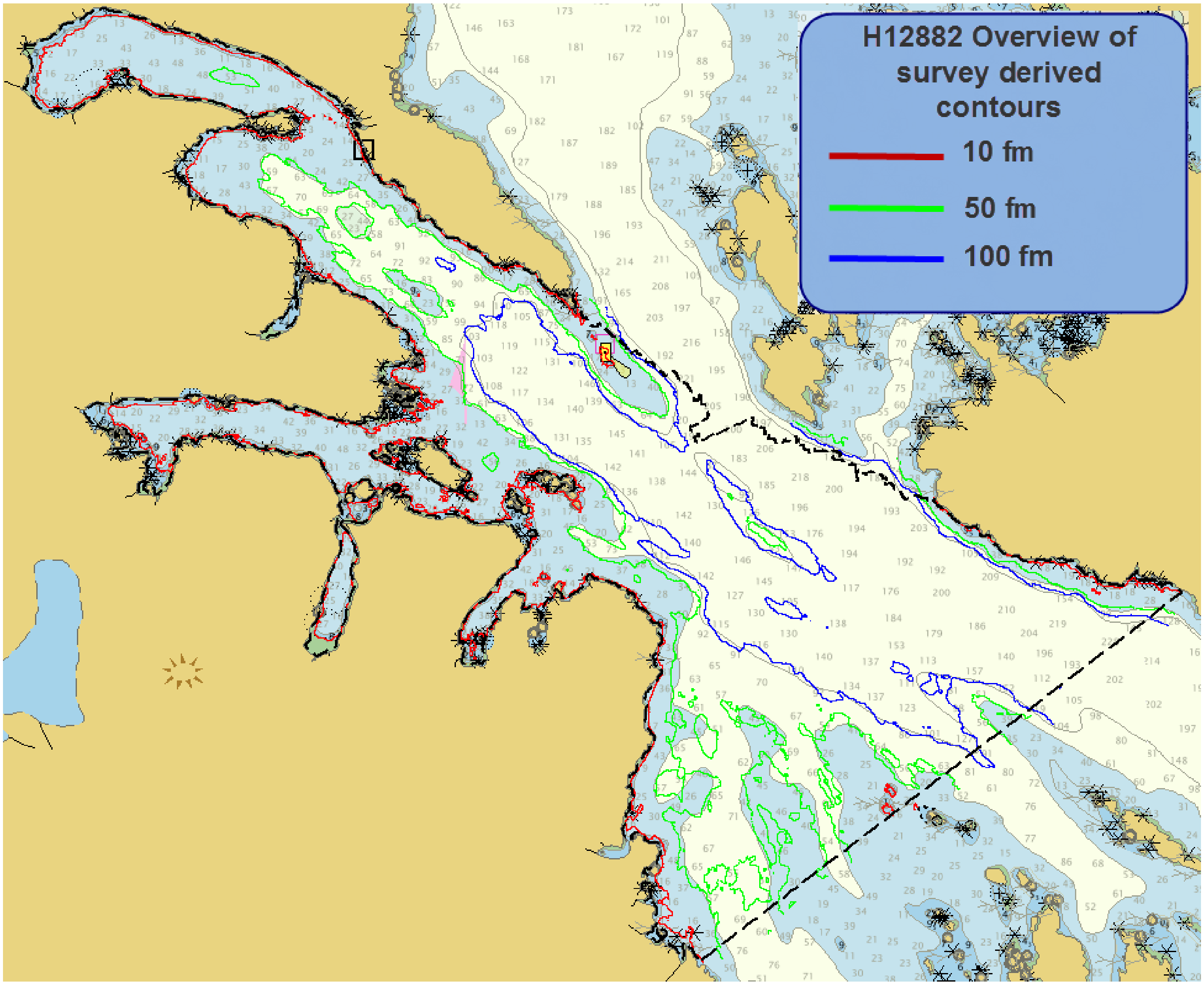


Figure 23: Overview of H12882 contours overlaid onto ENC US5AK4EM

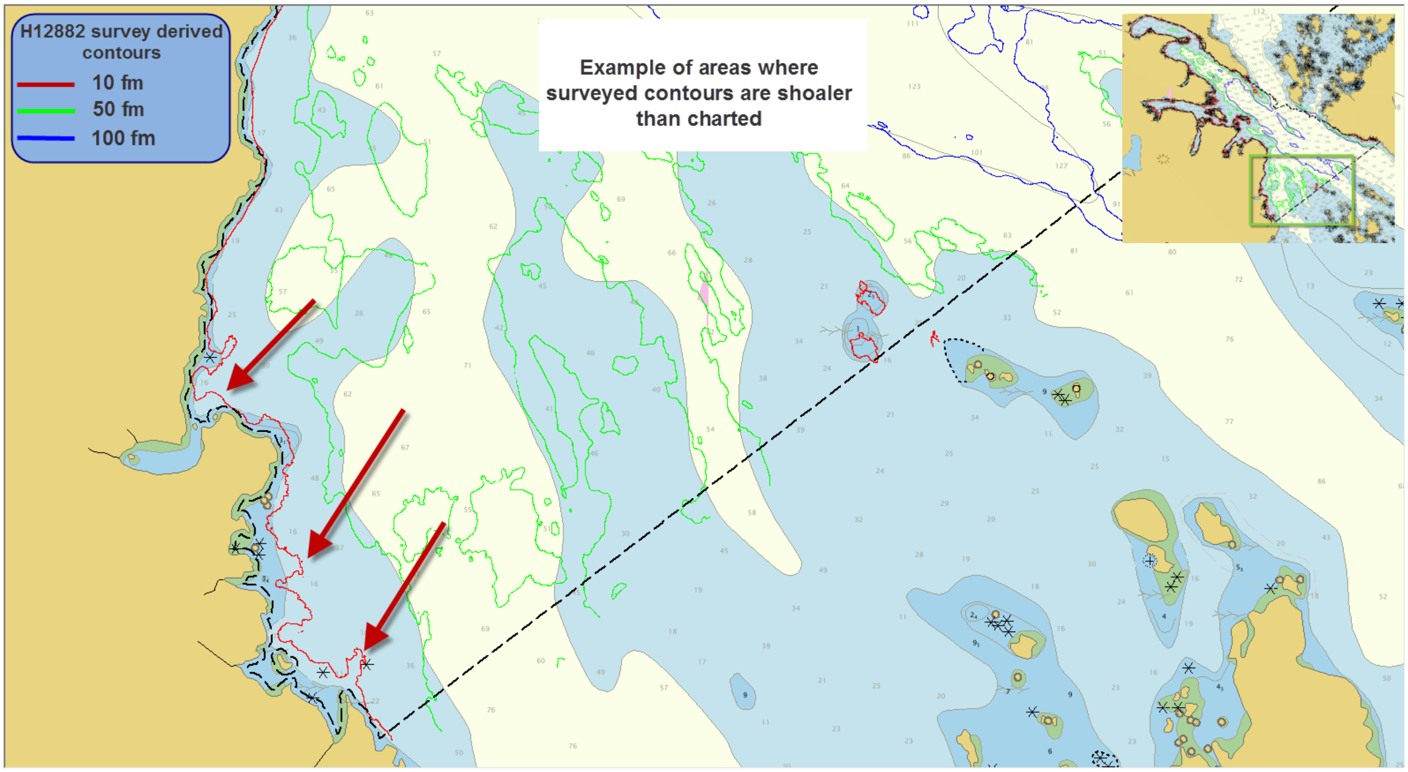


Figure 24: H12882 contour discrepancies

US5AK4IM

D.1.2 Maritime Boundary Points

No Maritime Boundary Points were assigned for this survey.

D.1.3 Charted Features

No charted features exist for this survey.

D.1.4 Uncharted Features

Survey H12882 has 97 new features that are addressed in the H12882 Final Feature File. Of these features there are 7 new land areas, 4 new seabed areas, 74 new underwater rocks, and 1 new kelp area.

D.1.5 Shoal and Hazardous Features

Two potentially hazardous uncharted shoals were discovered during MBES acquisition on H12882. A shoal with a least depth of 1.80 fathoms is present in an area offshore of the 10 fathom contour in the northwestern section Coco Harbor (Figure 25). A second shoal with a least depth of 0.87 fathoms is present in an area offshore of the 10 fathom contour in the southwestern section of Entrance Island (Figure 26). Although neither shoal was determined to be in an area of sufficient navigational significance to warrant the submission of a DTON, attention should be given to these areas when updating the chart.

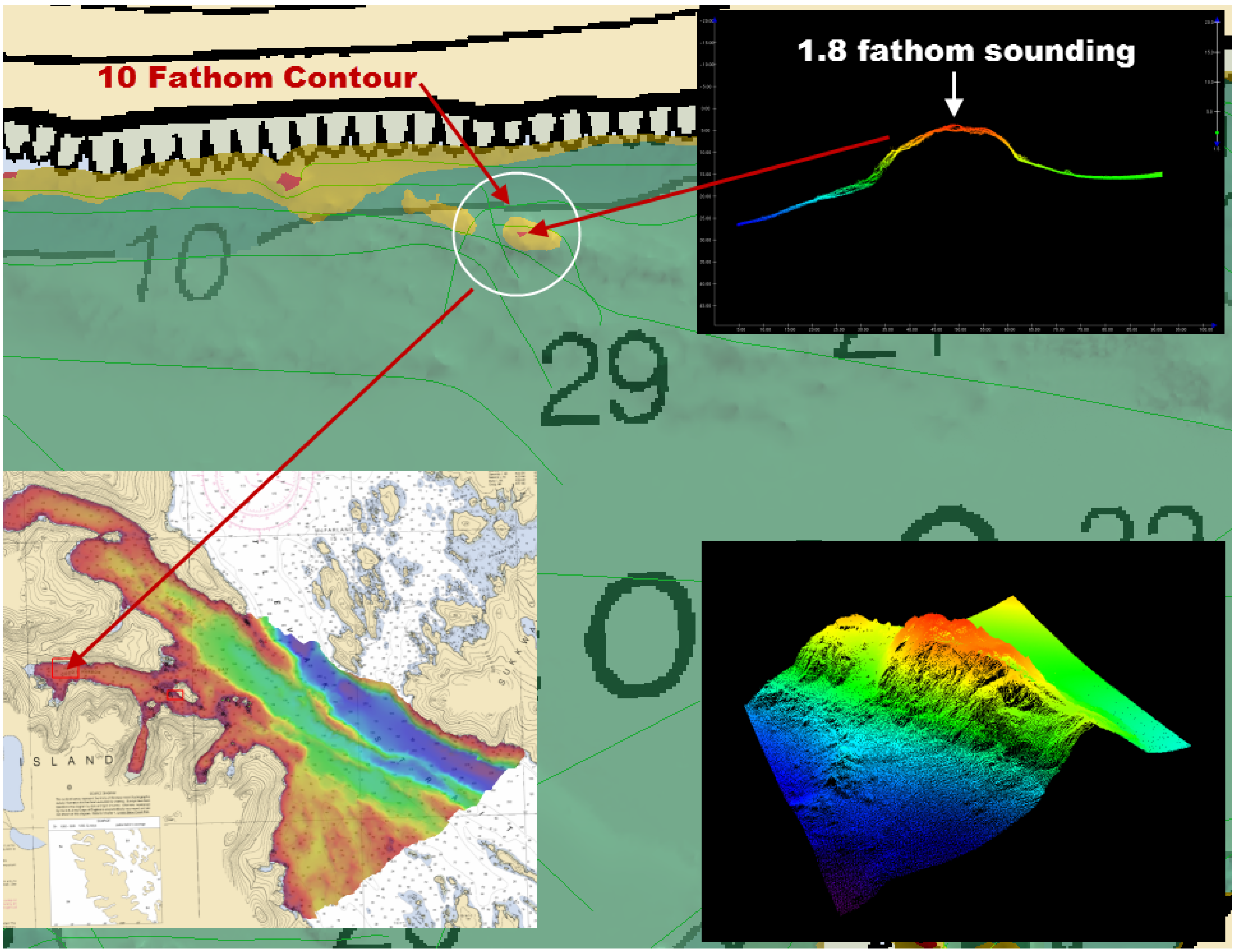


Figure 25: H12882 shoal in the vicinity of Coco Harbor

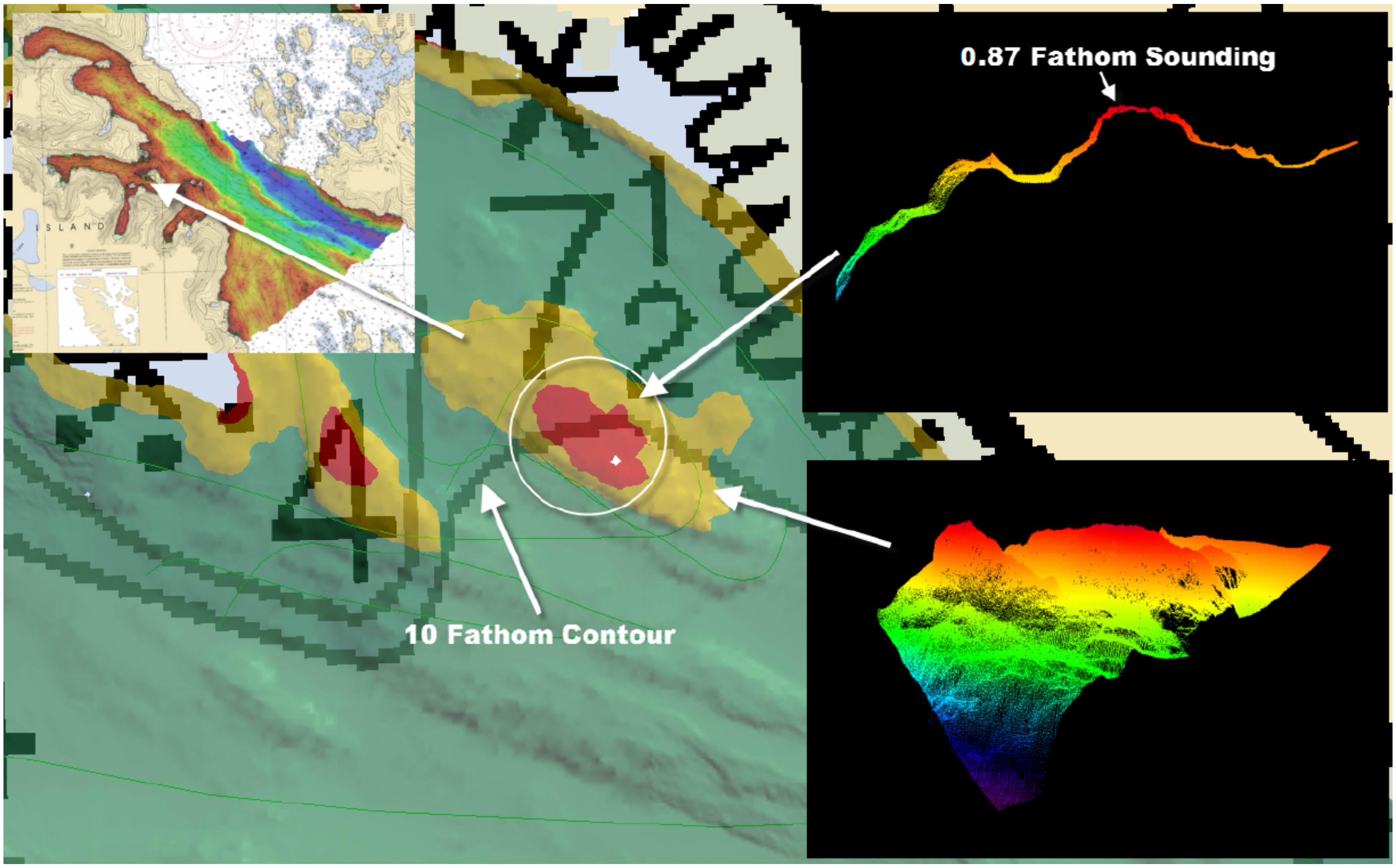


Figure 26: H12882 shoal in the vicinity of Entrance Island

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

Eight bottom samples were acquired in accordance with the Project Instructions for survey H12882. Several bottom samples were adjusted for backscatter information that was acquired and processed during survey operations. All bottom samples were entered in the H12882 Final Feature File. See Figure 27 for a graphical overview of sample locations.

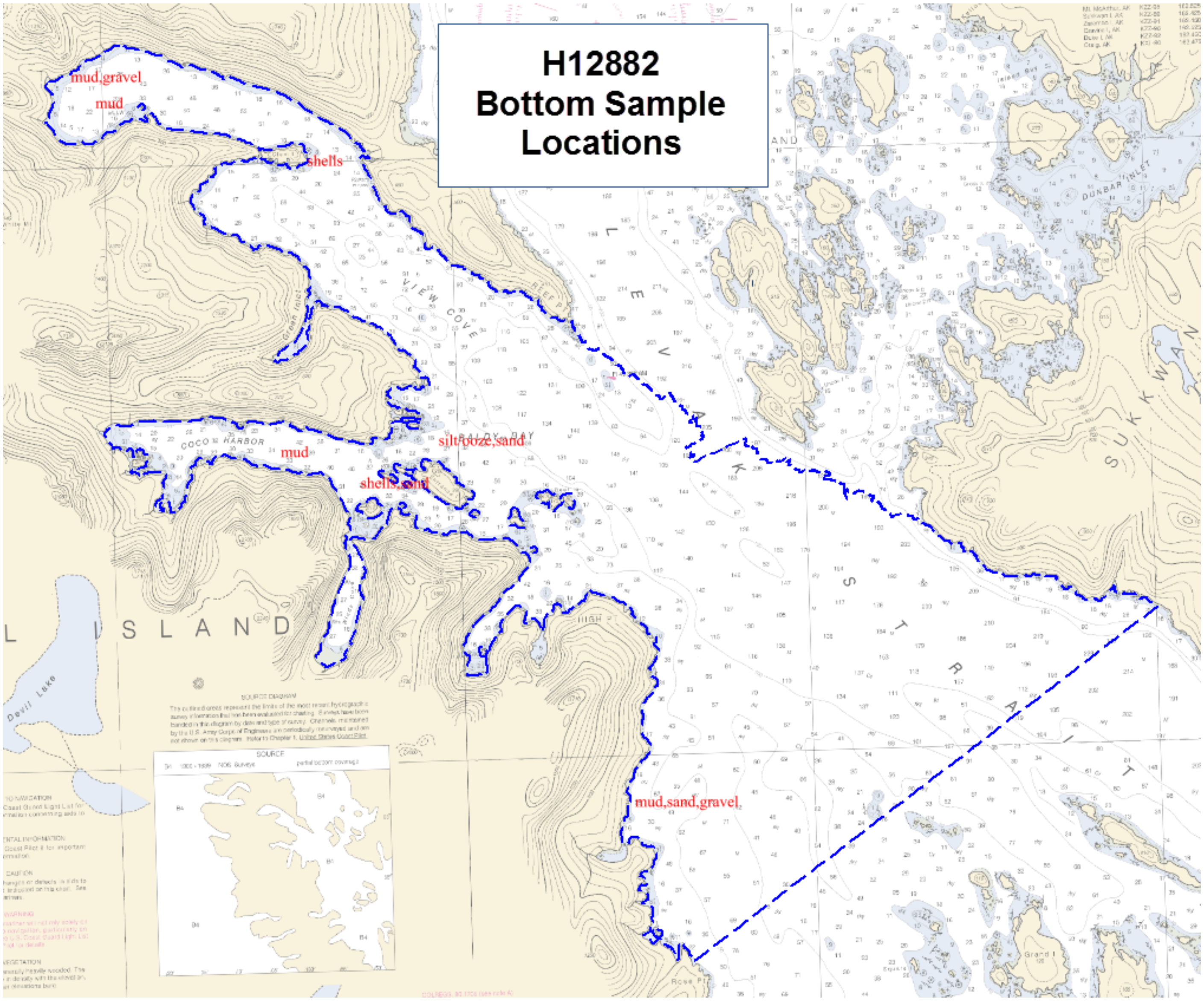


Figure 27: H12882 bottom sample locations

D.2 Additional Results

D.2.1 Shoreline

Fairweather personnel conducted limited shoreline verification and reconnaissance at times near predicted negative or low tides within the survey limits. Annotations, information, and diagrams collected DP forms and boat sheets during field operations were scanned and included in the Separates I Detached Positions folder. Shoreline verification procedures for H12882 conform to those detailed in the DAPR.

D.2.2 Prior Surveys

No prior survey comparisons exist for this survey.

D.2.3 Aids to Navigation

The daymark located near Reef Point (Figure 28) within H12882 was on station and observed to be serving it's intended purpose

Figure 28: H12882 daymark

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 and/or Environmental Conditions

Abnormal seafloor and/or environmental conditions were not observed 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 Recommendation

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

D.2.11 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 and Specifications Deliverables, Field Procedures Manual, Letter Instructions, and all HSD Technical Directives, except as noted in this Descriptive Report. These data are adequate to supersede charted data in their common areas. This survey is complete and no additional work is required unless otherwise noted herein.

Approver Name	Approver Title	Approval Date	Signature
CDR Mark Van Waes	Commanding Officer	12/18/2017	VAN WAES.MARK.1240076329 2017.12.20 15:24:21 -05'00'
FOR LT Damian Manda	Field Operations Officer	12/18/2017	VAN WAES.MARK.1240076329 2017.12.20 15:24:02 -05'00'
Sam Candio	Chief Survey Technician	12/18/2017	Digitally signed by CANDIO.SAMUEL.LOUIS.1515897743 DN: c=US, o=U.S. Government, ou=DoD, ou=PKI, ou=OTHER, cn=CANDIO.SAMUEL.LOUIS.1515897743 Date: 2017.12.18 07:35:23 -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	Continually Operating Reference Staiton
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
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
HSSD	Hydrographic Survey Specifications and Deliverables

Acronym	Definition
HSTP	Hydrographic Systems Technology Programs
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
MCD	Marine Chart Division
MHW	Mean High Water
MLLW	Mean Lower Low Water
NAD 83	North American Datum of 1983
NAIP	National Agriculture and Imagery Program
NALL	Navigable Area Limit Line
NM	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
PRF	Project Reference File

Acronym	Definition
PS	Physical Scientist
PST	Physical Science Technician
RNC	Raster Navigational Chart
RTK	Real Time Kinematic
SBES	Singlebeam Echosounder
SBET	Smooth Best Estimate and Trajectory
SNM	Square Nautical Miles
SSS	Side Scan Sonar
ST	Survey Technician
SVP	Sound Velocity Profiler
TCARI	Tidal Constituent And Residual Interpolation
TPE	Total Propagated Error
TPU	Topside Processing Unit
USACE	United States Army Corps of Engineers
USCG	United Stated Coast Guard
UTM	Universal Transverse Mercator
XO	Executive Officer
ZDA	Global Positiong System timing message
ZDF	Zone Definition File

UNITED STATES DEPARMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Ocean Service
Silver Spring, Maryland 20910

PROVISIONAL TIDE NOTE FOR HYDROGRAPHIC SURVEY

DATE : July 05, 2017

HYDROGRAPHIC BRANCH: Pacific
HYDROGRAPHIC PROJECT: OPR-O190-FA-2017
HYDROGRAPHIC SHEET: H12882
LOCALITY: Baldy Bay, Southeast AK
TIME PERIOD: May 29 - June 21, 2017

TIDE STATION USED: 945-0460 Ketchikan
Lat. 55° 19.9'N Long. 131° 37.6' W
PLANE OF REFERENCE (MEAN LOWER LOW WATER): 0.000 meters
HEIGHT OF HIGH WATER ABOVE PLANE OF REFERENCE: 4.433 meters

REMARKS: RECOMMENDED GRID Please use the TCARI grid "O190FA2017.tc" as the final grid for project OPR-O190-FA-2017, H12882, during the period between May 29 and June 21, 2017.

Refer to attachments for zoning information.

Note 1: Provided time series data are tabulated in metric units(meters), relative to MLLW and on Greenwich Mean Time on the 1983-2001 National Tidal Datum Epoch (NTDE).

Note 2: As of the issuance of this final tide, 2017 annual leveling for Ketchikan, AK (9450460) has not been verified. A review of the verified leveling records from June 2006 - 2016 shows the tide station benchmark network to be stable within an allowable 0.009 m tolerance, annually. This Tide Note may be used as final stability verification for survey OPR-O190-FA-2017, Registry No. H12882. CO-OPS will immediately provide a revised Tide Note should subsequent leveling records indicate any benchmark network stability movement beyond the allowable 0.009 m tolerance.

HOVIS.GERALD.THOMAS.JR.1365860250

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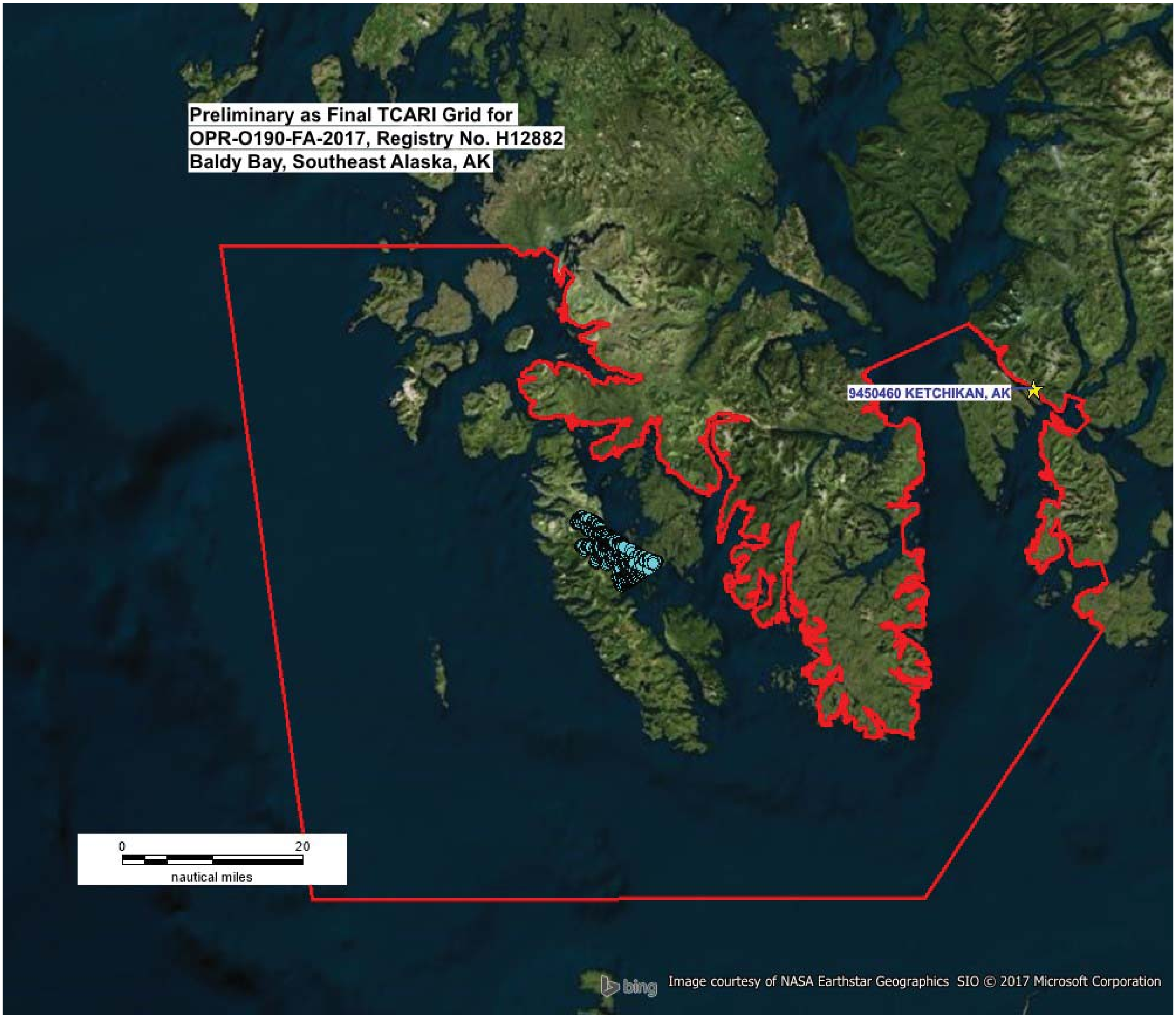
DN: c=US, o=U.S. Government, ou=DoD, ou=PKI, ou=OTHER, cn=HOVIS.GERALD.THOMAS.JR.1365860250
Date: 2017.07.07 10:44:58 -04'00'

CHIEF, PRODUCTS AND SERVICES BRANCH


Preliminary as Final TCARI Grid for
OPR-O190-FA-2017, Registry No. H12882
Baldy Bay, Southeast Alaska, AK
9450460 KETCHIKAN, AK
0
20
nautical miles
bing
Image courtesy of NASA Earthstar Geographics SIO © 2017 Microsoft Corporation

APPROVAL PAGE

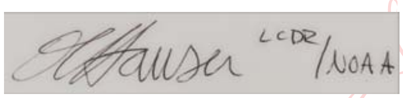
H12882

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: 

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Lieutenant Commander Olivia Hauser, NOAA
Chief, Pacific Hydrographic Branch