H12595

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

DESCRIPTIVE REPORT

Type of Survey:	Navigable Area
Registry Number:	H12595

LOCALITY

State(s):	Alaska
General Locality:	Shumagin Islands, AK
Sub-locality:	5 NM South of Simeonof Island

2013

CHIEF OF PARTY
Richard T. Brennan, CDR/NOAA

LIBRARY & ARCHIVES

Date:

U.S. DEPARTMENT OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION	REGISTRY NUMBER:
HYDROGRAPHIC TITLE SHEET	**H12595**

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:	**Shumagin Islands, AK**
Sub-Locality:	**5 NM South of Simeonof Island**
Scale:	**40000**
Dates of Survey:	**07/17/2013 to 09/03/2013**
Instructions Dated:	**05/31/2013**
Project Number:	**OPR-P183-RA-13**
Field Unit:	**NOAA Ship *Rainier***
Chief of Party:	**Richard T. Brennan, 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:

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 Geophysical Data Center (NGDC) and can be retrieved via http://www.ngdc.noaa.gov/.

Table of Contents

List of Tables

List of Figures

Descriptive Report to Accompany Survey H12595

Project: OPR-P183-RA-13

Locality: Shumagin Islands, AK

Sublocality: 5 NM South of Simeonof Island

Scale: 1:40000

July 2013 - September 2013

NOAA Ship *Rainier*

Chief of Party: Richard T. Brennan, CDR/NOAA

A. Area Surveyed

The survey area is referred to as Sheet 8: "5 NM South of Simeonof Island" within the Project Instructions (Figure 1). The area is 2.2 NM south of Simeonof Island and 3.7 NM east of Chernabura Island.

A.1 Survey Limits

Data were acquired within the following survey limits:

Northwest Limit	Southeast Limit
54° 49' 36.68" N 159° 24' 24.22" W	54° 44' 0.95" N 159° 6' 8.99" W

Table 1: Survey Limits

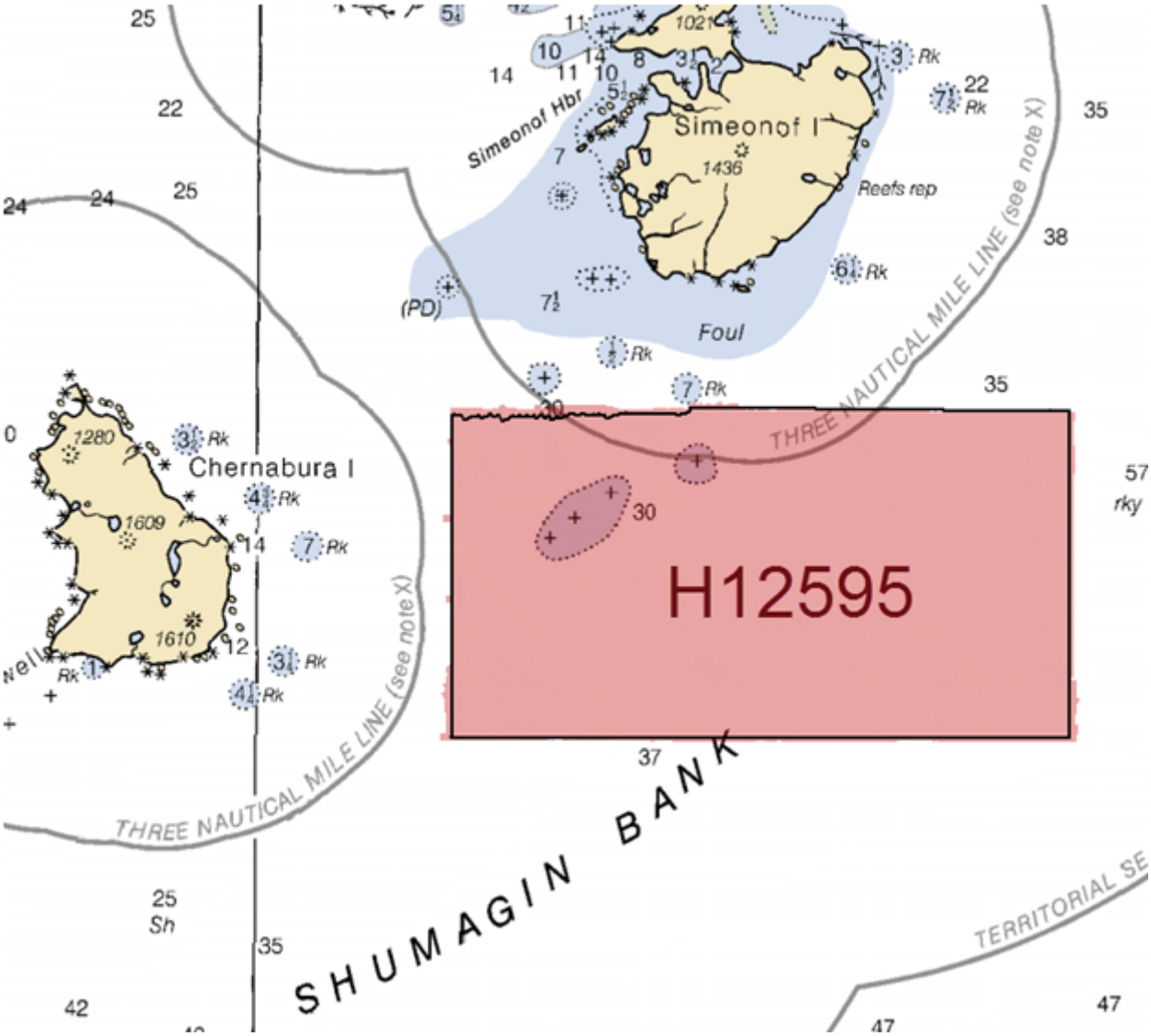


Figure 1: H12595 survey limits.

Parts of the northeast corner of this survey did not reach the sheet limits; however, prior survey H12475 completely covers this area and there is significant overlap between the two surveys (Figure 2).

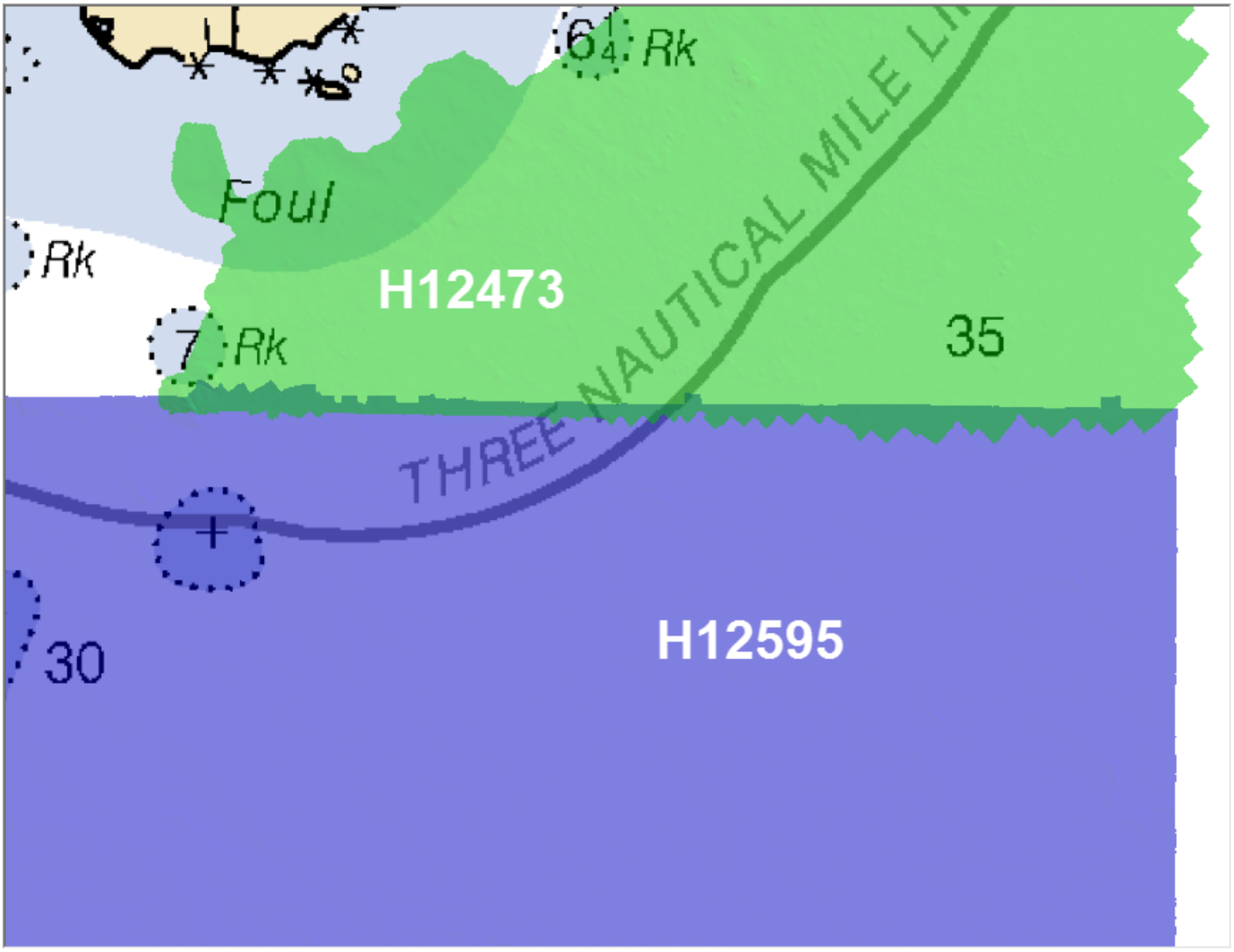


Figure 2: H12475 overlap with H12595 sheet limits.

SAR: Figure 2 contains a typo and the northern area pictured should read H12475, not H12473.

A.2 Survey Purpose

The purpose of this survey is to provide contemporary surveys to update National Ocean Service (NOS) nautical charting products.

A.3 Survey Quality

The entire survey is adequate to supersede previous data.

Data acquired on survey H12595 met complete multibeam echosounder (MBES) coverage requirements, including the 5 soundings per node data density requirements outlined in section 5.2.2.2 of the HSSD (Figure 3) with one exception:

The 1-meter surface fell slightly short of density requirements due to foul weather at the time of acquisition.

Statistics were extracted from the density layer of each finalized surface in CARIS and examined in Excel. Overall, the required data density was achieved in 100.0% of the nodes by area (Figure 4).

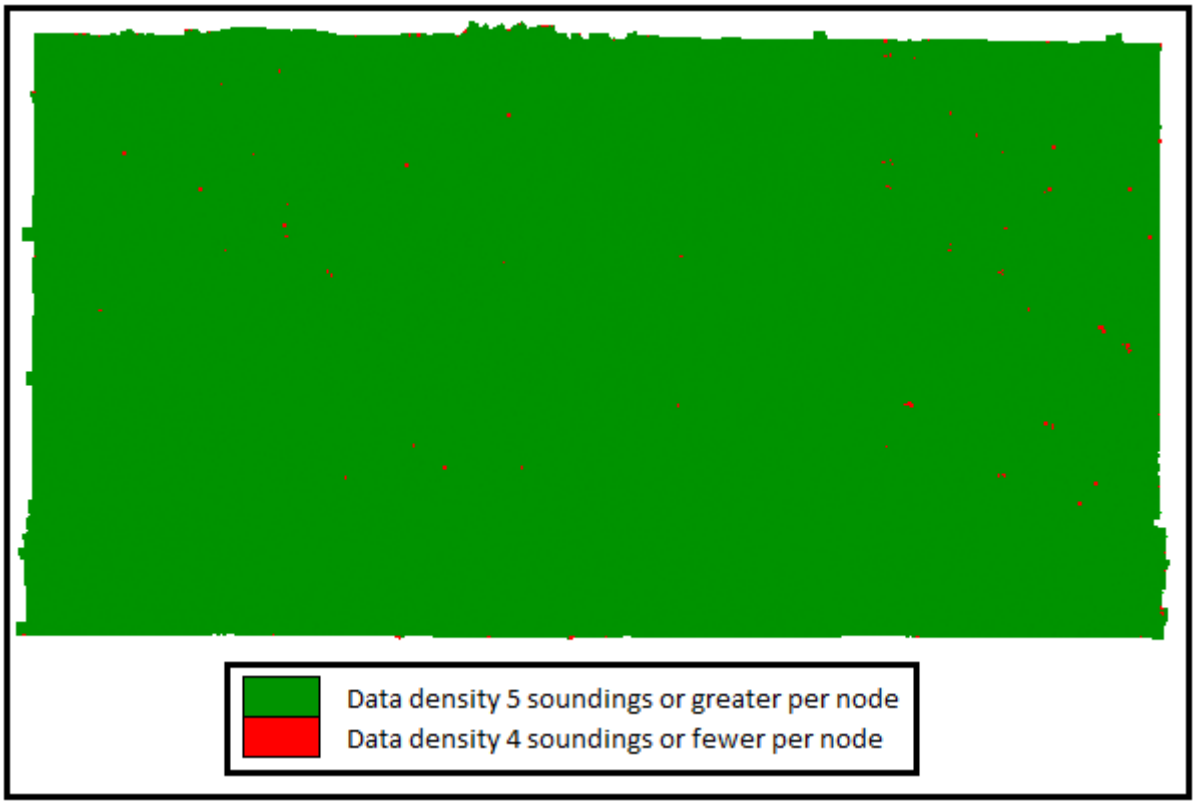


Figure 3: H12595 data density.

Resolution	Depth range	Number of nodes	Fewer than five soundings per node	Percent of nodes with greater than five soundings per node
1m	0 - 20m	12,709	1,004	92.1%
2m	18 - 40m	149,756	822	99.5%
4m	36 - 80m	12,630,353	4,020	100.0%
8m	72 - 160m	20,112	28	99.9%
	TOTAL:	12,812,930	5,874	100.0%
	TOTAL (by area):	203,984,549	70,404	100.0%

Figure 4: Summary table showing the percentage of nodes satisfying the 5 sounding density requirements, sub-divided by the appropriate depth ranges. Note: The final row has a unit of square meters, and sums the number of different resolution nodes into a common unit of area.

SAR: In review, the Density analysis was verified using a macro - FinalizedCSARSurfaceQA.py - distributed with NOAA's in-house software suite Pydro, which analyses values directly from the .csar

surfaces and do not use intermediate applications or files. The results disagree with the values found in Figure 4. The 1m surface contains 12172/12909 nodes (94.29%) which pass the density requirement. The 2m surface contains 149459/150054 nodes (99.6%) which pass the density requirement, and the 4m surface contains 12625970/12629583 nodes (99.97%) which pass the density requirement.

A.4 Survey Coverage

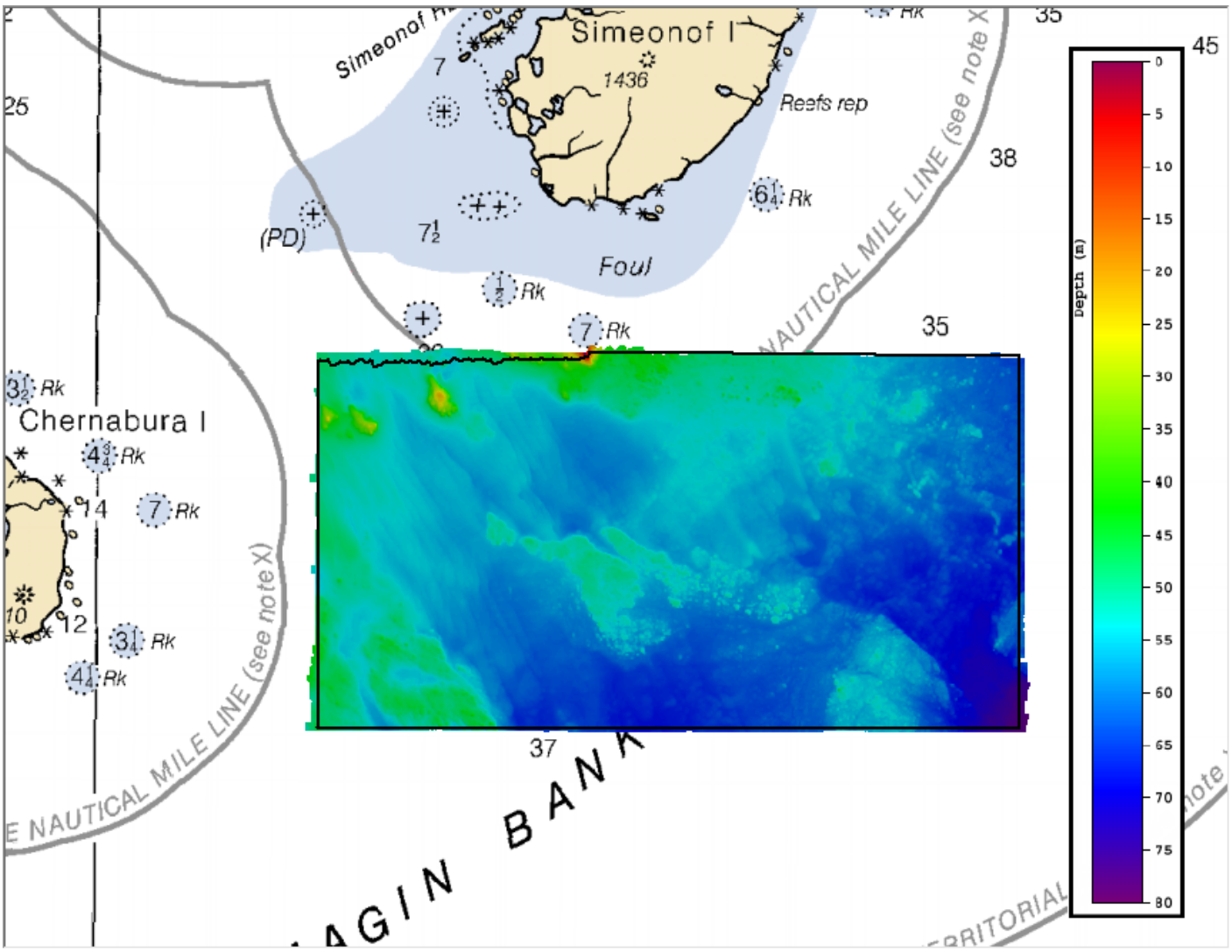


Figure 5: Acquired survey coverage overlaid on Chart 16540. Scale shows depth in meters.

Complete multibeam echosounder (MBES) coverage was achieved within the limits of hydrography as defined in the Project Instructions with the following exceptions:

Acoustic Shadowing: Almost all holidays were a result of acoustic shadowing (Figure 6). This effect was seen where data density on the 'dark' side of a feature or between features was too sparse to produce a surface at the appropriate resolution. All cases were investigated to assure that least depths were found.

Coverage Gaps: Data acquisition during poor weather conditions resulted in coverage gaps, the largest of which is 116 meters by 8 meters (Figure 7). All of the coverage gaps are at a depth of 30 meters or greater, and are not navigationally significant.

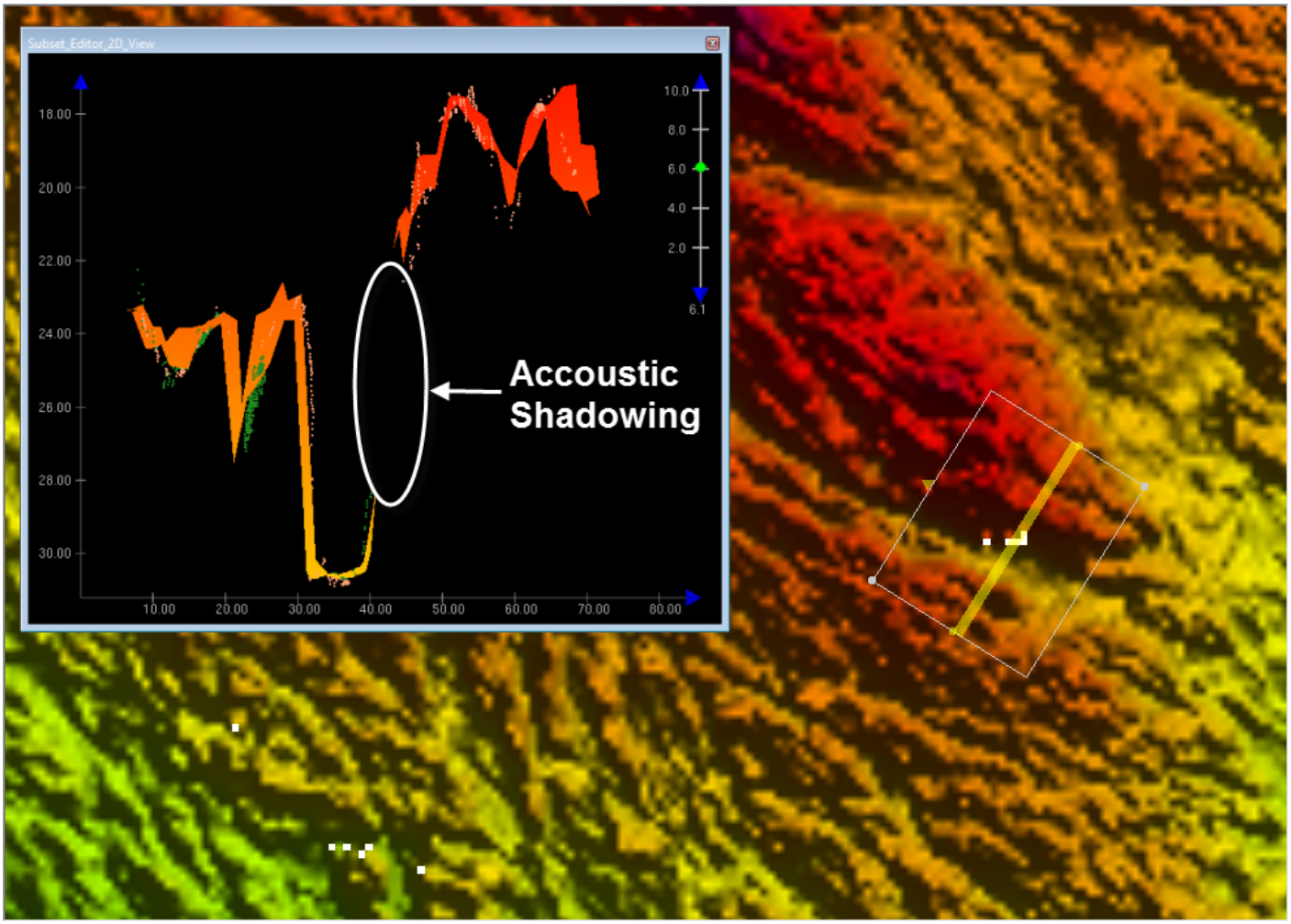


Figure 6: Subset exemplifying the acoustic shadows seen in the survey.

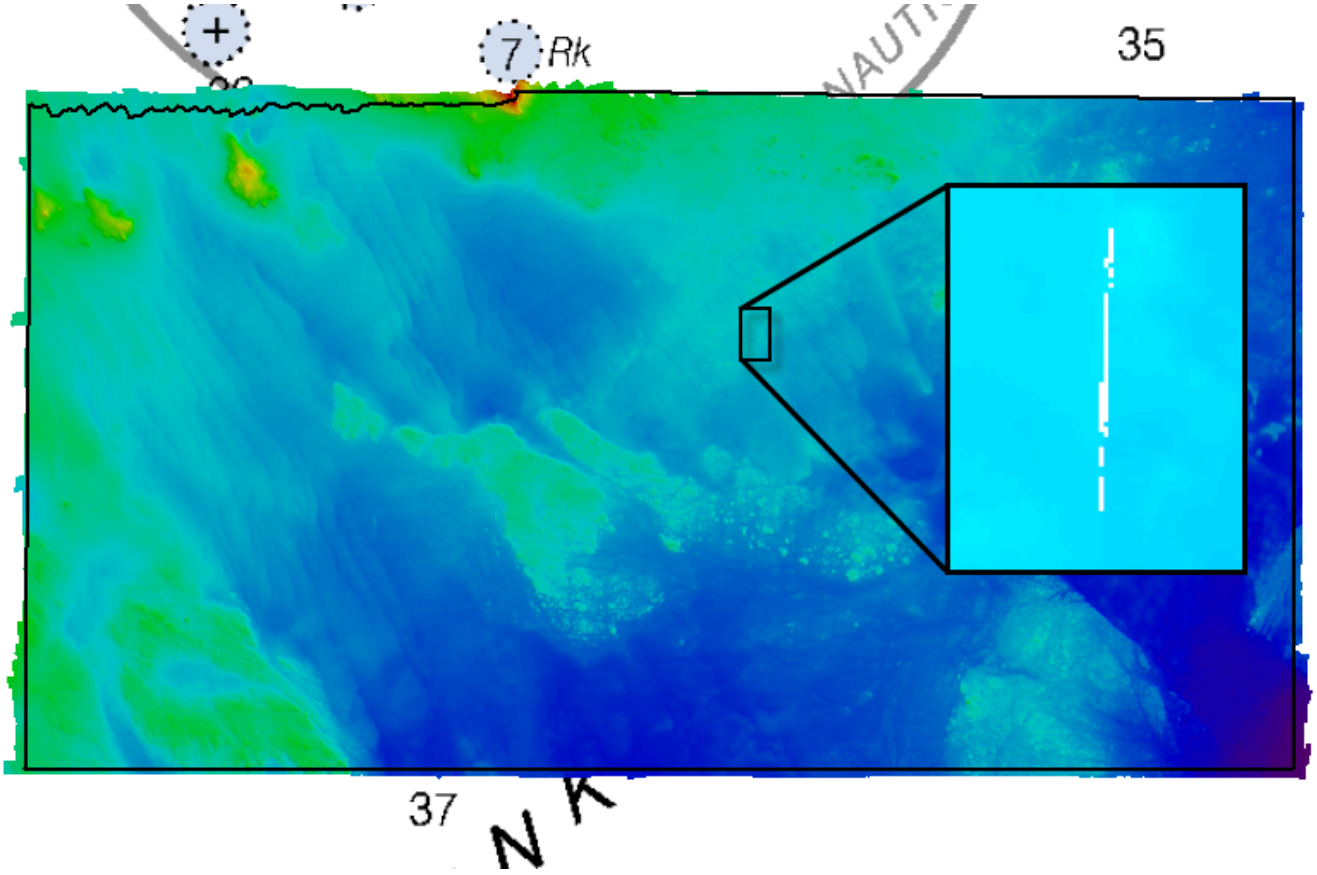


Figure 7: Location of largest coverage gap.

In review, the reviewer used a 4m resolution to grid the surfaces for compilation because the 8m surface was unnecessary given the depths. When gridded according to the HSSD, gaps appeared - caused by bubble sweep raking the sonar face in inclement weather and disrupting very short, swath-wide segments of bathymetry. The gaps were investigated and found to contain no navigationally significant features. All remaining data is adequate to supersede charted data.

A.5 Survey Statistics

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

	HULL ID	*S221*	*2801*	*2802*	*2803*	*2804*	*Total*
LNM	SBES Mainscheme	0	0	0	0	0	0
	MBES Mainscheme	510.3	17.0	50.9	25.0	44.0	647.2
	Lidar Mainscheme	0	0	0	0	0	0
	SSS Mainscheme	0	0	0	0	0	0
	SBES/MBES Mainscheme	0	0	0	0	0	0
	SBES/SSS Mainscheme	0	0	0	0	0	0
	MBES/SSS Mainscheme	0	0	0	0	0	0
	SBES/MBES Crosslines	0	0	0	0	29.0	29
	Lidar Crosslines	0	0	0	0	0	0
Number of Bottom Samples							12
Number of AWOIS Items Investigated							0
Number Maritime Boundary Points Investigated							0
Number of DPs							0
Number of Items Investigated by Dive Ops							0
Total SNM							59.11

Table 2: Hydrographic Survey Statistics

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

Survey Dates	Day of the Year
07/17/2013	198
07/18/2013	199
07/24/2013	205
08/02/2013	214
08/06/2013	218
08/08/2013	220
08/09/2013	221
08/10/2013	222
08/11/2013	223
09/02/2013	245
09/03/2013	246

Table 3: Dates of Hydrography

All data for survey H12595 was acquired by NOAA Ship RAINIER and her four survey launches (2801, 2802, 2803, and 2804). The survey launches and ship acquired MBES depth soundings, sound speed profiles, and bottom samples.

B. Data Acquisition and Processing

B.1 Equipment and Vessels

Refer to the Data Acquisition and Processing Report (DAPR) for a complete description of data acquisition and processing systems, survey vessels, quality control procedures and data processing methods. Additional information to supplement sounding and survey data, and any deviations from the DAPR are discussed in the following sections.

B.1.1 Vessels

The following vessels were used for data acquisition during this survey:

Hull ID	*S221 (Rainier)*	*2801 (RA-4)*	*2802 (RA-5)*	*2803 (RA-3)*	*2804 (RA-6)*
LOA	231 feet	28 feet	28 feet	28 feet	28 feet
Draft	16.5 feet	3.5 feet	3.5 feet	3.5 feet	3.5 feet

Table 4: Vessels Used

B.1.2 Equipment

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

Manufacturer	Model	Type
Reson	7125	MBES
Kongsberg	EM710	MBES
ODIM Brooke Ocean (Rolls-Royce Group)	MVP30	Conductivity, Temperature, and Depth Sensor
ODIM Brooke Ocean (Rolls-Royce Group)	MVP200	Conductivity, Temperature, and Depth Sensor
Applanix	POS-MV V4	Vessel Attitude and Positioning System
Seabird	SBE 19 Plus	Conductivity, Temperature, and Depth Sensor
Seabird	SBE 19	Conductivity, Temperature, and Depth Sensor
Reson	SVP 71	Sound Speed System
Reson	SVP 70	Sound Speed System

Table 5: Major Systems Used

B.2 Quality Control

B.2.1 Crosslines

Crosslines, acquired for this survey, totalled 4.5% of mainscheme acquisition.

Multibeam crosslines were acquired using the Reson 7125 on vessel 2801 (RA-4). A 4-meter CUBE surface was created using the mainscheme lines, while a second 4-meter CUBE surface was created using only crosslines, from which a difference surface was generated in CARIS at a 4-meter resolution (Figure 8). Statistics were then derived from the difference surface and are shown in Figure 9. The average difference between the depths derived from the mainscheme and crosslines was 0.04 meters (crosslines being shoaler) with a standard deviation of 0.17 meters.

For the respective depths, the difference surface was compared to the allowable IHO accuracy standards (Figure 10). In total, 100.0% of the depth differences between H12595 mainscheme and crossline data are within allowable IHO accuracies (Figure 11).

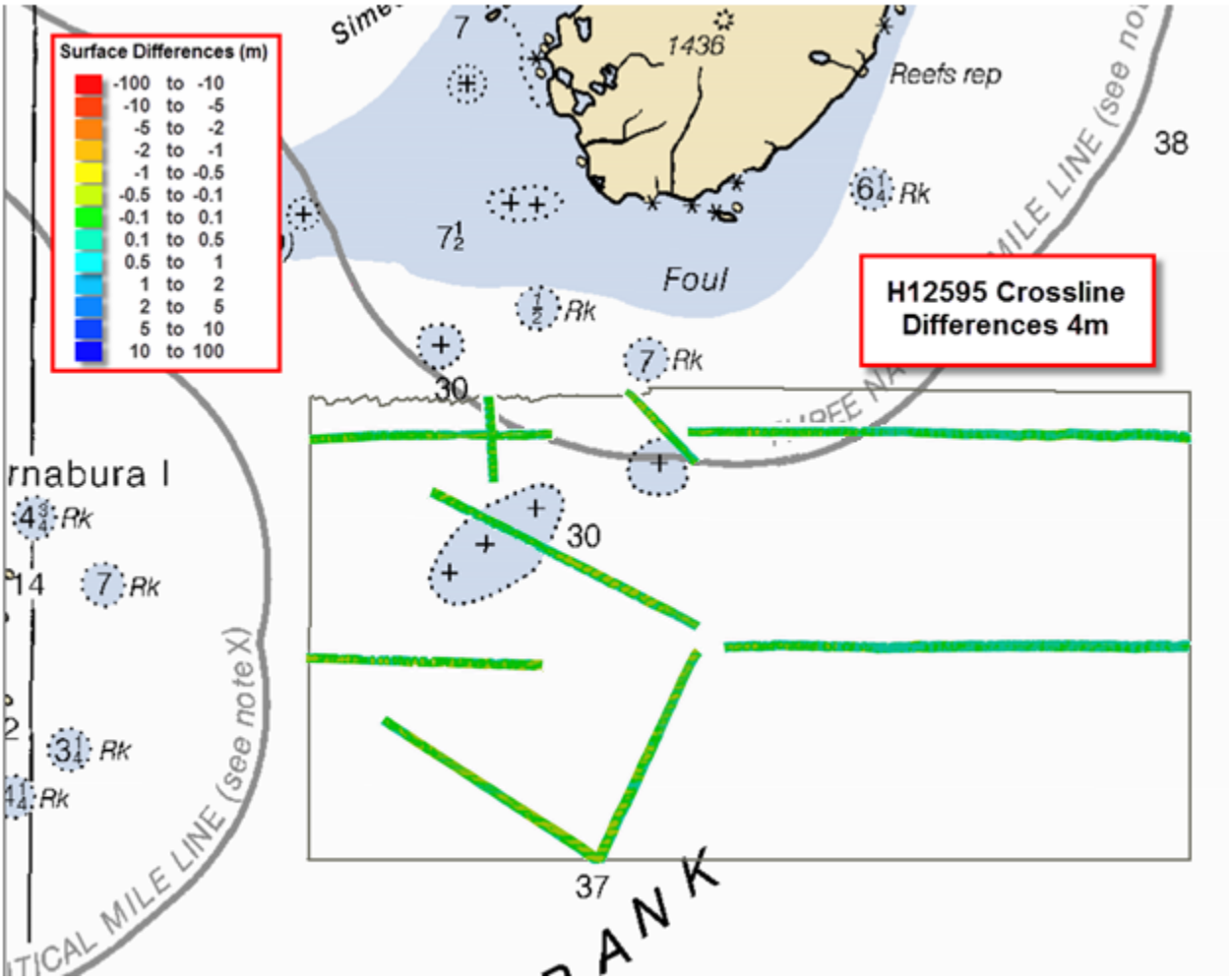


Figure 8: H12595 difference surface between the mainscheme and crosslines.

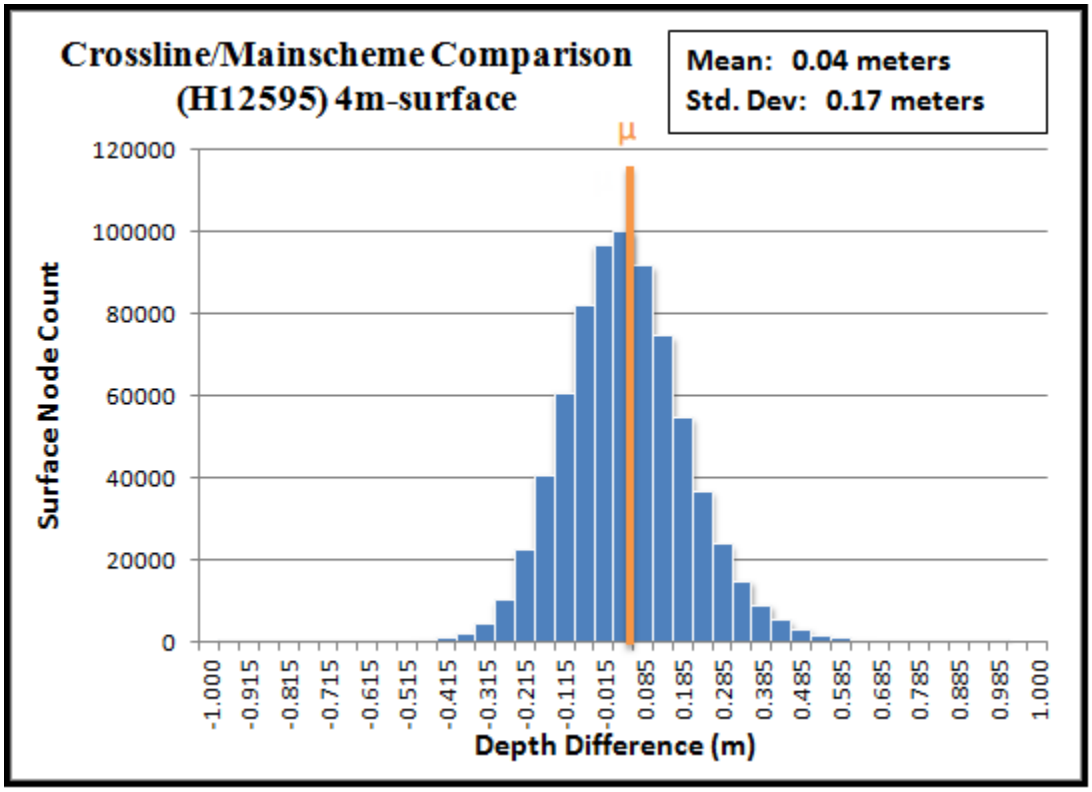


Figure 9: Crossline comparison with mainscheme lines.

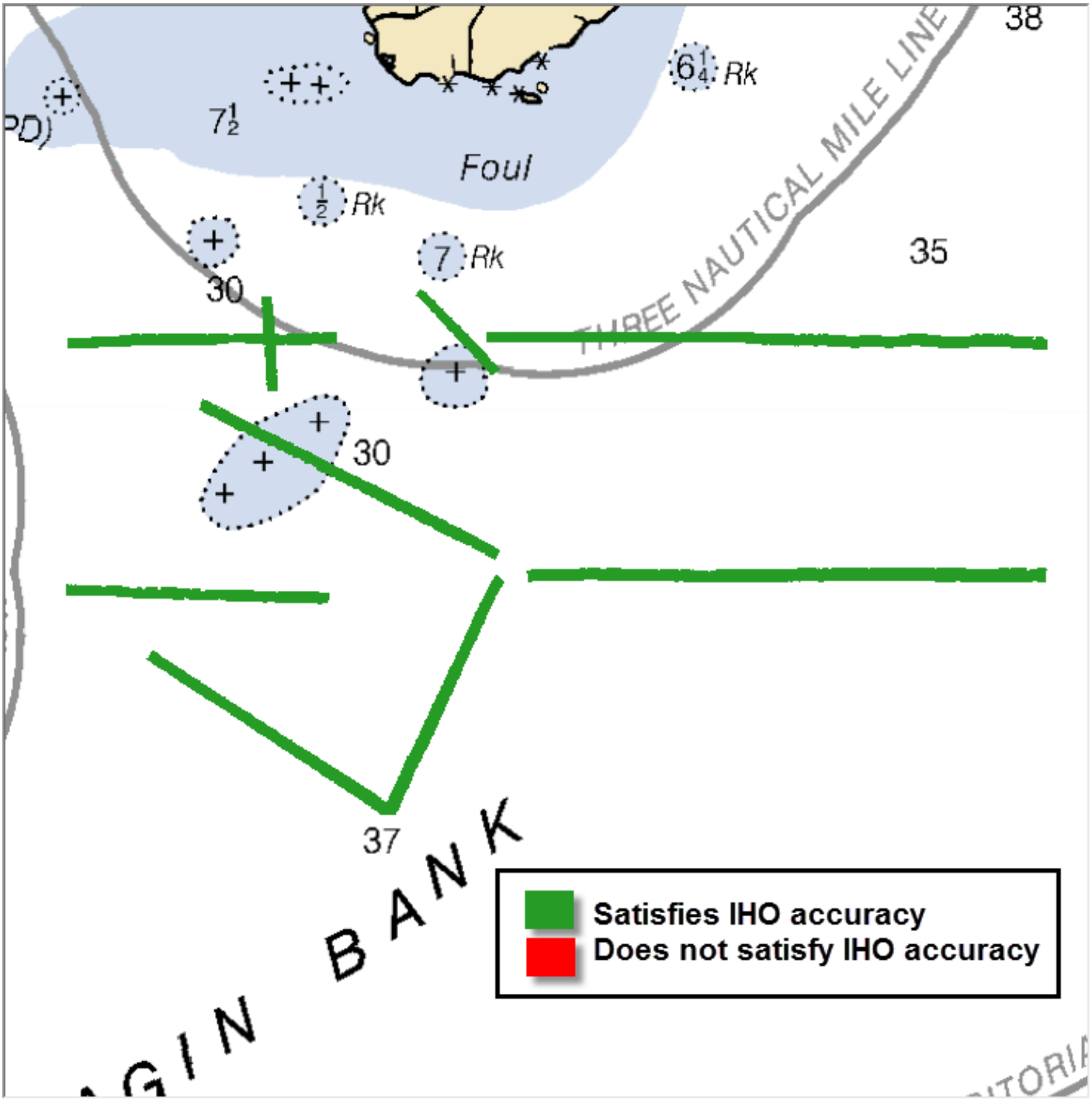


Figure 10: Depth differences between H12595 mainscheme and crossline data as compared to allowable IHO accuracy standards for the associated depths.

Depth range	IHO Order	Number of nodes	Nodes satisfying IHO accuracy	Percent nodes satisfying IHO accuracy
Less than 100m	Order 1	745,794	745,794	100.0%
	TOTAL:	745,794	745,794	100.0%

Figure 11: Summary table showing percentage of difference surface nodes between H12595 mainscheme and crossline data that meet allowable IHO accuracy standards for the respective depths.

B.2.2 Uncertainty

The following survey specific parameters were used for this survey:

Measured	Zoning
0 meters	0.045 meters

Table 6: Survey Specific Tide TPU Values

Hull ID	Measured - CTD	Measured - MVP	Surface
S221		1.0 meters/second	0.05 meters/second
2801	3.0 meters/second		0.15 meters/second
2802	3.0 meters/second		0.15 meters/second
2803	3.0 meters/second		0.15 meters/second
2804		3.0 meters/second	0.15 meters/second

Table 7: Survey Specific Sound Speed TPU Values

Total propagated uncertainty values for survey H12595 were derived from a combination of fixed values for equipment and vessel characteristics, as well as field assigned values for sound speed uncertainties. Tidal uncertainties were provided by NOAA's Center for Operational Oceanographic Products and Services (CO-OPS), and were applied to depth soundings.

Uncertainty values of submitted final grids were calculated in CARIS using the "Greater of the Two" of uncertainty and standard deviation (scaled to 95%). To visualize the locations in which accuracy requirements were met, for each finalized surface a custom "predicted IHO compliance" layer was created based on the difference between calculated uncertainty of the nodes and the allowable IHO uncertainty (Figure 12). To quantify the extent to which accuracy requirements were met, the preceding "predicted IHO compliance" layers were queried within CARIS and then examined in Excel (Figure 13). Overall, 100.0% by node and 100.0% by area of survey H12595 met the accuracy requirements stated in the HSSD.

In addition to the usual a priori estimates of uncertainty, some real-time and post-processed uncertainty sources were also incorporated into the depth estimates of survey H12595. Real-time uncertainties from both the EM710 and Reson 7125 were recorded and applied in post-processing. Applanix TrueHeave files are recorded on all survey vessels, which include an estimate of the heave uncertainty, and are applied during post-processing. Finally, the post-processed uncertainties associated with vessel roll, pitch, gyro and navigation are applied in CARIS HIPS via an SBET RMS file generated in POSPac.

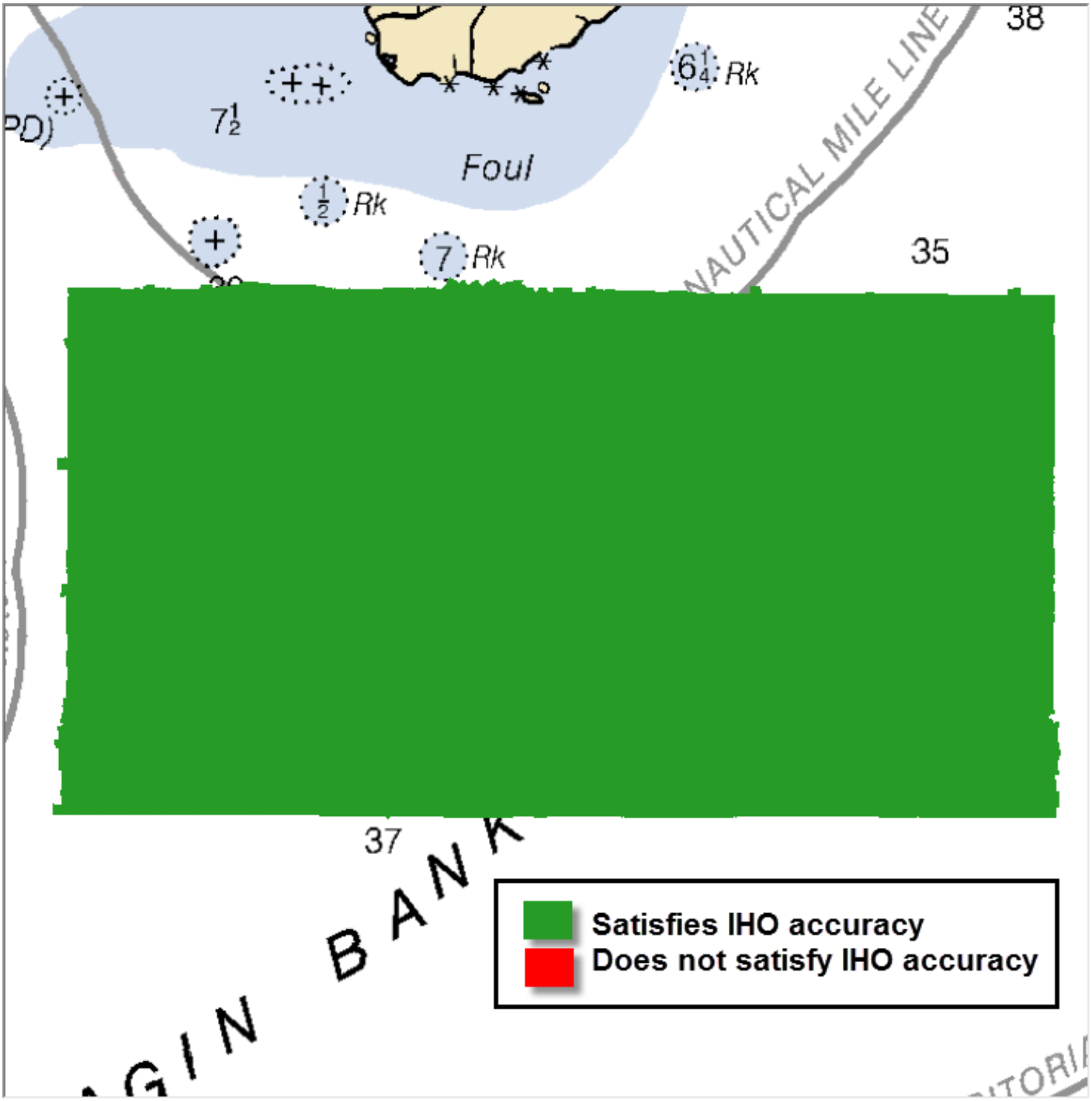


Figure 12: H12595 met IHO accuracy standards for 100.0% of the survey area.

Resolution	Depth range	IHO Order	Number of nodes	Nodes satisfying IHO accuracy	Percent nodes satisfying IHO accuracy
1m	0 - 20m	Order 1	12,707	12,707	100.0%
2m	18 - 40m	Order 1	148,793	148,793	100.0%
4m	36 - 80m	Order 1	12,630,418	12,630,418	100.0%
8m	72 - 100m	Order 1	20,112	20,112	100.0%
		TOTAL:	12,812,030	12,812,030	100.0%
		TOTAL (by area):	203,981,735	203,981,735	100.0%

Figure 13: Summary table showing the percentage of nodes satisfying the indicated IHO accuracy level, sub-divided by the appropriate depth ranges. Note: The final row has a unit of square meters, and sums different resolution nodes into a common unit of area.

SAR: In review, the TPU analysis was verified using a macro - FinalizedCSARSurfaceQA.py - distributed with NOAA's in-house software suite Pydro, which analyses values directly from the .csar surfaces and do not use intermediate applications or files. The results disagree with some values found in DR Figure 13. The 1m surface contains 12909/12909 nodes (100%) which pass the density requirement. The 2m surface contains 149885/150054 nodes (99.89%) which pass the density requirement, and the 4m surface contains 12629395/12629583 nodes (99.99%) which pass the density requirement. It should be noted that node counts for surfaces in the DR's Figure 4 and Figure 13 do not agree, which is indicative of an incomplete analysis. Despite these errors, the review shows that surveyed data is of the highest order quality and adequate to supersede charted soundings.

B.2.3 Junctions

Three junction comparisons were completed for H12595. One survey (H12594) was acquired concurrently with this survey, and two surveys (H12473 and H12475) were completed in 2012 by NOAA Ship RAINIER (Figure 14). Depth comparisons were performed using CARIS difference surfaces and Subset Editor.

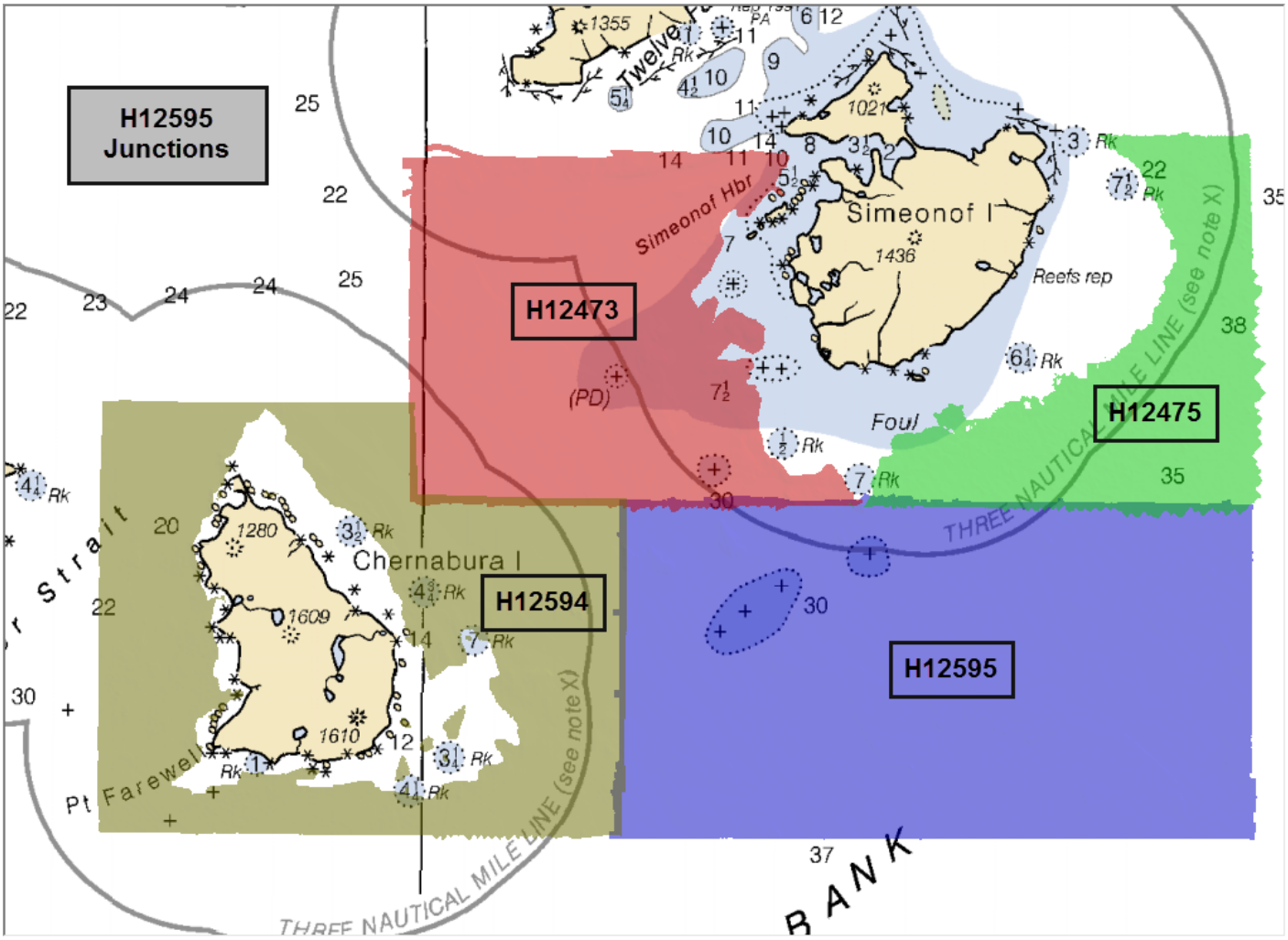


Figure 14: H12595 junction overview.

The following junctions were made with this survey:

Registry Number	Scale	Year	Field Unit	Relative Location
H12473	1:40000	2012	NOAA Ship RAINIER	NW
H12475	1:40000	2012	NOAA Ship RAINIER	NE
H12594	1:40000	2013	NOAA Ship RAINIER	W

Table 8: Junctioning Surveys

H12473

Overlap with survey H12473 ranges from 90 to 450 meters wide along the northwestern boundary of H12595 (Figure 15). Depths in the junction area range from approximately 10 to 60 meters. A difference surface analysis between CUBE depth layers for each survey showed H12595 to be an average of 0.04 meters deeper than H12473, with a standard deviation of 0.23 meters (Figure 16). This is well within IHO Order 1 accuracy at these depths.

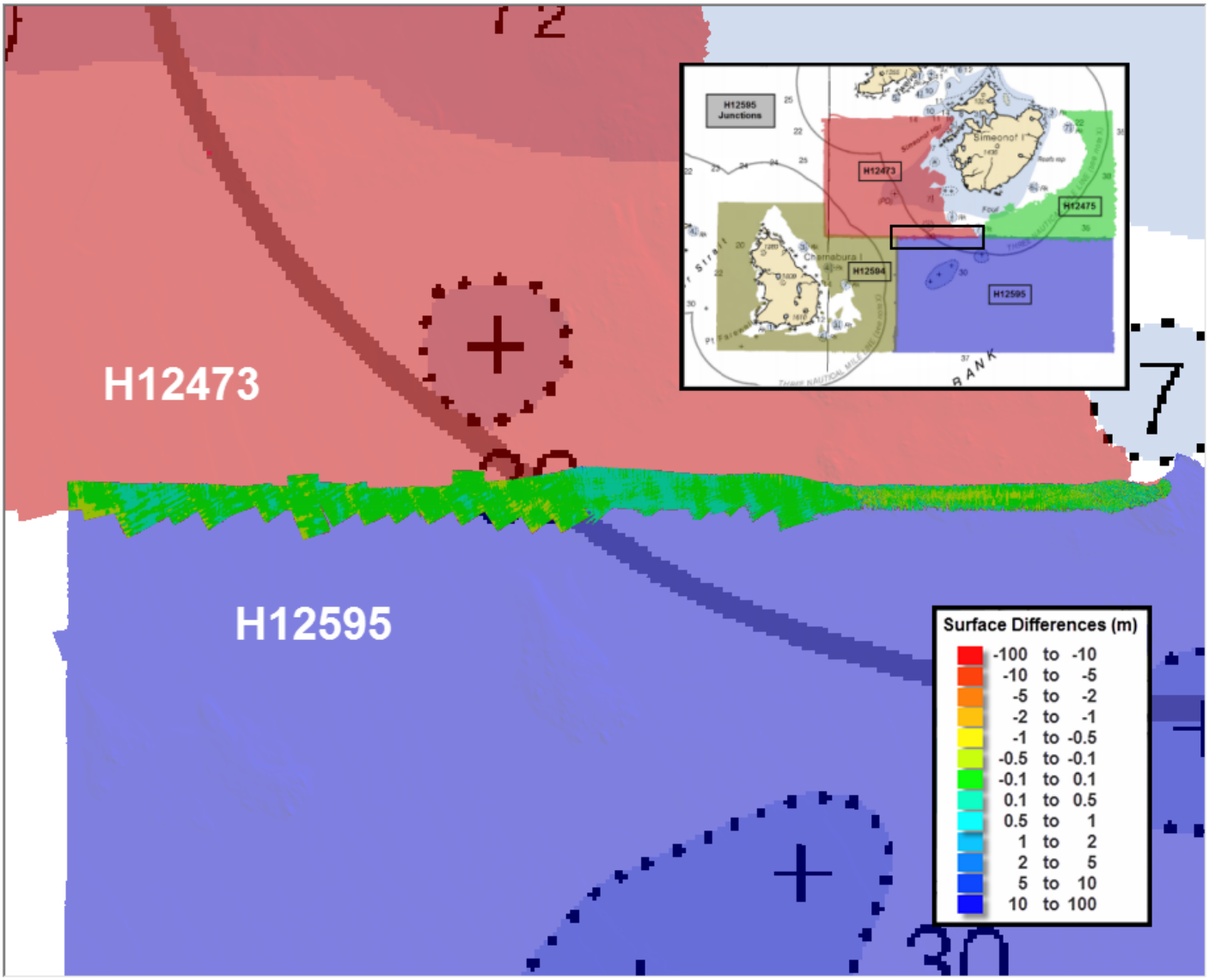


Figure 15: Junction between H12595 (blue) and H12473 (red).

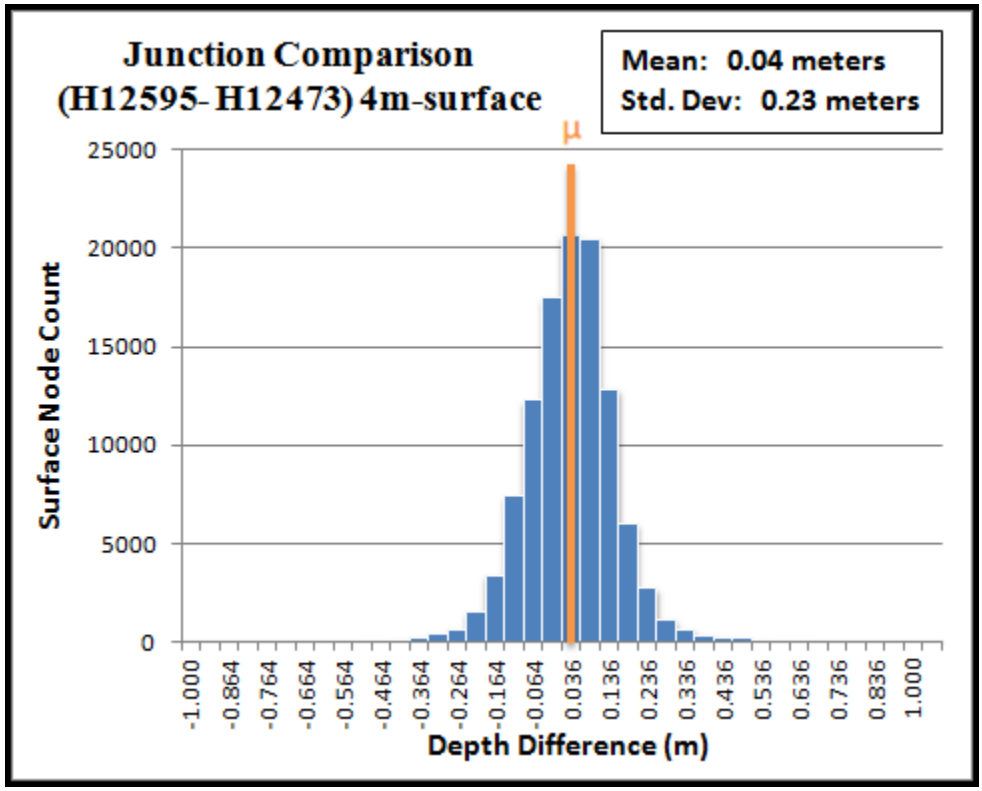


Figure 16: Difference surface statistics between H12595 and H12473 CUBE depth layers (4m grid size). H12595 is an average of 0.04 meters deeper.

H12475

Overlap with survey H12475 ranges from 60 to 490 meters wide along the northeastern boundary of H12595 (Figure 17). Depths in the junction area range from approximately 36 to 66 meters. A difference surface analysis between CUBE depth layers for each survey showed H12595 to be an average of 0.09 meters deeper than H12475, with a standard deviation of 0.17 meters (Figure 18). This is well within IHO Order 1 accuracy at these depths.

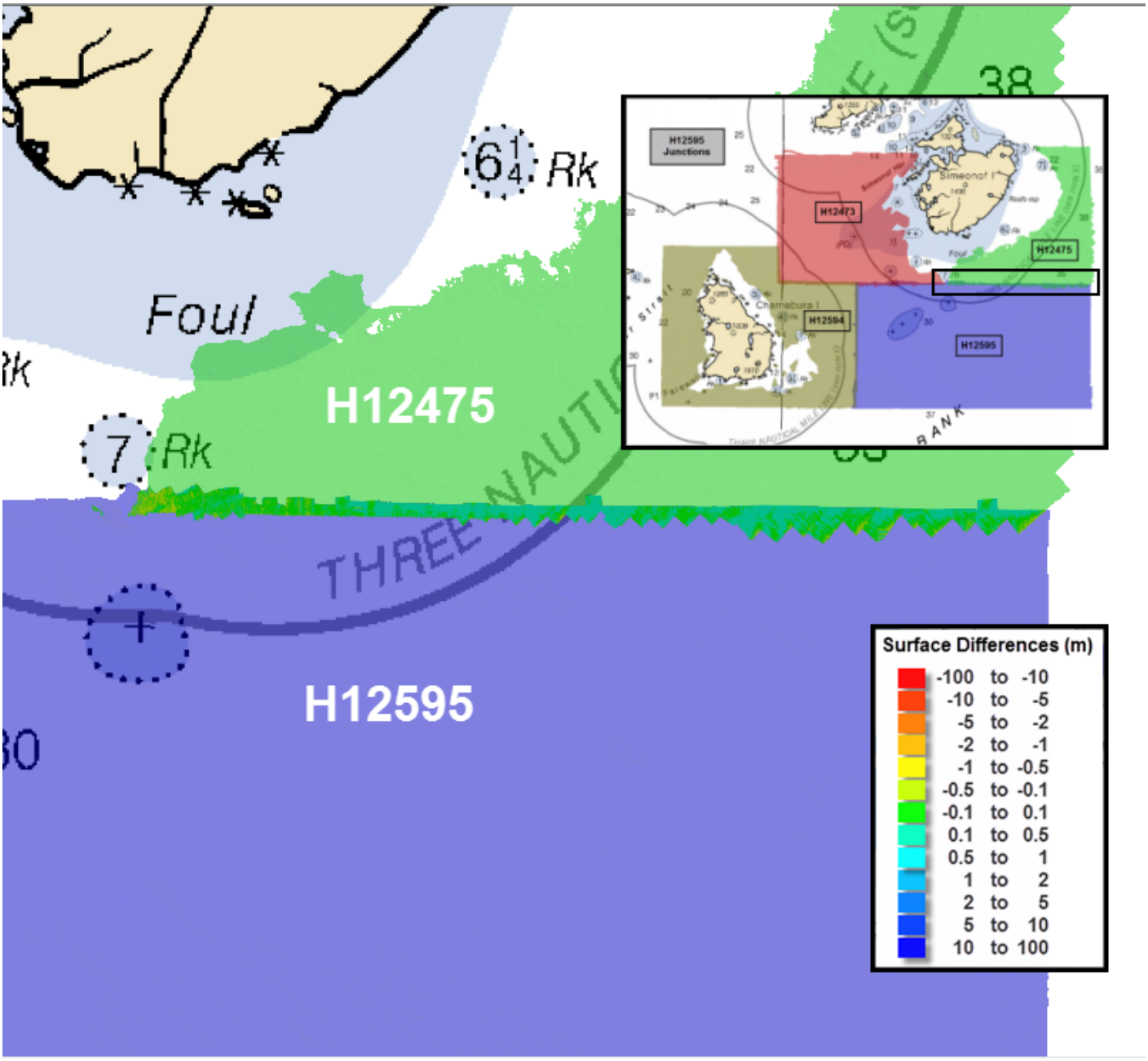


Figure 17: Junction between H12595 (blue) and H12475 (green).

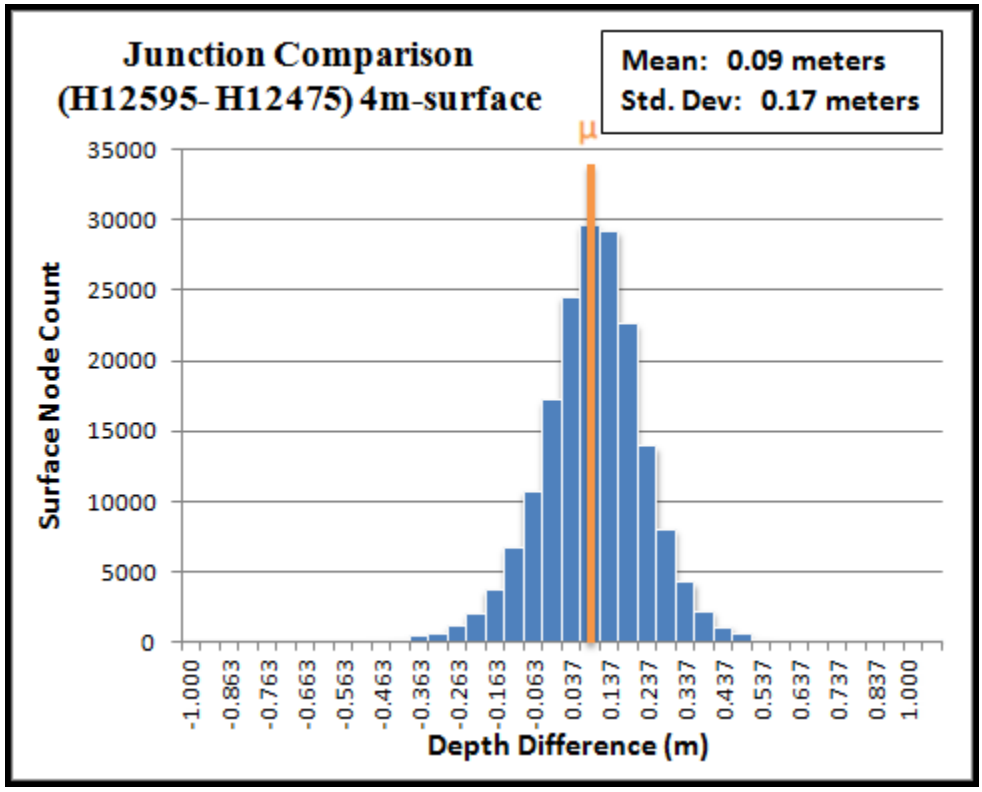


Figure 18: Difference surface statistics between H12595 and H12475 CUBE depth layers (4m grid size). H12595 is an average of 0.09 meters deeper.

H12594

Overlap with survey H12594 ranges from 160 to 460 meters wide along the western boundary of H12595 (Figure 19). Depths in the junction area range from approximately 35 to 60 meters. A difference surface analysis between CUBE depth layers for each survey showed H12595 to be an average of 0.09 meters shoaler than H12594, with a standard deviation of 0.12 meters (Figure 20). This is well within IHO Order 1 accuracy at these depths.

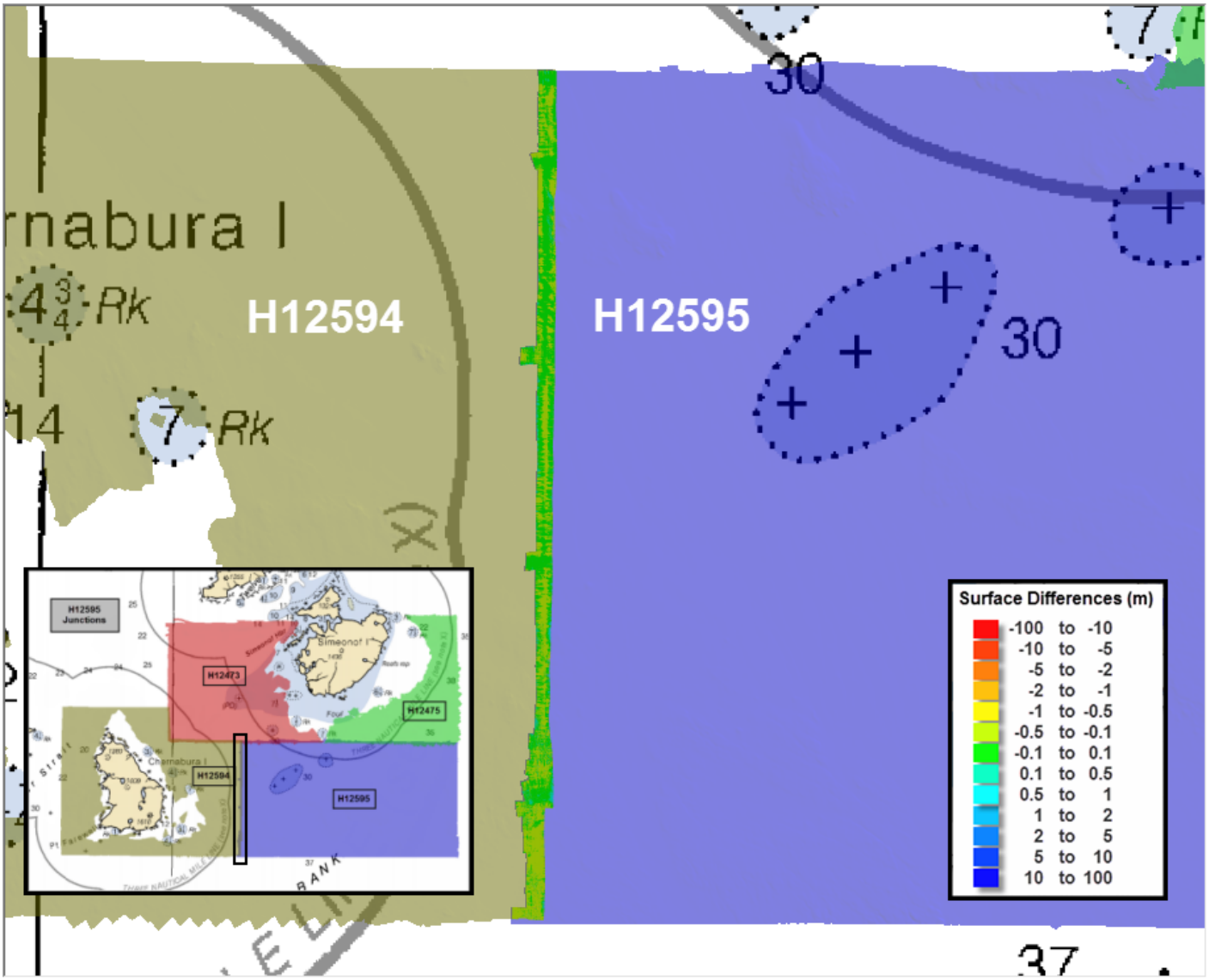


Figure 19: Junction between H12595 (blue) and H12594 (brown).

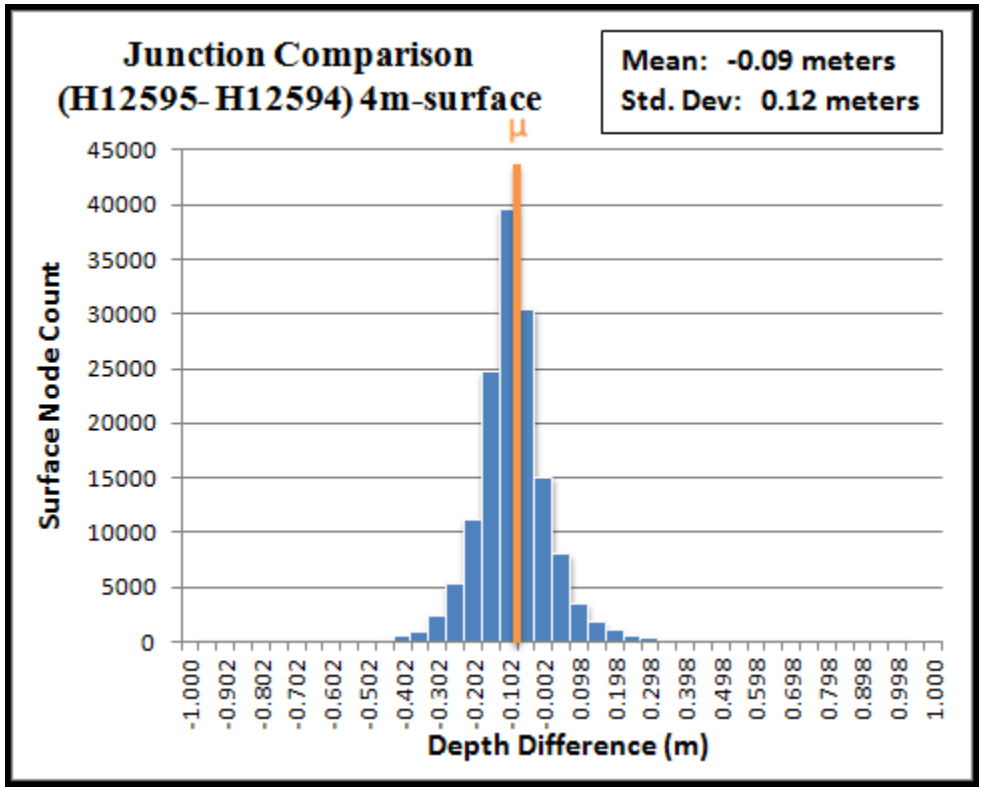


Figure 20: Difference surface statistics between H12595 and H12594 CUBE depth layers (4m grid size). H12595 is an average of 0.09 meters shoaler.

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

Ellipsoid-to-Tidal Surface Comparison

Using the GPS height determined from the SBET file, data from H12595 was referenced to the ellipse and gridded. As a QC tool an ERS to MLLW difference surface was created to identify artifacts. By differencing this ellipsoidally-referenced surface (ERS) from the traditional tidally-referenced surface, one should only see the ellipsoidal slope across the length of the survey. Any deviations from this slope would therefore be the result of an error intrinsic to either the ERS or tidal processing work flow. Misprojected SBETs, current

induced dynamic draft, incorrect waterline measurements, corrupt TrueHeave files, or poorly-modeled water levels are all examples of artifacts that can be identified through the difference of the ERS and tidally referenced surfaces.

The depth gradient between the MLLW and the ERS surfaces is expected to be similar in magnitude and position as the EGM2008-WGS84 geoid-ellipsoid separation model published by the National Geospatial-Intelligence Agency (NGA). In review, it was found that the two models compare well - exhibiting a signature northwest to southeast gradient of depth differences across the survey area - particularly considering the 2.5' resolution of the NGA surface and the expected differences between the geoid and MLLW (Figure 21).

There are three notable artifacts apparent in the data; two lines indicated on the eastern side of the survey show a heave artifact, and a dark red line shows vertical offsets from surrounding data. Upon review, it was found that the two lines on the eastern side of the survey had missing TrueHeave records for small segments of each line. This created heave artifacts of ± 0.5 meters that were present at MLLW but not on the ellipse. TrueHeave was retained for these lines in order to improve the quality of the majority of the data (see B.3.1 Corrections to Echo Soundings). The dark red line indicates vertical offsets of up to 0.4 meters from surrounding data. These offsets are only present on the ellipse.

Four lines were excluded from this difference surface due to problems with the application of SBETs (see C.3.3.1 Lines without SBETs).

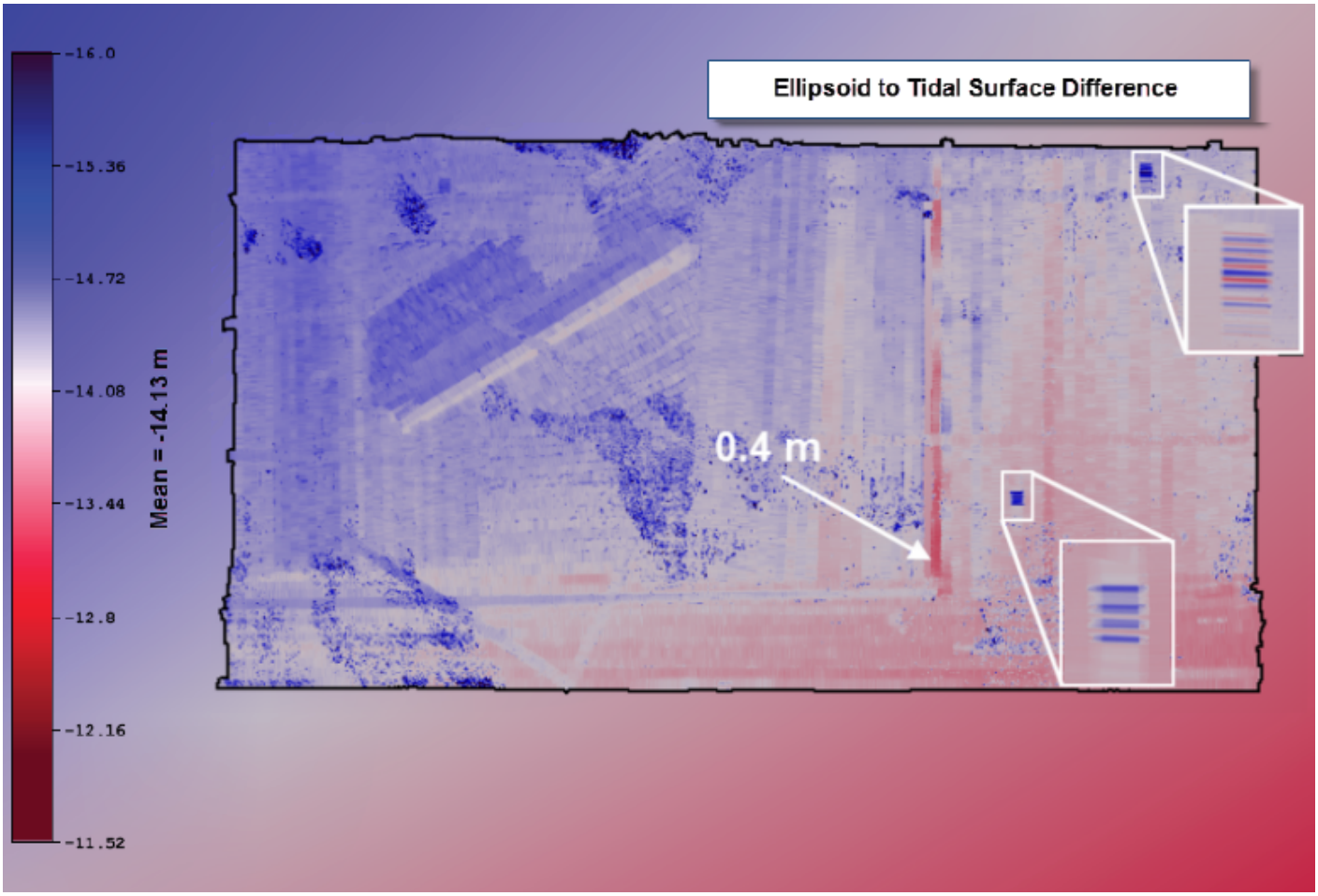


Figure 21: Difference surface between the ellipsoidally-referenced and tidally-referenced surfaces. Difference surface is overlaid on the EGM2008-WGS84 geoid-ellipsoid separation model with artifacts.

Sound Speed Artifacts

Despite casts being taken as frequently as every 15 minutes, with consideration to spatial distribution, sound speed artifacts were seen within the data. These artifacts occurred as "smiles" or "frowns" due to inadequately modeled refraction. In these areas, the outer beams were flagged as rejected to assist the gridding algorithm in bringing the surface back to better represent the true seafloor. Although this artifact exists within the data, it is within uncertainty standards specifications as stated within Section 5.1.3 of the HSSD. The Hydrographer finds that the data is adequate to supersede charted data (Figure 22).

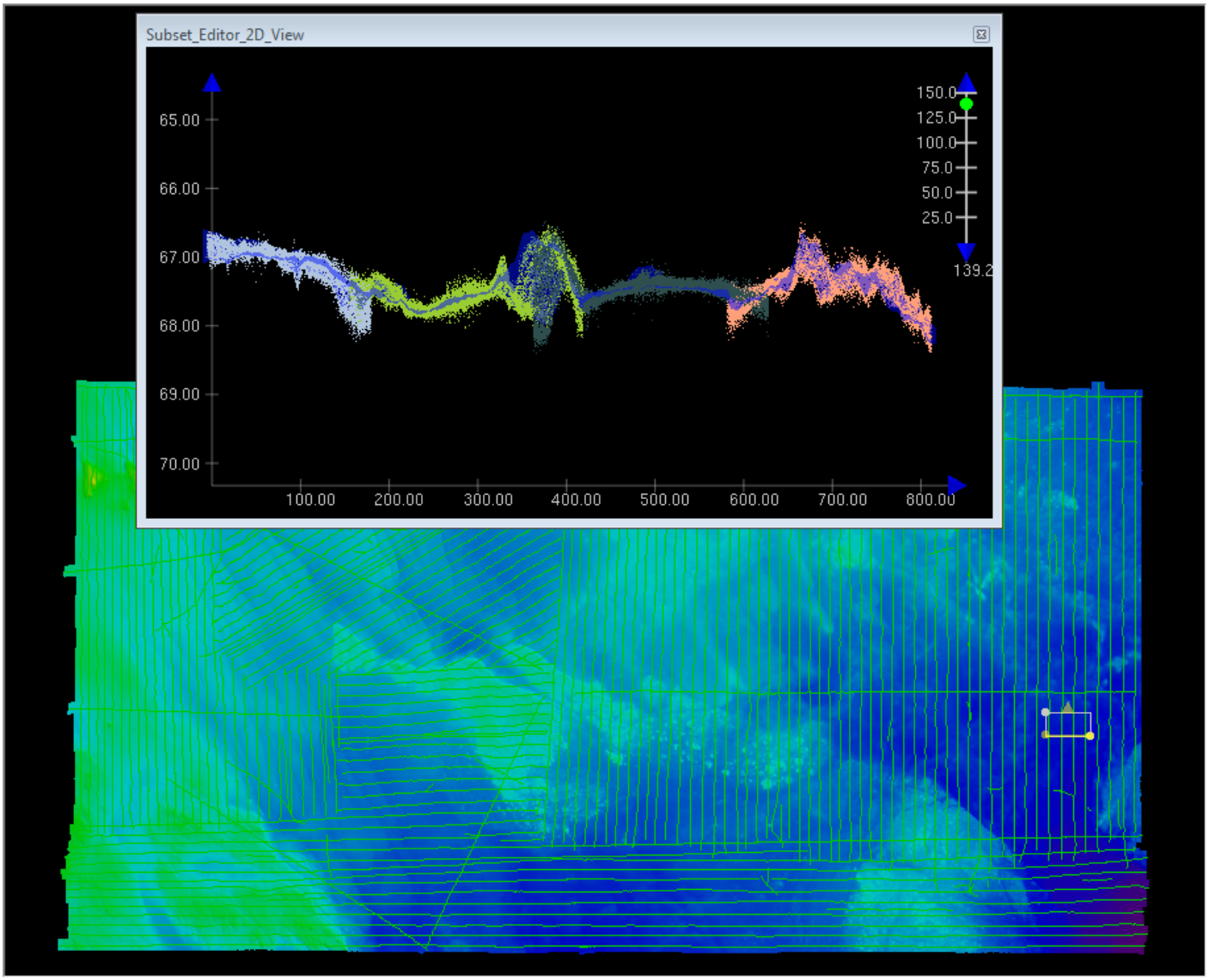


Figure 22: Example of sound speed artifact seen within H12595.

B.2.7 Sound Speed Methods

Sound Speed Cast Frequency: For casts collected on S221, profiles were acquired using the Rolls Royce MVP200 approximately every 15 minutes or when recommended by "CastTime", a cast frequency program developed at the University of New Hampshire. All other launch sound speed profiles were acquired using the SBE-19 and SBE-19 plus CTDs at discrete locations at least once every four hours. A concatenated sound speed casts file was created for each vessel and applied to all H12595 survey lines using the "Nearest in Distance within (4 hours) Time" profile selection method. A total of 282 CTD casts were used (Figure 23).

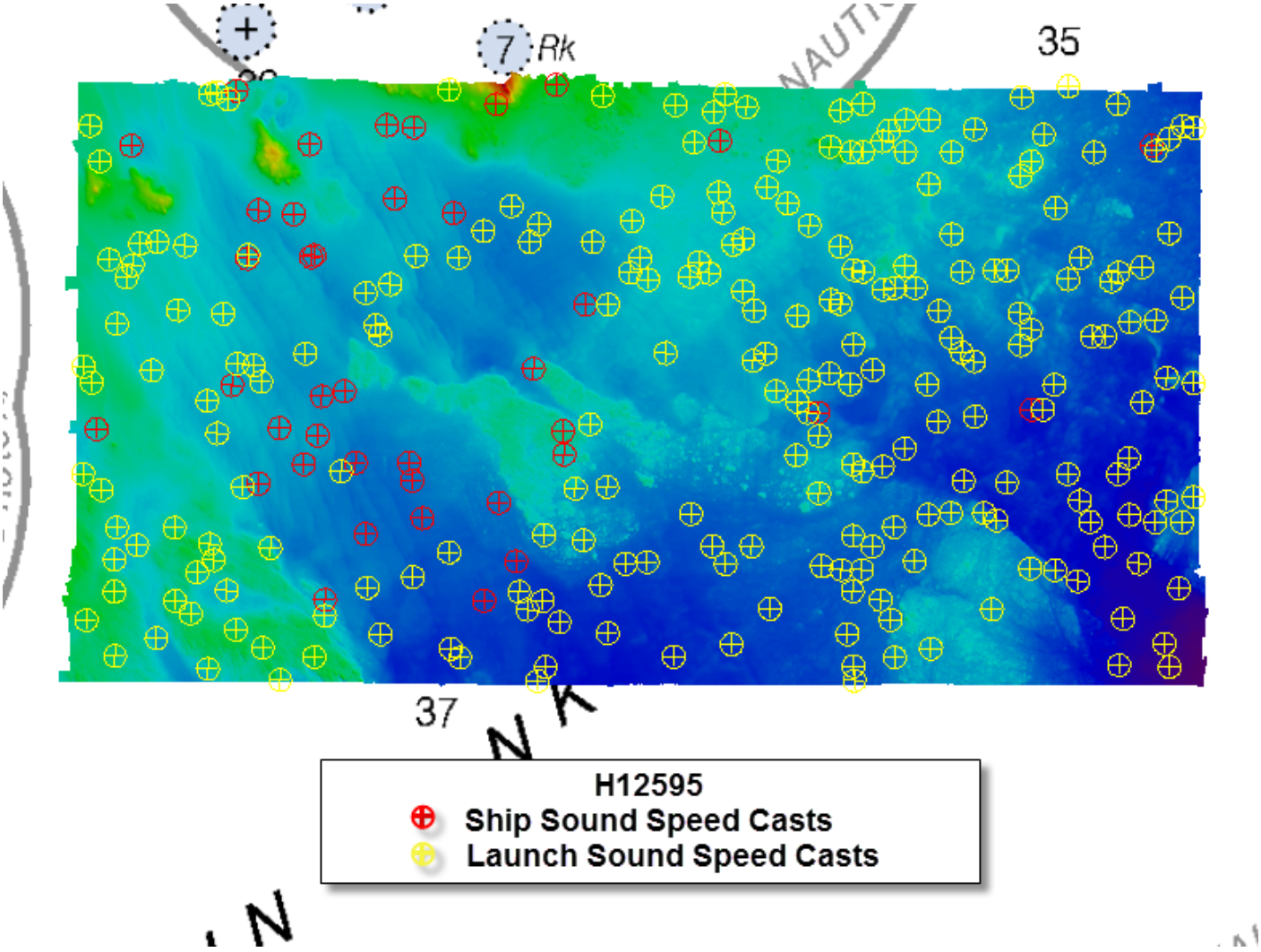


Figure 23: Distribution of sound speed profiles acquired for survey H12595.

B.2.8 Coverage Equipment and Methods

Modified EM710 Waterline Value:

A routine part of acquisition with the EM710 is a measurement of the ship's waterline immediately before commencing operations, or immediately after any evolution that is suspected to impact said waterline (e.g. the deployment/recovery of launches); see DAPR. On DN218, however, a waterline measurement was taken that was suspected to be in error (-4.556 meters), likely due to large seas at the time of observation. This measurement was not in keeping with historic values and led to a vertical shift in the data acquired by the ship on this day. To address this, the waterline measurement taken two days later and under similar loading conditions (-4.707 meters) was used for DN218. This change was observed to improve vertical agreement with surrounding data and is documented in the HVF.

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

Backscatter data was acquired, but not formally processed by RAINIER personnel. However, periodic spot checks were performed to ensure backscatter quality. Backscatter was logged as .7k or .ALL files and submitted to NGDC, but is not included with the data submitted to the Branch.

B.5 Data Processing

B.5.1 Software Updates

There were no software configuration changes after the DAPR was submitted.

The following Feature Object Catalog was used: NOAA Profile V_5_3_2

All data was processed using CARIS HIPS and SIPS 8.1.1. It should be noted that all Kongsberg EM710 data was intentionally processed without the Simrad Sound Velocity Correction (SVC) module. This was done in order to avoid a known error in the SVC module associated with reverse-mounted transducers. To accomplish this, a custom CARIS license file was used, which excluded the licensing for the Simrad SVC. For further details, refer to the DAPR.

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
H12595_1m	CUBE	1 meters	9 meters - 90 meters	NOAA_1m	Complete MBES
H12595_2m	CUBE	2 meters	9 meters - 90 meters	NOAA_2m	Complete MBES

Surface Name	Surface Type	Resolution	Depth Range	Surface Parameter	Purpose
H12595_4m	CUBE	4 meters	9 meters - 90 meters	NOAA_4m	Complete MBES
H12595_8m	CUBE	8 meters	9 meters - 90 meters	NOAA_8m	Complete MBES
H12595_1m_0to20m_Final	CUBE	1 meters	0 meters - 20 meters	NOAA_1m	Complete MBES
H12595_2m_18to40m__Final	CUBE	2 meters	18 meters - 40 meters	NOAA_2m	Complete MBES
H12595_4m_36to80m_Final	CUBE	4 meters	36 meters - 80 meters	NOAA_4m	Complete MBES
H12595_8m_72to100m_Final	CUBE	8 meters	72 meters - 100 meters	NOAA_8m	Complete MBES
H12595_Combined_8m	CUBE	8 meters	9 meters - 90 meters	NOAA_8m	Complete MBES

Table 9: Submitted Surfaces

Depth ranges for BASE surfaces, 4m Finalized, and 4m Combined surface (created in review for compilation) do not exceed 78m, and do not extend to 90m as stated in Table 9.
A 4 meter base surface was created during SAR review. The H12595_MB_4m_MLLW_Combined file was used for final compilation.

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.

Standard Vertical Control Methods Used:

Discrete Zoning

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

Station Name	Station ID
Sand Point, AK	945-9450

Table 10: NWLON Tide Stations

The following subordinate water level stations were established for this survey:

Station Name	Station ID
Bird Island, AK	945-9251

Table 11: Subordinate Tide Stations

File Name	Status
9459450.tid	Verified Observed
9459251.tid	Verified Observed

Table 12: Water Level Files (.tid)

File Name	Status
H12595CORF.zdf	Final

Table 13: Tide Correctors (.zdf or .tc)

A request for final approved tides was sent to N/OPS1 on 09/20/2013. The final tide note was received on 11/20/2013.

The tide station installed by RAINIER personnel on Bird Island, AK (945-9251) was used as the primary control for datum determination and as a source for water level reducers from 2348 UTC on 13 July (DN194) through 0436 UTC on 18 August (DN230). The National Water Level Observation Network (NWLON) tide station in Sand Point, AK (945-9450) served as a subordinate gauge during this time. During the time of acquisition when the Bird Island gauge was not operational, the NWLON tide station in Sand Point served as the primary gauge. A complete description of the vertical and horizontal control for this

survey can be found in the accompanying Horizontal and Vertical Control Report (HVCR), submitted under separate cover.

Tide note is appended to this report.

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 04N.

The following PPK methods were used for horizontal control:

Single Base

In conjunction with this project, a GPS base station was established by RAINIER personnel on Bird Island, AK; the station was operational from DN192 through DN207 and from DN222 through DN245. During the times when the Bird Island base station was not operational (DN208 through DN221 and DN246 through DN254), a Plate Boundary Observatory station on Chernabura Island (ChernaburaAK2008, AC12) was used for post-processing. There were two exceptions: On DN198 and DN199, there were several processing problems with the Bird Island base station; some of the data for these days was corrected using the Chernabura Island base station.

Vessel kinematic data was post-processed with Applanix POSPac and POSGNSS software using Single Base processing methods described in the DAPR.

Differential Global Positioning System (DGPS) correctors were used for horizontal control when the post-processing methods stated above were not possible (see C.3 Additional Horizontal or Vertical Control Issues).

The following user installed stations were used for horizontal control:

HVCR Site ID	Base Station ID
Bird Island	N/A

Table 14: User Installed Base Stations

The following DGPS Stations were used for horizontal control:

DGPS Stations
Kodiak, AK (313 kHz)
Cold Bay, AK (289 kHz)

Table 15: USCG DGPS Stations

C.3 Additional Horizontal or Vertical Control Issues

3.3.1 Lines without SBETs

SBETs could not be applied to Lines 0048_20130724_060218_Rainier and 0047_20130724_053305_Rainier acquired from vessel S221 DN205, and lines 2803_2013RA2221742 and 2803_2013RA2221802 acquired from vessel 2803 DN222 due to time extents not overlapping with the lines. DGPS correctors were retained for these lines. Inspection of the data in Subset Editor shows agreement with surrounding data.

D. Results and Recommendations

D.1 Chart Comparison

A comparison was made between survey H12595 and Chart 16540 using CARIS CUBE surfaces and a sounding layer. All data from H12595 should supersede charted data.

D.1.1 Raster Charts

The following are the largest scale raster charts, which cover the survey area:

Chart	Scale	Edition	Edition Date	LNM Date	NM Date
16540	1:300000	13	10/2010	10/12/2010	10/30/2010

Table 16: Largest Scale Raster Charts

16540

Comparison was performed with Chart 16540 (1:300000) using a CARIS sounding layer based on the combined 4-meter CUBE surface from H12595. During the comparison, it was observed that the charted rocks were not present.

The northern portion of the survey has a least depth of 5 fathoms just south of the charted 7 fathom sounding. In addition, there are several areas shoaler than charted, the shoalest being 15 fathoms. These shoals do not pose a danger to navigation (Figure 24).

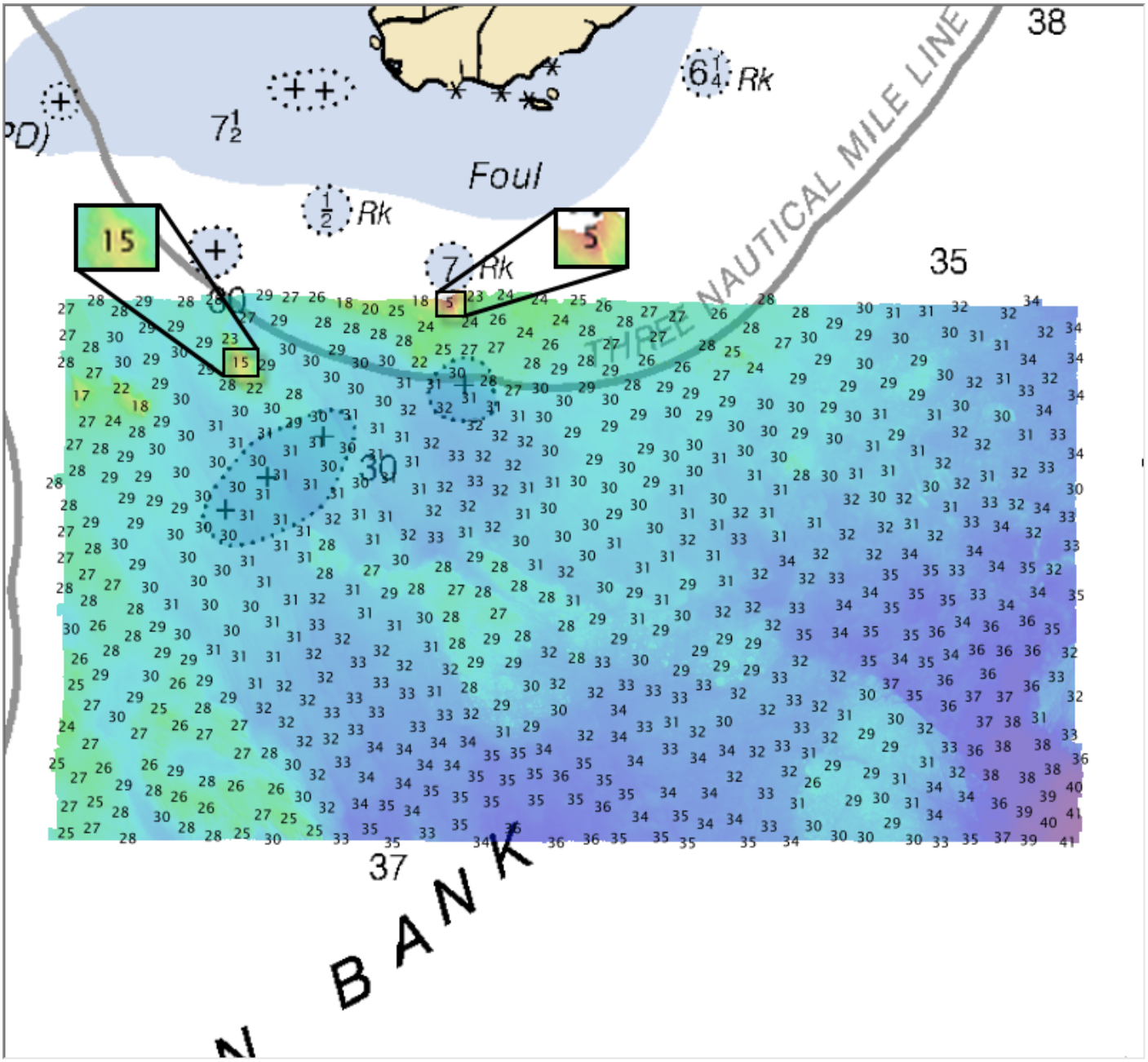


Figure 24: Chart 16540 depth comparison in fathoms.

Table 16 indicates that Notice to Mariners and Local Notice to Mariners were not applied to chart 16540 prior to comparison with field work by the hydrographer. The chart used for comparison during office review and compilation was corrected through LNTM 09/13/2014 and NTM 9/23/2014.

D.1.2 Electronic Navigational Charts

The following are the largest scale ENCs, which cover the survey area:

ENC	Scale	Edition	Update Application Date	Issue Date	Preliminary?
US3AK50M	1:300000	17	06/29/2011	06/29/2011	NO

Table 17: Largest Scale ENCs

US3AK50M

ENC US3AK50M was digitized from Chart 16540 and coincides with the raster. The depths on the ENC match the raster, and the comparison between survey H12595 and the ENC is equivalent to the preceding comparison with Chart 16540. The Hydrographer recommends that a sounding set derived from survey H12595 supersede charted depths.

D.1.3 AWOIS Items

No AWOIS items were assigned for this survey.

D.1.4 Maritime Boundary Points

No Maritime Boundary Points were assigned for this survey.

D.1.5 Charted Features

No charted features exist for this survey.

D.1.6 Uncharted Features

No uncharted features exist for this survey.

D.1.7 Dangers to Navigation

No Danger to Navigation Reports were submitted for this survey.

D.1.8 Shoal and Hazardous Features

No shoals or potentially hazardous features exist for this survey.

D.1.9 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.1.10 Bottom Samples

Bottom samples were acquired in accordance with the Project Instructions and the HSSD. Twelve proposed bottom sample locations were included in the Project Reference File; all twelve samples were collected. All samples were labeled in accordance with the HSSD with S-57 attribution, and can be found in the Final Feature File (Figure 25).

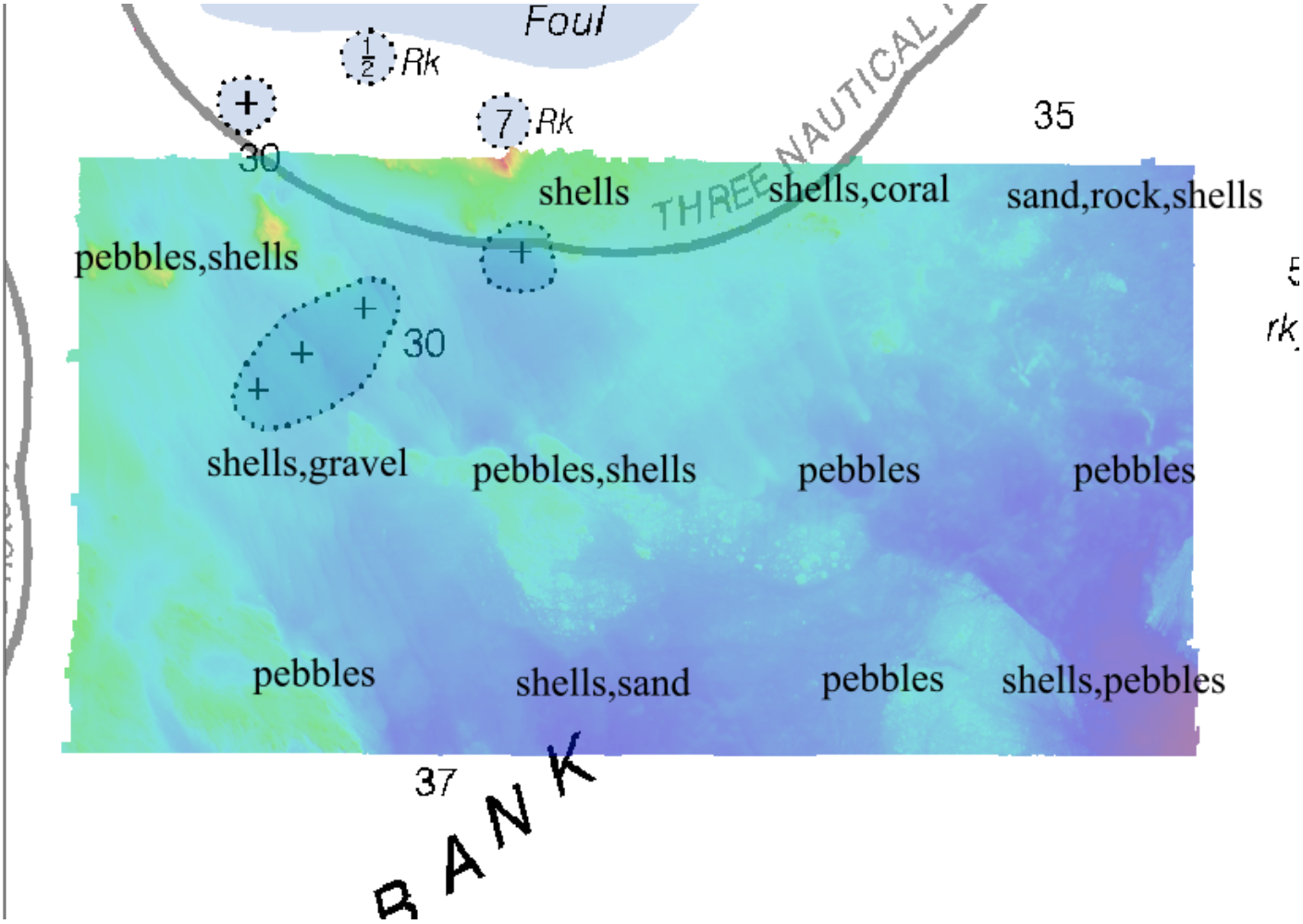


Figure 25: Bottom sample locations.

D.2 Additional Results

D.2.1 Shoreline

Shoreline was not assigned in the Hydrographic Survey Project Instructions or Statement of Work.

D.2.2 Prior Surveys

No prior survey comparisons exist for this survey.

D.2.3 Aids to Navigation

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

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 Ferry Routes and Terminals

No ferry routes or terminals exist for this survey.

D.2.7 Platforms

No platforms exist for this survey.

D.2.8 Significant Features

No significant features 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 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 Manual, 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
Richard T. Brennan, CDR/NOAA	Commanding Officer, NOAA Ship RAINIER	12/11/2013	Richard T. Brennan 2013.12.12 10:58:28 -08'00'
Meghan McGovern, LT/NOAA	Field Operations Officer, NOAA Ship RAINIER	12/11/2013	Date: 2013.12.11 17:13:26 -08'00'
James B. Jacobson	Chief Survey Technician, NOAA Ship RAINIER	12/11/2013	James Jacobson I have reviewed this document 2013.12.11 15:45:01 -08'00'
J.C. Clark, ENS/NOAA	Junior Officer, NOAA Ship RAINIER	12/11/2013	JC Clark 2013.12.11 15:43:04 -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	Local Notice to Mariners
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

Acronym	Definition
PRF	Project Reference File
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 Porpagated 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

TIDE NOTE FOR HYDROGRAPHIC SURVEY

DATE : November 18, 2013

HYDROGRAPHIC BRANCH: Pacific
HYDROGRAPHIC PROJECT: OPR-P183-RA-13
HYDROGRAPHIC SHEET: H12595

LOCALITY: 5NM South of Simeonof Island, Shumagin Islands, AK
TIME PERIOD: July 17, 2013 - September 4, 2013

TIDE STATION USED: 945-9450 Sand Point, AK
Lat. 55° 19.9'N Long. 160° 30.3' W
PLANE OF REFERENCE (MEAN LOWER LOW WATER): 0.000 meters
HEIGHT OF HIGH WATER ABOVE PLANE OF REFERENCE: 1.988 meters

TIDE STATION USED: 945-9251 Bird Island, AK
Lat. 54° 50.1' N Long. 159° 45.6' W
PLANE OF REFERENCE (MEAN LOWER LOW WATER): 0.000 meters
HEIGHT OF HIGH WATER ABOVE PLANE OF REFERENCE: 1.928 meters

REMARKS: RECOMMENDED ZONING
Use zone(s) identified as: SWA204, SWA206

Refer to attachments for zoning information.

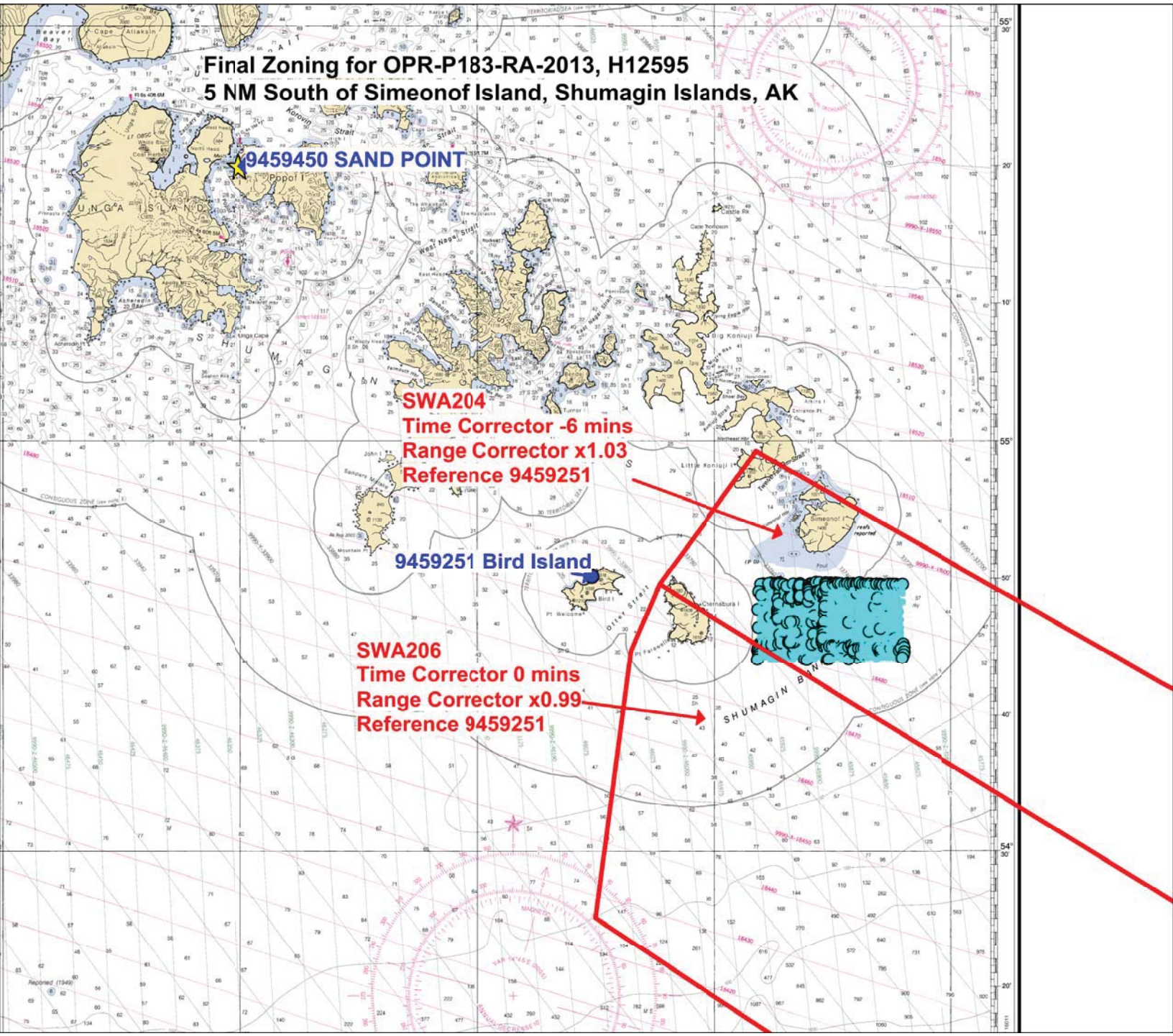
Note 1: Provided time series data are tabulated in metric units (meters), relative to MLLW and on Greenwich Mean Time on the 1983-2001 National Tidal Datum Epoch (NTDE).

Note 2: Use tide data from the appropriate station with applicable zoning correctors for each zone according to the order in which they are listed in the Tidezone corrector file (*.ZDF). For example, tide station one (TS1) would be the first choice for an applicable zone followed by TS2, etc. when data are not available.

HOVIS.GERALD.THOMAS.1365860250

Digitally signed by HOVIS.GERALD.THOMAS.1365860250
DN: c=US, o=U.S. Government, ou=DoD, ou=PKI, ou=OTHER, cn=HOVIS.GERALD.THOMAS.1365860250
Date: 2013.11.19 12:07:25 -05'00'

CHIEF, PRODUCTS AND SERVICES BRANCH


Final Zoning for OPR-P183-RA-2013, H12595
5 NM South of Simeonof Island, Shumagin Islands, AK
9459450 SAND POINT
SWA204
Time Corrector -6 mins
Range Corrector x1.03
Reference 9459251
9459251 Bird Island
SWA206
Time Corrector 0 mins
Range Corrector x0.99
Reference 9459251
UNGA ISLAND
SHUMAGIN ISLANDS
Simeonof I
Bird I
Big Koniuji
Little Koniuji I
Chernabura I
SHUMAGIN BANK

APPROVAL PAGE

H12595

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 NGDC for archive

- H12595_DR.pdf
- Collection of depth varied resolution BAGS
- Processed survey data and records
- H12595_GeoImage.pdf

The survey evaluation and verification has been conducted according current OCS Specifications.

Approved:_____

Peter Holmberg
Cartographic Team Lead, Pacific Hydrographic Branch

The survey has been approved for dissemination and usage of updating NOAA's suite of nautical charts.

Digitally signed by
EVANS.BENJAMIN.K.1237217094
Reason: I am approving this document
Date: 2014.11.19 11:26:37 -08'00'

Approved:_____

CDR, Benjamin K. Evans, NOAA
Chief, Pacific Hydrographic Branch