H12741

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

DESCRIPTIVE REPORT

Type of Survey:	Navigable Area
Registry Number:	H12741

LOCALITY

State(s):	Alaska
General Locality:	West Prince of Wales
Sub-locality:	Cape Bartolome to Port Santa Cruz

2015

CHIEF OF PARTY
CDR David J. Zezula, NOAA

LIBRARY & ARCHIVES

Date:

U.S. DEPARTMENT OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION	REGISTRY NUMBER:
HYDROGRAPHIC TITLE SHEET	**H12741**

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:	**West Prince of Wales**
Sub-Locality:	**Cape Bartolome to Port Santa Cruz**
Scale:	**20000**
Dates of Survey:	**09/23/2015 to 10/06/2015**
Instructions Dated:	**03/02/2015**
Project Number:	**OPR-O190-FA-15**
Field Unit:	**NOAA Ship *Fairweather***
Chief of Party:	**CDR David J. Zezula, NOAA**
Soundings by:	**Multibeam Echo Sounder**
Imagery by:	**Multibeam Echo Sounder Backscatter**
Verification by:	**Atlantic 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 Envitronmental Information (NCEI) and can be retrieved via http://www.ncei.noaa.gov/.

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Descriptive Report to Accompany Survey H12741

Project: OPR-O190-FA-15

Locality: West Prince of Wales

Sublocality: Cape Bartolome to Port Santa Cruz

Scale: 1:20000

September 2015 - October 2015

NOAA Ship *Fairweather*

Chief of Party: CDR David J. Zezula, NOAA

A. Area Surveyed

The survey area is located in Prince of Wales, AK, within the sub locality of Cape Bartolome to Port Santa Cruz.

A.1 Survey Limits

Data were acquired within the following survey limits:

Northwest Limit	Southeast Limit
55° 17' 47.17" N 133° 39' 16.85" W	55° 10' 35.2" N 133° 24' 13.28" W

Table 1: Survey Limits

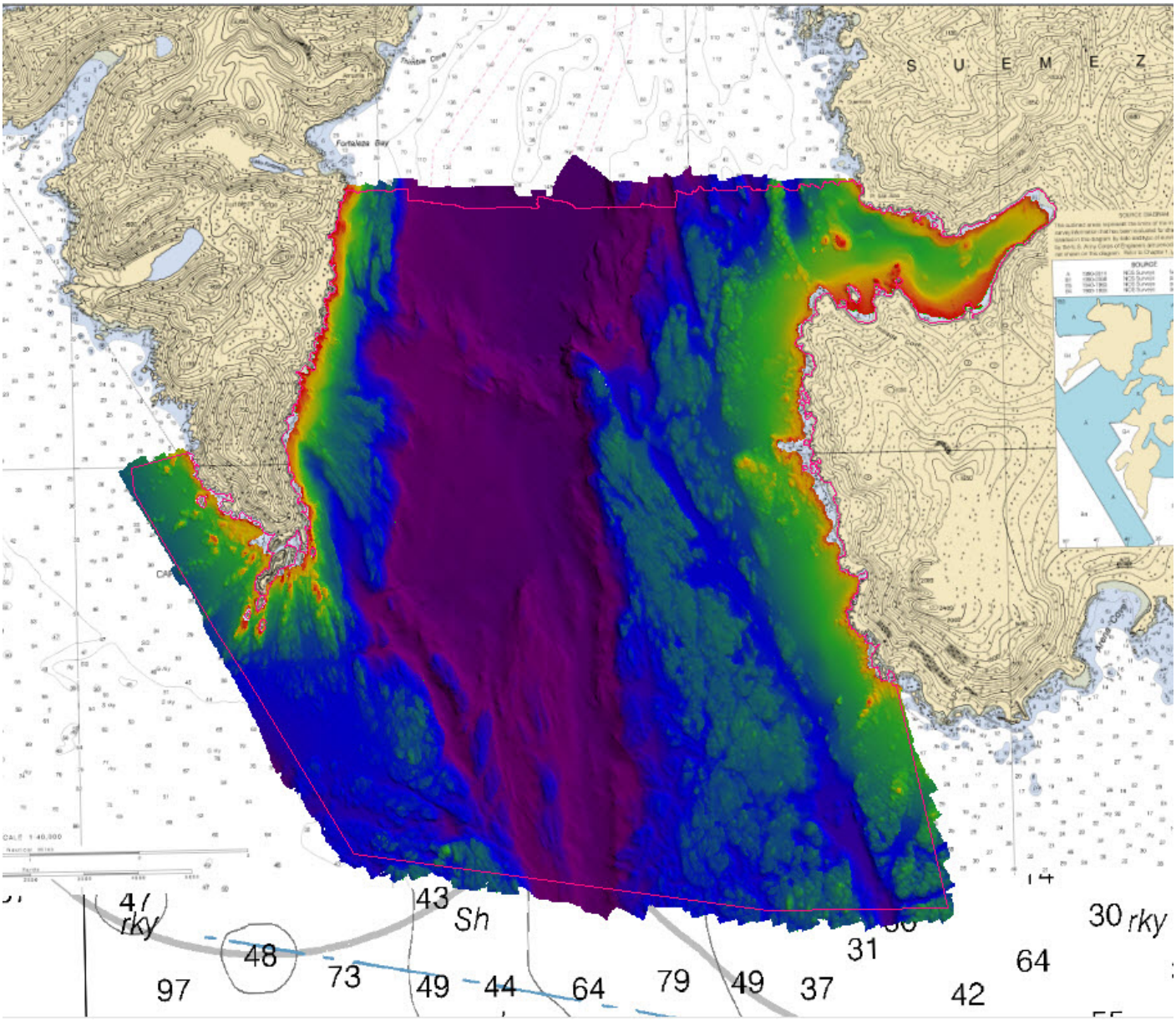


Figure 1: H12741 Survey Limits

Survey limits were acquired in accordance with the requirements in the Project Instructions and the Hydrographic Survey Specifications and Deliverables (HSSD) dated May 2015.

A.2 Survey Purpose

The purpose of this project is to provide contemporary surveys to update National Ocean Service (NOS) nautical charting products. This area is considered navigationally significant and of critical survey priority.

A.3 Survey Quality

The entire survey is adequate to supersede previous data.

A.4 Survey Coverage

The following table lists the coverage requirements for this survey as assigned in the project instructions:

Water Depth	Coverage Required
Inshore limit to 8 meters water depth	Either complete multi-beam echo sounder (MBES) coverage with backscatter, or set line spacing (single beam echo sounder)SBES/MBES (100m spacing in restricted areas and around rocky points, 200m along open coasts).
Greater than 8 meters water depth	Complete MBES with backscatter

All coverage for survey H12741 was acquired using complete MBES with backscatter. In some areas, such as those around Cape Bartolome (Figure 2) and the west coast of Suemez Island (Figure 3), coverage to either the 4m curve or the sheet limit was not attained due to factors such as kelp, breakers, and sea state.

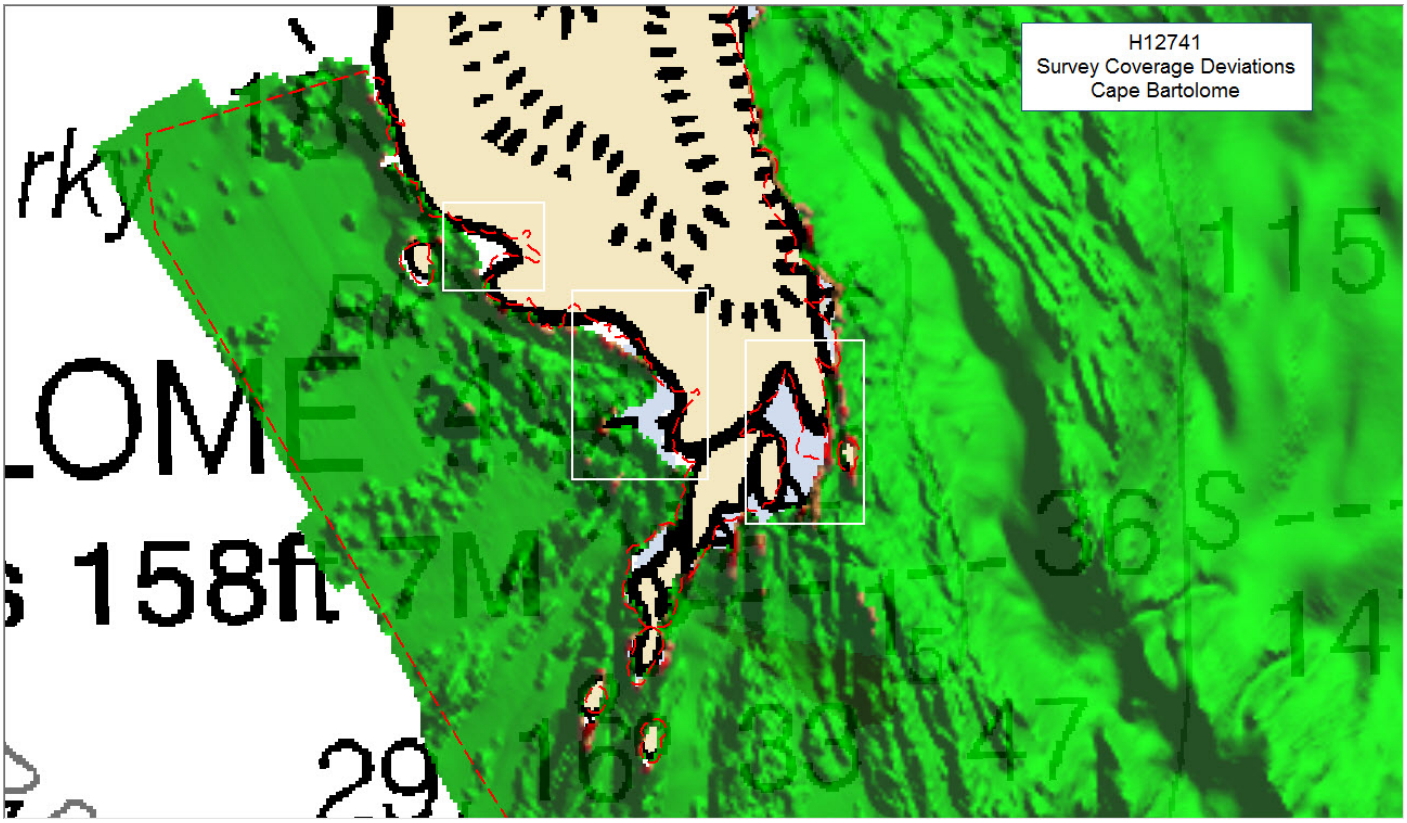


Figure 2: H12741 Coverage Deviations Cape Bartolome

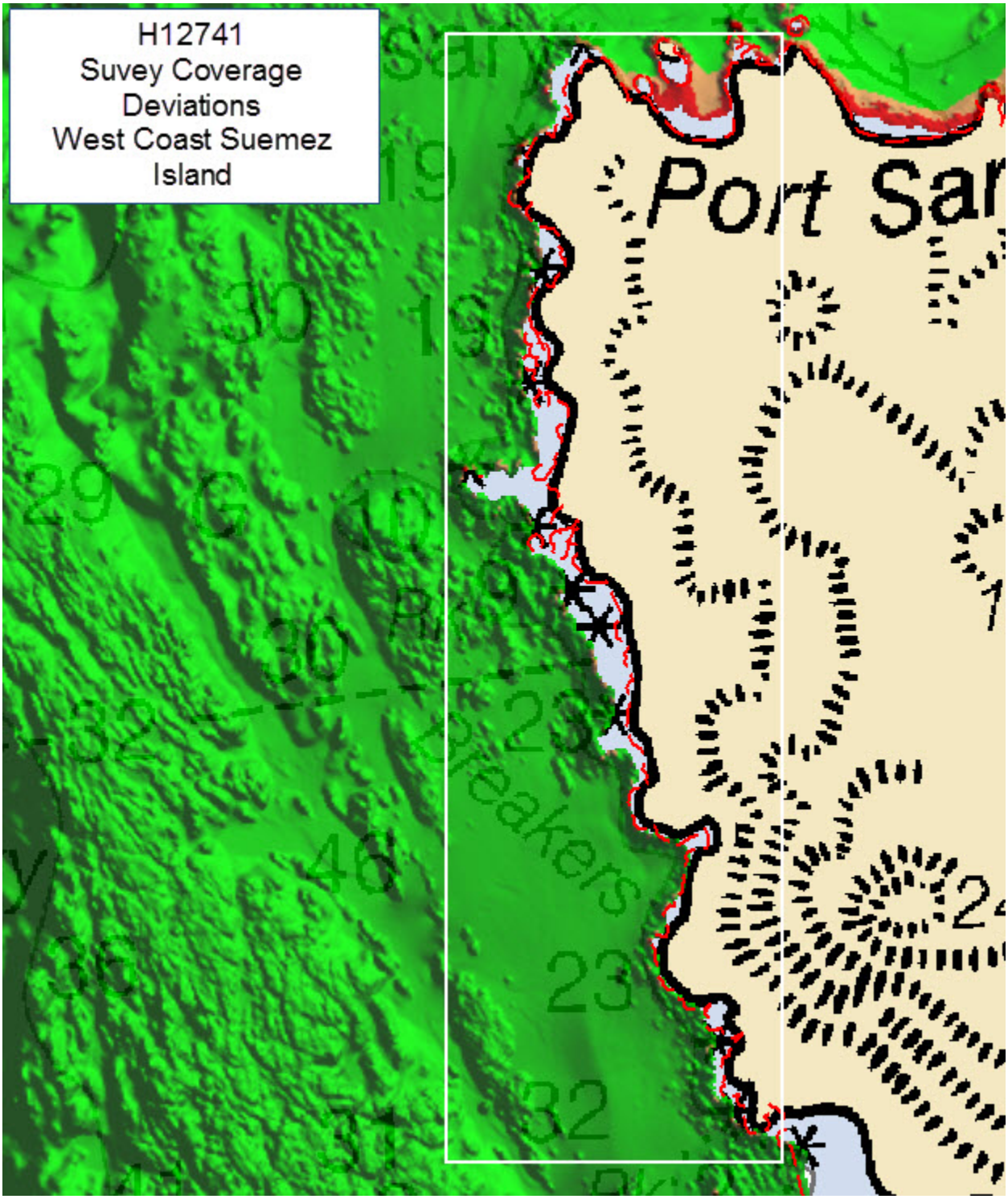


Figure 3: H12741 Coverage Deviations Suemez Island

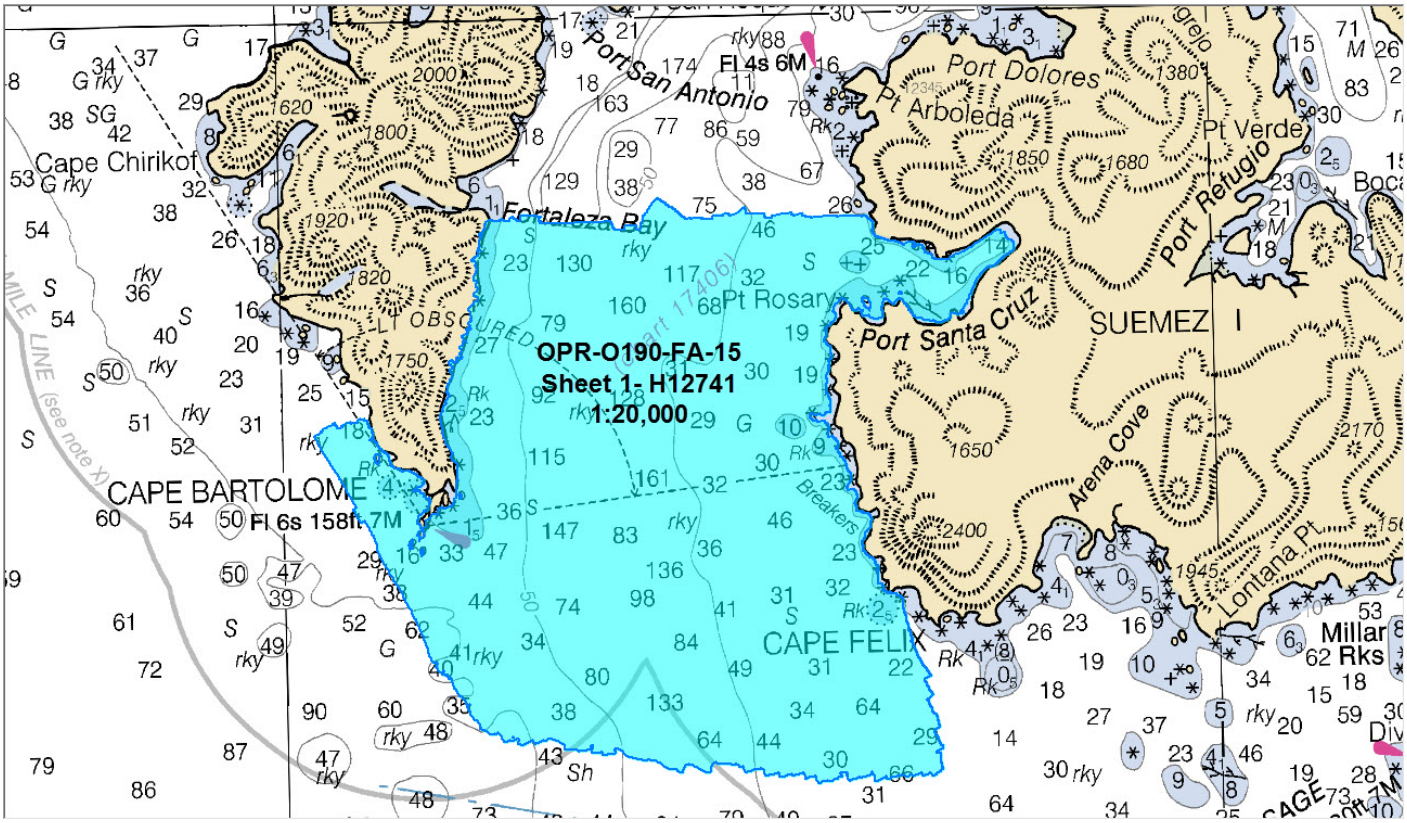


Figure 4: H12741 Survey Outline

A.5 Survey Statistics

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

	HULL ID	*S220*	*2808*	*2807*	*2806*	*2805*	*Total*
LNM	SBES Mainscheme	0	0	0	0	0	0
	MBES Mainscheme	206.65	77.75	2.28	79.02	46.69	412.39
	Lidar Mainscheme	0	0	0	0	0	0
	SSS 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	25.58	4.13	0	0	6.49	36.2
	Lidar Crosslines	0	0	0	0	0	0
Number of Bottom Samples							15
Number Maritime Boundary Points Investigated							1
Number of DPs							14
Number of Items Investigated by Dive Ops							0
Total SNM							37.22

Table 2: Hydrographic Survey Statistics

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

Survey Dates	Day of the Year
09/23/2015	266
09/24/2015	267

Survey Dates	Day of the Year
09/25/2015	268
09/26/2015	269
09/27/2015	270
09/29/2015	272
10/08/2015	281
10/09/2015	282
10/15/2015	288
10/24/2015	297
10/25/2015	298
11/04/2015	308
11/05/2015	309

Table 3: 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*	*2808*	*2807*	*2806*	*2805*
LOA	70.4 meters	8.64 meters	8.64 meters	8.64 meters	8.64 meters
Draft	4.7 meters	1.12 meters	1.12 meters	1.12 meters	1.12 meters

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 SV1	MBES
Kongsberg	EM710	MBES
Seabird	19plus	Conductivity, Temperature, and Depth Sensor
Reson	SVP70	Sound Speed System
Reson	SVP71	Sound Speed System
Applanix	POS/MV V4	Positioning and Attitude System
Rolls Royce	MVP200	Conductivity, Temperature, and Depth Sensor

Table 5: Major Systems Used

B.2 Quality Control

B.2.1 Crosslines

Crosslines acquired for this survey totaled 8.78% of mainscheme acquisition.

Crosslines were collected, processed and compared in accordance with section 5.2.4.3 of the HSSD. All crosslines were filtered 45 degrees from nadir on the port and starboard sides with the exception of two crosslines: 2015X_2662327 and 2015X_2702339 whose outer beams are accepted to augment coverage requirements of both sheet limits and mainscheme holiday coverage. See Figures 12 and 13.

Surface Differencing in CARIS HIPS and SIPS was used to assess crossline agreement with main scheme lines. A difference surface was created from a 16 meter crossline surface. Differences in crossline to main scheme lines are caused by steep slope and the rocky nature of the seafloor. Detailed graphical views can be seen in Figures 5 through 9 . See Figure 10 for a statistical analysis of the difference surface that indicates 95% of all nodes have a maximum deviation of +/- 2.15 meters with a mean deviation of 0.11 meters . This deviation falls within the total allowable uncertainties for these depths as seen in Figure 11 where green represents data within allowable uncertainties and red represents data exceeding allowable uncertainty. The difference surface is submitted digitally in the Separates/II Digital Data folder.

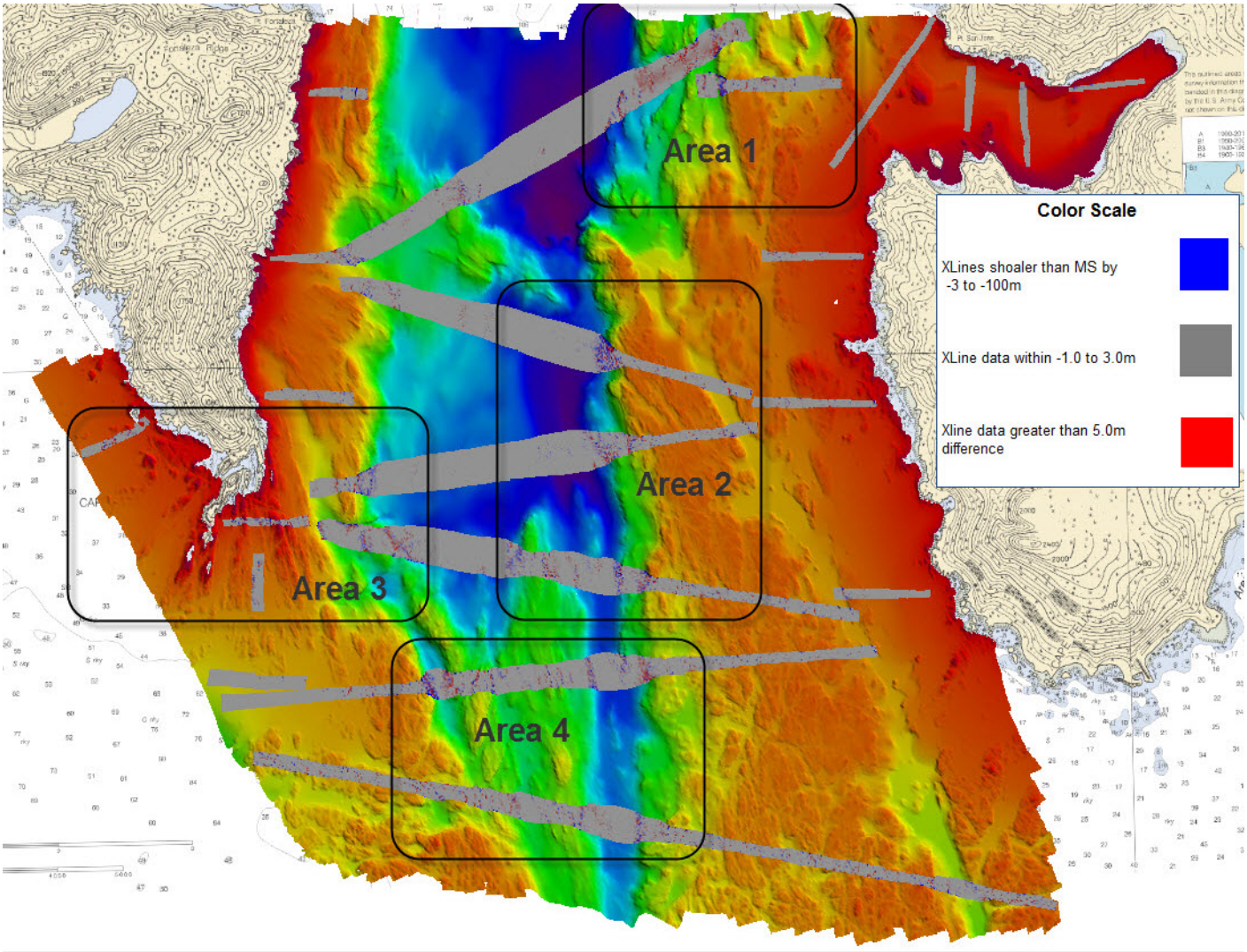


Figure 5: H12741 Crossline Difference Graphical Overview

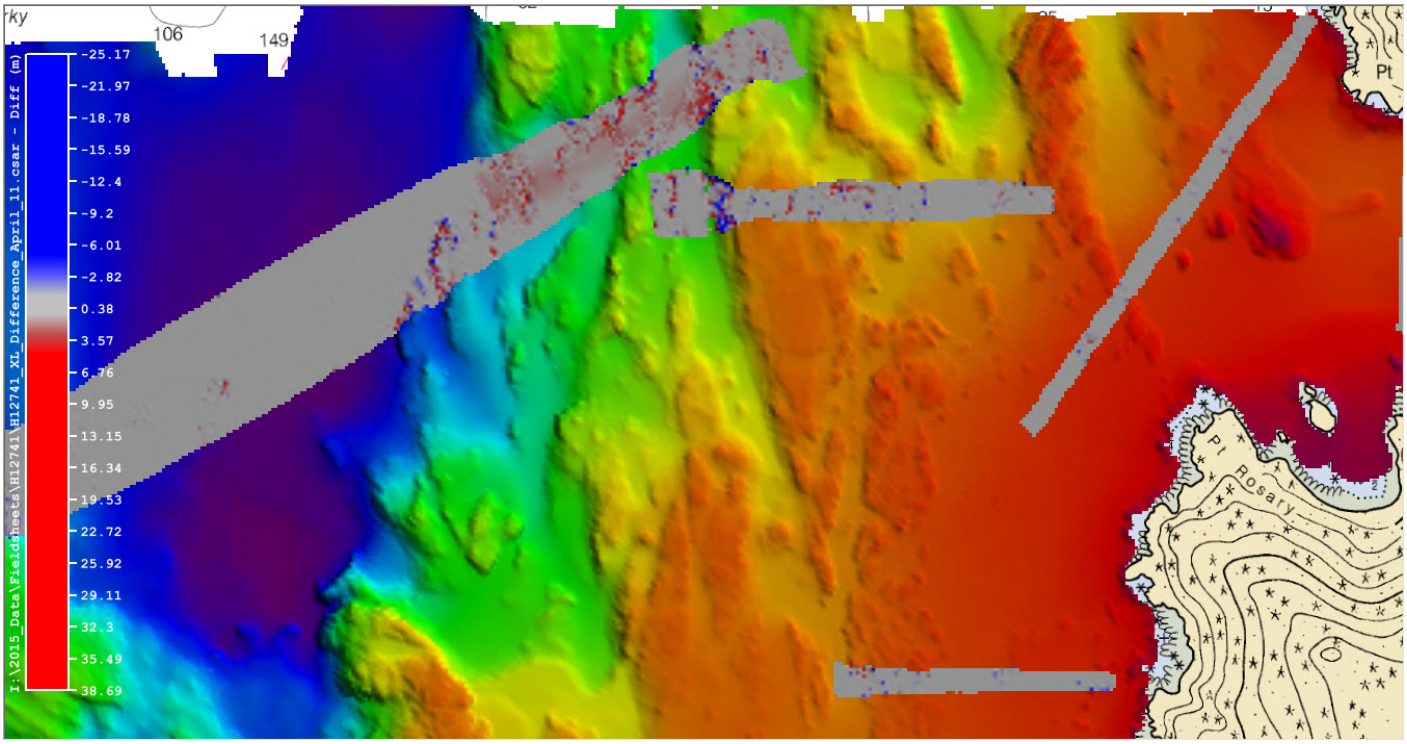


Figure 6: H12741 Graphical Zoom of Area 1 Crossline Differences

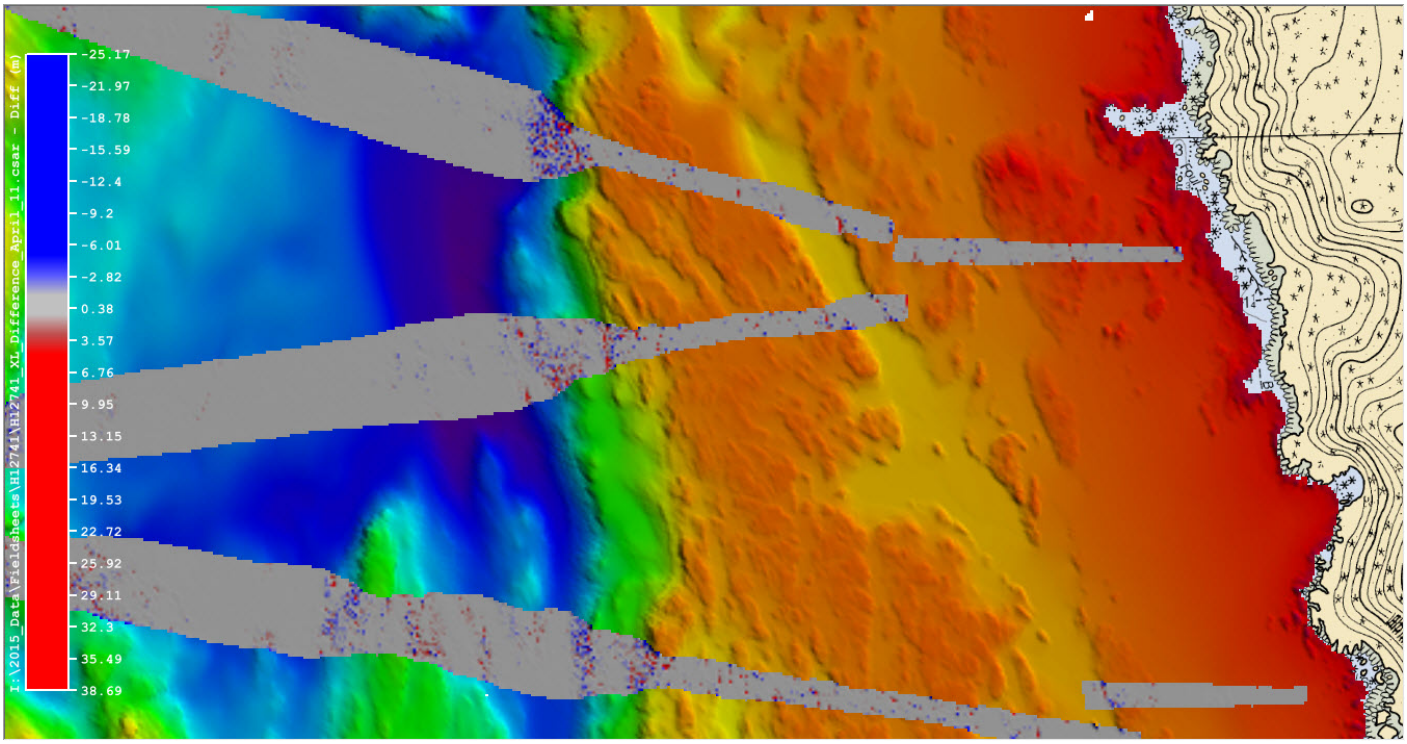


Figure 7: H12741 Graphical Zoom of Area 2 Crossline Differences

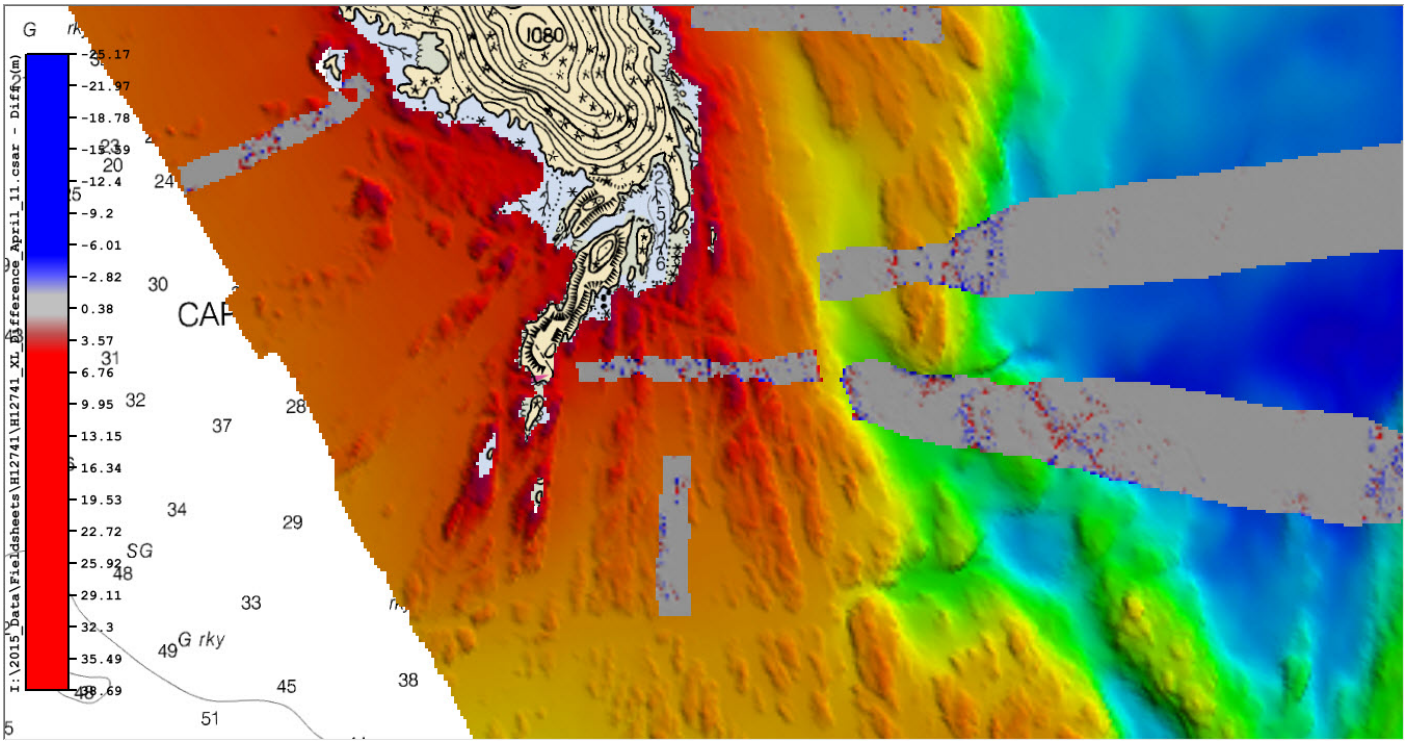


Figure 8: H12741 Graphical Zoom of Area 3 Crossline Differences

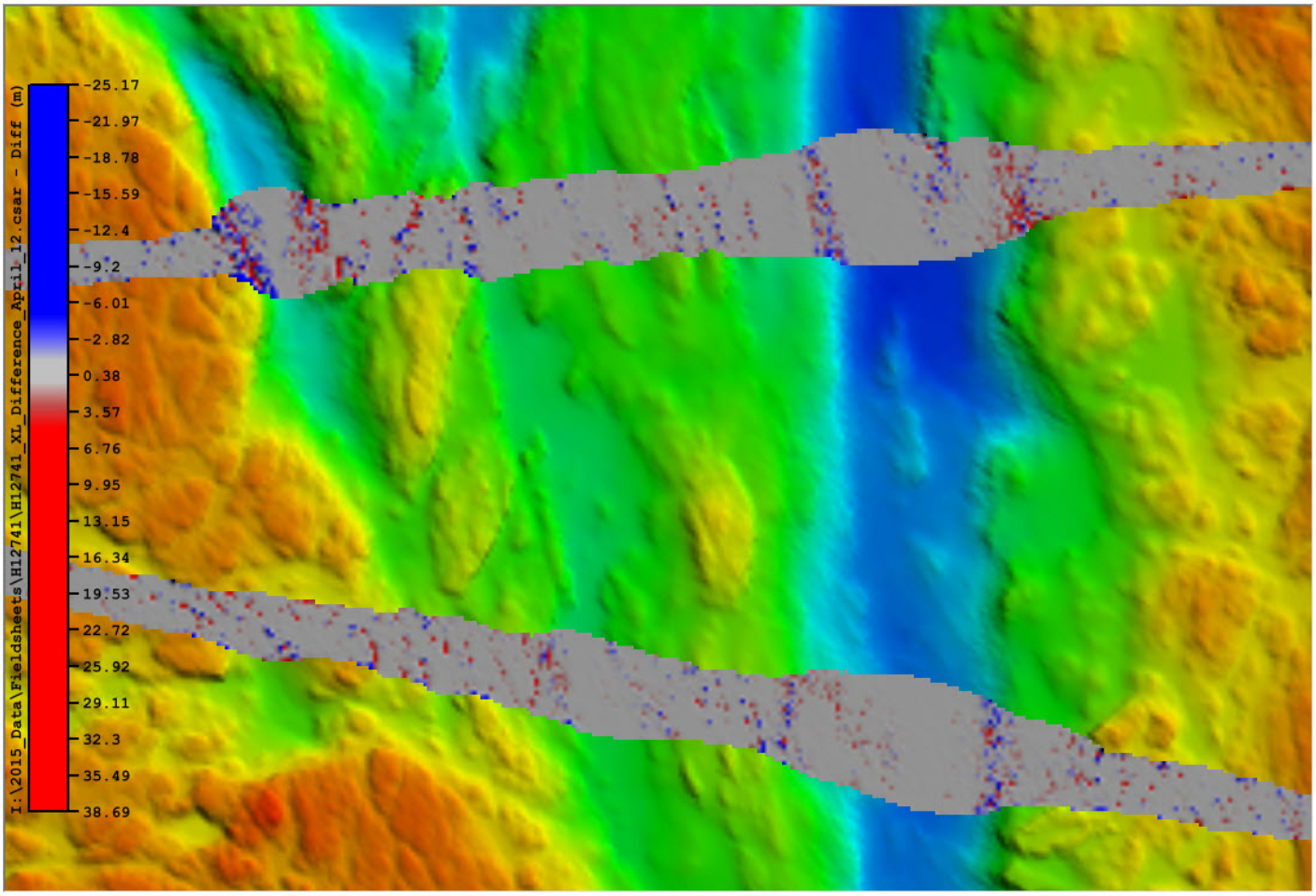
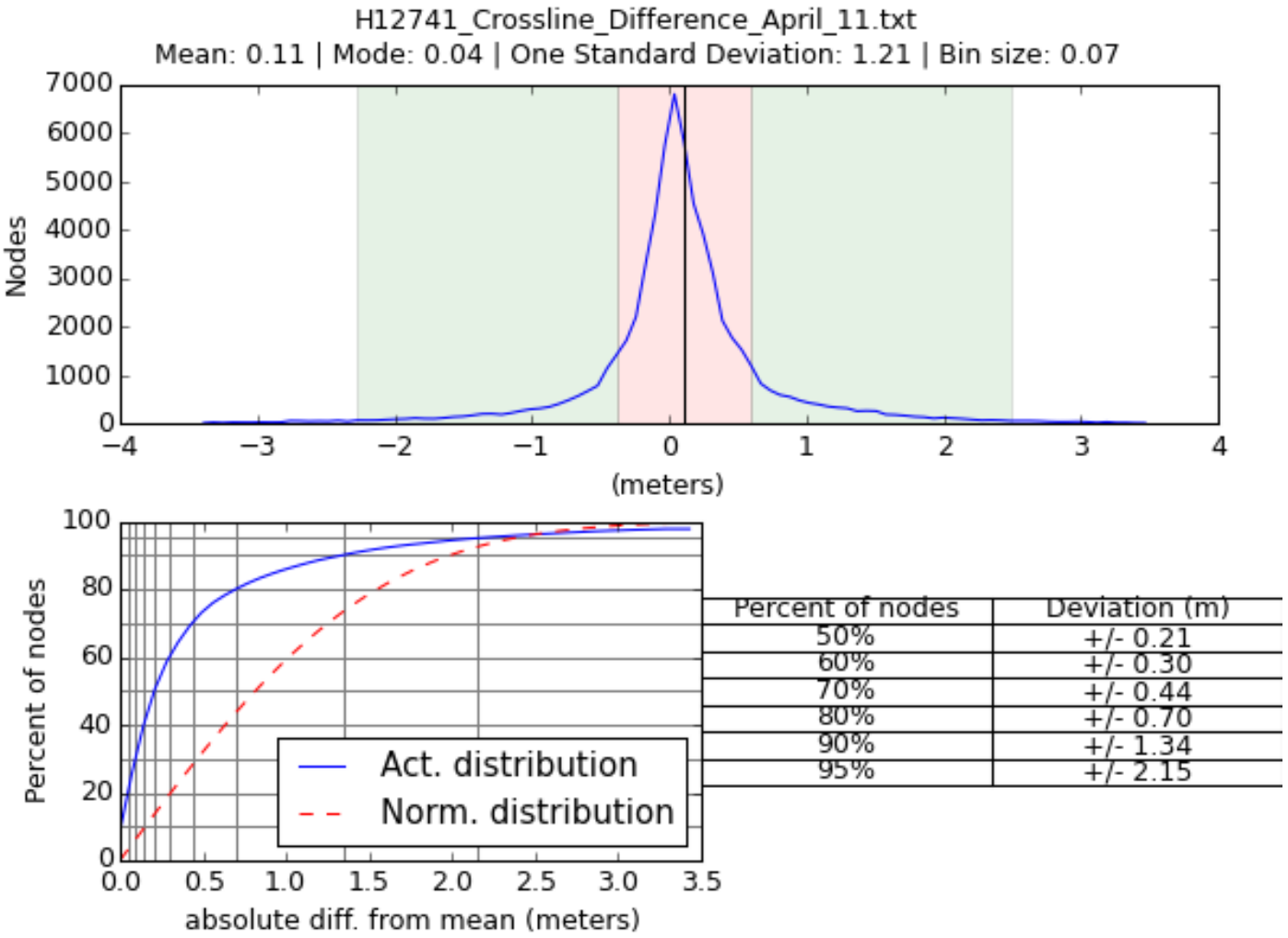


Figure 9: H12741 Graphical Zoom of Area 4 Crossline Differences



Percent of nodes	Deviation (m)
50%	+/- 0.21
60%	+/- 0.30
70%	+/- 0.44
80%	+/- 0.70
90%	+/- 1.34
95%	+/- 2.15

Figure 10: H12741 Main-scheme and Crossline Difference Statistics

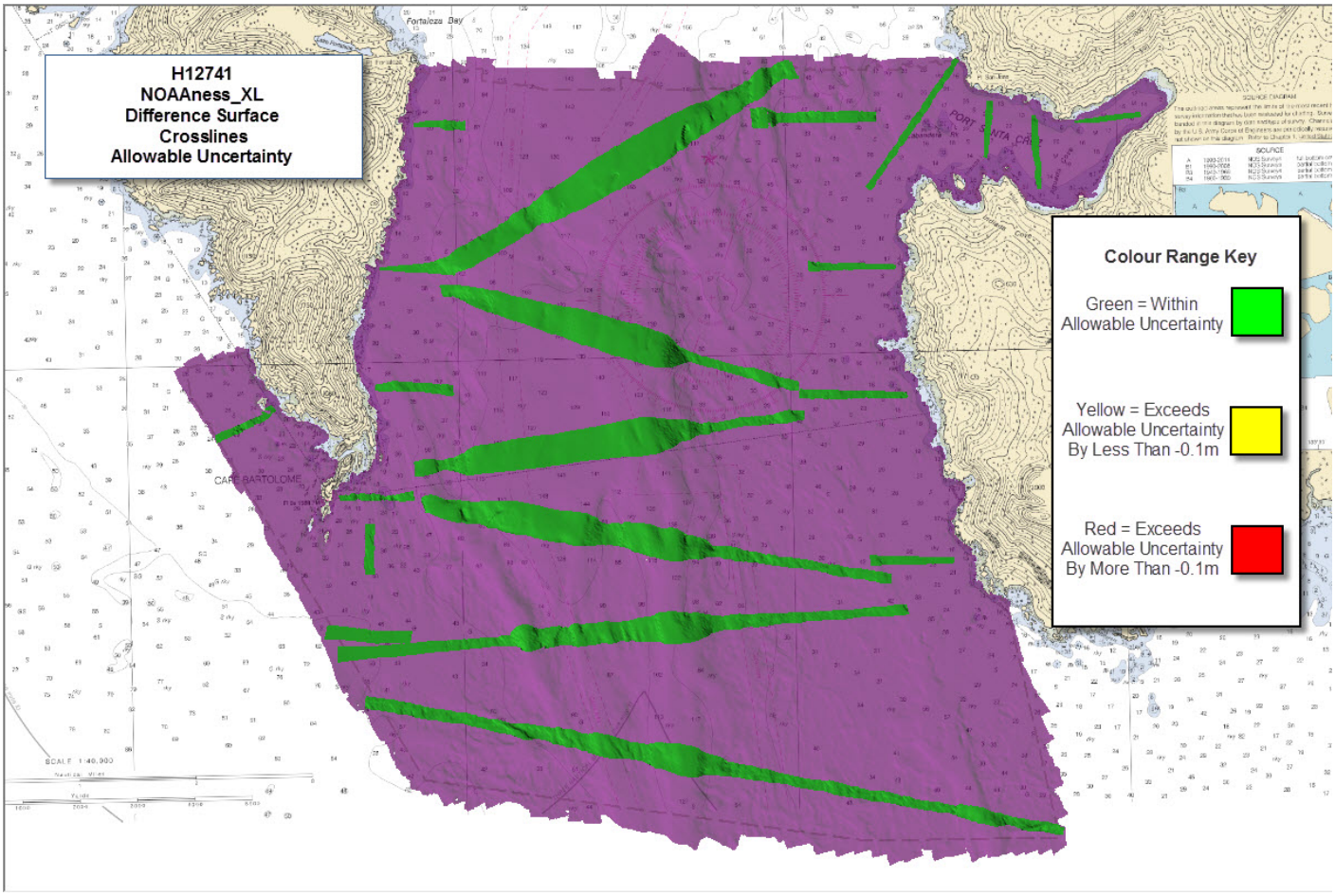


Figure 11: H12741 Crossline Surface Showing Allowable Uncertainty

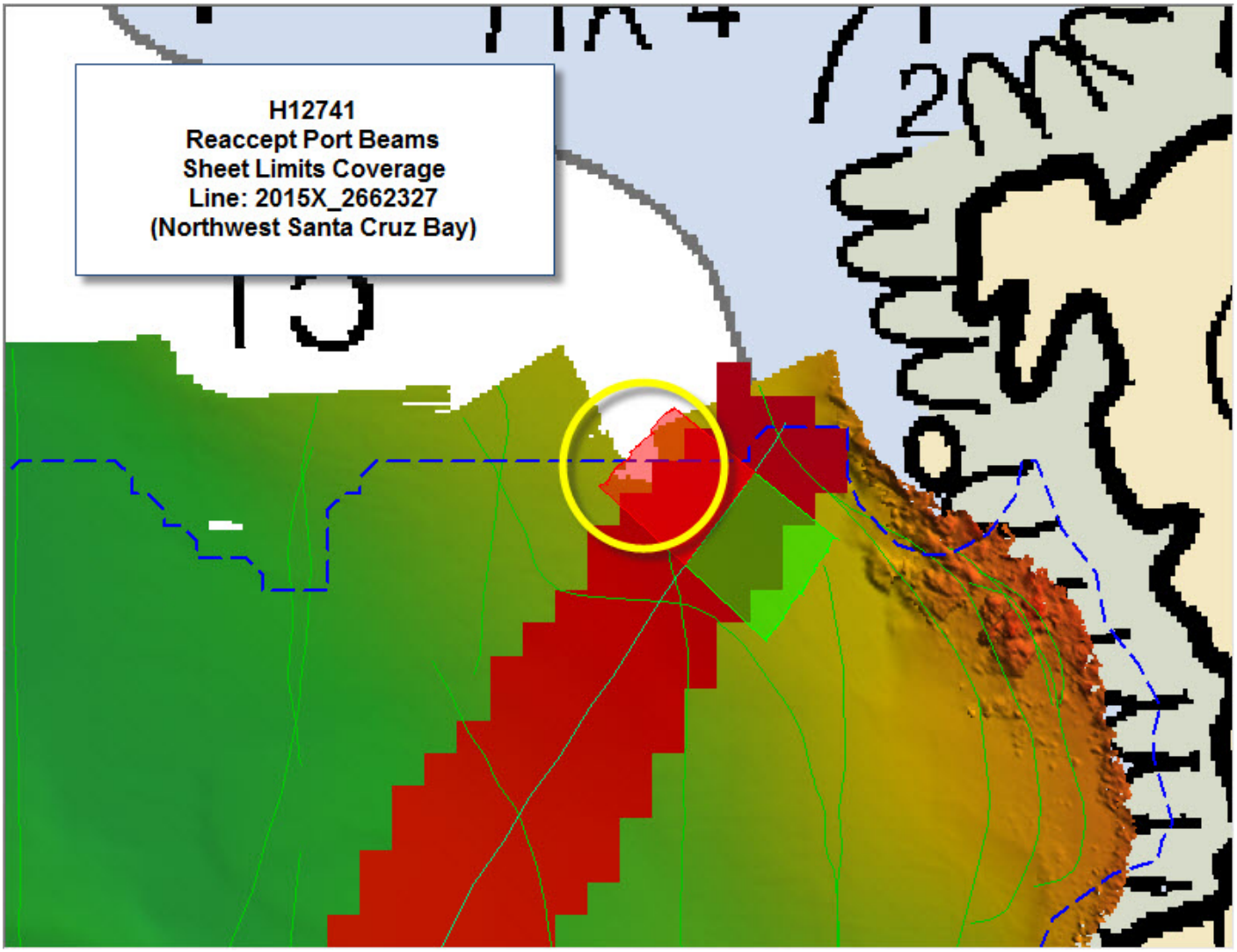


Figure 12: H12741 Crossline Port Side Beams Re-accepted For Holiday Coverage NW Santa Cruz Bay

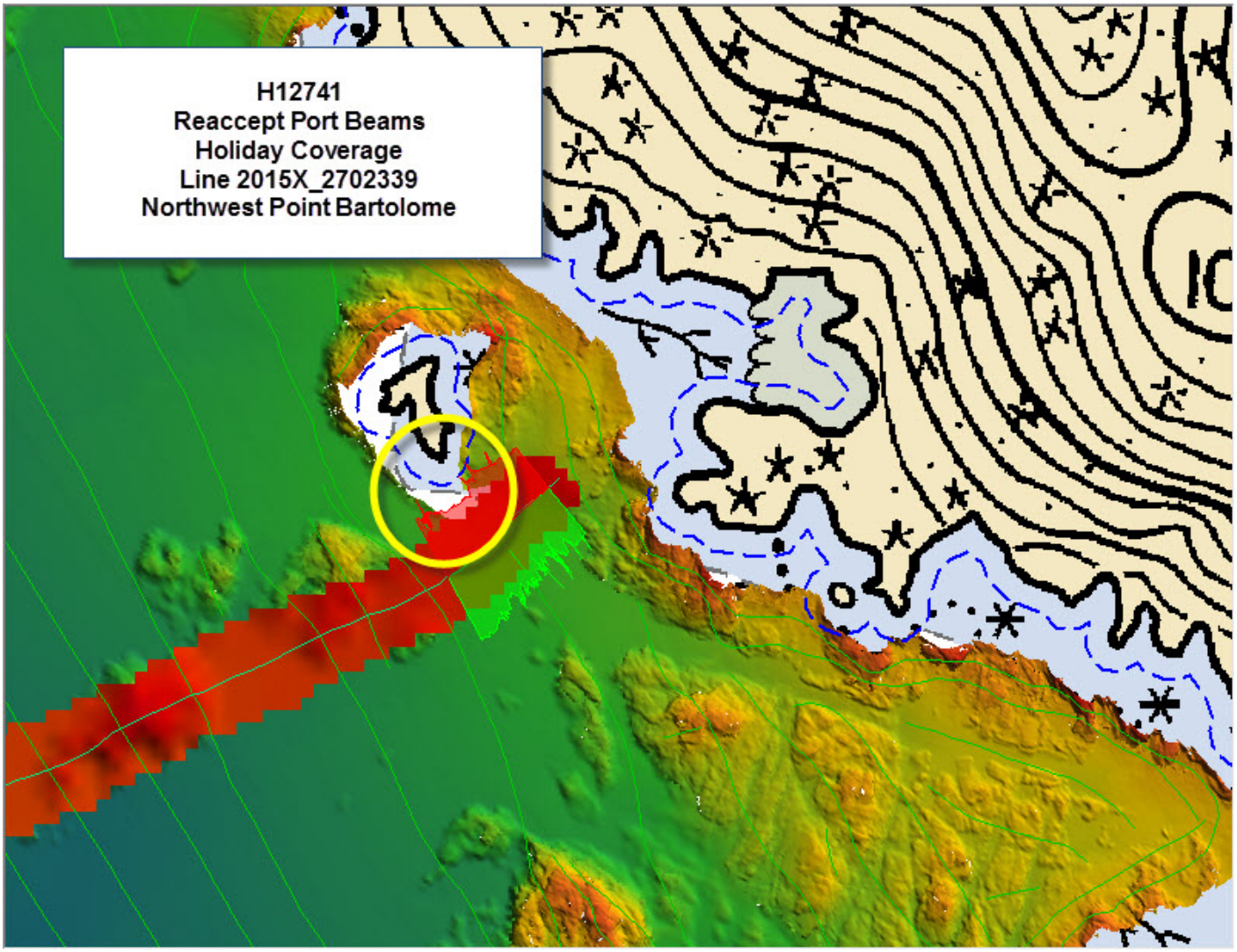


Figure 13: H12741 Crossline Port Side Beams Re-accepted For Holiday Coverage NW Point Bartolome

B.2.2 Uncertainty

The following survey specific parameters were used for this survey:

Measured	Zoning	Method
0 meters	0 meters	TCARI
0 meters	0.25 meters	Discrete Zoning

Table 6: Survey Specific Tide TPU Values.

Hull ID	Measured - CTD	Measured - MVP	Surface
S220		1 meters/second	0.5 meters/second
2808	2 meters/second		0.5 meters/second
2807	2 meters/second		0.5 meters/second
2806	2 meters/second		0.5 meters/second
2805	2 meters/second		0.5 meters/second

Table 7: Survey Specific Sound Speed TPU Values.

During acquisition, discrete tidal zoning uncertainty values were processed in CARIS HIPS and SIPS, at the receipt of final Tidal Constituents and Residual Interpolation (TCARI) the values were changed. The values shown in Table 6 above were entered into CARIS HIPS and real-time values incorporated in the TCARI grid were used. 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 H12741. Real-time uncertainties from both the EM710 and Reson 7125 data were recorded and applied in post-processing. Applanix TrueHeave files are recorded on all survey vessels, which includes 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.

B.2.3 Junctions

The areas of overlap between surveys were reviewed with CARIS HIPS and SIPS by surface differencing the 8 meter combined surface for H12742, and 16 meter combined surfaces for surveys H12292 and H12293 to assess surface agreement. The junction agreement is generally within the total allowable vertical uncertainty in their common areas and depths for all surfaces. Data overlap between all surveys was achieved. See Figure 14 for all areas of overlap.

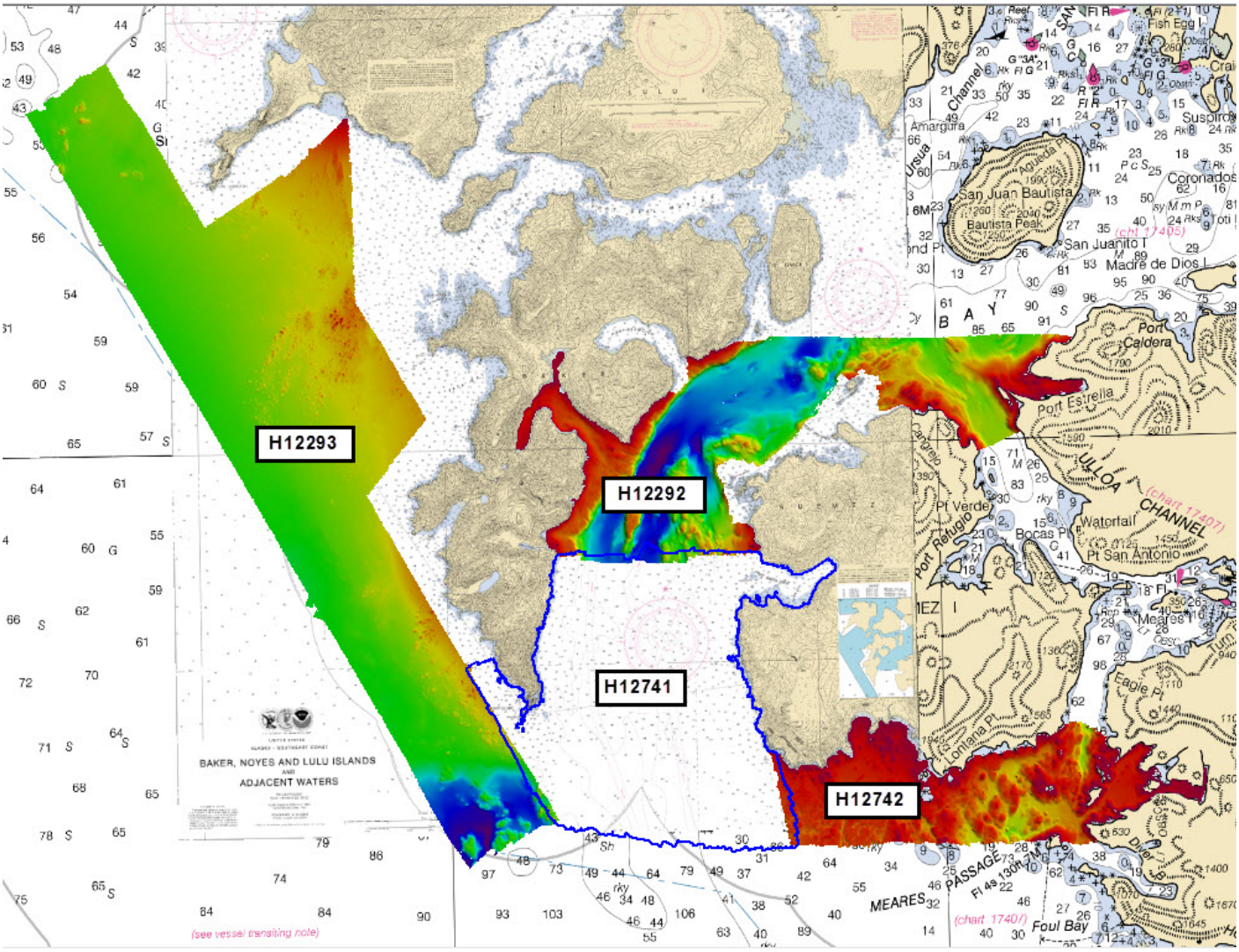


Figure 14: Junctions Between H12741,H12742,H12292,H12293

The following junctions were made with this survey:

Registry Number	Scale	Year	Field Unit	Relative Location
H12742	1:20000	2015	NOAA Ship FAIRWEATHER	E
H12292	1:20000	2011	NOAA Ship RAINIER	N
H12293	1:20000	2011	NOAA Ship RAINIER	W

Table 8: Junctioning Surveys

H12742

Surface differencing in CARIS HIPS and SIPS was used to assess junction agreement between the 8 meter combined surfaces from H12741 and the 8 meter combined surface from H12742. A graphical overview can be seen in Figure 15, the red circles indicating where the largest differences are. A Statistical Analysis can be seen in Figure 16 where the difference surface indicates 95% of all nodes have a maximum deviation of +/- 2.42m with a mean deviation of -0.64m.

The largest differences are located in the north area west of Cape Felix where the seafloor steeply shallows along the shore. Figure 17 highlights this area. Other areas with large differences are due to undeveloped data collected in the outer beams at the sheet limits over steep rock faces shared with survey H12742.

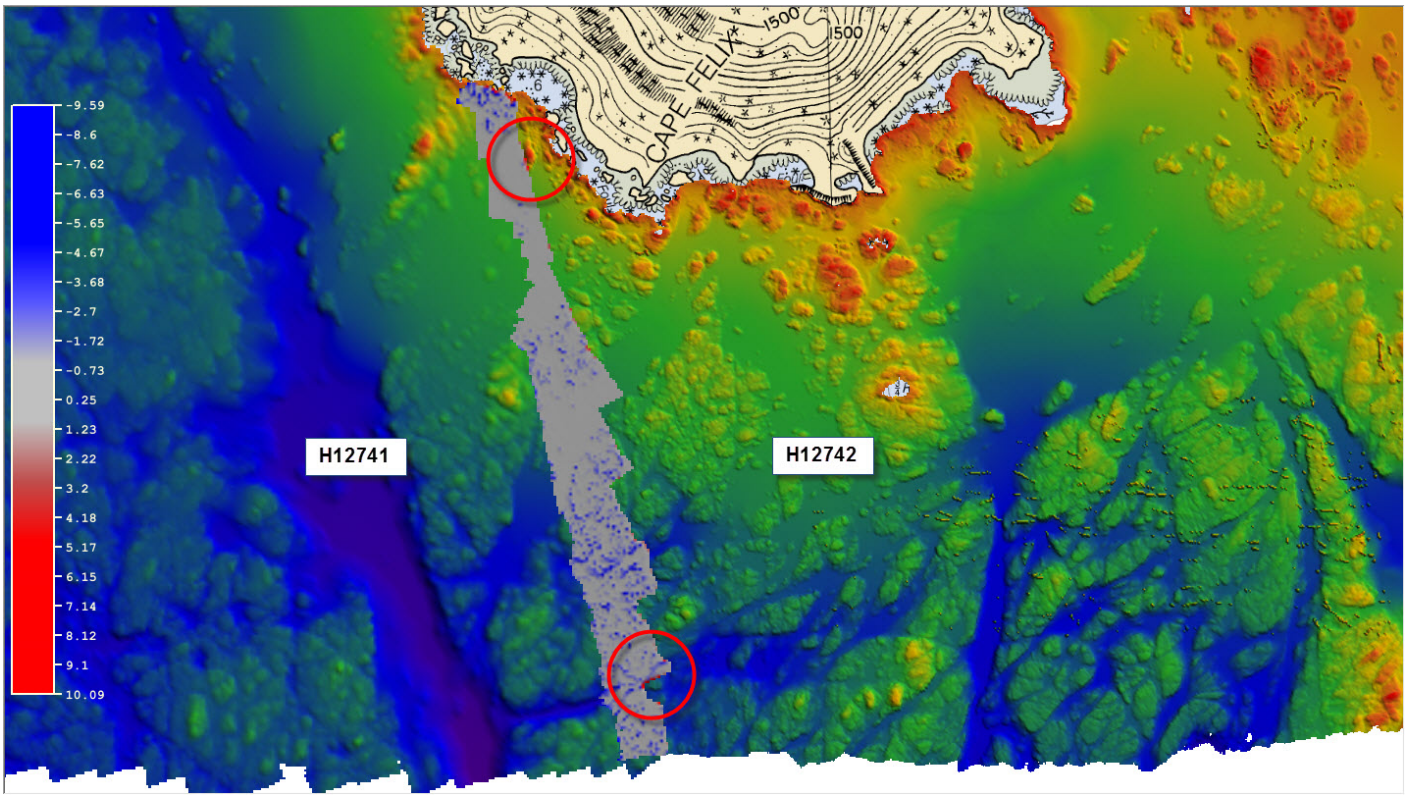
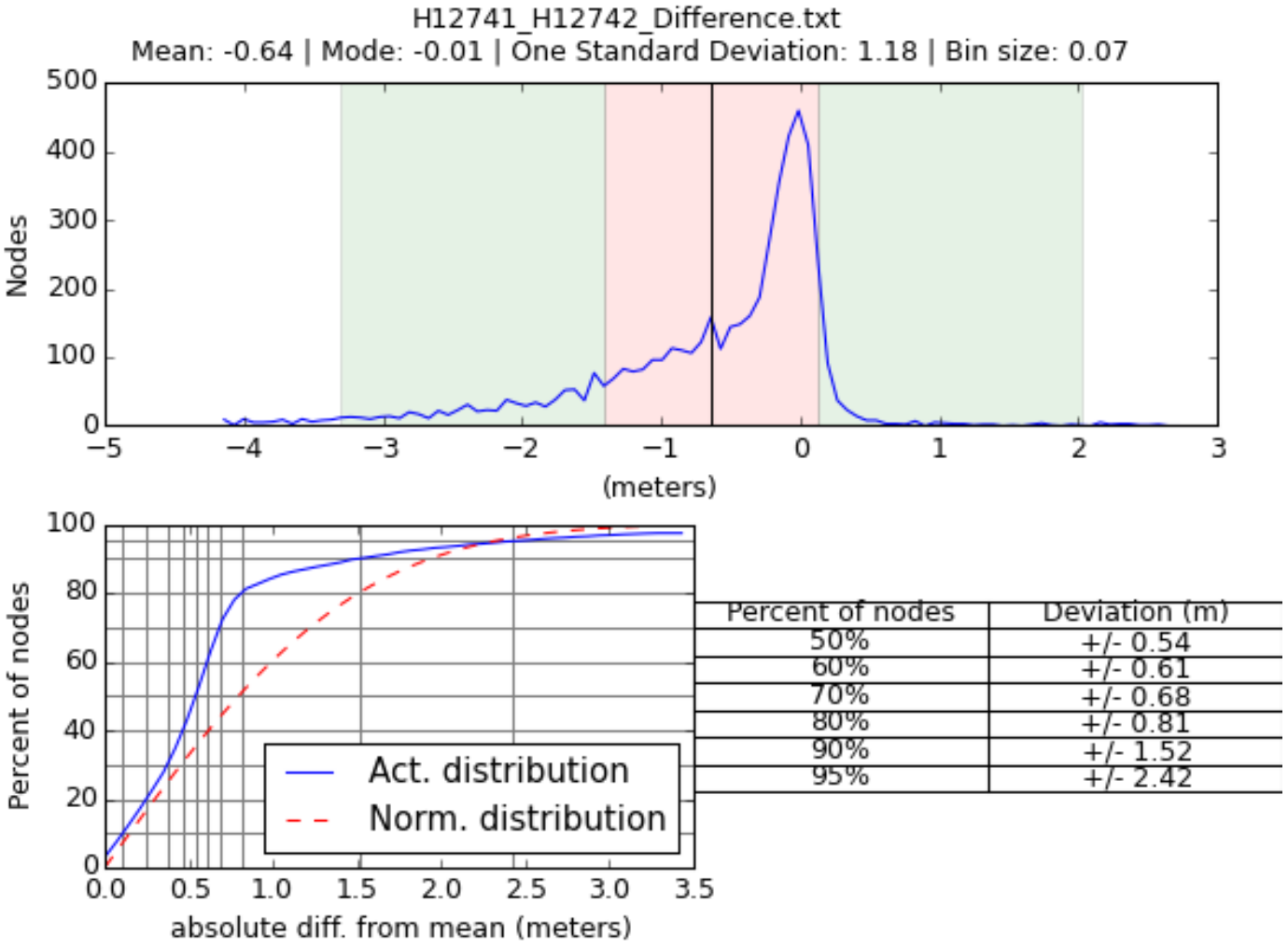


Figure 15: Junction Between H12741 and H12742



Percent of nodes	Deviation (m)
50%	+/- 0.54
60%	+/- 0.61
70%	+/- 0.68
80%	+/- 0.81
90%	+/- 1.52
95%	+/- 2.42

Figure 16: Difference Statistics H12741 and H12742

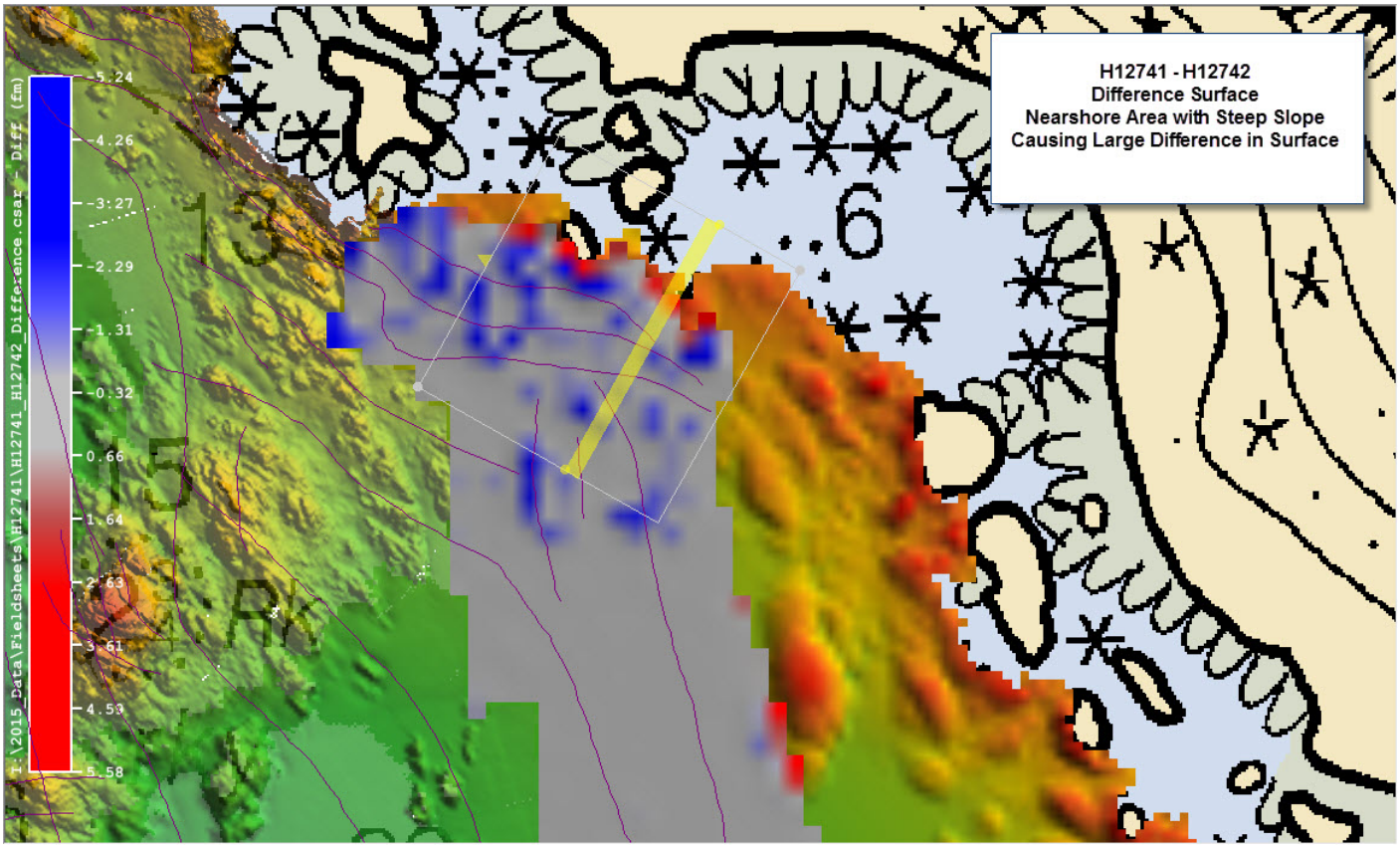


Figure 17: Graphical Overview of Area With Large Difference

H12292

Surface differencing in CARIS HIPS and SIPS was used to assess junction agreement between the 16 meter combined surfaces from H12741 and the 16 meter combined surface from H12292. The statistical analysis of the difference surface indicates 95% of all nodes have a maximum deviation of +/- 2.44 meters, with a mean deviation of 0.44m as shown in Figure 19. A detailed graphical overview can be seen in Figure 16.

The largest differences are located in the middle of Bucareli Bay: A zoom-in of a the surface difference in circle A can be seen in the top right corner of Figure 18. Though relatively flat in this area, it is possible that the large tidal movements seen throughout SE Alaska have caused the relocation of the ocean floor sediment. Another area of large difference is shown in circle B in Figure 18 which can be explained by the dynamic nature of the seafloor and its very steep inclines.

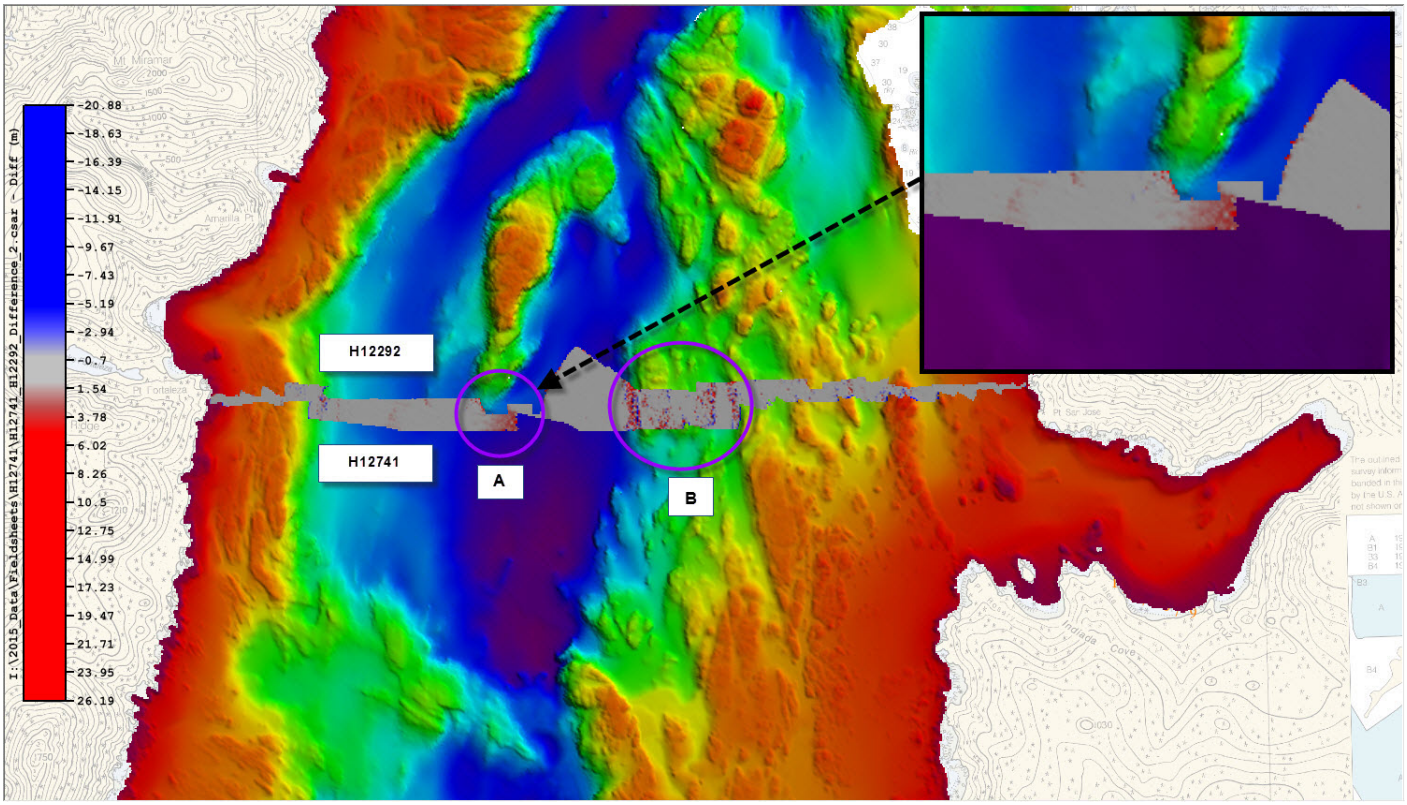
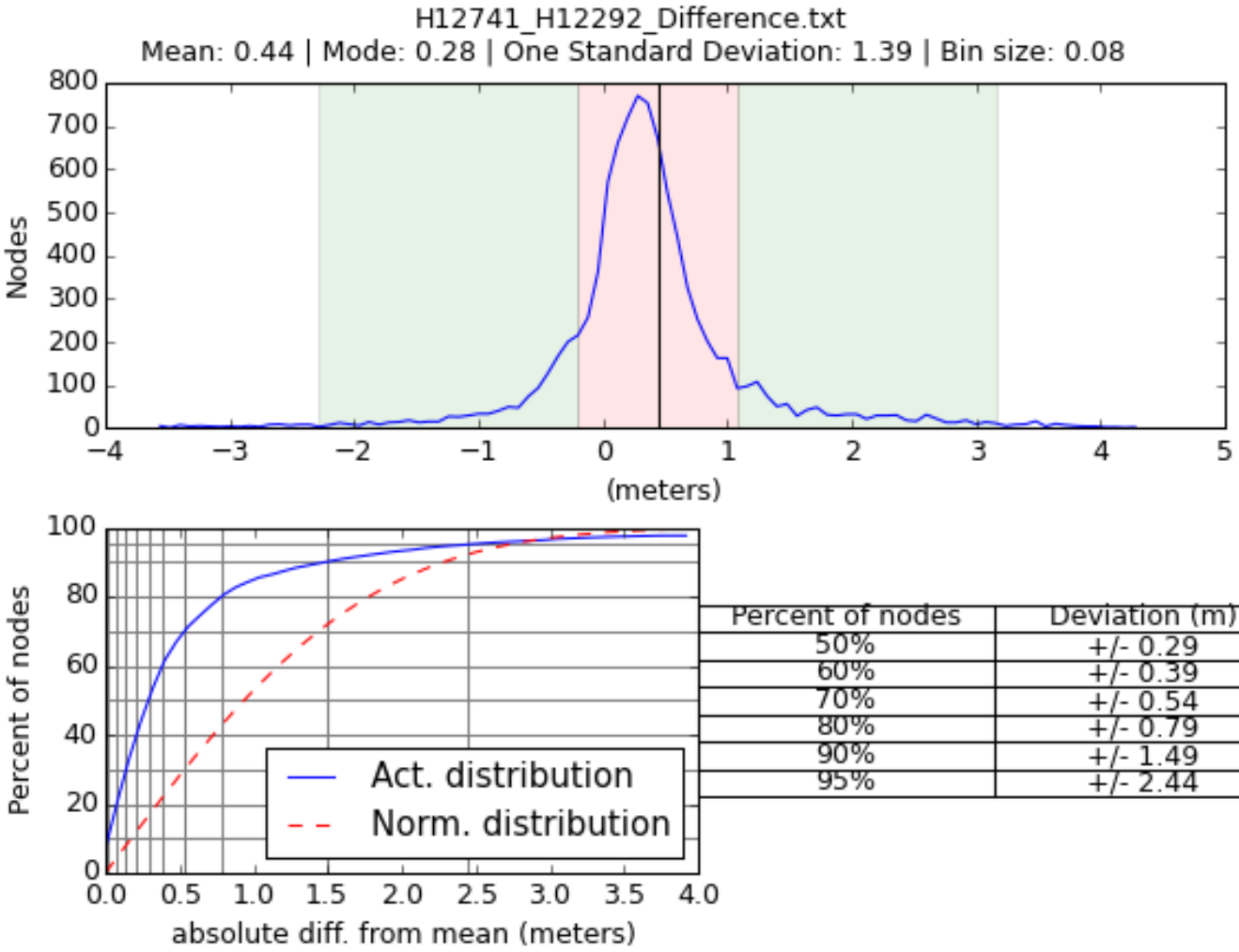


Figure 18: Junction Between H12741 and H12292



Percent of nodes	Deviation (m)
50%	+/- 0.29
60%	+/- 0.39
70%	+/- 0.54
80%	+/- 0.79
90%	+/- 1.49
95%	+/- 2.44

Figure 19: Difference Statistics of H12741 and H12292

H12293

Surface differencing in CARIS HIPS and SIPS was used to assess junction agreement between the 16 meter combined surfaces from H12741 and the 8 meter combined surface from H12293. Both sets of data at this junction reflect a relatively flat seafloor with less difference than that of Junctions H12742 and H12292 where rocky areas significantly increase differences between surfaces. The statistical analysis of the difference surface indicates 95% of all nodes have a maximum deviation of +/- 1.56m with a mean deviation of 0.41m and can be seen in Figure 21.

Differences exist in the more dynamic regions of Junction H12741 and H12293, see the outlined areas A,B and C seen in Figure 20.

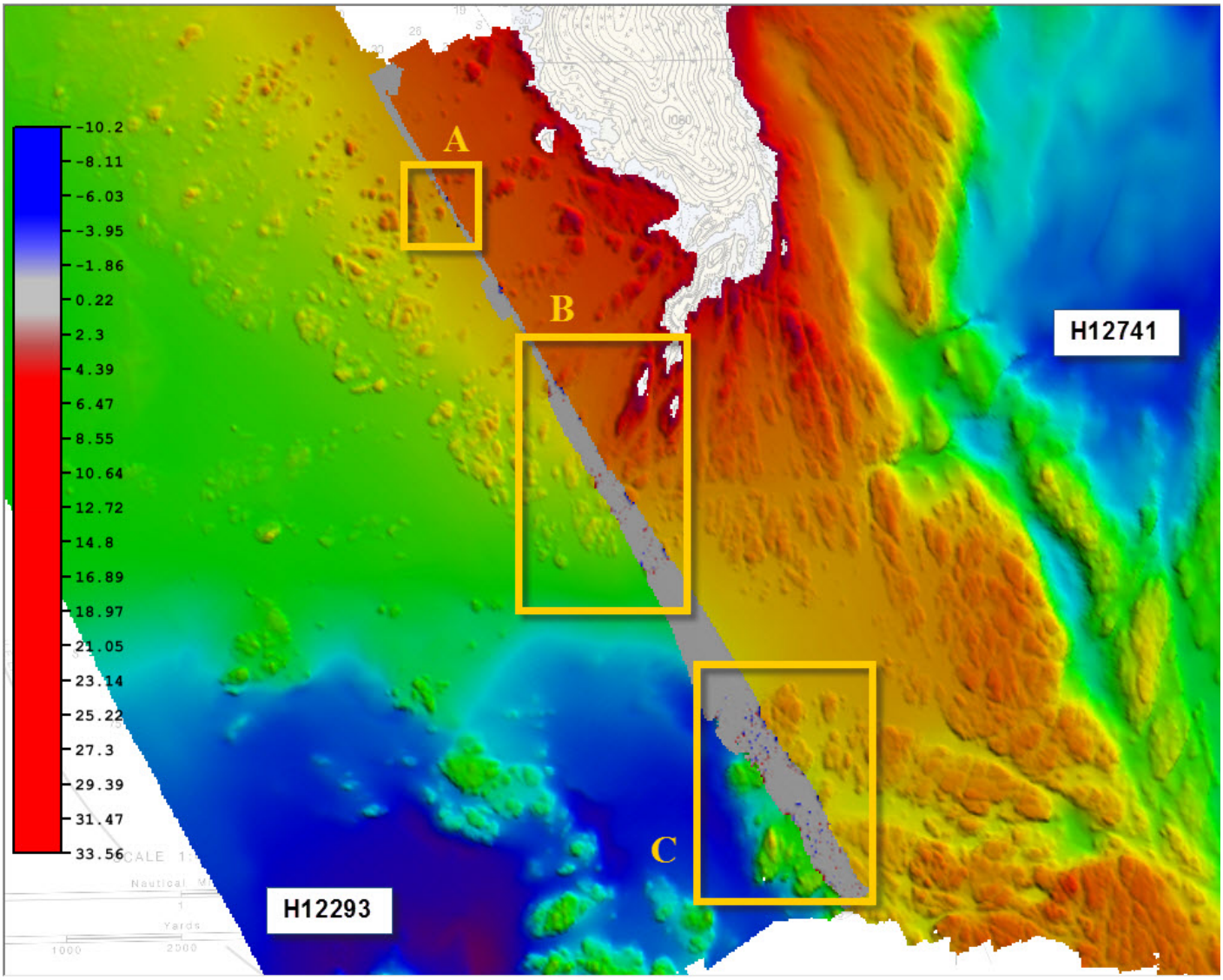
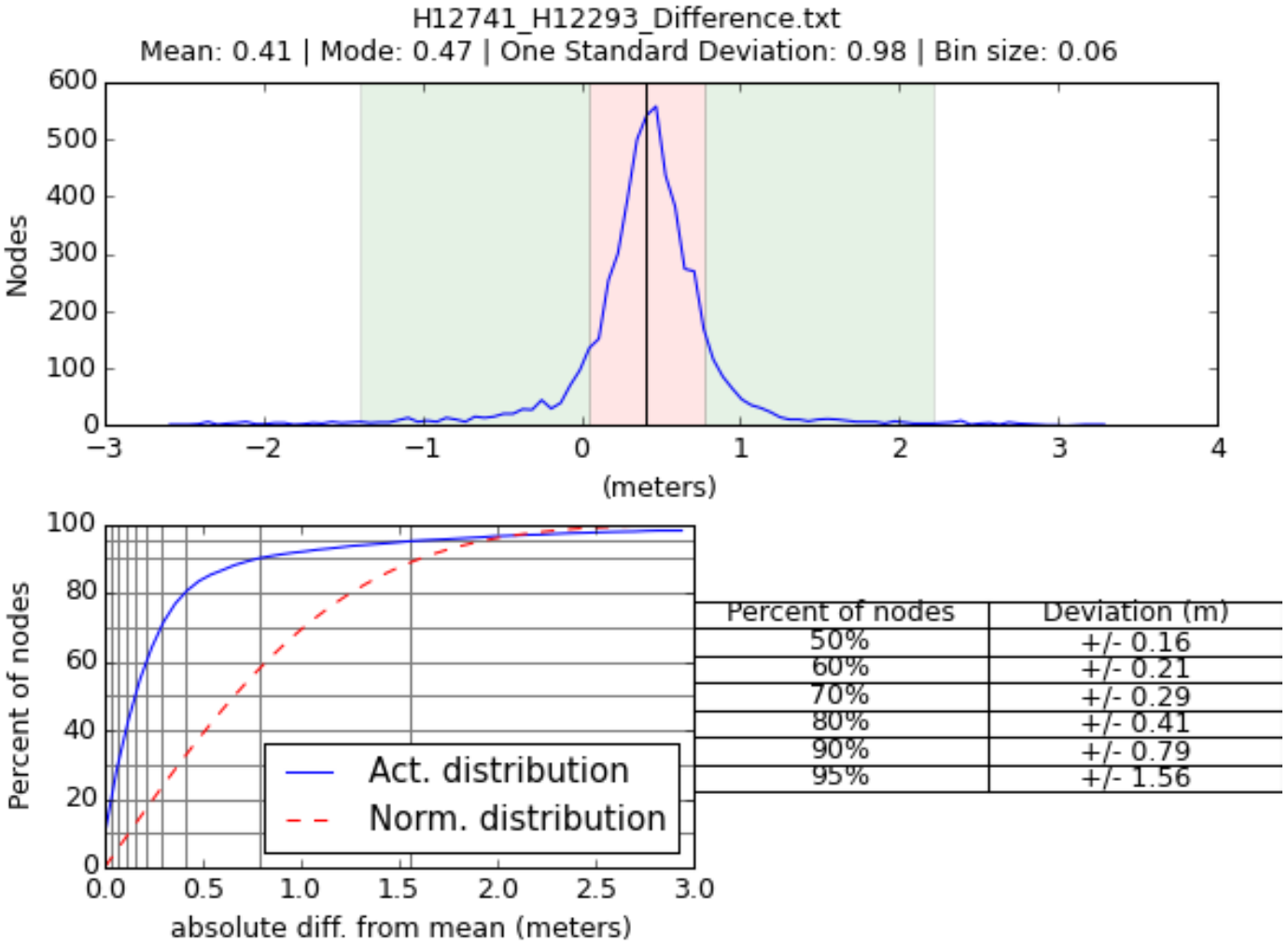


Figure 20: Junction Between H12741 and H12293



Percent of nodes	Deviation (m)
50%	+/- 0.16
60%	+/- 0.21
70%	+/- 0.29
80%	+/- 0.41
90%	+/- 0.79
95%	+/- 1.56

Figure 21: Difference Statistics of H12741 and H12293

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

Opperational Effectiveness Exceeded for RESON 7125 200kHz

During survey acquisition on DN 298, Fairweather launch 2808 ran an east to west line at approximately 2kts across Survey H12741 to pickup a holiday at the edge of the sheet limits. The depth at which line 2015M_2982153 was acquired exceeded the limitations of the RESON 7125 200kHz. Excessive noise was present while viewing through CARIS HIPS and SIPS Subset Editor causing the CUBE surface to misrepresent the sea floor. The outer most beams and any other noise affecting the surface was rejected at the

discretion of the hydrographer and the surfaces were recomputed resulting in no impact to data quality. The remaining beams on line 2015M_2982153 most accurately represent the surface. See Figures 22 and 23.

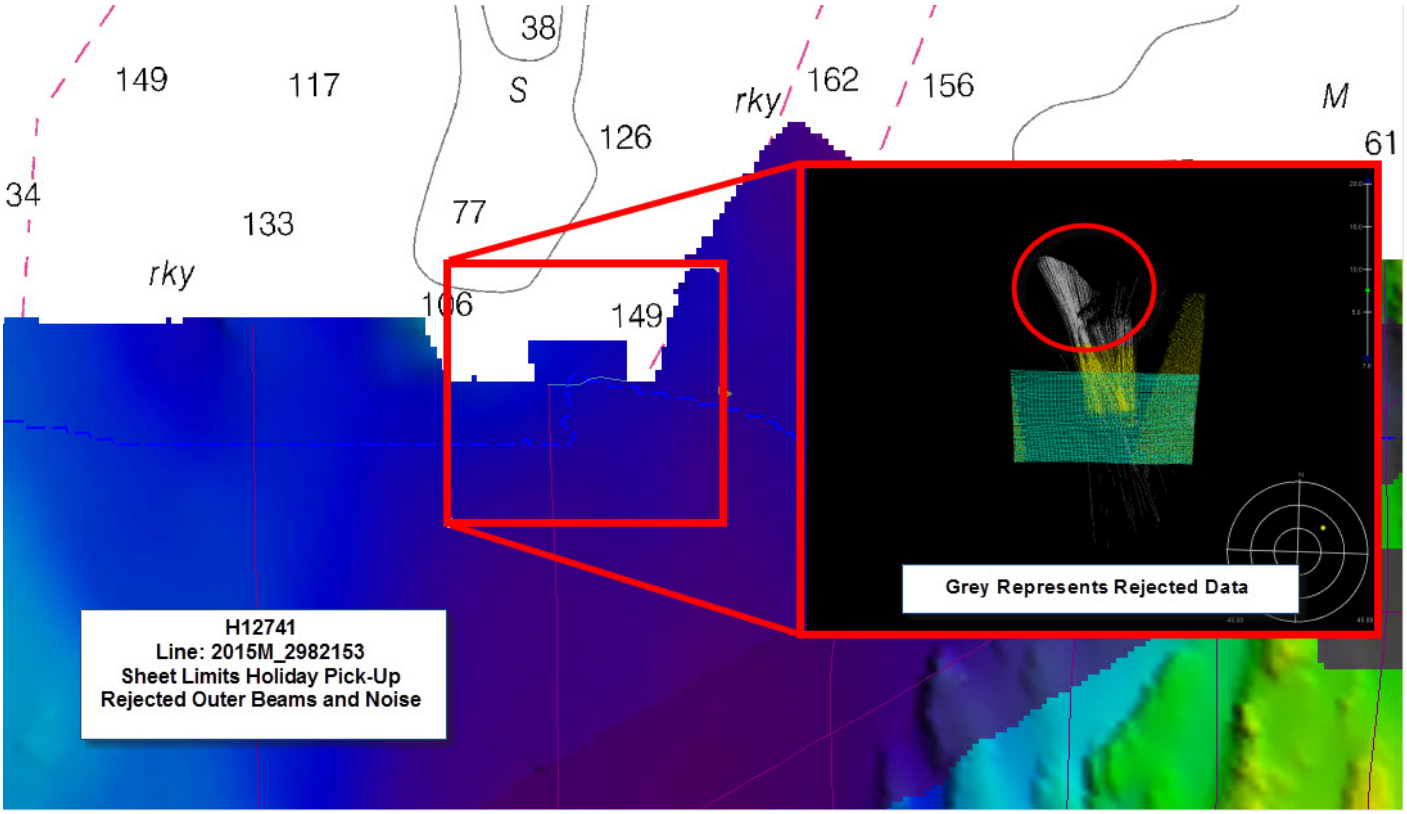


Figure 22: H12741 Sheet Limits Holiday Coverage Rejected Outer Beams Overview

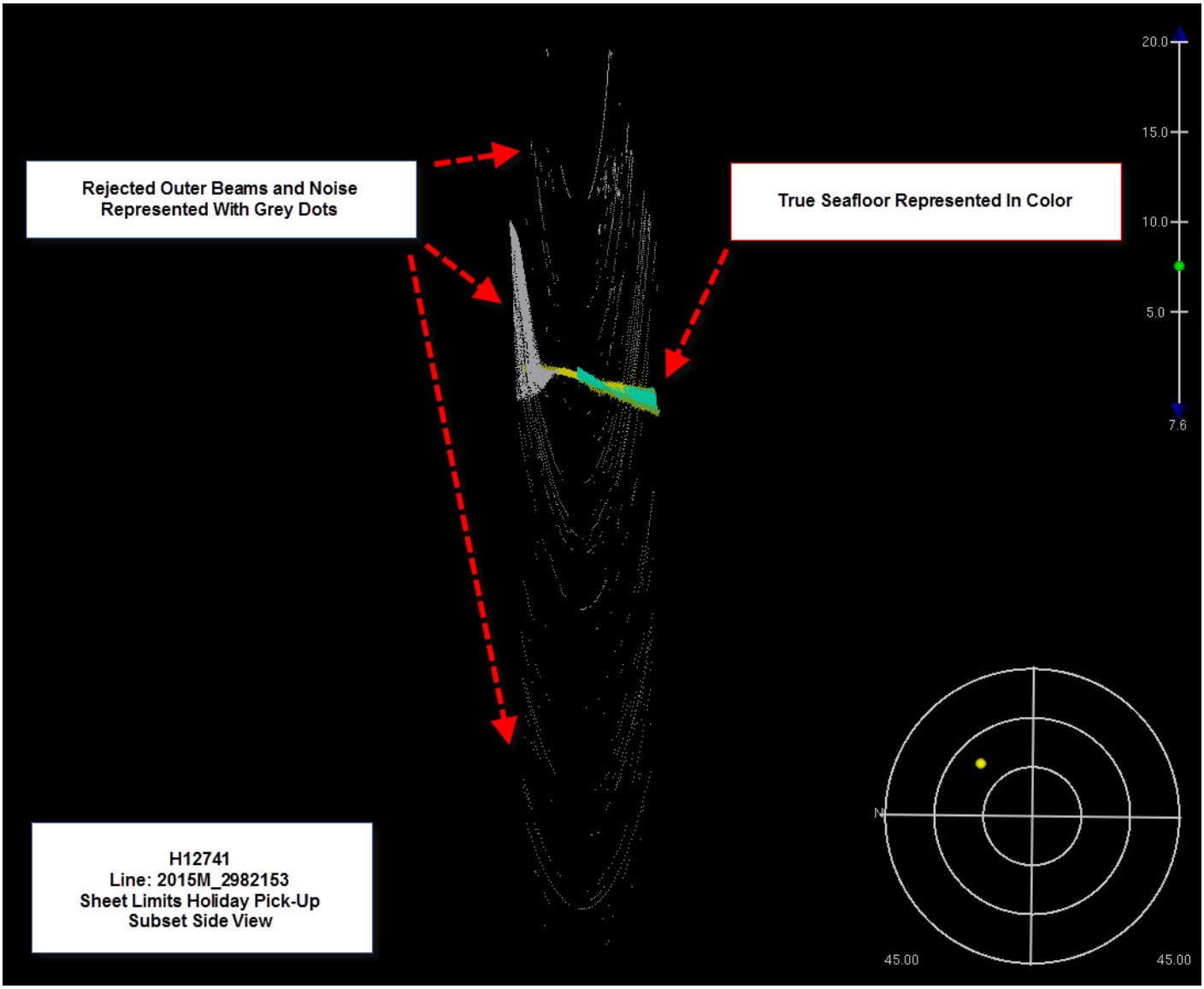


Figure 23: H12741 Sheet Limits Holiday Coverage Rejected Outer Beams Subset Side View

B.2.6 Factors Affecting Soundings

Sea Grass and Kelp

In shoal areas of survey H12741 there is a noticeable effect of kelp and sea grass on the Cube surfaces. The most notable are southwest of Point Isleta seen in Figure 24 and west of Pt. Santa Cruz Bay seen in Figure 25. For areas where charted sea grass or kelp obscured the bottom, very little cleaning was done near the surface so as not to inadvertently clean out any rocks. Where charted kelp was present and was distinguishable from features, it was cleaned out at the hydrographer's discretion. See Figure 26 for a Subset view of the effect of kelp on the CUBE surface and Figure 27 where the hydrographer rejected data due to kelp.

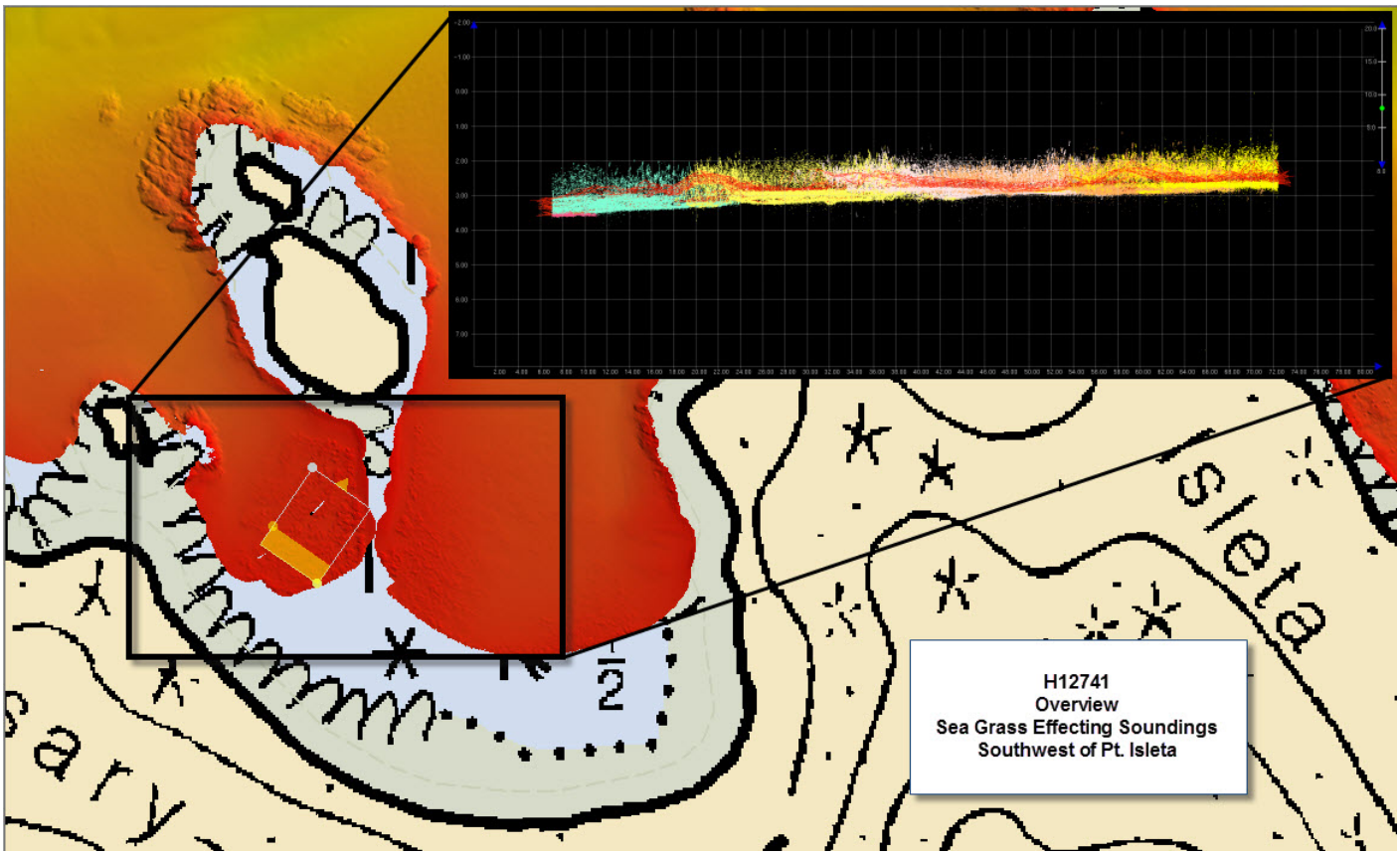


Figure 24: H12741 Example of The Effect of Sea Grass on The Cube Surface

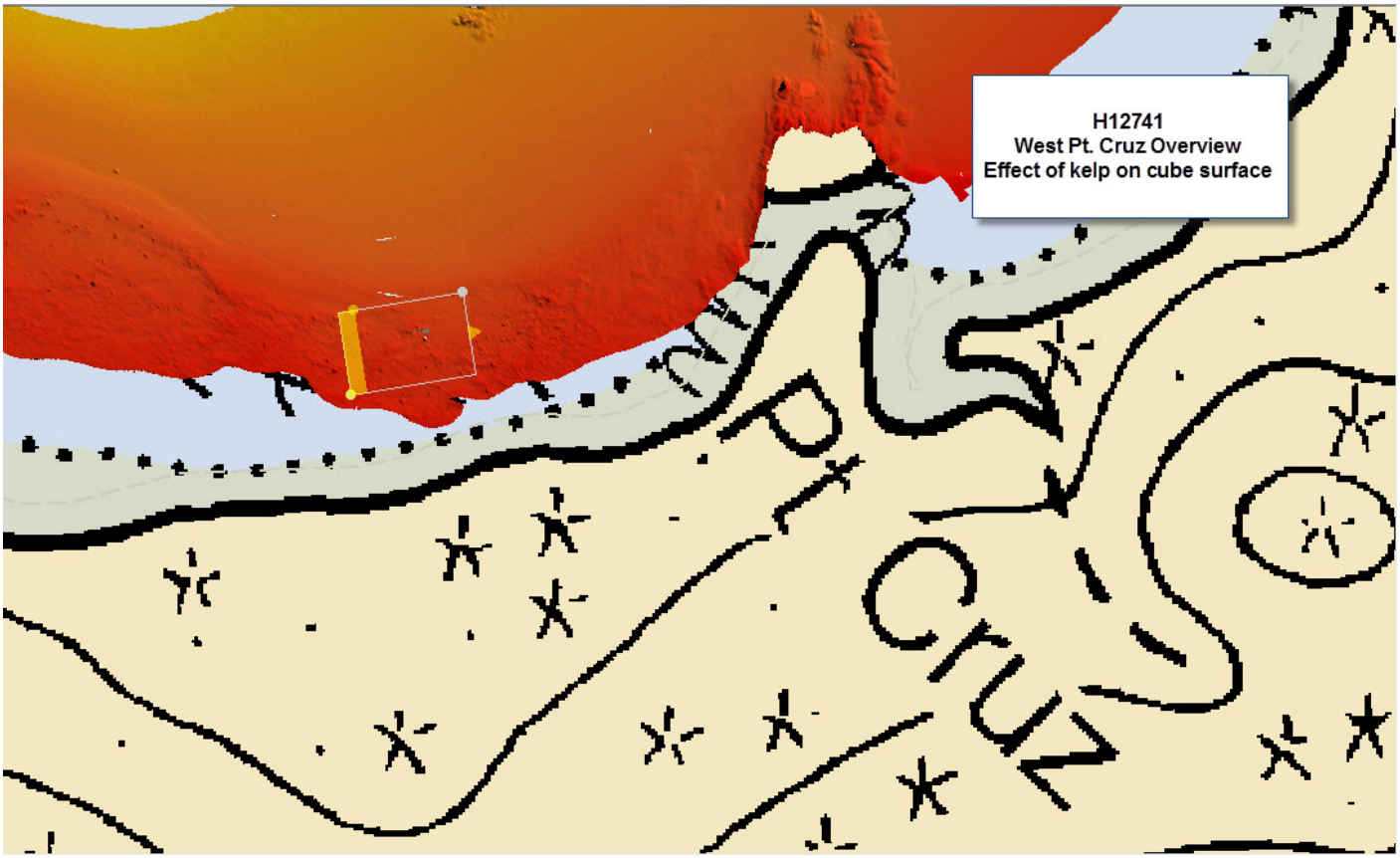


Figure 25: H12741 Graphical Overview of Example of The Effect of Kelp on The Cube Surface

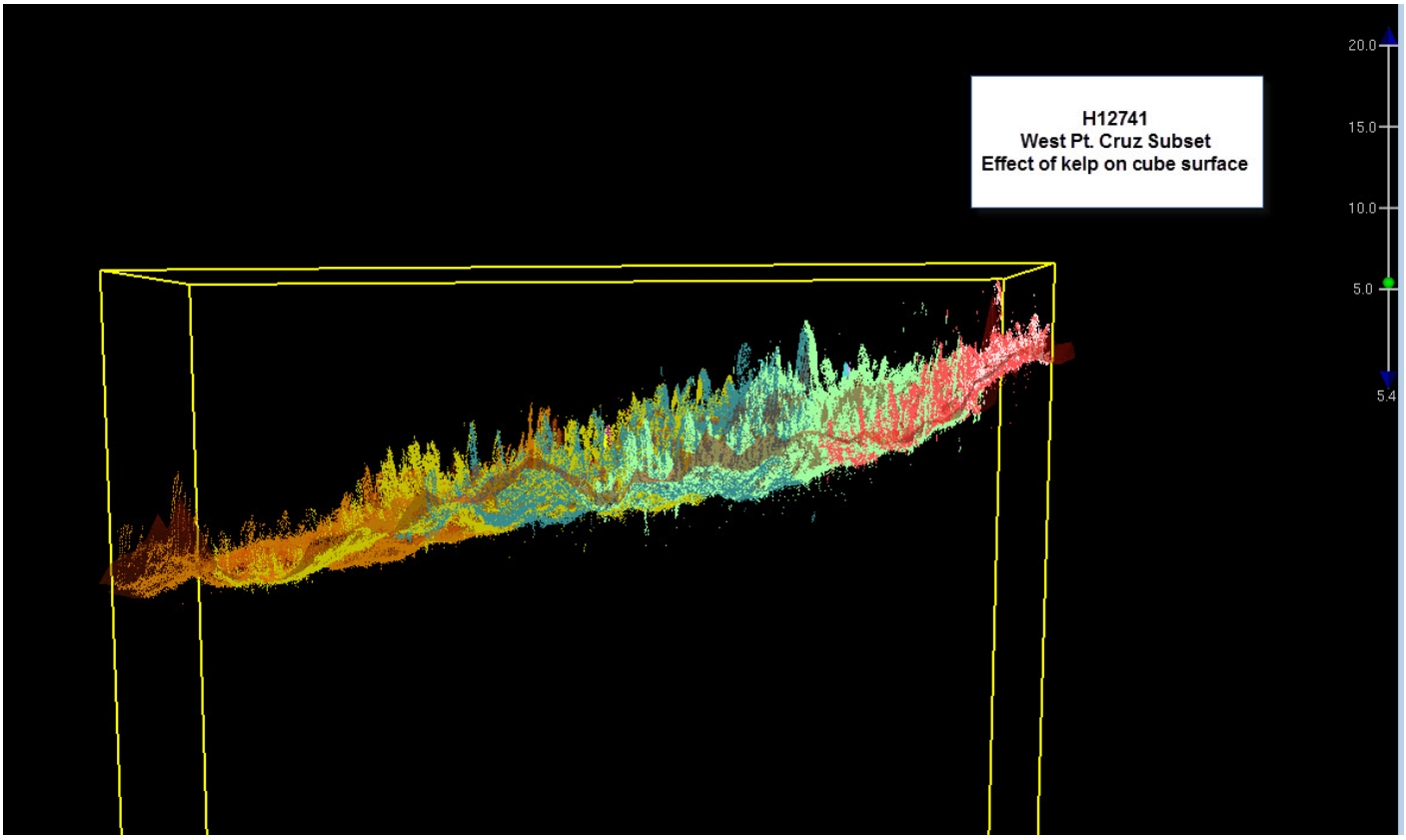


Figure 26: H12741 Graphical Subset of Example of The Effect of Kelp on The Cube Surface

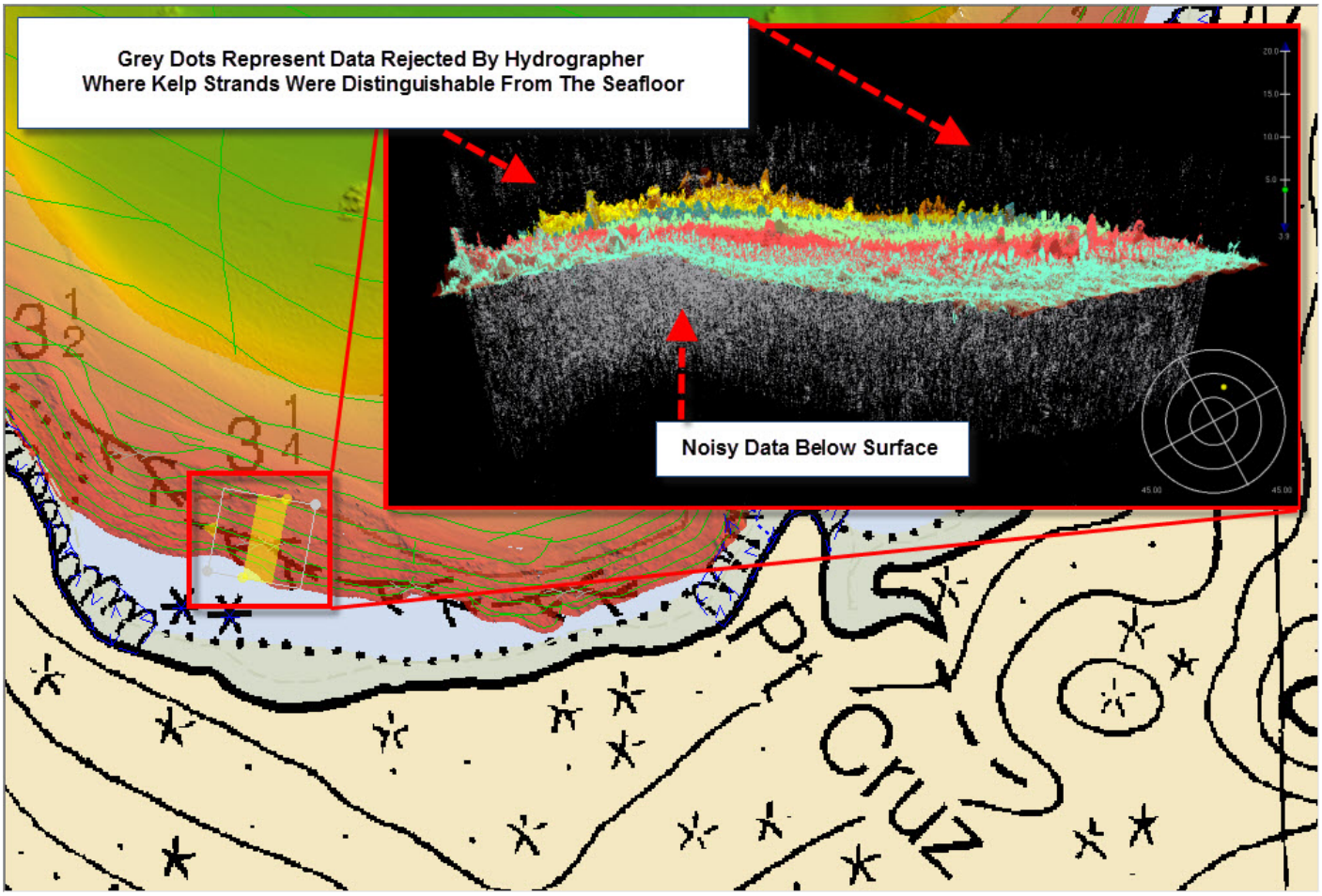


Figure 27: H12741 Example of Kelp Rejected at Hydrographers Discretion in Santa Cruz Bay

Sea State

During acquisition on survey H12741, the survey launches experienced periods of high sea-state and breakers due to weather causing excessive pitching. The results of the pitching were periods of blow-outs in the surface sound speed due to launch attitude. These blow-outs caused erroneous soundings which effected the CUBE surface. The MBES data was reviewed in CARIS HIPS and SIPS subset editor with appropriate reference surfaces, data effecting the CUBE surface was cleaned out. The bathymetry accurately depicts the sea floor. An example of these blow-outs can be found below in Figures 28 and 29.

Also during acquisition on Survey H12741, survey launch 2808 experienced excessive rolling while acquiring crossline: 2015X_2702339 NW of Cape Bartolome. The image below in Figure 30 shows the Cube surface with a 10x exaggeration. Figure 31 shows a 3D subset representation of the roll artifact.

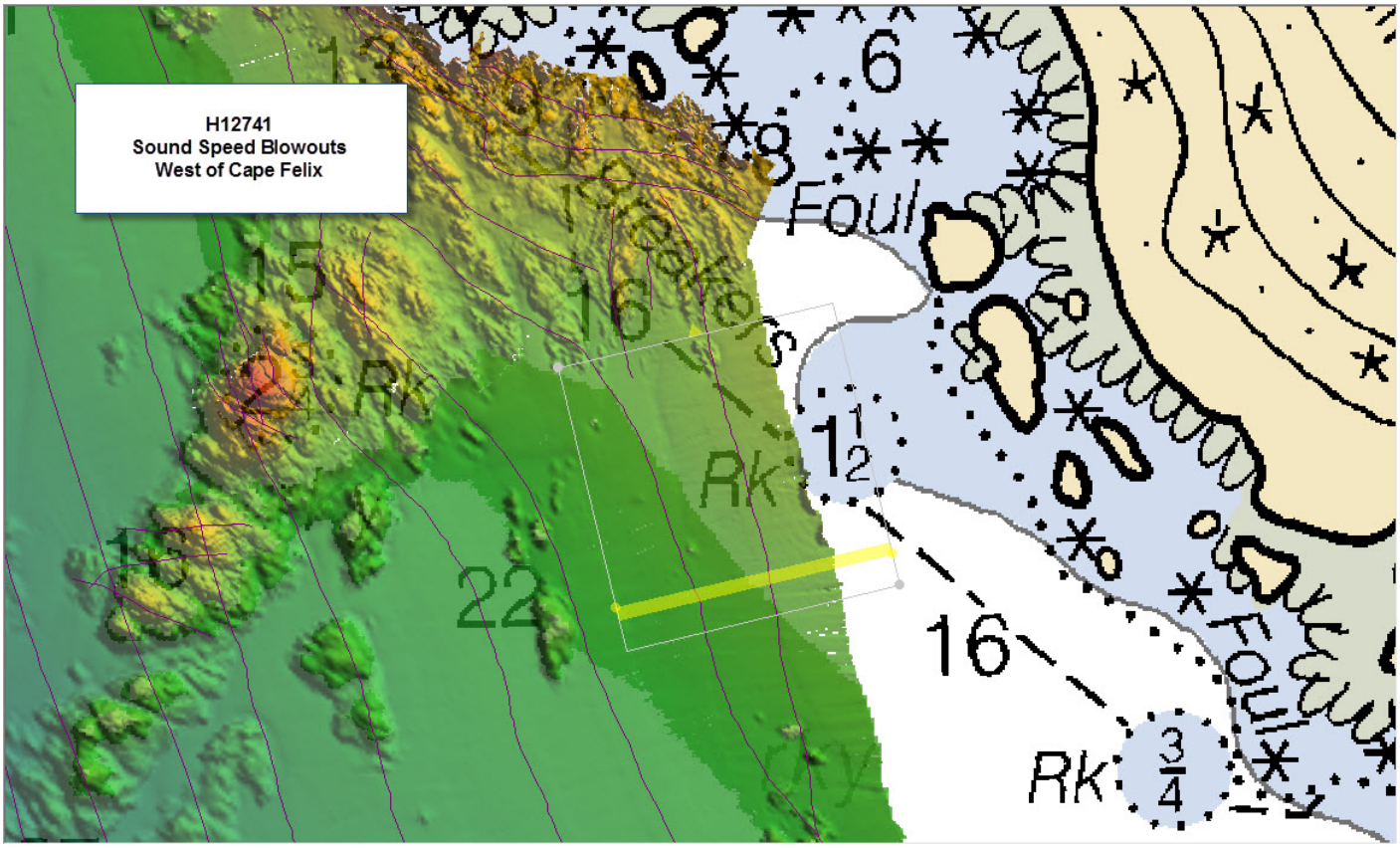


Figure 28: H12741 Surface Sound Speed Blow-outs Overview West of Cape Felix

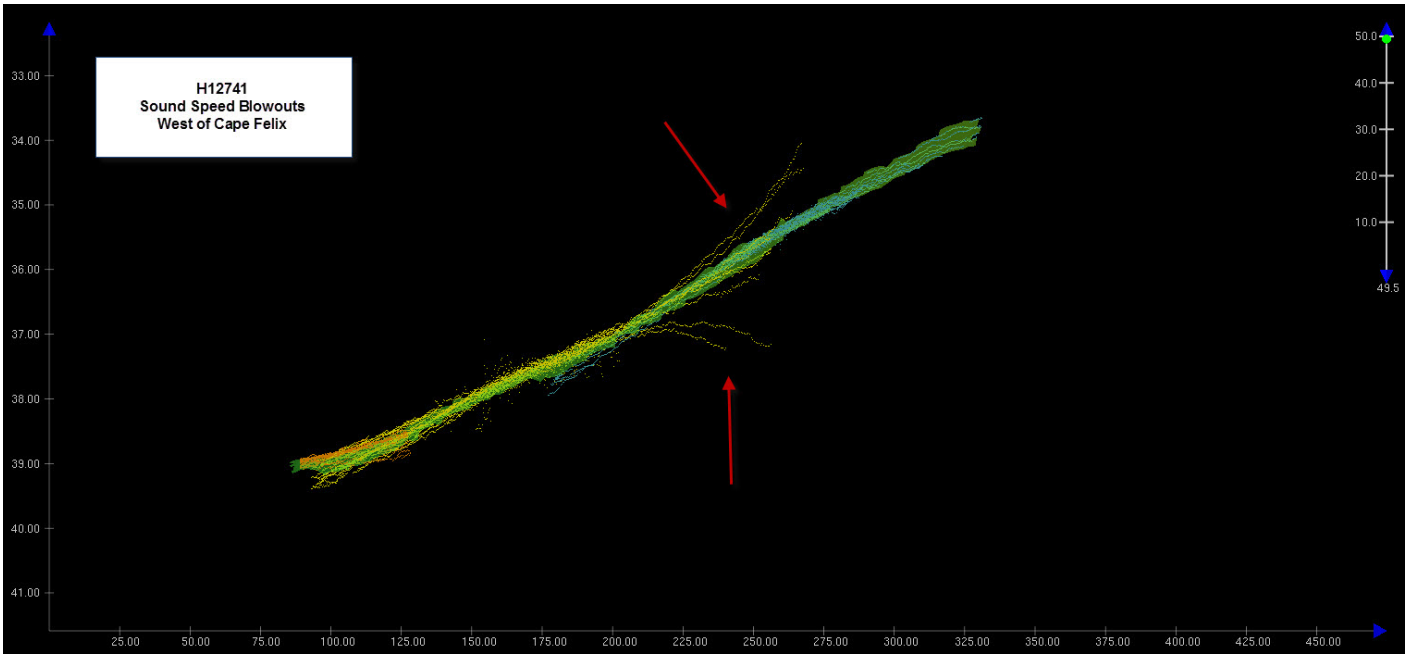


Figure 29: H12741 Surface Sound Speed Blow-out Subset View

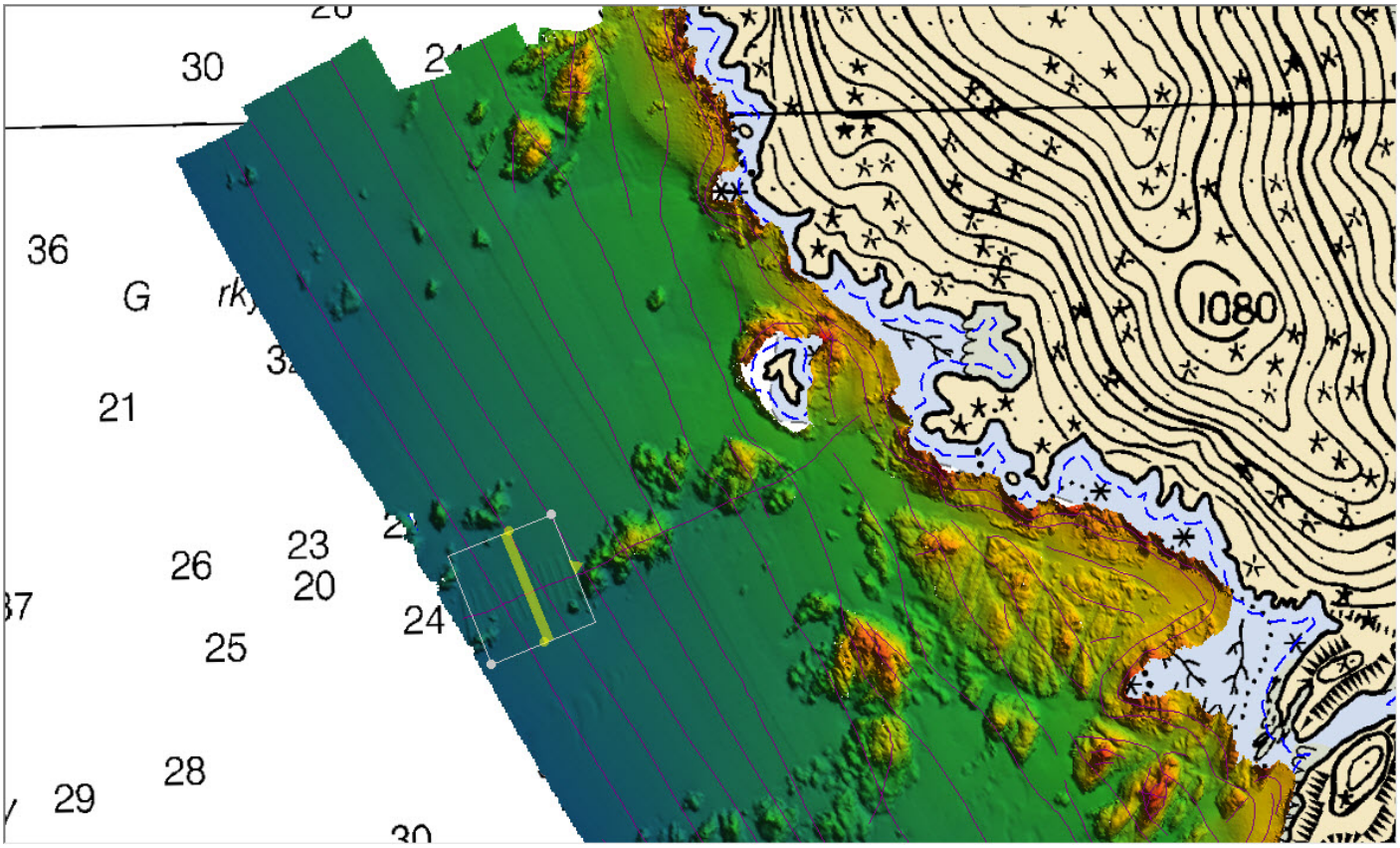


Figure 30: H12741 Overview of Excessive Rolling During Acquisition of Crossline

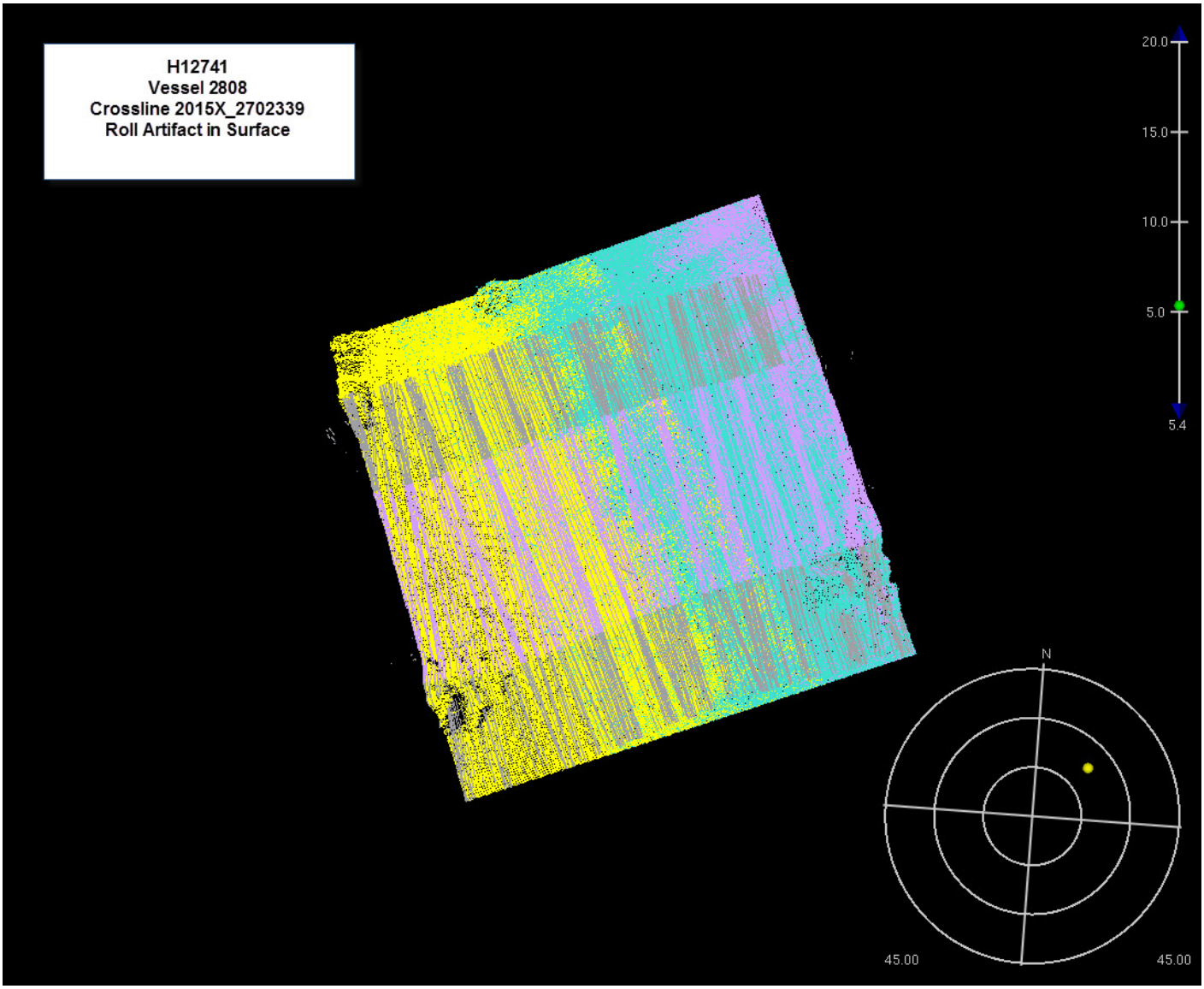


Figure 31: H12741 Subset View of Excessive Rolling During Acquisition of Crossline

Heave and yaw artifacts are more apparent in Figure 30 than roll artifacts.

Vertical Offset

During the survey of sheet H12741, data was acquired on different days in adjacent areas NW of Cape Bartolome. After reviewing the data that overlapped in these areas in CARIS HIPS and SIPS Subset Editor, a minor vertical offset of .35m was observed between data collected with S220 EM710 and 2808 400kHz. The offset observed does not fall outside the Total Vertical Allowable Uncertainty set by IHO order 1. This vertical offset was found to be more pronounced when GPS tides were applied. The data meets all NOAA specifications and the hydrographer recommends survey data supersede charted depths and contours. See a graphical overview in Figure 32 with its accompanied Subset view in Figure 33.

Figure 34 shows a graphical view of a crossline acquired NW of Cape Bartolome that also exhibits a vertical offset of 0.25m when observed in CARIS HIPS and SIPS Subset Editor. See Figure 35 for a subset view of this crossline.

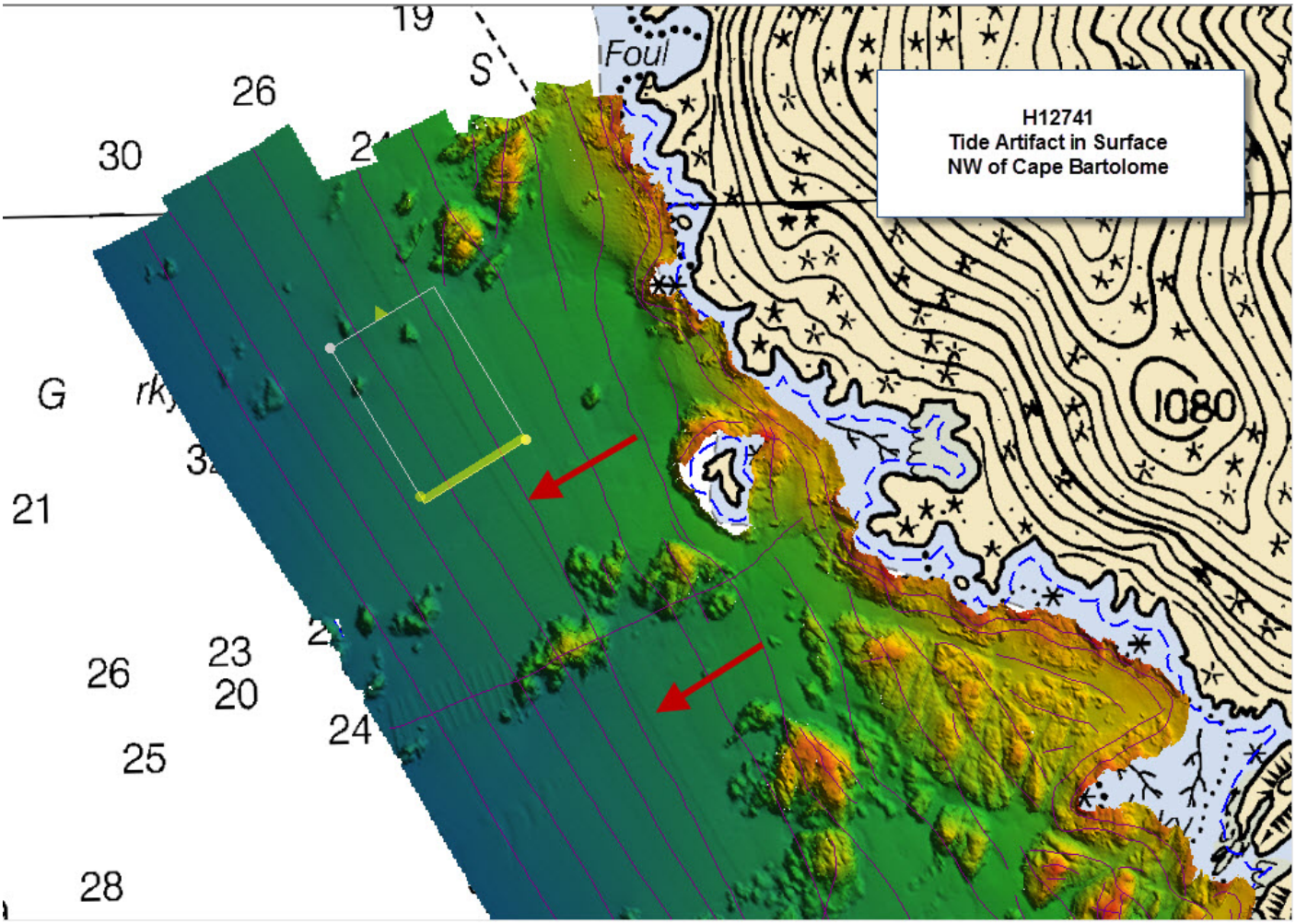


Figure 32: H12741 Graphical Overview Vertical Offset NW Cape Bartolome

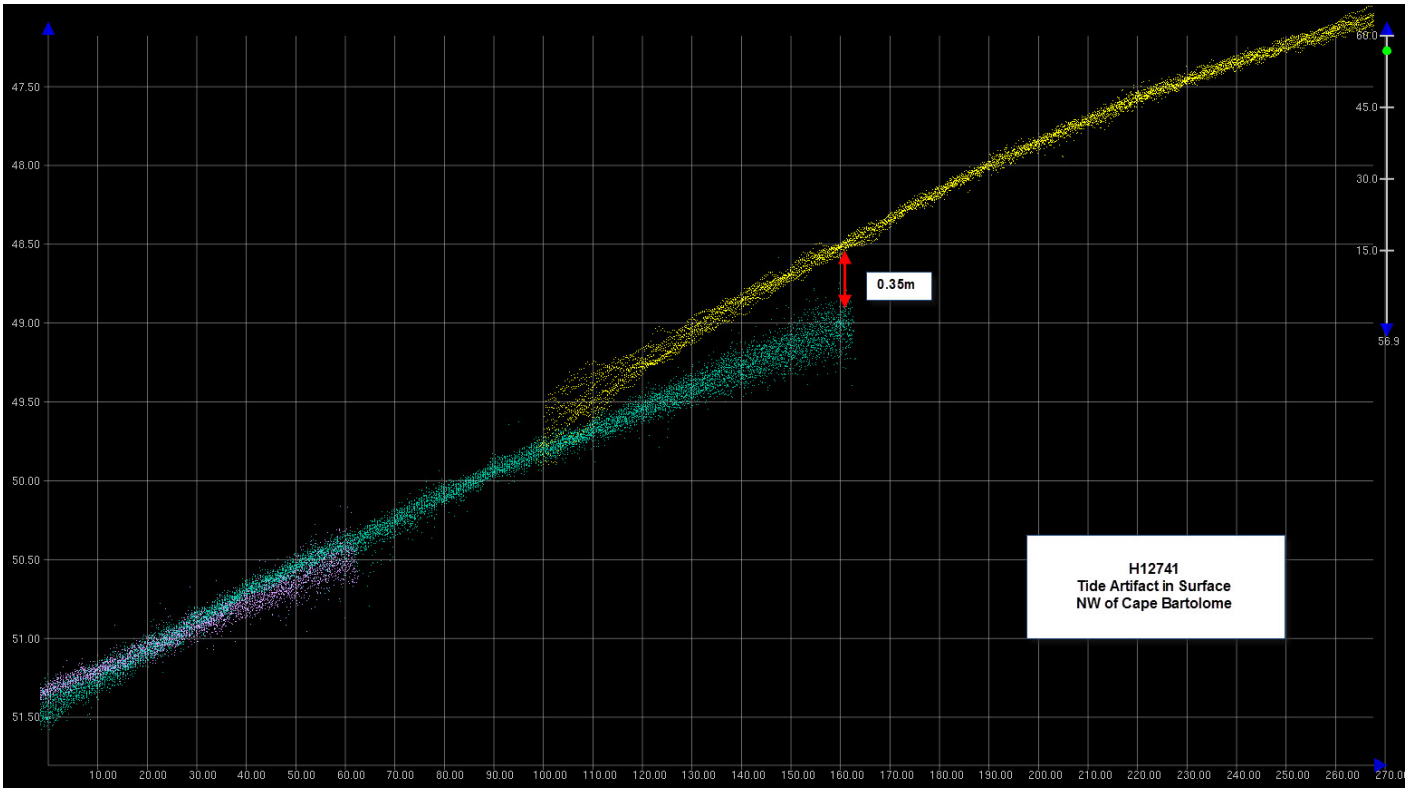


Figure 33: H12741 Subset View Vertical Offset NW Cape Bartolome

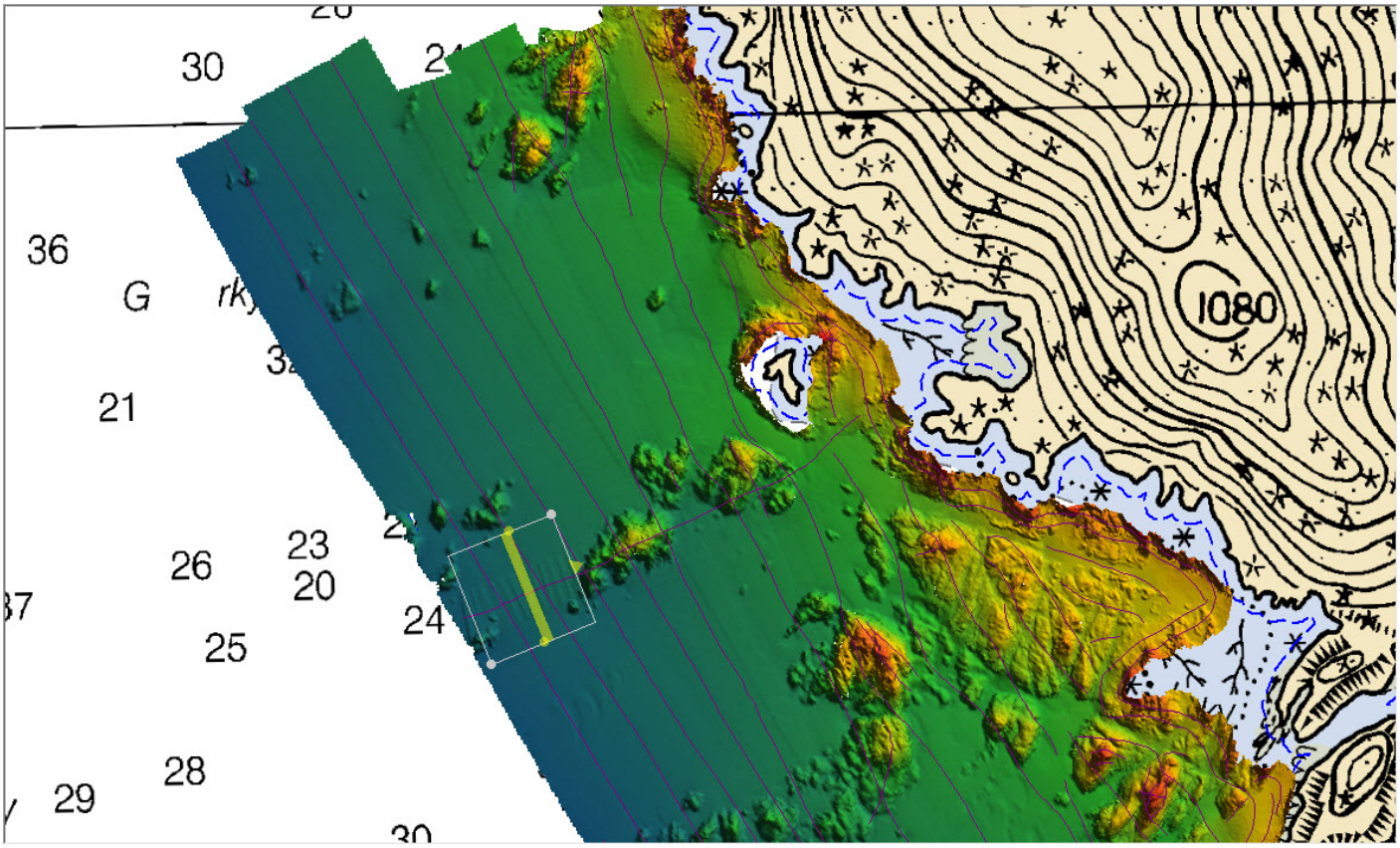


Figure 34: H12741 Graphical Overview of Vertical Offset NW Cape Bartolome Crossline

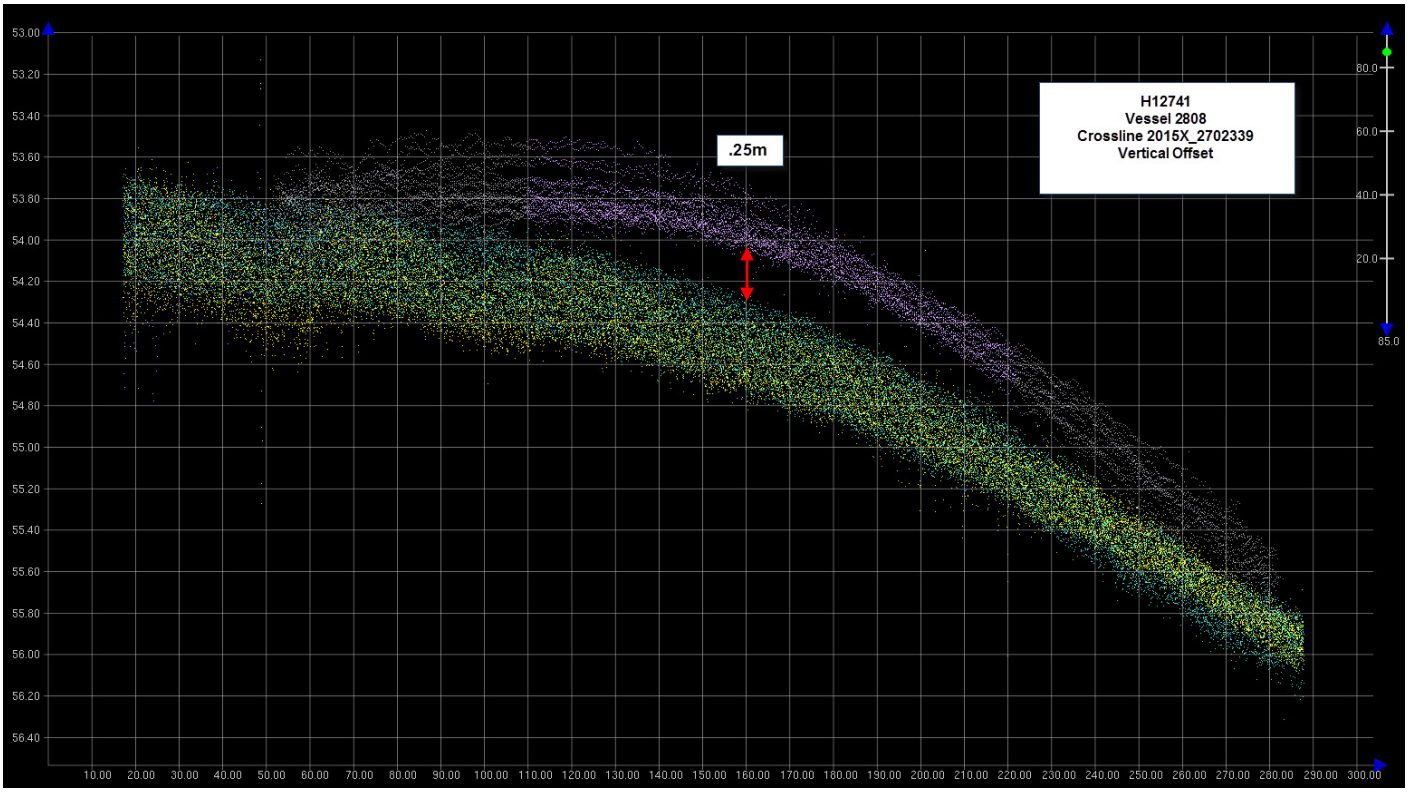


Figure 35: H12741 Subset of Vertical Offset NW Cape Bartolome Crossline

B.2.7 Sound Speed Methods

Sound Speed Cast Frequency: During launch acquisition, casts were conducted at least every four hours. Casts were conducted every 15-40 minutes while towing the Moving Vessel Profiler during ship acquisition.

B.2.8 Coverage Equipment and Methods

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

B.2.9 IHO Uncertainty

To assess vertical accuracy standards, a child layer titled "IHO1" was created for each of the 1-meter, 2-meter, 4-meter and 8-meter finalized surfaces. "IHO2" child layers were created for each of the 8-meter and 16-meter finalized surfaces, using the equation as stated in section C.2.1 of the DAPR. See Figures 43 to 47 and the Standards Compliance Review in Appendix II for detailed statistics.

The data meets the accuracy specifications as stated in the NOS Hydrographic Surveys Specifications and Deliverables (HSSD) dated May 2015. It was found that at least 95.4% of the nodes in all finalized surfaces

meet or exceed IHO order 1 specifications. Areas with high IHO uncertainty are highlighted in red by CARIS HIPS and SIPS and can be seen below in Figure 36.

Figures 37 and 38 show an example of high IHO uncertainty where minimal to no overlap was attained, resulting in low density where the sea floor slope changes.

Figures 39 and 40 show an example of high IHO uncertainty where CARIS Beam Disabling occurs causing low density.

Figures 41 and 42 show an example of High IHO Uncertainty Due to minimal to no overlap over dynamic seafloor.

The southern and southwestern border of H12741 exhibit high uncertainty where there is no data to overlap the outer beams.

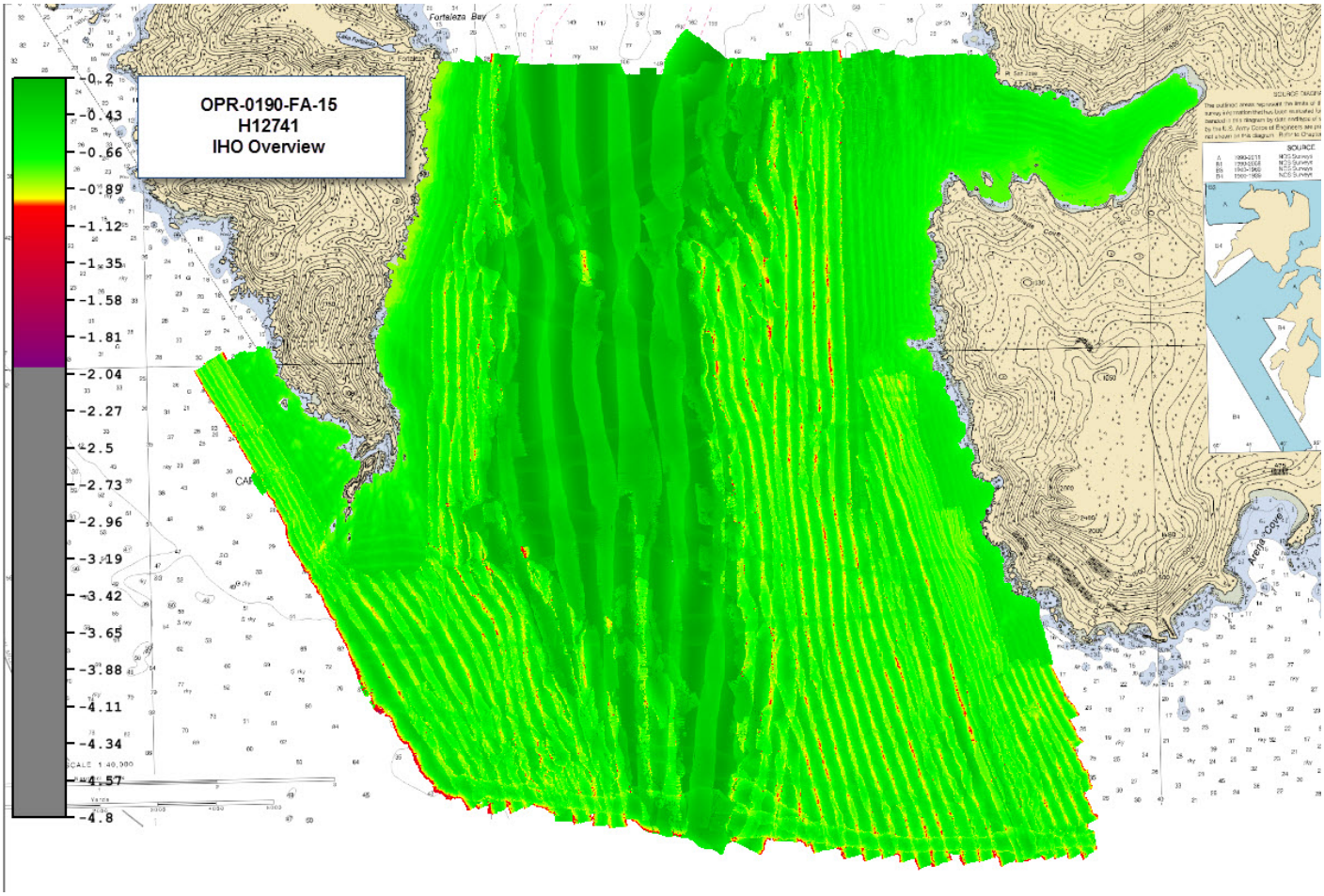


Figure 36: H12741 Graphical Representation of IHO Uncertainty

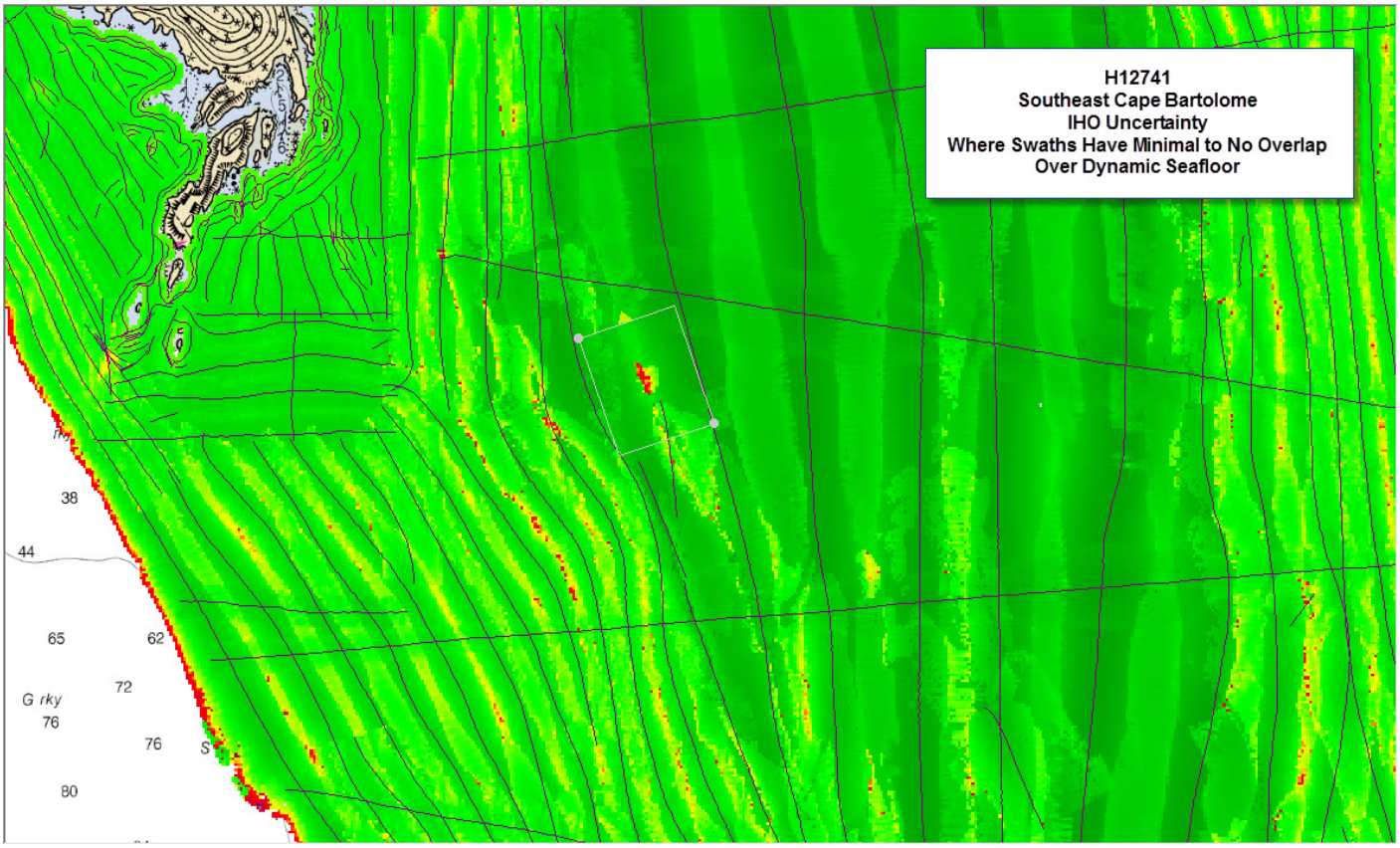


Figure 37: H12741 Graphical view of Southeast Cape Bartolome Area of High IHO Uncertainty, Minimal Overlap Over Dynamic Seafloor

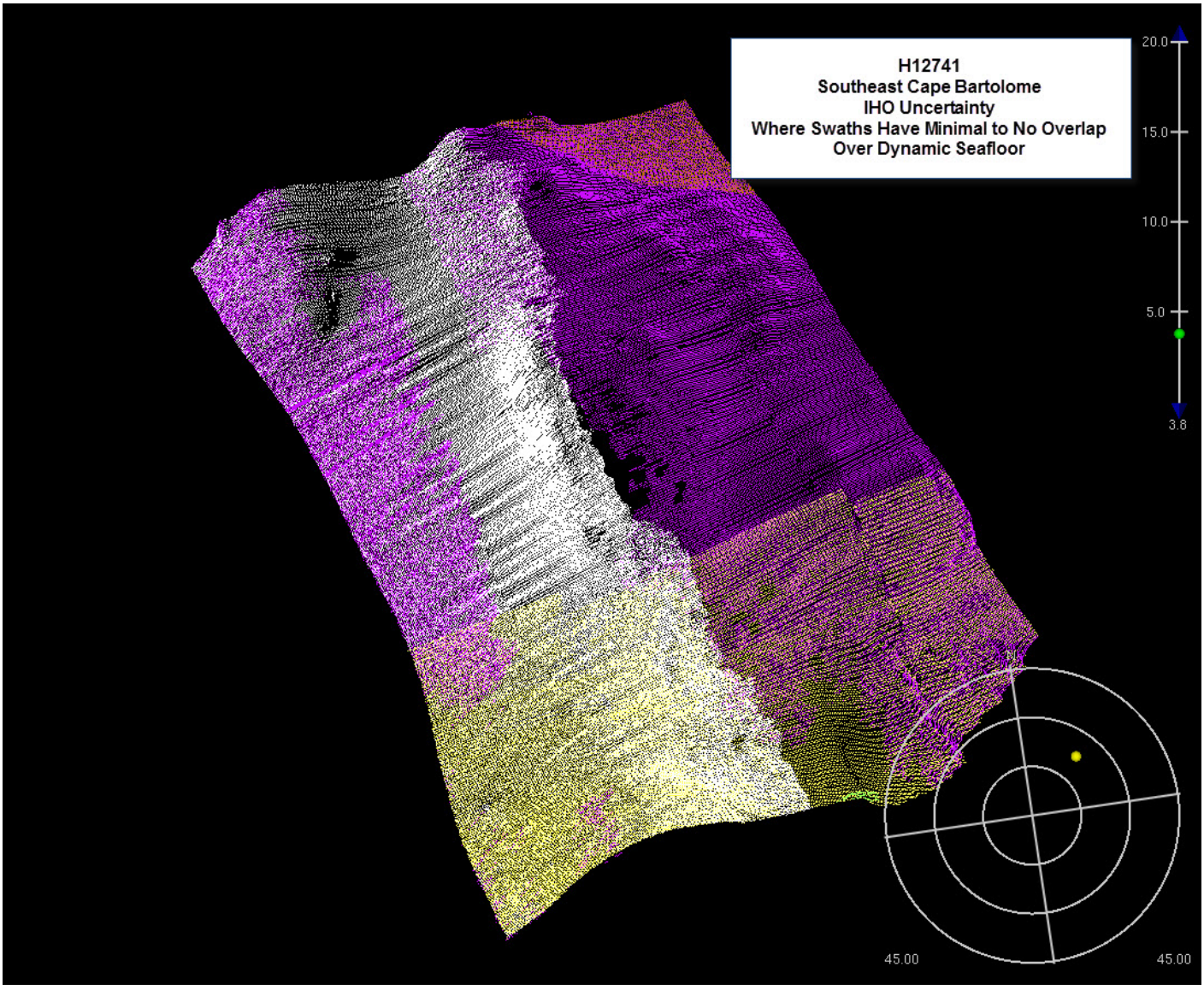


Figure 38: H12741 Subset View of Southeast Cape Bartolome Area of High IHO Uncertainty, Minimal Overlap Over Dynamic Seafloor

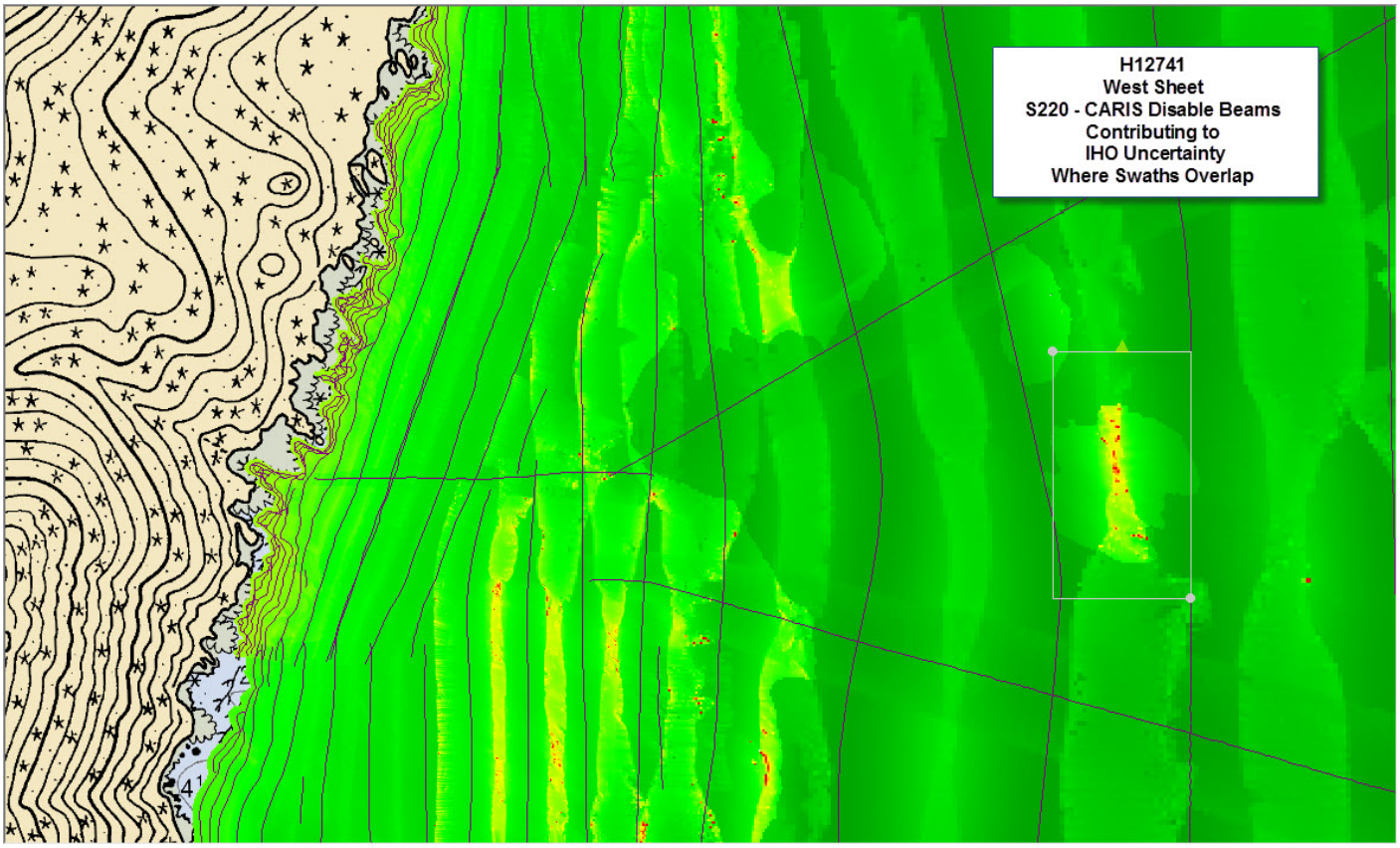


Figure 39: H12741 Graphical View of High IHO Uncertainty Where CARIS Disabled Beams

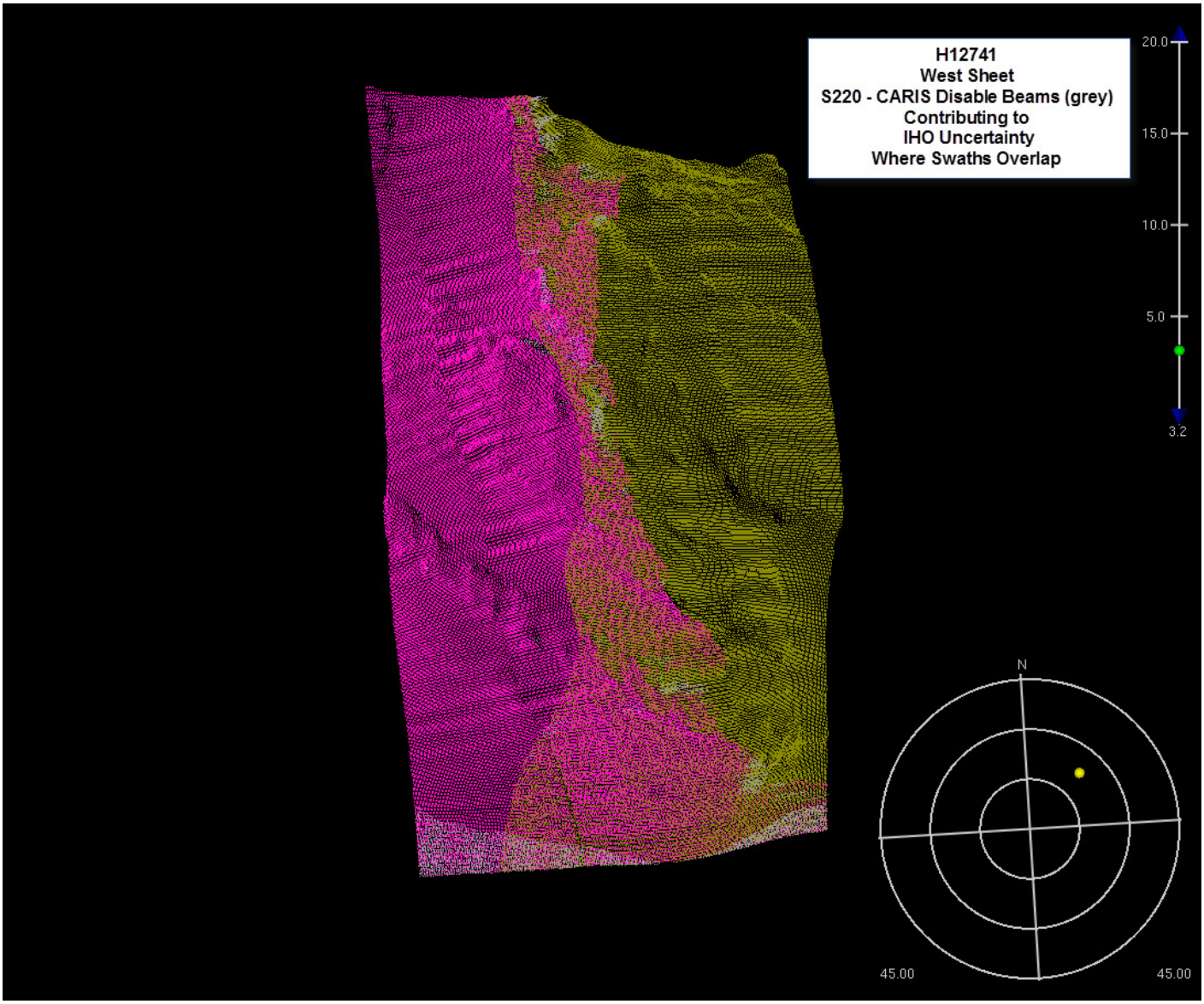


Figure 40: H12741 Subset View of High IHO Uncertainty Where CARIS Disabled Beams

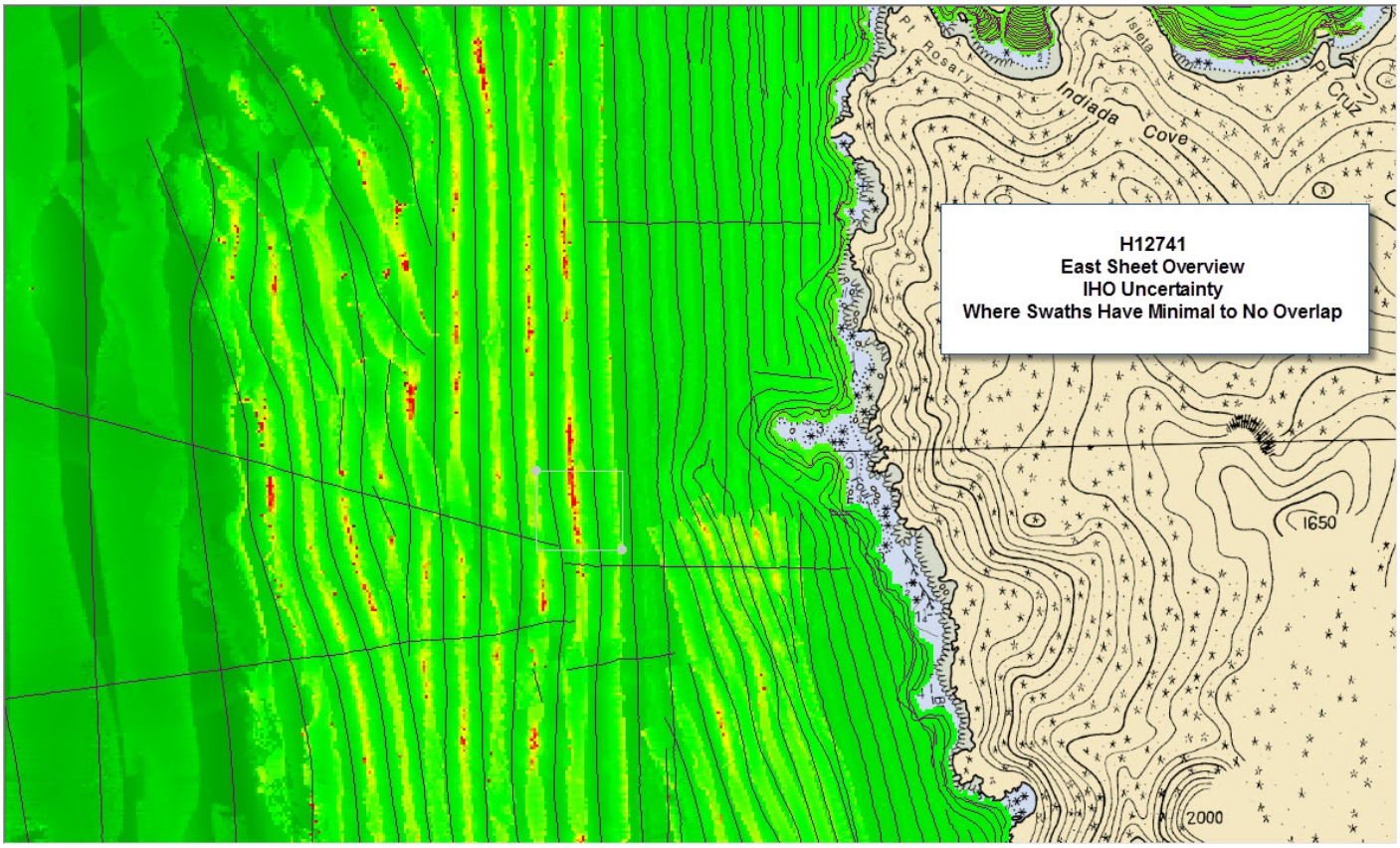


Figure 41: H12741 Graphical View of High IHO Uncertainty Due to Minimal to No Overlap Over Dynamic Seafloor

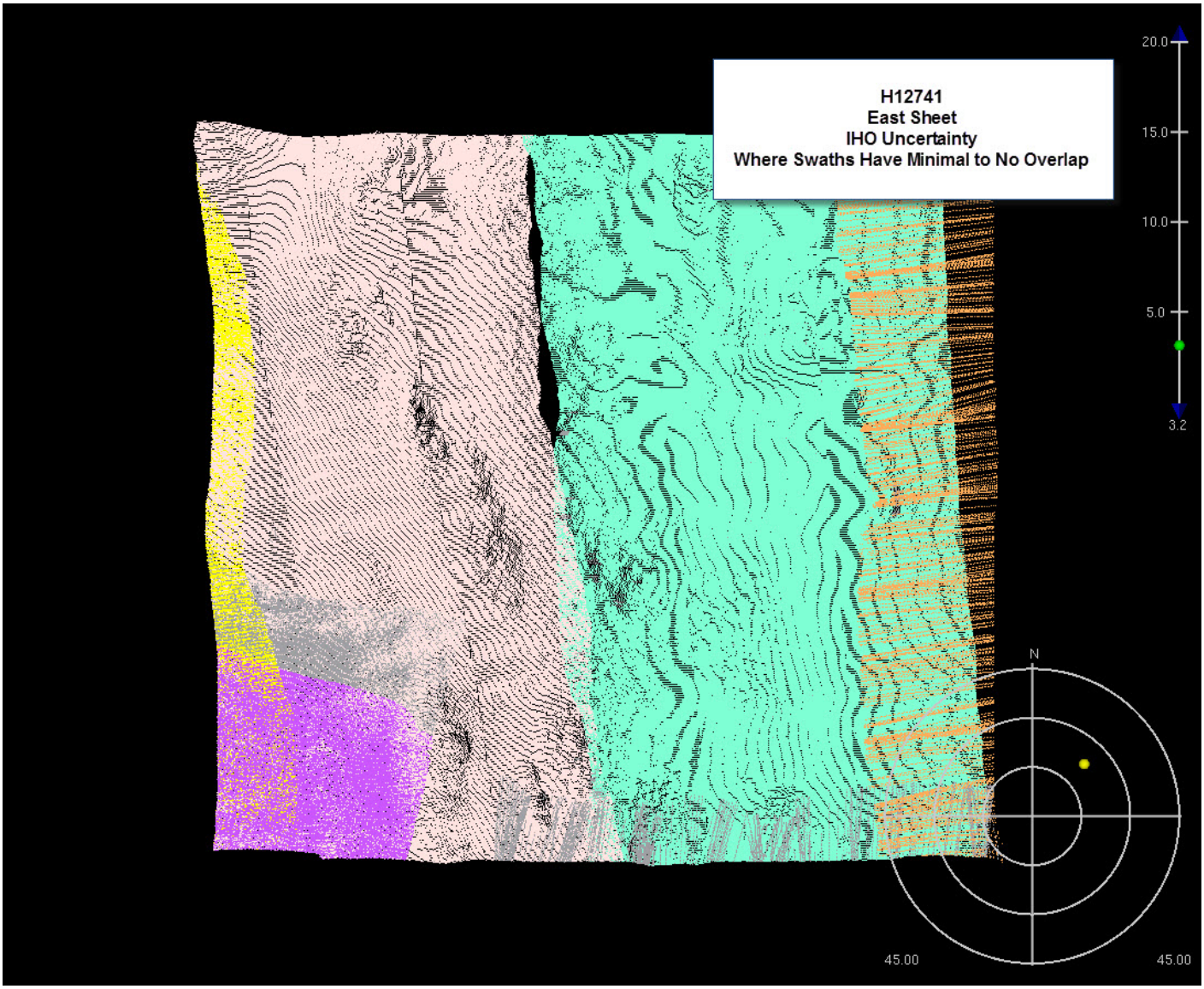


Figure 42: H12741 Subset View of High IHO Uncertainty Due to Minimal to No Overlap Over Dynamic Seafloor

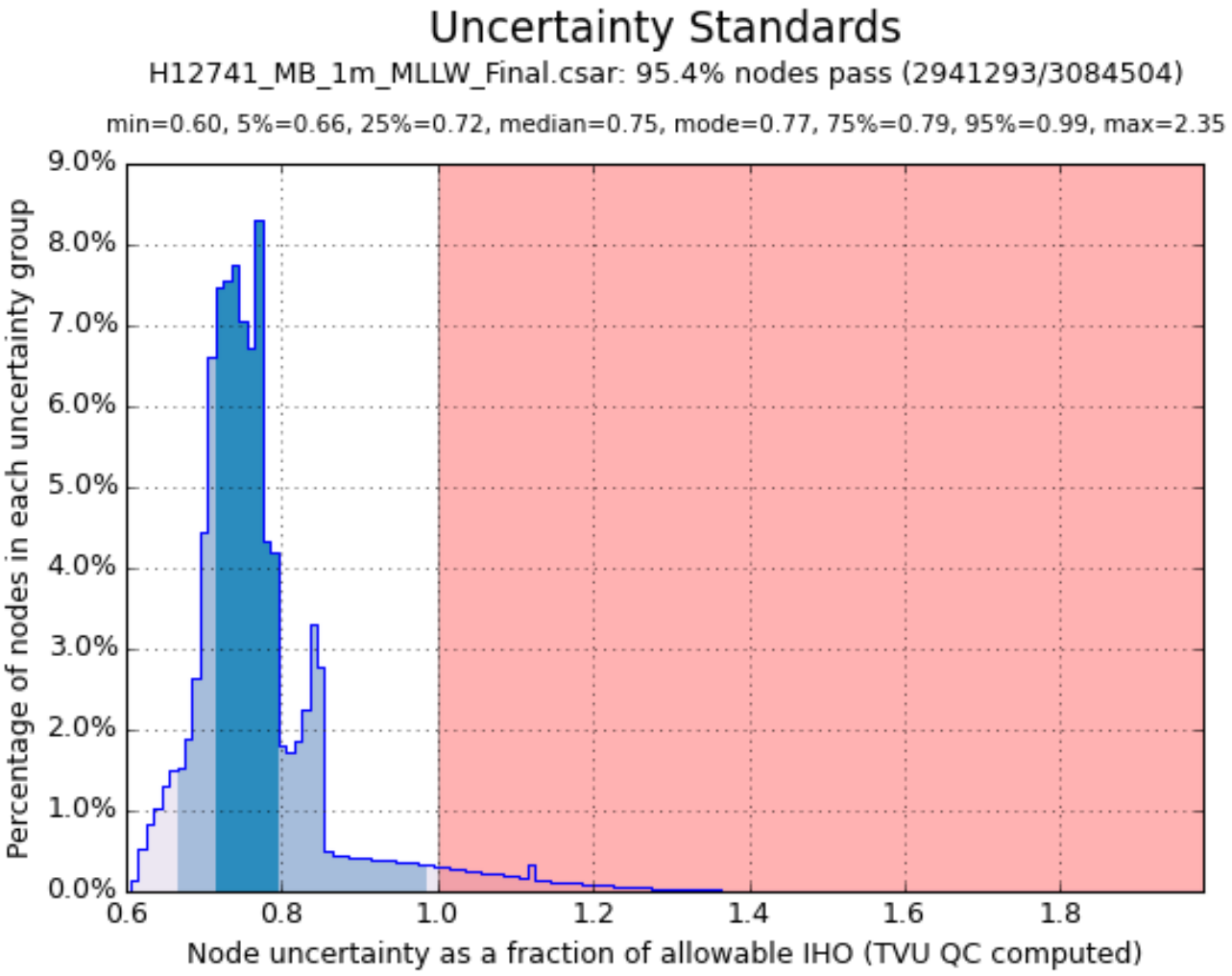


Figure 43: H12741 1m Finalized Surface Uncertainty Statistics

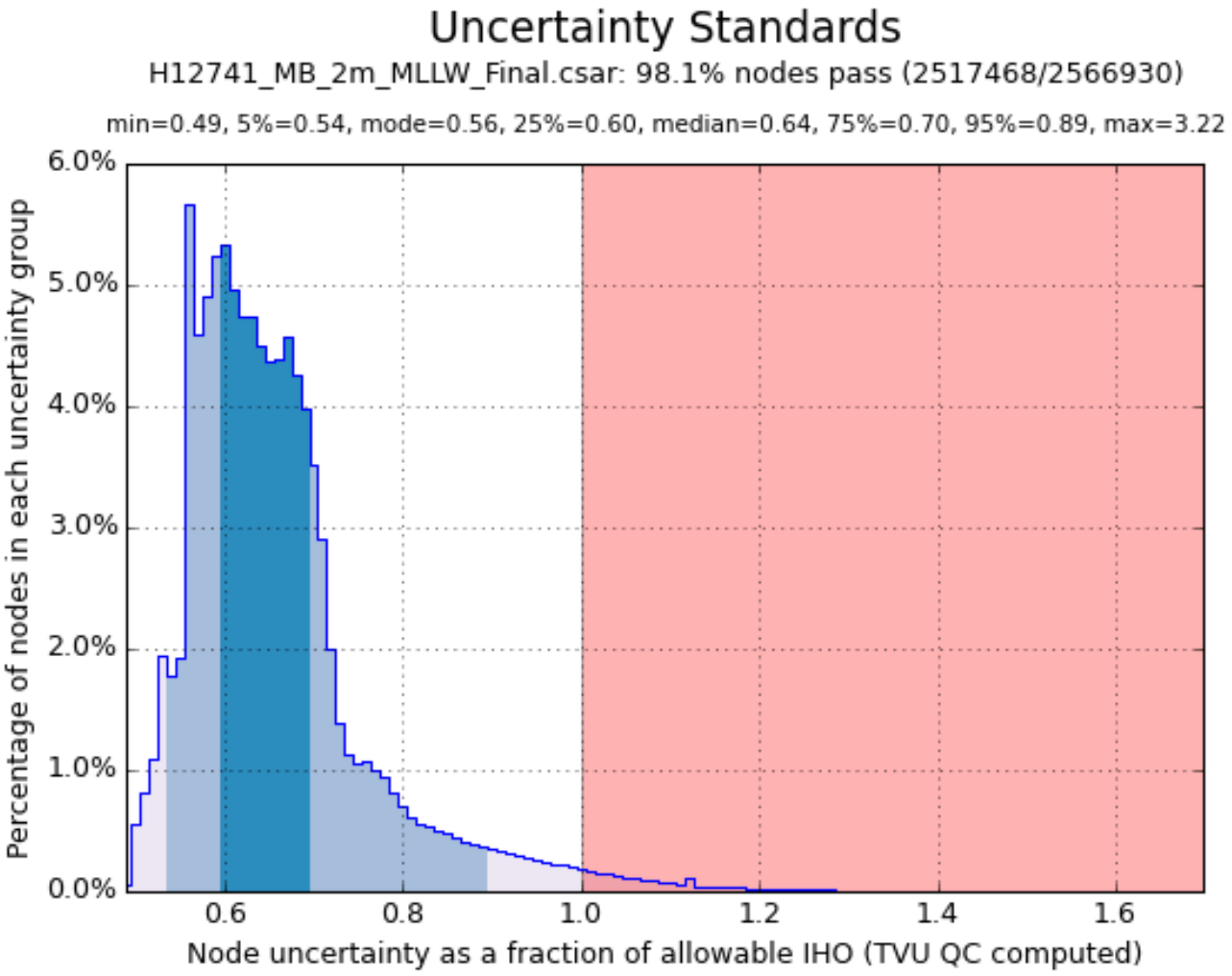


Figure 44: H12741 2m Finalized Surface Uncertainty Statistics

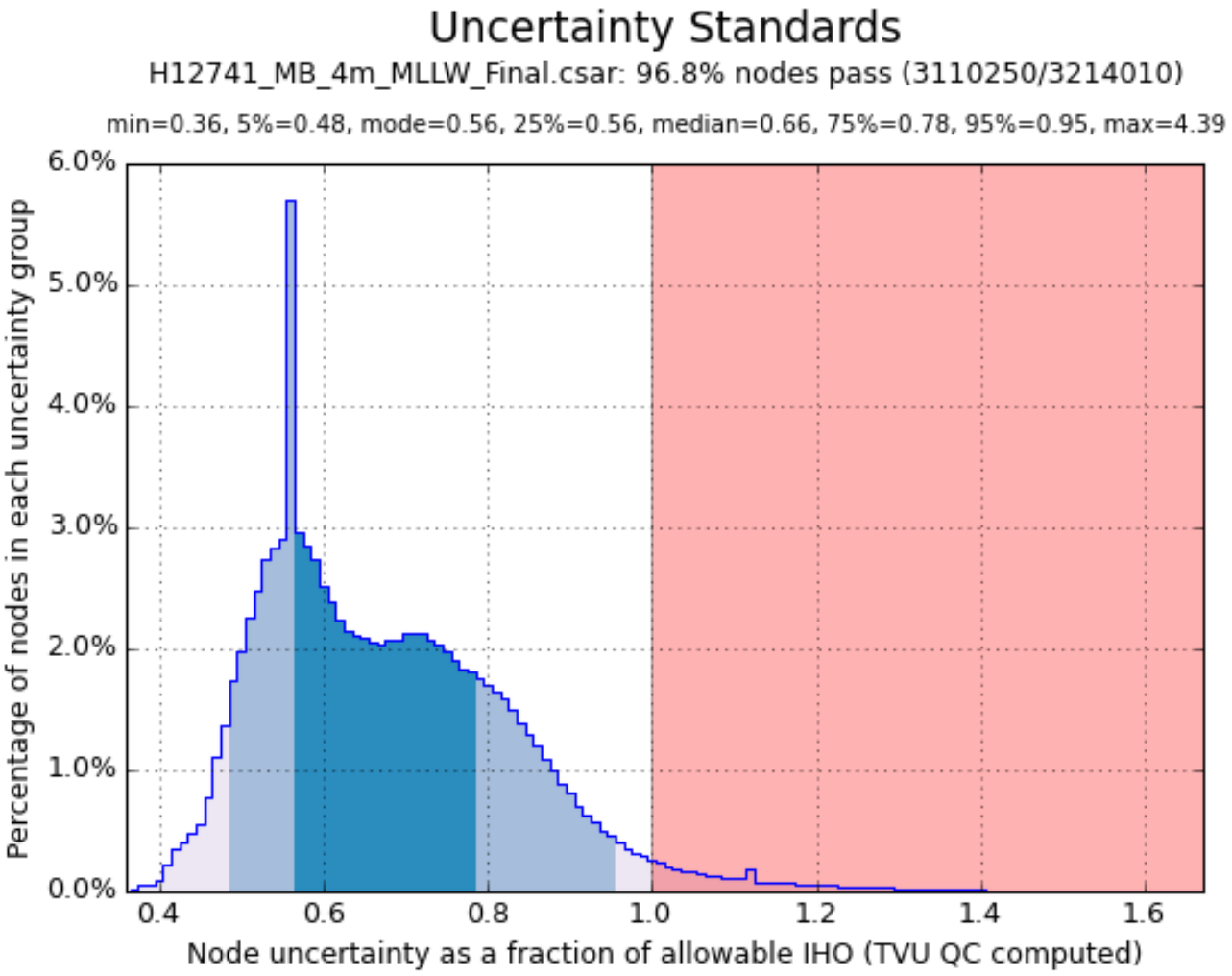


Figure 45: H12741 4m Finalized Surface Uncertainty Statistics

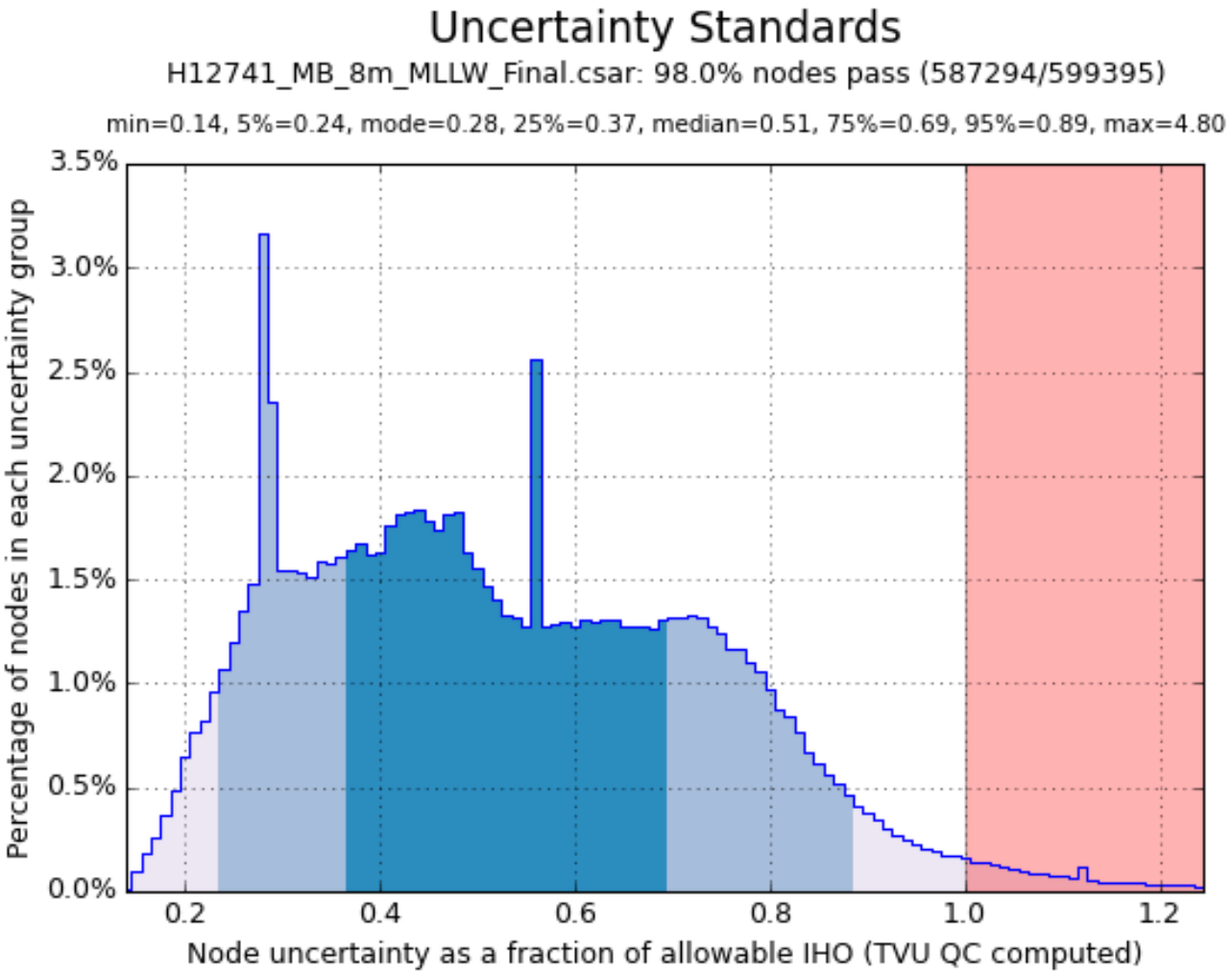


Figure 46: H12741 8m Finalized Surface Uncertainty Statistics

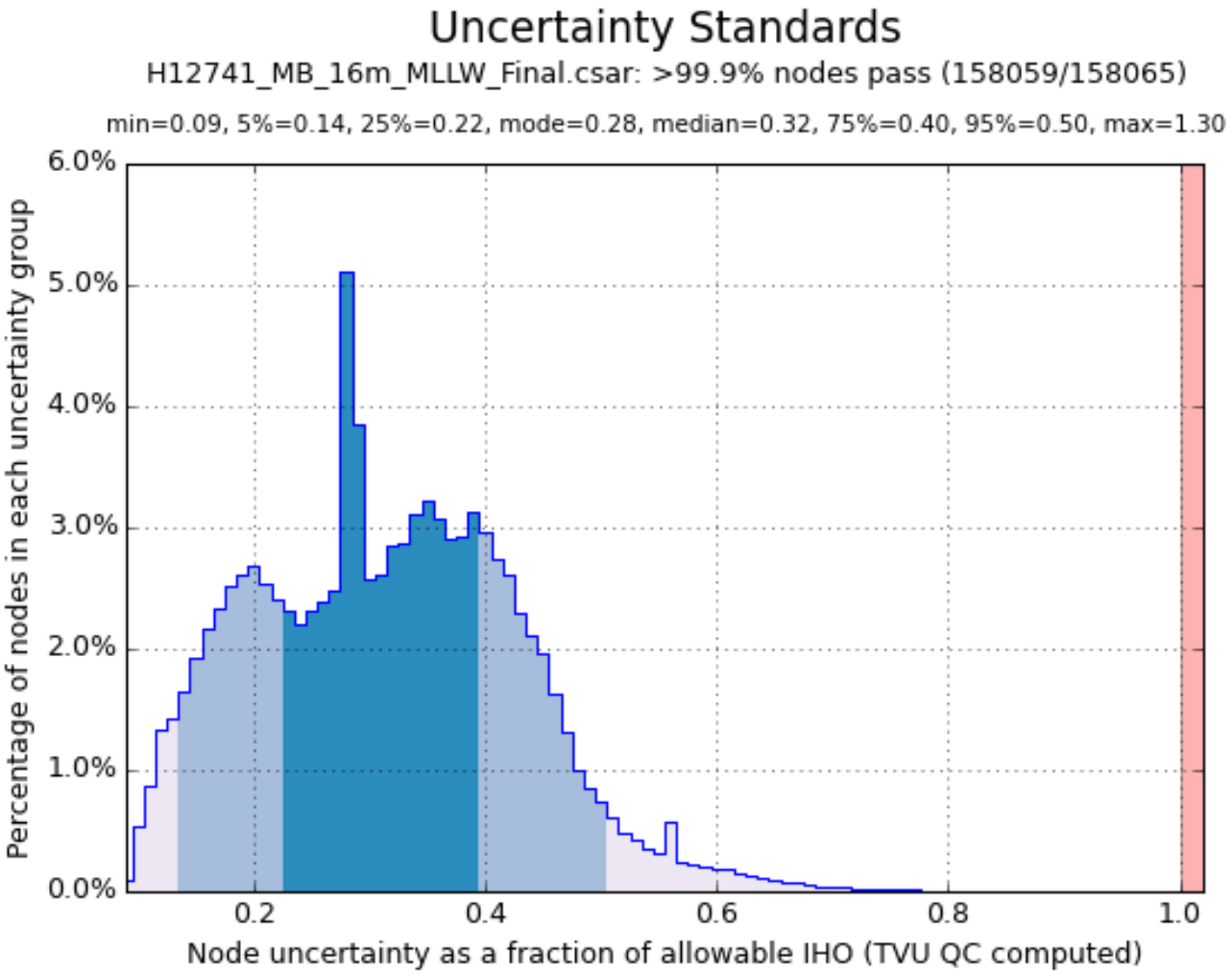


Figure 47: H12741 16m Finalized Surface Uncertainty Statistics

B.2.10 Density Compliance

Density requirements for the 1m, 2m, 4m, 8m and 16m finalized surfaces for H12741 were achieved with at least 99.5% of finalized surface nodes containing five or more soundings. See Figures 53 to 57 and the Standards Compliance Review in Appendix II for full statistics.

An overview of H12741 Density is provided in Figure 48.

Areas of low density can be seen in the figures below:

Figures 49 and 50 show an example of low density east of Pt. Rosary due to southern swell causing excessive yaw and push of survey vessel while operating within the vessel speed constraints of the RESON 200kHz multibeam sonar.

Figures 51 and 52 show an example of low density, less than 5 pings per node, southwest of Cape Felix due to minimal overlap and east winds 10 to 15kts with 3-6ft seas causing excessive yaw of the survey vessel.

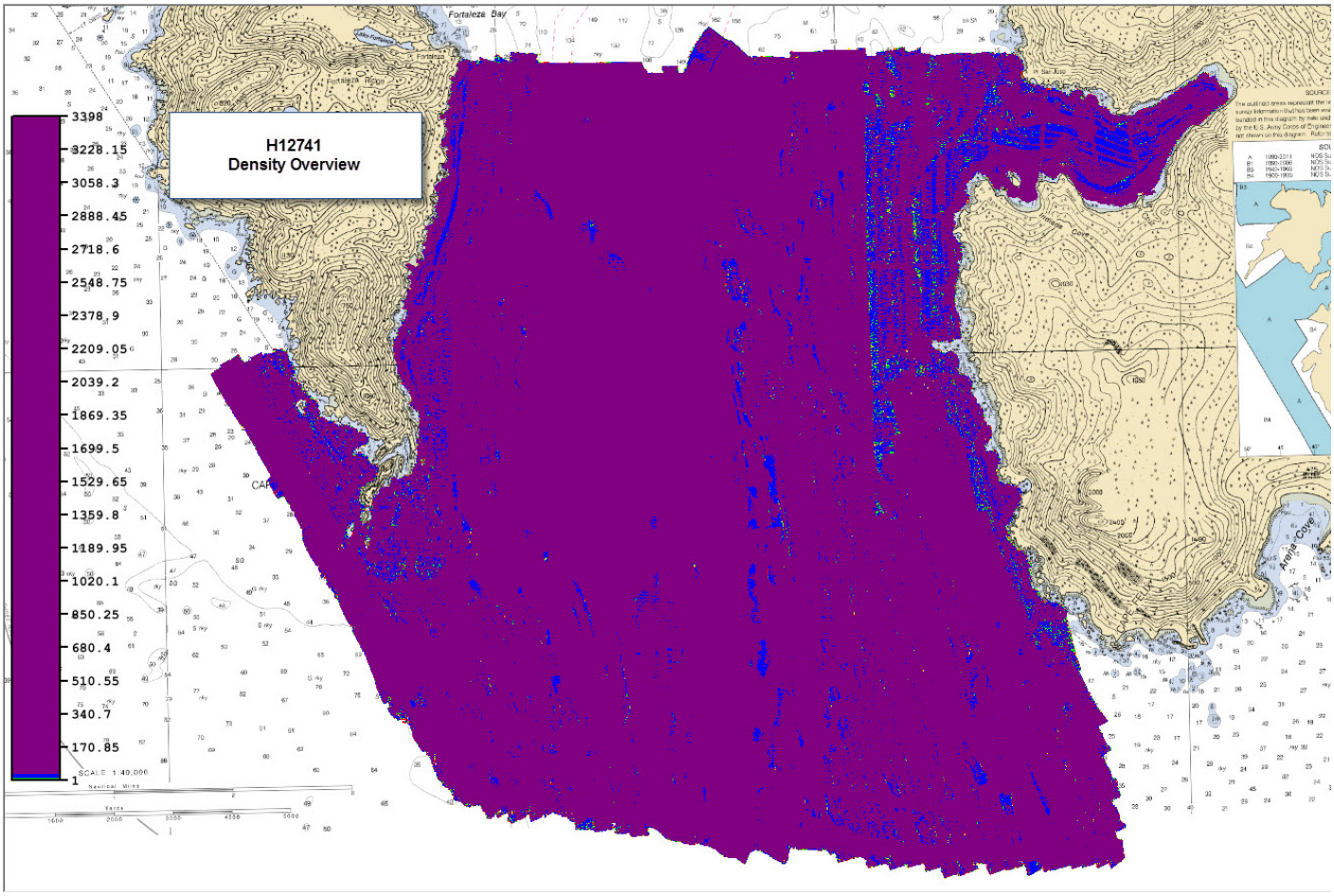


Figure 48: H12741 Density Overview

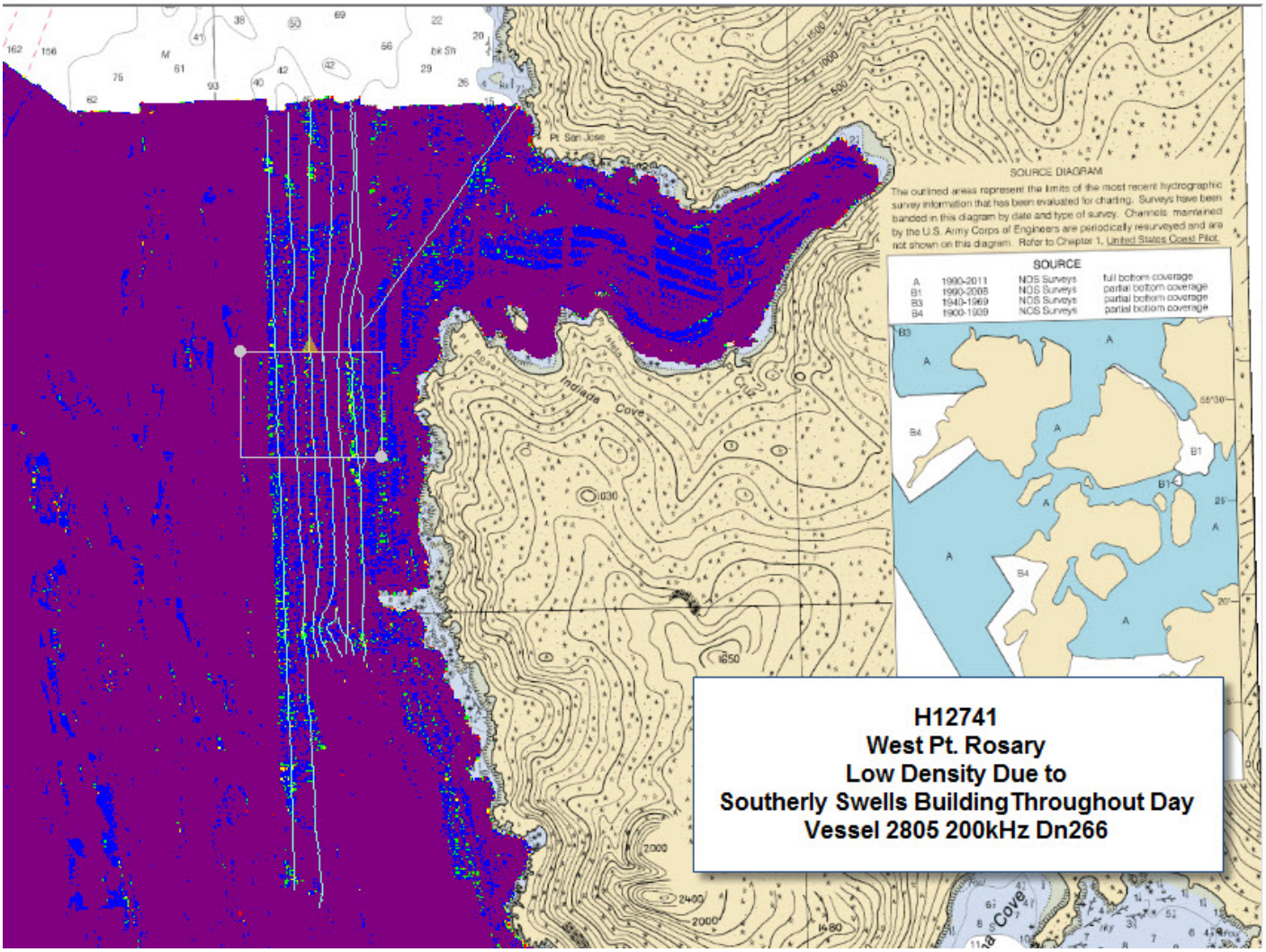


Figure 49: H12741 Graphical Overview of Low Density Due to Southern Swell

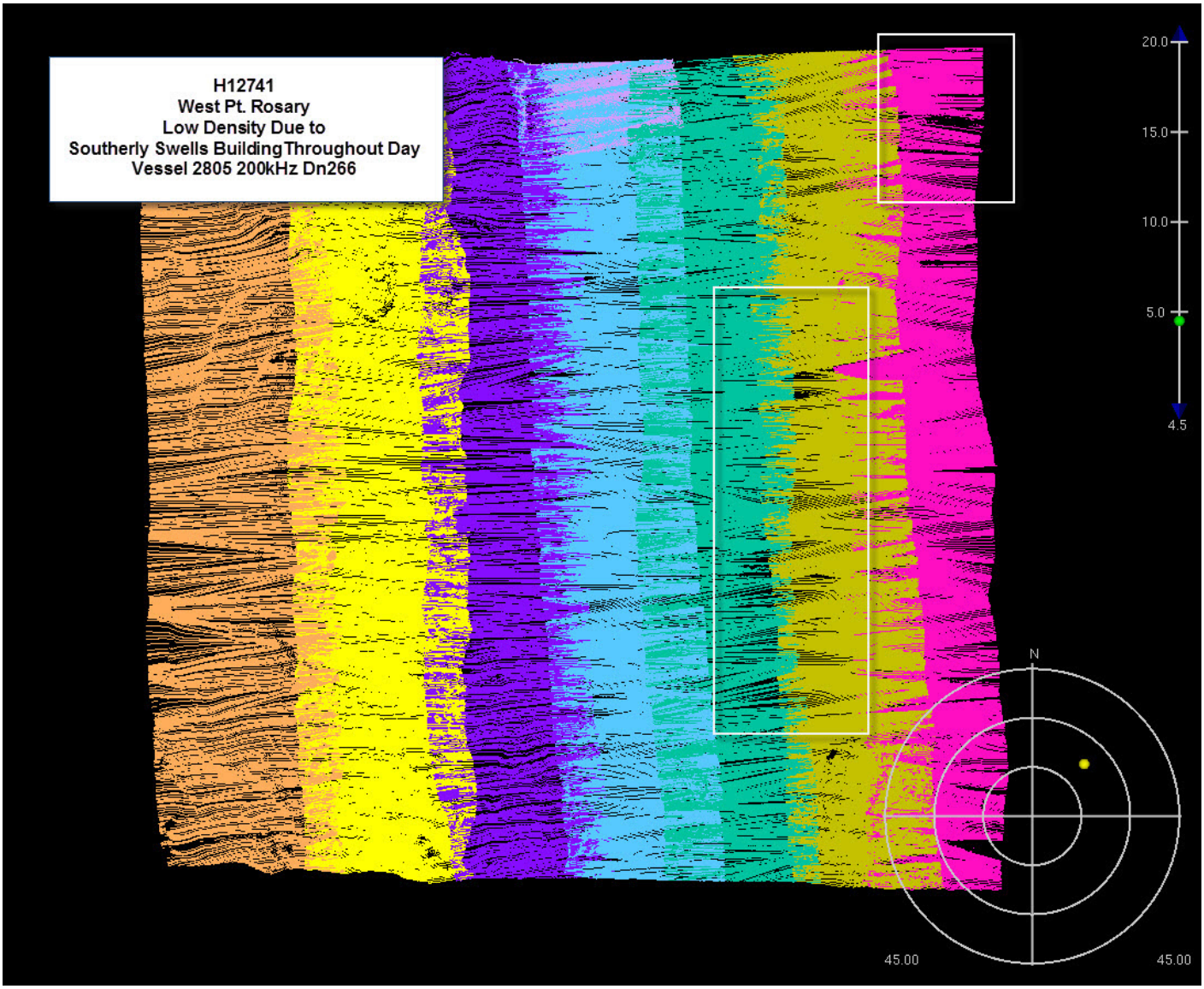


Figure 50: H12741 Subset of Low Density Due to Southern Swell

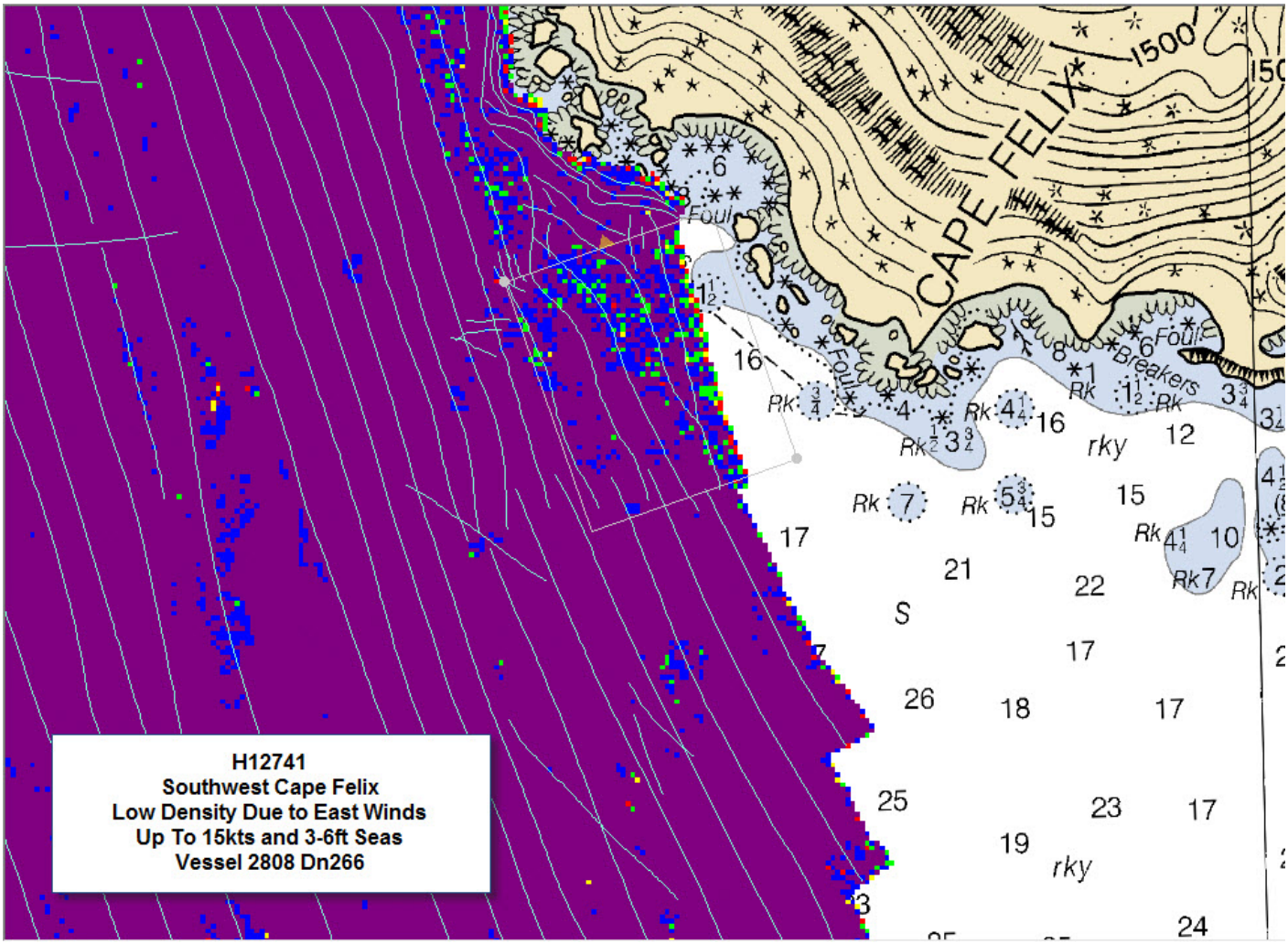


Figure 51: H12741 Graphical Overview of Low Density Due to East Winds 10 to 15kts

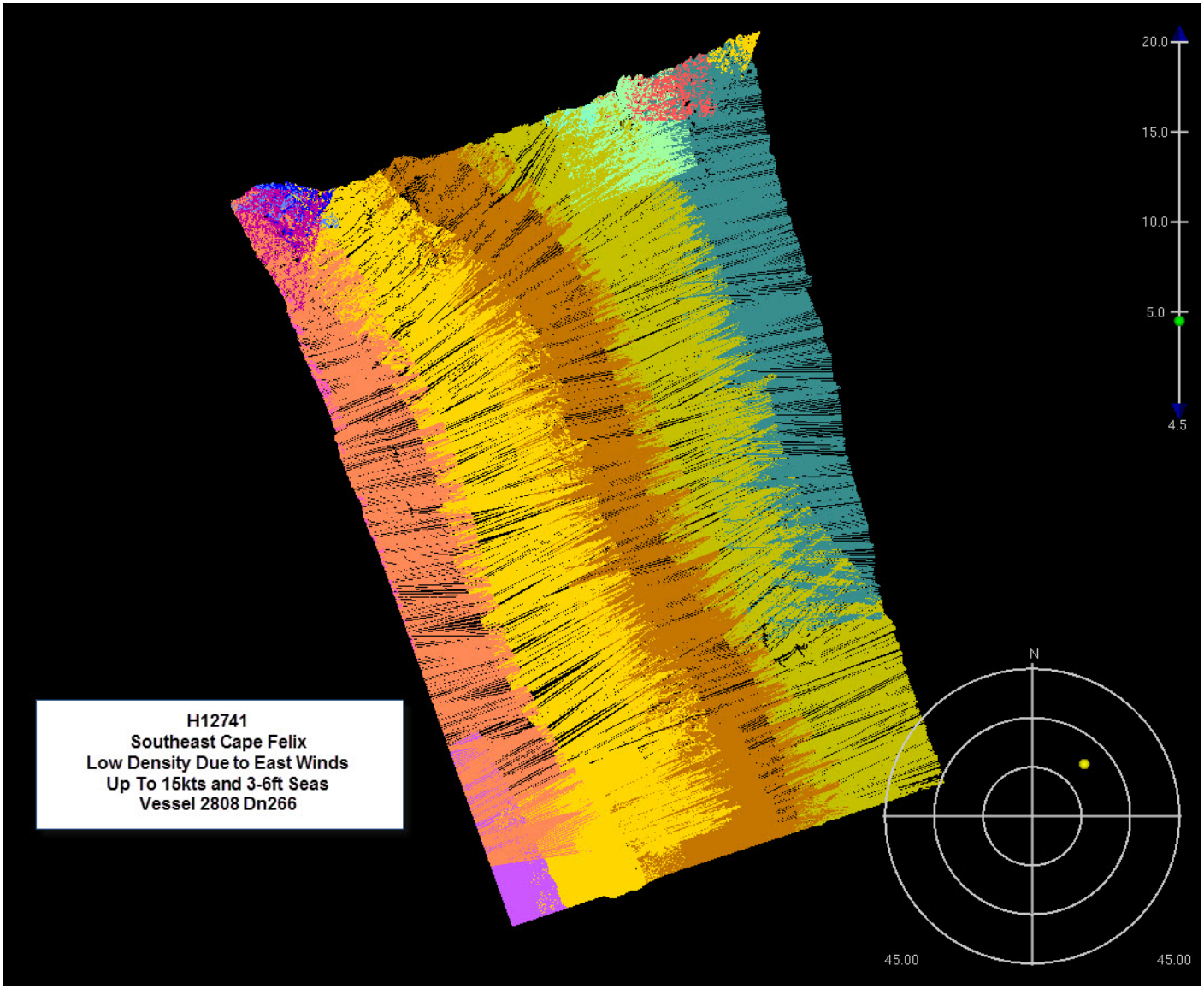


Figure 52: H12741 Subset of Low Density Due to East Winds 10 to 15kts

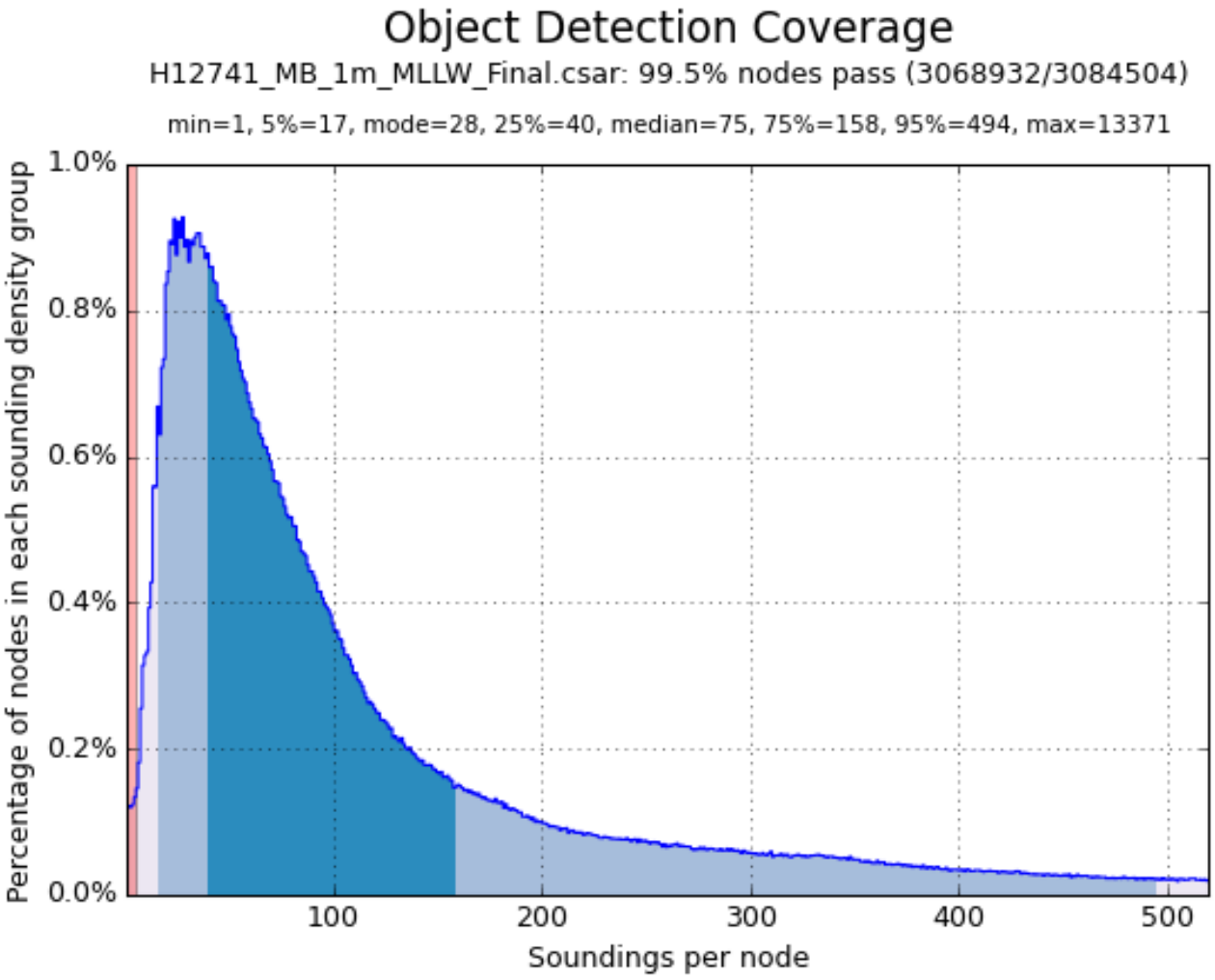


Figure 53: H12741 1m Finalized Surface Density Statistics

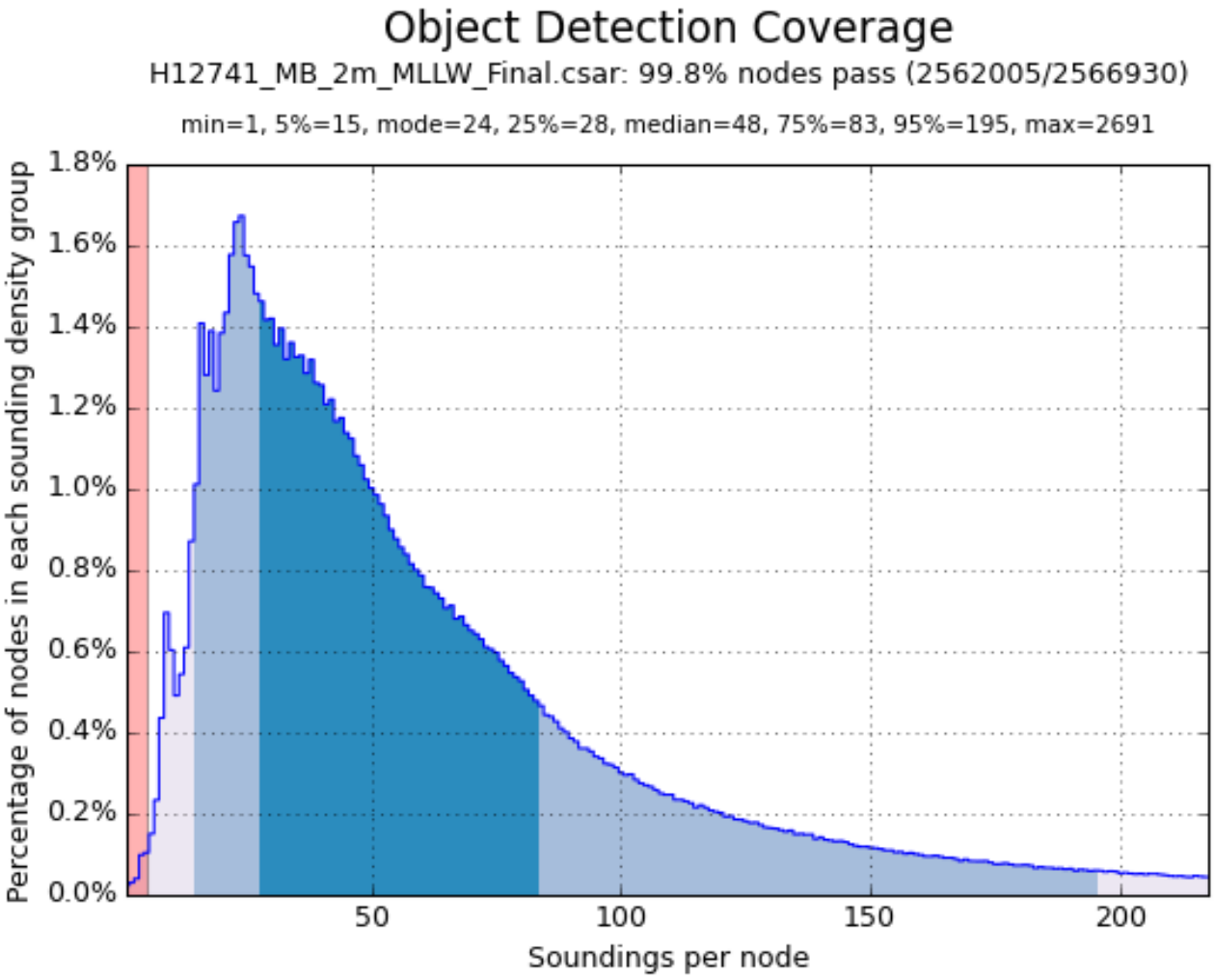


Figure 54: H12741 2m Finalized Surface Density Statistics

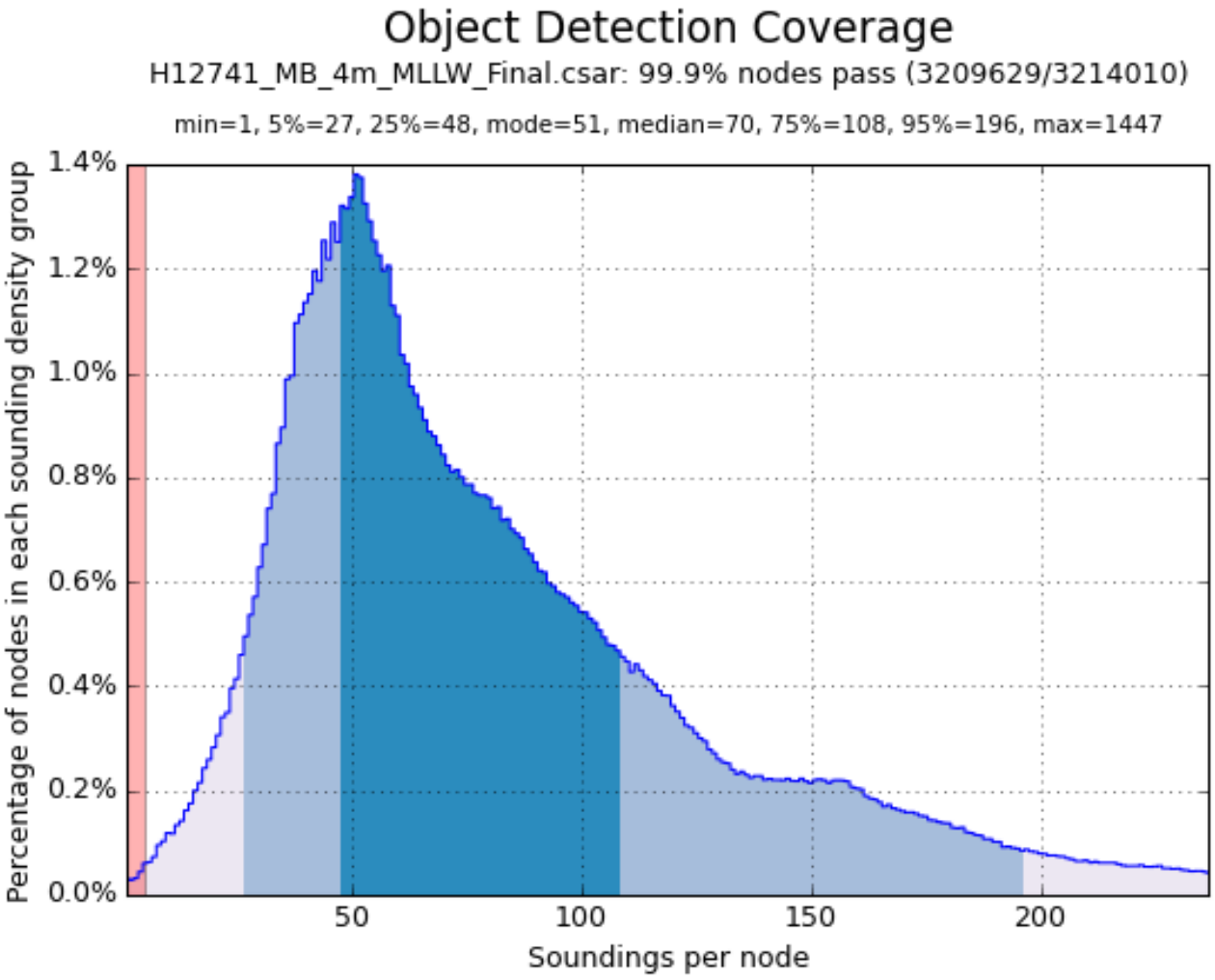


Figure 55: H12741 4m Finalized Surface Density Statistics

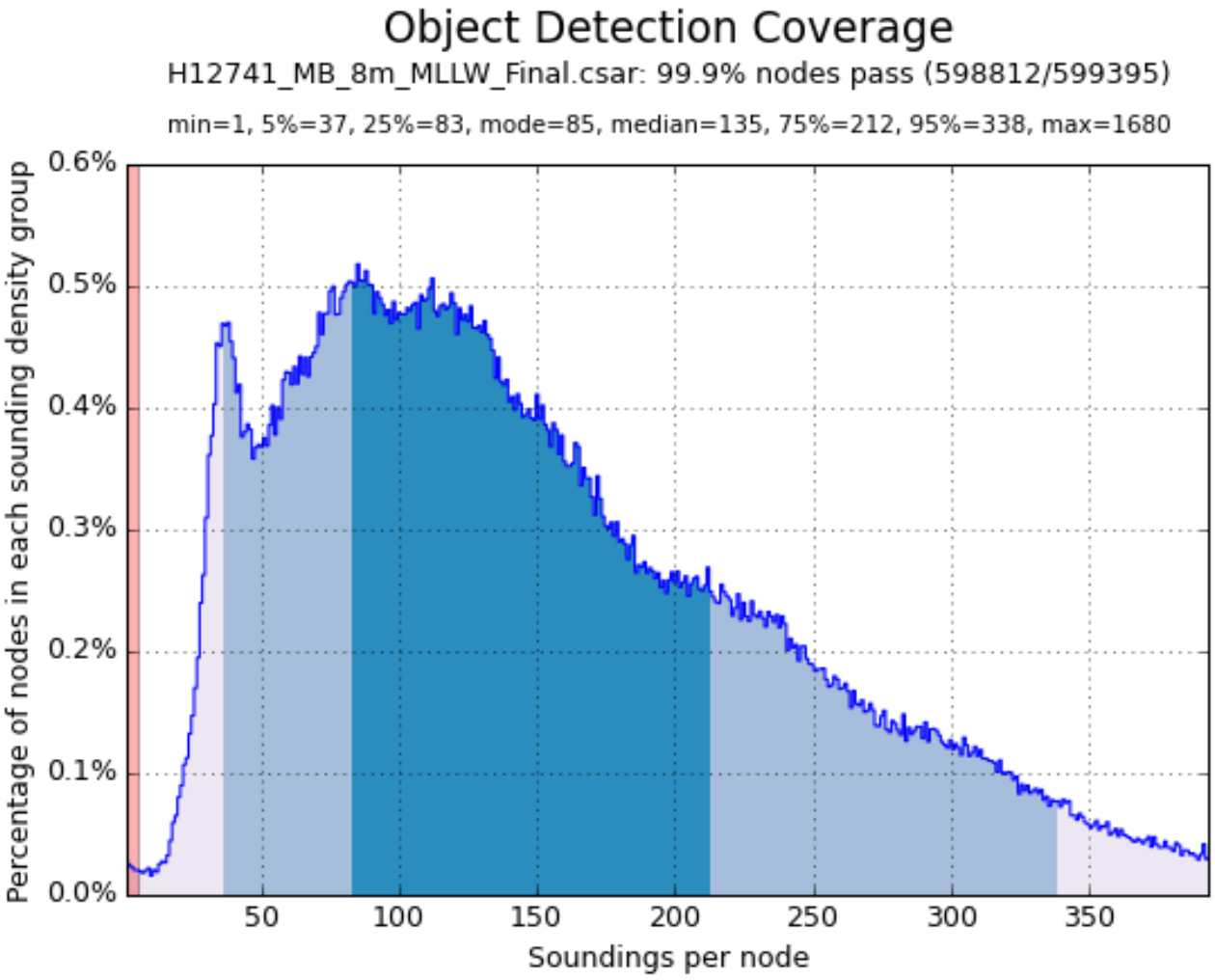


Figure 56: H12741 8m Finalized Surface Density Statistics

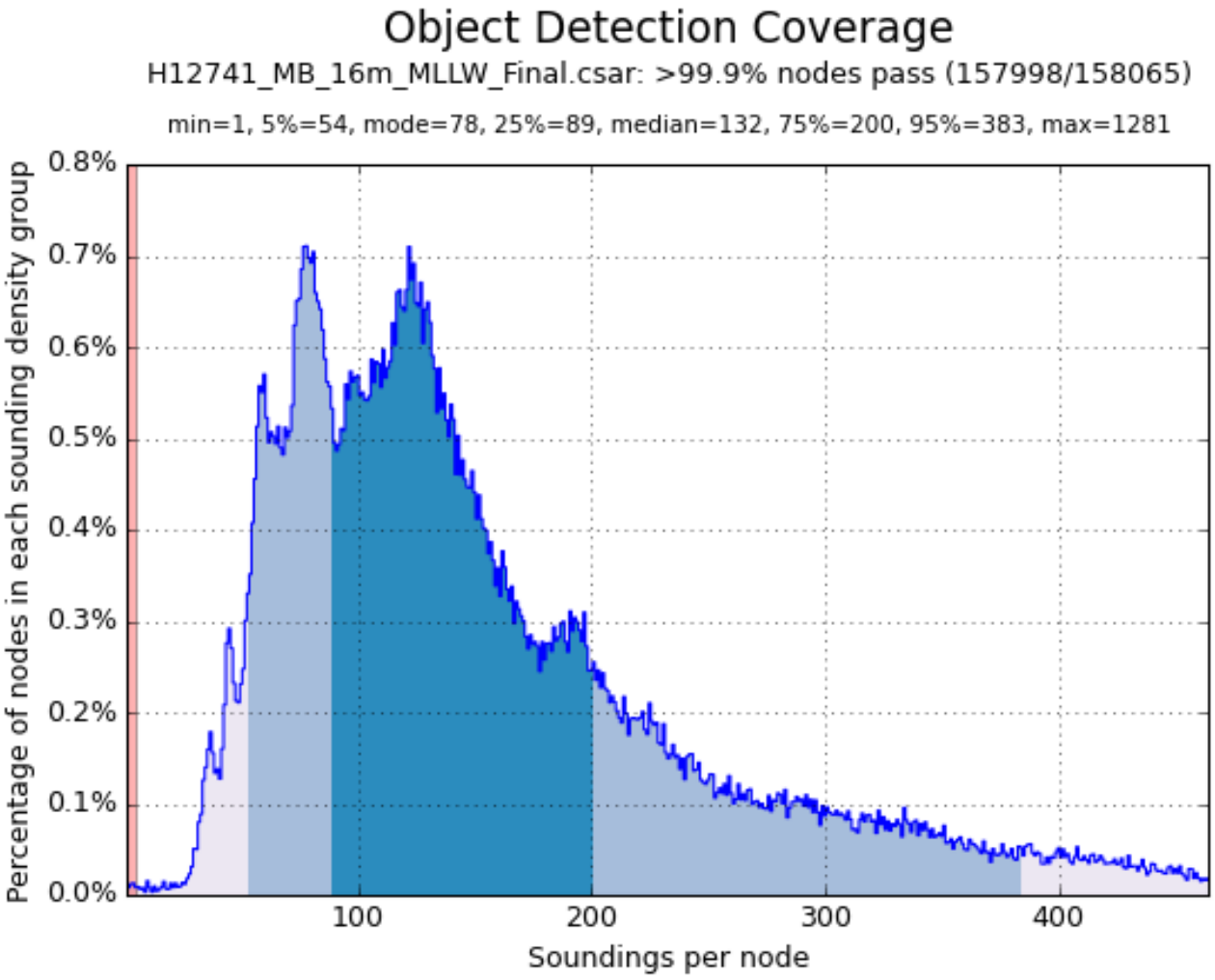


Figure 57: H12741 16m Finalized Surface Density Statistics

B.2.11 Holiday Assessment

H12741 data was reviewed in CARIS HIPS and SIPS. The May 2015 HSSD was used when assessing H12741 for holidays. Holidays are present in H12741 due to the following four factors:

1. Sea State (Holiday-pickup called off on DN 309 due to worsening seas) Refer to scanned boat sheets in Separates I Acquisition and Processing Logs Detached Positions for additional reference.
2. Foul areas of Kelp
3. Steep slope in rocky areas
4. Falling Tide Near Features

The least depths of all navigationally significant features are represented by H12741, with the exception of the examples below in Figures 59 and 60.

Figure 58 represents an example of a holiday northwest of Cape Bartolome where launch operations ceased due to large breakers and rising swells. Other holidays outlined on Boat sheets for vessel 2807 Day Number 309 are included in this category.

Figures 59 and 60 show an overview on the west coast of H12741 where the least depth of a feature was unable to be attained due to limits of hydrography i.e. the safe maneuverability of the survey vessel and large breakers.

Figures 61 and 62 show an example of areas which occur on both the east and west coasts of Survey H12741 that have incomplete multi-beam data due to acoustic shadows caused by steep downslope and the rocky nature of the coastline.

Figures 63 and 64 display an example in Santa Cruz Bay of incomplete coverage due to foul areas with kelp.

Holidays are present in the south bowl of Santa Cruz Bay near shore of Pt. Cruz due to dense kelp beds, refer to Section B.2.6 Factors Affecting Soundings and their images.

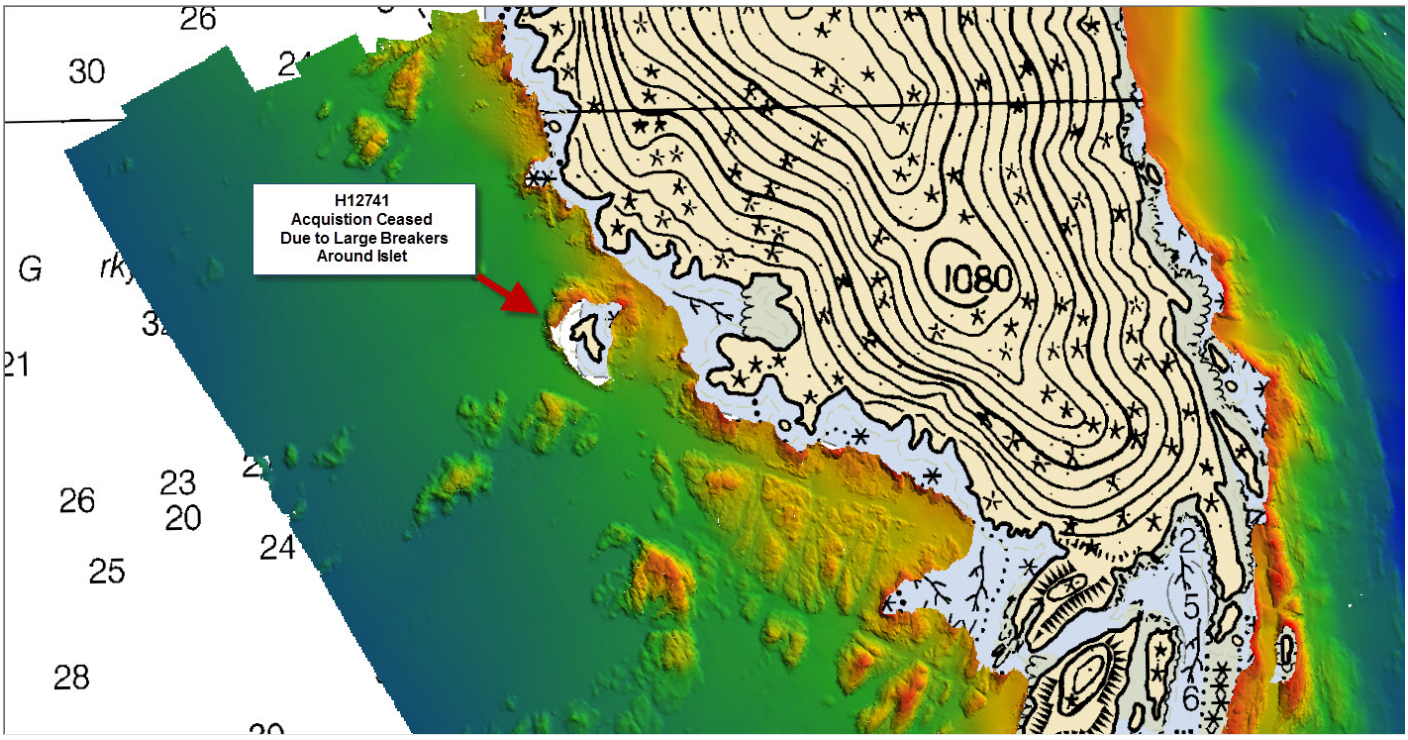


Figure 58: H12741 Graphical Overview of Holiday Due to Breakers Around Islet

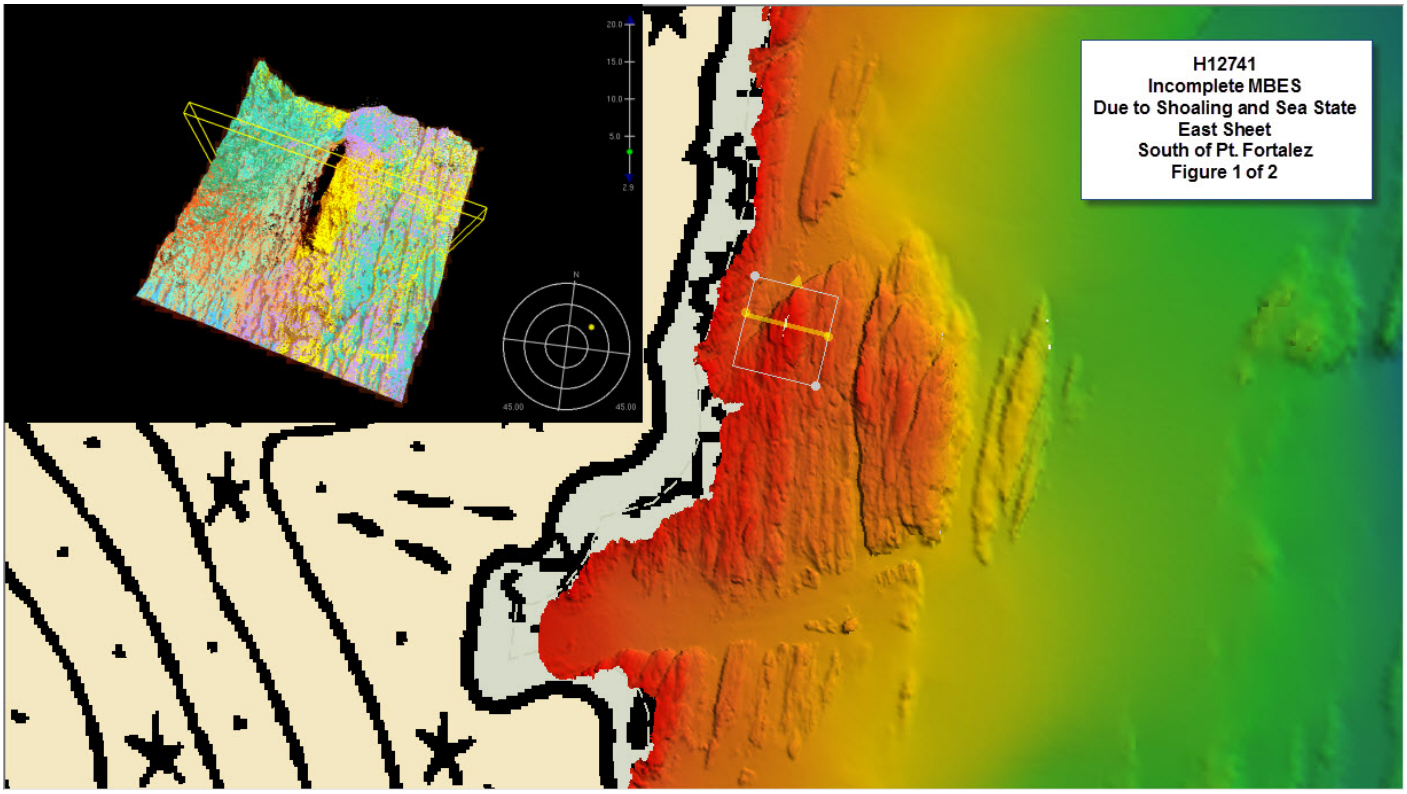


Figure 59: H12741 Graphical Overview of Holiday Due to Sea State

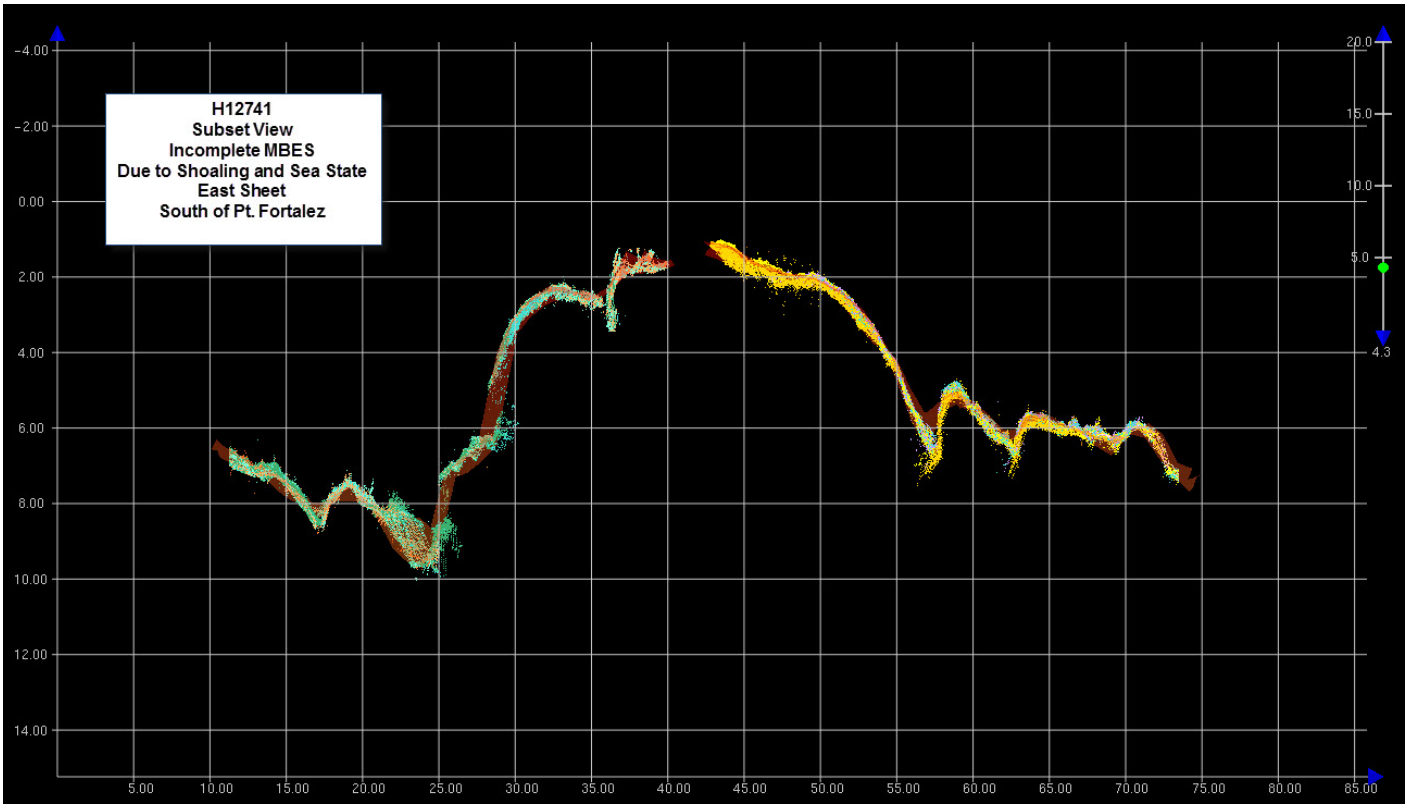


Figure 60: H12741 Graphical 2D Subset of Holiday Due to Sea state

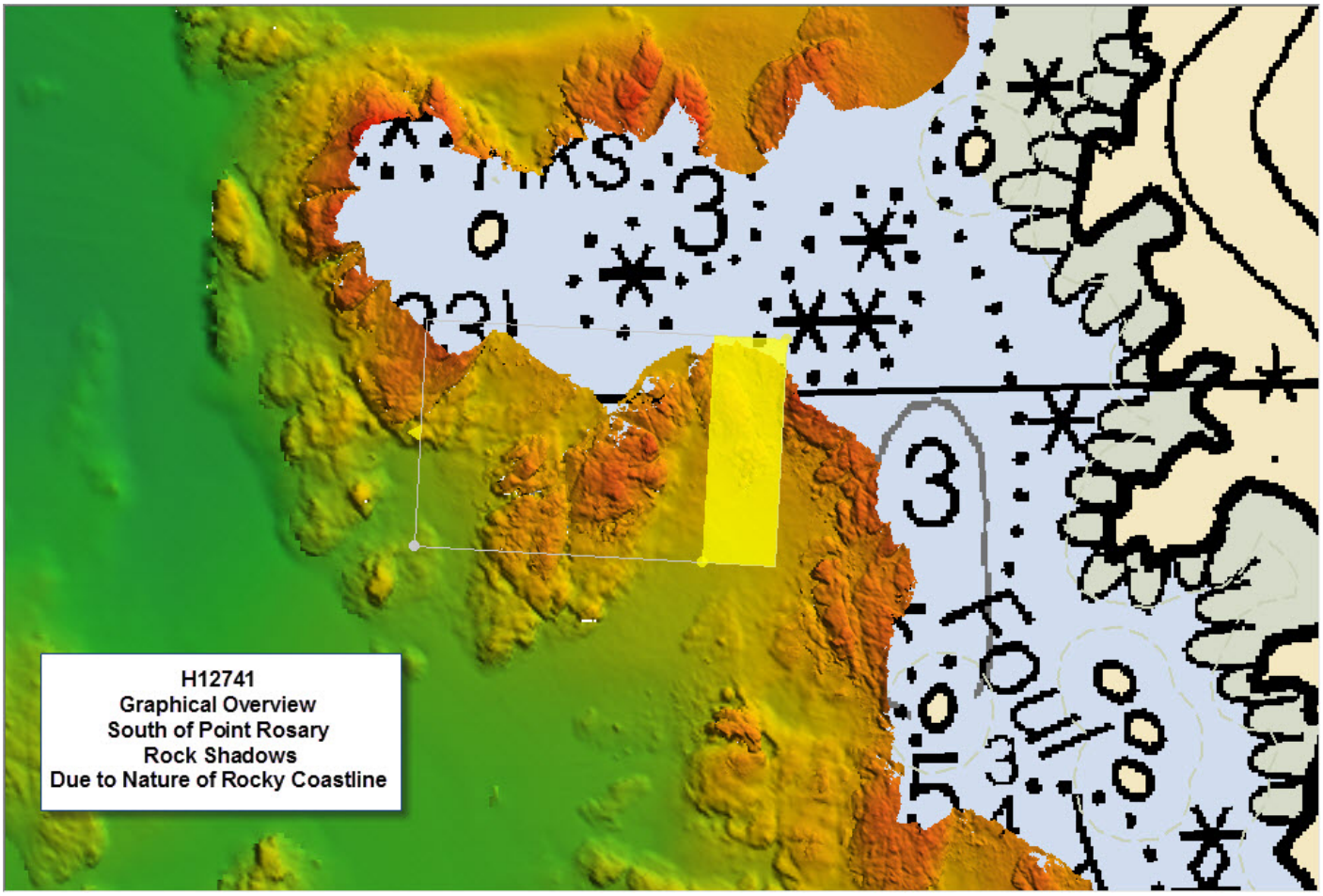


Figure 61: H12741 Graphical Overview of Holidays Due to Downslope of Rocky Coastal Line

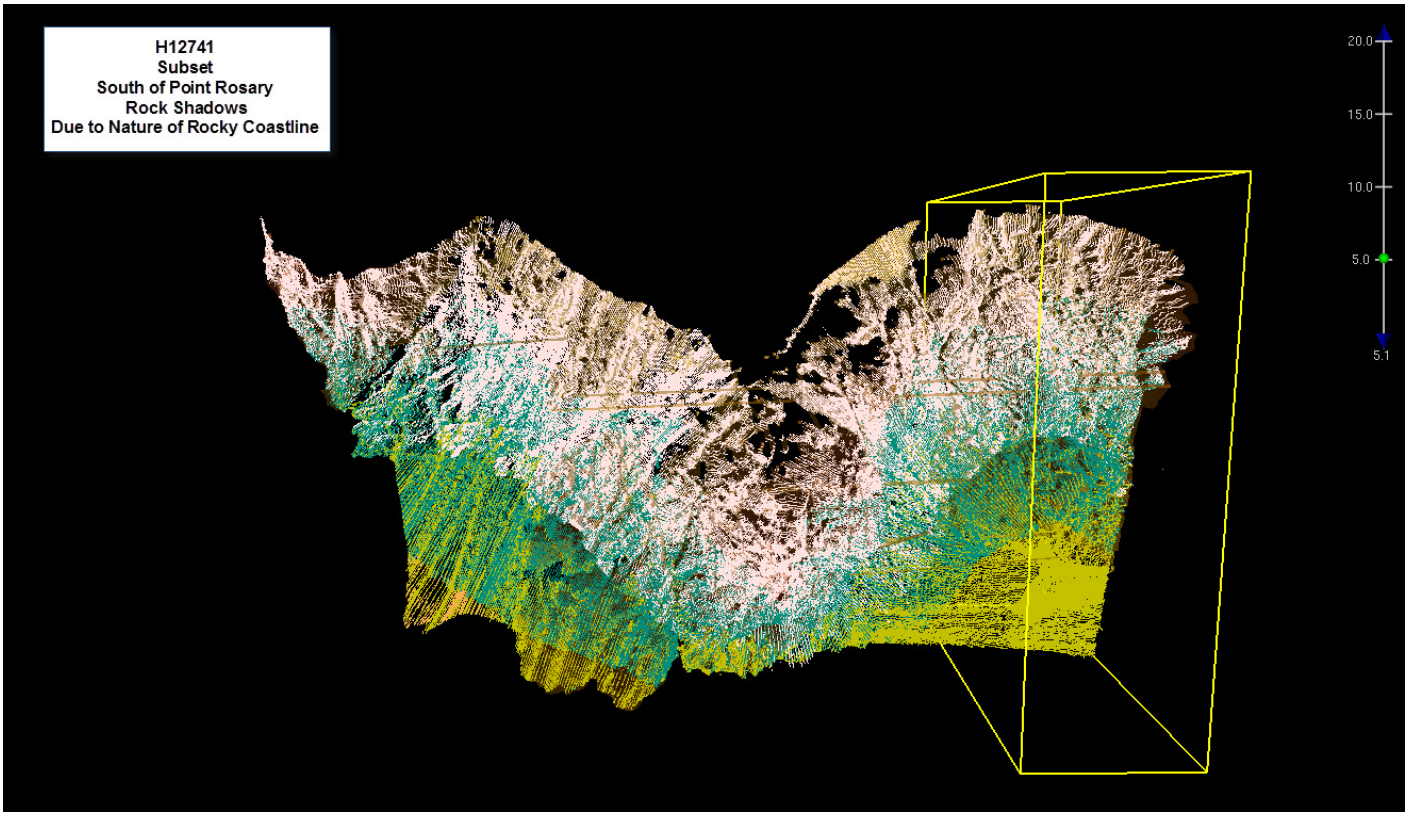


Figure 62: H12741 Graphical Subset of Holidays Due to Downslope of Rocky Coastal Line

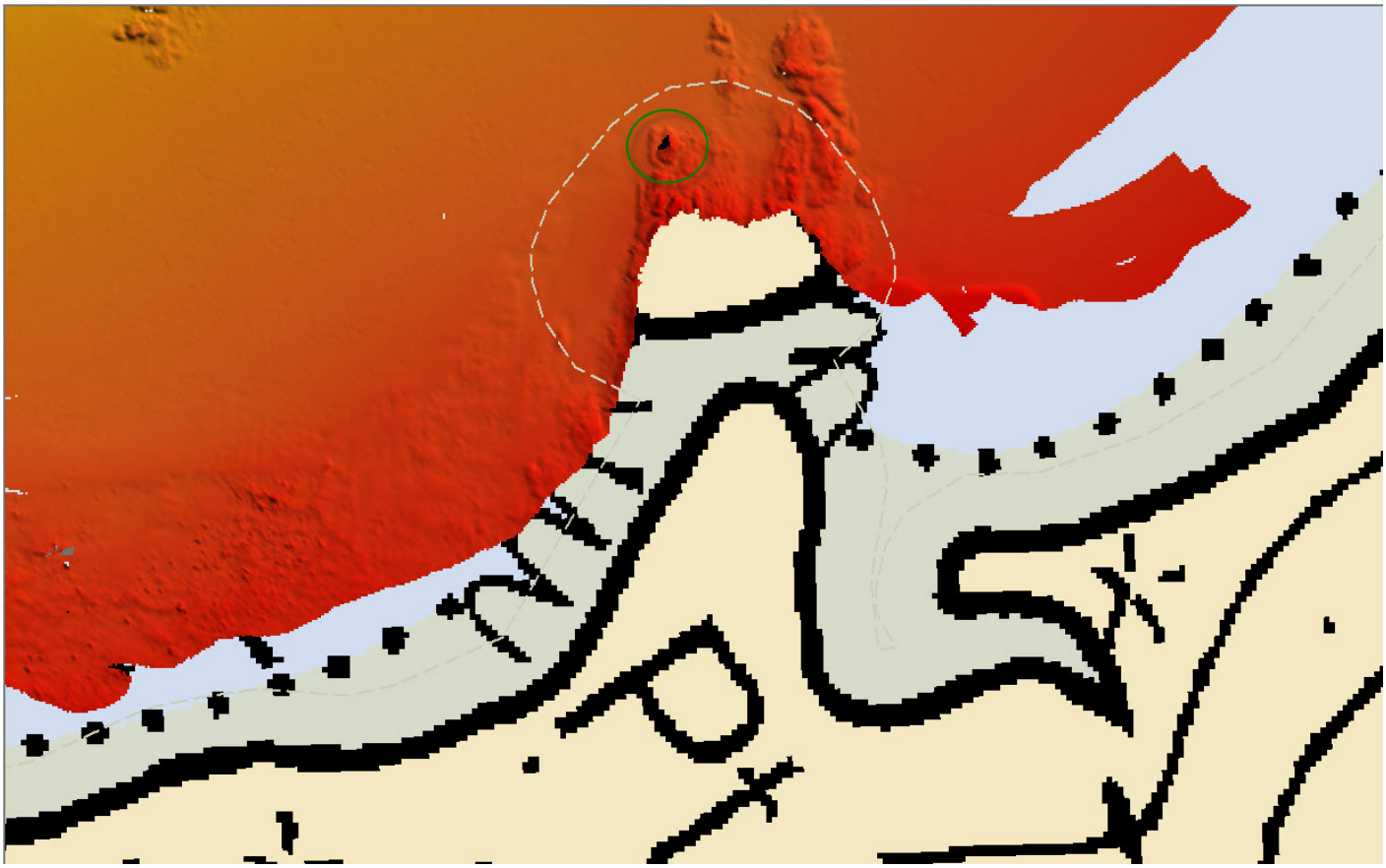


Figure 63: H12741 Graphical Overview of Holiday Due to Steep Downslope of Rocky Coastal Line

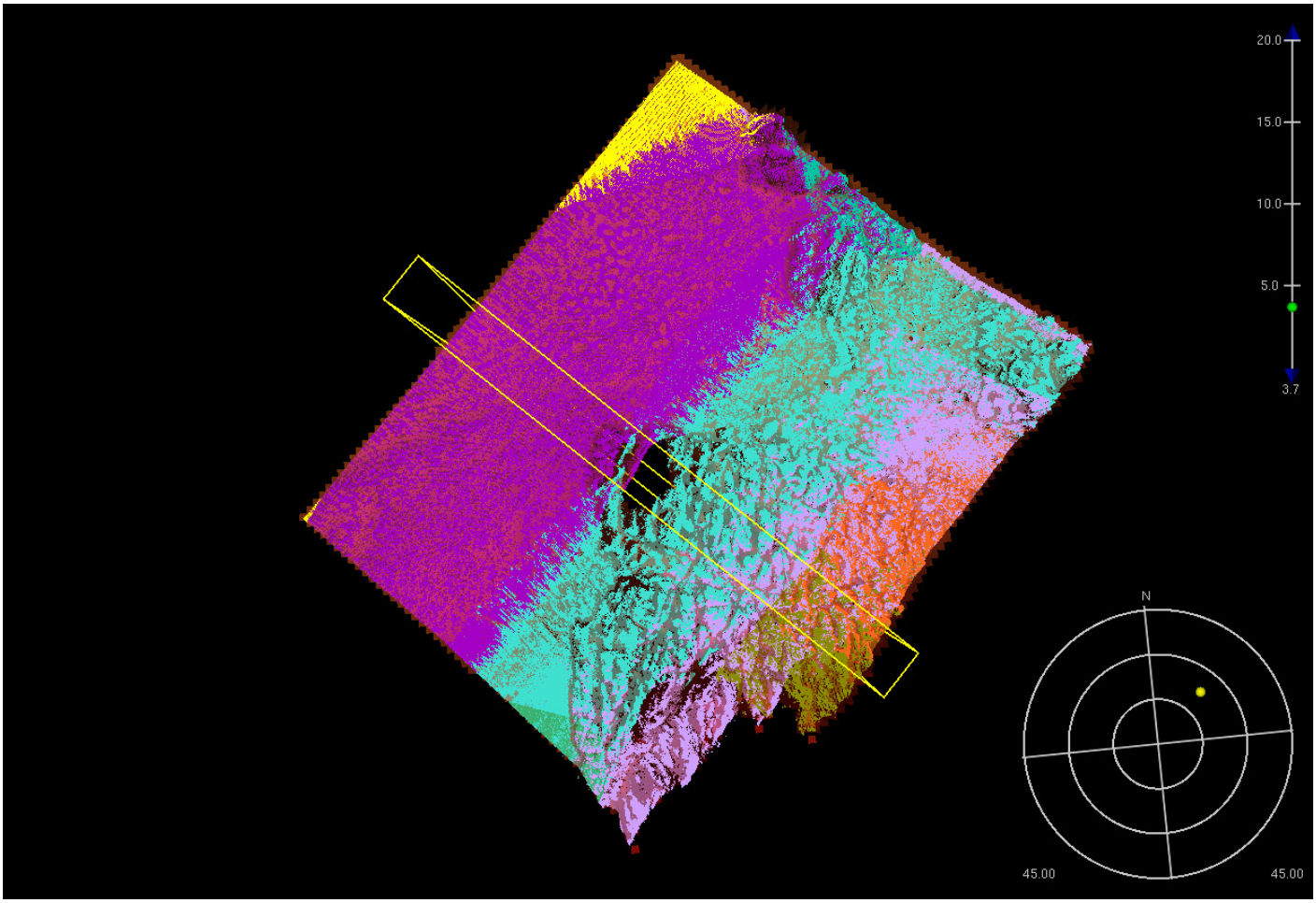


Figure 64: H12741 Subset View of Holiday Due to Steep Downslope of Rocky Coastal Line

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 was logged as a 7k file and has been sent to the Processing Branch. One line per day, per vessel of Backscatter was processed in the field by the field unit for quality control.

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/SIPS	9.0

Table 9: Primary bathymetric data processing software

The following Feature Object Catalog was used: NOAA Profile V_5_3_3

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
H12741_MB_1m_MLLW	CUBE	1 meters	-1.063 meters - 433.781 meters	NOAA_1m	Complete MBES
H12741_MB_2m_MLLW	CUBE	2 meters	-0.788 meters - 363.994 meters	NOAA_2m	Complete MBES
H12741_MB_4m_MLLW	CUBE	4 meters	-0.915 meters - 347.238 meters	NOAA_4m	Complete MBES
H12741_MB_8m_MLLW	CUBE	8 meters	-0.367 meters - 308.758 meters	NOAA_8m	Complete MBES
H12741_MB_16m_MLLW	CUBE	16 meters	-0.311 meters - 308.651 meters	NOAA_16m	Complete MBES
H12741_MB_1m_MLLW_Final	CUBE	1 meters	-3 meters - 20 meters	NOAA_1m	Complete MBES
H12741_MB_2m_MLLW_Final	CUBE	2 meters	18 meters - 40 meters	NOAA_2m	Complete MBES

Surface Name	Surface Type	Resolution	Depth Range	Surface Parameter	Purpose
H12741_MB_4m_MLLW_Final	CUBE	4 meters	36 meters - 80 meters	NOAA_4m	Complete MBES
H12741_MB_8m_MLLW_Final	CUBE	8 meters	72 meters - 160 meters	NOAA_8m	Complete MBES
H12741_MB_16m_MLLW_Final	CUBE	16 meters	144 meters - 320 meters	NOAA_16m	Complete MBES
H12741_MB_16m_MLLW_Combined	CUBE	16 meters	0 meters - 0 meters	NOAA_16m	Complete MBES

Table 10: Submitted Surfaces

The NOAA parameters mandated in the HSSD were used for the creation of all CUBE BASE surfaces in Survey H12741. The surfaces have been reviewed where noisy data, or 'fliers' are incorporated into the gridded solution causing the surface to be more shoal or deeper than the true sea floor. Where these spurious soundings cause the gridded surface to be shoaler or deeper than the reliably measured seabed by greater than the maximum allowable Total Vertical Uncertainty at that depth, the noisy data have been rejected and the surface recomputed.

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 velocity application are noted in the H12741 Data Log spreadsheet. All data logs are submitted digitally in the Seperates I folder.

B.5.4 Critical Soundings

Designation of soundings followed procedures as outlined in section 5.2.1.2 of the HSSD.

Survey H12741 contains 29 soundings which are designated in CARIS HIPS and SIPS. These designated soundings were used to draw the CUBE surface to the sounding which most accurately represented the sea floor in cases where the surface deviated from the sounding more than the total allowable vertical uncertainty in accordance with HSSD 2015. Designated soundings were necessary primarily in rocky areas.

B.5.5 CARIS Automatic Beam Disabling

During conversion of the EM710 data in CARIS HIPS and SIPS, some soundings were rejected due to disabled beams causing areas of low density soundings. See Figures 65 and 66 below for an example of where beam disabling was present due to the steep slope of the seafloor. Per instructions from CST Bravo, data from disabled beams were not re-accepted.

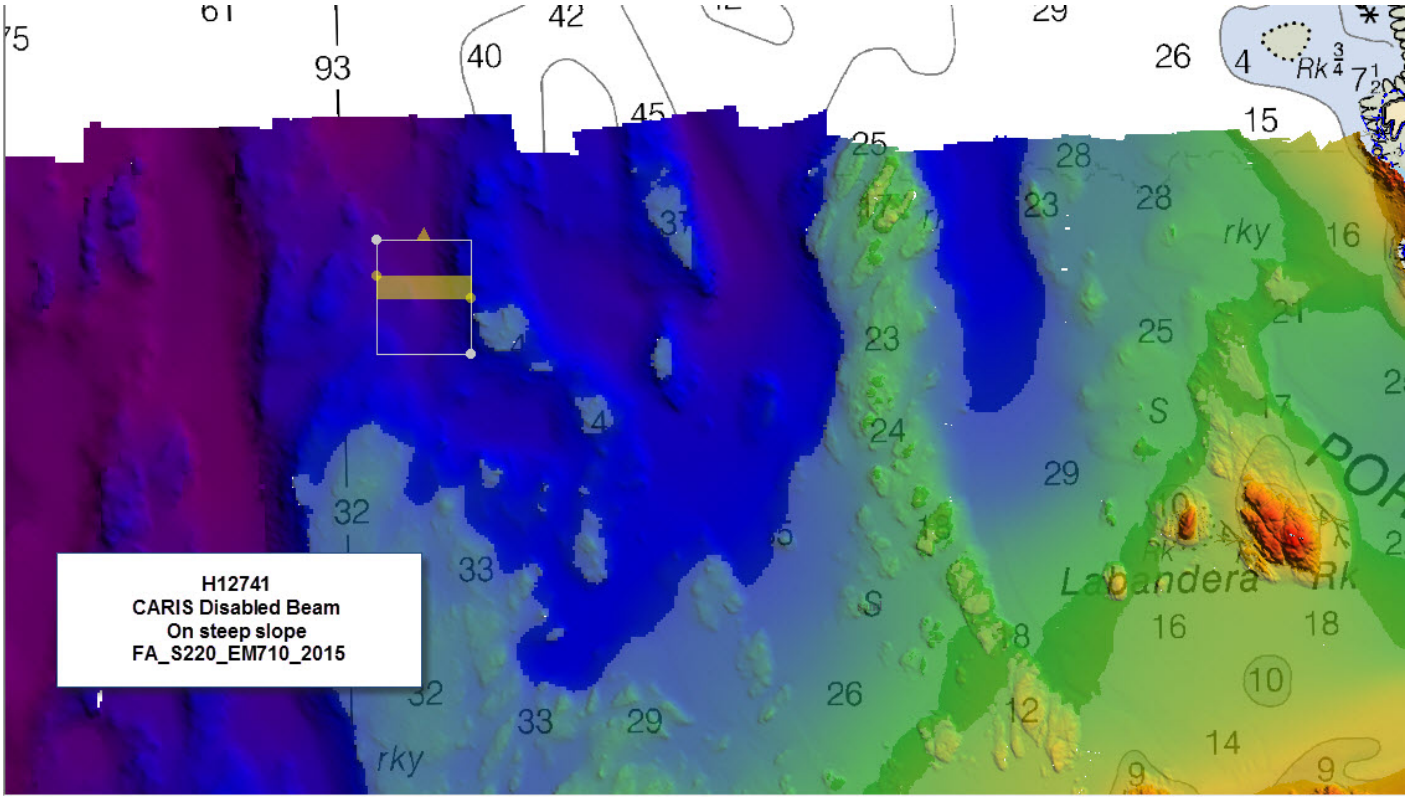


Figure 65: H12741 Graphical Overview EM710 CARIS Automatic Beam Disabling

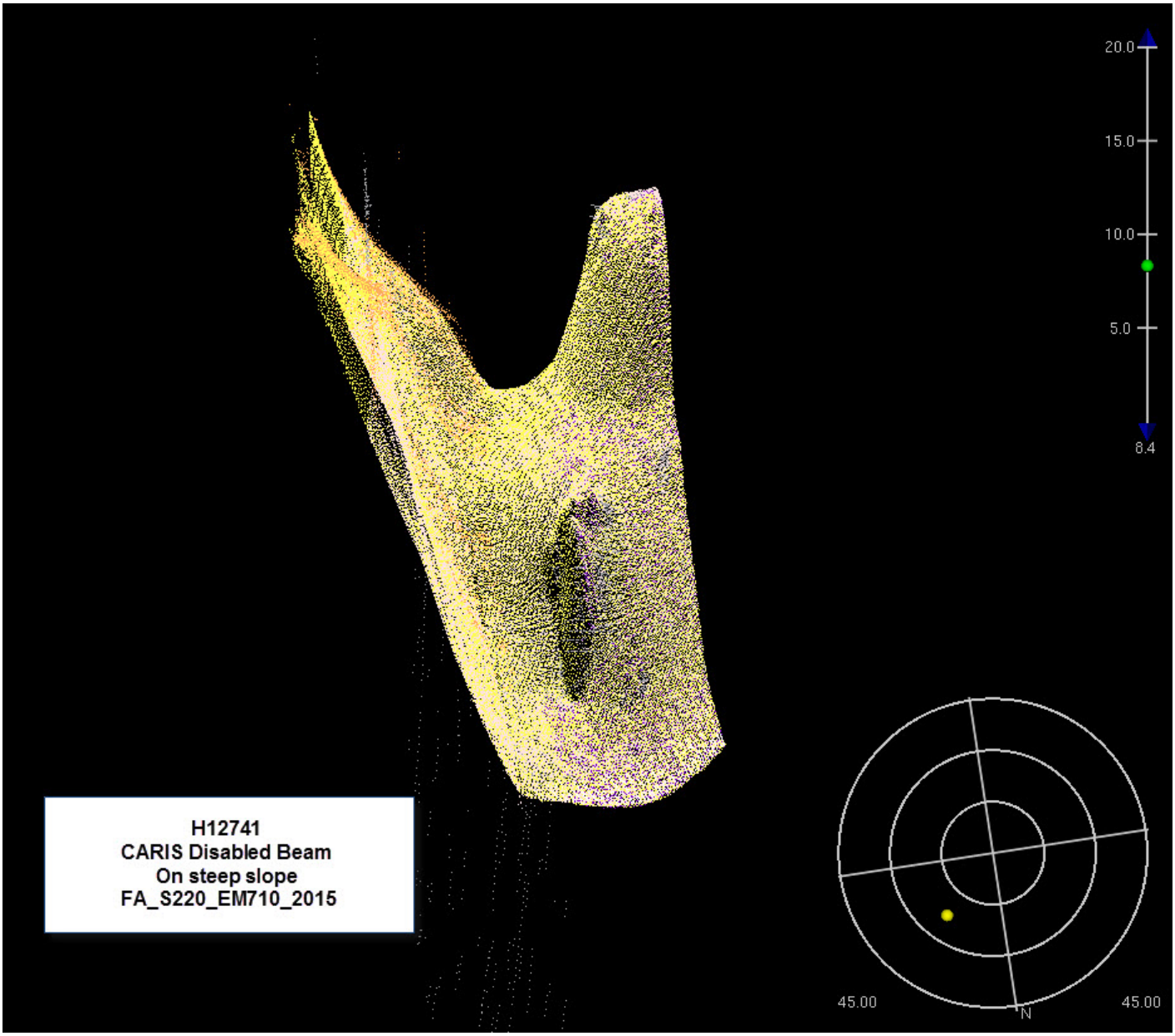


Figure 66: H12741 Subset EM710 CARIS Automatic Beam Disabling

B.5.6 Inconsistent Number of HSX, 7K, RAW Files

Due to numerous Hypack software crashes during acquisition on survey H12741 there are a number of days that have a contrasting number of data files. Refer to H12741_Data_Log where the record of PreProcess, HDCS_DATA, and Backscatter data differ in quantity. This anomaly did not affect data for charting purposes. The only data affected was the loss of 7K files resulting in no backscatter data being available.

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:

Discrete Zoning TCARI

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

Station Name	Station ID
Sitka, AK	9451600
Port Alexander, AK	9451054

Table 11: NWLON Tide Stations

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

Station Name	Station ID
Block Island, AK	9450406

Table 12: Subordinate Tide Stations

File Name	Status
9451600.tid	Verified Observed

Table 13: Water Level Files (.tid)

File Name	Status
O190FA2015_Final.tc	Final
O190FA2015CORP.zdf	Preliminary

Table 14: Tide Correctors (.zdf or .tc)

A request for final approved tides was sent to N/OPS1 on 11/18/2015. The final tide note was received on 03/11/2016.

A final Tidal Constituents and Residual Interpolation (TCARI) grid was issued in order to provide a better uncertainty value for OPR-O190-FA-15. Due to a sensor stability issue at Block Island, AK 9450406, the harmonic constituents and tidal datums from this station are not included in the TCARI solution. It should be noted that the TCARI error model underestimates the error in the area around Block Island.

The .tid file used for TCARI tide application was 9451054.tid.

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 8 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.

For further details regarding the processing and quality control checks performed see the H12741 POSPAC Processing Logs spreadsheet located in the Separates folder. See also the OPR-0190-FA-15 Horizontal and Vertical Control report, submitted under separate cover.

The following user installed stations were used for horizontal control:

HVCR Site ID	Base Station ID
9677	Waterfall

Table 15: User Installed Base Stations

Differential correctors from the US Coast Guard beacons at Gustavus (288kHz) and Annette Island (323kHz) were used during real time acquisition when not otherwise noted in the acquisition logs, and were the sole method of positioning of detached positions (DP) and bottom samples.

The following DGPS Stations were used for horizontal control:

DGPS Stations
Gustavus, AK (288kHz)
Annette Island, AK (323kHz)

Table 16: USCG DGPS Stations

D. Results and Recommendations

D.1 Chart Comparison

A comparison was performed between survey H12741 and Charts 17406 and 17400 as well as Electronic Navigation Charts (ENC): US3AK40M and US5AK4TM using CARIS sounding and contour layers derived from the 16 meter combined surface. The contours and soundings have been overlaid on the chart to assess differences. All data from H12741 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
17406	1:40000	8	10/2013	01/10/2015	12/30/2014
17400	1:229376	18	09/2013	01/10/2015	12/30/2014

Table 17: Largest Scale Raster Charts

17406

Soundings from survey H12741 generally agreed within 1 to 2 fathoms with charted depths on Chart 17406, however, there are numerous areas within the survey limits that have more significant disagreements. Included below with graphics and brief descriptions are examples of notable exceptions to this general agreement, specifically surveyed soundings shoaler than charted depths by 3 fathoms or more.

1. Surveyed soundings that are shoaler by 10 or more fathoms than charted are present throughout Survey H12741. See Figure 67 for an example.

2. Surveyed soundings of shoal rock formations in deep water are not adequately charted. An example is given below in Figure 68.

3. Surveyed soundings located near shore in disagreement to charted depths are shown below in Figure 69.

Figure 70 displays a 13 fathom surveyed sounding on the point of Cape Bartolome where a currently charted depth of 29 fathoms exists. This surveyed sounding of 13fm was reviewed in CARIS HIPS and SIPS Subset Editor and submitted to the Chief of Party for review as a potential DTON. Because of the surveyed sounding's proximity to the rocky and breaker-ridden point of Cape Bartolome it was determined to not be a danger to navigation. The hydrographer recommends updating the chart to reflect the shoalest sounding.

Contours generated in CARIS HIPS and SIPS closely approximate the charted 10, 50, and 100 fathom contours. The two greatest contour discrepancies can be seen in Figure 71 where in the southwest corner of survey H12741. The 50 fathom surveyed contour is located approximately 552 meters east of the charted 50 fathom contour. Similarly, in the southern middle part of survey H12741 the 100 fathom surveyed contour is located approximately 550 meters east of the charted 100 fathom contour. An additional area of interest seen in Figure 73 is located in the south western corner of the survey where the 50 fathom surveyed contour is approximately 354 meters west of the charted 50 fathom contour. The hydrographer recommends adding an additional 50 fathom contour as pictured in Figure 72 below.

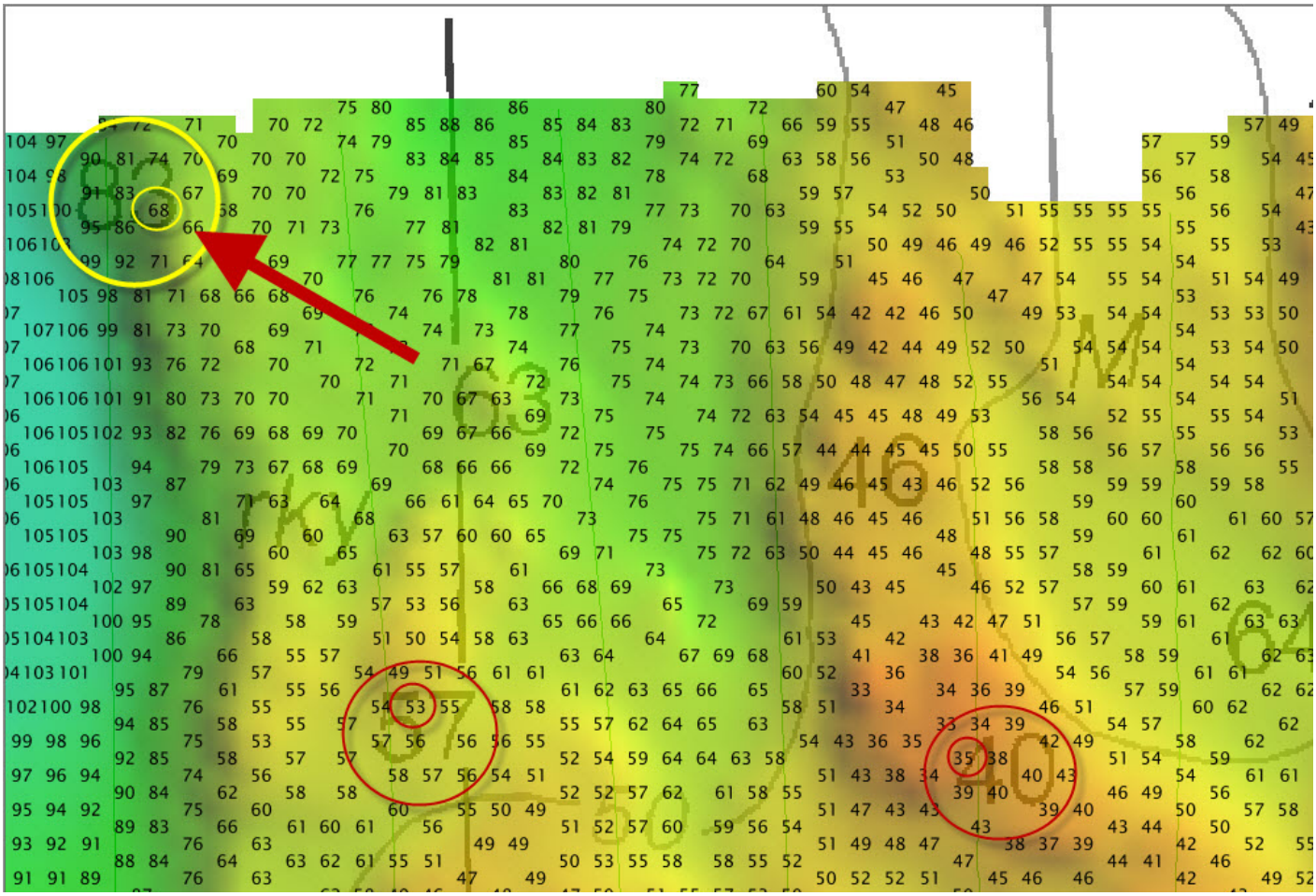


Figure 67: H12741 Example of Difference in Surveyed Soundings to Charted Depths by 10 or More Fathoms

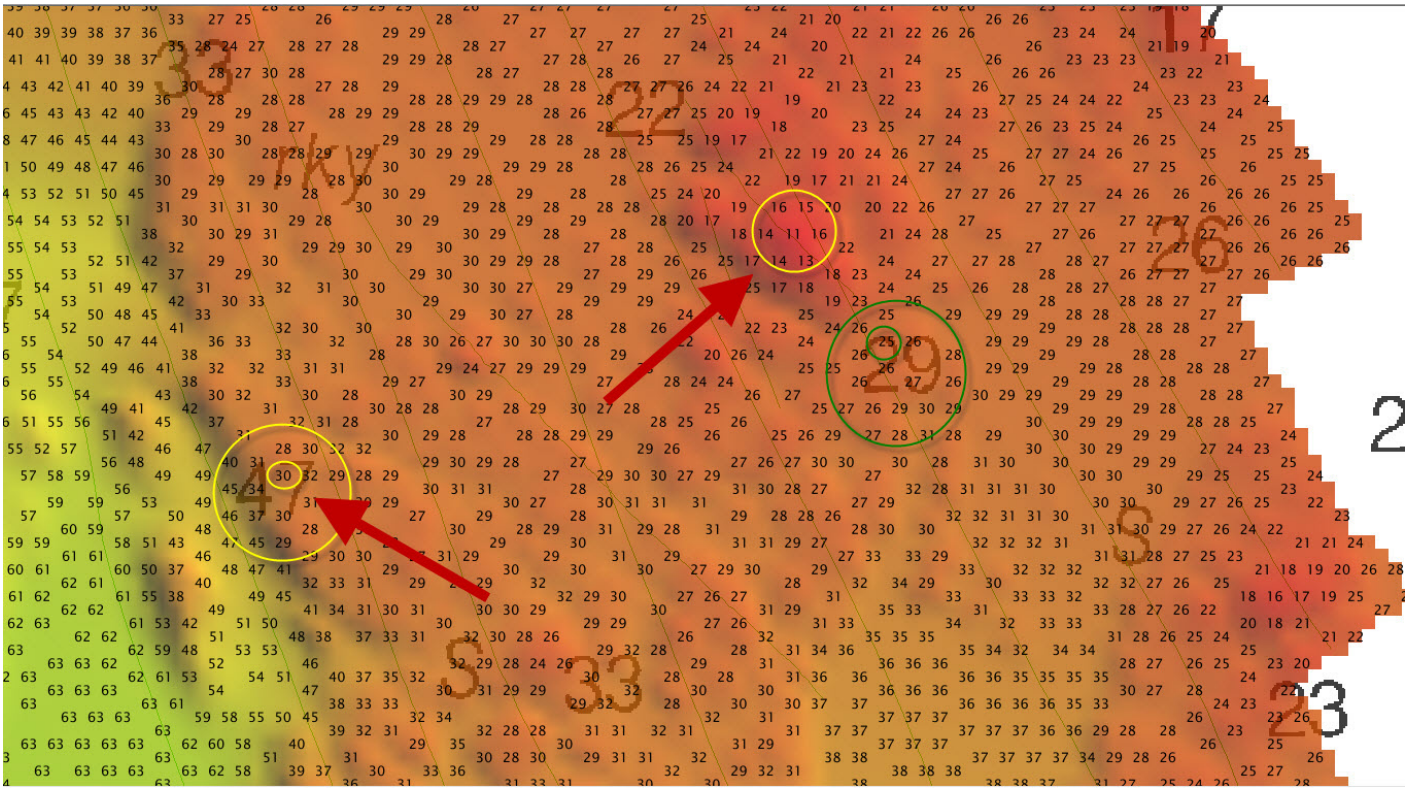


Figure 68: H12741 Example of Surveyed Shoaler Sounding in Proximity to Deeper Charted Depth

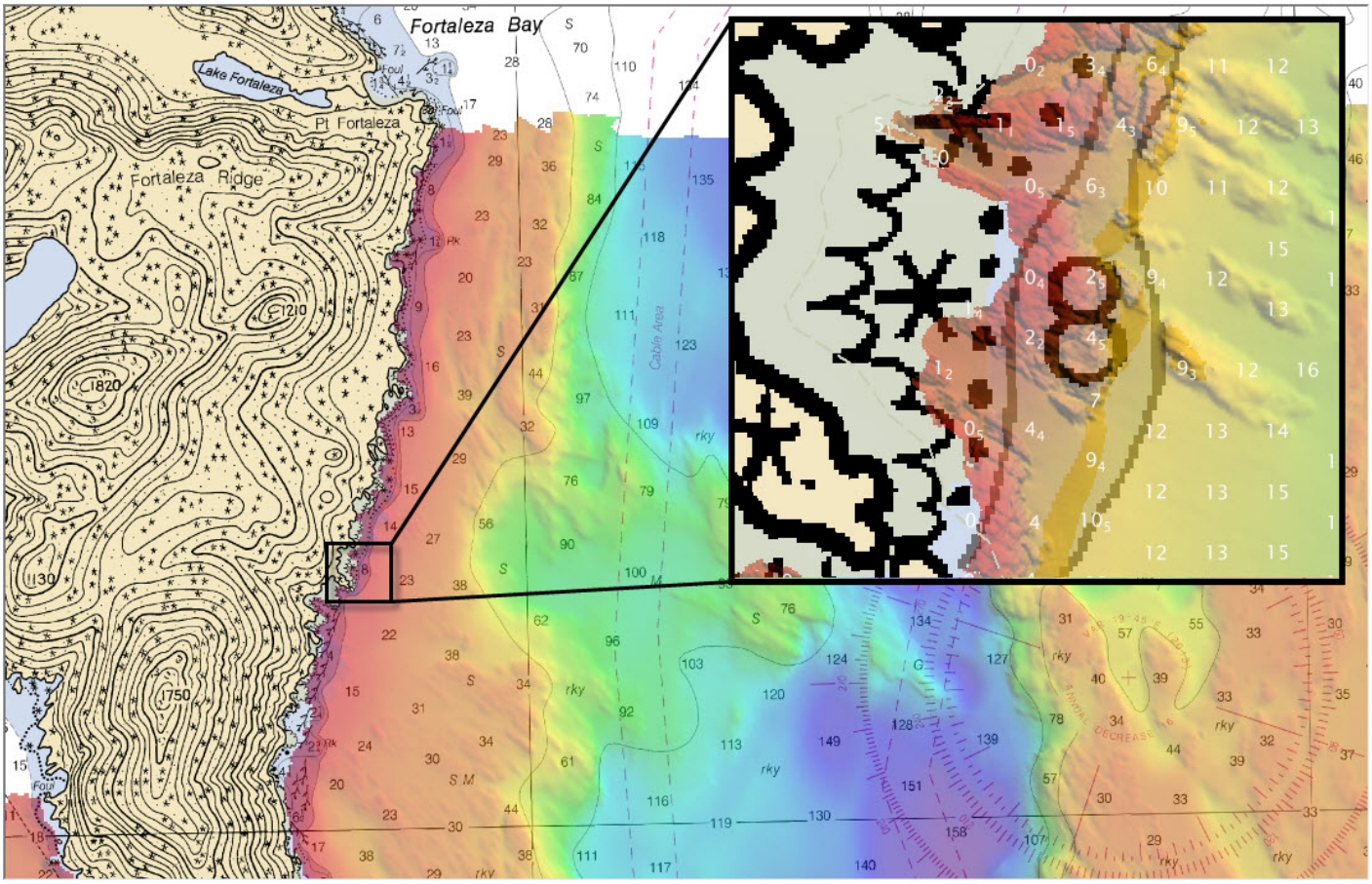


Figure 69: H12741 Example of Surveyed Soundings in Disagreement to Nearshore Charted Depth

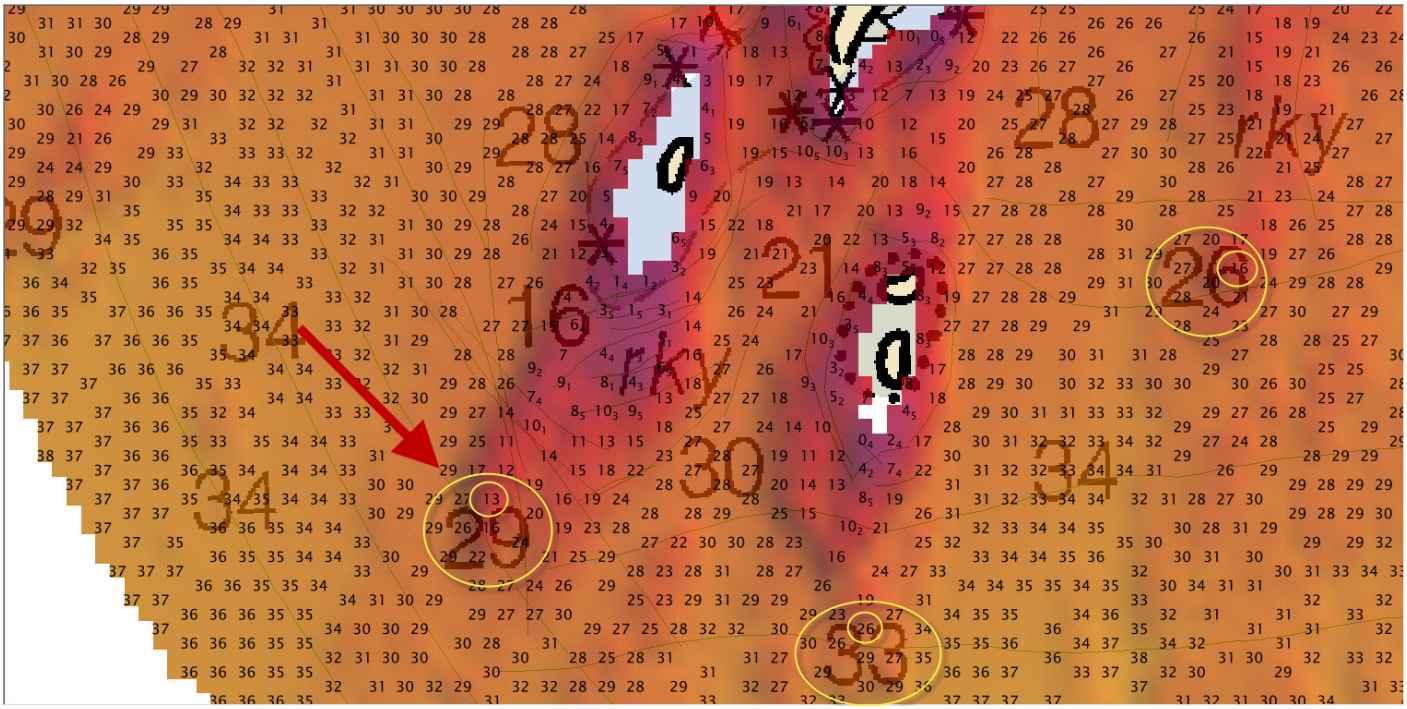


Figure 70: H12741 Surveyed Sounding in Disagreement to Charted Depth Near Point Bartolome

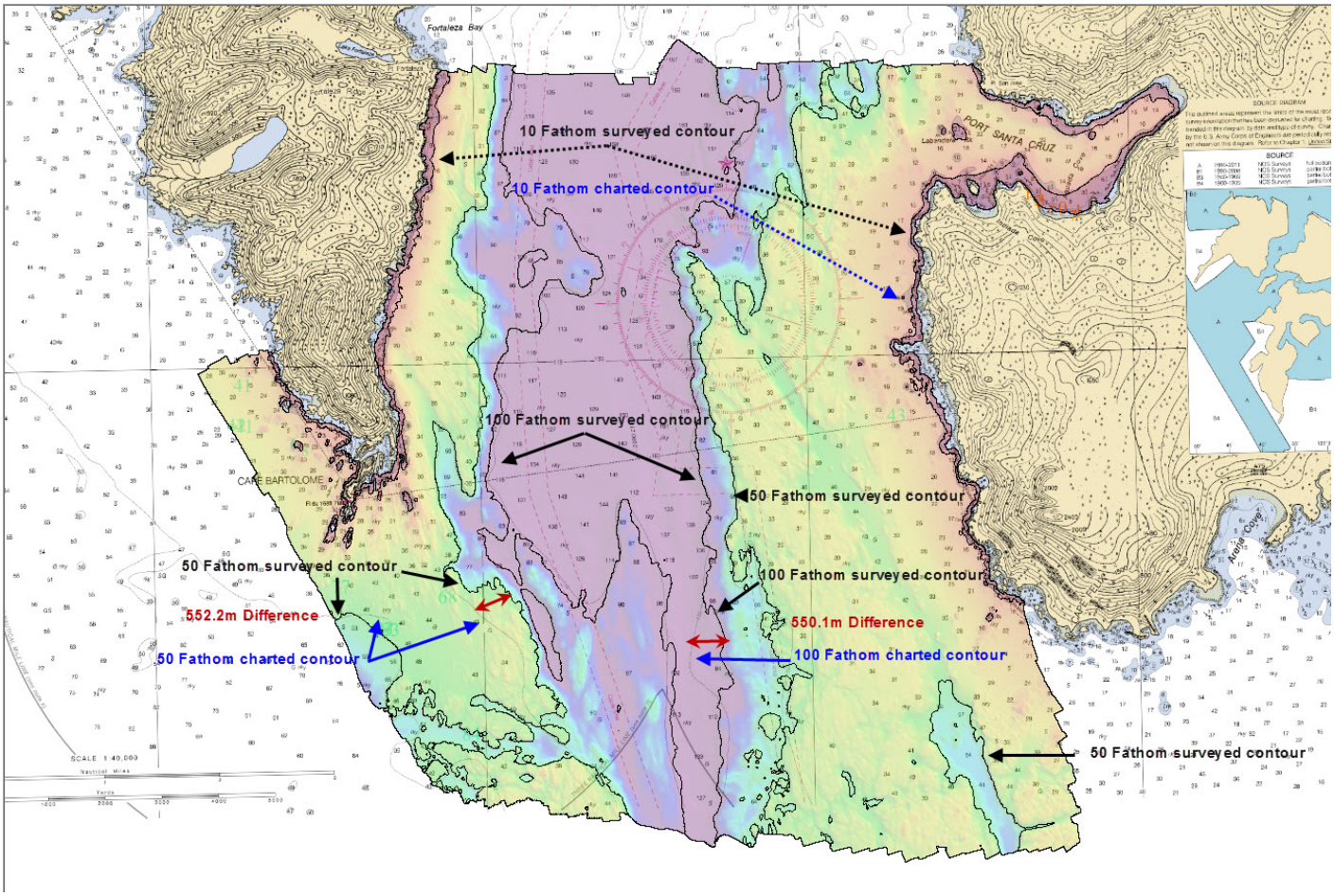


Figure 71: H12741 Graphical Overview of Contour Comparison

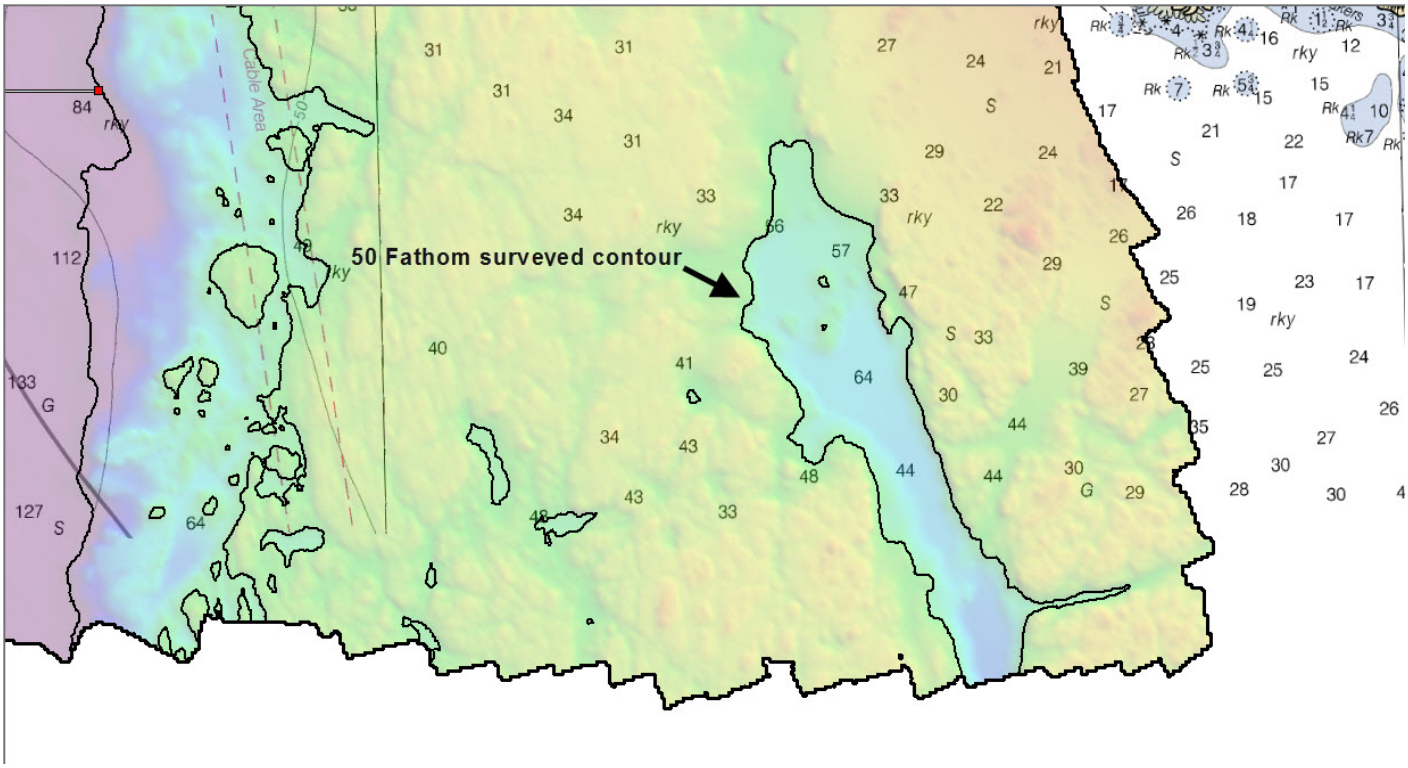


Figure 72: H12741 Graphical Overview Recommendation to Add 50 Fathom Surveyed Contour to Chart

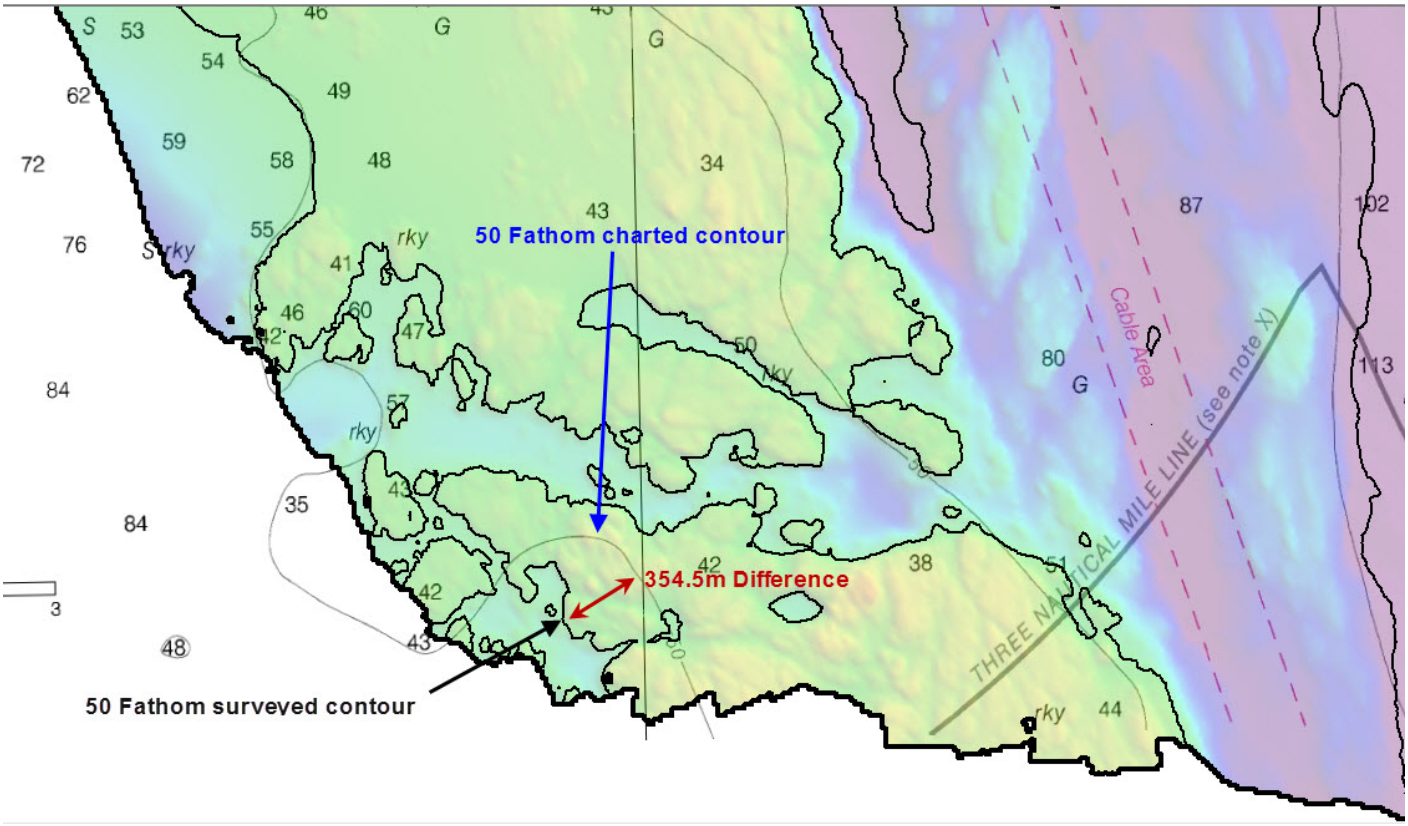


Figure 73: H12741 Graphical Overview of Contour Comparison

17400

The sounding comparison between H12741 and Chart 17400 closely resembles that performed to Chart 17406. See discussion above. Figure 74 shows two soundings on the Southern end of the survey area where surveyed soundings disagree with charted depths by as much as 30 fathoms.

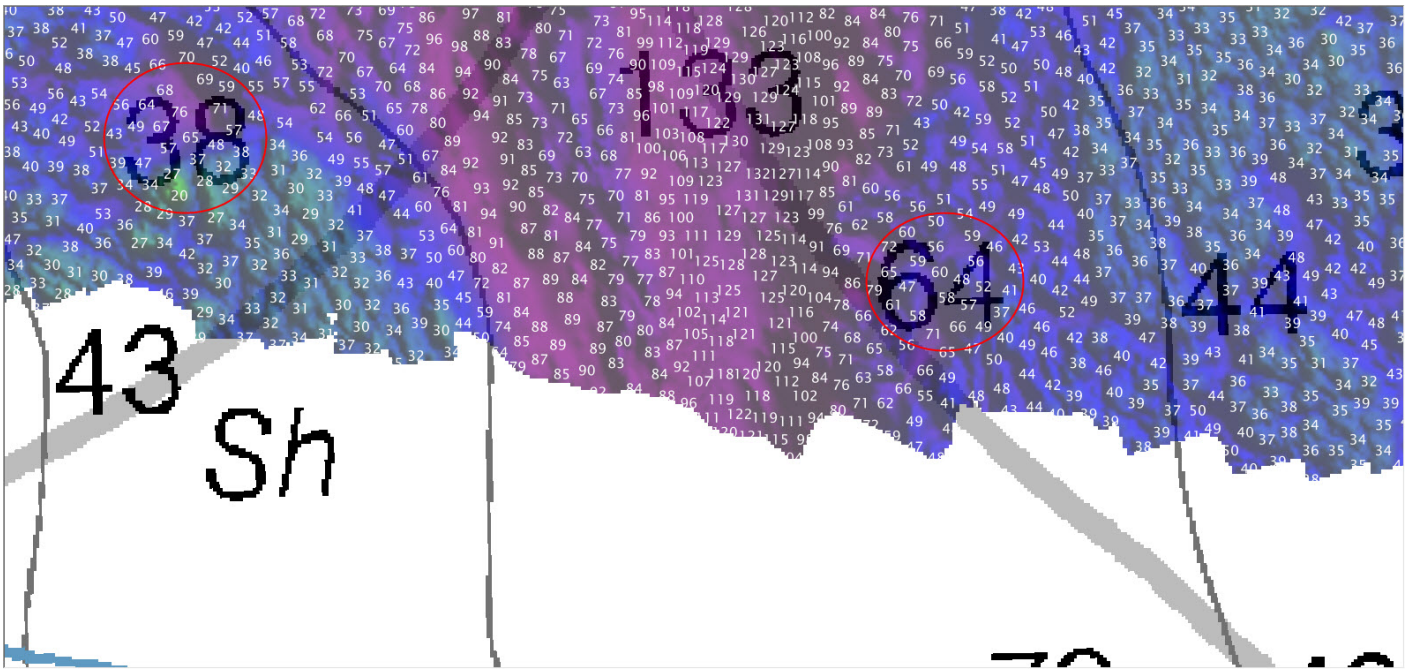


Figure 74: H12741 Sounding Discrepancies With Chart 17400

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?
US3AK40M	1:229376	7	04/07/2014	12/15/2014	NO
US5AK4TM	1:40000	2	02/24/2014	04/07/2016	NO

Table 18: Largest Scale ENCs

US3AK40M

Soundings from H12741 generally agreed within 1 to 2 fathoms on ENC US3AK40M. Notable exceptions to charted depths are listed and shown in the figures below.

Figure 75 displays where ENC US3AK40M was overlaid on Chart 17406 and was found to have one of many charted soundings on the ENC that are located over 100 meters away from the charted depths on Chart 17406. Its location misrepresents the more accurate location of charted depths on Chart 17406 and gives a false sense of disagreement in surrounding surveyed depths. The hydrographer recommends using surveyed soundings to update charted depths to update the accuracy between RNCs and ENCs.

Figure 76 shows one of few charted ENC depths that has a 30 fathom disagreement with H12741 surveyed soundings

Contours in CARIS HIPS closely approximate the charted contours, deviations from this general agreement are seen in the southern area of Survey H12741 where both the 100 and 50 fathom surveyed contours are located over 300 meters or more away from the charted contours. An overview of these differences is shown below in Figure 77.

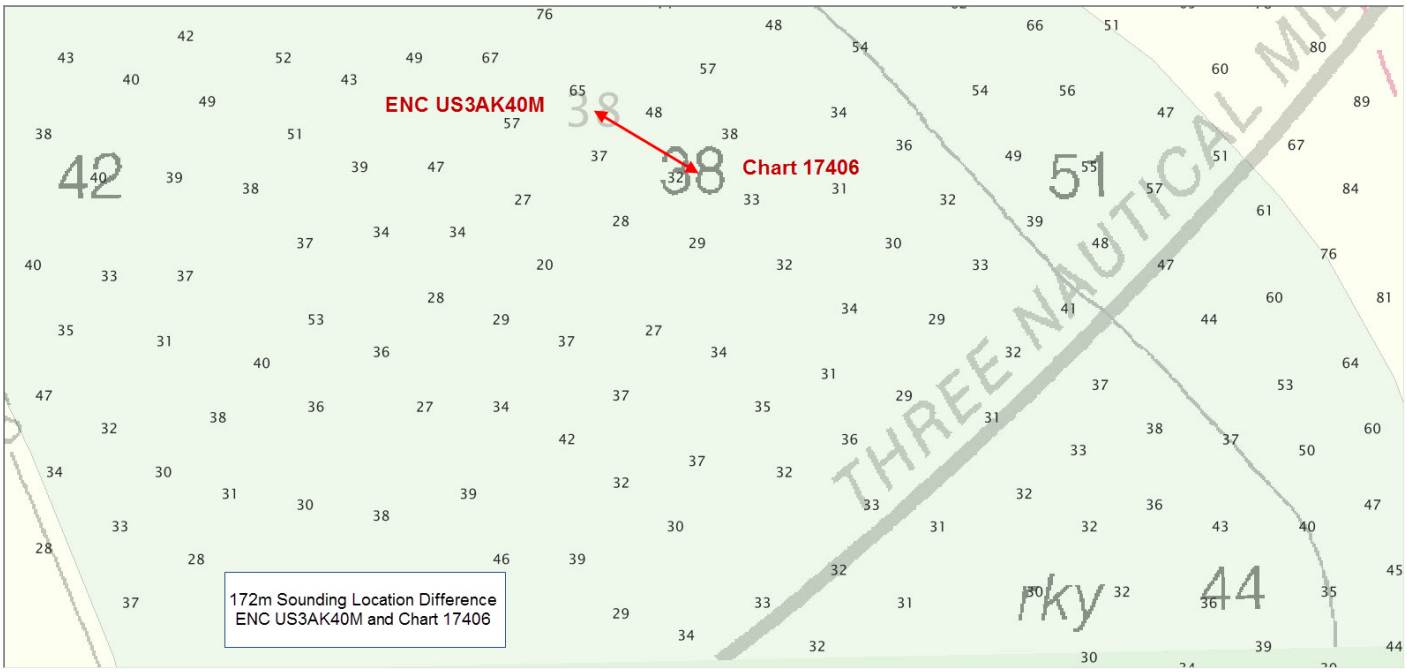


Figure 75: H12741 Sounding Proximity Between Chart 17406 and ENC US3AK40M

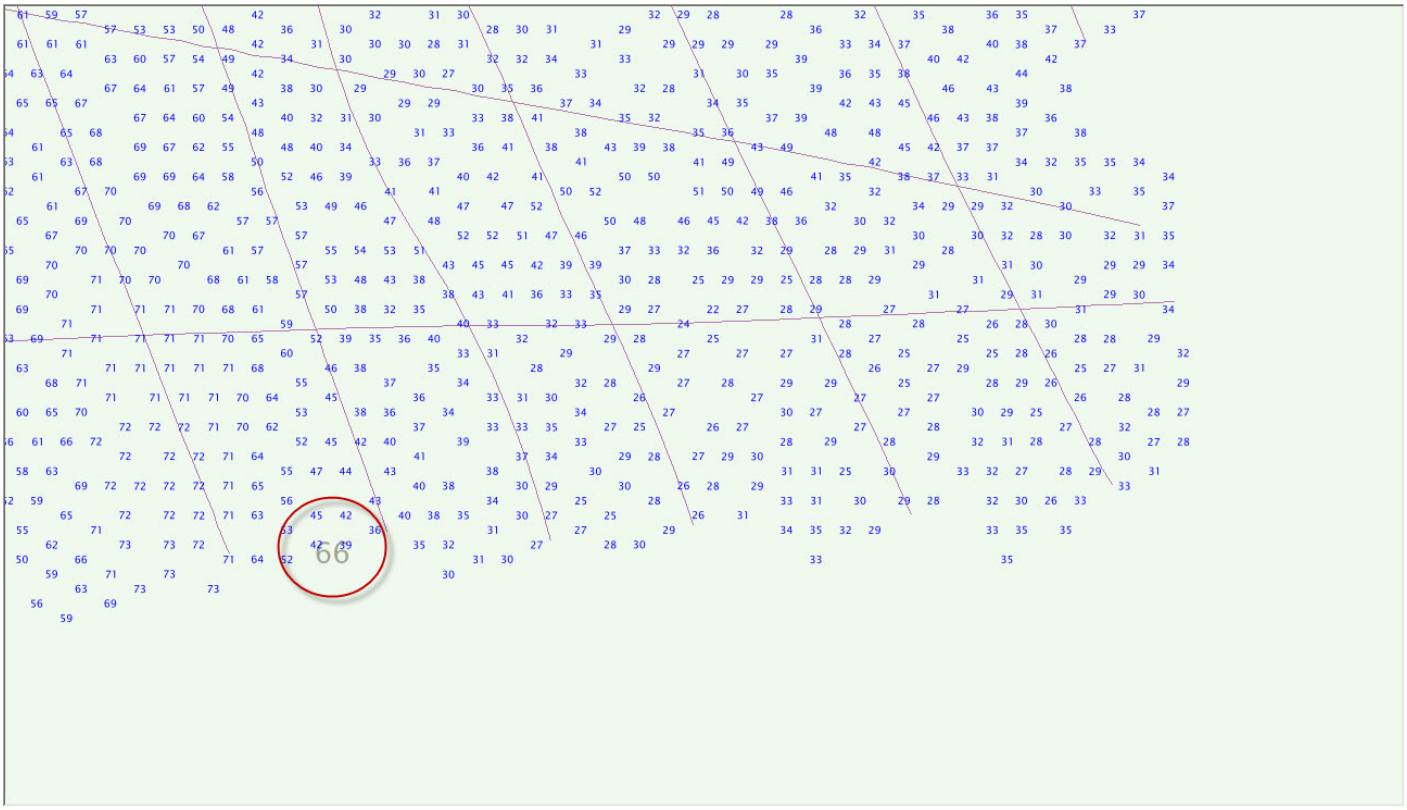


Figure 76: H12741 Difference Between Charted Depths US3AK40M and Surveyed Soundings: 30 Fathom Shoaler Disagreement With Charted Depth

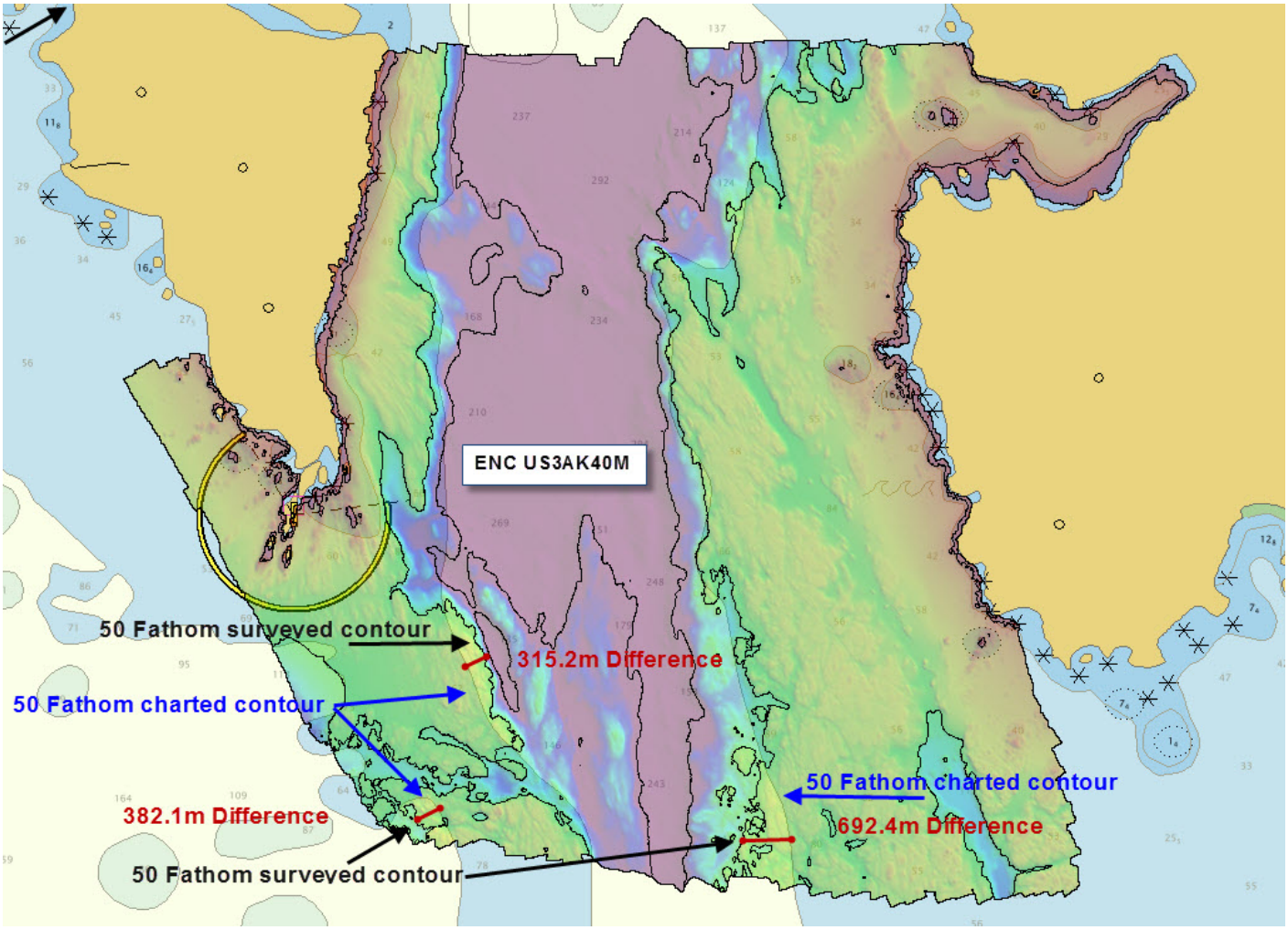


Figure 77: H12741 and US3AK40M 50 Fathom Contour Comparison

US5AK4TM

See above discussions from Raster Chart 17406 for discussions on sounding comparisons and contours.

D.1.3 Maritime Boundary Points

All assigned Maritime Boundary Points for survey H12741 were investigated, and are included in the H12741_Final_Feature_File.

D.1.4 Charted Features

All assigned features were addressed and are included in the H12741_Final_Feature_File.

D.1.5 Uncharted Features

No uncharted features exist for this survey.

D.1.6 Dangers to Navigation

No Danger to Navigation Reports were submitted for this survey.

D.1.7 Shoal and Hazardous Features

No shoals or potentially hazardous features exist for this survey.

D.1.8 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.1.9 Bottom Samples

Fifteen out of fifteen bottom samples for H12741 were collected and attributed and are located in the H12741 Final Feature File. Locations can be seen in the figure below.

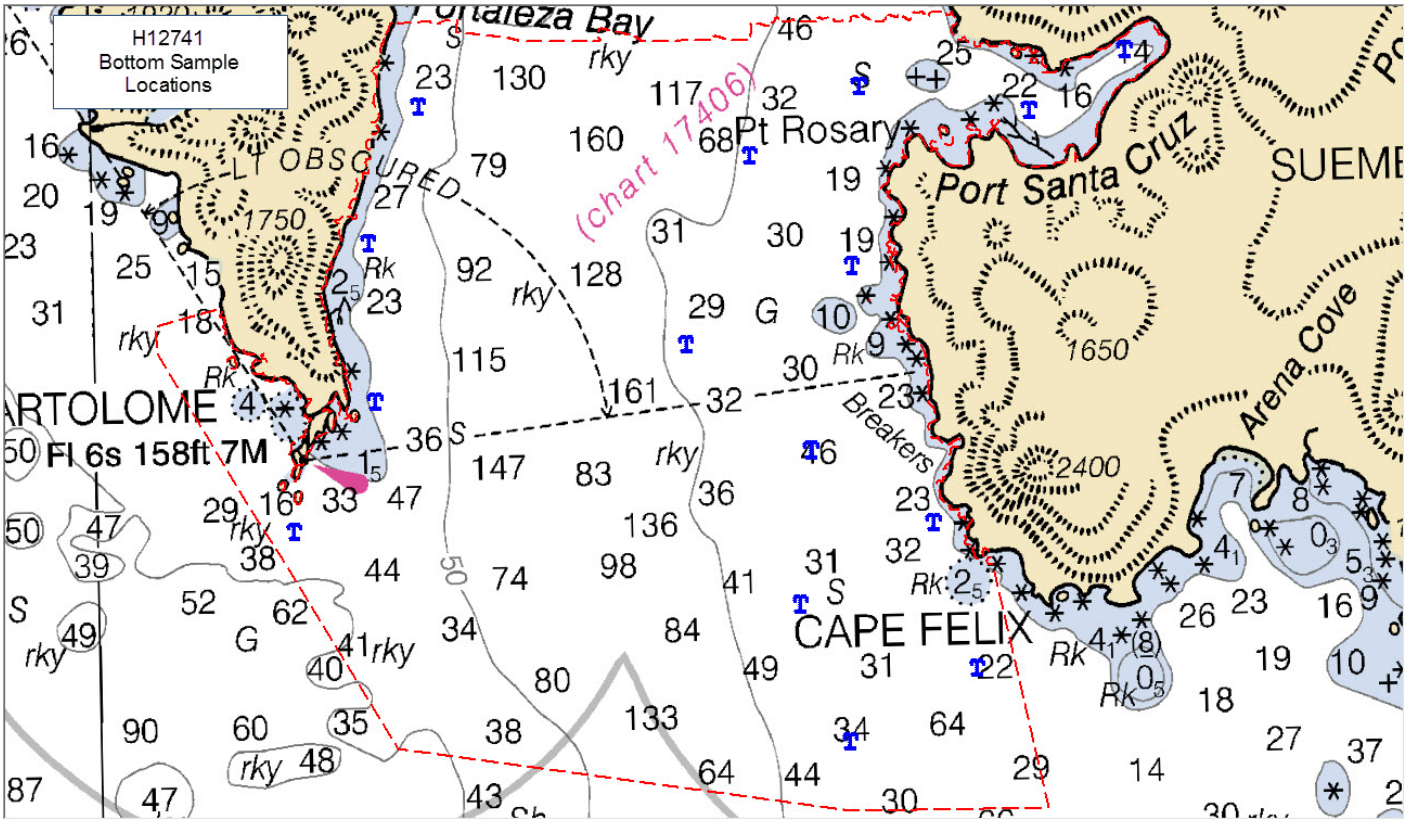


Figure 78: H12741 Bottom Sample Locations

D.2 Additional Results

D.2.1 Shoreline

Fairweather personnel conducted limited shoreline verification and reconnaissance at times near predicted low tides, however, no negative tides were present during the days of acquisition. Annotations, information, and diagrams collected on DP forms and boat sheets during field operations are scanned and included in the digital Separates I folder. Shoreline verification procedures for survey H12741 conform to those detailed in the DAPR.

D.2.2 Prior Surveys

Prior survey comparisons exist for this survey, but were not investigated.

D.2.3 Aids to Navigation

All ATONs within the survey limits of H12741 were found to be serving their intended purpose.

D.2.4 Overhead Features

No overhead features exist for this survey.

D.2.5 Submarine Features

No submarine features exist for this survey.

One cable area was noted in the survey area.

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.

Report Name	Report Date Sent
Data Acquisition and Processing Report	2016-04-21
Coast Pilot Report	2016-05-03
Horizontal and Vertical Control Report	2016-05-05

Approver Name	Approver Title	Approval Date	Signature
CDR David J. Zezula, NOAA	Chief of Party	04/13/2016	ZEZULA.DAVID.J.1097241836 2016.05.09 06:49:57 -08'00'
LT Matthew M. Forney, NOAA	Field Operations Officer	04/13/2016	Matthew Forney 2016.05.09 05:47:24 -08'00'
HCST Douglas A. Bravo	Chief Survey Technician	04/13/2016	2016.05.08 20:15:32 -08'00'
HSST Clinton R. Marcus	Sheet Manager	04/13/2016	Digitally signed by Clinton Marcus Date: 2016.05.08 19:37:55 -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 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

TIDE NOTE FOR HYDROGRAPHIC SURVEY

DATE : February 29, 2016

HYDROGRAPHIC BRANCH: Pacific
HYDROGRAPHIC PROJECT: OPR-O190-FA-2015
HYDROGRAPHIC SHEET: H12741

LOCALITY: Cape Bartolome to Port Santa Cruz, West Prince of Wales, AK
TIME PERIOD: September 23 - November 05, 2015

TIDE STATION USED: 945-1054 Port Alexander, AK
Lat.56° 14.8′ N Long. 134° 38.8' W
PLANE OF REFERENCE (MEAN LOWER LOW WATER): 0.000 meters
HEIGHT OF HIGH WATER ABOVE PLANE OF REFERENCE: 3.070 meters

REMARKS: RECOMMENDED GRID

Please use the TCARI grid "O190FA2015_Final.tc" as the final grid for project OPR-O190-FA-2015, Registry No. H12741, during the time period between September 23 and November 05, 2015.

Refer to attachments for grid 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: Due to a sensor stability issue at Block Island, AK 9450406, the harmonic constituents and tidal datums from this station are not included in the TCARI solution. It should be noted that the TCARI error model underestimates the error in the area around Block Island.

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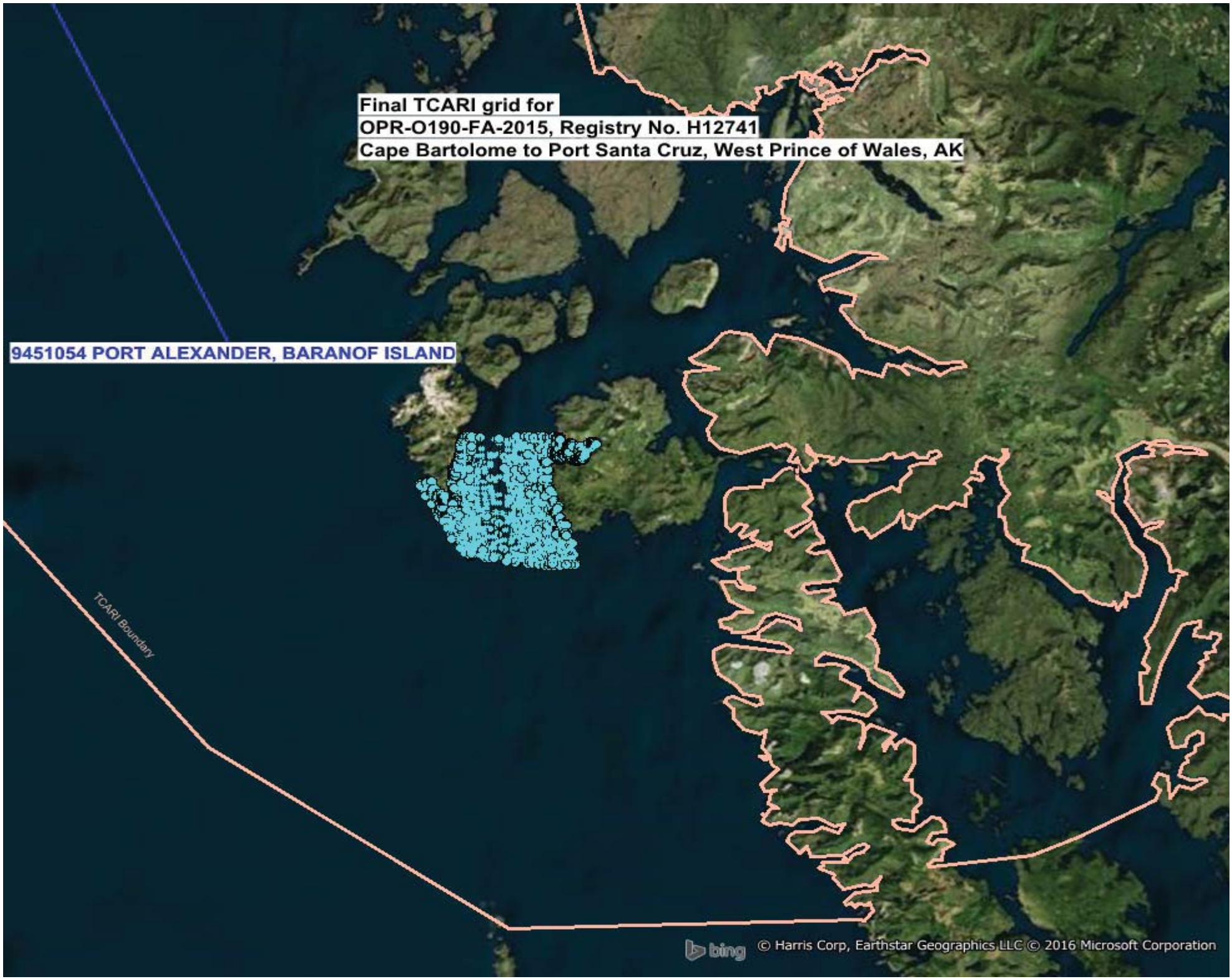
Date: 2016.03.11 15:22:23 -05'00'

CHIEF, PRODUCTS AND SERVICES BRANCH


Final TCARI grid for
OPR-O190-FA-2015, Registry No. H12741
Cape Bartolome to Port Santa Cruz, West Prince of Wales, AK
9451054 PORT ALEXANDER, BARANOF ISLAND
TCARI Boundary
bing
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APPROVAL PAGE

H12741

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

- H12741_DR.pdf
- Collection of depth varied resolution BAGS
- Processed survey data and records
- H12741_GeoImage.pdf

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

Approved:_____

Digitally signed by BROWN.KURT.E.1156712600
DN: c=US, o=U.S. Government, ou=DoD, ou=PKI, ou=OTHER, cn=BROWN.KURT.E.1156712600
Date: 2017.03.27 09:48:22 -07'00'

Kurt Brown
Physical Scientist, Pacific Hydrographic Branch

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

Approved:_____

Digitally signed by HOLMBERG.PETER.SCOTT.1365886101
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Pete Holmberg
Acting Chief, Pacific Hydrographic Branch