

H12031

NOAA FORM 76-35A

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

DESCRIPTIVE REPORT

Type of Survey Hydrographic Survey

Field No. RA-20-06-09

Registry No. H12031

LOCALITY

State Alaska

General Locality West of Prince of Wales Island

Sublocality Pt. Quemada to Adrian Cove

2009

CHIEF OF PARTY

..... Captain Donald W. Haines, NOAA

LIBRARY & ARCHIVES

DATE

<p style="text-align: center;">U.S. DEPARTMENT OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION</p> <p style="text-align: center;">HYDROGRAPHIC TITLE SHEET</p>	<p>REGISTRY No</p> <p style="text-align: center;">H12031</p>
<p>INSTRUCTIONS – The Hydrographic Sheet should be accompanied by this form, filled in as completely as possible, when the sheet is forwarded to the Office.</p>	<p>FIELD No: RA-20-06-09</p>
<p>State <u>Alaska</u></p> <hr/> <p>General Locality <u>West of Prince of Wales Island</u></p> <hr/> <p>Sub-Locality <u>Pt Quemada to Adrian Cove</u></p> <hr/> <p>Scale <u>1:20,000</u> Date of Survey <u>5/28/2009 - 6/8/2009</u></p> <hr/> <p>Instructions dated <u>4/8/2009</u> Project No. <u>OPR-O190-RA-09</u></p> <hr/> <p>Vessel <u>RA1 (1101), RA2 (1103), RA3 (2803), RA4 (2801), RA5 (2802), RA6 (2804)</u></p> <hr/> <p>Chief of party <u>Captain Donald W. Haines, NOAA</u></p> <hr/> <p>Surveyed by <u>RAINIER Personnel</u></p> <hr/> <p>Soundings by <u>Tilted Reson 8125, Knudsen 320M, Reson SeaBat 7125</u></p> <hr/> <p>SAR by <u>Annie Raymond</u> Compilation by <u>Peter Holmberg</u></p> <hr/> <p>Soundings compiled in <u>Fathoms</u></p> <hr/>	
<p>REMARKS: <u>All times are UTC. UTM Zone 8</u></p> <hr/> <p><u>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. Revisions and end notes in red were generated during office processing. Page numbering may be interrupted or non sequential.</u></p> <hr/> <p><u>All pertinent records for this survey, including the Descriptive Report, are archived at the National Geophysical Data Center (NGDC) and can be retrieved via http://www.ngdc.noaa.gov/.</u></p> <hr/>	

Descriptive Report to Accompany Hydrographic Survey H12031

Project OPR-O190-RA-09
West of Prince of Wales Island
Pt Quemada to Adrian Cove
Scale 1:20,000
May – June 2009
NOAA Ship *Rainier* (s221)
Chief of Party: Captain Donald W. Haines, NOAA

A. AREA SURVEYED

This hydrographic survey was completed as specified by Hydrographic Survey Project Instructions OPR-O190-RA-09 dated April 8, 2009 and all other applicable direction¹, with the exception of deviations noted in this report. The survey area is from Point Quemada to Adrian Cove and corresponds to sheet “F” in the sheet layout provided with the Project Instructions. The purpose of survey OPR-O190-RA-09 is to provide contemporary surveys to update National Ocean Service (NOS) nautical charts.

Complete multibeam echosounder (MBES) coverage was achieved in the area depicted in the survey outline (Figure 1) in waters 8 meters and deeper. Time constraints on acquisition precluded the completion of the entire assigned survey extents of H12031. In depths less than 8 meters additional MBES coverage was acquired to identify least depths over significant features or shoals, as appropriate for this survey. There were significant holidays throughout the survey due to help in inshore areas and operational time constraints on acquisition. Holidays are discussed in detail in section B-2. Total mileage acquired by each vessel and system is referenced in Table 1.

Data Acquisition Type	Hull Number with Mileage (nm)						Total
	1101	1103	2801	2802	2803	2804	
VBES (main scheme)	-	-	-	-	-	-	-
MBES (main scheme)	23.67	-	22.97	25.35	32.20	24.88	129.07
SSS (main scheme)	-	-	-	-	-	-	-
Crosslines	-	-	-	-	6.995	-	6.995
Developments	-	-	-	-	-	-	-
Shoreline	-	0.67	-	-	-	-	0.67
Bottom Samples	-	-	-	-	-	-	-
Total Number of Items Investigated	-	-	-	-	-	-	-
Total Area Surveyed (sq. nm)	-	-	-	-	-	-	5.005

Table 1: Statistics for survey H12031

Limited Shoreline Verification was performed for the survey area seaward of the Navigable Area Limit Line (NALL) for H12031, as per section 3.5.5 of the Field Procedures Manual

¹ NOS Hydrographic Surveys Specifications and Deliverables (April 2009), OCS Field Procedures Manual for Hydrographic Surveying (April 2009), and all Hydrographic Surveys Technical Directives issued through the dates of data acquisition.

April 2009 (FPM). Shoreline features were given S-57 attribution and included for submission in Notebook HOB files.

Data acquisition was conducted from May 28 to June 8, 2009 (DN 148 to 159).

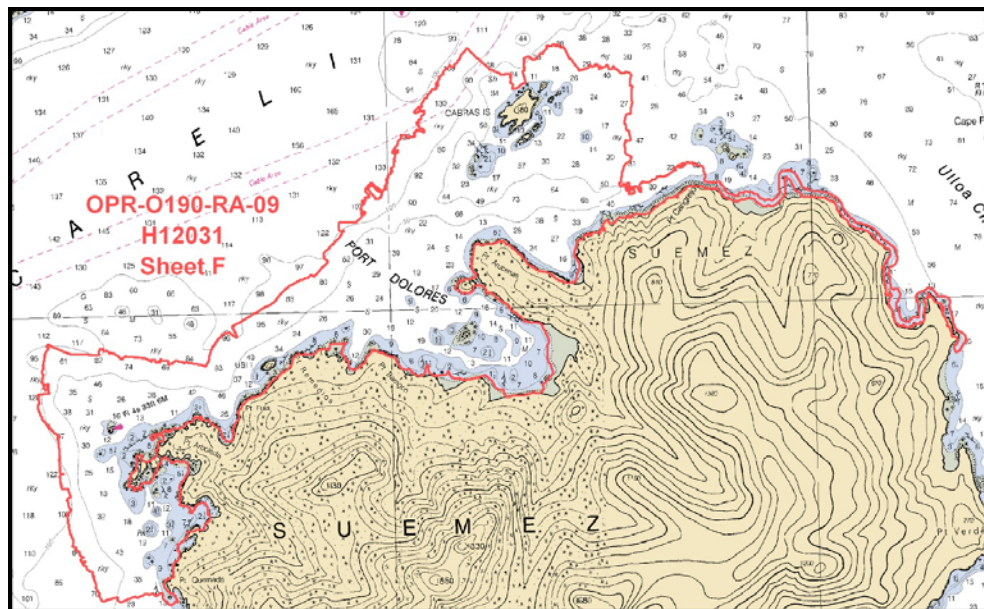


Figure 1: H12031 Survey Outline

B. DATA ACQUISITION AND PROCESSING

A complete description of data acquisition and processing systems, survey vessels, quality control procedures and data processing methods can be found in the *OPR-O190-RA-09 Data Acquisition and Processing Report (DAPR)*, submitted under separate cover. Items specific to this survey, and any deviations from the DAPR are discussed in the following sections.

Final Approved Water Levels have been applied to this survey. See Section C for additional information.

B.1. Equipment and Vessels

Data for this survey were acquired by the following vessels:

Hull Number	Name	Length (ft)	Draft (ft)	Acquisition Type
1101	RA-1	29	2	Reson 8125 Multibeam Echosounder
1103	RA-2	29	2	Knudsen 320M Vertical Beam Echosounder
2803	RA-3	29	3.5	Reson 7125 Multibeam Echosounder
2801	RA-4	29	3.5	Reson 7125 Multibeam Echosounder
2802	RA-5	29	3.5	Reson 7125 Multibeam Echosounder
2804	RA-6	29	3.5	Reson 7125 Multibeam Echosounder

Table 2: Data acquisition vessels and systems for H12031

Sound speed profiles were measured in accordance with the Specifications and Deliverables using SEACAT SBE-19+ profilers. Profiles were concatenated for the H12031 survey area and applied using the “nearest in distance within 4 hours” option in CARIS HIPS.

Multibeam vessel navigation and attitude data were measured and recorded using Applanix POS/MV 320 systems, version 4. Vertical Beam echosounder navigation and attitude data were measured using a Trimble DSM212L GPS receiver and a TSS MAHRS system.

A complete description of survey vessels, hardware, and software systems is included in the *OPR-O190-RA-09 DAPR*.

No unusual vessel configurations were used for data acquisition.

B.2. Quality Control

B.2.a. Crosslines

Multibeam Echosounder (MBES) crosslines totaled 6.995 nautical miles, comprising 6.15% of main scheme MBES hydrography. The main scheme bathymetry was manually compared to the crossline nadir beams in CARIS subset mode and generally agreed within 0.30 meters.¹

A statistical Quality Control Report has been conducted on representative data acquired with each system used on this survey. Results of these tests are included in the updated *2009 Ship Hydrographic System Readiness Review* package submitted with this survey.

B.2.b. Final Uncertainty

Uncertainty values of submitted, finalized grids are calculated in CARIS using the “Greater of the Two” of total propagated uncertainty and standard deviation (scaled to 95%). The Uncertainty of all finalized grids fall below the IHO levels as described in the NOS Specifications and Deliverables.² An IHO “child” attribute layer was created for the H12031_Final_Combined surface in CARIS HIPS and Fledermaus for analysis. Over 95% of nodes exceeded IHO uncertainty, as depicted in the node uncertainty distribution in figure 2. Areas close to shore surveyed with the tilted Reson 8125 and on the outer edges of the survey with no overlapping data were the most common instances of exceeded IHO uncertainty tolerances.³

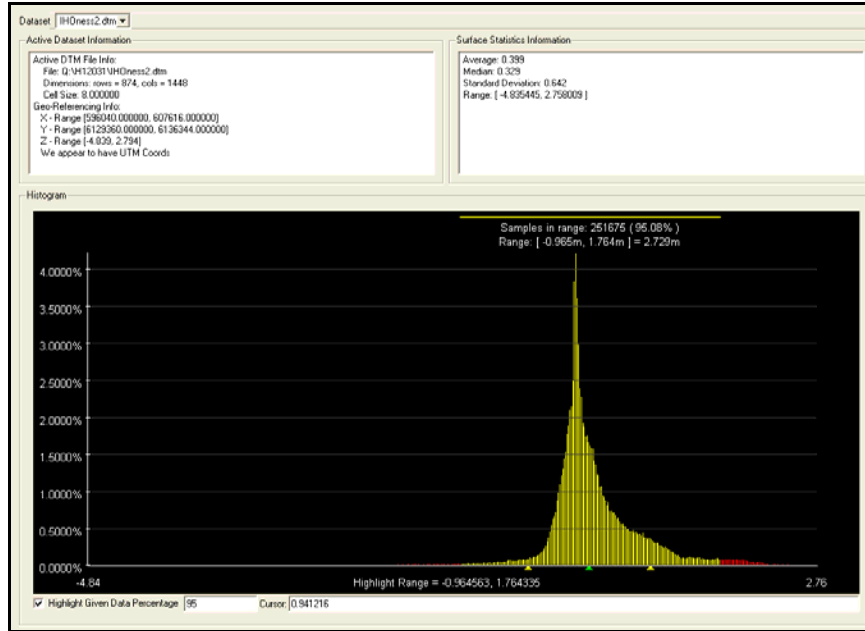


Figure 2: Surface statistics on IHO combined uncertainty child layer. Values > 0 exceed IHO uncertainty tolerance.

B.2.c. Junctions

Survey H12031 does not junction with any contemporary surveys and junction comparison was not performed. Although Lidar data were provided for shoreline recon only, a comparison of surfaces was conducted to ensure continuity. Surface comparison was conducted with Fledermaus statistical surface differencing with Lidar survey D00146, from project O190-KRL-08. Comparison showed good agreement with no evident systematic offsets when visually comparing depth contours. Figure 3 illustrates the summary of Fledermaus statistical analysis, showing LIDAR survey soundings on average 0.20 meters deeper than H12031 soundings, with 95% of H12031 soundings ranging between 1.77 meters shoaler and 2.22 meters deeper than D00146, yielding a standard deviation of 0.94 meters.

The Lidar survey soundings typically had deeper soundings on steep slopes where the Lidar was unable to accurately depict the rapidly changing features. The least depths on features and flat areas had excellent agreement within 0.5 meters. The areas around Point Arboleda Light and Cabras Island in particular had the most significant differences with the Lidar surface depicting deeper soundings on steep slopes leading up to the features.⁴

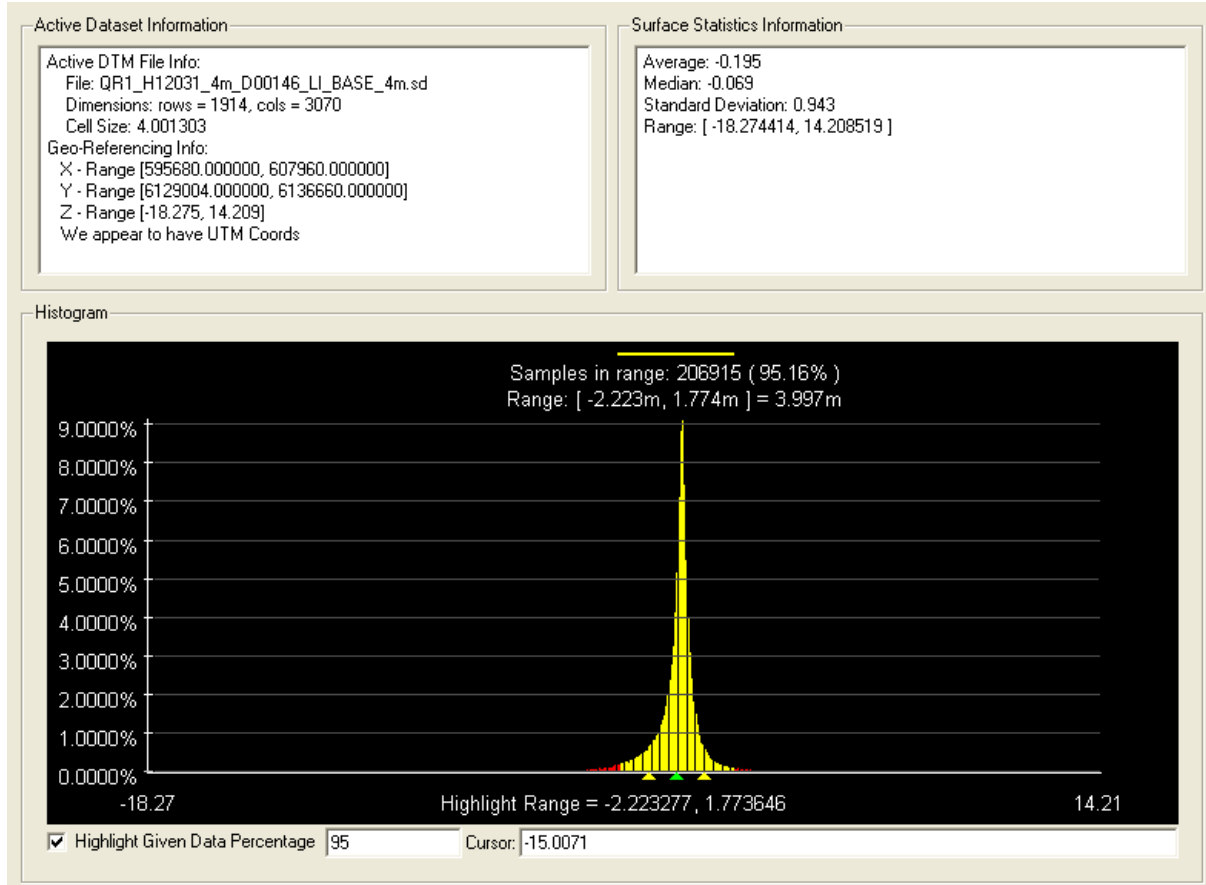


Figure 3: Surface Comparison with recon Lidar survey D00146 in project 0190KRL08

B.2.d. Quality Control Checks

MBES quality control checks were conducted as discussed in the quality control section B of the DAPR.

B.2.e. Data Quality Factors

Sound Speed Artifacts

Due to fresh-water runoff and the effects of tidal currents, a sharp demarcation of water masses was often observed in the field. This proved to be problematic in the acquisition and application of sound velocity correctors. After correction for sound velocity in HDCS, some lines still exhibited the characteristic "smiles" and "frowns" indicative of inaccurate sound speed corrections. Despite the best efforts of the Hydrographer to conduct sufficient sound velocity casts distributed both spatially and temporally, sound speed errors were still noticeable in several regions. To compensate, the Hydrographer, where possible, rejected soundings obviously in error on the outer beams.⁵

Sound Velocity Blow Outs

Multibeam echosounder data acquired with 1101 (RA-1) tilted Reson 8125 on DN 156 and 157 displayed several momentary sound velocity 'blowouts' where the vessel's Digibar

surface sound velocimeter was not reading the proper surface sound speed. Because this sonar uses surface sound speed input for beam forming, it was impossible to correct this data. To compensate, the Hydrographer, where possible, rejected soundings obviously in error on the outer beams. The corresponding multibeam backscatter side scan for these data was examined and no navigationally significant items were found.⁶ The intermittent Digibar sound speed error was corrected later in the field season through installation of a Reson SVP-71 Sound Velocimeter. See Figure 4 below.

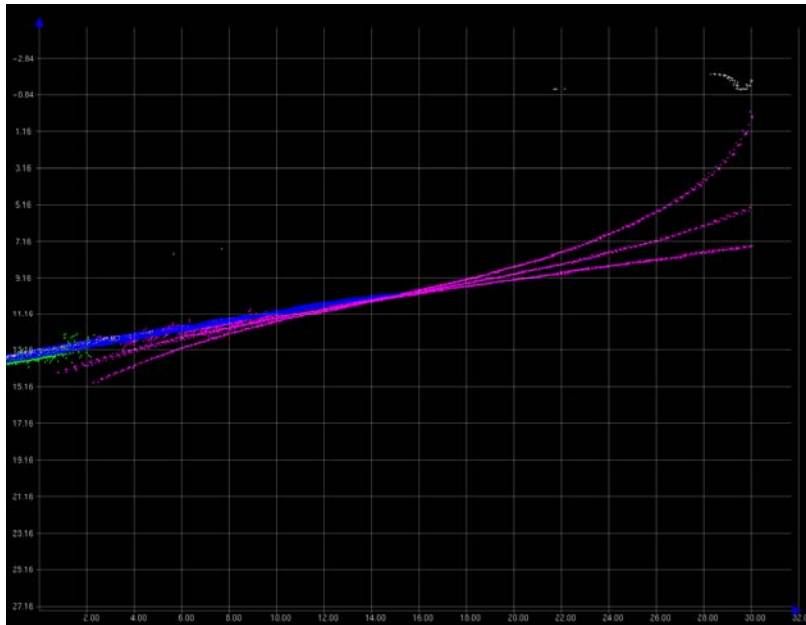


Figure 4: Vessel 1101 DN 156, Line 000_2205. Example of sound velocity blow out, located W of Pt. Cangrejo at approximately 55.34N and 133.38W

Horizontal Offset

On launch 2801 DN156 there was an unexpected break between lines 623_2358 and 623_0000 due to a malfunction of Hypack Hysweep software that occurs daily at UTC midnight. This malfunction forces a break of the line at midnight and in the case of 623_0000 incurred an unknown file error that made it impossible to apply True Heave corrections. A horizontal offset was observed in the data from line 623_0000. Figure 5 displays the maximum observed horizontal offset of 4.7 meters, within the IHO tolerance of 6 meters at 20 meters depth. The data were post-processed in POSpac to attempt to achieve a more precise positioning solution, however the error in the Hypack file precluded application of the SBET. Figure 6 depicts the location of line 623_0000. The surface generally preferred the other correlating lines, but in areas where 623_0000 was the only data supporting the surface, the offset can be observed. Hypack has been aware of this UTC midnight line break malfunction and is currently working on a solution.⁷

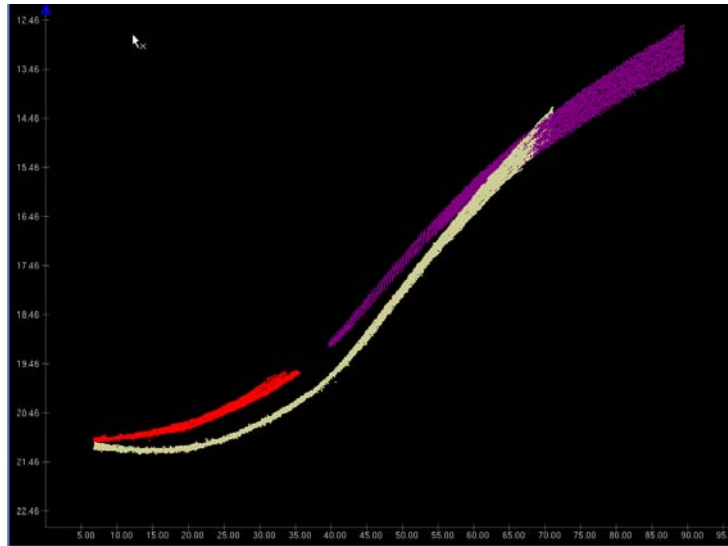


Figure 5: Launch 2801 DN 156 Line 623_0000; horizontal offset pictured in middle (tan)

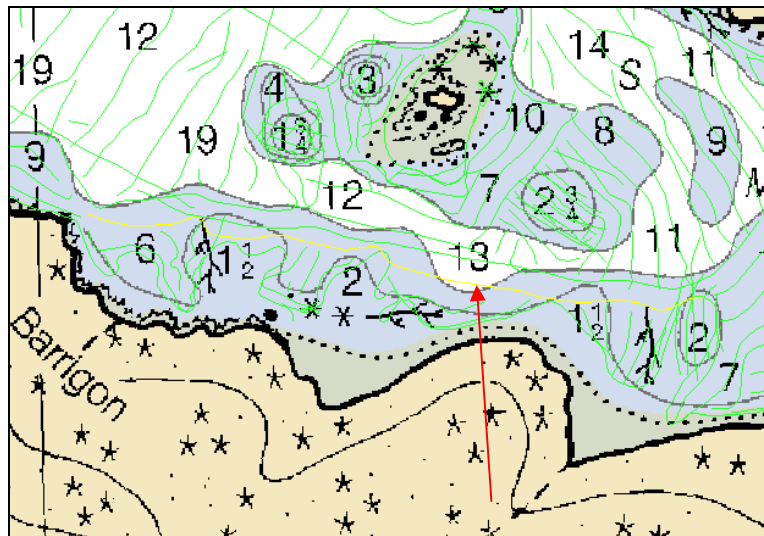


Figure 6: Launch 2801 DN 156 Line 623_0000 highlighted in yellow

B.2.f. Object Detection and Coverage Assessment

Many coverage holidays were present in the final BASE surface of H12031. Several of these holidays resulted from thick kelp beds that precluded the safe operation of launches in areas inshore. Although in many cases Launch 1101 (RA-1) was initially able to get inshore data with a tilted Reson 8125, due to lower water levels during subsequent acquisition and the deeper draft (3.5ft) of the other propeller driven multibeam launches, several holidays were left between the RA-1 data and main scheme bathymetry. These areas were typically inaccessible at lower tides due to thick kelp beds. Examples of this are shown in figures 7-20, 33, and 34. Although the chart in many cases depicted point kelp features, the H12031_Final_Feature_File.hob was updated to include additional kelp area and point features. Lidar supplied bathymetry has clearly defined least depths in the major holidays in figures 7 and 8.

In some instances Launch 1101 (RA-1) was unable to penetrate inshore to define the 4m or 8m curve due to hazardous shoreline conditions. Instances of this are illustrated in figures 21 through 27. Although in many instances there were charted Kelp point features, additional kelp point and area features were digitized into the H12031_Final_Feature_File.hob as appropriate.

Full coverage of features was not possible in some instances due to previously mentioned kelp patches. Although Launch 1101 (RA-1) was able to define the extents of some features with the tilted multibeam, full investigation of some features was not possible. When kelp was present, the file H12031_Final_Feature_File.hob was updated with additional kelp point or area features as appropriate. Examples of features without full multibeam coverage are illustrated in figures 28, 29 and 30. The shoreline deliverable H12031_Final_Feature_File.hob contains the Lidar derived least depths as provided in the OPR-0190-RA-09 Shoreline Composite Source File. For charting recommendations, see section D.1.⁸

Several holidays were present in deeper areas from outer beam loss on steep slopes. These data were examined for possible shoaling in outer beam region and none were found. Due to the irregular seafloor in this steeply sloping area, numerous holidays due to acoustic shadowing and the lack of returns from away-sloping features resulted in many holidays. Examination by the hydrographer indicates that least depths on all of the features in this area were ensonified. Examples of this down-slope shadowing are shown in figures 31 and 32.⁹

In addition to the holidays in coverage, there was no main scheme multibeam coverage in areas east of the coverage line near Pt Cangrejo. Although acquisition time precluded complete coverage eastward, limited shoreline verification and Launch 1101 (RA-1) tilted multibeam data were acquired over the southern extents of the survey to identify significant features.¹⁰

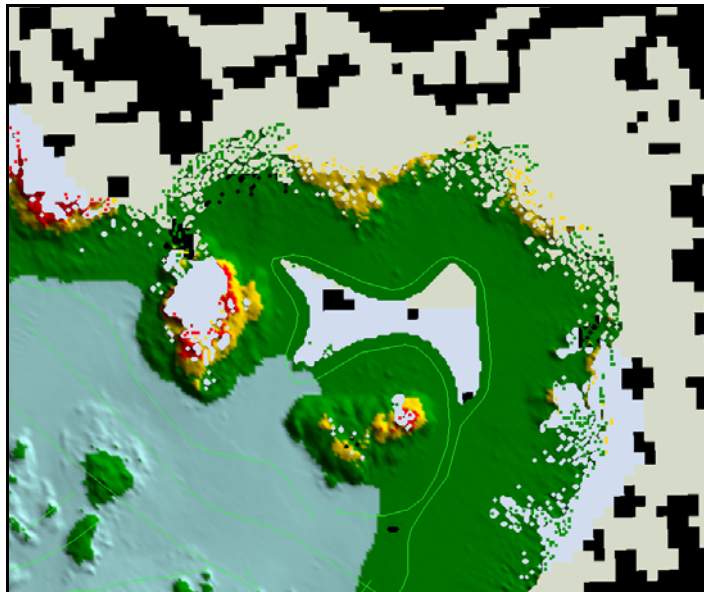


Figure 7: Holiday South of Pt Arboleda at approximately 55°18' 59"N 133° 27' 32"W. Shoreline verification and Lidar surface confirmed least depths were surveyed.

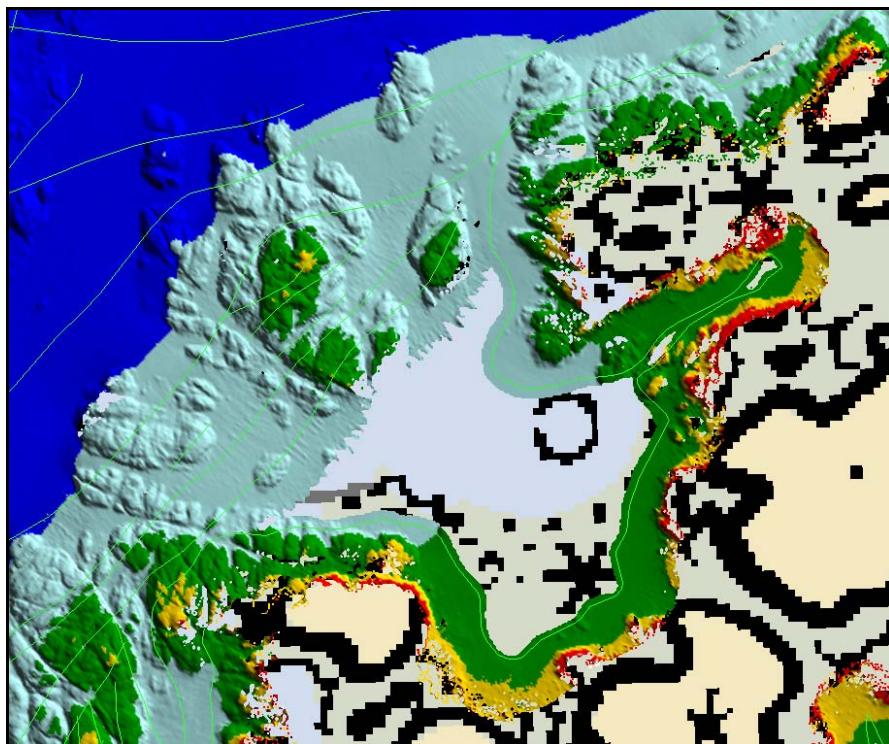


Figure 8: Holiday West of Pt Arboleda at approximately $55^{\circ} 19' 07''\text{N}$ $133^{\circ} 27' 56''\text{W}$. Lidar surface contains a shoal biased sounding of 2 fathoms in the inside of the holiday.

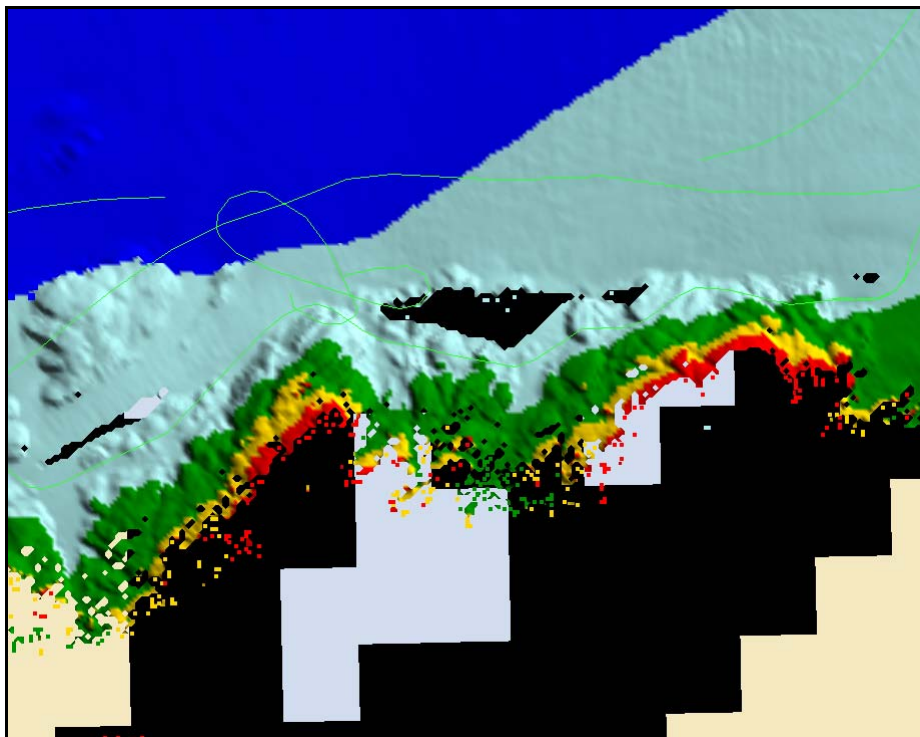


Figure 9: Holidays West of Pt Arboleda at approximately $55^{\circ} 19' 16''\text{N}$ $133^{\circ} 27' 40''\text{W}$. Least depths over surrounding features were obtained, correlating with Lidar surface.

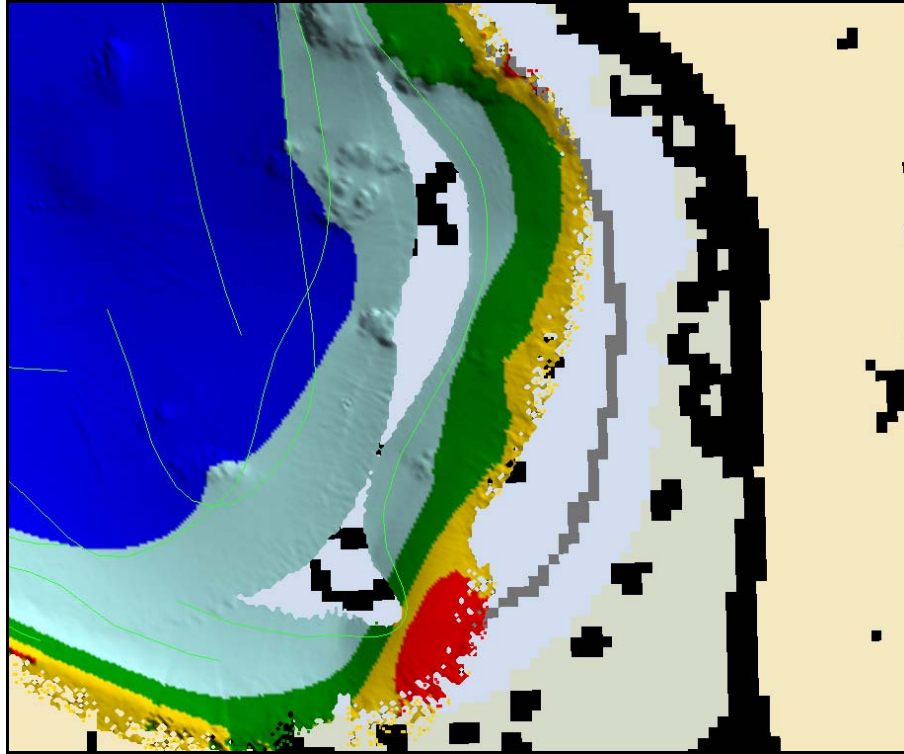


Figure 10: Holiday East of Pt Arucenas at approximately 55°20'16"N 133°22'50"W. Least depths over surrounding features were obtained, correlating with Lidar surface.

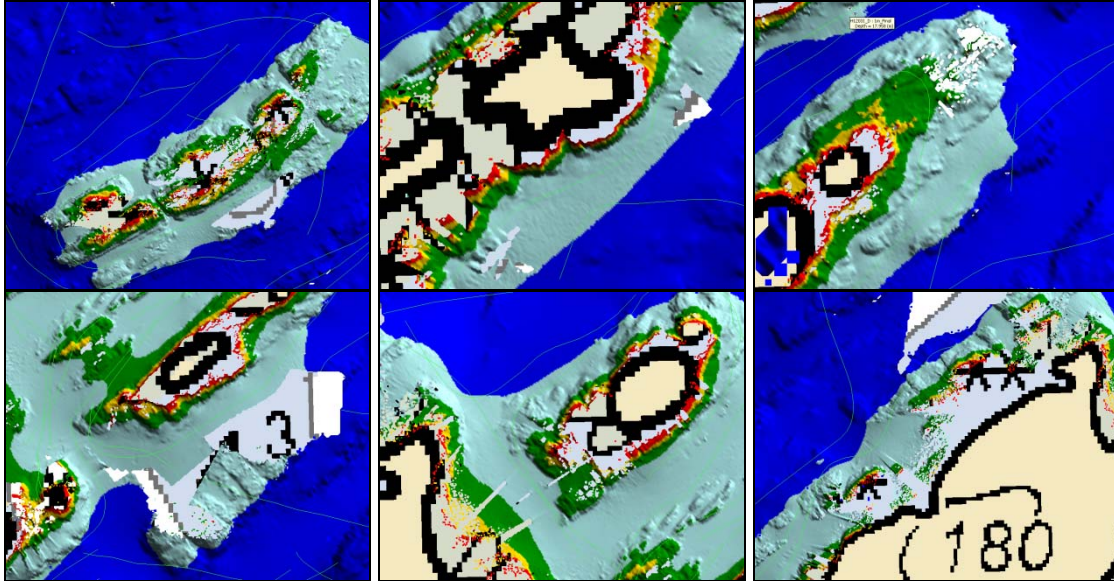


Figure 11: The above holidays are located near the Cabras Islands, located NNE of Pt Arucenas, at approximately 55°21'18"N 133°23'25"W. The southeast corner of Cabras island has a holiday over a feature with Lidar derived least depth of 3.7 fathoms (ref Figure 33).

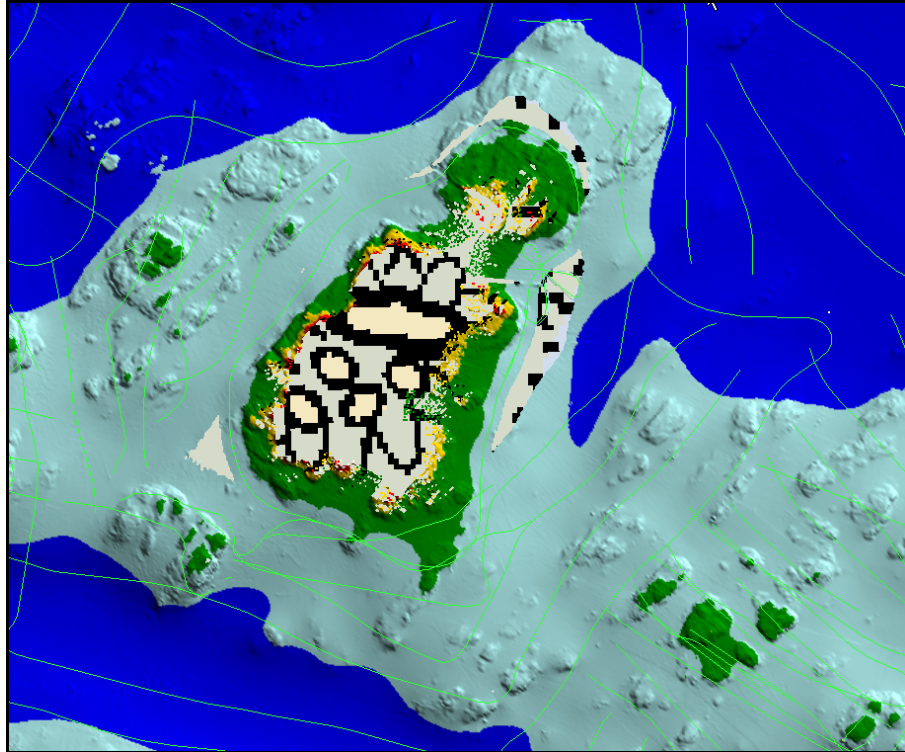


Figure 12: Three holidays surround the cluster of islands located S of Pt Arucas and ENE of Pt Barrigon. Least depths over surrounding features were obtained, correlating with Lidar surface.

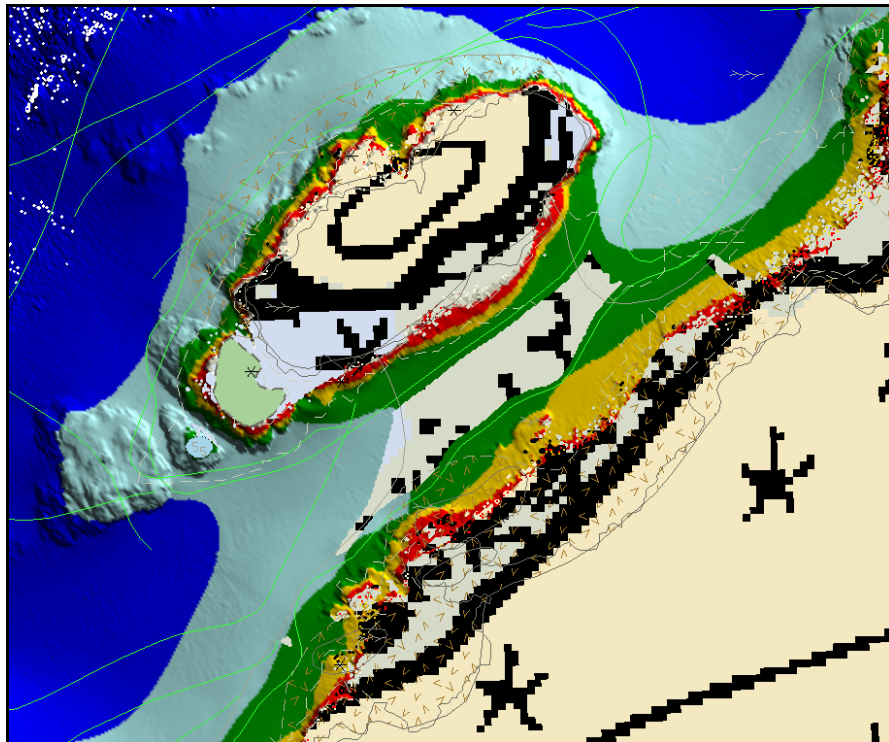


Figure 13: Holiday NE of Pt Fula and SW of Pt Remedios at approximately 55°19'36"N 133°26'24"W. No further features were detected in between the two lines, correlating with Lidar surface. Recommend retaining charted 3 fathom depth.

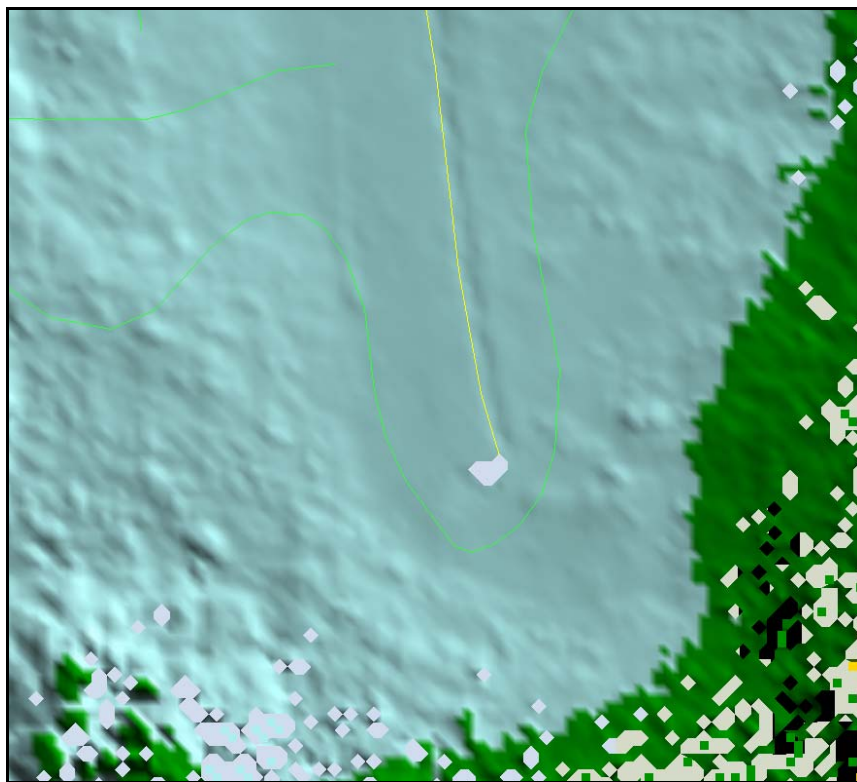


Figure 14: Holiday Northwest of Pt Quemada at 55°18'16.18"N 133°27'42.08"W. No features observed in surrounding data or Lidar surface.

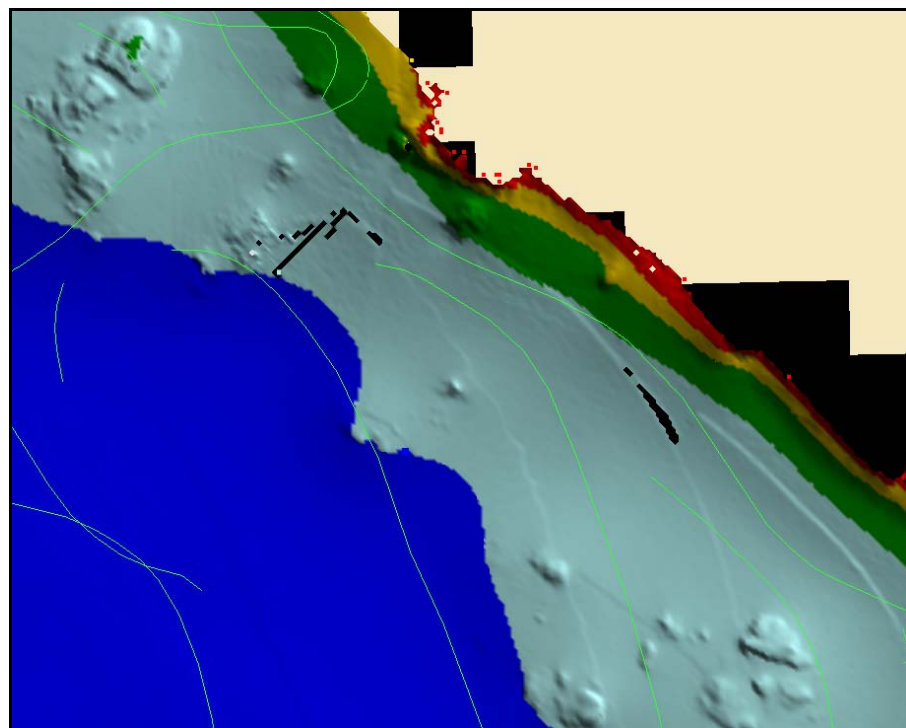


Figure 15: Holidays Souteast of Pt Arucenas at 55°19'55.41"N 133°23'30.99"W. No features observed in surrounding data or Lidar surface.

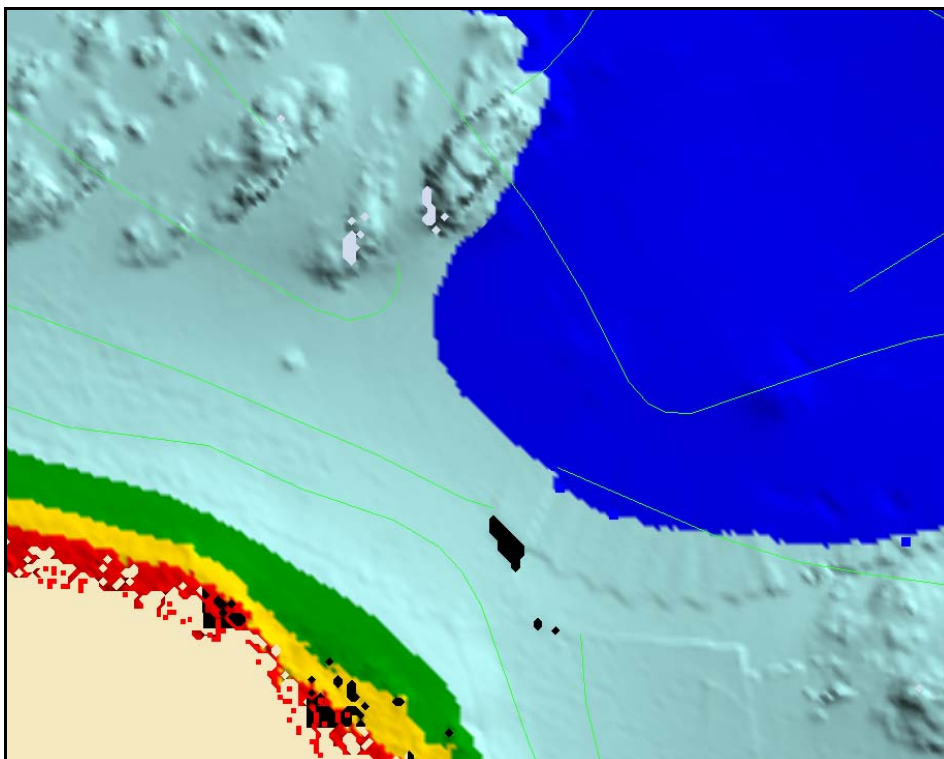


Figure 26: Holidays located near Port Dolores at 55°19'41.74"N 133°24'53.96"W. All features were surveyed to least depths, correlating with Lidar surface.

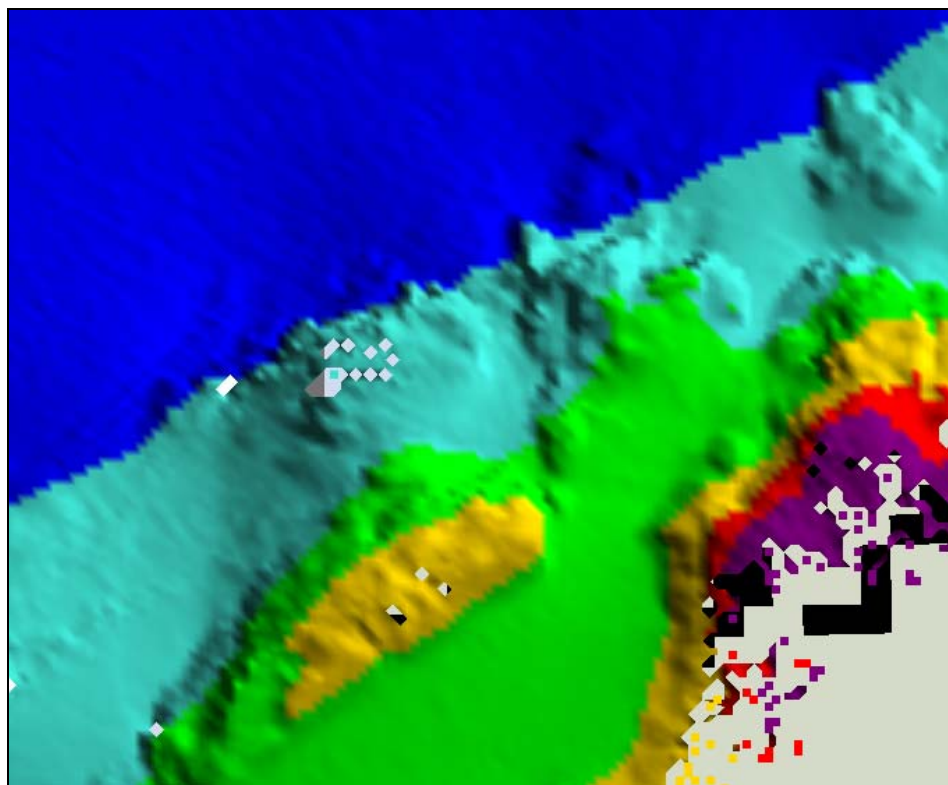


Figure 17: Holidays near Port Dolores Northeast of Pt Arboleda, at approximately 55°19' 47"N 133°25' 16"W. All features were surveyed to least depths, correlating with Lidar surface.

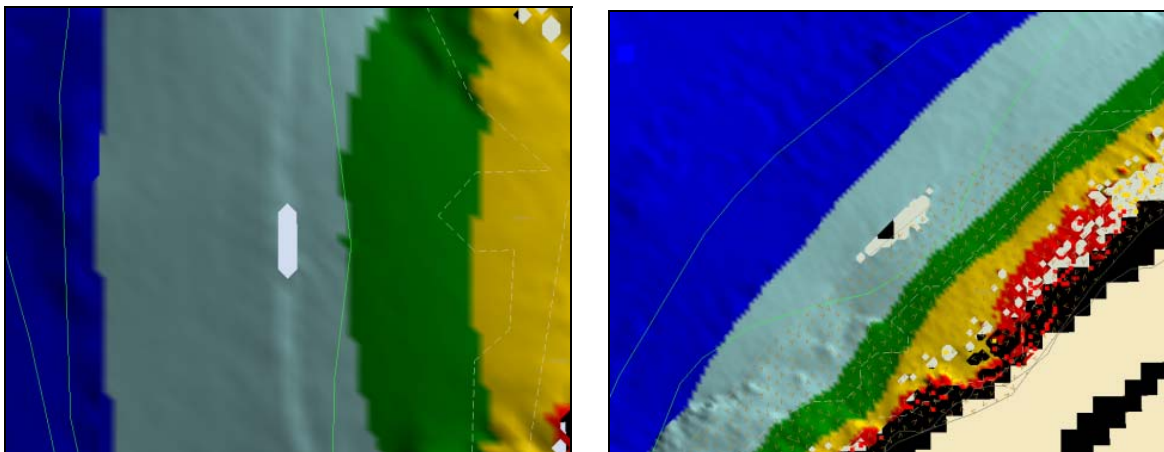


Figure 18: Holidays NE of Pt Arucenas at approximately 55°20' 21"N 133°22'52"W and 55°20'28"N 133°22'45"W, respectively. No features observed in surrounding data or Lidar surface.

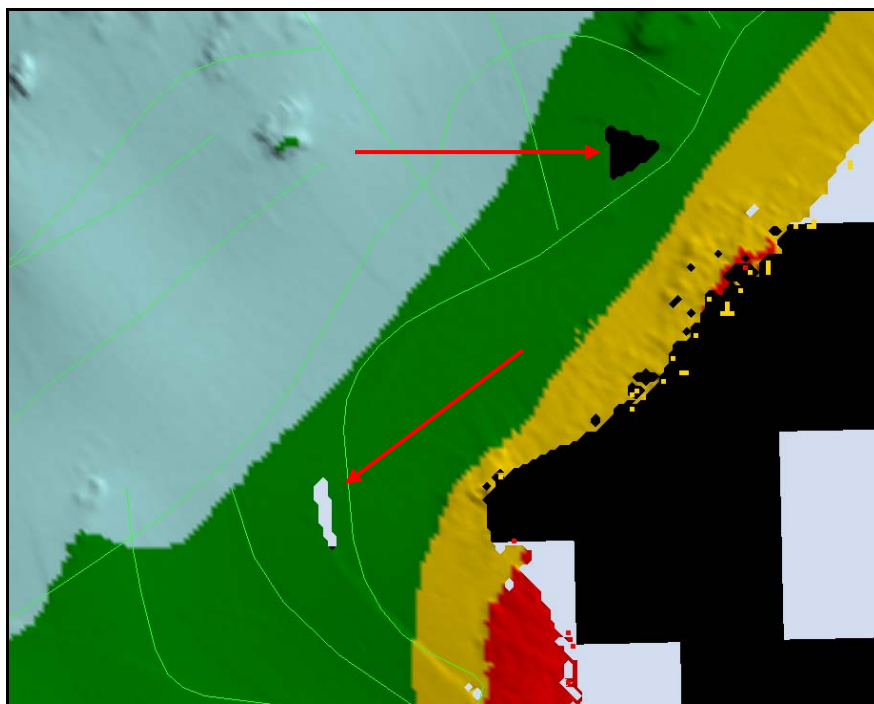


Figure 19: Holidays East of Pt Arboleda near Port Dolores at approximately 55°19'29"N 133°23'16"W. No features observed in surrounding data or Lidar surface.

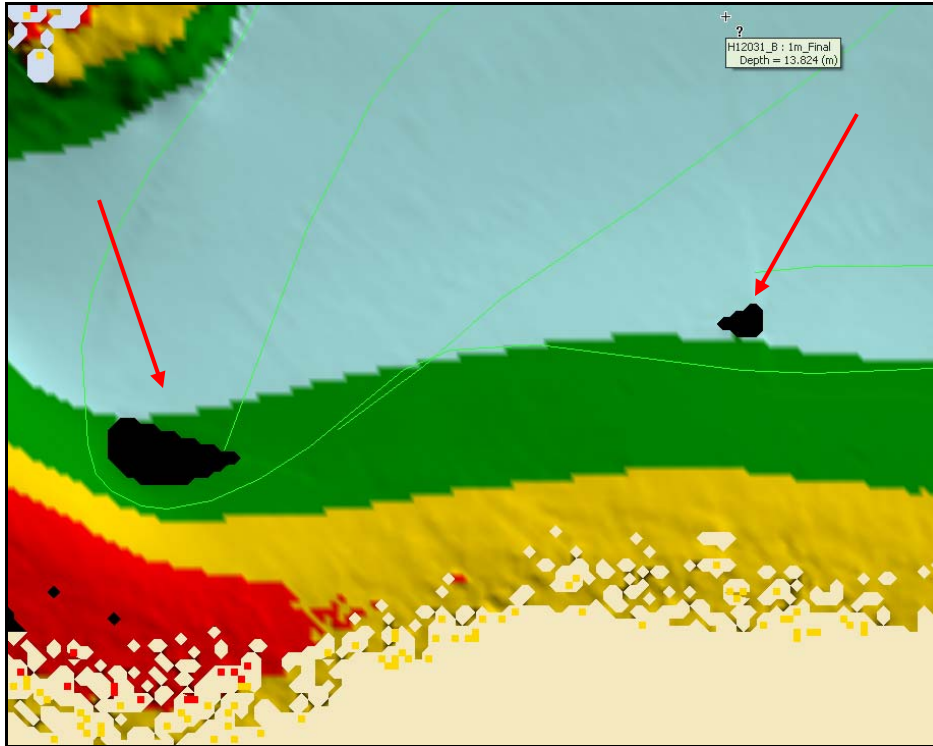


Figure 20: Holidays East of Pt Arboleda near Port Dolores at approximately 55°19'26"N 133°23'38"W. No features observed in surrounding data or Lidar surface.

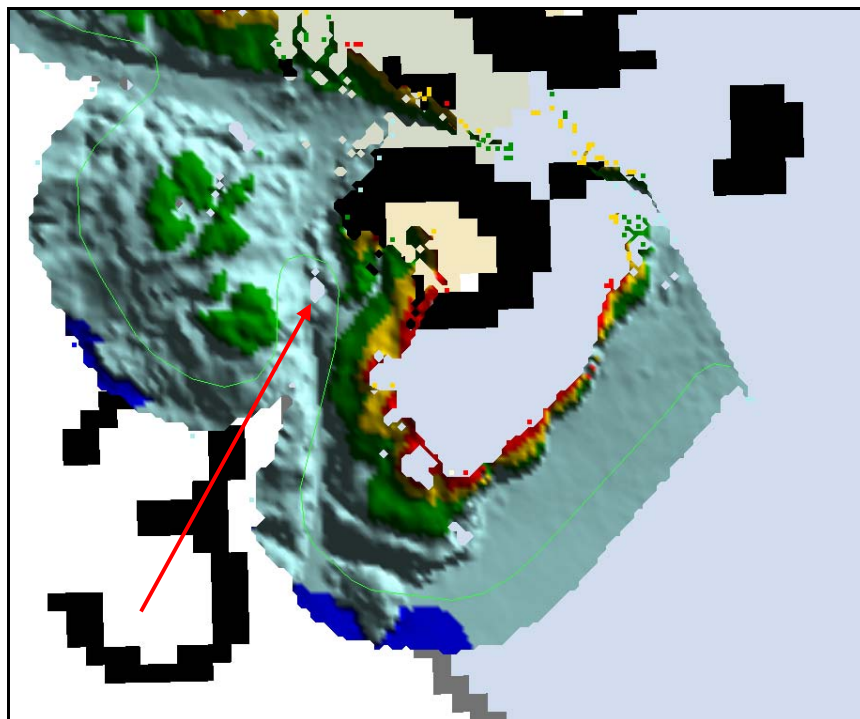


Figure 21: Holiday Southwest of Pt Quemada at 55°18'06.73"N 133°27'40.53"W. No further significant features were detected on shoreline verification or Lidar surface.

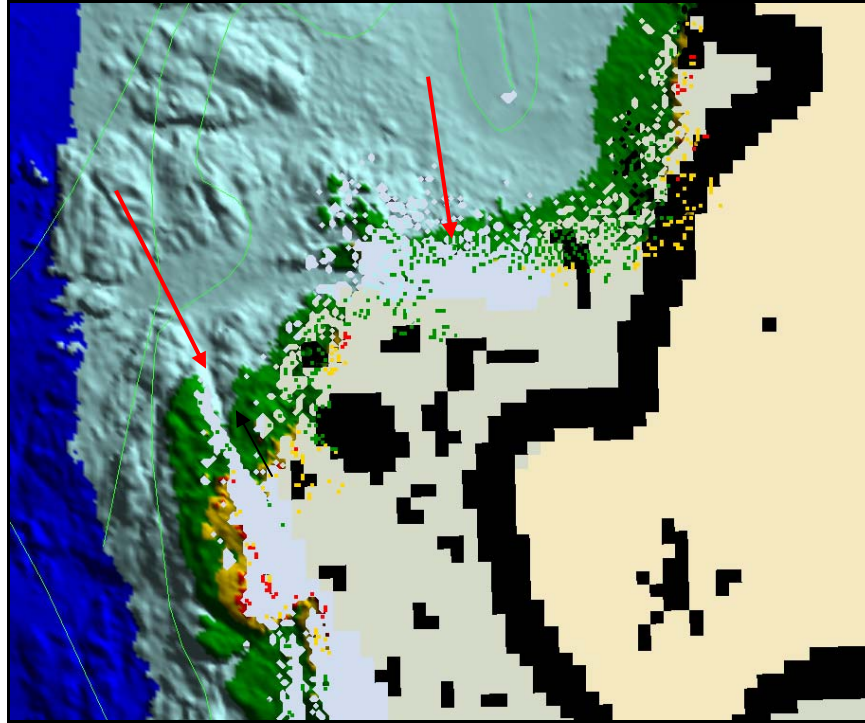


Figure 22: Holidays West of Pt Quemada, E of Pt Barrigon. No further significant features were detected on shoreline verification or by Lidar surface.

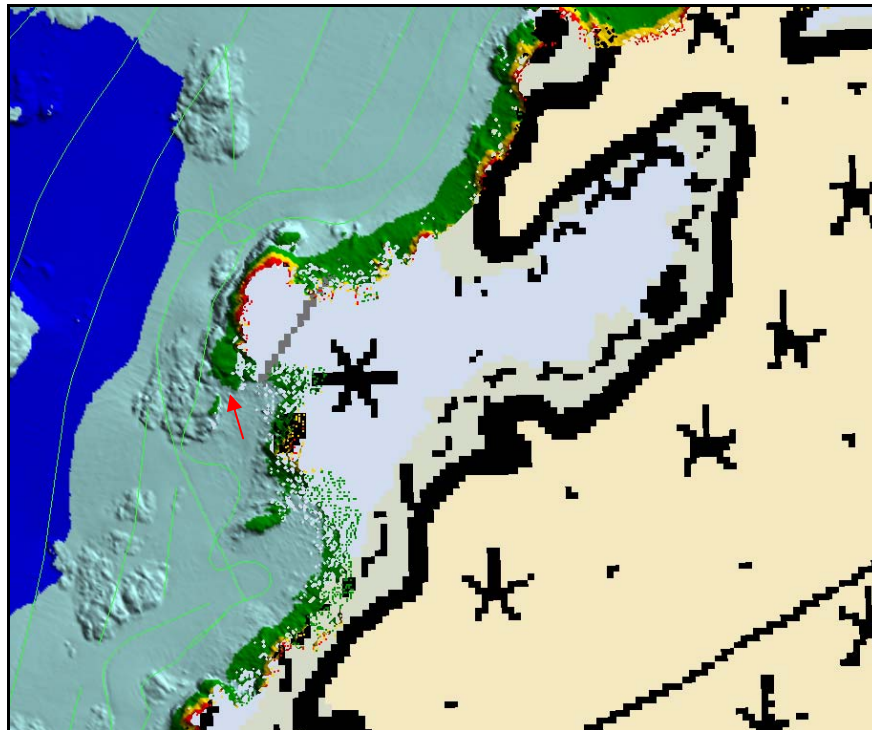


Figure 23: Holiday North of Pt Quemada at approximately 55°18'28"N 133°27' 31"W. Additional holiday indicated by the arrow, at 55°18' 25.68"N 133°27'38.92"W. No further significant features in the holidays were detected on shoreline verification or by Lidar surface.

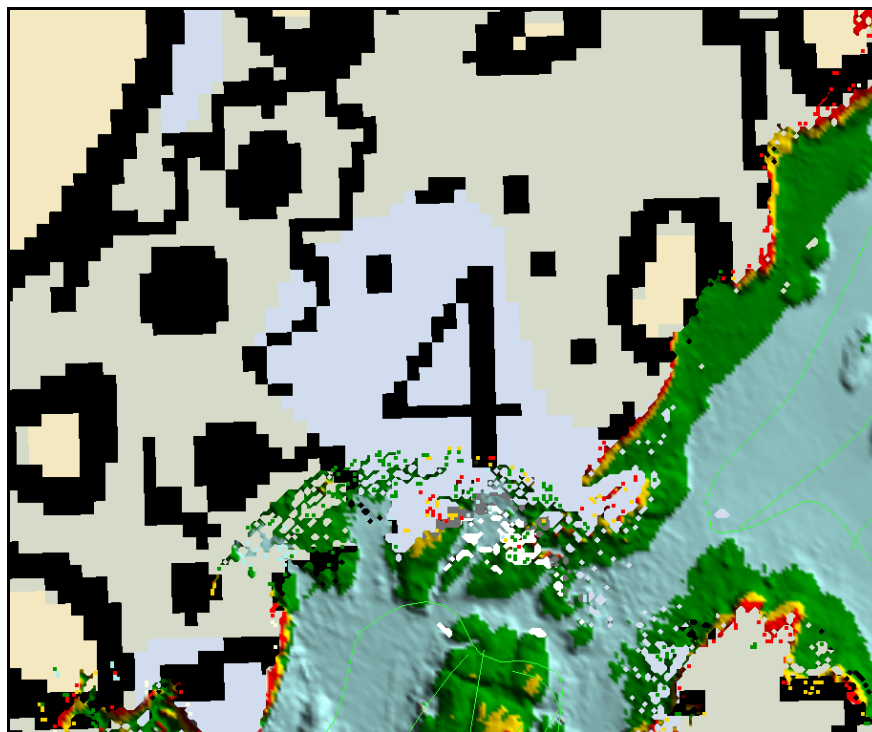


Figure 24: Holiday SW of Pt Arboleda at 55°18'53.57"N 133°27'56.40"W. Rocks in the holiday area as detected by Lidar and verified in shoreline precluded further entry into area.

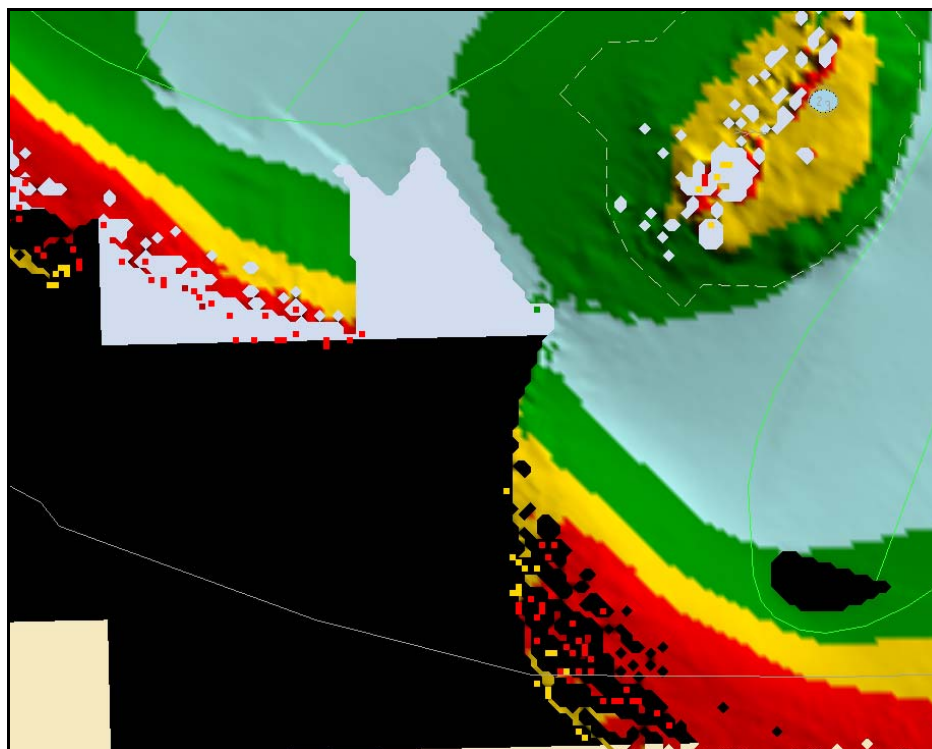


Figure 25: Holidays near Port Dolores at 55°19'28"N 133°23'41"W. A rock in the holiday area as detected by Lidar and verified in shoreline precluded further entry into area.

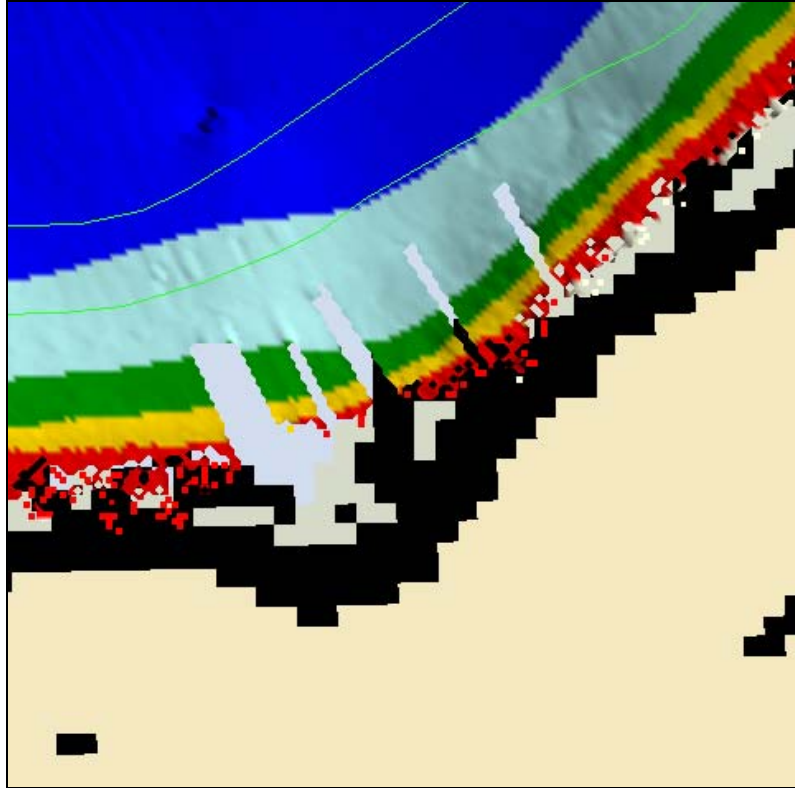


Figure 26: Holidays along the coast near Pt Cangrejo at 55°20'37.92"N 133°21' 55.95"W due to RA-1 Surface Sound Velocimeter failure. Least depths over significant features were obtained and verified with shoreline and Lidar surface.

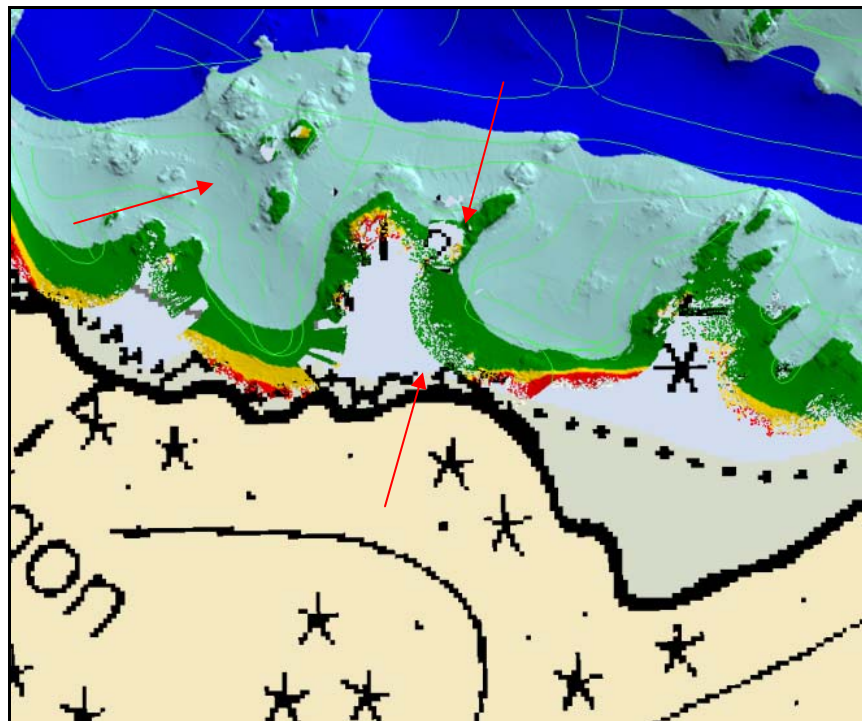


Figure 27: Offshore of Pt Barrigon - holidays on features on NW corner of graphic and 4m curve not defined on shore. Least depths over significant features were obtained, correlating with Lidar data.

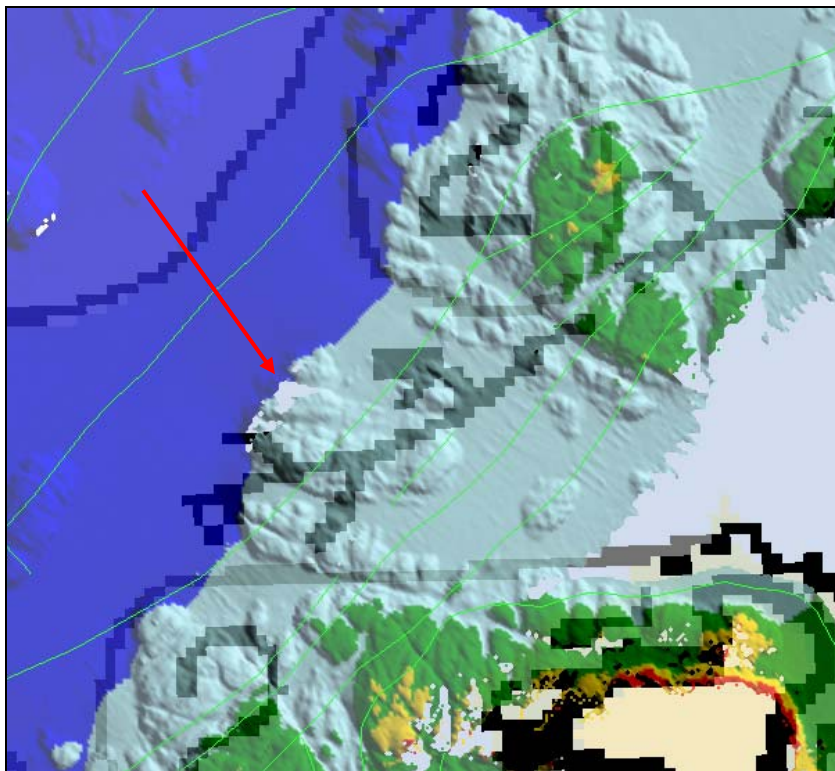


Figure 28: Downslope holiday indicated by arrow W of Pt Arboleda at 55°19'08"N 133°28'09"W. Least depth measured over feature was 4.6 fathoms. Lidar surface depicted 4 fathoms for least depth

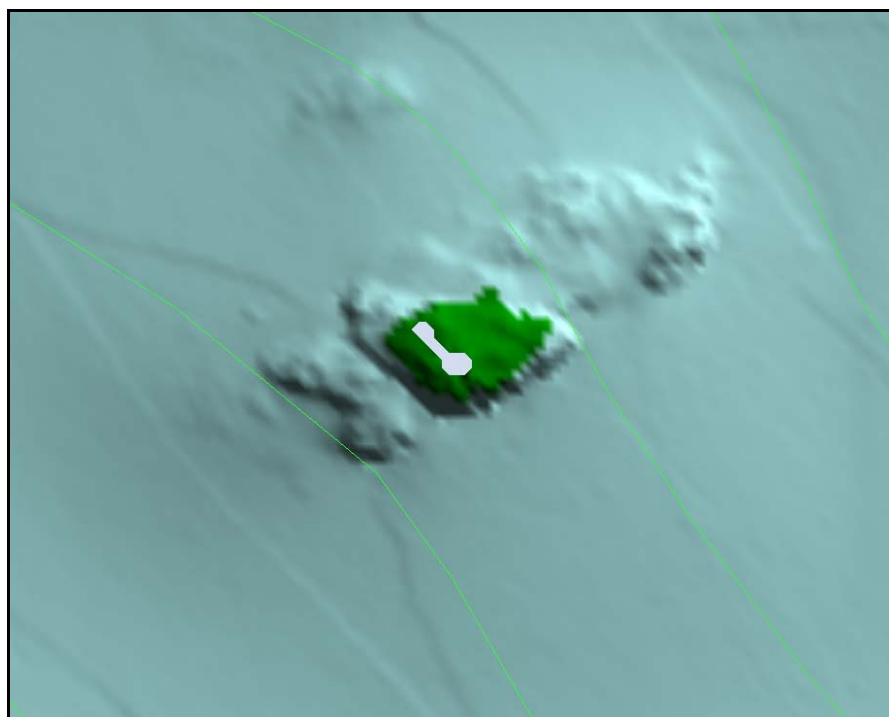


Figure 29: Holiday North of Pt Dolores and South of Pt Arucenas at 55°19' 49.80"N 133°23'20.87"W. Least depth as measured was 3 fathoms. Lidar derived depth measured 3.5 fathoms

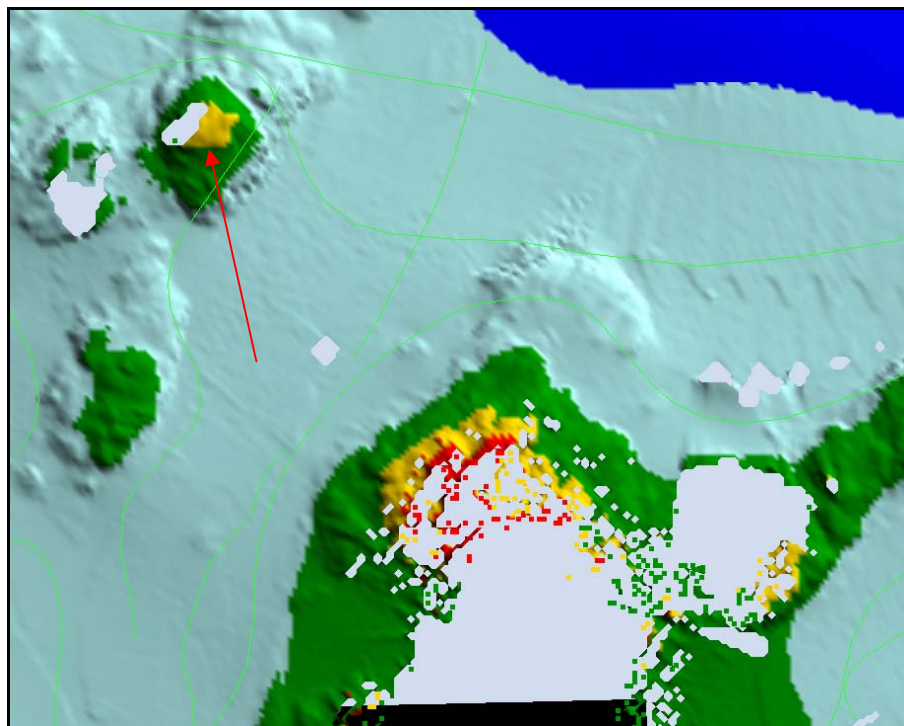


Figure 30: Holidays offshore of Pt Barrington at 55°19'40"N and 133°24' 35"W. Recommend using designated sounding of 1.5 fathoms for significant feature in northwest corner

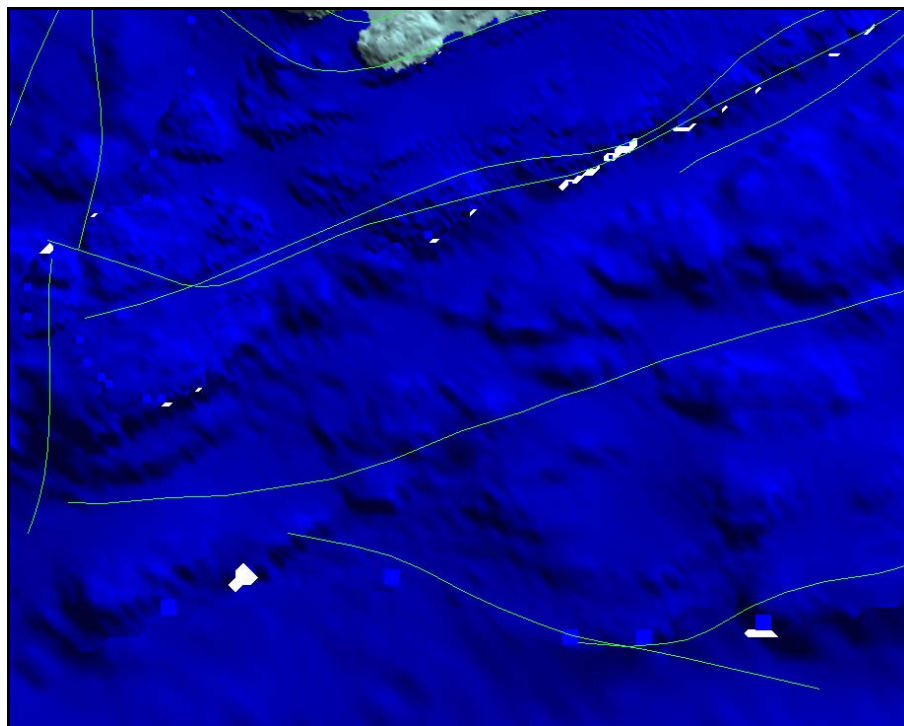


Figure 31: Down slope holidays North of Pt Arucenas at approximately 55°20'50"N 133°23'55"W. Least depths on rocks in area were acquired.

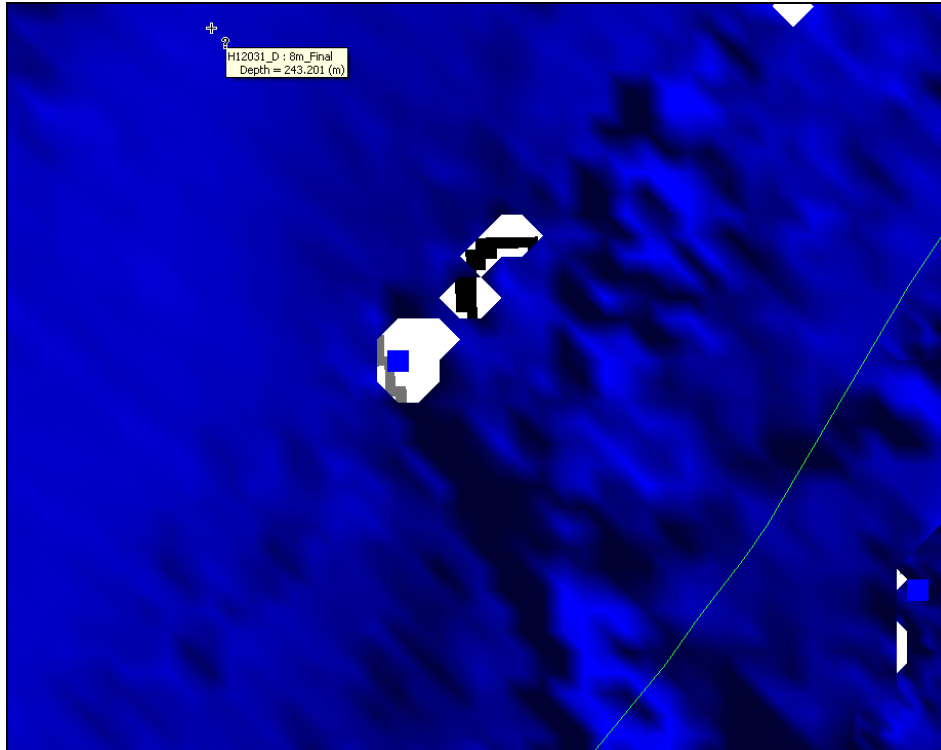


Figure 32: Down slope holiday Northwest of Cabras Islands at 55°21'31.43"N 133°24'05.04"W. Least depths on features in the area were acquired.

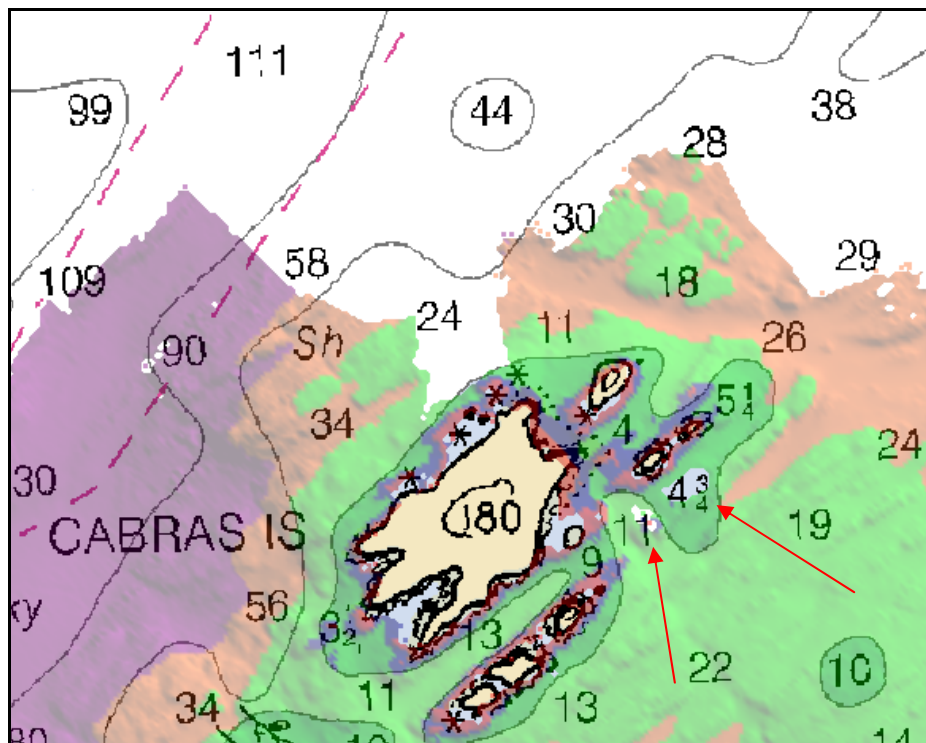


Figure 33: Holidays in coverage near southeastern edge of island, approximately 55°21.34'N 133°23.03'W. Lidar surface depicted a least depth of 3.7 fathoms on southeast corner.

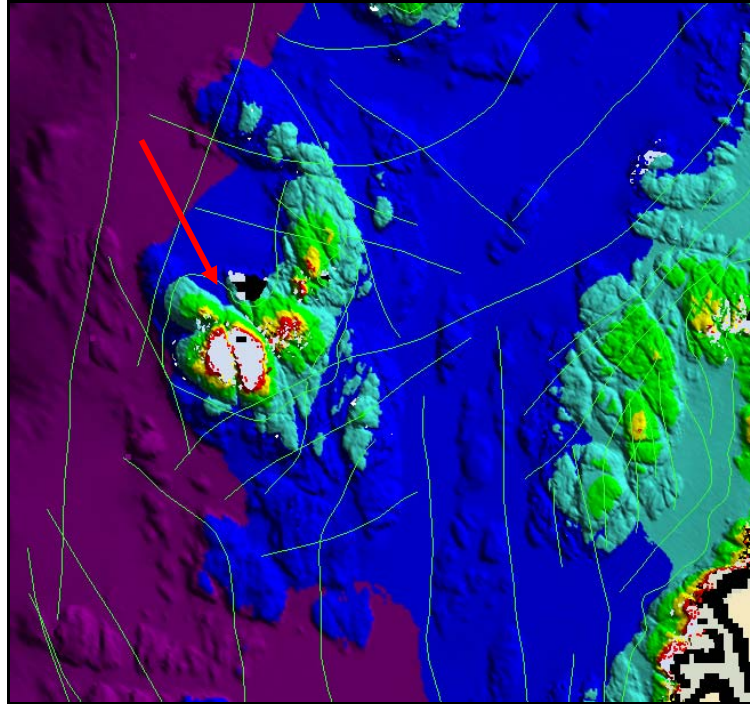


Figure 34: Holiday west of Pt Alboreda, in position 55°19.08'N 133°28.46'W. Least depth was obtained around the feature and verified with shoreline and Lidar surface.

B.2.g. Unusual Conditions

No unusual conditions were encountered during the survey that affected the expected accuracy and quality of survey data.

B.3. Corrections to Echo soundings

Data reduction procedures for survey H12031 conform to those detailed in the *OPR-O190-RA-09 DAPR*.

B.4. Data Processing

Data processing procedures for survey H12031 conform to those detailed in the DAPR. Data were processed using CARIS HIPS & SIPS v6.1, Service Pack 2, and Hotfix 8. Additional processing details regarding Total Propagated Uncertainty (TPU/TPE) and CUBE Surfaces and Parameters utilized, along with any the deviations from the processing procedures outlined in the DAPR are discussed below.

TPU VALUES:

The survey specific parameters used to compute TPU in CARIS for H12031 are listed in Table 3.

Tide values:	Measured	0.01 m	Zoning	0.12 m
Sound Speed Values:	Measured	0.50 m/s	Surface	As per DAPR

Table 3: Survey Specific CARIS TPU Parameters

Many BASE surfaces were used in processing H12031.¹¹ Final BASE surface resolutions and depth ranges were set according to Table 4 below. CUBE surfaces were processed with a parameter set corresponding to each resolution as per HTD 2009-2. The CUBE parameter XML file is included with the data deliverables. The submission Field Sheet and BASE Surface structure are shown in figures 35 and 36.

Depth Range (m)	Resolution (m)
0-23	1
20-52	2
46-115	4
103-350	8

Table 4: Depth range and surface resolutions for H12031

Soundings were generated in CARIS HIPS from the final combined BASE surface for field unit review purposes. They are included for reference only and are not intended as a deliverable.

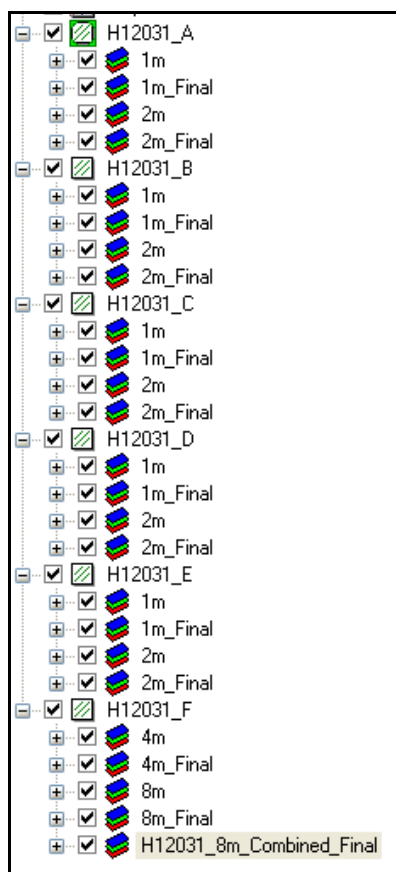


Figure 35: Field sheets and BASE surfaces submitted with H12031

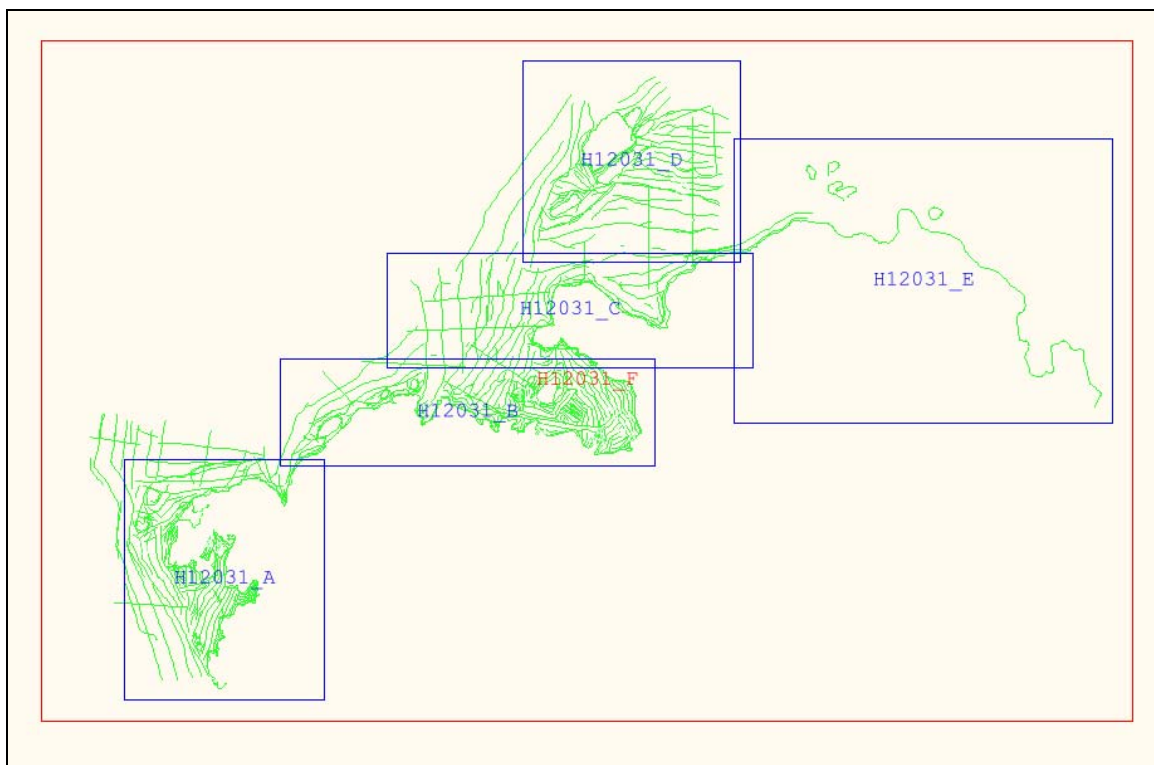


Figure 36: H12031 Field Sheet Layout

C. VERTICAL AND HORIZONTAL CONTROL

A complete description of vertical and horizontal control for survey H12031 can be found in the *OPR-O190-RA-09 Horizontal and Vertical Control Report*, submitted under separate cover. A summary of horizontal and vertical control for this survey follows.

C.1. Horizontal Control

The horizontal datum for this project is the North American Datum of 1983 (NAD83). Differential GPS (DGPS) was the sole method of positioning. The differential corrector beacons utilized for this survey are given in Table 5.

Location	Frequency	Operator	Priority
Level Island	295 kHz	USCG	Primary
Annette Island	323 kHz	USCG	Secondary

Table 5: Differential Corrector Sources for H12031

C.2. Vertical Control

The vertical datum for this project is Mean Lower-Low Water (MLLW). The operating National Water Level Observation Network (NWLON) primary tide station at Sitka, AK (945-1600) and Ketchikan, AK (945-0460) served as control for datum determination and as the primary source for water level reducers for survey H12031.

Ship personnel installed Sutron 8210 “bubbler” tide gauge at the following subordinate station in accordance with the Project Instructions. The gauges were installed in order to provide information to the Center for Operational Oceanographic Products and Services (CO-OPS N/OPS1) for the determination of time and height correctors. This station is described in detail in the *OPR-O190-RA-09 Horizontal and Vertical Control Report*.

Station Name	Station Number	Type of Gauge	Date of Installation	Date of Removal
Trocadero Bay	945- 0463	30-day	April 26, 2009	June 9, 2009

Table 6: Tide Stations installed by Ship personnel for H12031

As per the Project Instructions, all data were reduced to MLLW using the final approved water levels from the Trocadero Bay station (954-0463) by applying tide file 9450463.tid and time and height correctors through the zone corrector file H12031CORF.zdf. **It will not be necessary for the Pacific Hydrographic Branch to reapply the final approved water levels to the survey data during final processing.**

The request for Final Approved Water Levels for H12031 was submitted to CO-OPS on June 12, 2009 in accordance with the Field Procedures Manual (FPM), dated April 2009. The Final Tide Note was received on August 26, 2009. This documentation is included in Appendix IV.¹²

D. RESULTS AND RECOMMENDATIONS

D.1. Chart Comparison

D.1.a. Survey Agreement with Chart

Chart comparison procedures were followed as outlined in section 4.5 of the FPM and section 8.1.3-D.1 of the HSSDM, utilizing CARIS HIPS and SIPS 6.1 software program.

Survey H12031 was compared with the following charts:

Chart	Scale	Edition and Date	Local Notice to Mariners Applied Through
17405	1:40,000	16 th Ed, Oct 2008	01/30/2010
17406	1:40,000	7 th Ed; Feb 2004	01/30/2010
17407	1:40,000	15 th Ed; Nov 2003	01/30/2010

Table 7: Charts compared with H12031

All charts were compared against each other for continuity. Although agreement was generally good in all common areas of the chart, there was a 40 meter shift to the southeast of chart 17406 when comparing to chart 17405, as depicted in figure 37. There was also a 40 meter shift to the southeast of chart 17406 when comparing to chart 17407, as depicted in figure 38. Chart 17405 agreed well with 17407 with no discernable systematic offset.

Although all charted depths between charts agree in common areas, some features from 17405 were updated from photogrammetry and not applied to 17406 or 17407. Figure 37 shows rocks around Cabras Island on chart 17405 that were deconflicted in the field in lieu of Lidar

derived features. The hydrographer recommends updating all shoreline features with the enclosed H12031_Final_Feature_File.hob.¹³

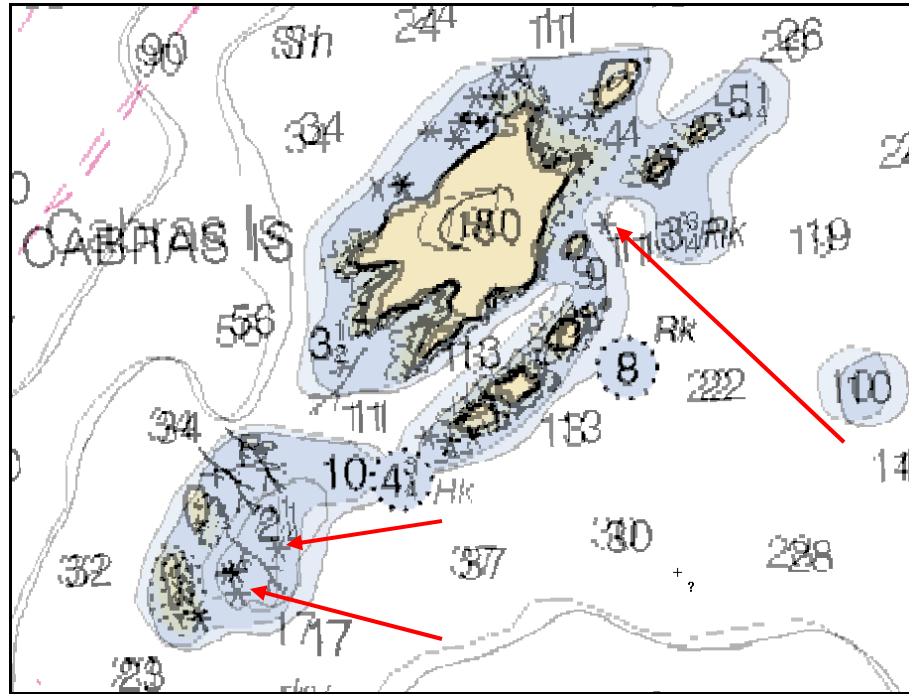


Figure 37: 40 Meter offset with 17405 overlaid on 17406. Arrows denote photogrammetry derived features on 17405 that were later deconflicted in the field.

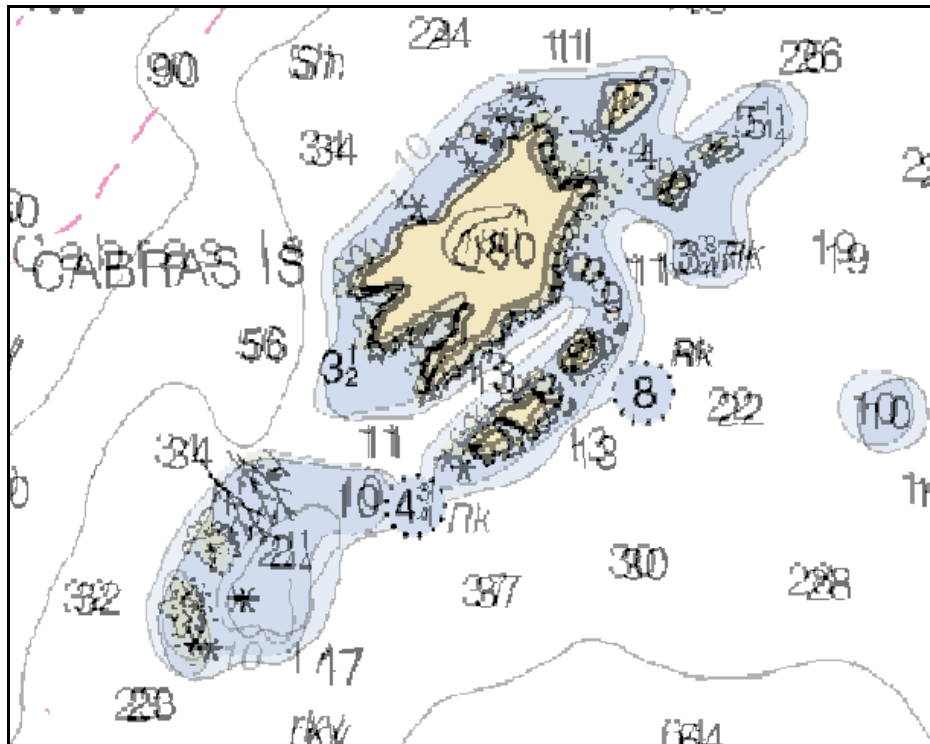


Figure 38: 40 meter offset with 17407 overlaid on 17406

All charted depths agree well with discrepancies no greater than one fathom with five significant exceptions.¹⁴

1. The inshore extent of Port Dolores in approximate position 55°19.61'N 133°23.40'W revealed soundings 2 to 3 fathoms shoaler than charted depths and the 5 fathom contour extending further offshore than charted. The hydrographer recommends charting as per the digital data.
2. The area directly north of Pt Arboleda in approximate position 55°19.38'N 133°27.29'W revealed soundings 10 fathoms deeper than the 2 ½ fathom charted depth. The hydrographer recommends charting as per the digital data.
3. The area directly north of Pt Aruncenas in approximate position 55°20.50'N 133°23.74'W revealed soundings 5 fathoms deeper than the 5 ¼ charted depth. The hydrographer recommends charting as per the digital data.
4. The area directly north of the Cabras Islands in approximate position 55°21.55'N 133°23.25'W revealed soundings 19 fathoms deeper than the 11 fathom charted depth. The hydrographer recommends charting as per the digital data.
5. The reefs charted southwest of Cabras Island in approximate position 55°21.01'N 133° 23.92'W are mischarted 170 meters northwest of the field observed features. The correct positions are clearly indicated through shoaling trends in the bathymetry and positions on Lidar supplied shoreline data. The hydrographer recommends updating the soundings in the area and updating the depth curves as per the digital data.

The Hydrographer recommends that survey soundings supersede all prior survey and charted depths in the common area, with the following exceptions:

1. In the area south of Point Arboleda depicted in Figure 7 in approximate position 55°18'59"N and 133°27'32"W there is a significant holiday due to extensive kelp beds in the area. The hydrographer recommends updating the chart using the features as depicted in H12031_Final_Feature_File.hob. Although there are shoaling trends in the area, extensive kelp prevented full investigation of features.¹⁵
2. In the area west of Point Arboleda depicted in Figure 8 in approximate position 55°19.10'N 133°27.91'W there is a significant holiday due to extensive kelp beds in the area. The file H12031_Final_Feature_File.hob depicts a Lidar derived shoal sounding of 2 fathoms, as provided in the OPR-0190-RA-09 Composite Source File.¹⁶
3. In the area between shore and Ubi Island, as depicted in Figure 13, complete coverage was not attained due to hazardous inshore conditions. Hydrographer recommends retaining the charted 3 fathoms for passage inshore of the island and updating features as depicted in H12031_Final_Feature_File.hob.¹⁷
4. Offshore of Point Barrigon there are several holidays over significant features as depicted in Figure 30. After evaluating the bathymetry, the least depth of the shoal is evident despite the holiday. The hydrographer recommends charting the area as per digital data.¹⁸
5. West of Pt Arboleda at approximately 55°19.12'N 133°28.11'W there is a holiday over a significant feature as depicted in Figure 28. Least depth measured over the

feature was 4.6 fathoms. The provided OPR-0190-RA-09 Composite Source File depicts a Lidar derived depth of 4 fathoms.¹⁹

6. North of Pt Dolores and South of Pt Arucenas there is a holiday over a significant feature located at approximately 55°19' 50"N and 133°23'21"W, as depicted in Figure 29. The least depth measured by multibeam was 2.9 fathoms. The provided OPR-0190-RA-09 Composite Source File depicts a Lidar derived depth of 3.5 fathoms. The hydrographer recommends charting as per the digital data.²⁰
7. East of Cabras Island there is a holiday over a significant feature located at approximately 55°21.34'N 133°23.03'W, as depicted in figure 33. The provided OPR-0190-RA-09 Composite Source File depicts a Lidar derived least depth of 3.7 fathoms.²¹

D.1.b. Automated Wreck and Obstruction Information System (AWOIS) Items

No AWOIS items were located within the survey limits of H12031.²²

D.1.c. Other Investigated Features

No additional charted items were investigated and no other features were located on survey H12031.

D.1.d. Dangers to Navigation

Four (4) Dangers to Navigation (DTONs) were found on survey H12031, and reported to the Marine Chart Division via email on February 8, 2010.²³ The original DTON submission package is included in Appendix I.²⁴

D.2. Additional Results

D.2.a. Shoreline Verification

Shoreline Source

Shoreline verification was accomplished using a combination of the composite source file (CSF) and project reference file (PRF) provided with the project instructions. The CSF has been created using the latest ENC's, most recent aerial photogrammetry, prior hydrographic surveys, and accepted Lidar survey features. Prior survey and Lidar features in the CSF are for reference. The composite source items for further investigation are printed on paper "boat sheets" and displayed in CARIS Notebook and Hypack for field verification.

Shoreline Verification

Limited shoreline verification was conducted near predicted low water in accordance with the Specifications and Deliverables section 8.2 and the Field Procedures Manual section 3.5 and 4.4. Detached positions (DPs) acquired during shoreline verification were recorded and S-57 attributed in CARIS Notebook. These indicate revisions to features and features not found in the provided CSF. In addition, annotations describing shoreline were recorded on the hard copy plots of the CSF as described above.

All shoreline data is submitted in CARIS Notebook HOB files. The session H12031_NTBK contains the following:

HOB File	Purpose and Contents
H12031_Comp_Source.hob	Original Source Data as provided for project OPR-O190-RA-09 and filtered to the limits of survey H12031
H12031_Reference.hob	Survey outline and limit lines.
H12031_Final_Feature_File.hob	Composite source data modified by the field to best represent the shoreline at survey scale. This includes the addition of new features and modification of source features. This file retains all features neither verified nor disproved by this survey
H12031_Disprovals.hob	Composite source items that were deleted or modified in position or geographic type.

Table 8: List and Description of Notebook HOB files

Recommendations

The Hydrographer recommends that the shoreline as depicted in the Notebook HOB files supersede and complement shoreline information compiled on the composite source file and charts as described above.²⁵

D.2.b. Prior Survey Comparison

Prior survey comparison was not performed.

D.2.c. Aids to Navigation

Survey H12031 included one aid to navigation (ATON). The ATON’s position was visually checked in the field against the digital raster chart. The ATONs was found to serve its intended purpose.²⁶

D.2.d. Overhead Features

There are no overhead features within the limits of survey H12031.²⁷

D.2.e. Submarine Cables and Pipelines


There is one (1) charted cable areas within the survey limits of H12031, as shown in Figure 39 in the northern portion of coverage west of Cabras Island. No visible indication of cables was evident in the MBES data in this cable area. The Hydrographer recommends retaining the cable areas as charted.²⁸

E. APPROVAL

As Chief of Party, field operations for hydrographic survey H12031 were conducted under my direct supervision, with frequent personal checks of progress and adequacy. I have reviewed the attached survey data and reports. The survey data meets or exceeds requirements as set forth in the NOS Hydrographic Surveys and Specifications Deliverables Manual (April 2009 edition), Field Procedures Manual (April 2009 edition), Standing and Project Instructions, and all HSD Technical Directives issued through June 2009. These data are adequate to supersede charted data in their common areas with the exception of deficiencies noted in the Descriptive Report. This survey requires additional work to complete the extents of the sheet as noted in the Descriptive Report. All data and reports are respectfully submitted to N/CS34, Pacific Hydrographic Branch.


Listed below are supplemental reports submitted separately that contain additional information relevant to this survey:


<u>Title</u>	<u>Date Sent</u>	<u>Office</u>
Hydrographic Systems Readiness Review Package	<i>Under separate Cover</i>	N/CS34
Data Acquisition and Processing Report for OPR-O190-RA-09	27-Oct-2009	N/CS34
Coast Pilot Report for OPR- O190-RA-09	<i>To be submitted</i>	N/CS26
Horizontal and Vertical Control Report for OPR-O190-RA-09	27-Oct-2009	N/CS34
Tides and Water Levels Package for OPR-O190-RA-09	12-Jun-2009	N/OPS1

Approved and Forwarded:  Donald W. Haines, CAPT/NOAA
I am approving this document
2010.03.11 08:19:43 -08'00'
Captain Donald W. Haines, NOAA
Commanding Officer, NOAA Ship *Rainier*

In addition, the following individuals were also responsible for overseeing data acquisition and processing of this survey:

Survey Sheet Manager:  Matthew Nardi
I am the author of this document
2010.03.09 19:11:16 Z
Ensign Matthew J. Nardi
Junior Officer, NOAA Ship *Rainier*

Chief Survey Technician:  James B. Jacobson
I have reviewed this document
2010.03.09 17:04:19 Z
James B. Jacobson
Chief Survey Technician, NOAA Ship *Rainier*

Field Operations Officer:  Brent Pounds
I have reviewed this document
2010.03.11 06:20:45 -09'00'
Lieutenant Brent J. Pounds, NOAA
Field Operations Officer, NOAA Ship *Rainier*

Revisions

¹ Concur.

² Concur.

³ Data are adequate to supersede charted data.

⁴ Some features from LIDAR survey D00146 were used in the compilation of H12031_CS.000 where multibeam from H12031 failed to provide coverage. No data from LIDAR survey D00146 were used to disprove or supplant charted soundings or features.

⁵ Despite sound speed artifacts, data are adequate to supersede charted data.

⁶ Concur.

⁷ Despite the small gap and offset object detection criteria and data density requirements were still met. Data are adequate to supersede charted data.

⁸ Holidays were addressed on a case by case basis during the compilation of H12031_CS.000 using the provided final features file and final base surface. Chart as depicted in H12031_CS.000.

⁹ Deep down slope holidays were not preserved in H12031_CS.000.

¹⁰ No data was compiled to H12031_CS.000 west of Point Cangrejo. The thin single passage of tilted multibeam alone is insufficient to replace currently charted near shore data. Note: the excluded data west of Point Cangrejo was reviewed and no uncharted hazards to navigation were detected.

¹¹ The base surface H12031_Final_Combined.csar with 8 meter resolution was used in the compilation of H12031_CS.000.

¹² Tide note is appended to this report.

¹³ Concur with clarification, the file H12031_Final_Feature_File.hob was used in the compilation of H12031_CS.000, however due to cartographic decisions made per chart scale (1:40,000), some generalizations from the field delivered feature file were necessary. Chart per H12031_CS.000.

¹⁴ Concur with recommendations 1-5, chart as shown in H12031_CS.000.

¹⁵ Concur with clarification, this area of sparse coverage and thick kelp has been compiled as a foul area in H12031_CS.000.

¹⁶ Concur, rock from LIDAR survey D00146 centered in the multibeam holiday was included in the compilation of H12031_CS.000.

¹⁷ Concur with clarification, . Retain the charted 3 fathoms for passage inshore of the island and update features as depicted in H12031_CS.000.

¹⁸ Do not concur. Chart 1 fathom 3 ft rock in immediate vicinity at 55-19-41N, 133-24-39W as per H12031_CS.000.

¹⁹ Chart 4 fathom sounding from LIDAR survey D00146 at 55-19-08N, 133-28-09W per H12031_CS.000.

²⁰ Concur.

²¹ The 3 fathom 4 foot rock from LIDAR survey D00146 has been included in H12031_CS.000 as well as a foul area encompassing the holiday from H12031.

²² Concur.

²³ DTONs are noted within H12031_CS.000 as either soundings or rocks.

²⁴ DTON report is appended to this report.

²⁵ Concur with clarification, the shoreline as depicted in the Notebook HOB files and composite source file were used in the compilation of this survey. Chart per H12031_CS.000.

²⁶ Chart per latest ATONIS publication.

²⁷ Concur.

²⁸ Concur.

²⁹ Concur.

³⁰ Do not concur. During compilation much of the surveyed area was deemed to be a rocky seabed area, which is in conflict with the surveyed bottom samples. Chart bottom types per H12031_CS.000.

H12031_DTON Report

Registry Number: H12031
State: Alaska
Locality: West of Prince of Wales Island
Sub-locality: Pt Quemada to Adrian Cove
Project Number: OPR-0190-RA-09
Survey Dates: 06/05/2009 - 06/06/2009

Charts Affected

Number	Edition	Date	Scale (RNC)	RNC Correction(s)*
17405	16th	10/01/2008	1:40,000 (17405_1)	[L]NTM: ?
17407	15th	11/01/2003	1:40,000 (17407_1)	USCG LNM: 08/07/2007 (12/09/2008) CHS NTM: None (11/28/2008) NGA NTM: None (12/13/2008)
17406	7th	02/01/2004	1:40,000 (17406_1)	USCG LNM: 05/24/2005 (12/02/2008) CHS NTM: None (11/28/2008) NGA NTM: None (12/13/2008)
17400	17th	03/01/2007	1:229,376 (17400_1)	[L]NTM: ?
16016	21st	10/01/2007	1:969,756 (16016_1)	[L]NTM: ?
531	24th	07/01/2007	1:2,100,000 (531_1)	[L]NTM: ?
500	8th	06/01/2003	1:3,500,000 (500_1)	[L]NTM: ?
501	12th	11/01/2002	1:3,500,000 (501_1)	[L]NTM: ?
530	32nd	06/01/2007	1:4,860,700 (530_1)	[L]NTM: ?
50	6th	06/01/2003	1:10,000,000 (50_1)	[L]NTM: ?

* Correction(s) - source: last correction applied (last correction reviewed--"cleared date")

Features

No.	Feature Type	Survey Depth	Survey Latitude	Survey Longitude
1.1	Shoal	2.95 m	55° 18' 41.4" N	133° 27' 34.9" W
1.2	Rock	0.47 m	55° 19' 49.0" N	133° 25' 51.0" W
1.3	Rock	-0.41 m	55° 20' 58.4" N	133° 23' 48.7" W
1.4	Shoal	11.68 m	55° 19' 09.4" N	133° 28' 27.6" W

1 - Danger To Navigation

1.1) Profile/Beam - 3726/219 from h12031 / 1101_reson8125 / 2009-156 / 000_1736

DANGER TO NAVIGATION

Survey Summary

Survey Position: 55° 18' 41.4" N, 133° 27' 34.9" W
Least Depth: 2.95 m (= 9.68 ft = 1.614 fm = 1 fm 3.68 ft)
TPU (±1.96σ): **THU (TPEh)** ±1.966 m ; **TVU (TPEv)** ±0.312 m
Timestamp: 2009-156.17:43:16.923 (06/05/2009)
Survey Line: h12031 / 1101_reson8125 / 2009-156 / 000_1736
Profile/Beam: 3726/219
Charts Affected: 17406_1, 17400_1, 16016_1, 531_1, 500_1, 501_1, 530_1, 50_1

Remarks:

Shoal Sounding

Feature Correlation

Address	Feature	Range	Azimuth	Status
h12031/1101_reson8125/2009-156/000_1736	3726/219	0.00	000.0	Primary

Hydrographer Recommendations

[None]

Cartographically-Rounded Depth (Affected Charts):

1 ½fm (17406_1, 17400_1, 16016_1, 530_1)
 1fm 3ft (531_1)
 3.0m (500_1, 501_1, 50_1)

S-57 Data

Geo object 1: Sounding (SOUNDG)
Attributes: SORDAT - 20090605
 SORIND - US, US, NSURF, H12031

Feature Images

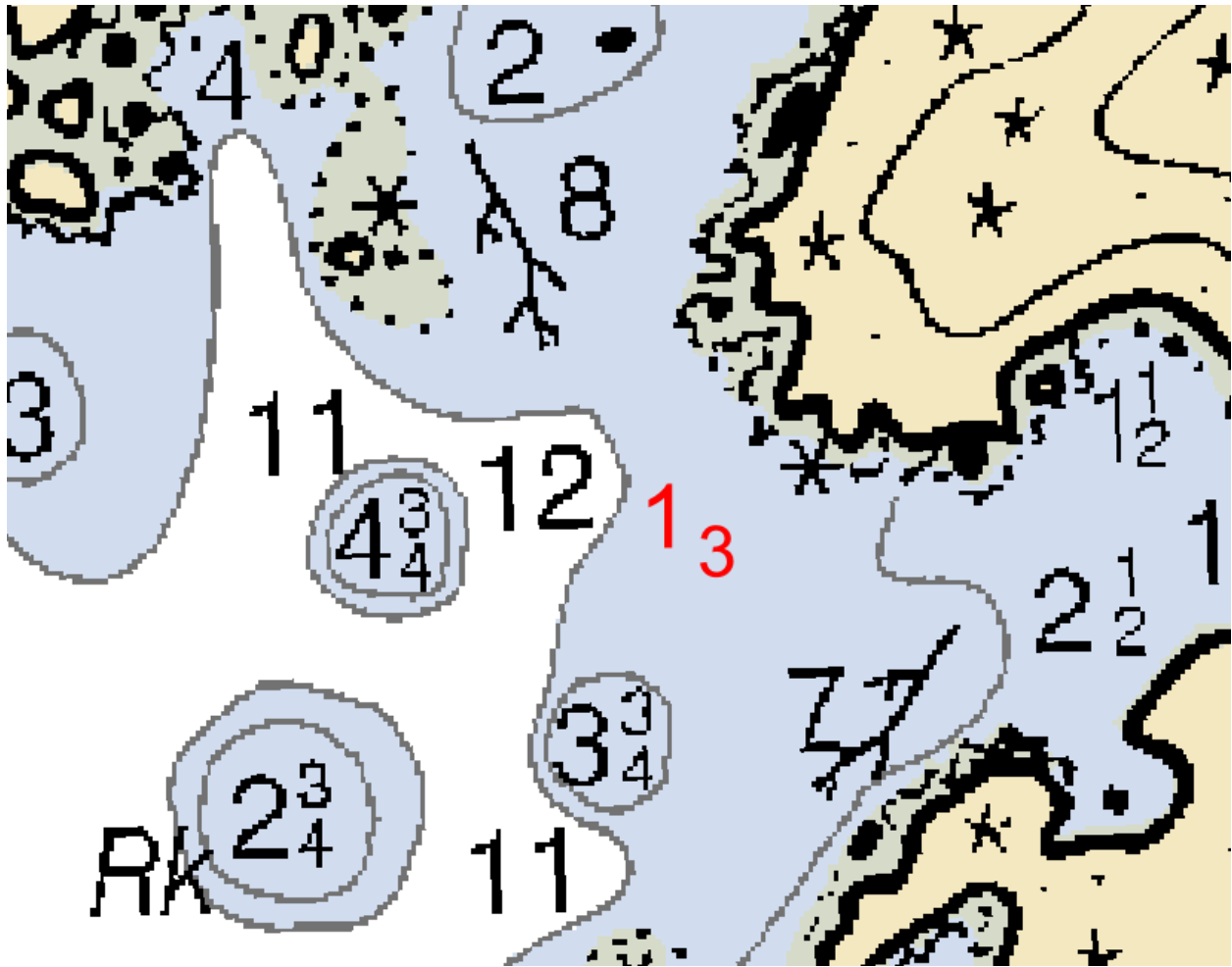


Figure 1.1.1

1.2) Profile/Beam - 434/228 from h12031 / 1101_reson8125 / 2009-156 / 000_2003

DANGER TO NAVIGATION

Survey Summary

Survey Position: 55° 19' 49.0" N, 133° 25' 51.0" W
Least Depth: 0.47 m (= 1.53 ft = 0.255 fm = 0 fm 1.53 ft)
TPU ($\pm 1.96\sigma$): **THU (TPEh)** ± 1.967 m ; **TVU (TPEv)** ± 0.408 m
Timestamp: 2009-156.20:04:20.162 (06/05/2009)
Survey Line: h12031 / 1101_reson8125 / 2009-156 / 000_2003
Profile/Beam: 434/228
Charts Affected: 17406_1, 17400_1, 16016_1, 531_1, 500_1, 501_1, 530_1, 50_1

Remarks:

Rock Awash

Feature Correlation

Address	Feature	Range	Azimuth	Status
h12031/1101_reson8125/2009-156/000_2003	434/228	0.00	000.0	Primary

Hydrographer Recommendations

[None]

Cartographically-Rounded Depth (Affected Charts):

0 ¼fm (17406_1, 17400_1, 16016_1, 530_1)

0fm 1ft (531_1)

.5m (500_1, 501_1, 50_1)

S-57 Data

Geo object 1: Underwater rock / awash rock (UWTROC)
Attributes: SORDAT - 20090605
 SORIND - US, US, NSURF, H12031
 VALSOU - 0.466 m

WATLEV - 5:awash

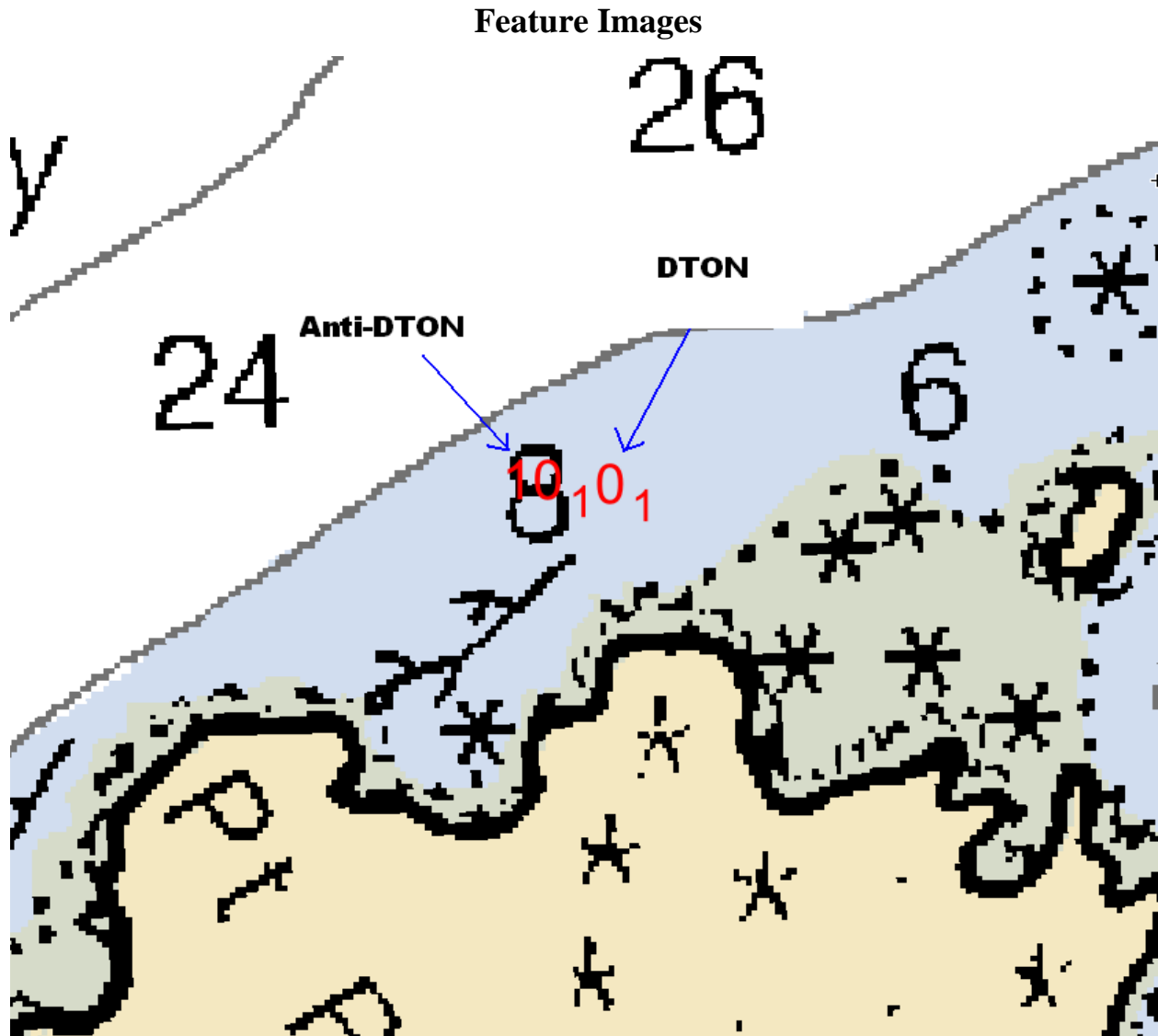


Figure 1.2.1

1.3) Profile/Beam - 129/240 from h12031 / 1101_reson8125 / 2009-157 / 000_2252

DANGER TO NAVIGATION

Survey Summary

Survey Position: 55° 20' 58.4" N, 133° 23' 48.7" W
Least Depth: -0.41 m (= -1.34 ft = -0.224 fm = 0 fm 4.66 ft)
TPU (±1.96σ): **THU (TPEh)** ±1.978 m ; **TVU (TPEv)** ±13.712 m
Timestamp: 2009-157.22:53:32.644 (06/06/2009)
Survey Line: h12031 / 1101_reson8125 / 2009-157 / 000_2252
Profile/Beam: 129/240
Charts Affected: 17405_1, 17406_1, 17407_1, 17400_1, 16016_1, 531_1, 500_1, 501_1, 530_1, 50_1

Remarks:

Rock Awash

Feature Correlation

Address	Feature	Range	Azimuth	Status
h12031/1101_reson8125/2009-157/000_2252	129/240	0.00	000.0	Primary

Hydrographer Recommendations

[None]

Cartographically-Rounded Depth (Affected Charts):

0 ¼fm (17405_1, 17406_1, 17407_1, 17400_1, 16016_1, 530_1)
 0fm 1ft (531_1)
 -.4m (500_1, 501_1, 50_1)

S-57 Data

Geo object 1: Underwater rock / awash rock (UWTROC)
Attributes: SORDAT - 20090606
 SORIND - US, US, NSURF, H12031
 VALSOU - -0.409 m

WATLEV - 5:awash

Feature Images

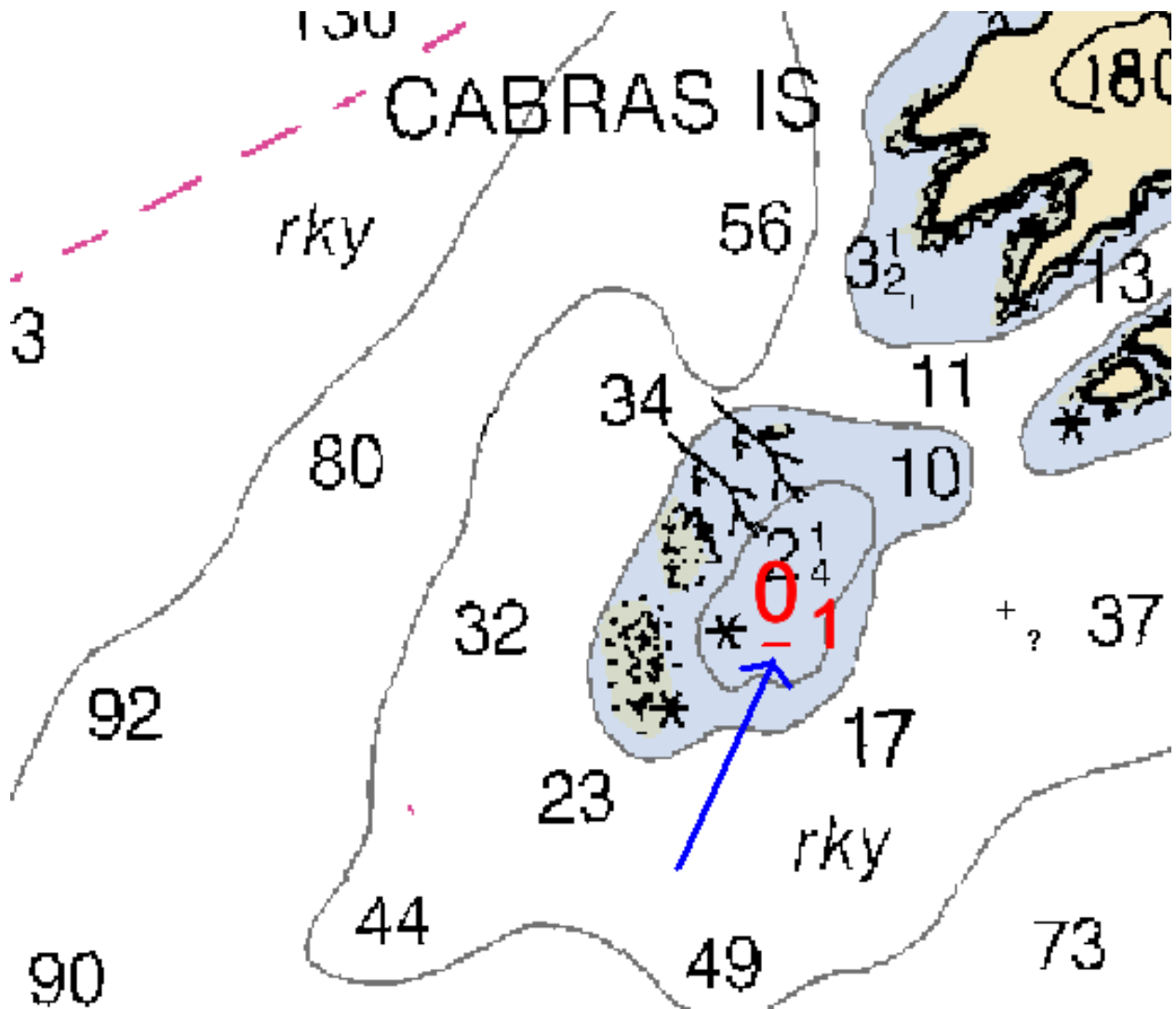


Figure 1.3.1

1.4) Profile/Beam - 754/89 from h12031 / 2803_reson7125_hf_512 / 2009-156 / 000_2058

DANGER TO NAVIGATION

Survey Summary

Survey Position: 55° 19' 09.4" N, 133° 28' 27.6" W
Least Depth: 11.68 m (= 38.32 ft = 6.387 fm = 6 fm 2.32 ft)
TPU (±1.96σ): **THU (TPEh)** ±1.967 m ; **TVU (TPEv)** ±0.275 m
Timestamp: 2009-156.21:00:41.911 (06/05/2009)
Survey Line: h12031 / 2803_reson7125_hf_512 / 2009-156 / 000_2058
Profile/Beam: 754/89
Charts Affected: 17406_1, 17400_1, 16016_1, 531_1, 500_1, 501_1, 530_1, 50_1

Remarks:

Shoal Sounding

Feature Correlation

Address	Feature	Range	Azimuth	Status
h12031/2803_reson7125_hf_512/2009-156/000_2058	754/89	0.00	000.0	Primary

Hydrographer Recommendations

[None]

Cartographically-Rounded Depth (Affected Charts):

6 ¼fm (17406_1, 17400_1, 16016_1, 530_1)
 6fm 2ft (531_1)
 11.7m (500_1, 501_1, 50_1)

S-57 Data

Geo object 1: Sounding (SOUNDG)
Attributes: SORDAT - 20090605
 SORIND - US, US, NSURF, H12031



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

TIDE NOTE FOR HYDROGRAPHIC SURVEY

DATE : August 26, 2009

HYDROGRAPHIC BRANCH: Pacific
HYDROGRAPHIC PROJECT: OPR-O190-RA-2009
HYDROGRAPHIC SHEET: H12031

LOCALITY: W of Prince of Wales Island Pt Quemada to Adrian Cove
TIME PERIOD: May 28 - June 8, 2009

TIDE STATION USED: 945-0463 Trocadero Bay
Lat. 55° 21.1'N Long. 132° 56.3' W

PLANE OF REFERENCE (MEAN LOWER LOW WATER): 0.000 meters
HEIGHT OF HIGH WATER ABOVE PLANE OF REFERENCE: 2.825 meters

REMARKS: RECOMMENDED ZONING
Use zone(s) identified as: SA250, SA250C

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).

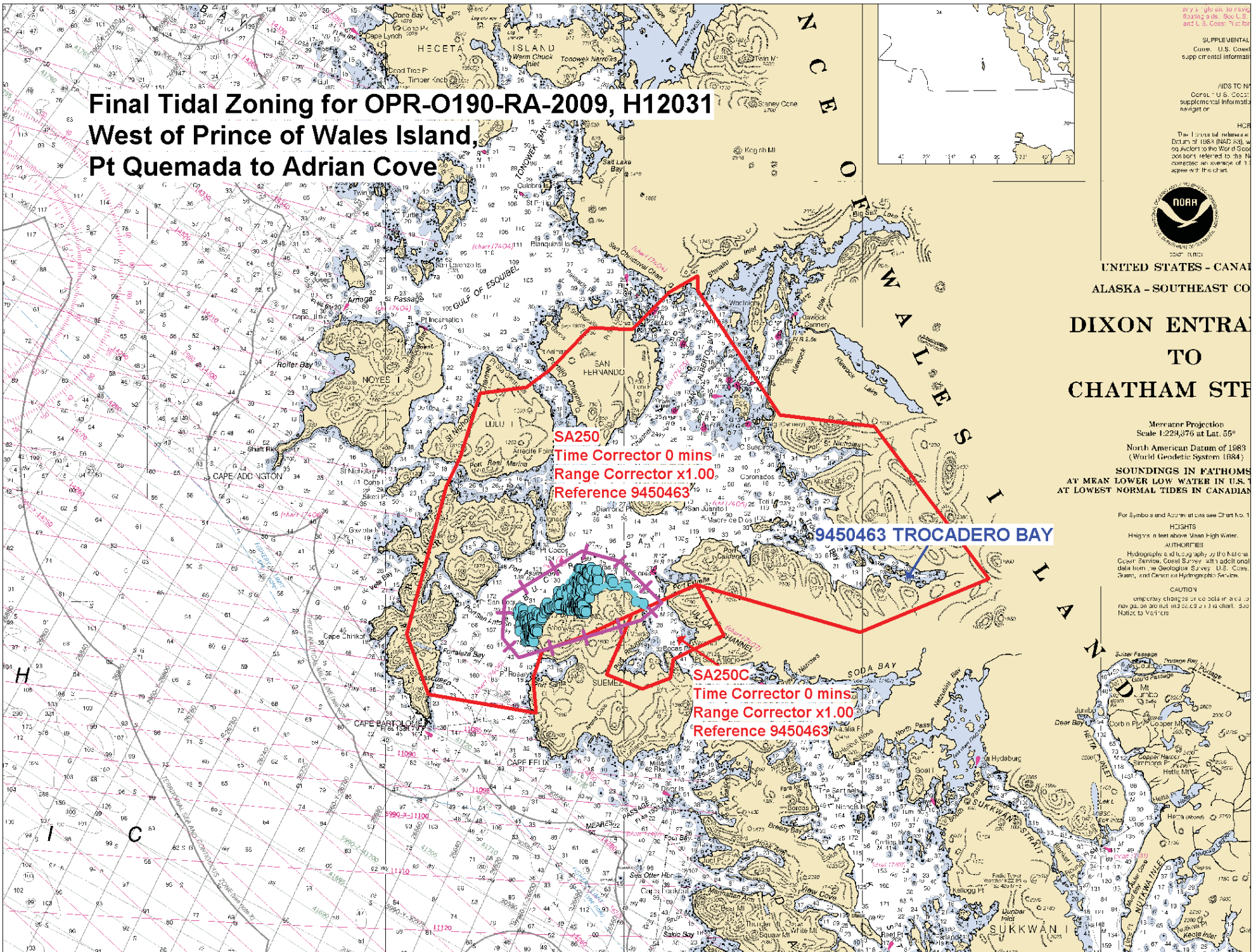
Peter J. Stone

Digitally signed by Peter J. Stone
DN: cn=Peter J. Stone, o=CO-OPS, ou=NOAA/
NOS, email=peter.stone@noaa.gov, c=US
Date: 2009.08.27 16:03:16 -04'00'

CHIEF, OCEANOGRAPHIC DIVISION



Final Tidal Zoning for OPR-O190-RA-2009, H12031 West of Prince of Wales Island, Pt Quemada to Adrian Cove



SA250
Time Corrector 0 mins
Range Corrector x1.00
Reference 9450463

9450463 TROCADERO BAY

SA250C
Time Corrector 0 mins
Range Corrector x1.00
Reference 9450463

only's scale to revise
tinting scale. See U.S.
and U.S. Coast Guard
supplemental information.

SUPPLEMENTAL
Charts: U.S. Coast
supplemental information.

AIDS TO NAV
Charts: U.S. Coast
supplemental information
navigator.

HCR
The format reference
Datum of 1984 (NAD 83), w
on project to the World Geod
coordinates referred to the N
corrected an average of 3
agree with this chart.



UNITED STATES - CANADIAN
ALASKA - SOUTHEAST COAST
**DIXON ENTRANCE TO
CHATHAM STRAIT**

Mercator Projection
Scale 1:224,376 at Lat. 55°
North American Datum of 1983
(World Geodetic System 1984)

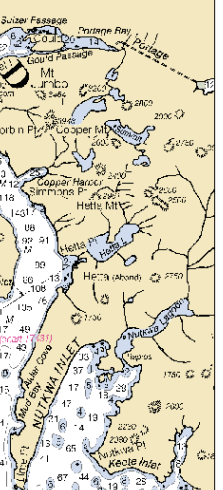
**SOUNDINGS IN FATHOMS
AT MEAN LOWER LOW WATER IN U.S.
AT LOWEST NORMAL TIDES IN CANADIAN**

For Symbols and Abbreviations see Chart No. 1

HIGHTS
Height in feet above Mean High Water.

AUTHORITIES
Hydrographic and topographic data from the Coast Survey, with additional data from the Geological Survey, U.S. Coast Guard, and Canadian Hydrographic Service.

CAUTION
Temporary changes or corrections in a chart are indicated by a red letter in a red circle. See Notice to Mariners.



H12031 HCell Report
Peter Holmberg, Physical Scientist
Pacific Hydrographic Branch

1. Specifications, Standards and Guidance Used in HCell Compilation

HCell compilation of survey H12031 used:

Office of Coast Survey HCell Specifications: Version: 4.0, 2 June, 2010.
HCell Reference Guide: Version 2.0, 2 June, 2010.

2. Compilation Scale

Depths and features for HCell H12031 were compiled to the largest scale raster chart shown below:

Chart	Scale	Edition	Edition Date	NTM Date
17406	1:40,000	7th	02/01/2004	01/29/2011

The following ENC was also used during compilation:

Chart	Scale
US5AK4CM	1:40,000

3. Soundings

A survey-scale sounding (SOUNDG) feature object layer was built from the 8-meter Combined Surface in CARIS BASE Editor. A shoal-biased selection was made at 1:10,000 survey scale using a Radius Table file with values shown in the table, below.

Shoal Limit (m)	Deep Limit (m)	Radius (mm)
-3	10	3
10	20	4
20	50	4.5
50	200	5

In CARIS BASE Editor soundings were manually selected from the high density sounding layers (SS) and imported into a new layer (CS) created to accommodate chart density depths. Manual selection was used to accomplish a density and distribution that closely represents the seafloor morphology.

4. Depth Contours

Depth contours at the intervals on the largest scale chart are included in the *_SS HCell for MCD raster charting division to use for guidance in creating chart contours. The metric and fathom equivalent contour values are shown in the table below.

Chart Contour Intervals in Fathoms from Chart 17406	Metric Equivalent to Chart Fathoms, Arithmetically Rounded	Metric Equivalent of Chart Fathoms, with NOAA Rounding Applied	Fathoms with NOAA Rounding Applied	Fathoms with NOAA Rounding Removed for Display on H12031_SS.000
0	0	0.2286	0.125	0
3	5.4864	5.715	3.125	3
5	9.144	9.3726	5.125	5
10	18.288	18.517	10.125	10
50	91.44	92.812	50.750	50
100	182.88	184.252	100.750	100

With the exception of the zero contours included in the *_CS file, contours have not been deconflicted against shoreline features, soundings and hydrography, as all other features in the *_CS file and soundings in the *_SS have been. This may result in conflicts between the *_SS file contours and HCell features at or near the survey limits. Conflicts with M_QUAL, COALNE and SBDARE objects, and with DEPCNT objects representing MLLW, should be expected. HCell features should be honored over *_SS.000 file contours in all cases where conflicts are found.

5. Meta Areas

The following Meta object area is included in HCell H12031:

M_QUAL

The Meta area object was constructed on the basis of the limits of the surveyed area.

6. Features

Features addressed by the field units are delivered to PHB where they are deconflicted against the hydrography and the largest scale chart. These features, as well as features to be retained from the chart and features digitized from the Base Surface, are included in the HCell. The geometry of these features may be modified to emulate chart scale per the HCell Reference Guide on compiling features to the chart scale HCell.

Some features from Lidar survey D00146 were included in compilation to supplement where multibeam coverage from H12031 was sparse or missing. No Lidar data were used to supplant charted data. Features from D00146 can be identified by their SORIND and SORDAT attributes.

7. Spatial Framework

7.1 Coordinate System

All spatial map and base cell file deliverables are in an LLDG geographic coordinate system, with WGS84 horizontal, MHW vertical, and MLLW (1983-2001 NTDE) sounding datums.

7.2 Horizontal and Vertical Units

DUNI, HUNI and PUNI are used to define units for depth, height and horizontal position in the chart units HCell, as shown below.

Chart Unit Base Cell Units:

Depth Units (DUNI):	Fathoms and feet
Height Units (HUNI):	Feet
Positional Units (PUNI):	Meters

During creation of the HCell in CARIS BASE Editor and CARIS S-57 Composer, all soundings and features are maintained in metric units with as high precision as possible. Depth units for soundings measured with sonar maintain millimeter precision. Depths on rocks above MLLW and heights on islets above MHW are typically measured with range finder, so precision is less. Units and precision are shown below.

BASE Editor and S-57 Composer Units:

Sounding Units:	Meters rounded to the nearest millimeter
Spot Height Units:	Meters rounded to the nearest decimeter

See the HCell Reference Guide for details of conversion from metric to charting units, and application of NOAA rounding.

8. Data Processing Notes

There were no significant deviations from the standards and protocols given in the HCell Specification and HCell Reference Guide.

9. QA/QC and ENC Validation Checks

H12031 was subjected to QA checks in S-57 Composer prior to exporting to the metric HCell base cell (000) file. The millimeter precision metric S-57 HCell was converted to chart units and NOAA rounding applied. dKart Inspector was then used to further check the data set for conformity with the S-58 ver. 2 standard (formerly Appendix B.1 Annex C of the S-57 standard). All tests were run and warnings and errors investigated and corrected unless they are MCD approved as inherent to and acceptable for HCells.

10. Products

10.1 HSD, MCD and CGTP Deliverables

H12031_CS.000	Base Cell File, Chart Units, Soundings and features compiled to 1:40,000
H12031_SS.000	Base Cell File, Chart Units, Soundings and Contours compiled to 1:10,000
H12031_DR.pdf	Descriptive Report including end notes compiled during office processing and certification, the HCell Report, and supplemental items
H12031_outline.gml	Survey outline
H12031_outline.xsd	Survey outline

10.2 Software

CARIS HIPS Ver. 7.0	Inspection of Combined BASE Surfaces
CARIS BASE Editor Ver. 2.3	Creation of soundings and bathy-derived features, creation of the depth area, meta area objects, and Blue Notes; Survey evaluation and verification; Initial HCell assembly.
CARIS S-57 Composer Ver. 2.1	Final compilation of the HCell, correct geometry and build topology, apply final attributes, export the HCell, and QA.
CARIS GIS 4.4a	Setting the sounding rounding variable for conversion of the metric HCell to NOAA charting units with NOAA rounding.
CARIS HOM Ver. 3.3	Perform conversion of the metric HCell to NOAA charting units with NOAA rounding.
HydroService AS, dKart Inspector Ver. 5.1, SP 1	Validation of the base cell file.
Northport Systems, Inc., Fugawi View ENC Ver.1.0.0.3	Independent inspection of final HCells using a COTS viewer.

11. Contacts

Inquiries regarding this HCell content or construction should be directed to:

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Peter.Holmberg@noaa.gov

APPROVAL SHEET
H12031

Initial Approvals:

The survey evaluation and verification has been conducted according to branch processing procedures and the HCell compiled per the latest OCS HCell Specifications.

The survey and associated records have been inspected with regard to survey coverage, delineation of the depth curves, development of critical depths, S-57 classification and attribution of soundings and features, cartographic characterization, and verification or disproof of charted data within the survey limits. The survey records and digital data comply with OCS requirements except where noted in the Descriptive Report and are adequate to supersede prior surveys and nautical charts in the common area.

I have reviewed the HCell, accompanying data, and reports. This survey and accompanying digital data meet or exceed OCS requirements and standards for products in support of nautical charting except where noted in the Descriptive Report.