

H12224

NOAA FORM 76-35A

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

**DESCRIPTIVE REPORT**

Type of Survey Hydrographic

Field No. ....

Registry No. H12224

**LOCALITY**

State Alaska

General Locality Behm Canal, AK

Sublocality Revillagigedo Channel and Thorn Arm

**2010**

**CHIEF OF PARTY**

**Captain David O. Neander, 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;"><b>HYDROGRAPHIC TITLE SHEET</b></p>	<p>REGISTRY No</p> <p style="text-align: center;"><b>H12224</b></p>
<p><b>INSTRUCTIONS</b> – 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: <b>N/A</b></p>
<p>State <u>Alaska</u></p> <p>General Locality <u>Behm Canal</u></p> <p>Sub-Locality <u>Revillagigedo Channel to Thorn Arm.</u></p> <p>Scale <u>1:20,000</u> Date of Survey <u>04/21/2010 to 05/24/2010</u></p> <p>Instructions dated <u>2/16/2010</u> Project No. <u>OPR-O193-FA-10</u></p> <p>Vessel <u>NOAA Ship Fairweather (S220), Lauches 2805, 2806, 2807 and 2808, Skiff 1905 and Ambar 2302</u></p> <hr/> <p>Chief of party <u>CAPT David O. Neander, NOAA</u></p> <p>Surveyed by <u>FAIRWEATHER Personnel</u></p> <p>Soundings by <u>Reson 8101, 8125 and 8111</u></p> <p>SAR by <u>Tyanne Faulkes</u> Compilation by <u>Fernando Ortiz</u></p> <p>Soundings compiled in <u>Fathoms</u></p>	
<p><b>REMARKS:</b> <u>All times are UTC. UTM Projection 9N</u></p> <p><u>The purpose of this survey is to provide contemporary surveys to update National Ocean Service (NOS) nautical charts. Revisions and end notes in red were generated during office processing.</u></p> <p><u>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 <a href="http://www.ngdc.noaa.gov/">http://www.ngdc.noaa.gov/</a>.</u></p>	

# Descriptive Report to Accompany Hydrographic Survey H12224

Project OPR-O193-FA-10  
Revillagigedo Channel and Thorn Arm, Alaska  
Scale 1:20,000  
April and May 2010  
**NOAA Ship *Fairweather***  
Chief of Party: Captain David O. Neander, NOAA

## A. AREA SURVEYED

The survey area is located in the vicinity of Behm Canal, within the sub-locality of Revillagigedo Channel and Thorne Arm. This survey corresponds to Sheet 7 and 9 in the extended project area sheet layout provided with the Project Instructions Change 1, as shown in Figure 1 below.

Data acquisition was conducted from April 21, 2010 to May 24, 2010 (DN 111 to DN 144).

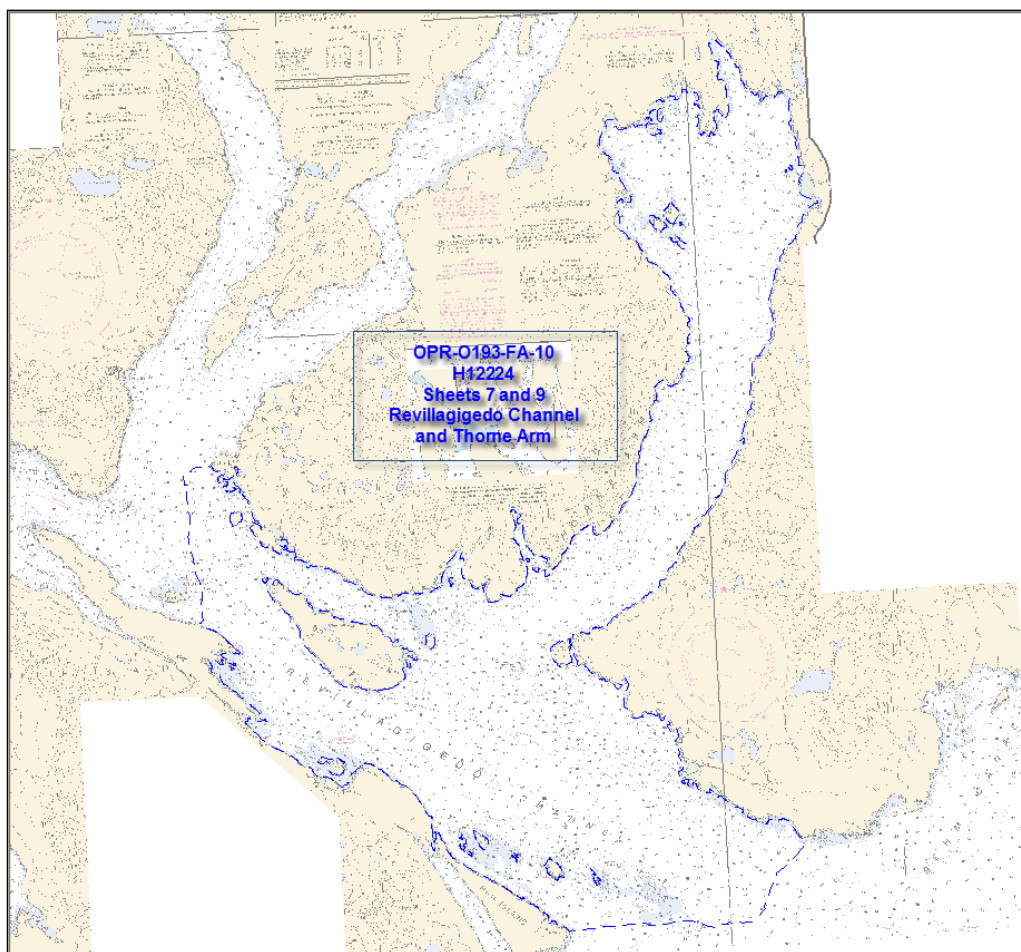


Figure 1: H12224 Survey Outline

Complete multibeam echosounder (MBES) coverage was obtained in the survey area to the Navigable Area Limit Line (NALL). Data were acquired as close to shore as safely possible, to the MHW Buffer, or to the 4-meter curve. Additional coverage was obtained in order to determine least depths over features or navigationally significant shoal areas.<sup>1</sup>

Limited shoreline verification was conducted to determine the inshore limit of hydrography and for feature verification of H12224, as per section 3.5.5.3 of the Field Procedures Manual April 2010 (FPM). Shoreline features were given S-57 attribution and included for submission in Notebook .hob files.

Mainscheme and crossline mileage for MBES and shoreline acquisition were calculated and are displayed in Table 1 below.

<b>MAIN SCHEME - Mileage</b>	
0	Single Beam MS
785.23	Multibeam MS mileage
0.00	FAIRWEATHER S-220
228.55	Launch 2805
167.41	Launch 2806
163.04	Launch 2807
226.22	Launch 2808
0	SideScan MS
785.23	Total MS
<b>CROSSLINE - Mileage</b>	
0	Single Beam XL
42.67	Multibeam XL
0.00	FAIRWEATHER S-220
8.88	Launch 2805
13.34	Launch 2806
20.45	Launch 2807
0.00	Launch 2808
42.67	Total XL
<b>OTHER</b>	
1.844285	Developments/AWOIS - Mileage
2.3	Shoreline/Nearshore Investigation - Mileage
21	Total # of Investigated Items
23	Total Bottom Samples
46.91	Total SNM
April 21 - 30, May 3 - 4, 7 - 8, 18 - 19, 22, and 24	Specific Dates of Acquisition
111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 123, 124, 127, 128, 138, 139, 142, and 144	Specific Dn#s of Acquisition

**Table 1: H12224 Survey Statistics**

## B. DATA ACQUISITION AND PROCESSING

A complete description of data acquisition, processing systems and survey vessels along with quality control procedures and data processing methods are included and described in the *NOAA Ship Fairweather 2010 Data Acquisition and Processing Report (DAPR)*, submitted under separate cover. Items specific to this survey and any deviations from the aforementioned report are discussed in the following sections. This hydrographic survey was completed as specified by Hydrographic Survey Project Instructions OPR-O193-FA-10, dated February 16, 2010, and Change 1, dated April 23, 2010.

### B.1 Equipment and Vessels

Equipment and vessels used for data acquisition and survey operations during this survey are listed below in Table 2.

	Launch 2805	Launch 2806	Launch 2807	Launch 2808	Skiff 1905	Ambar 2302
Hull Registration Number	2805	2806	2807	2808	1905	2302
Builder	All American	All American	All American	All American	SeaArk	Marine Silverships, Inc
Length Overall	28' 10"	28' 10"	28' 10"	28' 10"	19'	23'
Beam	10' 8"	10' 8"	10' 8"	10' 8"	8'	9' 4"
Draft, Maximum	4' 0" DWL	4' 0" DWL	4' 0" DWL	4' 0" DWL	1' 3"	1' 4"
Cruising Speed	28 knots	28 knots	28 knots	28 knots	20 knots	22 knots
Max Survey Speed	8 knots	8 knots	8 knots	8 knots		
Primary Echo-sounder(s)	RESON 7125	RESON 7125	RESON 7125	RESON 7125		
Sound Velocity Equipment	SBE 19plus	SBE19plus	SBE19plus	SBE19plus		
Attitude & Positioning Equipment	POS/MV V4	POS/MV V4	POS/MV V4	POS/MV V4		
Type of operation	MBES	MBES	MBES	MBES	Shoreline, Shore Station	Shoreline, Shore Station

Table 2: Vessel Inventory

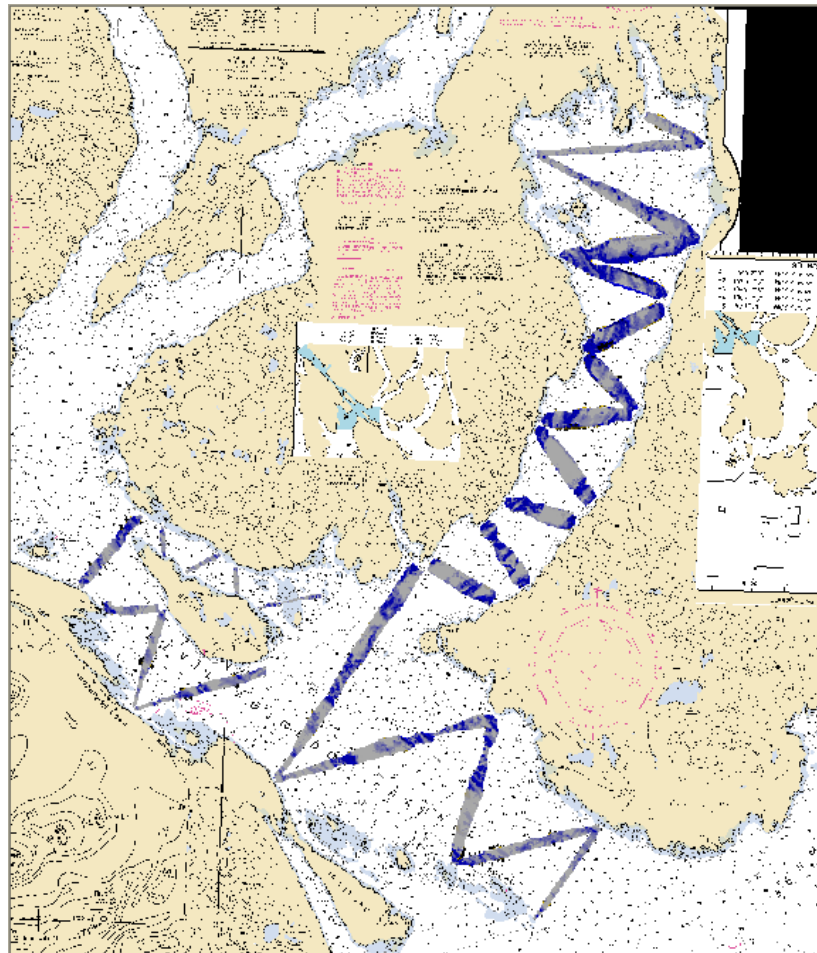
No vessel configurations used during data acquisition deviated from the DAPR.

## B.2 Quality Control

### B.2.1 Crosslines

Multibeam crosslines for this survey totaled 42.67 linear nautical miles (LNM), comprising 5.4% of the 785.23 LNM of mainscheme MBES hydrography. Both main scheme and crossline mileage are summarized in Table 1 above.

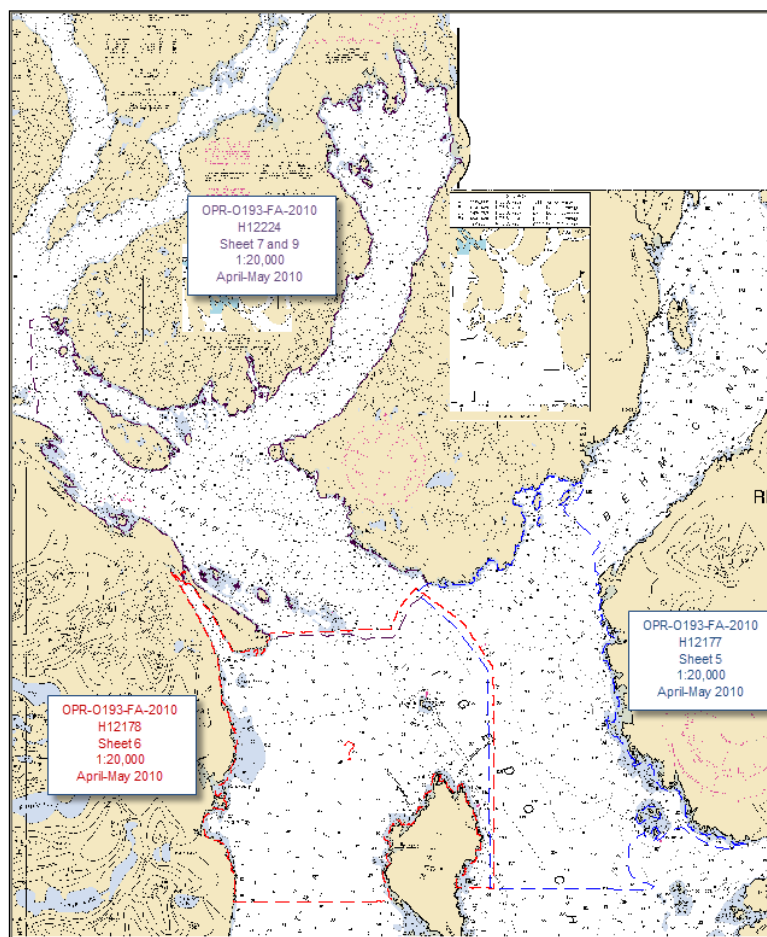
Surface differencing in CARIS BathyDataBASE was used to assess crossline agreement with main scheme lines. The crosslines had the greatest disagreement with mainscheme lines in areas where there were features and in areas where the seafloor is “steep and deep”.<sup>2</sup> Figure 2 depicts a difference surface between a 16-meter surface made with main scheme lines only and a 16-meter surface made with crosslines only. This difference surface is submitted digitally in the Separates I folder. Crosslines agree with main scheme lines within the total allowable vertical and horizontal uncertainty in their common areas.



**Figure 2: Crossline and main scheme differences (Gray indicates agreement, Blue indicate a Xls shallower than mainscheme and Yellow colors indicate Xls are deeper). The extreme range scale (black color) is due to the XL surface hypothesizing to noisy data and Reson 7125 “blowouts”.**

## B.2.2 Junctions

Survey H12224 junctions with H12177 and H12178, which are Sheets 5 and 6 of the same project, respectively.<sup>3</sup> The junctioning surveys are 1:20,000 survey scale. Survey H12177 refers to the survey location of Boca de Quadra to Alava Bay and the date of survey is May 24, 2010. Survey H12178 refers to the survey location of Felice Strait and the date of survey is May 19, 2010. The area of overlap between the sheets was reviewed in CARIS Subset Editor for consistency and data were found to be in agreement within one meter within the total allowable vertical and horizontal uncertainty in their common areas.<sup>4</sup> Additionally, surface differencing was utilized in CARIS BathyDataBASE to assess agreement between the forementioned surveys. The sheet limits and area of overlap for Sheets 5, 6, 7 and 9 are shown in Figure 3. Figure 4 depicts a difference surface between the 16-meter combined surfaces of adjacent surveys.



**Figure 3: Junction Between H12224, H12177 and H12178**



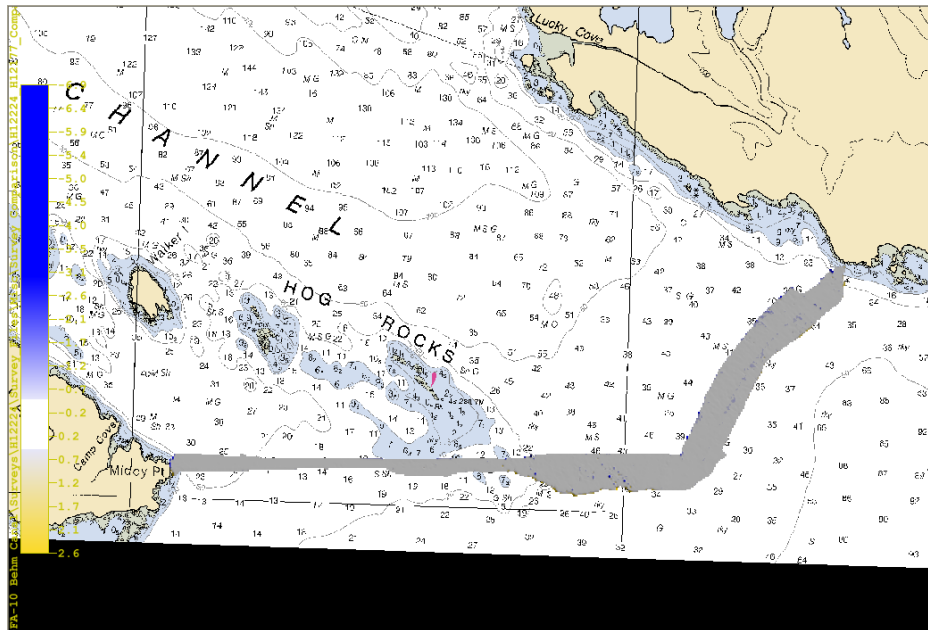


Figure 4: Survey Junction differences (Gray indicates agreement, Blue indicates H12224s shoaler than Junctions and Yellow colors indicate Junctions are deeper).

### B.2.3 Quality Control Checks

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

### B.2.4 Data Quality Factors

#### HOLIDAY ASSESSMENT

Complete multibeam coverage was obtained within the limits of H12224 with the exception of several small holidays. For holidays larger than three surface grid nodes, the corresponding multibeam side scan was examined and no navigationally significant items were found. The least depths of all navigationally significant features are represented by H12224.<sup>5</sup>

Several of the small holidays were found along the near shore areas of Bold Island and Thorne Arm where the bottom is “Steep and Deep”. These holidays appear in areas where the seafloor is virtually vertical rising from depths of 200 meters to 25 meters over a horizontal distance of as little as 100 meters. Due to the steep nature of the seafloor it is deemed by the Hydrographer that least depths are represented in these areas.<sup>6</sup>

There are a few along track holidays due to “blowouts” during data acquisition with the Reson 7125. These along track holidays are present near positions 55° 13' 29.2”N, 131° 27' 26.6”W and 55° 13' 38.5”N, 131° 27' 50.5”W from Launch 2808 on DN 113 lines 2010M\_1131739 and 2010M\_1131756, respectively, and near position 55° 15' 59.1”N, 131° 27' 35.9”W from Launch 2806 DN 142 line 2010M\_1421847. The backscatter side scan data from these lines were examined and the least depths are represented.<sup>7</sup>

Several holidays appear on features within H12224. The holiday located in western Nadzaheen Cove at



position  $55^{\circ} 14' 06.1''\text{N}$ ,  $131^{\circ} 28' 16.5''\text{W}$  is on a feature, but the holiday is located on the side of a rock and the least depth is represented.<sup>8</sup> The holiday is due to acoustic shadow as seen below in Figure 5. The Hydrographer recommends that the 1 fathom sounding on chart 17428 be retained.<sup>9</sup>

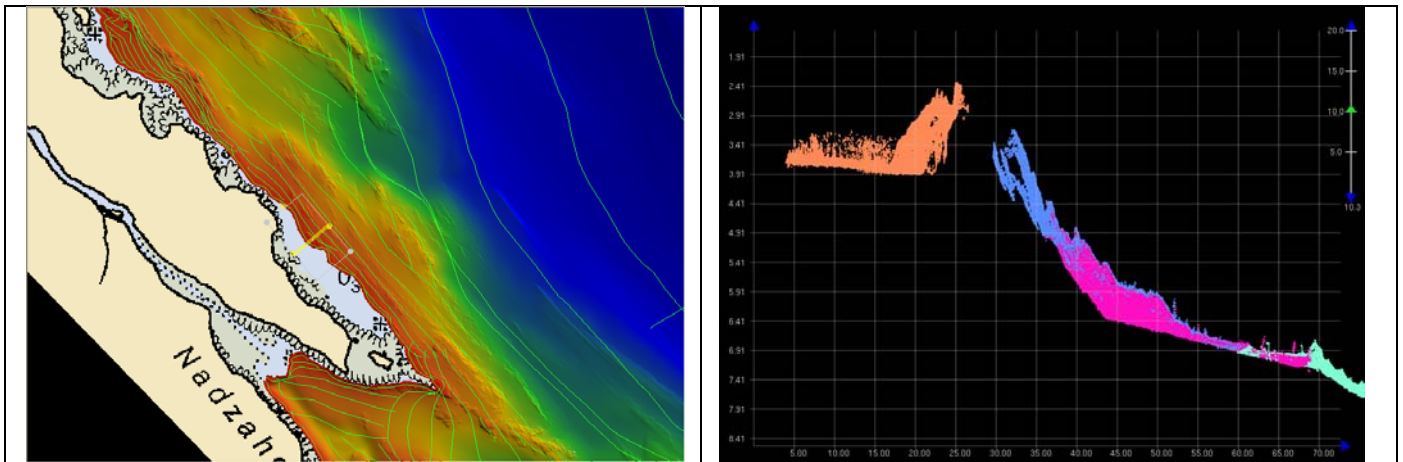


Figure 5: Holiday in western Nadzaheen Cove.

The holiday located in northwest Nadzaheen Cove south of Reef Point at position  $55^{\circ} 14' 38.7''\text{N}$ ,  $131^{\circ} 28' 35.6''\text{W}$  is on a feature. The Hydrographer recommends retaining the 0<sub>5</sub> fathom sounding from chart 17428.<sup>10</sup> An overview of the area is depicted in Figure 6.

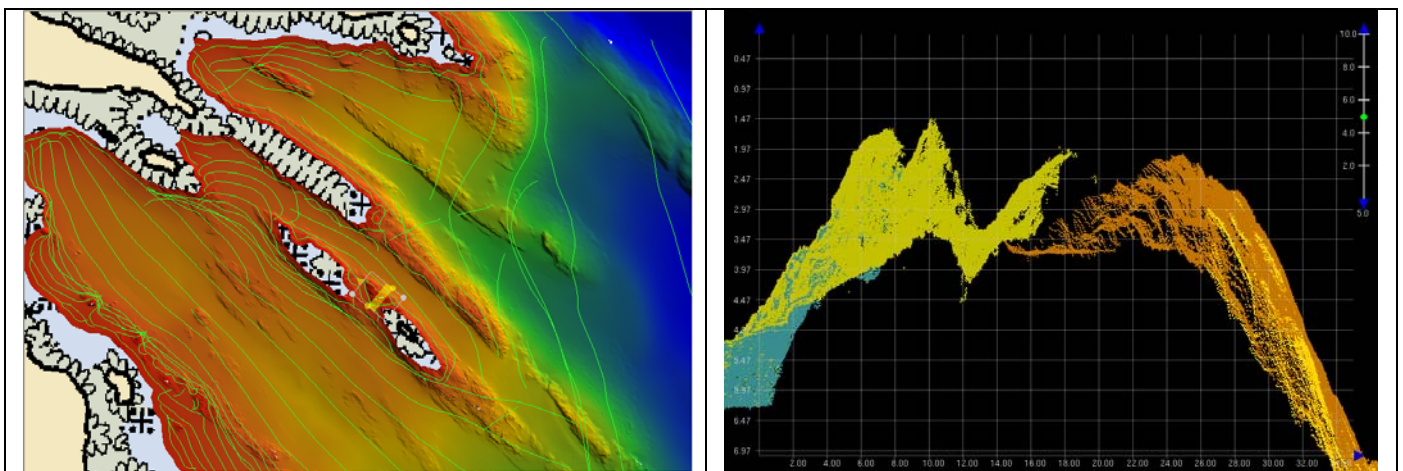


Figure 6: Holiday in northwest Nadzaheen Cove south of Reef Point

The holiday located in northwest Nadzaheen Cove at position  $55^{\circ} 14' 32.5''\text{N}$ ,  $131^{\circ} 29' 00.8''\text{W}$  is on a feature, but the holiday is located on the side of a rock and the least depth is represented.<sup>11</sup> The holiday is due to acoustic shadow as seen below in Figure 7.

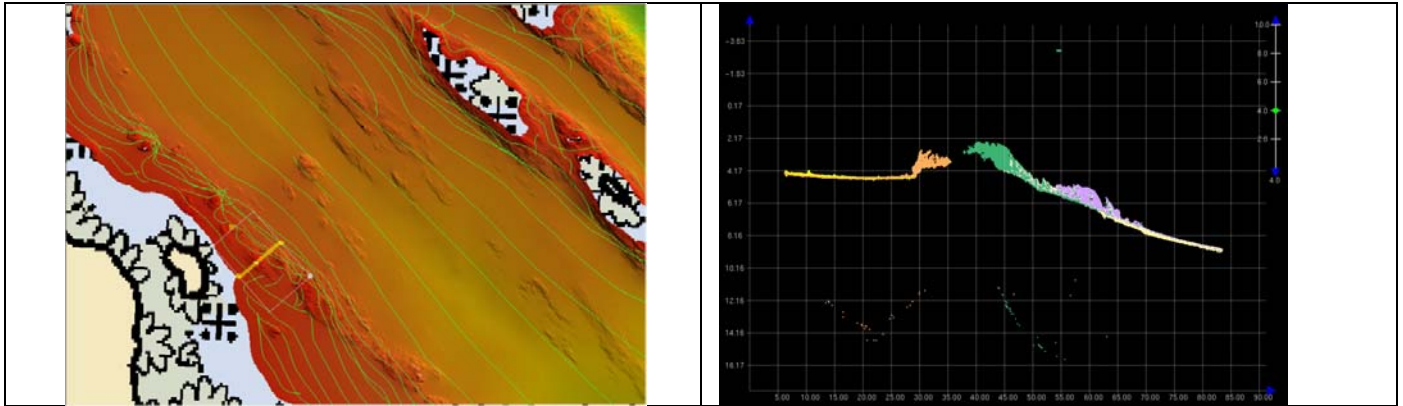


Figure 7: Holiday in northwest Nazdaheen Cove.

The holiday located in southeast Thorne Arm north of Cone Point near position  $55^{\circ} 15' 00.9''\text{N}$ ,  $131^{\circ} 18' 40.6''\text{W}$  has the least depth represented.<sup>12</sup> The holiday is depicted below in Figure 8.

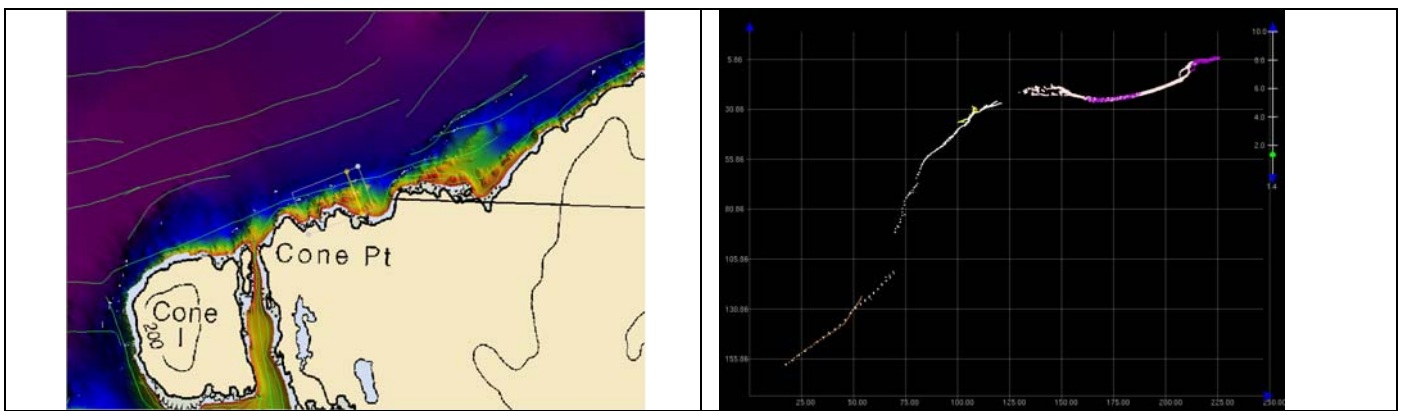


Figure 8: Holiday in southeast Thorne Arm north of Cone Point.

The holiday located in northeast Thorne Arm at position  $55^{\circ} 22' 14.8''\text{N}$ ,  $131^{\circ} 12' 00.4''\text{W}$  has the least depth represented.<sup>13</sup> The holiday is depicted below in Figure 9.

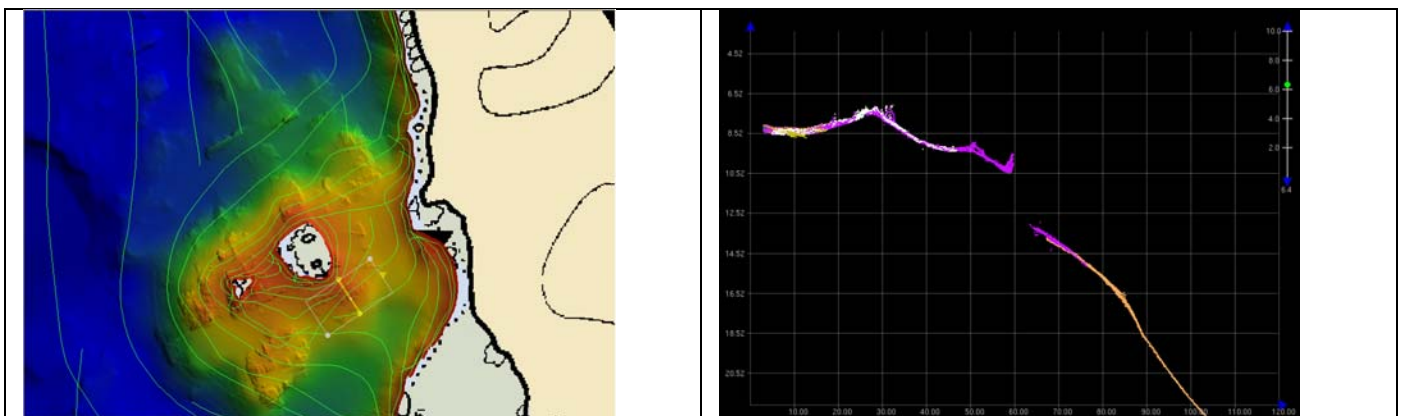


Figure 9: Holiday in northeast Thorne Arm.

The holidays located on a submerged ridge that runs from northwest to southeast near position  $55^{\circ} 12' 10.3''\text{N}$ ,  $131^{\circ} 15' 20.8''\text{W}$ , in southeast Revillagigedo Channel southeast of Lucky Cove, have the least depths represented.<sup>14</sup> The highlighted holiday below in Figure 10 may not have the shoal depth represented, though surveyed soundings were found to be shoaler than the 2<sub>2</sub> fathom sounding that appears on Chart 17428.<sup>15</sup> The Hydrographer recommends that the area be represented with a 2 fathom sounding as found with the MBES.<sup>16</sup> The holidays present to the southeast of the highlighted, have the least depths represented and are due to acoustic shadowing.

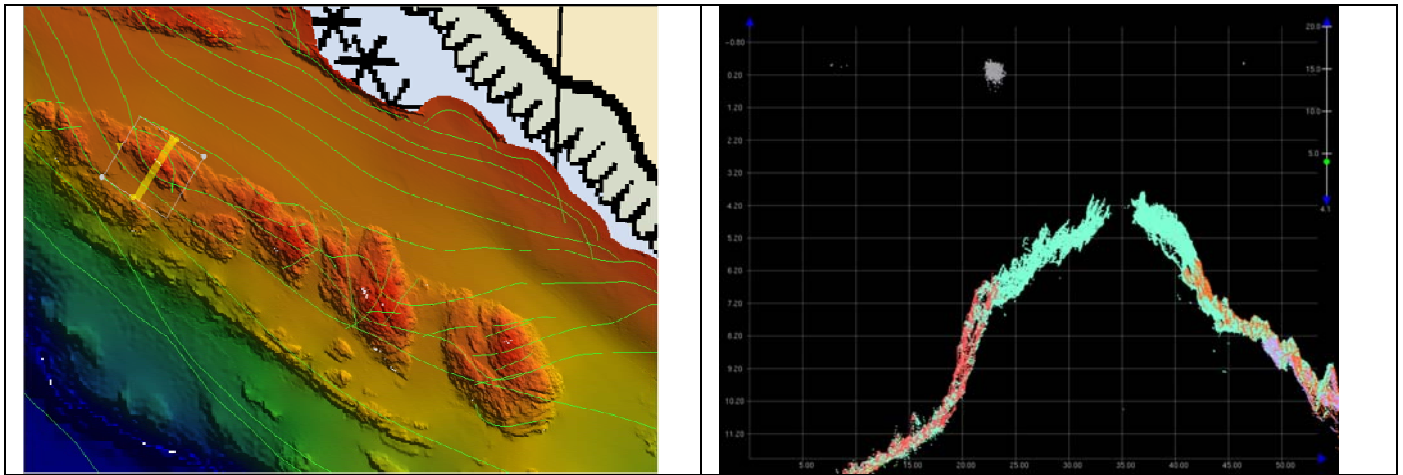


Figure 10: Holidays located on a ridge in southeast Revillagigedo Channel southeast of Lucky Cove.

The holiday located in the southeast corner of Revillagigedo Channel at position  $55^{\circ} 11' 35.5''\text{N}$ ,  $131^{\circ} 13' 02.7''\text{W}$  is on a feature, but the holiday is located on the side of a rock and the least depth is represented.<sup>17</sup> The holiday is due to acoustic shadow as seen below in Figure 11.

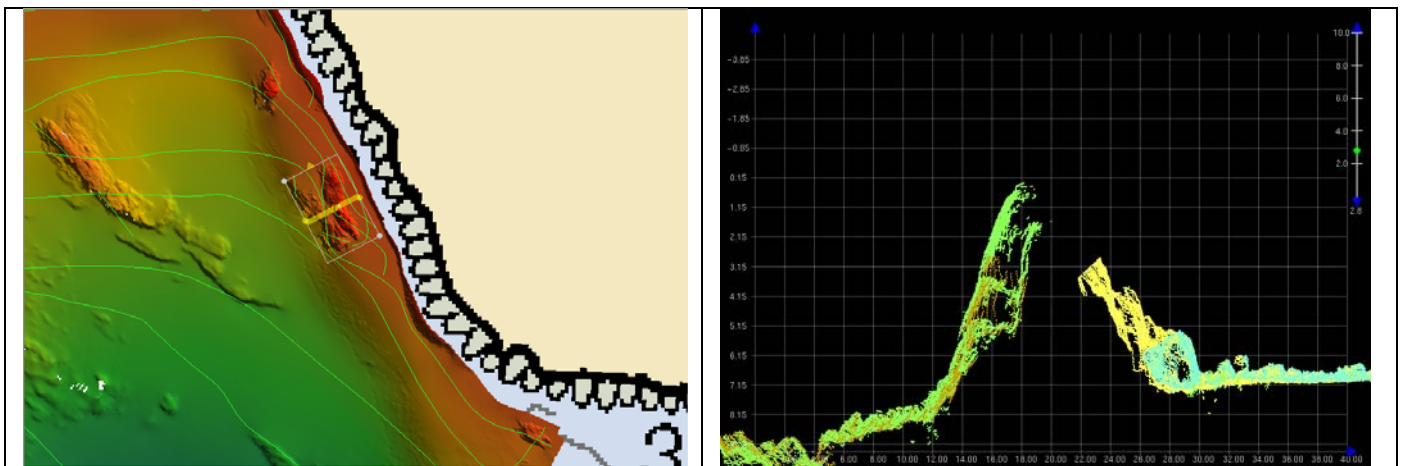


Figure 11: Holiday in southeast Revillagigedo Channel.

The holiday located in southwest Revillagigedo Channel northwest of camp cove at position  $55^{\circ} 10' 35.7''\text{N}$ ,  $131^{\circ} 20' 26.9''\text{W}$  has the least depth represented.<sup>18</sup> The holiday is depicted below in Figure 12.



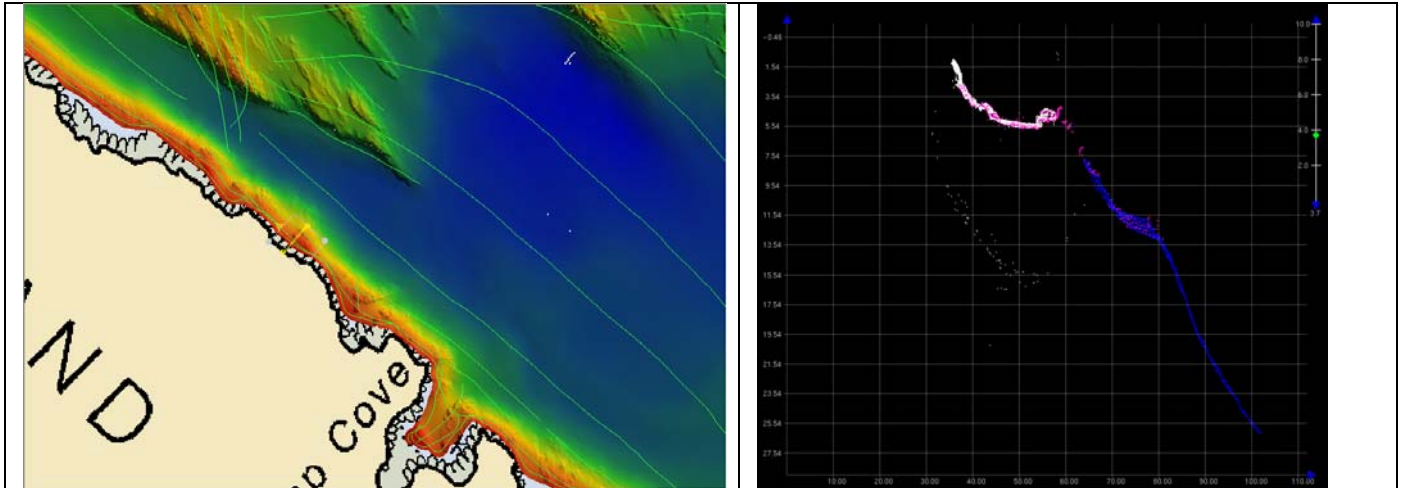


Figure 12: Holiday in southwest Revillagigedo Channel northwest of Camp Cove.

All holidays depicted above in Figures 5 through 12 have least depths represented with the exception of the feature depicted in Figure 6 and the highlighted feature in Figure 10. Data on those holidays were not obtained due to time constraints in the project area.<sup>19</sup>

## DENSITY

Density requirements for H12224 were achieved with at least 99% of finalized surface nodes containing five or more soundings (see Appendix V).<sup>20</sup>

## TRUEHEAVE

TrueHeave data could not be applied to MBES data for two lines (2010M\_1282355 and 2010M\_1282356) from launch 2806 from May 8, 2010 (DN 128), due to the files being logged close to UTC midnight at the end of the GPS week. The MBES data were investigated in CARIS Subset mode and data quality from that day was not affected by the lack of TrueHeave<sup>21</sup>.

To enable the application of TrueHeave some POS/MV files were “fixed” using the *fixTrueHeave.exe* utility from CARIS. Fixed files were assigned an additional \*.fixed suffix. This was performed for the following vessels and days:

Launch 2805 days 111 and 115;

Launch 2806 days 120, 128, and 142;

Launch 2807 days 115, 117, 119 and 142;

Launch 2808 days 113 and 116.

## SOUND VELOCITY (SV)

There is one small area of SV artifacts in the northeast portion of Thorne Arm.. The SV artifacts appear in an area where there is an out flow of fresh water from a stream and Low Lake. The MBES data were reviewed in CARIS Subset Mode with appropriate reference surfaces. The reference surface accurately depicts the seafloor.<sup>22</sup> Figure 13 below depicts an overview of the area in CARIS Subset Mode.

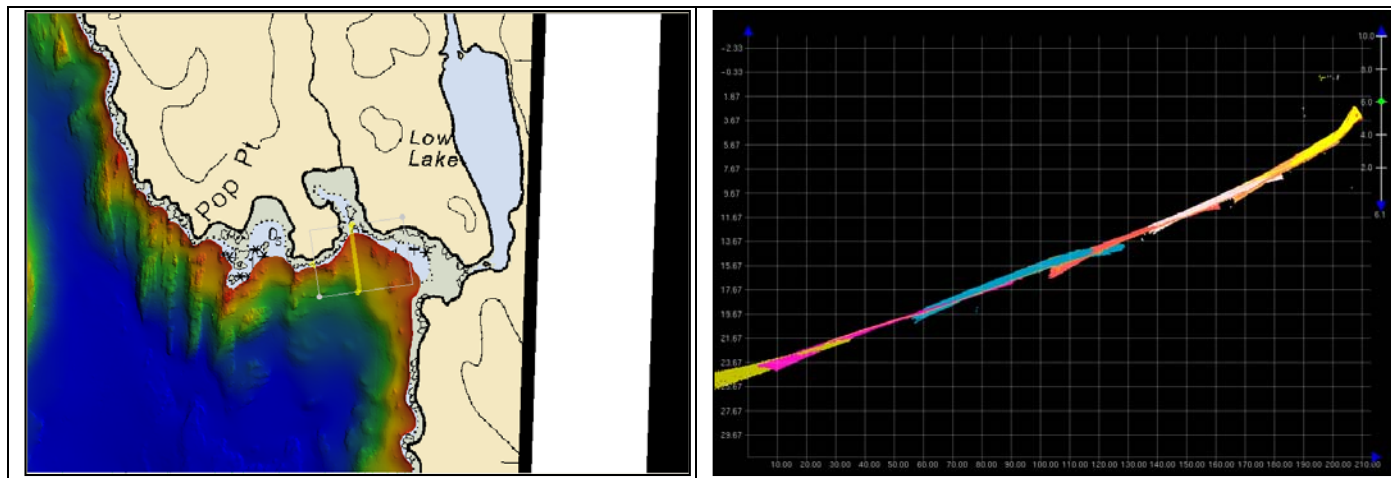


Figure 13: Subset and Area of Sound Velocity Issues in Northeast Thorne Arm

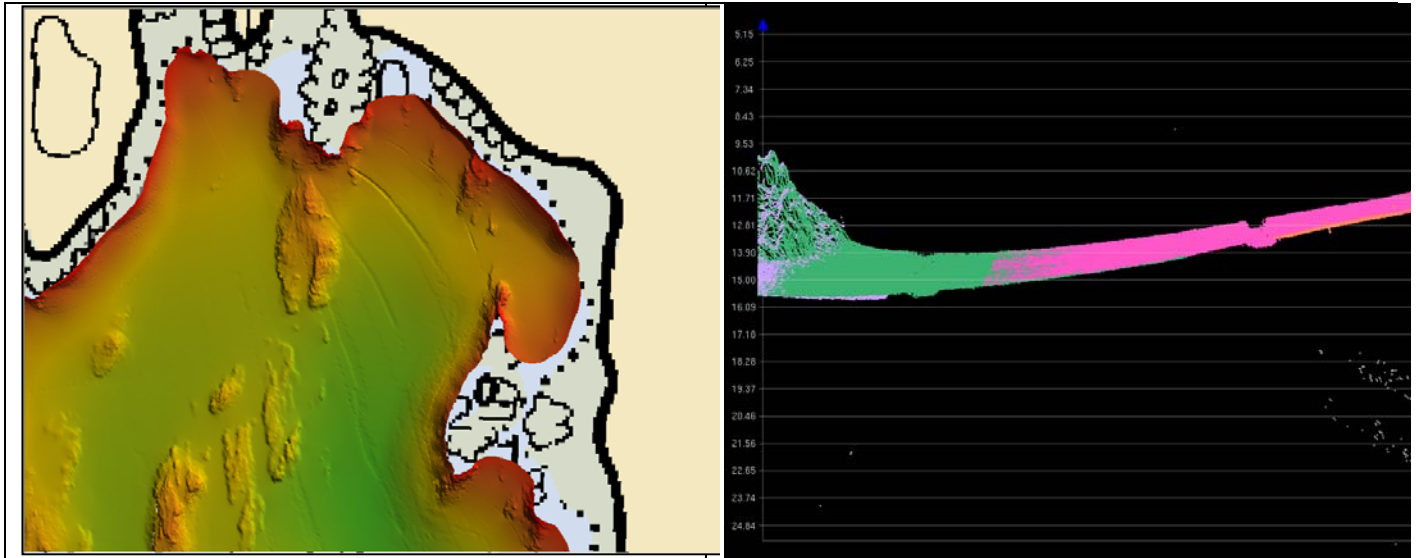
## DESIGNATED SOUNDINGS

Designation of soundings followed procedures as outlined in section 5.1.1.3 of the NOS Hydrographic Surveys Specifications and Deliverables (HSSD) dated April 2010.

Survey H12224 requires 62 designated soundings and 11 outstanding soundings. Two soundings were designated as Dangers to Navigation. 62 designated soundings are required to accurately represent the seafloor. 11 soundings were flagged as outstanding for feature creation in CARIS Notebook.<sup>23</sup>

## UNUSUAL CONDITIONS

In the northern portion of Thorne Arm between Mop Point and Minx Islands near position 55° 23' 30.8"N, 131° 14' 51.6" W, there is a near nadir effect, where these beams are deeper than the surrounding bottom (Figure 14). This artifact is estimated to be from an overpowering of the Reson 7125 MBES during acquisition. Launch 2808 collected these lines on DN 128. The following are the lines affected: 2010M\_1281719, 2010M\_1281725, 2010M\_1281731, 2010M\_1736, 2010M\_1754, and 2010M\_1757. The artifact is 0.5 meters deeper than the surrounding seafloor and is within IHO order 1 tolerances.<sup>24</sup>



**Figure 14: Near Nadir Beam Artifacts present in northern Thorne Arm**

### B.2.5 Accuracy Standards

All data meet the data accuracy specifications as stated in the HSSD.<sup>25</sup> Based on a review of the IHO Order 1 and two layers in CARIS HIPS and SIPS, the total propagated uncertainty of the 16-meter grid nodes of the combined surface are within IHO Order 1 specifications for the appropriate depth ranges.<sup>26</sup>

### B.3 Corrections to Echo Soundings

Data reduction procedures for survey H12224 conform to those detailed in the DAPR.

### B.4 Data Processing

Data acquisition and processing notes are included in the acquisition and processing logs, and additional processing such as final tide and sound velocity application is noted in the H12224\_Data\_Log spreadsheet. All datalogs are submitted digitally in the Separates I folder.

Data processing procedures for survey H12224 conform to those detailed in the DAPR. Data were processed initially using CARIS HIPS & SIPS v7.0, Service Pack 1, and Hotfix 4, Notebook v3.1 Hotfix 2, and BathyDatabase v2.3 Hotfix 17 in conjunction with version 2 of the NOAA object catalog support files. During the course of survey H12224, processing computer systems were updated to CARIS HIPS & SIPS v7.0, Service Pack 1, and Hotfix 5. Additional processing details regarding Total Propagated Uncertainty (TPU/TPE) and CUBE (Combined Uncertainty and Bathymetry Estimator) 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 H12224 are listed in Table 3.

Tide values:	Measured	0.01 m	Zoning	0.01 m
Sound Speed Values:	Measured	1.00 m/s	Surface	0.50 m/s

**Table 3: Survey Specific CARIS TPE Parameters**

## CUBE SURFACES

The CARIS HIPS BASE (Bathymetry Associated with Statistical Error) surfaces delivered with H12224 and their associated resolutions are listed in Table 5. The field sheet extent was adjusted using the *Base 16 Calculator* tool to ensure coincident nodes among all bathymetric surfaces regardless of the field sheet in which they are contained given the standard surface resolutions of one, two, four, eight, and sixteen meters. The NOAA CUBE parameters mandated in HSSD were used for the creation of all CUBE BASE surfaces in Survey H12224.<sup>27</sup>

The surfaces have been reviewed where noisy data, or ‘fliers’ are incorporated into the gridded solution causing the surface to be shoaler than the true seafloor. Where these spurious soundings cause the gridded surface to be shoaler than the reliably measured seabed by greater than the maximum allowable TVU at that depth, the noisy data have been rejected and the surface recomputed.

Fieldsheet Name	Surface Name	Depth Ranges (m)	Resolution (m)
H12224_QC	H12224_1m	All	1
	H12224_2m	All	2
	H12224_4m	All	4
	H12224_8m	All	8
	H12224_16m	All	16
	H12224_1m_final_0to22	-10-22	1
	H12224_2m_final_20to44	20-44	2
	H12224_4m_final_40to88	40-88	4
	H12224_8m_final_80to176	80-176	8
	H12224_16m_final_160to500	160 plus	16
	H12224_Combined_16m	All	16

**Table 4: Depth Ranges, Resolutions, and CUBE Parameters**

## C. HORIZONTAL AND VERTICAL CONTROL

A complete description of horizontal and vertical control for survey H12224 can be found in the *OPR-O193-FA-10 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 correctors from the U.S. Coast Guard beacon at Annette Island (323 kHz) 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 as there is currently no functionality for applying SBET files to these types of data.

The Post Processing Kinematic method (PPK) is the primary final method of horizontal positioning of MBES soundings on H12224. Correctors from a GPS base station established on horizontal control mark SOUTH TWIN RESET on South Twin Island were used for post processing all vessel-day POSMV files. Smoothed Best Estimate of Trajectory (SBETs) files and post processed solution accuracy files named SMRMSG files were applied to all MBES data in CARIS HIPS. A text record of the CARIS Output window after the SBET and SMRMSG files were applied in CARIS is included in the SBET folder with the GNSS data.

For further detail regarding the processing and quality control checks performed see the H12220\_POSPAC\_Processing\_Log.xls spreadsheet located in the SBET folder with the GNSS Data. See also the OPR-O193-FA-10 Horizontal and Vertical Control Report, submitted under separate cover.

## C.2 Vertical Control

The vertical datum for this project is Mean Lower Low Water (MLLW) as specified in the Project Instructions. The operating National Water Level Observation Network (NWLON) primary tide station at Ketchikan, AK (945-0460) served as control for datum determination and as the primary source for water level correctors for survey H12224.

*Fairweather* personnel installed one tide gauge at the tertiary station listed below in Table 5. The gauge was 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 in accordance with the Project Instructions.

Station Name	Station Number	Type of Gauge	Date of Installation	Date of Removal	Gauge #	S/N
Custom House Cove	945-0296	Tertiary 30 Day	April 12, 2010	May 23, 2010	14	24444

Table 5: Tide Gauge Information

Refer to the *OPR-O193-FA-10 Horizontal and Vertical Control Report* for further information about the tide stations.

A request for delivery of final approved (smooth) tides for survey H12224 was forwarded to N/OPS1 on May 25, 2010 in accordance with the FPM. A copy of the request is included in Appendix IV.<sup>28</sup>

As per the Project Instructions, all data were reduced to MLLW using final, approved water levels from the Ketchikan, AK station (945-0460), and Custom House Cove, AK station (945-0296) by applying tide files 9450460.tid and 9450296.tid and time and height correctors through the zone corrector file H12224CORF.zdf. **It will not be necessary for the Hydrographic Branch to reapply the final approved water levels (smooth tides) to the survey data during final processing.**

## D. RESULTS AND RECOMMENDATIONS

### D.1 Chart Comparison

Chart comparison procedures were followed as outlined in section 4.5 of the FPM and section 8.1.3-D.1 of the HSSD, utilizing CARIS Plot Composer software program.

Survey H12224 was compared with the following charts listed in Table 6.<sup>29</sup>

NOAA Chart Number	Chart Scale	Edition Number	Edition Date	Updated with Notice to Mariners through
17434	1:80,000	12 <sup>th</sup> Ed.	July 1, 2005	January 30, 2010 (5/10)
17428	1:40,000	10 <sup>th</sup> Ed.	April 1, 2007	January 30, 2010 (5/10)

Table 6: NOAA Charts compared with Survey H12224

#### D.1.1 Chart 17434

Soundings from H12224 generally agree within one to two fathoms with depths on chart 17434. Some of the shoaler charted depths near shore appear to have been pulled off shore for cartographic representation, but remain accurate within the scale of the chart.<sup>30</sup>

#### D.1.2 Chart 17428

Soundings from H12224 generally agree within one to two fathoms with depths on chart 17428. Some of the shoaler charted depths near shore appear to have been pulled off shore for cartographic representation, but remain accurate within the scale of the chart.<sup>31</sup>

A holiday is present on the side of a feature in western Nadzaheen Cove as depicted in Figure 6 above. The Hydrographer recommends that the 1 fathom sounding remain as depicted on Chart 17428.<sup>32</sup>

A holiday is present atop a feature in northwest Nadzaheen Cove as depicted in Figure 7 above. The Hydrographer recommends that the 0<sub>5</sub> fathom sounding remain on Chart 17428 due to insufficient coverage.<sup>33</sup>

A holiday is present atop a feature in southeast Revillagigedo Channel southeast of Lucky Cove. The holiday is highlighted in Figure 11 above. The hydrographer recommends that a 2 fathom sounding

replace a 2<sub>2</sub> fathom sounding on chart 17428 due to MBES data being shoaler than represented on the chart.<sup>34</sup>

### D.1.3 Chart Comparison Recommendations

The Hydrographer has determined that bottom coverage requirements have been met and data accuracy meets requirements specified by the HSSD. **All soundings from H12224 are adequate to supersede prior surveys in their common areas with the exceptions listed above.**<sup>35</sup>

## D.2 Automated Wreck and Obstruction Information System (AWOIS) Investigations

There was one AWOIS item located within the limits of H12224. AWOIS item number 53949 consisted of a US Forest Service Mooring Buoy. AWOIS item was verified and is charted correctly on chart 17428. It is recommended that AWOIS item 53949 be retained on the chart. AWOIS item was addressed and is included in the H12224\_Final\_Feature\_File.<sup>36</sup>

## D.3 Dangers to Navigation

There were two dangers to navigation (DTON) found within the survey limits.<sup>37</sup> The first is located to the east of Minx Island in upper Thorne Arm at position 55° 23' 09.1"N, 131° 15' 33.9"W. The DTON was submerged rock found to have a least depth of 2<sub>2</sub> fathoms atop of a 7<sub>3</sub> fathom sounding present on Chart 17428.

The second DTON is located in west Nadzaheen Cove in Revillagigedo Channel at position 55° 13' 44.6"N, 131° 27' 38.4"W. The DTON was found to have a least depth of 5<sub>4</sub> fathoms atop of a 8 fathom sounding present on Chart 17428.

DTON Report #1 for survey H12224 was forwarded to MCD on September 8, 2010 in accordance with the FPM. A copy of the H12224 DTON Report #1 is included in Appendix I.

## D.4 Additional Results

### D.4.1 Shoreline/Feature Verification

*Fairweather* personnel conducted limited shoreline verification and reconnaissance at times near predicted negative tides within the survey limits with the exception of the features collected on May 23, 2010 (Dn 143) and May 24, 2010 (Dn 144). Data on those positions were collected at times with approximately positive 3 feet and 10 feet of predicted tide, respectively. Annotations, information, and diagrams collected on DP forms and boat sheets during field operations are scanned with included in the digital Separates I folder. Shoreline verification procedures for survey H12224 conform to those detailed in the DAPR with the exceptions previously mentioned.

### D.4.2 Shoreline/Feature Data Processing

Source features collected or edited by the field have source indication (SORIND) and source date (SORDAT) attribute fields populated to reflect the survey number (US,US,graph H12224) and final

survey date 20100524. Unmodified source shoreline features were left with their original SORIND and SORDAT values.<sup>38</sup>

Numerous charted ledges and MLLW lines throughout the survey area are in conflict with hydrography. After discussion with representatives from both the Pacific Hydrographic Branch and the Atlantic Hydrographic Branch, it has been decided to leave the ledge area features intact for shore side personnel to manage.<sup>39</sup>

#### **D.4.3 Shoreline Recommendations**

The Hydrographer recommends that the shoreline depicted in the CARIS Notebook files and final sounding files supersede and complement shoreline information compiled on the CSF and charts.<sup>40</sup>

#### **D.4.4 Aids to Navigation**

Hog Rocks Light is the only assigned aid to navigation (ATON) for positioning within H12224. The light was found to serve its intended purpose. An ATON Report was submitted to [aton.report@noaa.gov](mailto:aton.report@noaa.gov) for all assigned ATONs within the survey area of OPR-O193-FA-10. See the *OPR-O193-FA-10 Horizontal and Vertical Control Report* regarding further information on positioned ATONs.<sup>41</sup>

#### **D.4.5 Overhead Features**

There are no overhead features within the limits of survey H12224.<sup>42</sup>

#### **D.4.6 Submarine Cables and Pipelines**

There are no submarine cables or pipelines charted within the limits of H12224, and none were detected by the survey.<sup>43</sup>

#### **D.4.7 Ferry Routes**

There are no ferry routes charted within the limits of survey H12224, and none were observed to be operating in the area.<sup>44</sup>

#### **D.4.8 Bottom Samples**

Bottom samples were collected on April 27, 2010 (DN 117) and May 24, 2010 (DN 144) and are included as seabed classifications along with the other S57 features in the Notebook H12224\_Final\_Feature\_File.hob file.<sup>45</sup>

### **D.5 Supplemental Reports**

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

<b><u>Title</u></b>	<b><u>Date Sent</u></b>	<b><u>Office</u></b>
Hydrographic Systems Readiness Review 2010	April 9, 2010	N/CS34
Data Acquisition and Processing Report 2010	August 9, 2010	N/CS34
Horizontal and Vertical Control Report for OPR-O193-FA-10	July 26, 2010	N/CS34
Tides and Water Levels Package for OPR-O193-FA-10	May 25, 2010	N/OPS1
ATON Report for OPR-O193-FA-10	September 5, 2010	N/CS2

## **Revisions and corrections performed during office processing and certification.**

<sup>1</sup> Concur.

<sup>2</sup> Concur. High variation between surfaces on steep slopes is expected. The data is adequate to supersede charted data in the common area.

<sup>3</sup> H12224 junctions with survey H12178 to the South and H12177 southwest. A common junction was made with an adjoining portion of H12178 and a common junction will be made with H12177 when it is compiled.

<sup>4</sup> Concur.

<sup>5</sup> Concur. Holidays were examined in Caris HIPS and SIPS 7.0 and there were no navigationally significant features evident.

<sup>6</sup> Concur.

<sup>7</sup> Concur. Data is adequate and within specifications despite the holidays due to “blowouts” in the Reson MB. It is recommended that the data from H12224 supersede charted data within the common area.

<sup>8</sup> Concur.

<sup>9</sup> Concur with clarification. It is recommended to chart a 0 fm, 5 ft that was found during office processing and certification.

<sup>10</sup> Concur with the hydrographers recommendations of retaining the 0 fm, 5ft already charted.

<sup>11</sup> Concur.

<sup>12</sup> Concur, a submerged rock was added to the HCell.

<sup>13</sup> Concur. Holiday was examined in Caris HIPS and SIPS 7.0 and the least depth was represented.

<sup>14</sup> Concur.

<sup>15</sup> Concur.

<sup>16</sup> Concur with clarification. A 2 fathoms 1feet sounding was added to the Hcell.

<sup>17</sup> Concur. Holiday was examined in Caris HIPS and SIPS 7.0 and the least depth was represented.

<sup>18</sup> Concur. Holiday was examined in Caris HIPS and SIPS 7.0 and the least depth was represented.

<sup>19</sup> Concur. Chart depths and features as depicted in the HCell.

<sup>20</sup> Concur.

<sup>21</sup> Concur. Data is adequate and within specifications despite the lack of True Heave. It is recommended that the data from H12224 supersede charted data within the common area.

<sup>22</sup> Concur. Data is adequate and within specifications despite Sound velocity artifacts. It is recommended that the data from H12224 supersede charted data within the common area.

<sup>23</sup> Concur with clarification. Designated soundings were used as appropriate to the scale of the chart.

<sup>24</sup> Concur.

<sup>25</sup> Concur.

<sup>26</sup> Concur.

<sup>27</sup> A 16 meter combined surface was created during the Survey Acceptance Review and was used for the cartographic compilation of this survey.

<sup>28</sup> Tide note is appended to this report.

<sup>29</sup> Concur with clarifications. During office processing and certification the following chart was used:

Chart	Scale	Edition	Edition Date	Date Local Notice to Mariners Applied Through
17428	1:40,000	10 <sup>th</sup>	April 1 <sup>st</sup> , 2007	04/16/2011

<sup>30</sup> Concur with clarification. Generalizing depths offshore is no longer accepted practice. Chart depths as depicted in the HCell

<sup>31</sup> Concur with clarification. Generalizing depths offshore is no longer accepted practice. Chart depths as depicted in the HCell.

---

<sup>32</sup> Do not concur. Chart the 0 fm 5 ft sounding as depicted in the HCell.

<sup>33</sup> Concur.

<sup>34</sup> Concur with clarification a 2fm 1ft sounding is included in the HCell.

<sup>35</sup> Concur.

<sup>36</sup> A blue note was added to the HCell to retain AWOIS Item # 53949. The item is located at 55-22-19.44 N, 131-11-50.24W

<sup>37</sup> Concur. The two reported DTONs have been applied to the charts. A DTON report is attached to this report.

<sup>38</sup> Concur.

<sup>39</sup> Concur. Chart features as depicted in the HCell.

<sup>40</sup> Concur with clarification. The submitted hob files were used in the compilation of HCell H12224. During compilation, some modifications were made to accommodate chart scale. Chart features as depicted in the HCell.

<sup>41</sup> Concur. Chart ATONs as per latest ATONIS information.

<sup>42</sup> Concur.

<sup>43</sup> Concur.

<sup>44</sup> Concur.

<sup>45</sup> Concur with clarification. The field submitted 27 bottom samples but only 11 bottom samples from the field were added to the HCell to be charted. 16 bottom samples from the field were removed because they were inside rocky seabed areas, in addition several blue notes were added to the HCell to retain charted bottom samples.



# H12224 Danger to Navigation Report#1

**Registry Number:** H12224  
**State:** Alaska  
**Locality:** Behm Canal  
**Sub-locality:** Revillagigedo Channel  
**Project Number:** OPR-O193-FA-10  
**Survey Dates:** April 21, 2010 - May 24, 2010

## Charts Affected

Number	Edition	Date	Scale (RNC)	RNC Correction(s)*
17428	10th	04/01/2007	1:40,000 (17428_1)	USCG LNM: 04/21/2009 (01/19/2010) NGA NTM: 02/05/2005 (01/30/2010)
17434	13th	07/01/2005	1:80,000 (17434_1)	[L]NTM: ?
17424	8th	05/01/2007	1:80,000 (17424_1)	[L]NTM: ?
17420	28th	03/01/2007	1:229,376 (17420_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: ?
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.	Name	Feature Type	Survey Depth	Survey Latitude	Survey Longitude	AWOIS Item
1.1	904/500	Shoal	10.45 m	55° 13' 44.6" N	131° 27' 38.4" W	---
1.2	688/261	Rock	4.38 m	55° 23' 09.1" N	131° 15' 33.9" W	---

## **1 - Danger To Navigation**

**1.1) Profile/Beam - 904/500 from h12224 /  
fa\_2808\_400khz\_rsn7125\_512bms\_2010 / 2010-113 / 2010m\_1131733**

**DANGER TO NAVIGATION**

**Survey Summary**

**Survey Position:** 55° 13' 44.6" N, 131° 27' 38.4" W  
**Least Depth:** 10.45 m (= 34.29 ft = 5.715 fm = 5 fm 4.29 ft)  
**TPU (±1.96σ):** **THU (TPEh)** ±0.095 m ; **TVU (TPEv)** ±0.123 m  
**Timestamp:** 2010-113.17:35:19.485 (04/23/2010)  
**Survey Line:** h12224 / fa\_2808\_400khz\_rsn7125\_512bms\_2010 / 2010-113 / 2010m\_1131733  
**Profile/Beam:** 904/500  
**Charts Affected:** 17428\_1, 17434\_1, 17420\_1, 16016\_1, 531\_1, 501\_1, 530\_1, 50\_1

**Remarks:**

Shoal sounding found with 100% MBES.

**Feature Correlation**

Address	Feature	Range	Azimuth	Status
h12224/fa_2808_400khz_rsn7125_512bms_2010/2010-113/2010m_1131733	904/500	0.00	000.0	Primary

**Hydrographer Recommendations**

Chart shoal sounding.

**Cartographically-Rounded Depth (Affected Charts):**

5 ¾fm (17434\_1, 17420\_1, 16016\_1, 530\_1)  
 5fm 4ft (17428\_1, 531\_1)  
 10.5m (501\_1, 50\_1)

**S-57 Data**

**Geo object 1:** Sounding (SOUNDG)  
**Attributes:** SORDAT - 20100524  
 SORIND - US,US,graph, survey H12224

### Feature Images

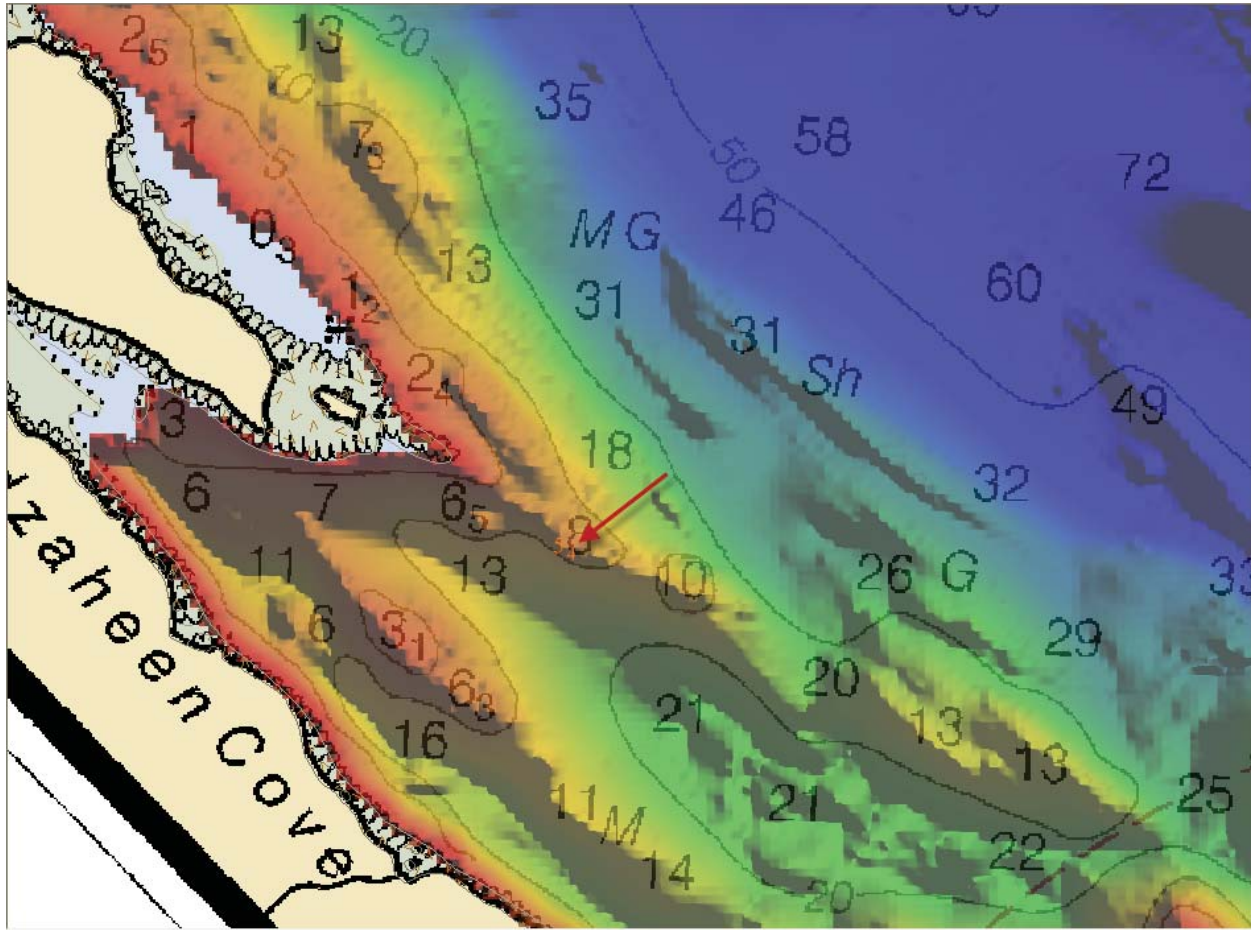


Figure 1.1.1

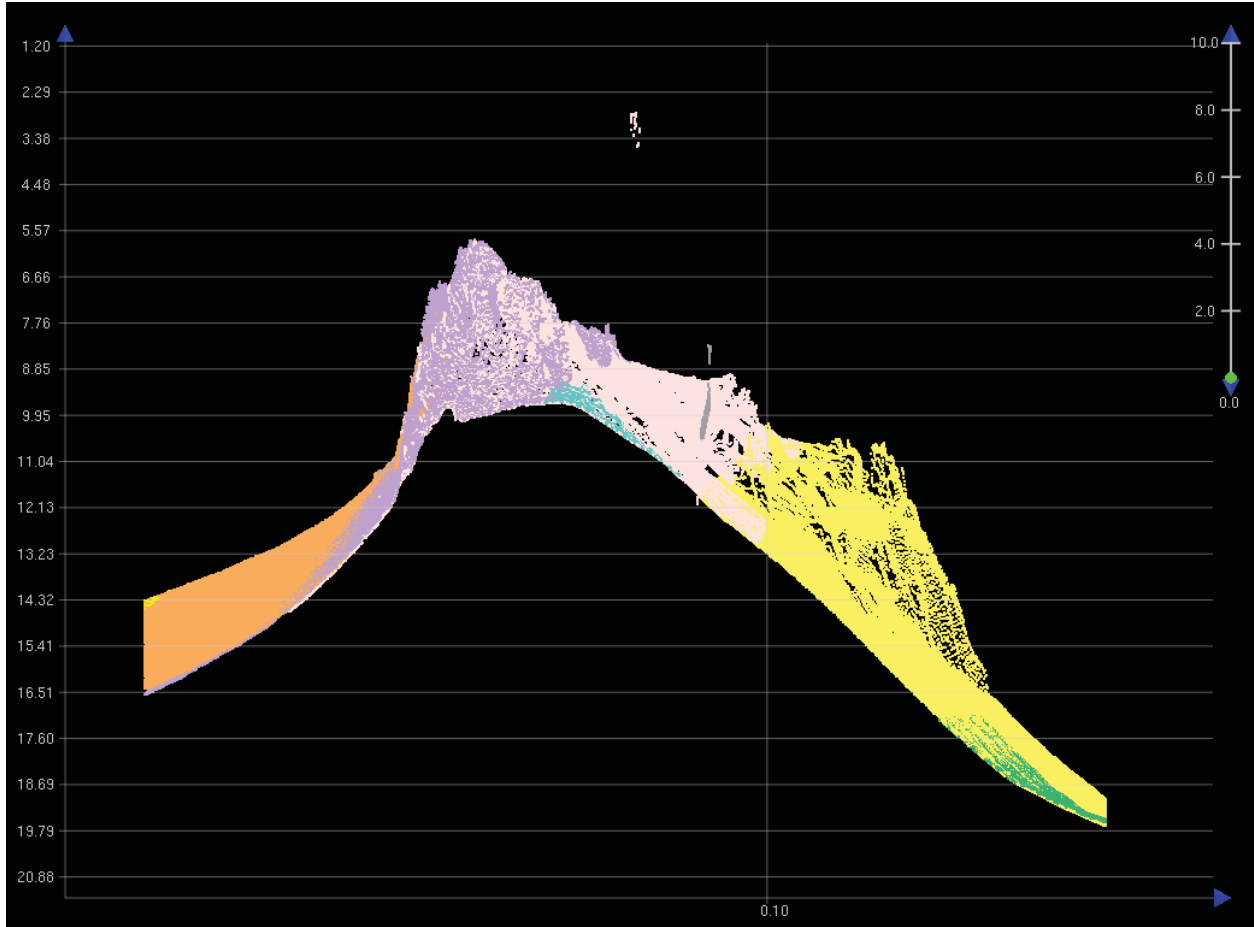


Figure 1.1.2

**1.2) Profile/Beam - 688/261 from h12224 /  
fa\_2808\_400khz\_rsn7125\_512bms\_2010 / 2010-128 / 2010m\_1281918**

**DANGER TO NAVIGATION**

**Survey Summary**

**Survey Position:** 55° 23' 09.1" N, 131° 15' 33.9" W  
**Least Depth:** 4.38 m (= 14.38 ft = 2.397 fm = 2 fm 2.38 ft)  
**TPU ( $\pm 1.96\sigma$ ):** **THU (TPEh)**  $\pm 0.083$  m ; **TVU (TPEv)**  $\pm 0.112$  m  
**Timestamp:** 2010-128.19:21:32.718 (05/08/2010)  
**Survey Line:** h12224 / fa\_2808\_400khz\_rsn7125\_512bms\_2010 / 2010-128 / 2010m\_1281918  
**Profile/Beam:** 688/261  
**Charts Affected:** 17428\_1, 17424\_1, 17420\_1, 16016\_1, 531\_1, 501\_1, 530\_1, 50\_1

**Remarks:**

Shoal sounding found on submerged rock with 100% MBES.

**Feature Correlation**

Address	Feature	Range	Azimuth	Status
h12224/fa_2808_400khz_rsn7125_512bms_2010/2010-128/2010m_1281918	688/261	0.00	000.0	Primary

**Hydrographer Recommendations**

Chart shoal sounding on rock.

**Cartographically-Rounded Depth (Affected Charts):**

2 ¼fm (17424\_1, 17420\_1, 16016\_1, 530\_1)

2fm 2ft (17428\_1, 531\_1)

4.4m (501\_1, 50\_1)

**S-57 Data**

**Geo object 1:** Underwater rock / awash rock (UWTROC)  
**Attributes:** SORDAT - 20100524  
 SORIND - US,US,graph, survey H12224  
 VALSOU - 4.383 m

WATLEV - 3:always under water/submerged



### Feature Images

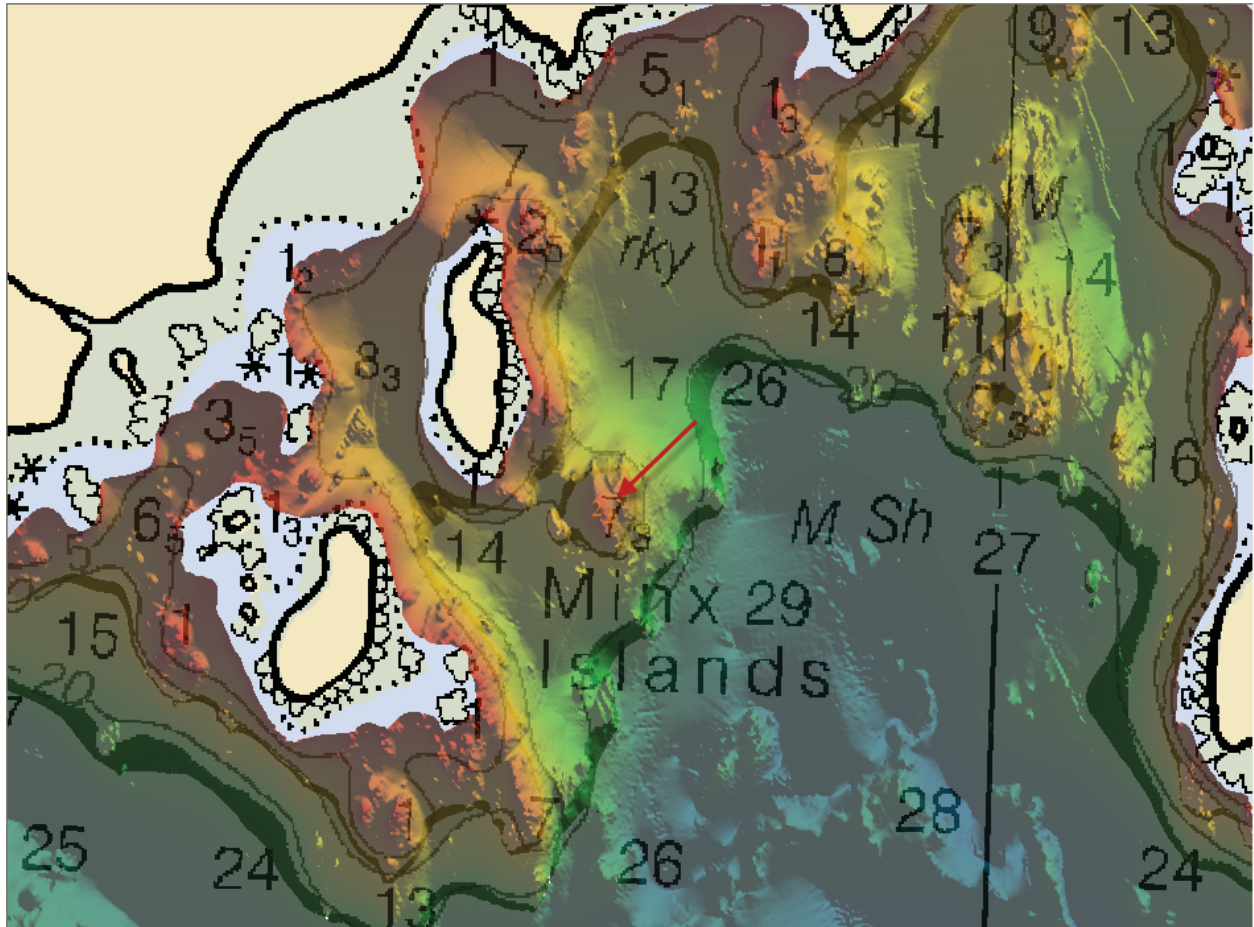


Figure 1.2.1

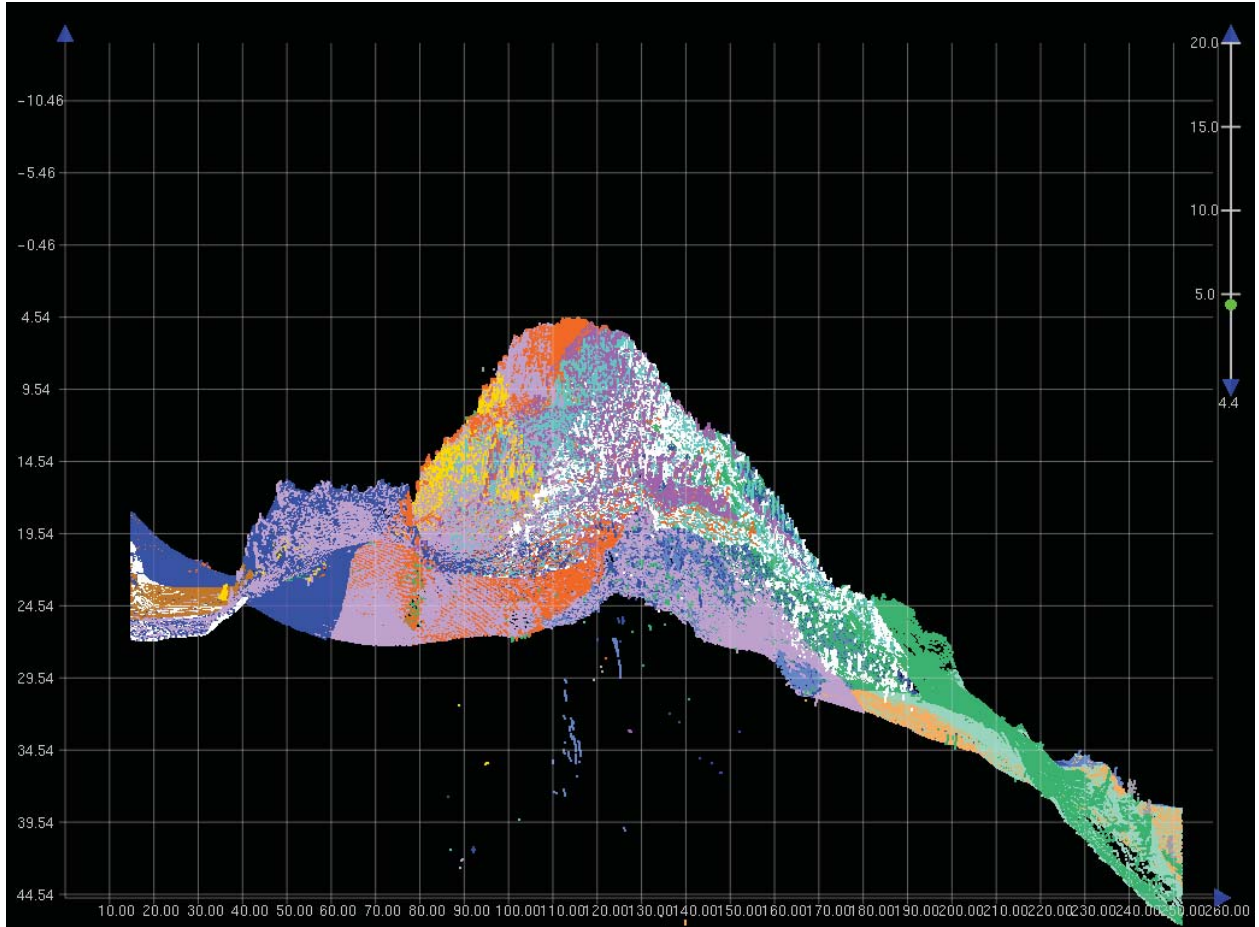


Figure 1.2.2



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

**TIDE NOTE FOR HYDROGRAPHIC SURVEY**

**DATE :** July 22, 2010

**HYDROGRAPHIC BRANCH:** Pacific  
**HYDROGRAPHIC PROJECT:** OPR-0193-FA-2010  
**HYDROGRAPHIC SHEET:** H12224

**LOCALITY:** Revillagigedo Channel, Behm Canal, AK  
**TIME PERIOD:** April 21 - May 23, 2010

**TIDE STATION USED:** 945-0296 Custom House Cove, AK  
Lat. 55° 5.77'N Long. 131° 13.33'W  
**PLANE OF REFERENCE (MEAN LOWER LOW WATER):** 0.000 meters  
**HEIGHT OF HIGH WATER ABOVE PLANE OF REFERENCE:** 4.369 meters

**TIDE STATION USED:** 945-0460 Ketchikan, AK  
Lat. 55° 19.91'N Long. 131° 37.57'W  
**PLANE OF REFERENCE (MEAN LOWER LOW WATER):** 0.000 meters  
**HEIGHT OF HIGH WATER ABOVE PLANE OF REFERENCE:** 4.433 meters

**REMARKS:** RECOMMENDED ZONING

**Use zone(s) identified as:** SA75, SA89, SA90, and SA90A

**Refer to attachments for zoning information.**

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

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

**Peter J. Stone**

Digitally signed by Peter J. Stone  
DN: cn=Peter J. Stone, o=Oceanographic Division,  
ou=NOAA/NOS/CO-OPS,  
email=peter.stone@noaa.gov, c=US  
Date: 2010.07.25 11:05:59 -04'00'

CHIEF, OCEANOGRAPHIC DIVISION







**H12224 HCell Report**  
Fernando Ortiz, Physical Scientist  
Pacific Hydrographic Branch

**1. Specifications, Standards and Guidance Used in HCell Compilation**

HCell compilation of survey H12224 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 H12224 were compiled to the largest scale raster charts shown below:

Chart	Scale	Edition	Edition Date	NTM Date
17428	1:40,000	10 <sup>th</sup>	04/01/2007	04/16/2011

The following ENC's were also used during compilation:

Chart	Scale
US5AK47M	1:40,000

**3. Soundings**

A survey-scale sounding (SOUNDG) feature object layer was built from the 16-meter Combined Surface in CARIS BASE Editor. A shoal-biased selection was made at 1:10,000 for chart 17428 at survey scale using a Radius Table file with values shown in the table, below.

Shoal Limit (m)	Deep Limit (m)	Radius (mm)
-5	10	2
10	20	3
20	50	3.5
50	500	4

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 17428	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 H12224_SS.000
0	0	0.2286	0.000	0
5	9.144	9.3726	5.125	5
10	18.288	18.517	10.125	10
20	36.576	37.9476	20.750	20
50	91.44	92.812	50.750	50
100	182.88	184.252	100.750	100
200	365.76	367.1316	200.750	200

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, 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 areas are included in HCell H12224:

M\_QUAL

The Meta area objects were constructed on the basis of the limits of the hydrography.

#### 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.

#### 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.

## 7.3 S-57 Object Classes

The CS HCell contains the following Object Classes:

\$CSYMB	Blue Notes (points) —Notes to the MCD chart Compiler
*DEPCNT	Modified surveyed MLLW
COALNE	Coastline
*LNDARE	Land area
*LNDELV	Land elevation
MORFAC	Mooring facility
M_QUAL	Data quality Meta object
PILPNT	Piles
SBDARE	Bottom samples, reefs, ledges, and rocky seabed areas
SOUNDG	Soundings at chart scale density
*UWTROC	Rock features

\* The M\_QUAL is adequate for NDB product searches except for features in these object classes which reside outside the M\_QUAL limits.

The SS HCell contains the following Object Classes:

DEPCNT	Generalized contours at chart scale intervals (See table under section 4.)
SOUNDG	Soundings at the survey scale density (See table under section 3.)

## 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

H12224 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

H12224_CS.000	Base Cell File, Chart Units, Soundings and features compiled to 1:40,000
H12224_SS.000	Base Cell File, Chart Units, Soundings and Contours compiled to 1:10,000
H12224_DR.pdf	Descriptive Report including end notes compiled during office processing and certification, the HCell Report, and supplemental items
H12224_outline.gml	Survey outline
H12224_outline.xsd	Survey outline

### 10.2 Software

CARIS HIPS Ver. 7.0	Inspection of Combined BASE Surfaces
CARIS BASE Editor Ver. 2.1	Creation of soundings and bathy-derived features, creation of the 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:

Fernando Ortiz  
Physical Scientist  
Pacific Hydrographic Branch  
Seattle, WA  
206-526-6859  
[Fernando.ortiz@noaa.gov](mailto:Fernando.ortiz@noaa.gov).

APPROVAL SHEET  
H12224

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 disapproval 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.