

H12221

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. N/A

Registry No. H12221

LOCALITY

State Washington

General Locality Olympic Coast National Marine Sanctuary

Sublocality Cape Alava

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;">HYDROGRAPHIC TITLE SHEET</p>	<p>REGISTRY No</p> <p style="text-align: center;">H12221</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: N/A</p>
<p>State <u>Washington</u></p> <hr/> <p>General Locality <u>Olympic Coast National Marine Sanctuary</u></p> <hr/> <p>Sub-Locality <u>Cape Alava</u></p> <hr/> <p>Scale <u>1:20,000</u> Date of Survey <u>June 7 to June 27, 2010</u></p> <hr/> <p>Instructions dated <u>5/11/2010</u> Project No. <u>OPR-N324-FA-10</u></p> <hr/> <p>Vessel <u>Survey launches 2805, 2806, 2807, 2808</u></p> <hr/> <p>Chief of party <u>Captain David O. Neander, NOAA</u></p> <hr/> <p>Surveyed by <u>Fairweather Personnel</u></p> <hr/> <p>Soundings by <u>Reson 7125</u></p> <hr/> <p>SAR by <u>Tyanne Faulkes</u> Compilation by <u>Kurt Brown</u></p> <hr/> <p>Soundings compiled in <u>Fathoms</u></p> <hr/>	
<p>REMARKS: <u>All times are UTC. UTM Zone 10N</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. The processing branch concurs with all information and recommendations in the DR unless otherwise noted. 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 H12221

Project OPR-N324-FA-10
Olympic Coast National Marine Sanctuary, Washington
Scale 1:20,000
June 2010

NOAA Ship *Fairweather*
Chief of Party: Captain David O. Neander, NOAA

A. AREA SURVEYED

The survey area is located within the Olympic Coast National Marine Sanctuary, within the sub-locality of Cape Alava. This survey corresponds to Sheet 3 in the sheet layout provided with the Project Instructions. A survey outline for the actual area surveyed which was modified during the course of the project is shown below in Figure 1. Modifications to the sheet layout were made in cooperation with and approval from the Hydrographic Surveys Division Operations Branch (see Project Correspondence).

Data acquisition was conducted from June 7, 2010, to June 27, 2010 (DN 159 to DN 178).

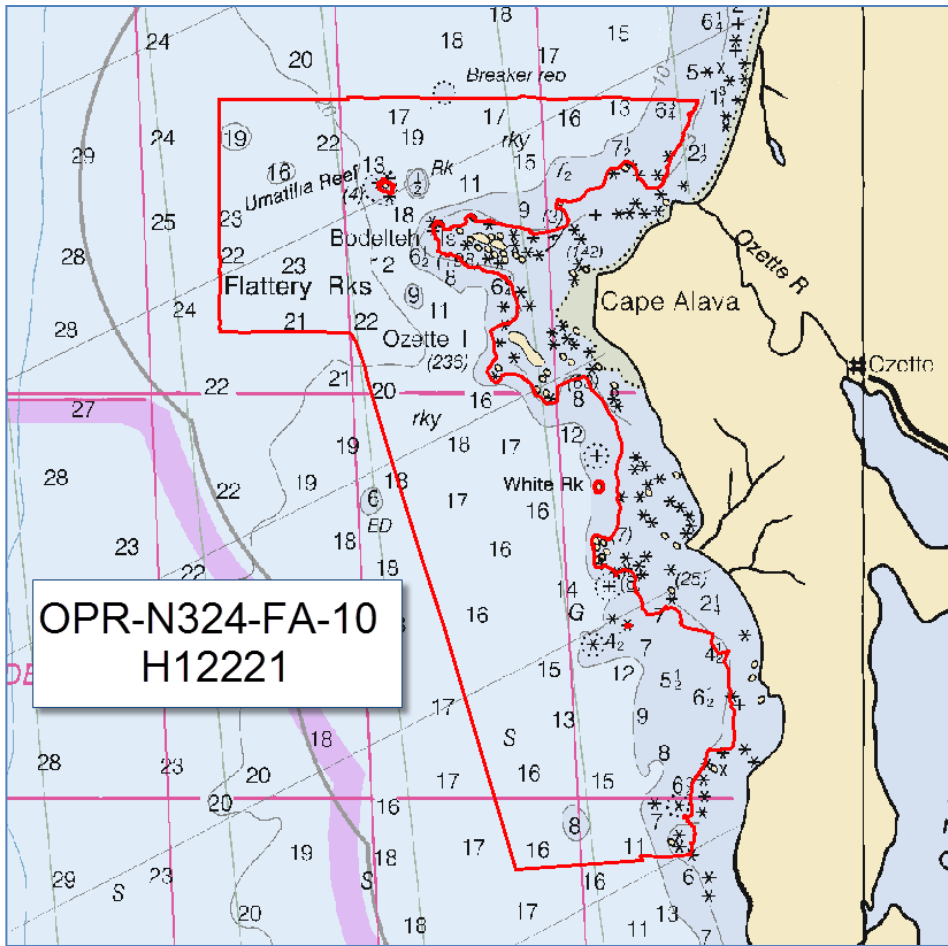


Figure 1: H12221 Survey Outline

Complete multibeam echosounder (MBES) coverage was obtained to the 8-meter curve or to the limits of safe navigation within the survey area. Due to weather, safety, and logistical factors, shoreline verification was not conducted on sheet H12221. Those features which were addressed by MBES coverage were examined and classified as per section 3.5.5 of the Field Procedures Manual April 2010 (FPM). Addressed features were given S-57 attribution and included for submission in CARIS Notebook ‘.hob’ files.

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

MAIN SCHEME - Mileage		OTHER	
0	Single Beam MS	0	Developments/AWOIS - Mileage
651.3	Multibeam MS mileage		
0	FAIRWEATHER S220	0	Shoreline/Nearshore Investigation - Mileage
213.76	Launch 2805		
137.4	Launch 2806	0	Total # of Investigated Items
183.96	Launch 2807		
116.18	Launch 2808	0	Total Bottom Samples
0	SideScan MS		
		19.13	Total SNM
651.3	Total MS		
CROSSLINE - Mileage		Specific Dates of Acquisition	
0	Single Beam XL	6/8, 6/9, 6/12, 6/22, 6/23, 6/24, 6/25, 6/27	
31.72	Multibeam XL		
0	FAIRWEATHER S-220	Specific Dn#s of Acquisition	
18.5	Launch 2805	DNs: 159, 160, 163, 173, 174, 175, 176, 178	
13.22	Launch 2806		
0	Launch 2807		
0	Launch 2808		
31.72	Total XL		

Table 1: H12221 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 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-N324-FA-10, dated May 11, 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
Hull Registration Number	2805	2806	2807	2807
Builder	All American	All American	All American	All American
Length Overall	28' 10"	28' 10"	28' 10"	28' 10"
Beam	10' 8"	10' 8"	10' 8"	10' 8"
Draft, Maximum	4' 0" DWL	4' 0" DWL	4' 0" DWL	4' 0" DWL
Cruising Speed	28 knots	28 knots	28 knots	28 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 & SVP71	SBE 19plus & SVP71	SBE 19plus & SVP71	SBE 19plus & SVP71
Attitude & Positioning Equipment	POS/MV V4	POS/MV V4	POS/MV V4	POS/MV V4
Type of operation	MBES	MBES	MBES	MBES

Table 2: Vessel Inventory

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

B.2. Quality Control

B.2.1. Crosslines

Multi-beam crosslines for this survey totaled 32 linear nautical miles (LNM), comprising 4.89% of the 652 LNM of mainscheme MBES hydrography. Both mainscheme and crossline mileage are summarized in Table 1 above.

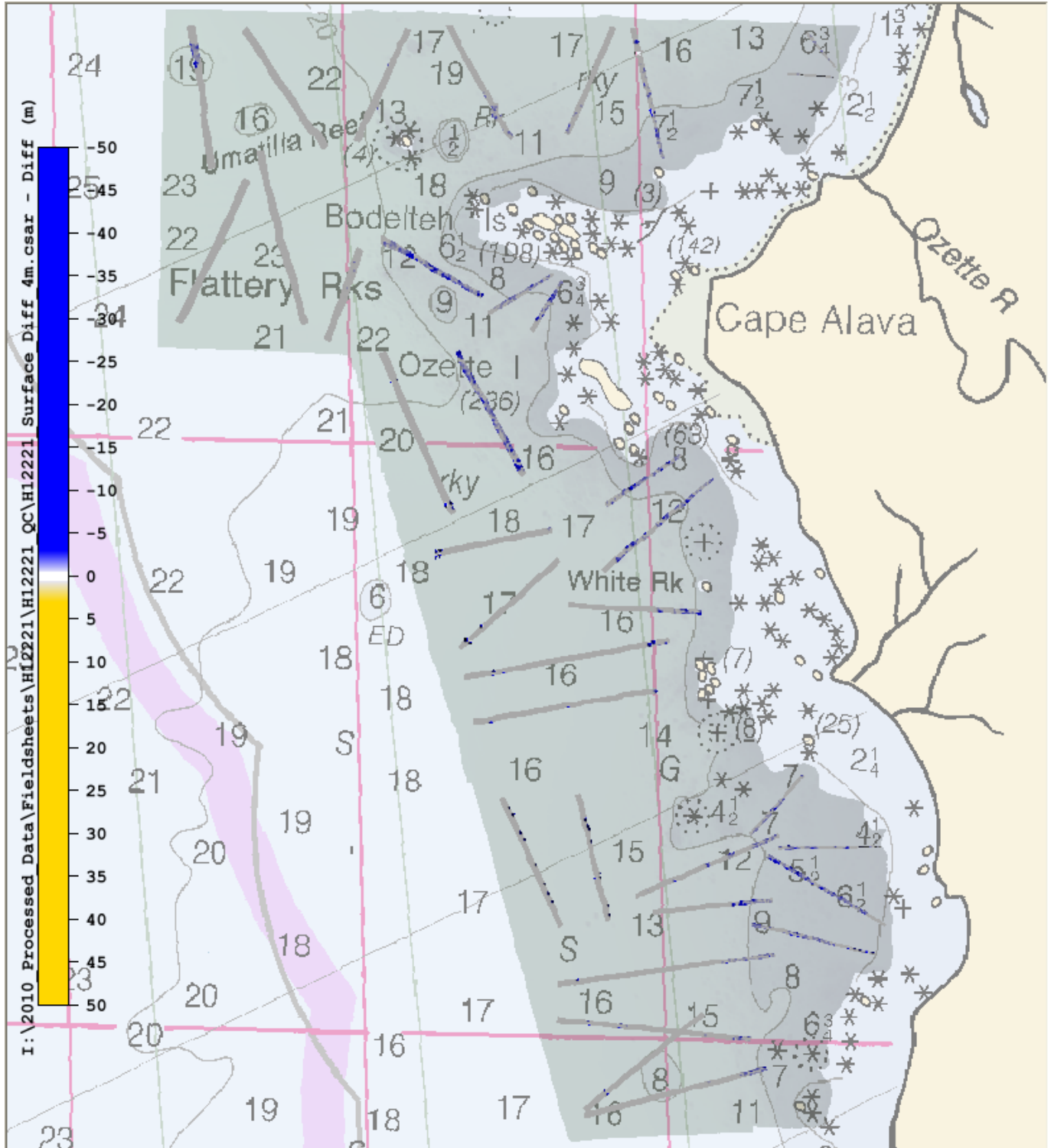


Figure 2: Crossline and main scheme differences (white indicates agreement, warm colors indicate XLs shoaler than mainscheme and cool colors indicate XLs deeper than main scheme).

Surface differencing in CARIS BathyDataBASE was used to assess crossline agreement with mainscheme lines. Figure 2 depicts a difference surface between a 4-meter finalized, combined surface made with mainscheme lines only and a 4-meter finalized, combined surface made with crosslines only. A 1-meter resolution crossline surface was also differenced with a 1-meter mainscheme surface. Both difference surfaces are submitted digitally in the Separates IV folder. Crosslines generally agree with mainscheme lines within the total allowable vertical and horizontal uncertainty for the depth of water in their common areas. Those areas with excessive differences (at least 1-3 meters) were examined in Subset Editor and have been determined to be caused by acoustic shadow holidays. Due to the dynamic nature of the seafloor, the crosslines were more likely to have acoustic shadows on the backside of rocks; whereas the mainscheme coverage was obtained with significant overlap between swaths to prevent acoustic holidays. Crosslines were deeper than mainscheme in the majority of the instances of disagreement, which also supports the Hydrographer's determination that the crossline coverage was less complete due to features hidden in acoustic shadows.

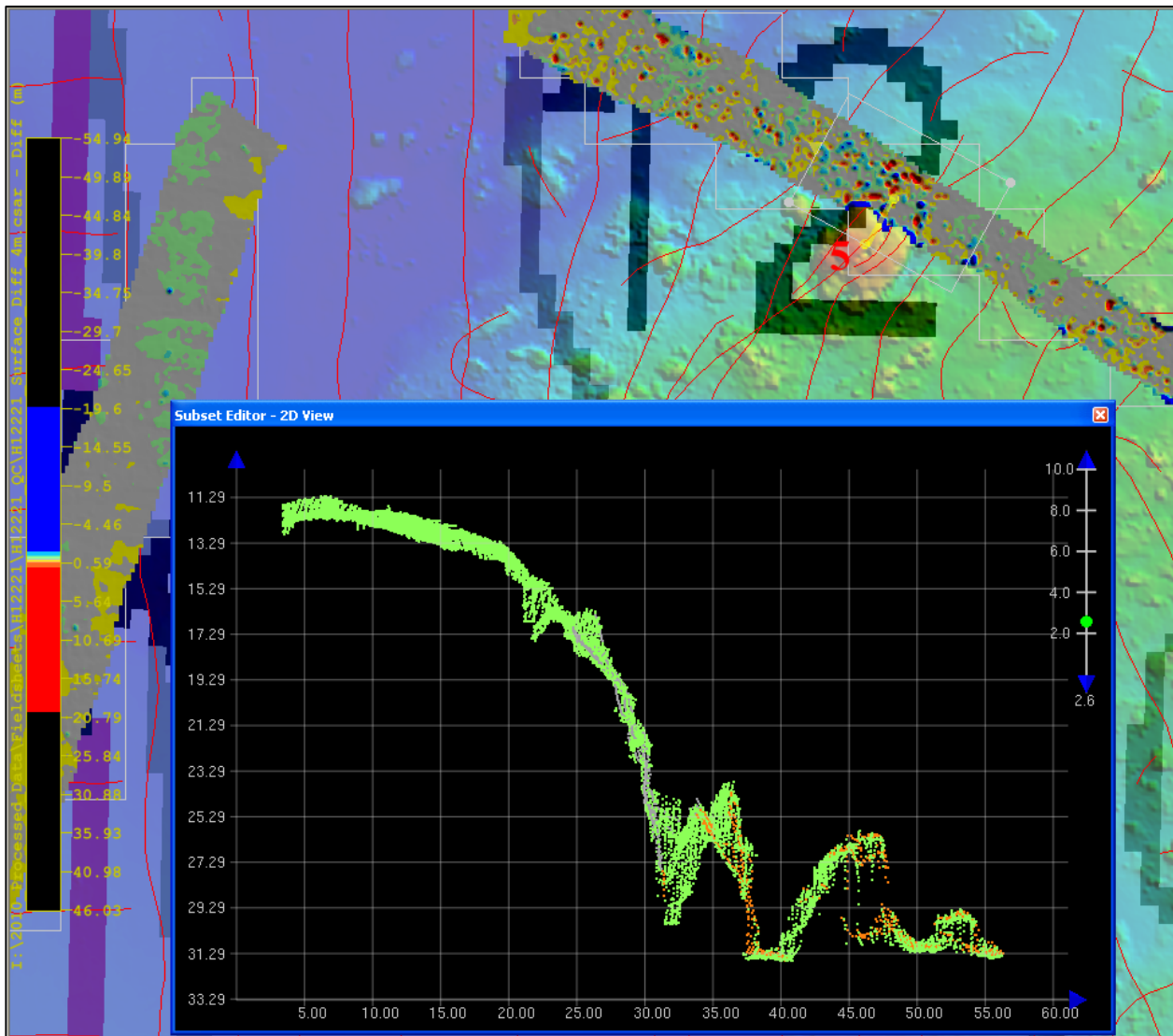


Figure 3: Crossline disagreement area (Caris HIPS 2-D Subset Editor) (XL Soundings are orange, MS are green)

B.2.2. Junctions

Survey H12221 junctions with H12219, H12220, H12222, and H12223, which are all of the same project¹. The area of overlap between the sheets was reviewed in CARIS Subset Editor for consistency and data were found to be in agreement within the total allowable vertical and horizontal uncertainty in their common areas (generally less than one meter difference). The sheet limits and area of overlap for sheets H12219, H12220, H12221, H12222, and H12223 is shown in Table 3.

Junction Survey	Survey Scale	Date of Survey	Survey Location
H12219	20000	20100602-20100622	Point of Arches
H12220	20000	20100603-2010629	NW Offshore Portion of Cape Flattery
H12222	20000	20100607-20100622	Central Offshore Portion of Cape Flattery
H12223	20000	20100622-20100629	Southern Offshore Portion of Cape Flattery

Table 3: Junction Surveys

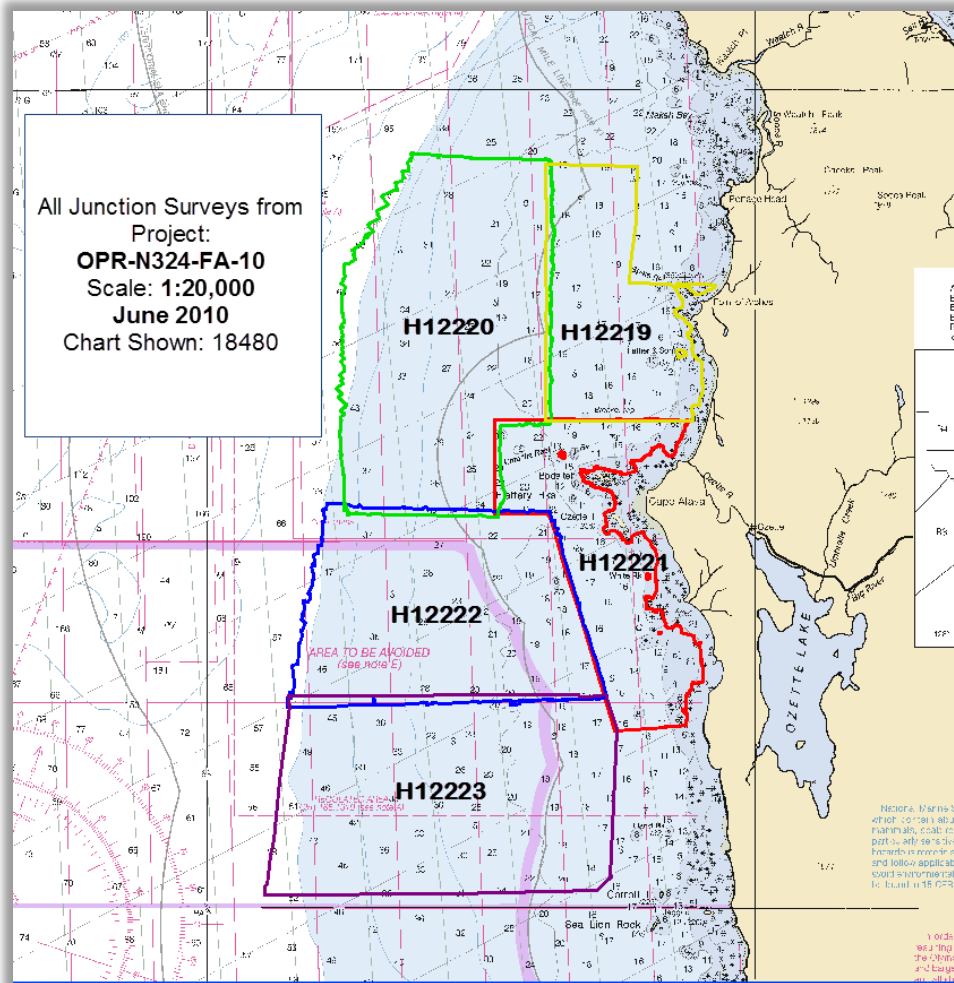


Figure 4: Junction between H12219, H12220, H12221, H12222, H12223.

B.2.3. Quality Control Checks

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

B.2.4. Data Quality Factors

The MBES data collected using the Reson 7125 400 kHz projector on launch 2807 on DN 174 and DN 175 were extraordinarily noisy. Figure 5 (below) illustrates the type of noise created by launch 2807 on these days. Recalibration (also known as acoustic normalization within the Reson 7K Center software) of the Reson 7125 400kHz solved the issue and improved the quality of the subsequent data collected using this sonar. Because this noise was found in all beams, depths, and qualities of soundings, intensive subset editing and swath editing was required to “clean” these data.

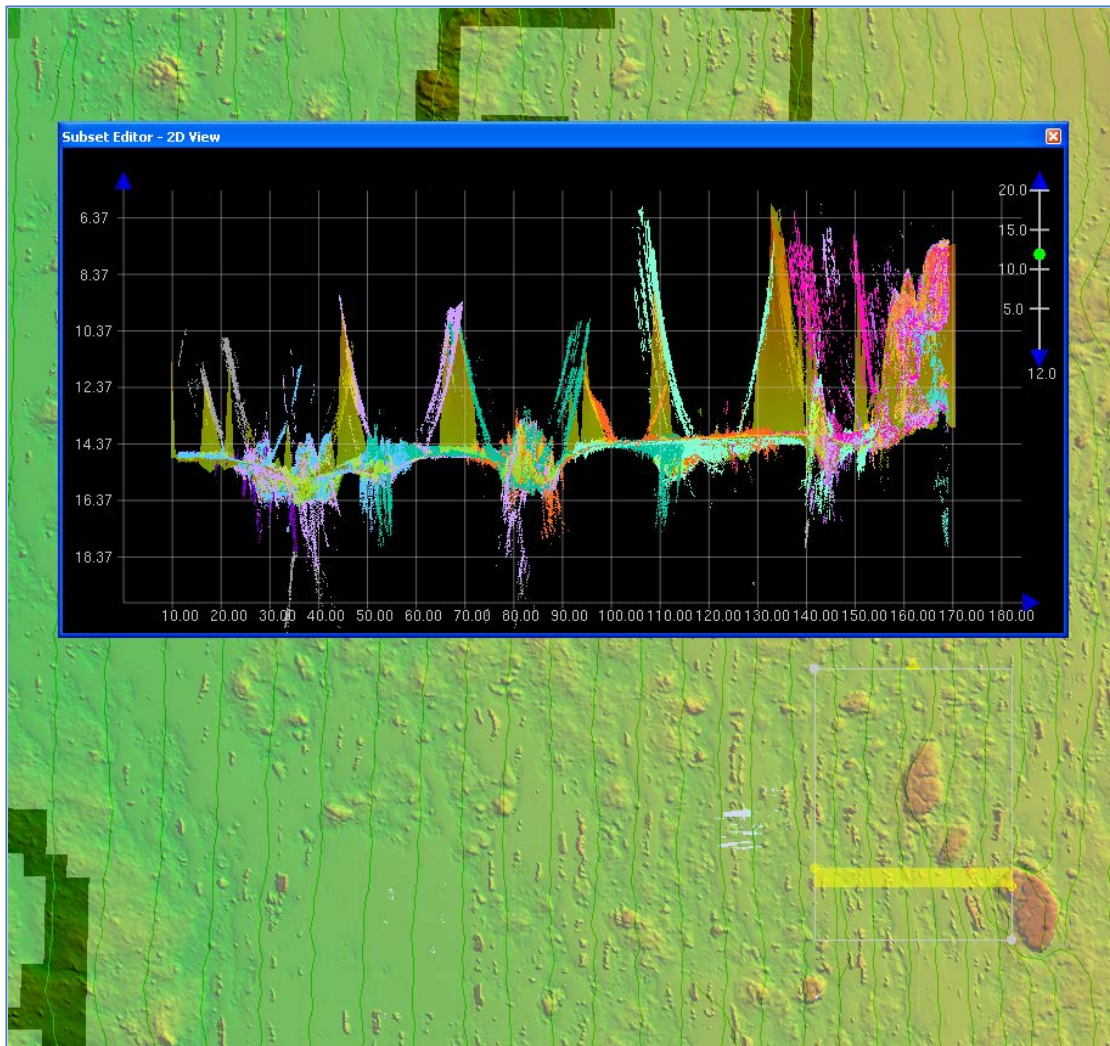


Figure 5: MBES Data from 2807 400 kHz, DN 174 (colored by line in CARIS HIPS 2D Subset Editor) prior to cleaning.

COVERAGE ASSESSMENT

Complete multibeam coverage was obtained within the limits of H12221. For holidays larger than three surface grid nodes, the corresponding multi-beam backscatter side scan was examined and no navigationally significant items were found. The least depths of all navigationally significant features are represented by H12221.

TRUEHEAVE

TrueHeave was applied to all MBES data for survey H12221. To enable the application of TrueHeave some POS/MV TrueHeave 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: Dn 163 and Dn 174,
- Launch 2806: Dn 160 (One line only)
- Launch 2808: Dn 174 and Dn 175

CRITICAL 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. There are a total of forty-six (46) designated soundings and seven (7) outstanding soundings contained within H12221. Of these designated soundings, eight (8) were submitted as DTONS². The remainder of the designated soundings (38) were designated to accurately preserve shoal depths in the surfaces³. Submerged features were flagged outstanding and imported into CARIS Notebook and attributed as features addressed by MBES.

UNUSUAL CONDITIONS

The presence of large schools of bait fish was also reflected in the MBES data. In some cases, as seen in Figure 6 below, the “bait balls” were dense enough to shield the bottom from the echosounder, creating an acoustic shadow holiday.

The rocky nature of the bottom frequently required the “half-stepping” method of MBES surveying, where the launch operates along the outer edge of its previous swath of coverage to ensure coverage of submerged features and to provide safer operating conditions near shore.

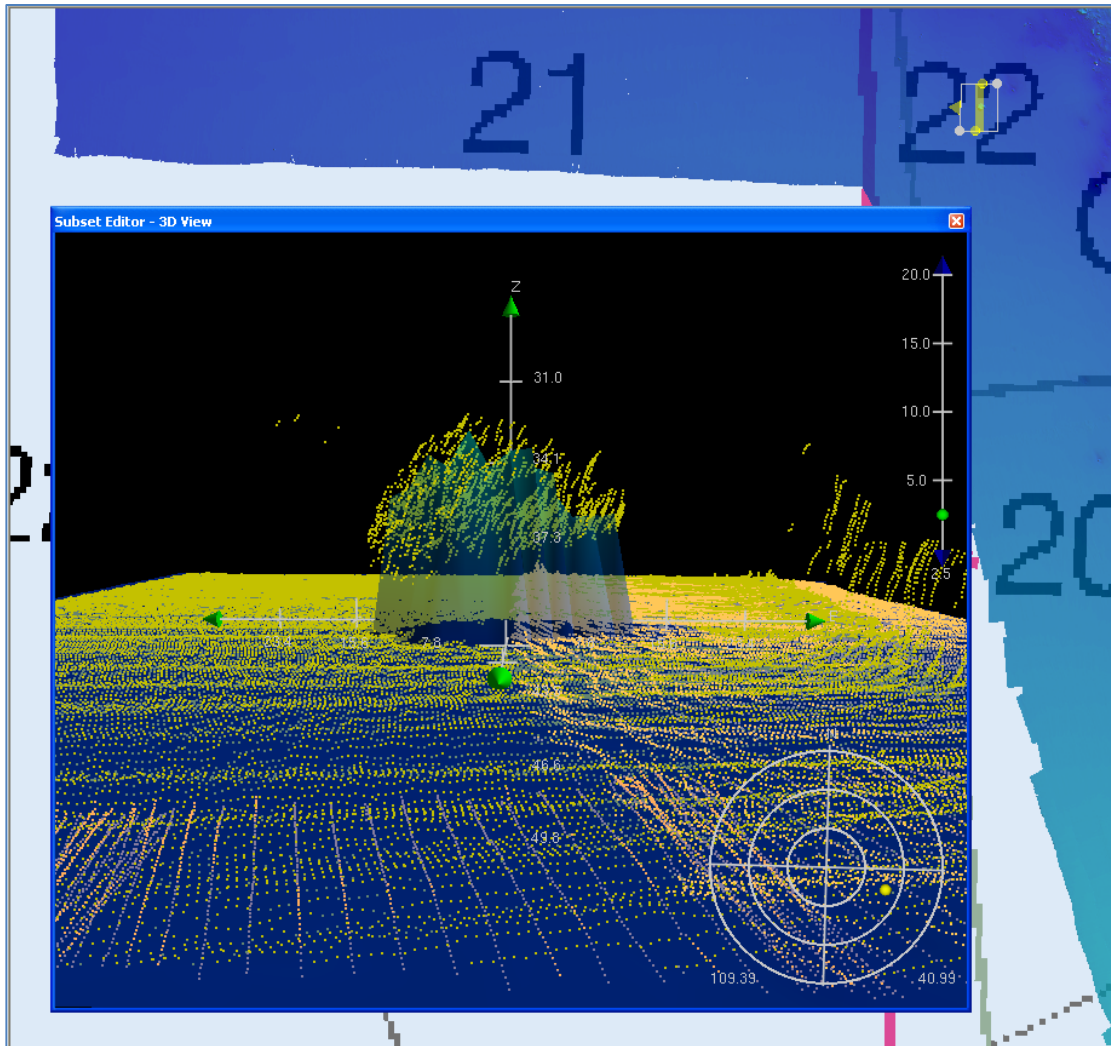


Figure 6: Baitfish observed in CARIS HIPS 3-D subset editor.

B.2.5. Accuracy Standards

Only IHO Order 1 uncertainty tolerances are applicable to MBES data collected within H12221. Fledermaus statistics indicate that the computed total propagated uncertainty of 99.64% of the nodes of the finalized 1-meter CUBE surface (finalized from 0 to 22 meters) are less than the total vertical uncertainty (TVU). The same statistic for the 2-meter and 4-meter finalized surfaces are greater than 99.99%. Surface statistics were derived from IHO surfaces exported from CARIS HIPS to ASCII that were imported into Fledermaus.

Nearly all of the nodes with uncertainties outside of IHO Order 1 tolerance are in depths of less than 22 meters. The roughest terrain was also found in these depths, which the Hydrographer believes to be the source of the high uncertainty among certain soundings. See Figure 7, which shows the IHO status of shallow-water soundings collected over a rocky seafloor.

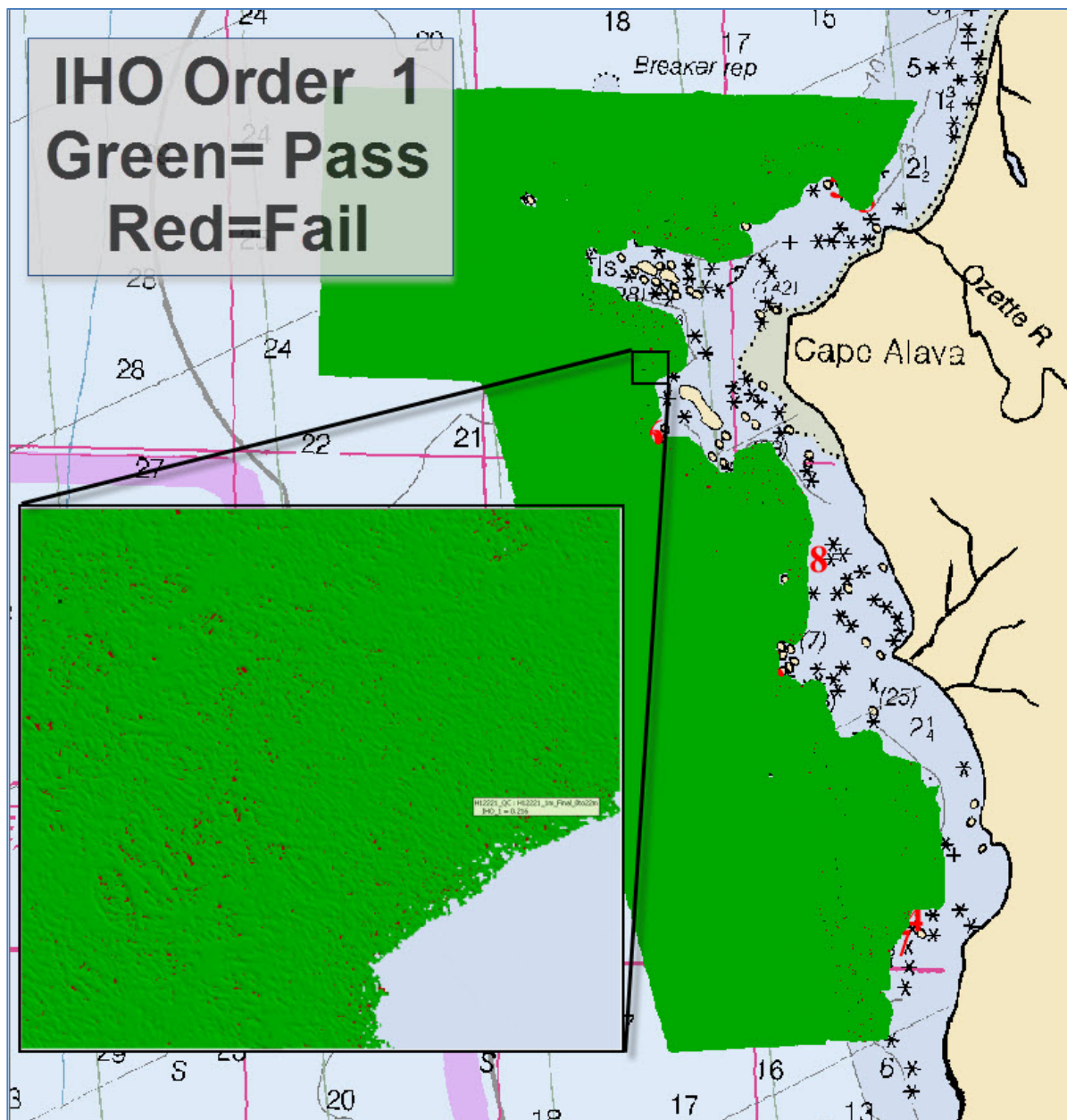


Figure 7: Finalized surfaces showing IHO Order 1 surface (green indicates uncertainty less than allowed TVU, red indicates uncertainty higher than allowed TVU).

B.3. Corrections to Echo Soundings

Data reduction procedures for survey H12221 conform to those detailed in the DAPR except where noted in this report.

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 H12221 Data Log spreadsheet. All data logs are submitted digitally in the Separates I folder.

Data processing procedures for survey H12221 conform to those detailed in the DAPR. Data were processed initially using CARIS HIPS & SIPS v7.0, Service Pack 1 (Hotfixes 4 and 5), 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 H12221, processing computer systems were updated to CARIS HIPS & SIPS v7.0, Service Pack 2, and Hotfix 3. The finalized and combined surfaces were created using Beta HF4 to force designated soundings to be honored in the finalized surfaces (see CARIS HelpDesk Request ID 01002900). 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.

TPE VALUES:

The survey specific parameters used to compute TPE in CARIS for H12221 are listed in Table 4.

Tide values:	Measured	0.01 m	Zoning	0.10 m
Sound Speed Values:	Measured	1.00 m/s	Surface	0.50 m/s

Table 4: Survey Specific CARIS TPE Parameters

CUBE SURFACES:

The CARIS HIPS BASE (Bathymetry Associated with Statistical Error) surfaces delivered with H12221 and their associated resolutions are listed in Table 5⁴. All field sheet extents were 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, and four meters. The NOAA CUBE parameters mandated by the 2010 HSSD were used for the creation of all CUBE BASE surfaces in H12221.

Fieldsheet Name	Surface Name	Depth Ranges (m)	Resolution (m)
H12221	H12221_2m	All	2
	H12221_4m	All	4
	H12221_2m_20to44	20-44	2
	H12221_4m_40to88	40-88	4
	H1221_Ellipsoid_4m	All	4
	H12221_4m_Combined	All	4
	H12221_A	H12221_A_1m	0-115
	H12221_A_1m_Final_0to22	0-22	1
	H12221_B	H12221_B_1m	0-47
	H12221_B_1m_Final_0to22	0-22	1

Table 5: Surfaces, Depth Ranges, Resolutions

ELLIPSOIDALLY-REFERENCED SURFACES:

A single 4-meter ellipsoidally-referenced surface is submitted with H12221 for experimental and evaluation purposes as part of the Office of Coast Survey's initiative to survey to the ellipsoid. This surface was created while the soundings were reduced to the ellipsoid after merging with "GPS Tides" applied in CARIS HIPS as described in the DAPR. After the ellipsoidal surface was created, the soundings were referenced back to MLLW during the CARIS merge process by unselecting the "Apply GPS tide" option. The traditional MLLW-vertically referenced finalized surfaces were then created as described in the DAPR according to the HSSD and FPM. The ellipsoidal surface appears out of date because the soundings used to create them have been moved back to MLLW.

The submitted 4-meter ellipsoid surface exhibits notable systematic offsets due to computed vessel altitude exceeding two meters in some locations. Offsets of this nature can be found on the following lines when reduced to the ellipsoid:

- DN 178 vessel 2805 Lines 2010X_17811649, 2010X_1781652, 2010X_1781711, 2010X_1781721 for Reson 7125 400kHz.
- DN 173 vessel 2807 Lines 7125 2010M_1731831 for Reson 7125 400kHz
- DN 175 vessel S220 Lines 2010M_1751859 for Reson 7111 & Reson 8160

C. HORIZONTAL AND VERTICAL CONTROL

A complete description of horizontal and vertical control for survey H12221 can be found in the *OPR-N324-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 Fort Stevens, WA, (287 kHz) were used during real-time acquisition when not otherwise noted in the acquisition logs. The primary method of horizontal positioning of MBES soundings on H12221 was Post-Processing Kinematic (PPK) using Applanix POSPac software with Single Base processing, utilizing the station Neah Bay AF9672.

Smoothed Best Estimate of Trajectory (SBET) files were created using the Single Base method. The SBET files and their associated error files (SMRMSG) files were applied to the CARIS HDCS data in HIPS & SIPS for improved vessel kinematic accuracy. All SBET and SMRMSG files applied to all HDCS lines without any errors.

For further detail regarding the processing and quality control checks performed see the H12221 POSPAC Processing Log spreadsheet located in the SBET folder with the GNSS (Global Navigational Satellite System) Data. See also the *OPR-O324-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 LaPush, WA, (9442396) served as control for datum determination and as the primary source for water level correctors for survey H12221. No subordinate water level stations were required for this project.

Water level corrections were applied to data using Discrete Tidal Zoning.

A request for delivery of final, approved tides for survey H12221 was forwarded to N/OPS1 on June 28, 2010 in accordance with the FPM. A copy of the request is included in Appendix IV. On July 7, 2010, preliminary zoning was accepted as final zoning in the Final Tide Note.

As per the Project Instructions, all data were reduced to MLLW using final, approved water levels from the LaPush, WA station (9442396) by applying tide file 9442396.tid and time and height correctors through the preliminary zone corrector file N324FA2010CORP.zdf⁵. **It will not be necessary for the Hydrographic Branch to reapply the final approved water levels 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 and CARIS HIPS and SIPS software programs.

Survey H12221 was compared with the following charts listed in Table 6⁶.

NOAA Chart Number	Chart Scale	Edition Number	Edition Date	Updated with Notice to Mariners through
18485	1:40,000	16 th Ed.	May 2007	July 27, 2010
18480	1:176,253	31 st Ed.	October 2006	September 19, 2010
18460	1:100,000	13 th Ed.	October 2006	September 10, 2010

Table 6: NOAA Charts Compared with Survey H12221

D.1.1. Chart 18460

SOUNDING COMPARISON:

Soundings generally agree with previously charted (18460) depths within one to two fathoms⁷. Significant differences between surveyed soundings and charted soundings were found in small, isolated groups, and mainly attributed to offshore underwater rocks that were not previously charted⁸. Eight (8) Dangers to Navigation (DTON) were submitted which represented navigationally significant new or repositioned rocks found by MBES⁹. See Figure 8 for examples of uncharted rocky areas.

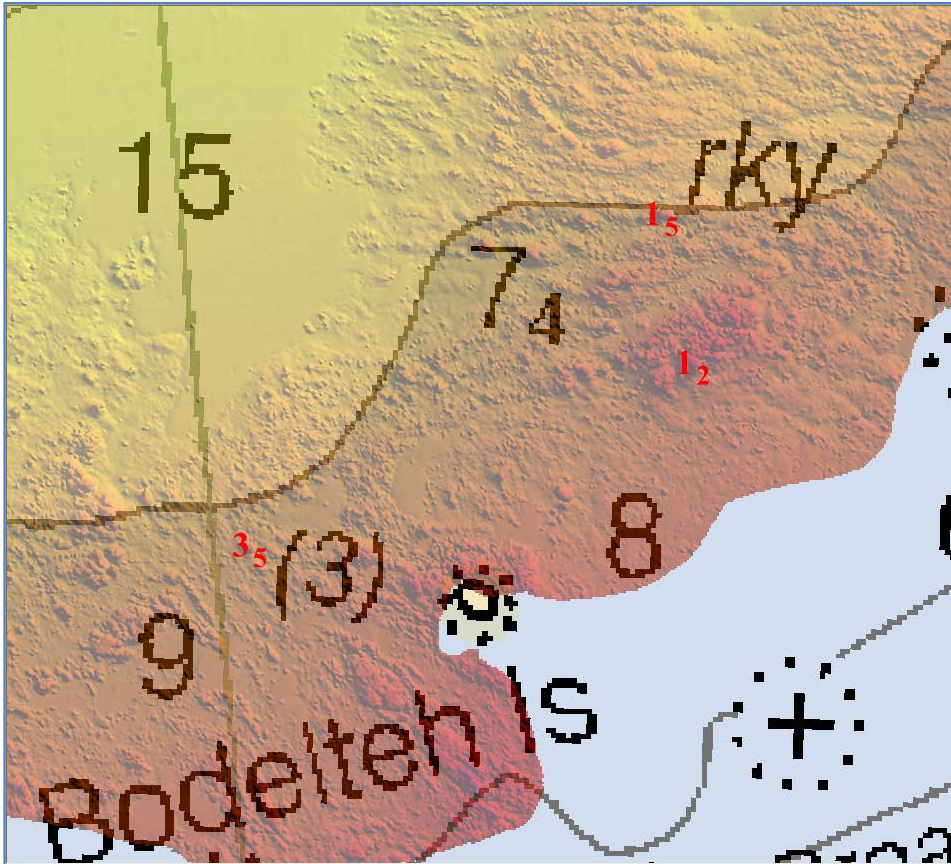


Figure 8: Surveyed soundings of uncharted rocks.

CONTOUR COMPARISON:

Depth contours generally agree with previously charted (18460) contours with the following exception:

The 20 fathom contour has shifted south by approximately 0.5 nautical miles in the area directly west of Ozette Island (Figure 9.)

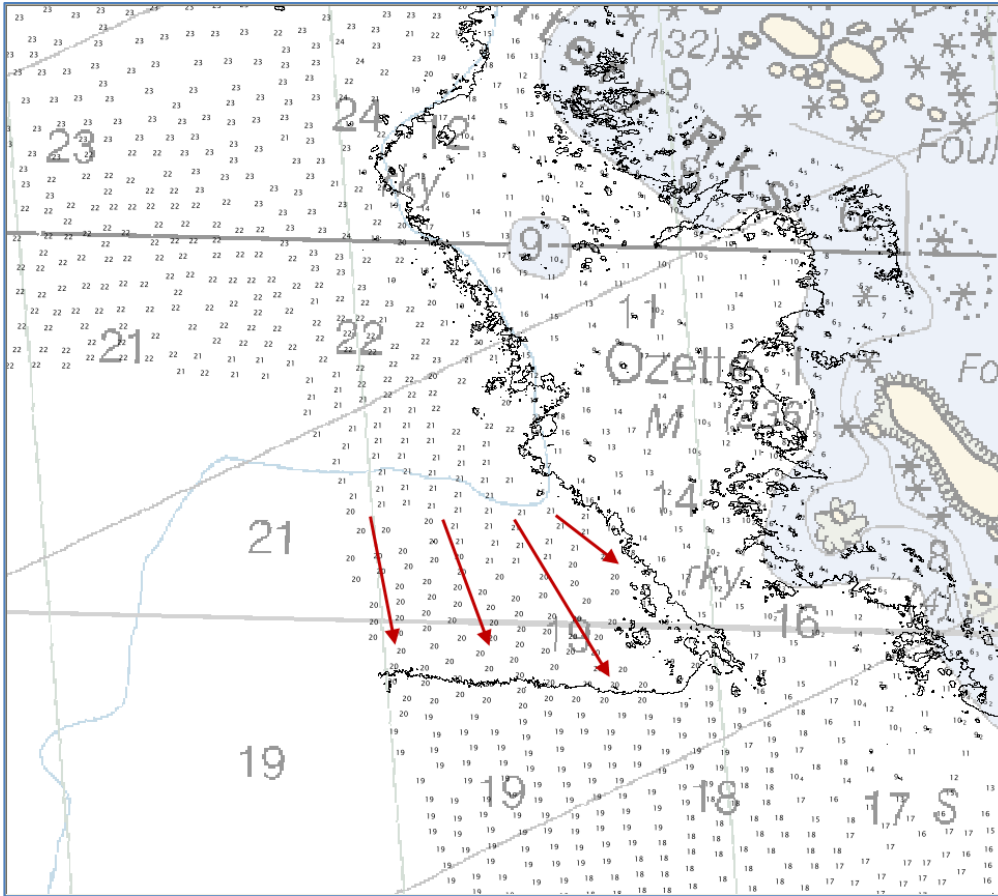


Figure 9: Contour shift

TREND COMPARISON:

Charted soundings and contours are generally accurate¹⁰.

D.1.2. 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 H12221 are adequate to supersede prior surveys in their common areas.**

Survey H12221 is within a charted Regulated Navigation Area and a charted Area To Be Avoided (ATBA). The charted Regulated Navigation Area corresponds with the restrictions on traffic for Vessel Traffic Services (VTS) coverage. Detailed description of VTS area extents and regulations can be found in 33 CFR Part 161, the Coast Pilot, and the applicable VTS User's Guide. The ATBA corresponds with the Olympic Coast National Marine Sanctuary, which is closed to transit for vessels over 1600 Gross Tons, carrying hazardous cargoes, or carrying oil. Detailed description of Sanctuary extents and regulations can be found in 15 CFR Part 922 and in the Coast Pilot. See notes A, D, E, F, G and H on chart 18485.

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

There were no assigned AWOIS items located within the limits of H12221; however, a DTON found north of Flattery Rocks is very likely related to a disproven AWOIS item numbered 53141 within the sheet limits of sheet H12219. The AWOIS “anti-DTON” was submitted under H12219 and the new rock believed to be associated with the charted ‘Reported Breaker’ was submitted as a DTON during the course of survey H12221 (Figure 10).

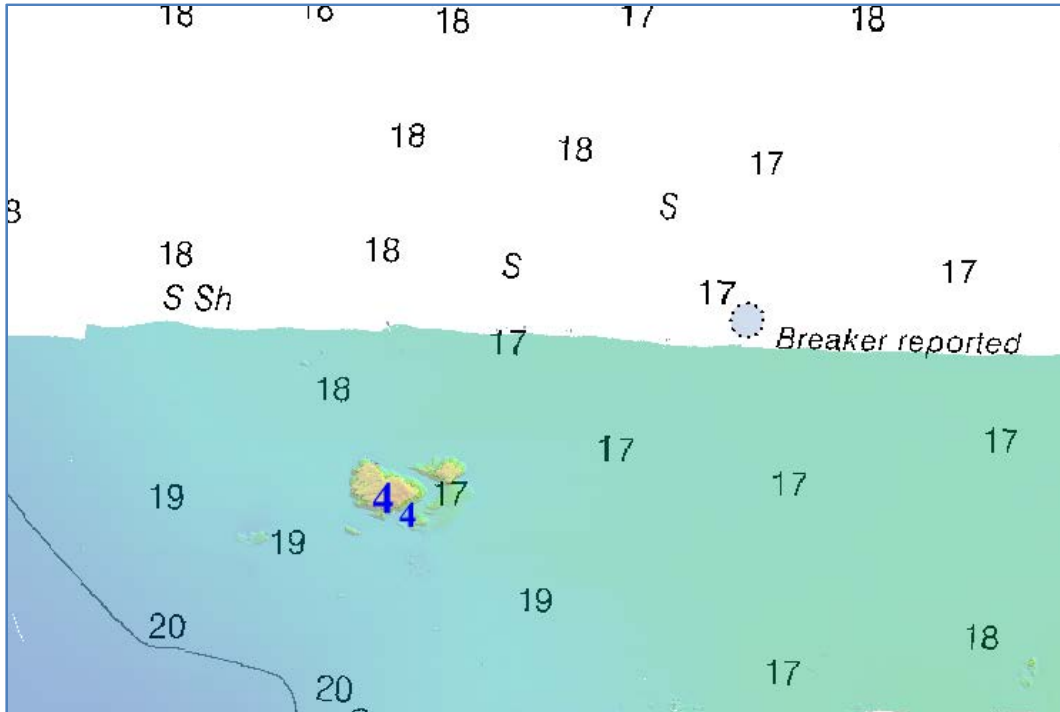


Figure 10: DTON believed to be AWOIS 53141

D.3. Dangers to Navigation

Eight (8) dangers to navigation (DTONs) were found within the limits of H12221, and were reported to the Marine Chart Division, in two separate reports, sent on June 14, 2010, and July 13, 2010. Copies of the DTON Reports are included in Appendix I and the email correspondence regarding each are included in Appendix V¹¹.

D.4. Additional Results

D.4.1. Shoreline Verification

Due to heavy seas and surf nearshore, limited shoreline verification as described in the FPM was not conducted during H12221. All addressed features were delineated or disproven exclusively by MBES.

D.4.2. Shoreline Data Processing

Feature processing procedures were followed as outlined in the DAPR.

D.5. Source Shoreline Changes, New Features and Charted Features

In accordance with section 4.4.10 of the FPM, field notes made by the Hydrographer were provided in the feature's Remarks field. When appropriate, recommendations to the Cartographer were included in the Recommendations field. Some charted islets and MLLW lines throughout the survey area are in conflict with hydrography. In all instances, these disagreements are properly represented and documented in the H12221_Final_Feature_File.hob file.

D.5.1. Shoreline Recommendations

The Hydrographer recommends that the features depicted in the CARIS Notebook files and final sounding files supersede and complement offshore feature information compiled on the CSF and charts¹².

D.6. Aids to Navigation

There were no aids to navigation within the survey limits.

D.7. Overhead Features

There are no overhead features within the limits of survey H12221.

D.8. Submarine Cables and Pipelines

There are no submarine cables or pipelines charted within the limits of H12221, and none were detected during the survey.

D.9. Ferry Routes

There are no ferry routes charted within the limits of survey H12221, and ferries were not observed operating within the survey area.

D.10. Bottom Samples

Bottom samples were not collected during H12221. There are future plans for Olympic Coast National Marine Sanctuary personnel to conduct extensive bottom sampling for use in ground truthing backscatter mosaics derived from the MBES data acquired during OPR-N324-FA-10. It is recommended that charted (18480) bottom samples be retained¹³.

D.11. Supplemental Reports

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 2010	April 9, 2010	N/CS34
Data Acquisition and Processing Report 2010	August 15, 2010	N/CS34
Horizontal and Vertical Control Report for OPR-N324-FA-10	August 15, 2010	N/CS34
Coast Pilot Report for OPR-N324-FA-10	TBD	N/CS26



UNITED STATES DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration
NOAA Marine and Aviation Operations
NOAA Ship FAIRWEATHER S-220
1010 Stedman Street
Ketchikan, AK 99901

October 29, 2010

MEMORANDUM FOR: Gary Nelson
Chief, Pacific Hydrographic Branch

FROM: CAPT David O. Neander, NOAA 2010.11.06
Commanding Officer *David O. Neander* 10:24:20 -08'00'

TITLE: Approval of Hydrographic Survey H12221,
OPR-N324-FA-10

As Chief of Party, I have ensured that standard field surveying and processing procedures were adhered to during acquisition and processing of hydrographic survey H12221 in accordance with the Hydrographic Manual, Fourth Edition; Field Procedures Manual, April 2010; and the NOS Hydrographic Surveys Specifications and Deliverables, April 2010. Additional guidance was provided by applicable Hydrographic Technical Directives. These data are adequate to supersede charted data in their common areas. This survey is complete and no additional work is required. All data and reports are respectfully submitted to N/CS34, Pacific Hydrographic Branch.

I acknowledge that all of the information contained in this report is complete and accurate to the best of my knowledge.

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

David
Francksen

Digitally signed by David Francksen
DN: cn=David Francksen, o=NOAA,
ou=NOAA Ship FAIRWEATHER,
email=David.Francksen@noaa.gov, c=US
Date: 2010.10.29 19:06:18 Z

ST David T. Francksen
Survey Manager

Briana J. Welton

Digitally signed by Briana Welton
DN: cn=Briana Welton, o=NOAA Ship
Fairweather, ou=NOAA,
email=briana.welton@noaa.gov, c=US
Date: 2010.10.30 16:38:47 Z

LT Briana J. Welton
Field Operations Officer

Lynette V. Morgan

Digitally signed by
Lynette V. Morgan
Date: 2010.10.29 20:25:11 Z

CST Lynnette V. Morgan
Chief Survey Technician

Attachment



Revisions and Corrections Compiled During Processing and Certification

- ¹ A common junction was made with all the surveys listed, all of which have been compiled.
- ² All DTONs have been charted and are noted in the NINFOM field of the associated feature.
- ³ Designated soundings were compiled in the HCell as appropriate to scale and surrounding soundings.
- ⁴ A single combined surface H12221_Office_4m_Combined was created during the SAR and used for compilation.
- ⁵ See attached tide note dated July 7, 2010.
- ⁶ Chart 18485 (16th Ed., 3/01/2007), Chart 18480 (31st Ed., 10/01/2006) and chart 18460 (13th Ed., 10/01/2006) all corrected through NTM 7/09/2011, were used for comparison during compilation.
- ⁷ Concur with clarification. Inshore depths were significantly shoaler in many areas due to uncharted rocks and shoals. Chart according to HCell H12221.
- ⁸ See endnote 6.
- ⁹ All DTONs have been charted and are noted in the NINFOM field of the associated feature.
- ¹⁰ See endnote 6.
- ¹¹ All DTONs have been charted and are noted in the NINFOM field of the associated feature. The DTON report is attached.
- ¹² Concur with clarification. The final feature notebook file was used for the compilation of the survey during which features were modified to accommodate chart scale. Chart according to HCell H12221.
- ¹³ Fifteen bottom samples were retained from the chart.

H12221 Danger to Navigation Report

Registry Number: H12221
State: Washington
Locality: Olympic Coast National Marine Sanctuary
Sub-locality: Cape Alava
Project Number: OPR-N324-FA-10
Survey Date: 8 June, 2010

Survey H12221 in progress at time of initial DTON submission. All tides and positioning data are predicted/preliminary.

Charts Affected

Number	Edition	Date	Scale (RNC)	RNC Correction(s)*
18485	16th	03/01/2007	1:40,000 (18485_1)	[L]NTM: ?
18460	13th	10/01/2006	1:100,000 (18460_1)	[L]NTM: ?
18480	31st	10/01/2006	1:176,253 (18480_1)	USCG LNM: 03/02/2010 (04/27/2010) NGA NTM: 10/17/2009 (05/15/2010)
18400	48th	12/01/2008	1:200,000 (18400_1)	[L]NTM: ?
18003	20th	11/01/2006	1:736,560 (18003_1)	[L]NTM: ?
18007	33rd	02/01/2009	1:1,200,000 (18007_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.	Feature Type	Survey Depth	Survey Latitude	Survey Longitude	AWOIS Item
1.1	Rock	8.55 m	48° 11' 44.1" N	124° 46' 57.2" W	---
1.2	Rock	2.56 m	48° 11' 12.0" N	124° 44' 08.9" W	---

1 - Danger To Navigation

1.1) 1332/342

DANGER TO NAVIGATION

Survey Summary

Survey Position: 48° 11' 44.1" N, 124° 46' 57.2" W
Least Depth: 8.55 m (= 28.04 ft = 4.673 fm = 4 fm 4.04 ft)
TPU (±1.96σ): **THU (TPEh)** ±0.982 m ; **TVU (TPEv)** ±0.254 m
Timestamp: 2010-160.22:45:52.331 (06/09/2010)
Survey Line: h12221 / fa_2806_400khz_rsn7125_512bms_2010 / 2010-160 / 2010m_1602241
Profile/Beam: 1332/342
Charts Affected: 18485_1, 18460_1, 18480_1, 18400_1, 18003_1, 18007_1, 531_1, 501_1, 530_1, 50_1

Remarks:

Rock shoaler than charted soundings.

Feature Correlation

Address	Feature	Range	Azimuth	Status
h12221/fa_2806_400khz_rsn7125_512bms_2010/2010-160/2010m_1602241	1332/342	0.00	000.0	Primary

Hydrographer Recommendations

Underwater rock is likely AWOIS item 53141 'Breaker rep' from chart (18480).

Cartographically-Rounded Depth (Affected Charts):

- 4 ½fm (18485_1, 18480_1, 18400_1, 18003_1, 18007_1, 530_1)
- 4fm 4ft (18460_1, 531_1)
- 8.5m (501_1, 50_1)

Feature Images

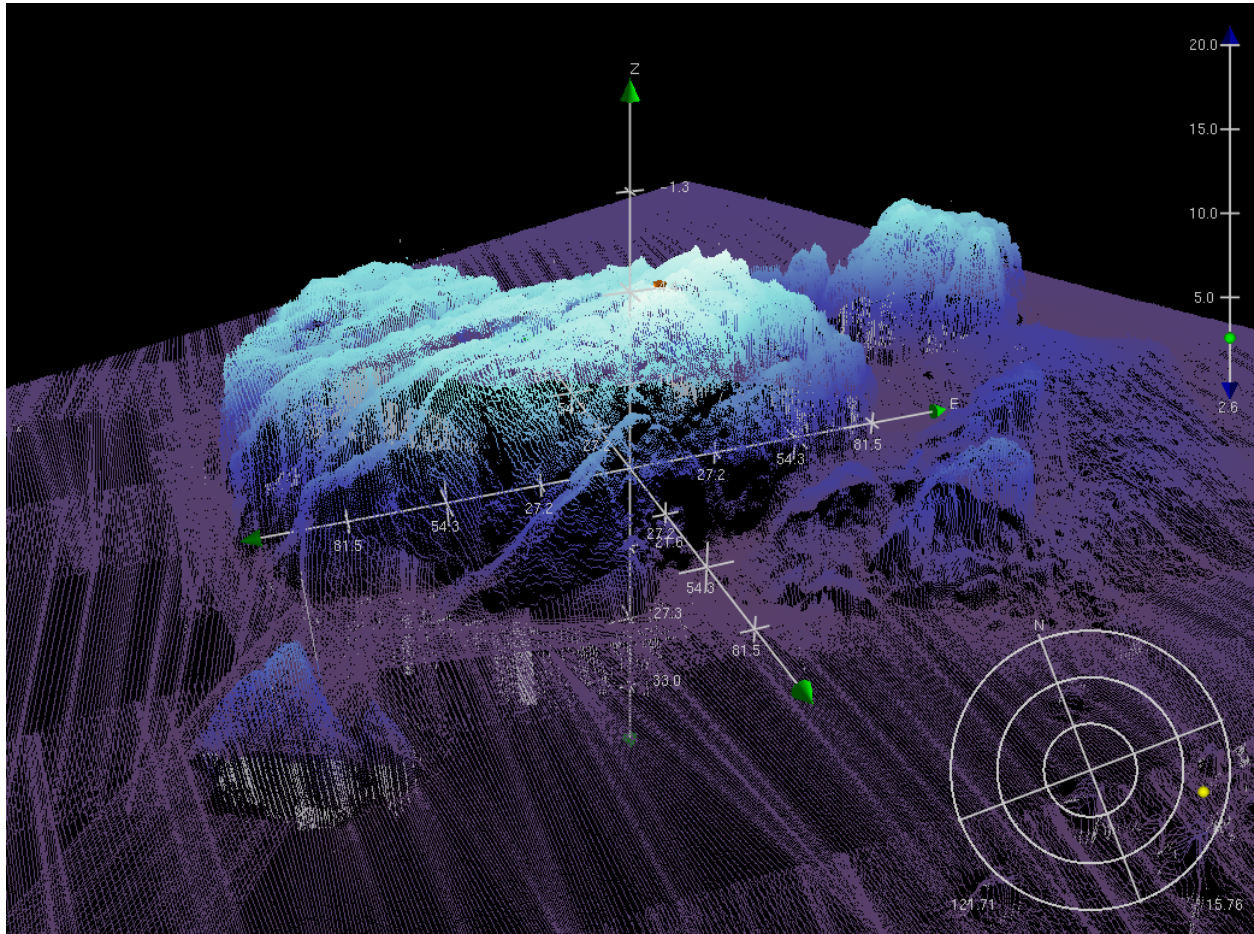


Figure 1.1.1

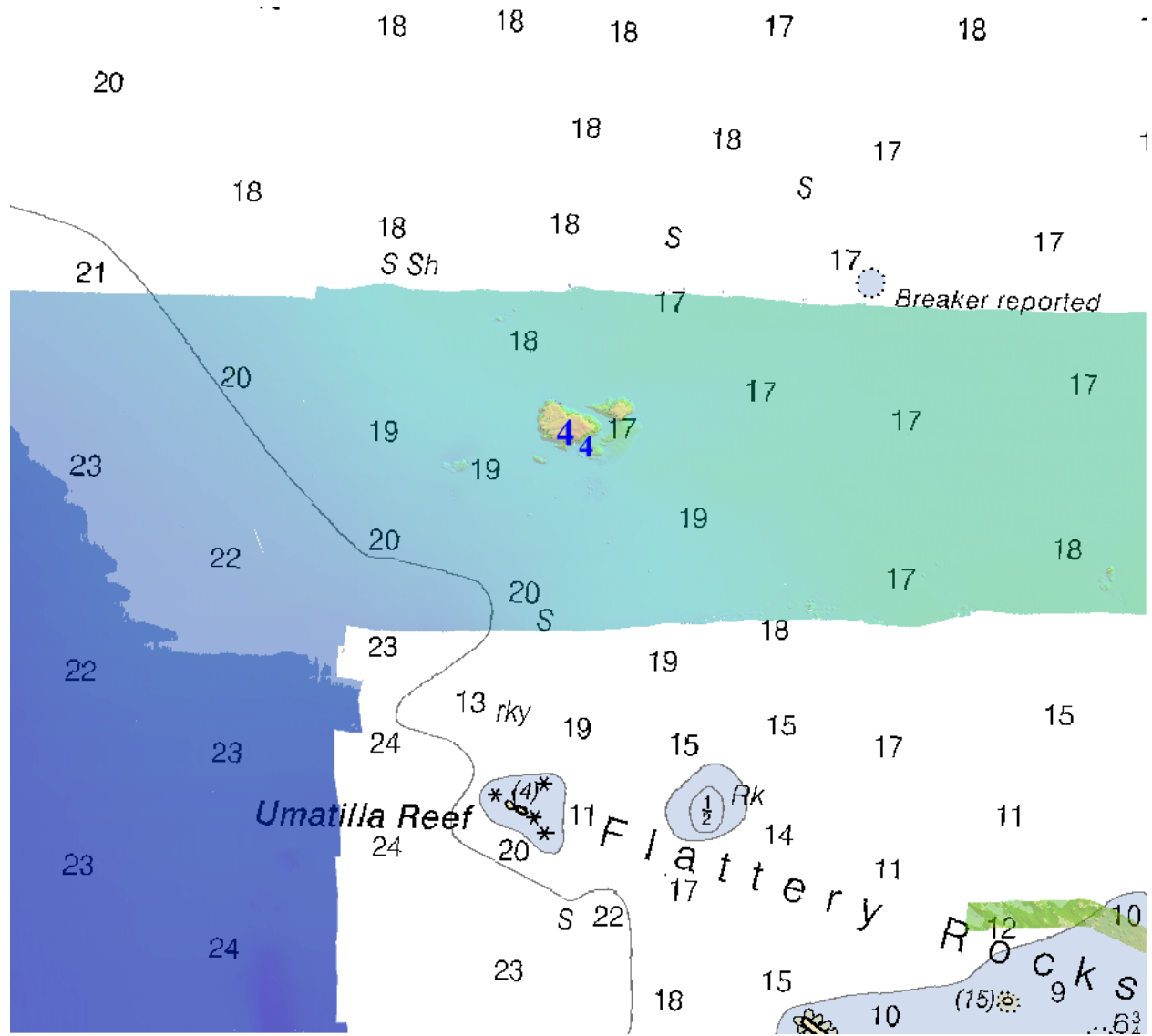


Figure 1.1.2

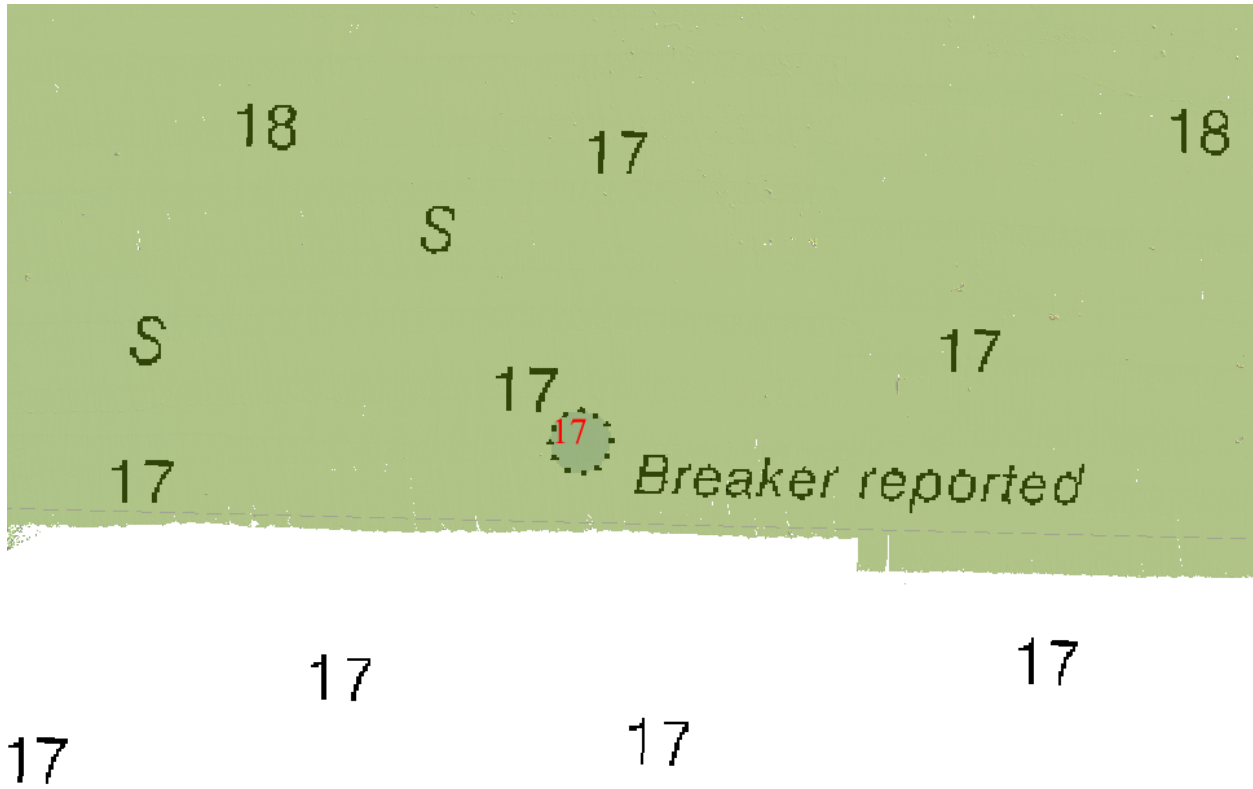


Figure 1.1.3

1.2) 385/512

DANGER TO NAVIGATION

Survey Summary

Survey Position: 48° 11' 12.0" N, 124° 44' 08.9" W
Least Depth: 2.56 m (= 8.41 ft = 1.401 fm = 1 fm 2.41 ft)
TPU ($\pm 1.96\sigma$): **THU (TPEh)** ± 0.982 m ; **TVU (TPEv)** ± 0.423 m
Timestamp: 2010-159.23:12:36.443 (06/08/2010)
Survey Line: h12221 / fa_2807_400khz_rsn7125_512bms_2010 / 2010-159 / 2010__1592312
Profile/Beam: 385/512
Charts Affected: 18485_1, 18460_1, 18480_1, 18400_1, 18003_1, 18007_1, 531_1, 501_1, 530_1, 50_1

Remarks:

Sounding on rock shoaler than charted depth.

Feature Correlation

Address	Feature	Range	Azimuth	Status
h12221/fa_2807_400khz_rsn7125_512bms_2010/2010-159/2010__1592312	385/512	0.00	000.0	Primary

Hydrographer Recommendations

[None]

Cartographically-Rounded Depth (Affected Charts):

1 ¼fm (18485_1, 18480_1, 18400_1, 18003_1, 18007_1, 530_1)
 1fm 2ft (18460_1, 531_1)
 2.6m (501_1, 50_1)

Feature Images

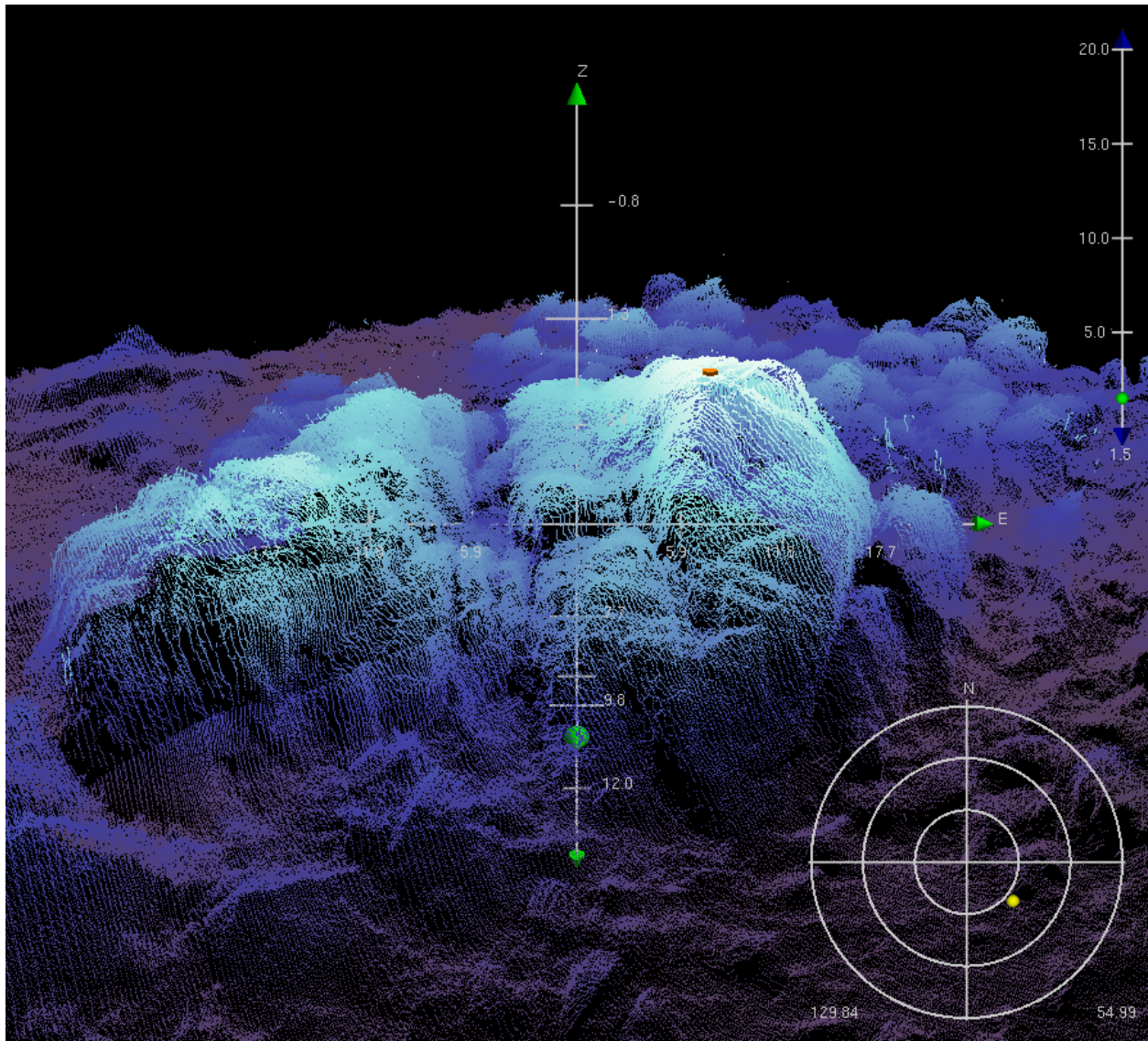


Figure 1.2.1

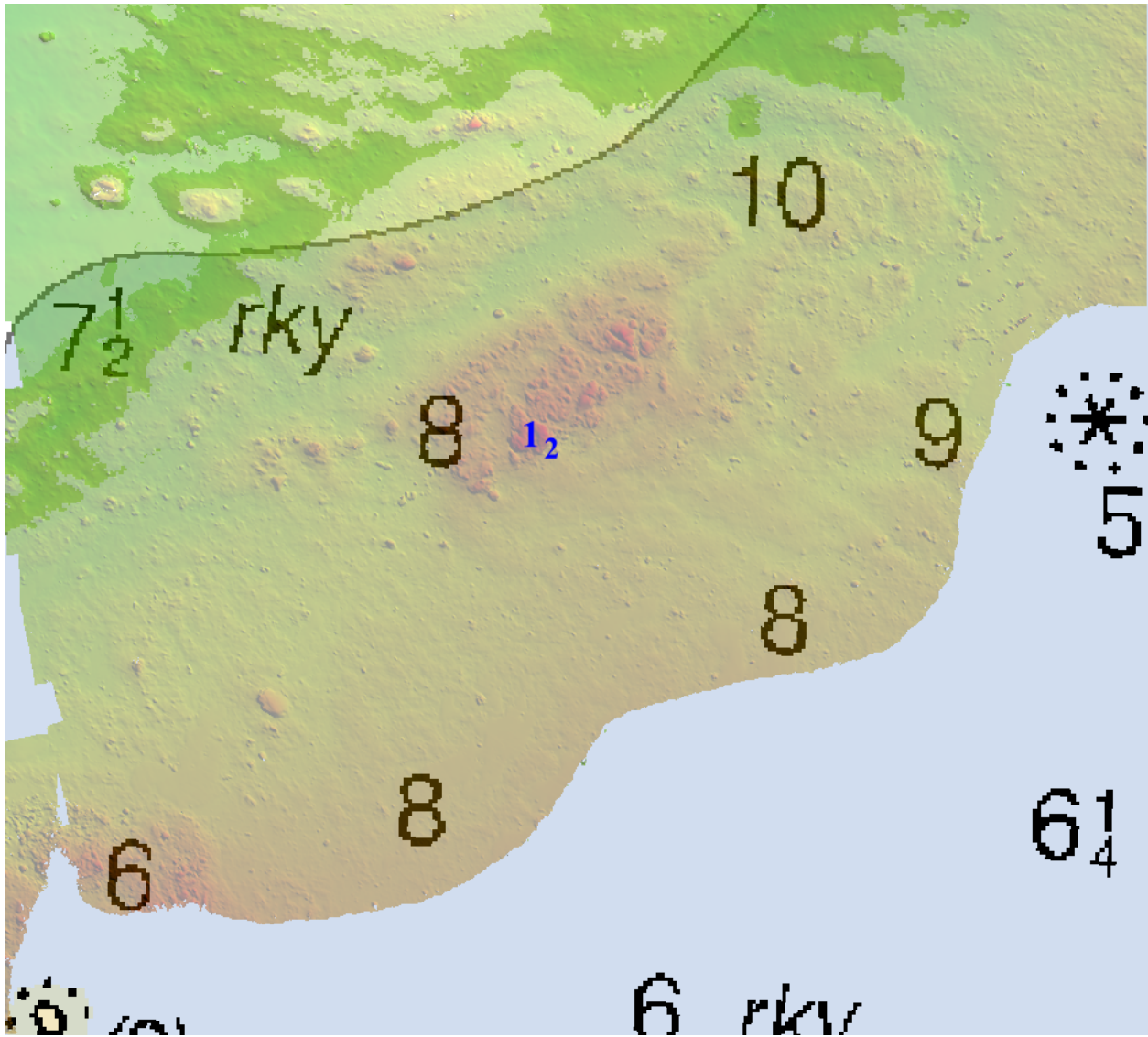


Figure 1.2.2

H12221 Danger to Navigation Report

Registry Number: H12221
State: Washington
Locality: Olympic Coast National Marine Sanctuary
Sub-locality: Cape Alava
Project Number: OPR-N324-FA-10
Survey Dates: 8 June, 2010 - 27 June, 2010

Verified tidal correctors were applied using the preliminary zoning file prior to submission of this report.

Charts Affected

Number	Edition	Date	Scale (RNC)	RNC Correction(s)*
18485	16th	03/01/2007	1:40,000 (18485_1)	[L]NTM: ?
18460	13th	10/01/2006	1:100,000 (18460_1)	[L]NTM: ?
18480	31st	10/01/2006	1:176,253 (18480_1)	USCG LNM: 03/02/2010 (04/27/2010) NGA NTM: 10/17/2009 (05/15/2010)
18400	48th	12/01/2008	1:200,000 (18400_1)	[L]NTM: ?
18003	20th	11/01/2006	1:736,560 (18003_1)	[L]NTM: ?
18007	33rd	02/01/2009	1:1,200,000 (18007_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.	Feature Type	Survey Depth	Survey Latitude	Survey Longitude	AWOIS Item
1.1	Rock	1.98 m	48° 08' 34.8" N	124° 43' 58.6" W	---
1.2	Rock	4.97 m	48° 10' 17.9" N	124° 47' 01.5" W	---
1.3	Rock	5.18 m	48° 07' 24.6" N	124° 44' 08.9" W	---
1.4	Rock	3.55 m	48° 11' 21.5" N	124° 44' 12.3" W	---
1.5	Rock	13.57 m	48° 05' 48.4" N	124° 45' 00.8" W	---
1.6	Rock	5.21 m	48° 06' 25.9" N	124° 44' 13.2" W	---

1 - Danger To Navigation

1.1) 243/399**DANGER TO NAVIGATION****Survey Summary**

Survey Position: 48° 08' 34.8" N, 124° 43' 58.6" W
Least Depth: 1.98 m (= 6.50 ft = 1.084 fm = 1 fm 0.50 ft)
TPU ($\pm 1.96\sigma$): **THU (TPEh)** ± 0.981 m ; **TVU (TPEv)** ± 0.246 m
Timestamp: 2010-163.23:02:44.933 (06/12/2010)
Survey Line: h12221 / fa_2805_400khz_rsn7125_512bms_2010 / 2010-163 / 2010m_1632302
Profile/Beam: 243/399
Charts Affected: 18460_1, 18480_1, 18400_1, 18003_1, 18007_1, 531_1, 501_1, 530_1, 50_1

Remarks:

Uncharted submerged rock.

Feature Correlation

Address	Feature	Range	Azimuth	Status
h12221/fa_2805_400khz_rsn7125_512bms_2010/2010-163/2010m_1632302	243/399	0.00	000.0	Primary

Hydrographer Recommendations

New soundings to supercede prior data.

Cartographically-Rounded Depth (Affected Charts):

1fm (18480_1, 18400_1, 18003_1, 18007_1, 530_1)

1fm 0ft (18460_1, 531_1)

2.0m (501_1, 50_1)

S-57 Data

Geo object 1: Underwater rock / awash rock (UWTROC)
Attributes: SORDAT - 20100627
 SORIND - US,US,graph,H12221
 VALSOU - 1.982 m

WATLEV - 3:always under water/submerged

Feature Images

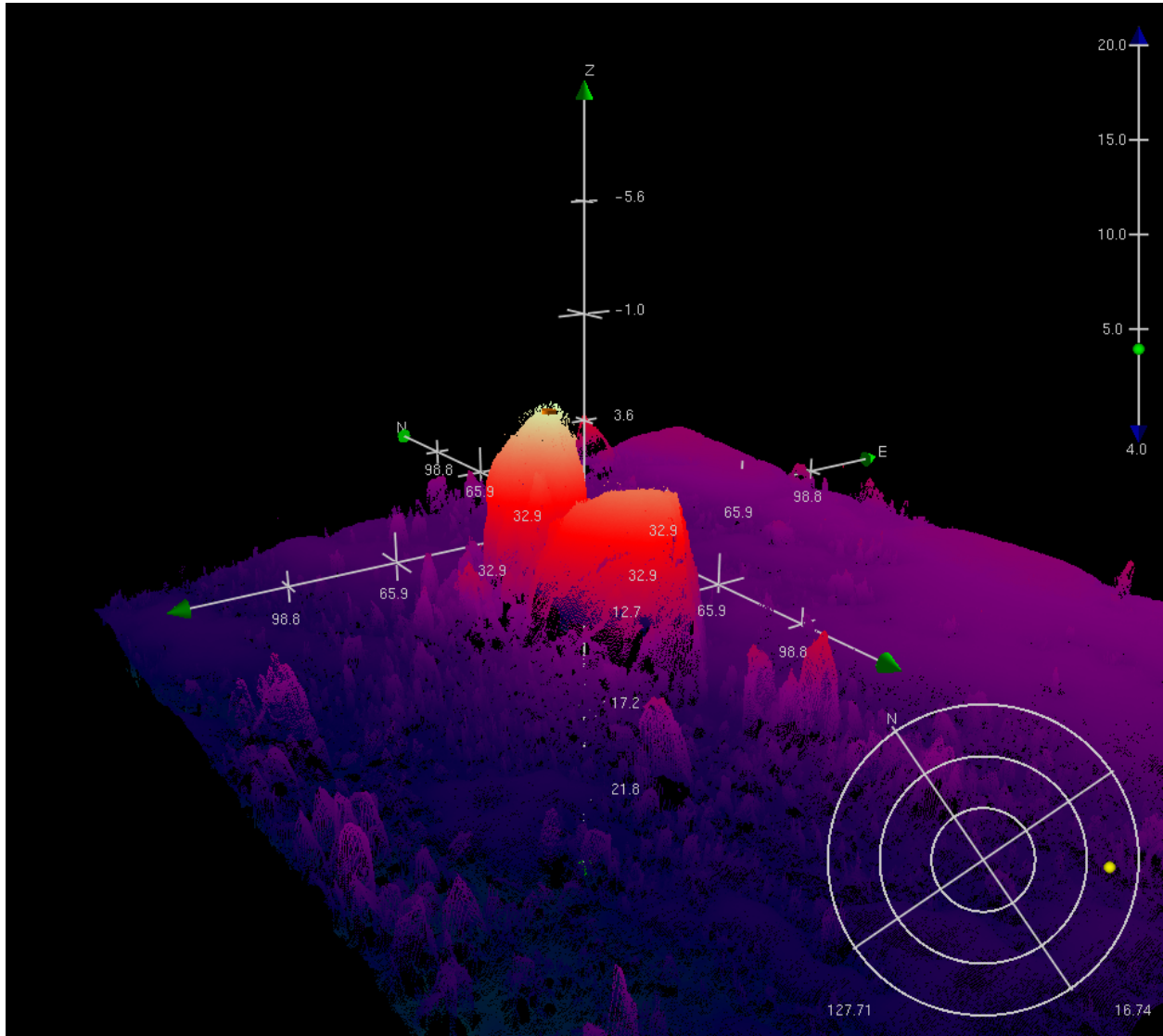


Figure 1.1.1

1.2) 615/41**DANGER TO NAVIGATION****Survey Summary**

Survey Position: 48° 10' 17.9" N, 124° 47' 01.5" W
Least Depth: 4.97 m (= 16.30 ft = 2.716 fm = 2 fm 4.30 ft)
TPU ($\pm 1.96\sigma$): **THU (TPEh)** ± 0.983 m ; **TVU (TPEv)** ± 0.423 m
Timestamp: 2010-163.17:14:46.871 (06/12/2010)
Survey Line: h12221 / fa_2807_400khz_rsn7125_512bms_2010 / 2010-163 / 2010m_1631712
Profile/Beam: 615/41
Charts Affected: 18485_1, 18460_1, 18480_1, 18400_1, 18003_1, 18007_1, 531_1, 501_1, 530_1, 50_1

Remarks:

Sounding on new rock shoaler than charted depth.

Feature Correlation

Address	Feature	Range	Azimuth	Status
h12221/fa_2807_400khz_rsn7125_512bms_2010/2010-163/2010m_1631712	615/41	0.00	000.0	Primary

Hydrographer Recommendations

Surveyed depths sufficient to supercede prior data.

Cartographically-Rounded Depth (Affected Charts):

2 ¾fm (18485_1, 18480_1, 18400_1, 18003_1, 18007_1, 530_1)

2fm 4ft (18460_1, 531_1)

5.0m (501_1, 50_1)

S-57 Data

Geo object 1: Underwater rock / awash rock (UWTROC)

Attributes: SORDAT - 20100621

SORIND - US,US,graph,H12221

STATUS - 1:permanent

TECSOU - 3:found by multi-beam

VALSOU - 4.967 m

WATLEV - 3:always under water/submerged

Feature Images

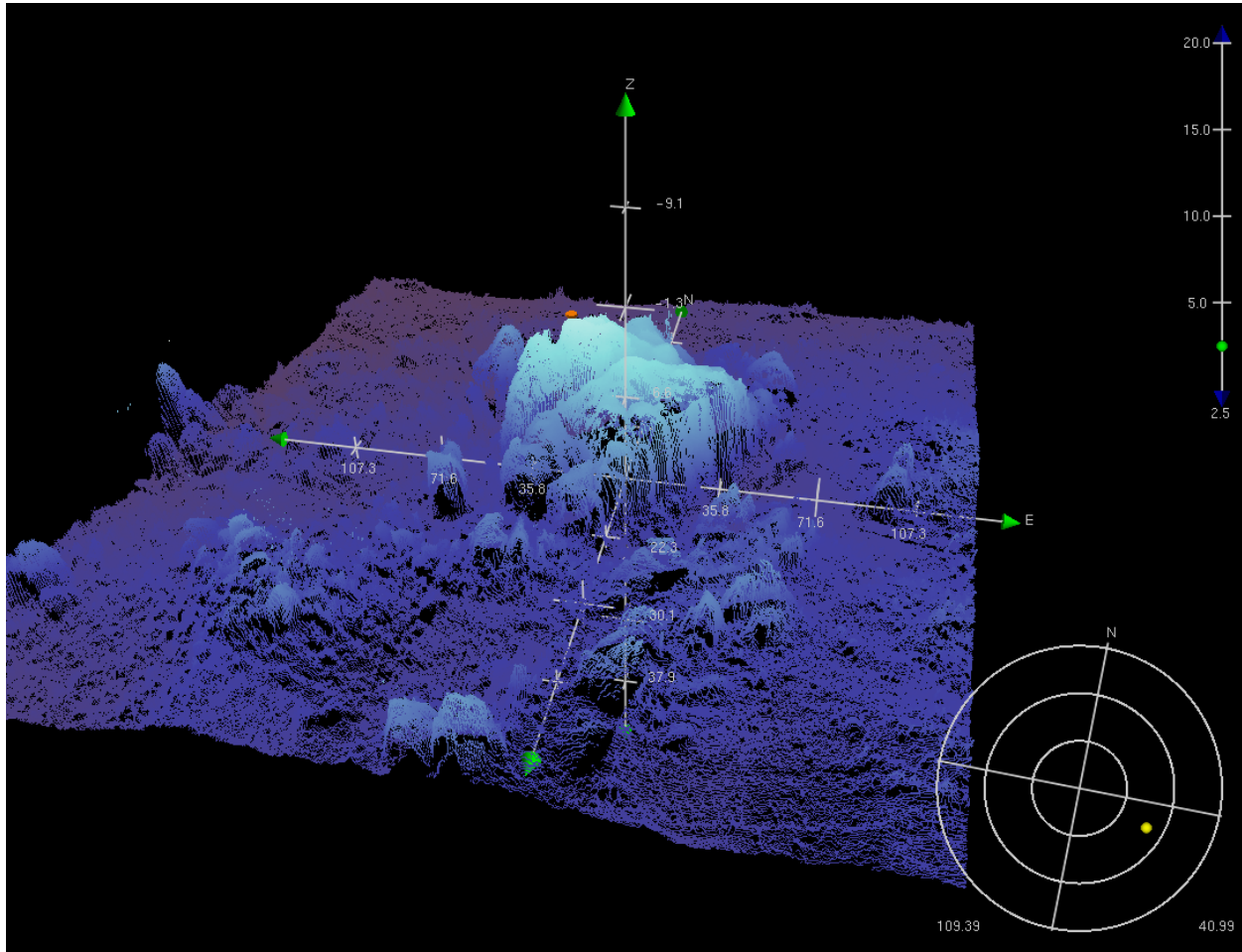


Figure 1.2.1

1.3) 1983/112**DANGER TO NAVIGATION****Survey Summary**

Survey Position: 48° 07' 24.6" N, 124° 44' 08.9" W
Least Depth: 5.18 m (= 16.99 ft = 2.832 fm = 2 fm 4.99 ft)
TPU ($\pm 1.96\sigma$): **THU (TPEh)** ± 0.981 m ; **TVU (TPEv)** ± 0.246 m
Timestamp: 2010-174.20:24:05.526 (06/23/2010)
Survey Line: h12221 / fa_2805_400khz_rsn7125_512bms_2010 / 2010-174 / 2010m_1742019
Profile/Beam: 1983/112
Charts Affected: 18460_1, 18480_1, 18400_1, 18003_1, 18007_1, 531_1, 501_1, 530_1, 50_1

Remarks:

Sounding on submerged rock shoaler than charted depth.

Feature Correlation

Address	Feature	Range	Azimuth	Status
h12221/fa_2805_400khz_rsn7125_512bms_2010/2010-174/2010m_1742019	1983/112	0.00	000.0	Primary

Hydrographer Recommendations

Modify charted (18480) depth contour to agree with new sounding.

Cartographically-Rounded Depth (Affected Charts):

2 $\frac{3}{4}$ fm (18480_1, 18400_1, 18003_1, 18007_1, 530_1)

2fm 5ft (18460_1, 531_1)

5.2m (501_1, 50_1)

S-57 Data

Geo object 1: Underwater rock / awash rock (UWTROC)
Attributes: SORDAT - 20100627
 SORIND - US,US,graph,H12221
 VALSOU - 5.180 m

WATLEV - 3:always under water/submerged

Feature Images

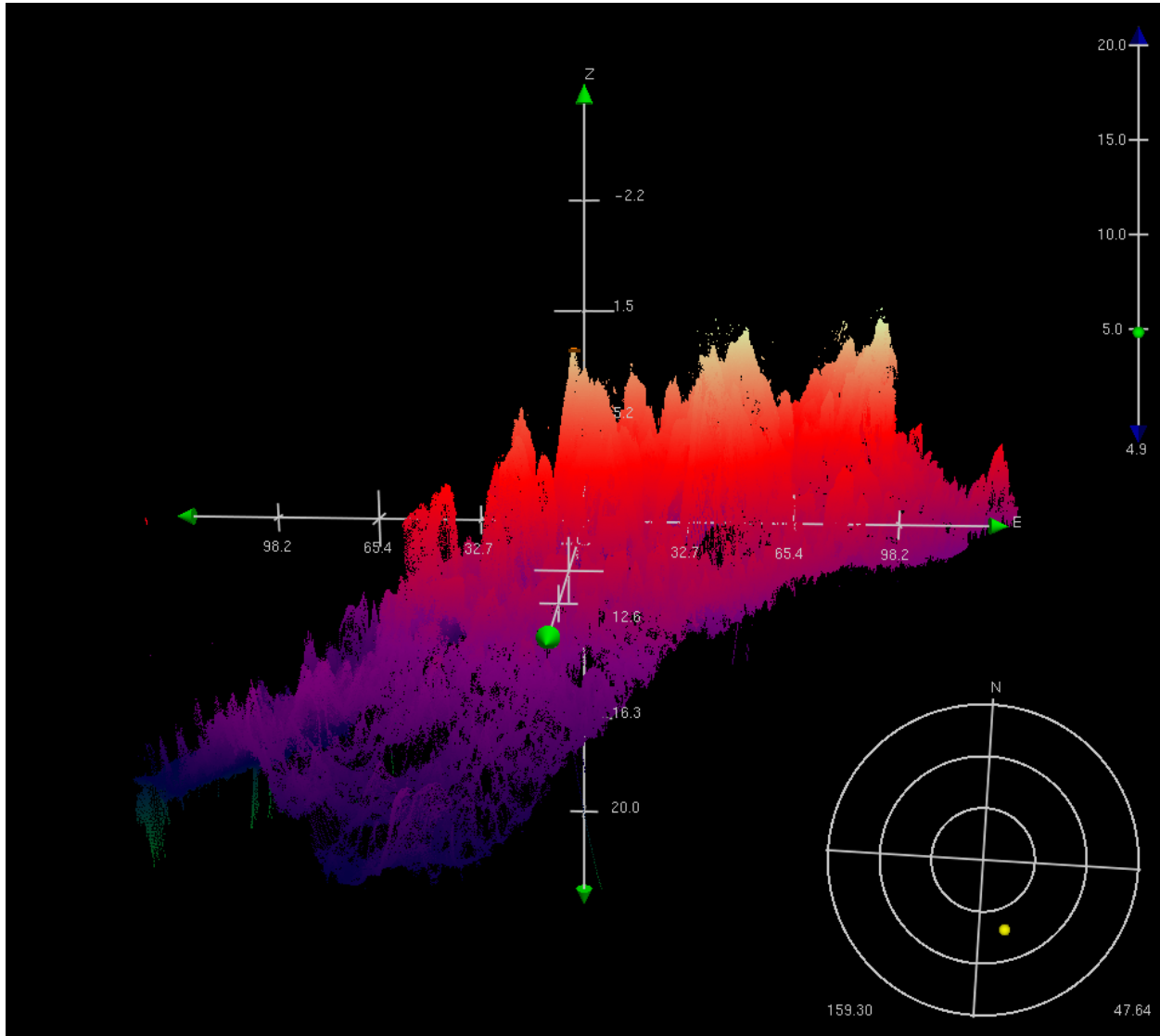


Figure 1.3.1

1.4) 2466/75**DANGER TO NAVIGATION****Survey Summary**

Survey Position: 48° 11' 21.5" N, 124° 44' 12.3" W
Least Depth: 3.55 m (= 11.64 ft = 1.940 fm = 1 fm 5.64 ft)
TPU ($\pm 1.96\sigma$): **THU (TPEh)** ± 0.982 m ; **TVU (TPEv)** ± 0.253 m
Timestamp: 2010-160.18:57:47.674 (06/09/2010)
Survey Line: h12221 / fa_2806_400khz_rsn7125_512bms_2010 / 2010-160 / 2010m_1601853
Profile/Beam: 2466/75
Charts Affected: 18485_1, 18460_1, 18480_1, 18400_1, 18003_1, 18007_1, 531_1, 501_1, 530_1, 50_1

Remarks:

Sounding on submerged rock shoaler than charted (18480) sounding.

Feature Correlation

Address	Feature	Range	Azimuth	Status
h12221/fa_2806_400khz_rsn7125_512bms_2010/2010-160/2010m_1601853	2466/75	0.00	000.0	Primary

Hydrographer Recommendations

Surveyed depths sufficient to supercede prior data.

Cartographically-Rounded Depth (Affected Charts):

2fm (18485_1, 18480_1, 18400_1, 18003_1, 18007_1, 530_1)

1fm 5ft (18460_1, 531_1)

3.5m (501_1, 50_1)

S-57 Data

Geo object 1: Underwater rock / awash rock (UWTROC)

Attributes: SORDAT - 20100627

SORIND - US,US,graph,H12221

VALSOU - 3.547 m

WATLEV - 3:always under water/submerged

Feature Images

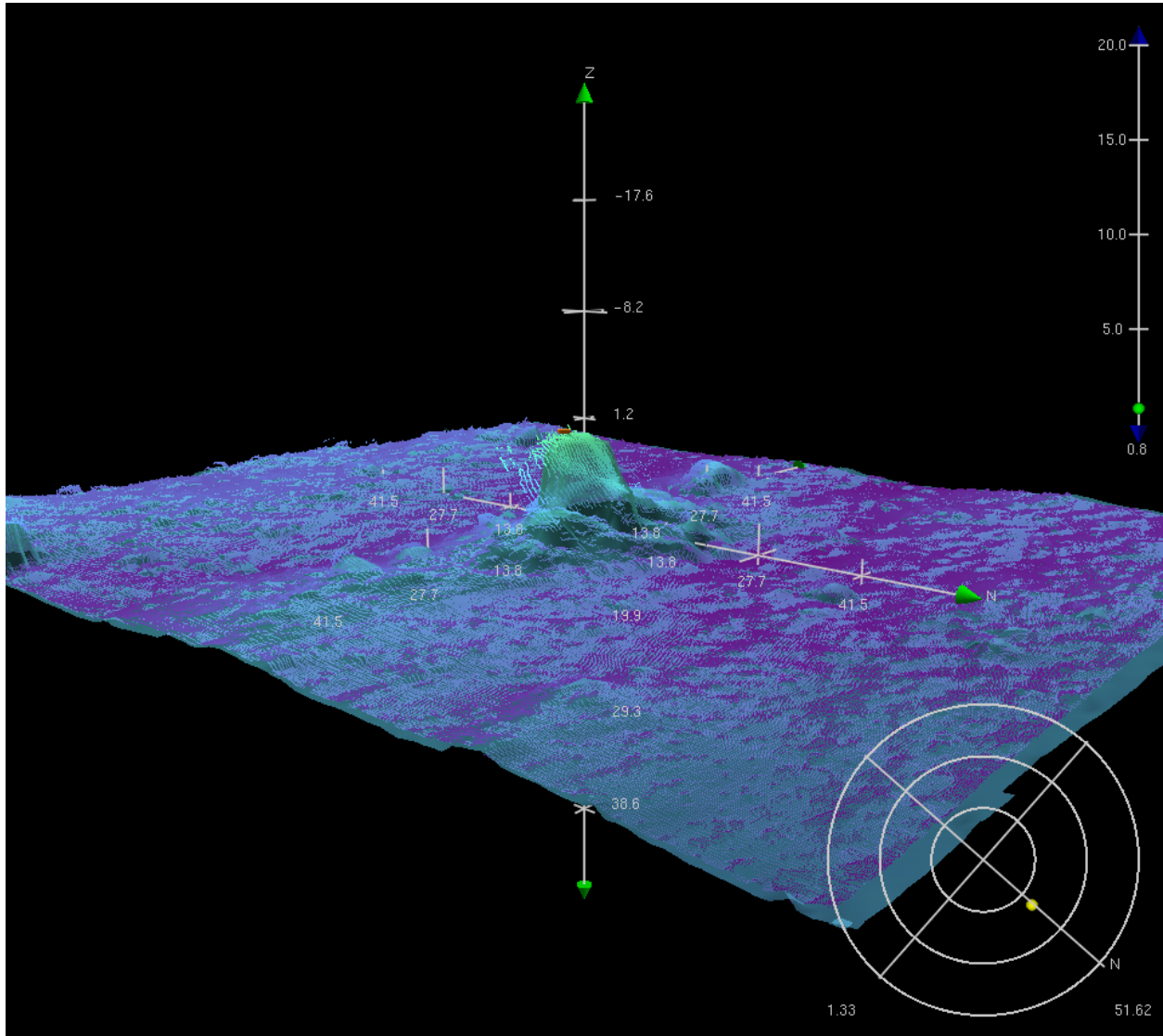


Figure 1.4.1

1.5) 1344/213**DANGER TO NAVIGATION****Survey Summary**

Survey Position: 48° 05' 48.4" N, 124° 45' 00.8" W
Least Depth: 13.57 m (= 44.54 ft = 7.423 fm = 7 fm 2.54 ft)
TPU ($\pm 1.96\sigma$): **THU (TPEh)** ± 0.983 m ; **TVU (TPEv)** ± 0.250 m
Timestamp: 2010-174.16:36:31.417 (06/23/2010)
Survey Line: h12221 / fa_2808_400khz_rsn7125_512bms_2010 / 2010-174 / 2010m_1741632
Profile/Beam: 1344/213
Charts Affected: 18460_1, 18480_1, 18400_1, 18003_1, 18007_1, 531_1, 501_1, 530_1, 50_1

Remarks:

Sounding on underwater rock shoaler than charted (18480) depths.

Feature Correlation

Address	Feature	Range	Azimuth	Status
h12221/fa_2808_400khz_rsn7125_512bms_2010/2010-174/2010m_1741632	1344/213	0.00	000.0	Primary

Hydrographer Recommendations

Surveyed depths sufficient to supercede prior data.

Cartographically-Rounded Depth (Affected Charts):

7 ¼fm (18480_1, 18400_1, 18003_1, 18007_1, 530_1)

7fm 2ft (18460_1, 531_1)

13.6m (501_1, 50_1)

S-57 Data

Geo object 1: Underwater rock / awash rock (UWTROC)
Attributes: SORDAT - 20100627
 SORIND - US,US,graph,H12221
 VALSOU - 13.575 m

WATLEV - 3:always under water/submerged

Feature Images

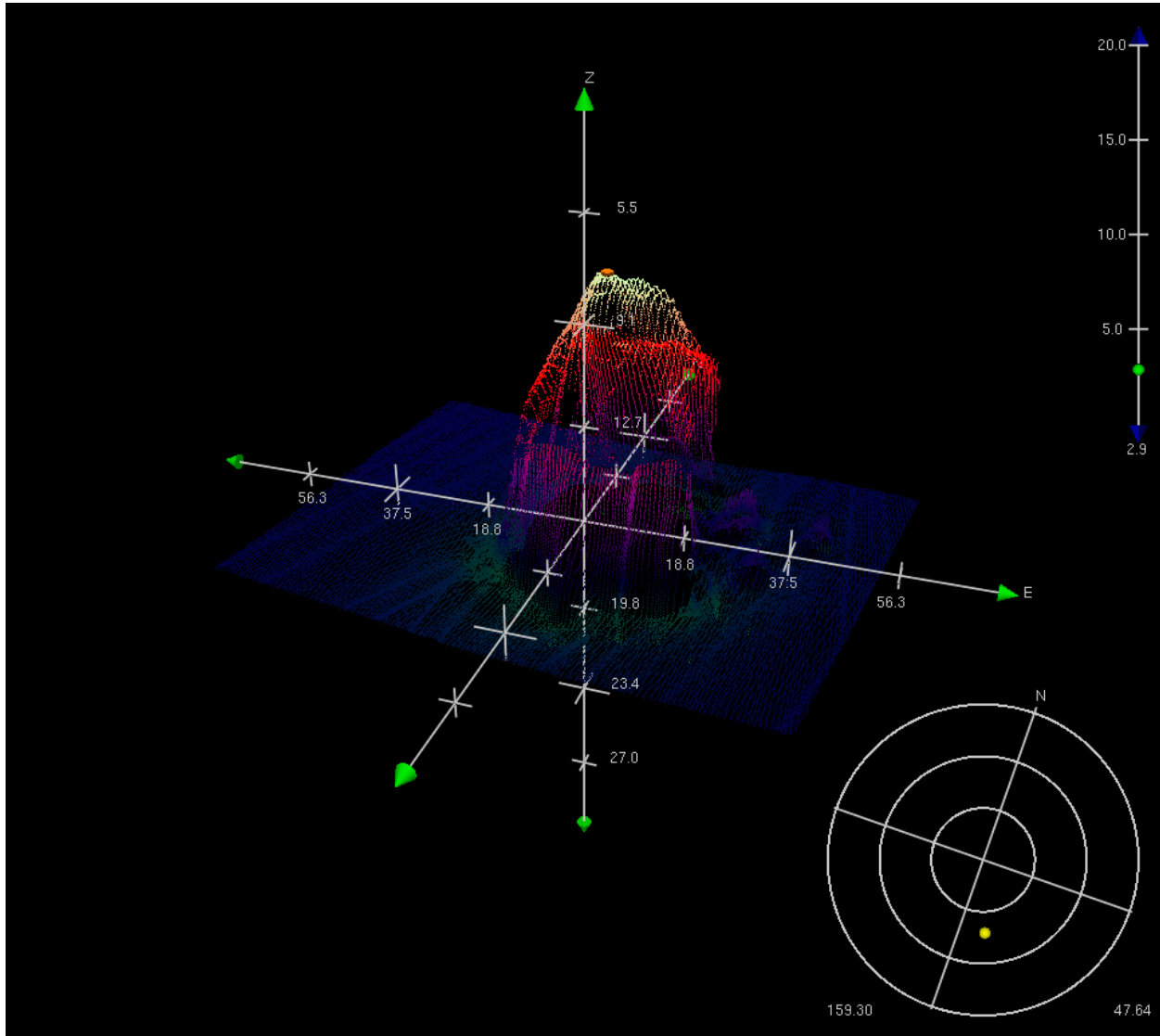


Figure 1.5.1

1.6) 170/74**DANGER TO NAVIGATION****Survey Summary**

Survey Position: 48° 06' 25.9" N, 124° 44' 13.2" W
Least Depth: 5.21 m (= 17.10 ft = 2.849 fm = 2 fm 5.10 ft)
TPU ($\pm 1.96\sigma$): **THU (TPEh)** ± 0.982 m ; **TVU (TPEv)** ± 0.245 m
Timestamp: 2010-174.21:55:42.945 (06/23/2010)
Survey Line: h12221 / fa_2808_400khz_rsn7125_512bms_2010 / 2010-174 / 2010m_1742155
Profile/Beam: 170/74
Charts Affected: 18460_1, 18480_1, 18400_1, 18003_1, 18007_1, 531_1, 501_1, 530_1, 50_1

Remarks:

Submerged rock is shoaler than charted (18480) depths.

Feature Correlation

Address	Feature	Range	Azimuth	Status
h12221/fa_2808_400khz_rsn7125_512bms_2010/2010-174/2010m_1742155	170/74	0.00	000.0	Primary

Hydrographer Recommendations

New sounding is sufficient to supercede prior data.

Cartographically-Rounded Depth (Affected Charts):

2 $\frac{3}{4}$ fm (18480_1, 18400_1, 18003_1, 18007_1, 530_1)

2fm 5ft (18460_1, 531_1)

5.2m (501_1, 50_1)

S-57 Data

Geo object 1: Underwater rock / awash rock (UWTROC)
Attributes: SORDAT - 20100627
 SORIND - US,US,graph,H12221
 VALSOU - 5.211 m

WATLEV - 3:always under water/submerged

Feature Images

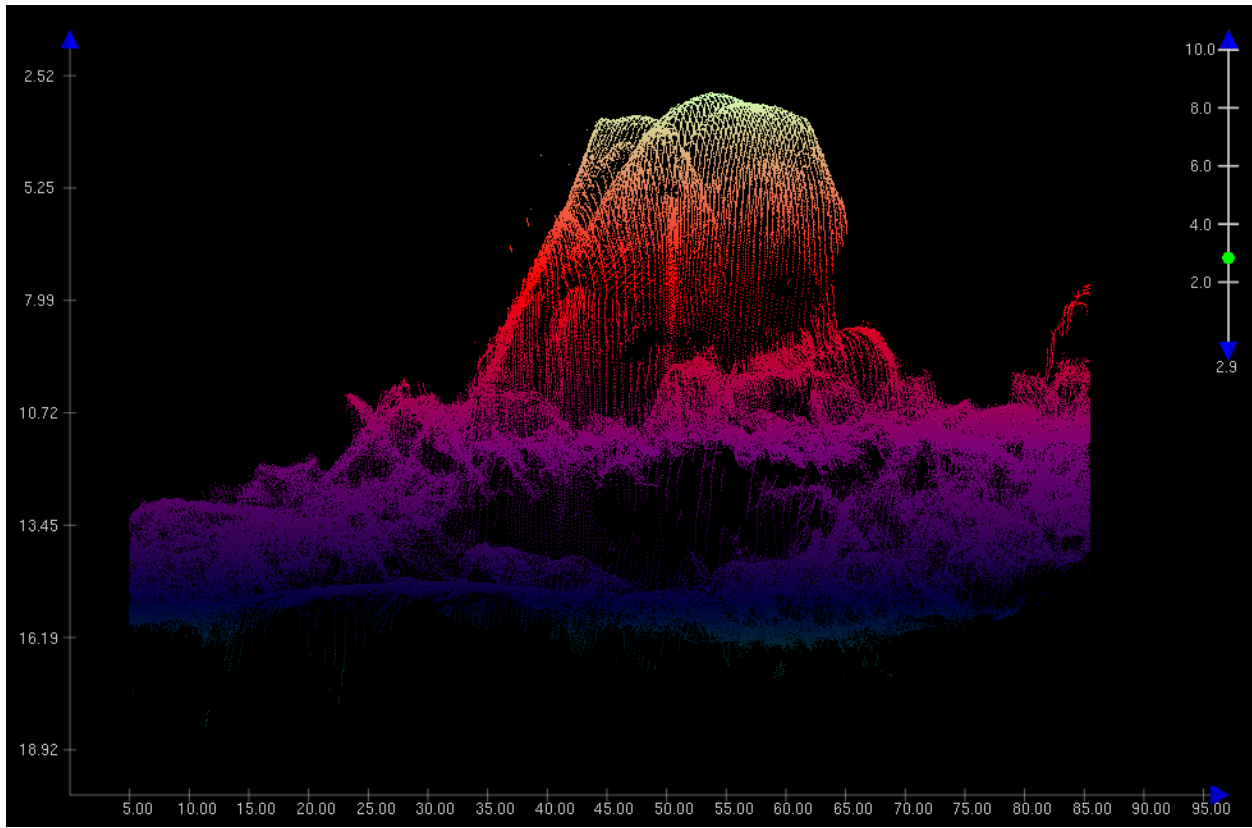


Figure 1.6.1



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

TIDE NOTE FOR HYDROGRAPHIC SURVEY

DATE : July 7, 2010

HYDROGRAPHIC BRANCH: Pacific
HYDROGRAPHIC PROJECT: OPR-N324-FA-2010
HYDROGRAPHIC SHEET: H12221

LOCALITY: Cape Alava, OCNMS
TIME PERIOD: June 7 - June 27, 2010

TIDE STATION USED: 944-2396 La Push, WA
Lat. 47° 54.8'N Long. 124° 38.1' W
PLANE OF REFERENCE (MEAN LOWER LOW WATER): 0.000 meters
HEIGHT OF HIGH WATER ABOVE PLANE OF REFERENCE: 2.357 meters

REMARKS: RECOMMENDED ZONING

Preliminary zoning is accepted as the final zoning for project OPR-N324-FA-2010, H12221, during the time period between June 7 to June 27, 2010.

Please use the zoning file "N324FA2010CORP" submitted with the project instructions for OCNMS. Zone PAC220 is the applicable zone for H12221.

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

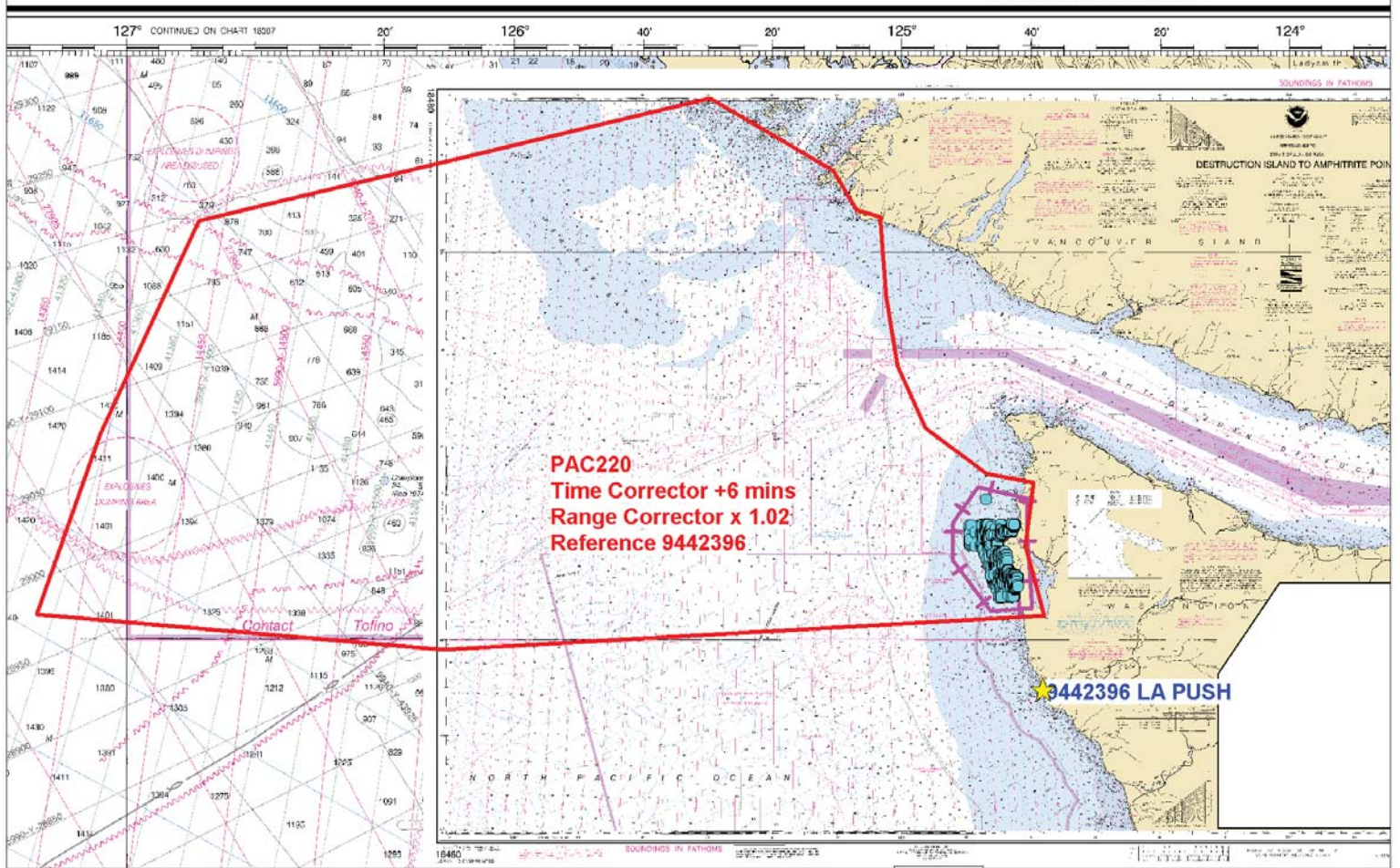
Digitally signed by Peter J. Stone
DN: cn=Peter J. Stone, o=CO-OPS, ou=NOAA/
NOS, email=peter.stone@noaa.gov, c=US
Date: 2010.07.08 12:42:59 -04'00'

CHIEF, OCEANOGRAPHIC DIVISION



Preliminary As Final Tidal Zoning for OPR-N324-FA-2010, H12221 Cape Alava, OCNMS, WA

Formal CS&BE 5022, 1st Ed., May 1999 G 1548 708 KA77 105



H12221 HCell Report
Kurt Brown, Physical Scientist
Pacific Hydrographic Branch

1.0 Specifications, Standards and Guidance Used in HCell Compilation

HCell compilation of survey H12221 used:

Office of Coast Survey HCell Specifications: Version: 6.1
Processing Branches Standards for HCell Compilation, Version 1.0

2.0 Compilation Scale

Depths and features for HCell H12221 were compiled to the largest scale raster charts shown below:

Chart	Scale	Edition	Edition Date	NTM Date
18485	1:40,000	16th	03/01/2007	07/09/2011
18460	1:100,000	13th	10/01/2006	07/09/2011
18480	1:176,253	31st	10/01/2006	07/09/2011

The following ENC's were also used during compilation:

Chart	Scale
US5WA04M	1:40,000
US4WA36M	1:100,000
US3WA01M	1:176,253

3.0 Soundings

A survey-scale sounding (SOUNDG) feature object layer was built from the 4-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)
-4.7	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.

4.0 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 18485	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 H12221_SS.000
1	1.8288	2.0574	1.125	1
2	3.6576	3.8862	2.125	2
3	5.4864	5.715	3.125	3
10	18.288	18.517	10.125	10
20	36.576	37.9476	20.75	20

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.

5.0 Meta Areas

The following Meta area objects are included in HCell H12221:

M_QUAL
M_CSCL

The M_QUAL area object was constructed on the basis of the limits of the hydrography.

6.0 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 raster chart scale.

7.0 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.

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. BASE Editor and S-57 Composer units and precision are shown below.

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.

8.0 Data Processing Notes

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

9.0 QA/QC and ENC Validation Checks

PHB HCells are subjected to QA checks in S-57 Composer prior to exporting to the final HCell (000) file. dKart Inspector is then used to further check the final data set for conformity with the S-58 ver. 2 standard (formerly Appendix B.1 Annex C of the S-57 standard). All tests are run and warnings and errors investigated and corrected unless they are MCD approved as inherent to and acceptable for HCells.

10.0 Products

10.1 HSD, MCD and CGTP Deliverables

CS HCell, Chart Units, Soundings and features compiled to chart scale.	H12221_CS.000
SS HCell, Chart Units, Soundings and Contours compiled to survey scale.	H12221_SS.000
HCell Report for MCD RNC Division.	H12221_HR.pdf
Descriptive Report including end notes compiled during office processing, the HCell Compilation Report, supplemental items, and signature Approval page.	H12221_DR.pdf

Features Listing	H12221_FL.txt
Survey Outline for SURDEX	H12221_Outline.gml and H12221_Outline.xsd
DAPR	OPR-N324-FA-10_DAPR.pdf

11.0 Software

CARIS HIPS Ver. 7.0	Inspection of Combined BASE Surfaces.
Pydro Version 11.7 (r3548)	Generation of Features Reports for surveys delivered with features in PSS files.
CARIS BASE Editor Ver. 3.2	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. 2.2	Final compilation of the HCell, make corrections to geometry and build topology, apply final attributes, export the HCell, and perform preliminary QA tests.
CARIS GIS 4.4a	Setting the sounding rounding variable for conversion of the metric HCell to NOAA charting units with NOAA rounding. (For Fathoms and Feet chart units HCells only.)
CARIS HOM Ver. 3.3	Perform conversion of the metric HCell to NOAA charting units with NOAA rounding. (For Fathoms and Feet chart units HCells only.)
CARIS Plot Composer	Generate plots of CARIS Session files used for QC.
HydroService AS, dKart Inspector Ver. 5.1, SP 1	Validation of the final *_CS.000 HCell file.
Northport Systems, Inc., Fugawi View ENC Ver.1.0.0.3	Independent inspection of final HCells using a COTS viewer.

12.0 Contacts

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

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APPROVAL SHEET
H12221

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.