H12546

NOAA Form 76-35A

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

# DESCRIPTIVE REPORT

| | |
|---|---|
| Type of Survey: | Basic Hydrographic Survey |
| Registry Number: | H12546 |

## LOCALITY

| | |
|---|---|
| State: | Alaska |
| General Locality: | Krenitzin Islands |
| Sub-locality: | Area East of Unalga Island |

**2013**

CHIEF OF PARTY
Dean Moyles

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Date:

| NOAA FORM 77-28 (11-72) | U.S. DEPARTMENT OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION | REGISTRY NUMBER: |
|---|---|---|
| **HYDROGRAPHIC TITLE SHEET** | | **H12546** |

INSTRUCTIONS: The Hydrographic Sheet should be accompanied by this form, filled in as completely as possible, when the sheet is forwarded to the Office.

| | |
|---|---|
| State: | **Alaska** |
| General Locality: | **Krenitzin Islands** |
| Sub-Locality: | **Area East of Unalga Island** |
| Scale: | **40000** |
| Dates of Survey: | **07/03/2013 to 07/23/2013** |
| Instructions Dated: | **05/15/2013** |
| Project Number: | **OPR-Q191-KR-13** |
| Field Unit: | **Fugro Pelagos, Inc.** |
| Chief of Party: | **Dean Moyles** |
| Soundings by: | **Multibeam Echo Sounder** |
| Imagery by: | **Multibeam Echo Sounder Backscatter** |
| Verification by: | **Pacific Hydrographic Branch** |
| Soundings Acquired in: | **meters at Mean Lower Low Water** |
| H-Cell Compilation Units: | ***meters at Mean Lower Low Water*** |

Remarks:

***The purpose of this survey is to provide contemporary surveys to update National Ocean Service (NOS) nautical charts. All separates are filed with the hydrographic data. Any revisions to the Descriptive Report (DR) generated during office processing are shown in bold red italic text. The processing branch maintains the DR as a field unit product, therefore, all information and recommendations within the body of the DR are considered preliminary unless otherwise noted. The final disposition of surveyed features is represented in the OCS nautical chart update products. All pertinent records for this survey, including the DR, are archived at the National Geophysical Data Center (NGDC) and can be retrieved via http:// www.ngdc.noaa.gov/.***

# Table of Contents

# List of Tables



# List of Figures

# Descriptive Report to Accompany Survey H12546

Project: OPR-Q191-KR-13

Locality: Krenitzin Islands

Sublocality: Area East of Unalga Island

Scale: 1:40000

July 2013 - July 2013

**Fugro Pelagos, Inc.**

Chief of Party: Dean Moyles

# A. Area Surveyed

H12546 is located East of Unalga Island.

## A.1 Survey Limits

Data was acquired within the following survey limits:

| Northeast Limit | Southwest Limit |
|---|---|
| 54.02278 N<br>165.64917 E | 53.93389 N<br>166.02222 E |

*Table 1: Survey Limits*

Survey Limits were acquired in accordance with the requirements in the Project Instructions and the HSSD.

## A.2 Survey Purpose

The purpose of this work is to provide NOAA with modern and accurate hydrographic survey data for the area East of Unalga Island. The survey covered 32.06 square nautical miles of critical survey area as designated in the NOAA Hydrographic Survey Priorities, 2012 edition.

## A.3 Survey Quality

The entire survey is adequate to supersede previous data.

## A.4 Survey Coverage

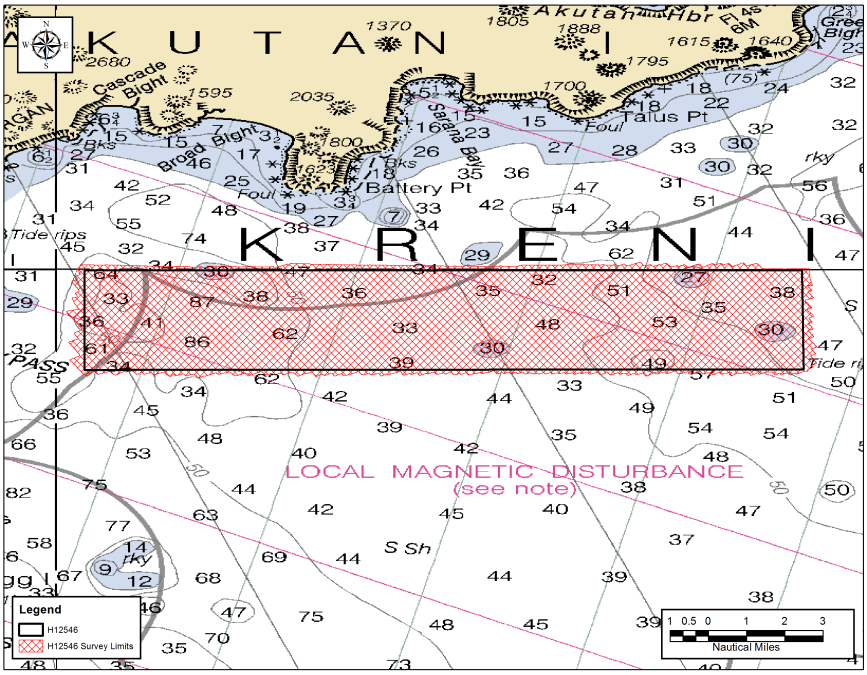


*Figure 1: H12546 Survey Limits*

Survey Coverage was in accordance with the requirements in the Project Instructions and the HSSD.

## A.5 Survey Statistics

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

| | HULL ID | *Ocean Pioneer* | *Total* |
|---|---|---|---|
| **LNM** | **SBES Mainscheme** | 0 | 0 |
| | **MBES Mainscheme** | 307.8 | 307.8 |
| | **Lidar Mainscheme** | 0 | 0 |
| | **SSS Mainscheme** | 0 | 0 |
| | **SBES/MBES Combo Mainscheme** | 0 | 0 |
| | **SBES/SSS Combo Mainscheme** | 0 | 0 |
| | **MBES/SSS Combo Mainscheme** | 0 | 0 |
| | **SBES/MBES Combo Crosslines** | 14.16 | 14.16 |
| | **Lidar Crosslines** | 0 | 0 |
| **Number of Bottom Samples** | | | 1 |
| **Number of DPs** | | | 0 |
| **Number of Items Items Investigated by Dive Ops** | | | 0 |
| **Total Number of SNM** | | | 307.8 |

*Table 2: Hydrographic Survey Statistics*

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

| *Survey Dates* |
|---|
| 07/03/2013 |
| 07/05/2013 |
| 07/15/2013 |
| 07/16/2013 |
| 07/21/2013 |
| 07/23/2013 |

*Table 3: Dates of Hydrography*

## A.6 Shoreline

Shoreline was investigated in accordance with the Project Instructions and the HSSD.

## A.7 Bottom Samples

Bottom Samples were acquired in accordance with the Project Instructions and the HSSD.

# B. Data Acquisition and Processing

## B.1 Equipment and Vessels

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

### B.1.1 Vessels

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

| **Hull ID** | ***Ocean Pioneer*** |
|---|---|
| **LOA** | 205 feet |
| **Draft** | 14 feet |

*Table 4: Vessels Used*

### B.1.2 Equipment

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

| Manufacturer | Model | Type |
|---|---|---|
| Applanix | POS M/V v4 | Positioning and Attitude System |
| OceanScience | UCTD | Conductivity, Temperature and Depth Sensor |
| Reson | 7125 | MBES |
| Reson | SVP70 | Sound Speed System |

*Table 5: Major Systems Used*

WaterLOG H3611 (Radar Water Level Sensors) were installed on the port and starboard gunwales of M/V Ocean Pioneer to obtain a more precise static draft measurement. Samples were taken over a 10 minute period and averaged to determine the vessel's draft. Traditional static draft measurement techniques were also employed as a substitute for the WaterLOG H3611 measurements when required.

## B.2 Quality Control

### B.2.1 Crosslines

Crosslines were planned and well distributed throughout the survey to ensure adequate quality control. Total crossline length surveyed was 14.2 nautical miles or 4.6 percent of the total mainscheme line length. Each crossline was compared to the entire mainscheme line plan through a 4m and 8m CUBE surface using the CARIS HIPS QC report routine.

The QC Reports fall well within the required accuracy specifications. Good conformity was seen between the mainscheme lines and crosslines as illustrated in the crossline profile from H12546.

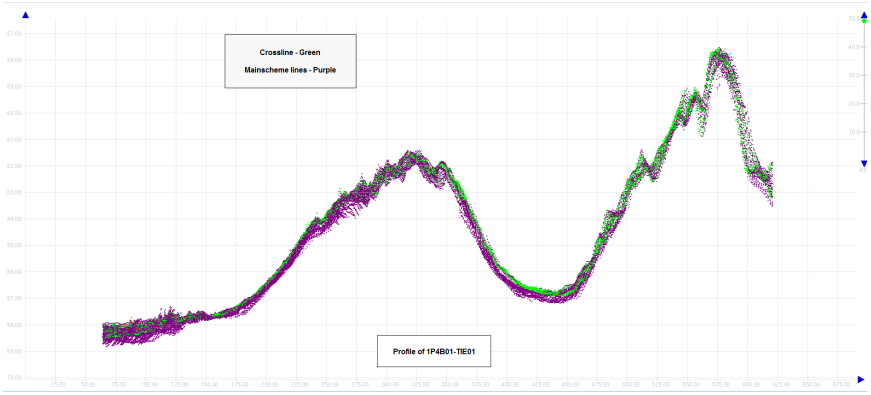


*Figure 2: Crossline Profile*

### B.2.2 Uncertainty

The following survey specific parameters were used for this survey:

| Measured | Zoning |
|---|---|
| 0.1meters | 0.2meters |

*Table 6: Survey Specific Tide TPU Values*

| Hull ID | Measured - CTD | Measured - MVP | Surface |
|---|---|---|---|
| Ocean Pioneer | 1.673meters/second | 0meters/second | 0.250meters/second |

*Table 7: Survey Specific Sound Speed TPU Values*

The majority of the data fell within IHO Order 1a accuracy specifications. Nodes that exceeded the allowable specifications were located in rough or rapidly changing topography or areas where the outer beams of the coverage boundaries were the single contributor to the surface. Despite the higher uncertainty values in these areas, agreement between adjacent lines and co-linearity between soundings was good.

Note: The percentage of nodes within IHO Oder 1a, were computed by CARIS using the Surface QC Report utility and are as follows:

CUBE Surface Uncertainty Report
Surface Depth Range (m) % of nodes within IHO Order 1a
H12546-4m_Final 36 - 80 99.97%
H12546-8m_Final 72 - 160 100.00%
H12546-16m_Final 144 - 320 100.00%

As illustrated in the uncertainty errors graphic, the uncertainty is generally lowest near the sonar nadir beams and increases toward the outside of each swath. This is expected and primarily a result of the sonar's device model used within CARIS HIPS for TPU calculations. In general, total propagated uncertainty varies

proportionally to water depth. Outer beams also have higher uncertainty values as a function of the bottom-detection algorithms within the sonar. Data met project specifications.

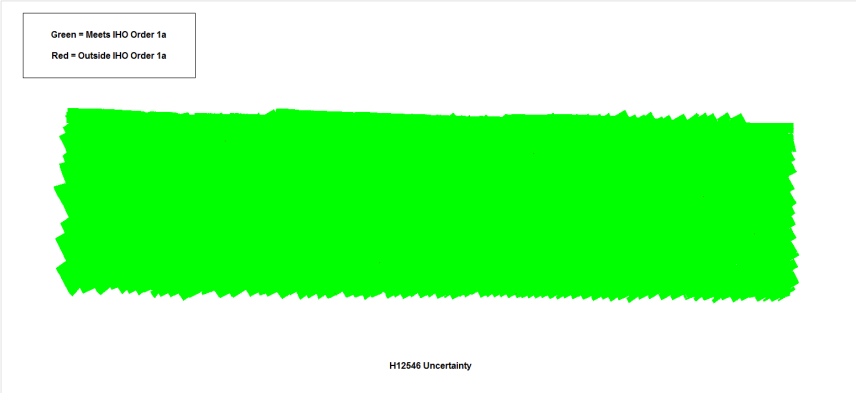


*Figure 3: H12546 Uncertainty*

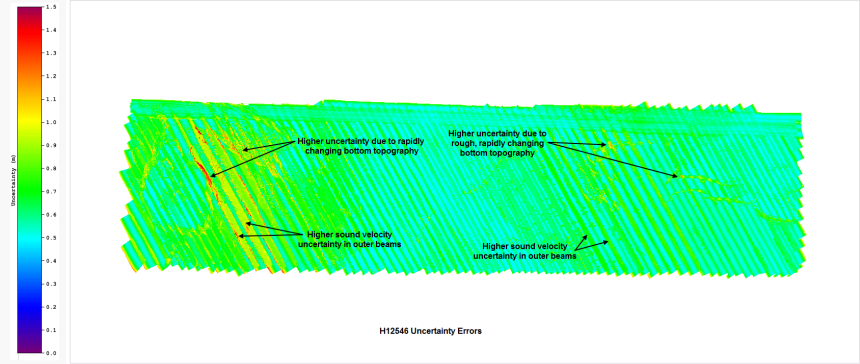


*Figure 4: H12546 Uncertainty Errors*

***To calculate TPU, the field used guidance from the 2012 HSSD, which recommends values for Measured Tidal Uncertainty and Tidal Zoning Uncertainty at a 95% confidence level. However, the CARIS HIPS Compute TPU routine expects these values to be entered at confidence levels of 68%. This deviance resulted in a doubling of the TVU associated with tides. This also explains the sound speed refraction errors noted in B.2.6.***

### B.2.3 Junctions

The surveys are in agreement along their common borders. The conformity between H12546 and the bordering survey areas (H12545 and H12547) was inspected during processing, using CARIS HIPS' Subset Editor routine and finalized BASE Surfaces. Difference surfaces were also created at an 8-meter resolution between H12546, and the junction with survey area H12445 (2012), the junction with the 5-meter surface from H11712 (2007), and the junction with the 5-meter surface from H11716 (2007). The data were well within the IHO Order 1a allowable error.

The following junctions were made with this survey:

| Registry Number | Scale | Year | Field Unit | Relative Location |
|---|---|---|---|---|
| H12445 | 1:40000 | 2012 | Fugro Pelagos Inc. | NE |
| H11712 | 1:10000 | 2007 | Fugro Pelagos Inc. | NW |
| H11716 | 1:10000 | 2007 | Fugro Pelagos Inc. | SW |

*Table 8: Junctioning Surveys*

H12445

A difference surface was created at an 8-meter resolution between H12546, and the junction with survey area H12445 (2012), confirming that approximately 96.17% of the nodes agree to within +/-0.50m. The other 3.83% were on the outer edges of the swath at the coverage boundaries. The data were well within the IHO Order 1a allowable error.

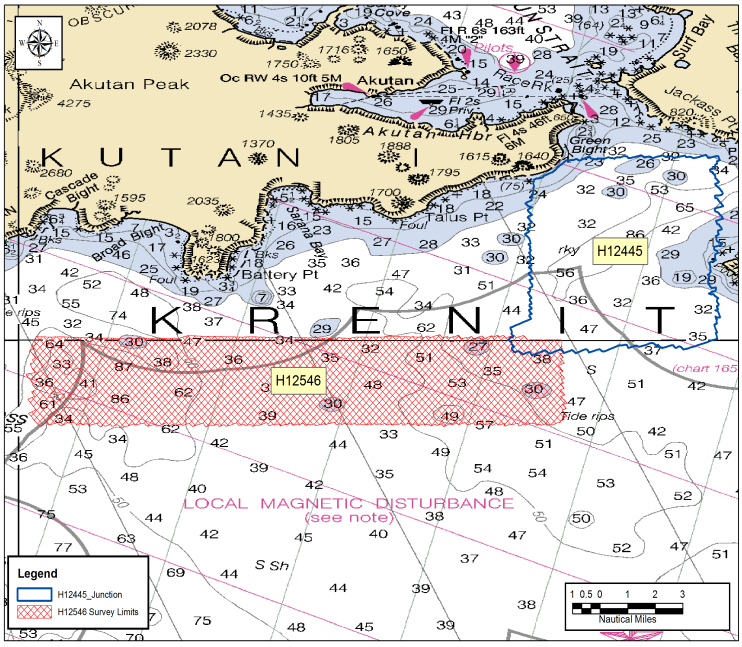

*Figure 5: H12546 Junctions with H12445*

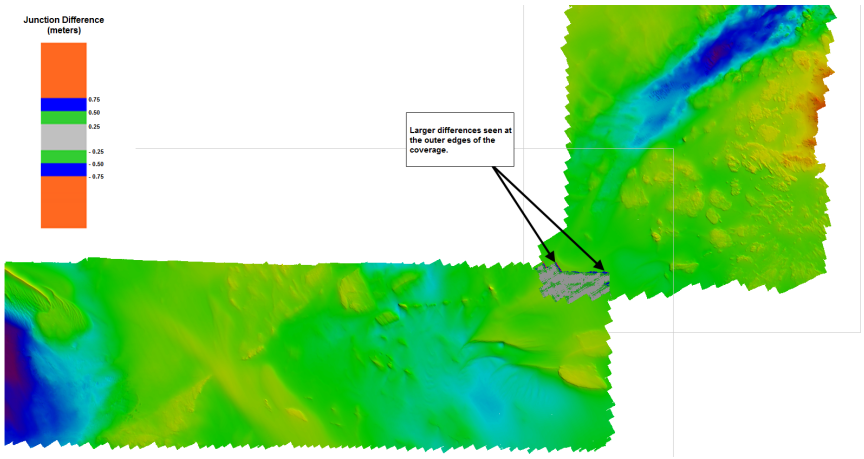


*Figure 6: Difference Surface H12546 vs. H12445*

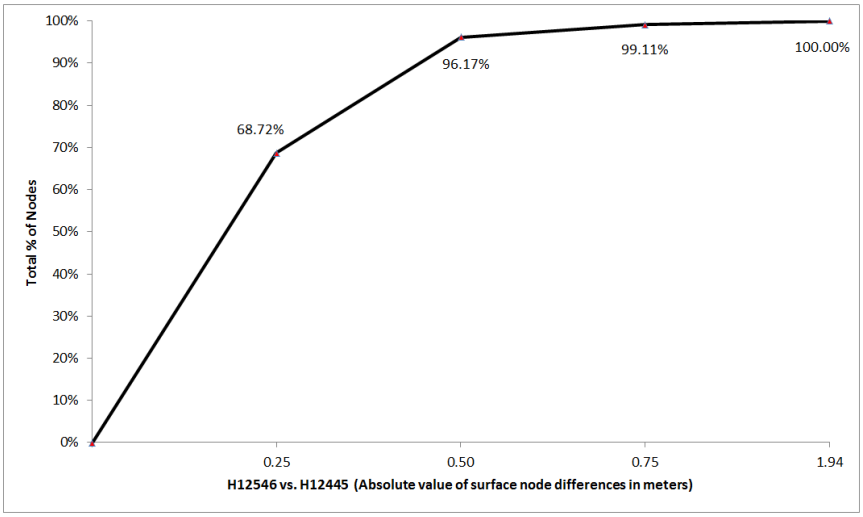


*Figure 7: Difference Surface Statistics H12546 vs. H12445*

H11712

A difference surface was created to compare the 4-meter surface from H12546 and the junction with the 5-meter surface from H11712 (2007), confirming that approximately 85.15% of the nodes agree to within +/-0.50m. The other 14.85% of the nodes were located in areas of water depths greater than 100 meters, areas with a steep seafloor slope, or areas ensonified by the outer edges of the swath at the coverage boundaries. The data were well within the IHO Order 1a allowable error.

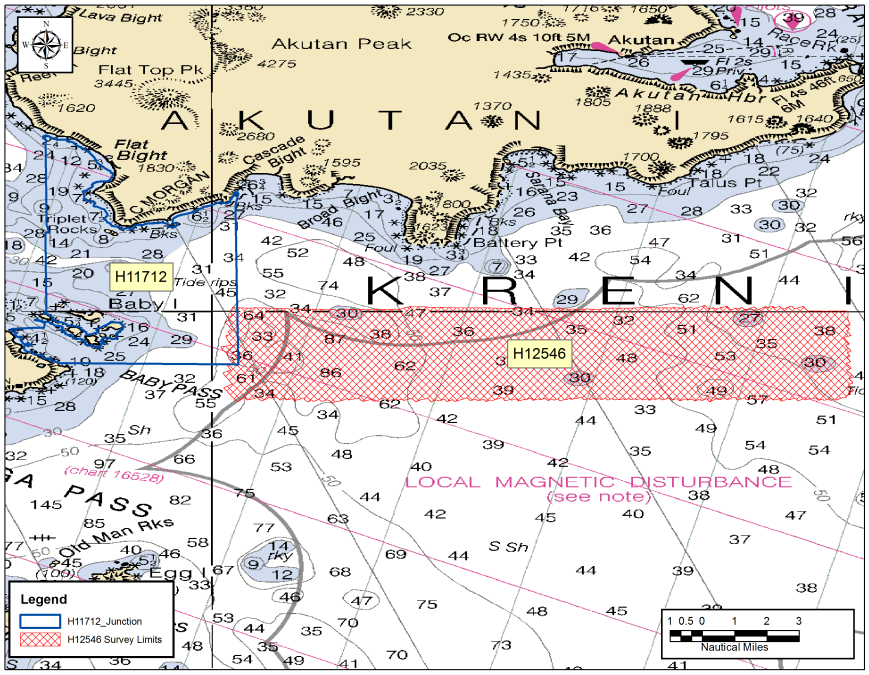


*Figure 8: H12546 Junctions with H11712*

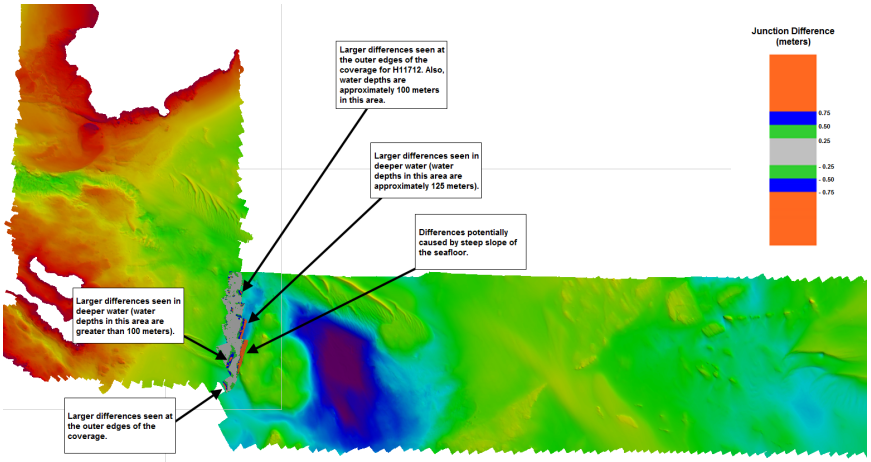


*Figure 9: Difference Surface H12546 vs. H11712*

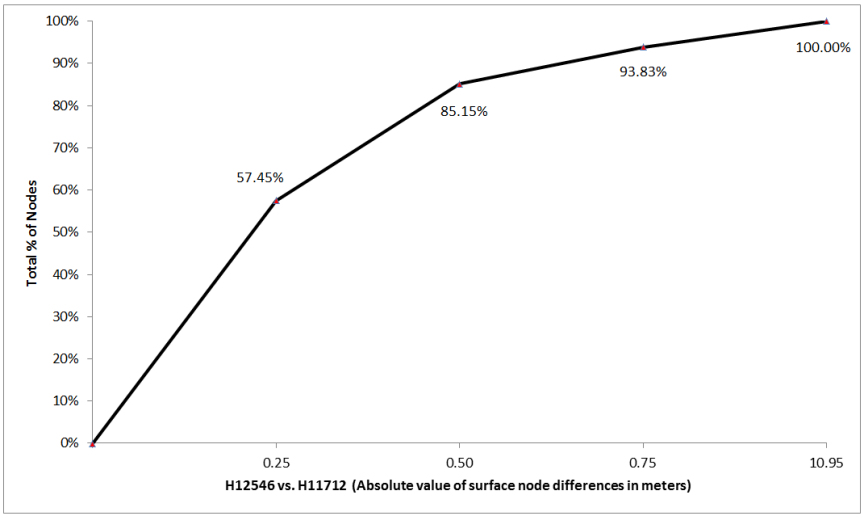


*Figure 10: Difference Surface Statistics H12546 vs. H11712*

H11716

A difference surface was created to compare the 4-meter surface from H12546 and the junction with the 5-meter surface from H11716 (2007), confirming that approximately 91.81% of the nodes agree to within +/-0.50m. The other 8.19% were on the outer edges of the swath at the coverage boundaries, which includes areas with water depths ranging from 85 meters to 115 meters. The data were well within the IHO Order 1a allowable error.

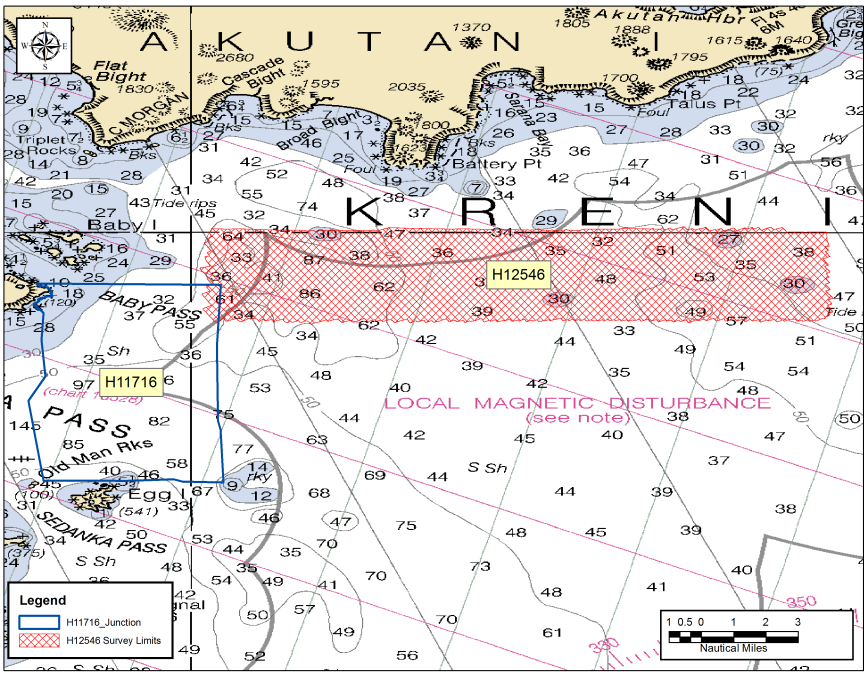


*Figure 11: H12546 Junctions with H11716*

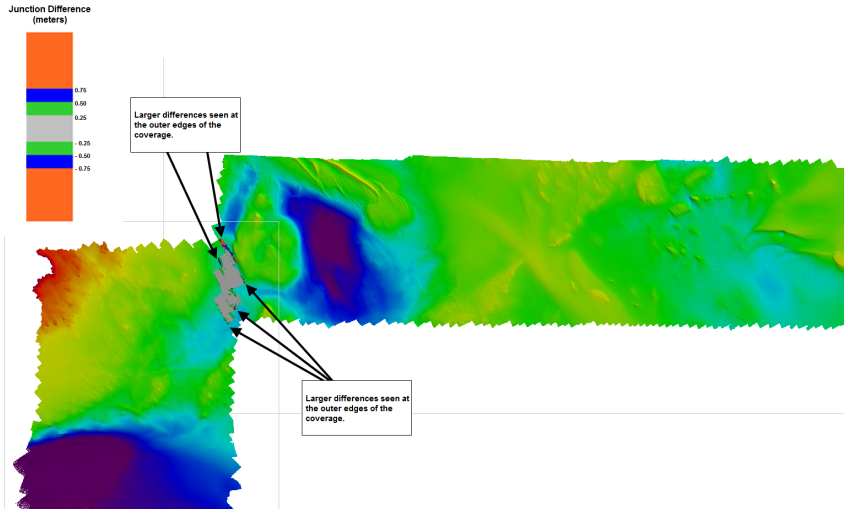


*Figure 12: Difference Surface H12546 vs. H11716*

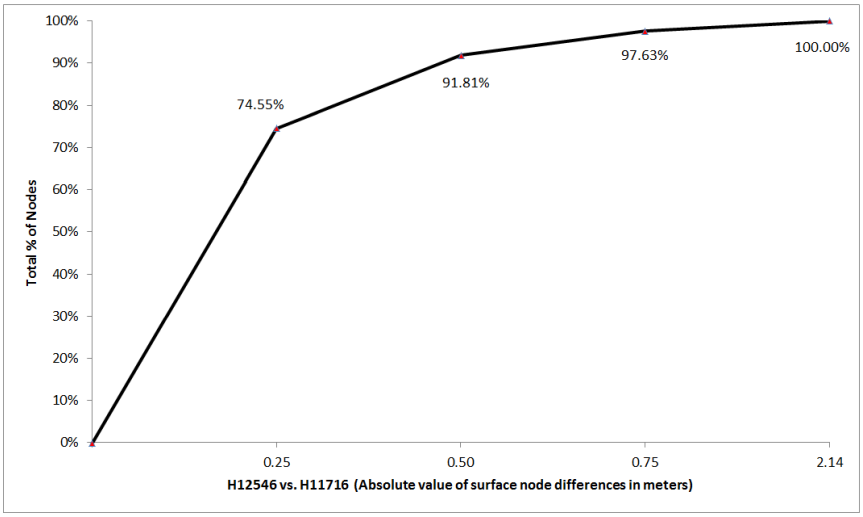


*Figure 13: Difference Surface Statistics H12546 vs. H11716*

## B.2.4 Sonar QC Checks

Sonar system quality control checks were conducted as detailed in the quality control section of the DAPR.

## B.2.5 Equipment Effectiveness

### B.2.5.1Bottom-Detection Artifacts

Dependent on sediment type, at the 200kHz frequency, the Reson SeaBat 7125 sonar system sometimes displayed bottom-detection artifacts near nadir of the multibeam swath. The bottom detection algorithm

in the Reson 7125 may have been affected by the time spreading of the signal return due to sediment penetration close to nadir. To mitigate these effects, the sonar pulse length was kept at low settings during acquisition and the artifacts were monitored closely during data processing to ensure all data met IHO Order 1a specifications.

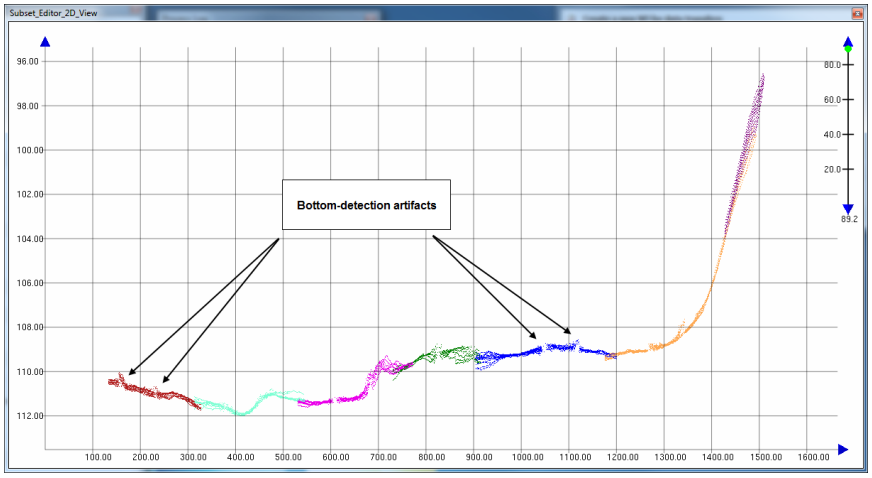


*Figure 14: Bottom-Detection Artifacts*

## B.2.6 Factors Affecting Soundings

### B.2.6.1 Sound Speed Refraction Errors

Sound speed refraction errors were seen in the outer beams of the swaths of survey lines that were run in deeper water. However, line overlap was sufficient, and the affected soundings were rejected in CARIS HIPS' Subset Editor routine to ensure the CUBE surface met IHO Order 1a specifications.

***During processing branch review, it was found that low-magnitude refraction errors persist across the survey, but that the errors are well within tolerance, and all surveyed soundings are adequate to supersede charted soundings.***

## B.2.7 Sound Speed Methods

Sound Speed Cast Frequency: Sound speed measurements were conducted and applied as discussed in the Corrections to Echo Soundings section of the DAPR.

## B.2.8 Coverage Equipment and Methods

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

### B.2.9 Data Density

The NOS Hydrographic Surveys Specifications and Deliverables, April 2012, requires 95% of all nodes to be populated with at least five soundings. Survey H12546 met these project specifications.

Density requirements for H12546 were achieved with at least 99.87% of finalized surface nodes containing five or more soundings. Nodes that exceeded the allowable specifications were located in rough or rapidly changing topography or areas where the outer beams of the coverage boundaries were the single contributor to the surface.

CUBE Surface Density Report
Surface, Depth Range (m), % of nodes within HSSD 2012

| | | |
|---|---|---|
| H12546-4m_Final | 36 - 80 | 99.89% |
| H12546-8m_Final | 72 - 160 | 99.88% |
| H12546-16m_Final | 144 - 320 | 100.00% |

Detection requirements were met by minimizing vessel speed when necessary, using sonar range scales appropriate to the water depth to maximize ping rates, and maximizing swath overlap. These variables were adjusted in real-time by the online acquisition crew based on the WinFrog QC and coverage displays. The shipboard processing crew provided feedback after preliminary processing and coverage creation in CARIS HIPS and In-fills were run as necessary.

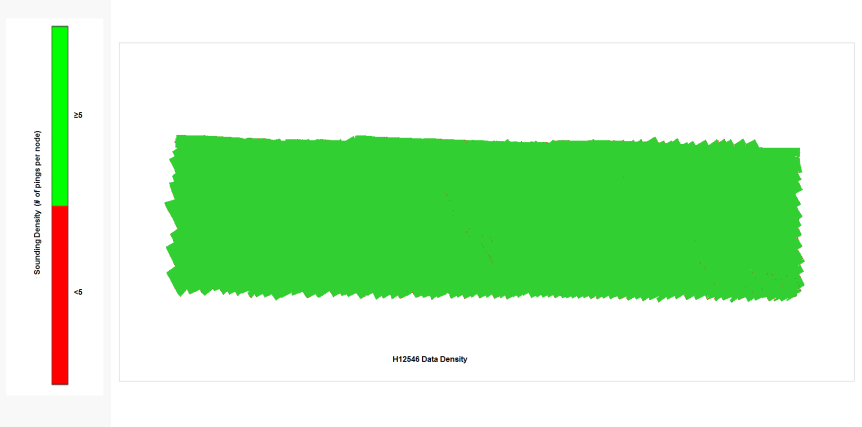


*Figure 15: H12546 Data Density*

## B.3 Echo Sounding Corrections

### B.3.1 Corrections to Echo Soundings

All data reduction procedures conform to those detailed in the DAPR.

### B.3.2 Calibrations

All sounding systems were calibrated as detailed in the DAPR.

## B.4 Backscatter

Towed Side Scan Sonar (SSS) operations were not required by this contract, but the backscatter and beam imagery snippet data from all multibeam systems were logged and are stored in the s7k files. All beam imagery snippet data was logged in the 7028 record of the s7k file for the project.

## B.5 Data Processing

### B.5.1 Software Updates

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

The following Feature Object Catalog was used: Version 5.3.2

### B.5.2 Surfaces

The following CARIS surfaces were submitted to the Processing Branch:

| Surface Name | Surface Type | Resolution | Depth Range | Surface Parameter | Purpose |
|---|---|---|---|---|---|
| H12546_4m | CUBE | 4 meters | 0 meters - 173 meters | NOAA_4m | Complete MBES |
| H12546_4m_Final | CUBE | 4 meters | 36 meters - 80 meters | NOAA_4m | Complete MBES |
| H12546_8m | CUBE | 8 meters | 0 meters - 173 meters | NOAA_8m | Complete MBES |
| H12546_8m_Final | CUBE | 8 meters | 72 meters - 160 meters | NOAA_8m | Complete MBES |
| H12546_16m | CUBE | 16 meters | 0 meters - 173 meters | NOAA_16m | Complete MBES |
| H12546_16m_Final | CUBE | 16 meters | 144 meters - 320 meters | NOAA_16m | Complete MBES |

*Table 9: CARIS Surfaces*

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.

The NOAA CUBE parameters mandated in HSSD were used for the creation of all CUBE BASE surfaces in Survey H12546.

***BASE surfaces submitted by the field did not include the crossline data, but these were added at the processing branch before finalizing and combining. It was also found that TVU values exceeded IHO budgets in nearshore areas with higher frequency than usual. However, data is adequate to supersede charted data in the common area.***

# C. Vertical and Horizontal Control

Additional information discussing the vertical and horizontal control for this survey can be found in the accompanying HVCR.

## C.1 Vertical Control

The vertical datum for this project is Mean Lower Low Water.

Standard Vertical Control Methods Used:

Discrete Zoning

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

| Station Name | Station ID |
|---|---|
| Unalaska, Dutch Harbor | 9462620 |
| King Cove | 9459881 |

*Table 10: NWLON Tide Stations*

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

| Station Name | Station ID |
|---|---|
| Broad Bight | 9462676 |
| SE Tigalda Island | 9462705 |
| Green Bight | 9462786 |

*Table 11: Subordinate Tide Stations*

| File Name | Status |
|---|---|
| 9462676.tid | Verified Observed |
| 9462705.tid | Verified Observed |
| 9462786.tid | Verified Observed |

*Table 12: Water Level Files (.tid)*

| File Name | Status |
|---|---|
| OPR-Q191-KR-13_Zoning_20131008.zfd | Preliminary |

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

A request for final approved tides was sent to N/OPS1 on 10/24/2013. The final tide note was received on 10/31/2013.

On October 08, 2013, John Oswald and Associates (JOA) issued verified tidal data and zoning for OPR-Q191-KR-13. All sounding data was then re-merged using CARIS HIPS and SIPS tide routine. JOA verified tidal data were used for all final Navigation BASE surfaces and S-57 Feature files. It should be noted that the tidal data applied to OPR-Q191-KR-13 is JOA verified and not CO-OPs verified. JOA are currently in the WALI verification process, which is pending, awaiting CO-OPs approval. Since the timeframe for CO-OPs verification is unknown, FPI were given approval, by our COTR, to submit the data with the JOA verified tides and zoning applied.

## C.2 Horizontal Control

The horizontal datum for this project is NAD83.

The following PPK methods were used for horizontal control:

Single Base

For real-time DGPS corrections, a CSI MBX-3 unit was tuned to the Cold Bay, Alaska USCG DGPS site. The unit output differentially corrected positions at 1 Hz to the (POS MV) 320 V4 where it was integrated with inertial data, and a position for the top-center of the IMU generated. This position was logged concurrently with the bathymetry from WinFrog and the POS file using Fugro Pelagos PosMvLogger. It was later corrected for offsets to the multibeam echosounder (MBES) by CARIS HIPS in post-processing.

Final positioning was done using post-processed kinematic (PPK) methods. Applanix POSPac MMS v5.4 software was used in conjunction with the POS files and local 1Hz base station data to generate a higher accuracy position, which was applied in processing to replace the real-time position records.

The following user installed stations were used for horizontal control:

| HVCR Site ID | Base Station ID |
|---|---|
| Broad Bight | BB_E |
| SE Tigalda Island | TI_N |

*Table 14: User Installed Base Stations*

The following DGPS Stations were used for horizontal control:

| DGPS Stations |
|---|
| Cold Bay DGPS Station |

*Table 15: USCG DGPS Stations*

# D. Results and Recommendations

## D.1 Chart Comparison

### D.1.1 Raster Charts

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

| Chart | Scale | Edition | Edition Date | LNM Date | NM Date |
|---|---|---|---|---|---|
| 16531 | 1:80000 | 7 | 02/2002 | 10/01/2013 | 09/28/2013 |

*Table 16: Largest Scale Raster Charts*

16531

The Raster chart was downloaded from NOAA’s Office of Coast Survey website on October 9, 2013.

Given that the survey area was ensonified with 100% multibeam coverage, discrepancies were discovered between the charted and surveyed depths.

Sounding agreement between surveyed soundings on sheet H12546 and spot soundings displayed on Raster chart 16531 generally varied between 1 and 2 fathoms.

The Hydrographer recommends that soundings within the survey limits of H12546 supersede all prior survey and charted depths.

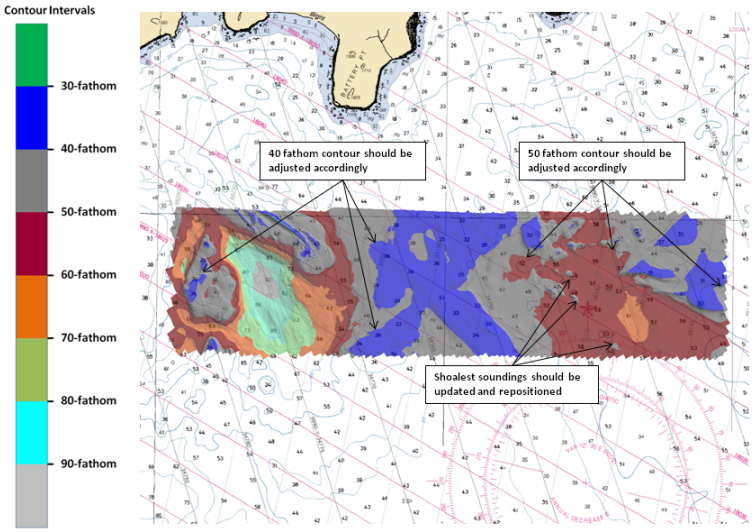


*Figure 16: Chart Comparison H12546 vs. 16531*

### D.1.2 Electronic Navigational Charts

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

| ENC | Scale | Edition | Update Application Date | Issue Date | Preliminary? |
|---|---|---|---|---|---|
| US3AK61M | 1:300000 | 16 | 01/12/2011 | 06/24/2013 | NO |
| US4AK6FM | 1:80000 | 8 | 04/28/2011 | 05/02/2013 | NO |

*Table 17: Largest Scale ENCs*

US3AK61M

The ENCs were downloaded from NOAA's Office of Coast Survey website on October 9, 2013. Thus, the issue dates displayed in the table above are more recent than the dates in the Project Instructions.

Given that the survey area was ensonified with 100% multibeam coverage, discrepancies were discovered between the charted and surveyed depths.

Sounding agreement between surveyed soundings on sheet H12546 and spot soundings displayed on ENC US3AK61M varied between 1 meter and 5 meters.

Although the ENC displays the spot soundings in meters, the contours are displayed in fathoms. The surveyed data for sheet H12546 shows contours that generally agree with the contour trends from ENC US3AK61M.

The Hydrographer recommends that soundings within the survey limits of H12546 supersede all prior survey and charted depths.

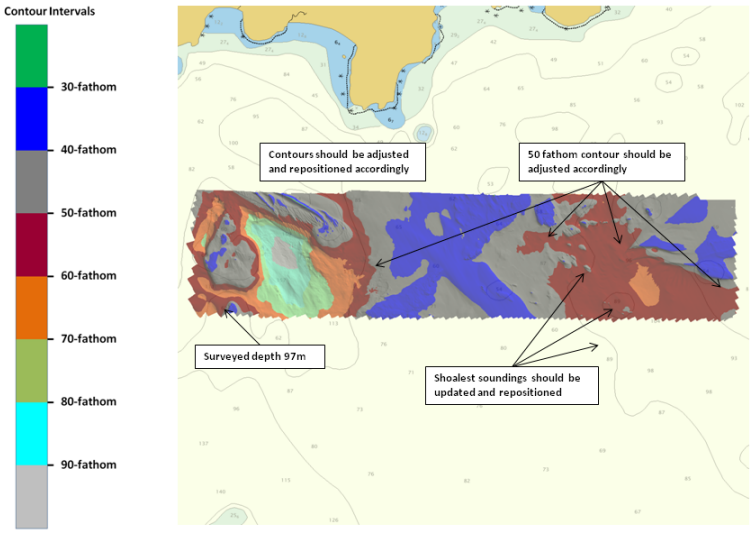


*Figure 17: Chart Comparison H12546 vs. US3AK61M*

US4AK6FM

Given that the survey area was ensonified with 100% multibeam coverage, discrepancies were discovered between the charted and surveyed depths.

Sounding agreement between surveyed soundings on sheet H12546 and spot soundings displayed on ENC US4AK6FM varied between 1 meter and 18 meters. Generally, the surveyed data in the vicinity of the charted spot soundings from the ENC agreed to within 1 to 5 meters. However, the largest discrepancy found was 18 meters.

Although the ENC displays the spot soundings in meters, the contours are displayed in fathoms. The surveyed data for sheet H12546 shows contours that generally agree with the contour trends from ENC US4AK6FM.

The Hydrographer recommends that soundings within the survey limits of H12546 supersede all prior survey and charted depths.

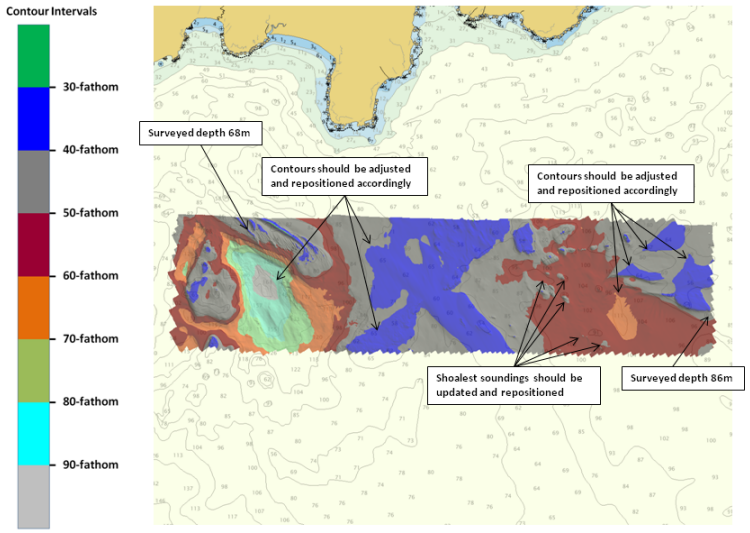


*Figure 18: Chart Comparison H12546 vs. US4AK6FM*

### D.1.3 AWOIS Items

No AWOIS items exist for this survey.

### D.1.4 Charted Features

No charted features exist for this survey.

### D.1.5 Uncharted Features

No uncharted features exist for this survey.

### D.1.6 Dangers to Navigation

No Danger to Navigation Reports were submitted for this survey.

### D.1.7 Shoal and Hazardous Features

No shoals or potentially hazardous features exist for this survey.

### D.1.8 Channels

No channels exist for this survey. There are no designated anchorages, precautionary areas, safety fairways, traffic separation schemes, pilot boarding areas, or channel and range lines within the survey limits.

## D.2 Additional Results

### D.2.1 Shoreline

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

### D.2.2 Prior Surveys

No prior survey comparisons exist for this survey.

### D.2.3 Aids to Navigation

Aids to navigation (ATONs) do not exist for this survey.

### D.2.4 Overhead Features

Overhead features do not exist for this survey.

### D.2.5 Submarine Features

Submarine features do not exist for this survey.

### D.2.6 Ferry Routes and Terminals

No ferry routes or terminals exist for this survey.

### D.2.7 Platforms

No platforms exist for this survey.

### D.2.8 Significant Features

No significant features exist for this survey.

### D.2 Construction and Dredging

There is no present or planned construction or dredging within the survey limits.

### D.2.9.1 Final Feature File

All features, including ones from the NOAA assigned feature file, that were within the geographical bounds of H12546 are included in the "H12546_Field_Features.000" file.

Features that fell within the survey limits were addressed and attributed appropriately. This file contains the object and metadata with extended attributes as required in the Specifications and Deliverables (April 2012).

Note: Since CARIS Notebook and Bathy DataBASE were unable to export to S-57 with the parameters outlined in section 8.2 of the HSSD 2012, an additional text file with the required meta information was sent to accompany the S-57 file.

# E. Approval Sheet

As Chief of Party, Field operations for this hydrographic survey were conducted under my direct supervision, with frequent personal checks of progress and adequacy. I have reviewed the attached survey data and reports.

All field sheets, this Descriptive Report, and all accompanying records and data are approved. All records are forwarded for final review and processing to the Processing Branch.

The survey data meets or exceeds requirements as set forth in the NOS Hydrographic Surveys and Specifications Deliverables Manual, Field Procedures Manual, Standing and Letter Instructions, and all HSD Technical Directives. These data are adequate to supersede charted data in their common areas. This survey is complete and no additional work is required with the exception of deficiencies noted in the Descriptive Report.

| Report Name | Report Date Sent |
|---|---|
| Data Acquisition and Processing Report | 2013-11-04 |
| Horizontal and Vertical Control Report | 2013-11-04 |
| Tides and Water Levels Package | 2013-11-04 |
| MAR-P-001-R2 MBES Acquisition Procedures | 2013-11-04 |
| DAC-P-010-R3 MBES Processing Procedures | 2013-11-04 |

| Approver Name | Approver Title | Approval Date | Signature |
|---|---|---|---|
| Dean Moyles | Senior Hydrographer (ACSM Cert. No. 226) | 11/04/2013 | Dean Moyles Digitally signed by Dean Moyles DN: cn=Dean Moyles, o=Fugro Pelagos, Inc., ou, email=dmoyles@fugro.com, c=US Date: 2014.05.23 04:13:27 -07'00' |

# F. Table of Acronyms

| Acronym | Definition |
|---|---|
| **AFF** | Assigned Features File |
| **AHB** | Atlantic Hydrographic Branch |
| **AST** | Assistant Survey Technician |
| **ATON** | Aid to Navigation |
| **AWOIS** | Automated Wreck and Obstruction Information System |
| **BAG** | Bathymetric Attributed Grid |
| **BASE** | Bathymetry Associated with Statistical Error |
| **CO** | Commanding Officer |
| **CO-OPS** | Center for Operational Products and Services |
| **CORS** | Continually Operating Reference Staiton |
| **CTD** | Conductivity Temperature Depth |
| **CEF** | Chart Evaluation File |
| **CSF** | Composite Source File |
| **CST** | Chief Survey Technician |
| **CUBE** | Combined Uncertainty and Bathymetry Estimator |
| **DAPR** | Data Acquisition and Processing Report |
| **DGPS** | Differential Global Positioning System |
| **DP** | Detached Position |
| **DR** | Descriptive Report |
| **DTON** | Danger to Navigation |
| **ENC** | Electronic Navigational Chart |
| **ERS** | Ellipsoidal Referenced Survey |
| **ERZT** | Ellipsoidally Referenced Zoned Tides |
| **FOO** | Field Operations Officer |
| **FPM** | Field Procedures Manual |
| **GAMS** | GPS Azimuth Measurement Subsystem |
| **GC** | Geographic Cell |
| **GPS** | Global Positioning System |
| **HIPS** | Hydrographic Information Processing System |
| **HSD** | Hydrographic Surveys Division |
| **HSSDM** | Hydrographic Survey Specifications and Deliverables Manual |

| Acronym | Definition |
|---|---|
| **HSTP** | Hydrographic Systems Technology Programs |
| **HSX** | Hypack Hysweep File Format |
| **HTD** | Hydrographic Surveys Technical Directive |
| **HVCR** | Horizontal and Vertical Control Report |
| **HVF** | HIPS Vessel File |
| **IHO** | International Hydrographic Organization |
| **IMU** | Inertial Motion Unit |
| **ITRF** | International Terrestrial Reference Frame |
| **LNM** | Local Notice to Mariners |
| **LNM** | Linear Nautical Miles |
| **MCD** | Marine Chart Division |
| **MHW** | Mean High Water |
| **MLLW** | Mean Lower Low Water |
| **NAD 83** | North American Datum of 1983 |
| **NAIP** | National Agriculture and Imagery Program |
| **NALL** | Navigable Area Limit Line |
| **NM** | Notice to Mariners |
| **NMEA** | National Marine Electronics Association |
| **NOAA** | National Oceanic and Atmospheric Administration |
| **NOS** | National Ocean Service |
| **NRT** | Navigation Response Team |
| **NSD** | Navigation Services Division |
| **OCS** | Office of Coast Survey |
| **OMAO** | Office of Marine and Aviation Operations (NOAA) |
| **OPS** | Operations Branch |
| **MBES** | Multibeam Echosounder |
| **NWLON** | National Water Level Observation Network |
| **PDBS** | Phase Differencing Bathymetric Sonar |
| **PHB** | Pacific Hydrographic Branch |
| **POS/MV** | Position and Orientation System for Marine Vessels |
| **PPK** | Post Processed Kinematic |
| **PPP** | Precise Point Positioning |
| **PPS** | Pulse per second |

| Acronym | Definition |
|---|---|
| **PRF** | Project Reference File |
| **PS** | Physical Scientist |
| **PST** | Physical Science Technician |
| **RNC** | Raster Navigational Chart |
| **RTK** | Real Time Kinematic |
| **SBES** | Singlebeam Echosounder |
| **SBET** | Smooth Best Estimate and Trajectory |
| **SNM** | Square Nautical Miles |
| **SSS** | Side Scan Sonar |
| **ST** | Survey Technician |
| **SVP** | Sound Velocity Profiler |
| **TCARI** | Tidal Constituent And Residual Interpolation |
| **TPU** | Total Porpagated Error |
| **TPU** | Topside Processing Unit |
| **USACE** | United States Army Corps of Engineers |
| **USCG** | United Stated Coast Guard |
| **UTM** | Universal Transverse Mercator |
| **XO** | Exectutive Officer |
| **ZDA** | Global Positiong System timing message |
| **ZDF** | Zone Definition File |

APPROVAL PAGE

**H12546**

Data meet or exceed current specifications as certified by the OCS survey acceptance review process. Descriptive Report and survey data except where noted are adequate to supersede prior surveys and nautical charts in the common area.

The following products will be sent to NGDC for archive

- H12546_DR.pdf
- Collection of depth varied resolution BAGS
- Processed survey data and records
- H12546_GeoImage.pdf

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

Approved: BARRY.CATHLEEN.JEANNETTE.1365891407 2014.09.16 13:09:56 -07'00'

**Cathleen Barry**
**Cartographer, Pacific Hydrographic Branch**

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

Approved: Digitally signed by EVANS.BENJAMIN.K.1237217094 Date: 2014.09.16 13:53:14 -07'00'

**LCDR Benjamin K. Evans, NOAA**
**Chief, Pacific Hydrographic Branch**