

H11933

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. H11933

LOCALITY

State Alaska

General Locality Kachemak Bay

Sublocality Aurora Lagoon to Bear Cove

2008

CHIEF OF PARTY

Captain Donald W. Haines, NOAA

LIBRARY & ARCHIVES

DATE

| | |
|--|---|
| <p style="text-align: center;">U.S. DEPARTMENT OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION</p> <p style="text-align: center;">HYDROGRAPHIC TITLE SHEET</p> | <p>REGISTRY No</p> <p style="text-align: center;">H11933</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>Alaska</u></p> <p>General Locality <u>Kachemak Bay</u></p> <p>Sub-Locality <u>Aurora Lagoon to Bear Cove</u></p> <p>Scale <u>1:10,000</u> Date of Survey <u>08/19/2008 to 08/28/2008</u></p> <p>Instructions dated <u>7/24/2008</u> Project No. <u>OPR-P357-RA-FA-08</u></p> <p>Vessel <u>RA1 (1101), RA2 (1103), RA3 (1021), RA4 (2801), RA5 (2802), RA6(1015)</u></p> <hr/> <p>Chief of party <u>CAPT Donald W. Haines, NOAA</u></p> <p>Surveyed by <u>RAINIER Personnel</u></p> <p>Soundings by <u>Reson SeaBat 8125, 8101, 7125 and Knudsen 320M</u></p> <p>SAR by <u>Martha Herzog</u> Compilation by <u>Fernando Ortiz</u></p> <p>Soundings compiled in <u>Fathoms</u></p> | |
| <p>REMARKS: <u>All times are UTC. UTM Zone 5</u></p> <p><u>The purpose of this survey is to provide contemporary surveys to update National Ocean Service (NOS) nautical charts. All separates are filed with the hydrographic data. Revisions and end notes in red were generated during office processing. Page numbering may be interrupted or non sequential.</u></p> <hr/> <hr/> | |

Descriptive Report to Accompany Hydrographic Survey H11933

Project OPR-P357-RA-FA-08

Kachemak Bay, Alaska

Aurora Lagoon to Bear Cove

Scale 1:10,000

August 2008

NOAA Ship *Rainier* (s221)

Chief of Party: Captain Donald W. Haines, NOAA

A. AREA SURVEYED

This hydrographic survey was completed as specified by Hydrographic Survey Letter Instructions OPR-P357-RA-FA-08 dated July 24, 2008 and all other applicable direction¹, with the exception of deviations noted in this report. The survey area is Aurora Lagoon to Bear Cove at the head of Kachemak Bay, Alaska. This survey corresponds to sheet “A” in the sheet layout provided with the Letter Instructions. OPR-P357-RA-FA-08 comprises the first year of a two year project in which the Office of Coast Survey is dedicating sea-days for the NOAA Ships *Rainier* and *Fairweather* to conduct a regional study of Kachemak Bay. “The purpose of this project is to provide contemporary surveys to update NOS nautical charts... While conducting normal survey operations the two ships will assist a variety of disciplines within the National Ocean Service” resulting in “a total regional examination of Kachemak Bay”.

Complete multibeam echosounder (MBES) coverage was achieved in the survey area in waters 8 meters and deeper. Complete MBES coverage was achieved in the survey area to 4 meters, except along the northern shore where 25 meter spaced MBES was acquired from 8 meters to 4 meters to improve efficiency. The survey area also contains the Harbor of Refuge area as delineated in the Project Instructions. Accordingly, the zero-meter curve was developed with 100 m-spaced VBES lines.¹ Total mileage acquired by each vessel and system is referenced in Table 1

Snippet data, as required by project instructions, were not collected by Launch 2802 on DN232.

Limited Shoreline Verification was performed in the survey area.

¹ NOS Hydrographic Surveys Specifications and Deliverables (April 2008), OCS Field Procedures Manual for Hydrographic Surveying (May 2008), and all Hydrographic Surveys Technical Directives issued through the dates of data acquisition.

| Data Acquisition Type | Hull Number with Mileage (nm) | | | | | | Total |
|------------------------------------|-------------------------------|------|-------|------|------|------|-------|
| | 1015 | 1101 | 1103 | 1021 | 2801 | 2802 | |
| VBES (mainscheme) | - | - | 138.9 | - | - | - | 138.9 |
| MBES (mainscheme) | 29.3 | 10.8 | - | 9.2 | 54.5 | 84.0 | 187.8 |
| SSS (mainscheme) | - | - | - | - | - | - | - |
| VBES + SSS (mainscheme) | - | - | - | - | - | - | - |
| PDBS (Testing) | - | - | - | - | - | - | - |
| Crosslines | 10.8 | - | 17.2 | - | - | - | 28.0 |
| Developments | - | - | - | 0.3 | 6.1 | - | 6.4 |
| Shoreline | - | - | 16.7 | - | - | - | 16.7 |
| Bottom Samples | - | - | 16 | - | - | - | 16 |
| Total Number of Items Investigated | - | - | 5 | - | - | - | 5 |
| Total Area Surveyed (sq. nm) | | | | | | | 15.48 |

Table 1: Statistics for survey H11933

Data acquisition was conducted from August 19 to August 28, 2008 (DN232 to DN241).

B. DATA ACQUISITION AND PROCESSING

A complete description of data acquisition and processing systems, survey vessels, quality control procedures and data processing methods can be found in the *OPR-P357-RA-08 Data Acquisition and Processing Report (DAPR)*,² submitted under separate cover. Items specific to this survey and any deviations from the DAPR are discussed in the following sections.

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

B1. Equipment and Vessels

Data for this survey were acquired by the following vessels:

| Hull Number | Name | Acquisition Type |
|-------------|------|--|
| 1101 | RA-1 | Reson 8125 titled Multibeam Echo sounder Vertical Beam Echo sounder |
| 1103 | RA-2 | Vertical Beam Echo sounder Detached Positions Bottom Samples |
| 1021 | RA-3 | Reson 8101 Multibeam Echo sounder |
| 2801 | RA-4 | Reson 7125 Multibeam Echo sounder |
| 2802 | RA-5 | Reson 7125 Multibeam Echo sounder |
| 1015 | RA-6 | Reson 8101 Multibeam Echo sounder |

Table 2: Data Acquisition Vessels for H11933.

Sound speed profiles were measured with SEACAT 19+ profilers and the Brooke Ocean MVP 30 profiler in accordance with the Specifications and Deliverables.

No unusual vessel configurations were used for data acquisition.

B2. Quality Control

System Certification and Calibration

Refer to the NOAA Ship *Rainier* DAPR and Hydrographic Systems Readiness Report (HSRR) for a complete description of system integration and initial calibration results for equipment and sensors used for this survey.

Crosslines

Vertical Beam Echosounder (VBES) crosslines including buffer lines totaled 17.15 nautical miles, comprising 12.38% of mainscheme VBES hydrography. Crossline and mainscheme bathymetry were manually compared in CARIS HIPS Subset Mode. Crosslines generally agreed within 0.2 meters of mainscheme hydrography.

Multibeam Echosounder (MBES) crosslines totaled 10.79 nautical miles, comprising 5.75% of mainscheme MBES hydrography. The mainscheme bathymetry was manually compared to the XL nadir beams in CARIS subset mode and agreed well with differences typically within 0.1 meters and not exceeding 0.4 meters.

A statistical Quality Control Report has been conducted on representative data acquired with each system used on this survey. Results of these tests are included in the updated 2008 *Rainier* Hydrographic System Readiness Review package submitted with this survey.

Junctions³

The following contemporary survey junctions with H11933 (See Figure 1):

| Registry # | Scale | Date | Field Party | Junction side |
|-------------------|--------------|-------------|--------------------|----------------------|
| H11934 | 1:10,000 | 2008 | <i>Rainier</i> | Southwest |

This junction survey was run concurrently within project OPR-P357-RA-FA-08. Data were reviewed in CARIS Subset Editor and depths were found to be consistent between the two surveys. All differences were typically between 0.07 to 0.4 meters, and did not exceed 0.5 meters. In the area of overlap near the northern shore these deviations can be attributed to sound velocity errors due to the highly variable waters within Kachemak Bay. In the area of overlap near the southern or eastern shore these can be attributed mainly to a positional offset as discussed in the Data Quality section of this report.

Data Quality Factors

Sound Speed Artifacts

Severe sound speed artifacts were observed throughout survey H11933 where tidal patterns, glacial outflows, and other freshwater inputs produced significant mixing. After applying sound speed corrections in CARIS HIPS, some lines still exhibited the characteristic “frowns” indicative of inaccurate sound speed corrections. CTD sound speed casts were taken more frequently than the standard 4 hour time interval. In addition, the moving vessel profiler (MVP) was used to take additional casts when possible. Despite the best efforts of the Hydrographer to conduct sufficient sound speed casts, distributed both spatially and temporally, and to correct for sound speed errors in post processing, sound speed errors are still noticeable in several regions. The Hydrographer compensated by rejecting obvious soundings in error on the outer beams. The BASE surfaces display some remaining artifacts, but are within International Hydrographic Organization (IHO) Order 1 specifications for acceptable total vertical uncertainty (Figures 2 and 3). As such, the acquired data is adequate to supersede charted depths.⁴

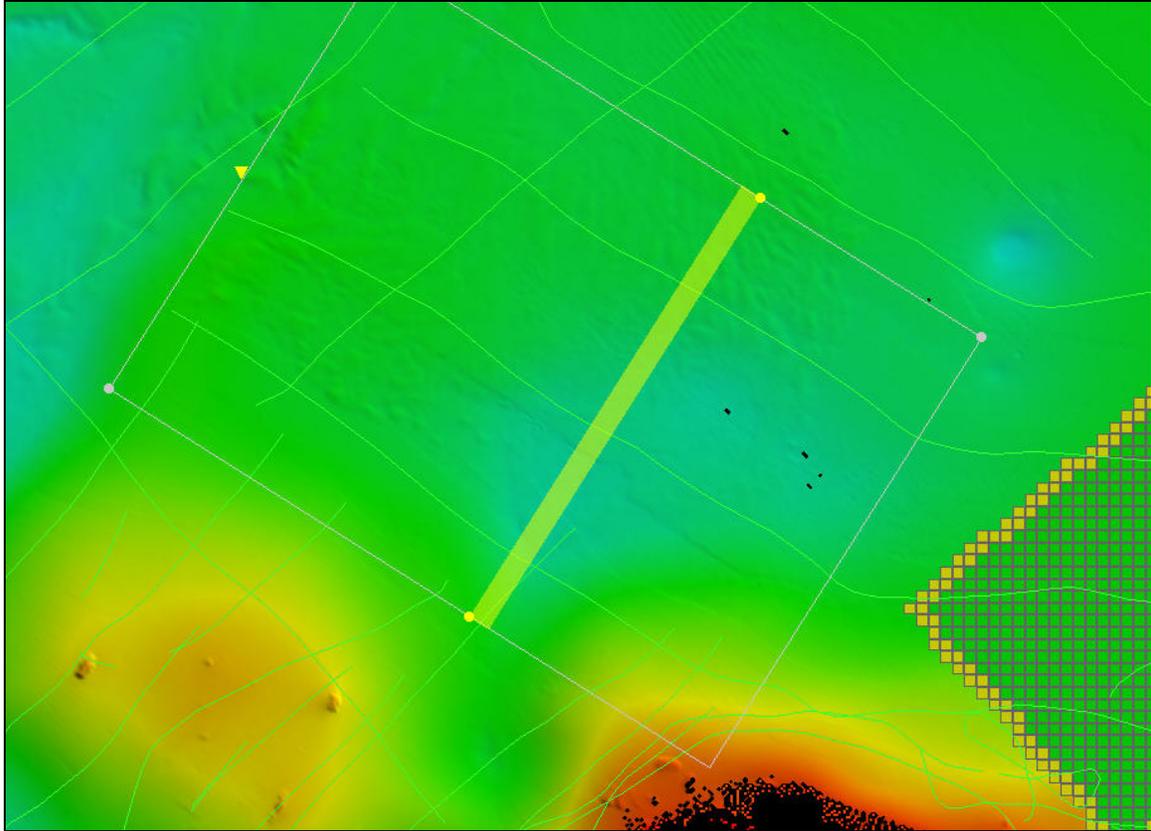


Figure 2: 2m surface showing sound speed artifacts prevalent on H11933.

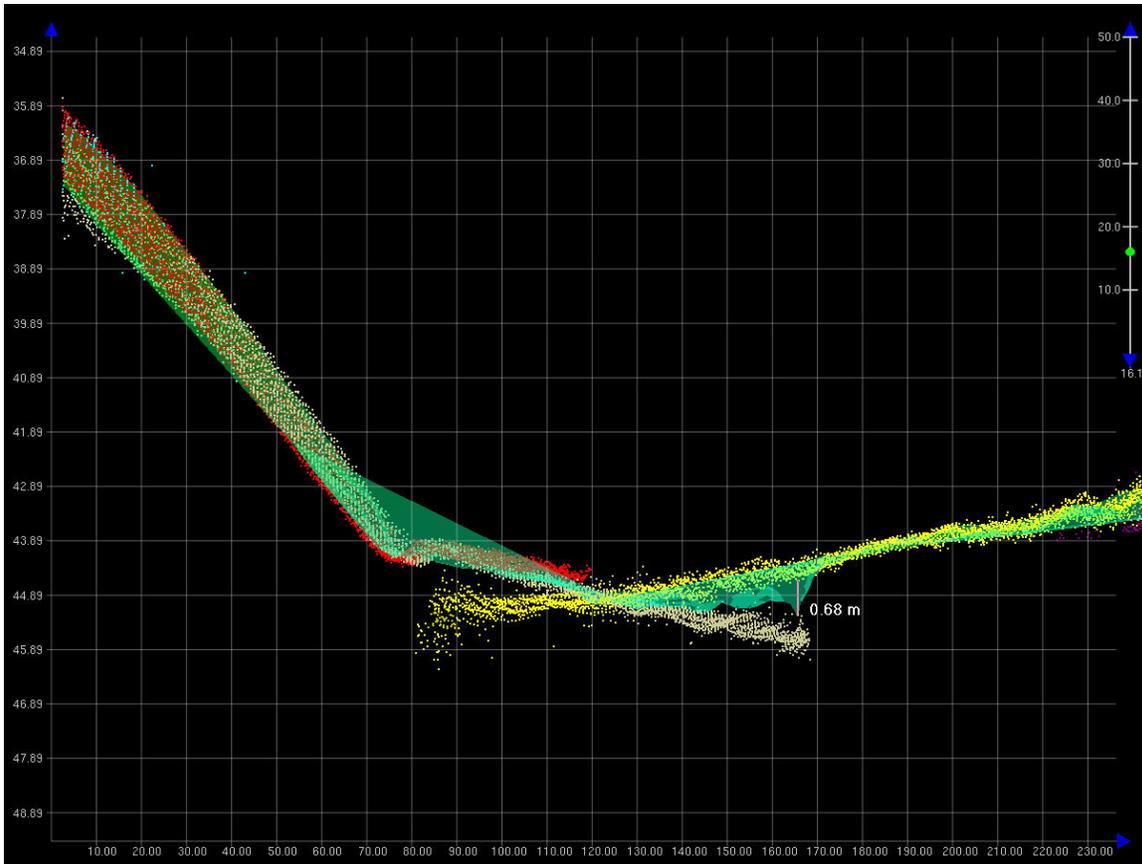


Figure 3: The subset depicted in Figure 2 in 2D View. As pictured, the offset due to sound speed artifacts meet IHO Order 1 specifications for acceptable total vertical uncertainty

POS MV Heading Accuracy

During the course of data acquisition, survey personnel noted occasional instances of POS MV heading accuracy decreasing from the normal level of ≤ 0.05 degrees to a maximum of 0.078 degrees. This phenomenon was seen almost daily, but was always self correcting after a period of approximately 15 to 20 minutes. The likely cause of decreased heading accuracy was less than optimal satellite geometry. Bathymetry data did not appear to be affected by this issue.⁵

Positional Offset

Positional errors of approximately two meters were observed along the shores of Bear Cove on H11933. Due to the steepness of the sloping bathymetry in the area, BASE surfaces appeared very ragged as the CUBE algorithm would cause the BASE surface to jump back and forth between the offset data (Figures 4 and 5). Post-Processing Kinematic (PPK) techniques were therefore used to correct the horizontal accuracy of the data. Dual frequency GPS was logged through the POS MV to a POS file. The resulting POS data were post processed using Applanix POSpac v. 5.1 software in order to achieve sub-meter horizontal accuracy. International GNSS Service (IGS) station Seldovia was used as the reference station for post processing; the resultant Smoothed Best Estimate of Trajectory (SBET) file is included in the raw data. In all cases the positioning uncertainty of the post processed SBET is less than 1 m. The SBET files were applied to the data using the Caris HIPS and SIPS

“Load attitude and navigation” function. Applying the SBET files to survey data eliminated most visible offsets. SBET files were loaded into Launch 1101 data from DN232 and DN233, Launch 2801 data from DN232 and DN238, Launch 2802 data from DN232 and DN238, and Launch 1015 data from DN238. All bathymetry data was then remerged and surfaces were recreated.⁶

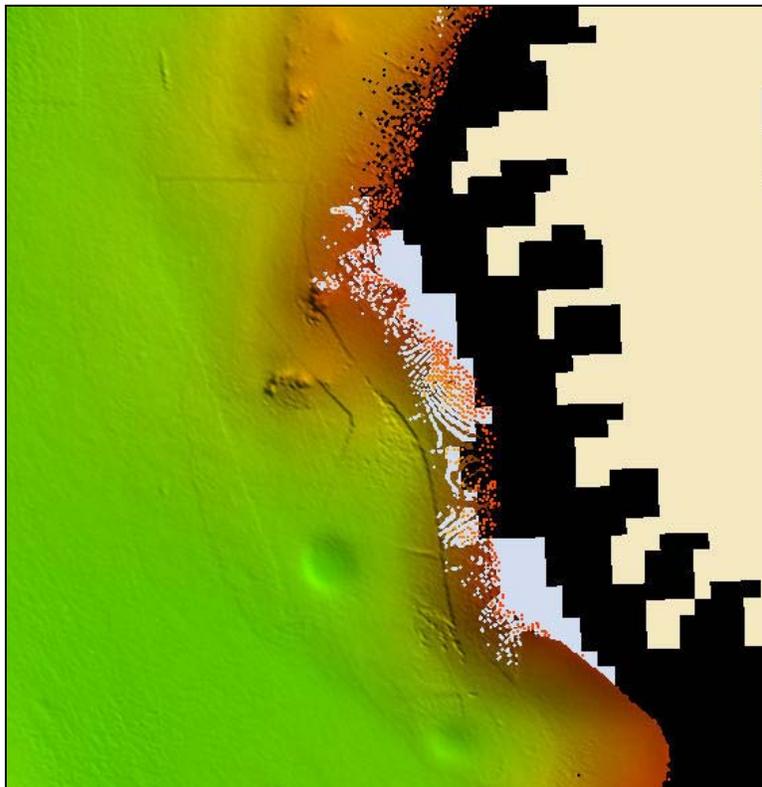


Figure 4: Example of surface artifact attributed to positional offset in survey H11933.

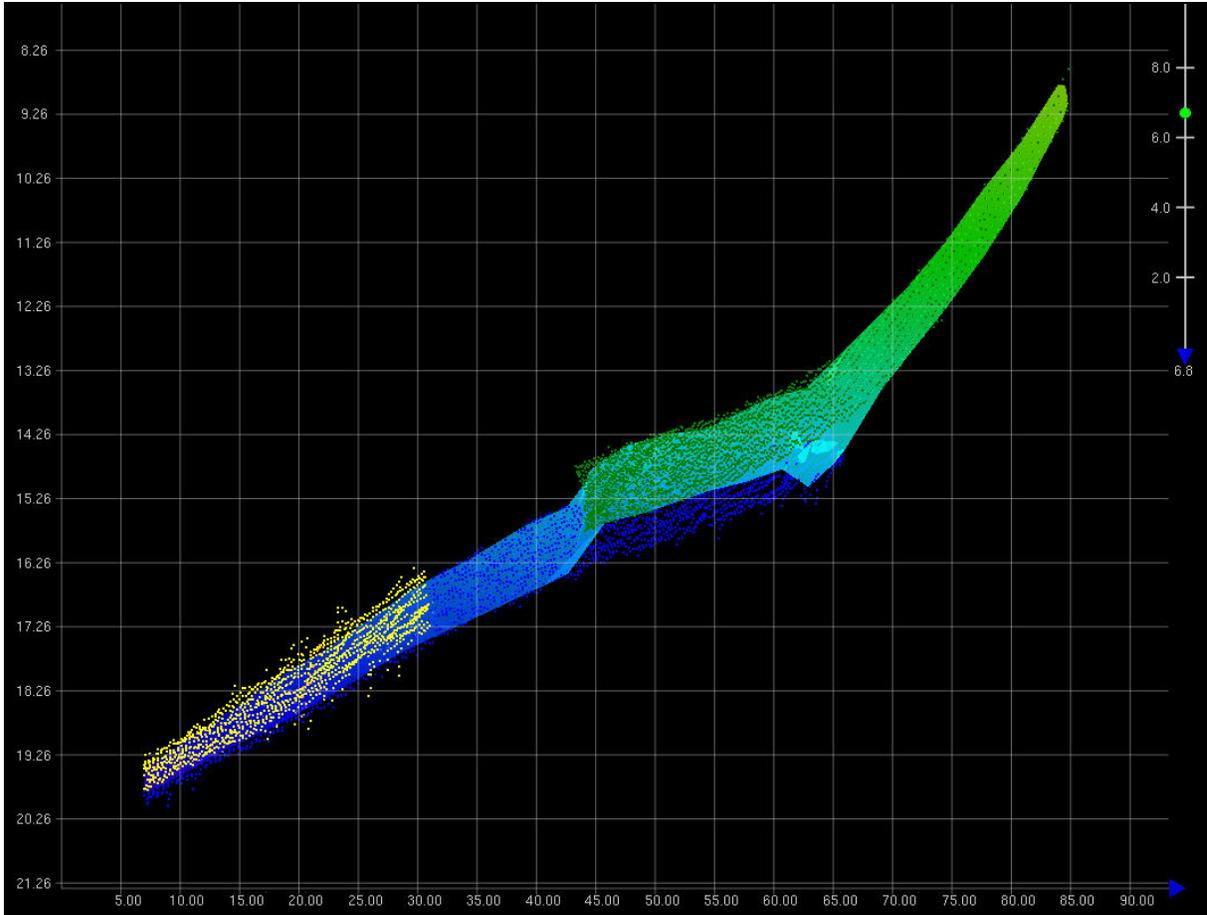


Figure 5: Example of positional offset observed in survey H11933 as viewed in subset mode.

The SBET time extents do not entirely cover line 445_0012 acquired by Launch 2801 on DN238. As a result, a portion of the line does not contribute to the surface. This occurs in depths less than 8 meters where other lines satisfy the 25-meter spacing requirement.

Data Gaps

One coverage gap appears in the 4-meter Final Combined surface for H11933 (Figures 6 and 7). No significant undeveloped shoals appear to be coincident with this coverage gap.⁷

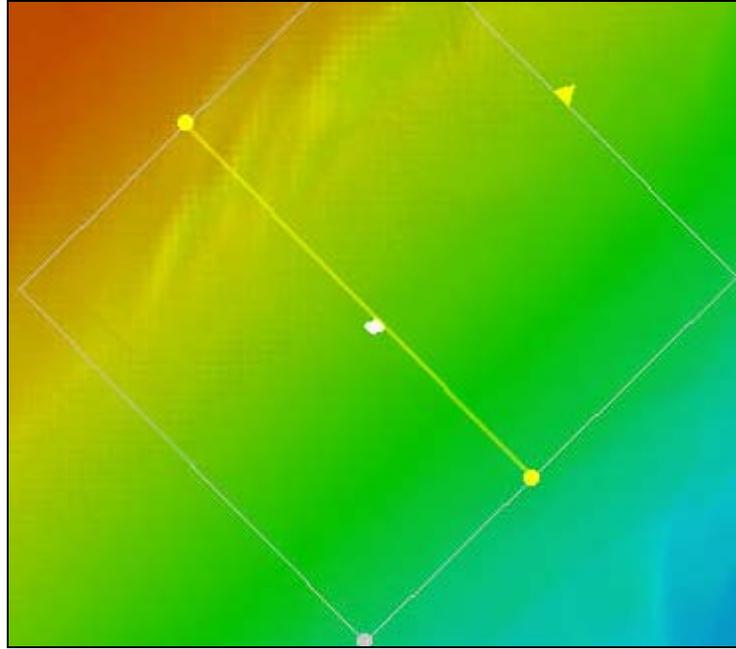


Figure 6: Data gap as depicted in the 2-meter surface for H11933.

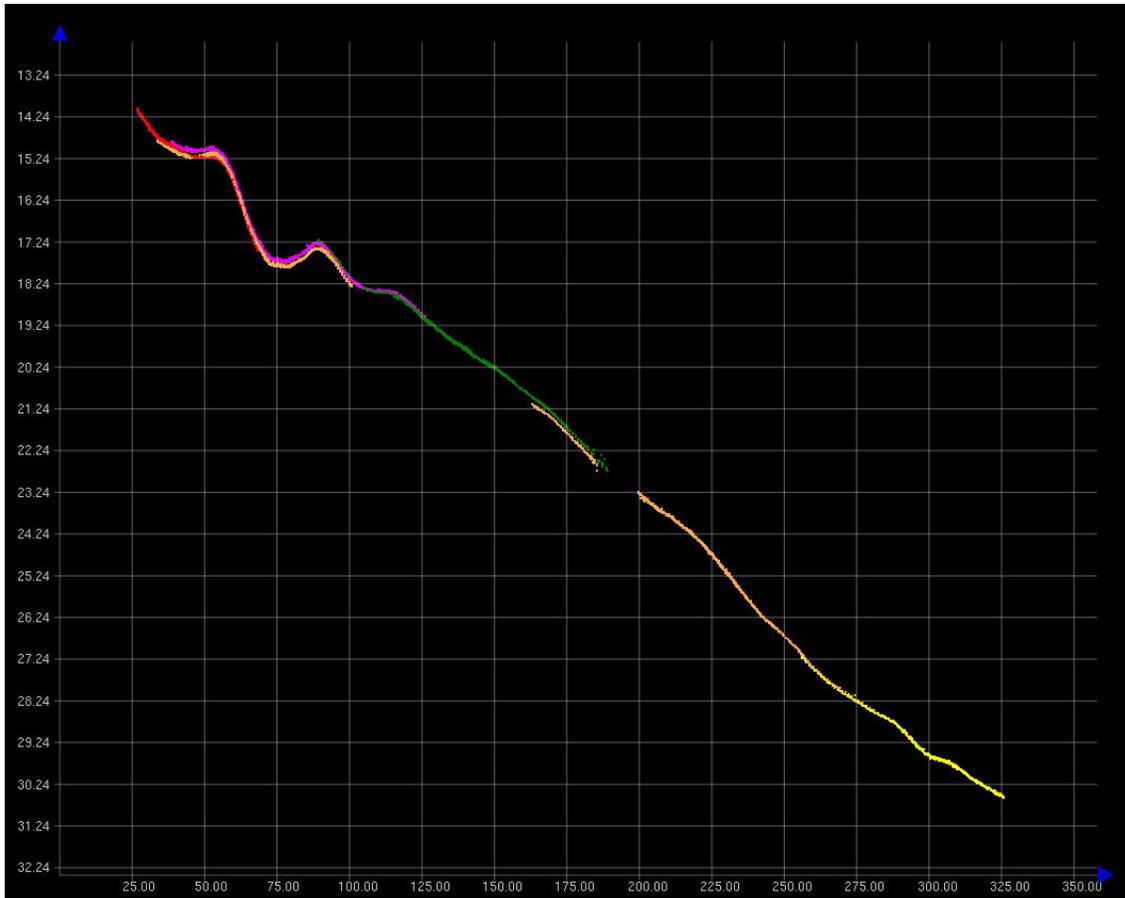


Figure 7: View in 2D Subset mode of the data gap pictured above.

B3. Correction to Echo Sounding (Data Reduction)

Data reduction procedures for survey H11933 conform to those detailed in the *OPR-P357-RA-08 DAPR*. The concatenated sound velocity profile data was applied in Caris HIPS and SIPS with the “Nearest in Distance Within Time – 2 hours” profile selection method.

In an effort to address sound speed artifacts in the surface, the Hydrographer edited the .svp file for cast 082331840 acquired by Launch 2802. Readings recorded during the upcast were used to adjust and re-establish several values not captured as the cast descended. The cast’s original .svp file submitted with H11933 contains the unedited values (see figure 8 below at left). The .svp file in the concatenated sheetwide file for the sheet contains the adjusted values (see figure 8 below at right).

| File Edit Format View Help | | | | | [SVP_VERSION_2] 082331840.svp | | | | |
|----------------------------|----------|---------|----------|------------|----------------------------------|----------|---------|----------|------------|
| Section | 2008-233 | 18:40 | 59:44:28 | -151:03:47 | Section | 2008-233 | 18:40 | 59:44:28 | -151:03:47 |
| 0.104 | | 1473.74 | | | 0.66 | | 1471.85 | | |
| 0.64 | | 1478.28 | | | 1.16 | | 1474.72 | | |
| 1.148 | | 1480.17 | | | 2.87 | | 1481.59 | | |
| 2.87 | | 1481.59 | | | 3.73 | | 1482.10 | | |
| 3.73 | | 1482.10 | | | 4.76 | | 1482.33 | | |
| 4.76 | | 1482.33 | | | 5.95 | | 1482.46 | | |
| 5.95 | | 1482.46 | | | 6.98 | | 1482.42 | | |
| 6.98 | | 1482.42 | | | 7.97 | | 1482.31 | | |
| 7.97 | | 1482.31 | | | 8.97 | | 1482.27 | | |
| 8.97 | | 1482.27 | | | 9.92 | | 1482.29 | | |
| 9.92 | | 1482.29 | | | 10.94 | | 1482.35 | | |
| 10.94 | | 1482.35 | | | 11.94 | | 1482.53 | | |
| 11.94 | | 1482.53 | | | 12.94 | | 1482.75 | | |
| 12.94 | | 1482.75 | | | 13.95 | | 1482.72 | | |
| 13.95 | | 1482.72 | | | 14.92 | | 1482.47 | | |
| 14.92 | | 1482.47 | | | 15.92 | | 1482.30 | | |
| 15.92 | | 1482.30 | | | 16.93 | | 1482.19 | | |
| 16.93 | | 1482.19 | | | 17.92 | | 1482.10 | | |
| 17.92 | | 1482.10 | | | 18.92 | | 1482.01 | | |
| 18.92 | | 1482.01 | | | 19.91 | | 1481.92 | | |
| 19.91 | | 1481.92 | | | 20.90 | | 1481.82 | | |
| 20.90 | | 1481.82 | | | 21.95 | | 1481.72 | | |
| 21.95 | | 1481.72 | | | 23.27 | | 1481.45 | | |
| 23.27 | | 1481.45 | | | 24.19 | | 1481.27 | | |
| 24.19 | | 1481.27 | | | 24.88 | | 1481.16 | | |
| 24.88 | | 1481.16 | | | 25.25 | | 1481.10 | | |
| 25.25 | | 1481.10 | | | 25.39 | | 1481.07 | | |
| 25.39 | | 1481.07 | | | 33.00 | | 1480.04 | | |
| 33.00 | | 1480.04 | | | | | | | |

Figure 8: Cast 082331840 original .svp file on left; adjusted file using upcast values on right

TrueHeave data were successfully applied to all MBES data acquired for H11933.

B4. Data Processing (Data Representation)

Data processing procedures for survey H11933 conform to those detailed in the DAPR.

There are three (3) total fieldsheets fulfilling the various resolution requirements for survey H11933. The submission Field Sheet and BASE Surface structure are shown in Figures 9 and 10. All BASE Surfaces are CUBE surfaces save for the 2m Uncertainty weighted grid created for VBES data.

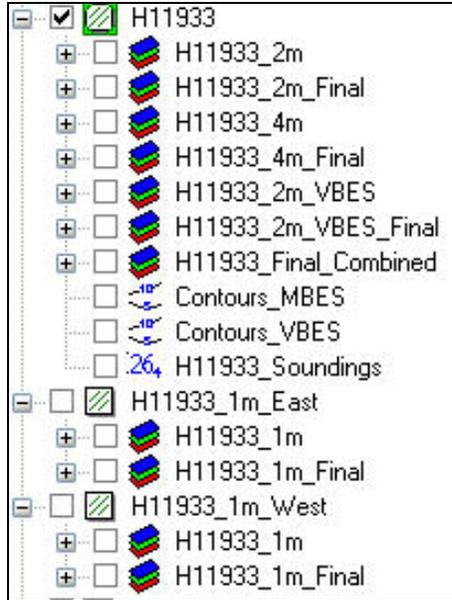


Figure 9: Field Sheets and BASE surfaces submitted with H11933.

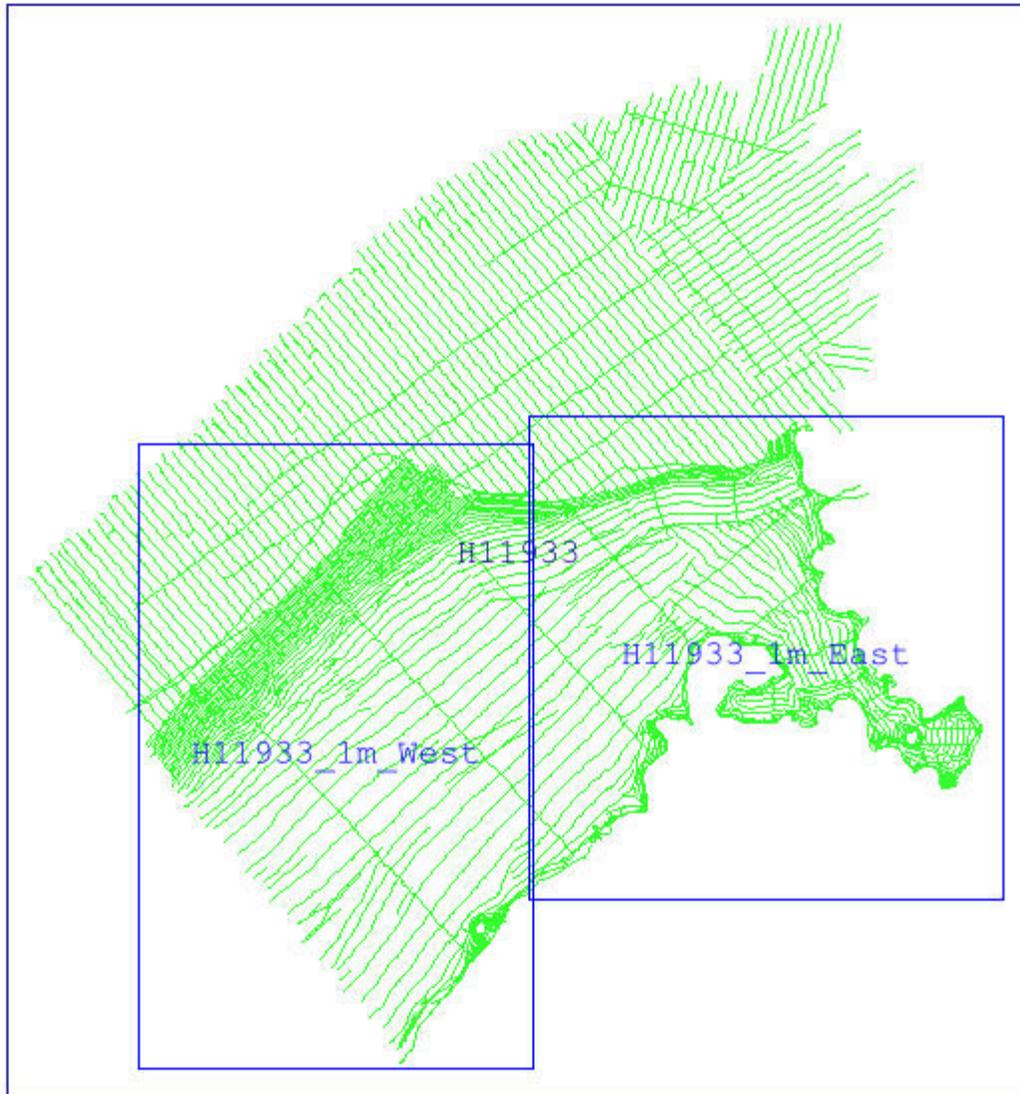


Figure 10: Field Sheet layout for H11933.

Fieldsheets have a grid resolution of at least 10% of the depth and are smaller than 25×10^6 nodes. This survey utilized the Combined Uncertainty and Bathymetry Estimator (CUBE) algorithm. As discussed in the DAPR, all 1 meter resolution surfaces use Shallow parameters, while 2- and 4- meter surfaces were created with an adjusted set of Deep parameters (see Figure 11).

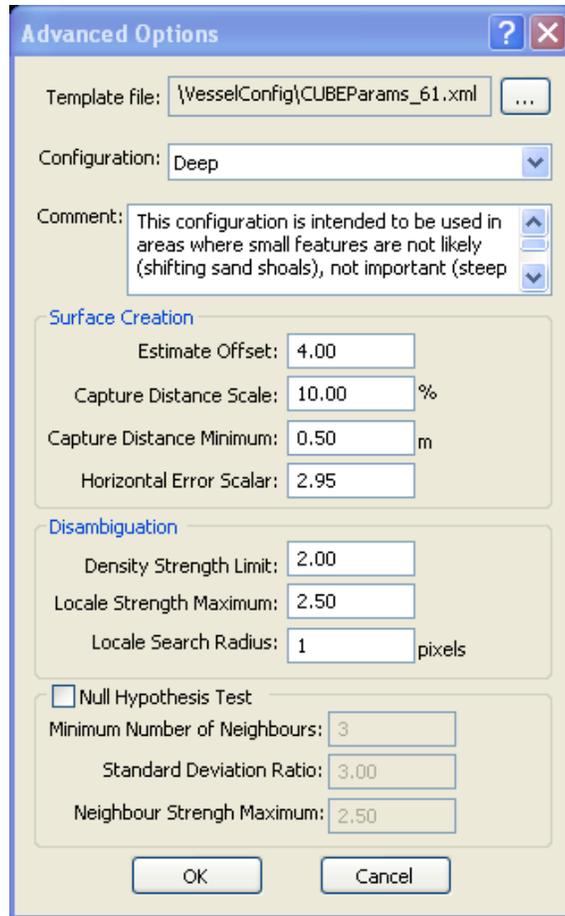


Figure 11: CUBE Deep parameters adjusted by Rainier personnel and used for 2- and 4-meter surfaces representing H11933.

Final BASE surface resolutions and depth ranges were set in accordance with the Specification and Deliverables Complete Multibeam Coverage requirements (see Table 3).

| Depth Range of Finalized Surface | Resolution |
|----------------------------------|------------|
| 0-21.5 | 1m |
| 18.5-52 | 2m |
| 46-115 | 4m |

Table 3: Depth range and resolution of finalized surfaces

Soundings and contours were generated in CARIS HIPS from the 4-meter final combined BASE surface for field unit review purposes. They are included for reference only and are not intended as a deliverable.

C. VERTICAL AND HORIZONTAL CONTROL

Project OPR-P357-RA-FA-08 required static GPS observations and tertiary gauges. NOAA Ship *Fairweather* personnel acquired and processed all of the horizontal and vertical control

data. Subsequently, a Horizontal and Vertical Control Report will be submitted by NOAA Ship *Fairweather* for this project.⁸

Horizontal Control

The horizontal datum for this project is the North American Datum of 1983 (NAD83). Differential GPS (DGPS) was the primary method of positioning. The differential corrector beacons utilized for this survey are given in Table 4. Intermittent outages of the Kenai beacon occurred during survey acquisition. At such times, hydrographers-in-charge switched to the Kodiak beacon. The beacon used each day is noted in this survey's acquisition logs included in Separates I. In addition, Continuously Operating Reference Stations (CORS) site, dual frequency GPS was logged through the POS MV to a POS file and applied to select survey lines as discussed above in section B2.

| Location | Frequency | Operator | Priority |
|----------|-----------|----------|-----------|
| Kenai | 310 kHz | USCG | Primary |
| Kodiak | 313 kHz | USCG | Secondary |

Table 4: Differential Corrector Sources for H11933.

Vertical Control

The vertical datum for this project is Mean Lower-Low Water (MLLW). The operating National Water Level Observation Network (NWLON) primary tide station at Seldovia, AK (945-5500) served as control for datum determination and as the primary source for water level reducers for survey H11933.

NOAA Ship *Fairweather* personnel installed and maintained two Sutron 8210 “bubbler” tide gauges at the tertiary stations listed in the Project Instructions: Kasitsna Bay, AK (945-5517) and Bear Cove, AK (945-5595). As stated above, NOAA Ship *Fairweather* personnel will submit the Horizontal and Vertical Control Report for further information about the tertiary tide stations.

All data were reduced to MLLW using final approved Tidal Constituent and Residual Interpolator (TCARI) water levels from H11933-TCARI.tc and station Seldovia, AK (945-5500) using the tide file 9455500.txt.

The request for Final Approved Water Levels for H11933 was submitted to CO-OPS on September 3rd, 2008 and the Final Tide Note was received on October 22nd, 2008. This documentation is included in Appendix IV.⁹

It will not be necessary for the Pacific Hydrographic Branch to reapply the final approved water levels to the survey data during final processing.

D. RESULTS AND RECOMMENDATIONS

D.1. Chart Comparison

D.1.a. Survey Agreement with Chart

Survey H11933 was compared with the following charts:¹⁰

| Chart | Edition | Edition Date | Local Notice to Mariners applied through | Scale |
|--------------|------------------|---------------------|---|--------------|
| 16645 | 18 th | January 2002 | October 18, 2008 | 1:82,662 |

Table 5: Chart compared with H11933.

Survey H11933 was compared with the provided composite source file, which was compiled from the associated Electronic Navigational Chart. No additional chart comparison was conducted for this Electronic Navigational Chart. The raster chart comparison was conducted using BASE surfaces displayed in CARIS HIPS and SIPS with the associated chart in the background.

Chart 16645

Chart 16645 encompasses the entirety of survey H11933. With the exceptions noted in this report, survey soundings generally agreed well with charted depths.

At the southern entrance to Bear Cove, survey soundings are 4 fathoms deeper than a charted 13-fathom depth. Complete coverage of the area indicates no significant shoaling in the vicinity.¹¹ This 13-fathom sounding may have been pulled off shore for charting purposes.

A number of charted rocks along the eastern shore and in Bear Cove appear to have been pulled offshore for charting purposes and were not observed in the field. Those that were covered with MBES have been moved into the H11933_Disprovals.hob and should be removed from the chart.¹²

The Hydrographer recommends that survey soundings supersede all prior survey and charted depths in the common area.¹³

Automated Wreck and Obstruction Information System (AWOIS) Investigations

There were no AWOIS items located within the limits of H11933.¹⁴

D.1.b. Dangers to Navigation

No dangers to navigation (DTONs) were found in survey H11933.¹⁵

D.1.c. Other Features

Additional Items

No additional charted items were investigated and no other features were located on survey H11933.

D.2. Additional Results

D.2.a. Prior Survey Comparison

Prior survey comparison was not performed.

D.2.b. Shoreline Verification

Shoreline Source

The Pacific Hydrographic Branch provided *Rainier* with a composite source .HOB file using data from the latest ENC's as well as prior survey features. Photogrammetric survey project GC10700 has been adequately applied to ENC's used in the composite source file. This source shoreline was used for orientation purposes in Hypack and Notebook.

Shoreline Verification

Traditional "limited shoreline verification" was required for this survey. The following field procedures were followed:

- The composite source shoreline was used for orientation and navigation while transiting along assigned H11933 shoreline.
- All new and charted items within the limits of H11933 (i.e., offshore of the limits prescribed in the Project Instructions and discussed in Section A.) were addressed.
- Limited shoreline verification was conducted at predicted low water in accordance with the Specifications and Deliverables and FPM sections 6.1 and 6.2.
- Investigation methods and recommendations are described in the Notebook "Remarks" and "Recommendations" fields.

Detached positions (DPs) acquired during shoreline verification were recorded in Caris Notebook or HYPACK. In addition, annotations describing shoreline were recorded on hard copy plots of digital shoreline, and transferred to the "remrks" attribute on the corresponding features in Notebook. Boat sheets are included in the *Separates to be Included with Survey Data*.

All shoreline data is submitted in Caris Notebook .hob files. All source shoreline changes and new features for survey H11933 are addressed in the deliverable Caris Notebook .hob files. If a source feature was edited in Notebook, the SORIND and SORDAT attribute fields were modified to reflect the survey number (US,US,survey,H11933) and final survey date (20080828). Remarks and recommendations are included in the .hob files when required. The session H11933_NTBK contains the following:

| HOB File | Purpose and Contents |
|---------------------------------|---|
| H11933_Original_Comp_Source.hob | Original Source Data as provided for project OPR-P357-RA-FA-08 and clipped to H11933 survey limits. |
| H11933_Field_Verified.hob | Field verified source features and shoreline, including edits and updates not requiring DPs, as well as features that were not addressed. |
| H11933_Disprovals.hob | Composite Source items that were disproved and have been moved from the Field Verified .hob |

Table 6: List and Description of Notebook .hob files

Source Shoreline Changes and New Features

As there were no AWOIS items located within the limits of H11933 and all features are addressed in the final deliverable .hob files, there is no traditional Pydro session or Survey Features Report included for H11933.

Recommendations

The Hydrographer recommends that the shoreline as depicted in the Notebook .hob files supersede and complement shoreline information compiled on the CSF and charts as described above.¹⁶

D.2.c. Aids to Navigation

There are no Aids to Navigation within the limits of H11933.¹⁷

D.2.d. Overhead Features

There are no overhead features within the limits of survey H11933.¹⁸

D.2.e. Submarine Cables and Pipelines

There are no submarine cables or pipelines charted within the limits of H11933, and none were detected by the survey.¹⁹

D.2.f. Ferry Routes

There are no ferry routes charted within the limits of survey H11933, and none were observed to be operating in the area.²⁰

D.2.g. Bottom Samples

Sixteen (16) bottom samples were collected during survey H11933. Nine samples were collected at historic bottom sample sites. Of these, four samples correctly matched current charted bottom type. Five samples did not match current charted bottom. Seven samples were collected in areas without prior data. Bottom samples were collected from Launch 1103 and logged into CARIS Notebook. The data is included in the submitted H11933_Field_Verified.hob layer.²¹

D.2.h. Other Findings

There are no other findings to report for survey H11933.

E. APPROVAL

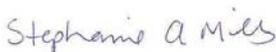
As Chief of Party, Field operations for hydrographic survey H11933 were conducted under my direct supervision, with frequent personal checks of progress and adequacy. I have reviewed the attached survey data and reports. The survey data meets or exceeds requirements as set forth in the NOS Hydrographic Surveys and Specifications Deliverables Manual (April 2008 edition), Field Procedures Manual (May 2008 edition), Standing and Letter Instructions, and all HSD Technical Directives issued through August 2008. 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.

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> |
|--|------------------|---------------|
| Data Acquisition and Processing Report for OPR-P357-RA-FA-08 | TBD | N/CS34 |
| Coast Pilot Report for OPR- P357-RA-FA-08 | TBD | N/CS26 |

Approved and Forwarded:  CAPT/NOAA
 CAPT Donald W. Haines, NOAA
 2009.01.21 09:36:59 -08'00'
 Captain Donald W. Haines, NOAA
 Commanding Officer, NOAA Ship *Rainier*

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

Survey Sheet Manager:  Stephanie Mills
 2009.01.16 09:29:43 -08'00'
 Stephanie A. Mills
 Hydrographic Survey Technician, NOAA Ship *Rainier*

Chief Survey Technician:  James B Jacobson
 I have reviewed this document
 2009.01.21 09:03:59 -08'00'
 James B. Jacobson
 Chief Survey Technician, NOAA Ship *Rainier*

Field Operations Officer:  I have reviewed this document
 2009.01.16 09:39:31 -08'00'
 Lieutenant Charles Yoos III, NOAA
 Field Operations Officer, NOAA Ship *Rainier*

Revisions and Corrections Compiled During Office Processing and Certification

- ¹ Concur. Intertidal areas were modified to new survey data. See HCell report section 4.
- ² Filed with project records.
- ³ H11933 junctions with H11934 to the Southwest. A common junction was made with an adjoining portion of H11933.
- ⁴ Concur.
- ⁵ The data is adequate to supersede charted data despite POS MV heading accuracy problems.
- ⁶ Data is adequate and within specifications after the application of POS data. It is recommended that the data from H11933 supersede the data currently on the chart.
- ⁷ Concur.
- ⁸ Filed with project records.
- ⁹ Tide note is attached to this report.
- ¹⁰ Concur with clarification. During HCell creation the following chart was used for comparison purposes.

| Chart | Edition | Edition Date | Local Notice to Mariners applied through | Scale |
|--------------|------------------|---------------------|---|--------------|
| 16645 | 19 th | July 2010 | September 4, 2010 | 1:82,662 |

- ¹¹ Concur, chart as shown in H11933.000
- ¹² Concur. A blue note is included in H11933_CS.000 to remove the rocks.
- ¹³ Concur.
- ¹⁴ Concur.
- ¹⁵ Concur.
- ¹⁶ Concur with clarification. The submitted hob files were used in the compilation of HCell H11933. During HCell compilation, some modifications were made to accommodate chart scale. Chart features as depicted in the HCell.
- ¹⁷ Concur.
- ¹⁸ Concur.
- ¹⁹ Concur.
- ²⁰ Concur.
- ²¹ Concur. 16 Bottom samples collected by the field are included in the HCell. Four bottom samples matched current charted samples and are included in the HCell to be retained.



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

TIDE NOTE FOR HYDROGRAPHIC SURVEY

DATE : October 22, 2008

HYDROGRAPHIC BRANCH: Pacific
HYDROGRAPHIC PROJECT: OPR-P357-FA/RA-2008
HYDROGRAPHIC SHEET: H11933

LOCALITY: Aurora Lagoon to Bear Cove, AK
TIME PERIOD: August 19 - 28, 2008

TIDE STATION USED: 945-5500 Seldovia, AK
Lat. 59° 26.4'N Long. 151° 43.2' W

PLANE OF REFERENCE (MEAN LOWER LOW WATER): 0.000 meters
HEIGHT OF HIGH WATER ABOVE PLANE OF REFERENCE: 5.252 meters

REMARKS: RECOMMENDED ZONING

Please use the TCARI grid, "H11933-TCARI.tc" posted at ftp://140.90.121.83/pub/outgoing/HPT/Smooth_Tides_TCARI as the final grid for project OPR-P357-RA/FA-2008, H11933, during the time period between August 19 - 28, 2008.

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: The water levels stations installed at Bear Cove, Ak (9455595) and Kasitsna Bay, AK (9455517), did not meet the requirements specified in the OCS Hydro Specifications and Deliverables manual. CO-OPS could not verify the stability of the stations sensors or staffs. Therefore, Bear Cove and Kasitsna Bay provided only harmonic constants and preliminary datums for this TCARI grid.

Stephen K. Gill

Digitally signed by Stephen K. Gill
DN: c=US, st=Maryland, l=Silver Spring, ou=Center for Operational
Oceanographic Products & Serv., o=National Oceanic and Atmospheric
Administration, cn=Stephen K. Gill, email=Stephen.Gill@noaa.gov
Date: 2008.10.22 17:51:28 -0400'

CHIEF, OCEANOGRAPHIC DIVISION



H11933 HCell Report
Fernando Ortiz, Physical Scientist
Pacific Hydrographic Branch

1. Specifications, Standards and Guidance Used in HCell Compilation

HCell compilation of survey H11933 used:

Office of Coast Survey HCell Specifications: Draft, Version: 4.0, 17 March, 2010.
HCell Reference Guide: Version 2.0, 22 February, 2010.

2. Compilation Scale

Depths and features for HCell H11933 were compiled to the largest scale raster charts shown below:

| Chart | Scale | Edition | Edition Date | NTM Date |
|-------|----------|------------------|--------------|-----------|
| 16645 | 1:82,662 | 19 th | 06/2010 | 08/242010 |

The following ENC's were also used during compilation:

| Chart | Scale |
|--------------|----------|
| US4AK1AM.000 | 1:82,662 |

3. 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 1:15,000 survey scale using a Radius Table file with values shown in the table, below.

| Shoal Limit (m) | Deep Limit (m) | Radius (mm) |
|-----------------|----------------|-------------|
| 0 | 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 16645_1 | 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 H11933_SS.000 |
|---|--|--|------------------------------------|---|
| 0 | 0 | 0.000 | 0.000 | 0 |
| 3 | 5.4864 | 5.715 | 3.125 | 3 |
| 5 | 9.144 | 9.3726 | 5.125 | 5 |
| 10 | 18.288 | 18.517 | 10.125 | 10 |

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

5. Meta Areas

The following Meta object areas are included in HCell H11933:

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.S-57 Objects and Attributes

The *_CS HCell contains the following Objects:

| | |
|---------|--|
| DEPCNT | Zero Contours |
| \$CSYMB | Blue Notes-Notes to the MCD chart Compiler |
| M_QUAL | Data quality Meta object |
| SBDARE | Bottom samples, and rocky seabed areas |
| SOUNDG | Soundings at the chart scale density |
| OBSTRN | Obstruction |
| UWTROC | Rock features |

The *_SS HCell contains the following Objects:

| | |
|--------|---|
| DEPCNT | Generalized contours at chart scale intervals |
| SOUNDG | Soundings at the survey scale density |

8. Spatial Framework

8.1 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.

8.2 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.

9. Data Processing Notes

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

10. QA/QC and ENC Validation Checks

H11933 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.

11. Products

11.1 HSD, MCD and CGTP Deliverables

| | |
|--------------------|--|
| H11933_CS.000 | Base Cell File, Chart Units, Soundings and features compiled to 1:82,662 |
| H11933_SS.000 | Base Cell File, Chart Units, Soundings and Contours compiled to 1:10,000 |
| H11933_DR.pdf | Descriptive Report including end notes compiled during office processing and certification, the HCell Report, and supplemental items |
| H11933_outline.gml | Survey outline |
| H11933_outline.xsd | Survey outline |

11.2 Software

| | |
|--|--|
| CARIS HIPS Ver. 6.1 | Inspection of Combined BASE Surfaces |
| CARIS BASE Editor Ver. 3.0 | Creation of soundings and bathy-derived features, creation of the depth area, meta area objects, and Blue Notes; Survey evaluation and verification; Initial HCell assembly. |
| CARIS S-57 Composer Ver. 2.1 | Final compilation of the HCell, correct geometry and build topology, apply final attributes, export the HCell, and QA. |
| CARIS GIS 4.4a | Setting the sounding rounding variable for conversion of the metric HCell to NOAA charting units with NOAA rounding. |
| CARIS HOM Ver. 3.3 | Perform conversion of the metric HCell to NOAA charting units with NOAA rounding. |
| HydroService AS, dKart Inspector Ver. 5.1, SP 1 | Validation of the base cell file. |
| Northport Systems, Inc., Fugawi View ENC Ver.1.0.0.3 | Independent inspection of final HCells using a COTS viewer. |

12. 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

APPROVAL SHEET
H11933

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 disproval 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.