

H11644

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. H11644

LOCALITY

State Alaska

General Locality Unimak Pass

Sublocality West of Unimak Island

2007

CHIEF OF PARTY

Raj Bhangu

LIBRARY & ARCHIVES

DATE

NOAA FORM 77-28 (11-72) <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>	REGISTRY No <p style="text-align: center;">H11644</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.	FIELD No. NA
<p>State <u>Alaska</u></p> <p>General Locality <u>Unimak Pass</u></p> <p>Sub-Locality <u>West of Unimak Island</u></p> <p>Scale <u>N/A</u> Date of Survey <u>June 3 – August 8, 2007</u></p> <p>Instructions dated <u>February 23, 2007</u> Project No. <u>OPR-P188-KR-07</u></p> <p>Vessel <u>R/V Kittiwake and Irish Ayes</u></p> <p>Chief of party <u>Raj Bhangu</u></p> <p>Surveyed by <u>TerraSond Ltd.</u></p> <p>Soundings by echo sounder, lead line, pole <u>Reson 8101 MBES</u></p> <p>Graphic record scaled by <u>N/A</u></p> <p>Graphic record checked by <u>N/A</u> Automated Plot <u>N/A</u></p> <p>Verification by <u>Sarah Wolfskehl</u> Evaluation By <u>Grant Froelich</u></p> <p>Soundings in fathoms feet at MLW MLLW <u>Meters at MLLW</u></p>	
<p>REMARKS: <u>Contract No.: DG133C-05-CQ-1079 TerraSond Ltd. 1617 South Industrial Way, Ste 3, Palmer, AK 99645</u></p> <p><u>All times recorded in UTC. The purpose of this survey was to provide contemporary surveys to update National Ocean Service</u></p> <p><u>(NOS) nautical charts. All separates are filed with the hydrographic data. Revisions and end notes in red were generated</u></p> <p><u>during office processing. As a result, page numbering may be interrupted or non sequential.</u></p>	

Descriptive Report to Accompany Hydrographic Survey H11644

Survey B

June 3, 2007 – July 31, 2007

TerraSond Ltd.

Lead Hydrographer: Raj Bhangu

A. AREA SURVEYED

This navigable area survey is conducted in accordance with Statement of Work OPR-P188-KR-07, West of Unimak Island, Unimak Pass, Alaska, dated February 23, 2007¹.

The purpose of this contract is to provide NOAA with modern, accurate hydrographic survey data with which to update the nautical charts of the assigned area. The project area is approximately 183 square nautical miles. The survey limits include the shoreline of Unimak Island, from south of Sennett Point to north of Cape Sarichef, and the safety fairway which runs approximately north-south, 5 NM to the west of the Unimak Island coastline.

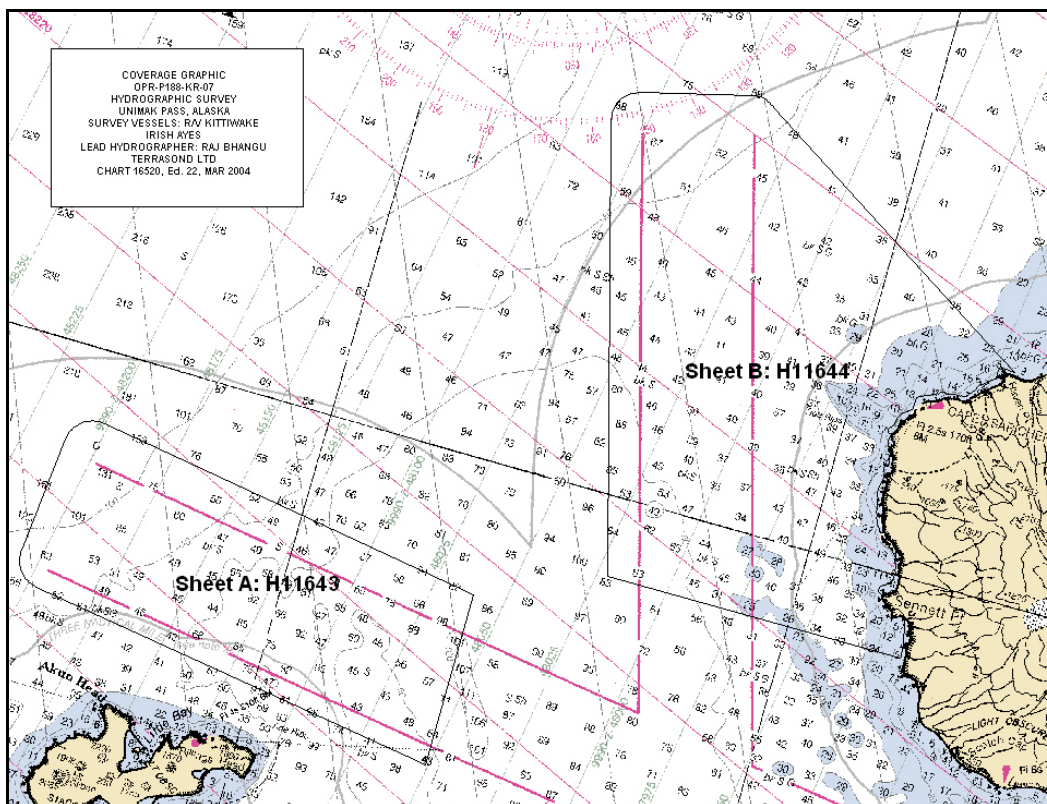


Figure 1 – Overview of H11643 and H11644 with Chart 16520, 22nd Edition, March 2004. Soundings in fathoms.

The project area encompasses a portion of the safety fairway that guides ships through Unimak Pass, which connects the Bering Sea with the Pacific Ocean. This thoroughfare is critical for large shipping companies which sail from Asia to various ports in Alaska and along the west coast of the United States and Canada. Other traffic includes fishing

vessels, commercial shipping vessels which provide supplies to the Aleutian and Pribilof Islands, and scientific research vessels.

Full bottom coverage, consisting of 100% shallow-water multibeam sonar, was achieved within the limits of hydrography for this survey except in the vicinity of dense kelp forests northwest of Cape Sarichef. The multibeam data were used to locate and determine the least depth over obstructions and shoals as well as to determine the least depths over the entire project area. This survey has a maximum depth of 180 meters and a minimum depth of 4 meters² below the Mean Lower Low Water (MLLW) tidal datum.

For complete survey limits, refer to Figure 1 on the preceding page.

B. DATA ACQUISITION AND PROCESSING

B.1. Equipment

Bathymetry for this survey was acquired using the hydrographic survey vessels *R/V Kittiwake* and *Irish Ayes*.

R/V Kittiwake

The *R/V Kittiwake* is a steel hull vessel, 30.3 meters length overall with a 7.9 meter beam and a 2.0 meter draft. Major systems used on the *R/V Kittiwake* are listed in Table 1.

VESSEL <i>R/V Kittiwake</i> LOA: 30.3m, BEAM 7.9m, DRAFT: 2.0m	
Equipment	Manufacturer & Model
Multibeam sonar	Reson SeaBat 8101
Positioning	Primary -- Seatex Seapath 200
Sound speed	Applied Microsystems SV Plus & SV Plus (V2)
Vessel attitude	Seatex MRU-5

Table 1 - Major systems used aboard the *R/V Kittiwake*.

Irish Ayes

Irish Ayes is an aluminum hull vessel, 7.3 meters length overall with a 2.6 meter beam and a 0.7 meter draft. Major systems used on *Irish Ayes* are listed in Table 2.

VESSEL <i>Irish Ayes</i> LOA: 7.3m, BEAM 2.6m, DRAFT: 0.7m	
Equipment	Manufacturer & Model
Multibeam sonar	Reson SeaBat 8101
Positioning	Primary – Trimble DSM-212
Sound speed	Applied Microsystems SV Plus & SV Plus (V2)
Vessel attitude	Coda Octopus F-180

Table 2 - Major systems used aboard *Irish Ayes*.

Equipment performance details are provided in the Data Acquisition and Processing Report (DAPR)³, Sections A. Equipment and B. Quality Control.

B.2. Quality Control

B.2.1. Shallow Water Multibeam

No conditions with the potential for adversely affecting data integrity were encountered with the multibeam suite used during this survey.

Multibeam confidence checks were conducted on the *R/V Kittiwake* and *Irish Ayes* to verify proper operation of the multibeam suite on a weekly basis, weather permitting. The confidence checks were performed by comparing nadir beam depths with lead line depths. The results of these comparisons and the line acquisition logs detailing aspects of quality control for each survey line are contained in “Separates I: Acquisition and Processing Logs” of this report.

A detailed discussion of multibeam system calibrations, patch tests, data acquisition, and processing is provided in the DAPR.

B.2.2. Crosslines

414 mainscheme lines totaling 1542.6 lineal nautical miles and 9 crosslines totaling 83.3 lineal nautical miles were run during the 2007 survey of H11644. The ratio of the lineal nautical miles of crosslines to the lineal nautical miles of mainscheme lines, at 5.4%, exceeds the 5% required by “NOAA Hydrographic Surveys Specifications and Deliverables”, Section 5.5.3.

Crossline analysis was conducted by creating a base surface of the mainscheme lines and a separate base surface using the crosslines. The surfaces were then compared and the differences between the surfaces were computed.

A comprehensive explanation of the crossline analysis process is in the DAPR. The reports generated from the crossline analysis are in “Separates IV: Crossline Comparisons.”⁴

B.2.3. Contemporary Survey Junctions

There are no contemporary surveys junctions with which to compare this survey⁵. Survey H11643 was conducted concurrently with survey H11644 but the survey boundaries were not contiguous.

B.3. Corrections to Echo Soundings

Survey H11644 was performed in conjunction with one other survey in Projects OPR-P188-KR-07. Any change to the corrections to echo soundings affects all surveys in the area and is described in detail in the DAPR.

Sounding data were reduced using zoning provided by NOAA/CO-OPS under the project instructions and final tides from the historic USC&GS tide station at Cape Sarichef, Unimak Island, AK (946-2787). Refer to the Horizontal and Vertical Control Report (HVCR)⁶ for tidal zoning methods and operations.

B.4. Data Processing

The final depth information for this survey was submitted as a collection of CARIS BASE surfaces which best represented the seafloor at the time of the 2007 survey. All possible measures were taken to ensure the data was correctly processed and an accurate representation of all bathymetric features were detailed in the finalized base surfaces.

Several grids of varying resolution were created for H11644 due to the wide depth range and varying bathymetry found in the survey area. Grid spacing of 2, 4, 5, 6, 7, 8, 9, 11 and 14 meters were used for the BASE surfaces and Digital Terrain Models (DTM) (Table 3).

Depth Range (m)	Resolution (m)
0 – 40	2
40 – 50	4
50 – 60	5
60 – 70	6
70 – 80	7
80 – 90	8
90 – 110	9
110 – 140	11
140 – 300	14

Table 3 – BASE surface resolution vs. survey depth.

27 digital products (3 for each variable BASE surface) were submitted for the 2007 survey. The nine variable BASE surfaces were combined to create a CARIS BASE uncertainty surface which covered the entire survey area in which the finalized uncertainty was the greater of the standard deviation and *a priori* uncertainty. A sun-illuminated DTM and an uncertainty DTM were created for each of the variable BASE surfaces and were submitted with the BASE surfaces. The naming conventions for each grid are:

CARIS BASE Uncertainty Surface: Sheet_B_0_40_2m.bms

- B represents the sheet (H11644)
- 0_40 represents the depth range
- 2m represents the resolution

Sun-Illuminated Elevation DTM: H11644_1_OF_9.tif

Uncertainty DTM: H11644_1_OF_9_Uncertainty.tif

The DAPR Sections A: Equipment – Data Collection; and B: Quality Control contain a detailed discussion of the steps followed when acquiring and processing the 2007 survey data.

C. VERTICAL AND HORIZONTAL CONTROL

Sounding data were tide adjusted using final tide levels for the historic USC&GS tide station at Cape Sarichef on Unimak Island, AK (946-2787). The final zoning methodology is described in detail in the project wide HVCR.

The horizontal control datum used for this survey was the North American Datum of 1983 (NAD 83). The projection used was UTM, Zone 3 North.

Sounding position control was determined using a Global Positioning System (GPS). The primary source of navigation correctors was the United States Coast Guard differential GPS (DGPS) station at Cold Bay, AK, StaID 296. Correctors from the USCG differential GPS station at Kodiak, AK, StaID 294, were used when the Cold Bay station was unavailable. A summary of weekly DGPS confidence checks is provided in Separates I: Acquisition and Processing Logs⁷.

D. RESULTS AND RECOMMENDATIONS

D.1. Chart Comparison

The chart comparison for H11644 was performed by examining the largest scale Electronic Navigation Chart (ENC)⁸ covering the survey area, Figure 2, and comparing the charted depths with the surveyed depths in the same location.

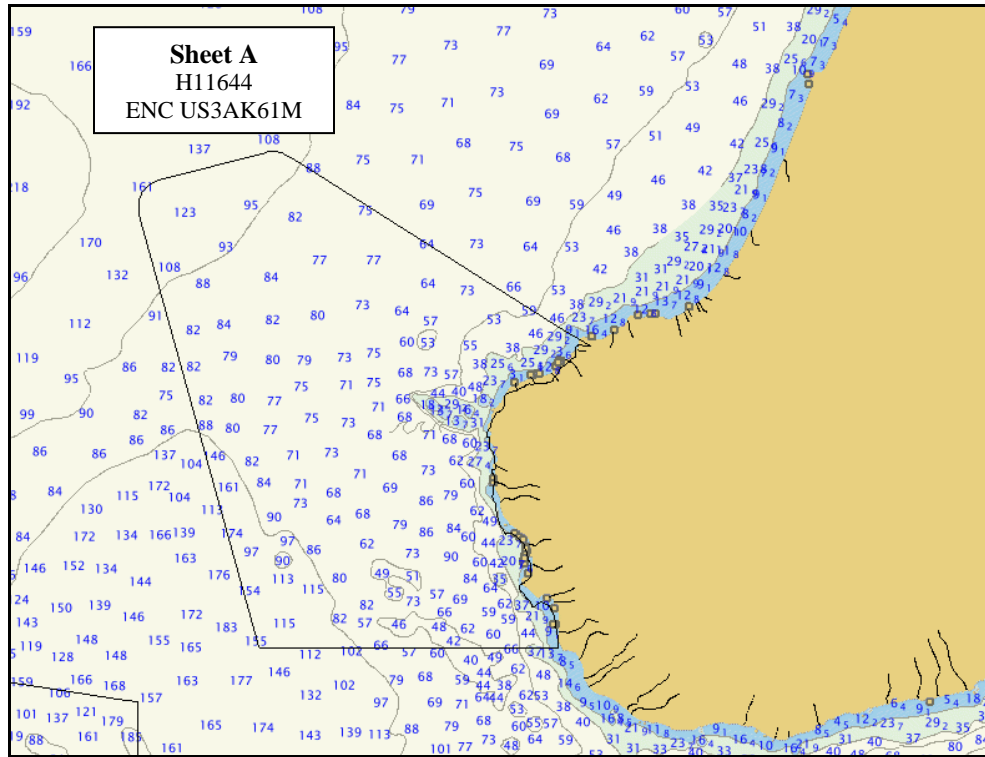


Figure 2 - Survey boundaries shown with sounding data from the largest scale ENC covering the survey area. ENC US3AK61M, 3rd edition. Soundings in meters.

CARIS HIPS & SIPS was used to create nine BASE surfaces with resolutions that varied as a function of water depth (Table 3). BASE surface resolutions were selected, based on water depth, to provide the highest resolution supported by the data in accordance with NOS Hydrographic Surveys Specifications and Deliverables. The ENC soundings were viewed in CARIS HIPS & SIPS as a background layer with the BASE surfaces in the foreground. Each ENC depth was thoroughly compared with the BASE surface depth for the plotted location. Each ENC depth and the shoalest corresponding BASE surface depth was then transferred to Microsoft Excel for final analysis. MS Excel was used to compare depth offsets between the ENC and BASE surface. The offsets were recorded in meters, where the survey depth was deeper or shallower than the charted depth, and as a percentage of the total, surveyed, depth.

All survey data were compared to the data published in the Electronic Navigation Chart (ENC) listed in Table 4.

Cell Name	Chart	Scale	Edition Number	Issue Date
US3AK61M	16520	1:300,000	3	03/26/2007

Table 4 - Electronic Navigation Charts used for chart comparison.

A total of 145 charted soundings from ENC US3AK61M were compared with the 2007 survey data. The survey data produced 29 depths that were shoaler than those found on the ENC and 115 depths that were deeper than the ENC depths. 34 surveyed depths varied from those found on the ENC by more than 10% of the surveyed water depth at the same location. In all cases where the surveyed depth varied from the charted depth by more than 10%, the surveyed depth was deeper than the depth found on the ENC.

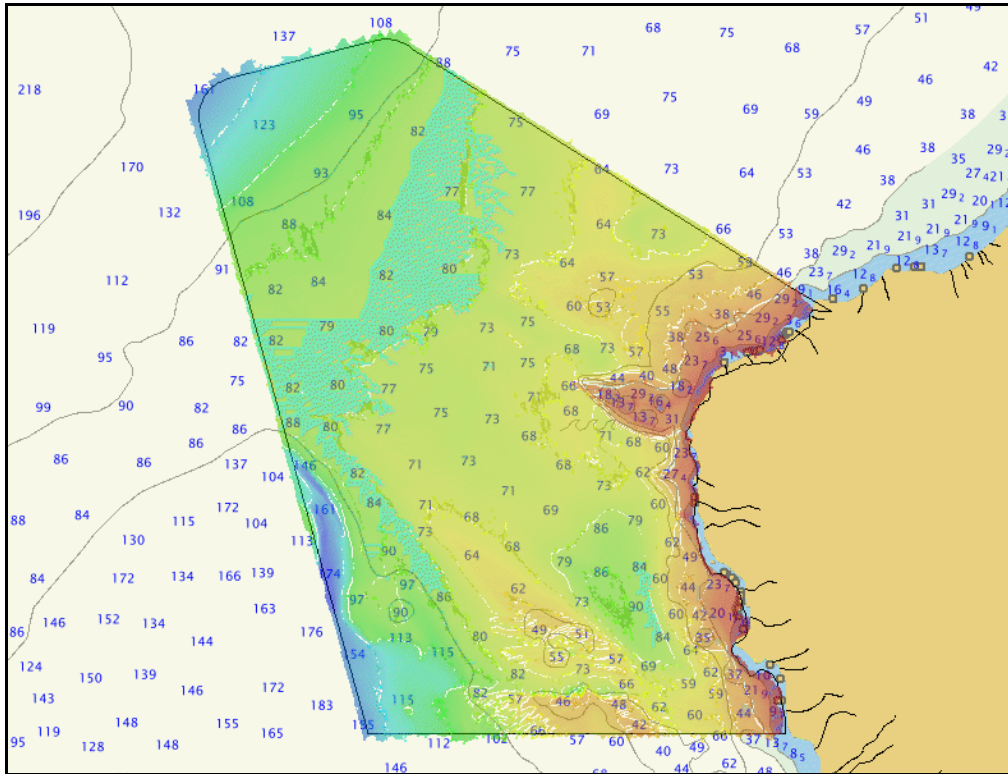


Figure 3 - H11644 overview showing variable Base Surfaces listed in Table 3 with ENC US3AK61M, 3rd Edition. Soundings in meters.

No Local Notice to Mariners (LNM) affected the survey area. LNM number 40 (Weekly Edition-October 2007) was the last notice reviewed for this project. No features or soundings were submitted as Dangers to Navigation (DTON) for the 2007 survey (Appendix I)⁹.

There were no charted features requiring investigation in H11644 at the time of the survey. The 2007 survey generally agrees with the largest scale electronic navigational chart covering the survey area. Figure 2 shows the survey limits superimposed on ENC US3AK61M.

The following paragraphs detail discrepancies between charted features and the 2007 survey data. The hydrographer recommends that the soundings on ENC US3AK61M be updated based on the 2007 survey data¹⁰.

D.1.1. New Features

No new features were identified by the 2007 survey¹¹. The hydrographer recommends updating the ENC's with data from the 2007 survey¹².

D.1.2. Charted Features

There were no charted features requiring investigation in H11644 at the time of the survey¹³.

D.1.3. Disproved Features

There were no charted features requiring investigation in H11644 at the time of the survey¹⁴.

D.1.4. Soundings

Survey depths are in general agreement with the charted depths for the largest scale ENC covering H11644. There are two areas in the eastern part of H11644,

, Figure 4 and Figure 5, where 34 charted depths differ significantly from the 2007 survey data (the difference between charted and surveyed depth was greater than 10% of surveyed depth). In all cases, the 2007 survey depths were deeper than the charted depths. The hydrographer recommends updating the ENC to reflect the 2007 survey data¹⁵.

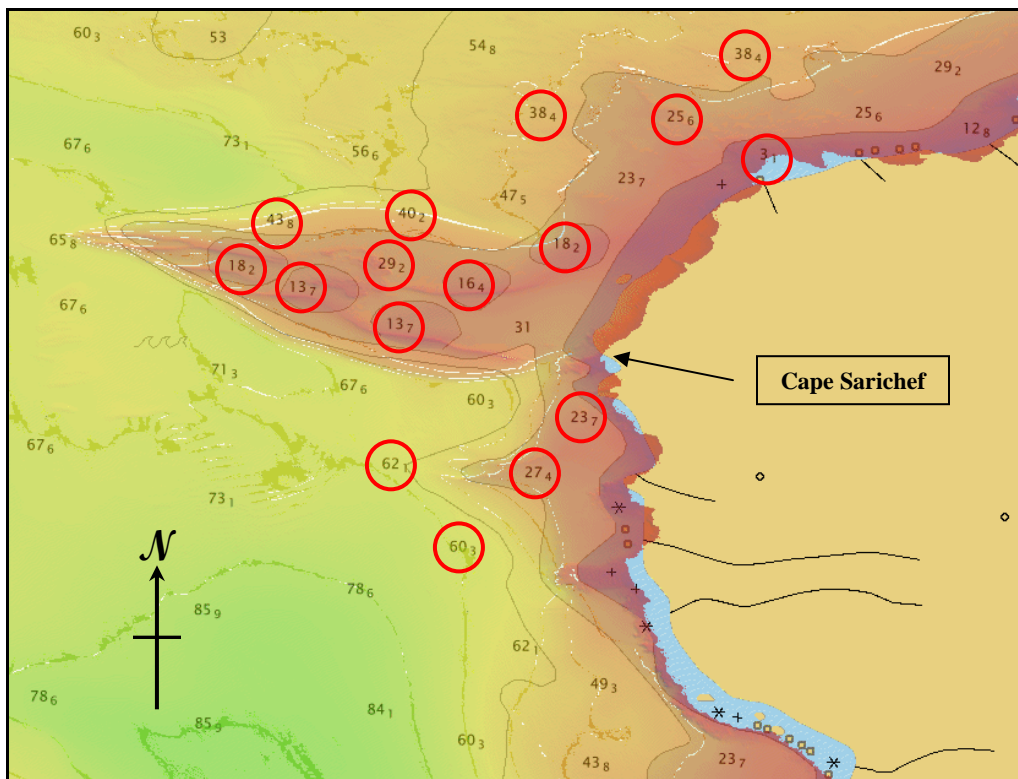


Figure 4 - Northeastern portion of H11644 showing ENC charted depths which differ significantly from the 2007 survey depths. ENC US3AK61M, 3rd edition. Soundings in meters.

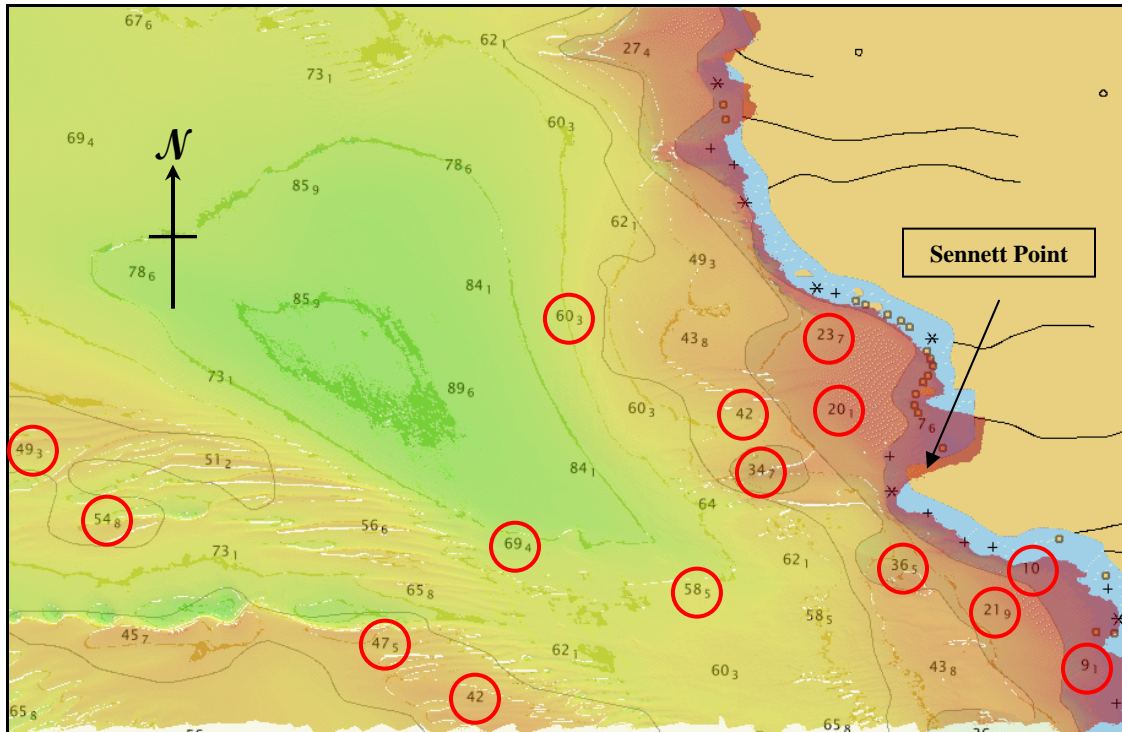


Figure 5 - Southeastern portion of H11644 showing ENC charted depths which differ significantly from the 2007 survey depths. ENC US3AK61M, 3rd edition. Soundings in meters.

Latitude	Longitude	ENC Depth (m)	Survey Depth (m)	Difference ENC/Survey Depth (m)	Difference as a function of Survey Depth (%)
54° 36' 53.3"N	164° 57' 32.7"W	38.4	46.5	8.1	17%
54° 36' 51.1"N	164° 56' 11.5"W	25.6	29.3	3.7	13%
54° 37' 28.1"N	164° 55' 31.7"W	38.4	43.4	5.0	12%
54° 36' 44.0"N	164° 53' 16.9"W	12.8	14.2	1.4	10%
54° 35' 50.5"N	165° 00' 07.8"W	43.8	49.5	5.7	12%
54° 35' 54.2"N	164° 58' 50.4"W	40.2	45.7	5.5	12%
54° 35' 24.6"N	164° 59' 02.1"W	29.2	33.4	4.2	13%
54° 35' 36.3"N	164° 57' 18.7"W	18.2	27.7	9.5	34%
54° 36' 28.9"N	164° 55' 20.0"W	3.1	12.5	9.4	75%
54° 35' 23.3"N	165° 00' 30.2"W	18.2	36.1	17.9	50%
54° 35' 10.8"N	164° 59' 54.2"W	13.7	31.6	17.9	57%
54° 34' 48.9"N	164° 58' 56.7"W	13.7	29.6	15.9	54%
54° 35' 12.5"N	164° 58' 14.7"W	16.4	28.5	12.1	42%
54° 33' 26.7"N	164° 59' 00.3"W	62.1	68.6	6.5	9%

Latitude	Longitude	ENC Depth (m)	Survey Depth (m)	Difference ENC/Survey Depth (m)	Difference as a function of Survey Depth (%)
54° 33' 21.5"N	164° 57' 35.4"W	27.4	33.5	6.1	18%
54° 33' 54.1"N	164° 57' 08.3"W	23.7	27.3	3.6	13%
54° 32' 37.7"N	164° 58' 19.9"W	60.3	69.9	9.6	14%
54° 30' 43.9"N	164° 58' 15.1"W	60.3	69.2	8.9	13%
54° 30' 33.0"N	164° 55' 41.1"W	23.7	29.8	6.1	20%
54° 29' 25.4"N	165° 03' 33.6"W	49.3	59.7	10.4	17%
54° 29' 47.4"N	164° 56' 32.1"W	42.0	53.2	11.2	21%
54° 29' 13.3"N	164° 56' 21.9"W	34.7	42.3	7.6	18%
54° 29' 49.1"N	164° 55' 35.4"W	20.1	24.7	4.6	19%
54° 29' 40.1"N	164° 54' 44.3"W	7.6	14.6	7.0	48%
54° 28' 44.2"N	165° 02' 47.3"W	54.8	64.8	10.0	15%
54° 28' 29.8"N	164° 58' 45.5"W	69.4	77.0	7.6	10%
54° 28' 02.9"N	164° 56' 59.5"W	58.5	65.1	6.6	10%
54° 28' 17.2"N	164° 54' 57.6"W	36.5	46.5	10.0	22%
54° 28' 16.1"N	164° 53' 42.7"W	10.0	21.0	11.0	52%
54° 27' 39.2"N	165° 04' 35.6"W	56.6	64.6	8.0	12%
54° 27' 31.0"N	165° 00' 03.2"W	47.5	53.1	5.6	11%
54° 27' 00.6"N	164° 59' 10.7"W	42.0	46.7	4.7	10%
54° 27' 50.8"N	164° 54' 02.9"W	21.9	34.2	12.3	36%
54° 27' 18.3"N	164° 53' 08.8"W	9.1	19.3	10.2	53%

Table 5 - Locations in H11644 where ENC charted depths differ significantly from the 2007 survey depths. ENC US3AK61M, 3rd edition.

D.1.5. Trends and Changeable Areas

Charted contours from ENC US3AK61M were compared with the 2007 survey data using CARIS BASE Editor. The ENC contours were superimposed on a plot of the variable base surfaces (Figure 3) and compared with the general depth trends indicated by the false color enhanced image generated by the base surfaces. The charted contours and the 2007 survey data are in general agreement although there are several areas where the survey data support the presence of continuous bathymetric features while the chart depicts the features as discontinuous.

The hydrographer recommends that the charted contours be updated to reflect the 2007 survey data¹⁶.

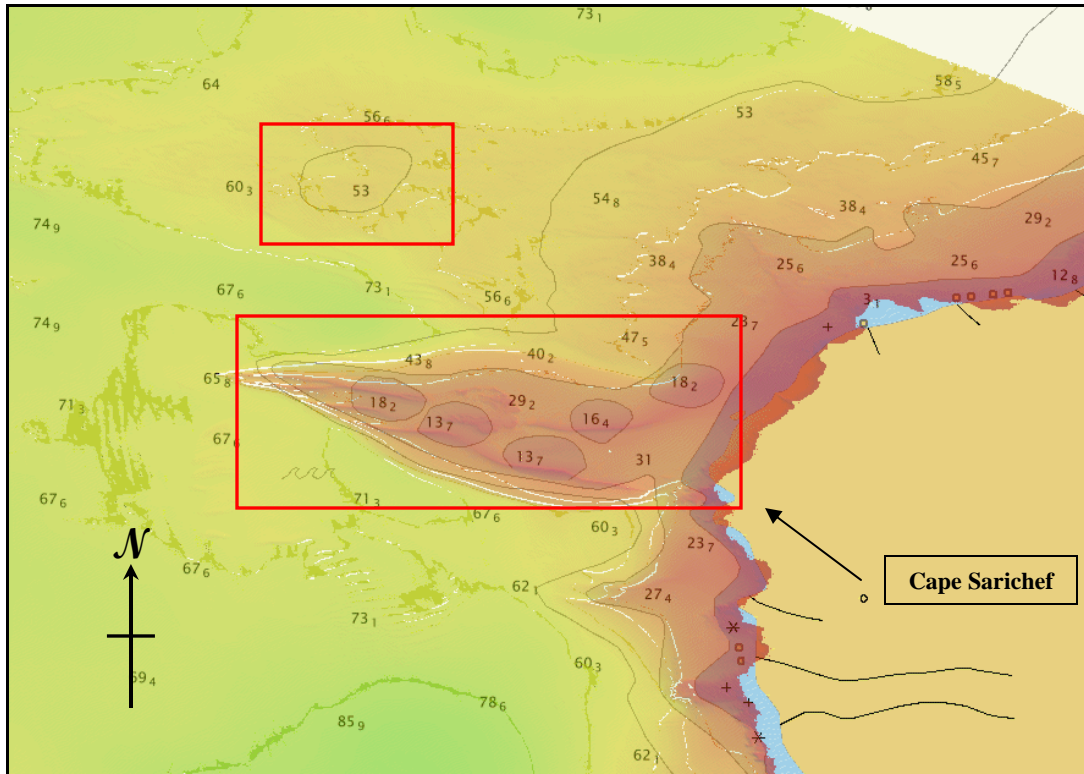


Figure 6 - Northeast part of H11644 where the ENC contours show discontinuous features while the 2007 data indicates the contours should reflect continuous bathymetric features.

D.1.6. AWOIS Items Summary

Investigation of Automated Wreck and Obstruction Information System (AWOIS) items was not required under this task order¹⁷.

D.2. Additional Results

D.2.1. Aids to Navigation

There were no floating aids to navigation in this survey area¹⁸.

D.2.2. Drilling Structures

There were no drilling structures in this survey area¹⁹.

D.2.3. Comparison with Prior Surveys

A comparison with prior surveys was not required under this task order²⁰.

D.2.4. Bottom Samples

139 bottom samples were collected in support of the 2007 survey (Appendix V). The samples were distributed geographically to obtain a full representation of the bottom characteristics as specified in “NOAA Hydrographic Surveys Specifications and Deliverables”, Section 7.1²¹.

D.2.5. Bridges and Overhead Cables

There were no bridges or overhead cables in the survey area²².

D.2.6. Submarine Cables and Pipelines

There were no submarine cables or pipelines in the survey area²³.

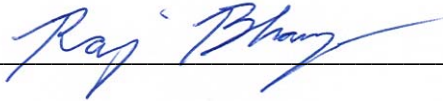
LETTER OF APPROVAL

REGISTRY NO. H11644

This report and the accompanying digital data are respectfully submitted.

Field operations contributing to the accomplishment of survey H-11644 were conducted under my direct supervision with frequent personal checks of progress and adequacy. This report, digital data, and accompanying records have been closely reviewed and are considered complete and adequate as per the Statement of Work²⁴. Other reports submitted with this survey include the Data Acquisition and Processing Report and the Horizontal and Vertical Control Report.

I believe this survey is complete and adequate for its intended purpose.



Raj Bhangu, Hydrographer

TerraSond Ltd.

Date December 6, 2007

Revision Compiled During Office Processing and Certification

¹ Concur

² Do not concur. The min depth range of the survey area is 1.45 meters.

³ Filed with Project Records

⁴ Filed with Hydrographic Records. Crosslines and main scheme lines are in general agreement.

⁵ Concur

⁶ Filed with Project Records

⁷ Filed with Hydrographic Records

⁸ During office processing H11644 was compared with ENC US3AK61M (4th Ed., issue date 4/28/08) and chart 16520, 1:300,000 (22nd Ed., March 1, 2004, NM 3/8/08). A slight offset exists between the charted shoreline and the GC shoreline and hydrography. As a result the hydrography covers the charted shoreline in various regions. Charted soundings and surveyed soundings were found to be in general agreement. Evaluator concurs with section D.1

⁹ Concur

¹⁰ Concur

¹¹ Do not concur. The field submitted an S-57 feature file US411644.000 with several new features that have been included in the HCell.

¹² Concur

¹³ Concur with clarification. A discrepancy exists between Chart 16520 and ENC US3AK61M. Foul lines depicted on the chart are represented as islets on the ENC. As bluenoted, the cartographer recommends removing the islets from the ENC and reassessing the foul areas based on the updated shoreline and the chart scale. One foul area is to be retained and has been digitized from the chart to the Hcell.

¹⁴ Concur with clarification. The DP form correlating with photo 'shoreline_006' suggests the disproval of a ledge on the GC shoreline (object ID 299358, position 54-27-56 N, 164-52-71 W), however the DP form and boat sheet do not provide enough evidence to fully disprove this feature. The cartographer recommends leaving the feature as depicted in the GC shoreline.

¹⁵ Concur, the evaluator concurs with the information in Table 5.

¹⁶ Concur

¹⁷ Concur

¹⁸ Concur

¹⁹ Concur

²⁰ Concur

²¹ Concur

²² Concur

²³ Concur

²⁴ Concur



APPENDIX I

Danger To Navigation Reports

There were no Danger to Navigation reports submitted for survey area H-11644.



APPENDIX II

Survey Feature Report

There were no Automated Wrecks and Obstructions (AWOIS) assigned in survey area H-11644.



APPENDIX V

Supplemental Survey Records and Correspondence

Bottom Samples

One hundred thirty-nine (139) bottom samples were collected in support of the 2007 survey. The samples were distributed geographically to obtain a full representation of the bottom characteristics as specified in NOAA Hydrographic Surveys specifications and Deliverables, Section 7.1.

Point Number	Date	Time (UTC)	Depth (m)	Latitude	Longitude	Color	Surface Description	Nature of Surface	Secondary Nature of Surface
B01	6/16/2007	01:40	12.0	54° 35' 45" N"	164° 56' 06" W"	black	volcanic	sand	none
B02	7/2/2007	00:50	37.0	54° 37' 08" N"	164° 55' 28" W"	black	calcareous	sand	shells
B03	7/2/2007	01:16	42.0	54° 37' 00" N"	164° 57' 21" W"	white	calcareous	coral	shells
B04	7/2/2007	01:30	52.0	54° 38' 05" N"	164° 57' 28" W"	black	fine	pebbles	shells
B05	7/2/2007	01:44	47.0	54° 38' 10" N"	164° 55' 23" W"	black	calcareous	shells	sand
B06	7/2/2007	02:02	45.0	54° 38' 04" N"	164° 53' 45" W"	black	volcanic	pebbles	mud
B07	7/2/2007	02:20	62.0	54° 39' 06" N"	164° 55' 29" W"	black	volcanic	mud	none
B08	7/2/2007	02:57	71.0	54° 39' 10" N"	164° 57' 26" W"	black	fine	sand	none
B09	7/2/2007	03:11	68.0	54° 39' 10" N"	164° 59' 10" W"	black	coarse	silt	none
B10	7/2/2007	03:36	64.0	54° 39' 11" N"	165° 01' 05" W"	white	broken	shells	sand
B11	7/2/2007	03:55	69.0	54° 39' 12" N"	165° 03' 06" W"	black	sticky	mud	shells
B12	7/2/2007	04:12	74.0	54° 39' 09" N"	165° 04' 48" W"	black	medium	gravel	sand
B13	7/2/2007	04:33	78.0	54° 39' 10" N"	165° 06' 46" W"	black	fine	sand	none
B14	7/2/2007	04:51	79.0	54° 39' 09" N"	165° 08' 29" W"	black	fine	sand	none

Point Number	Date	Time (UTC)	Depth (m)	Latitude	Longitude	Color	Surface Description	Nature of Surface	Secondary Nature of Surface
B15	7/2/2007	05:12	81.0	54° 39' 09" N"	165° 10' 21" W"	black	fine	sand	none
B16	7/2/2007	05:29	85.0	54° 39' 09" N"	165° 12' 21" W"	black	fine	sand	none
B17	7/2/2007	05:44	88.0	54° 39' 09" N"	165° 14' 04" W"	black	fine	sand	none
B18	7/2/2007	06:00	89.0	54° 39' 08" N"	165° 15' 54" W"	black	fine	pebbles	none
B19	7/2/2007	06:17	94.0	54° 40' 11" N"	165° 16' 01" W"	black	fine	sand	gravel
B20	7/2/2007	06:28	89.9	54° 40' 13" N"	165° 14' 10" W"	black	fine	sand	none
B21	7/2/2007	06:45	87.0	54° 40' 14" N"	165° 12' 20" W"	black	fine	sand	none
B22	7/2/2007	07:00	83.0	54° 40' 14" N"	165° 10' 28" W"	black	fine	sand	none
B23	7/2/2007	07:17	80.0	54° 40' 14" N"	165° 08' 37" W"	black	fine	sand	none
B24	7/2/2007	16:28	60.0	54° 26' 57" N"	165° 03' 06" W"	black	coarse	sand	pebbles
B25	7/2/2007	16:34	52.7	54° 27' 17" N"	165° 03' 05" W"	black	coarse	sand	shells
B26	7/2/2007	16:52	68.5	54° 27' 18" N"	165° 04' 49" W"	black	coarse	sand	gravel
B27	7/2/2007	17:07	91.4	54° 27' 18" N"	165° 06' 43" W"	black	medium	sand	gravel
B28	7/2/2007	17:24	96.5	54° 28' 19" N"	165° 06' 47" W"	black	fine	sand	none
B29	7/2/2007	17:41	74.6	54° 28' 22" N"	165° 04' 56" W"	black	fine	sand	gravel
B30	7/2/2007	18:00	62.4	54° 28' 21" N"	165° 03' 00" W"	black	medium	sand	shells
B31	7/2/2007	18:13	61.0	54° 28' 22" N"	165° 01' 08" W"	black	medium	sand	shells

Point Number	Date	Time (UTC)	Depth (m)	Latitude	Longitude	Color	Surface Description	Nature of Surface	Secondary Nature of Surface
B32	7/2/2007	18:30	67.1	54° 28' 20" N"	164° 59' 16" W"	black	fine	sand	shells
B33	7/2/2007	18:44	69.9	54° 28' 21" N"	164° 57' 24" W"	black	fine	sand	shells
B34	7/2/2007	19:05	53.7	54° 28' 20" N"	164° 55' 35" W"	black	fine	sand	shells
B35	7/2/2007	19:37	33.3	54° 29' 24" N"	164° 55' 36" W"	black	medium	sand	shells
B36	7/2/2007	19:57	61.2	54° 29' 27" N"	164° 57' 22" W"	black	medium	sand	shells
B37	7/2/2007	20:19	85.0	54° 29' 27" N"	164° 59' 19" W"	white	broken	shells	gravel
B38	7/2/2007	20:39	63.0	54° 29' 27" N"	165° 01' 09" W"	black	medium	sand	shells
B39	7/2/2007	21:06	86.0	54° 30' 32" N"	165° 01' 10" W"	black	fine	sand	none
B40	7/2/2007	21:23	85.0	54° 30' 32" N"	164° 59' 19" W"	black	fine	sand	shells
B41	7/2/2007	21:38	49.0	54° 30' 32" N"	164° 57' 28" W"	black	fine	sand	none
B42	7/2/2007	21:58	27.0	54° 30' 32" N"	164° 55' 36" W"	black	fine	sand	none
B43	7/4/2007	14:20	77.4	54° 40' 10" N"	165° 06' 46" W"	brown	fine	sand	none
B44	7/4/2007	14:39	75.3	54° 40' 17" N"	165° 04' 55" W"	brown	fine	sand	none
B45	7/4/2007	14:58	71.1	54° 40' 17" N"	165° 03' 02" W"	brown	fine	sand	shells
B46	7/4/2007	15:21	72.2	54° 41' 19" N"	165° 02' 55" W"	brown	fine	sand	shells
B47	7/4/2007	15:49	75.3	54° 41' 21" N"	165° 04' 46" W"	brown	fine	sand	none
B48	7/4/2007	16:06	78.3	54° 41' 20" N"	165° 06' 47" W"	brown	fine	sand	none

Point Number	Date	Time (UTC)	Depth (m)	Latitude	Longitude	Color	Surface Description	Nature of Surface	Secondary Nature of Surface
B49	7/4/2007	16:22	79.5	54° 41' 20" N"	165° 08' 28" W"	brown	fine	sand	none
B50	7/4/2007	16:40	85.0	54° 41' 20" N"	165° 10' 25" W"	brown	fine	sand	none
B51	7/4/2007	16:58	90.5	54° 41' 17" N"	165° 12' 17" W"	brown	fine	sand	none
B52	7/4/2007	17:15	95.3	54° 41' 16" N"	165° 14' 05" W"	brown	medium	sand	gravel
B53	7/4/2007	17:48	88.4	54° 42' 22" N"	165° 10' 34" W"	brown	fine	sand	none
B54	7/4/2007	18:04	81.9	54° 42' 24" N"	165° 08' 33" W"	brown	fine	sand	none
B55	7/4/2007	18:20	77.9	54° 42' 22" N"	165° 06' 43" W"	brown	fine	sand	none
B56	7/4/2007	18:37	74.7	54° 42' 24" N"	165° 05' 00" W"	brown	fine	sand	none
B58	7/5/2007	02:44	35.8	54° 33' 47" N"	164° 57' 28" W"	black	fine	sand	none
B59	7/5/2007	03:07	50.0	54° 32' 41" N"	164° 57' 27" W"	black	fine	sand	shells
B60	7/5/2007	03:28	64.6	54° 31' 37" N"	164° 57' 29" W"	black	fine	sand	shells
B61	7/5/2007	03:45	92.0	54° 31' 37" N"	164° 59' 20" W"	black	fine	sand	none
B62	7/5/2007	04:00	82.3	54° 31' 35" N"	165° 01' 07" W"	black	fine	sand	pebbles
B63	7/5/2007	04:16	78.4	54° 31' 37" N"	165° 03' 02" W"	black	fine	sand	pebbles
B64	7/5/2007	04:32	70.0	54° 32' 39" N"	165° 03' 00" W"	brown	fine	gravel	sand
B65	7/5/2007	04:50	70.5	54° 32' 41" N"	165° 04' 53" W"	green	medium	gravel	none
B66	7/5/2007	05:09	68.0	54° 31' 36" N"	165° 04' 52" W"	black	fine	sand	none

Point Number	Date	Time (UTC)	Depth (m)	Latitude	Longitude	Color	Surface Description	Nature of Surface	Secondary Nature of Surface
B67	7/5/2007	05:27	60.0	54° 30' 33" N"	165° 04' 54" W"	black	fine	sand	none
B68	7/5/2007	05:43	67.0	54° 30' 32" N"	165° 03' 02" W"	black	fine	sand	none
B69	7/5/2007	06:00	60.4	54° 29' 27" N"	165° 03' 01" W"	black	fine	sand	none
B70	7/5/2007	06:17	70.0	54° 29' 26" N"	165° 04' 52" W"	black	fine	sand	none
B71	7/5/2007	06:34	78.0	54° 29' 27" N"	165° 06' 44" W"	black	fine	sand	none
B72	7/5/2007	06:45	72.6	54° 30' 33" N"	165° 06' 45" W"	black	fine	sand	shells
B73	7/5/2007	06:57	62.0	54° 31' 38" N"	165° 06' 45" W"	black	fine	sand	none
B74	7/5/2007	07:10	71.5	54° 32' 42" N"	165° 06' 45" W"	black	fine	sand	none
B75	7/5/2007	07:22	74.4	54° 33' 47" N"	165° 06' 45" W"	black	fine	sand	none
B76	7/5/2007	07:38	73.0	54° 33' 47" N"	165° 04' 54" W"	black	medium	gravel	sand
B77	7/5/2007	07:53	73.0	54° 33' 46" N"	165° 03' 01" W"	black	medium	gravel	sand
B78	7/5/2007	16:27	42.4	54° 35' 57" N"	164° 57' 31" W"	black	medium	gravel	shells
B79	7/5/2007	16:51	49.5	54° 35' 59" N"	164° 59' 12" W"	black	medium	sand	gravel
B80	7/5/2007	17:04	56.3	54° 36' 56" N"	164° 59' 18" W"	black	medium	sand	shells
B81	7/5/2007	17:19	55.7	54° 38' 02" N"	164° 59' 18" W"	black	medium	sand	shells
B82	7/5/2007	17:45	68.6	54° 40' 10" N"	164° 59' 18" W"	brown	fine	sand	none
B83	7/5/2007	18:02	65.5	54° 41' 14" N"	165° 01' 01" W"	brown	fine	sand	none

Point Number	Date	Time (UTC)	Depth (m)	Latitude	Longitude	Color	Surface Description	Nature of Surface	Secondary Nature of Surface
B84	7/5/2007	18:20	62.4	54° 40' 14" N"	165° 01' 06" W"	brown	fine	sand	shells
B85	7/5/2007	18:48	58.8	54° 38' 05" N"	165° 01' 08" W"	white	broken	shells	sand
B86	7/5/2007	19:05	64.1	54° 37' 02" N"	165° 01' 10" W"	black	fine	sand	shells
B87	7/5/2007	19:23	64.0	54° 35' 53" N"	165° 01' 08" W"	black	hard	pebbles	sand
B88	7/5/2007	19:35	66.9	54° 34' 53" N"	165° 01' 08" W"	black	hard	pebbles	sand
B89	7/5/2007	19:50	21.4	54° 34' 51" N"	164° 59' 16" W"	black	fine	gravel	none
B90	7/5/2007	20:07	31.4	54° 34' 51" N"	164° 57' 27" W"	black	coarse	gravel	none
B91	7/5/2007	22:30	63.3	54° 33' 43" N"	164° 59' 16" W"	black	fine	sand	none
B92	7/5/2007	22:13	73.0	54° 32' 38" N"	164° 59' 20" W"	black	fine	sand	none
B93	7/5/2007	22:58	72.0	54° 32' 42" N"	165° 01' 10" W"	black	fine	sand	shells
B94	7/5/2007	22:45	68.0	54° 33' 46" N"	165° 01' 10" W"	black	medium	pebbles	sand
B95	7/6/2007	00:13	79.4	54° 31' 36" N"	165° 08' 35" W"	black	fine	sand	none
B96	7/6/2007	00:26	82.5	54° 30' 32" N"	165° 08' 35" W"	white	broken	shells	gravel
B97	7/6/2007	01:00	100.0	54° 29' 27" N"	165° 10' 26" W"	black	fine	sand	shells
B98	7/6/2007	02:50	83.6	54° 30' 32" N"	165° 10' 26" W"	brown	calcareous	shells	none
B99	7/6/2007	03:05	85.0	54° 31' 36" N"	165° 10' 26" W"	black	fine	sand	none
B100	7/6/2007	03:16	81.0	54° 32' 41" N"	165° 10' 26" W"	black	fine	sand	shells

Point Number	Date	Time (UTC)	Depth (m)	Latitude	Longitude	Color	Surface Description	Nature of Surface	Secondary Nature of Surface
B101	7/6/2007	03:32	70.3	54° 32' 41" N"	165° 08' 35" W"	black	fine	sand	none
B102	7/6/2007	03:47	72.0	54° 33' 46" N"	165° 08' 35" W"	black	fine	sand	none
B103	7/6/2007	04:00	71.5	54° 33' 46" N"	165° 10' 27" W"	black	fine	sand	none
B104	7/6/2007	04:15	82.0	54° 33' 46" N"	165° 12' 19" W"	black	coarse	sand	none
B105	7/6/2007	04:30	81.0	54° 34' 50" N"	165° 14' 10" W"	brown	coarse	sand	none
B106	7/6/2007	04:47	81.3	54° 34' 51" N"	165° 12' 19" W"	black	fine	sand	shells
B107	7/6/2007	05:05	77.0	54° 34' 52" N"	165° 10' 30" W"	black	fine	sand	none
B108	7/6/2007	05:20	74.7	54° 34' 52" N"	165° 08' 38" W"	black	fine	sand	none
B109	7/6/2007	05:35	75.2	54° 34' 52" N"	165° 06' 45" W"	black	fine	sand	none
B110	7/6/2007	05:53	73.0	54° 34' 52" N"	165° 04' 53" W"	white	broken	shells	pebbles
B111	7/6/2007	06:08	69.0	54° 34' 51" N"	165° 03' 02" W"	black	coarse	pebbles	none
B112	7/6/2007	06:24	66.6	54° 35' 55" N"	165° 03' 01" W"	black	coarse	pebbles	shells
B113	7/6/2007	06:40	70.1	54° 35' 57" N"	165° 04' 56" W"	white	broken	shells	sand
B114	7/6/2007	06:53	69.9	54° 37' 00" N"	165° 04' 53" W"	black	medium	pebbles	shells
B115	7/6/2007	07:09	67.0	54° 38' 05" N"	165° 04' 53" W"	grey	fine	pebbles	mud
B116	7/6/2007	07:23	62.0	54° 38' 09" N"	165° 03' 08" W"	black	sticky	mud	none
B117	7/6/2007	07:41	69.0	54° 37' 01" N"	165° 03' 08" W"	black	volcanic	cobbles	none

Point Number	Date	Time (UTC)	Depth (m)	Latitude	Longitude	Color	Surface Description	Nature of Surface	Secondary Nature of Surface
B118	7/6/2007	23:45	73.6	54° 35' 53" N"	165° 06' 39" W"	white	broken	shells	sand
B119	7/7/2007	00:00	74.1	54° 35' 57" N"	165° 08' 40" W"	black	fine	sand	shells
B120	7/7/2007	00:15	75.0	54° 35' 57" N"	165° 10' 31" W"	black	fine	sand	none
B121	7/7/2007	00:29	81.0	54° 35' 55" N"	165° 12' 19" W"	black	fine	sand	none
B122	7/7/2007	00:43	80.3	54° 35' 54" N"	165° 14' 10" W"	black	coarse	pebbles	sand
B123	7/7/2007	01:03	83.0	54° 36' 59" N"	165° 16' 03" W"	black	medium	sand	gravel
B124	7/7/2007	01:19	81.3	54° 36' 59" N"	165° 14' 10" W"	black	fine	sand	gravel
B125	7/7/2007	01:34	78.0	54° 36' 59" N"	165° 12' 19" W"	black	fine	sand	none
B126	7/7/2007	01:48	79.0	54° 36' 59" N"	165° 10' 27" W"	black	fine	sand	none
B127	7/7/2007	02:02	76.0	54° 37' 00" N"	165° 08' 36" W"	black	fine	sand	none
B128	7/7/2007	02:16	71.5	54° 37' 00" N"	165° 06' 44" W"	black	fine	sand	none
B129	7/7/2007	02:30	78.0	54° 38' 04" N"	165° 06' 44" W"	black	fine	sand	shells
B130	7/7/2007	02:43	80.0	54° 38' 05" N"	165° 08' 37" W"	black	fine	sand	none
B131	7/7/2007	03:03	78.5	54° 38' 04" N"	165° 10' 27" W"	black	fine	sand	none
B132	7/7/2007	03:15	84.0	54° 38' 04" N"	165° 12' 37" W"	black	fine	sand	none
B133	7/7/2007	03:32	83.0	54° 38' 04" N"	165° 14' 11" W"	black	fine	sand	none
B134	7/7/2007	03:46	85.6	54° 38' 05" N"	165° 16' 04" W"	black	fine	sand	none

Point Number	Date	Time (UTC)	Depth (m)	Latitude	Longitude	Color	Surface Description	Nature of Surface	Secondary Nature of Surface
B135	7/7/2007	03:56	97.0	54° 40' 13" N"	165° 16' 03" W"	black	fine	sand	pebbles
B136	8/10/2007	01:23	60.0	54° 27' 36" N"	165° 01' 22" W"	black	fine	sand	pebbles
B137	8/10/2007	01:43	55.0	54° 27' 17" N"	164° 59' 18" W"	black	fine	sand	none
B138	8/10/2007	02:03	67.0	54° 27' 17" N"	164° 57' 28" W"	black	fine	sand	none
B139	8/10/2007	02:24	58.0	54° 27' 16" N"	164° 55' 34" W"	black	fine	sand	shells
B140	8/10/2007	02:40	33.0	54° 27' 13" N"	164° 53' 35" W"	black	volcanic	cobbles	pebbles

H11644 HCell Report
Sarah Wolfskehl, Hydrographic Survey Intern
Pacific Hydrographic Branch

Introduction

The primary purpose of the HCell is to directly update NOAA ENC's with new survey information in International Hydrographic Organization (IHO) format S-57. HCell compilation of survey H11644 utilized Office of Coast Survey HCell Specifications Versions 3.0, in conjunction with the Field and Processing Branch Features Encoding Guide for West Coast US and Alaska Version 1.3. HCell H11644 will be used to update ENC US3AK61M (4th Ed., issue date 4/28/08) and chart 16520, 1:300,000 (22nd Ed., March 1, 2004, NM 3/8/08).

1. Compilation Scale

Contours and the density of soundings are compiled as appropriate to emulate those of Chart 16520, 1:300,000. Position and density of features included in the HCell have not been generalized from the scale of the hydrographic survey, 1:40,000.

2. Soundings

2.1 Source Data

A 14 m resolution combined BASE surface, H11644_Combined_14m.hns was used as the basis for HCell production following Branch certification.

A survey-scale full density sounding (SOUNDG) feature object source layer was built from the H11644_Combined_14m.hns surface in CARIS BASE Editor. A shoal-biased selection was made at the 1:40,000 survey scale using a radius table with values shown in Table 1. The sounding feature object source layer was exported as H11644_SS.hob, and imported into CARIS HOM.

Upper Limit (m)	Lower Limit (m)	Radius (mm)
0	10	3
10	20	4
20	50	4.5
50	180	5

Table 1.

2.2 Sounding Feature Objects

In CARIS BASE Editor soundings were manually selected from the survey scale sounding set H11644_SS.hob to create a chart scale sounding set H11644_CS.hob. The H11644_CS.hob sounding selection emulates the density and distribution of soundings on chart 16520, while more closely representing the seafloor morphology. The soundings were selected with regard to 3, 10, 20, 30, 50, and 100 fathom contours.

3. Depth Areas

3.1 Source Data

The finalized Base Surface, H11644_Combined_14m.hns, was used to generate a depth area, and for survey evaluation and verification purposes only, a set of contours. The contour set included the chart equivalent, 3, 10, 20, 30, 50, and 100 fathom contours. The depth contours were not submitted as deliverables, as according to OCS HCell Specifications ver. 3.0.

3.2 Depth Area Feature Objects

One all-encompassing depth range, 1 meter to 181 meters, was used for all depth area objects below MLLW. Upon conversion to NOAA charting units, this depth range is 0.54 to 98.9 fathoms.

4. Meta Areas

The following Meta object areas are included in HCell H11644:

M_QUAL
M_COVR

Meta area objects were constructed from filtered perimeter lines delineating the survey limits. The perimeter was first used to create the Skin of the Earth (SOTE) layer, then duplicated to the Meta object layers and attributed per the OCS HCell Specifications, Ver. 3.0.

5. Survey Features

New survey features for H11644 were delivered in .000 format and contain 3 breakers, 4 rocks, 5 kelp areas, and 139 bottom samples. Two features were digitized from chart 16520, a Tide Rips and Foul Area.

6. Shoreline / Tide Delineation

Segments of COALNE from GC10613 were used to create an inshore boundary for kelp and foul areas. No other shoreline features or intertidal areas are included in H-Cell H11644.

7. Attribution

All S-57 Feature Objects have been attributed as fully as possible based on information provided by the Hydrographer and in accordance with OCS HCell Specifications ver. 3.0

and the Field and Processing Branch Features Encoding Guide for West Coast US and Alaska Version 1.3.

8. Layout

8.1 CARIS HOM Layering Scheme

100	Survey Scale Soundings
101	Chart Scale Soundings
200	Depth Area/Skin of the Earth
300	Bottom Samples
301	New Rocks
302	New Breakers
303	Tide Rips from Chart
400	Kelp Areas
401	Foul Area from Chart
500	GC Shoreline (spatial only)
600	M_COVR
601	M_QUAL
800	Blue Notes (spatial only)
1001	Contours (spatial only)

8.2 Blue Notes

Notes regarding HCell feature compilation are on layer 800 and as shape file sets H11644_bluenotes_p.shp and H11644_bluenotes_l.shp for point and line figures, respectively. Blue notes along the east side of the survey area have line leaders, all others exist solely as point objects. A copy of the survey perimeter is included in the line shape file set for orientation purposes.

9. Spatial Framework

9.1 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.

9.2 Horizontal and Vertical Units

During creation of sounding sets and contours, and creation of the HCell, units are maintained as metric with millimeter resolution. NOAA rounding is applied at the same time that conversion to chart units is made to the metric HCell base cell file, at the end of the HCell compilation process.

The CARIS environment variable, uslXsounding_round, controls the depth at which rounding occurs. Setting this variable to NOAA fathoms and feet displays all soundings

equal to or greater than 11 fathoms as whole units. Depths shoaler than 11 fathoms are shown in fathoms and feet.

In an ENC viewer fathoms and feet display in the format X.YZZZ, where X is fathoms, Y is feet, and ZZZ is decimals of the foot. For fathoms and feet between 0 and 10 fathoms 4.5 feet (10.75 fms), soundings round to the deeper foot if the decimals of the foot are X.Y75000 or greater. For fathoms and feet deeper or equal to 11 fathoms, soundings round to the deeper fathom if feet and decimals of the foot are X.45000 (X.Y75000) or greater. In an ENC viewer, heights greater than 6 feet will register in fathoms and feet using the above stated rules. Drying heights are in feet and are rounded using arithmetic methods.

HOM Units

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

Chart Unit Base Cell Units

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

10. QA/QC

10.1 Data Processing Notes

Manual chart scale sounding selections were made for this survey.

10.2 ENC Validation Checks

H11644 was subjected to QA and Validation checks in HOM prior to exporting to the HCell base cell (000) file. Full millimeter precision was retained in the export of the metric S-57 base cell data set. This data set was then converted to a chart unit 000 file. dKart Inspector 5.0 (Service Pack 1) was then used to further check the data set for conformity to the S-58 version 2 standard (formerly Appendix B.1 Annex C of the S-57 standard). All tests were run and errors investigated and corrected where necessary.

11. Products

11.1 MCD Deliverables

H11644 Base Cell File, Chart Units, Soundings compiled to 1:300,000
H11644 Base Cell File, Chart Units, Soundings compiled to 1:40,000
H11644 Descriptive Report including end notes compiled during office processing and certification
H11644 HCell Report
H11644 Data Acquisition and Processing Report
Blue Notes shape files

11.2 File Naming Conventions

HOM file set prefix: *H11644_hc*

MCD Chart units base cell file: *US311644_CS.000*

MCD Chart units base cell file, survey scale soundings: *US311644_SS.000*

11.3 Software

HIPS 6.1:	Management and inspection of combined BASE surfaces
BASE Editor 2.1:	Combination of product surfaces and initial creation of the S-57 bathymetry-derived features, examination of base cell files against the chart; chart density sounding selection
HOM 3.3:	Assembly of the HCell, S-57 products, QA
GIS 4.4a:	Setting the sounding rounding variable
dKart Inspector 5.0:	S-58 Validation of the HCell base cell file

12. Contacts

Inquiries regarding this HCell content or construction should be directed to:
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Sarah.Wolfskehl@noaa.gov.

APPROVAL SHEET
H11644

Initial Approvals:

The survey evaluation and verification has been conducted according to branch processing procedures and the H-Cell compiled per the latest OCS H-Cell 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 H-Cell, 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.