

H11985

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. H11985

LOCALITY

State California and Oregon

General Locality Pacific Ocean - Northern California

Sublocality Pelican Island

2008

CHIEF OF PARTY

..... Dean Moyles Fugro Pelagos, Inc.

LIBRARY & ARCHIVES

DATE

NOAA FORM 77-28 (11-72)	U.S. DEPARTMENT OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION	REGISTER NO.
HYDROGRAPHIC TITLE SHEET		H11985
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.
State <u>California and Oregon</u>		
General Locality <u>Pacific Ocean - Northern California</u>		
Sublocality <u>Pelican Bay</u>		
Scale <u>N/A</u>	Date of Survey <u>09/08/2008 to 11/15/2008</u>	
Instructions Date <u>7/7/2008</u>	Project No. <u>M-L906-KR-08</u>	
Vessel <u>F/V PACIFIC STAR (556510), R/V R2 (623241), R/V D2 (647782)</u>		
Chief of Party <u>DEAN MOYLES</u>		
Surveyed by <u>ORTHMANN, MOYLES, REYNOLDS, BARROW, ZURITA, TODD, TIDEY, CAMERON, MOUNT, et.al</u>		
Soundings taken by <u>echo sounder</u> <u>RESON SEABAT 7125 & 8125 ECHOSOUNDERS HULL MOUNTED</u>		
Graphic record by <u>FUGRO PELAGOS, INC. PERSONNEL</u>		
Graphic record checked by <u>FUGRO PELAGOS, INC. PERSONNEL</u>		
Evaluation by <u>A. Raymond, J. Gardiner</u>	Automated plot by <u>N/A</u>	
Verification by <u>M. Litrico</u>		
Soundings in <u>Feet</u>	at	<u>MLLW</u>
REMARKS: <u>Time in UTC. UTM Projection Zone 10N</u>		
Revisions and annotations appearing as endnotes were		
generated during office processing. As a result, page numbering		
may be interrupted or non-sequential.		
All depths listed in this report are referenced to		
mean lower low water unless otherwise noted		
All separates are filed with the project or hydrographic data.		



A. AREA SURVEYED

H11985 (Sheet BO) is in the vicinity of Pelican Bay, California. It is bound by the coordinates listed in Table 1.¹

This data was collected by Fugro Pelagos, Inc. for NOAA and the State of California's Coastal Conservancy. While the State of California's interest in this data is primarily for fisheries habitat mapping, the necessary steps to meet NOAA specifications and make the data suitable to OCS for nautical charting purposes have been taken, as detailed in the 2008 Specifications and Deliverables and described in this and accompanying reports.

Hydrographic data collection began on September 8, 2008 and ended on November 15, 2008.

Table 1 – Sheet Bounds

Point	Latitude (North)	Longitude (West)
1	42-00-24	124-20-23
2	42-00-24	124-12-56
3	41-49-18	124-12-56
4	41-49-18	124-20-23
5	42-00-24	124-20-23

Note: The southern bounds were modified slightly (shifted further south) from originally planned to include additional survey area.²

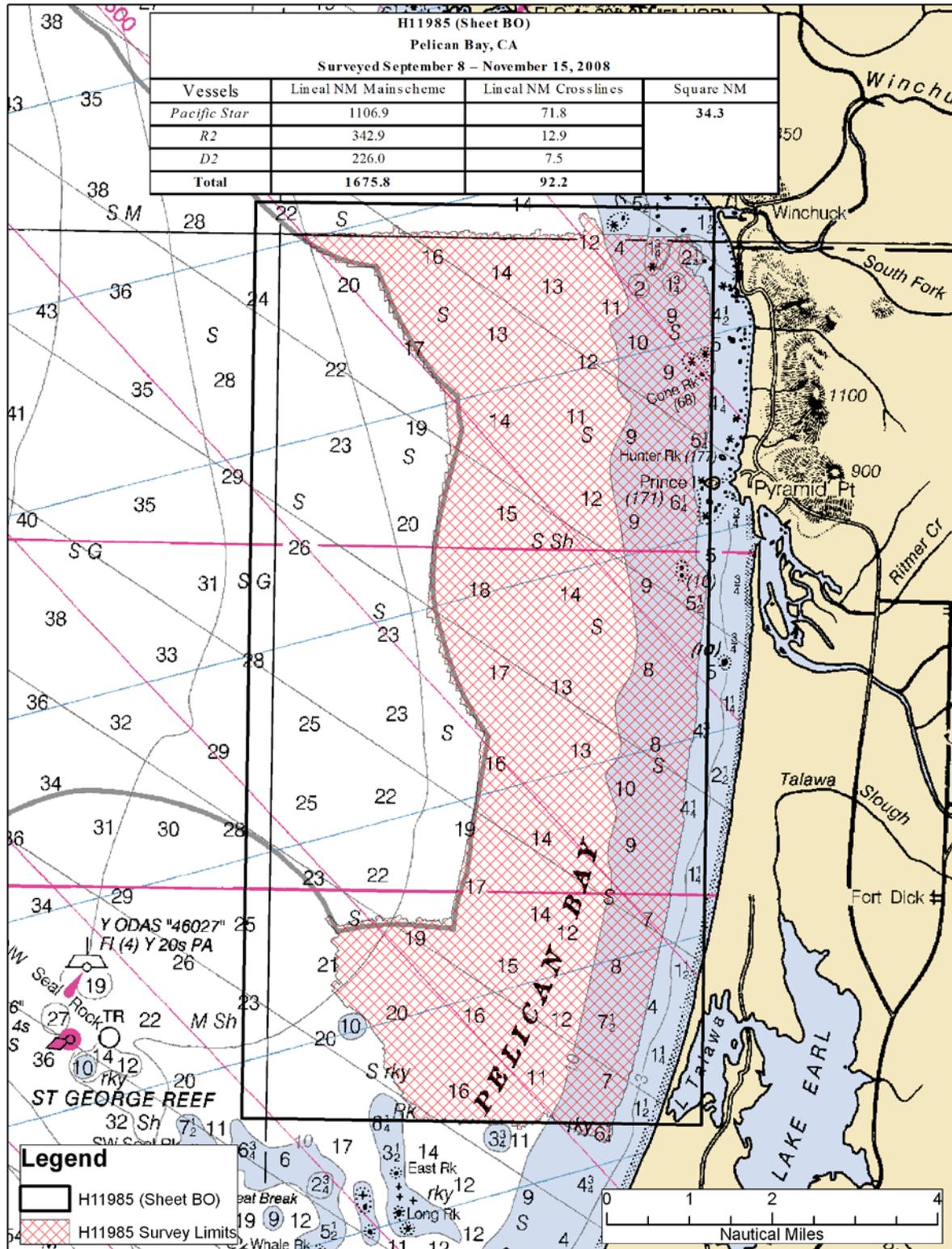


Figure 1 H11985 Area Surveyed

B. DATA ACQUISITION AND PROCESSING

Refer to the M-L906-KR-08 Data Acquisition and Processing Report³ for a detailed description of all equipment, survey vessels, processing procedures and quality control features. Items specific to this survey and any deviations from the Data Acquisition and Processing Report are discussed in the following sections.

B.1 Equipment & Vessels

The R/Vs R2, D2 and F/V Pacific Star acquired all sounding data for H11985.

The Pacific Star, which is 162 feet in length with a draft of 16 feet, was equipped with a Reson Seabat 7125 (400/200 kHz dual frequency) and a Reson Seabat 8111 for multibeam data acquisition. The vessel was also equipped with two AML sound velocity and pressure sensors (SV&P) and a Brooks Ocean Moving Vessel Profiler (MVP) for sound velocity profiles. Vessel attitude and position were measured using an Applanix Position and Orientation System for Marine Vessel (POS MV 320 V4) with S7K files logged in Winfrog Multibeam v 3.08.23.

Vessel D2, a Pacific Star launch, at 29 feet in length with a draft of 3 feet, was equipped similarly except no 8111 or MVP systems were installed. Note: the 7125 was replaced with an 8125 on September 9, 2008 after the vessel hit a submerged rock near Crescent City.

Vessel R2, with the same specifications as D2, was similarly equipped, except the 7125 system was single frequency (400 kHz only).

Refer to M-L906-KR-08 Data Acquisition and Processing Report for a complete listing of equipment and vessel descriptions.

B.2 Quality Control

Crosslines

Crosslines were planned and well distributed throughout the survey to ensure adequate quality control. Total crossline length surveyed was 92.2 nautical miles or 5.5 5.2 percent of the total main scheme line length, exceeding the 5 percent planned.⁴ Each crossline was compared to the entire main scheme line plan and CUBE surface it intersected, using the CARIS HIPS QC report routine.

The majority of QC Reports fall well within the required accuracy specifications.⁵ However, beams that fall below the 95 percent confidence level in the QC report are associated with areas and conditions illustrated below. It should be noted that these locations are in agreement with the surrounding adjacent lines and are considered well within the required specifications.

Results are located in Separate IV.

The majority of beams that fall below the 95 percent confidence level are located in areas having extremely steep slopes and/or rocks. Figures 2 and 3 below provide examples, note main scheme lines are shown in yellow and the crossline in purple.

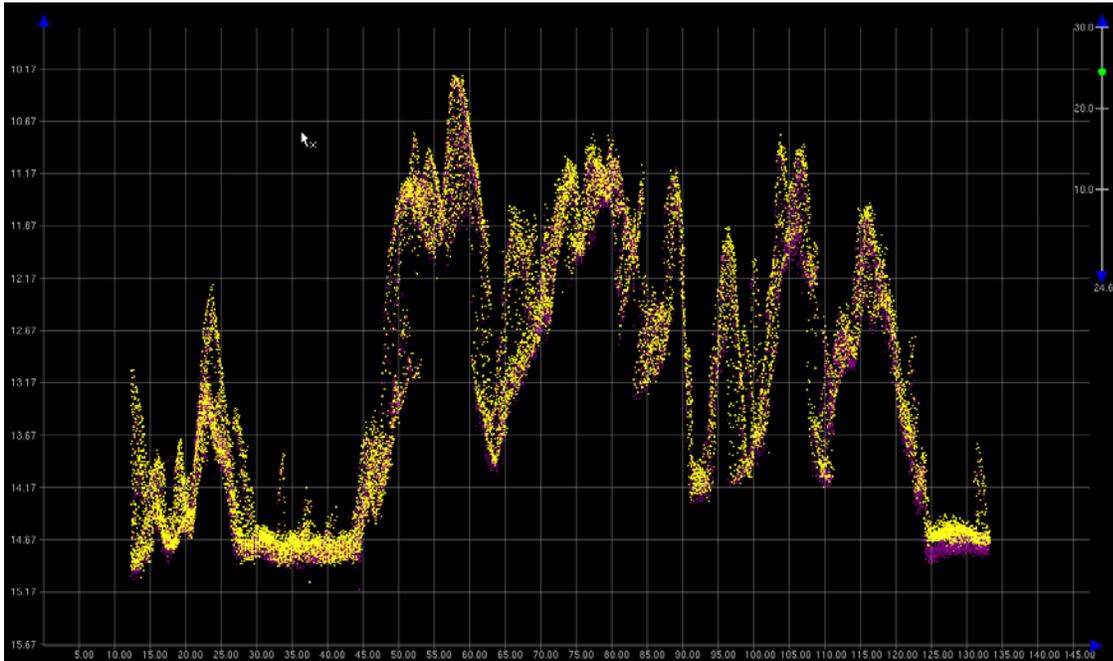


Figure 2 Profile of 5BO04-TIE02

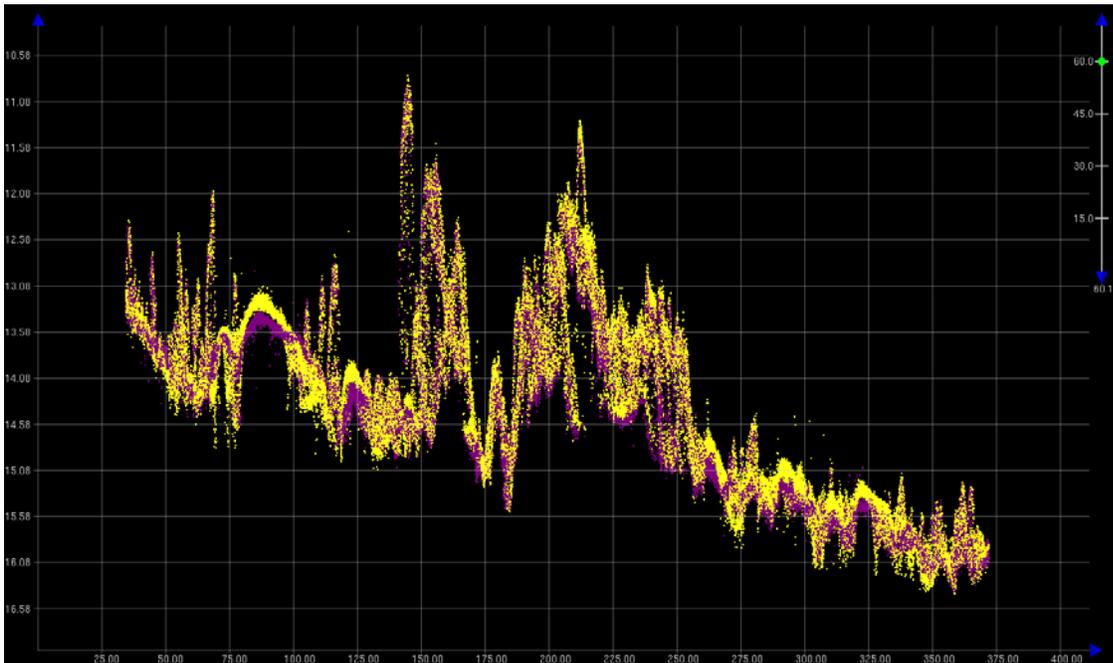


Figure 3 Profile of 5BO04-TIE05

Note: The QC reports were generated based on the given accuracy specification of:

$\pm \sqrt{(a^2 + (b * d)^2)}$ where $a = 0.2$, $b = 0.01$, and $d = \text{depth}$.

However, since a variance of a difference, rather than a variance from a mean is being used, the a and b values were defined in the user defined option within the CARIS HIPS QC Report routine as follows:

$$a = 0.2 * \sqrt{2} = 0.283$$

$$b = 0.01 * \sqrt{2} = 0.014$$

Uncertainty Values

The majority of H11985 had uncertainty values of 0.25 m to 0.35 m, which met project specifications.⁶

As seen in the uncertainty surface, 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 sound velocity error uncertainty.

Oscillations from port to starboard along lines in the uncertainty surface are due to higher uncertainty computed due to vessel roll, again prevalent mostly in the outer beams.

Higher uncertainties are seen in areas of steep or rapidly changing bottom topography and areas where outer beams were left to contribute to the surface. However, despite high uncertainty in these areas, data matchup is good and the data acceptable for nautical charting purposes.⁷

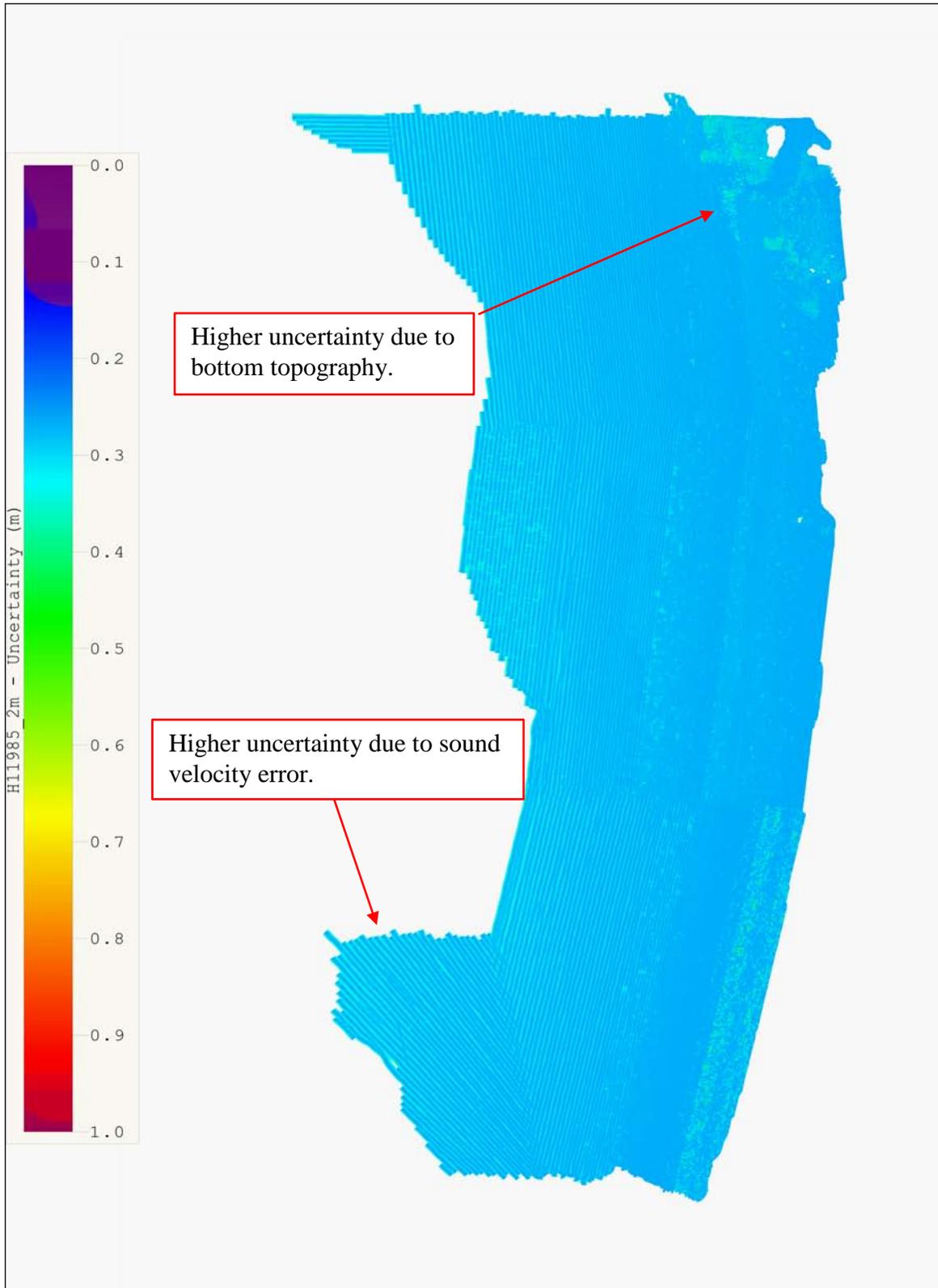


Figure 4 Uncertainty DTM

Survey Junctions

H11985 (Sheet BO) junctions with:

Registry #	Date	Junction Side
H11984	2008	Southwest

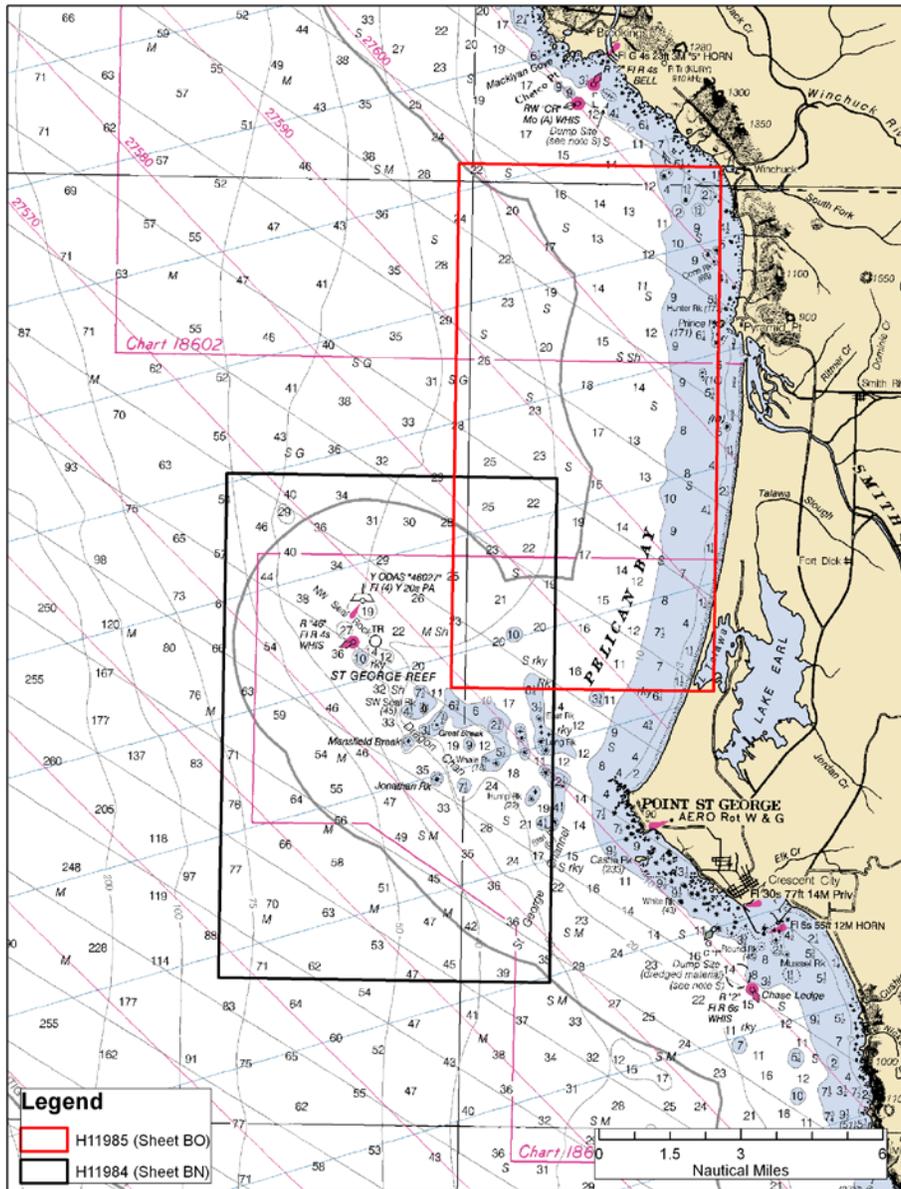


Figure 5 H11985 Survey Junctions

The surveys are in agreement along their common borders. The agreement was noted in the field using the CUBE surfaces during subset cleaning. The conformity is also apparent in the Final Combined BASE Surfaces.⁸

Quality Control Checks

Positioning system confidence checks were conducted on a daily basis using the POS MV controller software. The controller software had numerous real-time displays that were monitored throughout the survey to ensure the positional accuracies specified in the NOS Hydrographic Surveys Specifications and Deliverables were achieved. These include, but are not limited to the following: GPS Status, Position Accuracy, Receiver Status (which included HDOP), and Satellite Status. During periods of high HDOP and/or low number of available satellites, survey operations were stopped.

Data Quality

In general, the multibeam data quality for H11985 was good.⁹ Two notable problems follow:

1. Some small holidays exist in the data, the holidays are small and no shoaling is evident along their edges.
2. A general downward and/or upward cupping is noticeable in the across track sounding profiles for certain areas. This is possibly due to a high volume of thermal layering and strong undercurrents in the water column. This problem was addressed by conducting SVP casts more frequently and reducing the line spacing interval. Even though this SVP error is noticeable in the data, it is within required specifications.

The R2 and D2 launches collected sound velocity profiles every two hours to compensate for velocity changes over time. Profiles were collected on alternate ends of lines, or often in the middle of lines, to minimize the spatial aspect of sound velocity changes.

The MVP system on the Pacific Star was also used at an interval of every two hours, except that the system was used to collect as many as five profiles along the course of a single line. Two hours later, another set of profiles would be collected, with the net result being the creation of a grid of sound velocity profiles that kept differences in time and distance minimal between the survey data and the in-use sound velocity profile.

Object 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 office-based processing crew provided feedback after preliminary processing and coverage creation in CARIS HIPS, and reported re-runs or in-fills as necessary to the acquisition crew.

Refer to the M-L906-KR-08 Data Acquisition and Processing Report for a detailed description of the survey equipment and methodology used over the course of this survey.

B.3 Corrections to Echo Soundings

Refer to the M-L906-KR-08 Data Acquisition and Processing Report for a detailed description of all corrections to echo soundings. No deviations from the report occurred.

B.4 Data Processing

Refer to the M-L906-KR-08 Data Acquisition and Processing Report for a detailed description of the processing flow.

The final fieldsheets for H11985 were divided into separate resolutions (due to the volume of data) and are called:

- “H11985_0_5m” and it contains nine BASE surfaces.
- “H11985_1m” and it contains four BASE surfaces.
- “H11985_1_5m” and it contains four BASE surfaces.

The following parameters were used:

0-22 meters: 0.5 m resolution, name “H11985_0_5m”

20-33 meters: 1 m resolution, name “H11985_1m”

30-45 meters: 1.5 m resolution, name “H11985_1_5m”

Note: Maximum depth was approximately 40 m, therefore resolutions coarser than 1.5 m were not computed.

The final S57 file for this project is called “H11985_S57_Features.000”. This file contains the object and metadata S57 objects as required in the Specifications and Deliverables.

C. VERTICAL AND HORIZONTAL CONTROL

Refer to the M-L906-KR-08 Horizontal and Vertical Control Report¹⁰ for a detailed description of the horizontal and vertical control used on this survey. No deviations from the report occurred. A summary of the project’s horizontal and vertical control follows.

Horizontal Control

The horizontal control datum for this survey was the North American Datum of 1983 (NAD83).

For real-time DGPS corrections, a CSI MBX-3 unit was tuned to the Cape Mendocino, CA. 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 was



generated. This position was logged concurrently with the bathymetry from Winfrog and logged to the POS file by Winfrog POS logger. It was later corrected for offsets to the MBES sonar by CARIS HIPS in processing.

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

See M-L906-KR-08 Horizontal and Vertical Control Report for a more detailed description of PPK positioning methods used.

Vertical Control

All sounding data were initially reduced to mean lower low water (MLLW) using predicted tidal data. It should be noted that predicted tides were used in the field for preliminary processing only.

Table 2 – Tide Gauges

Gauge	Location	Latitude	Longitude
9419750	Crescent City, CA	41° 44.7' N	124° 10.9' W
9418767	North Spit, CA	40° 46.0' N	124° 13.0' W

Tides

All sounding data were initially reduced to mean lower low water (MLLW) using predicted tidal data. Predicted tidal data for a month long period, UTC (Pacific Standard Time to UTC was +7 hours), was assembled (for gauges 9418767 & 9419750) from the National Water Level Observation Program accessed through the NOAA tides and currents website (<http://tidesandcurrents.noaa.gov/>). A cumulative file for the gauges was updated monthly by appending the new data. It should be noted that predicted tides were used in the field for preliminary processing only. Refer to the Horizontal and Vertical Control Report for any additional tidal information.

On March 1, 2009, verified tide data was acquired from the National Water Level Observation Program accessed through the NOAA tides and currents website (<http://tidesandcurrents.noaa.gov/>). Tidal zoning file was developed and provided by NOAA. From March 1, 2009 to March 2, 2009, all sounding data were re-merged using CARIS HIPS and SIPS tide routine. Verified tidal data from the Crescent City, CA. (9419750) and the North Spit, CA. (9418767) tidal stations were used for the final Navigation Base Surfaces and S-57 Feature files. Tidal Stations were owned and operated by the NOAA's National Ocean Service through the National Water Level Observation Program.

Final tidal corrections for this portion of the project were traditional tides and zoning and not GPS-derived, because to date, no VDatum model exists for NAD83 to MLLW.

D. RESULTS AND RECOMMENDATIONS

D.1 Chart Comparison

H11985 survey was compared with the charts shown on Table 3.

Table 3 – Chart Comparisons

Chart Number	Type	Cell Name	Scale	Edition	Edition Date
18600	Raster	n/a	1:196,948	14 th	January 2002
18602	Raster	n/a	1:40,000	12 th	April 2003
18603	Raster	n/a	1:40,000	16 th	December 2002
18600	ENC	US3OR03M	n/a	6 th	October 2008
18007	ENC	US2WC12M	n/a	4 th	August 2008

Comparison of Soundings

A comparison of soundings was accomplished by overlaying the latest edition of NOAA charts and ENC's on the final BASE surfaces in CARIS HIPS & SIPS. The general agreement between charted soundings and H11985 soundings was noted. A more detailed comparison was undertaken for any charted shoals or other dangerous features.

Agreement between soundings on this survey and all charts is good (Raster and ENC), with BASE surface depths comparing to charted soundings generally within +/- 1 fathom.

Exceptions follow:

1. Some discrepancy exists at the exact position of charted soundings on steep slopes. This is likely due to the charted soundings being slightly out of position, making a large difference in depths apparent. Recommend soundings as charted be superseded by this survey.¹¹
2. Rocks charted on ENC US3OR03M fall in the multibeam coverage and should be modified to agree with the H11985 survey.¹²



Automated Wreck and Observation Information System

There were no AWOIS items assigned to H11985.¹³

Charted Features

There were no charted features labeled ED, PD, or PA within the limits of H11985.¹⁴

Dangers to Navigation

Three dangers to navigation were found and reported for this survey. See Appendix I for the DtoN reports.¹⁵

D.2 Additional Results

None to note.

Bottom Samples

None were assigned for this sheet.¹⁶

Aids to Navigation

No charted aids to navigation existed in the survey area.¹⁷

No uncharted aids to navigation were found in the survey area.

E. APPROVAL SHEET

Approval Sheet

For

H11985

Standard field surveying and processing procedures were followed in producing this survey in accordance with the following documents:

M-L906-KR-08 Statement of Work
NOS Hydrographic Surveys Specifications and Deliverables, April 2008 Edition
Fugro Pelagos, Inc. Acquisition Procedures (2009-MBES_Acquisition_Procedures_R0);
Fugro Pelagos, Inc. Processing Procedures (2009-MBES_Processing_Procedures_R0)

The data were reviewed daily during acquisition and processing, and the survey is complete and adequate for its intended purpose.

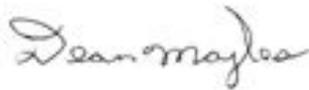
This report has been reviewed and approved. All records are forwarded for final review and processing to the Chief, Pacific Hydrographic Branch.

Approved and forwarded,

Dean Moyles,
Lead Hydrographer
Fugro Pelagos, Inc. Survey Party

5/13/2009

X



Dean Moyles
ACSM Certified

¹ Concur

² Concur

³ Filed with project records.

⁴ Concur with clarification. Crosslines length of 92.2 nm is 5.2 percent of the total lines run.

⁵ Concur

⁶ Concur

⁷ Concur

⁸ At the time of compilation of survey H11985, survey H11984 was still in review and junctioning data was not available for comparison. Verification of agreement between H11985 and H11984 will be completed when H11984 is compiled.

⁹ Concur

¹⁰ Filed with project records

¹¹ Concur

¹² Concur with clarification. Some features from both the RNC's and ENC's were found to be in agreement with the charts and some need modification as noted in Blue Notes. New features are included in the H11985_CS.000 file and were compiled from data submitted by the field.

¹³ Concur

¹⁴ Concur

¹⁵ DTON's submitted by the field were applied to the chart at the time of compilation. A copy of the DTON report is attached to this report.

¹⁶ Concur, retain bottom samples as charted

¹⁷ Concur

REPORT OF DANGERS TO NAVIGATION

Hydrographic Survey Registry Number: H11985 (Sheet BO)

Survey Title: **State:** California
 Locality: Pacific Ocean
 Sub-locality: Pelican Bay

Project Number: M-L906-KR-08

Survey Dates: September - November 2008

Survey Danger Acquisition Date and Time: See feature.

Features are reduced to Mean Lower Low Water using verified tide data from 9419750 (Crescent City).

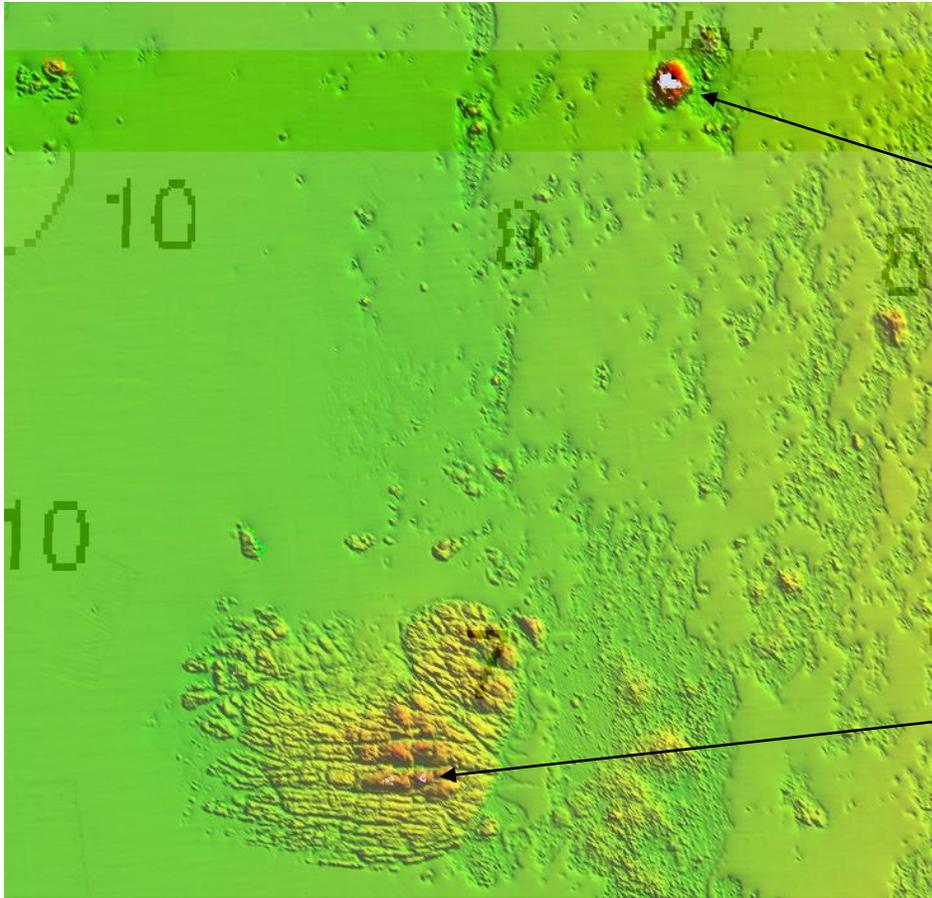
CHARTS AFFECTED:

Chart Number	Type	Cell Name	Scale	Edition	Edition Date
18600	Raster	n/a	1:196,948	14 th	January 2002
18602	Raster	n/a	1:40,000	12 th	April 2003
18600	ENC	US3OR03M	n/a	6 th	September 2008

DANGER:

Feature	Depth	Latitude (N)	Longitude (W)	Time (UTC)
1. Sounding *	3 fathoms 2 foot	41-58-44.79	124-13-44.21	2008-10-27 @ 16:31:39
2. Rock *	1 fathoms 2 foot	41-59-07.34	124-13-34.10	2008-11-07 @ 23:03:58
3. Sounding	3 fathoms 5 foot	41-59-39.82N	124-14-35.89	2008-10-28 @ 22:29:16

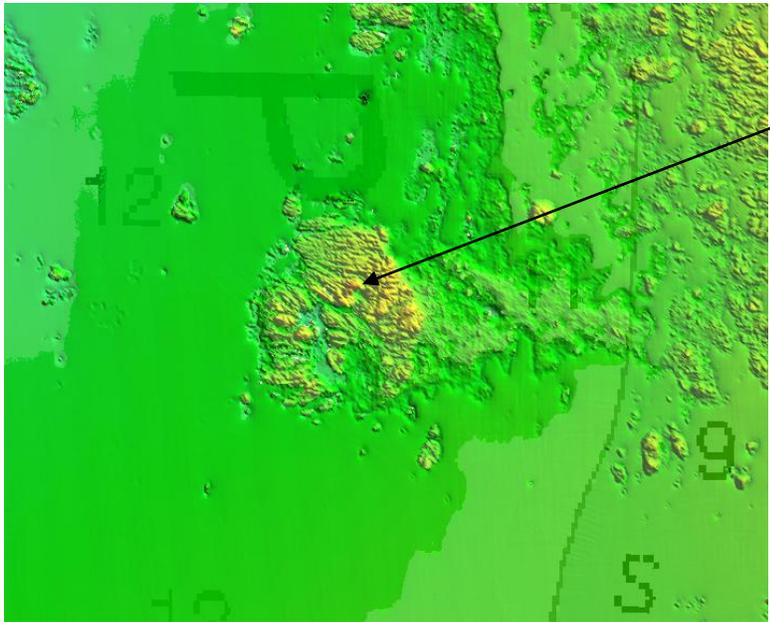
* *Least depth not obtained. This is the shoalest sounding acquired.*



DTON item 2: A 1 fathom 2 foot sounding acquired in the vicinity of 8 fathom sounding (chart 18602)

DTON item 1: A 3 fathom 2 foot sounding acquired in the vicinity of 7 fathom sounding (chart 18602)

DTON items 1 & 2



DTON item 3: A 3 fathom 5 foot sounding acquired in the vicinity of 11 fathom sounding (chart 18602)

DTON item 3

COMMENTS:

Questions concerning this report should be directed to the Chief, Pacific Hydrographic Branch (N/CS34), at (206) 526-6836.

H11985 HCell Report
Mary Beth Litrico, Physical Scientist
Pacific Hydrographic Branch

Introduction

The primary purpose of the HCell is to provide new survey information in International Hydrographic Organization (IHO) format S-57 to update the largest ENC and RNC in the region: NOAA ENC's, US3OR03M and US2WC12M, and NOAA RNC's, 18600, 18602 and 18603.

HCell compilation of survey H11985 utilized Office of Coast Survey HCell Specifications Version 3.1, with approved modifications to better align with PHB's HCell process and to meet MCD needs.

1. Compilation Scale

Soundings for HCell H11985 were compiled to the charts in the region, 18602 and 18603, at a scale of 1:40,000 and 18600 at a scale of 1:196948.

2. Soundings

A survey-scale sounding (SOUNDG) feature object layer was built from the **H11985_Office_Combined_4m** surface in CARIS BASE Editor. A shoal-biased selection was made using a single radius value of 1mm at chart scale (1:40,000) for areas of the survey covering charts 18602 and 18603. A shoal-biased selection was made using the Radius Table file with values shown in the table below for the area of the survey covering chart 18600 at chart scale 1:50,000. The resultant sounding layer contains 40,176 depths ranging from 1 to 43 meters.

Upper limit (m)	Lower limit (m)	Radius (mm)
0	10	3
10	20	4
20	50	4.5
50	345	5

In CARIS BASE Editor, soundings were manually selected from the high density sounding layers and imported into a new layer created to accommodate chart density depths. These were selected manually to accomplish a density and distribution that closely represents the seafloor morphology.

3. Depth Areas and Depth Contours

3.1 Depth Areas

The extents of the **H11985_Office_Combined_4m** BASE Surface together with the extents of the soundings layer were used to digitize the hydrographic extents, which were then used to create the single, all encompassing depth area (DEPARE). One depth range, from 1 to 43 meters, was used for DEPARE. Upon conversion to NOAA charting units, the depth range is 3.281 to 144.076 feet.

3.2 Depth Contours

Depth contours at the intervals on charts 18600 (1:196,948, fms), 18602 (1:40,000, fms) and 18603 (1:40,000, ft) are included in the H11985_SS HCell for MCD raster charting division to use for guidance in creating chart contours. The generalized metric and fathom equivalent contour values are shown in the table below.

Chart Contours in Fathoms	Metric Equivalent of Chart Contours	Metric Equivalent of Chart Contours Generalized	Actual Value of Chart Contours
3	5.4864	5.715	3.000
5	9.144	9.3726	5.000
10	18.288	18.5166	10.000
20	36.576	37.9476	20.000

Chart Contours in Feet	Metric Equivalent of Chart Contours	Metric Equivalent of Chart Contours Generalized	Actual Value of Chart Contours
30	9.144	9.3726	30.000
60	18.288	18.5166	60.000

Contours delivered in the H11985_SS file have not been deconflicted against soundings and hydrography as all other features in the H11985_CS file and soundings in the H11985_SS have been. Therefore, conflicts may exist between the H11985_SS file contours and HCell features at or near the survey limits. Conflicts with M_COVR, M_QUAL, M_CSCL, DEPARE and SBDARE objects should be expected. HCell features should be honored over H11985_SS.000 file contours in all cases where conflicts are found.

4. Meta Areas

The following Meta object areas are included in HCell H11985:

M_QUAL
M_COVR
M_CSCL

Meta area objects were constructed on the basis of the limits of the hydrography. (See 3.1 *Depth Areas*.)

5. Features

Two features files, **H11985_S57_Features.hob** and **H11985_S57_Features.000**, were delivered by the field. These were reviewed in the office and a new feature file was brought forward to compilation called **H11985_S57_Features_Office.hob**. Three DTONs were reported by the field and had been applied to the chart (18602) by the time of compilation.

Feature	Depth (feet)	Latitude (N)	Longitude (W)
Sounding	3 fms 2 ft	41-58-44.79	124-13-44.21
Rock	1 fm 2 ft	41-59-07.34	124-13-34.10
Sounding	3 fm 5 ft	41-59-39.82	124-14-35.89

Table 1: DTONs reported by the field unit for H11985.

DTONs were not included in the field submitted feature file so were added to the H11985_CS.000 file. Nor were DTONS designated and discrepancies of less than 1 foot exist between depths of these features and depths in the H11985_Office_Combined_4m surface used for compilation. To eliminate the excessive time required to designate soundings and regenerate surfaces, soundings were added to the H11985_SS.000 file with the correct depths for the three features.

Seven bottom sample features were imported from ENC US3OR03M. Refer to the SORIND field for the sources of all features included in the H11985 HCell.

6. S-57 Objects and Attributes

The H11985_CS HCell contains the following Objects:

\$CSYMB	Blue Notes
DEPARE	The all-encompassing depth area
M_COVR	Data coverage meta object
M_CSCL	Data coverage meta object
M_QUAL	Data quality meta object
SBDARE	Bottom samples and rocky seabed areas
SOUNDG	Soundings at the chart scale density
UWTROC	Rock features

The H11985_SS HCell contains the following Objects:

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

All S-57 Feature Objects in the H11985_CS HCell have been attributed as fully as possible based on information provided by the Hydrographer and in accordance with current guidance and the OCS HCell Specifications.

7. Blue Notes

Notes to the RNC and ENC chart compilers are included in the HCell as \$CSYMB features with the Blue Note information located in the INFORM field.

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):	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

Conversion to charting units and application of NOAA rounding is completed in the same step, at the end of the HCell compilation process.

Conversion to fathoms and feet charting units with NOAA rounding ensures that:

- All depths deeper or equal to 11 fathoms display as whole fathoms.
- All depth units between 0 fathoms (MLLW) and 11 fathoms display as fathoms and whole feet.
- All depth units skyward of 0 fathoms (MLLW) to 2.0 feet above MHW display in feet for values that round to 5 feet or less, and in fathoms and feet skyward of that.
- All height units (HUNI) which have been converted to charting units, and that are 2.00 feet above MHW and greater, are shown in feet.

In an ENC viewer fathoms and feet depth units (DUNI) display in the format X.YZZZ, where X is fathoms, Y is feet, and ZZZ is decimals of the foot. In an ENC viewer, heights (HUNI) display as whole feet.

9. Data Processing Notes

9.1 Junction with H11984

H11985 junctions with H11984, which was still in review at the time of compilation.

10. QA/QC and ENC Validation Checks

H11985 was subjected to QA checks in S-57 Composer prior to exporting to the HCell base cell (000) file. The millimeter precision metric S-57 HCell was converted to a 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

- H11985_CS, Chart Units, soundings and features compiled to 1:40,000 and 1:196,948.
- H11985_SS, Survey Units, soundings compiled to 1:40,000 and 1:50,000.
- H11985 Descriptive Report including end notes compiled during office processing and certification, the HCell Report, and supplemental items.
- H11985 Survey outline to populate the SURDEX.

11.2 File Naming Conventions

- Chart units base cell file, chart scale soundings, features, Blue Notes H11985_CS.000
- Chart units base cell file, survey scale sounding set H11985_SS.000
- Descriptive Report package H11985_DR.pdf
- Survey outline H11985_Outline.gml & *.xsd

11.3 Software

CARIS HIPS Ver. 6.1	Inspection of Combined BASE Surfaces
CARIS BASE Editor Ver. 2.3	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. 2.0	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	Validation of the base cell file.
Newport Systems, Inc., Fugawi View ENC	Independent inspection of final HCells using a

12. Contacts

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

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APPROVAL SHEET
H11985

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 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 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.