H11971

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. H11971

LOCALITY

State California

General Locality Pacific Ocean - Northern California

Sublocality Vicinity of Bear Landing

2008 - 2009

CHIEF OF PARTY
Dean Moyles, Fugro Pelagos, Inc

LIBRARY & ARCHIVES

DATE

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

HYDROGRAPHIC TITLE SHEET

REGISTRY No

H11971

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: California

General Locality: Pacific Ocean - Northern California

Sub-Locality: Vicinity of Bear Landing

Scale: 1:10,000 | Date of Survey: December 9, 2008 - October 16, 2009

Instructions dated: 7/7/2008 | Project No.: M-L906-KR-08

Vessel(s): F/V Pacific Star (556510), R/V R2 (623241), R/V D2 (647782)

Chief of party: Dean Moyles

Surveyed by: Moyles, Briggs, Farley, Reynolds, Cain, Lydon, Rokyta, Goodall, Lopez, Tixier, et al.

Soundings by: Reson SeaBat 7125 and Reson SeaBat 8125 echosounders hull-mounted

SAR by: Tyanne Faulkes | Compilation by: Katie Reser

Soundings compiled in: Fathoms

REMARKS: All times are UTC. UTM Zone 10N.

The purpose of this survey is to provide contemporary surveys to update National Ocean Service (NOS) nautical charts.

Revisions and end notes in red were generated during office processing.

Page numbering may be interrupted or non sequential.

All pertinent records for this survey, including the Descriptive Report, are archived at the National Geophysical Data Center (NGDC) and can be retrieved via http://www.ngdc.noaa.gov/.

A. AREA SURVEYED

H11971 (Sheet BA) is located in the vicinity of Bear Landing. It is bound by the coordinates listed in Table 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 in this area was carried out on December 09, 2008 and then from September 08 to October 16, 2009.

Table 1 – Sheet Bounds

Point	Latitude (North)	Longitude (West)
1	39-59-09	124-03-21
2	39-59-09	123-53-30
3	39-48-25	123-53-30
4	39-48-25	124-03-21
5	39-59-09	124-03-21

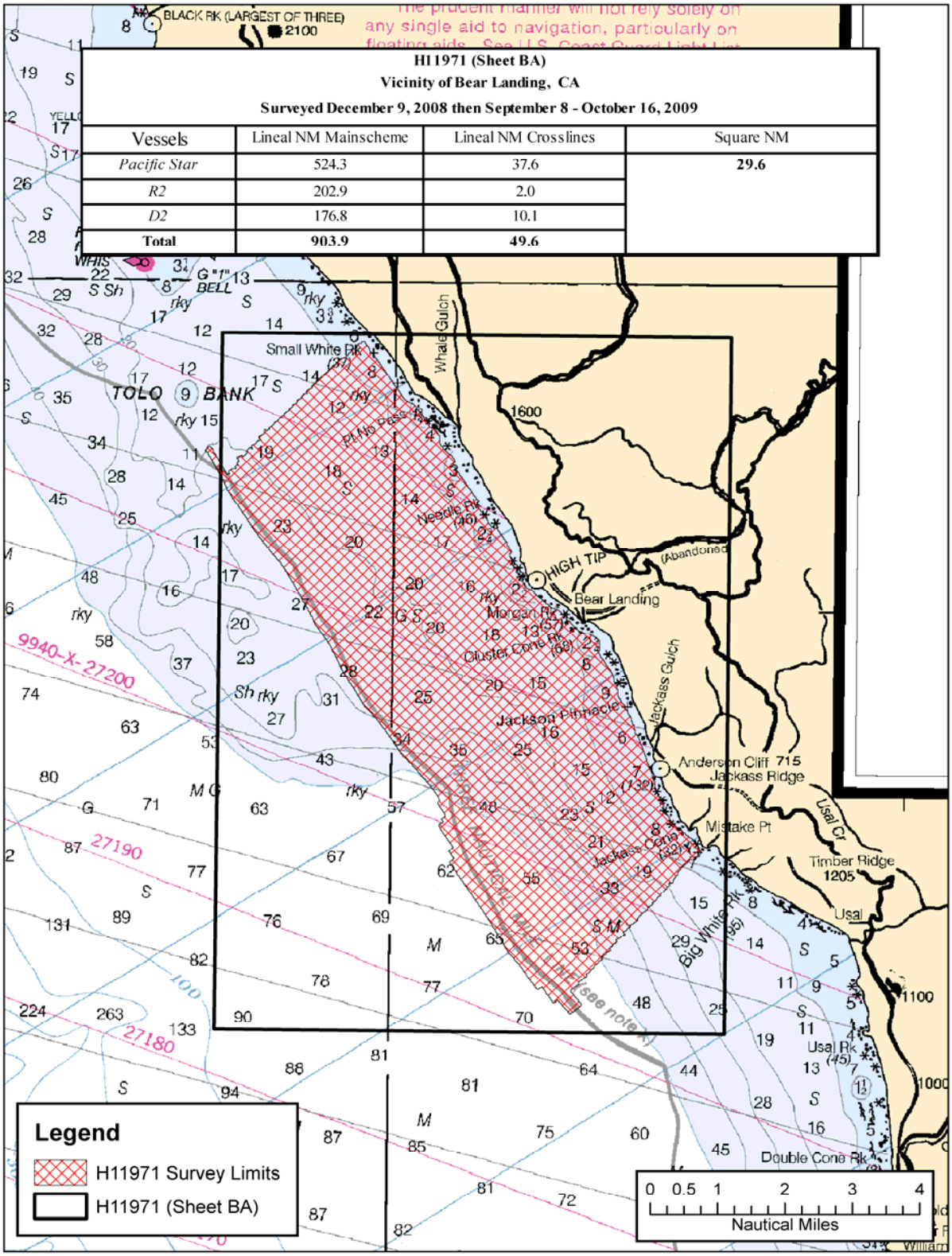

Figure 1 H11971 Area Surveyed

B. DATA ACQUISITION AND PROCESSING

Refer to the M-L906-KR-08 Data Acquisition and Processing Report 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 and D2 and F/V Pacific Star acquired all sounding data for H11971.

The Pacific Star, 162 feet in length with a draft of 16 feet, was equipped with both a Reson Seabat 7125 (400/200 kHz dual frequency) sonar, and a Reson Seabat 8111 sonar for multibeam data acquisition. The 7125 multibeam data files were logged in the S7K format, and the Reson 8111 files logged in the XTF format. All multibeam data files were logged using WinFrog Multibeam v 3.08.44.04. 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 Vessels (POS MV) 320 V4.

Vessel D2, a Pacific Star launch, is 29 feet in length with a draft of 3 feet. It was equipped with a Reson Seabat 8125 (455 kHz frequency) multibeam sonar system, two AML SV&P probes, and an Applanix (POS MV) 320 V4. Multibeam data files were logged in the XTF format using WinFrog Multibeam v 3.08.44.04.

Vessel R2, with the same specifications as D2, was similarly equipped, except that it was outfitted with a Reson 7125 system (400/200 kHz dual frequency).

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 49.6 nautical miles or 5.5 percent of the total main scheme line length. 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.[1] 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. Note: QC reports were conducted line by line with GPS derived tides, and by vessel with verified tides applied. A 4m resolution BASE surface was used in the crossline comparisons.

The majority of beams that fall below the 95 percent confidence level are located in areas having extremely steep slopes and/or rocks.[2] **Figures 2** and **3** below provide examples. Note: Main scheme lines are shown in yellow and crosslines in purple.

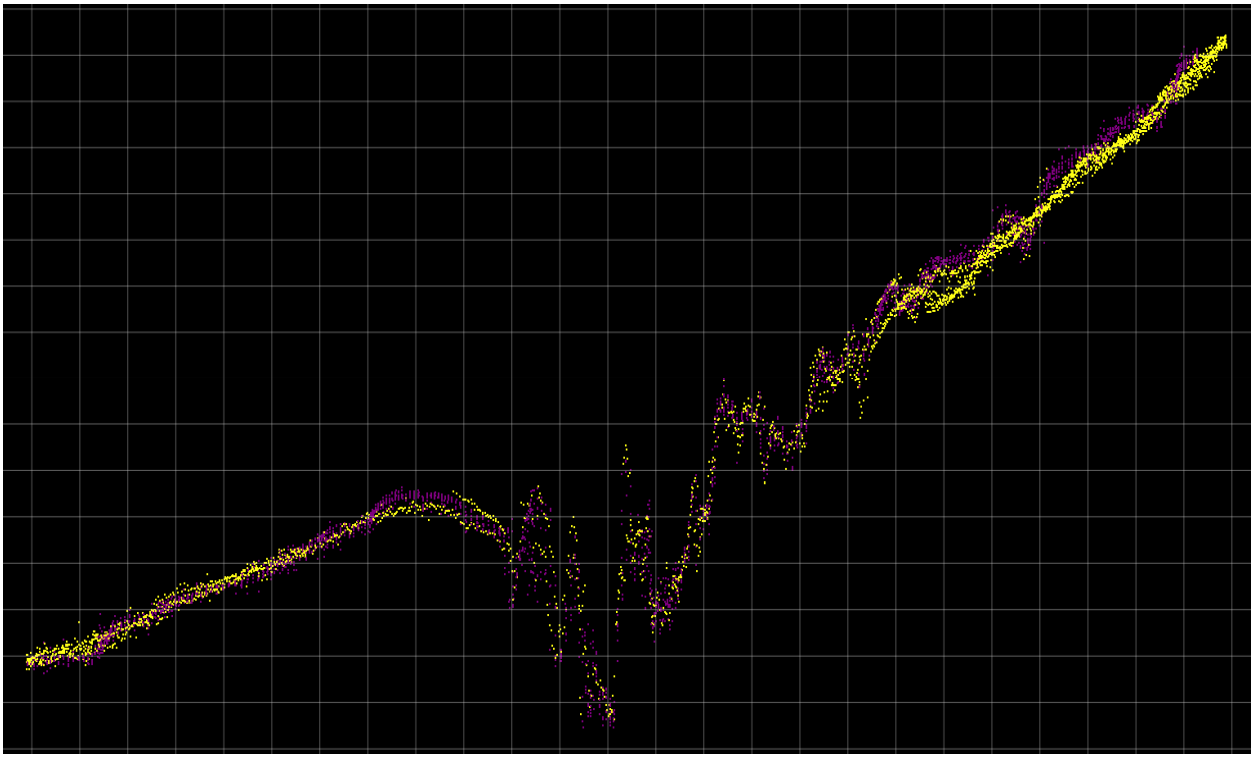

Figure 2 Profile of part of 5BA02-TIE001

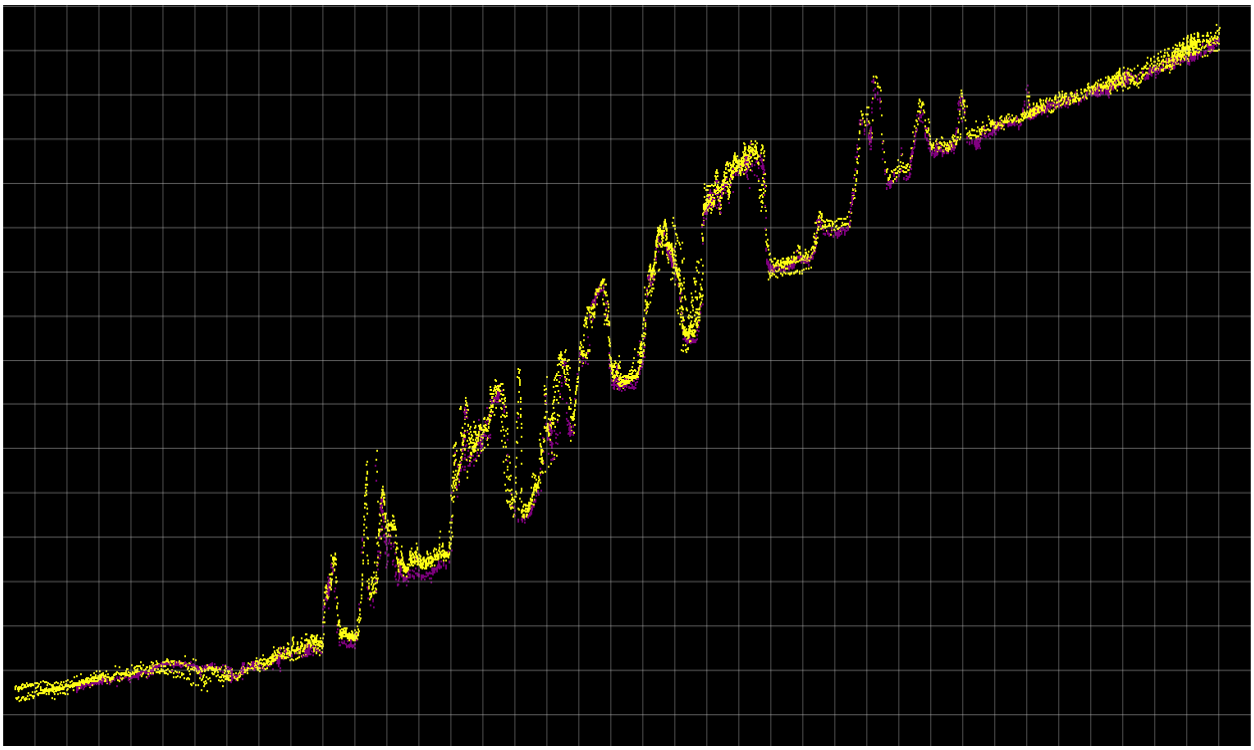

Figure 3 Profile of part of 4BA01-TIE04

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

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

Uncertainty Values

The majority of H11971 had uncertainty values of 0.20m to 0.60m, which meets project specifications.[3]

As seen in the uncertainty surface (**Figure 4)**, 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 and bottom detection.

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

Other areas of higher uncertainty include rock outcrops and irregular bottom topography. The increase in uncertainty levels at the South West corner of the block is due to a reduction in the data density for the deeper waters of this area.

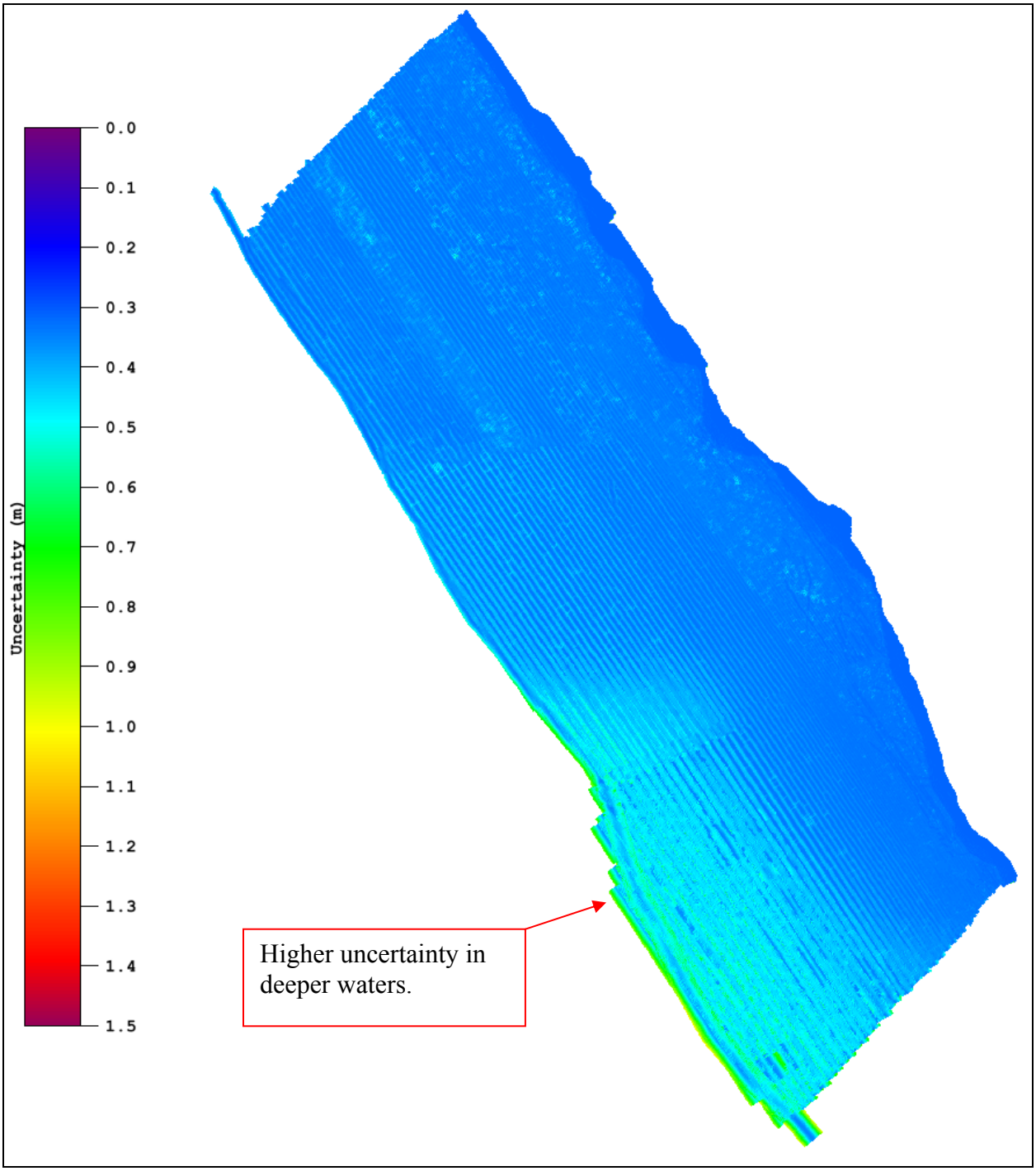

Figure 4 Uncertainty DTM

Survey Junctions

H11971 (Sheet BA) junctions with:[4]

Registry #	Date	Junction Side
H11970	2009	South
H11972	2009	North

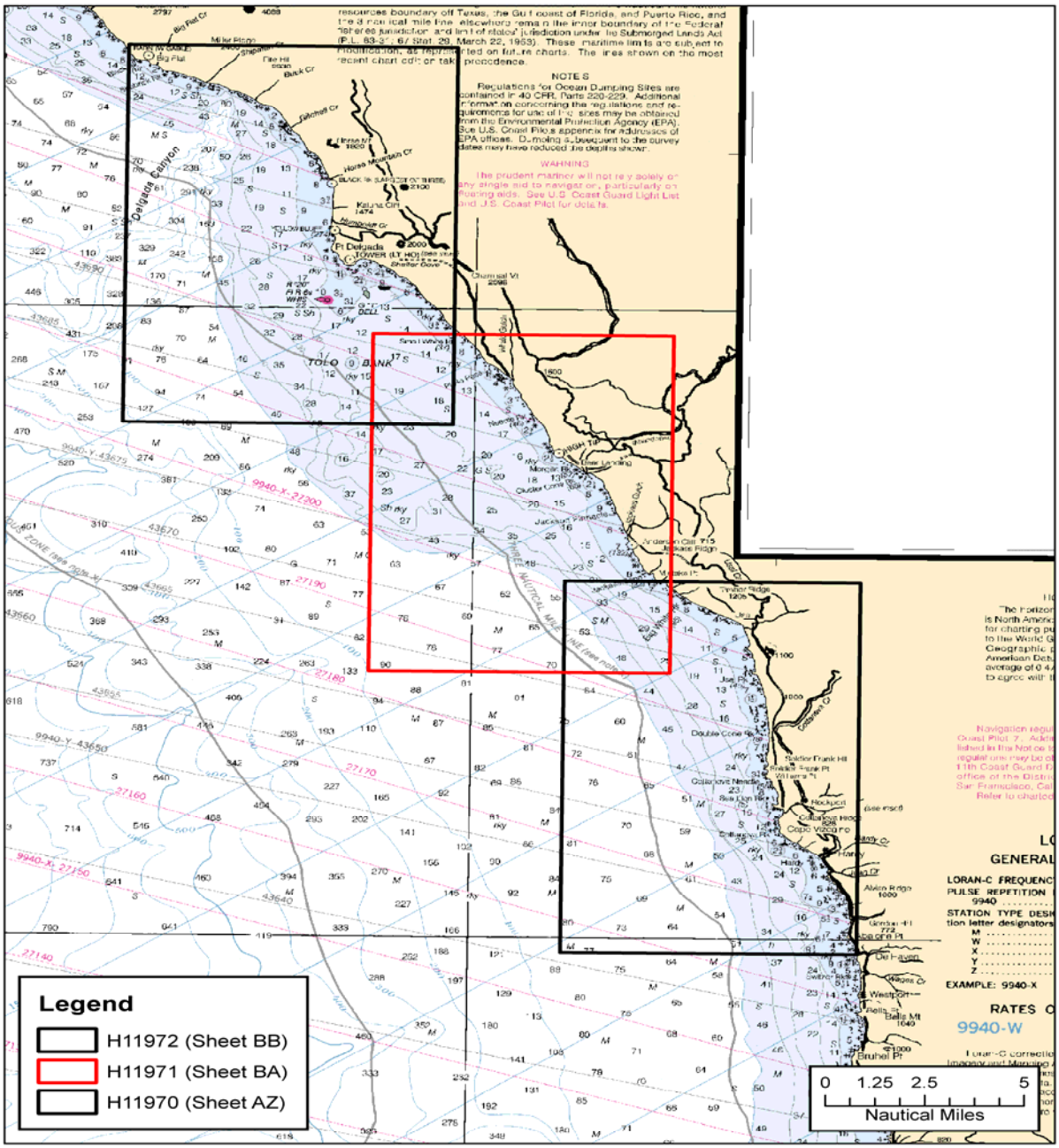

Figure 5 H11971 Survey Junctions

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.[5]

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 suspended.

Sonar system confidence checks were performed weekly by comparing post processed depth information collected by multiple vessels surveying over a common area. In addition, bar checks were performed to maintain a high confidence level. Sound Velocity Probe confidence checks were conducted weekly by producing comparative sound velocity data between all vessels. This was conducted by having all sound velocity profiling equipment (MVP and SVPs) perform a cast in close proximity to each other in a near simultaneous time period.

Comparison of PPK-GPSTide and Zoned Verified Tides

Tidal corrections for this survey were done using PPK-GPS derived altitudes which were reduced to MLLW using VDatum grids and the CARIS HIPS GPSTide function. Since conventional tidal data and zones were available, gross error and reality check comparisons were done between data corrected using both methods. The following tests were performed:

1. For a snapshot of general agreement throughout the survey area, a copy of the crossline data was corrected using zoned, verified smoothed tides. QC reports were then generated in HIPS for these "tidal" crosslines versus the BASE surfaces (GPSTide method) in the same manner described in the crossline comparison section above.

   Results: All "tidal" beams passed at 95% or better as compared to the BASE surfaces with exception of beams which did not pass for normal crossline comparisons due to rocky areas and steep slopes as previously discussed in the Crossline section of the report. Results are available in Separate IV.

2. In order to identify and quantify any static offsets between the two processing methods, a difference surface was created in CARIS Bathy DataBASE 2.3 using a CUBE surface created from the crosslines and a CUBE surface created from the same crosslines corrected using zoned, verified smooth tides. Difference surface = (tidal surface minus GPSTide surface). Both surfaces were created at a 4m resolution.

Results: Average difference was -0.230 m; median difference was -0.23 m, with a standard deviation of 0.073 m. Therefore, the GPSTide surface was about 23 cm deeper on average. No significant trends were apparent, but the greater differences evident on the Pacific Star lines can be attributed to the high uncertainty or inability to measure the waterline (static draft) values on this vessel in less than ideal sea states. See **Figure 6** below.

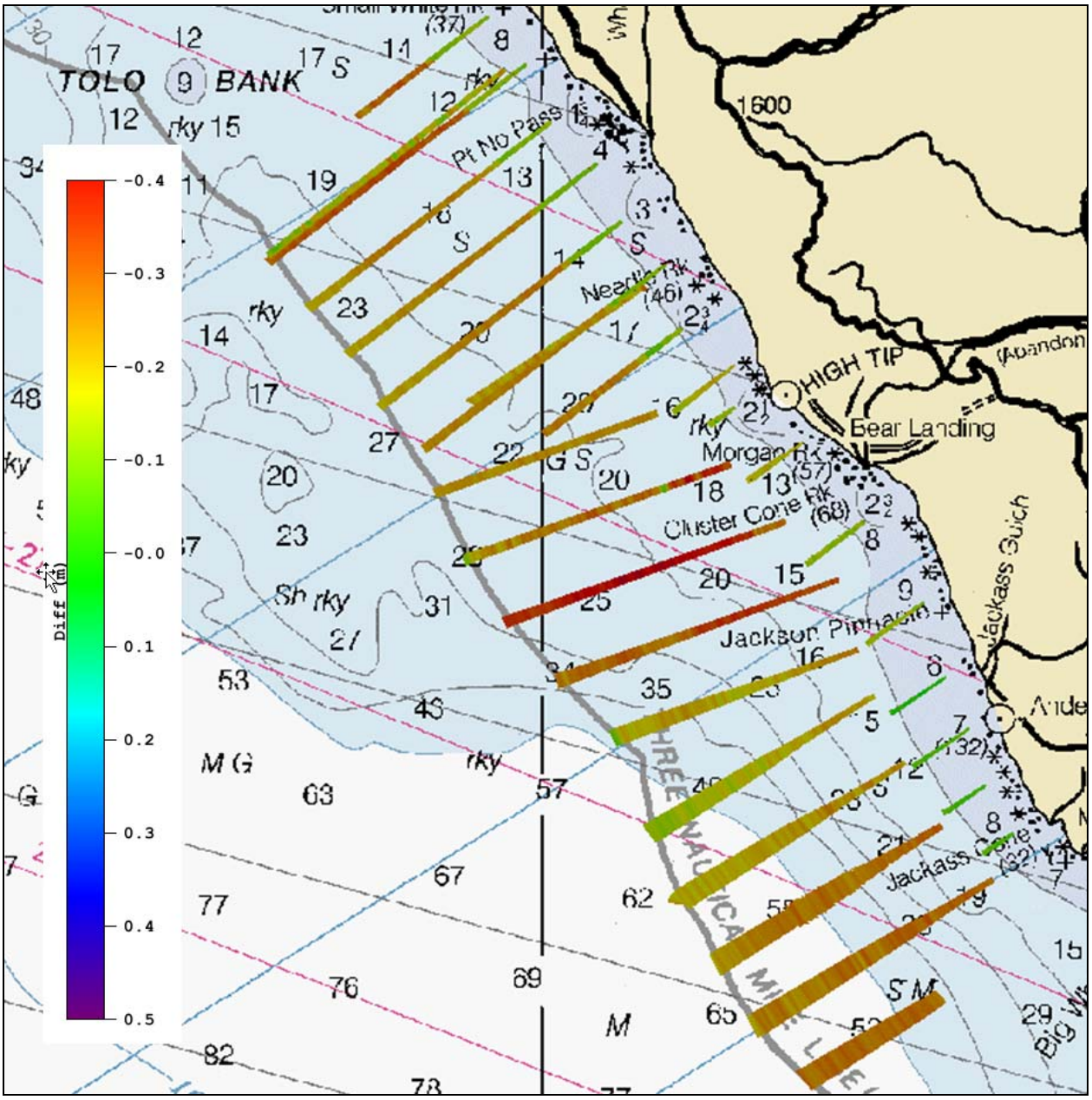

Figure 6 H11971 Difference Surface (Tidal minus GPSTide)

In conclusion, absolute correctness of one source of tidal correction over the other cannot be determined by direct comparisons between the two data sets. However, data corrected using both methods statistically compares very well to each other, and qualitatively the matchup between adjacent lines is good using both methods. Therefore, for this survey, the GPSTide method of tidal correction meets specification and is an acceptable alternative to the standard tidal method.[6]

Data Quality

In general, the multibeam data quality for H11971 was good. Three notable problems follow:

1. 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.[7]

R2 and D2 collected sound velocity profiles every two hours (or less) 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 to a minimum between the survey data and the in-use sound velocity profile.

2. Some small holidays exist in the data. These are due to insufficient along or across track data density due to the irregular bottom topography. The holidays are small, in relatively deep water, and no shoaling is evident along their edges.[8]

3. Some tide busts occur sporadically between adjacent lines. This was due to lower post-processed GPS accuracy than normal on certain lines. Although the busts are apparent in subset edit mode, they are relatively small (less than 0.10 m) and within specifications.[9]

4. Dynamic bottom issues were also present in H11971. Data acquisition for survey H11971 occurred on December 9, 2008, and again from September 8, 2009 through October 16, 2009. This 10 month time period resulted in vertical busts appearing between data collected in opposing weeks or years. These vertical busts can be attributed to dynamic bottom conditions occurring due to natural sediment transportation. When dynamic bottom was suspected, permanent features (i.e. rocks) were located to verify that the data from opposing years was in agreement. A sample of the dynamic bottom can be seen in Figure 7. In the example below, a significant weather event occurred which transported the soft sediments over a period of less than a week. Where appropriate, the shoaler data was retained.[10]

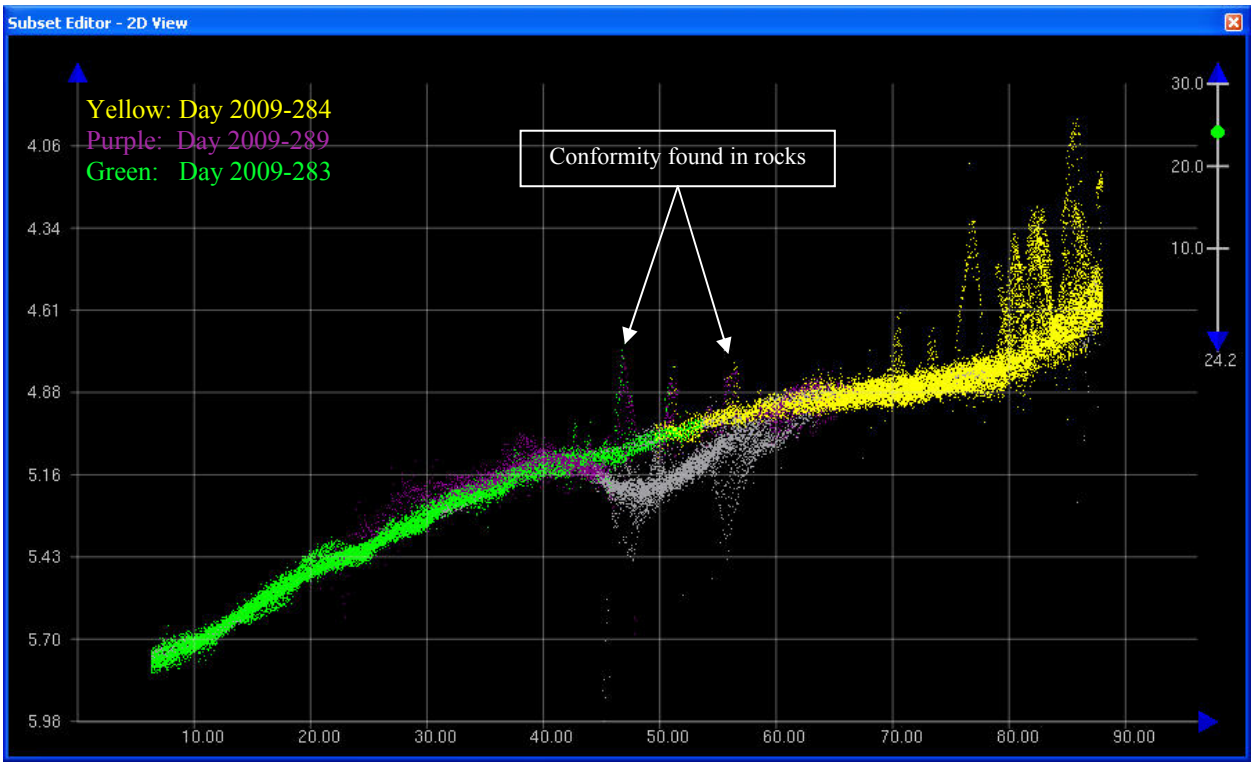

Figure 7 H11971 Dynamic Bottom

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 by 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 fieldsheet for H11971, named "H11971_(Sheet_BA)", contains five BASE surfaces. The following parameters were used:[11]

0-33 meters: 1 m resolution, name "H11971_1m_Final"
30-45 meters: 1.5 m resolution, name "H11971_1_5m_Final"
40-84 meters: 2 m resolution, name "H11971_2m_Final"
80-100 meters: 4 m resolution, name "H11971_4m_Final"
90-250 meters: 5 m resolution, name "H11971_5m_Final"

Notes:

- Maximum depth was approximately 120 m; therefore resolutions coarser than 5m were not computed.
- Due to the quantity of data, final CUBE BASE surfaces were created with CARIS v 7.0 in the CARIS Spatial Archive (CSAR) format. These surfaces are located under the "H11971\CARIS\Fieldsheets\" directory.

The final S57 file for this project is called "H11971_S57_Features.000". This file contains the object and metadata S57 objects as required in the Specifications and Deliverables.[12]

C. VERTICAL AND HORIZONTAL CONTROL

Refer to the M-L906-KR-08 Horizontal and Vertical Control Report 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 the POS file by WinFrog PosMvLogger. It was later corrected for offsets to the multibeam echosounder (MBES) 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 preliminary tidal data. It should be noted that preliminary tides were used in the field for the initial stage of processing only.

Table 2 – Tide Gauge

Gauge	Location	Latitude	Longitude
9418767	North Spit, CA	40° 46.0' N	124° 13.0' W
9416841	Arena Cove, CA	38° 54.8' N	123° 42.4' W
9415020	Point Reyes, CA	37° 59.7' N	122° 58.6' W

Final tidal corrections were generated using PPK processing methods in conjunction with NOAA's VDATUM model and the CARIS GPSTide routine. Applanix POSPac software produced a smoothed best estimate of trajectory (SBET) file that, among other data, contained GPS altitudes based on the NAD83 ellipsoid (GRS 80). The SBET altitudes were loaded into

every line in CARIS HIPS, and HIPS' GPSTide routine was run to compute a GPS-based tide. The GPSTide routine used a VDatum NAD83 to MLLW offset grid to produce MLLW tide correctors. This grid is an XYZ text file and is included with the CARIS data under the tide directory.

See M-L906-KR-08 Horizontal and Vertical Control Report for a more detailed description of the GPSTide methods.

D. RESULTS AND RECOMMENDATIONS

D.1 Chart Comparison

H11971 survey was compared with charts shown in Table 3.[13]

Table 3 – Chart Comparisons

Chart Number	Type	Cell Name	Scale	Edition	Edition Date
18010	Raster	n/a	1:811,980	21	Jan-07
18620	Raster	n/a	1:200,000	23	Jun-02
18640	Raster	n/a	1:207,840	25	Aug-05
18645	Raster	n/a	1:40,000	26	Sep-08
18622	Raster	n/a	1:25,000	54	Apr-10
18623	Raster	n/a	1:40,000	11	Aug-01
18626	Raster	n/a	1:40,000	15	Sep-00
18628	Raster	n/a	1:10,000	8	Nov-99
18640	ENC	US3CA14M	n/a	9	Jul-09
18620	ENC	US3CA15M	n/a	9	May-09
18007	ENC	US2WC12M	n/a	6	Jun-09
501	ENC	US1WC01M	n/a	23	Oct-09

Comparison of Soundings

A comparison of soundings was accomplished by overlaying the latest edition of NOAA charts and ENCs onto the final BASE surfaces in CARIS HIPS & SIPS. The general agreement between the charted soundings and H11971 soundings is noted. A more detailed comparison was undertaken for any charted shoals or other dangerous features.

Agreement between the H11971 BASE surface depths and the charted soundings for all applicable ENC and Raster charts was within +/- 1 to 3 fathoms.[14] Since the survey area was ensonified with 100% multibeam coverage, any shoaler depths between the charted soundings could be determined. In these areas, when necessary, the sounding was designated to insure its inclusion in the finalized BASE surface. Exceptions follow:

1. Some discrepancy exists at the exact position of charted soundings on steep slopes, likely due to the charted soundings being slightly out of position, making a large difference in depths apparent.
2. Discrepancies of both shoaler and deeper soundings were found in relation to the 10 and 20 fathom contours. Recommend updating contours to reflect soundings produced from survey H11971.[15]
3. Along the east side of ENCs US3CA15M and US2WC12M some charted rocks and islets witch fall within the 100% MBES coverage were not found. These discrepancies may be a result of digitizing displaced positions from RNCs. Recommend removal or repositioning of rocks and islets to conform to survey H11971.[16]

The Hydrographer recommends that soundings within the survey limits of H11971 supersede all prior survey and charted depths.[17]

Automated Wreck and Observation Information System

There were no AWOIS items assigned to H11971.[18]

Charted Features

There were no charted features labeled ED, PD, or PA within the limits of H11971.[19]

Dangers to Navigation

No dangers to navigation were found and reported for this survey.[20]

D.2 Additional Results

None to note.

Bottom Samples

None were assigned for this sheet.[21]

Aids to Navigation

No charted aids to navigation existed in the survey area.[22]

No uncharted aids to navigation were found in the survey area.[23]

E. APPROVAL SHEET

Approval Sheet

For

H11971

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,

David D Briggs,
Lead Hydrographer
Fugro Pelagos, Inc.
May 3, 2010

5/3/2010

X

David D Briggs
Lead Hydrographer

Revisions and Corrections Compiled During Office Processing and Certification

[1] Concur.
[2] The data is adequate to supersede charted data in the common area despite falling below the 95% confidence level on the crossline comparison.
[3] Concur. The areas of higher uncertainties discussed in this section are in situations where it is expected and, in those cases, deemed acceptable.
[4] Common junctions were made with H11970 and H11972, both of which have already been compiled.
[5] Concur.
[6] Concur.
[7] Concur. The data is adequate to supersede charted data in the common area.
[8] Concur. Given the small scale of the chart, the small holidays are insignificant and the data is adequate to supersede charted data.
[9] Concur.
[10] Concur. The data is adequate to supersede charted data in the common area despite the vertical errors between data collected in dynamic areas at different times.
[11] A 5m combined surface was created during the Survey Acceptance Review and was used as the basis of compilation.
[12] Concur with clarification. The submitted feature file only contains meta areas and rocky seabed areas delineated by the field. The meta area was re-generated during compilation and the rocky seabed areas were re-delineated to better accommodate chart scale. A new submerged rock was also digitized from the combined BASE surface during sounding selection.
[13] Do not concur. H11971 does not overlap all of the charts listed in the table. The largest scale chart covered by H11971 is 18620 (1:200,000) and ENC US3CA15M (1:200,000).
[14] Concur.
[15] Concur.
[16] Concur with clarification. Due to the small scale of chart 18620, it is recommended that the rocks be retained because it is uncertain if the actual position of those features falls inshore of the survey coverage. The islets on the ENC appear to have been foul areas digitized incorrectly from the raster. Recommend updating the ENC to match raster chart 18620.
[17] Concur with clarification. Chart depths as depicted in the HCell.
[18] Concur with clarification. No AWOIS items were assigned for investigation and none exist within the survey area.
[19] Concur.
[20] Concur.
[21] Concur with clarification. All charted bottom samples have been blue noted to be retained with the exception of those that fall within the rocky seabed areas delineated during compilation, which are blue noted to be removed.
[22] Concur.
[23] Concur.

H11971 HCell Report

Katie Reser, Physical Scientist
Pacific Hydrographic Branch

1. Specifications, Standards and Guidance Used in HCell Compilation

HCell compilation of survey H11971 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 H11971 were compiled to the largest scale raster chart shown below:

Chart	Scale	Edition	Edition Date	NTM Date
18620	1:200,000	23th	06/01/2002	09/25/2010

The following ENC were also used during compilation:

Chart	Scale
US3CA15M	1:200,000

3. Soundings

A survey-scale sounding (SOUNDG) feature object layer was built from a 5-meter multibeam combined surface in CARIS BASE Editor. A shoal-biased selection was made at 1:25,000 survey scale using a Radius Table file with values shown in the table, below.

Shoal Limit (m)	Deep Limit (m)	Radius (mm)
-5	10	3
10	20	4
20	50	4.5
50	500	5

In CARIS BASE Editor soundings were manually selected from the high density sounding layers (SS) and imported into a new layer (CS) created to accommodate chart density depths. Manual selection was used to accomplish a density and distribution that closely represents the seafloor morphology.

4. 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	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 H11971_SS.000
5	9.144	9.373	5.125	5
10	18.288	18.517	10.125	10
20	36.576	37.948	20.750	20
30	54.864	56.2356	30.750	30
40	73.152	74.5236	40.750	40
50	91.44	92.8116	50.750	50

HCell features should be honored over *_SS.000 file contours in all cases where conflicts are found.

5. Meta Areas

The following Meta object area is included in HCell H11971:

M_QUAL

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

6. Features

Shoreline verification was not conducted during this survey. The submitted feature file contains meta areas and rocky seabed areas delineated in the field. The meta area was re-generated during compilation and the rocky seabed areas were re-delineated to better accommodate chart scale. A new submerged rock was also digitized from the BASE surface during sounding selection.

7. S-57 Objects and Attributes

The *_CS HCell contains the following Objects:

$CSYMB	Blue notes
M_QUAL	Data quality meta object
SBDARE	Rocky seabed areas
SOUNDG	Soundings at the chart scale density
UWTROC	Rock

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

H11971 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

H11971_CS.000	Base Cell File, Chart Units, Soundings and features compiled to 1:200,000
H11971 _SS.000	Base Cell File, Chart Units, Soundings and Contours compiled to 1:25,000
H11971 _DR.pdf	Descriptive Report including end notes compiled during office processing and certification, the HCell Report, and supplemental items
H11971 _Outline.gml	Survey outline
H11971 _Outline.xsd	Survey outline

11.2 Software

CARIS HIPS Ver. 7.0	Inspection of Combined BASE Surfaces
CARIS BASE Editor Ver. 2.2	Creation of soundings and bathy-derived features, 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.
Northport Systems, Inc., Fugawi Marine ENC Ver.3.1.0.435	Independent inspection of final HCells using a COTS viewer.

12. Contacts

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

Katie Reser
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Seattle, WA
206-526-6864
katie.reser@noaa.gov

APPROVAL SHEET
H11971

The survey evaluation and verification has been conducted according to branch processing procedures and the HCell compiled per the latest OCS HCell Specifications.

Katie J. Reser

Katie Reser
2010.10.25
13:40:39 -07'00'

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.

Peter Holmberg

Digitally signed by Pete Holmberg
DN: cn=Pete Holmberg, o=NOAA, ou=PHB, email=peter.holmberg@noaa.gov, c=US
Date: 2010.10.25 14:03:00 -07'00'

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.

Gary C. Nelson

Digitally signed by Gary C. Nelson
DN: cn=Gary C. Nelson, o=NOAA, ou=Pacific Hydrographic Branch, email=gary.nelson@noaa.gov, c=US
Date: 2010.10.25 14:49:32 -07'00'

David Scharff

Digitally signed by David Scharff
DN: cn=David Scharff, o=OCS, ou=NOAA, email=david.scharff@noaa.gov, c=US
Reason: AWOIS and Surf Check complete
Date: 2010.11.03 15:13:55 -04'00'