H11974

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.

Registry No. H11974

LOCALITY

State California

General Locality Pacific Ocean -- Northern California

Sublocality Mussel Rocks to Punta Gorda

2008-2009

CHIEF OF PARTY

Dean Moyles

LIBRARY & ARCHIVES

DATE

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

HYDROGRAPHIC TITLE SHEET

REGISTRY No

H11974

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: N/A

State **California**

General Locality **Pacific Ocean -- Northern California**

Sub-Locality **Mussel Rocks to Punta Gorda**

Scale **1:10,000** Date of Survey **November 30, 2008 - October 17, 2009**

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

Vessel **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, Rokta, Goodall, Lopez, Tixier, et al.**

Soundings by **Reson SeaBat 7125, 8125 & 8111 Echosounders**

SAR by **Toshi Wozumi** Compilation by **Kurt Mueller**

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

H11974 (Sheet BD) is located from Mussel Rocks to Punta Gorda. 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 was conducted from November 30, 2008 to December 21, 2008 and again from September 11, 2009 to October 17, 2009.

Table 1 – Sheet Bounds

Point	Latitude (North)	Longitude (West)
1	40-21-42	124-27-25
2	40-21-42	124-20-07
3	40-11-45	124-20-07
4	40-11-45	124-27-25
5	40-21-42	124-27-25

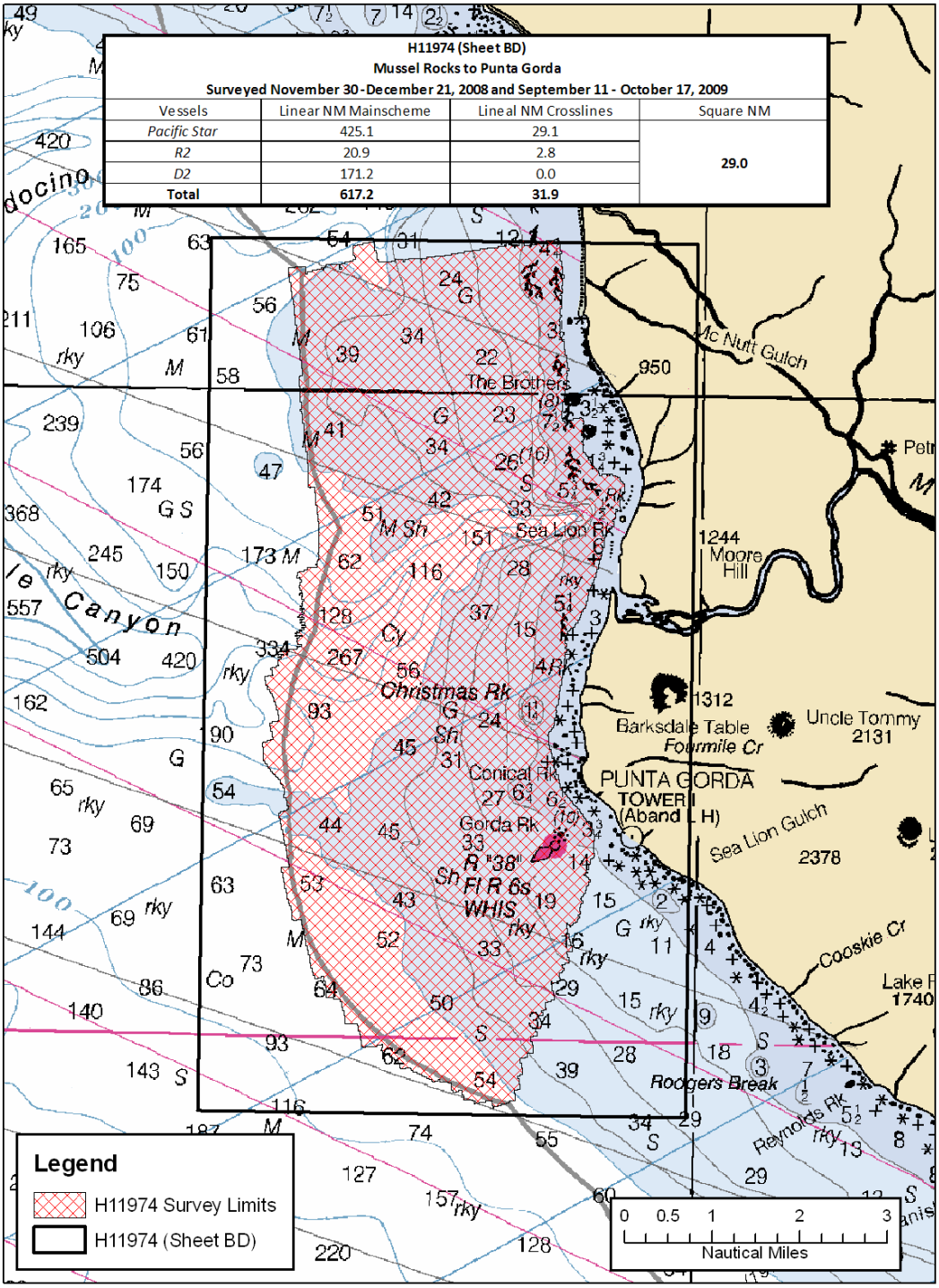


Figure 1 H11974 Area Surveyed

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/Vs Pacific Star acquired all sounding data for H11974.

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 31.9 nautical miles or 5.17 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. 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.[1] 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.

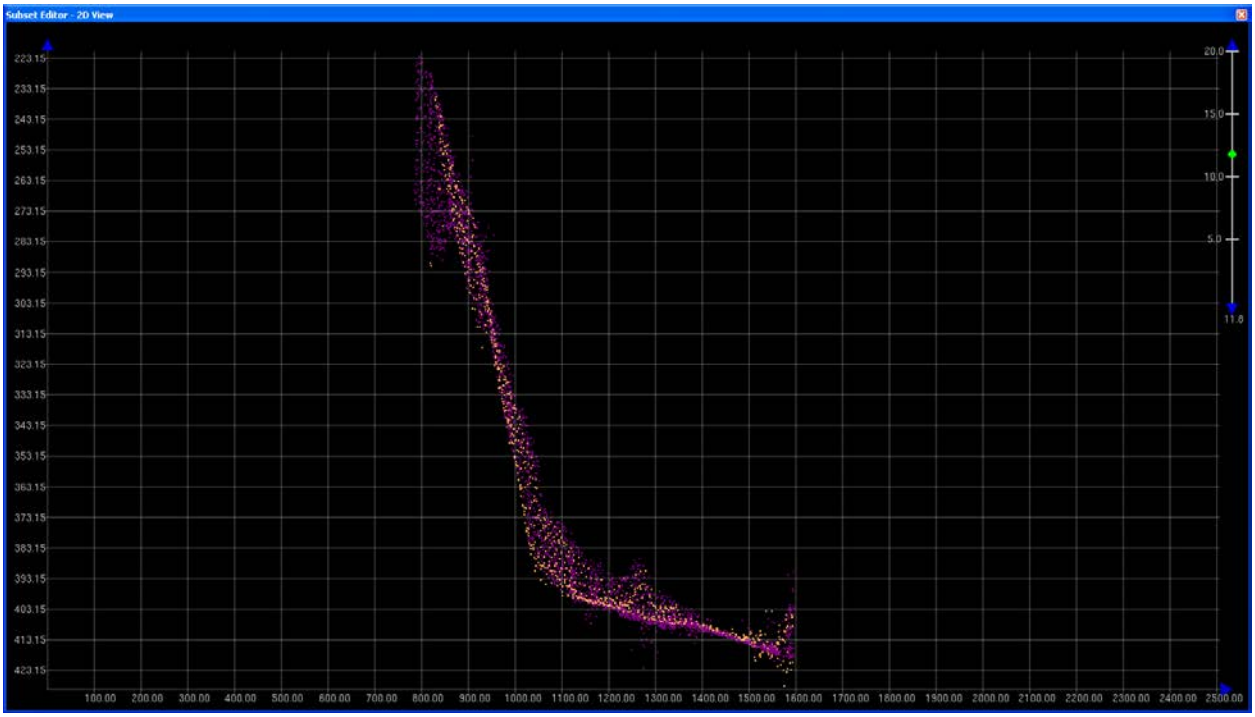


Figure 2 Profile of 3BD02-TIE01

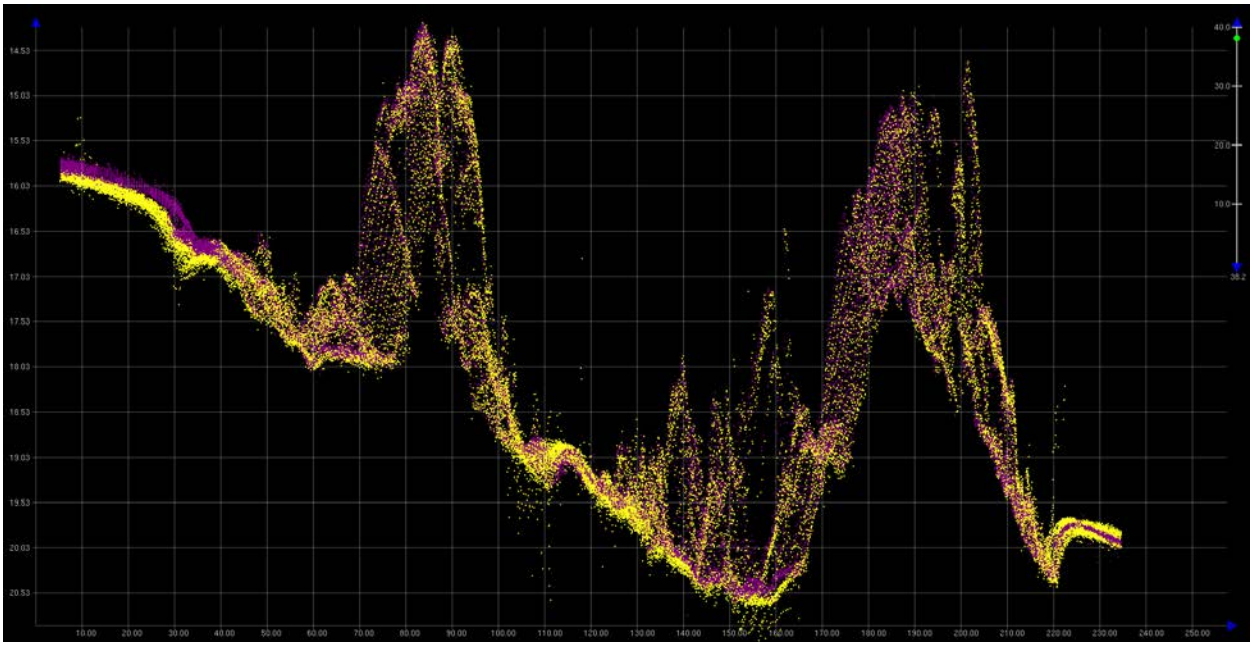


Figure 3 Profile of 4BD02-TIE50

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 H11974 had uncertainty values of 0.30 m to 0.70 m, which met project specifications.[3]

As seen in the uncertainly 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.

Other areas of higher uncertainty include rock outcrops, steep slopes, and irregular bottom topography.

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.

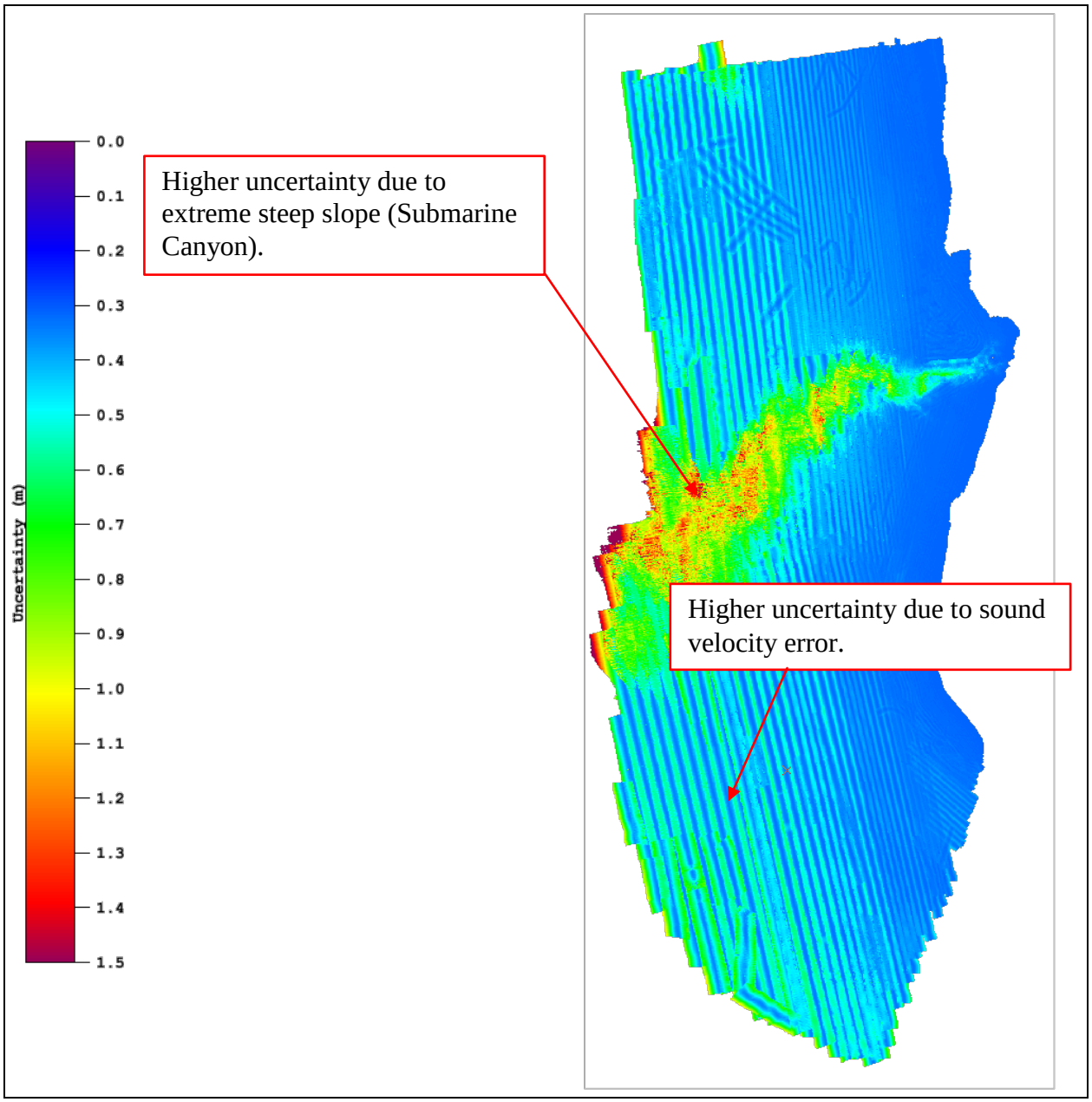


Figure 4 Uncertainty DTM

Survey Junctions

H11974 (Sheet BD) junctions with:[4]

Registry #	Date	Junction Side
H11973	2009	Southeast
H11975	2009	Northwest

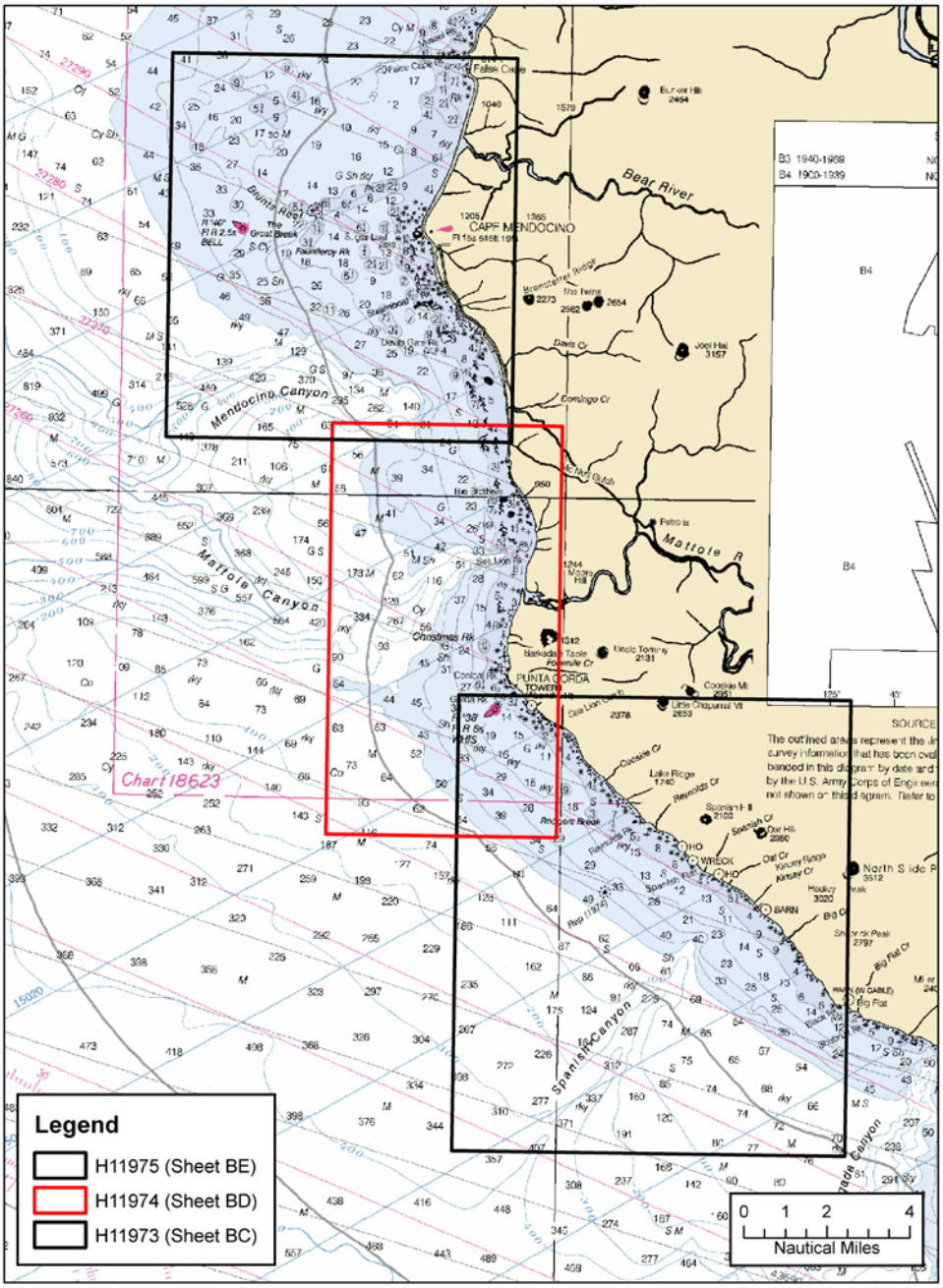


Figure 5 H11974 Survey Junctions

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: Most “tidal” beams for F/V Pacific Star passed at 95% confidence interval or better as compared to the BASE surfaces. The “tidal” beams for F/V Pacific Star that fell below the 95% confidence interval were located within the extreme slope of the Submarine Canyon. Results are available in Separate IV.

   R/V R2 “tidal” beams that fall below the 95% confidence level are located in rocky areas near shore, as well as in areas exhibiting a dynamic bottom. In some of the cases of dynamic bottom, the cross check lines were acquired 10 months apart from the main scheme lines.

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 between GPSTide and tidal surface was -0.180 m; median difference was -0.180 m, with a standard deviation of 0.116 m. Therefore, the GPSTide surface was about 18 cm deeper on average than the tidal surface. No significant trends were apparent, but a portion of the difference can be attributed to the high uncertainty or inability to measure the waterline (static draft) value on the Pacific Star in less than ideal sea states. See **Figure 6** below.

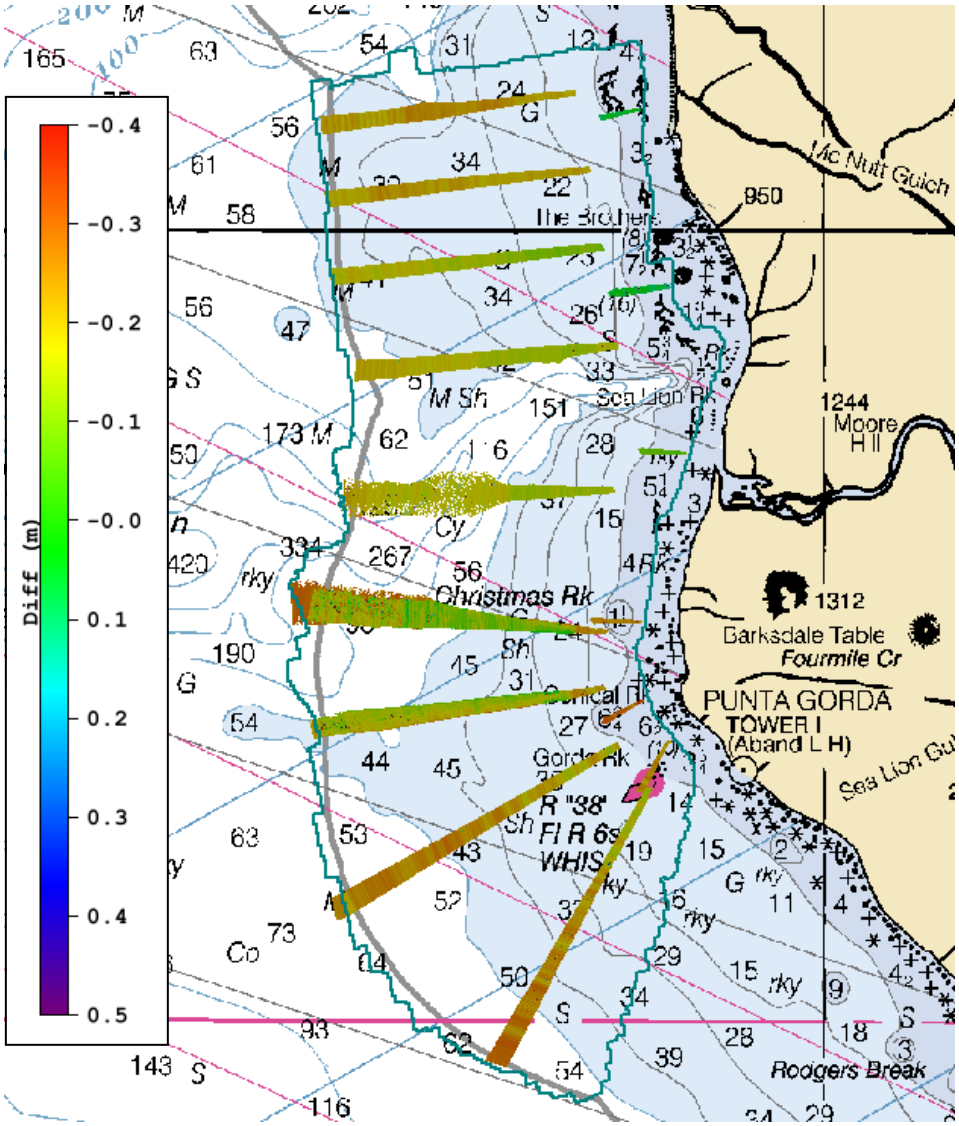


Figure 6 H11974 Difference Surface (Tidal minus GPSTide)

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 H11974 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 H11974. Data acquisition for survey H11974 occurred from November 30, 2008 through December 21, 2008, and again from September 11, 2009 through October 17, 2009. This 11 month time span resulted in offsets appearing between data collected in opposing years. These offsets 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**. Where appropriate, the shoaler data was retained.[10]

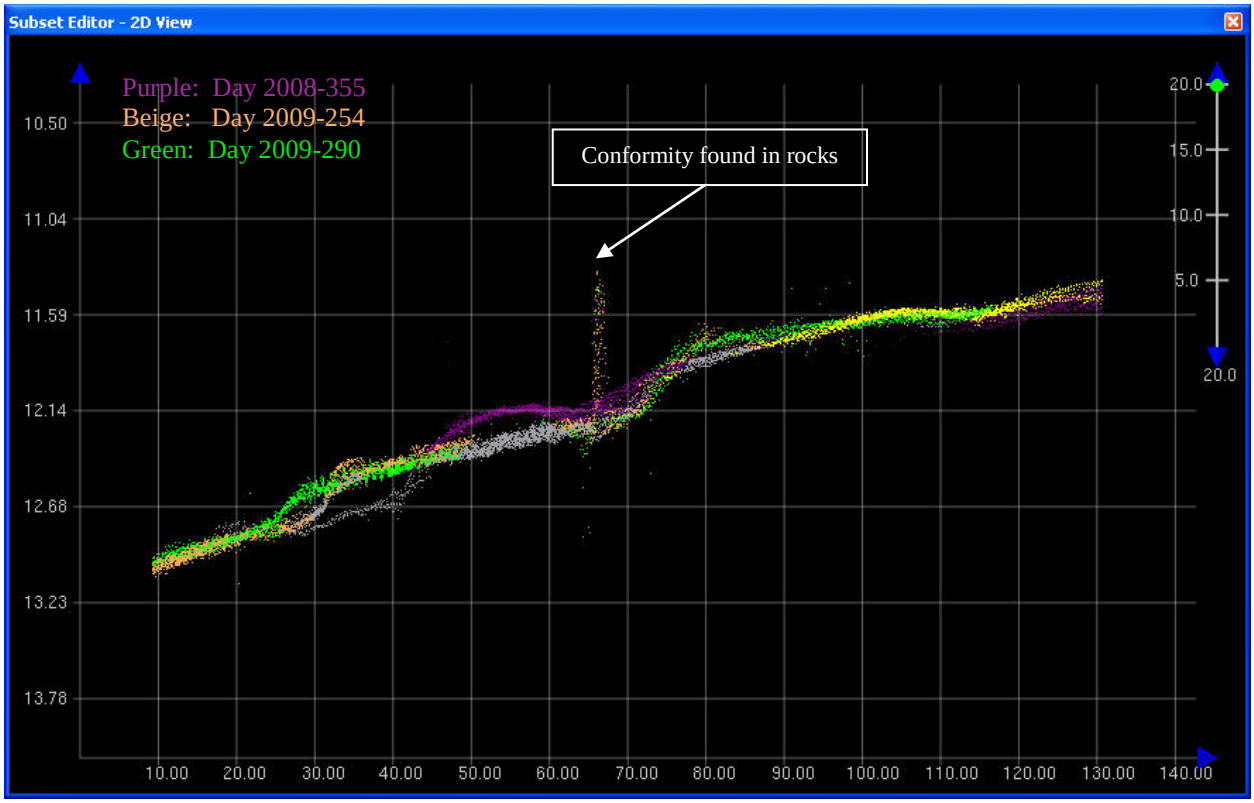


Figure 7 H11974 Dynamic Bottom

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 H11974, named “H11974_(Sheet_BD)” , contains six BASE surfaces.

The following parameters were used:[11]

0-33 meters: 1 m resolution, name “H11974_1m_Final”
30-45 meters: 1.5 m resolution, name “H11974_1_5m_Final”
40-84 meters: 2 m resolution, name “H11974_2m_Final”
80-100 meters: 4 m resolution, name “H11974_4m_Final”
90-250 meters: 5 m resolution, name “H11974_5m_Final”
230-571 meters: 10 m resolution, name “H11974_10m_Final”

Notes:

- 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 “H11974\CARIS\Fieldsheets\” directory.

The final S57 file for this project is called “H11974_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

H11974 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	1:196,948	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 on the final BASE surfaces in CARIS HIPS & SIPS. The general agreement between charted soundings and H11974 soundings was noted. A more detailed comparison was undertaken for any charted shoals or other dangerous features.

Agreement between H11974 Final BASE surface depths and all charted soundings for all applicable NOAA Raster and ENC Charts was within +/- 2 fathoms.[14] Since the survey area was ensonified with 100% multibeam coverage, shoaler depths were discovered between the charted soundings. In these areas, when necessary, the sounding was designated to ensure its inclusion in the finalized BASE surface. Exceptions follow:

1. Conformity to the charts was found to be in some areas poor. Deviations from the charts were mainly found inside of the 20 fathom contour, but some divergence exists between the 20 and 40 fathom contours. Some shoal and rock areas were found be more extensive that previously charted and need to be revised. This includes areas of sporadic subsurface rocks found in between currently charted shoals as well as subsurface rock

outcroppings which were found to be more extensive than previously charted. Recommend revising existing contours and shoal areas to conform to sounds collected in survey H11974.[15]

2. Several charted islets and rocks within the 20 fathom contour on ENC US2WC12M and US3CA15M are not revealed on hydrographic survey H11974 and should be removed from the chart. [16]

3. 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.[17]

The Hydrographer recommends that soundings within the survey limits of H11974 supersede all prior survey and charted depths.[18]

Automated Wreck and Observation Information System

There were no AWOIS items assigned to H11974.[19]

Charted Features

There were no charted features labeled ED, PD, or PA within the limits of H11974.[20]

Dangers to Navigation

Eight dangers to navigation were found and reported for this survey.[21] See Appendix I for DtoN reports.[22]

D.2 Additional Results

None to note.

Bottom Samples

None were assigned for this sheet.[23]

Aids to Navigation

1. Buoy R “38” 14 FI R 6s at) 40-14.87N, 124-22.12W (Chart 18623 and US3CA15M) was found to be correctly charted and serving its intended purpose.[24]

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

E. APPROVAL SHEET

Approval Sheet

For

H11974

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 2, 2010

5/2/2010

X

David D Briggs
Lead Hydrographer

Revisions and Corrections Compiled During Office Processing and Certification

[1] Concur.
[2] Concur.
[3] Concur. The areas of higher uncertainties as discussed in this section occurred in situations where it is expected and, in those cases, deemed acceptable.
[4] A common junction was made with H11973 and H11975.
[5] Concur.
[6] Concur.
[7] Concur.
[8] Concur. Data is adequate to supersede charted data.
[9] Concur.
[10] Concur. 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 10 meter combined surface was created during the Survey Acceptance Review and was used for cartographic compilation of this survey.
[12] Concur with clarification. The submitted feature file only contains meta areas and rocky seabed areas delineated by the field. The meta-areas were regenerated during compilation as well as the rocky seabed areas. Eight submerged rocks (UWTROC), one island (LNDARE) and one coastline (COALNE) were created during office review. Chart all features according to HCell.
[13] Do not concur. H11974 does not overlap all of the charts listed in the table. The charts covered by H11974 are raster charts 18623 (1:40,000) and 18620 (1:200,000), and ENC US2WC12M and US3CA15M.
[14] Do not concur. Discrepancies greater than 2 fathoms between depths as surveyed and depths as charted were found during office chart comparison. However, least depths are represented by survey H11974 and data is adequate to supersede charted depths. Recommend chart depths as depicted in HCell.
[15] Concur with clarification. Chart depths as depicted in HCell.
[16] Concur with clarification. The islets on ENC US2WC12M that have clearly been disproved by multibeam coverage have been blue-noted for removal.
[17] Concur.
[18] Concur with clarification. Chart depths as depicted in HCell.
[19] Concur.
[20] Concur.
[21] None of the reported DTONS were deemed significant and were therefore not applied to the charts; however, all are included as chart scale soundings in the HCell.
[22] See attached DTON report.
[23] Concur. Retain charted bottom samples.
[24] Concur. Use the latest ATONIS information for charting.

REPORT OF DANGERS TO NAVIGATION

Hydrographic Survey Registry Number: H11974 (Sheet BD)

Survey Title: **State:** California
Locality: Pacific Ocean
Sub-locality: Mussel Rocks to Punta Gorda

Project Number: M-L906-KR-08

Survey Dates: November 27, 2008 – October 17, 2009

Survey Danger Acquisition Date and Time: See feature.

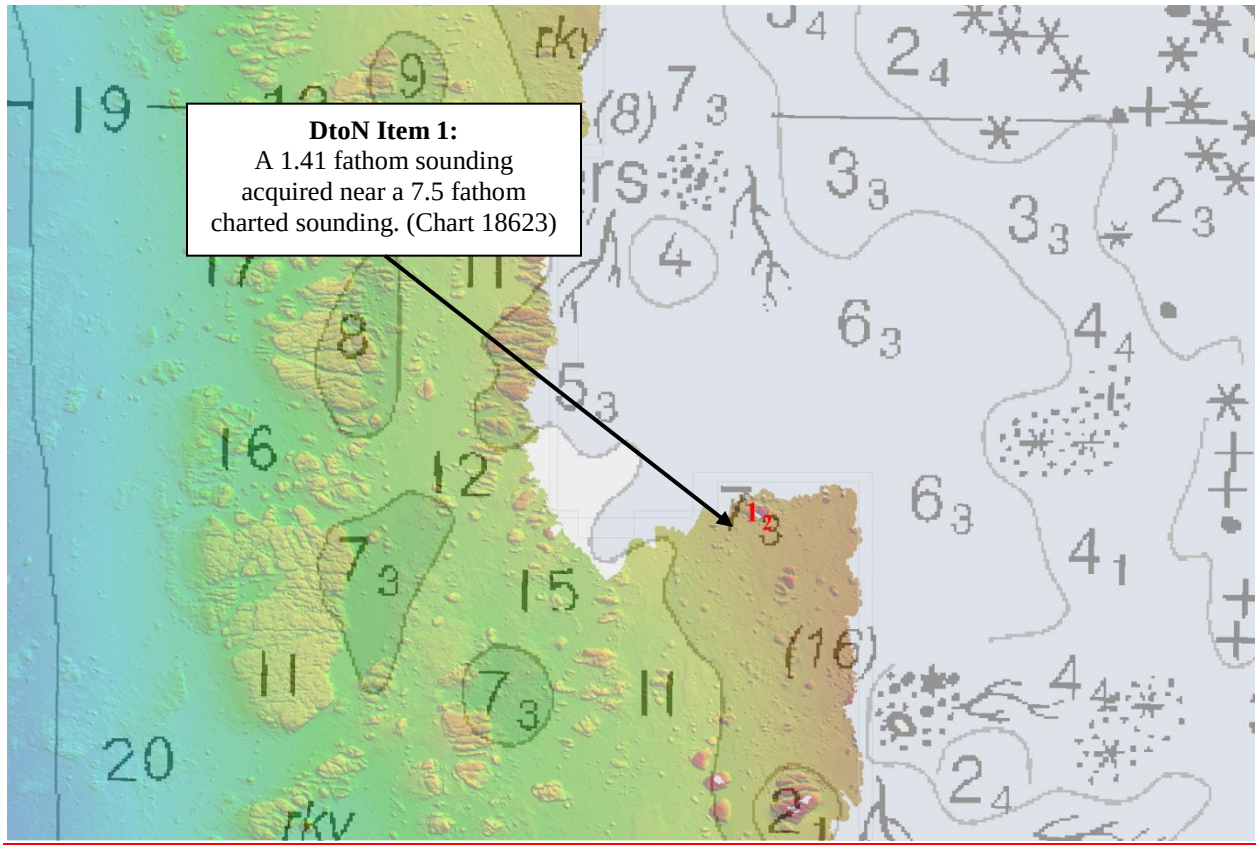
Features are reduced to Mean Lower Low Water with tidal corrections generated using PPK processing methods in conjunction with NOAA's VDATUM model and the CARIS GPSTide routine. Applanix POSPac software produced a smoothed best estimate of trajectory (SBET) file that, among other data, contained GPS altitudes based on the NAD83 ellipsoid (GRS 80). The GPSTide routine used a VDatum NAD83 to MLLW offset grid to produce MLLW tide correctors.

CHARTS AFFECTED:

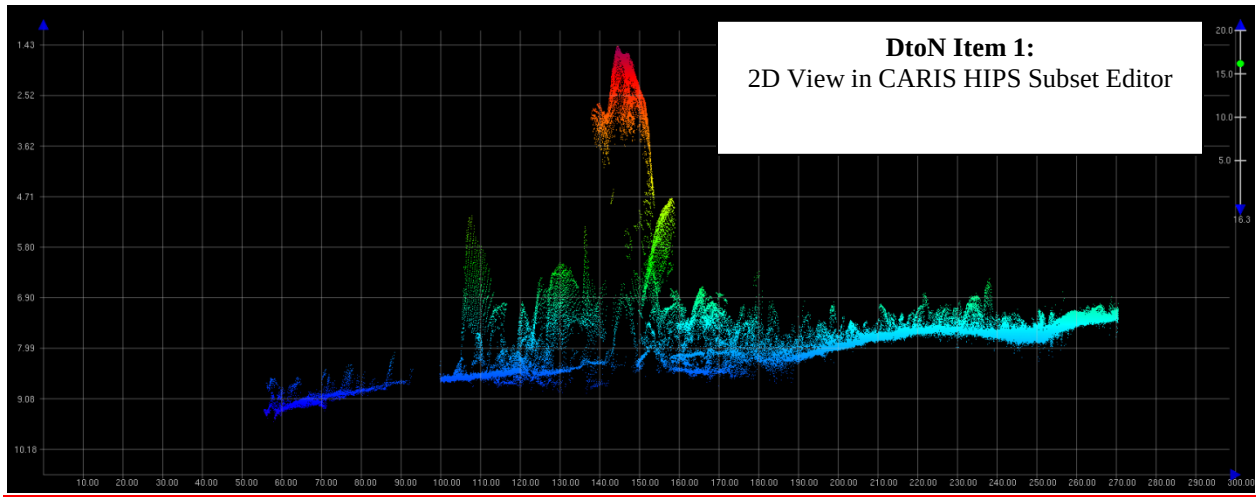
Chart Number	Type	Cell Name	Scale	Edition	Edition Date
18010	Raster	n/a	1:811,980	21	Jan-07
18620	Raster	n/a	1:196,948	23	Jun-02
18623	Raster	n/a	1:40,000	11	Aug-01
18620	ENC	US3CA15M	n/a	9	May-09
18007	ENC	US2WC12M	n/a	6	Jun-09

DANGER:

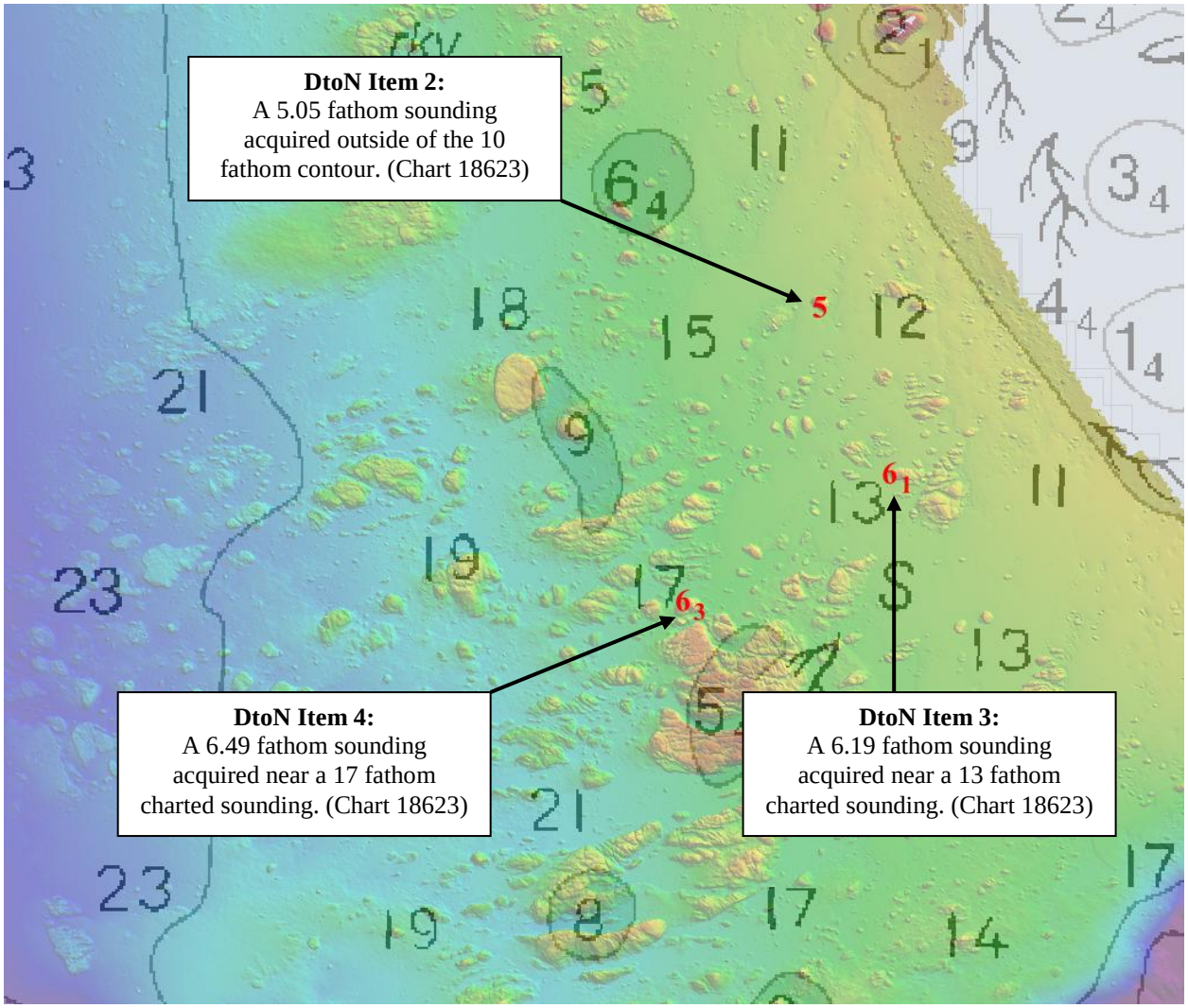
Feature	Depth	Latitude	Longitude	Time (UTC)
1. Sounding	1.41 fathoms	40-19-41.65N	124-21-53.72W	2008-12-20 16:07:52.921
2. Sounding	5.05 fathoms	40-19-15.33N	124-21-55.88W	2009-09-11 18:54:07.866
3. Sounding	6.19 fathoms	40-19-07.51N	124-21-51.06W	2009-09-11 19:48:14.617
4. Sounding	6.49 fathoms	40-19-01.48N	124-22-03.43W	2009-10-17 17:58:27.090
5. Sounding	3.86 fathoms	40-18-54.90N	124-31-30.07W	2008-12-19 18:22:37.168
6. Sounding	5.70 fathoms	40-18-23.97N	124-21-44.54W	2009-10-17 18:43:01.410
7. Sounding	5.25 fathoms	40-14-50.09N	124-21-49.66W	2009-10-17 19:02:30.145
8. Sounding	6.44 fathoms	40-16-18.36N	124-22-31.94W	2009-10-17 18:24:59.659



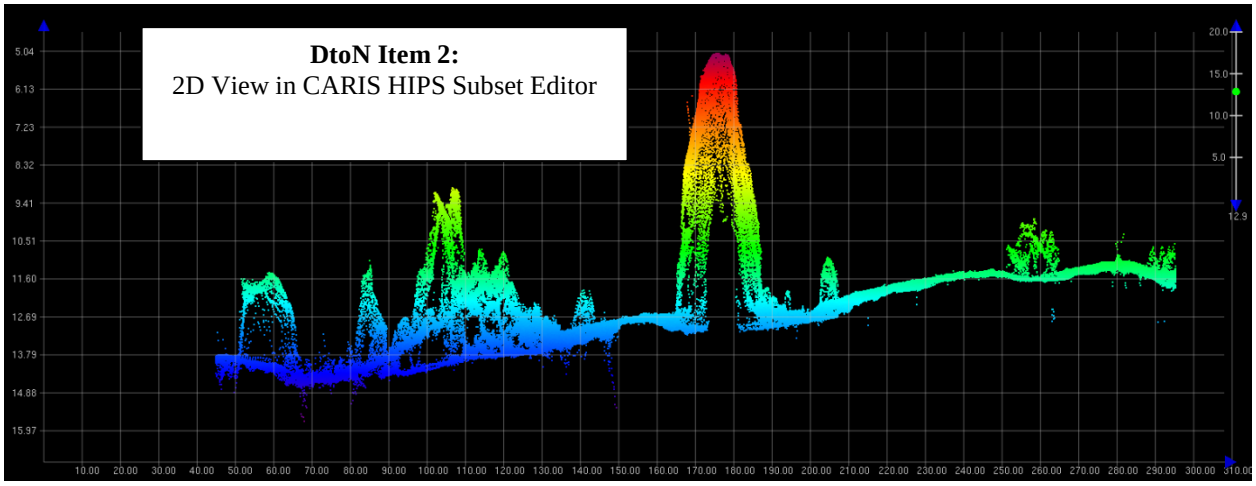
Planview DtoN Item 1



Profile DtoN Item 1



Planview DtoNs Items 2, 3 & 4



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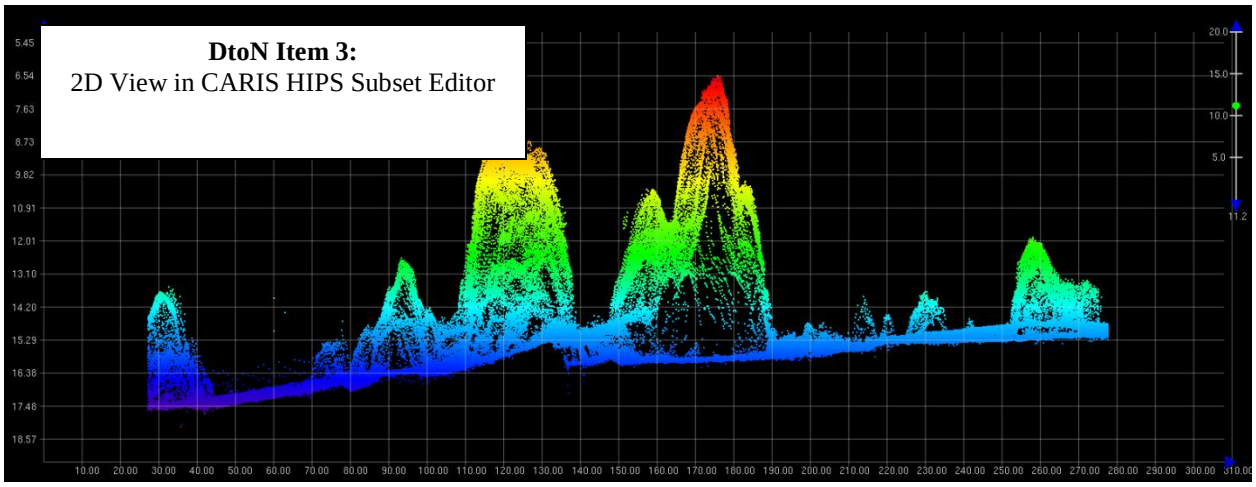

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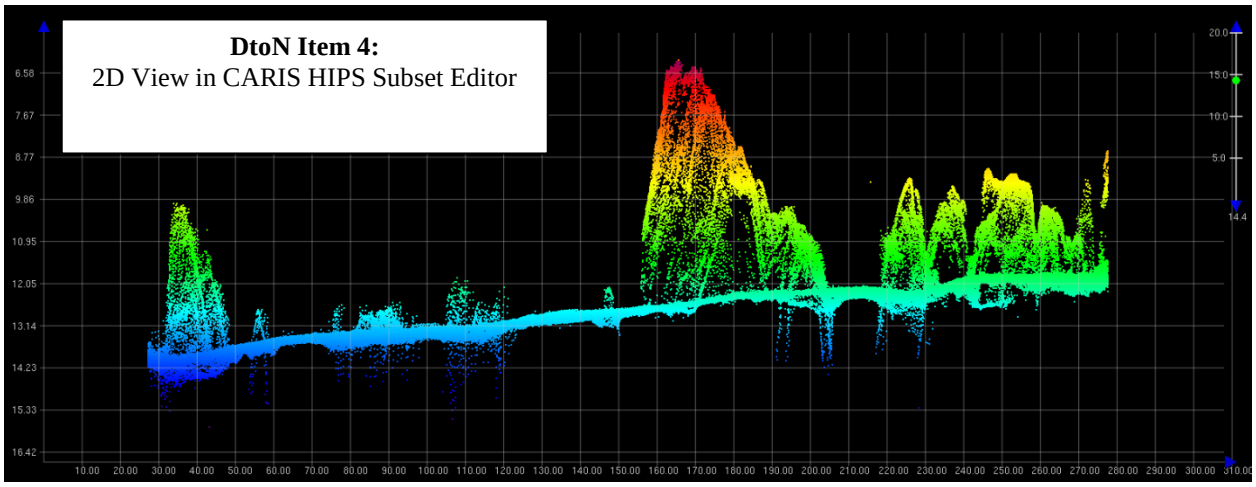

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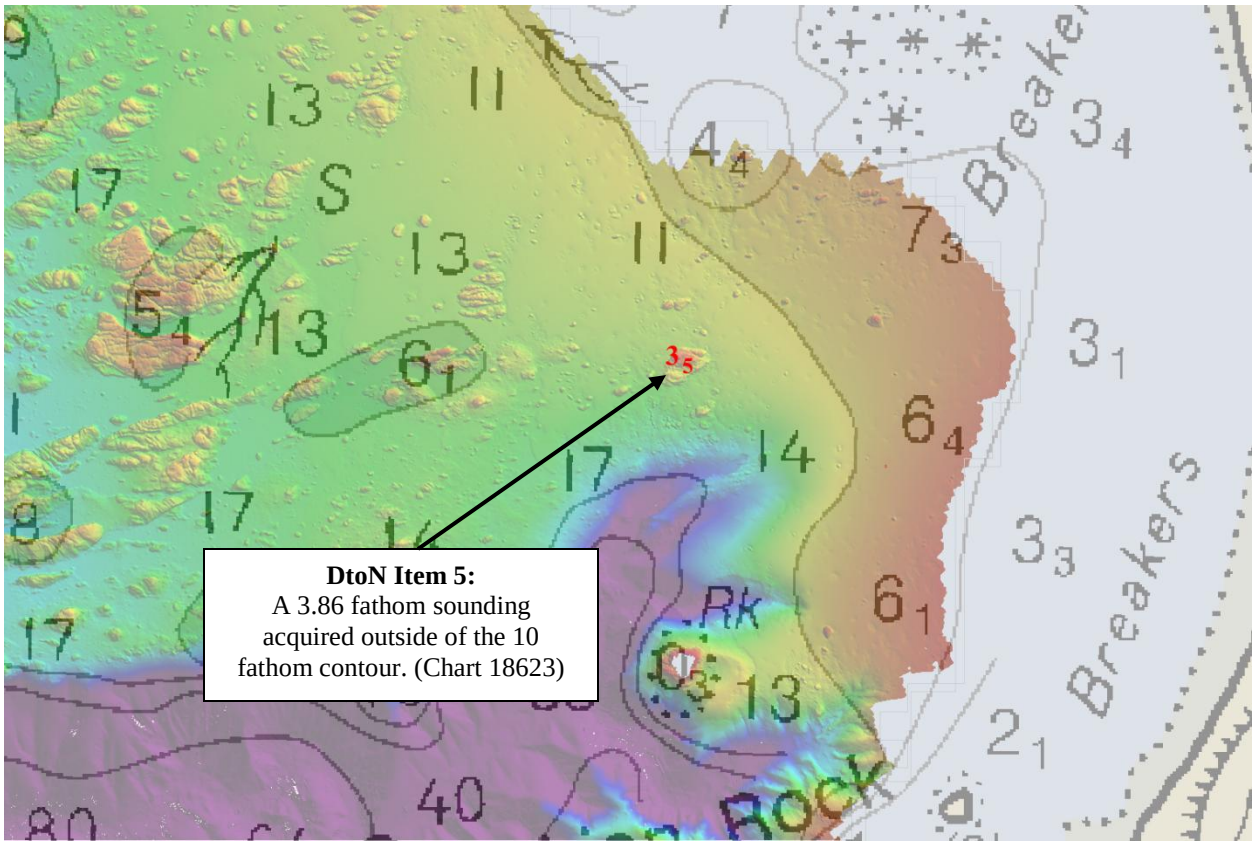
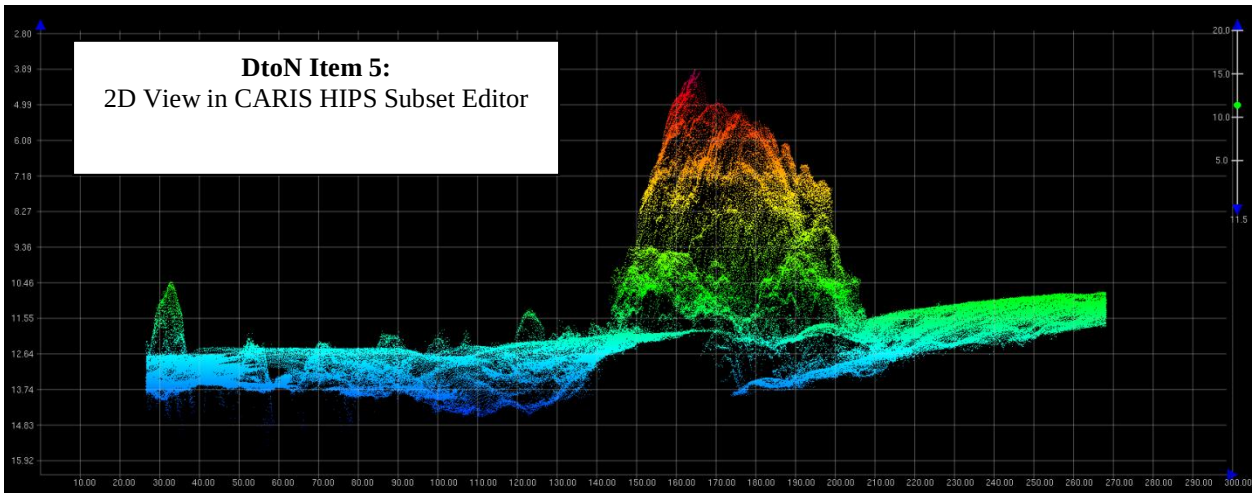


Planview DtoN Item 5



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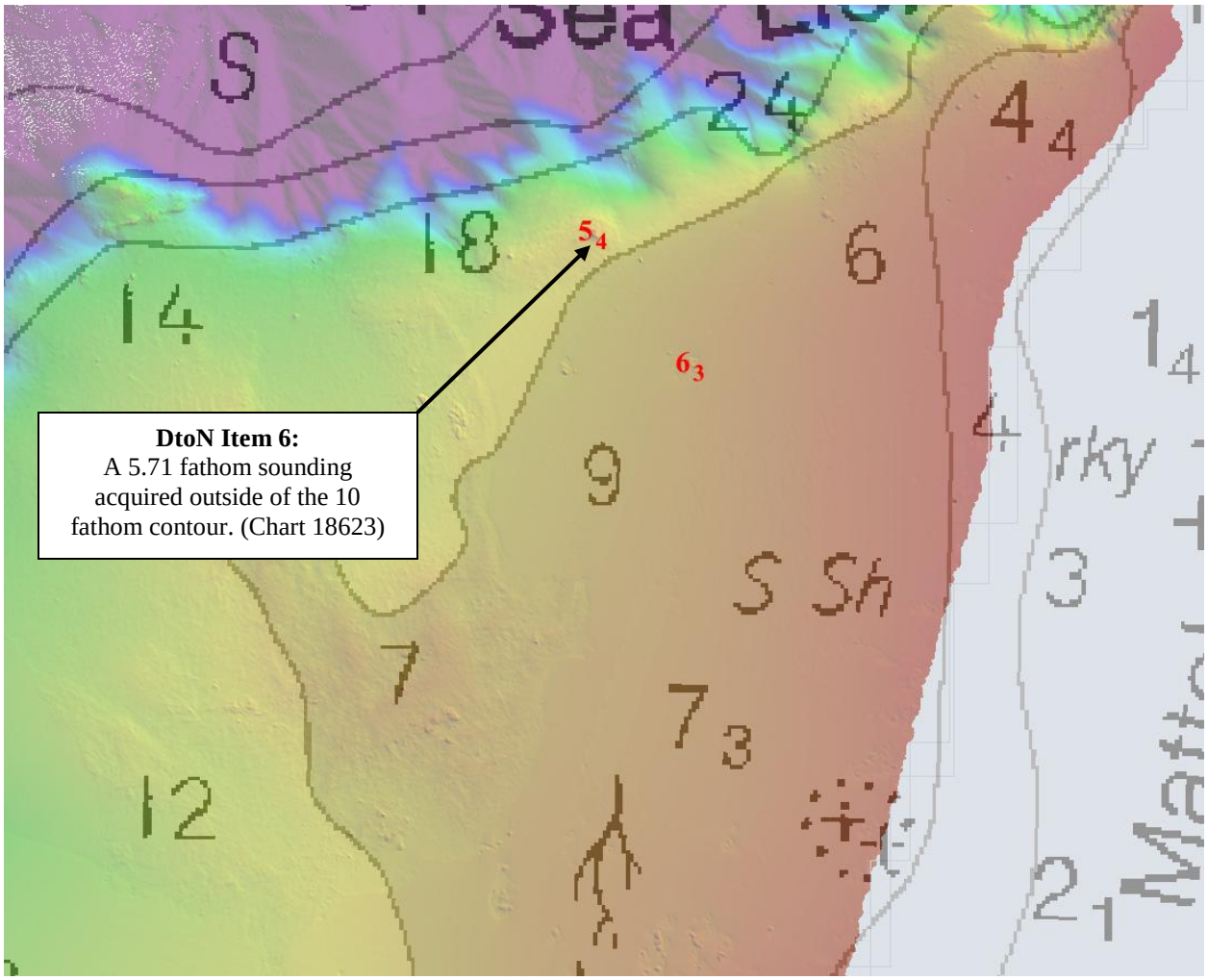
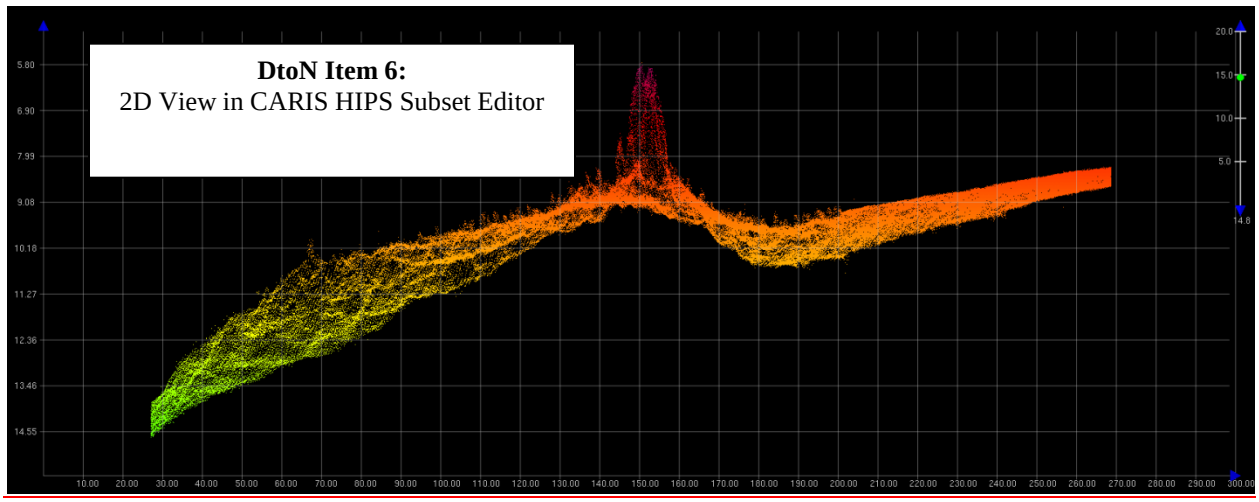
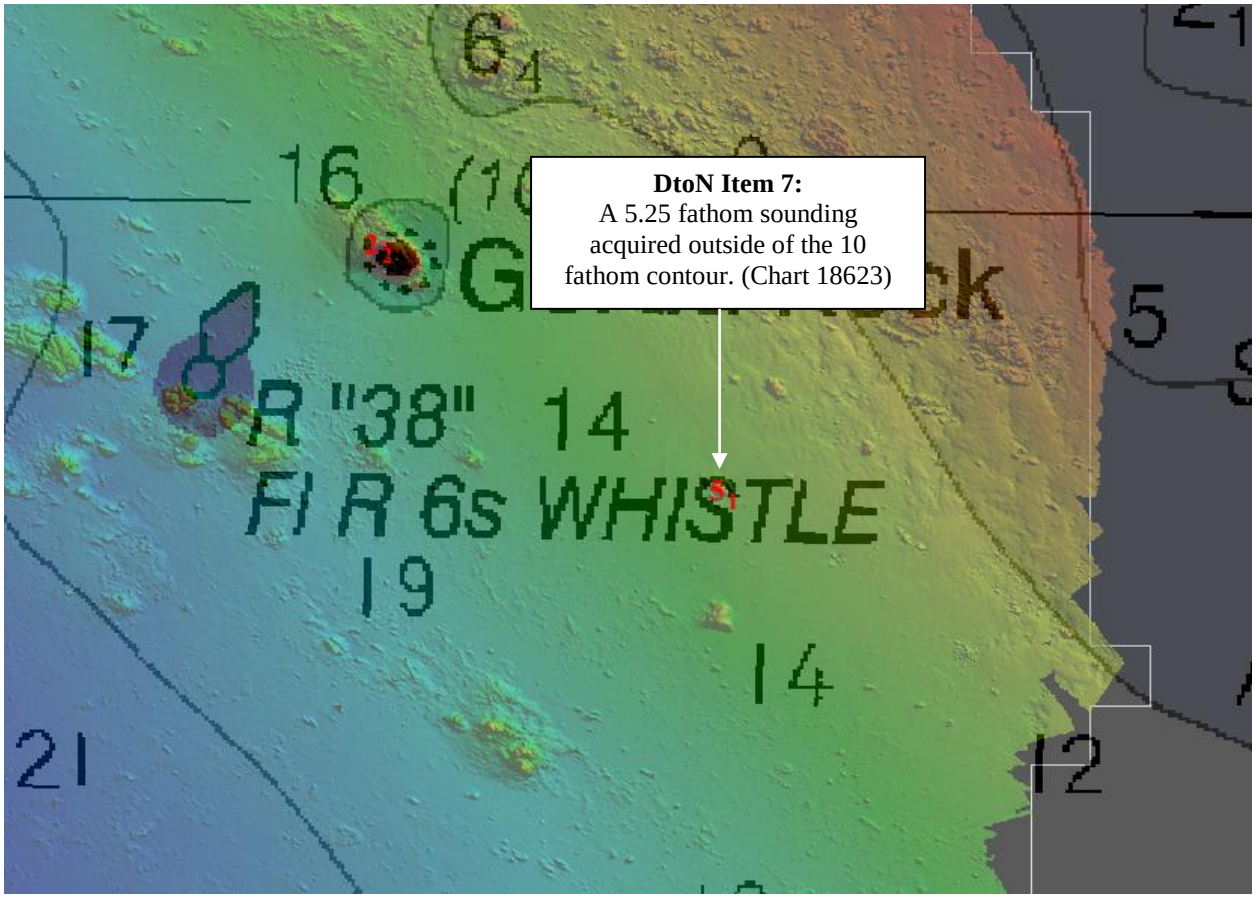


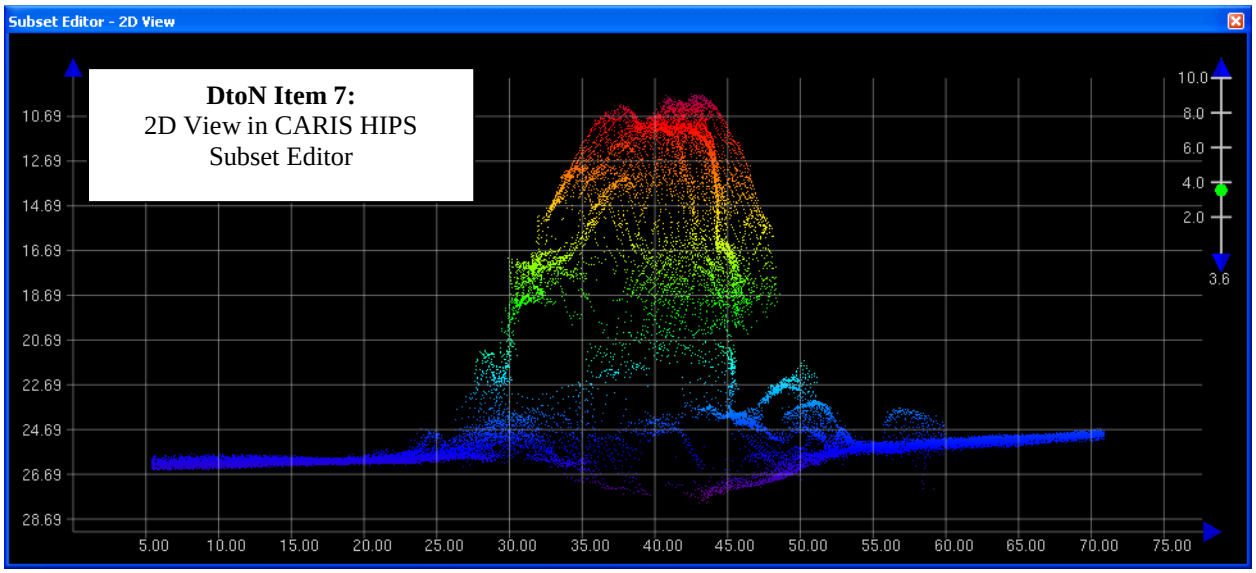
Planview DtoN Item 6



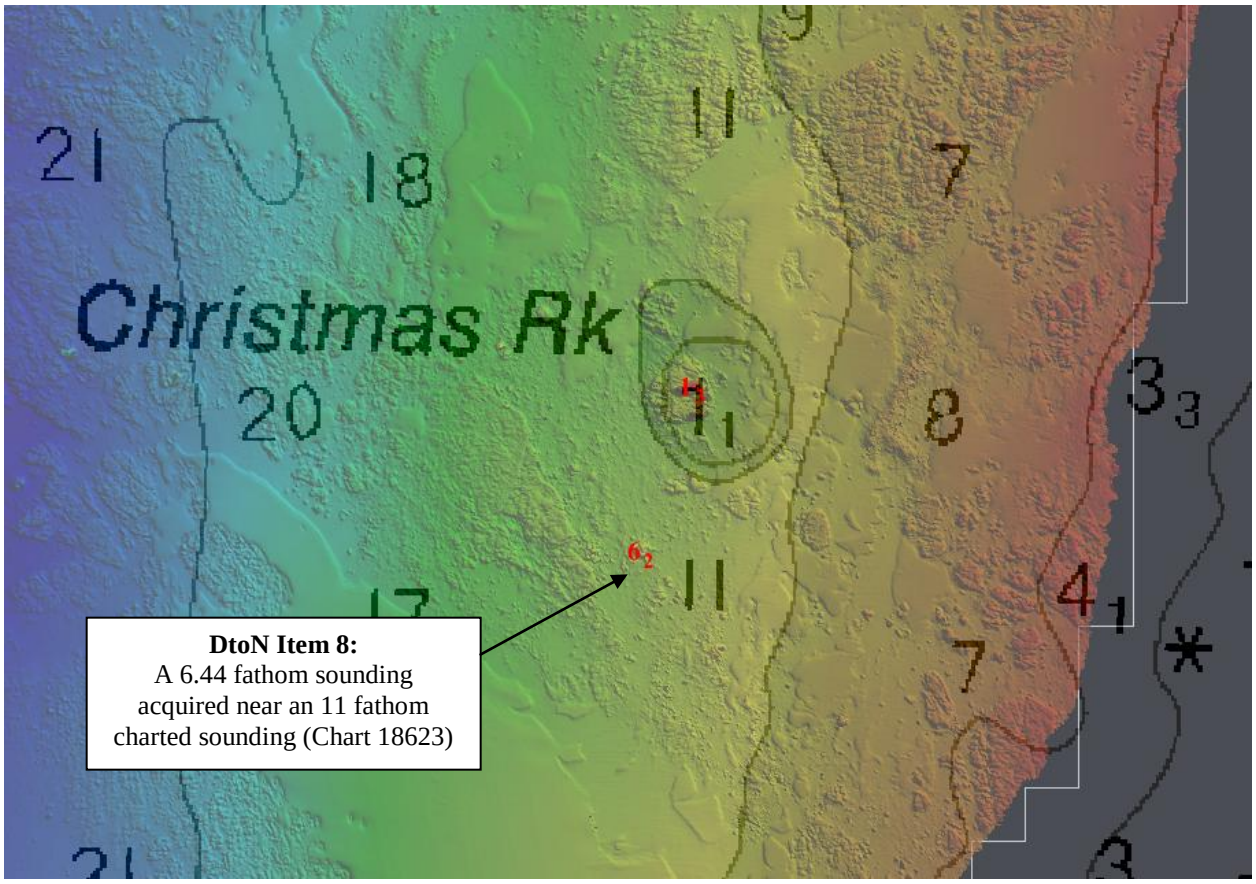
Profile DtoN Item 6



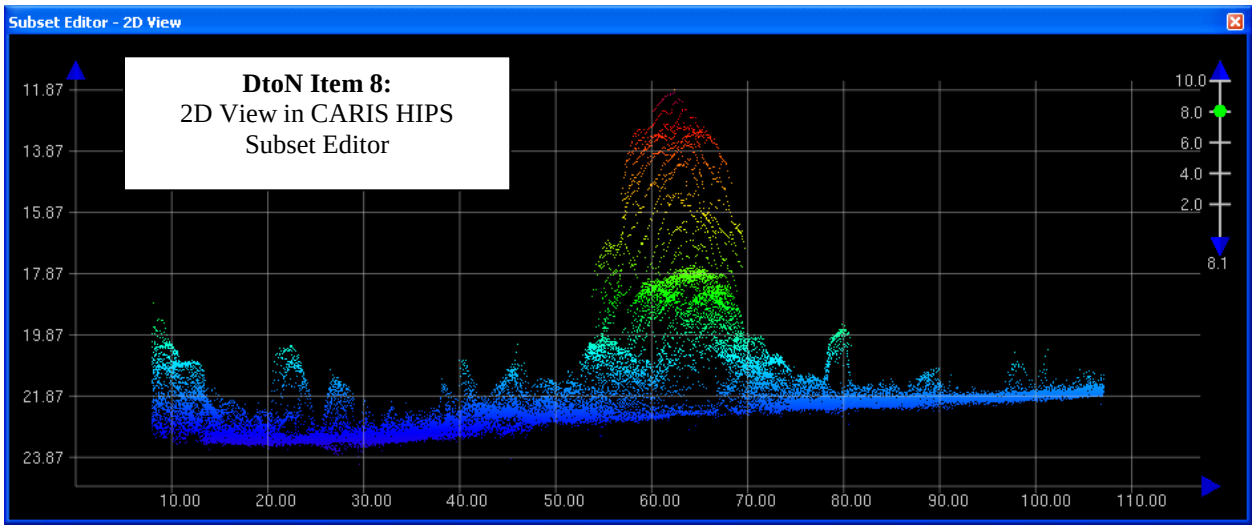
Planview DtoN Item 7



Profile DtoN Item 7



Planview DtoN Item 9



Profile DtoN Item 8

COMMENTS:

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

H11974 HCell Report

Kurt Mueller, ERT Contractor
Pacific Hydrographic Branch

1. Specifications, Standards and Guidance Used in HCell Compilation

HCell compilation of survey H11974 used:

Office of Coast Survey HCell Specifications: Version: 4.0, 2 June, 2010.
HCell Reference Guide: Draft, Version 2.1, 16 February, 2011.

2. Compilation Scale

Depths and features for HCell H11974 were compiled to the largest scale raster charts shown below:

Chart	Scale	Edition	Edition Date	NTM Date
18623	1:40,000	11	08/04/2001	01/29/2011
18620	1:200,000	23	06/01/2002	01/29/2011

The following ENCs were also used during compilation:

Chart	Scale
US2WC12M	1:500,000
US3CA15M	1:200,000

3. Soundings

A survey-scale sounding (SOUNDG) feature object layer was built from the 10-meter Combined Surface in CARIS BASE Editor. A shoal-biased selection was made at 1:15,000 survey scale using a Radius Table file with values shown in the table, below.

Shoal Limit (m)	Deep Limit (m)	Radius (mm)
0	10	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 H11974_SS HCell for MCD raster charting division to use for guidance in creating chart contours. The metric and fathom equivalent contour values are shown in the table below.

Chart Contour Intervals in Fathoms from Chart 18623	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 H11974_SS.000
3	5.4864	5.715	3.125	3
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	56.236	30.750	30
50	91.44	92.812	50.750	50
100	182.88	184.252	100.750	100
200	365.76	367.1316	200.75	200
300	548.64	550.0116	300.75	300

Chart Contour Intervals in Fathoms from Chart 18620	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 H11974_SS.000
40	73.152	74.5236	40.750	40

5. Meta Areas

The following Meta object areas are included in HCell H11974:

M_QUAL
M_CSCL

The Meta area objects were constructed on the basis of the limits of the hydrography.

6. Features

The submitted feature file contains meta areas and rocky seabed areas delineated in the field. The meta areas were re-generated during compilation as well as the rocky seabed areas. Eight submerged rocks (UWTROC), one island (LNDARE) and one coastline (COALNE) were created during office review.

7. S-57 Objects and Attributes

The H11974_CS HCell contains the following Objects:

$CSYMB	Blue Notes
M_QUAL	Data quality meta object
M_CSCL	Compilation scale meta object
SBDARE	Rocky seabed area
SOUNDG	Soundings at the chart scale density
UWTROC	Rocks
LNDARE	Land areas
COALNE	Coastline

The H11974_SS HCell contains the following Objects:

DEPCNT	Generalized contours at chart scale intervals
SOUNDG	Soundings at 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

H11974 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

H11974_CS.000	Base Cell File, Chart Units, Soundings and features compiled to 1:40,000 and 1:200,000
H11974 _SS.000	Base Cell File, Chart Units, Soundings and Contours compiled to 1:15,000
H11974 _DR.pdf	Descriptive Report including end notes compiled during office processing and certification, the HCell Report, and supplemental items
H11974 _outline.gml	Survey outline
H11974 _outline.xsd	Survey outline

11.2 Software

CARIS HIPS Ver. 7.0	Inspection of Combined BASE Surfaces
CARIS BASE Editor Ver. 3.0	Creation of soundings and bathy-derived features, creation of the depth area, meta area objects, and Blue Notes; Survey evaluation and verification; Initial HCell assembly.
CARIS S-57 Composer Ver. 2.2	Final compilation of the HCell, correct geometry and build topology, apply final attributes, export the HCell, and QA.
CARIS GIS 4.4a	Setting the sounding rounding variable for conversion of the metric HCell to NOAA charting units with NOAA rounding.
CARIS HOM Ver. 3.3	Perform conversion of the metric HCell to NOAA charting units with NOAA rounding.
HydroService AS, dKart Inspector Ver. 5.1, SP 1	Validation of the base cell file.
Northport Systems, Inc., Fugawi View ENC Ver.1.0.0.3	Independent inspection of final HCells using a COTS viewer.

12. Contacts

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

Kurt Mueller
ERT Contractor
Pacific Hydrographic Branch
Seattle, WA
206-526-6885
Kurt.Mueller@noaa.gov

APPROVAL SHEET
H11974

Initial Approvals:

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

2011.05.02
09:19:53
-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.

Kurt Brown
2011.05.02
10:05:33 -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.

Digitally signed by
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DN: c=US, o=U.S. Government,
ou=DoD, ou=PKI, ou=OTHER,
cn=NELSON.GARY.C.13658853
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