W00291

NOAA FORM 76-35A

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

DESCRIPTIVE REPORT

Type of Survey **Hydrographic Multibeam Survey**
Project No. **OPR-SH-15-03**
Registry No. **W00291**

LOCALITY

State **California**

General Locality **Channel Islands Marine Sanctuary**

Sub-locality **Santa Rosa Island**

2015

CHIEF OF PARTY
Chris Caldow

LIBRARY & ARCHIVES

DATE **August 24, 2008**

The purpose of this survey is to provide contemporary surveys to update National Ocean Service (NOS) nautical charts. All separates are filed with the hydrographic data. Any revisions to the Descriptive Report (DR) generated during office processing are shown in bold red italic text. The processing branch maintains the DR as a field unit product, therefore, all information and recommendations within the body of the DR are considered preliminary unless otherwise noted. The final disposition of surveyed features is represented in the OCS nautical chart update products. All pertinent records for this survey, including the DR, are archived at the National Centers for Environmental Information (NCEI) and can be retrieved via https://www.ncei.noaa.gov/.

Descriptive Report Summary to Accompany W00291	
Project	SH-15-03
Survey	W00291
State	California
Locality	Channel Islands Marine Sanctuary
Sub Locality	Santa Rosa Island
Scale of Survey	40,000
Sonars Used	ME70
Horizontal Datum	North American Datum of 1983 (NAD83)
Vertical Datum	Mean Lower Low Water (MLLW)
Vertical Datum Correction	None
Projection	Latitude-Longitude (WGS84) - Zone 10N
Field Unit	BELL M. SHIMADA
Survey Dates	3/17/2015-3/22/2015
Chief of Party	Chris Caldow, Channel Islands Marine Sanctuary

A. Area Surveyed

This hydrographic survey was acquired in accordance with the requirements defined in the SH1503 Cruise Plan.

Data was acquired within the following survey limits:

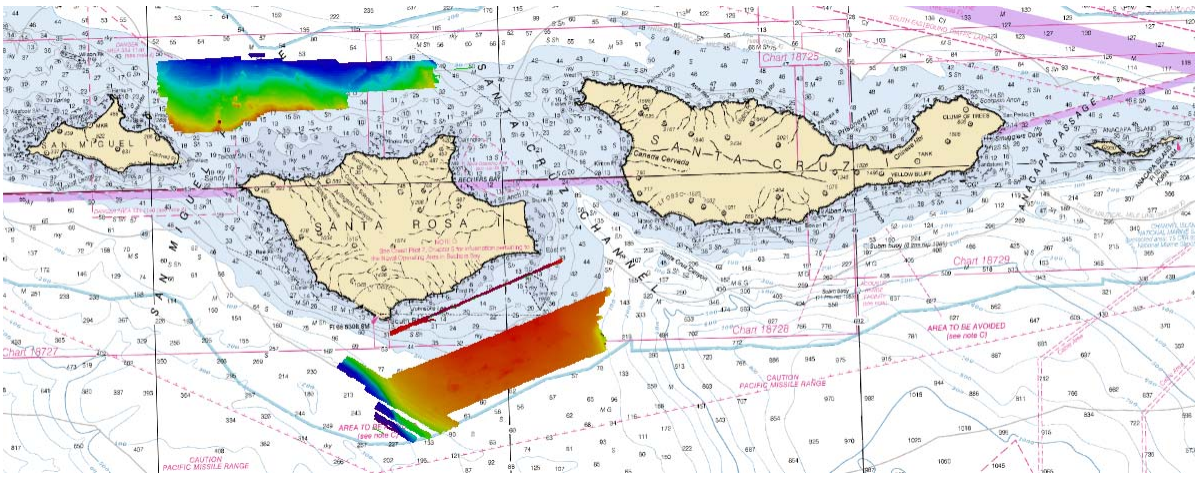

Figure 1: SH1503 Survey Overview and Channel Islands

Northeast Limit	Southwest Limit
34.11 N	34.04 N
120.33 W	120.04 W

Table 1: Survey Limits of area North of Santa Rosa Is.

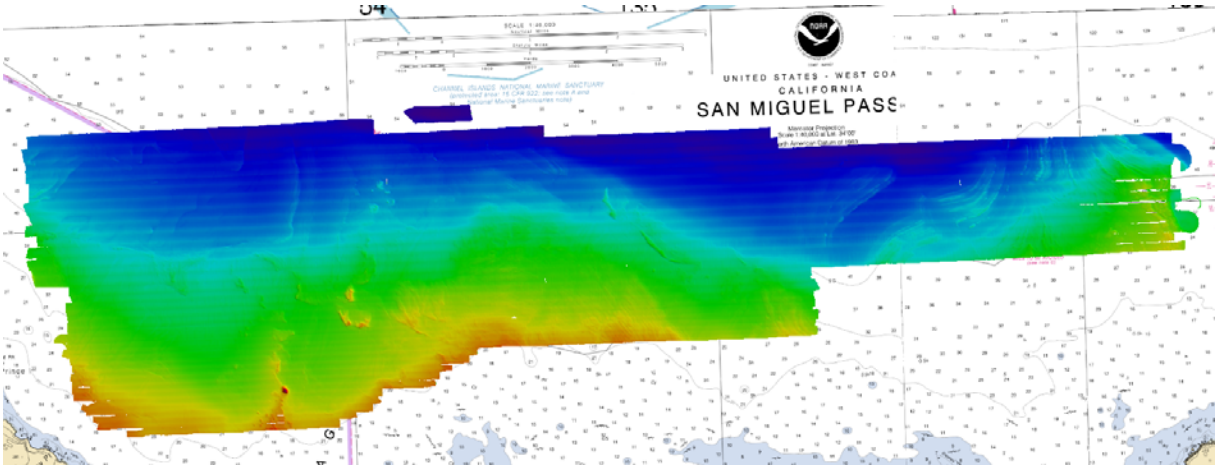

Figure 2: SH1503 North Santa Rosa Island Survey Overview

Northeast Limit	Southwest Limit
33.95 N	33.78 N
120.18 W	119. W

Table 2: Survey Limits of area South of Santa Rosa Is.

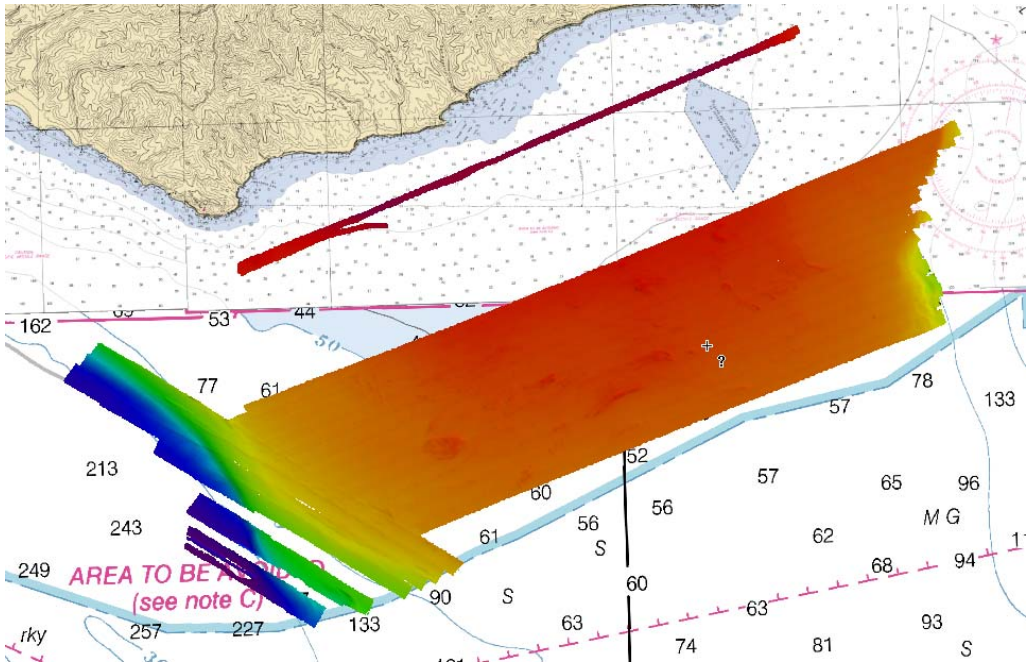

Figure 3: SH1503 South Santa Rosa Island Survey Overview

The following table lists the mainscheme and total square miles for this survey:

Survey	Vessel	MBES Mainscheme	Square Nautical Miles
North Santa Rosa	R-227	575.4 LNM	30.8 SNM
South Santa Rosa	R-227	273.2 LNM	32.4 SNM

Table 3: Survey Statistics

Overall the survey coverage meets the 2014 Hydrographic Survey Specifications and Deliverables requirements for 100% multibeam coverage. A number of small holidays do exist throughout the survey. They appear to be from a ping drop out during survey operations. There are also a number of gaps between survey lines in shallower edges of the survey. The hydrographer does not believe that it compromises the validity of the data for charting purposes. These holidays will not impede surface navigation.

B. Survey Purpose

The purpose of the project is to evaluate the spatial correlation of patterns of deep water coral and sponge communities and evaluate potential depth stratification of the these species. The data was not initially intended for charting purposes, but due to the data quality and the age of the charted data, it was deemed worthy of submission to the Hydrographic Surveys Division. In addition, this survey furthers the goals of the Integrated Ocean and Coastal Mapping mission to "Map Once, Use Many Times."

C. Intended Use of Survey

Data is adequate to supersede prior data and is intended for chart compilation.

D. Data Acquisition and Processing (DAPR)

There is currently no DAPR written for the ship. Refer to NOAA Ship Pisces Descriptive Report for more details on ME70 survey acquisition.

D.1 Vessel and Equipment

Table 4: Vessel and equipment

	 NOAA Ship *BELL M. SHIMADA*
Hull Number	R227
Builder	Halter Marine, Moss Point, MS
Length	63.6m (208.6 ft)
Beam	15m (49.2 ft)

Draft Center Board Retracted	5.9m (19.4 ft)
Draft Center Board Extended	9.05 m (29.7 ft)
Cruising Speed	11 knots
Survey Speed	5-8 knots
Primary Echosounder	Simrad ME70
Sound Speed Equipment	Surface sound speed: SBE21 & SBE45 Water column: XBT-Sippican MK21, SBE 9+
Attitude and Positioning Equipment	Applanix POS MV V4, No DGPS correctors provided

D.2 Bathymetry Systems

The Simrad ME70 is a multibeam echo sounder designed for fishery research applications, and therefore can collect information from the full water-column while minimizing side-lobe levels (Trenkel et al. 2008). The system operates in the 70 to 120 kHz frequency range over a 150° maximum total swath width. The beam parameters of the system are configurable and designated by XML file. Note that each of the beams can be set at a different frequency.

Beam configuration version 180315, written by Dr. Tom Weber from the University of New Hampshire Center for Coastal and Ocean Mapping, was used during SH1503.

D.3 Positioning, Heading and Motion Reference Systems

The POS MV inertial reference system supplies attitude, heading, heave, and position. The system consists of an IMU (used as the reference point for the ship), computer system, and two GPS antennas. The DGPS was not properly connected and the ETs were unable to locate the antenna for trouble shooting.

The POS MV GPS Azimuth Measurement Subsystem (GAMS) provides heading aiding to the system. A GAMS calibration was performed while underway and the updated baseline vector was updated. It is unclear whether the GAMS calibration was successful without DGPS working properly.

Ongoing Issues
The re-positioning of the antennas would provide a more clear view from horizon to horizon (no longer blocked by the mast), and the intermittent heading “dropouts” observed in the past would be mitigated. DGPS needs to be located and repaired for future surveys.

Figure 4: Image of POS antenna location on the flying bridge.

D.4 Sound Speed Equipment

The ship has two thermosalinographs (SBE45 and SBE21) that supply seawater temperatures and sound speed in real-time. The SBE45 supplies the real-time sound speed to the ME70 for beam steering.

Full water-column sounds speed profiles were obtained via XBT. File conversions from native format (.EDF) to Caris- compatible format (.SVP) were executed using the Pydro Velocipy python script. We were unable to perform sufficient XBTs in some areas of the survey due to a limited number of available XBTs. It is recommended to consider sound velocity variability in future survey areas to determine the number of XBTs needed.

D.5 Software Inventory

Table 5: Software Inventory

Hypack	2015	Line planning, navigation
Simrad ME70	N/A	Acquisition
MATLAB executable script	April 2015	*.RAW to *.GSF conversion
POS View	V4	Interface with POS MV
Caris Hips	9.0	Process bathymetry
Velocipy	14.6	*.EDF to *.SVP conversion

D.6 Patch Test

Latency, pitch, and heading calibrations were performed on DN075 over a rocky outcrop at approximately 34.086N, 120.068W. The location was less than ideal, but determined to be suitable. The roll calibrations were performed over flat seafloor nearby.

All mapping personnel derived timing and misalignment values. The average values are shown in Table 6, and were entered into the POS MV settings for Sensor 1 Frame with respect to Reference Frame, rather than the CARIS HVF. Setting the values in the POS MV ensures the motion data is in the correct reference frame prior to the roll and pitch

compensation performed by the ME70. However, the real-time heading logged in the raw data remains in the IMU reference frame, so it must be applied in CARIS. This is why the HVF contains only the heading correction.

Table 6: Patch Test Values

Pitch	-1.49°
Roll	0.3°
Heading	3.43°
Timing	0 sec

D.7 Tides and Water Levels

There are no active tide stations available in the vicinity of this survey. Soundings were reduced to MLLW using predicted water levels for Bechers Bay, Santa Rosa Island, CA Staition ID: 9410962. Predictions are available for high and low tides only. The predicted tide variation during survey operations varied with a minimum of -0.29 m and a maximum of 1.68 m

D.8 Data Processing

Issues affecting data quality

Heave

Real-time heave from the POS MV is logged in the raw ME70 data during acquisition and applied in post-processing. However, during times of increased sea state, the gridded bathymetry revealed a heave artifact up to 0.5m in magnitude. The artifact is also a function of the ship's heading, which is why the artifact is generally only observed on every other line in the grids. Application of True Heave in post-processing did not alleviate the artifact.

Refraction

The most significant issue affecting data quality is refraction. XBT data compared favorably to CTD casts

TPU was calculated using CARIS HIPS/SIPS 9.0 and the following parameters:

Tide Value Measured	0.0 m
Tide Value Zoning	0.5 m
Sound Speed Values	4.0 m/s
Surface Sound Speed Values	2.0 m/s

Table 7: Compute TPU Values.

Sound Speed Values Measured was obtained from the manual from the expendable bathythermograph (XBT).

E. Uncertainty

99.9% of nodes of the submitted surfaces agree with IHO Order 2 requirements.

F. Results and Recommendations

The following are the largest scale charts and ENCs which cover the survey area:

Chart	Scale	Edition	Edition Date	LNM Date	NM Date
18720	1:232,188	34	7/1/2013	5/26/2015	5/30/2015
18727	1:40,000	12	7/1/2004	5/26/2015	5/30/2015
12828	1:40,000	9	11/1/2004	5/26/2015	5/30/2015
ENC	Scale	Edition	Update Application Date	Issue Date	-
US5CA64M	1:40,000	7	3/19/2014	5/2/2014	-
US5CA66M	1:40,000	1	3/27/2014	3/27/2014	-
US3CA69M	1:232,188	16	5/16/2014	4/7/2015	-

A chart comparison was performed by the hydrographer. The surveyed soundings differed with charted soundings by an average of 3-4 meters and greater than 20 meters in some instances. To represent these differences the hydrographer created a surface from the charted (ENC) soundings and differenced the surface with the survey. Figures 5-8 represent the differences between the common areas. Red values are where the surveyed soundings are shoaler than charted, blue values are where surveyed soundings are deeper than charted. Additionally, the hydrographer compared the charted depth curves with contours derived from surveyed soundings and found numerous discrepancies between the two (See Figure 9-10).

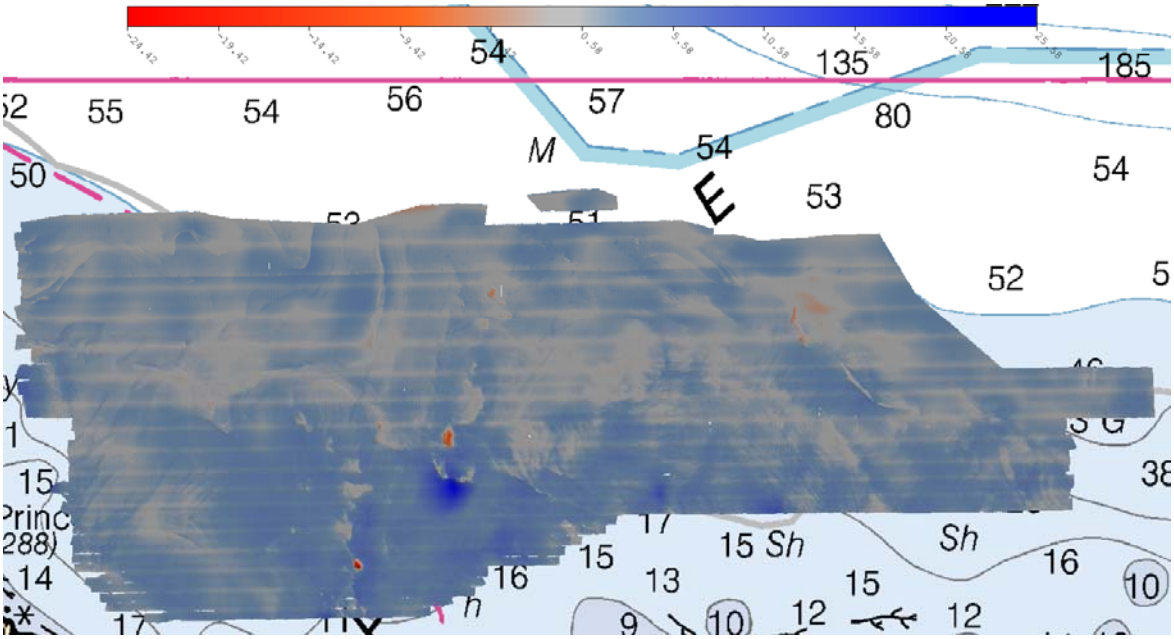

Figure 5: US5CA64M/18727 North Santa Rosa chart comparison

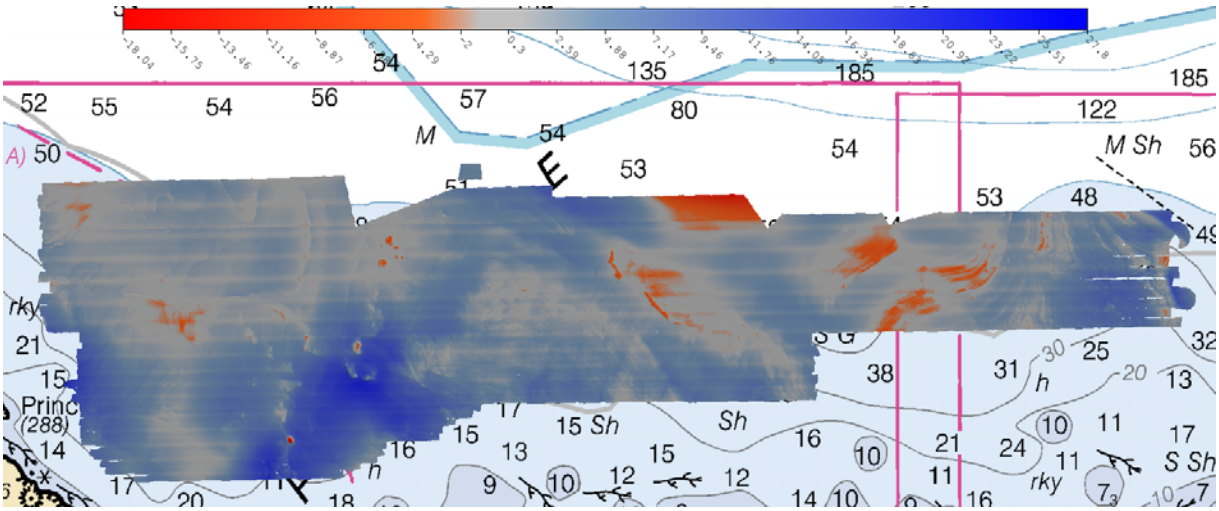

Figure 6: US3CA69M/18720 North Santa Rosa Chart comparison

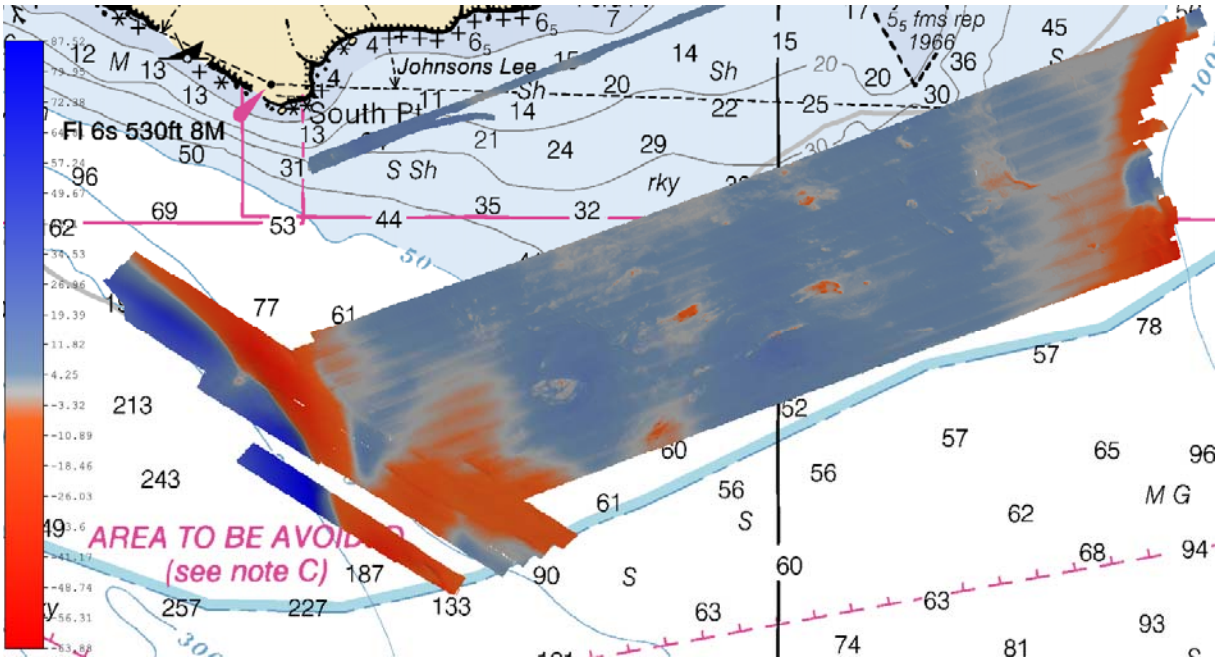

Figure 7: US3CA69M/18720 South Santa Rosa chart comparison

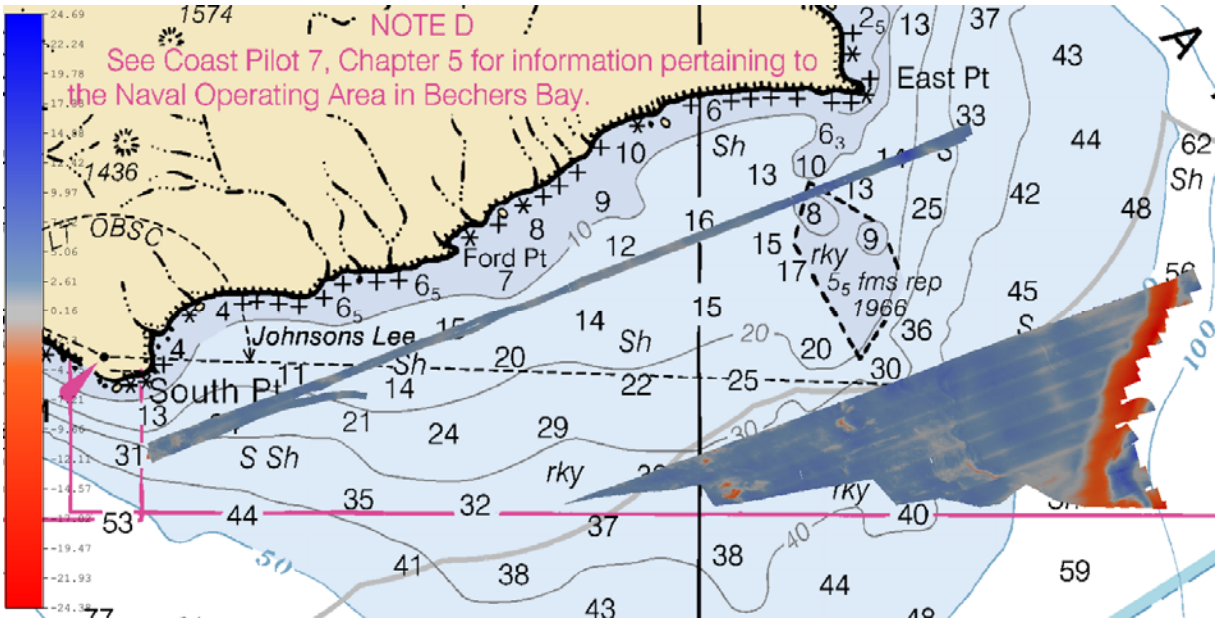

Figure 8: US5CA66M/18725 South Santa Rosa chart comparison

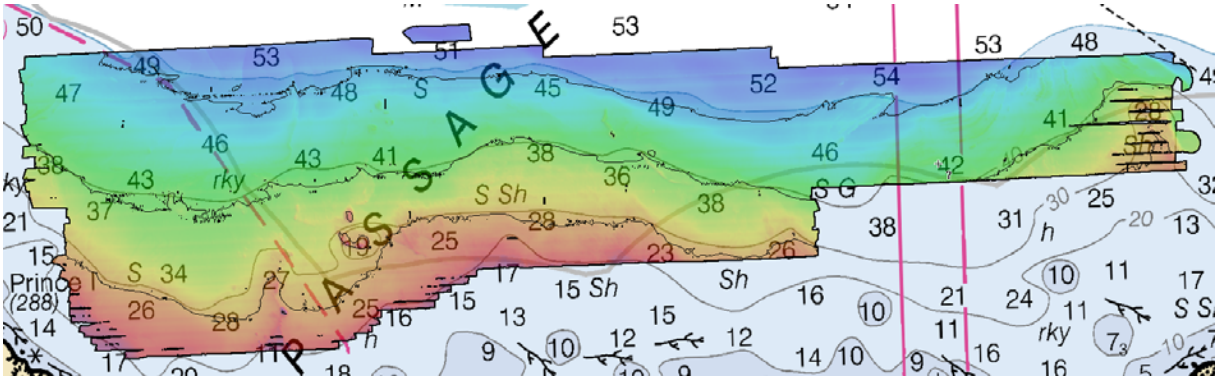

Figure 9: North Santa Rosa contours

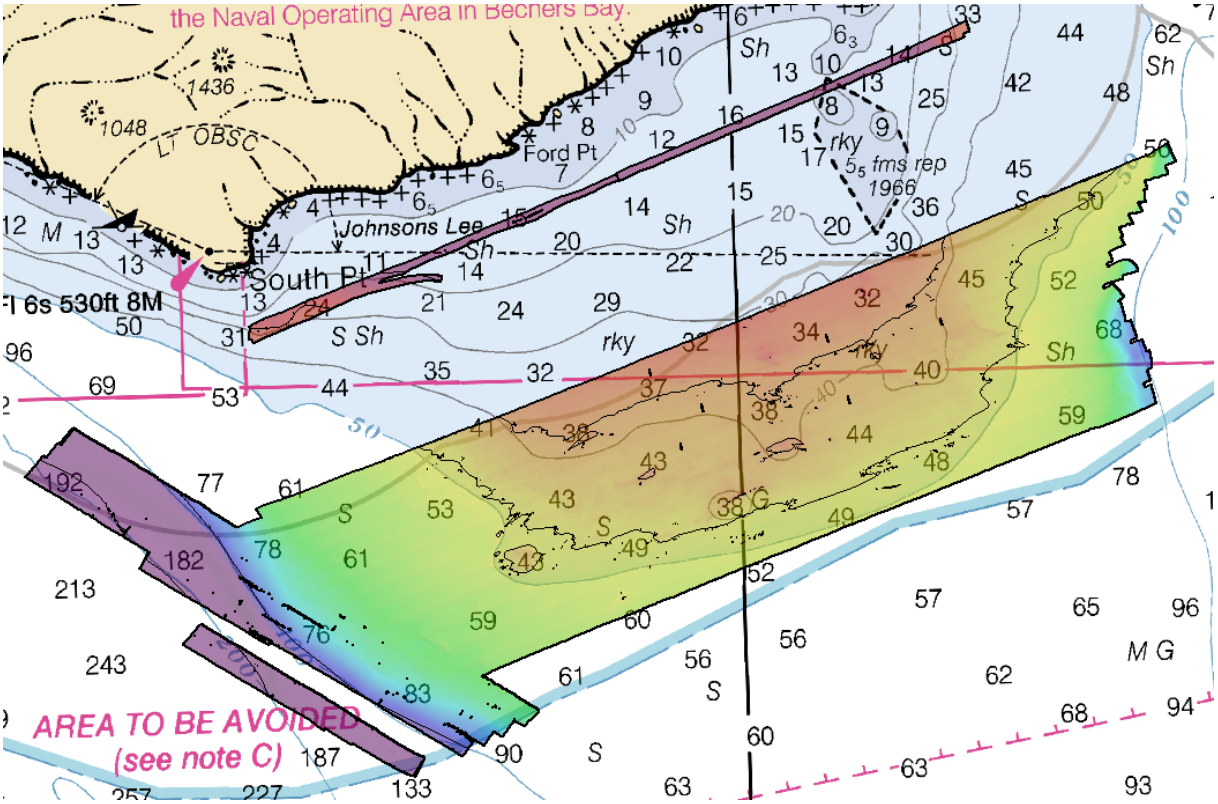

Figure 10: South Santa Rosa contours

Surface Name	Surface	Resolution	Depth Range	Surface Parameter	Purpose
SSantaRosa_MB_8m_MLLW	CUBE	8m	21.95-425.43m	NOAA_8m	Charting
NSantaRosa_MB_8m_MLLW	CUBE	8m	21.12-105.13m	NOAA_8m	Charting

Table 9: CUBE surfaces delivered for survey SH1503.

The surfaces delivered meet IHO Order 2 specifications for total vertical uncertainty (see Section E). The submitted surfaces comply with the density requirements in the 2014 HSSD: 99.87% of the nodes in the North Santa Rosa 8-meter surface have 5 or more soundings per node, and 99.87% of the nodes in the South Santa Rosa 8-meter surface have 5 or more soundings per node.

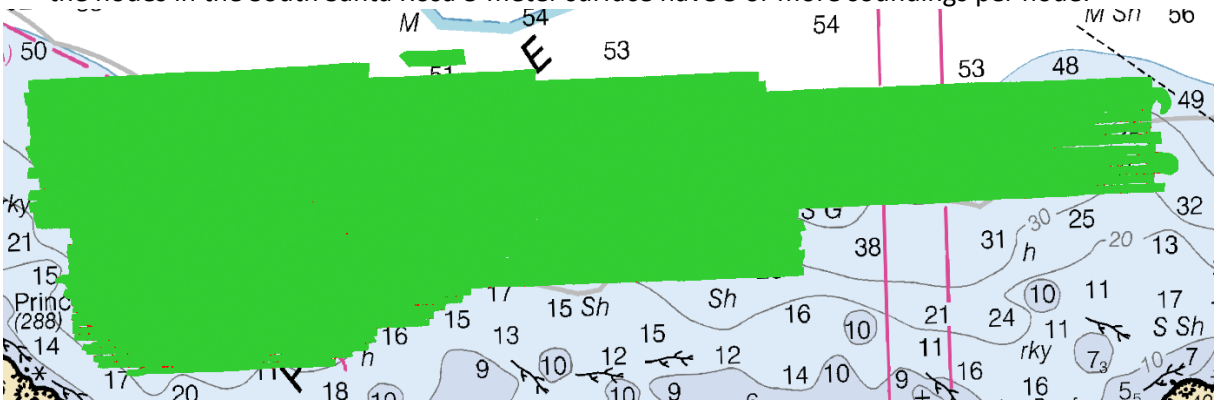

Figure 11: Density of surface from W00291, North Santa Rosa Island. Green represents nodes which comply with the HSSD, red are non-compliant nodes.

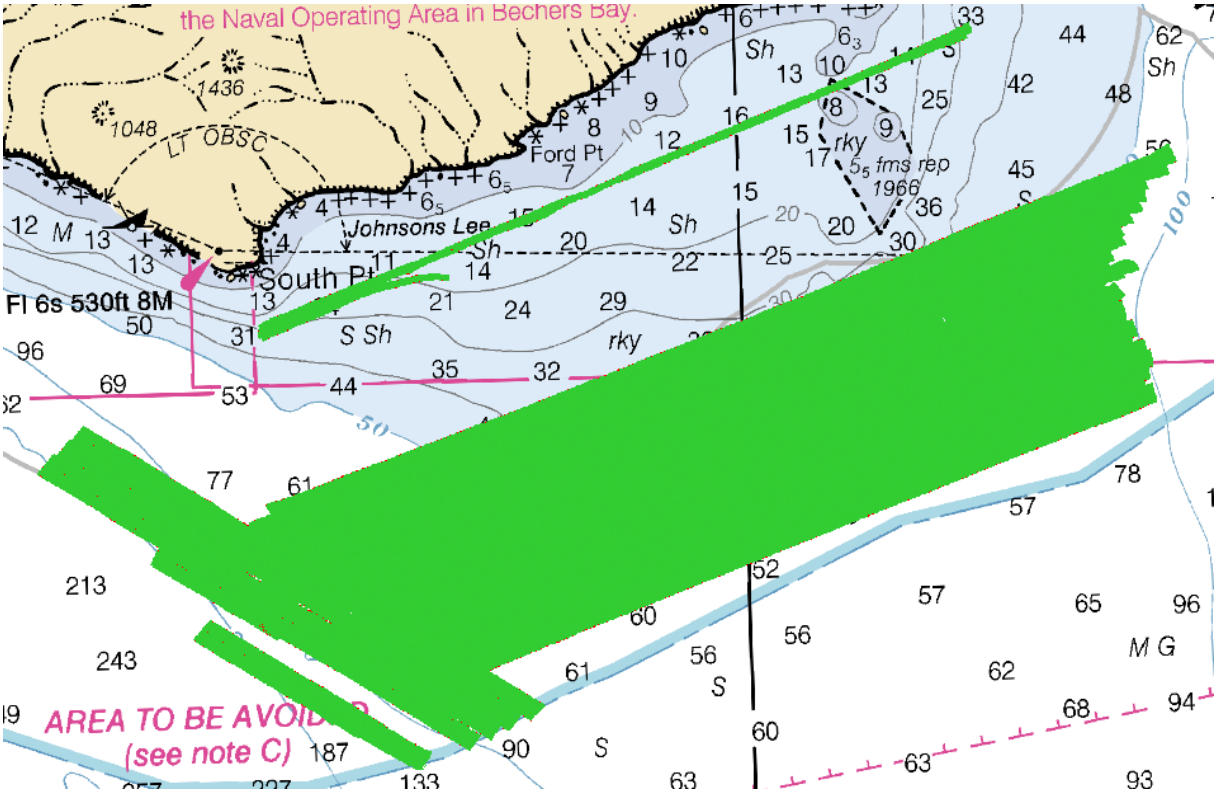

Figure 12: Density of surface from W00291, South Santa Rosa Island. Green represents nodes which comply with the HSSD, red are non-compliant nodes.

G. Vertical and Horizontal Control

The vertical datum for this project is Mean Lower Low Water. The tidal ranges for different tide stations in the region were analyzed and the range of tides in the area was approximately 1.7 m. See section D.7.

The horizontal datum for this project is North American Datum of 1983 (NAD83).

H. Additional Results

No additional results to report.

I. Approval

The survey data meets requirements as set forth in the NOS Hydrographic Surveys and Specifications Deliverables Manual, Field Procedures Manual, Standing and Letter Instructions, and all HSD Technical Directives. These data are adequate to supersede charted data in their common areas. This survey is complete and no additional work is required with the exception of deficiencies noted in the Survey Summary Report.

Approver Name	Approver Title	Approval Date	Signature
Erin Weller	Physical Scientist	6/3/2015	

APPENDIX I

TIDES AND WATER LEVELS

Tides are predicted water levels with no zoning sourced from the tide station Beechers Bay, Santa Rosa Island Station #9410962

APPENDIX II

SUPPLEMENTAL SURVEY RECORDS AND CORRESPONDENCE

There were no supplemental survey records or correspondence associated with survey W00291

APPROVAL PAGE

W00291

Data meet or exceed current specifications as certified by the OCS survey acceptance review process. Descriptive Report and survey data except where noted are adequate to supersede prior surveys and nautical charts in the common area.

The following products will be sent to NCEI for archive

- W00291_DR.pdf
- Collection of depth varied resolution BAGS
- Processed survey data and records

The survey evaluation and verification has been conducted according current OCS Specifications, and the survey has been approved for dissemination and usage of updating NOAA's suite of nautical charts.

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ou=DoD, ou=PKI, ou=OTHER,
cn=OWENS.EDWARD.A.1365816804
Date: 2016.08.11 14:50:51 -04'00'

Approved:_____

Lieutenant Commander Brianna Welton, NOAA
Chief, Atlantic Hydrographic Branch