

W00475

U.S. Department of Commerce
National Oceanic and Atmospheric Administration
National Ocean Service

DESCRIPTIVE REPORT

Type of Survey: Navigable Area

Registry Number: W00475

LOCALITY

State(s): California
Oregon

General Locality: Offshore California and Oregon

Sub-locality: Mendocino Canyon to Saint George Reef

2019

CHIEF OF PARTY
CAPT Marc Moser

LIBRARY & ARCHIVES

Date:

HYDROGRAPHIC TITLE SHEET

W00475

INSTRUCTIONS: The Hydrographic Sheet should be accompanied by this form, filled in as completely as possible, when the sheet is forwarded to the Office.

State(s): **California Oregon**

General Locality: **Offshore California and Oregon**

Sub-Locality: **Mendocino Canyon to Saint George Reef**

Scale: **80000**

Dates of Survey: **08/14/2019 to 08/22/2019**

Instructions Dated: **07/15/2019**

Project Number: **OPR-M328-FA-19**

Field Unit: **NOAA Ship *Fairweather***

Chief of Party: **CAPT Marc Moser**

Soundings by: **Kongsberg Maritime EM 710 (MBES)**

Imagery by: **Kongsberg Maritime EM 710 (MBES Backscatter)**

Verification by: **Pacific Hydrographic Branch**

Soundings Acquired in: **meters at Mean Lower Low Water**

Remarks:

Any revisions to the Descriptive Report (DR) applied during office processing are shown in red italic text. The DR is maintained as a field unit product, therefore all information and recommendations within this report are considered preliminary unless otherwise noted. The final disposition of survey data is represented in the NOAA nautical chart products. All pertinent records for this survey are archived at the National Centers for Environmental Information (NCEI) and can be retrieved via <https://www.ncei.noaa.gov/>. Products created during office processing were generated in NAD83 UTM 10N, MLLW. All references to other horizontal or vertical datums in this report are applicable to the processed hydrographic data provided by the field unit.

DESCRIPTIVE REPORT SUMMARY

A. Area Surveyed

This hydrographic survey was acquired in accordance with the requirements defined in the Project Instructions and the March 2019 NOS Hydrographic Surveys Specifications and Deliverables (HSSD). Sheet limits were not reached in some areas due to time constraints and prioritization in the project area. Coverage acquired in W00475 is shown in Figure 1 below.

Data were acquired within the following survey limits:

Northwest Limit	Southeast Limit
42° 30' 17.77" N 124° 57' 49.14" W	40° 40' 35.99" N 124° 21' 41.6" W

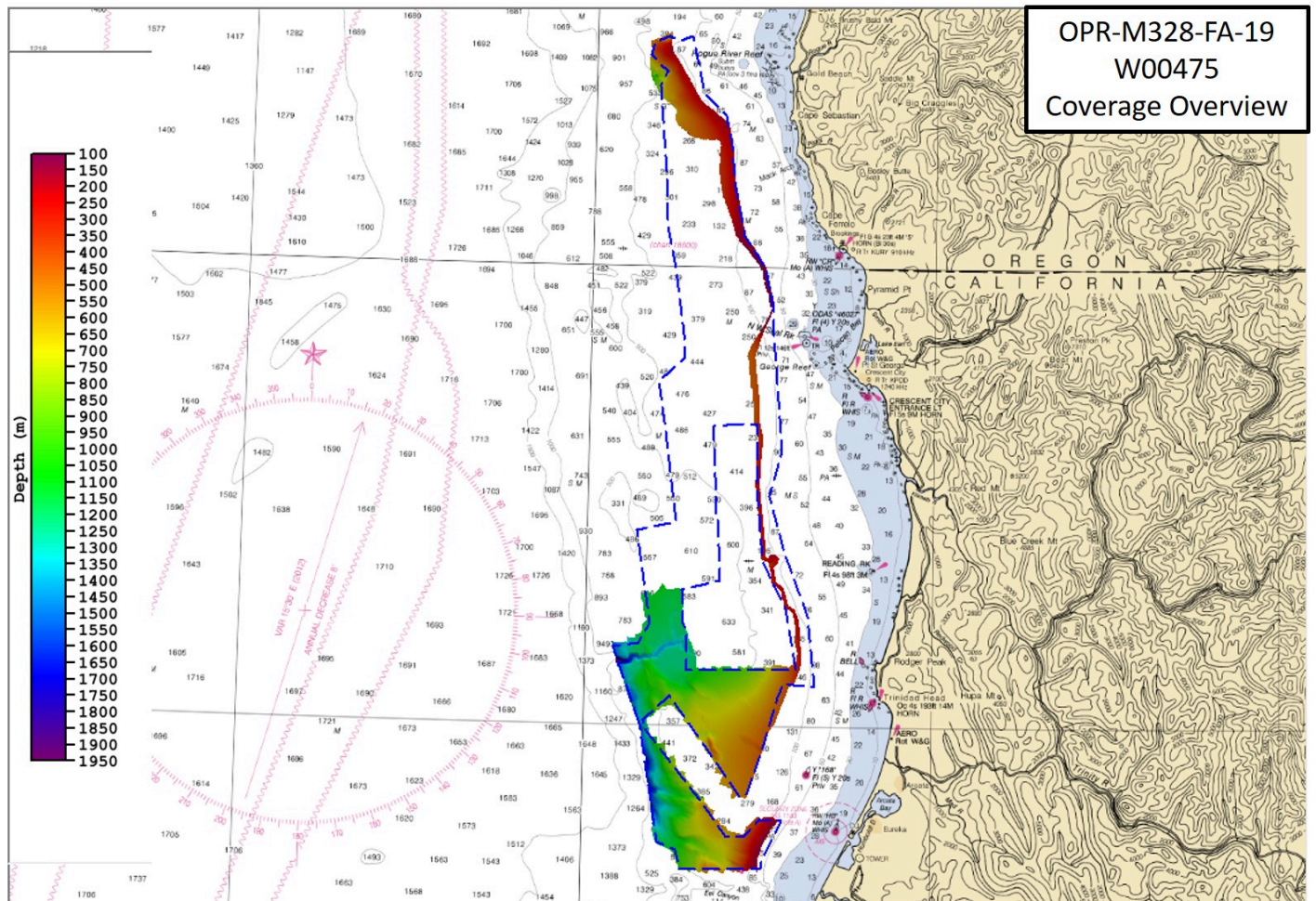


Figure 1: W00475 Coverage overview with sheet limits shown in blue

B. Survey Purpose

This project was conducted in collaboration with NOAA's Office of Coast Survey (OCS) and the Coastal and Marine Hazards and Resources Program (CMHRP) of the USGS across several large portions of the Cascadia continental margin, offshore of California and Oregon. The primary objective of this seafloor mapping project will be to provide multibeam bathymetry, acoustic backscatter data, and water column data to address USGS Hazard Mission Area objectives by providing key offshore constraints that feed directly into earthquake, tsunami, and landslide hazard assessments and situational awareness products. High-resolution multibeam and backscatter imagery allow identification and characterization of active faults and submarine landslides. These data will also provide an important pre-event bathymetric baseline for rapid assessment of seafloor deformation after a large earthquake. Water column data will expand mapping of seafloor seep distribution, which is key for understanding the relationship between seafloor failure and seismogenesis along the Cascadia margin. This project also supports the Expanding Pacific Research and Exploration of Submerged Systems (EXPRESS) campaign, which is comprised of a large and diverse team of federal and non-federal partners targeting deepwater areas off of the U.S. Pacific coast. This project also supports NOAA's Integrated Ocean and Coastal Mapping mantra, "map once, use many times" and data from this project will be further used to update NOAA's nautical charting products within the area. This project will cover a total of 1,500 SNM and survey data from this project is intended to supersede all prior survey data in the common area.

C. Intended Use of Survey

The entire survey is adequate to supersede previous data.

Data acquired in W00475 meet multibeam echo sounder (MBES) coverage requirements for complete coverage, as required by the HSSD.

D. Data Acquisition and Processing

Please reference Data Acquisition and Processing Report OPR-M328-FA-19 for a complete description of data acquisition and processing systems, survey vessels, quality control procedures and data processing methods.

E. Uncertainty

The surface was analyzed using HydrOffice QC Tools Grid QA feature to determine compliance with specifications. Overall, 99.5+% of nodes within the surface meet NOAA Allowable Uncertainty specifications for W00475 (Figure 2). Density requirements for W00475 were achieved with 99.5+% of surface nodes containing five or more soundings as required by HSSD Section 5.2.2.4 (Figure 3).

Uncertainty Standards

Grid source: W00475_MB_VR_MLLW

99.5+% pass (3,599,935 of 3,601,055 nodes), min=0.01, mode=0.06, max=2.67

Percentiles: 2.5%=0.02, Q1=0.04, median=0.06, Q3=0.08, 97.5%=0.13

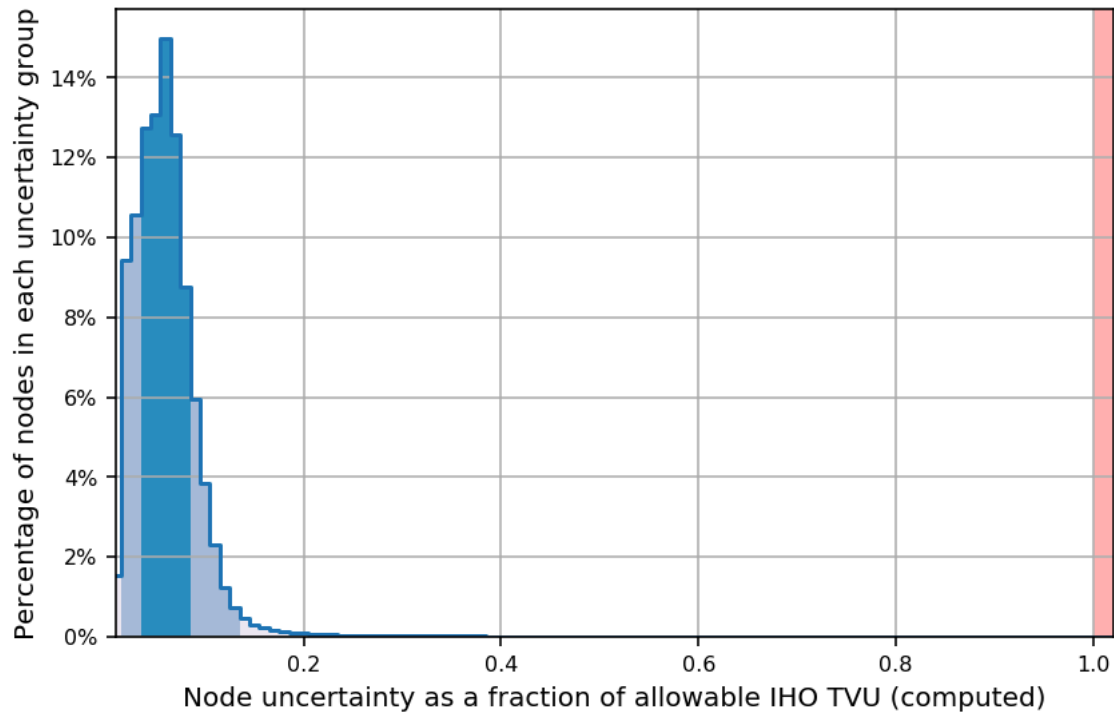


Figure 2: W00475 Allowable uncertainty statistics

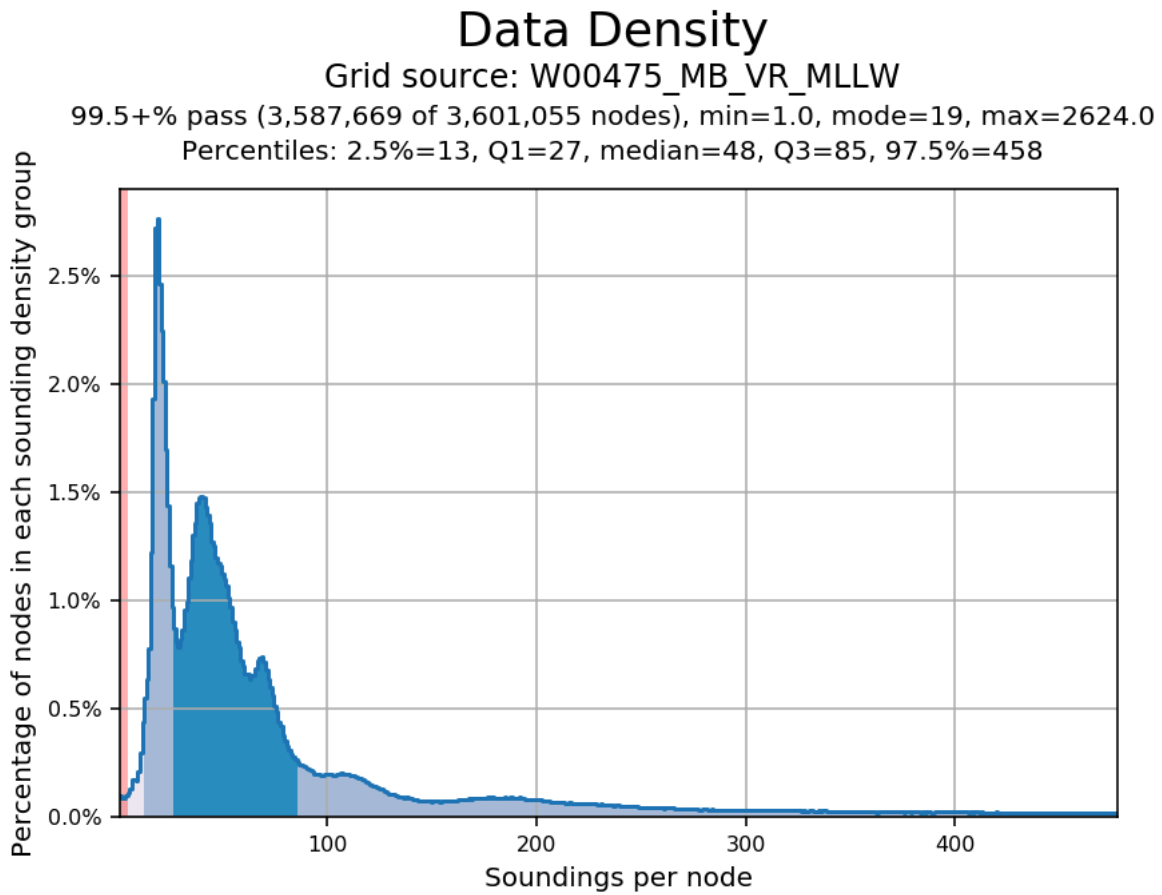


Figure 3: W00475 Density statistics

F. Results and Recommendations

The following are the largest scale ENC's, which cover the survey area:

ENC	Scale	Edition	Update Application Date	Issue Date
US3OR03M	1:196948	27	07/19/2018	11/21/2019
US3CA15M	1:200000	22	05/02/2018	05/09/2019

The following surfaces and/or BAGs were submitted to the Processing Branch:

Surface Name	Surface Type	Resolution	Depth Range	Surface Parameter	Purpose
W00475_MB_VR_MLLW	CARIS VR Surface (CUBE)	Variable Resolution m	103.97 m - 1937.46 m	NOAA_VR	Complete MBES
W00475_MB_VR_MLLW_Final	CARIS VR Surface (CUBE)	Variable Resolution m	103.97 m - 1937.46 m	NOAA_VR	Complete MBES

The NOAA CUBE parameters defined in the HSSD were used for the creation of all CUBE surfaces for W00475. The surfaces have been reviewed where noisy data, or "fliers" are incorporated into the gridded solutions causing the surface to be shoaler or deeper than the true seafloor. Where these spurious soundings cause the gridded surface to be shoaler or deeper than the reliably measured seabed by greater than the maximum allowable Total Vertical Uncertainty at that depth, the noisy data have been rejected by the hydrographer and the surface recomputed.

Flier Finder, part of the QC Tools package within HydrOffice, was used to assist the search for spurious soundings following gross cleaning. Flier Finder was run iteratively until remaining flagged fliers were deemed to be valid aspects of the surface.

G. Vertical and Horizontal Control

The vertical datum for this project is Mean Lower Low Water. The vertical control method used was VDatum.

Per section 5.1.2.3 of the Field Procedures Manual (2014 ed), no Horizontal and Vertical Control Report has been generated for W00475.

The horizontal datum for this project is North American Datum of 1983 (NAD 83). The projection used for this project is Universal Transverse Mercator (UTM) Zone 10.

Vessel kinematic data were post-processed using Applanix POSPac processing software and RTX positioning methods described in the DAPR. Smoothed Best Estimate of Trajectory (SBET) and associated error (RMS) data were applied to all MBES data in CARIS HIPS and SIPS.

The Wide Area Augmentation System (WAAS) was used for real-time horizontal control during data acquisition.

H. Additional Results

Holidays

W00475 data were reviewed in CARIS HIPS and SIPS for holidays in accordance with Section 5.2.2.3 of the HSSD. Six holidays which meet the 3 by 3 node definition were identified via HydrOffice QC Tools Holiday Finder tool. This tool automatically scans the surface for holidays as defined in the HSSD and was run in conjunction with a visual inspection of the surface by the hydrographer. See Figure 4 for an overview of these holidays. Three of these holidays were due to insufficient coverage overlap, two were created by increased sonar noise levels in the middle sector, and one was created as the ship attempted to develop the shelf above the canyons.

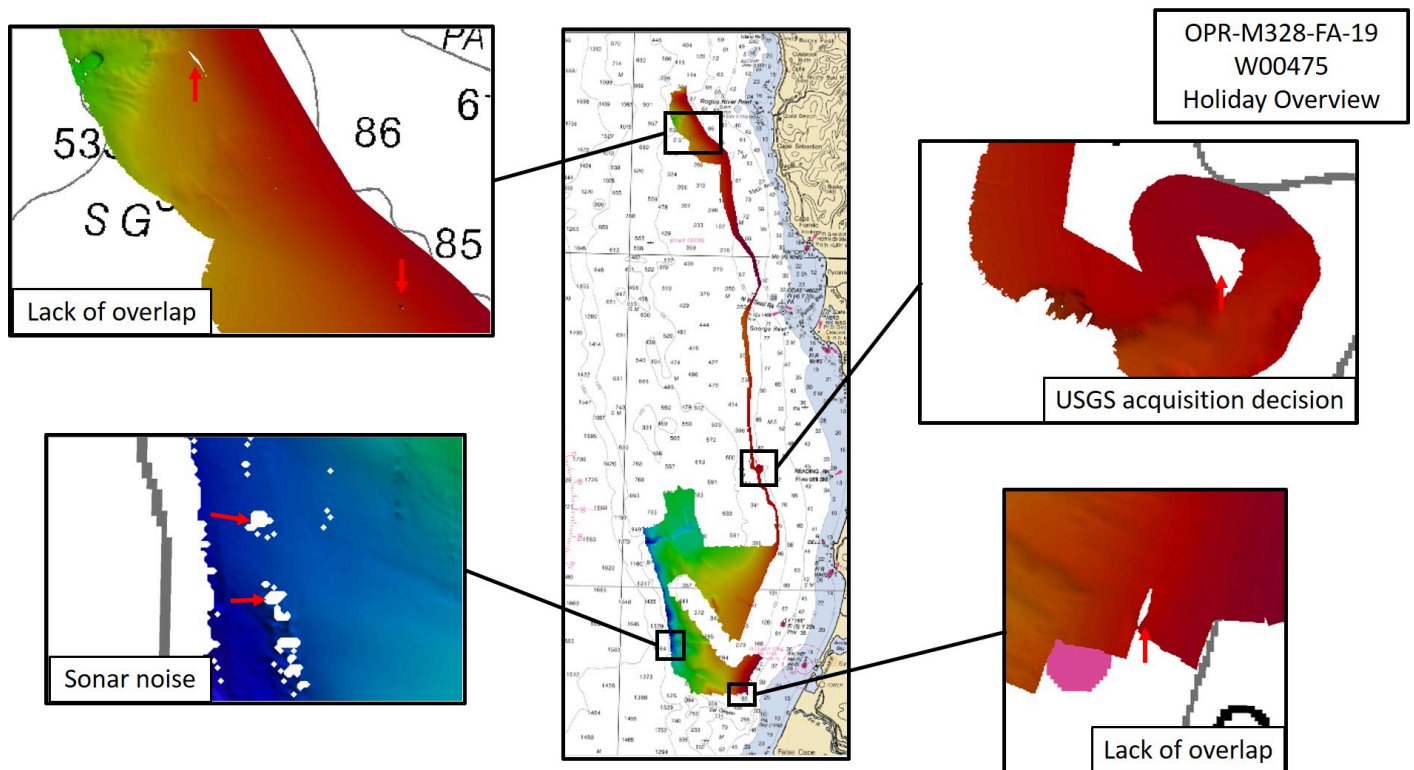


Figure 4: Overview of holidays

Backscatter

Raw backscatter data were stored in the .all file for Kongsberg systems. All backscatter were processed to GSF files, and a floating point mosaic was created by the field unit via Fledermaus FMGT 7.8.10. See Figure 5 for a greyscale representation of the complete mosaic.

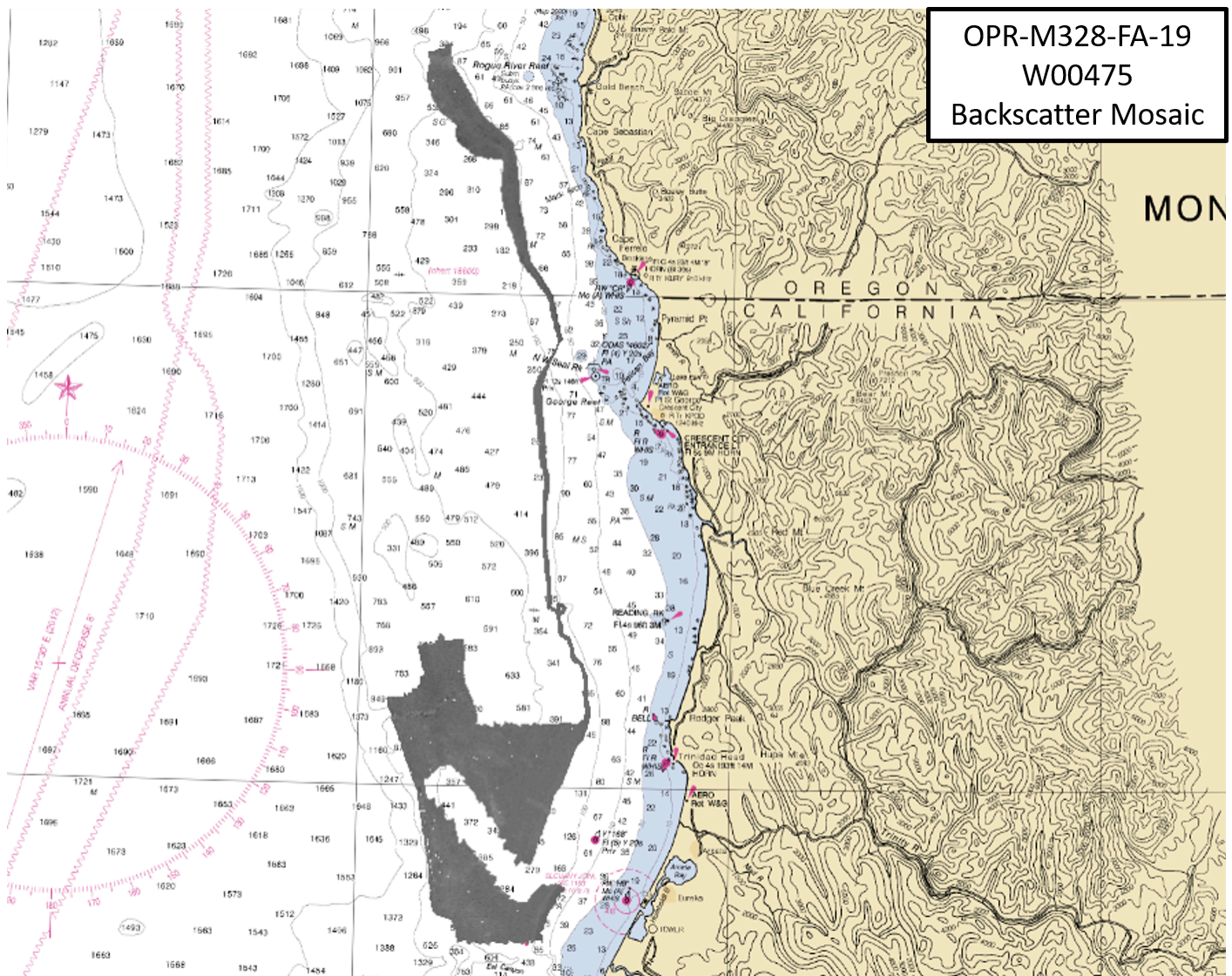


Figure 5: Backscatter mosaic for W00475

Crosslines

Crosslines were collected, processed and compared in accordance with Section 5.2.4.2 of the HSSD. To evaluate crosslines, a surface generated via data strictly from mainscheme lines and a surface generated via data strictly from crosslines were created. From these two surfaces, a difference surface (mainscheme - crosslines = difference surface) was generated (Figure 6), and is submitted in the Separates II Digital Data folder. Statistics show the mean difference between depths derived from mainscheme data and crossline data was -0.16 meters with 95% of nodes falling within +/- 2.49 meters (Figure 7). In total, 99.5+% of the depth differences between W00475 mainscheme and crossline data were within allowable NOAA uncertainties.

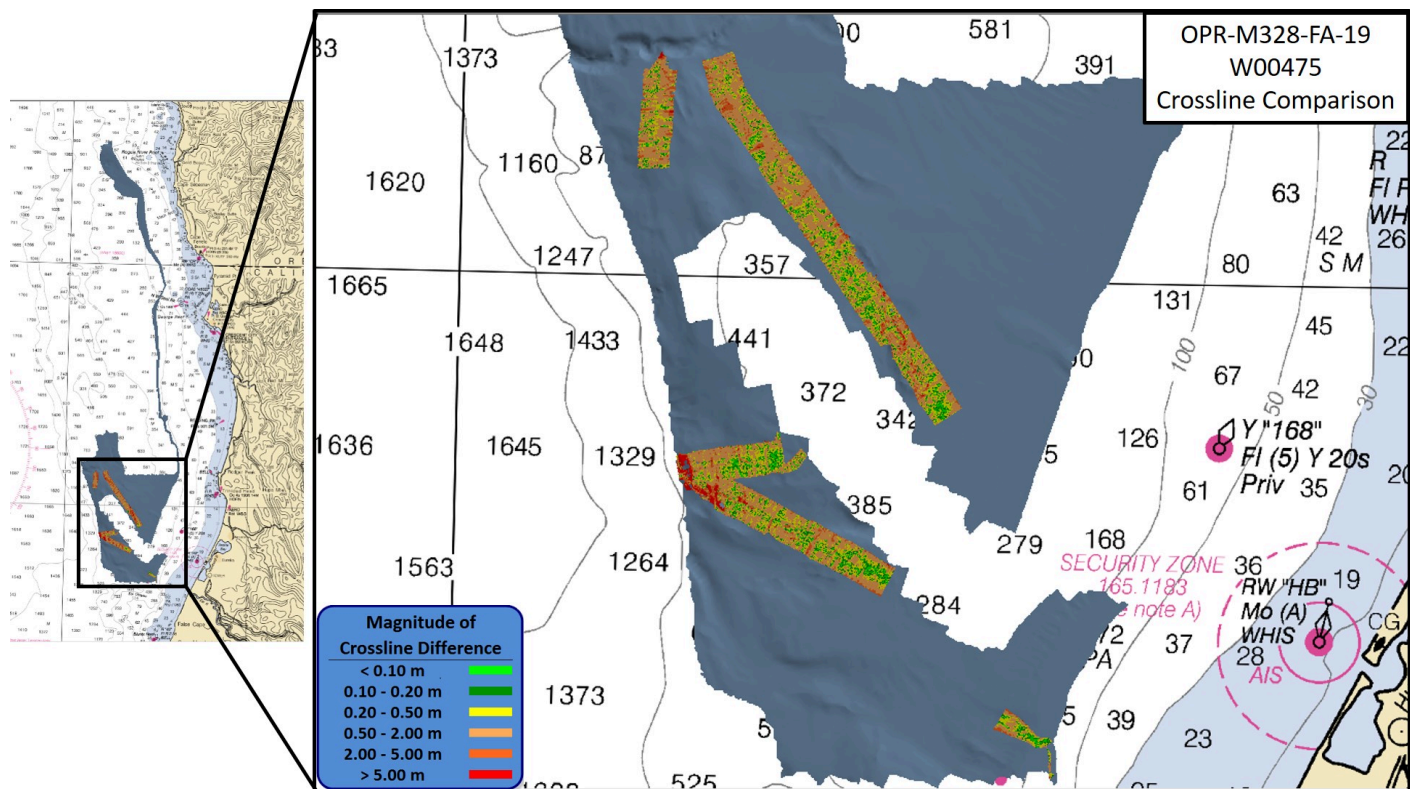


Figure 6: Overview of W00475 crosslines

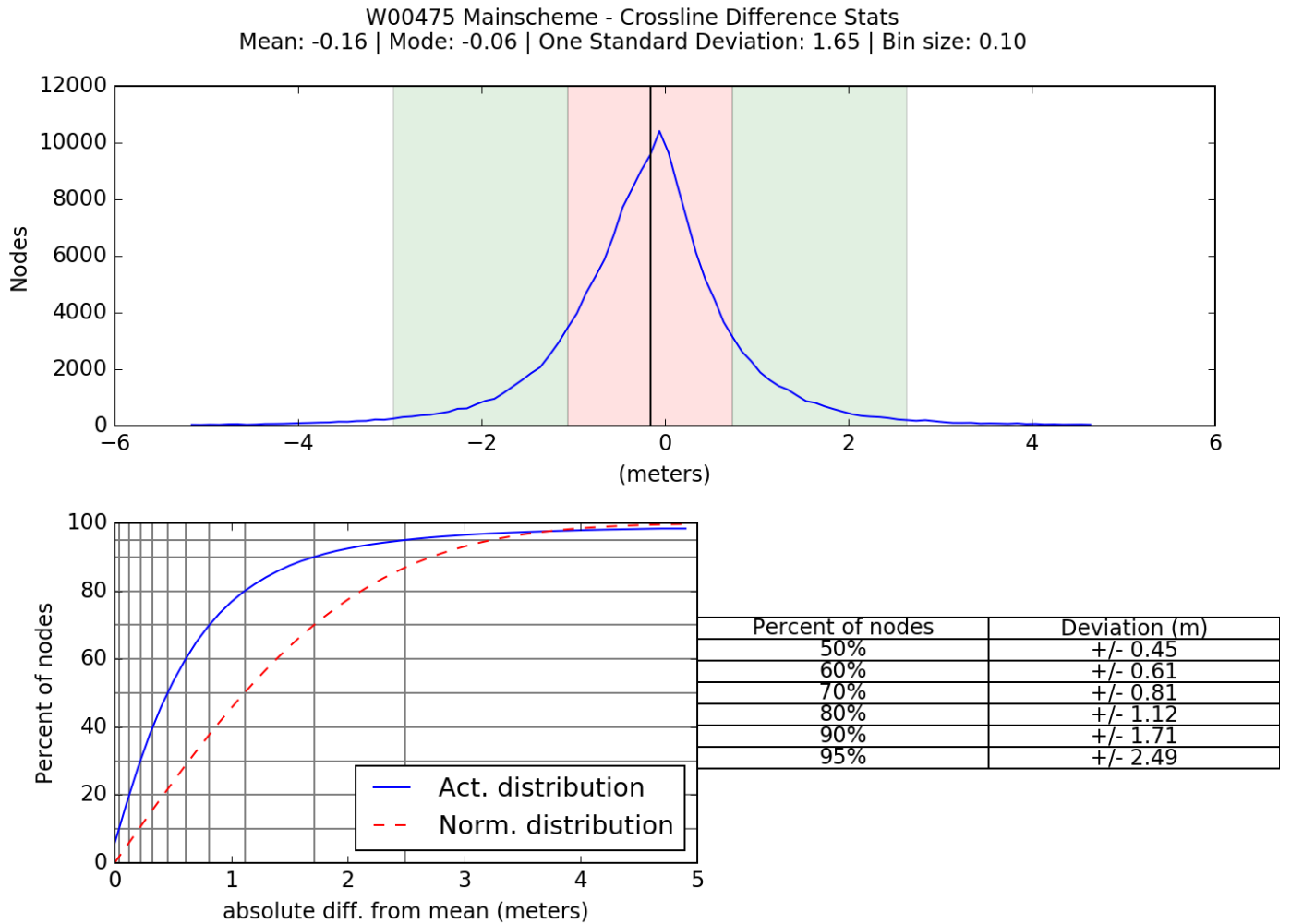


Figure 7: Crossline and mainscheme difference statistics

Chart Comparison

A comparison was performed between W00475 and ENC's US3CA15M and US3OR03M using CARIS HIPS and SIPS. Sounding and contour layers were overlaid on the ENC to assess differences between the surveyed soundings and charted depths. The ENC was compared to the surface by extracting all soundings from the chart and creating an interpolated TIN surface which could be differenced with the surface from W00475 (Figure 8). The mean difference between surveyed soundings from W00475 and the charted depths on ENC US3CA15M is -0.41 meters, with 95% of nodes having a deviation of +/- 46.59 meters as shown in Figure 9. The mean difference between surveyed sounding from W00475 and the charted depths on ENC US3OR03M is -4.83 meters, with 95% of nodes having a deviation of +/- 33.67 meters as shown in Figure 10.

All data from W00475 should supersede charted data. In general, surveyed soundings agree with the majority of charted depths on ENC US3CA15M and US3OR03M to 30 fathoms. The largest differences are seen in

deep areas with steep slopes, particularly for charted canyons that are incorrectly positioned. Contours from W00475 are in general agreement with the charted contours on ENC US3CA15M and US3OR03M.

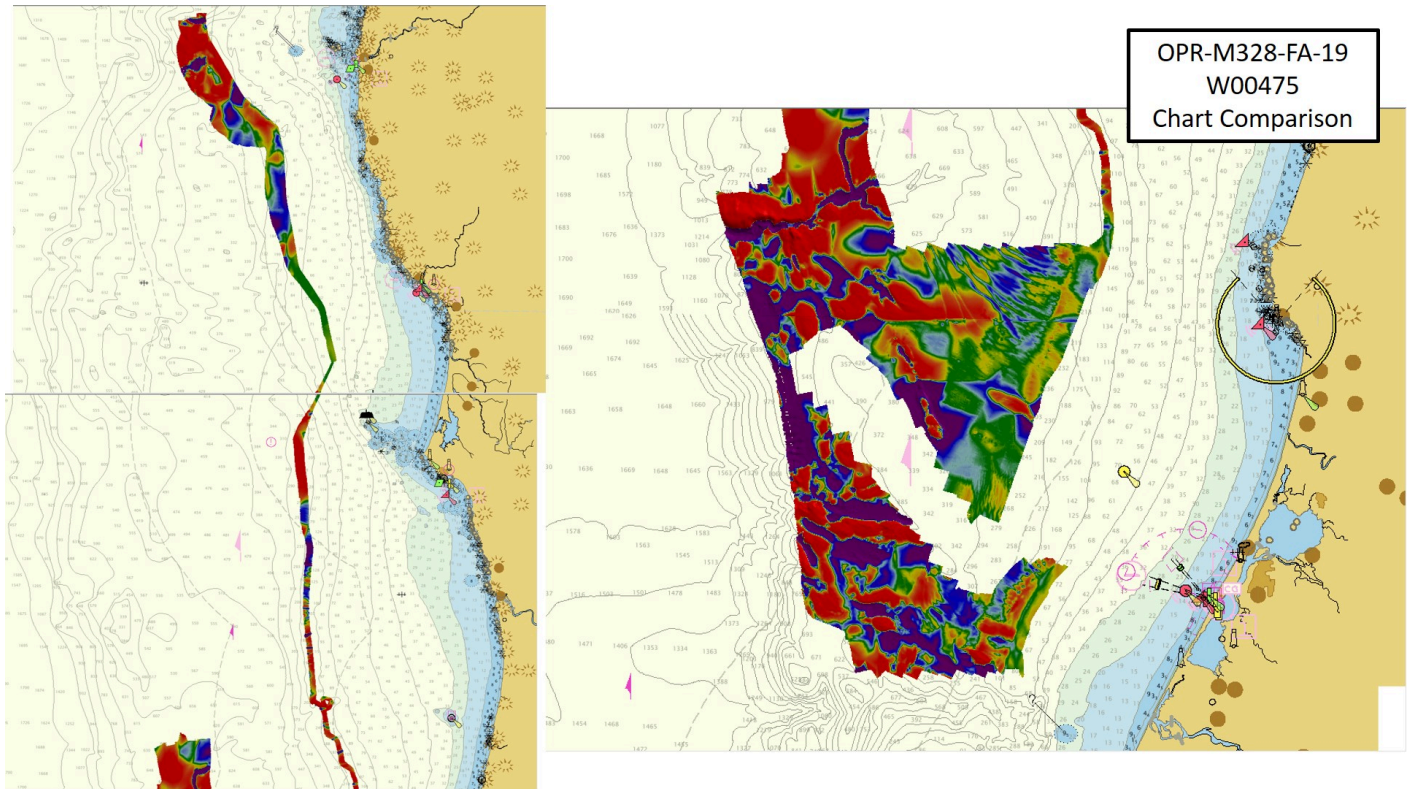


Figure 8: Difference surface between W00475 and interpolated TIN surface from US3CA15M and US3OR03M

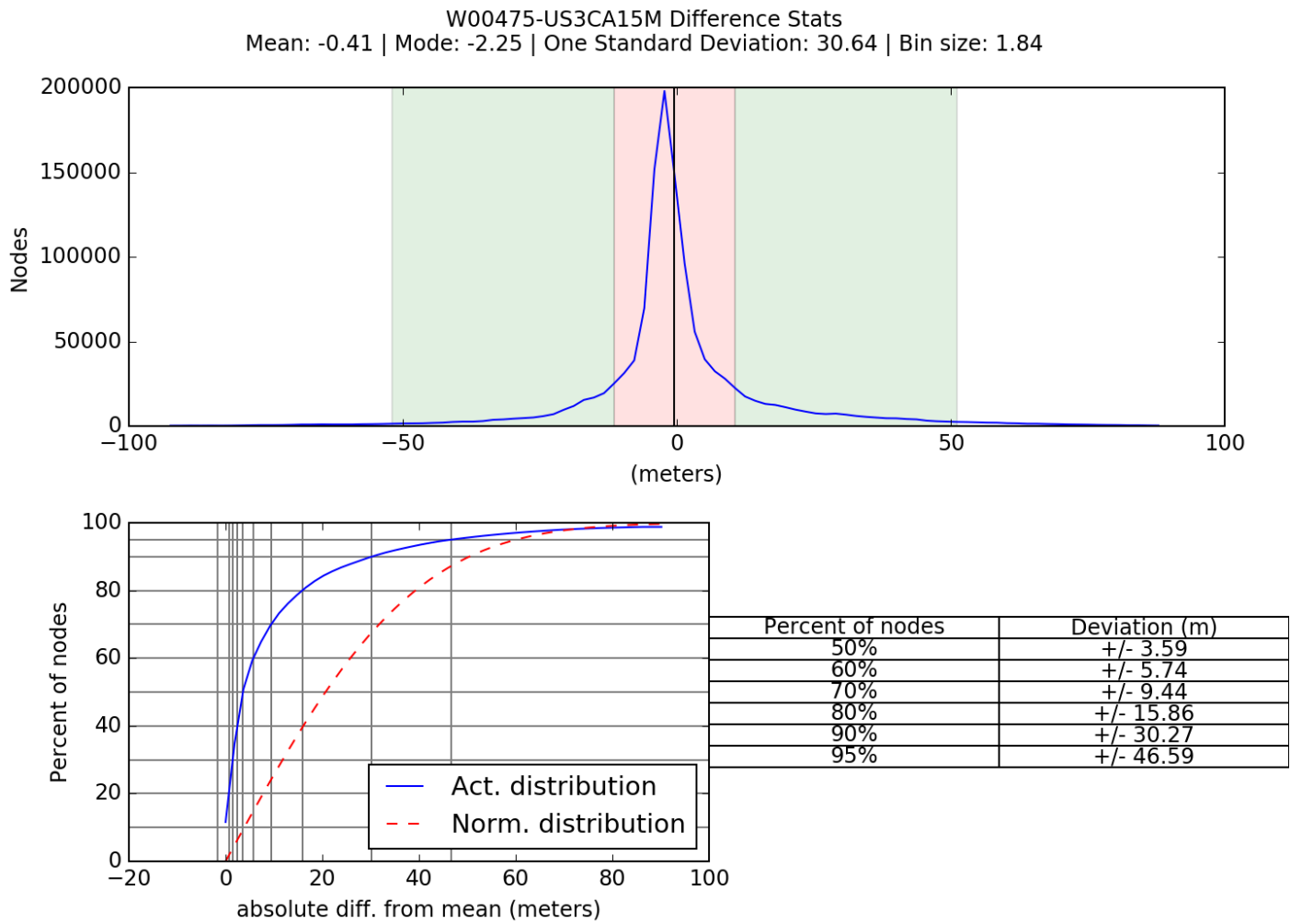


Figure 9: Difference surface statistics between W00475 and interpolated TIN surface from US3CA15M

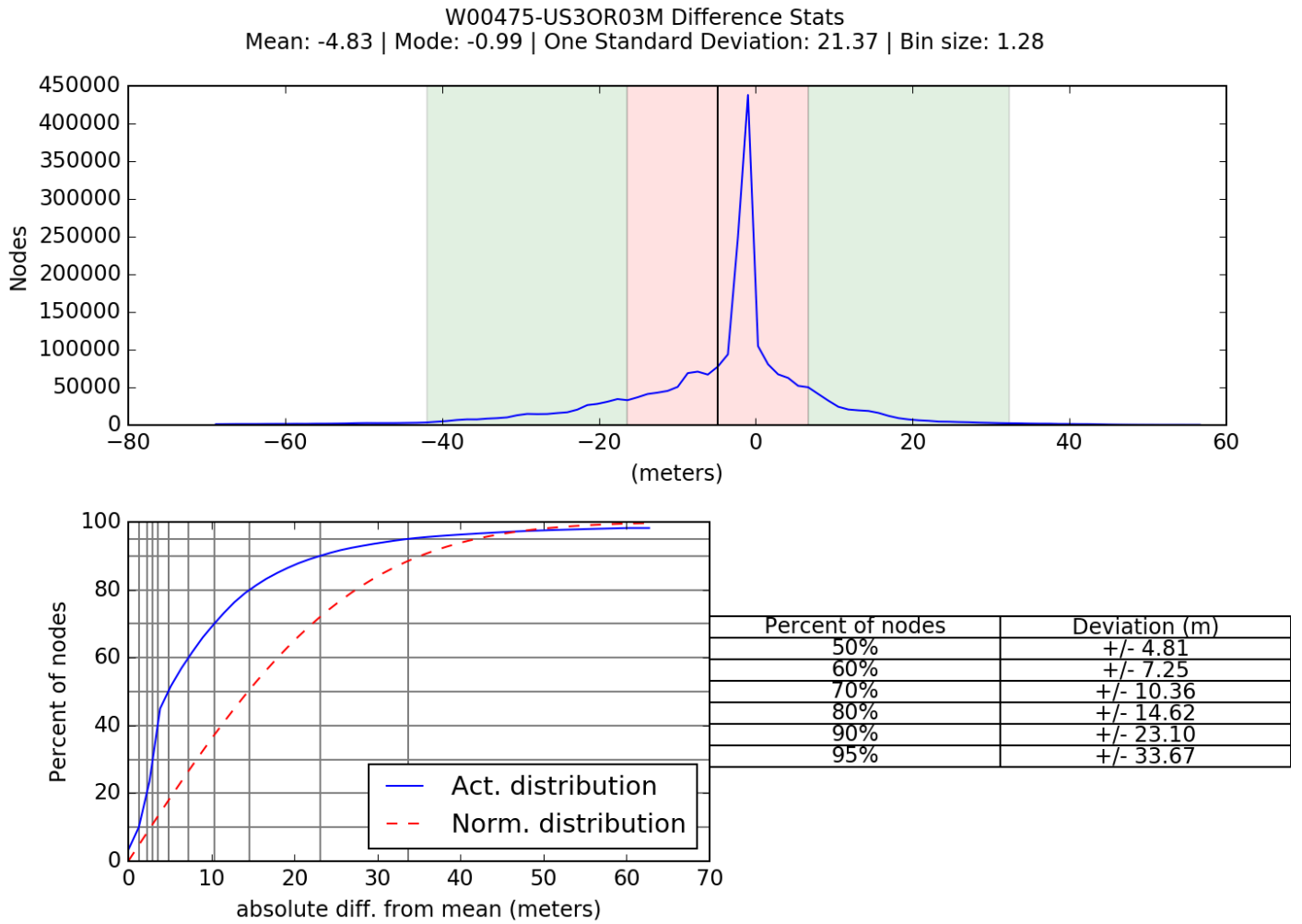


Figure 10: Difference surface statistics between W00475 and interpolated TIN surface from US3OR15M

Factors Affecting Soundings - Sonar Noise

Throughout the deeper areas of W00475, data quality suffered from increased noise levels heard in the sonars middle sector. These erroneous soundings appeared on both sides of the middle sector (Figure 11). Cleaning of these artifacts created many gaps in coverage, especially on the deepest, most westward line.

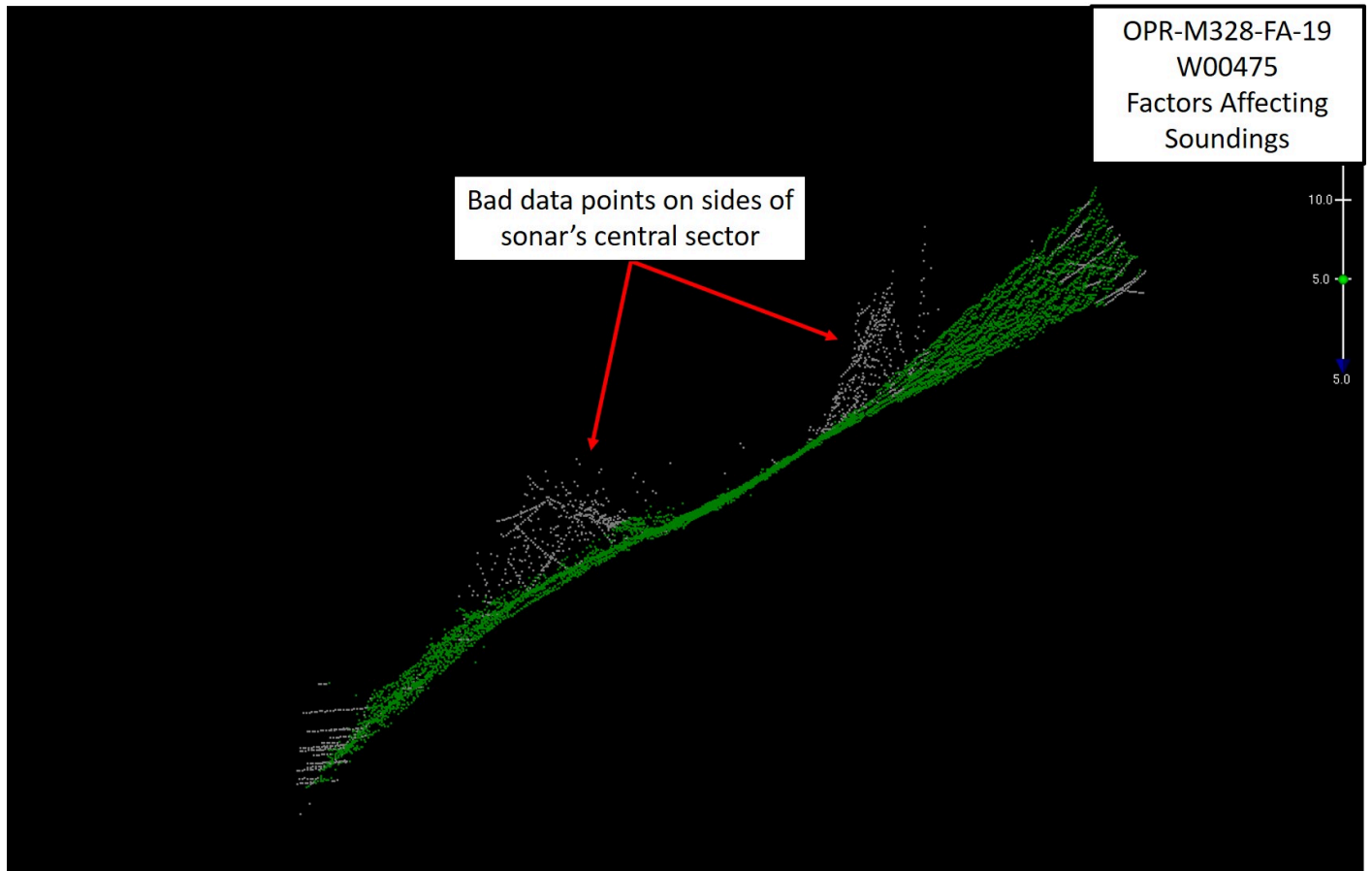


Figure 11: Example of area effected by increased sonar noise levels

I. Approval

As Chief of Party, field operations for this hydrographic survey were conducted under my direct supervision, with frequent personal checks of progress and adequacy. I have reviewed the attached survey data and reports.

All field sheets, this Survey Summary Report, and all accompanying records and data are approved. All records are forwarded for final review and processing to the Processing Branch.

The survey data meets or exceeds requirements as set forth in the NOS Hydrographic Surveys Specifications and Deliverables, 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	Title	Date	Signature
CAPT. Marc Moser	Chief of Party	01/23/2020	MOSER.MARC.STANTON.1163193902 Digitally signed by MOSER.MARC.STANTON.1163193902 Date: 2020.01.24 06:12:22 -08'00'
Lt. Steve Moulton	Operations Officer	01/23/2020	MOULTON.STEPHEN.F.1282116835 Digitally signed by MOULTON.STEPHEN.F.1282116835 Date: 2020.01.23 14:03:05 -08'00'
ACHST Alissa Johnson	Chief Survey Technician	01/23/2020	JOHNSON.ALISSA.JEAN.1537531165 Digitally signed by JOHNSON.ALISSA.JEAN.1537531165 Date: 2020.01.23 14:25:41 -08'00'
HSST Simon Swart	Sheet Manager	01/23/2020	SWART.SIMON.EDWARD.1543761962 Digitally signed by SWART.SIMON.EDWARD.1543761962 Date: 2020.01.23 13:52:46 -08'00'

APPROVAL PAGE

W00475

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

- Descriptive Report
- Collection of Bathymetric Attributed Grids (BAGs)
- Collection of backscatter mosaics
- Processed survey data and records
- GeoPDF of survey products

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.

Approved: _____

Peter Holmberg

Products Team Lead, Pacific Hydrographic Branch