

Descriptive Report Summary W00306	
Project	M-N908-RA-16
Survey	W00306
State	Washington
Locality	Offshore - Washington Coast
Sub Locality	Eastern Quinault Canyon
Scale of Survey	1:80000
Sonars Used	Kongsberg EM710 MBES
Horizontal Datum	World Geodetic Survey 1984 (WGS 84 (G1674))
Vertical Datum	Mean Lower Low Water
Vertical Datum Correction	TCARI
Projection	UTM Zone 10N
Field Unit	NOAA Ship <i>Rainier</i>
Survey Dates	04/30/2016 - 05/13/2016
Chief of Party	Edward J. Van Den Ameele, CAPT/NOAA

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 <http://www.ncei.noaa.gov/>.

A. Area Surveyed

This hydrographic survey was acquired in accordance with the requirements defined in the Project Instruction MN908-RA-16 with the exception of total survey assigned area not being achieved. Total survey area acquired was 99.94 SNM which is 61% of the planned 164 SNM (Figure 1). Full survey coverage was not acquired due to delay in ship's arrival in the project area. Due to time constraints, the visiting Chief Scientist requested prioritization for data acquisition in the western section of W00306 and the adjacent sheet W00311 to support project objectives.

Data were acquired within the following survey limits:

Northwest Limit	Southeast Limit
47° 57' 6.42" N 125° 10' 13.57" W	47° 18' 38.93" N 124° 47' 35.58" W

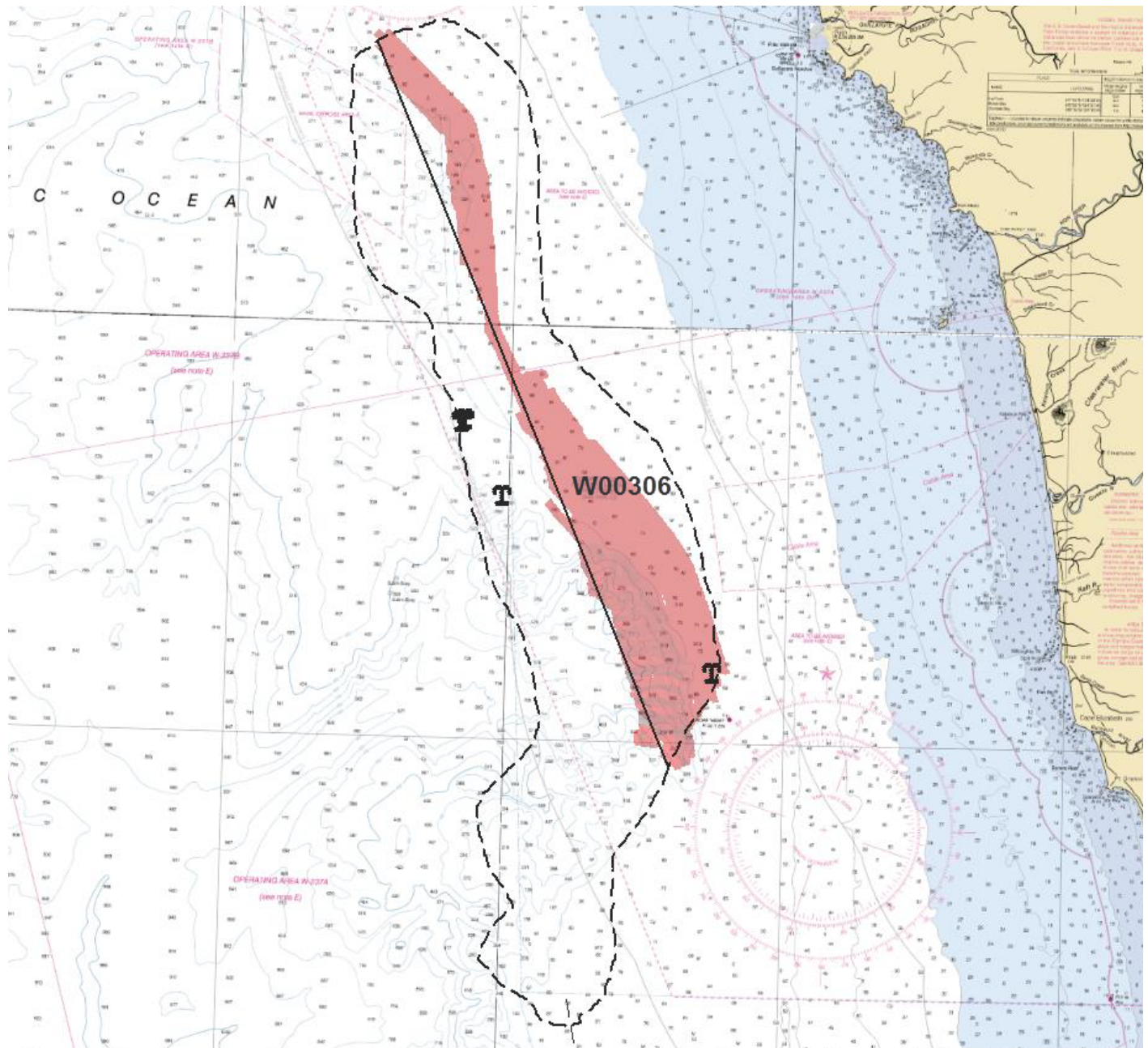


Figure 1: W00306 acquired survey coverage.

B. Survey Purpose

This project was conducted in collaboration with the National Ocean Service-Office of Coast Survey's (OCS) Integrated Ocean and Coastal Mapping Program (IOCM) and the Olympic Coast National Marine Sanctuary (OCNMS) and their partners in order to collect swath bathymetry, acoustic backscatter data, and water column data

within high priority areas of the OCNMS. The data from this project provides seafloor habitat information to support fishery and resource protection mandates and will be further used to update National Ocean Service nautical charting products within the area.

C. Intended Use of Survey

The entire survey is adequate to supersede previous data.

Survey data were acquired within survey limits in accordance with the requirements in the Project Instructions and the Hydrographic Surveys Specifications and deliverables (HSSD). This survey is recommended for charting by the hydrographer.

D. Data Acquisition and Processing

Refer to the 2016 DAPR for a complete description of data acquisition and processing systems, survey vessel, quality control procedures and data processing methods. Additional information to supplement survey data are discussed in the following sections.

Survey Coverage

Due to time constraints caused by a late departure at the start of the field season, coverage was not obtained over the entire assigned area of sheet W00306. A large unsurveyed area (30nm x 2nm in size) exists along the eastern edge of the sheet in a relatively shallow, flat and featureless region (Figure 1). MBES coverage was prioritized along the break between the continental shelf and slope, the area of the most scientific interest as decided by the Chief Scientist aboard for the project. Two holidays, shown within the yellow boxes in Figure 2, are present as a result of acoustic shadowing. This effect is seen where data density on the “dark” side of a feature or between features was too sparse to produce a surface at the appropriate resolution. All cases were investigated to ensure that the least depth was found. Three holidays, shown within the red boxes in Figure 2, are present as a result of the lack of swath overlap during ship acquisition. All cases were investigated in CARIS side scan editor using psuedo side scan imaging to ensure that the least depth was found.

Equipment Effectiveness

Yaw Error: GAMS calibration prior to the survey resulted in poor antenna separation results. A consequence of this error was an incorrect relative position of the ship's primary-secondary antennae - the GAMS baseline. This baseline error induced a yaw artifact in the data. The error was evaluated at approximately 3 degrees and a yaw corrector was placed in the S221 HVF for the duration of this survey dates. The HVF yaw corrector fixed misalignments of data between lines and after a thorough review the hydrographer considers all surveyed soundings adequate to supersede charted soundings within the survey limits. The GAMS calibration issue and solution are fully explained in the DAPR Section C.3.2.

Sound Speed Methods

Sound Speed Cast Frequency: Sound speed profiles were acquired using both the Rolls Royce MVP200 and Deep Blue Expendable Bathymograph (XBT) probes at discrete locations within the survey area at least once every four

hours, when significant changes in surface sound speed were observed, or when surveying in a new area. Reference the 2016 DAPR for XBT processing.

A total of 44 casts were acquired and applied to W00306 MBES data using the “Nearest in distance within time” profile selection method found in Caris HIPS. All lines used the 4 hours interval except for lines 0263-0265 on DN134 which used 6 hours. This method was chosen to account for the last three lines which were completed within approximately 4.5 hours after the last cast of the project. No adverse effects were seen in the data from the variations in sound speed methods.

Backscatter Data

Raw backscatter data were collected and sent to NOAA's Pacific Hydrographic Branch. Contact the visiting Chief Scientist to obtain processed backscatter data.

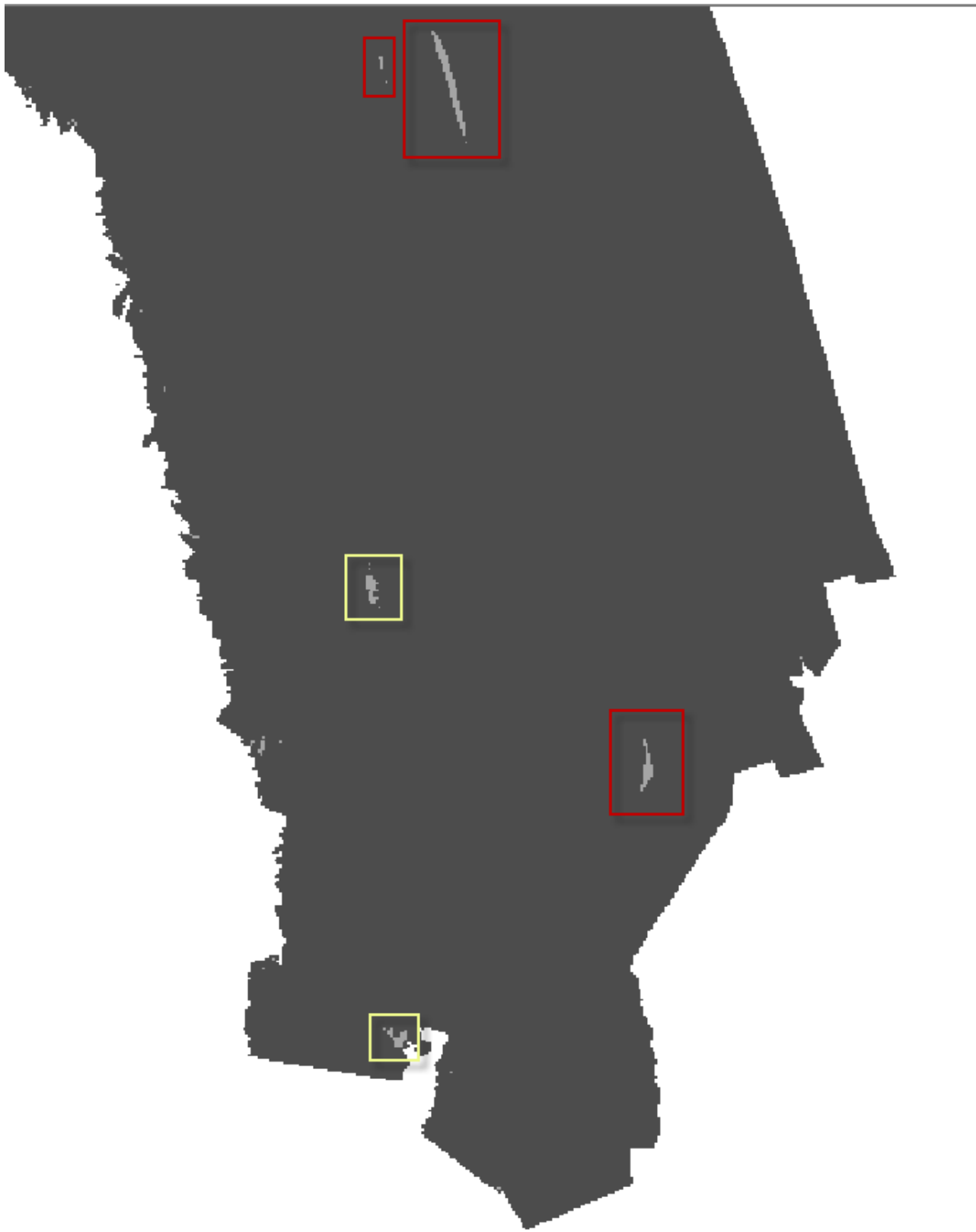


Figure 2: Five of the holidays found within W00306.

E. Uncertainty

Uncertainty values were measured and applied in accordance with Section B.4 of the DAPR.

Total Propagated Uncertainty (TPU) values for survey W00306 were derived from a combination of fixed values for equipment and vessel characteristics, as well as field assigned values for sound speed uncertainties. Tidal uncertainties were provided by NOAA's Center for Operational Oceanographic Products and Service (CO-OPS), and were applied to depth soundings using a Tidal Constituent and Residual Interpolation (TCARI) grid. TCARI automatically calculates the uncertainty associated with water level interpolation, which is then written into the Caris HDCS files. Therefore, no tidal uncertainty values were entered into the tide value section of the Caris compute TPU function related to TCARI.

Uncertainty values of submitted finalized grids were calculated in Caris using the "Greater of the Two" of uncertainty and standard deviation (scaled to 95%). The Finalized CSAR QA tool within Pydro was used to analyze W00306 MBES data. The results showed that 99.9% of W00306 nodes in the 8-meter, 16-meter, and 32-meter surfaces met HSSD uncertainty requirements (Figure 3-5).

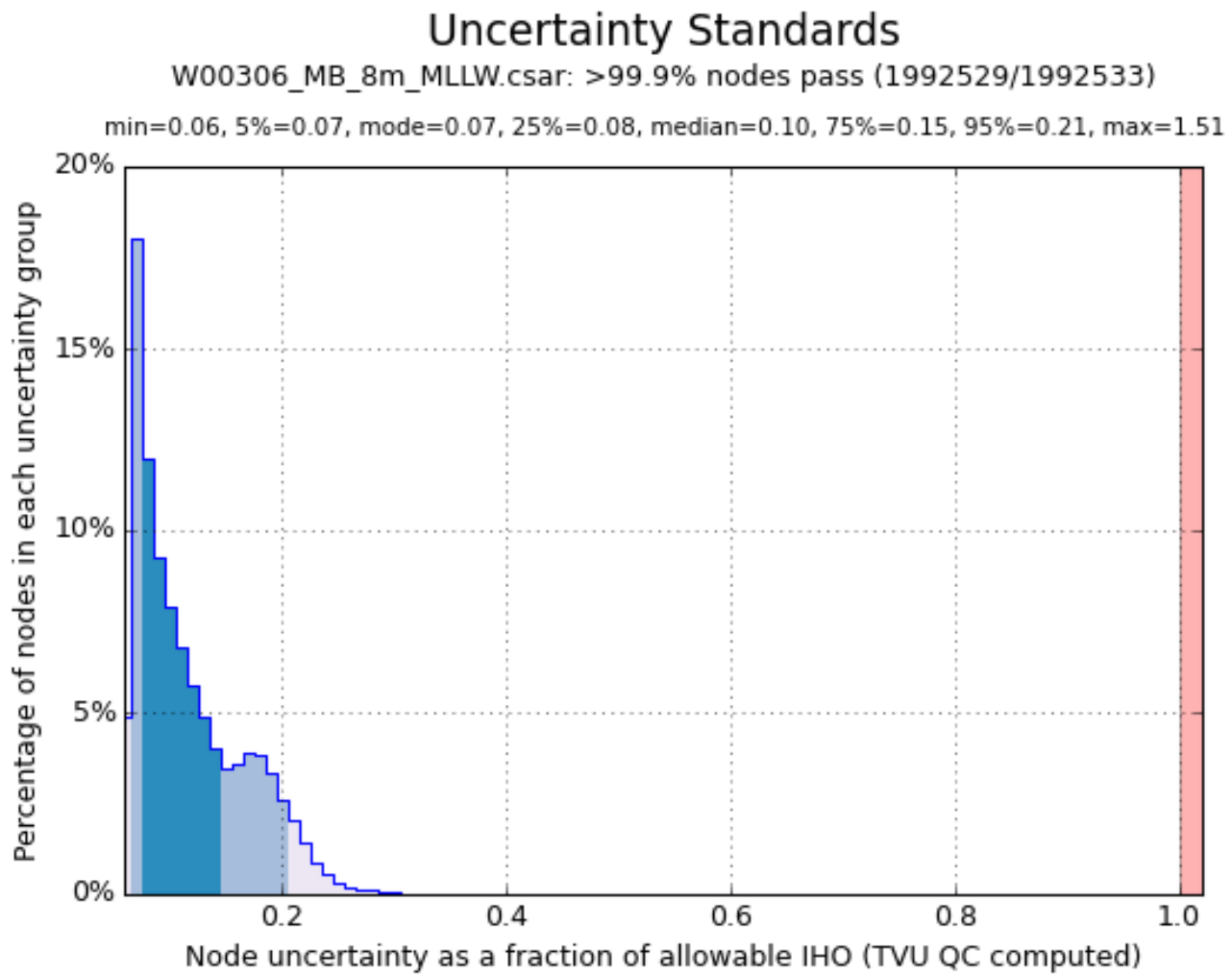


Figure 3: TVU Compliance to NOAA uncertainty standards as calculated using Pydro Finalized CSAR QA tool.

Uncertainty Standards

W00306_MB_16m_MLLW.csar: >99.9% nodes pass (738191/738225)

min=0.06, 5%=0.07, mode=0.07, 25%=0.08, median=0.11, 75%=0.16, 95%=0.23, max=1.64

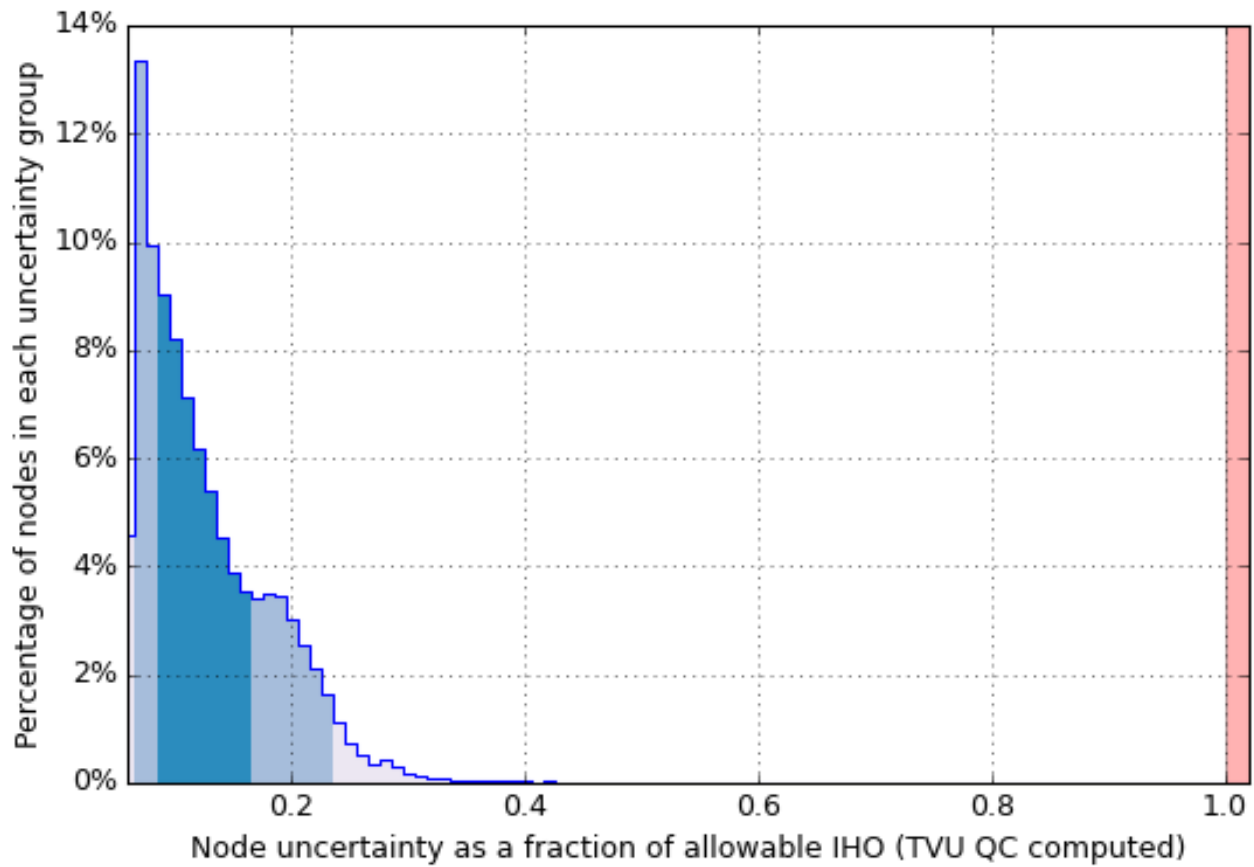


Figure 4: TVU Compliance to NOAA uncertainty standards as calculated using Pydro Finalized CSAR QA tool.

Uncertainty Standards

W00306_MB_32m_MLLW.csar: >99.9% nodes pass (84366/84371)

min=0.06, 5%=0.08, 25%=0.10, mode=0.10, median=0.13, 75%=0.17, 95%=0.25, max=1.34

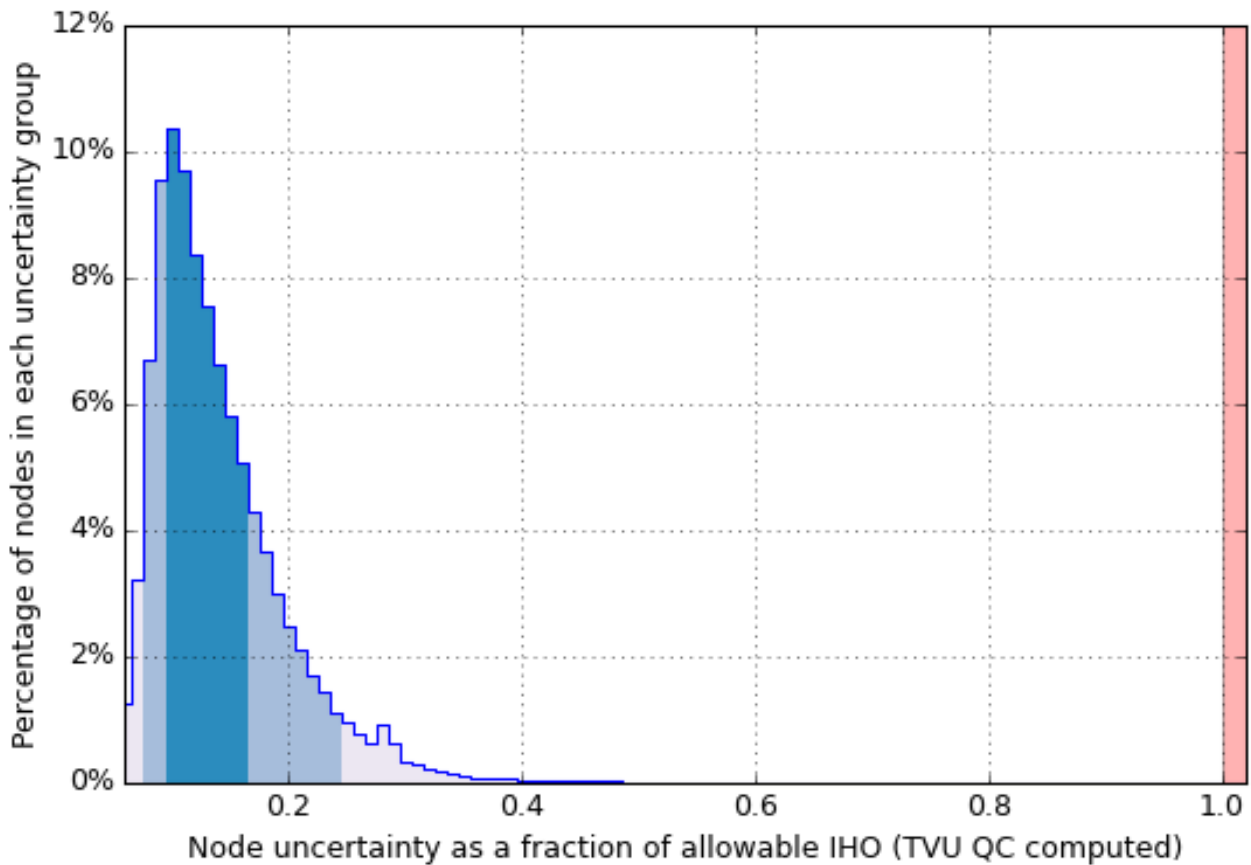


Figure 5: TVU Compliance to NOAA uncertainty standards as calculated using Pydro Finalized CSAR QA tool.

F. Results and Recommendations

The following are the largest scale RNC and ENC, which cover the survey area:

Chart	Scale	Edition	Edition Date	LNM Date	NM Date
18500	1:180789	30	05/2008	01/19/2016	02/19/2016
18480	1:176253	32	01/2013	01/19/2016	02/19/2016

ENC	Scale	Edition	Update Application Date	Issue Date	Preliminary?
US3WA03M	1:180789	18	11/18/2015	11/18/2015	NO
US3WA01M	1:176253	18	07/08/2013	06/03/2015	NO

Chart comparisons were performed using Caris sounding and contour layers based on the 32-meter combined CUBE surface. The soundings and contours were overlaid on the charts and compared for general agreement and to identify areas of significant change.

Charts 18500 and 18480

The comparison of selected soundings from W00306 to Chart 18500 showed general agreement in shoaler areas to within 6-fathoms and more variance in the deeper areas. The greatest difference in soundings was 60-fathoms along the 200-fathom contour. (Figure 6). The comparison of contours from W00306 to Chart 18500 and Chart 18480, respectively, showed general agreement (Figure 7 and 8).

Charts USWA01M and USWA03M

The comparison of depths and contours from both electronic charts coincided with the raster charts.

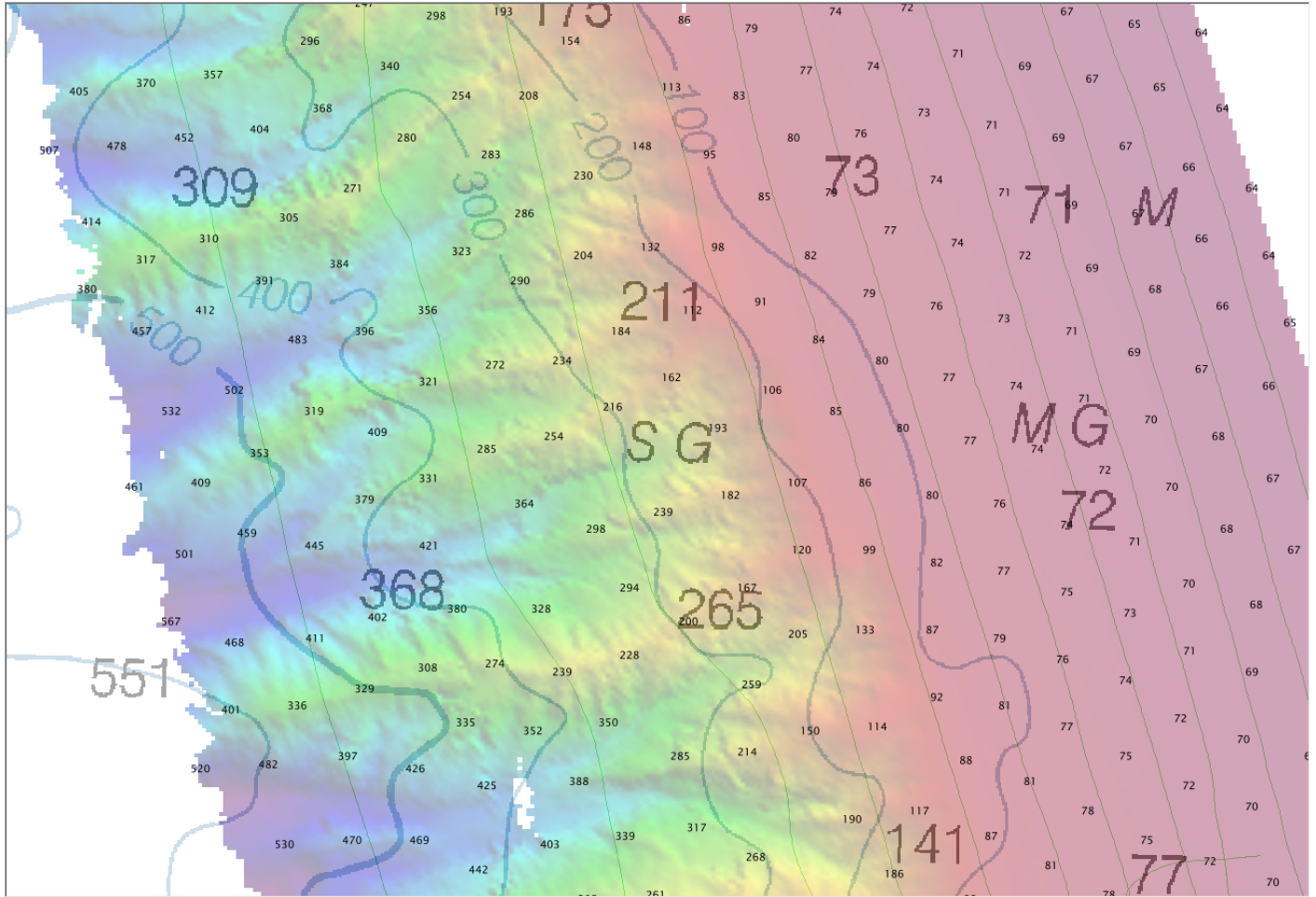


Figure 6: W00306 selected soundings overlaid on Chart 18500. All soundings in fathoms.

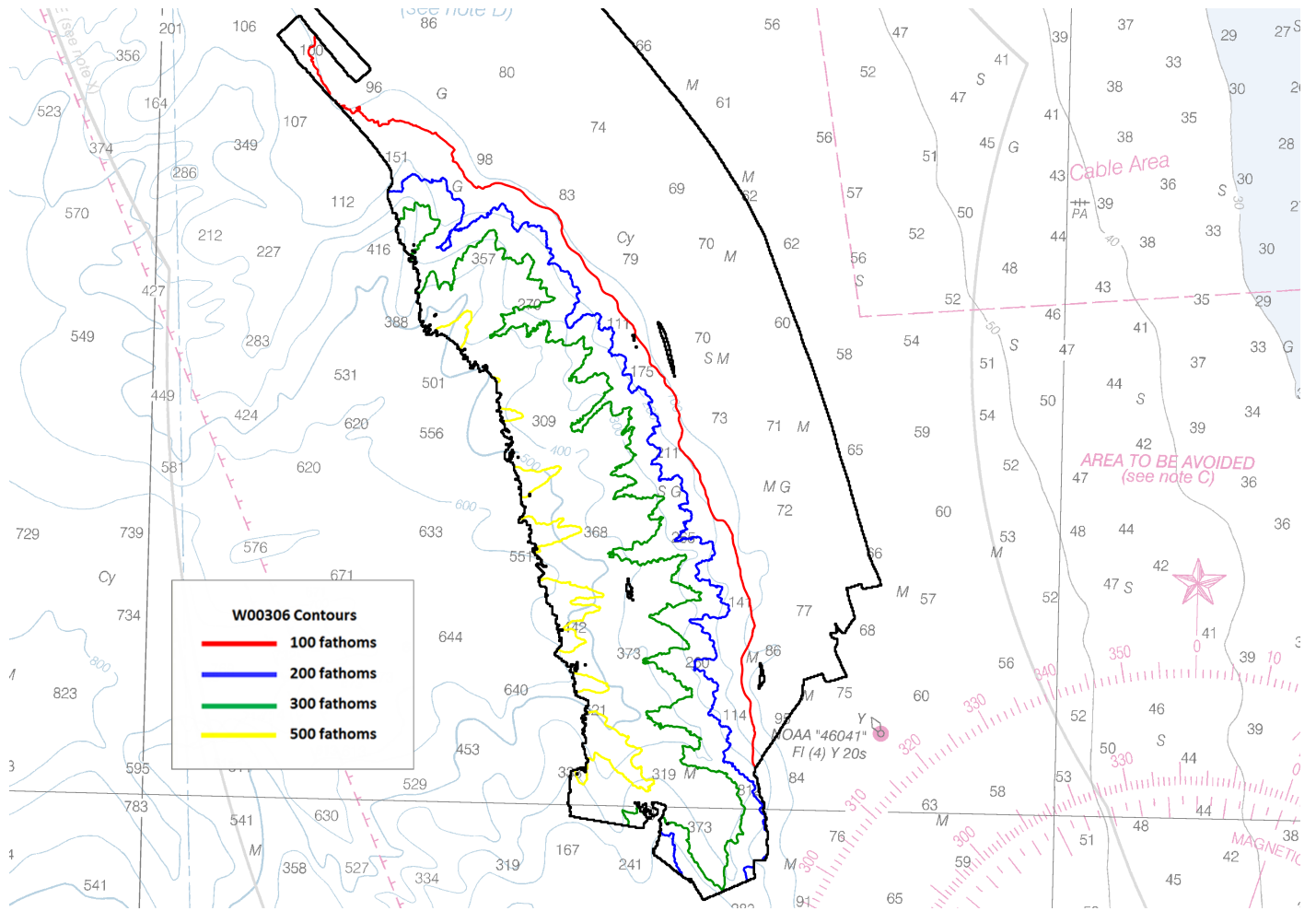


Figure 7: Chart 18500 overlaid with W00306 contours, south section.

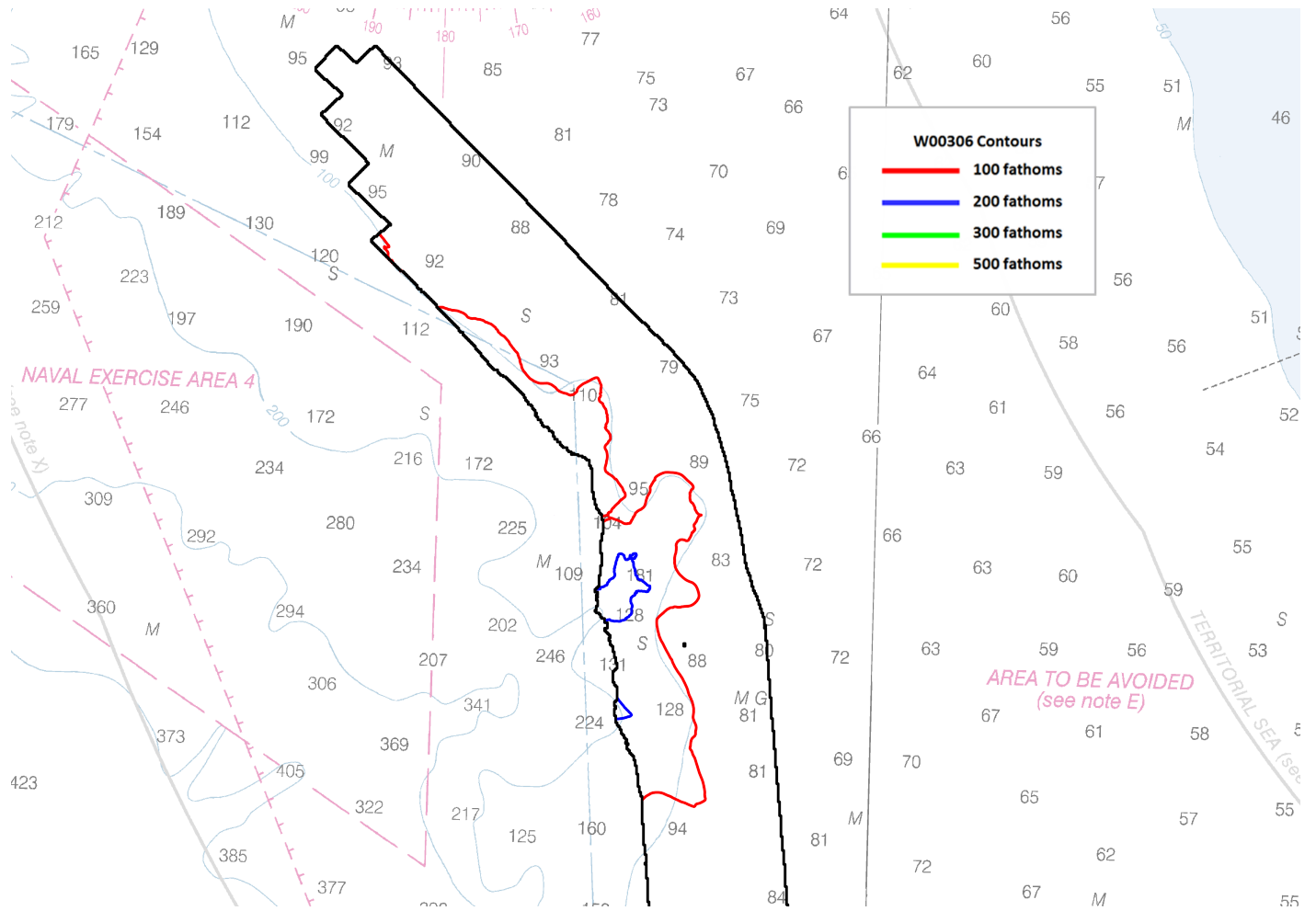


Figure 8: Chart 18480 overlaid with W00306 contours, north section.

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

Surface Name	Surface Type	Resolution	Depth Range	Surface Parameter	Purpose
W00306_MB_8m_MLLW	CUBE	8 m	115.90 m - 1078.49 m	NOAA_8m	Complete MBES
W00306_MB_16m_MLLW	CUBE	16 m	115.99 m - 1075.42 m	NOAA_16m	Complete MBES
W00306_MB_32m_MLLW	CUBE	32 m	116.10 m - 1075.40 m	NOAA_32m	Complete MBES
W00306_MB_8m_MLLW_final	CUBE	8 m	115.90 m - 160.00 m	NOAA_8m	Complete MBES
W00306_MB_16m_MLLW_final	CUBE	16 m	144.00 m - 319.99 m	NOAA_16m	Complete MBES

Surface Name	Surface Type	Resolution	Depth Range	Surface Parameter	Purpose
W00306_MB_32m_MLLW_final	CUBE	32 m	288.00 m - 1078.49 m	NOAA_32m	Complete MBES

G. Vertical and Horizontal Control

The vertical datum for this project is Mean Lower Low Water.

The vertical control method used for this survey was TCARI.

The following National Water Level Observation Network (NWLON) stations served as datum control for this survey:

Station Name	Station ID
Westport, WA	9441102
Neah Bay, WA	9443090
La Push, WA	9442396
Port Angeles, WA	9444090

The vertical datum for this project is Mean Lower Low Water. The following National Water Level Observation Network (NWLON) stations served as datum control for this survey:

A request for final approved tides was sent to N/OPS1 on 05/18/2016. The final tide note was received on 06/01/2016.

See attached Tide Note dated May 26, 2016.

The horizontal datum for this project is World Geodetic Survey 1984 (WGS 84 (G1674)). The projection used for this survey is UTM Zone 10N.

The following DGPS Stations were used for horizontal control:

DGPS Stations

The horizontal datum for this project is World Geodetic System (WGS 84 (G1674)). The projection used for this survey is UTM Zone 10N.

The Wide Area Augmentation System (WAAS) was used for positioning of these lines; all W00306 data meets HSSD horizontal accuracy requirements.

H. Additional Results

AWOIS Items

No AWOIS items were assigned for this survey.

Maritime Boundary Points

No Maritime Boundary Points were assigned for this survey.

Charted Features

No charted features exist for this survey.

Uncharted Features

No uncharted features exist for this survey.

Dangers to Navigation

No Danger to Navigation Reports were submitted for this survey.

Shoal and Hazardous Features

No shoals or potentially hazardous features exist for this survey.

Channels

No channels exist for this survey. There are no designated anchorages, precautionary areas, safety fairways, traffic separation schemes, pilot boarding areas, or channel and range lines within the survey limits.

Bottom Samples

There were no bottom samples assigned for this survey.

Shoreline

Shoreline was not assigned in the Hydrographic Survey Project Instructions or Statement of Work.

Prior Surveys

No prior survey comparisons exist for this survey.

Aids to Navigation

No Aids to Navigation (ATONs) exist for this survey.

Overhead Features

No overhead features exist for this survey.

Submarine Features

No submarine features exist for this survey.

Ferry Routes and Terminals

No ferry routes or terminals exist for this survey.

Platforms

No platforms exist for this survey.

Significant Features

No significant features exist for this survey.

Construction and Dredging

No present or planned construction or dredging exists within the survey limits.

New Survey Recommendation

No new surveys or further investigations are recommended for this area.

Inset Recommendation

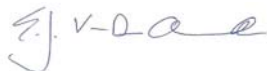



No new insets are recommended for this area.

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 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	Title	Date	Signature
Edward J. Van Den Ameele, CAPT/NOAA	Commanding Officer, NOAA Ship <i>Rainier</i>	09/20/2016	
Steven Loy, LT/NOAA	Field Operations Officer, NOAA Ship <i>Rainier</i>	09/20/2016	 Digitally signed by Steven Loy DN: cn=Steven Loy, o=NOAA, ou=NOAA RAINIER, email=ops.rainier@noaa.gov, c=US Date: 2016.09.23 15:02:10 -08'00'
James B. Jacobson	Chief Survey Technician, NOAA Ship <i>Rainier</i>	09/20/2016	 I am signing for CST Jacobson
Patricia Pyda	Hydrographic Assistant Survey Technician, NOAA Ship <i>Rainier</i>	09/20/2016	 Patricia Pyda



PROVISIONAL TIDE NOTE FOR HYDROGRAPHIC SURVEY

DATE : May 26, 2016

HYDROGRAPHIC BRANCH: Pacific
HYDROGRAPHIC PROJECT: M-N908-RA-2016
HYDROGRAPHIC SHEET: W00306

LOCALITY: Eastern Quinault Canyon, Washington Coast, WA
TIME PERIOD: May 09 - May 13, 2016

TIDE STATION USED: Port Angeles, WA 944-4090
Lat.48° 07.5' N Long. 123° 26.5' W

PLANE OF REFERENCE (MEAN LOWER LOW WATER): 0.000 meters
HEIGHT OF HIGH WATER ABOVE PLANE OF REFERENCE: 1.987 meters

TIDE STATION USED: La Push, WA 944-2396
Lat. 47° 54.8' N Long. 124° 38.2' W

PLANE OF REFERENCE (MEAN LOWER LOW WATER): 0.000 meters
HEIGHT OF HIGH WATER ABOVE PLANE OF REFERENCE: 2.362 meters

TIDE STATION USED: Neah Bay, WA 944-3090
Lat. 48° 22.2' Long. 124° 36.1'

PLANE OF REFERENCE (MEAN LOWER LOW WATER): 0.000 meters
HEIGHT OF HIGH WATER ABOVE PLANE OF REFERENCE: 2.168 meters

TIDE STATION USED: Westport, WA 944-1102
Lat. 46° 54.2' Long. 124° 06.3'

PLANE OF REFERENCE (MEAN LOWER LOW WATER): 0.000 meters
HEIGHT OF HIGH WATER ABOVE PLANE OF REFERENCE: 2.565 meters

REMARKS: RECOMMENDED Grid

Please use the TCARI grid "RA1601IOCM.tc" as the final grid for project M-N908-RA-2016, W00306, during the time period between May 09 and May 13, 2016.

Refer to attachments for grid information.

- Note 1: Provided time series data are tabulated in metric units (meters), relative to MLLW and on Greenwich Mean Time on the 1983-2001 National Tidal Datum Epoch (NTDE).
Note 2: Annual leveling for Port Angeles, WA (9444090) was not completed in FY15. A review of the verified leveling records from 2005-2014 shows the tide station benchmark network to be stable within an allowable tolerance. CO-OPS will immediately provide a revised Tide Note should subsequent leveling indicate any instability.

MICHALSKI.MICHAEL.PAUL.1280465174
L.PAUL.1280465174
Digitally signed by MICHALSKI.MICHAEL.PAUL.1280465174
DN: c=US, o=U.S. Government, ou=DoD, ou=PKI,
ou=OTHER, cn=MICHALSKI.MICHAEL.PAUL.1280465174
Date: 2016.06.01 17:05:03 -04'00'

CHIEF, PRODUCTS AND SERVICES BRANCH



**Preliminary as Final TCARI Grid for
M-N908-RA-2016, Registry No. W00306
Eastern Quinault Canyon**

★ 9443090 NEAH BAY, WA

★ 9444090 PORT ANGELES, WA

★ 9442396 LA PUSH, WA

★ 9441102 WESTPORT, WA

0 10
nautical miles

APPROVAL PAGE

W00306

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

- W00306_DR_Summary.pdf
- Collection of depth varied resolution BAGS
- Processed survey data and records
- W00306_GeoImage.pdf

The survey evaluation and verification has been conducted according current OCS Specifications.

Approved: _____

Peter Holmberg

Cartographic Team Lead, Pacific Hydrographic Branch

The survey has been approved for dissemination and usage of updating NOAA's suite of nautical charts.

Approved: _____

CDR Benjamin K. Evans, NOAA

Chief, Pacific Hydrographic Branch