F00826

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

DESCRIPTIVE REPORT

Type of Survey:	Natural Disaster Response
Registry Number:	F00826

LOCALITY

State(s):	Mississippi
General Locality:	Gulfport, MS
Sub-locality:	Gulfport Harbor

2020

CHIEF OF PARTY
LT John Kidd

LIBRARY & ARCHIVES

Date:

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

REGISTRY NUMBER:

HYDROGRAPHIC TITLE SHEET

F00826

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):	**Mississippi**
General Locality:	**Gulfport, MS**
Sub-Locality:	**Gulfport Harbor**
Scale:	**20000**
Dates of Survey:	**10/29/2020 to 10/29/2020**
Instructions Dated:	**10/29/2020**
Project Number:	**S-J943-NRT1-20**
Field Unit:	**NOAA Navigation Response Team - Stennis**
Chief of Party:	**LT John Kidd**
Soundings by:	**Multibeam Echosounder**
Imagery by:	**Side Scan Sonar**
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 16N, MLLW. All references to other horizontal or vertical datums in this report are applicable to the processed hydrographic data provided by the field unit.

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Descriptive Report to Accompany Survey F00826

Project: S-J943-NRT1-20

Locality: Gulfport, MS

Sublocality: Gulfport Harbor

Scale: 1:20000

October 2020 - October 2020

NOAA Navigation Response Team - Stennis

Chief of Party: LT John Kidd

A. Area Surveyed

The survey area is located in Gulfport, MS within the sub locality of Gulfport Harbor

A.1 Survey Limits

Data were acquired within the following survey limits:

Northwest Limit	Southeast Limit
30° 21' 39.93" N 89° 5' 40.95" W	30° 20' 52.49" N 89° 4' 51.86" W

Table 1: Survey Limits

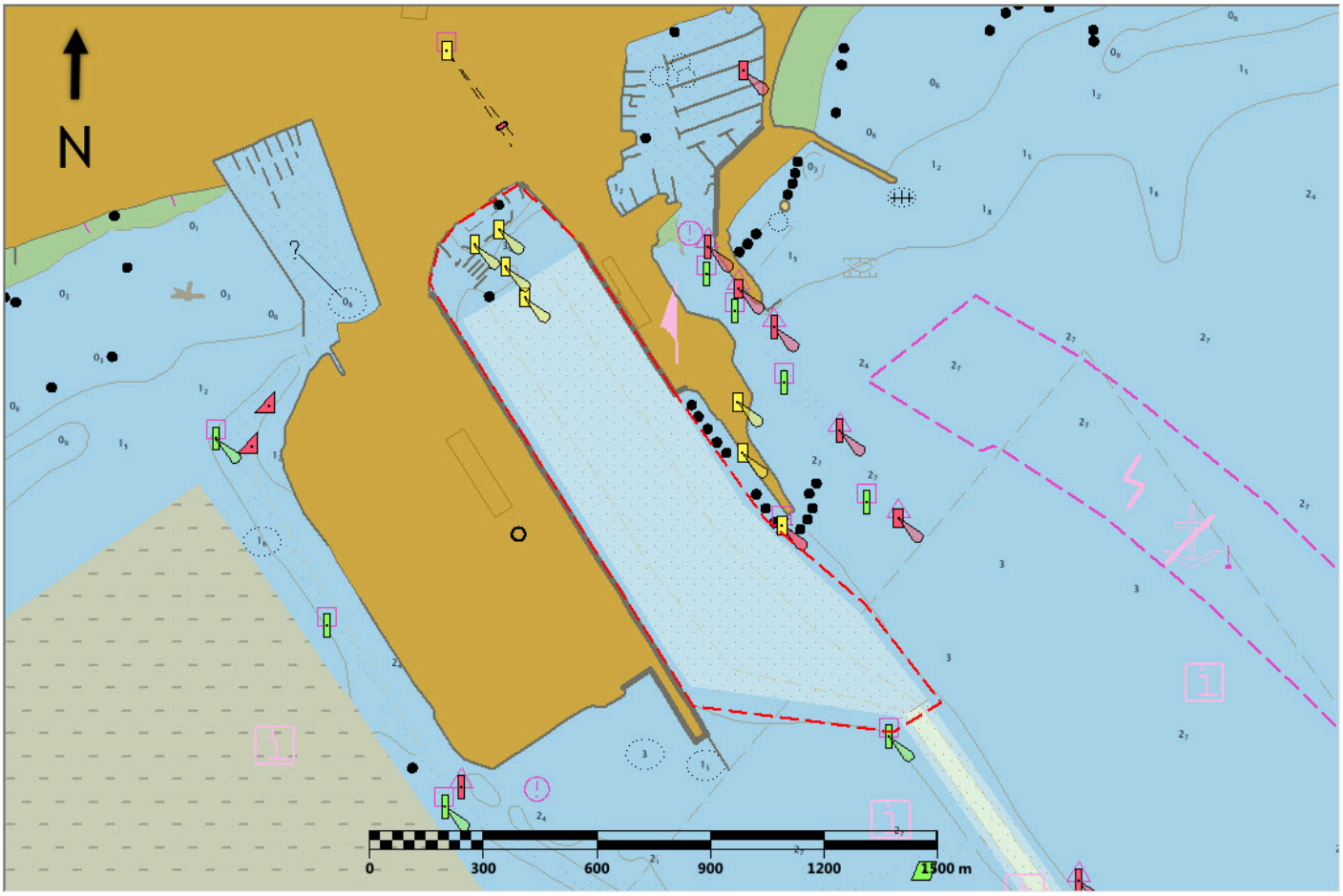


Figure 1: Project Reference file in red overlaid in ENC US5MS11M

Data were acquired to the survey limits in accordance with the requirements in the Project Instructions and the April 2020 NOS Hydrographic Surveys Specifications and Deliverables (HSSD). In all areas where the 3.5 meter depth contour or the sheet limits were not met, the Navigable Area Limit Line (NALL) was defined as the inshore limit of bathymetry due to the risks of maneuvering the survey vessel in close proximity to the steep and rocky shoreline.

A.2 Survey Purpose

USACE has requested a hydrographic survey in the Gulfport Harbor due to reports of containers being flipped and upended by Hurricane Zeta. There is concerns of possible containers in the harbor and them being a hazard to deep draft vessels trying to dock. Survey data from this project is intended to supersede all prior survey data in the common area.

A.3 Survey Quality

The entire survey is adequate to supersede previous data.

Data acquired in F00826 meets Object Detection CATZOC 1A.

A.4 Survey Coverage

The following table lists the coverage requirements for this survey as assigned in the project instructions:

Water Depth	Coverage Required
All waters in survey area	Object Detection Coverage (Refer to HSSD Section 5.2.2.2)

Table 2: Survey Coverage

The entirety of F00826 was acquired in accordance with the 200% SSS with concurrent MBES coverage standard, meeting the requirements listed above and in the HSSD.

A portion of the survey limits was not completed due to accessibility and safety of navigation.

A holiday exists in the 200% SSS coverage that the concurrent MBES bathymetry does not resolve.

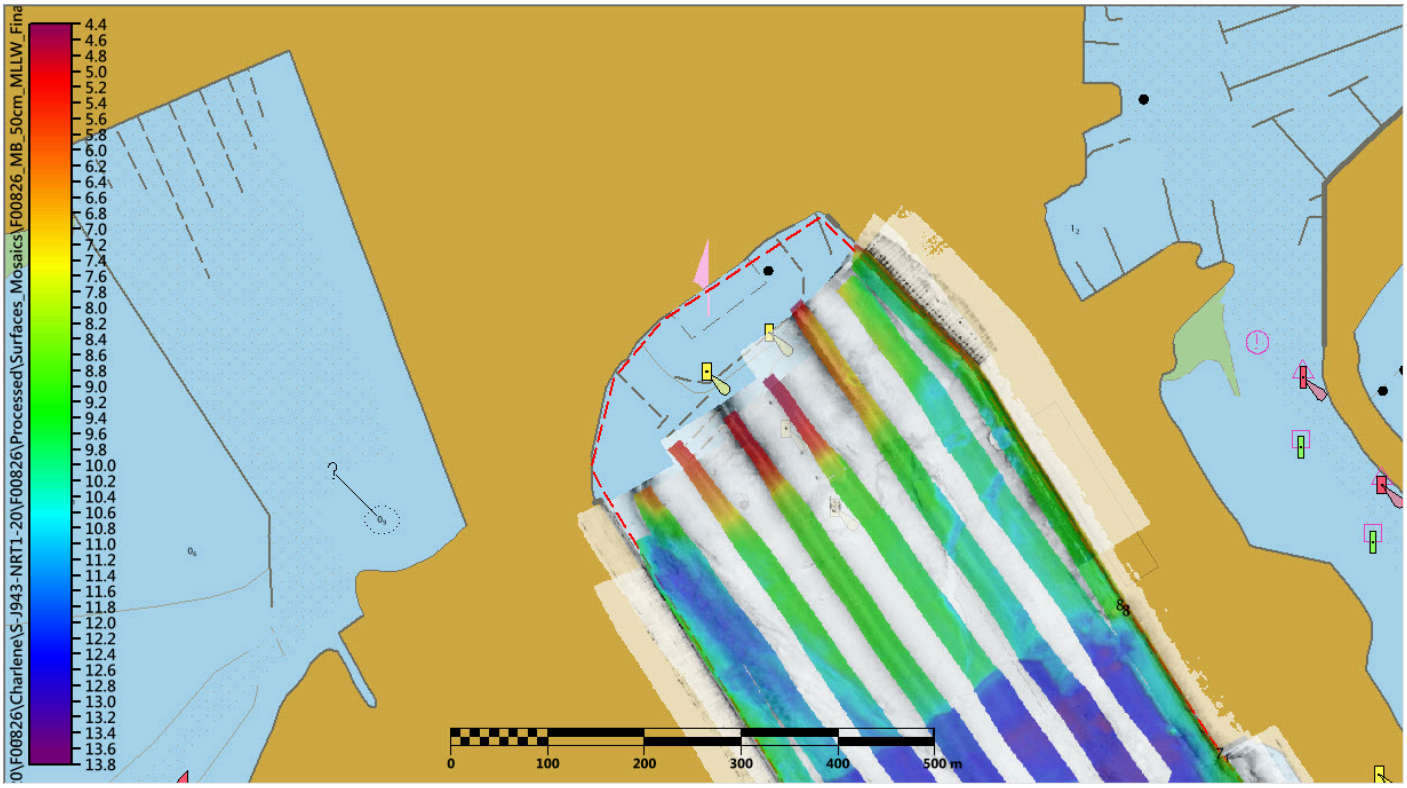


Figure 2: Inaccessible area northern portion of harbor

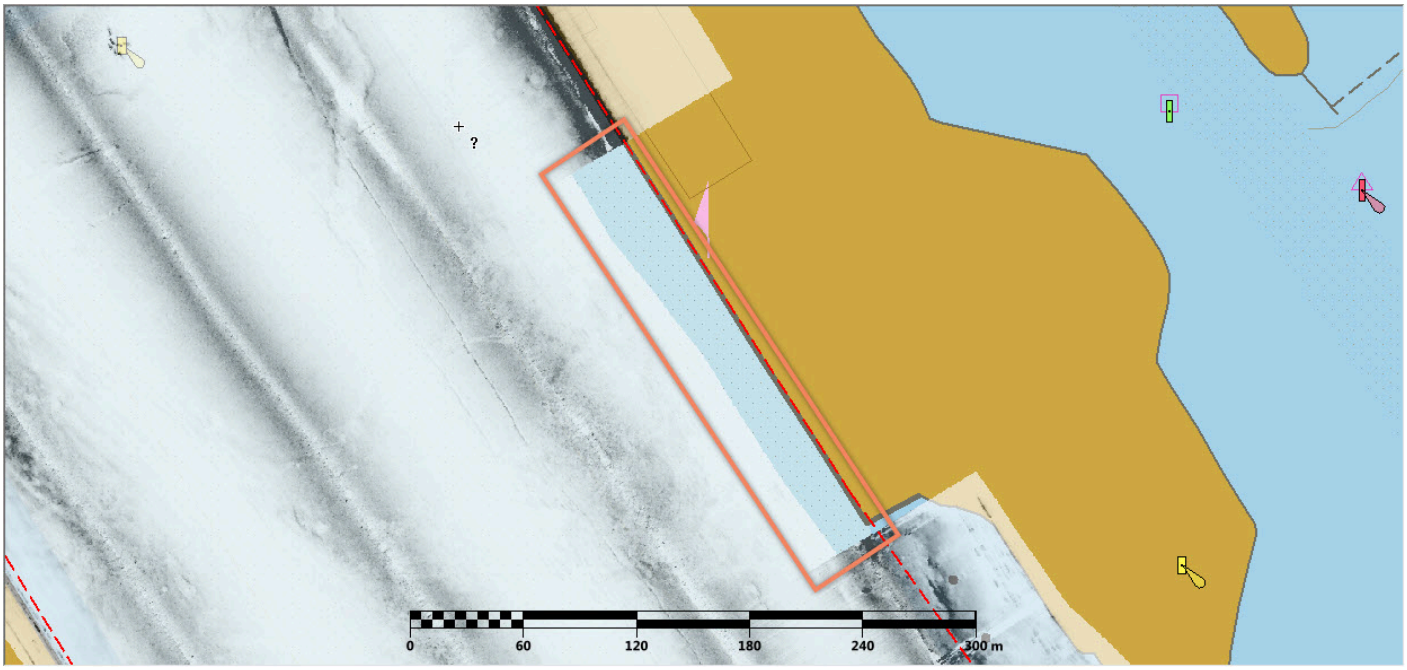


Figure 3: Gap in 200% SSS coverage

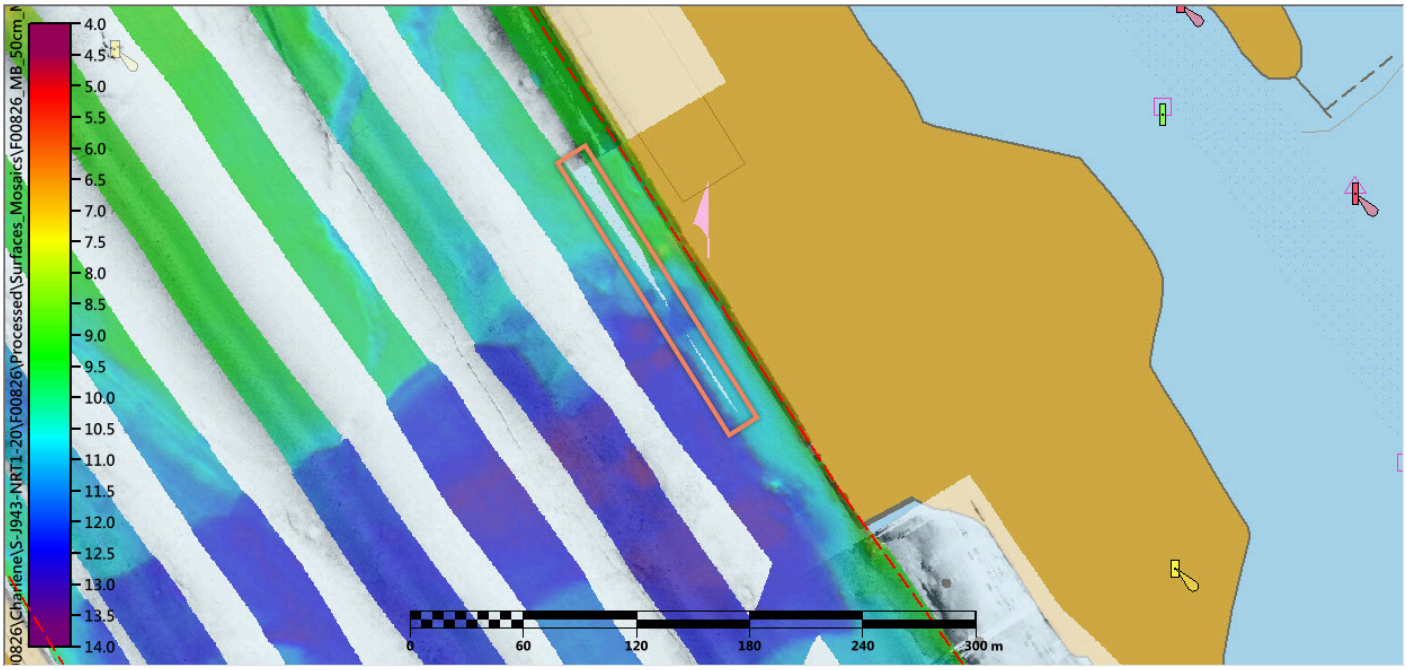


Figure 4: Concurrent MBES coverage and final resulting holiday.

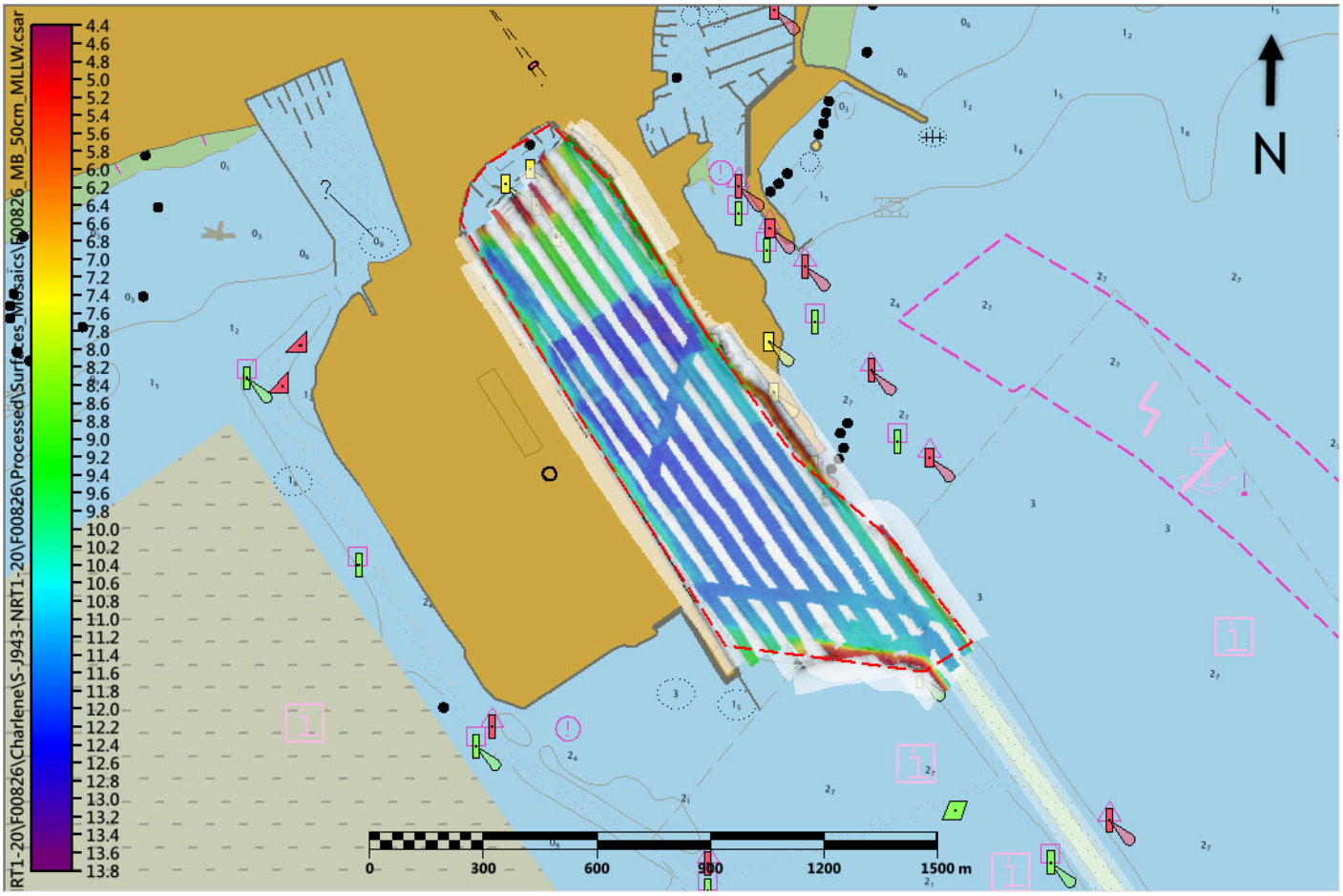


Figure 5: 200% SSS coverage with concurrent MBES overlaid on ENC US511M

A.6 Survey Statistics

The following table lists the mainscheme and crossline acquisition mileage for this survey:

	HULL ID	*NRT1_S3005*	*Total*
LNM	**SBES Mainscheme**	0.00	0.00
	MBES Mainscheme	7.53	7.53
	Lidar Mainscheme	0.00	0.00
	SSS Mainscheme	7.23	7.23
	SBES/SSS Mainscheme	0.00	0.00
	MBES/SSS Mainscheme	0.00	0.00
	SBES/MBES Crosslines	0.61	0.61
	Lidar Crosslines	0.00	0.00
Number of Bottom Samples			0
Number Maritime Boundary Points Investigated			0
Number of DPs			0
Number of Items Investigated by Dive Ops			0
Total SNM			0.180

Table 3: Hydrographic Survey Statistics

The following table lists the specific dates of data acquisition for this survey:

Survey Dates	Day of the Year
10/29/2020	303

Table 4: Dates of Hydrography

B. Data Acquisition and Processing

B.1 Equipment and Vessels

Refer to the S-J943-NRT1-20 Data Acquisition and Processing Report (DAPR) for a complete description of data acquisition and processing systems, survey vessels, quality control procedures and data processing methods. Additional information to supplement sounding and survey data, and any deviations from the DAPR, are discussed in the following sections.

B.1.1 Vessels

The following vessels were used for data acquisition during this survey:

Hull ID	***NRT1_S3005***
LOA	31 feet
Draft	1.2 feet

Table 5: Vessels Used

B.1.2 Equipment

The following major systems were used for data acquisition during this survey:

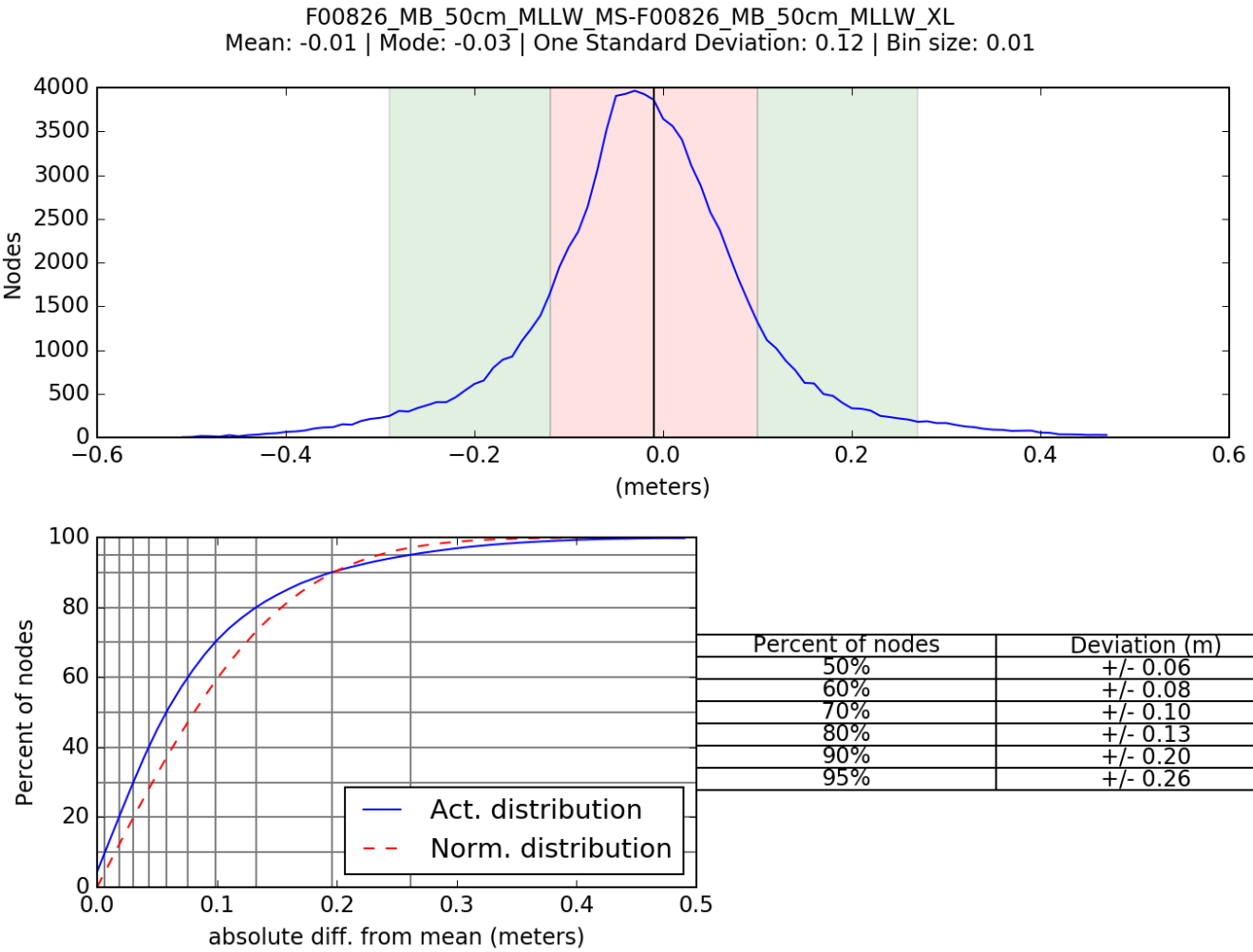
Manufacturer	Model	Type
Kongsberg Maritime	EM 2040C	MBES
EdgeTech	4125	SSS
Applanix	POS MV 320 v5	Positioning and Attitude System
AML Oceanographic	MicroX SV	Sound Speed System
YSI	CastAway-CTD	Conductivity, Temperature, and Depth Sensor

Table 6: Major Systems Used

B.2 Quality Control

B.2.1 Crosslines

Multibeam crosslines acquired for this survey totaled 8.1% of mainscheme acquisition. Mainscheme data were compared with a crossline analysis. Crosslines were collected, processed and compared in accordance with Section 5.2.4.32 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, and is submitted in the Separates II Digital Data folder. Using Pydro Compare Grids statistics show the mean difference between the depths derived from mainscheme data and crossline data was -0.01 meters (with mainscheme being deeper) and 95% of nodes falling within +/-0.26 meters. For the respective depths, the difference surface was compared to the allowable NOAA uncertainty standards. In total, 99.5+% of the depth differences between F00826 mainscheme and crossline data were within allowable NOAA uncertainties.



Percent of nodes	Deviation (m)
50%	+/- 0.06
60%	+/- 0.08
70%	+/- 0.10
80%	+/- 0.13
90%	+/- 0.20
95%	+/- 0.26

Figure 6: Pydro Compare Grids Plot mainscheme vs. crosslines

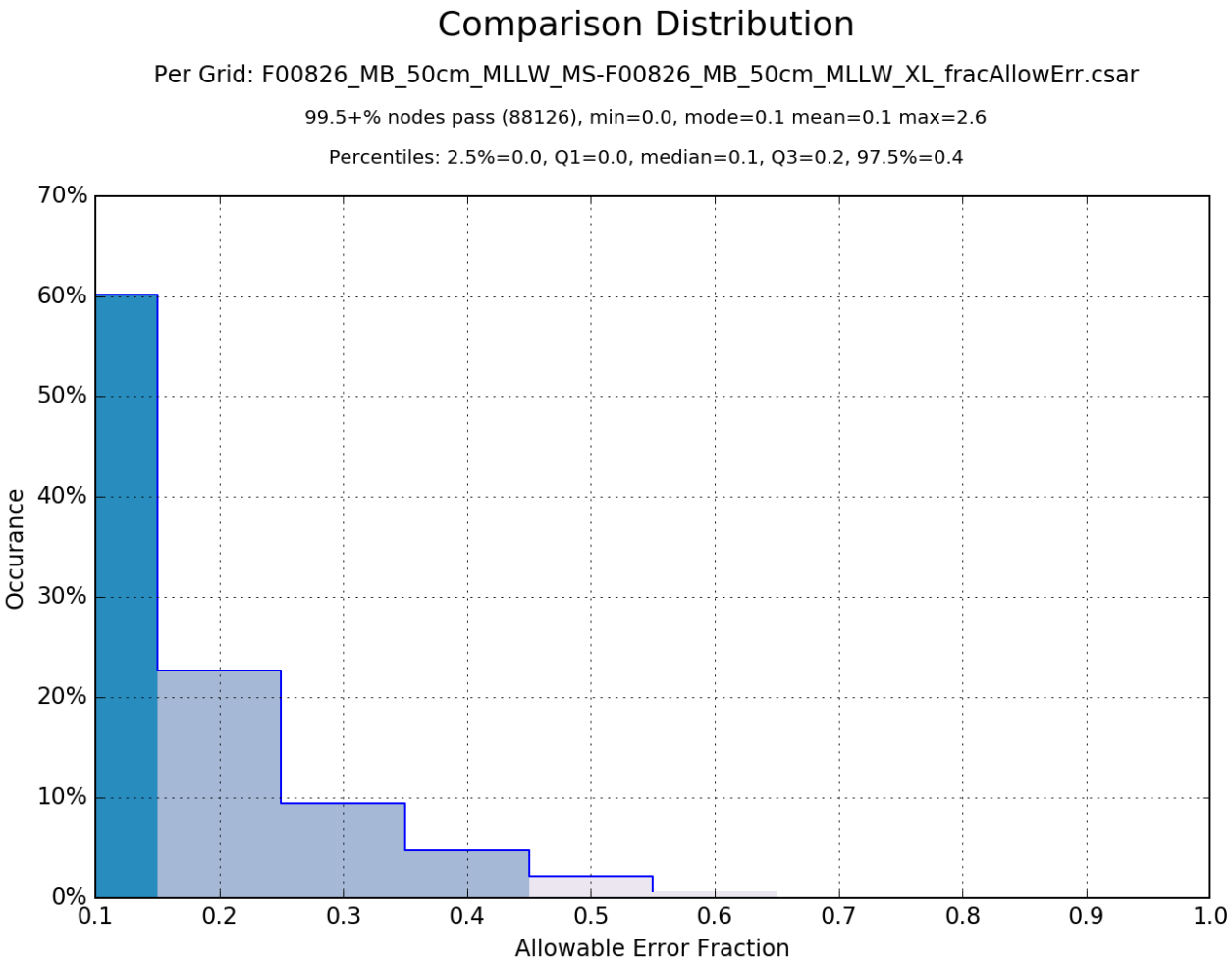


Figure 7: Pydro Compare grids Comparison Distribution plot

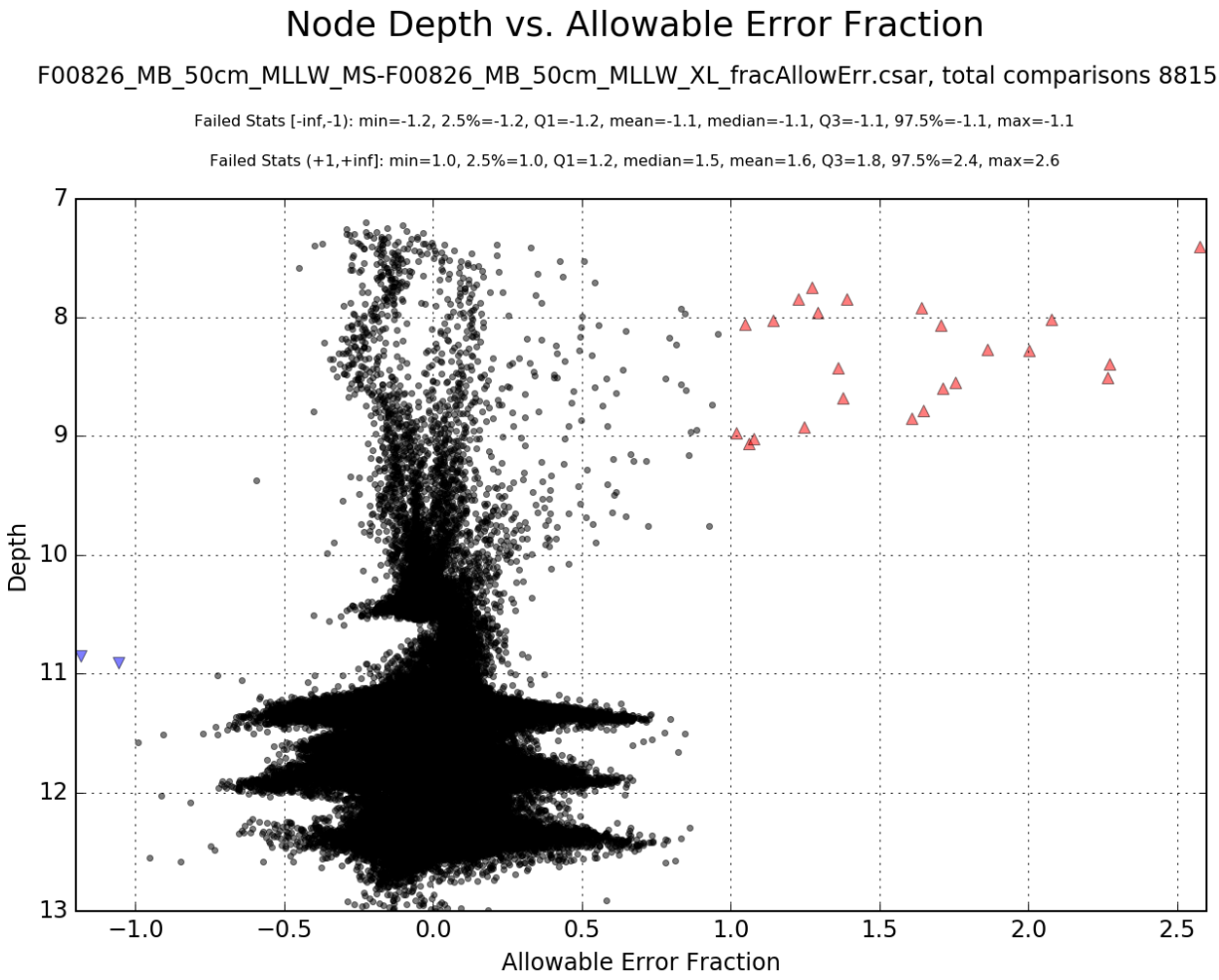


Figure 8: Pydro Compare Grids Node vs. Allowable Error Fraction

B.2.2 Uncertainty

The following survey specific parameters were used for this survey:

Method	Measured	Zoning
ERS via VDATUM	0.000 meters	0.170 meters

Table 7: Survey Specific Tide TPU Values.

Hull ID	Measured - CTD	Measured - MVP	Measured - XBT	Surface
S3005	2.00 meters/second	0.00 meters/second	0.00 meters/second	0.20 meters/second

Table 8: Survey Specific Sound Speed TPU Values.

In addition to the usual a priori estimates of uncertainty provided via device models for vessel motion, VDatum, and real-time and post-processed uncertainty sources were also incorporated into the depth estimates of survey F00826. Real-time uncertainties were provided via MBES data and Applanix Delayed Heave RMS. Following post-processing of the real-time vessel motion, recomputed uncertainties of vessel GPS height and navigation were applied in CARIS HIPS and SIPS via a Smoothed Best Estimate of Trajectory (SBET) RMS file generated in Applanix POSPac.

B.2.3 Junctions

None exist for this survey.

There are no contemporary surveys that junction with this survey.

B.2.4 Sonar QC Checks

Sonar system quality control checks were conducted as detailed in the quality control section of the DAPR.

B.2.5 Equipment Effectiveness

There were no conditions or deficiencies that affected equipment operational effectiveness.

B.2.6 Factors Affecting Soundings

Dual Density Layer

A dual density layer is evident in the data set resulting in higher vertical uncertainty in certain areas but does not degrade the overall quality of the survey.

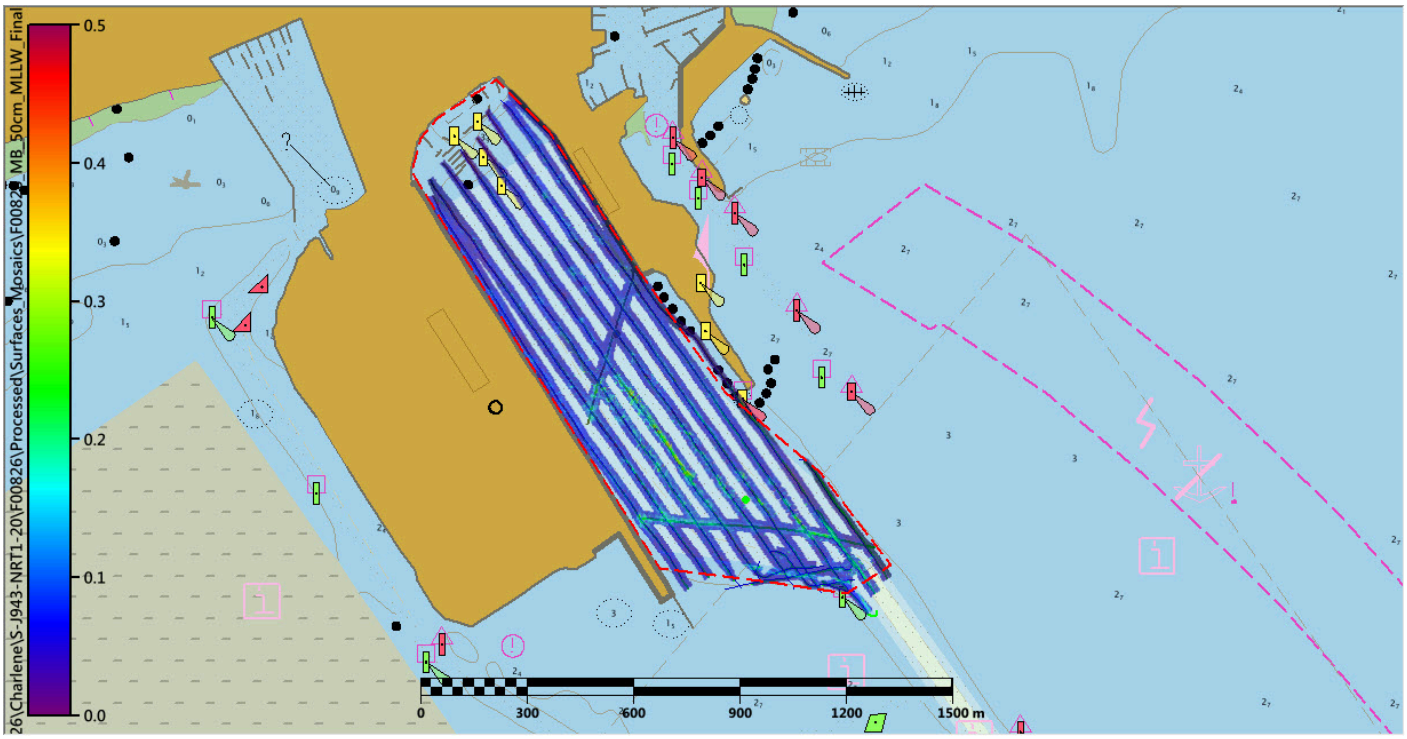


Figure 9: F00826_MB_50cm_MLLW_Final.csar Node Std Dev layer overview

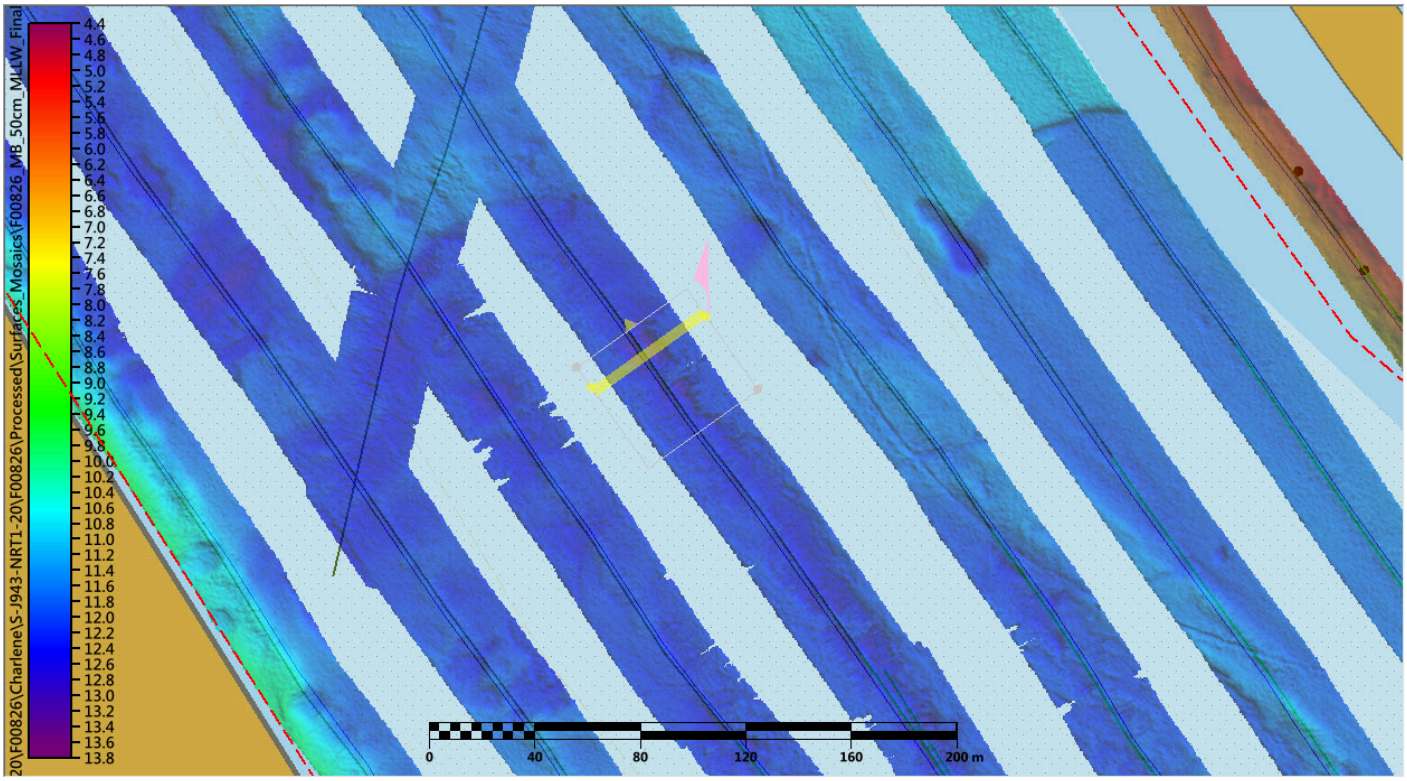


Figure 10: Subset area over depth layer

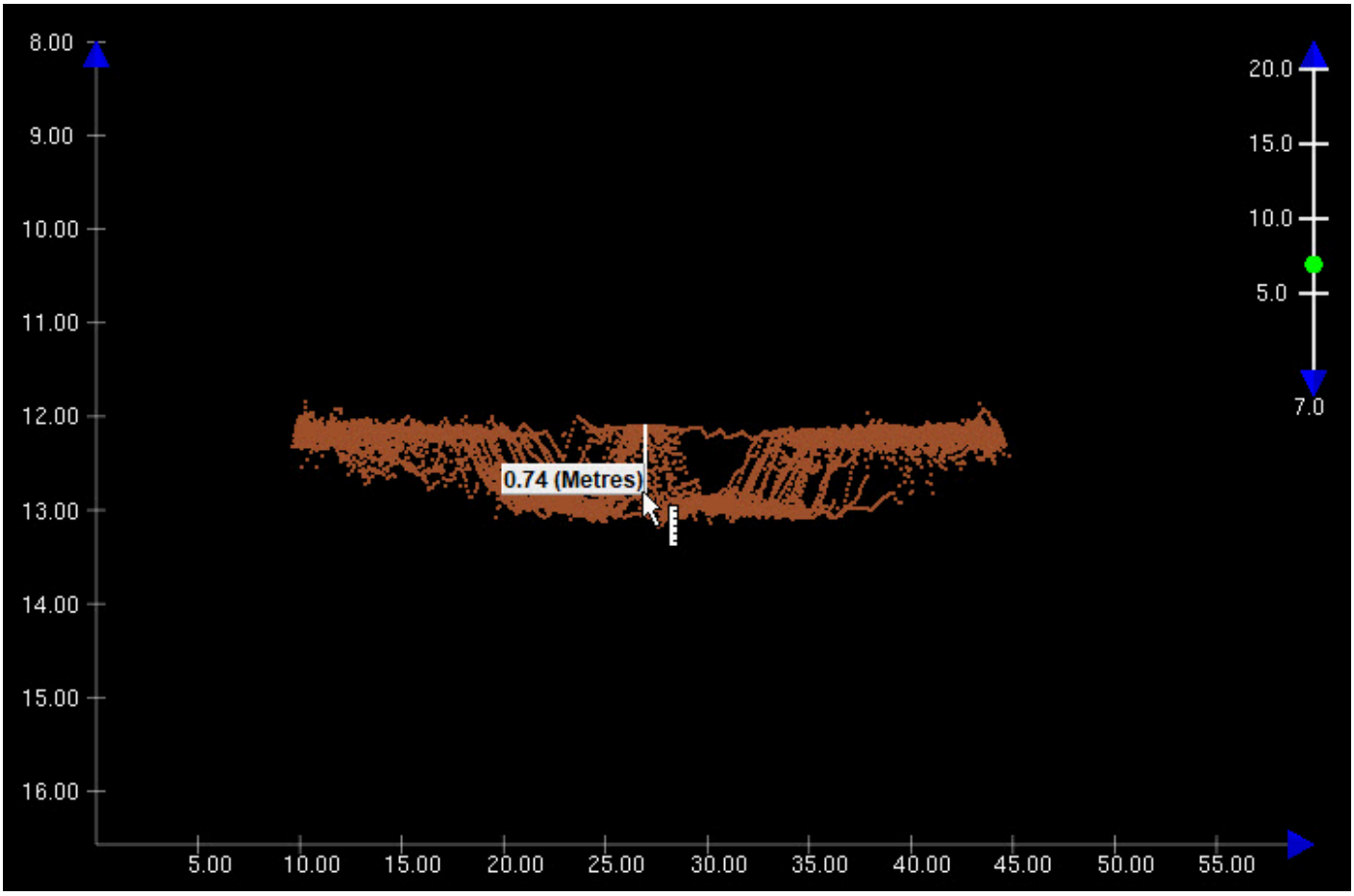


Figure 11: 2D subset view of vertical difference in soundings

B.2.7 Sound Speed Methods

Sound Speed Cast Frequency: Every 2 hours

Casts were conducted at a minimum of one every two hours during launch acquisition. Casts were conducted more frequently in areas where the influx of freshwater had an effect on the speed of sound in the water column and when there was a change in surface sound speed greater than two meters per second. All sound speed methods were used as detailed in the DAPR.

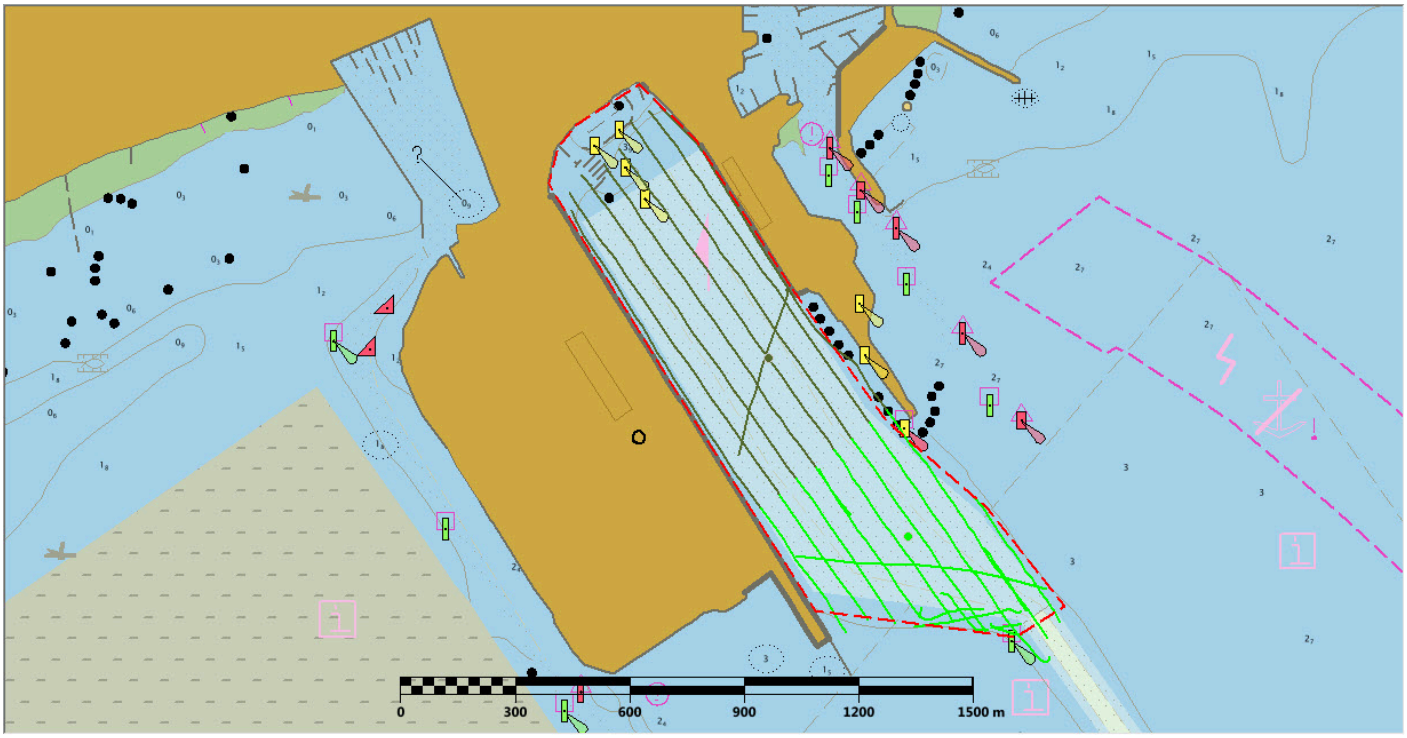


Figure 12: Overview of sound speed cast distribution

B.2.8 Coverage Equipment and Methods

All equipment and survey methods were used as detailed in the DAPR.

B.2.9 Density

The surface was analyzed using the HydrOffice QC Tools Grid QA feature and the results are shown below. Density requirements for F00826 were achieved with at least 99% of surface nodes containing five or more soundings as required by HSSD Section 5.2.2.3. The few nodes that did not meet density requirements are due to sparse data in the outer beams, especially near steep slopes and rocky areas where acoustic shadowing occurred, and at the edges of the survey limits. See below for the individual graph of density requirements.

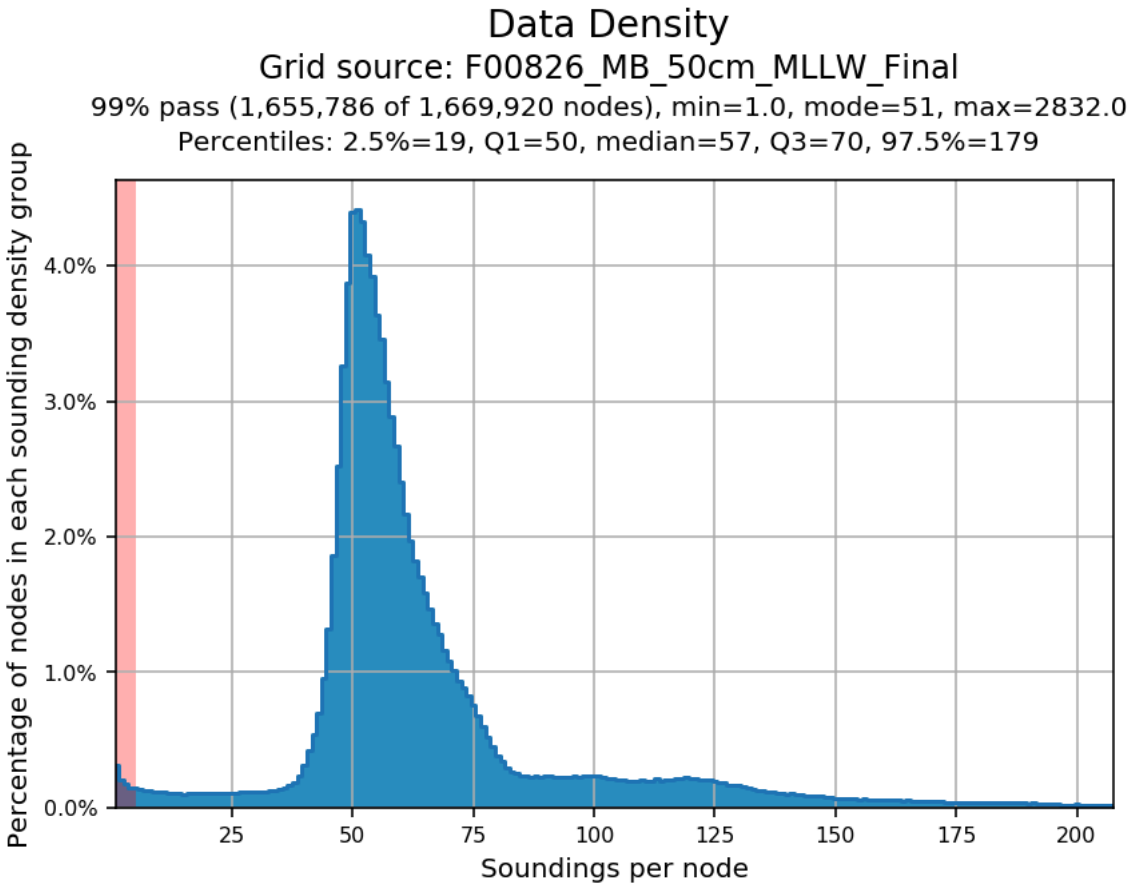


Figure 13: F00826 Data Density plot results from Pydro QC Tools

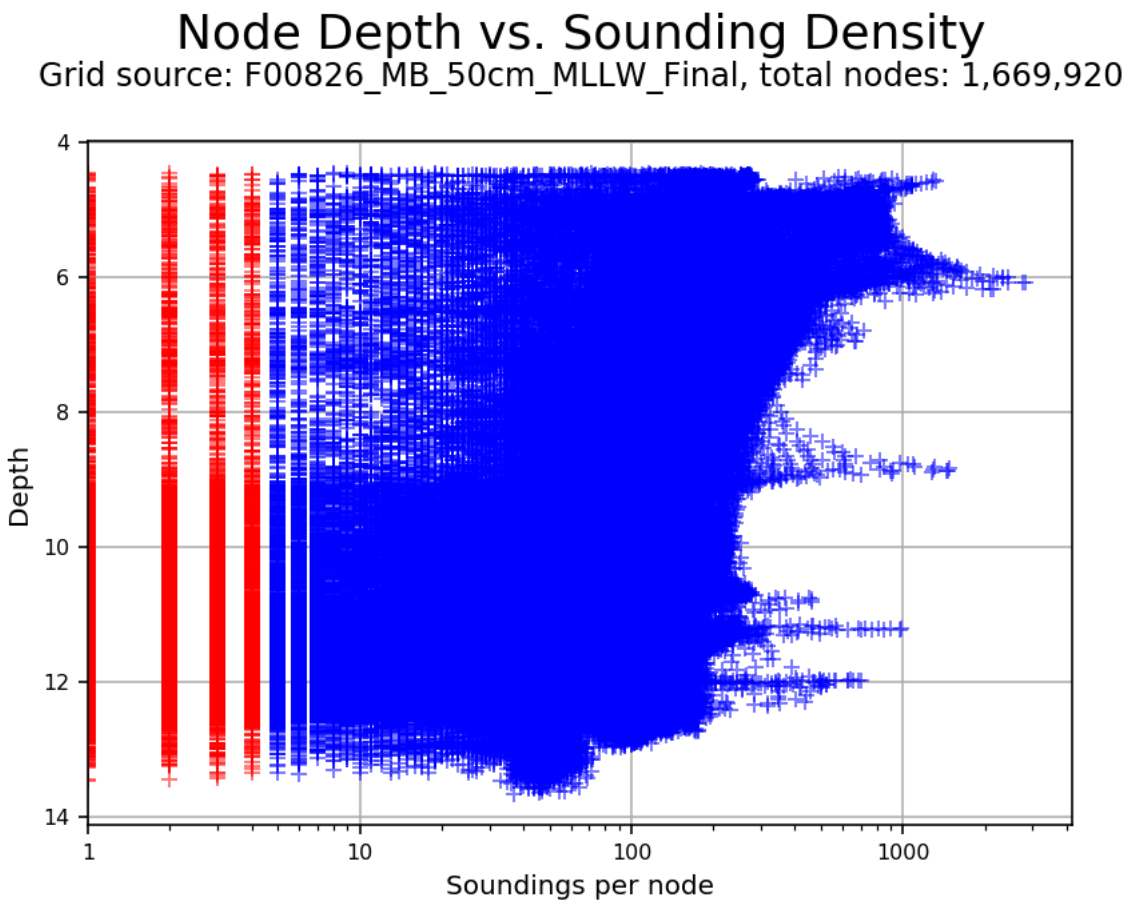


Figure 14: F00826 Node Depth vs. Sounding Density plot result from Pydro QC Tools

B.2.10 Total Vertical Uncertainty

The surface was analyzed using the HydroOffice QC Tools Grid QA feature and the results are shown below. Total Vertical Uncertainty is determined by a ratio of uncertainty to allowable error per NOAA and IHO specification: TVU\, QC = Uncertainty / \sqrt{A^2 + (B * Depth)^2}. Where A = 0.5, B = 0.013 for Order 1 (depths less than 100 m), and A = 1.0, B = 0.023 for Order 2 (depths greater than 100 m). TVU requirements for survey F00826 were achieved with 99% of nodes passing.

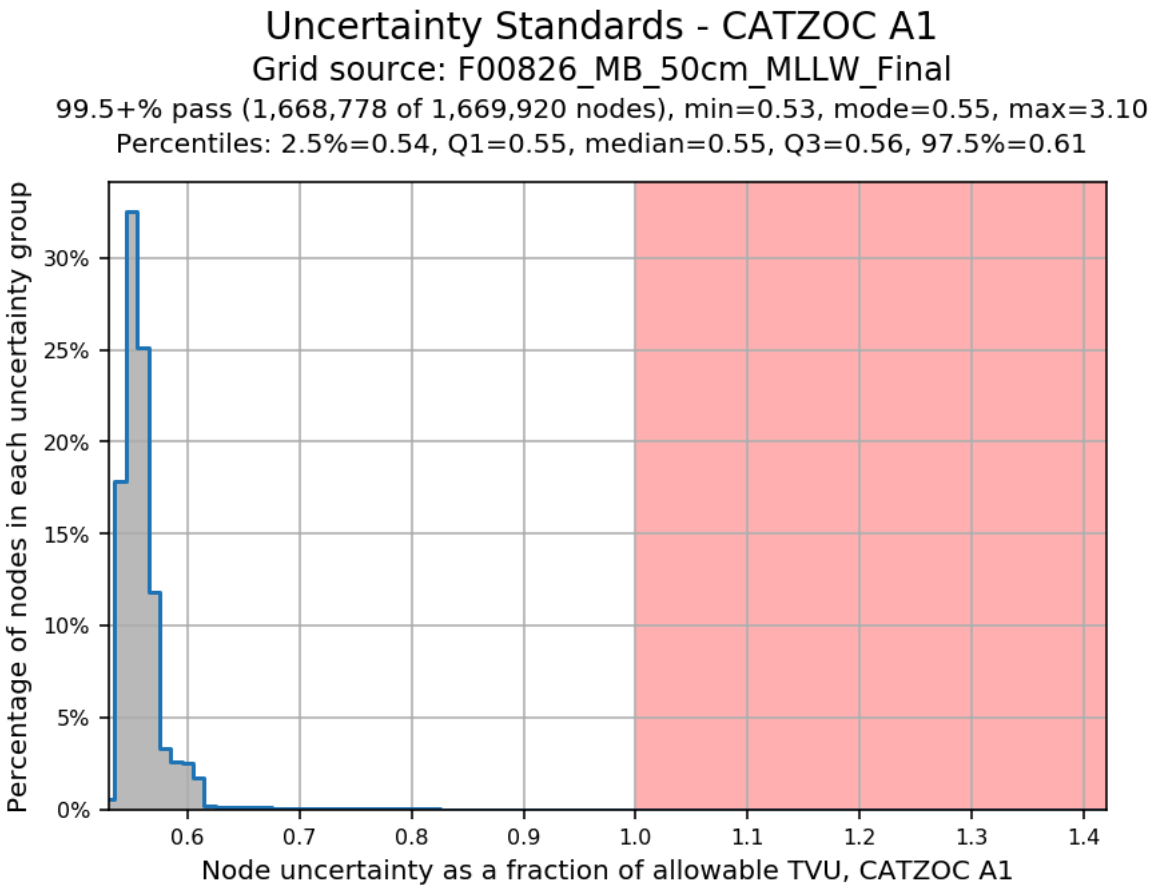


Figure 15: Plot display of Node Uncertainty as fraction of allowable TVU meeting CATZOC A1

B.3 Echo Sounding Corrections

B.3.1 Corrections to Echo Soundings

All data reduction procedures conform to those detailed in the DAPR.

B.3.2 Calibrations

All sounding systems were calibrated as detailed in the DAPR.

B.4 Backscatter

All equipment and survey methods were used as detailed in the DAPR. Raw backscatter data is logged as .all file for delivery to NOAA's Pacific Hydrographic Branch. NOAA's Navigation Response Branch field units are waived from producing backscatter mosaics for the 2020 field season.

B.5 Data Processing

B.5.1 Primary Data Processing Software

The following Feature Object Catalog was used: NOAA Profile Pool 2020.

B.5.2 Surfaces

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

Surface Name	Surface Type	Resolution	Depth Range	Surface Parameter	Purpose
F00826_MB_50cm_MLLW	CARIS Raster Surface (CUBE)	0.5 meters	4.454 meters - 13.657 meters	NOAA_0.5m	Concurrent MBES
F00826_MB_50cm_MLLW_Final	CARIS Raster Surface (CUBE)	0.5 meters	4.454 meters - 13.657 meters	NOAA_0.5m	Concurrent MBES
F00826_SSSAB_50cm_450kHz_1of2	SSS Mosaic	0.5 meters	-	NOAA_0.5m	200% SSS
F00826_SSSAB_50cm_450kHz_2of2	SSS Mosaic	0.5 meters	-	NOAA_0.5m	200% SSS

Table 9: Submitted Surfaces

The NOAA CUBE parameters defined in the HSSD were used for the creation of all CUBE surfaces for F00826. 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 sea floor. 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 all remaining flagged fliers were deemed to be valid aspects of the steep slopes and dynamic nature of the seafloor.

C. Vertical and Horizontal Control

Additional information discussing the vertical or horizontal control for this survey can be found in the accompanying HVCR.

C.1 Vertical Control

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

ERS Datum Transformation

The following ellipsoid-to-chart vertical datum transformation was used:

Method	Ellipsoid to Chart Datum Separation File
ERS via VDATUM	S-J943_Vdatum_100m_NAD83-MLLW_geoid12b.csar

Table 10: ERS method and SEP file

C.2 Horizontal Control

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 16.

The following PPK methods were used for horizontal control:

- RTX

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 Root Mean Square (RMS) data were applied to all MBES data in HIPS and SIPS.

WAAS

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

D. Results and Recommendations

D.1 Chart Comparison

A comparison was performed between survey F00826 and ENC US5MS11M using CARIS HIPS and SIPS sounding and contour layers derived from the 0.50 meter surface. The contours and soundings were overlaid on the chart to assess differences between the surveyed soundings and charted depths. ENCs were compared to a 0.50 meter grid using the HydroOffice CA Tools by extracting all soundings from the chart and creating an interpolated TIN which then generates a comparison to the CSAR grid. The survey soundings are categorized, within the triangles of the TIN, using the vertical distance. The flags alert both for dangers to navigation (DtoNs) or chart discrepancies. All data from F00826 should supersede charted data.

In general, survey soundings agree with the ENC soundings for US5MS11M. Discrepancies only arise in a few areas where all of the produced soundings are deeper than the ranges specified by the ENC. Two sounding discrepancies were produced as shoaler depths, but rest against the eastern pier face are of no concern. Potential Dangers to Navigation were flagged by CA Tools as well, These are deemed insignificant as the cluster of soundings that are shoaling, but well below the ENC soundings range

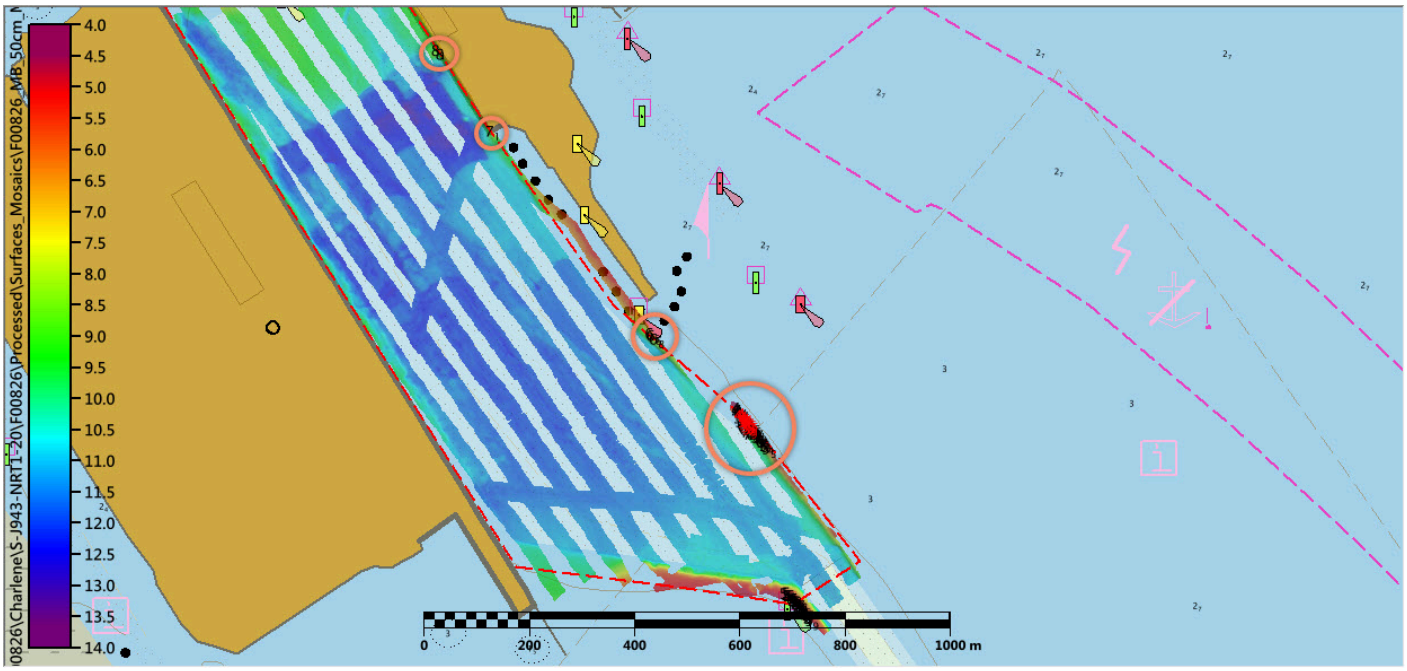


Figure 16: Overview of CA produced soundings overlaid on ENC US5MS11M

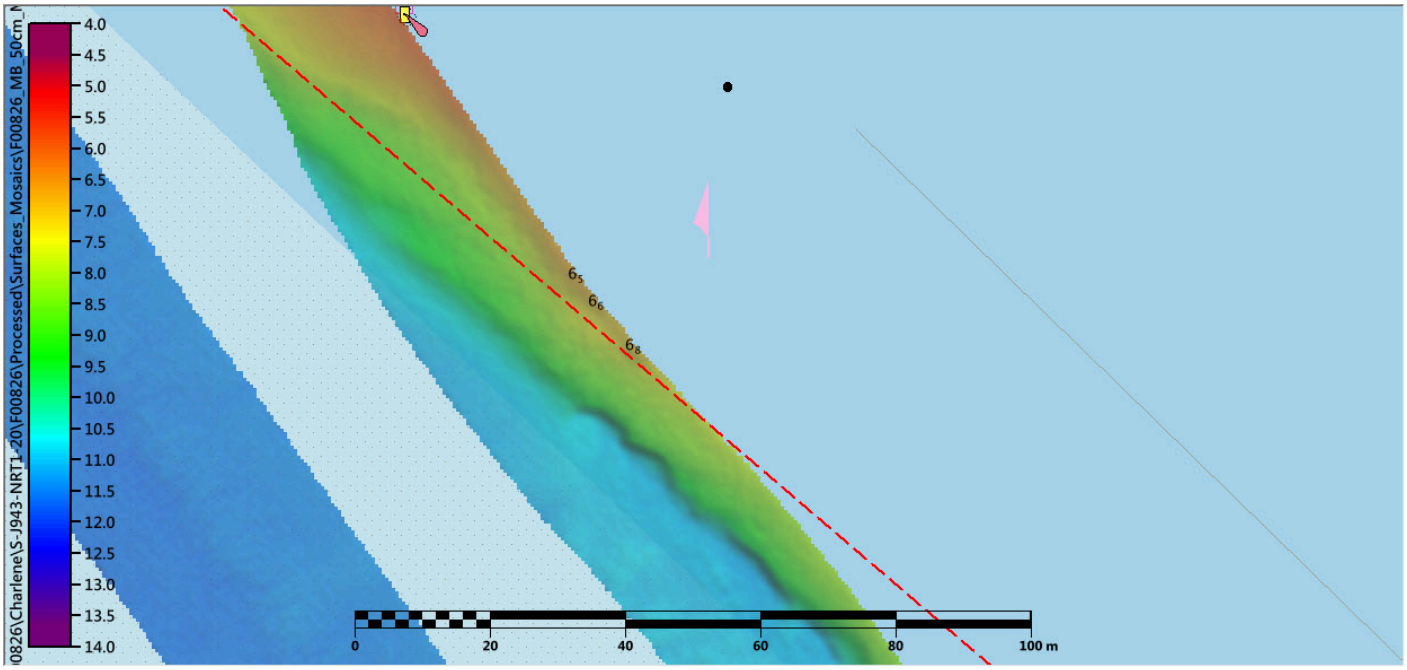


Figure 17: Selection of sounding discrepancies deeper than ENC depth range

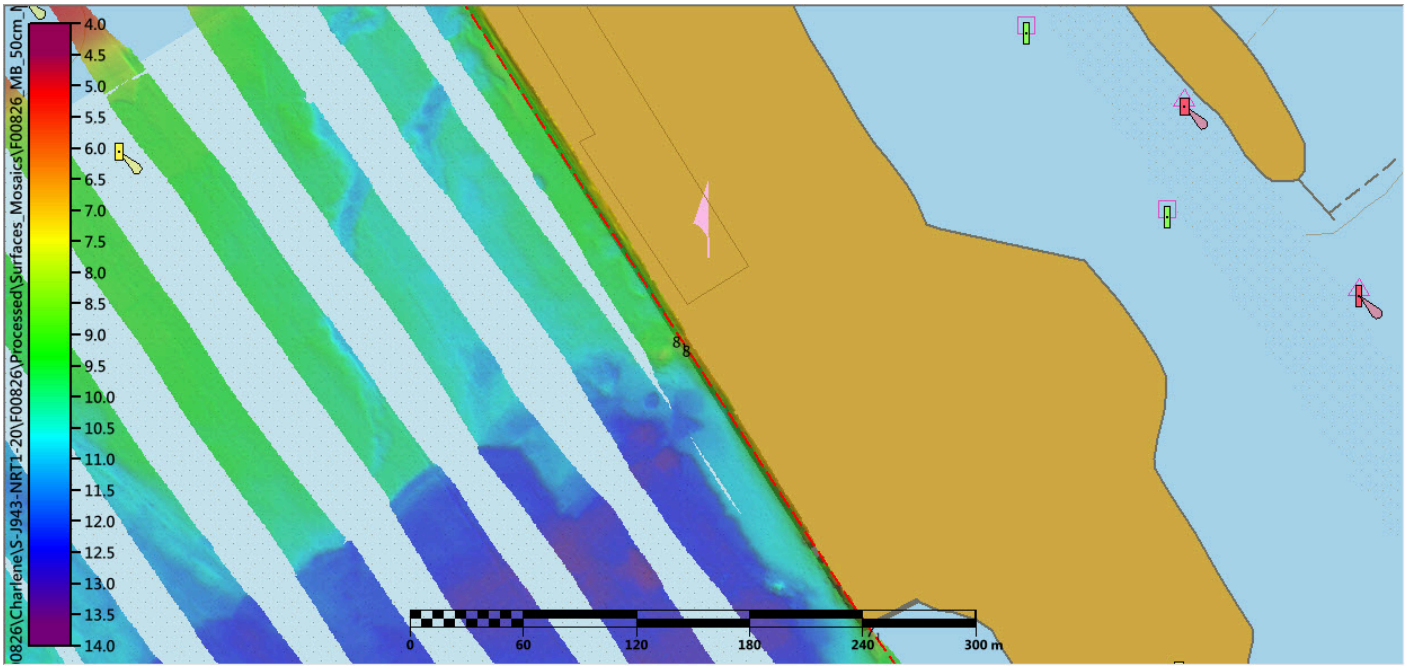


Figure 18: Shoaler sounding discrepancies against pier face

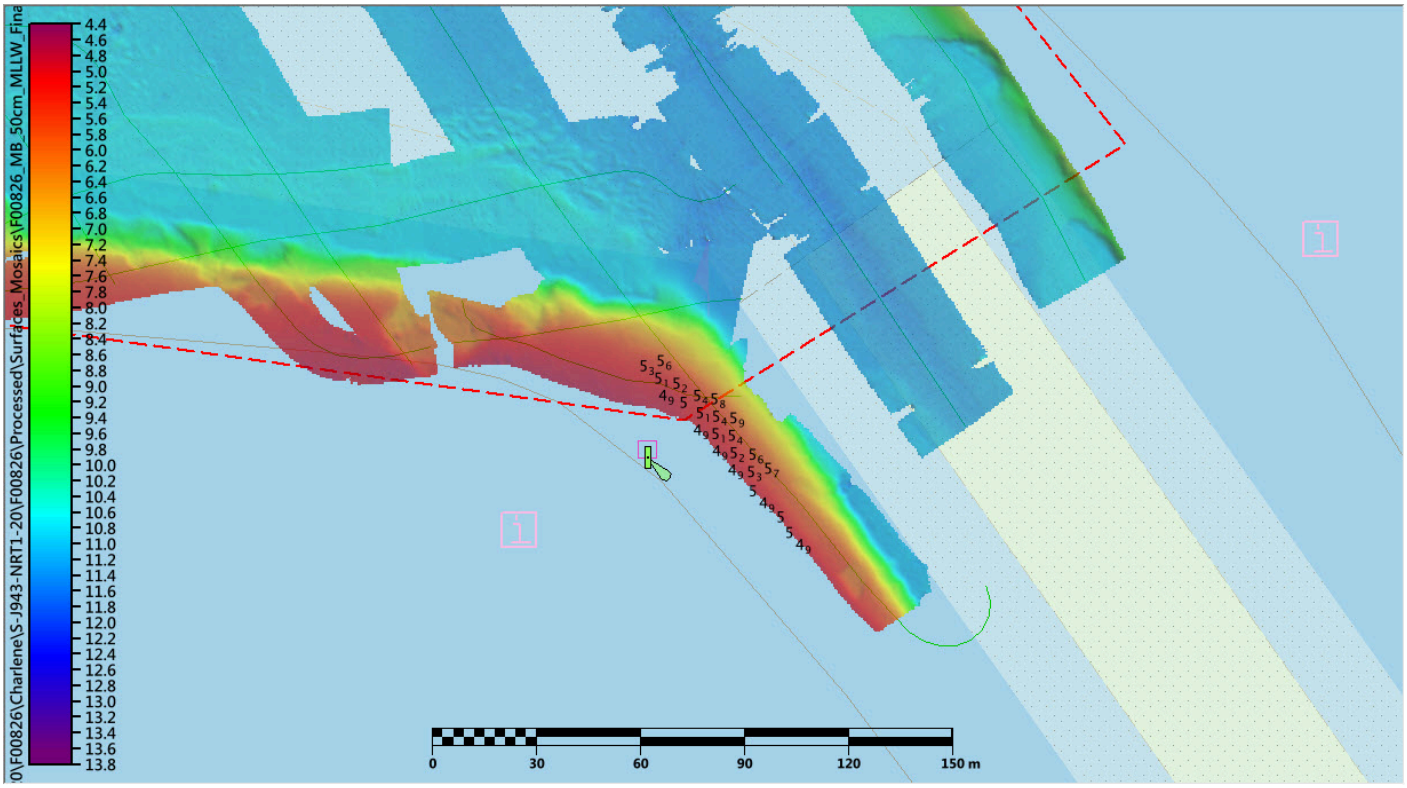


Figure 19: Selection of sounding discrepancies deeper than ENC depth range

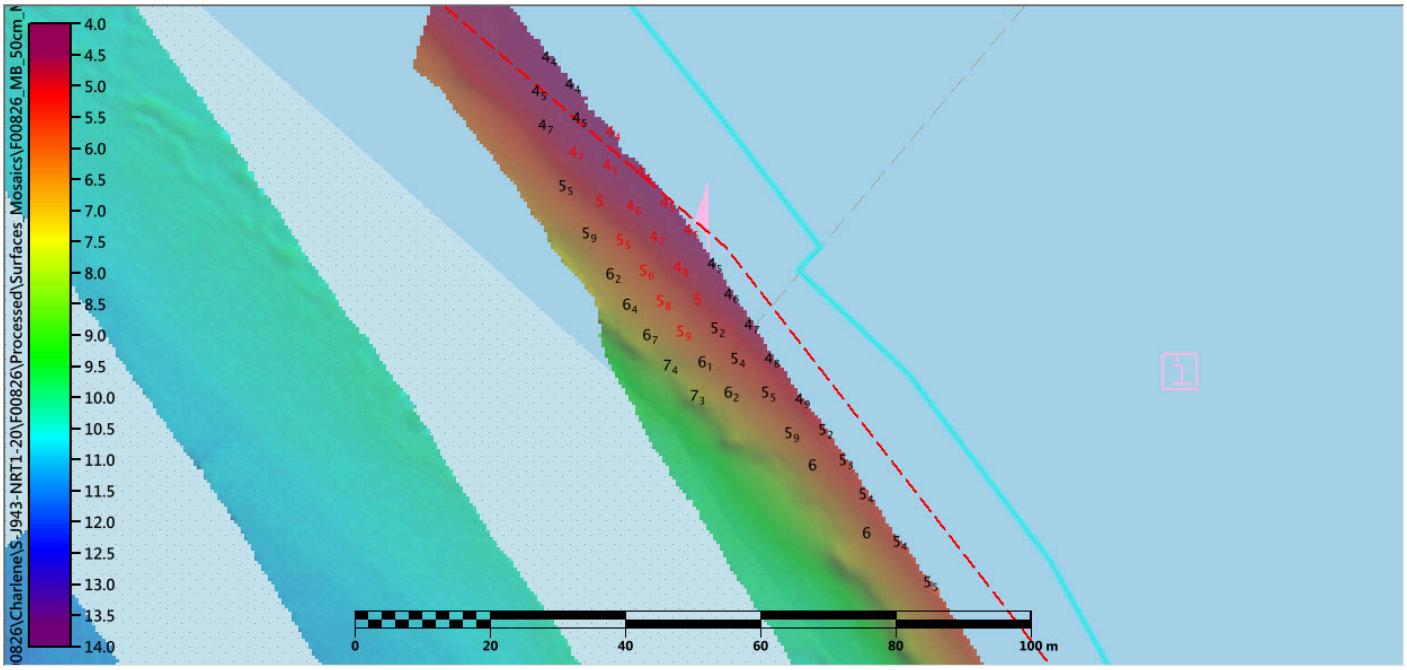


Figure 20: Potential DtoN soundings in red. Non-hazardous shoaling. All soundings deeper than ENC depth range.

D.1.1 Electronic Navigational Charts

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

ENC	Scale	Edition	Update Application Date	Issue Date
US5MS11M	1:40000	60	12/29/2020	12/29/2020

Table 11: Largest Scale ENCs

D.1.2 Shoal and Hazardous Features

No shoals or potentially hazardous features exist for this survey.

D.1.3 Charted Features

No charted features exist for this survey.

D.1.4 Uncharted Features

No uncharted features exist for this survey.

D.1.5 Channels

Refer to section D.1.1.

D.2 Additional Results

D.2.1 Aids to Navigation

AtoN G6 was investigated, not specifically assigned. The AtoN was not visible by field observations in realtime nor in the processed SSS and MBES data.

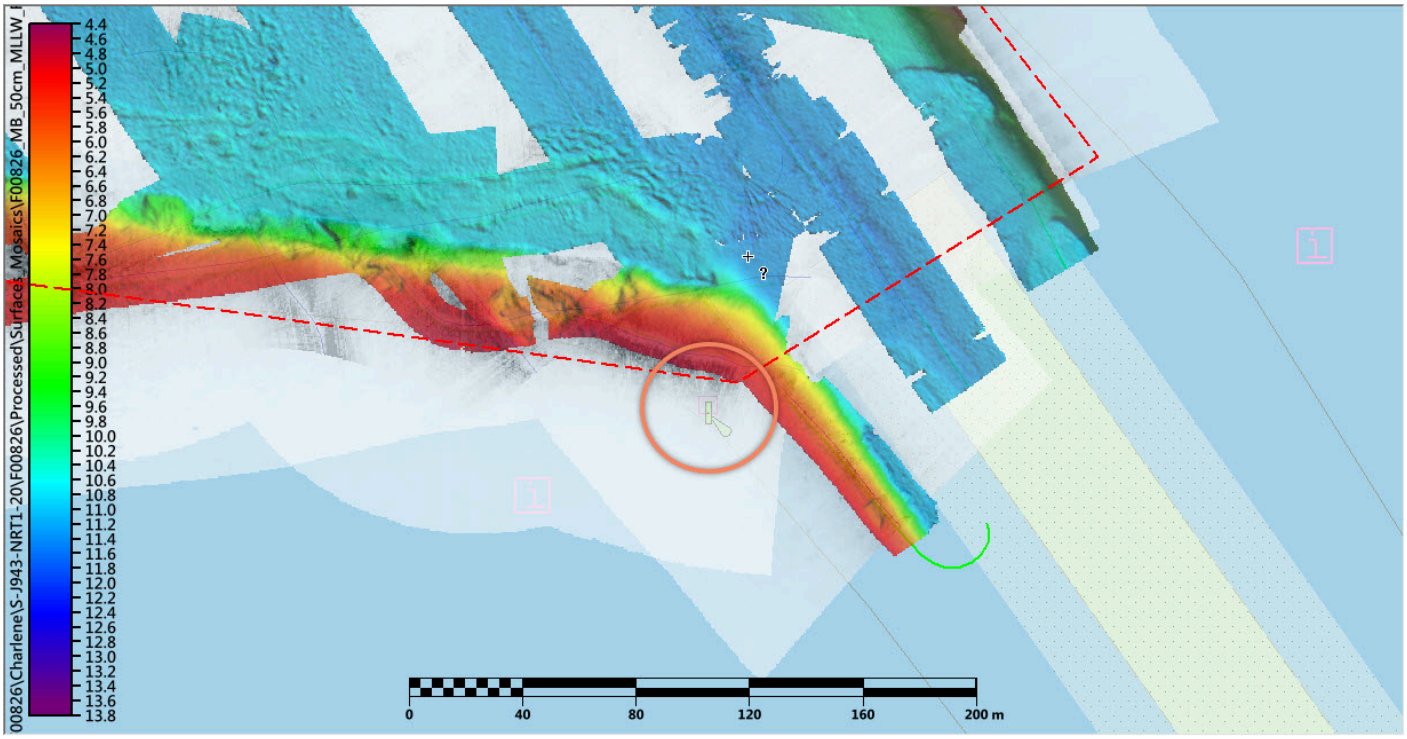


Figure 21: AtoN G6 circled in red

D.2.2 Maritime Boundary Points

No Maritime Boundary Points were assigned for this survey.

D.2.3 Bottom Samples

No bottom samples were required for this survey.

D.2.4 Overhead Features

No overhead features exist for this survey.

D.2.5 Submarine Features

No submarine features exist for this survey.

D.2.6 Platforms

No platforms exist for this survey.

D.2.7 Ferry Routes and Terminals

No ferry routes or terminals exist for this survey.

D.2.8 Abnormal Seafloor or Environmental Conditions

No abnormal seafloor or environmental conditions exist for this survey.

D.2.9 Construction and Dredging

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

D.2.10 New Survey Recommendations

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

D.2.11 ENC Scale Recommendations

No new ENC scales are recommended for this area.

E. Approval Sheet

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 Descriptive 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, 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 Descriptive Report.

Approver Name	Approver Title	Approval Date	Signature
PST Alex Ligon	Sheet Manager	03/12/2021	Digitally signed by LIGON.ALEX.C.1061008507 Date: 2021.03.12 09:50:55 -06'00'
LT John Kidd	Chief of Party	03/12/2021	Digitally signed by KIDD.JOHN.RYAN.1401688524 Date: 2021.03.12 16:10:03 -06'00'

F. Table of Acronyms

Acronym	Definition
AHB	Atlantic Hydrographic Branch
AST	Assistant Survey Technician
ATON	Aid to Navigation
AWOIS	Automated Wreck and Obstruction Information System
BAG	Bathymetric Attributed Grid
BASE	Bathymetry Associated with Statistical Error
CO	Commanding Officer
CO-OPS	Center for Operational Products and Services
CORS	Continuously Operating Reference Station
CTD	Conductivity Temperature Depth
CEF	Chart Evaluation File
CSF	Composite Source File
CST	Chief Survey Technician
CUBE	Combined Uncertainty and Bathymetry Estimator
DAPR	Data Acquisition and Processing Report
DGPS	Differential Global Positioning System
DP	Detached Position
DR	Descriptive Report
DTON	Danger to Navigation
ENC	Electronic Navigational Chart
ERS	Ellipsoidal Referenced Survey
ERTDM	Ellipsoidally Referenced Tidal Datum Model
ERZT	Ellipsoidally Referenced Zoned Tides
FFF	Final Feature File
FOO	Field Operations Officer
FPM	Field Procedures Manual
GAMS	GPS Azimuth Measurement Subsystem
GC	Geographic Cell
GPS	Global Positioning System
HIPS	Hydrographic Information Processing System
HSD	Hydrographic Surveys Division

Acronym	Definition
HSSD	Hydrographic Survey Specifications and Deliverables
HSTB	Hydrographic Systems Technology Branch
HSX	Hypack Hysweep File Format
HTD	Hydrographic Surveys Technical Directive
HVCR	Horizontal and Vertical Control Report
HVF	HIPS Vessel File
IHO	International Hydrographic Organization
IMU	Inertial Motion Unit
ITRF	International Terrestrial Reference Frame
LNM	Linear Nautical Miles
MBAB	Multibeam Echosounder Acoustic Backscatter
MCD	Marine Chart Division
MHW	Mean High Water
MLLW	Mean Lower Low Water
NAD 83	North American Datum of 1983
NALL	Navigable Area Limit Line
NTM	Notice to Mariners
NMEA	National Marine Electronics Association
NOAA	National Oceanic and Atmospheric Administration
NOS	National Ocean Service
NRT	Navigation Response Team
NSD	Navigation Services Division
OCS	Office of Coast Survey
OMAO	Office of Marine and Aviation Operations (NOAA)
OPS	Operations Branch
MBES	Multibeam Echosounder
NWLON	National Water Level Observation Network
PDBS	Phase Differencing Bathymetric Sonar
PHB	Pacific Hydrographic Branch
POS/MV	Position and Orientation System for Marine Vessels
PPK	Post Processed Kinematic
PPP	Precise Point Positioning
PPS	Pulse per second

Acronym	Definition
PRF	Project Reference File
PS	Physical Scientist
RNC	Raster Navigational Chart
RTK	Real Time Kinematic
RTX	Real Time Extended
SBES	Singlebeam Echosounder
SBET	Smooth Best Estimate and Trajectory
SNM	Square Nautical Miles
SSS	Side Scan Sonar
SSSAB	Side Scan Sonar Acoustic Backscatter
ST	Survey Technician
SVP	Sound Velocity Profiler
TCARI	Tidal Constituent And Residual Interpolation
TPU	Total Propagated Uncertainty
USACE	United States Army Corps of Engineers
USCG	United States Coast Guard
UTM	Universal Transverse Mercator
XO	Executive Officer
ZDF	Zone Definition File

APPROVAL PAGE

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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.

Digitally signed by HOLMBERG.PETER.SCOTT.1365886101
Date: 2021.05.19 09:07:10 -07'00'

Approved: _____

Peter Holmberg
Products Team Lead, Pacific Hydrographic Branch