F00722

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

DESCRIPTIVE REPORT

Type of Survey:	Navigable Area
Registry Number:	F00722

LOCALITY

State(s):	Oregon Washington
General Locality:	Columbia River, WA and OR
Sub-locality:	Cottonwood Anchorage Area, Prescott Anchorage Area, Kalama Anchorage Area, and Longview Anchorage Area - Columbia River

2018

CHIEF OF PARTY
Michelle M. Levano, LTJG/NOAA

LIBRARY & ARCHIVES

Date:

U.S. DEPARTMENT OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION	REGISTRY NUMBER:
HYDROGRAPHIC TITLE SHEET	**F00722**

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):	**Oregon Washington**
General Locality:	**Columbia River, WA and OR**
Sub-Locality:	**Cottonwood Anchorage Area, Prescott Anchorage Area, Kalama**
Scale:	**40000**
Dates of Survey:	**06/02/2018 to 09/26/2018**
Instructions Dated:	**05/21/2018**
Project Number:	**S-N918-NRT3-18**
Field Unit:	**NOAA Navigation Response Team 3**
Chief of Party:	**Michelle M. Levano, LTJG/NOAA**
Soundings by:	**Multibeam Echo Sounder**
Imagery by:	**Multibeam Echo Sounder Backscatter**
Verification by:	**Pacific Hydrographic Branch**
Soundings Acquired in:	**meters at Mean Lower Low Water**

Remarks:

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/.

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Descriptive Report to Accompany Survey F00722

Project: S-N918-NRT3-18

Locality: Columbia River, WA and OR

Sublocality: Cottonwood Anchorage Area, Prescott Anchorage Area,

Kalama Anchorage Area, and Longview Anchorage Area - Columbia River

Scale: 1:40000

June 2018 - September 2018

NOAA Navigation Response Team 3

Chief of Party: Michelle M. Levano, LTJG/NOAA

A. Area Surveyed

This hydrographic survey was acquired in accordance with the requirements defined in the Project Instruction S-N918-NRT3-18 (Figure 1). F00722 survey area includes the Cottonwood Anchorage Area, Prescott Anchorage Area, Kalama Anchorage Area, and Longview Anchorage Area on the Columbia River (Figure 2).

A.1 Survey Limits

Data were acquired within the following survey limits:

Northwest Limit	Southeast Limit
46° 7' 44.43" N 122° 59' 33.19" W	45° 59' 37.31" N 122° 50' 50.46" W

Table 1: Survey Limits

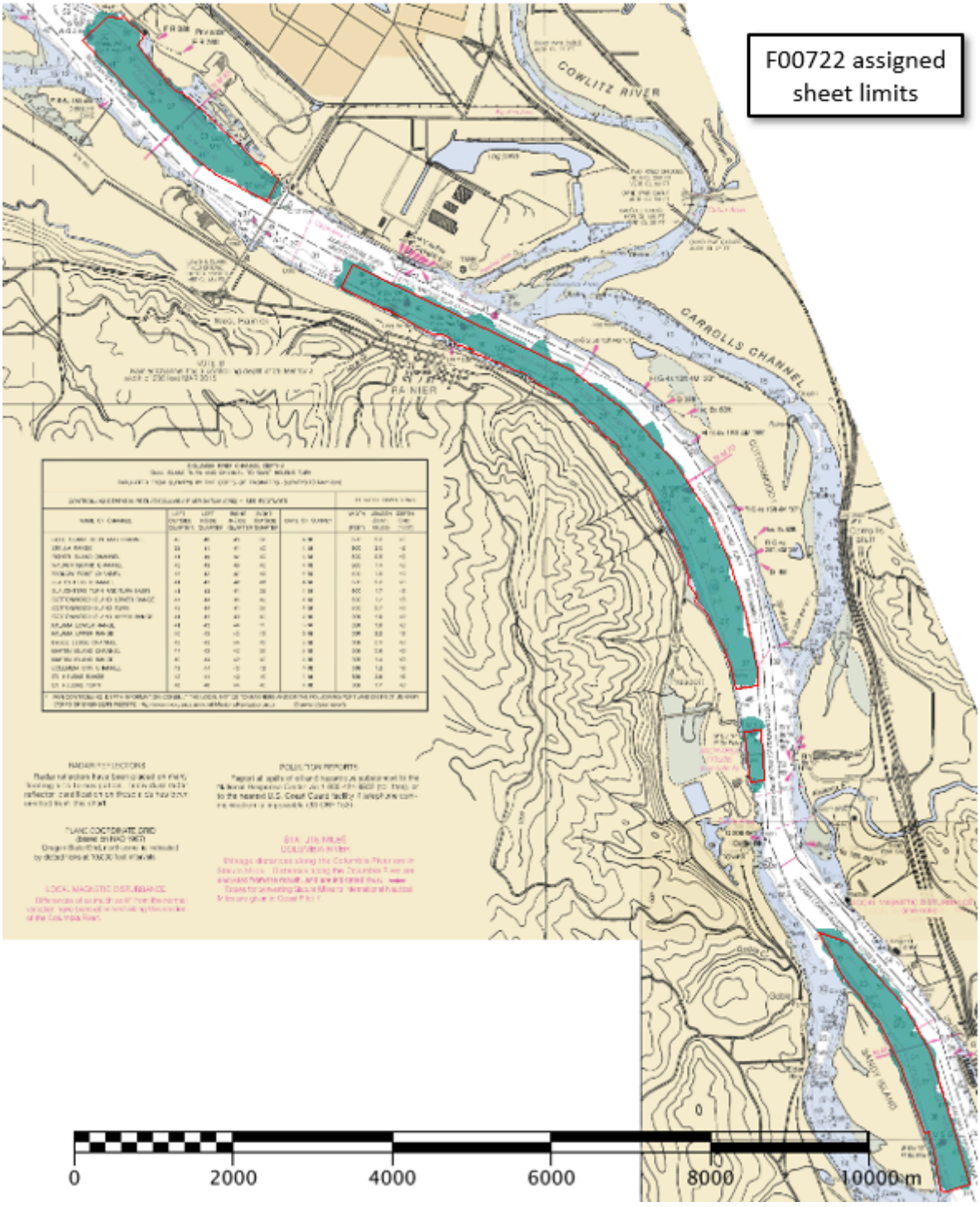


Figure 1: F00722 sheet limtis (in blue) overlaid on charts 18524_1, and 18524_2.

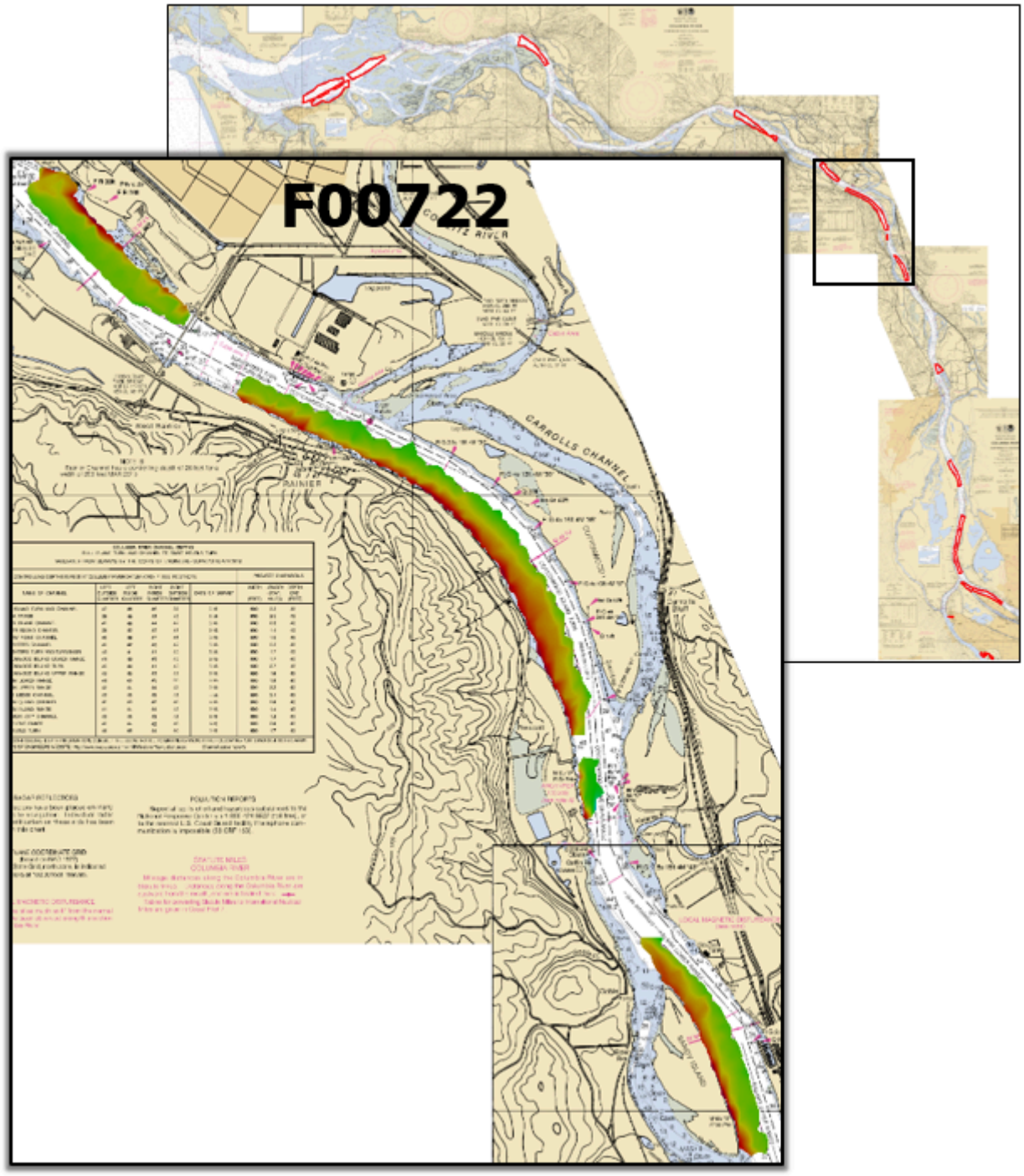


Figure 2: Relative location of F00722 in the Columbia River. Red areas are the sheet limits to other assigned areas in the S-N918-NRT3-18 project.

Data was acquired to the survey limits in accordance with the requirements in the Project Instructions and the National Ocean Service (NOS) 2018 Hydrographic Surveys Specifications and Deliverables (HSSD).

A.2 Survey Purpose

The Columbia River Steamship Operators' Association, Inc. (CRSOA) and the Columbia River Pilots (COLRIP) requested that NOAA's Office of Coast Survey collect multibeam bathymetric data of the Columbia River anchorages. The Columbia River is a dynamic river and soundings are constantly changing. This Columbia River survey the includes the Port of Longview, WA, North Pacific Paper Cooperation, PLS International, and various marine services.

A.3 Survey Quality

The entire survey is adequate to supersede previous data.

Data acquired in F00722 meet multibeam echo sounder (MBES) coverage requirements for object detection, as required by the HSSD. This includes crosslines (see Section B.2.1), NOAA allowable uncertainty (see Section B.2.10), and density requirements (see Section B.2.11).

The surface was analyzed using the HydrOffice QC Tools Grid QA feature (Figure 3). Density requirements for F00722 were achieved with at least 99.5% 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 shifting sand waves, slopes and rocky areas where acoustic shadowing occurred, and at the edges of the survey limits.

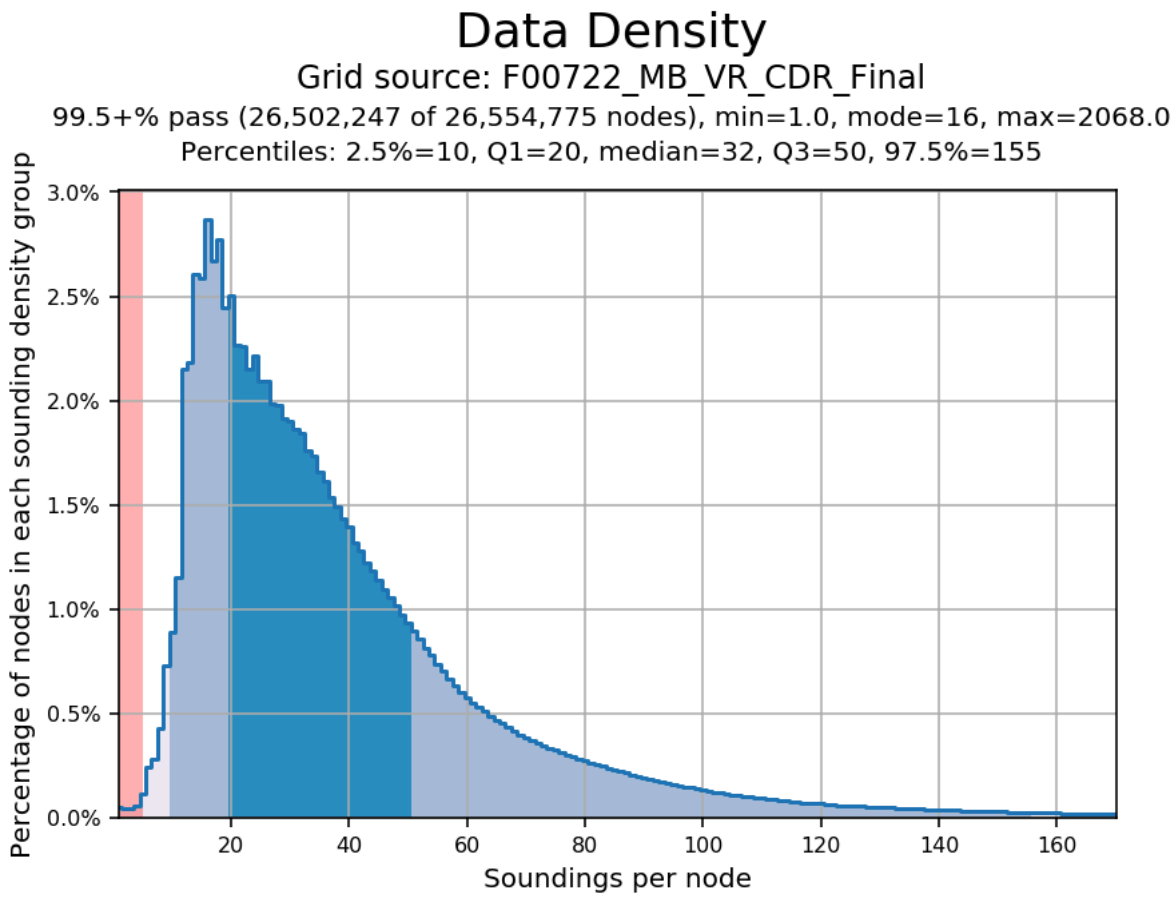


Figure 3: Pydro derived histogram plot showing HSSD object detection compliance of F00722 MBES within the finalized CUBE surface.

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 the survey area	Object Detection Coverage (Refer to HSSD Section 5.2.2.2)

Table 2: Survey Coverage

F00722 data were reviewed in CARIS HIPS and SIPS for holidays in accordance with Section 5.2.2.3 of the HSSD (Figure 4). 51 holidays were identified via HydrOffice QC Tools Holiday Finder tool. Upon hydrographer inspection, 6 of the identified holidays are within the survey limits and not along the edge of the survey. 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. The high number of fliers is discusses in section B.5.2 of this report.

Complete multibeam coverage was achieved within the limits of hydrography as defined in the project instructions with some exceptions (Figure 5). 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 shoreline and obstructions (Figure 6 and 7).

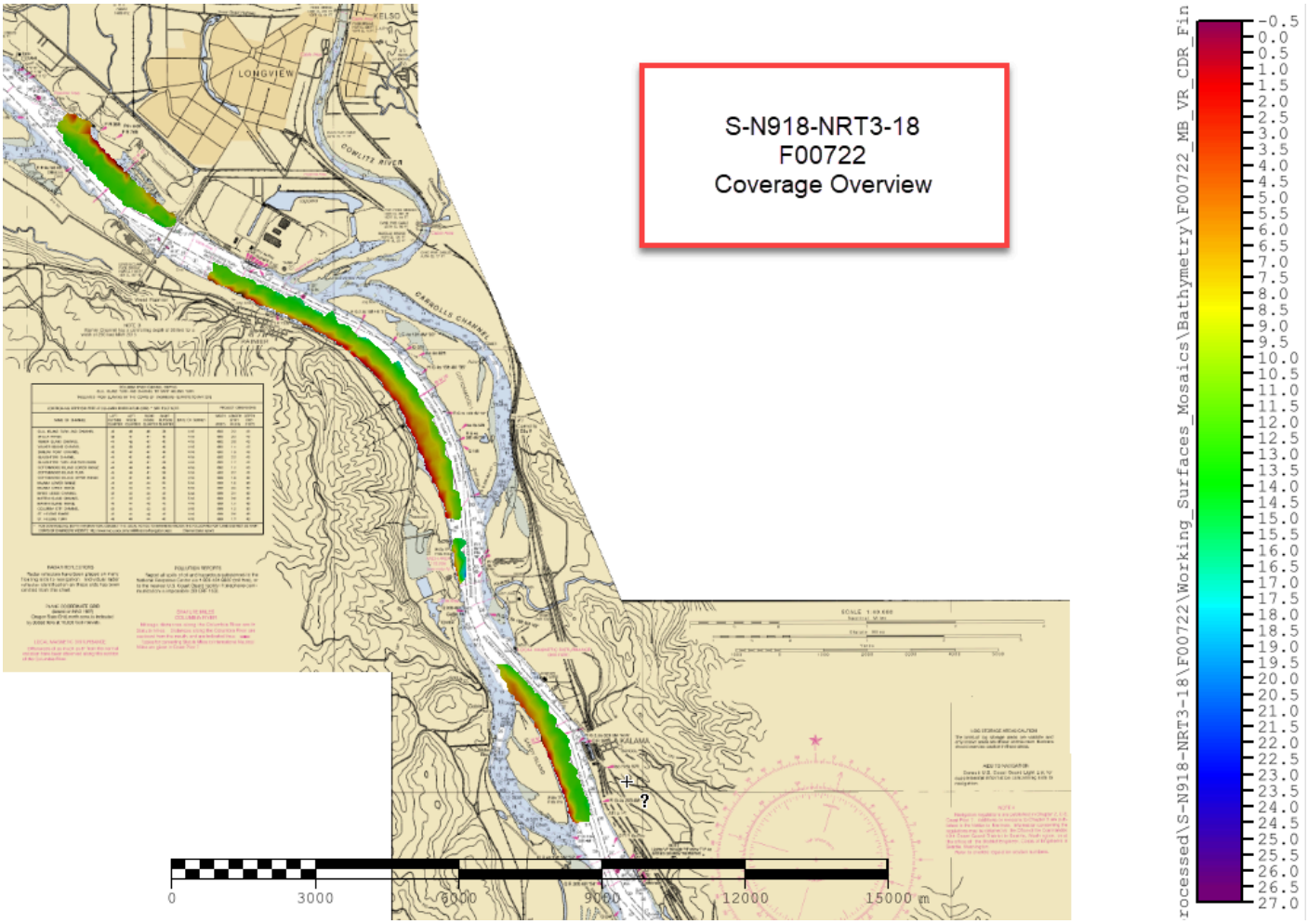


Figure 4: F00722 survey coverage overlaid onto charts 18524_1, and 18524_2.

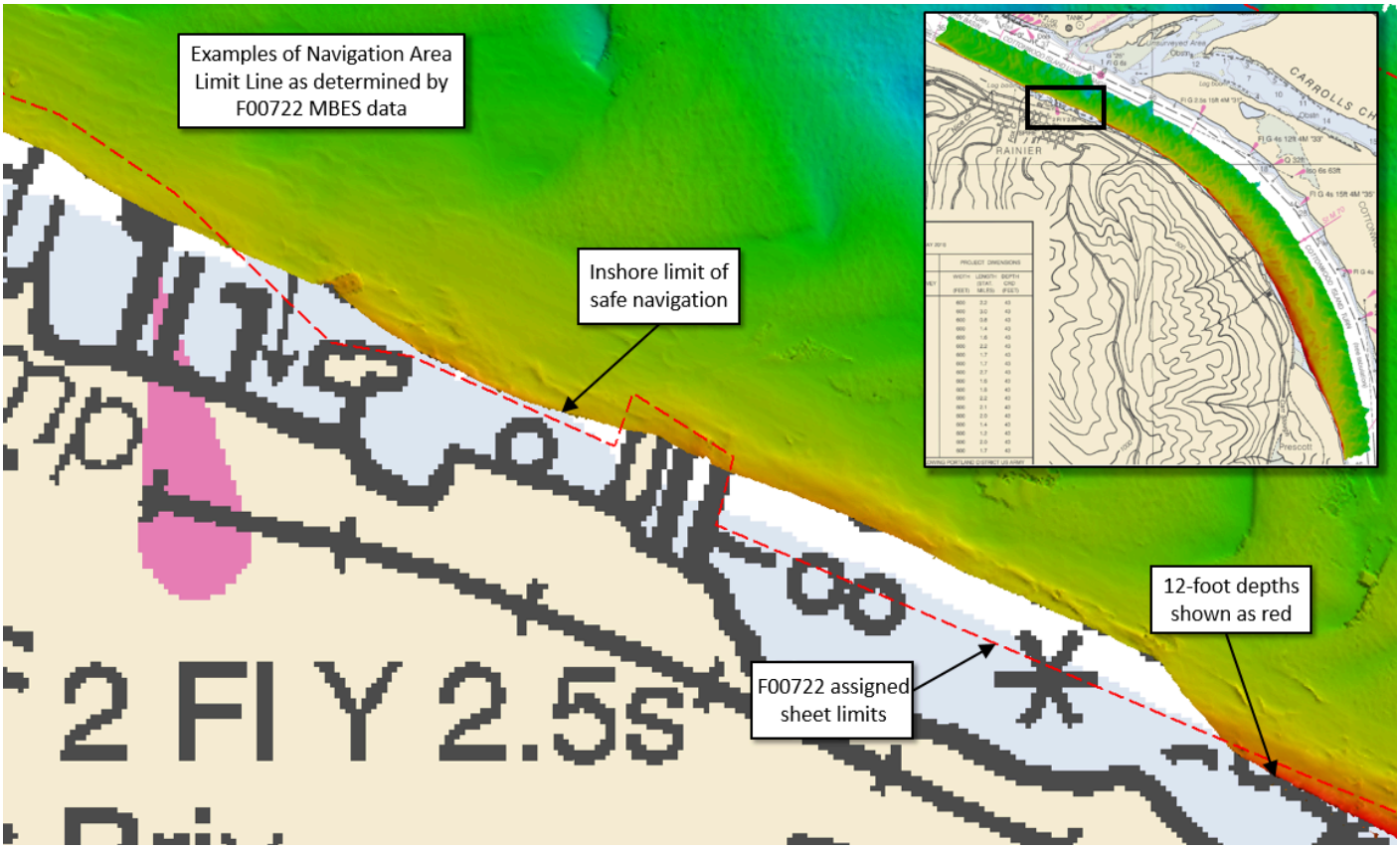


Figure 5: Examples of NALL determination

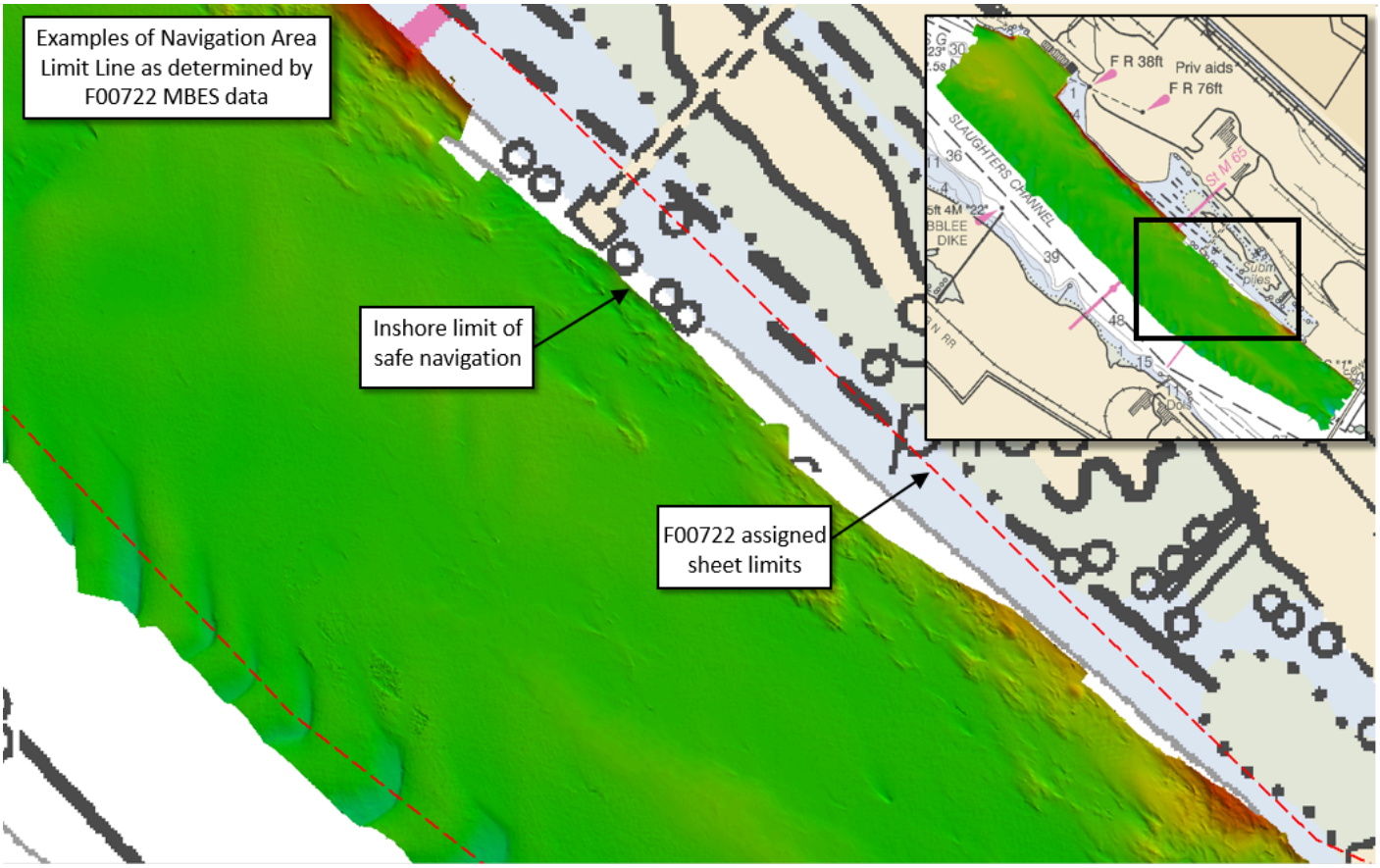


Figure 6: Examples of NALL determination

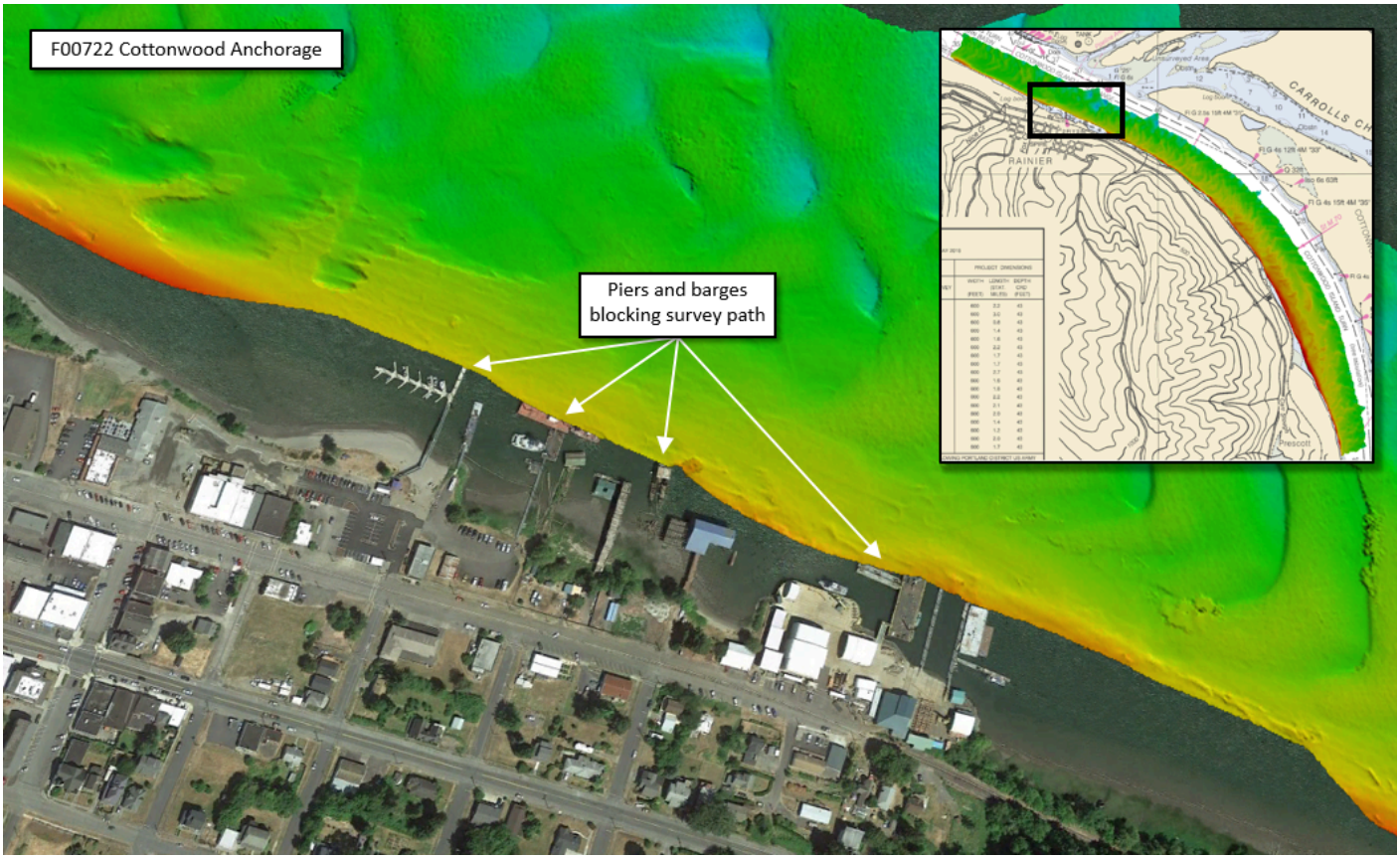


Figure 7: MBES coverage and obstacles preventing survey completion. (Google Aerial Imagery)

A.6 Survey Statistics

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

	HULL ID	*S3006*	*Total*
LNM	**SBES Mainscheme**	0	0
	MBES Mainscheme	134.59	134.59
	Lidar Mainscheme	0	0
	SSS Mainscheme	0	0
	SBES/SSS Mainscheme	0	0
	MBES/SSS Mainscheme	0	0
	SBES/MBES Crosslines	12.75	12.75
	Lidar Crosslines	0	0
Number of Bottom Samples			6
Number Maritime Boundary Points Investigated			0
Number of DPs			0
Number of Items Investigated by Dive Ops			0
Total SNM			1.71

Table 3: Hydrographic Survey Statistics

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

Survey Dates	Day of the Year
06/02/2018	153
06/03/2018	154

Survey Dates	Day of the Year
06/04/2018	155
06/05/2018	156
06/06/2018	157
06/07/2018	158
06/08/2018	159
06/09/2018	160
06/11/2018	162
09/26/2018	269

Table 4: Dates of Hydrography

The majority of this survey area data was collected between June 2 and June 11 of 2018. The field unit returned to the survey area on September 26, 2018 to collect additional data to meet NOAA Object Detection standards as outlined in the 2018 HSSD.

B. Data Acquisition and Processing

B.1 Equipment and Vessels

Refer to the 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	***S3006***
LOA	34 feet
Draft	4 feet

Table 5: Vessels Used

Figure 8: NRT3 S3006

B.1.2 Equipment

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

Manufacturer	Model	Type
Kongsberg Maritime	EM 2040C	MBES
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 were collected by S3006 across a variety of depth ranges, water masses, and survey dates with good spacial distribution.

Crosslines were collected, processed and compared in accordance with Section 5.2.4.2 of the HSSD (Figure 9). A Variable Resolution (VR) surface was created of only mainscheme lines, and a second VR surface was created of only crosslines. A difference surface was generated in Pydro Explorers Compare Grids tool by subtracting the crossline only surface from the mainscheme surface (mainscheme- crosslines= difference surface). From the difference surface, the following statistics were derived. The mainshceme only, crossline only, and difference surface are included in the submission of this survey as Digital Data.

For the respective depths, the difference surface was compared to the allowable NOAA uncertainty standards (Figure 10). Statistics show the mean difference between the depths derived from mainscheme data and crossline data was 0.3 meters, with mainscheme being shoaler/deeper. In total, 92% of the total number of nodes pass the TVUmax test between F00722 mainscheme and crossline data (Figure 11, 13 and 14). The coloring represents areas where the TVUmax error tolerance in exceeded; red, orange and yellow colors represent areas where mainscheme data is deeper than crossline data; the blue shades represent where crossline data is deeper than mainscheme data (Figure 12). The analysis was performed on F00722 MBES data reduced to Columbia River Datum (CRD) using Ellipsoidally Referenced Survey (ERS) methods.

The results of the crossline analysis does not meet the requirements as stated in the 2018 HSSD. The Columbia River is a highly dynamic area, and is constantly changing. The survey data is an accurate display of the sea floor at the time the data was collected. Differences between mainscheme and crossline data exists due to shifting sea floor from data collected over a variety of days. Please refer to the Appendices of this report for more information.

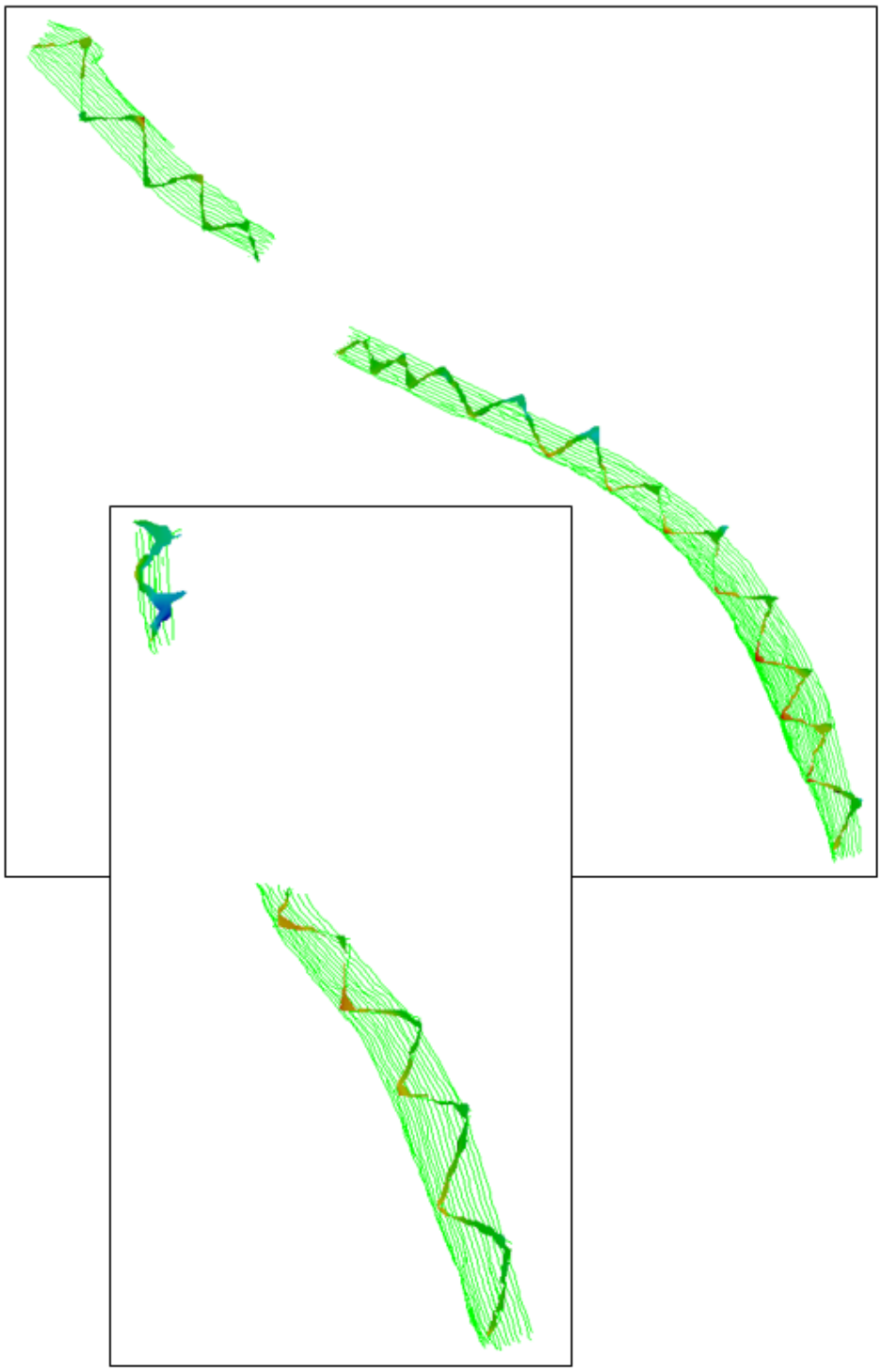


Figure 9: F00722 crossline surface overlaid on mainscheme tracklines showing good temporal and geographic distribution.

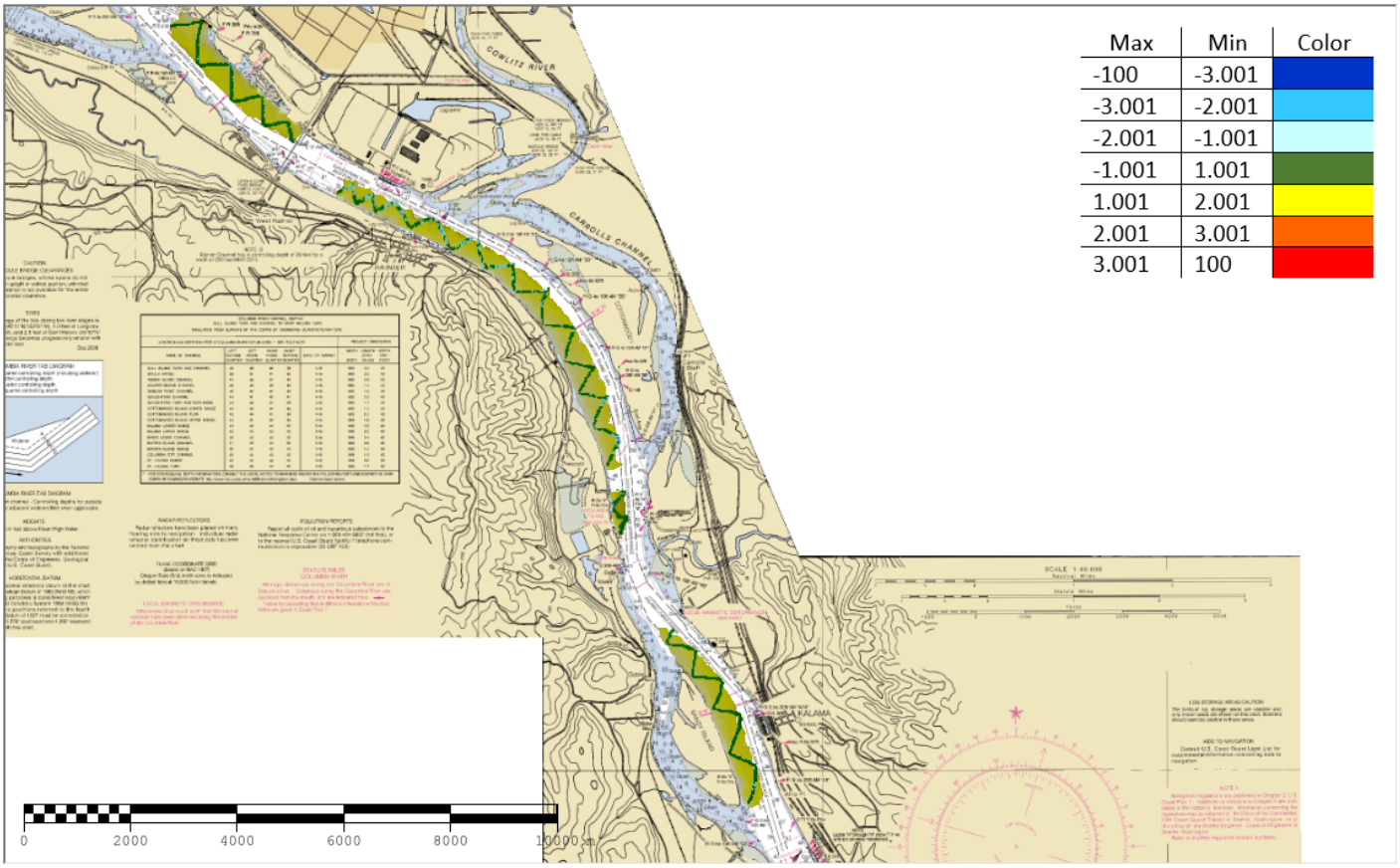


Figure 10: Depth differences between F00722 mainscheme and crossline data as compared to NOAA allowable uncertainty standards for the associated depths.

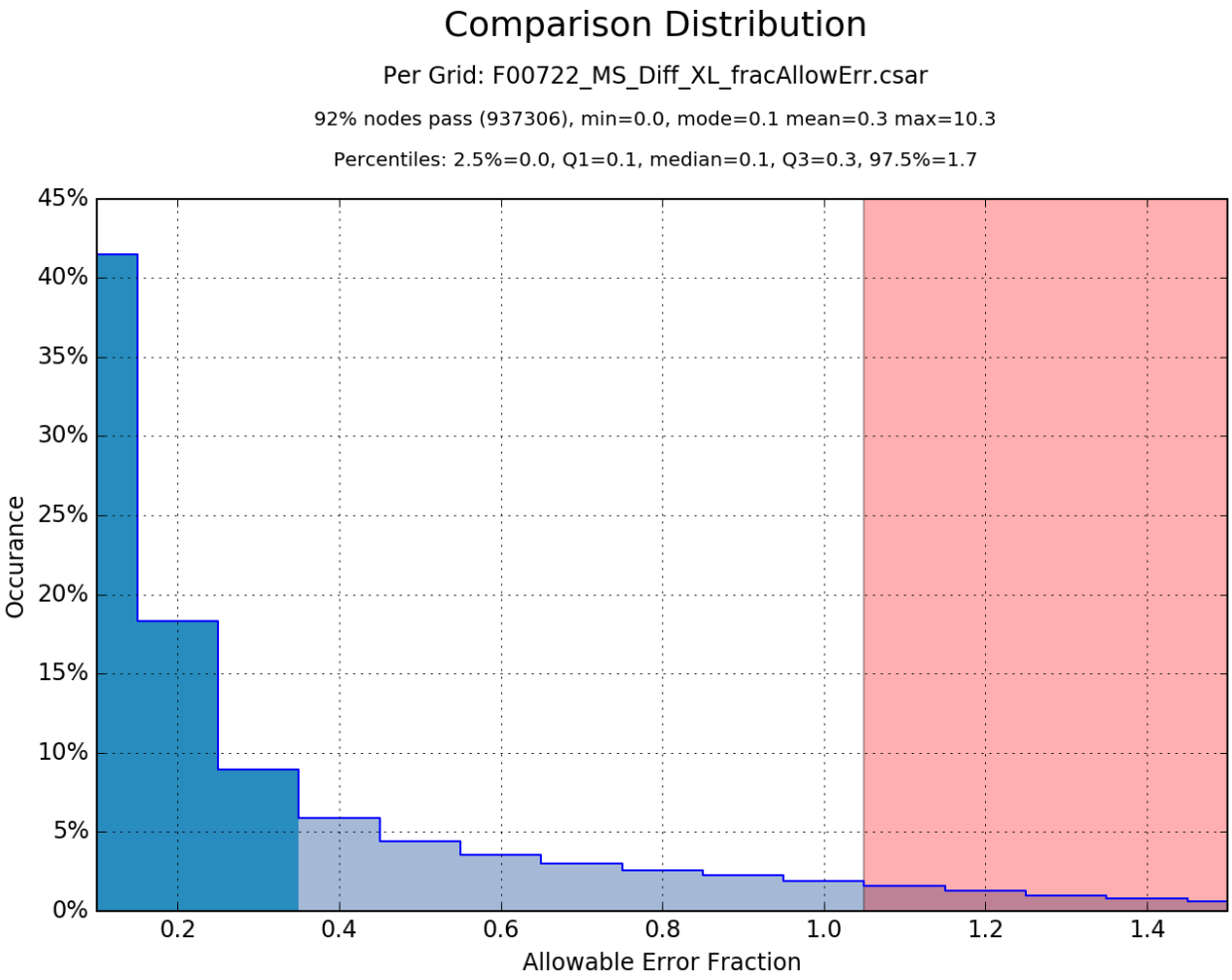
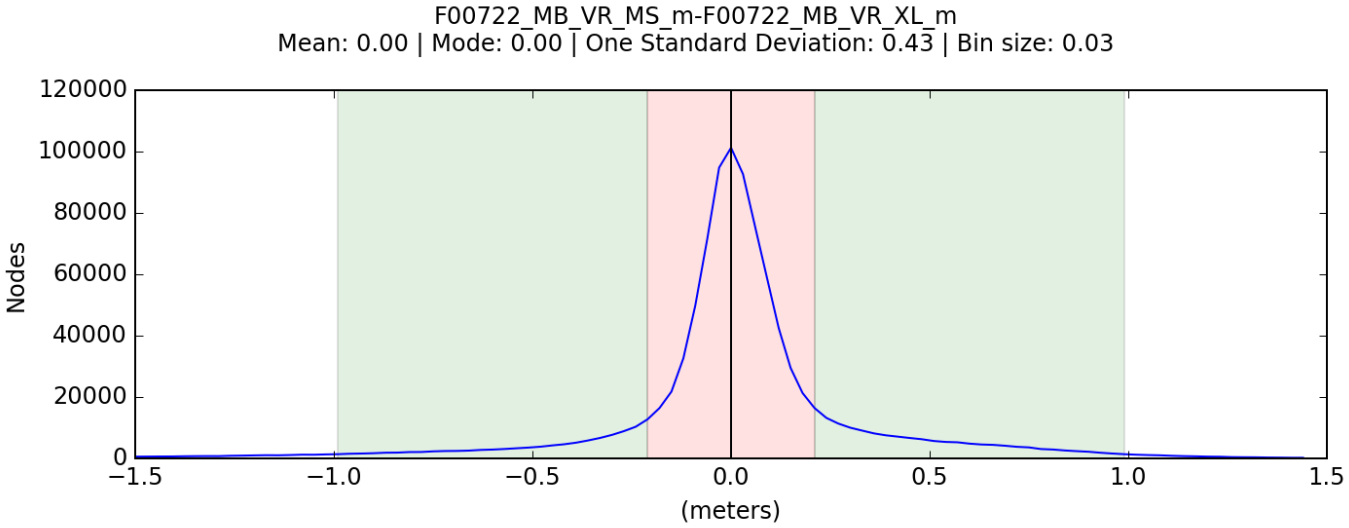
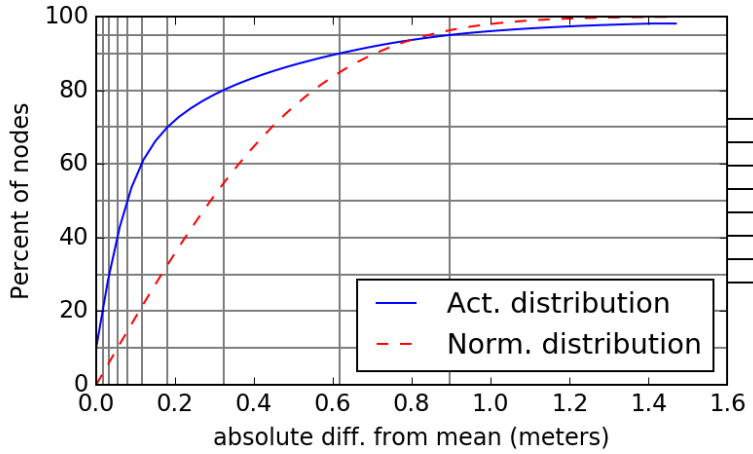


Figure 11: Histogram plot utilizing the magnitude (absolute value) of the Allowable Error Fraction to show the indication of what percentage of the total number of comparisons pass the TVUmax test.

Figure 12: Less than 95% of nodes pass the crossline analysis of F00722 due to changing environmental conditions.





Percent of nodes	Deviation (m)
50%	+/- 0.08
60%	+/- 0.12
70%	+/- 0.18
80%	+/- 0.32
90%	+/- 0.62
95%	+/- 0.90

Figure 13: The statistic and distribution summary plot of the difference between F00722 mainscheme and crossline data.

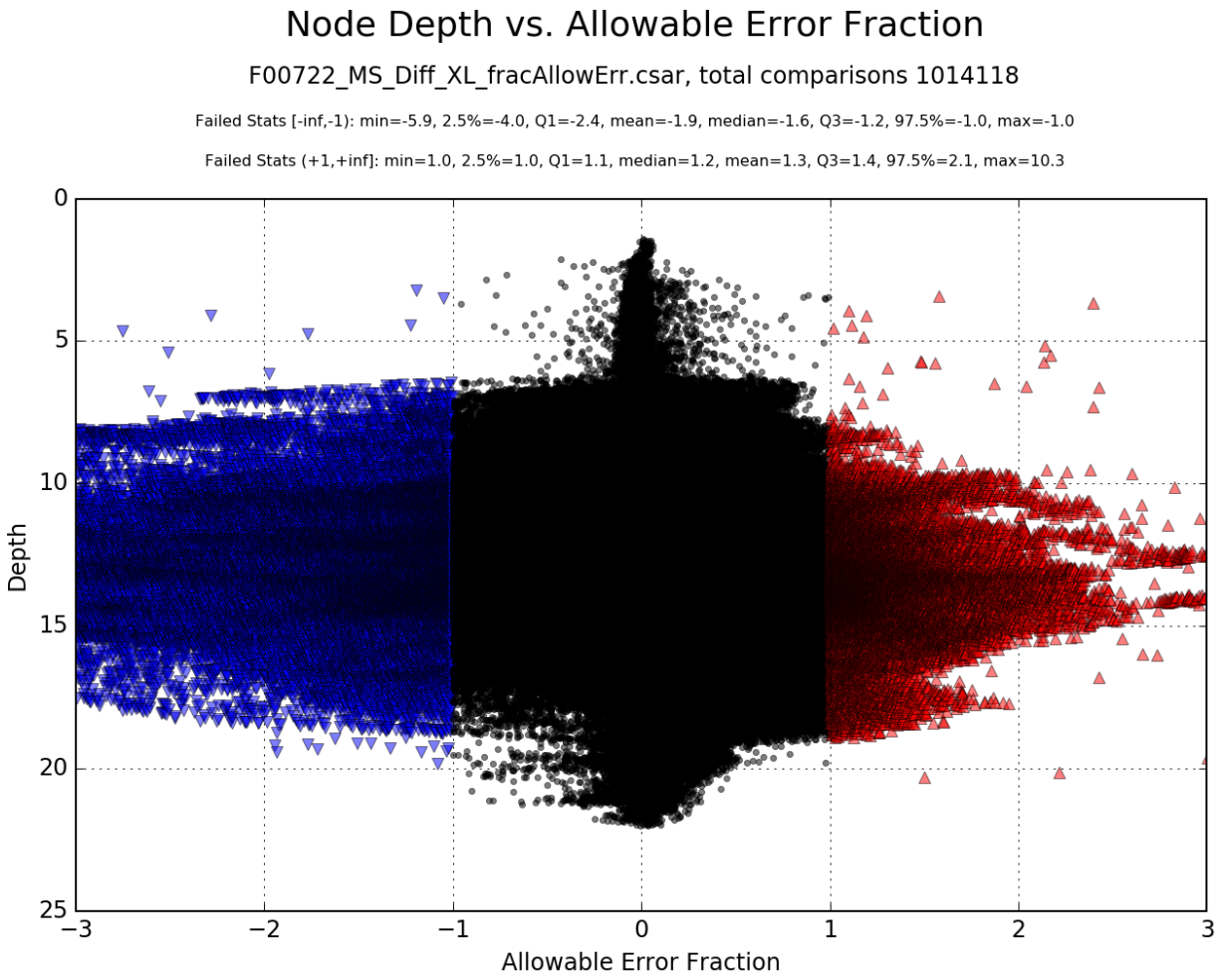


Figure 14: The depth dependent plot of the Allowable Error Fraction, with values between and including +/- 1 representing passing comparisons.

B.2.2 Uncertainty

The following survey specific parameters were used for this survey:

Method	Measured	Zoning
ERS via VDATUM	0.0 meters	0.12 meters

Table 7: Survey Specific Tide TPU Values.

Hull ID	Measured - CTD	Measured - MVP	Surface
S3006	1.0 meters/second	N/A meters/second	0.15 meters/second

Table 8: Survey Specific Sound Speed TPU Values.

Total Propagated Uncertainty (TPU) values for F00722 were derived from a combination of fixed values for equipment and vessel characteristics, as well as field assigned values for sound speed uncertainties. The uncertainty for the VDatum model was provided to the field unit. A visual inspection of the Uncertainty layer revealed the areas of higher uncertainty occurred in the outer beams, over sand waves, and shifting bottom types.

In addition to the usual a priori estimates of uncertainty provided via device models for vessel motion, ERS, real time and post processed uncertainty sources were also incorporated into the depth estimates of F00722. Real-time uncertainties from the Kongsberg 2040C MBES sonars were incorporated and applied during post processing. Uncertainties associated with vessel roll, gyro, and navigation were applied real-time. F00722 utilized kinematic (RTK) positioning service. The recorded delayed heave Applanix files included an estimate of the heave uncertainty and were applied during post processing. All of the aforementioned uncertainties were applied in CARIS. F00722 is an ellipsoidally referenced survey (ERS) and the tidal component was accomplished via separation model. Additional information about RTK and the separation model are located in Section C.1 and C.2 of this report.

The surface was analyzed using the 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 F00722 (Figure 15).

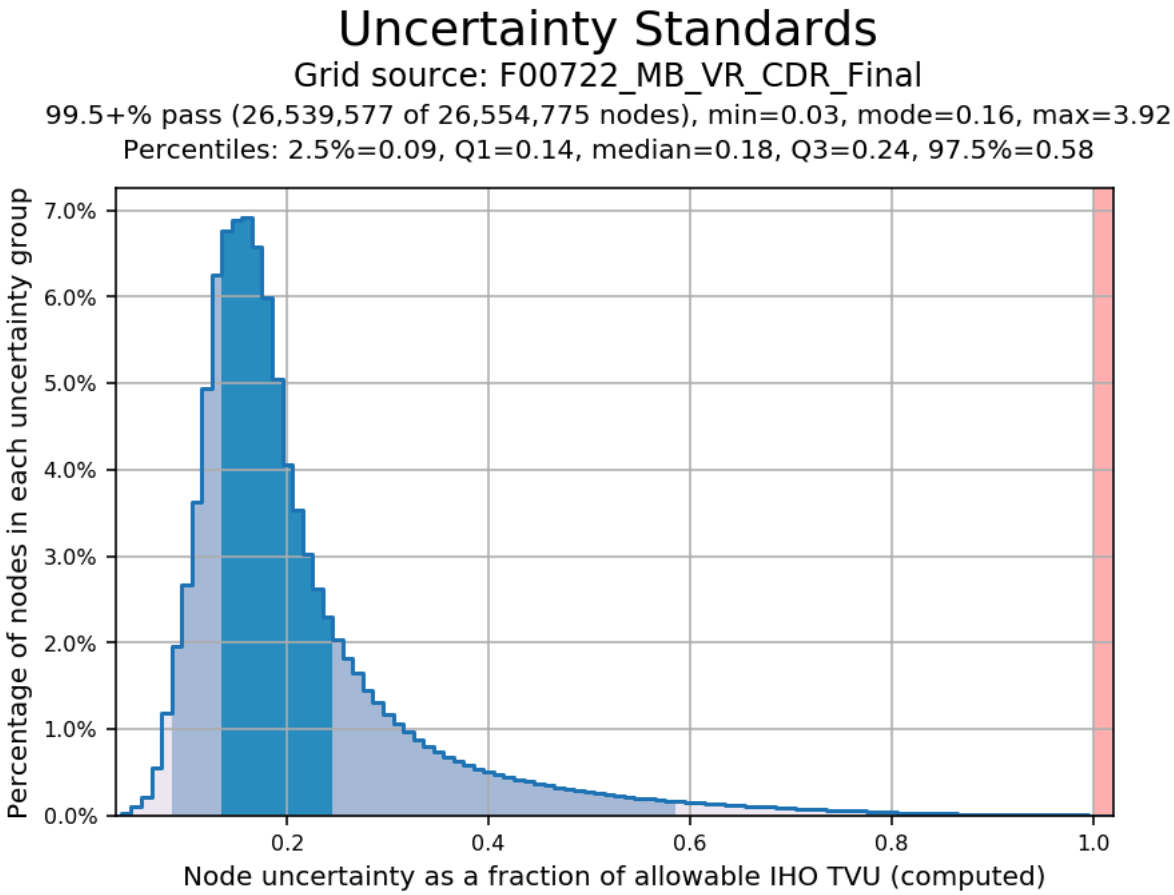


Figure 15: Pydro derived histogram plot showing HSSD uncertainty standards compliance for F00722 finalized VR surface.

B.2.3 Junctions

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

Environmental Conditions Impacting the Quality of the Survey

F00722 meets NOAA Uncertainty Standards per Section 5.1.3 of the 2018 HSSD, though environmental condition degraded the quality of survey data. Data for F00722 is an accurate representation of the sea floor at the time of data collection. Due to the dynamic nature of the Columbia River and the river's heavy sediment transport, river bottom and sand wave migration altered the river bottom throughout the time of survey. This created an offset between mainscheme, crossline, and holiday fill data (Figure 16).

Data was collected over a wide range of dates and times, and the sea floor changed over the scope of the survey. The difference in offset varies throughout the survey, and is dependent on localized sand wave formation and time elapsed between survey collection (Figure 17).

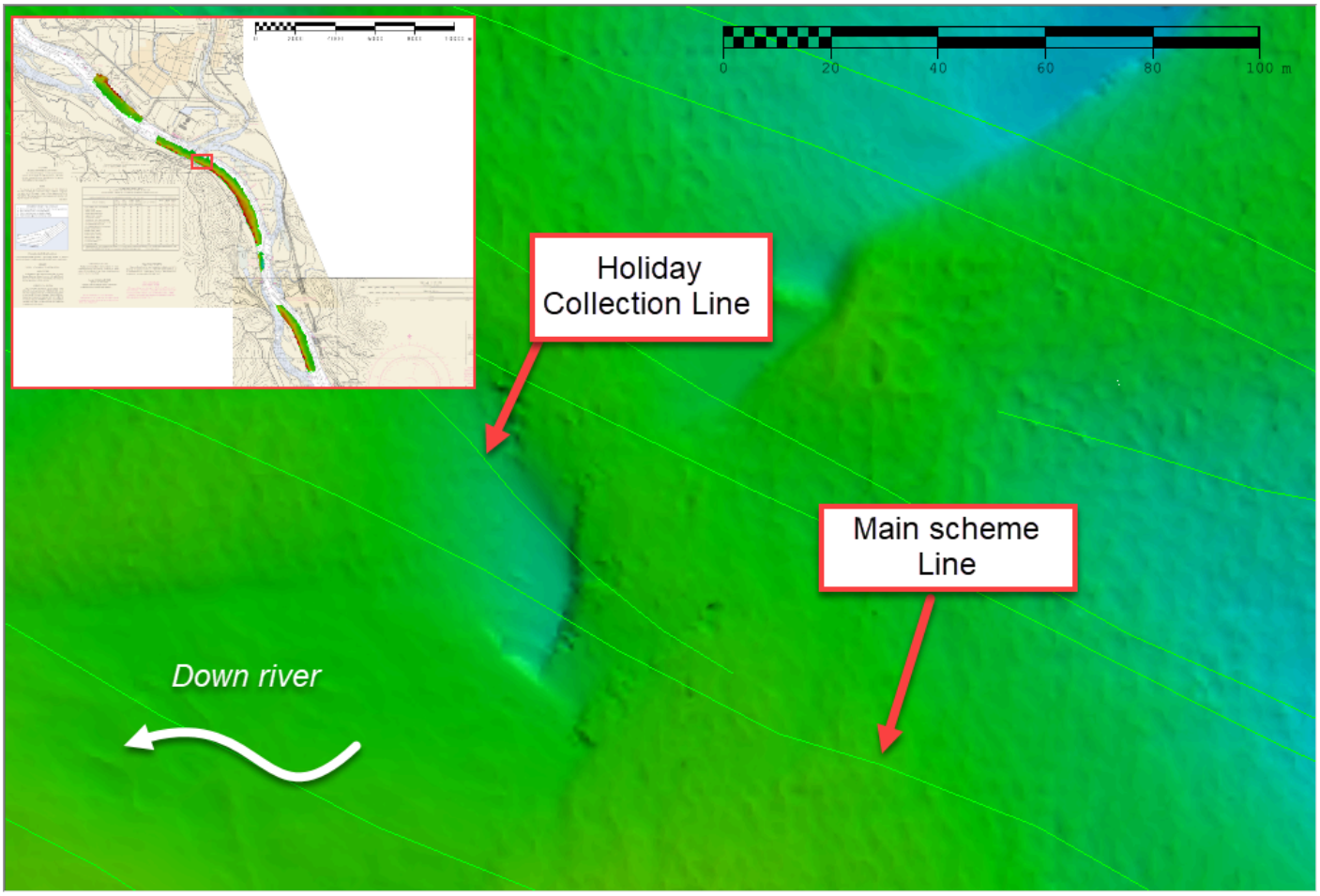


Figure 16: Movement for sea floor between mainscheme and holiday collection lines collected 7 days apart

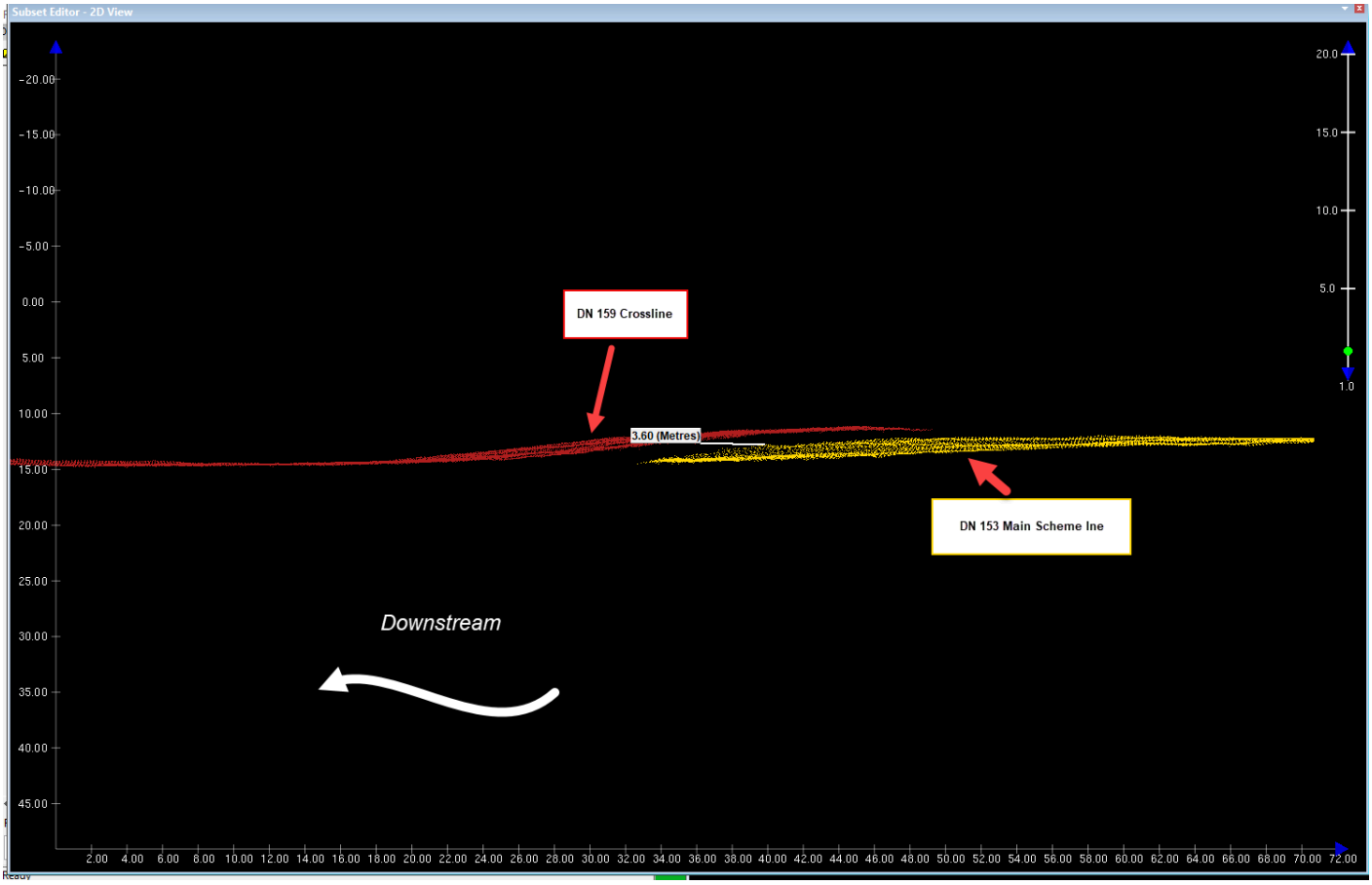


Figure 17: Sea floor migration between crossline and mainscheme lines collected 6 days apart.

B.2.7 Sound Speed Methods

Sound Speed Cast Frequency: At least every four hours

Sound Speed Cast Frequency: At least once every four hours with sufficient frequency, density, depth and accuracy as outlined in section 5.2.3.3 of the 2018 HSSD.

Sound Velocity Profiles (SVP) casts were taken at least once every four hours in the deepest water nearest to the survey area being worked on (Figure 18). The SVP casts were applied to the MBES lines in CARIS using the "nearest in distance within time of 4 hours" method.

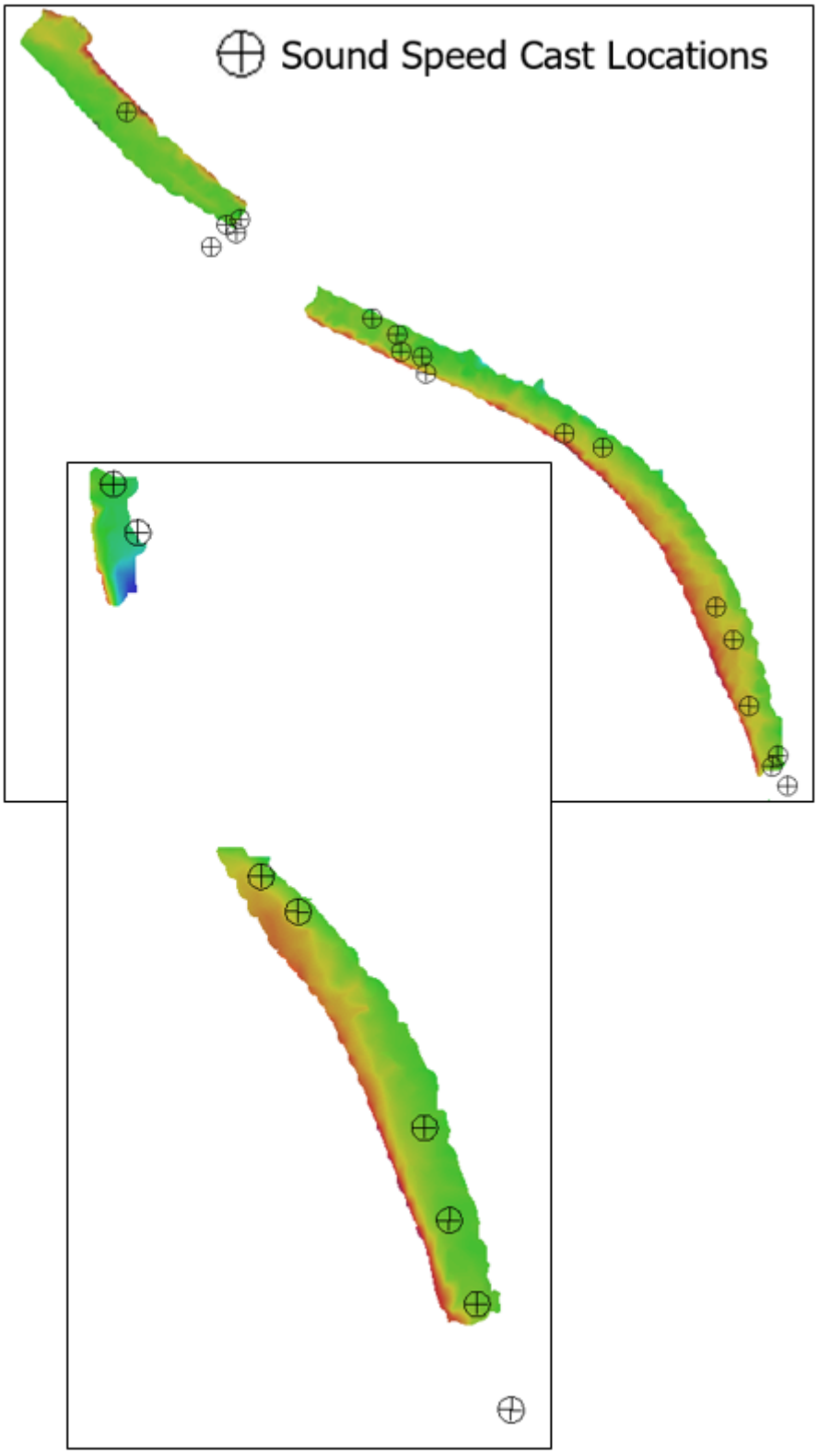


Figure 18: F00722 sound speed cast locations

B.2.8 Coverage Equipment and Methods

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

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

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 2018 field season. All equipment and survey methods were used as detailed in the DAPR.

B.5 Data Processing

B.5.1 Primary Data Processing Software

The following software program was the primary program used for bathymetric data processing:

Manufacturer	Name	Version
Caris	HIPS/SIPS	10.3.3

Table 9: Primary bathymetric data processing software

The following Feature Object Catalog was used: NOAA Profile V_5_8.

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
F00722_MB_CRD_VR	CARIS VR Surface (CUBE)	Variable Resolution	-0.4 meters - 26.6 meters	NOAA_VR	Object Detection
F00722_MB_CRD_VR_Final	CARIS VR Surface (CUBE)	Variable Resolution	-0.4 meters - 26.6 meters	NOAA_VR	Object Detection

Table 10: Submitted Surfaces

The survey was carried out to meet the Object Detection MBES Coverage requirements as defined by Section 5.2.2 of the 2018 Hydrographic Survey Specifications and Deliverables.

QC Tools in Pydro Explorer was used to analyze the surfaces for fliers. There were 137 fliers identified on the finalized surface. Upon review, they were found to be primarily at the steep river edge of the survey area (Figure 19). Additionally, the results produced from flier finder are representative of the ever changing sea floor bathymetry (Figure 20 and 21).

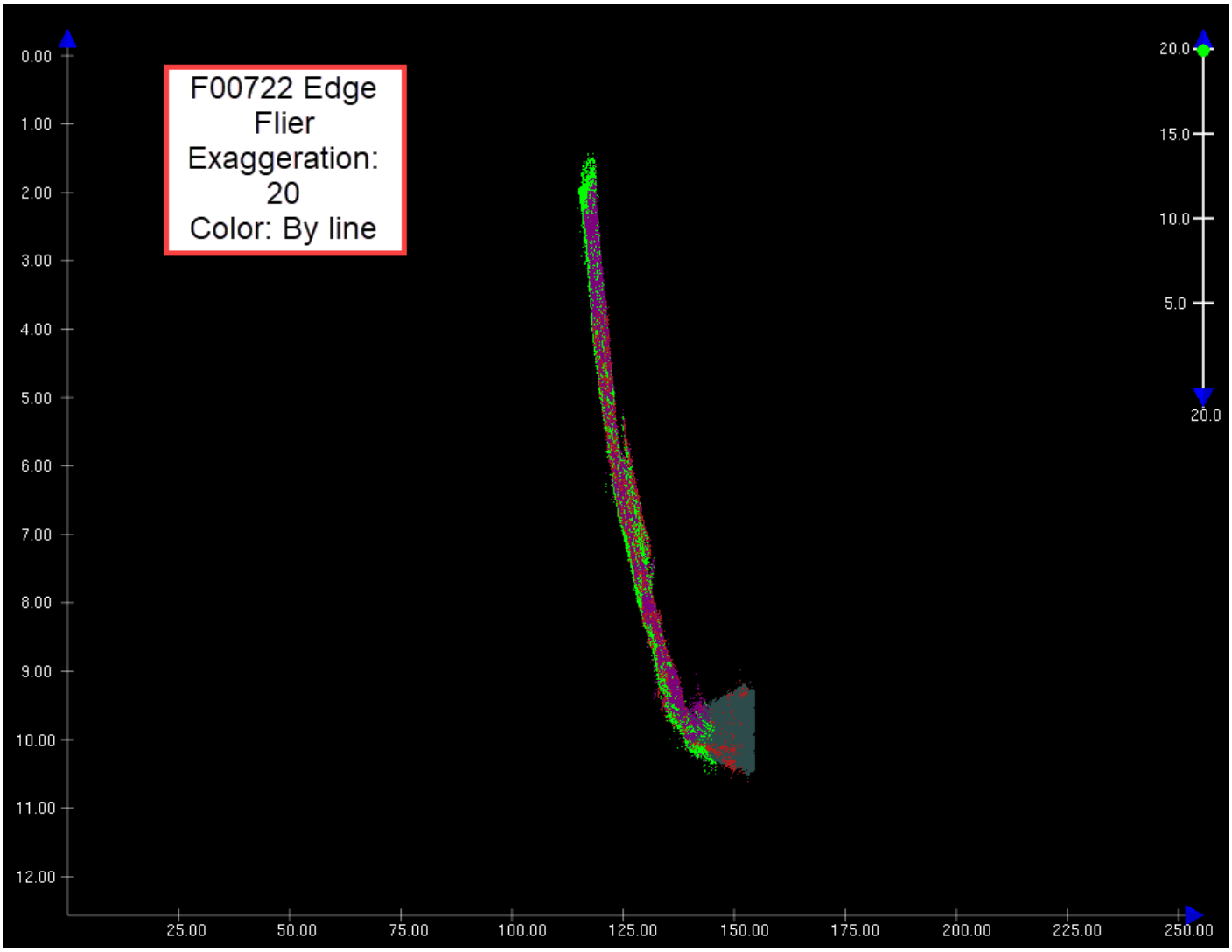


Figure 19: A 2-D example of one of the fliers identified by Flier finder on the edge of the sheet.

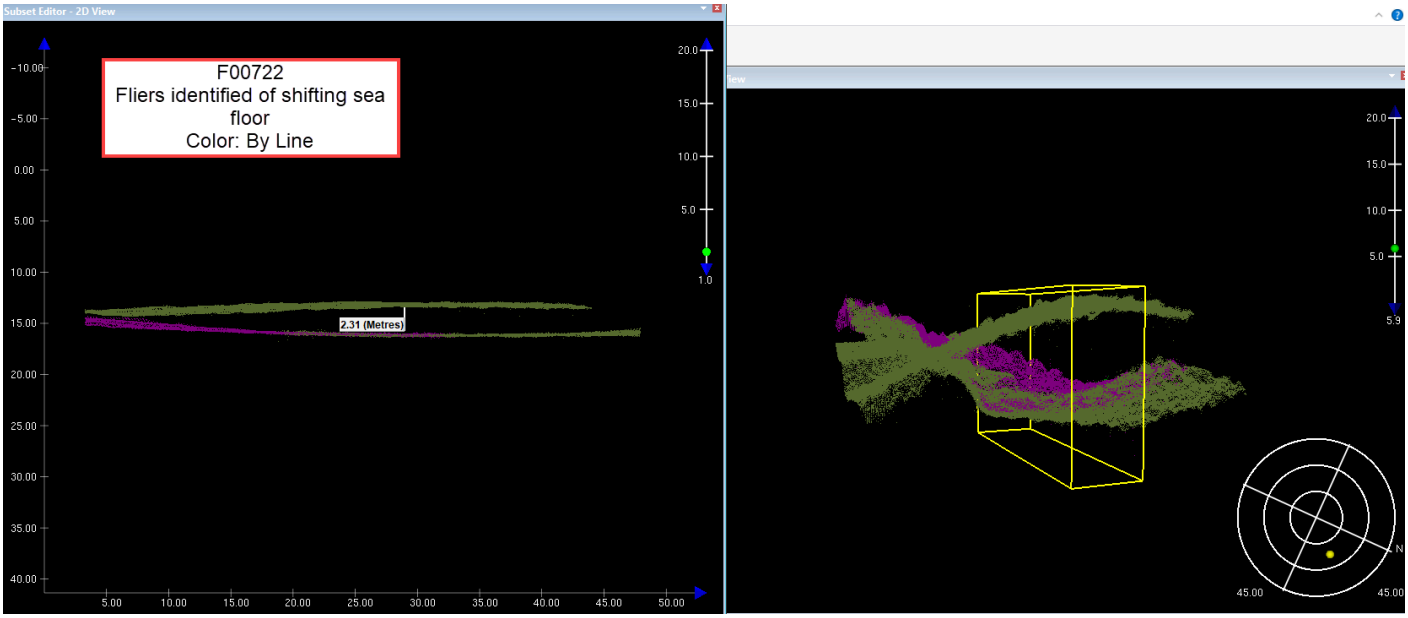


Figure 20: Example of the shifting sea floor identified as a flier.

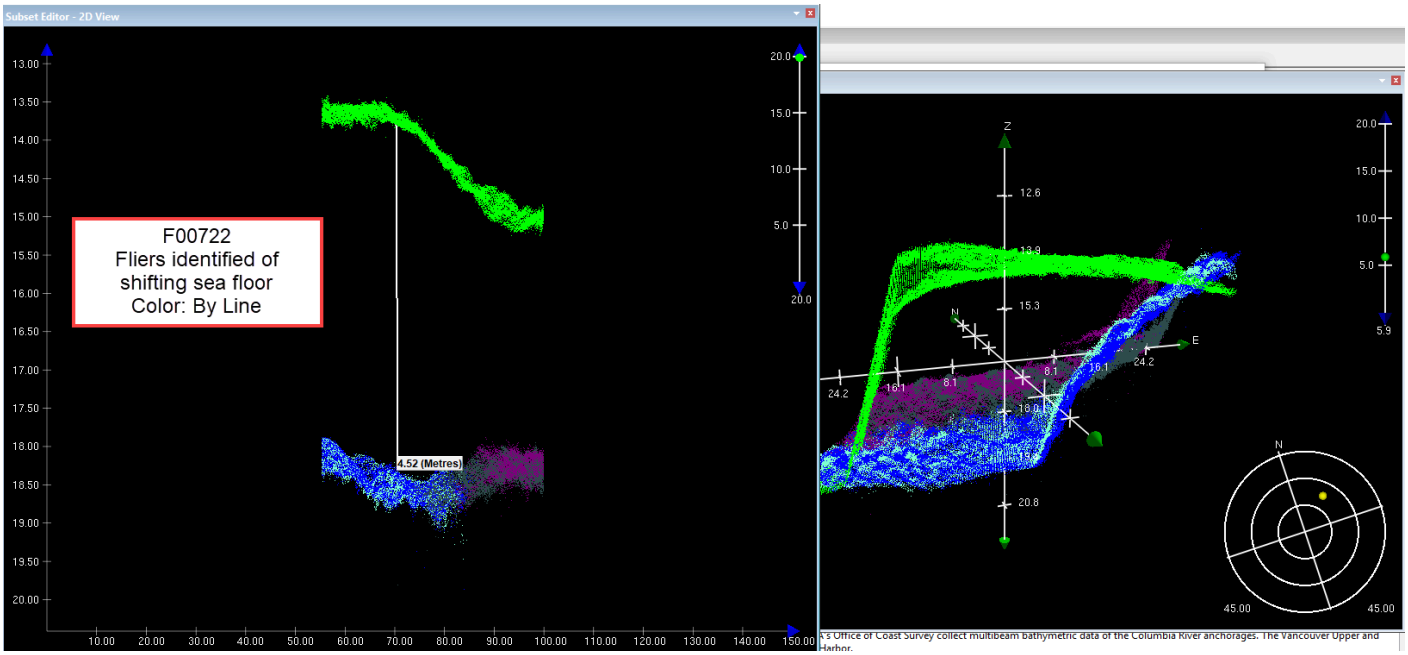


Figure 21: The height variation between shifting sea floor ranges widely throughout F00722 data.

C. Vertical and Horizontal Control

Field installed tide and GPS stations were not utilized for this survey. There is no HVCR report included with the submission of F00722.

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	NAD83-mllwCRD_Geoid09.csar

Table 11: ERS method and SEP file

Sounding elevations relative to the ellipsoid were collected through Ellipsoidal Referenced Survey (ERS) with post-processing of the daily logged POSPac data to create a statistical best estimate of trajectory (SBET) file, as detailed in the DAPR. All of F00722 meets HSSD vertical accuracy requirements.

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 10.

RTK

Precise Positioning-Real Time Extended (PP-RTX) processing methods were used in Applanix POSpac MMS 8.3 software to produce SBETs for post-processing horizontal correction. All of F00722 meets HSSD horizontal accuracy requirements

D. Results and Recommendations

D.1 Chart Comparison

The chart comparison was made using a CARIS sounding and contour layer derived from the finalized VR surface. The contours and sounders were overlaid on the chart and compared for general agreement and to identify areas of significant change.

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
US5OR13M	1:40000	58	02/08/2019	06/01/2018

Table 12: 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

The Obstruction Position Approximate (PA) on chart 18524_1 in the Longview anchorage area was not seen in F00722 survey data (Figure 25). F00722 data shows depths consistent with the charted soundings.

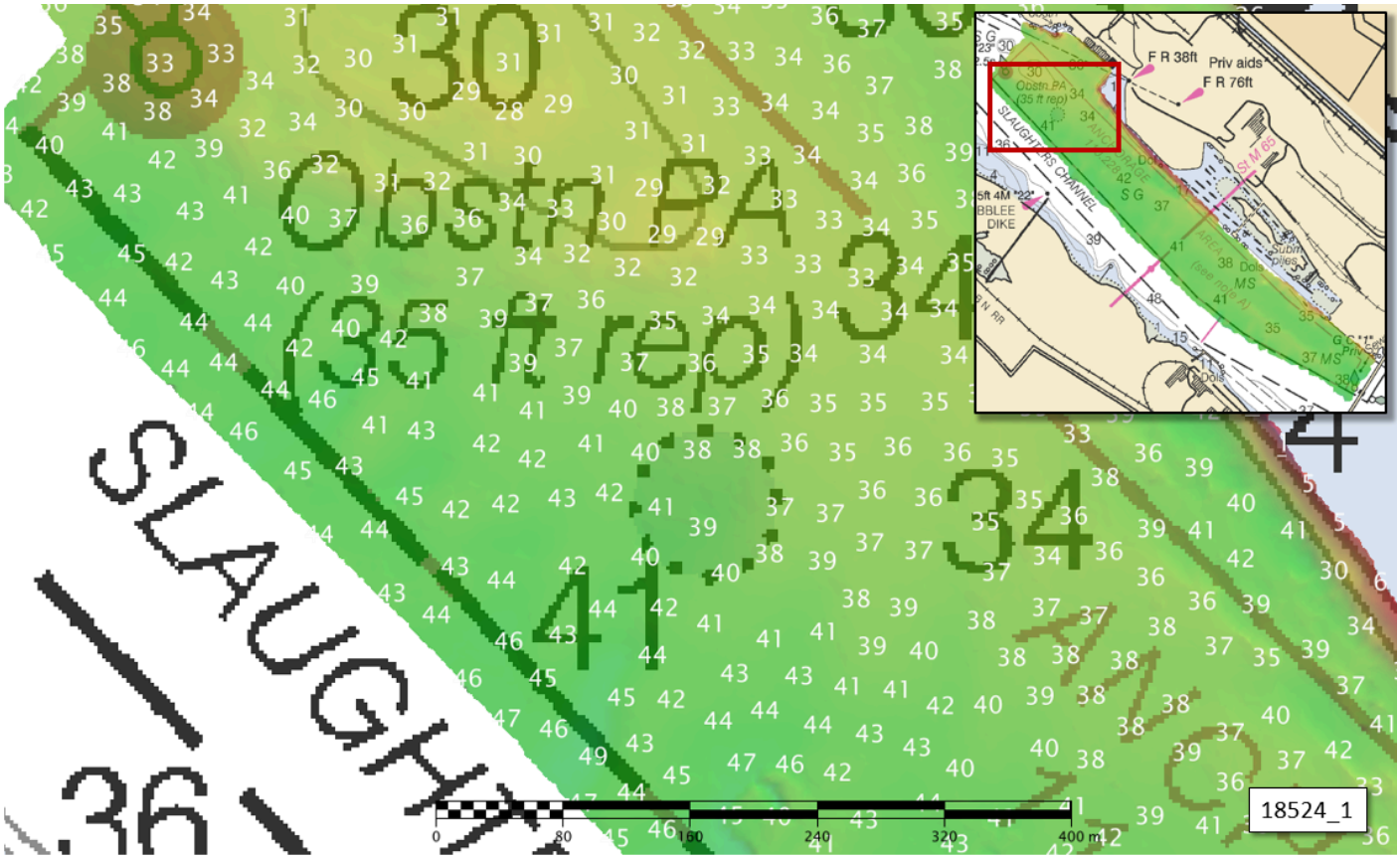


Figure 22: F00722 derived soundings overlaid on chart 18524_1.

D.1.4 Uncharted Features

Sand waves were not charted and have been added to the F00722 Final Feature File (Figure 26).

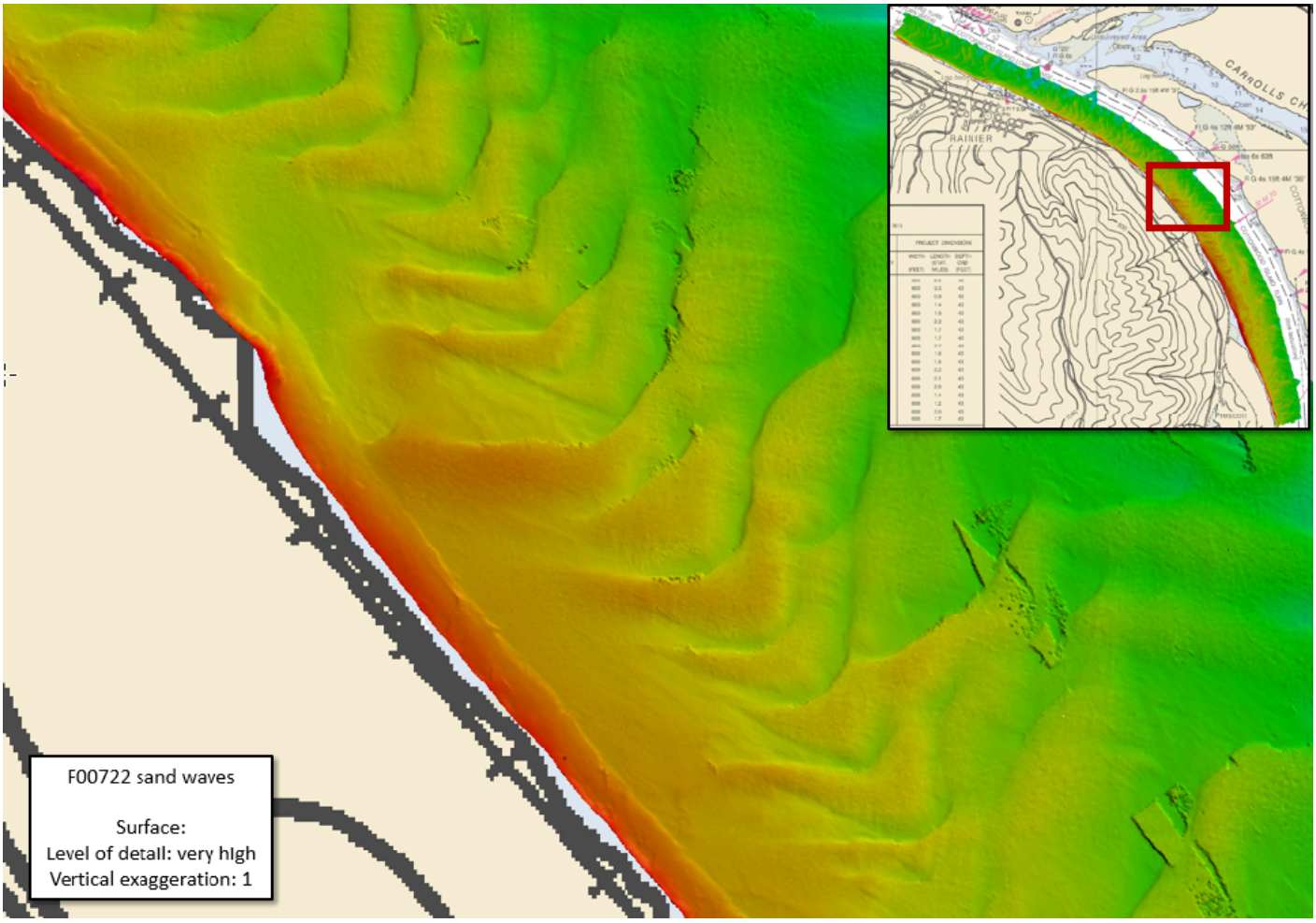


Figure 23: An example of one of the sand wave areas added to the Final Feature File.

During SAR, the extents of the SNDWAV features were modified to better represent the sandy seafloor.

D.1.5 Channels

F00722 survey data included the Longivew, Cottonwood, Prescott, and Kalama designated anchorages on the Columbia River. The sounding comparisons are discussed in section D.1.1 of this report.

D.2 Additional Results

D.2.1 Aids to Navigation

Four aids to navigation were assigned and investigated in the survey area of F00722. The four lighted buoys were serving their untented purpose and were on station. The structures were all observed but the light characteristics were not seen due to daylight.

D.2.2 Maritime Boundary Points

No Maritime Boundary Points were assigned for this survey.

D.2.3 Bottom Samples

Six bottom samples were acquired in accordance with the Project Instructions for survey F00722. Two additional bottom samples were attempted but were unsuccessful after three attempts in accordance to the 2014 Field Procedures Manual. There are no drop camera images submitted with these bottom samples. All bottom samples results are included in the F00722 Final Feature File submitted with this survey.

D.2.4 Overhead Features

The survey area includes the Lewis and Clark Bridge which spans from Longview, WA to Rainier, OR. The field unit did not have the ability to obtain and accurate height estimation on the bridge. This information is conveyed in the Final Feature File.

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

Large sand waves occur in a significant portion of the survey area. Most waves are within 1-2 1/2 meters high and run perpendicular to the water flow of the river (Figure 27).

The Columbia River is a dynamic place, with a constantly changing sea floor which can be observed in F00722 survey data.

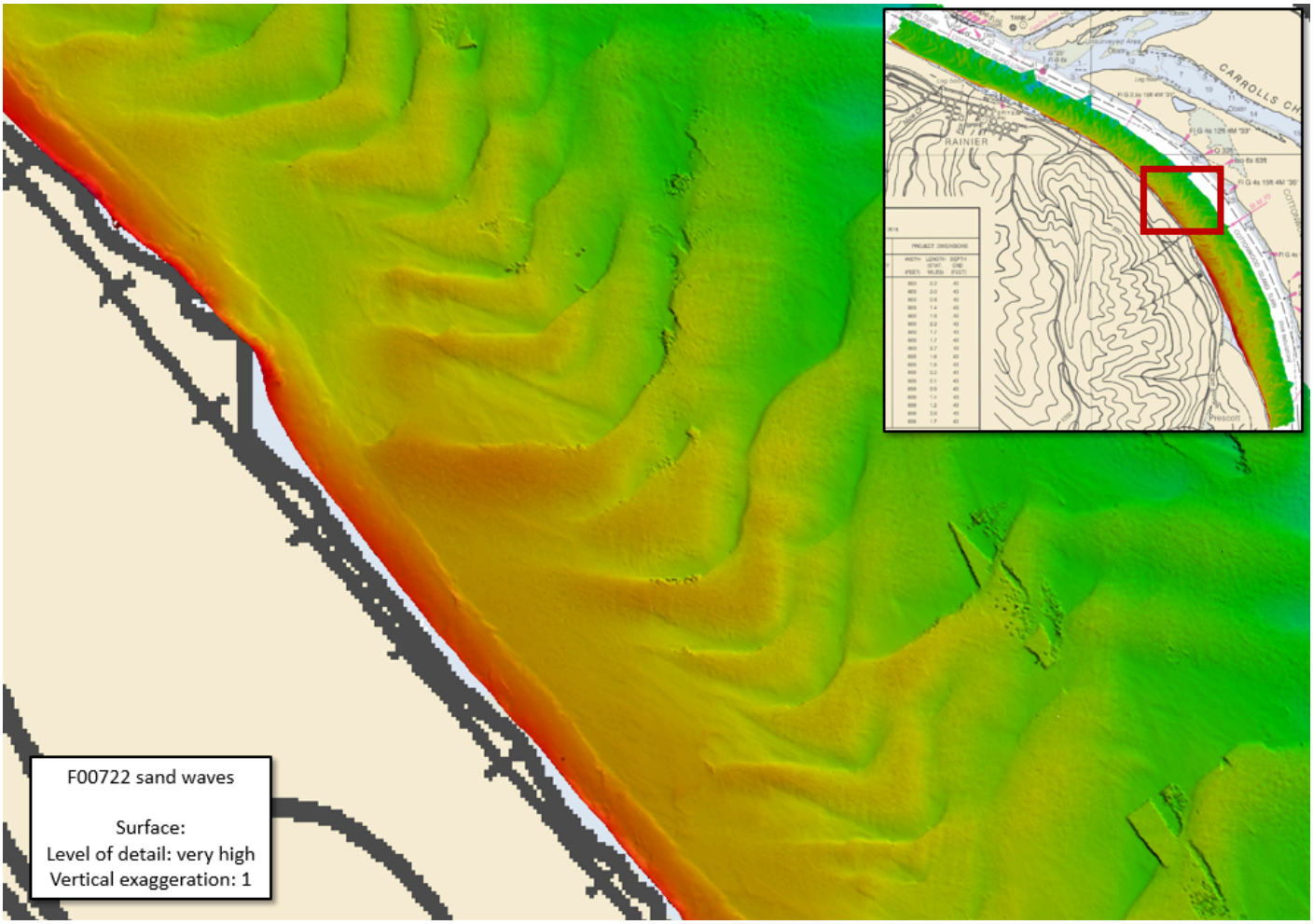


Figure 24: Sand waves present in F00722 survey area.

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 insets 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
Michelle M. Levano, LTJG/NOAA	Chief of Party	09/20/2019	Digitally signed by LEVANO.MICHELLE.MARIE.1516645888 Date: 2019.09.20 09:02:57 -07'00'
PST Timothy Wilkinson	Hydrographer	09/20/2019	WILKINSON.TIMOTHY.DAVID.1383074440 Digitally signed by WILKINSON.TIMOTHY.DAVID.1383074440 Date: 2019.09.20 08:23:33 -07'00'

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

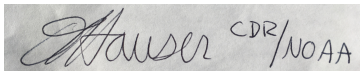
F00722

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)
- Processed survey data and records
- Bottom samples
- GeoPDF of survey products
- Collection of backscatter mosaics

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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Date: 2020.08.14 12:27:55 -07'00'

Approved:_____

Commander Olivia Hauser, NOAA
Chief, Pacific Hydrographic Branch