F00788

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

DESCRIPTIVE REPORT

Type of Survey:	Navigable Area
Registry Number:	F00788

LOCALITY

State(s):	Washington
General Locality:	Keystone Harbor
Sub-locality:	Approach to Keystone Harbor

2019

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	**F00788**

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):	**Washington**
General Locality:	**Keystone Harbor**
Sub-Locality:	**Approach to Keystone Harbor**
Scale:	**10000**
Dates of Survey:	**08/15/2019 to 08/19/2019**
Instructions Dated:	**08/13/2019**
Project Number:	**S-N921-NRT3-19**
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:

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.

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Descriptive Report to Accompany Survey F00788

Project: S-N921-NRT3-19

Locality: Keystone Harbor

Sublocality: Approach to Keystone Harbor

Scale: 1:10000

August 2019 - August 2019

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 project instructions S-N921-NRT3-19 (Figure 1). F00788 survey area includes the approach to Keystone Harbor and Keystone Harbor in the vicinity of Whidbey Island.

A.1 Survey Limits

Data were acquired within the following survey limits:

Northwest Limit	Southeast Limit
48° 8' 48.96" N 122° 41' 38.98" W	48° 8' 48.96" N 122° 39' 34.78" W

Table 1: Survey Limits

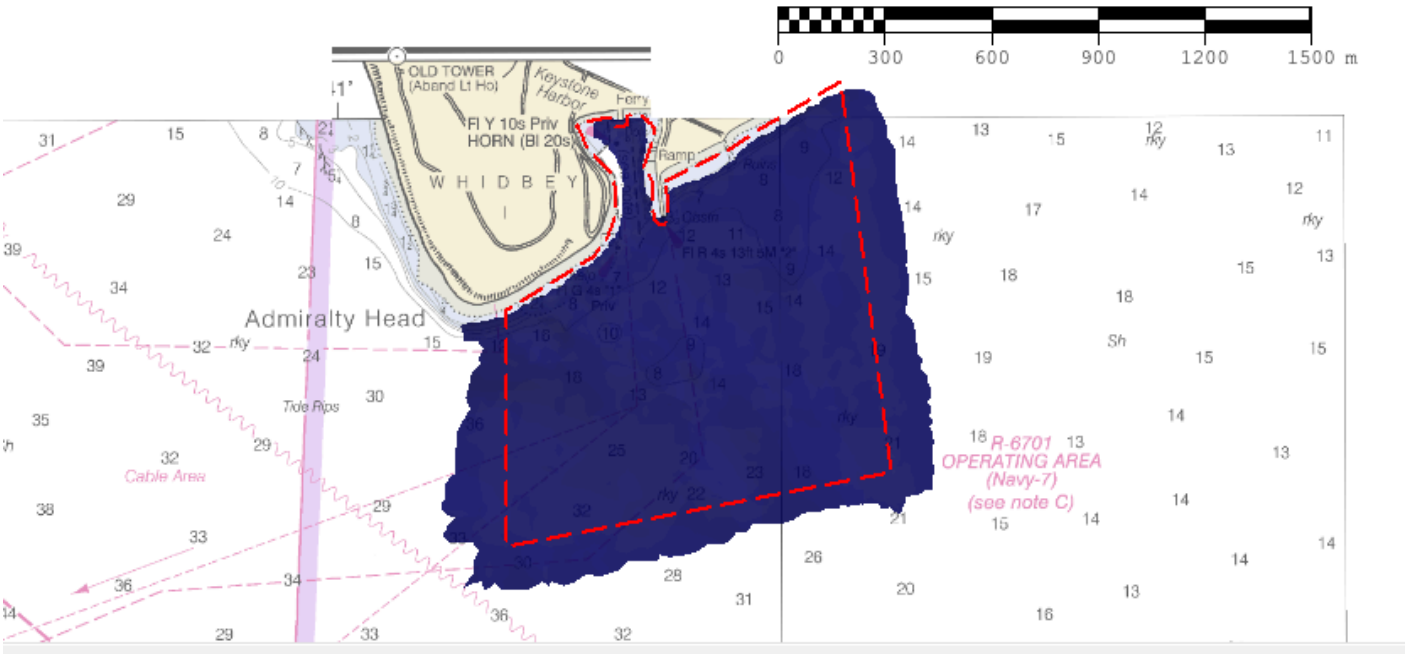


Figure 1: F00788 assigned survey limits (in red) overlaid on chart 18464_1 and completed survey area.

Data was acquired to the survey limits in accordance with the requirements in the Project Instructions and the Nation Ocean Service (NOS) 2019 Hydrographic Survey Specifications and Deliverables (HSSD).

A.2 Survey Purpose

This survey was completed at the request of the Washington State Ferries due to reported shoaling in the approaches to Keystone Harbor in the route of the two passenger ferries. This area was last surveyed in the 1940s and is intended to update National Ocean Service (NOS) nautical charting products. This survey includes the harbor the ferries use to load and unload passengers, vehicles, and goods in Whidbey island. Additionally, there is a small boat ramp at Keystone Harbor managed by Washington State parks.

A.3 Survey Quality

The entire survey is adequate to supersede previous data.

Data acquired in F00788 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 2). Density requirements for F00788 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, slopes and rocky areas where acoustic shadowing occurred, and at the edges of the survey limits.

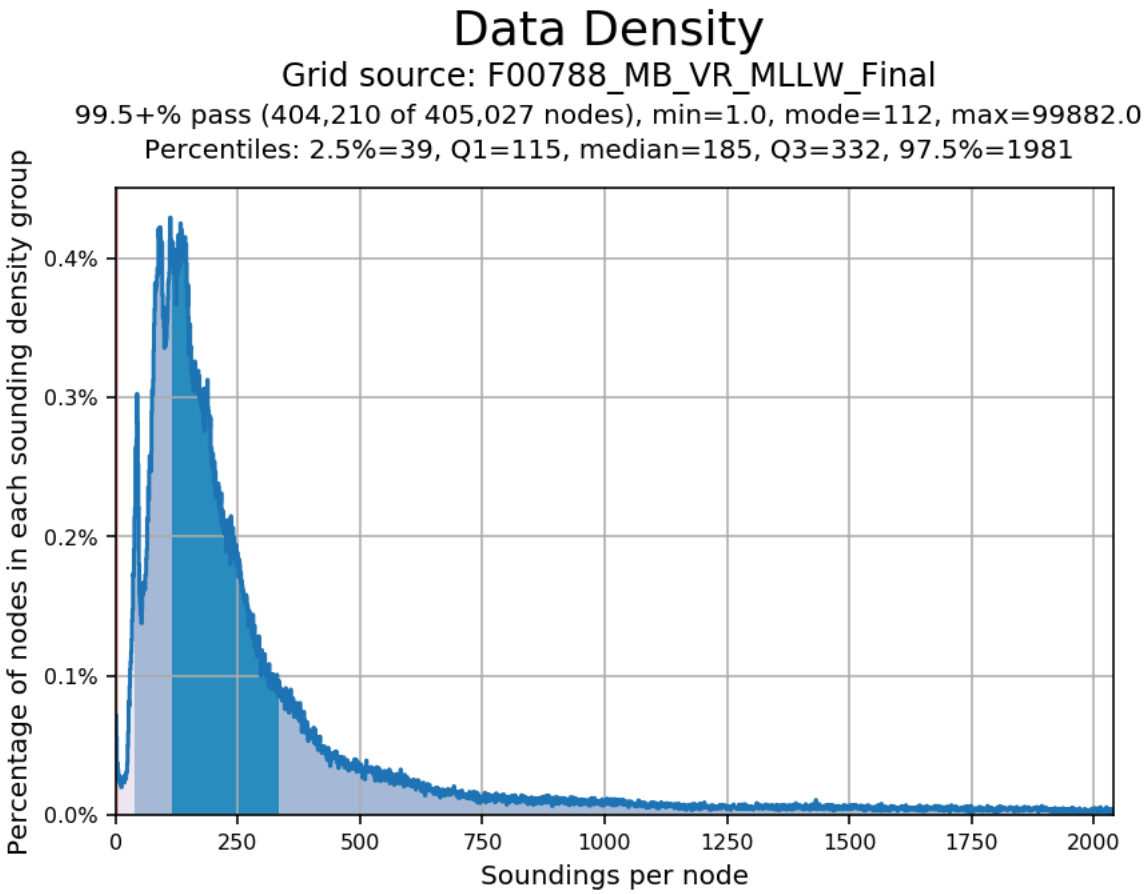


Figure 2: Pydro derived histogram plot showing HSSD object detection compliance of F00788 MBES with the finalized CUBE surface.

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

F00788 data was reviewed in HIPS and SIPS for holidays in accordance with Section 5.2.2.3 of the HSSD. Three holidays were identified via HydrOffice QC Tools Holiday Finder. The tool automatically scans the surface for holidays as defined in the HSSD and was run in conjunction with a visual inspection of the density surface by the hydrgrapher. There are three holidays within this project. Two data gaps are along a rocky seawall and are in less than 4 meters of water (Figure 3). The final holiday is due to a mooring pile that is utilized by the ferry. This pile is represented in the final feature file (Figure 4). Flier Finder results are discussed 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, obstructions, and kelp (Figure 6). This survey represents a small area of north Puget Sound, and is outside the channel (Figure 7 and 8).

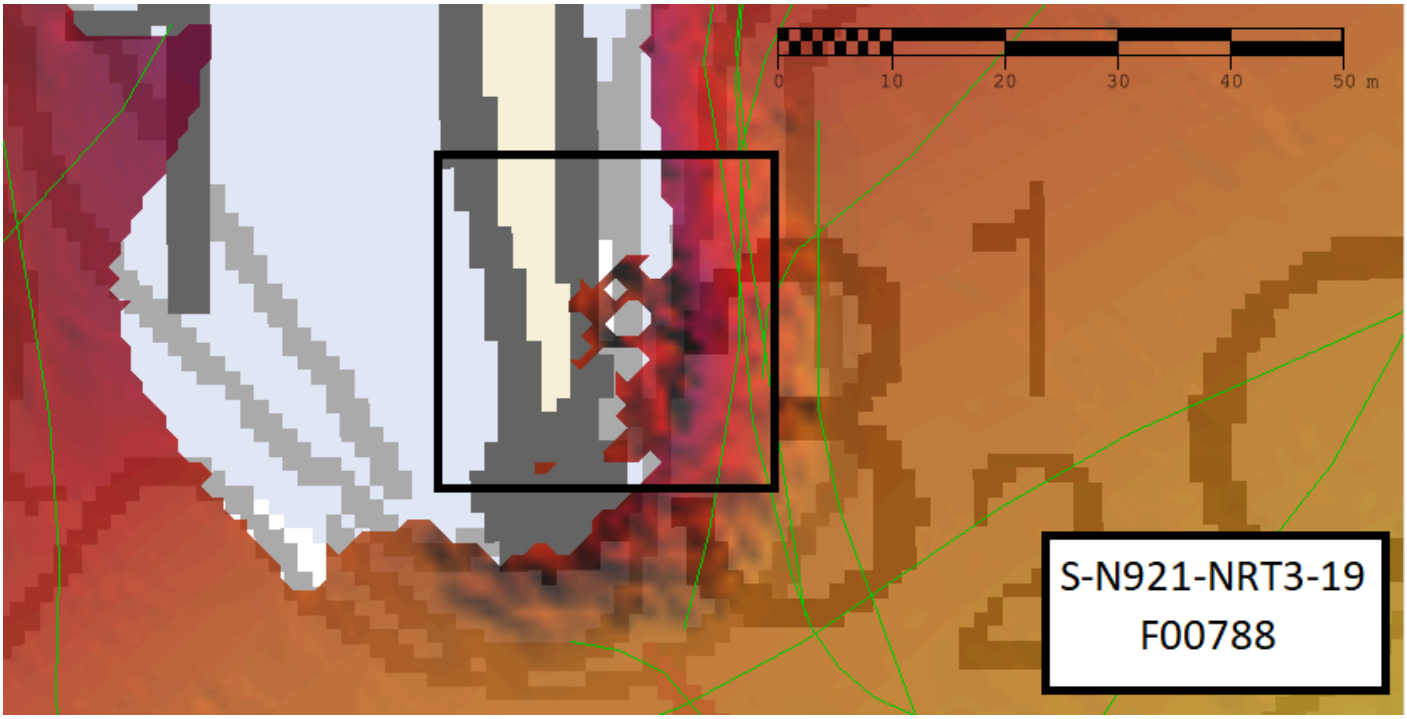


Figure 3: Two inshore holidays exist in four meters of water along the eastern sea wall approaching Keystone Harbor.

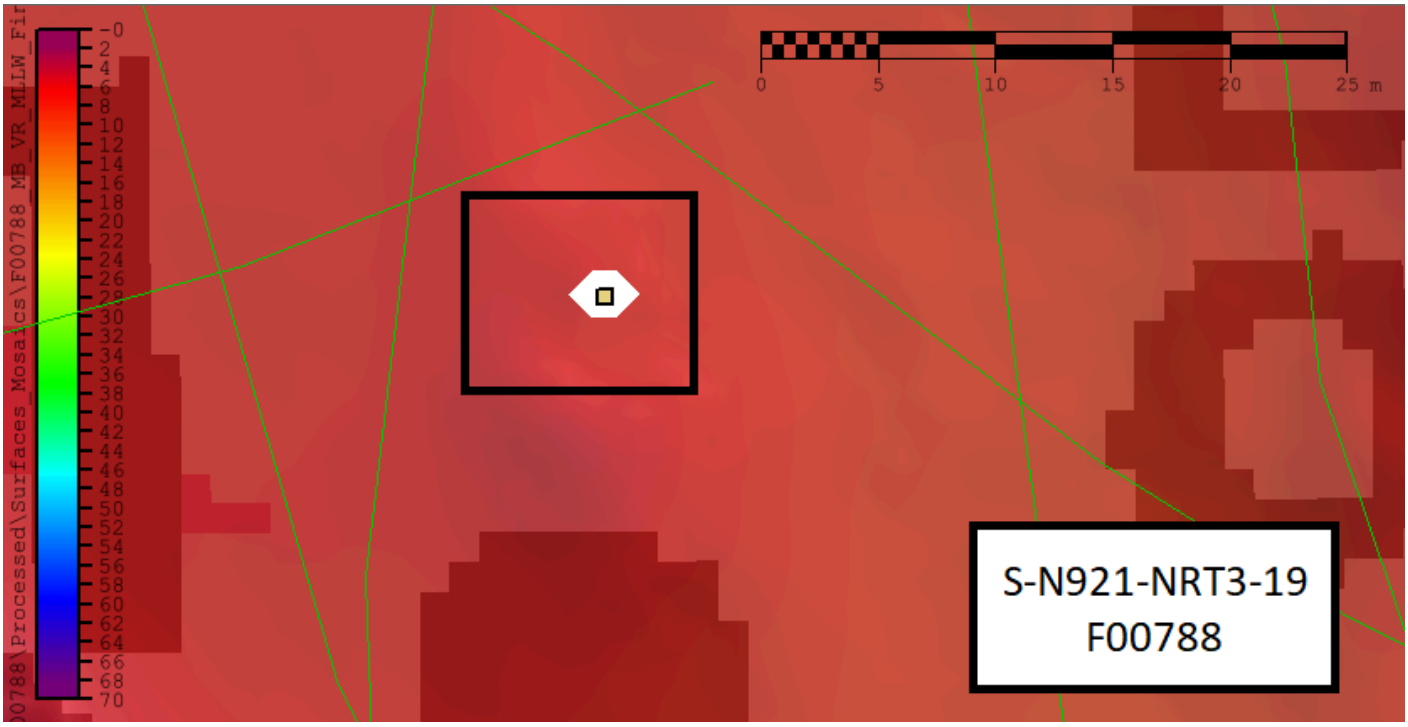


Figure 4: A data gap exists due to location of a pier piling.

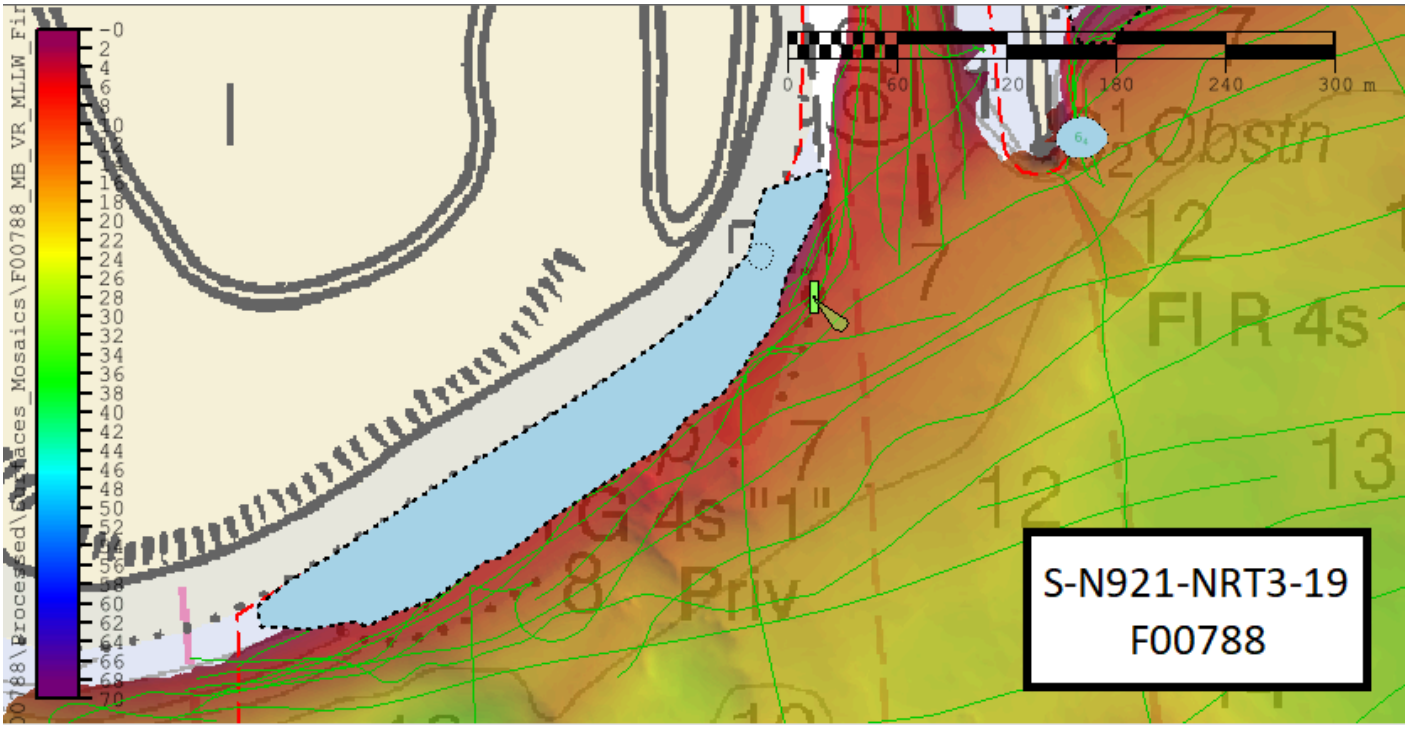


Figure 5: Example of where NALL was the inshore limit of safe navigation due to dense kelp beds, represented in the final feature file.

Figure 6: Dense kelp beds exist inshore of 8 meters on the north eastern and western shores of Keystone Harbor.

SAR: As a result of being formed by spurious soundings, the gridded data withing the Figure 3 box has been rejected in review. Those spurious grid nodes no longer exist in the gridded surface.

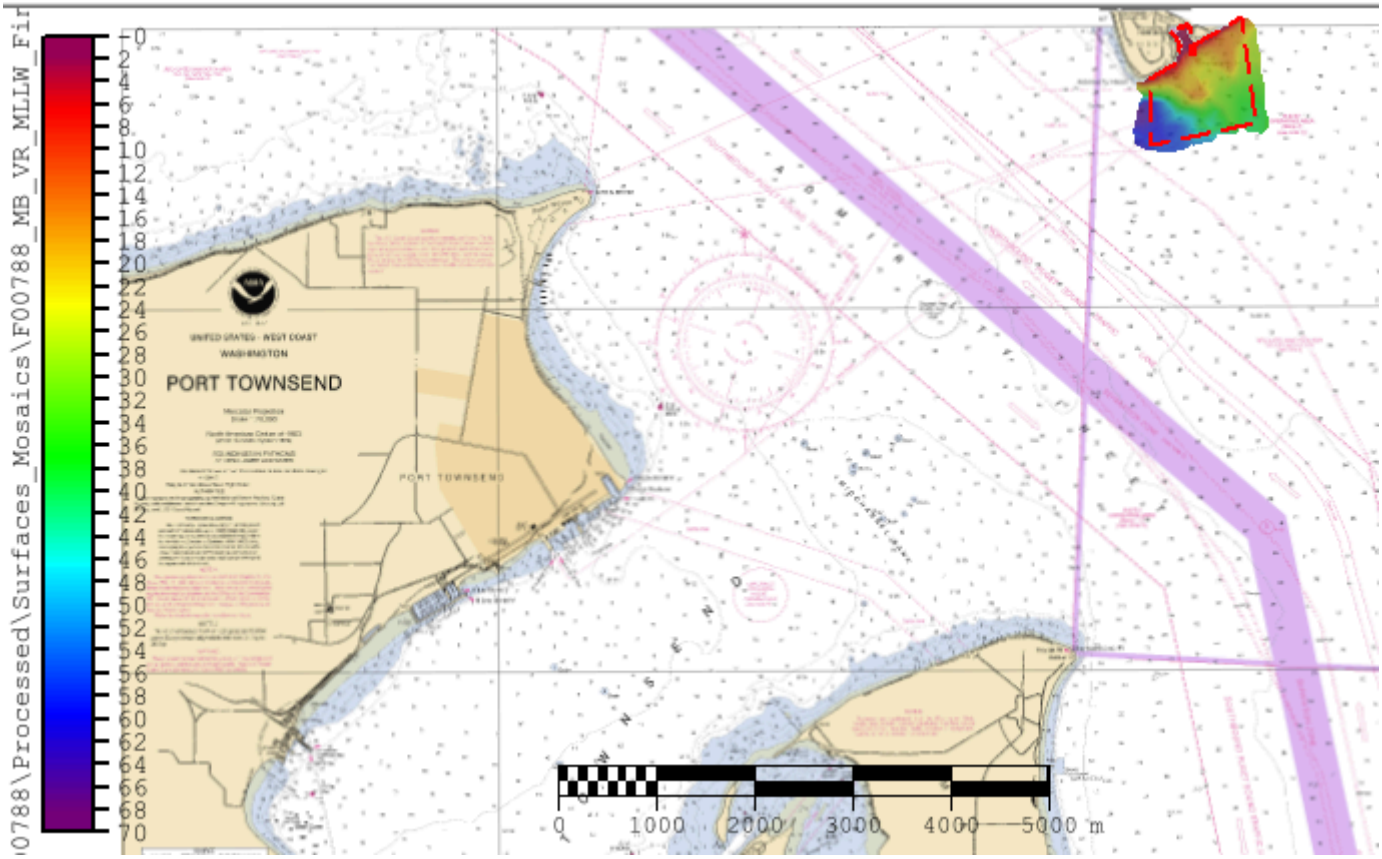


Figure 7: Survey coverage overview in relation to Port Townsend, WA on chart 18464

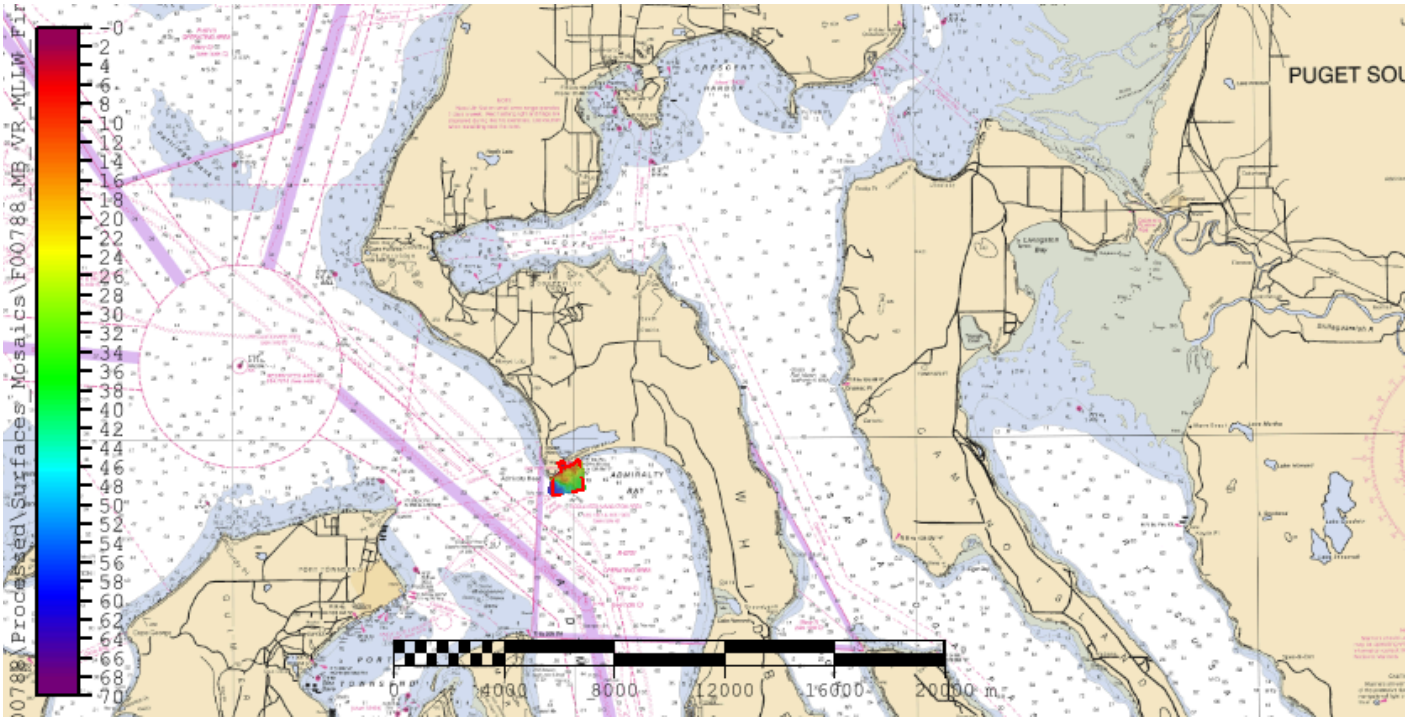


Figure 8: Survey coverage relative to northern Puget Sound on chart 18441

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	18.5	18.5
	Lidar Mainscheme	0	0
	SSS Mainscheme	0	0
	SBES/SSS Mainscheme	0	0
	MBES/SSS Mainscheme	0	0
	SBES/MBES Crosslines	3.1	3.1
	Lidar Crosslines	0	0
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			0.37

Table 3: Hydrographic Survey Statistics

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

Survey Dates	Day of the Year
08/15/2019	227
08/16/2019	228
08/17/2019	229
08/18/2019	230
08/19/2019	231

Table 4: Dates of Hydrography

This survey data was collected from August 15 to August 19 with the assistance of LTJG Joshua Fredrick of CO-OPs and Pacific Hydrographic Branch Pathways intern, Adrian Biesel.

Figure 9: NRT-Seattle with F/V SALISH in Keystone Harbor.

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 10: NRT-Seattle, S3006

S3006 is an aluminum survey boat built by Lake Assault Boats in Superior, WI (Figure 10).

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

The equipment listed above was used to collect all data on F00788.

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 11). 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. Statistics show the mean difference between the depths derived from mainscheme data and crossline data was 0.1 meters, with mainscheme being shoaler/deeper. In total, 99.5% of the total number of nodes pass the TVUmax test between F00788 mainscheme and crossline data (Figure 13-14). 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 F00788 MBES data reduced to Mean Lower Low Water (MLLW) using Ellipsoidally Referenced Survey (ERS) methods.

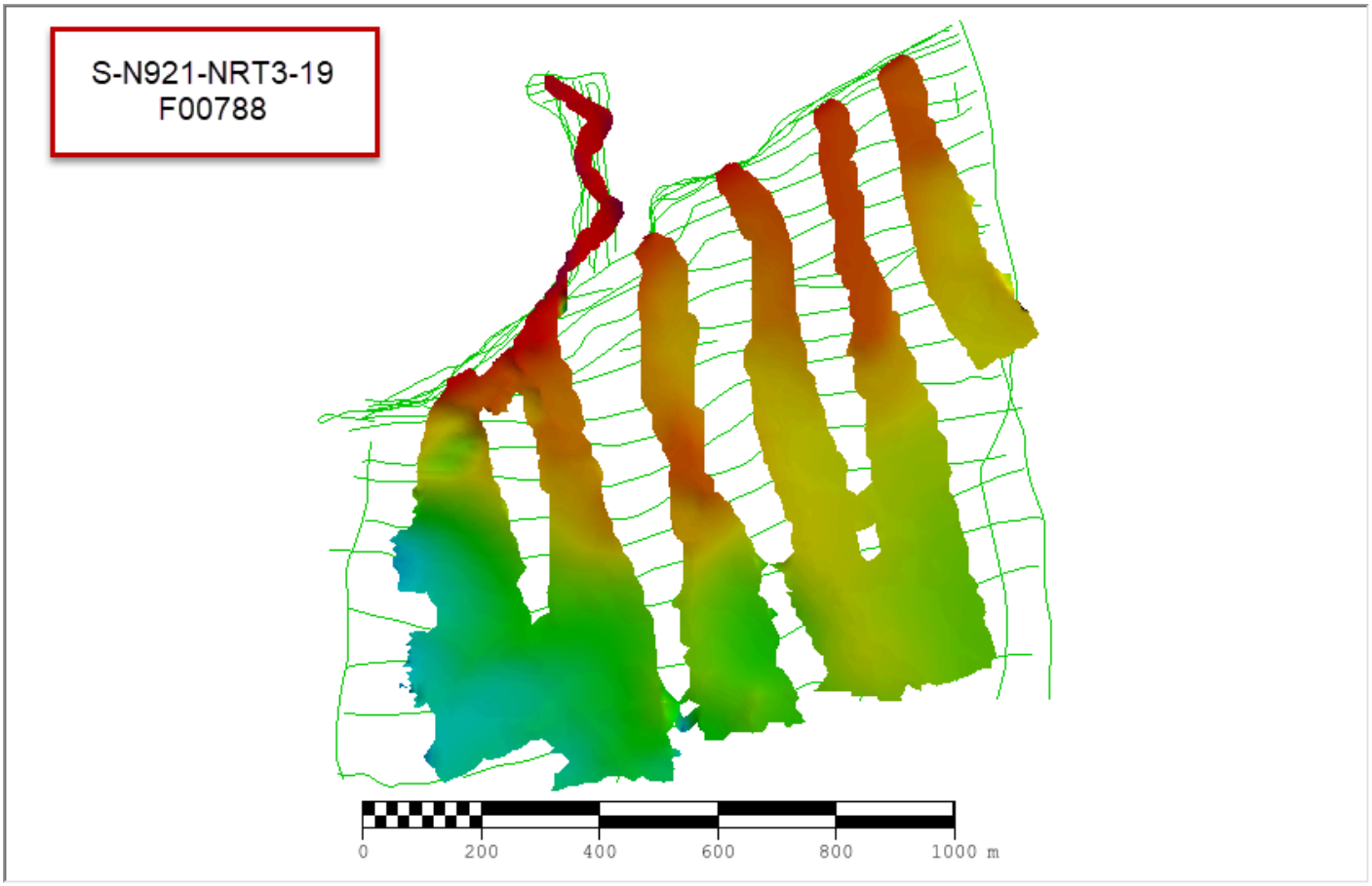


Figure 11: F00788 crossline surface overlaid on mainscheme tracklines showing good temporal and geographic distribution.

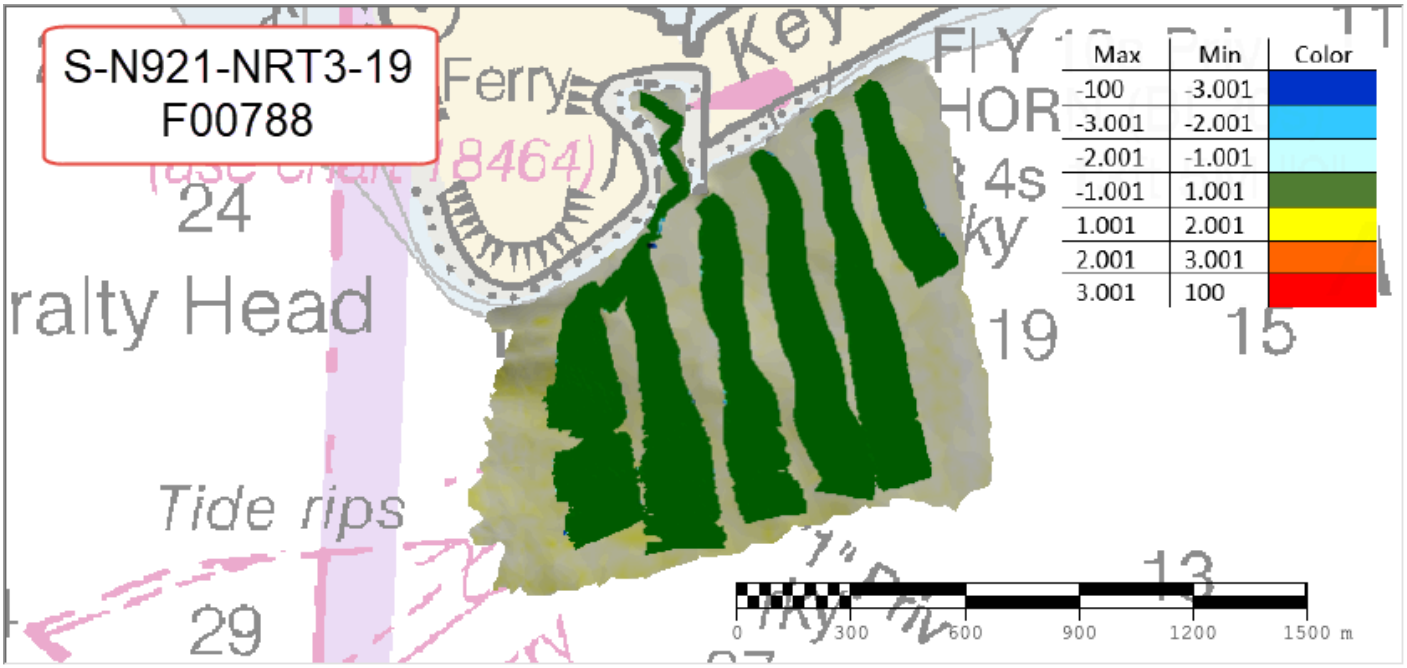
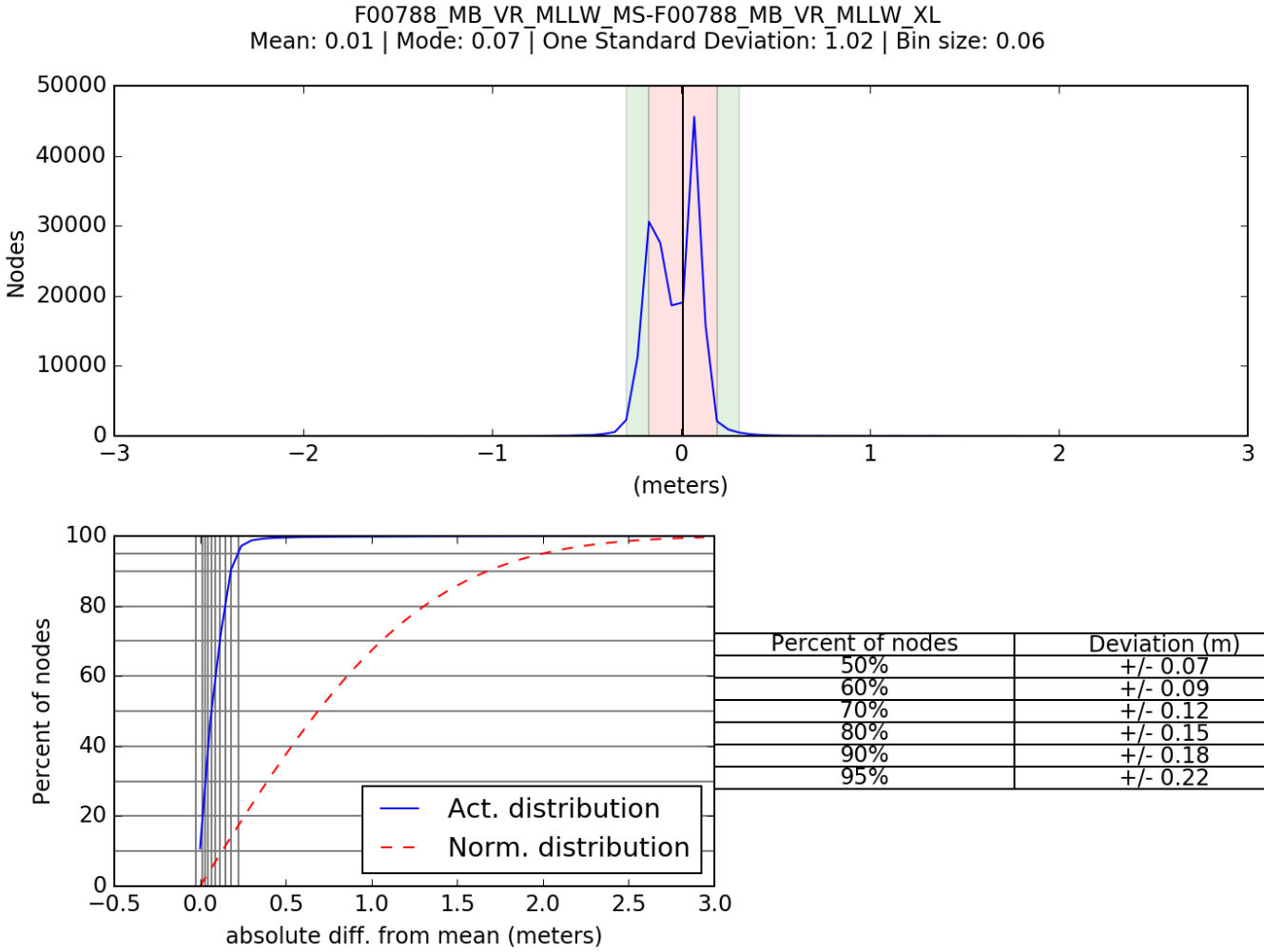


Figure 12: Depth differences between F00788 mainscheme and crossline data as compared to NOAA allowable uncertainty standards for the associated depths.



Percent of nodes	Deviation (m)
50%	+/- 0.07
60%	+/- 0.09
70%	+/- 0.12
80%	+/- 0.15
90%	+/- 0.18
95%	+/- 0.22

Figure 13: The statistic distribution summary plot of the difference between F00788 mainscheme and crossline data.

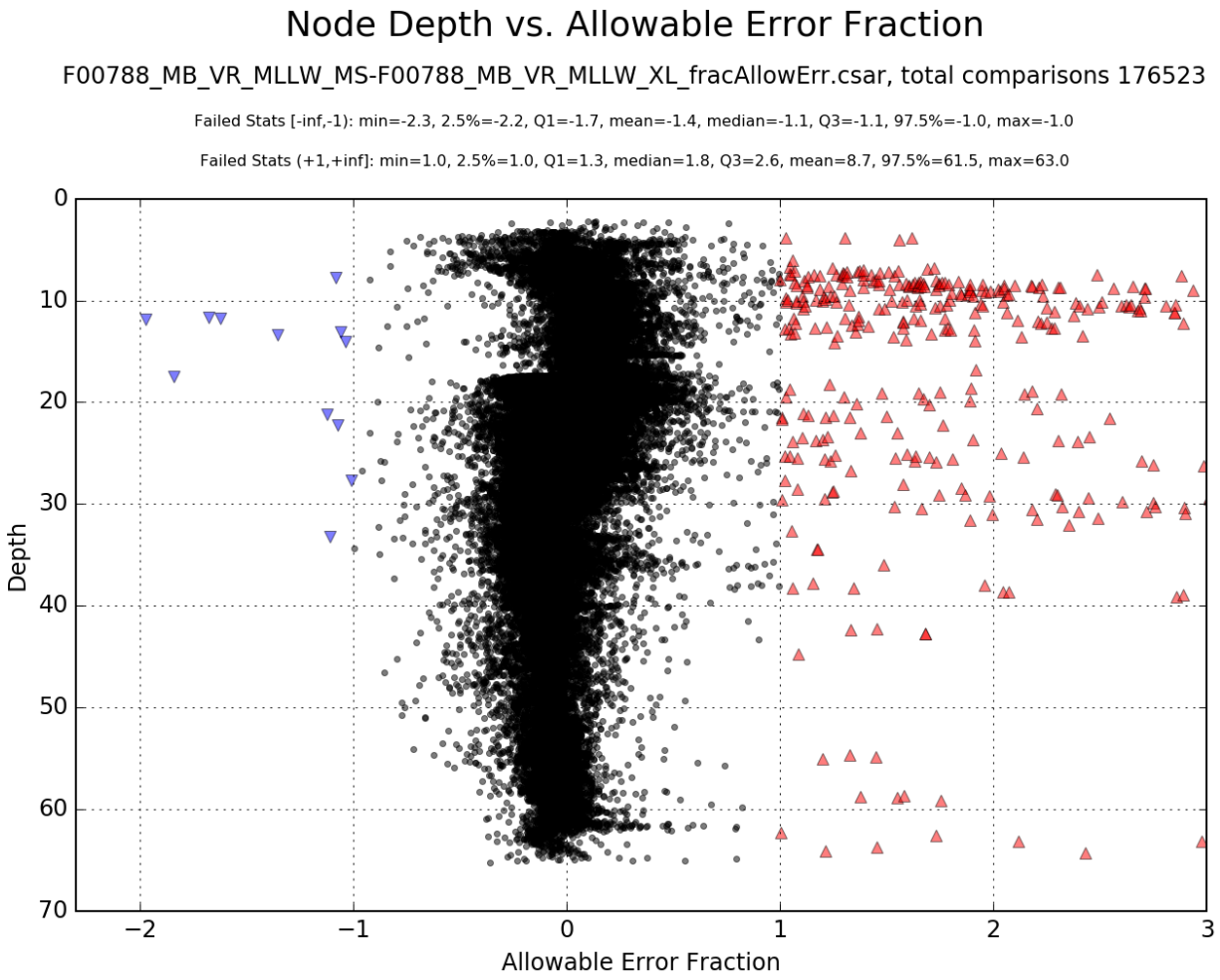


Figure 14: The depth dependent plot of the Allowable Error Fraction, with values between and including +/-1 representing passing comparisons.

B.2.2 Uncertainty

The following survey specific parameters were used for this survey:

Method	Measured	Zoning
ERS via VDATUM	0.0 meters	9.5 centimeters

Table 7: Survey Specific Tide TPU Values.

Hull ID	Measured - CTD	Measured - MVP	Measured - XBT	Surface
S3006	1.0 meters/second	0.0 meters/second	0.0 meters/second	0.15 meters/second

Table 8: Survey Specific Sound Speed TPU Values.

Total Propagated Uncertainty (TPU) values for F00788 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 in the project instructions. A visual inspection of the Uncertainty layer revealed the areas of higher uncertainty occurred in the outer beams, shifting bottom types, and deeper areas.

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 F00788. 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. F00788 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. F00788 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 F00788 (Figure 15).

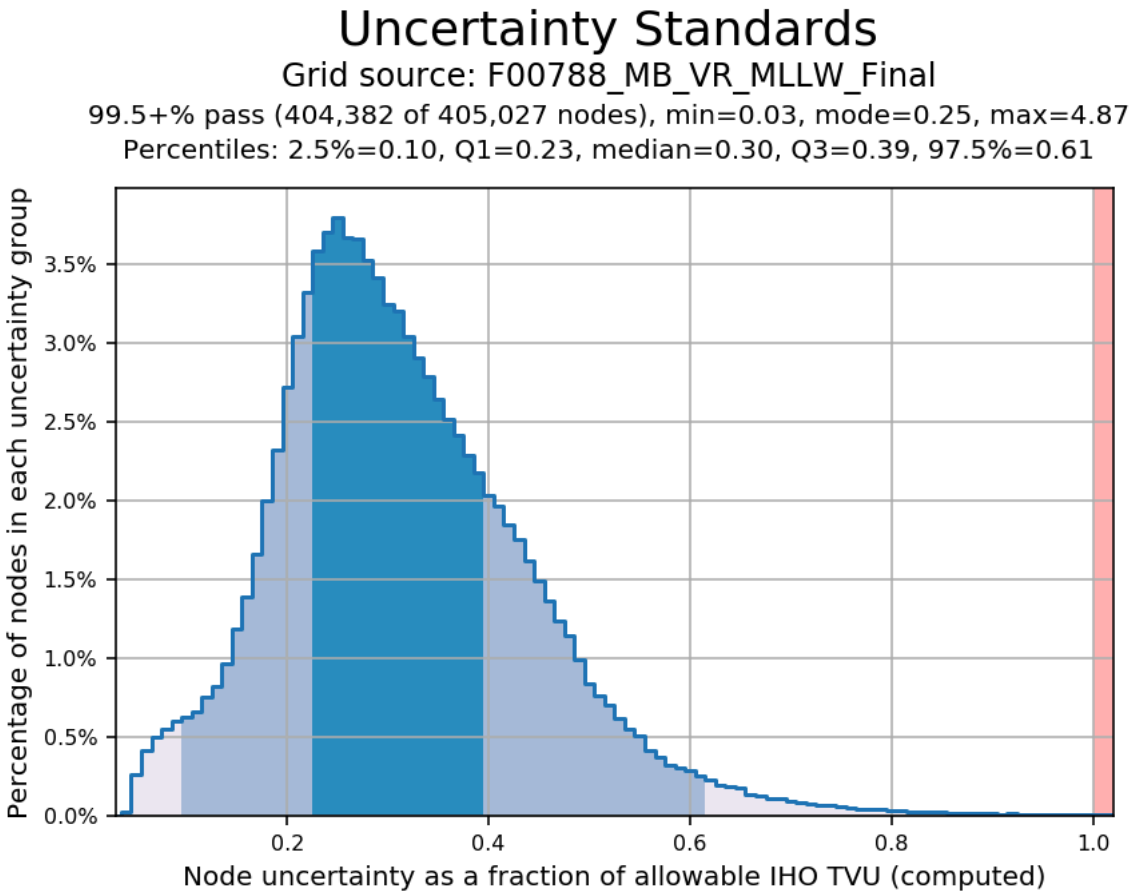


Figure 15: Pydro derived histogram plot showing HSSD uncertainty standards compliance for F00788 finalize VR surface.

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

There were no other factors that affected corrections to soundings.

B.2.7 Sound Speed Methods

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 16). The SVP casts were applied to the MBES lines in CARIS using the "nearest in distance within time of 4 hours" method.

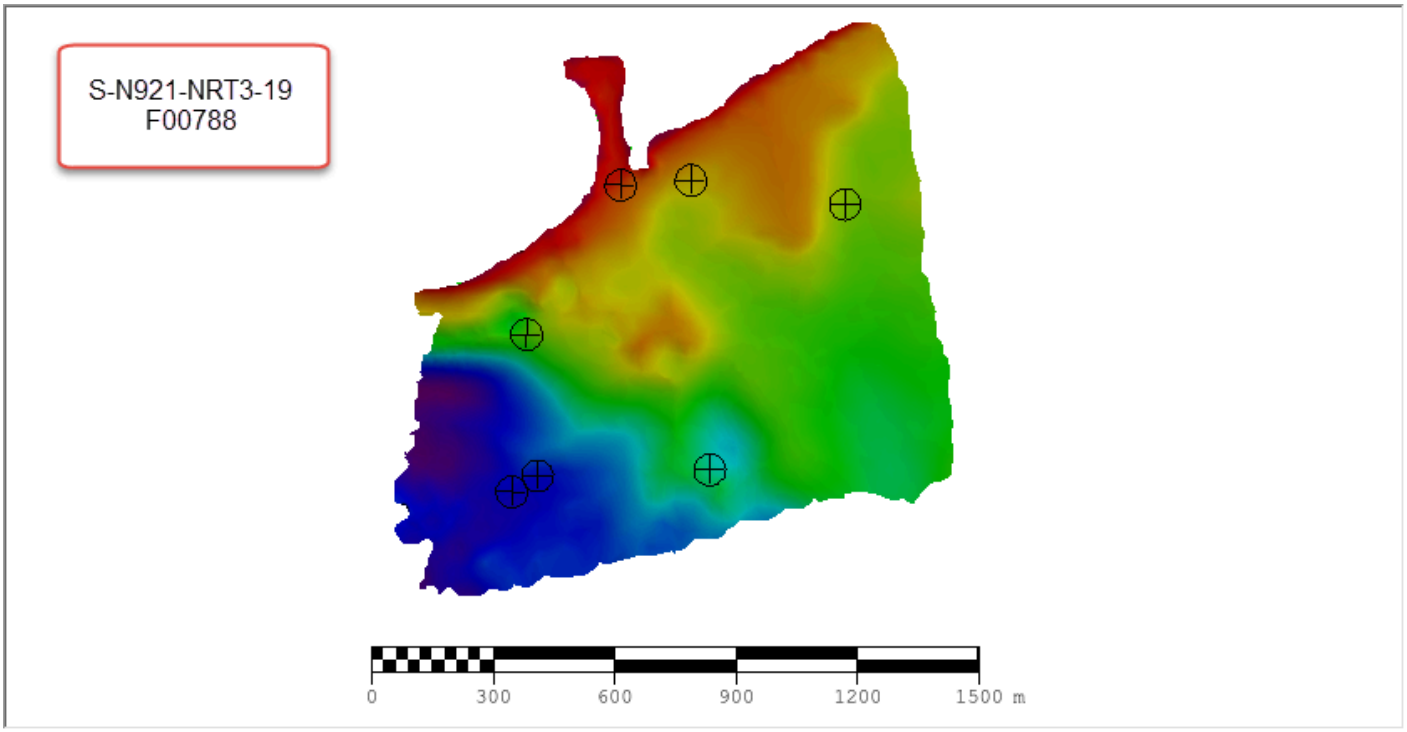


Figure 16: F00788 sound speed cast locations

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 2019 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
Teledyne	CARIS HIPS and SIPs	11.1.6

Table 9: Primary bathymetric data processing software

The following Feature Object Catalog was used: Caris_Support_Files_2019v1.

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
F00788_MB_VR_MLLW	CARIS VR Surface (CUBE)	Variable Resolution	1.6 meters - 68.5 meters	NOAA_VR	Object Detection
F00788_MB_VR_MLLW_Final	CARIS VR Surface (CUBE)	Variable Resolution	1.8 meters - 68.5 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 2019 Hydrographic Survey Specifications and Deliverables.

QC Tools in Pydro Explorer was used to analyze the surfaces for fliers. There were 3 fliers identified on the finalized surface. Upon review, they were found to be primarily at the steep and rocky shoreline edges of the survey area (Figure 17).

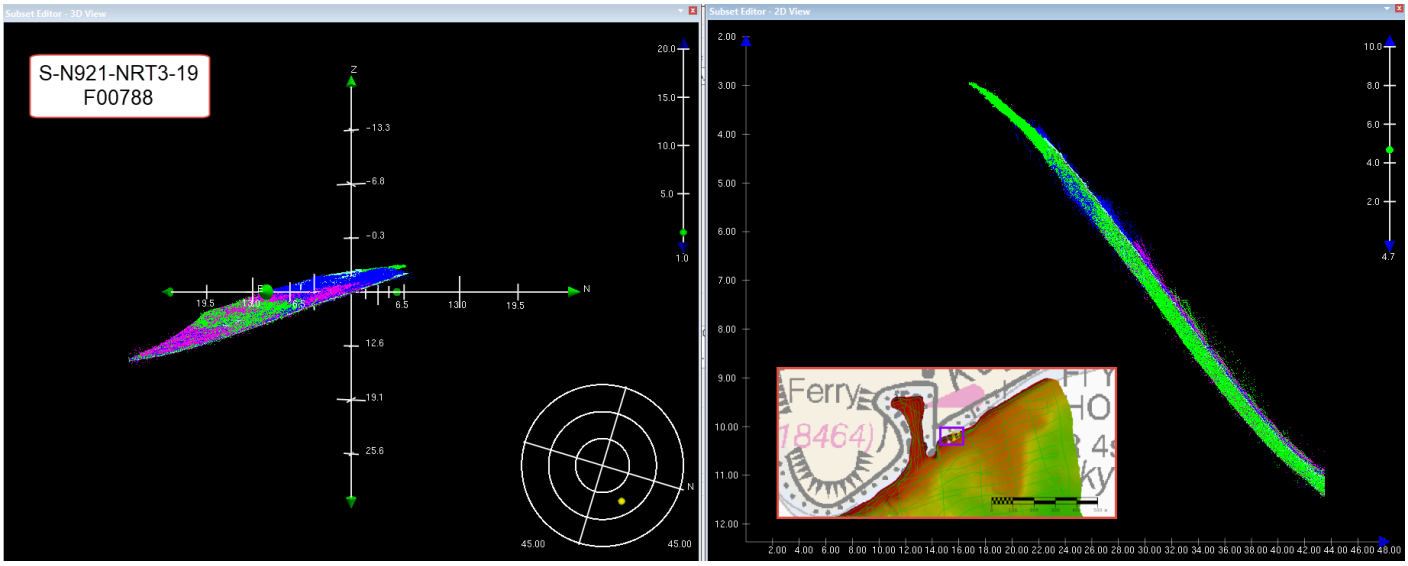


Figure 17: Example of a flier identified by QC tools over a rocky, kelp ridden shoreline.

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 F00788.

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-N921-NRT3-19_Sheets_100m_NAD83-MLLW_Geoid12b_

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 F00788 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 F00788 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
US5WA28M	1:20000	22	05/25/2019	05/15/2019

Table 12: Largest Scale ENCs

D.1.2 Shoal and Hazardous Features

Shoal soundings are compared in section D.1.1 of this report. Field derived survey data was compared to charted dredged depths. There was one danger to navigation report submitted with this survey that can be found in the appendixes of this report.

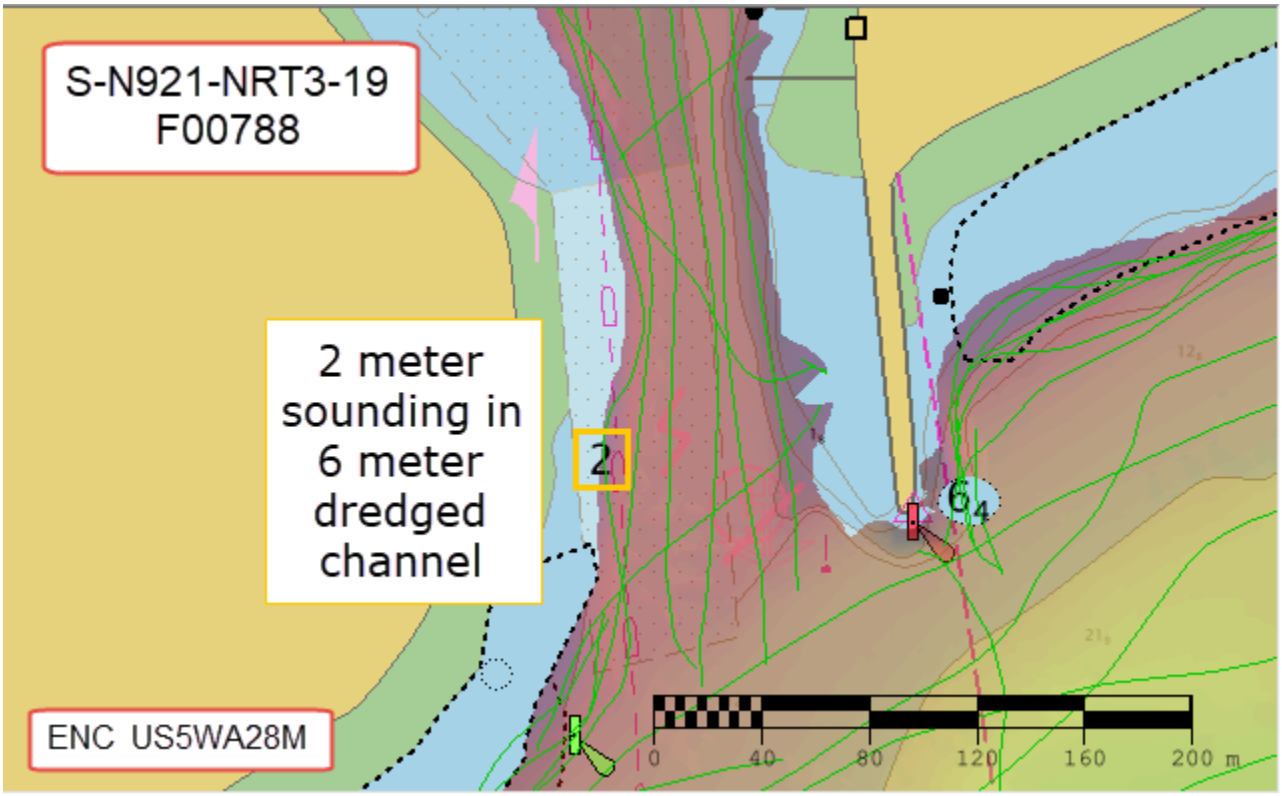


Figure 18: Image from the danger to navigation report submitted to MCD of a shoal sounding from F00788.

D.1.3 Charted Features

No charted features exist for this survey.

D.1.4 Uncharted Features

Heavy kelp that is to thick to navigate was observed on both the western and eastern shorelines. This area has been encoded as a foul area, and provided the remarks "Foul with kelp" into the file feature file of this survey (Figure 22).

Figure 19: Example of heavy kelp observed on the shorelines of F00788.

D.1.5 Channels

F00788 survey data included the dredge channel utilized by Washington State ferries to approach the Coupeville, WA ferry terminal. There is significant shoaling differences from the charted dredged channel, and F00788 survey data. Sounding comparisons and overview are discussed in section D.1.1 of this report (Figure 23).

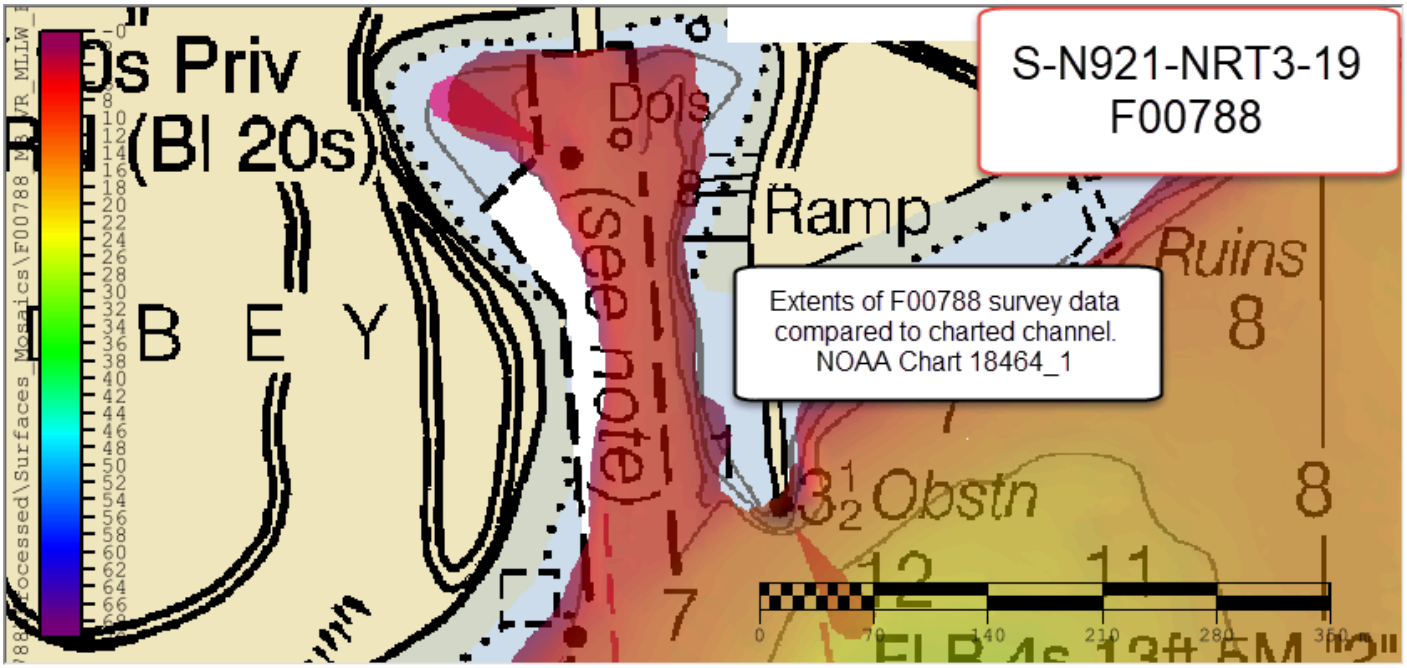


Figure 20: Extents of F00788 survey data compared to the charted channel on NOAA chart 18464_1. Depth legend is in meters.

D.2 Additional Results

D.2.1 Aids to Navigation

One USCG AtoN and one private light were assigned and investigated in the survey area of F00788. The light characteristics were not observed due to daylight, but structures were correctly positioned and serving their intended purpose. Washington State ferry operators were able to confirm that the fog signal and light were operational.

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

This survey was at the request of the Washington State ferries, F00788 survey data includes the Coupeville, WA ferry terminal (Figure 24). This terminal is utilized by two Washington State Ferries that operate in the area roughly every 30 minutes.

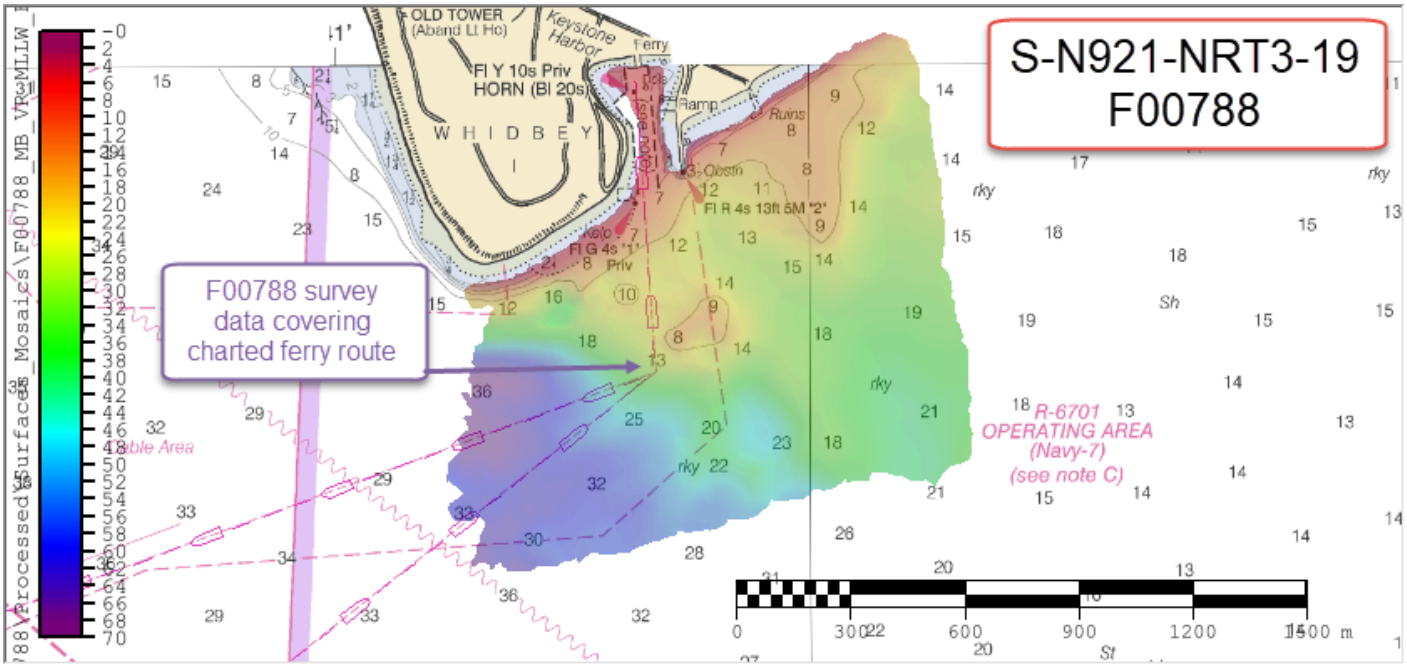


Figure 21: Charted ferry route over F00788 survey data

D.2.8 Abnormal Seafloor or Environmental Conditions

No abnormal seafloor and/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

This is the primary terminal for Washington State Ferries, in addition to a small boat launch for primarily recreational vessels. Survey data from F00788 should adequate to create a small scale chart of the Keystone Harbor.

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.

Report Name	Report Date Sent
Data Acquisition and Processing Report	2019-09-20

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: 2019.09.19 11:12:53 -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

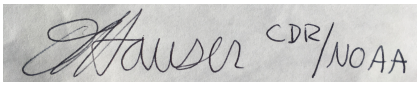
F00788

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.



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Approved: _____

Commander Olivia Hauser, NOAA
Chief, Pacific Hydrographic Branch