

**F00772**

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

**DESCRIPTIVE REPORT**

Type of Survey: Navigable Area

Registry Number: F00772

**LOCALITY**

State(s): Maryland

General Locality: Solomons, MD

Sub-locality: Back Creek

**2021**

CHIEF OF PARTY  
LTJG Kevin Tennyson

LIBRARY & ARCHIVES

Date:

**HYDROGRAPHIC TITLE SHEET**

**F00772**

**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): **Maryland**

General Locality: **Solomons, MD**

Sub-Locality: **Back Creek**

Scale: **10000**

Dates of Survey: **06/23/2021 to 12/01/2021**

Instructions Dated: **05/03/2021**

Project Number: **S-E916-BH2-21**

Field Unit: **NOAA R/V *Bay Hydro II***

Chief of Party: **LTJG Kevin Tennyson**

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 18N, 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 F00772

Project: S-E916-BH2-21

Locality: Solomons, MD

Sublocality: Back Creek

Scale: 1:10000

June 2021 - December 2021

**NOAA R/V *Bay Hydro II***

Chief of Party: LTJG Kevin Tennyson

### A. Area Surveyed

The survey area is located in Solomons, MD within the sub locality of Back Creek.

#### A.1 Survey Limits

Data were acquired within the following survey limits:

Northwest Limit	Southeast Limit
38° 20' 4.34" N 76° 27' 52.68" W	38° 19' 12.05" N 76° 26' 53.03" W

*Table 1: Survey Limits*

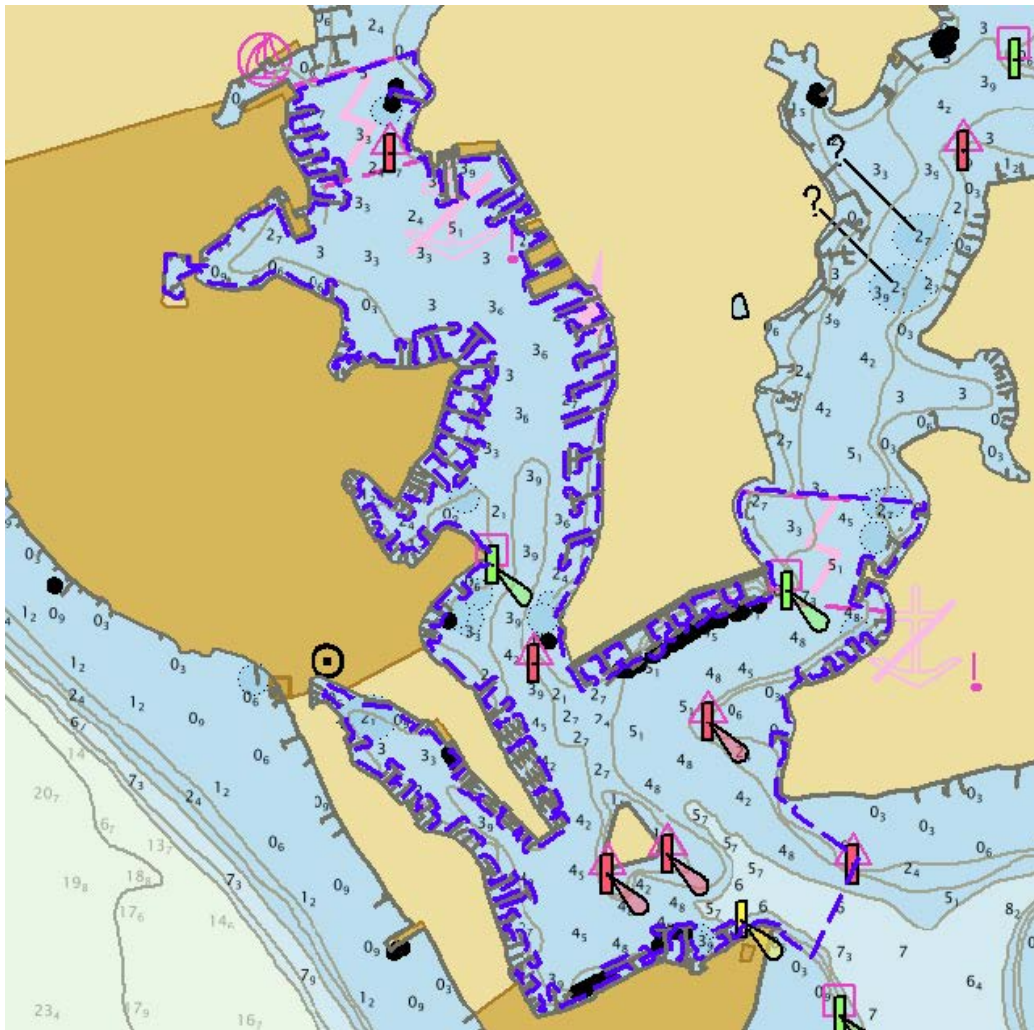


Figure 1: F00772 sheet limits (in blue) overlaid onto Chart US5MD31M.

Data was acquired to the survey limits in accordance with the requirements in the Project Instructions and the April 2021 NOS Hydrographic Surveys Specifications and Deliverables (HSSD) as shown in Figure 1. 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 pier faces and moored vessels. An example of such an area is shown in Figure 2.

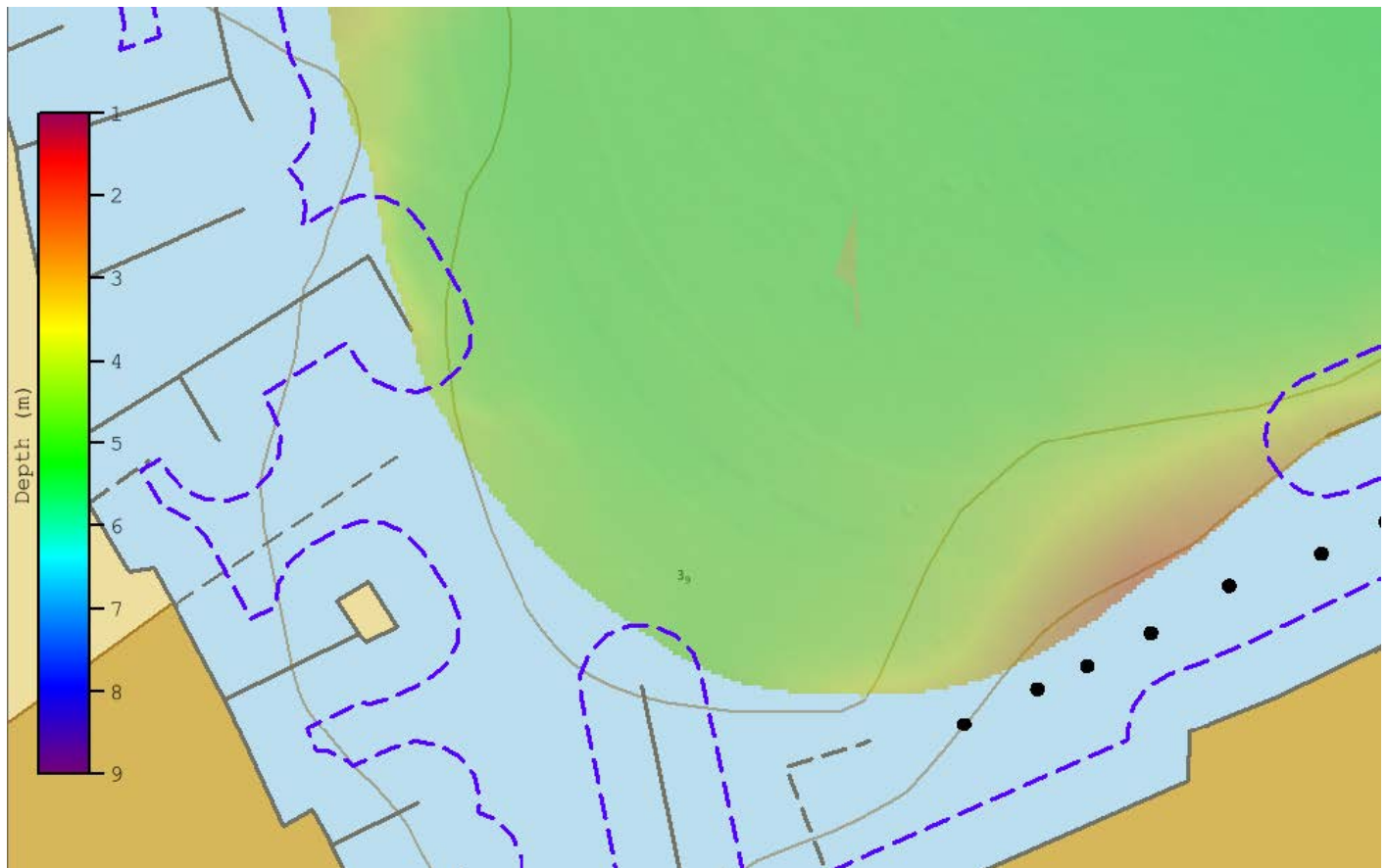


Figure 2: Region of F00772 where sheet limits were not met due to presence of moored vessels on pier faces.

## A.2 Survey Purpose

Bay Hydro II has received several request from local groups of reported chart discrepancies in the Solomon. The prior surveys for this area are from 1987 and in need of a contemporary hydrographic survey.

## A.3 Survey Quality

The entire survey is adequate to supersede previous data.

Data acquired in F00772 meets multibeam echo sounder (MBES) coverage requirements for complete coverage, 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). Additional compliance statistics can be found in the Standards and Compliance Review located in Appendix II of this report.

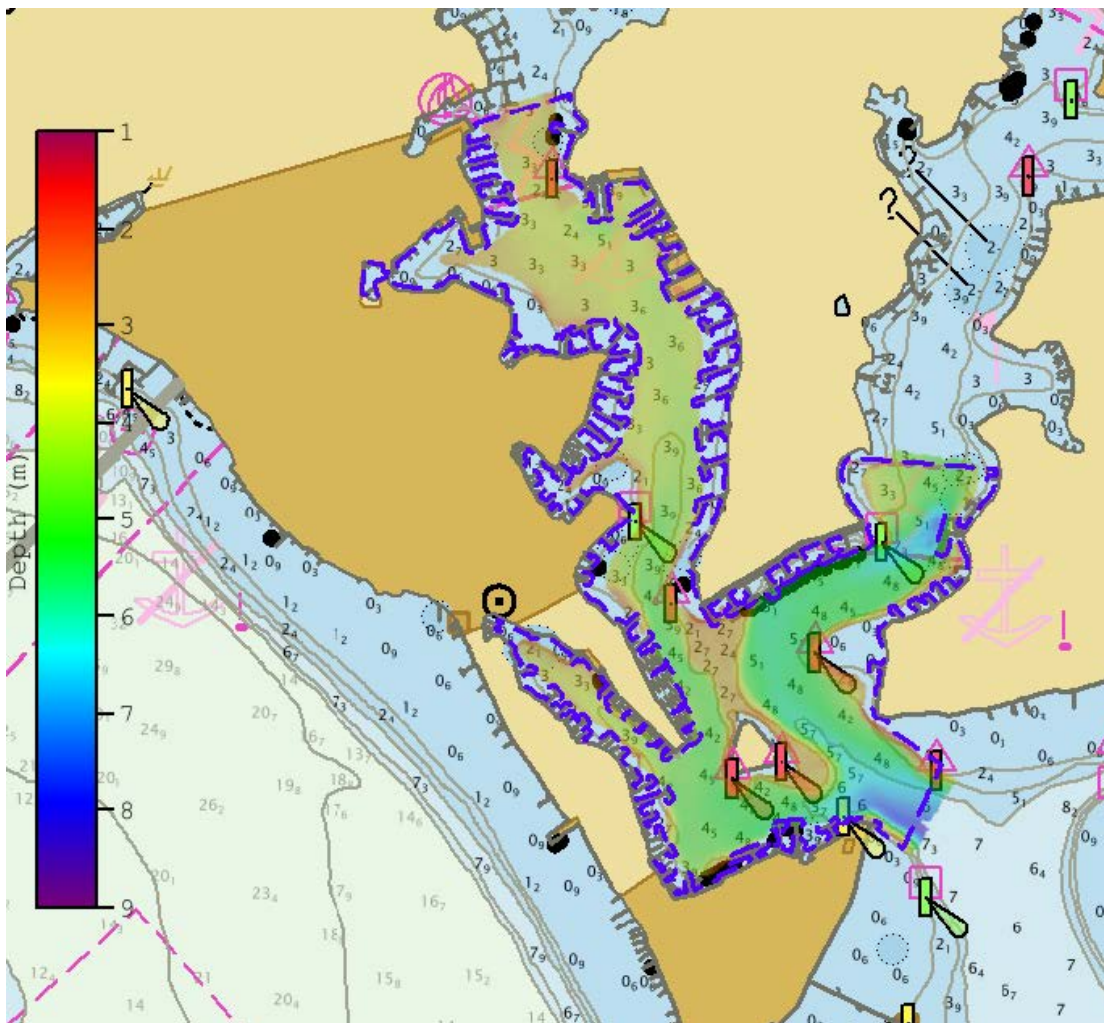
## A.4 Survey Coverage

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	Objet Detection Coverage

*Table 2: Survey Coverage*

The entirety of F00772 was acquired with Object Detection Coverage, meeting the requirements listed above and in the HSSD. See Figure 3 for an overview of coverage. Survey coverage was in accordance with the requirements in the Project Instructions and the HSSD with the exception of holidays present as a result of biological activity. All cases were investigated to ensure there is no threat of an obstruction and holidays are identified in an associated Holiday .hob file.



*Figure 3: F00772 survey coverage (50cm surface) overlaid onto Chart US5MD31M.*



## A.6 Survey Statistics

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

	<b>HULL ID</b>	<i>S5401</i>	<i>Total</i>
<b>LNM</b>	<b>SBES Mainscheme</b>	0.0	0.0
	<b>MBES Mainscheme</b>	17.75	17.75
	<b>Lidar Mainscheme</b>	0.0	0.0
	<b>SSS Mainscheme</b>	0.0	0.0
	<b>SBES/SSS Mainscheme</b>	0.0	0.0
	<b>MBES/SSS Mainscheme</b>	0.0	0.0
	<b>SBES/MBES Crosslines</b>	1.784	1.784
	<b>Lidar Crosslines</b>	0.0	0.0
<b>Number of Bottom Samples</b>			0
<b>Number Maritime Boundary Points Investigated</b>			0
<b>Number of DPs</b>			0
<b>Number of Items Investigated by Dive Ops</b>			0
<b>Total SNM</b>			0.14

*Table 3: Hydrographic Survey Statistics*

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

<b>Survey Dates</b>	<b>Day of the Year</b>
06/23/2021	174
06/25/2021	176
07/01/2021	182
07/02/2021	183
07/14/2021	195
12/01/2021	335

*Table 4: Dates of Hydrography*

## **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:

<b>Hull ID</b>	<i>S5401</i>
<b>LOA</b>	17.3 meters
<b>Draft</b>	1.8 meters

*Table 5: Vessels Used*

## B.1.2 Equipment

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

<b>Manufacturer</b>	<b>Model</b>	<b>Type</b>
Kongsberg Maritime	EM 2040CD	MBES
Unknown	CastAway-CTD	Conductivity, Temperature, and Depth Sensor
Applanix	POS MV 320 v5	Positioning and Attitude System
Valeport	MiniSVS	Sound Speed System

*Table 6: Major Systems Used*

## B.2 Quality Control

### B.2.1 Crosslines

Crosslines were collected, processed, and compared in accordance with Section 5.2.4.3 of the HSSD. To evaluate crosslines, a 50 centimeter CUBE surface using strictly mainscheme lines, and a 50 centimeter CUBE surface using strictly crosslines were created. From these two surfaces, a difference surface (mainscheme - crosslines = difference surface) was generated using Pydro's Compare Surfaces tool at a 50 centimeter resolution (Figure 4), and is submitted in the Separates II Digital Data folder. Statistics show the mean difference between the depths derived from mainscheme and crosslines was 1 centimeter with mainscheme being shoaler and 95% of nodes falling within 7 centimeters (Figure 5). In total, 99.995% of the depth differences between F00772 mainscheme and crossline data were within allowable NOAA uncertainties (Figure 6).

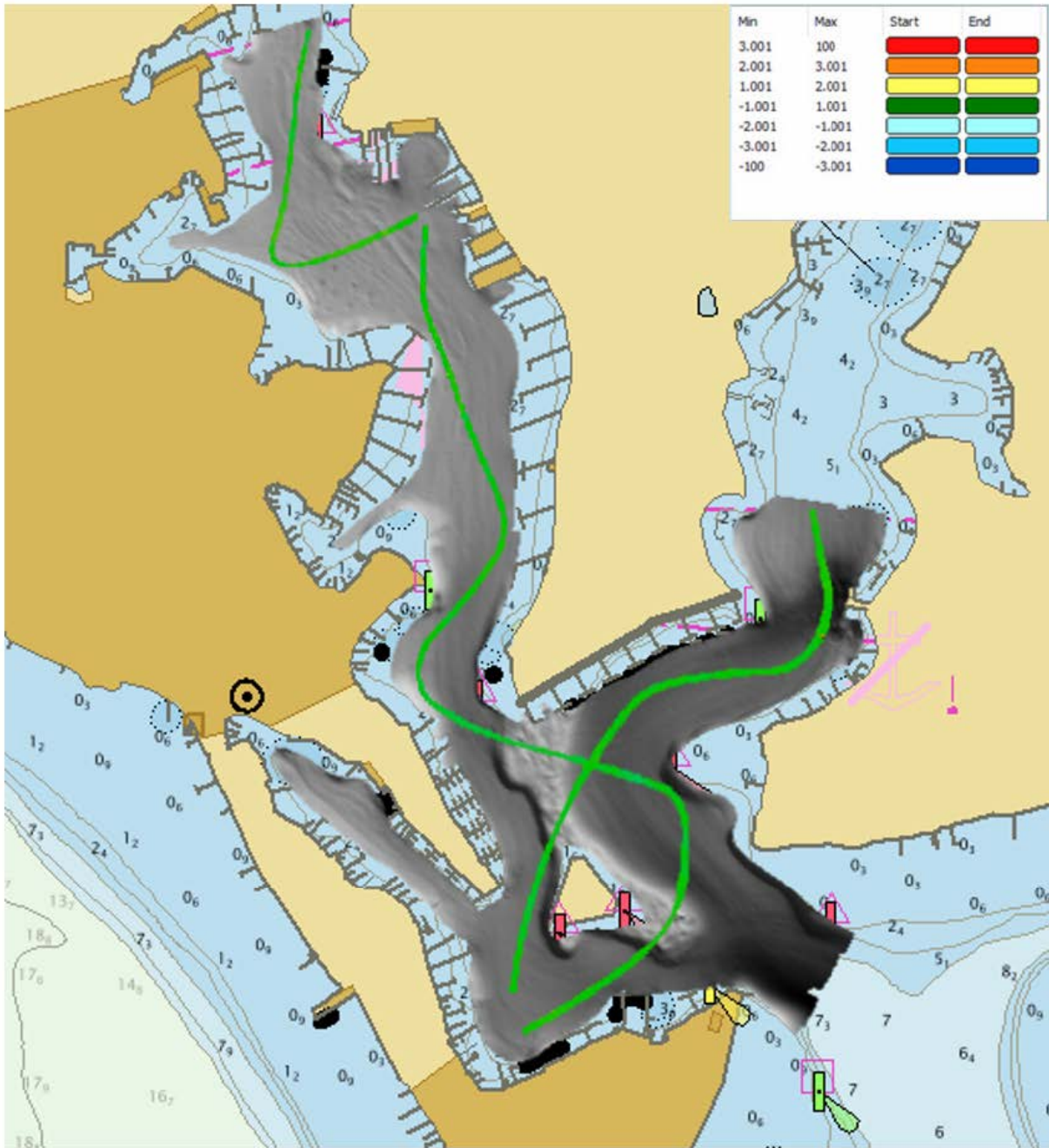


Figure 4: Overview of F00772 crosslines.

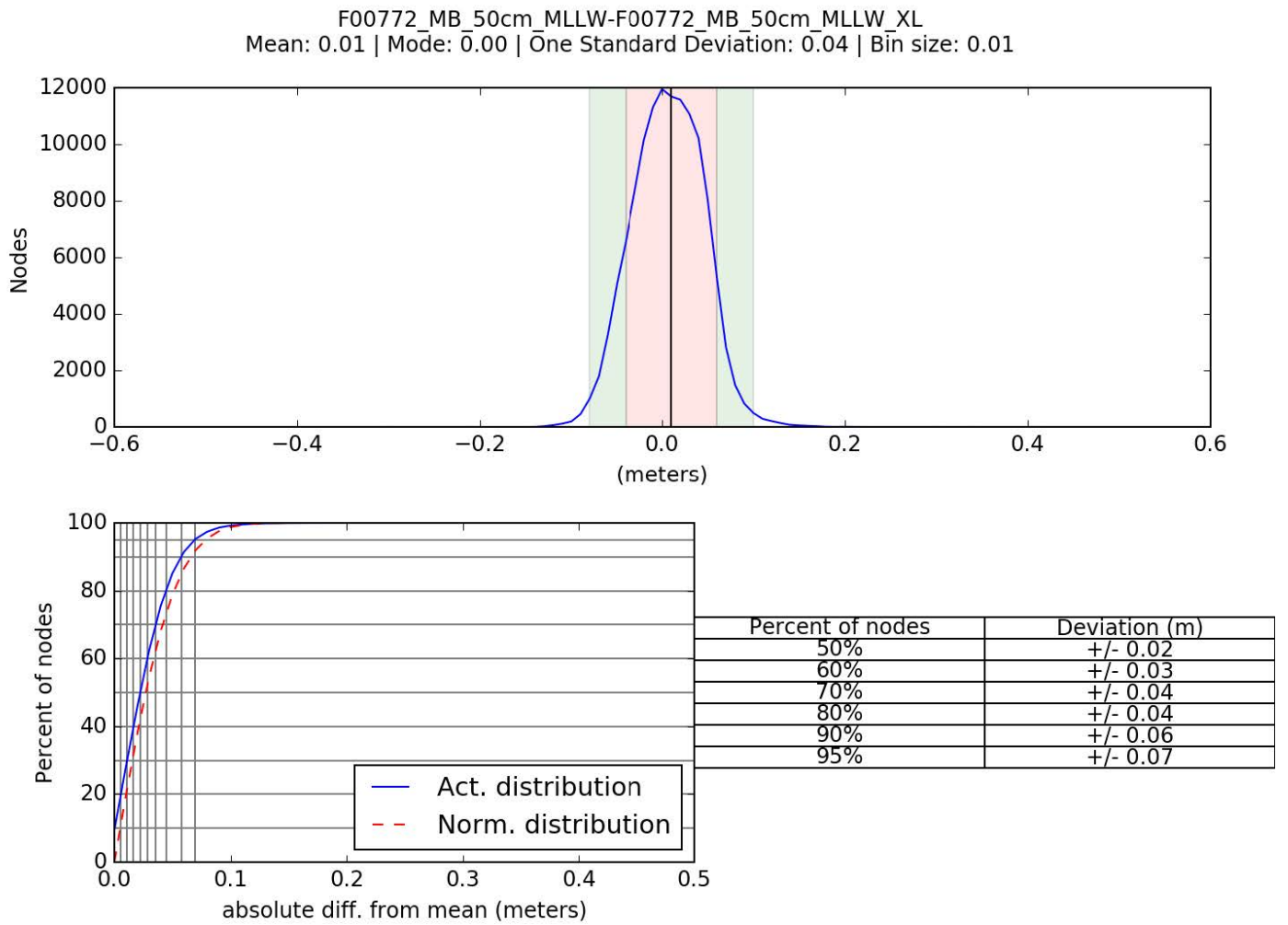


Figure 5: F00772 crossline and mainscheme difference statistics.

### Comparison Distribution

Per Grid: F00772\_MB\_50cm\_MLLW-F00772\_MB\_50cm\_MLLW\_XL\_fracAllowErr.csar

99.5+% nodes pass (124703), min=0.00, mode=0.01 mean=0.05 max=1.41

Percentiles: 2.5%=0.00, Q1=0.02, median=0.04, Q3=0.07, 97.5%=0.12

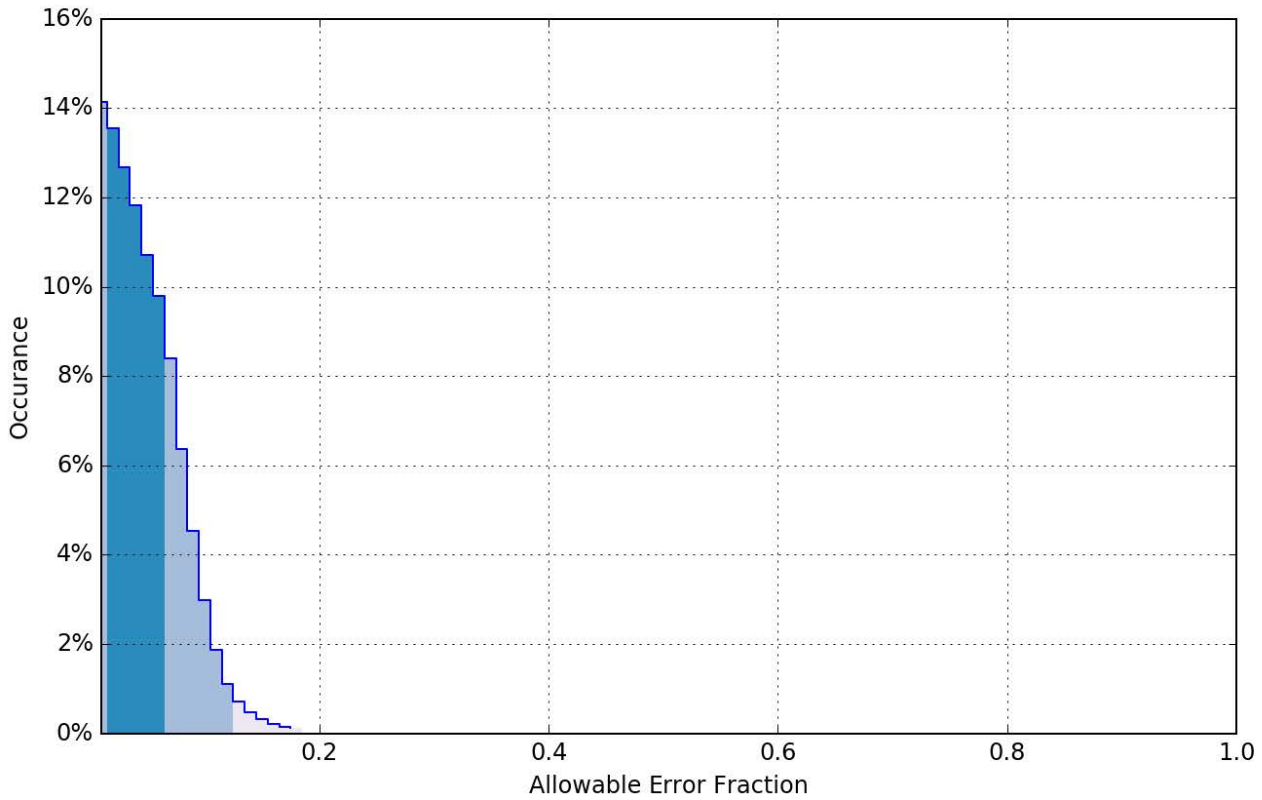


Figure 6: F00772 crossline and mainscheme NOAA allowable uncertainty statistics.

### B.2.2 Uncertainty

The following survey specific parameters were used for this survey:

Method	Measured	Zoning
ERS via VDATUM	0.0 meters	0.09 meters

Table 7: Survey Specific Tide TPU Values.

Hull ID	Measured - CTD	Measured - MVP	Measured - XBT	Surface
S5401	4 meters/second	0 meters/second	0 meters/second	1 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, discrete zoning tides, ERZT, and Poor Man's VDatum (PMVD), real-time and post-processed uncertainty sources were also incorporated into the depth estimates of survey F00772. Real-time uncertainties were provided via EM 2040CD MBES data, Applanix Delayed Heave RMS, and TCARI tides. Real-time vessel motion uncertainties of vessel roll, pitch, gyro and navigation were accounted for using RTK methods.

### **B.2.3 Junctions**

F00772 junctions with no adjacent surveys from prior projects.

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: Casts were conducted at a minimum of one every 4 hours during 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.

### **B.2.8 Coverage Equipment and Methods**

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

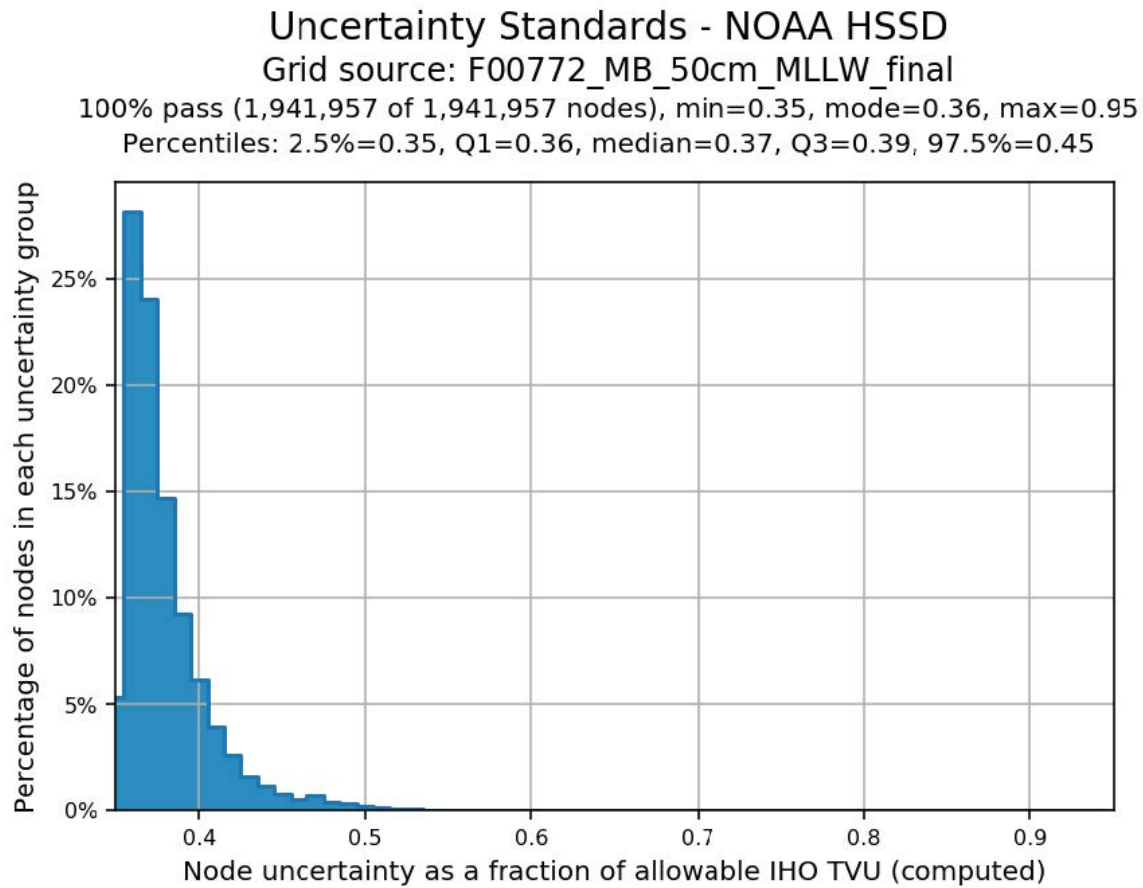
### **B.2.9 Gaps at the NALL**

Gaps in coverage are present at the inshore limits of F00772 and are a result of the presence of moored vessels on shoreline constructions at the inshore limit of safe navigation (NALL). An example of these gaps is shown in Figure 3.

### **B.2.10 NOAA Allowable Uncertainty**

To verify that all data meets the accuracy specifications as stated in HSSD Section 5.1.3, the finalized surface was analyzed using the Pydro QC Tools Grid QA feature to determine what percentage of the surface meets specifications. Figure 7 shows an overview of the NOAA Allowable Uncertainty. Overall, 100% of nodes within the surface meet or exceed NOAA Allowable Uncertainty specifications for F00772.

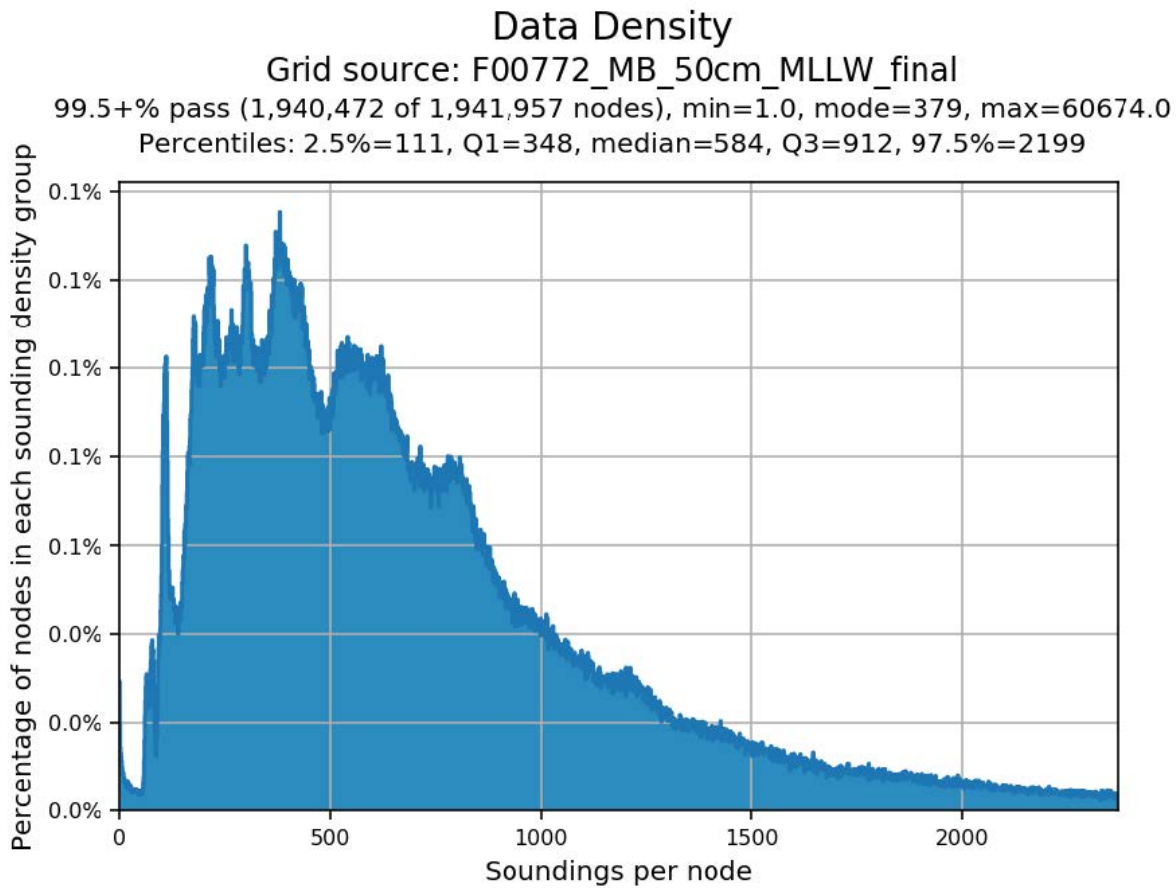




*Figure 7: F00772 Allowable Uncertainty Statistics*

### B.2.11 Density

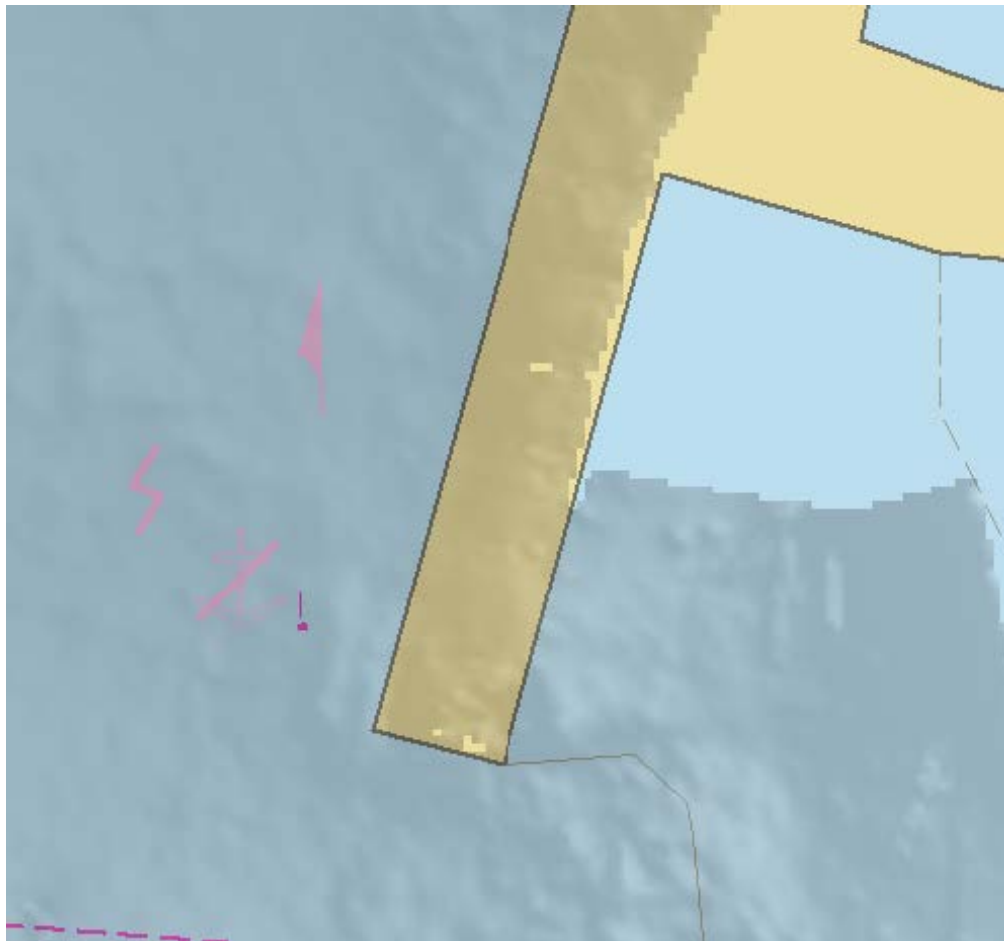
The finalized surface was analyzed using the Pydro QC Tools Grid QA feature and the results are shown in Figure 8 below. Density requirements for F00772 were achieved with at least 99.92% of finalized surface nodes containing five or more soundings as required by HSSD Section 5.2.2.3.



*Figure 8: F00772 Density Statistics*

### **B.2.12 Holidays**

F00772 data were reviewed in CARIS HIPS and SIPS for holidays in accordance with Section 5.2.2.3 of the HSSD. 4 holidays which meet the 3 by 3 node definition were identified via Pydro QC Tools Holiday Finder tool. This tool automatically scans finalized surfaces for holidays as defined in the HSSD and was run in conjunction with a visual inspection of all surfaces by the hydrographer. 2 additional holidays were flagged by QC tools, but were determined to be pilings from a pier face (Figure 9). The remaining holidays are identified in the Holiday.hob file.



*Figure 9: False holidays at a pier face*

### **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

Kongsberg EM2040 stores the backscatter data in the .all file. The data were sent to the Pacific Hydrographic Branch for processing.

## 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 and SIPS	11.3.17

*Table 9: Primary bathymetric data processing software*

The following Feature Object Catalog was used: NOAA Profile Version 2019.

### 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
F00772_MB_50cm_MLLW_final	CARIS Raster Surface (CUBE)	0.5 meters	1.8 meters - 8.5 meters	NOAA_0.5m	Object Detection

*Table 10: Submitted Surfaces*

The NOAA CUBE parameters defined in the HSSD were used for the creation of all CUBE surfaces in Survey F00772. 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 v8, part of the QC Tools package within Pydro, was used to assist the search for spurious soundings following gross cleaning. Flier Finder was run multiple times for each surface, reducing the flier

height value for each consecutive run. This allowed Flier Finder to accurately and quickly identify gross fliers, but as the flier height was reduced, the effectiveness of the tool diminished.

### **B.5.3 Data Logs**

Data acquisition and processing notes are included in the acquisition and processing logs, and additional processing such as final tide and sound speed application are noted in the F00772 Data Log spreadsheet. All data logs are submitted digitally in the Separates I folder.

### **B.5.4 Designated Soundings**

F00772 contains 15 designated soundings in accordance with HSSD Section 5.2.1.2.3. 1 designated sounding represents a DTON (see Section D.1.6), and the remaining 14 designated soundings were selected to accurately represent the seafloor including features such as wrecks, obstructions, rocks, and the like.

## **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:

<b>Method</b>	<b>Ellipsoid to Chart Datum Separation File</b>
ERS via VDATUM	SolomonsBackCreek_NAD83_2011-MLLW

*Table 11: ERS method and SEP file*

ERS methods were used as the final means of reducing F00772 to MLLW for submission.

## 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 18.

### RTK

Vessel kinematic data were post-processed using Applanix POSPac processing software and RTX Positioning methods described in the DAPR. Smoothed Best Estimate of Trajectory (SBET) and associated error (RMS) data were applied to all MBES data in CARIS HIPS and SIPS. For further details regarding the processing and quality control checks performed, see the F00772 POSPAC Processing Logs spreadsheet located in the Separates folder

### 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

#### D.1.1 Electronic Navigational Charts

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

ENC	Scale	Edition	Update Application Date	Issue Date
US5MD31M	1:10000	11	04/30/2018	05/11/2020

*Table 12: Largest Scale ENC's*

#### D.1.2 Shoal and Hazardous Features

Multiple potentially hazardous features were investigated on F00772 leading to the submission of one DTON report, submitted 9JUL2021. This DTON is an obstruction located in the region known as "The Narrows" in close proximity to a boat rental facility (Figure 10).

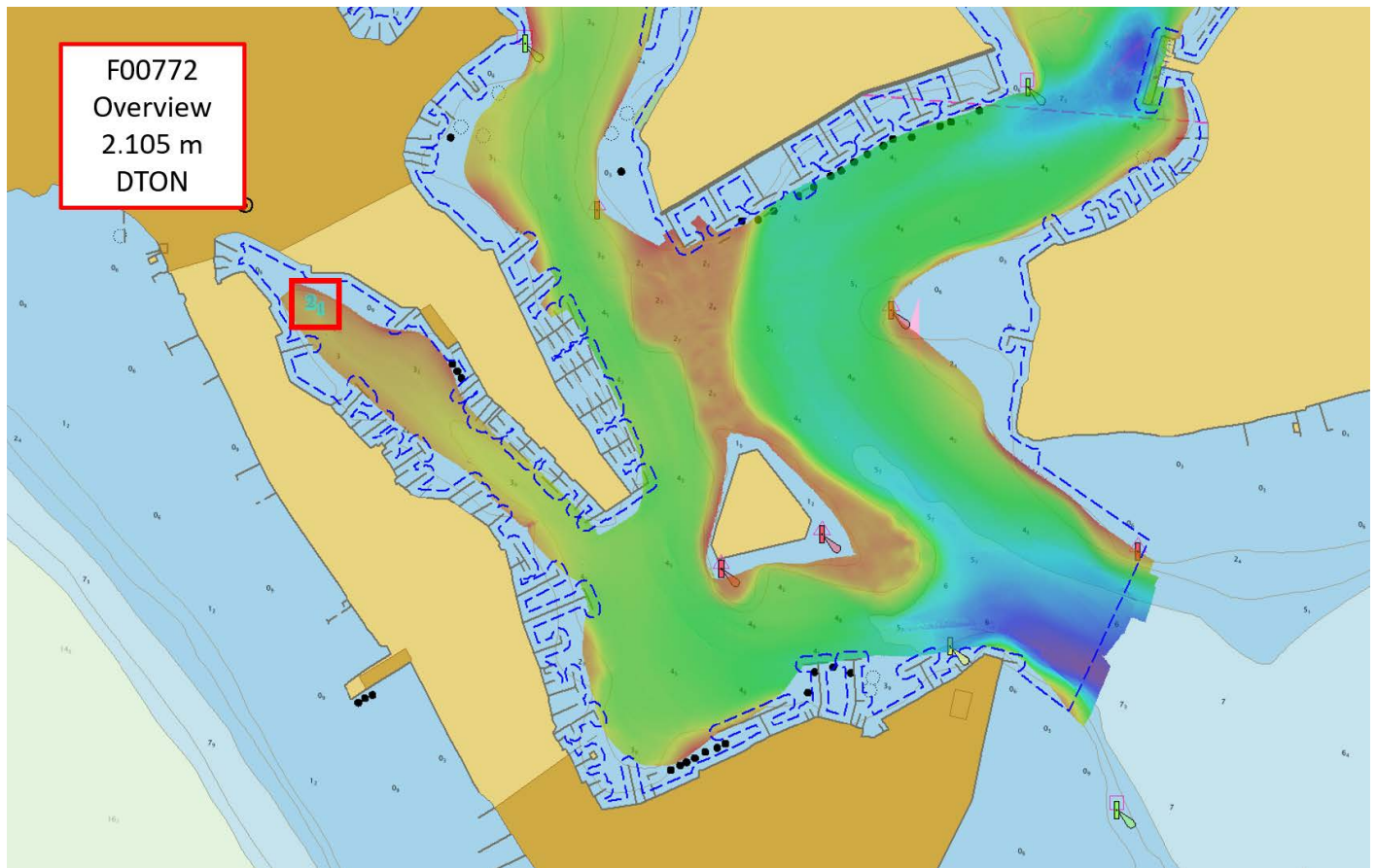


Figure 10: F00772 DTON.

*DTON has been applied to the latest Charts.*

### D.1.3 Charted Features

All assigned features within the NALL were addressed and are included in the F00772 Final Feature File. Assigned features inshore of the NALL were given the description of “Not Addressed” with remarks “Retain as charted, not investigated due to being inshore of NALL” in accordance with HSSD 7.3.1.

### D.1.4 Uncharted Features

Survey F00772 has 13 new features that are addressed in the F00772 Final Feature File. Of these features, there all are new Obstructions of which 1 was submitted as a DTON.

### D.1.5 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.

## **D.2 Additional Results**

### **D.2.1 Aids to Navigation**

All ATONS were observed to be on station and serving their intended purpose. Light characteristics were not verified due to daytime operations.

### **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**

Submerged features were investigated and included in the F00772 final feature file.

### **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**

Due to the ever changing nature of the shoreline construction in Solomons, MD, the filed unit recommends that a shoreline overflight survey be conducted in the near future to position and chart features inside the NALL.

**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
Kevin A. Tennyson	Chief of Party	04/06/2022	TENNYSON.KEVIN.ALEXANDER.1539170682 Digitally signed by TENNYSON.KEVIN.ALEXANDER.1539170682
Kevin A. Tennyson	Sheet Manager	04/06/2022	TENNYSON.KEVIN.ALEXANDER.1539170682 Digitally signed by TENNYSON.KEVIN.ALEXANDER.1539170682
Robert Mowery	Physical Science Technician	04/06/2022	MOWERY.ROBERT.WILLIAM.1379754488 Digitally signed by MOWERY.ROBERT.WILLIAM.1379754488

## F. Table of Acronyms

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

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

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