F00873

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

DESCRIPTIVE REPORT

Type of Survey:	Field Examination
Registry Number:	F00873

LOCALITY

State(s):	Maryland
General Locality:	Chesapeake Bay
Sub-locality:	Tangier Sound

2022

CHIEF OF PARTY
LTJG Jane Saunders

LIBRARY & ARCHIVES

Date:

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

REGISTRY NUMBER:

HYDROGRAPHIC TITLE SHEET

F00873

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:	**Chesapeake Bay**
Sub-Locality:	**Tangier Sound**
Scale:	**10000**
Dates of Survey:	**11/10/2022 to 11/10/2022**
Instructions Dated:	**11/09/2022**
Project Number:	**S-E933-BH2-22**
Field Unit:	**NOAA R/V *Bay Hydro II***
Chief of Party:	**LTJG Jane Saunders**
Soundings by:	**Multibeam Echo Sounder**
Imagery by:	
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 F00873

Project: S-E933-BH2-22

Locality: Chesapeake Bay

Sublocality: Tangier Sound

Scale: 1:10000

November 2022 - November 2022

NOAA R/V *Bay Hydro II*

Chief of Party: LTJG Jane Saunders

A. Area Surveyed

The survey area is located in the Chesapeake Bay within the sublocality of Tangier Sound, MD.

A.1 Survey Limits

Data were acquired within the following survey limits:

Northwest Limit	Southeast Limit
38° 5' 40.79" N 5° 59' 28.24" W	38° 4' 27.12" N 75° 57' 6.76" W

Table 1: Survey Limits

Data were acquired within the survey limits in accordance with the requirements in the Project Instructions (PIs) and the March 2022 NOS Hydrographic Surveys Specifications and Deliverables (HSSD). Survey limits were not met anywhere except for the northern and southern limits of the Lower Thorofare channel and easterly adjacent waters due to time constraints (Figure 1).

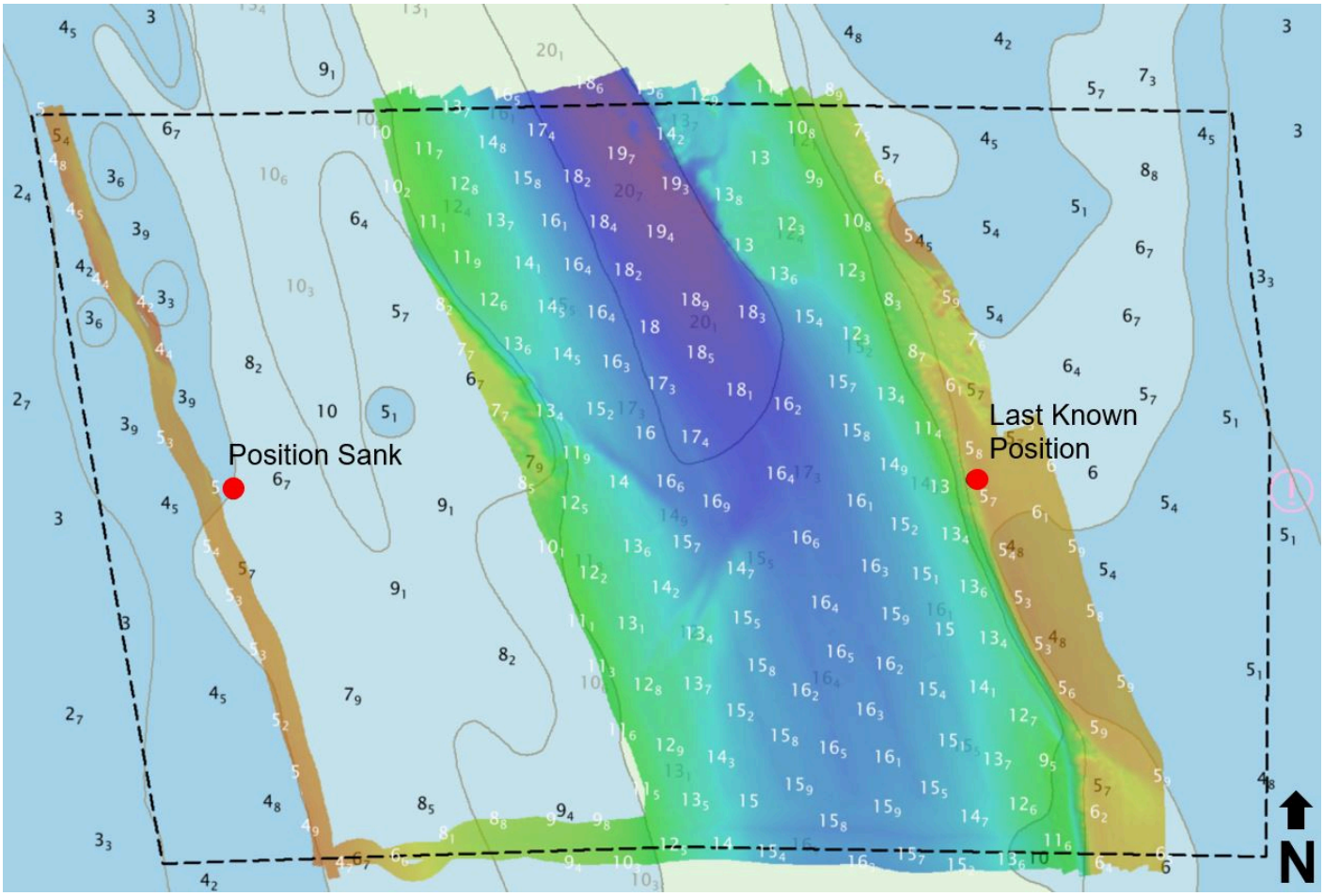

Figure 1: F00873 coverage overlaid onto survey limits (black)

A.2 Survey Purpose

The USCG has requested the help of the Office of Coast Survey to investigate the location of a sunken oyster boat in Tangier Sound. The sunk vessel's last known location was 38°05.085’N – 075°57.522’W, and the location where the vessel sank was 38°05.055’N – 075°59.052’W. The vessel was 25 feet long with a 12 foot A-frame. The Bay Hydro II is assigned to survey the waterway to see if the sunken vessel is a danger to navigation and if not located in water way, to keep surveying in the search area. If sunken vessel is not located in the search area and time permits, the team should expand the search area at their discretion. 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 F00873 meet multibeam echo sounder (MBES) coverage requirements for object detection, as required by the HSSD unless otherwise stated in this report. This includes NOAA allowable uncertainty (see Section B.2.10) and density requirements (see Section B.2.11).

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 F00873 was acquired with object detection coverage, meeting the requirements listed above and in the HSSD. See Figure 2 for an overview of coverage.

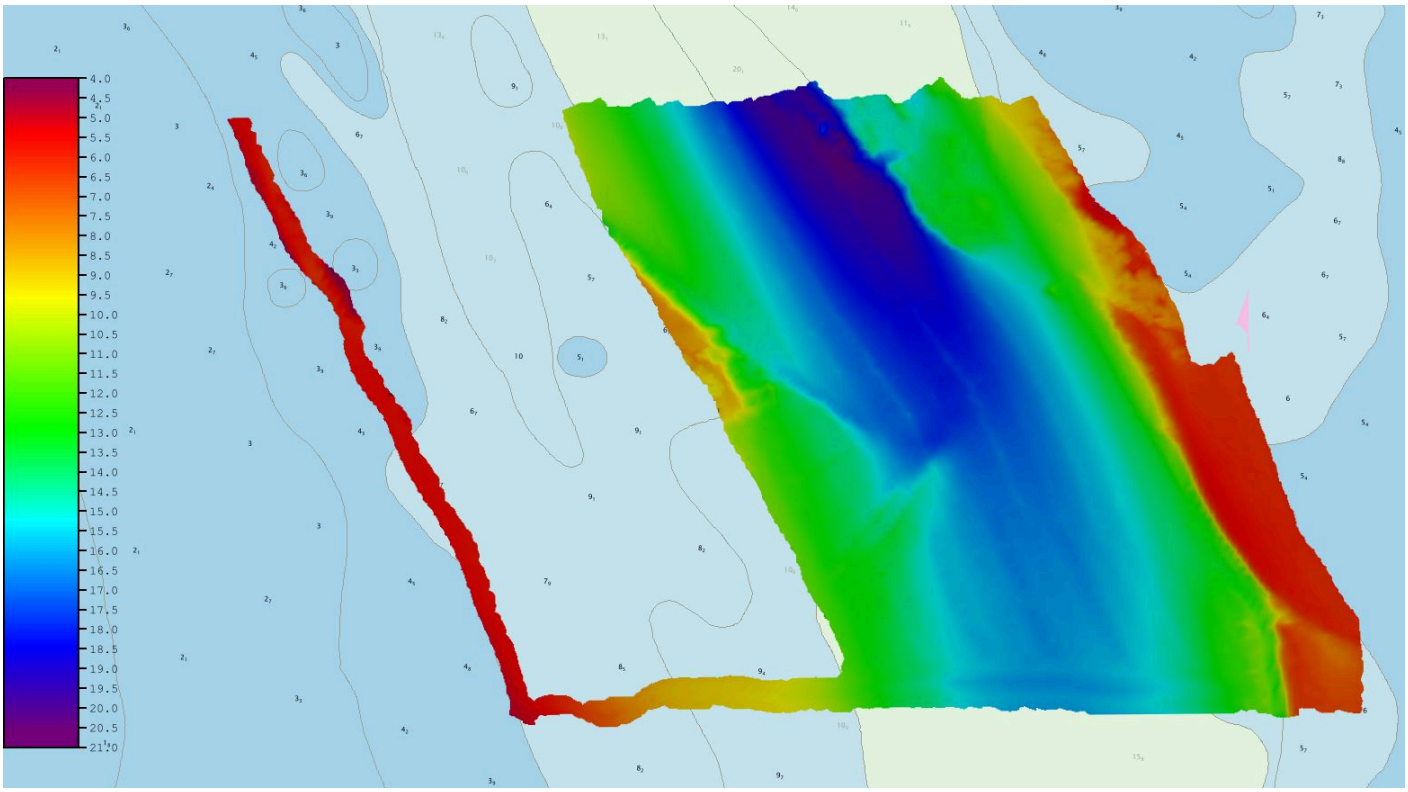

Figure 2: F00873 coverage overlaid onto Chart US5VA21M

A.6 Survey Statistics

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

	HULL ID	*S5401*	*Total*
LNM	**SBES Mainscheme**	0.0	0.0
	MBES Mainscheme	1.14	1.14
	Lidar Mainscheme	0.0	0.0
	SSS Mainscheme	0.0	0.0
	SBES/SSS Mainscheme	0.0	0.0
	MBES/SSS Mainscheme	1.14	1.14
	SBES/MBES Crosslines	0.0	0.0
	Lidar Crosslines	0.0	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			1.14

Table 3: Hydrographic Survey Statistics

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

Survey Dates	Day of the Year
11/10/2022	314

Table 4: Dates of Hydrography

F00873 consisted of one day of acquisition. The position of the oyster boat's sinking was investigated as was the portion of the Lower Thorofare channel within the assigned survey limits to determine if the sunken boat posed a threat to navigation. Afterwards, the search for the vessel expanded eastward from the last known position.

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	***S5401***
LOA	17.3 meters
Draft	1.8 meters

Table 5: Vessels Used

Figure 3: R/V Bay Hydro II, S5401

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
Valeport	MiniSVS	Sound Speed System
SonTek	CastAway-CTD	Conductivity, Temperature, and Depth Sensor

Table 6: Major Systems Used

B.2 Quality Control

B.2.1 Crosslines

Crosslines were not acquired for F00873 due to time constraints.

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	2 meters/second	0 meters/second	0 meters/second	0.5 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 and VDATUM, real-time and post processed uncertainty sources were also incorporated into the depth estimates of F00873. Real-time uncertainties were provided via EM 2040 CH MBES data and Applanix Delayed

Heave RMS. Following post-processing of the real-time vessel motion, recomputed uncertainties of vessel roll, pitch, gyro, 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

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

Bathymetric artifacts introduced by marine life

On a few occasions, a large school of fish and/or other marine life prohibited the MBES to identify the true seafloor. This interference resulted in artifacts in the processed data which did not accurately represent the seafloor. In some cases, removal of these artifacts in the MBES surface introduced gaps in coverage. Each of these gaps in coverage were examined in Caris HIPS and SIPS Subset Editor and determined not to degrade the confidence in the quality of the survey. These data gaps do not limit the ability to adequately verify charted depths.

B.2.7 Sound Speed Methods

Sound Speed Cast Frequency: Casts were conducted at a minimum of one every four hours during acquisition.

B.2.8 Coverage Equipment and Methods

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

B.2.9 Holidays

F00873 data were reviewed in CARIS HIPS and SIPS for holidays in accordance with Section 5.2.2.3 of the HSSD. 28 holidays which meet the object detection 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. Acquisition of F00873 took place during crabbing season for the area. Because of this, crab pots are evident in both the multibeam and backscatter data (Figure 4). Several pots were located along the southwestern sheet limits of F00873 and contributed to hazardous navigation for R/V Bay Hydro II. Holidays resulted from the avoidance maneuvers. In addition, object detection holidays resulted from vessel speed (Figure 5). Because F00873 survey only allowed for one day of acquisition, R/V Bay Hydro II did not address minor holidays.

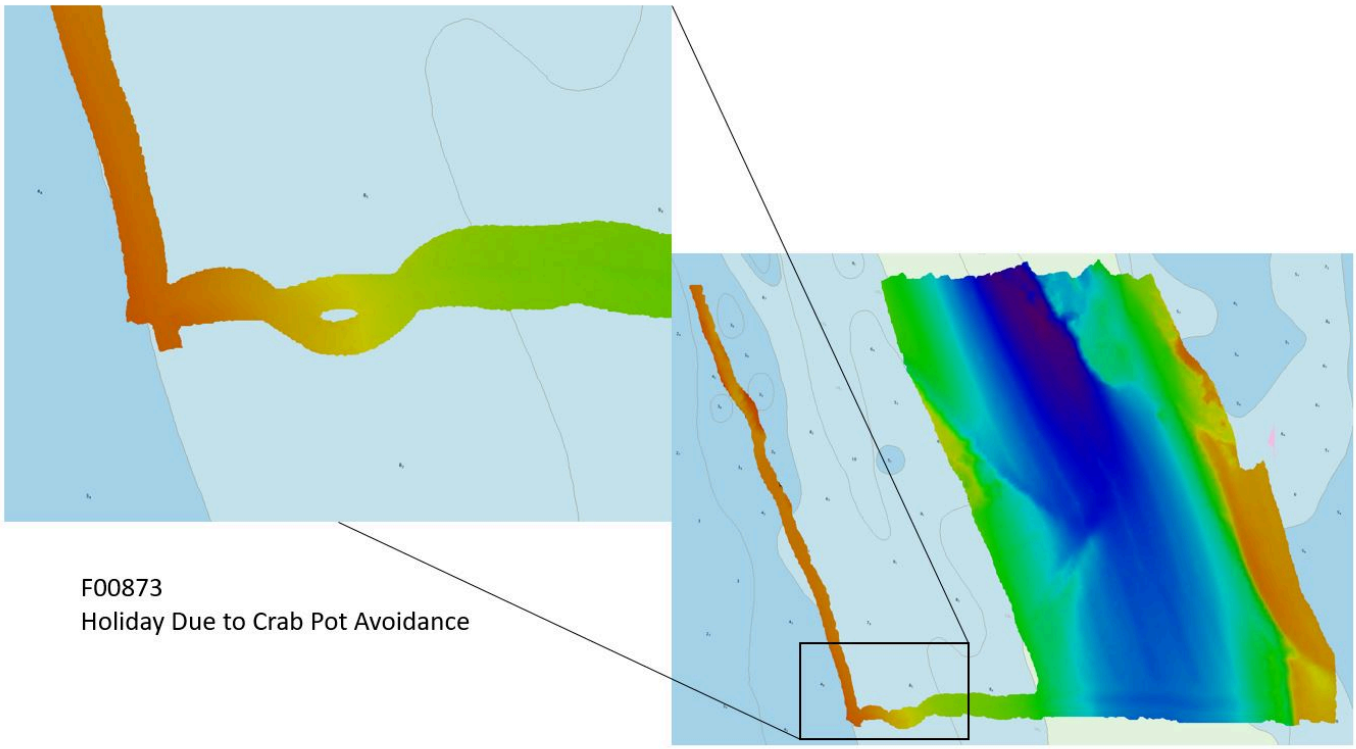

Figure 4: Holiday due to crab pot avoidance

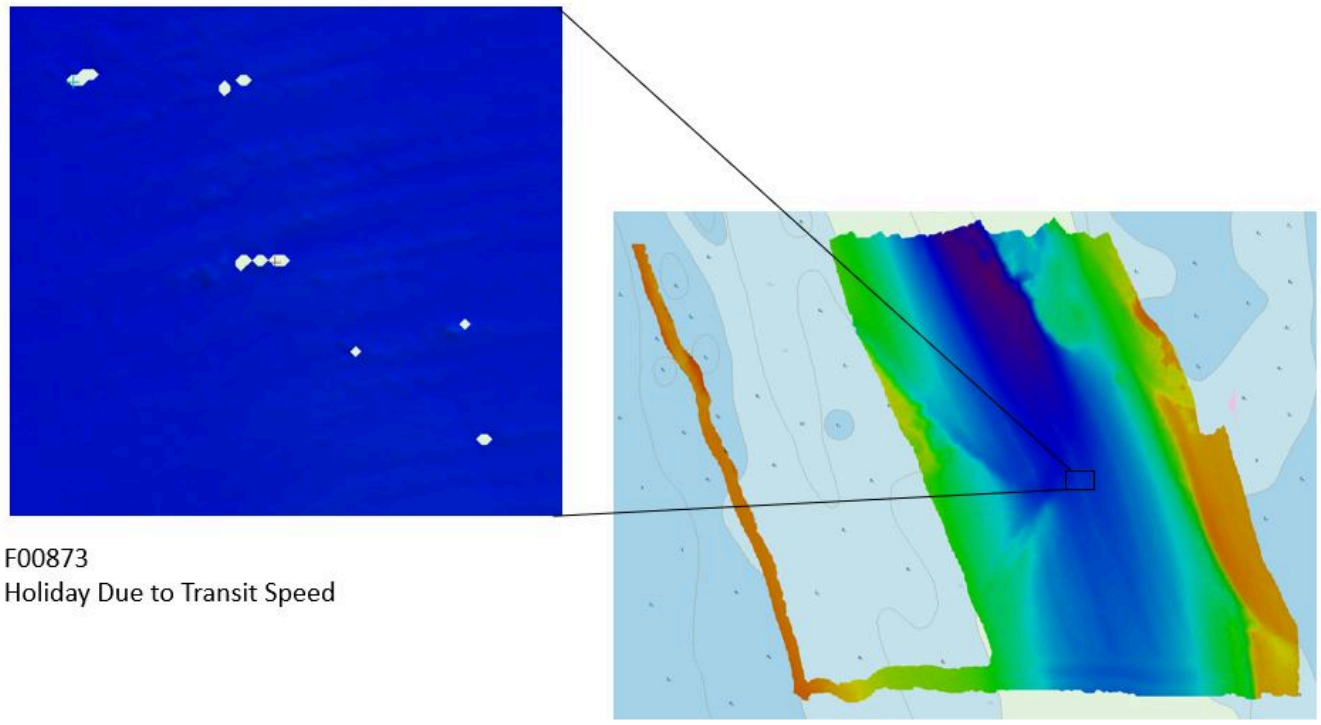

Figure 5: Holiday due to vessel speed

B.2.10 NOAA Allowable Uncertainty

To verify that all data meet 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 6 shows an overview of the NOAA Allowable Uncertainty. Overall, 99.5+% of nodes within the surface meet or exceed NOAA Allowable Uncertainty specifications for F00873.

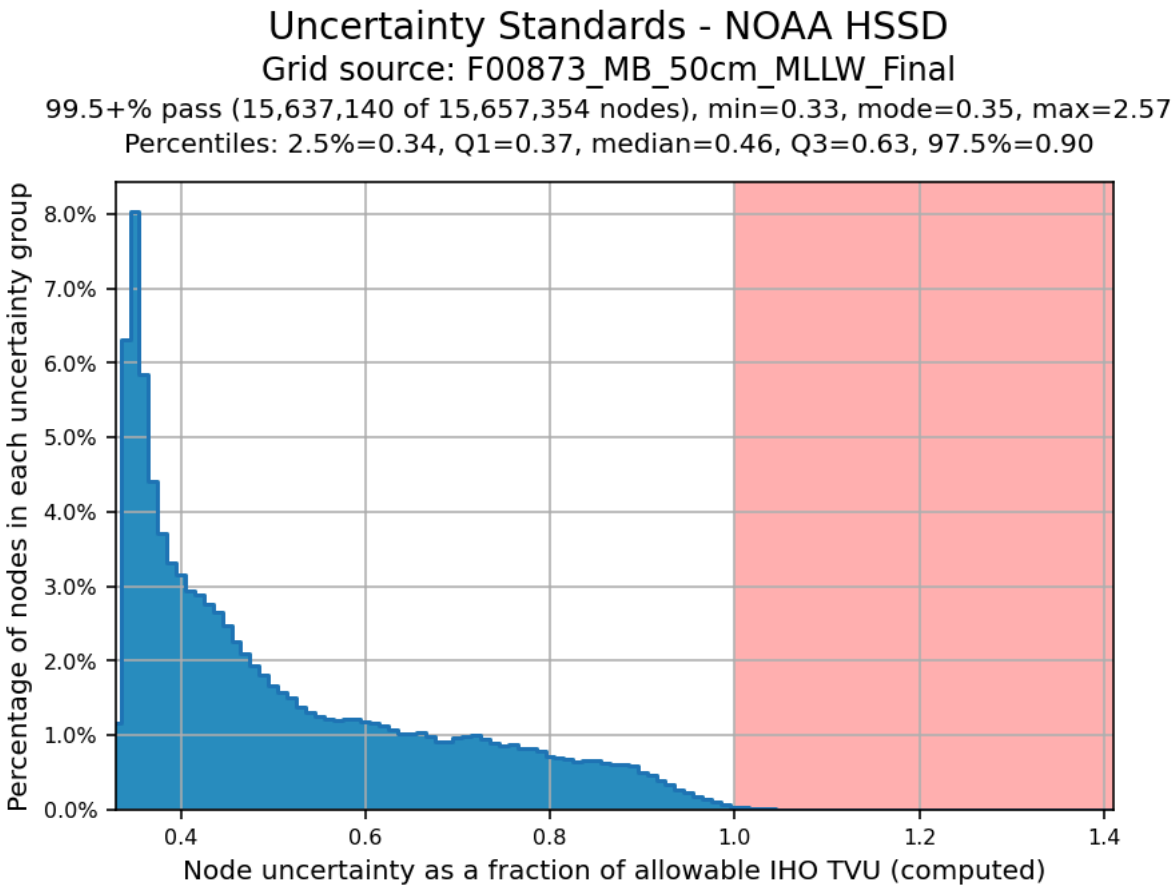

Figure 6: F00873 NOAA allowable uncertainty statistics

B.2.11 Density

The finalized surface was analyzed using the Pydro QC Tools Grid QA feature to determine compliance with specifications. Density requirements for F00873 were achieved with at least 99.5+% of surface nodes containing five or more soundings as required by HSSD Section 5.2.2.3 (Figure 7).

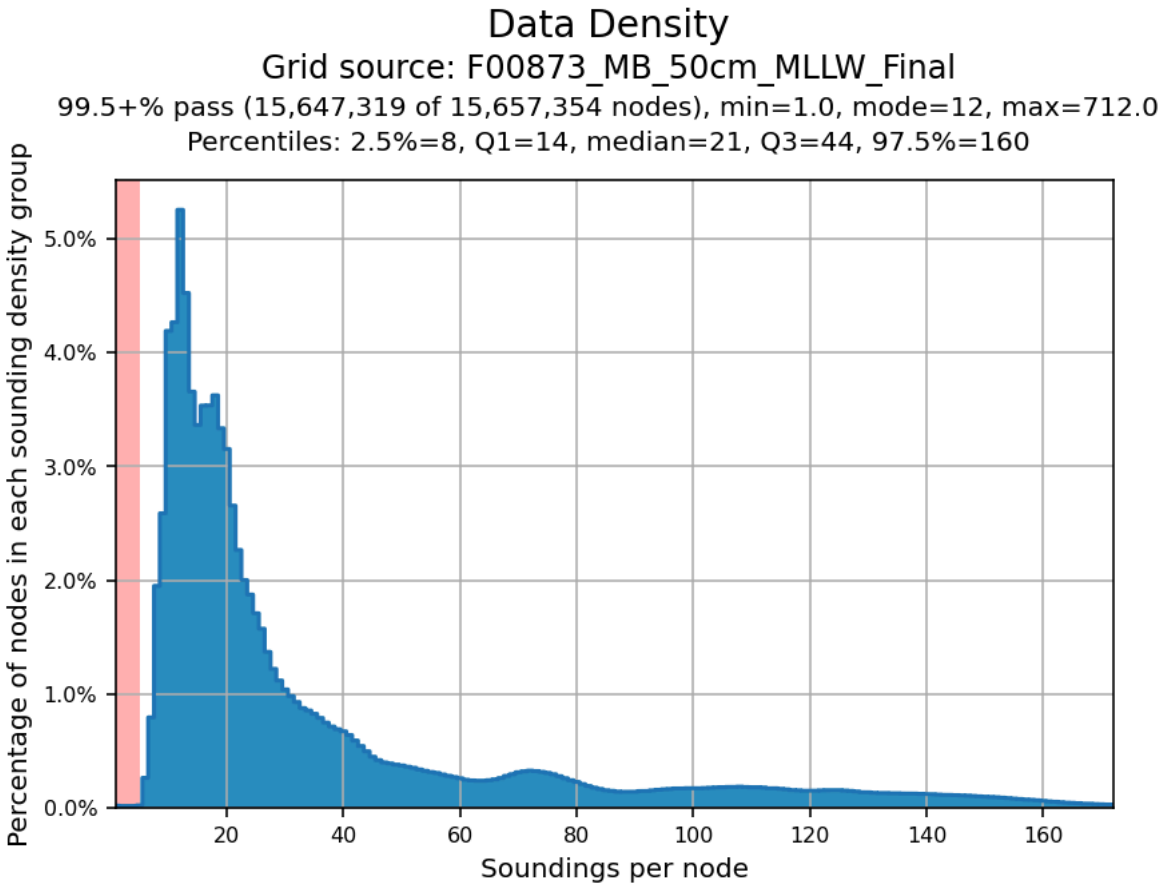

Figure 7: F00873 density statistics

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. Kongsberg EM2040C stores the raw backscatter data in the .all file. All backscatter data were processed to GSF files via Caris HIPS and SIPS 11.4.19, and a mosaic was created by the field unit via Caris HIPS and SIPS 11.4.6. Weighted Mean Average (WMA) with Area Based Angle Varying Gain (AVG) was utilized to populate the backscatter mosaic. See Figure 8 for a greyscale representation of the complete mosaic.

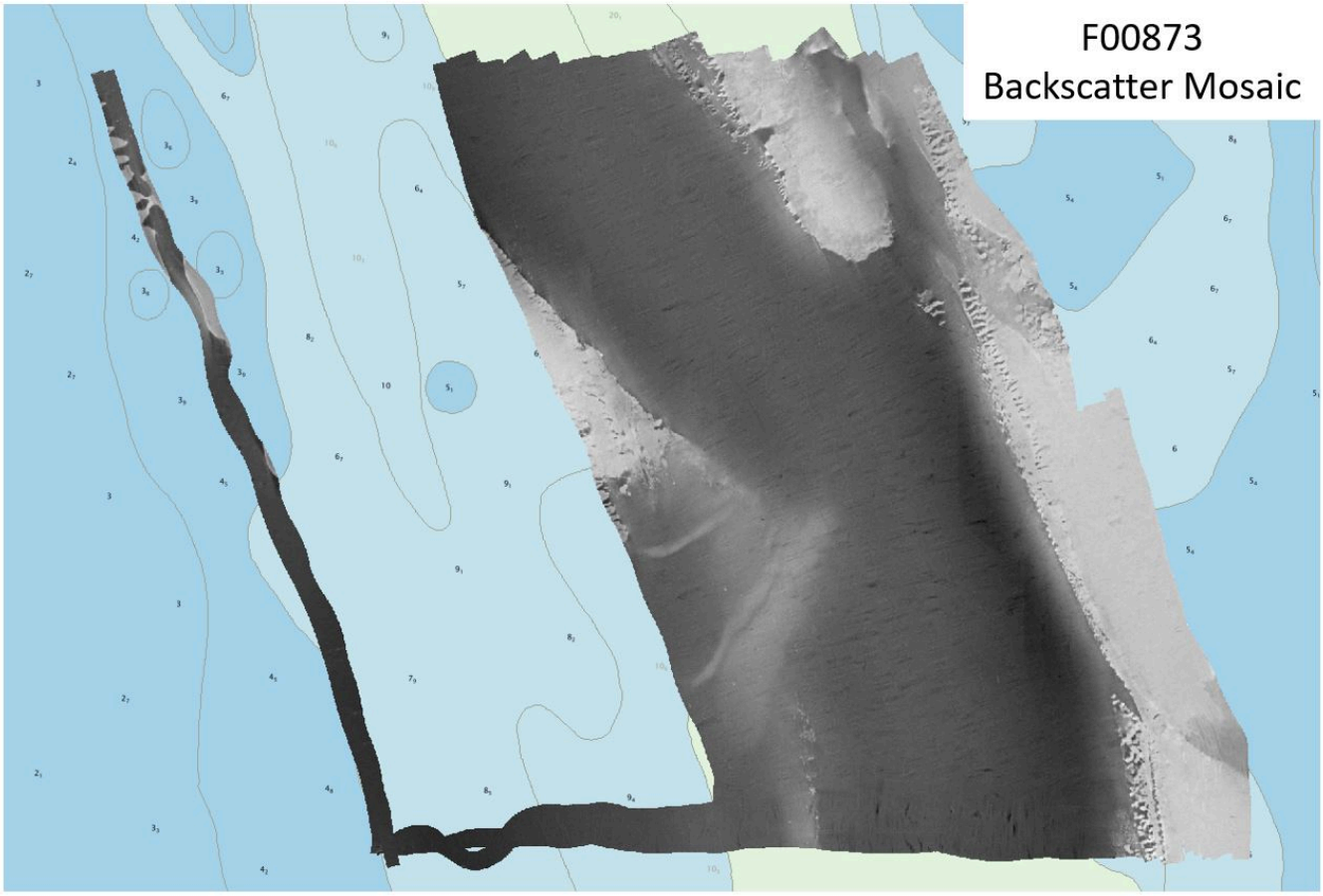

Figure 8: F00873 backscatter mosaic

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	11.4.6
CARIS	HIPS and SIPS	11.4.19

Table 9: Primary bathymetric data processing software

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

Manufacturer	Name	Version
CARIS	HIPS and SIPS	11.4.6

Table 10: Primary imagery data processing software

The following Feature Object Catalog was used: NOAA Profile Version 2022.

All processing including backscatter mosaic creation was completed using CARIS HIPS and SIPS 11.4.6. CARIS HIPS and SIPS 11.4.19 was only used to export GSF files, as directed by HSTB, because previous versions of CARIS HIPS and SIPS do not accurately capture the time-series backscatter diagram in the GSF.

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
F00873_MB_50cm_MLLW.scar	CARIS Raster Surface (CUBE)	0.5 meters	4.2 meters - 20.7 meters	NOAA_0.5m	Object Detection
F00873_MB_50cm_MLLW_Final.csar	CARIS Raster Surface (CUBE)	0.5 meters	4.2 meters - 20.7 meters	NOAA_0.5m	Object Detection
F00873_MBAB_2m_S5401_300khz_1of1.tiff	MB Backscatter Mosaic	2 meters	-	N/A	Multibeam Acoustic Backscatter

Table 11: Submitted Surfaces

The NOAA CUBE parameters defined in the HSSD were used for the creation of all CUBE surfaces for F00873. 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 vary from 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 surface.

C. Vertical and Horizontal Control

Per Section 5.2.2.1.3 of the 2021 Field Procedures Manual, no Horizontal and Vertical Control Report has been generated for F00873.

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-E933-BH2-22_Vdatum_100m_NAD83-MLLW_geoid12b.csar

Table 12: ERS method and SEP file

Following the successful application of Smoothed Best Estimate of Trajectory (SBET), ERS methods using VDATUM were used for reducing data to MLLW. ERS methods were used as the final means of reducing F00873 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.

The following PPK methods were used for horizontal control:

- Smart Base

Vessel kinematic data were post-processed using Applanix POSPac processing software and Smart Base Positioning methods described in the DAPR. SBET and associated error (RMS) data were applied to all MBES data in CARIS HIPS and SIPS.

The following CORS Stations were used for horizontal control:

HVCR Site ID	Base Station ID
Loyola W, Exmore, VA	LOYW
Assateague, Snow Hill, MD	MDAI
DelDOT South 2, Georgetown, VA	DED2
Glouster Point, VA	VAGP
Loyola F, Annapolis, MD	LOYF
Loyola X, Williamsburg, VA	LOYX

Table 13: CORS Base Stations

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 ENCs, which cover the survey area:

ENC	Scale	Edition	Update Application Date	Issue Date
US5VA21M	1:40000	27	10/12/2021	12/01/2022

Table 14: 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

R/V Bay Hydro II investigated the Lower Thorofare channel but did not detect the sunken oyster boat.

D.2 Additional Results

D.2.1 Aids to Navigation

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

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
LTJG Jane Saunders	Chief of Party	02/27/2023	SAUNDERS.JANE.DEVEREAUX.1087825414 Digitally signed by SAUNDERS.JANE.DEVEREAUX.1087825414 Date: 2023.04.04 14:28:13 -04'00'
LTJG Carly Robbins	Sheet Manager	02/27/2023	ROBBINS.CARLY.ANN.1555089534 Digitally signed by ROBBINS.CARLY.ANN.1555089534 Date: 2023.03.06 10:05:44 -05'00'

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