H13803

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

DESCRIPTIVE REPORT

Type of Survey:	Basic Hydrographic Survey
Registry Number:	H13803

LOCALITY

State(s):	Maryland
General Locality:	Chesapeake Bay
Sub-locality:	Patapsco River

2023

CHIEF OF PARTY
LTJG Jane Saunders

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Date:

U.S. DEPARTMENT OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION	REGISTRY NUMBER:
HYDROGRAPHIC TITLE SHEET	**H13803**

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:	**Patapsco River**
Scale:	**5000**
Dates of Survey:	**05/16/2023 to 06/01/2023**
Instructions Dated:	**05/15/2023**
Project Number:	**S-E917-BH2-23**
Field Unit:	**NOAA R/V *Bay Hydro II***
Chief of Party:	**LTJG Jane Saunders**
Soundings by:	
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 H13803

Project: S-E917-BH2-23

Locality: Chesapeake Bay

Sublocality: Patapsco River

Scale: 1:5000

May 2023 - June 2023

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 sub locality of the Patapsco River.

A.1 Survey Limits

Data were acquired within the following survey limits:

Northwest Limit	Southeast Limit
39° 17' 21.2" N 39° 10' 54.3" W	76° 37' 41.2" N 76° 26' 34.23" W

Table 1: Survey Limits

Due to repairs and contract deadlines, R/V Bay Hydro II was not able to complete the survey in the assigned survey limits south of the Baltimore Harbor, as shown in Figure 1. However, Baltimore Harbor data was acquired to the survey limits in accordance with the requirements in the Project Instructions and the March 2022 NOS Hydrographic Surveys Specifications and Deliverables (HSSD) as shown in Figure 2. In all areas in the Baltimore Harbor 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 shoreline construction and moored vessels. An example of such an area is shown in Figure 3.

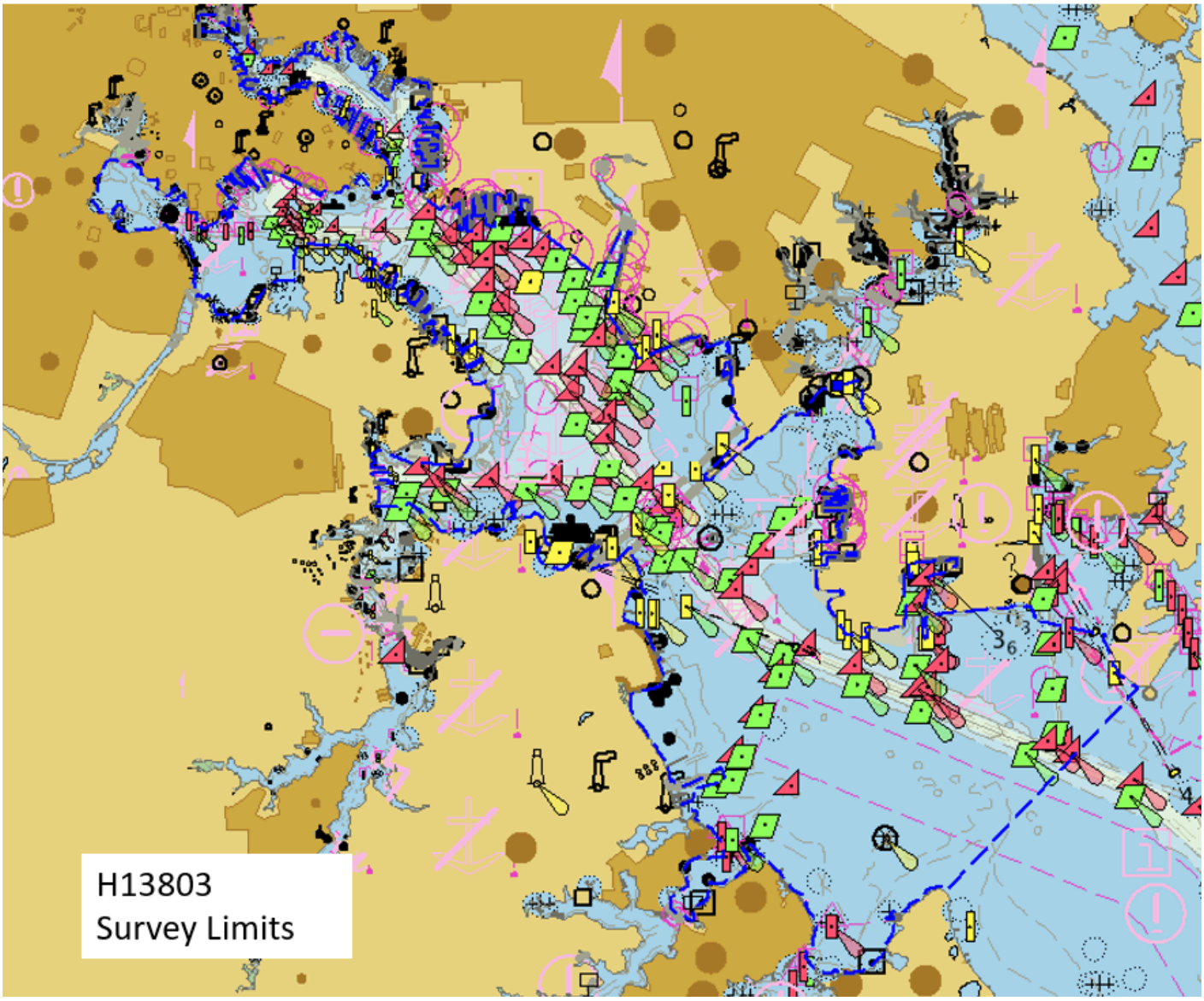

Figure 1: H13803 survey limits (blue) overlaid onto Charts US5BALBA, US5BALBB, US5BALBC, US5BALCA, US5BALCB, US5BALCC

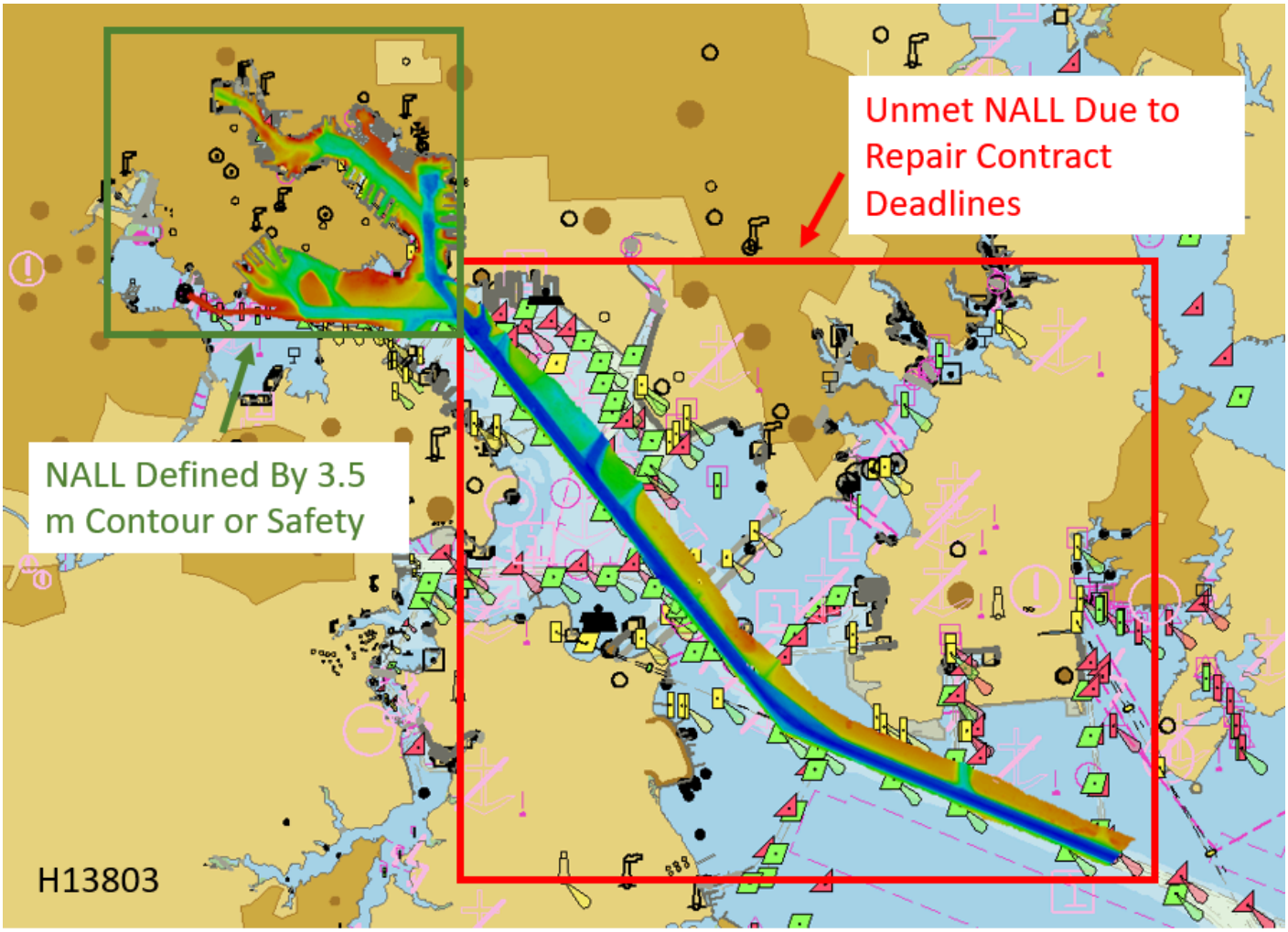

Figure 2: H13803 survey limits

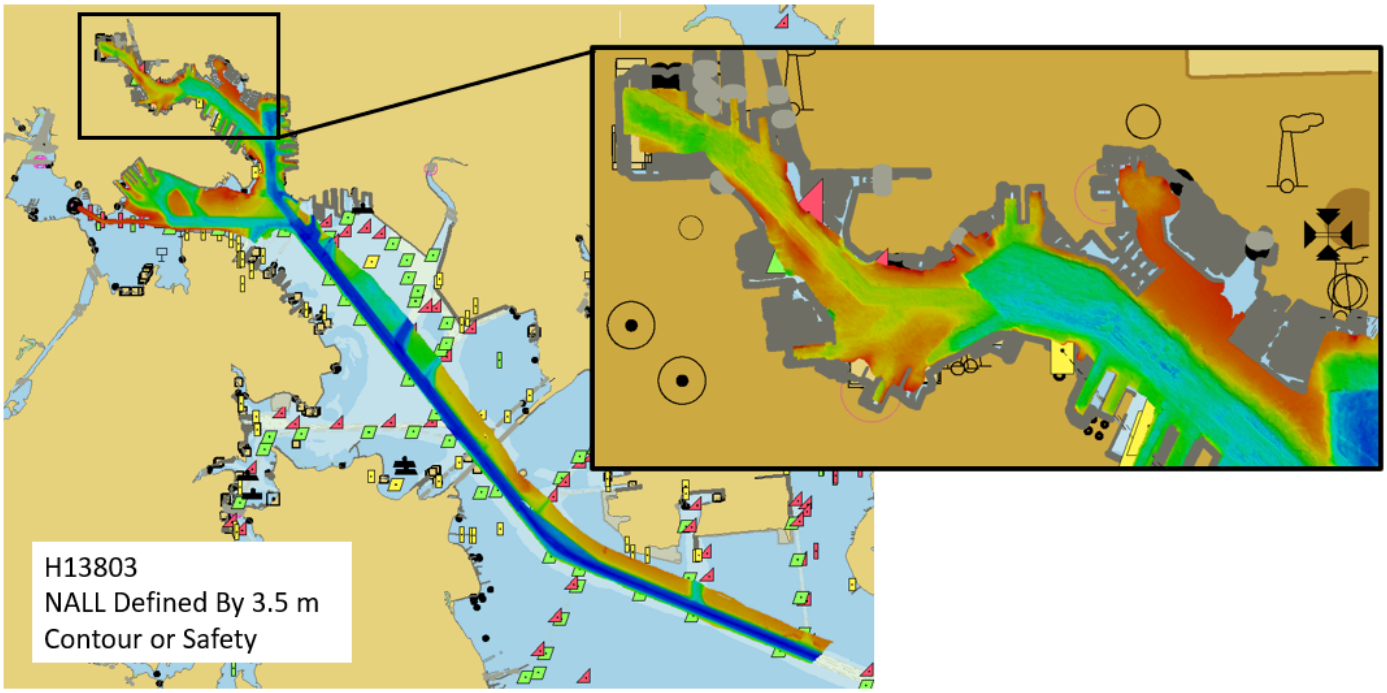

Figure 3: NALL defined by 3.5 m depth contour or safety of vessel

A.2 Survey Purpose

The Patapsco River, including Baltimore Harbor is in need of a modern bathymetric survey. The data from this survey will update NOAA's nautical products. 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 H13803 meets multibeam echo sounder (MBES) coverage requirements for complete coverage, as required by the HSSD. 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	Complete Coverage (Refer to HSSD Section 5.2.2.3)

Table 2: Survey Coverage

Survey coverage was in accordance with the requirements listed above and in the HSSD.

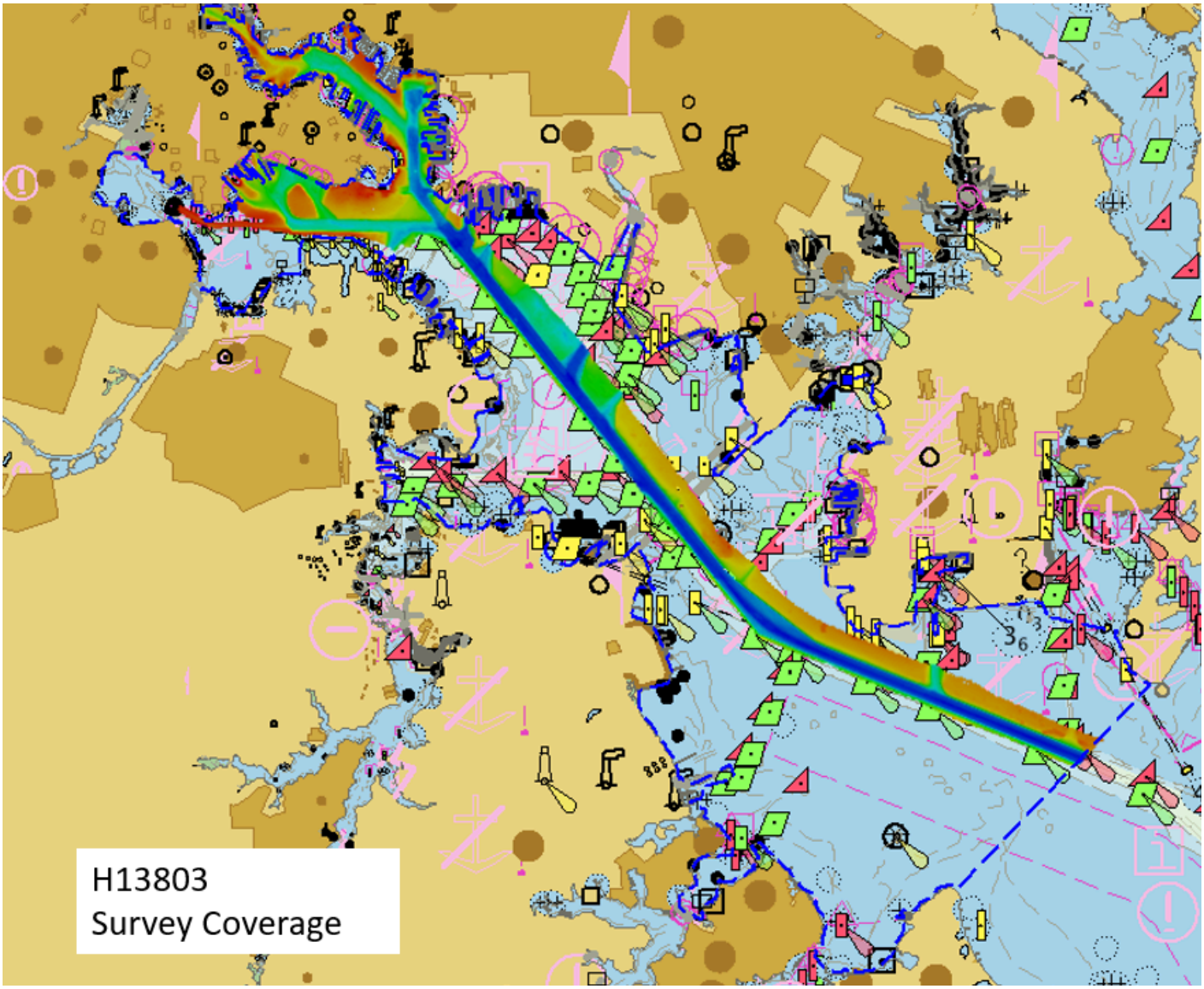

Figure 4: H13803 coverage overlaid onto Charts US5BALBA, US5BALBB, US5BALBC, US5BALCA, US5BALCB, US5BALCC

A.6 Survey Statistics

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

	HULL ID	*S-5401*	*Total*
LNM	**SBES Mainscheme**	0.0	0.0
	MBES Mainscheme	181.95	181.95
	Lidar Mainscheme	0.0	0.0
	SSS Mainscheme	0.0	0.0
	SBES/SSS Mainscheme	0.0	0.0
	MBES/SSS Mainscheme	181.95	181.95
	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			3.71

Table 3: Hydrographic Survey Statistics

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

Survey Dates	Day of the Year
05/16/2023	136
05/18/2023	138
05/19/2023	139
05/22/2023	142
05/25/2023	145
05/31/2023	151
06/01/2023	152

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:

Hull ID	***S5401***
LOA	17.3 meters
Draft	1.8 meters

Table 5: Vessels Used

Figure 5: NOAA R/V Bay Hydro II

B.1.2 Equipment

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

Manufacturer	Model	Type
Applanix	POS MV 320 v5	Positioning and Attitude System
SonTek	CastAway-CTD	Conductivity, Temperature, and Depth Sensor
Kongsberg Maritime	EM 2040CD	MBES

Table 6: Major Systems Used

For the entirety of H13803 survey, the surface sound speed probe Valport miniSVS was not utilized due to its cable being dysfunctional. The cable was replaced after the completion of H13803.

B.2 Quality Control

B.2.1 Crosslines

Crosslines were not acquired due to an unexpected incompletion of acquisition. The survey team was unable to complete crosslines as planned due to necessary vessel repairs.

B.2.2 Uncertainty

The following survey specific parameters were used for this survey:

Method	Measured	Zoning
ERS via VDATUM	0.09 meters	N/A

Table 7: Survey Specific Tide TPU Values.

Hull ID	Measured - CTD	Measured - MVP	Measured - XBT	Surface
S5401	2 meters/second	N/A	N/A	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 survey H13803. Real-time uncertainties were provided via EM 2040C DH 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 several 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 (Figure 6). 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.

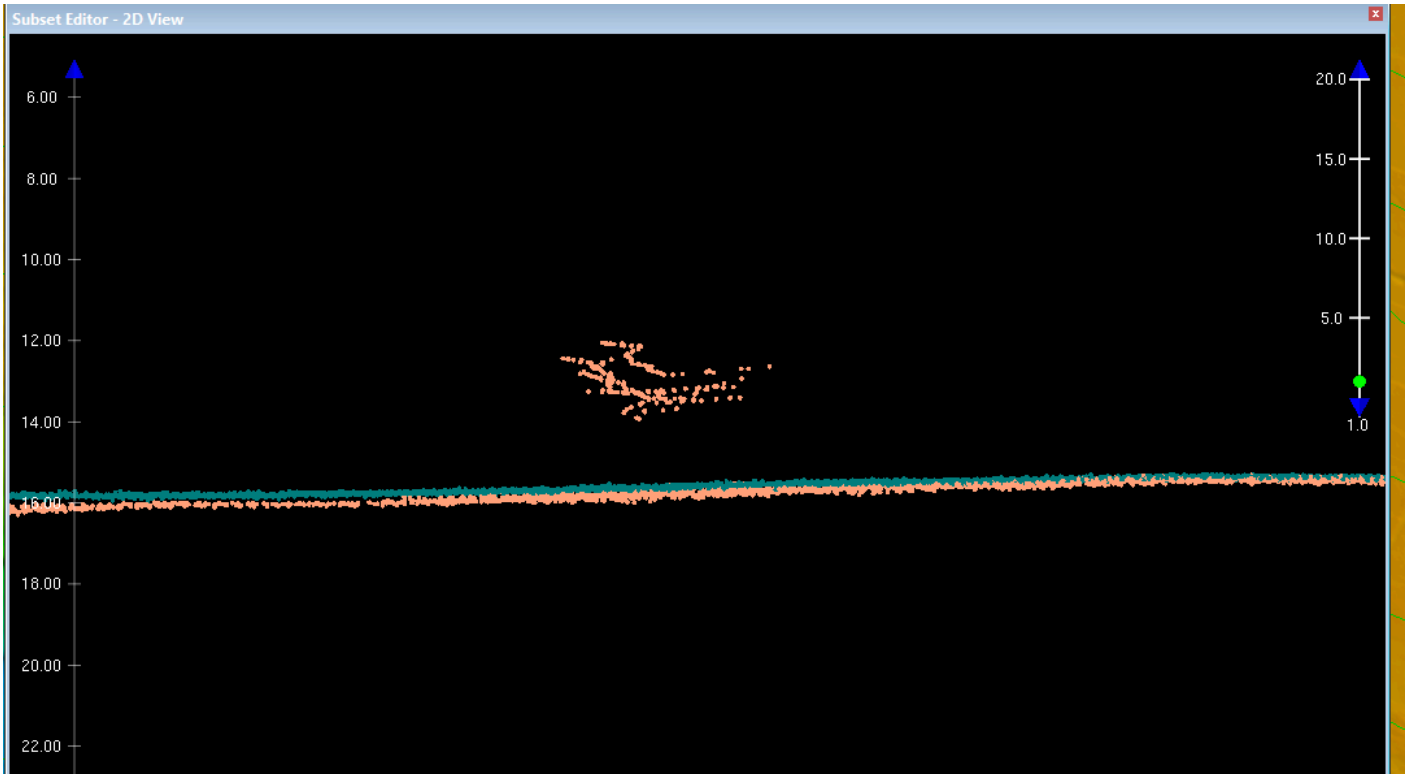

Figure 6: H13803 Marine Life Artifacts

Sound Speed Issues

The hydrographer and Hydrographic Systems Technology Branch have observed several data artifacts, suspected to be due to sound speed issues (See Descriptive Report Supplemental Records). During this survey, due to a failing cable, R/V Bay Hydro II utilized the CTD cast profile for surface sound velocity control, and was unable to utilize the vessel's surface sound velocity profile. While surface sound velocity measurements are always important for multibeam sonar ray tracing, they are especially critical when the sonar array is not parallel with the assumed plane (horizontal) of the sound speed gradients, which is R/V Bay Hydro II's configuration with its angled EM 2040C dual head. This is due to the so-called "Don Dinn" effect, whereby an error in surface sound velocity grows no worse when the array is in plane with the sound velocity gradient but gets worse with depth when the array is not in plane with the sound velocity gradient. Additionally, there may have been unaccounted for sources of freshwater input into the approaches, affecting sound speed.

Initially the team noticed a vertical offset between adjacent lines, seen most prominently in the transition from the purple to turquoise lines below on DN 151 and 152 in the approaches to Baltimore harbor (Figure 7). The soundings are colored by line file and exaggerated at 30x. There are prominent sound velocity artifacts (characteristic "smiles"), as observed in the lines between the dark blue and light blue lines. There is likely also some angular misalignment between the IMU and one or both of the sonar heads, as observed in the turquoise to dark purple and turquoise to amber lines. However, the larger concern is the suspected sound speed issues.

Sounding differences in adjacent lines in the approaches to the harbor are regularly ~0.3 m to 0.4 m. Offsets of 0.1 to 0.2 m are nearly ubiquitous throughout the survey area. See Figure 8, where DN 152 Baltimore peninsula soundings are colored by line file and exaggerated at 30x. There are sound velocity artifacts (characteristic "frowns"), but the vertical offsets are ~0.1 m or less. The allowable total vertical uncertainty specification for the deeper H13803 survey areas are around +/-0.5m. The majority of the observed artifacts are within the allowable total vertical uncertainty specification. Overall, 99.5+% of nodes within the surface meet NOAA Allowable Uncertainty specifications for H13803 (Section B.2.10, Figure 12).

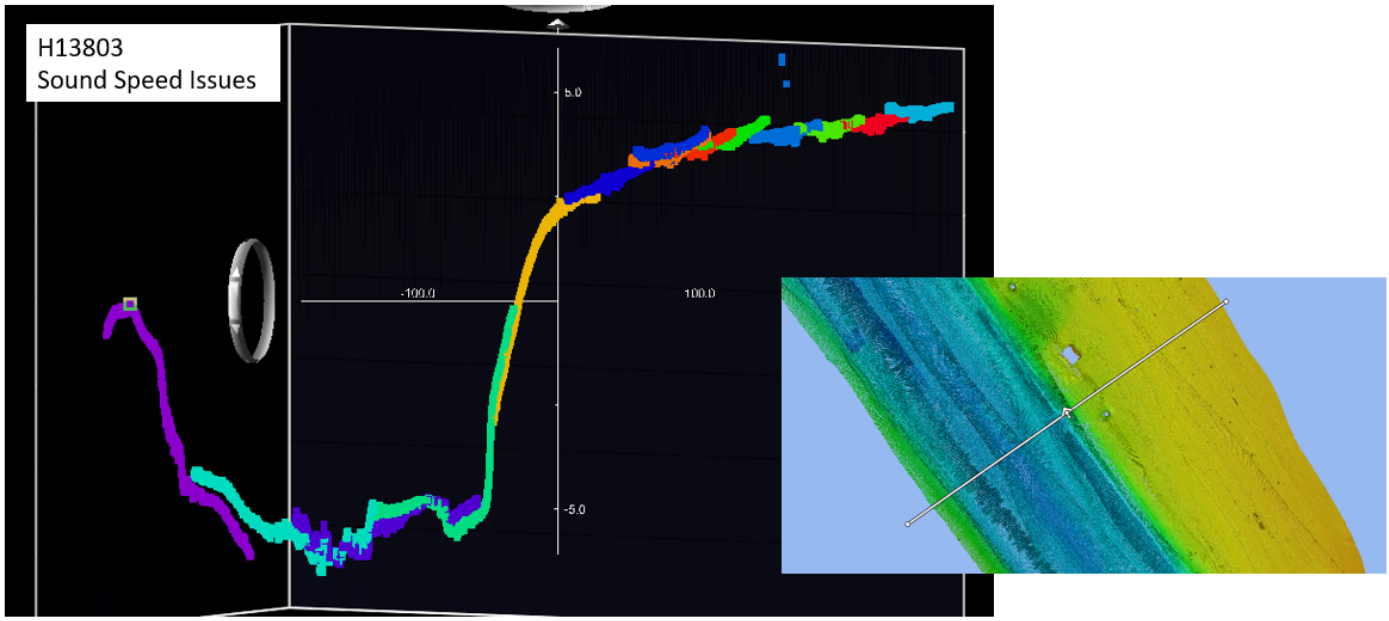

Figure 7: H13803 sound speed issues in approaches to harbor

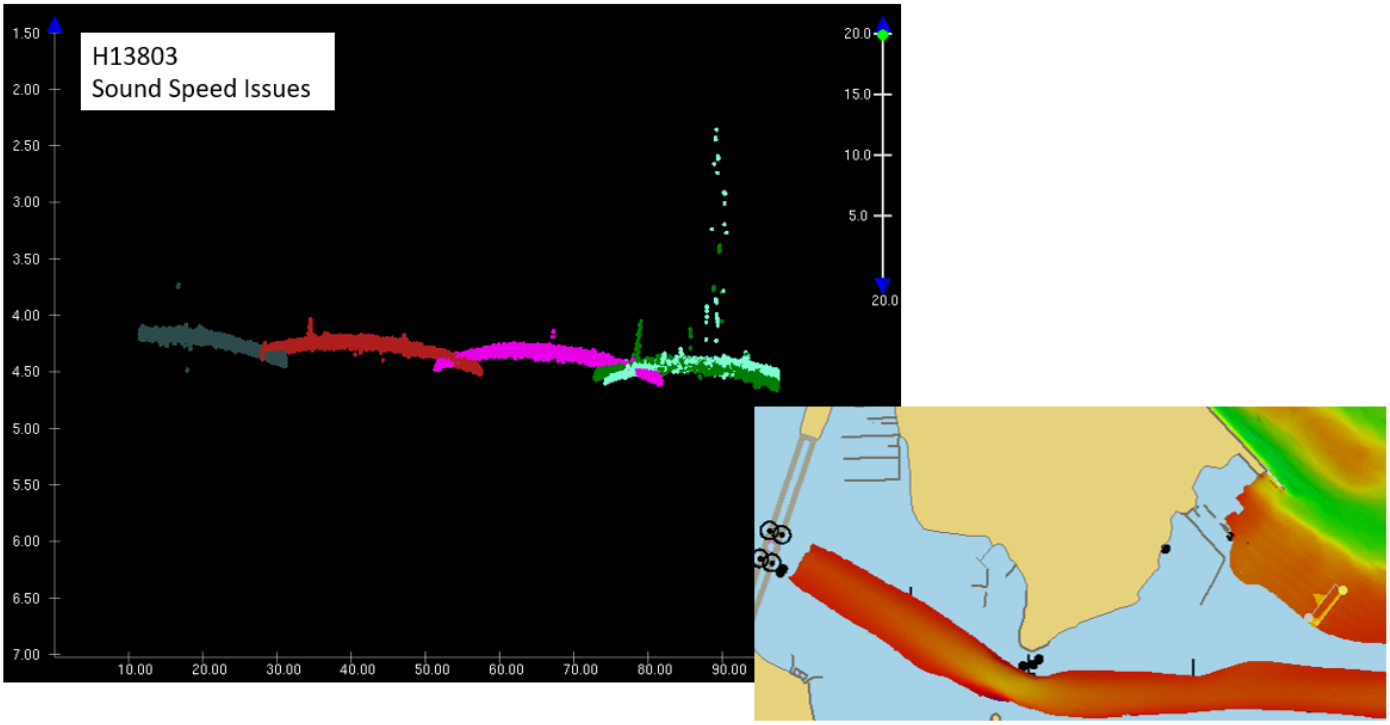

Figure 8: H13803 sound speed issues near Baltimore peninsula

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. For the entirety of H13803 survey, the CTD profile was used as the sound speed source for beam forming during acquisition because the surface sound speed probe cable was not functioning. Therefore, surface sound speed was not recorded, which most likely contributed to artifacts observed in the data.

B.2.8 Coverage Equipment and Methods

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

B.2.9 Holidays

H13803 data were reviewed in CARIS HIPS and SIPS for holidays in accordance with Section 5.2.2.3 of the HSSD. 24 holidays which meet the definition were identified via Pydro QC Tools Holiday Finder tool (See Figure 9 for an overview of holidays). 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. Five holidays were due to the presence of bridge pilings, land area, or mooring facilities. Likewise, seven holidays were the result of the presence of vessels (See Figure 10). Other holidays were the result of a lapse in coverage or an acoustic shadow in in steep areas as seen in Figure 11. These shadows are formed due to lack of coverage on the “back” side of a feature, usually due to rapid drops in the seafloor in conjunction with poor geometry from the sonar head. All areas with acoustic shadows were investigated in CARIS subset editor to verify that least depths were found. Additionally, holidays also resulted from rejecting fliers.

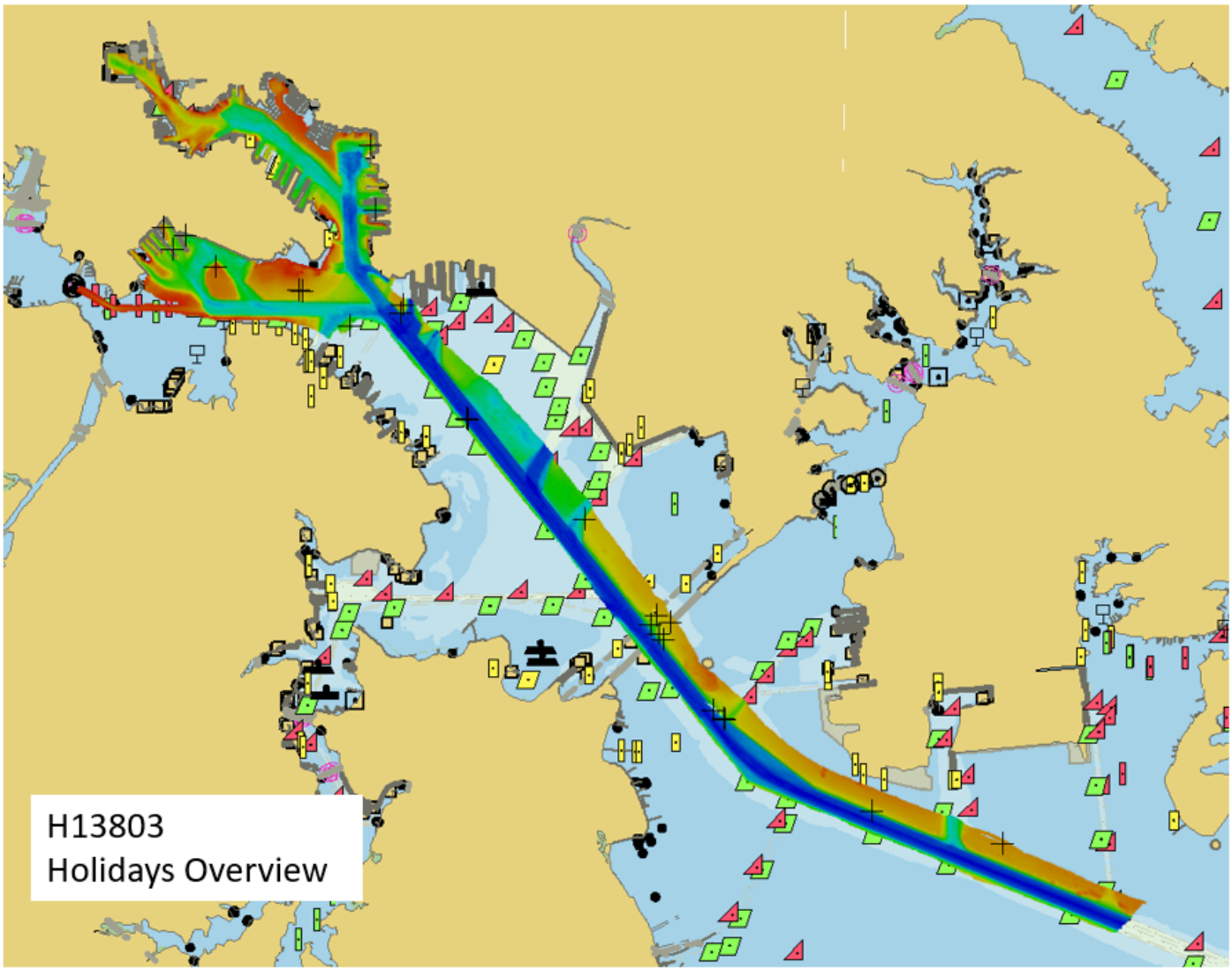

Figure 9: H13803 holidays overview

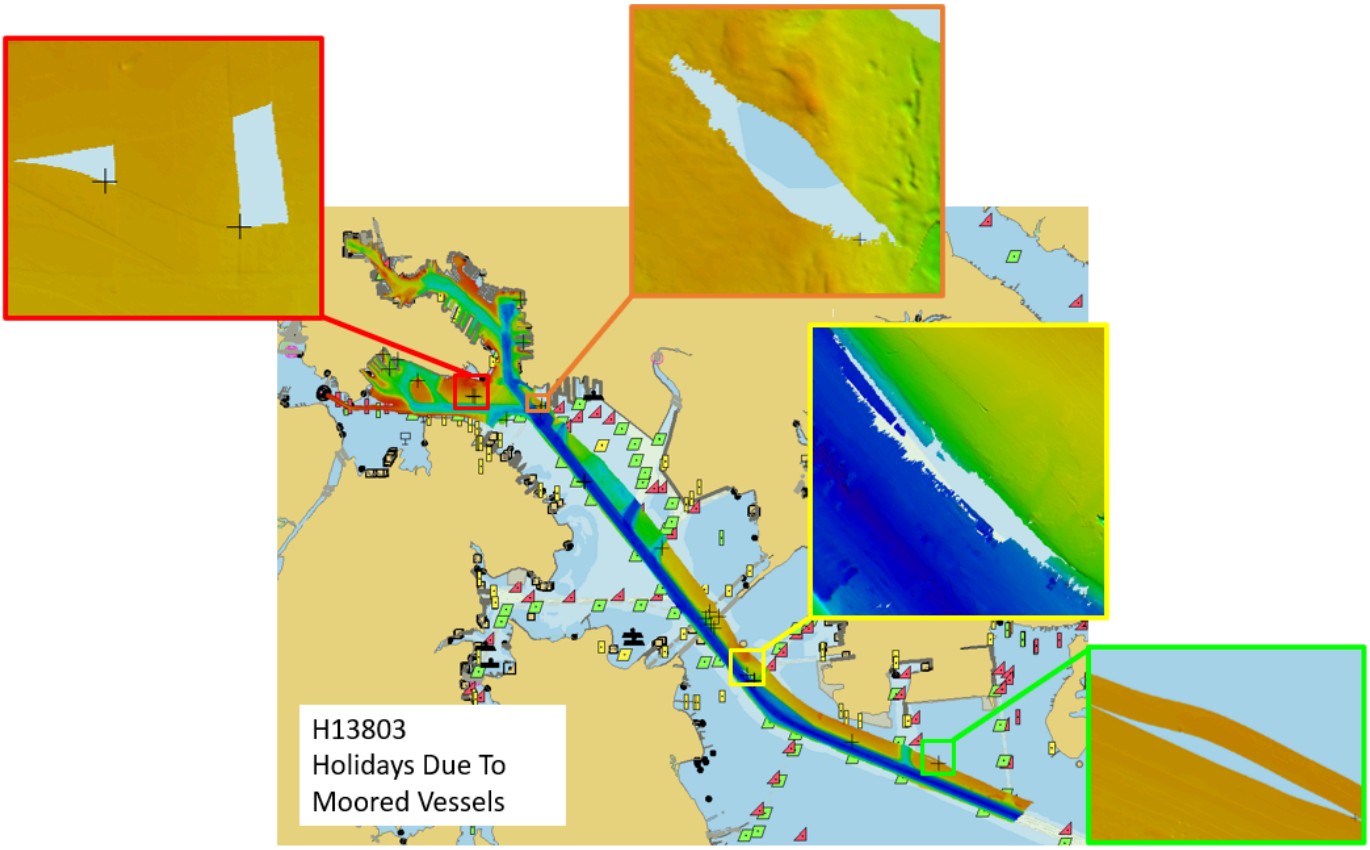

Figure 10: H13803 holidays due to vessels

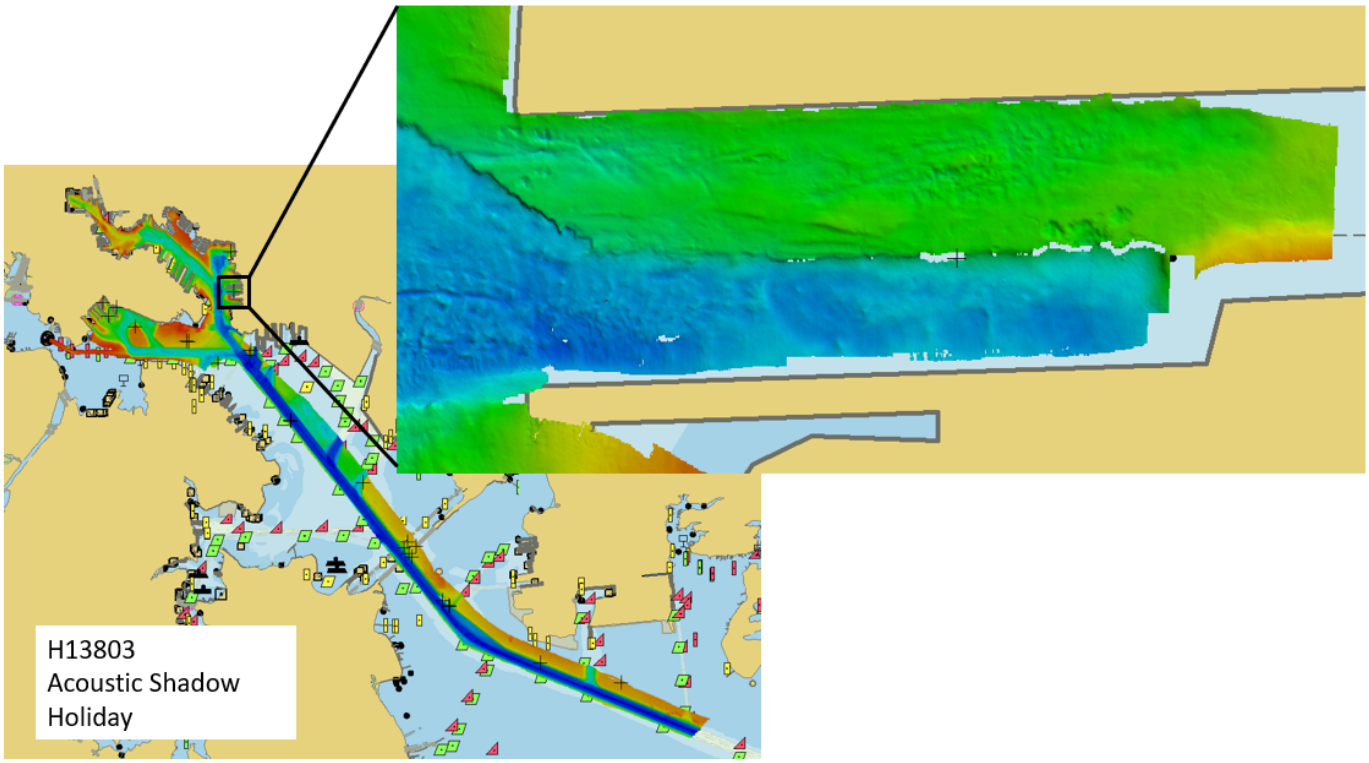

Figure 11: H13803 holidays due to acoustic shadow

B.2.10 NOAA Allowable Uncertainty

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 H13803 (Figure 12).

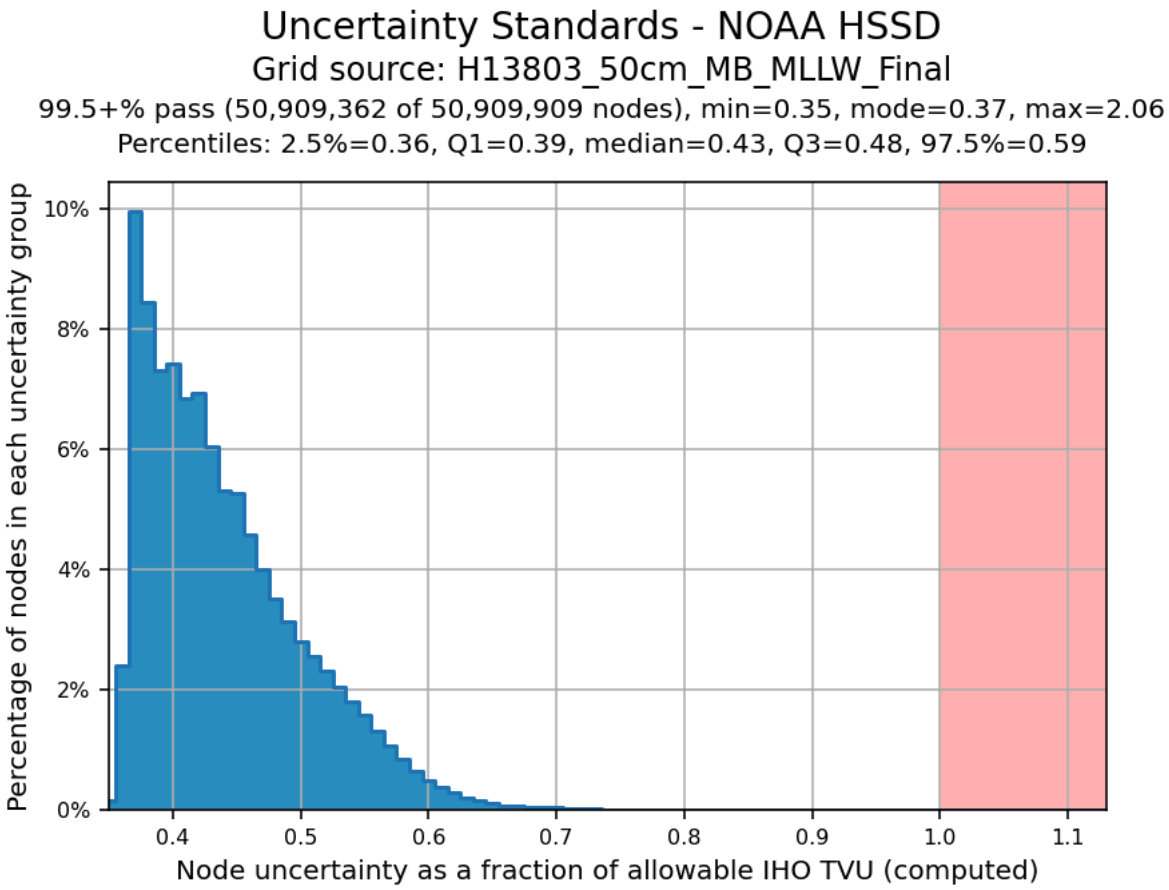

Figure 12: H13803 allowable uncertainty statistics

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 H13803 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 13).

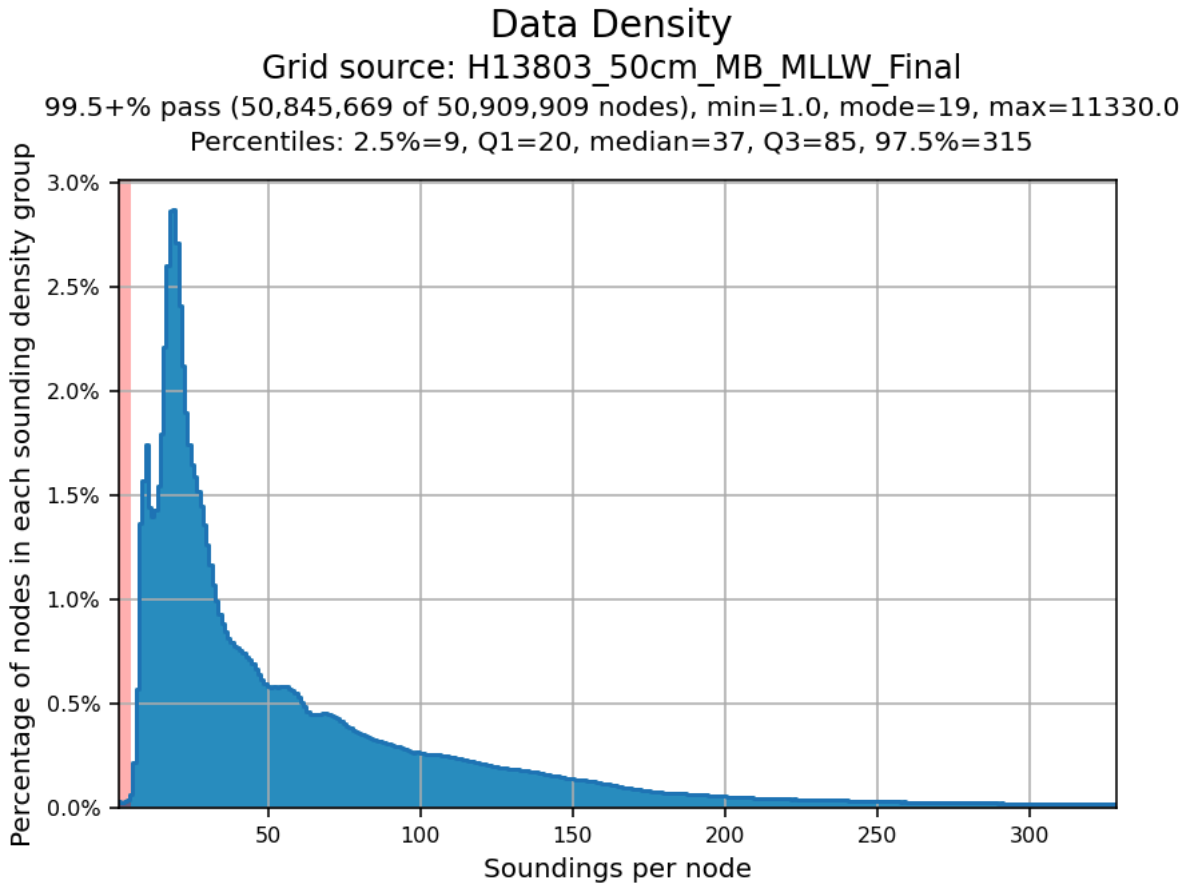

Figure 13: H13803 density statistics

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

Kongsberg EM2040C stores the raw backscatter data in the .all file. All equipment and survey methods were used as detailed in the DAPR. Raw MBES backscatter was logged as part of the .all file of the Kongsberg EM2040 systems. Backscatter was processed in QPS Fledermaus GeoCoder Toolbox (FMGT) software, and the exported geotiffs are included in the final processed data package. See Figure 14 for a greyscale representation of the complete mosaic.

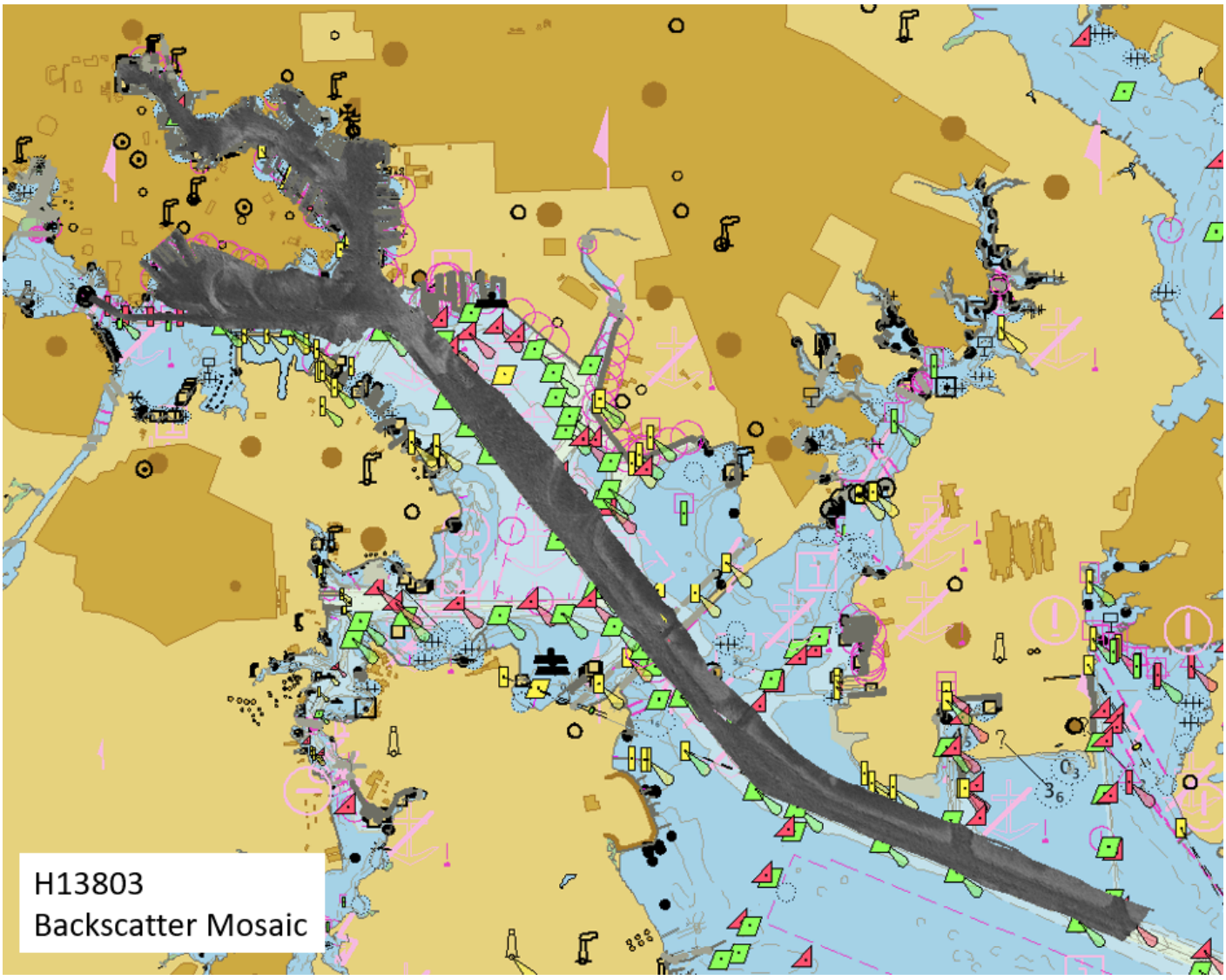

Figure 14: H13803 backscatter mosaic

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	11.4.19

Table 9: Primary bathymetric data processing software

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

Manufacturer	Name	Version
QPS	Fledermaus	7.10.2

Table 10: Primary imagery data processing software

The following Feature Object Catalog was used: NOAA Profile Version 2023.

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
H13803_50cm_MB_MLLW.csar	CARIS Raster Surface (CUBE)	0.5 meters	1.4 meters - 19.1 meters	NOAA_0.5m	Complete MBES
H13803_50cm_MB_MLLW_Final.csar	CARIS Raster Surface (CUBE)	0.5 meters	1.4 meters - 19.1 meters	NOAA_0.5m	Complete MBES
H13803_MBAB_2m_S5401_300khz_1of1.tif	MB Backscatter Mosaic	2 meters	-	NOAA_2m	100% SSS

Table 11: Submitted Surfaces

The NOAA CUBE parameters defined in the HSSD were used for the creation of all H13803 CUBE surfaces. The surfaces have been reviewed where noisy data, or "fliers," are incorporated into the gridded

solutions causing the surface to be shoaler or deeper than the true sea floor. Where these spurious soundings cause the gridded surface to be shoaler or deeper than the reliably measured seabed by greater than the maximum allowable Total Vertical Uncertainty at that depth, the noisy data have been rejected by the hydrographer and the surface recomputed.

Flier Finder, part of the QC Tools package within 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. Additionally, locations and digits of edge fliers were manually inspected in HIPS and SIPS.

The computed uncertainty derived from a mix of a priori and real-time uncertainty estimates was chosen during finalization of the gridded MBES surface.

B.5.3 Designated Soundings

H13803 contains nine designated soundings in accordance with HSSD Section 5.2.1.2.3. These designated soundings were selected to accurately represent the seafloor including features such as wrecks and obstructions. Figure 15 shows an overview of the survey area and the location of designated soundings.

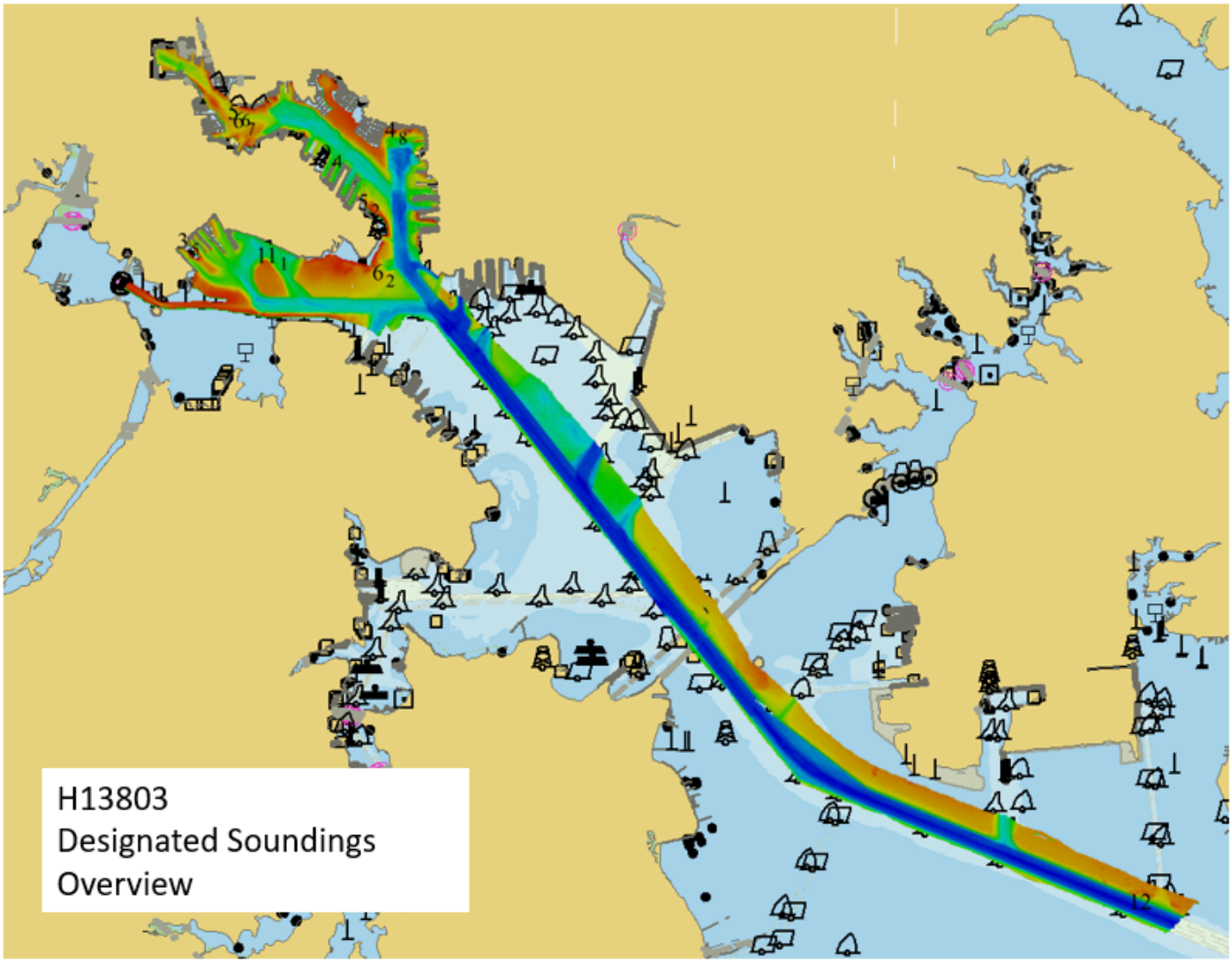

Figure 15: H13803 designated soundings overview

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 H13803.

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-E917_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 were used as the final means of reducing H13803 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. Smoothed Best Estimate of Trajectory (SBET) and associated error (RMS) data were applied to all MBES data in CARIS HIPS and SIPS. GODZ and WDC6 are Scripps Orbit and Permanent Array Center (SOPAC) stations.

The following CORS Stations were used for horizontal control:

HVCR Site ID	Base Station ID
University of MD Baltimore County, Catonsville, MD	UMBC
Baltimore County MD, Land Survey Division	BACO
Loyola F, Annapolis, MD	LOYF
Goddard Geophysical and Observatory, Greenbelt, MD	GODZ
US Naval Observatory National Geodspatial Intelligence Agency, Washington D.C.	WDC6
Loyola R, Perryville, MD	LOYR

Table 13: CORS Base Stations

WAAS

During real-time acquisition, S5401 received correctors from the Wide Area Augmentation System (WAAS) for increased accuracies. WAAS and SBETs were the sole methods of positioning for H13803.

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
US5BALBA	1:10000	4	02/14/2022	11/07/2023
US5BALBB	1:10000	6	08/02/2022	11/07/2023
US5BALBC	1:10000	4	11/24/2021	11/16/2023
US5BALCA	1:10000	4	03/08/2023	03/08/2023
US5BALCB	1:10000	5	11/24/2021	11/07/2023
US5BALCC	1:10000	1	06/11/2020	06/11/2020

Table 14: Largest Scale ENCs

D.1.2 Shoal and Hazardous Features

Inshore of Ferry Bar Channel Light 13, shoal water with a least depth of 1.4 m exists (See Figure 16). However, because this area is inshore of the ATON, and there is a charted 1.8 m contour as well as a 1.2 m sounding, this was not reported as a DTON.

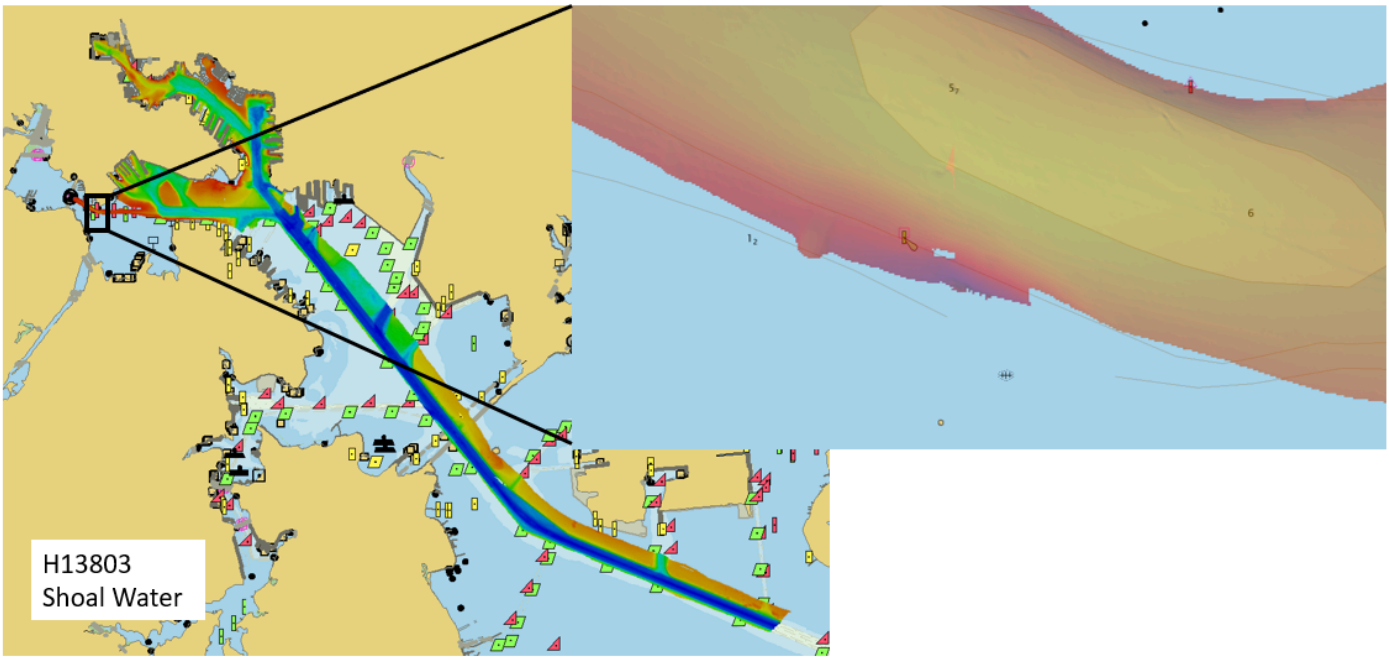

Figure 16: H13803 shoal

D.1.3 Charted Features

Because the H13803 survey was constrained by repair and contract deadlines, many assigned features were not addressed. However, of those addressed, three piers were observed to have incorrect extents, and five obstructions and one mooring facility were observed to be in incorrectly charted positions. The assigned unverified chart feature (UCF) with Feature ID 0_ 1684147289 00126 did not meet the disproval radius but the limit of safe navigation was met. Furthermore, there is no evidence of this UCF in the MBES data. All investigated features are addressed in the Final Feature File.

D.1.4 Uncharted Features

Three new obstructions, one foul area, and one wreck were observed in the MBES data and are recommended for charting. See the Final Feature File for details.

D.1.5 Channels

Northwest Harbor Channel, Ferry Bar Channel, Fort McHenry Channel, and a portion of Brewerton Channel were investigated and addressed in the Final Feature File.

D.2 Additional Results

D.2.1 Aids to Navigation

All ATONs investigated were observed as on station and serving as intended are not included in the Final Feature File, per HSSD 2022 Section 7.3.6.

D.2.2 Maritime Boundary Points

No Maritime Boundary Points were assigned for this survey.

D.2.3 Bottom Samples

No bottom samples were assigned for H13803.

D.2.4 Overhead Features

Assigned overhead features were addressed in the Final Feature File. However, no overhead clearances were determined.

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

Ferry routes and/or terminals exist for this survey, but were not investigated. Baltimore City CONNECTOR has three routes operating on weekdays. In April 2024, the Baltimore Water BUS will resume operations, and the Baltimore Water TAXI will begin operations.

D.2.8 Abnormal Seafloor or Environmental Conditions

No abnormal seafloor or environmental conditions exist for this survey.

D.2.9 Construction and Dredging

Present and/or planned construction or dredging exists within the survey limits, but was not thoroughly investigated. On DN 151 and 152, there was an active dredge within the approaches to the Baltimore Inner Harbor, in the Fort McHenry Channel. The dredge's presence lead to multiple holiday (See Figure 17).

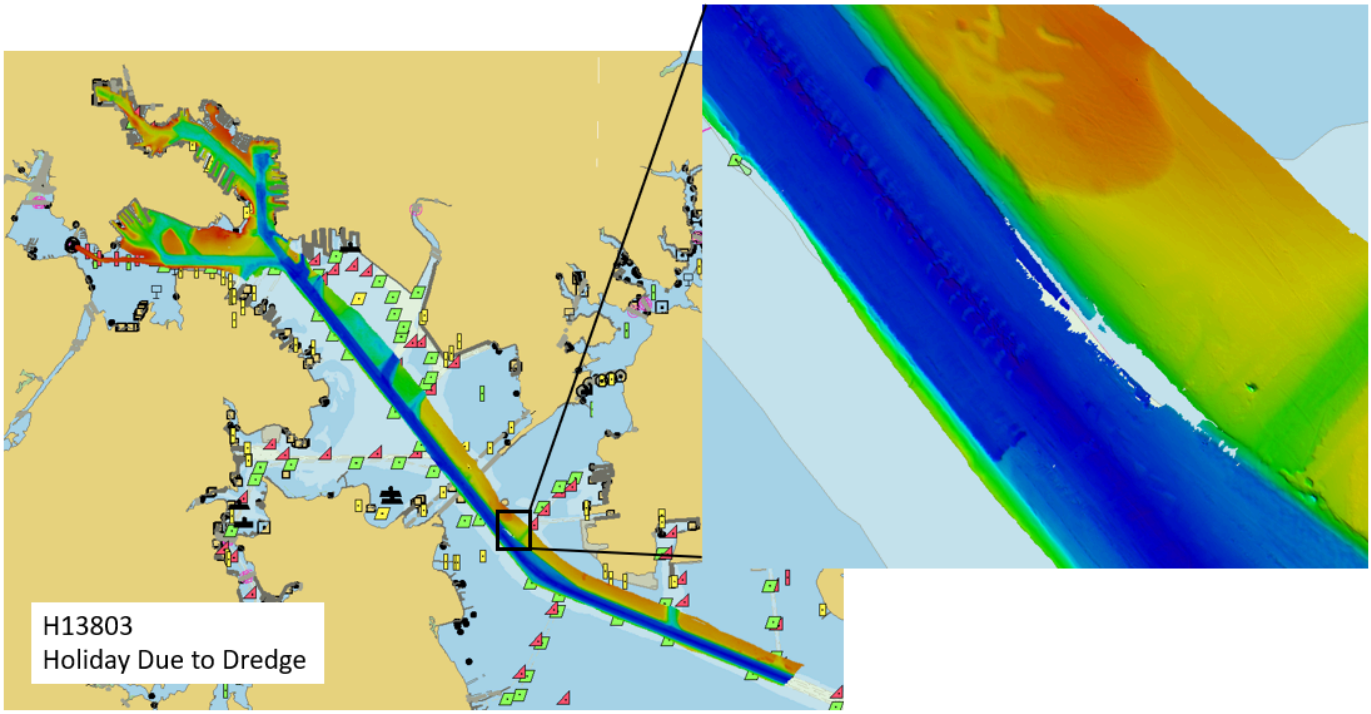

Figure 17: H13803 dredging in approaches to harbor

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	11/29/2023	
LTJG Carly Robbins	Sheet Manager	11/29/2023	ROBBINS.CARLY.ANN.1555089534 Digitally signed by ROBBINS.CARLY.ANN.1555089534 Date: 2023.11.29 10:56:27 -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