F00727

NOAA Form 76-35A

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

DESCRIPTIVE REPORT

Type of Survey: Navigable Area

Registry Number: F00727

LOCALITY

State: Maryland

General Locality: Chesapeake Bay

Sub-locality: Crisfield and Vicinity

2018

CHIEF OF PARTY
LT Sarah L. Chappel

NOAA FORM 77-28 (11-72)	U.S. DEPARTMENT OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION	REGISTRY NUMBER:
HYDROGRAPHIC TITLE SHEET		**F00727**

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:	**Maryland**
General Locality:	**Chesapeake Bay**
Sub-Locality:	**Crisfield and Vicinity**
Scale:	**1: 10,000**
Dates of Survey:	**06/19/2018 to 07/10/2018**
Instructions Dated:	**06/01/2018**
Project Number:	**S-E906-BH2-18**
Field Unit:	**NOAA R/V *Bay Hydro II***
Chief of Party:	**LT Sarah L. Chappel**
Soundings by:	**Multibeam Echo Sounder**
Imagery by:	**Side Scan Sonar Echo Sounder**
Verification by:	**Pacific Hydrographic Branch**
Soundings Acquired in:	**meters at Mean Lower Low Water**

Remarks:

The purpose of this survey is to provide contemporary surveys to update National Ocean Service (NOS) nautical charts. All separates are filed with the hydrographic data. Any revisions to the Descriptive Report (DR) generated during office processing are shown in bold red italic text. The processing branch maintains the DR as a field unit product, therefore, all information and recommendations within the body of the DR are considered preliminary unless otherwise noted. The final disposition of surveyed features is represented in the OCS nautical chart update products. All pertinent records for this survey, including the DR, are archived at the National Centers for Environmental Information (NCEI) and can be retrieved via http://www.ncei.noaa.gov/.

Descriptive Report Summary **F00727**	
Project	S-E906-BH2-18
Survey	F00727
State	Maryland
Locality	Chesapeake Bay
Sub Locality	Crisfield and Vicinity
Scale of Survey	1:10000
Sonars Used	Picotech PicoMB-120SF (MBES) Tritech Starfish 453 (SSS)
Horizontal Datum	North American Datum 1983
Vertical Datum	Mean Lower Low Water
Vertical Datum Correction	VDatum
Projection	Projected UTM 18
Field Unit	NOAA R/V *Bay Hydro II*
Survey Dates	06/19/2018 - 07/10/2018
Chief of Party	Lieutenant (Junior Grade) Sarah L. Chappel

A. Area Surveyed

Data were acquired to the survey limits in accordance with the requirements in the Project Instructions and the April 2018 NOS Hydrographic Surveys Specifications and Deliverables (HSSD). See Figures 1-4 for visual representations of the individual survey areas.

Data were acquired within the following survey limits:

Northwest Limit	Southeast Limit
38° 30' 9.57" N 76° 16' 52" W	37° 57' 46.92" N 75° 40' 10.21" W

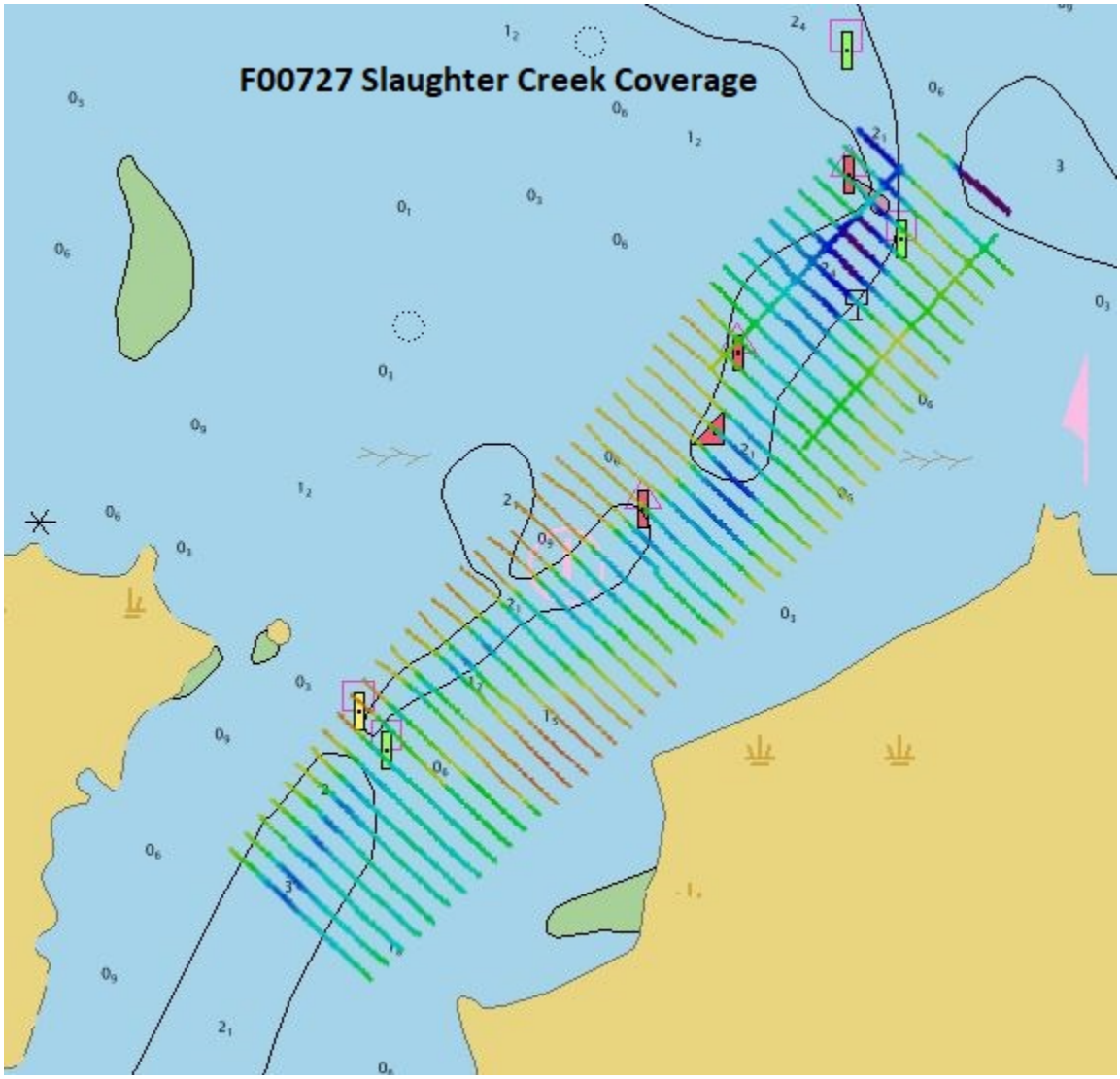


Figure 1: F00727 Slaughter Creek Coverage

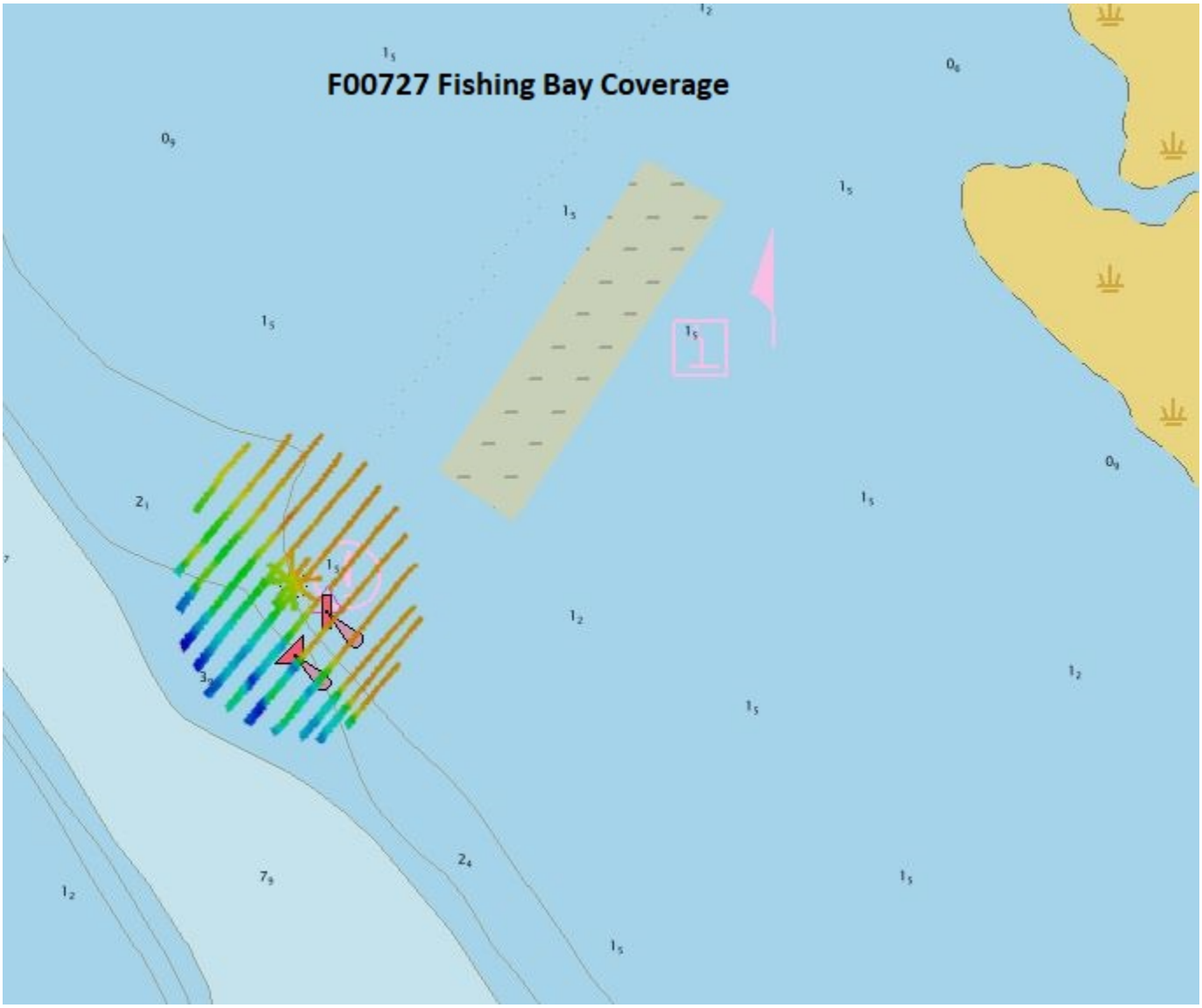


Figure 2: F00727 Fishing Bay Coverage

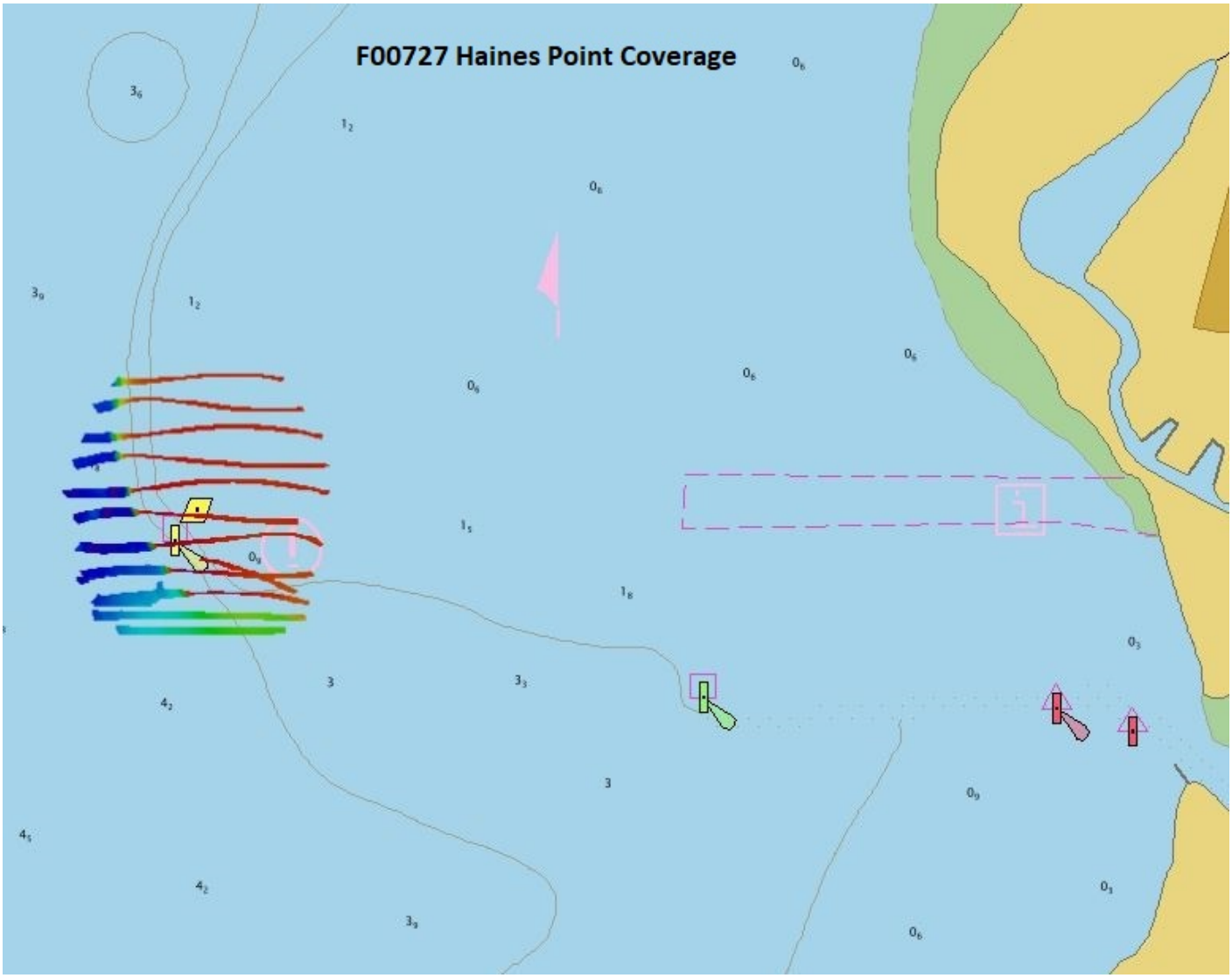


Figure 3: F00727 Haines Point Coverage

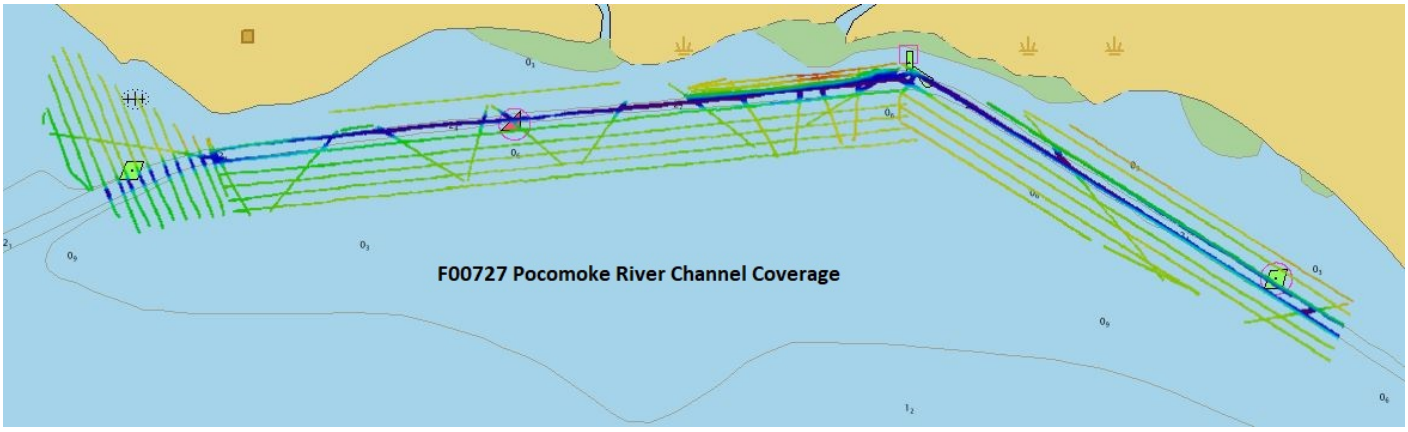


Figure 4: F00727 Pocomoke River Coverage

B. Survey Purpose

The United States Coast Guard has requested the Office of Coast Survey investigate four areas in the Chesapeake Bay. For the first area, in Slaughter Creek, the USCG needs a hydrographic survey to determine if relocating the ATONs to mark the best water is necessary due to reports of shoaling. In the second area, Fishing Bay, the Bay Hydro II is assigned to disprove the existence of a submerged obstruction with the charted label “Obstn rep PD” to facilitate USCG removal of ATON "WR4A". In third area off of Haines Point, the USCG would like to confirm the existence of old ATON structures. The fourth area in the Pocomoke River entrance channel, Bay Hydro II is assigned to locate old buoy blocks and report their locations for potential USCG removal.

C. Intended Use of Survey

The survey is partially adequate to supersede previous data.

Survey data in Slaughter Creek from F00727 is intended to supersede all prior survey data in their common areas. Data from the other survey areas are not intended to supersede data in their common areas. That data is intended only to meet requirements for either confirmation or removal of the specified features and ATONs from the nautical chart, with the exception of hazards to navigation.

Data acquired in F00727 meet multibeam echo sounder (MBES) coverage requirements for set line spacing coverage, or 200% side scan object detection coverage, as required by the HSSD except where described within this report. This includes crosslines, NOAA allowable uncertainty, and density requirements. Additional compliance statistics can be found in the QC Tools folder located in Appendix II of this report.

D. Data Acquisition and Processing

Refer to the S-E906-BH2-18 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.

E. Uncertainty

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 F00727. Real-time uncertainties were provided via Pico 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.

To verify that all data meets the accuracy specifications as stated in HSSD Section 5.1.3, a child layer titled NOAA_Allowed_1 was created for the 50cm surface using the equations stated in Section 5.1.3 of the HSSD. These

surfaces were then analyzed using the Pydro QC Tools Grid QA feature to determine what percentage of each surface meets specifications. Figure 5 shows the statistics for the surface. Overall, 99.5% of nodes meet or exceed NOAA Allowable Uncertainty specifications for F00727. For individual graphs per surface of uncertainty requirements, see the QC Tools Folder located in Appendix II.

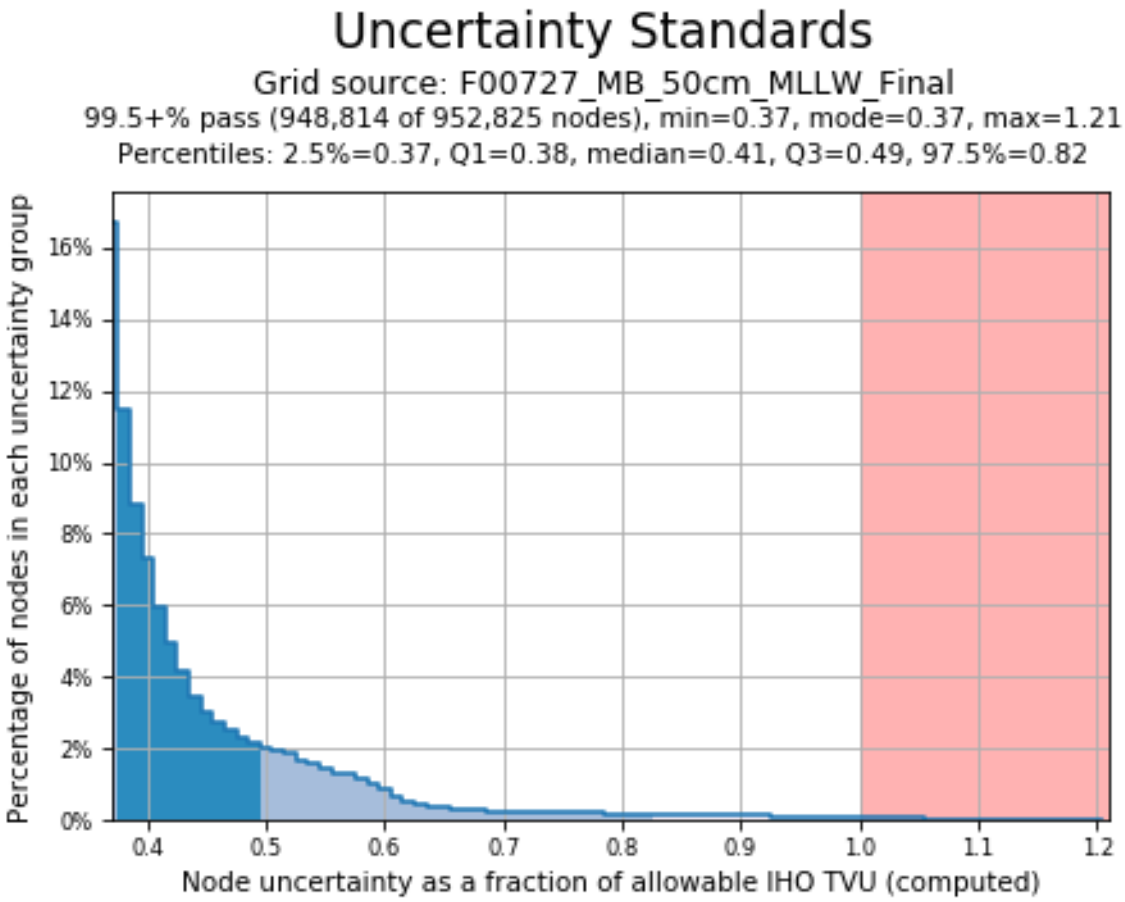


Figure 5: F00727 Total propagated uncertainty statistics

F. Results and Recommendations

The following are the largest scale ENC that cover the survey area:

ENC	Scale	Edition	Update Application Date	Issue Date	Preliminary?
US5MD1AM	1:40000	4	04/26/2018	08/07/2018	NO
US5MD23M	1:40000	16	11/30/2017	04/16/2018	NO
US5VA16M	1:40000	37	07/02/2018	07/02/2018	NO
US5VA21M	1:40000	21	05/02/2018	05/02/2018	NO

The following surfaces and/or BAGs were submitted to the Processing Branch:

Surface Name	Surface Type	Resolution	Depth Range	Surface Parameter	Purpose
F00727_MB_50cm_MLLW	CUBE	0.5 m	0.3 m - 6.0 m	NOAA_0.5m	Full Base Surface
F00727_MB_50cm_MLLW_Final	CUBE	0.5 m	0 m - 20 m	NOAA_0.5m	Finalized Surface
F00727_SSSAB_1m_100	SSS Mosaic	1 m	-	F00727 SSS Beam Pattern.bbp	100% coverage
F00727_SSSAB_1m_200	SSS Mosaic	1 m	-	F00727 SSS Beam Pattern.bbp	200% coverage

Due to the nature of set line spacing surveys, there are areas between lines that are not surveyed using MBES. To compare the data to the charts in their common areas, 1 meter resolution interpolated models were created to approximate the depths between the survey lines. All soundings used for comparison were derived from surveyed data, but the interpolated models were used to create contour lines for comparison.

Soundings from F00727 in the Slaughter Creek area are in a general agreement with charted depths on ENC US5MD1AM, with most depths agreeing to 0.5 meters as shown in Figure 6. The largest differences are in the southern part of the survey, where differences are as high as 0.7 meters as seen in Figure 6. Soundings in black are charted, while soundings in white are surveyed.

Contours from F00727 are not in agreement with charted contours on ENC US5MD1AM in the Slaughter Creek area. The surveyed contours follow the channel in a more linear fashion compared to the the pockets of deeper water depicted in the charted contours. Additionally, shoaling on the western side of the Chanel has pushed the contours eastward along most of the length of the channel (Figure 7). Contours in black are charted, while contours in white are surveyed.

Soundings from F00727 in the Fishing Bay area are generally deeper than charted on ENC US5MD23M by up to 0.8 meters in the south west as seen in Figure 8. Soundings in black are charted, while soundings in white are surveyed.

Contours from F00727 generally do not agree with charted contours on ENC US5MD23M in the area of Fishing Bay. The charted 1.8m contour is almost non existent in the surveyed data. The surveyed 3.6 meter contour is close to charted but is generally farther in shore. See Figure 9 for more detail. Contours in black are charted, while contours in white are surveyed.

Soundings from F00727 in the area of Haines Point are generally deeper than charted on ENC US5VA21M by up to 0.5 meters as seen in Figure 10. Soundings in green are charted, while soundings in white are surveyed.

Contours from F00727 are generally farther off shore than the charted contours of ENC US5VA21M in the area of Haines Point. The surveyed 3.6 meter contour is as far as 42 meters west of charted in the southern part of the survey area. The surveyed 1.8 meter contour is as far as 66 meters west of charted in the survey area. See Figure 11 for more detail. Charted contours are in black, while surveyed contours are white.

Soundings from F00727 in the Pocomoke River Channel are in general agreement with those charted on ENC US5VA16M, with most depths agreeing to within 0.2 meters. Examples can be seen in Figures 12 and 13 where charted soundings are pink and surveyed soundings are white.

The 1.8m contour from F00727 generally agrees with the 1.8 meter charted contour on ENC US5VA16M in the Pocomoke River. In some areas, the surveyed contour is pushed farther inshore than the charted contour. In general the southern 1.8 meter contour of the channel is farther off shore than charted by as much as 12 meters. The 0.9 meter contour that is charted in the western section of the survey area is almost non-existent in the survey data. See Figures 14 and 15 for more detail. Contours in pink are charted, while contours in white are surveyed.

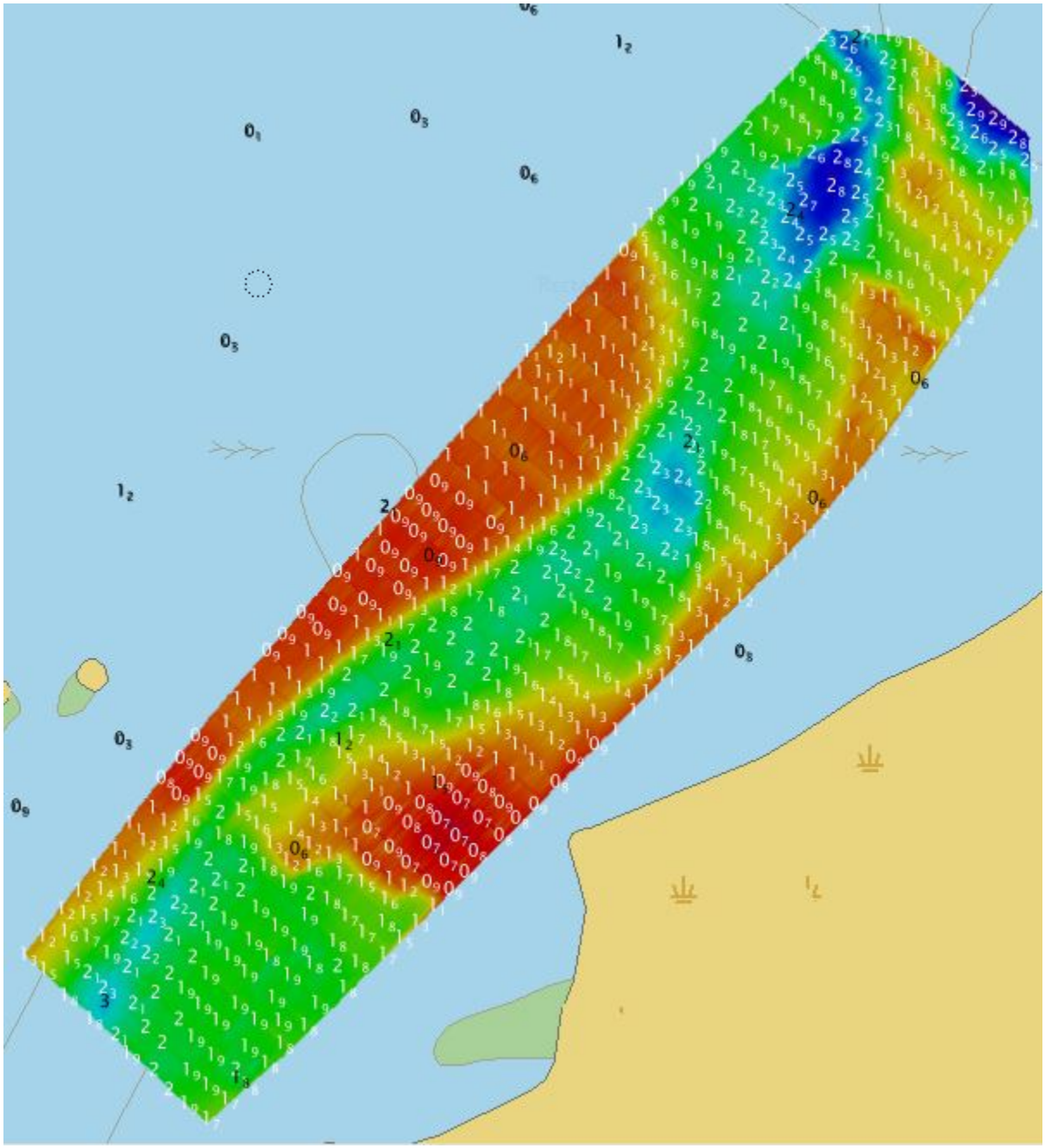


Figure 6: Sounding plot in the area of Slaughter Creek for F00727.

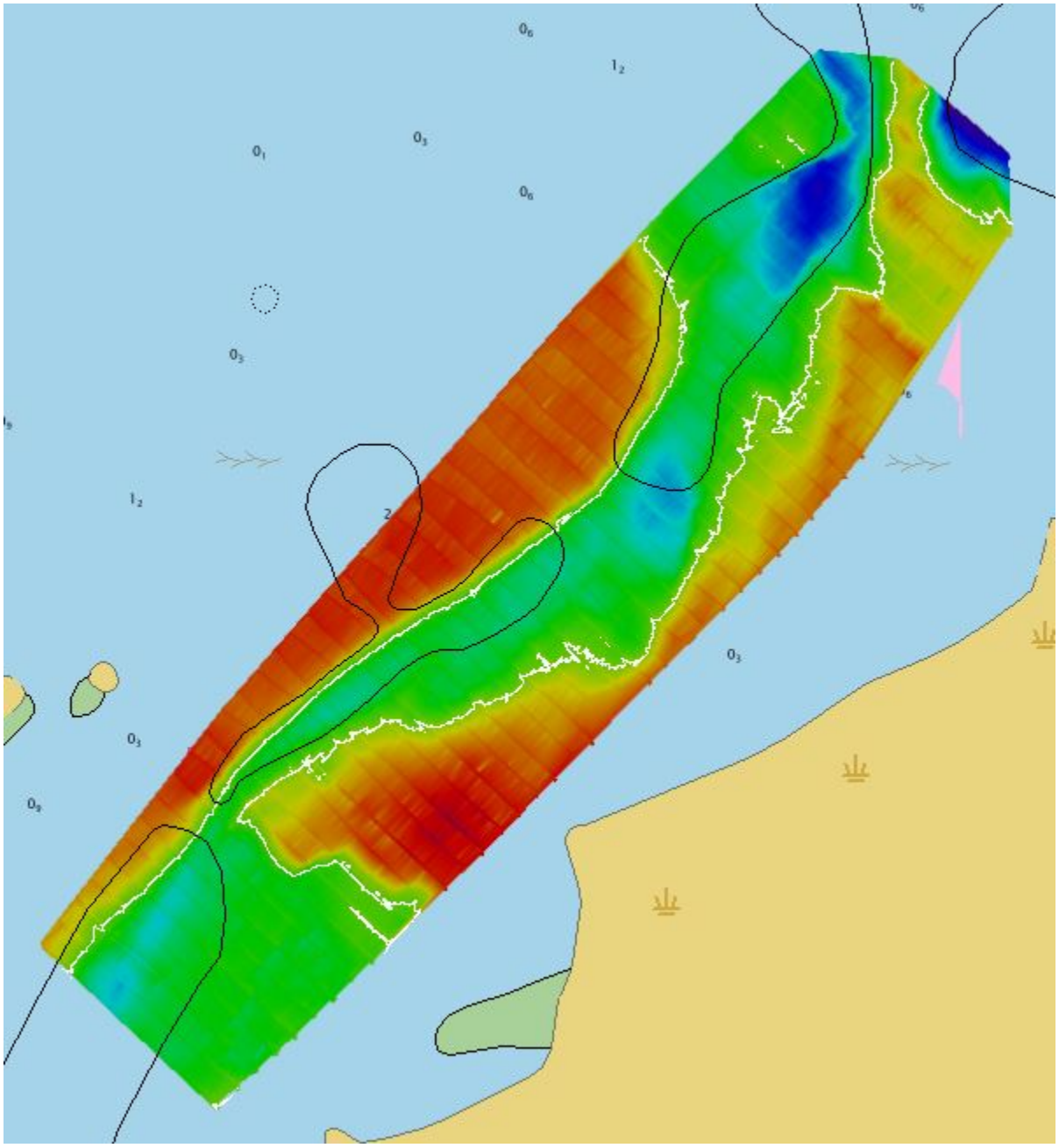


Figure 7: Contour plot in the area of Slaughter Creek for F00727.

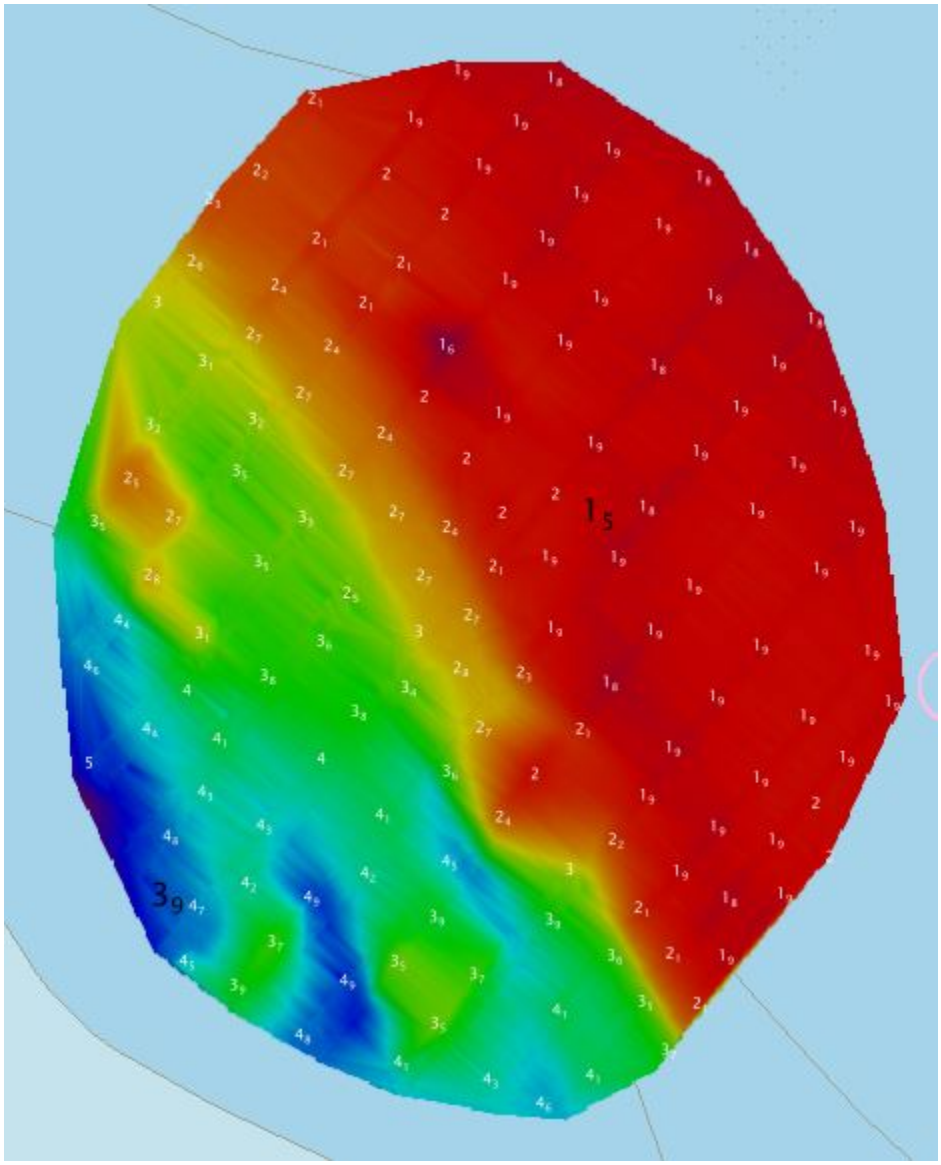


Figure 8: Sounding plot in the area of Fishing Bay for F00727.

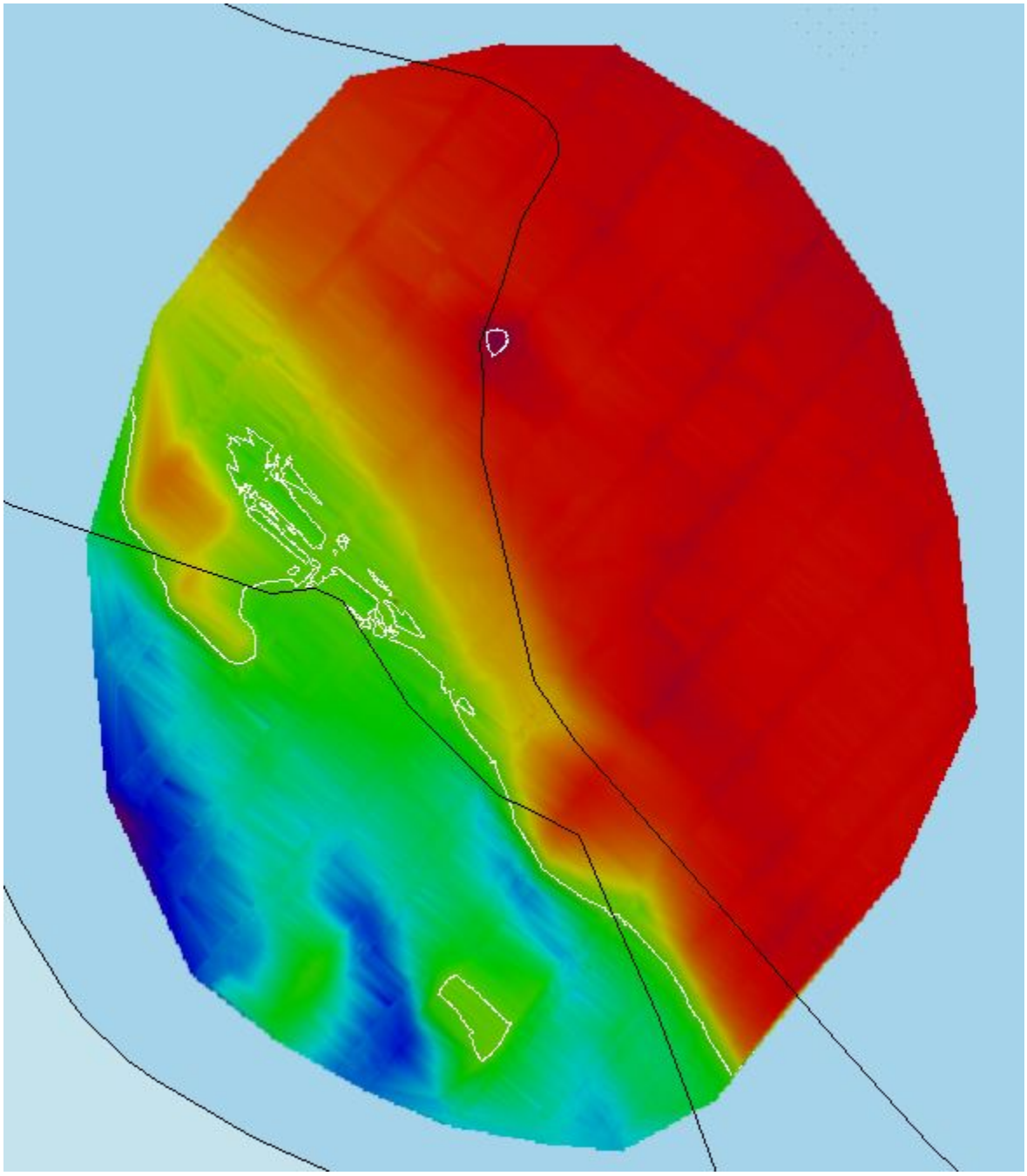


Figure 9: Contour plot in the area of Fishing Bay for F00727.

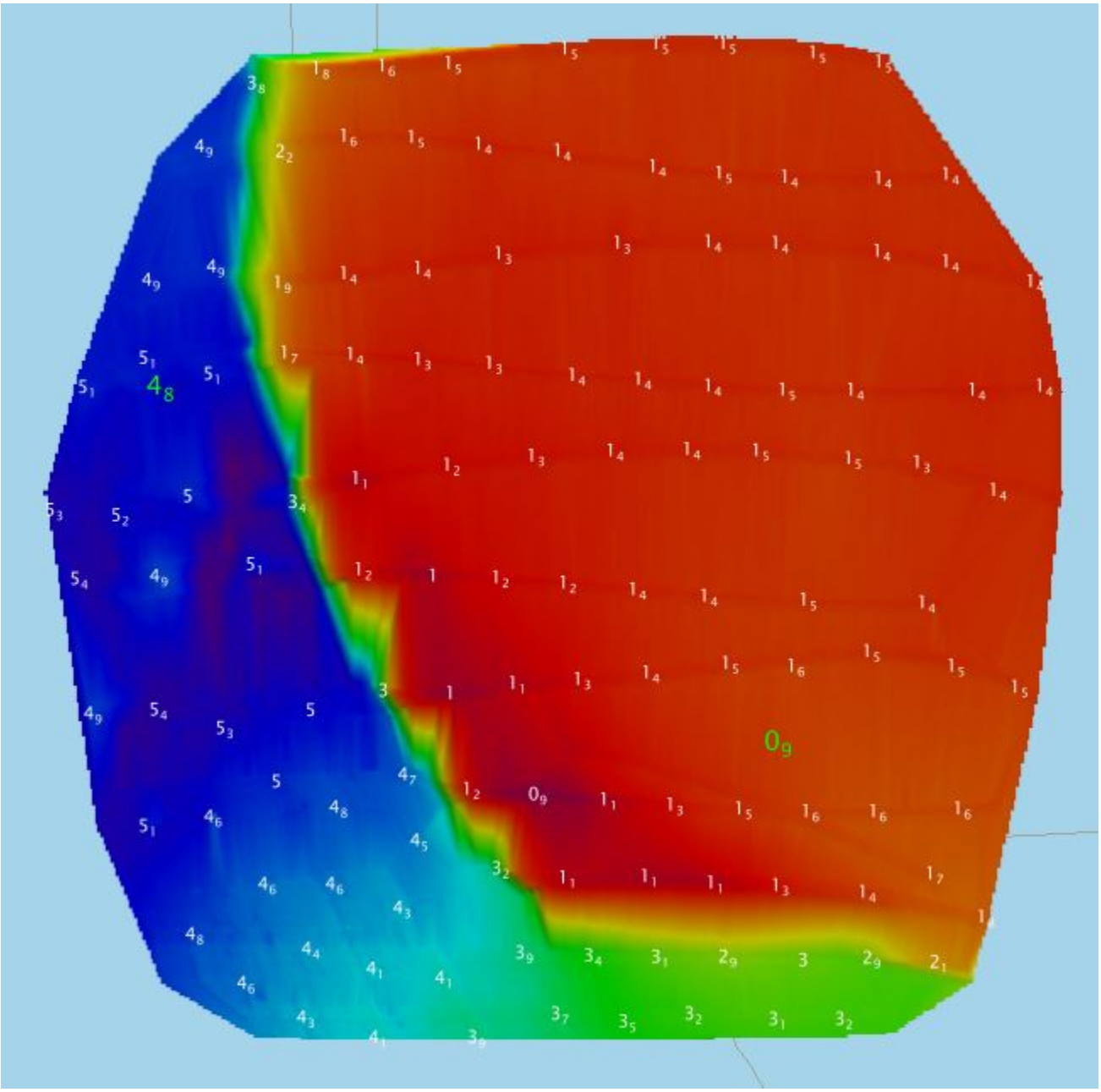


Figure 10: Sounding plot in the area of Haines Point for F00727.

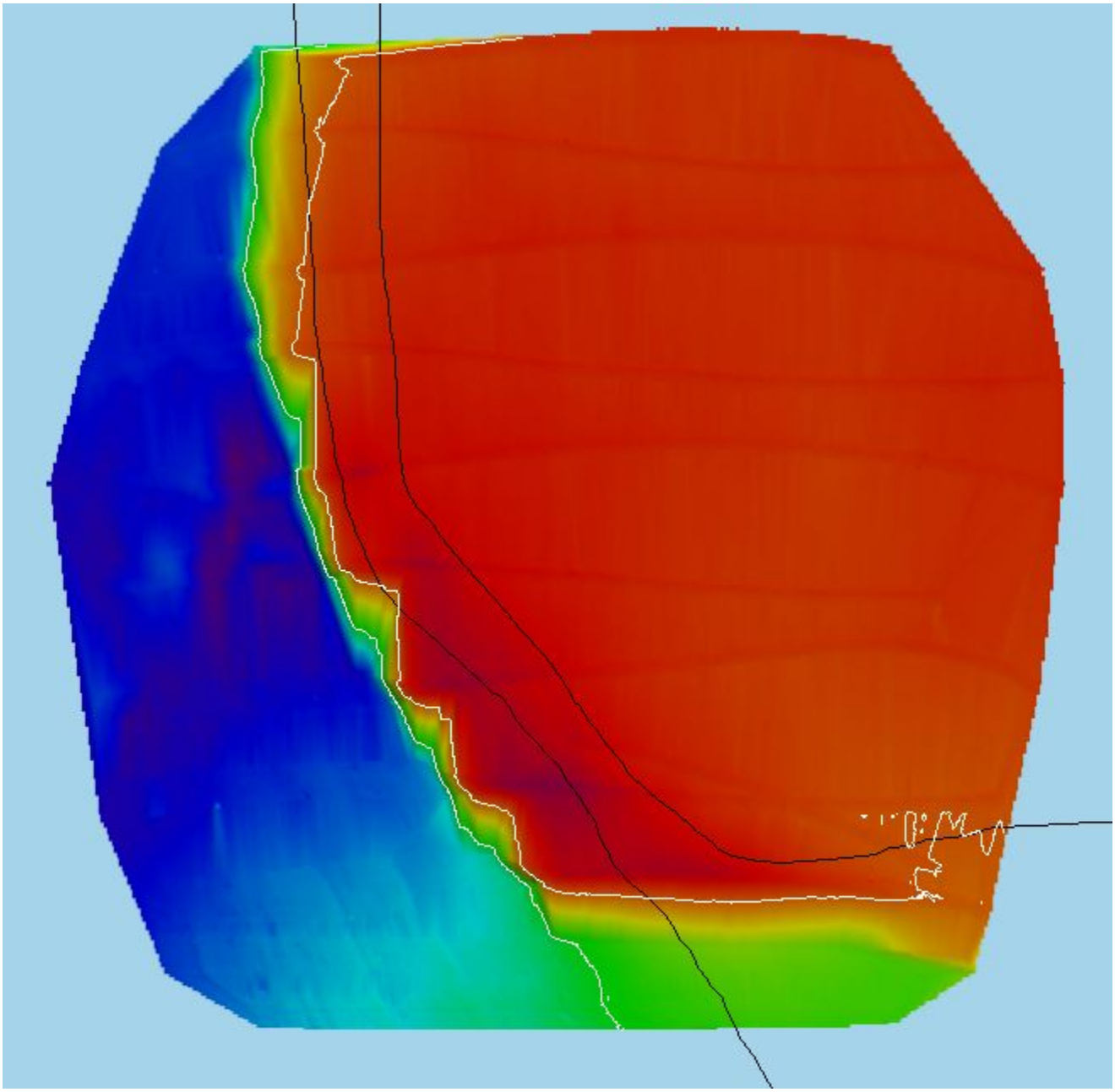


Figure 11: Contour plot in the area of Haines Point for F00727.

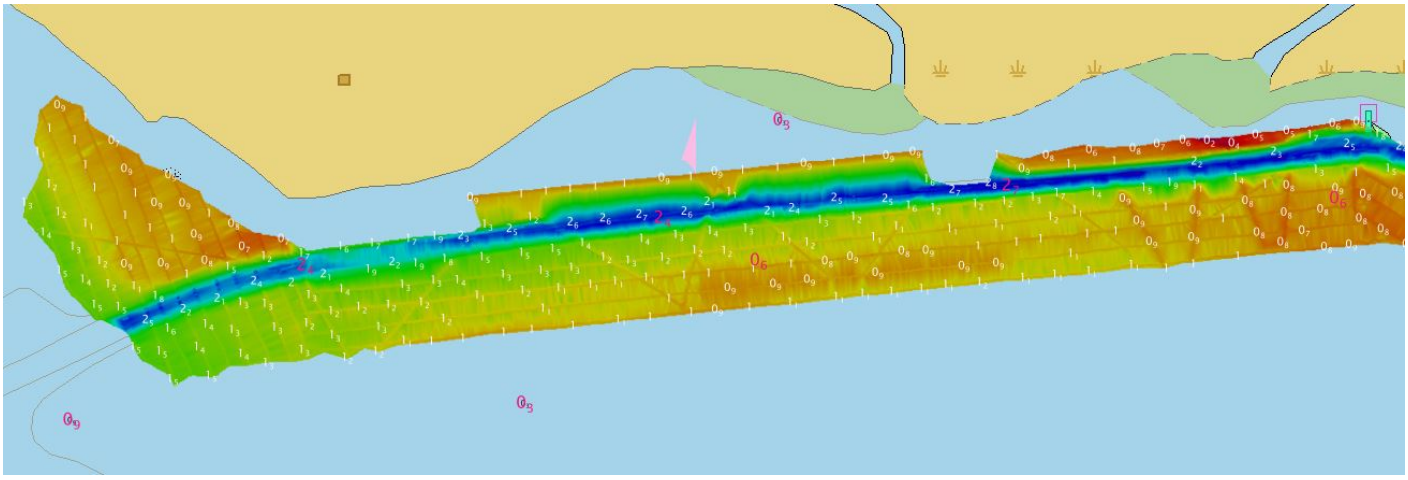


Figure 12: Sounding plot in the Pocomoke River Channel W of light "9" for F00727.

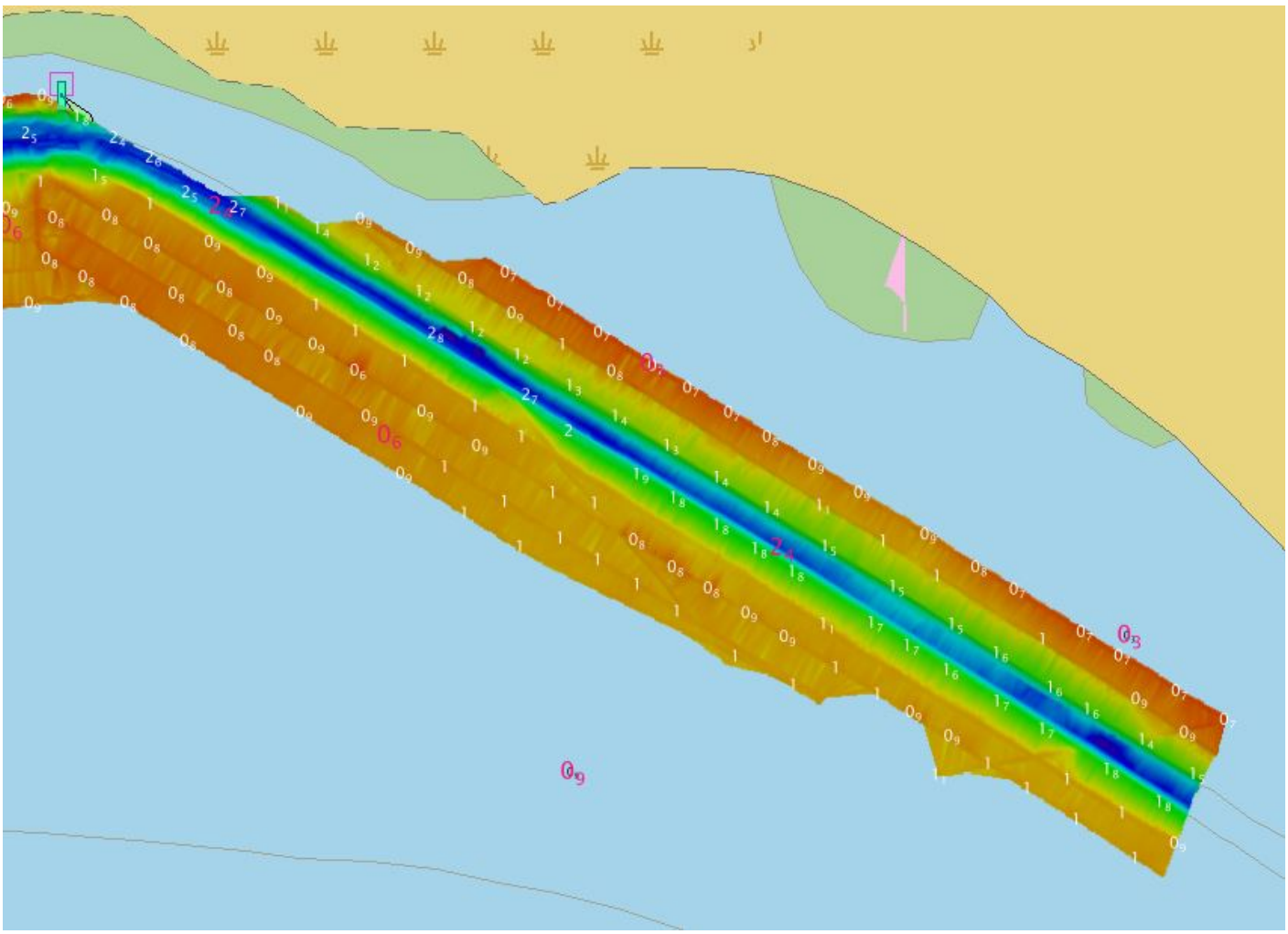


Figure 13: Sounding plot in the Pocomoke River Channel E of light "9" for F00727.

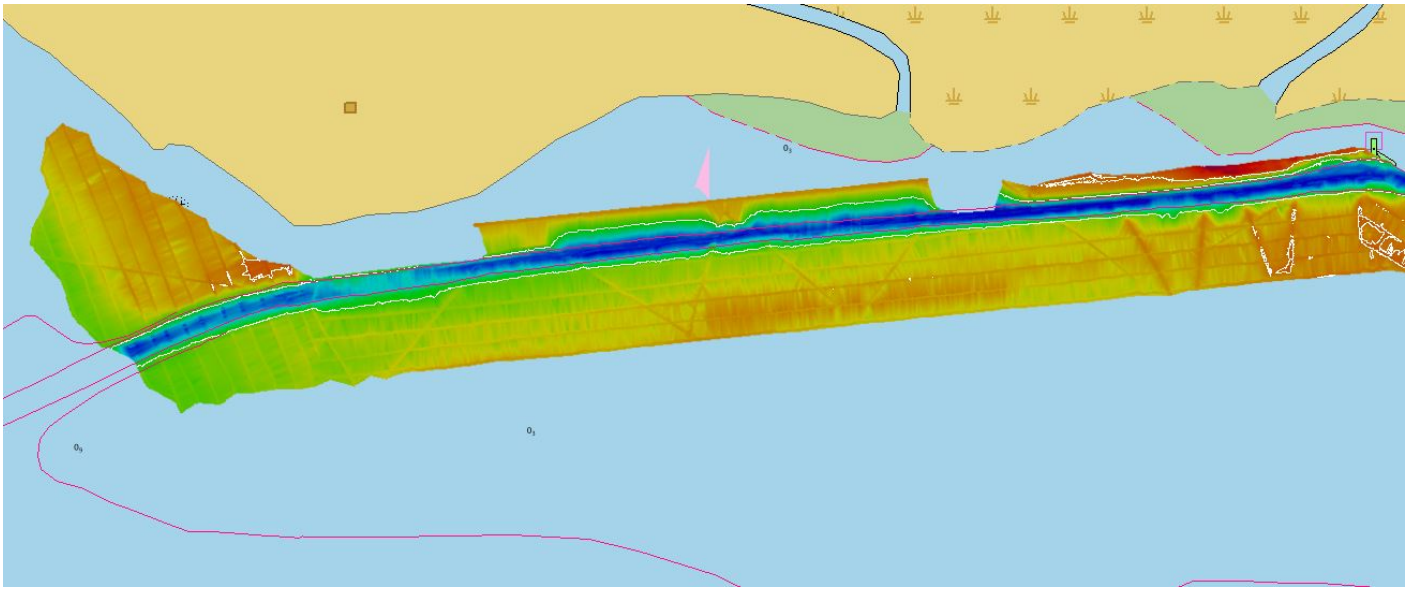


Figure 14: Contour plot in the Pocomoke River Channel W of light "9" for F00727.

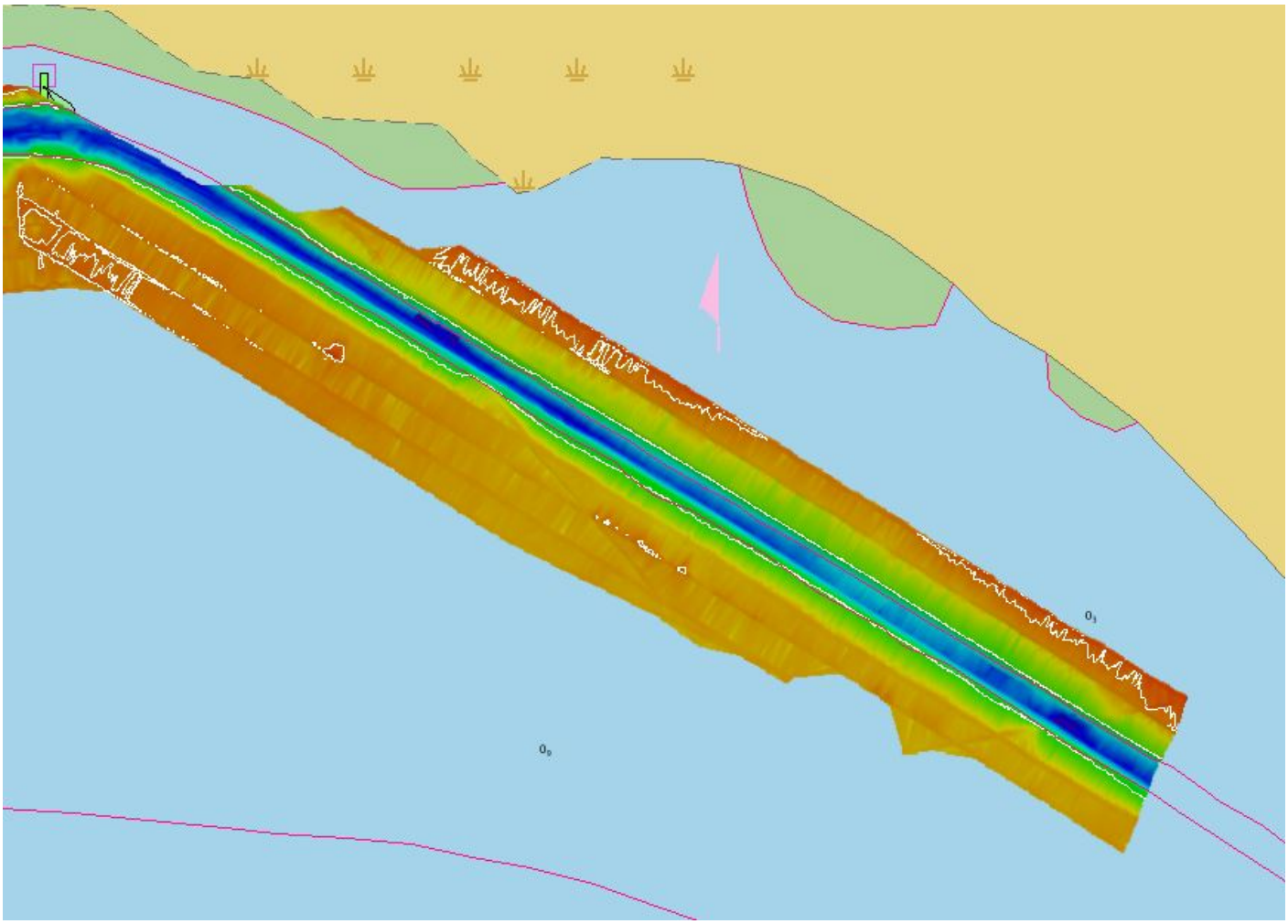


Figure 15: Contour plot in the Pocomoke River Channel E of light "9" for F00727.

G. Vertical and Horizontal Control

The vertical datum for this project is Mean Lower Low Water.

The vertical control method used for this survey was VDatum.

ERS methods were used as the final means of reducing F00727 to MLLW for submission. Data were reduced using the VDATUM model S-E906 SEP Model Limits_xyNAD83-MLLW_geoid12b.csar provided by the project manager.

The horizontal datum for this project is North American Datum 1983. The projection used for this survey is Projected UTM 18.

Vessel kinematic data were post-processed using Applanix POSPac processing software and Single 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. For further details regarding the processing and quality control checks performed, see the F00727 POSPAC Processing Logs spreadsheet located in the Separates folder.

During real-time acquisition, ASV007 received correctors from the Wide Area Augmentation System (WAAS) for increased accuracies similar to USCG DGPS stations. WAAS and SBETs were the sole methods of positioning for F00727.

H. Additional Results

ASV007's PicoMBES and Tritech sonars are not on the Approved Systems List released in Hydrographic Technical Directive 2018-2 by the Hydrographic Surveys Division. These systems were the best available to Bay Hydro II at the time of survey. The Navigation Response Branch and the Hydrographic Systems and Technology Branch are in the process of testing data from the ASV systems to ensure they meet the standards to make the Approved Systems List. Based on the data collected in this project and the ability to find known objects in a known location, the hydrographer believes the data collected for F00727 is still adequate to supersede all data in common areas as stated earlier in this report.

Crosslines were collected, processed, and compared in accordance with Section 5.2.4.3 of the HSSD. To evaluate crosslines, a 0.5 meter CUBE surface using strictly mainscheme lines in both the Slaughter Creek and Pocomoke River survey areas, and a 0.5 meter CUBE surface using strictly crosslines in both areas were created. From these surfaces, difference surfaces (mainscheme - crosslines = difference surface) were generated using Pydro’s Compare Surfaces tool at a 0.5 meter resolution, and are submitted in the Separates II Digital Data folder. Statistics show the mean difference between the depths derived from mainscheme and crosslines in Slaughter Creek was -0.04 meters and 95% of nodes falling within 0.11 meters (Figure 16). For the respective depths, the difference surface was compared to the allowable NOAA uncertainty standards using Compare Surfaces. In total, 100% of the depth differences between F00727 mainscheme in Slaughter Creek and crossline data were within allowable NOAA uncertainties (Figure 17). Statistics show the mean difference between the depths derived from mainscheme and crosslines in the Pocomoke

River were -0.03 meters and 95% of nodes falling within 0.15 meters (Figure 18). For the respective depths, the difference surface was compared to the allowable NOAA uncertainty standards using Compare Surfaces. In total, 100% of the depth differences between F00727 mainscheme in the Pocomoke River and crossline data were within allowable NOAA uncertainties (Figure 19).

The finalized surface was analyzed using the Pydro QC Tools Grid QA feature. Density requirements for F00727 were achieved with at least 97% of finalized surface nodes containing five or more soundings as required by HSSD Section 5.2.2.3. For individual graphs (per surface), see the QC Tools folder located in Appendix II.

Holidays were analyzed using the Pydro QC Tools Holiday finder tool. Many holidays were flagged, but all were at the junction of cross lines and mainscheme lines and is expected with a set line spacing survey. Therefore, no holidays are present for F00727. For information on the QC Tools settings and the results, see the QC Tools folder located in th Appendix II.

Fliers were analyzed using the Pydro QC Tools Flier Finder tool. Two fliers were flagged. Both are on the object found in the Fishing Bay area and are not considered fliers. For information on the QC Tools settings and the results, see the QC Tools folder located in th Appendix II.

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 affected 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 used are detailed in the DAPR.

Processing notes are included in the processing logs, and additional processing such as final tide and sound speed application are noted in the F00727 Data Log spreadsheet. All data processing logs are submitted digitally in the Separates I folder.

F00727 contains one designated sounding in accordance with HSSD Section 5.2.1.2.3. The designated sounding is included in the FFF, as it is anthropogenic or associated with a feature.

All assigned features were addressed and are included in the F00727 Final Feature File.

Multibeam data on F00727 contains some evident outer beam spreading (Figure 21). This is caused by sound speed variations in the area, as well as areas of soft mud and silt seafloor. In areas where the beam spreading was obvious, rather than a true seafloor feature, the spurious soundings were rejected and surfaces recomputed. These soundings were either rejected manually or by filtering the lines to 50 degrees from nadir. In some areas, the blowouts were egregious and data was removed down to within a few meters on either side of nadir.

The navigation data for both MBES and SSS data collected by the ASV was reviewed by the hydrographer. Data was occasionally collected through turns if current or wind forces kept the ASV from hitting the end gates. In order to ensure high quality data, large turns at the ends of track lines were rejected from the navigation data.

Due to the mounting configuration of the SSS control module relative to the propulsion controls within the ASV, some interference is evident in the SSS data, see Figure 22. This interference does not obscure objects from being found by the hydrographer and does not degrade the data beyond use.

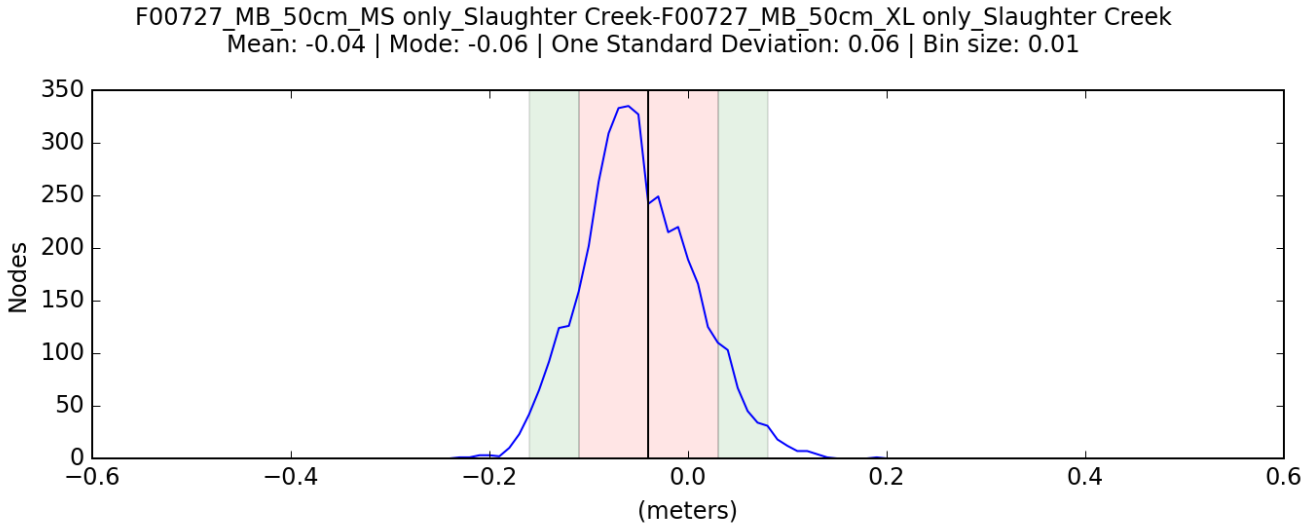
During survey in the Slaughter Creek and Pocomoke River entrance areas, use of a maximum depth gate was attempted to reduce the double returns seen in the data due to the shallow water. An issue with the gate, however, cut off some of true bottom outer beam data and accepted spurious side lobe data (Figure 23). This issue was not evident in real time data, but was obvious during post processing, and cleaned accordingly. In areas where the gate issue was obvious, rather than a true seafloor feature, the spurious soundings were rejected.

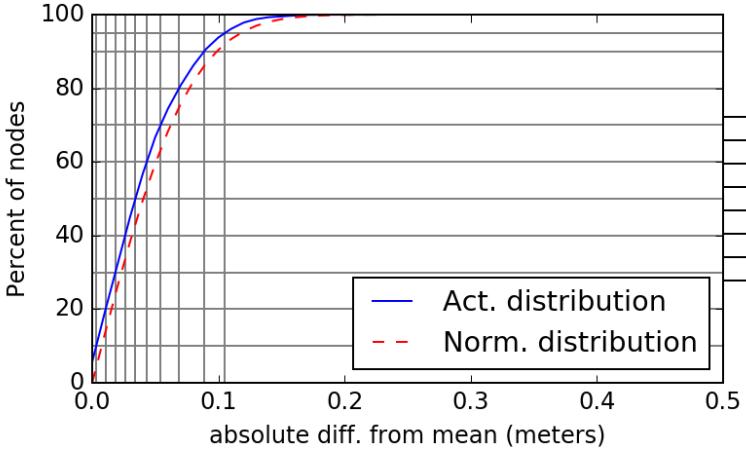
On DN190, the ASV operator had to cease the collection of positioning data. Upon restarting the positioning system, the operator forgot to restart logging of the data. Because of this, SBETs could not be made for the second set of data collected that day. Because SSS data does not rely on SBETS, that data was still used but all MBES data for which no SBET was made was removed from the project.

In the Haines Point and Fishing Bay areas, the BHII crew made every attempt to collect a full set of 200% side scan and investigate any contacts. Unfortunately, due to weather and boat issues, the crew was unable to fill in holidays in the 200% side scan data in Haines Point, could not fully develop the object located in Fishing Bay, nor make crosslines in these areas before the ASV had to ship out for hurricane season preparations. The hydrographer believes that the assigned object in Fishing Bay does not exist based on the SSS and MBES data available. Further, the hydrographer believes the object that was found at Fishing Bay, included in the F00727 FFF, has enough data over it between the side scan and MBES to prove its existence. Due to the holidays in the side scan for Haines Point, the hydrographer cannot say with complete certainty that the assigned object does not exist and recommends the USCG continue to service the ATONS marking the danger until it can be investigated further. A F00727_Holidays.hob file is included in Appendix II of this report showing where holidays exist in the 200% side scan for Haines Point.

A possible obstruction was found in the Fishing Bay area in both SSS and MBES data (Figure 24). The feature is included in the F00727 FFF. The object could not be fully developed for the reasons stated above, but the hydrographer firmly believes the objects exists because it was seen in both SSS and MBES data.

An interesting bottom feature was discovered in the Pocomoke River Channel near buoy number 7. As shown in Figure 25, there is evidence that the local tugs are pushing their barges through the banks of the channel in order to make the turn in the area of buoy number 7 leaving scours in the bottom. This may explain the occasional buoy strikes of number 7.





Percent of nodes	Deviation (m)
50%	+/- 0.03
60%	+/- 0.04
70%	+/- 0.05
80%	+/- 0.07
90%	+/- 0.09
95%	+/- 0.11

Figure 16: F00727 Crossline statistics in Slaughter Creek area

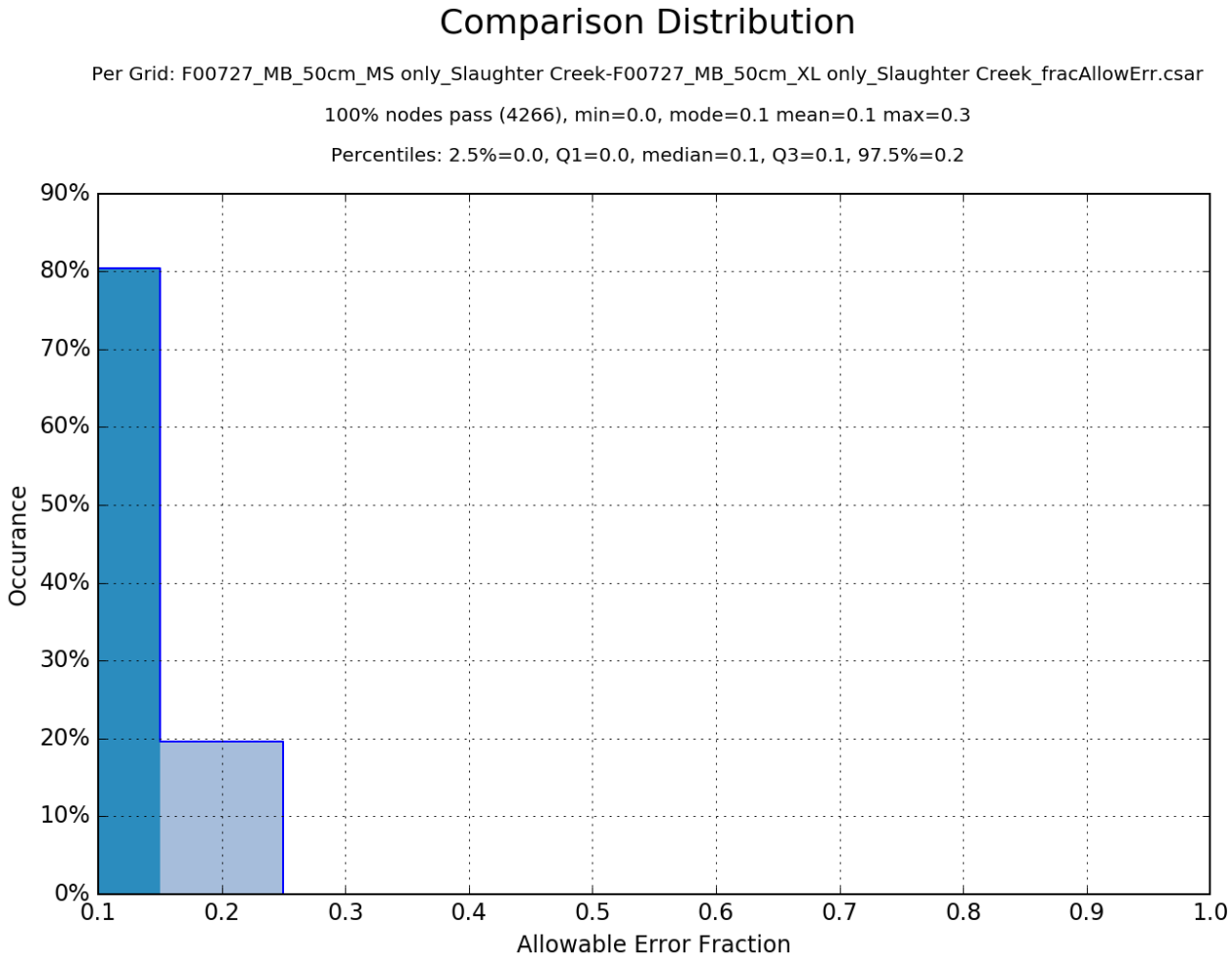
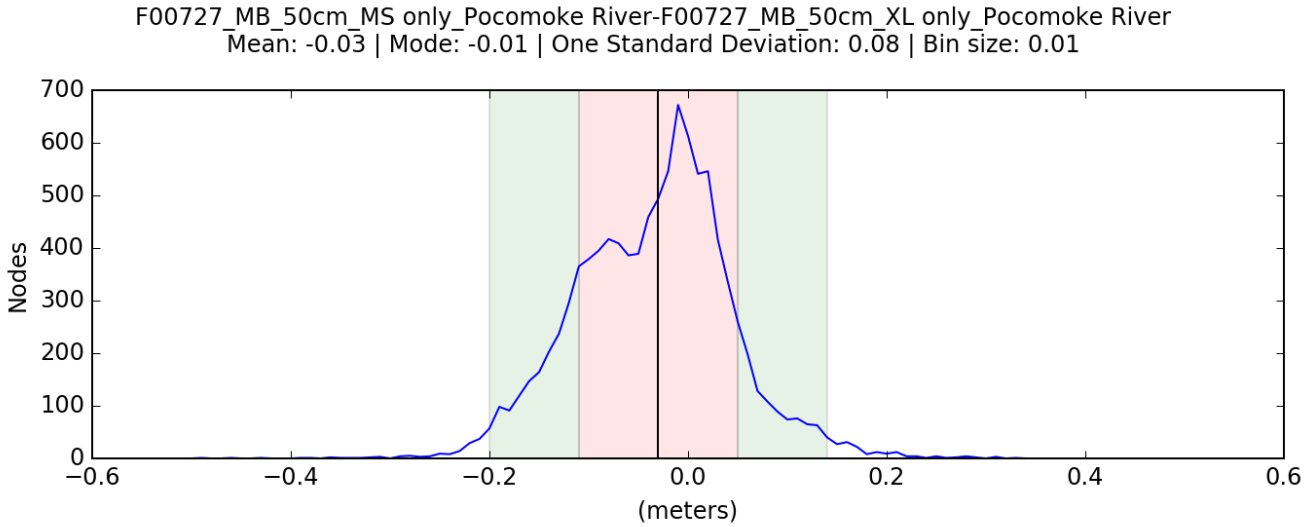
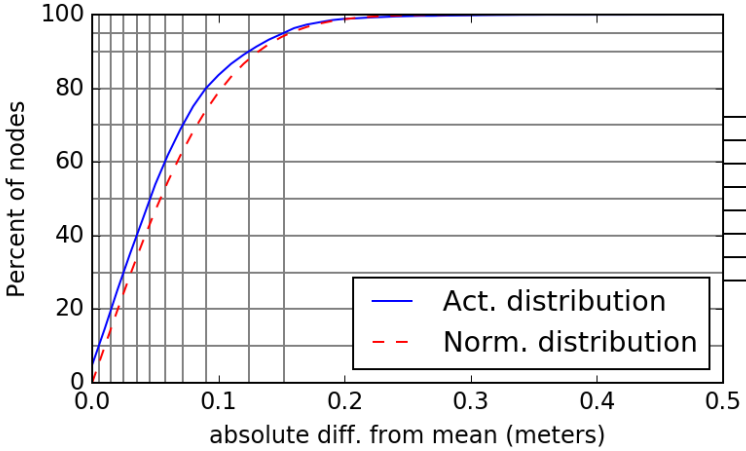


Figure 17: F00727 Crossline allowable uncertainty statistics in Slaughter Creek area





Percent of nodes	Deviation (m)
50%	+/- 0.05
60%	+/- 0.06
70%	+/- 0.07
80%	+/- 0.09
90%	+/- 0.12
95%	+/- 0.15

Figure 18: F00727 Crossline Statistics in Pocomoke River Channel

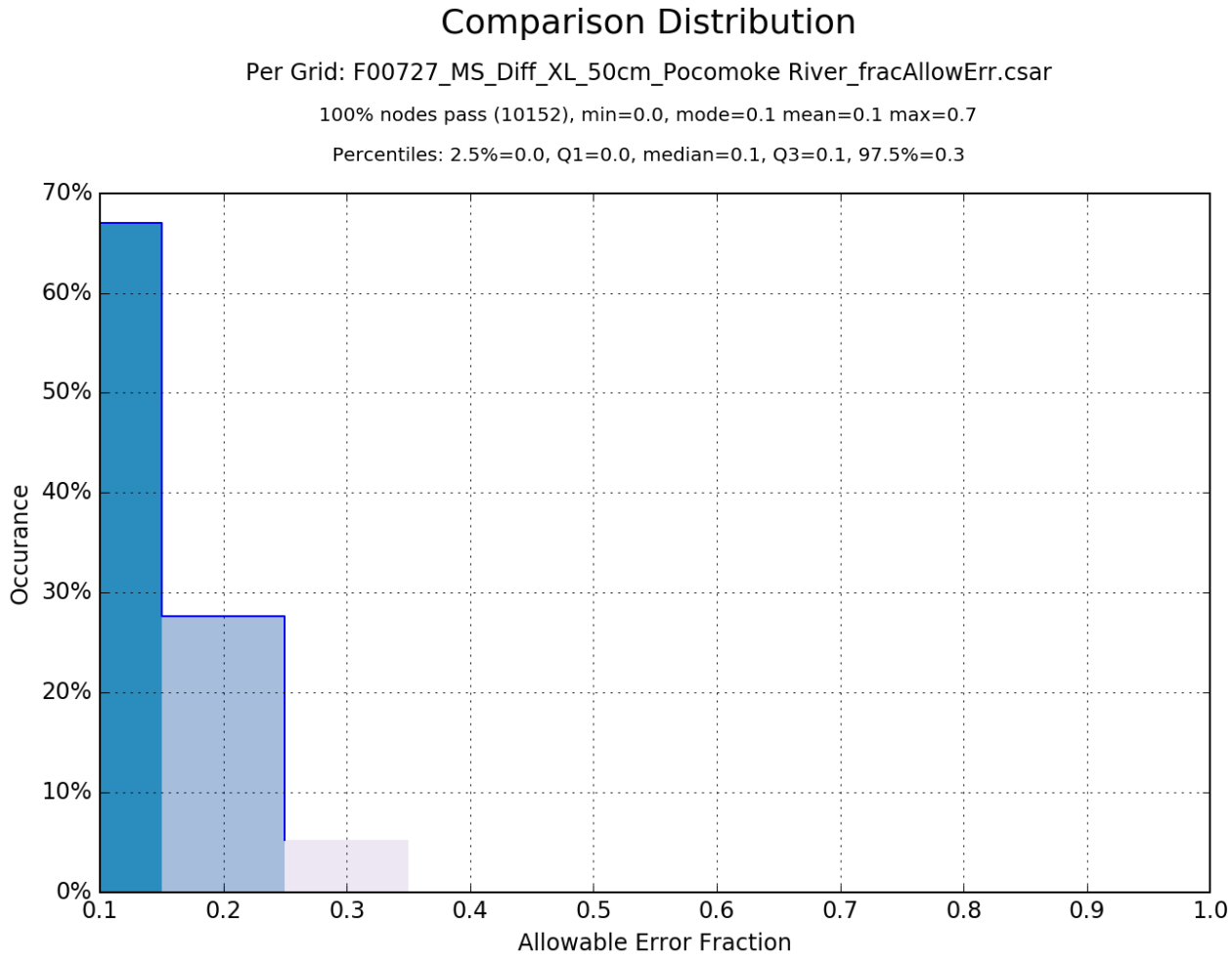


Figure 19: F00727 Crossline allowable uncertainty statistics in the Pocomoke River area

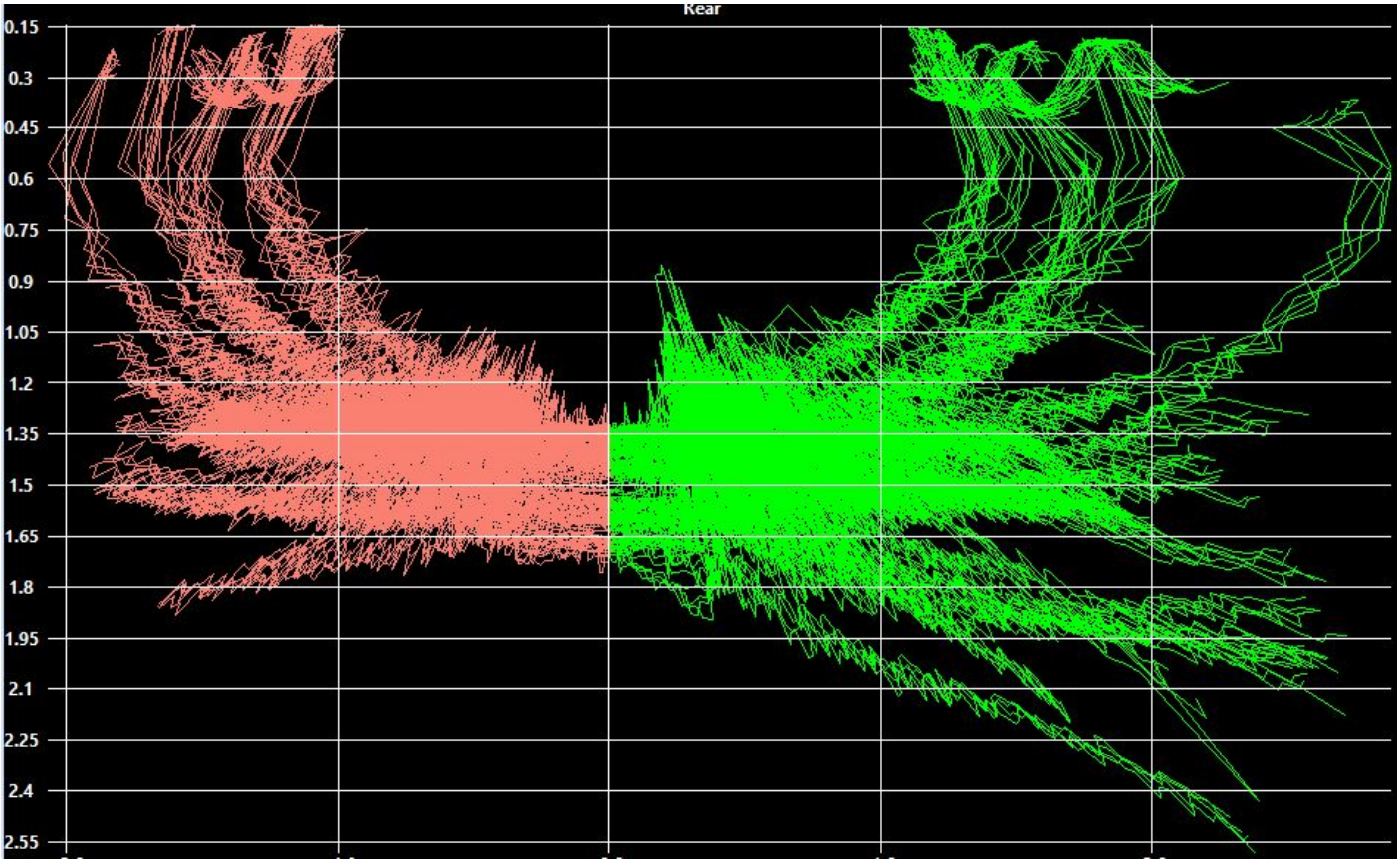


Figure 21: Example sound speed blowout from F00727.

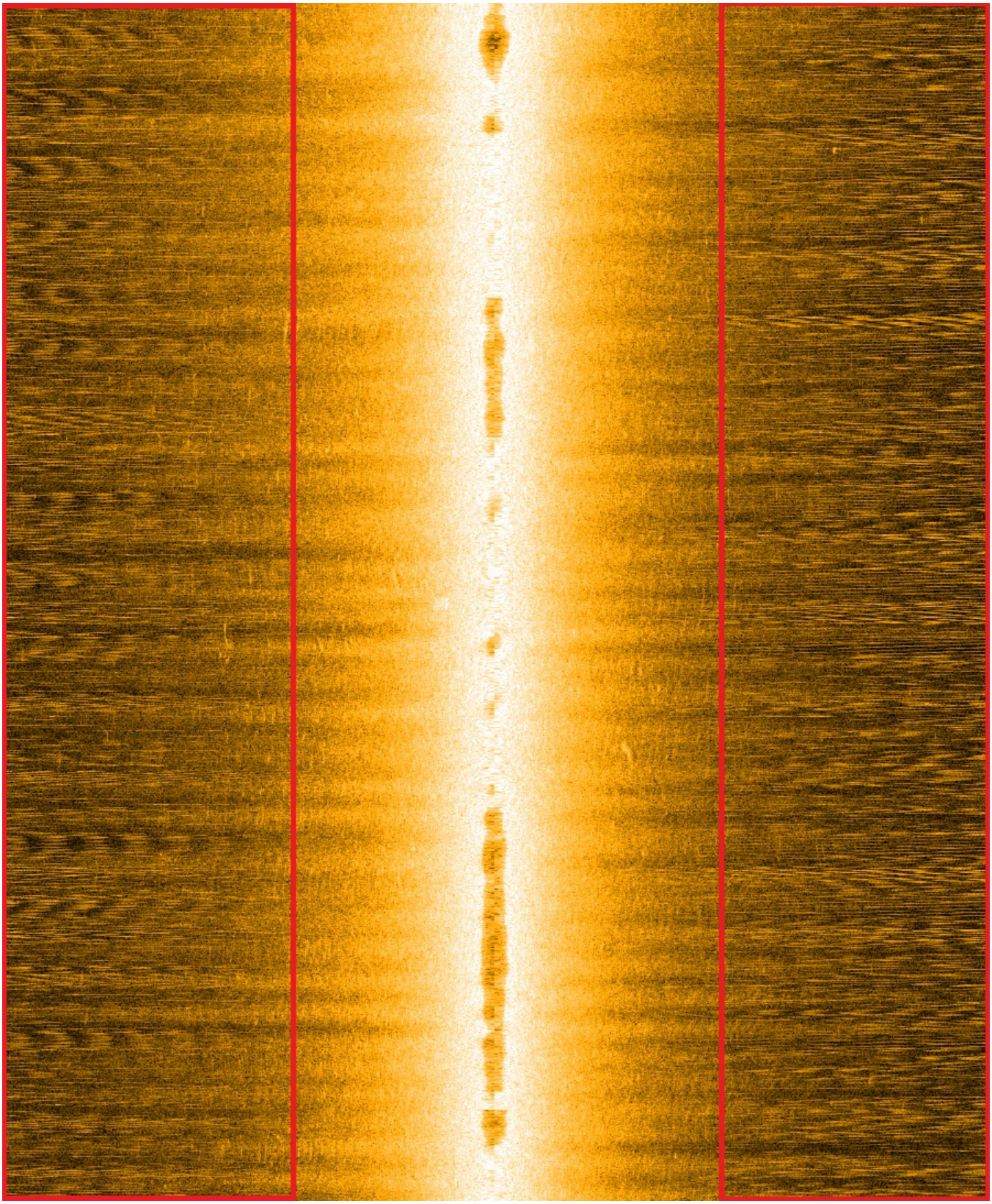


Figure 22: Example of interference in SSS data from ASV 007 thrusters on F00727.

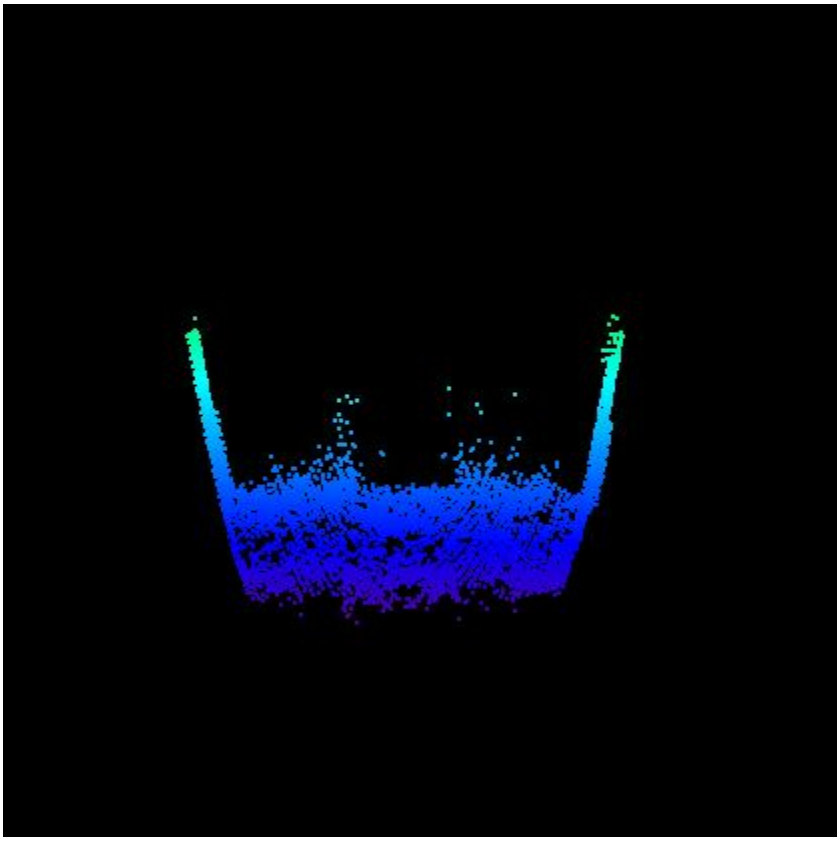


Figure 23: Example of spurious soundings created by gate on F00727.

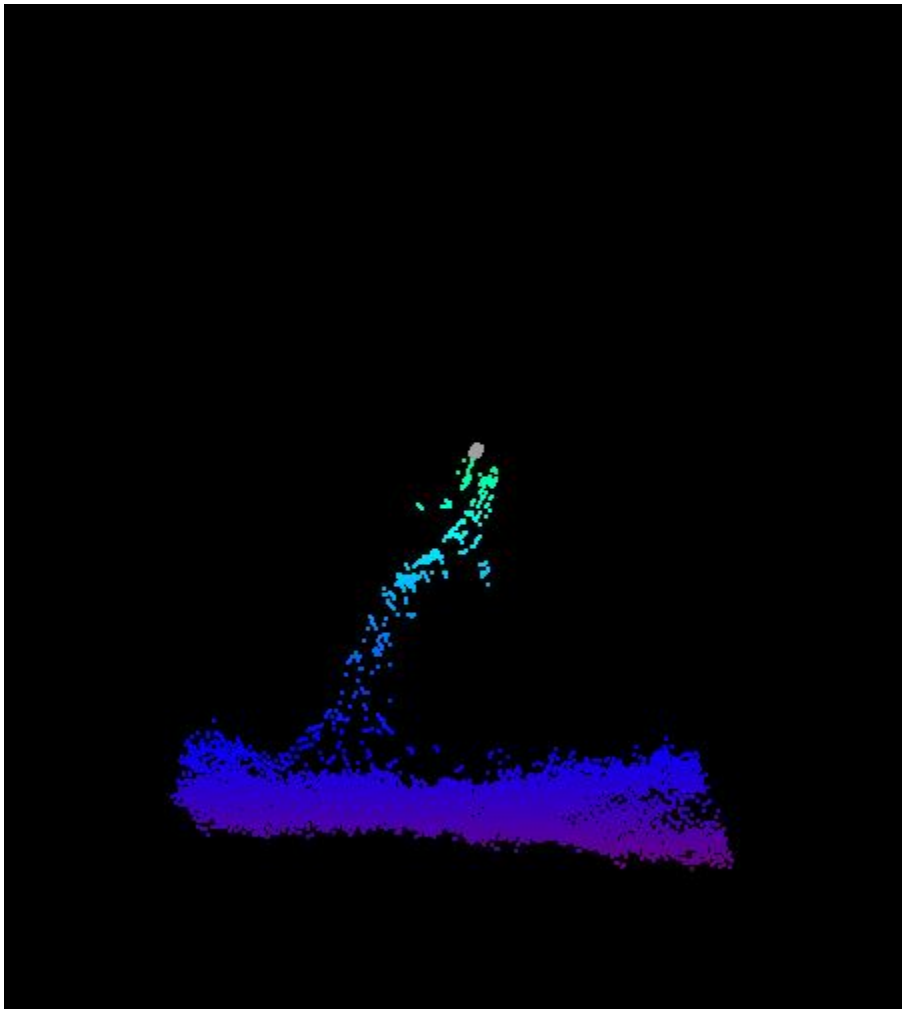


Figure 24: Possible obstruction found in Fishing Bay on F00727.

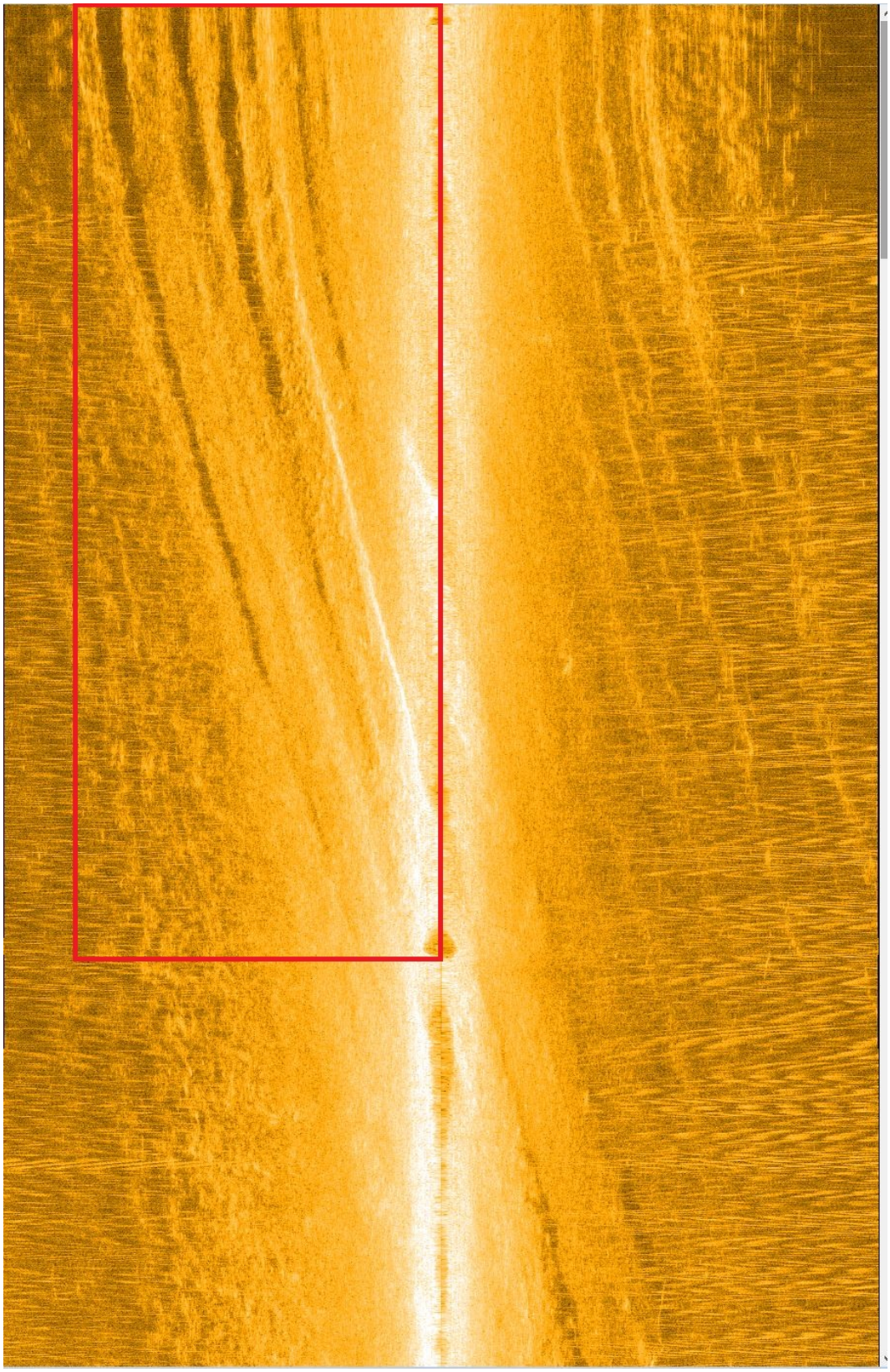


Figure 25: Scours from tugs in the Pocomoke River Channel

I. Approval

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 Survey Summary 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 and Specifications Deliverables, Field Procedures Manual, Standing and 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 herein.

Approver Name	Title	Date	Signature
Lieutenant (Junior Grade) Sarah L. Chappel	Chief of Party	09/14/2018	CHAPPEL.SARAH.LYNN.1472631272 2018.09.14 10:30:09 -04'00'
Lieutenant (Junior Grade) Patrick J. Debroisse	Sheet Manager	09/14/2018	Digitally signed by DEBROISSE.PATRICK.JOSEPH.1501248670 Date: 2018.09.14 10:24:48 -04'00'

Patrick Debroisse - NOAA Federal <patrick.j.debroisse@noaa.gov>

F00727 Changes to Assigned Survey Areas

1 message

Christopher Hare - NOAA Federal <christopher.hare@noaa.gov> Mon, Aug 6, 2018 at 10:25 AM
To: Patrick Debroisse - NOAA Federal <patrick.j.debroisse@noaa.gov>
Cc: OCS BHII - NOAA Service Account <ocs.bhii@noaa.gov>

After review of the requested changes to the assigned survey polygons for F00727 per the request of the Chief at the USCG ANT Crisfield, NRB has approved the changes to the survey areas and the deviation from the project instructions.

Chris Hare

--
Chris Hare
Project Manager
Navigation Response Branch
NOAA's Office of Coast Survey
240-533-0065

APPROVAL PAGE

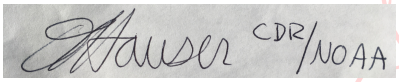
F00727

Data meet or exceed current specifications as certified by the OCS survey acceptance review process. Descriptive Report and survey data in the Slaughter Creek portion of F00727 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