H13326

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

DESCRIPTIVE REPORT

Type of Survey:	Navigable Area
Registry Number:	H13326

LOCALITY

State(s):	Virginia
General Locality:	Virginia/North Carolina
Sub-locality:	21 NM Offshore of False Cape, VA

2019

CHIEF OF PARTY
CDR Briana Hillstrom, NOAA

LIBRARY & ARCHIVES

Date:

U.S. DEPARTMENT OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION	REGISTRY NUMBER:
HYDROGRAPHIC TITLE SHEET	**H13326**

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):	**Virginia**
General Locality:	**Virginia/North Carolina**
Sub-Locality:	**21 NM Offshore of False Cape, VA**
Scale:	**40000**
Dates of Survey:	**10/22/2019 to 11/19/2019**
Instructions Dated:	**10/01/2019**
Project Number:	**OPR-D304-TJ-19**
Field Unit:	**NOAA Ship *Thomas Jefferson***
Chief of Party:	**CDR Briana Hillstrom, NOAA**
Soundings by:	**Multibeam Echo Sounder**
Imagery by:	**Multibeam Echo Sounder Backscatter**
Verification by:	**Atlantic 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.

Table of Contents

List of Tables

List of Figures

Descriptive Report to Accompany Survey H13326

Project: OPR-D304-TJ-19

Locality: Virginia/North Carolina

Sublocality: 21 NM Offshore of False Cape, VA

Scale: 1:40000

October 2019 - November 2019

NOAA Ship *Thomas Jefferson*

Chief of Party: CDR Briana Hillstrom, NOAA

A. Area Surveyed

Survey H13326 project area begins ~18 nautical miles offshore of False Cape, Virginia which is located near the Virginia and North Carolina border.

A.1 Survey Limits

Data were acquired within the following survey limits:

Northwest Limit	Southeast Limit
36° 41' 53.3" N 75° 26' 17.62" W	36° 29' 50.07" N 75° 22' 4.29" W

Table 1: Survey Limits

Data were acquired within the following survey limits (Table 1 and Figure 1). The sheet limits for H13326 were adjusted for efficiency of acquisition operations and to account for platform availability. The adjusted sheet limits were approved by the Project Manager. (See project correspondence documents, Figure 2, and 3).

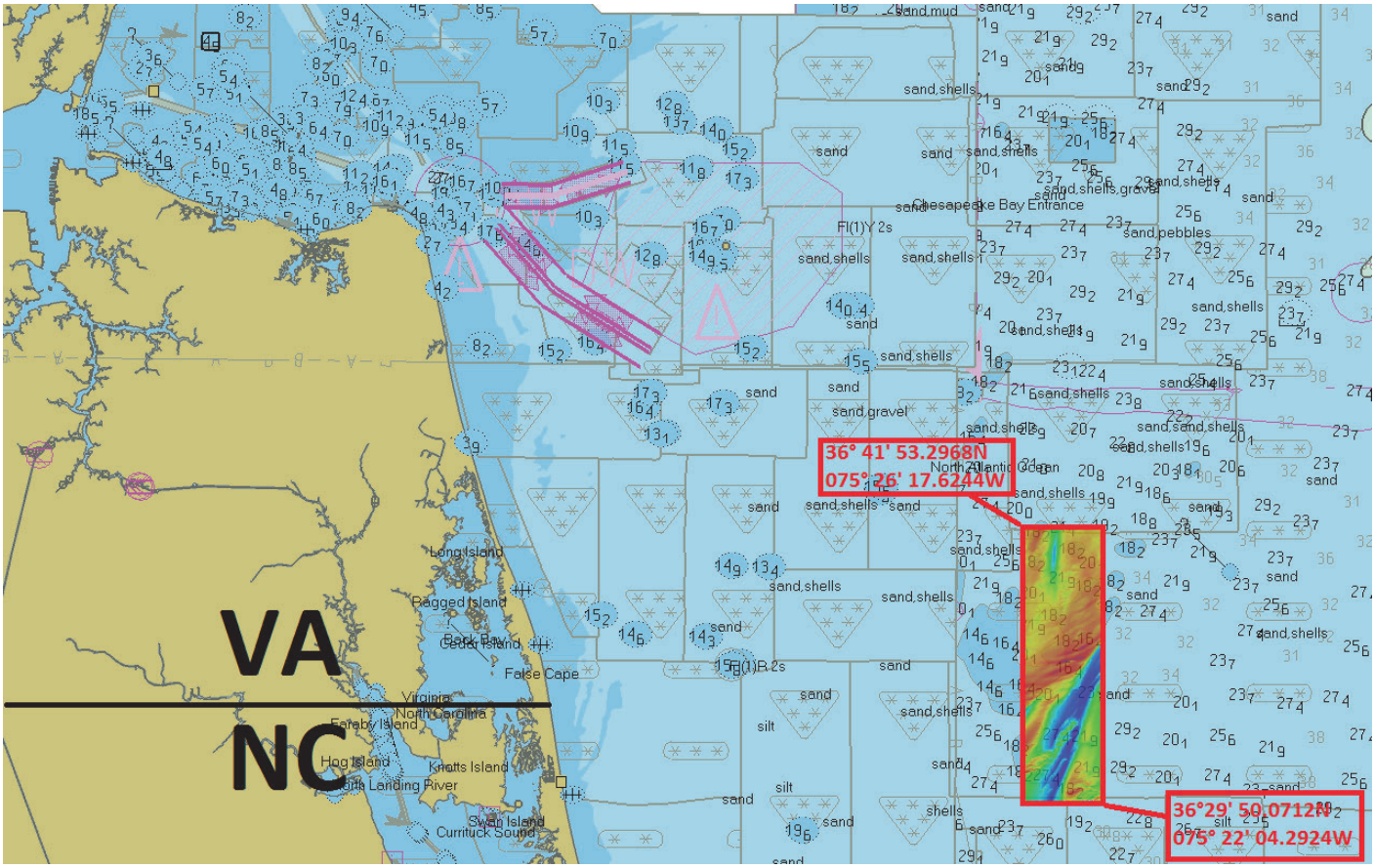


Figure 1: H13326 survey plotted over ENC USDE01M.

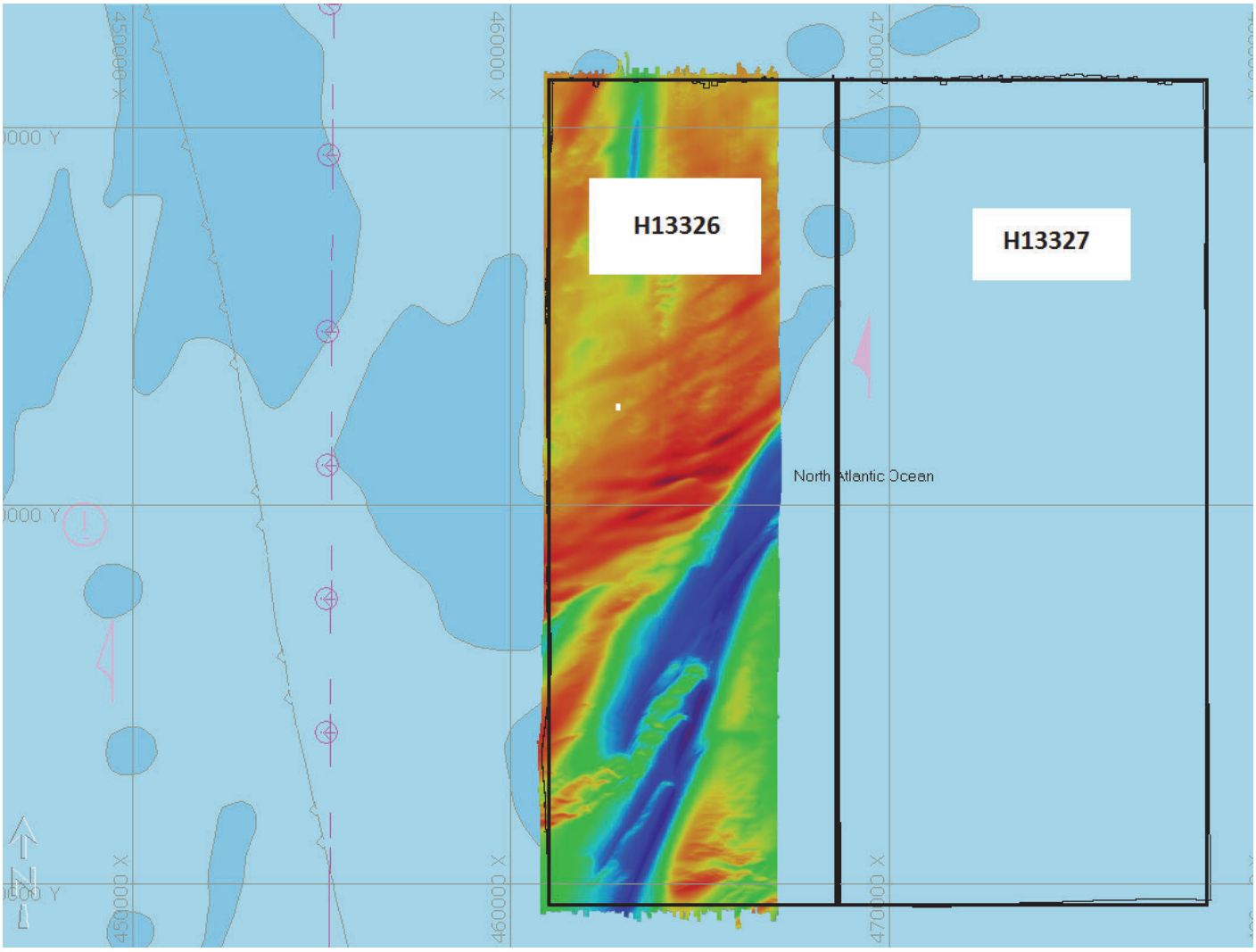


Figure 2: Original sheet limits shown in black as assigned for survey H13326 and H13327.

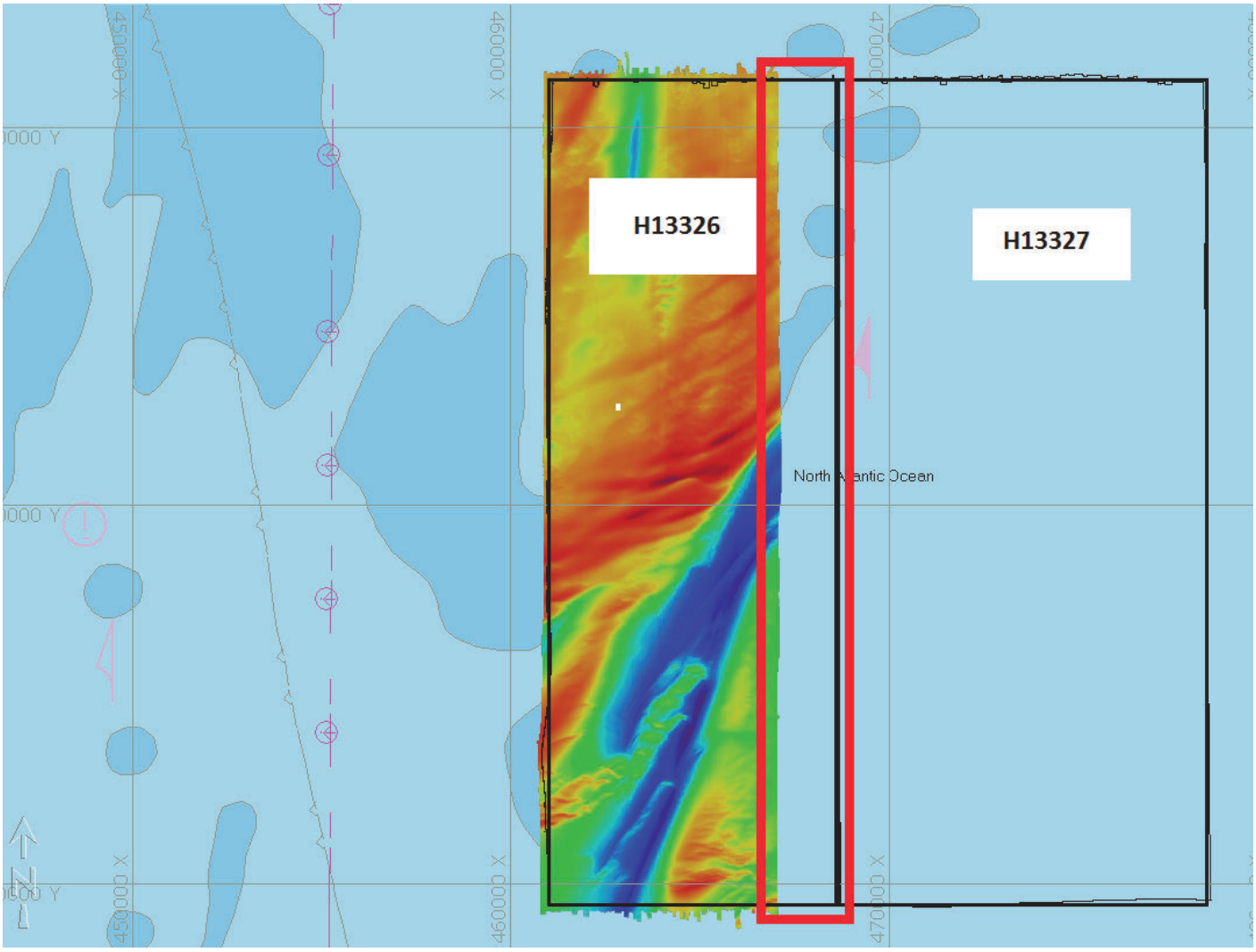


Figure 3: The area highlighted by red box was approved to be assigned to survey H13327 by the project manager.

A.2 Survey Purpose

The purpose of this project is to test the DriX Autonomous Surface Vehicle (ASV) while providing contemporary surveys to update National Ocean Service (NOS) nautical charting products.

This survey will cover 400 SNM of the approach to Hampton Roads, home to the world's largest naval base and a port that annually receives over 5,000 arrivals/departures of deep-draft vessels which continually increase in size over time. Within the survey area, there are currently reported depths that are comparable to those of the dredged Thimble Shoal Channel. A vessel ballasted for little-under keel clearance in the channel could risk grounding in the working area if uncharted shoaling has occurred. There are likely substantial changes to the seabed since the most recent partial-bottom coverage survey, which took place in the 1930s. This survey is a critical part of an ongoing, multi-year hydrographic survey covering the approaches to

Chesapeake Bay to support the safety of commerce and monitor the habitat and the environmental health of the region.

A.3 Survey Quality

The entire survey is adequate to supersede previous data.

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

One holiday exists on the northeastern edge of H13326. However, the holiday exists outside of the sheet limits for H13326 and the overlap from H13094 covers the holiday. (Figure 4 and 5)

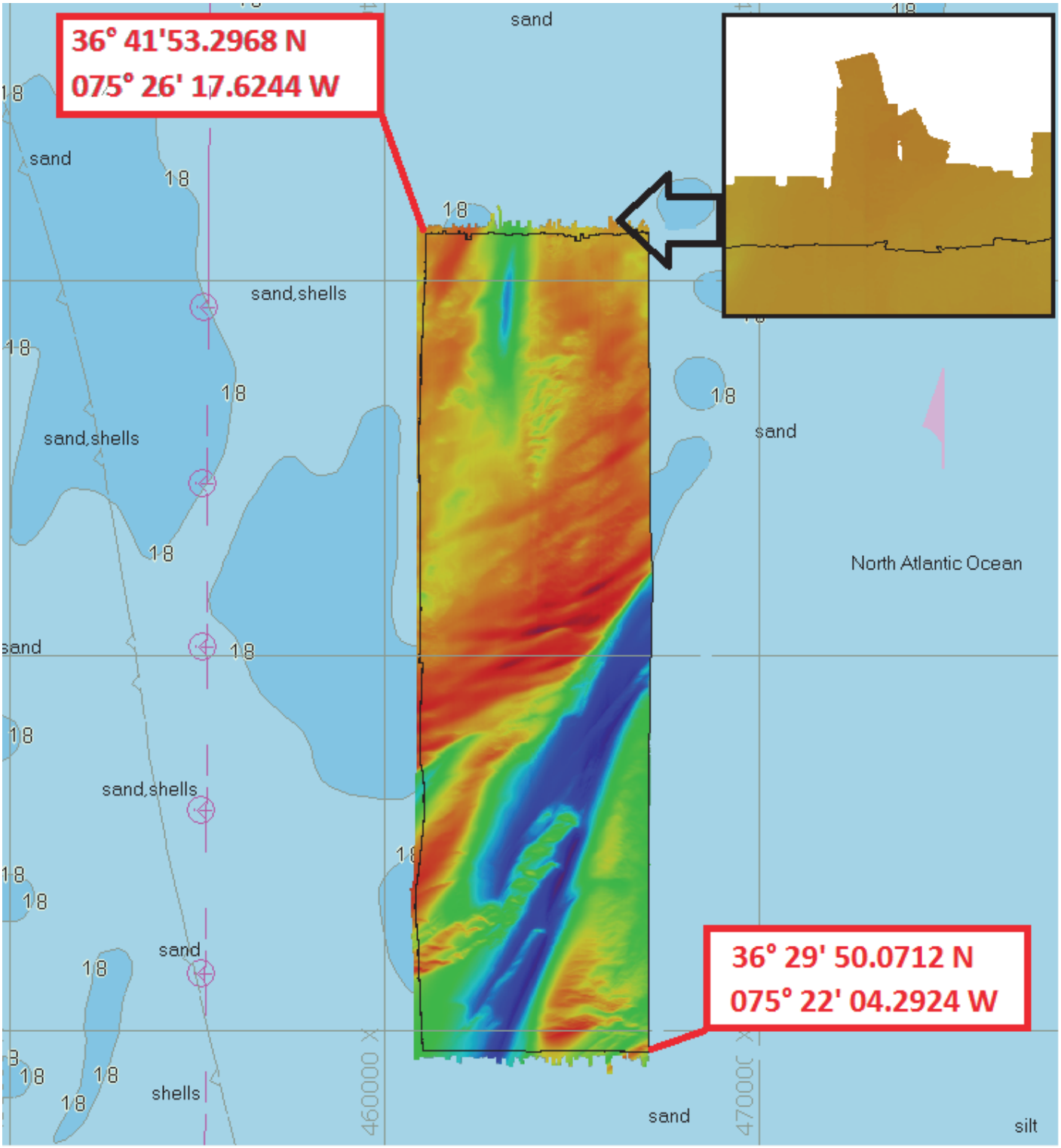


Figure 4: Holiday location on survey H13326 plotted over ENC USDE01M.

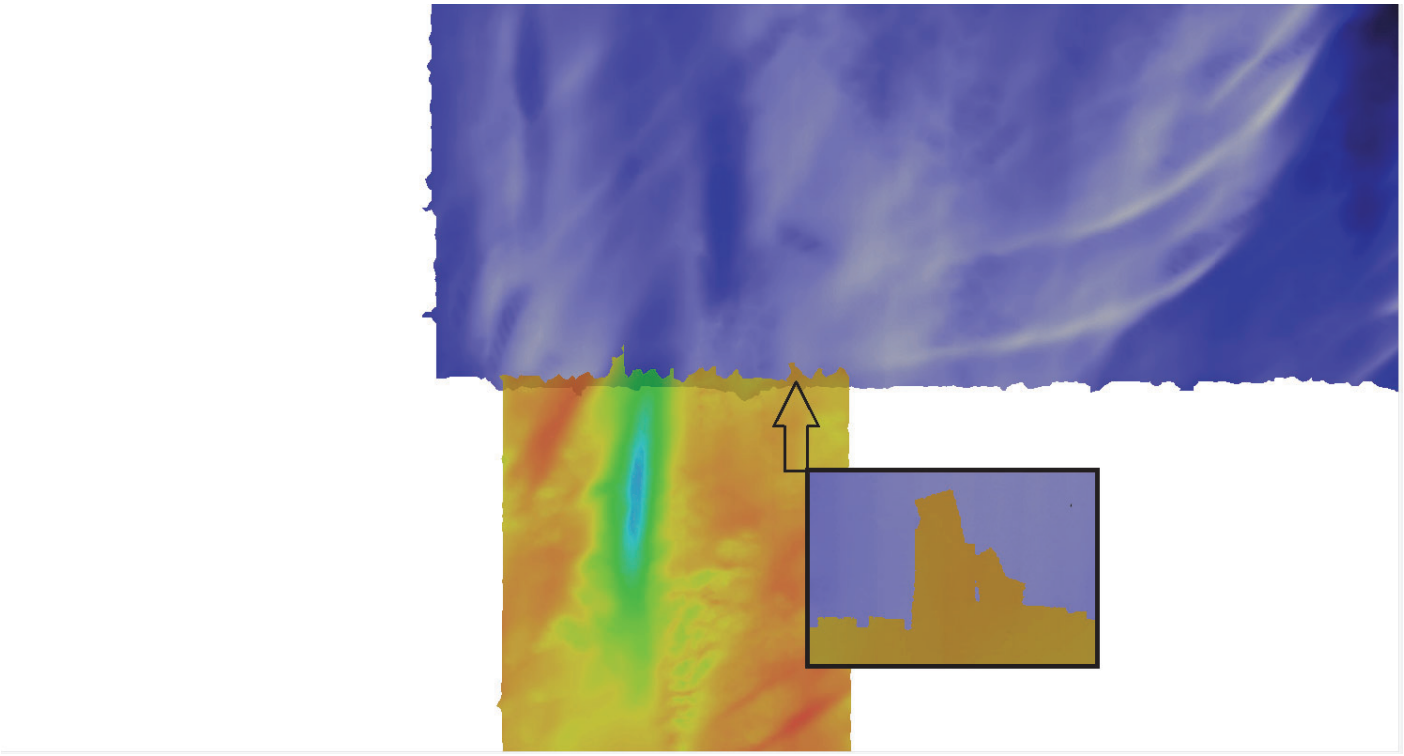


Figure 5: H13095 survey data has been colored blue to help highlight the coverage that exists for the holiday in H13326.

A.6 Survey Statistics

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

	HULL ID	*S222*	*2903*	*DriX*	*Total*
LNM	**SBES Mainscheme**	0	0	0	0
	MBES Mainscheme	1218.17	34.62	140.34	1393.13
	Lidar Mainscheme	0	0	0	0
	SSS Mainscheme	0	0	0	0
	SBES/SSS Mainscheme	0	0	0	0
	MBES/SSS Mainscheme	0	0	0	0
	SBES/MBES Crosslines	40.94	29.71	0	70.65
	Lidar Crosslines	0	0	0	0
Number of Bottom Samples					6
Number Maritime Boundary Points Investigated					0
Number of DPs					0
Number of Items Investigated by Dive Ops					0
Total SNM					40.56

Table 3: Hydrographic Survey Statistics

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

Survey Dates	Day of the Year
10/22/2019	295
10/23/2018	296

Survey Dates	Day of the Year
10/24/2019	297
10/26/2019	299
10/27/2019	300
10/28/2019	301
10/29/2019	302
10/30/2019	303
11/10/2019	314
11/11/2019	315
11/19/2019	323

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	*S222*	*2903*	*DriX*
LOA	63.4 meters	8.5 meters	7.7 meters
Draft	4.6 meters	1.2 meters	2 meters

Table 5: Vessels Used

B.1.2 Equipment

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

Manufacturer	Model	Type
Kongsberg Maritime	EM2040	MBES
Rolls Royce	MVP100	Sound Speed System
AML Oceanographic	MVP-X	Conductivity, Temperature, and Depth Sensor
Applanix	POS MV 320 v5	Positioning and Attitude System
Valeport	Thru-Hull SVS	Sound Speed System
Phins	C7	Attitude System
Septentrio	AsteRx-U Marine	Positioning System
Valeport	MiniSVS	Sound Speed System

Table 6: Major Systems Used

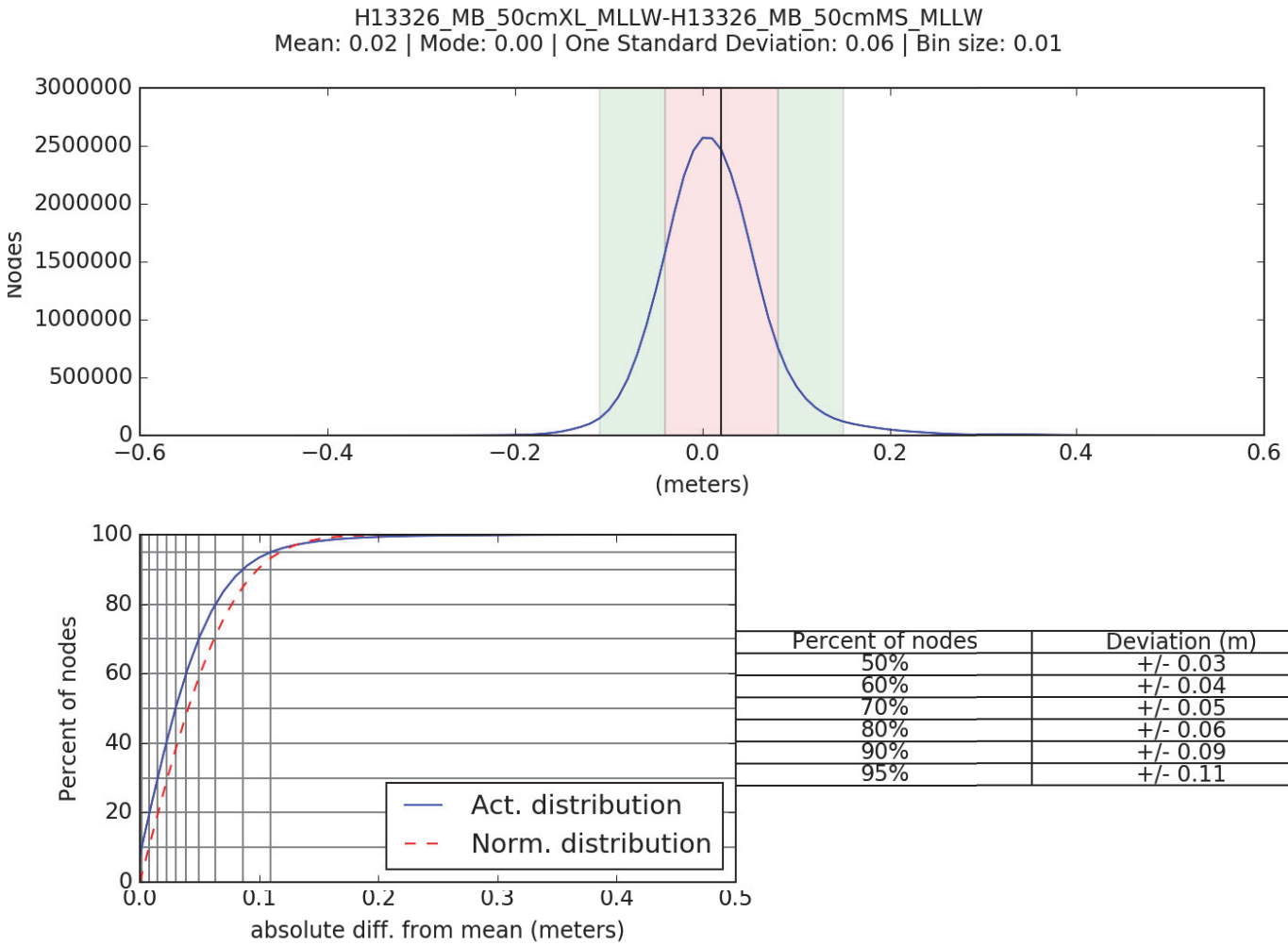
Vessel configurations, equipment operations, data acquisition, and processing were consistent with specifications described in the DAPR.

B.2 Quality Control

B.2.1 Crosslines

Multibeam/single beam echo sounder/side scan sonar crosslines acquired for this survey totaled 5.07% of mainscheme acquisition.

S222 and Hydrographic Survey Launch (HSL) 2903 collected 70.65 linear nautical miles of MBES crosslines. A single resolution Combined Uncertainty and Bathymetry Estimator (CUBE) surface of mainscheme data at the 1m resolution and a single resolution CUBE surface at the 1m resolution of crossline data were differenced. The resulting mean was 0.02m and the standard deviation 0.06m. Visual inspection and statistical analysis of the difference surface revealed no major issues in the data, however it was noticed that there was an offset between data collected by DriX and data collected by S222 and 2903. The offset can be found between data from Julian day number 297 of DriX and HSL 2903 and data from Julian day number 299 of S222 (Figures 6-9).The reason for the offset is unknown by the hydrographer but it is likely due to the distance between the sound speed profiles that were supplied from the ship and the DriX. The offset falls within Total Vertical Uncertainty specifications set by 2019 HSSD, with a max value of 52cm. The greatest offset is found found between HSL 2903 Crosslines 0000_20191024_131224_2903, 0012_20191024_165017_2903, 0001_20191024_133046_2903, and DriX Mainscheme line 0114_20191024_181548_DRIX_EM2040 (Figure 9).



Percent of nodes	Deviation (m)
50%	+/- 0.03
60%	+/- 0.04
70%	+/- 0.05
80%	+/- 0.06
90%	+/- 0.09
95%	+/- 0.11

Figure 6: Crossline-mainscheme comparison statistics for H13326.

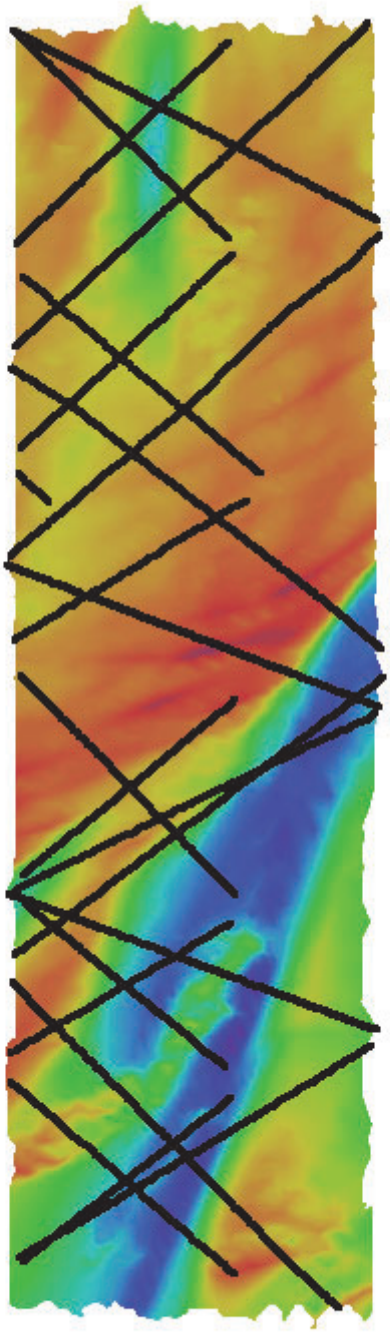


Figure 7: Overview of the crosslines acquired on H133126.

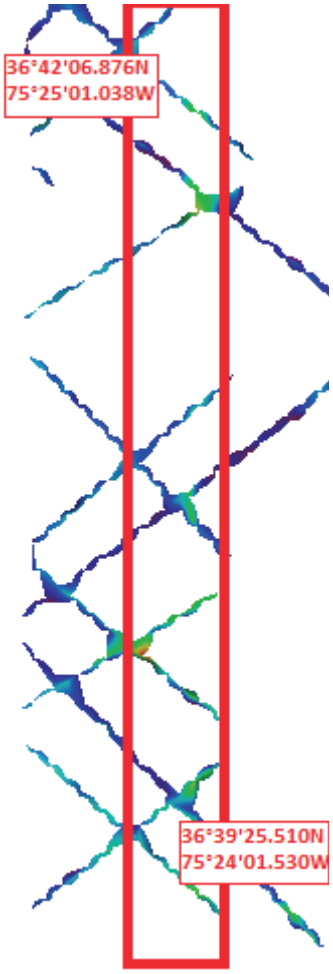


Figure 8: Crossline difference surface, with area of greatest difference highlighted by the red box. This area correlates directly with the mainscheme lines acquired by the iXblue DriX.

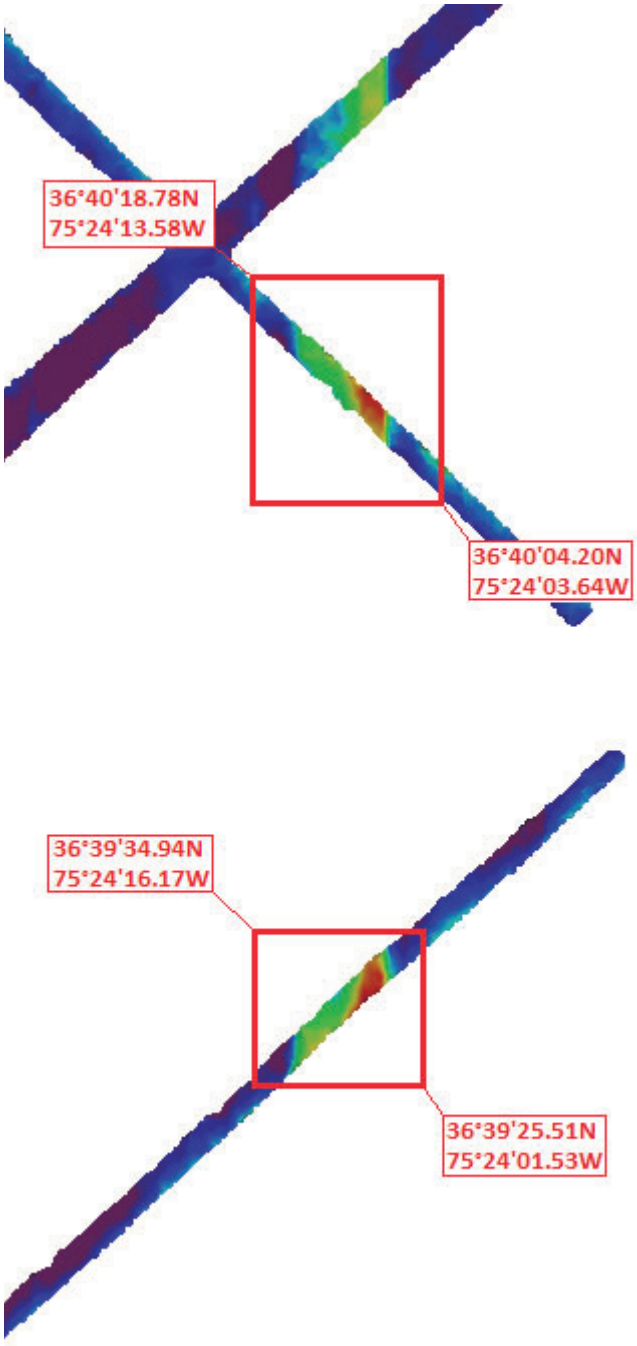


Figure 9: Areas where greatest XL vs. Mainscheme difference occurred, highlighted by red box, with a max value of 52cm.

B.2.2 Uncertainty

The following survey specific parameters were used for this survey:

Method	Measured	Zoning
ERS via VDATUM	0 meters	0.094 meters

Table 7: Survey Specific Tide TPU Values.

Hull ID	Measured - CTD	Measured - MVP	Surface
S222	4.0 meters/second	2.0 meters/second	0.2 meters/second

Table 8: Survey Specific Sound Speed TPU Values.

The bathymetric surface's uncertainty layer is compliant with HSSD 2019 uncertainty standards. Over 99.5% of all nodes pass uncertainty standards (Figure 10).

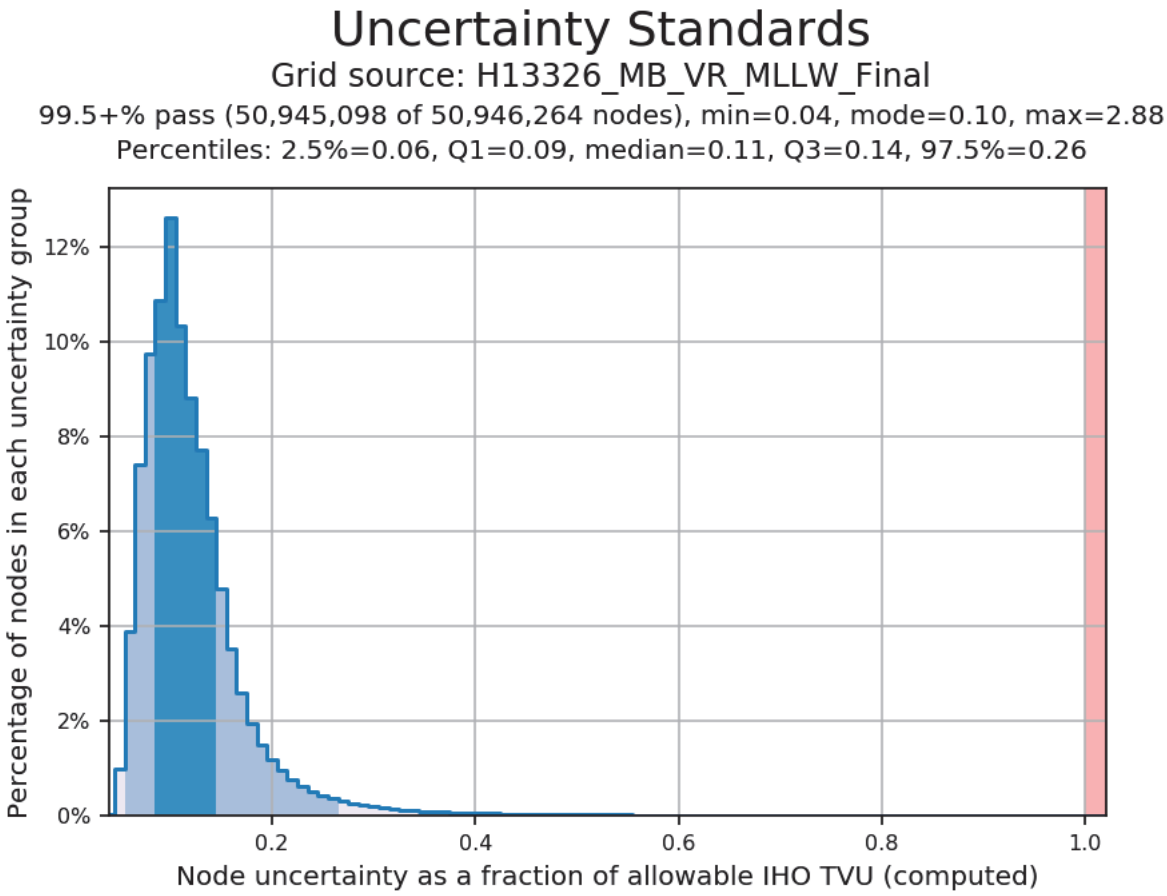


Figure 10: H13326 uncertainty statistics.

B.2.3 Junctions

Five contemporary surveys junction with H13326 (Figure11). The following junctions were made with this survey (Table 9):

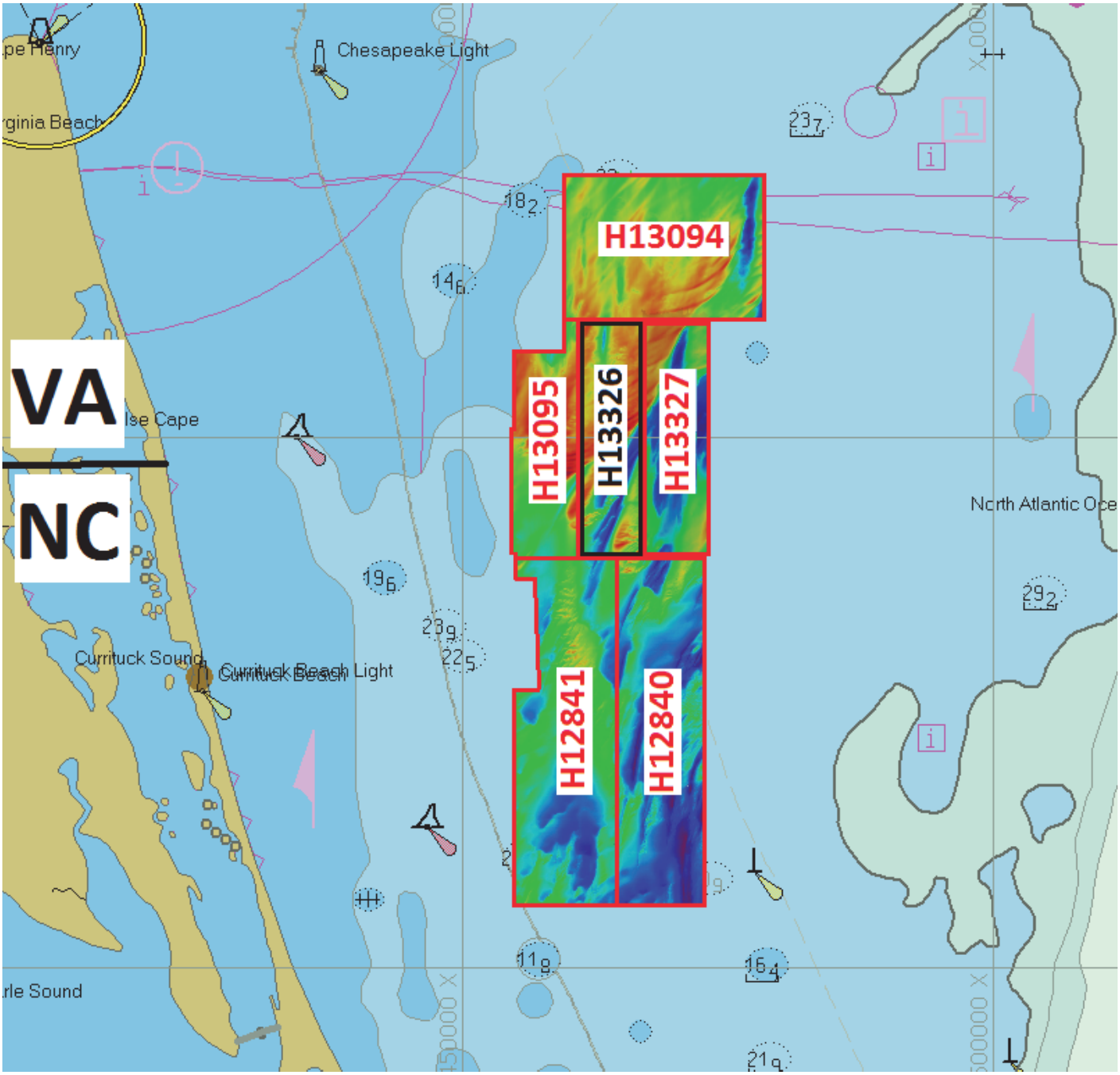


Figure 11: Survey H13326 limits outlined in black surrounded by all five junctioning surveys outlined in red, plotted over ENC USDE01M.

The following junctions were made with this survey:

Registry Number	Scale	Year	Field Unit	Relative Location
H12840	1:40000	2015	NOAA Ship FERDINAND R. HASSLER	SE
H12841	1:40000	2015	NOAA Ship FERDINAND R. HASSLER	SW
H13094	1:40000	2018	NOAA Ship FERDINAND R. HASSLER	N
H13095	1:40000	2018	NOAA Ship FERDINAND R. HASSLER	W
H13327	1:40000	2019	NOAA Ship THOMAS JEFFERSON	E

Table 9: Junctioning Surveys

H12840

The southeastern edge of survey H13326 junctioned with survey H12840 (Figure 12). A difference surface comparison was conducted in accordance with procedures outlined in the DAPR. The difference between surveys H13326 and H12840 ranged from -0.96m to 1.59m. The mean was 0.02 and the standard deviation 0.19 (Figure 13).

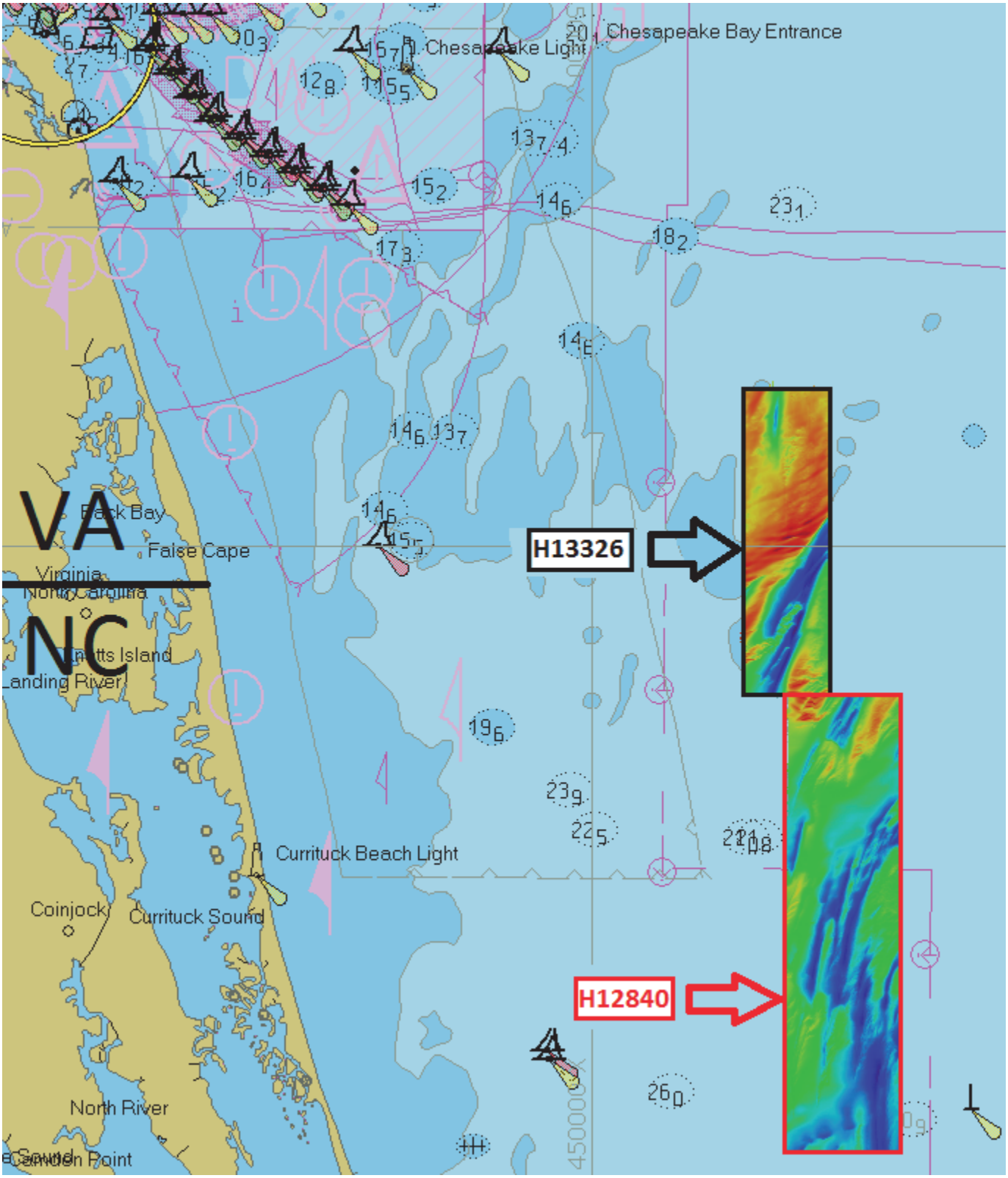


Figure 12: H12840 junctions on the southeastern edge of H13326.

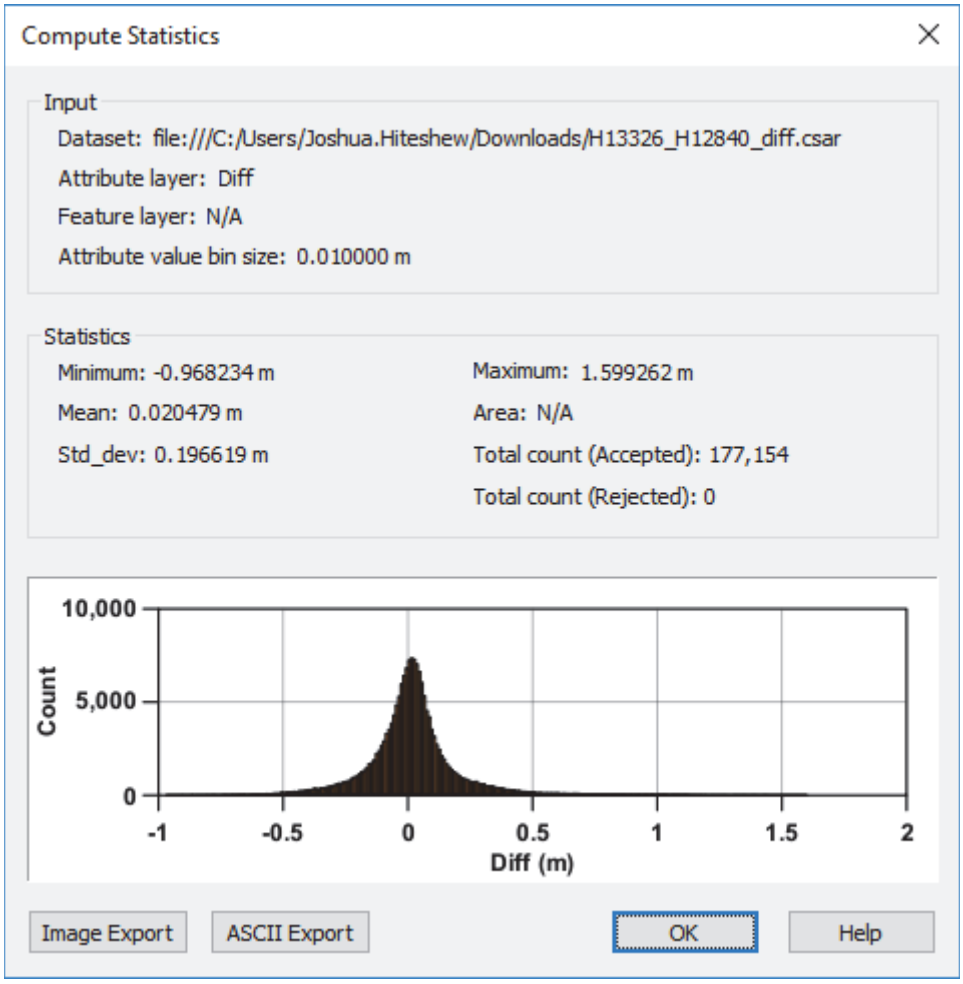


Figure 13: H13326 and H12840 difference surface comparison statistics.

H12841

The southwestern edge of survey H13326 junctioned with survey H12840 (Figure 14). A difference surface comparison was conducted in accordance with procedures outlined in the DAPR. The difference between surveys H13326 and H12841 ranged from -0.24m to 1.53m. The mean was 0.11m and the standard deviation 0.06m (Figure15).

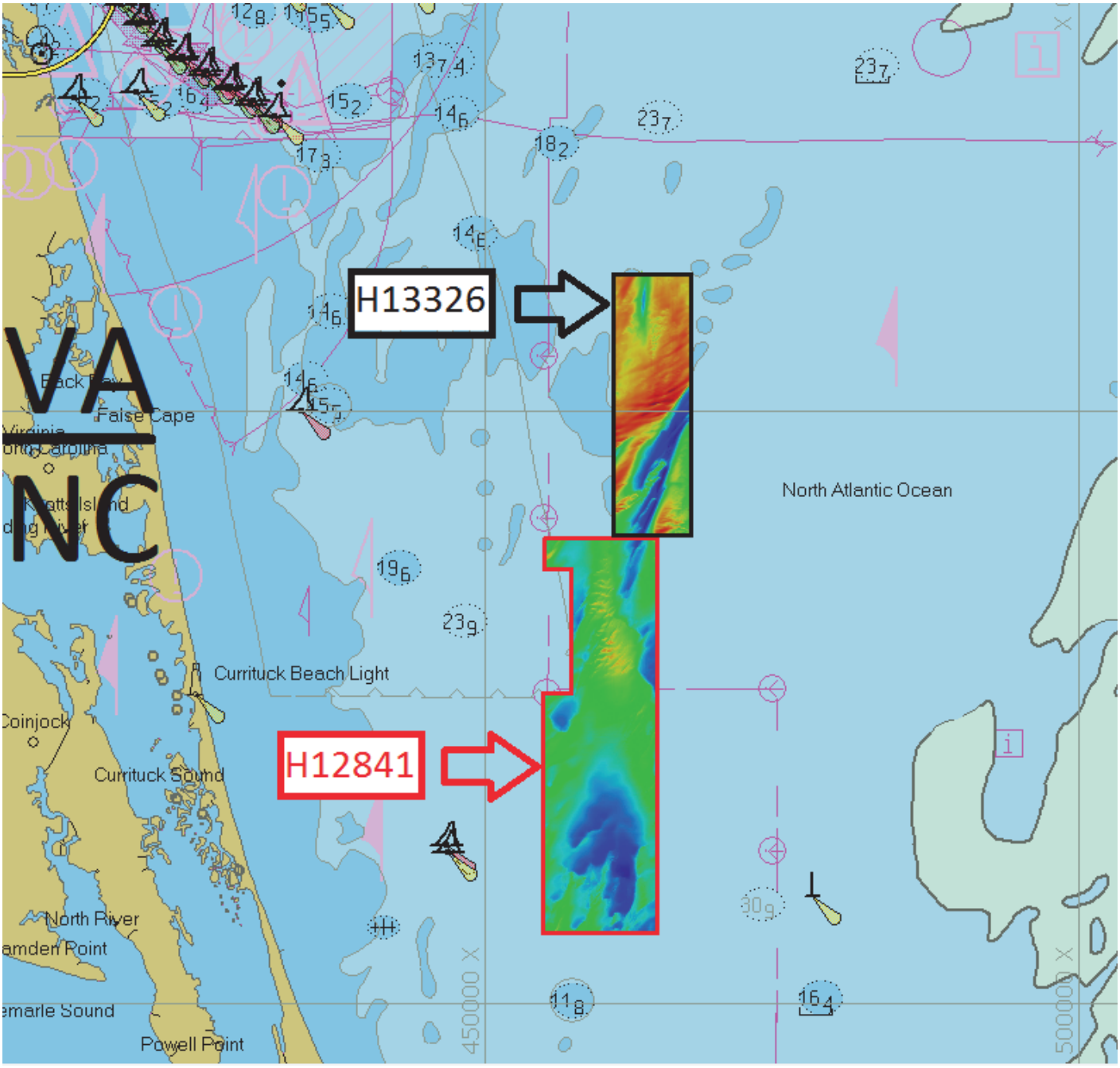


Figure 14: H12841 junctions on the southwestern edge of H13326.

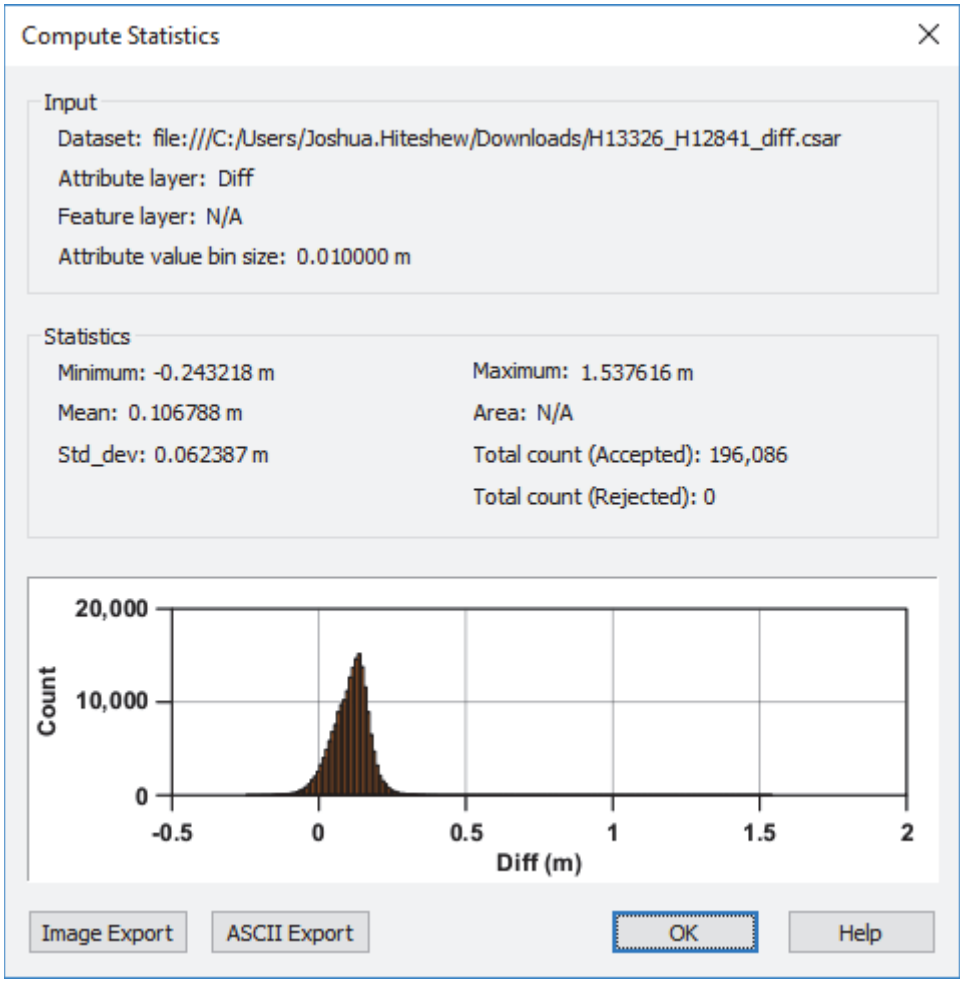


Figure 15: H12841 and H13326 difference surface comparison statistics.

H13094

The northern edge of survey H13326 junctioned with survey H13094 (Figure 16). A difference surface comparison was conducted in accordance with procedures outlined in the DAPR.The difference between surveys H13326 and H13094 ranged from -0.54m to 0.62m. The mean was 0.08m and the standard deviation 0.09m (Figure 17).

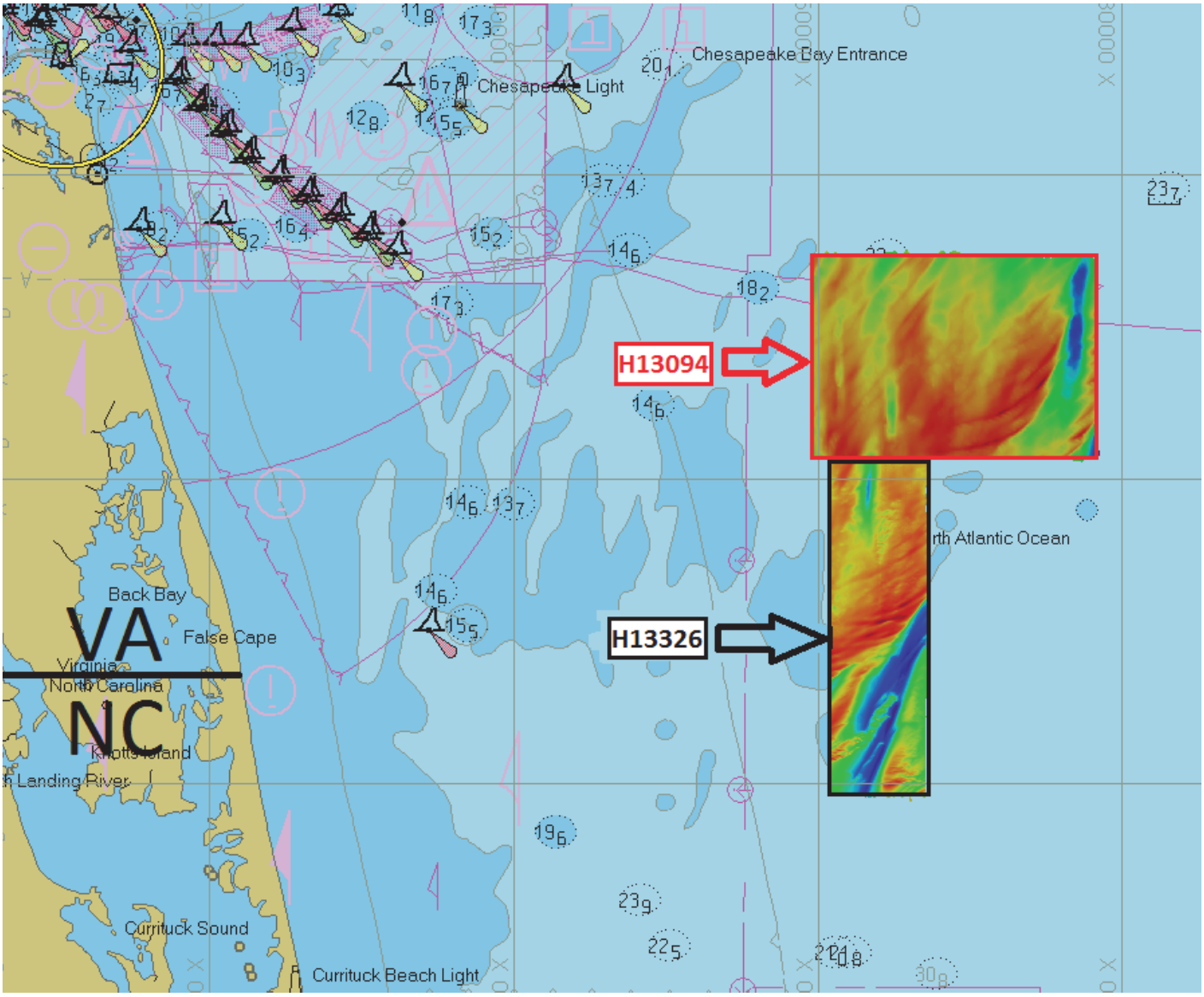


Figure 16: H13094 junctions on the northern edge of H13326.

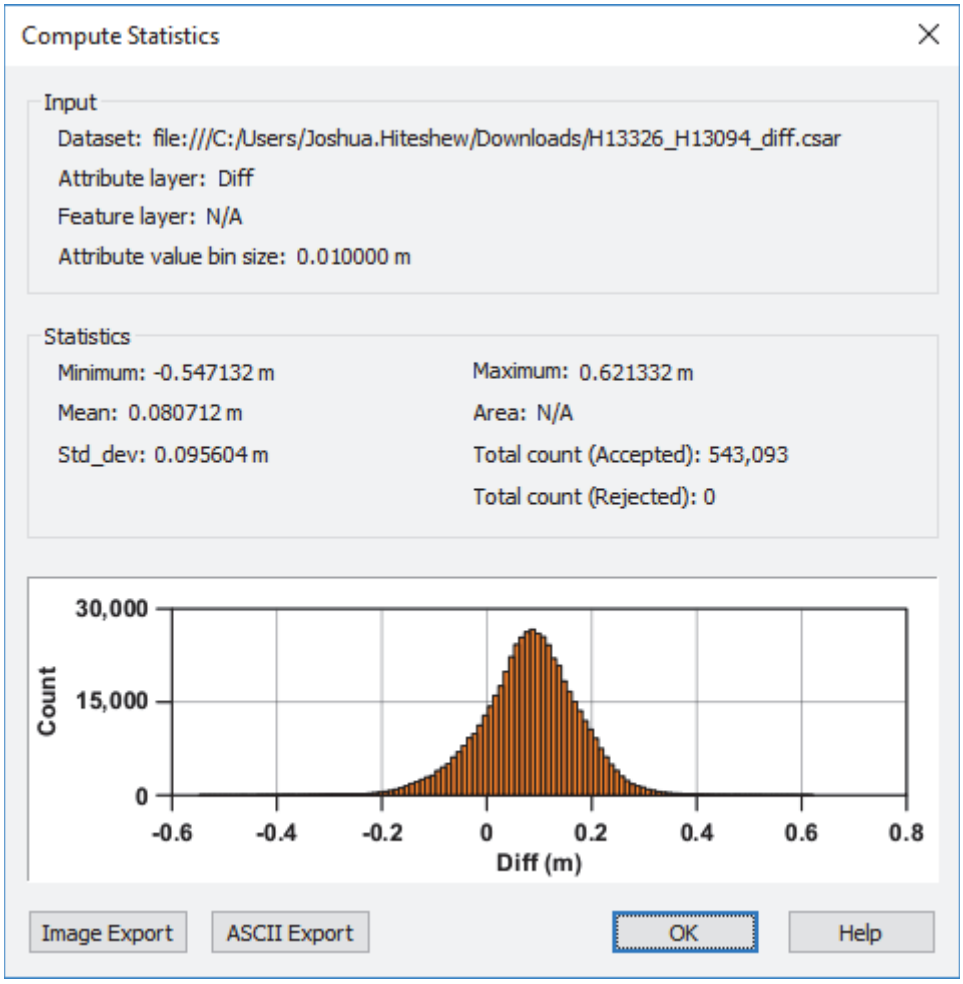


Figure 17: H13094 and H13326 difference surface comparison statistics.

H13095

The eastern edge of survey H13326 junctioned with survey H13095 (Figure 18). A difference surface comparison was conducted in accordance with procedures outlined in the DAPR.The difference between surveys H13326 and H13095 ranged from -1.79m to 2.08m. The mean was 0.06m and the standard deviation 0.13m (Figure 19).

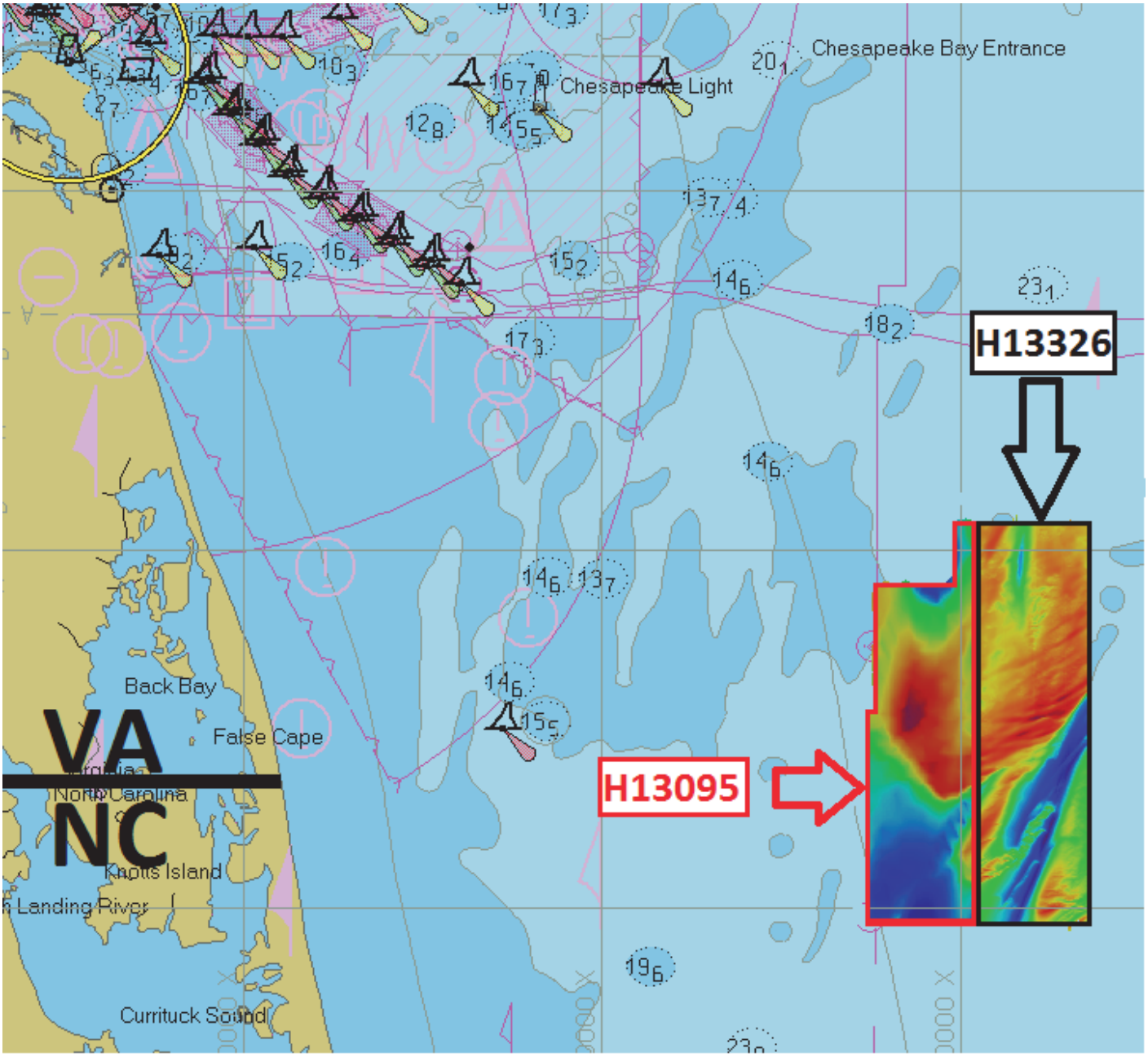


Figure 18: H13095 junctions on western edge of H13326.

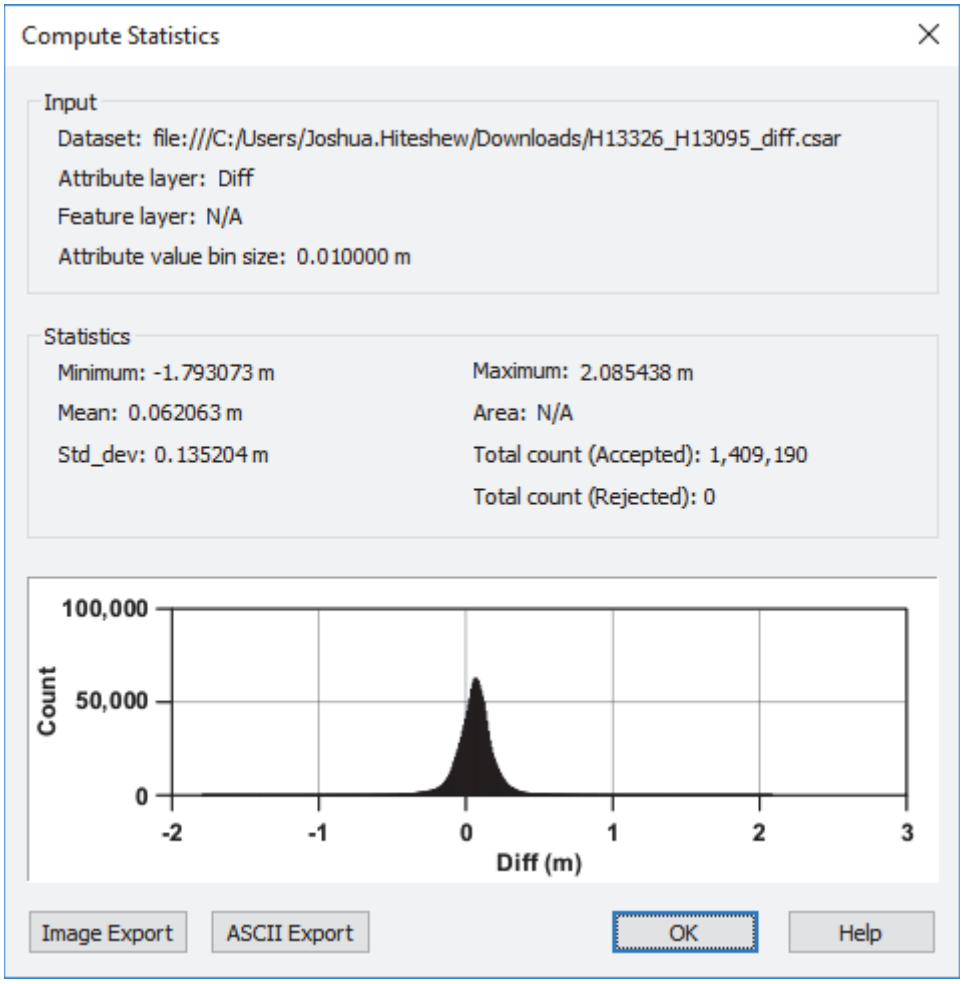


Figure 19: H13326 and H13095 difference surface comparison statistics.

H13327

The western edge of survey H13326 junctioned with survey H13327 (Figure 20). A difference surface comparison was conducted in accordance with procedures outlined in the DAPR. The difference between surveys H13326 and H13327 ranged from -0.79m to 0.68m. The mean difference between bathymetric surface nodes was 0.04 with a standard deviation of 0.05 (Figure 21). Statistics and visual inspection indicate that the surveys H13326 and H13327 are in general agreement.

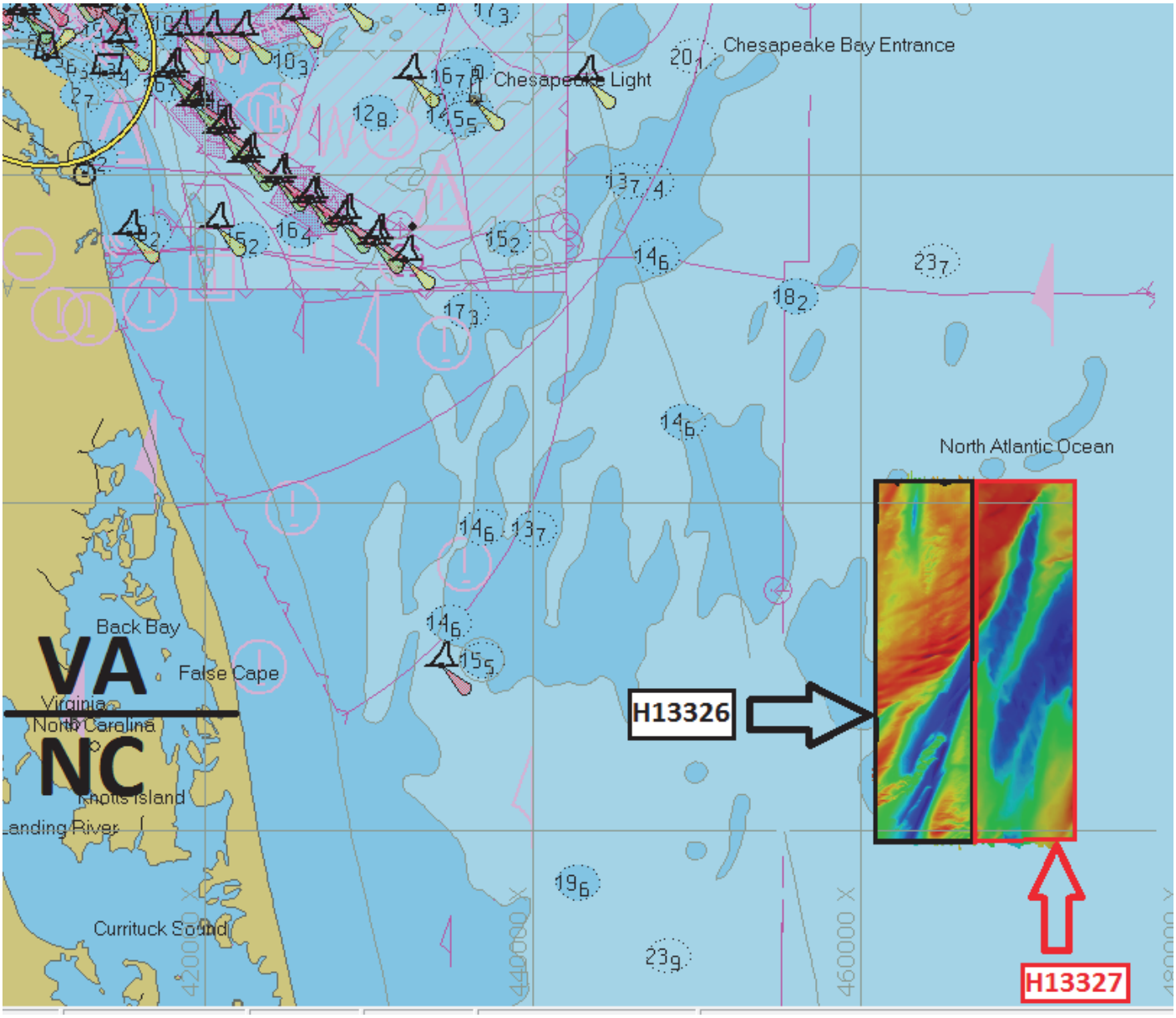
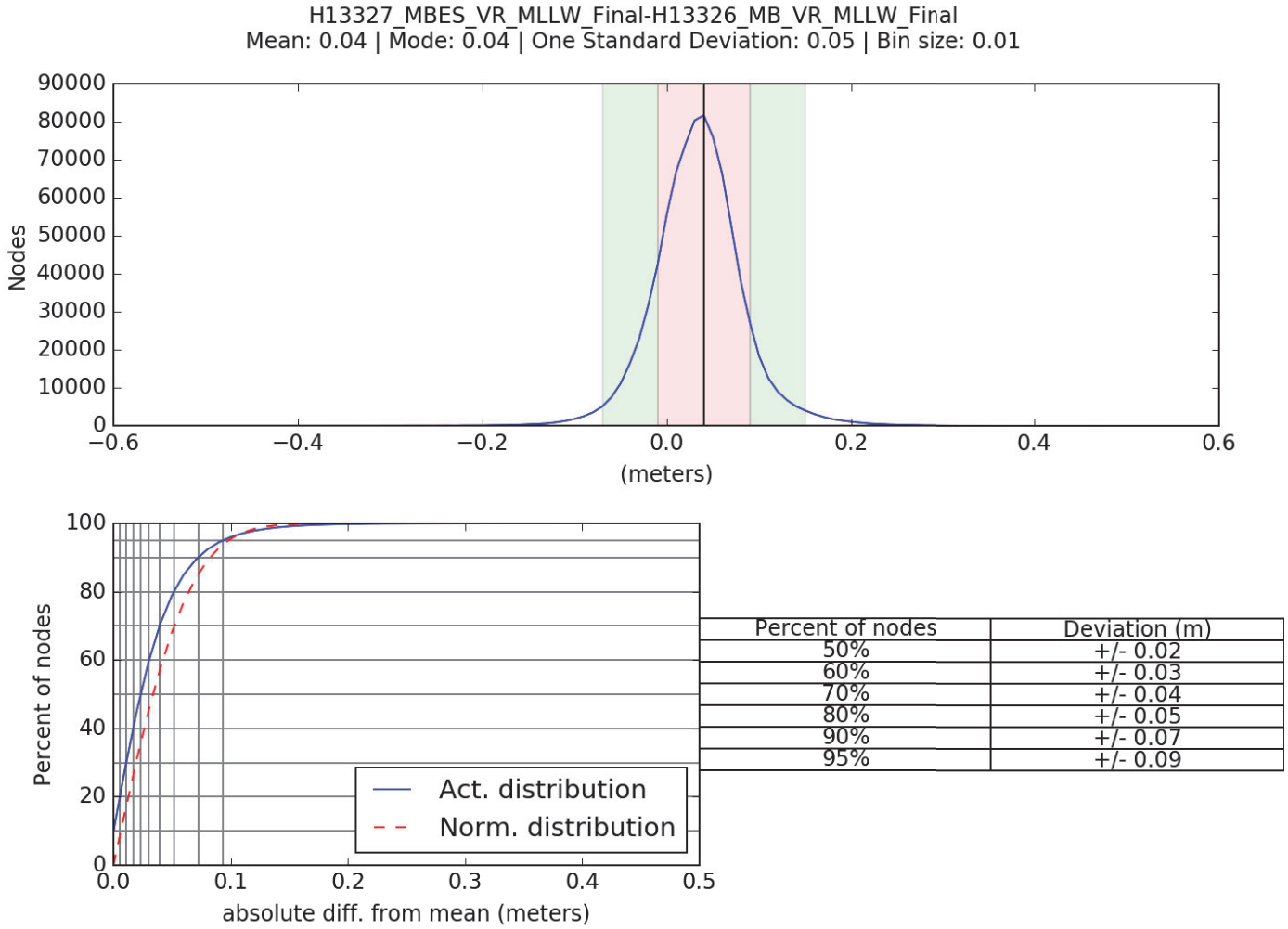


Figure 20: H13327 junctions on the eastern edge of H13326.



Percent of nodes	Deviation (m)
50%	+/- 0.02
60%	+/- 0.03
70%	+/- 0.04
80%	+/- 0.05
90%	+/- 0.07
95%	+/- 0.09

Figure 21: H13327 and H13326 difference surface statistics.

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 the start of acquisition day, and within four hours of each previous. Sound speed profiles were acquired from S222 in accordance with HSSD 2019 standards using a Rolls Royce Brooke Ocean Moving Vessel Profiler (MVP) 100. MVP casts were conducted from S222 approximately twice an hour. Sound speed was monitored by the survey watch to assess sound speed variation in the water column and conduct casts accordingly, casts from S222's MVP were given to the DriX crew and applied to iXblue's MBES accordingly.

Conductivity, Temperature, and Depth (CTD) casts were performed from HSL 2903 upon arrival to working grounds and within 4 hours of the previous cast as specified within the 2014 Field Procedures Manual (FPM). Sound speed profiles were acquired from HSL 2903 in accordance with HSSD 2019 standards using the SBE19 Plus.

S222, HSL 2903, and iXblue DriX data were corrected by applying sound speed profiles nearest in distance in time (4 hours). All sound speed profile data were concatenated into a master file. A total of 194 sound speed measurements were collected within the survey limits of H13326 with 14 additional measurements collected outside the data extents (Figure 22). All 14 of these outside measurements were collected within 500m of survey coverage as specified in the HSSD 2019. All casts provide data representative of the conditions found within the survey area and are appropriate for use.

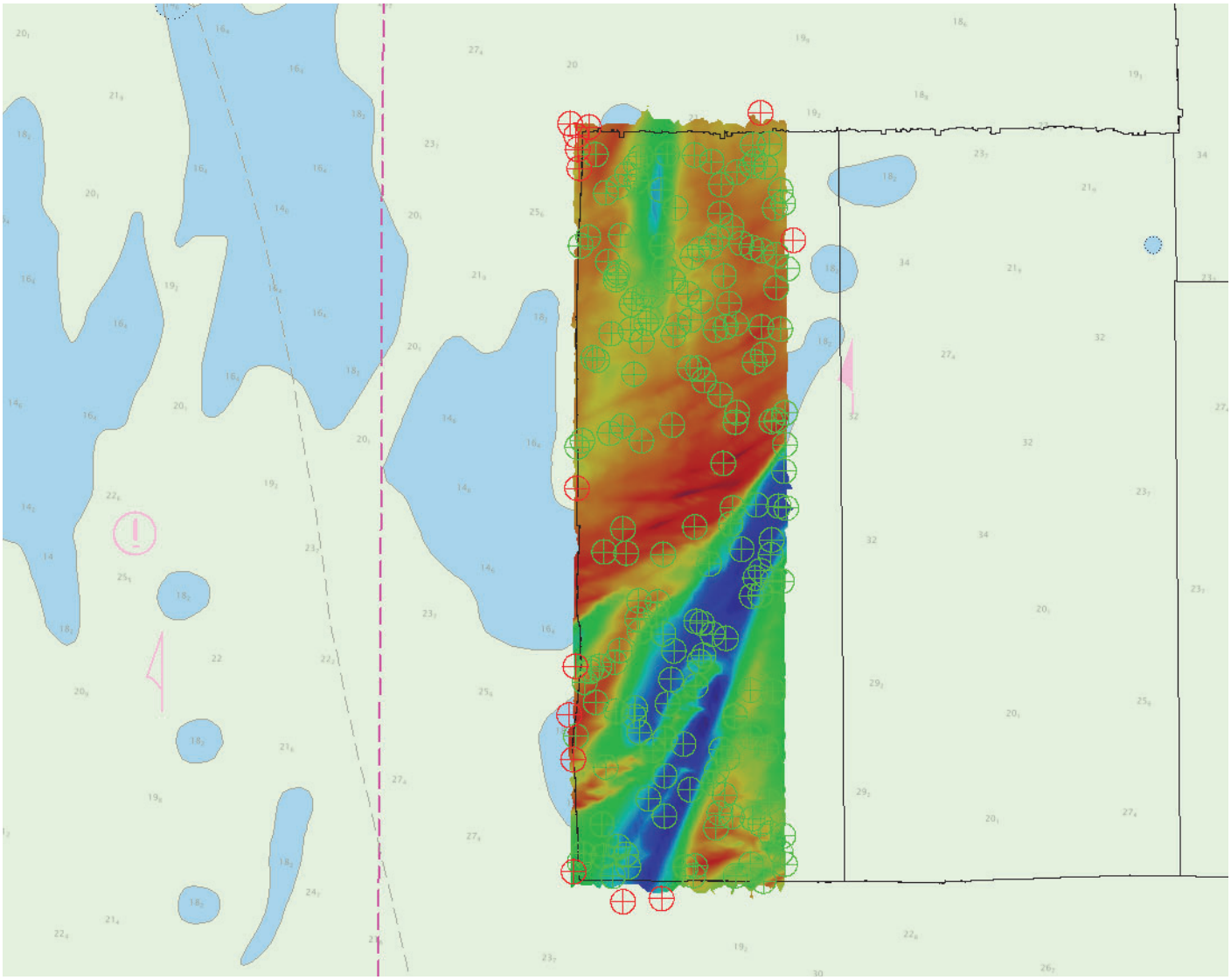


Figure 22: Overview of all SVP casts taken on H13326. The 14 cast located outside of survey limits are highlighted in red.

B.2.8 Coverage Equipment and Methods

S222, HSL 2903, and iXblue DriX acquired 100% MBES data to meet complete coverage requirements on survey H13326, as specified in the project instructions, using Kongsberg EM2040s.

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. Multibeam echo sounder acoustic backscatter (MBAB) was logged as part of the .all file of Kongsberg 2040 systems. Backscatter was processed in QPS Fledermaus GeoCoder Toolbox(FMGT) software and the exported geotiffs are included in the final processed data package (Figures 23-26). The hydrographer suspects that a sound velocity cast on line 0117_20191028_084303_S222_EM2040 of day 301 was applied in realtime with erroneous absorption coefficient values creating a swath of reduced decibels when compared with the surrounding MBAB data (Figure 27). MBAB holidays were observed within data acquired on 10/22/2019, 10/27/2019 and 10/28/2019 (Figures 28-31). These holidays are directly correlated with blowouts observed during acquisition due to rough sea state.

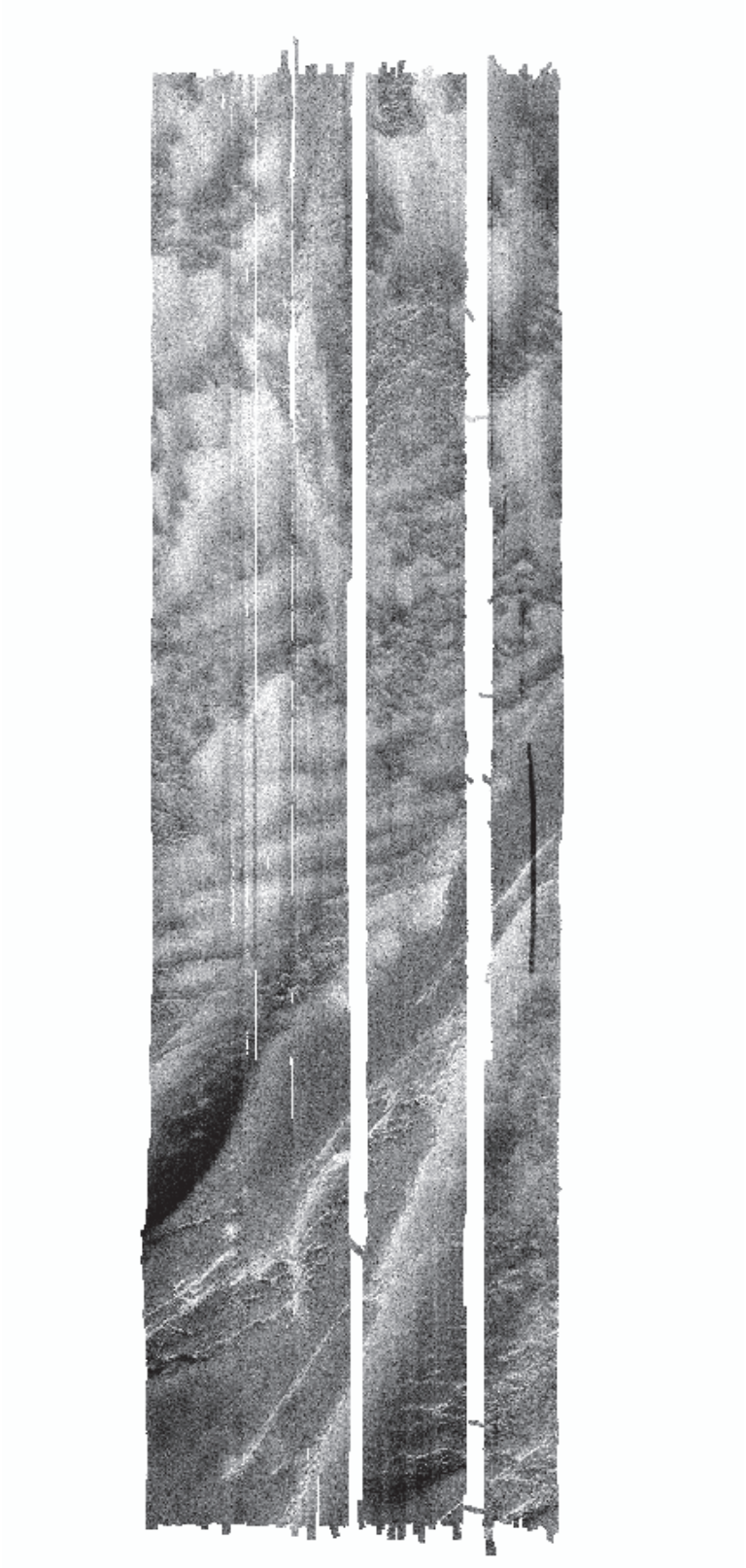


Figure 23: S222's 300kHz multibeam acoustic backscatter at 1m resolution.

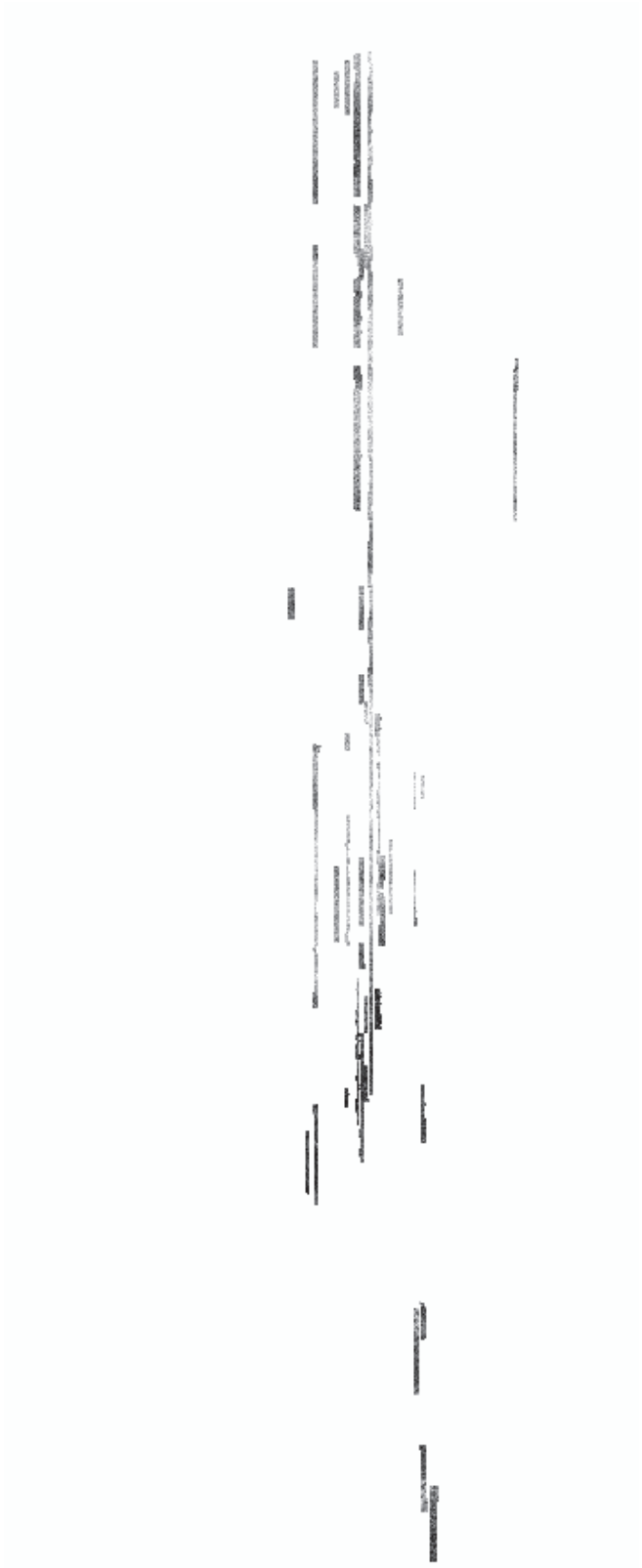


Figure 24: 2903's 300kHz multibeam acoustic backscatter at 1m resolution.

Figure 25: DriX's 300kHz multibeam acoustic backscatter at 1m resolution.

Figure 26: Combined image of all backscatter data acquired on survey H13326.

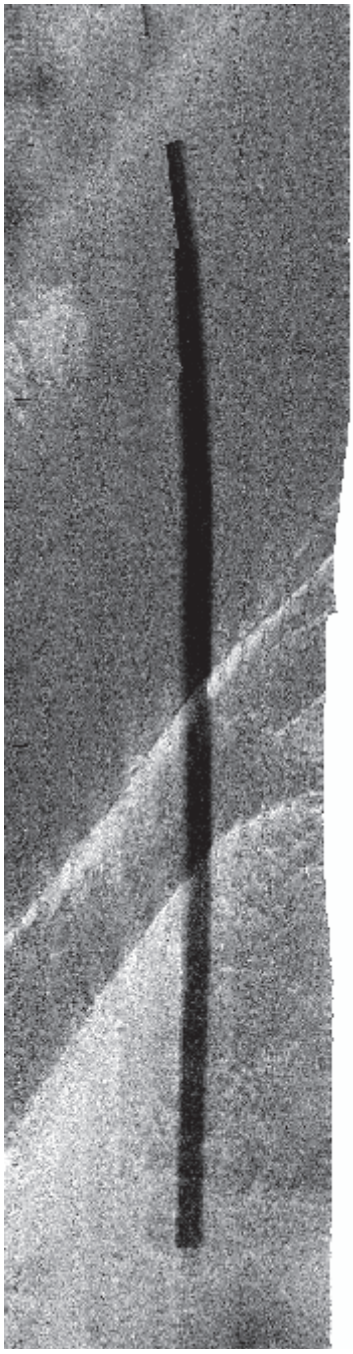


Figure 27: Abnormality present in H13326 backscatter data acquired by S222.

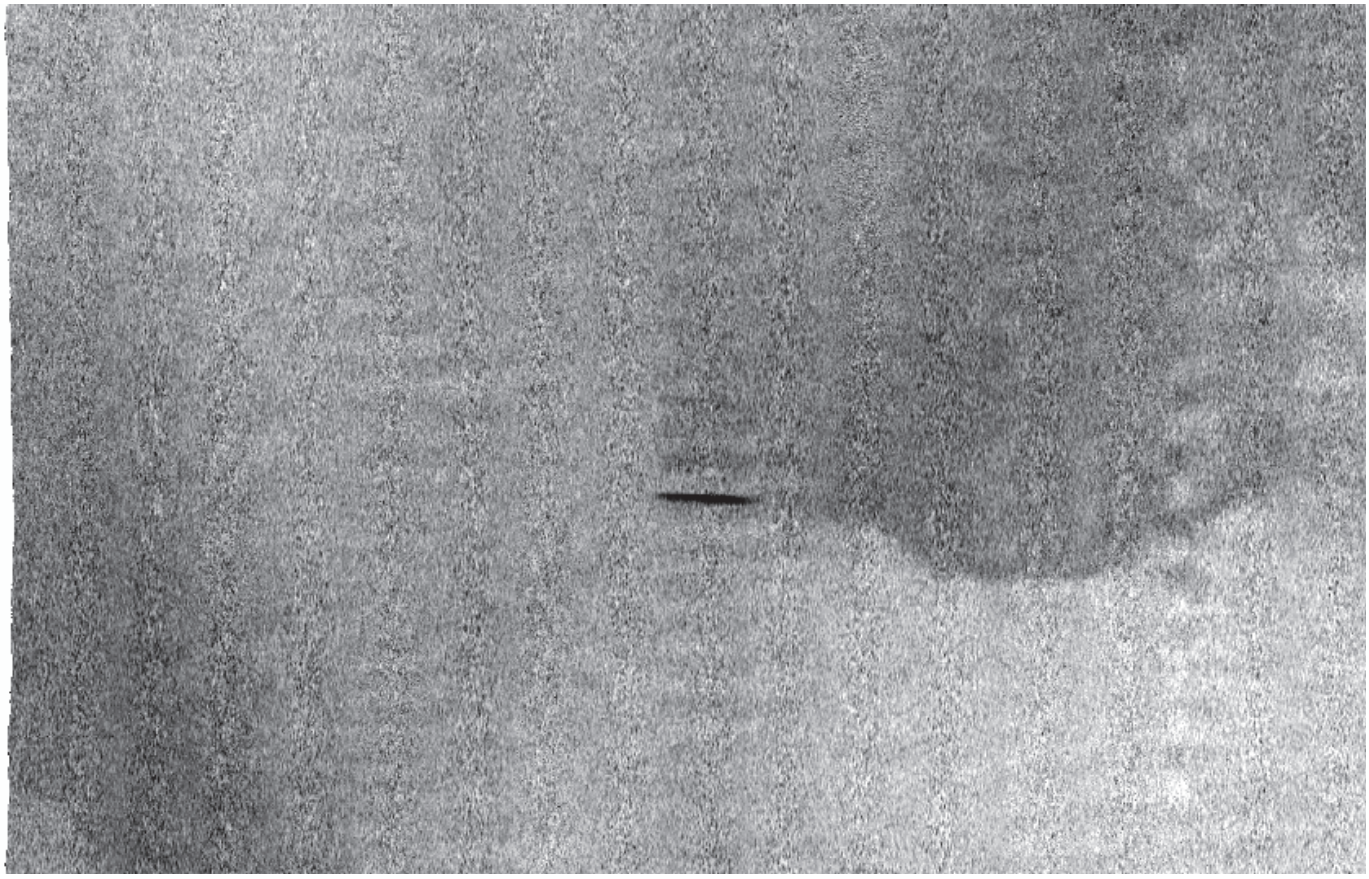


Figure 28: S222's multibeam acoustic backscatter holiday on line 0001_20191022_013830_S222_EM2040 on Julian day number 295. Approximate location of 36° 39' 15.26"N, 75° 25' 58.63"W.

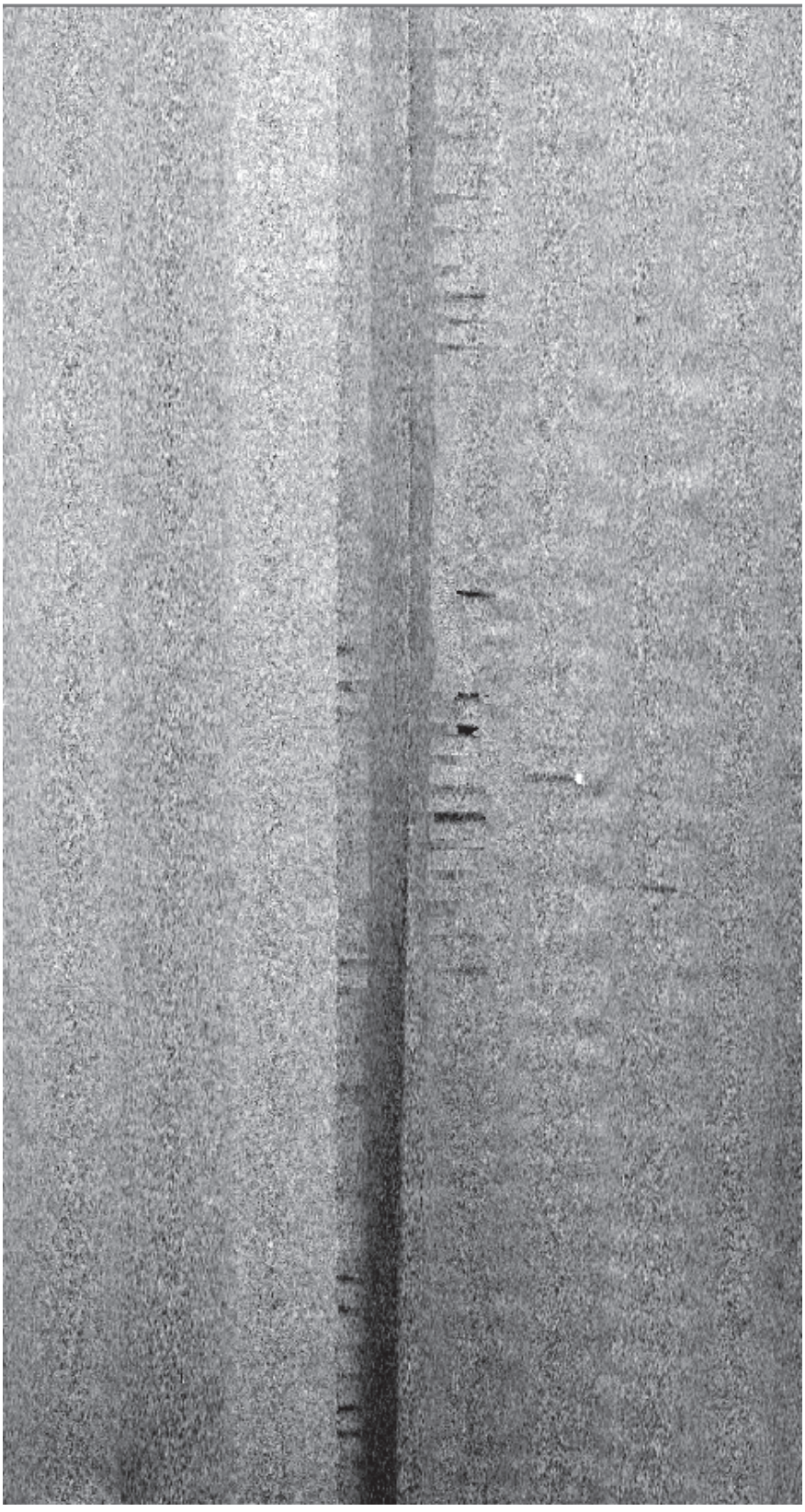


Figure 29: S222's multibeam acoustic backscatter holiday on line 0092_20191027_161014_S222_EM2040 on Julian day number 300. Approximate location of 36° 39' 15.26"N, 75° 25' 58.63"W.

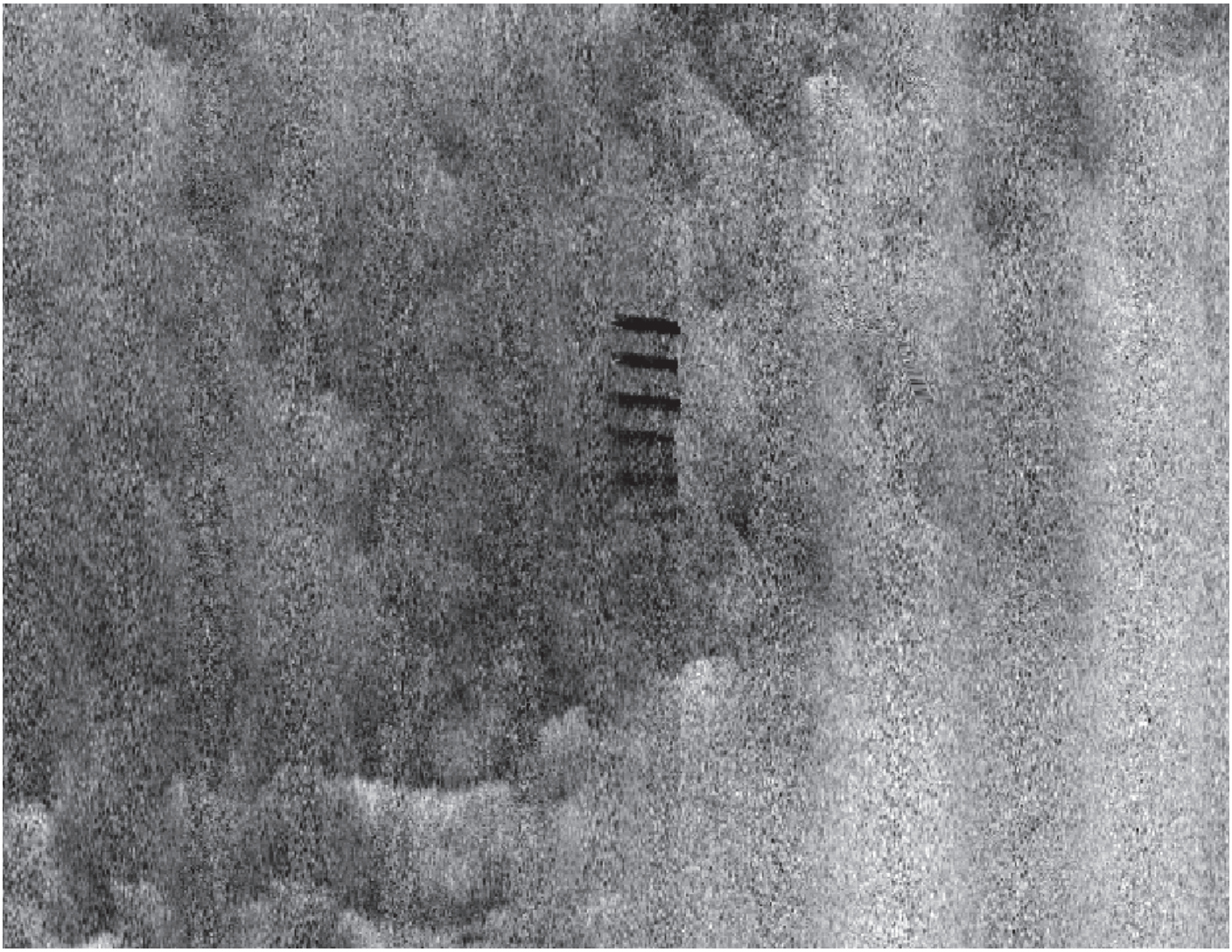


Figure 30: S222's multibeam acoustic backscatter holiday on line 0090_20191027_151422_S222_EM2040 on Julian day number 300. Approximate location of 36° 38' 30.89"N, 75° 23' 6.07"W.

Figure 31: S222's multibeam acoustic backscatter holiday on line 0128_20191028_155009_S222_EM2040 on Julian day number 301. Approximate location of 36° 30' 5.66"N, 75° 22' 9.12"W.

B.5 Data Processing

B.5.1 Primary 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
H13326_MB_VR_MLLW_Final.csar	CARIS VR Surface (CUBE)	Variable Resolution	16.23 meters - 35.59 meters	NOAA_VR	Complete MBES
H13326_MB_VR_MLLW.csar	CARIS VR Surface (CUBE)	Variable Resolution	16.23 meters - 35.59 meters	NOAA_VR	Complete MBES
H13326_MBAB_1m_S222_300kHz_1of3	MB Backscatter Mosaic	1 meters	-	N/A	Complete MBES
H13326_MBAB_1m_Drix_300kHz_2of3	MB Backscatter Mosaic	1 meters	-	N/A	Complete MBES
H13326_MBAB_1m_TJ2903_300kHz_3of3	MB Backscatter Mosaic	1 meters	-	N/A	Complete MBES

Table 10: Submitted Surfaces

Complete coverage requirements were met by 100% complete coverage multibeam as specified in section 5.2.2.3 of the HSSD 2019. All bathymetric grids for H13326 meet density requirements per the HSSD 2019 (Figure 32).

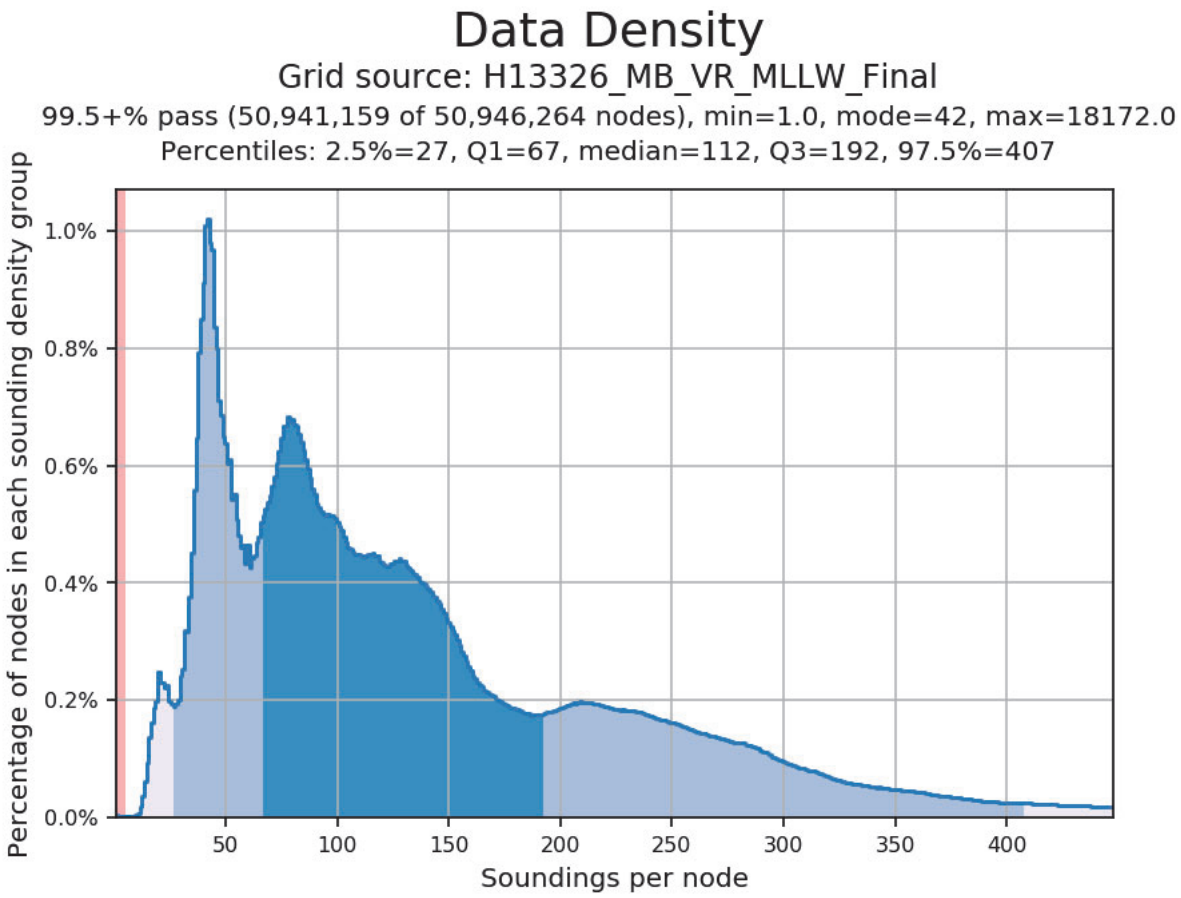


Figure 32: H13326 data density statistics.

C. Vertical and Horizontal Control

No Horizontal and Vertical Control Report (HVCR) is required for this survey.

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	OPR_D304_TJ_19_VDatum_100m_WGS84-MLLW_geoid12b.csar

Table 11: ERS method and SEP file

All soundings submitted for H13326 are reduced to MLLW using VDatum techniques as outlined in the DAPR

C.2 Horizontal Control

The horizontal datum for this project is World Geodetic System (WGS) 1984.

The projection used for this project is Universal Transverse Mercator (UTM) Zone 18.

PPP

Trimble-RTX service was used with an Applanix POS MVv5 GNSS_INS system to obtain highly accurate ellipsoidally referenced position data to meet ERS specifications for H13326 MBES data from vessels HSL 2903 and S222. The Fugro Marinestar G2 real-time precise point positioning service was used for MBES data of the DriX to meet ERS specifications for GNSS positioning.

WAAS

The Wide Area Augmentation System (WAAS) was used for real-time horizontal control during data acquisition on vessels S222 and HSL 2903.

D. Results and Recommendations

D.1 Chart Comparison

A chart comparison was conducted between survey H13326 and previously charted ENC US3DE01M in accordance with methods outlined in the DAPR.

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	Preliminary?
USDE01M	1:419707	22	07/10/2019	07/10/2019	NO

Table 12: Largest Scale ENCs

USDE01M

Sounding sets derived from H13326 bathymetric surfaces generally agreed with soundings from ENC USDE01M. However, one area on the southern end of sheet indicates a shoal being formed with soundings two to four meters shoaler than charted being observed. No DTONS were identified. Updates to the cartographic representation of sounding values and sounding locations are recommended by the hydrographer (Figures 33-35).

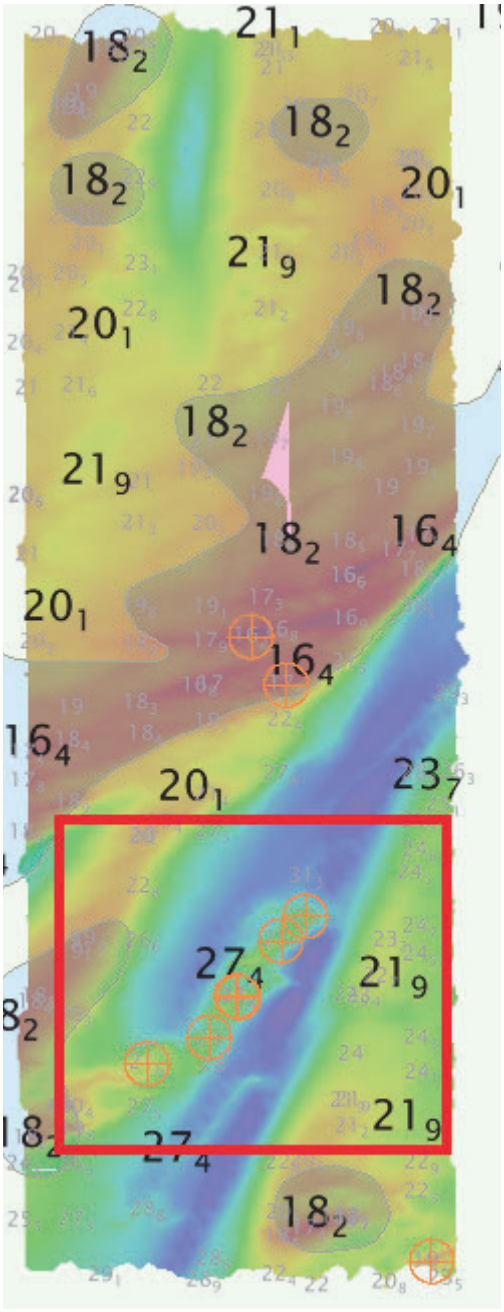


Figure 33: Overview of H13326, overlayed on ENC USDE01M. Black numbers represent charted depths on ENC USDE01M. The five targets inside the red box located on the southern end of sheet highlight the location of the shoal.

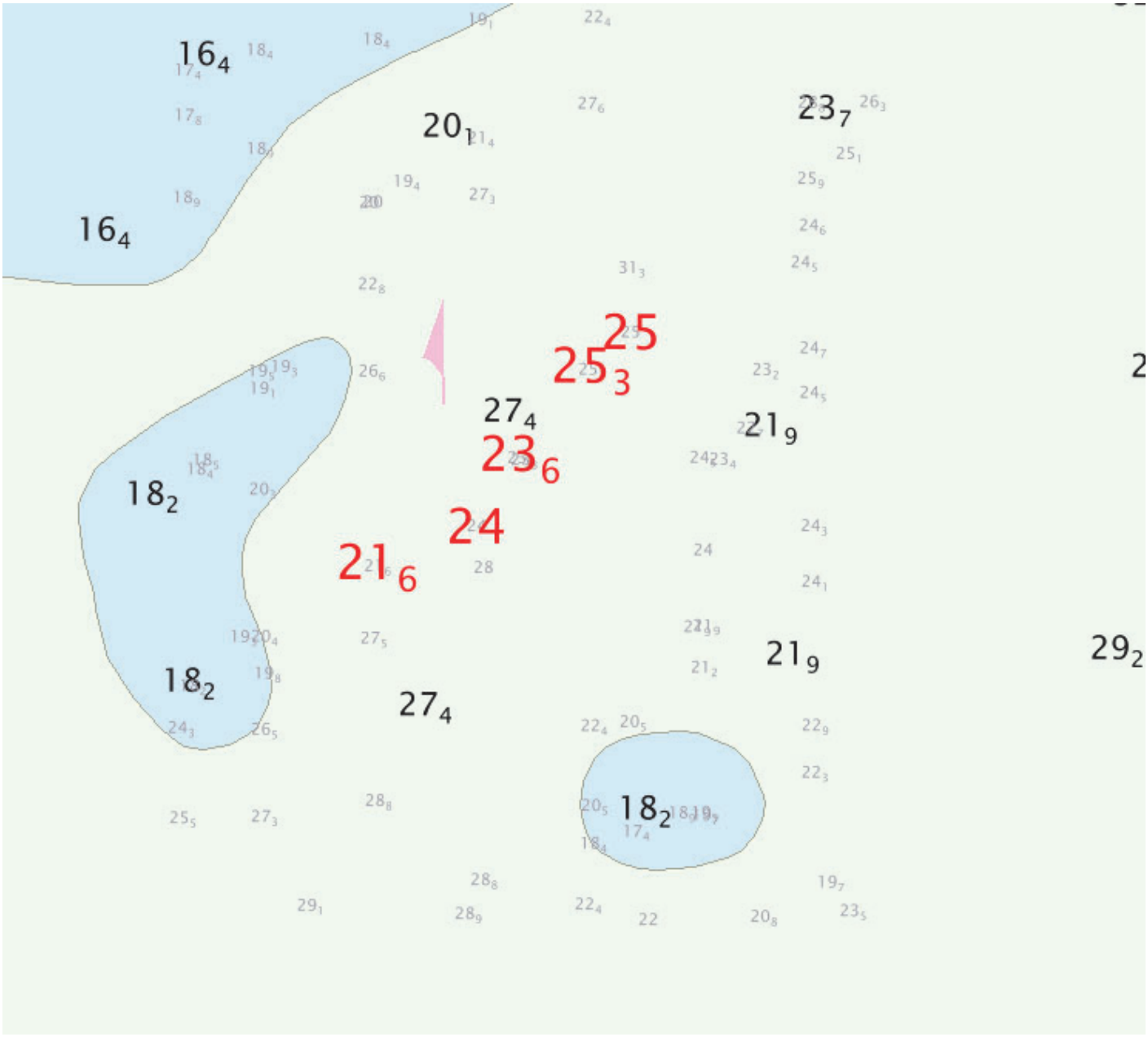


Figure 34: Black numbers represent charted soundings on ENC USDE01M, red numbers represent soundings that were flagged as possible DTON/Discrepancies acquired from the sounding set that was created from the data acquired on survey H13326.

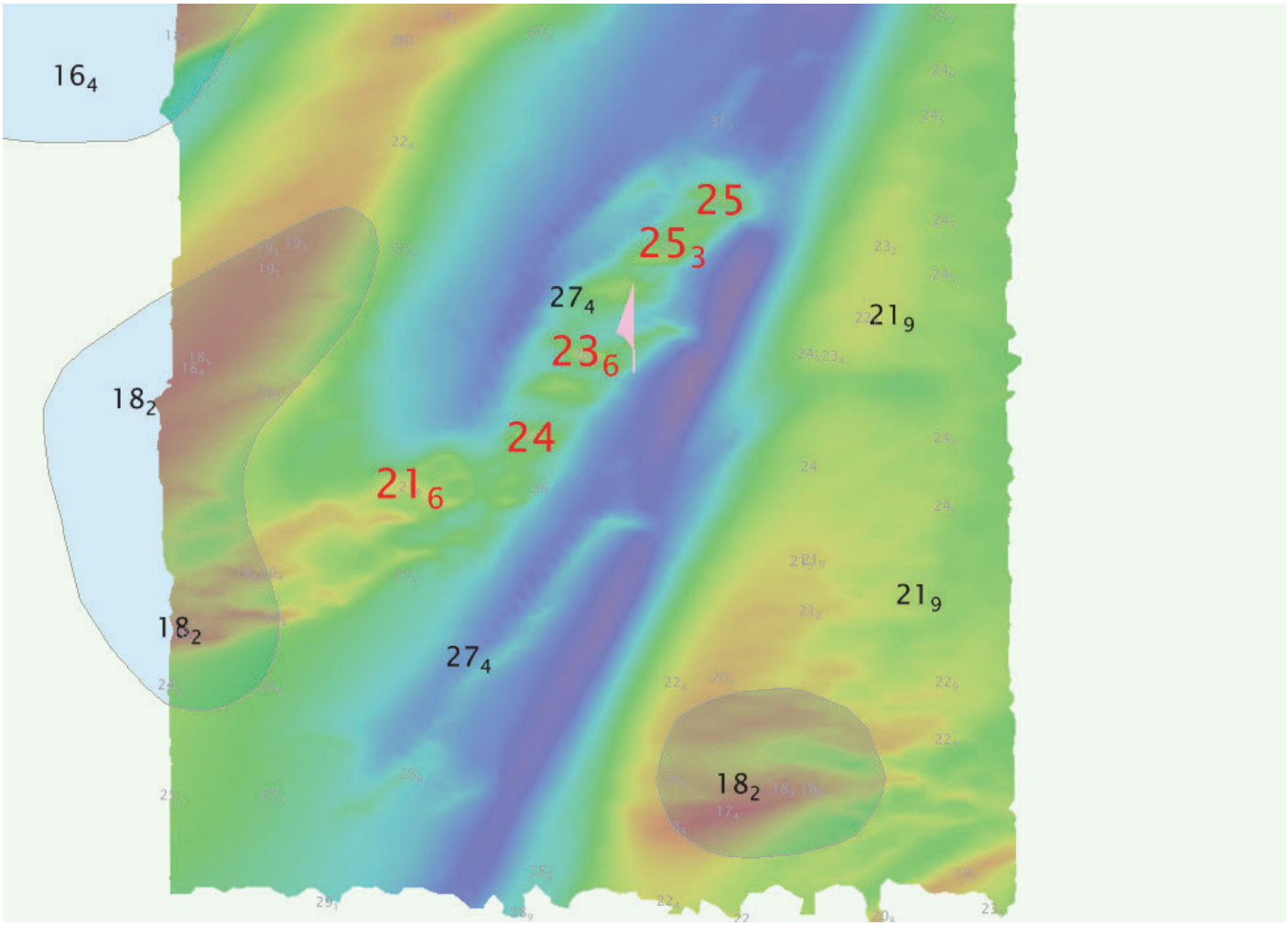


Figure 35: Image of shoaling that was observed within the data for survey H13326, overlayed on ENC USDE01M.

D.1.2 Maritime Boundary Points

No Maritime Boundary Points were assigned 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 Shoal and Hazardous Features

A shoal is present on the southern end of H13326. (See section D.1.1 Electronic Navigational Charts USDE01M and figures 33-35) No DTONS were identified.

D.1.6 Channels

No channels exist within the survey area. 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.1.7 Bottom Samples

Bottom samples were assigned, investigated, and are included in the Final Feature File. See Figure 36 for a generalized view of H13326's bottom sample locations.

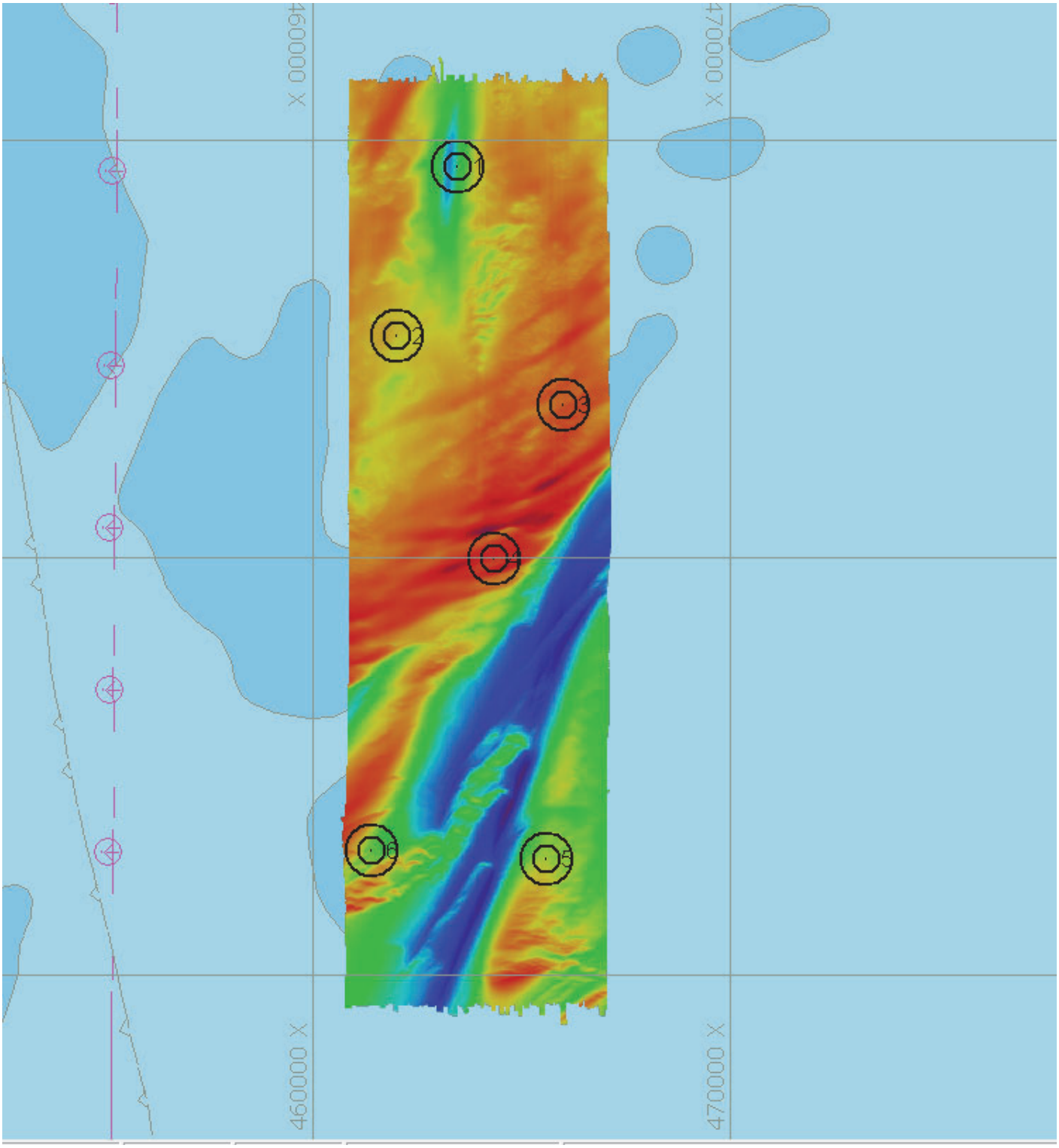


Figure 36: General locations of bottom samples investigated within the sheet limits of H13326.

D.2 Additional Results

D.2.1 Shoreline

Shoreline was not assigned in the Hydrographic Survey Project Instructions or Statement of Work.

D.2.2 Aids to Navigation

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

D.2.3 Overhead Features

No overhead features exist for this survey.

D.2.4 Submarine Features

No submarine features exist for this survey.

D.2.5 Platforms

No platforms exist for this survey.

D.2.6 Ferry Routes and Terminals

No ferry routes or terminals exist for this survey.

D.2.7 Abnormal Seafloor and/or Environmental Conditions

No abnormal seafloor and/or environmental conditions exist for this survey.

D.2.8 Construction and Dredging

No present or planned construction or dredging exist within the survey limits.

D.2.9 New Survey Recommendation

No new surveys or further investigations are recommended for this area.

D.2.10 Inset Recommendation

No new insets 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
CDR Briana Hillstrom, NOAA	Commanding Officer/ Chief of Party	03/25/2020	Briana Welton Hillstrom Digitally signed by HILLSTROM.BRIANA.WELTON.1267667531 Date: 2020.03.27 10:52:27 -04'00'
LT Calandria DeCastro, NOAA	Field Operations Officer	03/25/2020	DECASTRO.CALANDRIA.MALVINA.1468902156 Digitally signed by DECASTRO.CALANDRIA.MALVINA.1468902156 Date: 2020.03.27 19:39:44 -04'00'
Joshua Hiteshew	Chief Hydrographic Survey Technician	03/25/2020	HITESHEW.JOSHUA.TAYLOR.1537939652 Digitally signed by HITESHEW.JOSHUA.TAYLOR.1537939652 Date: 2020.03.27 14:31:59 Z
Kevin Brown	Sheet Manager	03/25/2020	HITESHEW.JOSHUA.TAYLOR.1537939652 Digitally signed by HITESHEW.JOSHUA.TAYLOR.1537939652 Date: 2020.04.06 17:05:36 Z

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