H13295

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

DESCRIPTIVE REPORT

Type of Survey: Basic Hydrographic Survey

Registry Number: H13295

LOCALITY

State(s): Virginia

General Locality: Southern Chesapeake Bay

Sub-locality: Old Plantation Flats

2020

CHIEF OF PARTY
Bridget W. Bernier

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Date:

U.S. DEPARTMENT OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION	REGISTRY NUMBER:
HYDROGRAPHIC TITLE SHEET	**H13295**

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:	**Southern Chesapeake Bay**
Sub-Locality:	**Old Plantation Flats**
Scale:	**20000**
Dates of Survey:	**10/26/2019 to 06/26/2020**
Instructions Dated:	**08/27/2019**
Project Number:	**OPR-E350-KR-19**
Field Unit:	**Leidos**
Chief of Party:	**Bridget W. Bernier**
Soundings by:	**Multibeam Echo Sounder**
Imagery by:	**Side Scan Sonar Multibeam Echo Sounder Backscatter**
Verification by:	**Atlantic Hydrographic Branch**
Soundings Acquired in:	**meters at Mean Lower Low Water**

Remarks:

Contract: EA-133C-14-CQ-0033/TO-0006. Contractor: Leidos, 221 Third Street, Newport, RI 02840 USA. Subcontractors: Divemasters, Inc., 15 Pumpshire Road, Toms River, NJ 08753; OARS, 8705 Shoal Creek Blvd, Suite 109, Austin, TX 78757. Leidos Doc. 20-TR-022. All times were recorded in UTC. Final data are corrected to North American Datum of 1983 (NAD83) 2011 realization 2010 (NAD83(2011)2010.0), UTM Zone 18N.

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 H13295

Project: OPR-E350-KR-19

Locality: Southern Chesapeake Bay

Sublocality: Old Plantation Flats

Scale: 1:20000

October 2019 - June 2020

Leidos

Chief of Party: Bridget W. Bernier

A. Area Surveyed

The area surveyed was a section of the Southern Chesapeake Bay west of Old Plantation Flats (Figure 1).

A.1 Survey Limits

Data were acquired within the following survey limits:

Northwest Limit	Southeast Limit
37° 18' 06.57" N 076° 08' 41.64" W	37° 05' 39.57" N 076° 01' 52.31" W

Table 1: Survey Limits

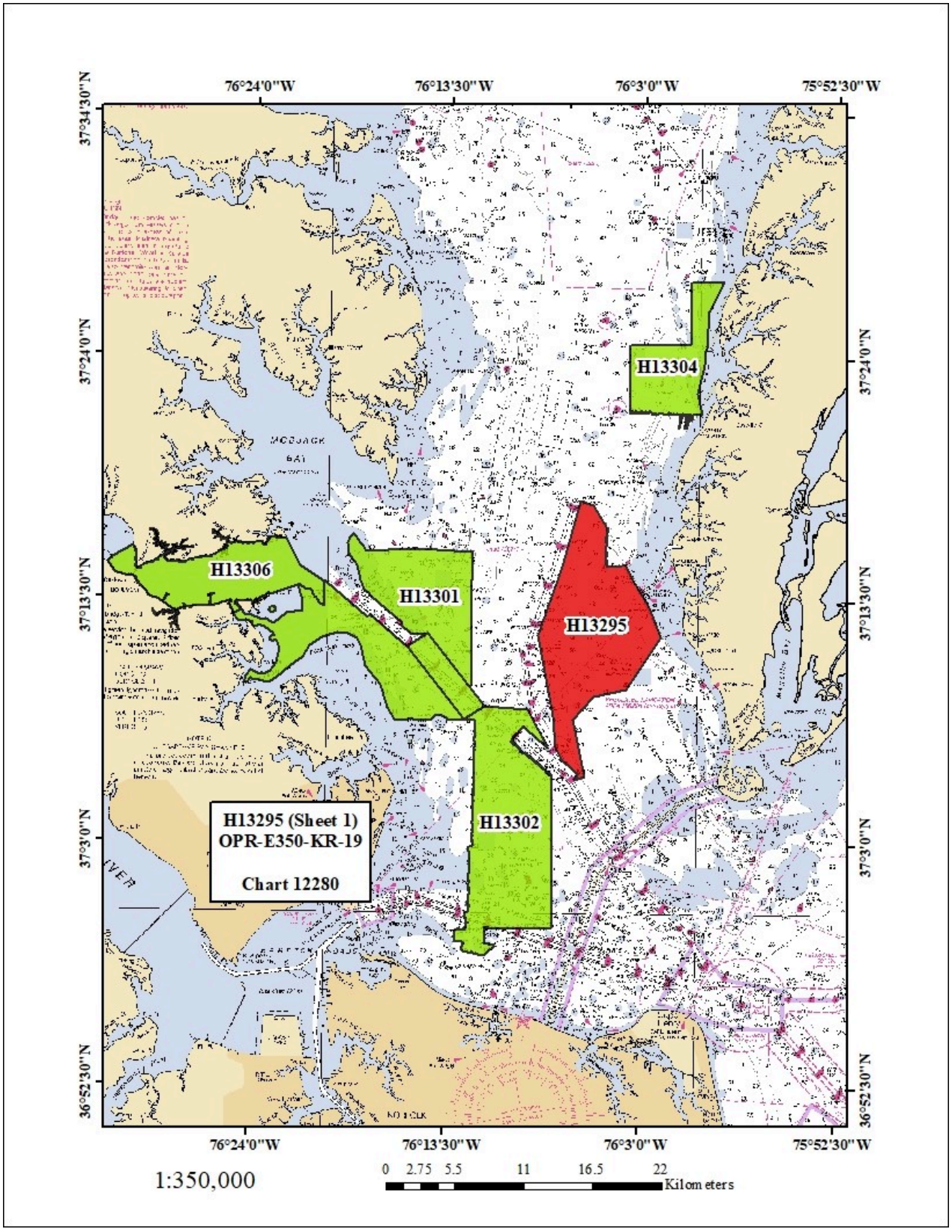

Figure 1: H13295 Survey Bounds

Survey limits were acquired in accordance with the requirements in the Project Instructions and the Hydrographic Surveys Specifications and Deliverables (HSSD), March 2019.

A.2 Survey Purpose

The purpose of this survey is to provide contemporary surveys to update National Ocean Service (NOS) nautical charting products. This project is located in the Chesapeake Bay in Virginia. The Chesapeake Bay is the largest of 130 estuaries in the United States. The Coast Guard is currently conducting a Waterways Assessment and Management Survey of the lower James River. This data will be used to assess if ATONs are correctly placed and help inform a comprehensive report regarding the location of shoals within the lower James River. Survey vintage in this area dates back to 1945. This project will provide critical data for the updating of National Ocean Service (NOS) nautical charting products to increase maritime safety in the region. 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.

Leidos warrants only that the survey data acquired by Leidos and delivered to NOAA under Contract EA-133C-14-CQ-0033 reflects the state of the sea floor in existence on the day and at the time the survey was conducted.

H13295 was surveyed in accordance with the following documents:
1. Project Instructions, OPR-E350-KR-19, dated 27 August 2019
2. Hydrographic Surveys Specifications and Deliverables (HSSD), March 2019
3. OPR-E350-KR-19 Statement of Work, dated 28 August 2019
4. Final_OPR-E350-KR-19_PRF.000, received 18 September 2019
5. Final_OPR-E350-KR-19_CSF.000, received 18 September 2019
6. OPR-E350-KR-19_Southern_Chesapeake_Bay_Questions.pdf, dated 05 November 2019
7. OPR-E350-KR-19: H13295 Grid Resolution Waiver, dated 05 March 2020
8. OPR-E350-KR-19_VERBAL AUTHORIZATION_ Southern OPR-E350-KR-19_Chesapeake Bay No-cost Extension - EA133C14CQ0033 1305M219FNCNJ0356, dated 08 May 2020

A.4 Survey Coverage

The following table lists the coverage requirements for this survey as assigned in the project instructions:

Water Depth	Coverage Required
H13295	Object Detection Coverage (Refer to HSSD Section 5.2.2.2)
8 meters water depth and shoaler	Sidescan may be acquired at an altitude of 6-20% of the range scale
All waters in survey area	Complete 5,553 LNM. Transit mileage, system calibration mileage and data which do not meet HSSD specifications shall not count towards the completion of the LNM requirement. Notify the Project Manager/COR upon nearing completion of LNM requirement. The final survey area shall be squared off and ensure the full investigation of any features within the surveyed extent.

Table 2: Survey Coverage

Leidos chose to achieve the coverage requirement using Object Detection Coverage, Option B (200% side scan sonar coverage with concurrent multibeam). Survey coverage achieved was in accordance with the requirements in the Project Instructions and the HSSD (Figure 2 through Figure 4).

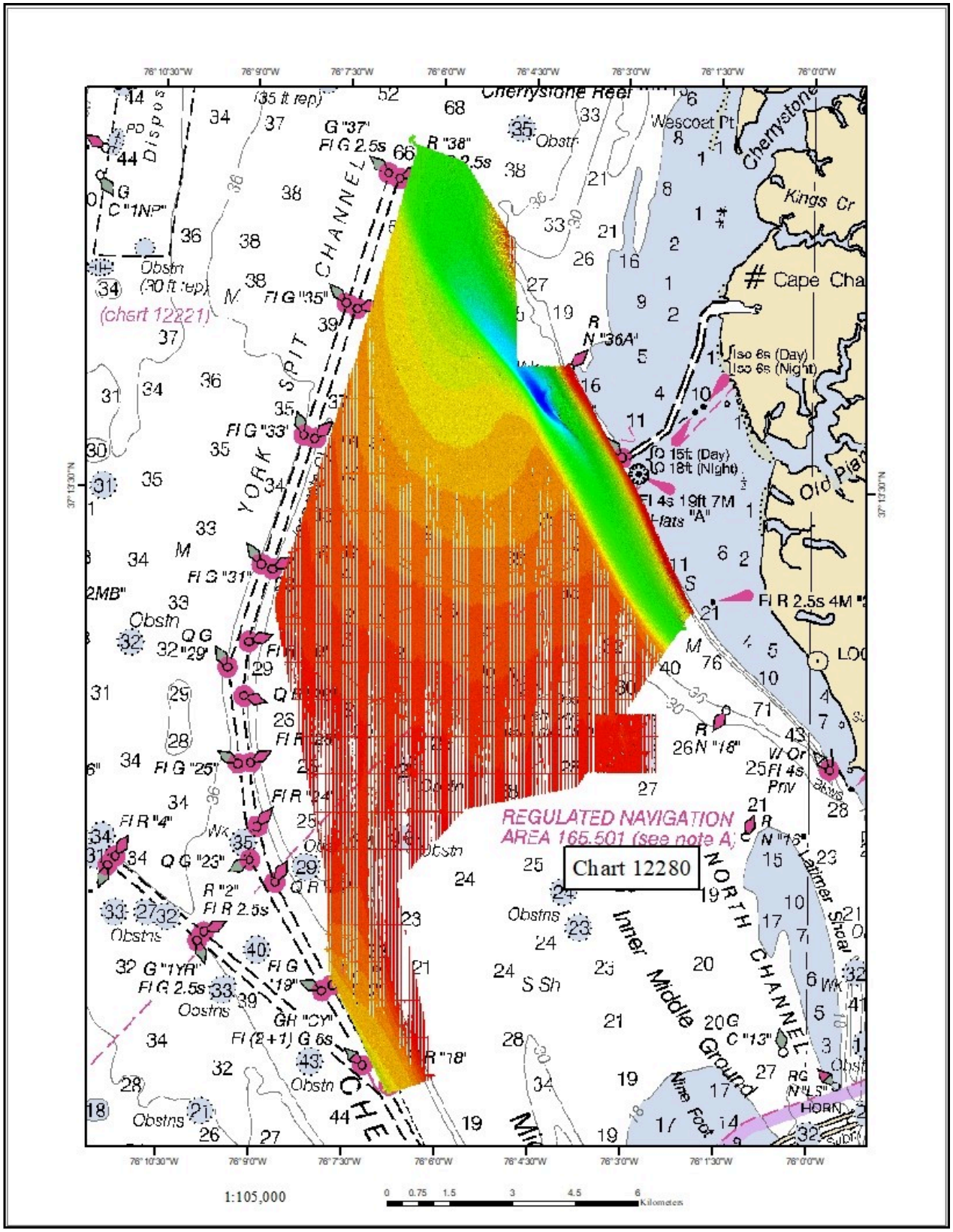

Figure 2: Final Bathymetry Coverage for H13295

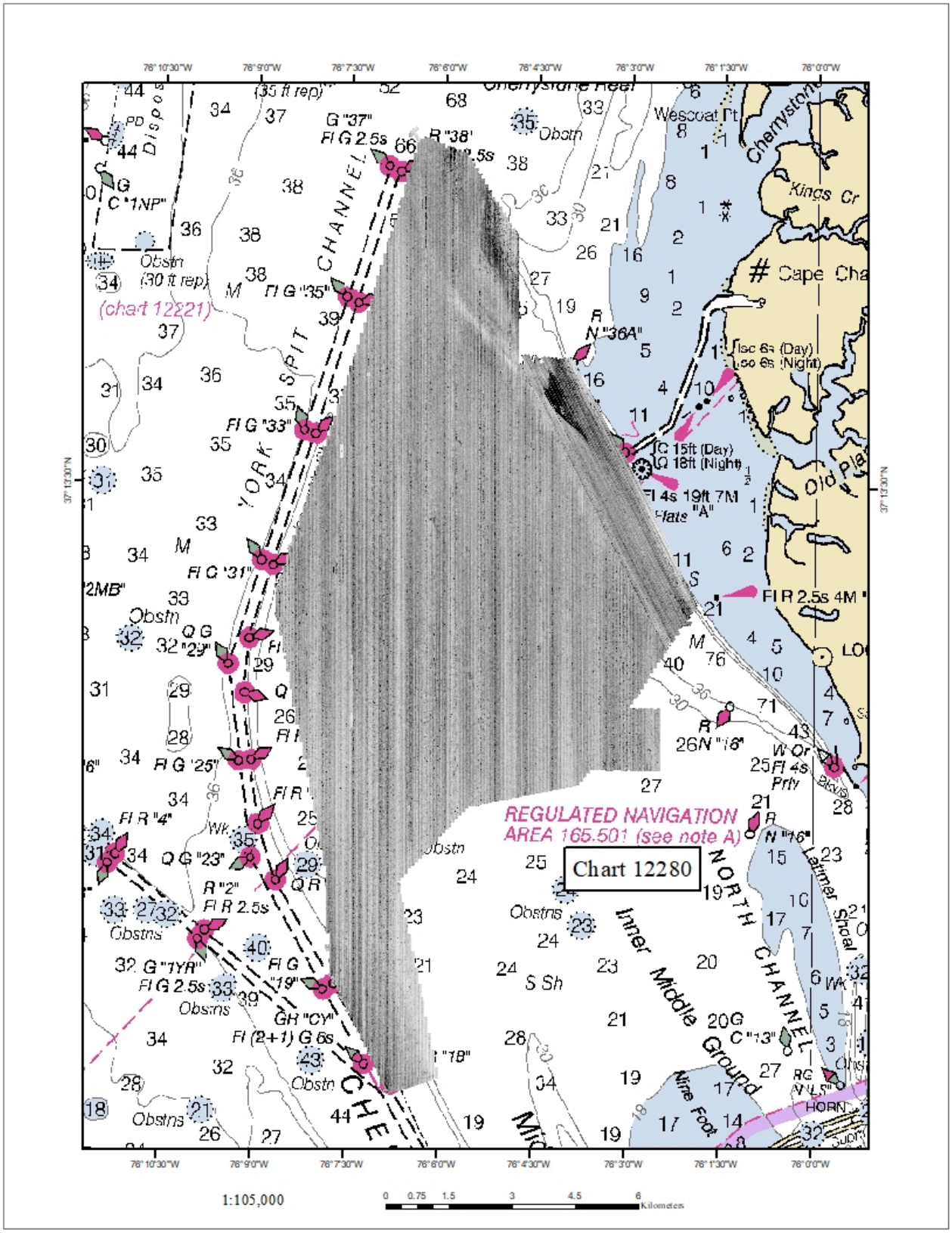

Figure 3: Final Side Scan Coverage for H13295 (First 100% coverage)

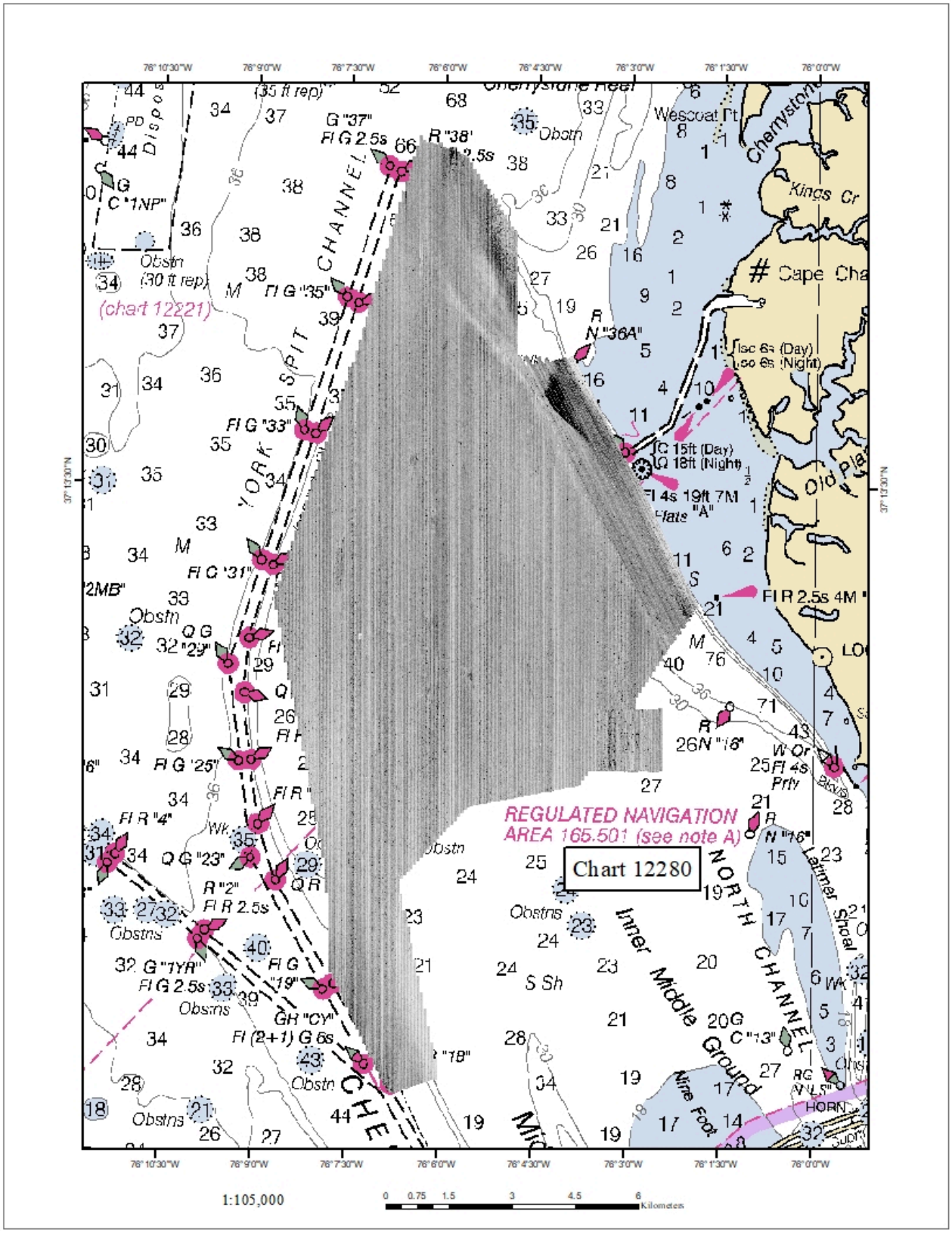

Figure 4: Final Side Scan Coverage for H13295 (Second 100% coverage)

A.5 Survey Statistics

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

	HULL ID	*M/V Atlantic Surveyor*	*Total*
LNM	**SBES Mainscheme**	0	0
	MBES Mainscheme	0	0
	Lidar Mainscheme	0	0
	SSS Mainscheme	0	0
	SBES/SSS Mainscheme	0	0
	MBES/SSS Mainscheme	1630.32	1630.32
	SBES/MBES Crosslines	67.40	67.40
	Lidar Crosslines	0	0
Number of Bottom Samples			9
Number Maritime Boundary Points Investigated			0
Number of DPs			0
Number of Items Investigated by Dive Ops			0
Total SNM			33.44

Table 3: Hydrographic Survey Statistics

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

Survey Dates	Day of the Year
10/26/2019	299
10/27/2019	300
10/28/2019	301
10/29/2019	302
10/30/2019	303
10/31/2019	304
11/01/2019	305
11/02/2019	306
11/03/2019	307
11/04/2019	308
11/05/2019	309
11/06/2019	310
11/07/2019	311
11/08/2019	312
11/09/2019	313
11/10/2019	314
11/11/2019	315
11/13/2019	317
12/10/2019	344
12/11/2019	345
12/12/2019	346
06/25/2020	177
06/26/2020	178

Table 4: Dates of Hydrography

B. Data Acquisition and Processing

B.1 Equipment and Vessels

Leidos used their ISS-2000 software on a Windows 7 platform to acquire these survey data. Survey planning and data analysis were conducted using the Leidos SABER software on Red Hat Enterprise 7 Linux

platforms. Klein 3000 side scan sonar (SSS) data were collected on a Windows 7 platform using Klein's SonarPro software. Subsequent processing and review of the SSS data, including the generation of coverage mosaics, were accomplished using SABER.

A detailed description of the systems and vessel used to acquire and process these data is included in the Data Acquisition and Processing Report (DAPR) for OPR-E350-KR-19, delivered concurrently with this Descriptive Report (DR). There were no variations from the equipment configuration described in the DAPR.

B.1.1 Vessels

The following vessels were used for data acquisition during this survey:

Hull ID	***M/V Atlantic Surveyor***
LOA	110 feet
Draft	9 feet

Table 5: Vessels Used

Figure 5: M/V Atlantic Surveyor

The M/V Atlantic Surveyor (Figure 5) was used to collect multibeam echo sounder (MBES) (RESON SeaBat T50), side scan sonar (SSS) (Klein 3000), and sound speed data during twenty-four hours per day survey operations.

A detailed description of the vessel used is included in the DAPR.

B.1.2 Equipment

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

Manufacturer	Model	Type
Teledyne RESON (RESON)	SeaBat T50	MBES
Klein Marine Systems, Inc. (Klein)	3000	SSS
Applanix	POS/MV 320 V5	Positioning and Attitude System
AML Oceanographic	MVP30	Sound Speed System

Table 6: Major Systems Used

A detailed description of the equipment installed is included 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 4.13% of mainscheme acquisition.

Refer to Separates II for details about how the crossing analyses were performed and a complete discussion of each analysis and tabular results. Figure 6 summarizes the crossline comparison results.

Difference Grid	Minimum and Maximum CUBE Depth (meters) of Crossline Grid	IHO Order 1A Maximum Allowable Uncertainty (meters) for the Range of Depths	Percentage of Depth Differences Within IHO Order 1A Maximum Allowable Uncertainty
M/V Atlantic Surveyor Multibeam 50-centimeter Crossline (Class 1) to 50-centimeter Mainscheme	6.363 – 20.553	0.507 – 0.567	99.99%
M/V Atlantic Surveyor Multibeam 1-meter Crossline (Class 1) to 1-meter Mainscheme	17.764 – 40.523	0.551 – 0.726	99.99%

Figure 6: Summary of Crossing Analysis

B.2.2 Uncertainty

For specific details on the use and application of the SABER Total Propagated Uncertainty (TPU) model, refer to the DAPR. Once the TPU model was applied to the GSF bathymetry data, each beam was attributed with the horizontal uncertainty and the vertical uncertainty at the 95% confidence level. The vertical and horizontal uncertainty values, estimated by the TPU model for individual multibeam soundings, varied little across the dataset, tending to be most affected by beam angle. Individual soundings that had vertical and horizontal uncertainty values above IHO S-44 5th Edition, Order 1a were flagged as invalid during the uncertainty attribution.

As discussed in the DAPR, SABER generates two vertical uncertainty surfaces; the Hypothesis Standard Deviation (Hyp. StdDev) and the Hypothesis Average Total Propagated Uncertainty (Hyp. AvgTPU). A third vertical uncertainty surface is generated from the larger value of these two uncertainties at each node and is referred to as the Hypothesis Final Uncertainty (Hyp. Final Uncertainty).

Per HSSD Section 5.2.2.2, H13295 depth data fell within three grid resolutions (50-centimeter, 1-meter, and 4-meter). Leidos was granted a waiver (05 March 2020) and the H13295 data are presented at 50-centimeter and 1-meter grid resolution. The email correspondence for the grid resolution waiver is included within Appendix II of this Descriptive Report.

The final H13295 50-centimeter PFM CUBE surface contained final vertical uncertainties that ranged from 0.210 meters to 1.476 meters. The IHO Order 1a maximum allowable vertical uncertainty was calculated to range between 0.503 to 0.569 meters, based on the minimum CUBE depth (4.098 meters) and maximum CUBE depth (20.851 meters). Results from the SABER Check PFM Uncertainty function identified that there were 1,267nodes in the final H13295 50-centimeter PFM CUBE surface with final vertical uncertainties that exceeded IHO Order 1a allowable vertical uncertainty. Nodes were associated along features and shifting sand waves, discussed in Section D.2.7. The SABER Frequency Distribution Tool was also used to review the Hyp. Final Uncertainty surface within the final H13295 50-centimeter PFM grid. Results showed that 99.99% of all nodes had final uncertainties less than or equal to 0.569 meters.

The final H13295 1-meter PFM CUBE surface contained final vertical uncertainties that ranged from 0.210 meters to 0.716 meters. The IHO Order 1a maximum allowable vertical uncertainty was calculated to range between 0.545 to 0.781 meters, based on the minimum CUBE depth (16.623 meters) and maximum CUBE depth (44.153 meters). Results from the SABER Check PFM Uncertainty function identified that there were 20 nodes in the final H13295 1-meter PFM CUBE surface with final vertical uncertainties that exceeded IHO Order 1a allowable vertical uncertainty. These nodes were associated shifting sand waves, discussed in Section D.2.7.The SABER Frequency Distribution Tool was also used to review the Hyp. Final Uncertainty surface within the final H13295 1-meter PFM grid. Results showed that 99.99% of all nodes had final uncertainties less than or equal to 0.760 meters.

B.2.3 Junctions

Per the Project Instructions, analyses of the H13295 junctions with adjacent surveys were performed between H13295 and the surveys listed in Table 7. Figure 7 shows the general locality of H13295 as it relates to the sheets to which junctions were performed. Refer to Separates II for details about how junction analyses were performed and a complete discussion of each analysis and tabular results.

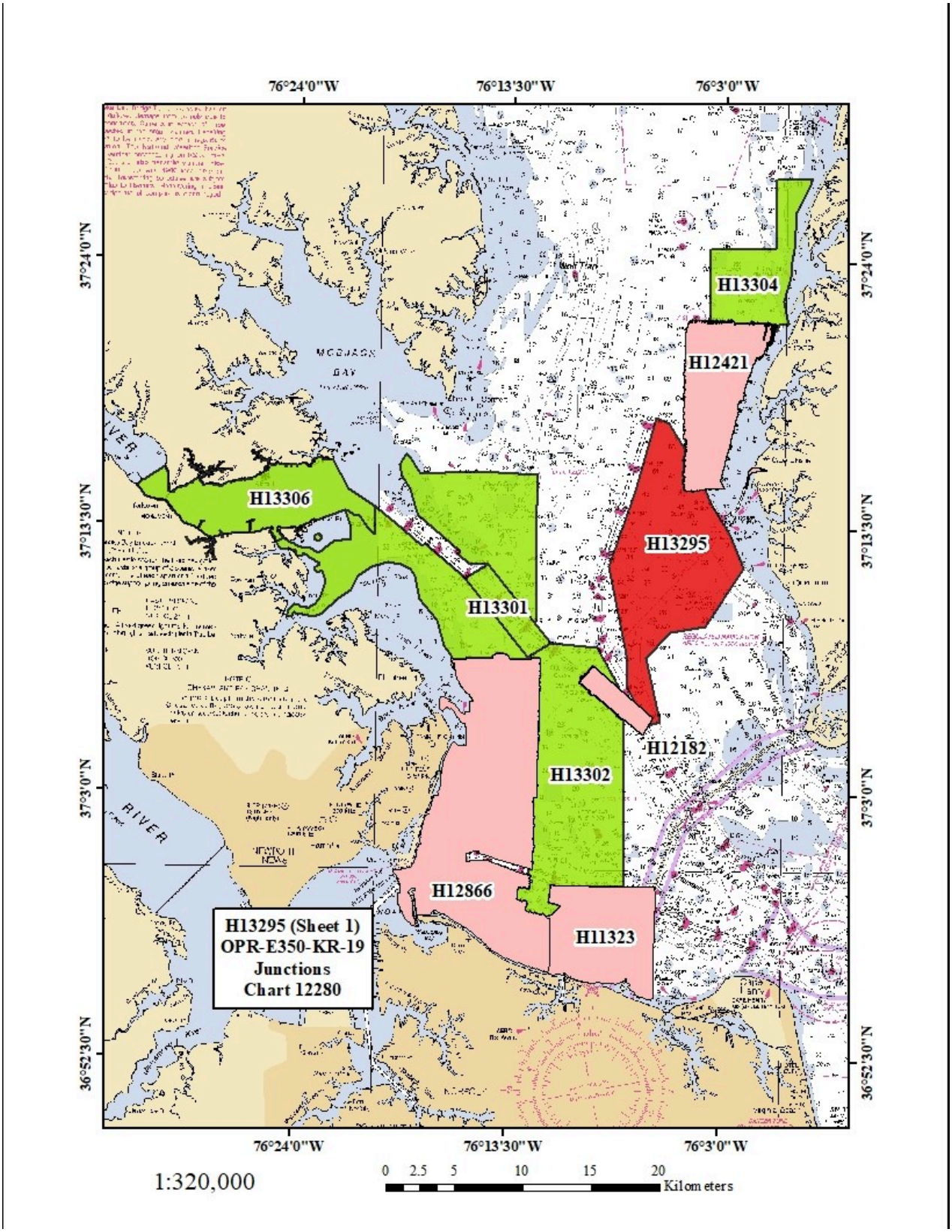

Figure 7: General Locality of H13295 with Junctioning Surveys

The following junctions were made with this survey:

Registry Number	Scale	Year	Field Unit	Relative Location
H12182	1:20000	2010	NOAA Ship Thomas Jefferson	SW
H12421	1:20000	2012	NOAA Ship Thomas Jefferson	NE

Table 7: Junctioning Surveys

H12182

H13295 junctions with H12182 to the southwest; 100% of the comparisons agreed within ±0.829 meters while 99.96% of the comparison results fell within the calculated maximum allowable TVU of 0.540 meters.

H12421

H13295 junctions with H12421 to the northeast; 100% of the comparisons agreed within ±1.965 meters while 77.22% of the comparison results fell within the calculated maximum allowable TVU of 0.710 meters.

B.2.4 Sonar QC Checks

Sonar system quality control checks were conducted as detailed in the DAPR; quality control checks conducted during H13295 are reported in Separates I.

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 factors which significantly impacted the soundings.

B.2.7 Sound Speed Methods

Sound Speed Cast Frequency: On the M/V Atlantic Surveyor, the MVP30 was the primary system used to collect sound speed profile (SSP) data, refer to the DAPR for additional details. SSP data were obtained at intervals frequent enough to meet depth accuracy requirements. Section 5.2.3.3 of the HSSD requires that if the sound speed measured at the sonar head differs by more than two meters/second from the commensurate profile data, then another cast shall be acquired.

All sound speed profiles applied for online bathymetry data collection were acquired within 500 meters of the bounds of the survey area as specified in Section 5.2.3.3 of the HSSD.

Confidence checks of the sound speed profile casts were conducted by comparing at least two consecutive casts taken with different SSP sensors. Six sound speed confidence checks were conducted during H13295 and the results can be found in Separates II within the “Comparison Cast Log” section.

All individual SSP files are delivered with the H13295 data and are broken out into sub-folders, which correspond to the purpose of each cast. Also, all individual SSP files for H13295 have been concatenated into four separate files based on the purpose of the cast, provided in CARIS format files (.svp), and delivered under (H13295/Processed/SVP/CARIS_SSP) on the delivery drive. In accordance with HSSD Section 8.3.6 H13295 data were collected over two years, the submission of the NCEI data is separated by calendar year. Refer to Separates II for additional details.

B.2.8 Coverage Equipment and Methods

All equipment and survey methods are detailed in the DAPR.

B.2.9 Multibeam Coverage Analysis

Leidos chose to achieve the coverage requirement using 200% side scan sonar coverage with concurrent multibeam bathymetry. To achieve this coverage, the M/V Atlantic Surveyor used a towed Klein 3000 SSS set to 50-meter range scale. Mainscheme line spacing was set to 40 meters, which ensured 200% SSS coverage.

The SABER Gapchecker program was used to flag MBES data gaps within the CUBE surface. Additionally, the entire surface was visually scanned for holidays at various points during the data processing effort. Additional survey lines were run to fill any holidays that were detected.

As referenced in Section B.2.2, the depth data for H13295 fell within multiple grid resolutions listed in the HSSD. Leidos received a waiver regarding the grid resolutions. A final review conducted on the CUBE Depth surfaces from the 50-centimeter and 1-meter PFM grids showed that there were no holidays as defined for object detection coverage surveys, HSSD Section 5.2.2.2.

Within the final CUBE surfaces (50-centimeter and 1-meter), there were instances where a three by one node gap exists, however, these were not considered holidays in the final multibeam CUBE surface as these instances generally resulted from either the holiday line data being slightly offset from the original line due to vessel line steering, or the swath width of the holiday lines being reduced compared to the original line due to water level differences.

The final H13295 CUBE PFM grids were examined for the number of soundings contributing to the chosen CUBE hypotheses for each node by running SABER's Frequency Distribution Tool on the Hypothesis Number of Soundings (Hyp. # Soundings) surface. The Hyp. # Soundings surface reports the number of soundings that were used to compute the chosen hypothesis. Analysis was conducted on the Hyp. # Soundings surfaces from each of the PFM grids to ensure that the requirements for object detection coverage surveys, as specified in HSSD Section 5.2.2.2 were met. Within the final 50-centimeter PFM grid 99.24% of all nodes contained five or more soundings; and in the 1-meter PFM grid 99.95% of all nodes contained five or more soundings.

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. Multibeam files associated with calibration are provided within the H13295/Processed/Sonar_Data/H13295_MB/Calibration_Files/ directory.

B.4 Backscatter

Side Scan Sonar (SSS) Coverage Analysis: For all details regarding SSS data processing, see the DAPR. Leidos chose to adhere to the coverage requirements in the Project Instructions using Object Detection Coverage, Option B (200% side scan sonar coverage with concurrent multibeam). As referenced in Section A.4, the Project Instructions provided a waiver to HSSD Section 6.1.2.3 for towed side scan towfish height. In waters less than 8 meters the towfish height above the bottom could be 6% of the range scale. Mosaics were analyzed for coverage at both 8% and 6% of range based on water depths greater or less than 8 meters.

Leidos generated two separate coverage mosaics at 1-meter cell size resolution as specified in Section 8.2.1 of the HSSD. The first 100% and second 100% coverage mosaics were independently reviewed using tools in SABER to verify data quality and swath coverage. The SABER Gapchecker routine was used to flag

data gaps within each of the 100% SSS coverage mosaics. Additionally, the entirety of each SSS surface was visually scanned for holidays at various points during the data processing effort. Additional survey lines were run to fill any holidays that were detected. Both coverage mosaics are determined to be complete and sufficient to meet the requirements contained within the Project Instructions and HSSD. Each 100 percent coverage mosaic is delivered as a single georeferenced raster file (datum of NAD83) in floating point GeoTIFF format, as specified in Sections 8.2.1 and 8.3.3 in the HSSD.

Multibeam Echo Sounder Seafloor Backscatter: Leidos collected MBES backscatter data with all GSF data acquired, in accordance with HSSD Section 6.2. The MBES settings used were checked to ensure acceptable quality standards were met and to mitigate acoustic saturation of the backscatter data. The MBES backscatter data acquired were written to the GSF in real-time by ISS-2000 and are delivered in the final GSF files for this sheet. Evaluation of backscatter data and processing were not required for OPR-E350-KR-19 and therefore no additional processing was performed by Leidos and no additional products were produced.

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
Leidos	SABER	5.4.0.30.1

Table 8: Primary bathymetric data processing software

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

Manufacturer	Name	Version
Leidos	SABER	5.4.0.30.1

Table 9: Primary imagery data processing software

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

The primary data processing software used for both bathymetry and imagery was SABER.

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
H13295_MB_50cm_MLLW_Final_1of6	BAG	50 centimeters	6.331 meters - 16.964 meters	N/A	Object detection coverage, Option B (200% side scan sonar coverage with concurrent multibeam)
H13295_MB_50cm_MLLW_Final_2of6	BAG	50 centimeters	5.525 meters - 12.762 meters	N/A	Object detection coverage, Option B (200% side scan sonar coverage with concurrent multibeam)
H13295_MB_50cm_MLLW_Final_3of6	BAG	50 centimeters	5.461 meters - 18.626 meters	N/A	Object detection coverage, Option B (200% side scan sonar coverage with concurrent multibeam)
H13295_MB_50cm_MLLW_Final_4of6	BAG	50 centimeters	4.098 meters - 20.396 meters	N/A	Object detection coverage, Option B (200% side scan sonar coverage with concurrent multibeam)
H13295_MB_50cm_MLLW_Final_5of6	BAG	50 centimeters	5.637 meters - 20.851 meters	N/A	Object detection

Surface Name	Surface Type	Resolution	Depth Range	Surface Parameter	Purpose
					coverage, Option B (200% side scan sonar coverage with concurrent multibeam)
H13295_MB_50cm_MLLW_Final_6of6	BAG	50 centimeters	8.910 meters - 20.339 meters	N/A	Object detection coverage, Option B (200% side scan sonar coverage with concurrent multibeam)
H13295_MB_1m_MLLW_Final	BAG	1 meters	16.623 meters - 44.153 meters	N/A	Object detection coverage, Option B (200% side scan sonar coverage with concurrent multibeam)
H13295_SSSAB_1m_100kHz_1of2	SSS Mosaic (.tif)	1 meters	0.00 meters - 0.00 meters	N/A	First 100% SSS
H13295_SSSAB_1m_100kHz_2of2	SSS Mosaic (.tif)	1 meters	0.00 meters - 0.00 meters	N/A	Second 100% SSS

Table 10: Submitted Surfaces

Object Detection Coverage Section 5.2.2.2 of the HSSD requires 50-centimeter node resolution for depths ranging from zero meters to 20 meters, 1-meter node resolution for depths ranging from 18 meters to 40 meters, and 4-meter node resolution for depths ranging from 36 meters to 80 meters. As noted in Section B.2.2, Leidos was granted a grid resolution waiver per correspondence with NOAA (Appendix II); Leidos generated CUBE PFM grids for H13295 at 50-centimeter and 1-meter resolution and used these surfaces to assess and document multibeam survey coverage for their respective depth ranges. Included within the waiver was the ability to provide the bathymetric coverage with minimum and maximum depth ranges that fell outside of the depth limits defined within the HSSD.

SABER populates the CUBE depth with either the node's chosen hypothesis or the depth of a feature or designated sounding set by the hydrographer, which overrides the chosen hypothesis. The range of CUBE depths of the H13295 50-centimeter and 1-meter PFM grids were from 4.098 meters (13.445 feet; 0.210 meters Total Vertical Uncertainty [TVU]) to 20.851 meters (68.409 feet; 0.210 meters TVU) and 16.623 meters (54.537 feet; 0.210 meters TVU) to 44.153 meters (144.859 feet; 0.239 meters TVU) respectively.

The final gridded bathymetry data are delivered as a Bathymetric Attributed Grid (BAG). The BAG files were exported from the CUBE PFM grid as detailed in the DAPR.

C. Vertical and Horizontal Control

Additional information discussing the vertical and horizontal control for this survey can be found in the DAPR.

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-E350-KR-19_NAD83_VDatum_MLLW.cov

Table 11: ERS method and SEP file

Refer to the DAPR for details regarding the application of VDatum to the MBES data files. No final tide note was provided from NOAA Center for Operational Oceanographic Products and Services (CO-OPS). While a final tide note was not required, a final tide note has been provided by Leidos in Appendix I.

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.

PPP

The vessel kinematic data (POS/MV files) were post-processed in Applanix POSPac software using the Applanix PP-RTX solution to generate the Smoothed Best Estimate of Trajectory (SBET) solutions which were applied through SABER to the multibeam data. Refer to the DAPR for additional information and for details regarding all antenna and transducer offsets. Any soundings with total horizontal uncertainties exceeding the maximum allowable IHO S-44 5th Edition Order 1a specifications were flagged as invalid and therefore were not used in the CUBE depth calculations.

D. Results and Recommendations

D.1 Chart Comparison

The chart comparisons were conducted using a combination of SABER and CARIS' HIPS and SIPS.

United States Coast Guard (USCG) District 5 Local Notice to Mariners (LNM) publications were reviewed for changes subsequent to the date of the Project Instructions and before the end of survey (as specified in Section 8.1.4 of the HSSD). The LNM reviewed were from week 42/19 (15 October 2019) until week 28/20 (14 July 2020).

H13295 data met data accuracy standards and bottom coverage requirements. Leidos recommends updating the common areas of all charts using data from this survey. Charting recommendations for new features, and updates to charted features, are documented in the H13295 S-57 FFF. Additional charted objects are discussed in later sections.

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?
US5VA13M	1:40000	41	10/24/2019	06/23/2020	NO
US5VA14M	1:40000	33	06/12/2019	06/23/2020	NO

Table 12: Largest Scale ENCs

US5VA13M

ENC US5VA13M covers the H13295 survey limit from 37° 08’ 30.60”N southward.

CUBE depths within H13295 agreed well with the charted depths across the contemporaneous survey area; observed depths were primarily within ±0.7 meters of charted depths (Figure 8). The depth contours on ENC US5VA13M generally agreed with depths that fell within the H13295 survey area (Figure 9).

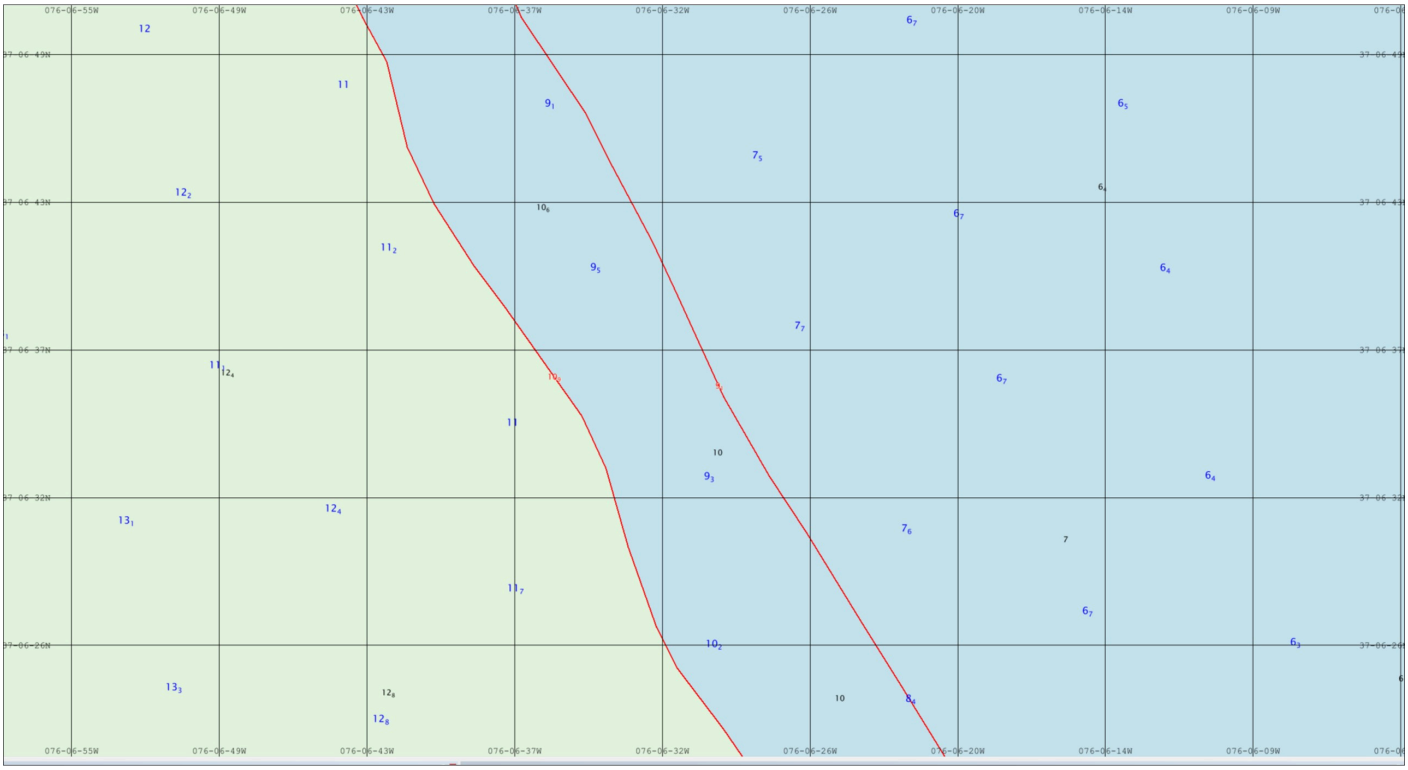

Figure 8: ENC US5VA13M Charted Soundings (black) with H13295 CUBE Depth Selected Soundings (blue)

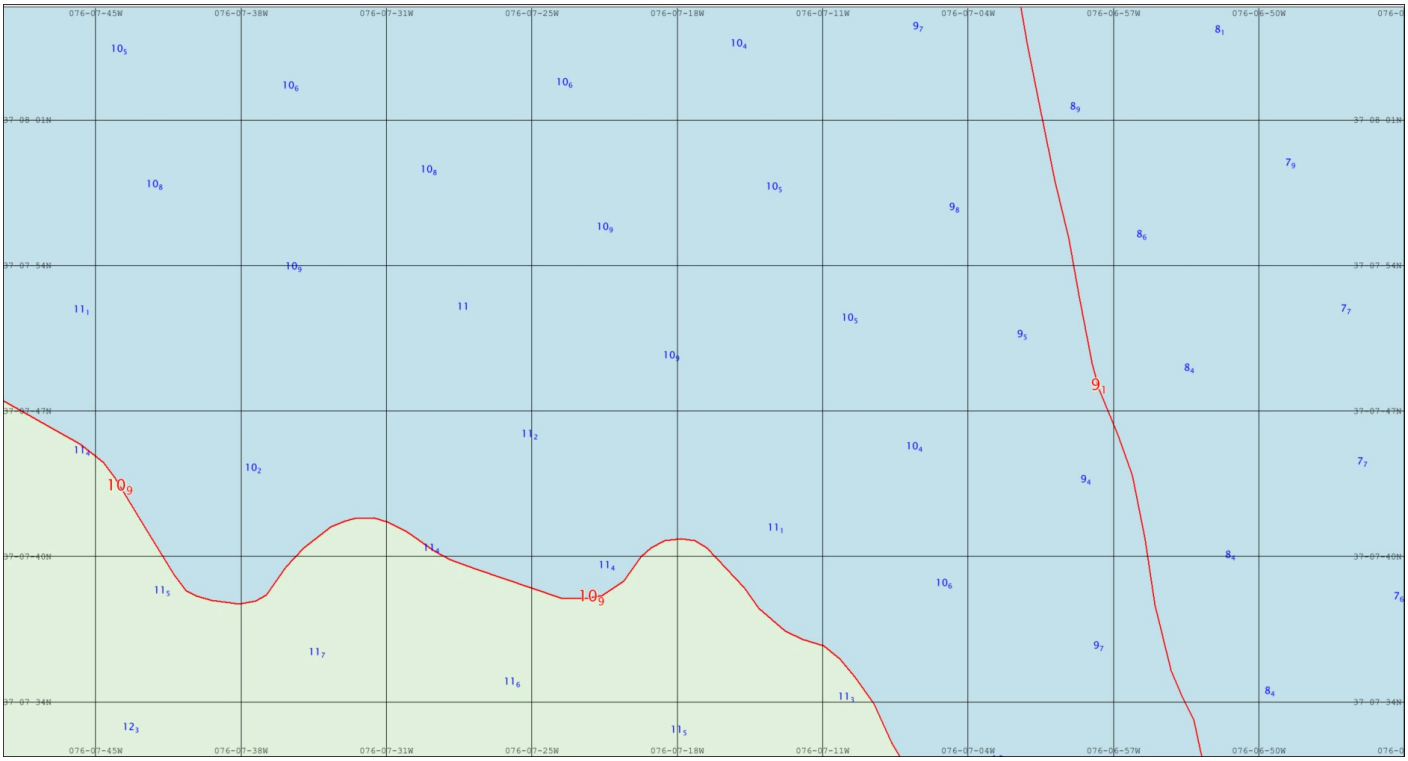

Figure 9: ENC US5VA13M with Charted Contour (red) with H13295 CUBE Depth Selected Soundings (blue)

US5VA14M

ENC US5VA14M covers the H13295 survey limit from 37° 08’ 30.60”N northward.

CUBE depths within H13295 agreed well with the charted depths across the contemporaneous survey area; observed depths were primarily within ±0.7 meters of charted depths (Figure 10).There was greater variability along the eastern extent of H13295 with observed depths deeper than charted depths (Figure 11). The depth contours on ENC US5VA14M generally agreed with depths that fell within the H13295 survey area (Figure 12).

LNM 26/20 notes that on June 29, 2020, the Coast Guard established a new Quarantine Anchorage R. Anchorage area R is contained within ENC US5VA14M and is coincident to the H13295 survey area along the western extent (Figure 13). This has been updated on the latest US5VA14M ENC.

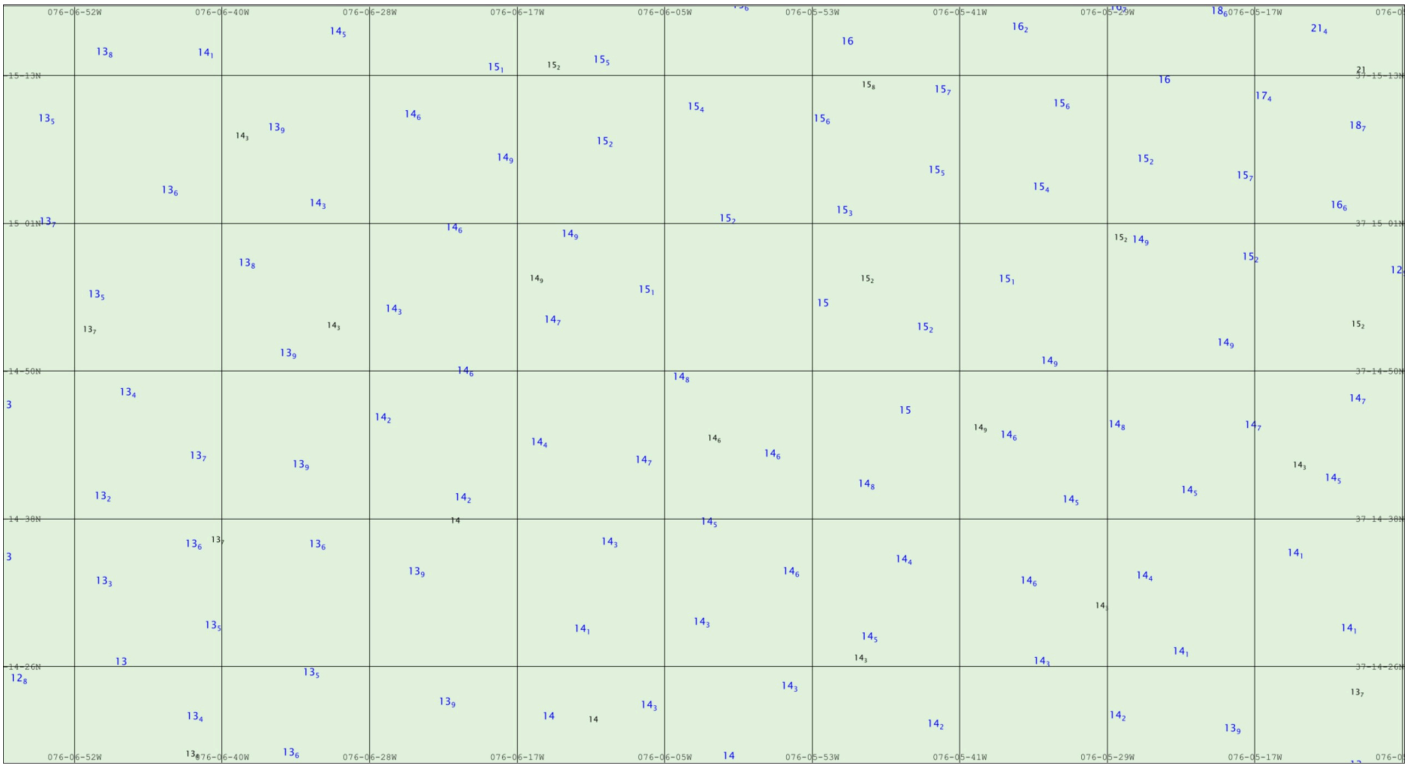

Figure 10: ENC US5VA14M Charted Soundings (black) with H13295 CUBE Depth Selected Soundings (blue)

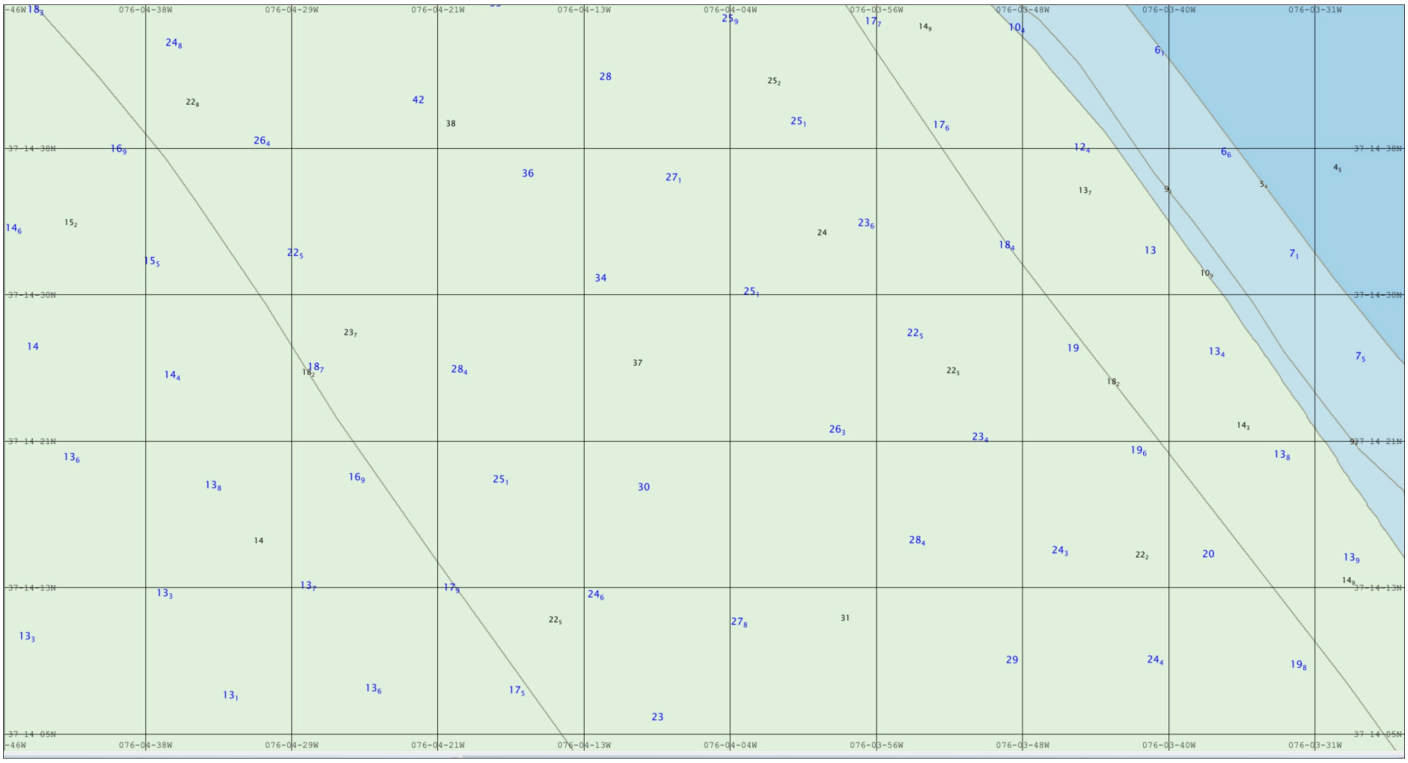

Figure 11: ENC US5VA14M Charted Soundings (black) with H13295 CUBE Depth Selected Soundings (blue)

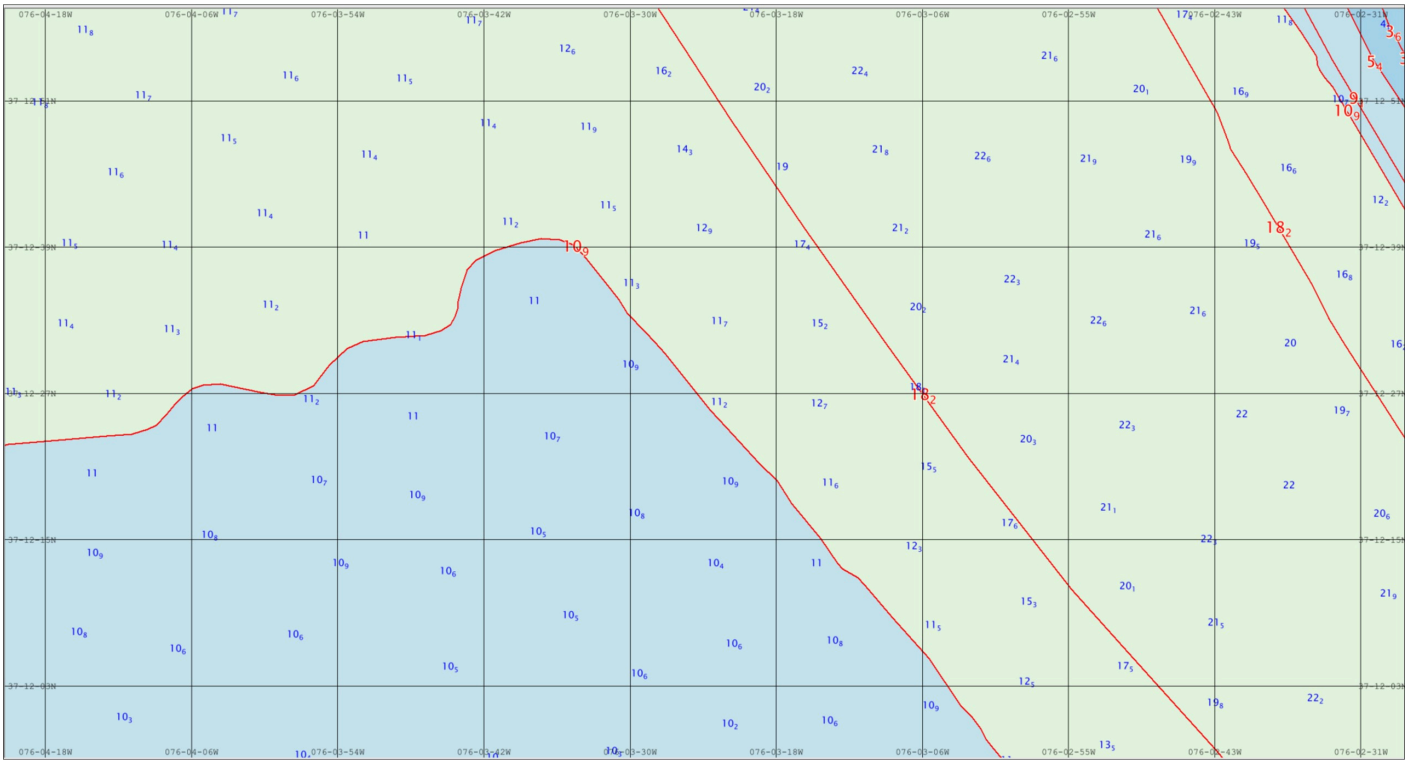

Figure 12: ENC US5VA14M Charted Contour (red) with H13295 CUBE Depth Selected Soundings (blue)

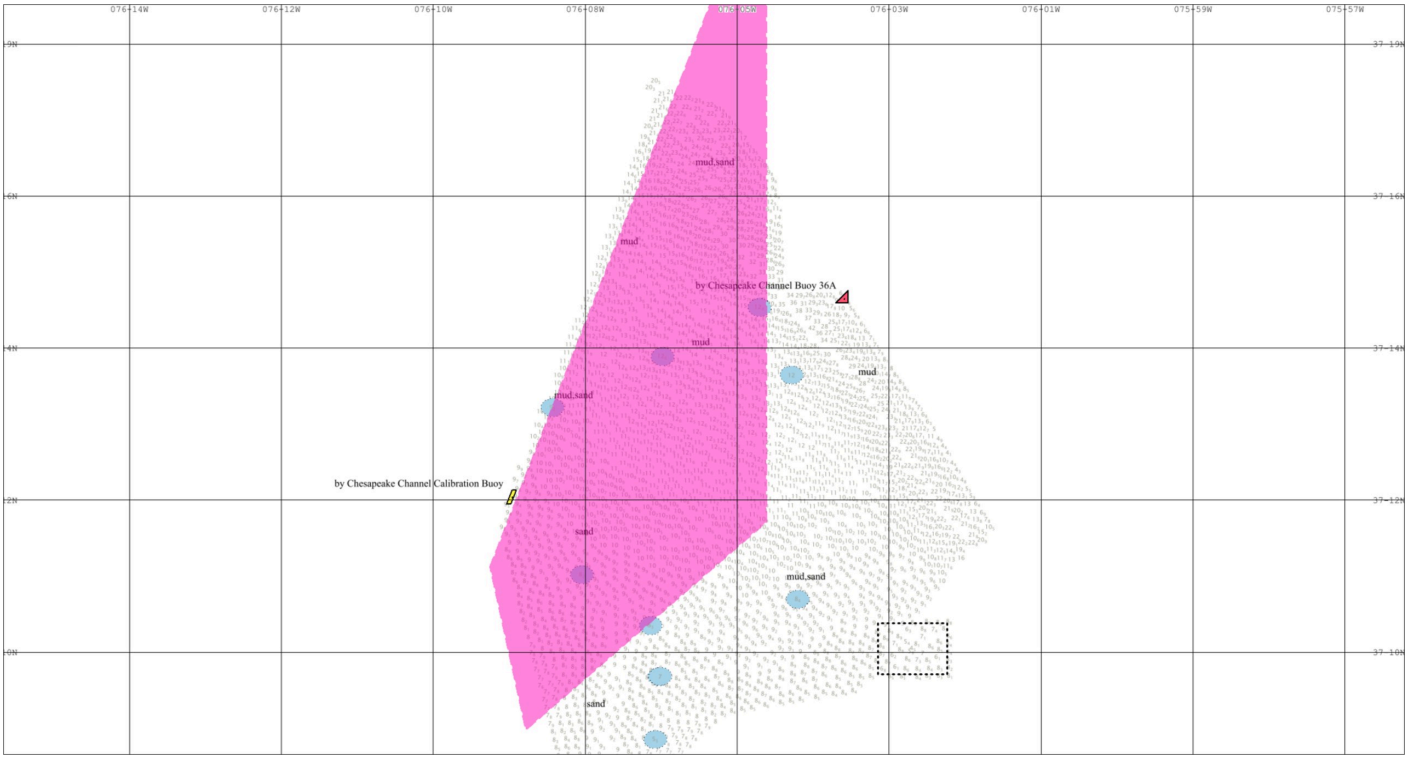

Figure 13: ENC US5VA14M with H13295 Survey Area and Anchorage R (magenta)

D.1.2 Maritime Boundary Points

No Maritime Boundary Points were assigned for this survey.

D.1.3 Charted Features

There were six assigned charted features in the final CSF (Final_OPR-E350-KR-19_CSF.000) within the SOW of H13295; however none of these features contained the label PA, ED, PD, or Rep. Per HSSD Section 8.1.4, these charted features are not addressed in this section, refer to the H13295 S-57 FFF (H13295_FFF.000) for all the details and recommendations regarding these features.

D.1.4 Uncharted Features

See the H13295 S-57 FFF for all the details and recommendations regarding new uncharted features investigated.

D.1.5 Shoal and Hazardous Features

There were no significant shoals or hazardous features within the area covered by this survey other than those referenced in Section D.1.4.

Leidos submitted one DTON for H13295. The DTON was submitted in S-57 format to the Atlantic Hydrographic Branch (AHB).

• DTON 01 was submitted on 04 November 2019, per HSSD Section 1.6.1 the observed wreck was submitted as an obstruction. This DTON was submitted to Nautical Data Brach (NDB) and Marine Chart Division (MCD) on 05 November 2019.
• DTON 02 was submitted to the US Coast Guard on 22 July 2020, for a missing buoy. The submission was made to the non-NOAA source authorities in accordance with HSSD Section 1.6.2. The buoy was not present, refer to the H13295 S-57 FFF.

Copies of the email correspondence for Leidos' submissions of H13295 DTON Report, as well as the DTON recommendation file, are included within Appendix II of this Descriptive Report. Figure 14 details the submitted DTON and the associated Feature number and object class in the S-57 FFF.

DTON Report Name	Date Submitted to AHB	AHB Submitted to NDB and MCD	NDB Registration	Date Submitted to USCG	Feature Number(s)	S-57 Object Class in the S-57 FFF
H13295_DTON_01.000	2019-11-04	2019-11-05	DD-31596	N/A	06	WRECKS
H13295_USCG_ATON_Discrepancy_Report.pdf	N/A	N/A	N/A	2020-07-22	N/A	BOYSPP

Figure 14: DTON Reports

D.1.6 Channels

There were no assigned channels within the H13295 SOW from the final CSF. However, as the survey limit acquired by Leidos extended beyond the assigned SOW; there is some data within H13295 coincident to the York Spit Channel. Survey depths did not exceed the controlling depths. Within the final CSF was an assigned anchorage area, Quarantine Anchorage Area Q, which was covered in its entirety by H13295. No significant features were identified within the anchorage area. This anchorage area has been expanded and is captured on ENC US5VA14M on 29 June 2020 (LNM 26/20) and renamed to be Quarantine Anchorage Area R see Section D.1.1. Per the investigation requirements from the CSF for the York Spit Channel and anchorage area these features are not included in the H13295 FFF.

D.1.7 Bottom Samples

In accordance with both the Project Instructions and Section 7.2.3 of the HSSD, bottom characteristics were obtained for H13295. Bottom characteristics were acquired at the nine locations assigned in the final PRF

(Final_OPR-E350-KR-19_PRF.000). Leidos did not modify the bottom sample locations from the location proposed by NOAA in the PRF. Bottom characteristics are included in the S-57 FFF. In addition, images of the sediment obtained for each bottom sample are referenced in the S-57 FFF and are included on the delivery drive under the folder H13295/Processed/Multimedia.

D.2 Additional Results

D.2.1 Shoreline

All features in the CSF within the assigned Survey Limits of H13295 were resolved. There were no assigned features inshore of the NALL.

D.2.2 Aids to Navigation

There were no assigned aids to navigation (ATON) within the SOW of H13295 from the final CSF. There were four charted unassigned ATONs which fell within survey limits of H13295; three within ENC US5VA13M and one within ENC US5VA14M. Three of these ATONs were observed on station and serving their intended purpose. Per the investigation requirements from the CSF, as they were on station and serving intended purpose, they are included in the H13295 FFF with description of retain (H13295 Feature 13, 14, and 15). There was one ATON that was not observed during H13295 data collection; therefore Leidos submitted an ATON Discrepancy Report (Appendix II) regarding the absence of Chesapeake Channel Calibration Buoy (ENC US5VA14M). See the H13295 S-57 FFF for all the details and recommendations regarding the ATONs.

D.2.3 Overhead Features

There were no overhead features within this survey area.

D.2.4 Submarine Features

Within the final CSF there was one assigned submarine cable with investigation requirements “Visually confirm feature object existence. If discrepancy, discuss in DR (see HSSD Section 8.1.4). Do not include feature in FFF”. The disused submarine cable was covered by 200% SSS with concurrent multibeam within the survey limits of H13295, no signature of a cable was observed within the area. This assigned submarine cable is not included in the H13295 FFF as there was no discrepancy from the CSF or ENC US5VA14M.

D.2.5 Platforms

No platforms exist within this survey area.

D.2.6 Ferry Routes and Terminals

No ferry routes or terminals exist within this survey area.

D.2.7 Abnormal Seafloor and/or Environmental Conditions

Sand waves were observed along the eastern extent of H13295. Bathymetric data acquired on different days indicated that these sand waves were shifting. While generally in the same area, the positional differences caused the CUBE calculated uncertainty (Hyp, Final Uncertainty) to be increase and in some areas exceed the allowable uncertainty. Figure 15 illustrates sand waves that had shifted during data acquisition. In the image, the bottom right show colors each line, the data from 30 October 2019 (JD 303 in red) and 02 November 2019 (JD 306 in yellow) in agreement while more recent data from 26 June 2020 (JD 178 in green and blue) also in agreement.

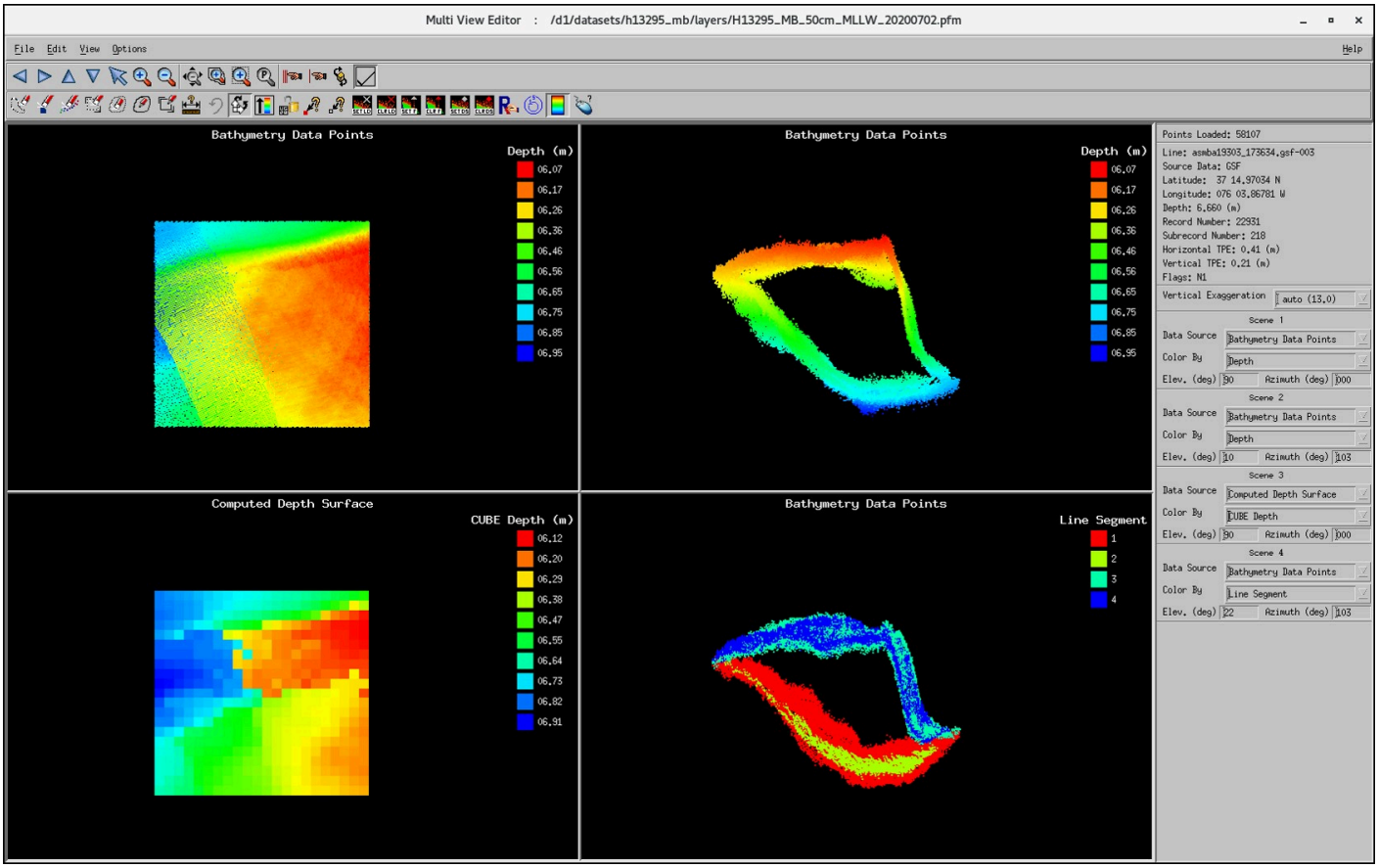

Figure 15: 2019 (Red and Yellow Lines) vs. 2020 (Blue Lines) Bathymetry Data Causing Elevated Uncertainties (Shown in Red) Due to Migrating Sand Waves

D.2.8 Construction and Dredging

No construction or dredging exists for this survey area.

D.2.9 New Survey Recommendation

No new survey recommendations are made for the area surrounding this survey area.

D.2.10 Designated Soundings

As discussed in the DAPR within Generic Sensor Format (GSF) there are separate flags for a designated sounding of a feature. During data analysis, these flags are used to preserve the shoalest sounding relative to the computed depth surface. All depths flagged as a feature or designated sounding in GSF override the CUBE best estimate of the depth in the final BAG files. GSF feature flags were set on significant features within H13295, and all information is contained in the H13295 S-57 FFF.

D.2.11 Final Feature S-57 File

Included with the H13295 delivery is the S-57 FFF, H13295_FFF.000. Details on how this file was generated and quality controlled can be found in the DAPR. The S-57 FFF delivered for H13295 contains millimeter precision for the value of sounding (VALSOU) attribute. As specified in Section 2.2 of the HSSD, the S-57 FFF is in the WGS84 datum and is unprojected with all depth units in meters. Per HSSD Section 2.2 bathymetry data were positioned to NAD83. All significant and recommended for charting features found in H13295 are included within the S-57 FFF.

In accordance with the HSSD, Leidos addressed all assigned objects from the provided CSF S-57 file that fell within the bounds of H13295 in the S-57 FFF.

D.2.12 Side Scan Sonar Contacts S-57 File

Included with the H13295 delivery is the Side Scan Sonar Contact S-57 File, H13295_SSCon.000. Details on how this file was generated and quality controlled can be found in the DAPR. As specified in Section 2.2 of the HSSD, the S-57 file is in the WGS84 datum and is unprojected with all depth units in meters. Per HSSD Section 2.2 side scan data were positioned to NAD83.

Side scan sonar contacts were investigated and confirmed using SABER Contact Review. All side scan contacts are retained within the Side Scan Sonar Contact S-57 File. For each contact included in this S-57 file, a JPEG image of the side scan contact is included under the NOAA Extended Attribute field “images”.

D.2.13 Coast Pilot Review Report

In accordance with the Project Instructions and HSSD Section 8.1.3, a Coast Pilot Review was performed for OPR-E350-KR-19. Within the Coast Pilot Field Report (OPR-E350-KR-19CoastPilotReport.docx) provided by NOAA to Leidos on 28 October 2019, there were assigned investigation items and inquiries from the Nautical Publications Branch. During survey, Leidos reviewed and updated the assigned and additional Coast Pilot paragraphs as possible for the survey area, port of call, and areas frequently transited. Recommendations were documented using the text from the 53rd Edition (19 July 2020) and are marked following the HSSD Section 8.1.3. Leidos followed NOAA's strategy for designating omitted paragraphs as provided in the delivered Coast Pilot Field Report (OPR-E350-KR-19CoastPilotReport.docx). Leidos submitted the Coast Pilot Field Report on 26 July 2020. The email correspondence for Leidos' submission of the Coast Pilot Review Report is included within the Project Correspondence.

D.2.14 Inset Recommendation

No inset recommendations are made for the area covered by this survey.

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.

This Descriptive Report, all BAG files, 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 Hydrographic Surveys Specifications and Deliverables, Project Instructions, and Statement of Work. These data are adequate to supersede charted data in their common areas. This survey is complete and no additional work is required. Previously, or concurrently, submitted deliverables for OPR-E350-KR-19 are provided in the table below.

Report Name	Report Date Sent
OPR-E350-KR-19_Marine_Species_ Awareness_Training_Record.pdf	2020-07-20
OPR-E350-KR-19_20200724.zip (NCEI Sound Speed Data 2019 data only)	2020-07-24
OPR-E350-KR-19_Coast Pilot Review Report.pdf	2020-07-26
OPR-E350-KR-19_DAPR.pdf	2020-07-29

Approver Name	Approver Title	Approval Date	Signature
Bridget W. Bernier	Data Processing Manager	07/29/2020	Bridget W Bernier Digitally signed by Bridget W Bernier Date: 2020.07.29 14:24:50 -04'00'