

H13304

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

DESCRIPTIVE REPORT

Type of Survey: Basic Hydrographic Survey

Registry Number: H13304

LOCALITY

State(s): Virginia

General Locality: Southern Chesapeake Bay

Sub-locality: 5 NM North of Cherrystone Reef

2020

CHIEF OF PARTY
Bridget W. Bernier

LIBRARY & ARCHIVES

Date:

HYDROGRAPHIC TITLE SHEET

H13304

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: **5 NM North of Cherrystone Reef**

Scale: **20000**

Dates of Survey: **07/15/2020 to 10/22/2020**

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: Divemaster s, Inc., 15 Pumpshire Road, Toms River, NJ 08753; OARS, 8705 Shoal Creek Blvd, Suite 109, Austin, TX 78757.

Leidos Doc. 20-TR-025. 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 H13304

Project: OPR-E350-KR-19

Locality: Southern Chesapeake Bay

Sublocality: 5 NM North of Cherrystone Reef

Scale: 1:20000

July 2020 - October 2020

Leidos

Chief of Party: Bridget W. Bernier

A. Area Surveyed

The area surveyed was a section of the Southern Chesapeake Bay 5 NM North of Cherrystone Reef (Figure 1).

A.1 Survey Limits

Data were acquired within the following survey limits:

Northwest Limit	Southeast Limit
37° 27' 22.32" N 076° 03' 56.37" W	37° 20' 54.64" N 075° 58' 46.38" W

Table 1: Survey Limits

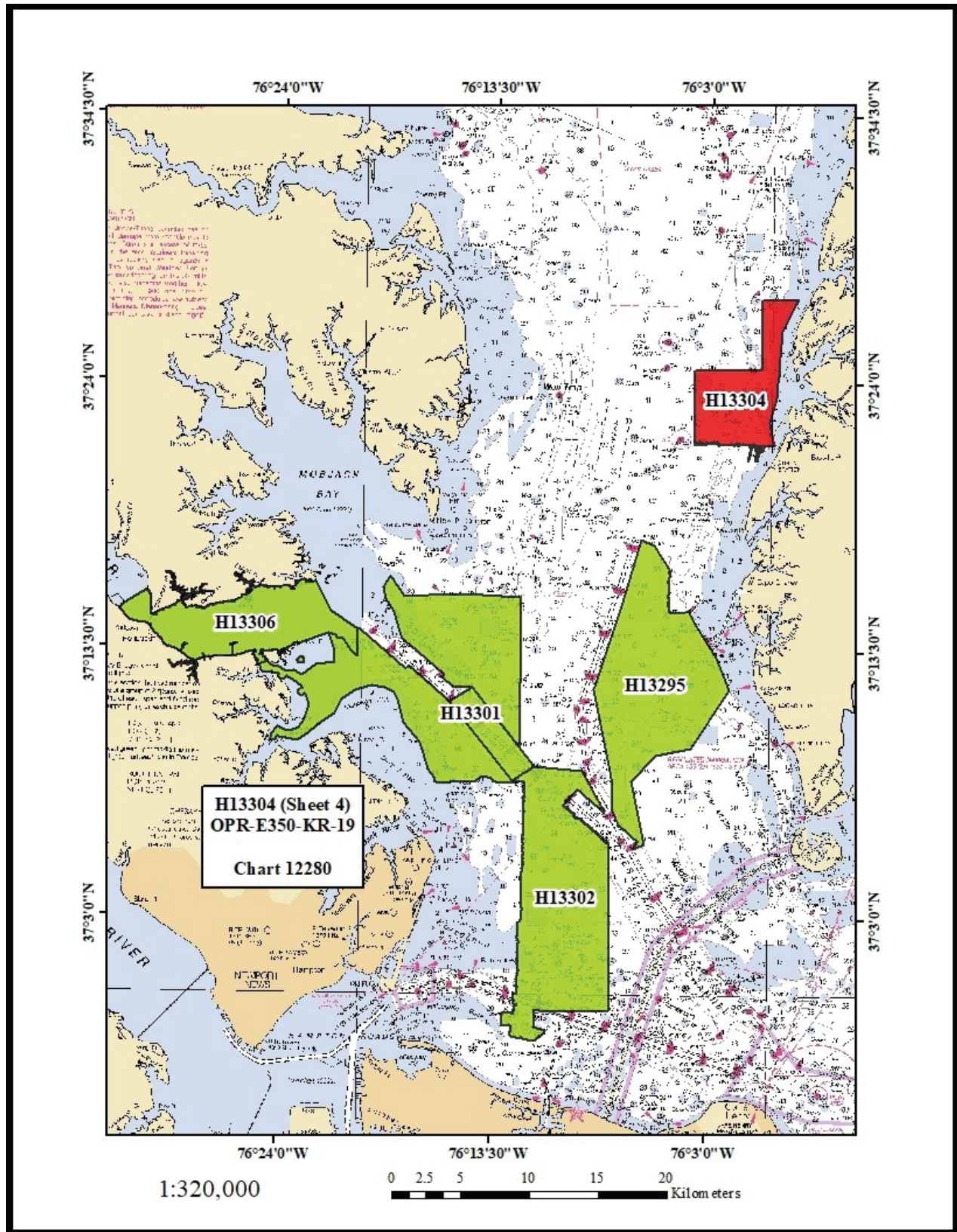


Figure 1: H13304 Survey Bounds

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.

H13304 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. OPR-E350-KR-19_PRF_10282019.000, received 28 October 2019
5. OPR-E350-KR-19_CSF_10282019.000, received 28 October 2019
6. OPR-E350-KR-19_Southern_Chesapeake_Bay_Questions.pdf, dated 05 November 2019
7. OPR_E350_KR_19_1305M219FNCNJ0356 Mod P20002 - No-cost Extension.pdf, dated 07 August 2020
8. OPR-E350-KR-19 Survey LNM and NALL.pdf, dated 15 October 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
H13304	Complete Coverage (Refer to HSSD Section 5.2.2.3)
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 COR/Project Manager 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 Complete Coverage, Option B (100% 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 and Figure 3).

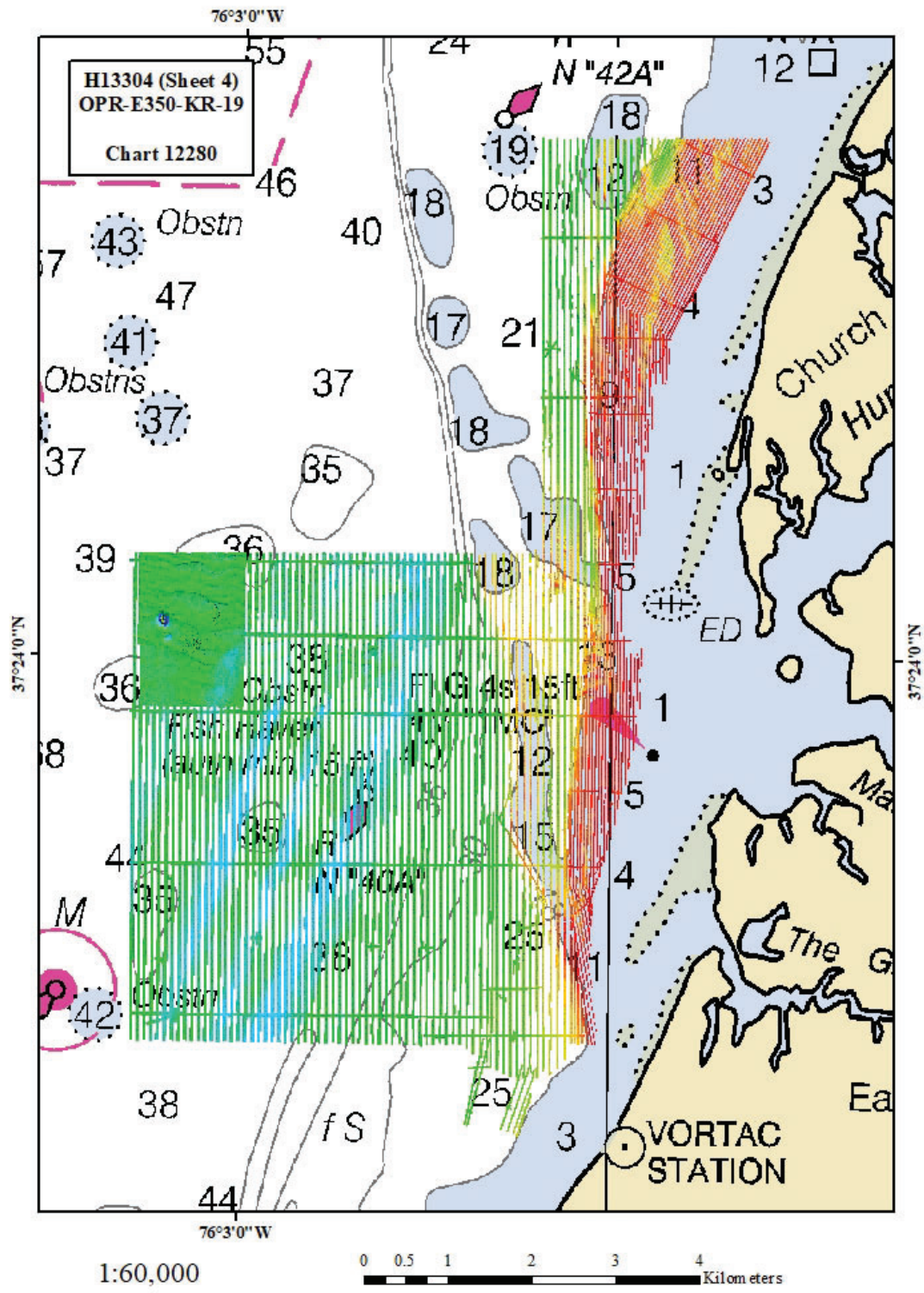


Figure 2: Final Bathymetry Coverage for H13304

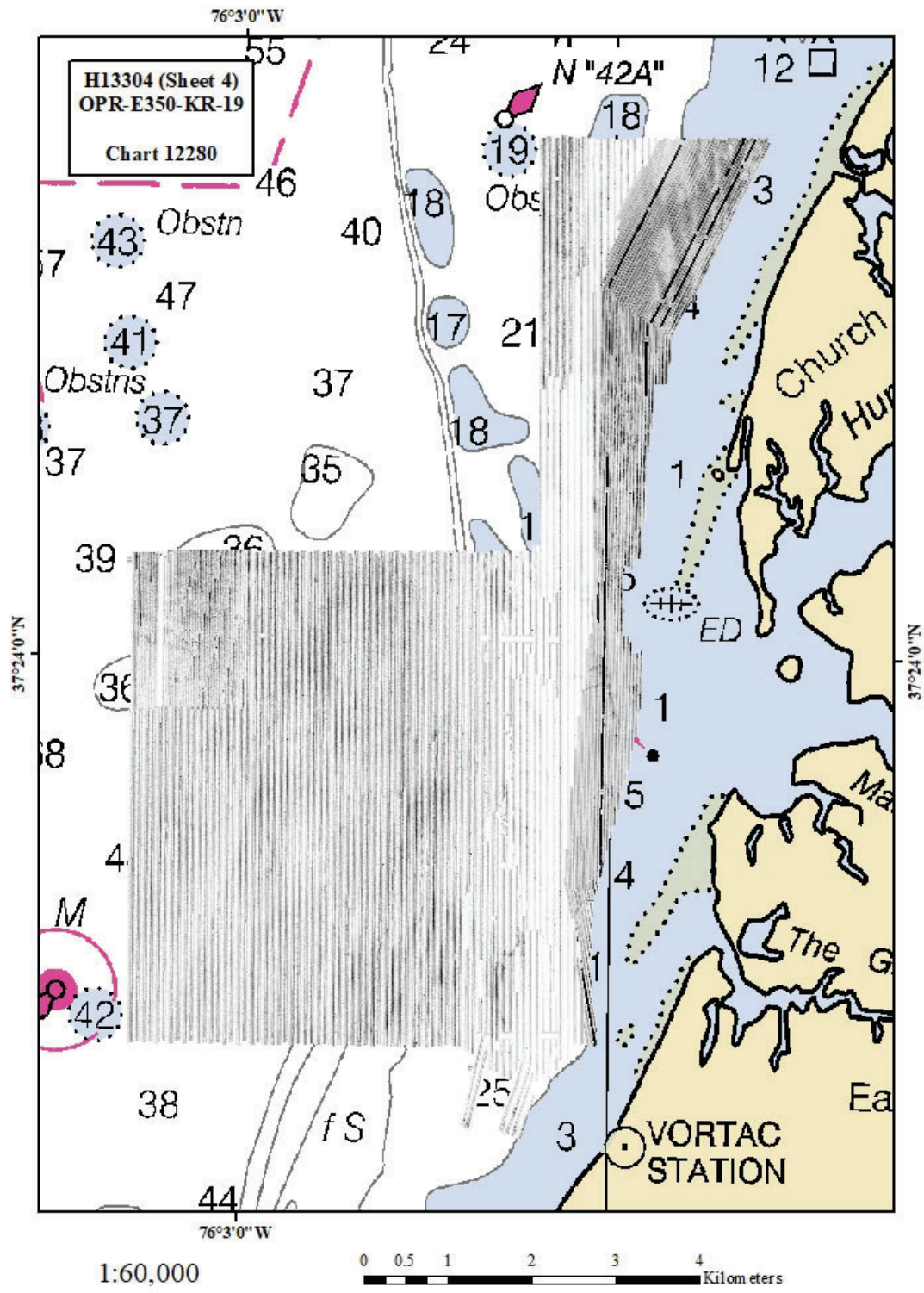


Figure 3: Final Side Scan Coverage for H13304 (100% coverage)

A.5 Survey Statistics

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

	HULL ID	<i>M/V Atlantic Surveyor</i>	<i>R/V Oyster Bay II</i>	Total
LNM	SBES Mainscheme	0	0	0
	MBES Mainscheme	0	0	0
	Lidar Mainscheme	0	0	0
	SSS Mainscheme	0	0	0
	SBES/SSS Mainscheme	0	0	0
	MBES/SSS Mainscheme	236.62	159.28	395.90
	SBES/MBES Crosslines	10.42	11.27	21.69
	Lidar Crosslines	0	0	0
Number of Bottom Samples				4
Number Maritime Boundary Points Investigated				0
Number of DPs				0
Number of Items Investigated by Dive Ops				0
Total SNM				12.70

Table 3: Hydrographic Survey Statistics

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

Survey Dates	Day of the Year
07/15/2020	197
07/16/2020	198
07/17/2020	199
07/18/2020	200
08/05/2020	218
08/06/2020	219
08/07/2020	220
08/08/2020	221
08/09/2020	222
08/19/2020	232
08/20/2020	233
10/05/2020	279
10/22/2020	296

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) rev 1 for OPR-E350-KR-19, delivered concurrently with this Descriptive Report (DR). There were no variations from the equipment configuration described in the DAPR rev 1.

B.1.1 Vessels

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

Hull ID	<i>M/V Atlantic Surveyor</i>	<i>R/V Oyster Bay II</i>
LOA	110 feet	30 feet
Draft	9 feet	3 feet

Table 5: Vessels Used



Figure 4: M/V Atlantic Surveyor



Figure 5: R/V Oyster Bay II

The M/V Atlantic Surveyor (Figure 4) 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. The R/V Oyster Bay II (Figure 5) was used to collect MBES (RESON SeaBat 7125 SV1), SSS (Klein 4900), and sound speed data during twelve hours per day survey operations.

A detailed description of the vessel used is included in the DAPR rev 1.

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
Teledyne RESON (RESON)	SeaBat 7125 SV1	MBES
Klein Marine Systems, Inc. (Klein)	3000	SSS
Klein Marine Systems, Inc. (Klein)	4900	SSS
Applanix	POS/MV 320 V5	Positioning and Attitude System
AML Oceanographic	MVP30	Sound Speed System
AML Oceanographic	BASEX2	Sound Speed System

Table 6: Major Systems Used

A detailed description of the equipment installed is included in the DAPR rev 1.

B.2 Quality Control

B.2.1 Crosslines

Multibeam/single beam echo sounder/side scan sonar crosslines acquired for this survey totaled 5.48% 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
Mainscheme to Crossline (Class 1) (all valid multibeam) 1-meter	1.632 – 14.593	0.500 – 0.535	99.99%
M/V Atlantic Surveyor multibeam 1-meter Crossline (Class 1) to 1-meter Mainscheme	6.320 – 14.593	0.507 – 0.535	100.00%
R/V Oyster Bay II multibeam 1-meter Crossline (Class 1) to 1-meter Mainscheme	1.632 – 13.821	0.500 – 0.531	100.00%
M/V Atlantic Surveyor RESON SeaBat T50 multibeam to R/V Oyster Bay II RESON SeaBat 7125 SV1 multibeam 1-meter	1.632 – 14.593	0.500 – 0.535	99.99%

Figure 6: Summary of Repeatability 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 rev 1. 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 rev 1, 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).

The final H13304 1-meter PFM CUBE surface contained final vertical uncertainties that ranged from 0.210 meters to 0.772 meters. The IHO Order 1a maximum allowable vertical uncertainty was calculated to range between 0.500 to 0.556 meters, based on the minimum CUBE depth (1.410 meters) and maximum CUBE depth (18.749 meters). Results from the SABER Check PFM Uncertainty function identified that there were two nodes in the final H13304 1-meter PFM CUBE surface with final vertical uncertainties that exceeded IHO Order 1a allowable vertical uncertainty. These nodes were associated with objects within the charted fish haven. The SABER Frequency Distribution Tool was also used to review the Hyp. Final Uncertainty surface within the final H13304 1-meter PFM grid. Results showed that 99.99% of all nodes had final uncertainties less than or equal to 0.556 meters.

B.2.3 Junctions

Per the Project Instructions, analyses of the H13304 junctions with adjacent surveys were performed between H13304 and the survey listed in Table 7. Figure 7 shows the general locality of H13304 as it relates to the sheet to which junctions were performed. Refer to Separates II for details about how junction analyses were performed and a complete discussion of the analysis and tabular results.

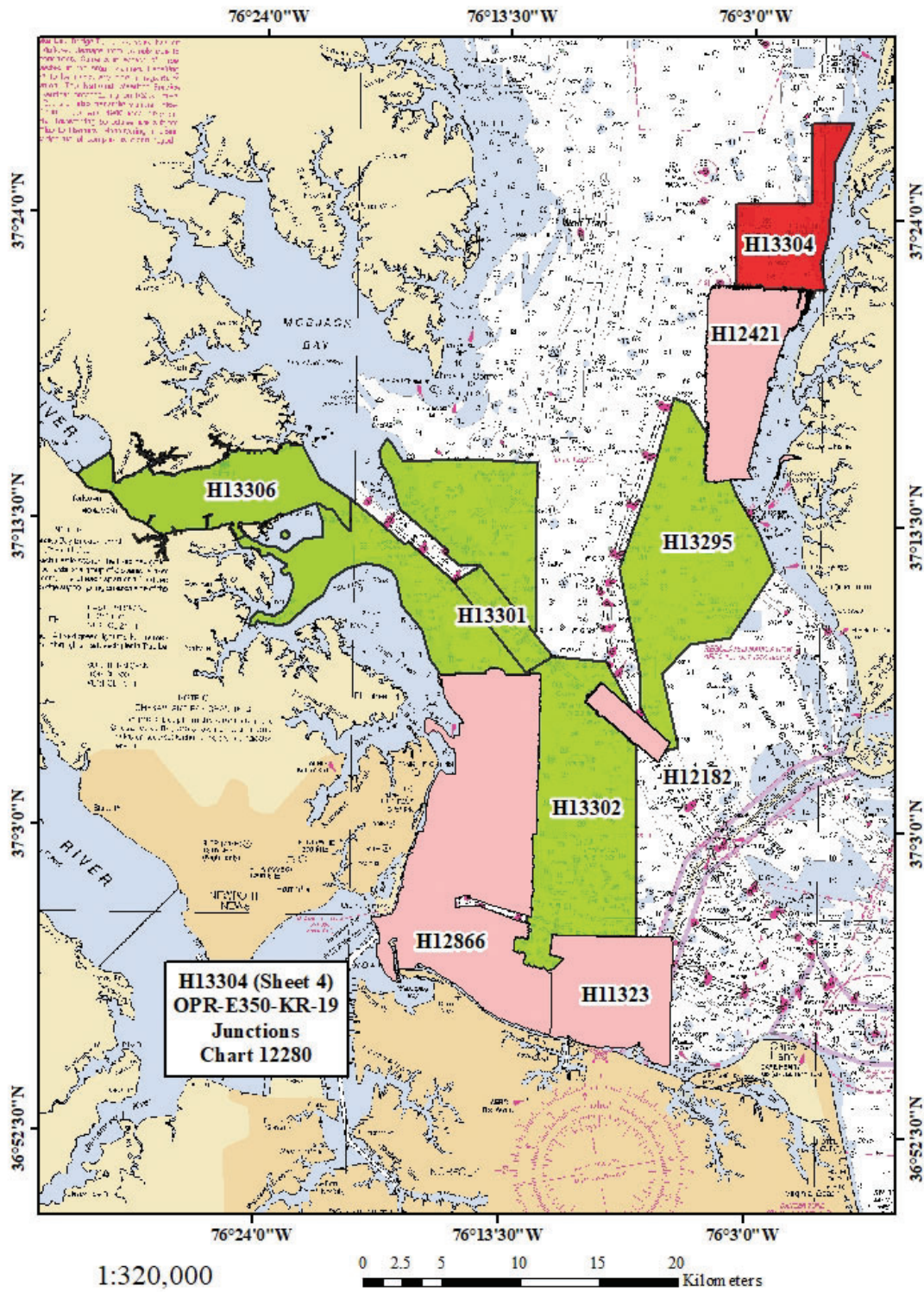


Figure 7: General Locality of H13304 with Junctioning Surveys

The following junctions were made with this survey:

Registry Number	Scale	Year	Field Unit	Relative Location
H12421	1:20000	2012	NOAA Ship Thomas Jefferson	S

Table 7: Junctioning Surveys

H12421

H13304 junctions with H12421 to the south; 100% of the comparisons agreed within ± 1.618 meters while 99.88% of the comparison results fell within the calculated maximum allowable TVU of 0.53 meters.

B.2.4 Sonar QC Checks

Sonar system quality control checks were conducted as detailed in the DAPR rev 1; quality control checks conducted during H13304 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

The R/V Oyster Bay II MBES data occasionally exhibited an artifact due to minor vibrations in the pole mount setup; attributed to sea state, currents, and vessel speed. The artifact was observed in the outer beams and when present it was generally within 2 to 3 centimeters and occasionally was observed in the range of 10 centimeters. The outer beam artifact had no significant impact on the final CUBE surface. When observed, these artifacts were within the IHO Order 1a allowable uncertainty standards as described in Section B.2.2.

Additionally, in discrete areas along the eastern boundary in shallow water depths, approximately 2 meters and less, the MBES, RESON 7125 SV1, had a reduced swath attributed to bottom characteristics. Additional holiday lines were run producing the same results. Figure 8 illustrates the multibeam ping data on the left

(colored by depth) with resulting CUBE depth on the right. In areas where this occurred Leidos ensured that the final valid survey data met HSSD requirements.

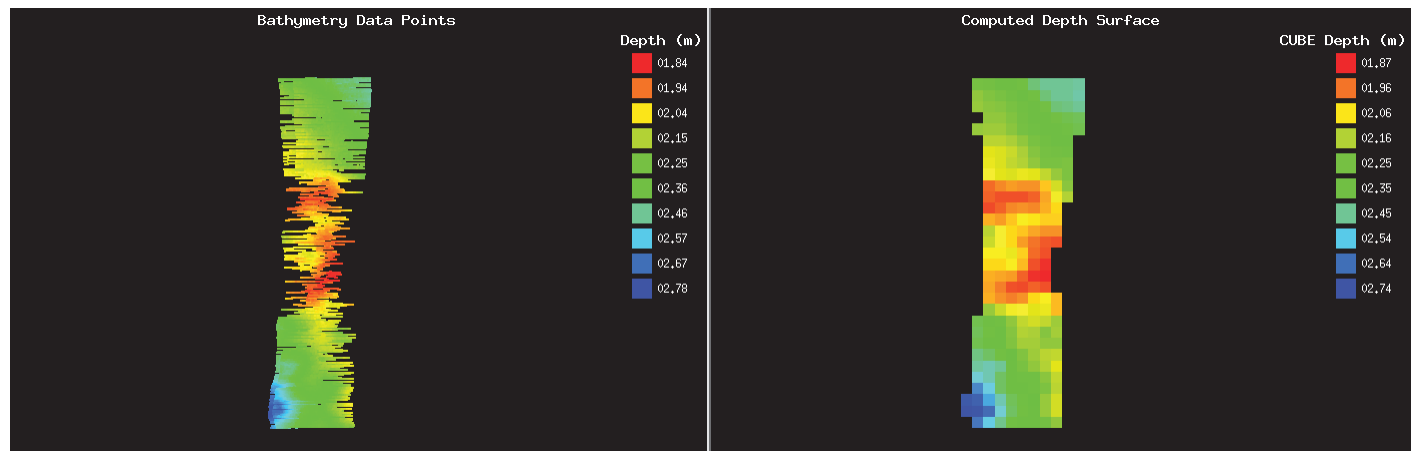


Figure 8: Reduced Multibeam Swath

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 rev 1 for additional details. On the R/V Oyster Bay II, the BASE-X2 was the primary system used to collect SSP data, refer to the DAPR rev 1 for additional details. SSP data were obtained at intervals frequent enough to meet depth accuracy requirements as specified in Section 5.2.3.3 of the HSSD.

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. Nine sound speed confidence checks were conducted during H13304, three from the M/V Atlantic Surveyor and six from the R/V Oyster Bay II, the results can be found in Separates II within the “Comparison Cast Log” section.

All individual SSP files are delivered with the H13304 data and are broken out into sub-folders, which correspond to the purpose of each cast. Also, all individual SSP files for H13304 have been concatenated into four separate files based on the purpose of the cast, provided in CARIS format files (.svp), and delivered under (H13304/Processed/SVP/CARIS_SSP) on the delivery drive. In accordance with HSSD Section 8.3.6, H13304 NCEI data will be submitted prior to the delivery of the last sheet for OPR-E350-KR-19. Refer to Separates II for additional details.

B.2.8 Coverage Equipment and Methods

All equipment and survey methods are detailed in the DAPR rev 1.

B.2.9 Multibeam Coverage Analysis

Leidos chose to achieve the coverage requirement using 100% side scan sonar coverage with concurrent multibeam bathymetry. To achieve this coverage, the SSS was set to 25-meter or 50-meter range scale, main scheme survey lines were collected at 40-meter or 80-meter, respectfully, to ensure 100% 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.

A final review of the CUBE Depth surface of the H13304 1-meter PFM showed that there were no holidays as defined for complete coverage surveys in Section 5.2.2.3 of the HSSD.

The final H13304 CUBE PFM grid was 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 surface of the PFM grid to ensure that the requirements for complete coverage surveys, as specified in HSSD Section 5.2.2.3 were met. Within the final 1-meter PFM grid 99.53% 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 rev 1.

B.3.2 Calibrations

All sounding systems were calibrated as detailed in the DAPR rev1. Multibeam files associated with calibration are provided within the H13304/Processed/Sonar_Data/H13304_MB/Calibration_Files/ directory.

B.4 Backscatter

Side Scan Sonar (SSS) Coverage Analysis: For all details regarding SSS data processing, see the DAPR rev 1. Leidos chose to adhere to the coverage requirements in the Project Instructions using Complete Coverage, Option B (100% side scan sonar coverage with concurrent multibeam). The HSSD Section 7.3.4 stated that 100% SSS coverage was insufficient to disprove a charted feature. Therefore, 100% SSS coverage was collected and verified for the entire survey area, and an additional 100% SSS coverage would have been collected over CSF assigned objects that were not found, to verify disproval. An additional 100% SSS coverage was not required as no feature disprovals were necessary during H13304, refer to the H13304 S-57 FFF. As referenced in Section A.4, the Project Instructions provided a waiver to HSSD Section 6.1.2.3 for 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 a single coverage mosaics at 1-meter cell size resolution as specified in Section 8.2.1 of the HSSD. The 100% coverage mosaic was independently reviewed using tools in SABER to verify data quality and swath coverage. The SABER Gapchecker routine was used to flag data gaps within the 100% SSS coverage mosaic. Additionally, the entirety of the 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. The coverage mosaics is determined to be complete and sufficient to meet the requirements contained within the Project Instructions and HSSD. The 100% 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
H13304_MB_1m_MLLW_Final	BAG	1 meters	1.410 meters - 18.749 meters	N/A	Complete coverage, Option B (100% side scan sonar coverage with concurrent multibeam)
H13304_SSSAB_1m_500kHz_900kHz_1of1	SSS Mosaic (.tif)	1 meters	0 meters - 0 meters	N/A	100% SSS

Table 10: Submitted Surfaces

Complete Coverage Section 5.2.2.3 of the HSSD requires one-meter node resolution for depths ranging from zero meters to 20 meters. Leidos generated CUBE PFM grids for H13304 at one-meter resolution.

The CUBE Depth surface of the final H13304 1-meter PFM (containing all valid depth data) was used to assess and document multibeam survey coverage. 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 H13304 1-meter PFM was from 1.410 meters (4.626 feet; 0.210 meters Total Vertical Uncertainty [TVU]) to 18.749 meters (61.512 feet; 0.210 meters TVU).

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 rev 1.

C. Vertical and Horizontal Control

Additional information discussing the vertical and horizontal control for this survey can be found in the DAPR rev 1.

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 rev 1 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 rev 1 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 46/20 (17 November 2020).

H13304 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 H13304 S-57 FFF. Additional charted objects are discussed in later sections.

D.1.1 Electronic Navigational Charts

The following are the largest scale ENC's, which cover the survey area:

ENC	Scale	Edition	Update Application Date	Issue Date	Preliminary?
US5VA10M	1:40000	26	05/22/2020	11/17/2020	NO
US5VA14M	1:40000	33	06/12/2019	09/29/2020	NO

Table 12: Largest Scale ENC's

US5VA10M

ENC US5VA10M covers the H13304 survey limit from 37° 23' 30.49"N northward.

CUBE depths within H13304 agreed well with the charted depths across the contemporaneous survey area; observed depths were primarily within ± 0.5 meters of charted depths (Figure 9). There was greater variability along the eastern extent of H13304 with observed depths shoaler than charted depths (Figure 10). The depth contours on ENC US5VA10M generally agreed with depths that fell within the H13304 survey area (Figure 11).

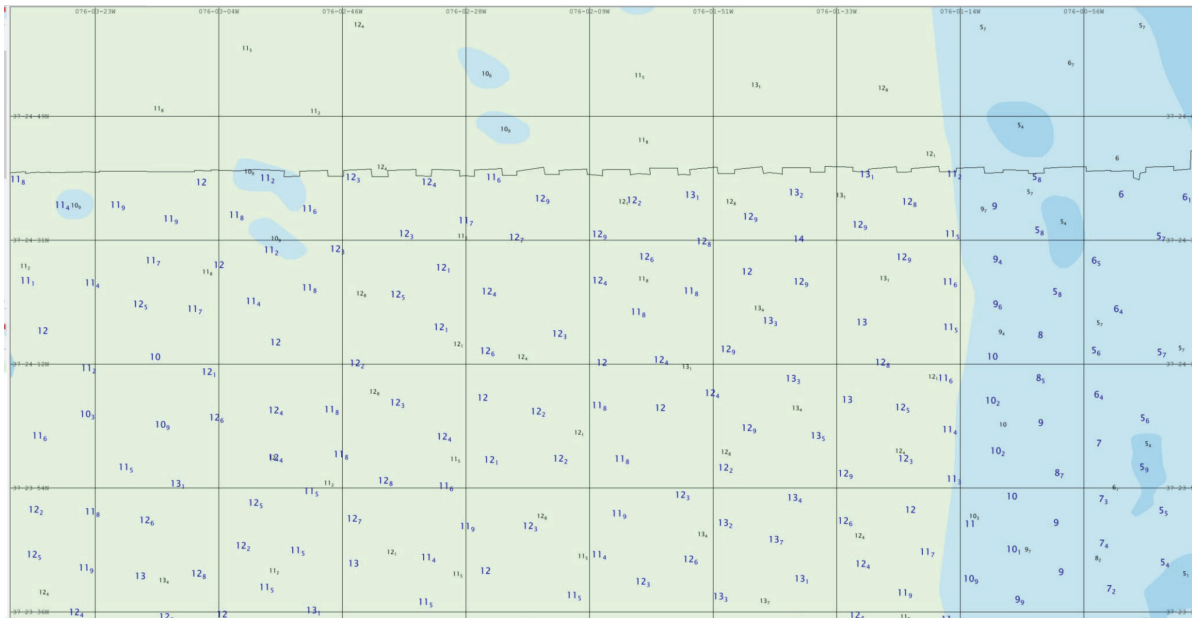


Figure 9: ENC US5VA10M Charted Soundings (black) with H13304 CUBE Depth Selected Soundings (blue)

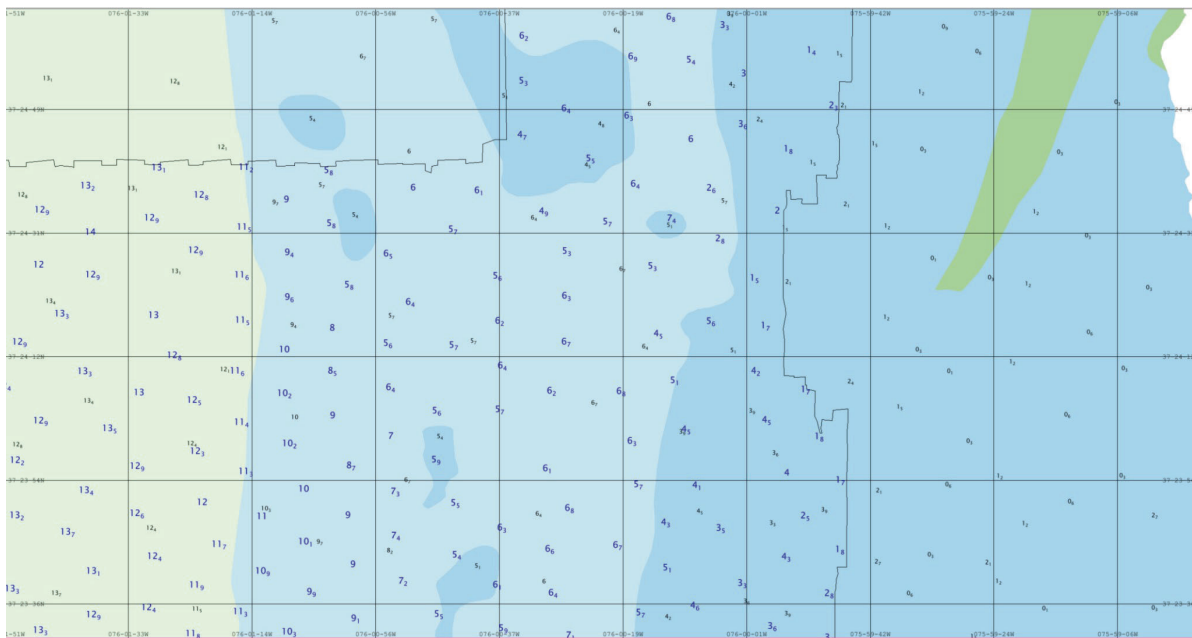
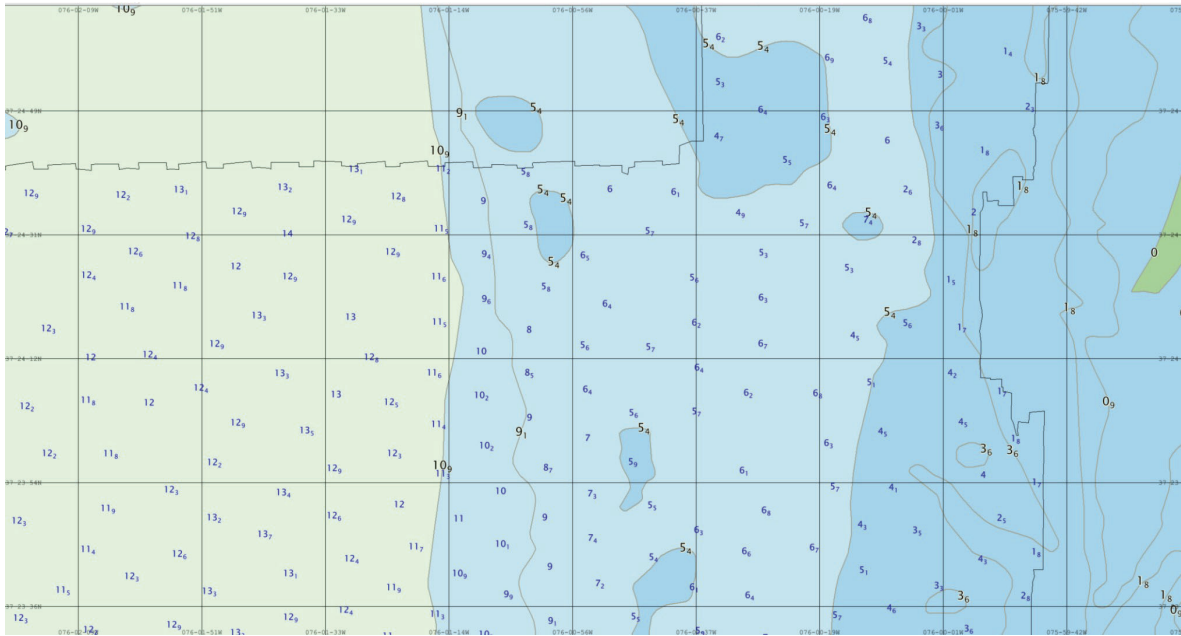


Figure 10: ENC US5VA10M Charted Soundings (black) with H13304 CUBE Depth Selected Soundings (blue)



*Figure 11: ENC US5VA10M with Charted Contour (black)
with H13304 CUBE Depth Selected Soundings (blue)*

US5VA14M

ENC US5VA14M covers the H13304 survey limit from 37° 23' 30.15"N southward.

CUBE depths within H13304 agreed well with the charted depths across the contemporaneous survey area; observed depths were primarily within ± 0.5 meters of charted depths (Figure 12). There was greater variability along the eastern extent of H13304 with observed depths shallower than charted depths (Figure 13). The depth contours on ENC US5VA14M generally agreed with depths that fell within the H13304 survey area (Figure 14).

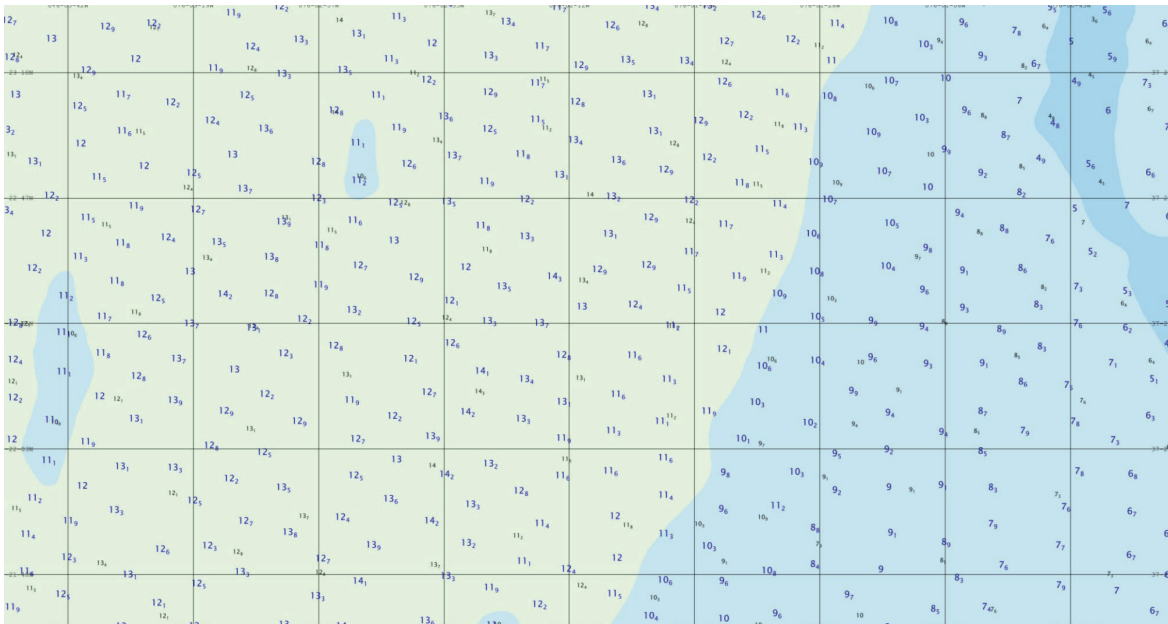


Figure 12: ENC US5VA14M Charted Soundings (black) with H13304 CUBE Depth Selected Soundings (blue)

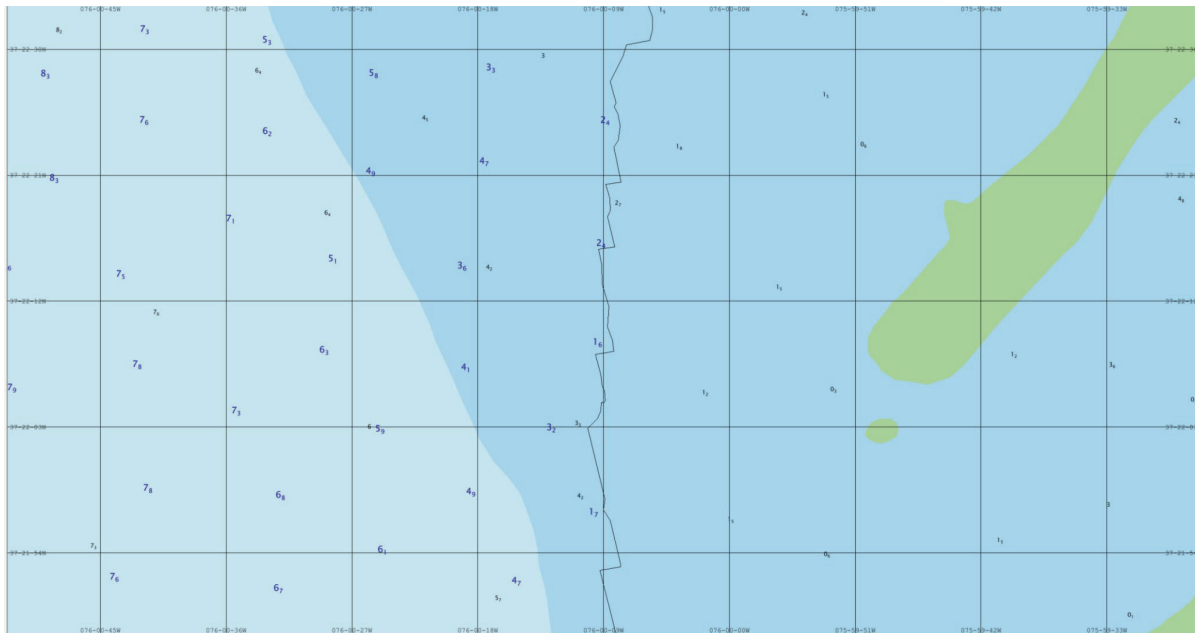


Figure 13: ENC US5VA14M Charted Soundings (black) with H13304 CUBE Depth Selected Soundings (blue)

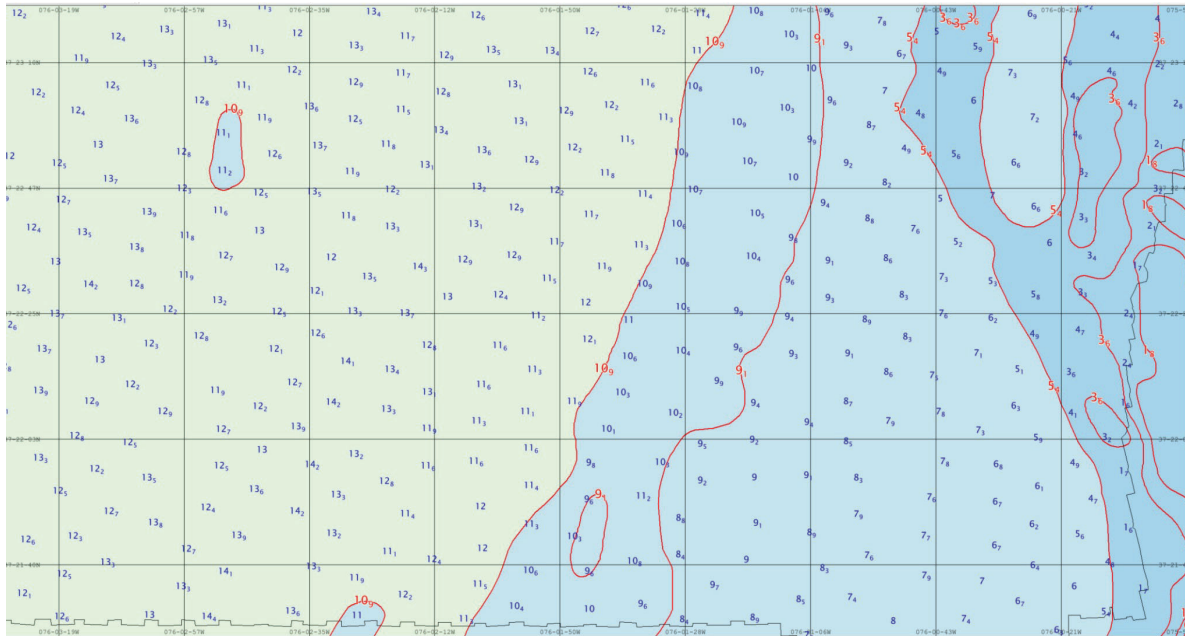


Figure 14: ENC US5VA14M Charted Contour (red) with H13304 CUBE Depth Selected Soundings (blue)

D.1.2 Maritime Boundary Points

No Maritime Boundary Points were assigned for this survey.

D.1.3 Charted Features

There were two assigned charted features in the final CSF (OPR-E350-KR-19_CSF_10282019.000) within the SOW of H13304; 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 H13304 S-57 FFF (H13304_FFF.000) for all the details and recommendations regarding these features.

D.1.4 Uncharted Features

See the H13304 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.

D.1.6 Channels

There were no channels within this survey area.

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 H13304. Bottom characteristics were acquired at the four locations assigned in the final PRF (OPR-E350-KR-19_PRF_10282019.000). 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 H13304/Processed/Multimedia.

D.2 Additional Results

D.2.1 Shoreline

All features in the CSF within the assigned Survey Limits of H13304 were resolved. There were no assigned features inshore of the NALL.

D.2.2 Aids to Navigation

There was one assigned aid to navigation (ATON) within the SOW of H13304 from the final CSF. The ATON was observed on station and serving its intended purpose. Per the investigation requirements from the CSF, as it was on station and serving intended purpose, it is included in the H13304 FFF with description of retain (H13304 Feature 3).

D.2.3 Overhead Features

There were no overhead features within this survey area.

D.2.4 Submarine Features

There were no submarine features charted or identified within this survey area.

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

No abnormal seafloor or environmental conditions, as defined in Section 8.1.3 of the HSSD, exist within this survey area other than those discussed in Section B.2.6.

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 rev 1 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 H13304, and all information is contained in the H13304 S-57 FFF.

D.2.11 Final Feature S-57 File

Included with the H13304 delivery is the S-57 FFF, H13304_FFF.000. Details on how this file was generated and quality controlled can be found in the DAPR rev 1. The S-57 FFF delivered for H13304 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 H13304 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 H13304 in the S-57 FFF.

D.2.12 Side Scan Sonar Contacts S-57 File

Included with the H13304 delivery is the Side Scan Sonar Contact S-57 File, H13304_SSCon.000. Details on how this file was generated and quality controlled can be found in the DAPR rev 1. 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. A Coast Pilot Field Report rev 1 was submitted on 01 December 2020 as new areas were navigated since the original submission as survey effort were on-going at time of original delivery.

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
H13295_DR.pdf	2020-07-29
H13302_DR.pdf	2020-07-30
OPR-E350-KR-19_Coast Pilot Review Report_rev1.pdf	2020-12-01
OPR-E350-KR-19_Marine_Species_Awareness_Training_Record_rev1.pdf	2020-12-02
OPR-E350-KR-19_DAPR_rev1.pdf	2020-12-04

Approver Name	Approver Title	Approval Date	Signature
Bridget W. Bernier	Data Processing Manager	12/04/2020	Bridget W Bernier <small>c=US, o=Leidos, ou=A01410C00000172D9DA294E00010820, cn=Bridget W Bernier 2020.12.03 13:59:11 -05'00'</small>

APPENDIX I. TIDES AND WATER LEVELS**Field Tide Note**

A field tide note was not required for H13304.

Final Tide Note

Per the Project Instructions H13304 multibeam data were to be corrected to Mean Lower Low Water (MLLW) by utilizing ellipsoid referenced survey (ERS) techniques. Ellipsoid to chart datum transformation was accomplished through the use of the VDatum separation model. As the VDatum was used for the final datum transformation, no final tide note was provided nor required from NOAA.

The on-line times for acquisition of valid hydrographic data are presented in the Abstract Times of Hydrography (Table A-1 and Table A-2).

Abstract Times of Hydrography

Project: OPR-K350-KR-19

Registry No.: H13304

Contractor Name: Leidos

Date: 04 December 2020

Sheet Designation: 4

Inclusive Dates: 15 July 2020 – 22 October 2020

Field work is complete.

Begin Date	Begin Julian Day	Begin Time	End Date	End Julian Day	End Time
15 July 2020	197	06:54:00	15 July 2020	197	23:59:59
16 July 2020	198	00:00:00	16 July 2020	198	19:00:00
17 July 2020	199	20:09:00	17 July 2020	199	23:59:59
18 July 2020	200	00:00:00	18 July 2020	200	23:54:00
19 August 2020	232	15:04:00	19 August 2020	232	23:59:59
20 August 2020	233	00:00:00	20 August 2020	233	06:29:00

Table A-1: Abstract Times of Hydrography, H13304 M/V Atlantic Surveyor

Begin Date	Begin Julian Day	Begin Time	End Date	End Julian Day	End Time
05 August 2020	218	13:40:00	05 August 2020	218	20:55:00
06 August 2020	219	12:03:00	06 August 2020	219	20:30:00
07 August 2020	220	11:55:00	07 August 2020	220	21:18:00
08 August 2020	221	13:13:00	08 August 2020	221	20:01:00
09 August 2020	222	12:02:00	09 August 2020	222	21:43:00
05 October 2020	279	15:11:00	05 October 2020	279	20:25:00
22 October 2020	296	14:15:00	22 October 2020	296	19:15:00

Table A-2: Abstract Times of Hydrography, H13304 R/V Oyster Bay II

Transmittal Letter to CO-OPS

A transmittal letter to CO-OPS was not required for H13304.

Request for Approved Tides/Water Levels Letter

A “Request for Approved Tides/Water Levels” letter was not required for H13304.

Other Correspondence Relating to Tides

Please refer to the Project Correspondence directory for correspondence related to water levels for H13304.

- NOAA_Leidos_VDATUM_Version_Correspondence.pdf
- OPR-E350-KR-19_Southern_Chesapeake_Bay_Questions.pdf

APPENDIX II. SUPPLEMENTAL SURVEY RECORDS AND CORRESPONDENCE

This Appendix contains copies of email exchanges between Leidos and NOAA concerning various aspects of the survey, data processing, and submittal topics.

Refer to the Project Correspondence directory for copies of email exchanges between Leidos and NOAA, which concerned various aspects of survey, data processing, and submittal topics that encompassed either the entire OPR-E350-KR-19 project or multiple sheets. This Appendix contains email exchanges unique to H13304.

Note that correspondence is complete through 11:00 PM on 02 December 2020.

CORRESPONDENCE

11/5/2019

National Oceanic and Atmospheric Administration Mail - RE: EXTERNAL: Re: Questions for COR TO-06 OPR-E350-KR-19 (part 2)



Christina Fandel - NOAA Federal <christina.fandel@noaa.gov>

RE: EXTERNAL: Re: Questions for COR TO-06 OPR-E350-KR-19 (part 2)

Christina Fandel - NOAA Federal <christina.fandel@noaa.gov>

Tue, Oct 29, 2019 at 3:06 PM

To: "Evans, Rhodri E." <RHODRI.E.EVANS@leidos.com>

Cc: Corey Allen - NOAA Federal <corey.allen@noaa.gov>, "Donaldson, Paul L." <PAUL.L.DONALDSON@leidos.com>, "Bernier, Bridget W." <BRIDGET.W.BERNIER@leidos.com>, Jacklyn James - NOAA Federal <jacklyn.c.james@noaa.gov>, Nicole Lawson - NOAA Federal <nicole.lawson@noaa.gov>

Rod,


Attached you will find updated VDATUM separation models for OPR-E350-KR-19 as well as a corresponding text file for each grid that documents the VDATUM version used to compute the separation grid (3.9) and it's associated weighted uncertainty. The vertical area-weighted uncertainty for the MLLW separation model is 9.0 cm and 8.8 cm for the MHW separation model.

Following my conversation with Bridget yesterday afternoon, I've confirmed that there will be no difference in the computed separation model or it's associated uncertainties if VDATUM model version 3.9 or 4.0 is used. That said, the attached separation model had to be extrapolated to include the tributaries surrounding Yorktown, VA. If Version 4.0 is referenced to create new separation models, the separation model will not extend into these areas. Please let us know if there is a preferred file format for the VDATUM separation models.

Thank you and please let me know if you have any questions,

Christy

[Quoted text hidden]

 **OPR-E350-KR-19_10292019_Final.zip**
2152K

From: [Bernier, Bridget W. \[US-US\]](#)
To: [Coast.Pilot@noaa.gov](#); [ocs.ndb@noaa.gov](#)
Cc: [Christy Fandel - NOAA Federal](#); [Starla Robinson - NOAA Federal \(Starla.Robinson@noaa.gov\)](#); [Evans, Rhodri E. \[US-US\]](#); [Donaldson, Paul L. \[US-US\]](#); [Bernier, Alex T. \[US-US\]](#); [Markham, Erin E. \[US-US\]](#)
Subject: OPR-E350-KR-19 Coast Pilot Review Report rev1
Date: Tuesday, December 01, 2020 10:08:43 PM
Attachments: [OPR-E350-KR-19 Coast Pilot Review Report_rev1.pdf](#)

Please find attached the Coast Pilot Review Report rev 1, for Contract EA-133C-14-CQ-0033, Project Number OPR-E350-KR-19, Task Order 0006 (Southern Chesapeake Bay, Virginia). This is submitted in accordance with the Hydrographic Surveys Specifications and Deliverables (March 2019) Section 8.1.3. The attached Report addresses the Coast Pilot Field Report delivered to Leidos for OPR-E350-KR-19 as well as a review of text from Coast Pilot 3 (53rd Edition), Chapters 9, 11, and 14.

In July, OPR-E350-KR-19 survey operations were on-going and have since concluded. Since the submission in July, additional areas were transited and surveyed, therefore additional text of the Coast Pilot were reviewed.

Thanks,
-Bridget

From: Laura Jeffery - NOAA Federal <laura.jeffery@noaa.gov>
Sent: Monday, July 27, 2020 9:27 AM
To: Bernier, Bridget W. [US-US] <BRIDGET.W.BERNIER@leidos.com>
Cc: ocs.ndb@noaa.gov; Coast.Pilot@noaa.gov; Christy Fandel - NOAA Federal <christina.fandel@noaa.gov>; Evans, Rhodri E. [US-US] <RHODRI.E.EVANS@leidos.com>; Donaldson, Paul L. [US-US] <PAULL.DONALDSON@leidos.com>; Bernier, Alex T. [US-US] <ALEX.T.BERNIER@leidos.com>; Markham, Erin E. [US-US] <ERIN.MARKHAM@leidos.com>
Subject: EXTERNAL: Re: OPR-E350-KR-19 Coast Pilot Review Report

Thank you very much! We will process this into CP3 as soon as possible.

Have a great week,
Laura

On Sun, Jul 26, 2020 at 1:00 PM 'Bernier, Bridget W.' via _NOS OCS NSD Coast Pilot <coast.pilot@noaa.gov> wrote:

Good day,
Please find attached the Coast Pilot Review Report for Contract EA-133C-14-CQ-0033, Project Number OPR-E350-KR-19, Task Order 0006 (Southern Chesapeake Bay, Virginia). This is submitted in accordance with the Hydrographic Surveys Specifications and Deliverables (March 2019) Section 8.1.3. The attached Report addresses the Coast Pilot Field Report delivered to Leidos for OPR-E350-KR-19 as well as a review of text from Coast Pilot 3 (53rd Edition), Chapters 9, 11, and 14.

Please contact me if there are any questions.

Thanks,
-Bridget

Bridget W. Bernier | Leidos

Data Processing Manager
Marine Survey and Engineering Solutions
office: 401.848.4615 | mobile: 401.239.7847
bridget.w.bernier@leidos.com | leidos.com

Please consider the environment before printing this email.

--

Laura B. Jeffery
Nautical Publications Branch/NOS
Cartographer/Reviewer
240-533-0073

NOAA-NOS-OCS-NSD-NPB
1315 E. West Hwy
SSMC3, Station 6315
Silver Spring, MD 20910

Marine Species Awareness Training Record

In accordance with the Hydrographic Surveys Specifications and Deliverables (HSSD) March 2019 Section 1.5, below is a record of staff who participated in survey work for Leidos under NOAA contract EA-133C-14-CQ-0033, project number OPR-E350-KR-19, Task Order 0006 (Southern Chesapeake Bay, Virginia). Individuals conducted training prior to the start of the filed season; new personnel conducted training upon arrival.

Marine Species Awareness Training Record

Name	Organization	Date
Jason Infantino	Leidos	03/22/2019 04/13/2020
Dorena Vogel	Leidos	03/22/2019 04/15/2020
Christopher Englert	Leidos	03/22/2019 04/16/2019
Capt. Chris Sevastakis	Divemasters	03/23/2019 06/07/2020
Capt. Bernie Borrelli	Divemasters	03/23/2019 06/08/2020
Capt. Henry Dollman	Divemasters	03/23/2019 06/06/2020
Matthew Spears	Divemasters	03/23/2019 05/22/2020
Sean Davies	Divemasters	03/23/2019 06/07/2020
Allison Weide	Leidos	03/25/2019 04/13/2020
Richard Nadeau	Leidos	03/26/2019 04/24/2020
Paul Donaldson	Leidos	03/26/2019 05/21/2020
Alex Bernier	Leidos	03/26/2019 06/07/2020
Stewart Kaczynski	Leidos	03/27/2019 04/14/2020
Michael Cole	Leidos	03/29/2019 04/17/2020
Erin Markham	Leidos	04/02/2019 04/15/2020
Timothy Mayer	Leidos	04/01/2019 08/30/2020
Daniel McGovern	Leidos	04/04/2019

Name	Organization	Date
Lisa Hill	OARS	04/19/2019 06/30/2020
Veronica Holton	OARS	05/11/2019
Brian Biggert	OARS	07/06/2019 08/21/2020
Darina DeBenedictis	OARS	07/06/2019 06/30/2020
Bruce Nutter	Divemasters	10/28/2019 07/15/2020
Alexander Schneider	OARS	10/21/2019
Rebecca Millsap	OARS	11/23/2019
John Kiernan	Leidos	06/13/2020
Austin Zimny	Divemasters	06/07/2020
Eli Smith	Leidos	06/22/2020
Alexander M. Bolvin	Leidos	07/21/2020
Austin Zimny	Divemasters	06/07/2020
Jack Donald	Divemasters	06/25/2020
Lindsay Critides	OARS	07/22/2020
Fernando de la Garza	OARS	07/28/2020
Kaios Ryan	OARS	07/28/2020
Kirk Peterzen	OARS	08/20/2020
Seth Furia	Divemasters	08/27/2020
Barry Davenport	OARS	09/11/2020
Sean Donovan	Leidos	09/29/2020

From: [Bernier, Bridget W. \[US-US\]](#)
To: ["survey.outlines@noaa.gov"](mailto:survey.outlines@noaa.gov)
Cc: [Christy Fandel - NOAA Federal](#); [Starla Robinson - NOAA Federal \(Starla.Robinson@noaa.gov\)](#); [Evans, Rhodri E. \[US-US\]](#); [Donaldson, Paul L. \[US-US\]](#); [Bernier, Alex T. \[US-US\]](#); [Markham, Erin E. \[US-US\]](#)
Subject: OPR-E35-KR-19 H13304 (Sheet 4) and H13306 (Sheet 5) Survey Outline
Date: Thursday, November 19, 2020 9:02:37 AM
Attachments: [H13304 Survey Outline.zip](#)
[H13306 Survey Outline.zip](#)

Please find attached two zip files containing the Survey Outline files for H13304 (Sheet 4) and H13306 (Sheet 5) from OPR-E350-KR-19, Southern Chesapeake Bay, Virginia Task Order-0006.

The survey outlines have been generated as shapefiles in Latitude/Longitude NAD83 (EPSG:4269, as specified in the March 2019 HSSD (Section 8.1.2)). The following file formats can be found within each of the zip files: .shp, .shx, .dbf, and .prj; per HSSD 2019.

The shapefile Attribute Table is populated with Platform, State, Scale, and category of coverage. Note that additional information listed in the HSSD if the Survey Outline were provided as a S-57 file is technique of sounding. The technique of sounding for these sheets were both MBES and SSS.

Please let me know if you have any questions

Thanks,
-Bridget

Bridget W. Bernier | Leidos

Data Processing Manager
Marine Survey and Engineering Solutions
office: 401.848.4615 | mobile: 401.239.7847
bridget.w.bernier@leidos.com | leidos.com

Please consider the environment before printing this email.

From: [Brian Mohr - NOAA Federal](#)
To: [Bernier, Bridget W. \[US-US\]](#)
Subject: EXTERNAL: Re: OPR-E35-KR-19 H13304 (Sheet 4) and H13306 (Sheet 5) Survey Outline
Date: Monday, November 30, 2020 10:06:59 AM

Thank you, I will get survey outline **H13304** and **H13306** appended into SURDEX shortly.

Brian Mohr
Data Manager
Hydrographic Surveys Division
brian.mohr@noaa.gov

On Thu, Nov 19, 2020 at 9:02 AM 'Bernier, Bridget W.' via [_NOS OCS Survey Outlines](#)
<survey.outlines@noaa.gov> wrote:

Please find attached two zip files containing the Survey Outline files for H13304 (Sheet 4) and H13306 (Sheet 5) from OPR-E350-KR-19, Southern Chesapeake Bay, Virginia Task Order-0006.

The survey outlines have been generated as shapefiles in Latitude/Longitude NAD83 (EPSG:4269, as specified in the March 2019 HSSD (Section 8.1.2)). The following file formats can be found within each of the zip files: .shp, .shx, .dbf, and .prj; per HSSD 2019.

The shapefile Attribute Table is populated with Platform, State, Scale, and category of coverage. Note that additional information listed in the HSSD if the Survey Outline were provided as a S-57 file is technique of sounding. The technique of sounding for these sheets were both MBES and SSS.

Please let me know if you have any questions

Thanks,

-Bridget

Bridget W. Bernier | Leidos

Data Processing Manager
Marine Survey and Engineering Solutions
office: 401.848.4615 | mobile: 401.239.7847

bridget.w.bernier@leidos.com | leidos.com

Please consider the environment before printing this email.

From: [Bernier, Bridget W. \[US-US\]](#)
To: NODC.submissions@noaa.gov
Cc: [Christy Fandel - NOAA Federal](#); [Evans, Rhodri E. \[US-US\]](#); [Donaldson, Paul L. \[US-US\]](#); [Bernier, Alex T. \[US-US\]](#); [Markham, Erin E. \[US-US\]](#)
Subject: OPR-E350-KR-19 NetCDF Sound Speed Data Files (2019)
Date: Friday, July 24, 2020 10:43:26 PM
Attachments: [OPR-350-KR-19_20200724.zip](#)

In accordance with Section 8.3.6 of the Hydrographic Surveys Specifications and Deliverables (March 2019), please find attached one zip file (OPR-E350-KR-19_20200724.zip) containing sound speed data in the NetCDF format used for Leidos hydrographic surveys under project number OPR-E350-KR-19, Contract: EA-133C-14-CQ-0033 (Task Order: 06).

Data collection for OPR-E350-KR-19 occurred within 2019 and 2020, survey operations remain on-going. The March 2019 HSSD state that the submission of NCEI data is to be separated by calendar year. As such there will be two deliveries for the NCEI files, this delivery which contains all of the 2019 data and the second will be of all the 2020 data. The second delivery will occur prior to the final sheet delivery under OPR-E350-KR-19.

Each individual sound speed profile file is delivered with the required .nc file extension and fields are populated with the project, survey, survey unit, and instrument. In addition, sound speed data files are broken out into four sub-folders, which correspond to the purpose of each cast as indicated below:

- OPR-E350-KR-19_NCEI_Used_for_Closing_2019
- OPR-E350-KR-19_NCEI_Used_for_Comparison_2019
- OPR-E350-KR-19_NCEI_Used_for_Final_Surfaces_2019
- OPR-E350-KR-19_NCEI_Used_for_Lead_Line_2019

Please contact me if there are any questions or problems with the attached information.

Thanks,
-Bridget

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APPROVAL PAGE

H13304

Data meet or exceed current specifications as certified by the OCS survey acceptance review process. Descriptive Report and survey data except where noted 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
- Data Acquisition and Processing Report
- Collection of Bathymetric Attributed Grids (BAGs)
- Processed survey data and records
- Geospatial PDF of survey products
- Collection of side scan sonar mosaics
- Collection of backscatter mosaics

The survey evaluation and verification have been conducted according to current OCS specifications, and the survey has been approved for dissemination and usage of updating NOAA's suite of nautical charts.

Approved: _____

Commander Meghan McGovern, NOAA
Chief, Atlantic Hydrographic Branch