H13306

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

DESCRIPTIVE REPORT

Type of Survey:	Basic Hydrographic Survey
Registry Number:	H13306

LOCALITY

State(s):	Virginia
General Locality:	Southern Chesapeake Bay
Sub-locality:	York River

2020

CHIEF OF PARTY
Paul L. Donaldson

LIBRARY & ARCHIVES

Date:

U.S. DEPARTMENT OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION	REGISTRY NUMBER:
HYDROGRAPHIC TITLE SHEET	**H13306**

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:	**York River**
Scale:	**10000**
Dates of Survey:	**07/10/2020 to 10/21/2020**
Instructions Dated:	**08/27/2019**
Project Number:	**OPR-E350-KR-19**
Field Unit:	**Leidos**
Chief of Party:	**Paul L. Donaldson**
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-026. 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 H13306

Project: OPR-E350-KR-19

Locality: Southern Chesapeake Bay

Sublocality: York River

Scale: 1:10000

July 2020 - October 2020

Leidos

Chief of Party: Paul L. Donaldson

A. Area Surveyed

The area surveyed was a section of the Southern Chesapeake Bay York River (Figure 1).

A.1 Survey Limits

Data were acquired within the following survey limits:

Northwest Limit	Southeast Limit
37° 15' 42.03" N 076° 31' 50.33" W	37° 13' 08.16" N 076° 20' 3.48" W

Table 1: Survey Limits

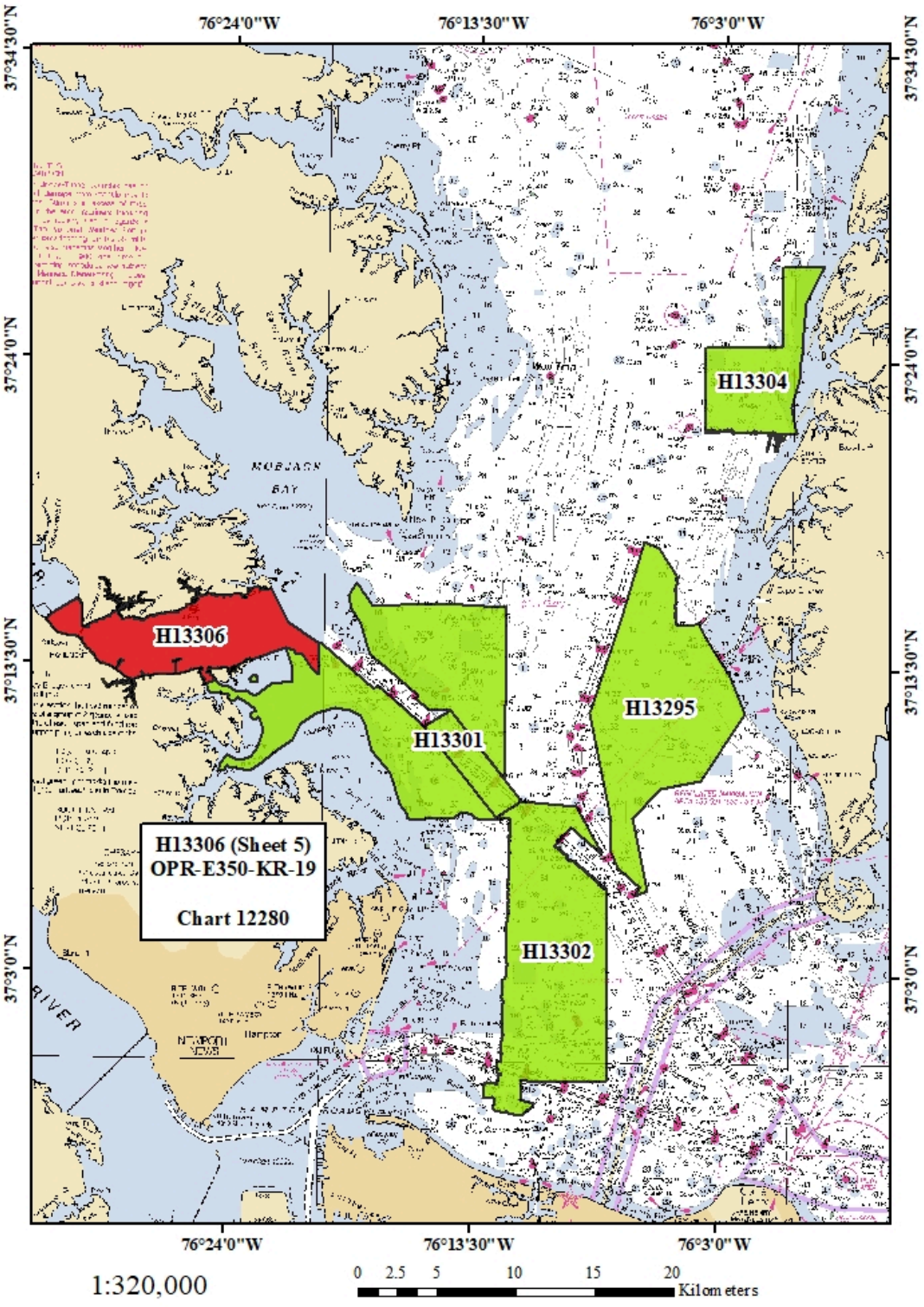

Figure 1: H13306 Survey Bounds

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.

H13306 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
H13306	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 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 a mix of Object Detection Coverage, Option A and B (100% multibeam coverage and 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, Figure 3, and Figure 4). The Project Instructions defined the Inshore Limit as “The Inshore Limit is the Navigable Area Limit Line (Refer to HSSD 1.3.2).” Per correspondence dated 15 October 2020, referenced above, Leidos exceeded the required total linear nautical miles of data collection and was directed to square off the survey area, ensure all features within the surveyed extent were addressed and meet project requirements, and to not conduct any further development of the NALL within the remaining assigned area of survey.

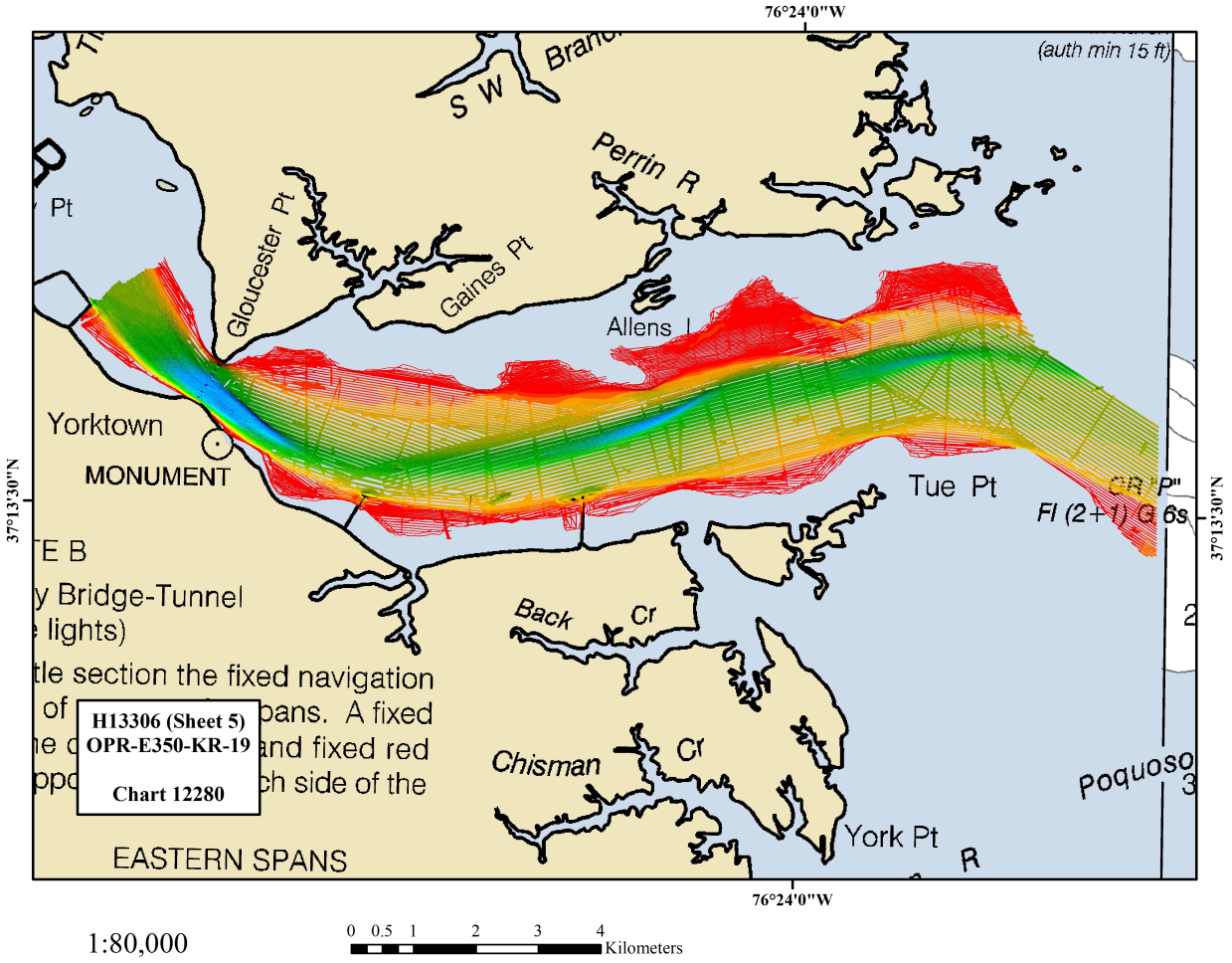

Figure 2: Final Bathymetry Coverage for H13306

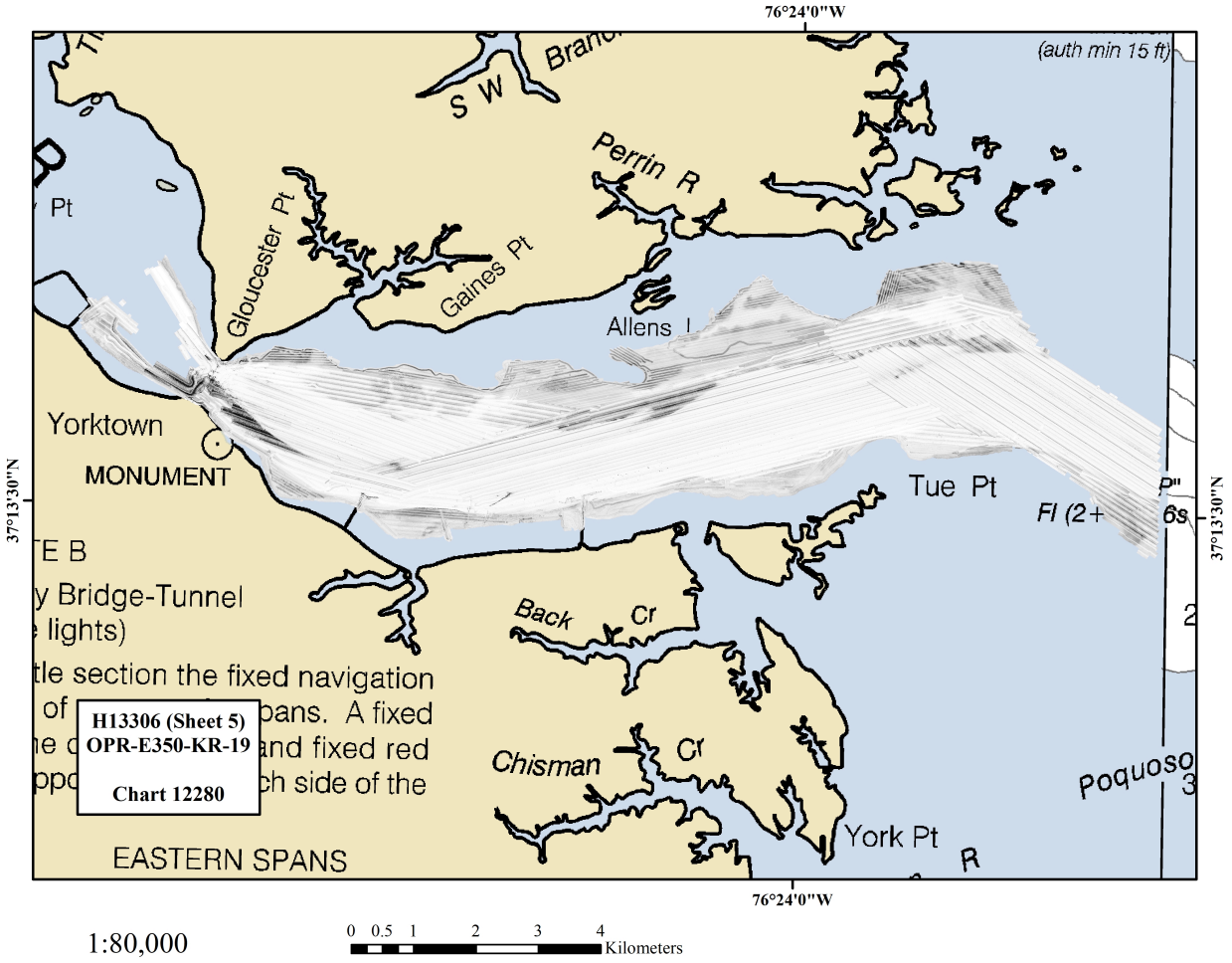

Figure 3: Final Side Scan Coverage for H13306 (First 100% coverage)

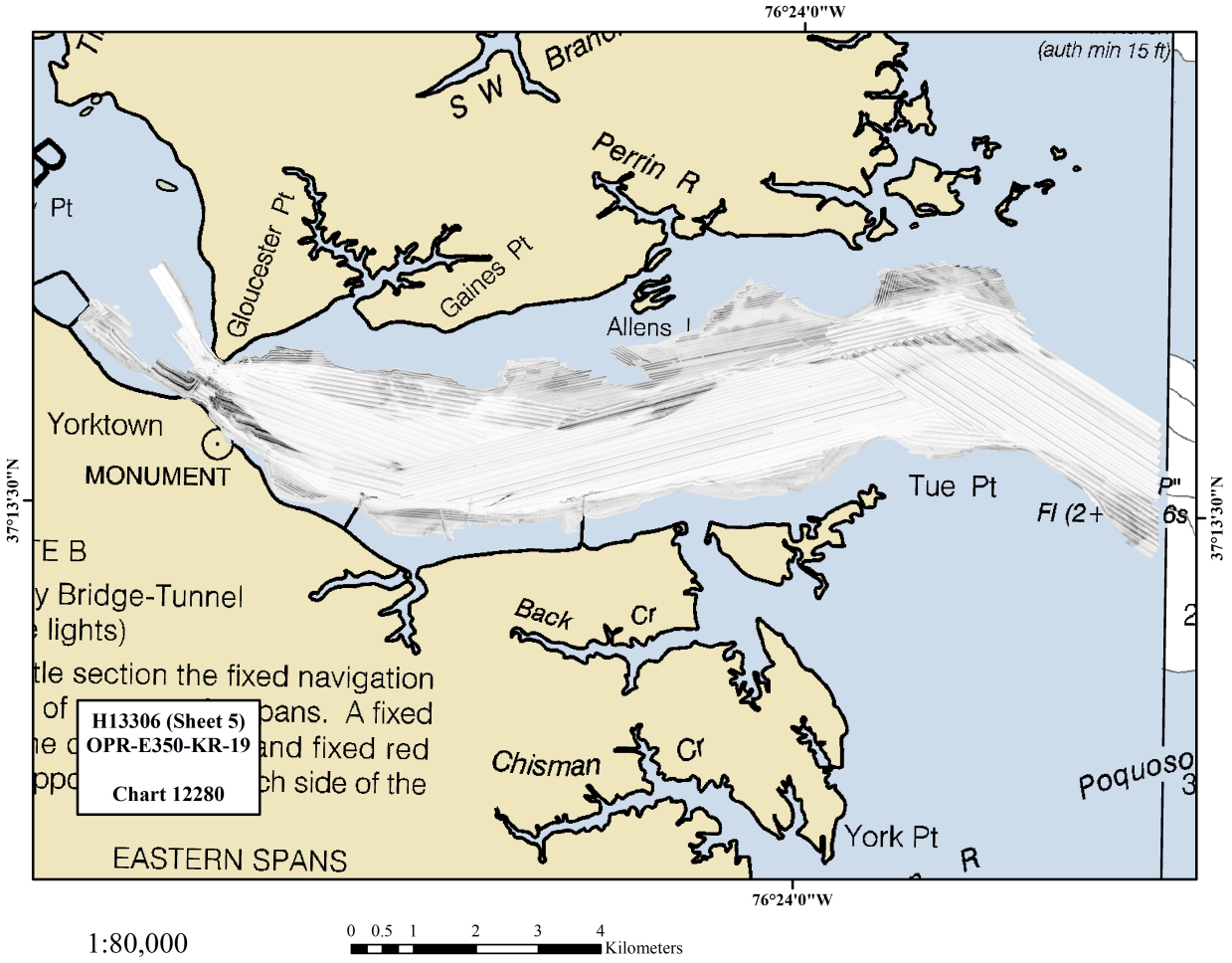

Figure 4: Final Side Scan Coverage for H13306 (Second 100% coverage)

A.5 Survey Statistics

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

	HULL ID	*M/V Atlantic Surveyor*	*R/V Oyster Bay II*	*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	399.27	384.92	784.19
	SBES/MBES Crosslines	11.87	21.68	33.55
	Lidar Crosslines	0	0	0
Number of Bottom Samples				10
Number Maritime Boundary Points Investigated				0
Number of DPs				0
Number of Items Investigated by Dive Ops				0
Total SNM				12.07

Table 3: Hydrographic Survey Statistics

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

Survey Dates	Day of the Year
07/10/2020	192

Survey Dates	Day of the Year
07/16/2020	198
07/20/2020	202
07/21/2020	203
07/22/2020	204
07/23/2020	205
07/24/2020	206
07/25/2020	207
08/03/2020	216
08/15/2020	228
08/17/2020	230
08/18/2020	231
08/19/2020	232
08/22/2020	235
08/23/2020	236
08/24/2020	237
08/26/2020	239
08/29/2020	242
08/30/2020	243
08/31/2020	244
09/01/2020	245
09/02/2020	246
09/24/2020	268
09/25/2020	269
09/26/2020	270
09/27/2020	271
09/28/2020	272
10/01/2020	275
10/04/2020	278
10/06/2020	280
10/19/2020	293
10/21/2020	295

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 and Klein 4900 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 previously with the H13304 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	***M/V Atlantic Surveyor***	***R/V Oyster Bay II***
LOA	110 feet	30 feet
Draft	9 feet	3 feet

Table 5: Vessels Used

Figure 5: M/V Atlantic Surveyor

Figure 6: R/V Oyster Bay II

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. The R/V Oyster Bay II (Figure 6) was used to collected 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 4.28% 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 7 summarizes the crossline comparison results.

Difference Grid	Resolution	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 and R/V Oyster Bay II multibeam Crossline (Class 1) to M/V Atlantic Surveyor and R/V Oyster Bay II Mainscheme	50-centimeter	2.325 – 24.864	0.501 – 0.595	99.99%
M/V Atlantic Surveyor multibeam Crossline (Class 1) to Mainscheme	50-centimeter	6.030 – 24.864	0.506 – 0.595	100.00%
R/V Oyster Bay II multibeam Crossline (Class 1) to Mainscheme	50-centimeter	2.324 – 24.576	0.501 – 0.593	99.99%
M/V Atlantic Surveyor All Data to R/V Oyster Bay II All data	1-meter	5.749 – 25.326	0.506 – 0.599	99.99%

Figure 7: 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 H13306 50-centimeter and 1-meter PFM CUBE surfaces contained final vertical uncertainties that ranged from 0.210 meters to 0.994 meters and 0.210 meters to 0.632 meters respectively. The IHO Order 1a maximum allowable vertical uncertainty for the 50-centimeter PFM CUBE surface was calculated to range between 0.500 to 0.574 meters, based on the minimum CUBE depth (0.910 meters) and maximum CUBE depth (21.726 meters) and 0.524 to 0.617 meters for the 1-meter PFM CUBE surface, based on the minimum CUBE depth (12.023 meters) and maximum CUBE depth (27.768 meters).

Results from the SABER Check PFM Uncertainty function identified that there were 118 nodes in the final H13306 50-centimeter PFM CUBE surface with final vertical uncertainties that exceeded IHO Order 1a allowable vertical uncertainty. These nodes were associated with objects, exposed pipelines, and pier structures. The SABER Frequency Distribution Tool was also used to review the Hyp. Final Uncertainty

surface within the final H13306 50-centimeter CUBE PFM grid. Results showed that 99.99% of all nodes had final uncertainties less than or equal to 0.574 meters.

Results from the SABER Check PFM Uncertainty function identified that there were two nodes in the final H13306 1-meter PFM CUBE surface with final vertical uncertainties that exceeded IHO Order 1a allowable vertical uncertainty. These nodes were associated with the Coleman Memorial Bridge footing and a discrete object; both of which were associated with outer swath data. The SABER Frequency Distribution Tool was also used to review the Hyp. Final Uncertainty surface within the final H13306 1-meter CUBE PFM grid. Results showed that 99.99% of all nodes had final uncertainties less than or equal to 0.617 meters..

B.2.3 Junctions

Per the Project Instructions, analysis of the H13306 junction with an adjacent survey was performed, as listed in Table 7. Figure 8 shows the general locality of H13306 as it relates to the sheet to which junctions were performed. Refer to Separates II for details about how junction analysis was performed and a complete discussion of the analysis and tabular results.

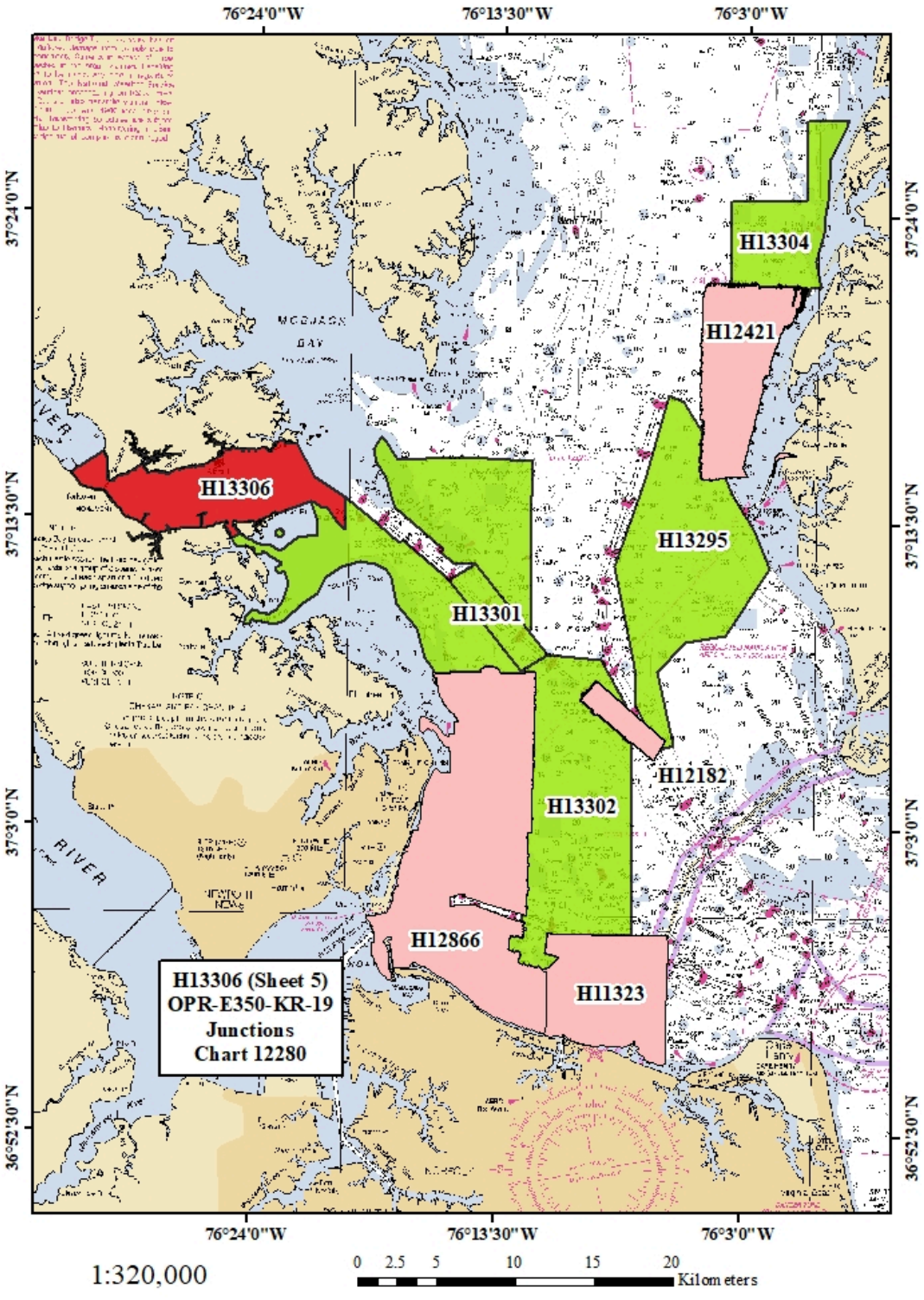

Figure 8: General Locality of H13306 with Junctioning Surveys

The following junctions were made with this survey:

Registry Number	Scale	Year	Field Unit	Relative Location
H13301	1:10000	2020	Leidos	SE

Table 7: Junctioning Surveys

H13301

H13306 junctions with H13301 to the southeast; 100% of the comparisons agreed within ±0.569 meters while 99.99% of the comparison results fell within the calculated maximum allowable TVU of 0.526 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 H13306 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.

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. Results from conducting the sound speed confidence checks conducted during H13306 acquisition period can be found in Separates II within the “Comparison Cast Log” section.

All individual SSP files are delivered with the H13306 data and are broken out into sub-folders, which correspond to the purpose of each cast. Also, all individual SSP files for H13306 have been concatenated into four separate files based on the purpose of the cast, provided in CARIS format files (.svp), and delivered under (H13306/Processed/SVP/CARIS_SSP) on the delivery drive. In accordance with HSSD Section 8.3.6, H13306 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 200% side scan sonar coverage with concurrent multibeam bathymetry except within a restricted area northwest of the Coleman Memorial Bridge. This restricted area restricted towing, as this area was primarily surveyed from the M/V Atlantic Surveyor; which operated with a towed SSS; 100% MBES was achieved for coverage. For side scan data collection, the SSS was set to 25-meter, 50-meter, or 75-meter range scale. Main scheme survey lines were collected at 20-meter, 40-meter, or 80-meter, respectfully, to ensure 200% SSS coverage. For multibeam data collection, survey lines were generally collected at 50-meter line spacing.

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 H13306 50-centimeter and the 1-meter PFM grids showed that there were no holidays as defined for object detection coverage surveys in Section 5.2.2.2 of the HSSD. Any three by one node gaps were along the outer swath data beyond side scan nadir coverage.

The final H13306 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 surface 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 CUBE PFM grid 99.47% of all nodes contained five or more soundings while 99.75% of all nodes contained five or more soundings for the 1-meter CUBE PFM grid.

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 were previously delivered under OPR-E350-KR-19 H13295 and H13304. No additional files contributed to the calibration than were previously delivered therefore no additional files are provided with H13306 per HSSD Section 8.3.2.

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 Object Detection Coverage, Option B (200% side scan sonar coverage with concurrent multibeam) except within the restricted area as noted previously. 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 each SSS coverage mosaic at 1-meter cell size resolution as specified in Section 8.2.1 of the HSSD. Each 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 are determined to be complete and sufficient to meet the requirements contained within the Project Instructions and HSSD. Each 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 of 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	5.4.0.30.4

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	5.4.0.30.4

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. Subsequent to the delivery of the OPR-E350-KR-19 DAPR rev 1 (submitted 2020-12-04), the SABER version was upgraded from 5.4.0.30.1 to 5.4.0.30.4 as captured in Table 8 and Table 9. There were no other changes from the software configuration as detailed in the DAPR.

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
H13306_MB_50cm_MLLW_Final-1of4	BAG	50 centimeters	7.059 meters - 8.648 meters	N/A	Object Detection Coverage
H13306_MB_50cm_MLLW_Final-2of4	BAG	50 centimeters	0.910 meters - 21.515 meters	N/A	Object Detection Coverage
H13306_MB_50cm_MLLW_Final-3of4	BAG	50 centimeters	1.431 meters - 21.726 meters	N/A	Object Detection Coverage
H13306_MB_50cm_MLLW_Final-4of4	BAG	50 centimeters	1.091 meters - 13.619 meters	N/A	Object Detection Coverage
H13306_MB_1m_MLLW_Final	BAG	1 meters	12.023 meters - 27.768 meters	N/A	Object Detection Coverage
H13306_SSSAB_1m_500kHz_900kHz_1of2	SSS Mosaic (.tif)	1 meters	0 meters - 0 meters	N/A	First 100% SSS
H13306_SSSAB_1m_500kHz_900kHz_2of2	SSS Mosaic (.tif)	1 meters	0 meters - 0 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 and 1-meter node resolution for depths ranging from 18 meters to 40 meters. Leidos generated CUBE PFM grids for H13306 at 50-centimeter and 1-meter resolutions.

The CUBE Depth surface of the final H13306 50-centimeter and 1-meter PFMs were 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 H13306 50-centimeter PFM was from 0.910 meters (2.986 feet; 0.210 meters Total Vertical Uncertainty [TVU]) to 21.726 meters (71.279 feet; 0.210 meters TVU) and 12.023 meters (39.445 feet; 0.210 meters Total Vertical Uncertainty [TVU]) to 27.768 meters (91.102 feet; 0.222 meters TVU) for the 1-meter PFM.

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).

H13306 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 H13306 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?
US5VA24M	1:40000	29	03/24/2020	10/23/2020	NO
US5VA60M	1:20000	20	05/29/2018	11/10/2020	NO

Table 12: Largest Scale ENCs

US5VA24M

ENC US5VA24M covers the H13306 survey limit from 076° 20' 15.00"W eastward.

CUBE depths within H13306 agreed well with the charted depth and depth contours across the contemporaneous survey area on ENC US5VA24M. There was one contemporaneous charted depth that differed by 1 meter from the surrounding CUBE depths but the depth contours were in agreement (Figure 9 and Figure 10).

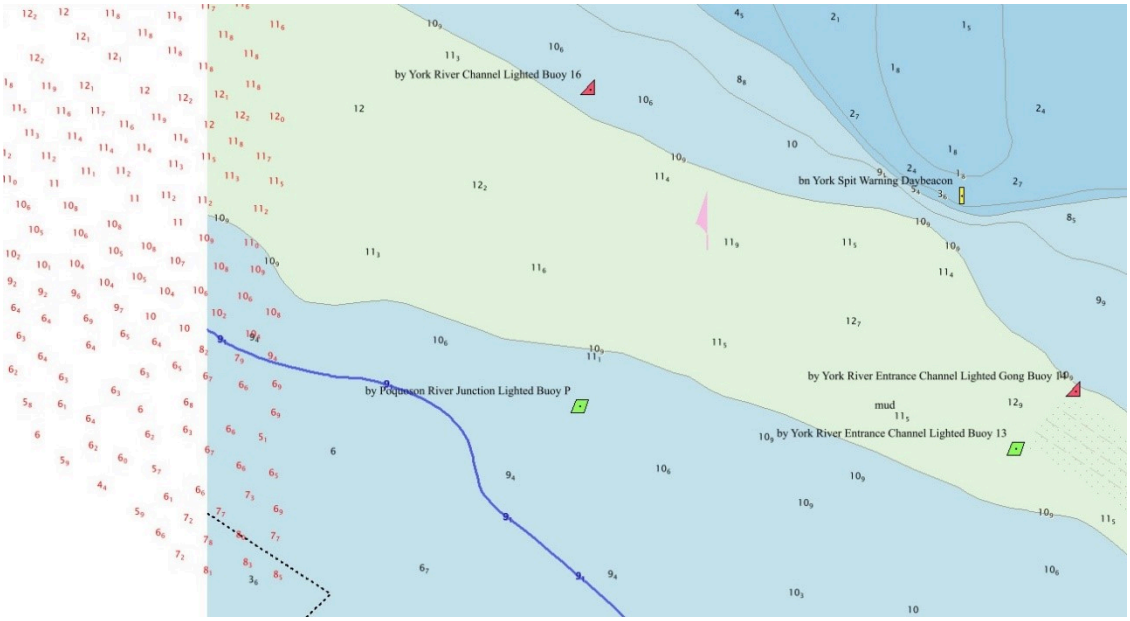

Figure 9: ENC US5VA24M Charted Soundings (black) with H13306 CUBE Depth Selected Soundings (red) and 9.1-meter depth contour (blue)

Figure 10: ENC US5VA24M Charted Soundings (black) with H13306 CUBE Depth Selected Soundings (red) and 10.9-meter contour (blue)

US5VA60M

ENC US5VA60M covers the H13306 survey limit from 076° 20’ 15.00”W westward.

CUBE depths within H13306 agreed well with the charted depth and depth contours across the contemporaneous survey area on US5VA60M. The observed depths were primarily within ±0.5 meters of charted depths and depth contours were in agreement (Figure 11 through Figure 14)..

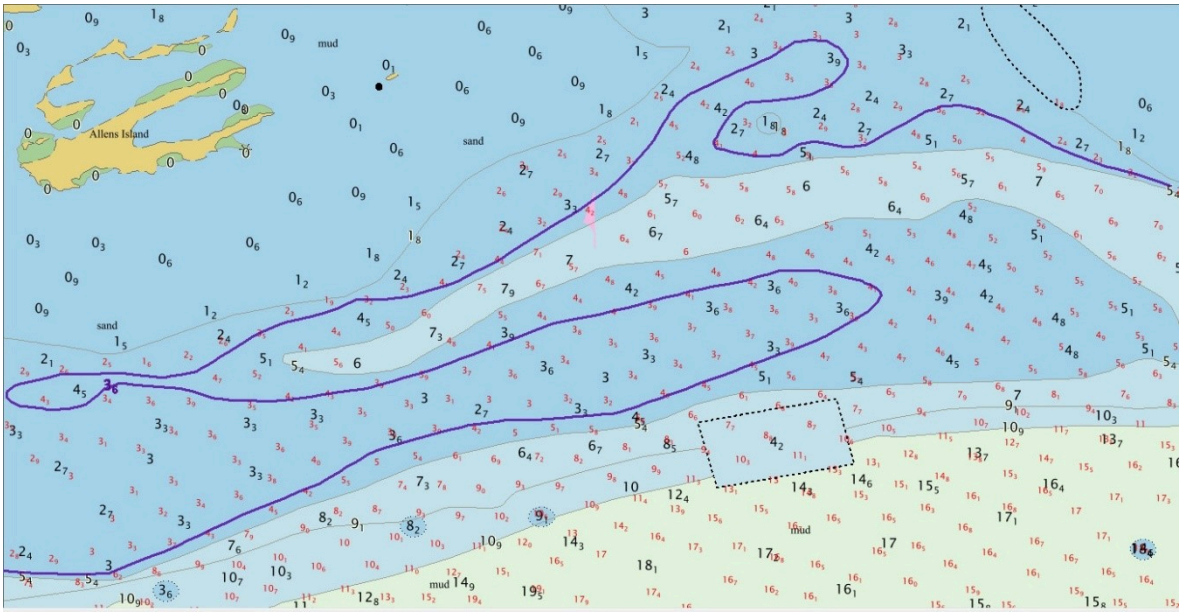

Figure 11: ENC US5VA60M Charted Soundings (black) with H13306 CUBE Depth Selected Soundings (red)

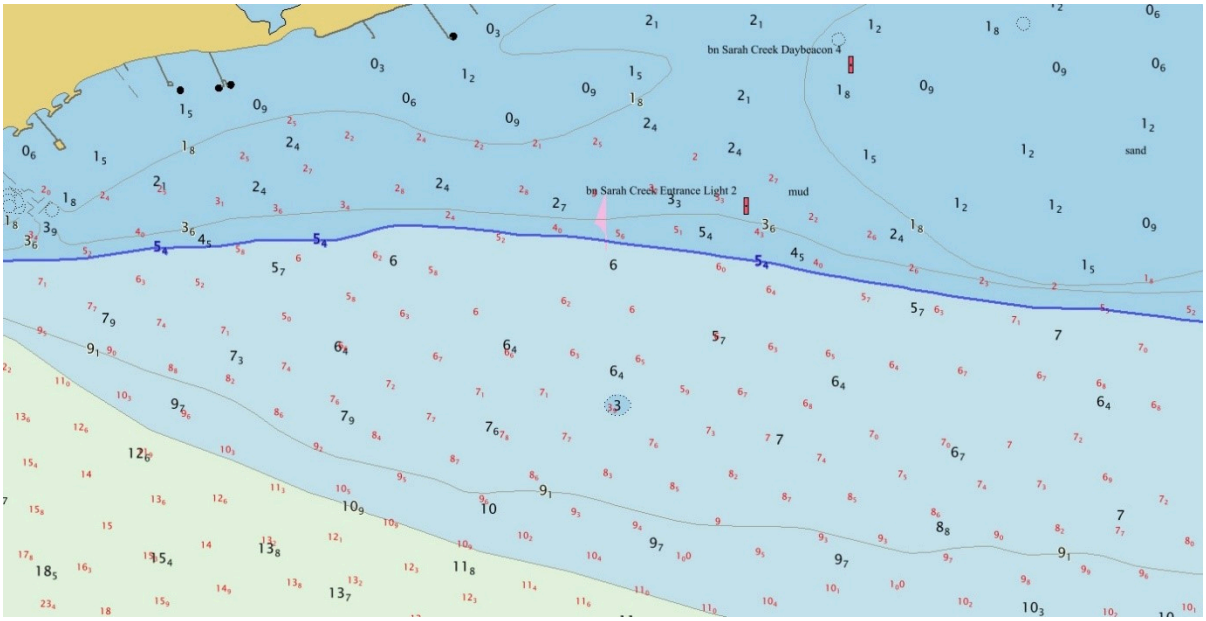

Figure 12: ENC US5VA60M Charted Soundings (black) with H13306 CUBE Depth Selected Soundings (red) and 5.4-meter depth contour (blue)

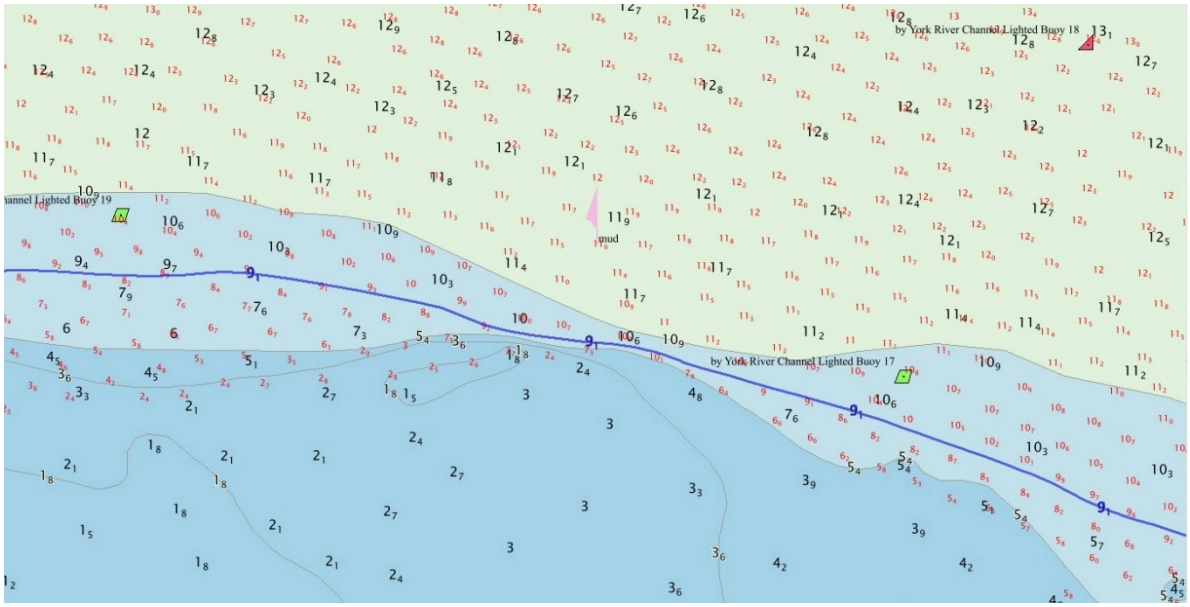

Figure 13: ENC US5VA60M Charted Soundings (black) with H13306 CUBE Depth Selected Soundings (red) and 9.1-meter depth contour (blue)

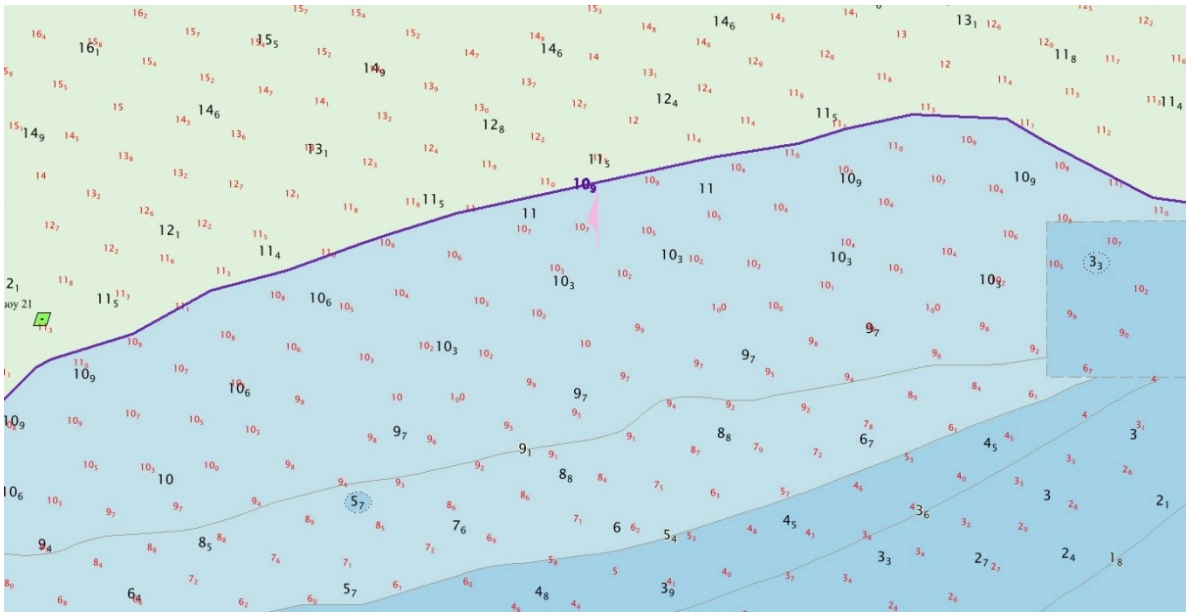

Figure 14: ENC US5VA60M Charted Soundings (black) with H13306 CUBE Depth Selected Soundings (red) and 10.9-meter depth contour (blue)

D.1.2 Maritime Boundary Points

No Maritime Boundary Points were assigned for this survey.

D.1.3 Charted Features

There were numerous assigned charted features in the final CSF (OPR-E350-KR-19_CSF_10282019.000) within the SOW of H13306; 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 H13306 S-57 Final Feature File (H13306_FFF.000) for all the details and recommendations regarding charted features.

D.1.4 Uncharted Features

See the H13306 S-57 FFF for all the details and recommendations regarding new uncharted features investigated. During the course of H13306 survey operations, various bamboo and PVC pipe markers were observed within the survey limits (Figure 15). These were determined to be temporary in nature as over the course of survey operations it was observed that several of the markers would no longer be present or moved. Due to their temporary nature, there are no features associated with these markers within the H13306 S-57 FFF.

Figure 15: Example of PVC and Broken Bamboo Markers

D.1.5 Shoal and Hazardous Features

There was the presence of shoaling along the southern side of the York River approximately 235 meters west of charted mooring buoy “B” and the AMOCO pier that is captured as Feature 55 in the H13306 S-57 FFF. As the shoal area was inshore of the NALL depths, less than 20 meters of survey data covers the shoal area. The H13306 observed least CUBE depth was 2.09m in approximately 3.5m of water. No danger to navigation was submitted as the shoal was located near shore beyond the NALL depth limits and is not utilized for general transit. There were no other significant shoals or hazardous features within the area covered by this survey other than those referenced in Section D.1.4.

Leidos submitted five DTONs for H13306. Three DTONs were submitted in S-57 format to the Atlantic Hydrographic Branch (AHB) and two DTONs were submitted to the U.S. Coast Guard; refer to the H13306 S-57 FFF.

• DTON 01 was submitted on 18 August 2020, for an obstruction. This DTON was submitted to Nautical Data Branch (NDB) and Marine Chart Division (MCD) on 18 August 2020.
• DTON 02 was submitted on 18 August 2020, for an uncharted pipeline. This DTON was submitted to Nautical Data Branch (NDB) and Marine Chart Division (MCD) on 18 August 2020.
• DTON 03 was submitted on 18 December 2020, for an obstruction.
• DTON 04 and 05 were submitted to the U.S. Coast Guard on 21 December 2020, for ATONs no longer present. The submission was made to the non-NOAA source authorities in accordance with HSSD Section 1.6.2.

Copies of the email correspondence for Leidos' submissions of H13306 DTON Report, as well as the DTON recommendation file, are included within Appendix II of this Descriptive Report. Figure 16 details the submitted DTONs and the associated feature number and object class in the S-57 FFF.

DTON Report Name	Date Submitted to USCG	Date Submitted to AHB	AHB Submitted to NDB and MCD	NDB Registration	Feature Number(s)	S-57 Object Class in the S-57 FFF
H13306 DTON 01 02.000	N/A	2020-08-18	2020-08-18	DD-33023	13	OBSTRN
H13306 DTON 01 02.000	N/A	2020-08-18	2020-08-18	DD-33023	01	PIPSOL
H13306 DTON 03.000	N/A	2020-12-18	N/A	N/A	67	OBSTRN
04 H13306 USCG ATON Discrepancy Report.pdf	2020-12-21	N/A	N/A	N/A	N/A	DAYMRK
05 H13306 USCG ATON Discrepancy Report.pdf	2020-12-21	N/A	N/A	N/A	N/A	DAYMRK

Figure 16: DTON Reports

D.1.6 Channels

H13306 SOW covered three channels, a creek, and a river. Sarah Creek, Perrin River, West Branch Channel, and the Goodwin Torofare Channel were all present but not surveyed as the depths were less than the inshore NALL depths. The York River Channel was covered with either 200% SSS and resulting MBES or 100% MBES data. Charted depths within the York River Channel agreed with the survey data (+/- 0.5m). There was one feature identified within the York River Channel with a least depth of 12.023m that was submitted as a DTON (DTON 01; Feature 13).

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 H13306. Bottom characteristics were acquired at the ten 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 H13306/Processed/Multimedia.

D.2 Additional Results

D.2.1 Shoreline

All features in the CSF within the Survey Limits of H13306 were resolved. Additional assigned features inshore of the survey limits were not addressed; refer to the H13306 FFF.

D.2.2 Aids to Navigation

There were 20 assigned aid to navigation (ATON) within the survey limits of H13306 from the final CSF. Two ATONs within the survey limits, Goodwin Thorofare Channel Warning Light GT and Virginia Power Debris Exclusion Boom Light C, were not present. ATON DTONs were submitted to the USCG as required in Section 1.6.2.2 of the HSSD. All other ATONs within the survey limits 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 H13306 FFF with description of retain.

D.2.3 Overhead Features

There were four overhead features assigned within H13306 survey area. All four assigned overhead objects were overhead pipelines associated with the AMOCO pier. The survey field team visually confirmed the presence of interconnected pier structures however none of the walkway piers that were assigned had associated overhead pipelines (Figure 17, through Figure 20). The overhead pipelines are not included within the H13306 FFF per the CSF investigation requirements. However, other sections of the pier structure contained overhead pipelines.

Figure 17: Assigned PIPOHD with no overhead pipelines

Figure 18: Assigned PIPOHD with no overhead pipelines

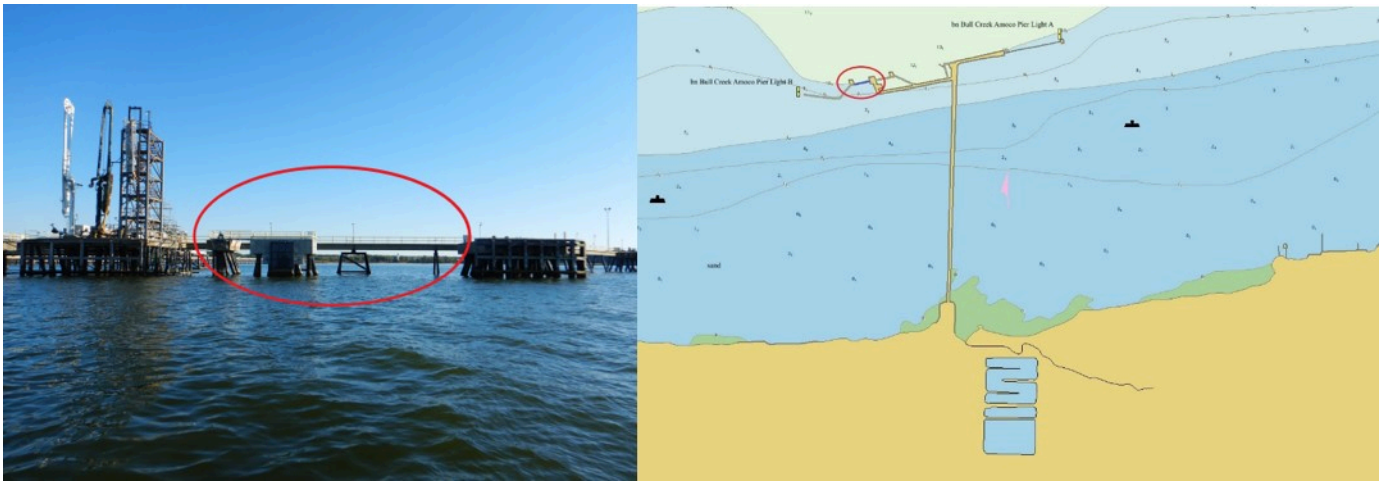

Figure 19: Assigned PIPOHD with no overhead pipelines

Figure 20: Assigned PIPOHD with no overhead pipelines

D.2.4 Submarine Features

The H13306 S-57 FFF contains three submarine features, two of which were assigned from the CSF. A submerged sewer pipeline north of the Coleman Memorial Bridge was assigned and not observed as exposed within the survey bounds. A second assigned sewer pipeline within the Virginia Power Intake Jetties was assigned and observed to be exposed within the H13306 surveyed data. The pipeline is a sewer outfall pipe with risers. A third uncharted pipeline was found during H13306 and was submitted as DTON 02 (Feature 01).

D.2.5 Platforms

No platforms exist within the survey limits of this survey. One platform was assigned from the CSF however it was not investigated as it fell in water depths shoaler than the NALL.

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 H13306, and all information is contained in the H13306 S-57 FFF.

D.2.11 Final Feature S-57 File

Included with the H13306 delivery is the S-57 FFF, H13306_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 H13306 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 H13306 are included within the S-57 FFF.

In accordance with the HSSD, Leidos addressed assigned objects from the provided CSF S-57 file that fell within the surveyed bounds of H13306 in the S-57 FFF. Assigned objects from the CSF which were not surveyed due to being inshore of the NALL are provided in the H13306 S-57 FFF.

D.2.12 Side Scan Sonar Contacts S-57 File

Included with the H13306 delivery is the Side Scan Sonar Contact S-57 File, H13306_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
H13304_DR.pdf	2020-12-04

Approver Name	Approver Title	Approval Date	Signature
Paul L. Donaldson	Chief Hydrographer	12/23/2020	Paul L Donaldson Digitally signed by: Paul L Donaldson DN: CN = Paul L Donaldson C = US O = Leidos OU = A01410D00000171EA2490940000BA8A Date: 2020.12.23 12:37:05 -05'00'