

H13220

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

DESCRIPTIVE REPORT

Type of Survey: Basic Hydrographic Survey

Registry Number: H13220

LOCALITY

State(s): Texas

General Locality: Port Arthur, TX

Sub-locality: 13 NM South of Mud Lake

2019

CHIEF OF PARTY
Erin Markham

LIBRARY & ARCHIVES

Date:

HYDROGRAPHIC TITLE SHEET

H13220

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): **Texas**

General Locality: **Port Arthur, TX**

Sub-Locality: **13 NM South of Mud Lake**

Scale: **40000**

Dates of Survey: **07/19/2019 to 09/29/2019**

Instructions Dated: **02/21/2019**

Project Number: **OPR-K371-KR-19**

Field Unit: **Leidos**

Chief of Party: **Erin Markham**

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:

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-005. All times were recorded in UTC.

Data were collected in North American Datum of 1983 (NAD83) 2011 realization 2010(NAD83(2011)2010.0), UTM Zone 15N.

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 15N, 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 H13220

Project: OPR-K371-KR-19

Locality: Port Arthur, TX

Sublocality: 13 NM South of Mud Lake

Scale: 1:40000

July 2019 - September 2019

Leidos

Chief of Party: Erin Markham

A. Area Surveyed

The area surveyed was a section of the Gulf of Mexico south of Mud Lake, Texas (Figure 1).

A.1 Survey Limits

Data were acquired within the following survey limits:

Northwest Limit	Southeast Limit
29° 28' 29.43" N 094° 15' 43.21" W	29° 20' 25.23" N 094° 05' 37.17" W

Table 1: Survey Limits

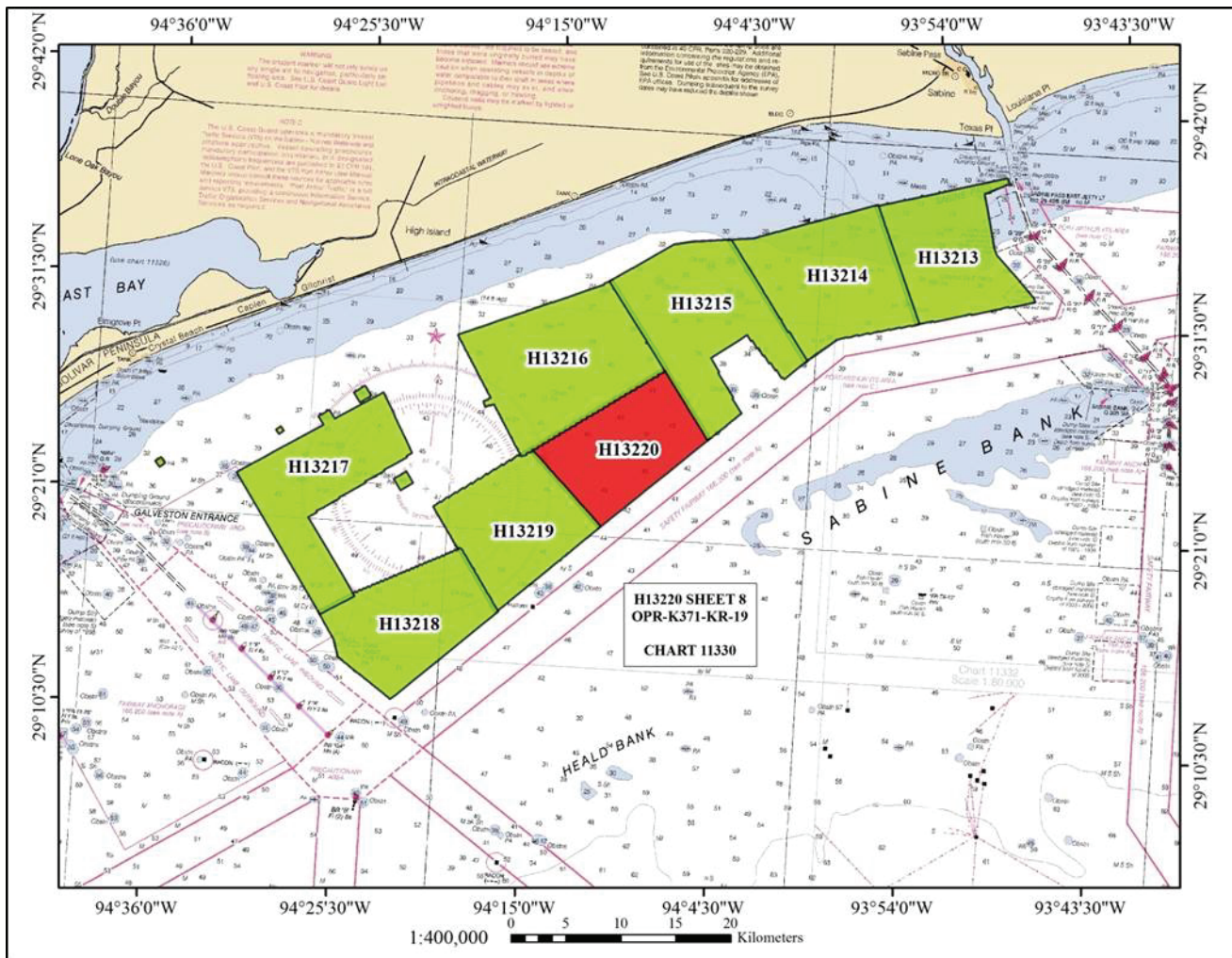


Figure 1: H13220 Survey Bounds

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. Port Arthur, located on the Gulf of Mexico Intra-coastal Waterway in Texas, is home to a large refinery network (1). The Port of Port Arthur hosts the Motiva refinery, the largest oil refinery in the United States (2). Traffic flow through the Port is heavy and in 2010, an oil spill occurred from an oil tanker and barge collision spilling 450,000 gallons of oil into the Sabine/Neches waterway (3). This busy seaport has also been hit by several hurricanes. On August 29, 2017, Hurricane Harvey hit Port Arthur bringing upwards of 40 inches of rainfall and widespread flooding to the area (4). This Hurricane had the potential to change the seafloor of the Port which sees over 35 million tons of vessel traffic (5).

To continue to promote safe passage of traffic through the Port, this project will survey 286 square nautical miles (SNM) of seafloor in Port Arthur. The survey will address concerns of migrating shoals and exposed hazards by updating bathymetry and positions of hazards and reducing the risk to navigation. Survey data from this project is intended to supersede all prior survey data in the common area and will provide contemporary data to update National Ocean Service (NOS) nautical charting products.

Citations

1. <https://www.portarthurtx.gov/236/About-Us>
2. "Tropical Storm Harvey Closes America's Biggest Refinery". *Maritime Executive*. 30 August 2017. Retrieved 31 August 2017.
3. Gonzalez, Angel (24 January 2010). "Oil Spill Hits Texas Port". *The Wall Street Journal*. Retrieved 24 January 2010.
4. Harrington, Rebecca. "Flash floods send Texans into 'survival mode' as Harvey hits Port Arthur with 26 inches of rain in one day". *BusinessInsider.com*. Business Insider. Retrieved 30 August 2017.
5. The U.S. Waterway System, 2016 Transportation Facts & Information. Navigation and Civil Works Decision Support Center, U.S. Army Corps of Engineers.

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.

H13220 was surveyed in accordance with the following documents:

1. Project Instructions, OPR-K371-KR-19, dated 21 February 2019
2. Hydrographic Surveys Specifications and Deliverables (HSSD), March 2019
3. Waiver_2019 HSSD_signed.pdf, dated 05 November 2019
4. OPR-K371-KR-19 Statement of Work, dated 21 February 2019

A.4 Survey Coverage

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

Water Depth	Coverage Required
All waters in survey area	Complete Coverage (Refer to HSSD Section 5.2.2.3). Complete 6443 LNMs. Transit mileage and data which do not meet HSSD specifications shall not count towards the completion of the LNM. Notify the Project Manager/COR upon nearing completion. The final survey area shall be squared off and ensure the full investigation of any features within the surveyed extent. Project Manager/COR may adjust survey prioritization based on observed shoaling. Additional or fewer sheets may be assigned based on survey area achieved.

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 through Figure 4).

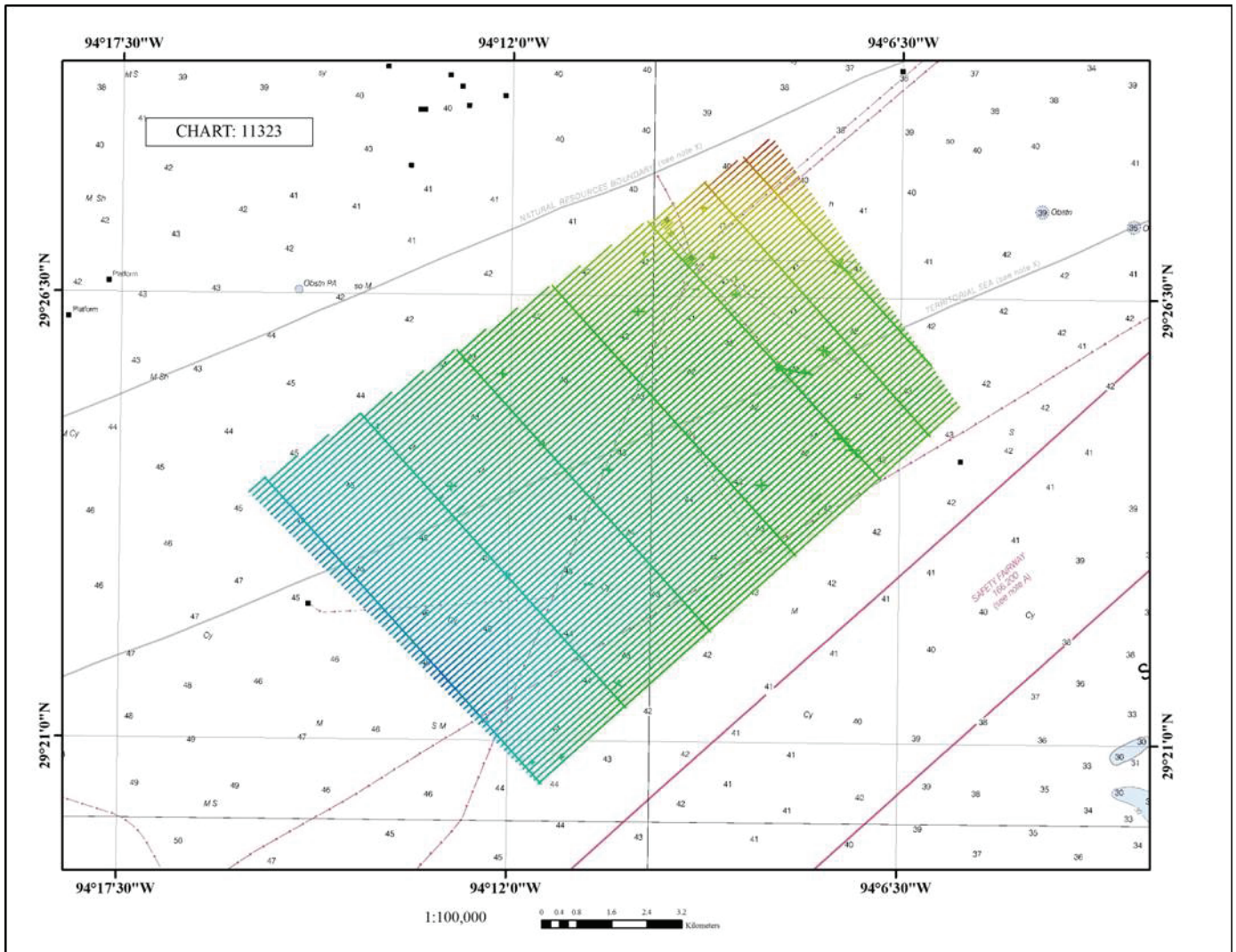


Figure 2: Final Bathymetry Coverage for H13220

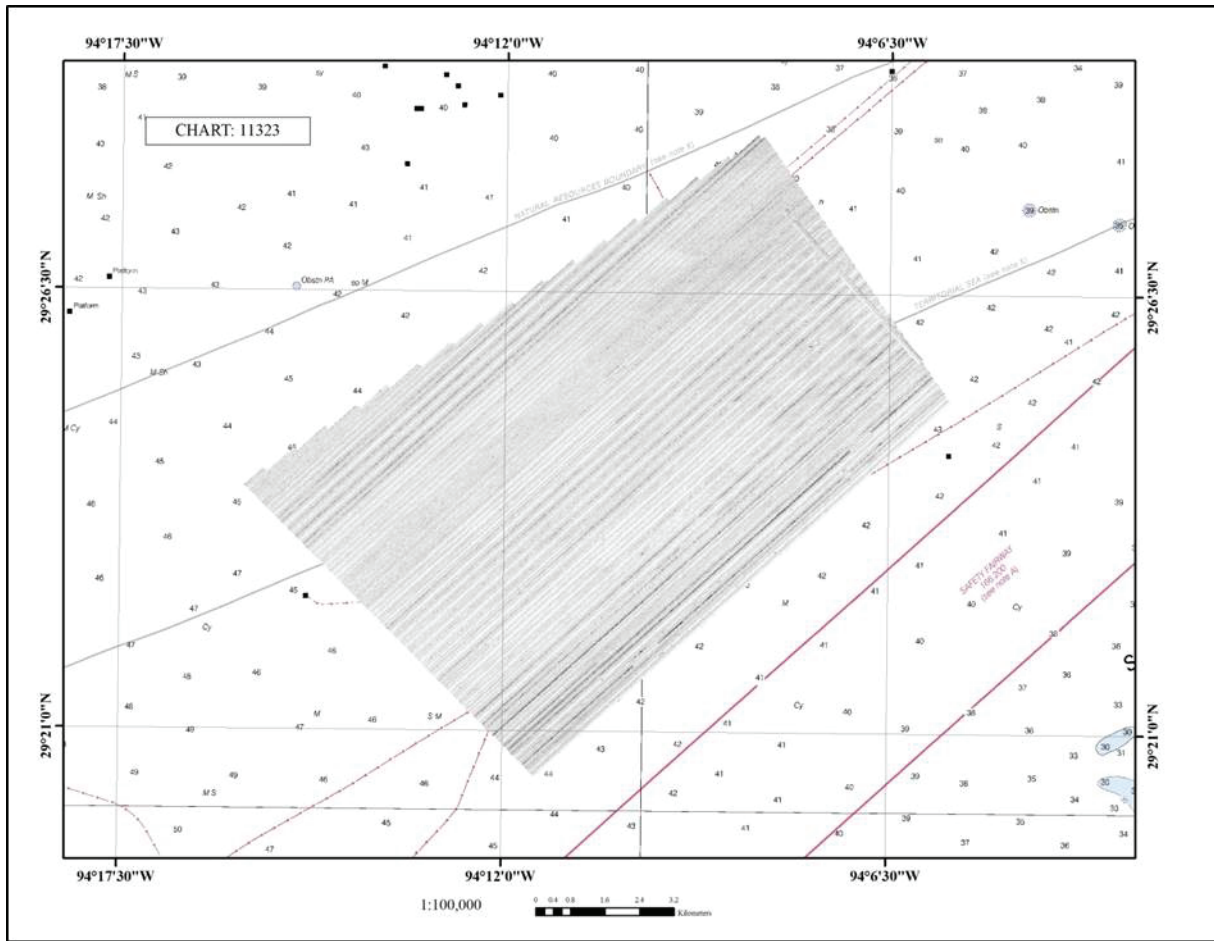


Figure 3: Final Side Scan Coverage for H13220 (100% coverage)

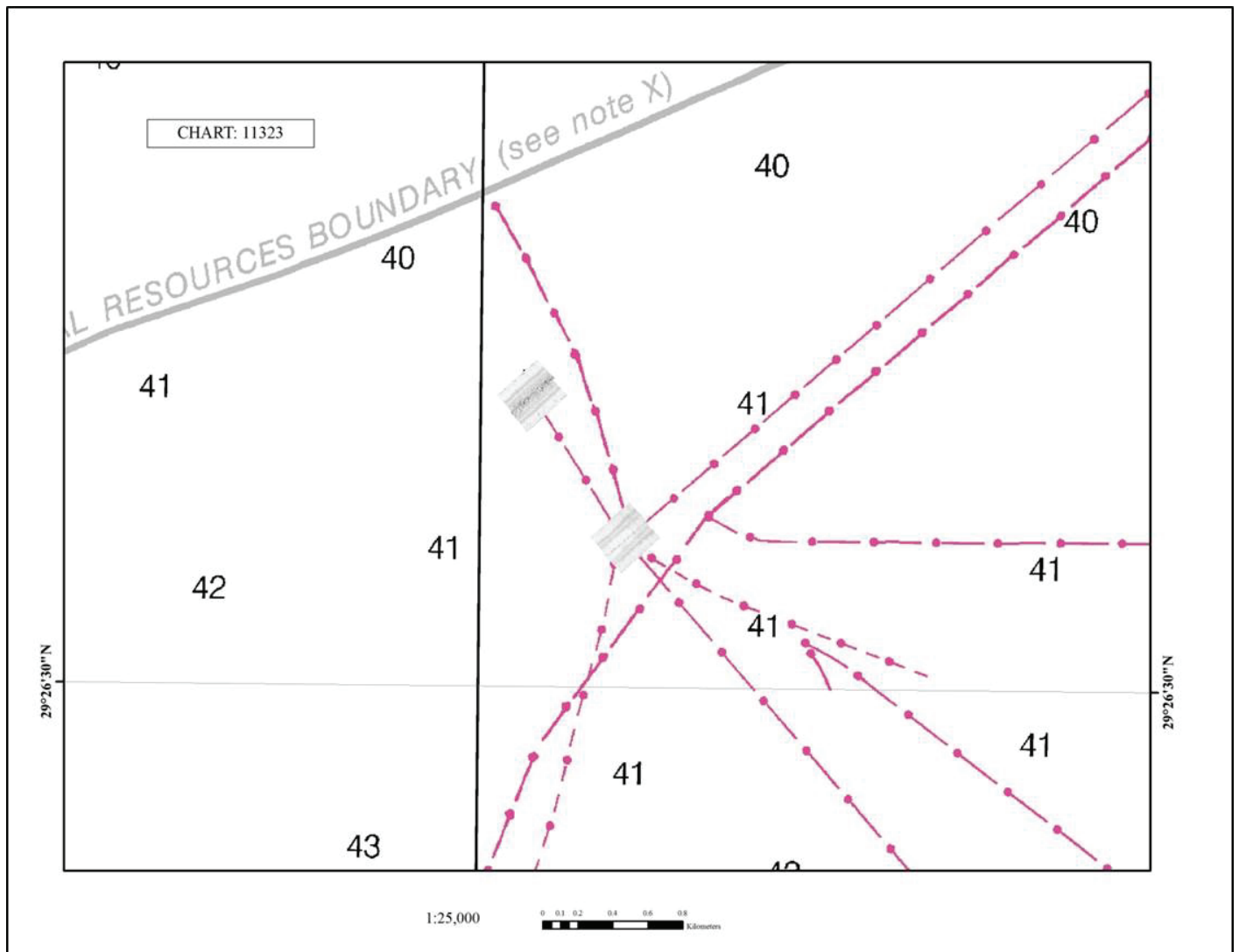


Figure 4: Final Side Scan Coverage for H13220 (disproval coverage)

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>Total</i>
LNM	SBES Mainscheme	0	0
	MBES Mainscheme	0	0
	Lidar Mainscheme	0	0
	SSS Mainscheme	0	0
	SBES/SSS Mainscheme	0	0
	MBES/SSS Mainscheme	562.85	562.85
	SBES/MBES Crosslines	31.31	31.31
	Lidar Crosslines	0	0
Number of Bottom Samples			3
Number Maritime Boundary Points Investigated			0
Number of DPs			0
Number of Items Investigated by Dive Ops			0
Total SNM			34

Table 3: Hydrographic Survey Statistics

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

Survey Dates	Day of the Year
07/19/2019	200

Survey Dates	Day of the Year
07/20/2019	201
07/21/2019	202
07/22/2019	203
07/23/2019	204
07/25/2019	206
07/26/2019	207
08/03/2019	215
09/28/2019	271
09/29/2019	272

Table 4: Dates of Hydrography

B. Data Acquisition and Processing

B.1 Equipment and Vessels

Leidos used their ISS-2000 software on a Windows 7 platform to acquire these survey data. Survey planning and data analysis were conducted using the Leidos SABER software on Red Hat Enterprise 7 Linux platforms. Klein 3000 side scan sonar (SSS) data were collected on a Windows 7 platform using Klein's SonarPro software. Subsequent processing and review of the SSS data, including the generation of coverage mosaics, were accomplished using SABER.

A detailed description of the systems and vessel used to acquire and process these data is included in the Data Acquisition and Processing Report (DAPR) for OPR-K371-KR-19, delivered previously with H13213. There were no variations from the equipment configuration described in the DAPR.

B.1.1 Vessels

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

Hull ID	<i>M/V Atlantic Surveyor</i>
LOA	110 feet
Draft	9 feet

Table 5: Vessels Used



Figure 5: M/V Atlantic Surveyor

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

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

B.1.2 Equipment

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

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

Table 6: Major Systems Used

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

B.2 Quality Control

B.2.1 Crosslines

Multibeam/single beam echo sounder/side scan sonar crosslines acquired for this survey totaled 5.56% 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 Less than IHO Order 1A Maximum Allowable Uncertainty
<i>M/V Atlantic Surveyor</i> Multibeam one-meter Crossline (Class 1) to one-meter Mainscheme	12.381 – 14.086	0.525 – 0.532	100.00

Figure 6: Summary of Crossing Analysis

B.2.2 Uncertainty

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

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

The final H13220 one-meter PFM CUBE surface contained final vertical uncertainties that ranged from 0.260 meters to 0.280 meters. The IHO Order 1a maximum allowable vertical uncertainty was calculated to range between 0.524 to 0.533 meters, based on the minimum CUBE depth (12.184 meters) and maximum CUBE depth (14.225 meters). Results from the SABER Check PFM Uncertainty function identified that there were no nodes in the final H13220 one-meter PFM CUBE surface with final vertical uncertainties that exceeded IHO Order 1a allowable vertical uncertainty. The SABER Frequency Distribution Tool was also

used to review the Hyp. Final Uncertainty surface within the final H13220 one-meter PFM grid, and the results showed that in the final one-meter PFM grid, 100.00% of all nodes had final uncertainties less than or equal to 0.280 meters.

B.2.3 Junctions

Per the Project Instructions, analyses of the H13220 junctions with adjacent surveys were performed. Junction analysis was conducted between H13220 and the surveys listed in Table 7. Figure 7 shows the general locality of H13220 as it relates to the sheets to which junctions were performed. Comparisons were not performed against H13219, as processing efforts for that sheet were still on-going. Refer to Separates II for details about how junction analysis was performed and a complete discussion of the analysis and tabular results.

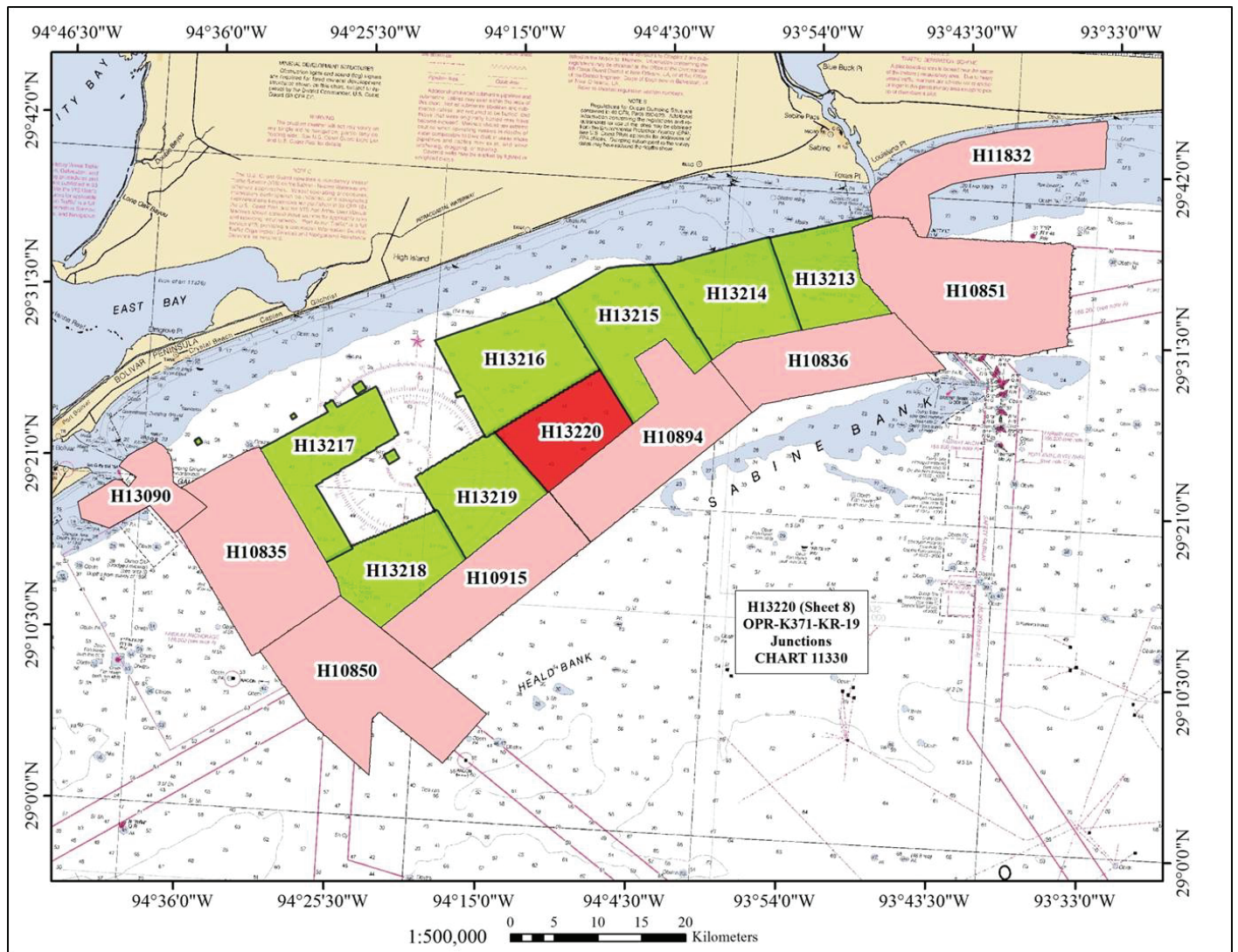


Figure 7: General Locality of H13220 with Junctioning Surveys

The following junctions were made with this survey:

Registry Number	Scale	Year	Field Unit	Relative Location
H13215	1:40000	2019	Leidos	E
H13216	1:40000	2019	Leidos	N
H10894	1:20000	1999	Fugro Pelagos, Inc.	SE
H10915	1:20000	1999	Fugro Pelagos, Inc.	S

Table 7: Junctioning Surveys

H13215

H13220 junctions with H13215 to the east; 100% of the comparisons agreed within ± 0.143 meters, fully within the calculated maximum allowable TVU of 0.529 meters.

H13216

H13220 junctions with H13216 to the north; 100% of the comparisons agreed within ± 0.192 meters, fully within the calculated maximum allowable TVU of 0.532 meters.

H10894

H13220 junctions with H10894 to the southeast; 100% of the comparisons agreed within ± 0.486 meters, fully within the calculated maximum allowable TVU of 0.531 meters.

H10915

H13220 junctions with H10915 to the south; 100% of the comparisons agreed within ± 0.103 meters, fully within the calculated maximum allowable TVU of 0.531 meters.

B.2.4 Sonar QC Checks

Sonar system quality control checks were conducted as detailed in the DAPR and quality control checks conducted during H13220 are reported in Separates I.

B.2.5 Equipment Effectiveness

Environmental factors resulting from seasonal conditions and local weather events lead to the occasional increase of Sargassum seaweed on the surface of discrete water masses within the survey area. Interactions could be seen in the SSS record as an increase in the signal returns (Figure 8). When observed in the SSS record, visual confirmations were frequently performed by the watchstanders and the Sargassum was often observed in the form of large mats on the water surface and often along discrete tide lines. When this was observed it was noted within the Side Scan Review Log (Separates I). In all cases, if the increased signal return of the SSS inhibited the ability to discern a 1x1x1-meter object, the data were reacquired.

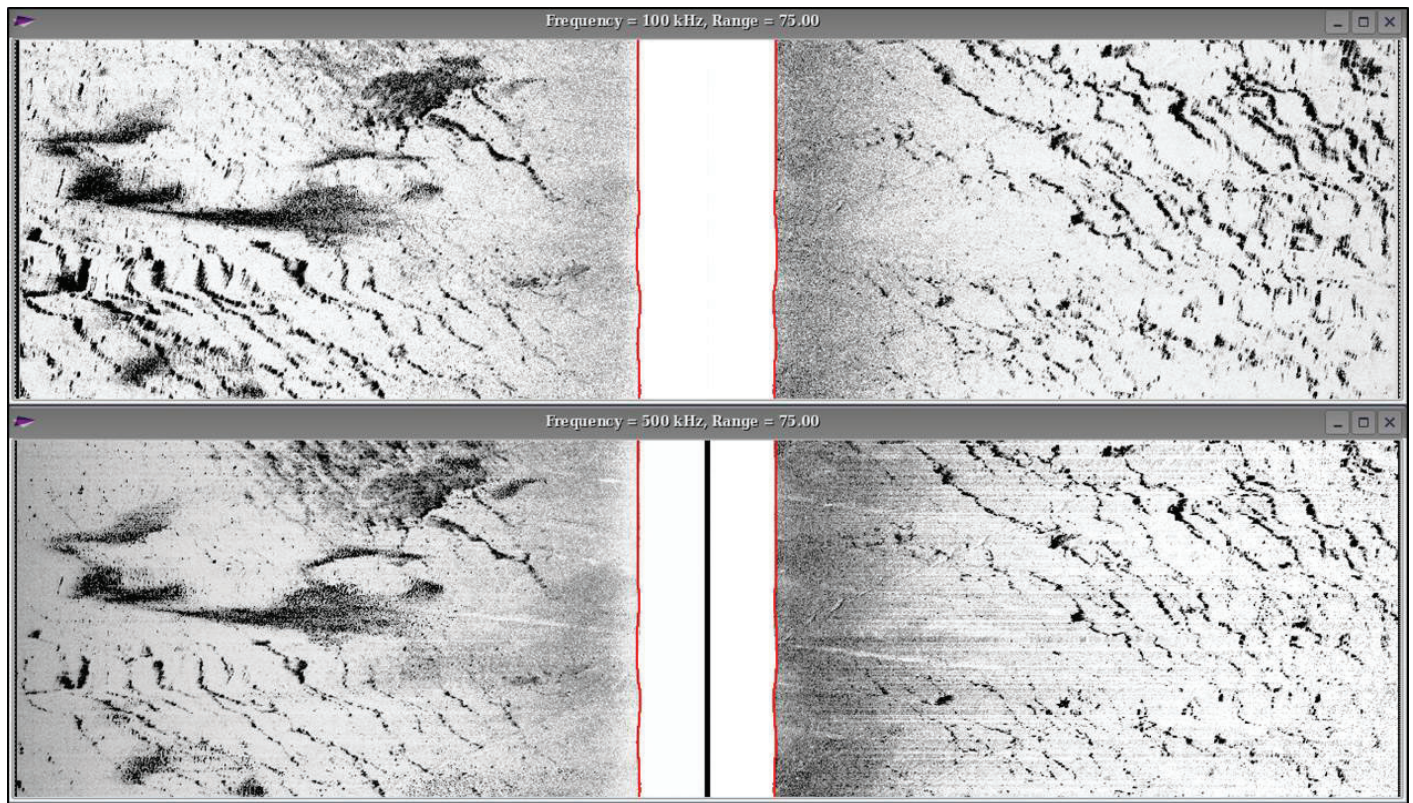


Figure 8: Sargassum Seaweed Visible in Side Scan Sonar Record

B.2.6 Factors Affecting Soundings

There were no factors which significantly impacted the soundings.

B.2.7 Sound Speed Methods

Sound Speed Cast Frequency: On the M/V Atlantic Surveyor, the MVP30 was the primary system used to collect sound speed profile (SSP) data, refer to the DAPR for additional details. SSP data were obtained at intervals frequent enough to meet depth accuracy requirements. Section 5.2.3.3 of the HSSD requires that if the sound speed measured at the sonar head differs by more than two meters/second from the commensurate profile data, then another cast shall be acquired. There were times when the sound speed values exceeded the two meters/second threshold due to the local temporal and tidal variability. During these times, several profiles were acquired and reapplied in an effort to reduce these effects. The product of this effort resulted in the final data bearing no significant artifacts due to sound speed differences.

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. Four sound speed confidence checks were conducted during H13220 and the results can be found in Separates II within the “Comparison Cast Log” section.

All individual SSP files are delivered with the H13220 data and are broken out into sub-folders, which correspond to the purpose of each cast. Also, all individual SSP files for H13220 have been concatenated into four separate files based on the purpose of the cast, provided in CARIS format files (.svp), and delivered under (H13220/Processed/SVP/CARIS_SSP) on the delivery drive. In addition, sound speed data for the entire OPR-K371-KR-19 project will be submitted to NCEI following the NetCDF template format as specified in Section 8.3.6 of the HSSD.

B.2.8 Coverage Equipment and Methods

All equipment and survey methods are detailed in the DAPR.

B.2.9 Multibeam Coverage Analysis

Leidos chose to achieve the coverage requirement using 100% side scan sonar coverage with concurrent multibeam bathymetry. To achieve this coverage, the M/V Atlantic Surveyor used a towed Klein 3000 SSS set to 75-meter range scale. Mainscheme line spacing was set to 120 meters, which ensured 100% SSS coverage.

The HSSD Section 7.3.4 stated that 100% SSS coverage was insufficient to disprove a charted feature. Therefore, Leidos reviewed the Composite Source File (CSF), BSB charts, and ENC charts and completed an additional 100% SSS coverage, and resulting MBES coverage over assigned objects not found during survey in order to verify disproval. A disproval search radius was developed as specified in the Project Reference File (PRF), Final_OPR-K371-KR-19_PRF.000 (provided on 18 March 2019), or following best practices if not specified. The radius is documented within the H13220 S-57 FFF. For all assigned objects within the H13220 Statement of Work (SOW), each object’s achieved disproval data covered an area of at least the assigned disproval search radius.

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 H13220 one-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 H13220 CUBE PFM 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 of the H13220 Hyp. # Soundings surface of the final H13220 one-meter PFM, revealed that 99.63% of all nodes contained five or more soundings; satisfying the requirements for complete coverage surveys, Option B, as specified in Section 5.2.2.3 of the HSSD.

B.3 Echo Sounding Corrections

B.3.1 Corrections to Echo Soundings

All data reduction procedures conform to those detailed in the DAPR.

B.3.2 Calibrations

All sounding systems were calibrated as detailed in the DAPR.

B.4 Backscatter

Side Scan Sonar (SSS) Coverage Analysis: For all details regarding SSS data processing, see the DAPR. Leidos chose to adhere to the coverage requirements in the Project Instructions using Complete Coverage, Option B (100% side scan sonar coverage with concurrent multibeam). The HSSD 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 was collected over CSF assigned objects that were not found, to verify disproval. Leidos generated two separate coverage mosaics at one-meter cell size resolution as specified in Section 8.2.1 of the HSSD. The first 100% and second 100% disproval coverage mosaics were independently reviewed using tools in SABER to verify data quality and swath coverage. The SABER Gapchecker routine was used to flag data gaps within each of the 100% SSS coverage mosaics. Additionally, the entirety of each SSS surface was visually scanned for holidays at various points during the data processing effort. Additional survey lines were run to fill any holidays that were detected. Both coverage mosaics are determined to be complete and sufficient to meet the requirements contained within the Project Instructions and HSSD. Each 100 percent coverage mosaic is delivered as a single georeferenced raster file in floating point GeoTIFF format, as specified in Sections 8.2.1 and 8.3.3 in the HSSD.

Multibeam Echo Sounder Seafloor Backscatter: In accordance with the HSSD Section 6.2, Leidos collected MBES backscatter with all GSF data acquired. 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. Per HSSD Section 6.2.1, as the Project Instructions did not state to evaluate the backscatter data; backscatter data were not processed 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	5.4.0.22.3

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	5.4.0.22.4

Table 9: Primary imagery data processing software

The following Feature Object Catalog was used: NOAA Extended Attribute File V5-4.

The primary data processing software used for both bathymetry and imagery was SABER. Subsequent to the delivery of the OPR-K371-KR-19 DAPR (submitted 2019-12-06), the SABER version was upgraded from 5.4.0.22.3 to 5.4.0.22.4 as captured in 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
H13220_MB_1m_MLLW_Final-1_of_2	BAG	1 meters	13.091 meters - 14.225 meters	N/A	Complete Coverage, Option B (100% side scan sonar)

Surface Name	Surface Type	Resolution	Depth Range	Surface Parameter	Purpose
					coverage with concurrent multibeam)
H13220_MB_1m_MLLW_Final-2_of_2	BAG	1 meters	12.184 meters - 13.870 meters	N/A	Complete Coverage, Option B (100% side scan sonar coverage with concurrent multibeam)
H13220_SSSAB_1m_100kHz_1of2	SSS Mosaic (.tif)	1 meters	0.00 meters - 0.00 meters	N/A	100% SSS
H13220_SSSAB_1m_100kHz_2of2	SSS Mosaic (.tif)	1 meters	0.00 meters - 0.00 meters	N/A	Second 100% SSS For Object Disproval

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 H13220 at one-meter resolution.

The CUBE Depth surface of the final H13220 one-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 H13220 one-meter PFM was from 12.184 meters (39.974 feet; 0.260 meters Total Vertical Uncertainty [TVU]) to 14.225 meters (46.670 feet; 0.270 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.

C. Vertical and Horizontal Control

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

C.1 Vertical Control

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

ERS Datum Transformation

The following ellipsoid-to-chart vertical datum transformation was used:

Method	Ellipsoid to Chart Datum Separation File
ERS via VDATUM	OPR-K371-KR-19_NAD83_VDatum_MLLW.cov

Table 11: ERS method and SEP file

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

C.2 Horizontal Control

The horizontal datum for this project is North American Datum of 1983 (NAD 83).

The projection used for this project is Universal Transverse Mercator (UTM) Zone 15.

PPP

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

D. Results and Recommendations

D.1 Chart Comparison

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

United States Coast Guard (USCG) District 8 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 13/19 (27 March 2019) until week 01/20 (08 January 2020).

H13220 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 H13220 S-57 FFF. Additional charted objects such as submarine pipelines and platforms 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?
US4TX71M	1:80000	37	11/08/2019	11/18/2019	NO

Table 12: Largest Scale ENC's

US4TX71M

ENC US4TX71M covers the entire H13220 survey area.

CUBE depths within H13220 were generally deeper than charted depths across the contemporaneous survey area; observed depths were primarily within 0.5 meters of charted depths (Figure 9). There were no depth contours on ENC US4TX71M that fell within the H13220 survey area.

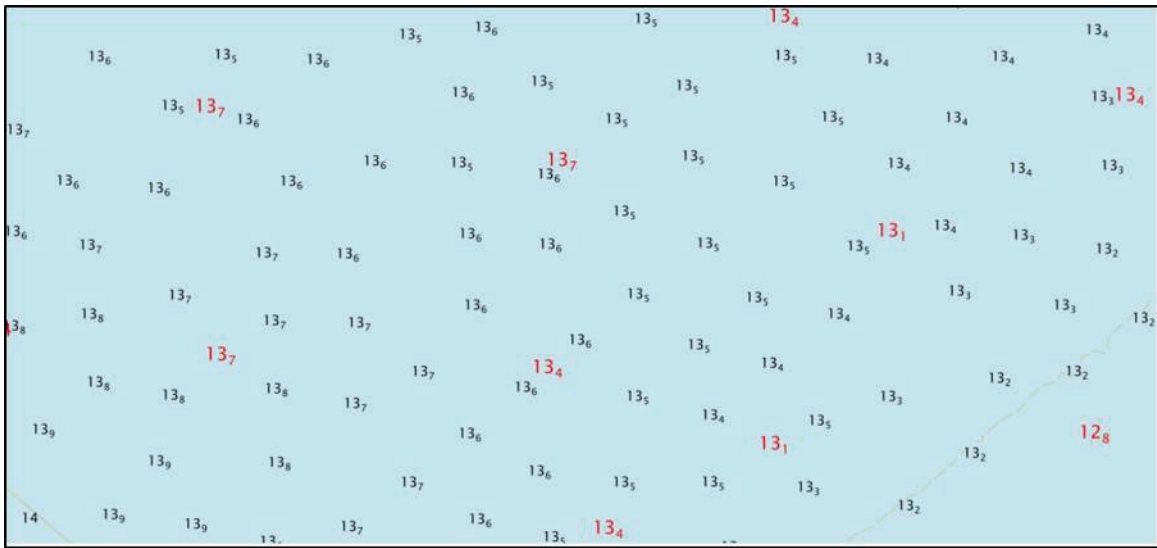


Figure 9: ENC US4TX71M Charted Soundings (red) with H13220 CUBE Depth Selected Soundings (black)

D.1.2 Maritime Boundary Points

No Maritime Boundary Points were assigned for this survey.

D.1.3 Charted Features

There were no charted features assigned in the final CSF (Final_OPR-K371-KR-19_CSF.000) that fell within the SOW of H13220. Refer to Section D.2.5 for information regarding charted platforms addressed in H13220.

D.1.4 Uncharted Features

There were no uncharted multibeam features within the area covered by this survey.

D.1.5 Shoal and Hazardous Features

There were no significant shoals or hazardous features within the area covered by this survey.

D.1.6 Channels

There were no channels within the area covered by this survey.

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 H13220. Bottom characteristics were acquired at the three locations assigned in the PRF by NOAA. Leidos did not modify the bottom sample locations from the location proposed by NOAA in the PRF. Bottom characteristics collected during H13220 are included in the H13220 S-57 FFF, named H13220_FFF.000, within the Seabed Area (SBDARE) object, and are classified according to the requirements set forth in the HSSD. In addition, images of the sediment obtained for each bottom sample are referenced in the H13220_FFF.000 and are included on the delivery drive under the folder H13220/Processed/Multimedia.

D.2 Additional Results

D.2.1 Shoreline

All features in the CSF within the assigned Survey Limits of H13220 were resolved. There were no assigned features inshore of the NALL.

D.2.2 Aids to Navigation

There were no aids to navigation that fell within this survey area.

D.2.3 Overhead Features

There were no overhead features within this survey area.

D.2.4 Submarine Features

There were no submarine features of significance within the area covered by this survey.

D.2.5 Platforms

There were two assigned offshore platform objects in the CSF, Final_OPR-K371-KR-19_CSF.000, which fell within the SOW for H13220. All of the assigned platforms were charted on ENC US4TX71M.

Investigation requirements for assigned platforms within the CSF, Final_OPR-K371-KR-19_CSF.000, stated to “Visually confirm feature object existence. If feature exists, include in FFF with descrp=retain. If feature is not visible, conduct a feature disproval (Section 7.3.4).”

Neither of the two charted platforms assigned within the survey area for H13220 were visible above the waterline, therefore disproval surveys were conducted. The disproval surveys were conducted by collecting 200% SSS and resulting MBES over an area centered at the CSF platform position with a radius of at least 80 meters. Within each of the disproval areas, there was no evidence of a platform in the SSS or MBES data. Refer to the H13220 S-57 FFF for details and charting recommendations on the charted platforms.

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 8.1.4 of the HSSD, exist within this survey area except as previously discussed in Section B.2.5 of this report.

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

Separate flags exist in the Generic Sensor Format (GSF) for a designated sounding and feature. During data analysis, designated soundings or feature flags are used to help better preserve the shoalest sounding relative to the computed depth surface. All depths flagged as features and designated soundings override the CUBE best estimate of the depth in the final BAG files. Both the designated sounding and feature flags, as defined within GSF, are mapped to the same HDCS flag when ingested into CARIS (PD_DEPTH_DESIGNATED_MASK). No GSF designated sounding flags or feature flags were set for H13220.

D.2.11 Final Feature S-57 File

Included with the H13220 delivery is the S-57 FFF, H13220_FFF.000. Details on how this file was generated and quality controlled can be found in the DAPR. The S-57 FFF delivered for H13220 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. All significant and recommended for charting features found in H13220 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 H13220 in the S-57 FFF.

D.2.12 Side Scan Sonar Contacts S-57 File

Included with the H13220 delivery is the Side Scan Sonar Contact S-57 File, H13220_SSCon.000. Details on how this file was generated and quality controlled can be found in the DAPR. As specified in Section 2.2 of the HSSD, the S-57 file is in the WGS84 datum and is unprojected with all depth units in meters.

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-K371-KR-19. Within the Coast Pilot Field Report (OPR-K371-KR-18CoastPilotReport.pdf) provided by NOAA to Leidos on 18 March 2019, it indicated that paragraphs 15 through 127 were relevant to the survey area of OPR-K371-KR-19 and there were no assigned investigation items. 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. Leidos downloaded Coast Pilot 5 Chapter 10 from the Coast Pilot website, 47th Edition of Coast Pilot 5, dated 17 November 2019. Recommendations were documented using the text from the 47th Edition 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-K371-KR-18CoastPilotReport.pdf). Leidos submitted the Coast Pilot Field Report on 22 November 2019. The email correspondence for Leidos' submission of the Coast Pilot Review Report is included within the Project Correspondence.

D.2.14 Inset Recommendation

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

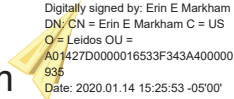
E. Approval Sheet

As Chief of Party, field operations for this hydrographic survey were conducted under my direct supervision, with frequent personal checks of progress and adequacy. I have reviewed the attached survey data and reports.

This Descriptive Report, all BAG files, and all accompanying records and data are approved. All records are forwarded for final review and processing to the Processing Branch.

The survey data meets or exceeds requirements as set forth in the Hydrographic Surveys Specifications and Deliverables, Project Instructions, and Statement of Work. These data are adequate to supersede charted data in their common areas. This survey is complete and no additional work is required. Previously, or concurrently, submitted deliverables for OPR-K371-KR-19 are provided in the table below.

Report Name	Report Date Sent
OPR-K371-KR-19_Coast Pilot Review Report.pdf	2019-11-22
OPR-K371-KR-19_Marine_Species_Awareness_Training_Record.pdf	2019-11-22
OPR-K371-KR-19_DAPR.pdf	2019-12-06
H13213_DR.pdf	2019-12-06
H13214_DR.pdf	2019-12-13
H13216_DR.pdf	2019-12-20
H13215_DR.pdf	2020-01-06
H13217_DR.pdf	2020-01-08
H13213_DR_rev1.pdf	2020-01-14
H13214_DR_rev1.pdf	2020-01-14
H13216_DR_rev1.pdf	2020-01-14
H13215_DR_rev1.pdf	2020-01-14
H13217_DR_rev1.pdf	2020-01-14

Approver Name	Approver Title	Approval Date	Signature
Erin Markham	Lead Hydrographer	01/14/2020	Erin E Markham  <small>Digitally signed by: Erin E Markham DN: CN = Erin E Markham C = US O = Leidos OU = A01427D0000016533F343A400000 936 Date: 2020.01.14 15:25:53 -05'00'</small>

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

A field tide note was not required for H13220.

Final Tide Note

Per the Project Instructions H13220 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).

Abstract Times of Hydrography

Project: OPR-K371-KR-19

Registry No.: H13220

Contractor Name: Leidos

Date: 14 January 2020

Sheet Designation: 8

Inclusive Dates: 19 July 2019 – 29 September 2019

Field work is complete.

Begin Date	Begin Julian Day	Begin Time	End Date	End Julian Day	End Time
19 July 2019	200	12:19:32	19 July 2019	200	23:59:59
20 July 2019	201	00:00:00	20 July 2019	201	23:59:59
21 July 2019	202	00:00:00	21 July 2019	202	23:59:59
22 July 2019	203	00:00:00	22 July 2019	203	13:17:50
22 July 2019	203	16:24:24	22 July 2019	203	23:59:59
23 July 2019	204	00:00:00	23 July 2019	204	19:13:09
25 July 2019	206	11:07:02	25 July 2019	206	23:59:59
26 July 2019	207	00:00:00	26 July 2019	207	06:59:23
03 August 2019	215	09:30:20	03 August 2019	215	11:15:43
28 September 2019	271	06:15:03	28 September 2019	271	20:37:01
29 September 2019	272	01:05:49	29 September 2019	272	02:27:37
29 September 2019	272	13:07:56	29 September 2019	272	17:24:55

Table A-1: Abstract Times of Hydrography, H13220

Transmittal Letter to CO-OPS

A transmittal letter to CO-OPS was not required for H13220.

Request for Approved Tides/Water Levels Letter

A “Request for Approved Tides/Water Levels” letter was not required for H13220.

Other Correspondence Relating to Tides

Please refer to the Project Correspondence directory for correspondence related to water levels for H13220.

- OPR-K371-KR-19_CSF_and_VDatum.pdf
- OPR-K371-KR-19_VDatum.pdf

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-K371-KR-19, Task Order 0005 (Port Arthur Traffic Lanes). 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
Dorena Vogel	Leidos	03/22/2019
Christopher Englert	Leidos	03/22/2019
Joshua Saunders	Leidos	03/22/2019
Capt. Chris Sevastakis	Divemasters	03/23/2019
Capt. Bernie Borrelli	Divemasters	03/23/2019
Capt. Henry Dollman	Divemasters	03/23/2019
Matthew Spears	Divemasters	03/23/2019
Sean Davies	Divemasters	03/23/2019
Jeffrey Adams	Leidos	03/25/2019
Allison Weide	Leidos	03/25/2019
Lucas Cappellini	Leidos	03/25/2019
Richard Nadeau	Leidos	03/26/2019
Paul Donaldson	Leidos	03/26/2019
Alex Bernier	Leidos	03/26/2019
Stewart Kaczynski	Leidos	03/27/2019
Peter Reheis	Leidos	03/27/2019
Michael Cole	Leidos	03/29/2019
Erin Markham	Leidos	04/02/2019
Timothy Mayer	Leidos	04/01/2019
Daniel McGovern	Leidos	04/04/2019
Lisa Hill	OARS	04/19/2019
Veronica Holton	OARS	05/11/2019

Name	Organization	Date
Brian Biggert	OARS	07/06/2019
Darina DeBenedictis	OARS	07/06/2019
Roland Brennan	OARS	07/27/2019
Capt. Fred Derry	Divemasters	08/07/2019

From: Richard Powell - NOAA Federal <richard.powell@noaa.gov>
Sent: Tuesday, November 26, 2019 6:20 AM
To: Donaldson, Paul L. [US-US]
Subject: EXTERNAL: Re: OPR-K371-KR-19 Coast Pilot Review Report

Paul,

Thanks for this report. I will track it and make sure it gets registered as source document with our data branch. Once registered, I will make the appropriate changes to Coast Pilot 5.

Have a good day!

Sincerely,

Richard Hodge Powell
Cartographer / Marine Information
Nautical Publications Branch
240-533-0060

National Oceanic and Atmospheric Administration
National Ocean Service
Office of Coast Survey

From: Laura Jeffery - NOAA Federal <laura.jeffery@noaa.gov>
Sent: Monday, November 25, 2019 9:13 AM
To: Donaldson, Paul L. [US-US]
Subject: EXTERNAL: Re: OPR-K371-KR-19 Coast Pilot Review Report

Thank you very much for your Coast Pilot 5 field report. We will have it registered and applied to the CP as soon as possible.

Happy Thanksgiving!

On Fri, Nov 22, 2019 at 4:02 PM 'Donaldson, Paul L.' via _NOS OCS NSD Coast Pilot <coast.pilot@noaa.gov> wrote:

Leidos Proprietary

Please find attached the Coast Pilot Review Report for Contract: EA-133C-14-CQ-0033, Project Number OPR-K371-KR-19, Task Order 0005 (Port Arthur Traffic Lanes). The one attached .pdf file addresses the Coast Pilot Field Report delivered to Leidos for OPR-K371-KR-19, and a separate review of the text within the 47th Edition of Coast Pilot 5, Chapter 10 paragraphs.

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

Paul L. Donaldson CH (NSPS #241)|Leidos

Hydrographic Survey & Data Solutions Manager/Chief Hydrographer

Phone: 401.848.4757

Mobile: 401.261.7895

Mobile: 860.857.8802

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--

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

From: Donaldson, Paul L. [US-US]
Sent: Friday, November 22, 2019 4:01 PM
To: 'OCS.NDB@noaa.gov'; 'Coast.Pilot@noaa.gov'
Cc: Kathryn Pridgen - NOAA Federal; Evans, Rhodri E. [US-US]; Bernier, Bridget W. [US-US]; Bernier, Alex T. [US-US]; Markham, Erin E. [US-US]
Subject: OPR-K371-KR-19 Coast Pilot Review Report
Attachments: OPR-K371-KR-19_Coast Pilot Review Report.pdf

Leidos Proprietary

Please find attached the Coast Pilot Review Report for Contract: EA-133C-14-CQ-0033, Project Number OPR-K371-KR-19, Task Order 0005 (Port Arthur Traffic Lanes). The one attached .pdf file addresses the Coast Pilot Field Report delivered to Leidos for OPR-K371-KR-19, and a separate review of the text within the 47th Edition of Coast Pilot 5, Chapter 10 paragraphs.

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

Paul L. Donaldson CH (NSPS #241) | Leidos
Hydrographic Survey & Data Solutions Manager/Chief Hydrographer
Phone: 401.848.4757
Mobile: 401.261.7895
Mobile: 860.857.8802
Fax: 401.849.1585
Email: paul.l.donaldson@leidos.com

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From: [Bernier, Bridget W. \[US-US\]](#)
To: ["survey.outlines@noaa.gov"](mailto:survey.outlines@noaa.gov); [Kathryn Pridgen \(kathryn.pridgen@noaa.gov\)](mailto:kathryn.pridgen@noaa.gov)
Cc: [Evans, Rhodri E. \[US-US\]](#); [Donaldson, Paul L. \[US-US\]](#); [Bernier, Alex T. \[US-US\]](#); [Markham, Erin E. \[US-US\]](#)
Subject: Survey Outlines for OPR-K371-KR-19 (H13215, H13216, and H13220)
Date: Thursday, October 24, 2019 1:51:20 PM
Attachments: [H13216_Survey_Outline.000](#)
[H13215_Survey_Outline.000](#)
[H13220_Survey_Outline.000](#)

Katy,

Please find attached the Survey Outlines for H13215 (Sheet 3), H13216 (Sheet 4), and H13220 (Sheet 8) from OPR-K371-KR-19, Port Arthur Traffic Lanes, Task Order-0005.

The survey outlines have been generated as S-57 Feature Object Class M_COVR in .000 format (WGS84 datum, un-projected) as specified in the March 2019 HSSD (Section 8.1.2).

This completes the final submittal of survey outlines for the 8 sheets conducted during OPR-K371-KR-19.

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

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UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
Office of Marine and Aviation Operations
NOAA Ship *Fairweather* (S220)
1010 Stedman Street, Ketchikan, Alaska 99901

Date: 11/05/2019

MEMORANDUM FOR: Rod Evans
Leidos, Inc.

FROM: Kathryn Pridgen, NOAA
Project Manager, Hydrographic Surveys Division Operations Branch
OPR-K371-KR-19 Port Arthur Traffic Lanes

SUBJECT: Request – 2019 Hydrographic Survey Specifications and Deliverables

At Leidos' request, I, Kathryn Pridgen, as Project Manager and COR, on behalf of HSD OPS, allow the use of the 2019 Hydrographic Survey Specifications and Deliverables (HSSD) in lieu of the 2018 Hydrographic Survey Specifications and Deliverables as specified in the project instructions for this project, OPR-K371-KR-19 Port Arthur Traffic Lanes.

Justification

This will allow the projects deliverables to be submitted using the most up to date specifications and requirements as outlined in the 2019 version of the HSSD.

PRIDGEN.KATHRYN.GRABOWSKI.1392550549
ABOWSKI.1392550549
Digitally signed by PRIDGEN.KATHRYN.GRABOWSKI.
1392550549
Date: 2019.11.05 13:56:54 -05'00'

Kathryn Pridgen
Project Manager and COR, NOAA
Hydrographic Survey Specifications and Deliverables



From: [Markham, Erin E. \[US-US\]](#)
To: NODC.submissions@noaa.gov
Cc: [Kathryn Pridgen - NOAA Federal](#); [Evans, Rhodri E. \[US-US\]](#); [Donaldson, Paul L. \[US-US\]](#); [Bernier, Alex T. \[US-US\]](#); [Bernier, Bridget W. \[US-US\]](#)
Subject: OPR-K371-KR-19 NetCDF Sound Speed Data Files
Date: Thursday, January 16, 2020 3:25:41 PM
Attachments: [image001.png](#)
[OPR-K371-KR-19_20200116.zip](#)

Leidos Proprietary

Good Afternoon,

In accordance with Section 8.3.6 of the Hydrographic Surveys Specifications and Deliverables (March 2019), please find attached one zip file (OPR-K371-KR-19_20200116.zip) containing sound speed data in the NetCDF format used for Leidos hydrographic surveys under project number OPR-K371-KR-19, Contract: EA-133C-14-CQ-0033 (Task Order: 05).

All individual sound speed profile files are 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-K371-KR-19_NCEI_Used_for_Closing
- OPR-K371-KR-19_NCEI_Used_for_Comparison
- OPR-K371-KR-19_NCEI_Used_for_Final_Surfaces
- OPR-K371-KR-19_NCEI_Used_for_Lead_Line

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

Thank you,

Erin Markham | Leidos

Hydrographer
Marine Survey & Engineering Solutions
office: 401.848.4707
mobile: 914.282.8377
erin.e.markham@leidos.com



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APPROVAL PAGE

H13220

The survey data meet or exceed the current requirements of the Office of Coast Survey hydrographic data review process and may be used to update NOAA products. The following survey products will be archived at the National Centers for Environmental Information:

- Descriptive Report
- Collection of Bathymetric Attributed Grids (BAGs)
- Collection of acoustic backscatter mosaics
- Bottom samples
- Geospatial PDF of survey products

Approved: _____

Commander Meghan McGovern, NOAA
Chief, Atlantic Hydrographic Branch