H13818

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

DESCRIPTIVE REPORT

Type of Survey:	Navigable Area
Registry Number:	H13818

LOCALITY

State(s):	Louisiana
General Locality:	Calcasieu, LA
Sub-locality:	13 NM South of Mud Lake

2023

CHIEF OF PARTY
Dorena S. Vogel

LIBRARY & ARCHIVES

Date:

U.S. DEPARTMENT OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION	REGISTRY NUMBER:
HYDROGRAPHIC TITLE SHEET	**H13818**

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):	**Louisiana**
General Locality:	**Calcasieu, LA**
Sub-Locality:	**13 NM South of Mud Lake**
Scale:	**20000**
Dates of Survey:	**08/21/2023 to 12/07/2023**
Instructions Dated:	**07/13/2023**
Project Number:	**OPR-K356-KR-23**
Field Unit:	**Leidos**
Chief of Party:	**Dorena S. Vogel**
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: 1305M220DNCNJ0056/TO-04. Contractor: Leidos, 221 Third Street, Newport, RI 02840 USA. Subcontractors: OARS, 8705 Shoal Creek Blvd, Suite 109, Austin, TX 78757. Leidos Doc. 24-TR-006. 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 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

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Descriptive Report to Accompany Survey H13818

Project: OPR-K356-KR-23

Locality: Calcasieu, LA

Sublocality: 13 NM South of Mud Lake

Scale: 1:20000

August 2023 - December 2023

Leidos

Chief of Party: Dorena S. Vogel

A. Area Surveyed

Leidos conducted hydrographic survey H13818, within the assigned area 13 NM South of Mud Lake, Louisiana (Figure 1). The survey was conducted in accordance with coverage requirements listed in the Project Instructions (PI) OPR-K356-KR-23 and the Statement of Work. Additionally, the survey data were acquired in accordance with Hydrographic Survey Specifications and Deliverables (HSSD), March 2022.

A.1 Survey Limits

Data were acquired within the following survey limits:

Northwest Limit	Southeast Limit
29° 37' 38.6" N 93° 39' 12.74" W	29° 30' 33.65" N 93° 21' 59.54" W

Table 1: Survey Limits

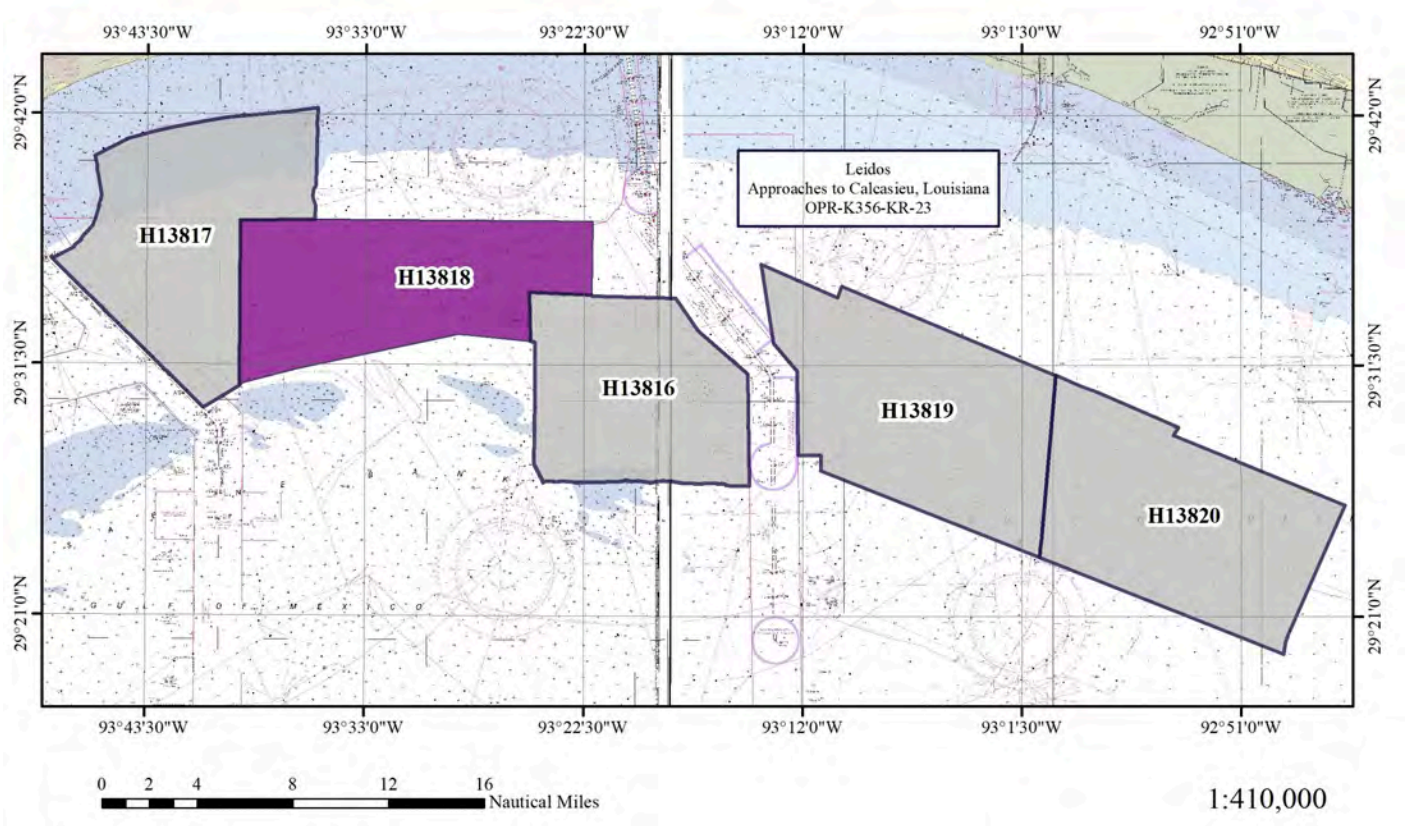

Figure 1: H13818 Survey Bounds

Survey limits were acquired in accordance with the requirements in the PI and the HSSD. The resulting survey limit is shown in Figure 1.

A.2 Survey Purpose

The Survey Purpose as defined in the PI: “The area offshore of Calcasieu Lake and Port Charles, Louisiana have been identified as an area in critical need of updated hydrographic data by NOAA's Hydrographic Health models and the Lake Charles Pilot's Association. The Port of Lake Charles is ranked fourteenth by tonnage for U.S. Ports (1), and the region is expected to see an expansion in marine commerce due in part to an increase in LNG distribution, as well as offshore wind-energy development. Since 2020, the Louisiana Coast has been hit by six hurricanes and two named tropical storms, several of which caused serious damage to the Ports of Lake Charles and Calcasieu. Many parts of the coverage area have not been charted since the 1930s.

This survey will provide contemporary data to update National Ocean Service (NOS) nautical charting products and services, improving the safety of maritime traffic and services available to the Port of Lake Charles by reducing the current risk that is present due to outdated bathymetry. Survey data from this project is intended to supersede all prior survey data in the common area.”

1: Bureau of Transportation Statistics, 2023. https://www.bts.gov/content/tonnage-top-50-us-water-ports-ranked-total-tons

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 1305M220DNCNJ0056 reflects the state of the sea floor in existence on the day and at the time the survey was conducted.

H13818 was surveyed in accordance with the following documents:
1. 1305M223FNCNJ0326 signed.pdf, received 13 July 2023
2. Hydrographic Survey Specifications and Deliverables (HSSD), March 2022
3. NOAA provided Project Reference File (PRF) OPR-K356-KR-23_PRF_FINAL.000, received 13 July 2023
4. NOAA provided Composite Source File (CSF) OPR-K356-KR-23_CSF_FINAL.000, received 13 July 2023
5. OPR-K356-KR-23 Project Brief, held 26 July 2023

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 All waters in survey area to HSSD Section 5.2.2.3)
All waters in survey area where 75-meter range scale is utilized on the side scan sonar.	Side scan may be acquired at an altitude of 6-20% of the range scale.

Table 2: Survey Coverage

Leidos chose to achieve the coverage requirement using Complete Coverage, Option B (100% side scan sonar coverage with concurrent multibeam) over the entire survey area. Multibeam Backscatter was logged continuously during data acquisition. Feature disprovals were conducted in accordance with defined disproval radii from the NOAA provided PRF, HSSD, and PI. Per HSSD Section 5.2.2.3, H13818 depth data fell within one resolution surface (1-meter). Refer to the Data Processing and Acquisition Report (DAPR) for additional information; the DAPR was previously delivered with H13817.

Survey coverage achieved was in accordance with the requirements in the PI and the HSSD (Figure 2).

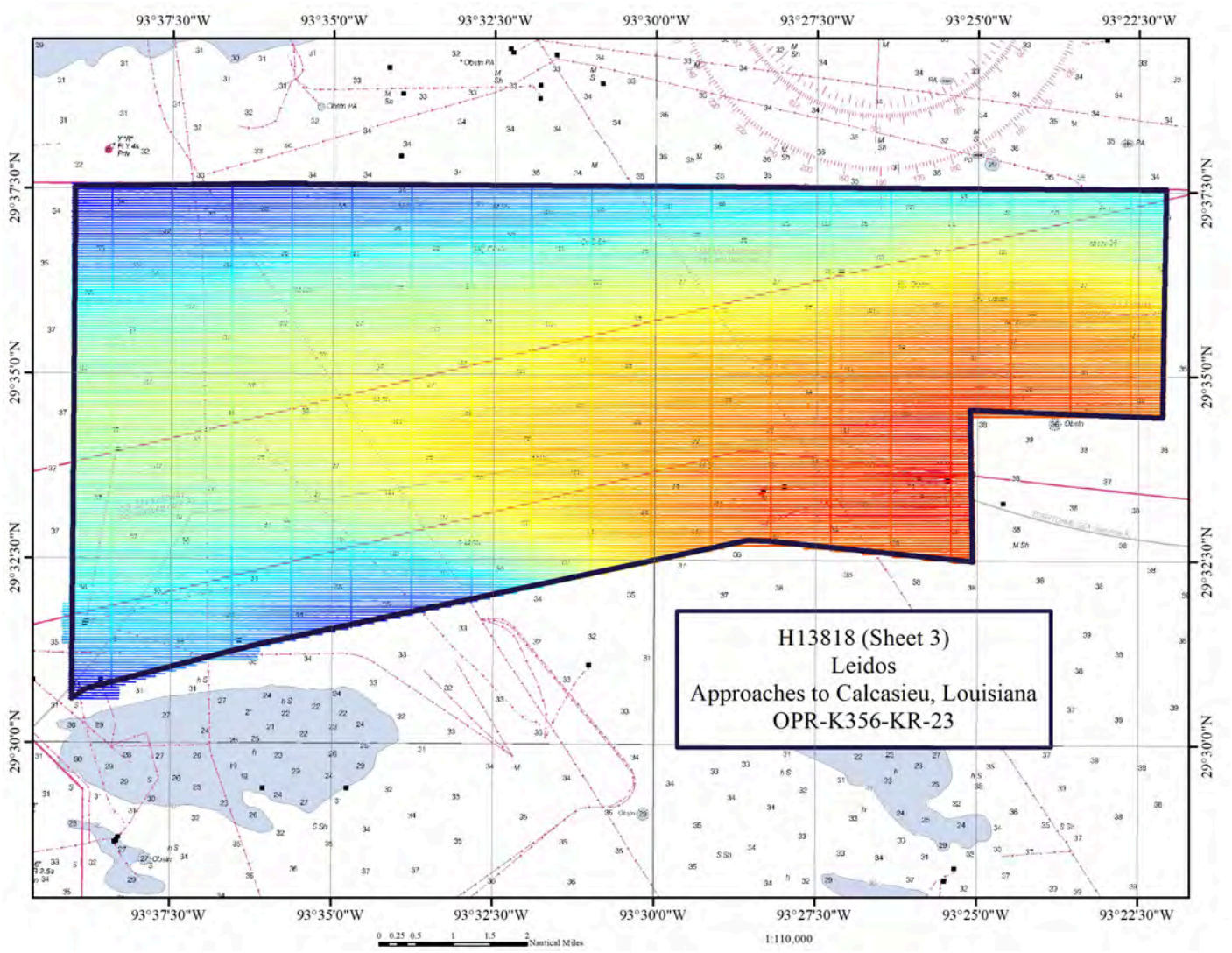

Figure 2: Final Bathymetry Coverage for H13818

A.6 Survey Statistics

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

	HULL ID	*R/V Sea Innovator I*	*Total*
LNM	**SBES Mainscheme**	0.0	0.0
	MBES Mainscheme	0.0	0.0
	Lidar Mainscheme	0.0	0.0
	SSS Mainscheme	0.0	0.0
	SBES/SSS Mainscheme	0.0	0.0
	MBES/SSS Mainscheme	2078.46	2078.46
	SBES/MBES Crosslines	94.17	94.17
	Lidar Crosslines	0.0	0.0
Number of Bottom Samples			4
Number Maritime Boundary Points Investigated			0
Number of DPs			0
Number of Items Investigated by Dive Ops			0
Total SNM			78.18

Table 3: Hydrographic Survey Statistics

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

Survey Dates	Day of the Year
08/21/2023	233

Survey Dates	Day of the Year
08/23/2023	235
08/24/2023	236
08/25/2023	237
08/26/2023	238
08/27/2023	239
08/28/2023	240
08/31/2023	243
09/01/2023	244
09/02/2023	245
09/03/2023	246
09/04/2023	247
09/05/2023	248
09/06/2023	249
09/07/2023	250
09/08/2023	251
09/09/2023	252
09/10/2023	253
09/11/2023	254
12/06/2023	340
12/07/2023	341

Table 4: Dates of Hydrography

B. Data Acquisition and Processing

B.1 Equipment and Vessels

A detailed description of the systems and vessel used to acquire and process these data is included in the DAPR. There were no variations from the vessel or equipment configuration described in the DAPR.

The Leidos owned and operated R/V Sea Innovator I was utilized as the survey platform. The R/V Sea Innovator I was used to collect multibeam echo sounder (MBES) (RESON SeaBat T50), side scan sonar (SSS) (Klein 4000), and sound speed data during twenty-four hours per day survey operations. As detailed in the DAPR the data acquisition was logged through Leidos ISS-2000 software and Klein SonarPro; side scan

sonar (SSS) only. Post processing and review of MBES and SSS data were conducted in Leidos' SABER software.

B.1.1 Vessels

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

Hull ID	***R/V Sea Innovator I***
LOA	135.0 feet
Draft	9.0 feet

Table 5: Vessels Used

Figure 3: R/V Sea Innovator I

B.1.2 Equipment

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

Manufacturer	Model	Type
Teledyne RESON	SeaBat T50-R	MBES
Teledyne RESON	SeaBat T50-R	MBES Backscatter
Klein Marine Systems	System 4000	SSS
Applanix	POS MV 320 v5	Positioning and Attitude System
AML Oceanographic	MVP30	Conductivity, Temperature, and Depth Sensor
AML Oceanographic	BaseX	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

MBES crosslines acquired 4.53% of H13818 and were distributed spatially and temporally across the sheet and survey duration per HSSD. The resulting crossline to mainscheme percentage met the requirement to achieve approximately four percent of mainscheme mileage for a complete coverage multibeam survey (Section 5.2.4.2 of the HSSD). H13818 requirements were for Complete Coverage, Option B, based on the classifications defined in Section 5.2.2.3 of the HSSD.

Refer to the DAPR, Section D.1.5 for details for Leidos conducting the repeatability analysis of mainscheme and crossline data. Crossline analysis was conducted within SABER, utilizing a 1-meter difference grid between the CUBE depth of mainscheme data and CUBE depth of near nadir cross line data. The SABER Frequency Distribution Tool was used to statistically analyze the difference grid created from the mainscheme and crossline PFM grids; results are summarized in Figure 4.

Section 5.2.4.2 of the HSSD states that the depth difference values are to be within the maximum allowable Total Vertical Uncertainty [TVU]. For H13818, 100% of the comparisons were within TVU for crossing analysis as summarized in Figure 5 and Figure 6.

Crossing Analysis	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
MBES 1m Crossline (Class 1) to MBES 1m Mainscheme	10.583 – 12.496	0.519 – 0.526	100.00%

Figure 4: Summary of Crossing Analysis

Depth Difference Range (m)	All		Positive		Negative		Zero	
	Count	Cumulative Percent	Count	Cumulative Percent	Count	Cumulative Percent	Count	Cumulative Percent
0-0.01	55115	15.98	26252	7.61	26213	7.60	2650	0.77
>0.01-0.02	46195	29.37	22170	14.04	24025	14.56		
>0.02-0.03	46694	42.91	22376	20.52	24318	21.61		
>0.03-0.04	42180	55.13	20410	26.44	21770	27.92		
>0.04-0.05	39914	66.71	19016	31.95	20898	33.98		
>0.05-0.06	30031	75.41	13976	36.01	16055	38.64		
>0.06-0.07	23593	82.25	10309	38.99	13284	42.49		
>0.07-0.08	16570	87.05	6743	40.95	9827	45.34		
>0.08-0.09	14398	91.23	5554	42.56	8844	47.90		
>0.09-0.10	10394	94.24	3954	43.71	6440	49.77		
>0.10-0.11	7479	96.41	2830	44.53	4649	51.12		
>0.11-0.12	4952	97.85	1719	45.02	3233	52.05		
>0.12-0.13	2831	98.67	993	45.31	1838	52.59		
>0.13-0.14	1743	99.17	572	45.48	1171	52.93		
>0.14-0.15	1192	99.52	315	45.57	877	53.18		
>0.15-0.16	730	99.73	158	45.61	572	53.35		
>0.16-0.17	467	99.86	139	45.65	328	53.44		
>0.17-0.18	347	99.96	202	45.71	145	53.48		
>0.18-0.19	100	99.99	57	45.73	43	53.50		
>0.19-0.20	18	99.99	6	45.73	12	53.50		
>0.20-0.25	4	99.99	1	45.73	3	53.50		
>0.25-0.30	0	99.99	0	45.73	0	53.50		
>0.30-0.338	1	100.00	1	45.73	0	53.50		
Total	**344948**	**100.00%**	**157753**	**45.73%**	**184545**	**53.50%**	**184545**	**0.77%**
Reference Grid: H13818_MB_1m_MLLW_cross_5deg_pfm_H13818_MB_1m_MLLW_main_pfm.dif								

Figure 5: Tabular Results Crossing Analysis, Crosslines vs. Mainscheme Lines

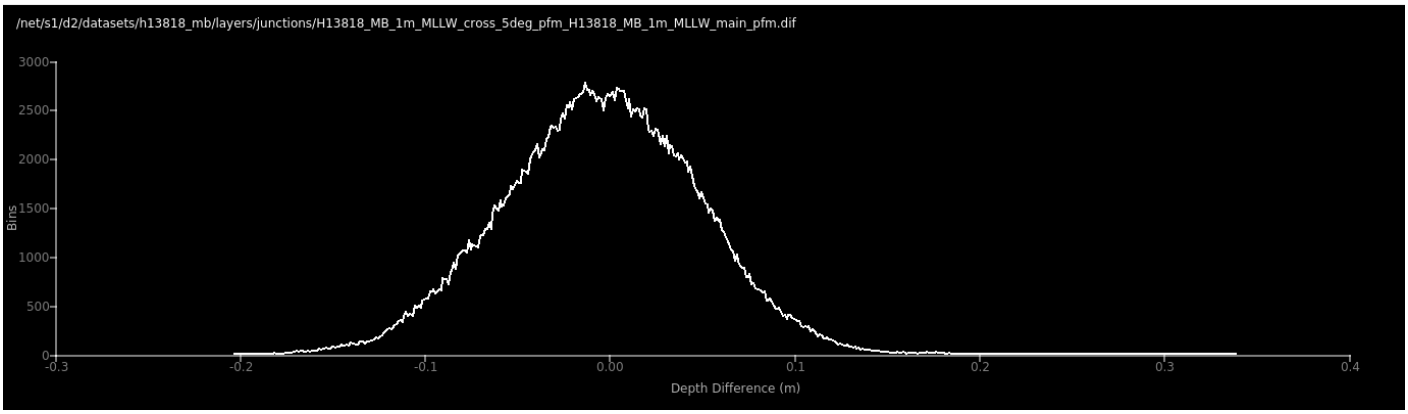

Figure 6: Plot of Crossing Analysis Crosslines vs. Mainscheme Lines

B.2.2 Uncertainty

The following survey specific parameters were used for this survey:

Method	Measured	Zoning
ERS via VDATUM	0.012 meters	0.2 meters

Table 7: Survey Specific Tide TPU Values.

Hull ID	Measured - CTD	Measured - MVP	Measured - XBT	Surface
R/V Sea Innovator I	N/A meters/second	1.0 meters/second	N/A meters/second	1.0 meters/second

Table 8: Survey Specific Sound Speed TPU Values.

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 Interval (CI). 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 6th Edition, Order 1a were flagged as invalid during the uncertainty attribution.

As referenced in the DAPR, Leidos analyses the grid surface several ways to verify that the data meet IHO S-44 6th Edition, Order 1a. The first is to analyze the range of derived uncertainty across the sheet and second is to compare each CUBE depth’s allowable uncertainty. The second method utilizes a statistical tool within SABER which outputs a designation if the allowable uncertainty exceeded IHO 6th Ed. Order 1a. For H13818, none of the nodes in the final surface had final vertical uncertainties that exceeded IHO

Order 1a allowable vertical uncertainty. The final uncertainty surface contained vertical uncertainties from 0.280 meters to 0.500 meters. The IHO Order 1a maximum allowable vertical uncertainty was calculated to range between 0.517 to 0.529 meters, based on the minimum CUBE depth (10.039 meters) and maximum CUBE depth (13.185 meters). Further analysis was conducted to compute statistical analysis on the vertical uncertainty surface using SABER's Frequency Distribution Tool; results showed that 100.00% of all nodes had final uncertainties less than or equal 0.500 meters, within the maximum allowable.

B.2.3 Junctions

Per the Project Instructions, junction analysis was performed between H13818, and the surveys listed in the Table 9 below and illustrated in Figure 7; results are discussed below.

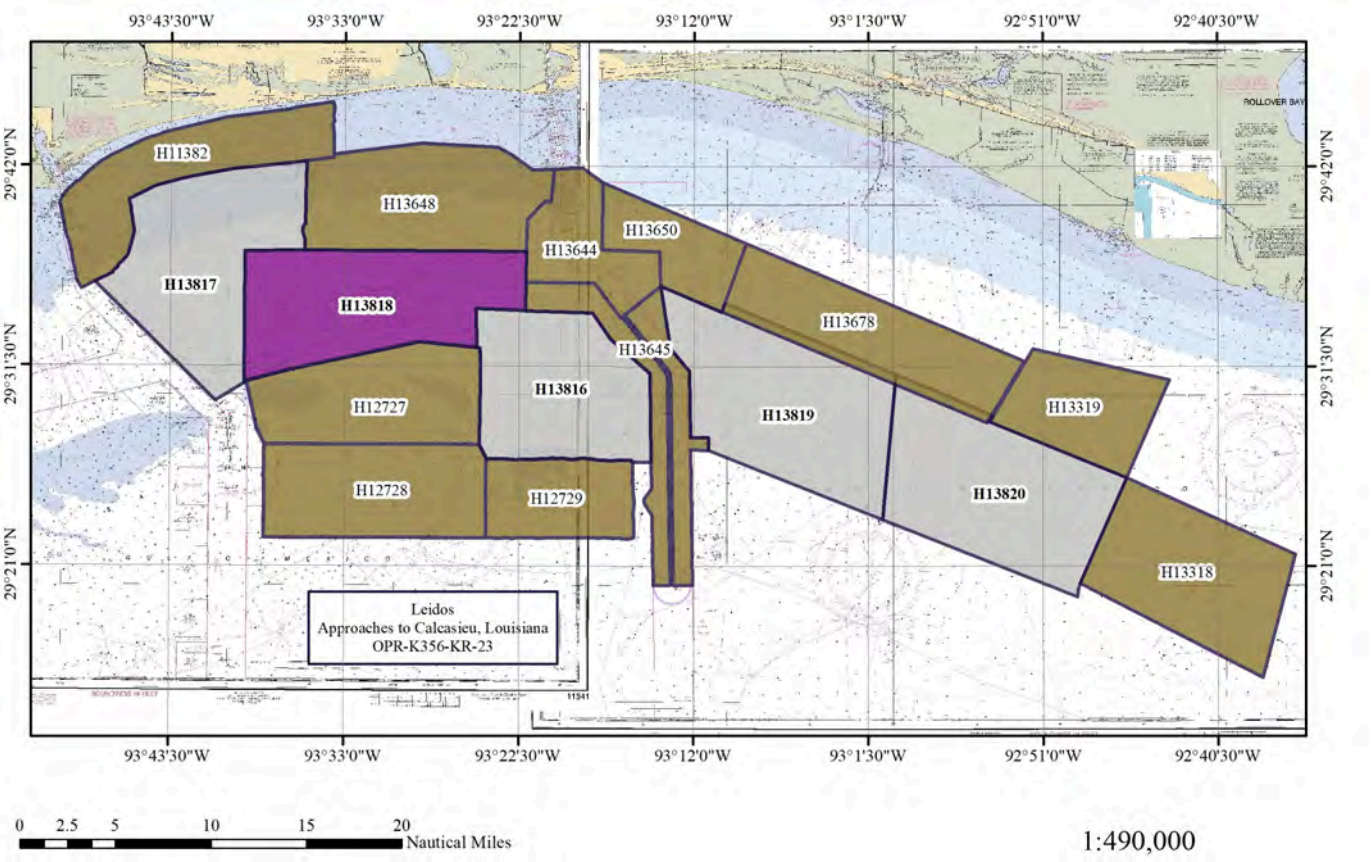

Figure 7: General Locality of H13818 with Junctioning Surveys

The following junctions were made with this survey:

Registry Number	Scale	Year	Field Unit	Relative Location
H12727	1:40000	2015	Leidos	S
H13644	1:10000	2022	DEA	E
H13645	1:10000	2022	DEA	E
H13648	1:10000	2022	DEA	N
H13816	1:10000	2023	Leidos	W
H13817	1:10000	2023	Leidos	SE

Table 9: Junctioning Surveys

H12727

Repeatability analysis was conducted by comparing the H12727 1-meter BAG depth surface to the H13818 1-meter BAG depth surface. The overlapping area was approximately 23,200 by 300 meters. Within the common area, observed depths were 9.688 to 12.514 meters which resulted in a calculated allowable TVU range of 0.516 to 0.526 meters. Results, show in Figure 8 indicate that 99.93% of the comparisons were 0.500 meters or less, within the calculated allowable TVU range. The distribution is skewed positive of zero as presented in Figure 9.

Depth Difference Range (m)	All		Positive		Negative		Zero	
	Count	Cumulative Percent	Count	Cumulative Percent	Count	Cumulative Percent	Count	Cumulative Percent
>0.01-0.02	107	0.03	23	0.01	1	0.00	0	0.00
>0.02-0.03	438	0.14	106	0.03	1	0.00		
>0.03-0.04	1120	0.41	438	0.14	0	0.00		
>0.04-0.05	1939	0.88	1120	0.41	0	0.00		
>0.05-0.06	2298	1.44	1939	0.88	0	0.00		
>0.06-0.07	2488	2.04	2298	1.43	0	0.00		
>0.07-0.08	2685	2.69	2488	2.04	0	0.00		
>0.08-0.09	3981	3.65	2685	2.69	0	0.00		
>0.09-0.10	6126	5.14	3981	3.65	0	0.00		
>0.10-0.11	6608	6.74	6126	5.14	0	0.00		
>0.11-0.12	5517	8.07	6608	6.74	0	0.00		
>0.12-0.13	4050	9.05	5517	8.07	0	0.00		
>0.13-0.14	3497	9.90	4050	9.05	0	0.00		
>0.14-0.15	4066	10.88	3497	9.90	0	0.00		
>0.15-0.16	4915	12.08	4066	10.88	0	0.00		
>0.16-0.17	6065	13.54	4915	12.07	0	0.00		
>0.17-0.18	8138	15.52	6065	13.54	0	0.00		
>0.18-0.19	9063	17.71	8138	15.51	0	0.00		
>0.19-0.20	12773	20.80	9063	17.71	0	0.00		
>0.20-0.21	15631	24.59	12773	20.80	0	0.00		
>0.21-0.22	15485	28.34	15631	24.59	0	0.00		
>0.22-0.23	14182	31.77	15485	28.34	0	0.00		
>0.23-0.24	14759	35.35	14182	31.77	0	0.00		
>0.24-0.25	19138	39.98	14759	35.35	0	0.00		
>0.25-0.26	23098	45.58	19138	39.98	0	0.00		
>0.26-0.27	24338	51.47	23098	45.58	0	0.00		
>0.27-0.28	22119	56.83	24338	51.47	0	0.00		
>0.28-0.29	17683	61.11	22119	56.83	0	0.00		
>0.29-0.30	14304	64.58	17683	61.11	0	0.00		
>0.30-0.35	68497	81.17	68497	81.17	0	0.00		
>0.35-0.40	58246	95.27	58246	95.27	0	0.00		
>0.40-0.45	18893	99.85	18893	99.85	0	0.00		
>0.45-0.50	324	99.93	324	99.93	0	0.00		
>0.50-0.55	4	99.93	4	99.93	0	0.00		
>0.55-0.60	214	99.98	214	99.98	0	0.00		
>0.60-0.634	88	100.00	88	100.00	0	0.00		
Total	**412901**	**100.00%**	**412899**	**100.00%**	**2**	**0.00%**	**0**	**0.00%**
Reference Grid: h13818_MB_1m_MLLW_20240218_pfm_H12727_MB_1m_MLLW_bag.dif								

Figure 8: Tabular Results Junction Analysis H13818 vs. H12727

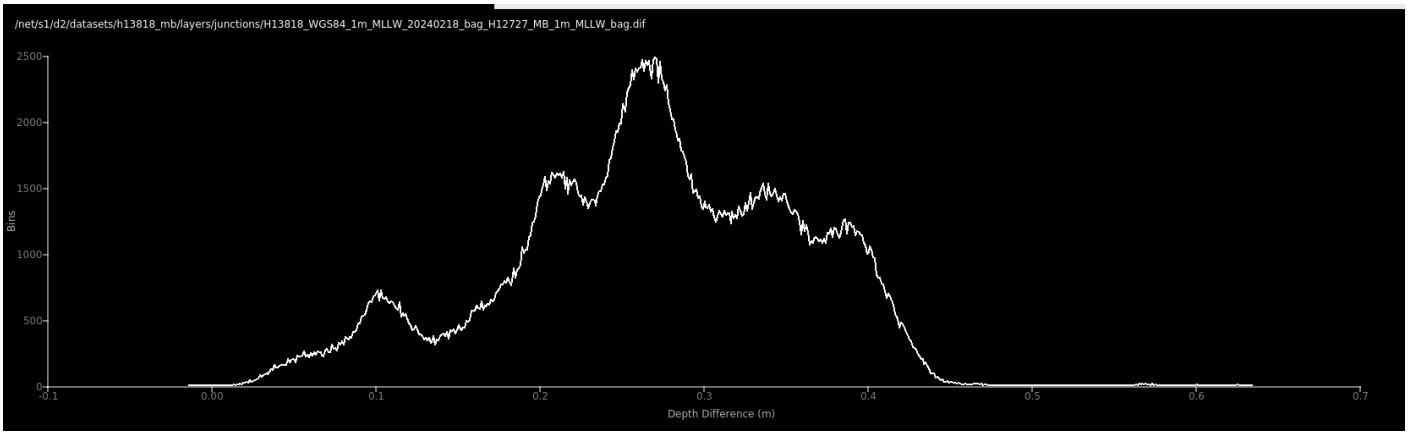

Figure 9: Plot of Junction Analysis H13818 vs. H12727

H13644

Repeatability analysis was conducted by comparing the H13644 50-centimeter BAG depth surface to the H13818 1-meter BAG depth surface. The overlapping area was approximately 3,240 by 225 meters. Within the common area, observed depths were 10.822 to 12.158 meters which resulted in a calculated allowable TVU range of 0.519 to 0.524 meters. Results, show in Figure 10 indicate that 100.00% of the comparisons were 0.298 meters or less, within the calculated allowable TVU range. The distribution is skewed positive of zero as presented in Figure 11.

Depth Difference Range (m)	All		Positive		Negative		Zero	
	Count	Cumulative Percent	Count	Cumulative Percent	Count	Cumulative Percent	Count	Cumulative Percent
0-0.01	4648	1.61	2423	0.84	1991	0.69	234	0.08
>0.01-0.02	4237	3.07	2949	1.86	1288	1.13		
>0.02-0.03	3435	4.26	2799	2.82	636	1.35		
>0.03-0.04	2363	5.07	2054	3.53	309	1.46		
>0.04-0.05	1972	5.75	1836	4.17	136	1.51		
>0.05-0.06	2152	6.50	2138	4.90	14	1.51		
>0.06-0.07	2744	7.44	2737	5.85	7	1.51		
>0.07-0.08	3899	8.79	3893	7.19	6	1.52		
>0.08-0.09	6770	11.13	6766	9.53	4	1.52		
>0.09-0.10	9456	14.39	9454	12.80	2	1.52		
>0.10-0.11	12637	18.76	12637	17.16	0	1.52		
>0.11-0.12	18045	24.99	18045	23.39	0	1.52		
>0.12-0.13	22836	32.88	22836	31.28	0	1.52		
>0.13-0.14	26249	41.95	26249	40.35	0	1.52		
>0.14-0.15	27899	51.58	27899	49.98	0	1.52		
>0.15-0.16	25749	60.48	25749	58.88	0	1.52		
>0.16-0.17	21420	67.87	21420	66.28	0	1.52		
>0.17-0.18	21291	75.23	21291	73.63	0	1.52		
>0.18-0.19	18897	81.75	18897	80.16	0	1.52		
>0.19-0.20	17487	87.79	17487	86.20	0	1.52		
>0.20-0.21	15387	93.11	15387	91.51	0	1.52		
>0.21-0.22	10027	96.57	10027	94.97	0	1.52		
>0.22-0.23	5333	98.41	5333	96.82	0	1.52		
>0.23-0.24	2858	99.40	2858	97.80	0	1.52		
>0.24-0.25	1198	99.82	1198	98.22	0	1.52		
>0.25-0.26	359	99.94	359	98.34	0	1.52		
>0.26-0.27	106	99.98	106	98.38	0	1.52		
>0.27-0.28	48	99.99	48	98.39	0	1.52		
>0.28-0.29	21	99.99	21	98.40	0	1.52		
>0.29-0.298	1	100.00	1	98.40	0	1.52		
Total	**289524**	**100.00%**	**284897**	**98.40%**	**4393**	**1.52%**	**234**	**0.08%**
Reference Grid: H13818_MB_1m_MLLW_20240218_bag_H13644_MB_50cm_MLLW_1of1_bag.dif								

Figure 10: Tabular Results Junction Analysis H13818 vs. H13644

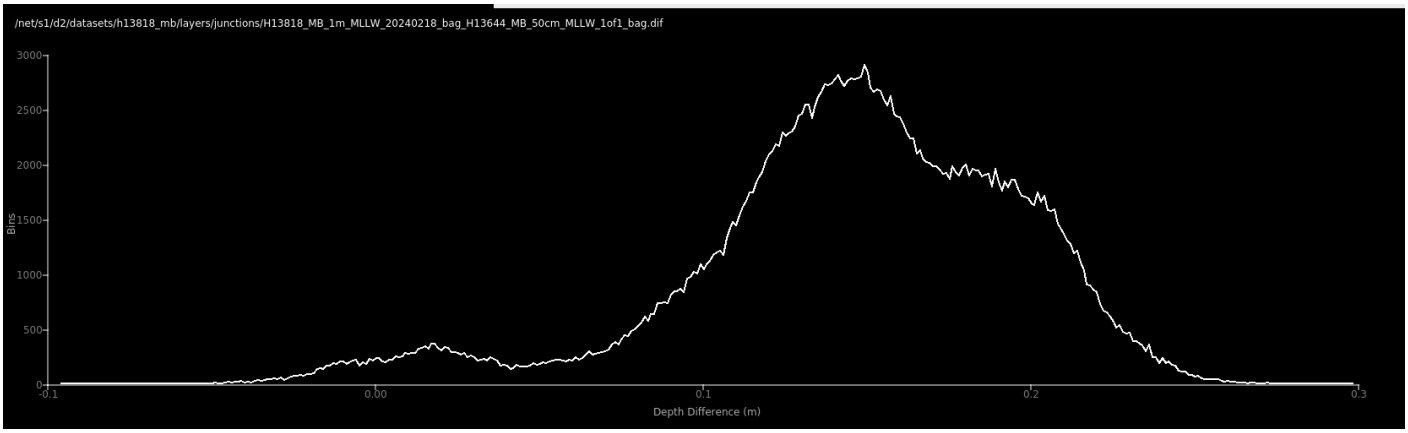

Figure 11: Plot of Junction Analysis H13818 vs. H13644

H13645

The H13645 1-meter BAG file (2of2) had coincident data with H13818. Leidos conducted repeatability analysis by comparing the H13645 1-meter BAG depth surface to the H13818 1-meter BAG depth surface. The overlapping area was approximately 3,000 by 260 meters. Within the common area, observed depths

were 11.770 to 12.437 meters which resulted in a calculated allowable TVU range of 0.523 to 0.525 meters. Results, show in Figure 12 indicate that 100.00% of the comparisons were 0.383 meters or less, within the calculated allowable TVU range. The distribution is skewed positive of zero as presented in Figure 13.

Depth Difference Range (m)	All		Positive		Negative		Zero	
	Count	Cumulative Percent	Count	Cumulative Percent	Count	Cumulative Percent	Count	Cumulative Percent
0-0.01	16	0.00	16	0.00	0	0.00	0	0.00
>0.01-0.02	256	0.07	256	0.07	0	0.00		
>0.02-0.03	1131	0.38	1131	0.38	0	0.00		
>0.03-0.04	1284	0.73	1284	0.73	0	0.00		
>0.04-0.05	995	1.00	995	1.00	0	0.00		
>0.05-0.06	2364	1.65	2364	1.65	0	0.00		
>0.06-0.07	5774	3.22	5774	3.22	0	0.00		
>0.07-0.08	10306	6.02	10306	6.02	0	0.00		
>0.08-0.09	14063	9.85	14063	9.85	0	0.00		
>0.09-0.10	17609	14.64	17609	14.64	0	0.00		
>0.10-0.11	24140	21.21	24140	21.21	0	0.00		
>0.11-0.12	27187	28.60	27187	28.60	0	0.00		
>0.12-0.13	24908	35.38	24908	35.38	0	0.00		
>0.13-0.14	22609	41.53	22609	41.53	0	0.00		
>0.14-0.15	22705	47.71	22705	47.71	0	0.00		
>0.15-0.16	24808	54.46	24808	54.46	0	0.00		
>0.16-0.17	26282	61.61	26282	61.61	0	0.00		
>0.17-0.18	33246	70.66	33246	70.66	0	0.00		
>0.18-0.19	32118	79.40	32118	79.40	0	0.00		
>0.19-0.20	27654	86.92	27654	86.92	0	0.00		
>0.20-0.21	20037	92.37	20037	92.37	0	0.00		
>0.21-0.22	12877	95.88	12877	95.88	0	0.00		
>0.22-0.23	7914	98.03	7914	98.03	0	0.00		
>0.23-0.24	3797	99.06	3797	99.06	0	0.00		
>0.24-0.25	1955	99.60	1955	99.60	0	0.00		
>0.25-0.26	936	99.85	936	99.85	0	0.00		
>0.26-0.27	392	99.96	392	99.96	0	0.00		
>0.27-0.28	133	99.99	133	99.99	0	0.00		
>0.28-0.29	22	99.99	22	99.99	0	0.00		
>0.30-0.35	2	99.99	2	99.99	0	0.00		
>0.35-0.383	2	100.00	2	100.00	0	0.00		
Total	**367523**	**100.00%**	**367523**	**100.00%**	**0**	**0.00%**	**0**	**0.00%**
Reference Grid: H13818_MB_1m_MLLW_20240218_bag_H13645_MB_1m_MLLW_2of2_bag.dif								

Figure 12: Tabular Results Junction Analysis H13818 vs. H13645

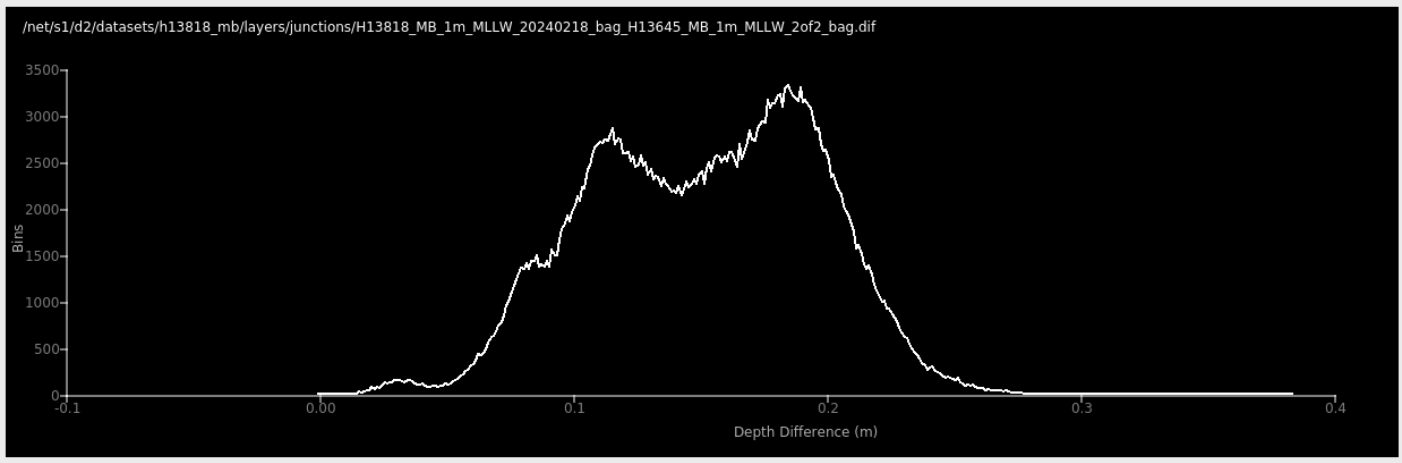

Figure 13: Plot of Junction Analysis H13818 vs. H13645

H13648

Repeatability analysis was conducted by comparing the H13648 1-meter BAG depth surface to the H13818 1-meter BAG depth surface. The overlapping area was approximately 22,030 by 300 meters. Within the common area, observed depths were 10.445 to 11.591 meters which resulted in a calculated allowable TVU range of 0.518 to 0.522 meters. Results, shown in Figure 14 indicate that 99.99% of the comparisons were 0.360 meters or less, within the calculated allowable TVU range. The distribution is skewed positive of zero as presented in Figure 15.

Depth Difference Range (m)	All		Positive		Negative		Zero	
	Count	Cumulative Percent	Count	Cumulative Percent	Count	Cumulative Percent	Count	Cumulative Percent
0-0.01	6	0.00	6	0.00	0	0.00	0	0.00
>0.01-0.02	77	0.01	77	0.01	0	0.00		
>0.02-0.03	337	0.03	337	0.03	0	0.00		
>0.03-0.04	876	0.10	876	0.10	0	0.00		
>0.04-0.05	2006	0.25	2006	0.25	0	0.00		
>0.05-0.06	2071	0.40	2071	0.40	0	0.00		
>0.06-0.07	3187	0.64	3187	0.64	0	0.00		
>0.07-0.08	10493	1.43	10493	1.43	0	0.00		
>0.08-0.09	27968	3.52	27968	3.52	0	0.00		
>0.09-0.10	45086	6.90	45086	6.90	0	0.00		
>0.10-0.11	67319	11.94	67319	11.94	0	0.00		
>0.11-0.12	82378	18.11	82378	18.11	0	0.00		
>0.12-0.13	100420	25.63	100420	25.63	0	0.00		
>0.13-0.14	119470	34.57	119470	34.57	0	0.00		
>0.14-0.15	141898	45.20	141898	45.20	0	0.00		
>0.15-0.16	144471	56.02	144471	56.02	0	0.00		
>0.16-0.17	122962	65.23	122962	65.23	0	0.00		
>0.17-0.18	103293	72.96	103293	72.96	0	0.00		
>0.18-0.19	69743	78.19	69743	78.19	0	0.00		
>0.19-0.20	54411	82.26	54411	82.26	0	0.00		
>0.20-0.21	43939	85.55	43939	85.55	0	0.00		
>0.21-0.22	39775	88.53	39775	88.53	0	0.00		
>0.22-0.23	36025	91.23	36025	91.23	0	0.00		
>0.23-0.24	29494	93.44	29494	93.44	0	0.00		
>0.24-0.25	23329	95.18	23329	95.18	0	0.00		
>0.25-0.26	18011	96.53	18011	96.53	0	0.00		
>0.26-0.27	13590	97.55	13590	97.55	0	0.00		
>0.27-0.28	10082	98.30	10082	98.30	0	0.00		
>0.28-0.29	7527	98.87	7527	98.87	0	0.00		
>0.29-0.30	5303	99.26	5303	99.26	0	0.00		
>0.3-0.35	9326	99.96	9326	99.96	0	0.00		
>0.35-0.40	485	99.99	485	99.99	0	0.00		
>0.4-0.45	3	99.99	3	99.99	0	0.00		
>0.45-0.50	3	99.99	3	99.99	0	0.00		
>0.50-0.55	3	99.99	3	99.99	0	0.00		
>0.55-0.552	1	100.00	1	100.00	0	0.00		
Total	**1335368**	**100.00%**	**1335368**	**100.00%**	**0**	**0.00%**	**0**	**0.00%**
Reference Grid: H13818_MB_1m_MLLW_20240218_bag_H13648_MB_1m_MLLW_1of1_bag.dif								

Figure 14: Tabular Results Junction Analysis H13818 vs. H13648

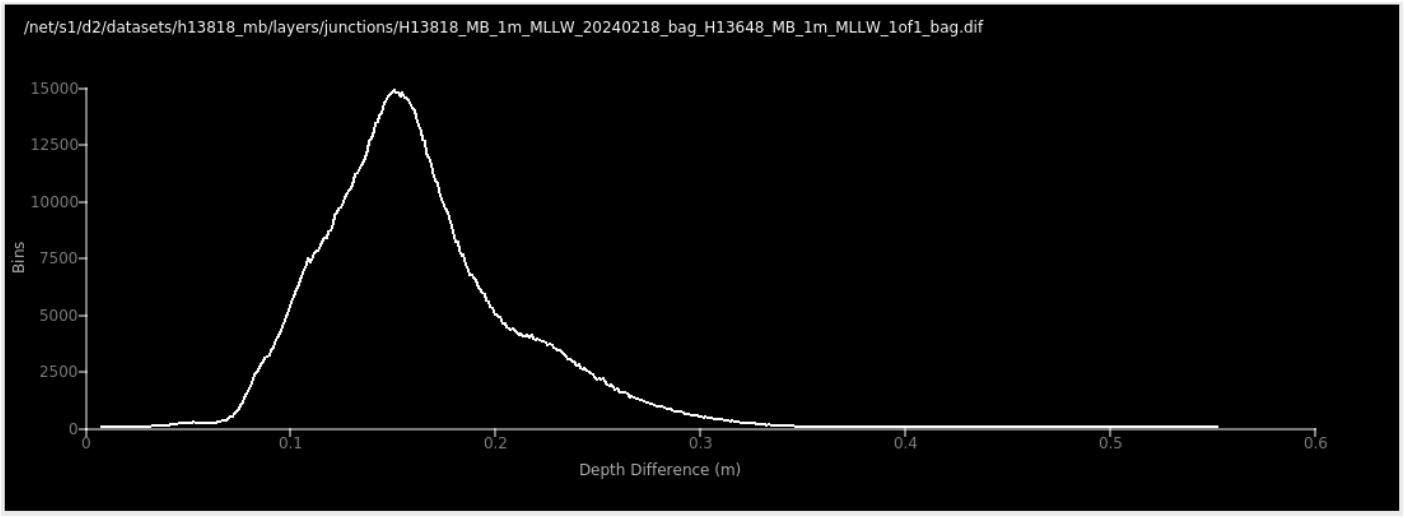

Figure 15: Plot of Junction Analysis H13818 vs. H13648

H13816

Repeatability analysis was conducted by comparing the H13816 1-meter BAG depth surface to the H13818 1-meter BAG depth surface. The overlapping area was approximately 4,000 by 150 meters. Within the common area, observed depths were 12.147 to 12.587 meters which resulted in a calculated allowable TVU range of 0.524 to 0.526 meters. Results, show in Figure 16 indicate that 100.00% of the comparisons were 0.270 meters or less, within the calculated allowable TVU range. The distribution is skewed negative of zero as presented in Figure 17.

Depth Difference Range (m)	All		Positive		Negative		Zero	
	Count	Cumulative Percent	Count	Cumulative Percent	Count	Cumulative Percent	Count	Cumulative Percent
0.00-0.01	44156	11.42	19501	5.04	22803	5.90	1852	0.48
>0.01-0.02	43812	22.75	18176	9.75	25636	12.53		
>0.02-0.03	51259	36.01	14799	13.57	36460	21.96		
>0.03-0.04	45640	47.82	8668	15.82	36972	31.52		
>0.04-0.05	39098	57.93	6899	17.60	32199	39.85		
>0.05-0.06	22982	63.88	3878	18.60	19104	44.79		
>0.06-0.07	16221	68.07	2040	19.13	14181	48.46		
>0.07-0.08	13120	71.46	1599	19.54	11521	51.44		
>0.08-0.09	18710	76.30	1562	19.95	17148	55.88		
>0.09-0.10	27656	83.46	798	20.15	26858	62.82		
>0.10-0.11	28290	90.78	636	20.32	27654	69.98		
>0.11-0.12	16872	95.14	698	20.50	16174	74.16		
>0.12-0.13	8234	97.27	1479	20.88	6755	75.91		
>0.13-0.14	5783	98.76	3262	21.73	2521	76.56		
>0.14-0.15	3363	99.63	2306	22.32	1057	76.83		
>0.15-0.16	990	99.89	618	22.48	372	76.93		
>0.16-0.17	258	99.96	133	22.52	125	76.96		
>0.17-0.18	87	99.98	37	22.53	50	76.97		
>0.18-0.19	23	99.99	5	22.53	18	76.98		
>0.19-0.20	14	99.99	2	22.53	12	76.98		
>0.20-0.21	13	99.99	0	22.53	13	76.99		
>0.21-0.22	4	99.99	0	22.53	4	76.99		
>0.22-0.23	8	99.99	0	22.53	8	76.99		
>0.23-0.24	6	99.99	0	22.53	6	76.99		
>0.24-0.25	5	99.99	0	22.53	5	76.99		
>0.25-0.26	3	99.99	0	22.53	3	76.99		
>0.26-0.270	1	100.00	0	22.53	1	76.99		
Total	**386608**	**100.00%**	**87096**	**22.53%**	**297660**	**76.99%**	**1852**	**0.48%**
Reference Grid: H13818_MB_1m_MLLW_20240218_bag_H13816_MB_1m_MLLW_Final_bag.dif								

Figure 16: Tabular Results Junction Analysis H13818 vs. H13816

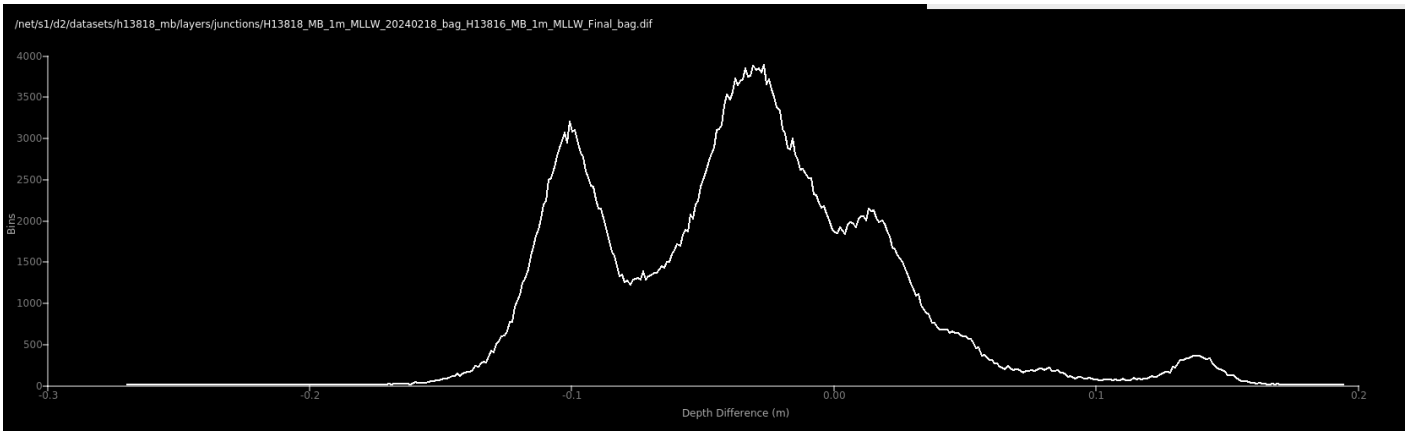

Figure 17: Plot of Junction Analysis H13818 vs. H13816

H13817

Repeatability analysis was conducted by comparing the H13817 1-meter BAG depth surface to the H13818 1-meter BAG depth surface. The overlapping area was approximately 13,000 by 180 meters. Within the common area, observed depths were 10.223 to 11.834 meters which resulted in a calculated allowable TVU range of 0.517 to 0.523 meters. Results, show in Figure 18 indicate that 100.00% of the comparisons were 0.360 meters or less, within the calculated allowable TVU range. The distribution is centered on zero as presented in Figure 19.

Depth Difference Range (m)	All		Positive		Negative		Zero	
	Count	Cumulative Percent	Count	Cumulative Percent	Count	Cumulative Percent	Count	Cumulative Percent
0-0.01	194491	16.64	86821	7.43	98209	8.40	9461	0.81
>0.01-0.02	165682	30.82	72978	13.68	92704	16.34		
>0.02-0.03	171984	45.54	74039	20.01	97945	24.72		
>0.03-0.04	151171	58.48	67294	25.77	83877	31.9		
>0.04-0.05	143996	70.80	64470	31.29	79526	38.70		
>0.05-0.06	106999	79.96	47701	35.37	59298	43.78		
>0.06-0.07	81973	86.97	38077	38.63	43896	47.53		
>0.07-0.08	54970	91.68	27655	40.99	27315	49.87		
>0.08-0.09	41316	95.21	21884	42.87	19432	51.54		
>0.09-0.1	25136	97.36	13759	44.05	11377	52.51		
>0.1-0.11	15069	98.65	9129	44.83	5940	53.02		
>0.11-0.12	8286	99.36	5447	45.29	2839	53.26		
>0.12-0.13	4040	99.71	2672	45.52	1368	53.38		
>0.13-0.14	1780	99.86	1096	45.62	684	53.44		
>0.14-0.15	769	99.93	404	45.65	365	53.47		
>0.15-0.16	377	99.96	178	45.66	199	53.48		
>0.16-0.17	187	99.97	100	45.67	87	53.49		
>0.17-0.18	111	99.98	63	45.68	48	53.50		
>0.18-0.19	53	99.99	23	45.68	30	53.50		
>0.19-0.2	20	99.99	13	45.68	7	53.50		
>0.2-0.21	23	99.99	10	45.68	13	53.50		
>0.2-0.25	73	99.99	45	45.69	28	53.50		
>0.25-0.30	25	99.99	25	45.69	0	53.50		
>0.3-0.35	12	99.99	12	45.69	0	53.50		
>0.35-0.36	1	100.00	1	45.69	0	53.50		
Total	**1168521**	**100.00%**	**533886**	**45.69%**	**625174**	**53.50%**	**9461**	**0.81%**
Reference Grid: H13818_MB_1m_MLLW_20240218_bag_H13817_MB_1m_MLLW_Final_bag.dif								

Figure 18: Tabular Results Junction Analysis H13818 vs. H13817

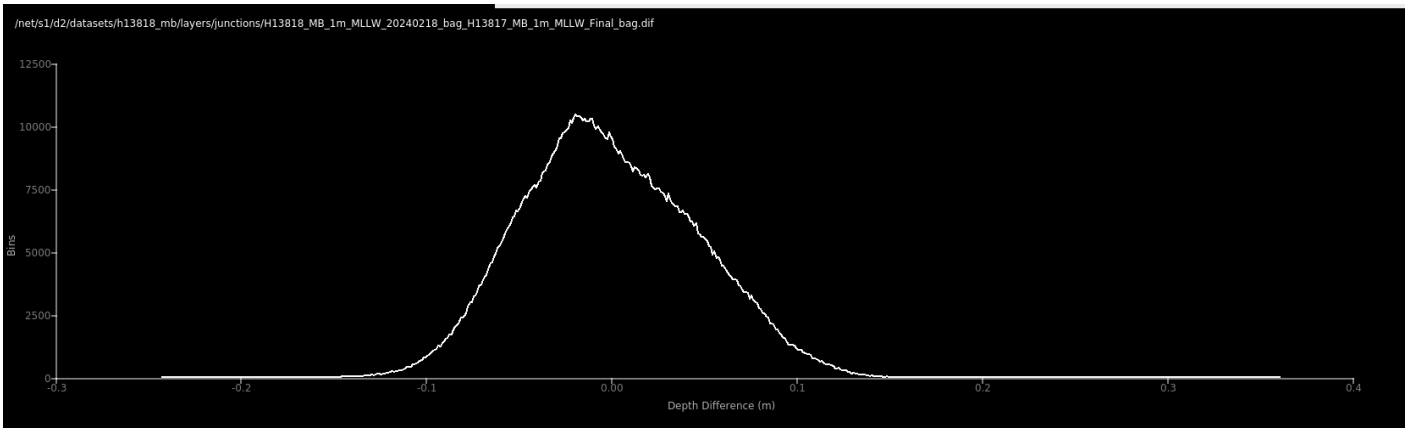

Figure 19: Plot of Junction Analysis H13818 vs. H13817

B.2.4 Sonar QC Checks

Sonar system quality control checks were conducted as detailed in the DAPR.

B.2.5 Equipment Effectiveness

RESON SeaBat T50-R

As discussed in the DAPR the RESON SeaBat T50-R exhibited degradation during OPR-K356-KR-23 and was replaced. Data acquisition was able to continue until the unit was swapped as data quality was not impacted and data acquired were validated. Refer to the DAPR for when the RESON SeaBat T50-R transducer was replaced.

B.2.6 Factors Affecting Soundings

There were no other factors that affected corrections to soundings.

B.2.7 Sound Speed Methods

Sound Speed Cast Frequency: On the R/V Sea Innovator I, 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.

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.

All individual SSP files are delivered with the H13818 data and are broken out into sub-folders, which correspond to the purpose of each cast. Also, all individual SSP files for H13818 have been concatenated into two separate files based on the purpose of the cast, provided in CARIS format files (.svp), and delivered under (H13818/Processed/SVP/CARIS_SSP) on the delivery drive. In accordance with HSSD Section 8.3.6, SSP files were also converted to NCEI format, as detailed in the DAPR, and will be provided as a separate delivery to NCEI.

B.2.8 Coverage Equipment and Methods

All equipment and survey methods are detailed in the DAPR.

For H13818, Leidos chose to achieve the complete coverage requirement using Complete Coverage, Option B (100% side scan sonar coverage with concurrent multibeam). To achieve this coverage and to continue to conduct survey during periods of weather; the SSS was set to either 75-meter or 50-meter range scale. Per the PI if an OFSPLF was not present during data acquisition a formal disproval did not need to be conducted.

Leidos utilized SABER's Gapchecker program to flag MBES data gaps within the final CUBE surface as well as within the SSS mosaics. Surfaces also visually scanned for holidays throughout the data processing effort. During data acquisition, additional lines were run to fill holidays that were detected. Bathymetric data and side scan sonar imagery were reviewed and bathymetric splits were acquired if deemed necessary per Hydrographer's discretion, as noted in Section 5.2.2.1 of the HSSD.

A final review of the CUBE depth surface showed that there were no holidays as defined for Complete Coverage surveys in HSSD Section 5.2.2.3. Any remaining three by three unpopulated nodes in the final MBES surfaces were along the outer swath data, beyond the side scan nadir coverage gap, and fully covered with 100% SSS coverage.

For all details regarding SSS data processing, see the DAPR. Leidos generated SSS coverage mosaic at 1-meter cell size resolution as specified in HSSD Section 8.2.1, note that 200% SSS disproval mosaic was not required or obtained for H13818. The SSS 100% coverage mosaic was reviewed using tools in SABER to verify data quality and swath coverage. The SABER Gapchecker routine was used to flag data gaps within this 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 mosaic is determined to be complete and sufficient to meet the requirements contained within

the PI and HSSD. The SSS coverage mosaic is delivered as a single georeferenced raster file (datum of NAD-83) in floating point GeoTIFF format, as specified in Sections 8.2.1 and 8.3.3 in the HSSD.

B.2.9 Multibeam Sounding Density

The Frequency Distribution Tool was used to analyze the number of soundings which contributed to the chosen CUBE hypothesis; to verify HSSD Section 5.2.2.3 for 95% of nodes to be populated with at least 5 soundings. Within the final 1-meter CUBE surface 99.46% of all nodes contained five or more soundings.

B.3 Echo Sounding Corrections

B.3.1 Corrections to Echo Soundings

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

B.3.2 Calibrations

All sounding systems were calibrated as detailed in the DAPR.

B.4 Backscatter

For all details regarding MBES backscatter acquisition and processing see the DAPR. 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 under the Processed/Sonar_Data/H13818_MB directory. Leidos followed previous guidance from NOAA to deliver the data in a single directory only as the data files are identical; therefore the raw directory is not populated.

Final MBES backscatter were mosaicked at 2-meter cell resolution. The MBES backscatter mosaics were reviewed for data quality and coverage. There were minor artifacts present in the MBES backscatter coverage; as discussed in the DAPR MBES settings were not adjusted in real-time to reduce impact to the MBES backscatter. Leidos verified that in these areas there are no CUBE artifacts. The MBES backscatter artifacts do not impact resulting coverage. All MBES backscatter mosaics are determined to be complete and sufficient to meet the requirements contained within the PI and HSSD. The coverage mosaics are delivered as a georeferenced raster file(s) (datum of NAD-83) in floating point GeoTIFF format, as specified in HSSD Section 6.2.4.2.

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	6.0.3.2.2

Table 10: Primary bathymetric data processing software

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

Manufacturer	Name	Version
Leidos	SABER	6.0.3.2.2
QPS	FMGT	7.10.3

Table 11: Primary imagery data processing software

The following Feature Object Catalog was used: NOAA Profile Version 2023.

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

B.5.2 Surfaces

The following surfaces and/or BAGs were submitted to the Processing Branch:

Surface Name	Surface Type	Resolution	Depth Range	Surface Parameter	Purpose
H13818_MB_1m_MLLW_Final	BAG		10.039 meters - 13.185 meters	N/A	Complete MBES
H13818_SSSAB_1m_400kHz_1of1	SSS Mosaic		0.0 meters - 0.0 meters	N/A	100% SSS
H13818_MBAB_2m_SeaInnovatorI_350kHZ_1of3	MB Backscatter Mosaic		0.0 meters - 0.0 meters	N/A	Complete MBES

Surface Name	Surface Type	Resolution	Depth Range	Surface Parameter	Purpose
H13818_MBAB_2m_SeaInnovatorI_350kHZ_2of3	MB Backscatter Mosaic		0.0 meters - 0.0 meters	N/A	Complete MBES
H13818_MBAB_2m_SeaInnovatorI_350kHZ_3of3	MB Backscatter Mosaic		0.0 meters - 0.0 meters	N/A	Complete MBES

Table 12: Submitted Surfaces

Complete Coverage HSSD Section 5.2.2.3 requires 1-meter grid resolution for depths ranging from 0 meters to 20 meters. Leidos generated the CUBE PFM grids for H13818 at 1-meter resolution. The final gridded MBES data are delivered in Bathymetric Attributed Grid (BAG) format as detailed in the DAPR.

C. Vertical and Horizontal Control

In accordance with HSSD Section 2.2, the horizontal datum for this project is NAD83. HSSD Section 2.2 states that the “only exception for the NAD83 datum requirement is that the S-57 Final Feature File (Section 7.3) will be in the WGS84 datum to comply with international S-57 specifications.” As discussed in the DAPR Section C.7, for every feature flag in a MBES GSF file, SABER converts the position from the NAD83 datum to the WGS84 datum to generate the S-57 file and comply with HSSD and IHO requirements. Feature positions meet the precision stated in HSSD Section 7.4 for each respective datum. Depending on geographic reference there may be approximately a 1-meter difference comparing positions between NAD83 and WGS84 datums. Therefore, if the feature overrides from the BAG surface (NAD83) are compared to the Final Feature File S-57 positions (WGS84) it is anticipated that there could be positional differences exceeding those listed in Section 7.4 of the HSSD. 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-K356-KR-23_NAD83_VDatum_MLLW.cov

Table 13: ERS method and SEP file

Final MBES data are reduced to MLLW through VDatum; refer to the DAPR for additional information. No final tide note was provided nor was it required from NOAA Center for Operational Oceanographic Products and Services (CO-OPS).

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 MBES 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 6th Edition Order 1a specifications were flagged as invalid and therefore do not contribute the CUBE depth calculations.

D. Results and Recommendations

D.1 Chart Comparison

Chart comparisons were conducted using a combination of SABER and CARIS' HIPS and SIPS. H13818 data met data accuracy standards and bottom coverage requirements. Charting recommendations for new features and updates to charted features, are documented in the H13818 FFF. Additional charted objects are discussed in later sections within this DR.

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 through final processing. The LNM reviewed were from week 30/23 (26 July 2023) until week 02/24 (10 January 2024).

Leidos noted that an offshore platform (OFSPLF) which was coincident to H13818, was documented within the LNM; refer to Section D.2.6 and the H13818 FFF for final charting recommendations. Platform located at 29° 33’ 34.926”N 093° 25’ 27.778”W was listed in LNM 30/23 through LNM 02/24 as ‘LT EXT/ SS INOP’. During survey operations, the 4 flashing lights on the OFSPLF corners and the whistle were confirmed to be operational.

Review showed that the H13818 CUBE data were generally in agreement with charted depths. Compared to the ENC’s listed in Section D.1.1. CUBE depths generally agreed with the charted depths within ±0.3-1.0 meters and were generally found to be deeper than charted.

Leidos recommends updating the common areas of all charts using data from this survey.

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
US4LA10M	1:80000	23	02/09/2024	02/09/2024
US4TX71M	1:80000	43	10/03/2023	11/20/2023
US5LCCHEA	1:20000	1	06/13/2023	12/20/2023
US5LCHFA	1:20000	1	06/13/2023	12/20/2023
US5POABE	1:20000	1	05/02/2023	07/25/2023
US5POACE	1:20000	1	05/02/2023	05/02/2023

Table 14: Largest Scale ENCs

D.1.2 Shoal and Hazardous Features

Refer to Section D.1.4 for significant shoals or hazardous features within the area covered by this survey.

Refer to the H13818 FFF (H13818_FFF.000).

D.1.3 Charted Features

There were numerous assigned charted features in the final CSF within the SOW of H13818. Per HSSD Section 8.1.4, these charted features are not addressed in this section, refer to the H13818 FFF (H13818_FFF.000) for all the details and recommendations regarding these features.

Assigned features from the NOAA provided CSF were addressed within H13818 and are included in the H13818 FFF. Any charted features that were disproven are also included within the H13818 FFF with assignment flag of Delete.

D.1.4 Uncharted Features

See the H13818 FFF for details and recommendations regarding new uncharted features investigated during this survey.

D.1.5 Channels

There were no assigned channels within the H13818 SOW from the final CSF. During the transit to and from port throughout OPR-K356-KR-23 Leidos observed shoaling within the Cameron Loop. This was submitted as a DTON to NOAA and is not directly associated with any sheet within this Project; refer to Project Correspondence.

D.2 Additional Results

D.2.1 Aids to Navigation

There were no assigned Aids to Navigation (ATON) within the SOW of H13818 from the final CSF. There were no ATONs within the surveyed area.

D.2.2 Maritime Boundary Points

No Maritime Boundary Points were assigned for this survey.

D.2.3 Bottom Samples

In accordance with both the PI and Section 7.2.3 of the HSSD, bottom characteristics were obtained for H13818. Bottom characteristics were acquired as assigned from the PRF; Leidos did not modify the bottom sample locations from the location proposed by NOAA in the PRF. Bottom characteristics are included in the H13818 FFF. In addition, images of the sediment obtained for each bottom sample are referenced in the FFF and are included on the delivery drive under the folder H13818/Processed/Multimedia.

D.2.4 Overhead Features

There were no overhead features within this survey area.

D.2.5 Submarine Features

Within the final CSF, there was several assigned submarine features for investigation. All assigned and new submarine features are detailed within the H13818 FFF.

Non-dangerous, unburied sections of pipelines were observed within the H13818 MBES and SSS data. As these fell outside the bounds of the State of Louisiana CZMA, they were submitted to BSEE and NOAA following HSSD Section 1.7.3; refer to Appendix II and Project Correspondence. All exposed pipelines were approximately within 0.5m of the surrounding depth area and determined to be non-dangerous. SSS contacts were retained on the non-dangerous pipelines and are included in the Side Scan Sonar Contact S-57 File.

D.2.6 Platforms

Platforms are addressed within the H13818 FFF. As noted in Section D.1, one platform coincident to H13818 was documented within the LNM.

D.2.7 Ferry Routes and Terminals

No ferry routes or terminals exist for this survey.

D.2.8 Abnormal Seafloor or Environmental Conditions

No other abnormal seafloor or environmental conditions, as defined in HSSD Section 8.1.4, exist within this survey area.

D.2.9 Construction and Dredging

No construction or dredging exists within this survey area.

D.2.10 New Survey Recommendations

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

D.2.11 ENC Scale Recommendations

No new ENC scales are recommended for this area.

E. Approval Sheet

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

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

The survey data meets or exceeds requirements as set forth in the Hydrographic Survey 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-K356-KR-23 are provided in the table below.

Report Name	Report Date Sent
OPR-K356-KR-23 Final Project Summary Report.pdf	2024-01-05
OPR-K356-KR-23_Coast Pilot Review Report.pdf	2024-01-09
OPR-K356-KR-23_ Marine_Species_Awareness_ Training_Record.pdf	2024-01-30
OPR-K356-KR-23_DAPR.pdf	2024-03-05
H13817_DR.pdf	2024-03-05
H13816_DR.pdf	2024-03-07

Approver Name	Approver Title	Approval Date	Signature
Dorena S. Vogel	Lead Hydrographer	03/08/2024	Dorena S. Vogel Digitally signed by Dorena S. Vogel Date: 2024.03.08 14:37:41 -05'00'

F. Table of Acronyms

Acronym	Definition
AHB	Atlantic Hydrographic Branch
AST	Assistant Survey Technician
ATON	Aid to Navigation
AWOIS	Automated Wreck and Obstruction Information System
BAG	Bathymetric Attributed Grid
BASE	Bathymetry Associated with Statistical Error
CO	Commanding Officer
CO-OPS	Center for Operational Products and Services
CORS	Continuously Operating Reference Station
CTD	Conductivity Temperature Depth
CEF	Chart Evaluation File
CSF	Composite Source File
CST	Chief Survey Technician
CUBE	Combined Uncertainty and Bathymetry Estimator
DAPR	Data Acquisition and Processing Report
DGPS	Differential Global Positioning System
DP	Detached Position
DR	Descriptive Report
DTON	Danger to Navigation
ENC	Electronic Navigational Chart
ERS	Ellipsoidal Referenced Survey
ERTDM	Ellipsoidally Referenced Tidal Datum Model
ERZT	Ellipsoidally Referenced Zoned Tides
FFF	Final Feature File
FOO	Field Operations Officer
FPM	Field Procedures Manual
GAMS	GPS Azimuth Measurement Subsystem
GC	Geographic Cell
GPS	Global Positioning System
HIPS	Hydrographic Information Processing System
HSD	Hydrographic Surveys Division

Acronym	Definition
HSSD	Hydrographic Survey Specifications and Deliverables
HSTB	Hydrographic Systems Technology Branch
HSX	Hypack Hysweep File Format
HTD	Hydrographic Surveys Technical Directive
HVCR	Horizontal and Vertical Control Report
HVF	HIPS Vessel File
IHO	International Hydrographic Organization
IMU	Inertial Motion Unit
ITRF	International Terrestrial Reference Frame
LNM	Linear Nautical Miles
MBAB	Multibeam Echosounder Acoustic Backscatter
MCD	Marine Chart Division
MHW	Mean High Water
MLLW	Mean Lower Low Water
NAD 83	North American Datum of 1983
NALL	Navigable Area Limit Line
NTM	Notice to Mariners
NMEA	National Marine Electronics Association
NOAA	National Oceanic and Atmospheric Administration
NOS	National Ocean Service
NRT	Navigation Response Team
NSD	Navigation Services Division
OCS	Office of Coast Survey
OMAO	Office of Marine and Aviation Operations (NOAA)
OPS	Operations Branch
MBES	Multibeam Echosounder
NWLON	National Water Level Observation Network
PDBS	Phase Differencing Bathymetric Sonar
PHB	Pacific Hydrographic Branch
POS/MV	Position and Orientation System for Marine Vessels
PPK	Post Processed Kinematic
PPP	Precise Point Positioning
PPS	Pulse per second

Acronym	Definition
PRF	Project Reference File
PS	Physical Scientist
RNC	Raster Navigational Chart
RTK	Real Time Kinematic
RTX	Real Time Extended
SBES	Singlebeam Echosounder
SBET	Smooth Best Estimate and Trajectory
SNM	Square Nautical Miles
SSS	Side Scan Sonar
SSSAB	Side Scan Sonar Acoustic Backscatter
ST	Survey Technician
SVP	Sound Velocity Profiler
TCARI	Tidal Constituent And Residual Interpolation
TPU	Total Propagated Uncertainty
USACE	United States Army Corps of Engineers
USCG	United States Coast Guard
UTM	Universal Transverse Mercator
XO	Executive Officer
ZDF	Zone Definition File