

H13427

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

**DESCRIPTIVE REPORT**

Type of Survey: Navigable Area  
Habitat Mapping

Registry Number: H13427

**LOCALITY**

State(s): Florida

General Locality: Key West

Sub-locality: Eastern Outer Band

**2021**

CHIEF OF PARTY  
David J. Bernstein, CH, PLS, GISP

LIBRARY & ARCHIVES

Date:

**HYDROGRAPHIC TITLE SHEET**

**H13427**

**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): **Florida**

General Locality: **Key West**

Sub-Locality: **Eastern Outer Band**

Scale: **20000**

Dates of Survey: **06/02/2021 to 06/20/2021**

Instructions Dated: **02/17/2021**

Project Number: **OPR-H355-KR-21**

Field Unit: **Geodynamics LLC**

Chief of Party: **David J. Bernstein, CH, PLS, GISP**

Soundings by: **Multibeam Echo Sounder**

Imagery by: **Multibeam Echo Sounder Backscatter**

Verification by: **Atlantic Hydrographic Branch**

Soundings Acquired in: **meters at Mean Lower Low Water**

Remarks:

*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 17N, MLLW. All references to other horizontal or vertical datums in this report are applicable to the processed hydrographic data provided by the field unit.*



# Table of Contents

<b>A. Area Surveyed</b> .....	1
A.1 Survey Limits.....	1
A.2 Survey Purpose.....	2
A.3 Survey Quality.....	3
A.4 Survey Coverage.....	3
A.6 Survey Statistics.....	4
<b>B. Data Acquisition and Processing</b> .....	6
B.1 Equipment and Vessels.....	6
B.1.1 Vessels.....	6
B.1.2 Equipment.....	7
B.2 Quality Control.....	7
B.2.1 Crosslines.....	7
B.2.2 Uncertainty.....	8
B.2.3 Junctions.....	9
B.2.4 Sonar QC Checks.....	12
B.2.5 Equipment Effectiveness.....	12
B.2.6 Factors Affecting Soundings.....	13
B.2.7 Sound Speed Methods.....	13
B.2.8 Coverage Equipment and Methods.....	13
B.2.9 Holidays.....	13
B.2.10 Density.....	14
B.2.11 Flier Finder.....	14
B.3 Echo Sounding Corrections.....	14
B.3.1 Corrections to Echo Soundings.....	14
B.3.2 Calibrations.....	14
B.4 Backscatter.....	14
B.5 Data Processing.....	15
B.5.1 Primary Data Processing Software.....	15
B.5.2 Surfaces.....	16
B.5.3 Designated Soundings.....	17
<b>C. Vertical and Horizontal Control</b> .....	17
C.1 Vertical Control.....	18
C.2 Horizontal Control.....	18
<b>D. Results and Recommendations</b> .....	18
D.1 Chart Comparison.....	18
D.1.1 Electronic Navigational Charts.....	20
D.1.2 Shoal and Hazardous Features.....	20
D.1.3 Charted Features.....	20
D.1.4 Uncharted Features.....	20
D.1.5 Channels.....	21
D.2 Additional Results.....	21
D.2.1 Aids to Navigation.....	21
D.2.2 Maritime Boundary Points.....	21

D.2.3 Bottom Samples.....	21
D.2.4 Overhead Features.....	21
D.2.5 Submarine Features.....	21
D.2.6 Platforms.....	21
D.2.7 Ferry Routes and Terminals.....	21
D.2.8 Abnormal Seafloor or Environmental Conditions.....	22
D.2.9 Construction and Dredging.....	22
D.2.10 New Survey Recommendations.....	22
D.2.11 ENC Scale Recommendations.....	22
<b>E. Approval Sheet.....</b>	<b>23</b>
<b>F. Table of Acronyms.....</b>	<b>24</b>

## List of Tables

Table 1: Survey Limits.....	1
Table 2: Survey Coverage.....	3
Table 3: Hydrographic Survey Statistics.....	5
Table 4: Dates of Hydrography.....	6
Table 5: Vessels Used.....	6
Table 6: Major Systems Used.....	7
Table 7: Survey Specific Tide TPU Values.....	8
Table 8: Survey Specific Sound Speed TPU Values.....	9
Table 9: Junctioning Surveys.....	10
Table 10: Primary bathymetric data processing software.....	15
Table 11: Primary imagery data processing software.....	15
Table 12: Submitted Surfaces.....	16
Table 13: ERS method and SEP file.....	18
Table 14: Largest Scale ENCs.....	20

## List of Figures

Figure 1: Overview of project survey limits (H13427 shown in blue), overlaid onto Charts 11439, 11442, and 11452.....	2
Figure 2: H13427 survey limits overlaid onto Charts 11442 and 11452.....	2
Figure 3: H13427 survey coverage overlaid onto Charts 11442 and 11452.....	4
Figure 4: H13427 crossline to mainscheme difference statistics.....	8
Figure 5: Overview of H13427 junction surveys.....	10
Figure 6: Junction analysis between H13427 and H13428.....	11
Figure 7: Junction analysis between H13427 and FL-1806-TB-C.....	12
Figure 8: H13427 backscatter.....	15
Figure 9: Image representing the finalized CUBE surface resolutions in H13427.....	17
Figure 10: H13427 statistical analysis of surveyed depths to charted depths.....	19

## Descriptive Report to Accompany Survey H13427

Project: OPR-H355-KR-21

Locality: Key West

Sublocality: Eastern Outer Band

Scale: 1:20000

June 2021 - June 2021

**Geodynamics LLC**

Chief of Party: David J. Bernstein, CH, PLS, GISP

### A. Area Surveyed

Geodynamics LLC conducted a hydrographic survey in the assigned area of H13427 located in the eastern outer band of Key West, Florida. Within H13427, all survey operations were conducted in accordance with the provided Statement of Work (SOW), Hydrographic Survey Project Instructions (PI), and the April 2021 National Ocean Service (NOS) Hydrographic Survey Specifications and Deliverables (HSSD). Any deviations from the aforementioned guidelines have been approved by the National Oceanographic and Atmospheric Administration (NOAA) Hydrographic Survey Division (HSD) Operations (OPS) branch and are documented in the survey correspondences.

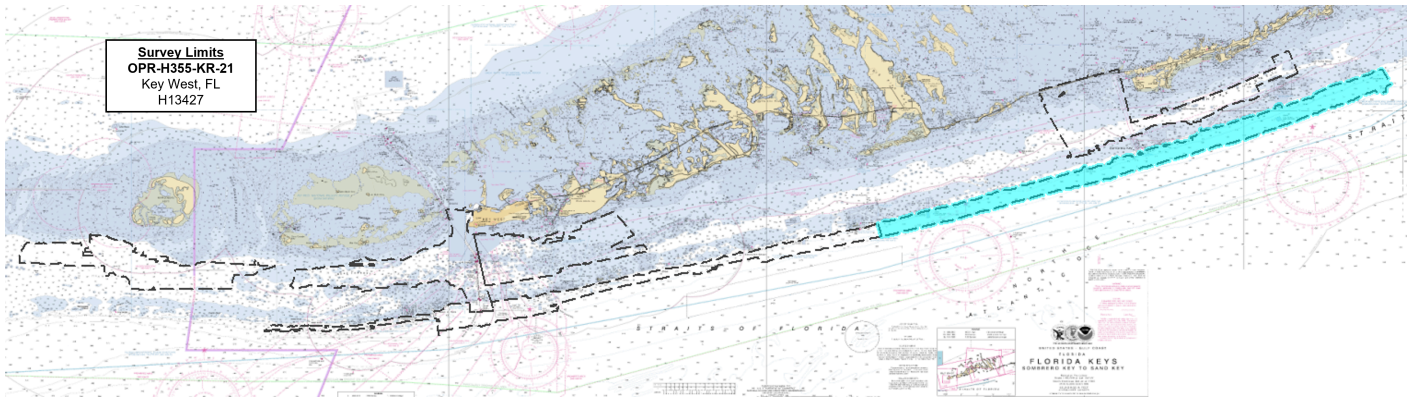
#### A.1 Survey Limits

Data were acquired within the following survey limits:

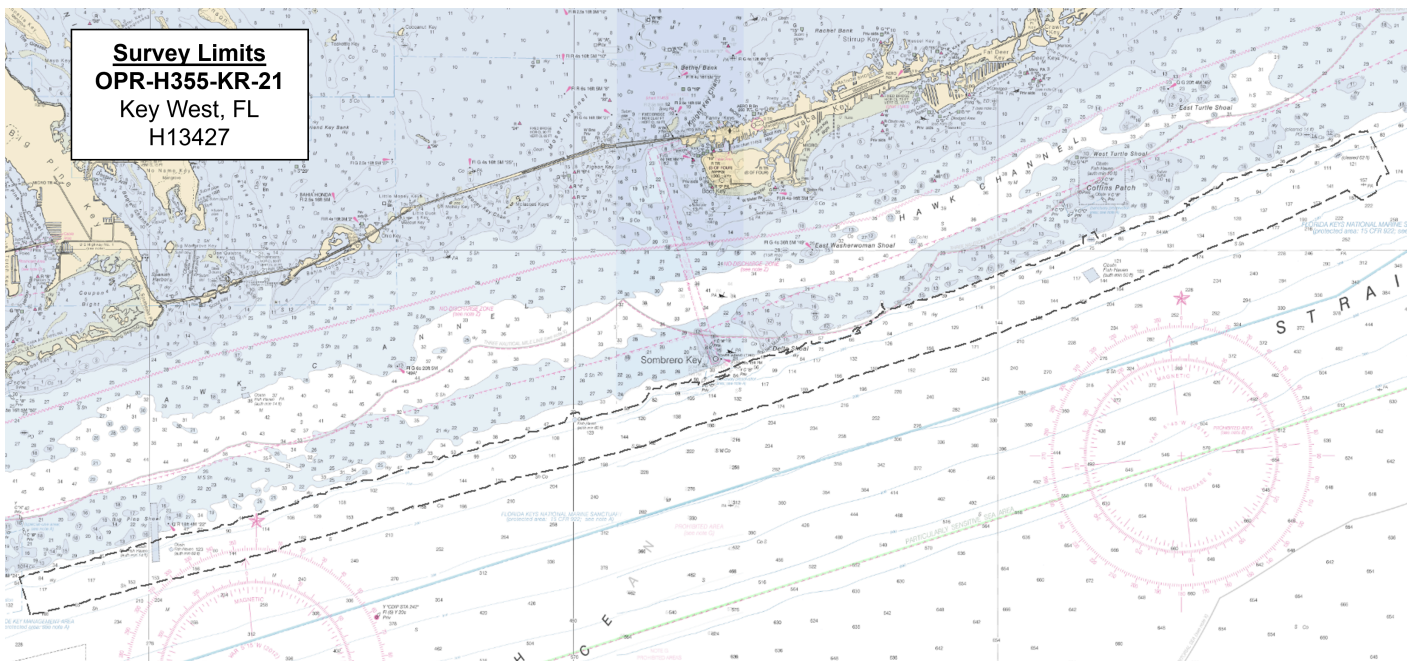
Northwest Limit	Southeast Limit
24° 42' 46.69" N 81° 23' 12.35" W	24° 31' 50.02" N 80° 50' 40.67" W

*Table 1: Survey Limits*

Data were acquired to the survey limits in accordance with the requirements listed in the PI and the HSSD.



*Figure 1: Overview of project survey limits (H13427 shown in blue), overlaid onto Charts 11439, 11442, and 11452*



*Figure 2: H13427 survey limits overlaid onto Charts 11442 and 11452*

## A.2 Survey Purpose

This project is located within the Florida Keys National Marine Sanctuary, with survey areas focused along the outer reef shelf as well as Hawk Channel, which is located in between the Keys and the barrier reef. Much of the 149 SNM survey area has not been surveyed since the 1950s, and many commercial and recreational boaters utilize Hawk Channel and the waters surrounding the coral reef for fishing, recreation, and other uses.

Conducting a modern bathymetric survey with concurrent backscatter data in this area will provide critical data for the updating of NOS nautical charting products and services to increase maritime safety near the

waters of the Florida Keys, and help classify the habitat of the reefs. Survey data from this project is intended to supersede all prior survey data in the common area.

### **A.3 Survey Quality**

The entire survey is adequate to supersede previous data.

Survey quality in H13427 meets or exceeds requirements set forth in the HSSD. Survey quality was assessed through visual inspection, the analysis of crosslines, and utilizing QC Tools to assess uncertainty and density. Additionally, junction analyses were conducted between overlapping data collected on this project and 2019 NOAA National Geodetic Survey (NGS) lidar data. For more information on methods and results of the survey data quality assessments for this survey, refer to section B.2 of this report.

### **A.4 Survey Coverage**

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

<b>Water Depth</b>	<b>Coverage Required</b>
All waters in survey area	Complete Coverage

*Table 2: Survey Coverage*

The entirety of H13427 was acquired with complete coverage in accordance with section 5.2.2.3 of the HSSD. See Figure 3 for an overview of coverage.

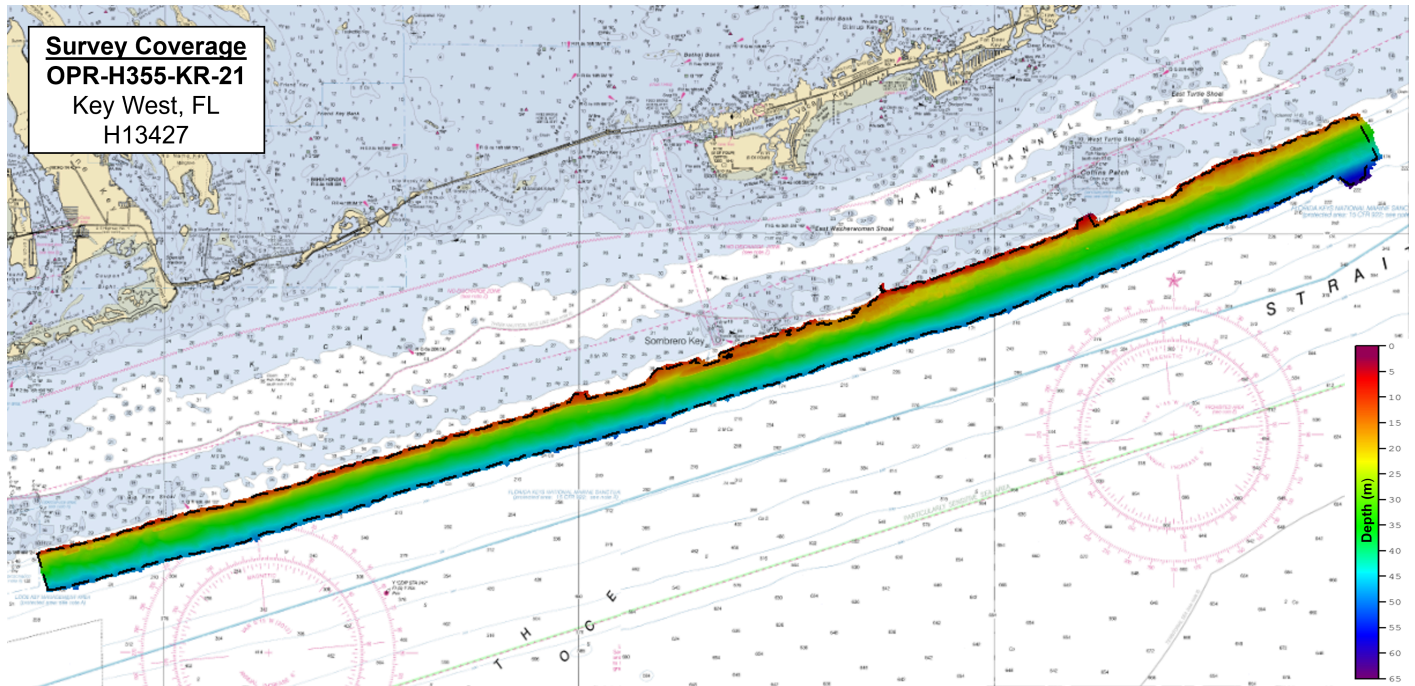


Figure 3: H13427 survey coverage overlaid onto Charts 11442 and 11452

### A.6 Survey Statistics

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

	<b>HULL ID</b>	<i>R/V Benthos</i>	<i>R/V Substantial</i>	<i>Total</i>
<b>LNM</b>	<b>SBES Mainscheme</b>	0	0	0
	<b>MBES Mainscheme</b>	1.92	590.89	592.81
	<b>Lidar Mainscheme</b>	0	0	0
	<b>SSS Mainscheme</b>	0	0	0
	<b>SBES/SSS Mainscheme</b>	0	0	0
	<b>MBES/SSS Mainscheme</b>	0	0	0
	<b>SBES/MBES Crosslines</b>	0	28.48	28.48
	<b>Lidar Crosslines</b>	0	0	0
<b>Number of Bottom Samples</b>				0
<b>Number Maritime Boundary Points Investigated</b>				0
<b>Number of DPs</b>				0
<b>Number of Items Investigated by Dive Ops</b>				0
<b>Total SNM</b>				33.15

*Table 3: Hydrographic Survey Statistics*

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

<b>Survey Dates</b>	<b>Day of the Year</b>
06/02/2021	153

<b>Survey Dates</b>	<b>Day of the Year</b>
06/03/2021	154
06/04/2021	155
06/05/2021	156
06/11/2021	162
06/12/2021	163
06/20/2021	171

*Table 4: Dates of Hydrography*

## **B. Data Acquisition and Processing**

### **B.1 Equipment and Vessels**

Refer to the OPR-H355-KR-21 Data Acquisition and Processing Report (DAPR) for a complete description of survey equipment and configurations, data acquisition procedures, data processing methods, quality control measures, and survey reporting methods. Additional information to supplement survey data and any deviations from the DAPR are discussed in the following sections.

#### **B.1.1 Vessels**

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

<b>Hull ID</b>	<b><i>R/V Benthos</i></b>	<b><i>R/V Substantial</i></b>
<b>LOA</b>	9.14 meters	16.15 meters
<b>Draft</b>	0.61 meters	1.89 meters

*Table 5: Vessels Used*



## B.1.2 Equipment

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

<b>Manufacturer</b>	<b>Model</b>	<b>Type</b>
Kongsberg Maritime	EM 2040C	MBES
Applanix	POS MV 320 v5	Positioning and Attitude System
AML Oceanographic	MicroX SV	Sound Speed System
AML Oceanographic	BaseX2	Sound Speed System
AML Oceanographic	MVP30-350	Sound Speed System

*Table 6: Major Systems Used*

R/V Benthos and the R/V Substantial utilized a dual-head Kongsberg EM 2040C multibeam system, a POS M/V 320 v5 positioning and attitude system, and an AML MicroX surface sound speed system. The R/V Benthos utilized an AML BaseX2 sound speed profiling system, and the R/V Substantial utilized an AML MVP30-350 moving vessel sound speed profiling system.

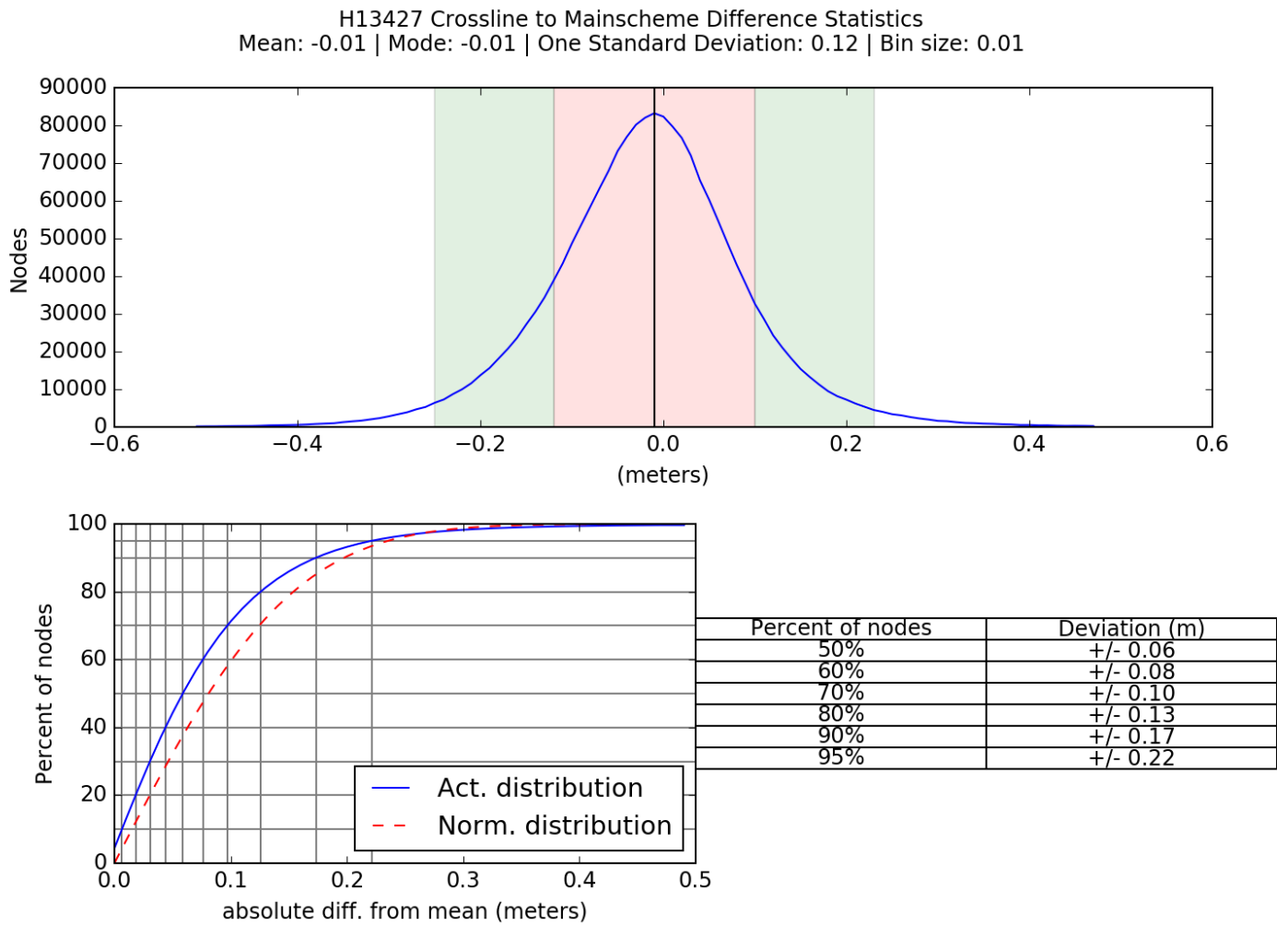
## B.2 Quality Control

### B.2.1 Crosslines

Multibeam crosslines acquired for H13427 totaled 4.80% of mainscheme acquisition.

H13427 crosslines were collected and analyzed in accordance with section 5.2.4.2 of the HSSD. Crosslines were evaluated in CARIS HIPS with a detailed visual inspection followed by a thorough statistical analysis. To conduct the statistical analysis, a CUBE surface was generated with strictly mainscheme data and a separate, equal resolution CUBE surface was generated with only crossline data. The mainscheme and crossline surfaces were analyzed using the Compare Grids tool in Pydro Explorer, which generated a difference surface and associated statistics. In addition to the direct statistics from the surface differencing, the tool assessed the difference surface statistics and computed the proportion of NOS total allowable vertical uncertainty (TVU) consumed by the mainscheme to crossline differences per surface node.

The statistical results of the difference comparison show 95% of nodes falling within +/- 0.22 m, with a mean difference of -0.01 m (Figure 4). Additionally, 99.5+% of the difference surfaces nodes met or exceeded TVU specifications, as described in section 5.1.3 of the HSSD.



*Figure 4: H13427 crossline to mainscheme difference statistics*

**B.2.2 Uncertainty**

The following survey specific parameters were used for this survey:

Method	Measured	Zoning
ERS via VDATUM	0.089 meters	0.00 meters

*Table 7: Survey Specific Tide TPU Values.*

Hull ID	Measured - CTD	Measured - MVP	Measured - XBT	Surface
R/V Benthos	2.00 meters/second	N/A	N/A	0.05 meters/second
R/V Substantial	N/A	2.00 meters/second	N/A	0.05 meters/second

*Table 8: Survey Specific Sound Speed TPU Values.*

The Tide Measured uncertainty was prescribed in the PI (0.089 m), and this was the value utilized in the TPU calculation (Table 7). It should be noted a small discrepancy was discovered between the uncertainty value listed in the PI (0.089 m) and the uncertainty value in the .log file accompanying the utilized separation model (0.094 m). Please refer to DR Appendix II Supplemental Records for additional information and related correspondence with the HSD Project Manager.

All finalized CUBE surfaces were analyzed using the HydrOffice QC Tools Grid QA tool to assure 95% of the surface nodes meet TVU specifications. The results of the Grid QA tool determined that all finalized surfaces met or exceeded the TVU specifications.

### **B.2.3 Junctions**

H13427 junctions with H13428 and 2019 NOAA NGS lidar data, registry number FL-1806-TB-C (Figure 5). Data overlap between H13427 and the adjacent surveys were attained. To conduct the junction analyses, similar to section B.2.1 of this report, the Pydro Compare Grids tool was utilized. The inputs for this tool were the surfaces for each individual survey at matching resolutions.

In addition to the statistical results of the junction analyses, the resultant difference surfaces were visually inspected and CARIS HIPS Subset Editor was used to examine overlapping data for consistency, agreement between surveys, and confirming data met TVU specifications.

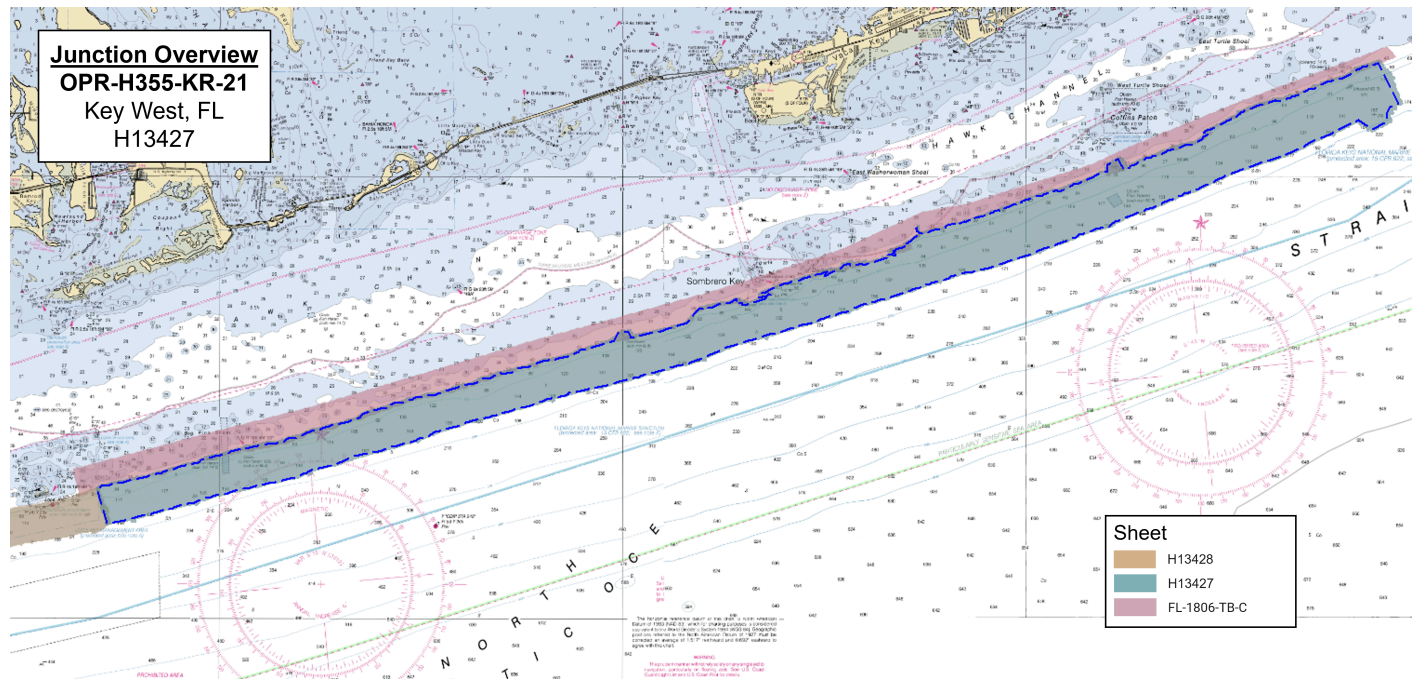


Figure 5: Overview of H13427 junction surveys

The following junctions were made with this survey:

Registry Number	Scale	Year	Field Unit	Relative Location
H13428	1:10000	2021	Geodynamics	W
FL-1806-TB-C	1:0	2019	NOAA NGS - Lidar	N

Table 9: Junctioning Surveys

### H13428

The statistical results of the difference comparison show 95% of nodes falling within +/- 0.19 m, with a mean difference of -0.05 m (Figure 6). Additionally, 99.5+% of the difference surface nodes met or exceed TVU specifications, as described in section 5.1.3 of the HSSD.

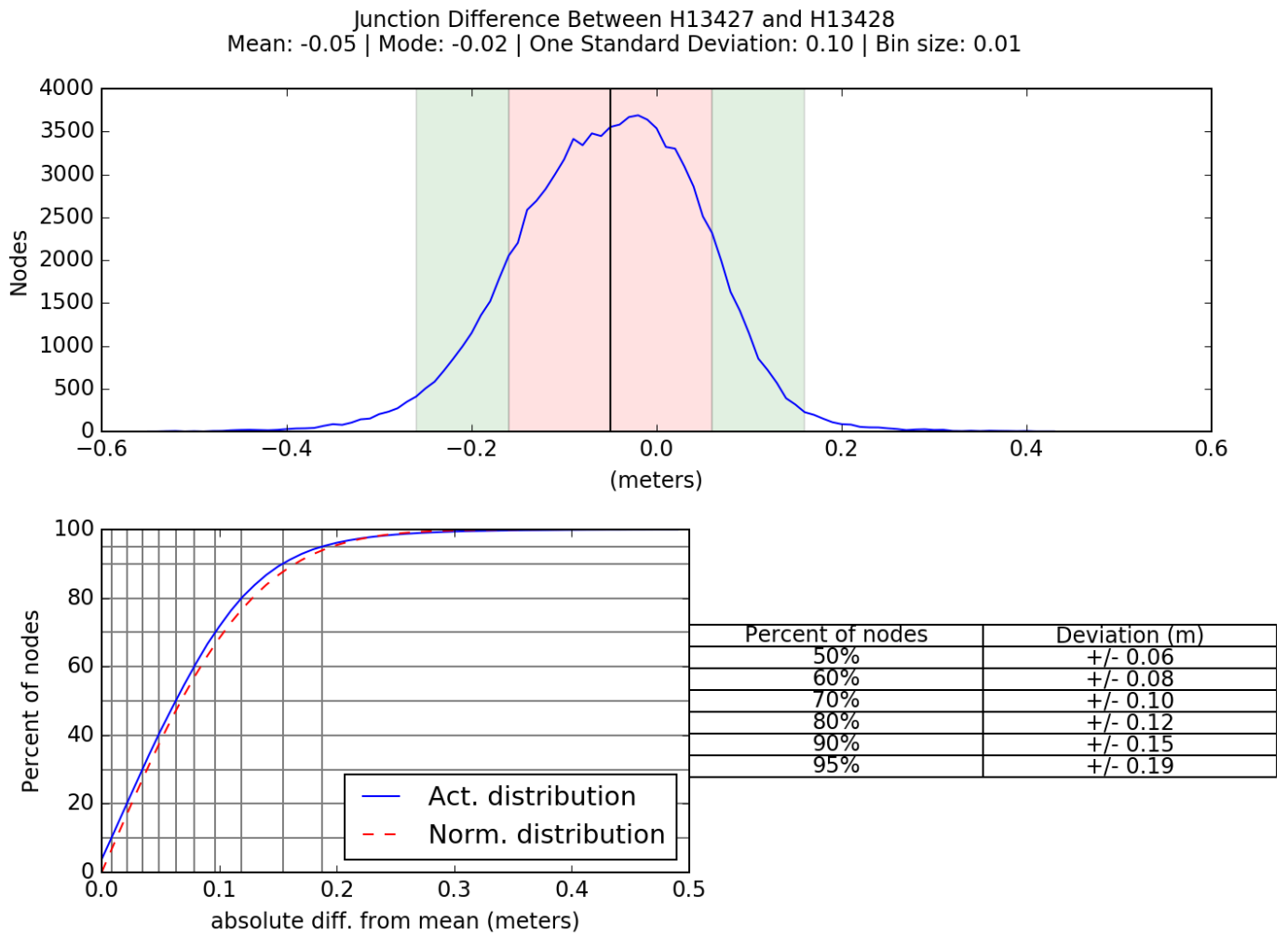


Figure 6: Junction analysis between H13427 and H13428

FL-1806-TB-C

The statistical results of the difference comparison show 95% of nodes falling within +/- 0.29 m, with a mean difference of 0.06 m (Figure 7). Additionally, 99.5+% of the difference surface nodes met or exceed TVU specifications, as described in section 5.1.3 of the HSSD.

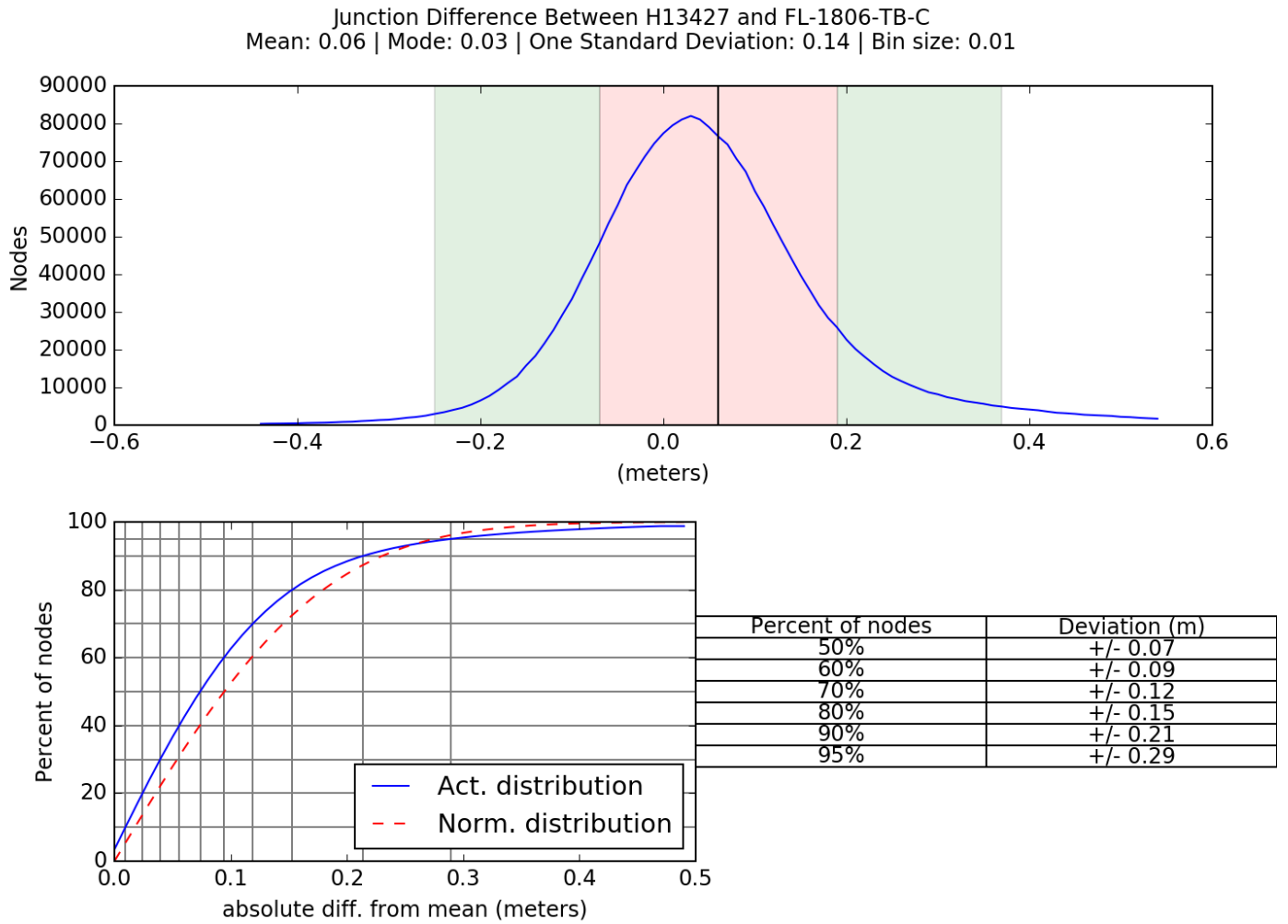


Figure 7: Junction analysis between H13427 and FL-1806-TB-C

### B.2.4 Sonar QC Checks

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

### B.2.5 Equipment Effectiveness

There were no conditions or deficiencies that affected equipment operational effectiveness.

### **B.2.6 Factors Affecting Soundings**

There were no other factors that affected corrections to soundings.

### **B.2.7 Sound Speed Methods**

Sound Speed Cast Frequency: Sound speed casts were acquired at least once every four hours. Casts were often conducted more frequently (~every two hours) than this time interval because of the dynamic water properties in the survey area. Additionally, the R/V Substantial utilized an MVP onboard allowing for a higher frequency of casts.

Surface sound speed was compared in real-time to the sound speed profile. When the comparison differed by more than 2 m/s, a new sound speed profile was acquired. Additionally, QPS Qinsy and Kongsberg SIS provided a real-time visual assessment of data quality (standard deviation grids, bathymetric grids, swath views) aiding the hydrographer in determining when a new cast was required.

For more detailed information on sound speed methods, please refer to the DAPR.

### **B.2.8 Coverage Equipment and Methods**

All equipment and survey methods were used as detailed in the DAPR.

### **B.2.9 Holidays**

All CUBE surfaces were analyzed using HydrOffice QC Tools Holiday Finder to determine if the surface contained holidays, as described in section 5.2.2.3 of the HSSD. The tool scanned the CUBE surfaces, identifying any holidays, and generated an S-57 file to illustrate the locations of holidays.

The tool determined no holidays were present within the sheet limits. In the 1 m CUBE surface, two holidays were identified outside of the sheet limits.

Another method of holiday evaluation was to visually pan the CUBE surfaces to identify holidays. The hydrographer would often alter the surface display (color ranges, symbology, shading) to help aid the hydrographer in identifying coverage gaps. The results reflected the same outcome as the tool, no holidays were identified within the sheet limits.

### **B.2.10 Density**

All finalized CUBE surfaces were analyzed using HydrOffice QC Tools Grid QA tool to assure data met the required density specifications. Density requirements were achieved for the finalized surfaces in H13427 with at least 95% of the surface nodes containing at least five or more soundings, exceeding the specifications required by section 5.2.2.3 of the HSSD.

### **B.2.11 Flier Finder**

In addition to a visual inspection, all CUBE surfaces were analyzed using HydrOffice QC Tools Flier Finder tool to assure data does not contain fliers (anomalous data as defined by QC Tools flier finding algorithms #2-5). While the Flier Finder tool flags surface fliers meeting a set criteria, it will also flag real surface features that meet the same criteria. Spurious soundings flagged by Flier Finder were cleaned until only the remaining flagged fliers were deemed valid aspects of the surface.

## **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**

Raw backscatter data were collected and stored within the .ALL files. Backscatter data were processed for quality assurance purposes in QPS FMGT. Additionally, mosaics were created to assure the coverage and quality of the backscatter (Figure 8). Hydrographers in the field monitored backscatter intensities in real-time and made efforts to collect quality backscatter without hindering bathymetric data quality. Refer to the DAPR for more information on backscatter data acquisition and processing procedures.



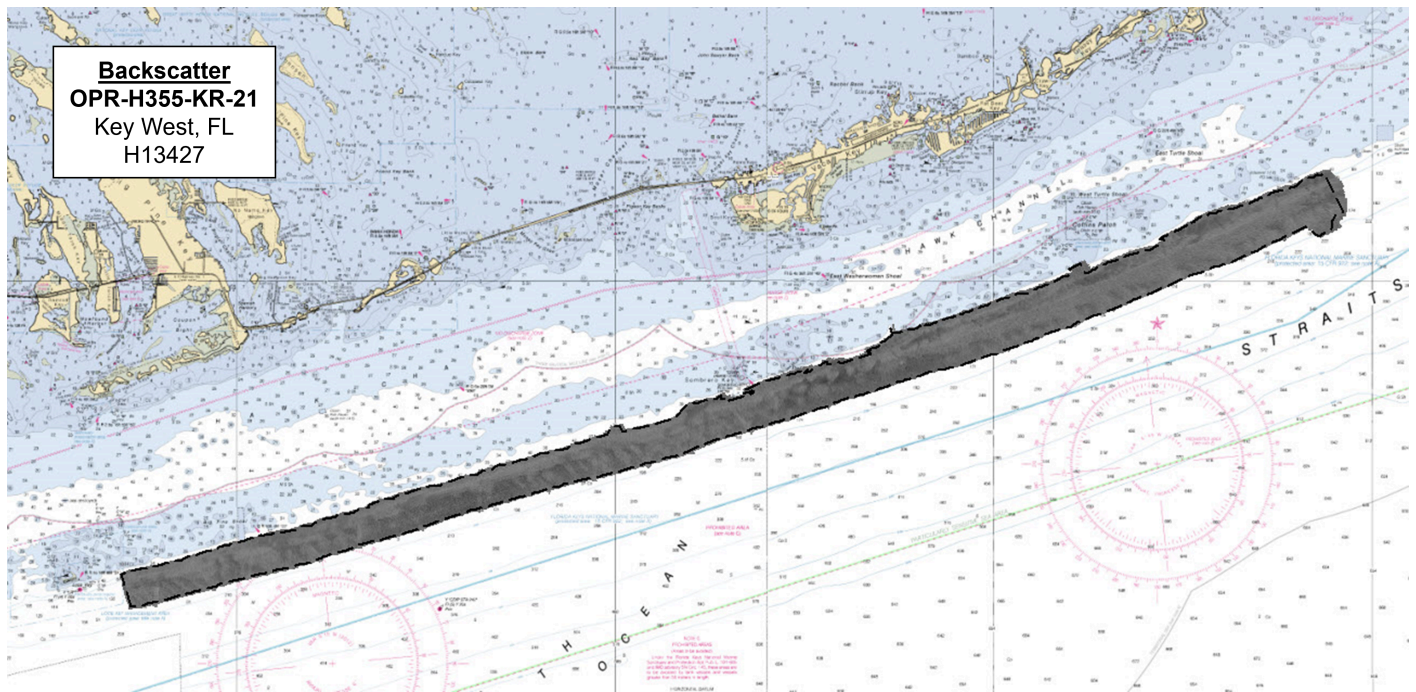


Figure 8: H13427 backscatter

## 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
CARIS	HIPS and SIPS	11.3.14

Table 10: Primary bathymetric data processing software

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

Manufacturer	Name	Version
QPS	FMGT	7.9.3

Table 11: Primary imagery data processing software

The following Feature Object Catalog was used: NOAA Profile Version 2021.

### 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
H13427_MB_1m_MLLW_Final	CARIS Raster Surface (CUBE)	1 meters	4.86 meters - 20.00 meters	NOAA_1m	Complete MBES
H13427_MB_2m_MLLW_Final	CARIS Raster Surface (CUBE)	2 meters	18.00 meters - 40.00 meters	NOAA_2m	Complete MBES
H13427_MB_4m_MLLW_Final	CARIS Raster Surface (CUBE)	4 meters	36.00 meters - 66.11 meters	NOAA_4m	Complete MBES
H13427_MB_1m_MLLW	CARIS Raster Surface (CUBE)	1 meters	4.86 meters - 66.23 meters	NOAA_1m	Complete MBES
H13427_MB_2m_MLLW	CARIS Raster Surface (CUBE)	2 meters	4.90 meters - 66.18 meters	NOAA_2m	Complete MBES
H13427_MB_4m_MLLW	CARIS Raster Surface (CUBE)	4 meters	4.90 meters - 66.11 meters	NOAA_4m	Complete MBES

*Table 12: Submitted Surfaces*

All surfaces submitted are in compliance with the complete coverage MBES requirements per section 5.2.2.3 of the HSSD. See Figure 9 below for an overview of the submitted finalized surface resolutions.

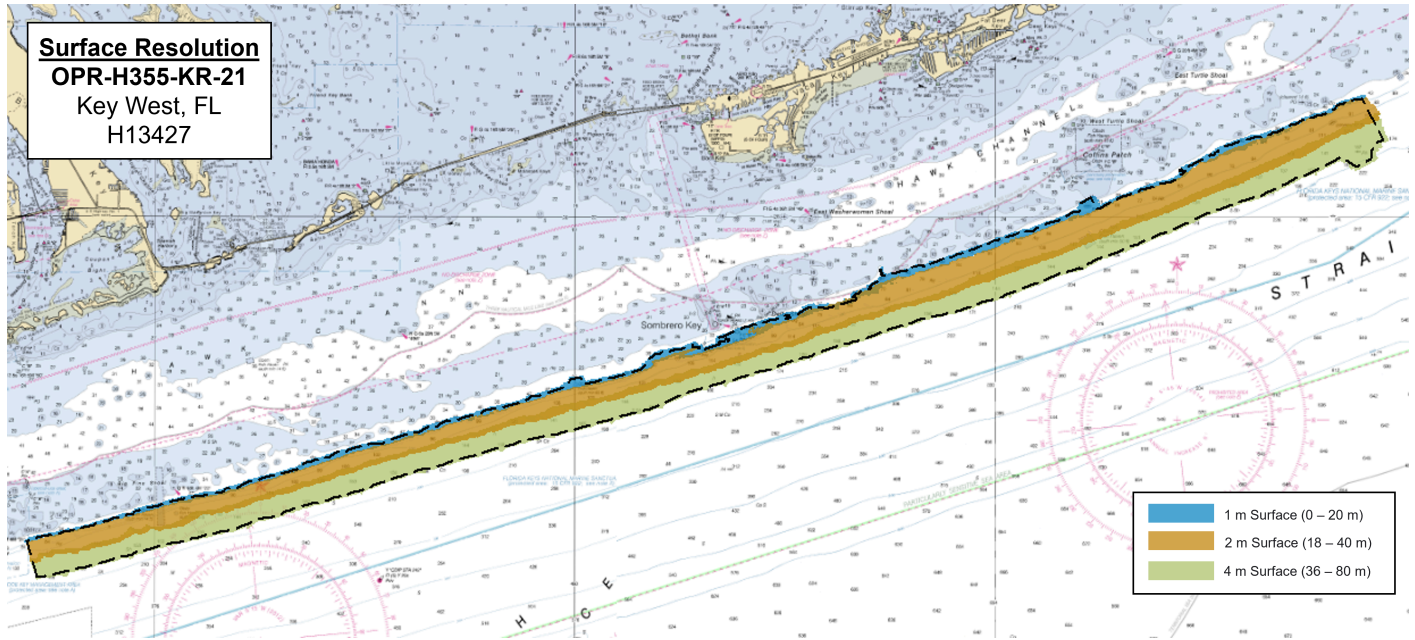


Figure 9: Image representing the finalized CUBE surface resolutions in H13427

### B.5.3 Designated Soundings

H13427 contains seven designated soundings in accordance with sections 5.2.1.2.3 and 7.4 of the HSSD. These designated soundings were created to facilitate feature management and best represent the least depths over features in the Final Feature File (FFF). In the finalized CUBE surfaces, the CARIS HIPS Apply Designated Soundings function ensured designated sounding depths are retained in the finalized surfaces.

## C. Vertical and Horizontal Control

Additional information discussing the vertical and horizontal control for this survey can be found in the accompanying HVCR and 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-H355-KR-21_NAD83_VDatum_MLLW.csar

*Table 13: ERS method and SEP file*

Real-time positional data were corrected with G2+ Global Navigation Satellite System (GNSS) satellite corrections provided by the Fugro Marinestar Satellite-Based Augmentation System (SBAS). To improve the accuracy of the real-time data, real-time position and attitude data were post-processed using Applanix POSPac Mobile Mapping Solution (MMS) software. Trimble CenterPoint RTX correction methods were used to create Smoothed Best Estimate of Trajectory (SBET) files, which were applied to the survey data in CARIS HIPS. The provided separation model was then utilized to bring the data from ellipsoid heights to chart datum.

## 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 17.

### RTK

Real-time positional data were corrected with G2+ GNSS satellite corrections provided by the Fugro Marinestar SBAS.

## D. Results and Recommendations

### D.1 Chart Comparison

A comparison was performed in CARIS HIPS between H13427 and the ENC's listed in Table 14 of section D.1.1. Sounding layers were generated from the CUBE surfaces and overlaid onto the ENC's to assess differences between the surveyed and charted depths.

In addition to a detailed visual inspection in CARIS HIPS, all soundings from the charts were downloaded as a shapefile from NOAA's ENC direct to GIS application and differenced with the nearest surveyed depth from the 2 m surface in ESRI ArcPro. A statistical analysis of the difference comparison is shown in Figure 10. The surveyed depths from H13427 generally agree with the charted soundings from the largest scale ENCs within the survey area, with a mean difference of 0.86 m.

Contour layers were generated from the 2 m CUBE surface and overlaid onto the ENCs to visually assess differences between the surveyed and charted contours. In H13427, the surveyed contours are in general agreement with the charted contours. Areas where discrepancies exist are the result of a dynamic seafloor with steep slopes.

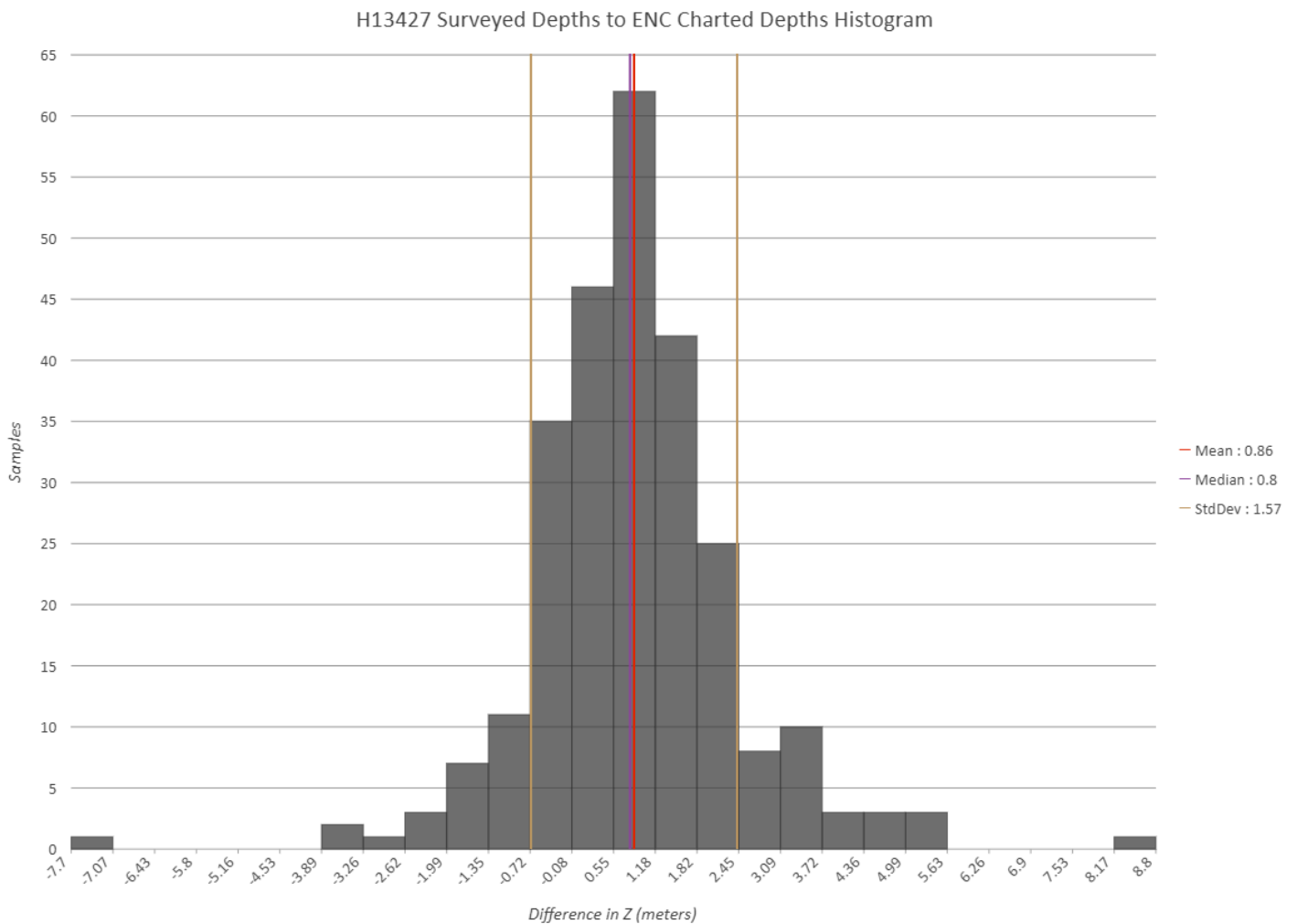


Figure 10: H13427 statistical analysis of surveyed depths to charted depths

### 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
US5FL95M	1:40000	12	10/05/2018	10/05/2018
US5FL98M	1:40000	16	07/29/2021	07/29/2021
US5FL29M	1:40000	19	08/06/2021	08/06/2021
US4FL97M	1:80000	21	08/04/2021	08/04/2021
US4FL26M	1:80000	12	08/06/2021	08/06/2021

*Table 14: Largest Scale ENC's*

### D.1.2 Shoal and Hazardous Features

No shoals or potentially hazardous features exist for this survey.

### D.1.3 Charted Features

There were nine assigned charted features within H13427 and are detailed in the FFF in accordance with section 7.3 of the HSSD. There were six assigned features with Special Feature Type as 'Unverified Charted Feature' that were investigated during survey operations, two of these assigned features were disproved, all of which are detailed as such in the FFF.

One charted obstruction with a categorization as Fish Haven was observed to have a least depth less than the allowable authorized minimum depth. Based on the existing charted soundings and the surrounding surveyed data, this feature was not deemed to be dangerous. The obstruction is detailed in the FFF with 'descrp'="Retain" in accordance with section 7.3 of the HSSD and guidance from the HSD Project Manager (see DR Appendix II Supplemental Records).

### D.1.4 Uncharted Features

There were six new features found within H13427 and are detailed in the FFF in accordance with section 7.3 of the HSSD.

### **D.1.5 Channels**

No channels exist for this survey. There are no designated anchorages, precautionary areas, safety fairways, traffic separation schemes, pilot boarding areas, or channel and range lines within the survey limits.

## **D.2 Additional Results**

### **D.2.1 Aids to Navigation**

A charted buoy was observed in the field to have an incorrectly charted shape description. The buoy in the charted position was observed to be spherical, and was reported to the USCG per HSSD 1.6.2.2. See DR Appendix II Supplemental Records for the report submitted to the USCG Navigation Center and correspondence with HSD Project Manager. All Aids to Navigation within the survey area are detailed in the FFF in accordance with section 7.3.6 of the HSSD.

### **D.2.2 Maritime Boundary Points**

No Maritime Boundary Points were assigned for this survey.

### **D.2.3 Bottom Samples**

No bottom samples were required for this survey.

### **D.2.4 Overhead Features**

No overhead features exist for this survey.

### **D.2.5 Submarine Features**

No submarine features exist for this survey.

### **D.2.6 Platforms**

No platforms exist for this survey.

### **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 abnormal seafloor or environmental conditions exist for this survey.

**D.2.9 Construction and Dredging**

No present or planned construction or dredging exist within the survey limits.

**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.

All field sheets, 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 NOS Hydrographic Surveys Specifications and Deliverables, Field Procedures Manual, Letter Instructions, and all HSD Technical Directives. These data are adequate to supersede charted data in their common areas. This survey is complete and no additional work is required with the exception of deficiencies noted in the Descriptive Report.

Report Name	Report Date Sent
Data Acquisition and Processing Report	2021-09-30
Horizontal and Vertical Control Report	2021-09-30
Coast Pilot Report	2021-09-10

Approver Name	Approver Title	Approval Date	Signature
David J. Bernstein	Chief of Party	09/30/2021	 Digitally signed by David J. Bernstein Date: 2021.09.30 13:10:31 -04'00'

## F. Table of Acronyms

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

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

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