H13705

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

DESCRIPTIVE REPORT

Type of Survey:	Navigable Area
Registry Number:	H13705

LOCALITY

State(s):	Texas
General Locality:	Galveston, Texas
Sub-locality:	15NM Southeast of Galveston Entrance

2023

CHIEF OF PARTY
Matthew Jaskoski, NOAA/CAPT

LIBRARY & ARCHIVES

Date:

U.S. DEPARTMENT OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION	REGISTRY NUMBER:
HYDROGRAPHIC TITLE SHEET	**H13705**

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:	**Galveston, Texas**
Sub-Locality:	**15NM Southeast of Galveston Entrance**
Scale:	**40000**
Dates of Survey:	**04/09/2023 to 06/06/2023**
Instructions Dated:	**02/09/2023**
Project Number:	**OPR-K371-TJ-23**
Field Unit:	**NOAA Ship *Thomas Jefferson***
Chief of Party:	**Matthew Jaskoski, NOAA/CAPT**
Soundings by:	**Multibeam Echo Sounder**
Imagery by:	**Multibeam Echo Sounder Backscatter Side Scan Sonar**
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 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 H13705

Project: OPR-K371-TJ-23

Locality: Galveston, Texas

Sublocality: 15NM Southeast of Galveston Entrance

Scale: 1:40000

April 2023 - June 2023

NOAA Ship *Thomas Jefferson*

Chief of Party: Matthew Jaskoski, NOAA/CAPT

A. Area Surveyed

Survey H13705, located in Galveston, Texas within the locality of 15NM Southeast of Galveston Entrance was conducted in accordance with coverage requirements set forth in the project instruction OPR-K371-TJ-23.

A.1 Survey Limits

Data were acquired within the following survey limits:

Northwest Limit	Southeast Limit
29° 12' 36" N 94° 39' 0" W	29° 0' 36" N 94° 18' 36" W

Table 1: Survey Limits

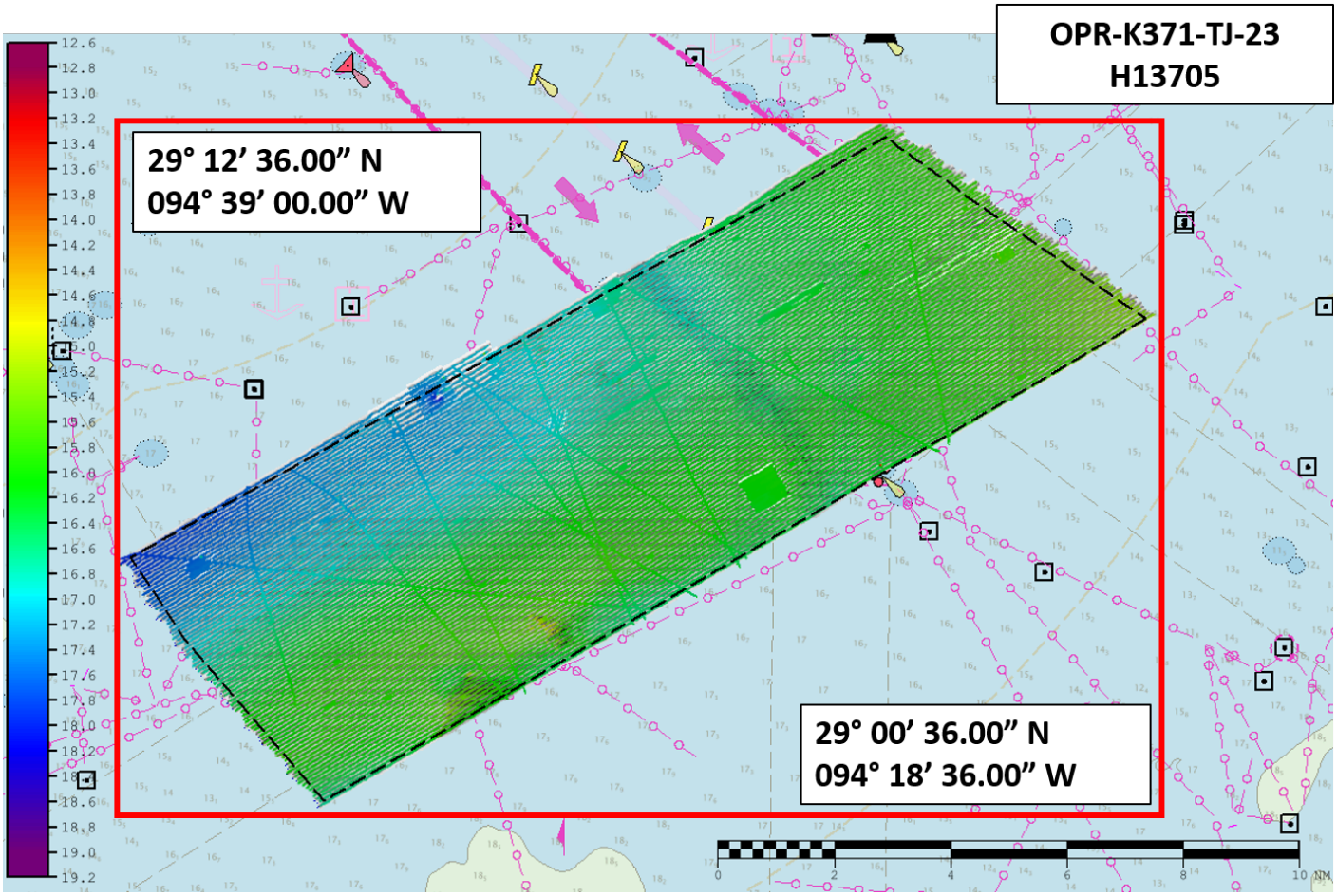


Figure 1: H13705 survey area outlined in dashed black, plotted over ENC US3GC02M.

Survey data were acquired in accordance with the Project Instructions (PI) and the 2022 Hydrographic Surveys Specifications and Deliverables (HSSD) (Figure 1).

A.2 Survey Purpose

This hydrographic survey covers an area where safe maritime commerce is critical to to the regional economy and environment. In 2018, the Port of Houston supported $159.8 Billion in trade. The area around the Houston Shipping Channel is the nation's largest importer/exporter of petroleum products and supported 713,000 jobs directly or indirectly.1

In 2018, the Port of Galveston supported $6.4 billion in trade and supported 28,000 jobs directly and indirectly. The Port of Galveston is also home to Texas’ main cruise ship terminal supporting over 250 cruise ship calls and approximately 2 million passengers.

This project covers approximately 880 square nautical miles between the Galveston Entrance and Sabine Bank Channels in an area which has not been surveyed since 1963. The current chart coverage shows numerous reported wrecks and obstructions with their positions reported to be approximate; these pose a risk to surface navigation. This survey will identify changes to the bathymetry and resolve position uncertainty in known hazards to navigation. Data from this project will provide contemporary surveys to update National Ocean Service nautical charts and products in an area critical to the nation's economy. Survey data from this project is intended to supersede all prior survey data in the common area.

1. Texas Comptroller of Public Accounts, https://comptroller.texas.gov/economy/economic-data/ports/houston.php

2. https://comptroller.texas.gov/economy/economic-data/ports/galveston.php

A.3 Survey Quality

The entire survey is adequate to supersede previous data.

Data acquired in H13705 meet 100% side scan sonar (SSS) coverage with concurrent multibeam echosounder (MBES) requirements for complete coverage, as specified in the 2022 HSSD. This includes crosslines (see Section B.2.1), NOAA allowable uncertainty (see Section B.2.2), and density requirements (see Section B.5.2).

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)

Table 2: Survey Coverage

Survey coverage is in accordance with requirements listed in Table 2 and the 2022 HSSD. Complete coverage requirements were met with 100% SSS with concurrent MBES. 200% SSS coverage was used to disprove some assigned features.

There are two holidays inside the sheet limits of H13705 (Figure 2). The northern holiday, as seen in the image, was not acquired due its proximity to the offshore platform. The second was not acquired due to operational time constraints.

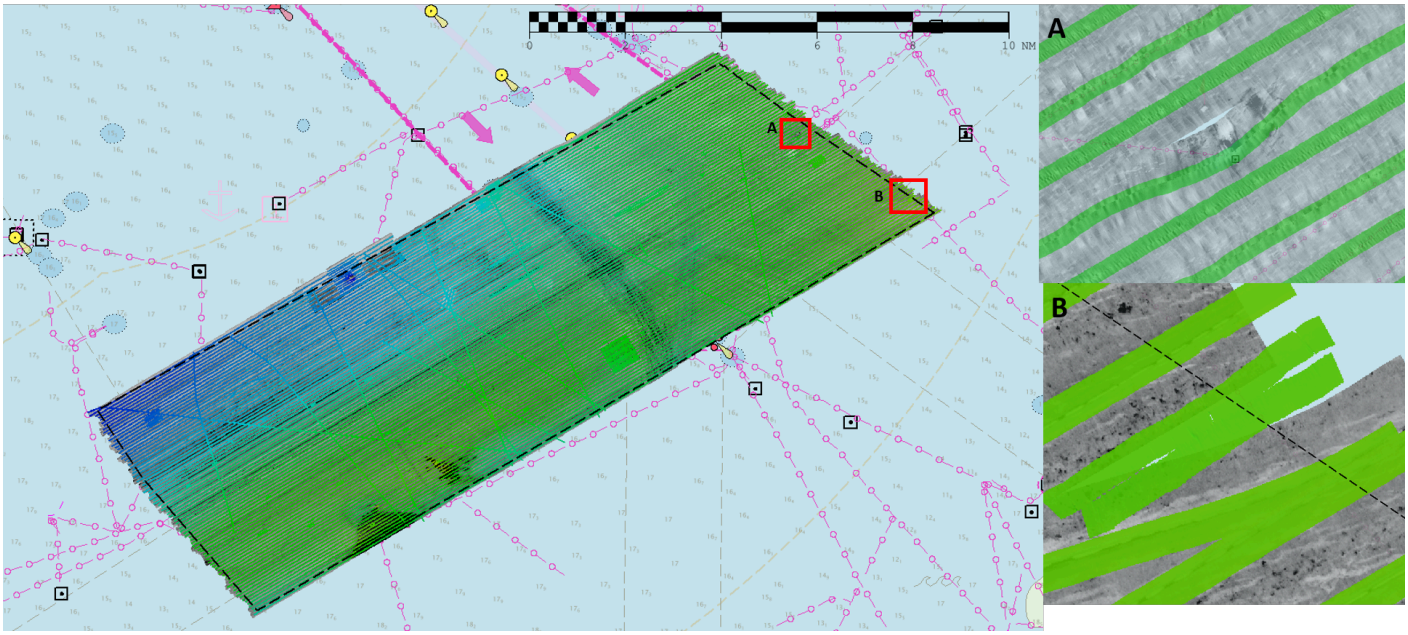


Figure 2: Holidays within H13705 sheet limits.

A.6 Survey Statistics

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

	HULL ID	*222*	*2903*	*Total*
LNM	**SBES Mainscheme**	0.0	0.0	0.0
	MBES Mainscheme	0.9	12.8	13.7
	Lidar Mainscheme	0.0	0.0	0.0
	SSS Mainscheme	0.0	0.0	0.0
	SBES/SSS Mainscheme	0.0	0.0	0.0
	MBES/SSS Mainscheme	1283.2	49.5	1332.7
	SBES/MBES Crosslines	60.4	0.0	60.4
	Lidar Crosslines	0.0	0.0	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				84.8

Table 3: Hydrographic Survey Statistics

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

Survey Dates	Day of the Year
04/09/2023	99
04/10/2023	100

Survey Dates	Day of the Year
04/11/2023	101
04/12/2023	102
04/25/2023	115
05/02/2023	122
05/03/2023	123
05/08/2023	128
05/09/2023	129
05/11/2023	131
05/12/2023	132
05/17/2023	137
05/25/2023	145
05/26/2023	146
06/04/2023	155
06/05/2023	156
06/06/2023	157

Table 4: Dates of Hydrography

B. Data Acquisition and Processing

B.1 Equipment and Vessels

Refer to the Data Acquisition and Processing Report (DAPR) for a complete description of data acquisition and processing systems, survey vessels, quality control procedures and data processing methods. Additional information to supplement sounding and 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:

Hull ID	*222*	*2903*
LOA	63.5 meters	8.5 meters
Draft	4.6 meters	1.2 meters

Table 5: Vessels Used

Figure 3: NOAA Ship Thomas Jefferson S222

Figure 4: Thomas Jefferson Launch 2903

B.1.2 Equipment

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

Manufacturer	Model	Type
Kongsberg Maritime	EM 2040	MBES
Kongsberg Maritime	EM 2040	MBES Backscatter
Applanix	POS MV 320 v5	Positioning and Attitude System
Sea-Bird Scientific	SBE 19plus V2	Conductivity, Temperature, and Depth Sensor
Teledyne RESON	SVP 70	Sound Speed System
AML Oceanographic	MVP200	Conductivity, Temperature, and Depth Sensor
Valeport	Thru-Hull SVS	Sound Speed System
EdgeTech	4200	SSS
Klein Marine Systems	System 5000	SSS

Table 6: Major Systems Used

Refer to the DAPR for a complete description of systems and equipment used by S222 and 2903.

B.2 Quality Control

B.2.1 Crosslines

S222 collected 60.4 linear nautical miles of MBES crosslines or 4.5% of mainscheme MBES data. The crosslines acquired represent good spatial and depth diversity for this survey area (Figure 5).

A Single Resolution (SR) 1m Combined Uncertainty and Bathymetry Estimator (CUBE) surface of mainscheme data and a SR 1m CUBE surface of crossline data were differenced - the resulting mean was 0.01 m with a standard deviation of 0.05 m (Figure 6). Over 99.5% of nodes are compliant with fraction of allowable error standards (Figure 7). Visual inspection of the difference surface indicated no systematic issues.

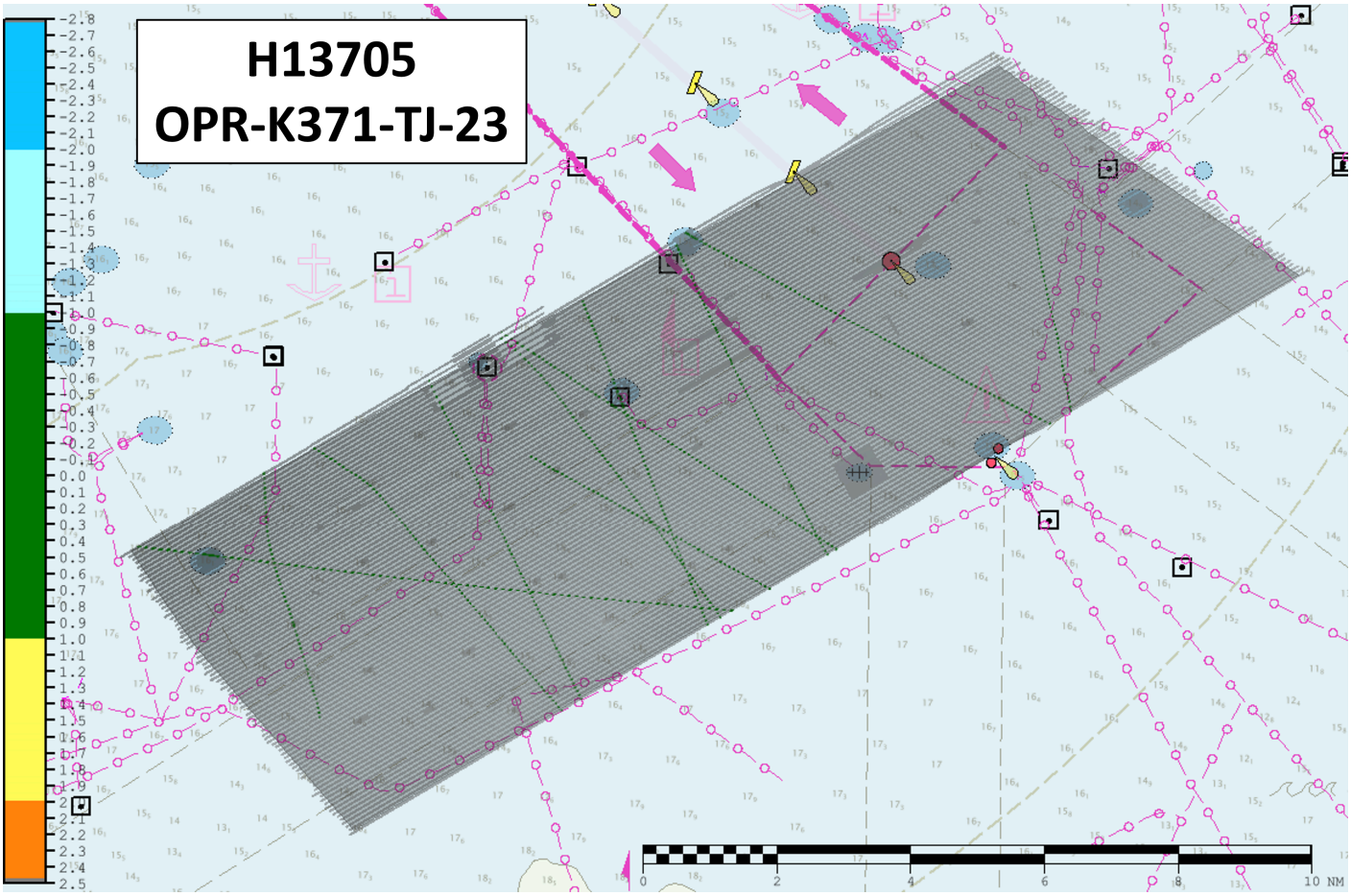
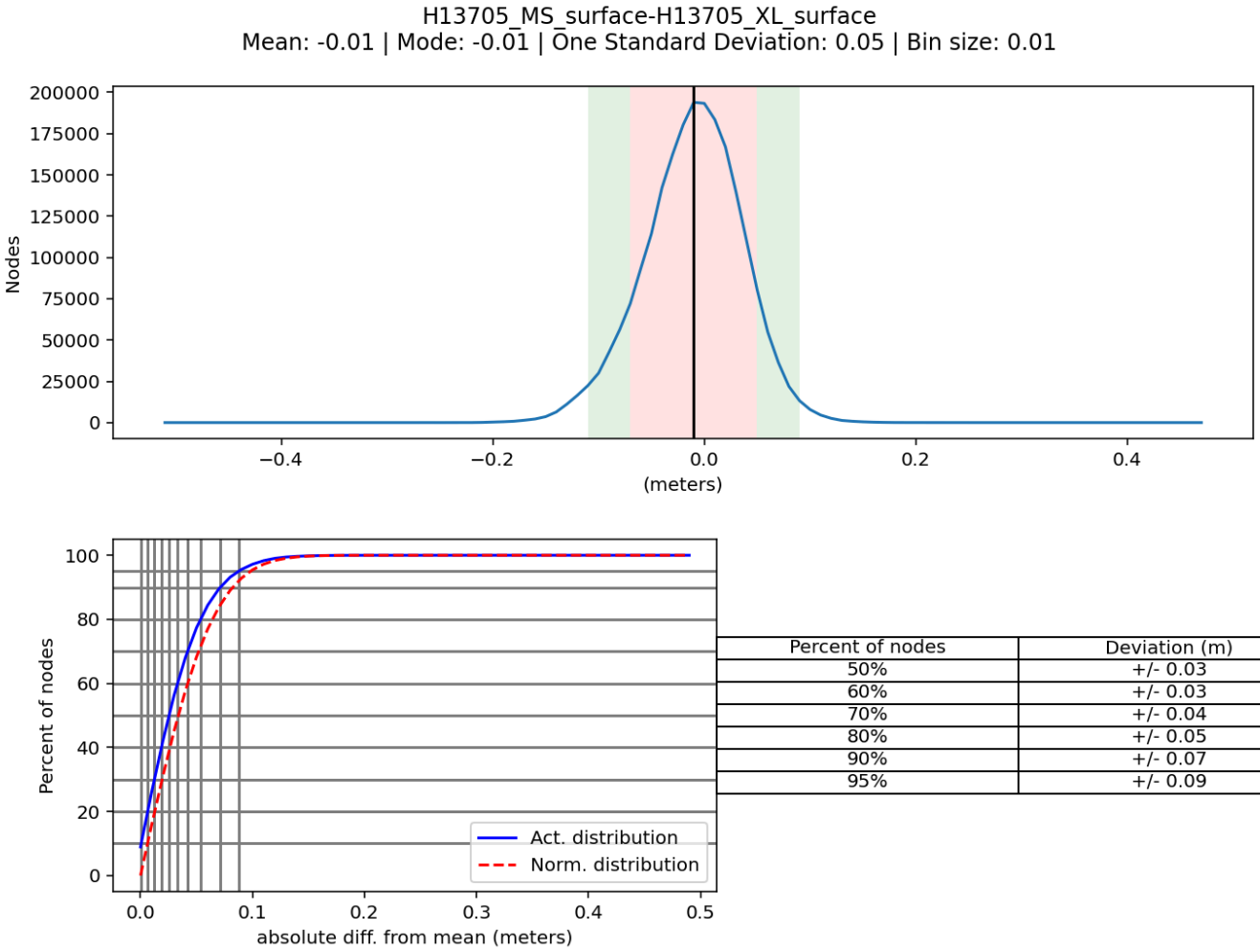


Figure 5: Overview of H13705 crossline distribution by geography colored by IHO's fraction of allowable error.



Percent of nodes	Deviation (m)
50%	+/- 0.03
60%	+/- 0.03
70%	+/- 0.04
80%	+/- 0.05
90%	+/- 0.07
95%	+/- 0.09

Figure 6: H13705 crossline/mainscheme comparison statistics.

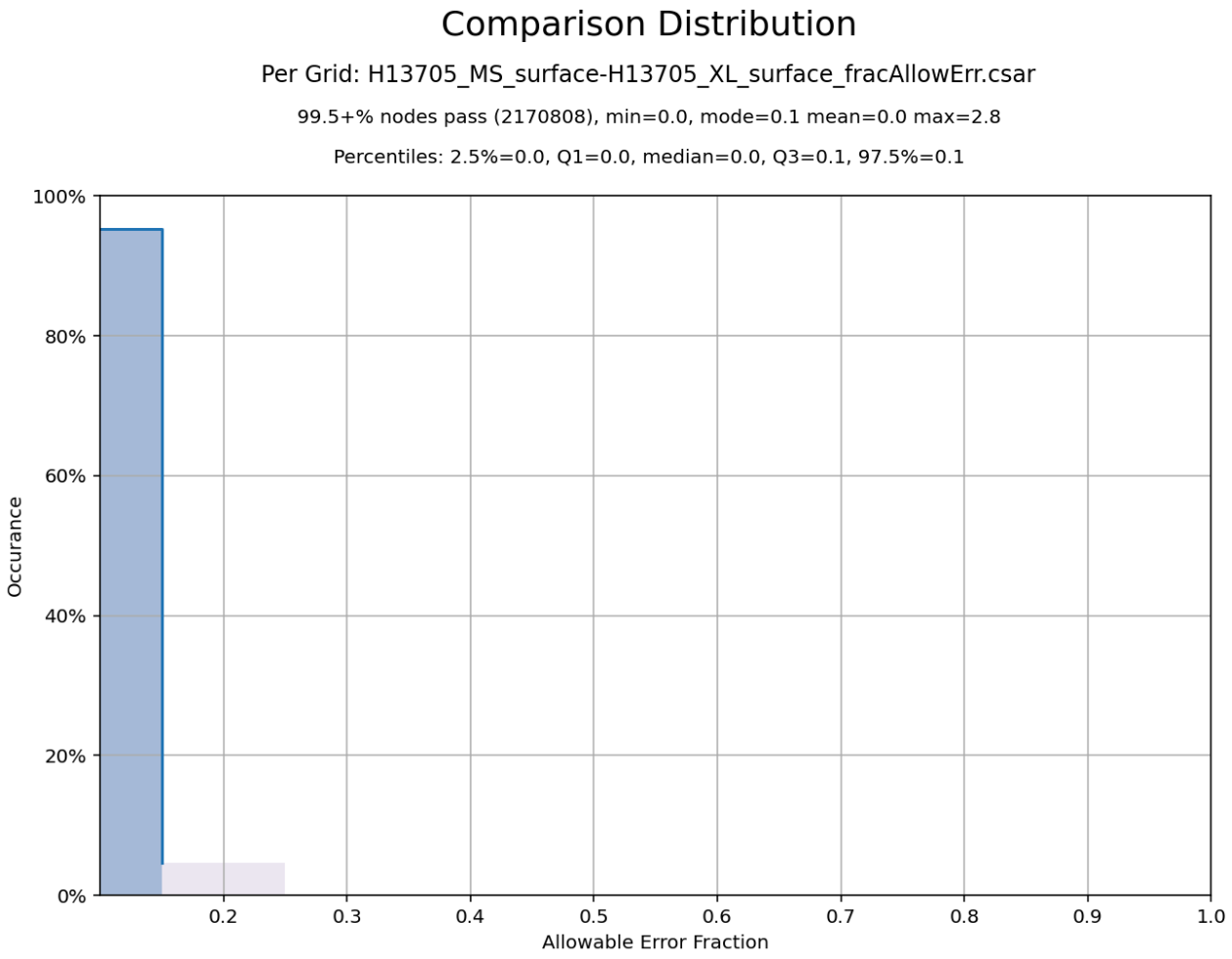


Figure 7: H13705 crossline fraction of allowable error statistics.

B.2.2 Uncertainty

The following survey specific parameters were used for this survey:

Method	Measured	Zoning
ERS via VDATUM	0.0 meters	0.12 meters

Table 7: Survey Specific Tide TPU Values.

Hull ID	Measured - CTD	Measured - MVP	Measured - XBT	Surface
222	4 meters/second	4 meters/second	N/A meters/second	0.2 meters/second
2903	4 meters/second	N/A meters/second	N/A meters/second	0.2 meters/second

Table 8: Survey Specific Sound Speed TPU Values.

The bathymetric surface's uncertainty layer is compliant with 2022 HSSD uncertainty standards. Over 99.5% of all nodes pass uncertainty standards (Figure 8).

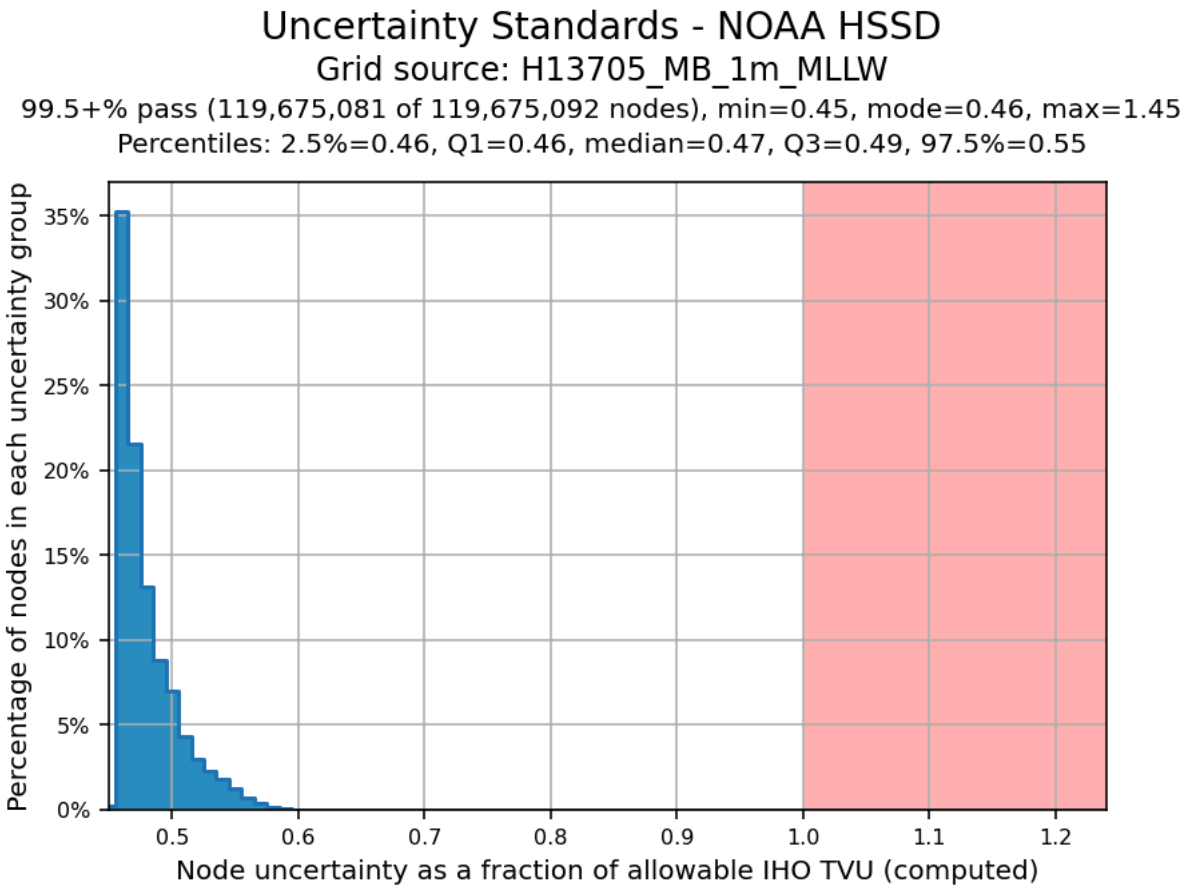


Figure 8: H13705 uncertainty standards.

B.2.3 Junctions

Survey H13705 junctions with contemporary surveys, H13703 and H13704, within the OPR-K371-TJ-23 project (Figure 9) and 2019 Leidos survey, H13218. Information regarding junction analysis with H13704 and H13218 can be found below. Reference the Descriptive Report for H13703 for more details regarding junction analysis with this sheet.

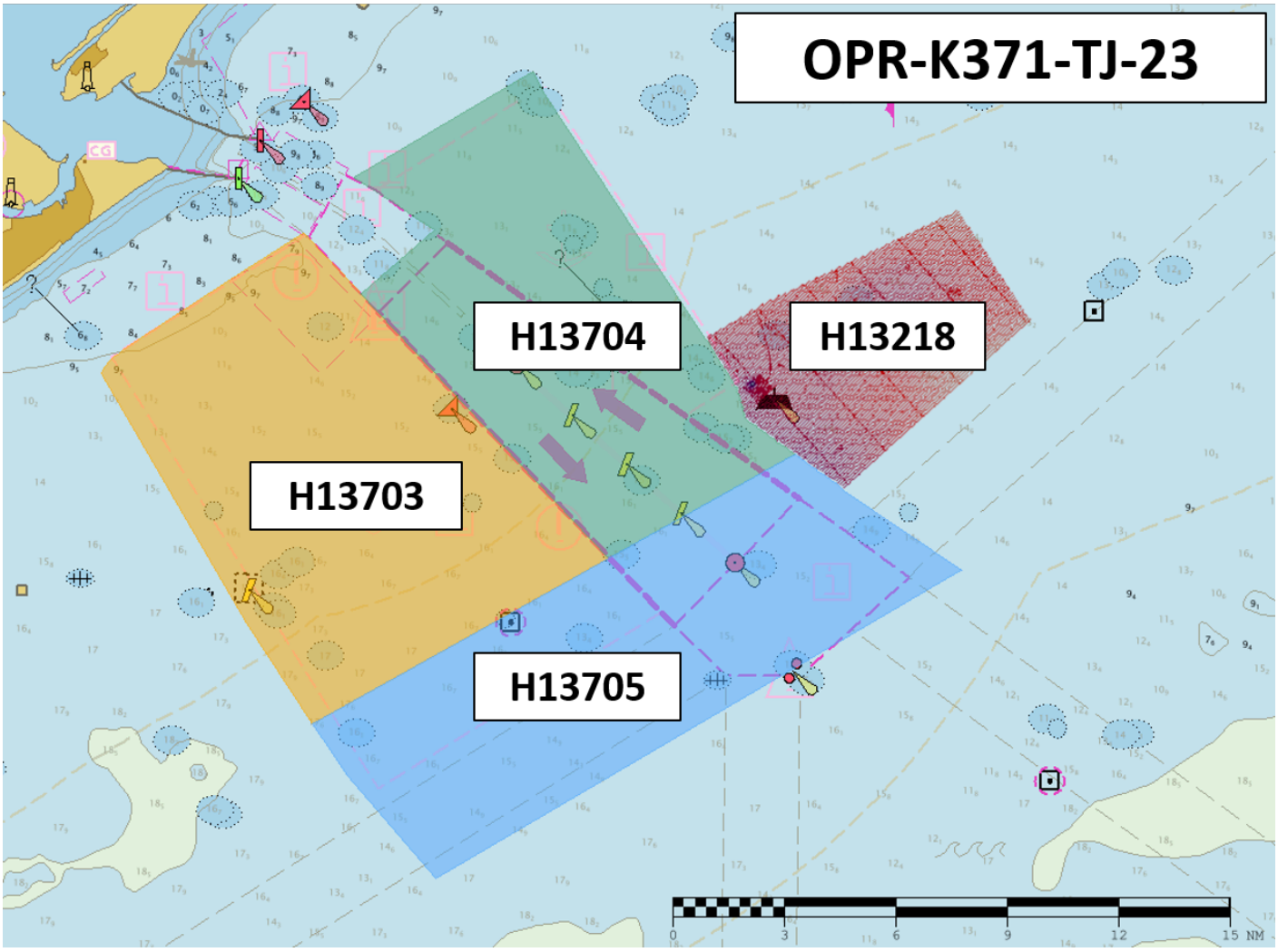


Figure 9: Overview of contemporary surveys H13703, H13704, H13705 and historical survey, H13218, overlaid on ENC US3GC02M.

The following junctions were made with this survey:

Registry Number	Scale	Year	Field Unit	Relative Location
H13703	1:40000	2023	TJ	NW
H13704	1:40000	2023	TJ	NW
H13218	1:20000	2019	Leidos	E

Table 9: Junctioning Surveys

H13703

Refer to the Descriptive Report for H13703 for information on the results of the junction analysis.

H13704

The northeast edge of H13705 junctions with sheet H13704 (Figure 10). A 1m SR CUBE surface of H13705 data and a 1m SR CUBE surface of H13704 were differenced. The mean difference between bathymetric surface nodes was 0.06m with a standard deviation of 0.06m (Figure 11). Statistics and visual inspection indicate the surveys are in general agreement (Figure 12).

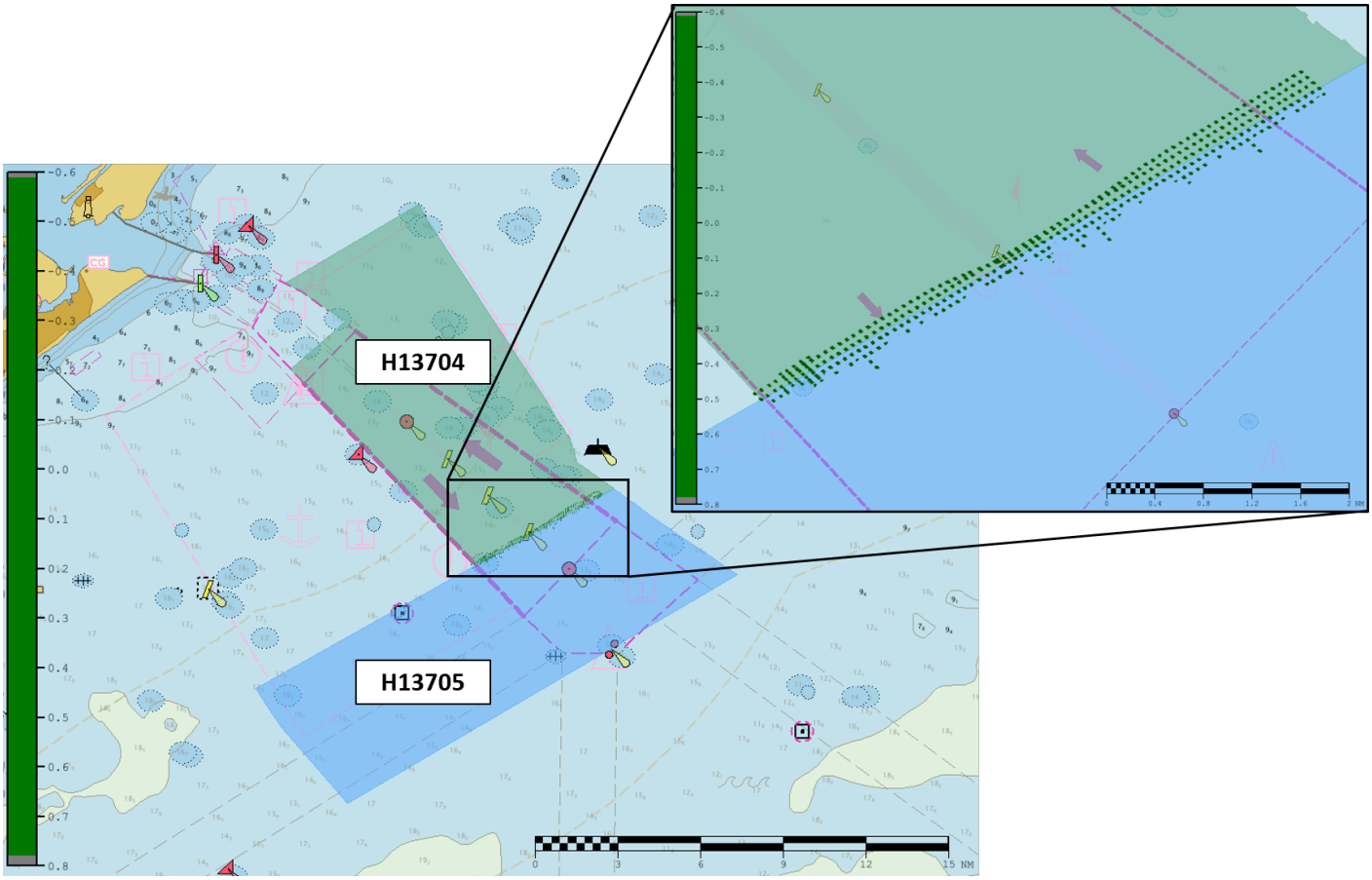
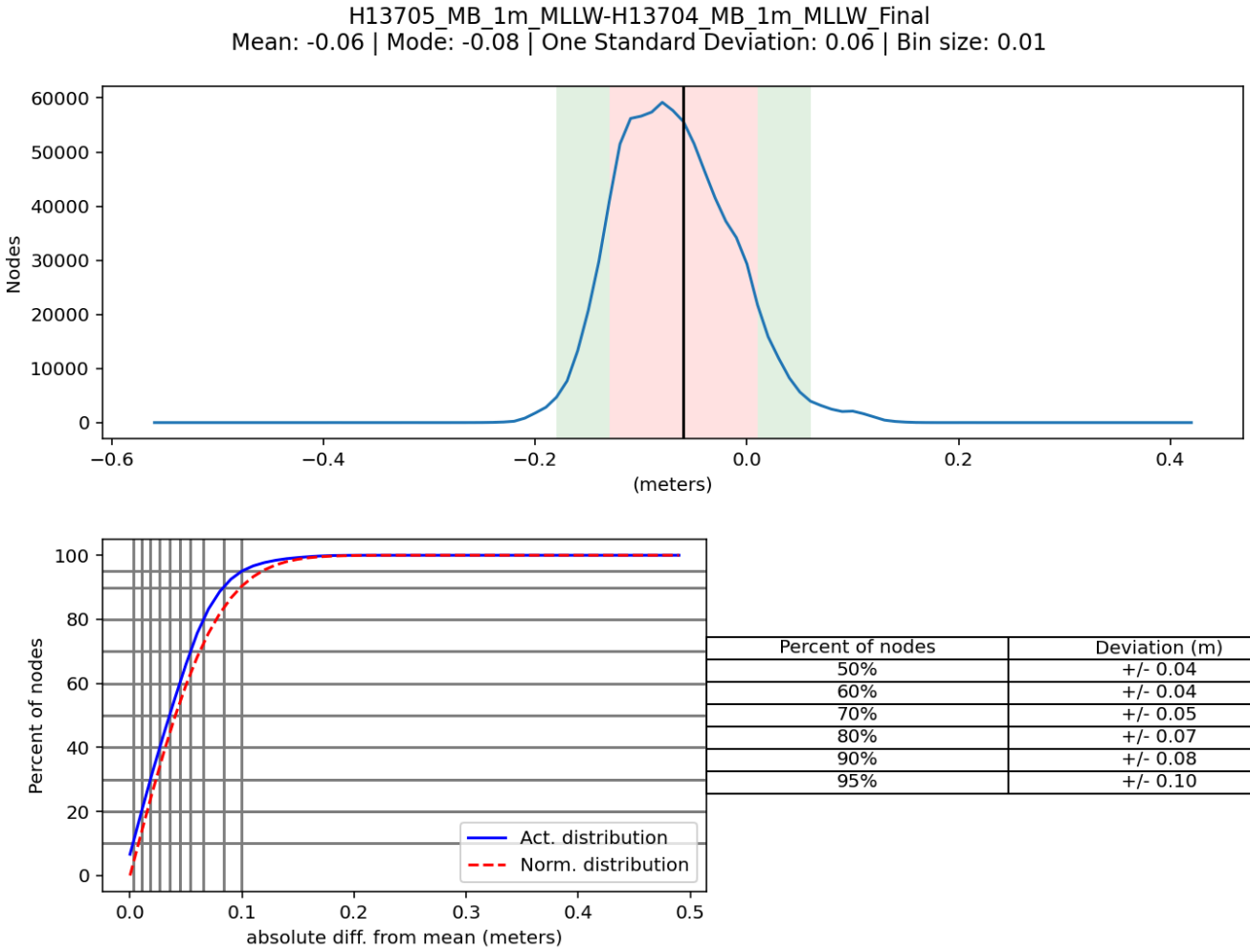


Figure 10: Fraction of allowable error surface difference comparison between H13704 and H13705, with a representative close up.



Percent of nodes	Deviation (m)
50%	+/- 0.04
60%	+/- 0.04
70%	+/- 0.05
80%	+/- 0.07
90%	+/- 0.08
95%	+/- 0.10

Figure 11: H13705 and H13704 surface difference comparison statistics.

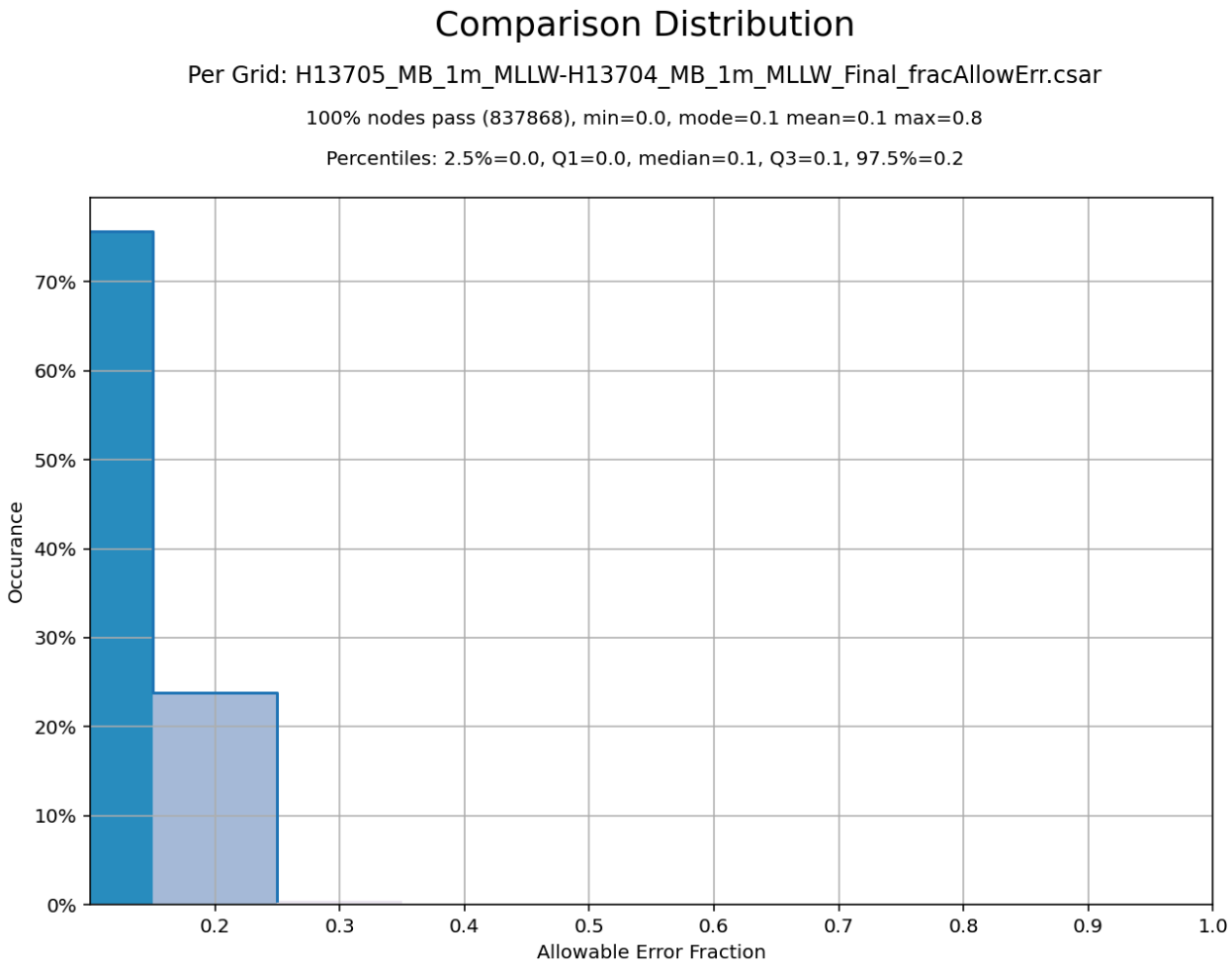


Figure 12: H13705 and H13704 fraction of allowable error statistics.

H13218

The eastern edge of H13705 junctions with sheet H13218 (Figure 13). A 1m SR CUBE surface of H13705 data and a 1m SR CUBE surface of H13218 were differenced. The mean difference between bathymetric surface nodes was 0.02m with a standard deviation of 0.05m (Figure 14). Statistics and visual inspection indicate the surveys are in general agreement (Figure 15).

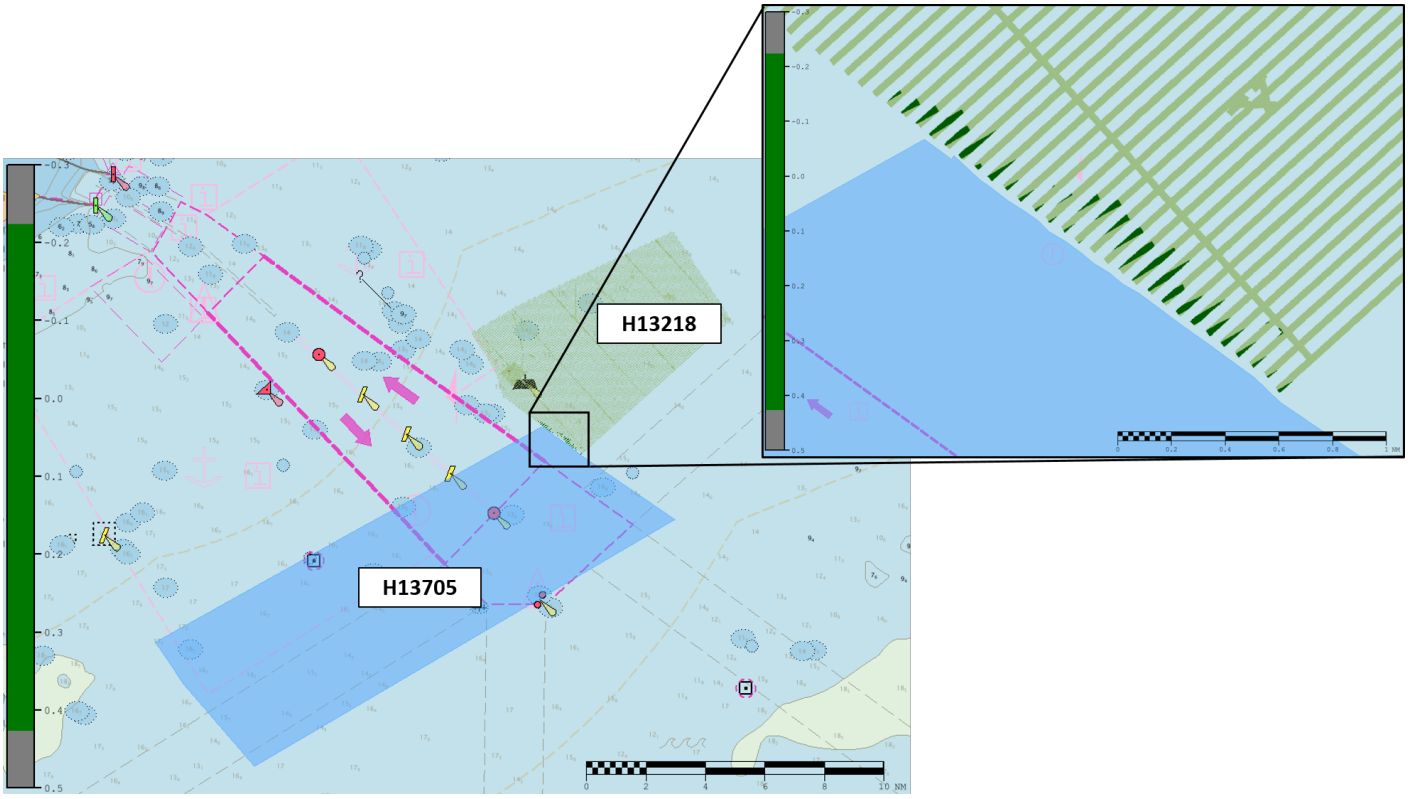
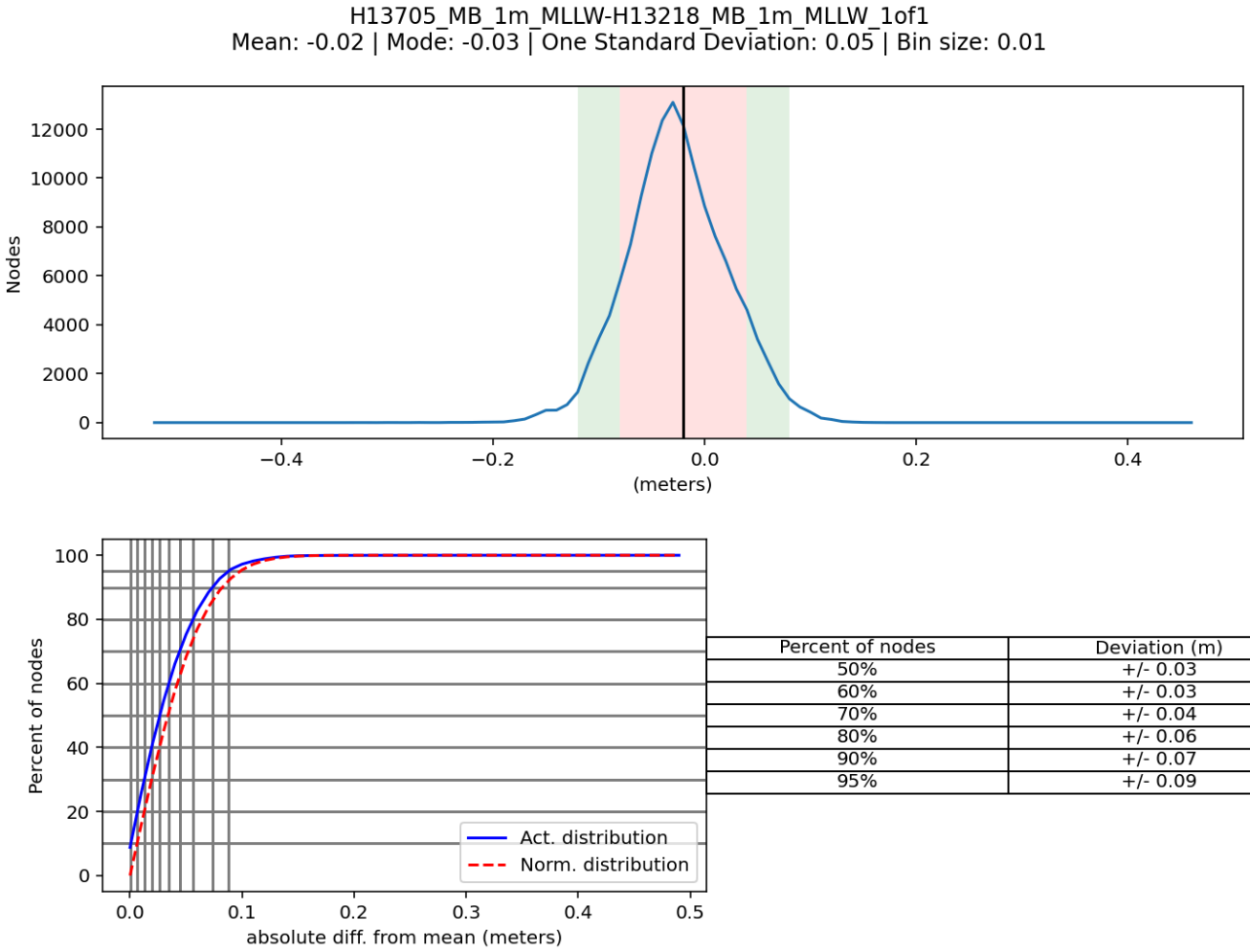


Figure 13: Fraction of allowable error surface difference comparison between H13218 and H13705, with a representative close up.



Percent of nodes	Deviation (m)
50%	+/- 0.03
60%	+/- 0.03
70%	+/- 0.04
80%	+/- 0.06
90%	+/- 0.07
95%	+/- 0.09

Figure 14: H13705 and H13218 surface difference comparison statistics.

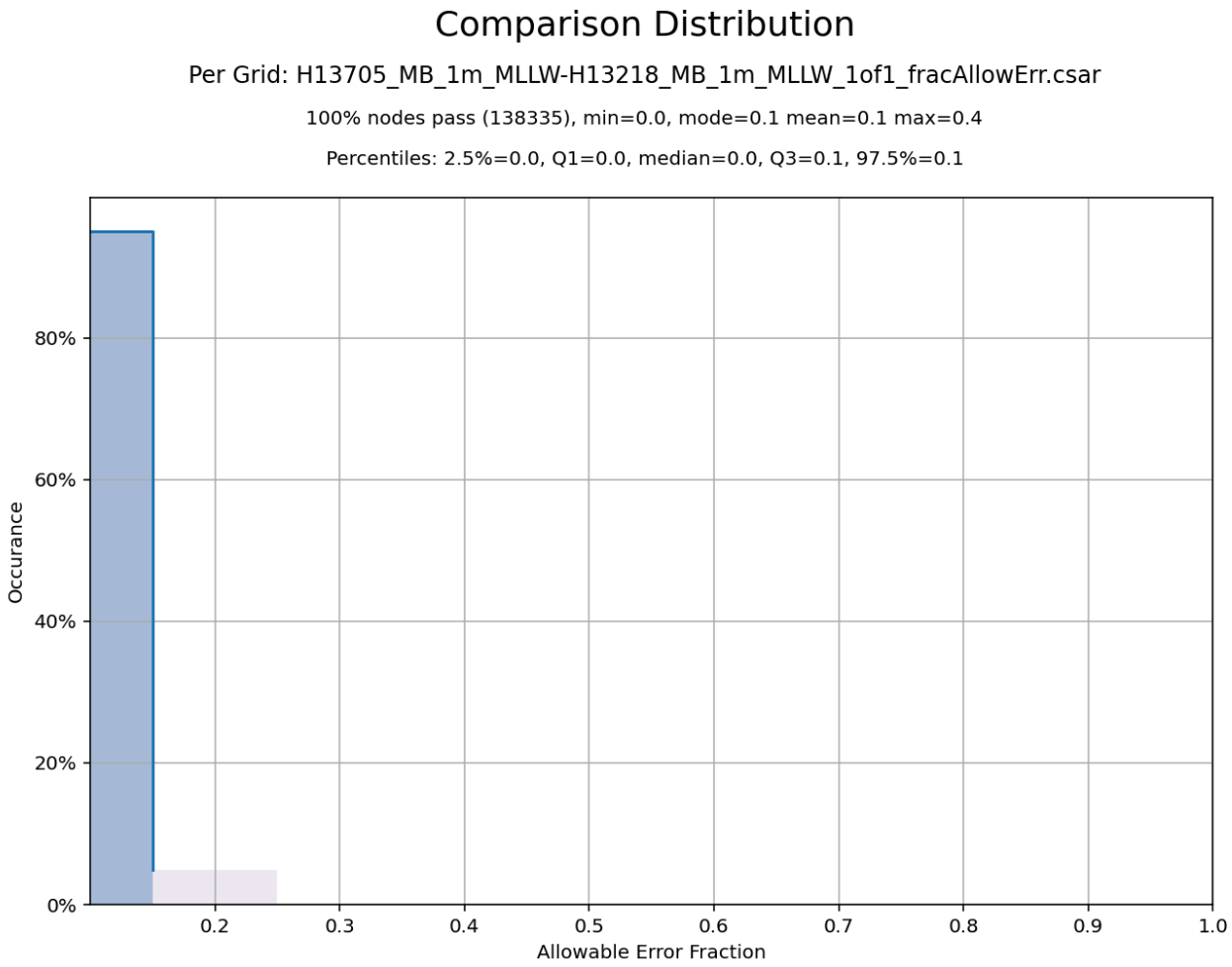


Figure 15: H13705 and H13218 fraction of allowable error statistics.

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: Conductivity, temperature, and depth (CTD) casts were conducted at the start of acquisition each day and at a minimum of once every four hours during acquisition using an MVP 200 system and a Seabird Seacat 19+ V2. Cast frequency was increased in areas where a change in surface sound speed greater than two meters per second was observed. All sound speed methods were used as detailed in the DAPR.

A total of 145 sound speed profiles were collected as part of acquisition of H13705 and display good spatial diversity (Figure 16). Six of these casts were located outside of the sheet limits and display profiles representative of the area. All sound speed profile data were concatenated into a master file for the sheet. MBES data were corrected by applying profiles nearest in distance in time (4 hours) using this master file.

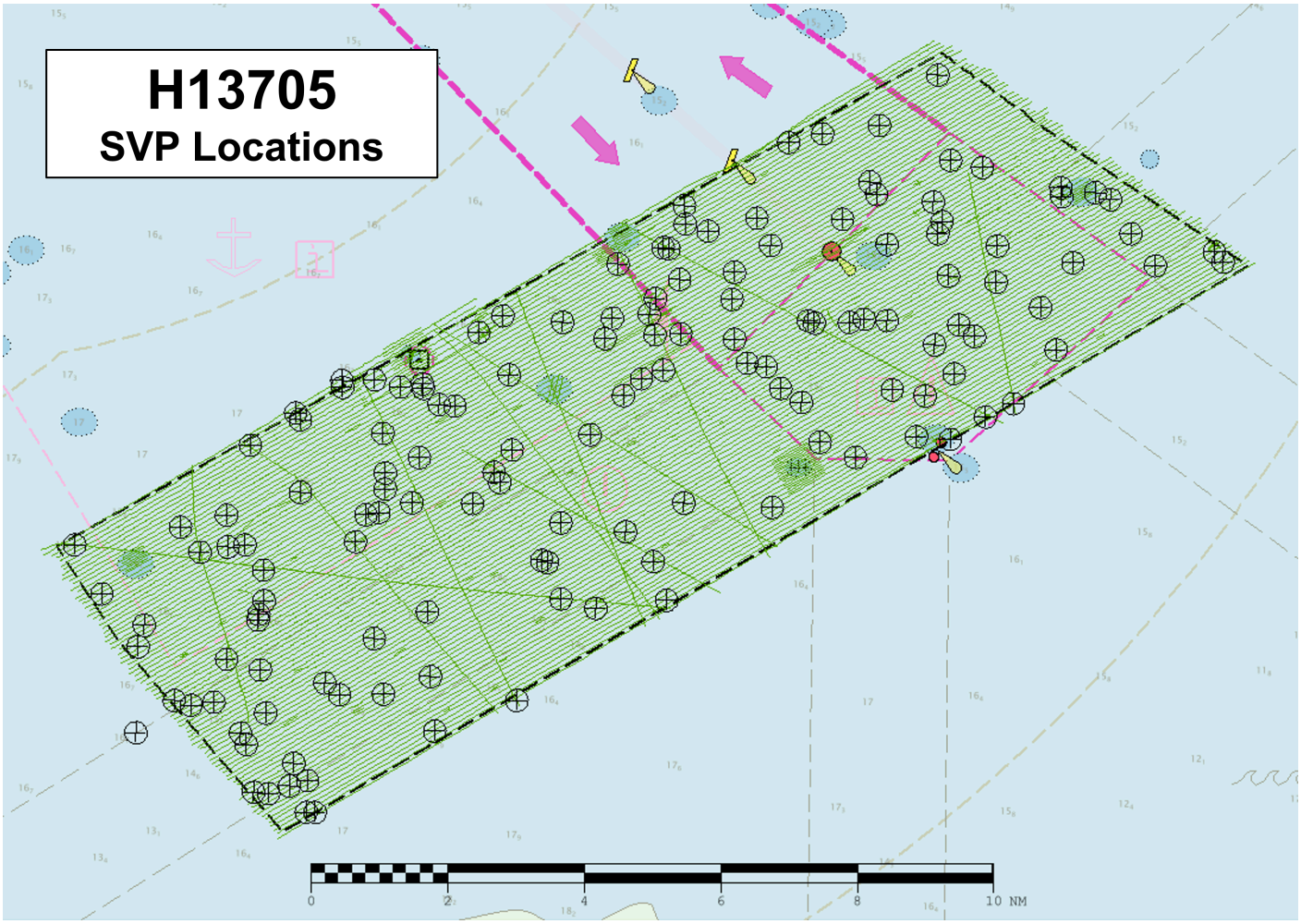


Figure 16: Overview of all sound velocity casts collected on H13705.
Cast locations shown as black targets overlaid on green MBES tracklines.

B.2.8 Coverage Equipment and Methods

Complete coverage requirements were met by 100% SSS coverage with concurrent MBES as specified under section 5.2.2.3 of the 2022 HSSD. Hydrographic survey vessel, Thomas Jefferson, was outfitted with a Klein 5000 V2 SSS system and a Kongsberg EM2040 MBES system, and was primarily used to acquire mainscheme coverage and crosslines. Vessel 2903 was outfitted with an Edgetech 4200 SSS system and a Kongsberg EM2040 MBES system, and was used to acquire mainscheme coverage, crosslines, developments, and holidays.

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

The following calibrations were conducted after the initial system calibration discussed in the DAPR:

Calibration Type	Date	Reason
Yaw Patch Value	2023-07-28	Incorrect yaw value entered in POS M/V following initial calibration.

Table 10: Calibrations not discussed in the DAPR.

At the end of OPR-K371-TJ-23 acquisition, the field unit observed a “wobble” effect in the outer edges of the multibeam for TJ launch 2903. Systematic issues were not observed during Hydrographic Systems Readiness Review (HSRR) or throughout the project due to acquisition in shallow water. The “wobble” became apparent in depths greater than 20 meters. Hydrographic Systems Technology Branch (HSTB) used QPS’ Qimera Software to investigate the issue and computed a yaw misalignment of +2.2° with the wobble tool. It was further determined that the yaw value calculated during initial patch testing was entered in Applanix POS M/V as -1.1° instead of +1.1°. The field unit used Applanix POSPac Software to update the Z-component of the IMU with respect to reference point mounting angles to 1.1° to correct the misalignment. Then, the following steps were taken:

1. Re-ran GNSS-inertial processor
2. Re-exported SBET (with corrected offsets)
3. Imported the new SBET and RMS to affected TJ Launch 2903 data and overwrote position, height, and attitude (gyro, pitch, and roll)
4. Georeferenced all affected data
5. Created new surfaces

Updated SBETs and RMS files are included in the product deliverables. Reference the Project Correspondence included in the submission package for a record of the correspondence with HSTB.

B.4 Backscatter

All equipment and survey methods were used as detailed in the DAPR. Raw MBES backscatter was logged as part of the .all file from the Kongsberg EM2040 systems. Backscatter was processed in QPS Fledermaus GeoCoder Toolbox (FMGT) software, and the exported geotiffs are included in the final processed data submission package (Figures 17 and 18).

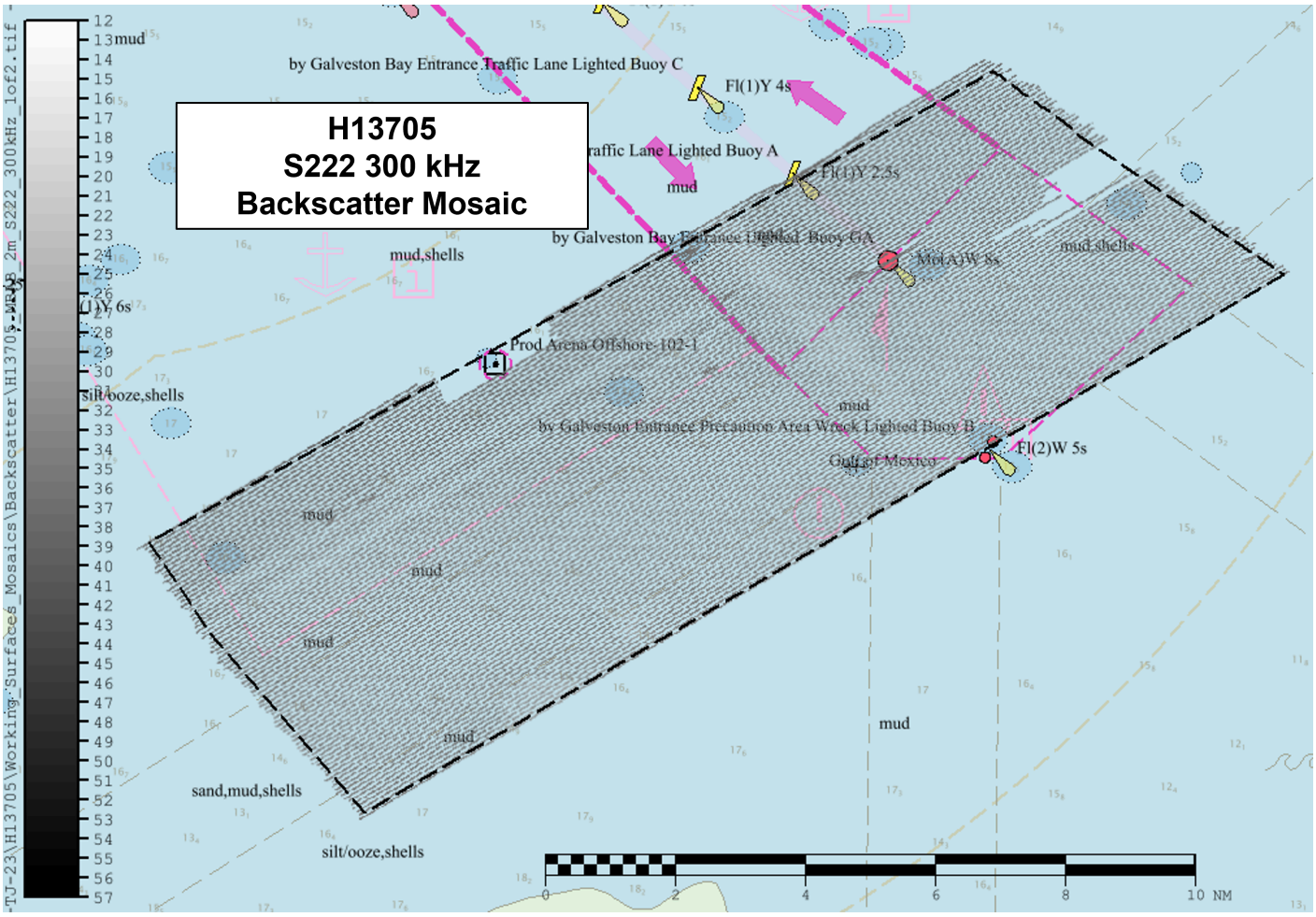


Figure 17: 300kHz backscatter mosaic from data acquired by S222.

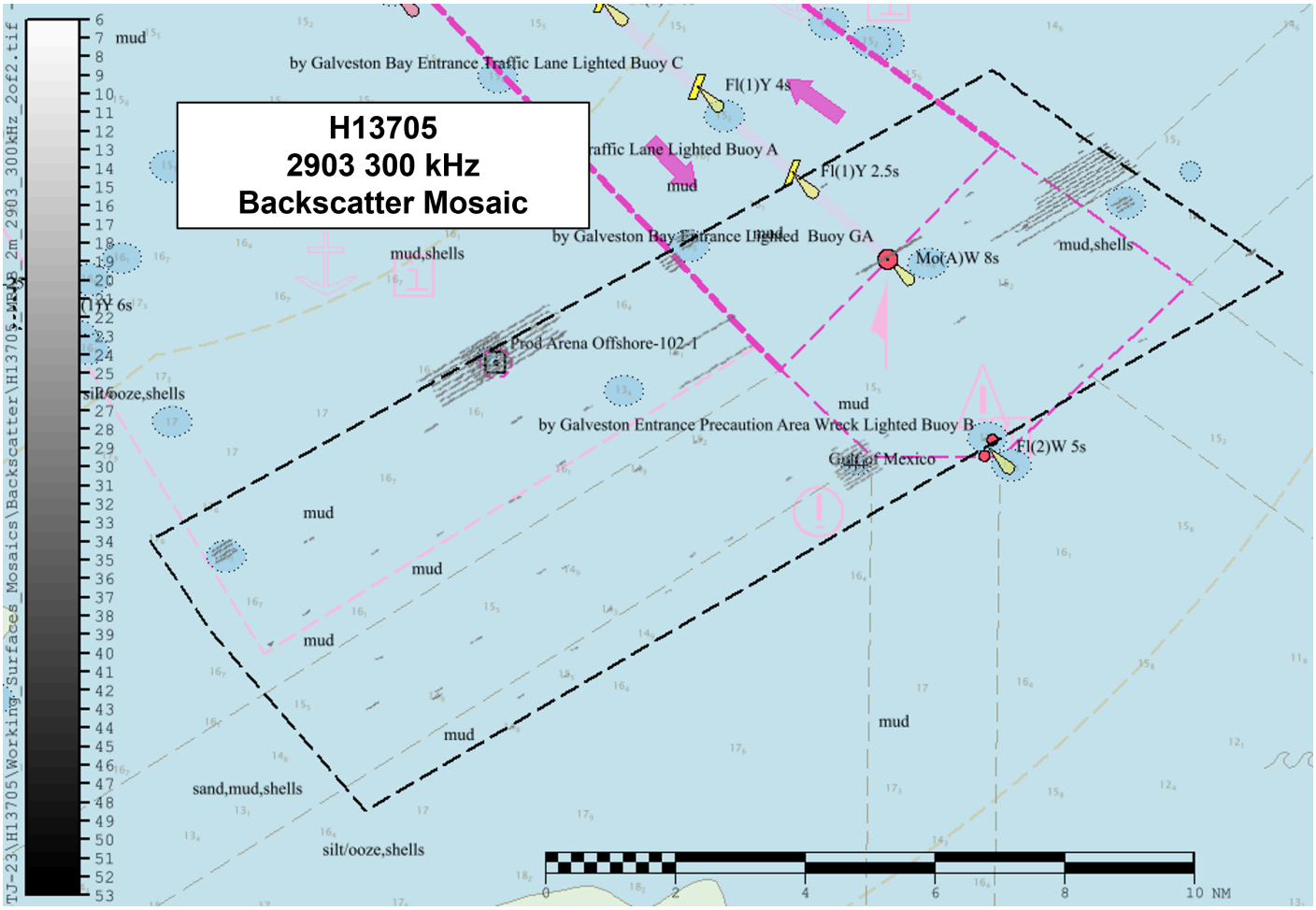


Figure 18: 300kHz backscatter mosaic from data acquired by 2903.

B.5 Data Processing

B.5.1 Primary Data Processing Software

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

Feature Object Catalog NOAA Profile Version 2023 was used for all S-57 attribution in the Final Feature File (FFF). All other software were used 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
H13705_MB_1m_MLLW	CARIS Raster Surface (CUBE)	1 meters	12.8 meters - 19.0 meters	NOAA_1m	Complete MBES
H13705_MB_1m_MLLW_Final	CARIS Raster Surface (CUBE)	1 meters	12.6 meters - 19.0 meters	NOAA_1m	Complete MBES
H13705_MBAB_2m_S222_300kHz_1of2	MB Backscatter Mosaic	2 meters	-	N/A	Complete MBES
H13705_MBAB_2m_2903_300kHz_2of2	MB Backscatter Mosaic	2 meters	-	N/A	Complete MBES
H13705_SSSAB_1m_455kHz_1of3	SSS Mosaic	1 meters	-	N/A	100% SSS
H13705_SSSAB_1m_600kHz_2of3	SSS Mosaic	1 meters	-	N/A	100% SSS
H13705_SSSAB_1m_600kHz_3of3	SSS Mosaic	1 meters	-	N/A	200% SSS

Table 11: Submitted Surfaces

Complete coverage requirements were met by 100% SSS coverage with concurrent MBES as specified under section 5.2.2.2 of the 2022 HSSD. See Section A.4 for details regarding coverage methods and holidays in the coverage achieved for H13705.

The MBES surface meets density standards specified in the 2022 HSSD with more than 99.5% of nodes in compliance (Figure 19). After multiple rounds of surface cleaning, three fliers remain as flagged by NOAA's Pydro22 Flier Finder. The hydrographer has reviewed the flagged grid nodes, considers them to be accurate representations of the sea floor, and has retained them in the delivered surfaces.

Throughout sheet H13705, turbulence from the ship’s propeller and surface waves was observed in the SSS imagery due to a roll in Thomas Jefferson’s Klein 5000V2 towfish. However, the data was determined to be of acceptable quality to discern contacts. The hydrographer is confident no significant features exist, since hard returns were visible in areas of significant prop wash and air bubbles.

200% SSS coverage was used to disprove some assigned features, and the mosaic is included in the final submission package.

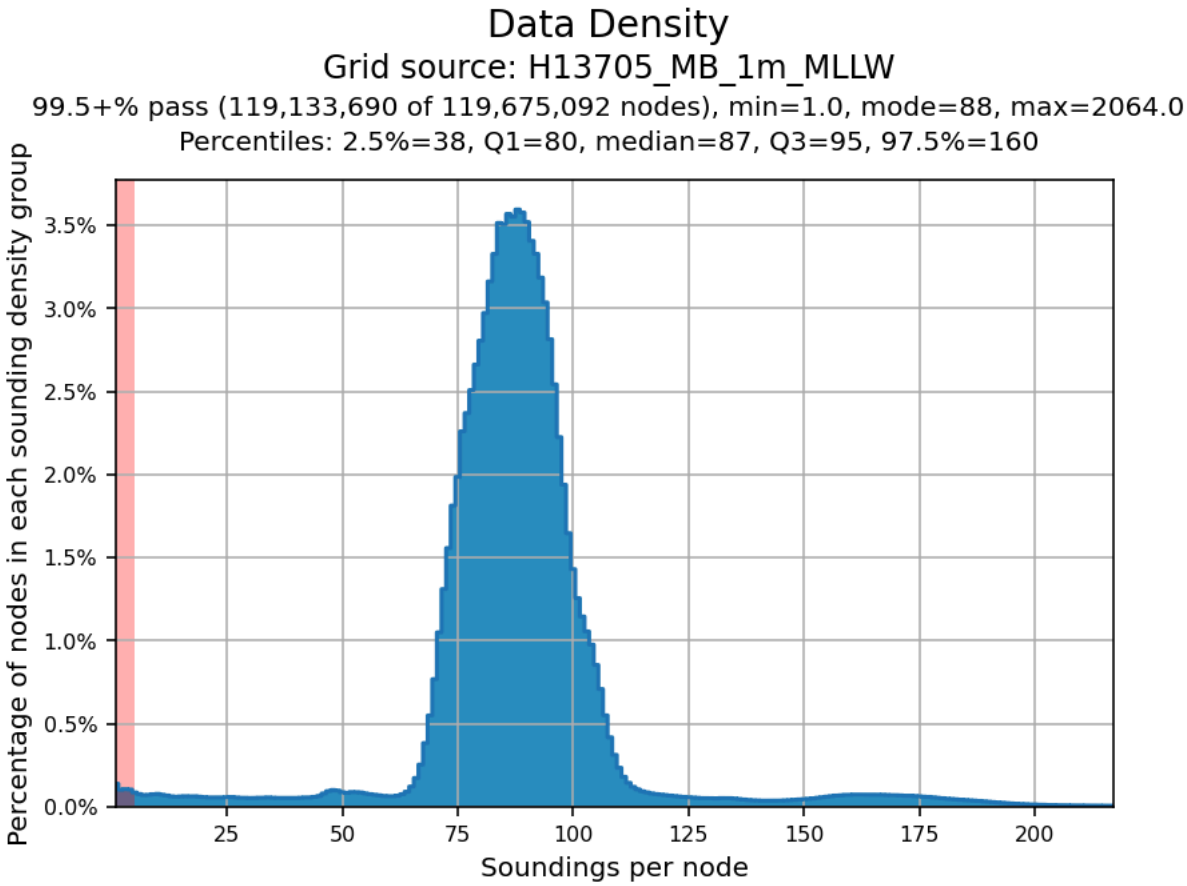


Figure 19: H13705 data density standards

C. Vertical and Horizontal Control

No Horizontal and Vertical Control Report (HVCR) is required for this survey.

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-TJ-23_NAD83_VDatum_MLLW_Galveston

Table 12: ERS method and SEP file

All soundings submitted for H13705 are reduced to MLLW using VDatum techniques as outlined in the DAPR.

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.

The following PPK methods were used for horizontal control:

- RTX

Trimble-RTX service was used with an Applanix POS MVv5 GNSS_INS system to obtain highly accurate ellipsoidally referenced position data to meet ERS specifications for H13705 MBES data from vessels S222 and HSL 2903.

WAAS

The Wide Area Augmentation System (WAAS) was used for real-time horizontal control during data acquisition on vessels S222 and HSL 2903.

D. Results and Recommendations

D.1 Chart Comparison

The field unit reviewed charted soundings between survey lines and identified soundings shallower than the adjacent surveyed depths by more than the maximum allowable TVU specified in the 2022 HSSD. To maintain acquisition efficiency, the hydrographer reduced the number of bathymetric splits to soundings

shallower than surveyed depths by 0.75m or greater in areas where natural dangers likely do not exist based on the surrounding bottom topography. The field unit used NOAA's Pydro22 CA Tools to compare the surveyed data to the largest scale ENC; no significant discrepancies exist.

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
US4TX52M	1:80000	36	07/12/2022	09/14/2022
US3GC02M	1:250000	46	10/19/2022	10/19/2022

Table 13: Largest Scale ENCs

D.1.2 Shoal and Hazardous Features

No shoals or potentially hazardous features exist for this survey.

D.1.3 Charted Features

Thirty-eight previously charted features were assigned for investigation within the extents of H13705. Twenty-eight features were recommended to be retained as charted and ten were recommended for deletion. Reference the FFF for information on the results of the feature investigations.

D.1.4 Uncharted Features

No uncharted features exist for this survey.

D.1.5 Channels

No channels exist within the survey limits.

D.2 Additional Results

D.2.1 Aids to Navigation

The Galveston Entrance Channel "GA" buoy exists within the sheet limits of H13705 and was observed in its charted location.

D.2.2 Maritime Boundary Points

No Maritime Boundary Points were assigned for this survey.

D.2.3 Bottom Samples

Three bottom sample locations were assigned and acquired per the PIs. The field unit relocated the samples after reviewing the SSS mosaics. See FFF for more information.

Figure 20: Example of a bottom sample acquired for survey H13705.

D.2.4 Overhead Features

No overhead features exist for this survey.

D.2.5 Submarine Features

Twenty-six charted submarine pipelines were present within the survey area. Two exposed pipelines were observed and reported to Bureau of Safety and Environment Enforcement (BSEE) in accordance with the 2022 HSSD. All pipelines were recommended to be retained as charted. Reference the FFF and Survey Correspondence documents for more information.

D.2.6 Platforms

Four charted platforms exist within H13705. Two were observed in their charted locations. Two were disproved during survey operations and are recommended for deletion.

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.

Approver Name	Approver Title	Approval Date	Signature
Matthew J. Jaskoski, CAPT/NOAA	Chief of Party	11/20/2023	JASKOSKI.MATTHEW.JACOB.1275636262 2023.11.21 07:43:42 -05'00'
Sydney M. Catoire, LT/NOAA	Field Operations Officer	11/20/2023	CATOIRE.SYDNEY.MARIE.1120060623 Digitally signed by CATOIRE.SYDNEY.MARIE.1120060623 Date: 2023.11.20 15:06:29 -05'00'
Erin K. Cziraki	Chief Survey Technician	11/20/2023	
Forrest M. Foxen, ENS/NOAA	Sheet Manager	11/20/2023	FOXEN.FORREST.MICHAEL.1398853470 Digitally signed by FOXEN.FORREST.MICHAEL.1398853470 Date: 2023.11.20 17:24:59 -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