H13449

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

DESCRIPTIVE REPORT

Type of Survey:	Navigable Area
Registry Number:	H13449

LOCALITY

State(s):	Alaska
General Locality:	Unimak Island, AK
Sub-locality:	3NM North of Cave Point

2021

CHIEF OF PARTY
Allison Stone

LIBRARY & ARCHIVES

Date:

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

REGISTRY NUMBER:

HYDROGRAPHIC TITLE SHEET

H13449

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):	**Alaska**
General Locality:	**Unimak Island, AK**
Sub-Locality:	**3NM North of Cave Point**
Scale:	**40000**
Dates of Survey:	**07/02/2021 to 07/21/2021**
Instructions Dated:	**04/02/2021**
Project Number:	**OPR-Q350-KR-21**
Field Unit:	**Fugro USA Marine, Inc.**
Chief of Party:	**Allison Stone**
Soundings by:	**Multibeam Echo Sounder**
Imagery by:	**Multibeam Echo Sounder Backscatter**
Verification by:	**Pacific 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 3N, 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 H13449

Project: OPR-Q350-KR-21

Locality: Unimak Island, AK

Sublocality: 3NM North of Cave Point

Scale: 1:40000

July 2021 - July 2021

Fugro USA Marine, Inc.

Chief of Party: Allison Stone

A. Area Surveyed

Survey H13449 (Figure 1 and Table 1) is located 3 nautical miles North of Cave Point on Unimak Island, AK. This area is utilized extensively by vessels involved in diverse fishery activities in the region, including cod and crab.

The R/V Woldstad acquired 500m set line spaced Multibeam Echosounder (MBES) and Multibeam Echosounder Acoustic Backscatter (MBAB) within the assigned survey limits from 2 July to 21 July 2021 (Tables 2-4).

A.1 Survey Limits

Data were acquired within the following survey limits:

Northwest Limit	Southeast Limit
55° 3' 25.56" N 165° 4' 23.65" W	54° 46' 40.91" N 164° 30' 47.46" W

Table 1: Survey Limits

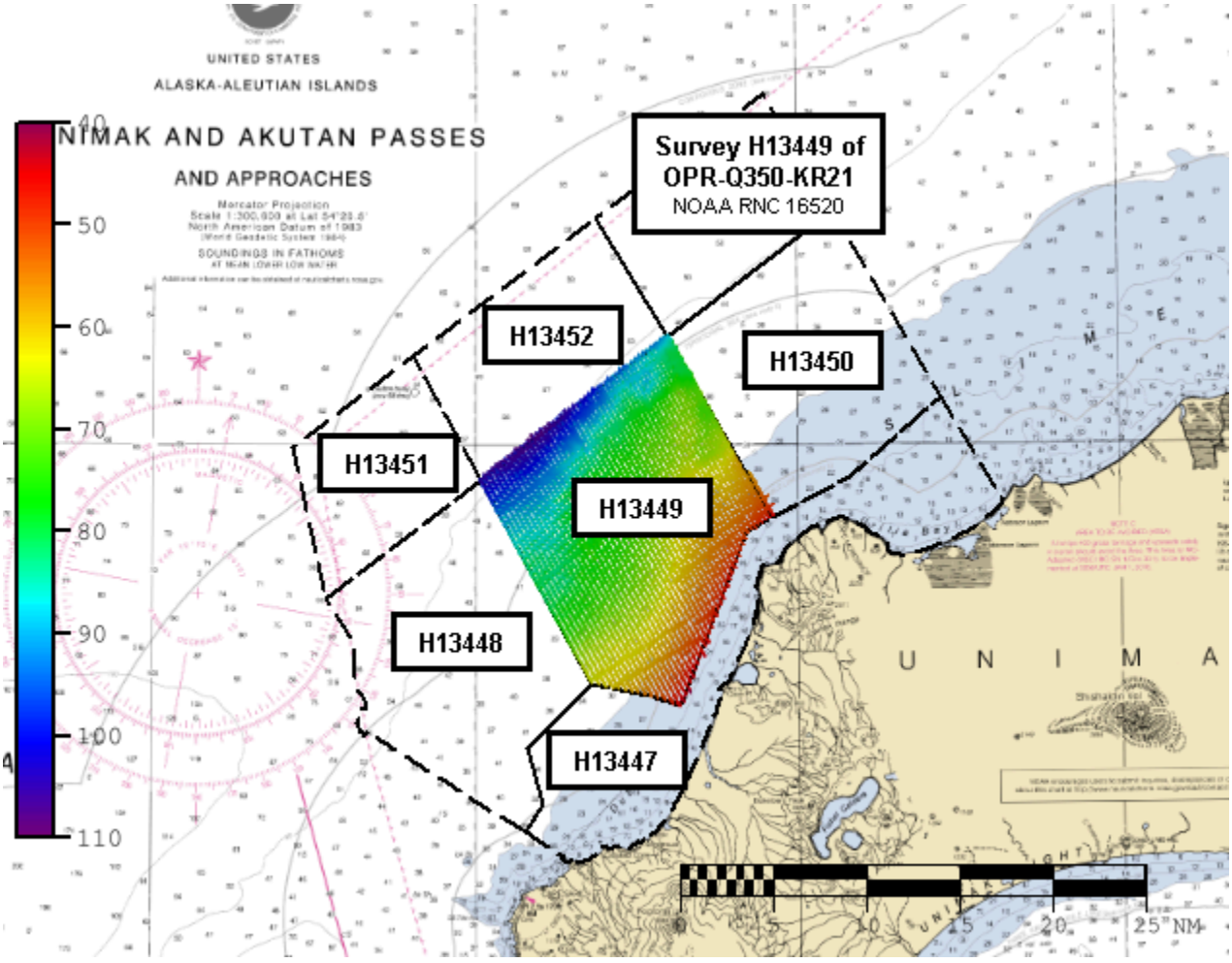

Figure 1: Survey H13449 relative to overall sheet limits of OPR-Q350-KR-21

Survey limits were acquired in accordance with the requirements set forth in the Project Instructions (PI) and the Hydrographic Surveys Specifications and Deliverables (HSSD) 2020.

A.2 Survey Purpose

This project will provide contemporary data to update NOS nautical charting products; increasing maritime safety and commerce in the region. The waters around the the North side of Unimak Island are an important fishing ground for the Bering Sea Pacific Cod and other fisheries. This area is part of the main route transited by vessels between Bristol Bay and Dutch Harbor, AK.

The North shore of Unimak Island commonly serves as a refuge from weather and waves coming off of the open waters from the North Pacific.

The area has been identified by the Western Alaska Tanker Lightering Best Practices Committee as a primary location for lightering operations to occur.

The project area has also been identified as an area of inadequate coverage by a risk-based model with respect to the desired coverage needed to support modern navigational needs.

A.3 Survey Quality

The entire survey is adequate to supersede previous data.

500m set line MBES was achieved within the survey limits of H13449 (Figures 2-4).

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 Sheet 6	320m Set Line Spacing (Reference HSSD Section 5.2.2.4 Option A). Note: The requirement to verify or disprove all charted depths falling between sounding lines and shallower than adjacent surveyed soundings is waived. Note: after assessing set line spacing at 320m, both HSD PM and Fugro PM determined 500m set line spacing to be a more effective spacing for meeting data acquisition goals.

Table 2: Survey Coverage

Survey coverage was in accordance with the requirements listed above and in the HSSD.

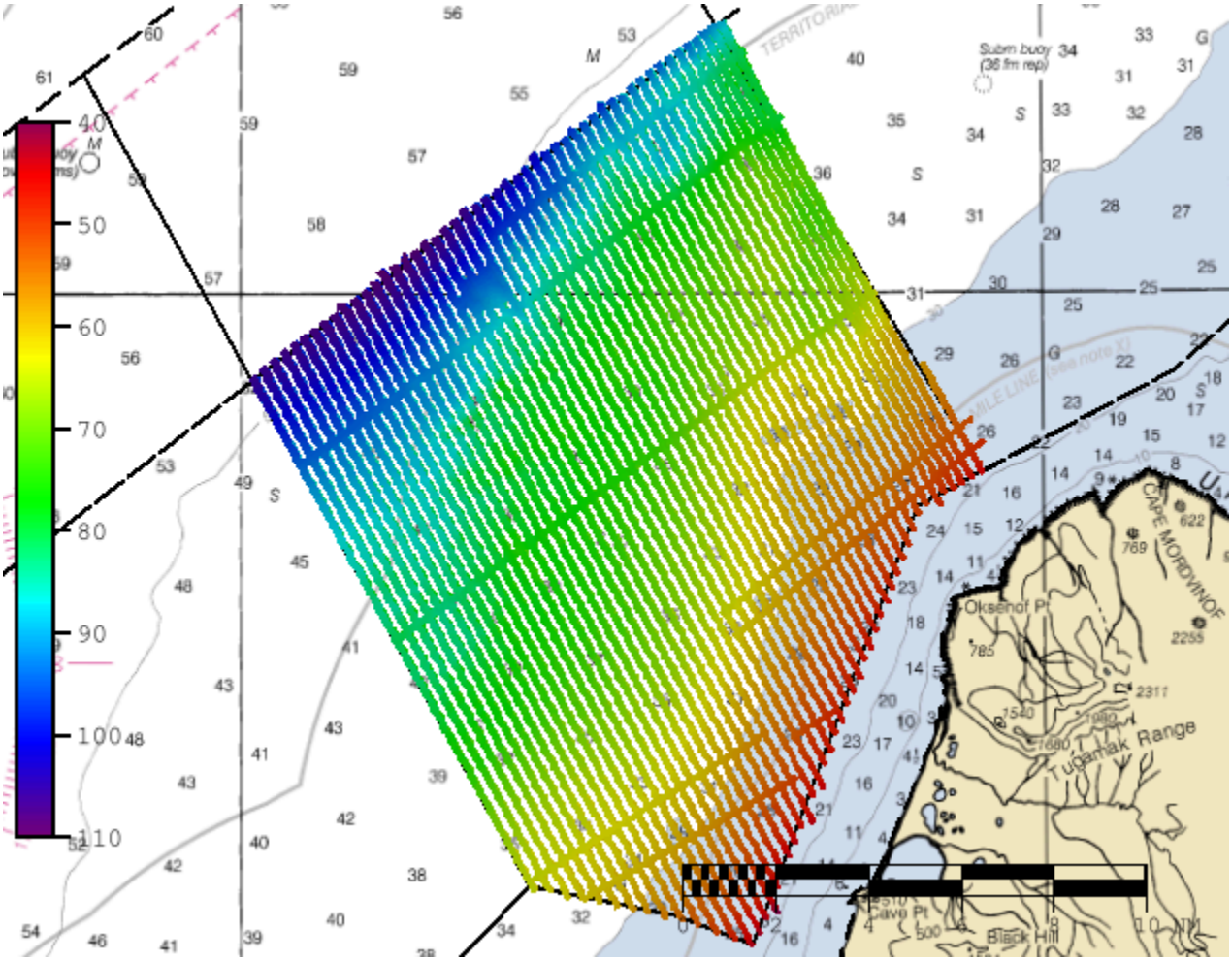

Figure 2: Survey H13449 MBES coverage

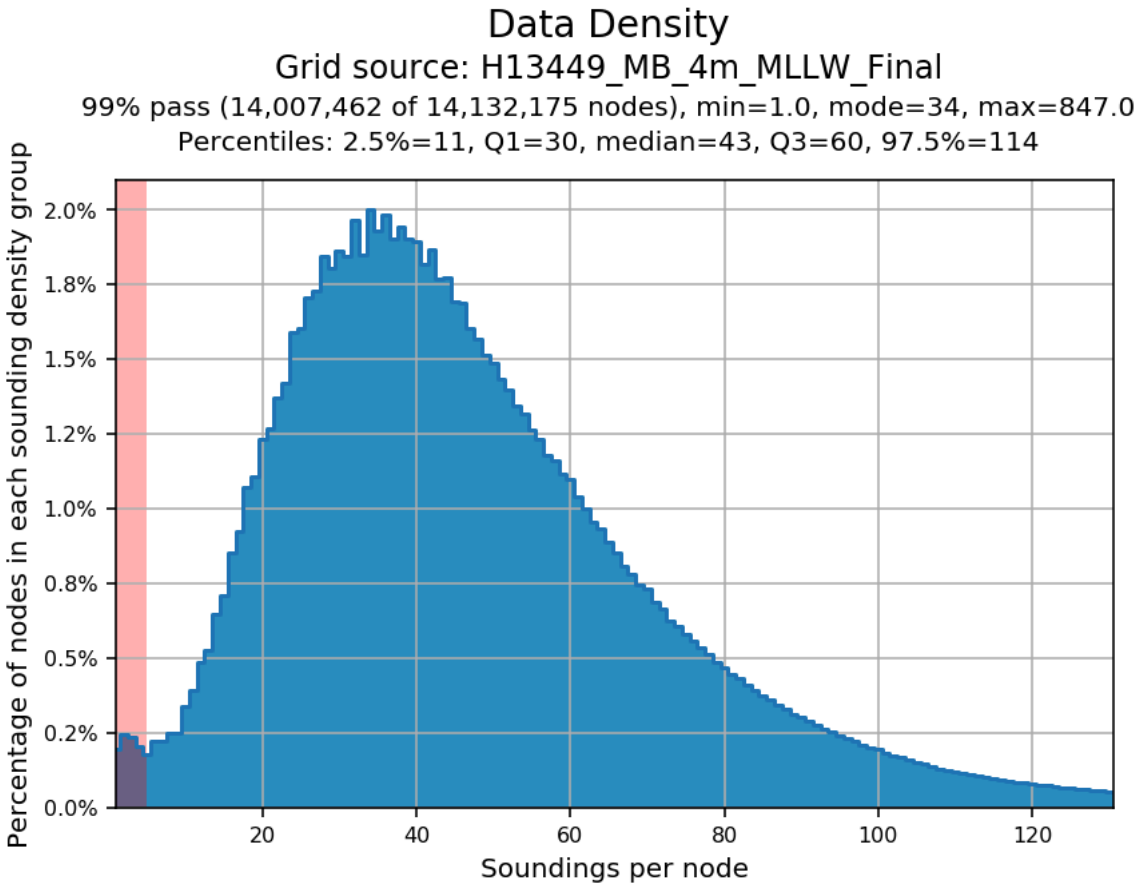

Figure 3: Survey H13449 4m finalized set line MBES density QC

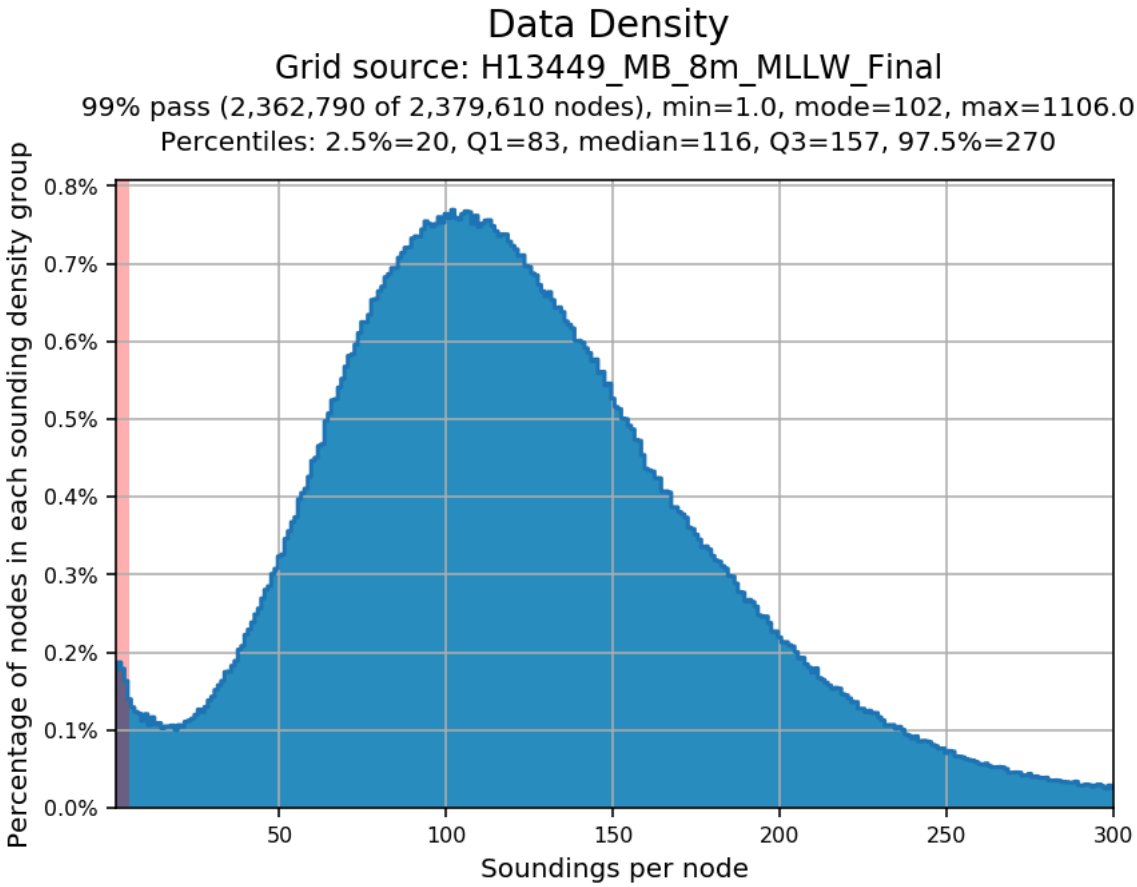

Figure 4: Survey H13449 8m finalized set line MBES density QC

A.6 Survey Statistics

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

	HULL ID	*R/V Woldstad*	*Total*
LNM	**SBES Mainscheme**	0	0
	MBES Mainscheme	684.96	684.96
	Lidar Mainscheme	0	0
	SSS Mainscheme	0	0
	SBES/SSS Mainscheme	0	0
	MBES/SSS Mainscheme	0	0
	SBES/MBES Crosslines	59.42	59.42
	Lidar Crosslines	0	0
Number of Bottom Samples			3
Number Maritime Boundary Points Investigated			0
Number of DPs			0
Number of Items Investigated by Dive Ops			0
Total SNM			175.83

Table 3: Hydrographic Survey Statistics

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

Survey Dates	Day of the Year
07/02/2021	183

Survey Dates	Day of the Year
07/04/2021	185
07/05/2021	186
07/09/2021	190
07/10/2021	191
07/11/2021	192
07/12/2021	193
07/16/2021	197
07/17/2021	198
07/20/2021	201
07/21/2021	202

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	***R/V Woldstad***
LOA	121 feet
Draft	12 feet

Table 5: Vessels Used

Figure 5: R/V Woldstad

R/V Woldstad (Table 5 and Figure 5) acquired MBES, MBAB, surface sound velocity, sound velocity profiles, attitude, and positioning data within the survey limits of H13449 (Table 6). For a detailed listing of equipment used to acquire survey data, refer to the DAPR submitted with this report under Project Reports.

B.1.2 Equipment

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

Manufacturer	Model	Type
Teledyne RESON	SeaBat 7125 SV2	MBES
Teledyne RESON	SVP 70	Sound Speed System
Applanix	POS MV 320 v5	Positioning and Attitude System
Teledyne Oceanscience	rapidCAST	Conductivity, Temperature, and Depth Sensor

Table 6: Major Systems Used

For a detailed listing of equipment, refer to the DAPR submitted with this report.

B.2 Quality Control

B.2.1 Crosslines

Crosslines for survey H13449 were acquired in accordance with section 5.2.4.2 of the HSSD 2020 (Figure 6). Mainscheme to crossline mileage percentage across H13449 is 8.67%. Of the 728,599 grid nodes compared between H13449 mainscheme MBES and MBES crosslines, 100% were within 1m difference. The mean difference is 0.00m, with a standard deviation of 0.12m (Figure 7).

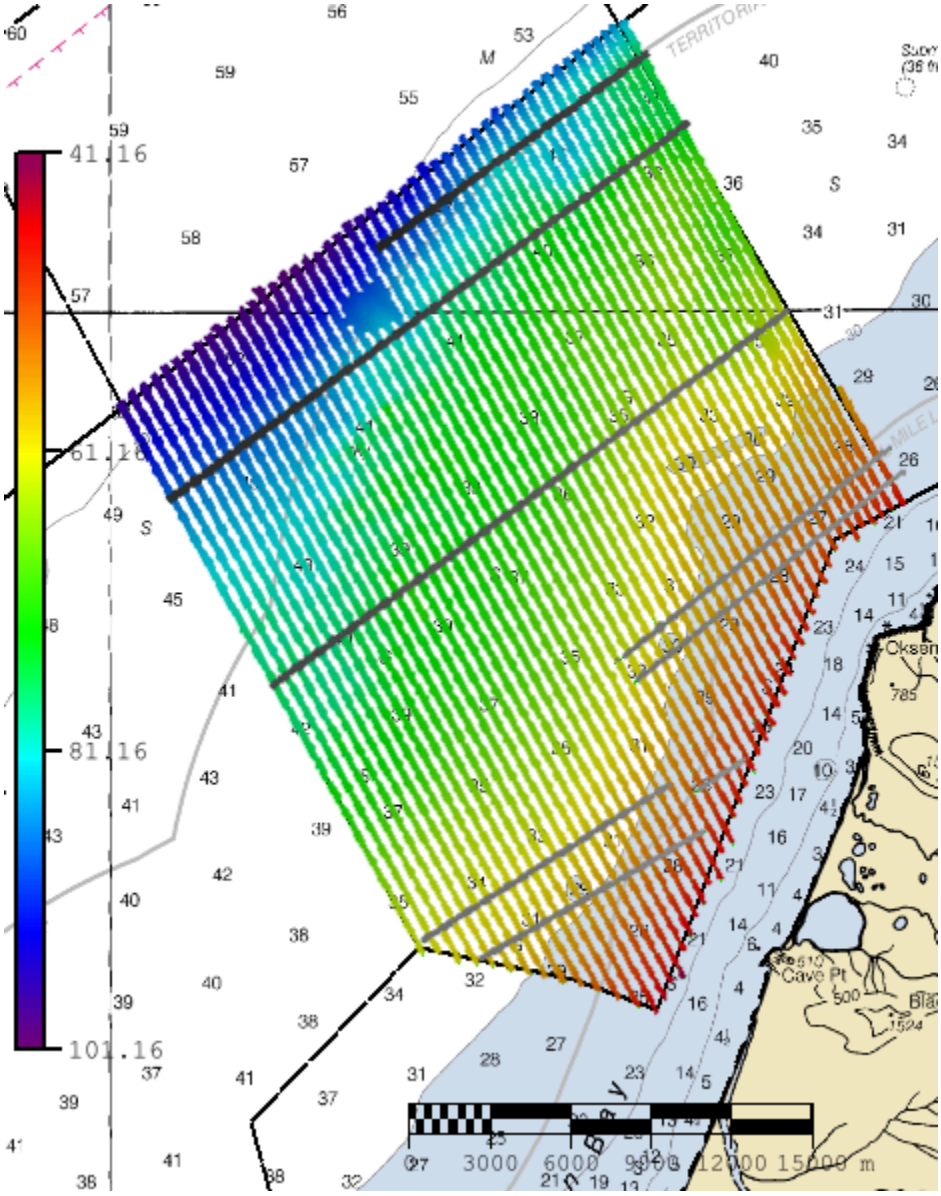

Figure 6: H13449 MBES mainscheme and MBES crossline distribution

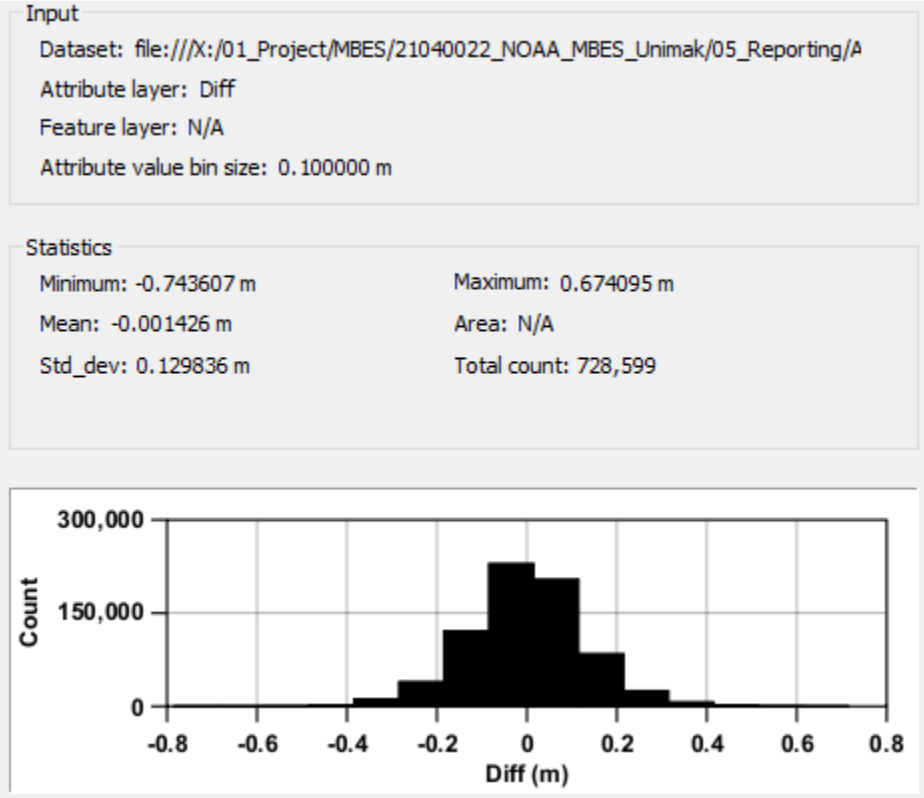

Figure 7: H13449 MBES mainscheme differenced from MBES crosslines statistical output

B.2.2 Uncertainty

The following survey specific parameters were used for this survey:

Method	Measured	Zoning
ERS via VDATUM	0.08 meters	0.101 meters

Table 7: Survey Specific Tide TPU Values.

Hull ID	Measured - CTD	Measured - MVP	Measured - XBT	Surface
R/V Woldstad	3.04 meters/second	N/A meters/second	N/A meters/second	0.25 meters/second

Table 8: Survey Specific Sound Speed TPU Values.

Survey H13449 uncertainty values (Tables 7 and 8) were evaluated in both CARIS HIPS 10.4 and via Pydro QC Tools v3.4.7. The finalized 4m (Figure 8) and 8m (Figure 9) bathymetric grids meet uncertainty standards with 99.9% of nodes passing.

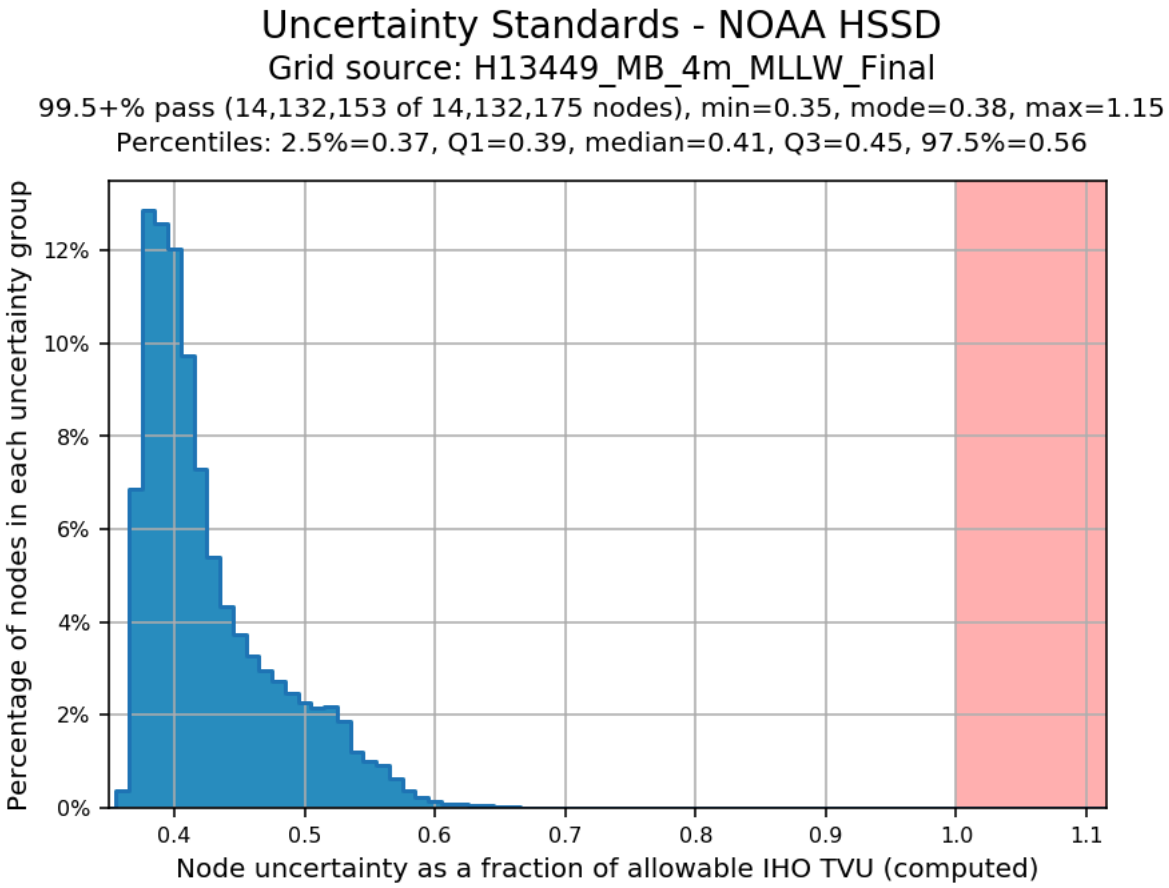

Figure 8: H13449 4m finalized grid TPU QC

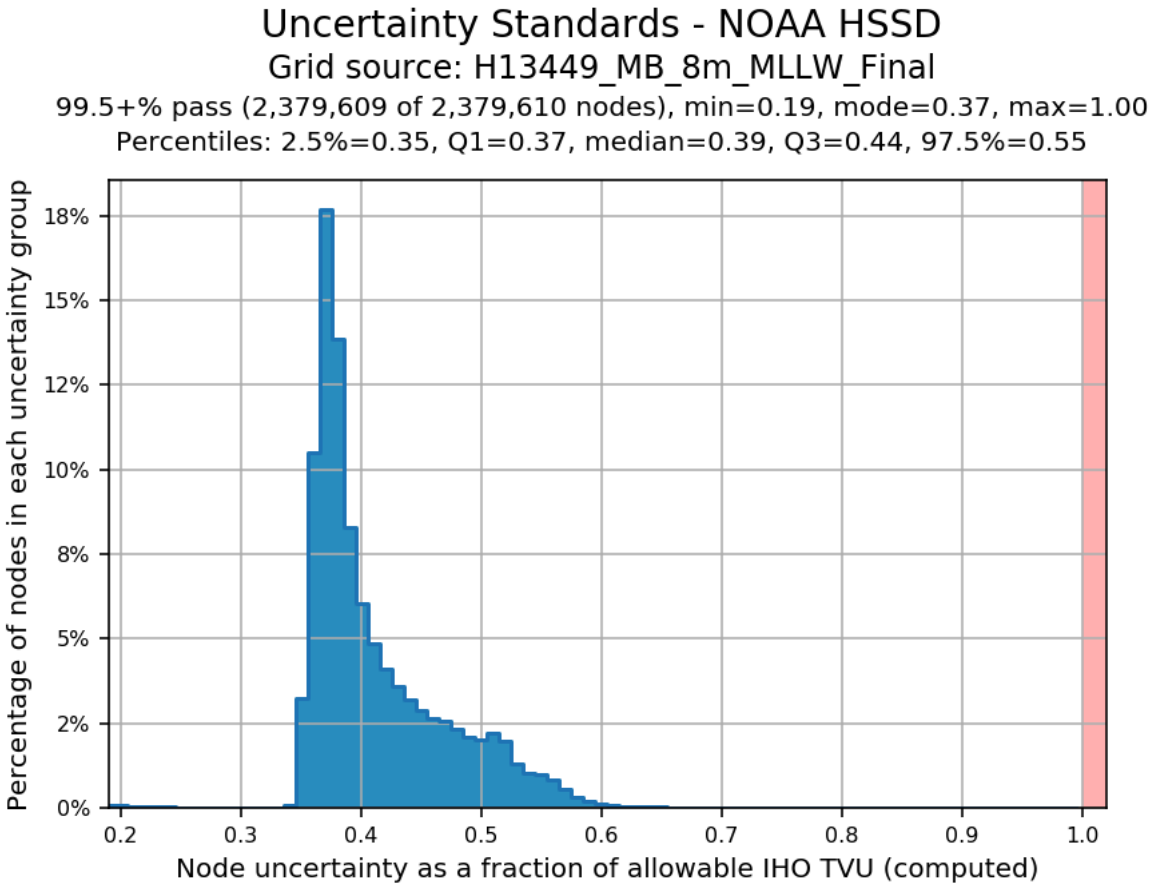

Figure 9: H13449 8m finalized grid TPU QC

B.2.3 Junctions

Four junction surveys are available for comparison to H13449: H13447, H13448, H13450 and H13452 (Table 9 and Figure 10).

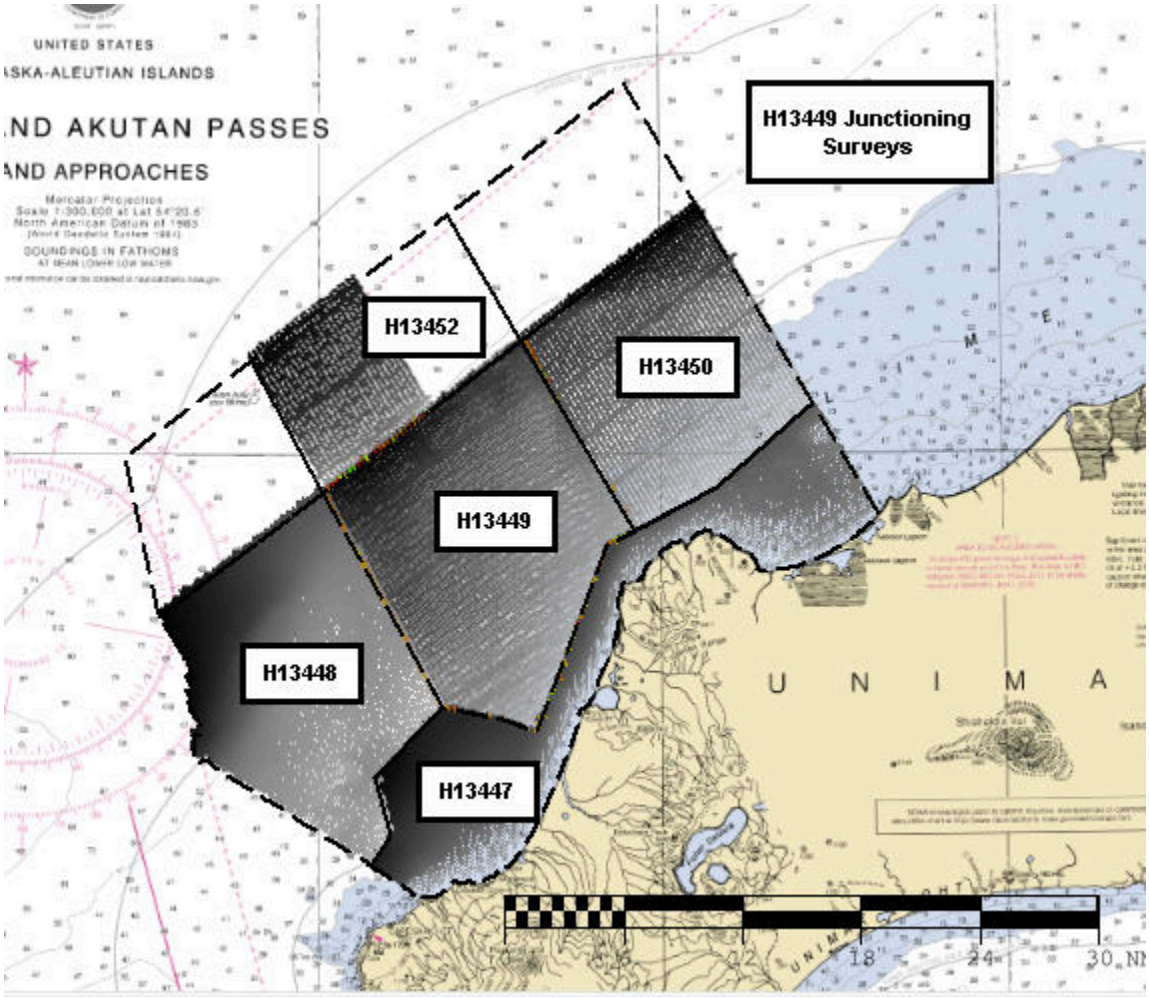

Figure 10: Junction surveys to H13449

The following junctions were made with this survey:

Registry Number	Scale	Year	Field Unit	Relative Location
H13447	1:40000	2021	Fugro USA Marine, Inc.	S
H13448	1:40000	2021	Fugro USA Marine, Inc.	E
H13450	1:40000	2021	Fugro USA Marine, Inc.	E
H13452	1:40000	2021	Fugro USA Marine, Inc.	NW

Table 9: Junctioning Surveys

H13447

Survey H13447 was acquired by Fugro USA Marine, Inc. in 2021 as a part of OPR-Q350-KR-21. Of the 203,902 grid nodes compared between H13449 and H13447, the mean difference is 0.24m; 99.9% agree within 1m (Figure 11).

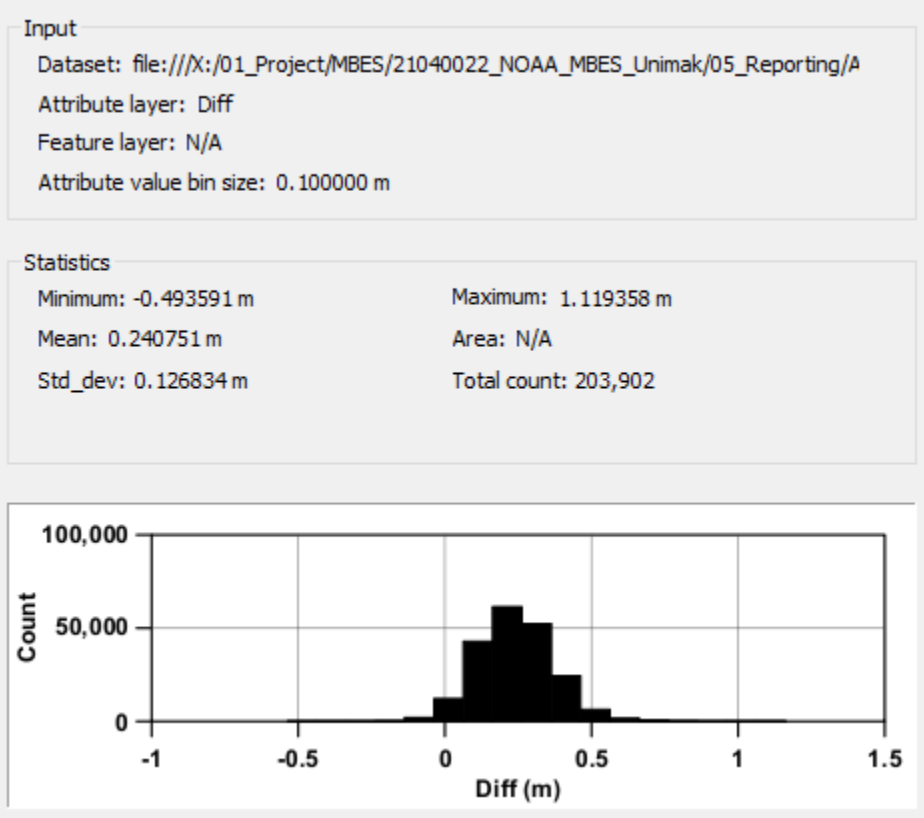

Figure 11: Survey H13449 junction with Survey H13447

H13448

Survey H13448 was acquired by Fugro USA Marine, Inc. in 2021 as a part of OPR-Q350-KR-21. Of the 240,092 grid nodes compared between H13449 and H13448 the mean difference is 0.03m; 99.9% agree within 1m (Figure 12).

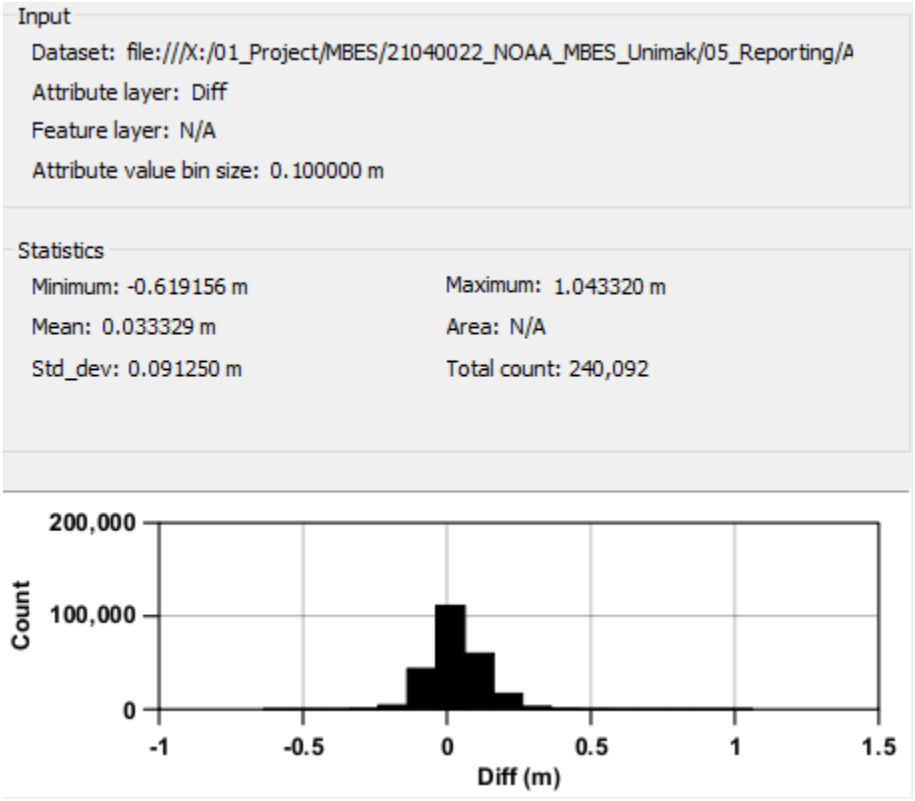

Figure 12: Survey H13449 junction with Survey H13448

H13450

Survey H13450 was acquired by Fugro USA Marine, Inc. in 2021 as a part of OPR-Q350-KR-21. Of the 54,627 grid nodes compared between H13449 and H13450 the mean difference is 0.08m; 100% agree within 1m (Figure 13).

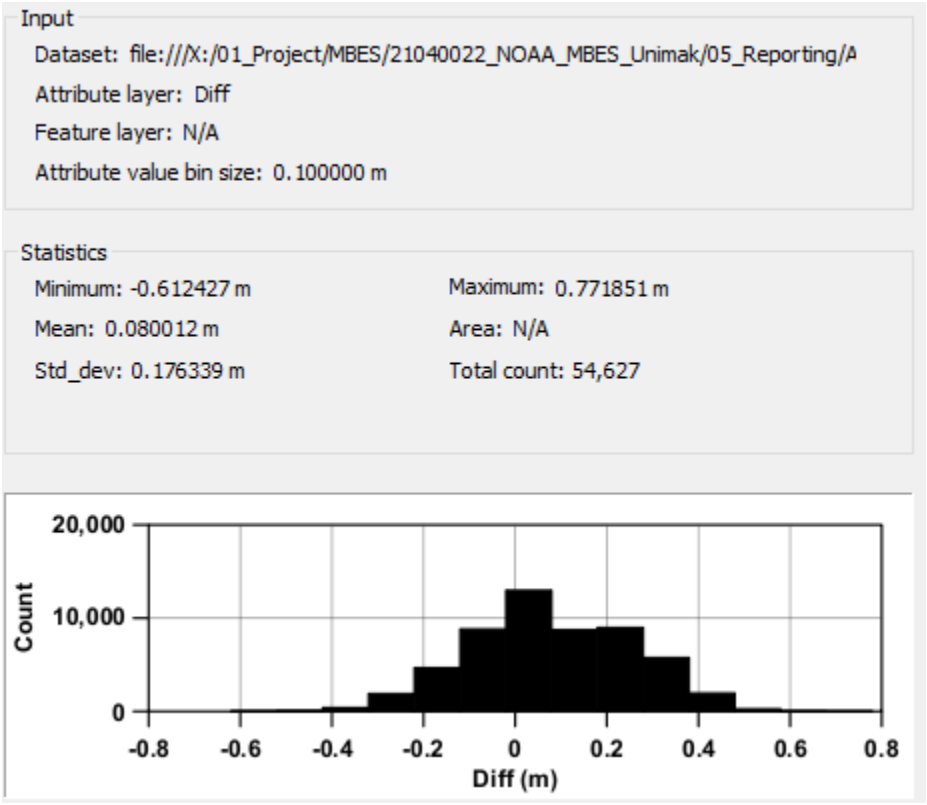

Figure 13: Survey H13449 junction with Survey H13450

H13452

Survey H13452 was acquired by Fugro USA Marine, Inc. in 2021 as a part of OPR-Q350-KR-21. Of the 108,523 grid nodes compared between H13449 and H13452 the mean difference is 0.05m; 100% agree within 1m (Figure 14).

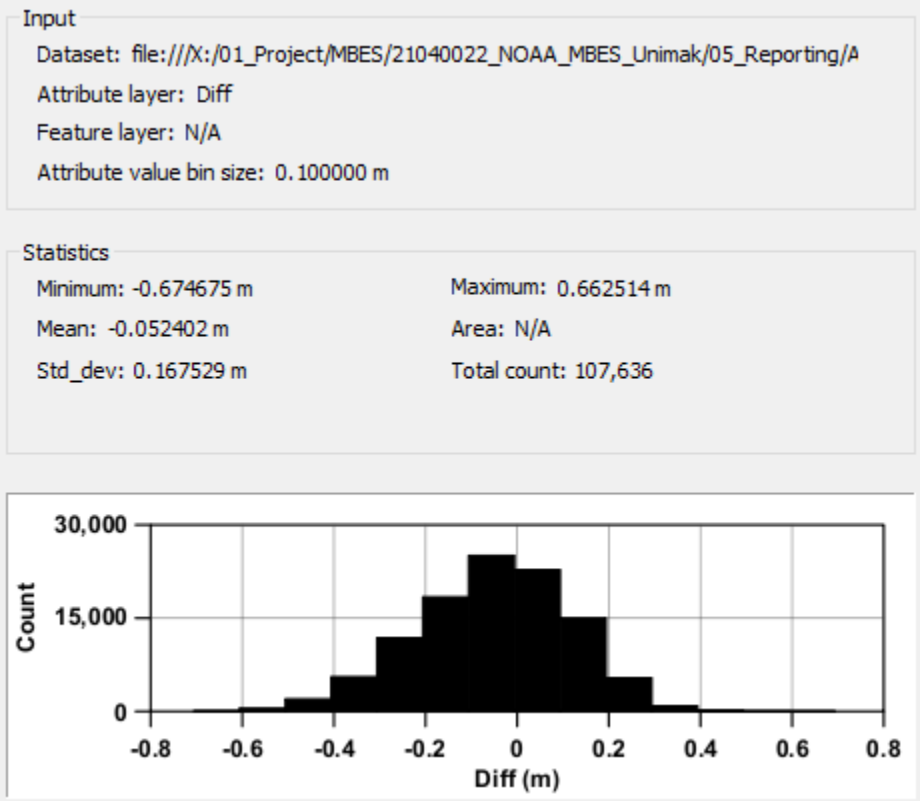

Figure 14: Survey H13449 junction with Survey H13452

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

Foul weather and loss of bottom tracking

During the acquisition of H13449, seas ranged from 1m to 4m; R/V Woldstad was both in the trough (rolling) and pitching into seas during the course of acquisition. Due to the sea state being both multi-directional and significantly large in relation to the vessel dimensions, several instances of loss of bottom tracking occur throughout the survey limits. Data processing was handled differently than the other projects in the vicinity of Unimak because of this: heavier swath filters were required to present only the cleanest and most accurate of the data and additional cleaning was required to remove any sound velocity blow outs from air being trapped in the surface sound velocity sensor.

After relaying the data quality issues to the HSD project manager, referencing the HSSD 2020 requirements for set line data quality in depths greater than 20m, and reviewing the surveyed data with relation to charted soundings, the decision was made to not reacquire the several days worth of data. Refer to Appendix II submitted with this report for correspondence between Fugro and NOAA project manager with regard to this topic.

B.2.6 Factors Affecting Soundings

Foul weather and loss of bottom tracking

Refer to Section B.2.5 of this report.

B.2.7 Sound Speed Methods

Sound Speed Cast Frequency: Sound velocity profiles were acquired approximately every two hours from the R/V Woldstad using a Teledyne Ocean Science Rapid Cast.

Refer to the DAPR for additional information.

B.2.8 Coverage Equipment and Methods

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

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

No backscatter deliverables are submitted with survey H13449. One line of data per vessel, per day was processed to ensure quality control. All equipment and survey methods utilized in the acquisition and processing of backscatter are detailed in the DAPR.

B.5 Data Processing

B.5.1 Primary 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
H13449_MB_4m_MLLW	CARIS Raster Surface (CUBE)	4 meters	41.89 meters - 101.15 meters	NOAA_4m	MBES Set Line Spacing
H13449_MB_4m_MLLW_Final	CARIS Raster Surface (CUBE)	4 meters	41.89 meters - 80 meters	NOAA_4m	MBES Set Line Spacing
H13449_MB_8m_MLLW	CARIS Raster Surface (CUBE)	8 meters	42.02 meters - 101.10 meters	NOAA_8m	MBES Set Line Spacing
H13449_MB_8m_MLLW_Final	CARIS Raster Surface (CUBE)	8 meters	72 meters - 101.1 meters	NOAA_8m	MBES Set Line Spacing

Table 10: Submitted Surfaces

The following surfaces were created during office review :
H13449_MB_4m_MLLW_1of3.bag
H13449_MB_8m_MLLW_2of3.bag

H13449_MB_8m_MLLW_3of3.bag

C. Vertical and Horizontal Control

No vertical or horizontal control reports were generated for this survey. All data were reduced to MLLW via VDatum model.

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_Q350_KR_21_CapeSarichef_ERTDM21-1_NAD83-MLLW

Table 11: ERS method and SEP file

All positioning and attitude data associated with OPR-Q350-KR-21 were post-processed in POSPac MMS using PP-RTX methods. For further discussion, reference the DAPR submitted with this report.

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 3.

PPP

All positioning and attitude data associated with OPR-Q350-KR-21 were post-processed in POSPac MMS using PP-RTX methods.

D. Results and Recommendations

D.1 Chart Comparison

A chart comparison was conducted using the Triangle Rule script within the Chart Review Tool of Pydro QC Tools. A combined s57 file of charted soundings extracted from the ENC listed in the project instructions and an s57 file of surveyed soundings were compared with the following results.

Survey H13449 surveyed soundings exhibit 40 instances where surveyed soundings are shoal to charted soundings by greater than 1m (Figure 15). The maximum instance of survey soundings being shoal to charted soundings is 1.95m in the vicinity of 55-02-47.93N 164-45-46.96W.

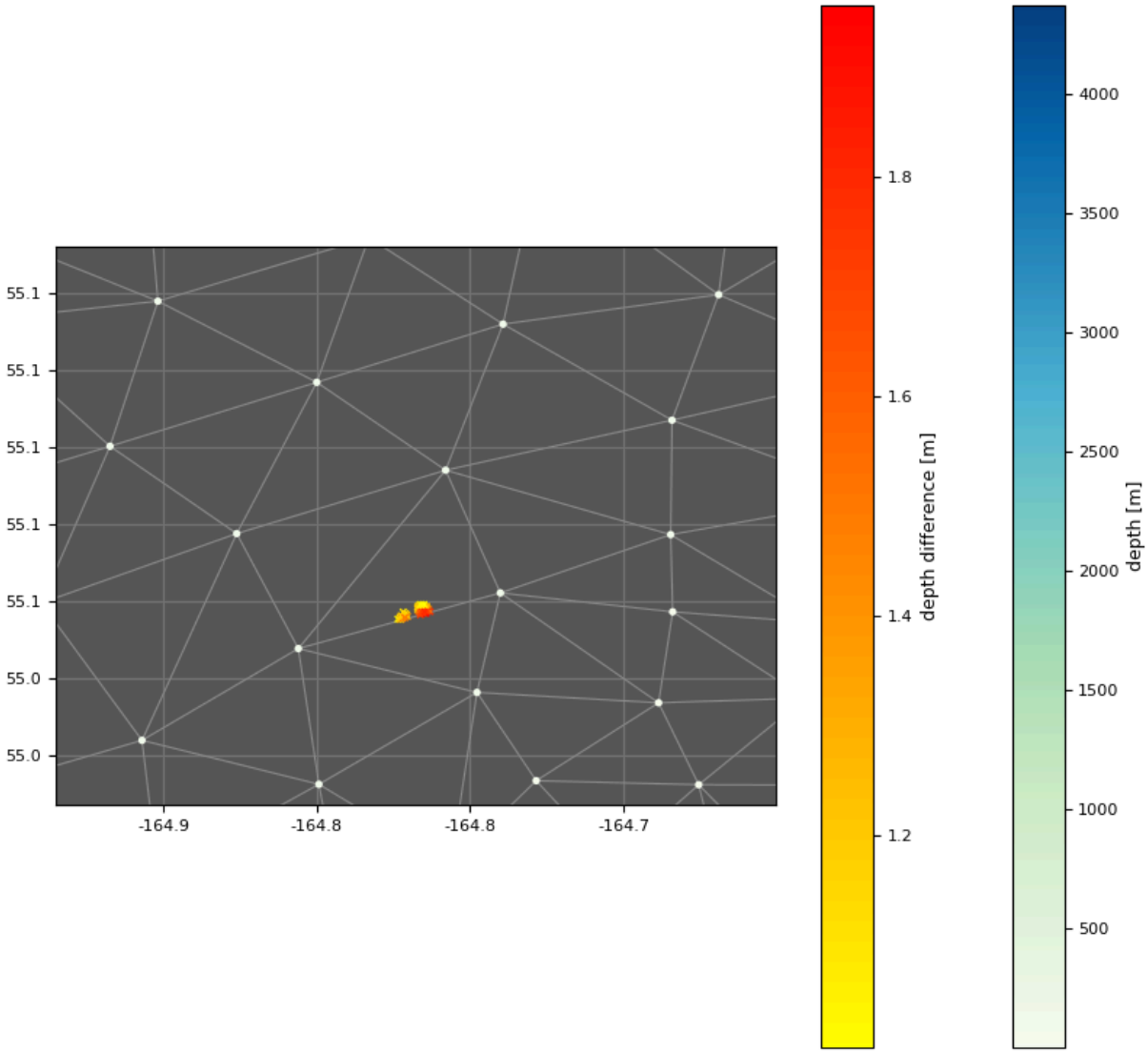

Figure 15: Pydro QC Tools chart review output of surveyed soundings shoal to charted soundings

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
US3AK61M	1:300000	25	03/20/2019	09/29/2020

Table 12: 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

One charted wreck PA exists within the survey limits of H13449. Refer to the FFF for further detail.

D.1.4 Uncharted Features

No uncharted features exist for this survey.

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

No Aids to Navigation (ATONs) exist for this survey.

D.2.2 Maritime Boundary Points

No Maritime Boundary Points were assigned for this survey.

D.2.3 Bottom Samples

Six bottom samples were required for Survey H13449. Refer to the FFF for further detail.

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	2021-10-24
Coast Pilot Report	2021-07-26

Approver Name	Approver Title	Approval Date	Signature
Allison C Stone	Chief of Party	11/01/2021	Allison C Stone Digitally signed by Allison C Stone Date: 2021.11.01 07:42:16 -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