

**H13693**

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

**DESCRIPTIVE REPORT**

Type of Survey: Basic Hydrographic Survey

Registry Number: H13693

**LOCALITY**

State(s): Alaska

General Locality: Norton Sound

Sub-locality: Approaches to Yukon River

**2023**

CHIEF OF PARTY  
David Neff, C.H.

LIBRARY & ARCHIVES

Date:

**HYDROGRAPHIC TITLE SHEET**

**H13693**

**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: **Norton Sound**

Sub-Locality: **Approaches to Yukon River**

Scale: **40000**

Dates of Survey: **08/10/2023 to 08/13/2023**

Instructions Dated: **03/01/2023**

Project Number: **OPR-R390-KR-23**

Field Unit: **eTrac**

Chief of Party: **David Neff, C.H.**

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:**

All times are UTC. The purpose of this survey is to update existing NOS nautical charts. H13693 covers approximately 74 square nautical miles in the Bering Sea, Alaska.

*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 H13693

Project: OPR-R390-KR-23

Locality: Norton Sound

Sublocality: Approaches to Yukon River

Scale: 1:40000

August 2023 - August 2023

**eTrac**

Chief of Party: David Neff, C.H.

### A. Area Surveyed

eTrac conducted hydrographic survey operations in the Bering Sea, Alaska. H13693 covers approximately 74 square nautical miles of survey area. 704.67 linear nautical miles were acquired during the survey.

Survey was conducted within these limits between August 10, 2023 (DN222) and August 13, 2023 (DN225).

#### A.1 Survey Limits

Data were acquired within the following survey limits:

Northwest Limit	Southeast Limit
62° 38' 38.33" N 165° 51' 11.17" W	62° 23' 39.21" N 165° 27' 14.97" W

*Table 1: Survey Limits*

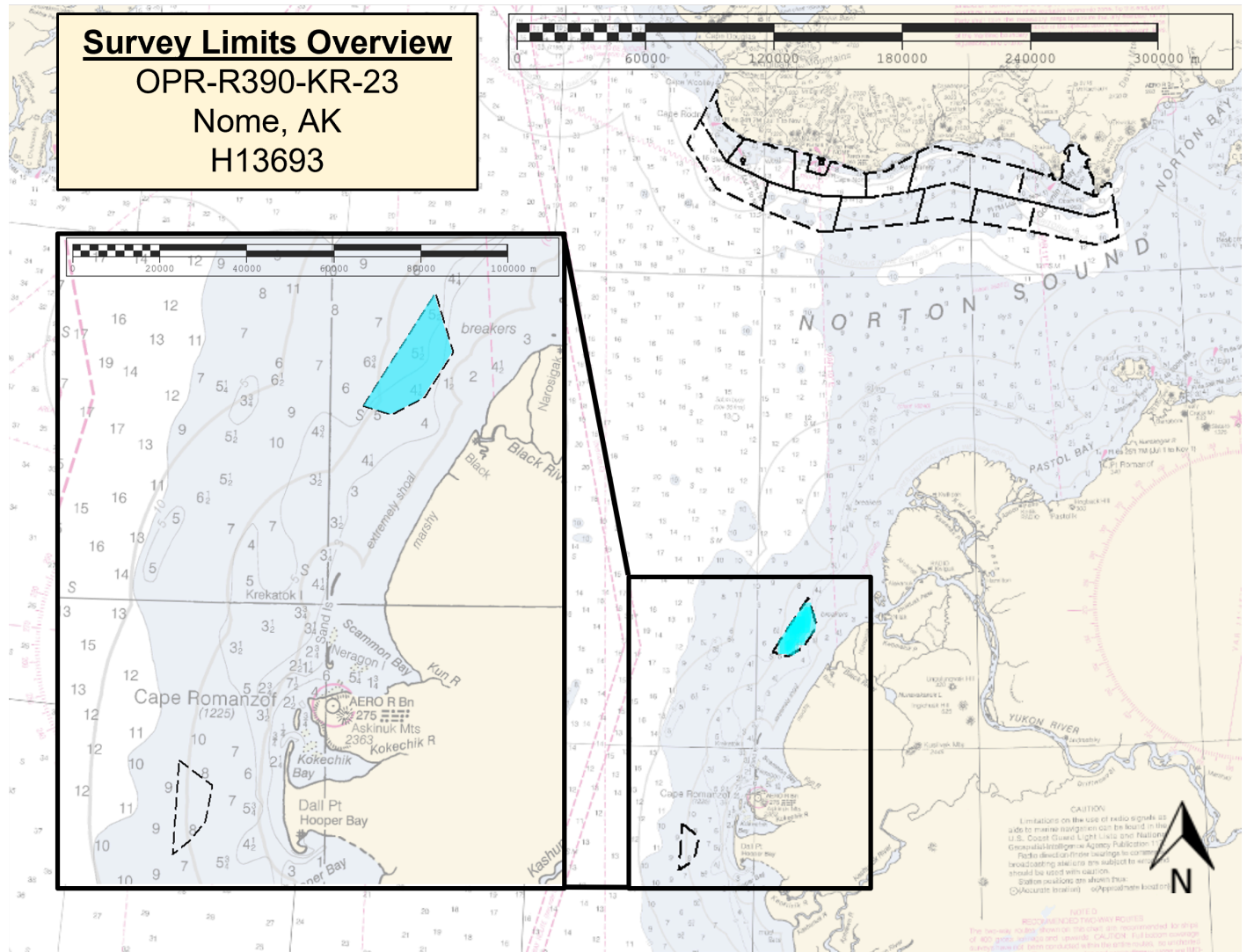


Figure 1: Survey Limits Overview (light blue area)

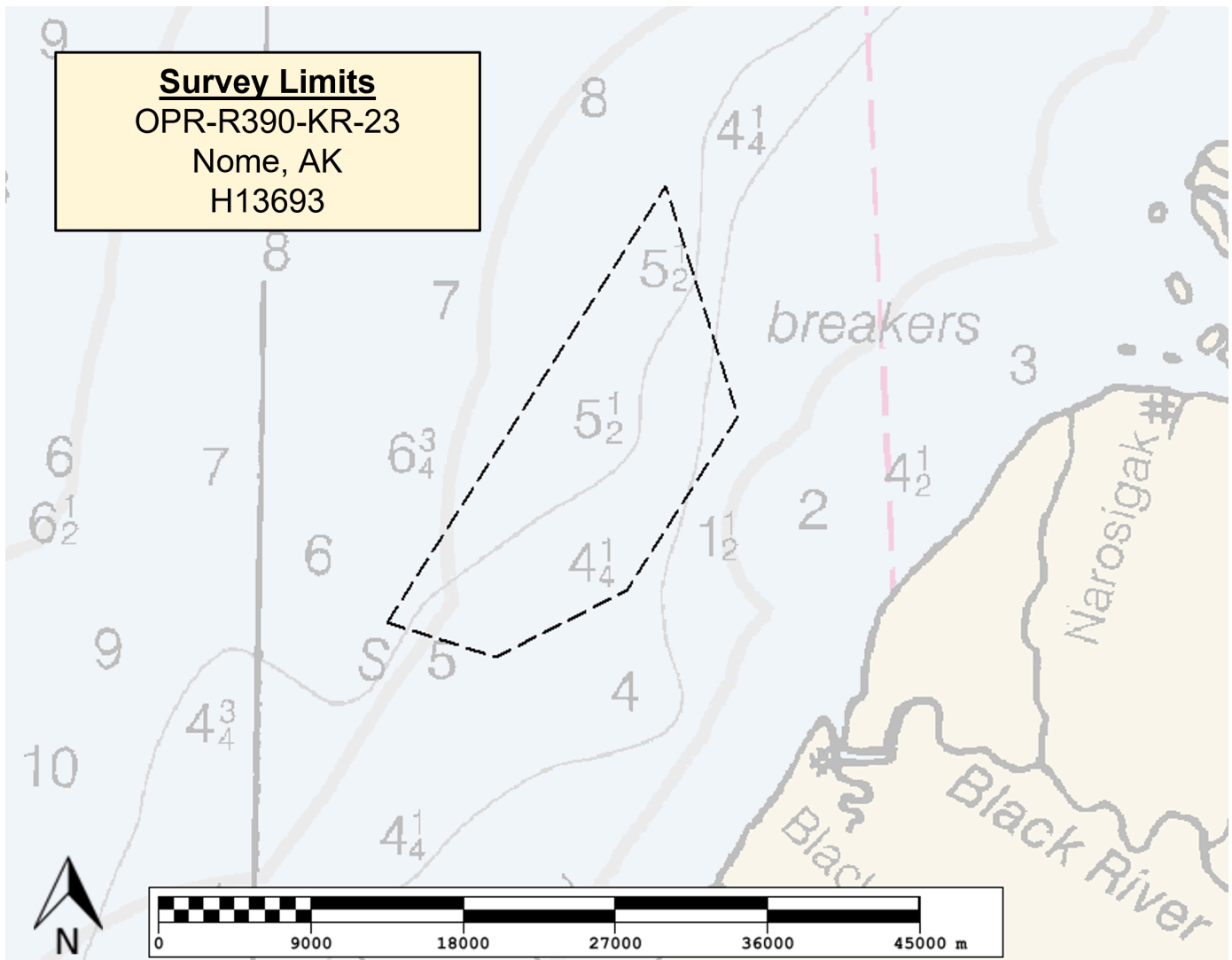


Figure 2: Survey Limits (black line)

All data were acquired in accordance with the requirements in the project instructions and specifications set forth in the Hydrographic Survey Specifications and Deliverables 2022 Edition (HSSD 2022).

## A.2 Survey Purpose

The purpose of this survey is to update existing National Ocean Service (NOS) nautical charts.

## A.3 Survey Quality

The entire survey is adequate to supersede previous data.

Survey H13693 is accurate to International Hydrographic Organization (IHO) Order 1a as required per the HSSD 2022.

#### 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 sheets 1, 5 - 7, 9, 12	240m Set Line Spacing MBES in accordance with the requirements listed below and HSSD 2022.
All waters in survey area	Collect a minimum of 13,210 LNMs. All significant shoals or features found in waters less than 20m deep shall be developed to complete coverage standards, or a set line spacing density suitable to delineate the 5m depth contour as determined in consultation with the COR. If navigationally significant differences exist between charted and surveyed depths, contact the COR and summarize the findings. Denser set line spacing may be required following consultation with the COR.

*Table 2: Survey Coverage*

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



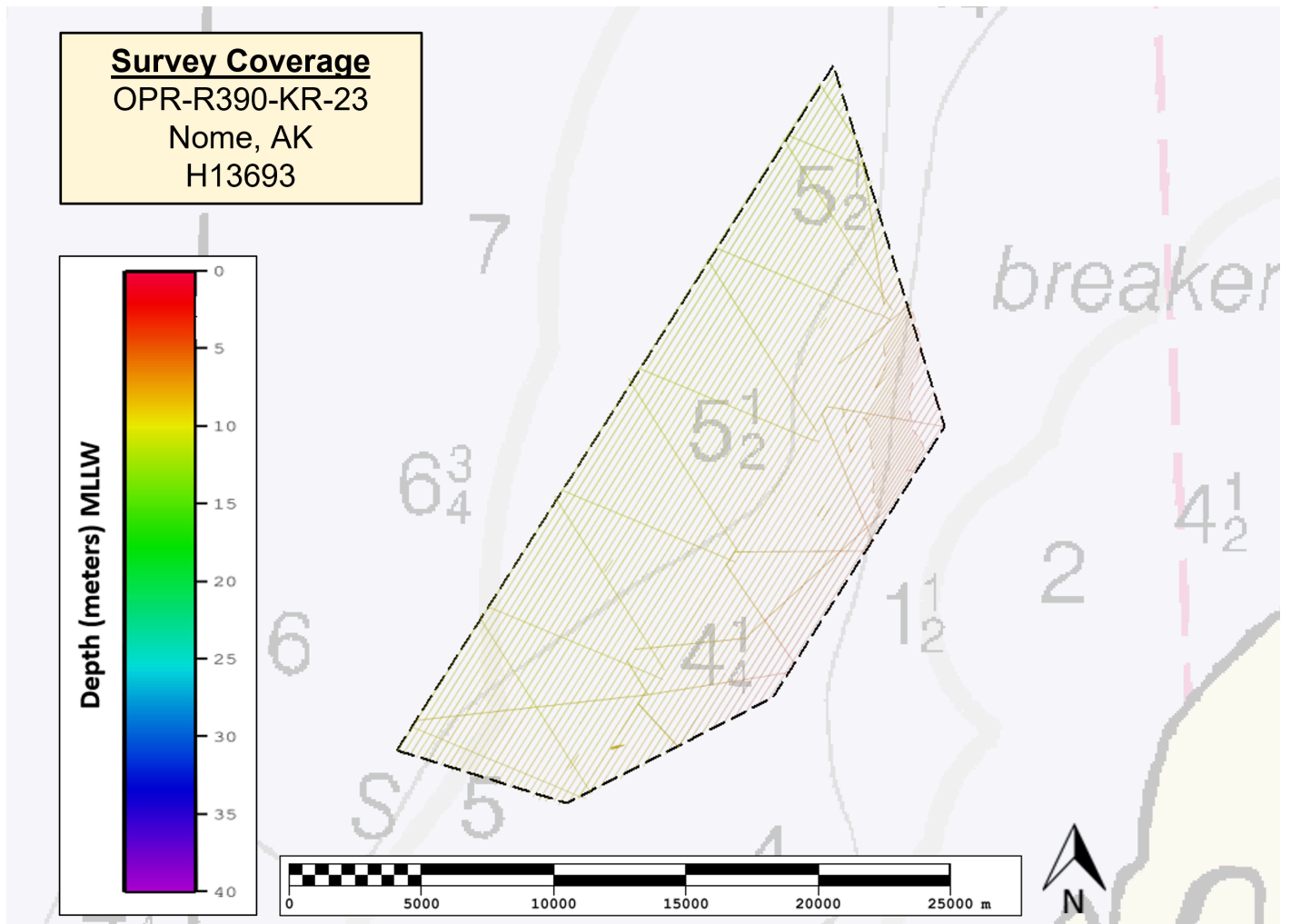


Figure 3: Survey Coverage

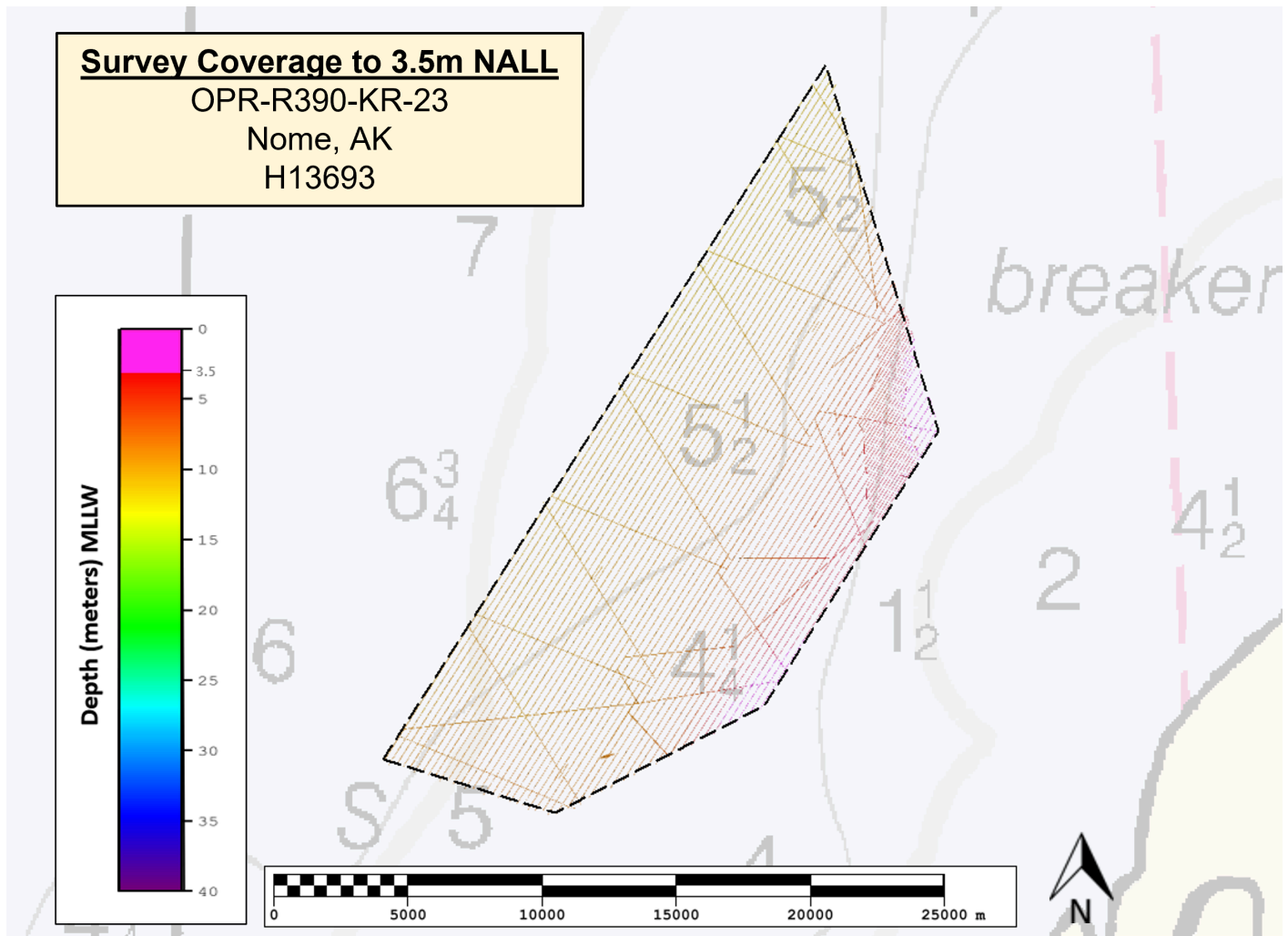


Figure 4: Survey Coverage with 3.5m NALL Displayed

### A.6 Survey Statistics

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

	<b>HULL ID</b>	<i>R/V Norseman II</i>	<i>ASV Inez</i>	<i>Total</i>
<b>LNM</b>	<b>SBES Mainscheme</b>	0.0	0.0	0.0
	<b>MBES Mainscheme</b>	313.53	332.52	646.05
	<b>Lidar Mainscheme</b>	0.0	0.0	0.0
	<b>SSS Mainscheme</b>	0.0	0.0	0.0
	<b>SBES/SSS Mainscheme</b>	0.0	0.0	0.0
	<b>MBES/SSS Mainscheme</b>	0.0	0.0	0.0
	<b>SBES/MBES Crosslines</b>	44.02	14.59	58.61
	<b>Lidar Crosslines</b>	0.0	0.0	0.0
<b>Number of Bottom Samples</b>			5	
<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>			74.0	

*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>
08/10/2023	222

<b>Survey Dates</b>	<b>Day of the Year</b>
08/11/2023	223
08/12/2023	224
08/13/2023	225

*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:

<b>Hull ID</b>	<i>R/V Norseman II</i>	<i>ASV Inez</i>
<b>LOA</b>	35.0 meters	7.0 meters
<b>Draft</b>	4.0 meters	0.56 meters

*Table 5: Vessels Used*

The R/V Norseman II is a 35 meter steel research vessel that originally served as a Bering Sea commercial fishing vessel. It is equipped with a custom over-the-side pole mount with secondary tie point.

ASV Inez is a 7 meter Wave Adaptive Modular Vessel (WAM-V) which is an innovative class of watercraft using unique suspension technology to radically improve seagoing capabilities. ASV Inez is equipped with a custom sonar mount.

## 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>
R2Sonic	2022	MBES
R2Sonic	2024	MBES
AML Oceanographic	MicroX SV	Sound Speed System
AML Oceanographic	BaseX2	Sound Speed System
AML Oceanographic	MVP-X	Sound Speed System
R2Sonic	I2NS	Positioning and Attitude System
Applanix	POS MV WaveMaster	Positioning and Attitude System

*Table 6: Major Systems Used*

Note: R/V Norseman II utilized a single head R2Sonic 2024 MBES, an AML Micro.X for the surface sound speed system, an AML/eTrac MVP-X for the sound speed system, an AML Base.X2 as a spare for the sound speed system, and an Applanix POS MV WaveMaster for the positioning and attitude system.

ASV Inez utilized a single head R2Sonic 2022 MBES, an AML Micro.X for the surface sound speed system, and a R2Sonic I2NS for the positioning and attitude system.

## B.2 Quality Control

### B.2.1 Crosslines

A beam-to-beam statistical analysis was performed using the Cross Check tool in Qimera. A 4 meter Combined Uncertainty and Bathymetric Estimator (CUBE) weighted dynamic surface was created incorporating only the mainscheme lines and excluded crosslines. The Cross Check tool was used to perform the beam-by-beam comparison of the crossline data to the mainscheme surface. Comparisons showed excellent agreement, well above 95% of the allowable TVU.

Note: This surface was created for QC only and is not submitted as a surface deliverable.

Below is a histogram of the crossline comparison statistics showing IHO Order 1a compliance per beam.

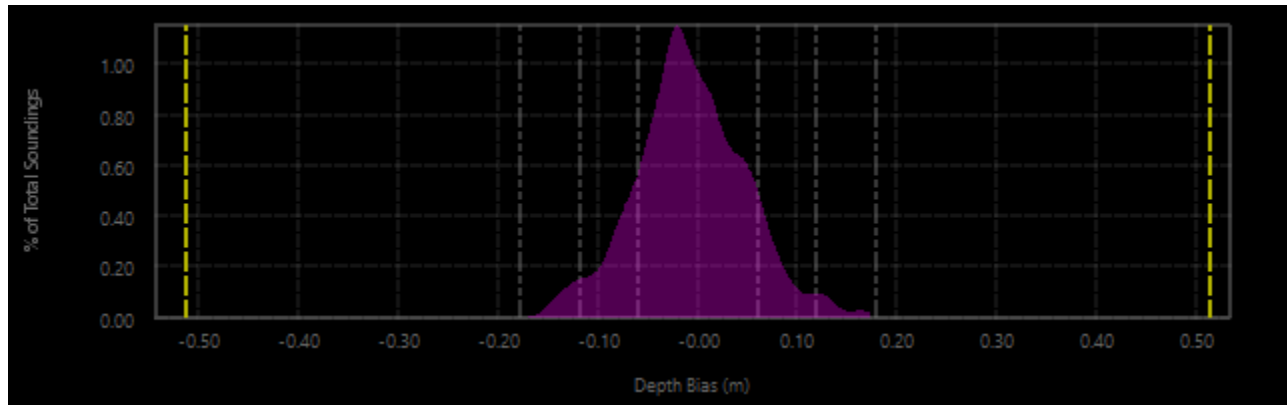


Figure 5: H13693 Crossline Comparison

### B.2.2 Uncertainty

The following survey specific parameters were used for this survey:

Method	Measured	Zoning
ERS via ERTDM	0.13 meters	N/A

Table 7: Survey Specific Tide TPU Values.

Hull ID	Measured - CTD	Measured - MVP	Measured - XBT	Surface
R/V Norseman II	0.05 meters/second	N/A	N/A	0.2 meters/second
ASV Inez	0.05 meters/second	N/A	N/A	0.2 meters/second

Table 8: Survey Specific Sound Speed TPU Values.

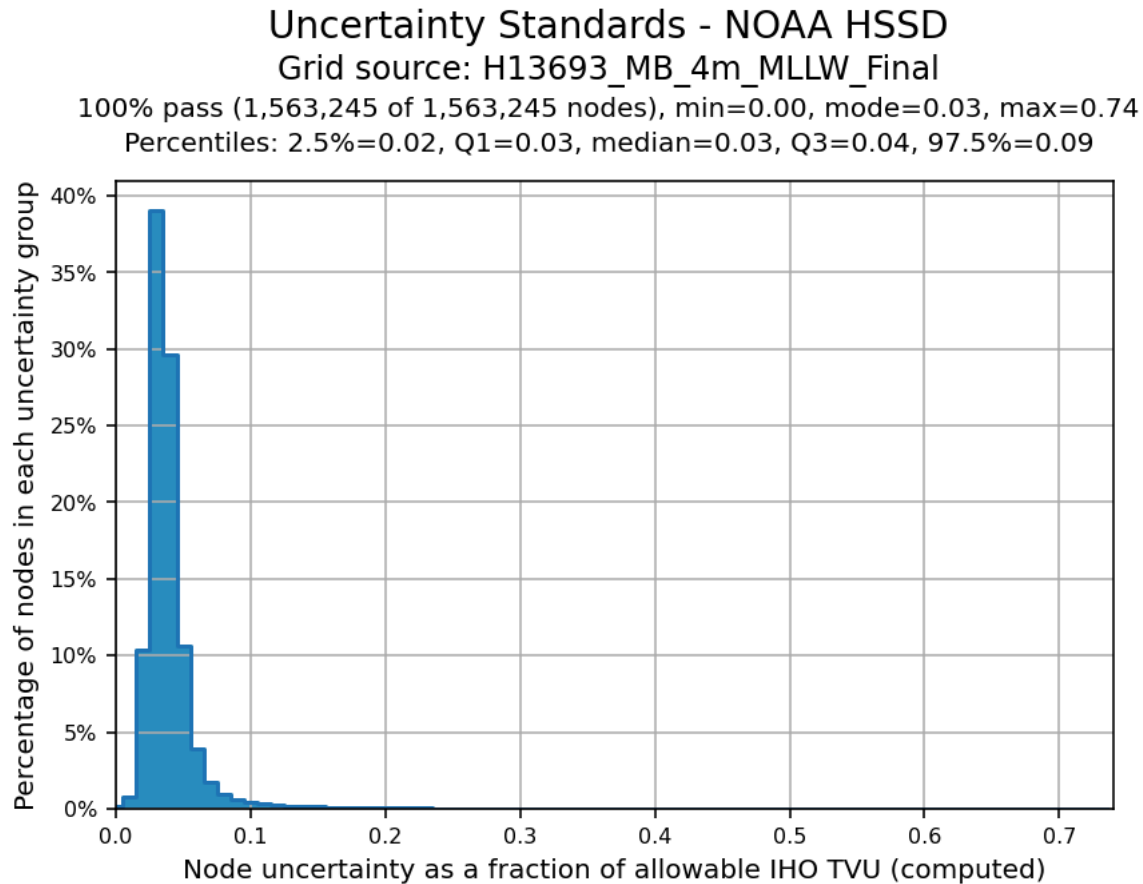
The standard deviation uncertainty and the total vertical uncertainty (TVU) layers of the Dynamic Surface were utilized during data processing to search for features, water column noise, and systematic errors.

IHO Order 1a uncertainty specification was met by 100% of the nodes.

In Qimera versions beginning in 2.5.1 and beyond, the user has the ability to export the Dynamic Surface to a Bathymetric Attributed Grid (BAG) with the TVU layer.

Using this BAG, the percentage of nodes that fell within the TVU specification for each Dynamic Surface was calculated using the NOAA QC tools program. These results are shown in an image below. The TVU was also reviewed using the Colormap Range in the Qimera TVU surface layer.

Set Line Spacing Coverage MBES (Finalized 4m CUBE weighted Dynamic Surface) = 100% of nodes are within the allowable TVU.



*Figure 6: H13693 Finalized 4m MBES TVU Statistics*

### B.2.3 Junctions

No junctions exist for this survey.

There are no contemporary surveys that junction with this survey.

#### **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: SVP casts were generally taken every 2 hours. Occasionally casts would exceed a 2 hour frequency, however would never exceed a 4 hour frequency.

On R/V Norseman II casts were applied in QPS Qinsy acquisition software at the time of the cast. Casts taken on R/V Norseman II were shared with ASV Inez and applied in QPS Qinsy at the same time. Surface sound velocity measured at 1Hz was compared to surface velocity from the sound velocity profile in real-time. If the surface velocity comparison was in excess of 2 m/s at any time during survey operations, a new cast was taken.

Surface sound speeds were compared in real-time and profile to profile for each cast on the vessel. Additionally, the processor reviewed profiles in Qimera to remove spurious readings within a cast, compare day-to-day casts, and to check distribution over the surveyed area, in order to better understand trends for efficient acquisition planning.

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

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



### B.2.9 Data Density Evaluation

In order to determine if the density of the data met the specified 5 soundings per node, data density was evaluated using DensityTrac in the AmiTrac program, developed in-house by eTrac. Each finalized CUBE weighted dynamic surface's nodes were exported to a BBH file. The BBH file was then loaded into the DensityTrac program and density statistics were computed.

For H13693 the following percentages represent the results of the density query:

Set Line Spacing Coverage MBES (Finalized 4m CUBE weighted Dynamic Surface) = 98.2% of nodes are composed from at least 5 soundings.

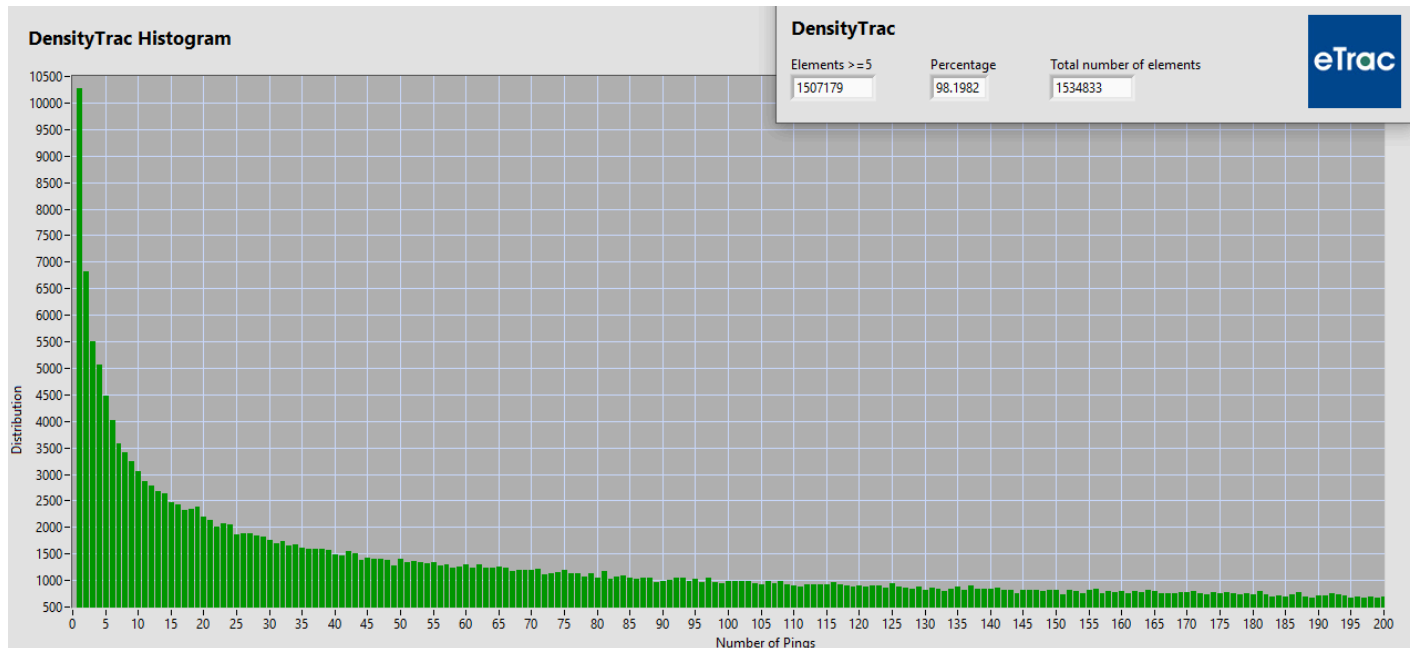


Figure 7: H13693 Finalized 4m Set Line Spacing MBES Density Distribution

## 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**

Backscatter data were collected throughout the survey and are retained in the raw DB files. Every effort was made in the field to collect quality backscatter data while maintaining the primary mandate of high quality bathymetric data. eTrac verified coverage and general quality of the backscatter data collected daily. A beam intensity window was monitored in Qinsy during acquisition to ensure backscatter data collection. Raw backscatter data were viewed in QPS FMGeocoder (FMGT) to further confirm collection criteria had been met. After MBES data was fully processed and cleaned in Qimera, GSF files were exported and brought into FMGT and processed into backscatter mosaics. Shown below is an example of the raw backscatter mosaic from H13693 DN224 (ASV Inez).



*Figure 8: Raw Backscatter from ASV Inez, (DN224)*

## **B.5 Data Processing**

### **B.5.1 Primary Data Processing Software**

The following Feature Object Catalog was used: NOAA Profile Version 2022.

Feature Object Catalog, NOAA Profile Version 2022 was used only in CARIS. Qimera was used as the primary processing software.

### 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
H13693_MB_4m_MLLW_Final	BAG	4 meters	2.28 meters - 11.56 meters	NOAA_4m	MBES Set Line Spacing
H13693_MBAB_2m_NO_400kHz_1of2	MB Backscatter Mosaic	2 meters	-	N/A	MBES Set Line Spacing
H13693_MBAB_2m_IN_400kHz_2of2	MB Backscatter Mosaic	2 meters	-	N/A	MBES Set Line Spacing

*Table 9: Submitted Surfaces*

A 4m surface is provided meeting Set Line Spacing MBES with backscatter specifications for H13693.

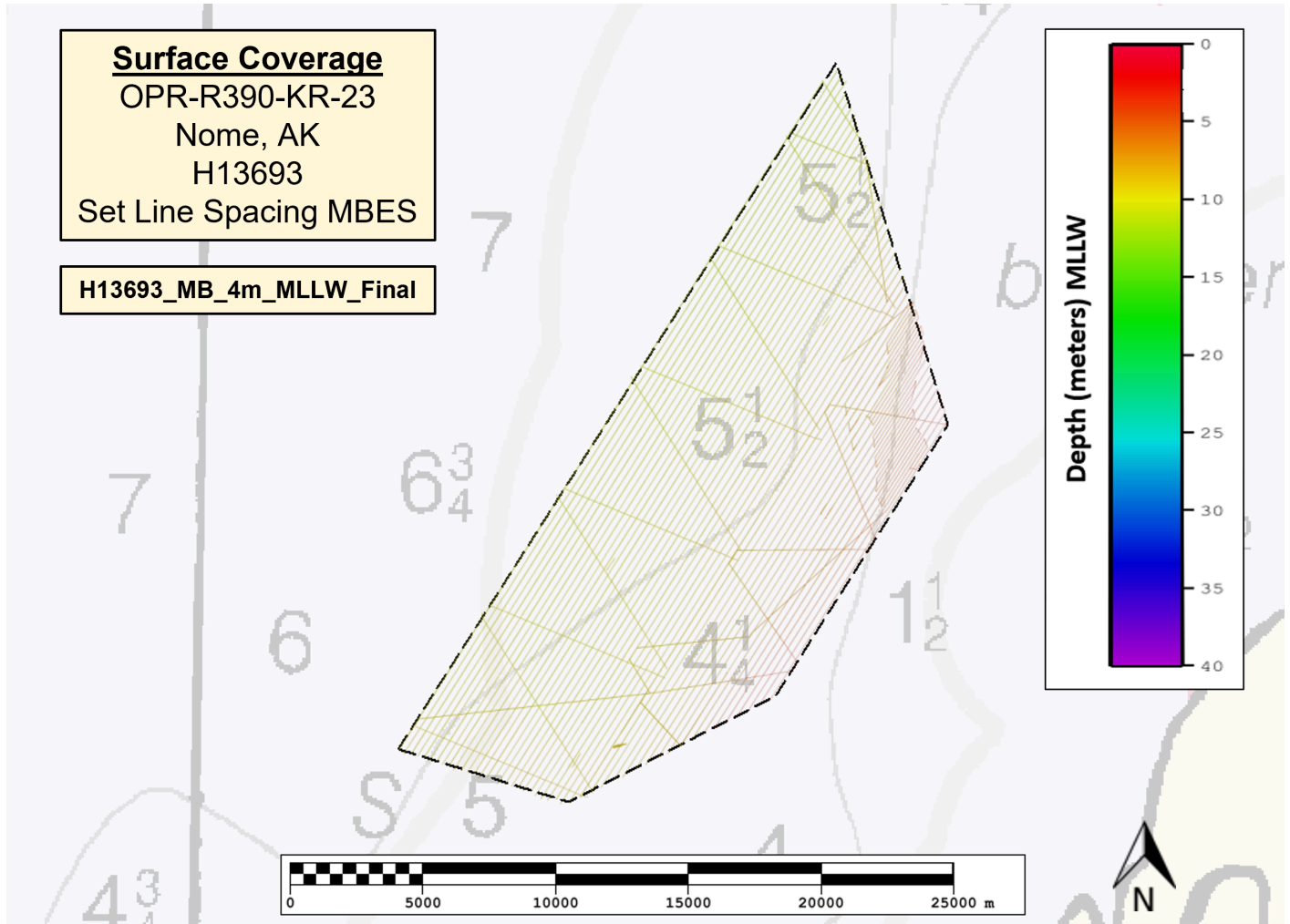


Figure 9: H13693 Finalized 4m CUBE weighted Dynamic Surface Coverage

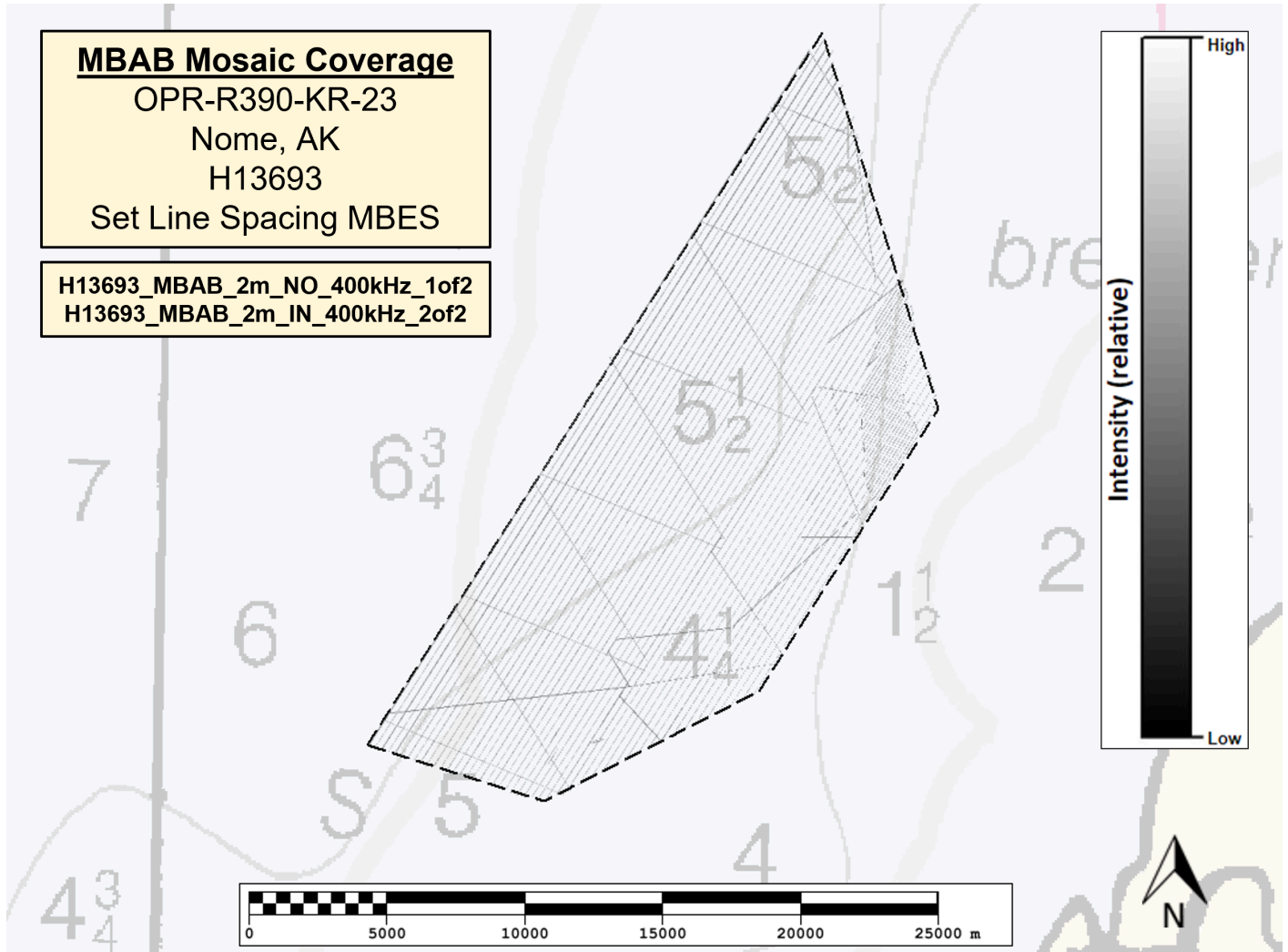


Figure 10: H13693 Finalized 2m MBAB Mosaic Coverage

## C. Vertical and Horizontal Control

Additional information discussing the vertical or 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 ERTDM	OPR-R390-KR-23_Nome_OffshoreNunamlqua_AK_ERTDM_2023_NAD83-MLLW.qgfvom

*Table 10: ERS method and SEP file*

In order to reference soundings to Mean Lower Low Water Datum, a separation model was provided by NOAA and was applied to the Qinsy DB files via a .qgfvom separation file in the acquisition software.

## 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.

The following PPK methods were used for horizontal control:

- RTX

Applanix PosPac MMS was utilized to post process real time positioning data utilizing Trimble's PP-RTX implementation of Trimble CenterPoint RTX to create a Smoothed Best Estimate of Trajectory (SBET).

### RTK

GNSS satellite corrections were received on each vessel using the G4+ carrier signal from the Marinestar Global Correction System maintained by Fugro.

## **D. Results and Recommendations**

### **D.1 Chart Comparison**

A chart comparison was conducted for H13693 using Pydro CA tools, Qimera, and Caris HIPS and SIPS. Survey data were compared against the largest scale ENC to accomplish the chart comparison.

US3AK83M, scale: 300000, edition: 13, update application date: 12/6/2022, issue date: 12/6/2022

Throughout survey operations sounding comparisons between the charted depths and the surveyed depths were analyzed to identify depth discrepancies. Using 4 meter CUBE weighted Dynamic surfaces, soundings were generated in the "Sounding Selection" tab of Pydro CA tools. Soundings were displayed against the charted soundings and a visual comparison was made in Caris HIPS and SIPS. Additionally, potential DtoNs and discrepancies were generated using the "DTM vs Chart" tab of Pydro CA tools. The results were displayed through CA tools and investigated in CARIS HIPS and SIPS and Qimera.

An overview image of the generated soundings on each chart is included below.

Results of the chart comparison are included in the following sections.



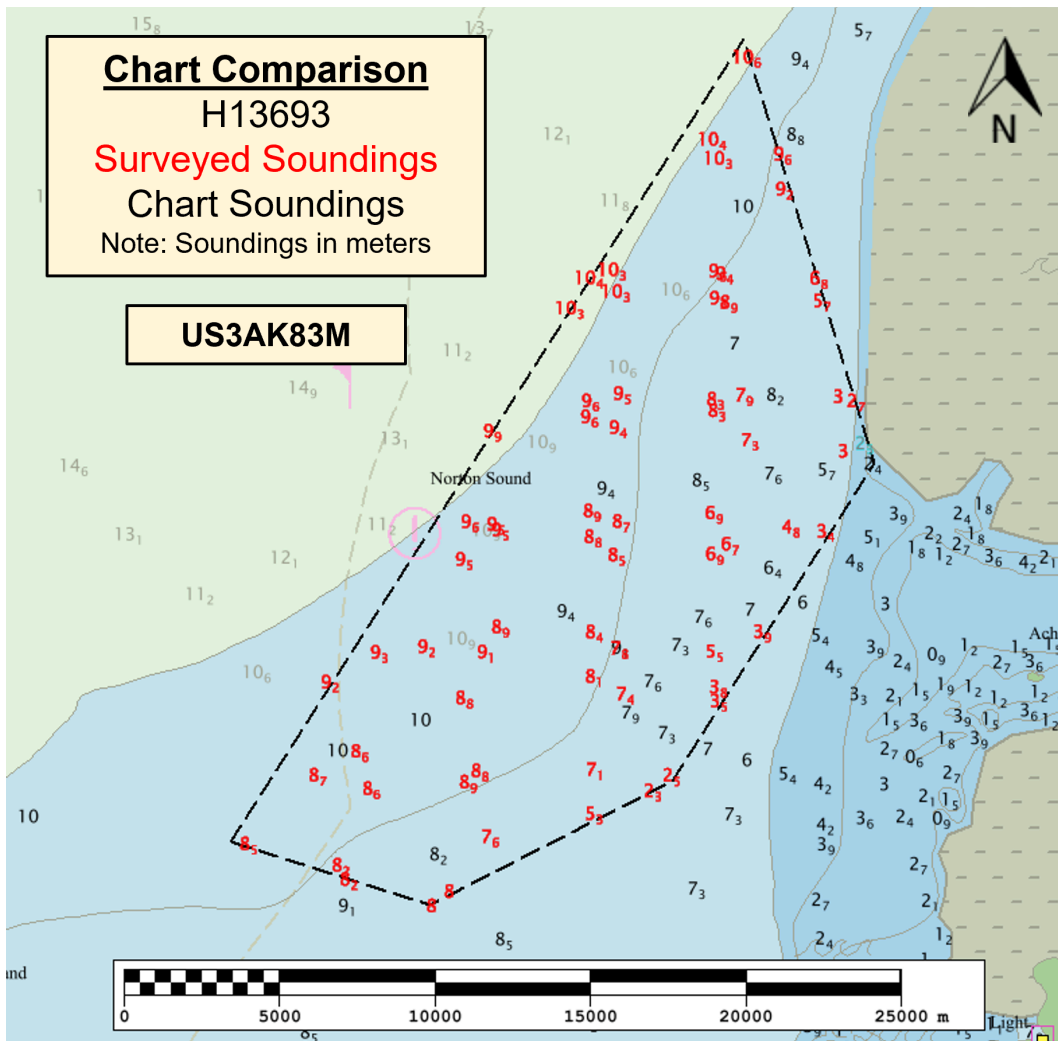


Figure 11: Generated Soundings used for Chart Comparison (US3AK83M)

### 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
US3AK83M	1:300000	13	12/06/2022	12/06/2022

Table 11: Largest Scale ENC's

### **D.1.2 Shoal and Hazardous Features**

Shoals within the survey area were found to have deviated from the charted contours. Per project instructions, splits between planned set lines were run to define the shoal.

Although the shoals were found to have deviated from the charts, it was determined they were not hazardous to navigation, so a Danger to Navigation Report was not submitted.

### **D.1.3 Charted Features**

No charted features exist for this survey.

### **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**

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**

5 bottom samples were obtained in accordance with section 7.1 of the HSSD 2022 in areas designated by the field through discussions with our COR. Detailed information and images of the bottom samples are located in the Final Feature File (FFF). Each bottom sample has been given a unique identifier in the "userid" field of the .000 S-57 file (format AX).

#### 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

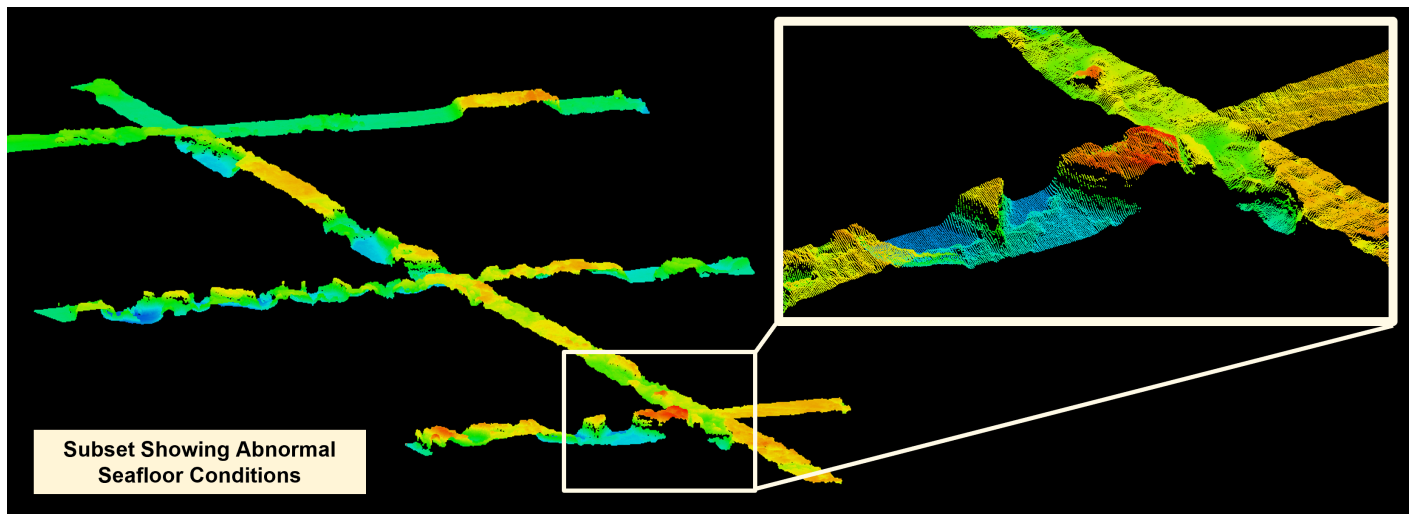
No platforms exist for this survey.

#### D.2.7 Ferry Routes and Terminals

No ferry routes or terminals exist for this survey.

#### D.2.8 Abnormal Seafloor or Environmental Conditions

Complex erosional patterns were noted in shoal waters in the northeastern section of H13693. In many areas these natural features are over 1m tall and flagged results from Flier Finder in NOAA QC Tools. This abnormal seafloor condition is possibly due to the differential erosion of overconsolidated sediments or submerged permafrost.



*Figure 12: Abnormal Seafloor Conditions in H13693*

**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**

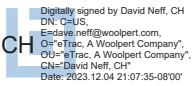
No new ENC scales are recommended for this area.

## 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 CUBE surfaces, 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 and Specifications Deliverables Manual, 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
David Neff, C.H.	Chief of Party	12/04/2023	David Neff, CH 

## 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