H13914

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

DESCRIPTIVE REPORT

Type of Survey:	Navigable Area
Registry Number:	H13914

LOCALITY

State(s):	Alaska
General Locality:	Kotzebue, AK
Sub-locality:	12 NM North of Cape Espenberg

2024

CHIEF OF PARTY
Andrew Orthmann

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Date:

U.S. DEPARTMENT OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION	REGISTRY NUMBER:
HYDROGRAPHIC TITLE SHEET	**H13914**

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:	**Kotzebue, AK**
Sub-Locality:	**12 NM North of Cape Espenberg**
Scale:	**40000**
Dates of Survey:	**07/08/2024 to 10/17/2024**
Instructions Dated:	**05/01/2024**
Project Number:	**OPR-S327-KR-24**
Field Unit:	**Terrasond**
Chief of Party:	**Andrew Orthmann**
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 WGS84 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 H13914

Project: OPR-S327-KR-24

Locality: Kotzebue, AK

Sublocality: 12 NM North of Cape Espenberg

Scale: 1:40000

July 2024 - October 2024

Terrasond

Chief of Party: Andrew Orthmann

A. Area Surveyed

The survey area is located in Kotzebue Sound, Alaska.

Kotzebue Sound is located in northwestern Alaska. The Arctic region is unnavigable for most of the year due to sea ice, with open water from approximately July through October. At the time of this survey, most of the area was poorly charted, with some areas uncharted altogether.

The remote area is off the road system, and the bulk of supplies (including fuel) necessary for local communities are transported here by barge during the short ice-free season. Nearby communities are relatively small, consisting primarily of Shishmaref, Kivalina, Deering, and Kotzebue. Members of these communities commonly engage in various subsistence activities throughout Kotzebue Sound, usually traveling by skiff.

Kotzebue is the largest community, with a population of 2,979 (2023). Limited services, including daily jet service to Anchorage, are available here. However, only shallow-draft vessels can navigate directly to Kotzebue due to a shoal of approximately 2 meters depth about 9 NM west of town, which necessitated relatively long transits to Nome—at least a 60-hour round trip—for most rotations and resupplies on this project.

The Port of Red Dog is located on the north side of Kotzebue Sound. The Port serves as the terminal for Red Dog Mine, one of the largest zinc and lead mining operations in the world. Ore is mined year-round and stored at the Port for transport out during the limited ice-free season. Shallow-draft vessels lighter the ore from the Red Dog dock to deep-draft bulk ore carriers, which typically wait at least 3 NM offshore.

On-site field work for project OPR-S327-KR-24 was carried out from July through October 2024. The overall project consisted of thirteen individual surveys. Final processing and reporting occurred from October 2024 through January 2025. Work was completed in accordance with the Hydrographic Survey Project Instructions (dated May 1, 2024), the accompanying Scope of Work, and the NOAA Hydrographic Surveys Specifications and Deliverables (HSSD, 2022 edition).

A.1 Survey Limits

Data were acquired within the following survey limits:

Northwest Limit	Southeast Limit
66° 54' 39.26" N 164° 0' 23.7" W	66° 40' 29.17" N 163° 28' 6.62" W

Table 1: Survey Limits

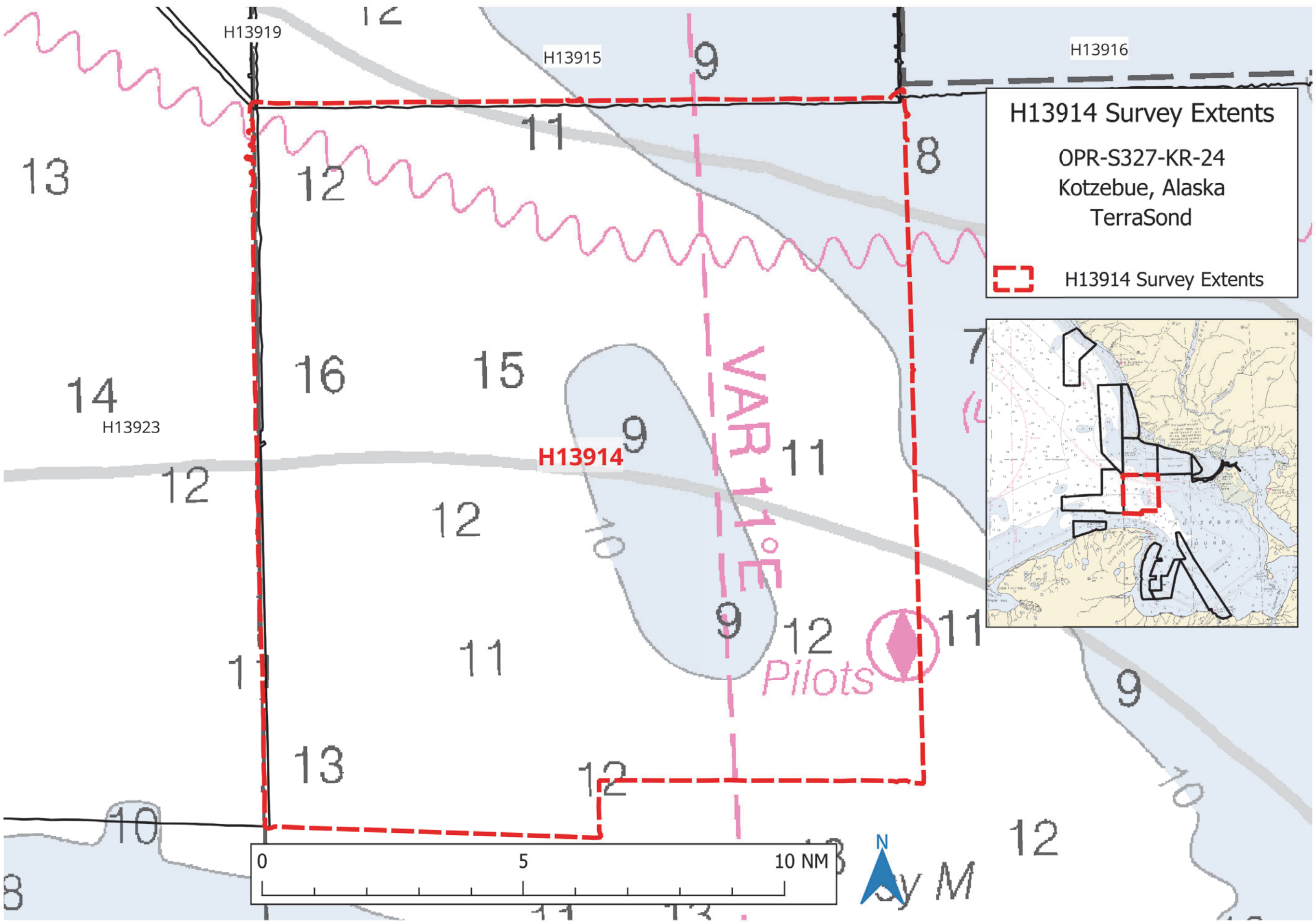

Figure 1: Figure showing the survey extents.

Survey limits were acquired in accordance with the requirements in the Project Instructions and the HSSD.

A.2 Survey Purpose

The purpose of this survey is described as follows in the Project Instructions:

This project will provide modern bathymetric data within Kotzebue Sound, Alaska. Kotzebue acts as the service and transportation center for all villages in the northwest region of Alaska, as well as the transfer point between ocean and inland shipping. Portions of Kotzebue Sound were last surveyed between 2011 and 2015, however a majority of the area has not been surveyed to modern standards.

The area experiences significant vessel traffic, particularly near the approaches to Kotzebue and Deering. The survey will focus on collecting data in the highly trafficked corridors, as well as for vessel lightering areas identified by the Western Alaska Tanker Lightering Best Practices Committee. These areas are used for ship-to-ship transfers of oil products, including fuel, which is of key importance to local residents.

Conducting a modern bathymetric survey in this area will address Seabed 2030 data gaps, identify hazards and changes to the seafloor, provide critical data for updating National Ocean Service (NOS) nautical charting products, and improve maritime safety. 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.

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 a minimum of 12,896 LNM. Unlogged transit mileage, system calibration mileage, and data which do not meet HSSD specifications shall not count towards the completion of the LNM requirement. Notify the COR/Project Manager upon nearing completion of LNM requirement. The final area shall be squared off and ensure the full investigation of any features within the surveyed extent.
All waters in survey area	Set Line Spacing MBES (Refer to HSSD Section 5.2.2.4 Option A)
Sheet H13914	Sounding lines shall be acquired with spacing adequate to collect data at an interval of at least 480 meters

Table 2: Survey Coverage

Coverage requirements were met. Additional clarification on specific requirements are provided below.

LNM requirements: A minimum of 12,896 LNM was required project-wide. 12,932 LNM were actually acquired. The excess was collected to compensate for incidental data collection such as crossline mileage that exceeded requirements, data acquired during run-ins or run-outs (including in shallow water while scouting depths between lines), and excess overlap (if any). LNM quantities do not include transit or calibration data, or data that doesn't meet HSSD requirements.

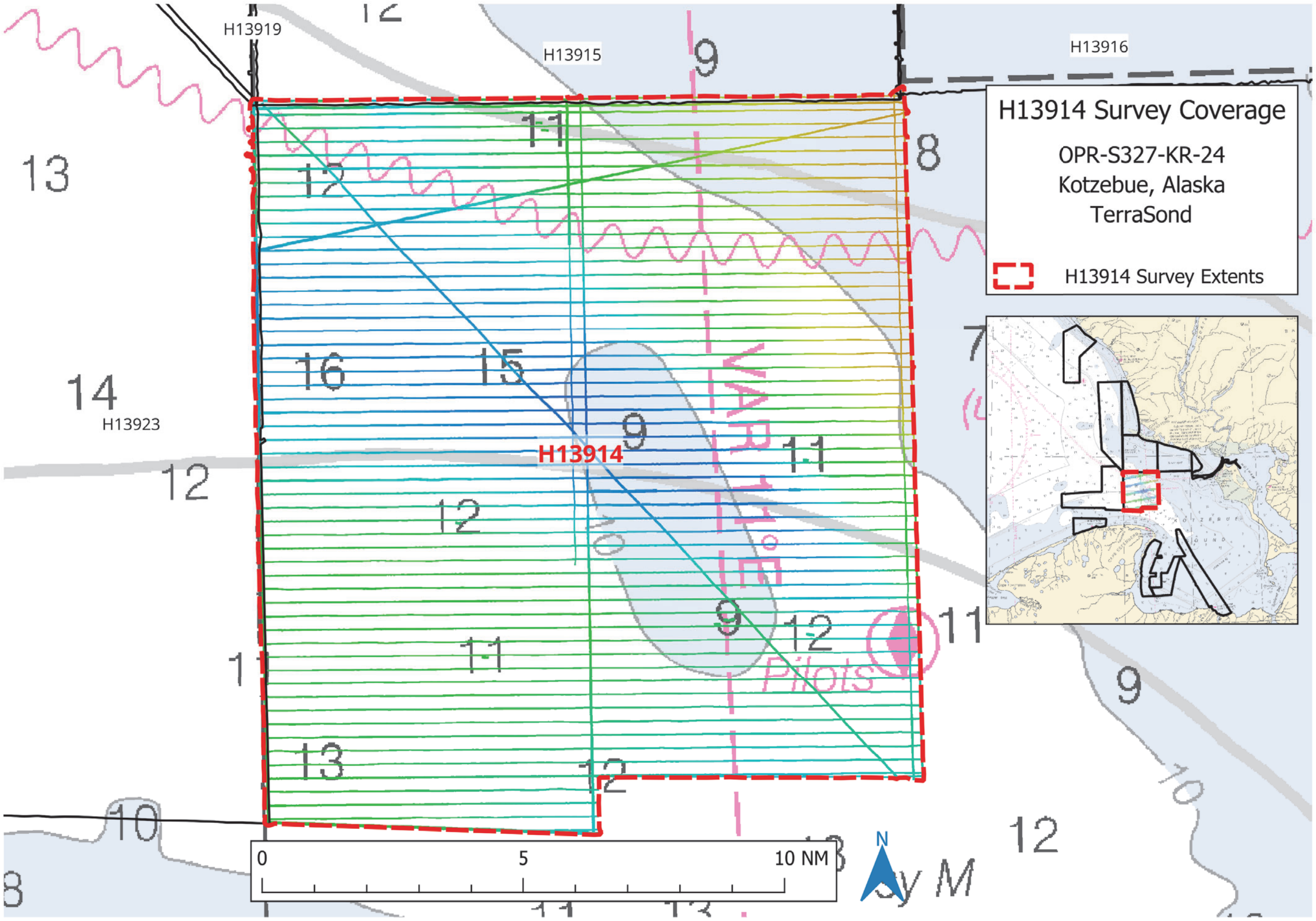

Figure 2: Figure showing coverage achieved on this survey.

A.6 Survey Statistics

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

	HULL ID	*Poseidon*	*ASV-LR1*	*Total*
LNM	SBES Mainscheme	0.0	0.0	0.0
	MBES Mainscheme	609.18	116.92	726.1
	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	0.0	0.0	0.0
	SBES/MBES Crosslines	52.96	14.21	67.17
	Lidar Crosslines	0.0	0.0	0.0
Number of Bottom Samples				9
Number Maritime Boundary Points Investigated				0
Number of DPs				0
Number of Items Investigated by Dive Ops				0
Total SNM				170.1

Table 3: Hydrographic Survey Statistics

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

Survey Dates	Day of the Year
07/08/2024	190

Survey Dates	Day of the Year
07/09/2024	191
07/10/2024	192
07/11/2024	193
07/14/2024	196
07/19/2024	201
07/21/2024	203
07/23/2024	205
07/24/2024	206
07/30/2024	212
08/01/2024	214
09/29/2024	273
10/02/2024	276
10/03/2024	277
10/09/2024	283
10/16/2024	290
10/17/2024	291

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	***Poseidon***	***ASV-LR1***
LOA	41.0 meters	7.6 meters
Draft	2.6 meters	1.0 meters

Table 5: Vessels Used

Figure 3: The R/V Poseidon.

Figure 4: The ASV-LR1.

The R/V Poseidon (Poseidon) is a 41 m steel-hull vessel owned and operated by Support Vessels of Alaska. The Poseidon was operated 24/7, acquiring multibeam data and providing housing and facilities for on-site data processing. The vessel was also used to collect bottom samples, conduct sound speed casts, and deploy/ recover the ASV-LR1 launch.

The ASV-LR1 (LR1) is a 7.6 m aluminum-hull Autonomous Surface Vessel (ASV). The vessel was configured to be "optionally crewed", enabling it to operate with or without a crew as operations required. When uncrewed it collected multibeam data in close proximity to the Poseidon, normally running parallel lines within 2 NM.

B.1.2 Equipment

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

Manufacturer	Model	Type
Teledyne RESON	SeaBat T50-R	MBES
Teledyne RESON	SeaBat T50-R	MBES Backscatter
Applanix	POS MV WaveMaster	Positioning and Attitude System
Applanix	POS MV OceanMaster	Positioning and Attitude System
Valeport	SWiFT SVP	Sound Speed System
AML Oceanographic	MicroX SV	Sound Speed System

Table 6: Major Systems Used

The survey vessels were configured for MBES data collection with nearly identical survey equipment and software.

The Poseidon and LR1 utilized Teledyne Reson Seabat T50-R MBES systems, with surface sound speed measurements provided by AML Oceanographic Micro-X sensors. Both vessels used Applanix POSMVs with submersible IP-68 rated IMUs for attitude and position measurements. QPS QINSy software, running on Microsoft Windows 10-based PCs, was used for multibeam data logging and vessel navigation. Sound speed profiles were collected using a Valeport SWiFT sensor, which was deployed while underway using a C-MAX Vigo winch on the Poseidon.

B.2 Quality Control

B.2.1 Crosslines

The percentage of crossline to mainscheme miles is 9.25%.

Effort was made to ensure crosslines (XLs) had good temporal and geographic distribution, were angled to enable nadir-to-nadir comparisons, and that the required minimum percent of mainscheme LNM was achieved.

Crosslines were conducted with all vessels to ensure there was ample overlap for inter-vessel comparisons, with each vessel crossing the other's mainscheme lines. Crosslines were often collected while transiting across the survey area to reach a different survey priority such as bottom sample locations or infills, leading to crosslines that were diagonal to the direction of mainscheme lines.

The crossline analysis was conducted using CARIS HIPS “Line QC Report” process. Each crossline (with all associated file segments) was selected and run separately through the process, which calculated the depth difference between each accepted crossline sounding and a "QC" BASE (CUBE-type) surface's depth layer created from the mainscheme data. The QC surface was created with the same parameters and resolution used for the final surface, with the important distinction that the QC surface did not include crosslines so as to not bias the results. Differences in depth were grouped by beam number and statistics were computed, including the percentage of soundings with differences from the QC surface falling within IHO Order 1a.

When at least 95% of the sounding differences exceed IHO Order 1a, the crossline was considered to "pass," but when less than 95% of the soundings compare within IHO Order 1, the crossline was considered to "fail." A 5% (or less) failure rate was considered acceptable since this approach compares soundings to a surface (instead of a surface to a surface), allowing for the possibility that noisy crossline soundings that don't adversely affect the final surface could be counted as a QC failure in this process.

Lines selected as crosslines and their percentage (%) of soundings passing IHO Order 1a, sorted from highest passing to lowest, are listed below. Note that lines used as crosslines have their "Line Class" attribute set to "Check" within the CARIS HIPS projects provided with the survey deliverables. In addition to lines run specifically as crosslines, these can also include lines run as junction comparisons and/or as shoreline trace lines where advantageous -- for example if they improve spatial distribution.

0188-214-LR1-C1XL1003 -- 100.0% pass
0402-JD212-Poseidon-C1XL1001 -- 100.0% pass
1648-JD291-Poseidon-C1XL1002 -- 100.0% pass
0427-JD214-Poseidon-C1XL1002 -- 100.0% pass
0227-JD201-Poseidon-C1XL1000 -- 100.0% pass
0228-JD201-Poseidon-C1XL1000 -- 100.0% pass
0226-JD201-Poseidon-C1XL1000 -- 99.9% pass

Results: Agreement between them mainscheme surface and crossline soundings is excellent. At least 95% of all crossline soundings compare to the mainscheme surface within IHO Order 1a for all crosslines. Refer to Separate II: Digital Data for the detailed Crossline QC reports.

B.2.2 Uncertainty

The following survey specific parameters were used for this survey:

Method	Measured	Zoning
ERS via ERTDM	0.14 meters	0.0 meters

Table 7: Survey Specific Tide TPU Values.

Hull ID	Measured - CTD	Measured - MVP	Measured - XBT	Surface
Poseidon	0 meters/second	5 meters/second	0 meters/second	0.025 meters/second
ASV-LR1	0 meters/second	5 meters/second	0 meters/second	0.025 meters/second

Table 8: Survey Specific Sound Speed TPU Values.

The uncertainty layer of the final surface was examined in CARIS HIPS software, as well as analyzed in Pydro QC Tools V3.10.20 Grid QA v6.

The computed uncertainty of the final grid cells range from 0.360 to 0.586 m. Greater than 99.5% of grid cells have TVU that fall within the allowable range by depth. Areas with the relatively few grid cells with elevated uncertainty were examined and found to be on deeper lines when weather conditions were rough, leading to additional motion-induced uncertainty. Despite the higher computed uncertainty, the depth data is within allowable TVU.

B.2.3 Junctions

During field operations, effort was made to ensure sufficient overlap was achieved between this survey and any overlapping surveys for junction analysis. This included extending survey lines into overlapping sheets, and often running lines along junction boundaries.

The "Gridded Surface Comparison V24.6" utility within Pydro was used to compare survey junctions. The utility differences the surfaces from the two surveys and generates statistics that include the percentage of grid cells that compare to within allowable TVU for the depth. 4 m resolution surfaces were used for all sheets completed under this project.

Prior surveys, where applicable, were downloaded from NOAA NCEI in BAG format. The resolution available in NCEI for each BAG surface varied by sheet and is noted below.

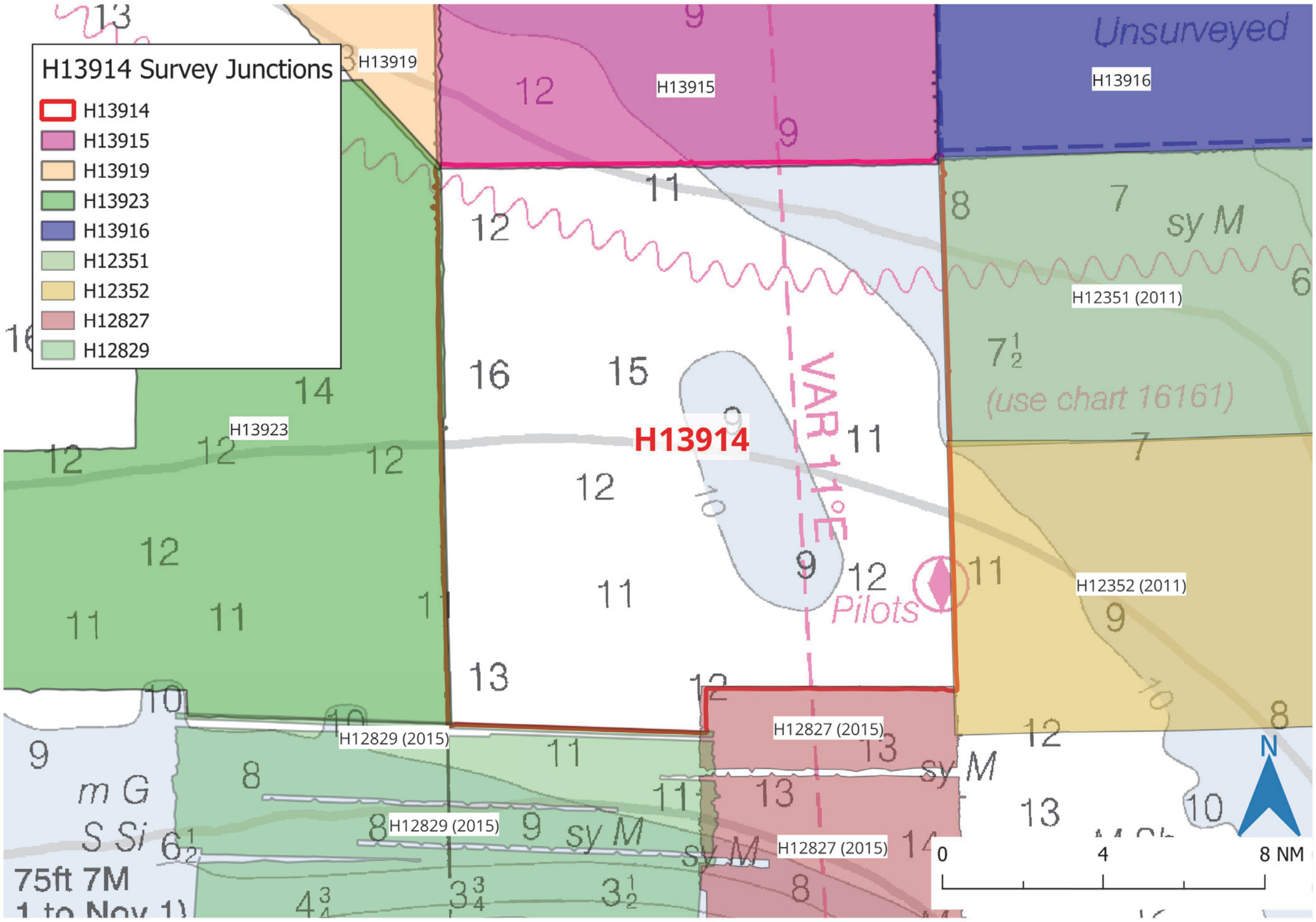

Figure 5: Figure showing survey junctions.

The following junctions were made with this survey:

Registry Number	Scale	Year	Field Unit	Relative Location
H12829	1:40000	2015	NOAA Ship Rainier	SW
H12827	1:40000	2015	NOAA Ship Rainier	SE
H12351	1:40000	2011	NOAA Ship Fairweather	NE
H12352	1:40000	2011	NOAA Ship Fairweather	SE
H13919	1:20000	2024	TerraSond	NW
H13923	1:40000	2024	TerraSond	W
H13915	1:20000	2024	TerraSond	N
H13916	1:20000	2024	TerraSond	NE

Table 9: Junctioning Surveys

H12829

A variable resolution (VR) BAG surface was available from NOAA NCEI and used for the comparison with the final surface from this survey. Significant overlap was achieved along the junction.

Agreement between the two surveys is very good. The mean difference is 0.07 m (H13914 is shoaler), with a standard deviation of 0.06 m. 100% of grid cells agree within allowable TVU by depth.

H12827

A variable resolution (VR) BAG surface was available from NOAA NCEI and used for the comparison with the final surface from this survey. Significant overlap was achieved along the junction.

Agreement between the two surveys is very good. The mean difference is 0.01 m (H13914 is shoaler), with a standard deviation of 0.15 m. Greater than 99.5% of grid cells agree within allowable TVU by depth.

H12351

A variable resolution (VR) BAG surface was available from NOAA NCEI and used for the comparison with the final surface from this survey. Significant overlap was achieved along the junction.

Agreement between the two surveys is good. The mean difference is 0.13 m (H13914 is shoaler), with a standard deviation of 0.05 m. Greater than 99.5% of grid cells agree within allowable TVU by depth.

H12352

A variable resolution (VR) BAG surface was available from NOAA NCEI and used for the comparison with the final surface from this survey. Significant overlap was achieved along the junction.

Agreement between the two surveys is very good. The mean difference is 0.05 m (H13914 is deeper), with a standard deviation of 0.06 m. 100% of grid cells agree within allowable TVU by depth.

H13919

The two surveys were completed concurrently under the same overall project. Overlap is minimal due to sharing only a small intersection at their two corners.

Agreement between the two surveys is excellent. The mean difference is 0.00 m, with a standard deviation of 0.07 m. 100% of grid cells agree within allowable TVU by depth.

H13923

The two surveys were completed concurrently under the same overall project. Significant overlap was achieved along the junction.

Agreement between the two surveys is very good. The mean difference is 0.07 m (H13914 is deeper), with a standard deviation of 0.09 m. 100% of grid cells agree within allowable TVU by depth.

H13915

The two surveys were completed concurrently under the same overall project. Significant overlap was achieved along the junction.

Agreement between the two surveys is excellent. The mean difference is 0.01 m (H13914 is shoaler), with a standard deviation of 0.07 m. 100% of grid cells agree within allowable TVU by depth.

H13916

The two surveys were completed concurrently under the same overall project. Overlap is minimal due to sharing only a small intersection at their two corners.

Agreement between the two surveys is excellent. The mean difference is 0.01 m (H13914 is deeper), with a standard deviation of 0.05 m. 100% of grid cells agree within allowable TVU by depth.

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

Poseidon Roll Misalignment

An across-track misalignment, or roll bias, is evident periodically in Poseidon data, adversely affecting outer beam soundings. The exact cause is unknown but is likely attributable to shifts in the POSMV lever arm from movement of the hydraulic MBES arm.

Affected lines were identified by difference surface methodology, wherein a surface made from all soundings was differenced from a TIN surface created using only near-nadir data. Lines that exhibited differences from the TIN approaching or exceeding allowable TVU received additional outer beam filters that rejected the erroneous data. Refer to the DAPR for additional detail on this process.

Following these corrections the negative effect on final surfaces, where this occurs, is generally less than 0.20 m and is within allowable TVU.

B.2.6 Factors Affecting Soundings

Sound Speed Error

Sound speed error, which is normally characterized by a general upward or downward across-track cupping of sounding data that increases in magnitude towards the outer beams, is common in the dataset.

Profiles were taken frequently, usually not exceeding two hours, and whenever changing areas, but some residual error remains. In processing, beam filters were applied to reject outer beams greater than 65 degrees from nadir on all lines in order to reject soundings most subject to sound speed error. The dataset was also systematically examined and additional filters were applied to individual lines where the effect of outer beam error on a 4 m surface appeared to approach or exceed specifications, removing the erroneous data. Additional filters often removed beams past 55 degrees, though in some cases filters of 45 degrees from nadir were necessary.

The effect on the final surfaces is relatively minor, normally less than 0.20 m where it occurs. Final data is within specifications.

Note that sound speed showed significantly more variance in this area than most other sheets surveyed under the same project. Profiles taken less than two hours apart could show radical differences in sound speed at the same depths, by up to 30 m/s in some cases.

B.2.7 Sound Speed Methods

Sound Speed Cast Frequency: 2 hours

Sound speed profiles or "casts" were acquired aboard the Poseidon while underway with a C-MAX Vigo profiling winch, utilizing a Valeport SWiFT sound speed profiler. These profiles were used to correct all Poseidon sounding data, as well as all LR1 sounding data. This was possible because when the LR1 worked in close vicinity to the Poseidon, usually within 2 NM.

Surface sound speed at the sonar head on the Poseidon was monitored continuously and a new cast was collected when the surface speed varied from the previous profile's speed at the same depth by greater than 2 m/s, leading to a cast interval of approximately 2 hours.

Casts were taken as deep as possible. On survey lines with significant differences in depth, the deeper portion of the line was normally favored to ensure that changes across the full water column were measured. The cast data was used to correct the sounding data using the "nearest in distance within time" (set to 2 hours) within CARIS HIPS. Exceptions, if any, are noted later in this report.

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

SVP Correction Exceptions:

The following lines were SVP corrected with "Nearest in Distance within 3 hours" instead of the standard 2 hours:

0092-JD190-Poseidon-C1EWSB2_-_0001
0093-JD190-Poseidon-C1EW24000_-_0001

The following lines were SVP corrected with "Nearest in Time" to improve issues with SVP error:

0103-JD191-Poseidon-C1EW19200
0104-JD191-Poseidon-C1EW18240

B.3.2 Calibrations

All sounding systems were calibrated as detailed in the DAPR.

B.4 Backscatter

All equipment and survey methods were used as 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 2024.

The most current version of NOAA's Extended Attribute Files available at the start of survey operations was utilized for this project.

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
H13914_MB_4m_MLLW_Final	CARIS Raster Surface (CUBE)	4 meters	14.21 meters - 25.8 meters	NOAA_4m	MBES Set Line Spacing
H13914_MBAB_2m_400kHz_1of1	MB Backscatter Mosaic	2 meters	14.21 meters - 25.8 meters	N/A	MBES Set Line Spacing

Table 10: Submitted Surfaces

The final depth information for this survey was submitted as a 4 m resolution CARIS BASE surface (CSAR format), computed with the CUBE algorithm, which best represents the seafloor at the time of the 2024 survey. The surface was created from fully processed data with all final corrections applied.

The surface was created using NOAA CUBE parameters and resolutions in conformance with the 2022 HSSD. The surface was finalized with a 0 to 80 m depth limit, "Uncertainty" selected as the final uncertainty source, and designated soundings were applied (if present). Horizontal projection was selected as WGS84 / UTM zone 3N.

A non-finalized version of the CSAR surface is also included with the survey deliverables for reference. This does not have the "_Final" designation in the filename.

The Multibeam Acoustic Backscatter (MBAB) surface(s), produced with QPS Fledermaus Geocoder Toolbox (FMGT), is also provided. All vessels ran their sonars at 400 kHz, therefore their MBAB data was combined in a single 400 kHz mosaic.

C. Vertical and Horizontal Control

Additional information discussing the vertical or horizontal control for this survey can be found in the accompanying HVCR.

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-S327-KR-24_AK_ERTDM_2023_WGS84(G2139)-MLLW.csar

Table 11: ERS method and SEP file

All soundings were reduced to MLLW using the ERTDM WGS84 to MLLW separation model grid file provided by NOAA using ERS methodology. The uncertainty stated for the model in the Project Instructions was 0.14 m.

Note all altitudes are relative to the WGS84 datum, therefore the WGS84 to MLLW ERTDM model was utilized to reduce soundings to MLLW.

C.2 Horizontal Control

The horizontal datum for this project is World Geodetic System (WGS) 1984.

The projection used for this project is Universal Transverse Mercator (UTM) Zone 3.

The following PPK methods were used for horizontal control:

- RTX

Post-processing of all navigation data for final positions was done in Applanix POSPac MMS (v9.1) software. Trimble PP-RTX was used as the primary processing methodology within POSPac. Exceptions (if any) were noted previously.

RTK

Real-time positions were primarily RTK. The POSMVs on each vessel were configured to receive Trimble CenterPoint RTX corrections using NTRIP protocol over the internet via Starlink Maritime receivers. This allowed the POSMVs to operate in RTK mode, assisting with real-time positioning in the field. Real-time positioning sources in the raw MBES records are therefore normally RTX. However, all real-time positions were replaced in post-processing, as described previously.

WAAS

The Wide Area Augmentation System (WAAS) was used for real-time horizontal control during data acquisition only if issues with reception of CenterPoint RTX corrections were experienced. These are usually noted in the Survey Line Logs, included with the survey deliverables.

C.3 Additional Horizontal or Vertical Control Issues

C.3.1 HSSD Section 2.2 (NAD83)

A waiver to HSSD Section 2.2 was was granted for this project. All products are submitted with horizontal positions as WGS84 instead of NAD83(2011). This was done to provide a consistent dataset from raw data, which was acquired in WGS84, through final processed data. See project correspondence for the waiver.

D. Results and Recommendations

D.1 Chart Comparison

An overview of this survey overlaid on the largest scale chart(s) covering the survey area is shown below.

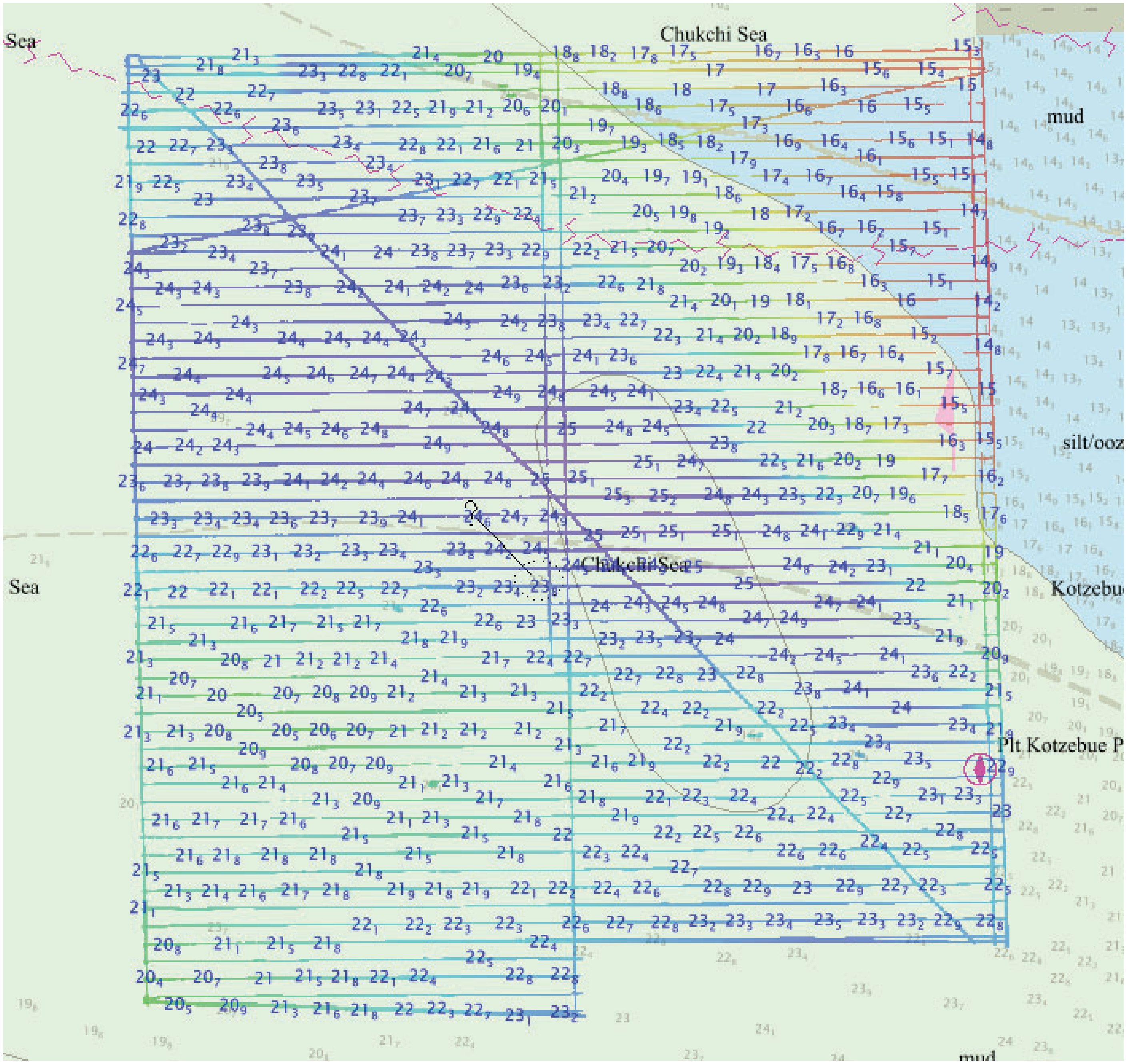

Figure 6: This survey overlaid on affected large scale ENCs. Soundings from this survey are blue. All soundings in meters.

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
US4AK6ZQ	1:40000	1	09/03/2020	01/26/2024
US4AK6YQ	1:80000	1	03/04/2021	03/04/2021
US4AK6YR	1:80000	2	09/17/2024	09/17/2024
US4AK6ZR	1:40000	2	09/17/2024	09/17/2024

Table 12: Largest Scale ENCs

D.1.2 Shoal and Hazardous Features

No shoals or potentially hazardous features exist for this survey. No DTONs were submitted for this survey.

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

The Project Instructions required 10 bottom samples for this survey. 9 were successfully acquired, at geographically dispersed locations, with specific locations chosen in regards to the acquired multibeam backscatter.

Samples were attempted at three additional locations in the area but were unsuccessful despite multiple attempts. These attempt locations have NATSUR set to "Unknown" in the FFF.

Samples were examined, photographed, and then discarded overboard. An overview of their results is shown below. Detailed results are provided in the project FFF.

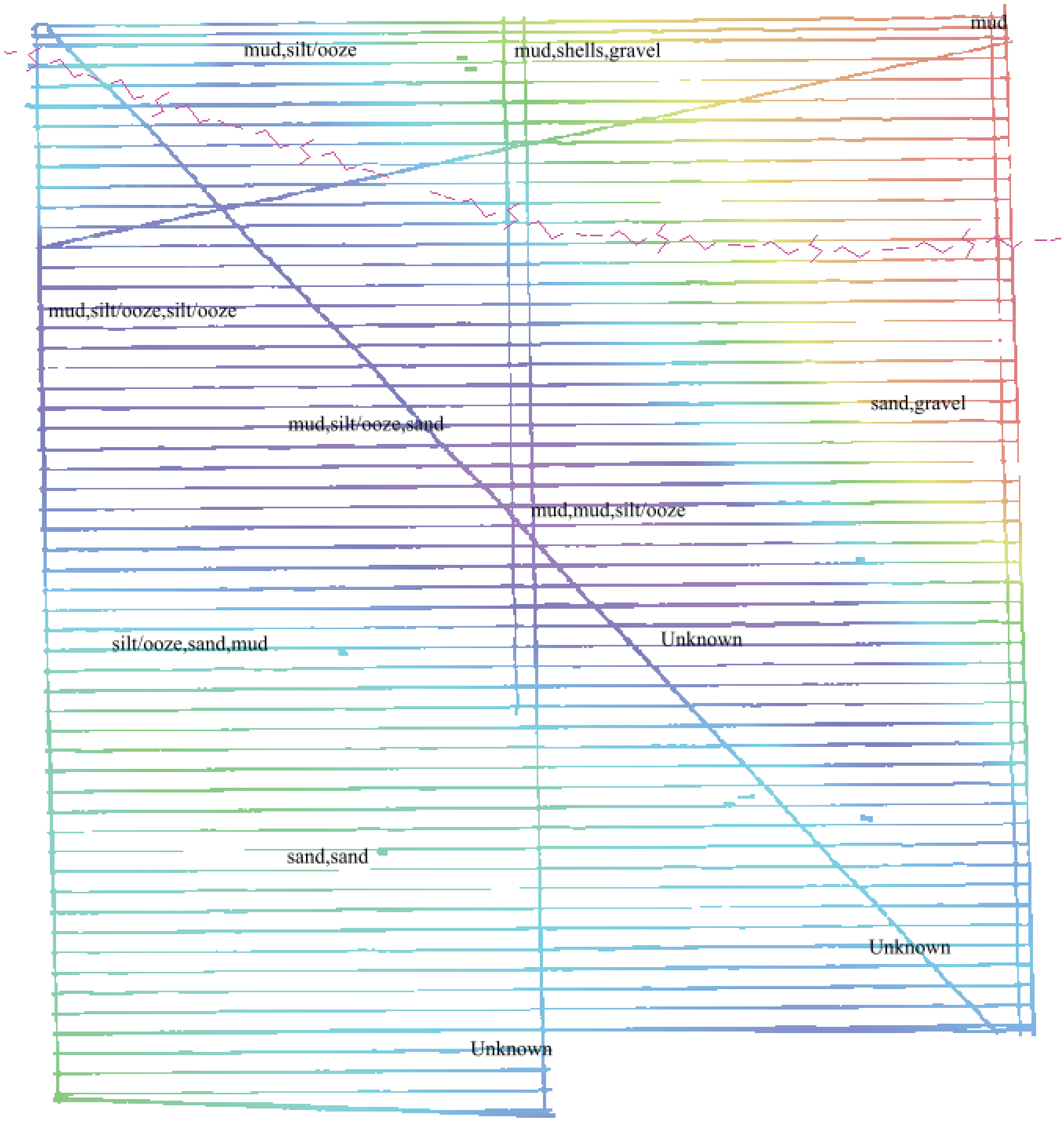

Figure 7: Locations of bottom samples relative to the survey area.

D.2.4 Overhead Features

No overhead features exist for this survey.

D.2.5 Submarine Features

A submarine cable transects the area on the large scale ENCs. It was assigned for investigation. It has a date reported of 2017.

The investigation consisted of examining the existing dataset for signs of this cable. No additional investigation efforts were required. Refer to the project correspondence for discussion on the investigation requirements.

A 1 m resolution surface was created from the existing dataset and examined, with a vertical exaggeration of 5x. Evidence of the cable, or a surface expression of the cable, is apparent at some its crossings with the MBES data. This expression is very subtle, to 0.05 m or less, and not apparent at all intersections. At locations where this is visible, the cable appears to be charted correctly. It is included in the FFF with a recommendation to retain. An example is shown below.

Figure 8: Example of indication of the charted submarine cable crossing a survey line. A 1 m resolution surface at 5x vertical exaggeration is shown, with transparency set to see the charted cable location. The depth at this location is 19.5 m. In this case a very slight trench of about 0.05 m depth is apparent, within 5 m of the charted location of the cable.

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

Ice scour is visible periodically in this area. These generally long, linear features of disturbed sediment can reach 1 m off the seafloor in some cases, and occur throughout the area at all depths. Examples are shown below.

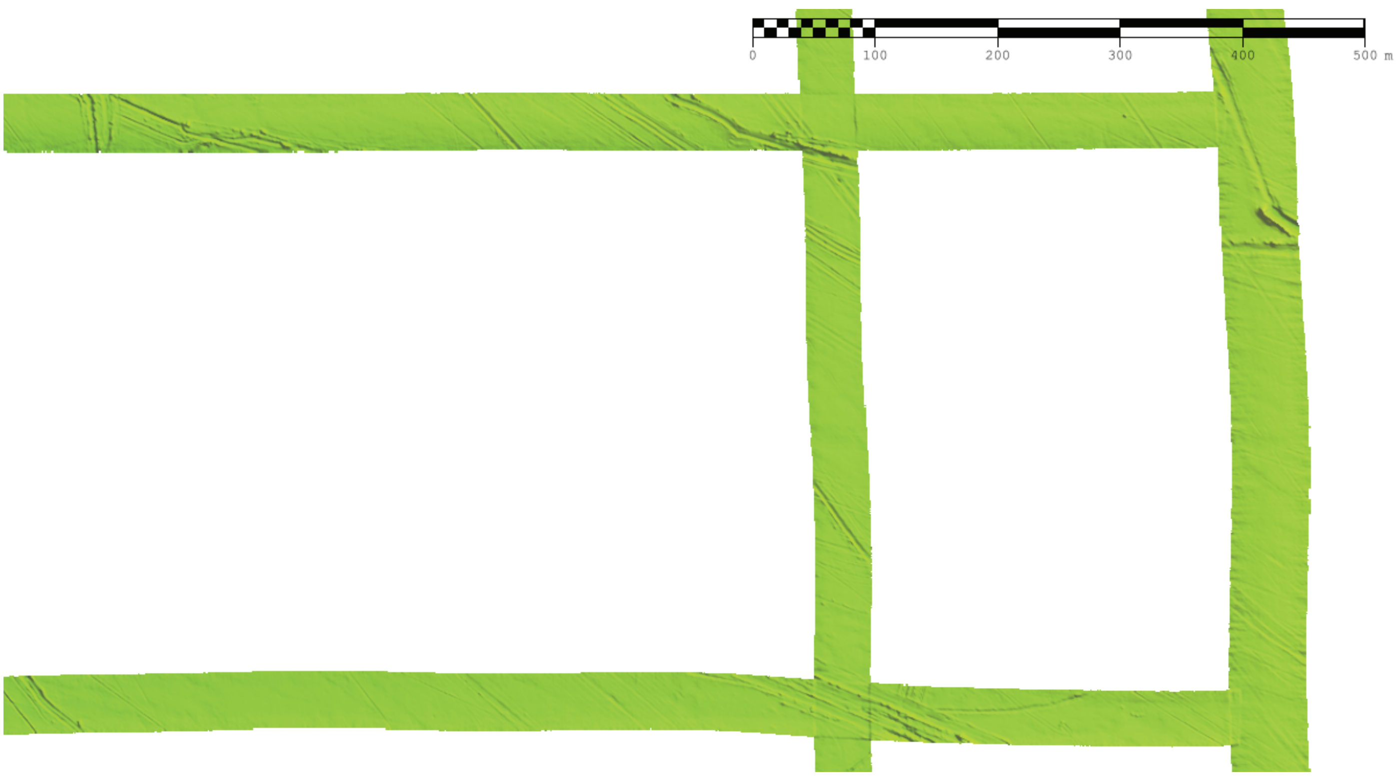

Figure 9: Example of ice scour on this survey. Water depth in this area is about 15 m. A mound is pushed up about 1 m off the seafloor here by scour.

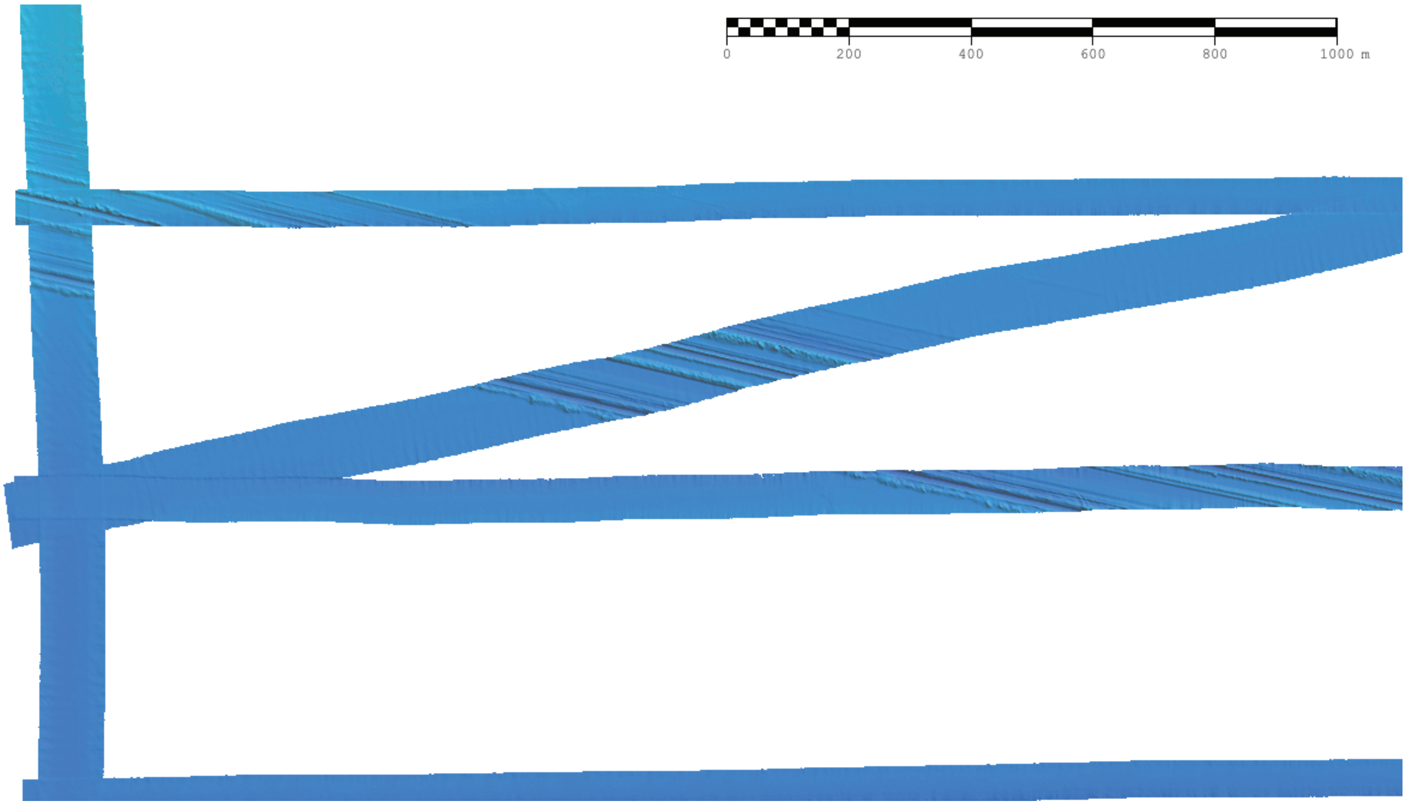

Figure 10: Example of ice scour in deeper water on this survey. Water depth in this area is about 24 m.

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, Hydrographic Survey Project Instructions, and Statement of Work. These data are adequate to supersede charted data in their common areas. This survey is complete and no additional work is required with the exception of deficiencies, if any, noted in the Descriptive Report.

Report Name	Report Date Sent
Survey Outline Submittal	2024-11-11
Final Progress Report	2024-11-15
Trained Marine Mammal Observer Log	2024-12-02
Marine Mammal Sightings Forms	2024-12-02
NCEI Sound Speed Data Submittal	2024-12-23
Coast Pilot Report	2025-01-16

Approver Name	Approver Title	Approval Date	Signature
Andrew Orthmann, CH	Charting Program Manager	01/25/2025	Andrew Orthmann Digitally signed by Andrew Orthmann Date: 2025.01.25 12:25:31 -09'00'

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