H13402

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

DESCRIPTIVE REPORT

Type of Survey:	Navigable Area
Registry Number:	H13402

LOCALITY

State(s):	Alaska
General Locality:	Glacier Bay
Sub-locality:	Pleasant Island

2021

CHIEF OF PARTY
Olivia A Hauser, CDR/NOAA

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Date:

U.S. DEPARTMENT OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION	REGISTRY NUMBER:
HYDROGRAPHIC TITLE SHEET	**H13402**

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:	**Glacier Bay**
Sub-Locality:	**Pleasant Island**
Scale:	**10000**
Dates of Survey:	**06/24/2021 to 07/09/2021**
Instructions Dated:	**03/04/2021**
Project Number:	**OPR-O351-RA-21**
Field Unit:	**NOAA Ship *Rainier***
Chief of Party:	**Olivia A Hauser, CDR/NOAA**
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 8N, 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 H13402

Project: OPR-O351-RA-21

Locality: Glacier Bay

Sublocality: Pleasant Island

Scale: 1:10000

June 2021 - July 2021

NOAA Ship *Rainier*

Chief of Party: Olivia A Hauser, CDR/NOAA

A. Area Surveyed

The survey area is referred to as H13402, "Pleasant Island" (sheet 4), within the Project Instructions. The area encompasses approximately 27 square nautical miles in the vicinity of Pleasant Island near the entrance to Glacier Bay, Alaska.

A.1 Survey Limits

Data were acquired within the following survey limits:

Northwest Limit	Southeast Limit
58° 24' 47.79" N 135° 54' 55.62" W	58° 20' 18.68" N 135° 31' 13.23" W

Table 1: Survey Limits

Data were acquired within the assigned survey limits as required in the Project Instructions and HSSD unless otherwise denoted.

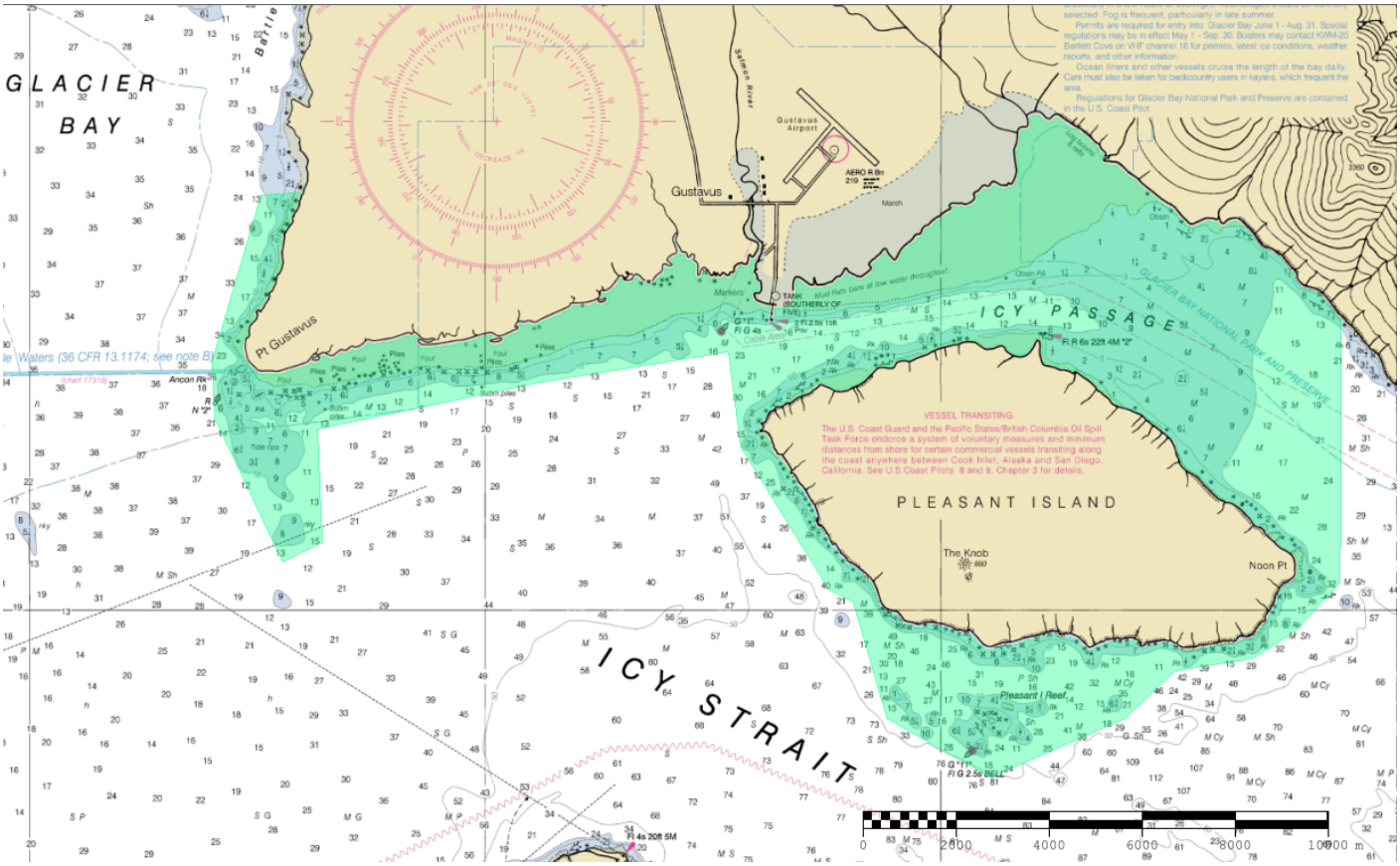


Figure 1: H13402 assigned survey area (Chart 17302).

A.2 Survey Purpose

Glacier Bay in Southeast Alaska was covered by a single ice sheet as recently as the late 1700s. The tidewater glaciers that visitors see today are remnants of the calving and retreat of this glacial ice. In 2019, Glacier Bay National Park received approximately 675,000 visitors traveling by cruise ships, tour boats, charter boats, and private vessels. Most of the glaciers within the bay are thinning and receding due to rapidly warming atmospheric temperatures and ocean water, exposing uncharted areas at the glacier faces. In addition, glacial till has altered the bathymetry in the fjords near the glaciers. While most of Glacier Bay was last surveyed in 2009, the southern portion was last surveyed prior to 2001.

Conducting a modern bathymetric survey in this area will provide critical data for the updating of National Ocean Service (NOS) nautical charting products and services to increase maritime safety in Glacier Bay. 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 water in survey area	Complete Coverage (refer to HSSD Section 5.2.2.3)

Table 2: Survey Coverage

A significant amount of multibeam echosounder coverage was acquired in H13402 to the inshore limit of hydrography, the Navigable Area Limit Line (NALL). The NALL is defined as the most seaward of the following: the surveyed 3.5 meter depth contour, the line defined by the distance seaward from the observed MHW line which is equivalent to 0.8 millimeters at chart scale (the assigned sheet limits closely reflect this) or the inshore limit of safe navigation. Areas where H13402 coverage reached neither 3.5 meters water depth, nor the assigned survey limits, were due to time constraints or encountering unsafe conditions. See the figures below for examples of H13402 MBES coverage.

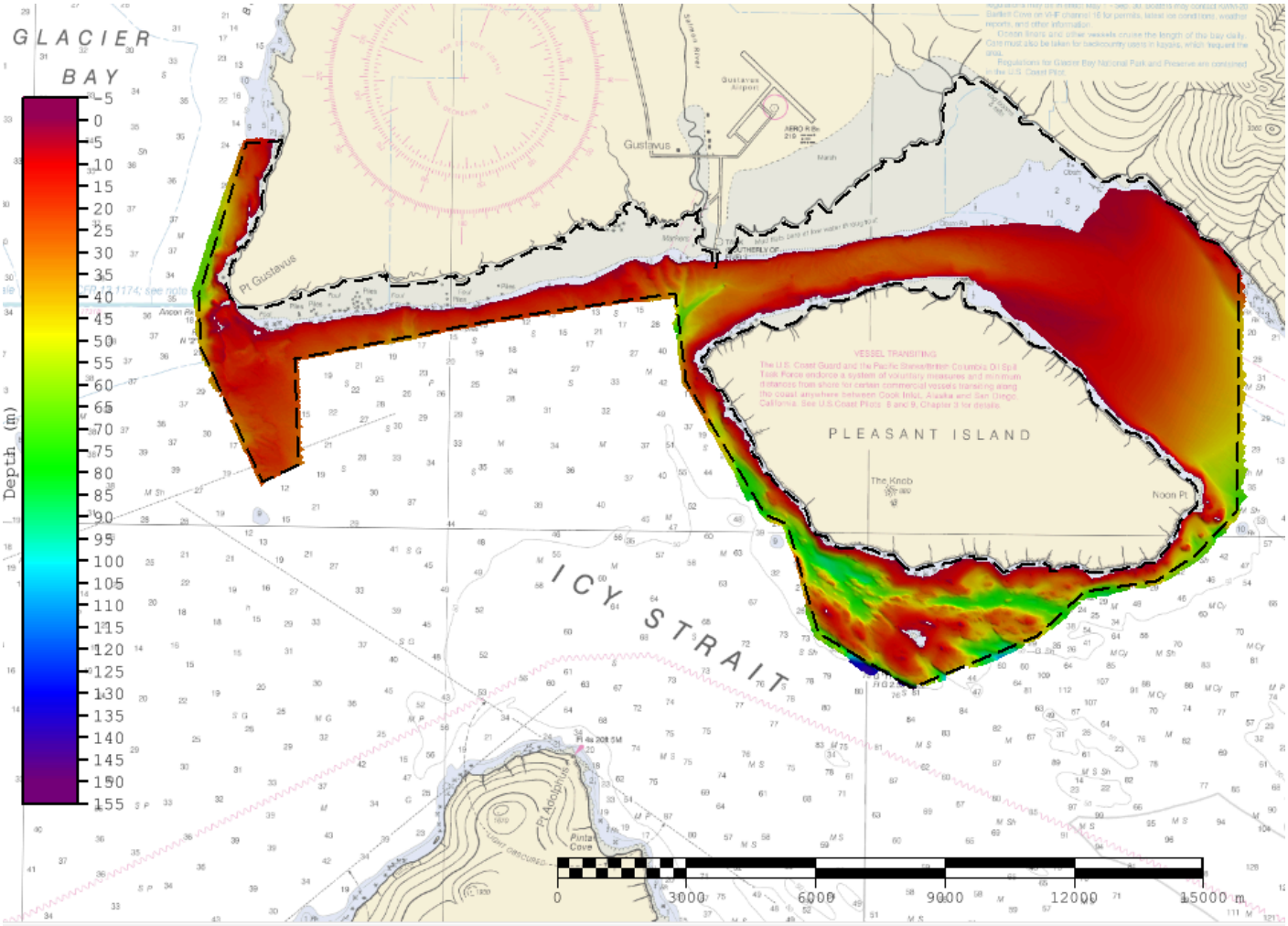


Figure 2: H13402 MBES coverage and assigned survey limits (dashed black line).

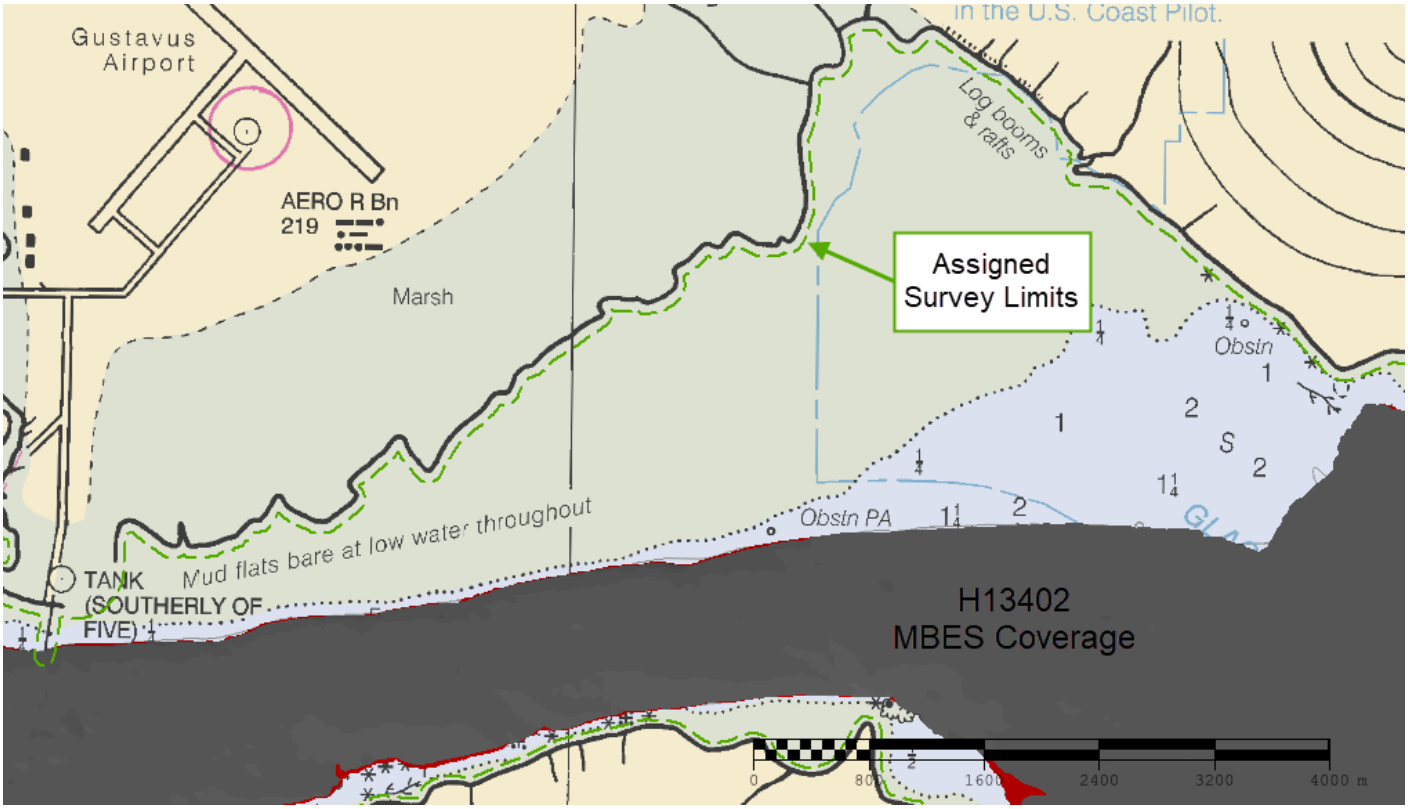


Figure 3: Example where H13402 MBES coverage did not extend to the most inshore limits of the assigned survey area (red indicates 3.5 meter water depth).

A.6 Survey Statistics

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

	HULL ID	*2801*	*2803*	*2802*	*Total*
LNM	**SBES Mainscheme**	0	0	0	0
	MBES Mainscheme	168.3	288.8	314.5	771.6
	Lidar Mainscheme	0	0	0	0
	SSS Mainscheme	0	0	0	0
	SBES/SSS Mainscheme	0	0	0	0
	MBES/SSS Mainscheme	0	0	0	0
	SBES/MBES Crosslines	9.4	7.0	0	16.4
	Lidar Crosslines	0	0	0	0
Number of Bottom Samples					0
Number Maritime Boundary Points Investigated					2
Number of DPs					69
Number of Items Investigated by Dive Ops					0
Total SNM					20.7

Table 3: Hydrographic Survey Statistics

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

Survey Dates	Day of the Year
06/25/2021	176
06/26/2021	177

Survey Dates	Day of the Year
06/27/2021	178
06/28/2021	179
06/29/2021	180
06/30/2021	181
07/02/2021	183
07/03/2021	184
07/04/2021	185
07/05/2021	186
07/06/2021	187
07/07/2021	188
07/08/2021	189
07/09/2021	190

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	*2803*	*2802*	*2801*	*2701*	*1906*
LOA	8.8 meters	8.8 meters	8.8 meters	7.62 meters	5.8 meters
Draft	1.1 meters	1.1 meters	1.1 meters	0.47 meters	0.53 meters

Table 5: Vessels Used

Figure 4: RAINIER survey launch 2803.

All data for H13402 were acquired by NOAA Ship RAINIER survey launches 2801, 2802, and 2803. These launches acquired MBES bathymetry, backscatter imagery and sound speed profiles. NOAA Ship RAINIER's jet boat 2701 and skiff 1906 conducted shoreline feature verification.

B.1.2 Equipment

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

Manufacturer	Model	Type
Applanix	POS MV 320 v5	Positioning System
Sea-Bird Scientific	SBE 19plus	Conductivity, Temperature, and Depth Sensor
Kongsberg Maritime	EM 2040	MBES
Teledyne RESON	SVP 70	Sound Speed System

Table 6: Major Systems Used

B.2 Quality Control

B.2.1 Crosslines

RAINIER launches 2801 and 2803 acquired 16.4 nautical miles (2.1% of mainscheme) of MBES crossline data across all depth ranges, water masses and boat days that were operationally practical in order to evaluate the internal consistency of H13402 sonar data. Crossline analysis was performed using the Compare Grids function within Pydro Explorer on Caris variable-resolution surfaces of H13402 mainscheme only and crossline only data. 99.5+% of grid nodes met allowable uncertainties, see Pydro generated histograms below.

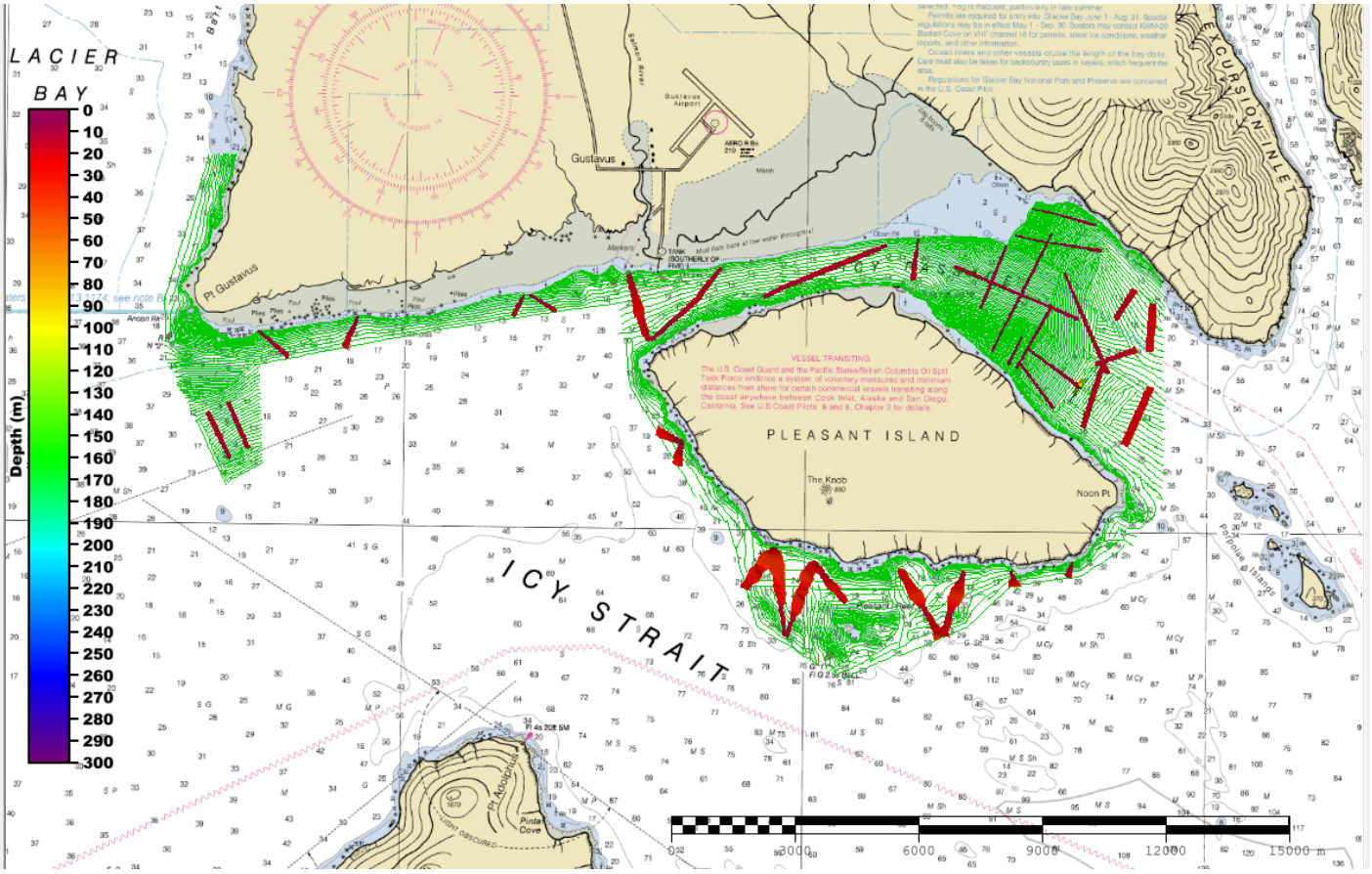
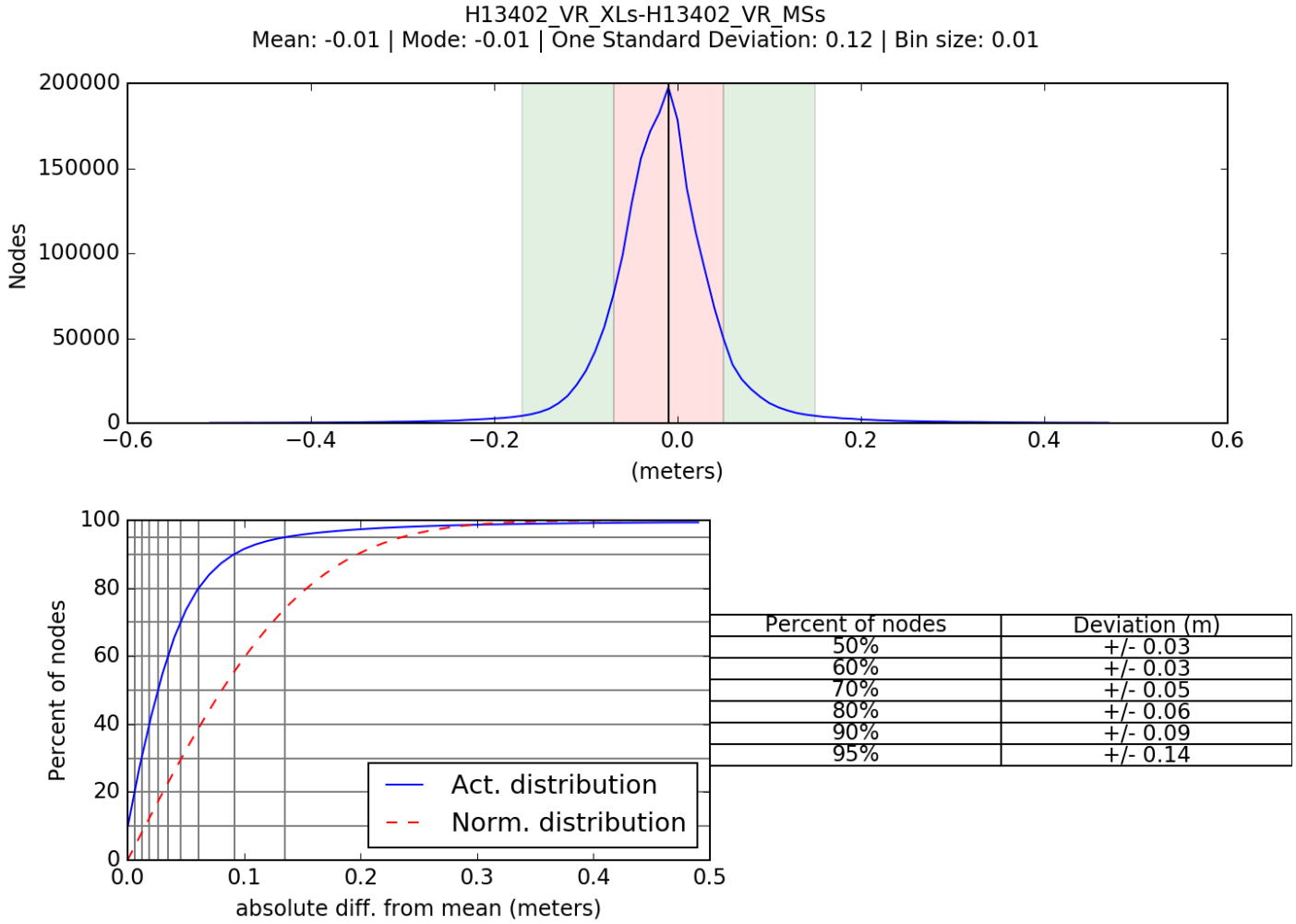


Figure 5: H13402 crossline surface overlaid on mainscheme track lines.



Percent of nodes	Deviation (m)
50%	+/- 0.03
60%	+/- 0.03
70%	+/- 0.05
80%	+/- 0.06
90%	+/- 0.09
95%	+/- 0.14

Figure 6: Pydro derived plot showing absolute difference statistics of H13402 mainscheme to crossline data.

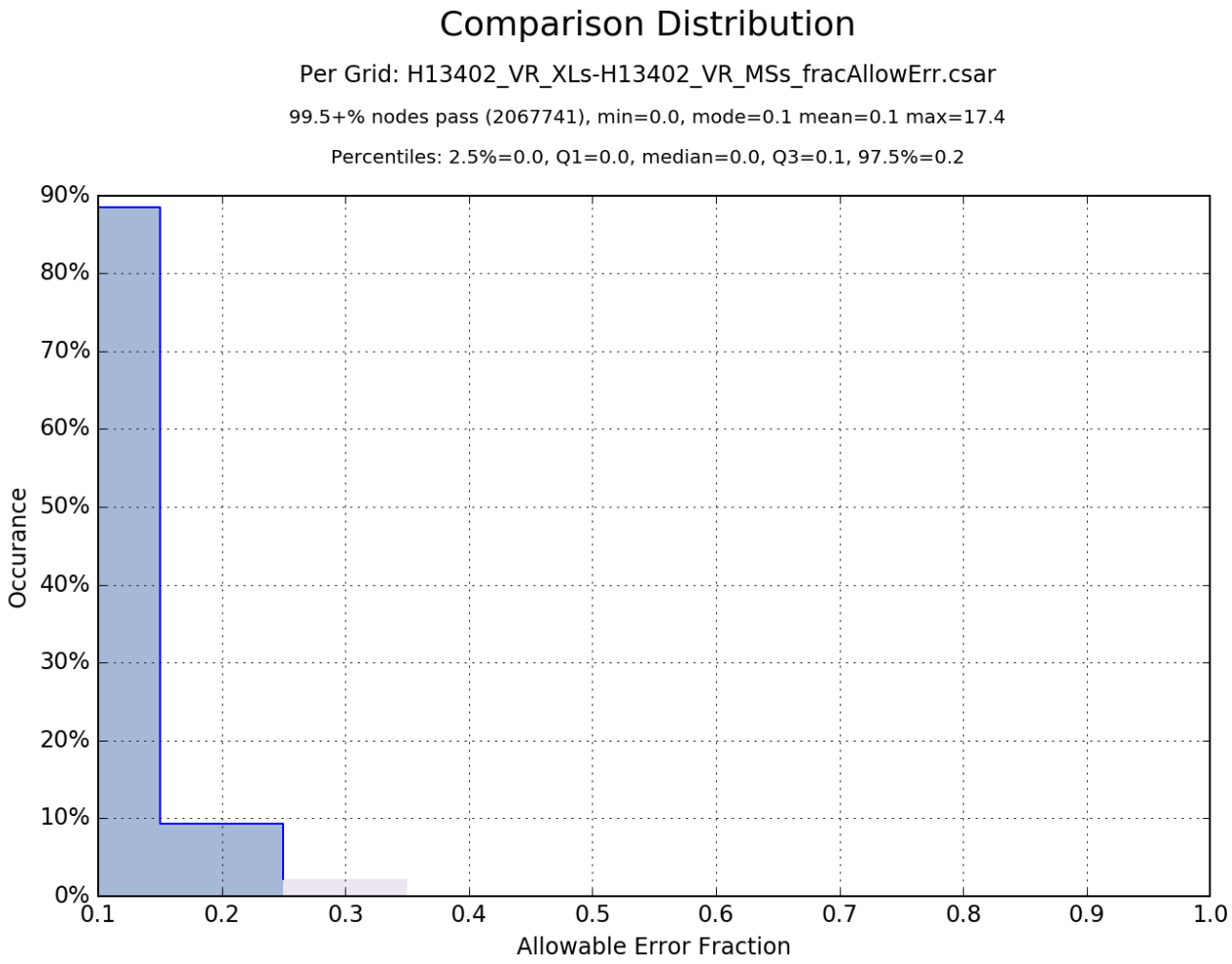


Figure 7: Pydro derived plot showing percentage pass value of H13402 mainscheme to crossline data.

B.2.2 Uncertainty

The following survey specific parameters were used for this survey:

Method	Measured	Zoning
ERS via VDATUM	0 meters	0.13 meters

Table 7: Survey Specific Tide TPU Values.

Hull ID	Measured - CTD	Measured - MVP	Measured - XBT	Surface
2808,2803,2804	3 meters/second	N/A	N/A	.05 meters/second

Table 8: Survey Specific Sound Speed TPU Values.

Total Propagated Uncertainty (TVU) values for survey H13402 were derived from from a combination of fixed values for equipment and vessel characteristics, as well as from field assigned values for sound speed uncertainties. Tidal uncertainty was provided in the project instructions for the NOAA vertical datum transformation model used for this survey.

In addition to the usual a priori estimates of uncertainty via device models for vessel motion and ERTDM/ VDATUM/TCARI, real-time and post-processed uncertainty sources were also incorporated into the depth estimates of survey H13402. Real-time uncertainties were provided via EM2040 MBES data and Applanix Delayed Heave RMS. Following post-processing of the real-time vessel motion, recomputed uncertainties of vessel roll, pitch, gyro and navigation were applied in CARIS HIPS and SIPS via a Smoothed Best Estimate of Trajectory (SBET) RMS file generated in Applanix POSPac.

Uncertainty values of the submitted finalized grids were calculated in Caris using "Greater of the Two" of uncertainty and standard deviations (scaled to 95%). Grid QA v5 within Pydro QC Tools was used to analyze H13402 TVU compliance. H13402 met HSSD requirements in over 99.5 percent of grid nodes, which is shown in the histogram plot below.

Pydro QC Tools 2 Grid QA was used to analyze H13402 multibeam echosounder (MBES) data density. The submitted H13402 variable-resolution (VR) surface met HSSD density requirements shown in the histograms below.

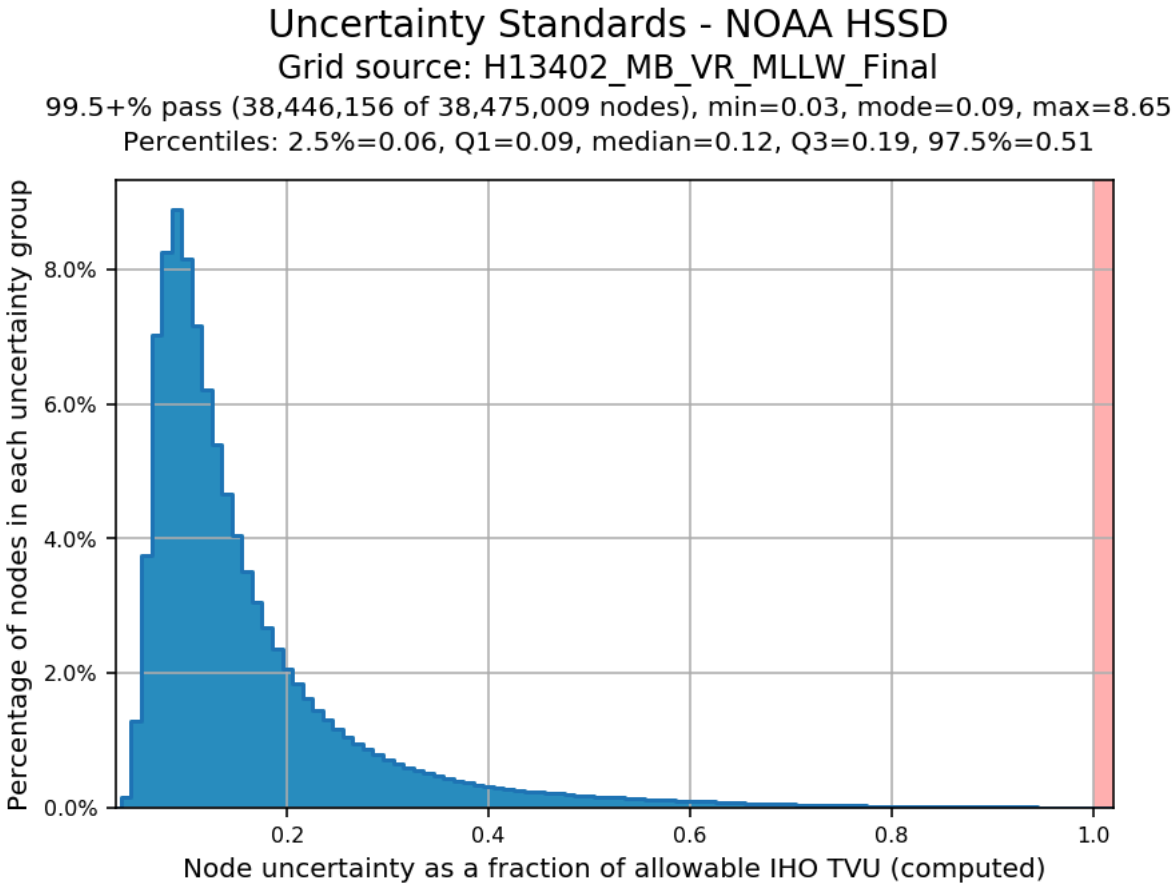


Figure 8: Pydro derived plot showing TVU compliance of H13402 finalized variable-resolution MBES data.

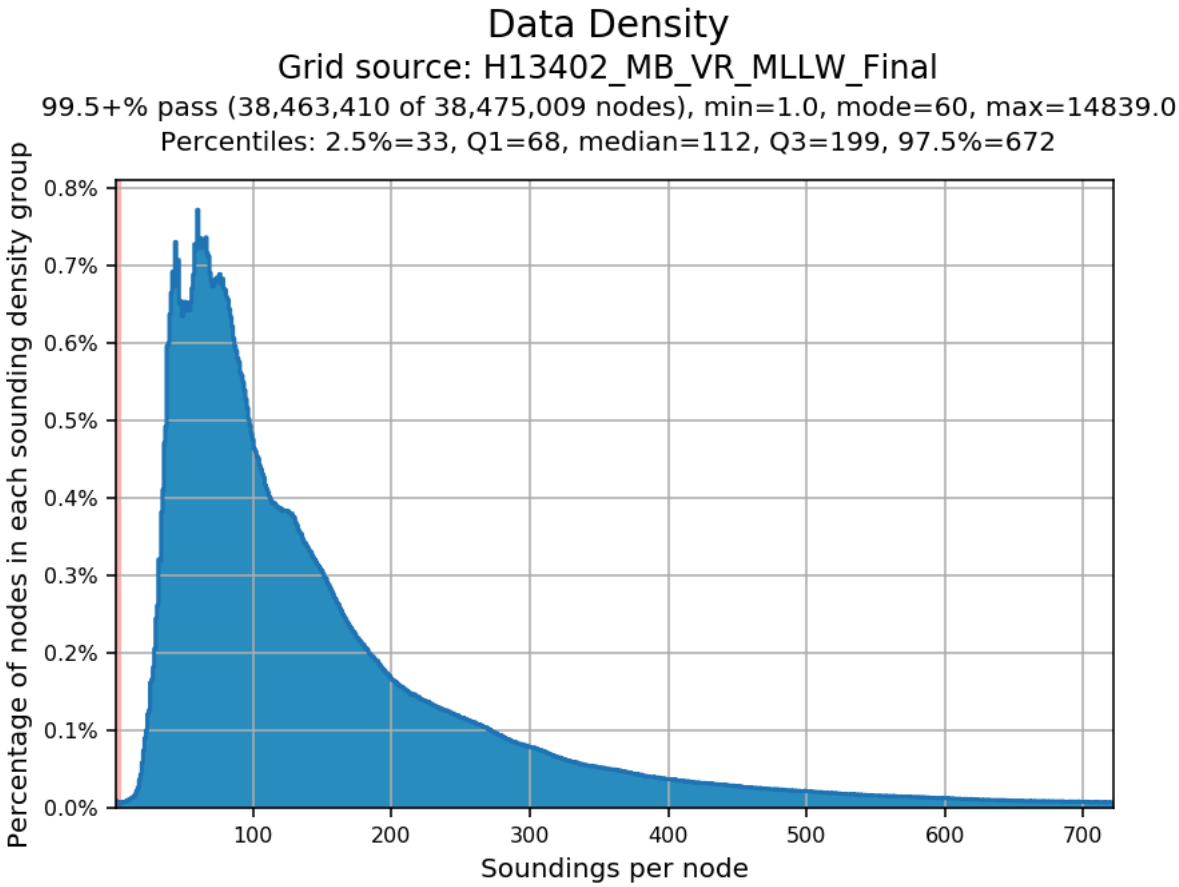


Figure 9: Pydro derived plot showing HSSD density compliance of H13402 finalized variable-resolution MBES data.

B.2.3 Junctions

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 on 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: 80 sound speed profiles were acquired for this survey at discrete locations within the survey area at least once every four hours, when significant changes to surface sound speed were observed, or when moving survey operations to a new area.

Sound speed data were acquired using Sea-Bird Scientific SBE 19plus profilers. All casts were concatenated into a master file and applied to H13402 MBES data using "nearest distance within time" (4 hours) profile selection method.

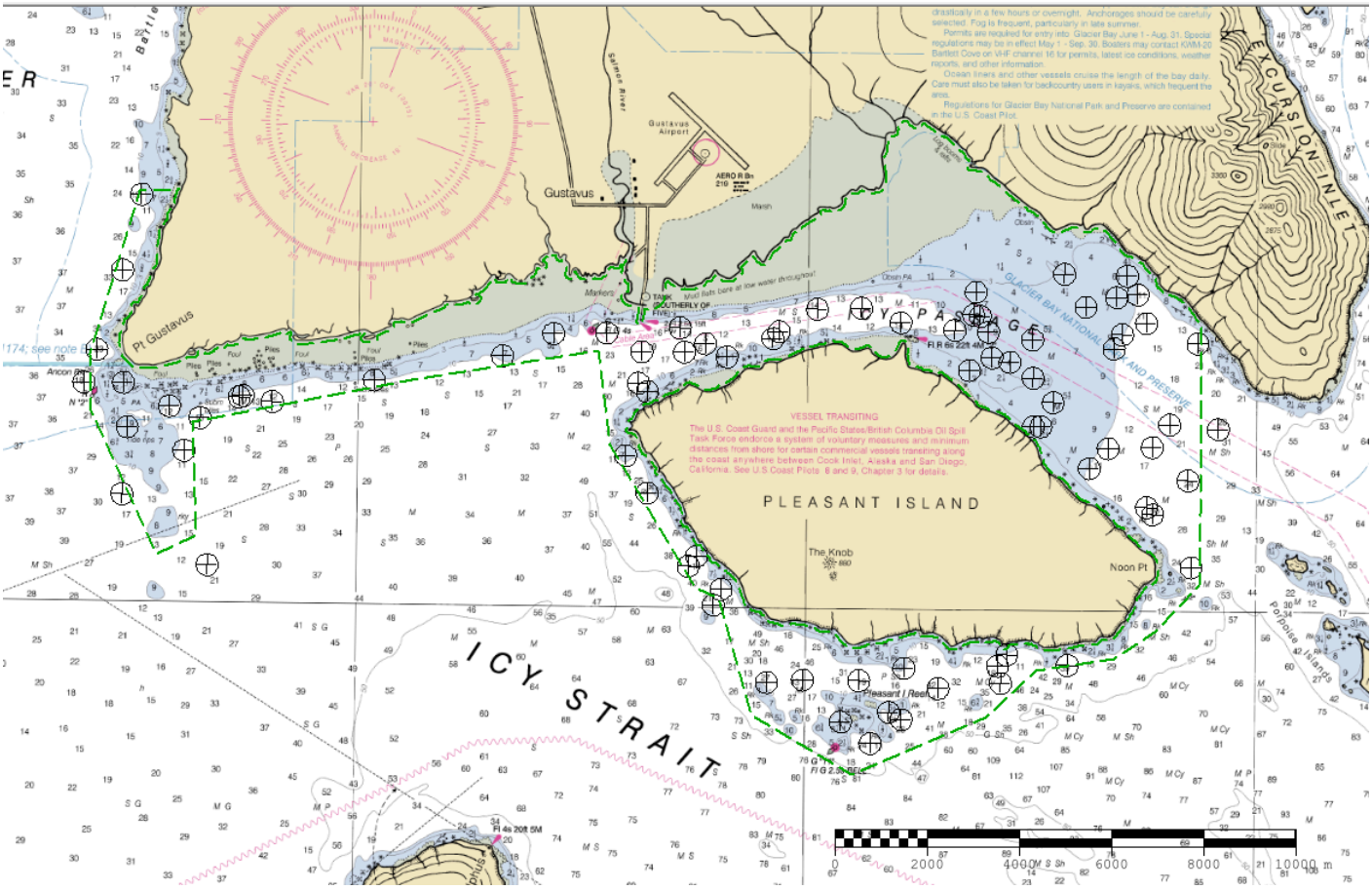


Figure 10: H13402 sound speed cast locations.

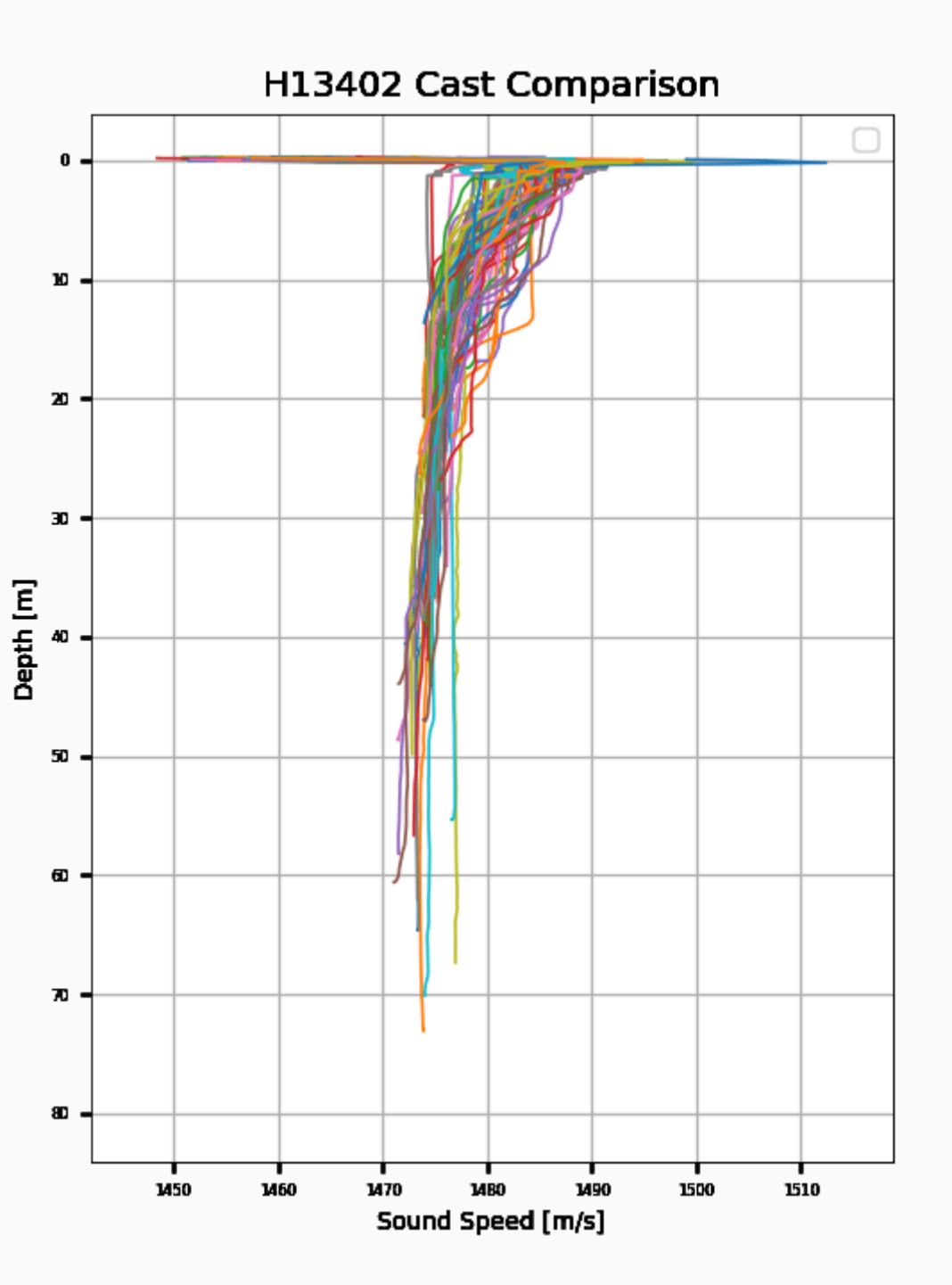


Figure 11: H13402 sound speed cast comparison graph.

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

Delayed heave data failed to apply to one H13402 MBES line (0015_20210630_213325_2801_300A_181) due to a data gap that exceeded the allowable two second limit. Our current ERS processing work flow overwrites delayed heave data, therefore the absence of heave on this line had no adverse effect. The line shows good agreement with adjacent data.

B.3.2 Calibrations

All sounding systems were calibrated as detailed in the DAPR.

B.4 Backscatter

Raw backscatter data were acquired as .ALL files logged during MBES operations and subsequently processed by RAINIER personnel. The .GSF files created during processing and backscatter mosaic data has been delivered with this report. Backscatter processing procedures are described in the DAPR.

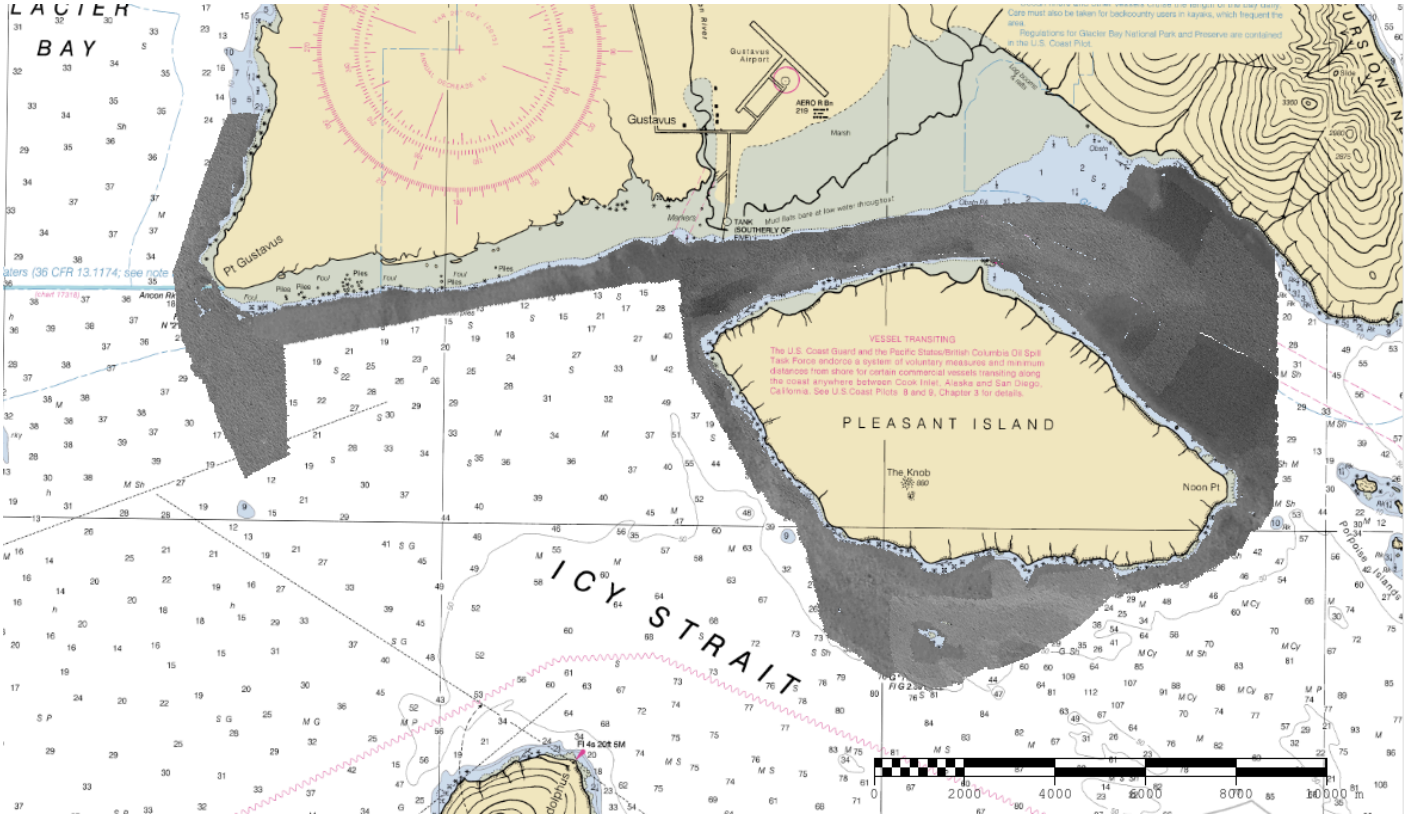


Figure 12: Overview of H13402 multibeam acoustic backscatter coverage.

B.5 Data Processing

B.5.1 Primary Data Processing Software

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

Manufacturer	Name	Version
CARIS	HIPS and SIPS	11.3.15

Table 9: Primary bathymetric data processing software

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

Manufacturer	Name	Version
QPS	FMGT	7.9.4

Table 10: Primary imagery data processing software

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

B.5.2 Surfaces

The following surfaces and/or BAGs were submitted to the Processing Branch:

Surface Name	Surface Type	Resolution	Depth Range	Surface Parameter	Purpose
H13402_MB_VR_MLLW	CARIS VR Surface (CUBE)	Variable Resolution	-0.53 meters - 152.92 meters	NOAA_VR	Complete MBES
H13402_MB_VR_MLLW_Final	CARIS VR Surface (CUBE)	Variable Resolution	-0.53 meters - 152.92 meters	NOAA_VR	Complete MBES

Table 11: Submitted Surfaces

Submitted H13402 surfaces were generated using NOAA recommended parameters for depth-based (Ranges) Caris variable-resolution bathymetric grids.

Pydro QC Tools (v3.4.5) Flier Finder program was used to assist in the search for spurious soundings following initial cleaning. Flier Finder was run iteratively until the nine fliers remaining were deemed to be real features on the seafloor.

Pydro QC Tools v3.4.5 Holiday Finder was used with default settings to find holidays in the finalized H13402 VR surface. Holiday Finder detected 12 holidays in the complete coverage surface. Of the detected holidays, 8 are on known features that could not be safely surveyed over top of. The remaining 4 detected holidays were confirmed to be gaps in data coverage, but they do not impact the reliability of the data. The 4 holidays that were data gaps were reviewed in the MBES data and based on the surrounding depths and location, it is assumed that there are no features or shoals of concern.

C. Vertical and Horizontal Control

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

C.1 Vertical Control

The vertical datum for this project is Mean Lower Low Water.

ERS Datum Transformation

The following ellipsoid-to-chart vertical datum transformation was used:

Method	Ellipsoid to Chart Datum Separation File
ERS via VDATUM	OPR-O351-FA-20_VDatum_100m_NAD83(2011)-MLLW_XGEOID16B.csar OPR-O351-FA-20_VDatum_100m_NAD83(2011)-MHW_XGEOID16B.csar

Table 12: ERS method and SEP file

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 8.

RTK

Precise Positioning-Real time Extended (PP-RTX) processing methods were used in Applanix POSPac MMS (v8.5) software for post-processing horizontal correction of submitted H13402 MBES data.

WAAS

The Wide Area Augmentation System (WAAS) was used for real-time horizontal control during data acquisition.

D. Results and Recommendations

D.1 Chart Comparison

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
US4AK36M	1:80000	1992	07/12/2021	07/12/2021

Table 13: Largest Scale ENCs

D.1.2 Shoal and Hazardous Features

A significant number of H13402 assigned features were addressed, however features inshore of the NALL were not investigated and are labeled as such in the H13402 Final Feature File (FFF). Due to a limited shoreline window, shoreline investigation was limited to areas with the most navigationally significant features.

D.1.3 Charted Features

Ancon Rock near Point Gustavus was found to be mis-charted and has been repositioned. In addition, a charted wreck (PA) near Point Gustavus was disproved with MBES coverage. An obstruction PA located on the northern shore of Icy Passage was inshore of the NALL and not investigated. See the H13402 FFF submitted with this report for more information. No Dangers To Navigation (DTON) were identified within the H13402 survey area.

D.1.4 Uncharted Features

Three previously uncharted wrecks were located within the H13402 survey area. Refer to the H13402 Final Feature File for additional information.

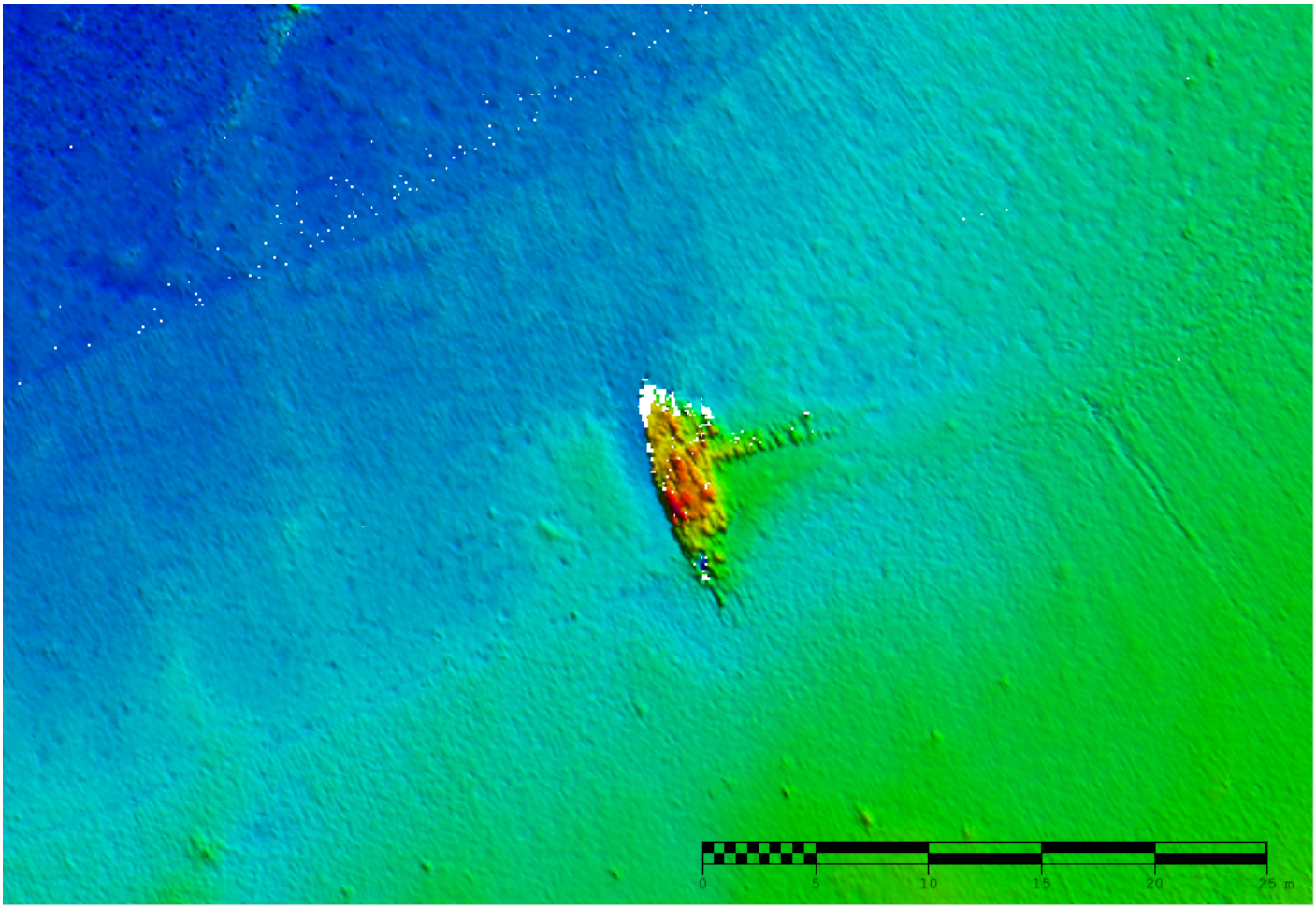


Figure 13: H13402 MBES coverage of apparent submerged wreck.

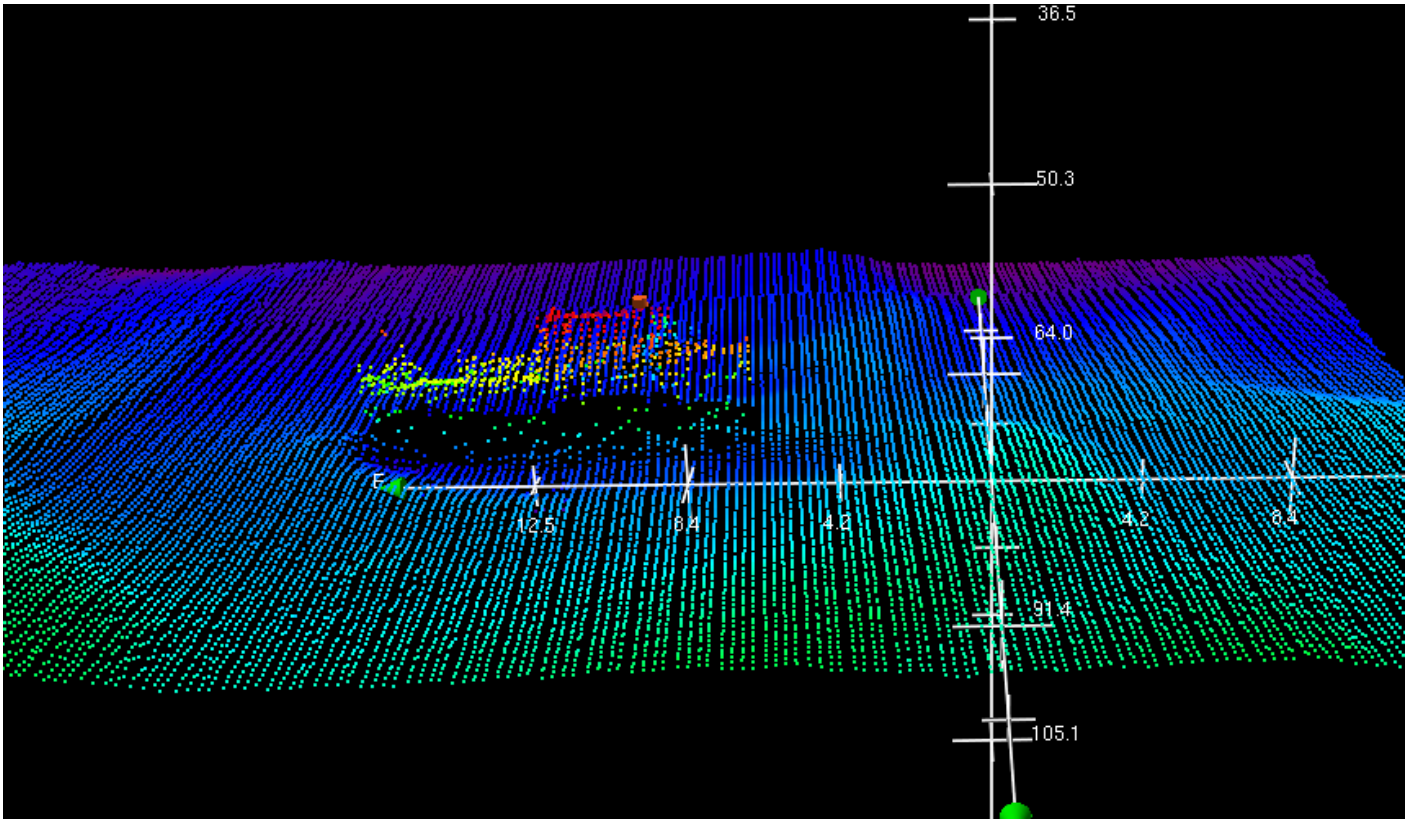


Figure 14: 3-D subset view of apparent H13402 wreck.

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

Three Aids to Navigation (ATON) were investigated (Icy Passage Light 2, Pleasant Island Lighted Bell Buoy 11 and Ancon Rock Buoy 2) and appeared to be serving their intended purpose. Gustavus Lighted Buoy 1, Gustavus Dock West Light and three markers for the approach to the Salmon River near Gustavus were not investigated due to time constraints.

D.2.2 Maritime Boundary Points

Five Maritime Boundary Points (MBP) were assigned, two were investigated at Pleasant Reef, the other three were not investigated. The unaddressed MBPs where on the south side of Pleasant Island where shoreline investigation was not conducted due to time constraints and limited shoreline windows.

D.2.3 Bottom Samples

Three bottom samples were assigned for this survey. Multiple collection attempts where made, but were unsuccessful. A possible explanation for this unsuccessful outcome is the rocky nature of the seafloor at the sample sites.

D.2.4 Overhead Features

No overhead features exist for this survey.

D.2.5 Submarine Features

A feature resembling a cable was seen in a 0.5-meter resolution H13402 MBES surface. The feature, located in Icy Passage, is approximately one nautical mile west of the day mark on the north shore of Pleasant Island, see image below.

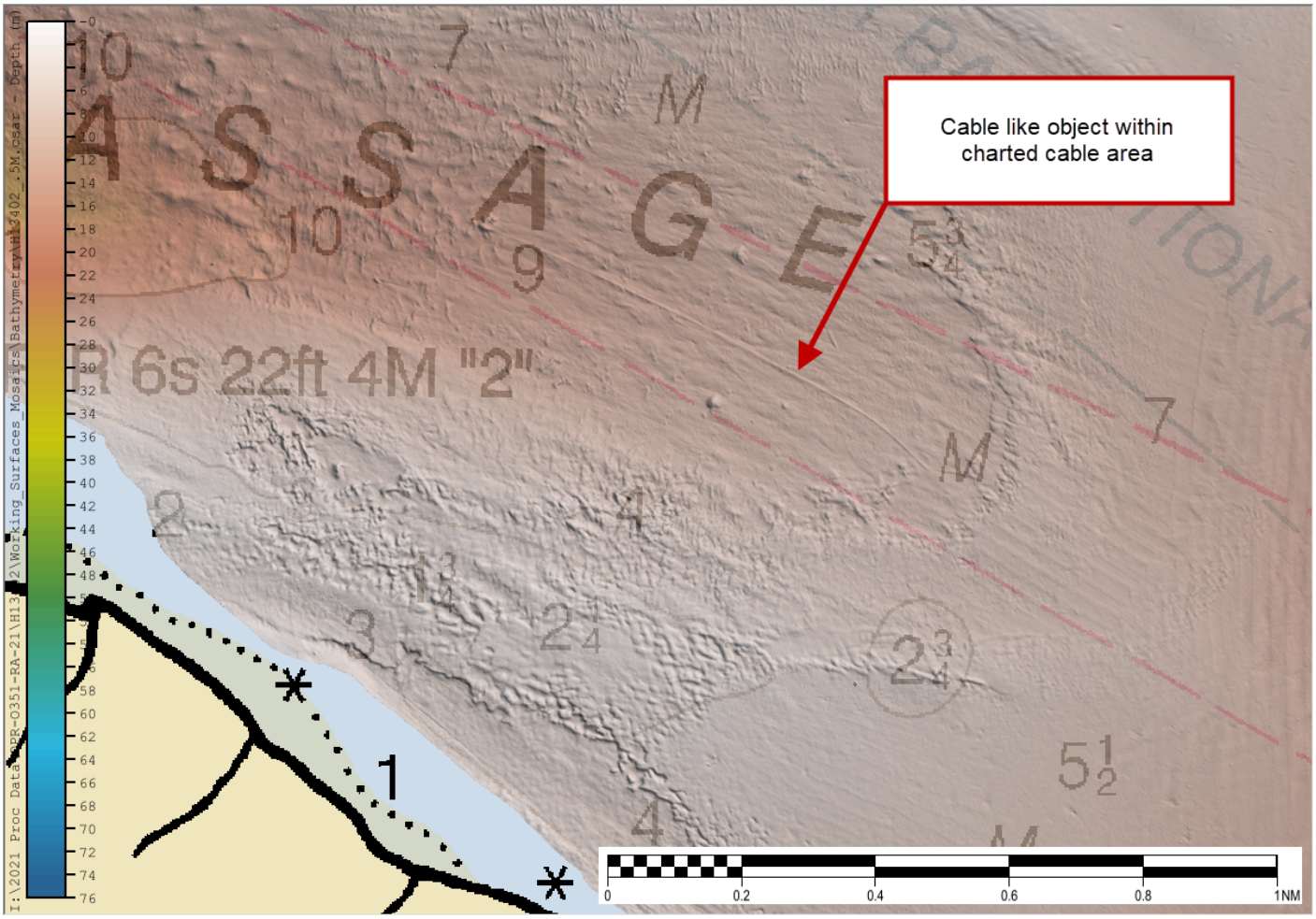


Figure 15: Feature resembling a cable, located within a charted cable area.

D.2.6 Platforms

No platforms exist for this survey.

D.2.7 Ferry Routes and Terminals

Ferry routes and/or terminals exist for this survey, but were not investigated.

D.2.8 Abnormal Seafloor or Environmental Conditions

Some interesting seafloor fetures were observed within the H13402 survey area, including sand waves and scours, see images below.

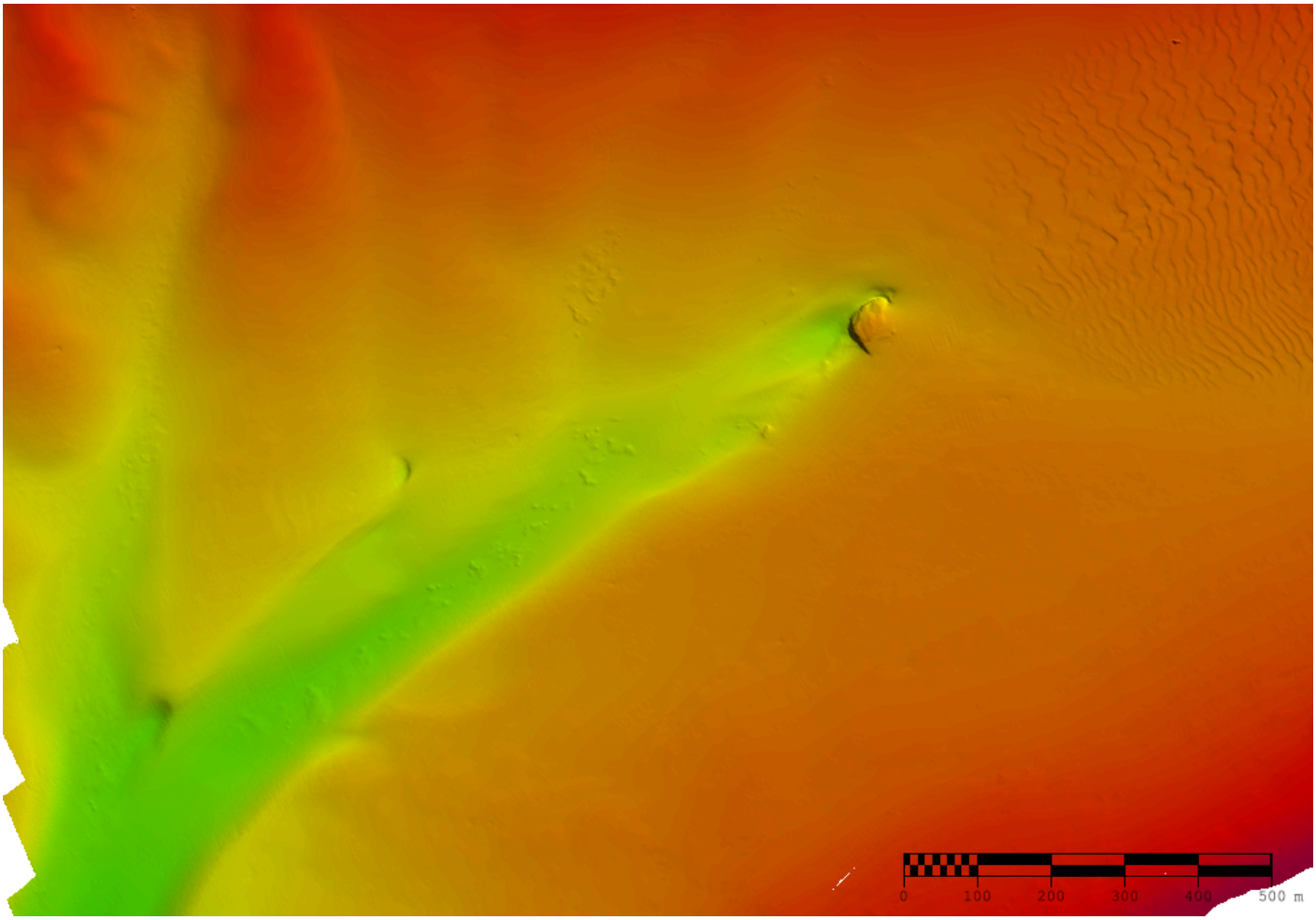


Figure 16: Seafloor scours near Gustavus pier.

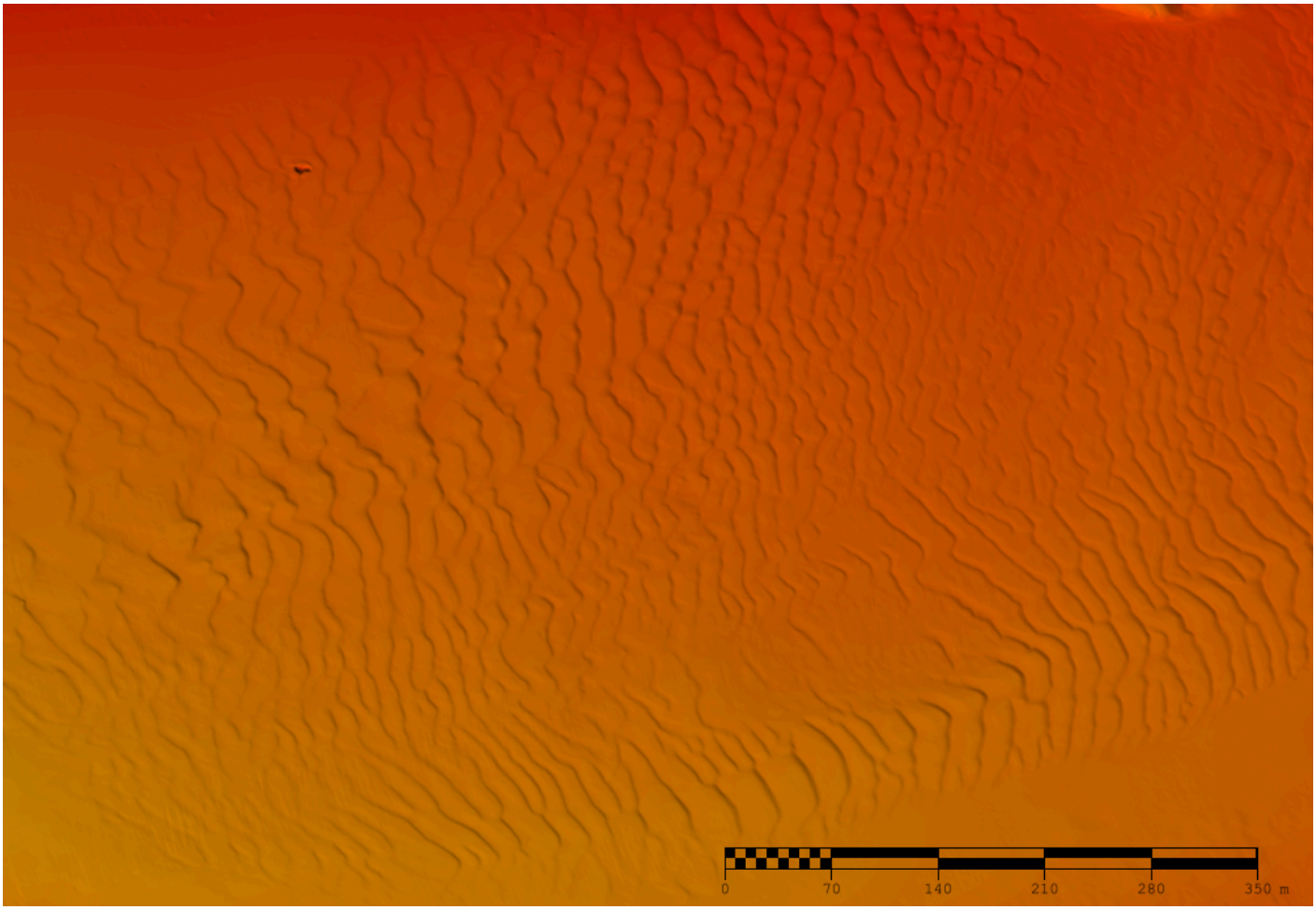


Figure 17: Sand waves near Gustavus pier.

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
Olivia A Hauser, CDR/NOAA	Chief of Party	12/01/2021	HAUSER.OLIVIA.ANN.1275636009 2021.12.01 17:08:55 -08'00'
Dylan A Koston, LT/NOAA	Field Operations Officer	12/01/2021	Digitally signed by KOSTEN.DYLAN.ANDREW.1504527405 Date: 2021.12.01 12:37:38 -08'00'
James B Jacobson	Chief Survey Technician	12/01/2021	JACOBSON.JAMES.BRYAN.1269664017 I have reviewed this document 2021.12.01 10:41:24 -08'00'
Bailey A Schrader	Sheet Manager	12/01/2021	

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