H13071

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

DESCRIPTIVE REPORT

Type of Survey:	Navigable Area
Registry Number:	H13071

LOCALITY

State(s):	Alaska
General Locality:	Yakutat Bay
Sub-locality:	Disenchantment Bay

2017

CHIEF OF PARTY
CDR Mark Van Waes, NOAA

LIBRARY & ARCHIVES

Date:

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

REGISTRY NUMBER:

HYDROGRAPHIC TITLE SHEET

H13071

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:	**Yakutat Bay**
Sub-Locality:	**Disenchantment Bay**
Scale:	**40000**
Dates of Survey:	**09/02/2017 to 11/03/2017**
Instructions Dated:	**08/10/2017**
Project Number:	**OPR-O346-FA-17**
Field Unit:	**NOAA Ship *Fairweather***
Chief of Party:	**CDR Mark Van Waes, 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:

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Descriptive Report to Accompany Survey H13071

Project: OPR-O346-FA-17

Locality: Yakutat Bay

Sublocality: Disenchantment Bay

Scale: 1:40000

September 2017 - November 2017

NOAA Ship *Fairweather*

Chief of Party: CDR Mark Van Waes, NOAA

A. Area Surveyed

The survey area is located in Yakutat Bay within the sub locality of Disenchantment Bay.

A.1 Survey Limits

Data were acquired within the following survey limits:

Northwest Limit	Southeast Limit
60° 1' 57.03" N 139° 37' 39.9" W	59° 55' 49.02" N 139° 29' 53.81" W

Table 1: Survey Limits

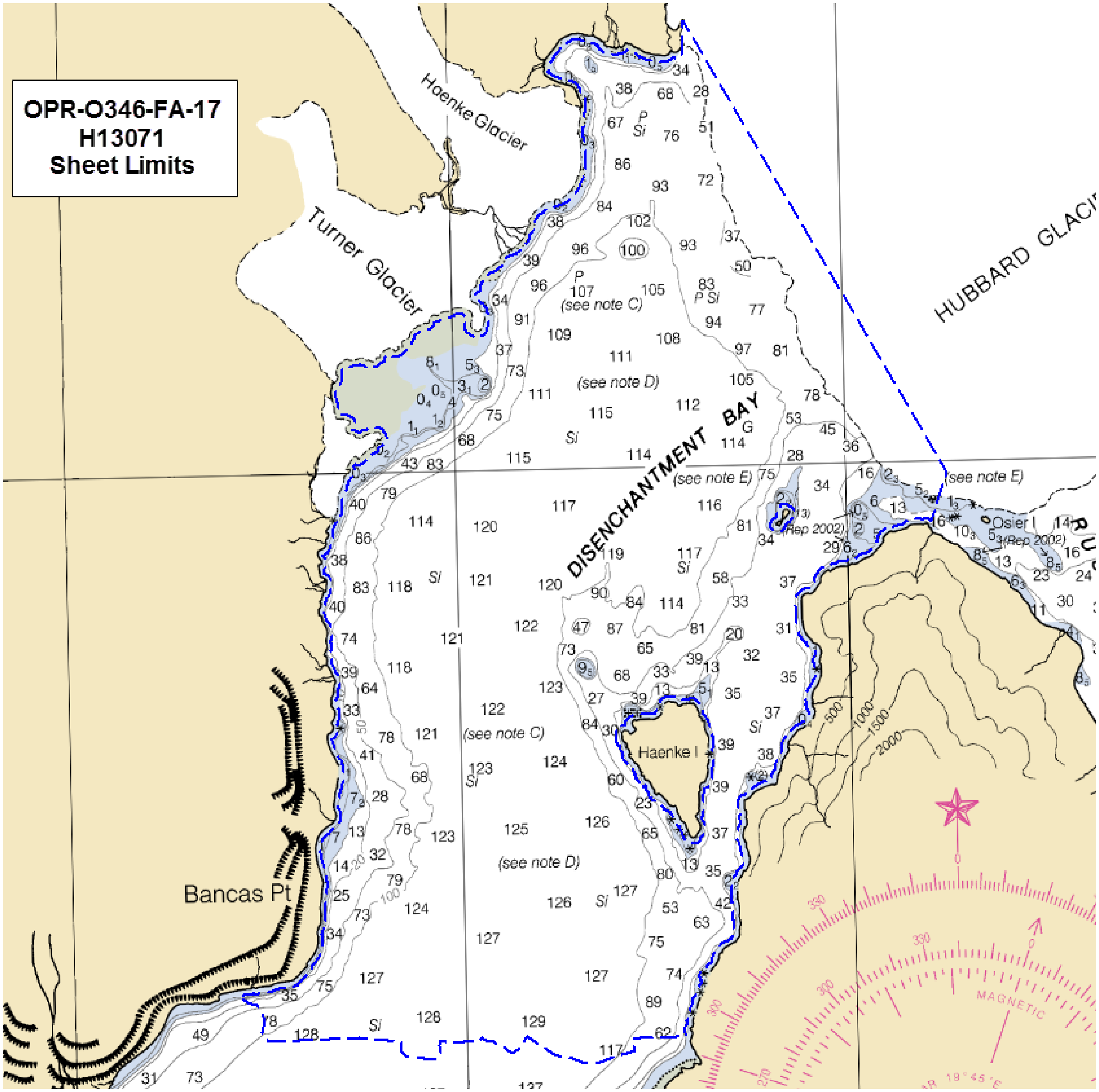


Figure 1: H13071 sheet limits (in blue) overlaid onto Chart 16761

Data were acquired to the survey limits in accordance with the requirements in the Project Instructions and the April 2017 NOS Hydrographic Surveys Specifications and Deliverables (HSSD), as shown in Figure 1. In all areas where the four meter depth contour or the sheet limits were not met, the Navigable Area Limit Line (NALL) was defined as the inshore limit of bathymetry due to the risks of maneuvering the survey vessel in close proximity to the steep and rocky shoreline, near the glacial terminus, and in proximity to ice debris.

Additionally, a 1000 meter safety buffer was observed in front of the glacial terminus of Hubbard Glacier, the only actively calving glacier in Disenchantment Bay. The Hubbard Glacier has advanced up to 1200 meters since Chart 16761 was published. The 1000 meter safety buffer was drawn according to the glacial terminus as shown by a LANDSAT image taken in July 2017 (Figure 2).

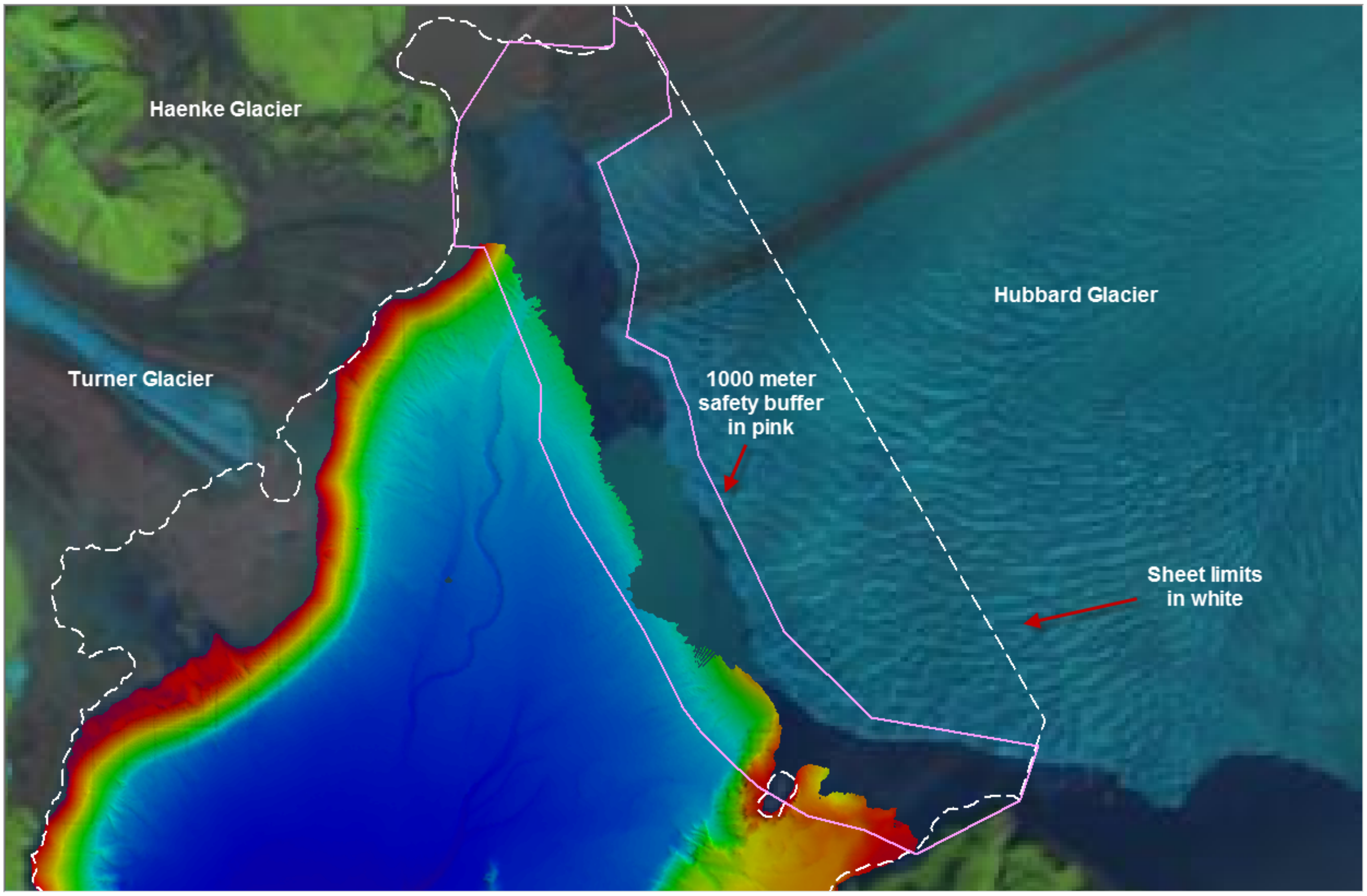


Figure 2: Glacial safety buffer drawn on LANDSAT imagery

A.2 Survey Purpose

Yakutat Bay has seen a rapid increase in the number and size of visiting vessels in recent years. Much of this can be attributed to ecotourism amid the area's glaciers, wilderness, and Tongass National Forest. Hubbard Glacier, one of four glaciers which terminate in Disenchantment Bay at the north end of Yakutat Bay, is the largest tidewater glacier in North America. Unlike most other glaciers in Alaska, which are receding, Hubbard's terminus is predicted to continue advancing during the next several years. As a result of this advancement and the glacier's dramatic calving displays, the glacier is likely to draw more vessel traffic for the foreseeable future to an area of shifting moraines and lag deposits.

A.3 Survey Quality

The entire survey is adequate to supersede previous data.

Data acquired in H13071 meet multibeam echo sounder (MBES) coverage requirements for complete coverage, as required by the HSSD. This includes crosslines (see Section B.2.1), NOAA allowable uncertainty (see Section B.2.10), and density requirements (see Section B.2.11). Additional compliance statistics can be found in the Standards and Compliance Review located in Appendix II of this report.

A.4 Survey Coverage

The following table lists the coverage requirements for this survey as assigned in the project instructions:

Water Depth	Coverage Required
All waters in survey area	Complete Coverage Multibeam

Table 2: Survey Coverage

The entirety of H13071 was acquired with complete coverage MBES, meeting the requirements listed above and in the HSSD. See Figure 3 for an overview of coverage.

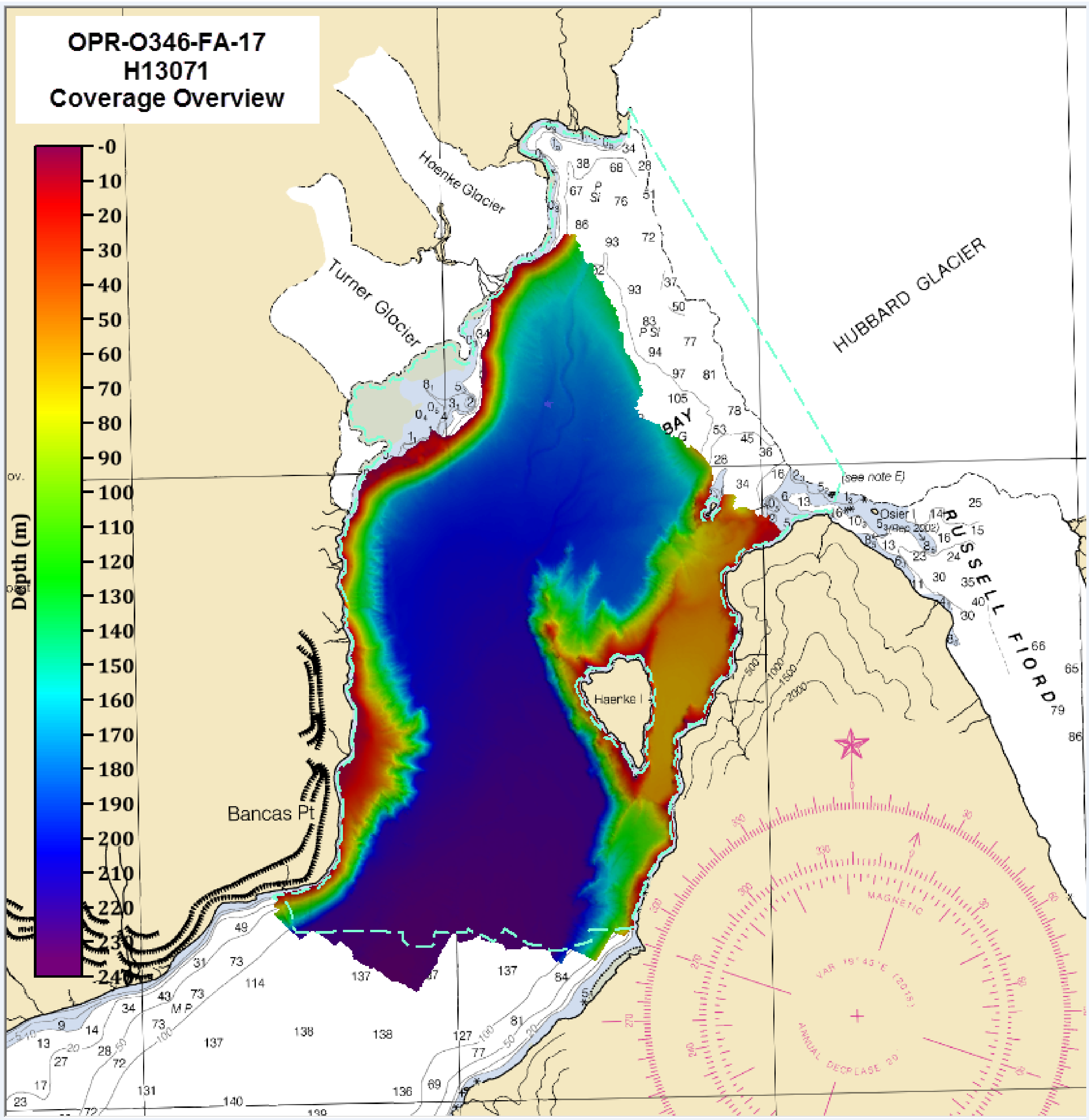


Figure 3: H13071 survey coverage overlaid onto Chart 16761

A.6 Survey Statistics

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

	HULL ID	*2806*	*2807*	*S220*	*Total*
LNM	SBES Mainscheme	0	0	0	0
	MBES Mainscheme	64.39	58.58	8.57	131.54
	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	3.45	7.81	0	11.26
	Lidar Crosslines	0	0	0	0
Number of Bottom Samples					2
Number Maritime Boundary Points Investigated					0
Number of DPs					0
Number of Items Investigated by Dive Ops					0
Total SNM					13.16

Table 3: Hydrographic Survey Statistics

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

Survey Dates	Day of the Year
09/16/2017	259
09/17/2017	260

Survey Dates	Day of the Year
09/18/2017	261
10/14/2017	287

Table 4: Dates of Hydrography

B. Data Acquisition and Processing

B.1 Equipment and Vessels

Refer to the OPR-O346-FA-17 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	***S220***	***2806***	***2807***
LOA	70.4 meters	8.6 meters	8.6 meters
Draft	4.8 meters	1.1 meters	1.1 meters

Table 5: Vessels Used

B.1.2 Equipment

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

Manufacturer	Model	Type
Kongsberg Maritime	EM 710	MBES
Kongsberg Maritime	EM 2040	MBES
Sea-Bird Scientific	SBE 19plus V2	Conductivity, Temperature, and Depth Sensor
AML Oceanographic	MVP200	Conductivity, Temperature, and Depth Sensor
Teledyne RESON	SVP 70	Sound Speed System
Teledyne RESON	SVP 71	Sound Speed System
Applanix	POS MV 320 v5	Positioning and Attitude System

Table 6: Major Systems Used

The equipment was installed on the survey platforms as follows: S220 utilizes the Kongsberg EM 710 MBES, SVP 70 surface sound speed sensors, and AML Oceanographic MVP 200 for conductivity, temperature, and depth (CTD) casts. All launches utilize Kongsberg EM 2040 MBES, Teledyne RESON SVP71 surface sound speed sensors, and Sea-Bird Scientific 19plus CTD casts.

B.2 Quality Control

B.2.1 Crosslines

Multibeam/single beam echo sounder/side scan sonar crosslines acquired for this survey totaled 8.56% of mainscheme acquisition.

Crosslines were collected, processed and compared in accordance with Section 5.2.4.3 of the HSSD. To evaluate crosslines, a surface using strictly mainscheme lines and a surface using strictly crosslines were created. From these two surfaces a difference surface (mainscheme - crosslines = difference surface) was generated (Figure 4), and is submitted in the Separates II Digital Data folder. Statistics show the mean difference between the depths derived from mainscheme and crosslines is -0.07 meters (with mainscheme being shoaler) and 95% of nodes falling within 1.93 meters (Figure 5). For the respective depths the difference surface was compared to the allowable NOAA uncertainty standards. In total, 96.09% of the depth differences between H13071 mainscheme and crossline data were within allowable NOAA uncertainties. The largest differences exhibited are in areas where the geologic structure of the seafloor is dynamic, as depicted in Figure 4.

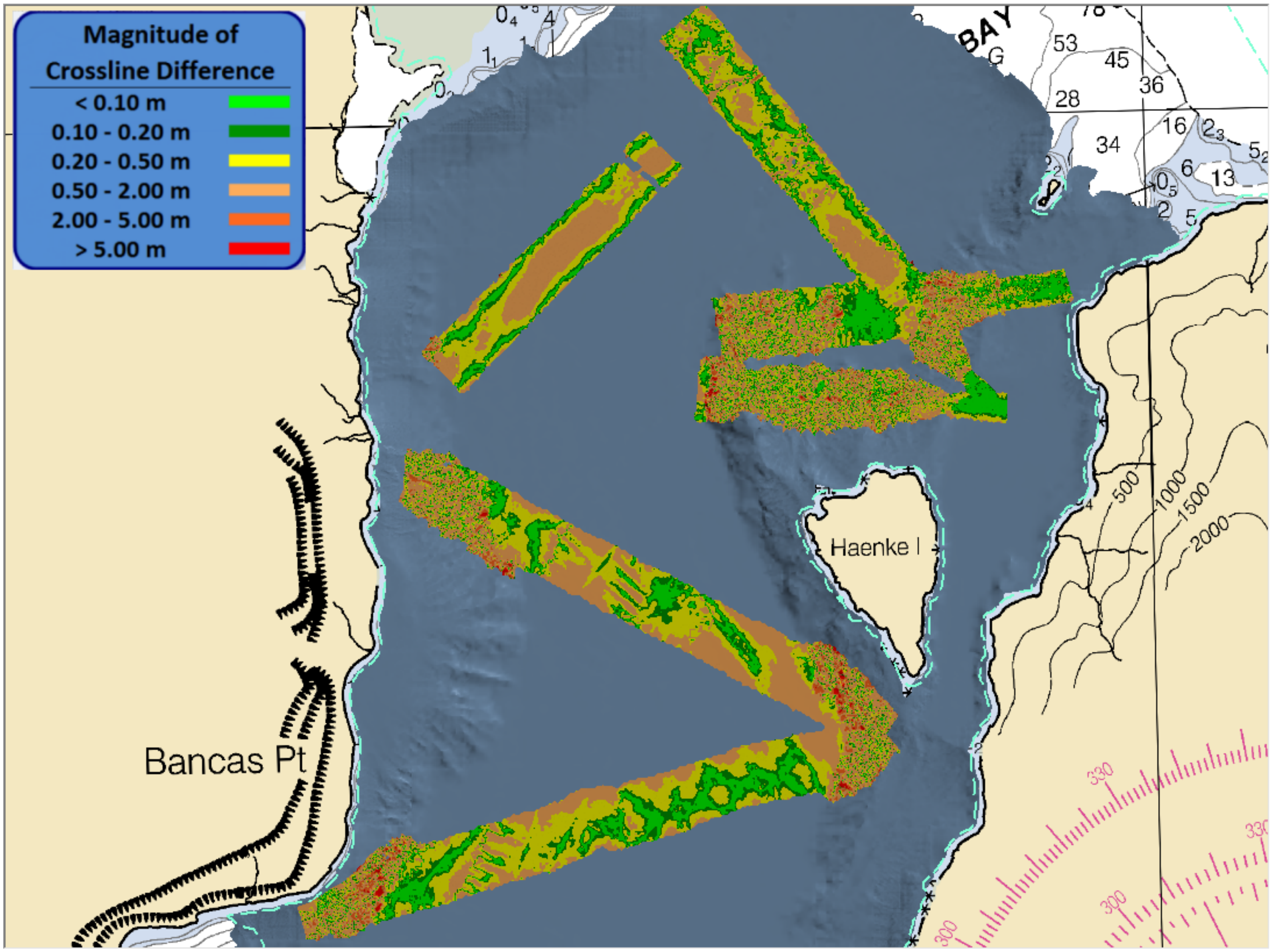
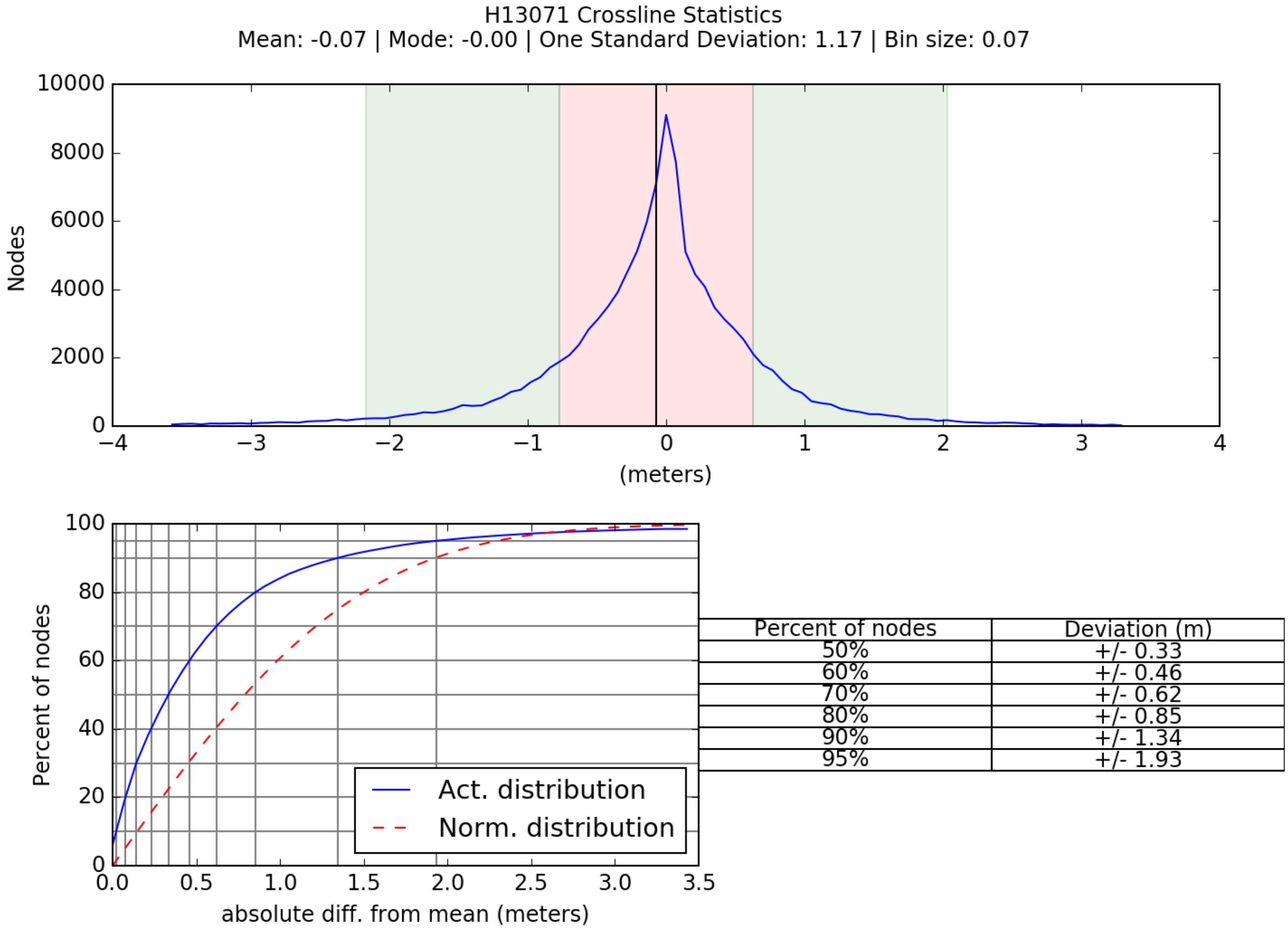


Figure 4: Overview of H13071 crosslines



Percent of nodes	Deviation (m)
50%	+/- 0.33
60%	+/- 0.46
70%	+/- 0.62
80%	+/- 0.85
90%	+/- 1.34
95%	+/- 1.93

Figure 5: H13071 crossline difference statistics

B.2.2 Uncertainty

The following survey specific parameters were used for this survey:

Method	Measured	Zoning
ERS via PMVD	0.0 meters	0.13 meters

Table 7: Survey Specific Tide TPU Values.

Hull ID	Measured - CTD	Measured - MVP	Surface
S220	N/A meters/second	1 meters/second	0.5 meters/second
280x (all launches)	2 meters/second	N/A meters/second	0.5 meters/second

Table 8: Survey Specific Sound Speed TPU Values.

In addition to the usual a priori estimates of uncertainty provided via device models for vessel motion, ERZT, and Poor Man's VDatum (PMVD), real-time and post-processed uncertainty sources were also incorporated into the depth estimates of survey H13071. Real-time uncertainties were provided via EM 710 and EM 2040 MBES data, Applanix Delayed Heave RMS, and TCARI tides. 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.

B.2.3 Junctions

H13071 junctions with one adjacent survey from this project, H13072 (Figure 6). The area of overlap between surveys was reviewed with CARIS HIPS and SIPS by surface differencing to assess surface agreement. The multibeam data were also examined in CARIS Subset Editor for consistency and agreement. For the descriptive statistics that describe this junction, a negative difference indicates H13071 was shoaler, and a positive difference indicates H13071 was deeper.

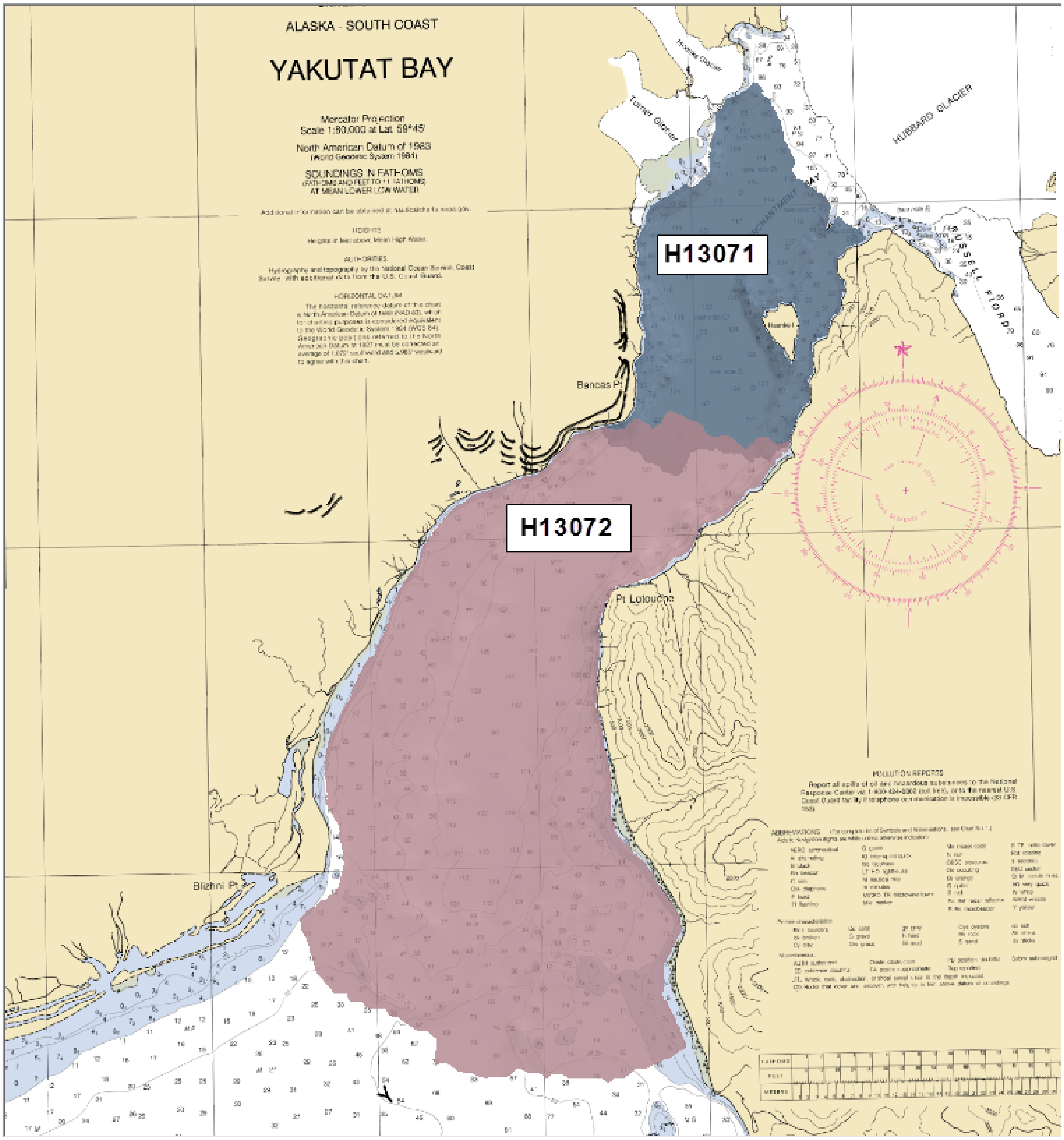


Figure 6: Overview of H13071 junction survey

The following junctions were made with this survey:

Registry Number	Scale	Year	Field Unit	Relative Location
H13072	1:40000	2017	NOAA Ship FAIRWEATHER	S

Table 9: Junctioning Surveys

H13072

Surface differencing in CARIS HIPS and SIPS was used to assess junction agreement between the surface from H13071 and the surface from H13072 (Figure 7). The statistical analysis of the difference surface shows a mean of 0.05 meters with 95% of all nodes having a maximum deviation of +/-1.45 meters, as seen in Figure 8. It was found that 97.88% of nodes are within NOAA allowable uncertainty.

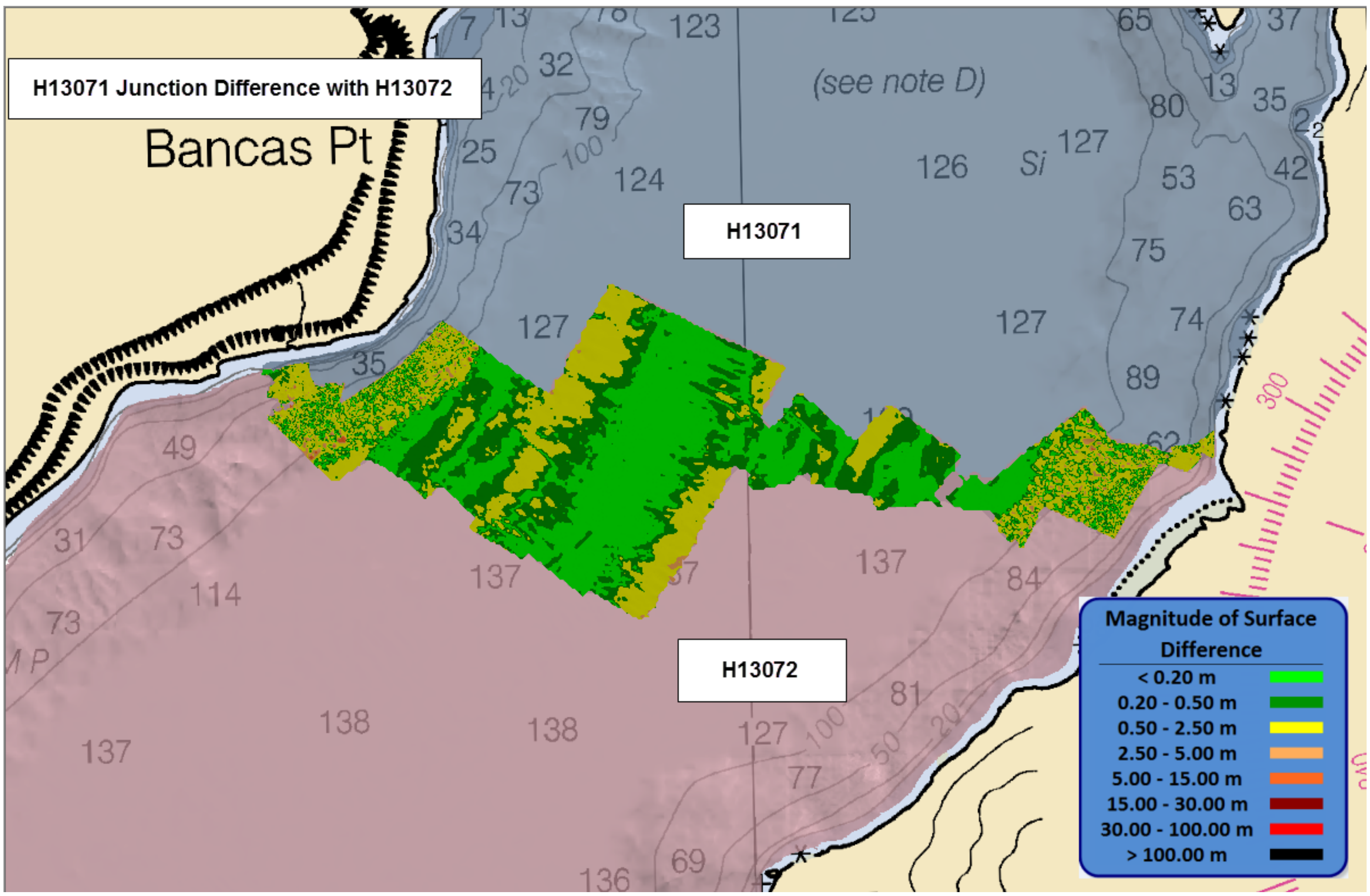
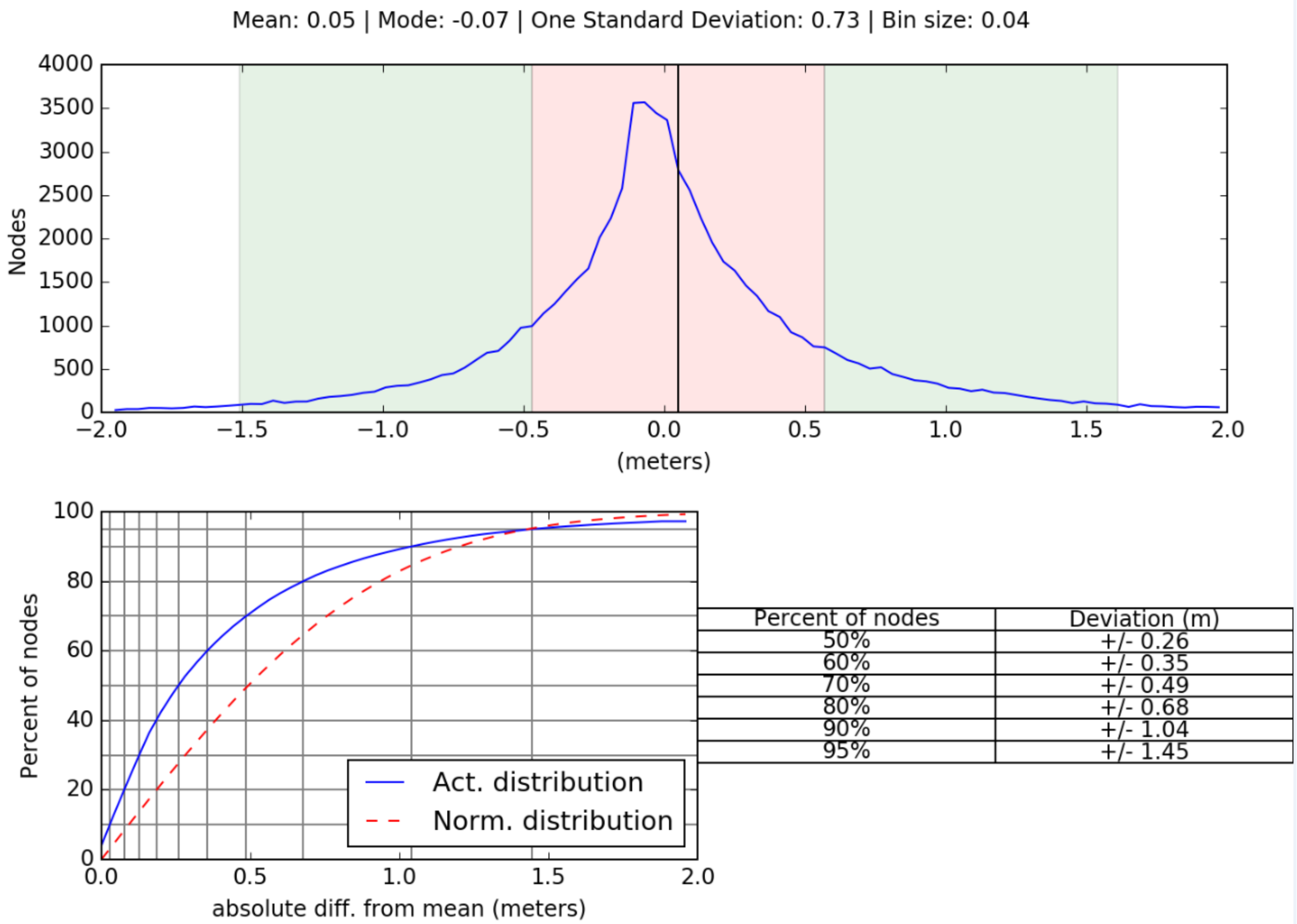


Figure 7: Difference surface between H13071 (grey) and junctioning survey H13072 (pink)



Percent of nodes	Deviation (m)
50%	+/- 0.26
60%	+/- 0.35
70%	+/- 0.49
80%	+/- 0.68
90%	+/- 1.04
95%	+/- 1.45

Figure 8: Difference surface statistics between H13071 and H13072

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

Sonar Reading a "Second Return"

Throughout acquisition of H13071, the Kongsberg EM2040 sonars occasionally received and displayed a second bottom return during real-time acquisition. This second return was prevalent in the nearshore environment, particularly in areas with higher turbidity or freshwater influx, most notably in front of the glacial moraine of Turner Glacier. Soundings correlated to this second bottom return phenomena were rejected to enable a more accurate representation of the true seafloor. See Figure 9 for an example.

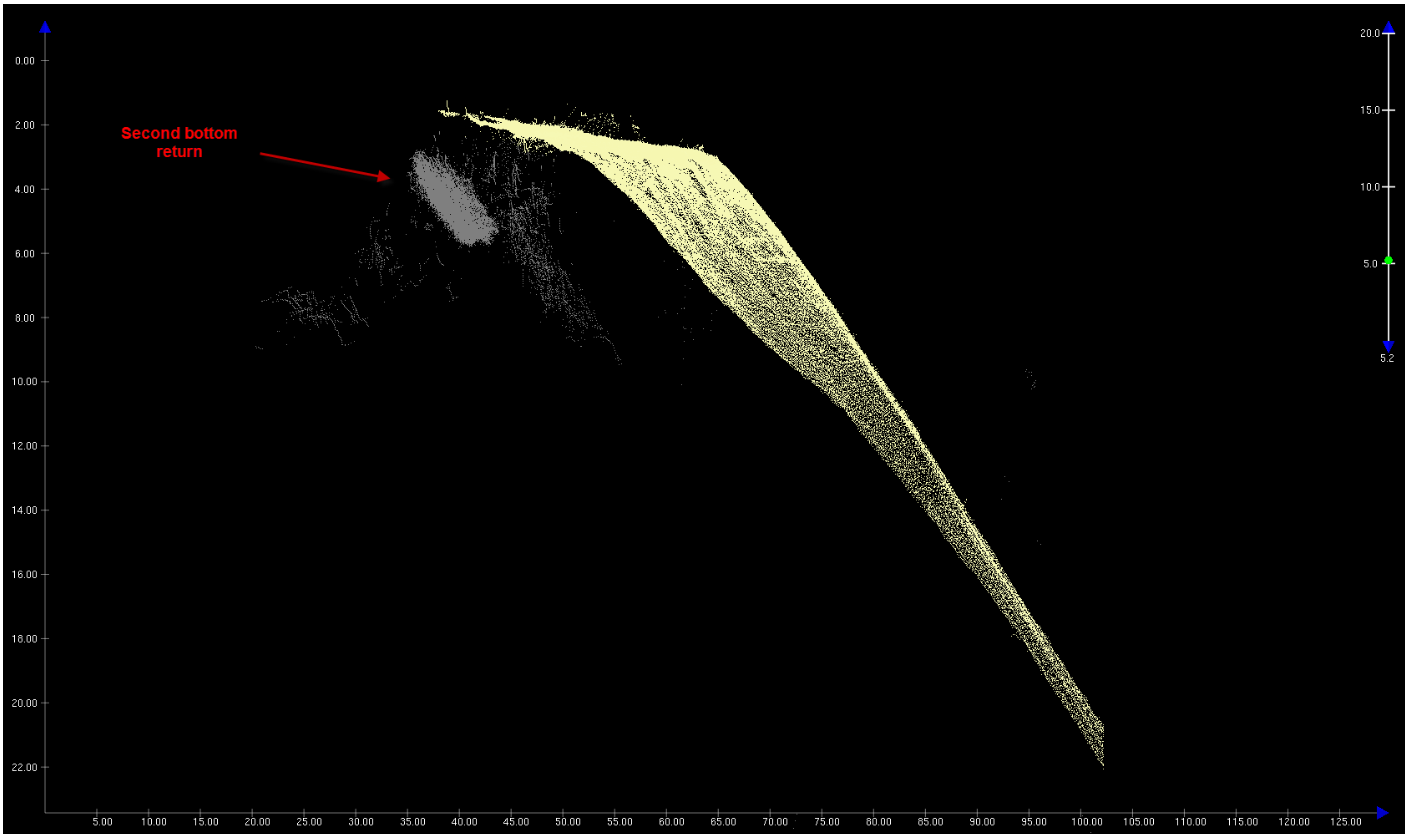


Figure 9: Example of second bottom return during acquisition of H13071

B.2.7 Sound Speed Methods

Sound Speed Cast Frequency: Casts were conducted at a minimum of once every four hours during launch acquisition.

Casts were conducted more frequently in areas where the influx of freshwater had an effect on the speed of sound in the water column and when there was a change in surface sound speed greater than two meters per second. Due to the risk of maneuvering S220 and operating the MVP in proximity to icebergs within

Disenchantment Bay, no sound velocity casts were taken during ship acquisition on DN 258. During post-processing sound speed casts from DN 259 were applied to the data from S220 DN 258 in CARIS HIPS and SIPS, using the nearest cast in distance within 24 hours (Figure 10). The casts from DN 259 were taken 14 hours after acquisition on DN 258, falling outside of the normally observed principle that casts should be taken at a minimum of once every four hours during acquisition. These areas were investigated by the hydrographer, and it was determined that no significant sound speed artifacts exist in the data.

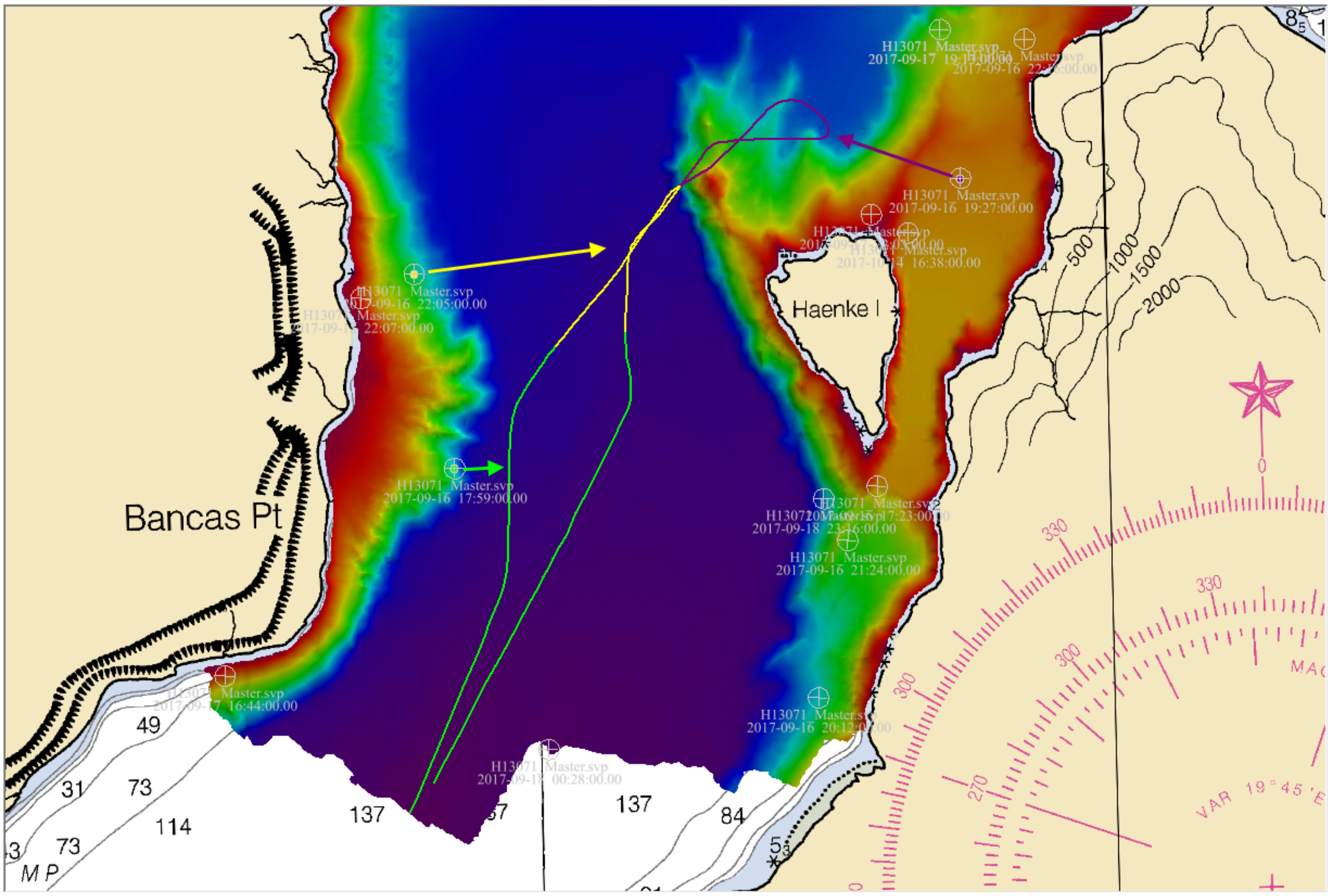


Figure 10: DN 259 tracklines colored by applied sound velocity cast

B.2.8 Coverage Equipment and Methods

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

B.2.9 Holidays

H13071 data were reviewed in CARIS HIPS and SIPS for holidays in accordance with Section 5.2.2.3 of the HSSD. Six holidays which meet the definition described in HTD 2017-2 for complete coverage were identified via the Pydro QC Tools Holiday Finder tool. This tool automatically scans the surface for holidays as defined in the HSSD and was run in conjunction with a visual inspection of the surface by the hydrographer.

As mentioned in Section B.2.6, second bottom returns were prevalent in the nearshore areas of H13071. Cleaning the noise generated by the second return resulted in a total of five holidays, as shown in Figure 11 (see holidays labeled 1-5). All holidays were analyzed by the hydrographer, and all data deemed to represent a second bottom return were rejected (Figure 12).

The sixth holiday is a result of poor outerbeam data that were rejected by disabled beam upon conversion (see holiday labeled 6 in Figure 11). This holiday is in data outside our glacier safety buffer line, and therefore was not investigated at a later date.

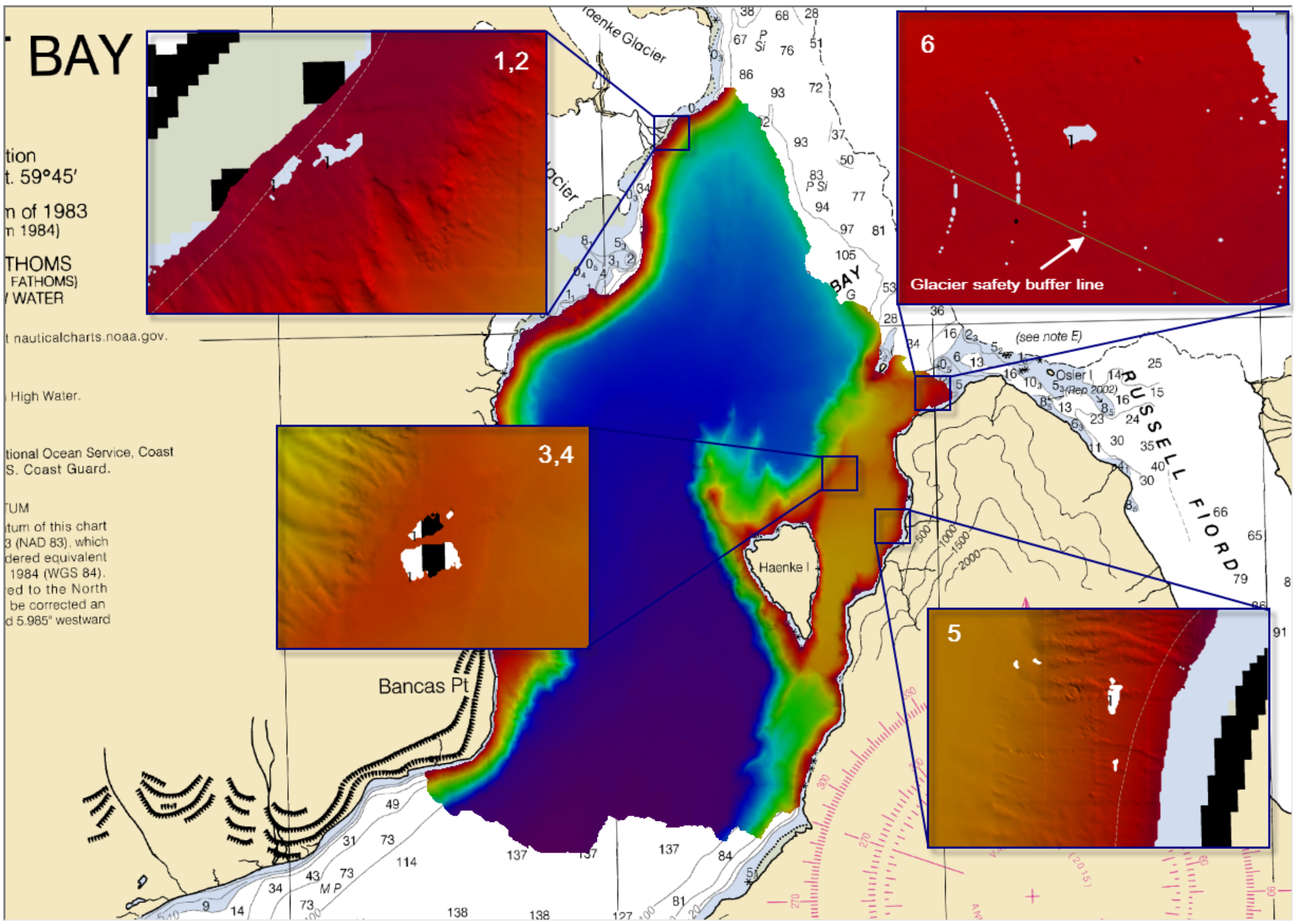


Figure 11: H13071 holiday overview

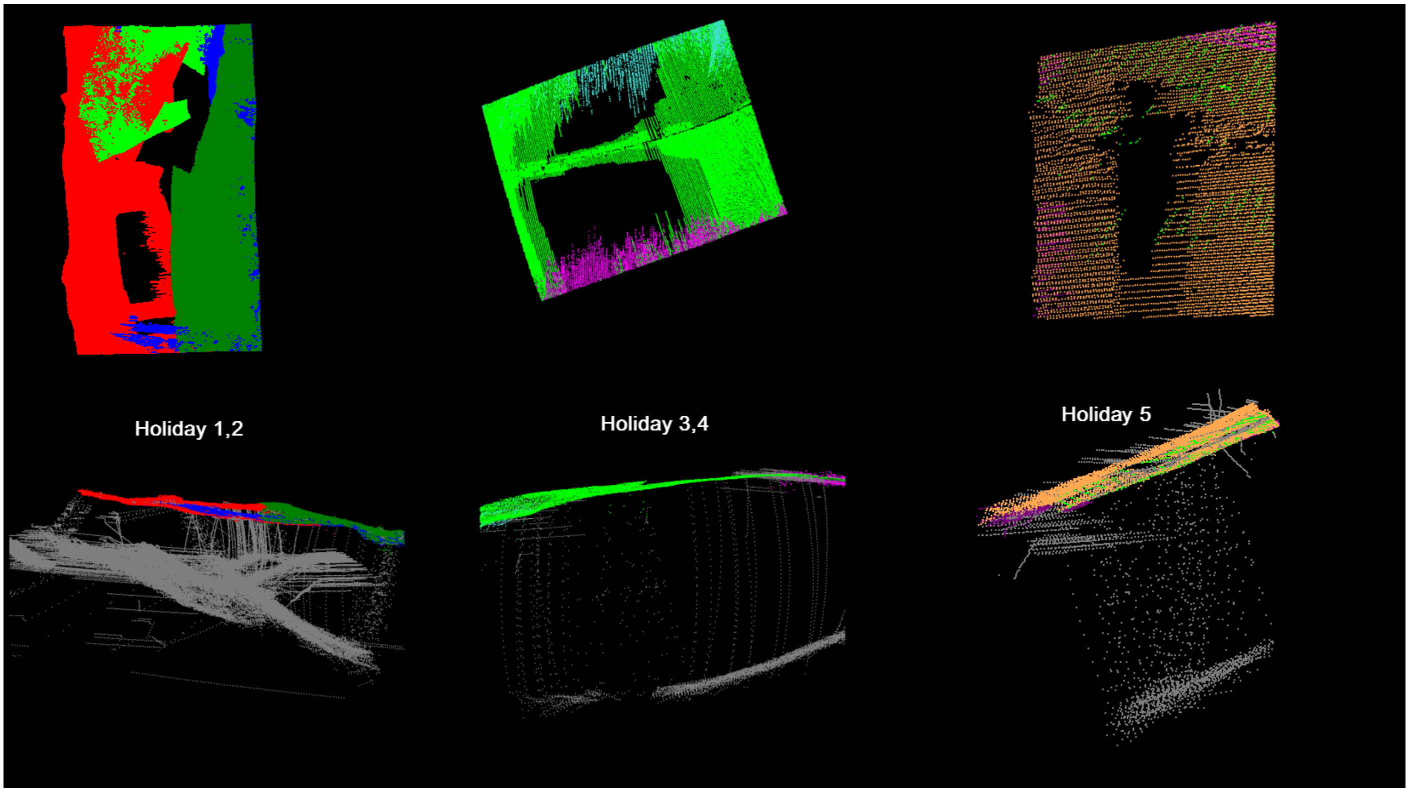


Figure 12: Second bottom return holidays

B.2.10 NOAA Allowable Uncertainty

The surface was analyzed using the Pydro QC Tools Grid QA feature to determine compliance with specifications. Overall, more than 99% of nodes within the surface meet NOAA Allowable Uncertainty specifications for H13071. See the Standards and Compliance Review located in Appendix II for a graphical representation of uncertainty compliance.

B.2.11 Density

The surface was analyzed using the Pydro QC Tools Grid QA feature to determine compliance with specifications. Overall, 98% of nodes within the surface meet density specifications for H13071. See the Standards and Compliance Review located in Appendix II for a graphical representation of density compliance.

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

Raw Backscatter data were stored in the .all file for both Kongsberg systems. All backscatter data were processed by the field unit via Fledermaus FMGT 7.7.3. All processed mosaics and .gsf files have been submitted to the Pacific Hydrographic Branch. See Figure 13 for a complete mosaic.

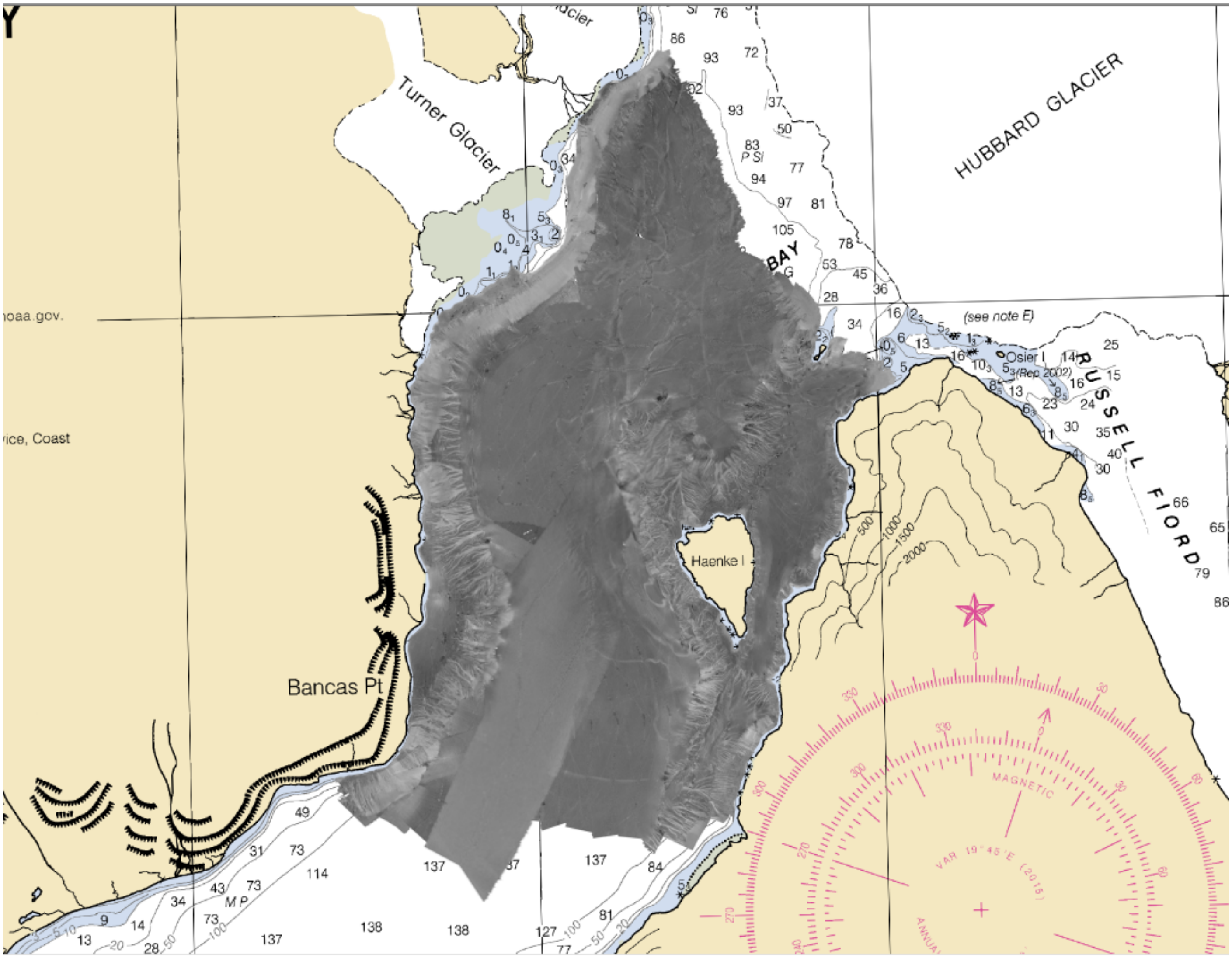


Figure 13: H13071 Complete backscatter mosaic

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
Teledyne CARIS	HIPS and SIPS	10.3.3

Table 10: Primary bathymetric data processing software

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

Manufacturer	Name	Version
QPS	Fledermaus FMGT	7.5.3

Table 11: Primary imagery data processing software

The following Feature Object Catalog was used: NOAA Profile V_5.6.

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**
H13071_MB_VR_MLLW	CARIS VR Surface (CUBE)	Variable Resolution meters	0 meters - 235.1 meters	NOAA_VR	Complete MBES
H13071_MB_VR_MLLW_Final	CARIS VR Surface (CUBE)	Variable Resolution meters	0 meters - 235.1 meters	NOAA_VR	Complete MBES

Table 12: Submitted Surfaces

The NOAA CUBE parameters defined in the HSSD were used for the generation of all CUBE surfaces for survey H13071. The surfaces have been reviewed where noisy data, or "fliers," are incorporated into the gridded solutions causing the surface to be shoaler or deeper than the true sea floor. Where these spurious soundings cause the gridded surface to vary from the reliably measured seabed by greater than the maximum allowable Total Vertical Uncertainty at that depth, the noisy data have been rejected by the hydrographer and the surface recomputed.

Flier Finder v5, part of the QC Tools package within Pydro, was used to assist the search for spurious soundings following gross cleaning. Flier Finder was run iteratively until all remaining flagged fliers were deemed to be valid aspects of the steep slopes and dynamic nature of the seafloor.

B.5.3 Data Logs

Data acquisition and processing notes are included in the acquisition and processing logs, and additional processing such as final tide and sound speed application are noted in the H13071 Data Log spreadsheet. All data logs are submitted digitally in the Separates I folder.

C. Vertical and Horizontal Control

Per Section 5.1.2.3 of the 2014 Field Procedures Manual, no Horizontal and Vertical Control Report has been generated for H13071.

C.1 Vertical Control

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

Traditional Methods Used:

TCARI

The following National Water Level Observation Network (NWLON) stations served as datum control for this survey:

Station Name	Station ID
Yakutat, AK	9453220

Table 13: NWLON Tide Stations

File Name	Status
3453220.tid	Final Approved

Table 14: Water Level Files (.tid)

File Name	Status
O346FA2017.tc	Final

Table 15: Tide Correctors (.zdf or .tc)

A request for final approved tides was sent to N/OPS1 on 10/18/2017. The final tide note was received on 10/30/2017.

After final tides were received, the final TCARI grid was applied to the data and used for reducing features to MLLW.

Initial reduction of acquired data to MLLW was accomplished via traditional tidal means using the TCARI grid provided by HSD-OPS. Following the successful application of SBETs and computation of an Ellipsoidally Referenced Zone Tide (ERZT) separation model, ERS methods were used for reducing data to MLLW.

<u>ERS Methods Used:</u>

ERS via Poor Mans VDATUM

<u>Ellipsoid to Chart Datum Separation File:</u>

O346FA2017_PMVD_EPSG6332_NAD83_MLLW_Debiased

ERS methods were used as the final means of reducing H13071 to MLLW for submission. Data were initially reduced via traditional tidal means until an ERZT separation model could be calculated. This empirically derived model was then checked for consistency and compared to the Poor Man's VDatum (PMVD) separation model provided with the Project Instructions. The PMVD separation model was then vertically shifted such that the average difference between these two separation models is zero. This vertical shift de-biases the PMVD separation model, correcting for local offsets that cannot be effectively modeled by the PMVD.

C.2 Horizontal Control

The horizontal datum for this project is North American Datum of 1983 (NAD83).

The projection used for this project is UTM Zone 07 North.

Vessel kinematic data were post-processed using Applanix POSPac processing software and RTX methods described in the DAPR. Smoothed Best Estimate of Trajectory (SBET) and associated error (RMS) data were applied to all MBES data in CARIS HIPS and SIPS.

For further details regarding the processing and quality control checks performed, see the H13071 POSPAC Processing Logs spreadsheet located in the Separates folder.

During real-time acquisition S220 and launches 2806 and 2807 received correctors from the Wide Area Augmentation System (WAAS) for increased accuracies similar to USCG DGPS stations. WAAS and SBETs were the sole methods of correcting position for H13071, as no DGPS stations were available for realtime horizontal control.

D. Results and Recommendations

D.1 Chart Comparison

A comparison was performed between survey H13071 and ENC US4AK3XM using CARIS HIPS and SIPS sounding and contour layers derived from the surface generated from H13071 data. The contours and soundings were overlaid on the chart to assess differences between the surveyed soundings and charted depths. An eight meter grid was generated from the ENC by extracting all soundings from the chart and creating an interpolated TIN surface which could be differenced with the surface generated from H13071 data. All H13071 data should supersede charted data. In general, surveyed soundings agree with the majority of charted depths. A full discussion of the disagreements follows below.

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	Preliminary?
US4AK3XM	1:80000	4	07/30/2015	07/30/2015	NO

Table 16: Largest Scale ENCs

<u>US4AK3XM</u>

Soundings from H13071 are in general agreement with charted depths on ENC US4AK3XM, with the exception of the areas adjoining the glacial terminus of Turner and Hubbard Glaciers where differences range to 40 fathoms.

To more accurately visualize trends within these differences, an eight meter TIN surface was interpolated from the ENC sounding layer. This surface was then differenced with a corresponding surface from H13071 and is visualized in Figure 14. The mean difference between the TIN surface and H13071 is -4.88 meters (Figure 15). In this difference surface red colors indicate H13071 is shoaler than the ENC US4AK3XM, green colors indicate agreement, and blue colors indicate H13071 is deeper than ENC US4AK3XM.

In front of the glacial terminus for Hubbard Glacier are active turbid meltwater plumes releasing sediment into Disenchantment Bay. Turner Glacier has also receded onto land and is actively discharging turbid meltwater from its glacial moraine. The dynamic sediment flux in front of these two glaciers is most likely the reason for the depth discrepancies that were found between charted data and surveyed data.

A sounding layer was derived from H13071 and overlaid onto ENC US4AK3XM. The soundings agreed within two to four fathoms except in areas close to the NALL where sediment influx from Turner Glacier has dramatically changed the seafloor depth as shown in Figures 16 and 17.

Contours from H13071 are in a general agreement with charted contours on ENC US4AK3XM. The largest differences are seen in the parts of Disenchantment Bay closer to Hubbard Glacier where surveyed and charted contours differ in position by over 1800 meters, as seen in Figure 18.

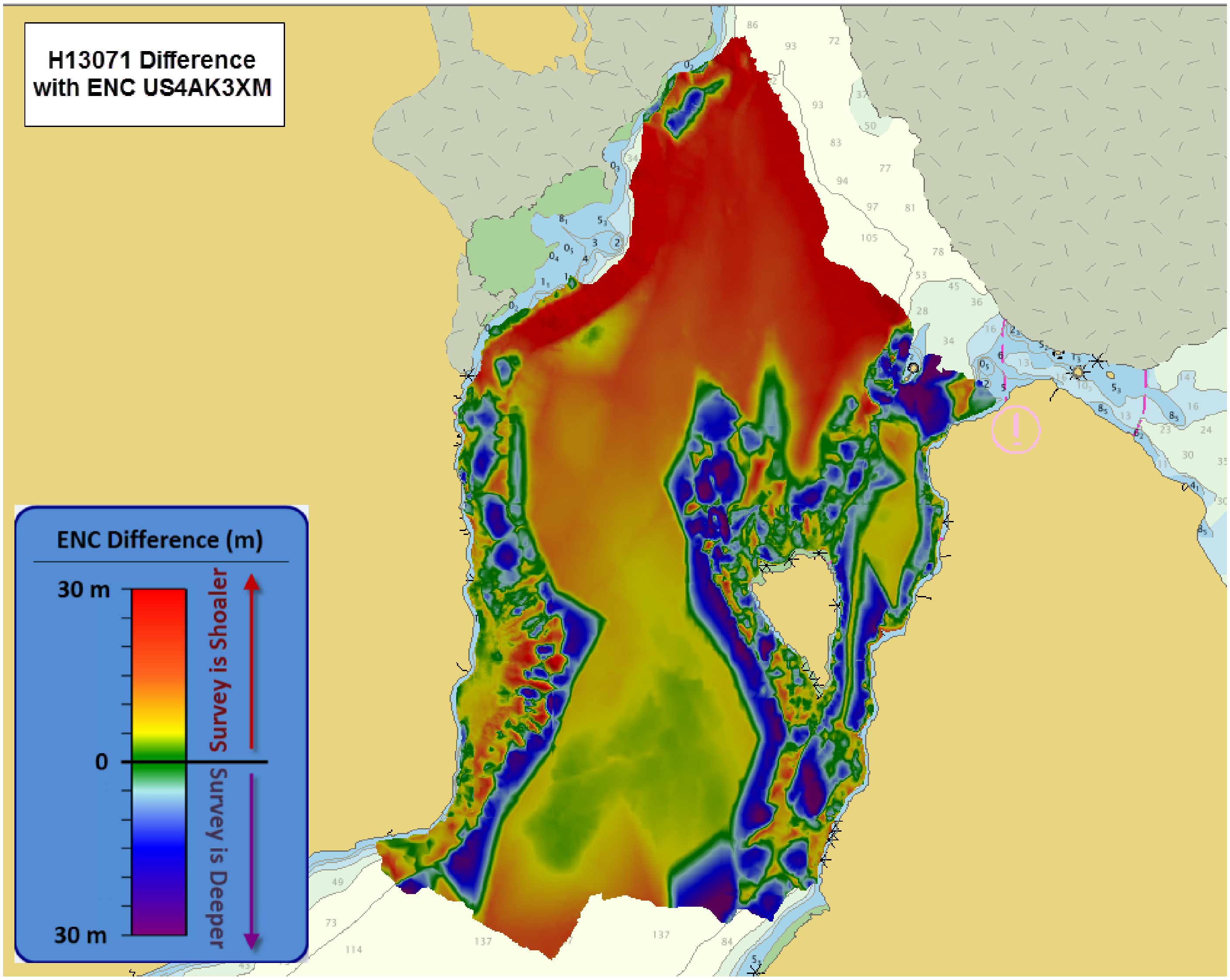
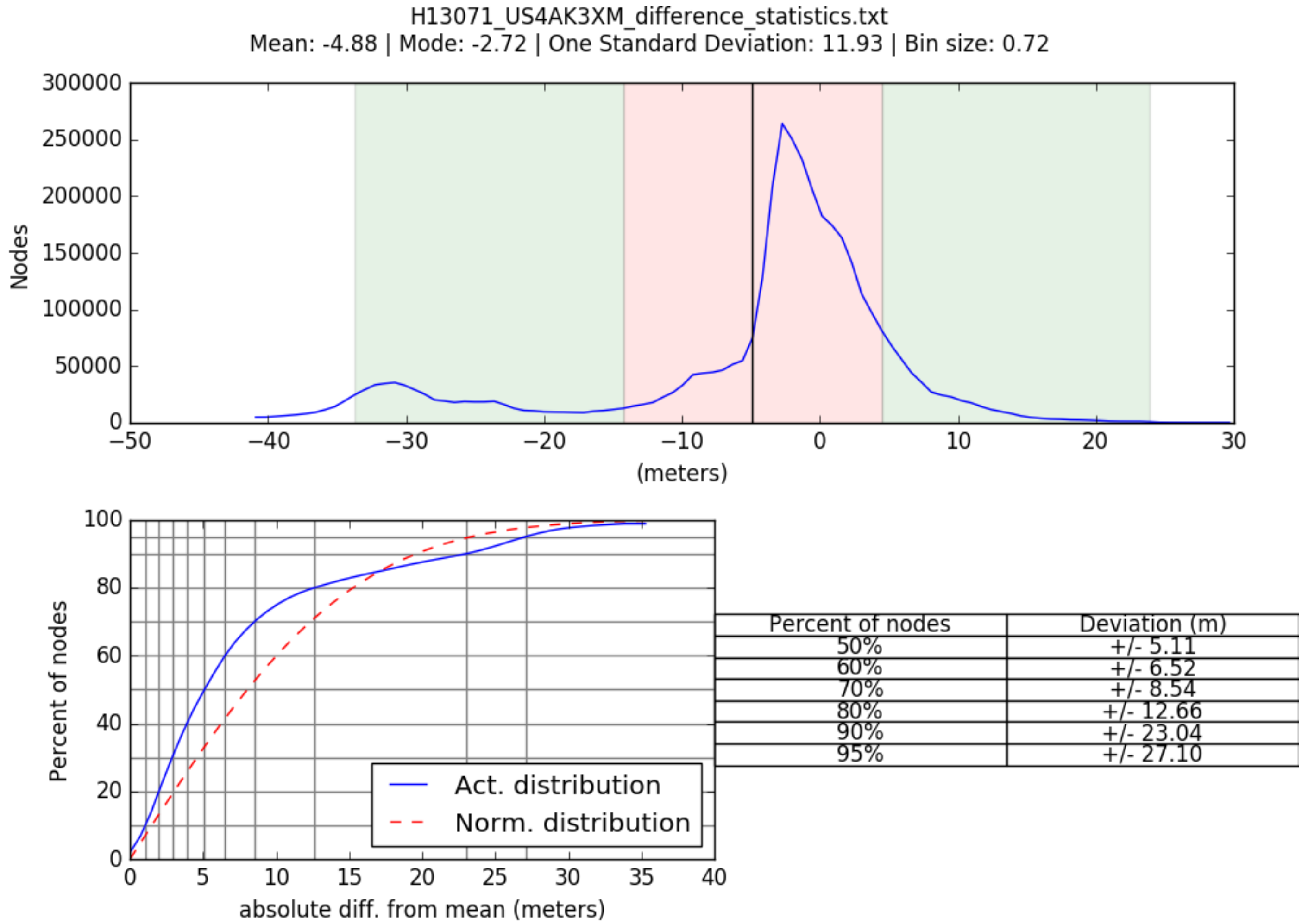


Figure 14: Difference surface between H13071 and interpolated TIN surface from US4AK3XM



Percent of nodes	Deviation (m)
50%	+/- 5.11
60%	+/- 6.52
70%	+/- 8.54
80%	+/- 12.66
90%	+/- 23.04
95%	+/- 27.10

Figure 15: Difference surface statistics between H13071 and interpolated TIN surface from US4AK3XM

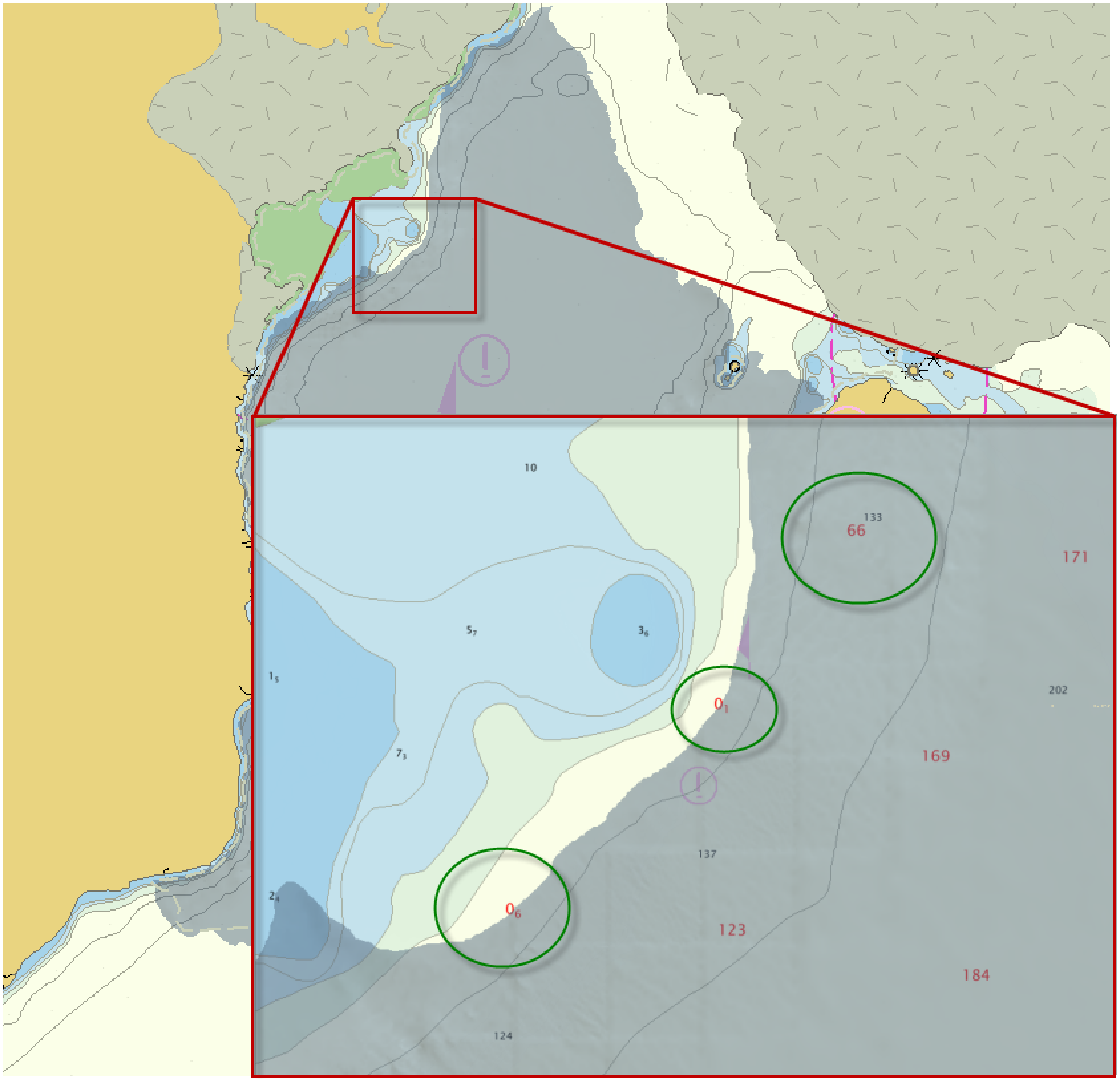


Figure 16: Sounding discrepancy between H13071 (soundings in red) and ENC US4AK3XM (soundings in black) in the vicinity of the Turner Glacier terminus

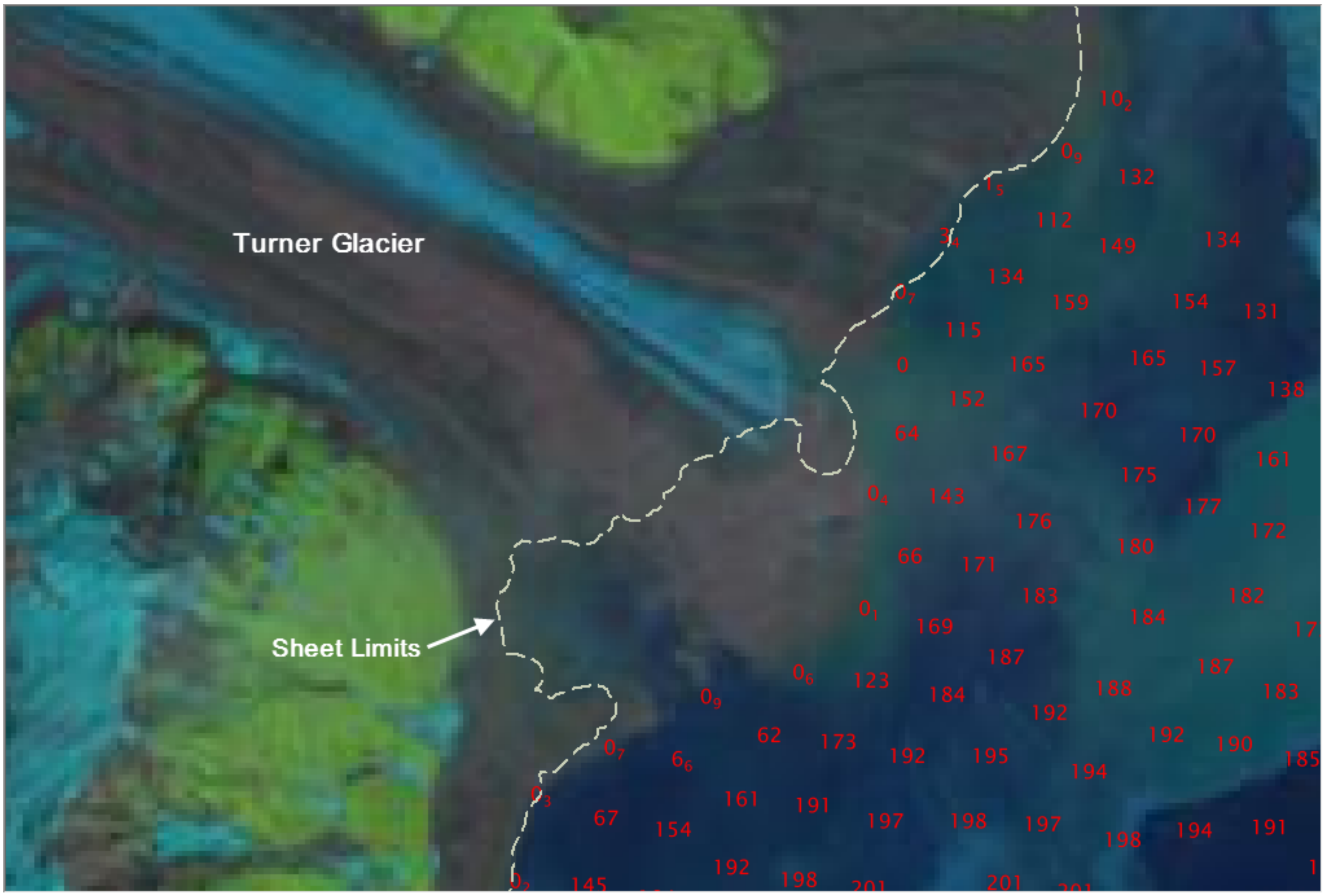


Figure 17: Surveyed soundings from H13071 overlaid onto LANDSAT image taken in August 2017

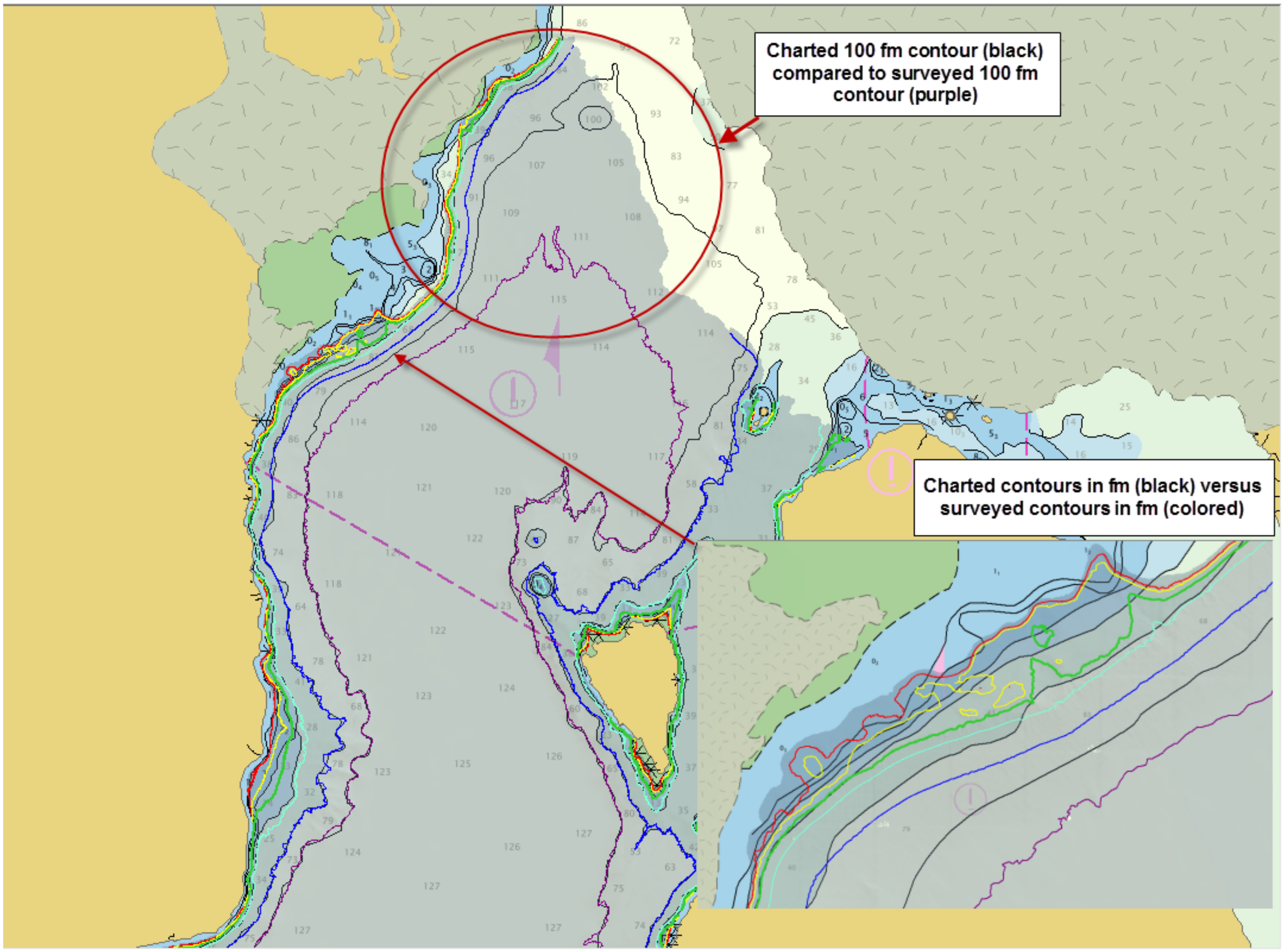


Figure 18: Contour comparison between H13071 and ENC US4AK3XM

D.1.2 Maritime Boundary Points

No Maritime Boundary Points were assigned for this survey.

D.1.3 Charted Features

Two shoals reported in 2002 were within the sheet limits of H13071 (Figure 19). The northern shoal (0.5 fathoms) was inside of the 1000 meter glacial safety buffer, and therefore was not investigated. The southern shoal (6 fathoms, 2 feet) was covered by MBES, and should be replaced by surveyed soundings.

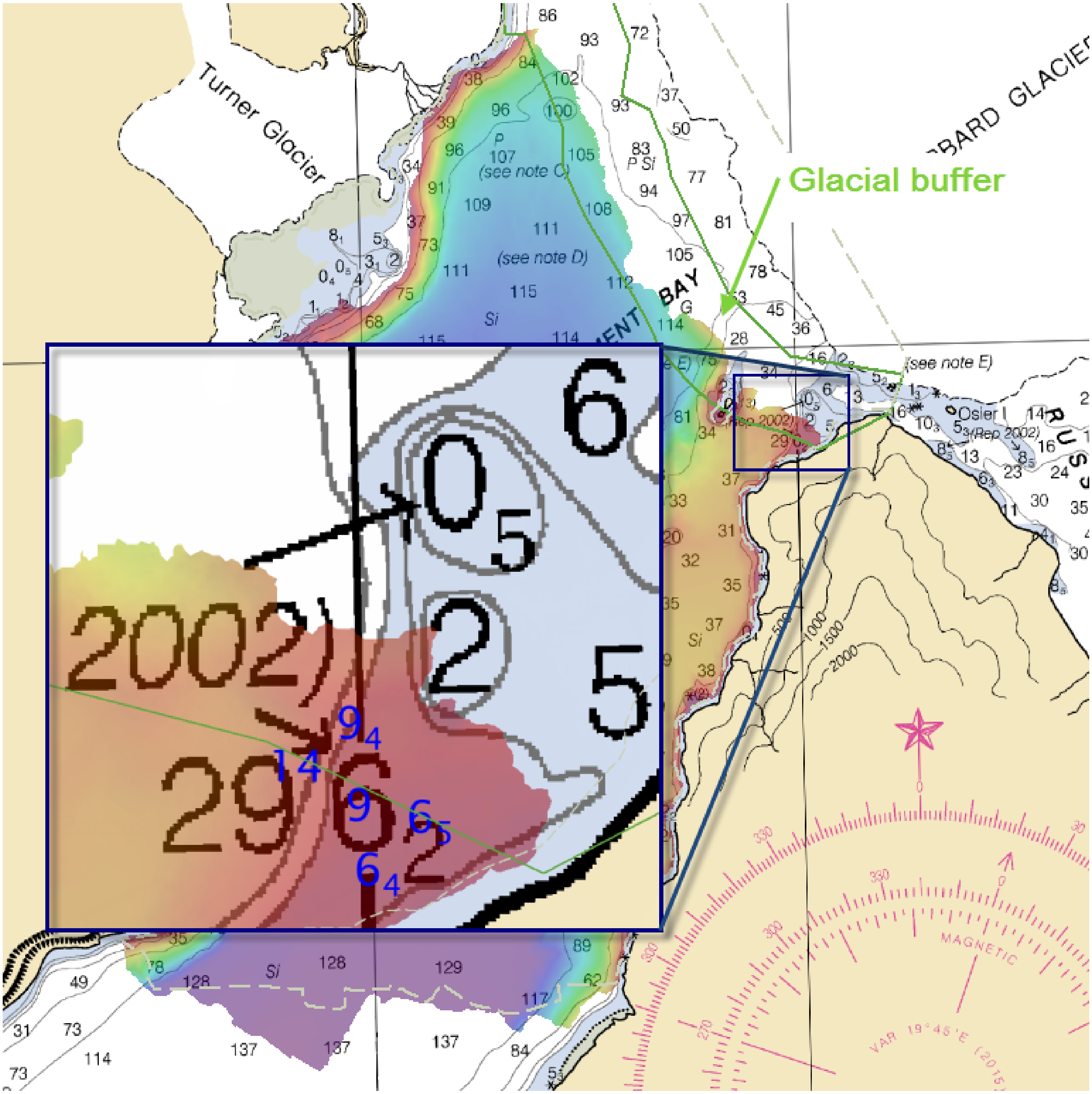


Figure 19: H13071 reported shoals (surveyed soundings in blue)

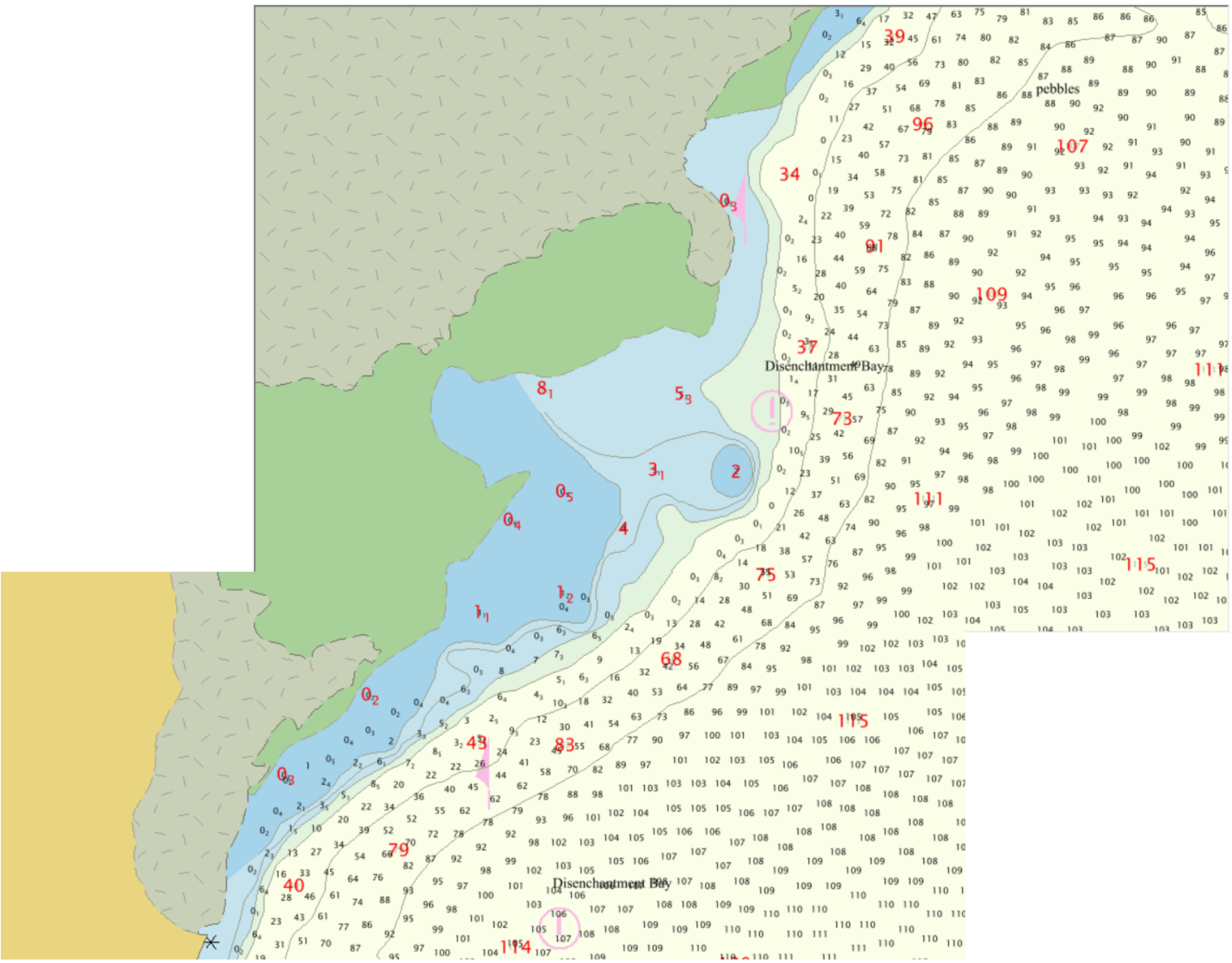
D.1.4 Uncharted Features

No uncharted features exist for this survey.

D.1.5 Shoal and Hazardous Features

No shoals or potentially hazardous features exist for this survey.

Extensive shoaling is noted in the vicinity of Turner Glacier. The image below shows an example of the shoaling. The Marine Chart Division was consulted about the shoaling and it was advised that a DtoN report should not be submitted but the survey should receive elevated priority. Correspondence has been provided in the Appendix of this report.



Soundings represented in fathoms and feet. The red soundings represent charted soundings and black represent selected soundings from survey data.

D.1.6 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.1.7 Bottom Samples

Two bottom samples were acquired in accordance with the Project Instructions for survey H13071. All bottom samples were entered in the H13071 Final Feature File. See Figure 20 for a graphical overview of sample locations.

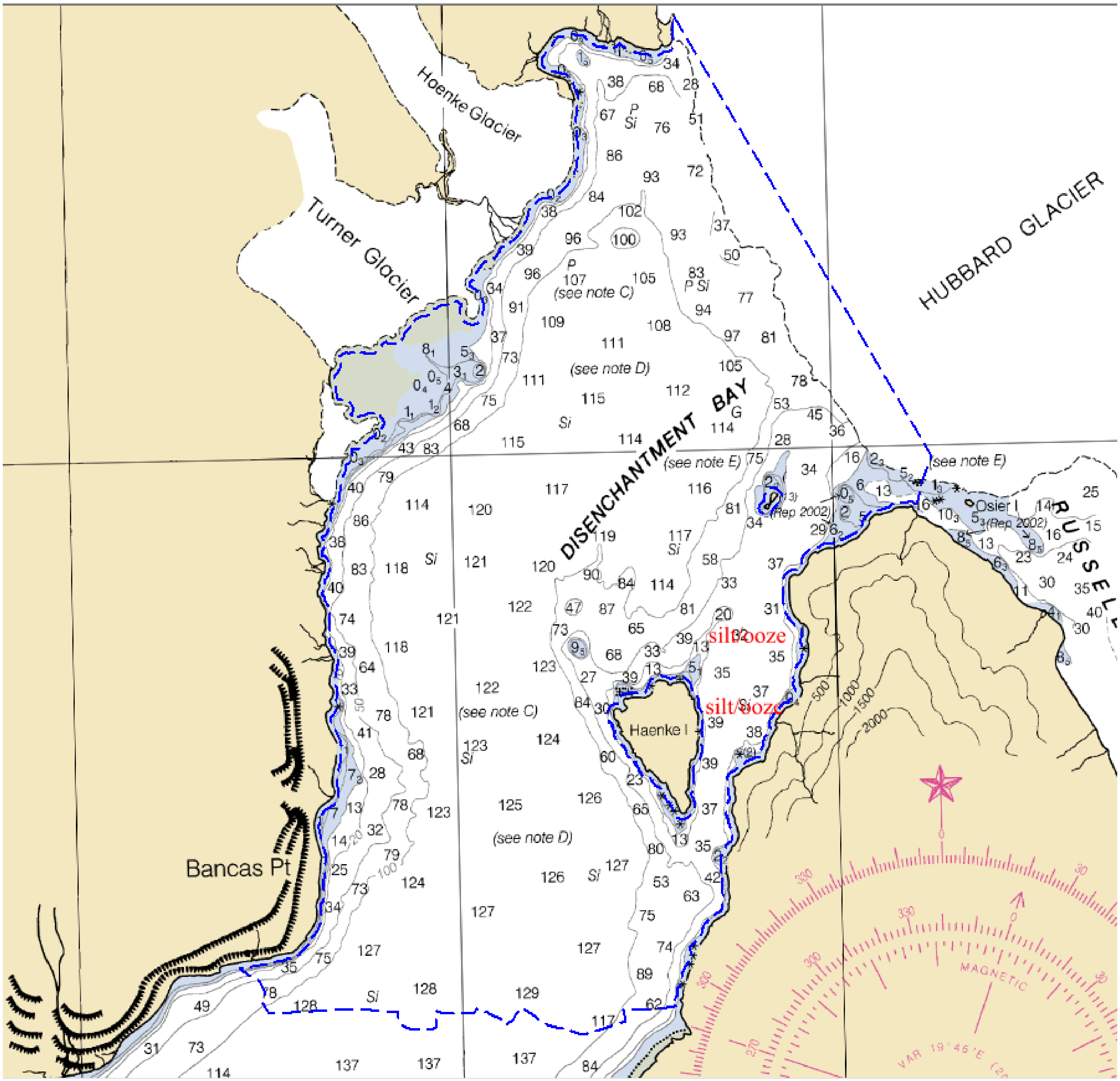


Figure 20: Locations of bottom samples in H13071

D.2 Additional Results

D.2.1 Shoreline

H13071 survey limits extended to the NALL (see Section A.1) and all features within these limits were addressed and attributed in the H13071 Final Feature File. All features inshore of the NALL were attributed in the Final Feature File with the description of “Not Addressed” and remarks of “Retain as charted, not investigated due to being inshore of NALL” as per HSSD Section 7.3.1. Annotations, information, and diagrams collected on DP forms and boat sheets during field operations are scanned and included in the Separates I Detached Positions folder.

D.2.2 Prior Surveys

H13071 overlaps with survey H10902 from the NOAA Ship Rainier in 1999.

Surface differencing in CARIS HIPS and SIPS was used to assess surface agreement between H13071 and H10902 (Figures 21, 22). For comparison purposes, a 20 meter surface was generated for H13071 to match the resolution of the junction data provided from H10902. For gridding at the 20 meter node size, the CUBE parameters were the same as the defined NOAA resolutions, with "Capture_Distance_Min" adjusted to be (1/sqrt(2)) * 20 m = 14.14 m, since this is the only parameter which changes among the standard resolutions. The statistical analysis shows a mean difference of 13.51 meters, with 95% of the depth differences falling within +/- 22.24 meters (Figure 23). The areas with the largest differences are closest to the terminus of Hubbard Glacier, where sediment discharges from the glacial terminus.

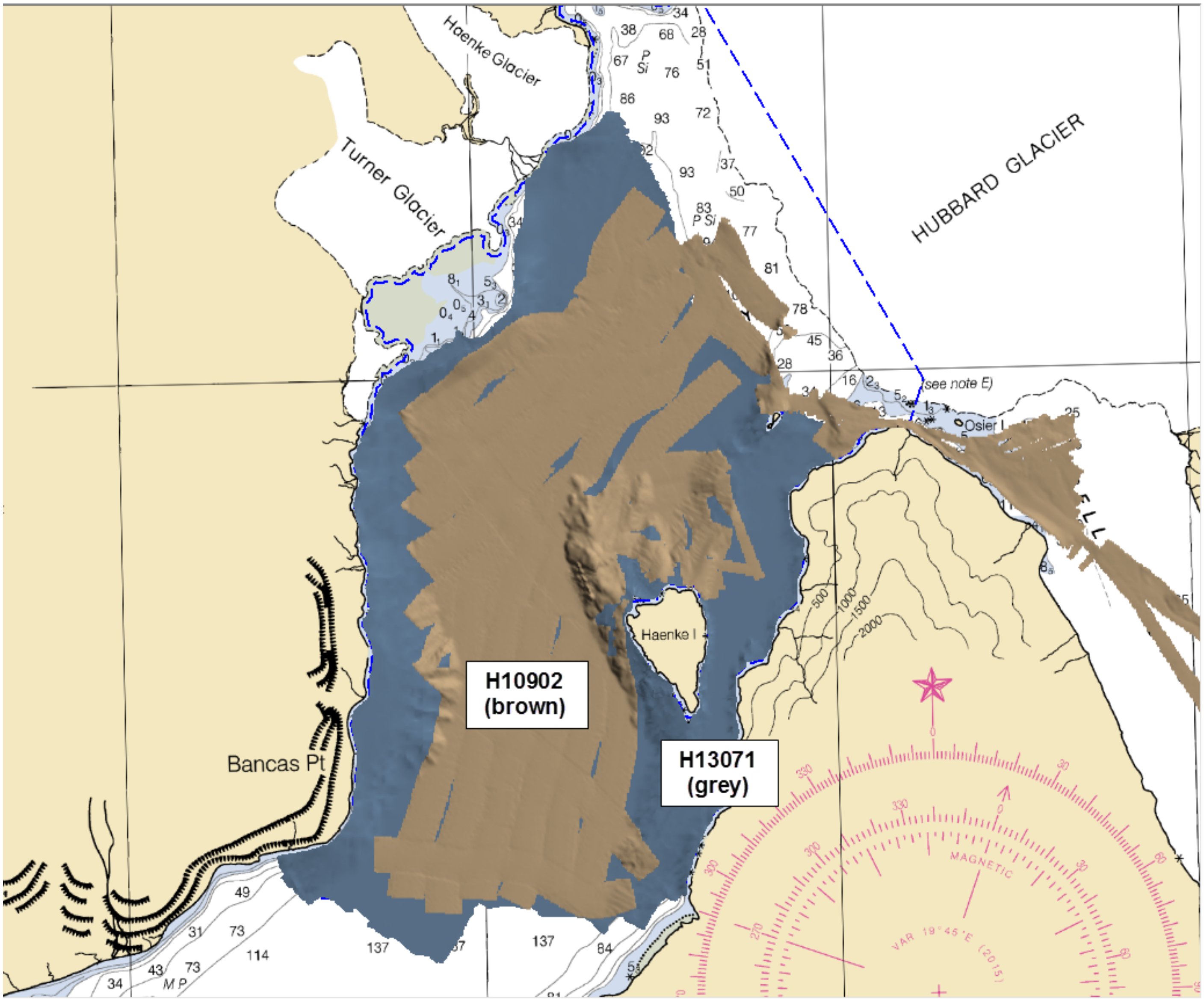


Figure 21: Overview of H10902 survey

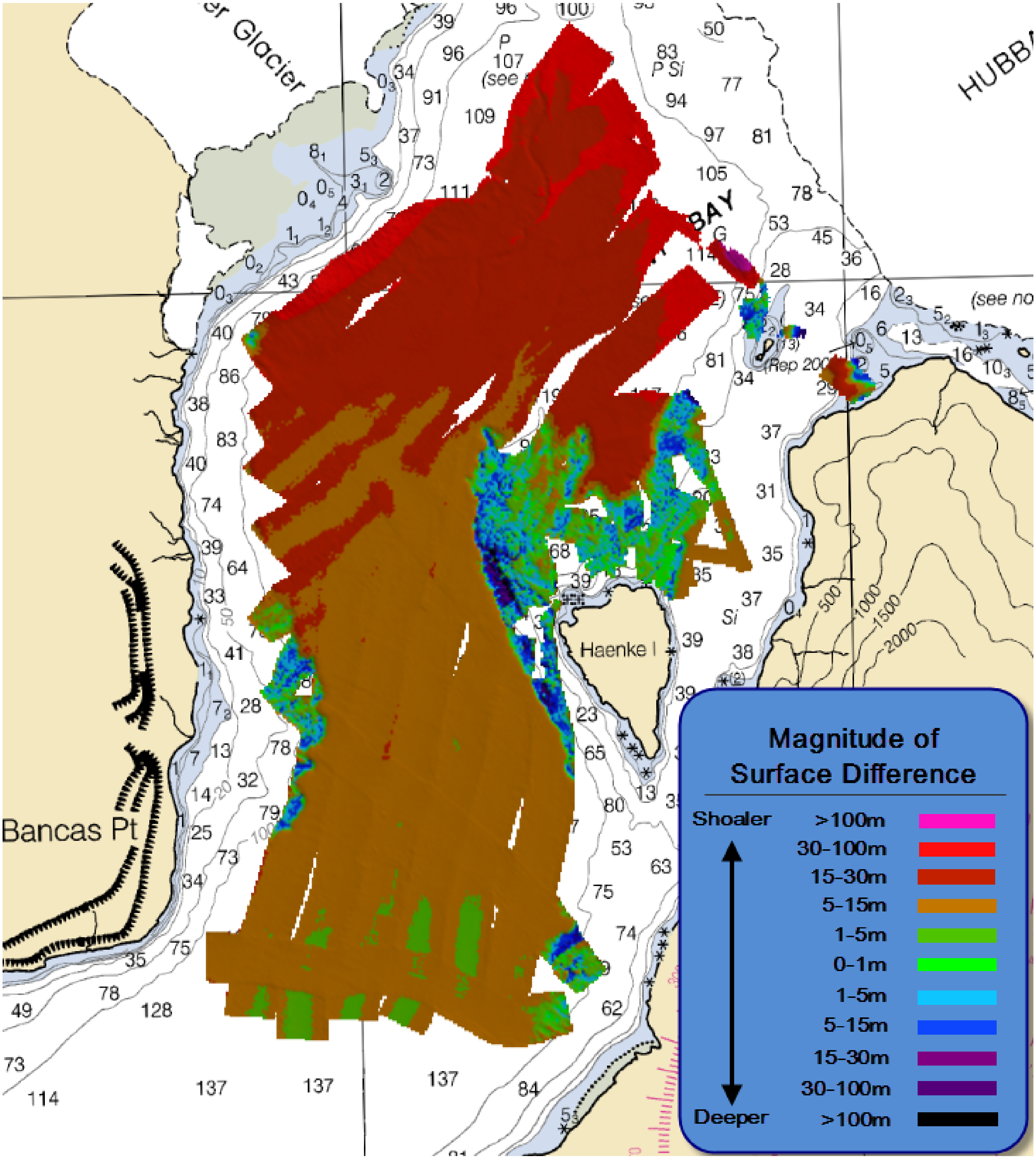
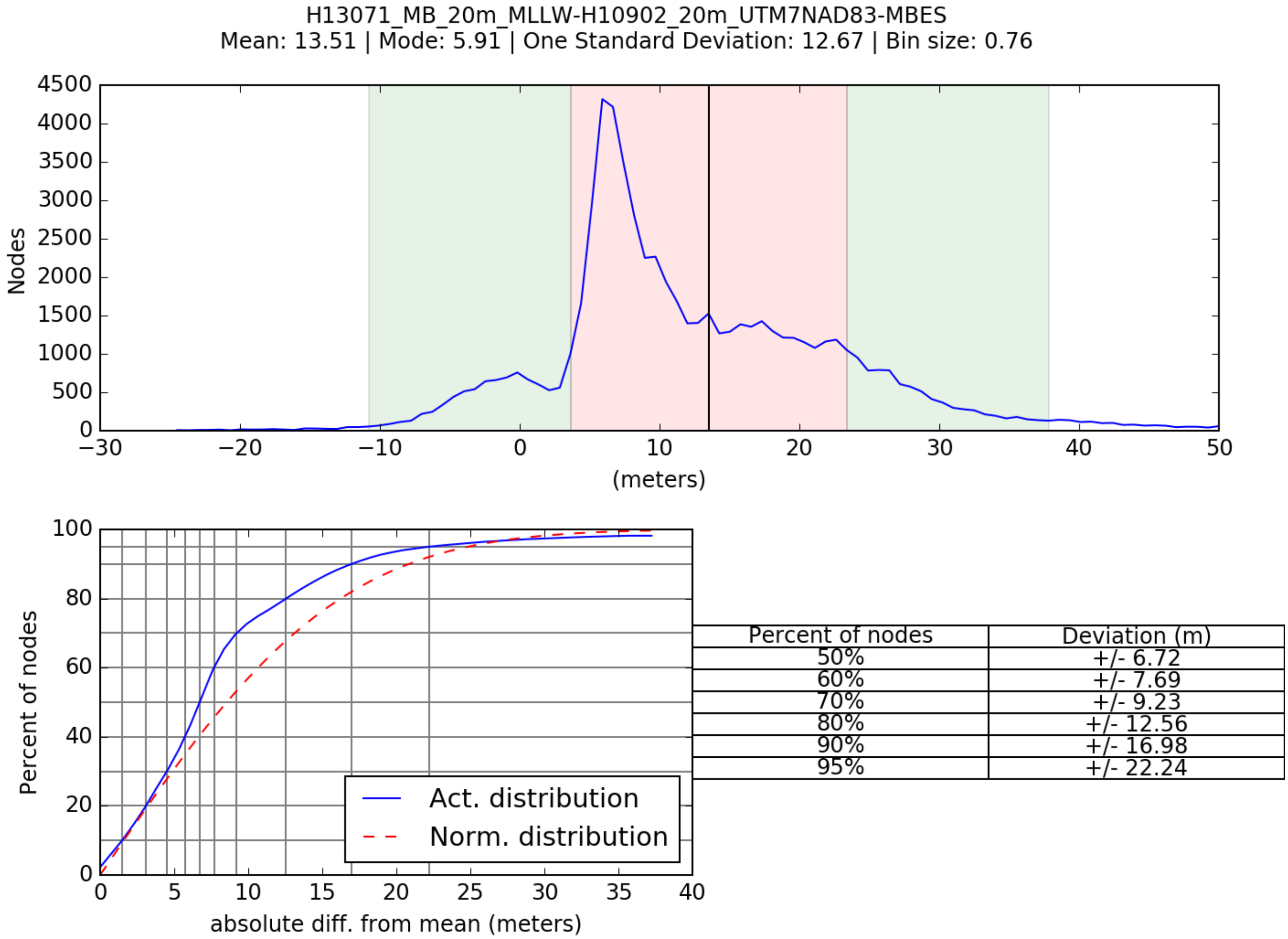


Figure 22: Difference surface between H13071 and H10902



Percent of nodes	Deviation (m)
50%	+/- 6.72
60%	+/- 7.69
70%	+/- 9.23
80%	+/- 12.56
90%	+/- 16.98
95%	+/- 22.24

Figure 23: Difference surface statistics between H13071and H10902

D.2.3 Aids to Navigation

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

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 and/or Environmental Conditions

There are three glacial termini in the northern end of Disenchantment Bay. The largest, Hubbard Glacier, actively calves and discharges heavy flows of ice and sediment into the waters of Disenchantment Bay. Turner and Haenke Glaciers have almost completely receded onto land, but appear to continue to release dynamic sediment plumes into Disenchantment Bay (Figure 24). These conditions made acquiring data challenging, with excessive variations in sound speed and large volumes of ice acting as obstacles for survey launches. In some areas, particularly the nearshore regions of H13071, these conditions affected data density and contributed to conditions that may have exacerbated the problem of the "second bottom return" discussed above. Additionally, due to safety concerns survey vessels did not approach within 1000 meters of Hubbard Glacier, and did not attempt to enter Russel Fiord. Hubbard Glacier has advanced nearly one kilometer further than currently charted (Figure 25). In general, Disenchantment Bay is a dynamic area that mariners should expect to change from year to year, especially in proximity to Hubbard, Turner, and Haenke Glaciers.

Figure 24: H13071 survey outline overlaid on satellite imagery with evidence of potential sediment and meltwater plumes

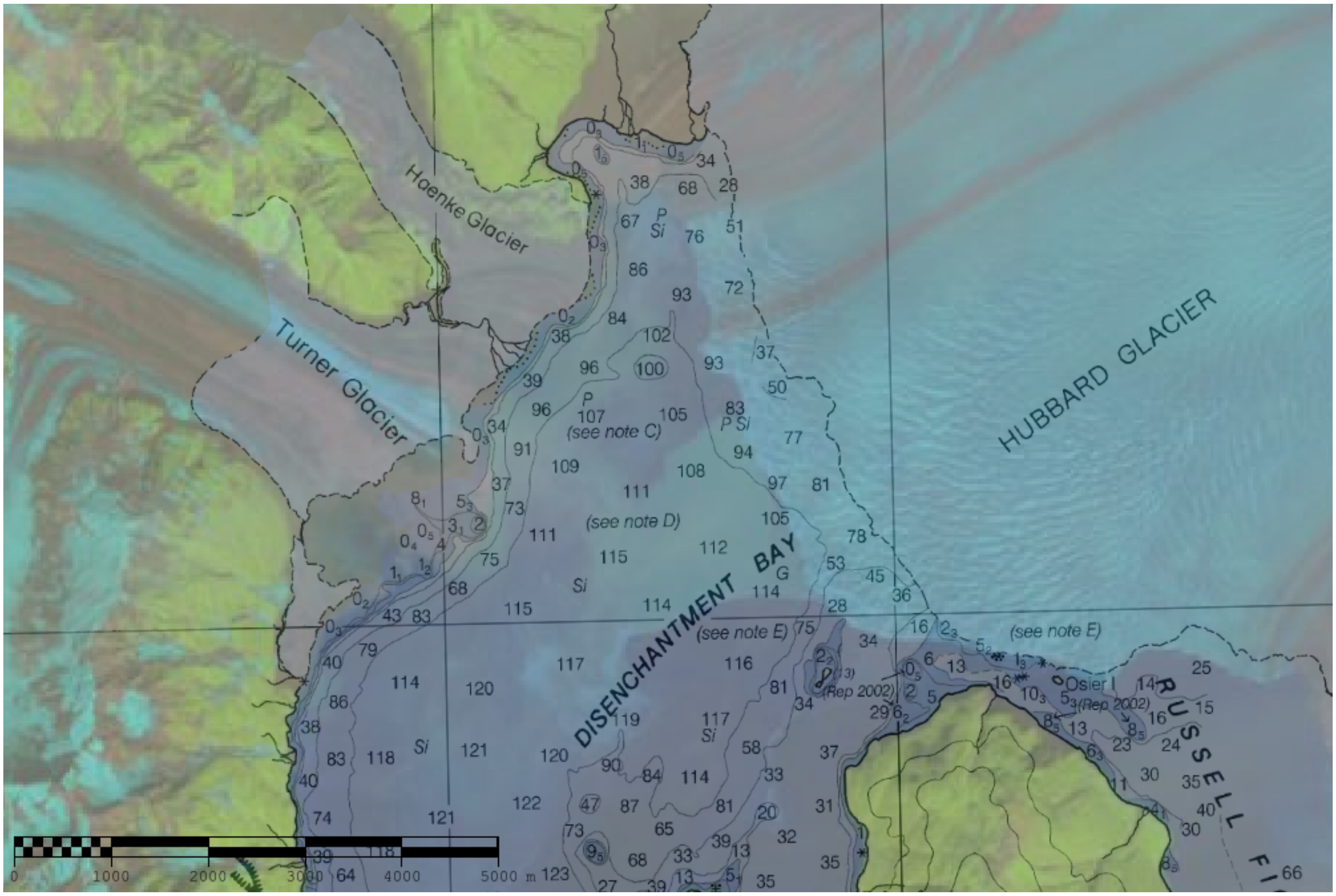


Figure 25: Satellite imagery overlaid on Chart 16761 showing glacial advance

D.2.9 Construction and Dredging

No present or planned construction or dredging exist within the survey limits.

D.2.10 New Survey Recommendation

No new surveys or further investigations are recommended for this area.

D.2.11 Inset Recommendation

No new insets 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 and Specifications 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 herein.

Approver Name	Approver Title	Approval Date	Signature
CDR Mark Van Waes	Chief of Party	03/08/2018	VAN WAES.MARK.1240076329 2018.03.08 15:51:56 -08'00'
LT Damian Manda, NOAA	Field Operations Officer	03/08/2018	MANDA.DAMIAN.CURTIS.1396610660 2018.03.08 14:49:23 -08'00'
HCST Sam Candio	Chief Survey Technician	03/08/2018	Digitally signed by CANDIO.SAMUEL.LOUIS.1515897743 DN: c=US, o=U.S. Government, ou=DoD, ou=PKI, ou=OTHER, cn=CANDIO.SAMUEL.LOUIS.1515897743 Date: 2018.03.08 08:09:53 -08'00'
HSST Hannah Marshburn	Sheet Manager	03/08/2018	Digitally signed by MARSHBURN.HANNAH.ELIZABETH.1517254360 DN: c=US, o=U.S. Government, ou=DoD, ou=PKI, ou=OTHER, cn=MARSHBURN.HANNAH.ELIZABETH.1517254360 Date: 2018.03.08 14:31:48 -08'00'

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	Continually Operating Reference Staiton
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
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
HSSD	Hydrographic Survey Specifications and Deliverables

Acronym	Definition
HSTP	Hydrographic Systems Technology Programs
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
NAIP	National Agriculture and Imagery Program
NALL	Navigable Area Limit Line
NM	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
PST	Physical Science Technician
RNC	Raster Navigational Chart
RTK	Real Time Kinematic
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
TPE	Total Propagated Error
TPU	Topside Processing Unit
USACE	United States Army Corps of Engineers
USCG	United Stated Coast Guard
UTM	Universal Transverse Mercator
XO	Executive Officer
ZDA	Global Positiong System timing message
ZDF	Zone Definition File

UNITED STATES DEPARMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Ocean Service
Silver Spring, Maryland 20910

TIDE NOTE FOR HYDROGRAPHIC SURVEY

DATE : October 30, 2017

HYDROGRAPHIC BRANCH: Pacific
HYDROGRAPHIC PROJECT: OPR-O346-FA-2017
HYDROGRAPHIC SHEET: H13071

LOCALITY: Disenchantment Bay, Yakutat Bay, AK
TIME PERIOD: September 16 - October 14, 2017

TIDE STATION USED: 945-3220 Yakutat, AK
Lat. 59° 32.9'N Long. 139° 44.0' W
PLANE OF REFERENCE (MEAN LOWER LOW WATER): 0.000 meters
HEIGHT OF HIGH WATER ABOVE PLANE OF REFERENCE: 2.807 meters

REMARKS: RECOMMENDED GRID

Please use the TCARI grid "O346FA2017.tc" as the final grid for project OPR-O347-FA-2017, H13071, during the time period between September 16 and October 14, 2017.

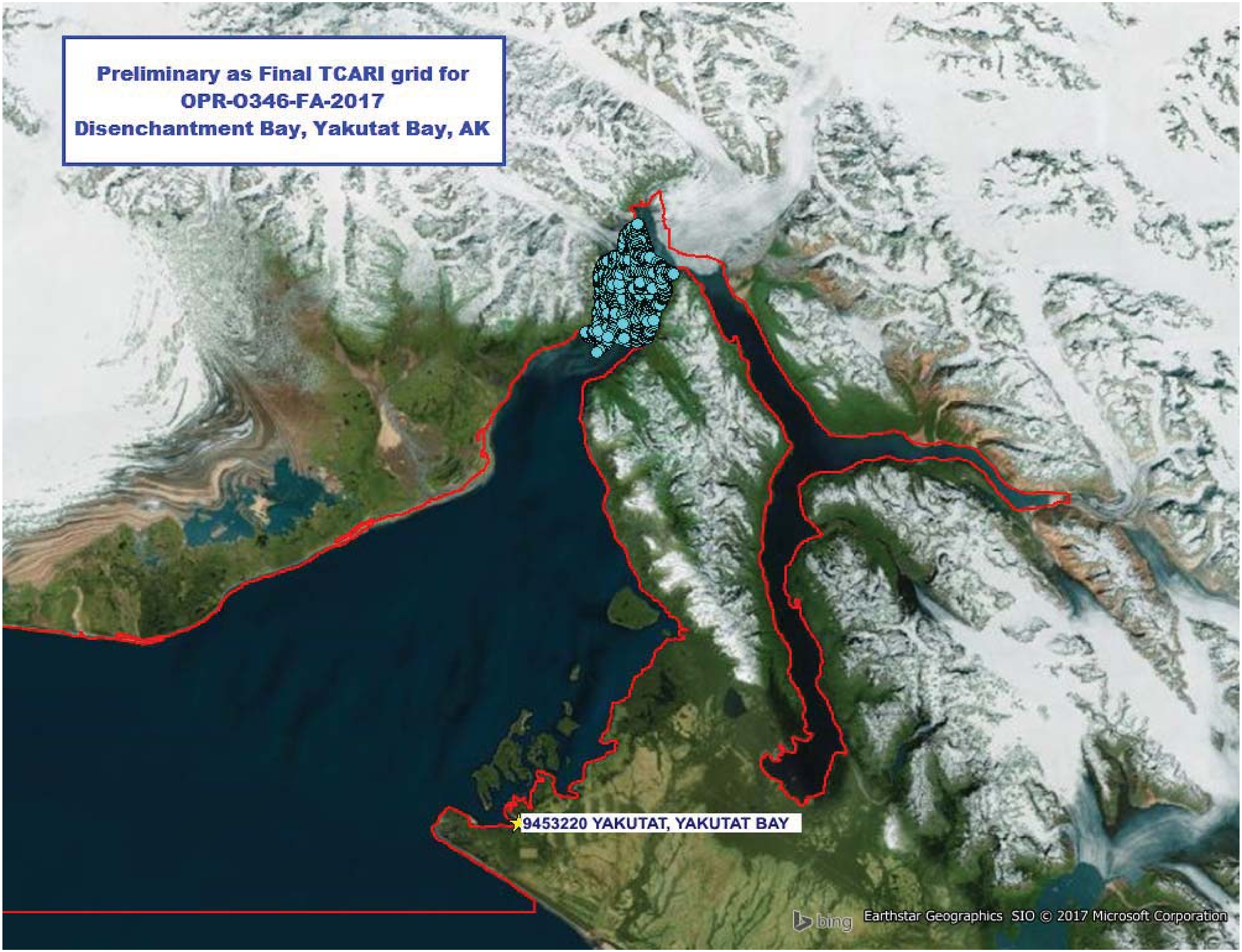
Refer to attachments for grid information.

Note 1: Provided time series data are tabulated in metric units (meters), relative to MLLW and on Greenwich Mean Time on the 1983-2001 National Tidal Datum Epoch (NTDE).

Note 2: Due to inaccurate shoreline, survey track lines fall outside of the TCARI grid boundaries in some areas. TCARI will extrapolate the tide corrector to cover these soundings.

BURKE.PATRICK.B.1365830335 Digitally signed by BURKE.PATRICK.B.1365830335 Date: 2017.11.01 18:45:31 -04'00'

CHIEF, OCEANOGRAPHIC DIVISION


Preliminary as Final TCARI grid for
OPR-O346-FA-2017
Disenchantment Bay, Yakutat Bay, AK
9453220 YAKUTAT, YAKUTAT BAY
bing
Earthstar Geographics SIO © 2017 Microsoft Corporation

OPS Fairweather - NOAA Service Account <ops.fairweather@noaa.gov>

Coast Pilot Report for OPR-O346-FA-17

1 message

OPS Fairweather <ops.fairweather@noaa.gov> Wed, Mar 7, 2018 at 4:35 PM
To: _NOS OCS NSD Coast Pilot <coast.pilot@noaa.gov>, OCS NDB <OCS.NDB@noaa.gov>
Cc: Starla Robinson - NOAA Federal <Starla.Robinson@noaa.gov>, "ChiefST.Fairweather" <chiefst.fairweather@noaa.gov>

Coast Pilot Branch,

The Coast Pilot Review report for OPR-R365-FA-17, Port Clarence and Vicinity, AK is attached in pdf format. All questions are addressed directly in the original PDF provided with the project and revised text with additional notes is also provided. Please let us know if you have any questions or need clarifications.

Very Respectfully,

LT Damian Manda

Operations Officer
NOAA Ship *Fairweather*
1010 Stedman Street
Ketchikan, Alaska 99901

Ship Cell: 907.254.2842
Iridium: 808.659.0054
OPS.Fairweather@noaa.gov

OPR-O346-FA-17_Coast Pilot Review Report.pdf
5486K

ChiefST Fairweather - NOAA Service Account <chiefst.fairweather@noaa.gov>

Fwd: NOAA Ship Fairweather NODC Submissions: OPR-O346-FA-17 (Yakutat, AK)

Hannah Marshburn - NOAA Federal <hannah.marshburn@noaa.gov> Fri, Dec 8, 2017 at 12:41 PM
To: Starla Robinson - NOAA Federal <Starla.Robinson@noaa.gov>, Douglas Wood - NOAA Federal <douglas.wood@noaa.gov>, _OMAO MOP OPS Fairweather <ops.fairweather@noaa.gov>, Douglas Bravo - NOAA Federal <ChiefST.fairweather@noaa.gov>

---------- Forwarded message ----------
From: **Hannah Marshburn - NOAA Federal** <hannah.marshburn@noaa.gov>
Date: Fri, Dec 8, 2017 at 12:39 PM
Subject: NOAA Ship Fairweather NODC Submissions: OPR-O346-FA-17 (Yakutat, AK)
To: "NODC.Submissions" <nodc.submissions@noaa.gov>

Greetings!!

I am writing to submit the NODC files that correspond to project OPR-O346-FA-17_Yakutat, AK. The data has been sorted by Project/ Registry Number/Vessel/Julian Day Number.

Thank you,

Hannah Marshburn

Senior Hydrographic Survey Technician
NOAA Ship Fairweather
1010 Stedman Street
Ketchikan, AK 99901

OPR-O346-FA-17_20171208.zip
2026K

ChiefST Fairweather - NOAA Service Account <chiefst.fairweather@noaa.gov>

Survey Outline for H13071 (OPR-O346-FA-17)

2 messages

ChiefST Fairweather - NOAA Service Account <chiefst.fairweather@noaa.gov> Thu, Oct 19, 2017 at 11:11 AM
To: _NOS OCS Survey Outlines <survey.outlines@noaa.gov>, Starla Robinson - NOAA Federal <Starla.Robinson@noaa.gov>, "CO Fairweather (CDR Mark Van Waes)" <co.fairweather@noaa.gov>, _OMAO MOP OPS Fairweather <ops.fairweather@noaa.gov>, Hannah Marshburn - NOAA Federal <hannah.marshburn@noaa.gov>

Greetings,

Attached is the survey outline for H13071 (Sheet 3) of OPR-O346-FA-17, Yakutat. Included are three files; an unprojected S-57, an unprojected shape file, and a shape file projected in NAD83 UTM zone 07 North.

Please let me know if you have any questions or issues with the files. Thanks!

Very Respectfully,

--

Sam Candio
Chief Survey Technician
NOAA Ship Fairweather (S-220)
1010 Stedman St
Ketchikan, AK 99901
Ship Cell: 907-254-2842
Iridium: 808-659-0054
ChiefST.Fairweather@noaa.gov

H13071_Survey_Outline.zip
89K

Brian Mohr - NOAA Federal <brian.mohr@noaa.gov> Wed, Oct 25, 2017 at 5:44 AM
To: ChiefST Fairweather - NOAA Service Account <chiefst.fairweather@noaa.gov>

Got them, Thanks.

Brian Mohr
Physical Scientist - Data Manager
Hydrographic Surveys Division
brian.mohr@noaa.gov
301 713 2700

[Quoted text hidden]

Tyanne Faulkes - NOAA Federal <tyanne.faulkes@noaa.gov>

DtoNs in the Vicinity of the Turner Glacier

8 messages

Tyanne Faulkes - NOAA Federal <tyanne.faulkes@noaa.gov> Thu, Aug 30, 2018 at 8:22 AM
To: Andrew Kampia - NOAA Federal <andrew.kampia@noaa.gov>, Peter Holmberg <peter.holmberg@noaa.gov>, Olivia Hauser <olivia.hauser@noaa.gov>

Good Morning Andy,

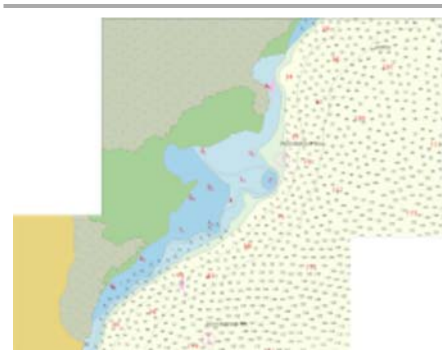
I am currently working on a SAR for survey H13071 which is located in Yackutat, Alaska. During my review I found large discrepancies between the chart and surveyed soundings in the vicinity of the Turner Glacier. This has been flagged as a concern because under keel clearance is a risk for the larger cruise ships that transit this area, which can draft up to 8 meters.

The question is how would you like us to handle this discrepancy. Would you like us to select a number of discrete DtoNs that represent the shoaling in the area or would you like us to expedite the SAR process with a note to the compiler which states the urgent nature of this data?

Please see the attached image of the data that we are talking about. Soundings are represented in fathoms and feet. The red soundings are the charted soundings and the black soundings are selected soundings from survey H13071.

Please let me know if you have any questions or concerns. Looking forward to hearing from you.

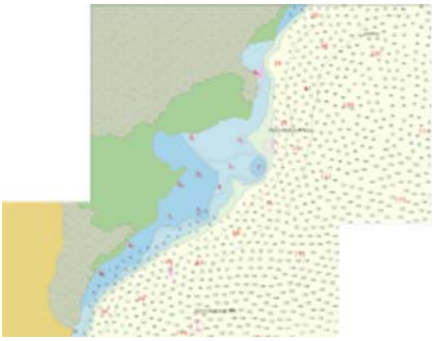
Tyanne
--
Tyanne Faulkes
Physical Scientist
NOAA's National Ocean Service
Office of Coast Survey, Hydrographic Surveys Division
Pacific Hydrographic Branch



H13071_DtoNs.png
508K

Tyanne Faulkes - NOAA Federal <tyanne.faulkes@noaa.gov> Thu, Aug 30, 2018 at 8:26 AM
To: Grant Froelich <grant.froelich@noaa.gov>

FYI. I forgot to include you.
[Quoted text hidden]



H13071_DtoNs.png

Andrew Kampia - NOAA Federal <andrew.kampia@noaa.gov> Thu, Aug 30, 2018 at 8:43 AM
To: Tyanne Faulkes - NOAA Federal <tyanne.faulkes@noaa.gov>
Cc: Peter Holmberg <peter.holmberg@noaa.gov>, Olivia Hauser <olivia.hauser@noaa.gov>

Tyanne,

I think the full application of the survey is the only thing that will solve this issue. In the meantime, the charted notes advise extreme caution and describe daily changes to the conditions near those glaciers. Let's just get the survey on the charts as quickly as we can.

NOTE C

Hubbard and Turner Glaciers actively discharge ice into Disenchantment Bay, changing their limits daily. Icebergs, flow ice, and large swells due to calving are usually present. Mariners are urged to use extreme caution when navigating this area.

NOTE D

Significant shoaling has been found within one-quarter nautical mile of the glaciers at the head of Disenchantment Bay as presently charted. Mariners are urged to navigate with extreme caution as some depths found are up to 20 fathoms shoaler than charted and will continue to change in the future.

Thanks!
[Quoted text hidden]
--
Andy Kampia
Chief, Products Branch A (Alaska)
Marine Chart Division - Office of Coast Survey
240-533-0116

Tyanne Faulkes - NOAA Federal <tyanne.faulkes@noaa.gov> Thu, Aug 30, 2018 at 8:44 AM
To: Grant Froelich <grant.froelich@noaa.gov>

And the results...
[Quoted text hidden]

Olivia Hauser - NOAA Federal <olivia.hauser@noaa.gov> Thu, Aug 30, 2018 at 8:45 AM

To: Andrew Kampia - NOAA Federal <andrew.kampia@noaa.gov>
Cc: Tyanne Faulkes - NOAA Federal <tyanne.faulkes@noaa.gov>, Peter Holmberg <peter.holmberg@noaa.gov>

Thanks, Andy. We will do that.

V/R, Olivia
[Quoted text hidden]
--

LCDR Olivia Hauser, NOAA
Chief, Pacific Hydrographic Branch
Office: 206-526-6835
Cell: 302-229-3368
NOAA/NOS/OCS/HSD/PHB
olivia.hauser@noaa.gov

Peter Holmberg - NOAA Federal <peter.holmberg@noaa.gov> Thu, Aug 30, 2018 at 8:49 AM
To: Grant Froelich <grant.froelich@noaa.gov>
Cc: Olivia Hauser <olivia.hauser@noaa.gov>, Tyanne Faulkes <Tyanne.Faulkes@noaa.gov>

FYI, H13701 just became a line jumper.

---------- Forwarded message ----------
From: **Olivia Hauser - NOAA Federal** <olivia.hauser@noaa.gov>
Date: Thu, Aug 30, 2018 at 8:45 AM
Subject: Re: DtoNs in the Vicinity of the Turner Glacier
[Quoted text hidden]

--
Peter Holmberg
Cartographic Team Lead
Pacific Hydrographic Branch
7600 Sand Point Way N.E.
Room 1001B
Seattle, WA 98115
206-526-6843

Peter Holmberg - NOAA Federal <peter.holmberg@noaa.gov> Thu, Aug 30, 2018 at 8:50 AM
To: Grant Froelich <grant.froelich@noaa.gov>
Cc: Olivia Hauser <olivia.hauser@noaa.gov>, Tyanne Faulkes <Tyanne.Faulkes@noaa.gov>

Urrrr, I mean H13071 (not H13701)
[Quoted text hidden]

Tyanne Faulkes - NOAA Federal <tyanne.faulkes@noaa.gov> Thu, Aug 30, 2018 at 8:54 AM
To: Peter Holmberg - NOAA Federal <peter.holmberg@noaa.gov>
Cc: Grant Froelich <grant.froelich@noaa.gov>, Olivia Hauser <olivia.hauser@noaa.gov>

Working on getting it completed ASAP.
[Quoted text hidden]

APPROVAL PAGE

H13071

Data meet or exceed current specifications as certified by the OCS survey acceptance review process. Descriptive Report and survey data except where noted are adequate to supersede prior surveys and nautical charts in the common area.

The following products will be sent to NCEI for archive

- Descriptive Report
- Collection of Bathymetric Attributed Grids (BAGs)
- Collection of backscatter mosaics
- Processed survey data and records
- Bottom samples
- GeoPDF of survey products

The survey evaluation and verification has been conducted according current OCS Specifications, and the survey has been approved for dissemination and usage of updating NOAA's suite of nautical charts.

Digitally signed by Peter Holmberg
Reason: I am approving this document
Date: 2018.10.30 08:36:10 -07'00'

Approved:____

Physical Scientist Peter Holmberg

Acting Chief, Pacific Hydrographic Branch