H12821

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

DESCRIPTIVE REPORT

Type of Survey:	Navigable Area
Registry Number:	H12821

LOCALITY

State(s):	Alaska
General Locality:	Kotzebue Sound, AK
Sub-locality:	SW Portion of Good Hope Bay

2015

CHIEF OF PARTY
Edward J. Van Den Ameele, CDR/NOAA

LIBRARY & ARCHIVES

Date:

U.S. DEPARTMENT OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION	REGISTRY NUMBER:
HYDROGRAPHIC TITLE SHEET	**H12821**

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 Sound, AK**
Sub-Locality:	**SW Portion of Good Hope Bay**
Scale:	**40000**
Dates of Survey:	**08/08/2015 to 08/11/2015**
Instructions Dated:	**05/28/2015**
Project Number:	**OPR-S327-RA-15**
Field Unit:	**NOAA Ship *Rainier***
Chief of Party:	**Edward J. Van Den Ameele, CDR/NOAA**
Soundings by:	**Multibeam Echo Sounder**
Imagery by:	**Multibeam Echo Sounder Backscatter Side Scan Sonar**
Verification by:	**Pacific Hydrographic Branch**
Soundings Acquired in:	**meters at Mean Lower Low Water**

Remarks:

The purpose of this survey is to provide contemporary surveys to update National Ocean Service (NOS) nautical charts. All separates are filed with the hydrographic data. Any revisions to the Descriptive Report (DR) generated during office processing are shown in bold, red italic text. The processing branch maintains the DR as a field unit product, therefore, all information and recommendations within the body of the DR are considered preliminary unless otherwise noted. The final disposition of surveyed features is represented in the OCS nautical chart update products. All pertinent records for this survey, including the DR, are archived at the National Centers for Environmental Information (NCEI) and can be retrieved via http://www.ncei.noaa.gov/.

Table of Contents

List of Tables

List of Figures

Descriptive Report to Accompany Survey H12821

Project: OPR-S327-RA-15

Locality: Kotzebue Sound, AK

Sublocality: SW Portion of Good Hope Bay

Scale: 1:40000

August 2015 - August 2015

NOAA Ship *Rainier*

Chief of Party: Edward J. Van Den Ameele, CDR/NOAA

A. Area Surveyed

The project area is referred to as Sheet 10: "SW Portion of Good Hope Bay" within the Project Instructions. The area is directly north of Clifford Point, AK (Figure 1).

A.1 Survey Limits

Data were acquired within the following survey limits:

Northwest Limit	Southeast Limit
66° 18' 4.29" N 163° 32' 36.45" W	66° 13' 14.91" N 163° 27' 28.14" W

Table 1: Survey Limits

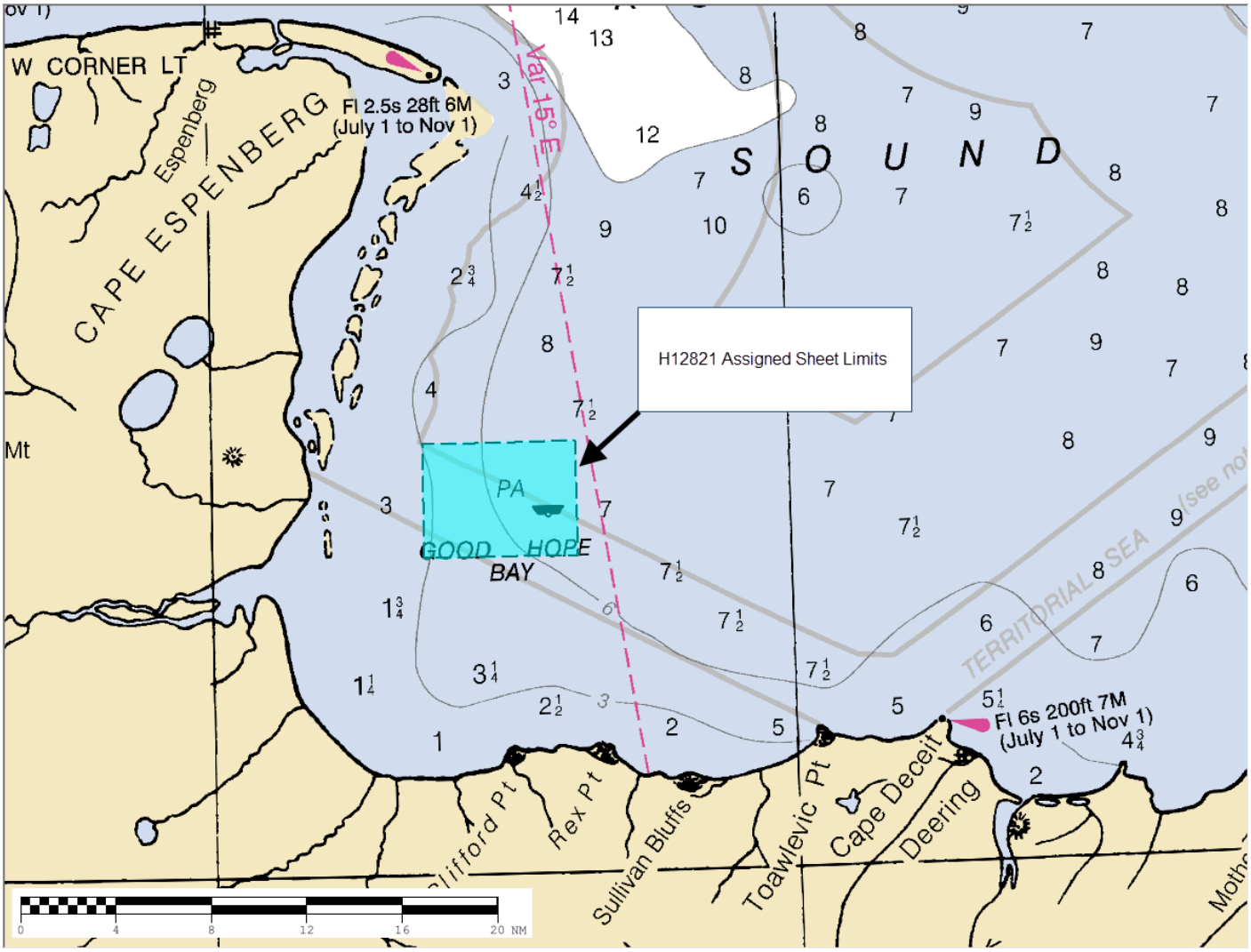


Figure 1: H12821 survey area as assigned in Project Instructions dated May 28, 2015 (Chart 16005).

H12821 data were partially acquired within the survey limits in accordance with the Project Instructions and the HSSD. Deviations from the Project Instructions and HSSD are explained below.

A.2 Survey Purpose

The purpose of this project is to provide contemporary surveys to update National Ocean Service (NOS) nautical charting products. Information for survey priorities was collected and compiled from a number of users/customers in the region: Alaska Marine Pilots, USCG D17 & the buoy tender Hickory, Crowley Tug & Barge, as well as field reports from USCG and NOAA personnel.

A.3 Survey Quality

The survey is partially adequate to supersede previous data.

The regions of H12821 surveyed with 100% side scan sonar and concurrent multibeam met NOS HSSD May 2015 quality requirements and Project Instruction coverage standards with exceptions, described below (A.4 SSS holidays). The finalized CSAR surface IHO compliance tool within Pydro was used to analyze H12821 MBES data. The results showed that 99.38% of MBES nodes met HSSD object detection coverage requirements (Figure 2). The regions of H12821 surveyed using MBES at a set line spacing is adequate to supersede previous data only when shoaler than previously charted. SSS data were qualitatively examined by the hydrographer utilizing a SSS mosaic in accordance with the DAPR.

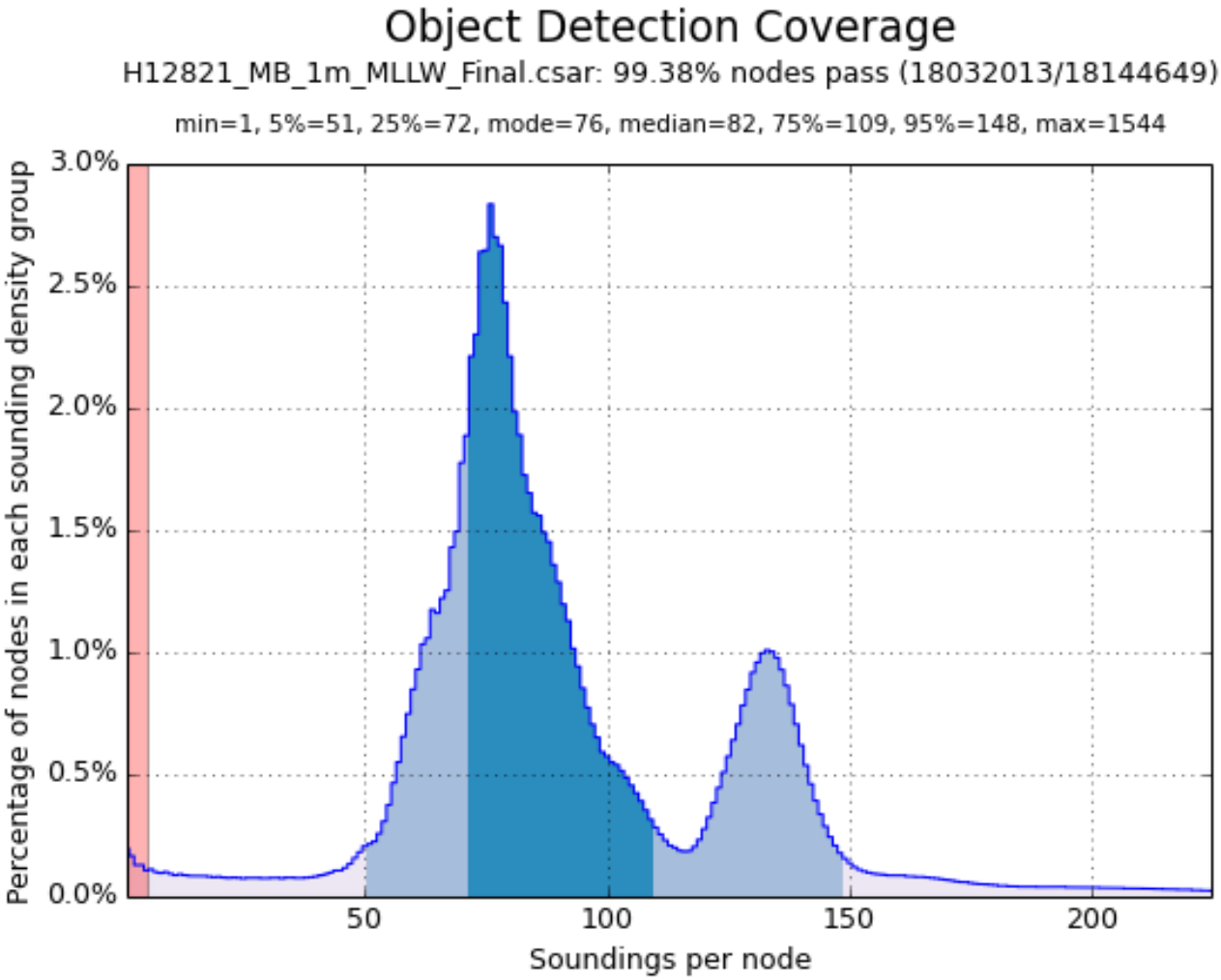


Figure 2: Pydro derived histogram plot showing HSSD object detection compliance of H12821 MBES data within complete coverage area.

A.4 Survey Coverage

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

Water Depth	Coverage Required
Inshore limit to 8 meters water depth	300 meter spaced Set Line Spacing SBES or MBES with backscatter.
8-20 meters	Either 1) 100% SSS with concurrent set line spacing SBES or MBES with backscatter, or 2) complete MBES with backscatter.
Greater than 20 meters water depth	Complete MBES coverage with backscatter.

On July 10, 2015, NOAA Hydrographic Survey Division (HSD) Operations Branch altered the coverage requirements for Kotzebue Sound surveys. For specific changes, refer to "OPR-S327-RAFA-15 Updated Coverage Requirements.pdf" located in the supplemental correspondence folder included with this report.

On July 14, 2015 NOAA HSD further altered coverage requirements for Kotzebue Sound surveys. For details see supplemental correspondence document "Second Change OPR-S327-RAFA-15 Updated Coverage Requirements.pdf". See Figure 5 for H12821 survey outline (Sheet 10).

These combined changes included the following: a transit corridor was developed within which H12821 was required to obtain either 100% SSS with concurrent set line spacing SBES or MBES with backscatter, or complete MBES with backscatter; the requirement for 300-meter line spacing outside the corridor was dropped. To the west of the full coverage corridor 500-meter line spacing with MBES was acquired to develop the six fathom contour.

Holidays: There are several holidays caused by a mix of ending/starting SSS logging too soon/late, refraction, inadequate line driving, and avoiding anchored vessels. The largest holiday is about 700 meters x 30 meters and is located in the northern part of the corridor (see Figure 7). Holidays in the side scan data were identified by examining the imagery in the SSS editor, marking areas of potential holidays, and comparing with adjacent lines. Areas determined to be holidays were digitized in the file H12821_Holidays.hob. Potential contacts were identified by examining the length of the shadow and if the shadow indicated a height of over a meter it was designated. The data surrounding the holidays does not have any significant features. Some MBES holidays caused by blowouts are also reflected in the SSS imagery (Figure 6). Due to an unplanned early departure from the project area we were unable to address the holidays.

Figure 3: Mosaic of H12821 side scan sonar coverage (Chart 16005).

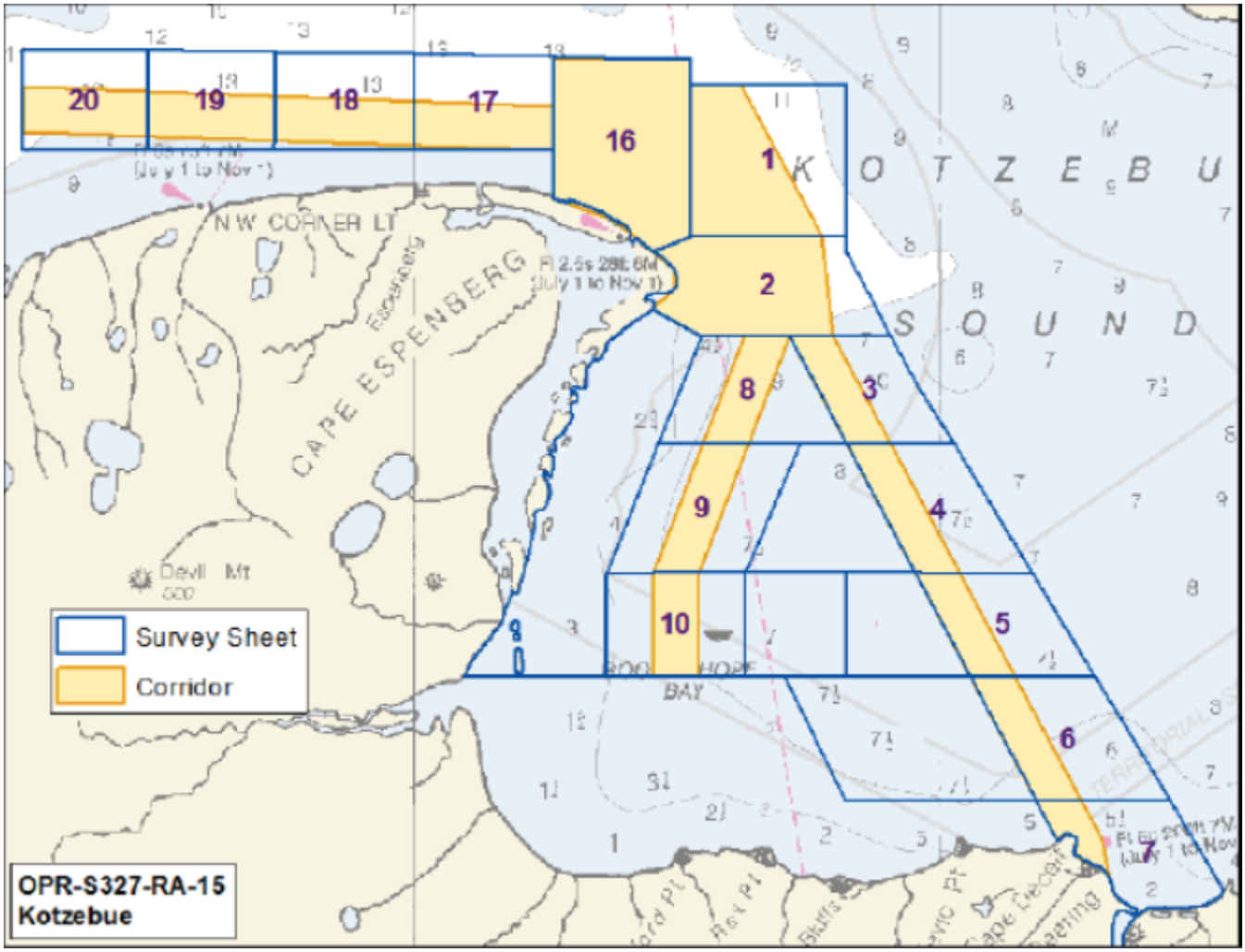


Figure 4: OPR-S327-RA-15 altered coverage requirements, July 14, 2015

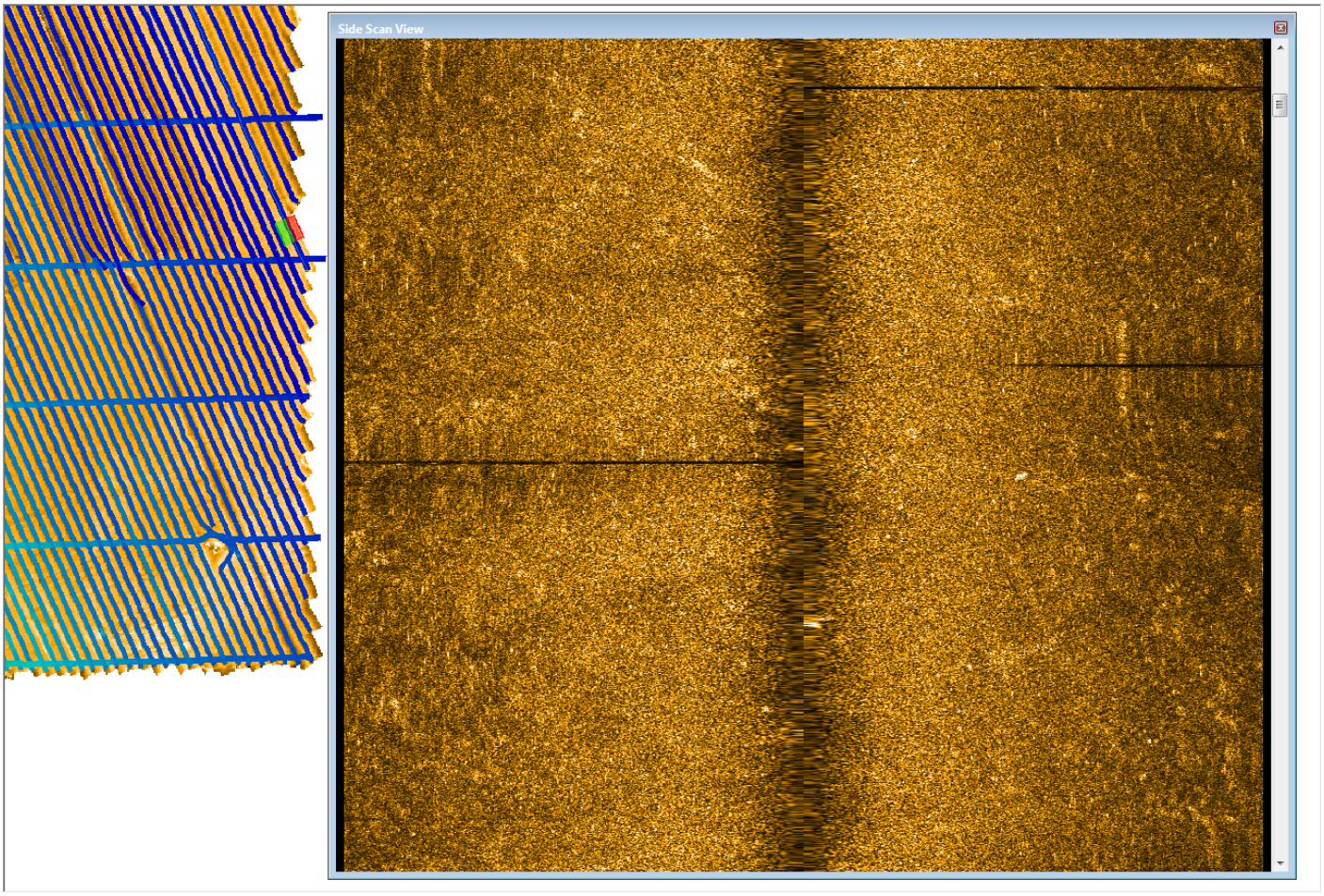


Figure 5: SSS image showing blowouts.

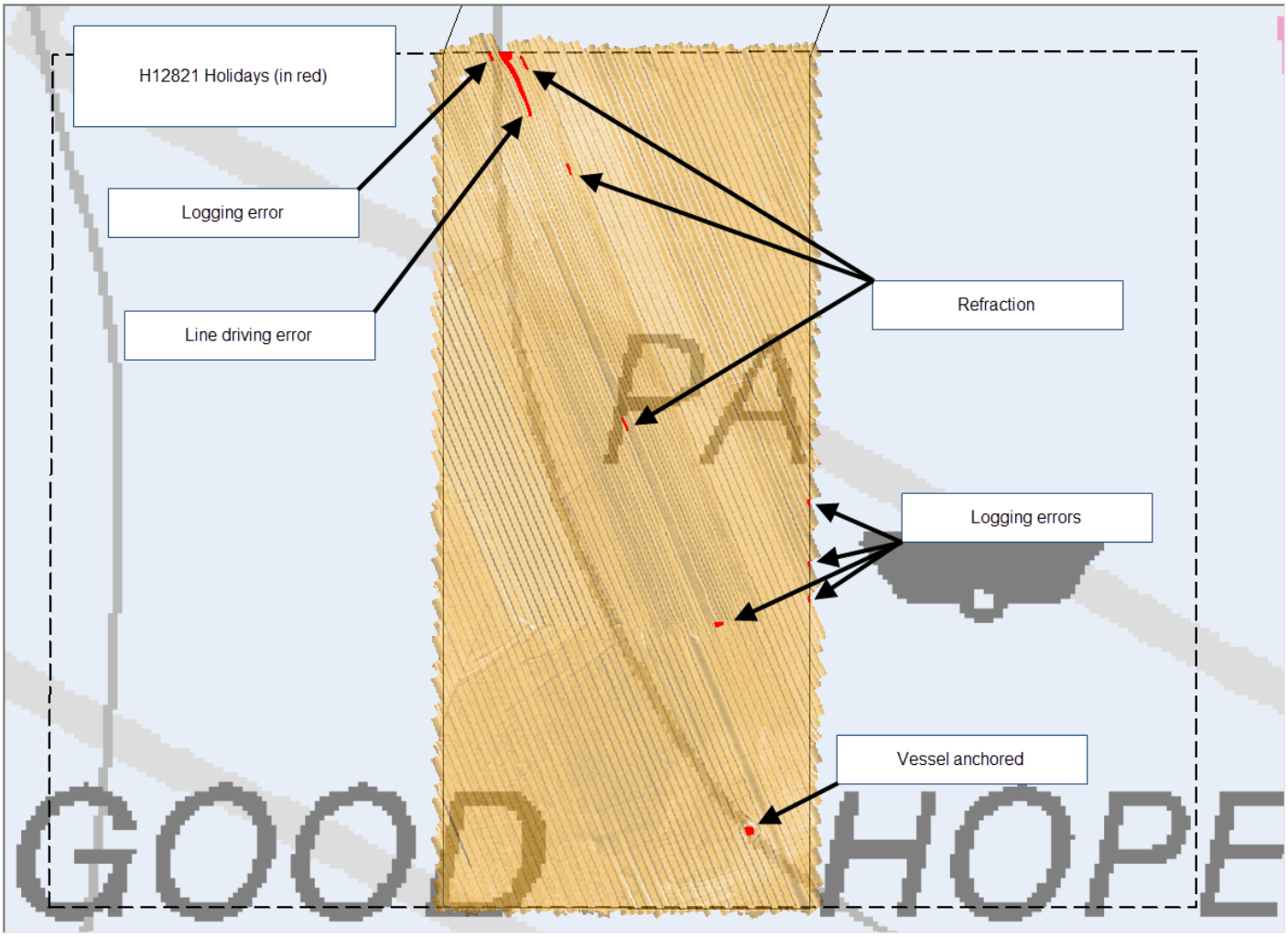


Figure 6: H12821 holidays in SSS/MBES coverage.

See attached correspondence regarding changes to the coverage requirements. The data is adequate for charting despite the holidays noted above.

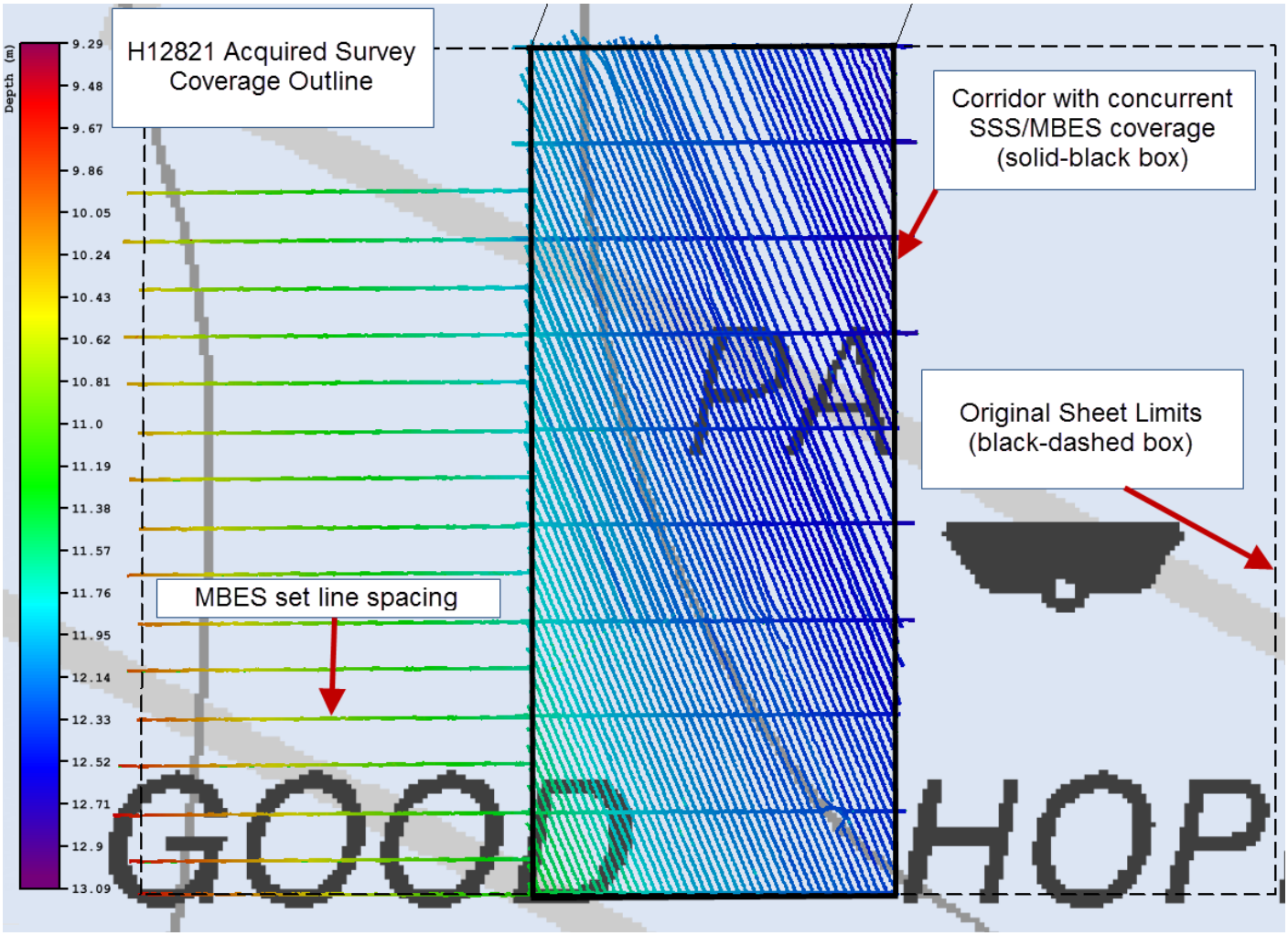


Figure 7: Acquired survey coverage overlaid on Chart 16005.

A.5 Survey Statistics

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

	HULL ID	*2802*	*2803*	*2804*	*S221*	*Total*
LNM	SBES Mainscheme	0	0	0	0	0
	MBES Mainscheme	32.1	0	4.5	0	36.6
	Lidar Mainscheme	0	0	0	0	0
	SSS Mainscheme	0	0	0	0	0
	SBES/SSS Mainscheme	0	0	0	0	0
	MBES/SSS Mainscheme	45.2	0	128.6	51.2	225
	SBES/MBES Crosslines	13.0	9.2	0	0	22.2
	Lidar Crosslines	0	0	0	0	0
Number of Bottom Samples						0
Number Maritime Boundary Points Investigated						0
Number of DPs						0
Number of Items Investigated by Dive Ops						0
Total SNM						11.1

Table 2: Hydrographic Survey Statistics

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

Survey Dates	Day of the Year
08/08/2015	220
08/09/2015	221

Survey Dates	Day of the Year
08/10/2015	222
08/11/2015	223

Table 3: Dates of Hydrography

B. Data Acquisition and Processing

B.1 Equipment and Vessels

Refer to the 2015 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	*S221*	*2802*	*2803*	*2804*
LOA	70.4 meters	8.8 meters	8.8 meters	8.8 meters
Draft	4.7 meters	1.1 meters	1.1 meters	1.1 meters

Table 4: Vessels Used

Figure 8: NOAA Ship Rainier survey launch 2803

All data for H12821 were acquired by NOAA Ship Rainier S221, and survey launches 2802, 2803, 2804. The vessels acquired MBES depth soundings, backscatter data, side scan sonar imagery, and sound speed profiles.

B.1.2 Equipment

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

Manufacturer	Model	Type
Kongsberg	EM710	MBES
Reson	SeaBat 7125 SV2	MBES
Reson	SeaBat 7125-B	MBES
Odim Brooke Ocean	MVP200	Conductivity, Temperature, and Depth Sensor
Reson	SVP70	Sound Speed System
Reson	SVP71	Sound Speed System
Edgetech	4200-MP	SSS
Sea-Bird Electronics	SBE 19Plus SEACAT Profiler	Conductivity, Temperature, and Depth Sensor
Applanix	POS-MV V4	Positioning and Attitude System

Table 5: Major Systems Used

B.2 Quality Control

B.2.1 Crosslines

Crosslines acquired for this survey totaled 8.49% of mainscheme acquisition.

For the corridor, crosslines totaled 9.89% of mainscheme acquisition. MBES 500-meter set line spacing were acquired to the west of the corridor by launches 2802 and 2804 to help develop the 6 fathom contour.

Multibeam crosslines were acquired using Rainier launches 2802 and 2803. A 1 meter CUBE surface was created using only H12821 mainscheme lines, and a second 1 meter surface was created using only crosslines. A 1 meter difference surface was then generated in CARIS from which statistics were derived. The difference surface was compared to the IHO allowable total vertical uncertainty (TVU) standards. In total, 99.99% of the depth differences between H12821 mainscheme and crossline data met HSSD TVU standards. This analysis was performed with final tides applied and reduced to MLLW using ERZT methods.

A mainscheme to crossline comparison between H12821 data reduced to MLLW using traditional TCARI methods and ERZT methods was conducted. TCARI mainscheme to crossline data differed by an average of

0.106 meters with a standard deviation of 0.092 meters. ERZT mainscheme to crossline data differed by an average of -0.017 meters with a standard deviation of 0.067 meters

Depth range	IHO Order	Number of nodes	Nodes satisfying HSSD	Percent nodes satisfying HSSD accuracy
Less than 100m	Order 1	750,248	750,242	100.0%

Figure 9: Summary table indicating percentage of difference surface nodes between H12821 mainscheme and crossline data that met HSSD allowable TVU standards.

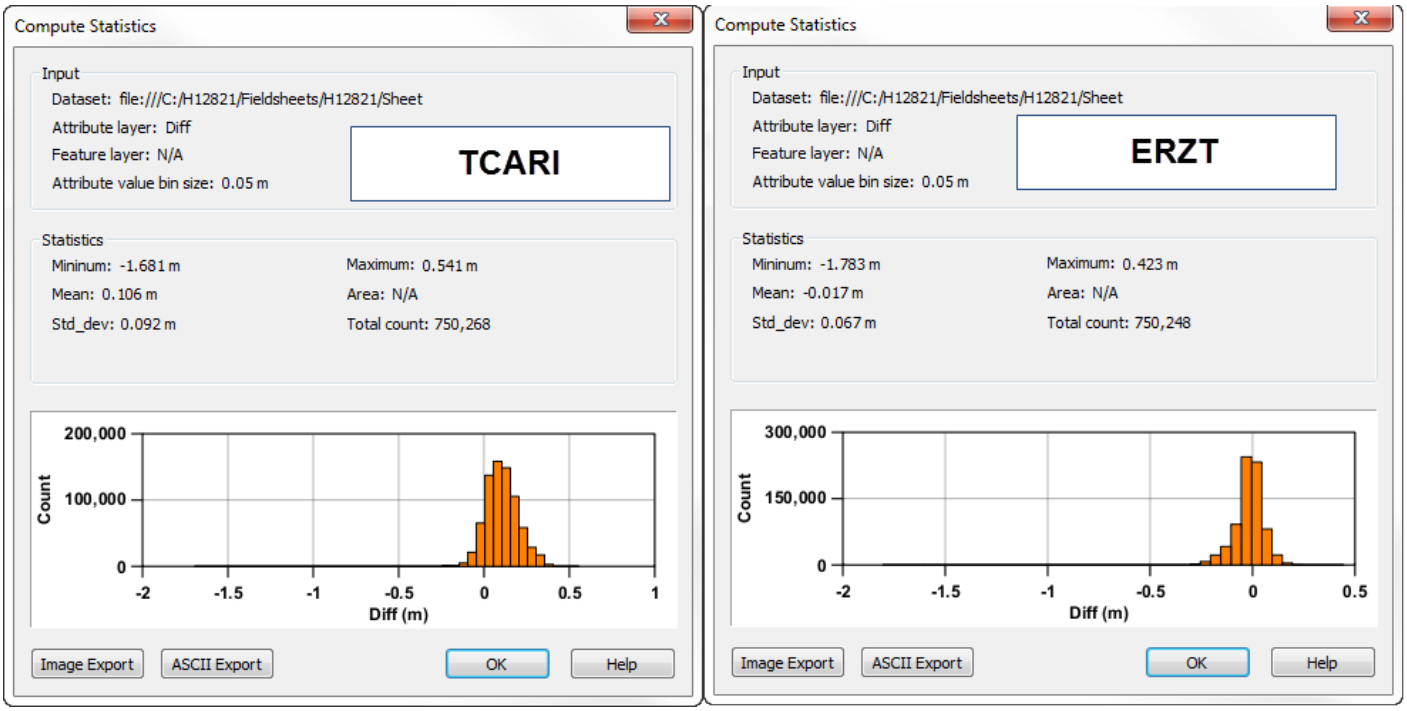


Figure 10: H12821 mainscheme to crossline comparison statistics using TCARI (left) and ERZT (right) methods.

B.2.2 Uncertainty

The following survey specific parameters were used for this survey:

Measured	Zoning	Method
0.017 meters	0 meters	

Table 6: Survey Specific Tide TPU Values

Hull ID	Measured - CTD	Measured - MVP	Surface
2802, 2803, 2804	3 meters/second		0.15 meters/second
S221		1 meters/second	0.05 meters/second

Table 7: Survey Specific Sound Speed TPU Values

Total Propagated Uncertainty (TPU) values for H12821 were derived from a combination of fixed values for equipment and vessel characteristics, as well as field assigned values for sound speed uncertainties. Tidal uncertainties were accounted for by examining the created 1000-m separation model and statistically determining a measured uncertainty. The measured tide uncertainty value of 0.017 meters was entered to account for ERZT processing methods. See the OPR-S327-RA-15 ERZT memo included in Supplemental Correspondence for further information.

In addition to the usual a priori estimates of uncertainty, some real-time and post processed uncertainty sources were also incorporated into the depth estimates of this survey. Real-time uncertainties from Reson MBES sonars were recorded and applied during post processing. Applanix TrueHeave (POS) files, which record estimates of heave uncertainty, were also applied during post processing. Finally, the post processed uncertainties associated with vessel roll, pitch, yaw and navigation, were applied in CARIS HIPS using SBET / RMS files generated using POSPac software.

Uncertainty values of submitted finalized grids were calculated in CARIS using the "Greater of the Two" of uncertainty and standard deviation (scaled to 95%). The finalized CSAR IHO compliance tool within Pydro was used to analyze H12821 MBES data. The results showed that 100.00% of H12821 nodes met HSSD uncertainty requirements (Figure 11).

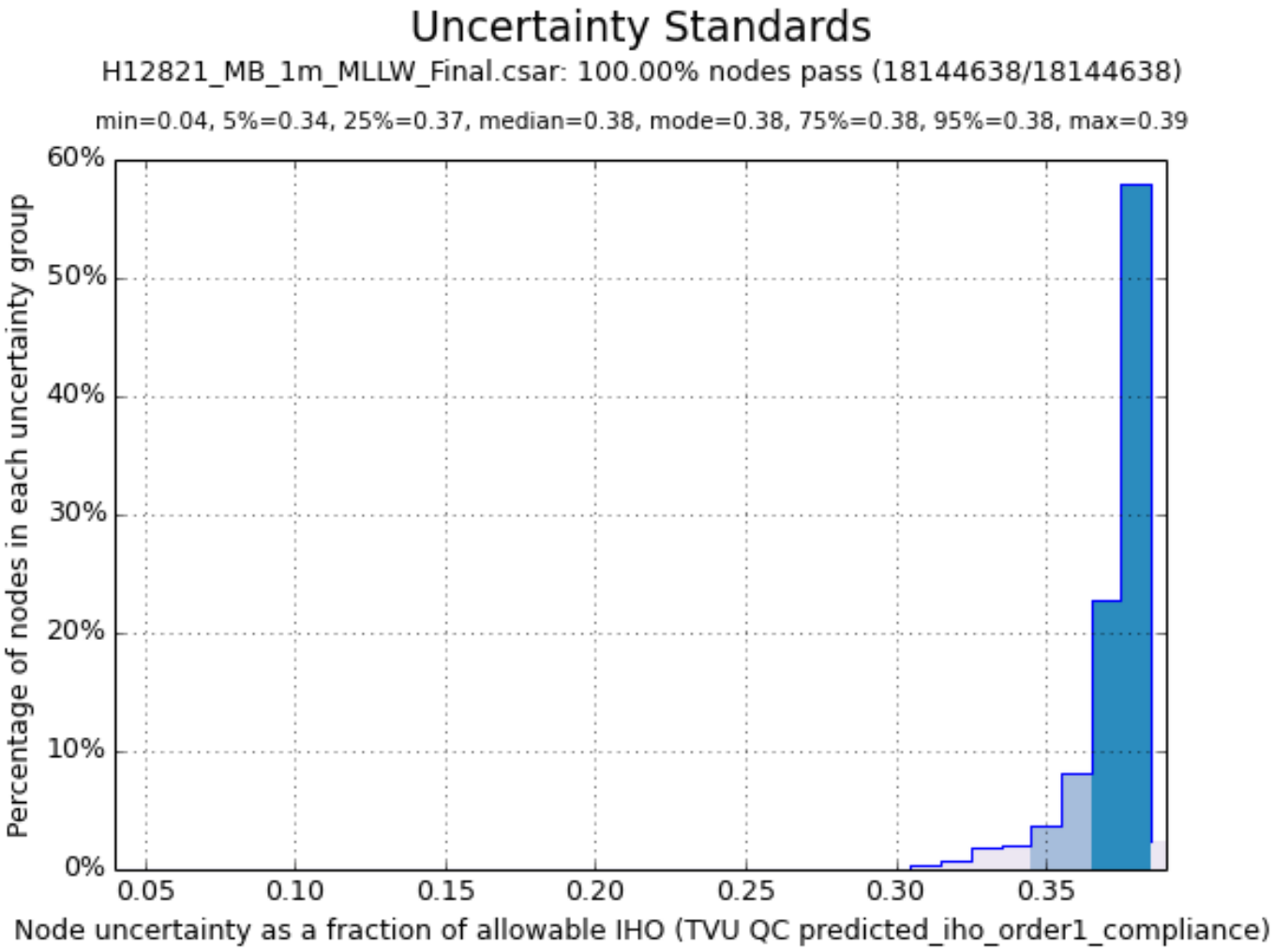


Figure 11: Pydro derived histogram plot showing HSSD uncertainty standards compliance of H12821 MBES data.

B.2.3 Junctions

One junction comparison was made with H12821, which was a contemporary survey conducted in 2015 as part of the same project (Figure 12). Analysis specifics are located in the H12820 DR.

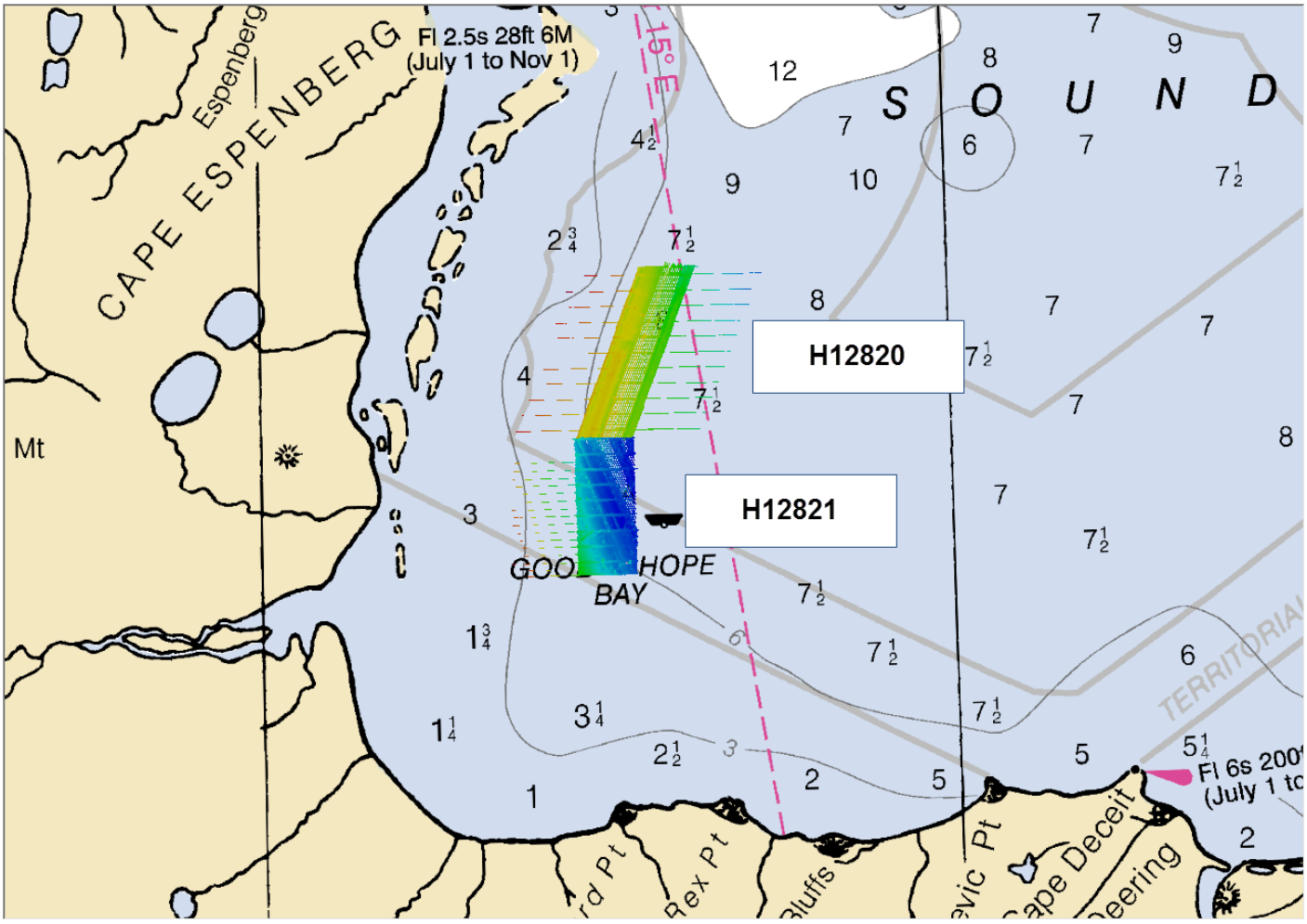


Figure 12: H12821 junction survey (Chart 16005).

There are no contemporary surveys that junction with this survey.

H12821 junctioned with H12820 to the south. For the respective depths, the difference surface was compared to the allowable TVU standards specified in the HSSD. In total, 99.99% of the depth differences between H12821 and H12820 were within allowable uncertainties with a mean of 0.38 meters and standard deviation of 0.065 meters.

B.2.4 Sonar QC Checks

Ice scours were used to monitor SSS effectiveness and outer range of swath coverage per HSSD confidence checks requirements. Swath effective coverage was noted in acquisition logs.

B.2.5 Equipment Effectiveness

Systematic Side Scan Errors

Errors in SSS heading, velocity, speed, and navigation data were prolific throughout the survey in ship (S221) towed data (Figure 13) and created smeared regions in the SSS mosaic. The source of these errors is unknown. Due to the large number of these errors, they have not been edited from the data. These errors only affect the appearance and quality of the mosaic; all SSS data were examined in SIPS to ensure that all significant contacts were detected. Very few contacts were detected throughout this survey, and where contacts were found, navigation data were examined to ensure that an accurate position was calculated for each contact. Refraction affecting the quality of the outer edges of the SSS range scale was also frequent throughout the SSS data and is detailed further in B.2.6 Factors Affecting Soundings.

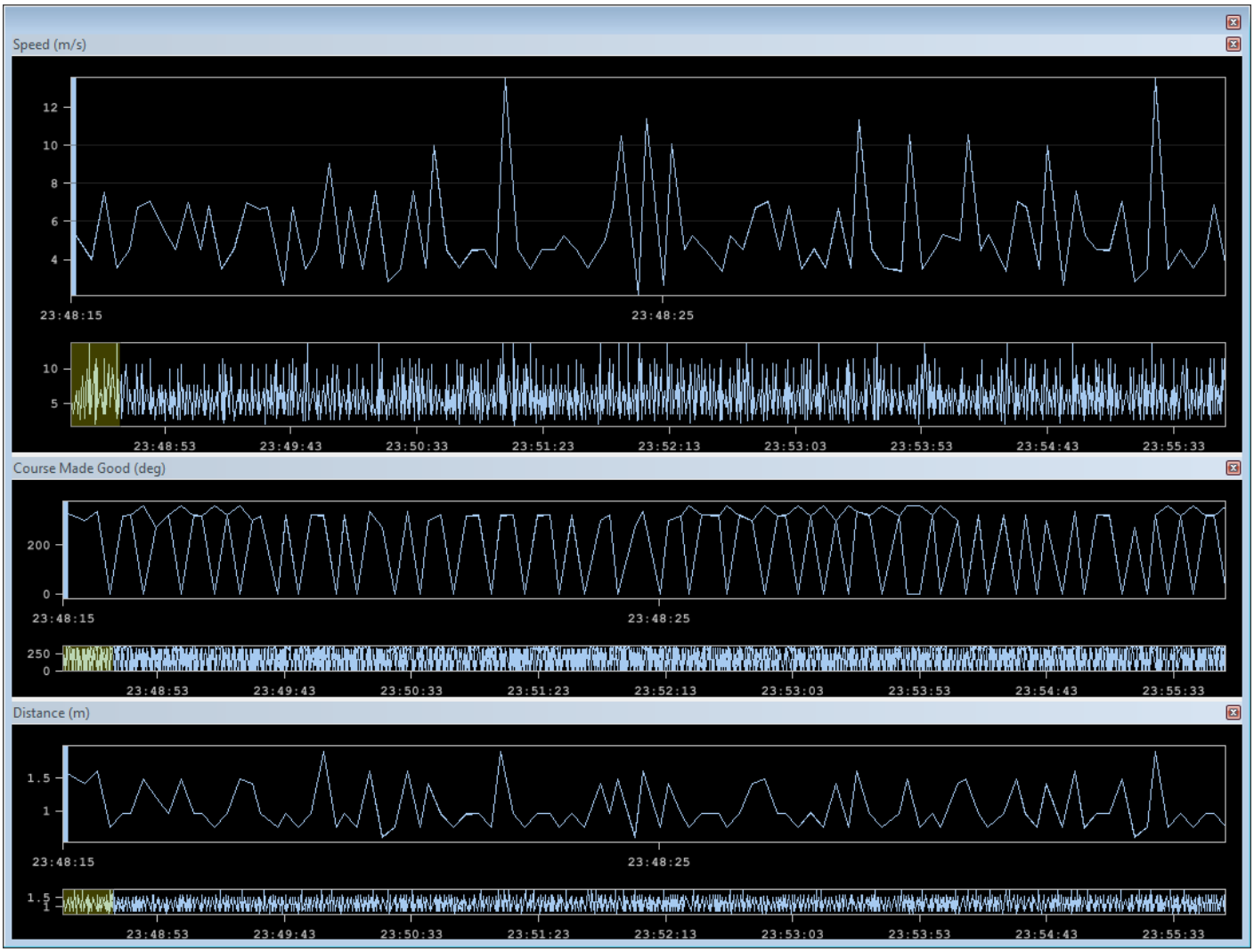


Figure 13: Errors in SSS navigation data.

B.2.6 Factors Affecting Soundings

Sea State

Vessels 2802 and 2804 experienced MBES blowouts while acquiring data on DN221 due to the sea state. Some blowouts in the MBES data also have corresponding blowouts in the SSS data (Figure 6).

The data is adequate for charting despite the motion artifacts due to sea state.

Side Scan Sonar Refraction

The presence of a strong pycnocline (a marked difference in water density) sometimes caused refraction of side scan sonar imagery, reducing the effective range of SSS data for object detection. Side scan data for this survey was acquired with hull mounted (for launches 2802 and 2804) and towed (S221) systems. In order to address the reduced performance of the sonars, the majority of H12821 SSS data were acquired using one hundred meter range scale and 80 meter spaced lines, rather than the more standard 160 meter set line spacing. As a result, much greater overlap between adjacent lines was achieved essentially yielding 200% coverage which enhanced object detection ability. Holidays were assessed using the methods discussed in the 2015 DAPR.

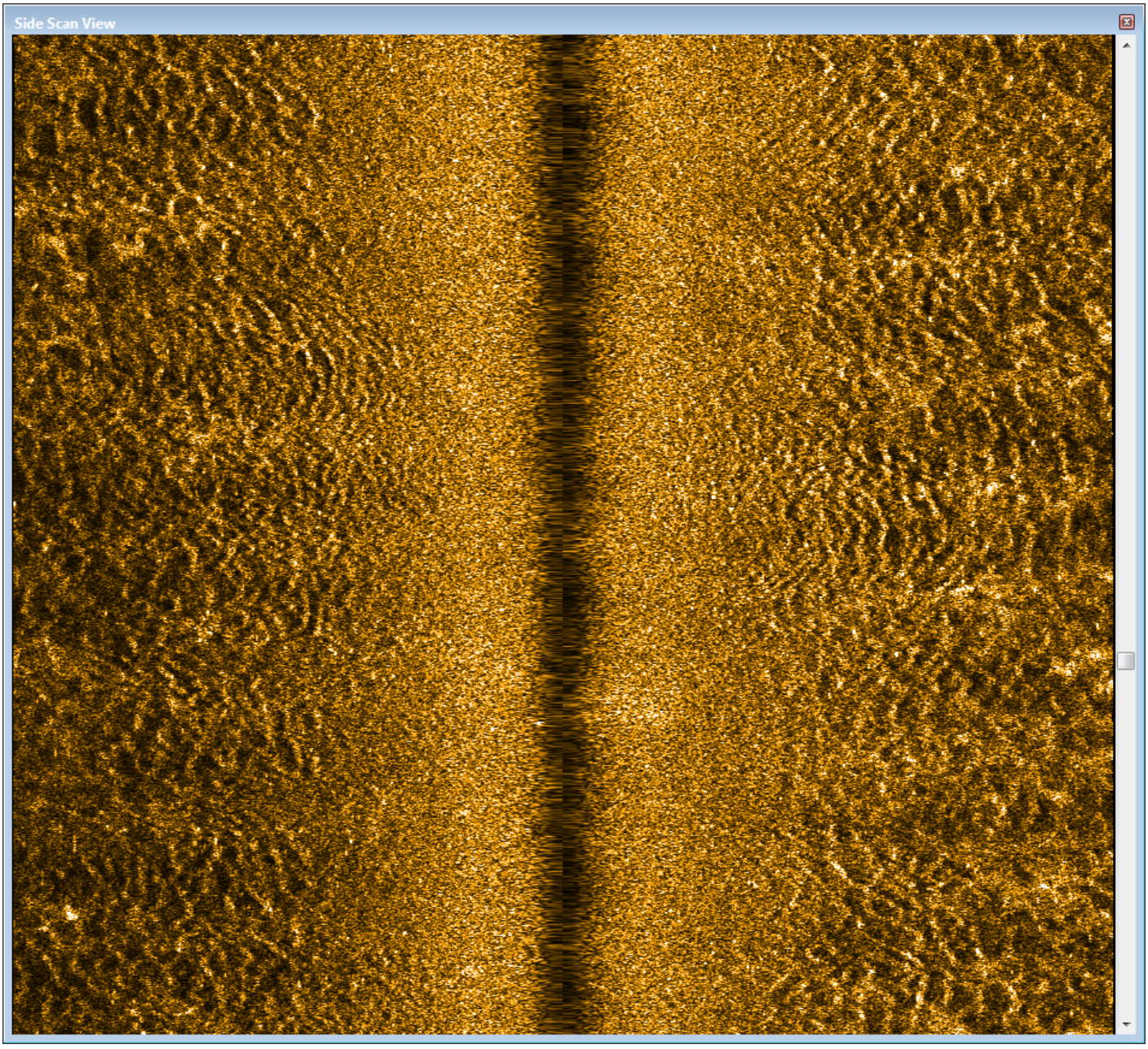


Figure 14: SSS image showing refraction.

Suboptimal Sound Speed Correction

Due to variations in the water column, thermal layering, salinity differences and other factors, a distinct demarcation of water masses was sometimes observed in the field. This proved problematic in the acquisition and application of sound speed correction data. Despite the best efforts of the hydrographer to conduct sufficient sound speed casts distributed spatially and temporally, in some areas sound speed data correction was suboptimal. H12821 XL data acquired in the northern portion of the survey area exhibits an upward deflection of approximately 0.14 meters when viewed in CARIS subset editor. As a result, sound speed related artifacts can be found in the submitted CUBE surface.

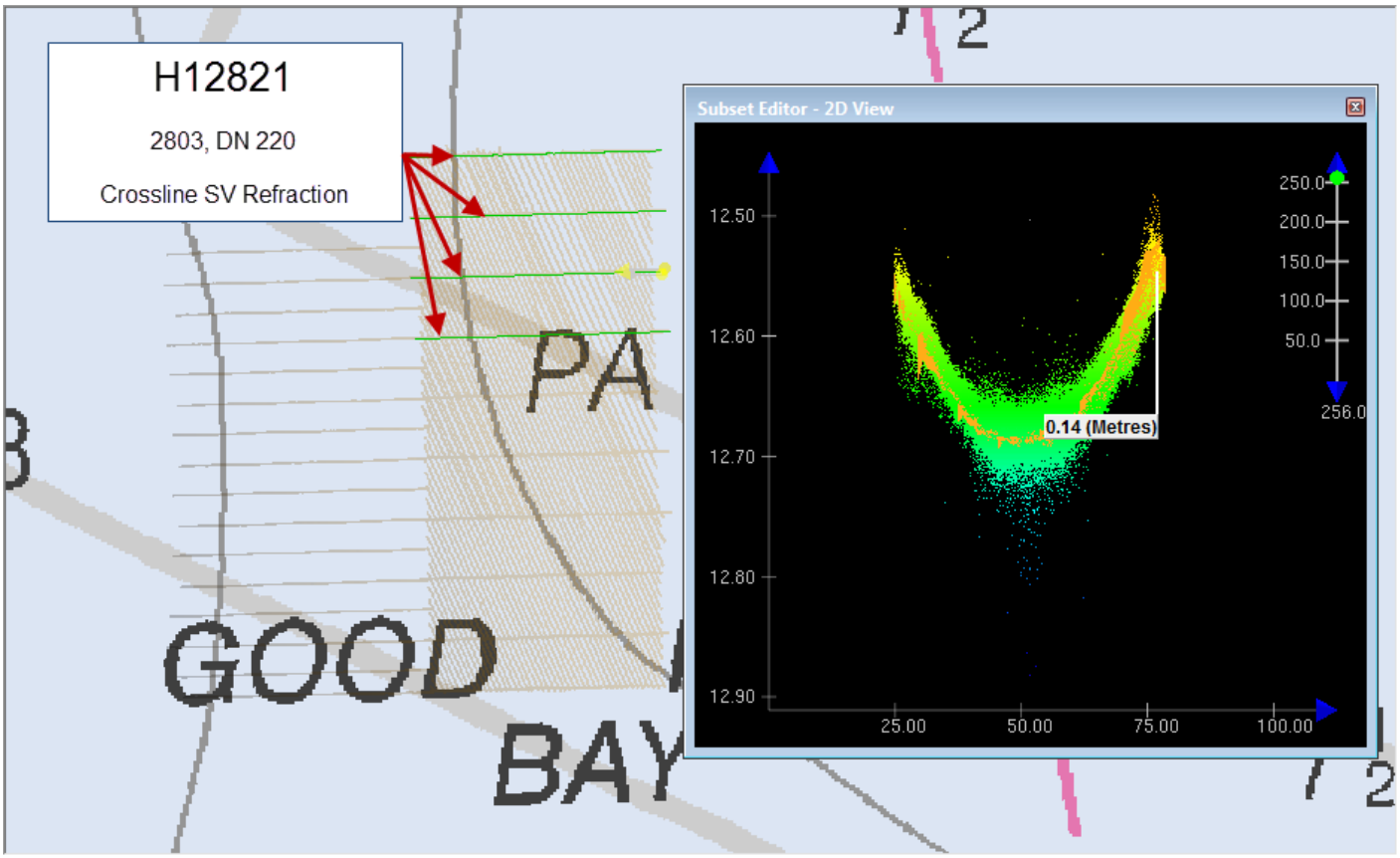


Figure 15: Subset view of H12821 MBES data with suboptimal sound speed correction.
The data is adequate for charting despite the presence of sound speed artifacts.

B.2.7 Sound Speed Methods

Sound Speed Cast Frequency: Sound speed profiles were acquired on Rainier using a MVP200 and Rainier's launches using SBE 19plus CTD probes at discrete locations within the survey area at least once every four hours, when significant changes in surface sound speed were observed, or when surveying in a new area. Twenty CTD casts and nine MVP casts were acquired and applied to H12821 MBES data using the nearest in distance within time (4 hours) method.

B.2.8 Coverage Equipment and Methods

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

B.3 Echo Sounding Corrections

B.3.1 Corrections to Echo Soundings

All data reduction procedures conform to those detailed in the DAPR.

B.3.2 Calibrations

All sounding systems were calibrated as detailed in the DAPR.

B.4 Backscatter

Backscatter data, logged as .7k and .all files, were acquired but not formally processed by Rainier personnel. Sample backscatter lines were reviewed on Rainier for quality control purposes. The data were submitted directly to the National Centers for Environmental Information (NCEI). The 7k file for line XL_2802_2015_2231659 could not be transferred.

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/SIPS	

Table 8: Primary bathymetric data processing software

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

Manufacturer	Name	Version
Caris	HIPS/SIPS	

Table 9: Primary imagery data processing software

The following Feature Object Catalog was used: NOAA Profile V_5_3_3

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
H12821_MB_1m_MLLW	CUBE	1 meters	9.56 meters - 13.05 meters	NOAA_1m	SSS with Concurrent MBES
H12821_MB_1m_MLLW_FINAL	CUBE	1 meters	0 meters - 20 meters	NOAA_1m	SSS with Concurrent MBES
H12821_SSS_1m	SSS Mosaic	1 meters	-	N/A	100% SSS

Table 10: Submitted Surfaces

Based on HSSD requirements, ten soundings were designated within the H12821 survey area.

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.

Standard Vertical Control Methods Used:

ERZT

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

Station Name	Station ID
Red Dog Dock	9491094

Table 11: NWLON Tide Stations

The following subordinate water level stations were established for this survey:

Station Name	Station ID
Good Hope Bay	9469833
Kotzebue	9490424
Cape Espenberg	9490096

Table 12: Subordinate Tide Stations

File Name	Status
9491094.tid	Final Approved
9469833.tid	Final Approved
9490424.tid	Final Approved
9490096.tid	Final Approved

Table 13: Water Level Files (.tid)

File Name	Status
S327FARA2015_Final.tc	Final

Table 14: Tide Correctors (.zdf or .tc)

A request for final approved tides was sent to N/OPS1 on 09/02/2015. The final tide note was received on 01/29/2016.

CO-OPS delivery of final tides for this project was significantly delayed; see Appendix II, Supplemental Correspondence document "CO-OPS_Delayed_Kotzebue Tides.pdf" for details. In addition, see supplemental correspondence regarding final tides data gaps.

Correspondence noted above is appended to this report. See attached Tide Note dated January 28, 2016.

Non-Standard Vertical Control Methods Used:

Ellipsoid to Chart Datum Separation File:

H12821_WGS84_MLLW_SEP_1000m.csar

Ellipsoidally Referenced Zoned Tides (ERZT) methods were used to transform between the ellipsoid and water level data. A 1000-meter resolution separation model between the ellipsoid and MLLW was computed using the real-time position measurements observed during the survey relative to the water line and the loaded TCARI tide file. "GPS tides" were then computed using the above separation model and the corrected GPS-height-to-water level data (SBET). The 1000-meter resolution separation model was generated in WGS84 due to the SBETs being exported in WGS84. For additional information see the OPR-S327-RA-15 ERS/ERZT Capability Memo included with supplemental correspondence.

See attached ERZT Capability Memo.

C.2 Horizontal Control

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

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

The following PPK methods were used for horizontal control:

Single Base

Vessel kinematic data (POS files) were post-processed with Applanix POSPac and POSGNSS software using In-Fusion SingleBase processing methods described in the DAPR. SBET and RMS data were applied to all H12821 survey lines except for lines 2804_2015_2210005, XL_2802_2015_2240004, 2804_2015_2210030, and 2804_2015_2210103 where RMS failed to apply.

The following user installed stations were used for horizontal control:

HVCR Site ID	Base Station ID
9715	Terntower (Rainier's Cape Espenberg station)

Table 15: User Installed Base Stations

D. Results and Recommendations

D.1 Chart Comparison

A comparison was made between H12821 survey data and Chart 16005 using a CARIS CUBE surface and selected soundings.

D.1.1 Raster Charts

The following are the largest scale raster charts, which cover the survey area:

Chart	Scale	Edition	Edition Date	LNM Date	NM Date
16005	1:700000	11	05/2015	08/25/2015	08/22/2015

Table 16: Largest Scale Raster Charts

16005

H12821 sounding data coincides with zero charted depths as shown in Figure 16. The 6 fathom depth contour identified by H12821 data was located approximately 4,000 meters west (inshore) of the currently charted position. The charted 3 fathom contour is deeper than expected with depth measurements ranging from 5.4 to 5.8 fathoms according to H12821 data.

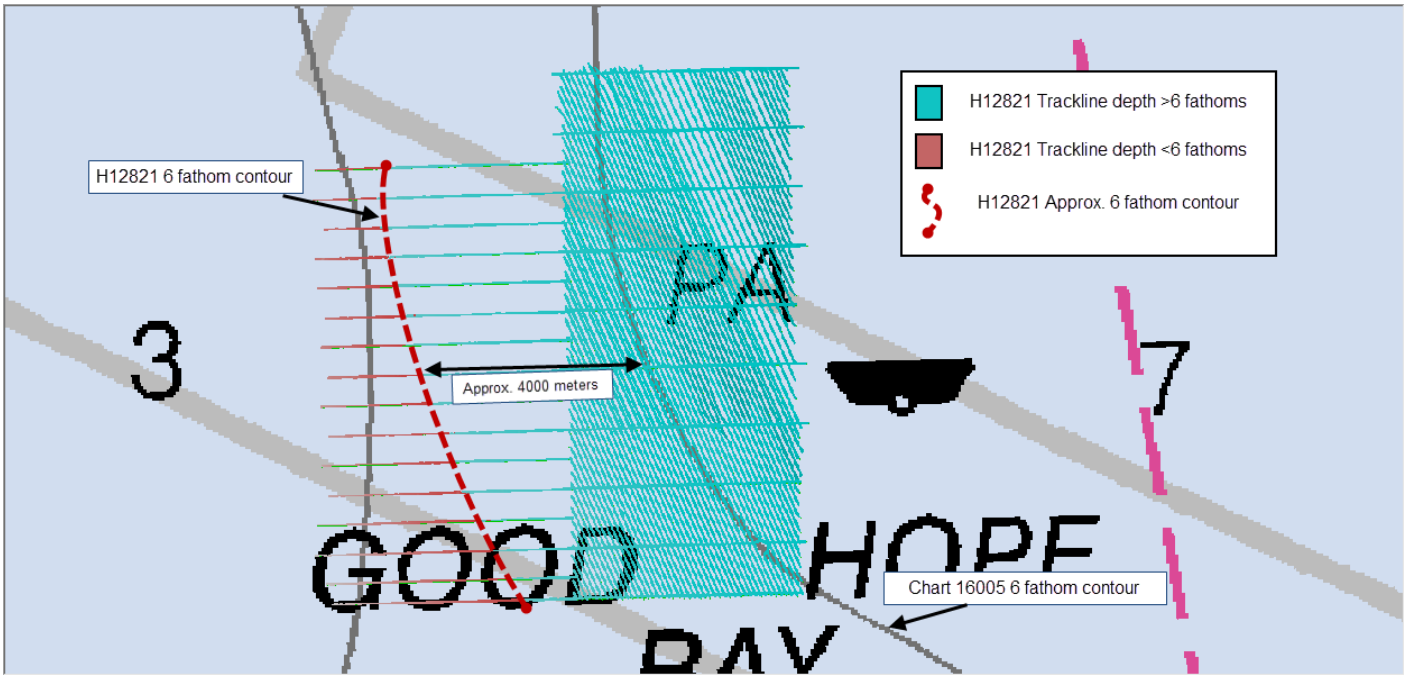


Figure 16: Location of H12821 6 fathom depth contour approximately 4,000 meters west of charted (16005) position.

D.1.2 Electronic Navigational Charts

The following are the largest scale ENCs, which cover the survey area:

ENC	Scale	Edition	Update Application Date	Issue Date	Preliminary?
US2AK92M	1:700000	7	05/02/2011	11/13/2014	NO
US1AK90M	1:1587870	10	03/18/2015	03/18/2015	NO

Table 17: Largest Scale ENCs

US2AK92M

In the area of survey H12821, Electronic Navigation Chart (ENC) US2AK92M coincides with Chart 16005, therefore a comparison between H12821 and the ENC is equivalent to the preceding comparison with Chart 16005.

US1AK90M

An offset between ENC US1AK90M and Chart 16005 of approximately 4000 meters was observed prior to acquisition of survey H12821. The matter was brought to the attention of the project manager at the HSD Operations Branch, see "Kotzebue Sheets_ENC Offset.pdf" in H12821 Supplemental Correspondence folder in appendix II. No comparison was made between survey H12821 and ENC US1AK90M.

See attached correspondence regarding the ENC offset.

D.1.3 Maritime Boundary Points

No Maritime Boundary Points were assigned for this survey.

D.1.4 Charted Features

Charted features exist for this survey, but were not investigated.

There are no charted features within the limits of this survey.

D.1.5 Uncharted Features

No uncharted features exist for this survey.

A new obstruction feature was identified during office review. See Figure 23 in Section D.2.8 below.

D.1.6 Dangers to Navigation

No Danger to Navigation Reports were submitted for this survey.

D.1.7 Shoal and Hazardous Features

No shoals or potentially hazardous features exist for this survey.

D.1.8 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.1.9 Bottom Samples

Two bottom samples were assigned for this survey, but were not acquired due to an earlier than scheduled departure from the project area.

D.2 Additional Results

D.2.1 Shoreline

Shoreline was not assigned in the Hydrographic Survey Project Instructions or Statement of Work.

D.2.2 Prior Surveys

No prior survey comparisons exist for this survey.

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 Ferry Routes and Terminals

No ferry routes or terminals exist for this survey.

D.2.7 Platforms

No platforms exist for this survey.

D.2.8 Significant Features

Two side scan sonar contacts, located in the "Contacts" child layer in H12821_SSS.hips, and some MBES features exist for this survey, but were not investigated due to an earlier than planned departure. Multiple boats and a mooring buoy were in the area during acquisition in the southern area of the H12821 corridor which required some lines to alter course and also multiple chains and anchors to show up in SSS/MBES imagery (Figures 17, 18, 19, 20, 21). The vessels with their chains and anchors, and the mooring buoy are seasonal objects. One SSS contact (Figure 21) shows a possible anchor and the other shows a rocky feature (Figure 22), and one MBES feature (Figure 23) has a height of 1.46 meters; however, it is still deeper than charted.

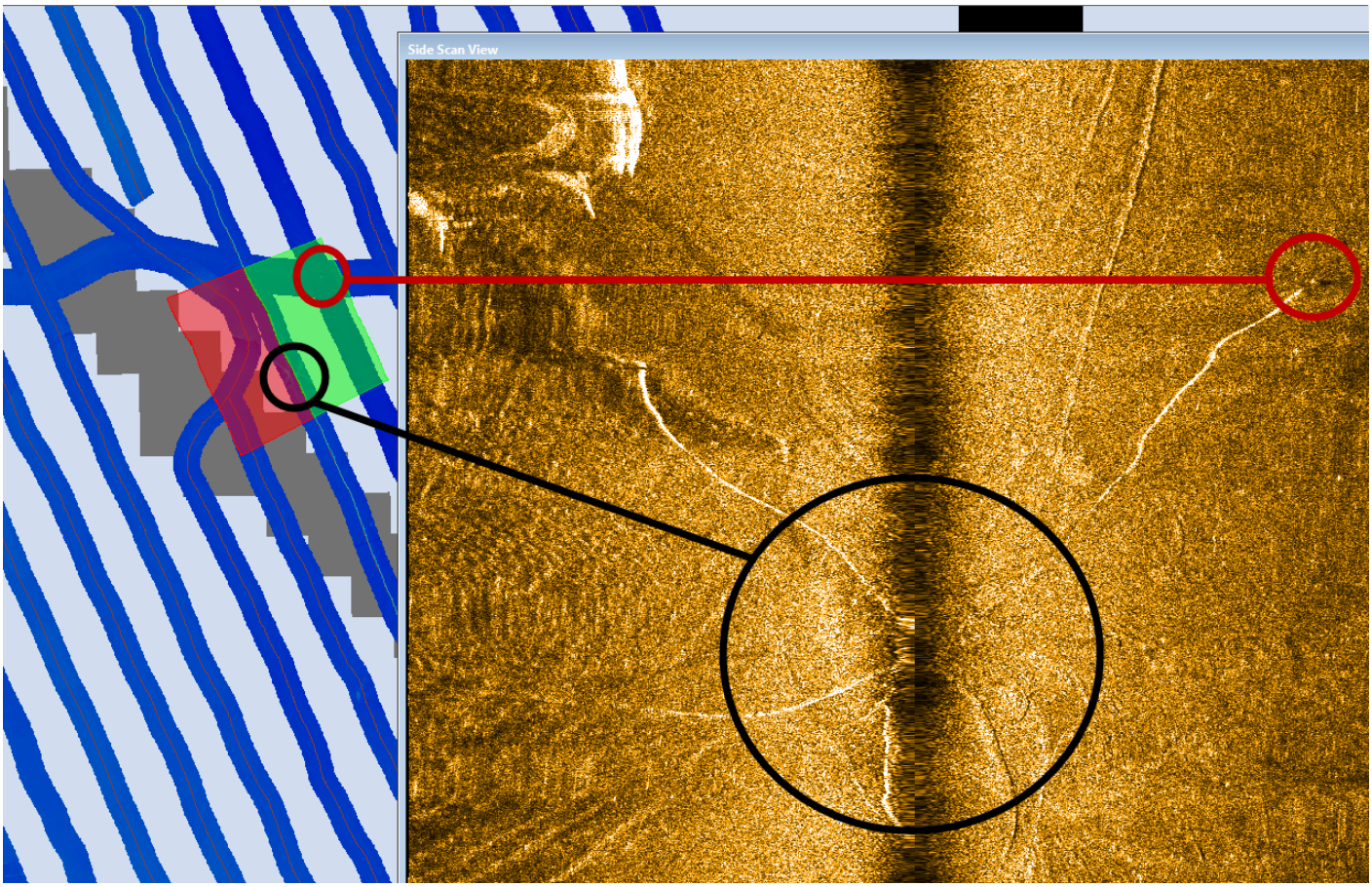


Figure 17: SSS showing possible chain and anchor location. Trackline deviates away from anchored vessel.

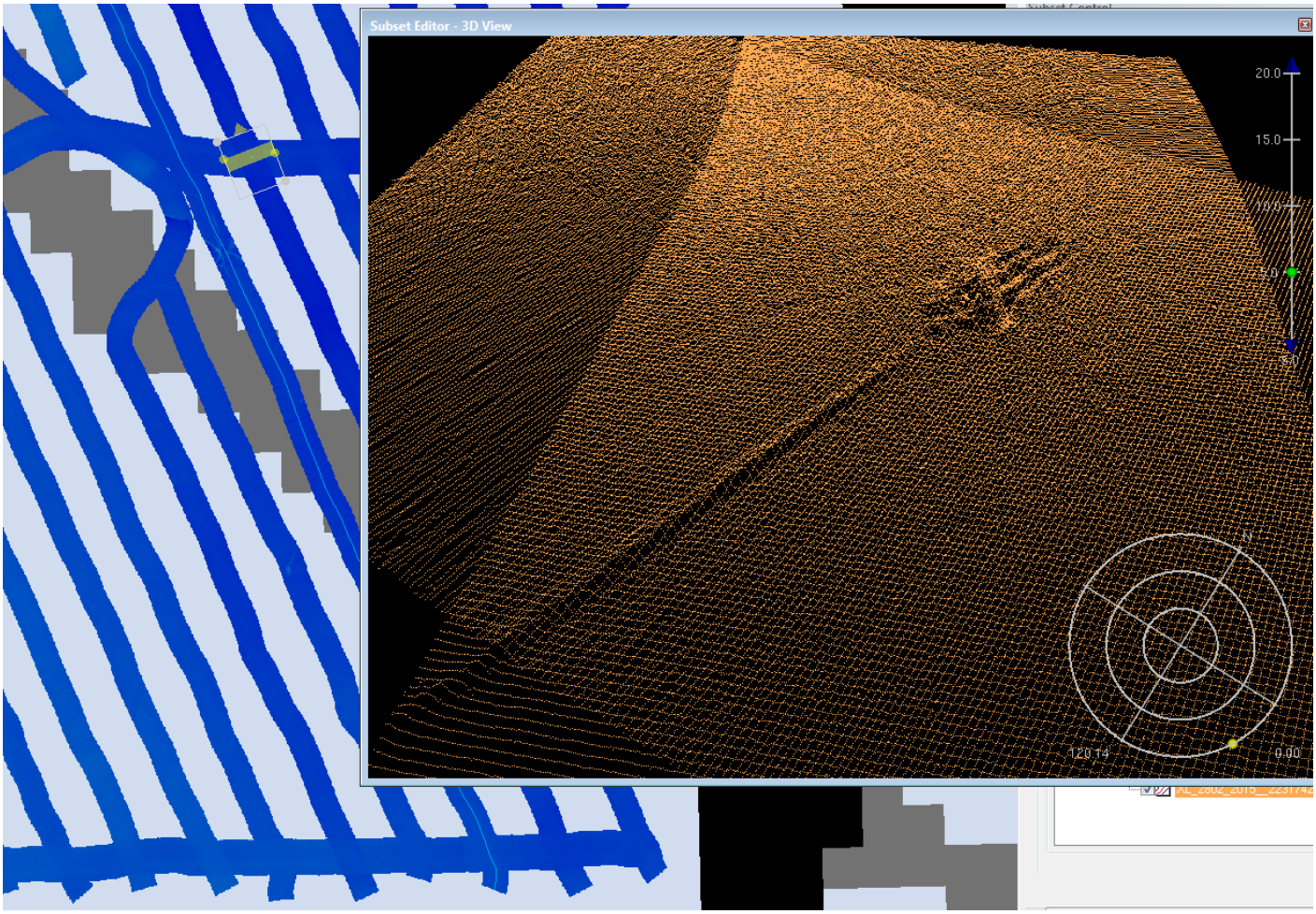


Figure 18: 3D subset showing possible anchor and chain.

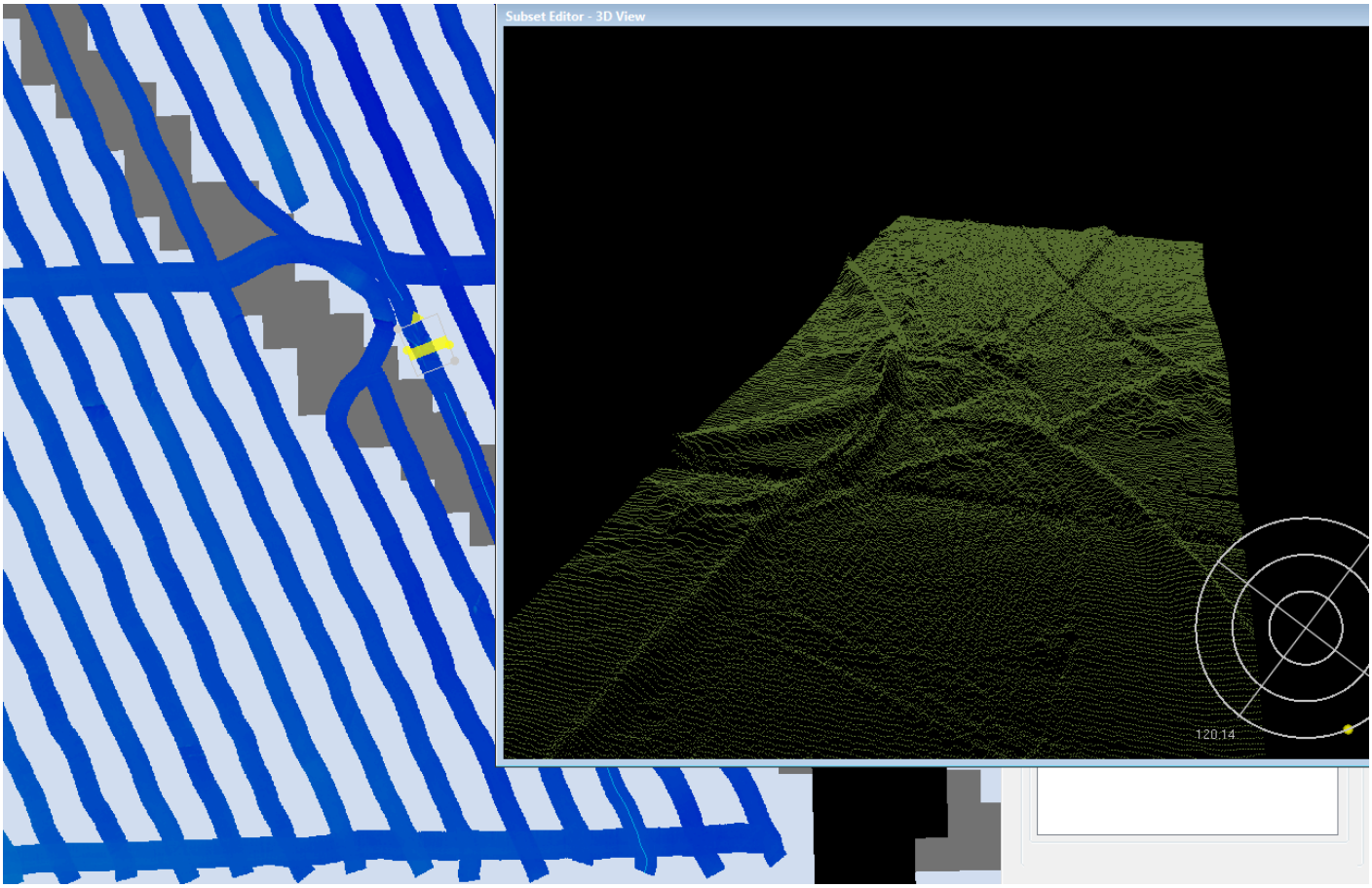


Figure 19: 3D subset showing possible location of multiple chains near anchored/moored vessels.

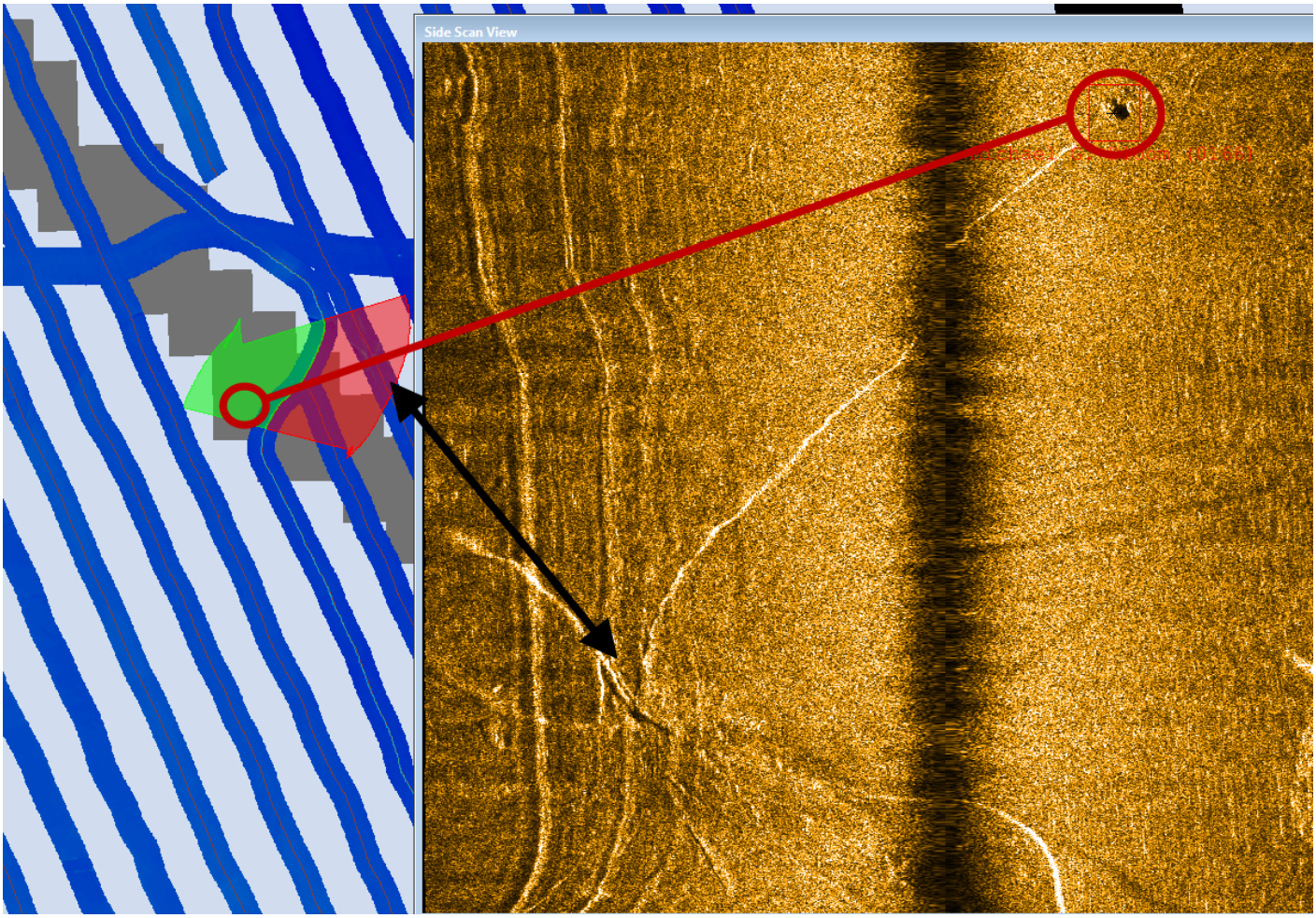


Figure 20: SSS showing possible chain and anchor location.

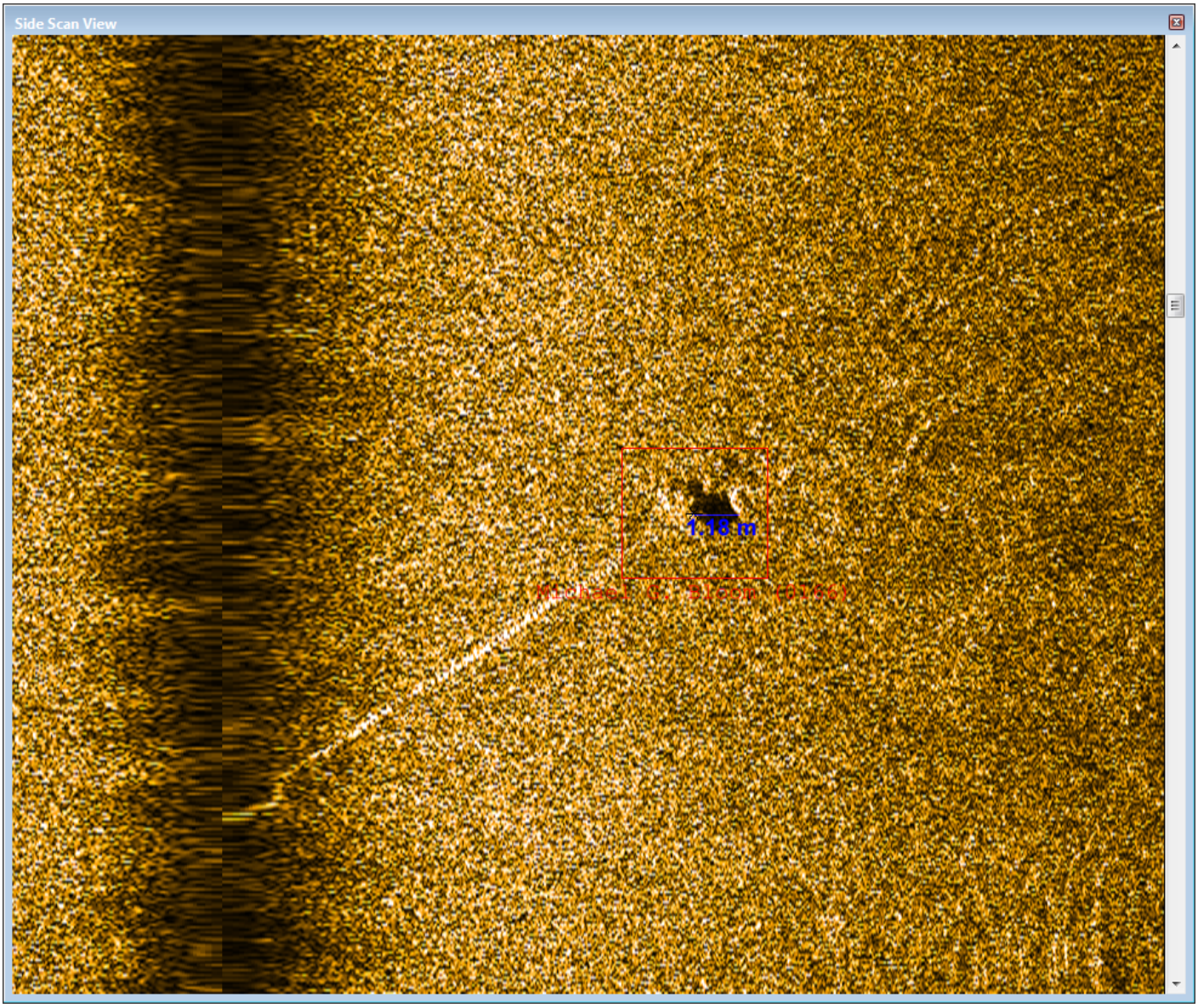


Figure 21: SSS showing an anchor with a height of greater than 1 meter.

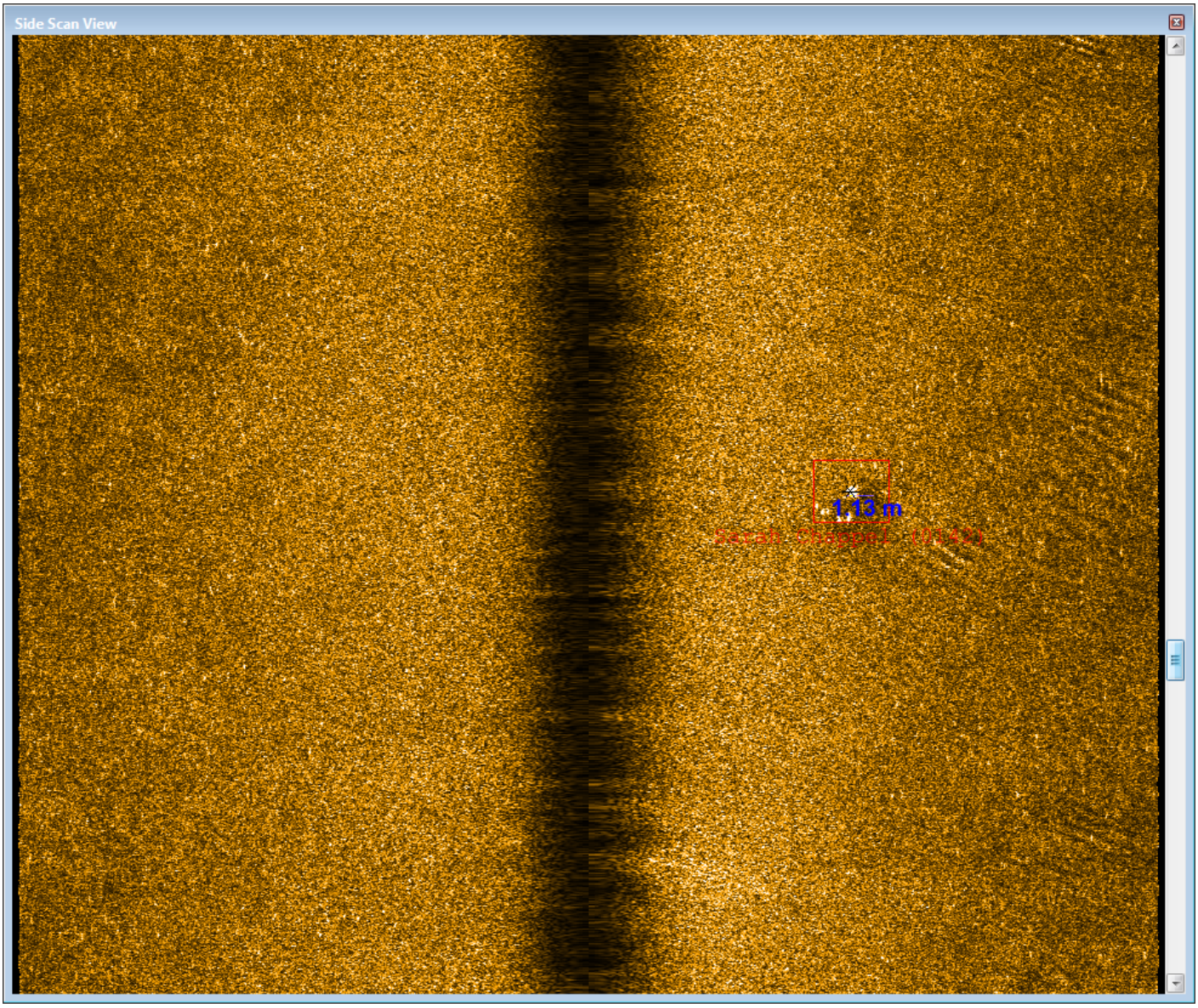


Figure 22: SSS showing a possible rocky feature with a height of greater than 1 meter.

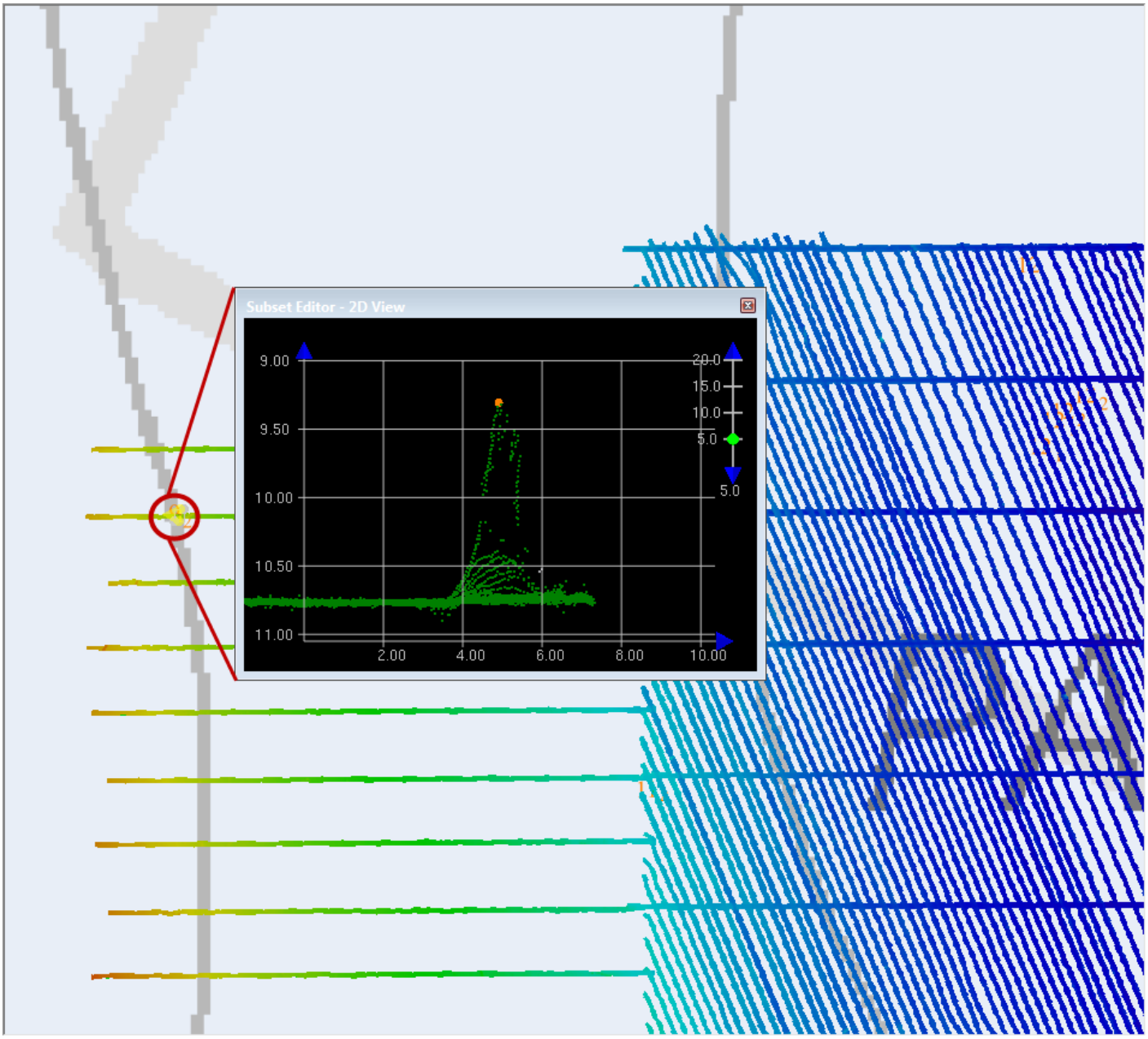


Figure 23: MBES feature found within MBES 500-meter set line spacing, 1.46 meters in height. Subset is 5x exaggerated.

The item in Figure 23 was determined to be an obstruction during office review.

D.2.9 Construction and Dredging

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

D.2.10 New Survey Recommendation

Investigation is recommended of the feature discovered in Figure 23, located in the northern region of the MBES 500-meter set line spacing, and the SSS contacts.

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 Manual, Field Procedures Manual, Letter Instructions, and all HSD Technical Directives. These data are adequate to supersede charted data in their common areas. This survey is complete and no additional work is required with the exception of deficiencies noted in the Descriptive Report.

Approver Name	Approver Title	Approval Date	Signature
Edward J. Van Den Ameele, CDR/NOAA	Commanding Officer, NOAA Ship Rainier	04/29/2016	Edward J. Van Den Ameele 2016.05.02 12:41:40 -07'00'
Steven Loy, LT/NOAA	Field Operations Officer, NOAA Ship Rainier	04/29/2016	Digitally signed by Steven Loy DN: cn=Steven Loy, o=NOAA, ou=NOAA RAINIER, email=ops.rainier@noaa.gov, c=US Date: 2016.05.04 07:44:54 -07'00'
James B. Jacobson	Chief Survey Technician, NOAA Ship Rainier	04/29/2016	James Jacobson I have reviewed this document 2016.05.03 11:26:10 -08'00'
Michael G. Bloom	Hydrographic Survey Technician, NOAA Ship Rainier	04/29/2016	Michael Bloom I am the author of this document 2016.04.29 13:35:22 -07'00'

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	Local Notice to Mariners
LNM	Linear Nautical Miles
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
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 : January 28, 2016

HYDROGRAPHIC BRANCH: Alaska
HYDROGRAPHIC PROJECT: OPR-S327-RA-2015
HYDROGRAPHIC SHEET: H12821

LOCALITY: SW Portion of Goodhope Bay, Kotzebue Sound, AK
TIME PERIOD: August 8 - 12, 2015

TIDE STATION USED: 9491094 Red Dog Dock, AK
Lat.67° 34.6′ N Long. 164° 03.9' W
PLANE OF REFERENCE (MEAN LOWER LOW WATER): 0.000 meters
HEIGHT OF HIGH WATER ABOVE PLANE OF REFERENCE: 0.240 meters

TIDE STATION USED: 9490424 Kotzebue, AK
Lat. 66° 54.3' N Long. 162° 35.0' W
PLANE OF REFERENCE (MEAN LOWER LOW WATER): 0.000 meters
HEIGHT OF HIGH WATER ABOVE PLANE OF REFERENCE: 0.192 meters

Tide STATION USED: 9469833 Goodhope Bay, AK
Lat. 66° 13.8′ Long. 163° 54.3' W
PLANE OF REFERENCE (MEAN LOWER LOW WATER): 0.000 meters
HEIGHT OF HIGH WATER ABOVE PLANE OF REFERENCE: 0.477 meters

REMARKS: RECOMMENDED GRID

Please use the TCARI grid "S327FARA2015_Final.tc" as the final grid for project OPR-S327-RA-2015, H12821 during the time period between August 8th and 12th, 2015.

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: Tidal datums at Goodhope Bay and Cape Espenberg are provisional due to higher uncertainties resulting from either a lack of benchmarks or data processing that accounted for gauge slippage events.

HOVIS.GERALD.THOMAS.JR.1365860250

Digitally signed by HOVIS.GERALD.THOMAS.JR.1365860250
DN: c=US, o=U.S. Government, ou=DoD, ou=PKI, ou=OTHER, cn=HOVIS.GERALD.THOMAS.JR.1365860250
Date: 2016.01.28 13:09:40 -05'00'

CHIEF, PRODUCTS AND SERVICES BRANCH


Final TCARI Grid for OPR-S327-RA-2015, H12821
SW Portion of Goodhope Bay, Kotzebue Sound, AK
9491094 RED DOG DOCK
9490424 KOTZEBUE
9469833 GOODHOPE BAY
bing
Image courtesy of NASA Earthstar Geographics SIO © 2016 Microsoft Corporation

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
Office of Marine and Aviation Operations
NOAA Ship *Rainier* (S-221)
2002 SE Marine Science Dr, Newport, OR 97365

March 15, 2016

MEMORANDUM FOR: Lieutenant Commander Michael O. Gonsalves, NOAA
Chief, Operations Branch
Hydrographic Surveys Division

FROM: Commander Edward J. Van Den Ameele, NOAA
Commanding Officer

SUBJECT: OPR-S327-RA-15 H12829, H12821, H12820 ERS/ERZT Capability Memo

NOAA Ship *Rainier* personnel conducted an evaluation of utilizing Ellipsoidal Referenced Survey (ERS) methods using Ellipsoidally Referenced Zoned Tides (ERZT) per the OPR-S327-RA-15 Project Instructions (PIs) to reduce sounding data to chart datum, and compared these methods with traditional reduction methods utilizing observed water levels and Tidal Constituent and Residual Interpolation (TCARI). Results indicate that the differences between the two methods are within acceptable limits and both are valid methods for reducing sounding data to chart datum. Procedures, results, and recommendations are in the attached report.

It is recommended that survey H12829, H12821 and H12820 be reduced to Mean Lower-Low Water (MLLW) using ERZT, as detailed in the attached report.

It is understood that upon review of this report, a determination will be made for the final vertical transformation technique to be used to create the final deliverables.

Attachment:
H12829, H12821, H12820 ERZT Report

H12829, H12821, H12820 ERZT Report

1.0 Introduction

This document describes the methods and results of the vertical datum analysis component of the vertical control requirements of the Hydrographic Survey Project Instructions for OPR-S327-RA-15 Kotzebue Sound. This report specifically addresses surveys H12829, H12821 and H12820.

The Project Instructions required *Rainier* to recommend the final vertical transformation technique after comparing crossline data. The recommendations and supporting data included in this report are intended for use by the Hydrographic Surveys Division (HSD) to support the final decision on the use of ellipsoidally-referenced zoned tides (ERZT) methods to reduce hydrographic data to chart datum using the field-generated separation model in lieu of reduction using measured water levels and the Tidal Constituent and Residual Interpolation (TCARI) methodology for the OPR-S327-RA-15 surveys.

The basis of this analysis is a comparison of the results of using both TCARI and ERZT bathymetry for vertical control for each survey, and a comparison of different ERZT separation models (SEP).

2.0 Procedure

The ERZT evaluation was conducted with a standard operating procedure (SOP) provided by HSD as a primary reference. Though the SOP was utilized as an initial reference, *Rainier* did not find that it adequately addressed all issues required for utilization. *Rainier* addressed this through development of our own SOPs, and numerous emails, phone calls, and decisions as hydrographers. The general procedure is outlined below.

Survey data for H12829, H12821 and H12820 were reduced to Mean Lower Low Water (MLLW) using the final approved TCARI grid and water levels to produce the traditional surfaces and time series data. Survey data were also reduced to MLLW using a field-created ERZT SEP applied to the data with GPS tides and then merged. ERZT SEPs were first created at a fine resolution (100m) to use in analysis and troubleshooting of vertical positioning, primarily in the case of Smoothed Best Estimate of Trajectories (SBET) data.

SBETs were generated using a PPK single base method as outlined in OPR-S327-RA-15 HVCR. In error, *Rainier* SBETs for this project have been produced in WGS84 rather than NAD83. Due to the significant effort required to re-export and re-apply all SBETs, the decision was made in consultation with HSD and Hydrographic Systems Technology Branch (HSTB) to keep data in WGS84.The TCARI method does not utilize the vertical component of the SBET data in the process of reducing to MLLW; thus, the incorrect datum, WGS84 instead of NAD83, only affects the horizontal component of positioning when using TCARI to reduce to MLLW. This error introduces a bias into the horizontal positioning; the total difference between NAD83 and WGS84 within the survey area is within allowable horizontal position uncertainties.

Once all SBETs were resolved, or a consistent ERZT SEP model could be generated with a majority of the SBETs being correct, a coarser ERZT SEP was generated (1000m) for sounding reduction in application of GPS Tides. ERZT SEP models were also compared to an estimated separation surface provided by HSTB based on Geoid12B, the TCARI model amplitudes, and a model of sea-surface topography. These estimated separation models (ESEP) provided by HSTB were used as an additional means of evaluation and troubleshooting and were not used to reduce final data to MLLW.

ERZT uncertainty was calculated using a standard error estimator, wherein the mean of the ERZT standard deviation layer was divided by the square root of an estimated number of survey lines in a given node. This value was then applied when computing Total Propagated Uncertainty (TPU).

Crossline difference surfaces (main-scheme versus crossline data) and statistics were generated for each method of reduction to MLLW and compared against one another.

ERZT SEPs generated by *Rainier* were also compared to the HSTB-created ESEPs as a means of comparison and troubleshooting. Difference surfaces and statistics of these two SEPs were also evaluated.

3.0 Results

This report will answer two questions:

ÅWhat are the quantitative and qualitative differences between the two reduction methods?

ÅWhich method of reduction to MLLW is appropriate for this specific survey?

3.1 ERZT Model

The ERZT model separation surfaces were generated by RA using the ERZT SOP (Figures 1-3). These models provide the separation between the WGS84 ellipsoid and MLLW datums. The slope of the separation model was examined for errors and inconsistencies that could produce vertical offsets in reduced data. See Table 1 for a list of ERZT Models generated, and Figures 1-3 for images of each SEP model.

Sheet	Resolution	Separation Model File Name
H12819	1000m	H12829_WGS84_MLLW_SEP_1000m.csar
H12821	1000m	H12821_WGS84_MLLW_SEP_1000m.csar
H12820	1000m	H12820_WGS84_MLLW_SEP_1000m.csar

Table 1. Separation models submitted

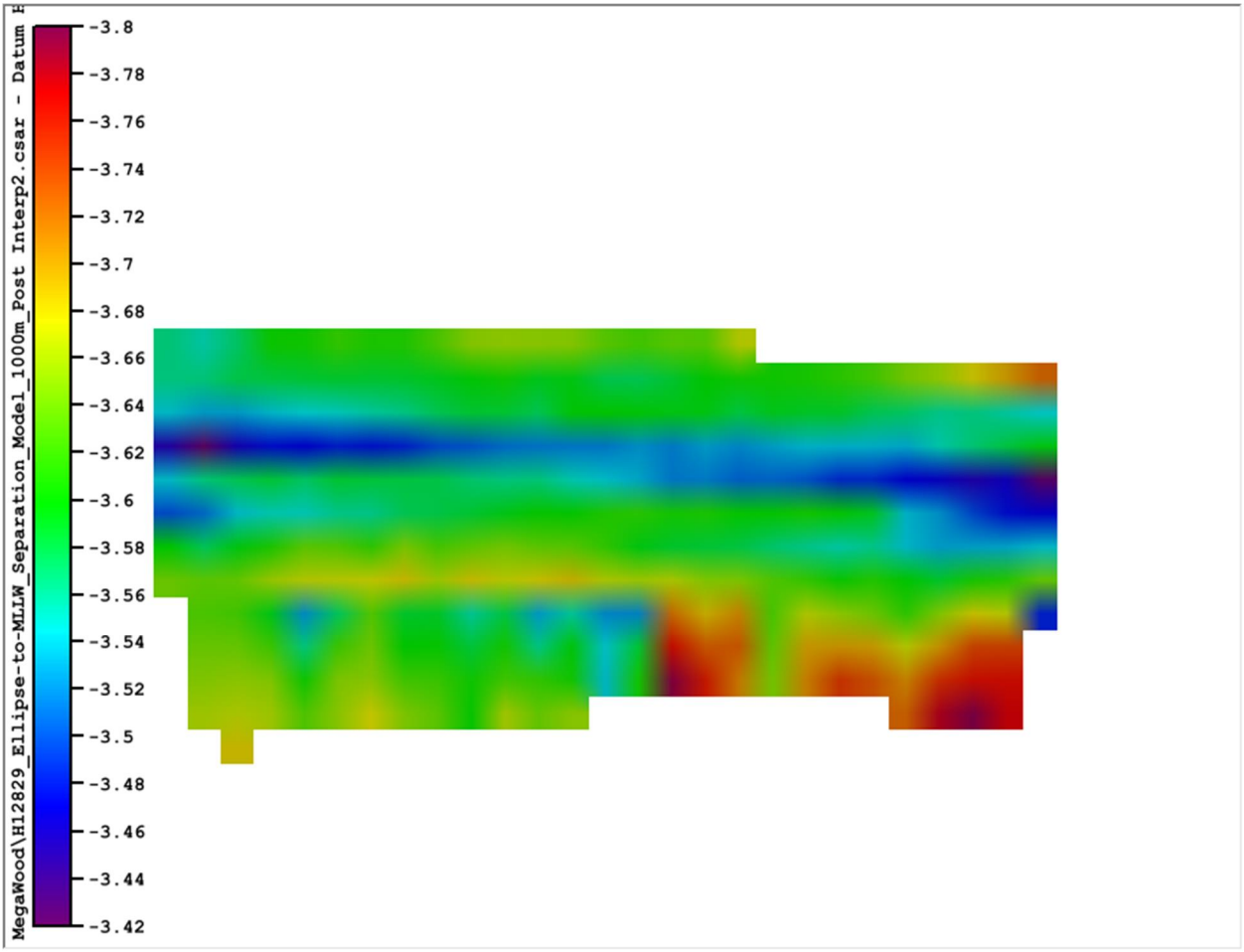


Figure 1. Image of H12829 H12829_WGS84_MLLW_SEP_1000m.csar ERZT SEP with 1000m resolution.

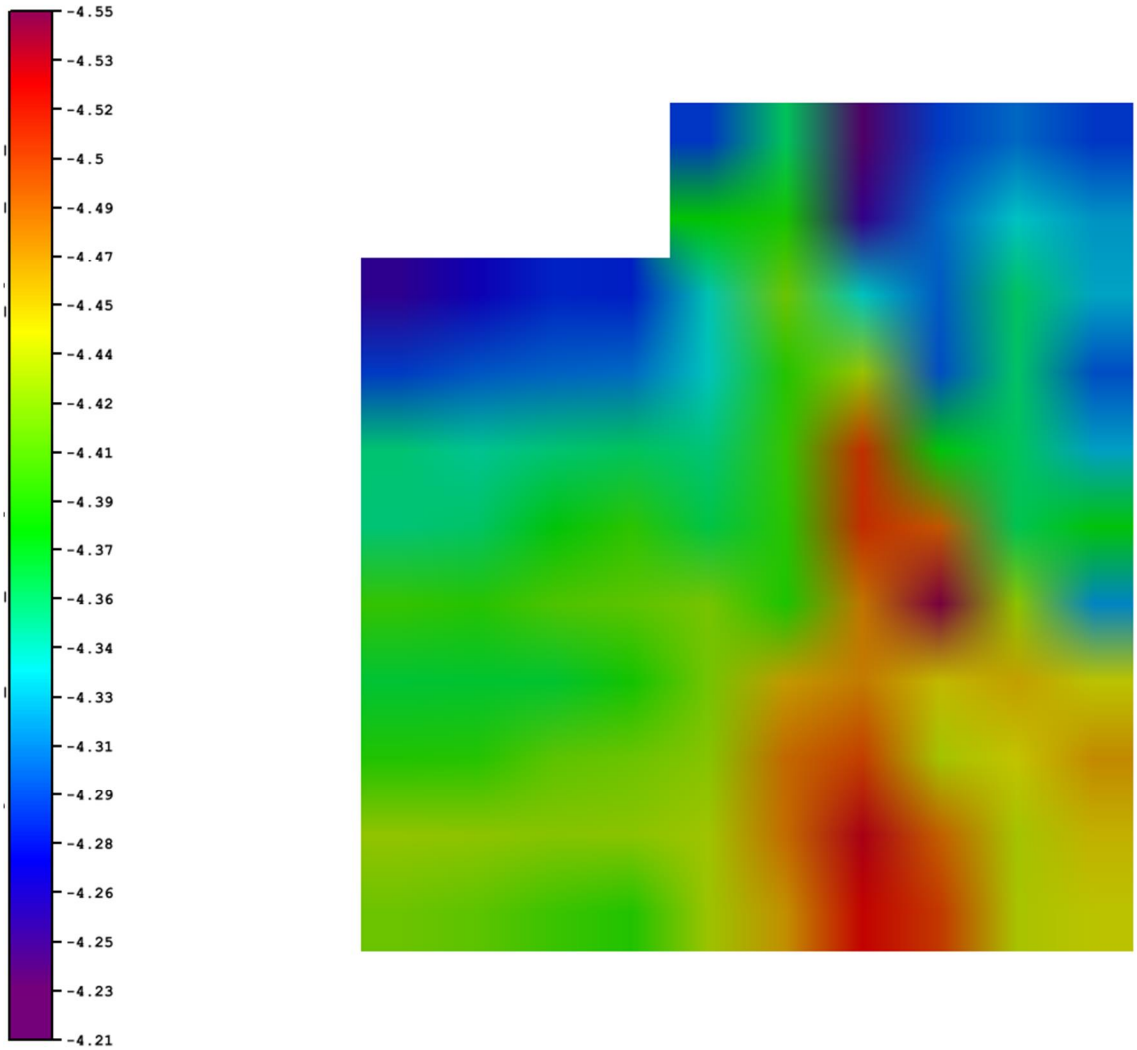


Figure 2. Image of H12821 H12821_WGS84_MLLW_SEP_1000m.csar ERZT SEP with 1000m resolution.

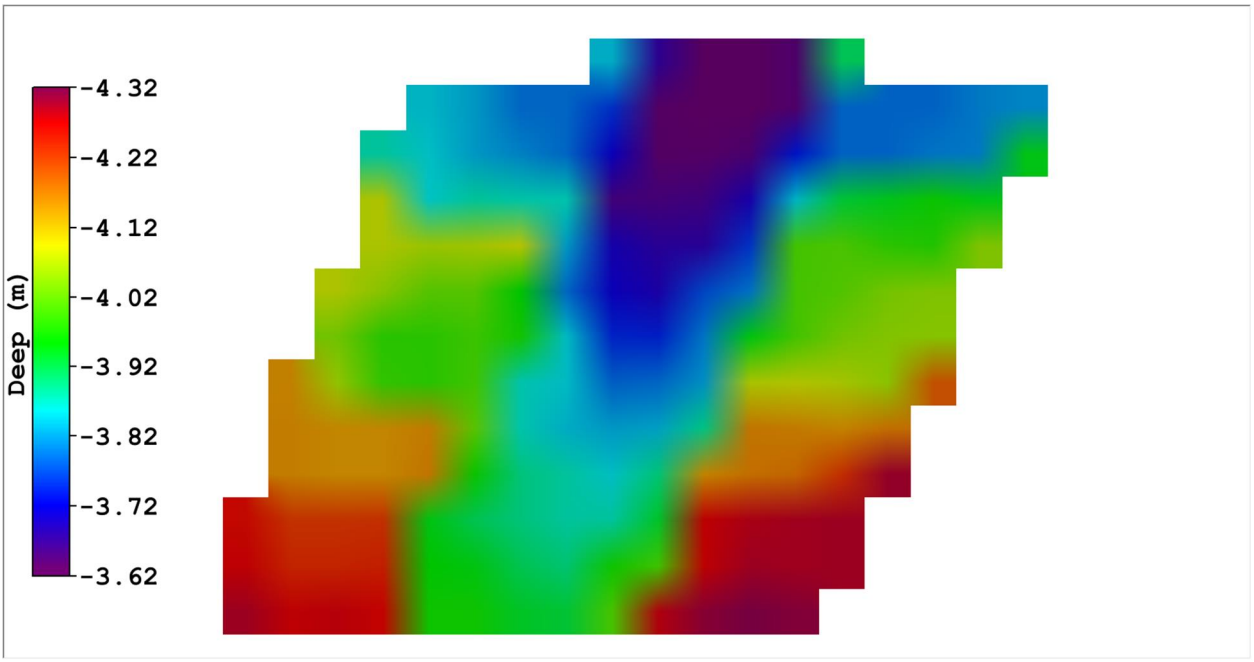


Figure 3. Image of H12820 H2820_WGS84_MLLW_SEP_1000m.csar ERZT SEP with 1000m resolution.

The separation surface is free of gaps and anomalies within the H12829, H12821, H12820 survey area. Variability (as seen in Figures 1-3) in the ERZT separation surface is due to variation in the SBETs, Tide Model, Sea Surface topography, heave, dynamic and static draft. More gradual trends represent the variation of the SEP over large distances.

Examining the SEP alone within the limits of H12829, H12821, H12820 there are no anomalous spikes or discontinuities, suggesting the overall vertical positioning and using the model as a means of sounding reduction are both reasonable.

3.2. Quantitative Analysis

	TCARI XL Difference		ERZT XL Difference		ESEP- ERZT (WGS84) Difference		TCARI MLLW - ERZT MLLW Difference	
Sheet	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**
H12829	-0.026	0.156	-0.017	0.079	-0.079	0.075	0.00	0.109
H12821	0.106	0.092	-0.017	0.067	-0.058	0.055	0.00	0.065
H12820	0.111	0.136	-0.005	0.067	-0.051	0.080	0.00	0.099

Table 2. Results of difference surface analysis

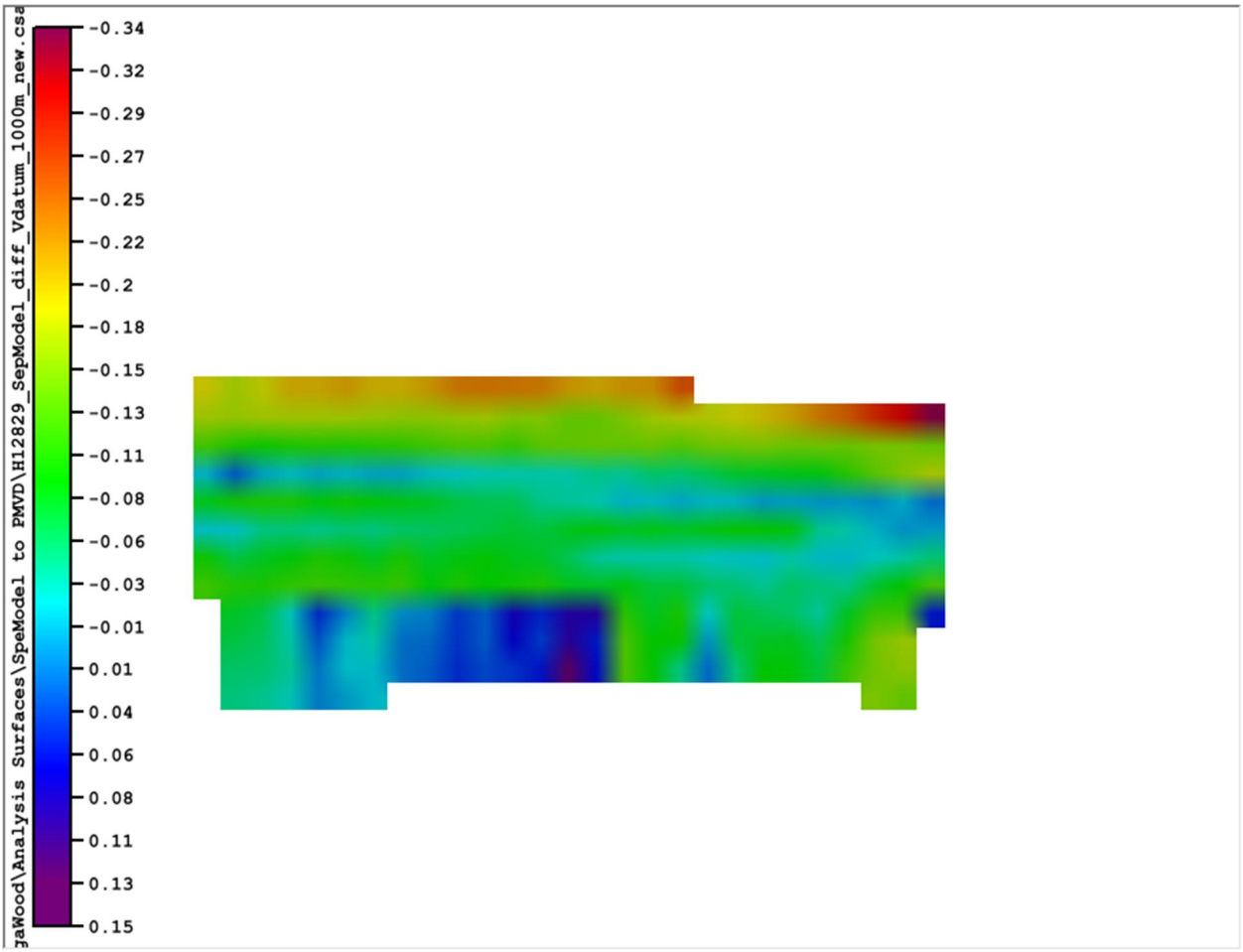


Figure 4. Image of H12829 ESEP - ERZT SEP difference surface 1000m resolution

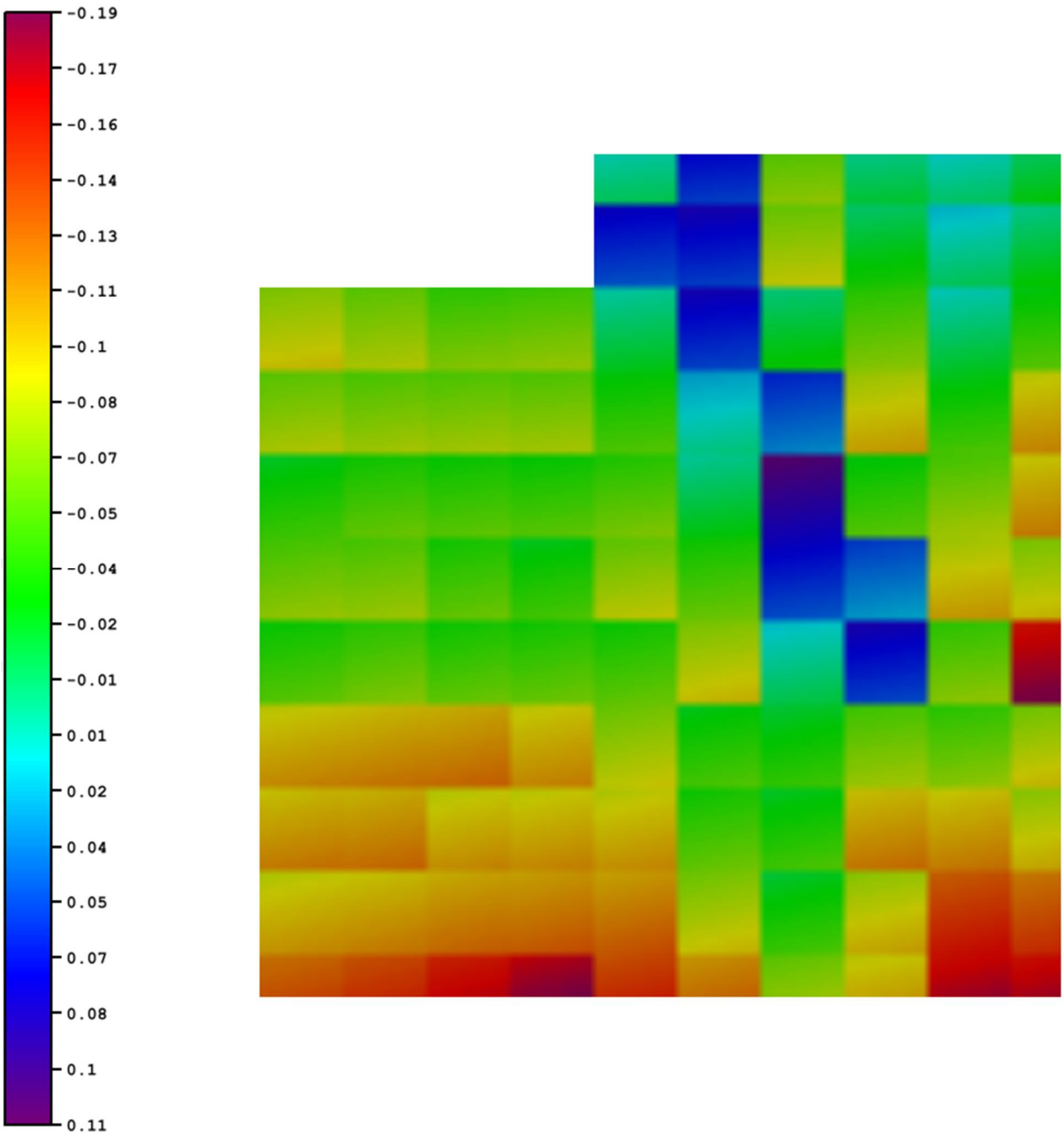


Figure 5. Image of H12821 ESEP - ERZT SEP difference surface 1000m resolution

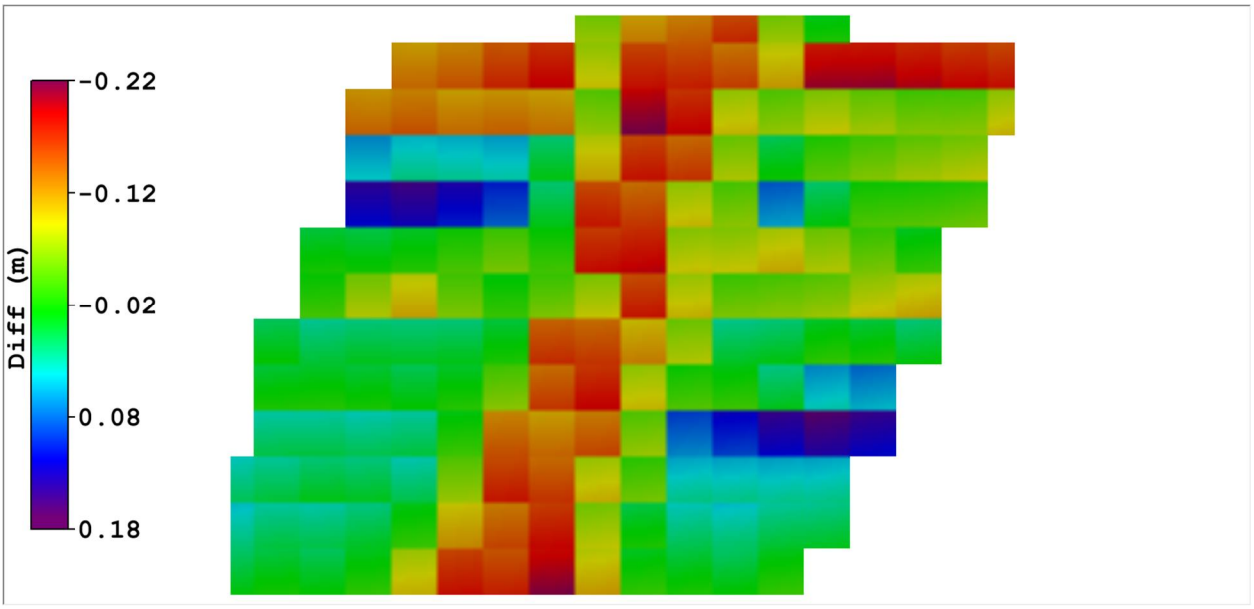


Figure 6. Image of H12820 ESEP - ERZT SEP difference surface 1000m resolution

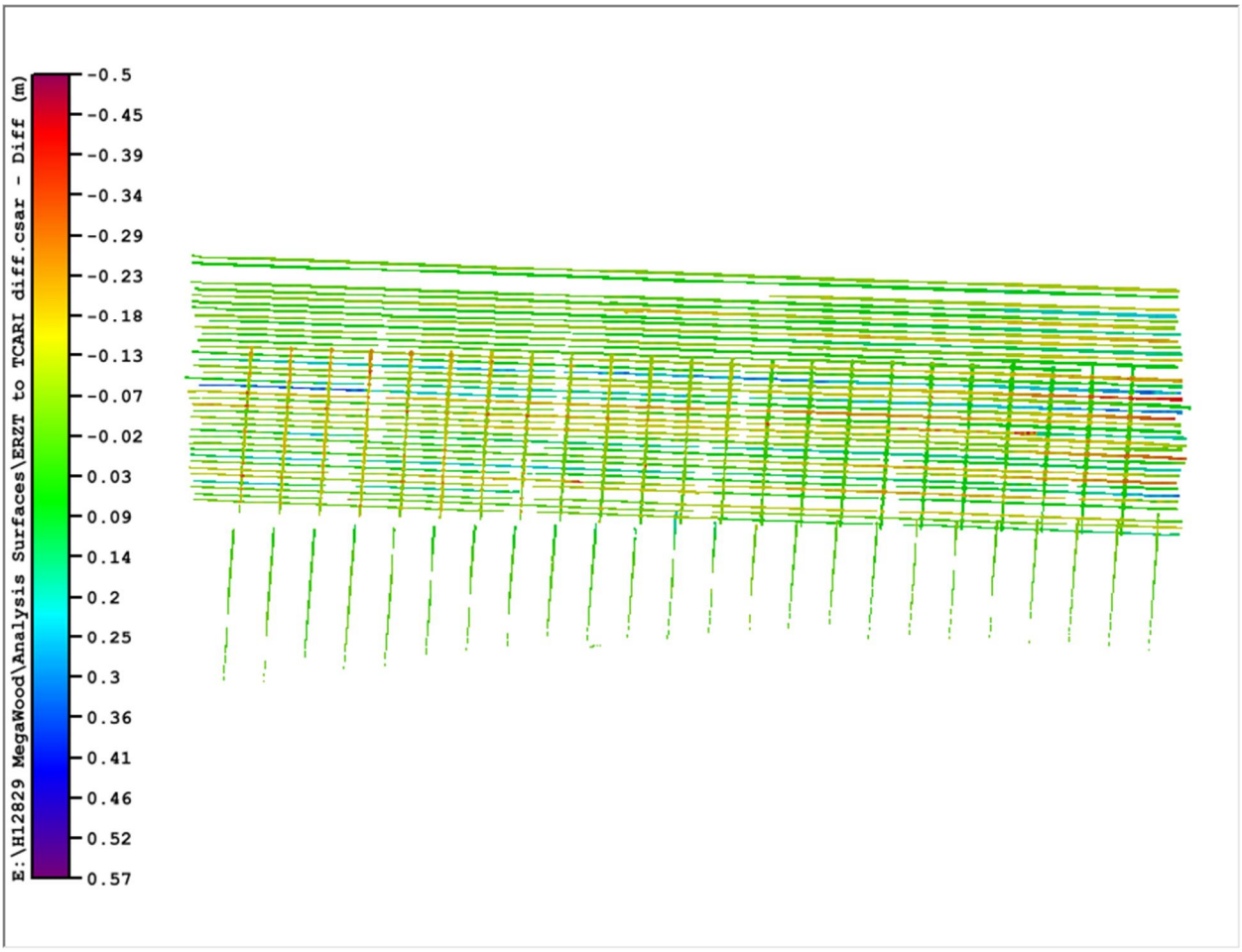


Figure 7. Image of H12829 ERZT MLLW - TCARI MLLW difference surface

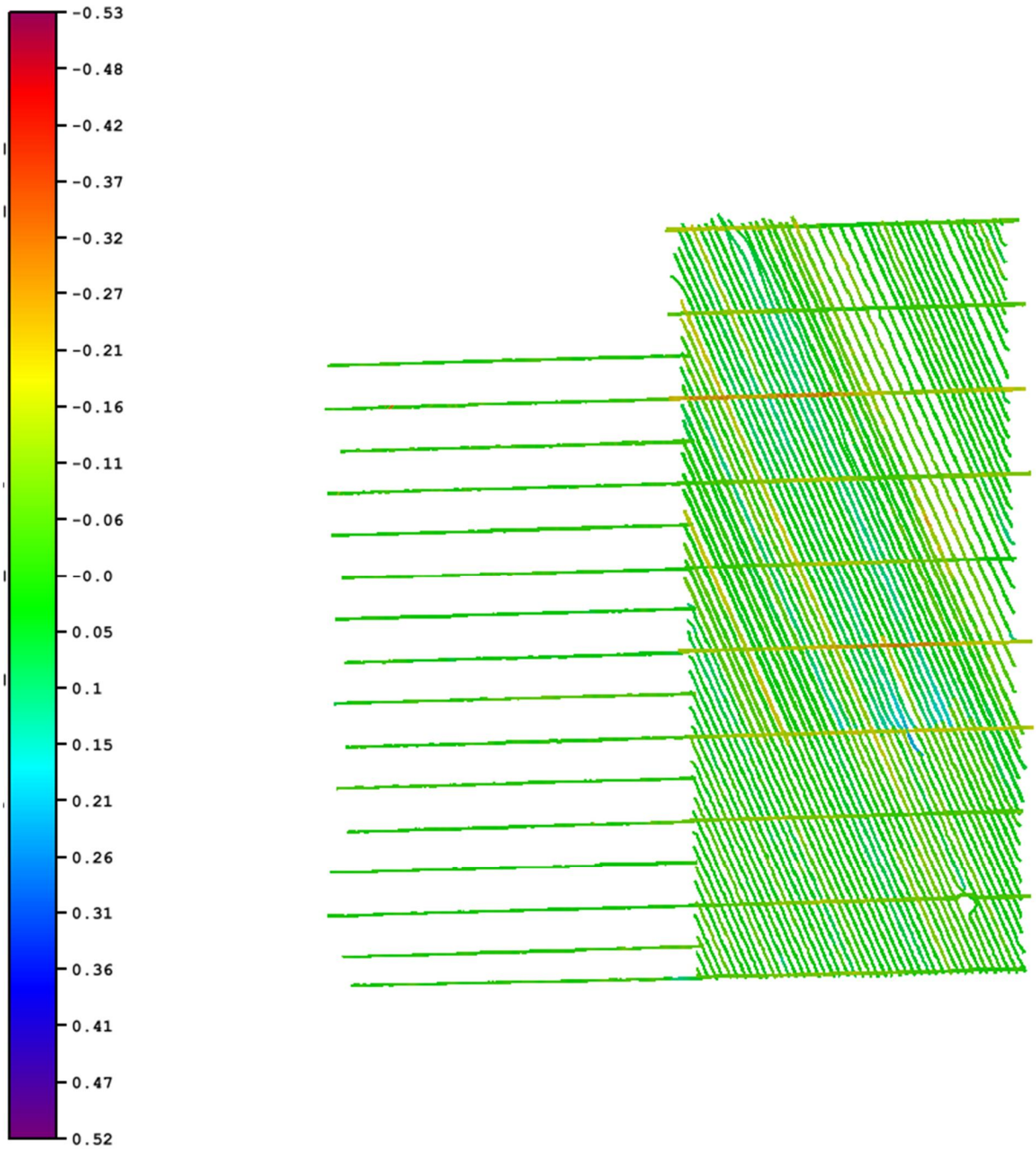


Figure 8. Image of H12821 ERZT MLLW - TCARI MLLW difference surface

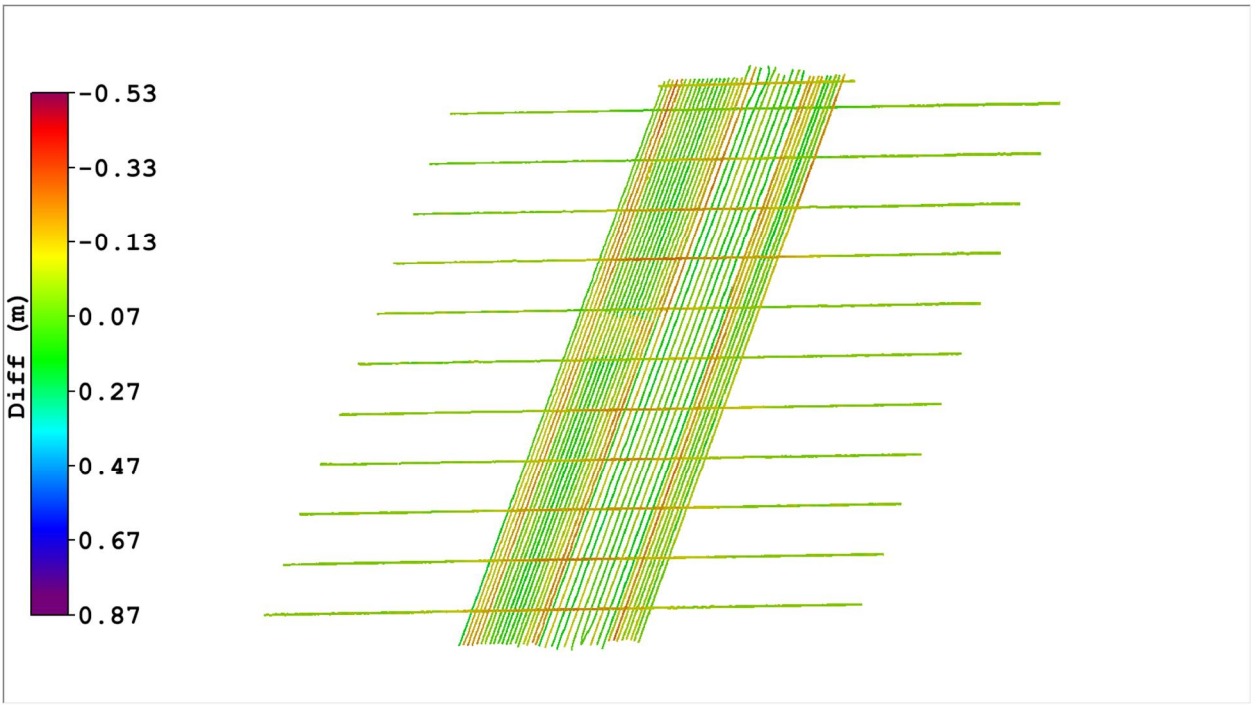


Figure 9. Image of H12820 ERZT MLLW - TCARI MLLW difference surface

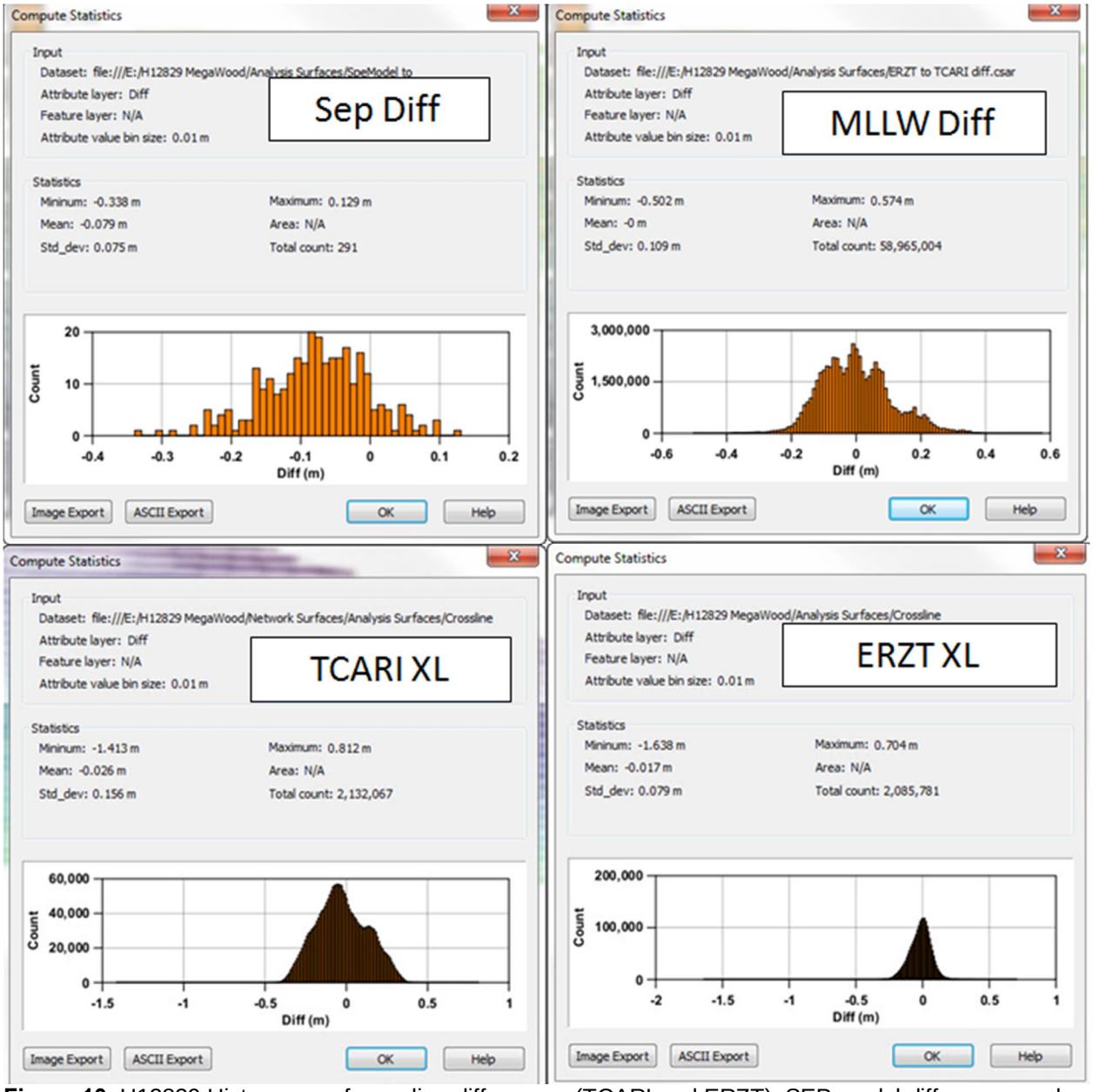


Figure 10. H12829 Histograms of crossline differences (TCARI and ERZT), SEP model difference, and MLLW difference

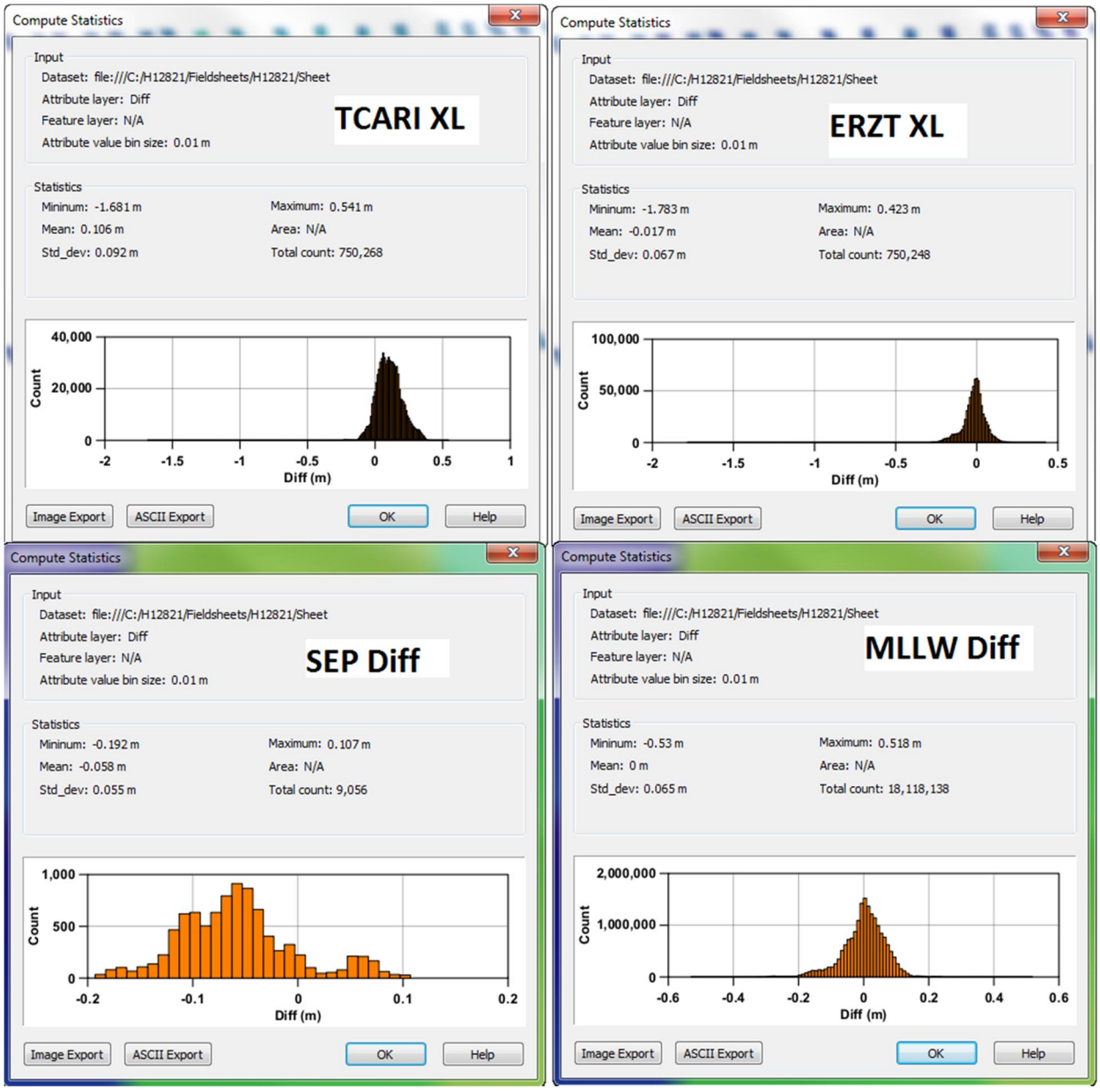


Figure 11. Histograms H12821 of crossline differences (TCARI and ERZT), SEP model difference, and MLLW difference

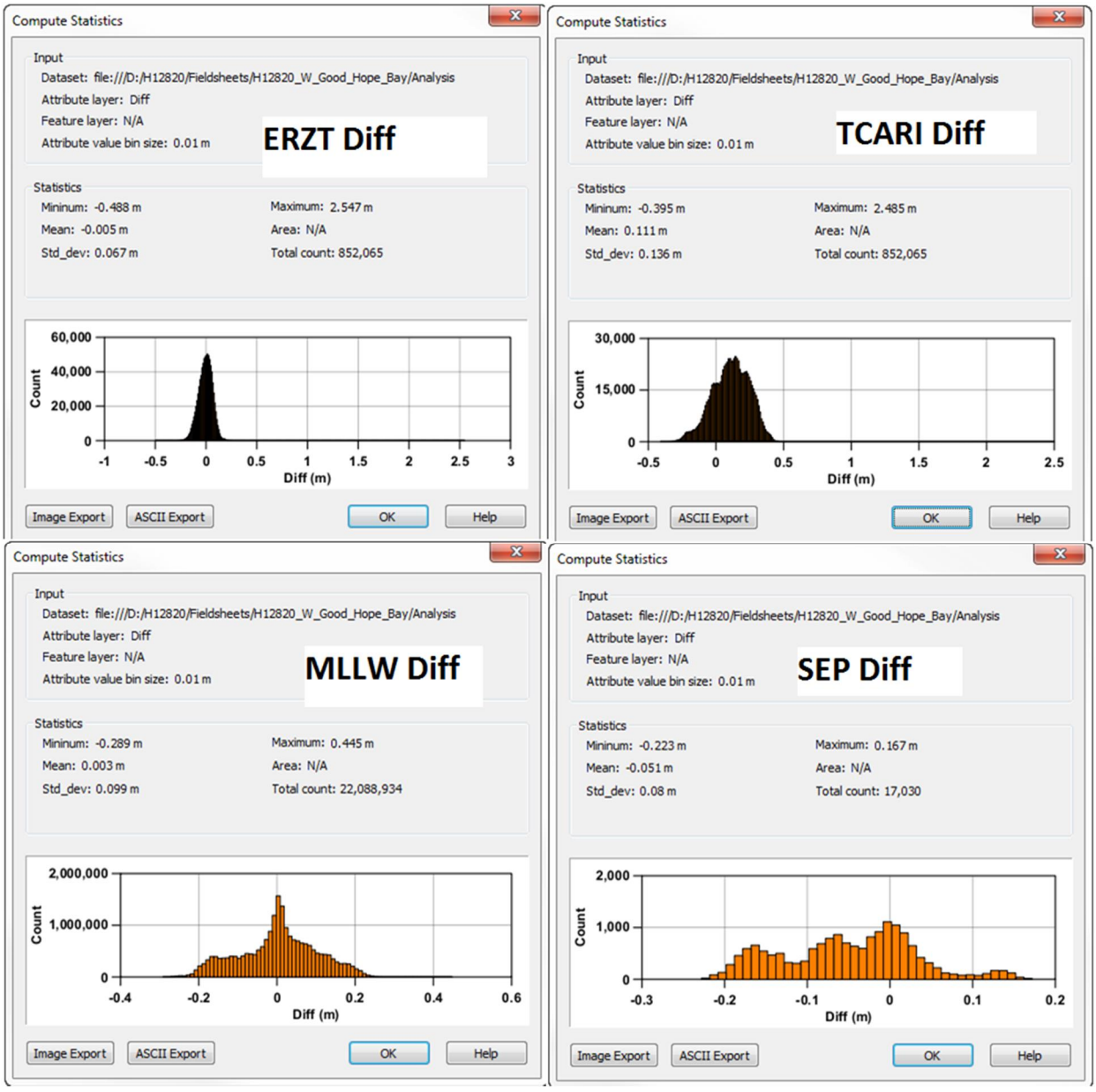


Figure 12. Histograms H12820 of crossline differences (TCARI and ERZT), SEP model difference, and MLLW difference

For surveys H12829, H12821, H12820, the ERZT-reduced data show a smaller mean difference and standard deviation in the crossline depth analysis. This result suggests for this survey, ERZT is an acceptable and more consistent method of sounding reduction.

A difference surface of ESEP minus ERZT were created to examine the variation between field vessel derived separation models as compared to those created using datum differences at tide stations.

The two realizations of MLLW were differenced, and show zero mean difference, and a small standard deviation, suggesting that both realizations of bathymetry data are equivalent, and that both methods of reduction are the unbiased relative to each other.

4.0 Interpolation and Uncertainty

For surveys H12821, H12820 no SBETs required interpolation. For H12819 the following SBETs required interpolation using Pydro AutoQC due to the reasons noted:

Sheet	Day	Vessel	Interpolated SBET	Total Interpolation Length (NM)	Notes
H12829	218	S221	2015_218_S221_SBET_Interp.out and 2015_218b_S221_SBET_Interp.out	26.83	Interpolation to correct for incorrect vertical solution.
H12829	219	S221	2015_219b_S221_SBET_Interp.out	13.41	Interpolation to correct for incorrect vertical solution.

Table 3. Interpolated SBETs for H12819.

The following shows the uncertainty value determination for H12829, H12821, and H12820:

Sheet	Surface	Mean of Std_Dev child layer (Mean)	Estimated lines per cell (N)	Resultant 1 sigma uncertainty (Mean/Sqrt(N))
H12829	H12829_Ellipse-to-MLLW_Separation_Model_1000m_PostInterp2.csar	0.0804	7	0.030398
H12821	H12821_Separation_Model_1000m.csar	0.0537	10	0.016989
H12820	H2820_ERZT_100mSepModel.csar	0.0531	4.86	0.024106

Table 4. Uncertainty determination.

Post-processed position solutions were consistently accurate for the entirety of H12829 following SBET correction and interpolation. The use of AutoQC to interpolate many long lines of data is reasonable given that the line and before/after results can be compared to adjacent SEP and sounding data spatially and temporally.

For H12829 one ERS specific holiday line exists for reduced to MLLW via ERZT as compared to the tidally reduced data. This line had an incorrect SBET altitude that was unresolvable by the field. This line was not used for ERZT derived MLLW surface creation, but was examined for significance in subset and

when reduced via TCARI. The line is included as part of the submittal for reference but not used in creation of the SEP for H12829.

For H12829, H12821, and H12820, had there been ERS holidays or lines that could not be adjusted with interpolation in AutoQC the TCARI-reduced data still remains adequate for chart applications.

For H12829, H12821, H12820, a given number of lines per cell (N) were used as a reasonable value for the number of lines in a given node of the separation model. For the SEP model created for this survey, any given SEP cell at 1000m resolution could have had tens of survey lines or as few as one inside its bounds. With minimal guidance or tools hydrographers chose a value they felt best represented the average for a given sheet. Use of a larger or smaller value reasonable changes the final SEP model uncertainty by up to centimeters.

5.0 Results and Recommendations

For H12829, H12821 and H12820 it is recommended that soundings be reduced to MLLW through use of the ERZT method. Quantitative analysis of crosslines for this survey demonstrates ERZT as a more precise reduction method compared to TCARI. Qualitatively, hydrographers involved in the production of the survey believe the ERZT reduced data to be a potential improvement as compared to the TCARI reduction, due to the greater accuracy, precision, and significant potential for faster data analysis and submission.

For future ERZT and ERS surveys, the following recommendations should be considered:

1. Procedures and workflows should be fully tested and documented prior to delivery to the *Rainier*. The ERZT SOP as provided from HSD did not provide any detail on how to determine uncertainty. Numerous references to VDatum were also in the SOP, though no VDatum model exists for Alaska during the time of survey. The SOP focused on crosslines, though for *Rainier* the irregular and inconsistent application of incorrect single base antenna heights combined with the occasional need to interpolate would require analysis of all lines. Crosslines alone without Vdatum or other reference SEP might not be fully representative of the ERS specific conditions of an area. To best troubleshoot SBETs, a comparison is required to discover any bias. Without this comparison, a bias would be difficult to quickly troubleshoot.
2. NOAA HSSD and Project Instructions should be updated to specify the vertical and horizontal datums of all positions and separation models.
3. Best practices and tools to determine ERZT uncertainty should be explored. Determination of applied SEP model resolution should be evaluated further, likely in consideration of the tide model resolution in areas where ERZT could be applied. Geographic information system type tools could be used to better count and determine uncertainty for a grid allowing for standardized procedures and results.
4. *Rainier* ERS SOPs and data submission for items related to vertical reduction of soundings should be independently evaluated by OCS staff for consistency and to minimize errors. *Rainier* SBETs have been processed and exported in a WGS84 datum for some time, though most NOAA specifications require NAD83.
5. Due to staffing challenges on *Rainier*, only a few crewmembers aboard are familiar with software used in the processing and troubleshooting of these SBETs. *Rainier* personnel need additional training on ERS and ERZT theory, as well as hands on training on how to use associated equipment and software most effectively to ensure *Rainier* capability of ERS.
6. Numerous SBETs on *Rainier* required reprocessing due to incorrect antenna height values initially entered. All SBETs have been created on an ñincorrectò datum of WGS84, when HSSD

requirements are NAD83. *Rainier* should update and improve their quality control procedures and have procedures reviewed by outside unit experts.

7. Original SBETs were typically generated and applied within 2 weeks upon receipt of base station data for the Kotzebue project, though due to equipment limitations of radio range and data throughput, base station downloads were infrequent. Low internet bandwith also limited ability for the ship to download required clock and ephemeris data in a consistent and timely manner. Full use of ERZT methods and troubleshooting occurred months after completion of the project.
8. *Rainier* only has 2 POSPAC MMS keys, limiting the amount of data that can be processed concurrently. Increasing the number of projects to be processed simultaneously would be advantageous given the possibility for *Rainier* to have 5 different POSMV units operating simultaneously.
9. *Rainier*, HSD and HSTB should attempt to resolve SBETs using ERZT methods sooner, and investigate methods to improve data throughput and processing time.
10. Implementation of decimeter or centimeter level real time corrections (SBAS, RTK, RTG, etc) should be further investigated for potential to minimize post processing efforts while ensuring high precision and accurate vertical positioning.
11. With proper control of vessel positioning, ERZT methodology could offer significant possibilities to reduce overall survey submission time, particularly in areas with well established tidal control. Reduced dependency upon tertiary tide stations and/or concurrent hydrographic data collection adds additional time for data acquisition, and greater operational flexibility. Data could conceivably be reduced and submitted without having or waiting for receipt of final tides packages from CO-OPS, minimizing field unit waiting and burden. Continue efforts on implementing full ERS/ERZT methods.
12. Analysis of ERZT SEP models allows sheet managers and other processors to evaluate vertical positioning quality in a visual manner, allowing for ñdirected editingòtechniques to be applied to problem troubleshooting. These visual and surface based approaches are often more approachable for many users than detailed inspection of PPK graphs, and determination if errors also overlap with sonar data collection. This could significantly alter SBET processing workflows by reducing total QC performed and only focusing on problematic data.
13. The following published resources were useful as references in this effort and should be disseminated more widely.
    a. Measuring the Water Level Datum Relative to the Ellipsoid During Hydrographic Survey, Rice and Riley, 2011. http://ushydro.thsoa.org/hy11/0427A_08.pdf - This describes ERZT theory.
    b. Ellipsoidally Referenced Surveying for Hydrography, Mills and Dodd, 2014 https://www.fig.net/resources/publications/figpub/pub62/Figpub62.pdf - A good general resource for ERS topics.
    c. INVESTIGATION OF THRESHOLD CROSSING HEIGHT VARIATIONS FOR WIDE AREA AUGMENTATION SYSTEM (WAAS) LOCALIZER PERFORMANCE WITH VERTICAL GUIDANCE (LPV) APPROACH PROCEDURES, Johnson and DiBenedetto, 2007. https://www.faa.gov/air_traffic/flight_info/avn/flightinspection/onlineinformation/pdf/06-27_Official_Final_Report_Body.pdf - Describes datum differences and application to aviation for WGS84 and NAD83.

Michael Bloom - NOAA Federal <michael.g.bloom@noaa.gov>

Fwd: Kotzebue Tides

1 message

Steven Loy <steven.loy@noaa.gov> Wed, Mar 23, 2016 at 8:16 AM
To: Micheal Bloom <michael.g.bloom@noaa.gov>

Begin forwarded message:

From: Starla Robinson - NOAA Federal <starla.robinson@noaa.gov>
Date: January 6, 2016 at 13:32:07 PST
To: Steven Loy - NOAA Federal <steven.loy@noaa.gov>, Douglas Bravo - NOAA Federal <ChiefST.fairweather@noaa.gov>, Corey Allen - NOAA Federal <corey.allen@noaa.gov>
Cc: _OMAO MOP OPS Rainier <ops.rainier@noaa.gov>, _OMAO MOP OPS Fairweather <OPS.Fairweather@noaa.gov>, "CO - Fairweather (Zezula)" <co.fairweather@noaa.gov>, CDR Rick Brennan <CO.Rainier@noaa.gov>, Megan Greenaway - NOAA Federal <megan.greenaway@noaa.gov>, Adam Pfundt - NOAA Federal <adam.pfundt@noaa.gov>, Matthew Forney - NOAA Federal <matthew.forney@noaa.gov>, Bart Buesseler - NOAA Federal <bart.o.buesseler@noaa.gov>, Barry Jackson - NOAA Federal <barry.jackson@noaa.gov>, CST RAINIER <chiefst.rainier@noaa.gov>
Subject: Re: Kotzebue Tides

Colleen says "The 8 Field Tide Notes associated with S327RA/FA Kotzebue Sound should be delivered by January 28."

- Starla

On Tue, Jan 5, 2016 at 11:44 AM, Starla Robinson - NOAA Federal <starla.robinson@noaa.gov> wrote:

> Happy New Year!
>
> We expect word on the final tides soon. In the meanwhile I have some other goodies for you.
>
> On the ftp site at: ftp://205.156.4.84/Fairweather/ there is a file called **Kotzubue_Hydro_Tide_Data.zip** from JOA. It should have the horizontal control data that Bravo asked for earlier. The file is large, and raw, but it has the site reports in it.
>
> Thank you for pinging me, Steve and Bravo. We will email you as soon as we have word on the tides.
>
> Best of luck,
> Starla
>
> On Mon, Jan 4, 2016 at 6:19 PM, Steven Loy - NOAA Federal <steven.loy@noaa.gov> wrote:
>
> > Starla,

Hope your holidays went well. Any update as if this data access issue has been resolved or moved forward, or if there are any updated time estimates as to when we might receive Kotzebue Final Tides?

Between RA's upcoming drydock, HSRR, and impending assignment rotations of many of our Kotzebue sheet managers we're eager to hear any updates.

Thanks,
Steve

On Thu, Dec 10, 2015 at 7:14 AM, Starla Robinson - NOAA Federal <starla.robinson@noaa.gov> wrote:

> Fairweather and Rainier,
>
> Processing tides for Kotzebue Sound has been delayed (see below). Kotzebue is a high priority but they have no time estimates. We will let you know when we hear more.
>
> Thank you and Happy Holidays,
> Starla Robinson
>
> ---------- Forwarded message ----------
> From: **Michael Gonsalves - NOAA Federal** <michael.gonsalves@noaa.gov>
> Date: Wed, Dec 9, 2015 at 7:33 PM
> Subject: Kotzebue Tides
> To: Starla Robinson - NOAA Federal <Starla.Robinson@noaa.gov>
> Cc: Corey Allen - NOAA Federal <corey.allen@noaa.gov>, Megan Greenaway - NOAA Federal <Megan.Greenaway@noaa.gov>
>
> Starla,
>
> At this week's Tri-Office meeting, CO-OPS informed us that they recently experienced a significant problem when they attempted to upgrade some of their data servers. At this time, some of the data from Kotzebue Sound, while intact, is completely inaccessible. The top levels are aware of this problem and are endeavoring to find a solution; however, there is no time line as yet as to when this will be resolved. Until such time as it is resolved, the processing of tides for Kotzebue Sound are on hold. Please advise the FA and RA.
>
> ~~ michael.gonsalves, LCDR/NOAA
> HSD Operations Branch, Chief
>
> --
> *Starla D. Robinson, Physical Scientist*
> *NOS - OCS - HSD - Operations Branch*
> *National Oceanic Atmospheric Administration*
> *Office: 301-713-7202 x125*
> *Cell: 360-689-1431*

--
LT Steven Loy, NOAA
NOAA Ship Rainier
2002 SE Marine Science Drive
Newport, OR 97365-5229
Ship's Cell (206) 660-8747

> --
> *Starla D. Robinson, Physical Scientist*
> *NOS - OCS - HSD - Operations Branch*
> *National Oceanic Atmospheric Administration*
> *Office: 301-713-7202 x125*
> *Cell: 360-689-1431*

--
Starla D. Robinson, Physical Scientist
NOS - OCS - HSD - Operations Branch
National Oceanic Atmospheric Administration
Office: 301-713-7202 x125
Cell: 360-689-1431

Barry Jackson - NOAA Federal <barry.jackson@noaa.gov>

Fwd: Re: H12812 Final Tides data gap errors

1 message

Adam Pfundt <ops.rainier@noaa.gov> Fri, Feb 19, 2016 at 10:11 AM
To: Barry Jackson - NOAA Federal <barry.jackson@noaa.gov>, Danial Palance <danial.g.palance@noaa.gov>, "michael.g.bloom@noaa.gov" <michael.g.bloom@noaa.gov>, Sarah Chappel - NOAA Federal <sarah.l.chappel@noaa.gov>, ENS Christopher Wood <christopher.m.wood@noaa.gov>
Cc: "chiefst.rainier@noaa.gov" <chiefst.rainier@noaa.gov>

Kotz sheet managers,

I wanted to forward the email chain below regarding some of the issues associated with tide notes for Kotzebue surveys. Because not all of the associated gauges were operating during all periods of acquisition the calculations using the approved TCARI varied. This has all been stated and approved from CO-OPS but is worth including in supplemental correspondence.

V/r,

LT Pfundt

-------- Forwarded Message --------
Subject: Re: H12812 Final Tides data gap errors
Date: Mon, 01 Feb 2016 12:14:35 -0500
From: Lijuan Huang - NOAA Affiliate <Lijuan.Huang@noaa.gov>
To: Barry Gallagher <Barry.Gallagher@noaa.gov>
CC: Matthew Forney - NOAA Federal <Matthew.Forney@noaa.gov>, Corey Allen - NOAA Federal <Corey.Allen@noaa.gov>, Starla Robinson - NOAA Federal <Starla.Robinson@noaa.gov>, ChiefST.Fairweather <ChiefST.Fairweather@noaa.gov>, _OMAO MOP OPS Fairweather <OPS.Fairweather@noaa.gov>, _OMAO MOP OPS Rainier <OPS.Rainier@noaa.gov>, Chief ST Rainier <ChiefST.Rainier@noaa.gov>, Steven Eykelhoff - NOAA Federal <Steven.J.Eykelhoff@noaa.gov>, Daniel Devereaux - NOAA Federal <Daniel.R.Devereaux@noaa.gov>, HPT <NOS.COOPS.HPT@noaa.gov>

Don't change the residual controls because of this altering message. By doing that, you'll force TCARI to use a "less-optimal" solution for the entire survey period. Using this final tide note as an example, verified data at Kotzebue 9490424 is available after 06/29 08:48, so TCARI will use the "optimal" solution after that. If you remove the residuals from Kotzebue, TCARI will use the "less optimal" solution for the entire survey period.

Hope this helps.

Thanks,
Lijuan

On Fri, Jan 29, 2016 at 4:28 PM, Barry Gallagher <barry.gallagher@noaa.gov> wrote:

> Matt just forwarded the message and Lijuan was correct, the TC file co-ops supplied is operating correctly. The message is just alerting you that a primary residual gauge in the preferred solution is not available and it is switching to a different solution for the given time. If CO-OPS says that the grid is ok (which they did) then you do not need to do anything additional.
>
> ```
> Data gap or gauge failure at date/time and gauge(s): 2015-06-28 18:52:21  ['9490424']
> Using solution based on gauges: ['9491094', '9469833', '9490096']
> ```

bg

On 1/29/2016 4:18 PM, Barry Gallagher wrote:

> Being a late add on this email chain I haven't seen the error messages. What Lijuan was saying is that TCARI can hold multiple solution sets, for example one with Cape E and one without.
>
> There are warning messages for two cases that usually cause people confusion. One is when surveying outside the grid which will still make water levels. The other is when residuals aren't available and it switches to an alternate "less-optimal" solution. It sounds like you might have seen this latter case.
>
> If you send me your error messages I can likely determine what is happening. If that isn't enough I'd ask for the TC file (from coops) and a line of nav from FA.
>
> bg
>
> On 1/29/2016 3:30 PM, Matthew Forney - NOAA Federal wrote:
>
> > Thanks Lijuan, Cristina, and Corey!
> >
> > It sounds like we at OCS and the Ship just need to create a new .tc file to remove those residuals. No rush on this today. We can work with HSD Ops on Monday to try and find a resolution. Hope everyone has a great weekend and it was great to see those present at FPW. Thanks again for all the correspondence and help.
> >
> > V/R,
> > Matt
> >
> > LT Matthew Forney
> > Operations Officer
> > NOAA Ship *Fairweather*
> > 1010 Stedman Street
> > Ketchikan, Alaska 99901
> >
> > Cell: 907-254-2842
> > Iridium: 808-659-0054
> > Personal Cell: 513-235-5328
> >
> > On Fri, Jan 29, 2016 at 12:27 PM, Lijuan Huang - NOAA Affiliate <lijuan.huang@noaa.gov> wrote:
> >
> > > Hi Barry,
> > > We have saved the solution without residual data at Cape E in the .tc file. I think the error message is just for an FYI, FA/RA is supposed to be able to get tide reductions from the grid?
> > >
> > > Matt, the grid has been QCed that without the residual data at Cape E, tide reductions are still within hydro specs.
> > >
> > > Thanks,
> > > Lijuan
> > >
> > > Sent from my iPhone
> > >
> > > On Jan 29, 2016, at 2:13 PM, Corey Allen - NOAA Federal <corey.allen@noaa.gov> wrote:

Hey Matt,
Sitting at airport so limited in ability to troubleshoot.... Can you confirm verified data exists for those days? I'll teach out to coops, but assuming no verified data so we may need to adjust the tc file to remove residuals from those gauges....we just need to make sure we appropriately adjust the tpu values and aren't then blowing budget.

Corey

On Friday, January 29, 2016, Matthew Forney - NOAA Federal <matthew.forney@noaa.gov> wrote:

> Hello Starla,
>
> I wanted to inform you that we did recieve Final Tides for all of our Kotz Surveys. It seems that we are getting errors when applying the files that were downloaded and used in TCARI. Attached are three (3) files. One a screen shot of the errors in Pydro. Second, the TCARI Error Log, and an excel detailing the boats and the lines that did not have final tides applied. It looks like the first four days and final two days of acquisition. Please advise on how to proceed. I appreciate any and all feedback you can provide.
>
> V/R,
> Matt
>
> LT Matthew Forney
> Operations Officer
> NOAA Ship *Fairweather*
> 1010 Stedman Street
> Ketchikan, Alaska 99901
>
> Cell: 907-254-2842
> Iridium: 808-659-0054
> Personal Cell: 513-235-5328
>
> ---------- Forwarded message ----------
> From: **Steven Eykelhoff - NOAA Federal** <Steven.J.Eykelhoff@noaa.gov>
> Date: Fri, Jan 29, 2016 at 11:22 AM
> Subject: H12812 Final Tides data gap errors
> To: OPS Fairweather <OPS.Fairweather@noaa.gov>, Douglas Bravo - NOAA Federal <ChiefST.Fairweather@noaa.gov>
>
> Please find attached a screen shot of the pydro command screen, error log file and spreadsheet indicating the days tides will not apply to.
>
> --
> Steven Eykelhoff
>
> NOAA Ship Fairweather (S-220)
> 1010 Stedman St

Ketchikan, AK 99901

Ship Cell: 907-254-2842
Iridium: 808-659-0054
Cell: 315-520-2663
Email: steven.j.eykelhoff@noaa.gov

--
J. Corey Allen
Team Lead, Operations Branch
Hydrographic Surveys Division
Office of Coast Survey, NOAA
Corey.Allen@noaa.gov
301.713.2777 x119 (Office)
301.717.7271 (Cell)

--
Lijuan Huang
NOAA/NOS/CO-OPS/Hydro Planning Team
1305 East-West Highway
N/OPS3, Sta. 7134 SSMC4
Silver Spring, MD 20910-3218
Email: lijuan.huang@noaa.gov
Phone: 240-533-0613

Fwd: Re: OPR-S327-RAFA-15 Updated Coverage Requirements

1 message

Adam Pfundt <ops.rainier@noaa.gov> Tue, Jul 14, 2015 at 6:08 PM
To: Barry Jackson - NOAA Federal <barry.jackson@noaa.gov>, Danial Palance - NOAA Federal <danial.g.palance@noaa.gov>, Christopher Wood <christopher.m.wood@noaa.gov>, Eli Smith <eli.r.smith@noaa.gov>, Michael Bloom - NOAA Federal <michael.g.bloom@noaa.gov>
Cc: _OMAO MOP ChiefST RAINIER <ChiefST.Rainier@noaa.gov>

Kotzebue Sheet Managers,

The coverage requirements for Kotzebue sheets continues to change. Sheet 16 is the only sheet remaining with coverage requirements consistent with the original Project Instructions.

A corridor has been developed for sheets 8-10 and a second corridor has been established for sheets 17-20. The associated files are located here:

K:\Projects\2015_Projects\OPR-S327-RA-15_Kotzebue_Sound\Shoreline\GIS Files\Corridor

At present these corridors require full bottom coverage with either 100% MBES or 100% SSS with concurrent MBES and MBES development of contacts. Please plan on creating 80m line spacing to fill these corridor areas with SSS and 1000m spaced lines running perpendicular for crosslines. Any questions please let me know.

V/r,

FOO

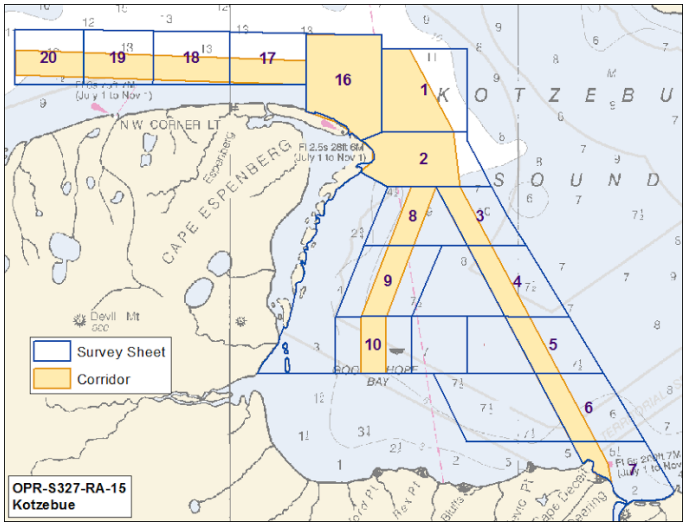
-------- Forwarded Message --------
Subject: Re: OPR-S327-RAFA-15 Updated Coverage Requirements
Date: Tue, 14 Jul 2015 11:17:27 -0400
From: Starla Robinson - NOAA Federal <Starla.Robinson@noaa.gov>
To: David J. Zezula <CO.Fairweather@noaa.gov>
CC:CO - Rainier <CO.Rainier@noaa.gov>, _OMAO MOP OPS Rainier <OPS.Rainier@noaa.gov>, _OMAO MOP ChiefST RAINIER <ChiefST.Rainier@noaa.gov>, Michael Gonsalves - NOAA Federal <Michael.Gonsalves@noaa.gov>, Kathryn Pridgen - NOAA Federal <Kathryn.Pridgen@noaa.gov>, Eric Berkowitz - NOAA Federal <Eric.W.Berkowitz@noaa.gov>, Megan Greenaway - NOAA Federal <Megan.Greenaway@noaa.gov>, Corey Allen - NOAA Federal <Corey.Allen@noaa.gov>, Katrina Wyllie - NOAA Federal <Katrina.Wyllie@noaa.gov>, _OMAO MOP OPS Fairweather <OPS.Fairweather@noaa.gov>, Douglas Bravo - NOAA Federal <ChiefST.Fairweather@noaa.gov>, Timothy Smith - NOAA Federal <Timothy.M.Smith@noaa.gov>, Jacklyn James - NOAA Federal <Jacklyn.C.James@noaa.gov>

Attached is the corridor shapefile.

Thanks,
Starla

On Tue, Jul 14, 2015 at 10:13 AM, Starla Robinson - NOAA Federal <starla.robinson@noaa.gov> wrote:

> CO's,
>
> Based on present acquisition rates, and with consultation with the navigation manager we are refining the priorities on the Kotzebue Project. Specifically we wish to 1) develop transit corridors within sheets 17 -20, 3-7, and 8-10; 2) develop the shoal around Cape Espenberg in sheets 1, 2 and 16; and 3) forego the 300 meter line spacing zones outside the preceding areas.
>
> When launch operations are untenable the ships may survey outside the corridors.
>
> Sheets 19 and 20 are dependent on a tide gauge that will be removed 7/30. So while COOPS feel they can resolve vertical control without the gauge, they cannot speak towards the accuracy at this point in time. If possible we would like the Rainier to prioritize the corridor in sheets 19 and 20 for this leg.
>
> These are our latest thoughts on the matter. Does this make sense from the field's perspective?
>
> Thank you,
> Starla



On Mon, Jul 13, 2015 at 4:05 PM, Starla Robinson - NOAA Federal <starla.robinson@noaa.gov> wrote:

Hello Fairweather and Rainier,

We are planning to amend the coverage requirements to focus on complete coverage corridors, and drop the 300m line spacing outside of sheets 1, 2, and 16.

Sheets 1, 2, and 16 cover the point of Cape Espenberg. As an area of converging traffic we intend to retain the coverage requirements as stated in the previous email. Our primary objective after that is to acquire the corridors for the North, Deering, and Good Hope Bay.

The Fairweathers next leg (Clarence or Kotzebue) will be determined by how much we get done in Kotzebue this leg. Given the weather constraints it will be hard to predict the progress we can achieve on the launch sheets.

I will have another shapefile with a 2nm corridor for sheets 17 through 20, soon.

Thank you for your flexibility on this project,
Starla

On Sun, Jul 12, 2015 at 4:18 PM, David J. Zezula <co.fairweather@noaa.gov> wrote:

My only concern it that AIS Data show's that coastal traffic is cutting the corner inside the 20m curve. If the intent of our survey is to provide marine traffic with a full bottom corridor it seems we should be doing that where they are already transiting. 8-20 m on sheet 2 and 16 is going to be a significant effort, but I don't see a way around it and still provide the mariner CATZOC A.

DZ

On 7/12/2015 10:32 AM, CO - Rainier wrote:

All,

Attached is RA's coverage on Sheet 16 after 72 hours of ship operations. It's not a considerable extra effort extending 100% MBES north to the sheet limits of 16-20, so I recommend we hold fast with the original requirements in waters deeper than 20m.

Requirements inshore of the 20m contour on sheets 16-20 may be worth further consideration. Completing 100% MBES or 100% SSS coverage in the 8-20m "ribbon" will be the most time consuming and least efficient part of these surveys. It is debatable how much value would be added to the surveys, and we have a high degree of confidence from survey results so far that we would not miss any significant shoals or features in this area by shifting to set line spacing inshore of 20m. Recommend that inshore of 20m (or perhaps 18, as that's the 10-fathom curve), coverage requirements are set line spacing no greater than 300m apart, with all shoals and features further developed. This would roughly coincide with the southern limit of FA's proposed corridor anyway.

Also, we've found to date that we can only get launches out about 50% of the time due to weather (Have yet to have launches in the water for a full day so far, out of 5 days on project this leg), so we want to be able to get the most bang for the buck when we can get boats out.

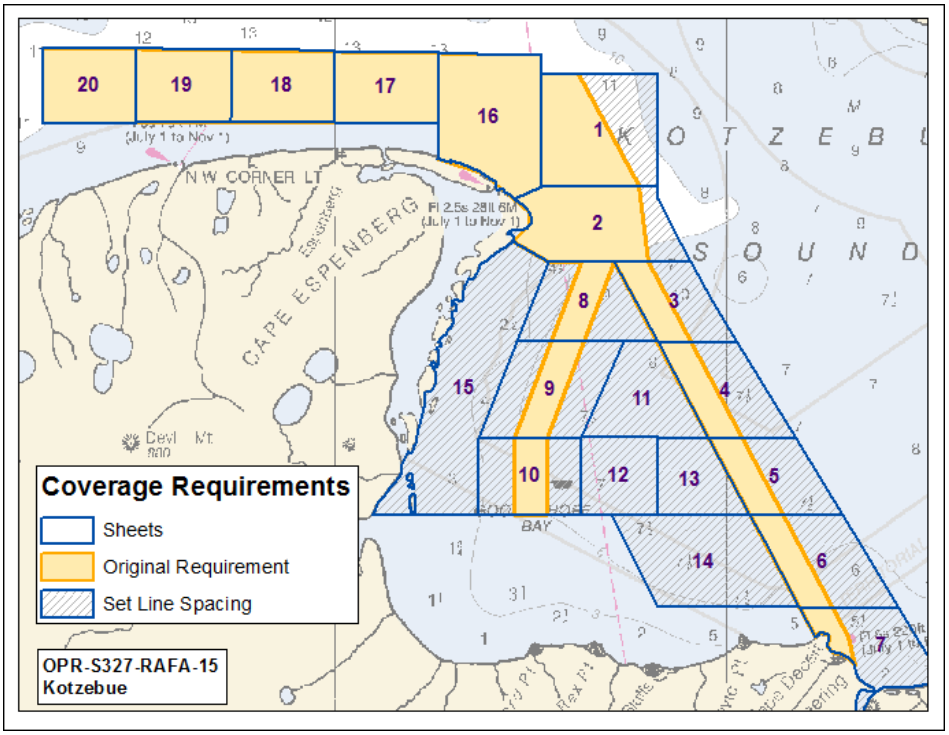
-EJ

--
CDR E.J. Van Den Ameele, NOAA
Commanding Officer, NOAA Ship Rainier
2002 SE Marine Science Drive
Newport, OR 97365
Land Line (541) 867-8770

Ship's Cell (206) 660-8747
At sea: (301) 713-7771

On 7/11/2015 12:26 PM, David J. Zezula wrote:

> Starla,
>
> Thought we were doing a 2nm wide corridor on sheets 17-20 also? See Attached.
>
> DZ
>
> On 7/10/2015 1:52 PM, Starla Robinson - NOAA Federal wrote:
>
> > *Fairweather* and *Rainier*,
> >
> > Based on preliminary data acquired by *Fairweather* and *Rainier*, we are altering the coverage requirements for Kotzebue Sound as follows (New requirement highlighted in red):
> >
> > **Greater than 20 meters water depth (outside of the designated set line spacing zone):** Complete MBES coverage with backscatter.
> >
> > **8 meters to 20 meters water depth (outside of the designated set line spacing zone):** Either 1) 100% SSS with concurrent set line spacing SBES or MBES with backscatter, or 2) complete MBES with backscatter. Note: Complete MBES is sufficient for both determination of least depth identified with SSS and for disproving a feature - 100% SSS is insufficient to disprove a feature. Refer to Section 6.1.2 of the HSSD to confirm proper SSS acquisition parameters. Gaps in SSS coverage should be treated as gaps in MBES coverage and addressed accordingly.
> >
> > **Inshore limit to 8 meters water depth OR in the designated set line spacing zone:** No greater than 300 meter Set Line Spacing SBES or MBES with backscatter. Please ensure the following: 1) Indications of shoaling falling between set line spacing main scheme lines must be investigated 2) Set Line Spacing Line orientation should be approximately perpendicular to isobaths whenever possible.
> >
> > Attached is a shapefile designating the boundary for the set line spacing zone.
> >
> > Thank you,
> > Starla Robinson



--

Starla D. Robinson, Physical Scientist
NOS - OCS - HSD - Operations Branch
National Oceanic Atmospheric Administration

Office: 301-713-7202 x125
Cell: 360-689-1431

--

David Zezula, CDR/NOAA

Commanding Officer
NOAA Ship Fairweather (S-220)
2002 SE Marine Science Dr.
Newport, OR 97365-5229

(907) 254-2842: Ships Cell
(907) 254-2836: CO Cell
(301) 713-7779: VOIP

www.moc.noaa.gov/fa

--

David Zezula, CDR/NOAA

Commanding Officer
NOAA Ship Fairweather (S-220)
2002 SE Marine Science Dr.
Newport, OR 97365-5229

(907) 254-2842: Ships Cell
(907) 254-2836: CO Cell
(301) 713-7779: VOIP

www.moc.noaa.gov/fa

--
Starla D. Robinson, Physical Scientist
NOS - OCS - HSD - Operations Branch
National Oceanic Atmospheric Administration
Office: 301-713-7202 x125
Cell: 360-689-1431

--
Starla D. Robinson, Physical Scientist
NOS - OCS - HSD - Operations Branch
National Oceanic Atmospheric Administration
Office: 301-713-7202 x125
Cell: 360-689-1431

--
Starla D. Robinson, Physical Scientist
NOS - OCS - HSD - Operations Branch
National Oceanic Atmospheric Administration
Office: 301-713-7202 x125
Cell: 360-689-1431

Corridor_Poly_0714.zip
3K

Fwd: Kotzebue Sheets / ENC Offset

1 message

Starla Robinson - NOAA Federal <starla.robinson@noaa.gov> Thu, Jun 18, 2015 at 9:57 PM
To: CST RAINIER <chiefst.rainier@noaa.gov>, Barry Jackson - NOAA Federal <barry.jackson@noaa.gov>, Adam Pfundt - NOAA Federal <adam.pfundt@noaa.gov>

Hello Chief and Barry,

I didn't see the CC. ENC US1AK90M has an offset from US2AK92M. Does ENC US2AK92M match up?

Happy Hydroing,
Starla

---------- Forwarded message ----------
From: **Starla Robinson - NOAA Federal** <starla.robinson@noaa.gov>
Date: Thu, Jun 18, 2015 at 5:45 PM
Subject: Re: Kotzebue Sheets / ENC Offset
To: Adam Pfundt <ops.rainier@noaa.gov>, Corey Allen - NOAA Federal <corey.allen@noaa.gov>

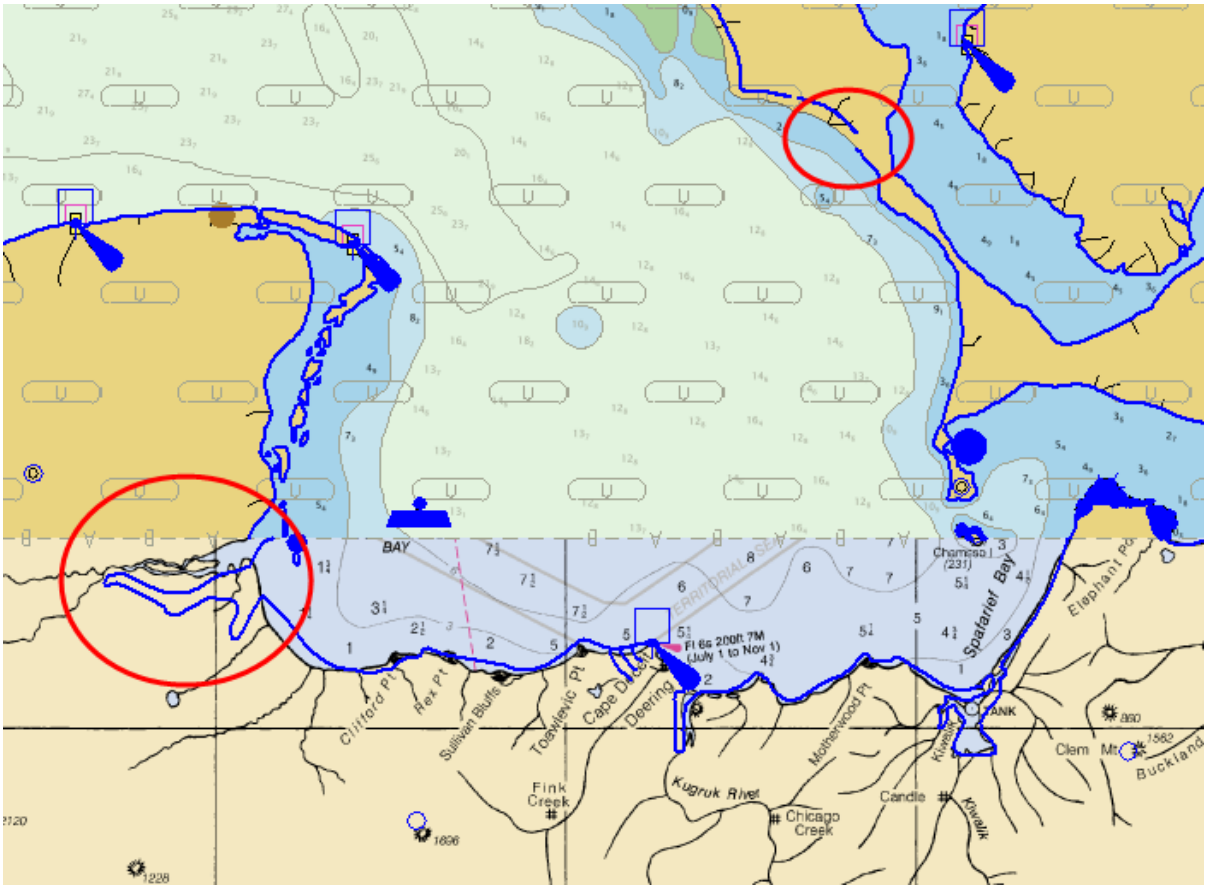
Hey Adam,

I took a look, I think the issue is US1AK90M is off by about 4000 meters. I think its ok as long as it lines up with US2AK92M and its corresponding raster 16005. While I was preparing the CSF I digitized the shoreline from 16005 because the adjacent raster did not have it, and the rest of the shoreline is GC, which for that coast agrees well.

I suppose the next question is for **Corey**...
The charts/encs clearly have an offset on both sides of the bay, actually in both ENC's. If someone inspects US1AK90M, US2AK92M, and US5AK97, there are clear offsets. US2AK92M disagrees with US5AK97M by 2000 meters on the eastern shore. US5AK97 is our last adventures data, and I would trust that over the rest. How should we best report this? I had thought it would be brought up in the DR, but it occurs to me that maybe we should be addressing it sooner.... on the other hand someone must have noticed this in 2012.

I hope this is primarily a chart scale issue. Please let me know.

Thank you,
Starla



On Thu, Jun 18, 2015 at 5:07 PM, Starla Robinson - NOAA Federal <starla.robinson@noaa.gov> wrote:

> Thank you Adam, That looks terrible. I will see what I can do from this end. - Starla

On Thu, Jun 18, 2015 at 4:51 PM, Adam Pfundt <ops.rainier@noaa.gov> wrote:

> Starla,
>
> I wanted to get some clarification on Kotzebue sheet limits before we get on project. Opening the various files associated with the project has created some confusion. In Caris the raster chart and the PRF agree well. However when opening in Hypack there is an offset that is created and varies depending on zoom. We have reached out to Hypack for guidance or assistance in getting the chart and CSF to agree for planning and acquisition purposes.
>
> When opened in Caris the ENC does not agree well with the raster chart or PRF. I'm not sure if all these descrepencies are a product of scale. They do not appear to be projection associated issues. We are

planning on doing everything for this project in UTM zone 3 north. I wanted to make sure we get the correct locations for all sheet limits and associated files. Could you check the display of raster vs. PRF vs. ENC and let us know what we should use to guide our planning and acquisition?

Thanks,

Adam

-------- Forwarded Message --------
Subject: Kotzebue Sheets / ENC Offset
Date: Wed, 17 Jun 2015 22:38:06 +0000
From: Barry Jackson - NOAA Federal <barry.jackson@noaa.gov>
To:ops <OPS.Rainier@noaa.gov>

FOO,

Thought this might help:

Attached is a Caris screen grab showing the misalignment between the ENC and RA's Kotzebue sheets. Also notice the differences in shoreline represented. The CSF shoreline tracts well with the sheet limits, meaning it does not align with the ENC either. As you know, the raster chart displays correctly in Caris and ArcGIS, but not in Hypack.

Thanks,

Jackson

--
Starla D. Robinson, Physical Scientist
NOS - OCS - HSD - Operations Branch
National Oceanic Atmospheric Administration
Office: 301-713-7202 x125
Cell: 360-689-1431

--
Starla D. Robinson, Physical Scientist
NOS - OCS - HSD - Operations Branch
National Oceanic Atmospheric Administration
Office: 301-713-7202 x125
Cell: 360-689-1431

--
Starla D. Robinson, Physical Scientist
NOS - OCS - HSD - Operations Branch
National Oceanic Atmospheric Administration
Office: 301-713-7202 x125
Cell: 360-689-1431

APPROVAL PAGE

H12821

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

- H12821_DR.pdf
- Collection of depth varied resolution BAGS
- Processed survey data and records
- H12821_GeoImage.pdf

The survey evaluation and verification has been conducted according current OCS Specifications.

Approved: Digitally signed by HOLMBERG.PETER.SCOTT.1365886101 DN: c=US, o=U.S. Government, ou=DoD, ou=PKI, ou=OTHER, cn=HOLMBERG.PETER.SCOTT.1365886101 Date: 2016.12.21 07:31:22 -08'00'

Peter Holmberg
Cartographic Team Lead, Pacific Hydrographic Branch

The survey has been approved for dissemination and usage of updating NOAA's suite of nautical charts.

Approved: Digitally signed by BROWN.KURT.E.1156712600 DN: c=US, o=U.S. Government, ou=DoD, ou=PKI, ou=OTHER, cn=BROWN.KURT.E.1156712600 Date: 2016.12.20 13:01:33 -08'00'

Kurt Brown
Physical Scientist, Pacific Hydrographic Branch