

H12893

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

**DESCRIPTIVE REPORT**

Type of Survey: Navigable Area

Registry Number: H12893

**LOCALITY**

State(s): South Carolina

General Locality: Approaches to Wilmington

Sub-locality: 53 Miles East of Cape Romain

**2016**

CHIEF OF PARTY  
LCDR Matthew Jaskoski, NOAA

LIBRARY & ARCHIVES

Date:

**HYDROGRAPHIC TITLE SHEET**

**H12893**

**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): **South Carolina**

General Locality: **Approaches to Wilmington**

Sub-Locality: **53 Miles East of Cape Romain**

Scale: **40000**

Dates of Survey: **07/12/2016 to 08/19/2016**

Instructions Dated: **06/29/2016**

Project Number: **OPR-G309-FH-16**

Field Unit: **NOAA Ship *Ferdinand R. Hassler***

Chief of Party: **LCDR Matthew Jaskoski, NOAA**

Soundings by: **Multibeam Echo Sounder**

Imagery by: **Multibeam Echo Sounder Backscatter**

Verification by: **Atlantic 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 <https://www.ncei.noaa.gov/>.*

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## Descriptive Report to Accompany Survey H12893

Project: OPR-G309-FH-16

Locality: Approaches to Wilmington

Sublocality: 53 Miles East of Cape Romain

Scale: 1:40000

July 2016 - August 2016

**NOAA Ship *Ferdinand R. Hassler***

Chief of Party: LCDR Matthew Jaskoski, NOAA

### A. Area Surveyed

Survey H12893 was conducted in Long Bay, with a sublocality of 53 miles East of Cape Romain as shown in Figure 1.

#### A.1 Survey Limits

Data were acquired within the following survey limits:

Northwest Limit	Southeast Limit
33° 9' 54.35" N 78° 29' 17.22" W	32° 58' 54.07" N 78° 16' 19.49" W

*Table 1: Survey Limits*

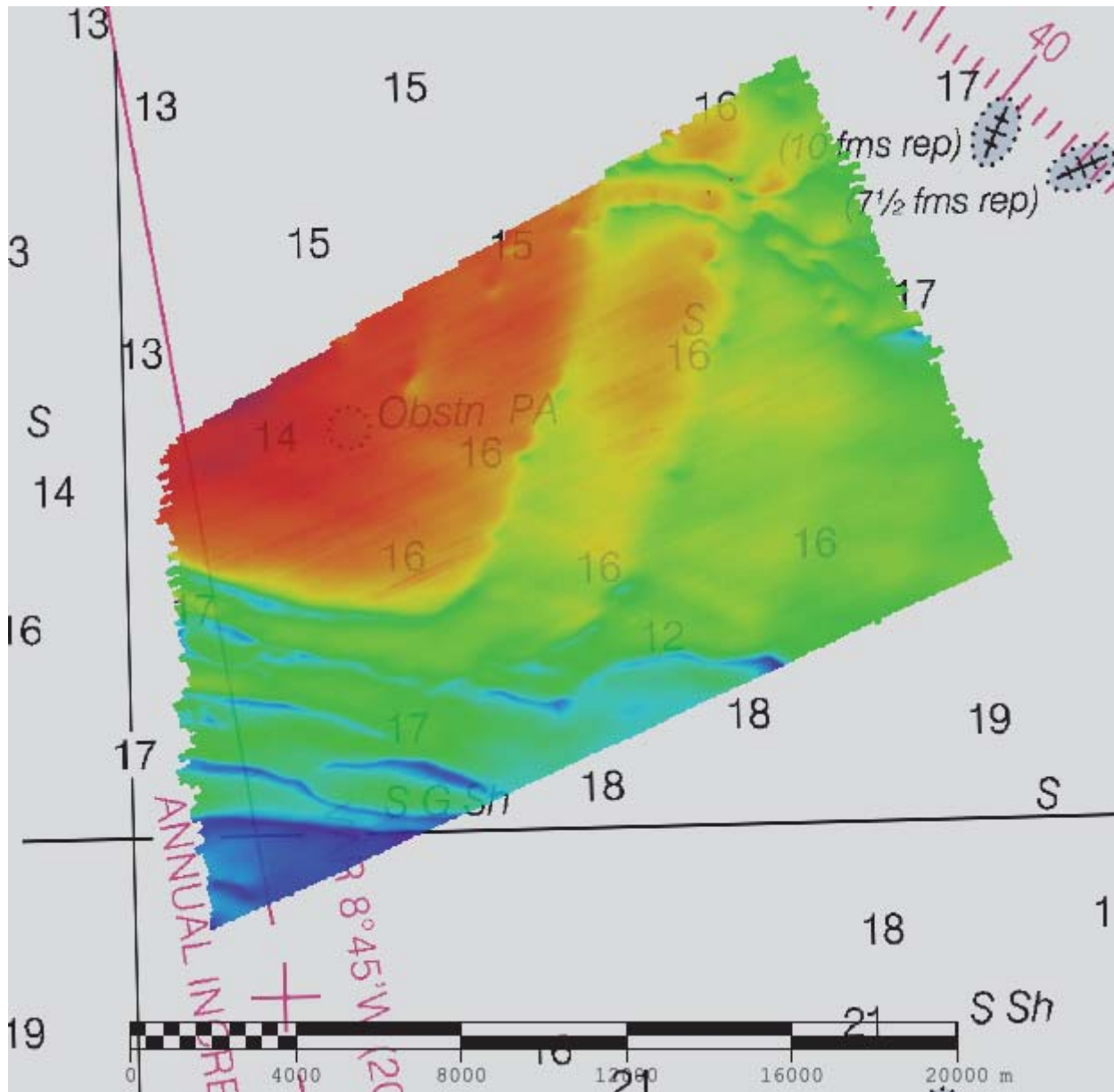


Figure 1: H12893 Survey Limits

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

## A.2 Survey Purpose

The purpose of this project is to provide contemporary surveys to update National Ocean Service (NOS) nautical charting products. The project is based on a request from an Atlantic Coast Port Access Route Study conducted by Pacific Northwest National Laboratory at the request of the U.S. Coast Guard to delineate traffic corridors using Automated Identification Systems (AIS). This project will improve the chart for traffic navigating from Port to Port along the Atlantic Ocean Channel.



### A.3 Survey Quality

The entire survey is adequate to supersede previous data.

### A.4 Survey Coverage

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

Water Depth	Coverage Required
All waters in survey area. Refer to HSSD Section 5.2.2.3	Complete Multibeam with Backscatter.

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

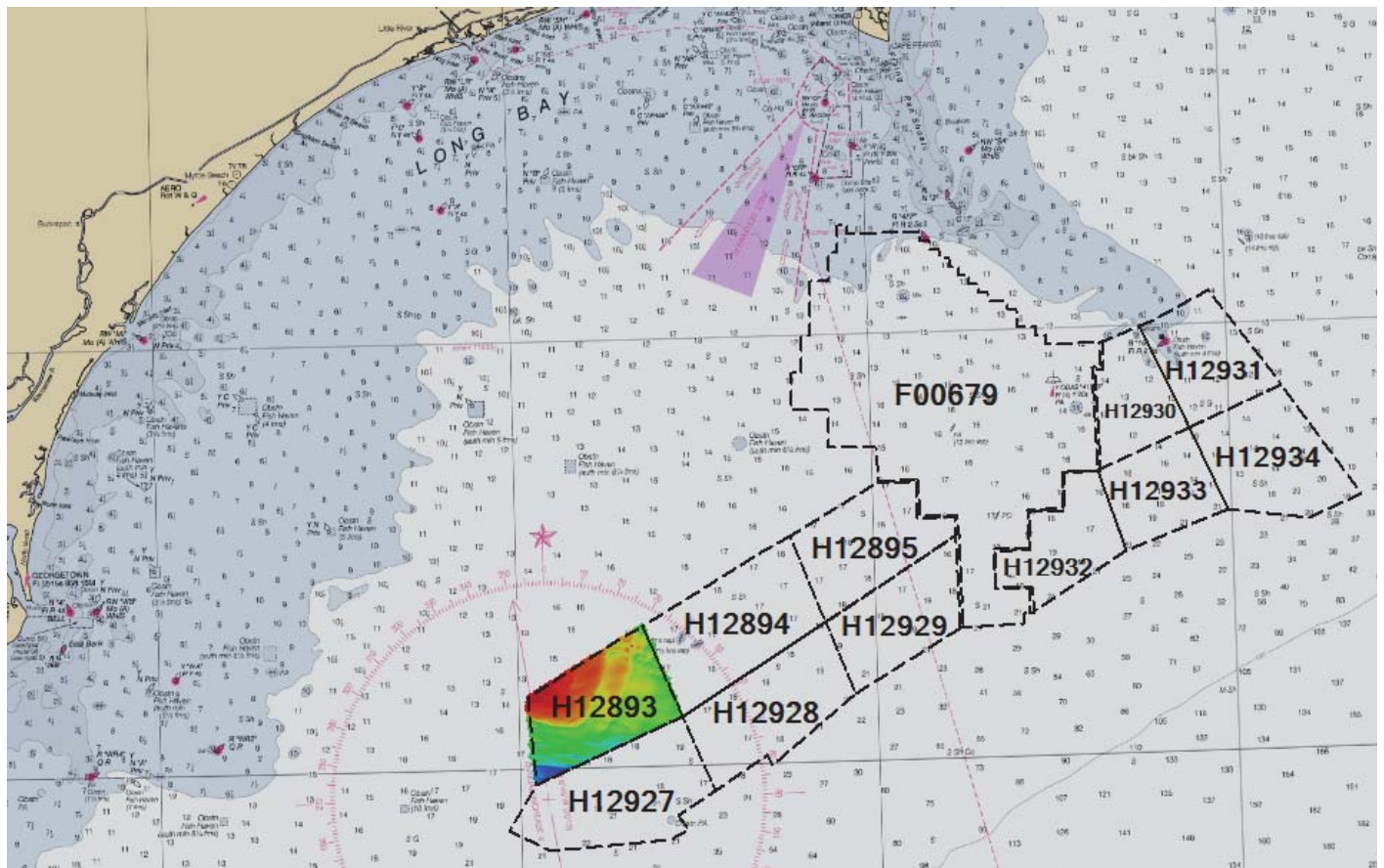


Figure 2: Survey layout for OPR-G309-FH-16 overlaying RNC 11520.

## A.5 Survey Statistics

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

	<b>HULL ID</b>	<i>S250</i>	<i>Total</i>
<b>LNM</b>	<b>SBES Mainscheme</b>	0	0
	<b>MBES Mainscheme</b>	1052.9	1052.9
	<b>Lidar Mainscheme</b>	0	0
	<b>SSS Mainscheme</b>	0	0
	<b>SBES/SSS Mainscheme</b>	0	0
	<b>MBES/SSS Mainscheme</b>	0	0
	<b>SBES/MBES Crosslines</b>	59.8	59.8
	<b>Lidar Crosslines</b>	0	0
<b>Number of Bottom Samples</b>			5
<b>Number Maritime Boundary Points Investigated</b>			0
<b>Number of DPs</b>			0
<b>Number of Items Investigated by Dive Ops</b>			0
<b>Total SNM</b>			69.6

*Table 2: Hydrographic Survey Statistics*

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

Survey Dates	Day of the Year
07/12/2016	194
07/13/2016	195
07/14/2016	196
07/27/2016	209
07/28/2016	210
07/29/2016	211
07/30/2016	212
07/31/2016	213
08/10/2016	223
08/11/2016	224
08/19/2016	232

*Table 3: Dates of Hydrography*

Mainscheme survey lines were run with a dual-head multibeam echosounder with independent port and starboard inertial measurement units (IMU) used for positioning. Linear nautical miles were calculated using statistics from the port system.

The starboard sonar head was offline due to overheating from DN 194 (07/12/2016) through DN 196 (07/14/2016). Only port sonar head data were acquired on these dates.

Due to only the starboard GNSS positioning system having licensing with the Fugro Marinestar GNSS corrector subscription after DN 213 (07/31/2016), starboard IMU data was applied to port bathymetry data for DN 223 (08/10/2016), 224 (08/11/2016), and 232 (08/19/2016). Data from these dates were processed in CARIS HIPS with a unique vessel file named: FH\_S250\_PORT\_Reson7125\_STBD\_IMU\_512bms\_400kHz\_S7K\_2016. See DR Section 3.3.1 for more details.

## **B. Data Acquisition and Processing**

### **B.1 Equipment and Vessels**

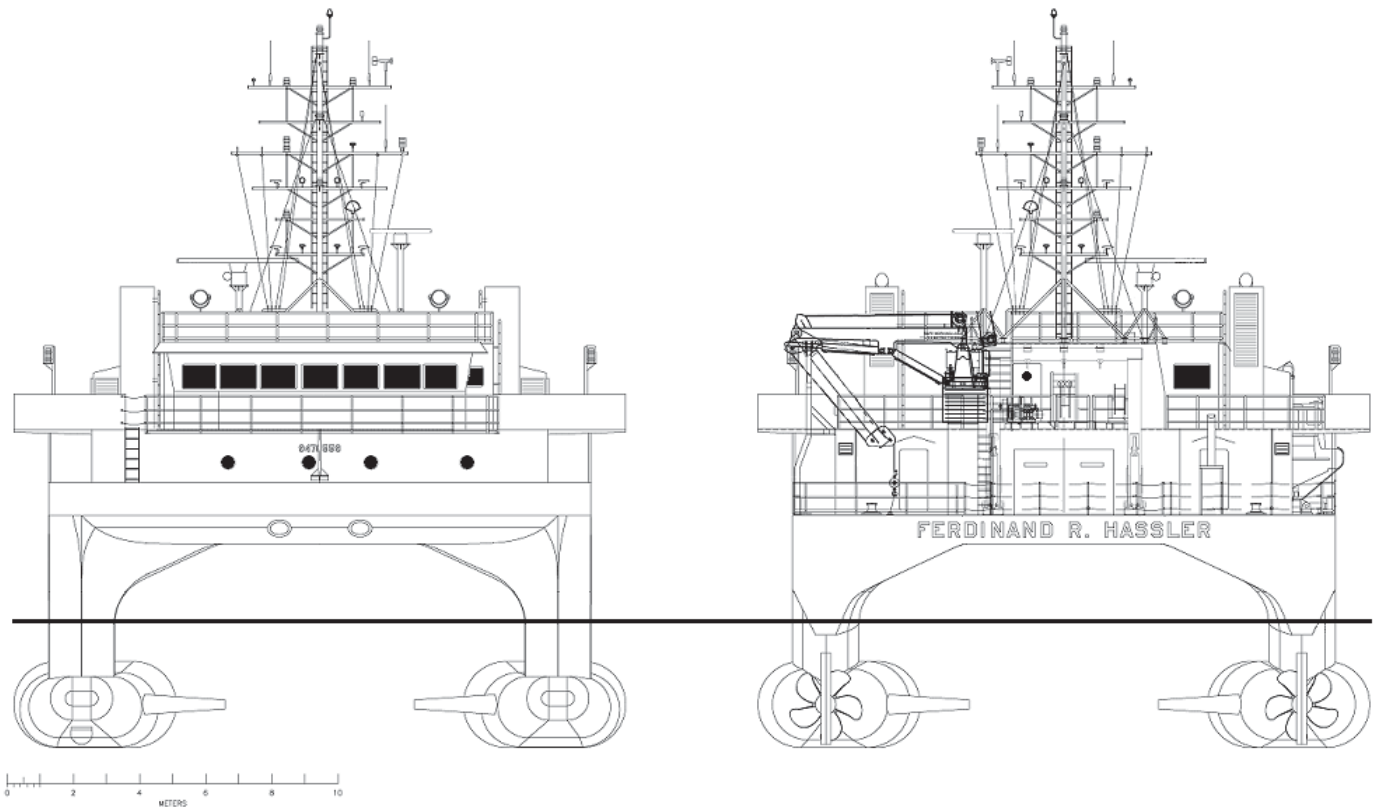
Refer to the Data Acquisition and Processing Report (DAPR) for a complete description of data acquisition and processing systems, survey vessels, quality control procedures and data processing methods. Additional information to supplement sounding and survey data, and any deviations from the DAPR are discussed in the following sections.

### B.1.1 Vessels

The following vessels were used for data acquisition during this survey:

<b>Hull ID</b>	<i>S250</i>
<b>LOA</b>	37.7 meters
<b>Draft</b>	3.77 meters

*Table 4: Vessels Used*



*Figure 3: NOAA Ship FERDINAND R. HASSLER*

NOAA Ship FERDINAND R. HASSLER (S250), shown in Figure 3, acquired all surveyed soundings during operation for H12893.

## B.1.2 Equipment

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

<b>Manufacturer</b>	<b>Model</b>	<b>Type</b>
RESON	SeaBat 7125	MBES
Applanix	POS M/V 320 V5	Positioning and Attitude System
Hemisphere	MBX-4	Positioning System
AML Oceanographic	MicroCTD	Sound Speed System
ODIM Brooke Ocean	MVP-200	Sound Speed System
RESON	SVP-70	Surface Sound Speed System
Sea-Bird Electronics	SBE 19plus SeaCAT	Conductivity, Temperature, and Depth Sensor

*Table 5: Major Systems Used*

## B.2 Quality Control

### B.2.1 Crosslines

Crosslines acquired for this survey totaled 5.68% of mainscheme acquisition.

The ratio of crossline to main scheme mileage was calculated to be 5.68% which is within specifications set forth in Section 5.2.4.3 of the 2016 HSSD.

A geographic plot of crosslines is shown in Figure 4. To evaluate crossline agreement, two 2-meter surfaces were created: one from crossline depths, the other from mainscheme depths. These two surfaces were differenced using CARIS BASE Editor. The two surfaces are in excellent agreement. See Figure 5. Nodes totaling greater than 4.9 million have a difference value range between -9.61 meters and 4.14 meters. The statistical analysis of the differences between the mainscheme and crossline surfaces is shown in Figure 5. The average difference between the surfaces is -0.008 meters with a standard deviation of 0.12 meters. Ninety-five percent of nodes agree within +/- 0.21 meters of the mean. Two hundred eighteen (218) nodes exhibit a difference between -1.0 m and -9.61 m. These nodes represent deep fliers that were included in the 2 meter crossline surface, but were not included in the 2 meter mainscheme surface. Further, these aberrant nodes are not included in the 2 meter finalized surface submitted as the main deliverable.

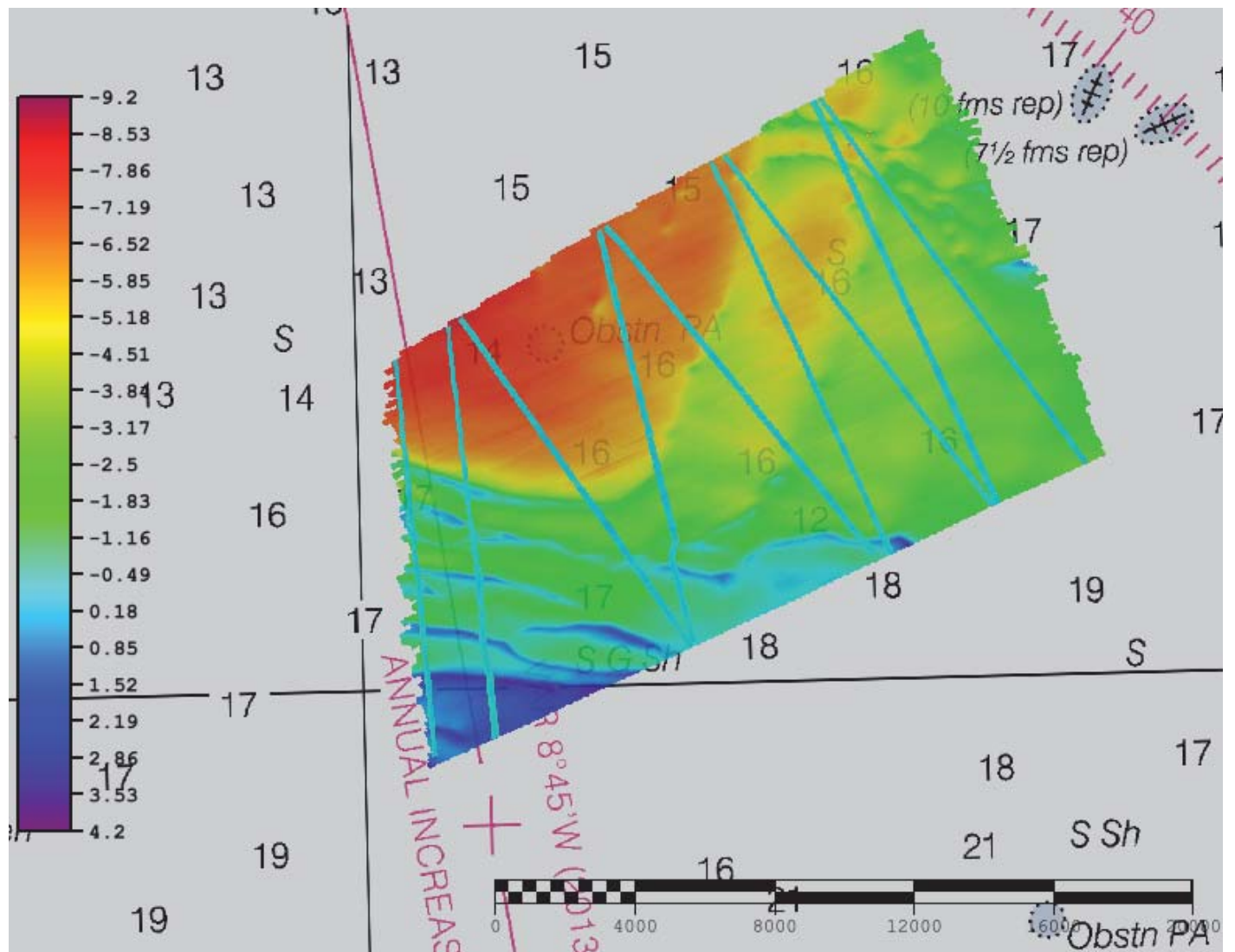


Figure 4: H12893 MBES crossline data overlaid on mainscheme data. The legend represents the difference surface values.

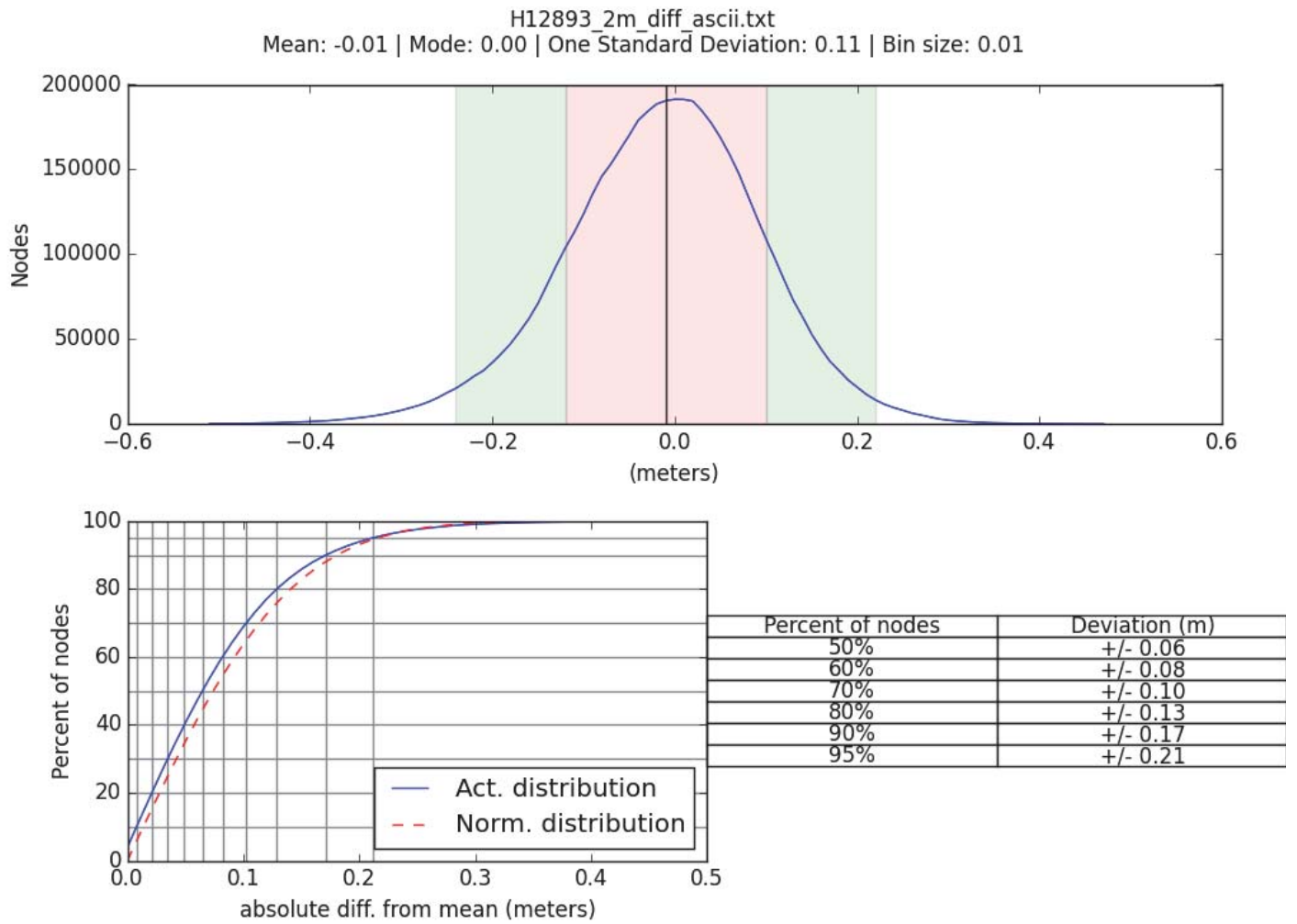


Figure 5: H12893 crossline difference statistics: mainscheme minus crossline.

### B.2.2 Uncertainty

The following survey specific parameters were used for this survey:

Measured	Zoning	Method
0.01 meters	0.148 meters	ERS via VDATUM

Table 6: Survey Specific Tide TPU Values.

Hull ID	Measured - CTD	Measured - MVP	Surface
S250	1 meters/second	1 meters/second	0.5 meters/second

*Table 7: Survey Specific Sound Speed TPU Values.*

Two (2) tidal models were available for water level corrections associated with survey H12893. A discrete tide zone file, produced by CO-OPS for project OPR-G309-FH-16-02, was provided to the field unit. Additionally, a vertical datum transformation (VDatum) model was delivered to the field unit in the project instructions. All final gridded data for survey H12893 were reduced to MLLW via VDatum. This model functioned as a gridded separation model for GPS tide computations with a 0.148 meter uncertainty. Final TPU calculations are derived from the following sources: VDatum separation model, sound velocity (MVP, CTD and surface sound velocimeter), HVF uncertainties, and SBET post processed uncertainty. Error data sources applied through CARIS processing software are listed in Figure 6.

The ODIM Brooke Ocean Moving Vessel Profiler (MVP) experienced intermittent mechanical issues during the course of H12893 data acquisition. When not operational, a Sea-Bird CTD was used to conduct static casts to model the water column sound speed profile approximately every two to four hours. Frequency was dependent on changes observed in refraction errors within processed data and comparison of previous profile data. MVP cast data were used on DN 210 through 213. CTD cast data were used in data processing on DN 194 through 196, 209, 223, 224, and 231. CTD cast data collected on DN 231 at 2144 GMT was applied to bathymetry data collected on DN 232 within four (4) hours of the cast.

<i>Uncertainty</i>	<i>Source</i>
Position	Realtime
Sonar	Vessel
Heading	Realtime
Pitch	Realtime
Roll	Realtime
Vertical	Realtime heave
Tide	Static

*Figure 6: Sources of error data applied during CARIS processing.*

### B.2.3 Junctions

Three (3) contemporary surveys of the same project junction with H12893. H12894 adjoins H12893 to the northeast, while H12928 and H12927 are to the southeast and south respectively. At the time of submission, only H12894 was available for comparison. H12927 and H12928 were not acquired during the current field season due to time constraints. See Figure 7.



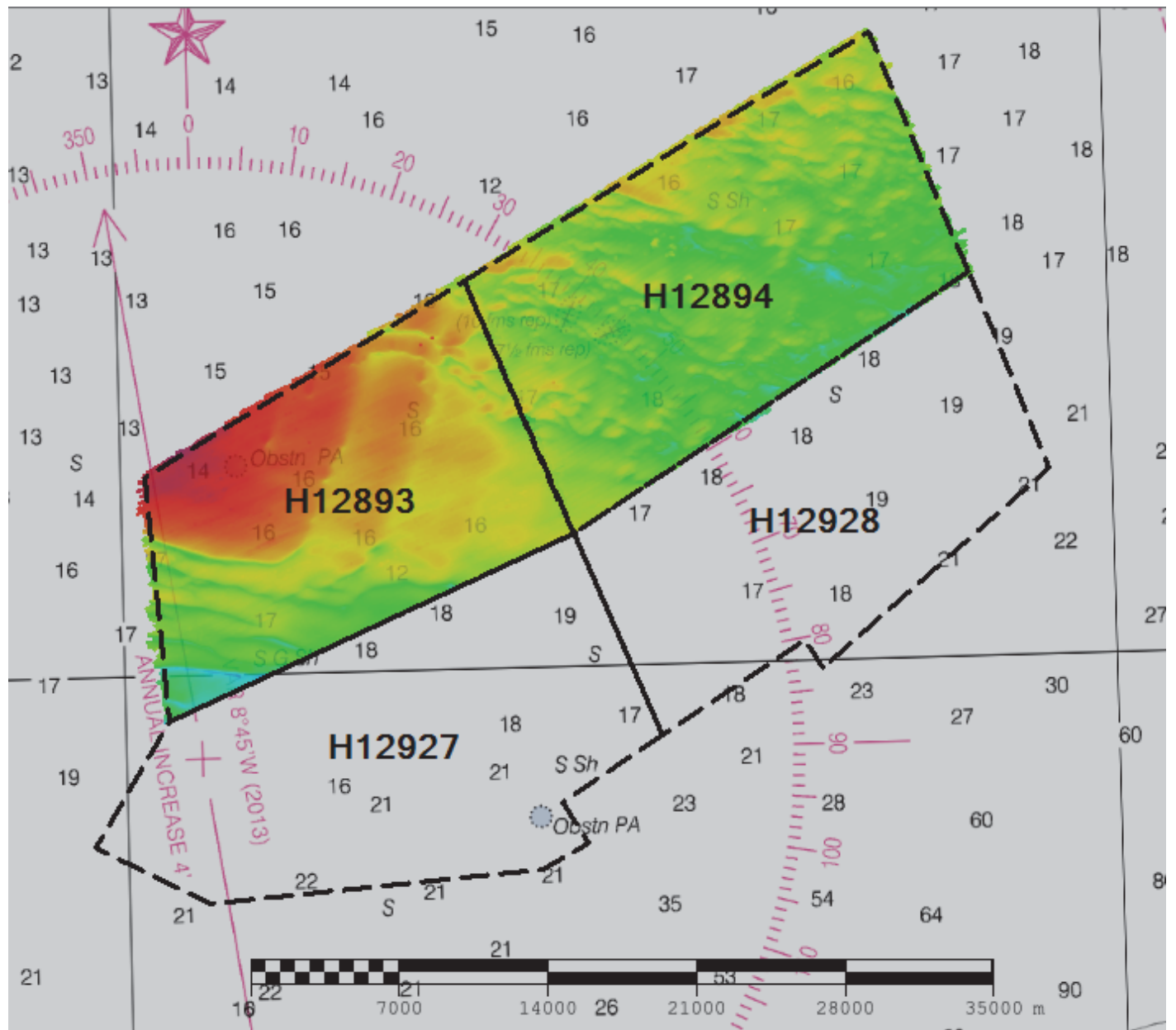


Figure 7: Contemporary junction surveys associated with survey H12893.

The following junctions were made with this survey:

Registry Number	Scale	Year	Field Unit	Relative Location
H12894	1:40000	2016	NOAA Ship FERDINAND R. HASSLER	NE

Table 8: Junctioning Surveys

H12894

Survey H12893 junctions with its contemporary survey H12894 to the northeast and their respective nodes overlap by approximately 150 meters to 950 meters. The minimum and maximum depth difference between the two surveys is -0.95 meters and 0.81 meters respectively. Of the greater than 1.3 million overlapping nodes, the average difference is -0.02 meters with a standard deviation of 0.11 meters. Ninety-five percent of the differenced surface nodes are within +/- 0.22 meters of the mean, as shown in Figure 8.

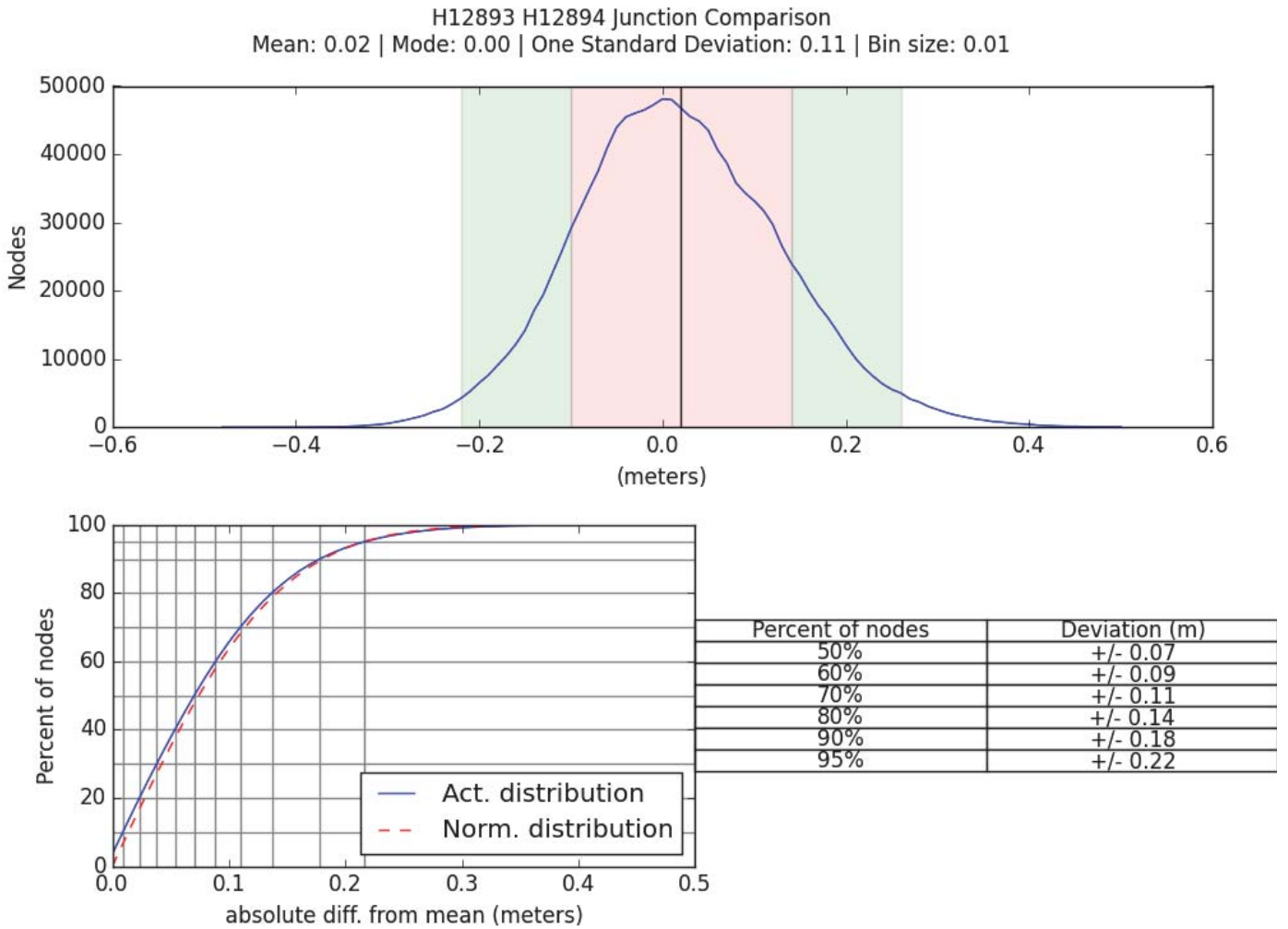


Figure 8: Difference surface statistics for H12893 and H12894.

**B.2.4 Sonar QC Checks**

Sonar system quality control checks were conducted as detailed in the quality control section of the DAPR.

### **B.2.5 Equipment Effectiveness**

There were no conditions or deficiencies that affected equipment operational effectiveness.

### **B.2.6 Factors Affecting Soundings**

There were no other factors that affected corrections to soundings.

### **B.2.7 Sound Speed Methods**

Sound Speed Cast Frequency: As noted in prior sections, the ODIM Brooke Ocean MVP experienced intermittent mechanical issues during the course of data acquisition and both moving and static casts (via Sea-Bird CTD) were collected. These sound speed measurements were collected using the MVP-200 and Sea-Bird CTD approximately every one to four hours. The mean sampling frequency for all casts was 68 minutes, while the shortest interval was 11 minutes and the longest interval 227 minutes (nearly 6 hours).

A total of 133 sound speed profiles were taken within the boundaries of H12893. Two (2) casts acquired on DN 223 and 224 were collected outside the survey bounds while acquiring mainscheme data on adjacent sheet H12894. See Figure 9. However, these data were also applied to H12893 as the ship shifted operations back to acquiring holiday and feature data on H12893. Given the ship was required to halt operations to collect static CTD due to mechanical failure of the MVP and the water column profile was suitably consistent over the spatial and temporal extents, it was deemed acceptable to include the outside casts for processing in H12893.

A significant, but rather consistent thermocline existed in the water column throughout the period of data collection. This mid-water column thermocline which resided between approximately 15 and 25 meters demonstrated sound speed variations of up to 20 meters per second. See Figure 10. In some areas outer beam data became susceptible to refraction errors associated with the changing thermocline and in turn the submitted surface displayed small offsets where it honored the anomalous data. In some localized areas these offsets approached 65 cm, which is still within acceptable vertical uncertainty tolerances for the given depths. See Figure 11.

Overall, cast frequency was appropriate as evidenced via a ray tracing uncertainty analysis identifying casts that exceeded the allowance for refraction as defined in 2016 HSSD Section 5.2.3.5. As shown in Figure 12, the blue lines in the graph are consecutive cast comparisons and the red dots are the allowable vertical error due to refraction. In cases where the blue line exceeds the red dots, those are examples of where the estimations show the allowable refraction error is being exceeded. As shown, refraction issues never exceed allowable error tolerances.

Depending on cast frequency, sound speed corrections were applied in CARIS HIPS/SIPS using the Nearest in Distance Within Time (NIDWT) selection with time frequency varying between 2 and 4 hours.

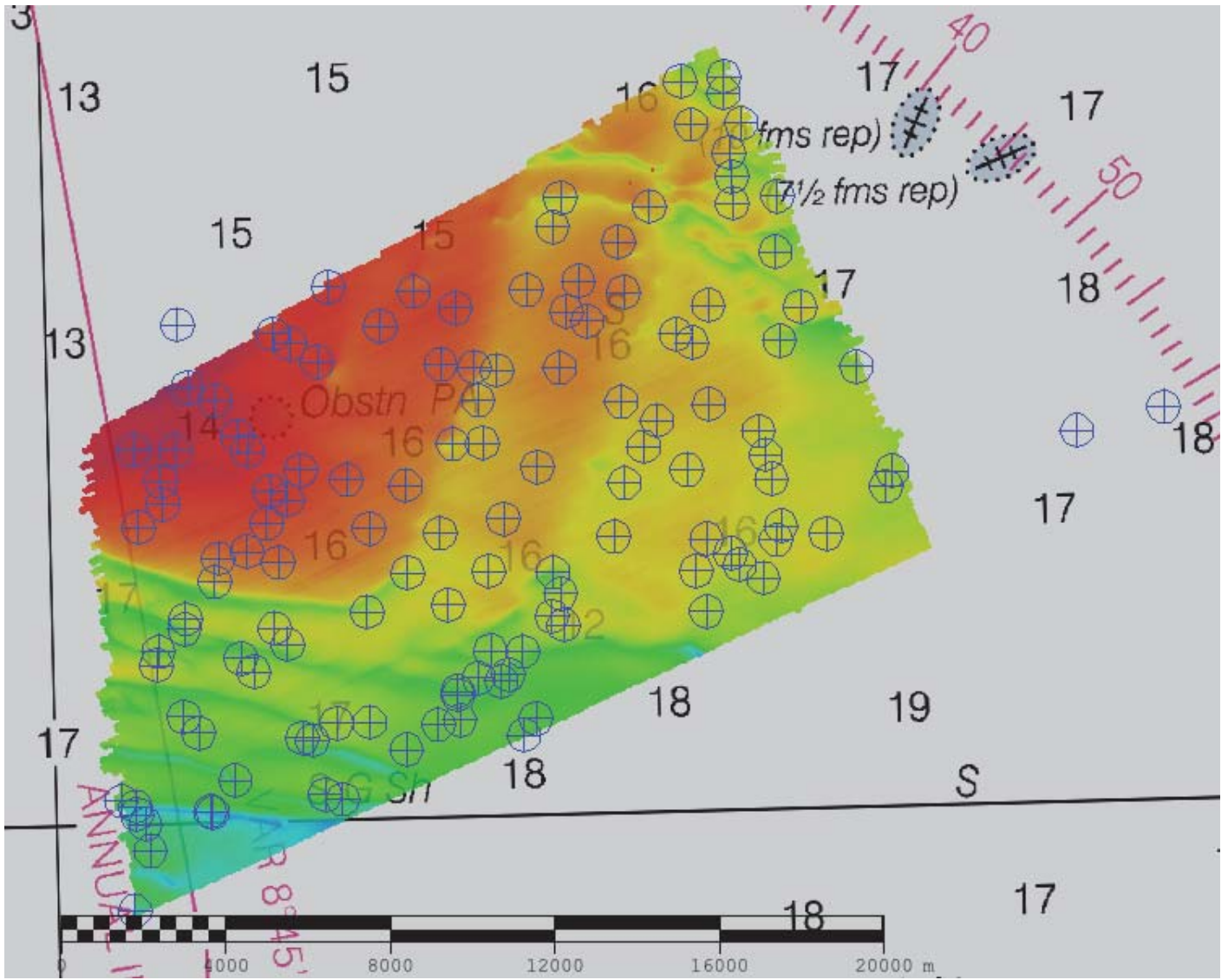
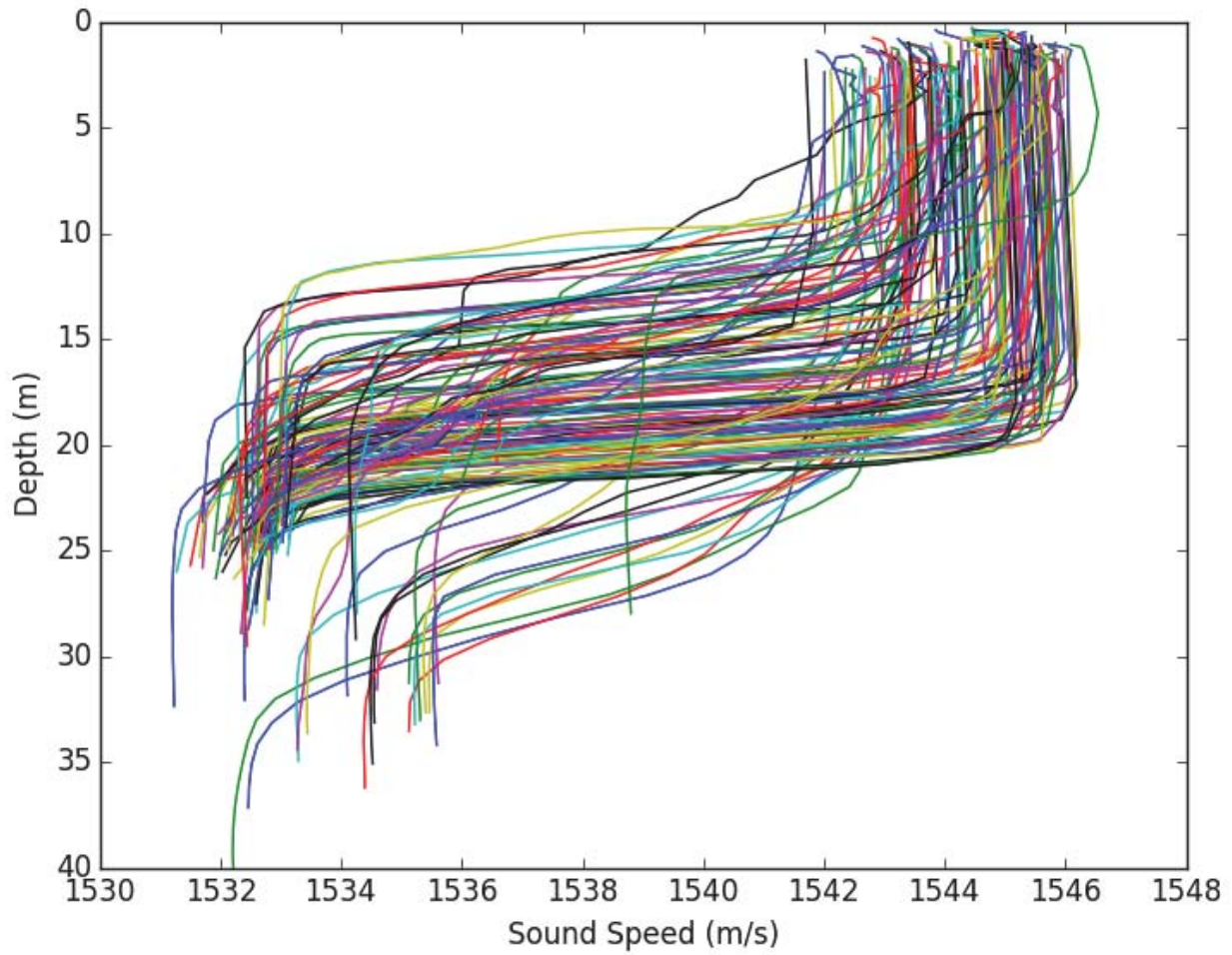


Figure 9: H12893 sound speed profile locations.



*Figure 10: Sound speed profiles for Survey H12893.*

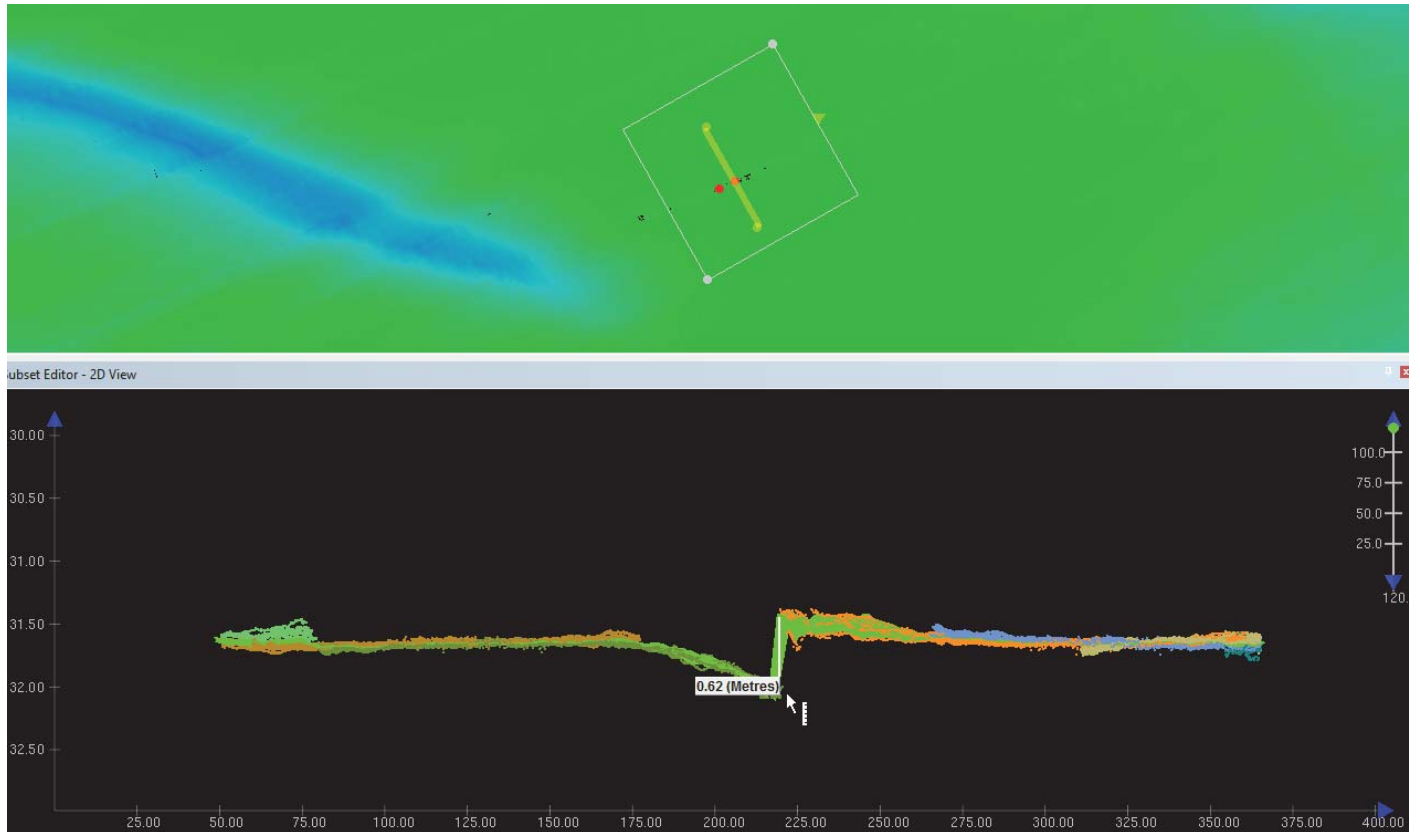


Figure 11: Example of vertical offset of the 2m submitted surface associated with outer beam refraction error. General position: 33-01-25.420 N and 078-25-41.014 W.

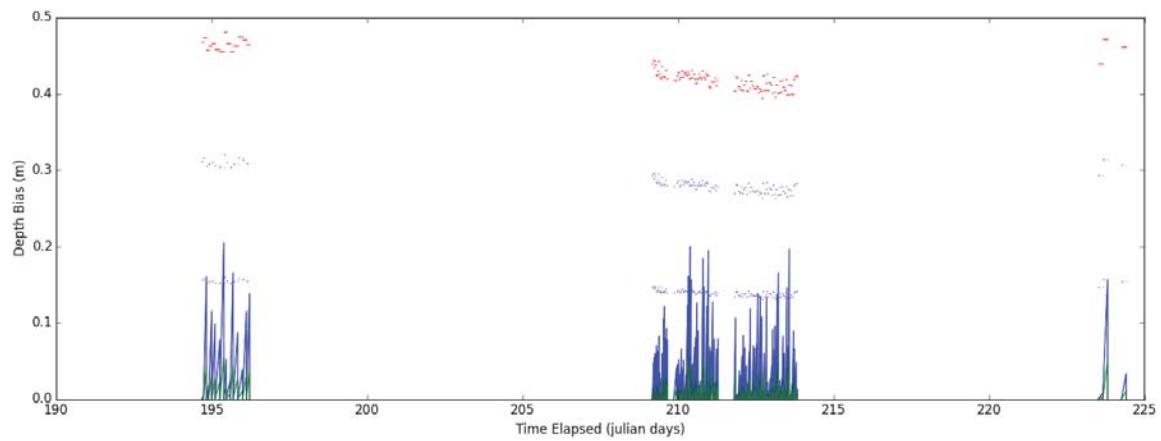


Figure 12: Ray tracing uncertainty analysis for all H12893 sound speed profiles.

### 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 was logged in RESON datagram 7008 snippets record in the raw .s7k files. The .s7k file also holds the navigation record and bottom detections for all lines of survey H12893. The files were paired with the CARIS HDCS data, imported, and processed using Fledermaus Geocoder Toolbox (FMGT). The FMGT projects and backscatter mosaic imagery is included in the field submission. The processed mosaic is formatted as a geo-referenced tiff image per specifications. The following information is provided as metadata for the processing branch:

Backscatter data processing and mosaicking performed in Fledermaus FMGT version 7.6.3 using Reson DeTVG plugins where appropriate.

Backscatter data has a histogram range of 10 to -70dB

Backscatter data is provided in separate layers broken down by survey vessel hull number and sonar operating frequency.

H12893\_S250\_Port\_400kHz | 4m resolution mosaic | Absorption Coefficient = 100dB/km

H12893\_S250\_Stbd\_400kHz | 4m resolution mosaic | Absorption Coefficient = 100dB/km

## **B.5 Data Processing**

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

The following Feature Object Catalog was used: NOAA Profile V\_5\_4

### 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
H12893_MB_2m_MLLW_parent	CUBE	2 meters	26.22 meters - 36.80 meters	NOAA_2m	Complete MBES
H12893_MB_2m_MLLW_Final	CUBE	2 meters	25.49 meters - 36.80 meters	NOAA_2m	Complete MBES

*Table 9: Submitted Surfaces*

### B.5.3 No Sound Speed Correction (Caris SVC processing) After SBET Application

Based on feedback from the Atlantic Hydrographic Branch (AHB), the Ferdinand R. Hassler discovered that one element of the recommended Caris processing workflow was not followed throughout project OPR-G309-FH-16. The Caris Sound Velocity Correction (SVC) process was conducted before but not after loading Smoothed Best Estimates of Trajectory (SBETs). It is recommended to perform the SVC process after loading SBETs in order for the ray tracing to account for the updated motion and attitude information. A copy of survey H12932 was re-processed to assess the effect of not applying SVC after loading SBETs. As viewed in Caris Subset Editor, the vertical difference between processing methods ranged from 0.005 - 0.010 meters in all sampled areas, including two wrecks. The SVC processing methods were also compared using 2 meter and 4 meter difference surfaces. In the 2 meter difference surface, the depths differ by -8.17 to 3.07 meters, with a mean difference of 0.00 meters and a standard deviation of 0.00 meters, and 95% of nodes exhibit a depth difference of  $\pm 0.01$  meters. In the 4 meter difference surface, the depths differ by -0.74 to 0.62 meters, with a mean difference of 0.00 meters and a standard deviation of 0.00 meters, and 95% of nodes exhibit a depth difference of  $\pm 0.01$  meters. The high values in the difference surfaces are isolated and limited to features and steep slopes. A detailed review confirmed that the high values in the difference surfaces are entirely the result of CUBE gridding inconsistencies and small horizontal shifts in the grid node structure rather than actual vertical differences in the sounding data. The results of this testing were discussed with HSD Operations and AHB. Based on the limited magnitude of the error, it was concluded that re-processing the entire project was unnecessary. The ship's Caris processing SOP has been updated to reflect the recommended SVC workflow. Please refer to the DAPR and the correspondence in Appendix II for more information.

### B.5.4 Delayed Heave

Fourteen (14) total lines from the port and starboard bathymetry data did not have delayed heave applied and have no associated delayed heave file. After investigation, it appears eleven (11) lines do not have delayed



heave applied and were either recorded in error (i.e. fat finger) or are submitted as holiday lines having only limited temporal and spatial extents covering the holiday being addressed. These lines are:

PORT DN 212 Line #2016\_2122227.HSX  
PORT DN 224 Line #2016\_2240337.HSX  
PORT DN 224 Line #2016\_2240654.HSX  
PORT DN 224 Line #2016\_2240705.HSX  
PORT DN 232 Line #2016\_2320137.HSX

STBD DN 210 Line #2016\_2101235.HSX (2)  
STBD DN 212 Line #2016\_2122227.HSX  
STBD DN224 Line # 2016\_2240337.HSX  
STBD DN224 Line # 2016\_2240654.HSX  
STBD DN224 Line # 2016\_2240705.HSX  
STBD DN232 Line # 2016\_2320137.HSX

Three (3) additional lines both from DN 213 also did not have delayed heave applied. This appears to be associated with a timing error identified in the logged POS M/V data that could not be resolved. These lines are:

STBD DN 213 Line #2016\_2130012.HSX  
STBD DN 213 Line #2016\_2130115.HSX  
STBD DN 213 Line #2016\_2132038.HSX

There is higher uncertainty associated with these lines, however all are still within allowable total vertical uncertainty tolerances and meet the standards as set forth in the 2016 HSSD.

### **B.5.5 Data Density**

A density analysis was run to calculate the number of soundings per surface node. The results determined that greater than 99.5% of all nodes contained five (5) or more soundings which meets the data density specifications (See Figure 13).

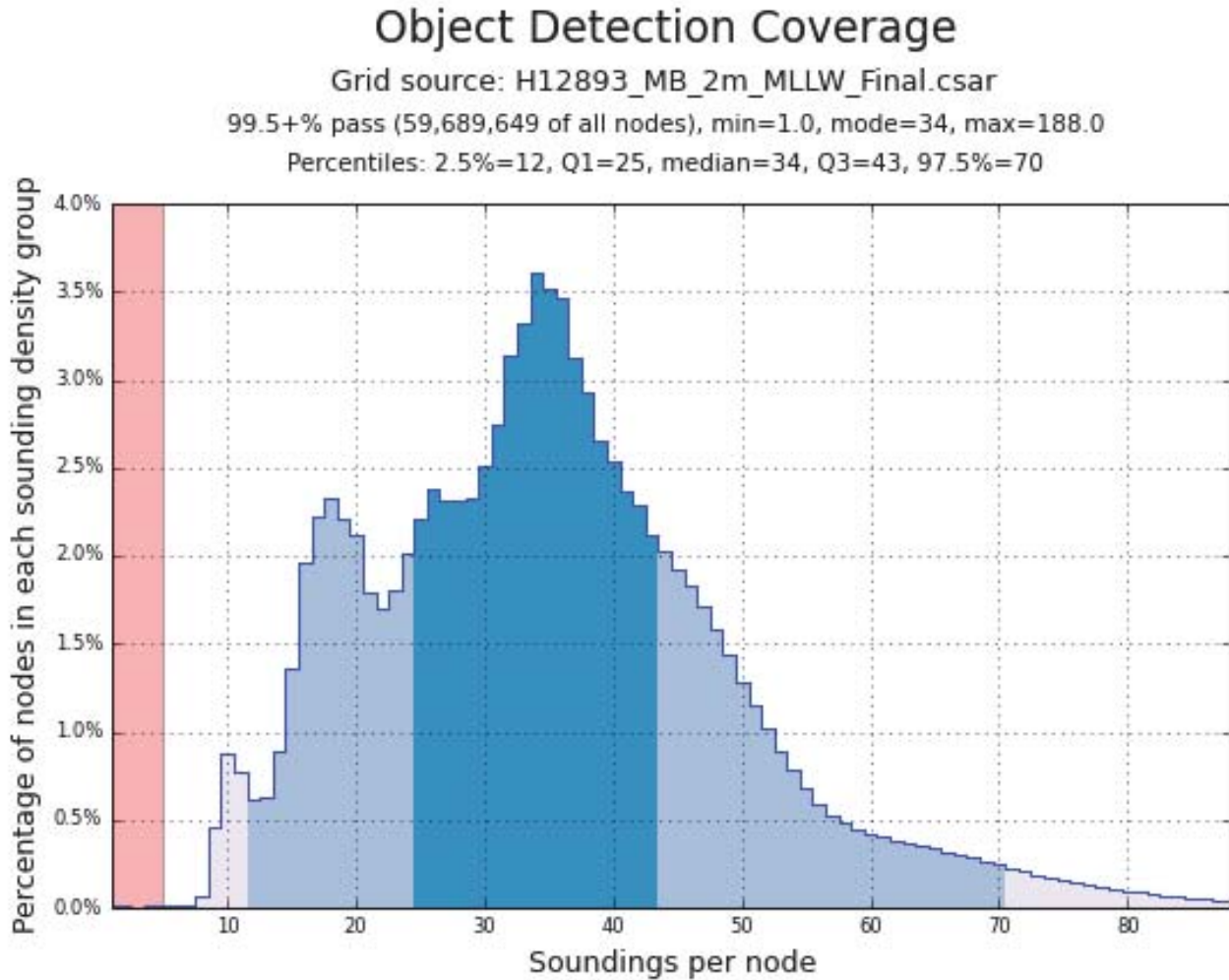


Figure 13: Data density of the 2-meter finalized surface.

### B.5.6 Total Vertical Uncertainty Analysis

Pydro's Finalized CSAR QA tool was used to calculate the percentage of nodes which meet total vertical uncertainty (TVU) specifications. The resulting statistical analysis yielded greater than 99.5% of all nodes meet TVU specifications (See Figure 14). In addition, a custom layer was created for the finalized surfaces submitted in correlation with H12893. The layer was derived from the difference between the calculated uncertainties of individual nodes and the allowable uncertainty at the coupled node.

When applying the greater of the two uncertainty values to the finalized surface, the custom TVU QC layer flagged eleven (11) nodes out of more than 59.7 million that exceeded allowable TVU tolerances (See Figure 15). Each highlighted node was investigated and is associated with either significant vertical relief of a bottom feature, or minor vertical offsets between overlapping lines associated with outer beam refraction errors and/or minor tide errors. See Figure 16 for an example. Overall, the submitted surface remains within 2016 HSSD specifications.

## Uncertainty Standards

Grid source: H12893\_MB\_2m\_MLLW\_Final.csar

99.5+% pass (59,706,133 of all nodes), min=0.50, mode=0.56, max=1.20

Percentiles: 2.5%=0.53, Q1=0.55, median=0.57, Q3=0.61, 97.5%=0.75

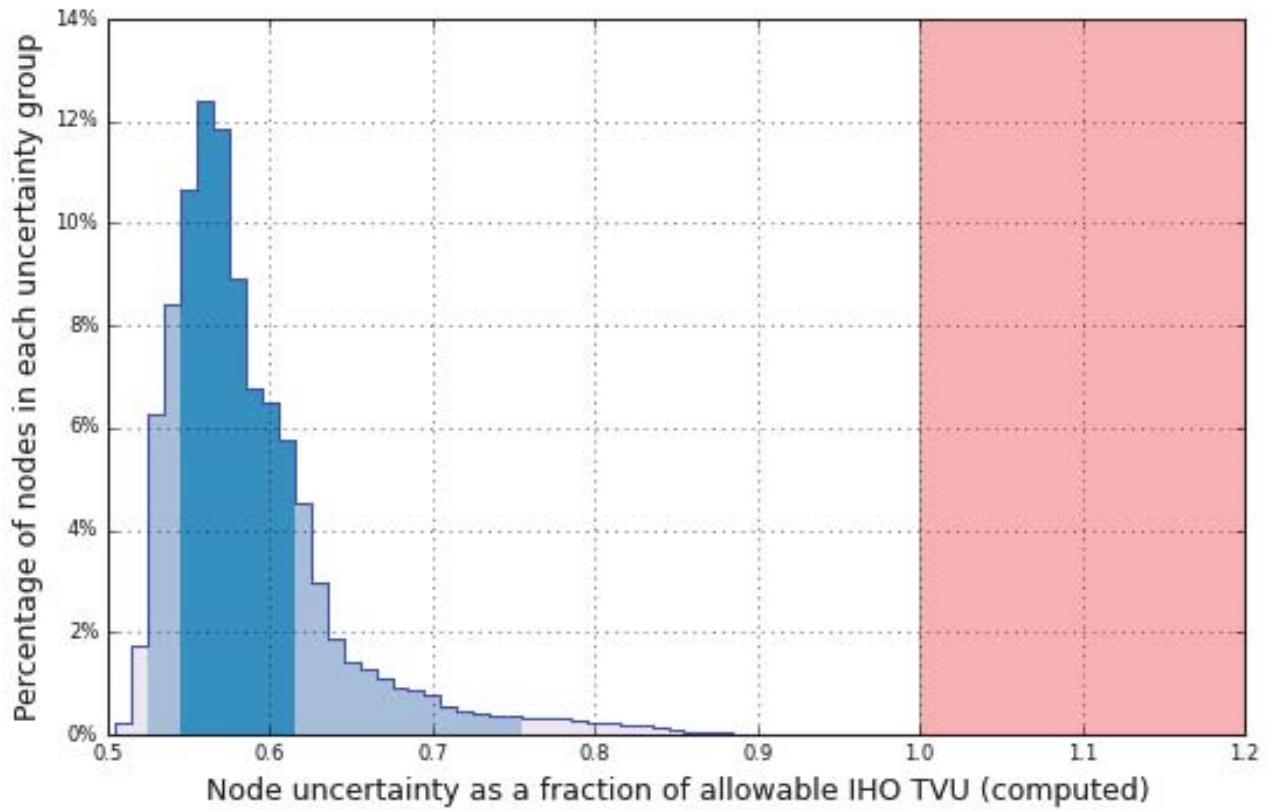
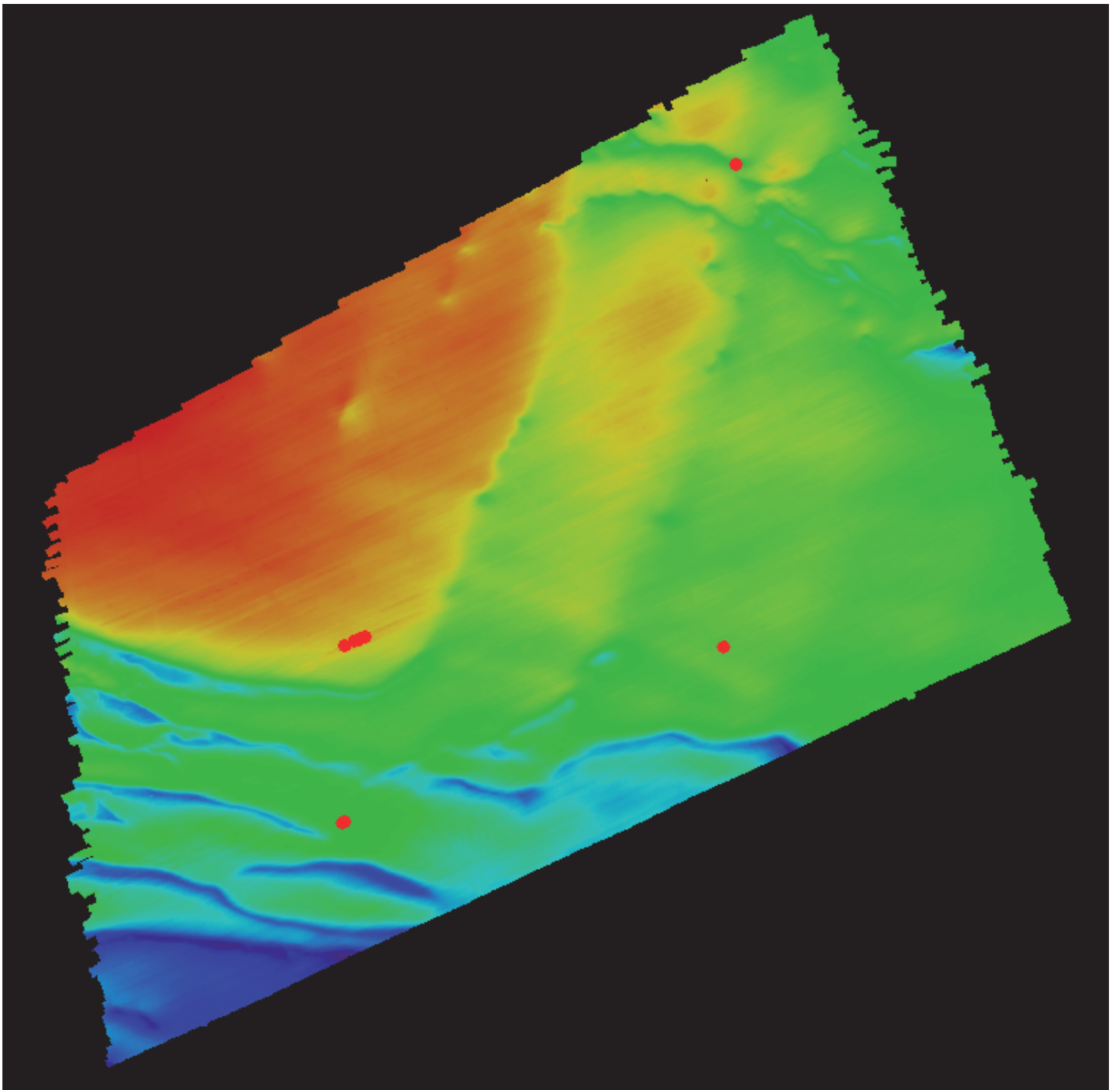
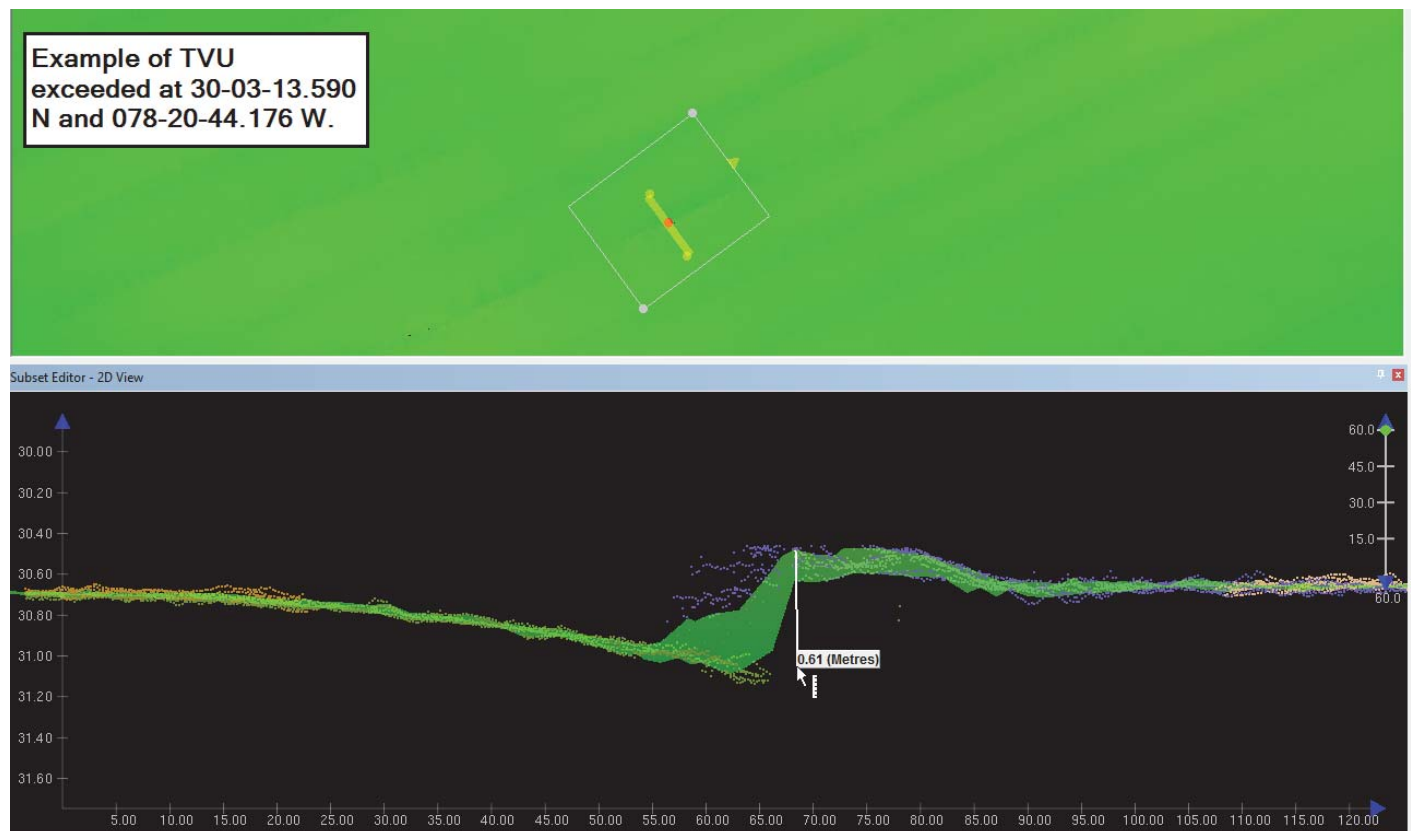


Figure 14: Total vertical uncertainty analysis for the 2-meter finalized surface.



*Figure 15: Eleven (11) nodes exceeding allowable total vertical uncertainty exist within the sheet limits.*



*Figure 16: CARIS subset highlighting an area flagged as exceeding TVU tolerance due to outer beam refraction at position 33-03-13.590 N and 078-20-44.176W.*

### B.5.7 Designated Soundings

Within the limits of H12893, two (2) soundings are flagged as designated.

## C. Vertical and Horizontal Control

Additional information discussing the vertical or horizontal control for this survey can be found in the accompanying ERS Checkline and ERS Capability Memo(s).

### C.1 Vertical Control

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

ERS Methods Used:

ERS via VDATUM

Ellipsoid to Chart Datum Separation File:

G309FH16ExpandedProjectArea\_xyWGS84-MLLW\_geoid12b

All soundings submitted for H12893 have been reduced to MLLW using documented VDatum techniques.

## C.2 Horizontal Control

The horizontal datum for this project is World Geodetic System of 1984: WGS84 (G1674).

The projection used for this project is UTM Zone 17 North.

An SBAS (satellite base augmentation solution) subscription was utilized through Fugro Marinestar to achieve a post-processed precise point position (5P) solution. See the associated DAPR and ERS Capability Memo for technical details.

The following DGPS Stations were used for horizontal control:

DGPS Stations
Kensington, SC (292 kHz)

*Table 10: USCG DGPS Stations*

## C.3 Additional Horizontal or Vertical Control Issues

### 3.3.1 Marinestar Subscription License

A satellite-based augmentation system (SBAS) subscription through Fugro Marinestar was utilized to obtain precise point positions and post-processed in POSpac MMS software to achieve improved accuracy solutions in the form of smoothed best estimate trajectory (SBET) files. See the associated DAPR for greater technical details.

Given the Hassler requires a unique set of position data for both the port and starboard inertial measurement units (IMU) to create the SBET's, two (2) Marinestar subscription licenses are typically necessary to apply the required correction data. Licenses for both the port and starboard systems were procured for this project, however the license for the port system concluded on August 1, 2016 (DN 214) and was unable to be immediately renewed.

Thus, as a temporary fix the Marinestar position data acquired for the starboard system from DN 223 through 232 was also applied to the port system. A unique hydrographic vessel file (.HVF) with the name FH\_S250\_PORT\_Reson7125\_STBD\_IMU\_512bms\_400kHz\_S7K\_2016 was created to account for the horizontal offsets between starboard and port systems allowing for all processed data to be correctly georeferenced. Review of the data collected on those days shows all are within specifications as set forth by the 2016 HSSD. Figure 17 below shows a subset positioned at 33-08-27.935 N and 078-20-24.923 W highlighting the excellent agreement between port and starboard sounding data on DN 224 using the single MarineStar corrector solution.

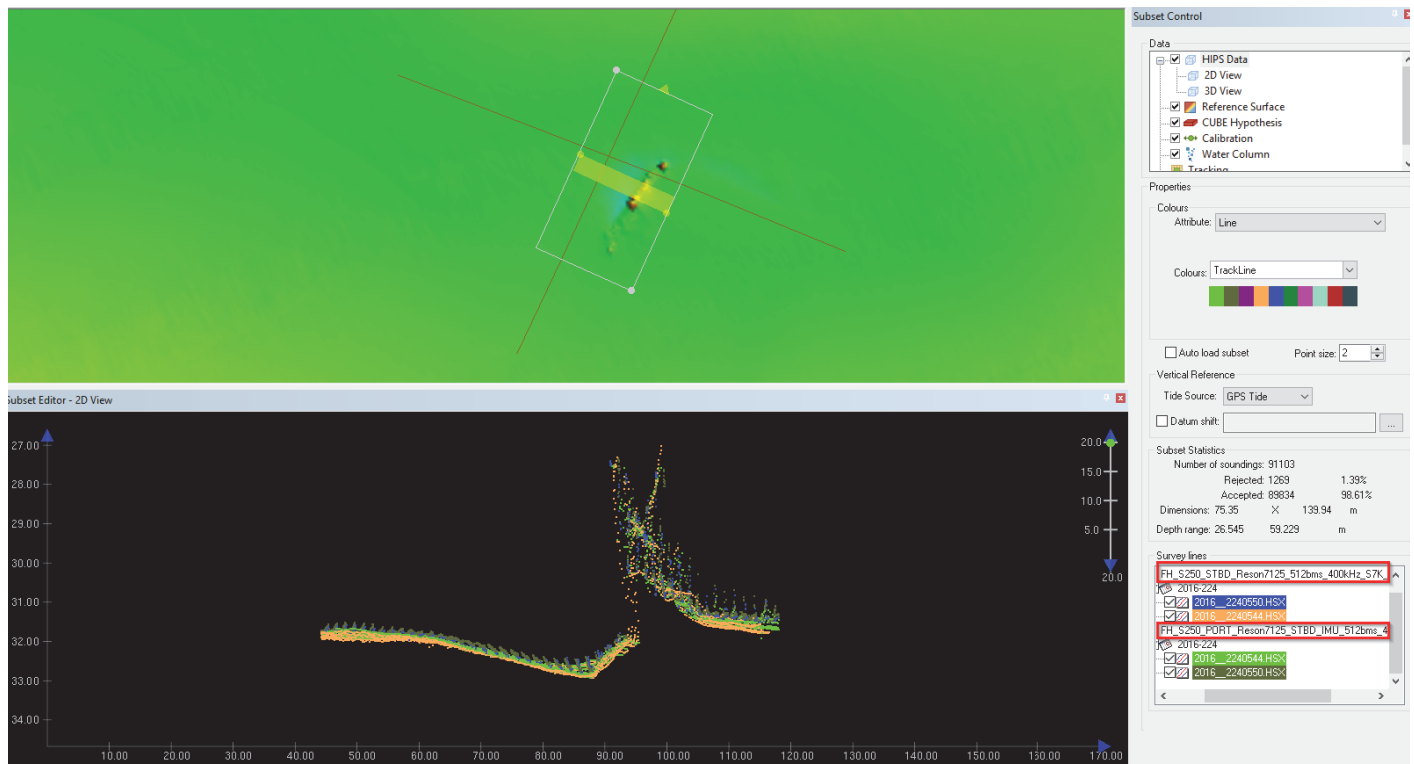


Figure 17: Starboard Marinestar data applied to port sonar system.

### 3.3.2 WGS84 Horizontal Datum

The horizontal datum requirement stated in the 2016 HSSD Section 2.1 was given as World Geodetic System of 1984 (WGS84 (G1674)). The field unit followed this requirement, however after data acquisition had already begun, Hydrographic Technical Directive #2016-03 was published rescinding this requirement and re-established the horizontal datum requirement to be the North American Datum of 1983 (NAD83). Subsequent email correspondence from the Chief of HSD Operations stated that any survey initiated in the WGS84 horizontal datum may be continued for the duration of the project and or sheet.

### 3.3.3 Discrete Zoned Tides

All soundings submitted as H12893 are reduced to MLLW using documented VDatum techniques as required by the Project Instructions. However, if it is deemed necessary to change the water level reduction method to discrete zoning the following additional information may be useful:

- 1) The National Water Level Observation Network (NWLON) station serving as datum control for this survey is Springmaid Pier, SC (8661070).
- 2) The verified water level file (8661070.tid) has been loaded for all data, but not applied in the final merge of data. GPS tides were applied in the final merge of all data as required for ellipsoidally referenced surveys.
- 3) The submitted tide corrector (OPRG309FH2016CORP.zdf) is the preliminary zoning file that was accepted as final per final tide note, submitted in Appendix I. This file has been loaded to all CARIS lines submitted as H12893.
- 4) A request for final approved tides was sent to COOPS on 31 August, 2016. The final tide note was received on 7 September 2016, stating that preliminary zoning is accepted as the final zoning for project OPR-G309-FH-16, H12893, during the time period between 12 July 2016 and 19 August 2016.

## D. Results and Recommendations

### D.1 Chart Comparison

The hydrographer has compared a sounding plot from the surveyed area to the charted soundings. Additionally, a Chart Comparison Tool contained in the HCellScan utility under PydroExplorer was run to compare the most recent large scale ENC (US3SC10M) to processed sounding data and the S-57 Final Feature File. There are no charted contours to compare.

#### D.1.1 Raster Charts

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

Chart	Scale	Edition	Edition Date	LNLM Date	NM Date
11520	1:432720	45	09/2013	09/27/2016	10/08/2016

Table 11: Largest Scale Raster Charts



11520

A comparison was performed with Chart 11520 (1:432,720) using soundings derived from the 2-meter parent surface, shown in Figure 18 and 19. Charted depths agree within 1 fathom of H12893 surveyed soundings.

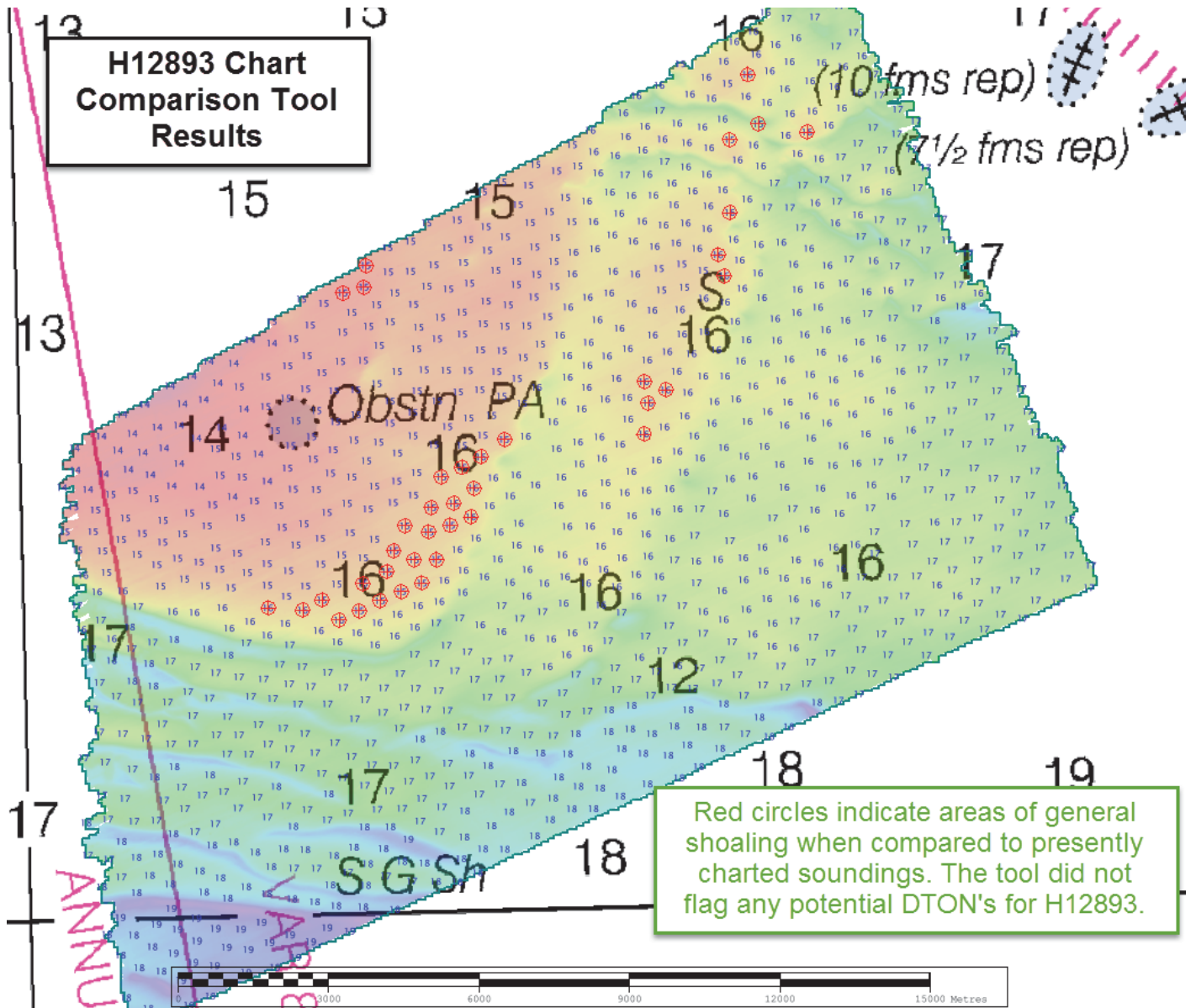


Figure 18: Chart 11520 comparison. Soundings flagged in red are generally 1 fathom shoaler than the closest charted sounding.

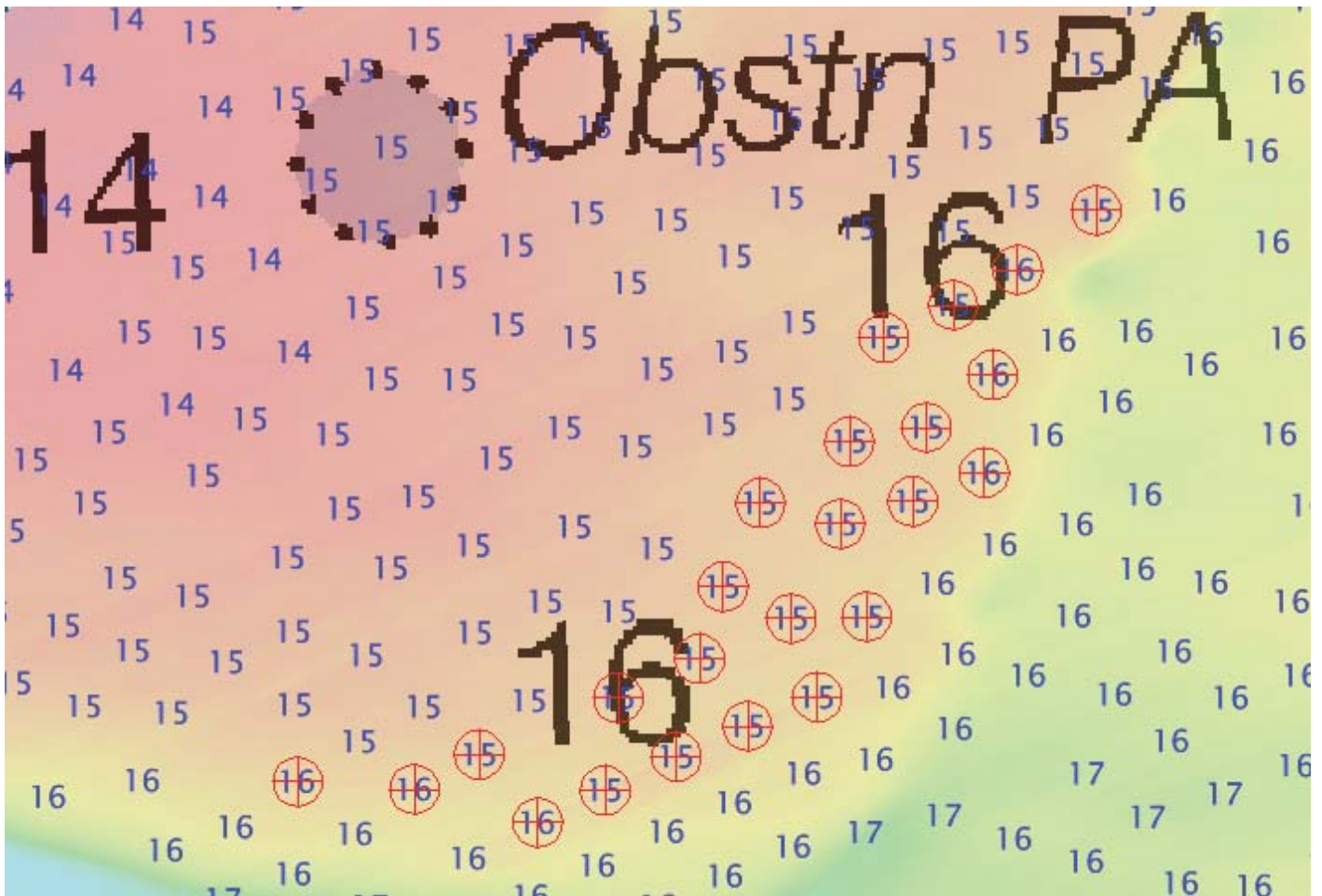


Figure 19: Zoom showing minor shoaling in the region of 33-04-05.700 N and 078-24-30.060 W. Soundings flagged in red are approximately 1 m shoaler than currently charted nearby soundings.

### D.1.2 Electronic Navigational Charts

The following are the largest scale ENC's, which cover the survey area:

ENC	Scale	Edition	Update Application Date	Issue Date	Preliminary?
US3SC10M	1:432720	21	09/15/2014	10/06/2016	NO

Table 12: Largest Scale ENC's

US3SC10M

ENC US3SC10M objects and soundings from within the survey bounds of H12893 were ungrouped in CARIS BASE Editor. Using the QC Tools Chart Comparison function these were then compared to a survey scale sounding set extracted from H12893 with a radius value of 1mm at a 1:200,000 scale. Similar to the visual comparison made for RNC 11520, results showed that minor shoaling of no more than 1 fathom exists. See Figure 18 and 19 above.

### **D.1.3 Maritime Boundary Points**

No Maritime Boundary Points were assigned for this survey.

### **D.1.4 Charted Features**

An obstruction PA was investigated at 33-05-20.158 N and 078-26-28.903 W. Complete coverage multibeam over this site disproved this feature and it is recommended it be removed from the chart.

### **D.1.5 Uncharted Features**

Two (2) new uncharted wrecks were identified with least depths greater than 20 m. Although not considered dangers to surface navigation, it is recommended these feature be considered for charting. See the associated final feature file for more information.

### **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**

Five (5) bottom samples were acquired for this survey. Two (2) additional bottom sample were attempted but no sample was recovered. Per Section 7.5 of the 2016 HSSD these have been included in the final feature file with NATSUR (nature of surface) attribution of "unknown." See final feature file for more information.

## **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**

Prior survey comparisons exist for this survey, but were not investigated.

### **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**

No Significant Features exist for this survey.

### **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 the direct supervision of Commanding Officer, LCDR Matthew Jaskoski, 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
LCDR Matthew Jaskoski, NOAA	Chief of Party	02/17/2017	
LT Nicholas Morgan, NOAA	Field Operations Officer	02/17/2017	 MORGAN.NICHOLAS.CHA RLES.1292288138 2017.03.02 22:37:24 -05'00'
PS Jeff Marshall	Sheet Manager	02/17/2017	MARSHALL.JEFFERY.A.1471 674504 <small>Digitally signed by MARSHALL.JEFFERY.A.1471674504 DN: cn=JEFF, o=U.S. Government, ou=DOC, ou=PR, ou=OTHER, ou=MARSHALL.JEFFERY.A.1471674504 Date: 2017.03.02 11:15:11 -0500</small>

## F. Table of Acronyms

<b>Acronym</b>	<b>Definition</b>
<b>AHB</b>	Atlantic Hydrographic Branch
<b>AST</b>	Assistant Survey Technician
<b>ATON</b>	Aid to Navigation
<b>AWOIS</b>	Automated Wreck and Obstruction Information System
<b>BAG</b>	Bathymetric Attributed Grid
<b>BASE</b>	Bathymetry Associated with Statistical Error
<b>CO</b>	Commanding Officer
<b>CO-OPS</b>	Center for Operational Products and Services
<b>CORS</b>	Continually Operating Reference Station
<b>CTD</b>	Conductivity Temperature Depth
<b>CEF</b>	Chart Evaluation File
<b>CSF</b>	Composite Source File
<b>CST</b>	Chief Survey Technician
<b>CUBE</b>	Combined Uncertainty and Bathymetry Estimator
<b>DAPR</b>	Data Acquisition and Processing Report
<b>DGPS</b>	Differential Global Positioning System
<b>DP</b>	Detached Position
<b>DR</b>	Descriptive Report
<b>DTON</b>	Danger to Navigation
<b>ENC</b>	Electronic Navigational Chart
<b>ERS</b>	Ellipsoidal Referenced Survey
<b>ERZT</b>	Ellipsoidally Referenced Zoned Tides
<b>FFF</b>	Final Feature File
<b>FOO</b>	Field Operations Officer
<b>FPM</b>	Field Procedures Manual
<b>GAMS</b>	GPS Azimuth Measurement Subsystem
<b>GC</b>	Geographic Cell
<b>GPS</b>	Global Positioning System
<b>HIPS</b>	Hydrographic Information Processing System
<b>HSD</b>	Hydrographic Surveys Division
<b>HSSD</b>	Hydrographic Survey Specifications and Deliverables

<b>Acronym</b>	<b>Definition</b>
<b>HSTP</b>	Hydrographic Systems Technology Programs
<b>HSX</b>	Hypack Hysweep File Format
<b>HTD</b>	Hydrographic Surveys Technical Directive
<b>HVCR</b>	Horizontal and Vertical Control Report
<b>HVF</b>	HIPS Vessel File
<b>IHO</b>	International Hydrographic Organization
<b>IMU</b>	Inertial Motion Unit
<b>ITRF</b>	International Terrestrial Reference Frame
<b>LNM</b>	Local Notice to Mariners
<b>LNM</b>	Linear Nautical Miles
<b>MCD</b>	Marine Chart Division
<b>MHW</b>	Mean High Water
<b>MLLW</b>	Mean Lower Low Water
<b>NAD 83</b>	North American Datum of 1983
<b>NAIP</b>	National Agriculture and Imagery Program
<b>NALL</b>	Navigable Area Limit Line
<b>NM</b>	Notice to Mariners
<b>NMEA</b>	National Marine Electronics Association
<b>NOAA</b>	National Oceanic and Atmospheric Administration
<b>NOS</b>	National Ocean Service
<b>NRT</b>	Navigation Response Team
<b>NSD</b>	Navigation Services Division
<b>OCS</b>	Office of Coast Survey
<b>OMAO</b>	Office of Marine and Aviation Operations (NOAA)
<b>OPS</b>	Operations Branch
<b>MBES</b>	Multibeam Echosounder
<b>NWLON</b>	National Water Level Observation Network
<b>PDBS</b>	Phase Differencing Bathymetric Sonar
<b>PHB</b>	Pacific Hydrographic Branch
<b>POS/MV</b>	Position and Orientation System for Marine Vessels
<b>PPK</b>	Post Processed Kinematic
<b>PPP</b>	Precise Point Positioning
<b>PPS</b>	Pulse per second



<b>Acronym</b>	<b>Definition</b>
<b>PRF</b>	Project Reference File
<b>PS</b>	Physical Scientist
<b>PST</b>	Physical Science Technician
<b>RNC</b>	Raster Navigational Chart
<b>RTK</b>	Real Time Kinematic
<b>SBES</b>	Singlebeam Echosounder
<b>SBET</b>	Smooth Best Estimate and Trajectory
<b>SNM</b>	Square Nautical Miles
<b>SSS</b>	Side Scan Sonar
<b>ST</b>	Survey Technician
<b>SVP</b>	Sound Velocity Profiler
<b>TCARI</b>	Tidal Constituent And Residual Interpolation
<b>TPE</b>	Total Propagated Error
<b>TPU</b>	Topside Processing Unit
<b>USACE</b>	United States Army Corps of Engineers
<b>USCG</b>	United States Coast Guard
<b>UTM</b>	Universal Transverse Mercator
<b>XO</b>	Executive Officer
<b>ZDA</b>	Global Positioning System timing message
<b>ZDF</b>	Zone Definition File

APPENDIX I  
TIDES AND WATER LEVELS



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

**TIDE NOTE FOR HYDROGRAPHIC SURVEY**

**DATE :** December 15, 2016

**HYDROGRAPHIC BRANCH:** Atlantic  
**HYDROGRAPHIC PROJECT:** OPR-G309-FH-2016\_Revise3  
**HYDROGRAPHIC SHEET:** H12893 Rev

**LOCALITY:** 53 miles East of Cape Romain, App. to Wilmington, NC  
**TIME PERIOD:** July 12 - August 19, 2016

**TIDE STATION USED:** 8658163 Wrightsville Beach, NC  
Lat. 34° 12.8'N Long. 77° 47.2' W

**PLANE OF REFERENCE (MEAN LOWER LOW WATER):** 0.000 meters  
**HEIGHT OF HIGH WATER ABOVE PLANE OF REFERENCE:** 1.206 meters

**ESTIMATED ZONING ERROR:** 0.37 meters

**REMARKS: RECOMMENDED ZONING**  
Use zone(s) identified as: SA107, SA119

**Refer to attachments for zoning 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).

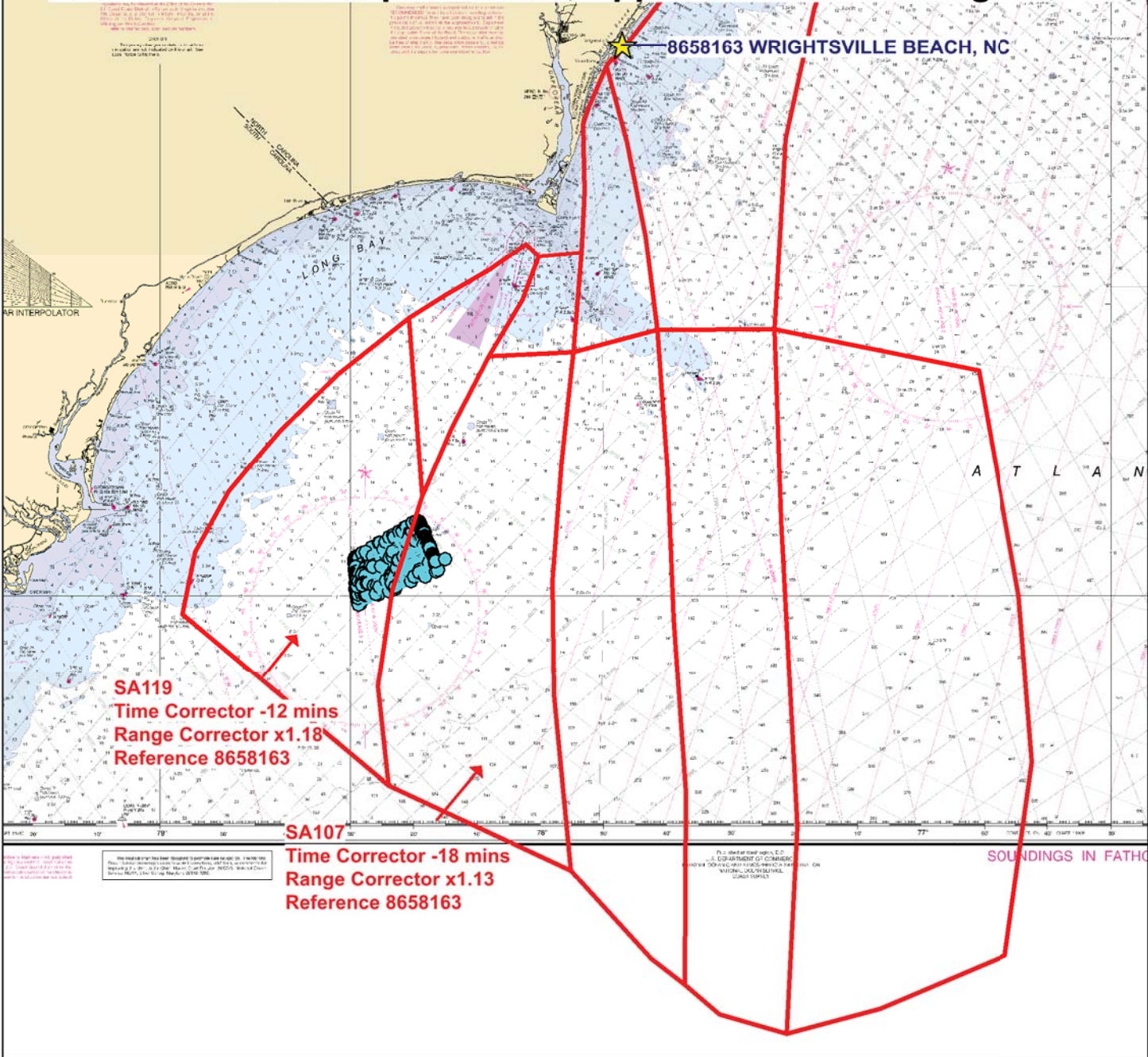
**HOVIS.GERALD.THOMAS.JR.1365860250**

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: 2016.12.20 11:19:33 -05'00'

CHIEF, PRODUCTS AND SERVICES BRANCH



# Tidal Zoning for OPR-G309-FH-2016\_ Revised3, H12893\_Rev 53 miles East of Cape Romain, Approaches to Wilmington, NC



APPENDIX II

SUPPLEMENTAL SURVEY RECORDS  
AND CORRESPONDENCE



OPS.Ferdinand Hassler - NOAA Service Account <ops.ferdinand.hassler@noaa.gov>

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## Hydro Hot List request, OPR-G309-FH-16

6 messages

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**OPS.Ferdinand Hassler - NOAA Service Account** <ops.ferdinand.hassler@noaa.gov> Sat, Jul 9, 2016 at 6:01 AM  
To: \_NOS CO-OPS OET Team <nos.coops.oetteam@noaa.gov>, "\_NOS.CO-OPS.HPT" <NOS.COOPS.HPT@noaa.gov>  
Cc: Starla Robinson - NOAA Federal <Starla.Robinson@noaa.gov>, Jonathan French - NOAA Federal <jonathan.r.french@noaa.gov>

Good morning,

NOAA Ship *Ferdinand Hassler* is scheduled to begin survey operations on OPR-G309-FH-16 on July 12th, 2016. Please add the following station to the Hydro Hot List for OPR-G309-FH-16:

**8661070 - Springmaid Pier, SC**

V/r  
Nick Morgan

Field Operations Officer, NOAA Ship *Ferdinand R. Hassler*  
29 Wentworth Road  
New Castle, NH, 03854

---

**Hua Yang - NOAA Affiliate** <hua.yang@noaa.gov> Mon, Jul 11, 2016 at 7:54 AM  
To: "OPS.Ferdinand Hassler - NOAA Service Account" <ops.ferdinand.hassler@noaa.gov>  
Cc: \_NOS CO-OPS OET Team <nos.coops.oetteam@noaa.gov>, "\_NOS.CO-OPS.HPT" <NOS.COOPS.HPT@noaa.gov>, Starla Robinson - NOAA Federal <Starla.Robinson@noaa.gov>, Jonathan French - NOAA Federal <jonathan.r.french@noaa.gov>

Good morning Nick,

The station was just added to the [Hydro Hot List](#). Thank you for your timely notice.

Have a good survey,

Hua Yang

Hydrographic Planning Team  
NOAA/National Ocean Service  
Center for Operational Oceanographic Products and Services  
Station 7128  
1305 East West Highway, SSMC4  
Silver Spring, MD 20910  
Office: 240-533-0612  
Email: [Hua.Yang@noaa.gov](mailto:Hua.Yang@noaa.gov)  
Web: <http://tidesandcurrents.noaa.gov/>

Hydro Hot List: <http://tidesandcurrents.noaa.gov/hydro.shtml>

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**OPS.Ferdinand Hassler - NOAA Service Account** <ops.ferdinand.hassler@noaa.gov> Mon, Jul 11, 2016 at 9:59 AM  
To: Hua Yang - NOAA Affiliate <hua.yang@noaa.gov>  
Cc: \_NOS CO-OPS OET Team <nos.coops.oetteam@noaa.gov>, "\_NOS.CO-OPS.HPT" <NOS.COOPS.HPT@noaa.gov>, Starla Robinson - NOAA Federal <Starla.Robinson@noaa.gov>, Jonathan French - NOAA Federal <jonathan.r.french@noaa.gov>

Thank you very much!

Field Operations Officer, NOAA Ship *Ferdinand R. Hassler*  
29 Wentworth Road  
New Castle, NH, 03854

[Quoted text hidden]

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**OPS.Ferdinand Hassler - NOAA Service Account** <ops.ferdinand.hassler@noaa.gov> Tue, Aug 23, 2016 at 1:01 PM  
To: Hua Yang - NOAA Affiliate <hua.yang@noaa.gov>  
Cc: \_NOS CO-OPS OET Team <nos.coops.oetteam@noaa.gov>, "\_NOS.CO-OPS.HPT" <NOS.COOPS.HPT@noaa.gov>, Starla Robinson - NOAA Federal <Starla.Robinson@noaa.gov>, Jonathan French - NOAA Federal <jonathan.r.french@noaa.gov>

Good morning,

I've noticed some voltage issues showing up on the Springmaid Pier tide station. I just wanted to check in to make sure that the station is operating correctly.

Thank you,  
-Nick

Field Operations Officer, NOAA Ship *Ferdinand R. Hassler*  
29 Wentworth Road  
New Castle, NH, 03854

[Quoted text hidden]

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**Colleen Fanelli - NOAA Federal** <colleen.fanelli@noaa.gov> Tue, Aug 23, 2016 at 1:46 PM  
To: "OPS.Ferdinand Hassler - NOAA Service Account" <ops.ferdinand.hassler@noaa.gov>  
Cc: Hua Yang - NOAA Affiliate <hua.yang@noaa.gov>, \_NOS CO-OPS OET Team <nos.coops.oetteam@noaa.gov>, "\_NOS.CO-OPS.HPT" <NOS.COOPS.HPT@noaa.gov>, Starla Robinson - NOAA Federal <Starla.Robinson@noaa.gov>, Jonathan French - NOAA Federal <jonathan.r.french@noaa.gov>

Nick,

Our field office visited the station today and replaced a blown fuse and a battery. The power system is back to working as expected. Thank you.

~Colleen

--

Colleen Fanelli  
Oceanographer, Hydrographic Planning Team Lead  
NOAA/National Ocean Service  
Center for Operational Oceanographic Products and Services  
Station 7127  
1305 East-West Highway N/OPS3  
Silver Spring, MD 20910  
[Colleen.Fanelli@noaa.gov](mailto:Colleen.Fanelli@noaa.gov)  
Phone (NEW): (240) 533 - 0615

*Compare the meteorologist with his or her oceanographer colleague: the oceanographer may spend many years planning a campaign of observations of currents, temperature and salinity in a tiny area of the ocean, many weeks of discomfort on a ship taking the observations and several years analysing them back at the laboratory. All of this work is done for the research meteorologist, several times a day on a global basis, who merely has to read the numbers from an archive and construct whatever diagnostic quantity is required.*

*—Jan N. James, Introduction to Circulating Atmospheres*

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**OPS.Ferdinand Hassler - NOAA Service Account** <ops.ferdinand.hassler@noaa.gov> Tue, Aug 23, 2016 at 1:57 PM  
To: Colleen Fanelli - NOAA Federal <colleen.fanelli@noaa.gov>

Cc: Hua Yang - NOAA Affiliate <hua.yang@noaa.gov>, \_NOS CO-OPS OET Team <nos.coops.oetteam@noaa.gov>, "\_NOS.CO-OPS.HPT" <NOS.COOPS.HPT@noaa.gov>, Starla Robinson - NOAA Federal <Starla.Robinson@noaa.gov>, Jonathan French - NOAA Federal <jonathan.r.french@noaa.gov>

Great, thanks!

Field Operations Officer, NOAA Ship *Ferdinand R. Hassler*  
29 Wentworth Road  
New Castle, NH, 03854

On Tue, Aug 23, 2016 at 1:57 PM, OPS.Ferdinand Hassler - NOAA Service Account <ops.ferdinand.hassler@noaa.gov> wrote:

Field Operations Officer, NOAA Ship *Ferdinand R. Hassler*  
29 Wentworth Road  
New Castle, NH, 03854

[Quoted text hidden]





OPS.Ferdinand Hassler - NOAA Service Account &lt;ops.ferdinand.hassler@noaa.gov&gt;

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**CORMS Morning Report - Wednesday, August 24, 2016**

1 message

**CORMS Operations** <corms@noaa.gov>

Wed, Aug 24, 2016 at 7:52 AM

To: Morning Report &lt;nos.co-ops.cormsmorningreport@noaa.gov&gt;

Cc: corms@noaa.gov

**CORMS Morning Report****Wednesday, August 24, 2016****ALL WATER LEVEL STATION OUTAGES** (missing all data for more than 3 days)

None.

**NWLON STATION ISSUES****8658120** Wilmington (all data) was stopped from 1155 to 1409 UTC 08/23, for maintenance.**8661070** Springmaid Pier (all data) was stopped at 1607 UTC 08/23, for maintenance. A1-DCP1 water level, wind & air press were restarted at 1745 UTC 08/23, after maintenance and review. Water & air temps remain stopped for suspect data.**Great Lakes Water Level 7-Day Summary**

Pass.

**MAPPING/CHARTING STATION ISSUES****8418150** Portland (all DCP's) appears suspect at 1248 UTC 08/22. All data was stopped from 1714 to 1918 UTC 08/23, for maintenance.**8661070** Springmaid Pier L2 is above 60 V until 0630 UTC 08/23 and then returned to normal. L1 appears normal. All DCP's appear missing from 0606 to 1642 UTC 08/23 and suspect (spiking) at 1648 08/23.**8741533** Pascagoula NOAA Lab L2 is below 12.5 V until 1242 UTC 08/23 and after 2354 UTC 08/23. L1 appears normal.**9463502** Port Moller (all DCP's) has several periods of intermittent data.**9464212** Village Cove water levels (all DCP's) are suspect.**PARTNER STATION ISSUES****9414575** Coyote Creek Y1-DCP1 water level is suspect (spiking) from 2100 to 2200 UTC 08/23.**9752619** Isabel Segunda, Vieques Island (PRSN) L2 is missing. L1 appears normal.**9753216** Fajardo (PRSN) L2 is missing. L1 appears normal. All DCP's appear missing from 0854 to 1130 UTC 08/23.**9754228** Yabucoa Harbor (PRSN) L2 is missing. L1 appears normal.

**9757112** Caja de Muertos (PRSN) L2 is missing. L1 appears normal.

**9757809** Arecibo (PRSN) L2 is missing. L1 appears normal.

**9759412** Aguadilla (PRSN) (all) did not update.

**9761115** Barbuda water levels (except T1-DCP1) are suspect (not following predictions).

### **TCOON STATION ISSUES**

**8775237** Port Aransas (TCOON) (all sensors) was stopped at 1704 UTC 08/23, for maintenance.

### **STATIONS IN HIGH WATER CONDITION**

None.

### **PORTS ISSUES**

#### **Chesapeake Bay**

**8573364** Tolchester Beach C1-DCP1 wind was switched to primary at 1448 UTC 08/23, after suspect data ended and review.

#### **Lower Columbia River**

**9440569** Skamokawa N1-DCP1 water level was stopped from 1720 to 2303UTC 08/23, for maintenance.

#### **Voice/Text**

**St. Charles Parish Project** VOICE remains out of service.

For an updated list of current PORTS outages or maintenance, click on the CORMS Instrument Status Page link:  
[https://corms.nos.noaa.gov/instrument\\_status.html](https://corms.nos.noaa.gov/instrument_status.html)

### **TSUNAMI REPORTS**

None.

### **OPERATIONAL FORECAST SYSTEMS**

No problems.

### **IT OPERATIONS**

The PORTS Stations Monitor page for cb0201 York Spit LBB 22 current meter is showing no data, and it appears to be stuck at 1747 UTC 05/09/16.

### **SIGNIFICANT COASTAL WEATHER EVENTS**

Gale Warnings are posted along southwest Alaska. High Surf Advisories are in effect for American Samoa.

## **TROPICAL OUTLOOK**

### **Atlantic, Caribbean Sea, and Gulf of Mexico**

At 0900 UTC 08/24, Tropical Storm Gaston was located about 975 miles west of the Cabo Verde Islands and was moving west-northwest at 15 knots. Maximum sustained winds were 60 knots with gusts to 75 knots. There are no coastal watches or warnings in effect.

A broad area of low pressure located near the southernmost of the Leeward Islands has a medium (50%) chance of becoming a tropical cyclone during the next 48 hours.

Elsewhere, tropical cyclone formation is not expected during the next 48 hours.

### **Eastern Pacific**

An area of low pressure located about 350 miles south-southwest of Manzanillo, Mexico has a high (80%) chance of becoming a tropical cyclone during the next 48 hours.

Elsewhere, tropical cyclone formation is not expected during the next 48 hours.

### **Central/Western Pacific**

At 0900 UTC 08/24, Tropical Depression 14W was located about 500 miles north of Guam and was moving north at 21 knots. TD 14W is moving away from the Marianas. There are no coastal watches or warnings in effect.

Elsewhere, tropical cyclone formation is not expected during the next 48 hours.

## **OPERATIONS STAFF**

Camel Banks / Molly Smith

*Continuous Operational Real-time Monitoring Service*

NOAA/NOS/CO-OPS/OD/PMAB/DMAT/CORMS

<http://tidesandcurrents.noaa.gov>

301-713-2540 (desk)

301-758-4080 (cell)

1-800-For-NOAA



OPS.Ferdinand Hassler - NOAA Service Account <ops.ferdinand.hassler@noaa.gov>

## Final Tide Notes for OPR-G309-FH-2016, Registry Numbers H12893, H12894, & H12895

3 messages

**Colleen Fanelli - NOAA Federal** <colleen.fanelli@noaa.gov> Wed, Sep 14, 2016 at 2:06 PM  
 To: CO.Ferdinand.Hassler@noaa.gov, "OPS.Ferdinand Hassler - NOAA Service Account" <OPS.Ferdinand.Hassler@noaa.gov>  
 Cc: "\_NOS.CO-OPS.HPT" <nos.coops.hpt@noaa.gov>, Jerry Hovis <gerald.hovis@noaa.gov>, Corey Allen <corey.allen@noaa.gov>, Michael Gonsalves - NOAA Federal <michael.gonsalves@noaa.gov>, Castle Parker - NOAA Federal <castle.e.parker@noaa.gov>, AHB Chief - NOAA Service Account <ahb.chief@noaa.gov>



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

DATE: 09/14/2016

MEMORANDUM FOR: LCDR Matthew Jaskoski  
Commanding Officer, NOAA Ship Ferdinand Hassler

FROM: Gerald Hovis  
Chief, Products and Services Branch, N/OPS3

SUBJECT: Delivery of Tide Requirements for Hydrographic Surveys

This is notification that the preliminary zoning is accepted as the final zoning for survey project OPR-G309-TJ-2016, Registry Numbers H12893, H12894, & H12895 during the time period between July 12 and August 19, 2016. The accepted reference station for Registry Numbers H12893, H12894, & H12895 is Springmaid Pier, SC (8661070).


Included with this memo is a Tide Note for each Registry Number in .PDF format, stating the preliminary zoning has been accepted as the final zoning.

Colleen Fanelli  
 Oceanographer, Hydrographic Planning Team Lead  
 NOAA/National Ocean Service  
 Center for Operational Oceanographic Products and Services  
 Station 7127  
 1305 East-West Highway N/OPS3  
 Silver Spring, MD 20910  
[Colleen.Fanelli@noaa.gov](mailto:Colleen.Fanelli@noaa.gov)  
 Phone (NEW): (240) 533 - 0615

*Compare the meteorologist with his or her oceanographer colleague: the oceanographer may spend many years planning a campaign of observations of currents, temperature and salinity in a tiny area of the ocean, many weeks of discomfort on a ship taking the observations and several years analysing them back at the laboratory. All of this work is done for the research meteorologist, several times a day on a global basis, who merely has to read the numbers from an archive and construct whatever diagnostic quantity is required.*  
 -Ian N. James, Introduction to Circulating Atmospheres

### 3 attachments

**H12893.pdf**  
 304K

 **H12894.pdf**  
281K

 **H12895.pdf**  
305K

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**OPS.Ferdinand Hassler - NOAA Service Account** <ops.ferdinand.hassler@noaa.gov>  
To: Jeffery Marshall - NOAA Federal <jeffery.marshall@noaa.gov>

Wed, Sep 14, 2016 at 2:14 PM

Hi Jeff,

Looks like our preliminary tides are good as final tides.


-Nick


Field Operations Officer, NOAA Ship *Ferdinand R. Hassler*  
29 Wentworth Road  
New Castle, NH, 03854


[Quoted text hidden]

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**3 attachments**

 **H12893.pdf**  
304K

 **H12894.pdf**  
281K

 **H12895.pdf**  
305K

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**OPS.Ferdinand Hassler - NOAA Service Account** <ops.ferdinand.hassler@noaa.gov>  
To: Colleen Fanelli - NOAA Federal <colleen.fanelli@noaa.gov>

Wed, Sep 14, 2016 at 2:15 PM

Cc: "CO.Ferdinand Hassler - NOAA Service Account" <CO.Ferdinand.Hassler@noaa.gov>, "\_NOS.CO-OPS.HPT" <nos.coops.hpt@noaa.gov>, Jerry Hovis <gerald.hovis@noaa.gov>, Corey Allen <corey.allen@noaa.gov>, Michael Gonsalves - NOAA Federal <michael.gonsalves@noaa.gov>, Castle Parker - NOAA Federal <castle.e.parker@noaa.gov>, AHB Chief - NOAA Service Account <ahb.chief@noaa.gov>

Received, thank you!

V/r  
Nick

Field Operations Officer, NOAA Ship *Ferdinand R. Hassler*  
29 Wentworth Road  
New Castle, NH, 03854

[Quoted text hidden]



OPS.Ferdinand Hassler - NOAA Service Account  
 <ops.ferdinand.hassler@noaa.gov>

## Final Tide Notes for project OPR-G309-FH-2016\_ Revised3, Registry Nos. F00679, H12893, H12894, H12895, H12929, H12930, H12931, H12932, and H12934

12 messages

**Cristina Urizar - NOAA Federal** <cristina.urizar@noaa.gov> Tue, Dec 20, 2016 at 1:31 PM  
 To: "CO.Ferdinand Hassler" <co.ferdinand.hassler@noaa.gov>, "OPS.Ferdinand Hassler" <ops.ferdinand.hassler@noaa.gov>  
 Cc: "\_NOS.CO-OPS.HPT" <nos.coops.hpt@noaa.gov>, Jerry Hovis <gerald.hovis@noaa.gov>, Corey Allen <corey.allen@noaa.gov>, Russell Quintero - NOAA Federal <russell.quintero@noaa.gov>, Castle E Parker <Castle.E.Parker@noaa.gov>, AHB Chief - NOAA Service Account <ahb.chief@noaa.gov>

Dear FERDINAND HASSLER Operations Officer,

Attached is a zipped file containing the final tide files for project OPR-G309-FH-2016\_ Revised3, Registry Nos. F00679, H12893, H12894, H12895, H12929, H12930, H12931, H12932, and H12934. Below is a description of those files. If you have any problems retrieving any of the information, please give me a call. The following files are included in the zipped attachment G309FH2016\_Rev3\_Zoning\_and\_Tide\_Notes.zip for project OPR-G309-FH-2016, F00679, H12893, H12894, H12895, H12929, H12930, H12931, H12932, and H12934:

F00679Rev.pdf  
 H12893Rev.pdf  
 H12894Rev.pdf  
 H12895Rev.pdf  
 H12929.pdf  
 H12930.pdf  
 H12931.pdf  
 H12932.pdf  
 H12934.pdf  
 G309FH2016\_Rev3\_CORP.zdf

**Note that the four (4) revised final tide notes for project OPR-G309-FH-2016\_ Revised3, Registry Nos. F00679, H12893, H12894 and H12895 are being issued to provide consistent final tidal zoning across the project. The final tide files included in this email apply to all tide notes also included in this email.**

There are nine (9) final tide notes for OPR-G309-FH-2016\_ Revised3 in this email. Tide station data for Wrightsville Beach, NC (8658163) may be retrieved via the Internet from the CO-OPS website service at <http://opendap.co-ops.nos.noaa.gov/axis/text.html>. The \*.pdf file is the tide note in Adobe Acrobat format with the graphic.

The following files are the MapInfo zoning files:

G309FH2016\_Rev3\_CORP.DAT  
 G309FH2016\_Rev3\_CORP.ID  
 G309FH2016\_Rev3\_CORP.IND  
 G309FH2016\_Rev3\_CORP.MAP  
 G309FH2016\_Rev3\_CORP.TAB  
 G309FH2016\_Rev3\_LABP.DAT  
 G309FH2016\_Rev3\_LABP.ID  
 G309FH2016\_Rev3\_LABP.MAP  
 G309FH2016\_Rev3\_LABP.TAB  
 G309FH2016\_Rev3\_STNP.DAT  
 G309FH2016\_Rev3\_STNP.ID  
 G309FH2016\_Rev3\_STNP.IND

G309FH2016\_Rev3\_STNP.MAP  
G309FH2016\_Rev3\_STNP.TAB

Please e-mail me when you have captured all files successfully. Give me a call at [727-209-5954](tel:727-209-5954), if there are any problems.

--  
Cristina Urizar  
Oceanographer

National Oceanic and Atmospheric Administration  
NOS/CO-OPS/Oceanographic Division  
263 13th Avenue South, Rm. 302  
St Petersburg, Florida 33701  
Office: [727-209-5954](tel:727-209-5954)  
Cell: [301-325-6793](tel:301-325-6793)

<http://tidesandcurrents.noaa.gov>

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 **G309FH2016\_Rev3\_Zoning\_and\_Tide\_Notes.zip**  
6604K

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**OPS.Ferdinand Hassler - NOAA Service Account**

Mon, Jan 9, 2017 at  
1:14 PM

<ops.ferdinand.hassler@noaa.gov>

To: Starla Robinson - NOAA Federal <Starla.Robinson@noaa.gov>

Cc: Jonathan French - NOAA Federal <jonathan.r.french@noaa.gov>, CO HASSLER

<co.ferdinand.hassler@noaa.gov>

Hi Starla,

CO-OPS has provided a revised zoning file for all of the surveys that were done pre-hurricane Matthew (H12893, 94, 95, and F00679). I was planning on doing a final shipboard review with the CO and Jeff Marshall when he comes out here over the next couple of weeks. Do we need to re-apply final tides using the new Wrightsville Beach, NC tide station that we switched to Post-Hurricane Matthew? Or should we keep it using the Springmaid Pier, SC station? I guess the question is, do we want to submit all surveys using a single tide station or Springmaid for pre-Hurricane Matthew and Wrightsville for post-Hurricane Matthew?

Personally I don't really want to have to go in and re-apply tides to three surveys that we are close to sending off. But if we think this saves headaches down the line we can.

V/r  
Nick

Field Operations Officer, NOAA Ship *Ferdinand R. Hassler*  
29 Wentworth Road  
New Castle, NH, 03854

[Quoted text hidden]

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**Starla Robinson - NOAA Federal** <starla.robinson@noaa.gov>

Mon, Jan 9, 2017 at 3:00 PM

To: "OPS.Ferdinand Hassler - NOAA Service Account" <ops.ferdinand.hassler@noaa.gov>, Corey Allen -

NOAA Federal <corey.allen@noaa.gov>, "russell.quintero" <russell.quintero@noaa.gov>

Cc: Jonathan French - NOAA Federal <jonathan.r.french@noaa.gov>, CO HASSLER

<co.ferdinand.hassler@noaa.gov>

[I will look into it. I am CCing Corey and LT Quintero on this email.](#)

[Quoted text hidden]

--

*Starla D. Robinson, Physical Scientist*  
*NOS - OCS - Hydrographic Survey Division - Operations Branch*  
*National Oceanic Atmospheric Administration*  
*Office: 301-713-2702 x125*  
*Cell: 360-689-1431*  
*Website: [HSD Planned Hydrographic Surveys](#)*

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**Starla Robinson - NOAA Federal** <starla.robinson@noaa.gov>

Mon, Jan 9, 2017 at 3:31 PM

To: cristina.urizar@noaa.gov

Cc: Corey Allen - NOAA Federal <corey.allen@noaa.gov>, "russell.quintero" <russell.quintero@noaa.gov>, "OPS.Ferdinand Hassler - NOAA Service Account" <ops.ferdinand.hassler@noaa.gov>

Hello Cristina,

I am the HSD project manager for OPR-G309-FH-2016. The first four surveys for the project were completed well before the hurricane. They are processed and nearly complete. Would it be possible to use the original Springmaid Pier, SC final water levels and zones for those four surveys? We would like a final tide note referencing Springmaid Pier, unless there is a compelling reason not to.

Thank you,  
Starla

**Note that the four (4) revised final tide notes for project OPR-G309-FH-2016\_Revised3, Registry Nos. F00679, H12893, H12894 and H12895 are being issued to provide consistent final tidal zoning across the project. The final tide files included in this email apply to all tide notes also included in this email.**

[Quoted text hidden]

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*Starla D. Robinson, Physical Scientist*  
*NOS - OCS - Hydrographic Survey Division - Operations Branch*  
*National Oceanic Atmospheric Administration*  
*Office: 301-713-2702 x125*  
*Cell: 360-689-1431*  
*Website: [HSD Planned Hydrographic Surveys](#)*

---

**Cristina Urizar - NOAA Federal** <cristina.urizar@noaa.gov>

Tue, Jan 10, 2017 at 9:05 AM

To: Starla Robinson - NOAA Federal <starla.robinson@noaa.gov>

Cc: Corey Allen - NOAA Federal <corey.allen@noaa.gov>, "russell.quintero" <russell.quintero@noaa.gov>, "OPS.Ferdinand Hassler - NOAA Service Account" <ops.ferdinand.hassler@noaa.gov>, "\_NOS.CO-OPS.HPT" <nos.coops.hpt@noaa.gov>, Jerry Hovis <gerald.hovis@noaa.gov>

Good morning,

It was nice chatting with you yesterday afternoon, Starla. Below is a summary of our conversation.

Before I began working on the tide notes, Colleen reached out to Corey to discuss the various products HPT provided OCS (preliminary zoning and revised preliminary zoning) and how the files were labeled. In that conversation, Corey and Colleen agreed that the best way forward was for CO-OPS to deliver zoning based on Wrightsville Beach, NC that would be used to process all the data collected for G309 regardless of when it was collected (pre- or post-hurricane Matthew). This was to be done for three reasons:

1. The estimated error of the zoning based on Wrightsville Beach is less than the estimated error of the zoning based on Springmaid Pier.
2. To provide consistency across the project as a whole in the processing phase. Switching between control stations may introduce error.
3. To reduce any confusion regarding which files to use in the final processing of the data.



The tidal zoning provided in the previously delivered tide notes using Springmaid Pier as control (with Reg Nos. F00679, H12893, H12894 and H12895) was within OCS error tolerances.

Thank you,  
Cristina

[Quoted text hidden]

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**Starla Robinson - NOAA Federal** <starla.robinson@noaa.gov> Thu, Jan 12, 2017 at 8:52 AM  
To: "OPS.Ferdinand Hassler - NOAA Service Account" <ops.ferdinand.hassler@noaa.gov>  
Cc: Jonathan French - NOAA Federal <jonathan.r.french@noaa.gov>, CO HASSLER <co.ferdinand.hassler@noaa.gov>, Corey Allen - NOAA Federal <corey.allen@noaa.gov>, "russell.quintero" <russell.quintero@noaa.gov>

Hello Nick,

Could you send us an estimate on how much time it would take to apply the Wrightsville Beach, NC tide station data to the three pre-hurricane surveys and the difference in uncertainty it will gain us?

Thank you,  
Starla

[Quoted text hidden]

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*Starla D. Robinson, Physical Scientist*  
*NOS - OCS - Hydrographic Survey Division - Operations Branch*  
*National Oceanic Atmospheric Administration*  
*Office: 301-713-2702 x125*  
*Cell: 360-689-1431*  
*Website: [HSD Planned Hydrographic Surveys](#)*

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**OPS.Ferdinand Hassler - NOAA Service Account** Thu, Jan 12, 2017 at 9:28 AM  
<ops.ferdinand.hassler@noaa.gov>  
To: Starla Robinson - NOAA Federal <starla.robinson@noaa.gov>  
Cc: Jonathan French - NOAA Federal <jonathan.r.french@noaa.gov>, CO HASSLER <co.ferdinand.hassler@noaa.gov>, Corey Allen - NOAA Federal <corey.allen@noaa.gov>, "russell.quintero" <russell.quintero@noaa.gov>

Starla,

We are reviewing all 3 of Jeff's surveys with the CO tomorrow. Do we want to go down this hole? This would be a big hold-up and we are trying to review these while Jeff is here and he's likely leaving this weekend. It appears that our ship won't be getting U/W for this habitat mapping leg (likely it seems right now at least). This is affording us a really good opportunity to get these surveys off the ship. It's hard to say how long it would take but applying the tides, merging, TPU...etc, recomputed surfaces and then making changes to the DRs. Maybe call it a week? Then we'd be kicking the review down the road. What would we really gain?

-Nick

Field Operations Officer, NOAA Ship *Ferdinand R. Hassler*  
29 Wentworth Road  
New Castle, NH, 03854

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**Russell Quintero - NOAA Federal** <russell.quintero@noaa.gov>

Thu, Jan 12, 2017 at 10:00  
AM

To: "OPS.Ferdinand Hassler - NOAA Service Account" <ops.ferdinand.hassler@noaa.gov>  
Cc: Starla Robinson - NOAA Federal <starla.robinson@noaa.gov>, Jonathan French - NOAA Federal <jonathan.r.french@noaa.gov>, CO HASSLER <co.ferdinand.hassler@noaa.gov>, Corey Allen - NOAA Federal <corey.allen@noaa.gov>

Nick,

There's a lot going on over here, so I'm trying to sort out the exact state of things and haven't gotten far yet. My intention is to try and change things as little as possible once we start down a path; minimize changes to the PI and similarly minimize changes to the requests we send to CO-OPS. Stability breeds efficiency. It seems from a very brief chat with Starla that the agreement with CO-OPS may not have been communicated to her or to you, but using the older gauge causes non-trivial costs on other offices.

If you proceed with preliminary tides, CO-OPS will need to generate a new set of final tides and we all know how long that takes. AHB will need to apply them and do all of the processing that you would do if you just applied the final already given to you, and then AHB would need to check for any problems. This also gets a little odd as any data QC issues in the surfaces they created now may not have been there when you delivered it...they are now QCing their own product instead of yours.

As for the timeline, I think a week is grossly inflated if getting this off is a priority. How many places in the DR does this exist? By memory I can think of one; updating this is a 15 minute job total for all 3 surveys. It's not much different than fixing a typo or some verbiage the CO doesn't like that's identified during the review. In fact, there is no real reason to fix it before the review; just note that it will be changed.

Apply Tides, Merge, and TPU surely take less than 3 hours total. Caris doesn't multithread efficiently unless something has changed a lot in Caris 10 and the network is the primary bottleneck on most ships, so you can run all 3 surveys on one machine or just use more than one computer, set them all to go, and come back at the end of the workday. I'm certain they would be done.

Save a copy of the current surfaces, difference the new one to highlight any major changes. That's a 20 minute process max, plus 30 for scanning the surfaces for changes.

You can also proceed with the survey review simply knowing that this process is pending, and with the expectation that any big changes get brought to the FOO/CO's attention. 99.5% of the content in the DR and the FFF will be unchanged, and the bathy should improve if anything.

If we failed to communicate the change in tide station to you, I can certainly appreciate your frustration and I apologize. However, the right answer here isn't kicking the can down the pipeline for someone else to fix, and the most efficient fix is to fix it now, on the ship.

V/r,  
Russ

Lieutenant Russell Quintero, NOAA  
Chief, Hydrographic Surveys Division Operations Branch  
National Oceanic & Atmospheric Administration  
1315 East-West Hwy, SSMC3 6217  
Silver Spring, MD 20910  
Cell: 970-481-2030

[Quoted text hidden]

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**OPS.Ferdinand Hassler - NOAA Service Account**

<ops.ferdinand.hassler@noaa.gov>

To: Russell Quintero - NOAA Federal <russell.quintero@noaa.gov>

Thu, Jan 12, 2017 at  
10:13 AM

Cc: Starla Robinson - NOAA Federal <starla.robinson@noaa.gov>, Jonathan French - NOAA Federal <jonathan.r.french@noaa.gov>, CO HASSLER <co.ferdinand.hassler@noaa.gov>, Corey Allen - NOAA Federal <corey.allen@noaa.gov>

Hi Russ,

Just FYI we had received final tides for Springmaid Pier (the original gauge) long ago. So these three surveys already have final tides applied but from Springmaid Pier.

-V/r  
Nick

Field Operations Officer, NOAA Ship *Ferdinand R. Hassler*  
29 Wentworth Road  
New Castle, NH, 03854

[Quoted text hidden]

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**Russell Quintero - NOAA Federal** <russell.quintero@noaa.gov> Thu, Jan 12, 2017 at 10:20 AM  
To: "OPS.Ferdinand Hassler - NOAA Service Account" <ops.ferdinand.hassler@noaa.gov>  
Cc: Starla Robinson - NOAA Federal <starla.robinson@noaa.gov>, Jonathan French - NOAA Federal <jonathan.r.french@noaa.gov>, CO HASSLER <co.ferdinand.hassler@noaa.gov>, Corey Allen - NOAA Federal <corey.allen@noaa.gov>

Yeah, I'm on the phone with CO-OPS right now and they just told me that.

I'll get back to you shortly.

Lieutenant Russell Quintero, NOAA  
Chief, Hydrographic Surveys Division Operations Branch  
National Oceanic & Atmospheric Administration  
1315 East-West Hwy, SSMC3 6217  
Silver Spring, MD 20910  
Cell: 970-481-2030

[Quoted text hidden]

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**Russell Quintero - NOAA Federal** <russell.quintero@noaa.gov> Thu, Jan 12, 2017 at 10:28 AM  
To: "OPS.Ferdinand Hassler - NOAA Service Account" <ops.ferdinand.hassler@noaa.gov>  
Cc: Starla Robinson - NOAA Federal <starla.robinson@noaa.gov>, Jonathan French - NOAA Federal <jonathan.r.french@noaa.gov>, CO HASSLER <co.ferdinand.hassler@noaa.gov>, Corey Allen - NOAA Federal <corey.allen@noaa.gov>

Just got off the phone with CO-OPS. I was incorrectly under the assumption that you had only preliminary from the original gauge that was taken out during the hurricane.

These four have final tides for both stations. The uncertainty is slightly lower using Wrightsville, but Springmaid is in spec and can be used if it's more convenient.

F00679  
H12893  
H12894  
H12895

These have survey before and after the hurricane and must use the Wrightsville gauge.

H12929  
H12930  
H12931

H12932  
H12934

Hopefully that helps you get these off the ship.

R/  
Russ

Lieutenant Russell Quintero, NOAA  
Chief, Hydrographic Surveys Division Operations Branch  
National Oceanic & Atmospheric Administration  
1315 East-West Hwy, SSMC3 6217  
Silver Spring, MD 20910  
Cell: 970-481-2030

[Quoted text hidden]

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**OPS.Ferdinand Hassler - NOAA Service Account**

Thu, Jan 12, 2017 at  
10:38 AM

<ops.ferdinand.hassler@noaa.gov>

To: Russell Quintero - NOAA Federal <russell.quintero@noaa.gov>

Cc: Starla Robinson - NOAA Federal <starla.robinson@noaa.gov>, Jonathan French - NOAA Federal <jonathan.r.french@noaa.gov>, CO HASSLER <co.ferdinand.hassler@noaa.gov>, Corey Allen - NOAA Federal <corey.allen@noaa.gov>

Great, thanks Russ. It will definitely help. I know a week was probably exaggerating but the way things go on this ship any derailment when making good progress can turn into a lot of time letting a survey sit because nobody is here to work on it. So I was exaggerating because we don't have a designated person to work on it once Jeff leaves.

-Nick

Field Operations Officer, NOAA Ship *Ferdinand R. Hassler*  
29 Wentworth Road  
New Castle, NH, 03854

[Quoted text hidden]



OPS.Ferdinand Hassler - NOAA Service Account <ops.ferdinand.hassler@noaa.gov>

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## Fwd: Wilmington Bottom Sample Guidance

8 messages

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**Nicholas Morgan - NOAA Federal** <nicholas.morgan@noaa.gov>

Sat, Oct 1, 2016 at 10:55 AM

To: "OPS.Ferdinand Hassler - NOAA Service Account" <ops.ferdinand.hassler@noaa.gov>

----- Forwarded message -----

From: **Starla Robinson - NOAA Federal** <starla.robinson@noaa.gov>

Date: Sat, Oct 1, 2016 at 10:39 AM

Subject: Wilmington Bottom Sample Guidance

To: Nicholas Morgan - NOAA Federal <nicholas.morgan@noaa.gov>, Matthew Jaskoski - NOAA Federal <Matthew.Jaskoski@noaa.gov>, Chris Taylor - NOAA Federal <chris.taylor@noaa.gov>, Adam Reed - NOAA Federal <adam.reed@noaa.gov>, Michael White - NOAA Affiliate <michael.white@noaa.gov>, Juliet Kinney - NOAA Affiliate <juliet.kinney@noaa.gov>

Cc: Ashley Chappell - NOAA Federal <ashley.chappell@noaa.gov>

OPS,

Here is the guidance for the next set of the Wilmington bottom samples, and some other useful documents. Please let me know what you think, and add to this. The main changes are recording the position of the camera, and guidance on what to send to Chris and I. This is a starting place, incorporating what feedback I received from the first round.

We are going to get drop cameras for the fleet. I am was thinking we could send these documents and any resulting SOP with the drop cameras.

In addition to this guidance we would like to hear your feedback on the operation of the drop camera. Please send that review to me and Juliet and I.

It was also recommended we incorporating Coastal and Marine Ecological Classification Standard (CMECS) into our classification methodology. We are still looking into that, but if you are interested more information is at: <https://www.cmeccatalog.org/>.

Thank you,  
Starla

--

*Starla D. Robinson, Physical Scientist*

*NOS - OCS - Hydrographic Survey Division - Operations Branch*

*National Oceanic Atmospheric Administration*

*Office: 301-713-2702 x125*

*Cell: 360-689-1431*

*Website: [In-House Planned Hydrographic Surveys -2016](#)*

--

*LT Nick Morgan, NOAA*

*Operations Officer*

*NOAA Ship Ferndiand R. Hassler*

**Physical Address (UPS/FedEx):**

*UNH Judd Gregg Marine Research Complex*

*29 Wentworth Rd.*

*New Castle, NH 03854*

**Mailing Address:**

*PO Box 638*

New Castle, NH 03854

Ship's landline: 603-431-4500

Ship's cell: 603-812-8748

Cell Phone: 907-617-0963



**Bottom\_Sample\_Guidance.zip**

10828K

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**Starla Robinson - NOAA Federal** <starla.robinson@noaa.gov>

Wed, Nov 9, 2016 at 5:11 PM

To: "OPS.Ferdinand Hassler - NOAA Service Account" <ops.ferdinand.hassler@noaa.gov>, Jonathan French - NOAA Federal <jonathan.r.french@noaa.gov>, John Doroba - NOAA Federal <john.doroba@noaa.gov>, Chris Taylor - NOAA Federal <chris.taylor@noaa.gov>, Michael White - NOAA Affiliate <michael.white@noaa.gov>, Juliet Kinney - NOAA Affiliate <juliet.kinney@noaa.gov>, Cody Guilday - NOAA Affiliate <cody.guilday@noaa.gov>

Cc: Matthew Jaskoski - NOAA Federal <Matthew.Jaskoski@noaa.gov>, Nicholas Morgan - NOAA Federal <nicholas.morgan@noaa.gov>, "CO.Ferdinand Hassler - NOAA Service Account" <co.ferdinand.hassler@noaa.gov>, Adam Reed - NOAA Federal <adam.reed@noaa.gov>

Hello FH Folk,

As you make your triumphant return, I want to remind you that we would like the additional bottom characteristic products listed in the attached guidance package.

Please make the mosaics at the same resolution the bathymetry, and record the processing times in the [backscatter metrics](#) log.

Please copy this email and documents into your correspondence folder.

Thank you,  
Starla

----- Forwarded message -----

From: **Starla Robinson - NOAA Federal** <starla.robinson@noaa.gov>

Date: Sat, Oct 1, 2016 at 10:39 AM

Subject: Wilmington Bottom Sample Guidance

To: Nicholas Morgan - NOAA Federal <nicholas.morgan@noaa.gov>, Matthew Jaskoski - NOAA Federal <Matthew.Jaskoski@noaa.gov>, Chris Taylor - NOAA Federal <chris.taylor@noaa.gov>, Adam Reed - NOAA Federal <adam.reed@noaa.gov>, Michael White - NOAA Affiliate <michael.white@noaa.gov>, Juliet Kinney - NOAA Affiliate <juliet.kinney@noaa.gov>

Cc: Ashley Chappell - NOAA Federal <ashley.chappell@noaa.gov>

OPS,

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We are going to get drop cameras for the fleet. I am was thinking we could send these documents and any resulting SOP with the drop cameras.

In addition to this guidance we would like to hear your feedback on the operation of the drop camera. Please send that review to me and Juliet and I.

..

Thank you,  
Starla

--

*Starla D. Robinson, Physical Scientist*

NOS - OCS - Hydrographic Survey Division - Operations Branch

National Oceanic Atmospheric Administration

Office: 301-713-2702 x125

Cell: 360-689-1431

Website: [HSD Planned Hydrographic Surveys](#)



**Bottom\_Sample\_Guidance.zip**

10828K

**Michael White - NOAA Affiliate** <michael.white@noaa.gov>

Thu, Nov 10, 2016 at 9:19 AM

To: Starla Robinson - NOAA Federal <starla.robinson@noaa.gov>

Cc: "OPS.Ferdinand Hassler - NOAA Service Account" <ops.ferdinand.hassler@noaa.gov>, Jonathan French - NOAA Federal <jonathan.r.french@noaa.gov>, John Doroba - NOAA Federal <john.doroba@noaa.gov>, Chris Taylor - NOAA Federal <chris.taylor@noaa.gov>, Juliet Kinney - NOAA Affiliate <juliet.kinney@noaa.gov>, Cody Guilday - NOAA Affiliate <cody.guilday@noaa.gov>, Matthew Jaskoski - NOAA Federal <Matthew.Jaskoski@noaa.gov>, Nicholas Morgan - NOAA Federal <nicholas.morgan@noaa.gov>, "CO.Ferdinand Hassler - NOAA Service Account" <co.ferdinand.hassler@noaa.gov>, Adam Reed - NOAA Federal <adam.reed@noaa.gov>

Hi All,

The mosaics were currently being gridded at 4 meter cells. Likely the data will support finer resolutions, but it is not what the SOP instructs. The SOP states, "The final exported Mosaic (.tiff) will be approximately 5% of the Mosaic Memory used in FMGT by a single tile...If the export exceeds 20MB, use a coarser resolution." For the attached spreadsheet I would suggest having two more columns labeled "Mosaic Memory" and "Pixel Size."

Additionally:

1) The default range of the FMGT histogram is 10 to -70. Typically mosaics will only populate part of this range. If the processor resets the bounds of the histogram to match the spread of the created mosaic and *then* exports the TIFF, the resulting mosaic will have better contrast and look less "grayed out."

I placed two examples in: R:\Temporary\_Fledermaus\_Projects\H1229\_S250Port\_400kHz.fmproj\Output\SD

2) In FMGT under the Settings tab -> Processing Parameters there is a window to set the acquisition system. By selecting, "Reson 2175" the default setting will fill in for all of the fields. These can be adjusted to match the true values for each head, but having the defaults set will likely result in better mosaics. This is not in the SOP.

For the operation of the bottom camera and sediment samples:

Along with the images from the bottom sampler, Cody and I were taking images on deck of the samples and storing them in the Multimedia folder. These may be useful for additional characterization/verification of the sediment characterization. We might want to consider keeping them with the bottom sample images. I would say the bottom sample images are better at showing the in situ bottom type (ripples, bio cover, large clasts) compared to capturing fine scale sediment size. Chris Taylor may have more to say from a habitat perspective. I will attach examples.

Currently the plan is attaching one image to each sample. Do we have guidelines to choose the image? I.e. what makes one image better than the others. Attached are the images from Samples 4, 5 and 6



**Examples.zip**

for H12930. Some show the bottom type, some a close up of the sediment and the hand sample. If we attach one image, which image?

The grab sampler also seems to take more reliable samples when the camera is attached. When the camera was not operational, we had several stations without samples but always got a sample with the device attached. Even if the camera is not working, may be worth have the device attached to the grabber.

Hope this input helps,

Mike White

[Quoted text hidden]

--

Michael P. White  
Hydrographic Analyst (E.R.T., Inc.)  
NOAA/CCOM Joint Hydrographic Center  
UNH, Durham

---

**Starla Robinson - NOAA Federal** <starla.robinson@noaa.gov>

Thu, Nov 10, 2016 at 5:35 PM

To: Michael White - NOAA Affiliate <michael.white@noaa.gov>, "OPS.Ferdinand Hassler - NOAA Service Account" <ops.ferdinand.hassler@noaa.gov>, Jonathan French - NOAA Federal <jonathan.r.french@noaa.gov>, John Doroba - NOAA Federal <john.doroba@noaa.gov>, Chris Taylor - NOAA Federal <chris.taylor@noaa.gov>, Juliet Kinney - NOAA Affiliate <juliet.kinney@noaa.gov>, Cody Guilday - NOAA Affiliate <cody.guilday@noaa.gov>, Matthew Jaskoski - NOAA Federal <Matthew.Jaskoski@noaa.gov>, Nicholas Morgan - NOAA Federal <nicholas.morgan@noaa.gov>, Adam Reed - NOAA Federal <adam.reed@noaa.gov>

Cc: "CO.Ferdinand Hassler - NOAA Service Account" <co.ferdinand.hassler@noaa.gov>, Corey Allen - NOAA Federal <corey.allen@noaa.gov>, "russell.quintero" <russell.quintero@noaa.gov>

Good point Mike,

Looking back through my files I think we did 4 meter resolution backscatter as well. So please do not do any additional 2 meter mosaic creation until I can check in with Chris.

For the final product I have been asking for a non-stretched mosaic, because that is the easiest way to keep the range consistent between sheets. If we were to expand this requirements to other projects we would want to keep it standardized between platform/sonar units. I was stretching the grayscale contrast to do the bottom sample selection. If you were the customer, what would you find useful? Or would you rebuild mosaics from the raw data?

For the Final Features file you can connect multiple images. My suggestion is choose one that shows the substrate well, and one that shows the surrounding habitat, if it adds useful data. No more than 4 images, less is better. From a habitat point of view what do you think would be useful? This is not a rhetorical question, we could use the input.

The Wilmington project is a collaboration between HSD / NCCOS / and UNH-JHC-CCOM. We have been asking for additional products and ideas along the way so we could meet each group's needs; and explore different ways of doing things. Your input is essential. Any ideas or advice you can give, now is the time, so we can add it to our recommendations.

Thank you for making this project a reality!

- Starla

[Quoted text hidden]

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**Chris Taylor - NOAA Federal** <chris.taylor@noaa.gov>

Fri, Nov 18, 2016 at 8:00 AM

To: Starla Robinson - NOAA Federal <starla.robinson@noaa.gov>

Cc: Michael White - NOAA Affiliate <michael.white@noaa.gov>, "OPS.Ferdinand Hassler - NOAA Service Account" <ops.ferdinand.hassler@noaa.gov>, Jonathan French - NOAA Federal <jonathan.r.french@noaa.gov>, John Doroba - NOAA Federal <john.doroba@noaa.gov>, Juliet Kinney - NOAA Affiliate <juliet.kinney@noaa.gov>, Cody Guilday - NOAA Affiliate <cody.guilday@noaa.gov>, Matthew Jaskoski - NOAA Federal <Matthew.Jaskoski@noaa.gov>, Nicholas Morgan - NOAA Federal <nicholas.morgan@noaa.gov>, Adam Reed - NOAA Federal <adam.reed@noaa.gov>, "CO.Ferdinand Hassler - NOAA Service Account" <co.ferdinand.hassler@noaa.gov>, Corey Allen - NOAA Federal <corey.allen@noaa.gov>, "russell.quintero" <russell.quintero@noaa.gov>

All,

Thanks for the update on this project and sorry for the delays in responding. I concur with all that Starla and Mike have presented regarding resolution for mosaics. We (NCCOS) appreciate the extra effort gathering and managing bottom sample/imagery. We look forward to reviewing the imagery and producing some preliminary seafloor characterization surfaces.

We look forward to collaborating with HSD and others on future projects where we are able to improve seafloor habitat mapping in concert with core mission objectives for OCS.

Regards,  
Chris

[Quoted text hidden]

--



J. Christopher Taylor, PhD  
National Centers for Coastal Ocean Science  
@ NOAA's Beaufort Laboratory  
101 Pivers Island Road, Beaufort, North Carolina 28516  
O: +1 252 838 0833 M: +1 252 723 3993  
Website: <http://coastalscience.noaa.gov/>

---

**Starla Robinson - NOAA Federal** <starla.robinson@noaa.gov> Fri, Nov 18, 2016 at 6:29 PM  
To: Chris Taylor - NOAA Federal <chris.taylor@noaa.gov>, "OPS.Ferdinand Hassler - NOAA Service Account" <ops.ferdinand.hassler@noaa.gov>  
Cc: Matthew Jaskoski - NOAA Federal <Matthew.Jaskoski@noaa.gov>, Nicholas Morgan - NOAA Federal <nicholas.morgan@noaa.gov>, Adam Reed - NOAA Federal <adam.reed@noaa.gov>, "CO.Ferdinand Hassler - NOAA Service Account" <co.ferdinand.hassler@noaa.gov>, Corey Allen - NOAA Federal <corey.allen@noaa.gov>, "russell.quintero" <russell.quintero@noaa.gov>, Michael White - NOAA Affiliate <michael.white@noaa.gov>, Cody Guilday - NOAA Affiliate <cody.guilday@noaa.gov>, Jonathan French - NOAA Federal <jonathan.r.french@noaa.gov>

OPS,

Four meter backscatter mosaics, or whatever you used, are fine. How do we best get the data from you?

Thank you,  
Starla

[Quoted text hidden]

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**Starla Robinson - NOAA Federal** <starla.robinson@noaa.gov> Wed, Dec 21, 2016 at 3:19 PM  
To: "OPS.Ferdinand Hassler - NOAA Service Account" <ops.ferdinand.hassler@noaa.gov>  
Cc: Matthew Jaskoski - NOAA Federal <Matthew.Jaskoski@noaa.gov>, Nicholas Morgan - NOAA Federal <nicholas.morgan@noaa.gov>, Jonathan French - NOAA Federal <jonathan.r.french@noaa.gov>, "CO.Ferdinand Hassler - NOAA Service Account" <co.ferdinand.hassler@noaa.gov>, Briana Welton - NOAA Federal <briana.welton@noaa.gov>, "russell.quintero" <russell.quintero@noaa.gov>

Hello Hassler,

Congratulations on pulling off another amazing and challenging year. What you have accomplished as a ship -especially a ship with no stable survey department- is impressive. I am singing your successes among the halls. I am currently writing up a project summary and I cannot wait to share it. That said...

I am looking through the preliminary bottom sample data, and I saw some things that need to be corrected before the finals are submitted. For example the S57 files have no reference to the sample site and there are no associated images, and the images in the folder do not follow naming convention. The bottom sample logs are not the version requested, they do not include the measurements from the camera face to the sampler, and they are incomplete. Given that the data was preliminary, a rushed request, and you may have corrected it already.

**Again, attached is the official bottom sample guidance.** Please ensure the sheet managers have this. This data will be testing our bottom image workflow from acquisition to NCEI and other data discovery platforms. It is important that the S57 files have correct attribution.

Thank you again,  
Starla

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 **Bottom\_Sample\_Guidance.zip**  
10828K

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**OPS.Ferdinand Hassler - NOAA Service Account** <ops.ferdinand.hassler@noaa.gov> Wed, Jan 11, 2017 at 12:22 PM  
To: Jeffery Marshall - NOAA Federal <jeffery.marshall@noaa.gov>

Bottom Sample Guidance from Starla.....

Field Operations Officer, NOAA Ship *Ferdinand R. Hassler*  
29 Wentworth Road

2/7/2017

National Oceanic and Atmospheric Administration Mail - Fwd: Wilmington Bottom Sample Guidance

New Castle, NH, 03854

----- Forwarded message -----

From: **Starla Robinson - NOAA Federal** <starla.robinson@noaa.gov>

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**Bottom\_Sample\_Guidance.zip**

10828K



OPS.Ferdinand Hassler - NOAA Service Account <ops.ferdinand.hassler@noaa.gov>

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## OPR-G309-FH-16 ERS Capability Memo

1 message

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**OPS.Ferdinand Hassler - NOAA Service Account** <ops.ferdinand.hassler@noaa.gov> Wed, Feb 15, 2017 at 9:05 AM

To: \_NOS OCS HSD ERS Deliverables <ers.deliverables@noaa.gov>

Cc: Starla Robinson - NOAA Federal <Starla.Robinson@noaa.gov>, CO HASSLER <co.ferdinand.hassler@noaa.gov>, James J Miller <james.j.miller@noaa.gov>, Jonathan French - NOAA Federal <jonathan.r.french@noaa.gov>

Please find the attached ERS Capability Memo for project OPR-G309-FH-16 Approaches to Wilmington.

V/r  
LT Morgan

Field Operations Officer, NOAA Ship *Ferdinand R. Hassler*  
29 Wentworth Road  
New Castle, NH, 03854

---

 **OPR-G309-FH-16\_ERS\_Capability\_Memo.pdf**  
1111K



OPS.Ferdinand Hassler - NOAA Service Account <ops.ferdinand.hassler@noaa.gov>

---

## NOAA Ship Hassler SV Correct

4 messages

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**Richard Brennan - NOAA Federal** <richard.t.brennan@noaa.gov>

Wed, Feb 15, 2017 at 10:11 AM

To: Briana Welton <Briana.Welton@noaa.gov>, Benjamin K Evans <benjamin.k.evans@noaa.gov>, CO HASSLER <CO.Ferdinand.Hassler@noaa.gov>, "OPS. Ferdinand Hassler" <OPS.Ferdinand.Hassler@noaa.gov>, Russell Quintero - NOAA Federal <Russell.Quintero@noaa.gov>, Samuel Greenaway - NOAA Service Account <Samuel.Greenaway@noaa.gov>, Lorraine Robidoux - NOAA Federal <lorraine.robidoux@noaa.gov>

LCDR Jaskoski,

I have reviewed the technical details associated with the situation surrounding the Hassler surveys that are currently in question. As currently understood, there are approximately 16 surveys between AHB and Hassler. The issue, as I understand it in general terms, is that the data in question was not SVP corrected after SBET computation and application to the data. Based on my technical review I would like the current remediation:

1. Pick one survey to serve as a representative example of this set. Save the current BASE surface with the SVP applied *before* SBET application as `_OLD`. Then, re-apply SVP and recompute a *new* grid. Do a difference surface and compute the min, max, average, and standard deviation for this difference surface.

Based on my review the SBET process does no change the roll, pitch, or yaw nor the location of the transducer in the water column - or at least not in a meaningful way. This representative data set should confirm that.

2. Please report the finding of this analysis. Assuming it is exceedingly small, I think the next steps are:

- Create a revised DAPR that can be used for all surveys that describes the problem and the analysis. I expect that you will work with AHB to arrange this documentation is properly included with all surveys.
- I will provide a waiver in light of this analysis that authorizes the data to proceed using the current process.
- Include both the waiver and this email in the separates for all theses surveys to document the action taken.
- Ensure Hassler SOPs are updated to ensure this process is corrected.

3. If the analysis shows anything more than a 5cm difference, please advise me. We will discuss how to proceed from there.

It is my expectation that we will manage similar problems encountered with other field units or our contractors in a similar and consistent fashion. If there are any questions, concerns, or details I have not addressed I expect you or LCDR Welton will contact me with that information.

Rick

**CAPT Rick Brennan, NOAA**

Chief, Hydrographic Surveys Division

1315 East-West Highway, SSMC3 Room 6823

Silver Spring, MD 20910

Work: [301-713-2700](tel:301-713-2700)

Cell: [443-994-3301](tel:443-994-3301)

---

**OPS.Ferdinand Hassler - NOAA Service Account** <ops.ferdinand.hassler@noaa.gov>

Wed, Feb 15, 2017 at 10:36 AM

To: James J Miller <james.j.miller@noaa.gov>, Patrick Debrousse - NOAA Federal <patrick.j.debrousse@noaa.gov>, Jonathan French - NOAA Federal <jonathan.r.french@noaa.gov>

Field Operations Officer, NOAA Ship *Ferdinand R. Hassler*  
29 Wentworth Road  
New Castle, NH, 03854



OPS.Ferdinand Hassler - NOAA Service Account &lt;ops.ferdinand.hassler@noaa.gov&gt;

---

**Project workflow for processing**

34 messages

**Clinton Marcus - NOAA Federal** <clinton.r.marcus@noaa.gov>

Tue, Feb 7, 2017 at 1:36 PM

To: "OPS.Ferdinand Hassler - NOAA Service Account" &lt;ops.ferdinand.hassler@noaa.gov&gt;

Cc: James J Miller &lt;James.J.Miller@noaa.gov&gt;, Tyanne Faulkes &lt;tyanne.faulkes@noaa.gov&gt;

Hi Nick and Jonathan,

I had a question about your processing workflow on the Hassler. Is it standard procedure to only apply SVC once? I ask because I'm noticing that SV was not reapplied at any time after loading SBETs. In my experience, and according to CARIS, it has been standard to re-SVC any time Attitude (heave, pitch, roll) have been edited or updated as it is affecting the ray-trace.

I also noticed that after applying the verified tides, that the data was not merged w/o GPS Tide. This isn't really an issue, unless there was a difference surface made to validate the VDatum model.

Let me know if you have any questions about my train of thought here. It may be the empty stomach affecting my thought process.

Thanks for all the clarification and quick turn-arounds on my questions. Hope the survey is going well out there.

Sincerely,

Clint Marcus

Physical Scientist

NOAA Office of Coast Survey

Atlantic Hydrographic Branch

Phone: (757) 441-6746 ext 208

Cell: (541) 264-6406

---

**OPS.Ferdinand Hassler - NOAA Service Account** <ops.ferdinand.hassler@noaa.gov>

Tue, Feb 7, 2017 at 2:26 PM

To: Clinton Marcus - NOAA Federal &lt;clinton.r.marcus@noaa.gov&gt;

Cc: James J Miller &lt;James.J.Miller@noaa.gov&gt;, Tyanne Faulkes &lt;tyanne.faulkes@noaa.gov&gt;, Patrick Debrousse - NOAA Federal &lt;patrick.j.debrousse@noaa.gov&gt;

Hi Clint,

We are going to check into it with Caris to see exactly how it affects things. Pat Berube did all the processing on this survey and since he was of the FA processing mold, I have to believe that he might have cut that step out for a reason (I HOPE). We are going to contact Caris and find out so standby. LTJG Debrousse is aboard and seems to remember hearing that Caris mentioned that it's not necessary but the FA still went through the step anyhow.

Anyways, James Miller is currently inquiring with Caris.

-Nick

Field Operations Officer, NOAA Ship *Ferdinand R. Hassler*

29 Wentworth Road

New Castle, NH, 03854

[Quoted text hidden]

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**Clinton Marcus - NOAA Federal** <clinton.r.marcus@noaa.gov>

Tue, Feb 7, 2017 at 2:34 PM

To: "OPS.Ferdinand Hassler - NOAA Service Account" &lt;ops.ferdinand.hassler@noaa.gov&gt;

Cc: James J Miller &lt;James.J.Miller@noaa.gov&gt;, Tyanne Faulkes &lt;tyanne.faulkes@noaa.gov&gt;, Patrick Debrousse - NOAA Federal &lt;patrick.j.debrousse@noaa.gov&gt;

Thanks for the quick reply. I'll be standing by to see what CARIS has to say. Thanks again.

Cheers,

Clint Marcus

Physical Scientist

NOAA Office of Coast Survey

Atlantic Hydrographic Branch

Phone: (757) 441-6746 ext 208

Cell: (541) 264-6406

[Quoted text hidden]

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

Tue, Feb 7, 2017 at 2:35 PM

To: Clinton Marcus - NOAA Federal &lt;clinton.r.marcus@noaa.gov&gt;

Cc: "OPS.Ferdinand Hassler - NOAA Service Account" &lt;ops.ferdinand.hassler@noaa.gov&gt;, James J Miller &lt;James.J.Miller@noaa.gov&gt;, Patrick Debrousse - NOAA Federal &lt;patrick.j.debrousse@noaa.gov&gt;

Hi all,

As far as I remember SVC is not required again unless you are using a Kongsberg system. I will try to dig up the email if I have one...

Tyanne

[Quoted text hidden]

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

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**OPS.Ferdinand Hassler - NOAA Service Account** <ops.ferdinand.hassler@noaa.gov>

Tue, Feb 7, 2017 at 4:51 PM

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

Cc: Clinton Marcus - NOAA Federal <clinton.r.marcus@noaa.gov>, James J Miller <James.J.Miller@noaa.gov>, Patrick Debrousse - NOAA Federal <patrick.j.debrousse@noaa.gov>

So we got a quick response from Caris that SVC does need to happen after applying new attitude/nav data such as an SBET. I did a quick check of our 2016 Chesapeake Surveys and those seem to be processed that way so that's good. However, our 2016 Wilmington surveys are all processed without SVC after SBETs. I believe we may end up going back for those and re-applying SV. James is doing a brief comparison to see what kind of difference we see in the data between the two. I imagine though that it varies survey to survey as to how different your SBET is from your original POS data.

-Nick

Field Operations Officer, NOAA Ship *Ferdinand R. Hassler*  
29 Wentworth Road  
New Castle, NH, 03854

[Quoted text hidden]

---

**Clinton Marcus - NOAA Federal** <clinton.r.marcus@noaa.gov>

Wed, Feb 8, 2017 at 7:00 AM

To: "OPS.Ferdinand Hassler - NOAA Service Account" <ops.ferdinand.hassler@noaa.gov>

Cc: Tyanne Faulkes - NOAA Federal <tyanne.faulkes@noaa.gov>, James J Miller <James.J.Miller@noaa.gov>, Patrick Debrousse - NOAA Federal <patrick.j.debrousse@noaa.gov>, Castle Parker - NOAA Federal <castle.e.parker@noaa.gov>, Starla Robinson - NOAA Federal <Starla.Robinson@noaa.gov>

Hey Nick,

Just got done talking with Gene. We're gonna try a few test lines and compare the difference before we would move forward with re-processing the entire survey. Basically, the same thing James is doing out there for you. Thanks again for looking into that.

Cheers,

Clint Marcus  
Physical Scientist  
NOAA Office of Coast Survey  
Atlantic Hydrographic Branch  
Phone: (757) 441-6746 ext 208  
Cell: (541) 264-6406

[Quoted text hidden]

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**OPS.Ferdinand Hassler - NOAA Service Account** <ops.ferdinand.hassler@noaa.gov>

Wed, Feb 8, 2017 at 7:57 AM

To: Jeffery Marshall - NOAA Federal <jeffery.marshall@noaa.gov>

Hi Jeff,

Just wanted to inform you on this....

Field Operations Officer, NOAA Ship *Ferdinand R. Hassler*  
29 Wentworth Road  
New Castle, NH, 03854

[Quoted text hidden]

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**OPS.Ferdinand Hassler - NOAA Service Account** <ops.ferdinand.hassler@noaa.gov>

Wed, Feb 8, 2017 at 7:59 AM

To: Clinton Marcus - NOAA Federal <clinton.r.marcus@noaa.gov>

Cc: Tyanne Faulkes - NOAA Federal <tyanne.faulkes@noaa.gov>, James J Miller <James.J.Miller@noaa.gov>, Patrick Debrousse - NOAA Federal <patrick.j.debrousse@noaa.gov>, Castle Parker - NOAA Federal <castle.e.parker@noaa.gov>, Starla Robinson - NOAA Federal <Starla.Robinson@noaa.gov>

2/27/2017

National Oceanic and Atmospheric Administration Mail - Project workflow for processing

Ok, James just did a comparison with some of our Wilmington data and found that the difference was ~1cm generally. It's a limited sample size but he can probably share the results with you shortly.

Field Operations Officer, NOAA Ship *Ferdinand R. Hassler*  
29 Wentworth Road  
New Castle, NH, 03854

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**Jeffery Marshall - NOAA Federal** <jeffery.marshall@noaa.gov>  
To: "OPS.Ferdinand Hassler - NOAA Service Account" <ops.ferdinand.hassler@noaa.gov>

Wed, Feb 8, 2017 at 8:35 AM

Ugh...

I would imagine there could be small differences between the ray tracing process, but also would have thought it just re-considered the SVP data that was already loaded when re-merging after the SBET and GPS Tides had been applied.

Let me know if there is anything I can do to help.

Jeff

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—  
*Jeff Marshall*  
Certified Hydrographer/Physical Scientist  
NOAA's Office of Coast Survey  
Atlantic Hydrographic Branch  
439 West York St.  
Norfolk, VA 23435  
Office Phone: 757-441-6746 ext. 109  
Telework Phone: 908-601-2940  
Email: [jeffery.marshall@noaa.gov](mailto:jeffery.marshall@noaa.gov)

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**OPS.Ferdinand Hassler - NOAA Service Account** <ops.ferdinand.hassler@noaa.gov>  
To: Jeffery Marshall - NOAA Federal <jeffery.marshall@noaa.gov>

Wed, Feb 8, 2017 at 8:41 AM

We are still trying to determine a course of action. We may end up re-applying SV to all the Wilmington data since we haven't submitted it yet (but we were so close! was just doing checksums).

Field Operations Officer, NOAA Ship *Ferdinand R. Hassler*  
29 Wentworth Road  
New Castle, NH, 03854

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**OPS.Ferdinand Hassler - NOAA Service Account** <ops.ferdinand.hassler@noaa.gov>  
To: Starla Robinson - NOAA Federal <Starla.Robinson@noaa.gov>

Wed, Feb 8, 2017 at 8:54 AM

Cc: Tyanne Faulkes - NOAA Federal <tyanne.faulkes@noaa.gov>, James J Miller <James.J.Miller@noaa.gov>, Patrick Debrousse - NOAA Federal <patrick.j.debrousse@noaa.gov>, Castle Parker - NOAA Federal <castle.e.parker@noaa.gov>, Clinton Marcus - NOAA Federal <clinton.r.marcus@noaa.gov>, CO HASSLER <co.ferdinand.hassler@noaa.gov>

Hi Starla,

I just wanted to bring you in the loop. Clint found an error in our processing workflow during a SAR of H12843 (2015 Chesapeake) that involved not re-applying SV after applying SBETs. James Miller did a test with our Wilmington data that compared data without SV after SBETs and with SV after SBETs. In his test, we found that the difference is only on the order of about 1cm. It sounds like AHB is going to run a quick test of their own to see if they get similar results. We will have to figure out a course of action on this. We expect it to be a drop in the bucket in terms of the total uncertainty but we'll see.

Let us know if you or HSD has any thoughts or recommendations on this.

Thanks,  
-Nick

Field Operations Officer, NOAA Ship *Ferdinand R. Hassler*  
29 Wentworth Road  
New Castle, NH, 03854

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**James J. Miller** <james.j.miller@noaa.gov>  
To: Clinton Marcus - NOAA Federal <clinton.r.marcus@noaa.gov>

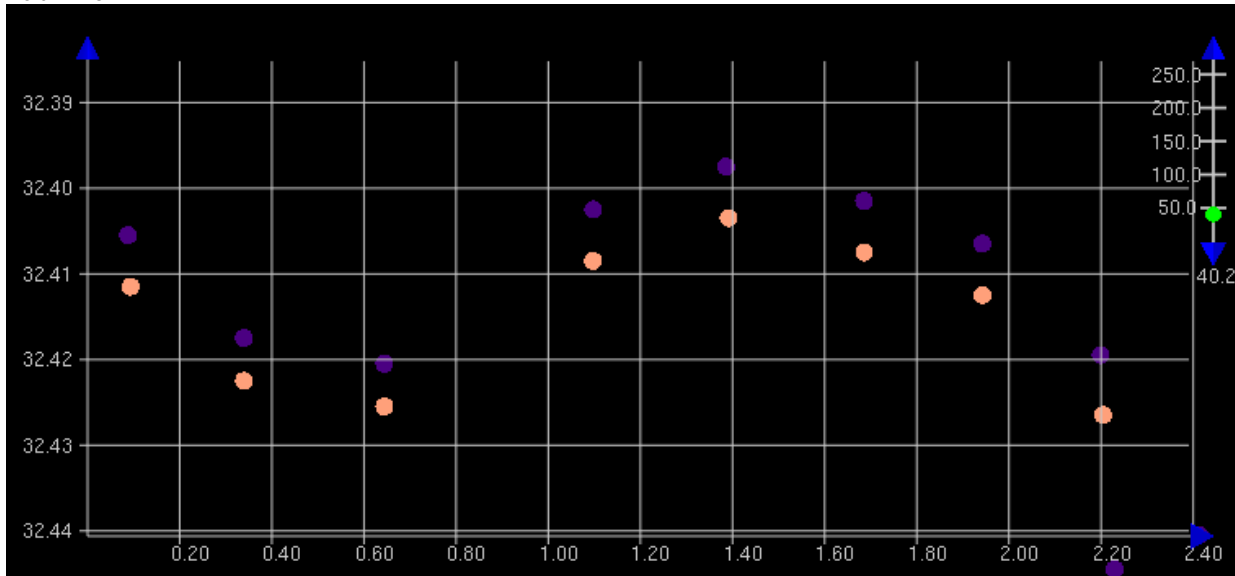
Wed, Feb 8, 2017 at 6:11 PM

Cc: "OPS.Ferdinand Hassler - NOAA Service Account" <ops.ferdinand.hassler@noaa.gov>, CO HASSLER <co.ferdinand.hassler@noaa.gov>, Starla Robinson - NOAA Federal <Starla.Robinson@noaa.gov>, Tyanne Faulkes - NOAA Federal <tyanne.faulkes@noaa.gov>, Castle Parker - NOAA Federal <castle.e.parker@noaa.gov>, John Doroba - NOAA Federal <john.doroba@noaa.gov>, Janice Eisenberg - NOAA Federal <janice.eisenberg@noaa.gov>, Grant Froelich <grant.froelich@noaa.gov>, Patrick Debroisse - NOAA Federal <patrick.j.debroisse@noaa.gov>

Hi everyone,

Thank you Clint for identifying this issue. And thank you all for clarifying that the proper workflow is to run (or re-run) SVC after loading the SBET if gyro, pitch, roll, heave or GPS height are applied. Unfortunately, this workflow was not followed during project OPR-G309-FH-16, which consists of 8 surveys and over 500 SNM of coverage. This issue is also relevant for the survey Clint is reviewing (H12843). Due to the large amount of data that is affected, it would take a significant amount of time to re-run SVC, re-Merge, re-check the designated soundings, and re-compute the grids. So in the interest of saving time, we were curious whether the problem is small enough to be documented in the DRs without reprocessing the data.

To assess the magnitude of the problem, we re-processed test copies of the crosslines for several surveys in project OPR-G309-FH-16 and conducted a comparison between running SVC before or after applying SBETs. As viewed in Subset Editor, the vertical difference between these methods did not exceed 1 cm (see image below), even in the outermost beams which exhibited larger offsets than nadir beams (as expected). Depths ranged from 20-45 m. At least from our testing on project OPR-G309-FH-16, the magnitude of the offset is small enough that reprocessing does not seem worthwhile.



Clint, what did your reprocessed test lines show on survey H12843? How large were the vertical offsets between running SVC before or after loading SBETs? Greater than 1 cm?

Thanks,  
James

James J. Miller  
Physical Scientist  
NOAA Office of Coast Survey  
Atlantic Hydrographic Branch  
439 W York St | Norfolk, VA | 23510  
757-441-6746 x 111  
[Quoted text hidden]

Clinton Marcus - NOAA Federal <clinton.r.marcus@noaa.gov>

Wed, Feb 8, 2017 at 6:32 PM

To: "James J. Miller" <james.j.miller@noaa.gov>

Cc: "OPS.Ferdinand Hassler - NOAA Service Account" <ops.ferdinand.hassler@noaa.gov>, CO HASSLER <co.ferdinand.hassler@noaa.gov>, Starla Robinson - NOAA Federal <Starla.Robinson@noaa.gov>, Tyanne Faulkes - NOAA Federal <tyanne.faulkes@noaa.gov>, Castle Parker - NOAA Federal <castle.e.parker@noaa.gov>, John Doroba - NOAA Federal <john.doroba@noaa.gov>, Janice Eisenberg - NOAA Federal <janice.eisenberg@noaa.gov>, Grant Froelich <grant.froelich@noaa.gov>, Patrick Debroisse - NOAA Federal <patrick.j.debroisse@noaa.gov>

Hi James, et. al.

I ran a small subset of lines (8) on H12843 that were development lines over a wreck. I made a local project and took the lines through the entire processing workflow and re-SVC'd after the application of SBETs. I created a combined 2m surface which I then differenced with the field submitted combined surface. The result was that 95% of nodes had a +/- 6cm difference. There were localized differences of up to 52cm over the wreck. Unfortunately, I did not difference the soundings before and after the post-SBET SVC. I believe Gene and Bri were going to talk about how to proceed with H12843.

Hope that helps in the decision making process. I don't have the data in front of me, unfortunately, so I don't have any screen grabs available. I can send some out in the morning when I get to the office.

Thanks,  
Clint



Clint Marcus  
Physical Scientist  
NOAA Office of Coast Survey  
Atlantic Hydrographic Branch  
Phone: (757) 441-6746 ext 208  
Cell: (541) 264-6406

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**OPS.Ferdinand Hassler - NOAA Service Account** <ops.ferdinand.hassler@noaa.gov>

Wed, Feb 8, 2017 at 8:00 PM

To: Clinton Marcus - NOAA Federal <clinton.r.marcus@noaa.gov>

Cc: "James J. Miller" <james.j.miller@noaa.gov>, CO HASSLER <co.ferdinand.hassler@noaa.gov>, Starla Robinson - NOAA Federal <Starla.Robinson@noaa.gov>, Tyanne Faulkes - NOAA Federal <tyanne.faulkes@noaa.gov>, Castle Parker - NOAA Federal <castle.e.parker@noaa.gov>, John Doroba - NOAA Federal <john.doroba@noaa.gov>, Janice Eisenberg - NOAA Federal <janice.eisenberg@noaa.gov>, Grant Froelich <grant.froelich@noaa.gov>, Patrick Debroisse - NOAA Federal <patrick.j.debroisse@noaa.gov>

Clint,  
Thanks for for the extra analysis. The 52 cm around the wreck is alarming to me at first notice compared to the rest. Do you know what quality the soundings were that had that large difference? Are we talking extreme outer beams? Are there other soundings that may be more reliable on the shoalest portion of the feature that agree better? If not we may have to go ahead and reprocess our Wilmington surveys to be sure. At the very least reexamine our features in Wilmington.

Fun first SAR eh?

Nick

On Feb 8, 2017, at 6:32 PM, Clinton Marcus - NOAA Federal <clinton.r.marcus@noaa.gov> wrote:

Hi James, et. al.

I ran a small subset of lines (8) on H12843 that were development lines over a wreck. I made a local project and took the lines through the entire processing workflow and re-SVC'd after the application of SBETs. I created a combined 2m surface which I then differenced with the field submitted combined surface. The result was that 95% of nodes had a +/- 6cm difference. There were localized differences of up to 52cm over the wreck. Unfortunately, I did not difference the soundings before and after the post-SBET SVC. I believe Gene and Bri were going to talk about how to proceed with H12843.

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Thanks,  
Clint

Clint Marcus  
Physical Scientist  
NOAA Office of Coast Survey  
Atlantic Hydrographic Branch  
Phone: (757) 441-6746 ext 208  
Cell: (541) 264-6406

On Wed, Feb 8, 2017 at 6:11 PM, James J. Miller <james.j.miller@noaa.gov> wrote:

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To assess the magnitude of the problem, we re-processed test copies of the crosslines for several surveys in project OPR-G309-FH-16 and conducted a comparison between running SVC before or after applying SBETs. As viewed in Subset Editor, the vertical difference between these methods did not exceed 1 cm (see image below), even in the outermost beams which exhibited larger offsets than nadir beams (as expected). Depths ranged from 20-45 m. At least from our testing on project OPR-G309-FH-16, the magnitude of the offset is small enough that reprocessing does not seem worthwhile.

<2017-02-08\_17-14-54.png>

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Thanks,  
James

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**OPS.Ferdinand Hassler - NOAA Service Account** <ops.ferdinand.hassler@noaa.gov>

Wed, Feb 8, 2017 at 8:26 PM

To: Clinton Marcus - NOAA Federal <clinton.r.marcus@noaa.gov>

Cc: "James J. Miller" <james.j.miller@noaa.gov>, CO HASSLER <co.ferdinand.hassler@noaa.gov>, Starla Robinson - NOAA Federal <Starla.Robinson@noaa.gov>, Tyanne Faulkes - NOAA Federal <tyanne.faulkes@noaa.gov>, Castle Parker - NOAA Federal

2/27/2017

National Oceanic and Atmospheric Administration Mail - Project workflow for processing

<castle.e.parker@noaa.gov>, John Doroba - NOAA Federal <john.doroba@noaa.gov>, Janice Eisenberg - NOAA Federal <janice.eisenberg@noaa.gov>, Grant Froelich <grant.froelich@noaa.gov>, Patrick Debroisse - NOAA Federal <patrick.j.debroisse@noaa.gov>

Also, it could be possible that a horizontal change in position of the soundings could exacerbate the vertical difference in a sharp feature like a wreck but correct me if I'm wrong.

Nick

On Feb 8, 2017, at 6:32 PM, Clinton Marcus - NOAA Federal <clinton.r.marcus@noaa.gov> wrote:

Hi James, et. al.

I ran a small subset of lines (8) on H12843 that were development lines over a wreck. I made a local project and took the lines through the entire processing workflow and re-SVC'd after the application of SBETs. I created a combined 2m surface which I then differenced with the field submitted combined surface. The result was that 95% of nodes had a +/- 6cm difference. There were localized differences of up to 52cm over the wreck. Unfortunately, I did not difference the soundings before and after the post-SBET SVC. I believe Gene and Bri were going to talk about how to proceed with H12843.

Hope that helps in the decision making process. I don't have the data in front of me, unfortunately, so I don't have any screen grabs available. I can send some out in the morning when I get to the office.

Thanks,  
Clint

Clint Marcus  
Physical Scientist  
NOAA Office of Coast Survey  
Atlantic Hydrographic Branch  
Phone: (757) 441-6746 ext 208  
Cell: (541) 264-6406

On Wed, Feb 8, 2017 at 6:11 PM, James J. Miller <james.j.miller@noaa.gov> wrote:

Hi everyone,

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<2017-02-08\_17-14-54.png>

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Thanks,  
James

[Quoted text hidden]

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**Clinton Marcus - NOAA Federal** <clinton.r.marcus@noaa.gov>

Thu, Feb 9, 2017 at 7:42 AM

To: "OPS.Ferdinand Hassler - NOAA Service Account" <ops.ferdinand.hassler@noaa.gov>

Cc: "James J. Miller" <james.j.miller@noaa.gov>, CO HASSLER <co.ferdinand.hassler@noaa.gov>, Starla Robinson - NOAA Federal <Starla.Robinson@noaa.gov>, Tyanne Faulkes - NOAA Federal <tyanne.faulkes@noaa.gov>, Castle Parker - NOAA Federal <castle.e.parker@noaa.gov>, John Doroba - NOAA Federal <john.doroba@noaa.gov>, Janice Eisenberg - NOAA Federal <janice.eisenberg@noaa.gov>, Grant Froelich <grant.froelich@noaa.gov>, Patrick Debroisse - NOAA Federal <patrick.j.debroisse@noaa.gov>

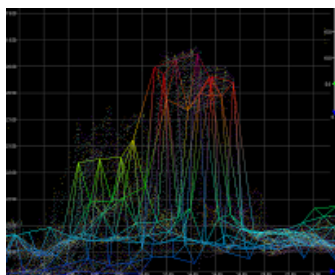
Hi Nick,

With the soundings all being from development lines, there is good parity within the data. The soundings were for the most part all of a Quality Flag of 3. We are going to process another subset of H12843 to help validate our findings. The screen shot attached is of a subset over the wreck showing the density of soundings. We'll keep you posted with our findings.

Cheers,

Clint Marcus  
Physical Scientist  
NOAA Office of Coast Survey  
Atlantic Hydrographic Branch  
Phone: (757) 441-6746 ext 208  
Cell: (541) 264-6406

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**H12843 Validation subset 2D.png**  
156K

**James J. Miller** <james.j.miller@noaa.gov>

Thu, Feb 9, 2017 at 9:12 AM

To: Clinton Marcus - NOAA Federal <clinton.r.marcus@noaa.gov>

Cc: "OPS.Ferdinand Hassler - NOAA Service Account" <ops.ferdinand.hassler@noaa.gov>, CO HASSLER <co.ferdinand.hassler@noaa.gov>, Starla Robinson - NOAA Federal <Starla.Robinson@noaa.gov>, Tyanne Faulkes - NOAA Federal <tyanne.faulkes@noaa.gov>, Castle Parker - NOAA Federal <castle.e.parker@noaa.gov>, John Doroba - NOAA Federal <john.doroba@noaa.gov>, Janice Eisenberg - NOAA Federal <janice.eisenberg@noaa.gov>, Grant Froelich <grant.froelich@noaa.gov>, Patrick Debroisse - NOAA Federal <patrick.j.debroisse@noaa.gov>

Hi Clint,

Thanks for all the helpful information and screen shots. For your next test subset, I think it would be worth comparing the original survey lines (re-SVC not conducted after SBETs) to the test lines at the sounding level in Subset Editor. When comparing surfaces, they often exhibit apparent vertical differences along slopes and features due to small horizontal shifts, rather than actual vertical changes. We are curious about the magnitude of the vertical difference between the soundings.

Even though survey H12859 was not affected by this issue because SVC was run after loading SBETs, we conducted a test because it is in the vicinity of H12843. We re-processed test copies of the H12859 crosslines and did not re-SVC after loading SBETs. As viewed in Subset Editor, the vertical difference between processing methods mostly ranged from 2-3 cm and reached a maximum of 5 cm in some areas. This seems similar to the H12843 difference surface where you found that 95% of nodes were +/- 6 cm.



I will follow your lead and try testing a couple features on H12859 and the OPR-G309-FH-16 surveys. Worth checking how the least depths are affected.

James J. Miller  
Physical Scientist  
NOAA Office of Coast Survey  
Atlantic Hydrographic Branch  
439 W York St | Norfolk, VA | 23510  
757-441-6746 x 111

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**Clinton Marcus - NOAA Federal** <clinton.r.marcus@noaa.gov>

Thu, Feb 9, 2017 at 12:23 PM

To: "James J. Miller" <james.j.miller@noaa.gov>

Cc: "OPS.Ferdinand Hassler - NOAA Service Account" <ops.ferdinand.hassler@noaa.gov>, CO HASSLER <co.ferdinand.hassler@noaa.gov>, Starla Robinson - NOAA Federal <Starla.Robinson@noaa.gov>, Tyanne Faulkes - NOAA Federal <tyanne.faulkes@noaa.gov>, Castle Parker - NOAA Federal <castle.e.parker@noaa.gov>, John Doroba - NOAA Federal <john.doroba@noaa.gov>, Janice Eisenberg - NOAA Federal <janice.eisenberg@noaa.gov>, Grant Froelich <grant.froelich@noaa.gov>, Patrick Debroisse - NOAA Federal <patrick.j.debroisse@noaa.gov>

Hi all,

After taking another sub-section of H12843 for reprocessing, it was found that 95% of the nodes were +/- 2cm. I will go so far as to say the difference would likely be even smaller if I had filtered the one XL present, which is what the FH did (I believe).

I took a total of 37 lines in an area of general bathymetry (no features) and followed the same procedure as previously noted. Taking the data from conversion thru SBETs, and re-applying SVC after SBETs.

Looking at the data in subset, there was little to no difference between the two projects.

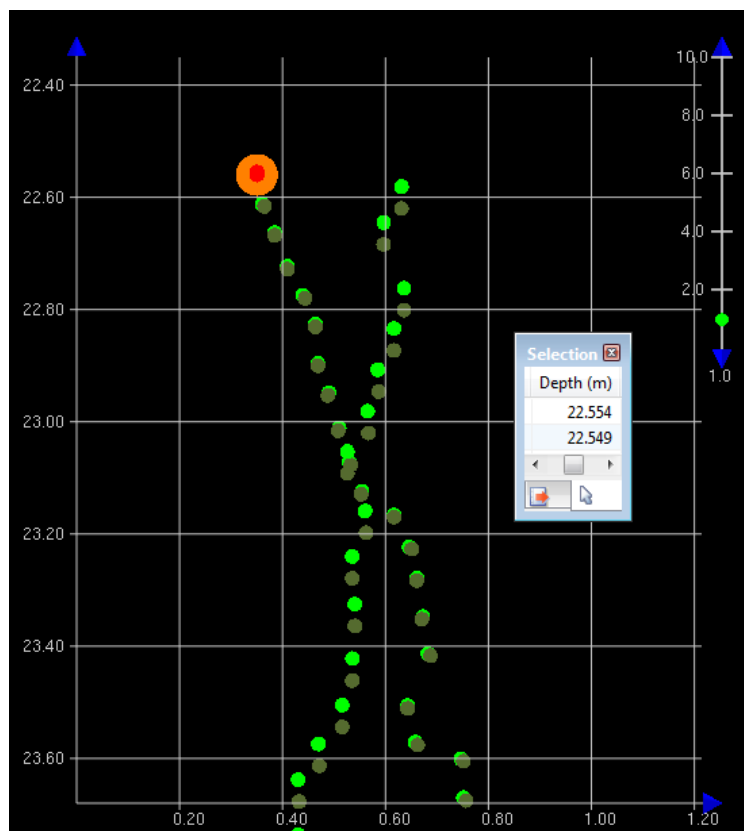
After talking with Gene, we determined that it would not be necessary to reprocess the entire survey for such a small difference. Yay!

You might want to just double check with them (CO, Gene, Bri), but I don't think it is necessary for you to go back and reprocess the OPR-G309-FH-16 data.

Hope this all helped.

Cheers,  
Clint Marcus  
Physical Scientist  
NOAA Office of Coast Survey  
Atlantic Hydrographic Branch  
Phone: (757) 441-6746 ext 208  
Cell: (541) 264-6406





Survey H12932 (OPR-G309-FH-16) has one wreck that we tested. The vertical differences between processing methods were even smaller, ranging from 0.004 - 0.010 m. The least depth of the wreck would change by 0.004 m depending on the processing method.

We are relieved that preprocessing appears to be unnecessary for H12843 and OPR-G309-FH-16. Thanks again for identifying this problem and helping with the testing.

Thanks,  
James

James J. Miller  
Physical Scientist  
NOAA Office of Coast Survey  
Atlantic Hydrographic Branch  
439 W York St | Norfolk, VA | 23510  
[757-441-6746 x 111](tel:757-441-6746)

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**Starla Robinson - NOAA Federal** <starla.robinson@noaa.gov>

Mon, Feb 13, 2017 at 5:46 PM

To: "OPS.Ferdinand Hassler - NOAA Service Account" <ops.ferdinand.hassler@noaa.gov>, CO HASSLER <co.ferdinand.hassler@noaa.gov>

Cc: Clinton Marcus - NOAA Federal <clinton.r.marcus@noaa.gov>, Tyanne Faulkes - NOAA Federal <tyanne.faulkes@noaa.gov>, Castle Parker - NOAA Federal <castle.e.parker@noaa.gov>, John Doroba - NOAA Federal <john.doroba@noaa.gov>, Janice Eisenberg - NOAA Federal <janice.eisenberg@noaa.gov>, Grant Froelich <grant.froelich@noaa.gov>, Patrick Debrousse - NOAA Federal <patrick.j.debrousse@noaa.gov>, "James J. Miller" <james.j.miller@noaa.gov>

HSD understands the desire to not reprocess this data, however after much soul searching and deliberation including consultation with the Chief of HSD... reprocess the data. The TVU budget is not for blunders. Captain Brennan has requested that the ship provide a plan on how to resolve this in a timely manner.

To help speed things up, we think you could do a difference surface of the final surfaces with the previous products. By showing there is no statistically significant difference between the two surfaces, you could make the argument that the analysis (cross-lines, junctions, and chart comparisons) does not need to be redone. HSD can then issue a waiver concurring with this.

Sincerely,  
Starla

[Quoted text hidden]

Starla D. Robinson, Physical Scientist  
NOS - OCS - Hydrographic Survey Division - Operations Branch  
National Oceanic Atmospheric Administration  
Office: 301-713-2702 x125

Cell: 360-689-1431

Website: [HSD Planned Hydrographic Surveys](#)

---

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

Mon, Feb 13, 2017 at 5:52 PM

To: CO HASSLER &lt;co.ferdinand.hassler@noaa.gov&gt;, "OPS.Ferdinand Hassler - NOAA Service Account" &lt;ops.ferdinand.hassler@noaa.gov&gt;, Starla Robinson - NOAA Federal &lt;starla.robinson@noaa.gov&gt;

Cc: Castle Parker - NOAA Federal &lt;castle.e.parker@noaa.gov&gt;, Clinton Marcus - NOAA Federal &lt;clinton.r.marcus@noaa.gov&gt;, Grant Froelich &lt;grant.froelich@noaa.gov&gt;, "James J. Miller" &lt;james.j.miller@noaa.gov&gt;, Janice Eisenberg - NOAA Federal &lt;janice.eisenberg@noaa.gov&gt;, John Doroba - NOAA Federal &lt;john.doroba@noaa.gov&gt;, Patrick Debrousse - NOAA Federal &lt;patrick.j.debrousse@noaa.gov&gt;

I am currently out sick. When I get back to the office I will talk to Ben to see if I can work with AHB and the FH to fix the surveys that I was survey manager on (I think there were three).

Tyanne

[Quoted text hidden]

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**James J. Miller** <james.j.miller@noaa.gov>

Mon, Feb 13, 2017 at 6:34 PM

To: Starla Robinson - NOAA Federal &lt;starla.robinson@noaa.gov&gt;

Cc: Tyanne Faulkes - NOAA Federal &lt;tyanne.faulkes@noaa.gov&gt;, CO HASSLER &lt;co.ferdinand.hassler@noaa.gov&gt;, "OPS.Ferdinand Hassler - NOAA Service Account" &lt;ops.ferdinand.hassler@noaa.gov&gt;, Castle Parker - NOAA Federal &lt;castle.e.parker@noaa.gov&gt;, Clinton Marcus - NOAA Federal &lt;clinton.r.marcus@noaa.gov&gt;, Grant Froelich &lt;grant.froelich@noaa.gov&gt;, Janice Eisenberg - NOAA Federal &lt;janice.eisenberg@noaa.gov&gt;, John Doroba - NOAA Federal &lt;john.doroba@noaa.gov&gt;, Patrick Debrousse - NOAA Federal &lt;patrick.j.debrousse@noaa.gov&gt;

If this exact same situation applied to a contractor, would OPS require the contractor to re-process the data?

The error predominantly ranges from 0.5 - 1cm, with the occasional difference reaching 4cm. The vast majority of the project coverage will only affect a small-scale fathoms chart (1:432,000) where the error is unlikely to change the rounded depths on the chart. Processing and personnel resources are limited on the Hassler. Do we really think it is prudent and worthwhile to spend our limited time this way?

James J. Miller

Physical Scientist

NOAA Office of Coast Survey

Atlantic Hydrographic Branch

439 W York St | Norfolk, VA | 23510

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---

**Starla Robinson - NOAA Federal** <starla.robinson@noaa.gov>

Mon, Feb 13, 2017 at 7:17 PM

To: "James J. Miller" &lt;james.j.miller@noaa.gov&gt;, "russell.quintero" &lt;russell.quintero@noaa.gov&gt;, Briana Welton - NOAA Federal &lt;briana.welton@noaa.gov&gt;, CO HASSLER &lt;co.ferdinand.hassler@noaa.gov&gt;, "OPS.Ferdinand Hassler - NOAA Service Account" &lt;ops.ferdinand.hassler@noaa.gov&gt;

Cc: Tyanne Faulkes - NOAA Federal &lt;tyanne.faulkes@noaa.gov&gt;, Castle Parker - NOAA Federal &lt;castle.e.parker@noaa.gov&gt;, Clinton Marcus - NOAA Federal &lt;clinton.r.marcus@noaa.gov&gt;, Grant Froelich &lt;grant.froelich@noaa.gov&gt;, Janice Eisenberg - NOAA Federal &lt;janice.eisenberg@noaa.gov&gt;, John Doroba - NOAA Federal &lt;john.doroba@noaa.gov&gt;, Patrick Debrousse - NOAA Federal &lt;patrick.j.debrousse@noaa.gov&gt;

Precisely James, we would have the contractor fix it. We had a contractor resubmit a year's worth of data for having the wrong TVU values. It was an error. It had to be fixed.

Given the amount of effort we all put into this it is hard to have this delay. Correcting blunders is a cost of doing business, regardless of whether a contractor or a ship is responsible for the product. I know we are eager for the finish line but it is a bit further. I have added CMD Welton and LT Quintero in case they have any ideas to add to how we can help get there.

Sincerely,

Starla

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---

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

Mon, Feb 13, 2017 at 7:30 PM

To: Briana Welton - NOAA Federal &lt;briana.welton@noaa.gov&gt;, CO HASSLER &lt;co.ferdinand.hassler@noaa.gov&gt;, "James J. Miller" &lt;james.j.miller@noaa.gov&gt;, "OPS.Ferdinand Hassler - NOAA Service Account" &lt;ops.ferdinand.hassler@noaa.gov&gt;, Starla Robinson - NOAA Federal &lt;starla.robinson@noaa.gov&gt;, "russell.quintero" &lt;russell.quintero@noaa.gov&gt;

Cc: Castle Parker - NOAA Federal &lt;castle.e.parker@noaa.gov&gt;, Clinton Marcus - NOAA Federal &lt;clinton.r.marcus@noaa.gov&gt;, Grant Froelich &lt;grant.froelich@noaa.gov&gt;, Janice Eisenberg - NOAA Federal &lt;janice.eisenberg@noaa.gov&gt;, John Doroba - NOAA Federal &lt;john.doroba@noaa.gov&gt;, Patrick Debrousse - NOAA Federal &lt;patrick.j.debrousse@noaa.gov&gt;

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Precisely James, we would have the contractor fix it. We had a contractor resubmit a year's worth of data for having the wrong TVU values. It was an error. It had to be fixed.

Given the amount of effort we all put into this it is hard to have this delay. Correcting blunders is a cost of doing business, regardless of whether a contractor or a ship is responsible for the product. I know we are eager for the finish line but it is a bit further. I have added CMD Welton and LT Quintero in case they have any ideas to add to how we can help get there.

Sincerely,  
Starla

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James J. Miller  
Physical Scientist  
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439 W York St | Norfolk, VA | 23510  
[757-441-6746](tel:757-441-6746) x 111

On Mon, Feb 13, 2017 at 5:52 PM, Tyanne Faulkes - NOAA Federal <[tyanne.faulkes@noaa.gov](mailto:tyanne.faulkes@noaa.gov)> wrote:

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HSD understands the desire to not reprocess this data, however after much soul searching and deliberation including consultation with the Chief of HSD... reprocess the data. The TVU budget is not for blunders. Captain Brennan has requested that the ship provide a plan on how to resolve this in a timely manner.

To help speed things up, we think you could do a difference surface of the final surfaces with the previous products. By showing there is no statistically significant difference between the two surfaces, you could make the argument that the analysis (cross-lines, junctions, and chart comparisons) does not need to be redone. HSD can then issue a waiver concurring with this.

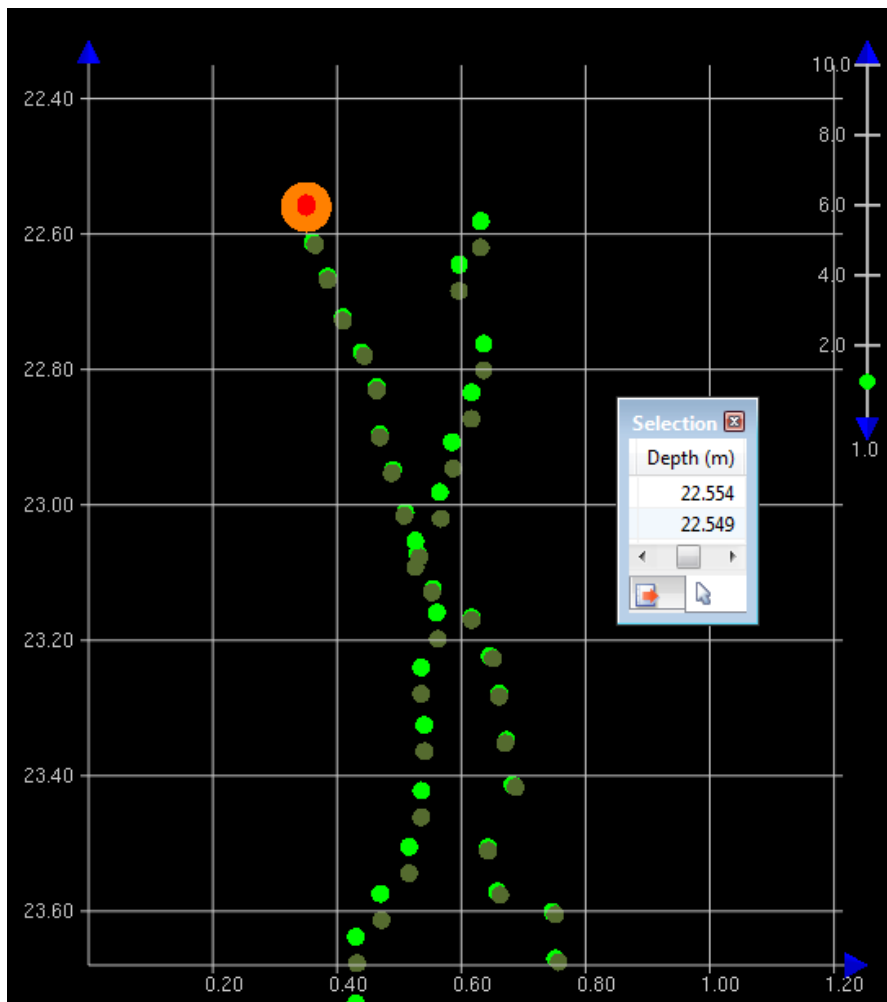
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Looking at the data in subset, there was little to no difference between the two projects.

After talking with Gene, we determined that it would not be necessary to reprocess the entire survey for such a small difference. Yay!

You might want to just double check with them (CO, Gene, Bri), but I don't think it is necessary for you to go back and reprocess the OPR-G309-FH-16 data.

Hope this all helped.

Cheers,  
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Physical Scientist



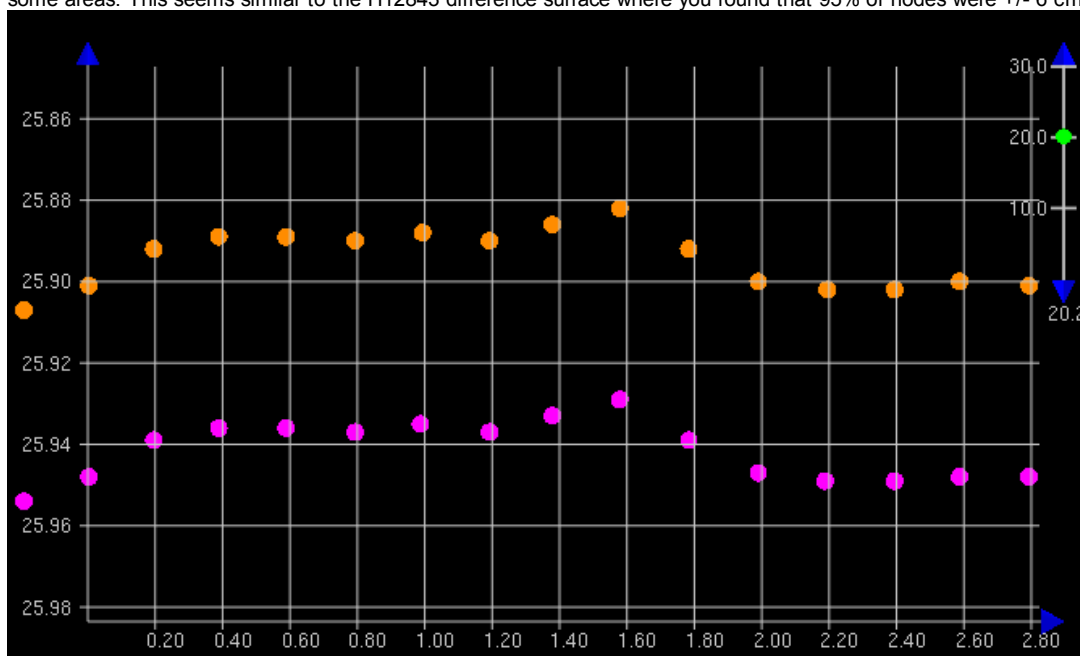
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On Wed, Feb 8, 2017 at 8:26 PM, OPS.Ferdinand Hassler - NOAA Service Account <ops.ferdinand.hassler@noaa.gov> wrote:

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Nick

On Feb 8, 2017, at 6:32 PM, Clinton Marcus - NOAA Federal <clinton.r.marcus@noaa.gov> wrote:

Hi James, et. al.

I ran a small subset of lines (8) on H12843 that were development lines over a wreck. I made a local project and took the lines through the entire processing workflow and re-SVC'd after the application of SBETs. I created a combined 2m surface which I then differenced with the field submitted combined surface. The result was that 95% of nodes had a +/- 6cm difference. There were localized differences of up to 52cm over the wreck. Unfortunately, I did not difference the soundings before and after the post-SBET SVC. I believe Gene and Bri were going to talk about how to proceed with H12843.

Hope that helps in the decision making process. I don't have the data in front of me, unfortunately, so I don't have any screen grabs available. I can send some out in the morning when I get to the office.

Thanks,  
Clint

Clint Marcus  
Physical Scientist  
NOAA Office of Coast Survey  
Atlantic Hydrographic Branch  
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On Wed, Feb 8, 2017 at 6:11 PM, James J. Miller <[james.j.miller@noaa.gov](mailto:james.j.miller@noaa.gov)> wrote:

Hi everyone,

Thank you Clint for identifying this issue. And thank you all for clarifying that the proper workflow is to run (or re-run) SVC after loading the SBET if gyro, pitch, roll, heave or GPS height are applied. Unfortunately, this workflow was not followed during project OPR-G309-FH-16, which consists of 8 surveys and over 500 SNM of coverage. This issue is also relevant for the survey Clint is reviewing (H12843). Due to the large amount of data that is affected, it would take a significant amount of time to re-run SVC, re-Merge, re-check the designated soundings, and re-compute the grids. So in the interest of saving time, we were curious whether the problem is small enough to be documented in the DRs without reprocessing the data.

To assess the magnitude of the problem, we re-processed test copies of the crosslines for several surveys in project OPR-G309-FH-16 and conducted a comparison between running SVC before or after applying SBETs. As viewed in Subset Editor, the vertical difference between these methods did not exceed 1 cm (see image below), even in the outermost beams which exhibited larger offsets than nadir beams (as expected). Depths ranged from 20-45 m. At least from our testing on project OPR-G309-FH-16, the magnitude of the offset is small enough that reprocessing does not seem worthwhile.

<2017-02-08\_17-14-54.png>

Clint, what did your reprocessed test lines show on survey H12843? How large were the vertical offsets between running SVC before or after loading SBETs? Greater than 1 cm?

Thanks,  
James

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Physical Scientist  
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On Wed, Feb 8, 2017 at 8:54 AM, OPS.Ferdinand Hassler - NOAA Service Account

<[ops.ferdinand.hassler@noaa.gov](mailto:ops.ferdinand.hassler@noaa.gov)> wrote:

Hi Starla,

I just wanted to bring you in the loop. Clint found an error in our processing workflow during a SAR of H12843 (2015 Chesapeake) that involved not re-applying SV after applying SBETs. James Miller did a test with our Wilmington data that compared data without SV after SBETs and with SV after SBETs. In his test, we found that the difference is only on the order of about 1cm. It sounds like AHB is going to run a quick test of their own to see if they get similar results. We will have to figure out a course of action on this. We expect it to be a drop in the bucket in terms of the total uncertainty but we'll see.

Let us know if you or HSD has any thoughts or recommendations on this.

Thanks,  
-Nick

Field Operations Officer, NOAA Ship *Ferdinand R. Hassler*  
29 Wentworth Road  
New Castle, NH, 03854

On Wed, Feb 8, 2017 at 7:59 AM, OPS.Ferdinand Hassler - NOAA Service Account

<[ops.ferdinand.hassler@noaa.gov](mailto:ops.ferdinand.hassler@noaa.gov)> wrote:

Ok, James just did a comparison with some of our Wilmington data and found that the difference was ~1cm generally. It's a limited sample size but he can probably share the results with you shortly.

Field Operations Officer, NOAA Ship *Ferdinand R. Hassler*  
29 Wentworth Road  
New Castle, NH, 03854

On Wed, Feb 8, 2017 at 7:00 AM, Clinton Marcus - NOAA Federal <[clinton.r.marcus@noaa.gov](mailto:clinton.r.marcus@noaa.gov)> wrote:

Hey Nick,  
Just got done talking with Gene. We're gonna try a few test lines and compare the difference before we would move forward with re-processing the entire survey. Basically, the same thing James is doing out there for you. Thanks again for looking into that.

Cheers,

Clint Marcus  
Physical Scientist  
NOAA Office of Coast Survey  
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On Tue, Feb 7, 2017 at 4:51 PM, OPS.Ferdinand Hassler - NOAA Service Account <[ops.ferdinand.hassler@noaa.gov](mailto:ops.ferdinand.hassler@noaa.gov)> wrote:

So we got a quick response from Caris that SVC does need to happen after applying new attitude/nav data such as an SBET. I did a quick check of our 2016 Chesapeake Surveys and those seem to be processed that way so that's good. However, our 2016 Wilmington surveys are all processed without SVC after SBETs. I believe we may end up going back for those and re-applying SV. James is doing a brief comparison to see what kind of difference we see in the data between the two. I imagine though that it varies survey to survey as to how different your SBET is from your original POS data.

-Nick

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On Tue, Feb 7, 2017 at 2:35 PM, Tyanne Faulkes - NOAA Federal <[tyanne.faulkes@noaa.gov](mailto:tyanne.faulkes@noaa.gov)> wrote:  
Hi all,

As far as I remember SVC is not required again unless you are using a Kongsberg system. I will try to dig up the email if I have one...

Tyanne

On Tue, Feb 7, 2017 at 11:34 AM, Clinton Marcus - NOAA Federal <[clinton.r.marcus@noaa.gov](mailto:clinton.r.marcus@noaa.gov)> wrote:

Thanks for the quick reply. I'll be standing by to see what CARIS has to say. Thanks again.

Cheers,

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Hi Clint,

We are going to check into it with Caris to see exactly how it affects things. Pat Berube did all the processing on this survey and since he was of the FA processing mold, I have to believe that he might have cut that step out for a reason (I HOPE). We are going to contact Caris and find out so standby. LTJG Debrousse is aboard and seems to remember hearing that Caris mentioned that it's not necessary but the FA still went through the step anyhow.

Anyways, James Miller is currently inquiring with Caris.

-Nick

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On Tue, Feb 7, 2017 at 1:36 PM, Clinton Marcus - NOAA Federal <[clinton.r.marcus@noaa.gov](mailto:clinton.r.marcus@noaa.gov)> wrote:

Hi Nick and Jonathan,

I had a question about your processing workflow on the Hassler. Is it standard procedure to only apply SVC once? I ask because I'm noticing that SV was not reapplied at any time after loading SBETs. In my experience, and according to CARIS, it has been standard to re-SVC any time Attitude (heave, pitch, roll) have been edited or updated as it is affecting the ray-trace.

I also noticed that after applying the verified tides, that the data was not merged w/o GPS Tide. This isn't really an issue, unless there was a difference surface made to validate the VDatum model.

Let me know if you have any questions about my train of thought here. It may be the empty stomach affecting my thought process.

Thanks for all the clarification and quick turn-arounds on my questions. Hope the survey is going well out there.

Sincerely,  
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Mon, Feb 13, 2017 at 7:48 PM

To: Tyenne Faulkes - NOAA Federal <tyenne.faulkes@noaa.gov>

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I agree with Tyenne. The magnitude of the error is well within the sound speed error budget of 0.30m plus 0.5% of depth (2016 HSSD Section 5.2.3.5). All surveys contain errors and blunders. What matters is whether the error exceeds the specs.

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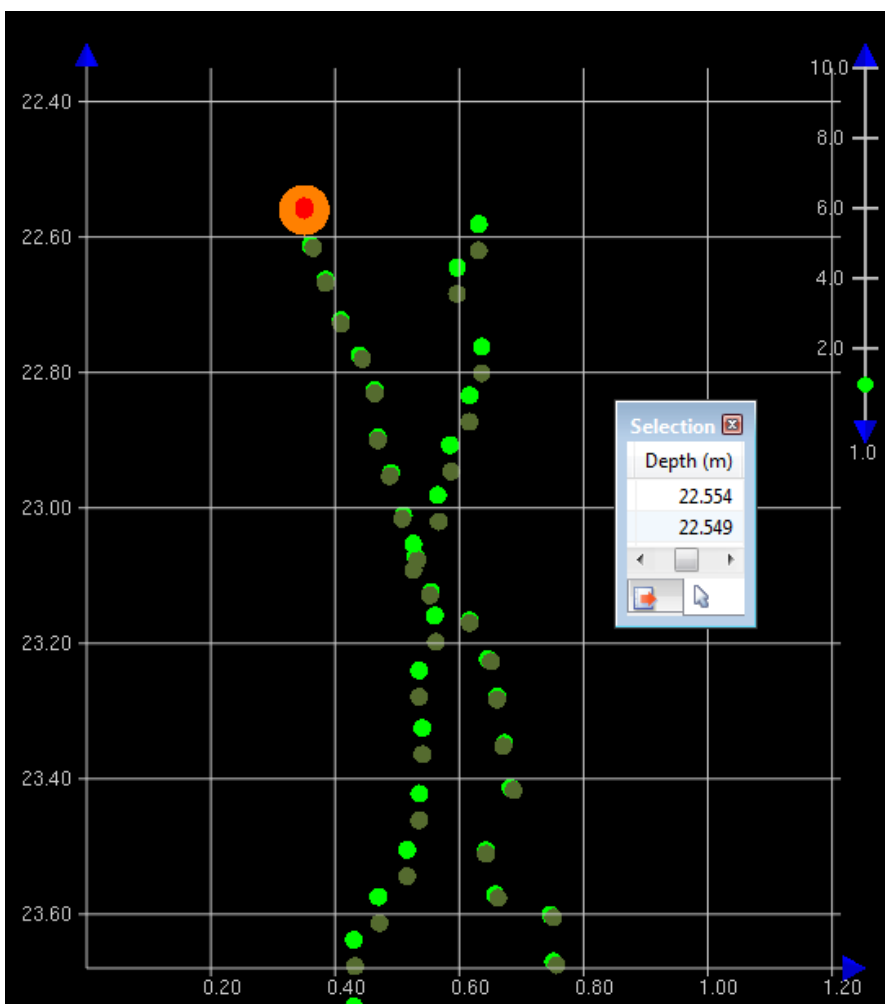
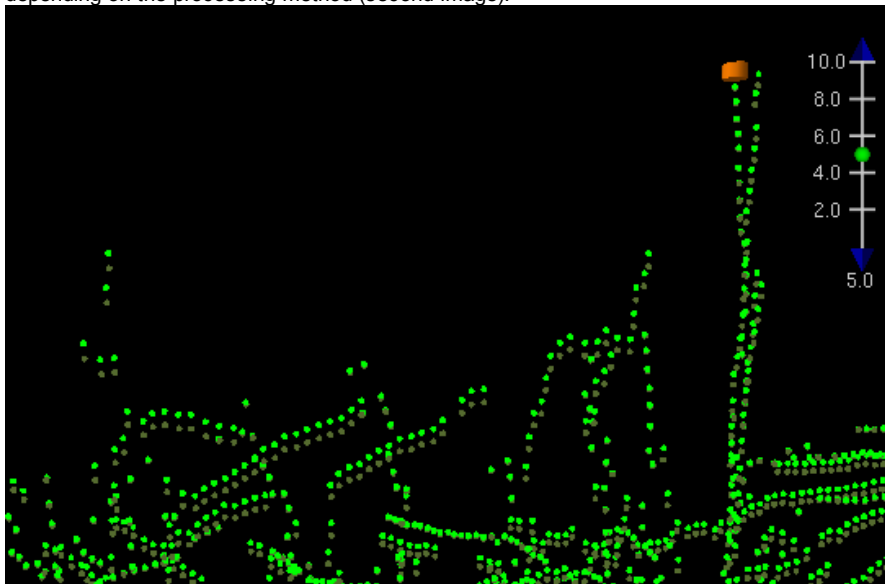
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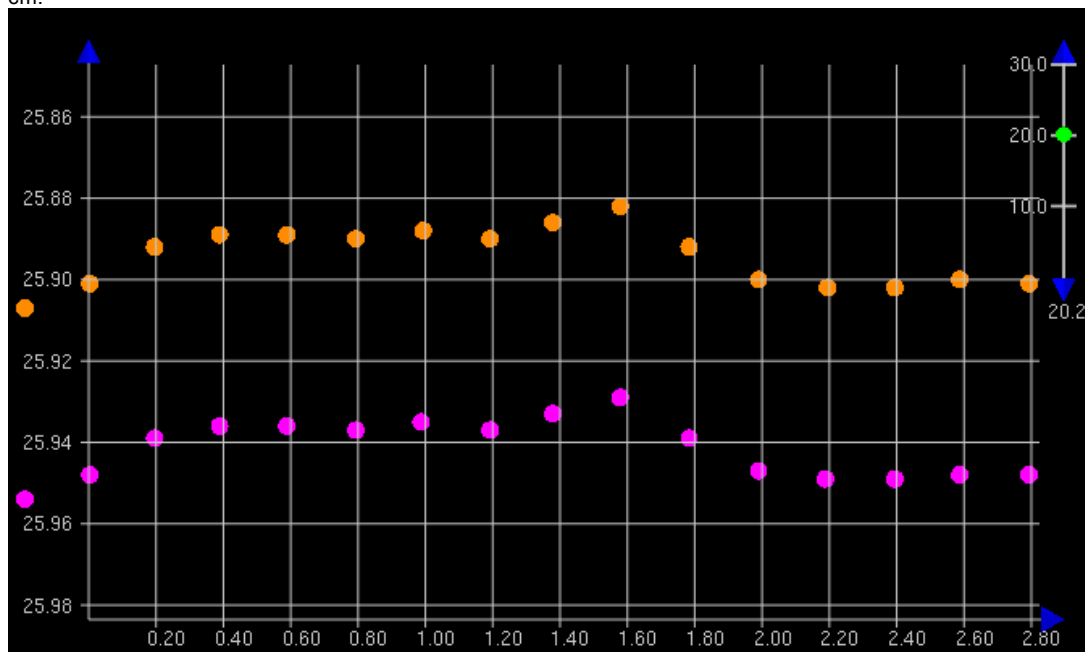
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I ran a small subset of lines (8) on H12843 that were development lines over a wreck. I made a local project and took the lines through the entire processing workflow and re-SVC'd after the application of SBETs. I created a combined 2m surface which I then differenced with the field submitted combined surface. The result was that 95% of nodes had a +/- 6cm difference. There were localized differences of up to 52cm over the wreck. Unfortunately, I did not difference the soundings before and after the post-SBET SVC. I believe Gene and Bri were going to talk about how to proceed with H12843.

Hope that helps in the decision making process. I don't have the data in front of me, unfortunately, so I don't have any screen grabs available. I can send some out in the morning when I get to the office.

Thanks,  
Clint

Clint Marcus  
Physical Scientist  
NOAA Office of Coast Survey  
Atlantic Hydrographic Branch  
Phone: [757-441-6746](tel:757-441-6746) ext 208  
Cell: [541-264-6406](tel:541-264-6406)

On Wed, Feb 8, 2017 at 6:11 PM, James J. Miller <[james.j.miller@noaa.gov](mailto:james.j.miller@noaa.gov)> wrote:

Hi everyone,

Thank you Clint for identifying this issue. And thank you all for clarifying that the proper workflow is to run (or re-run) SVC after loading the SBET if gyro, pitch, roll, heave or GPS height are applied. Unfortunately, this workflow was not followed during project OPR-G309-FH-16, which consists of 8 surveys and over 500 SNM of coverage. This issue is also relevant for the survey Clint is reviewing (H12843). Due to the large amount of data that is affected, it would take a significant amount of time to re-run SVC, re-Merge, re-check the designated soundings, and re-compute the grids. So in the interest of saving time, we were curious whether the problem is small enough to be documented in the DRs without reprocessing the data.

To assess the magnitude of the problem, we re-processed test copies of the crosslines for several surveys in project OPR-G309-FH-16 and conducted a comparison between running SVC before or after applying SBETs. As viewed in Subset Editor, the vertical difference between these methods did not exceed 1 cm (see image below), even in the outermost beams which exhibited larger offsets than nadir beams (as expected). Depths ranged from 20-45 m. At least from our testing on project OPR-G309-FH-16, the magnitude of the offset is small enough that reprocessing does not seem worthwhile.

<2017-02-08\_17-14-54.png>



Clint, what did your reprocessed test lines show on survey H12843? How large were the vertical offsets between running SVC before or after loading SBETs? Greater than 1 cm?

Thanks,  
James

James J. Miller  
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On Wed, Feb 8, 2017 at 8:54 AM, OPS.Ferdinand Hassler - NOAA Service Account <[ops.ferdinand.hassler@noaa.gov](mailto:ops.ferdinand.hassler@noaa.gov)> wrote:

Hi Starla,

I just wanted to bring you in the loop. Clint found an error in our processing workflow during a SAR of H12843 (2015 Chesapeake) that involved not re-applying SV after applying SBETs. James Miller did a test with our Wilmington data that compared data without SV after SBETs and with SV after SBETs. In his test, we found that the difference is only on the order of about 1cm. It sounds like AHB is going to run a quick test of their own to see if they get similar results. We will have to figure out a course of action on this. We expect it to be a drop in the bucket in terms of the total uncertainty but we'll see.

Let us know if you or HSD has any thoughts or recommendations on this.

Thanks,  
-Nick

Field Operations Officer, NOAA Ship *Ferdinand R. Hassler*  
29 Wentworth Road  
New Castle, NH, 03854

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Ok, James just did a comparison with some of our Wilmington data and found that the difference was ~1cm generally. It's a limited sample size but he can probably share the results with you shortly.

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Hey Nick,

Just got done talking with Gene. We're gonna try a few test lines and compare the difference before we would move forward with re-processing the entire survey. Basically, the same thing James is doing out there for you. Thanks again for looking into that.

Cheers,

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On Tue, Feb 7, 2017 at 2:35 PM, Tyanne Faulkes - NOAA Federal <[tyanne.faulkes@noaa.gov](mailto:tyanne.faulkes@noaa.gov)> wrote:

Hi all,

As far as I remember SVC is not required again unless you are using a Kongsberg system. I will try to dig up the email if I have one...

Tyanne

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We are going to check into it with Caris to see exactly how it affects things. Pat Berube did all the processing on this survey and since he was of the FA processing mold, I have to believe that he might have cut that step out for a reason (I HOPE). We are going to contact Caris and find out so standby. LTJG Debroisse is aboard and seems to remember hearing that Caris mentioned that it's not necessary but the FA still went through the step anyhow.

Anyways, James Miller is currently inquiring with Caris.

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On Tue, Feb 7, 2017 at 1:36 PM, Clinton Marcus - NOAA Federal <[clinton.r.marcus@noaa.gov](mailto:clinton.r.marcus@noaa.gov)> wrote:

Hi Nick and Jonathan,

I had a question about your processing workflow on the Hassler. Is it standard procedure to only apply SVC once? I ask because I'm noticing that SV was not reapplied at any time after loading SBETs. In my experience, and according to CARIS, it has been standard to re-SVC any time Attitude (heave, pitch, roll) have been edited or updated as it is affecting the ray-trace.

I also noticed that after applying the verified tides, that the data was not merged w/o GPS Tide. This isn't really an issue, unless there was a difference surface made to validate the VDatum model.

Let me know if you have any questions about my train of thought here. It may be the empty stomach affecting my thought process.

Thanks for all the clarification and quick turn-arounds on my questions. Hope the survey is going well out there.

Sincerely,  
Clint Marcus  
Physical Scientist  
NOAA Office of Coast Survey  
Atlantic Hydrographic Branch  
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—  
Tyanne Faulkes  
Physical Scientist  
NOAA's National Ocean Service  
Office of Coast Survey, Hydrographic Surveys Division  
Pacific Hydrographic Branch

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*Starla D. Robinson, Physical Scientist*  
 NOS - OCS - Hydrographic Survey Division - Operations Branch  
 National Oceanic Atmospheric Administration  
 Office: 301-713-2702 x125  
 Cell: 360-689-1431  
 Website: [HSD Planned Hydrographic Surveys](#)

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 Office of Coast Survey, Hydrographic Surveys Division  
 Pacific Hydrographic Branch

**Russell Quintero - NOAA Federal** <russell.quintero@noaa.gov>

Mon, Feb 13, 2017 at 7:54 PM

To: Briana Welton - NOAA Federal <briana.welton@noaa.gov>, CO HASSLER <co.ferdinand.hassler@noaa.gov>, "James J. Miller" <james.j.miller@noaa.gov>, "OPS.Ferdinand Hassler - NOAA Service Account" <ops.ferdinand.hassler@noaa.gov>, Starla Robinson - NOAA Federal <starla.robinson@noaa.gov>, Tyanne Faulkes - NOAA Federal <tyanne.faulkes@noaa.gov>  
 Cc: Castle Parker - NOAA Federal <castle.e.parker@noaa.gov>, Clinton Marcus - NOAA Federal <clinton.r.marcus@noaa.gov>, Grant Froelich <grant.froelich@noaa.gov>, Janice Eisenberg - NOAA Federal <janice.eisenberg@noaa.gov>, John Doroba - NOAA Federal <john.doroba@noaa.gov>, Patrick Debrousse - NOAA Federal <patrick.j.debrousse@noaa.gov>

What if the mistake was a tide file with a 1m static offset? MHHW instead of MLLW, for example. All internal checks line up, no statistical issues...passes all of our QC until a sharp-eyed PS notices it during SAR.

That's a clear blunder, and it "blows spec." If it's only a 0.2m offset? That's still not within spec, because it's an Uncertainty Budget, not an Error Budget. Mistakes don't get a pass just for being small enough.

We made another ship reconvert lines because they used the wrong datum for a handful of lines, even though the induced offset was minor. We would have done the same even if it was most of their survey. Mistakes have to be fixed.

This one is really unsatisfying all around because it's the perfect storm of a small effect affecting a large volume of data...but being inconvenient doesn't change that the right answer is still right. If this was a contractor, our answer would be the same; even if it risked making that TO unprofitable. We don't have to worry about turning a profit, just a never ending pile of work we would rather work on, but our answer has to be consistent.

We stand by ready to concur with a request to waive redoing the analysis if the reprocessed data is barely different. We have no desire to be punitive here, and we have every reason to strive to make both the field and office as efficient as possible. We are extremely sympathetic and Starla and I both worked on the wording of the bad news email to ensure it didn't come across as negative in any way; but that doesn't change that the right answer is to make it right.

Very Respectively,

Russell

On Mon, Feb 13, 2017 at 19:30 Tyanne Faulkes - NOAA Federal <[tyanne.faulkes@noaa.gov](mailto:tyanne.faulkes@noaa.gov)> wrote:

How about adding rednotes to all the surveys that differ from the DAPR? As James said these errors are on the magnitude of centimeters. When a contractor sent in data with the wrong TVU calculated this made all surfaces fail TVU specifications. We are talking about apples and oranges here.

On Mon, Feb 13, 2017 at 4:17 PM Starla Robinson - NOAA Federal <[starla.robinson@noaa.gov](mailto:starla.robinson@noaa.gov)> wrote:

Precisely James, we would have the contractor fix it. We had a contractor resubmit a year's worth of data for having the wrong TVU values. It was an error. It had to be fixed.

Given the amount of effort we all put into this it is hard to have this delay. Correcting blunders is a cost of doing business, regardless of whether a contractor or a ship is responsible for the product. I know we are eager for the finish line but it is a bit further. I have added CMD Welton and LT Quintero in case they have any ideas to add to how we can help get there.

Sincerely,  
Starla

On Mon, Feb 13, 2017 at 6:34 PM, James J. Miller <[james.j.miller@noaa.gov](mailto:james.j.miller@noaa.gov)> wrote:

If this exact same situation applied to a contractor, would OPS require the contractor to re-process the data?

The error predominantly ranges from 0.5 - 1cm, with the occasional difference reaching 4cm. The vast majority of the project coverage will only affect a small-scale fathoms chart (1:432,000) where the error is unlikely to change the rounded depths on the chart. Processing and personnel resources are limited on the Hassler. Do we really think it is prudent and worthwhile to spend our limited time this way?

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On Mon, Feb 13, 2017 at 5:52 PM, Tyanne Faulkes - NOAA Federal <[tyanne.faulkes@noaa.gov](mailto:tyanne.faulkes@noaa.gov)> wrote:

I am currently out sick. When I get back to the office I will talk to Ben to see if I can work with AHB and the FH to fix the surveys that I was survey manager on (I think there were three).

Tyanne

On Mon, Feb 13, 2017 at 2:47 PM Starla Robinson - NOAA Federal <[starla.robinson@noaa.gov](mailto:starla.robinson@noaa.gov)> wrote:

HSD understands the desire to not reprocess this data, however after much soul searching and deliberation including consultation with the Chief of HSD... reprocess the data. The TVU budget is not for blunders. Captain Brennan has requested that the ship provide a plan on how to resolve this in a timely manner.

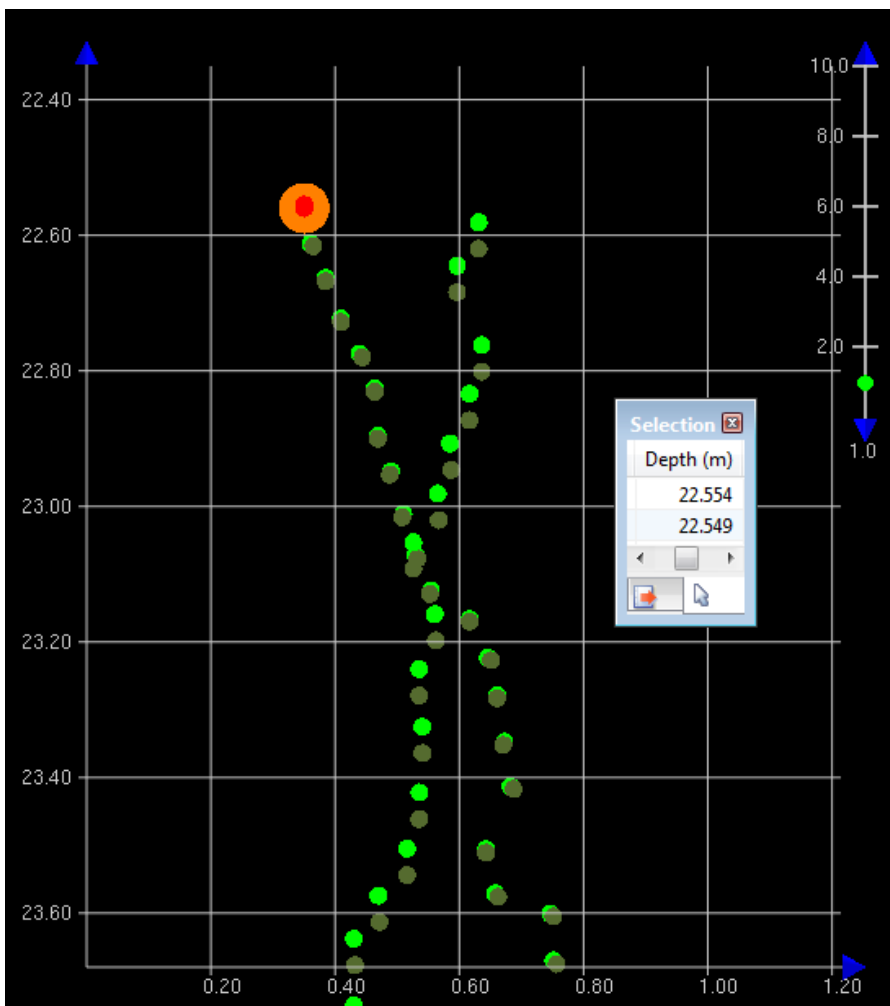
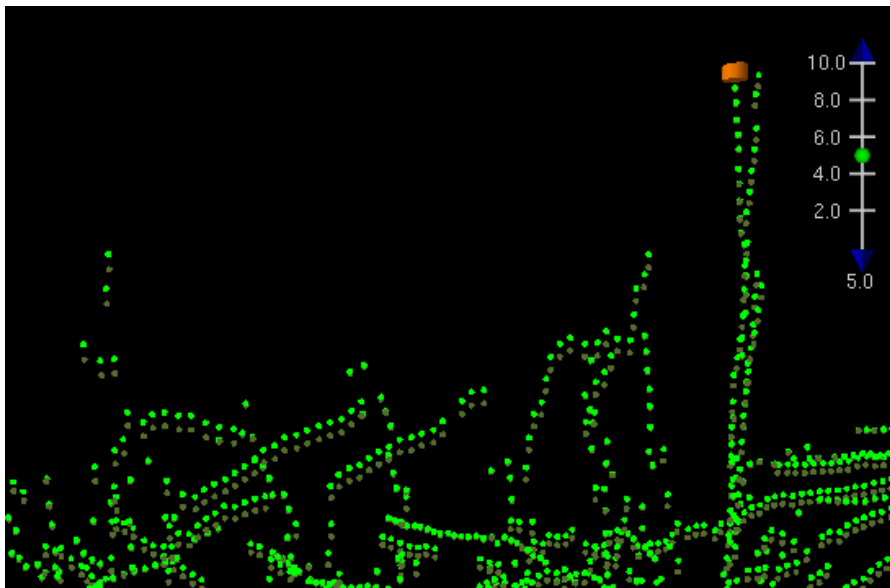
To help speed things up, we think you could do a difference surface of the final surfaces with the previous products. By showing there is no statistically significant difference between the two surfaces, you could make the argument that the analysis (cross-lines, junctions, and chart comparisons) does not need to be redone. HSD can then issue a waiver concurring with this.

Sincerely,  
Starla

On Thu, Feb 9, 2017 at 12:35 PM, James J. Miller <[james.j.miller@noaa.gov](mailto:james.j.miller@noaa.gov)> wrote:

Hi Clint,

Our testing is consistent with your findings. Survey H12859 has one wreck that we used for additional testing. The vertical difference between processing methods ranged from 0.005 - 0.040 m over the wreck. The least depth of the wreck would change by 0.005 m depending on the processing method (second image).



Survey H12932 (OPR-G309-FH-16) has one wreck that we tested. The vertical differences between processing methods were even smaller, ranging from 0.004 - 0.010 m. The least depth of the wreck would change by 0.004 m depending on the processing method.

We are relieved that preprocessing appears to be unnecessary for H12843 and OPR-G309-FH-16. Thanks again for identifying this problem and helping with the testing.

Thanks,  
James

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On Thu, Feb 9, 2017 at 12:23 PM, Clinton Marcus - NOAA Federal <[clinton.r.marcus@noaa.gov](mailto:clinton.r.marcus@noaa.gov)> wrote:

Hi all,

After taking another sub-section of H12843 for reprocessing, it was found that 95% of the nodes were +/- 2cm. I will go so far as to say the difference would likely be even smaller if I had filtered the one XL present, which is what the FH did (I believe).

I took a total of 37 lines in an area of general bathymetry (no features) and followed the same procedure as previously noted. Taking the data from conversion thru SBETs, and re-applying SVC after SBETs.

Looking at the data in subset, there was little to no difference between the two projects.

After talking with Gene, we determined that it would not be necessary to reprocess the entire survey for such a small difference. Yay!

You might want to just double check with them (CO, Gene, Bri), but I don't think it is necessary for you to go back and reprocess the OPR-G309-FH-16 data.

Hope this all helped.

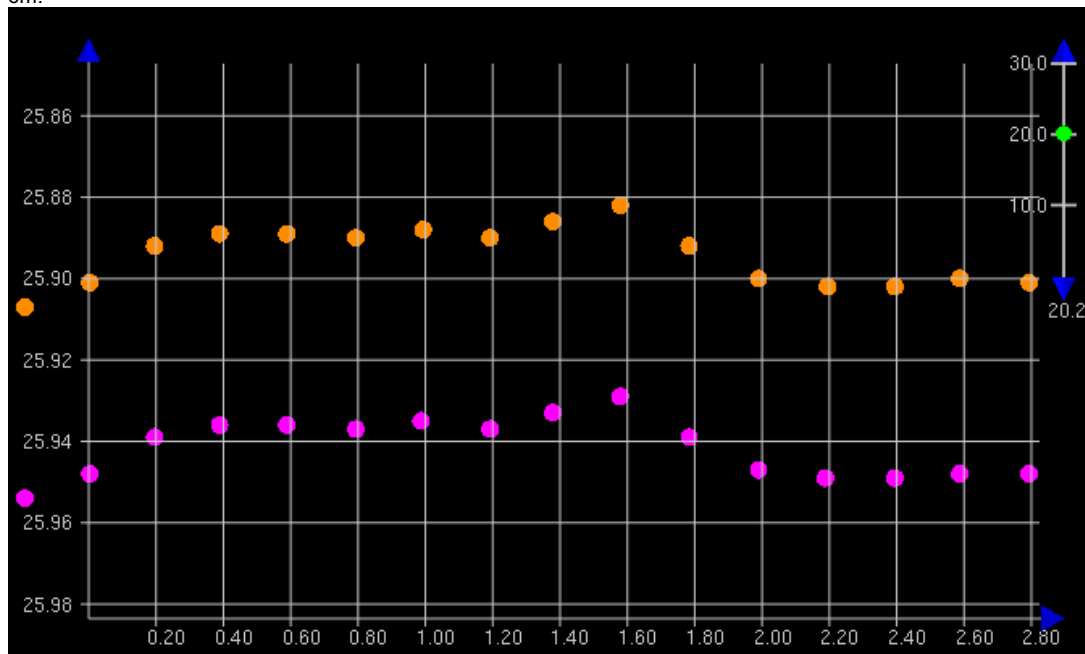
Cheers,  
 Clint Marcus  
 Physical Scientist  
 NOAA Office of Coast Survey  
 Atlantic Hydrographic Branch  
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 Cell: (541) 264-6406

On Thu, Feb 9, 2017 at 9:12 AM, James J. Miller <[james.j.miller@noaa.gov](mailto:james.j.miller@noaa.gov)> wrote:

Hi Clint,

Thanks for all the helpful information and screen shots. For your next test subset, I think it would be worth comparing the original survey lines (re-SVC not conducted after SBETs) to the test lines at the sounding level in Subset Editor. When comparing surfaces, they often exhibit apparent vertical differences along slopes and features due to small horizontal shifts, rather than actual vertical changes. We are curious about the magnitude of the vertical difference between the soundings.

Even though survey H12859 was not affected by this issue because SVC was run after loading SBETs, we conducted a test because it is in the vicinity of H12843. We re-processed test copies of the H12859 crosslines and did not re-SVC after loading SBETs. As viewed in Subset Editor, the vertical difference between processing methods mostly ranged from 2-3 cm and reached a maximum of 5 cm in some areas. This seems similar to the H12843 difference surface where you found that 95% of nodes were +/- 6 cm.



I will follow your lead and try testing a couple features on H12859 and the OPR-G309-FH-16 surveys. Worth checking how the least depths are affected.

James J. Miller  
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On Thu, Feb 9, 2017 at 7:42 AM, Clinton Marcus - NOAA Federal <[clinton.r.marcus@noaa.gov](mailto:clinton.r.marcus@noaa.gov)> wrote:

Hi Nick,

With the soundings all being from development lines, there is good parity within the data. The soundings were for the most part all of a Quality Flag of 3. We are going to process another subset of H12843 to help validate our findings. The screen shot attached is of a subset over the wreck showing the density of soundings. We'll keep you posted with our findings.

Cheers,

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Also, it could be possible that a horizontal change in position of the soundings could exacerbate the vertical difference in a sharp feature like a wreck but correct me if I'm wrong.

Nick

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Hope that helps in the decision making process. I don't have the data in front of me, unfortunately, so I don't have any screen grabs available. I can send some out in the morning when I get to the office.

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I also noticed that after applying the verified tides, that the data was not merged w/o GPS Tide. This isn't really an issue, unless there was a difference surface made to validate the VDatum model.

Let me know if you have any questions about my train of thought here. It may be the empty stomach affecting my thought process.

Thanks for all the clarification and quick turn-arounds on my questions. Hope the survey is going well out there.

Sincerely,  
Clint Marcus  
Physical Scientist  
NOAA Office of Coast Survey  
Atlantic Hydrographic Branch  
Phone: (757) 441-6746 ext 208  
Cell: (541) 264-6406

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

--  
Lieutenant Russell Quintero, NOAA  
Chief, Hydrographic Surveys Division Operations Branch  
National Oceanic & Atmospheric Administration  
1315 East-West Hwy, SSMC3 6217  
Silver Spring, MD 20910  
Cell: 970-481-2030

**OPS.Ferdinand Hassler - NOAA Service Account** <ops.ferdinand.hassler@noaa.gov>

Mon, Feb 13, 2017 at 8:38 PM

To: Russell Quintero - NOAA Federal <russell.quintero@noaa.gov>

Cc: Briana Welton - NOAA Federal <briana.welton@noaa.gov>, CO HASSLER <co.ferdinand.hassler@noaa.gov>, "James J. Miller"

<james.j.miller@noaa.gov>, Starla Robinson - NOAA Federal <starla.robinson@noaa.gov>, Tyanne Faulkes - NOAA Federal

<tyanne.faulkes@noaa.gov>, Castle Parker - NOAA Federal <castle.e.parker@noaa.gov>, Clinton Marcus - NOAA Federal

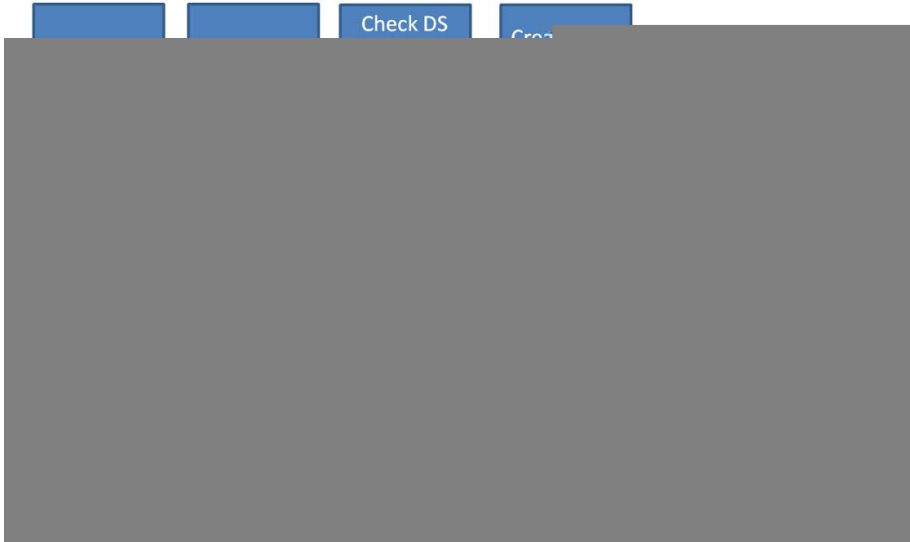
<clinton.r.marcus@noaa.gov>, Grant Froelich <grant.froelich@noaa.gov>, Janice Eisenberg - NOAA Federal <janice.eisenberg@noaa.gov>, John Doroba

- NOAA Federal <john.doroba@noaa.gov>, Patrick Debroisse - NOAA Federal <patrick.j.debroisse@noaa.gov>

Just a rough outline of the work that needs to be done. See slide two for additional factors that will affect processing times....

V/r  
Nick

## FH Wilmington 2016 Reapply SVC Workflow (10 Surveys)



## Additional Factors

- Ship's Visiting Physical Scientists leave Friday, February 17<sup>th</sup>
- Troubleshooting of the ship's generators will likely cause prolonged power outages the rest of the week



Field Operations Officer, NOAA Ship *Ferdinand R. Hassler*  
29 Wentworth Road  
New Castle, NH, 03854

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What if the mistake was a tide file with a 1m static offset? MHHW instead of MLLW, for example. All internal checks line up, no statistical issues...passes all of our QC until a sharp-eyed PS notices it during SAR.

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Russell

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How about adding rednotes to all the surveys that differ from the DAPR? As James said these errors are on the magnitude of centimeters. When a contractor sent in data with the wrong TVU calculated this made all surfaces fail TVU specifications. We are talking about apples and oranges here.

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Precisely James, we would have the contractor fix it. We had a contractor resubmit a year's worth of data for having the wrong TVU values. It was an error. It had to be fixed.

Given the amount of effort we all put into this it is hard to have this delay. Correcting blunders is a cost of doing business, regardless of whether a contractor or a ship is responsible for the product. I know we are eager for the finish line but it is a bit further. I have added CMD Welton and LT Quintero in case they have any ideas to add to how we can help get there.

Sincerely,  
Starla

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The error predominantly ranges from 0.5 - 1cm, with the occasional difference reaching 4cm. The vast majority of the project coverage will only affect a small-scale fathoms chart (1:432,000) where the error is unlikely to change the rounded depths on the chart. Processing and personnel resources are limited on the Hassler. Do we really think it is prudent and worthwhile to spend our limited time this way?

James J. Miller  
Physical Scientist  
NOAA Office of Coast Survey  
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439 W York St | Norfolk, VA | 23510  
[757-441-6746](tel:757-441-6746) x 111

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Tyanne

On Mon, Feb 13, 2017 at 2:47 PM Starla Robinson - NOAA Federal <[starla.robinson@noaa.gov](mailto:starla.robinson@noaa.gov)> wrote:

HSD understands the desire to not reprocess this data, however after much soul searching and deliberation including consultation with the Chief of HSD... reprocess the data. The TVU budget is not for blunders. Captain Brennan has requested that the ship provide a plan on how to resolve this in a timely manner.

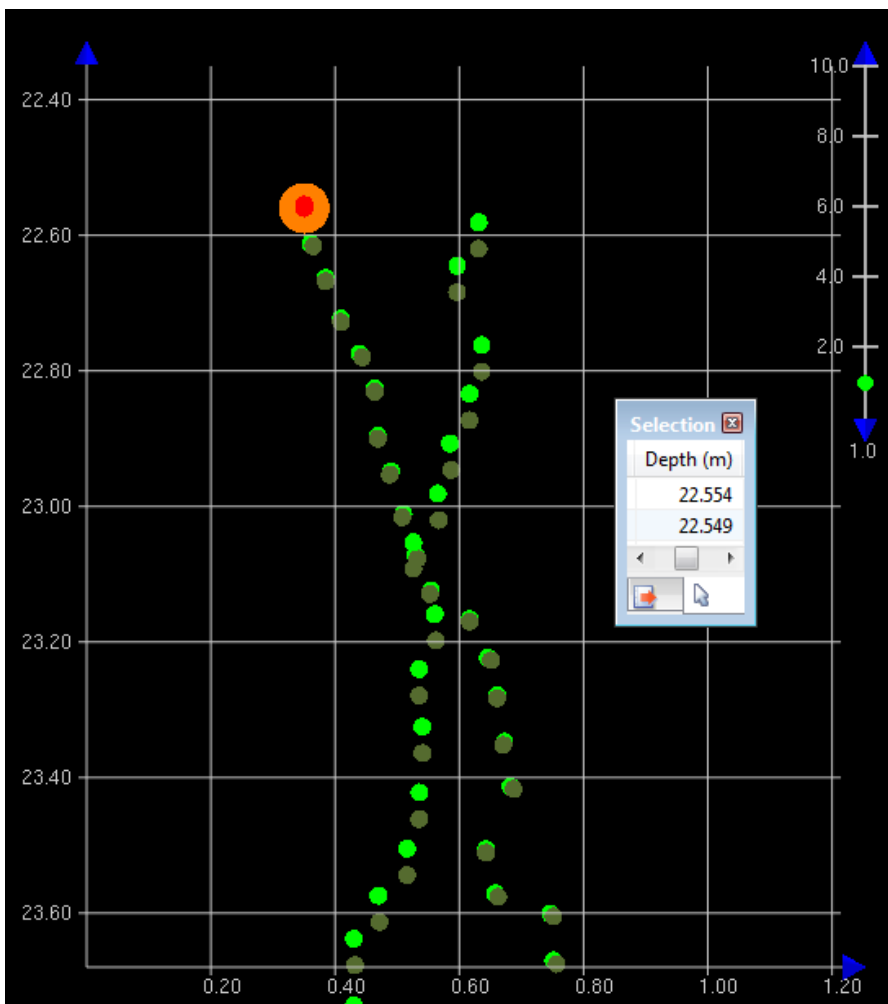
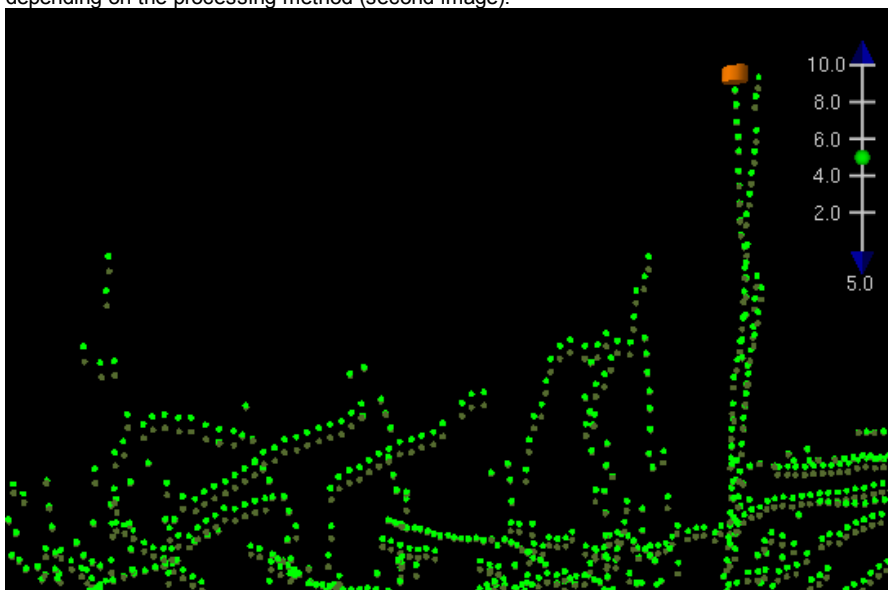
To help speed things up, we think you could do a difference surface of the final surfaces with the previous products. By showing there is no statistically significant difference between the two surfaces, you could make the argument that the analysis (cross-lines, junctions, and chart comparisons) does not need to be redone. HSD can then issue a waiver concurring with this.

Sincerely,  
Starla

On Thu, Feb 9, 2017 at 12:35 PM, James J. Miller <james.j.miller@noaa.gov> wrote:

Hi Clint,

Our testing is consistent with your findings. Survey H12859 has one wreck that we used for additional testing. The vertical difference between processing methods ranged from 0.005 - 0.040 m over the wreck. The least depth of the wreck would change by 0.005 m depending on the processing method (second image).



Survey H12932 (OPR-G309-FH-16) has one wreck that we tested. The vertical differences between processing methods were even smaller, ranging from 0.004 - 0.010 m. The least depth of the wreck would change by 0.004 m depending on the processing method.

We are relieved that preprocessing appears to be unnecessary for H12843 and OPR-G309-FH-16. Thanks again for identifying this problem and helping with the testing.

Thanks,  
James

James J. Miller  
Physical Scientist  
NOAA Office of Coast Survey  
Atlantic Hydrographic Branch  
439 W York St | Norfolk, VA | 23510  
[757-441-6746](tel:757-441-6746) x 111

On Thu, Feb 9, 2017 at 12:23 PM, Clinton Marcus - NOAA Federal <[clinton.r.marcus@noaa.gov](mailto:clinton.r.marcus@noaa.gov)> wrote:

Hi all,

After taking another sub-section of H12843 for reprocessing, it was found that 95% of the nodes were +/- 2cm. I will go so far as to say the difference would likely be even smaller if I had filtered the one XL present, which is what the FH did (I believe).

I took a total of 37 lines in an area of general bathymetry (no features) and followed the same procedure as previously noted. Taking the data from conversion thru SBETs, and re-applying SVC after SBETs.

Looking at the data in subset, there was little to no difference between the two projects.

After talking with Gene, we determined that it would not be necessary to reprocess the entire survey for such a small difference. Yay!

You might want to just double check with them (CO, Gene, Bri), but I don't think it is necessary for you to go back and reprocess the OPR-G309-FH-16 data.

Hope this all helped.

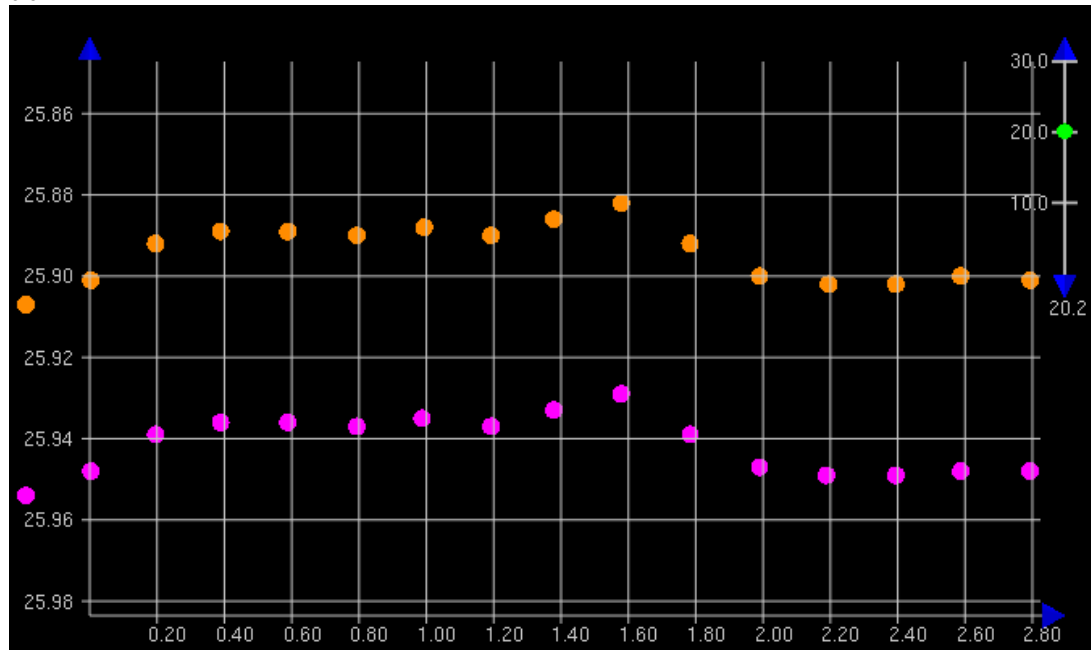
Cheers,  
Clint Marcus  
Physical Scientist  
NOAA Office of Coast Survey  
Atlantic Hydrographic Branch  
Phone: (757) 441-6746 ext 208  
Cell: (541) 264-6406

On Thu, Feb 9, 2017 at 9:12 AM, James J. Miller <[james.j.miller@noaa.gov](mailto:james.j.miller@noaa.gov)> wrote:

Hi Clint,

Thanks for all the helpful information and screen shots. For your next test subset, I think it would be worth comparing the original survey lines (re-SVC not conducted after SBETs) to the test lines at the sounding level in Subset Editor. When comparing surfaces, they often exhibit apparent vertical differences along slopes and features due to small horizontal shifts, rather than actual vertical changes. We are curious about the magnitude of the vertical difference between the soundings.

Even though survey H12859 was not affected by this issue because SVC was run after loading SBETs, we conducted a test because it is in the vicinity of H12843. We re-processed test copies of the H12859 crosslines and did not re-SVC after loading SBETs. As viewed in Subset Editor, the vertical difference between processing methods mostly ranged from 2-3 cm and reached a maximum of 5 cm in some areas. This seems similar to the H12843 difference surface where you found that 95% of nodes were +/- 6 cm.



I will follow your lead and try testing a couple features on H12859 and the OPR-G309-FH-16 surveys. Worth checking how the least depths are affected.

James J. Miller  
Physical Scientist  
NOAA Office of Coast Survey  
Atlantic Hydrographic Branch  
439 W York St | Norfolk, VA | 23510  
[757-441-6746](tel:757-441-6746) x 111

On Thu, Feb 9, 2017 at 7:42 AM, Clinton Marcus - NOAA Federal <[clinton.r.marcus@noaa.gov](mailto:clinton.r.marcus@noaa.gov)> wrote:

Hi Nick,

With the soundings all being from development lines, there is good parity within the data. The soundings were for the most part all of a Quality Flag of 3. We are going to process another subset of H12843 to help validate our findings. The screen shot attached is of a subset over the wreck showing the density of soundings. We'll keep you posted with our findings.

Cheers,

Clint Marcus  
Physical Scientist  
NOAA Office of Coast Survey  
Atlantic Hydrographic Branch  
Phone: (757) 441-6746 ext 208  
Cell: (541) 264-6406

On Wed, Feb 8, 2017 at 8:26 PM, OPS.Ferdinand Hassler - NOAA Service Account <[ops.ferdinand.hassler@noaa.gov](mailto:ops.ferdinand.hassler@noaa.gov)> wrote:

Also, it could be possible that a horizontal change in position of the soundings could exacerbate the vertical difference in a sharp feature like a wreck but correct me if I'm wrong.

Nick

On Feb 8, 2017, at 6:32 PM, Clinton Marcus - NOAA Federal <[clinton.r.marcus@noaa.gov](mailto:clinton.r.marcus@noaa.gov)> wrote:

Hi James, et. al.

I ran a small subset of lines (8) on H12843 that were development lines over a wreck. I made a local project and took the lines through the entire processing workflow and re-SVC'd after the application of SBETs. I created a combined 2m surface which I then differenced with the field submitted combined surface. The result was that 95% of nodes had a +/- 6cm difference. There were localized differences of up to 52cm over the wreck. Unfortunately, I did not difference the soundings before and after the post-SBET SVC. I believe Gene and Bri were going to talk about how to proceed with H12843.

Hope that helps in the decision making process. I don't have the data in front of me, unfortunately, so I don't have any screen grabs available. I can send some out in the morning when I get to the office.

Thanks,  
Clint

Clint Marcus  
Physical Scientist  
NOAA Office of Coast Survey  
Atlantic Hydrographic Branch  
Phone: (757) 441-6746 ext 208  
Cell: (541) 264-6406

On Wed, Feb 8, 2017 at 6:11 PM, James J. Miller <[james.j.miller@noaa.gov](mailto:james.j.miller@noaa.gov)> wrote:

Hi everyone,

Thank you Clint for identifying this issue. And thank you all for clarifying that the proper workflow is to run (or re-run) SVC after loading the SBET if gyro, pitch, roll, heave or GPS height are applied. Unfortunately, this workflow was not followed during project OPR-G309-FH-16, which consists of 8 surveys and over 500 SNM of coverage. This issue is also relevant for the survey Clint is reviewing (H12843). Due to the large amount of data that is affected, it would take a significant amount of time to re-run SVC, re-Merge, re-check the designated soundings, and re-compute the grids. So in the interest of saving time, we were curious whether the problem is small enough to be documented in the DRs without reprocessing the data.

To assess the magnitude of the problem, we re-processed test copies of the crosslines for several surveys in project OPR-G309-FH-16 and conducted a comparison between running SVC before or after applying SBETs. As viewed in Subset Editor, the vertical difference between these methods did not exceed 1 cm (see image below), even in the outermost beams which exhibited larger offsets than nadir beams (as expected). Depths ranged from 20-45 m. At least from our testing on project OPR-G309-FH-16, the magnitude of the offset is small enough that reprocessing does not seem worthwhile.

<2017-02-08\_17-14-54.png>

Clint, what did your reprocessed test lines show on survey H12843? How large were the vertical offsets between running SVC before or after loading SBETs? Greater than 1 cm?

Thanks,  
James

James J. Miller  
Physical Scientist  
NOAA Office of Coast Survey  
Atlantic Hydrographic Branch  
439 W York St | Norfolk, VA | 23510  
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On Wed, Feb 8, 2017 at 8:54 AM, OPS.Ferdinand Hassler - NOAA Service Account <[ops.ferdinand.hassler@noaa.gov](mailto:ops.ferdinand.hassler@noaa.gov)> wrote:

Hi Starla,

I just wanted to bring you in the loop. Clint found an error in our processing workflow during a SAR of H12843 (2015 Chesapeake) that involved not re-applying SV after applying SBETs. James Miller did a test with our Wilmington data that compared data without SV after SBETs and with SV after SBETs. In his test, we found that the difference is only on the order of about 1cm. It sounds like AHB is going to run a quick test of their own to see if they get similar results. We will have to figure out a course of action on this. We expect it to be a drop in the bucket in terms of the total uncertainty but we'll see.

Let us know if you or HSD has any thoughts or recommendations on this.

Thanks,  
-Nick

Field Operations Officer, NOAA Ship *Ferdinand R. Hassler*  
29 Wentworth Road  
New Castle, NH, 03854

On Wed, Feb 8, 2017 at 7:59 AM, OPS.Ferdinand Hassler - NOAA Service Account <[ops.ferdinand.hassler@noaa.gov](mailto:ops.ferdinand.hassler@noaa.gov)> wrote:

Ok, James just did a comparison with some of our Wilmington data and found that the difference was ~1cm generally. It's a limited sample size but he can probably share the results with you shortly.

Field Operations Officer, NOAA Ship *Ferdinand R. Hassler*  
29 Wentworth Road  
New Castle, NH, 03854

On Wed, Feb 8, 2017 at 7:00 AM, Clinton Marcus - NOAA Federal <[clinton.r.marcus@noaa.gov](mailto:clinton.r.marcus@noaa.gov)> wrote:

Hey Nick,

Just got done talking with Gene. We're gonna try a few test lines and compare the difference before we would move forward with re-processing the entire survey. Basically, the same thing James is doing out there for you. Thanks again for looking into that.

Cheers,

Clint Marcus  
Physical Scientist  
NOAA Office of Coast Survey  
Atlantic Hydrographic Branch  
Phone: (757) 441-6746 ext 208  
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On Tue, Feb 7, 2017 at 4:51 PM, OPS.Ferdinand Hassler - NOAA Service Account <[ops.ferdinand.hassler@noaa.gov](mailto:ops.ferdinand.hassler@noaa.gov)> wrote:

So we got a quick response from Caris that SVC does need to happen after applying new attitude/nav data such as an SBET. I did a quick check of our 2016 Chesapeake Surveys and those seem to be processed that way so that's good. However, our 2016 Wilmington surveys are all processed without SVC after SBETs. I believe we may end up going back for those and re-applying SV. James is doing a brief comparison to see what kind of difference we see in the data between the two. I imagine though that it varies survey to survey as to how different your SBET is from your original POS data.

-Nick

Field Operations Officer, NOAA Ship *Ferdinand R. Hassler*  
29 Wentworth Road  
New Castle, NH, 03854

On Tue, Feb 7, 2017 at 2:35 PM, Tyanne Faulkes - NOAA Federal <[tyanne.faulkes@noaa.gov](mailto:tyanne.faulkes@noaa.gov)> wrote:

Hi all,

As far as I remember SVC is not required again unless you are using a Kongsberg system. I will try to dig up the email if I have one...

Tyanne

On Tue, Feb 7, 2017 at 11:34 AM, Clinton Marcus - NOAA Federal <[clinton.r.marcus@noaa.gov](mailto:clinton.r.marcus@noaa.gov)> wrote:

Thanks for the quick reply. I'll be standing by to see what CARIS has to say. Thanks again.

Cheers,

Clint Marcus  
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NOAA Office of Coast Survey  
Atlantic Hydrographic Branch  
Phone: (757) 441-6746 ext 208  
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On Tue, Feb 7, 2017 at 2:26 PM, OPS.Ferdinand Hassler - NOAA Service Account <[ops.ferdinand.hassler@noaa.gov](mailto:ops.ferdinand.hassler@noaa.gov)> wrote:

Hi Clint,

We are going to check into it with Caris to see exactly how it affects things. Pat Berube did all the processing on this survey and since he was of the FA processing mold, I have to believe that he might have cut that step out for a reason (I HOPE). We are going to contact Caris and find out so standby. LTJG Debroisse is aboard and seems to remember hearing that Caris mentioned that it's not necessary but the FA still went though the step anyhow.

Anyways, James Miller is currently inquiring with Caris.

-Nick

Field Operations Officer, NOAA Ship *Ferdinand R. Hassler*  
29 Wentworth Road  
New Castle, NH, 03854

On Tue, Feb 7, 2017 at 1:36 PM, Clinton Marcus - NOAA Federal <[clinton.r.marcus@noaa.gov](mailto:clinton.r.marcus@noaa.gov)> wrote:

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 Lieutenant Russell Quintero, NOAA  
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 National Oceanic & Atmospheric Administration  
 1315 East-West Hwy, SSMC3 6217  
 Silver Spring, MD 20910  
 Cell: 970-481-2030

 **FH Wilmington 2016 Reapply SVC Workflow.pptx**  
 71K

**Janice Eisenberg - NOAA Federal** <janice.eisenberg@noaa.gov>

Mon, Feb 13, 2017 at 8:41 PM

To: John Doroba <John.Doroba@noaa.gov>, "eric.g.younklin@noaa.gov (Google Drive)" <eric.g.younklin@noaa.gov>

Cc: Samuel Greenaway - NOAA Federal <samuel.greenaway@noaa.gov>

Bcc: ops.ferdinand.hassler@noaa.gov

Eric, John,

I've been staying out of this thread, waiting to see how HSD OPS would ultimately rule. Unfortunately, looks like FH will need to reprocess all of OPR-G309-FH-16.

Do you have any thoughts on how HSTB might help reduce the effort required (esp. where active time is concerned) to reprocess an entire project? Are there any creative solutions here?

Maybe, say, processing on a blade server using a modified version of your benchmarking script? Bonus if we can automate a cursory QC of the resulting surfaces (e.g., surface differencing)?

Thanks,  
 Janice

----- Forwarded message -----

From: Russell Quintero - NOAA Federal <russell.quintero@noaa.gov>

Date: Mon, Feb 13, 2017 at 7:54 PM

Subject: Re: Project workflow for processing

To: Briana Welton - NOAA Federal <briana.welton@noaa.gov>, CO HASSLER <co.ferdinand.hassler@noaa.gov>, James J. Miller <james.j.miller@noaa.gov>, OPS.Ferdinand Hassler - NOAA Service Account <ops.ferdinand.hassler@noaa.gov>, Starla Robinson - NOAA Federal <starla.robinson@noaa.gov>, Tyanne Faulkes - NOAA Federal <tyanne.faulkes@noaa.gov>

Cc: Castle Parker - NOAA Federal <castle.e.parker@noaa.gov>, Clinton Marcus - NOAA Federal <clinton.r.marcus@noaa.gov>, Grant Froelich <grant.froelich@noaa.gov>, Janice Eisenberg - NOAA Federal <janice.eisenberg@noaa.gov>, John Doroba - NOAA Federal <john.doroba@noaa.gov>, Patrick Debrousse - NOAA Federal <patrick.j.debrousse@noaa.gov>

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Tyanne

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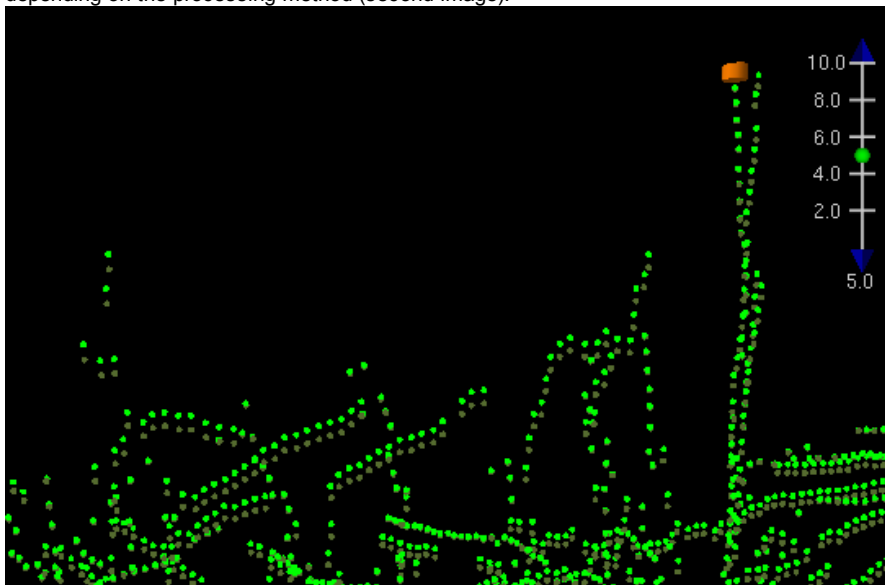
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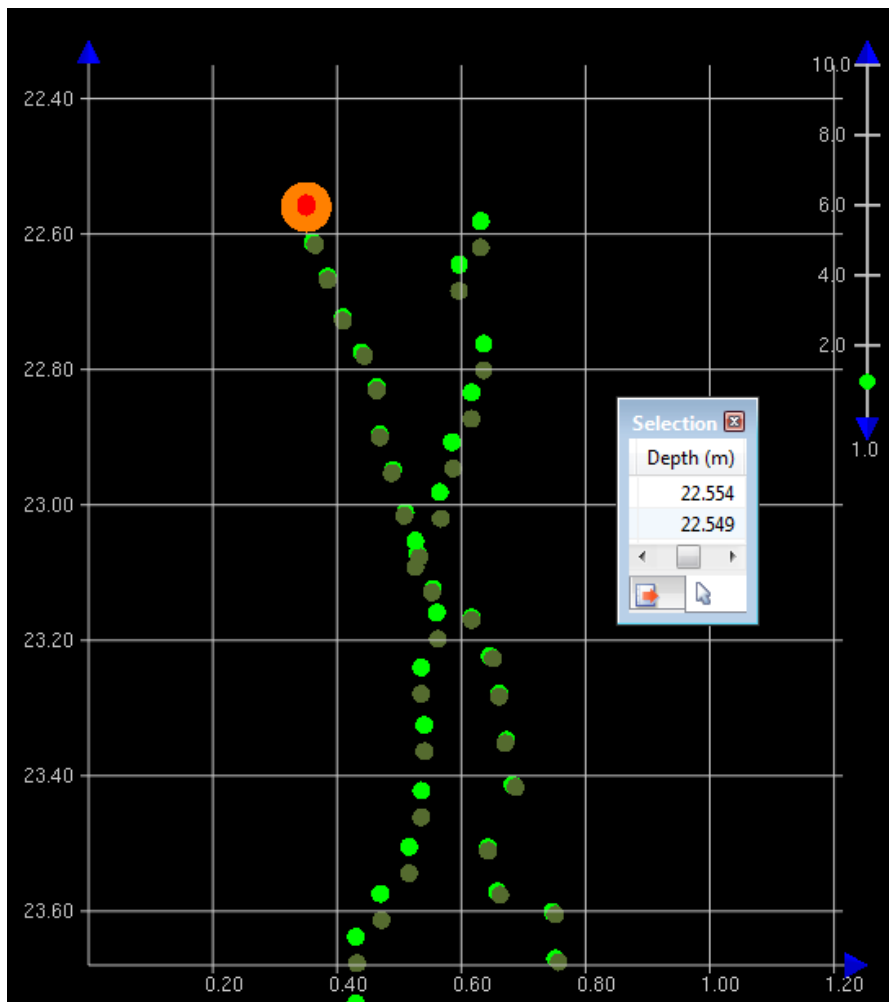
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Thanks,  
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James J. Miller  
Physical Scientist  
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Looking at the data in subset, there was little to no difference between the two projects.

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You might want to just double check with them (CO, Gene, Bri), but I don't think it is necessary for you to go back and reprocess the OPR-G309-FH-16 data.

Hope this all helped.

Cheers,  
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Physical Scientist

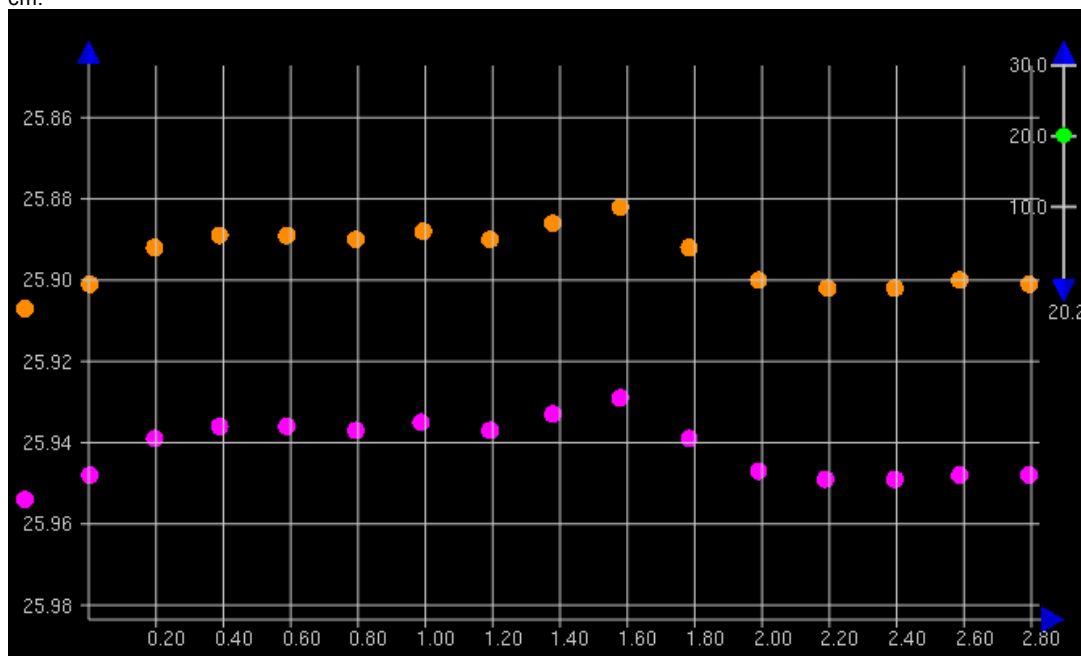
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Hope that helps in the decision making process. I don't have the data in front of me, unfortunately, so I don't have any screen grabs available. I can send some out in the morning when I get to the office.

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On Wed, Feb 8, 2017 at 8:54 AM, OPS.Ferdinand Hassler - NOAA Service Account <[ops.ferdinand.hassler@noaa.gov](mailto:ops.ferdinand.hassler@noaa.gov)> wrote:

Hi Starla,

I just wanted to bring you in the loop. Clint found an error in our processing workflow during a SAR of H12843 (2015 Chesapeake) that involved not re-applying SV after applying SBETs. James Miller did a test with our Wilmington data that compared data without SV after SBETs and with SV after SBETs. In his test, we found that the difference is only on the order of about 1cm. It sounds like AHB is going to run a quick test of their own to see if they get similar results. We will have to figure out a course of action on this. We expect it to be a drop in the bucket in terms of the total uncertainty but we'll see.

Let us know if you or HSD has any thoughts or recommendations on this.

Thanks,  
-Nick

Field Operations Officer, NOAA Ship *Ferdinand R. Hassler*  
29 Wentworth Road  
New Castle, NH, 03854

On Wed, Feb 8, 2017 at 7:59 AM, OPS.Ferdinand Hassler - NOAA Service Account <[ops.ferdinand.hassler@noaa.gov](mailto:ops.ferdinand.hassler@noaa.gov)> wrote:

Ok, James just did a comparison with some of our Wilmington data and found that the difference was ~1cm generally. It's a limited sample size but he can probably share the results with you shortly.

Field Operations Officer, NOAA Ship *Ferdinand R. Hassler*  
29 Wentworth Road  
New Castle, NH, 03854

On Wed, Feb 8, 2017 at 7:00 AM, Clinton Marcus - NOAA Federal <[clinton.r.marcus@noaa.gov](mailto:clinton.r.marcus@noaa.gov)> wrote:

Hey Nick,  
Just got done talking with Gene. We're gonna try a few test lines and compare the difference before we would move forward with re-processing the entire survey. Basically, the same thing James is doing out there for you. Thanks again for looking into that.

Cheers,

Clint Marcus  
Physical Scientist  
NOAA Office of Coast Survey  
Atlantic Hydrographic Branch  
Phone: (757) 441-6746 ext 208  
Cell: (541) 264-6406

On Tue, Feb 7, 2017 at 4:51 PM, OPS.Ferdinand Hassler - NOAA Service Account <[ops.ferdinand.hassler@noaa.gov](mailto:ops.ferdinand.hassler@noaa.gov)> wrote:

So we got a quick response from Caris that SVC does need to happen after applying new attitude/nav data such as an SBET. I did a quick check of our 2016 Chesapeake Surveys and those seem to be processed that way so that's good. However, our 2016 Wilmington surveys are all processed without SVC after SBETs. I believe we may end up going back for those and re-applying SV. James is doing a brief comparison to see what kind of difference we see in the data between the two. I imagine though that it varies survey to survey as to how different your SBET is from your original POS data.

-Nick

Field Operations Officer, NOAA Ship *Ferdinand R. Hassler*  
29 Wentworth Road  
New Castle, NH, 03854

On Tue, Feb 7, 2017 at 2:35 PM, Tyanne Faulkes - NOAA Federal <[tyanne.faulkes@noaa.gov](mailto:tyanne.faulkes@noaa.gov)> wrote:

Hi all,

As far as I remember SVC is not required again unless you are using a Kongsberg system. I will try to dig up the email if I have one...

Tyanne

On Tue, Feb 7, 2017 at 11:34 AM, Clinton Marcus - NOAA Federal <[clinton.r.marcus@noaa.gov](mailto:clinton.r.marcus@noaa.gov)> wrote:

Thanks for the quick reply. I'll be standing by to see what CARIS has to say. Thanks again.

Cheers,

Clint Marcus  
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On Tue, Feb 7, 20

--  
Janice Eisenberg  
Physical Scientist  
Hydrographic Systems and Technology Branch  
NOAA Office of Coast Survey  
301-713-2653 X144  
[Janice.Eisenberg@noaa.gov](mailto:Janice.Eisenberg@noaa.gov)

**Starla Robinson - NOAA Federal** <[starla.robinson@noaa.gov](mailto:starla.robinson@noaa.gov)> Mon, Feb 13, 2017 at 9:22 PM  
To: "OPS.Ferdinand Hassler - NOAA Service Account" <[ops.ferdinand.hassler@noaa.gov](mailto:ops.ferdinand.hassler@noaa.gov)>, Briana Welton - NOAA Federal <[briana.welton@noaa.gov](mailto:briana.welton@noaa.gov)>, Janice Eisenberg - NOAA Federal <[janice.eisenberg@noaa.gov](mailto:janice.eisenberg@noaa.gov)>, Erin Weller - NOAA Federal <[erin.weller@noaa.gov](mailto:erin.weller@noaa.gov)>, Robert Short - NOAA Federal

<robert.short@noaa.gov>, Douglas Wood - NOAA Affiliate <douglas.wood@noaa.gov>  
Cc: Russell Quintero - NOAA Federal <russell.quintero@noaa.gov>, CO HASSLER <co.ferdinand.hassler@noaa.gov>, "James J. Miller" <james.j.miller@noaa.gov>, Tyanne Faulkes - NOAA Federal <tyanne.faulkes@noaa.gov>, Castle Parker - NOAA Federal <castle.e.parker@noaa.gov>, Clinton Marcus - NOAA Federal <clinton.r.marcus@noaa.gov>, Grant Froelich <grant.froelich@noaa.gov>, John Doroba - NOAA Federal <john.doroba@noaa.gov>, Patrick Debroisse - NOAA Federal <patrick.j.debroisse@noaa.gov>

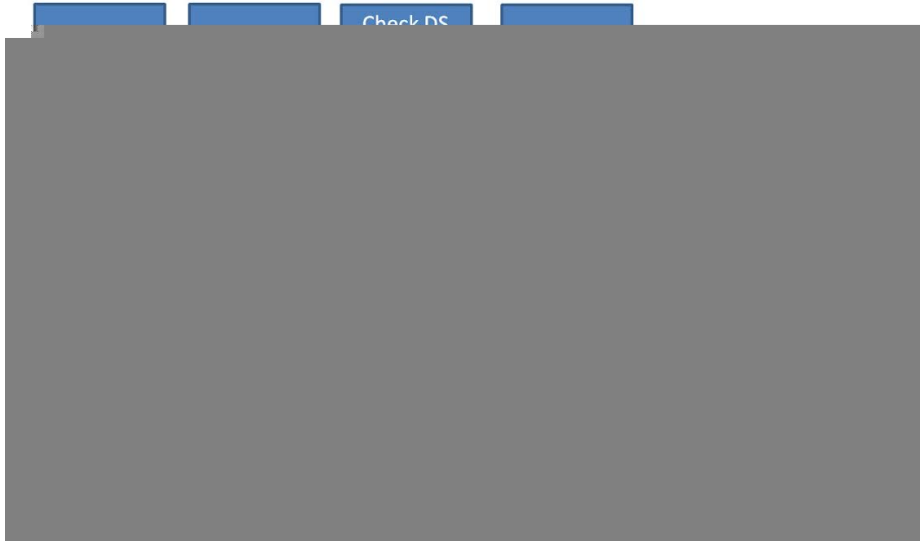
Bobby Short and Doug Wood will be able to help next leg. Would this be an opportunity to use remote support?

Janice, How many instances of CARIS can you process on simultaneously?

On Mon, Feb 13, 2017 at 8:38 PM, OPS.Ferdinand Hassler - NOAA Service Account <ops.ferdinand.hassler@noaa.gov> wrote:  
Just a rough outline of the work that needs to be done. See slide two for additional factors that will affect processing times....

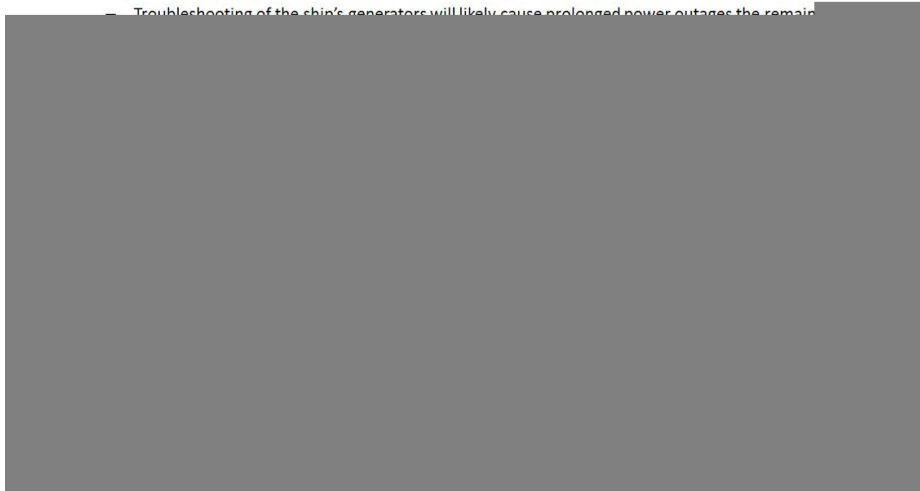
V/r  
Nick

## FH Wilmington 2016 Reapply SVC Workflow (10 Surveys)



## Additional Factors

- Ship's Visiting Physical Scientists leave Friday, February 17<sup>th</sup>
  - Troubleshooting of the ship's generators will likely cause prolonged power outages the remain



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On Mon, Feb 13, 2017 at 7:54 PM, Russell Quintero - NOAA Federal <[russell.quintero@noaa.gov](mailto:russell.quintero@noaa.gov)> wrote:

What if the mistake was a tide file with a 1m static offset? MHHW instead of MLLW, for example. All internal checks line up, no statistical issues...passes all of our QC until a sharp-eyed PS notices it during SAR.

That's a clear blunder, and it "blows spec." If it's only a 0.2m offset? That's still not within spec, because it's an Uncertainty Budget, not an Error Budget. Mistakes don't get a pass just for being small enough.

We made another ship reconvert lines because they used the wrong datum for a handful of lines, even though the induced offset was minor. We would have done the same even if it was most of their survey. Mistakes have to be fixed.

This one is really unsatisfying all around because it's the perfect storm of a small effect affecting a large volume of data...but being inconvenient doesn't change that the right answer is still right. If this was a contractor, our answer would be the same; even if it risked making that TO unprofitable. We don't have to worry about turning a profit, just a never ending pile of work we would rather work on, but our answer has to be consistent.

We stand by ready to concur with a request to waive redoing the analysis if the reprocessed data is barely different. We have no desire to be punitive here, and we have every reason to strive to make both the field and office as efficient as possible. We are extremely sympathetic and Starla and I both worked on the wording of the bad news email to ensure it didn't come across as negative in any way; but that doesn't change that the right answer is to make it right.

Very Respectively,  
Russell

On Mon, Feb 13, 2017 at 19:30 Tyanne Faulkes - NOAA Federal <[tyanne.faulkes@noaa.gov](mailto:tyanne.faulkes@noaa.gov)> wrote:

How about adding rednotes to all the surveys that differ from the DAPR? As James said these errors are on the magnitude of centimeters. When a contractor sent in data with the wrong TVU calculated this made all surfaces fail TVU specifications. We are talking about apples and oranges here.

On Mon, Feb 13, 2017 at 4:17 PM Starla Robinson - NOAA Federal <[starla.robinson@noaa.gov](mailto:starla.robinson@noaa.gov)> wrote:

Precisely James, we would have the contractor fix it. We had a contractor resubmit a year's worth of data for having the wrong TVU values. It was an error. It had to be fixed.

Given the amount of effort we all put into this it is hard to have this delay. Correcting blunders is a cost of doing business, regardless of whether a contractor or a ship is responsible for the product. I know we are eager for the finish line but it is a bit further. I have added CMD Welton and LT Quintero in case they have any ideas to add to how we can help get there.

Sincerely,  
Starla

On Mon, Feb 13, 2017 at 6:34 PM, James J. Miller <[james.j.miller@noaa.gov](mailto:james.j.miller@noaa.gov)> wrote:

If this exact same situation applied to a contractor, would OPS require the contractor to re-process the data?

The error predominantly ranges from 0.5 - 1cm, with the occasional difference reaching 4cm. The vast majority of the project coverage will only affect a small-scale fathoms chart (1:432,000) where the error is unlikely to change the rounded depths on the chart. Processing and personnel resources are limited on the Hassler. Do we really think it is prudent and worthwhile to spend our limited time this way?

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On Mon, Feb 13, 2017 at 5:52 PM, Tyanne Faulkes - NOAA Federal <[tyanne.faulkes@noaa.gov](mailto:tyanne.faulkes@noaa.gov)> wrote:

I am currently out sick. When I get back to the office I will talk to Ben to see if I can work with AHB and the FH to fix the surveys that I was survey manager on (I think there were three).

Tyanne

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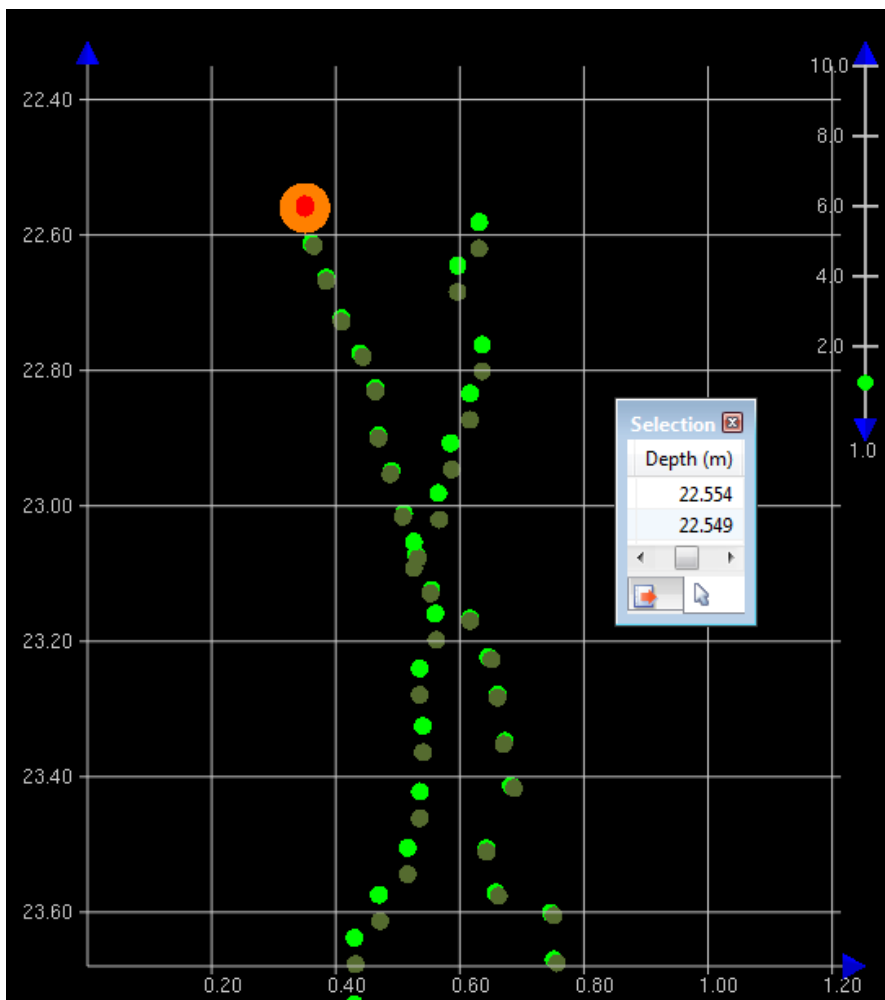
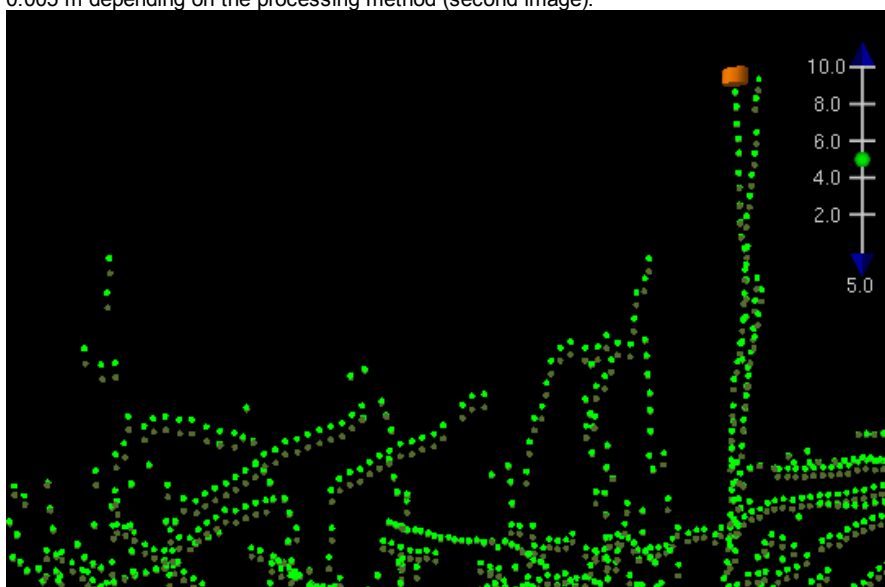
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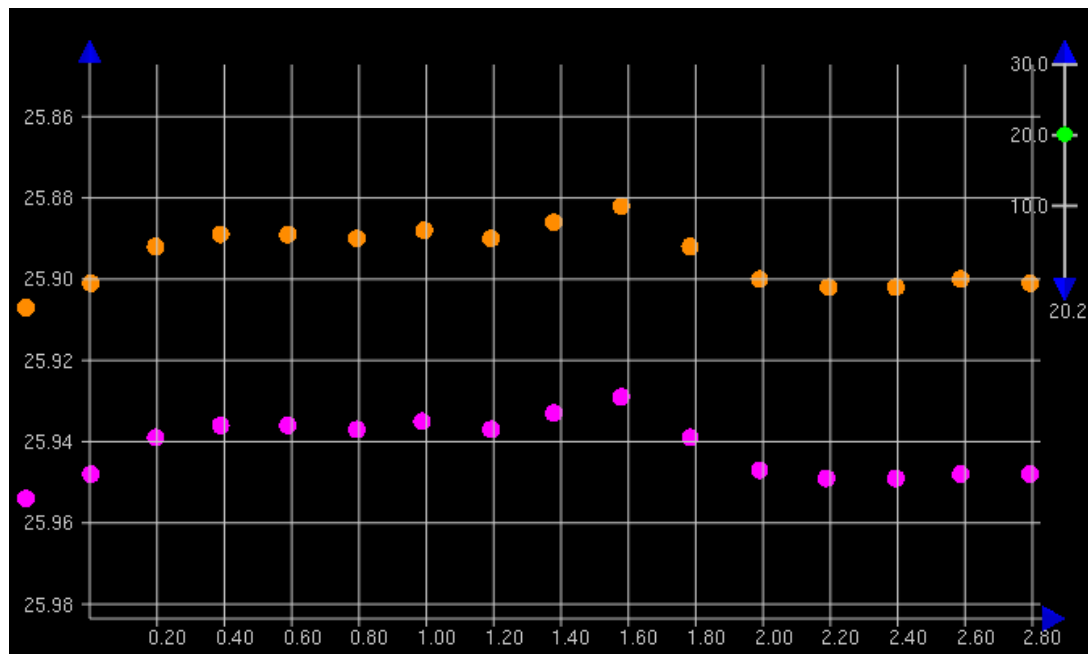
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439 W York St | Norfolk, VA | 23510  
[757-441-6746 x 111](tel:757-441-6746)

On Wed, Feb 8, 2017 at 8:54 AM, OPS.Ferdinand Hassler - NOAA Service Account <[ops.ferdinand.hassler@noaa.gov](mailto:ops.ferdinand.hassler@noaa.gov)> wrote:  
Hi Starla,

I just wanted to bring you in the loop. Clint found an error in our processing workflow during a SAR of H12843 (2015 Chesapeake) that involved not re-applying SV after applying SBETs. James Miller did a test with our Wilmington data that compared data without SV after SBETs and with SV after SBETs. In his test, we found that the difference is only on the order of about 1cm. It sounds like AHB is going to run a quick test of their own to see if they get similar results. We will have to figure out a course of action on this. We expect it to be a drop in the bucket in terms of the total uncertainty but we'll see.

Let us know if you or HSD has any thoughts or recommendations on this.

Thanks,  
-Nick

Field Operations Officer, NOAA Ship *Ferdinand R. Hassler*  
29 Wentworth Road  
New Castle, NH, 03854

On Wed, Feb 8, 2017 at 7:59 AM, OPS.Ferdinand Hassler - NOAA Service Account <[ops.ferdinand.hassler@noaa.gov](mailto:ops.ferdinand.hassler@noaa.gov)> wrote:

Ok, James just did a comparison with some of our Wilmington data and found that the difference was ~1cm generally. It's a limited sample size but he can probably share the results with you shortly.

Field Operations Officer, NOAA Ship *Ferdinand R. Hassler*  
29 Wentworth Road  
New Castle, NH, 03854

On Wed, Feb 8, 2017 at 7:00 AM, Clinton Marcus - NOAA Federal <[clinton.r.marcus@noaa.gov](mailto:clinton.r.marcus@noaa.gov)> wrote:

Hey Nick,  
Just got done talking with Gene. We're gonna try a few test lines and compare the difference before we would move forward with re-processing the entire survey. Basically, the same thing James is

doing out there for you. Thanks again for looking into that.

Cheers,

Clint Marcus  
Physical Scientist  
NOAA Office of Coast Survey  
Atlantic Hydrographic Branch  
Phone: (757) 441-6746 ext 208  
Cell: (541) 264-6406

On Tue, Feb 7, 2017 at 4:51 PM, OPS.Ferdinand Hassler - NOAA Service Account <[ops.ferdinand.hassler@noaa.gov](mailto:ops.ferdinand.hassler@noaa.gov)> wrote:

So we got a quick response from Caris that SVC does need to happen after applying new attitude/nav data such as an SBET. I did a quick check of our 2016 Chesapeake Surveys and those seem to be processed that way so that's good. However, our 2016 Wilmington surveys are all processed without SVC after SBETs. I believe we may end up going back for those and re-applying SV. James is doing a brief comparison to see what kind of difference we see in the data between the two. I imagine though that it varies survey to survey as to how different your SBET is from your original POS data.

-Nick

Field Operations Officer, NOAA Ship *Ferdinand R. Hassler*  
29 Wentworth Road  
New Castle, NH, 03854

On Tue, Feb 7, 2017 at 2:35 PM, Tyanne Faulkes - NOAA Federal <[tyanne.faulkes@noaa.gov](mailto:tyanne.faulkes@noaa.gov)> wrote:

Hi all,

As far as I remember SVC is not required again unless you are using a Kongsberg system. I will try to dig up the email if I have one...

Tyanne

On Tue, Feb 7, 2017 at 11:34 AM, Clinton Marcus - NOAA Federal <[clinton.r.marcus@noaa.gov](mailto:clinton.r.marcus@noaa.gov)> wrote:

Thanks for the quick reply. I'll be standing by to see what CARIS has to say. Thanks again.

Cheers,

Clint Marcus  
Physical Scientist  
NOAA Office of Coast Survey  
Atlantic Hydrographic Branch  
Phone: (757) 441-6746 ext 208  
Cell: (541) 264-6406

On Tue, Feb 7, 2017 at 2:26 PM, OPS.Ferdinand Hassler - NOAA Service Account <[ops.ferdinand.hassler@noaa.gov](mailto:ops.ferdinand.hassler@noaa.gov)> wrote:

Hi Clint,

We are going to check into it with Caris to see exactly how it affects things. Pat Berube did all the processing on this survey and since he was of the FA processing mold, I have to believe that he might have cut that step out for a reason (I HOPE). We are going to contact Caris and find out so standby. LTJG Debrousse is aboard and seems to remember hearing that Caris mentioned that it's not necessary but the FA still went through the step anyhow.

Anyways, James Miller is currently inquiring with Caris.

-Nick

Field Operations Officer, NOAA Ship *Ferdinand R. Hassler*  
29 Wentworth Road  
New Castle, NH, 03854

On Tue, Feb 7, 2017 at 1:36 PM, Clinton Marcus - NOAA Federal <[clinton.r.marcus@noaa.gov](mailto:clinton.r.marcus@noaa.gov)> wrote:

Hi Nick and Jonathan,

I had a question about your processing workflow on the Hassler. Is it standard procedure to only apply SVC once? I ask because I'm noticing that SV was not reapplied at any time after loading SBETs. In my experience, and according to CARIS, it has been standard to re-SVC any time Attitude (heave, pitch, roll) have been edited or updated as it is affecting the ray-trace.

I also noticed that after applying the verified tides, that the data was not merged w/o GPS Tide. This isn't really an issue, unless there was a difference surface made to validate the VDatum model.

Let me know if you have any questions about my train of thought here. It may be the empty stomach affecting my thought process.

Thanks for all the clarification and quick turn-arounds on my questions. Hope the survey is going well out there.

Sincerely,  
 Clint Marcus  
 Physical Scientist  
 NOAA Office of Coast Survey  
 Atlantic Hydrographic Branch  
 Phone: (757) 441-6746 ext 208  
 Cell: (541) 264-6406

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

--  
 Lieutenant Russell Quintero, NOAA  
 Chief, Hydrographic Surveys Division Operations Branch  
 National Oceanic & Atmospheric Administration  
 1315 East-West Hwy, SSMC3 6217  
 Silver Spring, MD 20910  
 Cell: 970-481-2030

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 Starla D. Robinson, Physical Scientist  
 NOS - OCS - Hydrographic Survey Division - Operations Branch  
 National Oceanic Atmospheric Administration  
 Office: 301-713-2702 x125  
 Cell: 360-689-1431  
 Website: [HSD Planned Hydrographic Surveys](#)

---

**Janice Eisenberg - NOAA Federal** <janice.eisenberg@noaa.gov> Mon, Feb 13, 2017 at 9:35 PM  
 To: Briana Welton - NOAA Federal <briana.welton@noaa.gov>, Douglas Wood - NOAA Affiliate <douglas.wood@noaa.gov>, Erin Weller - NOAA Federal <erin.weller@noaa.gov>, "OPS.Ferdinand Hassler - NOAA Service Account" <ops.ferdinand.hassler@noaa.gov>, Robert Short - NOAA Federal <robert.short@noaa.gov>, Starla Robinson - NOAA Federal <starla.robinson@noaa.gov>  
 Cc: CO HASSLER <co.ferdinand.hassler@noaa.gov>, Castle Parker - NOAA Federal <castle.e.parker@noaa.gov>, Clinton Marcus - NOAA Federal <clinton.r.marcus@noaa.gov>, Grant Froelich <grant.froelich@noaa.gov>, "James J. Miller" <james.j.miller@noaa.gov>, John Doroba - NOAA Federal <john.doroba@noaa.gov>, Patrick Debroisse - NOAA Federal <patrick.j.debroisse@noaa.gov>, Russell Quintero - NOAA Federal <russell.quintero@noaa.gov>, Tyanne Faulkes - NOAA Federal <tyanne.faulkes@noaa.gov>

Starla,

With the volume of data we are talking about here, I would recommend that we carefully consider processing configurations, including some more creative solutions which may be available. I am currently discussing with HSTB.

We should bear in mind that any bottlenecks in our existing processing capabilities -- whether on the ship or shoreside -- are likely to be exacerbated by the volume of data we will be ramming through the pipeline.

I'll be in touch tomorrow.

Thanks,  
 Janice

On Mon, Feb 13, 2017 at 9:22 PM Starla Robinson - NOAA Federal <starla.robinson@noaa.gov> wrote:  
 Bobby Short and Doug Wood will be able to help next leg. Would this be an opportunity to use remote support?

Janice, How many instances of CARIS can you process on simultaneously?

On Mon, Feb 13, 2017 at 8:38 PM, OPS.Ferdinand Hassler - NOAA Service Account <ops.ferdinand.hassler@noaa.gov> wrote:

Just a rough outline of the work that needs to be done. See slide two for additional factors that will affect processing times....

V/r  
Nick

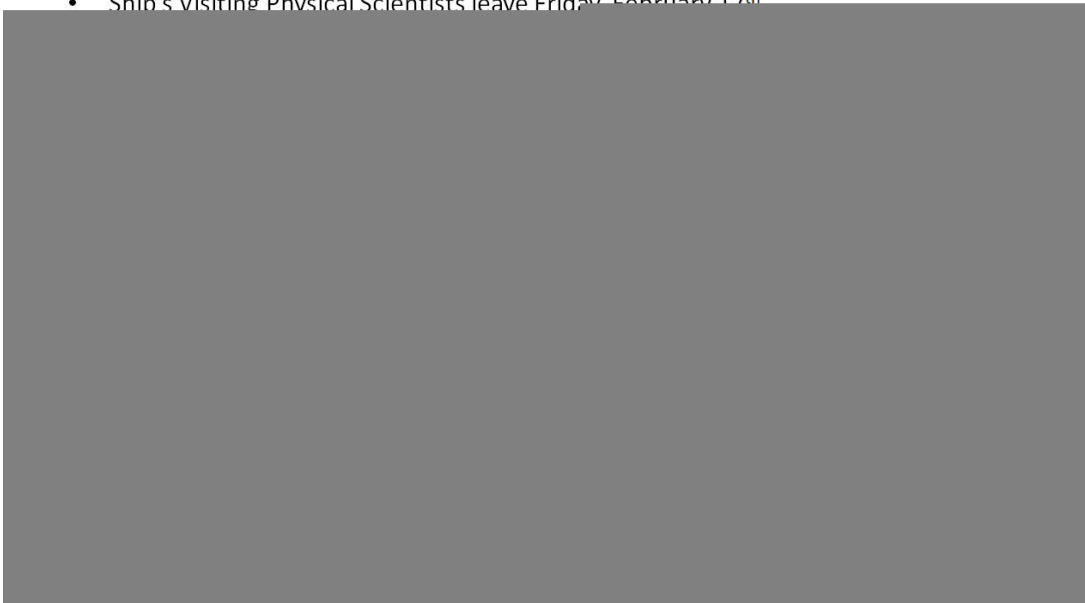
## FH Wilmington 2016 Reapply SVC Workflow

(10 Comments)



## Additional Factors

- Ship's Visiting Physical Scientists leave Friday, February 17th



Field Operations Officer, NOAA Ship *Ferdinand R. Hassler*  
29 Wentworth Road  
New Castle, NH, 03854

On Mon, Feb 13, 2017 at 7:54 PM, Russell Quintero - NOAA Federal <[russell.quintero@noaa.gov](mailto:russell.quintero@noaa.gov)> wrote:

What if the mistake was a tide file with a 1m static offset? MHHW instead of MLLW, for example. All internal checks line up, no statistical issues...passes all of our QC until a sharp-eyed PS notices it during SAR.

That's a clear blunder, and it "blows spec." If it's only a 0.2m offset? That's still not within spec, because it's an Uncertainty Budget, not an Error Budget. Mistakes don't get a pass just for being small enough.

We made another ship reconvert lines because they used the wrong datum for a handful of lines, even though the induced offset was minor. We would have done the same even if it was most of their survey. Mistakes have to be fixed.

This one is really unsatisfying all around because it's the perfect storm of a small effect affecting a large volume of data...but being inconvenient doesn't change that the right answer is still right. If this was a contractor, our answer would be the same; even if it risked making that TO unprofitable. We don't have to worry about turning a profit, just a never ending pile of work we would rather work on, but our answer has to be consistent.

We stand by ready to concur with a request to waive redoing the analysis if the reprocessed data is barely different. We have no desire to be punitive here, and we have every reason to strive to make both the field and office as efficient as possible. We are extremely sympathetic and Starla and I both worked on the wording of the bad news email to ensure it didn't come across as negative in any way; but that doesn't change that the right answer is to make it right.

Very Respectively,  
Russell

On Mon, Feb 13, 2017 at 19:30 Tyanne Faulkes - NOAA Federal <[tyanne.faulkes@noaa.gov](mailto:tyanne.faulkes@noaa.gov)> wrote:

How about adding rednotes to all the surveys that differ from the DAPR? As James said these errors are on the magnitude of centimeters. When a contractor sent in data with the wrong TVU calculated this made all surfaces fail TVU specifications. We are talking about apples and oranges here.

On Mon, Feb 13, 2017 at 4:17 PM Starla Robinson - NOAA Federal <[starla.robinson@noaa.gov](mailto:starla.robinson@noaa.gov)> wrote:

Precisely James, we would have the contractor fix it. We had a contractor resubmit a year's worth of data for having the wrong TVU values. It was an error. It had to be fixed.

Given the amount of effort we all put into this it is hard to have this delay. Correcting blunders is a cost of doing business, regardless of whether a contractor or a ship is responsible for the product. I know we are eager for the finish line but it is a bit further. I have added CMD Welton and LT Quintero in case they have any ideas to add to how we can help get there.

Sincerely,  
Starla

On Mon, Feb 13, 2017 at 6:34 PM, James J. Miller <[james.j.miller@noaa.gov](mailto:james.j.miller@noaa.gov)> wrote:

If this exact same situation applied to a contractor, would OPS require the contractor to re-process the data?

The error predominantly ranges from 0.5 - 1cm, with the occasional difference reaching 4cm. The vast majority of the project coverage will only affect a small-scale fathoms chart (1:432,000) where the error is unlikely to change the rounded depths on the chart. Processing and personnel resources are limited on the Hassler. Do we really think it is prudent and worthwhile to spend our limited time this way?

James J. Miller  
Physical Scientist  
NOAA Office of Coast Survey  
Atlantic Hydrographic Branch  
439 W York St | Norfolk, VA | 23510  
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On Mon, Feb 13, 2017 at 5:52 PM, Tyanne Faulkes - NOAA Federal <[tyanne.faulkes@noaa.gov](mailto:tyanne.faulkes@noaa.gov)> wrote:

I am currently out sick. When I get back to the office I will talk to Ben to see if I can work with AHB and the FH to fix the surveys that I was survey manager on (I think there were three).

Tyanne

On Mon, Feb 13, 2017 at 2:47 PM Starla Robinson - NOAA Federal <[starla.robinson@noaa.gov](mailto:starla.robinson@noaa.gov)> wrote:

HSD understands the desire to not reprocess this data, however after much soul searching and deliberation including consultation with the Chief of HSD... reprocess the data. The TVU budget is not for blunders. Captain Brennan has requested that the ship provide a plan on how to resolve this in a timely manner.

To help speed things up, we think you could do a difference surface of the final surfaces with the previous products. By showing there is no statistically significant difference between the two surfaces, you could make the argument that the analysis (cross-lines, junctions, and chart comparisons) does not need to be redone. HSD can then issue a waiver concurring with this.

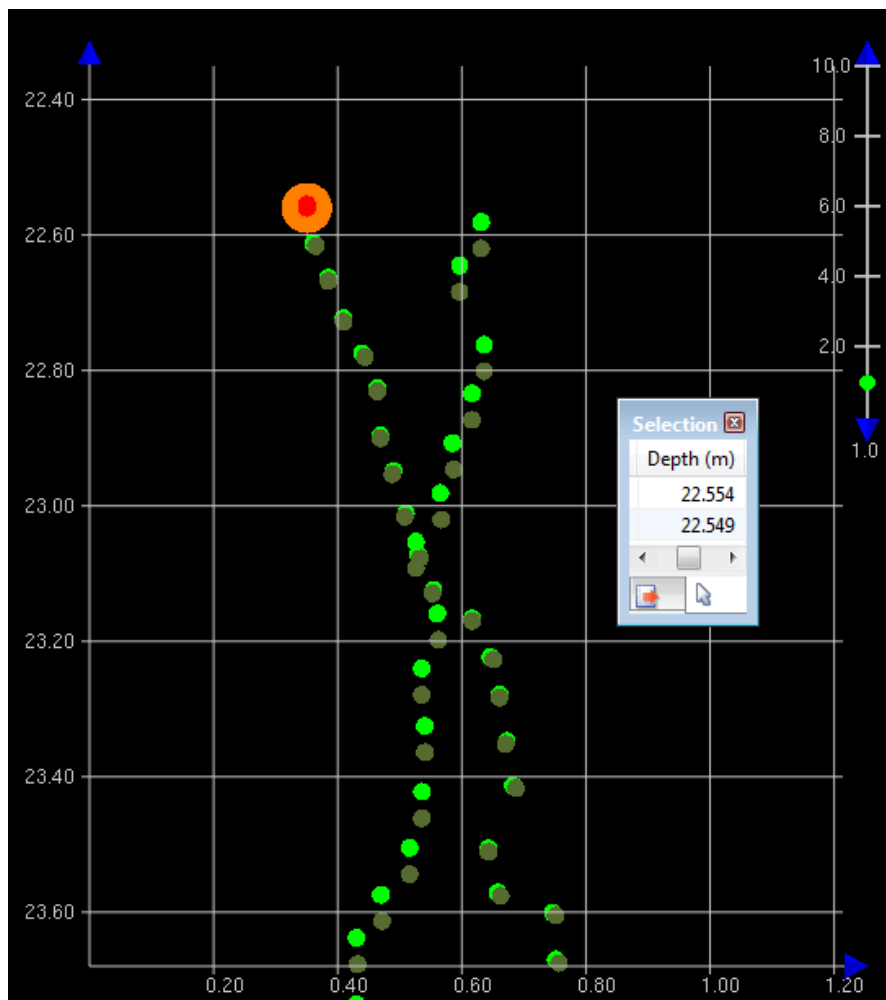
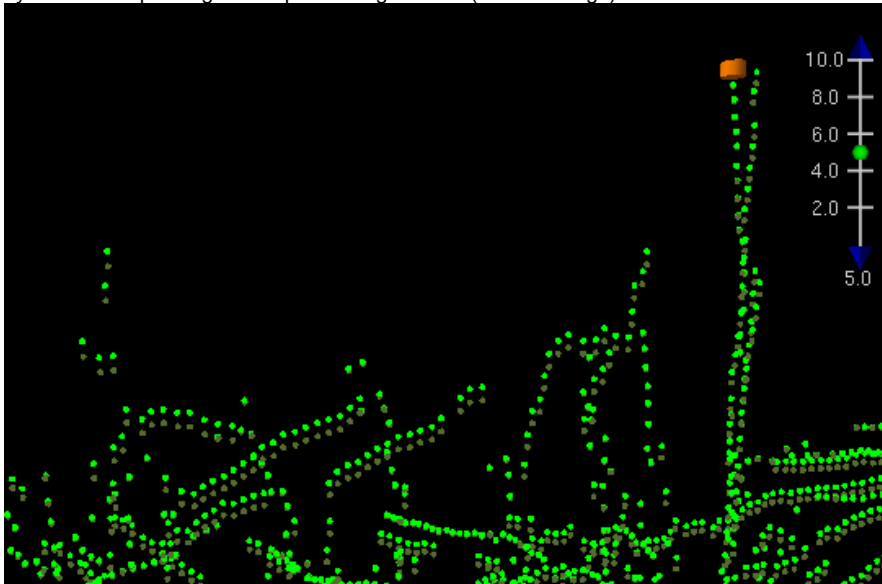
Sincerely,



Starla

On Thu, Feb 9, 2017 at 12:35 PM, James J. Miller <james.j.miller@noaa.gov> wrote:  
Hi Clint,

Our testing is consistent with your findings. Survey H12859 has one wreck that we used for additional testing. The vertical difference between processing methods ranged from 0.005 - 0.040 m over the wreck. The least depth of the wreck would change by 0.005 m depending on the processing method (second image).



Survey H12932 (OPR-G309-FH-16) has one wreck that we tested. The vertical differences between processing methods were even smaller, ranging from 0.004 - 0.010 m. The least depth of the wreck would change by 0.004 m depending on the processing

method.

We are relieved that preprocessing appears to be unnecessary for H12843 and OPR-G309-FH-16. Thanks again for identifying this problem and helping with the testing.

Thanks,  
James

James J. Miller  
Physical Scientist  
NOAA Office of Coast Survey  
Atlantic Hydrographic Branch  
439 W York St | Norfolk, VA | 23510  
[757-441-6746](tel:757-441-6746) x 111

On Thu, Feb 9, 2017 at 12:23 PM, Clinton Marcus - NOAA Federal <[clinton.r.marcus@noaa.gov](mailto:clinton.r.marcus@noaa.gov)> wrote:

Hi all,

After taking another sub-section of H12843 for reprocessing, it was found that 95% of the nodes were +/- 2cm. I will go so far as to say the difference would likely be even smaller if I had filtered the one XL present, which is what the FH did (I believe).

I took a total of 37 lines in an area of general bathymetry (no features) and followed the same procedure as previously noted. Taking the data from conversion thru SBETs, and re-applying SVC after SBETs.

Looking at the data in subset, there was little to no difference between the two projects.

After talking with Gene, we determined that it would not be necessary to reprocess the entire survey for such a small difference. Yay!

You might want to just double check with them (CO, Gene, Bri), but I don't think it is necessary for you to go back and reprocess the OPR-G309-FH-16 data.

Hope this all helped.

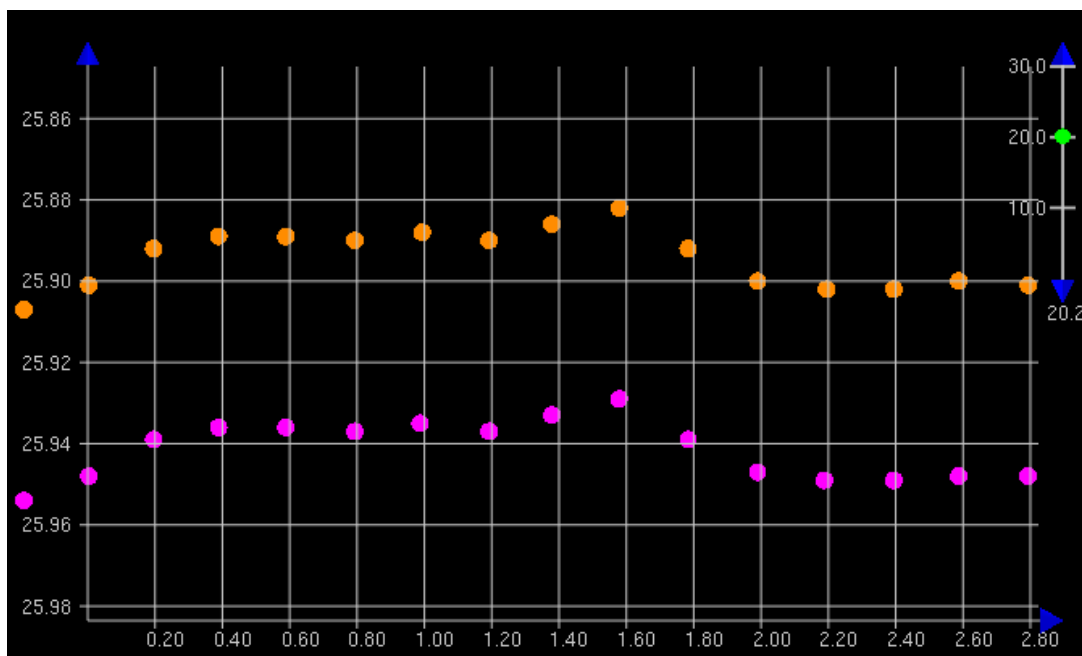
Cheers,  
Clint Marcus  
Physical Scientist  
NOAA Office of Coast Survey  
Atlantic Hydrographic Branch  
Phone: (757) 441-6746 ext 208  
Cell: (541) 264-6406

On Thu, Feb 9, 2017 at 9:12 AM, James J. Miller <[james.j.miller@noaa.gov](mailto:james.j.miller@noaa.gov)> wrote:

Hi Clint,

Thanks for all the helpful information and screen shots. For your next test subset, I think it would be worth comparing the original survey lines (re-SVC not conducted after SBETs) to the test lines at the sounding level in Subset Editor. When comparing surfaces, they often exhibit apparent vertical differences along slopes and features due to small horizontal shifts, rather than actual vertical changes. We are curious about the magnitude of the vertical difference between the soundings.

Even though survey H12859 was not affected by this issue because SVC was run after loading SBETs, we conducted a test because it is in the vicinity of H12843. We re-processed test copies of the H12859 crosslines and did not re-SVC after loading SBETs. As viewed in Subset Editor, the vertical difference between processing methods mostly ranged from 2-3 cm and reached a maximum of 5 cm in some areas. This seems similar to the H12843 difference surface where you found that 95% of nodes were +/- 6 cm.



I will follow your lead and try testing a couple features on H12859 and the OPR-G309-FH-16 surveys. Worth checking how the least depths are affected.

James J. Miller  
Physical Scientist  
NOAA Office of Coast Survey  
Atlantic Hydrographic Branch  
439 W York St | Norfolk, VA | 23510  
[757-441-6746](tel:757-441-6746) x 111

On Thu, Feb 9, 2017 at 7:42 AM, Clinton Marcus - NOAA Federal <[clinton.r.marcus@noaa.gov](mailto:clinton.r.marcus@noaa.gov)> wrote:

Hi Nick,

With the soundings all being from development lines, there is good parity within the data. The soundings were for the most part all of a Quality Flag of 3. We are going to process another subset of H12843 to help validate our findings. The screen shot attached is of a subset over the wreck showing the density of soundings. We'll keep you posted with our findings.

Cheers,

Clint Marcus  
Physical Scientist  
NOAA Office of Coast Survey  
Atlantic Hydrographic Branch  
Phone: (757) 441-6746 ext 208  
Cell: (541) 264-6406

On Wed, Feb 8, 2017 at 8:26 PM, OPS.Ferdinand Hassler - NOAA Service Account <[ops.ferdinand.hassler@noaa.gov](mailto:ops.ferdinand.hassler@noaa.gov)> wrote:

Also, it could be possible that a horizontal change in position of the soundings could exacerbate the vertical difference in a sharp feature like a wreck but correct me if I'm wrong.

Nick

On Feb 8, 2017, at 6:32 PM, Clinton Marcus - NOAA Federal <[clinton.r.marcus@noaa.gov](mailto:clinton.r.marcus@noaa.gov)> wrote:

Hi James, et. al.

I ran a small subset of lines (8) on H12843 that were development lines over a wreck. I made a local project and took the lines through the entire processing workflow and re-SVC'd after the application of SBETs. I created a combined 2m surface which I then differenced with the field submitted combined surface. The result was that 95% of nodes had a +/- 6cm difference. There were localized differences of up to 52cm over the wreck. Unfortunately, I did not difference the soundings before and after the post-SBET SVC. I believe Gene and Bri were going to talk about how to proceed with H12843.

Hope that helps in the decision making process. I don't have the data in front of me, unfortunately, so I don't have any screen grabs available. I can send some out in the morning when I get to the office.

Thanks,  
Clint

Clint Marcus  
Physical Scientist  
NOAA Office of Coast Survey  
Atlantic Hydrographic Branch  
Phone: (757) 441-6746 ext 208  
Cell: (541) 264-6406

On Wed, Feb 8, 2017 at 6:11 PM, James J. Miller <james.j.miller@noaa.gov> wrote:  
Hi everyone,

Thank you Clint for identifying this issue. And thank you all for clarifying that the proper workflow is to run (or re-run) SVC after loading the SBET if gyro, pitch, roll, heave or GPS height are applied. Unfortunately, this workflow was not followed during project OPR-G309-FH-16, which consists of 8 surveys and over 500 SNM of coverage. This issue is also relevant for the survey Clint is reviewing (H12843). Due to the large amount of data that is affected, it would take a significant amount of time to re-run SVC, re-Merge, re-check the designated soundings, and re-compute the grids. So in the interest of saving time, we were curious whether the problem is small enough to be documented in the DRs without reprocessing the data.

To assess the magnitude of the problem, we re-processed test copies of the crosslines for several surveys in project OPR-G309-FH-16 and conducted a comparison between running SVC before or after applying SBETs. As viewed in Subset Editor, the vertical difference between these methods did not exceed 1 cm (see image below), even in the outermost beams which exhibited larger offsets than nadir beams (as expected). Depths ranged from 20-45 m. At least from our testing on project OPR-G309-FH-16, the magnitude of the offset is small enough that reprocessing does not seem worthwhile.  
<2017-02-08\_17-14-54.png>

Clint, what did your reprocessed test lines show on survey H12843? How large were the vertical offsets between running SVC before or after loading SBETs? Greater than 1 cm?

Thanks,  
James

James J. Miller  
Physical Scientist

--  
Janice Eisenberg  
Physical Scientist  
Hydrographic Systems and Technology Branch  
NOAA Office of Coast Survey  
301-713-2653 X144  
Janice.Eisenberg@noaa.gov

**James J. Miller** <james.j.miller@noaa.gov>

Mon, Feb 13, 2017 at 9:39 PM

To: Russell Quintero - NOAA Federal <russell.quintero@noaa.gov>

Cc: Briana Welton - NOAA Federal <briana.welton@noaa.gov>, CO HASSLER <co.ferdinand.hassler@noaa.gov>, "OPS.Ferdinand Hassler - NOAA Service Account" <ops.ferdinand.hassler@noaa.gov>, Starla Robinson - NOAA Federal <starla.robinson@noaa.gov>, Tyanne Faulkes - NOAA Federal <tyanne.faulkes@noaa.gov>, Castle Parker - NOAA Federal <castle.e.parker@noaa.gov>, Clinton Marcus - NOAA Federal <clinton.r.marcus@noaa.gov>, Grant Froelich <grant.froelich@noaa.gov>, Janice Eisenberg - NOAA Federal <janice.eisenberg@noaa.gov>, John Doroba - NOAA Federal <john.doroba@noaa.gov>, Patrick Debroisse - NOAA Federal <patrick.j.debroisse@noaa.gov>

Russell,

Thank you for the detailed information. I appreciate all the points you and Starla have discussed and your understanding on this issue.

If this was a tide-referenced survey, there would be no problem because SVC was applied after loading delayed heave and tides. In terms of SVC, I think of SBETs as providing a (potentially) refined solution, not the "correct" solution because there is always uncertainty in our measurements. The SBET provides refined attitude information for the ray tracing, but it does not provide a radically different solution compared to using raw attitude. This is why it had such a small effect on the soundings. And this is why I do not consider it a failure to meet specs.

A similar example would be if someone elected not to load delayed heave. Yes, we recommend loading delayed heave because it provides a smoother result, but failing to use it does not constitute a failure to meet specs.

I suppose this entire discussion hinges on what a blunder is, and what is covered by the uncertainty budget. Clearly we all agree that the recommended Caris workflow was not followed during OPR-G309-FH-16 because SVC was not re-applied after loading SBETs. Yet it is not clear to me that this fails the specs. To my knowledge, the specs provide minimum requirements for the data but they do not prohibit any processing mistakes.

In my opinion, failing to re-apply SVC after loading SBETs provided a less precise solution and introduced uncertainty to the sounding measurements. It did not introduce a static offset, since it made some soundings slightly deeper and others slightly shallower. The degree of uncertainty that was introduced is identical to it being a tide-referenced survey, since we would consider the raw attitude and delayed heave as adequate for SVC ray tracing in that case. Yet for this ERS project, we are saying that same practice fails to meet the specs.

In addition, the 2016 HSSD does distinguish between an error budget and an uncertainty budget (images below). I suppose it is debatable whether this issue falls within the description of sound speed errors in 5.2.3.5, but it is worth consideration.

Respectfully,  
James

### 5.2.3.5 Error Budget Analysis for Depths

The hydrographer shall discuss (in Section B.2 of the Descriptive Report) the methods used to minimize the errors

Sound speed error: The factors associated with this error include (1) the ability to accurately measure sound speed or calculate sound speed from temperature, conductivity and pressure, (2) the spatial and temporal changes of

### 5.2.3.6 Uncertainty Budget Analysis for Depths

The hydrographer shall discuss (in Section B.2 of the Descriptive Report) the methods used to minimize the

James J. Miller  
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What if the mistake was a tide file with a 1m static offset? MHHW instead of MLLW, for example. All internal checks line up, no statistical issues...passes all of our QC until a sharp-eyed PS notices it during SAR.

That's a clear blunder, and it "blows spec." If it's only a 0.2m offset? That's still not within spec, because it's an Uncertainty Budget, not an Error Budget. Mistakes don't get a pass just for being small enough.

We made another ship reconvert lines because they used the wrong datum for a handful of lines, even though the induced offset was minor. We would have done the same even if it was most of their survey. Mistakes have to be fixed.

This one is really unsatisfying all around because it's the perfect storm of a small effect affecting a large volume of data...but being inconvenient doesn't change that the right answer is still right. If this was a contractor, our answer would be the same; even if it risked making that TO unprofitable. We don't have to worry about turning a profit, just a never ending pile of work we would rather work on, but our answer has to be consistent.

We stand by ready to concur with a request to waive redoing the analysis if the reprocessed data is barely different. We have no desire to be punitive here, and we have every reason to strive to make both the field and office as efficient as possible. We are extremely sympathetic and Starla and I both worked on the wording of the bad news email to ensure it didn't come across as negative in any way; but that doesn't change that the right answer is to make it right.

Very Respectively,  
Russell

On Mon, Feb 13, 2017 at 19:30 Tyanne Faulkes - NOAA Federal <[tyanne.faulkes@noaa.gov](mailto:tyanne.faulkes@noaa.gov)> wrote:

How about adding rednotes to all the surveys that differ from the DAPR? As James said these errors are on the magnitude of centimeters. When a contractor sent in data with the wrong TVU calculated this made all surfaces fail TVU specifications. We are talking about apples and oranges here.

On Mon, Feb 13, 2017 at 4:17 PM Starla Robinson - NOAA Federal <[starla.robinson@noaa.gov](mailto:starla.robinson@noaa.gov)> wrote:

Precisely James, we would have the contractor fix it. We had a contractor resubmit a year's worth of data for having the wrong TVU values. It was an error. It had to be fixed.

Given the amount of effort we all put into this it is hard to have this delay. Correcting blunders is a cost of doing business, regardless of whether a contractor or a ship is responsible for the product. I know we are eager for the finish line but it is a bit further. I have added CMD Welton and LT Quintero in case they have any ideas to add to how we can help get there.

Sincerely,  
Starla

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439 W York St | Norfolk, VA | 23510  
[757-441-6746](tel:757-441-6746) x 111

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HSD understands the desire to not reprocess this data, however after much soul searching and deliberation including consultation with the Chief of HSD... reprocess the data. The TVU budget is not for blunders. Captain Brennan has requested that the ship provide a plan on how to resolve this in a timely manner.

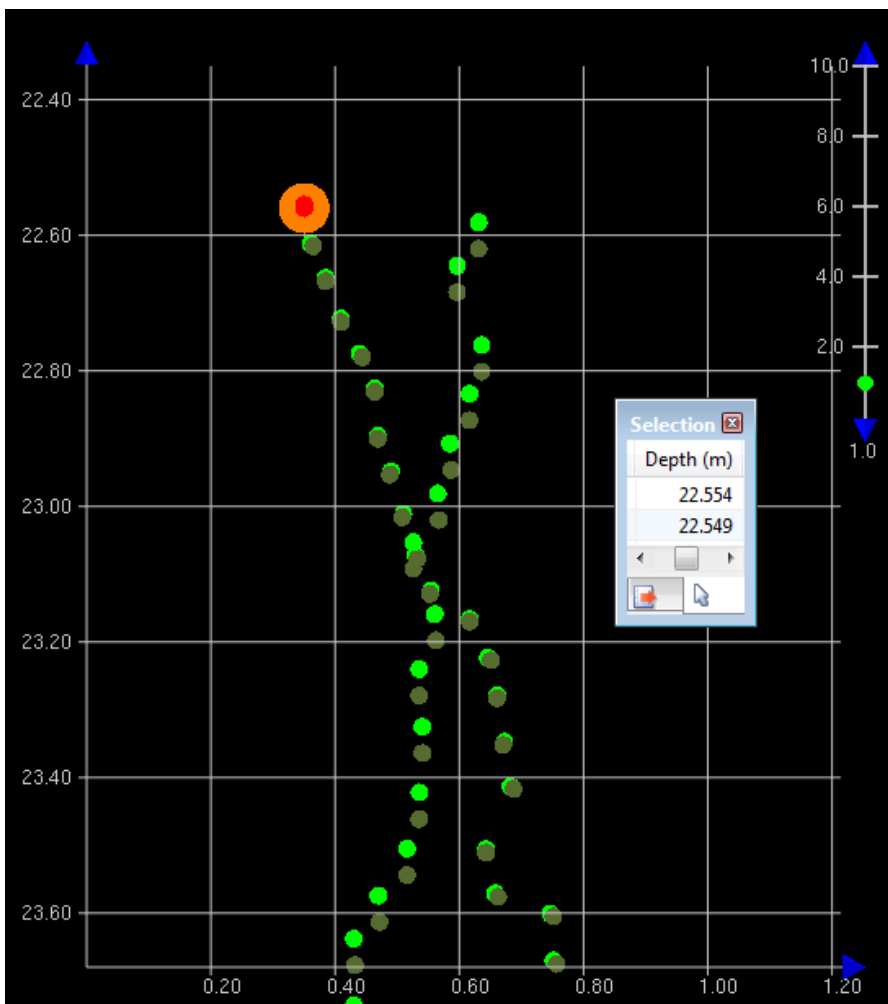
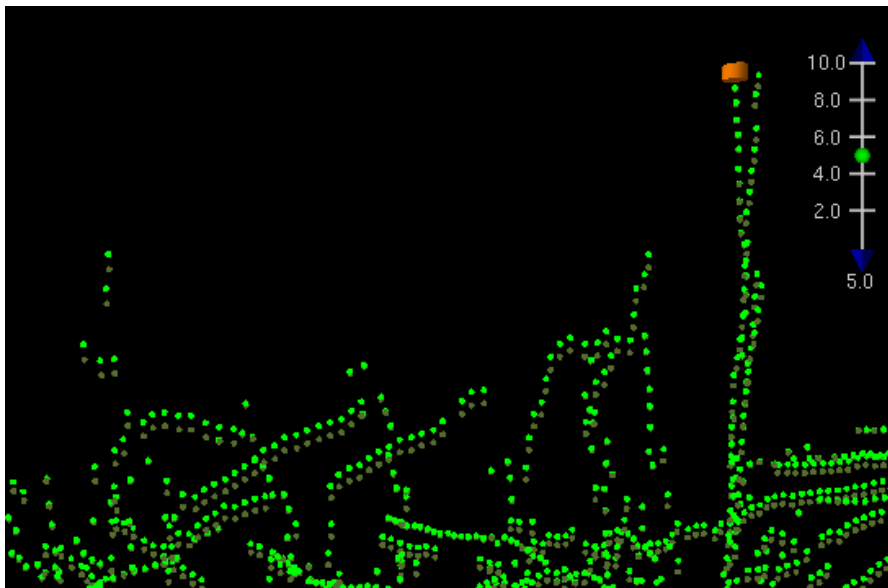
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Hi Clint,

Our testing is consistent with your findings. Survey H12859 has one wreck that we used for additional testing. The vertical difference between processing methods ranged from 0.005 - 0.040 m over the wreck. The least depth of the wreck would change by 0.005 m depending on the processing method (second image).



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We are relieved that preprocessing appears to be unnecessary for H12843 and OPR-G309-FH-16. Thanks again for identifying this problem and helping with the testing.

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James

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 Hi all,

After taking another sub-section of H12843 for reprocessing, it was found that 95% of the nodes were +/- 2cm. I will go so far as to say the difference would likely be even smaller if I had filtered the one XL present, which is what the FH did (I believe).

I took a total of 37 lines in an area of general bathymetry (no features) and followed the same procedure as previously noted. Taking the data from conversion thru SBETs, and re-applying SVC after SBETs.

Looking at the data in subset, there was little to no difference between the two projects.

After talking with Gene, we determined that it would not be necessary to reprocess the entire survey for such a small difference. Yay!

You might want to just double check with them (CO, Gene, Bri), but I don't think it is necessary for you to go back and reprocess the OPR-G309-FH-16 data.

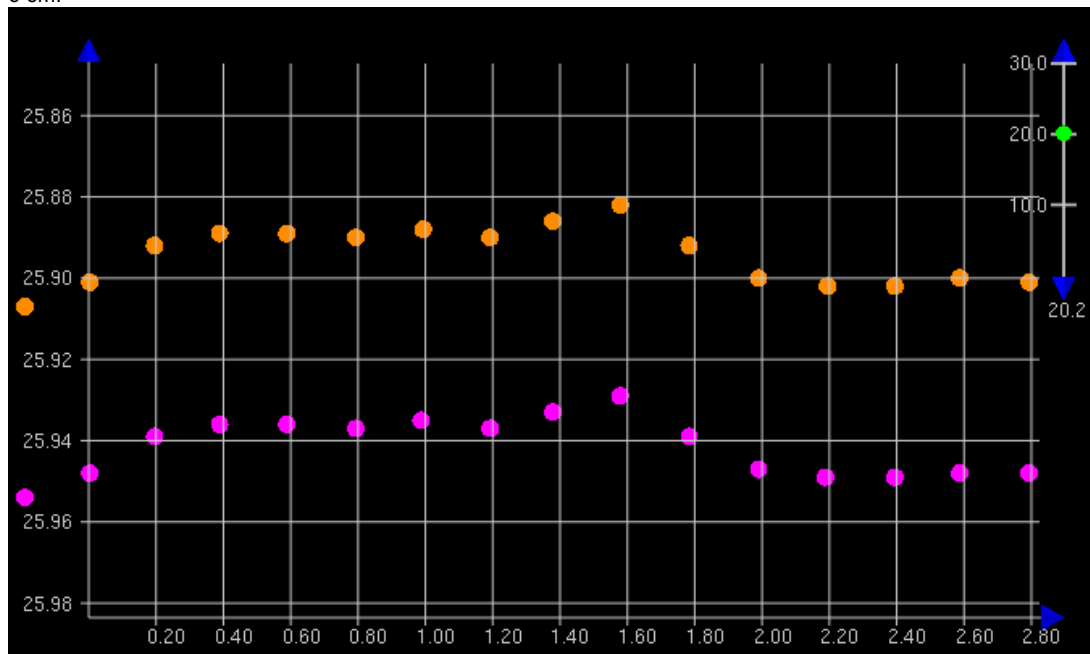
Hope this all helped.

Cheers,  
 Clint Marcus  
 Physical Scientist  
 NOAA Office of Coast Survey  
 Atlantic Hydrographic Branch  
 Phone: (757) 441-6746 ext 208  
 Cell: (541) 264-6406

On Thu, Feb 9, 2017 at 9:12 AM, James J. Miller <[james.j.miller@noaa.gov](mailto:james.j.miller@noaa.gov)> wrote:  
 Hi Clint,

Thanks for all the helpful information and screen shots. For your next test subset, I think it would be worth comparing the original survey lines (re-SVC not conducted after SBETs) to the test lines at the sounding level in Subset Editor. When comparing surfaces, they often exhibit apparent vertical differences along slopes and features due to small horizontal shifts, rather than actual vertical changes. We are curious about the magnitude of the vertical difference between the soundings.

Even though survey H12859 was not affected by this issue because SVC was run after loading SBETs, we conducted a test because it is in the vicinity of H12843. We re-processed test copies of the H12859 crosslines and did not re-SVC after loading SBETs. As viewed in Subset Editor, the vertical difference between processing methods mostly ranged from 2-3 cm and reached a maximum of 5 cm in some areas. This seems similar to the H12843 difference surface where you found that 95% of nodes were +/- 6 cm.



I will follow your lead and try testing a couple features on H12859 and the OPR-G309-FH-16 surveys. Worth checking how the least depths are affected.

James J. Miller  
 Physical Scientist  
 NOAA Office of Coast Survey



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On Thu, Feb 9, 2017 at 7:42 AM, Clinton Marcus - NOAA Federal <[clinton.r.marcus@noaa.gov](mailto:clinton.r.marcus@noaa.gov)> wrote:

Hi Nick,

With the soundings all being from development lines, there is good parity within the data. The soundings were for the most part all of a Quality Flag of 3. We are going to process another subset of H12843 to help validate our findings. The screen shot attached is of a subset over the wreck showing the density of soundings. We'll keep you posted with our findings.

Cheers,

Clint Marcus  
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NOAA Office of Coast Survey  
Atlantic Hydrographic Branch  
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Cell: (541) 264-6406

On Wed, Feb 8, 2017 at 8:26 PM, OPS.Ferdinand Hassler - NOAA Service Account <[ops.ferdinand.hassler@noaa.gov](mailto:ops.ferdinand.hassler@noaa.gov)> wrote:

Also, it could be possible that a horizontal change in position of the soundings could exacerbate the vertical difference in a sharp feature like a wreck but correct me if I'm wrong.

Nick

On Feb 8, 2017, at 6:32 PM, Clinton Marcus - NOAA Federal <[clinton.r.marcus@noaa.gov](mailto:clinton.r.marcus@noaa.gov)> wrote:

Hi James, et. al.

I ran a small subset of lines (8) on H12843 that were development lines over a wreck. I made a local project and took the lines through the entire processing workflow and re-SVC'd after the application of SBETs. I created a combined 2m surface which I then differenced with the field submitted combined surface. The result was that 95% of nodes had a +/- 6cm difference. There were localized differences of up to 52cm over the wreck. Unfortunately, I did not difference the soundings before and after the post-SBET SVC. I believe Gene and Bri were going to talk about how to proceed with H12843.

Hope that helps in the decision making process. I don't have the data in front of me, unfortunately, so I don't have any screen grabs available. I can send some out in the morning when I get to the office.

Thanks,  
Clint

Clint Marcus  
Physical Scientist  
NOAA Office of Coast Survey  
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On Wed, Feb 8, 2017 at 6:11 PM, James J. Miller <[james.j.miller@noaa.gov](mailto:james.j.miller@noaa.gov)> wrote:

Hi everyone,

Thank you Clint for identifying this issue. And thank you all for clarifying that the proper workflow is to run (or re-run) SVC after loading the SBET if gyro, pitch, roll, heave or GPS height are applied. Unfortunately, this workflow was not followed during project OPR-G309-FH-16, which consists of 8 surveys and over 500 SNM of coverage. This issue is also relevant for the survey Clint is reviewing (H12843). Due to the large amount of data that is affected, it would take a significant amount of time to re-run SVC, re-Merge, re-check the designated soundings, and re-compute the grids. So in the interest of saving time, we were curious whether the problem is small enough to be documented in the DRs without reprocessing the data.

To assess the magnitude of the problem, we re-processed test copies of the crosslines for several surveys in project OPR-G309-FH-16 and conducted a comparison between running SVC before or after applying SBETs. As viewed in Subset Editor, the vertical difference between these methods did not exceed 1 cm (see image below), even in the outermost beams which exhibited larger offsets than nadir beams (as expected). Depths ranged from 20-45 m. At least from our testing on project OPR-G309-FH-16, the magnitude of the offset is small enough that reprocessing does not seem worthwhile.

<2017-02-08\_17-14-54.png>

Clint, what did your reprocessed test lines show on survey H12843? How large were the vertical offsets between running SVC before or after loading SBETs? Greater than 1 cm?

Thanks,  
James

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Physical Scientist  
NOAA Office of Coast Survey

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On Wed, Feb 8, 2017 at 8:54 AM, OPS.Ferdinand Hassler - NOAA Service Account <[ops.ferdinand.hassler@noaa.gov](mailto:ops.ferdinand.hassler@noaa.gov)> wrote:

Hi Starla,

I just wanted to bring you in the loop. Clint found an error in our processing workflow during a SAR of H12843 (2015 Chesapeake) that involved not re-applying SV after applying SBETs. James Miller did a test with our Wilmington data that compared data without SV after SBETs and with SV after SBETs. In his test, we found that the difference is only on the order of about 1cm. It sounds like AHB is going to run a quick test of their own to see if they get similar results. We will have to figure out a course of action on this. We expect it to be a drop in the bucket in terms of the total uncertainty but we'll see.

Let us know if you or HSD has any thoughts or recommendations on this.

Thanks,  
-Nick

Field Operations Officer, NOAA Ship *Ferdinand R. Hassler*  
29 Wentworth Road  
New Castle, NH, 03854

On Wed, Feb 8, 2017 at 7:59 AM, OPS.Ferdinand Hassler - NOAA Service Account <[ops.ferdinand.hassler@noaa.gov](mailto:ops.ferdinand.hassler@noaa.gov)> wrote:

Ok, James just did a comparison with some of our Wilmington data and found that the difference was ~1cm generally. It's a limited sample size but he can probably share the results with you shortly.

Field Operations Officer, NOAA Ship *Ferdinand R. Hassler*  
29 Wentworth Road  
New Castle, NH, 03854

On Wed, Feb 8, 2017 at 7:00 AM, Clinton Marcus - NOAA Federal <[clinton.r.marcus@noaa.gov](mailto:clinton.r.marcus@noaa.gov)> wrote:

Hey Nick,

Just got done talking with Gene. We're gonna try a few test lines and compare the difference before we would move forward with re-processing the entire survey. Basically, the same thing James is doing out there for you. Thanks again for looking into that.

Cheers,

Clint Marcus  
Physical Scientist  
NOAA Office of Coast Survey  
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On Tue, Feb 7, 2017 at 4:51 PM, OPS.Ferdinand Hassler - NOAA Service Account <[ops.ferdinand.hassler@noaa.gov](mailto:ops.ferdinand.hassler@noaa.gov)> wrote:

So we got a quick response from Caris that SVC does need to happen after applying new attitude/nav data such as an SBET. I did a quick check of our 2016 Chesapeake Surveys and those seem to be processed that way so that's good. However, our 2016 Wilmington surveys are all processed without SVC after SBETs. I believe we may end up going back for those and re-applying SV. James is doing a brief comparison to see what kind of difference we see in the data between the two. I imagine though that it varies survey to survey as to how different your SBET is from your original POS data.

-Nick

Field Operations Officer, NOAA Ship *Ferdinand R. Hassler*  
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New Castle, NH, 03854

On Tue, Feb 7, 2017 at 2:35 PM, Tyanne Faulkes - NOAA Federal <[tyanne.faulkes@noaa.gov](mailto:tyanne.faulkes@noaa.gov)> wrote:

Hi all,

As far as I remember SVC is not required again unless you are using a Kongsberg system. I will try to dig up the email if I have one...

Tyanne

On Tue, Feb 7, 2017 at 11:34 AM, Clinton Marcus - NOAA Federal <[clinton.r.marcus@noaa.gov](mailto:clinton.r.marcus@noaa.gov)> wrote:

Thanks for the quick reply. I'll be standing by to see what CARIS has to say. Thanks again.

Cheers,

Clint Marcus  
Physical Scientist  
NOAA Office of Coast Survey  
Atlantic Hydrographic Branch  
Phone: (757) 441-6746 ext 208  
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On Tue, Feb 7, 20

...

[Message clipped]

**Starla Robinson - NOAA Federal** <[starla.robinson@noaa.gov](mailto:starla.robinson@noaa.gov)>

Tue, Feb 14, 2017 at 5:13 AM

To: "James J. Miller" <[james.j.miller@noaa.gov](mailto:james.j.miller@noaa.gov)>

Cc: Russell Quintero - NOAA Federal <[russell.quintero@noaa.gov](mailto:russell.quintero@noaa.gov)>, Briana Welton - NOAA Federal <[briana.welton@noaa.gov](mailto:briana.welton@noaa.gov)>, CO HASSLER <[co.ferdinand.hassler@noaa.gov](mailto:co.ferdinand.hassler@noaa.gov)>, "OPS.Ferdinand Hassler - NOAA Service Account" <[ops.ferdinand.hassler@noaa.gov](mailto:ops.ferdinand.hassler@noaa.gov)>, Tyanne Faulkes - NOAA Federal <[tyanne.faulkes@noaa.gov](mailto:tyanne.faulkes@noaa.gov)>, Castle Parker - NOAA Federal <[castle.e.parker@noaa.gov](mailto:castle.e.parker@noaa.gov)>, Clinton Marcus - NOAA Federal <[clinton.r.marcus@noaa.gov](mailto:clinton.r.marcus@noaa.gov)>, Grant Froelich <[grant.froelich@noaa.gov](mailto:grant.froelich@noaa.gov)>, Janice Eisenberg - NOAA Federal <[janice.eisenberg@noaa.gov](mailto:janice.eisenberg@noaa.gov)>, John Doroba - NOAA Federal <[john.doroba@noaa.gov](mailto:john.doroba@noaa.gov)>, Patrick Debrouse - NOAA Federal <[patrick.j.debrouse@noaa.gov](mailto:patrick.j.debrouse@noaa.gov)>, Michael Gonsalves - NOAA Federal <[michael.gonsalves@noaa.gov](mailto:michael.gonsalves@noaa.gov)>, Douglas Wood - NOAA Affiliate <[douglas.wood@noaa.gov](mailto:douglas.wood@noaa.gov)>, Robert Short - NOAA Federal <[robert.short@noaa.gov](mailto:robert.short@noaa.gov)>, Katrina Wyllie - NOAA Federal <[katrina.wyllie@noaa.gov](mailto:katrina.wyllie@noaa.gov)>

This is a good question.

The uncertainty budget accounts for random errors associated with our chosen method and tool of measurement, those assumptions are accounted for in the descriptive report and are recorded in the data as TVU. We can choose to use a less precise tool or method but its uncertainty assumptions have to be accounted for.

Not recalculating the beam steering from the SVC after the positional shift of SBETS incurs a static error similar to a calibration offset that is propagated to the depths. Because the error is not random it is not appropriate to account for it within the uncertainty budget.

The error budget is referencing specific sources of errors regardless of whether they are random or systematic. I believe "How the sound speed profile is used to convert measured time to depth.." is referring to the biases associated with the algorithms applied for beam steering, not the inputs put into those algorithm.

Could we write it off? When there is an artifact we can not easily rectify or diagnose we often use TVU as a way to measure an artifact's relative significance when we are discussing it in the DR. Sound speed artifacts are an example of this. We cannot correct them post acquisition with our current accepted procedures, so we document and quantify them in the DR to write them off. This error however, can be fixed so it should not be written off.

While I cannot find a "thou shall fix fixable errors" in the HSSD... I think that is the requirement. The closest I found was a reference at the end of the **5.2.4.3 Crosslines**, assuming the errors are fixed: "Conversely, any errors identified through crossline analysis and the means by which they were corrected shall be discussed."

I am working this problem out myself. Thank you for the discussion.

Sincerely,  
Starla

On Mon, Feb 13, 2017 at 9:39 PM, James J. Miller <[james.j.miller@noaa.gov](mailto:james.j.miller@noaa.gov)> wrote:

Russell,

Thank you for the detailed information. I appreciate all the points you and Starla have discussed and your understanding on this issue.

If this was a tide-referenced survey, there would be no problem because SVC was applied after loading delayed heave and tides. In terms of SVC, I think of SBETs as providing a (potentially) refined solution, not the "correct" solution because there is always uncertainty in our measurements. The SBET provides refined attitude information for the ray tracing, but it does not provide a radically different solution compared to using raw attitude. This is why it had such a small effect on the soundings. And this is why I do not consider it a failure to meet specs.

A similar example would be if someone elected not to load delayed heave. Yes, we recommend loading delayed heave because it provides a smoother result, but failing to use it does not constitute a failure to meet specs.

I suppose this entire discussion hinges on what a blunder is, and what is covered by the uncertainty budget. Clearly we all agree that the recommended Caris workflow was not followed during OPR-G309-FH-16 because SVC was not re-applied after loading SBETs. Yet it is not clear to me that this fails the specs. To my knowledge, the specs provide minimum requirements for the data but they do not prohibit any processing mistakes.

In my opinion, failing to re-apply SVC after loading SBETs provided a less precise solution and introduced uncertainty to the sounding measurements. It did not introduce a static offset, since it made some soundings slightly deeper and others slightly shallower. The degree of

uncertainty that was introduced is identical to it being a tide-referenced survey, since we would consider the raw attitude and delayed heave as adequate for SVC ray tracing in that case. Yet for this ERS project, we are saying that same practice fails to meet the specs.

In addition, the 2016 HSSD does distinguish between an error budget and an uncertainty budget (images below). I suppose it is debatable whether this issue falls within the description of sound speed errors in 5.2.3.5, but it is worth consideration.

Respectfully,  
James

### 5.2.3.5 Error Budget Analysis for Depths

The hydrographer shall discuss (in Section B.2 of the Descriptive Report) the methods used to minimize the errors

Sound speed error: The factors associated with this error include (1) the ability to accurately measure sound speed or calculate sound speed from temperature, conductivity and pressure, (2) the spatial and temporal changes of

### 5.2.3.6 Uncertainty Budget Analysis for Depths

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On Mon, Feb 13, 2017 at 7:54 PM, Russell Quintero - NOAA Federal <[russell.quintero@noaa.gov](mailto:russell.quintero@noaa.gov)> wrote:

What if the mistake was a tide file with a 1m static offset? MHHW instead of MLLW, for example. All internal checks line up, no statistical issues...passes all of our QC until a sharp-eyed PS notices it during SAR.

That's a clear blunder, and it "blows spec." If it's only a 0.2m offset? That's still not within spec, because it's an Uncertainty Budget, not an Error Budget. Mistakes don't get a pass just for being small enough.

We made another ship reconvert lines because they used the wrong datum for a handful of lines, even though the induced offset was minor. We would have done the same even if it was most of their survey. Mistakes have to be fixed.

This one is really unsatisfying all around because it's the perfect storm of a small effect affecting a large volume of data...but being inconvenient doesn't change that the right answer is still right. If this was a contractor, our answer would be the same; even if it risked making that TO unprofitable. We don't have to worry about turning a profit, just a never ending pile of work we would rather work on, but our answer has to be consistent.

We stand by ready to concur with a request to waive redoing the analysis if the reprocessed data is barely different. We have no desire to be punitive here, and we have every reason to strive to make both the field and office as efficient as possible. We are extremely sympathetic and Starla and I both worked on the wording of the bad news email to ensure it didn't come across as negative in any way; but that doesn't change that the right answer is to make it right.

Very Respectfully,  
Russell

On Mon, Feb 13, 2017 at 19:30 Tyanne Faulkes - NOAA Federal <[tyanne.faulkes@noaa.gov](mailto:tyanne.faulkes@noaa.gov)> wrote:

How about adding rednotes to all the surveys that differ from the DAPR? As James said these errors are on the magnitude of centimeters. When a contractor sent in data with the wrong TVU calculated this made all surfaces fail TVU specifications. We are talking about apples and oranges here.

On Mon, Feb 13, 2017 at 4:17 PM Starla Robinson - NOAA Federal <[starla.robinson@noaa.gov](mailto:starla.robinson@noaa.gov)> wrote:

Precisely James, we would have the contractor fix it. We had a contractor resubmit a year's worth of data for having the wrong TVU values. It was an error. It had to be fixed.

Given the amount of effort we all put into this it is hard to have this delay. Correcting blunders is a cost of doing business, regardless of whether a contractor or a ship is responsible for the product. I know we are eager for the finish line but it is a bit further. I have added CMD Welton and LT Quintero in case they have any ideas to add to how we can help get there.

Sincerely,  
Starla

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If this exact same situation applied to a contractor, would OPS require the contractor to re-process the data?

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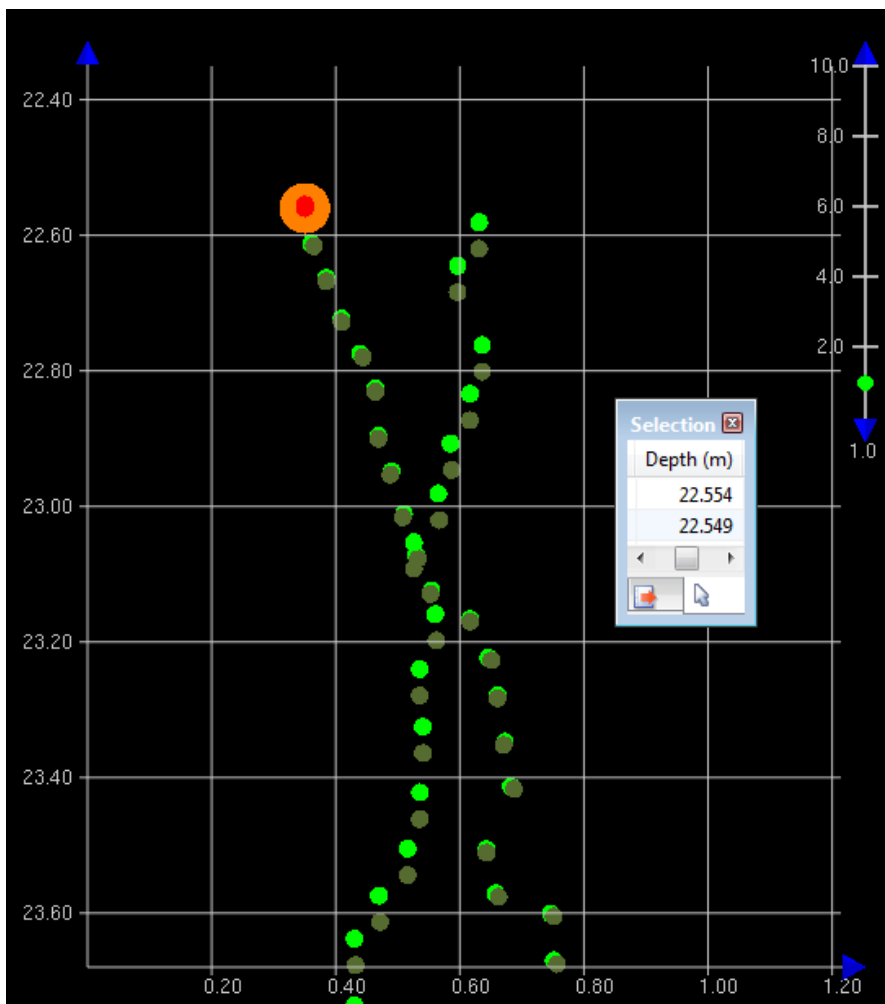
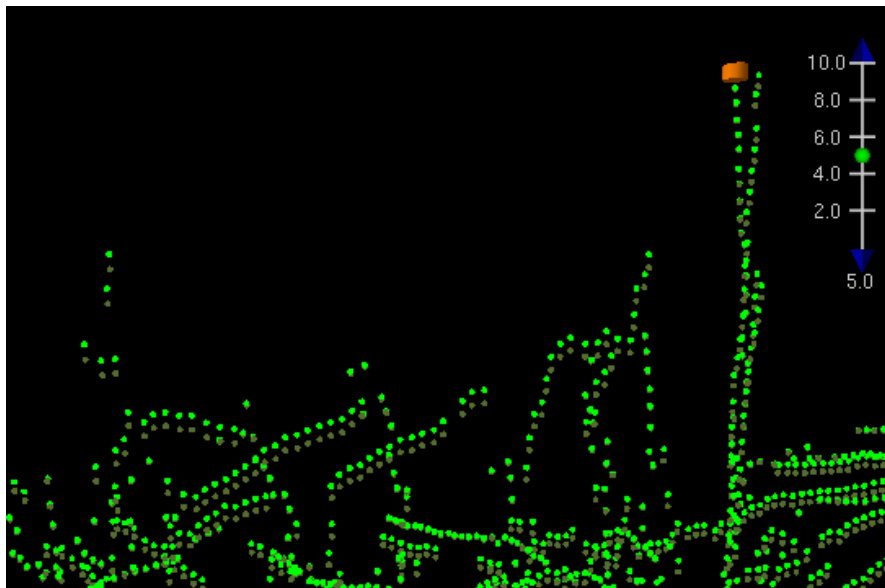
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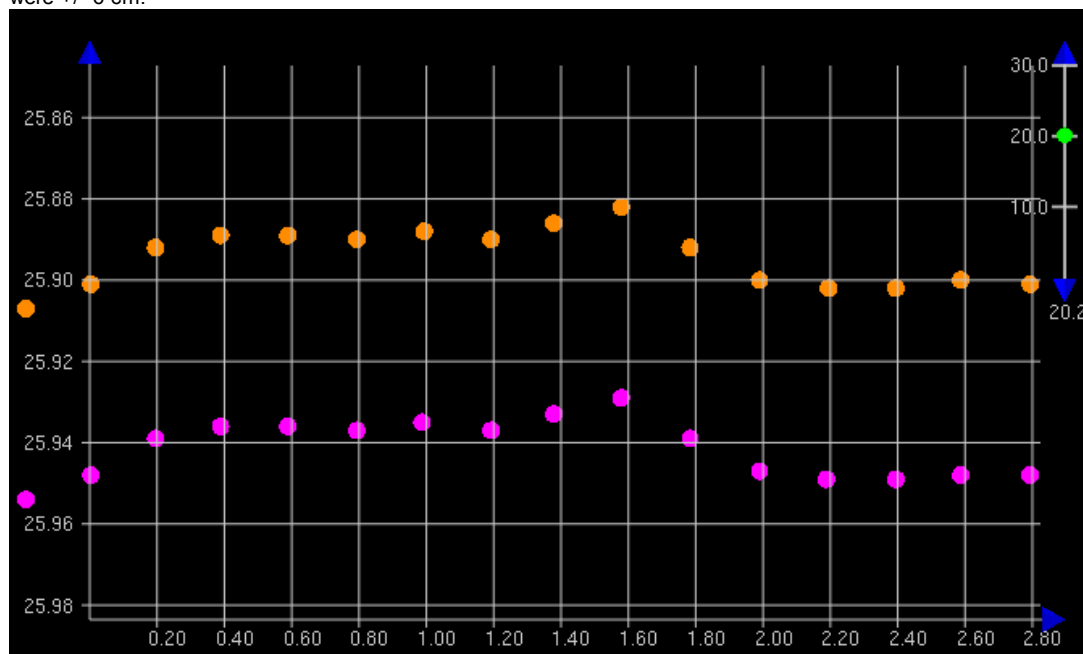
Hope this all helped.

Cheers,  
Clint Marcus  
Physical Scientist  
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Phone: (757) 441-6746 ext 208  
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Thanks for all the helpful information and screen shots. For your next test subset, I think it would be worth comparing the original survey lines (re-SVC not conducted after SBETs) to the test lines at the sounding level in Subset Editor. When comparing surfaces, they often exhibit apparent vertical differences along slopes and features due to small horizontal shifts, rather than actual vertical changes. We are curious about the magnitude of the vertical difference between the soundings.

Even though survey H12859 was not affected by this issue because SVC was run after loading SBETs, we conducted a test because it is in the vicinity of H12843. We re-processed test copies of the H12859 crosslines and did not re-SVC after loading SBETs. As viewed in Subset Editor, the vertical difference between processing methods mostly ranged from 2-3 cm and reached a maximum of 5 cm in some areas. This seems similar to the H12843 difference surface where you found that 95% of nodes were +/- 6 cm.



I will follow your lead and try testing a couple features on H12859 and the OPR-G309-FH-16 surveys. Worth checking how the least depths are affected.

James J. Miller  
Physical Scientist  
NOAA Office of Coast Survey

Atlantic Hydrographic Branch  
439 W York St | Norfolk, VA | 23510  
[757-441-6746 x 111](tel:757-441-6746)

On Thu, Feb 9, 2017 at 7:42 AM, Clinton Marcus - NOAA Federal <[clinton.r.marcus@noaa.gov](mailto:clinton.r.marcus@noaa.gov)> wrote:

Hi Nick,

With the soundings all being from development lines, there is good parity within the data. The soundings were for the most part all of a Quality Flag of 3. We are going to process another subset of H12843 to help validate our findings. The screen shot attached is of a subset over the wreck showing the density of soundings. We'll keep you posted with our findings.

Cheers,

Clint Marcus  
Physical Scientist  
NOAA Office of Coast Survey  
Atlantic Hydrographic Branch  
Phone: [757-441-6746 ext 208](tel:757-441-6746)  
Cell: [541-264-6406](tel:541-264-6406)

On Wed, Feb 8, 2017 at 8:26 PM, OPS.Ferdinand Hassler - NOAA Service Account <[ops.ferdinand.hassler@noaa.gov](mailto:ops.ferdinand.hassler@noaa.gov)> wrote:

Also, it could be possible that a horizontal change in position of the soundings could exacerbate the vertical difference in a sharp feature like a wreck but correct me if I'm wrong.

Nick

On Feb 8, 2017, at 6:32 PM, Clinton Marcus - NOAA Federal <[clinton.r.marcus@noaa.gov](mailto:clinton.r.marcus@noaa.gov)> wrote:

Hi James, et. al.

I ran a small subset of lines (8) on H12843 that were development lines over a wreck. I made a local project and took the lines through the entire processing workflow and re-SVC'd after the application of SBETs. I created a combined 2m surface which I then differenced with the field submitted combined surface. The result was that 95% of nodes had a +/- 6cm difference. There were localized differences of up to 52cm over the wreck. Unfortunately, I did not difference the soundings before and after the post-SBET SVC. I believe Gene and Bri were going to talk about how to proceed with H12843.

Hope that helps in the decision making process. I don't have the data in front of me, unfortunately, so I don't have any screen grabs available. I can send some out in the morning when I get to the office.

Thanks,  
Clint

Clint Marcus  
Physical Scientist  
NOAA Office of Coast Survey  
Atlantic Hydrographic Branch  
Phone: [757-441-6746 ext 208](tel:757-441-6746)  
Cell: [541-264-6406](tel:541-264-6406)

On Wed, Feb 8, 2017 at 6:11 PM, James J. Miller <[james.j.miller@noaa.gov](mailto:james.j.miller@noaa.gov)> wrote:

Hi everyone,

Thank you Clint for identifying this issue. And thank you all for clarifying that the proper workflow is to run (or re-run) SVC after loading the SBET if gyro, pitch, roll, heave or GPS height are applied. Unfortunately, this workflow was not followed during project OPR-G309-FH-16, which consists of 8 surveys and over 500 SNM of coverage. This issue is also relevant for the survey Clint is reviewing (H12843). Due to the large amount of data that is affected, it would take a significant amount of time to re-run SVC, re-Merge, re-check the designated soundings, and re-compute the grids. So in the interest of saving time, we were curious whether the problem is small enough to be documented in the DRs without reprocessing the data.

To assess the magnitude of the problem, we re-processed test copies of the crosslines for several surveys in project OPR-G309-FH-16 and conducted a comparison between running SVC before or after applying SBETs. As viewed in Subset Editor, the vertical difference between these methods did not exceed 1 cm (see image below), even in the outermost beams which exhibited larger offsets than nadir beams (as expected). Depths ranged from 20-45 m. At least from our testing on project OPR-G309-FH-16, the magnitude of the offset is small enough that reprocessing does not seem worthwhile.  
<2017-02-08\_17-14-54.png>

Clint, what did your reprocessed test lines show on survey H12843? How large were the vertical offsets between running SVC before or after loading SBETs? Greater than 1 cm?

Thanks,  
James

James J. Miller  
Physical Scientist



NOAA Office of Coast Survey  
Atlantic Hydrographic Branch  
439 W York St | Norfolk, VA | 23510  
[757-441-6746 x 111](tel:757-441-6746)

On Wed, Feb 8, 2017 at 8:54 AM, OPS.Ferdinand Hassler - NOAA Service Account  
<[ops.ferdinand.hassler@noaa.gov](mailto:ops.ferdinand.hassler@noaa.gov)> wrote:

Hi Starla,

I just wanted to bring you in the loop. Clint found an error in our processing workflow during a SAR of H12843 (2015 Chesapeake) that involved not re-applying SV after applying SBETs. James Miller did a test with our Wilmington data that compared data without SV after SBETs and with SV after SBETs. In his test, we found that the difference is only on the order of about 1cm. It sounds like AHB is going to run a quick test of their own to see if they get similar results. We will have to figure out a course of action on this. We expect it to be a drop in the bucket in terms of the total uncertainty but we'll see.

Let us know if you or HSD has any thoughts or recommendations on this.

Thanks,  
-Nick

Field Operations Officer, NOAA Ship *Ferdinand R. Hassler*  
29 Wentworth Road  
New Castle, NH, 03854

On Wed, Feb 8, 2017 at 7:59 AM, OPS.Ferdinand Hassler - NOAA Service Account  
<[ops.ferdinand.hassler@noaa.gov](mailto:ops.ferdinand.hassler@noaa.gov)> wrote:

Ok, James just did a comparison with some of our Wilmington data and found that the difference was ~1cm generally. It's a limited sample size but he can probably share the results with you shortly.

Field Operations Officer, NOAA Ship *Ferdinand R. Hassler*  
29 Wentworth Road  
New Castle, NH, 03854

On Wed, Feb 8, 2017 at 7:00 AM, Clinton Marcus - NOAA Federal <[clinton.r.marcus@noaa.gov](mailto:clinton.r.marcus@noaa.gov)>  
wrote:

Hey Nick,

Just got done talking with Gene. We're gonna try a few test lines and compare the difference before we would move forward with re-processing the entire survey. Basically, the same thing James is doing out there for you. Thanks again for looking into that.

Cheers,

Clint Marcus  
Physical Scientist  
NOAA Office of Coast Survey  
Atlantic Hydrographic Branch  
Phone: (757) 441-6746 ext 208  
Cell: (541) 264-6406

On Tue, Feb 7, 2017 at 4:51 PM, OPS.Ferdinand Hassler - NOAA Service Account  
<[ops.ferdinand.hassler@noaa.gov](mailto:ops.ferdinand.hassler@noaa.gov)> wrote:

So we got a quick response from Caris that SVC does need to happen after applying new attitude/nav data such as an SBET. I did a quick check of our 2016 Chesapeake Surveys and those seem to be processed that way so that's good. However, our 2016 Wilmington surveys are all processed without SVC after SBETs. I believe we may end up going back for those and re-applying SV. James is doing a brief comparison to see what kind of difference we see in the data between the two. I imagine though that it varies survey to survey as to how different your SBET is from your original POS data.

-Nick

Field Operations Officer, NOAA Ship *Ferdinand R. Hassler*  
29 Wentworth Road  
New Castle, NH, 03854

On Tue, Feb 7, 2017 at 2:35 PM, Tyanne Faulkes - NOAA Federal <[tyanne.faulkes@noaa.gov](mailto:tyanne.faulkes@noaa.gov)>  
wrote:

Hi all,

As far as I remember SVC is not required again unless you are using a Kongsberg system. I will try to dig up the email if I have one...

Tyanne

On Tue, Feb 7, 2017 at 11:34 AM, Clinton Marcus - NOAA Federal  
<[clinton.r.marcus@noaa.gov](mailto:clinton.r.marcus@noaa.gov)> wrote:

Thanks for the quick reply. I'll be standing by to see what CARIS has to say. Thanks again.

Cheers,

Clint Marcus  
Physical Scientist  
NOAA Office of Coast Survey  
Atlantic Hydrographic Branch  
Phone: (757) 441-6746 ext 208  
Cell: (541) 264-6406

On Tue, Feb 7, 20

...

[Message clipped]

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Starla D. Robinson, Physical Scientist  
NOS - OCS - Hydrographic Survey Division - Operations Branch  
National Oceanic Atmospheric Administration  
Office: 301-713-2702 x125  
Cell: 360-689-1431  
Website: [HSD Planned Hydrographic Surveys](#)

**Russell Quintero - NOAA Federal** <[russell.quintero@noaa.gov](mailto:russell.quintero@noaa.gov)>

Tue, Feb 14, 2017 at 8:03 AM

To: "James J. Miller" <[james.j.miller@noaa.gov](mailto:james.j.miller@noaa.gov)>

Cc: Briana Welton - NOAA Federal <[briana.welton@noaa.gov](mailto:briana.welton@noaa.gov)>, CO HASSLER <[co.ferdinand.hassler@noaa.gov](mailto:co.ferdinand.hassler@noaa.gov)>, "OPS.Ferdinand Hassler - NOAA Service Account" <[ops.ferdinand.hassler@noaa.gov](mailto:ops.ferdinand.hassler@noaa.gov)>, Starla Robinson - NOAA Federal <[starla.robinson@noaa.gov](mailto:starla.robinson@noaa.gov)>, Tyanne Faulkes - NOAA Federal <[tyanne.faulkes@noaa.gov](mailto:tyanne.faulkes@noaa.gov)>, Castle Parker - NOAA Federal <[castle.e.parker@noaa.gov](mailto:castle.e.parker@noaa.gov)>, Clinton Marcus - NOAA Federal <[clinton.r.marcus@noaa.gov](mailto:clinton.r.marcus@noaa.gov)>, Grant Froelich <[grant.froelich@noaa.gov](mailto:grant.froelich@noaa.gov)>, Janice Eisenberg - NOAA Federal <[janice.eisenberg@noaa.gov](mailto:janice.eisenberg@noaa.gov)>, John Doroba - NOAA Federal <[john.doroba@noaa.gov](mailto:john.doroba@noaa.gov)>, Patrick Debroisse - NOAA Federal <[patrick.j.debroisse@noaa.gov](mailto:patrick.j.debroisse@noaa.gov)>, Corey Allen - NOAA Federal <[corey.allen@noaa.gov](mailto:corey.allen@noaa.gov)>

James,

I think I should have been more precise in my language before. The issue is that this isn't a measurement error (difference from the Platonic "true" value) or an uncertainty, it's a blunder. We are all human, and our current organizational staffing has long hours and low experience levels as the rule, not the exception. These things will happen, and when they do, we need to fix them.

This isn't using a less precise method, like opting for PPP in lieu of dealing with a base station because of the operational losses from maintaining that station, or using raw nav instead of SBETs on a non-ERS survey.

Perhaps Caris 10 catches this, but I know it used to be possible to load preliminary tides, do all of your processing, then apply final tides, merge, and recompute without redoing SVC. However, having the wrong tide value changes where you are in the water column and produces an incorrect ray-trace. The values you get are wrong; not as a statistically less accurate value but because the operator made a mistake in process and (garbage in, garbage out) the algorithm accurately put out an erroneous value. The effect is usually small, but it is there and it is wrong.

These blunders do not get captured in the calculated TVU and do not get passed along. We know we made the mistake, we push it under the rug, and it disappears. Your test patches have found errors of up to 4cm so far; what's the max value that might be present in the dataset? How much do you need to reprocess to get a statistically valid sample of the whole survey to make the statement that we have a 95% confidence that the errors from this are less than x cm? Do we then add that as a static contribution to the TVU (call it a bias), recompute TVU, remerge, and recompute the surfaces? That would accurately capture the bias from this blunder...but it also sounds like more work than just redoing it correctly.

No one enjoys being pedantic (that's probably not true, but I certainly don't). I also don't think it's in my purview to waive blunders; which makes this not my call. I consulted with Captain Brennan yesterday before Starla responded, and the decision was his. If AHB really thinks FH shouldn't have to reprocess this, I'm not sure on the process there but I imagine it goes through getting Bri or Jasko to request that Captain Brennan reconsider. Maybe it's a topic for the Chief's Meeting, but I can't overrule his decision and I'm not the one to advocate for this even if I was convinced and neither is Starla.

V/r,  
Russ

Lieutenant Russell Quintero, NOAA  
Chief, Hydrographic Surveys Division Operations Branch  
National Oceanic & Atmospheric Administration  
1315 East-West Hwy, SSMC3 6217  
Silver Spring, MD 20910  
Cell: 970-481-2030

On Mon, Feb 13, 2017 at 9:39 PM, James J. Miller <[james.j.miller@noaa.gov](mailto:james.j.miller@noaa.gov)> wrote:  
Russell,

Thank you for the detailed information. I appreciate all the points you and Starla have discussed and your understanding on this issue.

If this was a tide-referenced survey, there would be no problem because SVC was applied after loading delayed heave and tides. In terms of SVC, I think of SBETs as providing a (potentially) refined solution, not the "correct" solution because there is always uncertainty in our measurements. The SBET provides refined attitude information for the ray tracing, but it does not provide a radically different solution compared to using raw attitude. This is why it had such a small effect on the soundings. And this is why I do not consider it a failure to meet specs.

A similar example would be if someone elected not to load delayed heave. Yes, we recommend loading delayed heave because it provides a smoother result, but failing to use it does not constitute a failure to meet specs.

I suppose this entire discussion hinges on what a blunder is, and what is covered by the uncertainty budget. Clearly we all agree that the recommended Caris workflow was not followed during OPR-G309-FH-16 because SVC was not re-applied after loading SBETs. Yet it is not clear to me that this fails the specs. To my knowledge, the specs provide minimum requirements for the data but they do not prohibit any processing mistakes.

In my opinion, failing to re-apply SVC after loading SBETs provided a less precise solution and introduced uncertainty to the sounding measurements. It did not introduce a static offset, since it made some soundings slightly deeper and others slightly shallower. The degree of uncertainty that was introduced is identical to it being a tide-referenced survey, since we would consider the raw attitude and delayed heave as adequate for SVC ray tracing in that case. Yet for this ERS project, we are saying that same practice fails to meet the specs.

In addition, the 2016 HSSD does distinguish between an error budget and an uncertainty budget (images below). I suppose it is debatable whether this issue falls within the description of sound speed errors in 5.2.3.5, but it is worth consideration.

Respectfully,  
James

### 5.2.3.5 Error Budget Analysis for Depths

The hydrographer shall discuss (in Section B.2 of the Descriptive Report) the methods used to minimize the errors

Sound speed error: The factors associated with this error include (1) the ability to accurately measure sound speed or calculate sound speed from temperature, conductivity and pressure, (2) the spatial and temporal changes of

### 5.2.3.6 Uncertainty Budget Analysis for Depths

The hydrographer shall discuss (in Section B.2 of the Descriptive Report) the methods used to minimize the

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On Mon, Feb 13, 2017 at 7:54 PM, Russell Quintero - NOAA Federal <[russell.quintero@noaa.gov](mailto:russell.quintero@noaa.gov)> wrote:

What if the mistake was a tide file with a 1m static offset? MHHW instead of MLLW, for example. All internal checks line up, no statistical issues...passes all of our QC until a sharp-eyed PS notices it during SAR.

That's a clear blunder, and it "blows spec." If it's only a 0.2m offset? That's still not within spec, because it's an Uncertainty Budget, not an Error Budget. Mistakes don't get a pass just for being small enough.

We made another ship reconvert lines because they used the wrong datum for a handful of lines, even though the induced offset was minor. We would have done the same even if it was most of their survey. Mistakes have to be fixed.

This one is really unsatisfying all around because it's the perfect storm of a small effect affecting a large volume of data...but being inconvenient doesn't change that the right answer is still right. If this was a contractor, our answer would be the same; even if it risked making that TO unprofitable. We don't have to worry about turning a profit, just a never ending pile of work we would rather work on, but our answer has to be consistent.

We stand by ready to concur with a request to waive redoing the analysis if the reprocessed data is barely different. We have no desire to be punitive here, and we have every reason to strive to make both the field and office as efficient as possible. We are extremely sympathetic and Starla and I both worked on the wording of the bad news email to ensure it didn't come across as negative in any way; but that doesn't change that the right answer is to make it right.

Very Respectively,  
Russell

On Mon, Feb 13, 2017 at 19:30 Tyanne Faulkes - NOAA Federal <[tyanne.faulkes@noaa.gov](mailto:tyanne.faulkes@noaa.gov)> wrote:

How about adding rednotes to all the surveys that differ from the DAPR? As James said these errors are on the magnitude of centimeters. When a contractor sent in data with the wrong TVU calculated this made all surfaces fail TVU specifications. We are talking about apples and oranges here.

On Mon, Feb 13, 2017 at 4:17 PM Starla Robinson - NOAA Federal <[starla.robinson@noaa.gov](mailto:starla.robinson@noaa.gov)> wrote:

Precisely James, we would have the contractor fix it. We had a contractor resubmit a year's worth of data for having the wrong TVU values. It was an error. It had to be fixed.

Given the amount of effort we all put into this it is hard to have this delay. Correcting blunders is a cost of doing business, regardless of whether a contractor or a ship is responsible for the product. I know we are eager for the finish line but it is a bit further. I have added CMD Welton and LT Quintero in case they have any ideas to add to how we can help get there.

Sincerely,  
Starla

On Mon, Feb 13, 2017 at 6:34 PM, James J. Miller <[james.j.miller@noaa.gov](mailto:james.j.miller@noaa.gov)> wrote:

If this exact same situation applied to a contractor, would OPS require the contractor to re-process the data?

The error predominantly ranges from 0.5 - 1cm, with the occasional difference reaching 4cm. The vast majority of the project coverage will only affect a small-scale fathoms chart (1:432,000) where the error is unlikely to change the rounded depths on the chart. Processing and personnel resources are limited on the Hassler. Do we really think it is prudent and worthwhile to spend our limited time this way?

James J. Miller  
Physical Scientist  
NOAA Office of Coast Survey  
Atlantic Hydrographic Branch  
439 W York St | Norfolk, VA | 23510  
[757-441-6746](tel:757-441-6746) x 111

On Mon, Feb 13, 2017 at 5:52 PM, Tyanne Faulkes - NOAA Federal <[tyanne.faulkes@noaa.gov](mailto:tyanne.faulkes@noaa.gov)> wrote:

I am currently out sick. When I get back to the office I will talk to Ben to see if I can work with AHB and the FH to fix the surveys that I was survey manager on (I think there were three).

Tyanne

On Mon, Feb 13, 2017 at 2:47 PM Starla Robinson - NOAA Federal <[starla.robinson@noaa.gov](mailto:starla.robinson@noaa.gov)> wrote:

HSD understands the desire to not reprocess this data, however after much soul searching and deliberation including consultation with the Chief of HSD... reprocess the data. The TVU budget is not for blunders. Captain Brennan has requested that the ship provide a plan on how to resolve this in a timely manner.

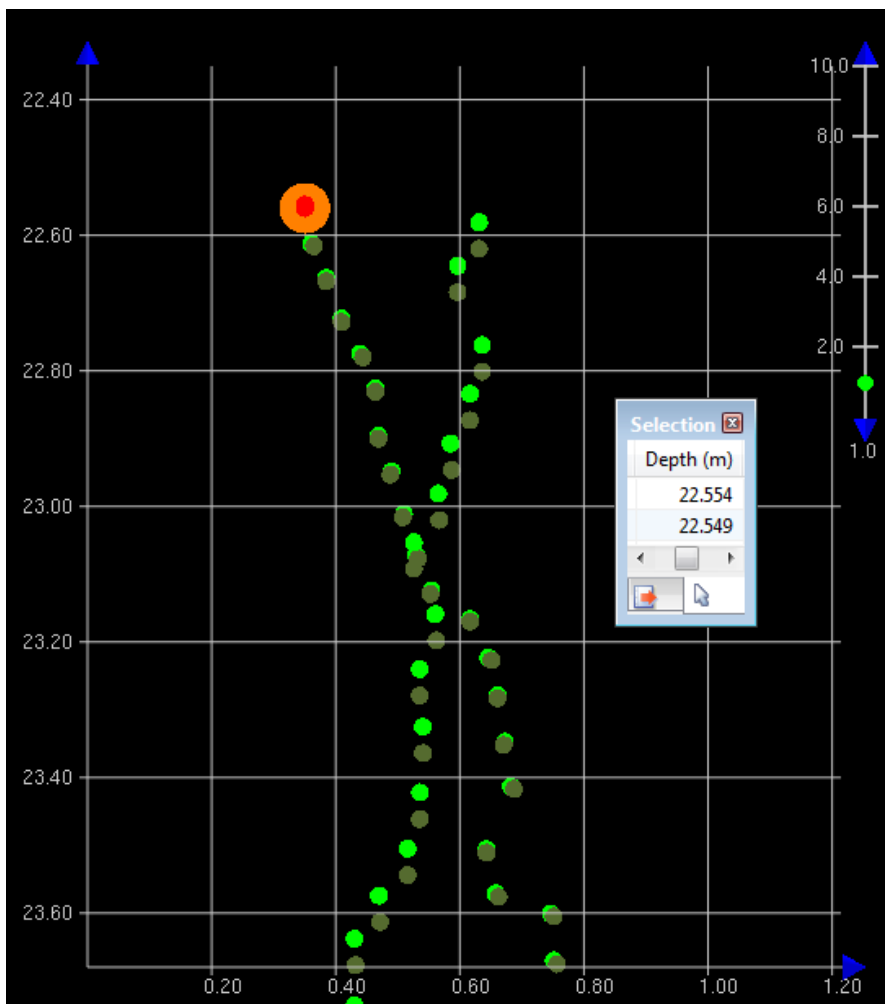
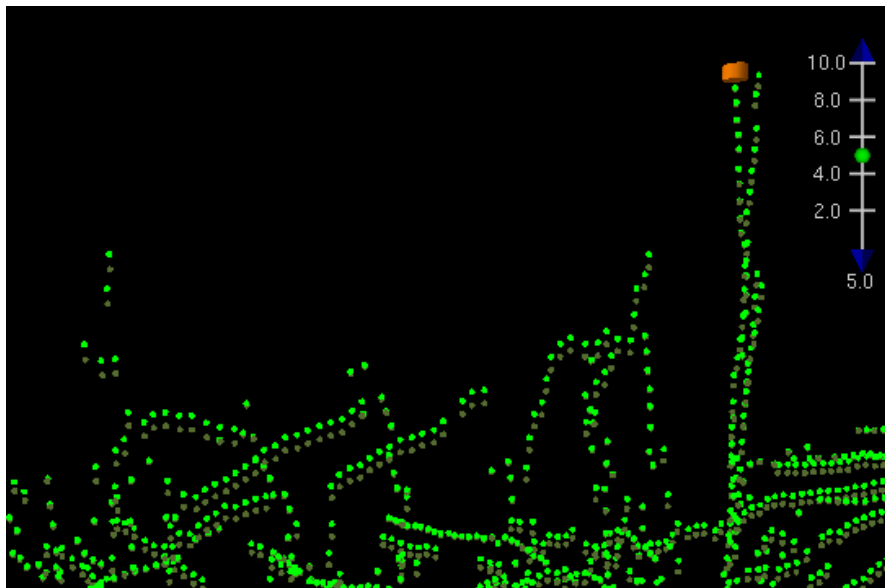
To help speed things up, we think you could do a difference surface of the final surfaces with the previous products. By showing there is no statistically significant difference between the two surfaces, you could make the argument that the analysis (cross-lines, junctions, and chart comparisons) does not need to be redone. HSD can then issue a waiver concurring with this.

Sincerely,  
Starla

On Thu, Feb 9, 2017 at 12:35 PM, James J. Miller <[james.j.miller@noaa.gov](mailto:james.j.miller@noaa.gov)> wrote:

Hi Clint,

Our testing is consistent with your findings. Survey H12859 has one wreck that we used for additional testing. The vertical difference between processing methods ranged from 0.005 - 0.040 m over the wreck. The least depth of the wreck would change by 0.005 m depending on the processing method (second image).



Survey H12932 (OPR-G309-FH-16) has one wreck that we tested. The vertical differences between processing methods were even smaller, ranging from 0.004 - 0.010 m. The least depth of the wreck would change by 0.004 m depending on the processing method.

We are relieved that preprocessing appears to be unnecessary for H12843 and OPR-G309-FH-16. Thanks again for identifying this problem and helping with the testing.

Thanks,  
James

James J. Miller  
Physical Scientist  
NOAA Office of Coast Survey

Atlantic Hydrographic Branch  
439 W York St | Norfolk, VA | 23510  
757-441-6746 x 111

On Thu, Feb 9, 2017 at 12:23 PM, Clinton Marcus - NOAA Federal <clinton.r.marcus@noaa.gov> wrote:

Hi all,

After taking another sub-section of H12843 for reprocessing, it was found that 95% of the nodes were +/- 2cm. I will go so far as to say the difference would likely be even smaller if I had filtered the one XL present, which is what the FH did (I believe).

I took a total of 37 lines in an area of general bathymetry (no features) and followed the same procedure as previously noted. Taking the data from conversion thru SBETs, and re-applying SVC after SBETs.

Looking at the data in subset, there was little to no difference between the two projects.

After talking with Gene, we determined that it would not be necessary to reprocess the entire survey for such a small difference. Yay!

You might want to just double check with them (CO, Gene, Bri), but I don't think it is necessary for you to go back and reprocess the OPR-G309-FH-16 data.

Hope this all helped.

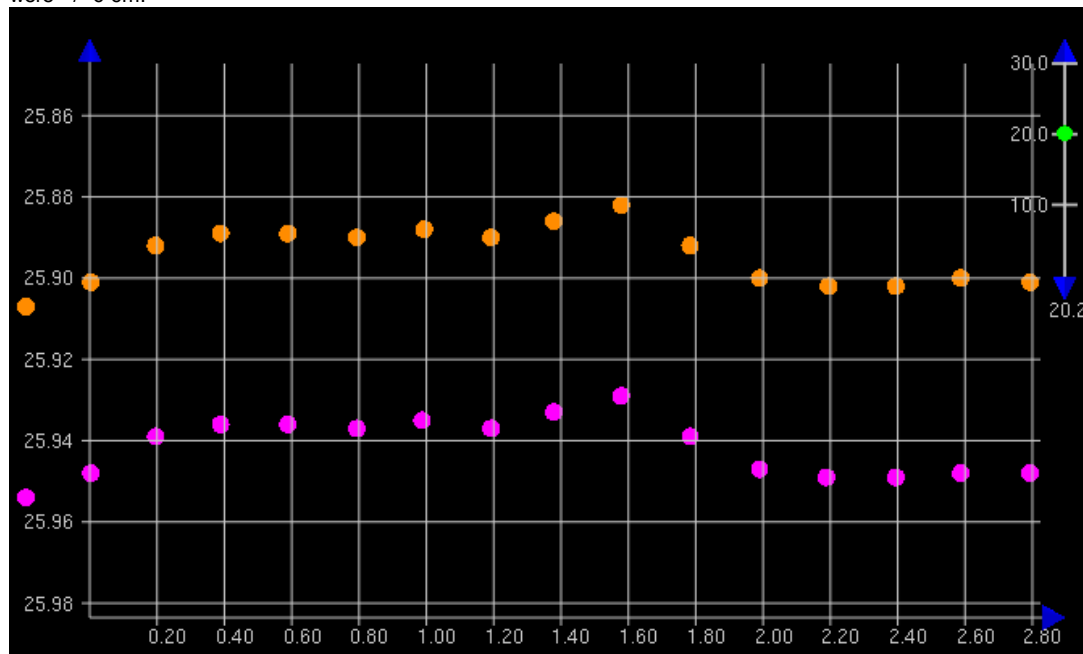
Cheers,  
Clint Marcus  
Physical Scientist  
NOAA Office of Coast Survey  
Atlantic Hydrographic Branch  
Phone: (757) 441-6746 ext 208  
Cell: (541) 264-6406

On Thu, Feb 9, 2017 at 9:12 AM, James J. Miller <james.j.miller@noaa.gov> wrote:

Hi Clint,

Thanks for all the helpful information and screen shots. For your next test subset, I think it would be worth comparing the original survey lines (re-SVC not conducted after SBETs) to the test lines at the sounding level in Subset Editor. When comparing surfaces, they often exhibit apparent vertical differences along slopes and features due to small horizontal shifts, rather than actual vertical changes. We are curious about the magnitude of the vertical difference between the soundings.

Even though survey H12859 was not affected by this issue because SVC was run after loading SBETs, we conducted a test because it is in the vicinity of H12843. We re-processed test copies of the H12859 crosslines and did not re-SVC after loading SBETs. As viewed in Subset Editor, the vertical difference between processing methods mostly ranged from 2-3 cm and reached a maximum of 5 cm in some areas. This seems similar to the H12843 difference surface where you found that 95% of nodes were +/- 6 cm.



I will follow your lead and try testing a couple features on H12859 and the OPR-G309-FH-16 surveys. Worth checking how the least depths are affected.

James J. Miller  
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NOAA Office of Coast Survey

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Hi Nick,

With the soundings all being from development lines, there is good parity within the data. The soundings were for the most part all of a Quality Flag of 3. We are going to process another subset of H12843 to help validate our findings. The screen shot attached is of a subset over the wreck showing the density of soundings. We'll keep you posted with our findings.

Cheers,

Clint Marcus  
Physical Scientist  
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Also, it could be possible that a horizontal change in position of the soundings could exacerbate the vertical difference in a sharp feature like a wreck but correct me if I'm wrong.

Nick

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Hi James, et. al.

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Hope that helps in the decision making process. I don't have the data in front of me, unfortunately, so I don't have any screen grabs available. I can send some out in the morning when I get to the office.

Thanks,  
Clint

Clint Marcus  
Physical Scientist  
NOAA Office of Coast Survey  
Atlantic Hydrographic Branch  
Phone: [757-441-6746 ext 208](tel:757-441-6746)  
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On Wed, Feb 8, 2017 at 6:11 PM, James J. Miller <[james.j.miller@noaa.gov](mailto:james.j.miller@noaa.gov)> wrote:

Hi everyone,

Thank you Clint for identifying this issue. And thank you all for clarifying that the proper workflow is to run (or re-run) SVC after loading the SBET if gyro, pitch, roll, heave or GPS height are applied. Unfortunately, this workflow was not followed during project OPR-G309-FH-16, which consists of 8 surveys and over 500 SNM of coverage. This issue is also relevant for the survey Clint is reviewing (H12843). Due to the large amount of data that is affected, it would take a significant amount of time to re-run SVC, re-Merge, re-check the designated soundings, and re-compute the grids. So in the interest of saving time, we were curious whether the problem is small enough to be documented in the DRs without reprocessing the data.

To assess the magnitude of the problem, we re-processed test copies of the crosslines for several surveys in project OPR-G309-FH-16 and conducted a comparison between running SVC before or after applying SBETs. As viewed in Subset Editor, the vertical difference between these methods did not exceed 1 cm (see image below), even in the outermost beams which exhibited larger offsets than nadir beams (as expected). Depths ranged from 20-45 m. At least from our testing on project OPR-G309-FH-16, the magnitude of the offset is small enough that reprocessing does not seem worthwhile.  
<2017-02-08\_17-14-54.png>

Clint, what did your reprocessed test lines show on survey H12843? How large were the vertical offsets between running SVC before or after loading SBETs? Greater than 1 cm?

Thanks,  
James

James J. Miller  
Physical Scientist

NOAA Office of Coast Survey  
Atlantic Hydrographic Branch  
439 W York St | Norfolk, VA | 23510  
[757-441-6746 x 111](tel:757-441-6746)

On Wed, Feb 8, 2017 at 8:54 AM, OPS.Ferdinand Hassler - NOAA Service Account <[ops.ferdinand.hassler@noaa.gov](mailto:ops.ferdinand.hassler@noaa.gov)> wrote:

Hi Starla,

I just wanted to bring you in the loop. Clint found an error in our processing workflow during a SAR of H12843 (2015 Chesapeake) that involved not re-applying SV after applying SBETs. James Miller did a test with our Wilmington data that compared data without SV after SBETs and with SV after SBETs. In his test, we found that the difference is only on the order of about 1cm. It sounds like AHB is going to run a quick test of their own to see if they get similar results. We will have to figure out a course of action on this. We expect it to be a drop in the bucket in terms of the total uncertainty but we'll see.

Let us know if you or HSD has any thoughts or recommendations on this.

Thanks,  
-Nick

Field Operations Officer, NOAA Ship *Ferdinand R. Hassler*  
29 Wentworth Road  
New Castle, NH, 03854

On Wed, Feb 8, 2017 at 7:59 AM, OPS.Ferdinand Hassler - NOAA Service Account <[ops.ferdinand.hassler@noaa.gov](mailto:ops.ferdinand.hassler@noaa.gov)> wrote:

Ok, James just did a comparison with some of our Wilmington data and found that the difference was ~1cm generally. It's a limited sample size but he can probably share the results with you shortly.

Field Operations Officer, NOAA Ship *Ferdinand R. Hassler*  
29 Wentworth Road  
New Castle, NH, 03854

On Wed, Feb 8, 2017 at 7:00 AM, Clinton Marcus - NOAA Federal <[clinton.r.marcus@noaa.gov](mailto:clinton.r.marcus@noaa.gov)> wrote:

Hey Nick,

Just got done talking with Gene. We're gonna try a few test lines and compare the difference before we would move forward with re-processing the entire survey. Basically, the same thing James is doing out there for you. Thanks again for looking into that.

Cheers,

Clint Marcus  
Physical Scientist  
NOAA Office of Coast Survey  
Atlantic Hydrographic Branch  
Phone: (757) 441-6746 ext 208  
Cell: (541) 264-6406

On Tue, Feb 7, 2017 at 4:51 PM, OPS.Ferdinand Hassler - NOAA Service Account <[ops.ferdinand.hassler@noaa.gov](mailto:ops.ferdinand.hassler@noaa.gov)> wrote:

So we got a quick response from Caris that SVC does need to happen after applying new attitude/nav data such as an SBET. I did a quick check of our 2016 Chesapeake Surveys and those seem to be processed that way so that's good. However, our 2016 Wilmington surveys are all processed without SVC after SBETs. I believe we may end up going back for those and re-applying SV. James is doing a brief comparison to see what kind of difference we see in the data between the two. I imagine though that it varies survey to survey as to how different your SBET is from your original POS data.

-Nick

Field Operations Officer, NOAA Ship *Ferdinand R. Hassler*  
29 Wentworth Road  
New Castle, NH, 03854

On Tue, Feb 7, 2017 at 2:35 PM, Tyanne Faulkes - NOAA Federal <[tyanne.faulkes@noaa.gov](mailto:tyanne.faulkes@noaa.gov)> wrote:

Hi all,

As far as I remember SVC is not required again unless you are using a Kongsberg system. I will try to dig up the email if I have one...

Tyanne



On Tue, Feb 7, 2017 at 11:34 AM, Clinton Marcus - NOAA Federal

<[clinton.r.marcus@noaa.gov](mailto:clinton.r.marcus@noaa.gov)> wrote:

Thanks for the quick reply. I'll be standing by to see what CARIS has to say. Thanks again.

Cheers,

Clint Marcus  
Physical Scientist  
NOAA Office of Coast Survey  
Atlantic Hydrographic Branch  
Phone: (757) 441-6746 ext 208  
Cell: (541) 264-6406

On Tue, Feb 7, 20

...

[Message clipped]

**Briana Welton - NOAA Federal** <[briana.welton@noaa.gov](mailto:briana.welton@noaa.gov)>

Tue, Feb 14, 2017 at 11:24 AM

To: Russell Quintero - NOAA Federal <[russell.quintero@noaa.gov](mailto:russell.quintero@noaa.gov)>

Cc: "James J. Miller" <[james.j.miller@noaa.gov](mailto:james.j.miller@noaa.gov)>, CO HASSLER <[co.ferdinand.hassler@noaa.gov](mailto:co.ferdinand.hassler@noaa.gov)>, "OPS.Ferdinand Hassler - NOAA Service Account" <[ops.ferdinand.hassler@noaa.gov](mailto:ops.ferdinand.hassler@noaa.gov)>, Starla Robinson - NOAA Federal <[starla.robinson@noaa.gov](mailto:starla.robinson@noaa.gov)>, Tyanne Faulkes - NOAA Federal <[tyanne.faulkes@noaa.gov](mailto:tyanne.faulkes@noaa.gov)>, Castle Parker - NOAA Federal <[castle.e.parker@noaa.gov](mailto:castle.e.parker@noaa.gov)>, Clinton Marcus - NOAA Federal <[clinton.r.marcus@noaa.gov](mailto:clinton.r.marcus@noaa.gov)>, Grant Froelich <[grant.froelich@noaa.gov](mailto:grant.froelich@noaa.gov)>, Janice Eisenberg - NOAA Federal <[janice.eisenberg@noaa.gov](mailto:janice.eisenberg@noaa.gov)>, John Doroba - NOAA Federal <[john.doroba@noaa.gov](mailto:john.doroba@noaa.gov)>, Patrick Debrousse - NOAA Federal <[patrick.j.debrousse@noaa.gov](mailto:patrick.j.debrousse@noaa.gov)>, Corey Allen - NOAA Federal <[corey.allen@noaa.gov](mailto:corey.allen@noaa.gov)>, Erin Weller - NOAA Federal <[erin.weller@noaa.gov](mailto:erin.weller@noaa.gov)>, Matthew Wilson <[Matthew.Wilson@noaa.gov](mailto:Matthew.Wilson@noaa.gov)>

All,

A couple points:

1.) On what appears to be the original question of, "Would we have a contractor re-do this?," the answer is, "No," because we don't have contractors do ellipsoidally referenced surveys. The surveys as processed would have been perfectly acceptable for any NOAA field unit not doing ERS and are perfectly acceptable now for a KR survey.

2.) On the question of whether this is tolerable measurement uncertainty or measurement error, I don't think that's the right question to ask. It's a question of what is an acceptable processing workflow, and therefore is a matter of best practice versus acceptable practice. I agree that the SBET solution is most often better, which is why we prescribe it, but it's not the only solution. We can always do better, but at what cost? This is a question of, "Is it good enough?," and I argue that the answer to that question is yes. The different depth solutions are coming from where in the water column we measured the MBES to be at the time of transmit and receive (the difference between pitch, roll, and heave of the unprocessed .000 file and the processed .SBET file) and those measurement impacts on the modeled/estimated ray path of each beam to and from the seafloor. The vertical and horizontal launch position and the launch angle may be slightly different, which may change which sound speed cast is applied and which cast value is applied to the initial launch angle. Yes, SBETs would theoretically result in a better depth solution, but there are a lot of other things that we *could but don't do* to make the solution better, such as: use a better beam configuration, use a better seafloor detection algorithm, use a better beam steering algorithm, use a better ray tracing algorithm, use a better ray tracing model (something other than the cave man method), etc, because they cost too much. There are five (5) surveys at AHB that have been processed this way, one of which is already in compilation, and ten (10) on FH. Reprocessing 15 surveys for this reason doesn't seem like a good use of resources to me.

3.) I would like to discuss further with HSD Chief. AHB will do whatever is decided, but based on this email chain I don't believe the situation has been considered sufficiently or completely. As Gene just wisely told me, we'll get paid either way.

4.) What is the status of hiring dedicated survey personnel for FH?

V/r,

Bri

On Tue, Feb 14, 2017 at 8:03 AM, Russell Quintero - NOAA Federal <[russell.quintero@noaa.gov](mailto:russell.quintero@noaa.gov)> wrote:

James,

I think I should have been more precise in my language before. The issue is that this isn't a measurement error (difference from the Platonic "true" value) or an uncertainty, it's a blunder. We are all human, and our current organizational staffing has long hours and low experience levels as the rule, not the exception. These things will happen, and when they do, we need to fix them.

This isn't using a less precise method, like opting for PPP in lieu of dealing with a base station because of the operational losses from maintaining that station, or using raw nav instead of SBETs on a non-ERS survey.

Perhaps Caris 10 catches this, but I know it used to be possible to load preliminary tides, do all of your processing, then apply final tides, merge, and recompute without redoing SVC. However, having the wrong tide value changes where you are in the water column and produces an incorrect

ray-trace. The values you get are wrong; not as a statistically less accurate value but because the operator made a mistake in process and (garbage in, garbage out) the algorithm accurately put out an erroneous value. The effect is usually small, but it is there and it is wrong.

These blunders do not get captured in the calculated TVU and do not get passed along. We know we made the mistake, we push it under the rug, and it disappears. Your test patches have found errors of up to 4cm so far; what's the max value that might be present in the dataset? How much do you need to reprocess to get a statistically valid sample of the whole survey to make the statement that we have a 95% confidence that the errors from this are less than x cm? Do we then add that as a static contribution to the TVU (call it a bias), recompute TVU, remerge, and recompute the surfaces? That would accurately capture the bias from this blunder...but it also sounds like more work than just redoing it correctly.

No one enjoys being pedantic (that's probably not true, but I certainly don't). I also don't think it's in my purview to waive blunders; which makes this not my call. I consulted with Captain Brennan yesterday before Starla responded, and the decision was his. If AHB really thinks FH shouldn't have to reprocess this, I'm not sure on the process there but I imagine it goes through getting Bri or Jasko to request that Captain Brennan reconsider. Maybe it's a topic for the Chief's Meeting, but I can't overrule his decision and I'm not the one to advocate for this even if I was convinced and neither is Starla.

V/r,  
Russ

Lieutenant Russell Quintero, NOAA  
Chief, Hydrographic Surveys Division Operations Branch  
National Oceanic & Atmospheric Administration  
1315 East-West Hwy, SSMC3 6217  
Silver Spring, MD 20910  
Cell: 970-481-2030

On Mon, Feb 13, 2017 at 9:39 PM, James J. Miller <[james.j.miller@noaa.gov](mailto:james.j.miller@noaa.gov)> wrote:  
Russell,

Thank you for the detailed information. I appreciate all the points you and Starla have discussed and your understanding on this issue.

If this was a tide-referenced survey, there would be no problem because SVC was applied after loading delayed heave and tides. In terms of SVC, I think of SBETs as providing a (potentially) refined solution, not the "correct" solution because there is always uncertainty in our measurements. The SBET provides refined attitude information for the ray tracing, but it does not provide a radically different solution compared to using raw attitude. This is why it had such a small effect on the soundings. And this is why I do not consider it a failure to meet specs.

A similar example would be if someone elected not to load delayed heave. Yes, we recommend loading delayed heave because it provides a smoother result, but failing to use it does not constitute a failure to meet specs.

I suppose this entire discussion hinges on what a blunder is, and what is covered by the uncertainty budget. Clearly we all agree that the recommended Caris workflow was not followed during OPR-G309-FH-16 because SVC was not re-applied after loading SBETs. Yet it is not clear to me that this fails the specs. To my knowledge, the specs provide minimum requirements for the data but they do not prohibit any processing mistakes.

In my opinion, failing to re-apply SVC after loading SBETs provided a less precise solution and introduced uncertainty to the sounding measurements. It did not introduce a static offset, since it made some soundings slightly deeper and others slightly shallower. The degree of uncertainty that was introduced is identical to it being a tide-referenced survey, since we would consider the raw attitude and delayed heave as adequate for SVC ray tracing in that case. Yet for this ERS project, we are saying that same practice fails to meet the specs.

In addition, the 2016 HSSD does distinguish between an error budget and an uncertainty budget (images below). I suppose it is debatable whether this issue falls within the description of sound speed errors in 5.2.3.5, but it is worth consideration.

Respectfully,  
James

### 5.2.3.5 Error Budget Analysis for Depths

The hydrographer shall discuss (in Section B.2 of the Descriptive Report) the methods used to minimize the errors

Sound speed error: The factors associated with this error include (1) the ability to accurately measure sound speed or calculate sound speed from temperature, conductivity and pressure, (2) the spatial and temporal changes of

### 5.2.3.6 Uncertainty Budget Analysis for Depths

The hydrographer shall discuss (in Section B.2 of the Descriptive Report) the methods used to minimize the

James J. Miller  
Physical Scientist  
NOAA Office of Coast Survey  
Atlantic Hydrographic Branch  
439 W York St | Norfolk, VA | 23510  
[757-441-6746](tel:757-441-6746) x 111

On Mon, Feb 13, 2017 at 7:54 PM, Russell Quintero - NOAA Federal <[russell.quintero@noaa.gov](mailto:russell.quintero@noaa.gov)> wrote:

What if the mistake was a tide file with a 1m static offset? MHHW instead of MLLW, for example. All internal checks line up, no statistical issues...passes all of our QC until a sharp-eyed PS notices it during SAR.

That's a clear blunder, and it "blows spec." If it's only a 0.2m offset? That's still not within spec, because it's an Uncertainty Budget, not an Error Budget. Mistakes don't get a pass just for being small enough.

We made another ship reconvert lines because they used the wrong datum for a handful of lines, even though the induced offset was minor. We would have done the same even if it was most of their survey. Mistakes have to be fixed.

This one is really unsatisfying all around because it's the perfect storm of a small effect affecting a large volume of data...but being inconvenient doesn't change that the right answer is still right. If this was a contractor, our answer would be the same; even if it risked making that TO unprofitable. We don't have to worry about turning a profit, just a never ending pile of work we would rather work on, but our answer has to be consistent.

We stand by ready to concur with a request to waive redoing the analysis if the reprocessed data is barely different. We have no desire to be punitive here, and we have every reason to strive to make both the field and office as efficient as possible. We are extremely sympathetic and Starla and I both worked on the wording of the bad news email to ensure it didn't come across as negative in any way; but that doesn't change that the right answer is to make it right.

Very Respectively,  
Russell

On Mon, Feb 13, 2017 at 19:30 Tyanne Faulkes - NOAA Federal <[tyanne.faulkes@noaa.gov](mailto:tyanne.faulkes@noaa.gov)> wrote:

How about adding rednotes to all the surveys that differ from the DAPR? As James said these errors are on the magnitude of centimeters. When a contractor sent in data with the wrong TVU calculated this made all surfaces fail TVU specifications. We are talking about apples and oranges here.

On Mon, Feb 13, 2017 at 4:17 PM Starla Robinson - NOAA Federal <[starla.robinson@noaa.gov](mailto:starla.robinson@noaa.gov)> wrote:

Precisely James, we would have the contractor fix it. We had a contractor resubmit a year's worth of data for having the wrong TVU values. It was an error. It had to be fixed.

Given the amount of effort we all put into this it is hard to have this delay. Correcting blunders is a cost of doing business, regardless of whether a contractor or a ship is responsible for the product. I know we are eager for the finish line but it is a bit further. I have added CMD Welton and LT Quintero in case they have any ideas to add to how we can help get there.

Sincerely,  
Starla

On Mon, Feb 13, 2017 at 6:34 PM, James J. Miller <[james.j.miller@noaa.gov](mailto:james.j.miller@noaa.gov)> wrote:

If this exact same situation applied to a contractor, would OPS require the contractor to re-process the data?

The error predominantly ranges from 0.5 - 1cm, with the occasional difference reaching 4cm. The vast majority of the project coverage will only affect a small-scale fathoms chart (1:432,000) where the error is unlikely to change the rounded depths on the chart. Processing and personnel resources are limited on the Hassler. Do we really think it is prudent and worthwhile to spend our limited time this way?

James J. Miller  
Physical Scientist  
NOAA Office of Coast Survey  
Atlantic Hydrographic Branch  
439 W York St | Norfolk, VA | 23510  
[757-441-6746](tel:757-441-6746) x 111

On Mon, Feb 13, 2017 at 5:52 PM, Tyanne Faulkes - NOAA Federal <[tyanne.faulkes@noaa.gov](mailto:tyanne.faulkes@noaa.gov)> wrote:

I am currently out sick. When I get back to the office I will talk to Ben to see if I can work with AHB and the FH to fix the surveys that I was survey manager on (I think there were three).

Tyanne

On Mon, Feb 13, 2017 at 2:47 PM Starla Robinson - NOAA Federal <[starla.robinson@noaa.gov](mailto:starla.robinson@noaa.gov)> wrote:

HSD understands the desire to not reprocess this data, however after much soul searching and deliberation including consultation with the Chief of HSD... reprocess the data. The TVU budget is not for blunders. Captain Brennan has requested that the ship provide a plan on how to resolve this in a timely manner.

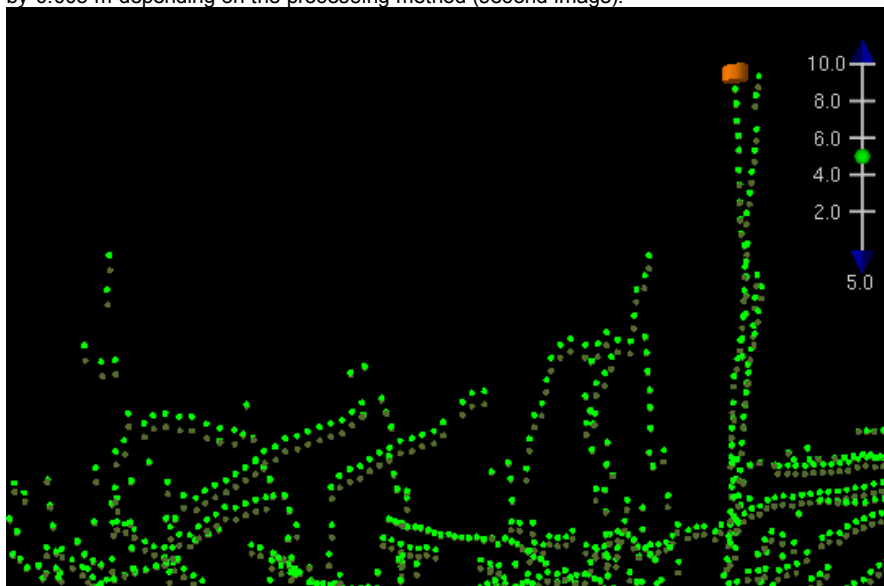
To help speed things up, we think you could do a difference surface of the final surfaces with the previous products. By showing there is no statistically significant difference between the two surfaces, you could make the argument that the analysis (cross-lines, junctions, and chart comparisons) does not need to be redone. HSD can then issue a waiver concurring with this.

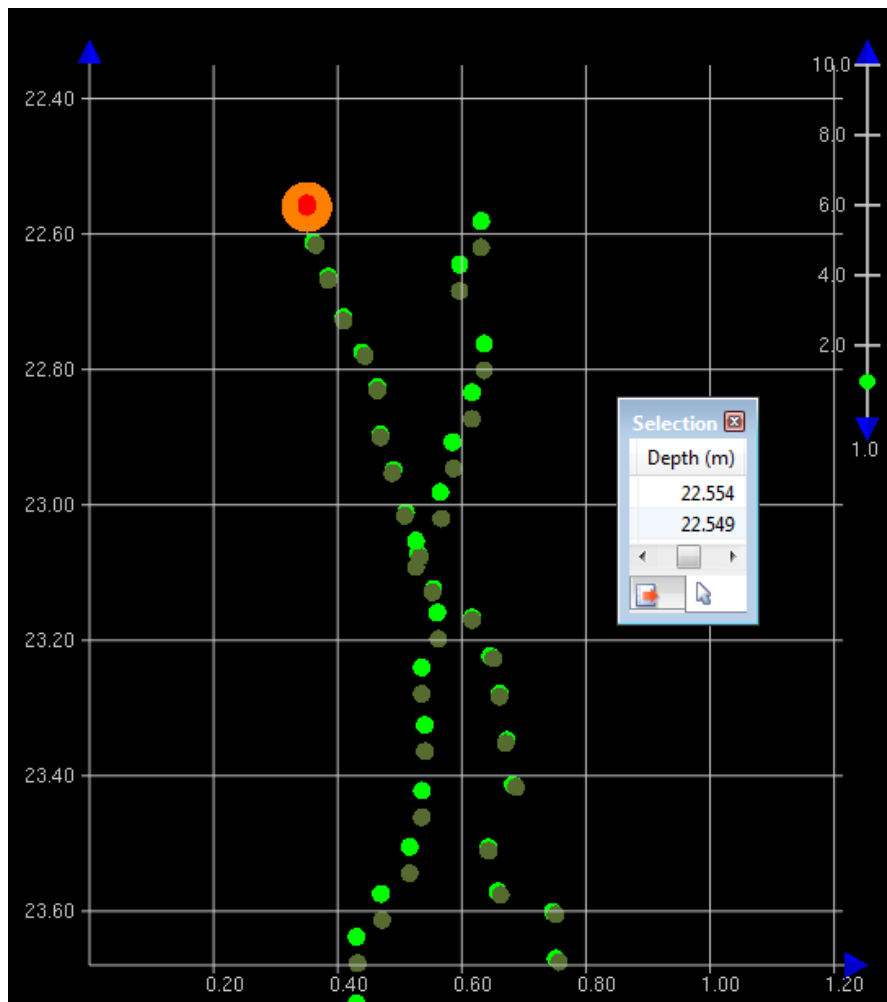
Sincerely,  
Starla

On Thu, Feb 9, 2017 at 12:35 PM, James J. Miller <[james.j.miller@noaa.gov](mailto:james.j.miller@noaa.gov)> wrote:

Hi Clint,

Our testing is consistent with your findings. Survey H12859 has one wreck that we used for additional testing. The vertical difference between processing methods ranged from 0.005 - 0.040 m over the wreck. The least depth of the wreck would change by 0.005 m depending on the processing method (second image).





Survey H12932 (OPR-G309-FH-16) has one wreck that we tested. The vertical differences between processing methods were even smaller, ranging from 0.004 - 0.010 m. The least depth of the wreck would change by 0.004 m depending on the processing method.

We are relieved that preprocessing appears to be unnecessary for H12843 and OPR-G309-FH-16. Thanks again for identifying this problem and helping with the testing.

Thanks,  
James

James J. Miller  
Physical Scientist  
NOAA Office of Coast Survey  
Atlantic Hydrographic Branch  
439 W York St | Norfolk, VA | 23510  
[757-441-6746](tel:757-441-6746) x 111

On Thu, Feb 9, 2017 at 12:23 PM, Clinton Marcus - NOAA Federal <[clinton.r.marcus@noaa.gov](mailto:clinton.r.marcus@noaa.gov)> wrote:

Hi all,

After taking another sub-section of H12843 for reprocessing, it was found that 95% of the nodes were +/- 2cm. I will go so far as to say the difference would likely be even smaller if I had filtered the one XL present, which is what the FH did (I believe).

I took a total of 37 lines in an area of general bathymetry (no features) and followed the same procedure as previously noted. Taking the data from conversion thru SBETs, and re-applying SVC after SBETs.

Looking at the data in subset, there was little to no difference between the two projects.

After talking with Gene, we determined that it would not be necessary to reprocess the entire survey for such a small difference. Yay!

You might want to just double check with them (CO, Gene, Bri), but I don't think it is necessary for you to go back and reprocess the OPR-G309-FH-16 data.

Hope this all helped.

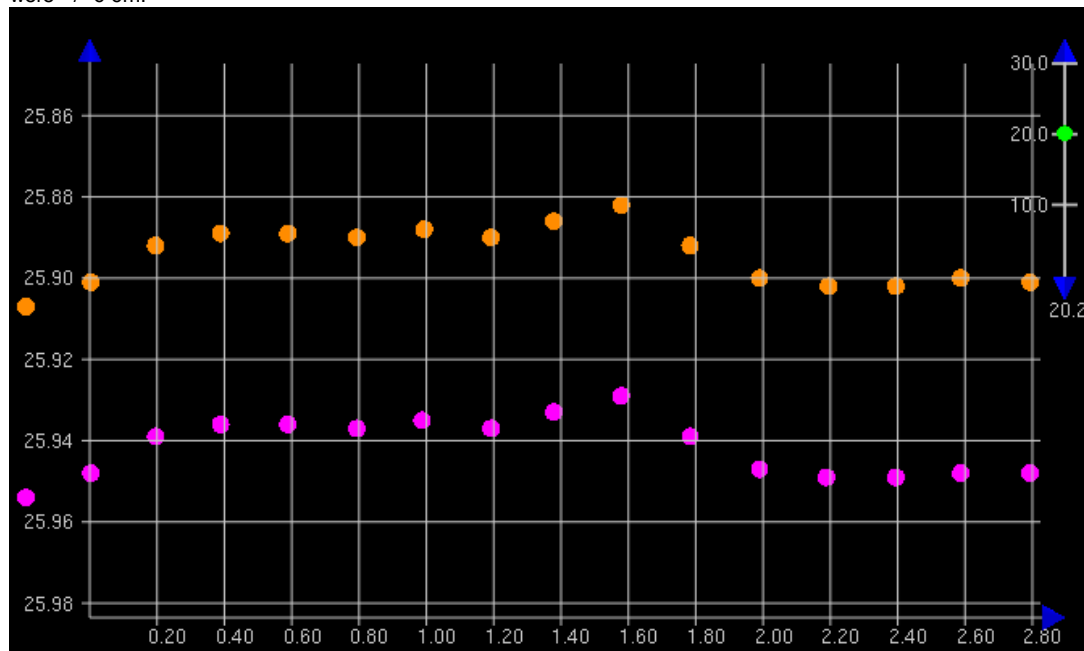
Cheers,

Clint Marcus  
Physical Scientist  
NOAA Office of Coast Survey  
Atlantic Hydrographic Branch  
Phone: (757) 441-6746 ext 208  
Cell: (541) 264-6406

On Thu, Feb 9, 2017 at 9:12 AM, James J. Miller <james.j.miller@noaa.gov> wrote:  
Hi Clint,

Thanks for all the helpful information and screen shots. For your next test subset, I think it would be worth comparing the original survey lines (re-SVC not conducted after SBETs) to the test lines at the sounding level in Subset Editor. When comparing surfaces, they often exhibit apparent vertical differences along slopes and features due to small horizontal shifts, rather than actual vertical changes. We are curious about the magnitude of the vertical difference between the soundings.

Even though survey H12859 was not affected by this issue because SVC was run after loading SBETs, we conducted a test because it is in the vicinity of H12843. We re-processed test copies of the H12859 crosslines and did not re-SVC after loading SBETs. As viewed in Subset Editor, the vertical difference between processing methods mostly ranged from 2-3 cm and reached a maximum of 5 cm in some areas. This seems similar to the H12843 difference surface where you found that 95% of nodes were +/- 6 cm.



I will follow your lead and try testing a couple features on H12859 and the OPR-G309-FH-16 surveys. Worth checking how the least depths are affected.

James J. Miller  
Physical Scientist  
NOAA Office of Coast Survey  
Atlantic Hydrographic Branch  
439 W York St | Norfolk, VA | 23510  
757-441-6746 x 111

On Thu, Feb 9, 2017 at 7:42 AM, Clinton Marcus - NOAA Federal <clinton.r.marcus@noaa.gov> wrote:

Hi Nick,  
With the soundings all being from development lines, there is good parity within the data. The soundings were for the most part all of a Quality Flag of 3. We are going to process another subset of H12843 to help validate our findings. The screen shot attached is of a subset over the wreck showing the density of soundings. We'll keep you posted with our findings.

Cheers,

Clint Marcus  
Physical Scientist  
NOAA Office of Coast Survey  
Atlantic Hydrographic Branch  
Phone: (757) 441-6746 ext 208  
Cell: (541) 264-6406

On Wed, Feb 8, 2017 at 8:26 PM, OPS.Ferdinand Hassler - NOAA Service Account <ops.ferdinand.hassler@noaa.gov> wrote:

Also, it could be possible that a horizontal change in position of the soundings could exacerbate the vertical difference in a sharp feature like a wreck but correct me if I'm wrong.

Nick

On Feb 8, 2017, at 6:32 PM, Clinton Marcus - NOAA Federal <[clinton.r.marcus@noaa.gov](mailto:clinton.r.marcus@noaa.gov)> wrote:

Hi James, et. al.

I ran a small subset of lines (8) on H12843 that were development lines over a wreck. I made a local project and took the lines through the entire processing workflow and re-SVC'd after the application of SBETs. I created a combined 2m surface which I then differenced with the field submitted combined surface. The result was that 95% of nodes had a +/- 6cm difference. There were localized differences of up to 52cm over the wreck. Unfortunately, I did not difference the soundings before and after the post-SBET SVC. I believe Gene and Bri were going to talk about how to proceed with H12843.

Hope that helps in the decision making process. I don't have the data in front of me, unfortunately, so I don't have any screen grabs available. I can send some out in the morning when I get to the office.

Thanks,  
Clint

Clint Marcus  
Physical Scientist  
NOAA Office of Coast Survey  
Atlantic Hydrographic Branch  
Phone: (757) 441-6746 ext 208  
Cell: (541) 264-6406

On Wed, Feb 8, 2017 at 6:11 PM, James J. Miller <[james.j.miller@noaa.gov](mailto:james.j.miller@noaa.gov)> wrote:

Hi everyone,

Thank you Clint for identifying this issue. And thank you all for clarifying that the proper workflow is to run (or re-run) SVC after loading the SBET if gyro, pitch, roll, heave or GPS height are applied. Unfortunately, this workflow was not followed during project OPR-G309-FH-16, which consists of 8 surveys and over 500 SNM of coverage. This issue is also relevant for the survey Clint is reviewing (H12843). Due to the large amount of data that is affected, it would take a significant amount of time to re-run SVC, re-Merge, re-check the designated soundings, and re-compute the grids. So in the interest of saving time, we were curious whether the problem is small enough to be documented in the DRs without reprocessing the data.

To assess the magnitude of the problem, we re-processed test copies of the crosslines for several surveys in project OPR-G309-FH-16 and conducted a comparison between running SVC before or after applying SBETs. As viewed in Subset Editor, the vertical difference between these methods did not exceed 1 cm (see image below), even in the outermost beams which exhibited larger offsets than nadir beams (as expected). Depths ranged from 20-45 m. At least from our testing on project OPR-G309-FH-16, the magnitude of the offset is small enough that reprocessing does not seem worthwhile.

...

[Message clipped]

--  
LCDR Briana Welton, NOAA  
Office of Coast Survey  
Chief, Atlantic Hydrographic Branch  
439 W York St, Norfolk, VA 23510  
office: 757-441-6746, ext 200  
cell: 520-227-9269



OPS.Ferdinand Hassler - NOAA Service Account <ops.ferdinand.hassler@noaa.gov>

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## NOAA Ship Hassler SV Correct

9 messages

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**Richard Brennan - NOAA Federal** <richard.t.brennan@noaa.gov> Wed, Feb 15, 2017 at 10:11 AM  
To: Briana Welton <Briana.Welton@noaa.gov>, Benjamin K Evans <benjamin.k.evans@noaa.gov>, CO HASSLER <CO.Ferdinand.Hassler@noaa.gov>, "OPS. Ferdinand Hassler" <OPS.Ferdinand.Hassler@noaa.gov>, Russell Quintero - NOAA Federal <Russell.Quintero@noaa.gov>, Samuel Greenaway - NOAA Service Account <Samuel.Greenaway@noaa.gov>, Lorraine Robidoux - NOAA Federal <lorraine.robidoux@noaa.gov>

LCDR Jaskoski,

I have reviewed the technical details associated with the situation surrounding the Hassler surveys that are currently in question. As currently understood, there are approximately 16 surveys between AHB and Hassler. The issue, as I understand it in general terms, is that the data in question was not SVP corrected after SBET computation and application to the data. Based on my technical review I would like the current remediation:

1. Pick one survey to serve as a representative example of this set. Save the current BASE surface with the SVP applied *before* SBET application as `_OLD`. Then, re-apply SVP and recompute a *new* grid. Do a difference surface and compute the min, max, average, and standard deviation for this difference surface.

Based on my review the SBET process does no change the roll, pitch, or yaw nor the location of the transducer in the water column - or at least not in a meaningful way. This representative data set should confirm that.

2. Please report the finding of this analysis. Assuming it is exceedingly small, I think the next steps are:

- Create a revised DAPR that can be used for all surveys that describes the problem and the analysis. I expect that you will work with AHB to arrange this documentation is properly included with all surveys.
- I will provide a waiver in light of this analysis that authorizes the data to proceed using the current process.
- Include both the waiver and this email in the separates for all theses surveys to document the action taken.
- Ensure Hassler SOPs are updated to ensure this process is corrected.

3. If the analysis shows anything more than a 5cm difference, please advise me. We will discuss how to proceed from there.

It is my expectation that we will manage similar problems encountered with other field units or our contractors in a similar and consistent fashion. If there are any questions, concerns, or details I have not addressed I expect you or LCDR Welton will contact me with that information.

Rick  
**CAPT Rick Brennan, NOAA**  
Chief, Hydrographic Surveys Division  
1315 East-West Highway, SSMC3 Room 6823  
Silver Spring, MD 20910  
Work: [301-713-2700](tel:301-713-2700)  
Cell: [443-994-3301](tel:443-994-3301)

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**OPS.Ferdinand Hassler - NOAA Service Account** <ops.ferdinand.hassler@noaa.gov> Wed, Feb 15, 2017 at 10:36 AM  
To: James J Miller <james.j.miller@noaa.gov>, Patrick Debrousse - NOAA Federal <patrick.j.debrousse@noaa.gov>, Jonathan French - NOAA Federal <jonathan.r.french@noaa.gov>

Field Operations Officer, NOAA Ship *Ferdinand R. Hassler*  
29 Wentworth Road  
New Castle, NH, 03854



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**CO.Ferdinand Hassler - NOAA Service Account** <co.ferdinand.hassler@noaa.gov> Wed, Feb 15, 2017 at 10:53 AM  
To: Richard Brennan - NOAA Federal <richard.t.brennan@noaa.gov>  
Cc: Briana Welton <Briana.Welton@noaa.gov>, Benjamin K Evans <benjamin.k.evans@noaa.gov>, "OPS. Ferdinand Hassler" <OPS.Ferdinand.Hassler@noaa.gov>, Russell Quintero - NOAA Federal <Russell.Quintero@noaa.gov>, Samuel Greenaway - NOAA Service Account <Samuel.Greenaway@noaa.gov>, Lorraine Robidoux - NOAA Federal <lorraine.robidoux@noaa.gov>

CAPT,  
Will do.

v/r  
Matt

Lieutenant Commander Matthew Jaskoski, NOAA  
Commanding Officer, NOAA Ship *Ferdinand R. Hassler* (S-250)  
CO cell: (240) 687-4602  
Ship's VIOP: (541) 867-8935  
Sat Phone: (808) 851-3826  
Personal cell: (757) 647-3356

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**OPS.Ferdinand Hassler - NOAA Service Account** <ops.ferdinand.hassler@noaa.gov> Wed, Feb 15, 2017 at 3:26 PM  
To: Jeffery Marshall - NOAA Federal <jeffery.marshall@noaa.gov>

FYI

Field Operations Officer, NOAA Ship *Ferdinand R. Hassler*  
29 Wentworth Road  
New Castle, NH, 03854

----- Forwarded message -----

From: **Richard Brennan - NOAA Federal** <richard.t.brennan@noaa.gov>  
Date: Wed, Feb 15, 2017 at 10:11 AM  
Subject: NOAA Ship Hassler SV Correct  
To: Briana Welton <Briana.Welton@noaa.gov>, Benjamin K Evans <benjamin.k.evans@noaa.gov>, CO HASSLER <CO.Ferdinand.Hassler@noaa.gov>, "OPS. Ferdinand Hassler" <OPS.Ferdinand.Hassler@noaa.gov>, Russell Quintero - NOAA Federal <Russell.Quintero@noaa.gov>, Samuel Greenaway - NOAA Service Account <Samuel.Greenaway@noaa.gov>, Lorraine Robidoux - NOAA Federal <lorraine.robidoux@noaa.gov>

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**CO.Ferdinand Hassler - NOAA Service Account** <co.ferdinand.hassler@noaa.gov> Tue, Feb 21, 2017 at 12:55 PM  
To: Richard Brennan - NOAA Federal <richard.t.brennan@noaa.gov>  
Cc: Briana Welton <Briana.Welton@noaa.gov>, Benjamin K Evans <benjamin.k.evans@noaa.gov>, "OPS. Ferdinand Hassler" <OPS.Ferdinand.Hassler@noaa.gov>, Russell Quintero - NOAA Federal <Russell.Quintero@noaa.gov>, Samuel Greenaway - NOAA Service Account <Samuel.Greenaway@noaa.gov>, Lorraine Robidoux - NOAA Federal <lorraine.robidoux@noaa.gov>

CAPT,  
attached is our report of analysis of the two grids. The algorithm chose a couple different hypotheses around features and a slope area, but it appears that both grids are nearly identical. No change to VALSOU's etc.

v/r  
Matt

Lieutenant Commander Matthew Jaskoski, NOAA  
Commanding Officer, NOAA Ship *Ferdinand R. Hassler* (S-250)  
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Ship's VIOP: (541) 867-8935

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 **H12932 Re-SVC Process Analysis.pptx**  
1988K

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**Briana Welton - NOAA Federal** <briana.welton@noaa.gov> Wed, Mar 1, 2017 at 8:28 AM  
To: "CO.Ferdinand Hassler - NOAA Service Account" <co.ferdinand.hassler@noaa.gov>  
Cc: Richard Brennan - NOAA Federal <richard.t.brennan@noaa.gov>, Benjamin K Evans <benjamin.k.evans@noaa.gov>, "OPS. Ferdinand Hassler" <OPS.Ferdinand.Hassler@noaa.gov>, Russell Quintero - NOAA Federal <Russell.Quintero@noaa.gov>, Samuel Greenaway - NOAA Service Account <Samuel.Greenaway@noaa.gov>, Lorraine Robidoux - NOAA Federal <lorraine.robidoux@noaa.gov>

LCDR Jaskoski and CAPT Brennan,

Based on the ship's analysis, I agree that reprocessing is unnecessary. I suggest that the ship accurately document how the data have been processed either in a revised DAPR or in the DR for each survey as deviation from the DAPR for all surveys still in the ship's control; and that AHB document how the data have been processed for the surveys that are in our control.

V/r,

Bri

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<H12932 Re-SVC Process Analysis.pptx>

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**Richard Brennan - NOAA Federal** <richard.t.brennan@noaa.gov> Thu, Mar 2, 2017 at 10:30 AM  
To: Briana Welton - NOAA Federal <briana.welton@noaa.gov>  
Cc: "CO.Ferdinand Hassler - NOAA Service Account" <co.ferdinand.hassler@noaa.gov>, Benjamin K Evans <benjamin.k.evans@noaa.gov>, "OPS. Ferdinand Hassler" <OPS.Ferdinand.Hassler@noaa.gov>, Russell Quintero - NOAA Federal <Russell.Quintero@noaa.gov>, Samuel Greenaway - NOAA Service Account <Samuel.Greenaway@noaa.gov>, Lorraine Robidoux - NOAA Federal <lorraine.robidoux@noaa.gov>

LCDR Welton,

I concur with your recommendations. Please proceed with this plan as you described.

LCDR Jaskoski,

Please work with AHB with regard to the best path regarding DAPR revision or documentation of this process in the DR.

Rick

**CAPT Rick Brennan, NOAA**  
Chief, Hydrographic Surveys Division  
1315 East-West Highway, SSMC3 Room 6823  
Silver Spring, MD 20910  
Work: 301-713-2700  
Cell: 443-994-3301

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**CO.Ferdinand Hassler - NOAA Service Account** <co.ferdinand.hassler@noaa.gov> Thu, Mar 2, 2017 at 10:39 AM  
To: Richard Brennan - NOAA Federal <richard.t.brennan@noaa.gov>

3/2/2017

National Oceanic and Atmospheric Administration Mail - NOAA Ship Hassler SV Correct

Cc: Briana Welton - NOAA Federal <briana.welton@noaa.gov>, Benjamin K Evans <benjamin.k.evans@noaa.gov>, "OPS. Ferdinand Hassler" <OPS.Ferdinand.Hassler@noaa.gov>, Russell Quintero - NOAA Federal <Russell.Quintero@noaa.gov>, Samuel Greenaway - NOAA Service Account <Samuel.Greenaway@noaa.gov>, Lorraine Robidoux - NOAA Federal <lorraine.robidoux@noaa.gov>

Will do.

v/r  
Matt

Lieutenant Commander Matthew Jaskoski, NOAA  
Commanding Officer, NOAA Ship *Ferdinand R. Hassler* (S-250)  
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**CO.Ferdinand Hassler - NOAA Service Account** <co.ferdinand.hassler@noaa.gov>

Thu, Mar 2, 2017 at 10:42 AM

To: Briana Welton - NOAA Federal <briana.welton@noaa.gov>

Cc: "OPS.Ferdinand Hassler" <ops.ferdinand.hassler@noaa.gov>

Hey Bri,  
we've got these ready to go - might be able to submit them before we depart on Saturday, if not they'll be ready to go at our next inport (3/15-18)

Jasko

Lieutenant Commander Matthew Jaskoski, NOAA  
Commanding Officer, NOAA Ship *Ferdinand R. Hassler* (S-250)  
CO cell: (240) 687-4602  
Ship's VIOP: (541) 867-8935  
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APPROVAL PAGE

H12893

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

- H12893\_DR.pdf
- Collection of depth varied resolution BAGS
- Processed survey data and records
- H12893\_GeoImage.pdf

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.

Approved: \_\_\_\_\_

**Commander Briana W. Hillstrom, NOAA**  
Chief, Atlantic Hydrographic Branch