H13092

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

DESCRIPTIVE REPORT

Type of Survey:	Navigable Area
Registry Number:	H13092

LOCALITY

State(s):	New York
General Locality:	Hudson River
Sub-locality:	Piermont Pier to South of Ossining

2017

CHIEF OF PARTY
LTJG Dylan Kosten

LIBRARY & ARCHIVES

Date:

U.S. DEPARTMENT OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION	REGISTRY NUMBER:
HYDROGRAPHIC TITLE SHEET	**H13092**

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):	**New York**
General Locality:	**Hudson River**
Sub-Locality:	**Piermont Pier to South of Ossining**
Scale:	**5000**
Dates of Survey:	**07/31/2017 to 11/09/2017**
Instructions Dated:	**10/12/2017**
Project Number:	**OPR-B396-NRT5BH2-17**
Field Unit:	**Navigation Response Team 5 and Bay Hydro II**
Chief of Party:	**LTJG Dylan Kosten**
Soundings by:	**Multibeam Echo Sounder**
Imagery by:	
Verification by:	**Pacific Hydrographic Branch**
Soundings Acquired in:	**meters at Mean Lower Low Water**

Remarks:

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

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Descriptive Report to Accompany Survey H13092

Project: OPR-B396-NRT5BH2-17

Locality: Hudson River

Sublocality: Piermont Pier to South of Ossining

Scale: 1:5000

July 2017 - November 2017

Navigation Response Team 5 and Bay Hydro II

Chief of Party: LTJG Dylan Kosten

A. Area Surveyed

The survey area extends from approximately 1.5 nautical miles south of Ossining to just north of the Tappan Zee Bridge (Figure 1).

A.1 Survey Limits

Data were acquired within the following survey limits:

Northwest Limit	Southeast Limit
41° 8' 16.22" N 73° 54' 25.17" W	41° 2' 35.05" N 73° 52' 26.92" W

Table 1: Survey Limits

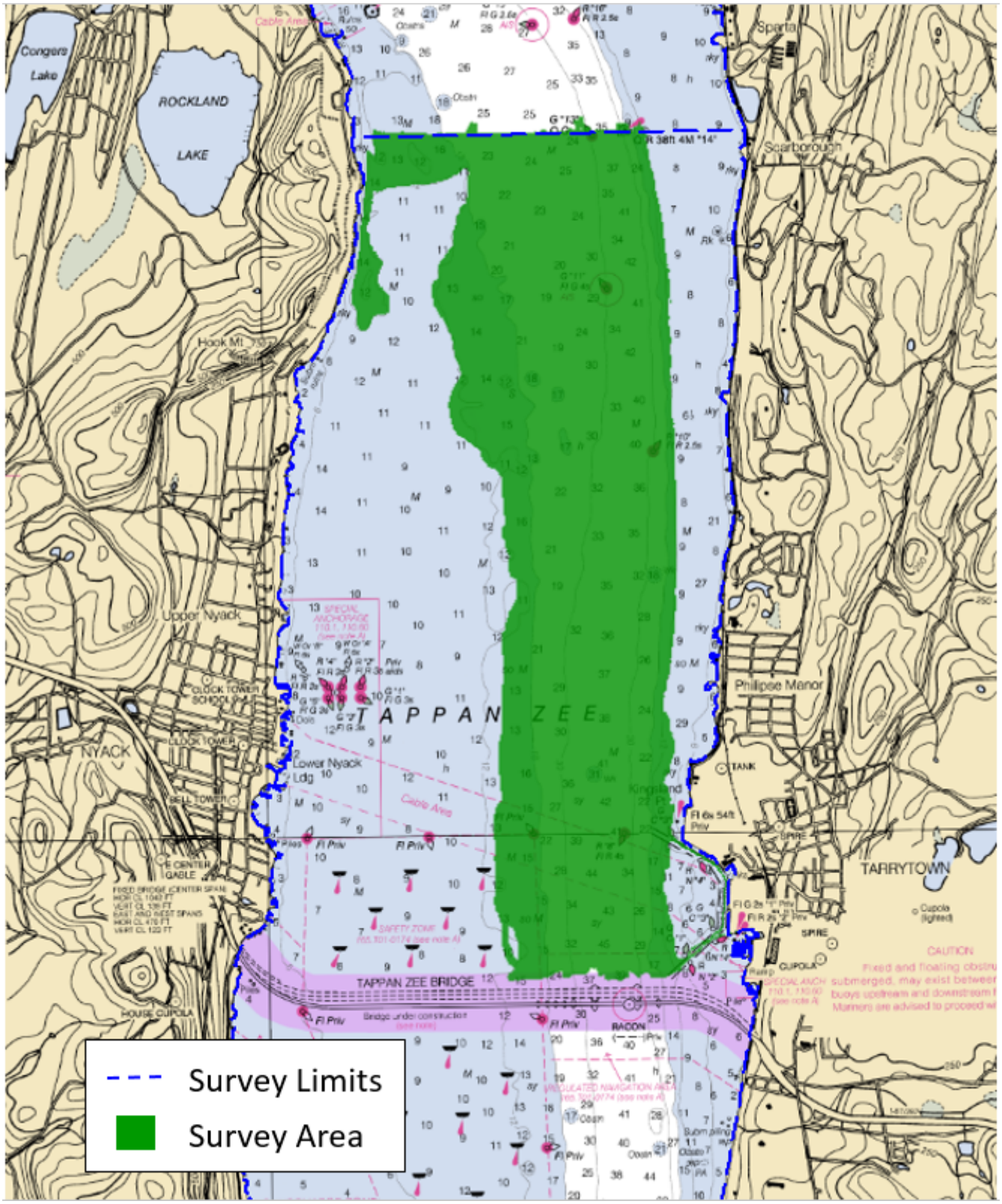


Figure 1: H13092 Survey Limits

Data were acquired within the survey limits in accordance with the requirements in the Project Instructions and HSSD.

A.2 Survey Purpose

The Hudson River Pilots Association is requesting updated survey data in the Hudson River from the Tappan Zee Bridge up to Albany, NY. Ship traffic to the facilities in Albany and along this section of the Hudson River is steadily increasing and the maximum draft of the vessels calling on the port is getting deeper. Existing chart data outside the federal channels in this area dates from prior to 1939 and in many cases pre-1900 surveys. The federal channel in this area is only 400-ft wide and the size of ships is exceeding 600-ft in length, which necessitates maneuvering outside of the federal channel. The pilots feel more recent survey data is warranted in this area, especially given the heavy storm activity that has occurred in the past several years, and the increased shipping traffic carrying hazardous cargoes, such as crude oil.

A.3 Survey Quality

The entire survey is adequate to supersede previous data.

The Pydro Grid QA tool was used to analyze multibeam echosounder (MBES) data density. The final surface for this project was found to meet the HSSD data density requirement (Figure 2).

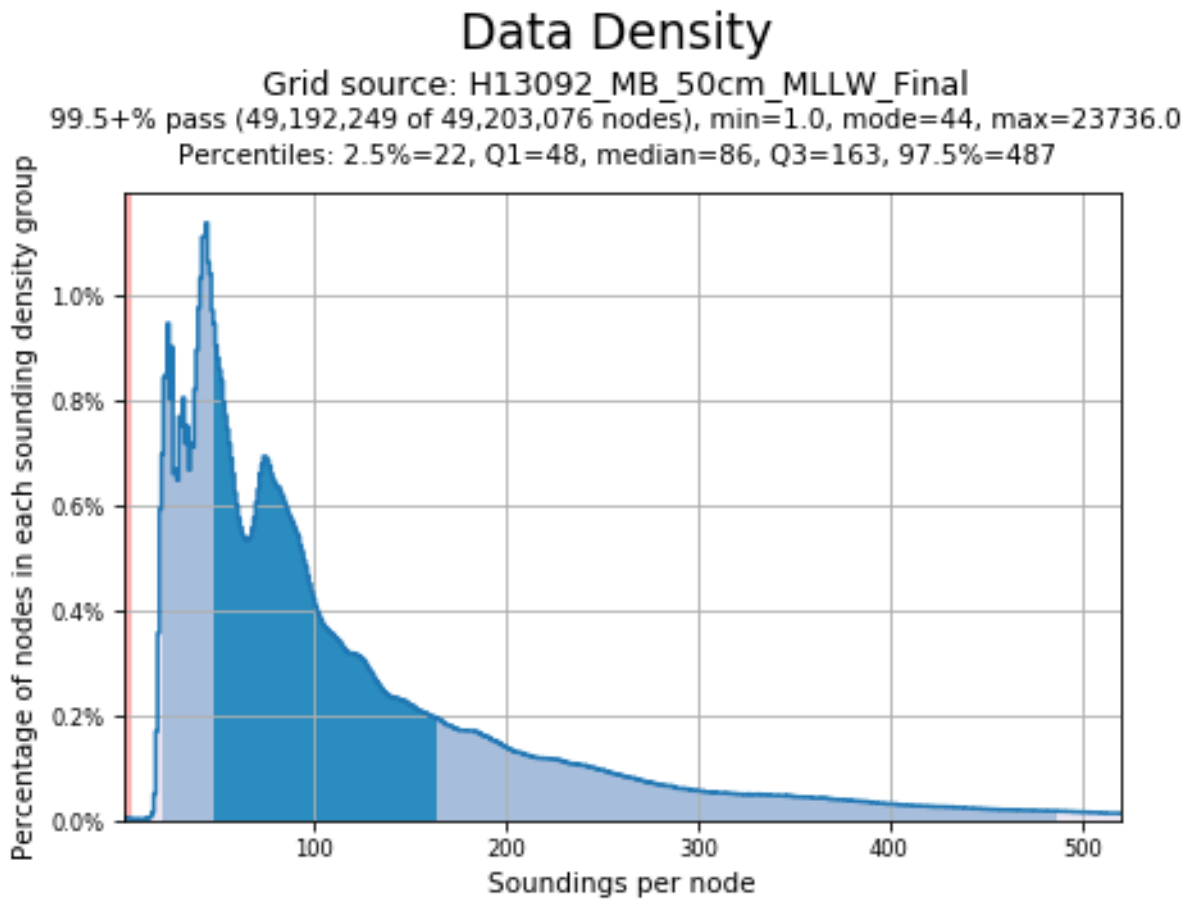


Figure 2: Pydro derived histogram plot showing HSSD compliance of H13092 MBES data within the 50 cm final CUBE surface

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	Object Detection Coverage (refer to HSSD Section 5.2.2.2)

Table 2: Survey Coverage

Object detection multibeam coverage was achieved within the limits of hydrography as defined in the Project Instructions with some exceptions:

1) Some stretches, largely along the west shoreline, do not meet the coverage requirements due to time constraints and deteriorating weather conditions (Figures 3, 4).

2) For the same reasons as above, it was decided not to extend the survey coverage past the Tappan Zee Bridge. Survey coverage stops just north of the Governor Mario M. Cuomo Bridge, which was still under construction at the time of survey (Figure 5).

3) An approxiamtely 300 meter long by 70 meter wide holiday exists at the south west corner of the survey area where data was acquired around a barge moored to a buoy (Figure 6).

4) Two survey lines were run through the center of the Tarrytown Harbor Channel to identify and potential hazards and investigate assigned shoreline features. Due to the exploratory nature of these lines, there are a few gaps in between survey coverage where the sonar swath did not overlap (Figure 7).

5) A total of 34 holidays exist in the survey coverage. They are the result of insufficient overlap in relatively shallow waters where the sonar's swath width was at its lower limit. Many of these holidays were created during the final days on the project where weather conditions were progressively worsening and sufficient time was unavailable to address them all. None of these holidays were found to be over significant features (Figure 8).

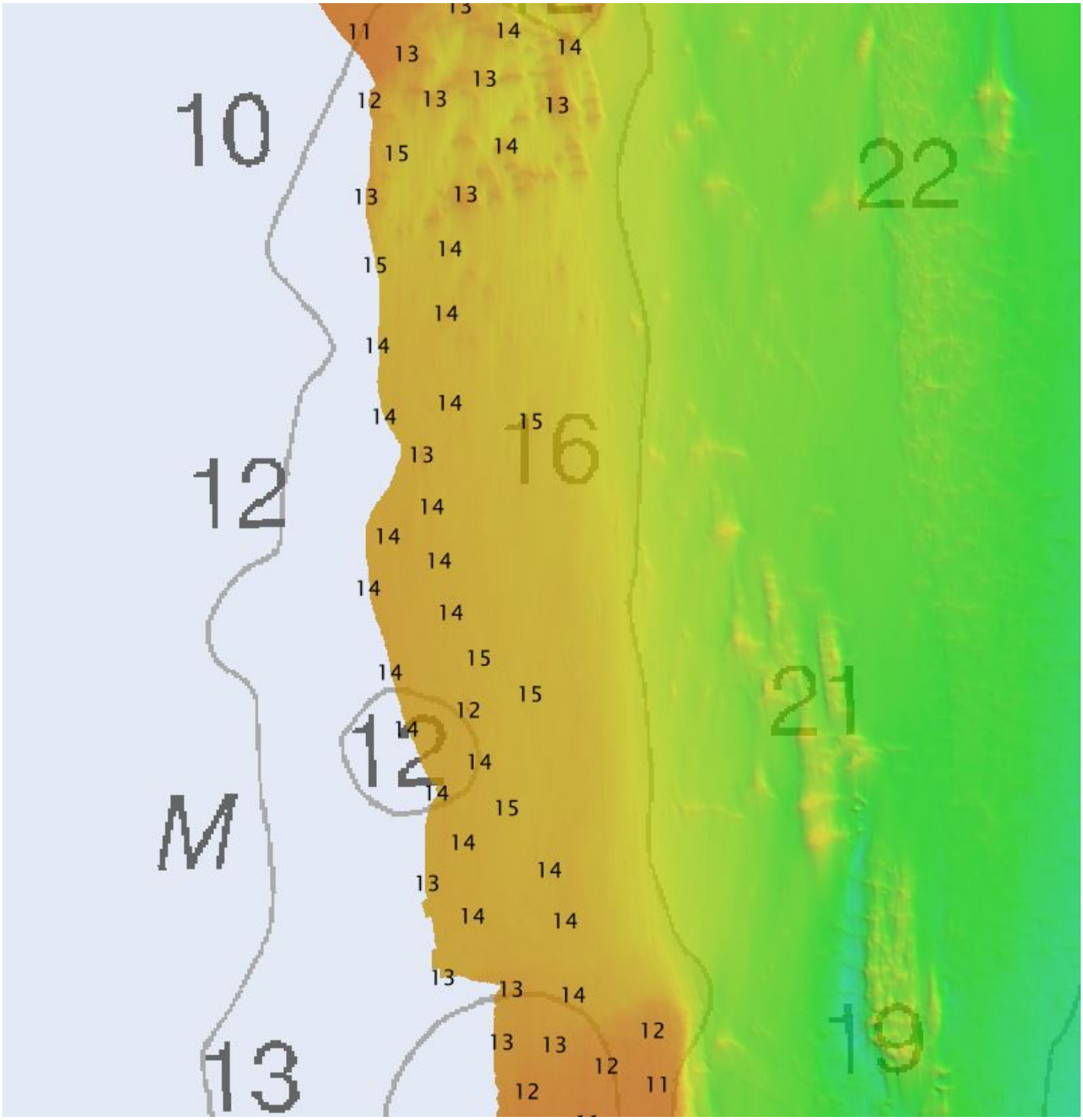


Figure 3: Survey coverage does not fully reach the 12 foot contour

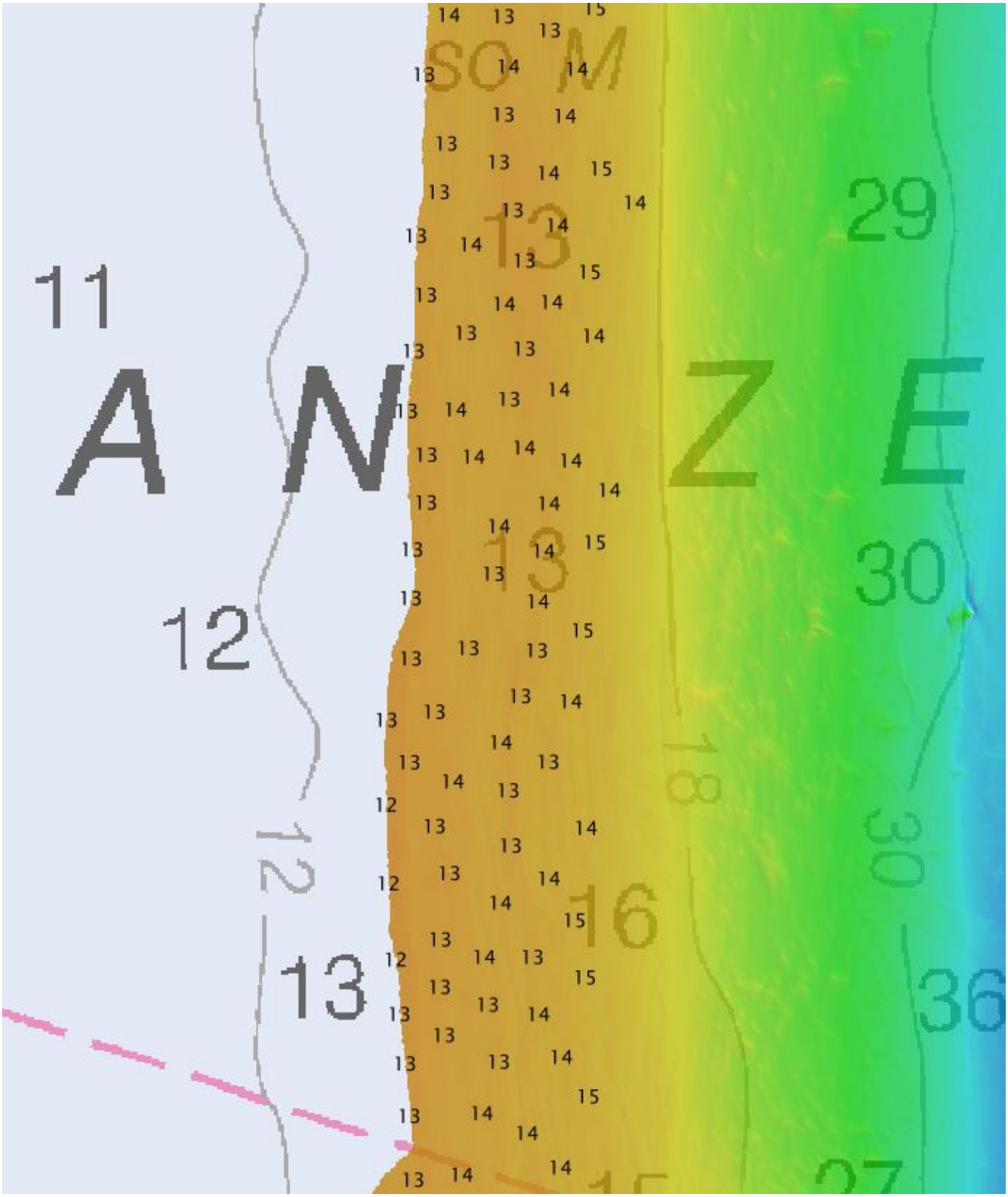


Figure 4: Another example of where the survey coverage does not fully reach the 12 foot contour

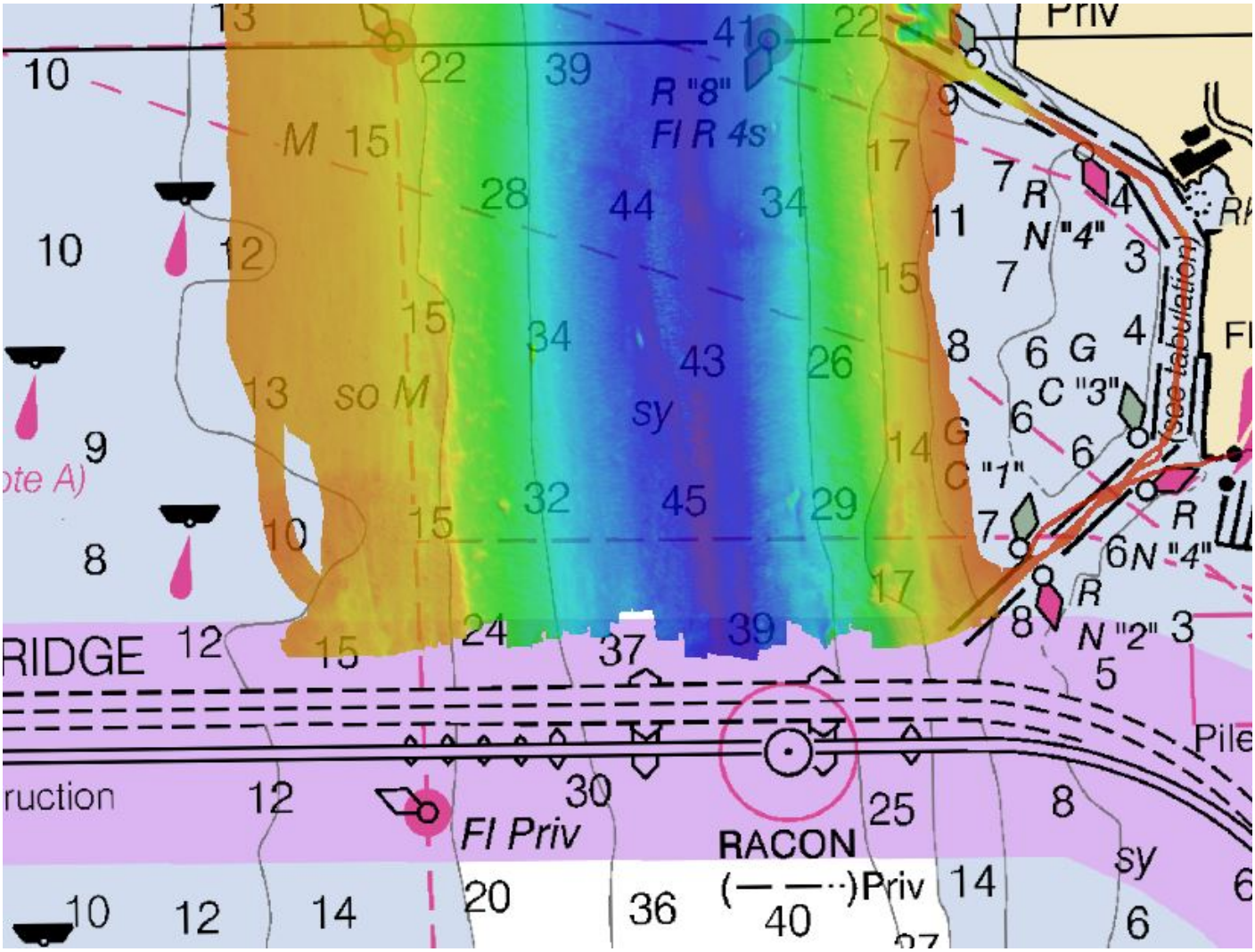


Figure 5: Survey coverage stops just north of the Tappan Zee Bridge

Figure 6: Holiday from surveying around a moored barge

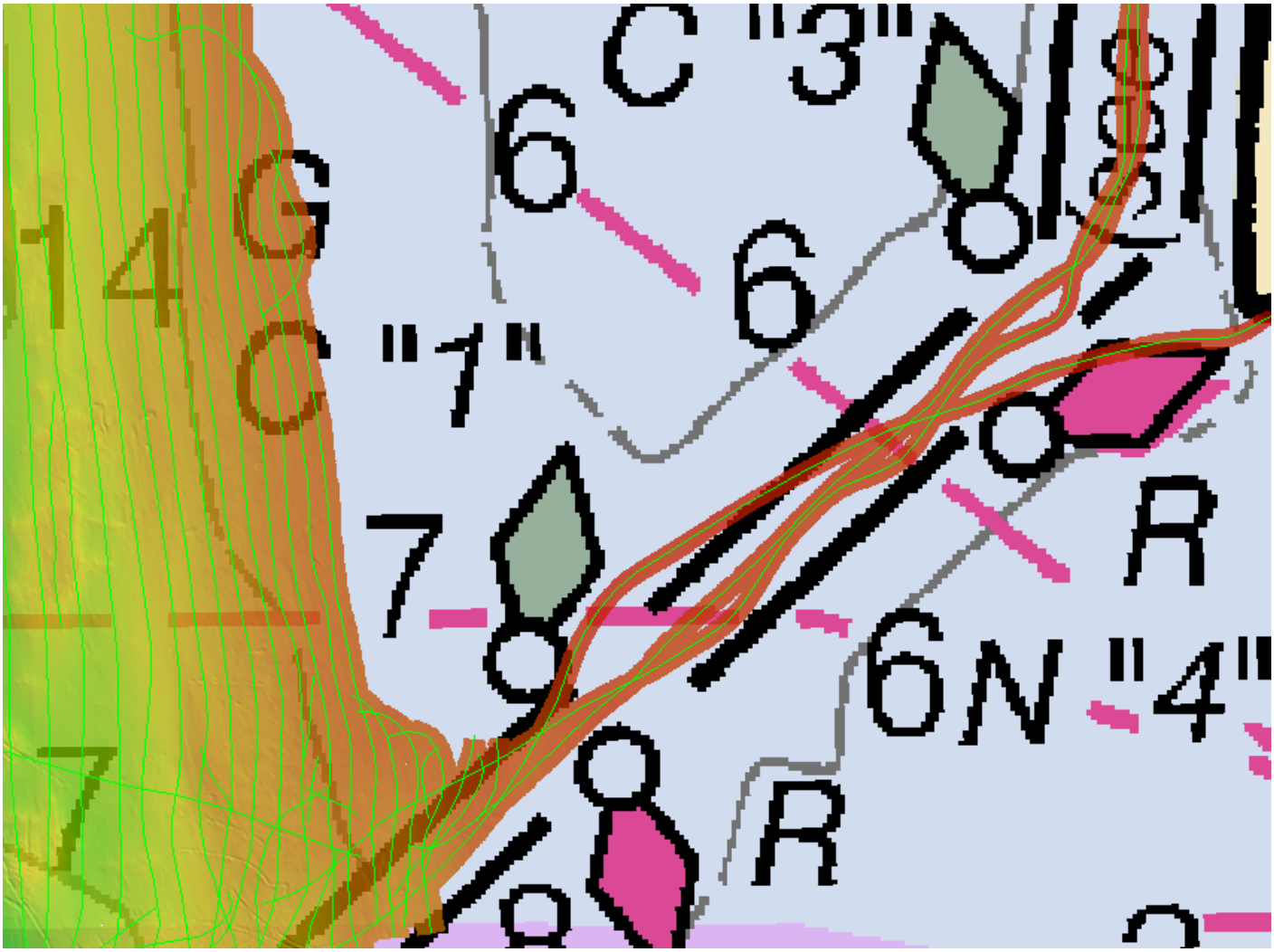


Figure 7: Tarrytown Channel holidays

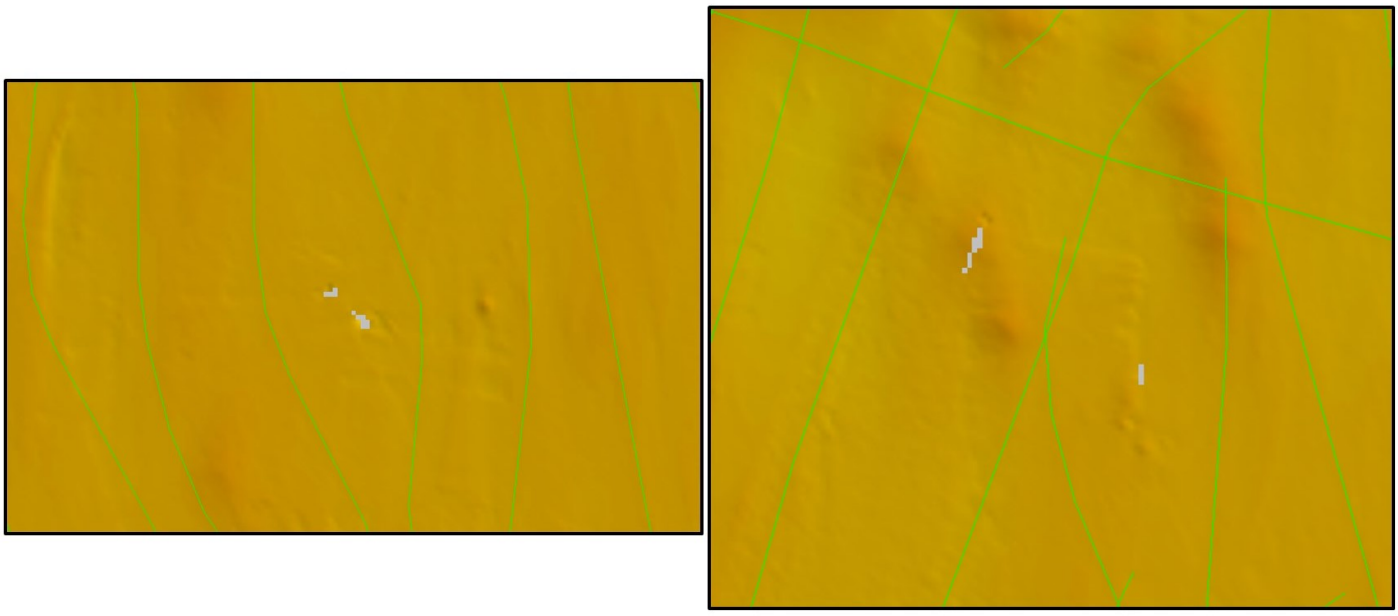


Figure 8: Holidays resulting from insufficient swath overlap

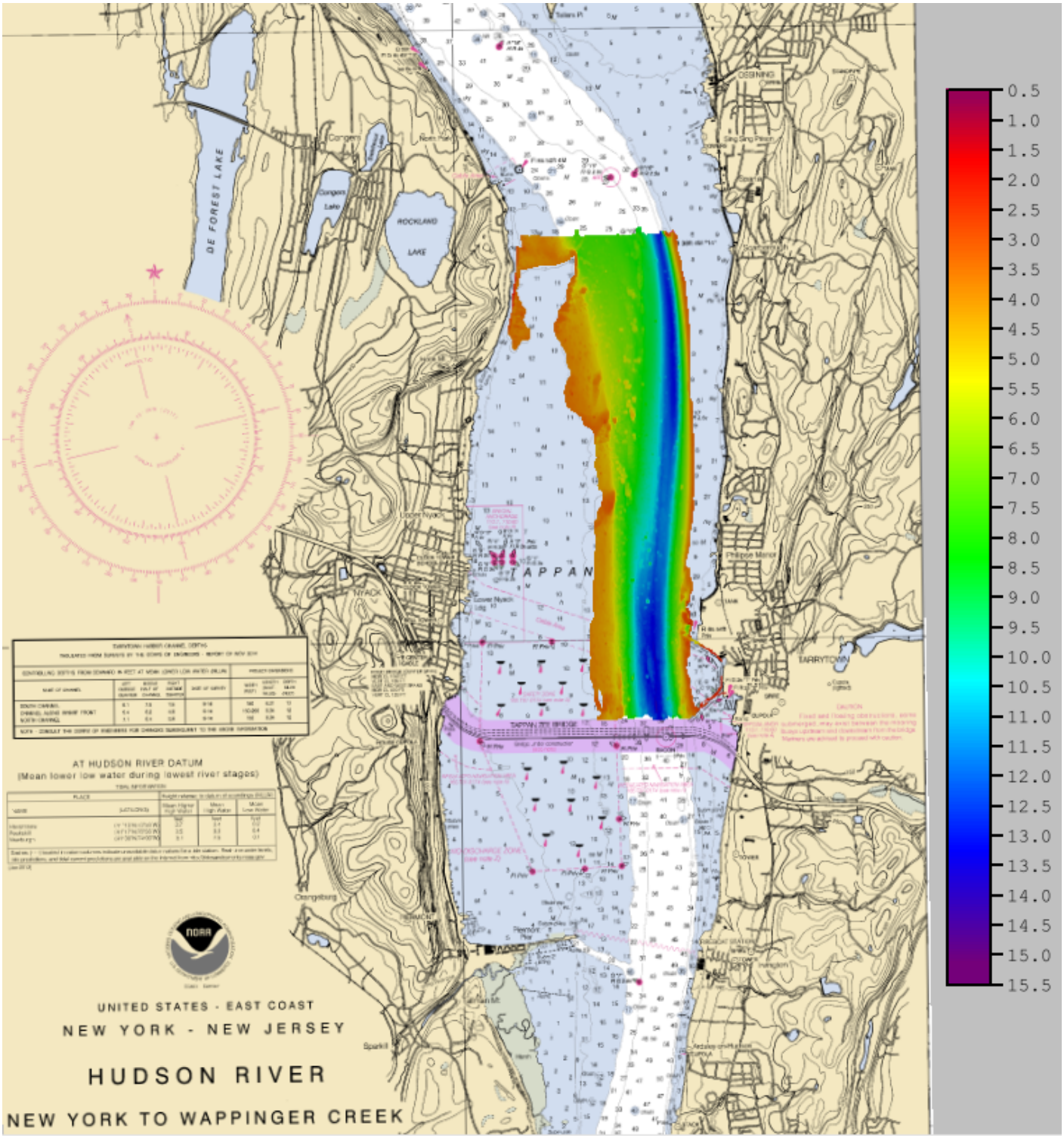


Figure 9: Survey coverage within the project area

A.6 Survey Statistics

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

	HULL ID	*S3007*	*S3002*	*S5401*	*Total*
LNM	**SBES Mainscheme**	0	0	0	0
	MBES Mainscheme	278.4	91.9	35.1	405.4
	Lidar Mainscheme	0	0	0	0
	SSS Mainscheme	0	0	0	0
	SBES/SSS Mainscheme	0	0	0	0
	MBES/SSS Mainscheme	0	0	0	0
	SBES/MBES Crosslines	11.2	1.2	0	12.4
	Lidar Crosslines	0	0	0	0
Number of Bottom Samples					10
Number Maritime Boundary Points Investigated					0
Number of DPs					0
Number of Items Investigated by Dive Ops					0
Total SNM					440.3

Table 3: Hydrographic Survey Statistics

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

Survey Dates	Day of the Year
07/31/2017	212
08/01/2017	213
08/02/2017	214
08/03/2017	215
08/07/2017	219
08/08/2017	220
10/16/2017	289
10/17/2017	290
10/18/2017	291
10/19/2017	292
10/25/2017	298
10/26/2017	299
10/31/2017	304
11/01/2017	305
11/02/2017	306
11/07/2017	311
11/08/2017	312
11/09/2017	313

Table 4: Dates of Hydrography

B. Data Acquisition and Processing

B.1 Equipment and Vessels

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

B.1.1 Vessels

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

Hull ID	*S3007*	*S3002*	*S5401*
LOA	33 feet	33 feet	57 feet
Draft	2.5 feet	2.5 feet	6 feet

Table 5: Vessels Used

All data for survey H13092 was acquired by S3007, S3002, and S5401. Survey vessels S3007, S3002, and S5401 acquired multibeam depth soundings, backscatter data, and sound speed profiles. Survey vessel S3007 acquired bottom samples and conducted shoreline verification.

B.1.2 Equipment

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

Manufacturer	Model	Type
Applanix	POS MV 320 v5	Positioning and Attitude System
AML Oceanographic	MicroX SVS	Sound Speed System
YSI	CastAway-CTD	Conductivity, Temperature, and Depth Sensor
Kongsberg Maritime	EM 3002	MBES
Kongsberg Maritime	EM 2040C	MBES
Kongsberg Maritime	EM 2040	MBES

Table 6: Major Systems Used

B.2 Quality Control

B.2.1 Crosslines

Multibeam/single beam echo sounder/side scan sonar crosslines acquired for this survey totaled 3.06% of mainscheme acquisition.

S3002, S3007, and S5401 acquired 405.4 linear nautical miles of mainscheme bathymetry and S3007 and S3002 acquired 12.4 linear nautical miles of crosslines, which equates to 3.06% of mainscheme acquisition (Figure 10). 50 cm CUBE surfaces of mainscheme and crossline coverage were compared using the Pydro Compare Grids tool (Figures 11, 12). The largest differences were found to be on the scale of 0.2 to 0.6 meter, and are possibly due to issues had with an invalid POS MV lever arm configuration. Most of the vertical offsets that resulted from this error were resolved in post-processing.

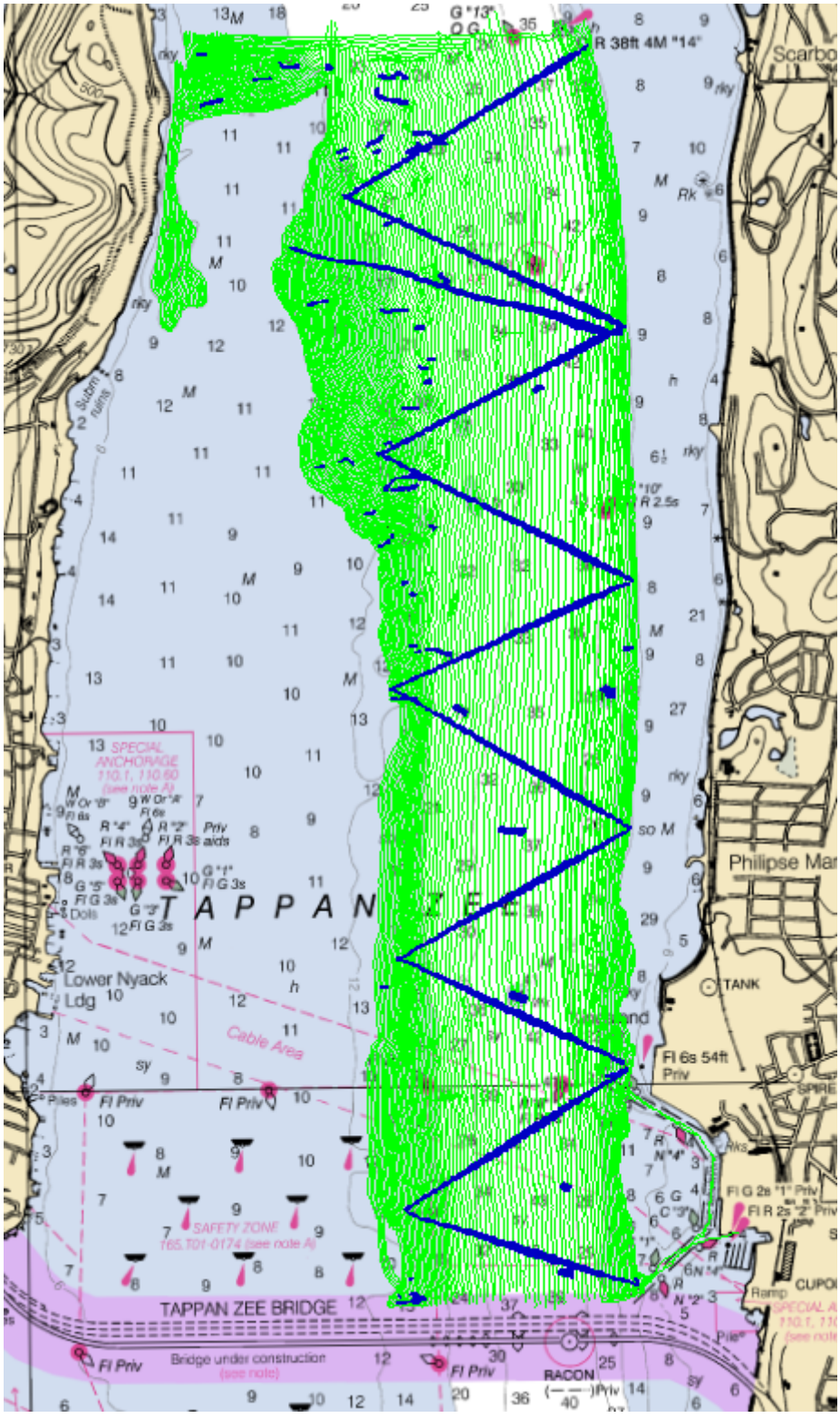


Figure 10: H13092 crossline coverage

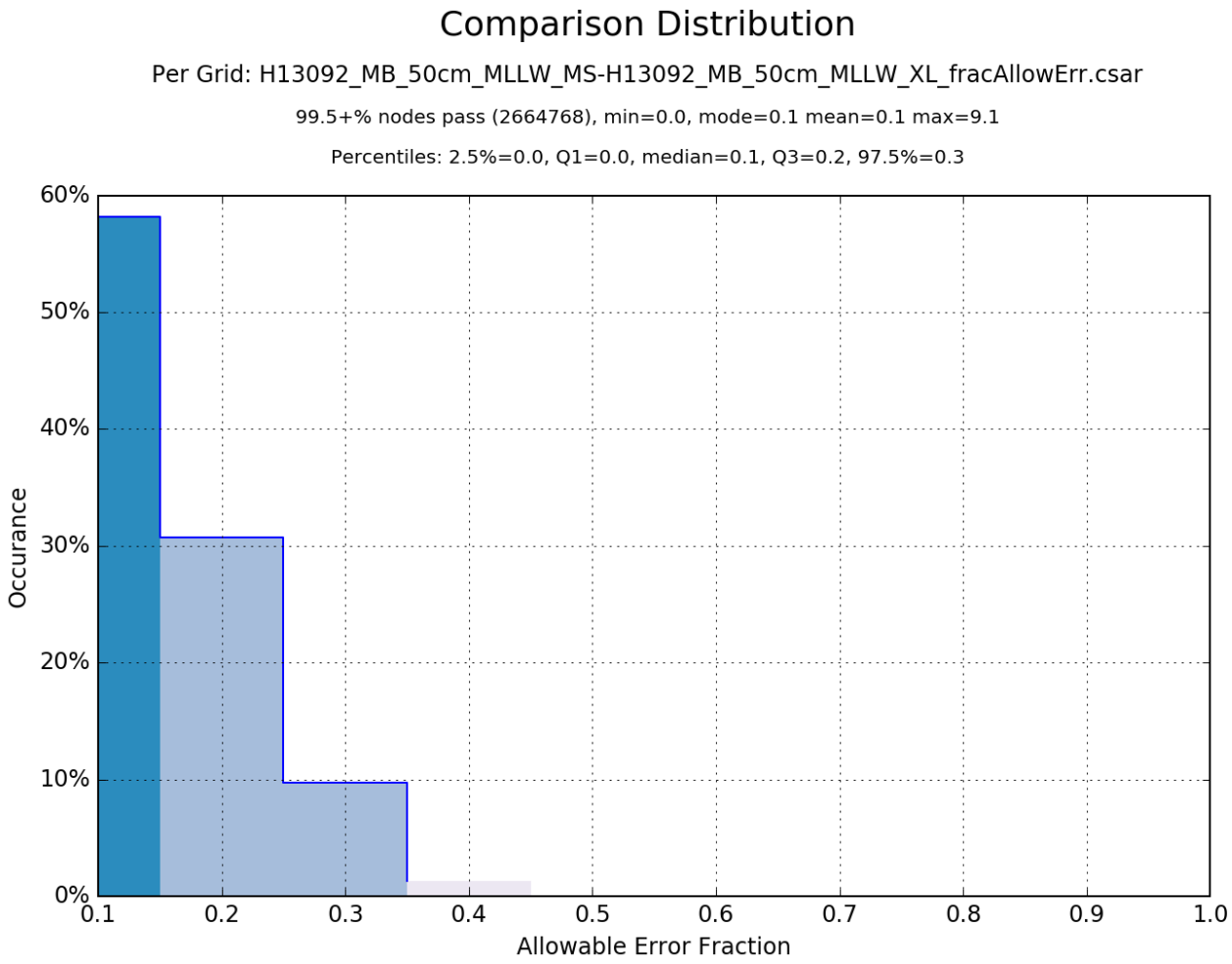
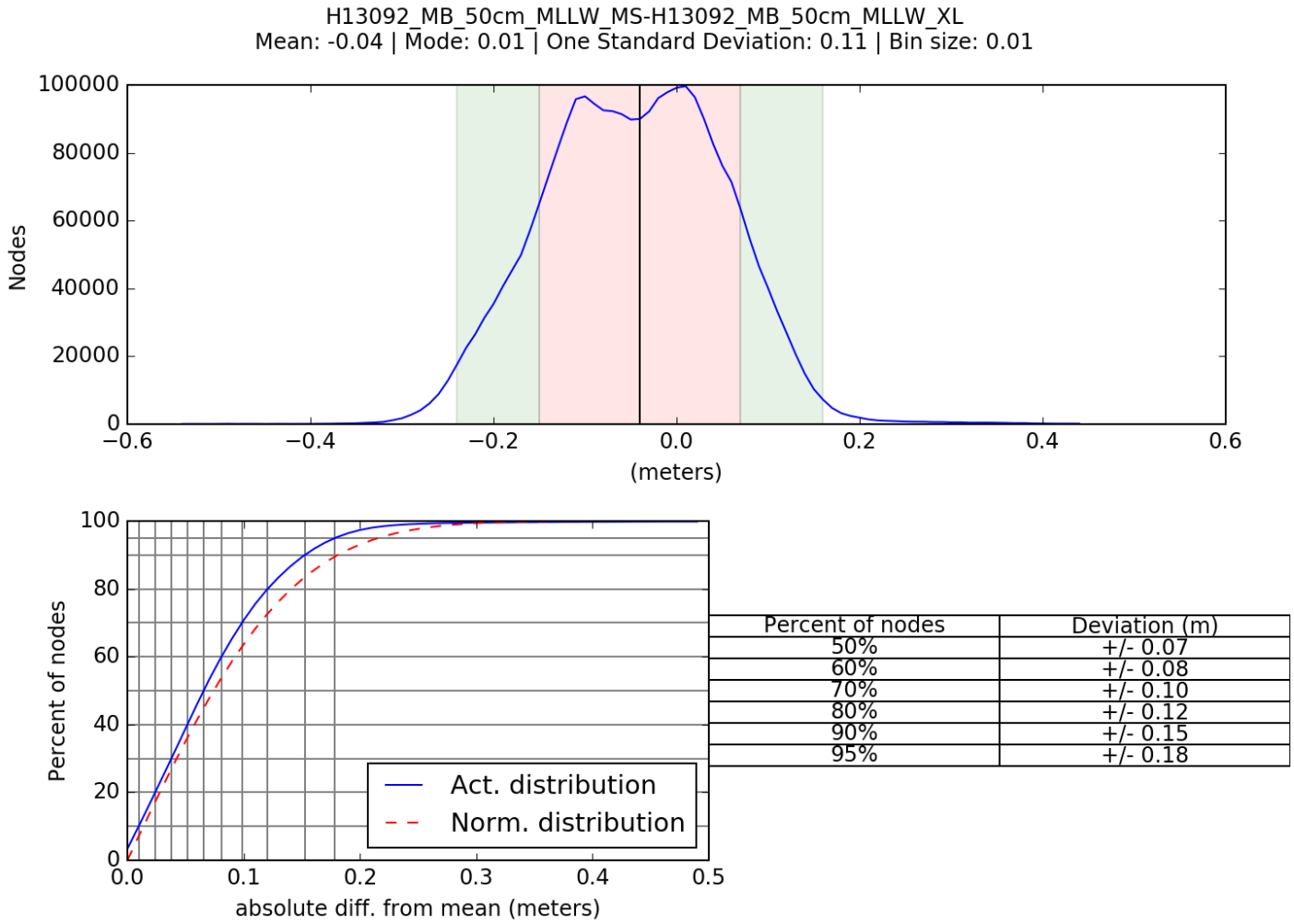


Figure 11: Comparison distribution of the magnitude of the fractional allowable errors. 99.5+% of nodes passed this assessment.



Percent of nodes	Deviation (m)
50%	+/- 0.07
60%	+/- 0.08
70%	+/- 0.10
80%	+/- 0.12
90%	+/- 0.15
95%	+/- 0.18

Figure 12: Statistics and distribution summary of grid nodes from the mainscheme-to-crossline difference surface

B.2.2 Uncertainty

The following survey specific parameters were used for this survey:

Method	Measured	Zoning
ERS via VDATUM	0 meters	0.094 meters

Table 7: Survey Specific Tide TPU Values.

Hull ID	Measured - CTD	Measured - MVP	Surface
S3002	2 meters/second	0 meters/second	0.5 meters/second
S5401	2 meters/second	0 meters/second	0.5 meters/second
S3007	2 meters/second	0 meters/second	0.5 meters/second

Table 8: Survey Specific Sound Speed TPU Values.

Total Propagated Uncertainty (TPU) values for H13092 were derived from a combination of fixed values for equipment and vessel characteristics, as well as field determined values for sound speed uncertainties. The uncertainty value for the VDatum model was provided to the field unit.

In addition to the usual a priori estimates of uncertainty, some real time and post processed uncertainty sources were also incorporated into the depth estimates of the survey. Real-time uncertainties from the Kongsberg MBES sonars were incorporated and applied during post processing. Applanix TrueHeave (POS) files, which record estimates of heave uncertainty, were also applied during post processing. Finally, the post processed uncertainties associated with vessel roll, pitch, yaw, and navigation, were applied in CARIS HIPS using SBET/RMS files generated using POSPac software. H13092 is an ellipsoidally referenced survey (ERS) and the tidal component was accomplished with a VDatum separation model.

Uncertainty values of submitted final grids were calculated in Caris using the "Greater of the Two" of uncertainty and standard deviation (scaled to 95%). The Pydro Grid QA tool was used to analyze H13092 MBES uncertainty (Figure 13). From a visual inspection, some vertical offsets were found which exceed the accepted IHO uncertainty (Figures 14-16). These offsets are possibly related to incorrect lever arm settings in POS MV (see section C.3) and/or a faulty secondary secondary GNSS antenna (see section B.2.5). Both of these issues were corrected for as much as possible in post-processing.

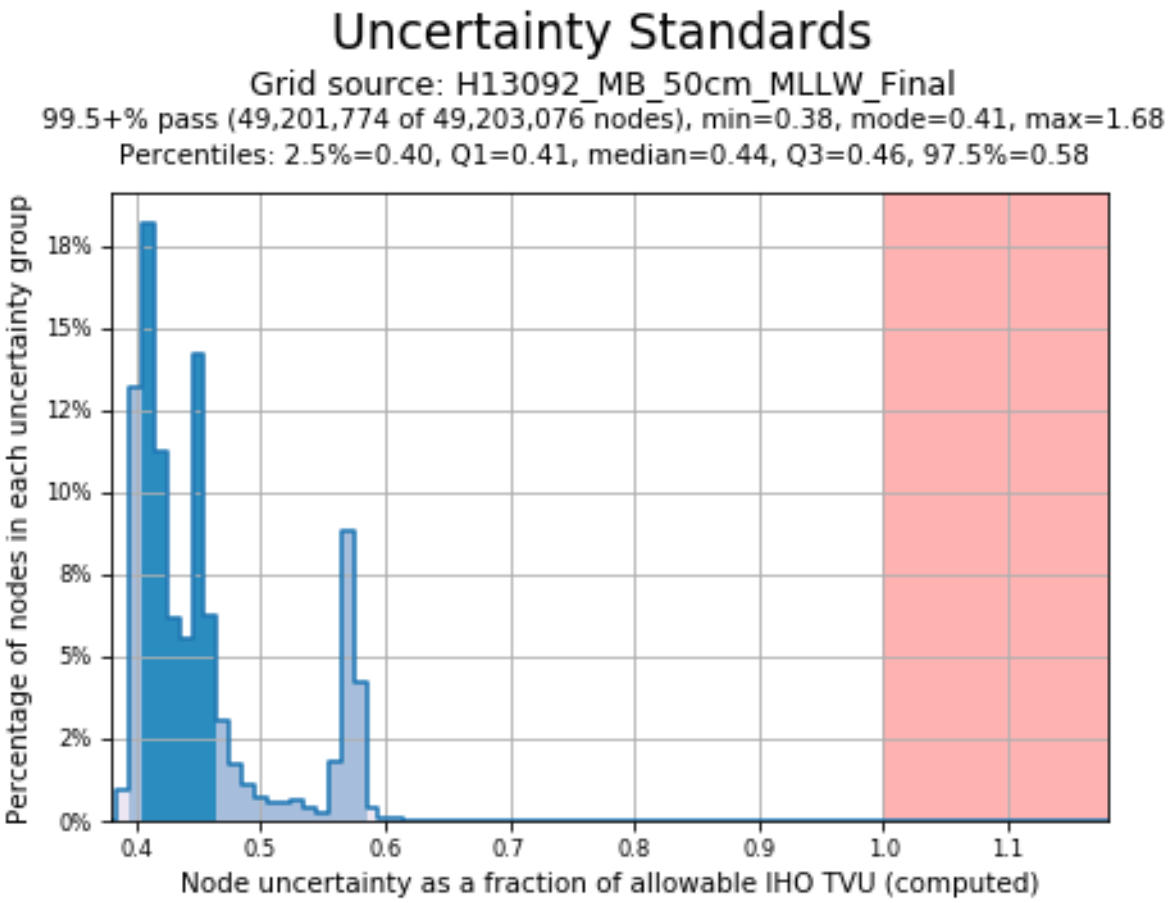


Figure 13: H13092 meets IHO uncertainty requirements

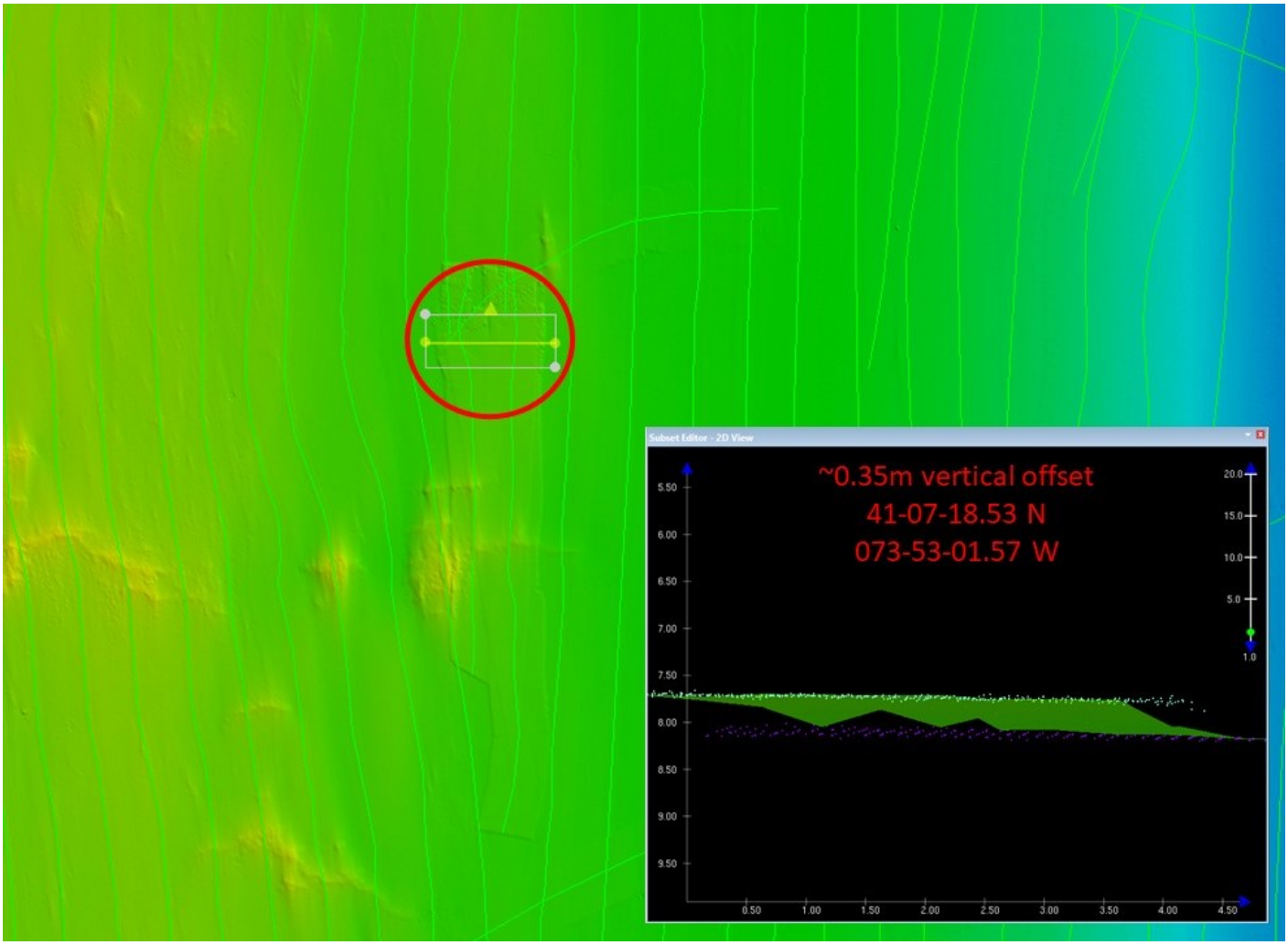


Figure 14: Vertical offset in sounding data resulting in IHO non-compliance

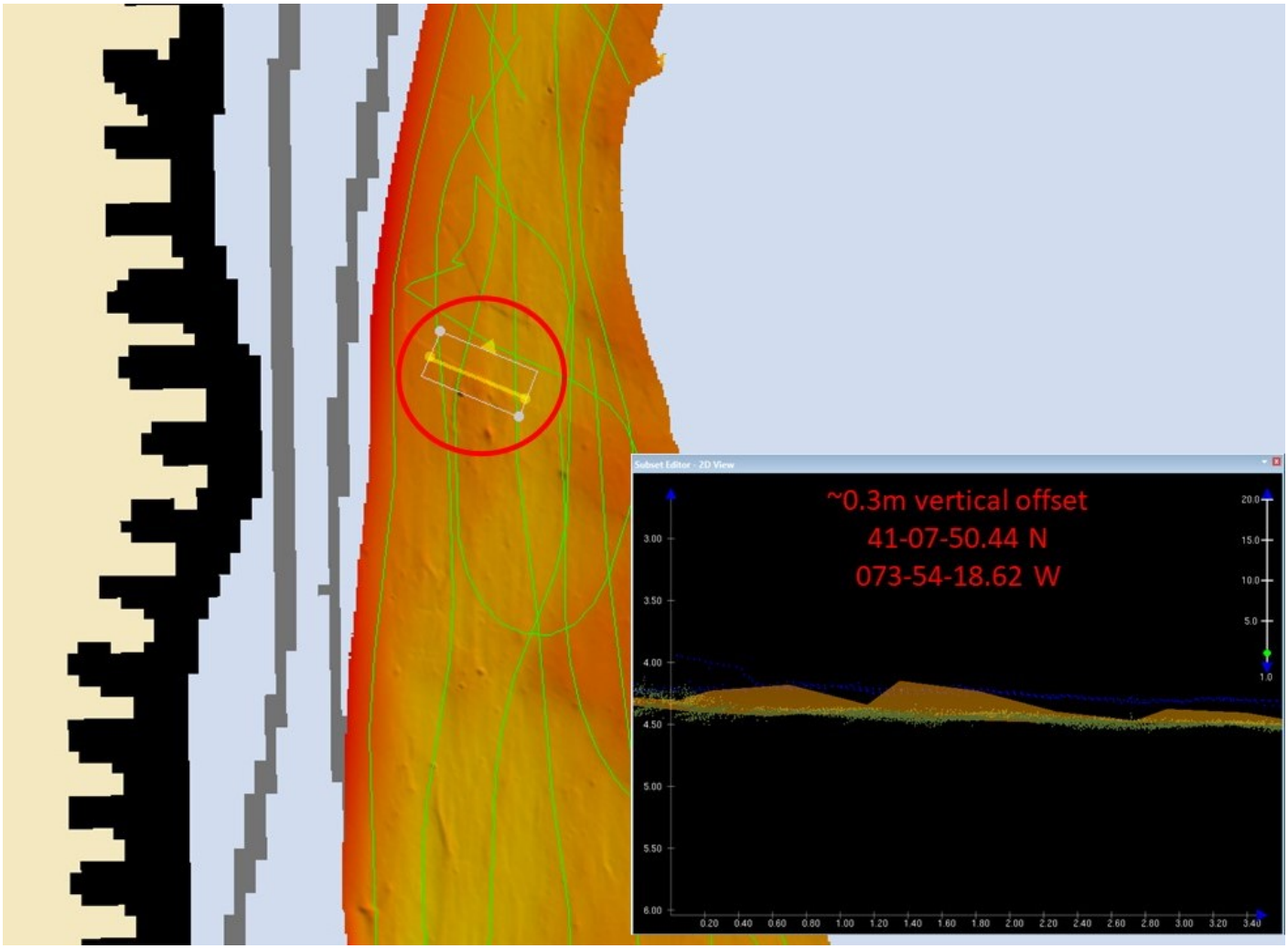


Figure 15: Vertical offset in sounding data resulting in IHO non-compliance

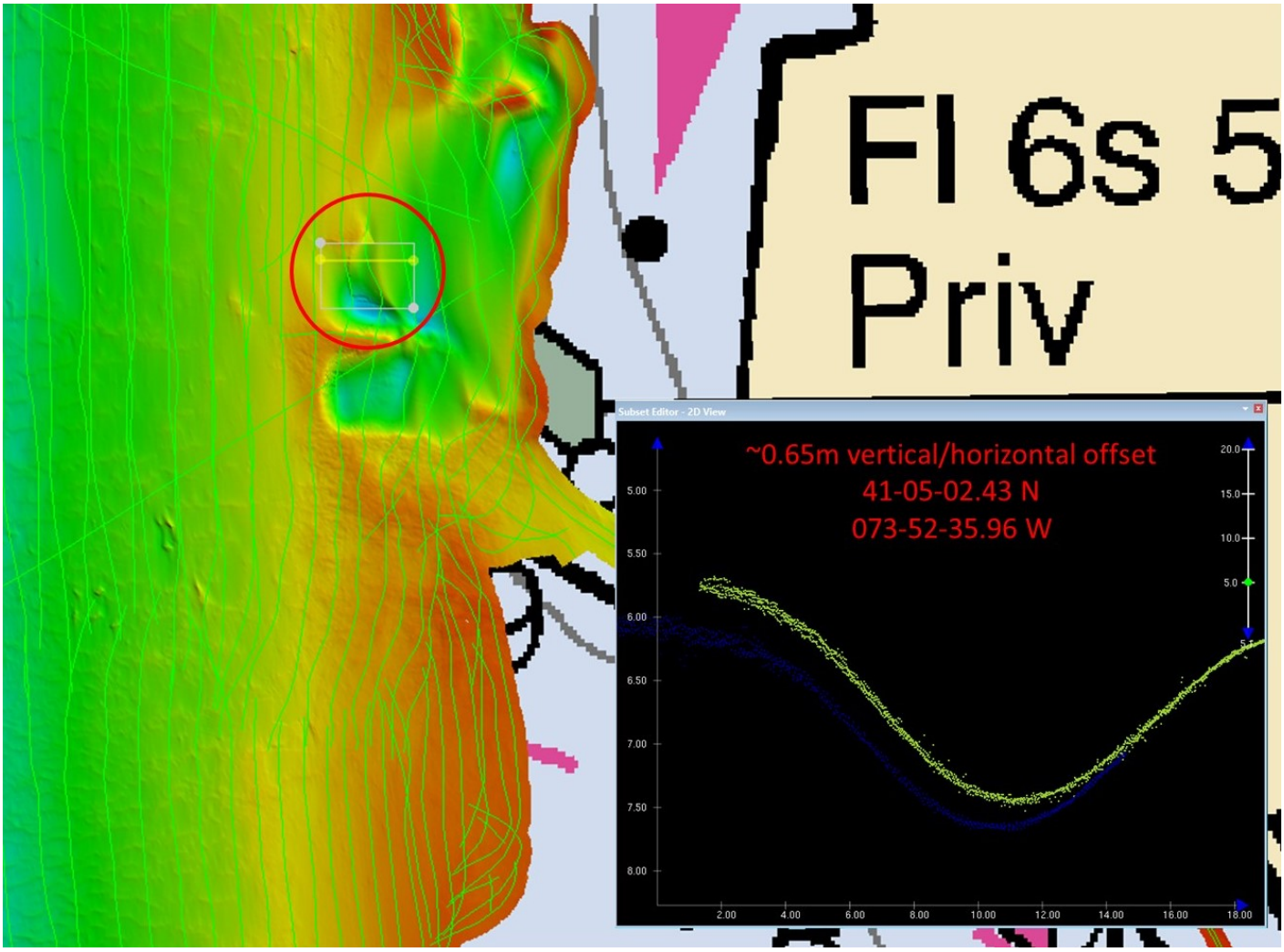


Figure 16: Vertical/horizontal offset in sounding data resulting in IHO non-compliance

B.2.3 Junctions

One junction comparison was completed for H13092 with survey H13023, which was acquired concurrently by NRT5 and Bay Hydro II.

The following junctions were made with this survey:

Registry Number	Scale	Year	Field Unit	Relative Location
H13023	1:5000	2017	Navigation Response Team 5	N

Table 9: Junctioning Surveys

H13023

Overlap with survey H13023 ranges from approximately 50 to 200 meters wide along the northern boundary of H13092 (Figure 17). Depths in the junction area range from approximately 11 to 43 feet. Junction coverage was assessed using the Pydro Compare Grids tool for uncertainty and general depth agreement statistics (Figures 18, 19).

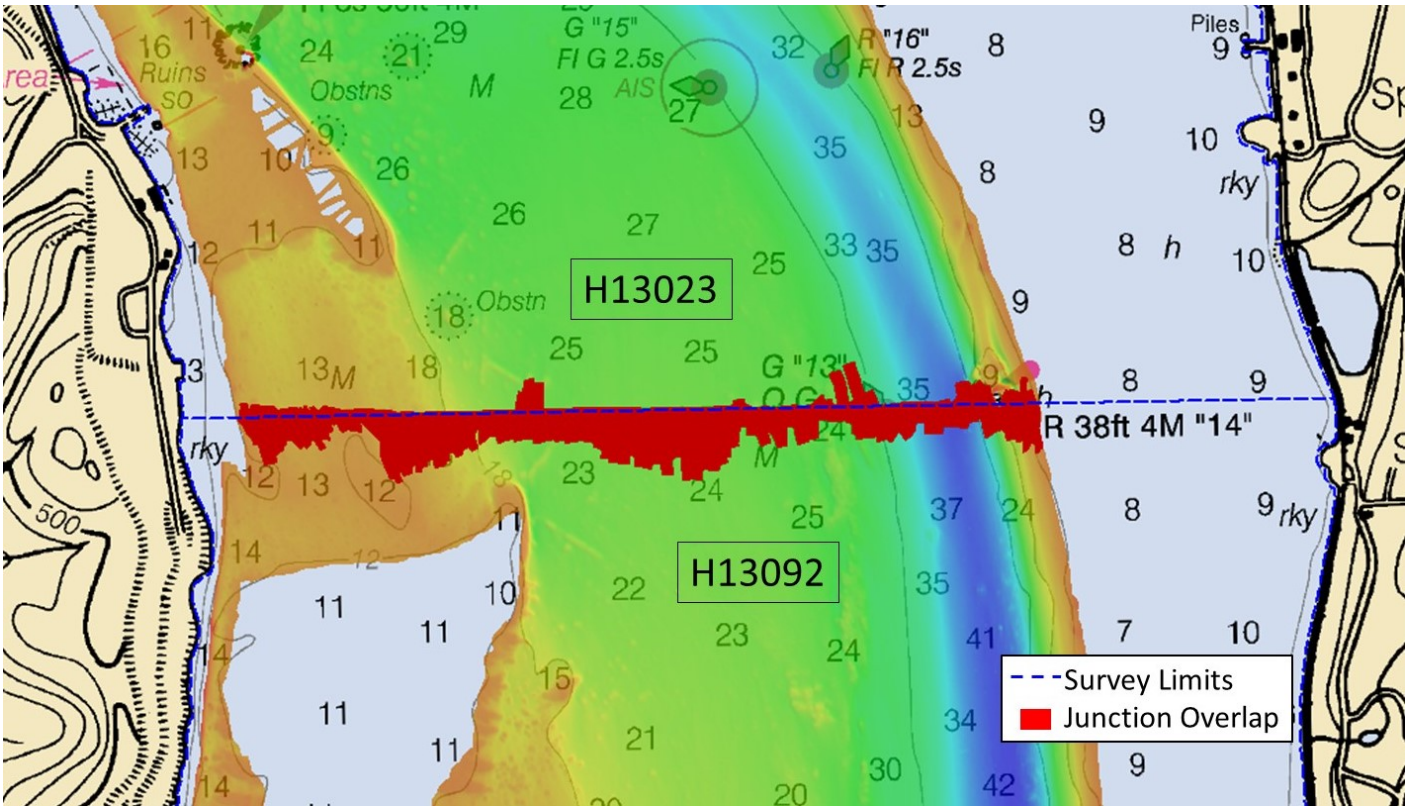


Figure 17: Overlap with survey H13023

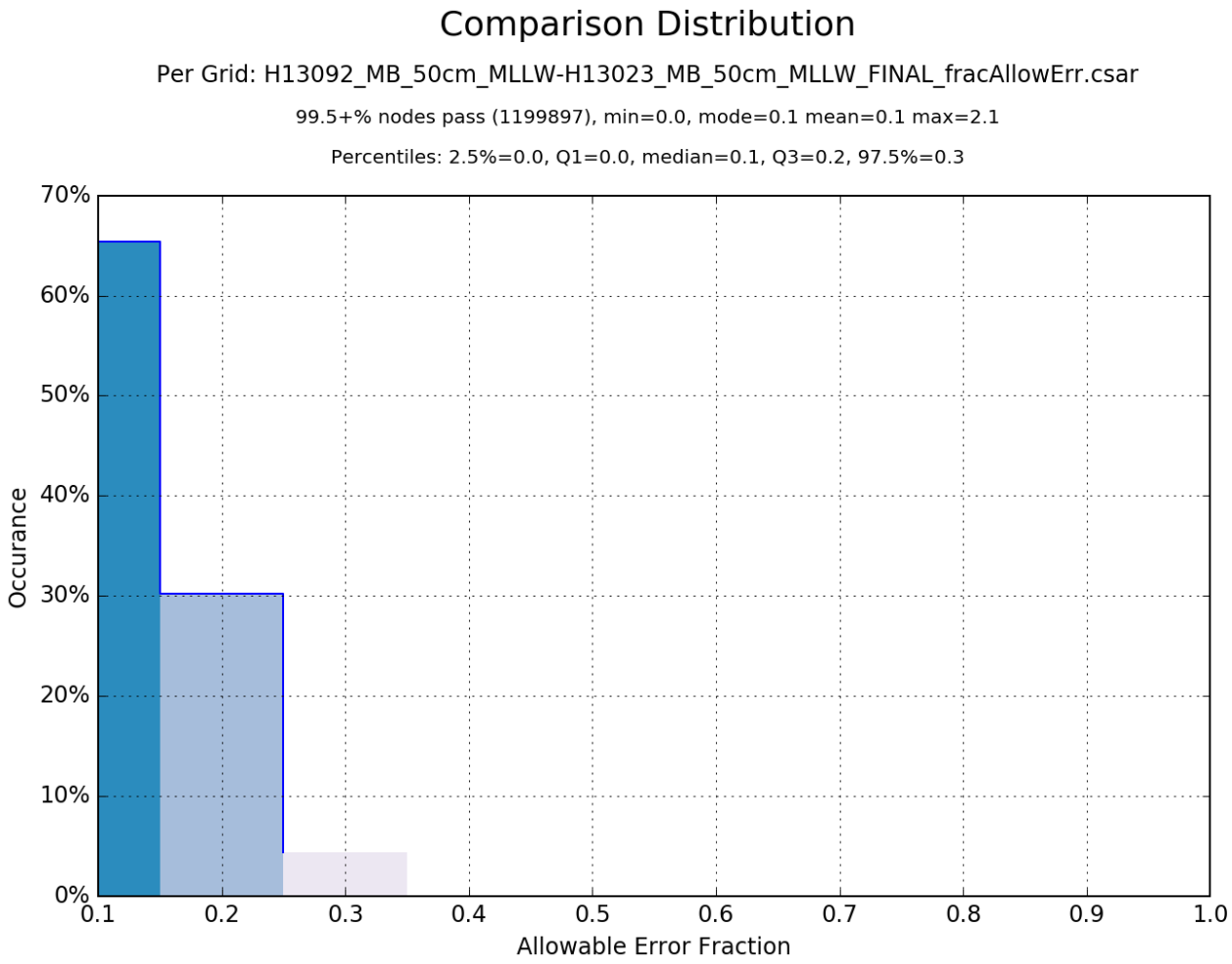
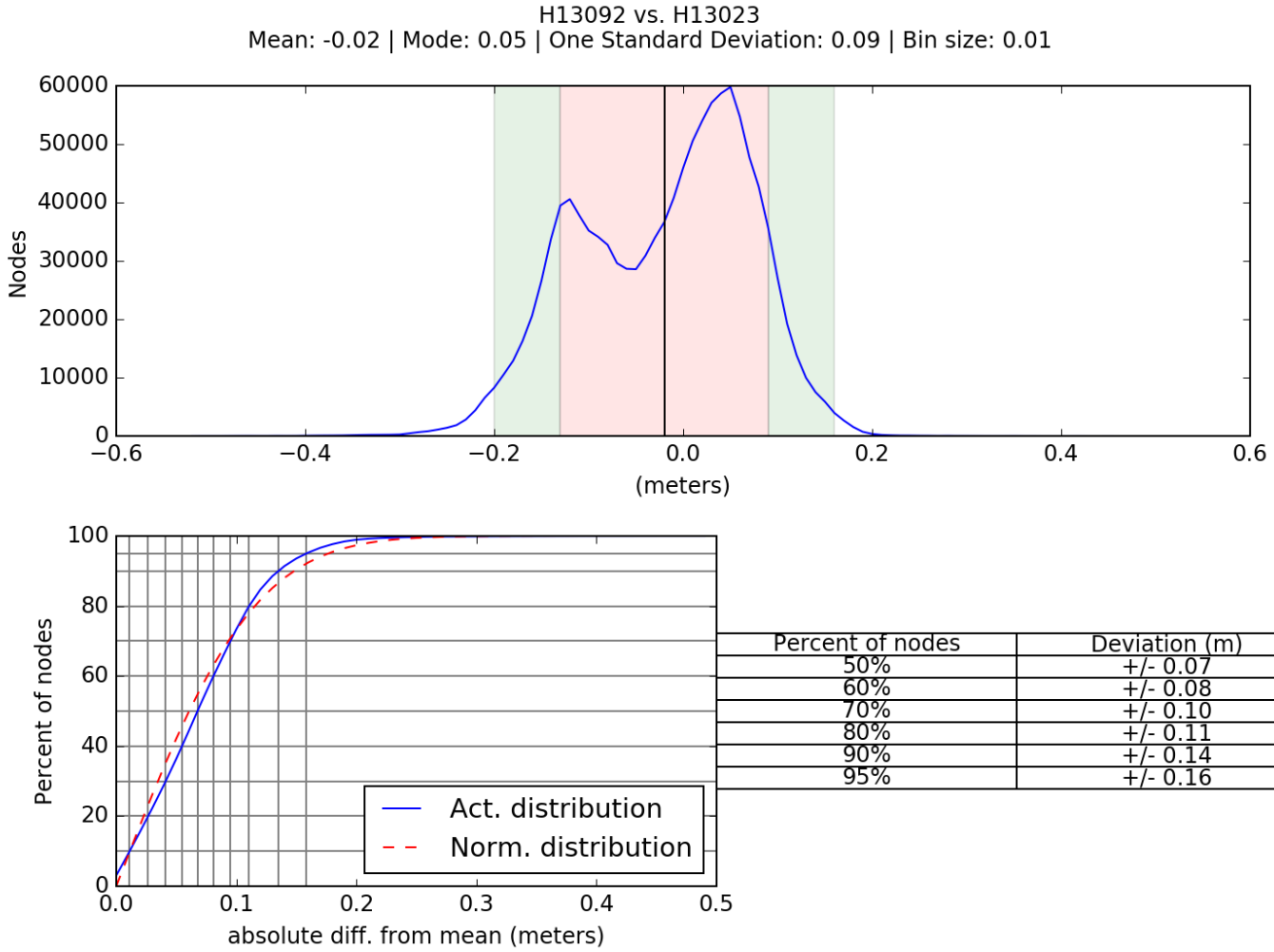


Figure 18: Comparison distribution of the magnitude of the fractional allowable errors. 99.5+% of nodes passed this assessment.



Percent of nodes	Deviation (m)
50%	+/- 0.07
60%	+/- 0.08
70%	+/- 0.10
80%	+/- 0.11
90%	+/- 0.14
95%	+/- 0.16

Figure 19: Statistics and distribution summary of grid nodes from the junction difference surface

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

Secondary GNSS antenna failure

Data collected from October 16 (DN289) through October 26 (DN299) were collected utilizing a faulty secondary GNSS antenna. On October 30, both primary and secondary GNSS antennas were replaced with Trimble GA530's, for there was not a spare available to replace the faulty Trimble Zephyr 2. Acquisition

resumed on October 31 (DN304). The slight changes in the antenna phase center and lever arm offsets were accounted for in POS MV and a GAMS calibration was performed with the new configuration.

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: At least once every 4 hours

SVP casts were taken at least once every four hours in the deepest water nearest to the survey area being worked on. The SVP casts were applied to the MBES lines in CARIS using the "nearest in distance within time of 4 hours" method.

B.2.8 Coverage Equipment and Methods

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

B.3 Echo Sounding Corrections

B.3.1 Corrections to Echo Soundings

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

B.3.2 Calibrations

All sounding systems were calibrated as detailed in the DAPR.

B.4 Backscatter

Raw Backscatter was logged in .all files and will be sent to the Processing Branch. Backscatter was not processed by the field unit.

B.5 Data Processing

B.5.1 Primary Data Processing Software

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

Manufacturer	Name	Version
CARIS	HIPS/SIPS	10.4

Table 10: Primary bathymetric data processing software

The following Feature Object Catalog was used: NOAA Profile V_5_7.

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
H13092_MB_50cm_MLLW	CARIS Raster Surface (CUBE)	0.5 meters	2.06 meters - 49.84 feet	NOAA_0.5m	Object Detection
H13092_MB_50cm_MLLW_Final	CARIS Raster Surface (CUBE)	0.5 meters	2.06 feet - 49.84 feet	NOAA_0.5m	Object Detection

Table 11: Submitted Surfaces

The survey was carried out to meet the Object Detection MBES Coverage requirements as defined by section 5.2.2.2 of the Hydrographic Surveys Specifications and Deliverables.

C. Vertical and Horizontal Control

Field installed tide or GPS stations were not utilized for this survey, so no HVCR report is included.

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:

OPR-B396-NRB-17_xyNAD83-MLLW_geoid12b.csar

A separation model was provided by NOAA's Navigation Response Branch.

C.2 Horizontal Control

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

The projection used for this project is UTM Zone 18N.

The following PPK methods were used for horizontal control:

Smart Base
Single Base

Vessel kinematic data (POS files) were post-processed with Applanix POSPac software using Smart Base and Single Base processing methods. SBET and RMS data was applied to all survey lines. All SBETs were exported in NAD83 and applied to lines.

The following CORS Stations were used for horizontal control:

HVCR Site ID	Base Station ID
NYVH	NYVH
LAMT	LAMT
RVDI	RVDI
NYNB	NYNB
NYLC	NYLC
NYMD	NYMD
NYQN	NYQN
CTDA	CTDA
NYBP	NYBP

Table 12: CORS Base Stations

While the NYSNet spatial reference network was utilized with vessels S5401 and S3002, S3007 was unable to reliably connect to this network to accept real time corrections and so it used the Wide Area Augmentation System (WAAS) for real time corrections instead. In addition, no records had been made by previous survey parties that detailed the effectiveness of the NYSNet corrections in use for vessels S5401 and S3002. Therefore, for sake of consistency, it was decided to create SBET files for all days of acquistion.

WAAS was used for real time corrections due to difficulties with connecting to the RTK network.

The following WAAS Stations were used for horizontal control:

DGPS Stations

Table 13: FAA WAAS Stations

C.3 Additional Horizontal or Vertical Control Issues

C.3.1 Incorrect Lever Arm Offsets

During data processing procedures it was observed that there were vertical offsets between the data acquired from S3002, S5401, and S3007. These offsets were widespread throughout the project area and were typically on the scale of about 50 cm. Through troubleshooting it was found that the lever arm values entered in the POSMV were incorrect. This impacted all data acquired by S3007. As a result, the Reference to IMU Lever Arm and the Reference to Primary GNSS Lever Arm were corrected for in POSPac MMS processing. The lever arm values were corrected on January 12. See Appendix II for documentation concerning this issue.

C.3.2 Altitude spikes

Altitude spikes occurred throughout survey H13092 and were cleaned out through interpolation in post processing in Pydro's POSPac Automated QC tool (Figure 20). Subsequently, new SBETs were exported and applied to the bathymetry data in CARIS.

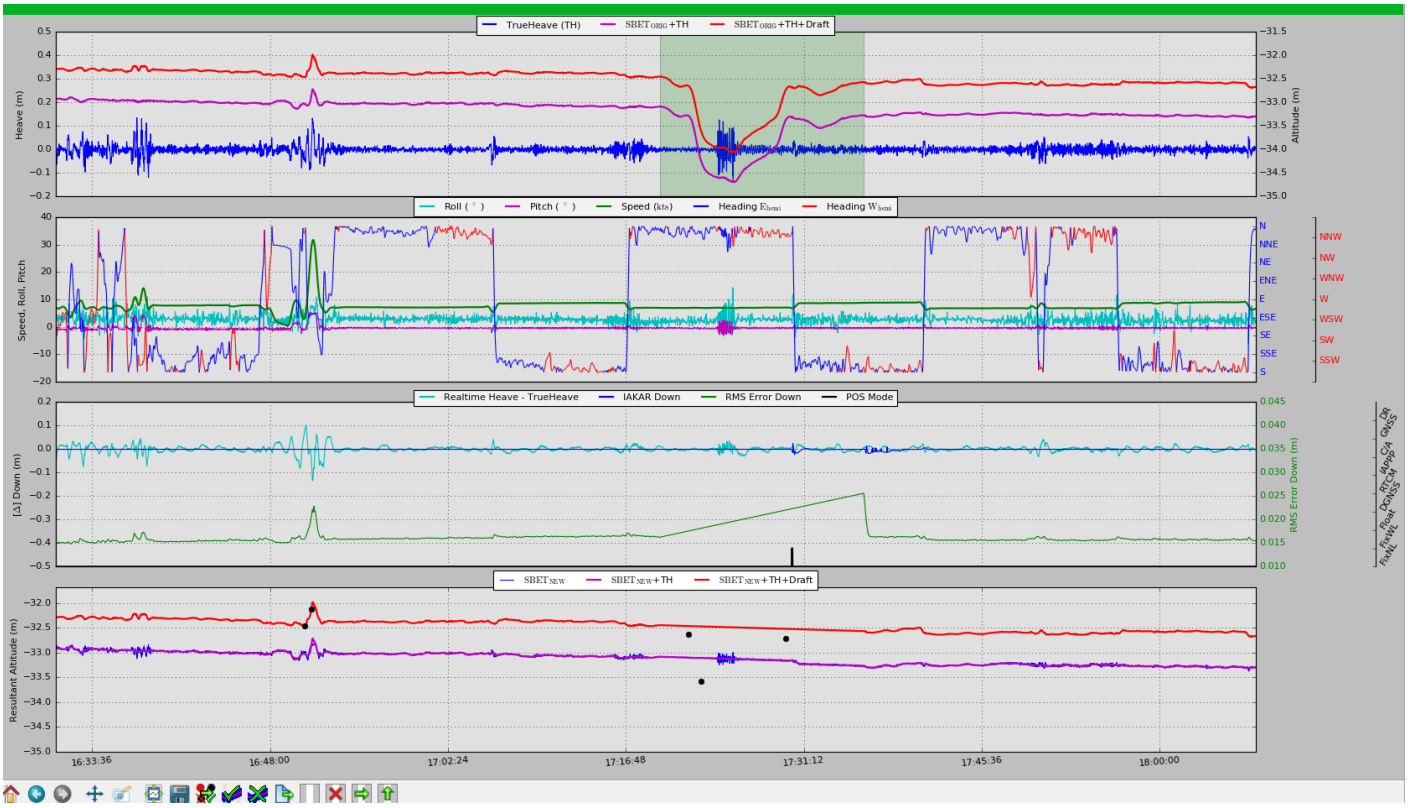


Figure 20: Exampe of an interpolated altitude spike in POSPac Auto QC

D. Results and Recommendations

D.1 Chart Comparison

Chart comparisons were made using a CARIS sounding and contour layer derived from a 50 cm CUBE surface. The contours and soundings were overlaid on the latest ENC and compared for general agreement and to identify areas of significant change.

D.1.1 Electronic Navigational Charts

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

ENC	Scale	Edition	Update Application Date	Issue Date	Preliminary?
US5NY40M	1:40000	16	12/26/2017	12/26/2017	NO

Table 14: Largest Scale ENCs

US5NY40M

Overall, the charted soundings agree well with the surveyed soundings, with most surveyed soundings within 1 to 2 feet. Depth contours derived from the survey coverage highlighted two trends. There is an overall deepening trend seen as the surveyed contours largely fall inshore of what is charted (Figure 21). There are also some shoals that have migrated to deeper water (Figures 22, 23).

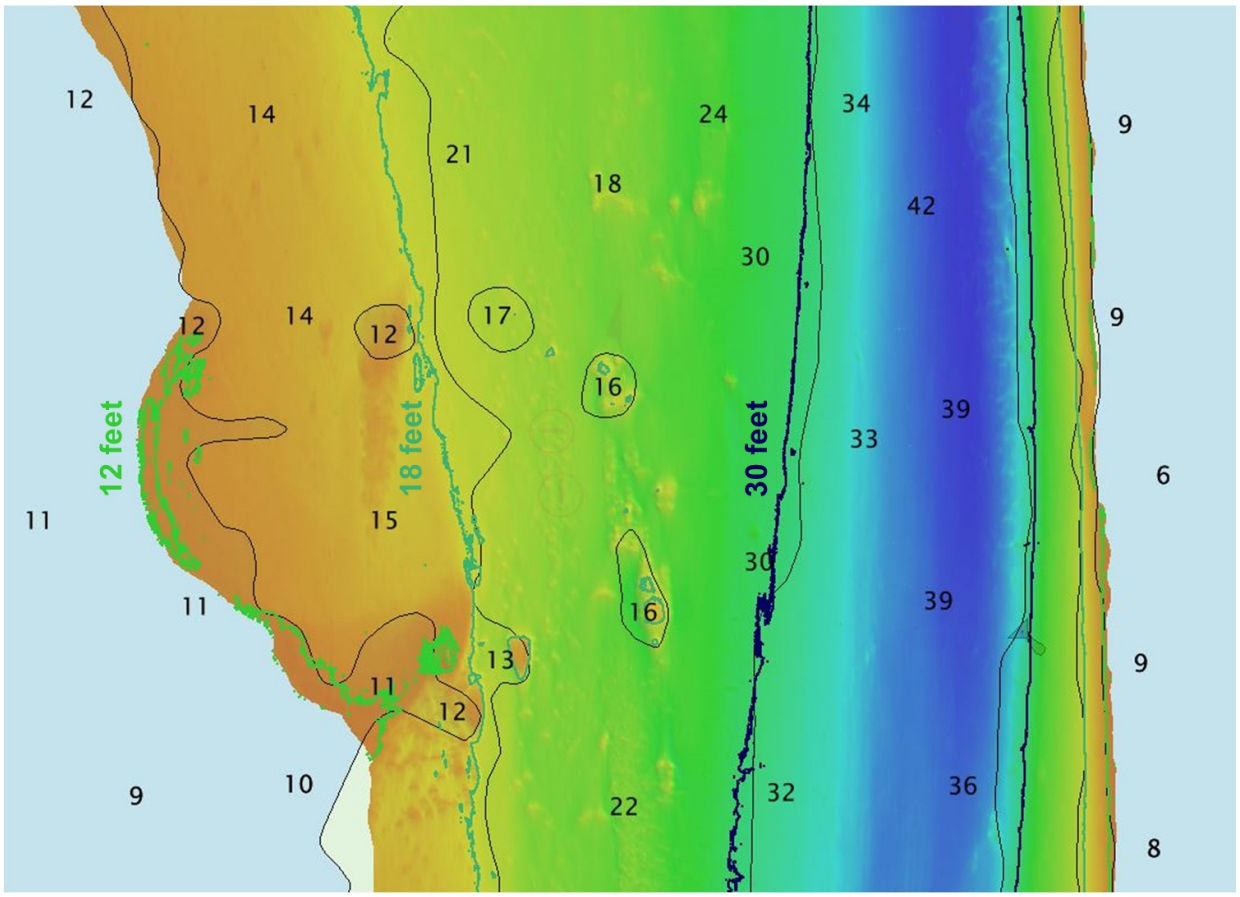


Figure 21: Deepening trend seen across the channel

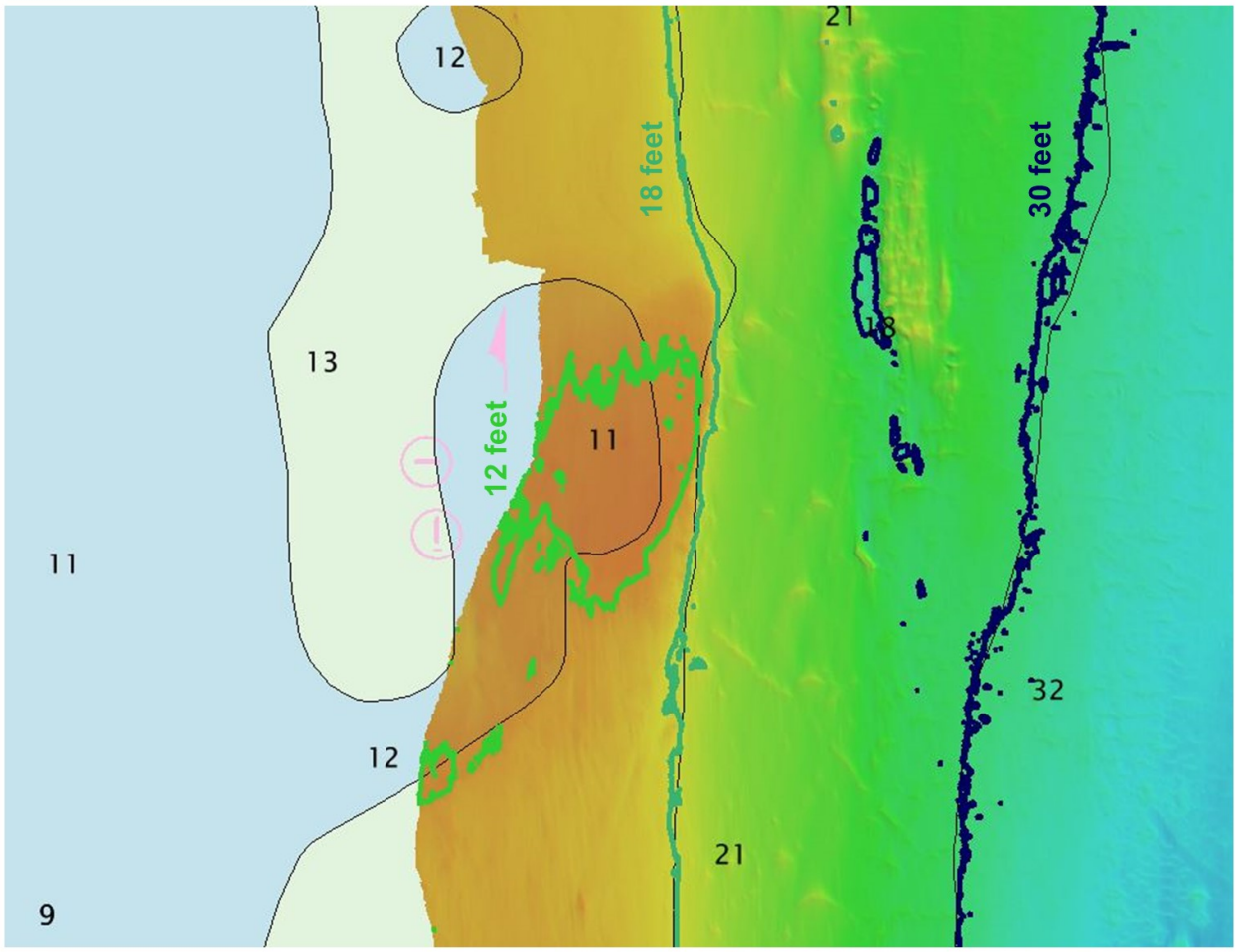


Figure 22: Shoal migrating eastward

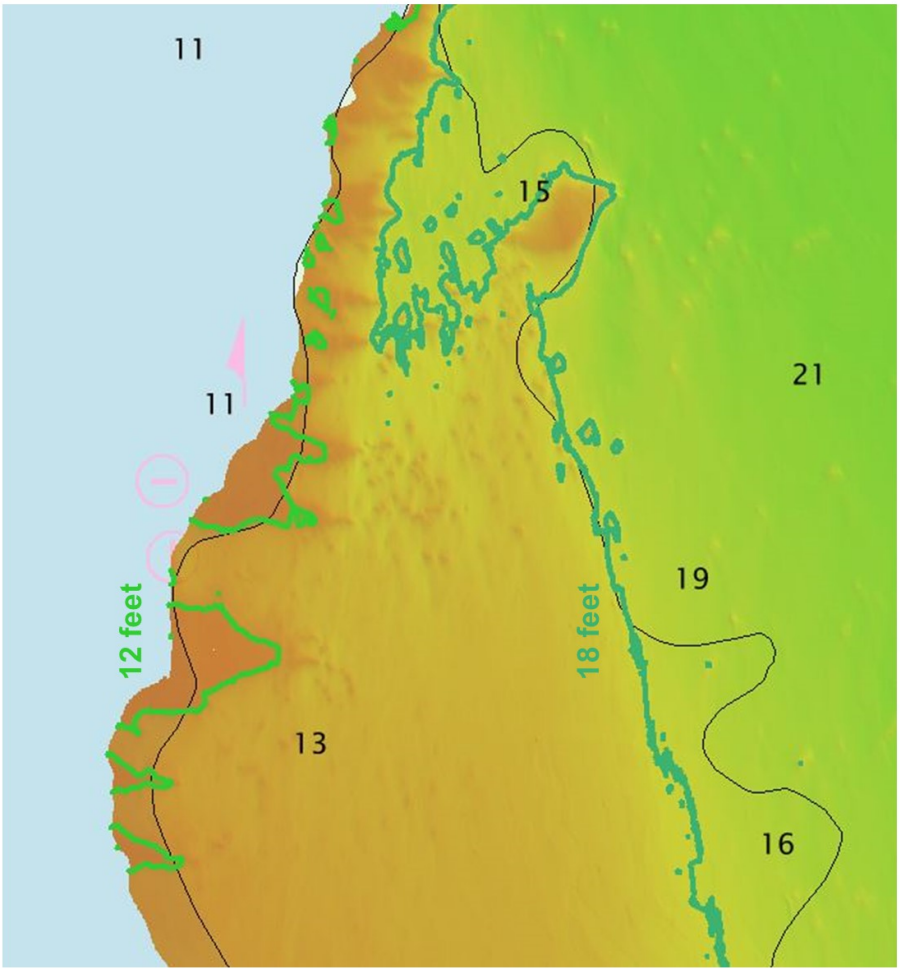


Figure 23: More shoals migrating eastward

D.1.2 Maritime Boundary Points

No Maritime Boundary Points were assigned for this survey.

D.1.3 Charted Features

No charted features exist for this survey.

D.1.4 Uncharted Features

Several new features were found and are detailed in the Final Feature File.

D.1.5 Shoal and Hazardous Features

One DTON report was submitted concerning an off station buoy in the Tarrytown South Channel (Figure 24). See appendices for DTON Report submission and related correspondence.

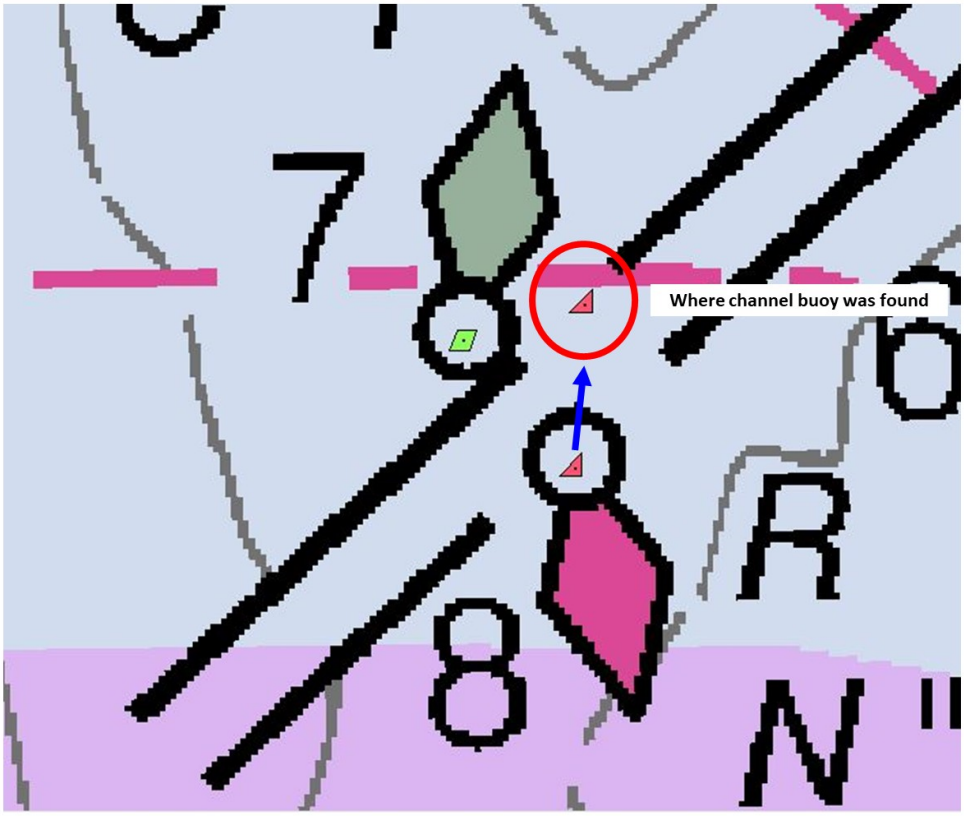


Figure 24: Location of off station channel buoy

D.1.6 Channels

While investigating shoreline features along the Tarrytown Harbor Channel, some sounding data was acquired, mostly within the middle half of the channel. From the survey coverage acquired, the surveyed depths were found to agree the controlling depths specified in the chart tabulation.

D.1.7 Bottom Samples

Ten bottom samples were acquired within the vicinity of proposed sites and where time and opportunity allowed. Acquired bottom samples are addressed with S-57 attribution and recorded in the Final Feature File submitted with this report.

D.2 Additional Results

D.2.1 Shoreline

Due to time constraints on this project, shoreline investigation was conducted partially over the project area. Features that were decided to be the most navigationally significant have been documented in the Final Feature File. Out of the 208 assigned features, 42 features were retained, 29 features were added as new, 4 features were updated, and 5 features were deleted and replaced. All features are addressed as required with the S-57 attribution and recorded in the H13092 Final Feature File.

D.2.2 Prior Surveys

No prior survey comparisons exist for this survey.

D.2.3 Aids to Navigation

All aids to navigation in the survey area that were addressed were confirmed to be on station and serving their intended purpose, with three exceptions. As previously discussed, one channel buoy was found off station in the Tarrytown South Channel (See Shoals and Hazardous Features). Hudson River Light 14 was found to be mischarted and has been repositioned to align with the multibeam data (Figure 25). Lastly, two temporary buoys were identified marking the main route of transit under the Tappan Zee bridge while construction is ongoing for the new bridge (Figures 26, 27).

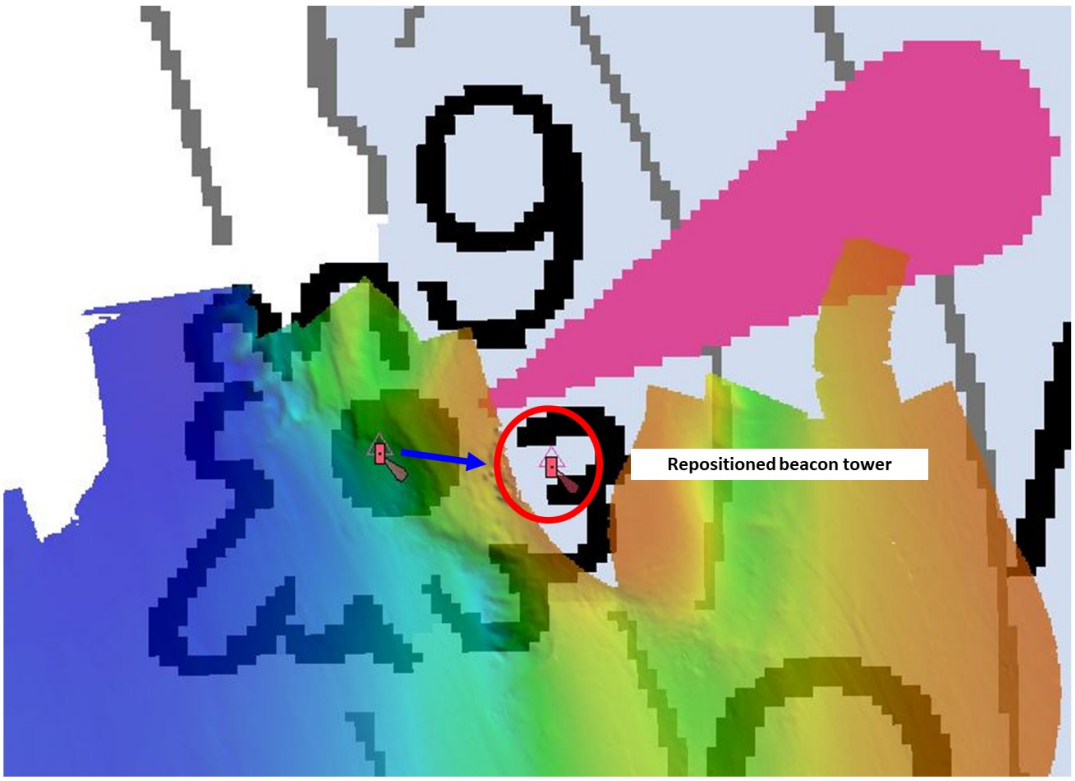


Figure 25: Mischarted beacon tower has been repositioned in the Final Feature File

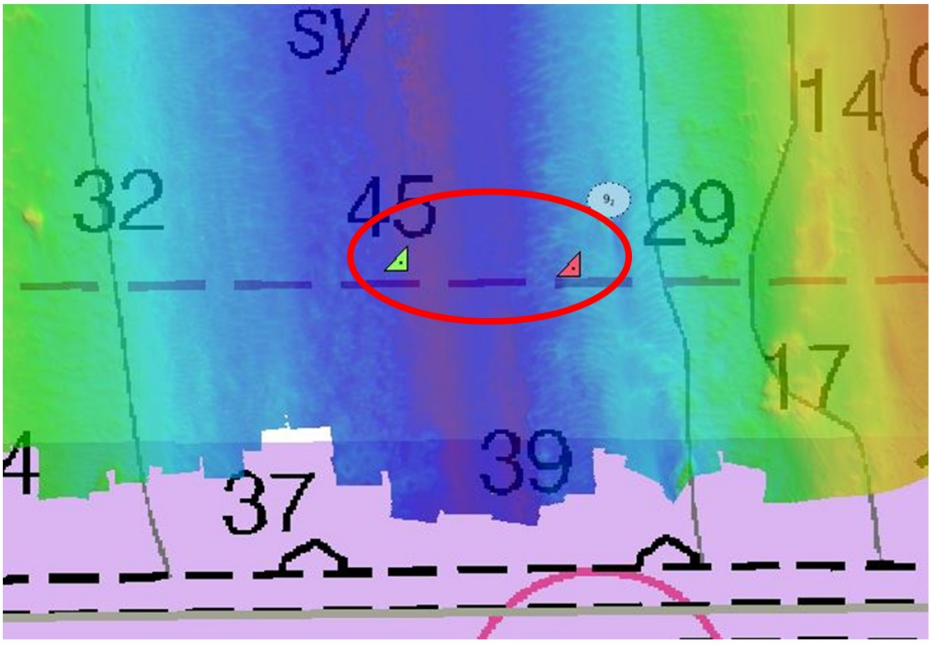


Figure 26: Buoys found marking transit route under Tappan Zee bridge

Figure 27: Temporary buoys in marking main route during bridge construction

D.2.4 Overhead Features

No overhead features exist for this survey.

D.2.5 Submarine Features

No submarine features exist for this survey.

D.2.6 Platforms

No platforms exist for this survey.

D.2.7 Ferry Routes and Terminals

No ferry routes or terminals exist for this survey.

D.2.8 Abnormal Seafloor and/or Environmental Conditions

No abnormal seafloor and/or environmental conditions 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 my direct supervision, with frequent personal checks of progress and adequacy. I have reviewed the attached survey data and reports.

All field sheets, this Descriptive Report, and all accompanying records and data are approved. All records are forwarded for final review and processing to the Processing Branch.

The survey data meets or exceeds requirements as set forth in the NOS Hydrographic Surveys and Specifications Deliverables, Field Procedures Manual, Letter Instructions, and all HSD Technical Directives. These data are adequate to supersede charted data in their common areas. This survey is complete and no additional work is required with the exception of deficiencies noted in the Descriptive Report.

Approver Name	Approver Title	Approval Date	Signature
LTJG Dylan Kosten	Chief of Party	03/07/2018	KOSTEN.DYLAN.ANDREW.1504527405 Digitally signed by KOSTEN.DYLAN.ANDREW.1504527405 Date: 2018.03.08 07:42:31 -05'00'
Eli Smith	Sheet Manager	03/07/2018	SMITH.ELI.RYAN.1500603654 Digitally signed by SMITH.ELI.RYAN.1500603654 Date: 2018.03.08 08:35:25 -05'00'

F. Table of Acronyms

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

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

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

Eli Smith - NOAA Federal <eli.r.smith@noaa.gov>

H13092 DTON Report

3 messages

Eli Smith - NOAA Federal <eli.r.smith@noaa.gov> Mon, Dec 18, 2017 at 3:16 PM
To: OCS NDB - NOAA Service Account <ocs.ndb@noaa.gov>
Cc: Dylan Kosten - NOAA Federal <dylan.kosten@noaa.gov>, David Vejar - NOAA Federal <david.vejar@noaa.gov>, Chief NRB OCS - NOAA Service Account <chief.nrb.ocs@noaa.gov>, Christopher Hare - NOAA Federal <christopher.hare@noaa.gov>

Hello,

Please see attached for a DTON report concerning an off station channel buoy in the Hudson River.

Regards,

-Eli

H13092 Danger to Navigation Report #1.zip

--
Eli Smith
Physical Scientist Technician
Navigation Response Team 5
1 Chelsea Street
New London, CT
Cell: (509) 592-7754

Eli Smith - NOAA Federal <eli.r.smith@noaa.gov> Mon, Dec 18, 2017 at 3:19 PM
To: PHB Chief - NOAA Service Account <phb.chief@noaa.gov>

Sorry, forgot to add you on this as well.
[Quoted text hidden]

OCS NDB - NOAA Service Account <ocs.ndb@noaa.gov> Tue, Dec 19, 2017 at 5:41 PM
To: Eli Smith <eli.r.smith@noaa.gov>
Cc: Dylan Kosten - NOAA Federal <dylan.kosten@noaa.gov>, David Vejar - NOAA Federal <david.vejar@noaa.gov>, Chief NRB OCS - NOAA Service Account <chief.nrb.ocs@noaa.gov>, Christopher Hare <Christopher.Hare@noaa.gov>, _NOS OCS PBA Branch <ocs.pba@noaa.gov>, _NOS OCS PBB Branch <ocs.pbb@noaa.gov>, _NOS OCS PBC Branch <ocs.pbc@noaa.gov>, _NOS OCS PBD Branch <ocs.pbd@noaa.gov>, _NOS OCS PBE Branch <ocs.pbe@noaa.gov>, _NOS OCS PBG Branch <ocs.pbg@noaa.gov>, Castle E Parker <Castle.E.Parker@noaa.gov>, Charles Porter - NOAA Federal <charles.porter@noaa.gov>, James M Crocker <James.M.Crocker@noaa.gov>, Ken Forster <Ken.Forster@noaa.gov>, Kevin Jett - NOAA Federal <kevin.jett@noaa.gov>, Matt Kroll <Matt.Kroll@noaa.gov>, Michael Gaeta <Michael.Gaeta@noaa.gov>, Nautical Data Branch <OCS.NDB@noaa.gov>, NSD Coast Pilot <coast.pilot@noaa.gov>, PHB Chief <PHB.Chief@noaa.gov>, Tara Wallace <Tara.Wallace@noaa.gov>

DD-29104 has been registered by the Nautical Data Branch and directed to Products Branch C for processing.

The DtoN reported is an off station AtoN in the Hudson River, NY.

The following chart is affected:
12343 kapp 2230

The following ENC is affected:
US5NY40M

References:

H13092
OPR-B396-NRT5BH2-17

This information was discovered and submitted by the crew of NRT 5.

Nautical Data Branch/Marine Chart Division/
Office of Coast Survey/National Ocean Service/
Contact: ocs.ndb@noaa.gov

NOAA NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
UNITED STATES DEPARTMENT OF COMMERCE

---------- Forwarded message ----------
From: **Eli Smith - NOAA Federal** <eli.r.smith@noaa.gov>
Date: Mon, Dec 18, 2017 at 3:16 PM
Subject: H13092 DTON Report
To: OCS NDB - NOAA Service Account <ocs.ndb@noaa.gov>
Cc: Dylan Kosten - NOAA Federal <dylan.kosten@noaa.gov>, David Vejar - NOAA Federal <david.vejar@noaa.gov>, Chief NRB OCS - NOAA Service Account <chief.nrb.ocs@noaa.gov>, Christopher Hare - NOAA Federal <christopher.hare@noaa.gov>

[Quoted text hidden]

Eli Smith - NOAA Federal <eli.r.smith@noaa.gov>

H13092 Survey Outline

2 messages

Eli Smith - NOAA Federal <eli.r.smith@noaa.gov> Tue, Nov 21, 2017 at 10:00 AM
To: _NOS OCS Survey Outlines <survey.outlines@noaa.gov>
Cc: Christopher Hare - NOAA Federal <christopher.hare@noaa.gov>

Hello,

Please see attached for the survey outline for H13092.

-Eli

--
Eli Smith
Physical Scientist Technician
Navigation Response Team 5
1 Chelsea Street
New London, CT
Cell: (509) 592-7754

H13092_Survey_Outline.000
15K

Brian Mohr - NOAA Federal <brian.mohr@noaa.gov> Tue, Nov 21, 2017 at 10:04 AM
To: Eli Smith - NOAA Federal <eli.r.smith@noaa.gov>

Got them, Thanks.

Brian Mohr
Physical Scientist - Data Manager
Hydrographic Surveys Division
brian.mohr@noaa.gov
301 713 2700
[Quoted text hidden]

Eli Smith - NOAA Federal <eli.r.smith@noaa.gov>

Vertical Offsets Between Vessels

Jack Riley - NOAA Federal <jack.riley@noaa.gov> Fri, Jan 12, 2018 at 6:03 PM
To: Eli Smith - NOAA Federal <eli.r.smith@noaa.gov>
Cc: Samuel Greenaway - NOAA Federal <samuel.greenaway@noaa.gov>, Dylan Kosten - NOAA Federal <dylan.kosten@noaa.gov>, Michael Annis <michael.j.annis@noaa.gov>, Eric Younkin - NOAA Federal <eric.g.younkin@noaa.gov>

I think we have the definitive numbers now -- and there's an additional wrinkle as to values to use in the post-processing fix vs. going forward with new acquisition:

I. NEW ERS post-processing fix for data acquired under the bad settings:

1.) Requires changing the lever arm values in POSPac MMS processing:
Ref to IMU Lever Arm X,Y,Z = +0.010,+0.000,-0.277 m (as shown in POSPac MMS data, "IMU" is sensing center rather than target on enclosure 'top hat')
Ref to Primary GNSS Lever Arm X,Y,Z = +4.225,-0.864,-3.158 m

You can accomplish this in MMS via Project Settings: GNSS-Inertial Processor, Lever Arms and Mounting -- which can be set in a Project Template, so you don't have to enter into the Project Settings dialog each time

2.) Process the new SBET and bring that into HIPS for normal (re)processing for GPS Tide & subsequent Merge:
- Import Auxiliary Data - Applanix SBET: Navigation & GPS Height; e.g., (note in particular GPSHeight records (re)applied, to get our new ERS height the feeds into our new GPS Tide calc on the next step):

```
0038_20171018_173031_S3007
     Total Navigation records applied: 30578
     Total GPSHeight records applied: 30578
```

- Process, Compute: GPS Tide
- Process, Merge (w/ GPS Tide)

II. Going forward with new acquisition:

1.) Fix the lever arms in the POS MV configuration per measured values -- different from above for Ref to IMU Lever Arm, because above actually includes offset to IMU sensing center ("black" POS MV housing: dX,dY,dZ = +0.005,-0.006,+0.089):
Ref to IMU Lever Arm X,Y,Z = +0.005,+0.006,-0.366 m (DIFFERENT from above)
Ref to Primary GNSS Lever Arm X,Y,Z = +4.225,-0.864,-3.158 m (same as above)

[Quoted text hidden]

Eli Smith - NOAA Federal <eli.r.smith@noaa.gov>

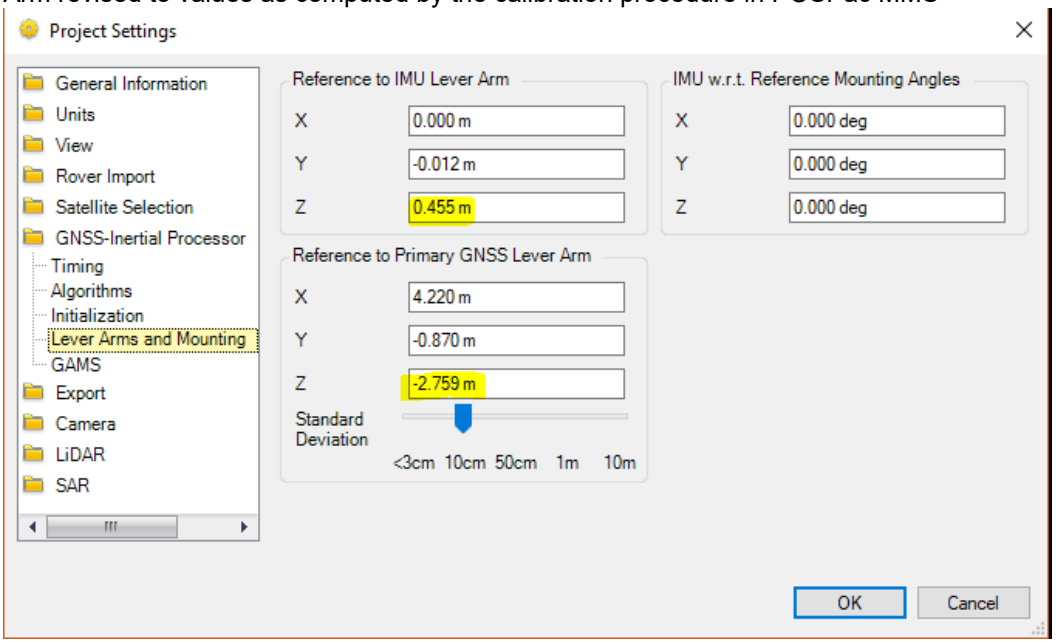
Vertical Offsets Between Vessels

Jack Riley - NOAA Federal <jack.riley@noaa.gov> Fri, Jan 12, 2018 at 11:35 AM
To: Eli Smith - NOAA Federal <eli.r.smith@noaa.gov>
Cc: Samuel Greenaway - NOAA Federal <samuel.greenaway@noaa.gov>, Dylan Kosten - NOAA Federal <dylan.kosten@noaa.gov>, Michael Annis <michael.j.annis@noaa.gov>

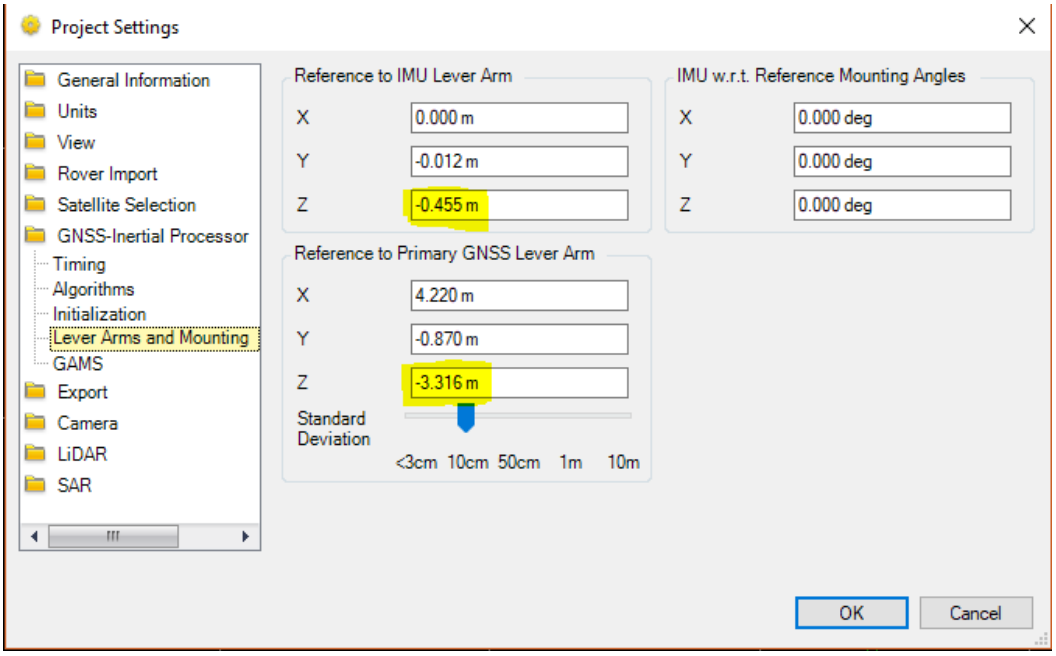
Hi Eli,

It turned out to be a problem with the lever arm offsets in the POS MV setup. Fortunately those can be adjusted in POSPac MMS processing -- see below for a screenshot of your current "bad" values vs. the revised values:

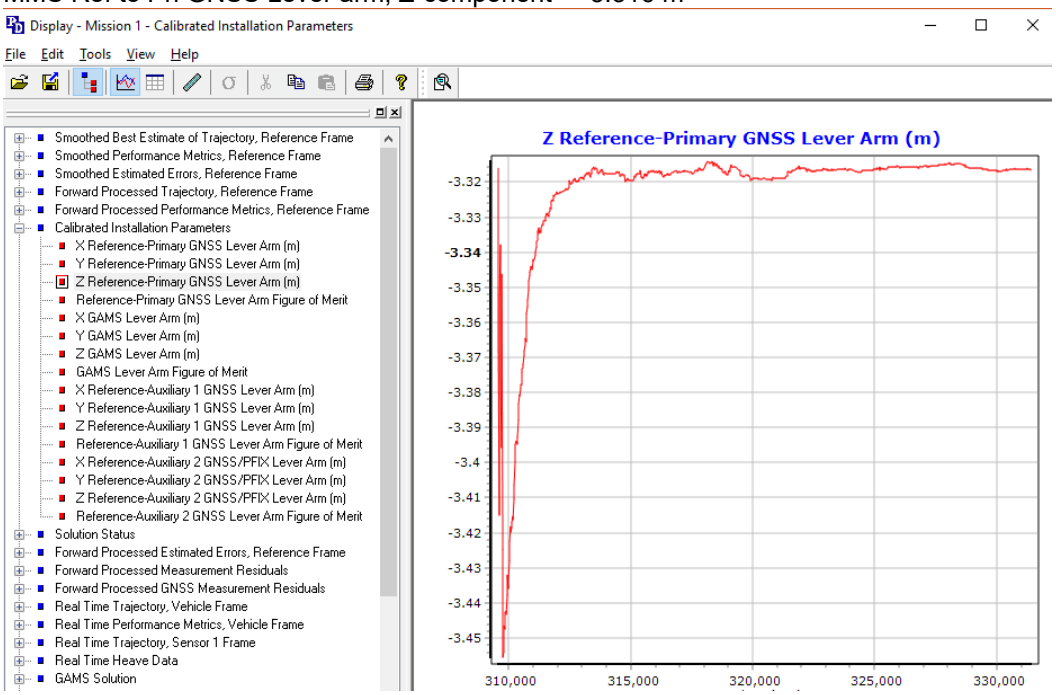
Existing "bad" values; Note: Ref. to IMU Z has wrong sign (should be - rather than positive), and Ref. to Pri. GNSS Lever Arm revised to values as computed by the calibration procedure in POSPac MMS



Revised (correct) values; Note: Ref to IMU Z correct sign (-) and Ref to Pri GNSS Lever arm revised per POSPac MMS calibration to -3.316:



MMS Ref to Pri GNSS Lever arm, Z-component = -3.316 m



Can also see the installed vs. calibrated lever arms in Pydro XL - POSPacAutoQC:

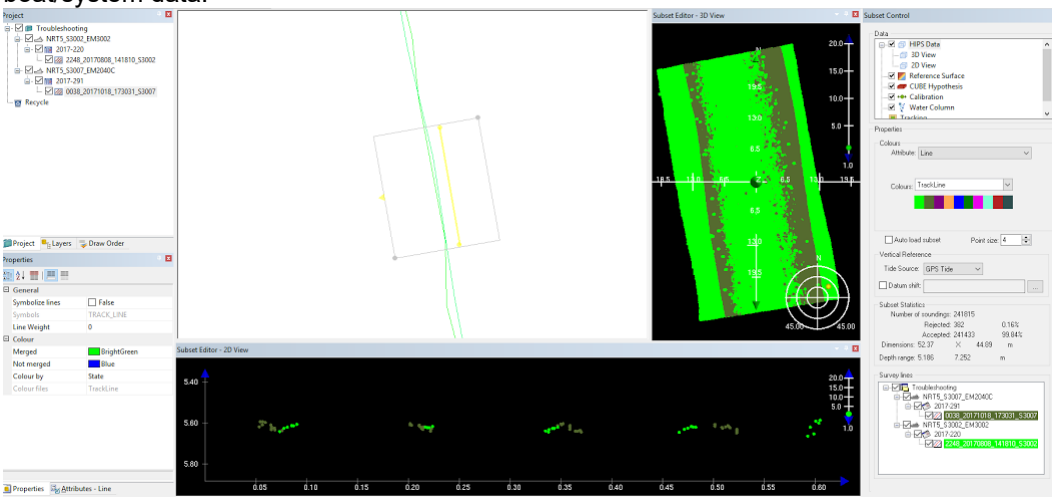
BEFORE lever arm fixes, POSPacAutoQC Logs/Summary tab:
-- Note the ~33 cm discrepancy in Ref. to Pri. GNSS lever arm Z-component between as-entered in POS MV (top red circle)
vs. Calibrated Z-component from POSPac MMS. Discrepancies larger than a few cm and you should question accuracy of POS MV config values

```
<IINPP Forward Navigator -- fwdproc_POSPAC_DN291.log>
Selected GNSS mode                    :  IN-Fusion PP-RTX
Vehicle to reference alignment angles :  0.000  0.000  0.000
Multipath setting                     :  LOW
Reference to IMU lever arm            :  0.000 -0.012  0.455
Reference to IMU alignment angles     :  0.000  0.000  0.000
Reference to primary GNSS lever arm   :  4.220 -0.870 -2.759
GAMS antenna separation               :  1.685
GAMS baseline vector                  :  0.009  1.685 -0.003
GAMS heading calibration threshold    :  0.500
GAMS heading correction               :  0.000
GAMS Baseline Standard Deviation      :  0.010

<Secondary GNSS Import -- >
N:\CSDL\HSTP\Test Data\Charlene\TO\H13092\Troubleshooting\Data\Processed\GNSS_Data\I

<Primary GNSS Import -- mgpsconv_POSPAC_DN291.log>
Records written             Number  Start Time   End Time
GNSS primary navigation     21870   309574.00    331443.00
GNSS attitude               11175   309973.00    331443.00
Primary observables         21870   309574.00    331443.00
GPS iono parameters           218   309604.00    331304.00
GPS ephemerides                27   309593.00    331228.00
GLONASS ephemerides           886   309603.00    331438.00
QZSS ephemerides                0        0.00         0.00
BEIDOU ephemerides              0        0.00         0.00
Less than 5 SV                  0        0.00         0.00

GNSS secondary navigation   10250   309981.00    331443.00
Secondary observables       15185   309943.00    331443.00
Less than 5 SV                865   309943.00    331430.00


-----------------------------------
Calibration Installation Parameters
-----------------------------------
Warning: detected unknown 29 fields iincal file format, contact HSTB if necessary.
Reference to primary GNSS lever arm
xMean yMean zMean: 4.230, -0.848, -2.429
xStd yStd zStd: 1.50e-05, 4.38e-05, 1.17e-04
Max Figure of Merit: 100.0
```

AFTER lever arm fixes, POSPacAutoQC Logs/Summary tab:
-- Note that config & calibrated Z values match (x & y with a few cm, so we left them as-is).
Final Z value here is different from the Calibrated value above, because above didn't have the sign fix in the Ref to IMU Z applied; note "bad" +0.455 in previous screenshot, vs "good" -0.455 here:

```
<IINPP Forward Navigator -- fwdproc_Mission 1.log>
Selected GNSS mode                    :  IN-Fusion PP-RTX
Vehicle to reference alignment angles :  0.000  0.000  0.000
Multipath setting                     :  LOW
Reference to IMU lever arm            :  0.000 -0.012 -0.455
Reference to IMU alignment angles     :  0.000  0.000  0.000
Reference to primary GNSS lever arm   :  4.220 -0.870 -3.316
GAMS antenna separation               :  1.685
GAMS baseline vector                  :  0.009  1.685 -0.003
GAMS heading calibration threshold    :  0.500
GAMS heading correction               :  0.000
GAMS Baseline Standard Deviation      :  0.010

<Secondary GNSS Import -- >
C:\Users\Jack.Riley\Documents\POSPac MMS\Unnamed(11)\Mission 1\Extract\sgpsconv_Mission 1.log

<Primary GNSS Import -- mgpsconv_Mission 1.log>
Records written             Number   Start Time    End Time
GNSS primary navigation     21870    309574.00     331443.00
GNSS attitude               11175    309973.00     331443.00
Primary observables         21870    309574.00     331443.00
GPS iono parameters           218    309604.00     331304.00
GPS ephemerides                27    309593.00     331228.00
GLONASS ephemerides           886    309603.00     331438.00
QZSS ephemerides                0         0.00          0.00
BEIDOU ephemerides              0         0.00          0.00
Less than 5 SV                  0         0.00          0.00

GNSS secondary navigation   10250    309981.00     331443.00
Secondary observables       15185    309943.00     331443.00
Less than 5 SV                865    309943.00     331430.00


-------------------------------------
Calibration Installation Parameters
-------------------------------------
Warning: detected unknown 29 fields iincal file format, contact HSTB if necessary.
Reference to primary GNSS lever arm
xMean yMean zMean: 4.228, -0.845, -3.316
xStd yStd zStd: 2.29e-05, 3.76e-05, 7.84e-05
Max Figure of Merit: 100.0
```

Loading the revised SBET Navigation & GPS Height into the NRT5_S3007_EM2040C/2017-291/ 0038_20171018_173031_S3007 line you sent, followed by (re)Compute GPS Tide & (re)Merge makes it align with the old boat/system data:



[Quoted text hidden]

APPROVAL PAGE

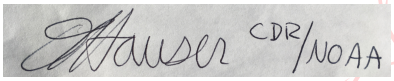
H13092

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

The following products will be sent to NCEI for archive

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

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

Approved:  Digitally signed by HAUSER.OLIVIA.A.1275636009 Date: 2018.10.23 15:10:42 -07'00'

Lieutenant Commander Olivia Hauser, NOAA
Chief, Pacific Hydrographic Branch