H13212

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

DESCRIPTIVE REPORT

Type of Survey:	Navigable Area
Registry Number:	H13212

LOCALITY

State(s):	Louisiana
General Locality:	Mississippi River
Sub-locality:	Mississippi River, Southwest Pass

2018

CHIEF OF PARTY
Jonathan L. Dasler, PE, PLS, CH

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Date:

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

REGISTRY NUMBER:

HYDROGRAPHIC TITLE SHEET

H13212

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):	**Louisiana**
General Locality:	**Mississippi River**
Sub-Locality:	**Mississippi River, Southwest Pass**
Scale:	**5000**
Dates of Survey:	**02/11/2019 to 04/29/2019**
Instructions Dated:	**08/08/2019**
Project Number:	**OPR-J347-KR-18**
Field Unit:	**David Evans and Associates**
Chief of Party:	**Jonathan L. Dasler, PE, PLS, CH**
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:

Any revisions to the Descriptive Report (DR) applied during office processing are shown in red italic text. The DR is maintained as a field unit product, therefore all information and recommendations within this report are considered preliminary unless otherwise noted. The final disposition of survey data is represented in the NOAA nautical chart products. All pertinent records for this survey are archived at the National Centers for Environmental Information (NCEI) and can be retrieved via https://www.ncei.noaa.gov/. Products created during office processing were generated in NAD83 UTM 16N, MLLW. All references to other horizontal or vertical datums in this report are applicable to the processed hydrographic data provided by the field unit.

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Descriptive Report to Accompany Survey H13212

Project: OPR-J347-KR-18

Locality: Mississippi River

Sublocality: Mississippi River, Southwest Pass

Scale: 1:5000

February 2019 - April 2019

David Evans and Associates

Chief of Party: Jonathan L. Dasler, PE, PLS, CH

A. Area Surveyed

David Evans and Associates, Inc. (DEA) conducted a hydrographic survey of the assigned area in the Mississippi River. Survey H13212 was conducted in accordance with the November 19, 2018 Statement of Work and Hydrographic Survey Project Instructions dated August 8, 2019.

The Hydrographic Survey Project Instructions reference the National Ocean Service (NOS) Hydrographic Surveys Specifications and Deliverables Manual (HSSD) (March, 2018) as the technical requirements for this project.

A.1 Survey Limits

Data were acquired within the following survey limits:

Northwest Limit	Southeast Limit
29° 9' 3.51" N 89° 26' 25.14" W	28° 53' 2" N 89° 14' 48.54" W

Table 1: Survey Limits

Survey Limits were surveyed in accordance with the requirements in the Project Instructions and the HSSD.

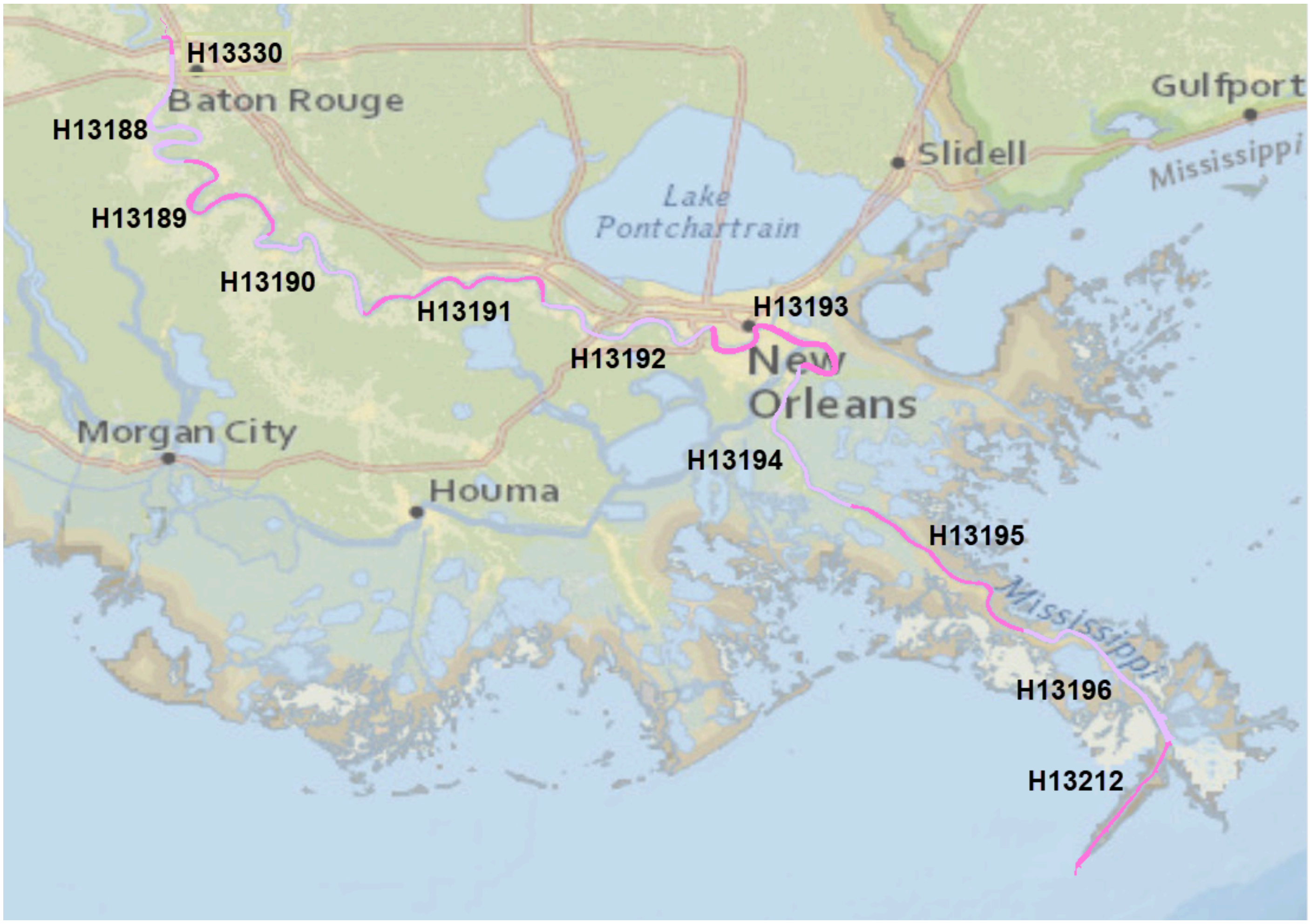


Figure 1: OPR-J347-KR-18 Survey Areas

A.2 Survey Purpose

The Ports of Southern Mississippi River represent the largest port complex in the world and one of the most heavily trafficked waterways in the United States. Annually, over 500 million tons of cargo is moved on the Lower Mississippi. This project area includes the Port of South Louisiana, the Port of New Orleans, the Port of Greater Baton Rouge, and Plaquemines Port, all ranking in the top 12 ports for annual tonnage in the United States. The Port of South Louisiana, river mile 114.9 to 168.5, is the largest tonnage port in the western hemisphere, handling approximately 262 million tons. The Port of New Orleans, river mile 81.2 to 114.9, handles approximately 90 million tons annually. The Port of Greater Baton Rouge, river mile 168.5 to 253, and Plaquemines Port, river mile 0 to 81.2, handle approximately 73 and 57 million tons annually, respectively.*

Critical Charting updates are needed for the Mississippi River, especially for areas outside of the U.S. Army Corps of Engineers (USACE) federally maintained channel areas. These areas outside of the federally maintained channel account for the majority of the navigable river and include ports and terminals essential for commerce and trade. The new bathymetric data in this project area, encompassing 89 SNM, will support high resolution charting products for maritime commerce and update National Ocean Service (NOS) nautical charting products.

* U.S. Army Corps of Engineers, Navigation Data Center, Waterborne Commerce Statistics Center, Principal Ports of the United States, www.navigationdatacenter.us/data/datappor.htm

A.3 Survey Quality

The entire survey is adequate to supersede previous data.

The river bottom is continuously changing due to currents, vessel propeller wash, dredging activity, construction and/or other factors present in the river environment. Changes in the river bed were observed during acquisition, primarily due to sediment migration and dredging activity. Section B.2.6 of this report further discusses these issues and impacts to the final deliverable data. In all cases the hydrographer has verified that soundings accurately depicted the river bed at the time of acquisition.

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 (HSSD Section 5.2.2.2)

Table 2: Survey Coverage

Project Instructions called for high resolution charting at 1:5,000 survey scale to support NOAA's Precision Navigation initiative for the Mississippi River including: Object Detection Coverage for all waters in the survey area to the 2-meter depth contour; Ellipsoid Reference Survey (ERS) using a custom separation model for the Mississippi River; verification of ATONs; assignment of shoreline and nearshore features (including bridges, overhead wires, revetments, assigned existing terminals, and all uncharted features) to be obtained by a vessel based mobile laser scanning technology and imaging system; and delivery of LAS data referenced using ERS methods. Operational challenges included, but were not limited to: conducting surveys in a heavily congested industrial waterway; high river current velocities and transiting debris from high water levels; over 465 miles of shoreline surveys in restricted waters with small launch operations in close proximity to terminals, large barge fleets, wrecks, ruins, submerged piling, and numerous snags; minimal river access for provisioning and refueling; dynamic sediment migration exceeding 0.5 meters per hour in some areas; resolution of chart datum and revisions to the separation model; coordinating mapping efforts with ships at berth; dense fog; on-going dredging operations; and various navigational trials associated with a heavily trafficked industrial waterway. To mitigate these challenges and with the volume of shoreline operations required, survey operations were conducted during daylight hours only, AIS and internet vessel tracking systems were utilized, and continuous communications were made to terminal operators and vessel captains by radio and phone.

Object detection coverage was obtained over the survey area in depths greater than 2 meters relative to chart datum using 100% multibeam echosounder (MBES) and backscatter unless otherwise discussed in individual sections of this report. This coverage type follows Option A of the Object Detection Coverage requirement specified in Section 5.2.2 of the 2018 HSSD. Historic flooding of the Mississippi River during OPR-J347-KR-18 survey impacted safe operations in high currents and restricted operations. Many features were in locations that restricted a 90-degree pass due to strong currents and proximity to shoreline or fixed structures. Further, dredging activity, flooding, and strong river currents resulted in significant sediment migration during and between survey operations, evident on this survey sheet.

Unavoidable coverage gaps are evident in some areas and are primarily due to training walls that impeded safe vessel operations. Other factors that blocked or impeded safe vessel operations resulting in data gaps included: high river currents, out-flow pipe areas, in-water facilities, and ruins. Significant efforts were expended to maximize coverage to the extent possible in these areas. Section B.2.10 of this report discusses issues restricting this survey coverage in greater detail. Figure 2 depicts the survey outline that was obtained for H13212.

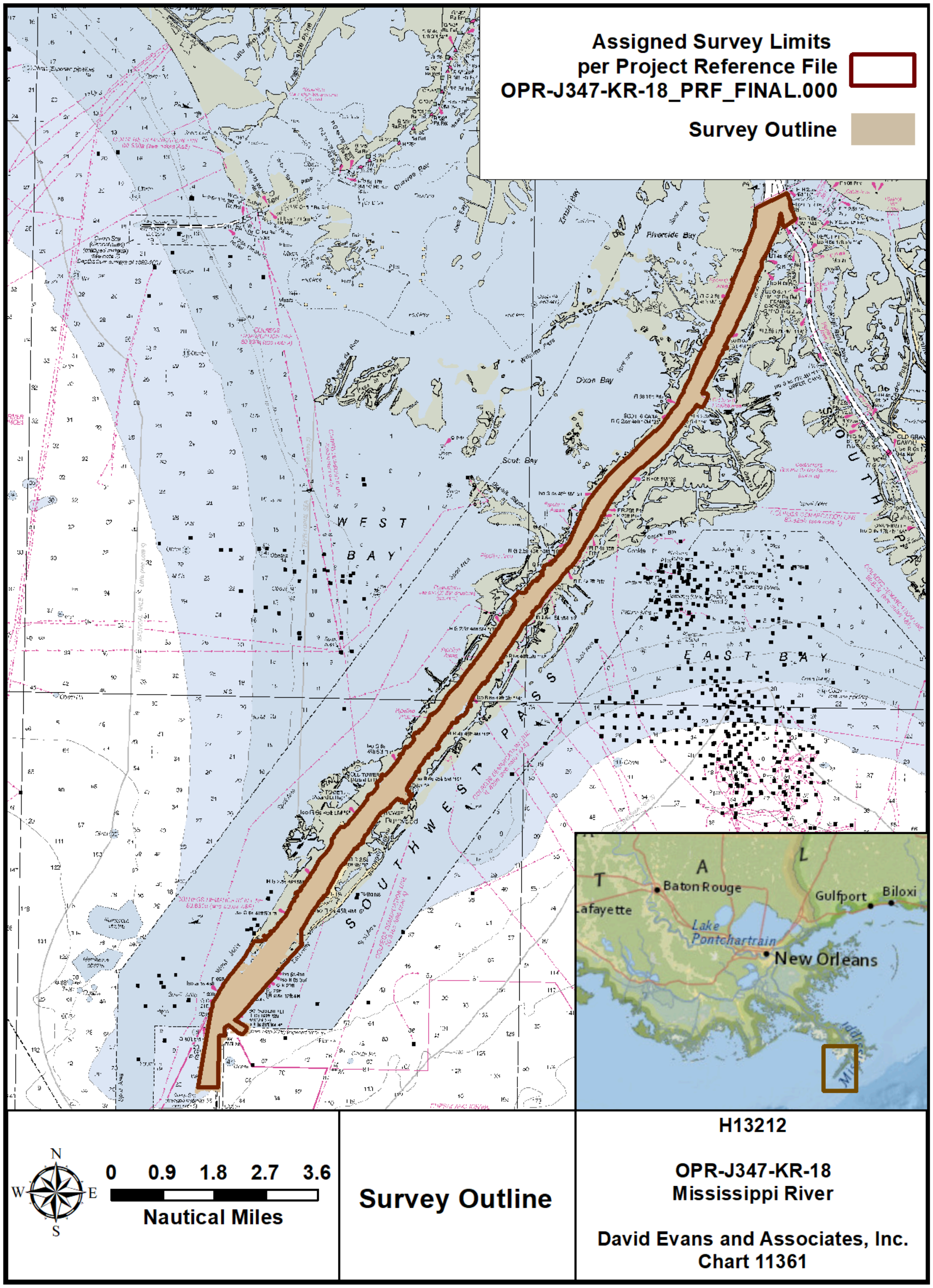


Figure 2: H13212 Survey Outline

A.6 Survey Statistics

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

	HULL ID	***S/V Blake***	***RHIB Sigsbee***	***Total***
LNM	**SBES Mainscheme**	0	0	0
	MBES Mainscheme	260.2	587.5	847.7
	Lidar Mainscheme	77.02	0	77.02
	SSS Mainscheme	0	0	0
	SBES/SSS Mainscheme	0	0	0
	MBES/SSS Mainscheme	0	0	0
	SBES/MBES Crosslines	18.18	16.48	34.66
	Lidar Crosslines	0	0	0
Number of Bottom Samples				0
Number Maritime Boundary Points Investigated				0
Number of DPs				0
Number of Items Investigated by Dive Ops				0
Total SNM				6.7~~6~~ ***005***

Table 3: Hydrographic Survey Statistics

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

Survey Dates	Day of the Year
02/11/2019	42
02/12/2019	43
02/13/2019	44
02/26/2019	57
02/27/2019	58
03/01/2019	60
03/02/2019	61
03/04/2019	63
03/05/2019	64
03/07/2019	66
03/08/2019	67
03/09/2019	68
03/10/2019	69
03/11/2019	70
03/12/2019	71
03/13/2019	72
04/13/2019	103
04/14/2019	104
04/15/2019	105
04/16/2019	106
04/17/2019	107
04/18/2019	108
04/19/2019	109
04/20/2019	110
04/21/2019	111
04/22/2019	112
04/23/2019	113
04/24/2019	114
04/25/2019	115
04/26/2019	116
04/27/2019	117
04/28/2019	118

Survey Dates	Day of the Year
04/29/2019	119

Table 4: Dates of Hydrography

B. Data Acquisition and Processing

B.1 Equipment and Vessels

The OPR-J347-KR-18 Data Acquisition and Processing Report (DAPR), previously submitted with survey H13195, details equipment and vessel information as well as data acquisition and processing procedures. There were no vessel or equipment configurations used during data acquisition that deviated from those described in the DAPR.

B.1.1 Vessels

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

Hull ID	***S/V Blake***	***RHIB Sigsbee***
LOA	83 feet	18 feet
Draft	4.5 feet	1.0 feet

Table 5: Vessels Used

Figure 3: S/V Blake

Figure 4: RHIB Sigsbee

B.1.2 Equipment

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

Manufacturer	Model	Type
Teledyne RESON	SeaBat T50-R	MBES
Teledyne RESON	SeaBat T50-P	MBES
RIEGL	LMS-Z390i	Lidar System
Applanix	POS MV 320 v5	Positioning and Attitude System
iXblue	Hydrins	Positioning and Attitude System
Trimble	SPS851	Positioning System
Trimble	SPS855	Positioning System
Intuicom	RTK Bridge-X	Positioning System
Trimble	SPS851	Positioning System
AML Oceanographic	MVP30-350	Sound Speed System
AML Oceanographic	Micro SVP&T	Sound Speed System
AML Oceanographic	SmartX	Sound Speed System
AML Oceanographic	BaseX	Sound Speed System
AML Oceanographic	MicroX SV	Sound Speed System
Sea-Bird Scientific	SBE 19plus	Conductivity, Temperature, and Depth Sensor
Trimble	NetR5	Positioning System

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 4.09% of mainscheme acquisition.

Lidar crosslines acquired for this survey totaled 0.00% of mainscheme acquisition.

Multibeam crosslines were run across the entire survey area to provide a varied spatial and temporal distribution for analysis of internal consistency within the survey data.

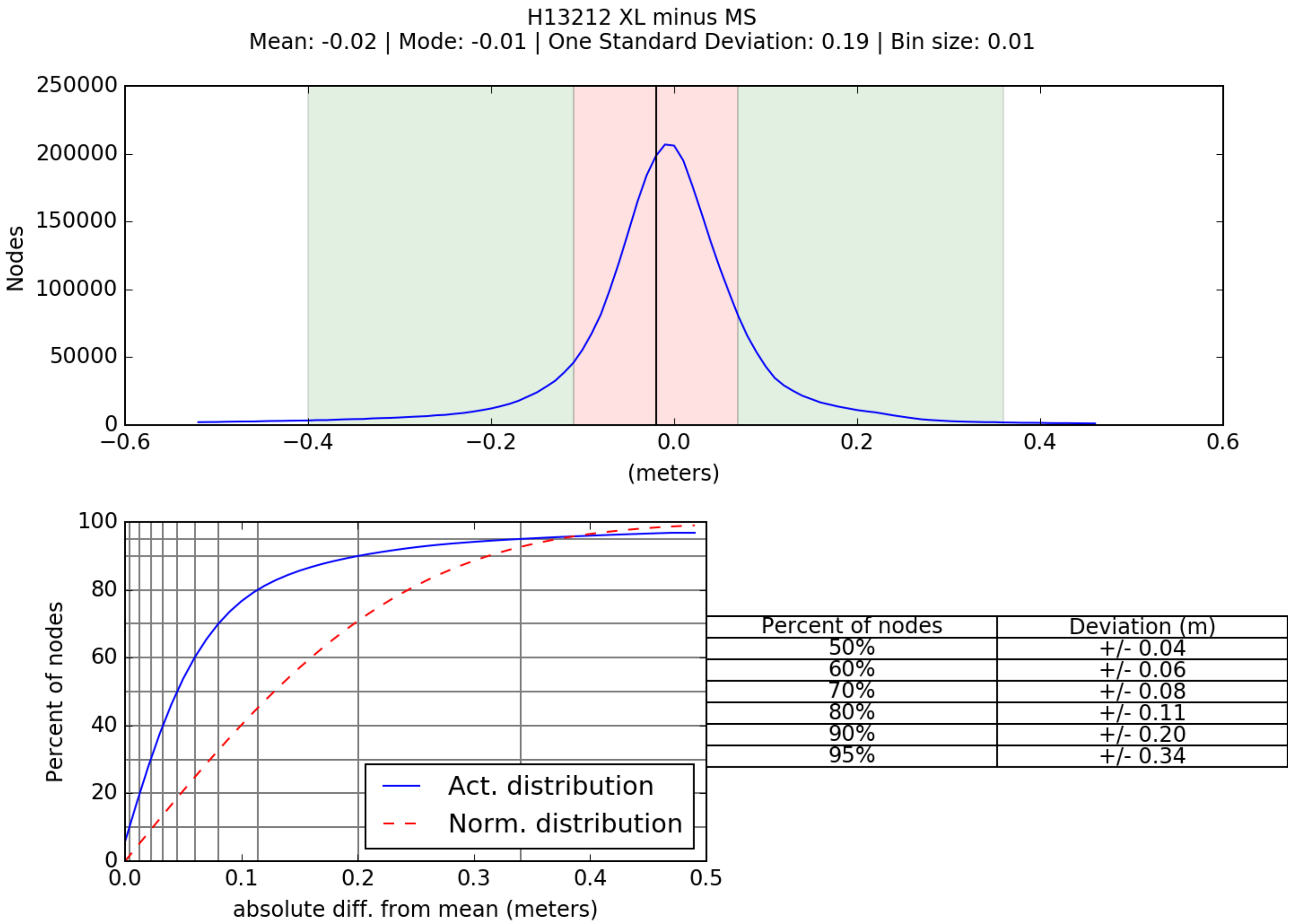
Crossline analysis was performed using the CARIS Hydrographic Information Processing System (HIPS) Quality Control (QC) Report tool, which compares crossline data to a gridded surface and reports results by beam number. Crosslines were compared to a 1-meter CUBE surface encompassing mainscheme, fill, and investigation data for the entire survey area. The QC Report tabular output and plots for both survey vessels are included in Separate II Checkpoint Summary and Crossline Comparison. For the S/V Blake the output and plot contain data from a dual-head system, beams 1-256 are from the starboard head while 257-512 are from the port head.

Due to significant sediment migration occurring within the survey, crosslines were generally conducted on the same day (occasionally next day) as mainscheme acquisition in order to reduce the impact of the changing riverbed on crossline agreement. This resulted in a typical time differential of less than ten hours, but did not exceed 24 hours, between mainscheme and crossline acquisition and significant change in the riverbed was still apparent. Tests run prior to the 2019 flooding event, which was in full swing during this survey, showed sediment wave movement at a rate of 0.25 meters per hour with even higher rates observed during flooding. Even with these operational adjustments, crossline statistics from the S/V Blake, which operated in deeper water over the main channel, just meet International Hydrographic Organization (IHO) Order 1 specification as reported by the CARIS HIPS QC Report tool.

DEA performed an additional crossline analysis using the NOAA Pydro Compare Grids tool to analyze the differences between gridded mainscheme depths and gridded crossline depths. Input grids were 1-meter resolution CUBE surfaces of mainscheme and crossline depths. Results from the crossline to mainscheme difference analysis are depicted in Figure 5. Figure 6 depicts a difference surface portraying the sediment migration seen throughout the duration of survey. This figure details crosslines conducted the next survey day, approximately 24 hours after the first mainscheme line was acquired. Change is significant in the sediment wave field with horizontal migration of up to 15 meters occurring between mainscheme and crossline acquisition. The shape of the waves is apparent in both the crossline/mainscheme difference image and the final multibeam hillshade. In the crossline difference image, overlayed on the final multibeam hillshade, shades of yellow and red indicate shoaling and shades of blue indicate deepening with both following the form of the wave field as sediment waves migrate. Shades of grey indicate areas that meet requirements and are generally outside the sediment wave field where there has been less change.

DEA remains confident that data consistency was maintained during acquisition based on swath to swath comparison of two vessel platforms and three sonars operating simultaneously in the same survey area. DEA confirmed that a systematic error, such as positioning or sound speed measurements, was not a factor leading to these large differences based on weekly system comparisons detailed in Separate I Acquisition and Processing Logs of this report. To further document the system performance, an additional crossline report was run on data acquired in the vicinity of Gulfport Channel, near the project’s mobilization grounds and outside of the influence of sediment migration. The output of this report confirms the S/V Blake’s sonar and acquisition and processing procedures are capable of acquiring data that exceeds IHO specification for Order 1 and Special Order as reported by the HIPS QC Report tool. Output from the report is included in Separate II Checkpoint Summary & Crossline Comparisons.

This issue was not limited to this survey area; sediment migration affected the entire OPR-J347-KR-18 project area. Impacts of sediment migration are further discussed in section B.2.6 of this report.



Percent of nodes	Deviation (m)
50%	+/- 0.04
60%	+/- 0.06
70%	+/- 0.08
80%	+/- 0.11
90%	+/- 0.20
95%	+/- 0.34

Figure 5: H13212 Crossline Difference Distribution Summary Plot

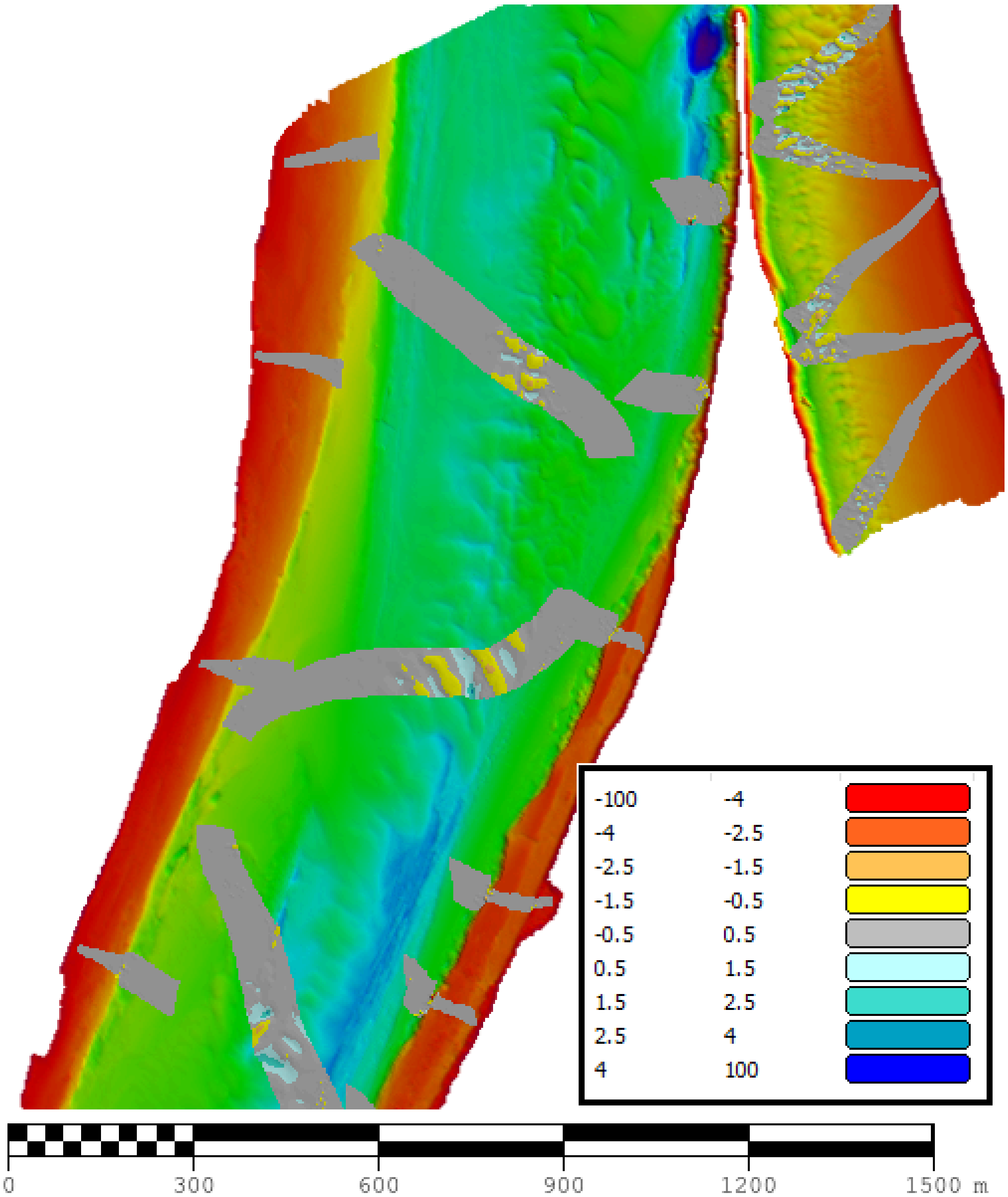


Figure 6: H13212 crossline difference surface overlayed on the multibeam hillshade highlighting sediment migration

B.2.2 Uncertainty

The following survey specific parameters were used for this survey:

Method	Measured	Zoning
ERS via VDATUM	0.030 meters	0.084 meters

Table 7: Survey Specific Tide TPU Values.

Hull ID	Measured - CTD	Measured - MVP	Surface
S/V Blake	N/A	1.0 meters/second	0.5 meters/second
RHIB Sigsbee	1.0 meters/second	N/A	0.5 meters/second

Table 8: Survey Specific Sound Speed TPU Values.

Additional discussion of these parameters is included in the DAPR. Sound speed profiles collected from the RHIB Sigsbee were acquired with AML BaseX or AML SmartX sound speed sensors. The measurement uncertainty for these sensors is listed in the CTD column in Table 8.

During surface finalization in HIPS, the "Greater of the two values" option was selected, where the calculated uncertainty from Total Propagated Uncertainty (TPU) is compared to the standard deviation of the soundings influencing the node, and where the greater value is assigned as the final uncertainty of the node. The uncertainty of the finalized surfaces increased for nodes where the standard deviation of the node was great than the TPU.

To determine if the surface grid nodes met IHO Order 1 specification, a ratio of the final node uncertainty to the allowable uncertainty at that depth was determined. As a percentage, this value represents the amount of error budget utilized by the total vertical uncertainty (TVU) at each node. Values greater than 100% indicate nodes exceeding the allowable IHO uncertainty. The resulting calculated TVU values of all nodes in the submitted finalized surfaces are shown in Figures 7 and 8.

The finalized surfaces include occasional large vertical uncertainties which exceed IHO Order 1 allowances. These high uncertainties were caused by introducing areas of high depth standard deviation associated with steep slopes when finalizing surfaces with the greater of the two option; and incorporating erroneous real-time sonar uncertainty values during TPU computation. On occasion, the real-time uncertainty logged during acquisition included a sounding with an extremely high depth uncertainty which was well outside of realistic values. During processing, an IHO filter was applied to all sounding data, which rejected soundings exceeding IHO Order 1 thresholds for TVU. These rejected soundings have at times been reaccepted after thorough review by the hydrographer. This issue appears to have been caused by an unresolved software bug in either the sonar top side unit or acquisition system impacting the reported uncertainty, but not the actual depth.

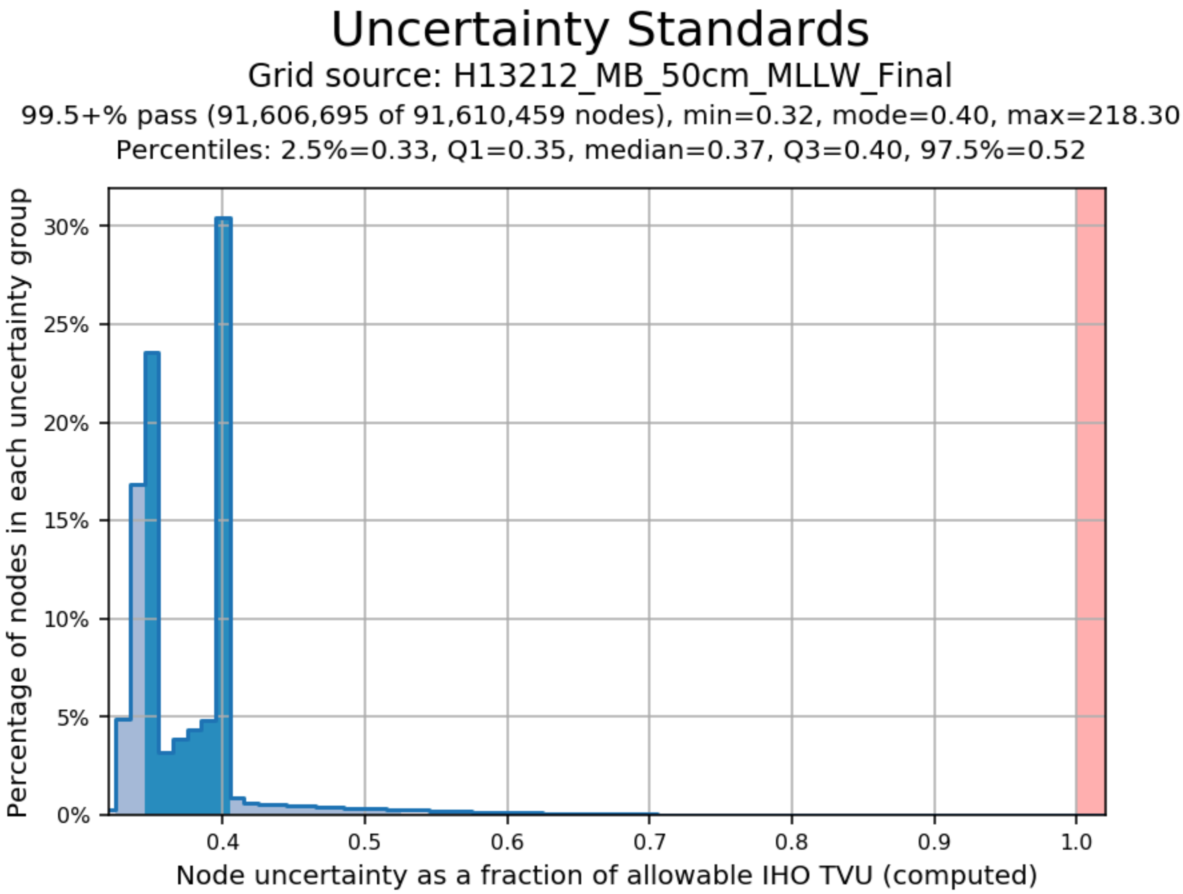


Figure 7: Node TVU statistics - 50cm finalized

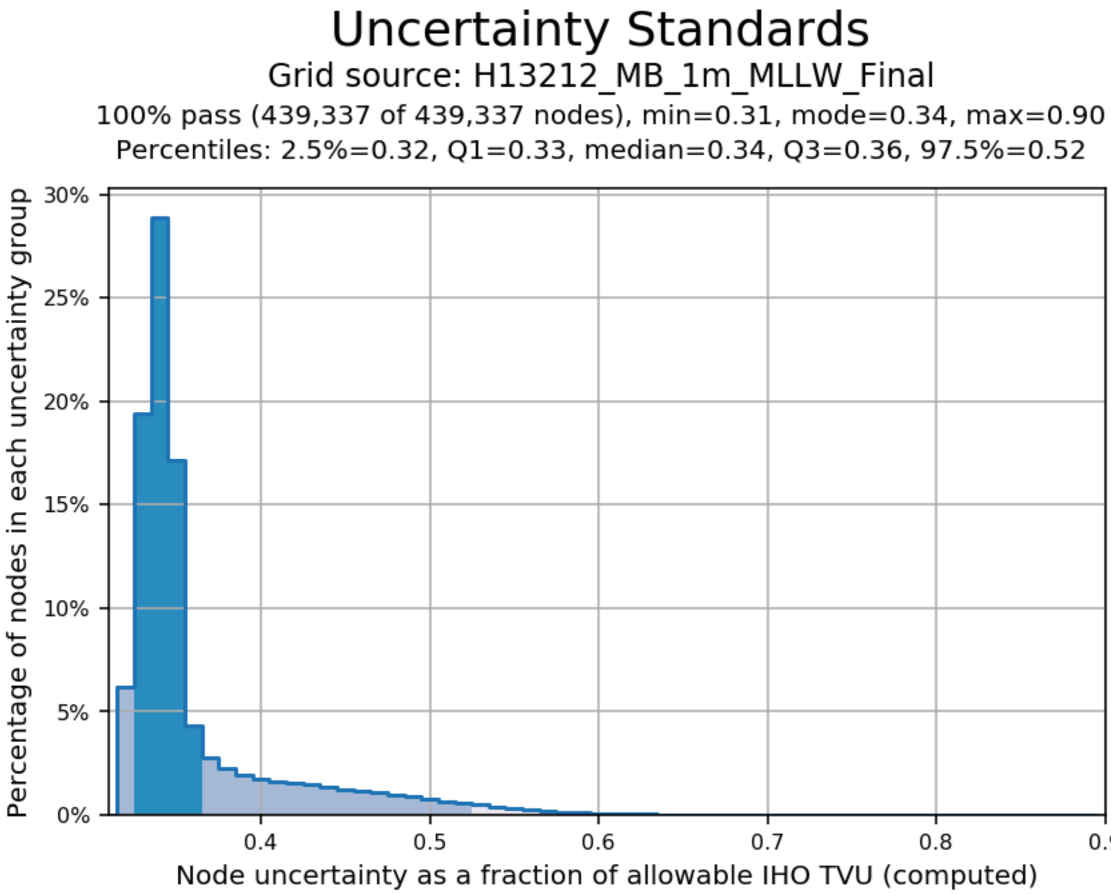


Figure 8: Node TVU statistics - 1m finalized

B.2.3 Junctions

Survey H13212 junctions with current survey H13196 and prior survey H12634.

The following junctions were made with this survey:

Registry Number	Scale	Year	Field Unit	Relative Location
H13196	1:5000	2018	David Evans & Associates, Inc.	N
H12634	1:40000	2014	Oceaneering	S

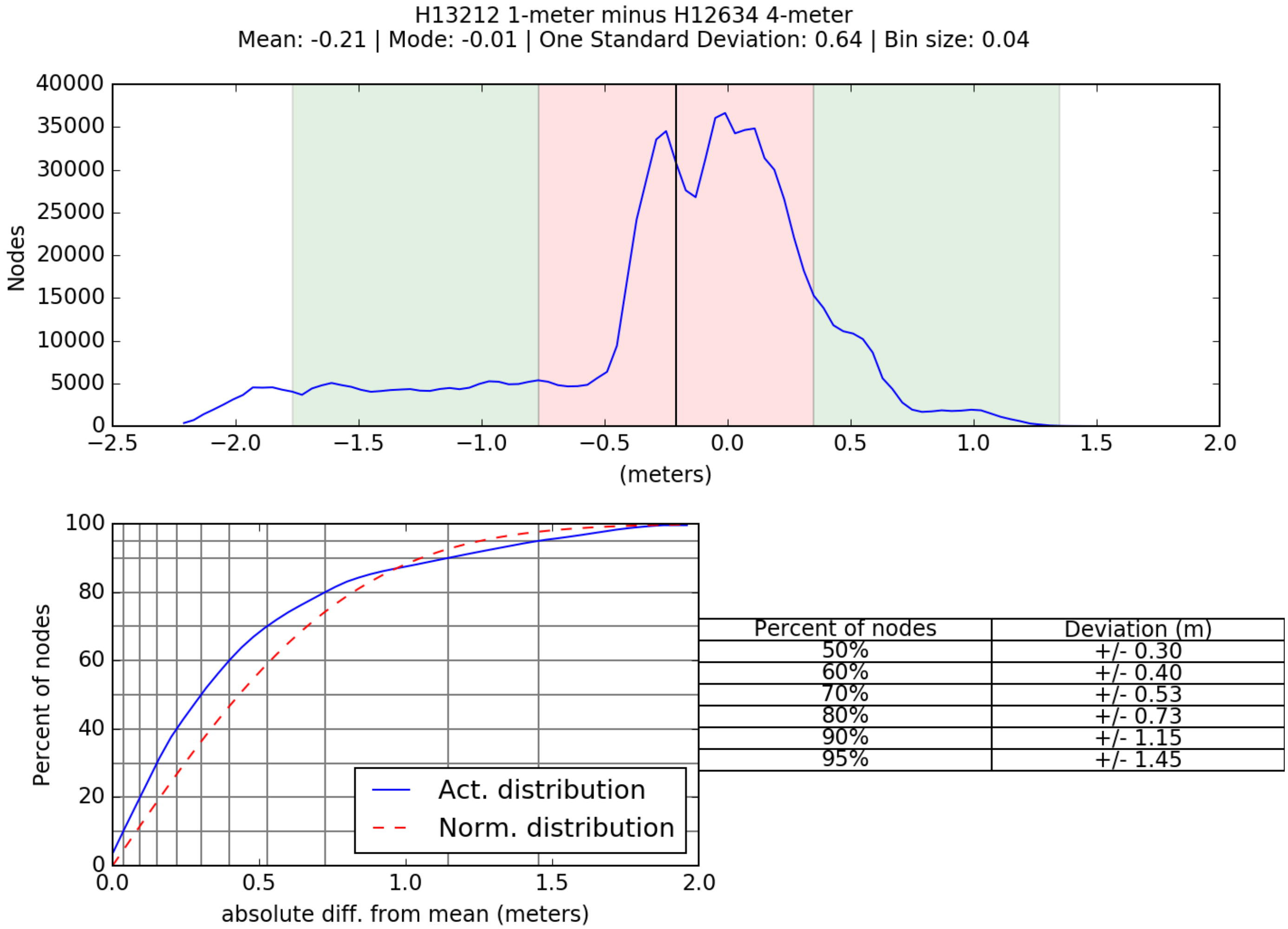
Table 9: Junctioning Surveys

H13196

At the time of writing, data from survey H13196 was still being processed. The Descriptive Report for H13196 will include the junction analysis with H13212.

H12634

Survey H12634 was previously conducted by Oceaneering in 2014. The mean difference between H13212 and H12634 survey depths is 21 centimeters (H13212 shoaler than H12634), shown in Figure 9. The surveys agree well, with the major differences representative of surveys impacted by recent dredging activity of Southwest Pass. Figure 10 shows the area of overlap with grey shades showing general agreement. Warmer colors in Figure 10 represent H13212 survey depths shoaler than H12634, while cooler colors indicate H13212 survey depths deeper than H12634. The largest differences appear to be outside the H13212 survey area and associated with the channel and dredging for the Southwest Pass entrance as well as the dump site for said dredging material.



Percent of nodes	Deviation (m)
50%	+/- 0.30
60%	+/- 0.40
70%	+/- 0.53
80%	+/- 0.73
90%	+/- 1.15
95%	+/- 1.45

Figure 9: Distribution summary plot of survey H13212 1-meter vs H12634 4-meter

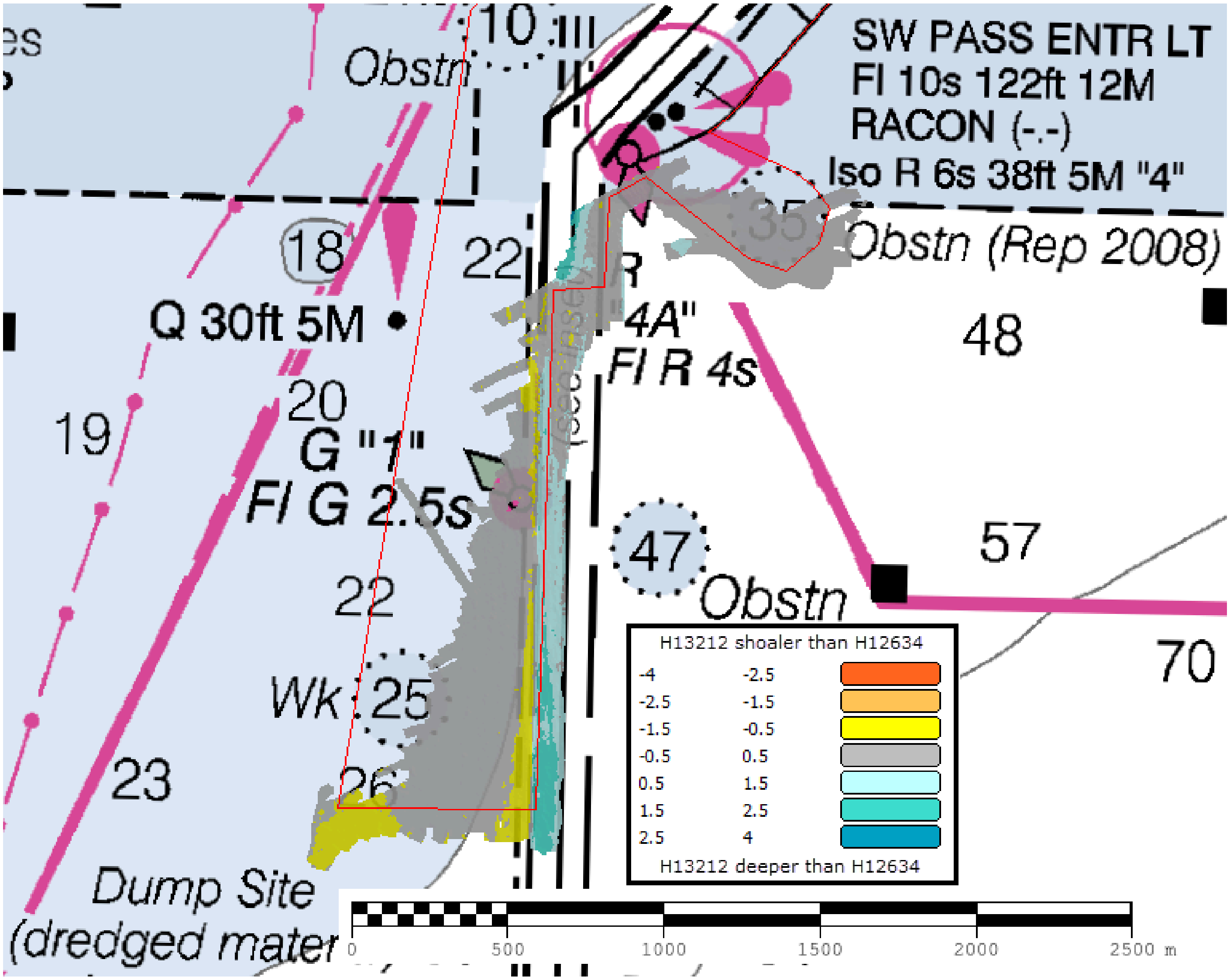


Figure 10: Junction difference surface between surveys H13212 and H12634

B.2.4 Sonar QC Checks

Quality control is discussed in detail in Section B of the DAPR. Results from weekly position checks and weekly multibeam bar checks are included in Separate I Acquisition and Processing Logs of this report. Sound speed checks can be found in Separate II Sound Speed Data Summary of this report.

Multibeam data were reviewed at multiple levels of data processing including: CARIS HIPS conversion, subset editing, and analysis of anomalies revealed in CUBE surfaces.

B.2.5 Equipment Effectiveness

<u>High Frequency artifact in dual-head MBES system</u>

High frequency artifacts are visible periodically in the data collected with the dual-head system on the S/V Blake. Despite extensive testing and troubleshooting of mount stability under a range of vessel motion dynamics and speed, applied offsets, and application of patch tests bias, no single source of the artifact could be identified. The high frequency artifact was transient and unrelated to vessel dynamics and loading on sonar mounts at different speeds and induced rolling during testing and is periodically present in both sonars, with a higher magnitude observed on the port sonar. From the findings of the troubleshooting, it is the hydrographer's belief that this is not related to mount instability relative to the IMU of patch test bias values applied and may be related to minor transient timing issues in the dual head system relative to the application of motion data (primarily role). Under this assumption, the further away the sensor is from the ship reference point, the great the magnitude of the error. In this case, while the artifact negatively affects the aesthetic of the final surface deliverable, it is well within IHO specifications for this survey. Figures 11 and 12, display the transient artifact for the dual-head operations.

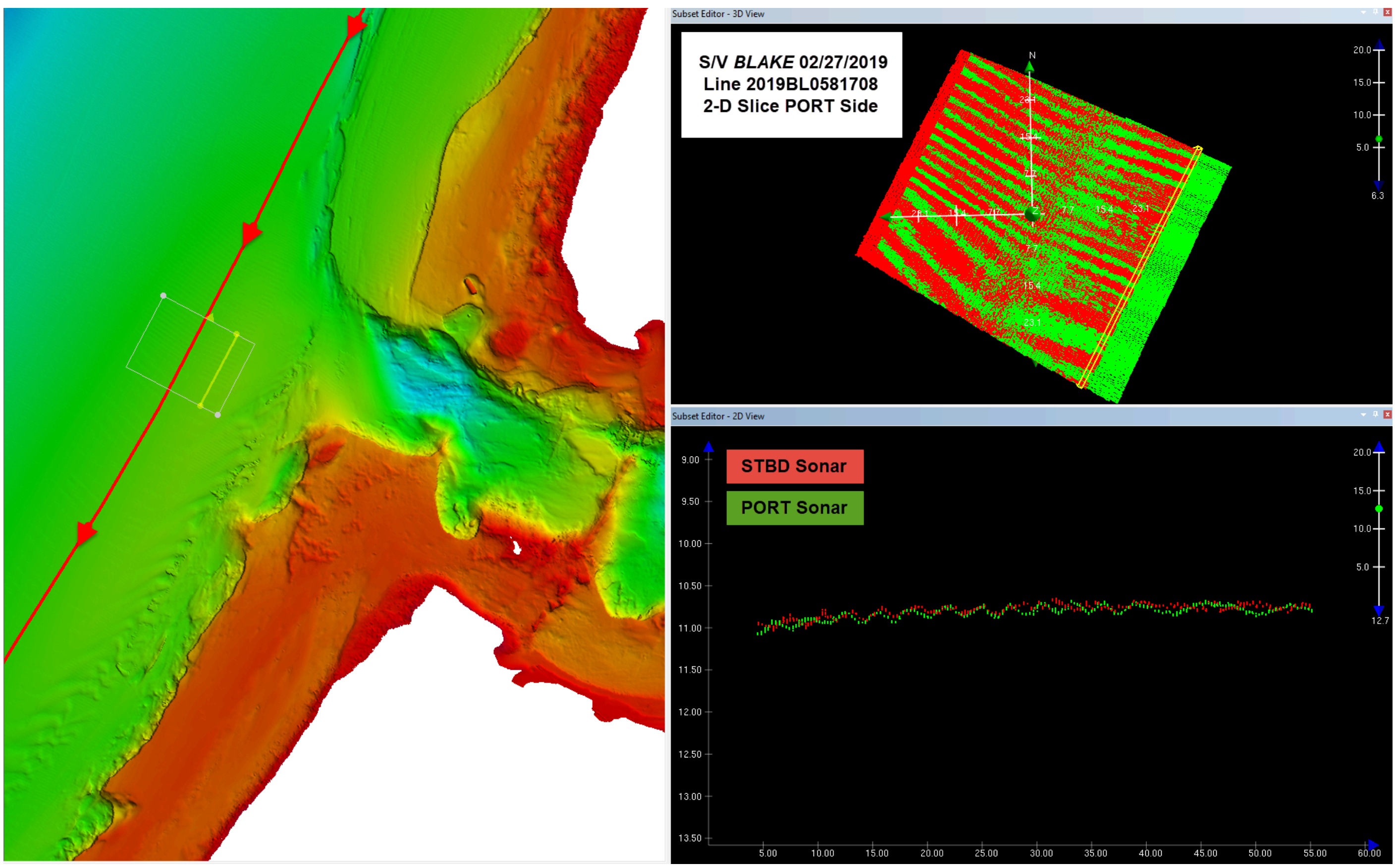


Figure 11: Example of high frequency artifact shown in surface and along track subset. Subsets of differing magnitudes between separate sonar heads of dual-head system shown on port side of swath (starboard beams shown in red, port beams in green)

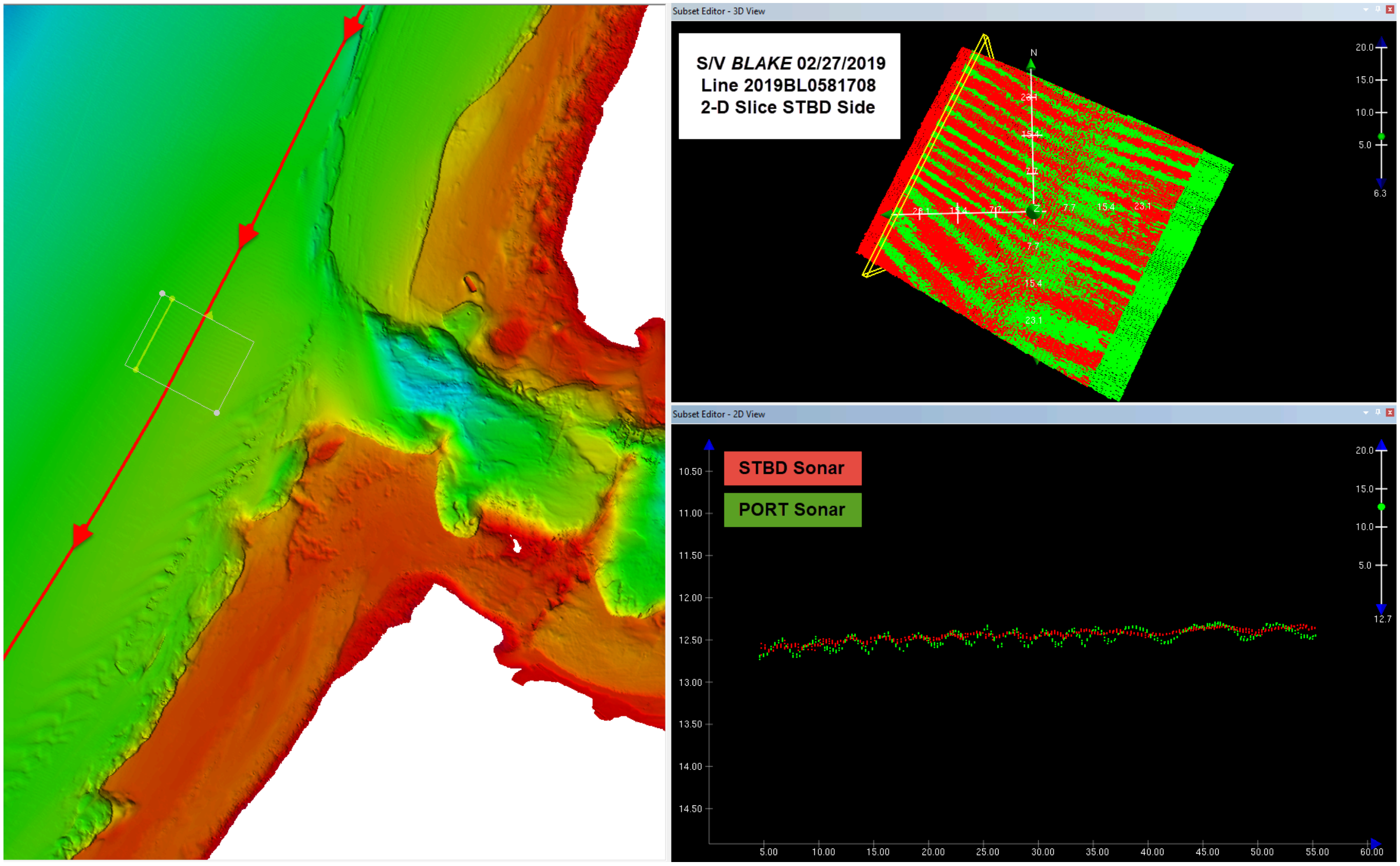


Figure 12: Example of high frequency artifact shown in surface and along track subset. Subsets of differing magnitudes between separate sonar heads of dual-head system shown on starboard side of swath (starboard beams shown in red, port beams in green)

<u>Bottom tracking in shallow water</u>

During survey acquisition, it was apparent that the combination of shallow water and the river bottom type (an assumption of soft silty mud) made it difficult to get a clean bottom track return from the MBES system. This most frequently was displayed in shallow, flat areas out of the main channel current. To try to mitigate the effect, sonar settings were changed by the hydrographer during acquisition, including changing power, gain, time variable gain (TVG) settings, and pulse length. In the end no clear solution fixed the issue and the hydrographer continuously tuned the sonar for the best return at the time. This is likely a limitation of the instrument and the acoustic properties of the sediments in the depths being surveyed. The HDCS dataset was well cleaned to mitigate the effects to the final surfaces. However, artifacts within IHO specifications, will be apparent in the final delivered surface as shown in Figure 13.

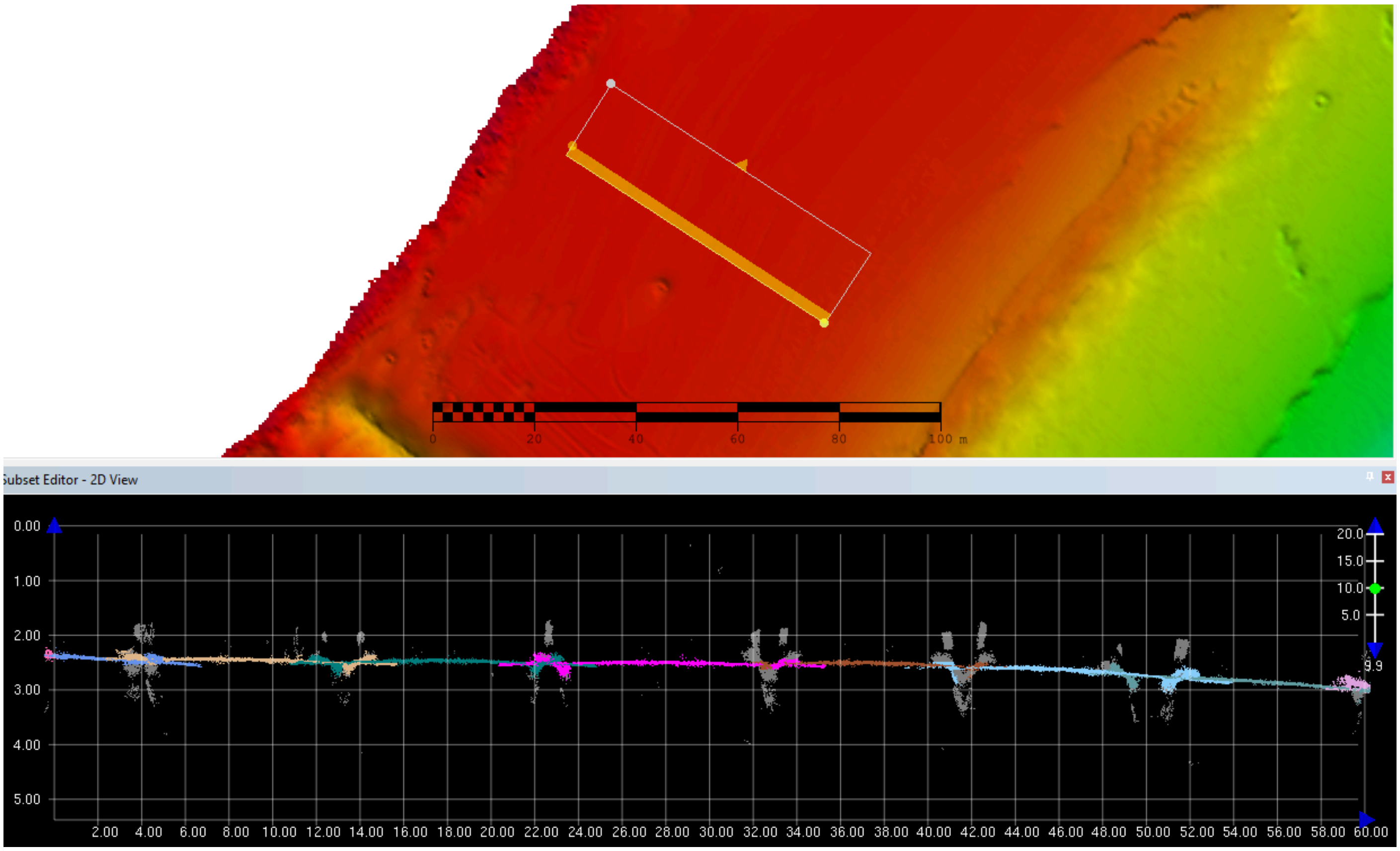


Figure 13: Example of erroneous bottom tracking of flat shoal areas in HDCS data and resultant surface artifact (gray soundings rejected manually by hydrographer to limit effects to the surface)

Delayed Heave

Delayed heave was applied to data collected by the S/V Blake using the POS M/V .000 file logged during acquisition. This file is loaded using the CARIS Import Auxiliary Data tool. Delayed heave is chosen during the SVC and Merge processing steps.

Delayed heave was applied to data collected by the RHIB Sigsbee using the IXSEA Output_E.log file logged during acquisition. This file is formatted similarly to the POS M/V .000 file for delayed heave, but does not contain any position, motion, or associated RMS values. The Output_E.log file was loaded using the CARIS Import Auxiliary Data tool and applied during the SVC and Merge processing steps.

The following lines are submitted with real-time heave due to logging errors during acquisition that resulted in no delayed heave file being logged:

2019SI0612122
2019SI0641912
2019SI0641921

Dual-head configuration setup error

The S/V Blake acquisition configuration setup for data collected on April 28, 2019 (DN118) was in error. Instead of logging the starboard sonar with beams 1-256 and the port sonar with beams 257-512; the setup was configured to log the port sonar twice, with beams 1-256 and 257-512. To account for this error all erroneous 1-256 beams were rejected using a swath filter and only data collected from the appropriate sonar are accepted. As this data was fill and investigation data, no data gaps were generated as a result of rejecting one sonar head.

B.2.6 Factors Affecting Soundings

Sediment Migration

Sediment migration on the river bottom was evident throughout the course of this survey. Crosslines and fill lines that were run hours after mainscheme acquisition still exceeded the allowable vertical uncertainty in some areas. Following guidance from HSD OPS and the Atlantic Hydrographic Branch, the hydrographer allowed the CUBE algorithm to estimate a gridded depth in these areas without manual cleaning of the sounding data. The submitted surface has numerous artifacts resulting from these areas of disagreement. When reviewed, soundings deemed as fliers were still rejected. It is the hydrographer's belief that the submitted depths are accurate at the time of the survey. An example of approximately 4-meter horizontal disagreement for H13212 submitted surfaces is shown in Figure 14.

Some areas of the greatest disagreement have been noted in the H13212_Notes_for_Reviewer.hob file with the SNDWAV area feature class, submitted in Appendix II Supplemental Survey Records of this report. This is not an exhaustive list of areas, but should detail those that show the major surface artifacts resulting from sediment migration.

In the vicinity of Baton Rouge, while in an area of significant sediment migration but prior to flood levels, a field test was conducted to attempt to quantify the amount of change the river bottom experienced at that time of survey. The same line was run upstream at similar speeds with time elapsing between subsequent passes. A subset of the results is shown in Figure 15. A high vertical exaggeration is used in Figure 15 to highlight the magnitude of the sediment migration. The hydrographer's best estimate for this test is that the smaller waves on top are migrating at nearly 1 meter per hour while the larger waves, nearly 2 meters high, are migrating at 5 meters per day.

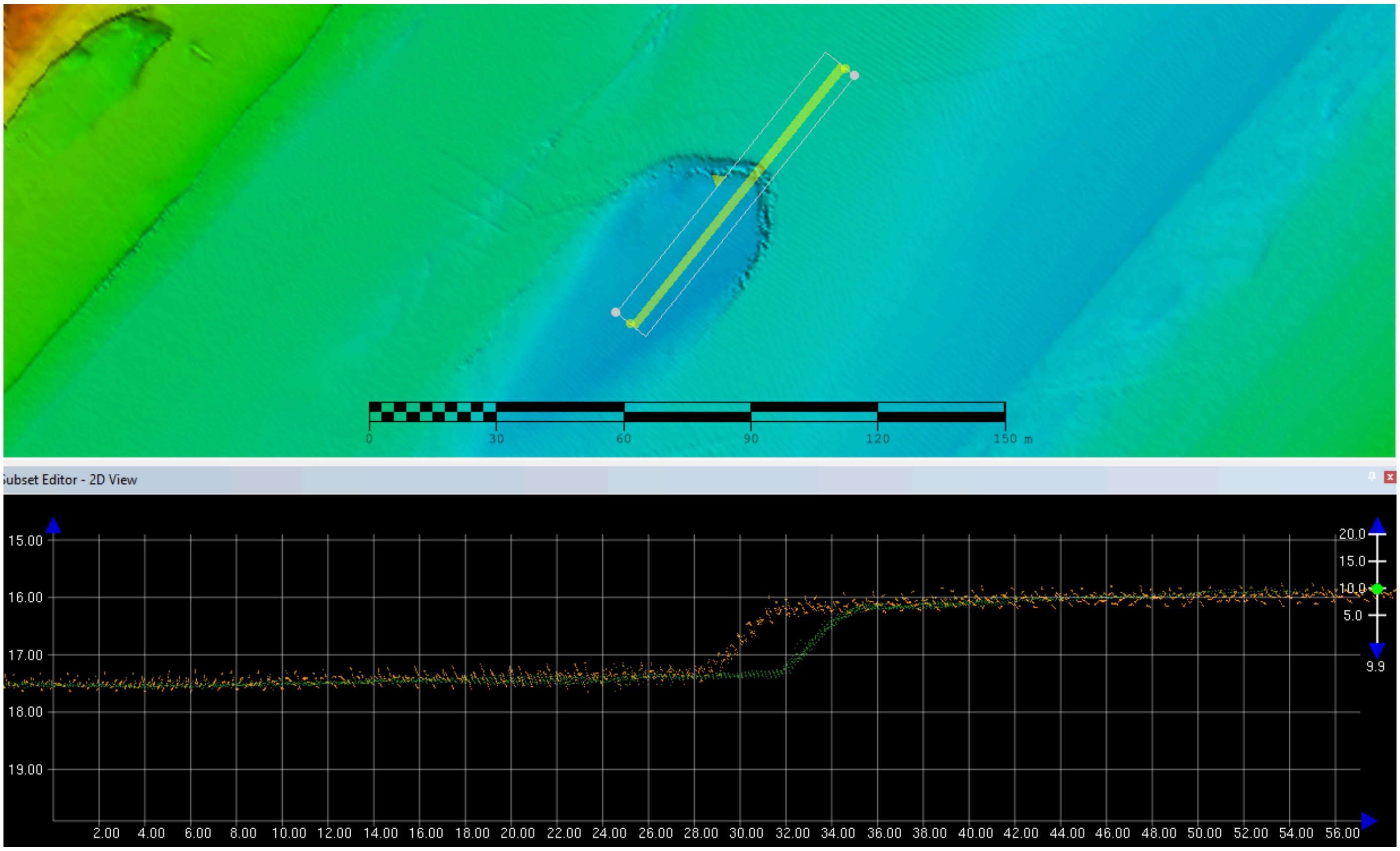


Figure 14: Example of artifacts caused by sediment migration during H13212 operations

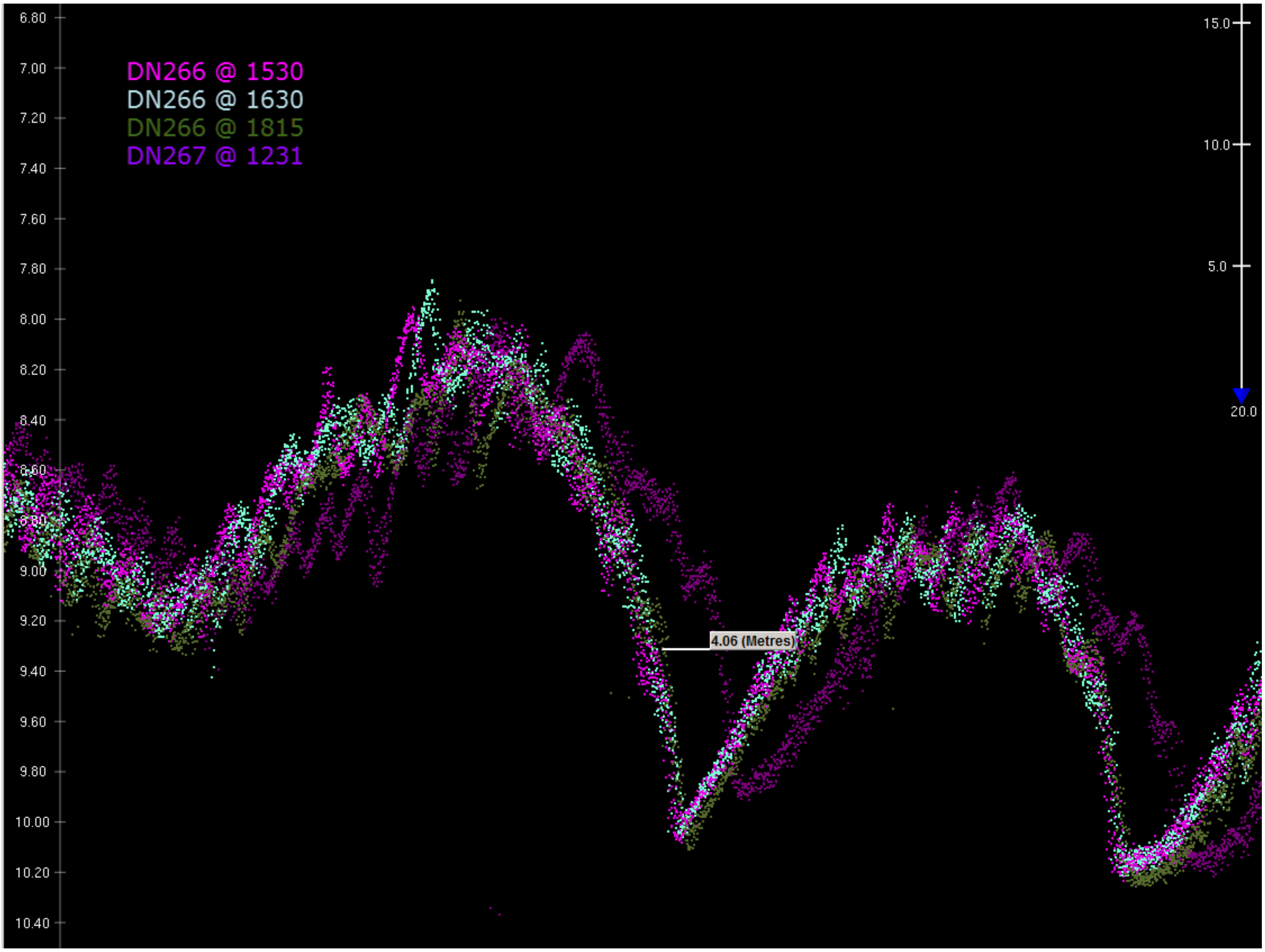


Figure 15: Along-track subset view of field test, prior to flood levels, portraying river bottom changes due to sediment migration

B.2.7 Sound Speed Methods

Sound Speed Cast Frequency: Approximately four-hour intervals

An AML Oceanographic Moving Vessel Profiler (MVP) and an AML SmartX or BaseX were the primary instruments used to acquire sound speed readings during multibeam operations for the S/V Blake and the RHIB Sigsbee, respectively. Additional discussion of sound speed methods can be found in the DAPR.

For the majority of H13212 survey operations, sound speed was well mixed and varied negligibly, both temporally and spatially. Due to the consistent sound speed profile encountered in this reach of the river, sound speed profiles were measured at approximately one to two-hour intervals during survey operations.

Sound speed readings were applied in CARIS at an approximate interval of four hours based on consistent profiles observed throughout the day of survey. Field hydrographers noticed that as hydrographic operations approached the Gulf of Mexico, a salt water influx was present. Due to the variation in sound speed measurements near the mouth of the Mississippi River, cast frequency was increased to 15-minute intervals. Sound speed readings for these days were applied in CARIS at approximately a one-hour time interval based on capturing the most representative sound speed for the day of survey. To visualize this variability, two days of sound speed measurements from S/V Blake are shown in Figure 16, some of these show a change greater than 50 meters per second. Days that were impacted with refraction artifacts and have more frequent sound speed measurements applied to address the variability are listed as follows:

S/V Blake DN110 – all lines have SV applied nearest in distance within 1 hour
S/V Blake DN111 – all lines have SV applied nearest in distance within 1 hour
S/V Blake DN113 – all lines have SV applied nearest in distance within 1 hour
RHIB Sigsbee DN113 – lines 1725 through 1751 have SV applied nearest in distance within 1 hour
S/V Blake DN118 – all lines have SV applied nearest in distance within 1 hour

Even with the increased sound speed sampling acquisition, sound speed effects of varying magnitudes are present in the delivered HDCS data. The mouth of the third largest drainage of the world is a difficult environment to capture all sound speed variabilities present throughout the watercolumn.

All sound speed measurements were made within 250 meters of the planned survey boundary.

In general, a sound speed measurement was made immediately preceding bathymetric operations, per HSSD. Occasionally a sound velocity profile was taken before survey operations and then rejected during data QC, or taken shortly after the start of acquisition. Figure 17 details all instances when there was a deviation from the HSSD for H13212.

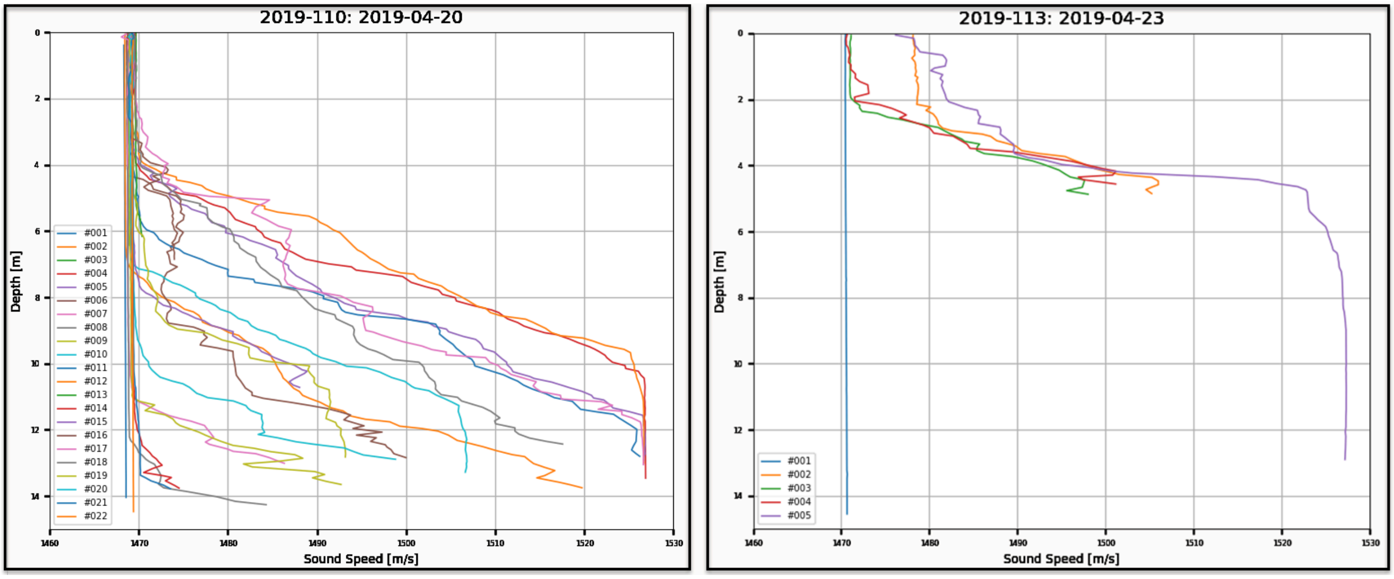


Figure 16: Comparison graphs showing sound speed variability of two days while surveying the mouth of Southwest Pass

Day Number	Vessel	Time of first SSP (UTC)	Time of first ping (UTC)	Comments
2019-057	S/V Blake	1351	1342	SV taken on-line, approximately 9 minutes after starting acquistion. Data analyzed, SV changes minimal.
2019-067	RHIB Sigsbee	1349	1338	SV taken on-line, approximately 11 minutes after starting acquistion. Data analyzed, SV changes minimal.
2019-069	RHIB Sigsbee	1917	1859	SV taken on-line, approximately 18 minutes after starting acquistion. Data analyzed, SV changes minimal.
2019-105	RHIB Sigsbee	1253	1238	SV taken 15 minutes after starting acquisition. Data analyzed, SV changes minimal.
2019-118	S/V Blake	1420	1419	SV taken on-line, approximately one minute after starting acquistion. Data analyzed, SV changes minimal.
2019-118	RHIB Sigsbee	1424	1413	SV taken 11 minutes after starting acquisition. Data analyzed, SV changes minimal.

Figure 17: Sound speed measurement exceeding start of operations specification

B.2.8 Coverage Equipment and Methods

Survey speeds were typically maintained to meet or exceed along-track density requirements. However, due to swift current pushing the vessel downriver and the need to maintain maneuverability, combined with deep areas requiring expansion of the sonar range and thereby slowing the sonar ping rate, along-track low-density areas are occasionally present in the final data. These typically are narrow swaths centered along nadir and do not impact meeting density requirements for 95% of all nodes.

Mobile lidar coverage was obtained on the full extents of both river banks spanning the survey area.

B.2.9 Density

The sounding density requirement of 95% of all nodes, populated with at least five soundings per node, was verified by analyzing the density layer of each finalized surface. Individual surface results are stated in Figures 18 and 19.

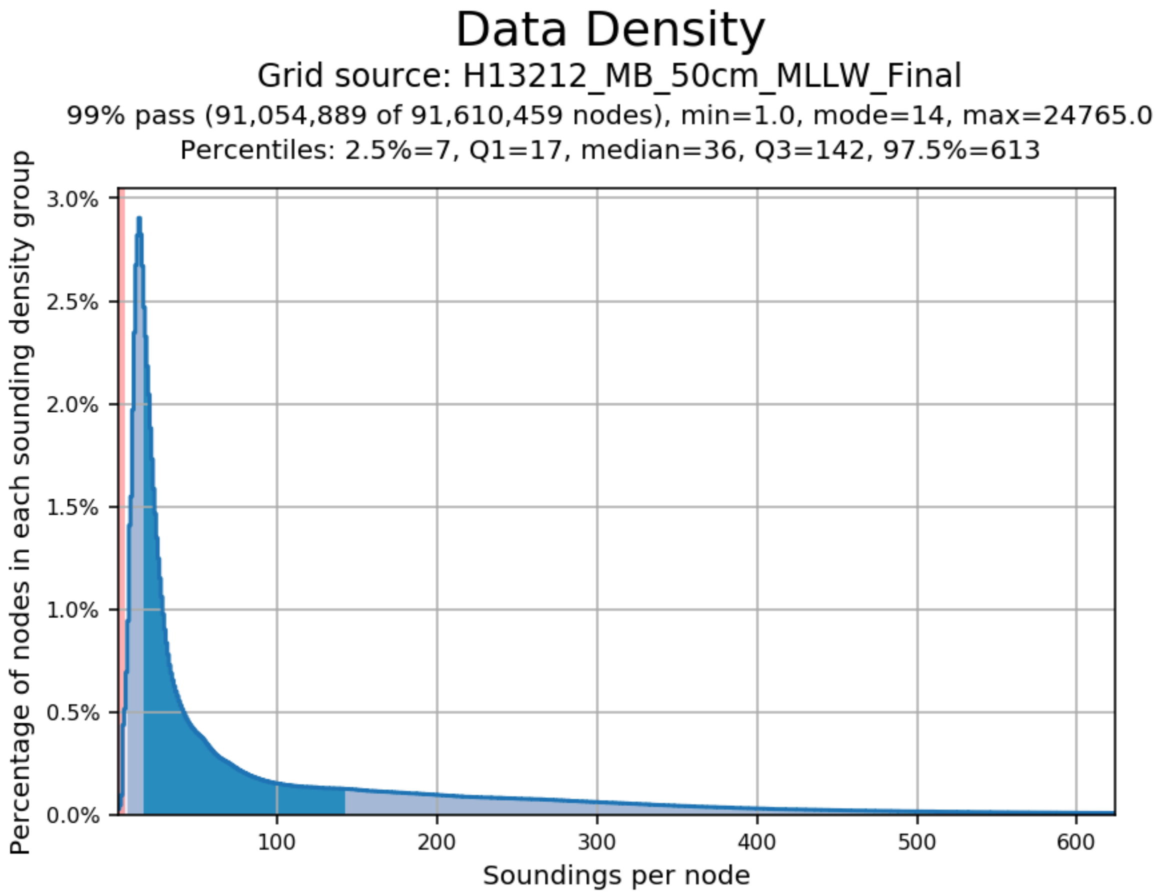


Figure 18: Node density statistics - 50cm finalized

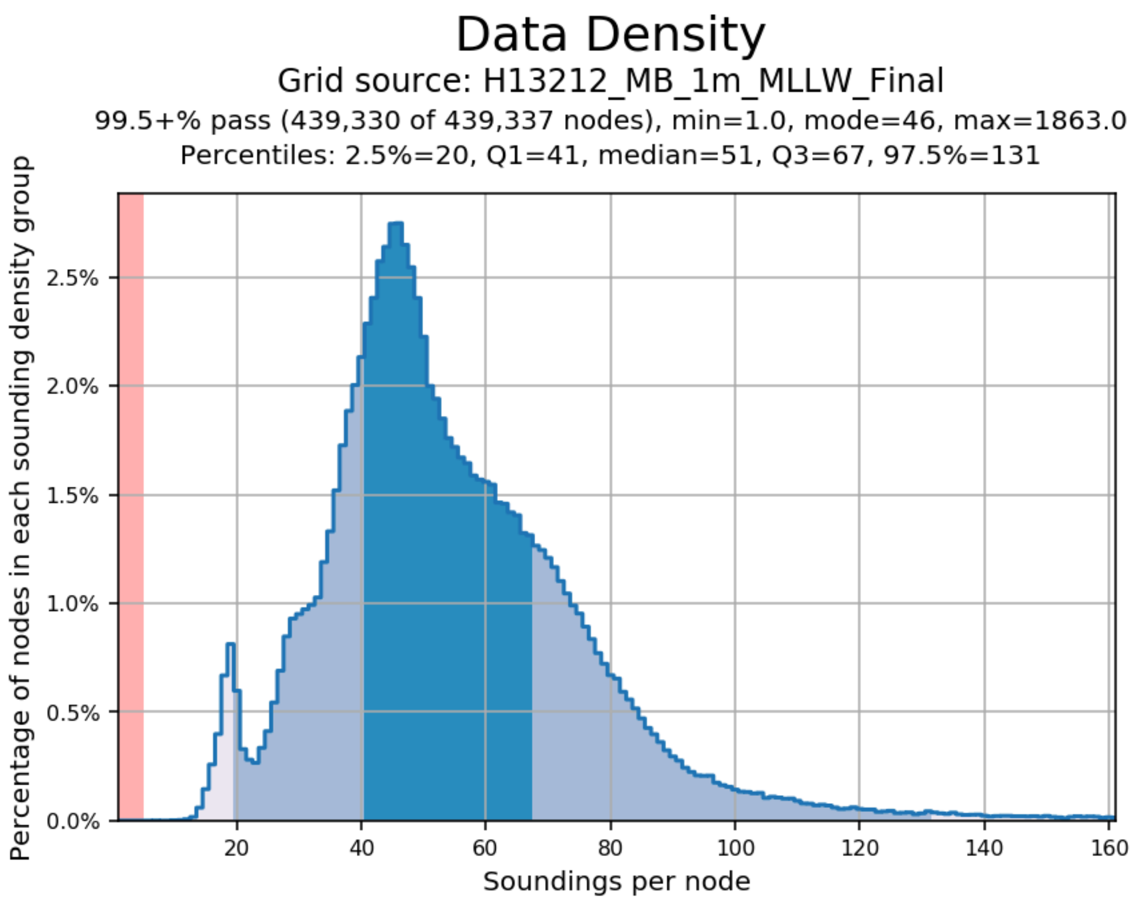


Figure 19: Node density statistics - 1m finalized

B.2.10 Data gaps in bathymetric coverage

Occasional data gaps in the final Object Detection surfaces exist due to operational restrictions at time of survey. These data gaps were further analyzed after acquisition and determined to be unattainable due to safety or other factors impacting vessel operations. Significant effort was expended during survey operations to maximize object detection coverage in these areas.

Some of the sources for these data gaps include:
- Holidays or 2-meter coverage gaps behind piers or other baring structures where field unit was physically unable to operate, or safety concerns limited their ability.
- Holidays beyond the 2-meter curve (NALL) which were not further investigated due to safety concerns in shallow water.
- Holidays or 2-meter coverage gaps near training walls extending into shallow waters.
- Holidays beneath baring structures that met the area requirement were rejected in the survey data for final delivery.
- Any 2-meter coverage gaps that were previously met prior to final separation model adjustment further discussed in section C.3.3 of this report.

Holidays that exist in the final surfaces have been noted in the H13212_Notes_for_Reviewer.hob with the cvrage area feature class, submitted in Appendix II, and attributed with remarks stating the contributing factor leading to the data gap. Areas where the 2-meter curve was not met are included in the H13212_Notes_for_Reviewer.hob with SLCONS feature class and attributed with remarks stating the contributing factor for this deficiency.

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

Multibeam backscatter was logged in Hypack 7k format and included with the H13212 digital deliverables. Data were processed periodically in CARIS HIPS to evaluate backscatter quality, but the processed data is not included with the deliverables. For dual-head MBES data on S/V Blake, individual 7k files were logged for each sonar head in order to better facilitate additional changes required between systems.

For data management purposes, the names of multibeam crosslines have been appended with the suffix _XL. This change was made to HIPS files only. The original file names of raw data files (Hypack HSX and 7k) have been retained.

Backscatter processing to be performed at the Branch deviates from the current OCS Backscatter Processing SOP dated 02/21/2020. Specifically, for the dual-head sonar configuration used in this survey, the processed depth files in the HDCS survey lines contain combined bathymetric data from both sonar heads. However, due to software limitations, the resulting GSF format data files and backscatter mosaic are based on time series data in .7k files (snippets data) from one individual sonar head, paired with the dual-head sounding data. This is represented in the backscatter mosaic with the vessel name BlakeDHS or BlakeDHP, indicating one set of .7k files from the starboard or port head, respective of the dual-head system was paired with the combined-head HDCS. The naming convention for the MBAB mosaic is H13212_MBAB_2m_BlakeDHS_350kHz_1of2.tiff (DHS for the starboard head of a dual head

configuration). This product is the best available from the files associated with this particular dual-head sonar configuration and combined-head acquisition process.

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	10.4.5

Table 10: Primary bathymetric data processing software

The following Feature Object Catalog was used: NOAA Profile Version 5.7.

A detailed listing of all data processing software, including software used to process the mobile lidar data, is included in the DAPR.

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
H13212_MB_50cm_MLLW	CARIS Raster Surface (CUBE)	0.5 meters	0.155 meters - 24.558 meters	NOAA_0.5m	Object Detection
H13212_MB_1m_MLLW	CARIS Raster Surface (CUBE)	1 meters	0.433 meters - 24.553 meters	NOAA_1m	Object Detection
H13212_MB_50cm_MLLW_Final	CARIS Raster Surface (CUBE)	0.5 meters	0.155 meters - 20.000 meters	NOAA_0.5m	Object Detection
H13212_MB_1m_MLLW_Final	CARIS Raster Surface (CUBE)	1 meters	18.000 meters - 24.553 meters	NOAA_1m	Object Detection

Table 11: Submitted Surfaces

Bathymetric grids were created relative to MLLW in CUBE format using Object Detection resolution requirements as described in the HSSD.

Grids were originally submitted by the field unit as 50 cm, 1m and 4m finalized single resolution grids and were accepted by the Branch as meeting specifications during the H13212 RSA. After additional review during the SAR, it was found some grids required additional re-computation and re-finalization due to minor revisions of the sounding data and FFF. It was agreed amongst both PHB and AHB to modify the final grid products from single resolution to variable resolution (VR) grids following the NOAA object detection depth based (ranges) estimation method parameters. The effect was improved grid management reducing the number of total number grids from eight (8) to two (2). Given final products are now submitted as VR, no final combined surface is included with this submission.

B.5.3 Designated Soundings

A total of 233 soundings in H13212 were designated in bathymetric data: 226 to facilitate feature management for inclusion in the H13212 Final Feature File (FFF), and seven to override the gridded surface model.

B.5.4 CARIS HDCS Navigation Sources

During processing of S/V Blake HDCS lines, navigation information was imported from POS M/V .000 files while importing delayed heave, motion and associated RMS values. This navigation source, Applanix.ApplanixGroup1, is automatically applied at merge when it exists. However, when a CARIS project file is rebuilt, CARIS will report that the navigation source is the HDCSNav. This is a display issue only and does not change the navigation source.

This is not an issue for data collected by the RHIB Sigsbee, which relies on HDCS navigation, and does not apply logged navigation, motion and RMS.

Additionally, when a line is renamed, such as with the suffix _XL, the HDCS Nav source disappears from the metadata display. Again, this appears to be a display issue only and does not change any navigation sources.

B.5.5 Mobile Laser Scanner Data

A vessel based laser scanner was used to acquire lidar data along the survey area's shoreline in order to facilitate the survey, management, and reporting of shoreline and nearshore features. Processed LAS data from the laser scanner are included with the survey deliverables in the Processed directory. Photos were captured during hydrographic operations to aid in the interpretation of the lidar data during processing, for inclusion in the FFF by using the images attribute, and for reporting purposes.

C. Vertical and Horizontal Control

A complete description of the horizontal and vertical control for survey H13212 can be found in the OP-J347-KR-18 Horizontal and Vertical Control Report (HVCR), to be submitted with the final survey for this project. A summary of horizontal and vertical control for this survey follows.

C.1 Vertical Control

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

ERS Datum Transformation

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

Method	Ellipsoid to Chart Datum Separation File
ERS via VDATUM	NAD83-LWRP2007_RM13.4_MLLW2012-2016_Geoid12B.csar

Table 12: ERS method and SEP file

While ERS via VDATUM is listed in Table 12, it was one of the limited options available in the XML DR schema’s enumerated values. The separation model covering the H13212 survey area was constructed by the HSD Operations Branch specifically for this survey project using NAVD88 (GEOID 2012B) to Mean Lower Low Water (MLLW 2012-2016) values. Refer to the HVCR submitted under separate cover for additional information.

C.2 Horizontal Control

The horizontal datum for this project is North American Datum of 1983 (NAD 83).

The projection used for this project is Universal Transverse Mercator (UTM) Zone 16.

RTK

During acquisition, RTK correctors were obtained from Louisiana State University’s (LSU) Center for Geoinformatics (C4G) service via a dedicated cellular modem in the extents of cellular coverage. The southern end of survey H13212 was outside of cellular coverage. In this area a RTK GNSS base station was installed at the NOAA Center for Operational Products and Services (CO-OPS) water level station at Pilot Station East in Southwest Pass. These correctors provided RTK level of accuracy for horizontal and vertical positions for all survey data. If a loss of service was experienced during acquisition it was noted by the field watch stander, and those data were further analyzed to be resurveyed. No prolonged outages were experienced while surveying on the network of H13212. Verification of the C4G network correctors were conducted by the field unit at various monuments established by USACE along the shoreline of the OPR-J347-KR-18 project area. The base station was positioned using the National Geodetic Survey (NGS) Online Positioning User Service (OPUS) and compared to an RTK position obtained from the C4G network. Methods, analysis and results of position checks are further documented in the project wide HVCR.

C.3 Additional Horizontal or Vertical Control Issues

C.3.1 RTK corrector sources

LSU's C4G provided RTK corrections for the northern half of H13212. The cutoff line was a perpendicular line to Southwest Pass approximately 8.5 miles Below Head of Passes (BHOP), as shown in Figure 20. The C4G network's most southeast base station, BVHS, is located in Boothville, LA approximately 30 km to the northwest of this line.

Due to the distance of this survey from the reference stations used in LSU’s C4G network, DEA installed a base station (BASE) at the Southwest Pass Pilot Station to provide an additional source of RTK corrections. This station was utilized for all multibeam survey data collected downriver of mile 8.5 BHOP. The base station installation and use followed practices specified in the HSSD and was routinely verified by the field unit by conducting periodic position checks. This was a temporary setup and no permanent survey marker was occupied or established. Figure 21 shows details of this setup location.

Methods, analysis and results of these monument and base station check-ins are further documented in the project wide HVCR.

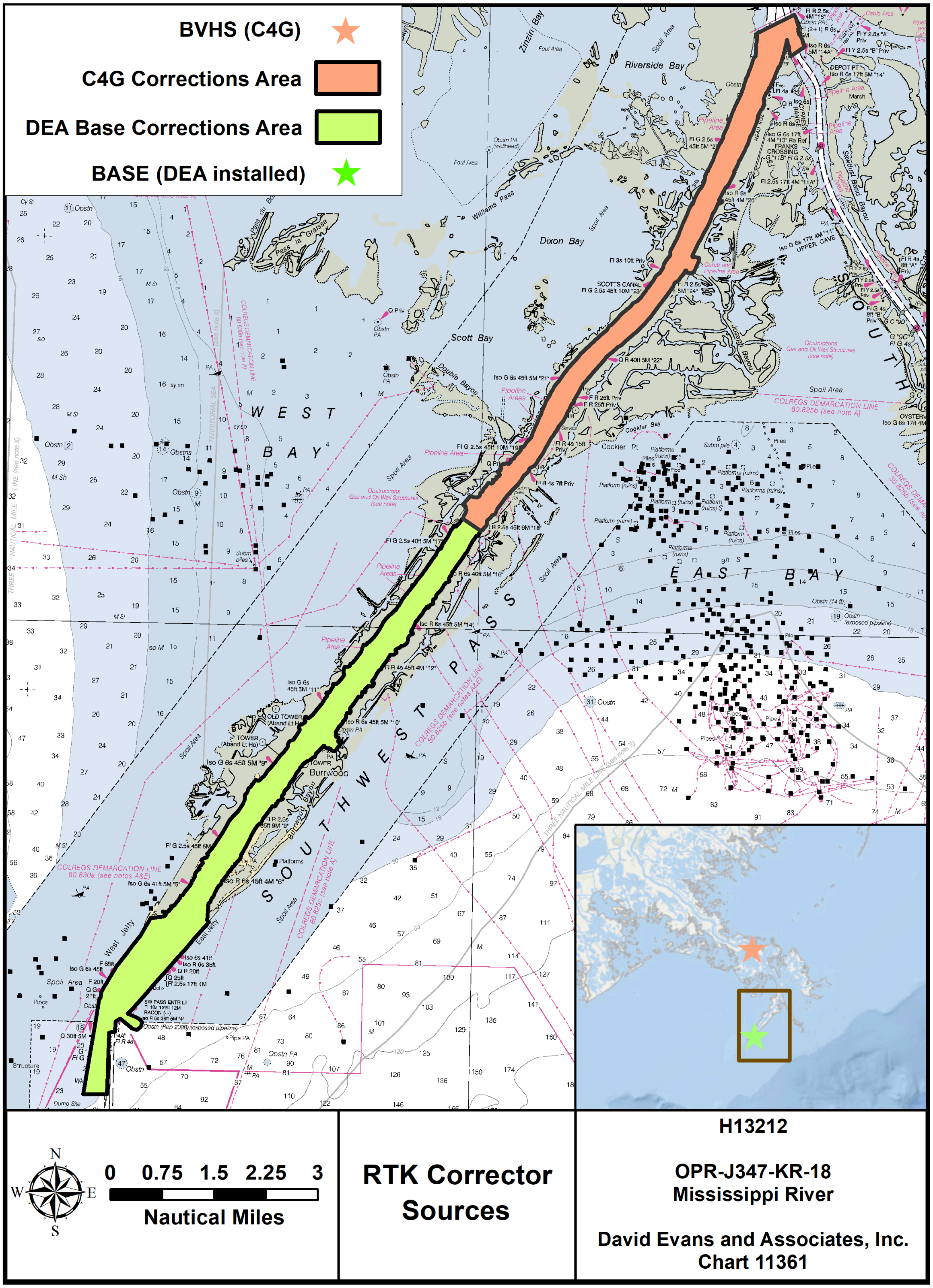


Figure 20: H13212 RTK Corrector Sources

Figure 21: H13212 DEA Installed GNSS Station "BASE"

C.3.2 Water Level Floats

Water level floats were conducted by the field unit at the location of each USACE or NOAA gauge within the OPR-J347-KR-18 project area. Methods, analysis and results of these floats are further documented in the project wide HVCR. In general, these floats helped identify issues between the USACE and NOAA datums and that of the MLLW separation model utilized during acquisition. These tests resulted in iterations to the model by NOAA, discussed in detail in the HVCR.

C.3.3 Separation model change and re-processing

As discussed in section C4 of the DAPR and the project wide HVCR, due to a revision of the separation model used during acquisition, all ERS water levels were reprocessed after the revised model was issued. Refer to section B4.c of the DAPR for an outline of the processing steps.

D. Results and Recommendations

D.1 Chart Comparison

The chart comparison was performed by comparing H13212 survey depths to a digital surface generated from electronic navigational charts (ENCs) covering the survey area. A 10-meter product surface was generated from a triangular irregular network (TIN) created from the ENC's soundings, depth contours, and depth features. An additional 10-meter HIPS product surface of the entire survey area was generated from the 4-meter CUBE surface. The chart comparison was conducted by creating and reviewing a difference surface using the ENC surface and survey surface as inputs. The chart comparison also included a review of all assigned charted features within the survey area. The results of the comparison are detailed below. Sediment migration and other river environmental conditions contribute to a continually changing river bottom resulting in large differences observed by the field unit daily.

The relevant charts used during the comparison were reviewed to check that all US Coast Guard (USCG) Local Notice to Mariners (LNMs) issued during survey acquisition, and impacting the survey area, were applied and addressed by this survey.

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?
US6LA5AM	1:12000	6	07/17/2018	07/23/2019	NO

Table 13: Largest Scale ENCs

<u>US6LA5AM</u>

ENC US6LA5AM covered the full extents of survey H13212. Large differences exist between the surveyed depths and charted soundings mainly contributed to the continuously changing river environment. Figures 22 through 31 show the magnitude of differences along the comparison area.

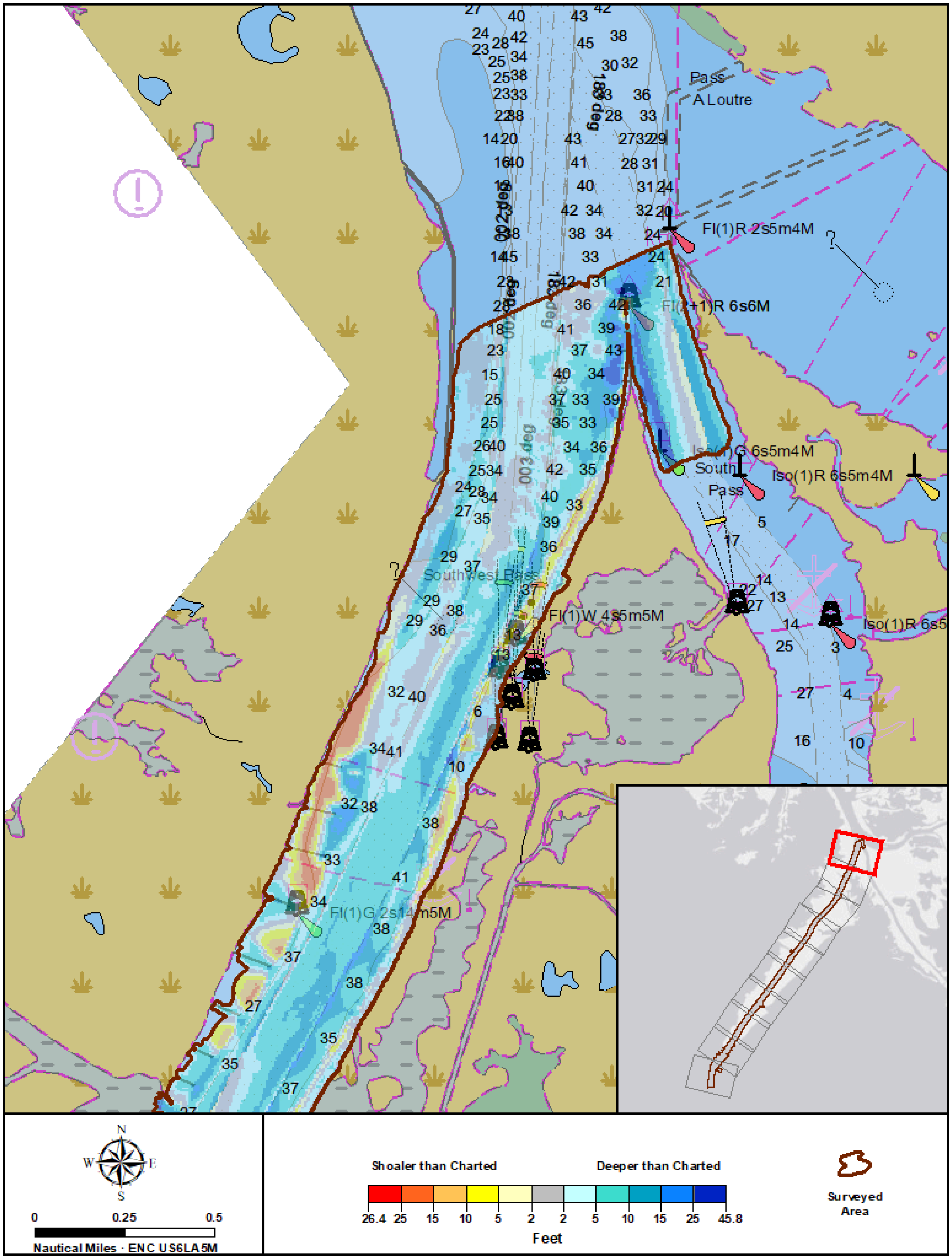


Figure 22: Depth difference between H13212 and chart US6LA5AM, area 1 of 10

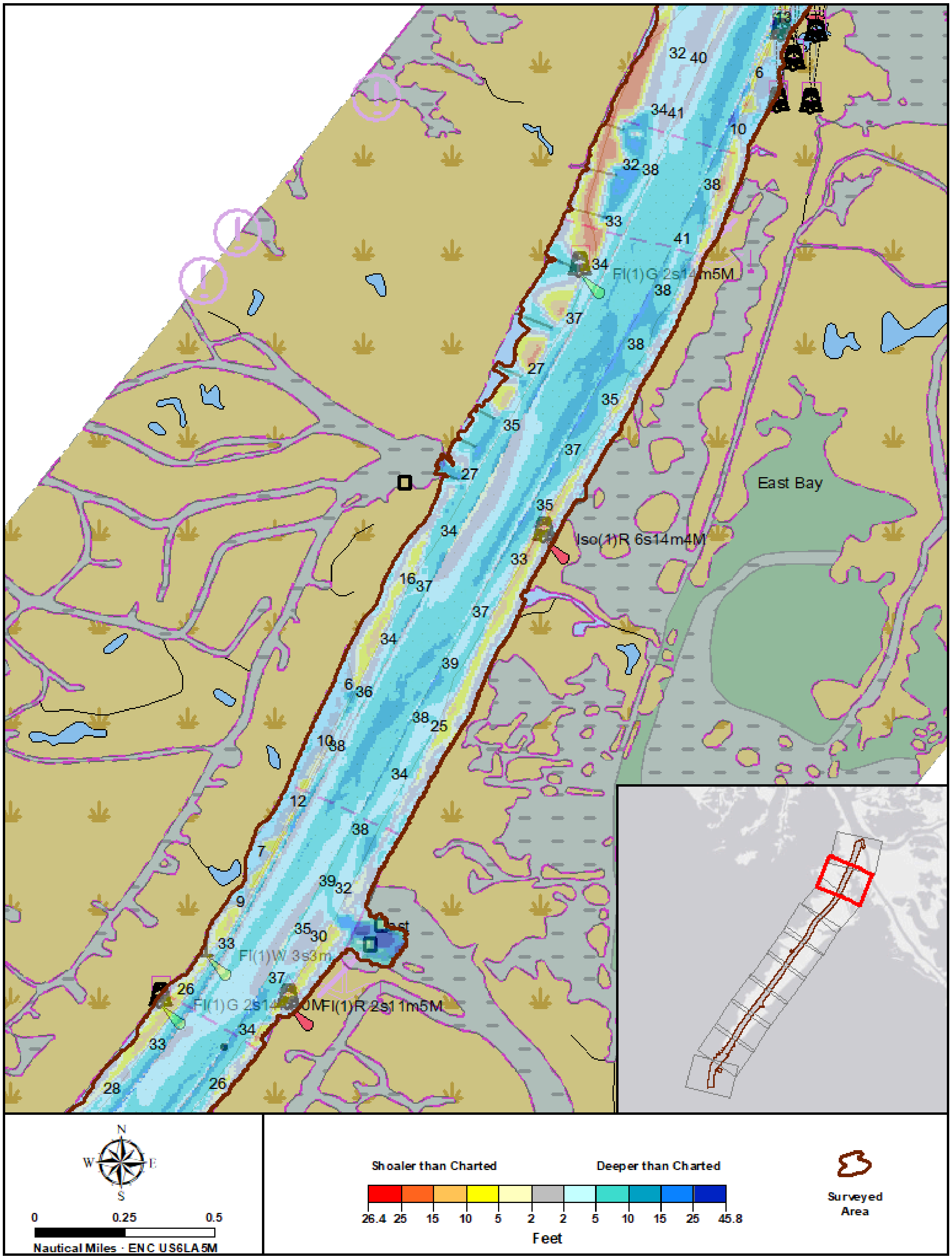


Figure 23: Depth difference between H13212 and chart US6LA5AM, area 2 of 10

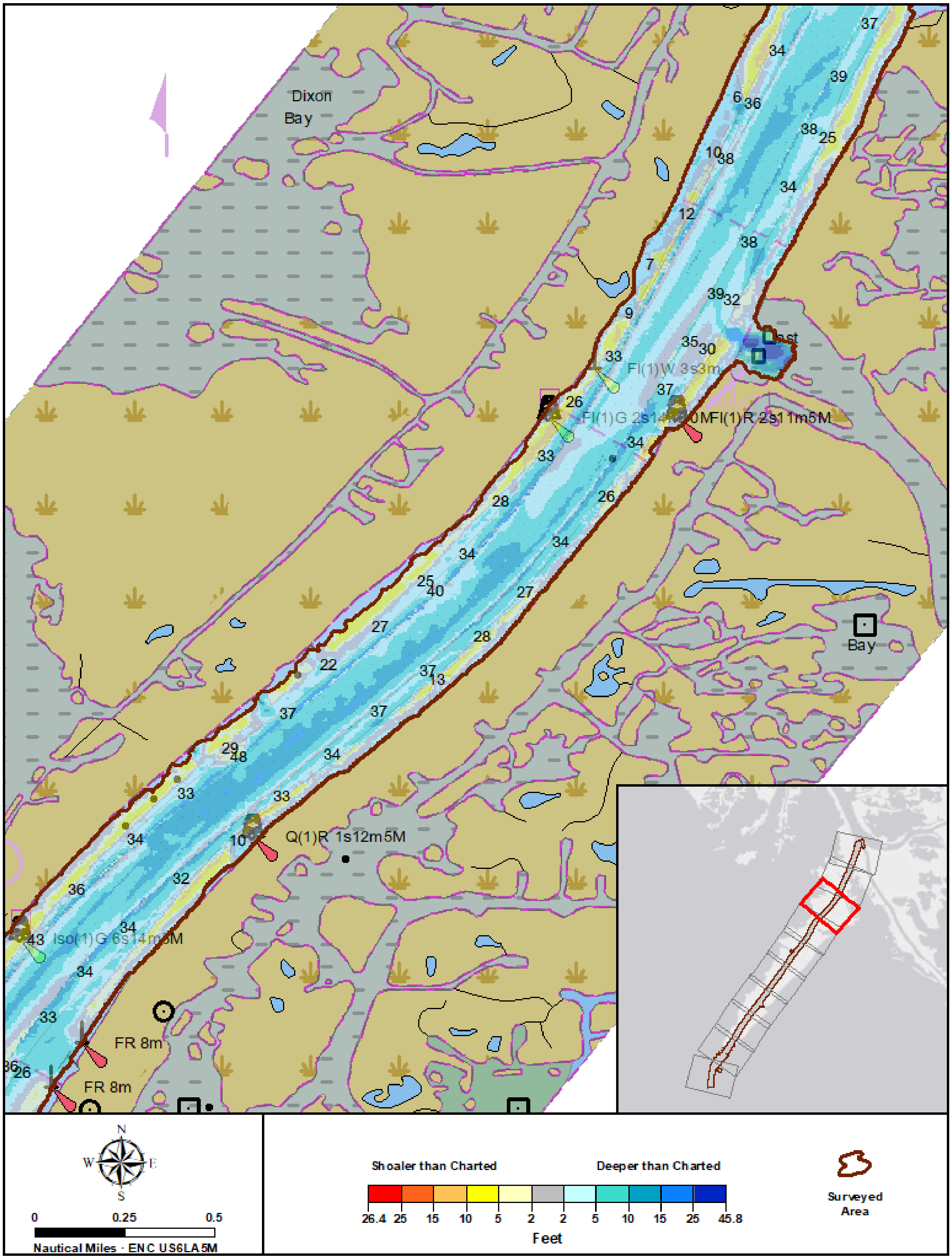


Figure 24: Depth difference between H13212 and chart US6LA5AM, area 3 of 13

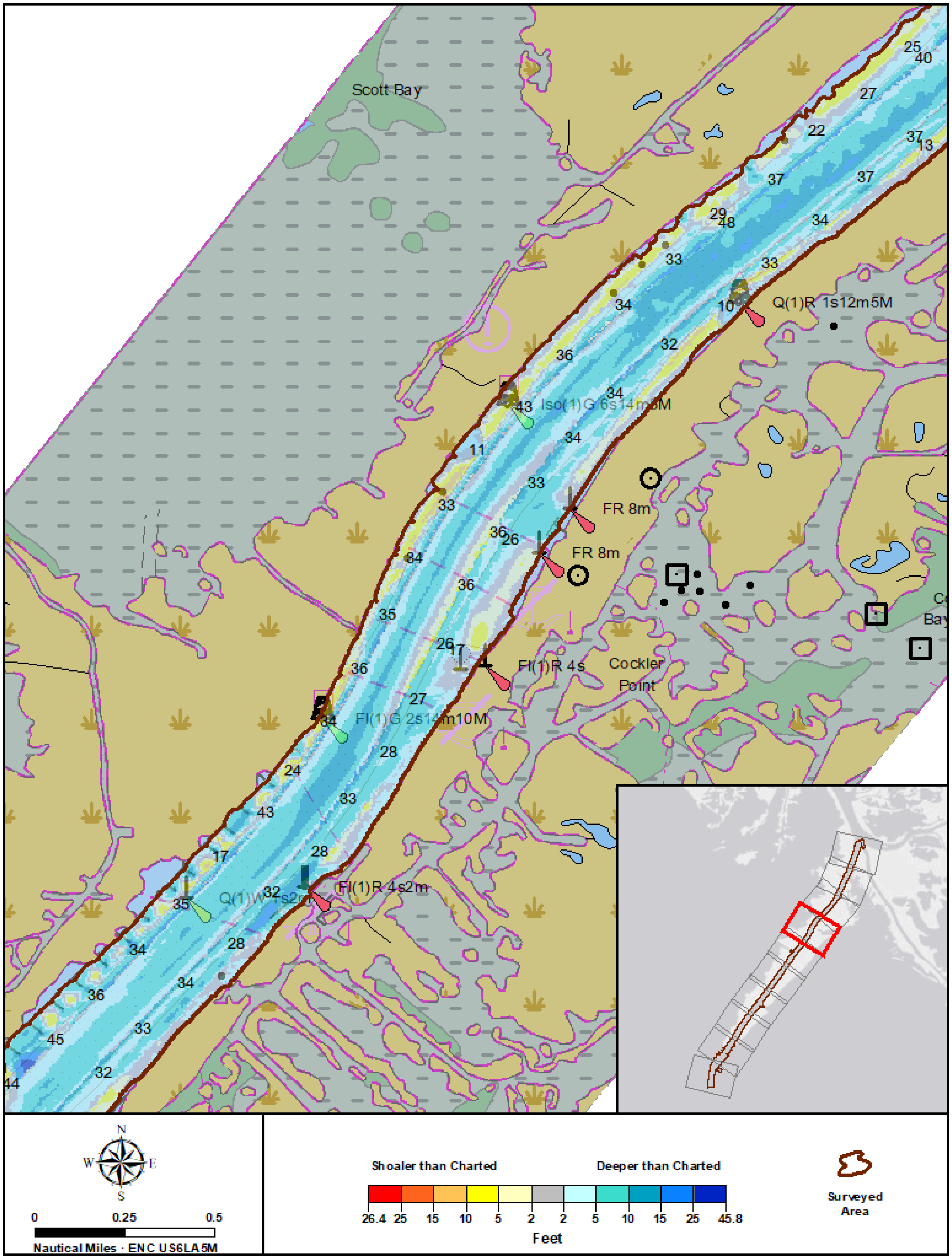


Figure 25: Depth difference between H13212 and chart US6LA5AM, area 4 of 10

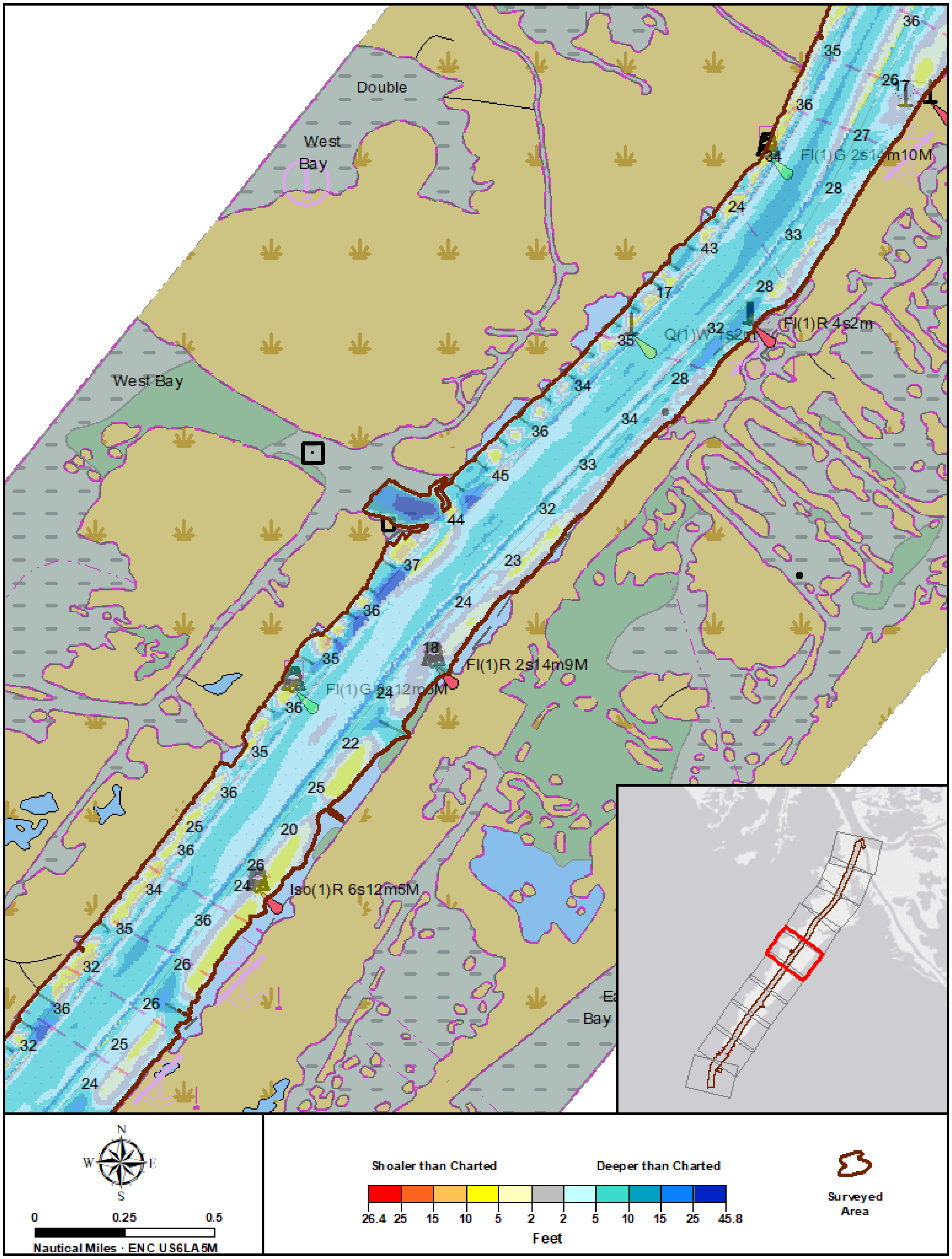


Figure 26: Depth difference between H13212 and chart US6LA5AM, area 5 of 10

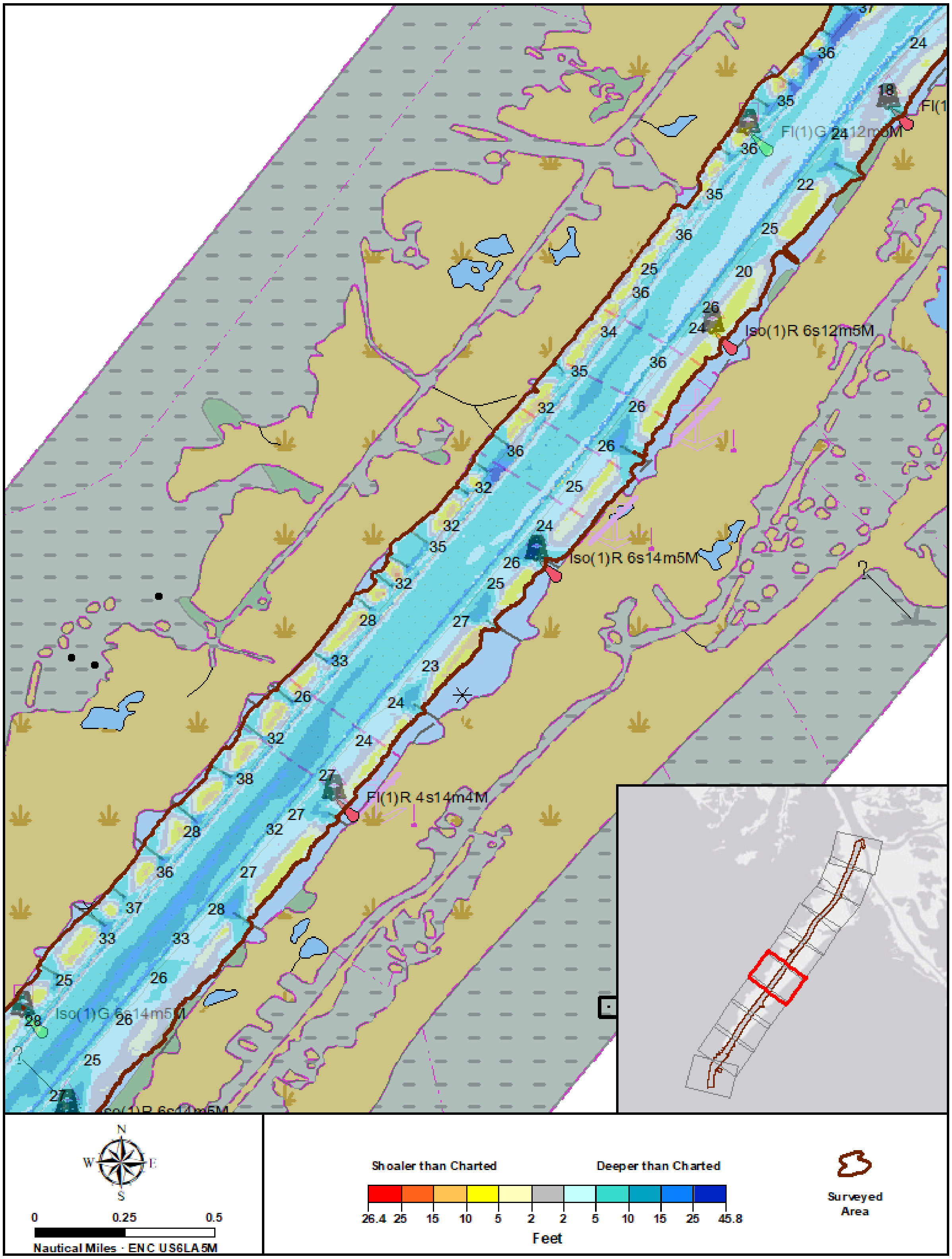


Figure 27: Depth difference between H13212 and chart US6LA5AM, area 6 of 10

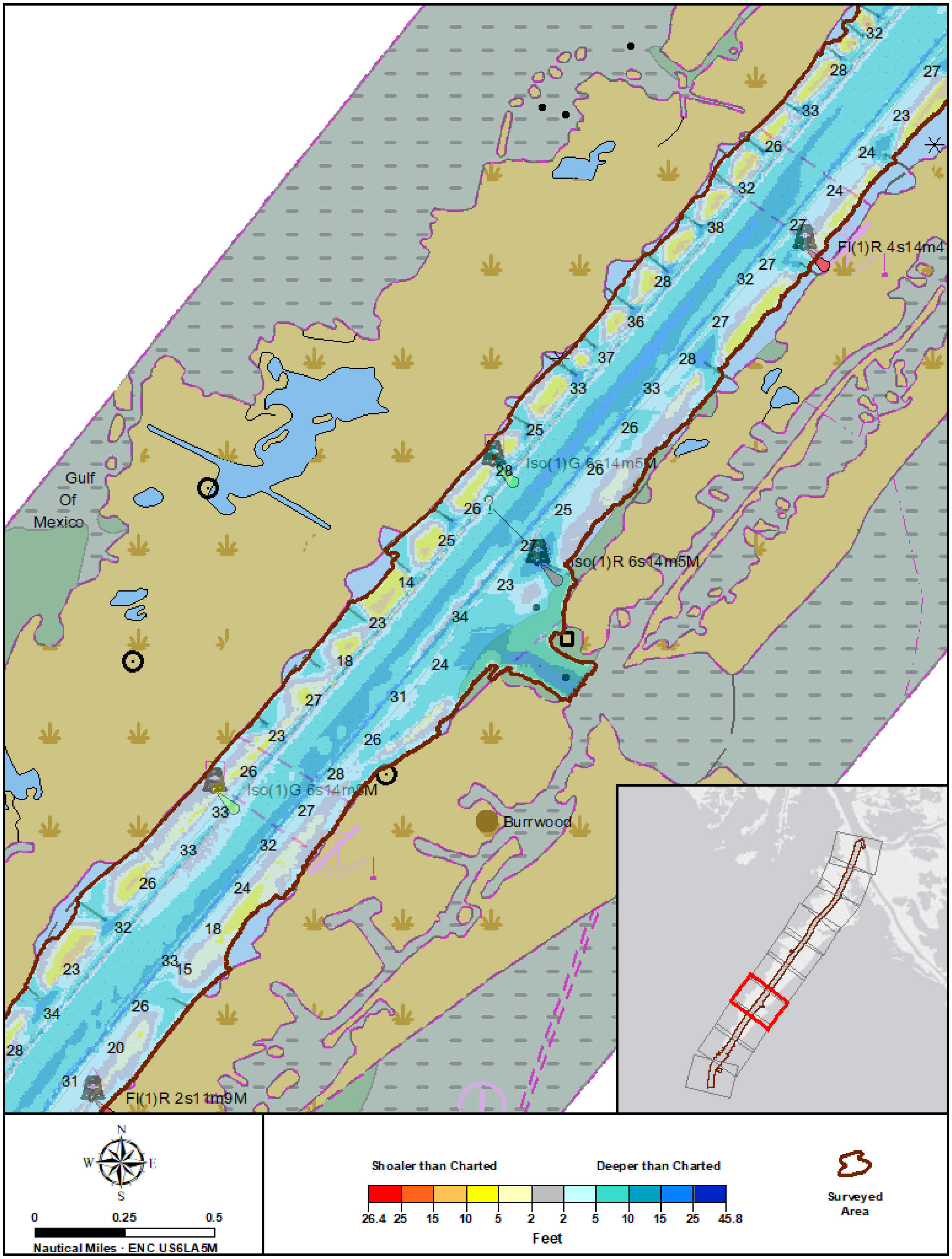


Figure 28: Depth difference between H13212 and chart US6LA5AM, area 7 of 10

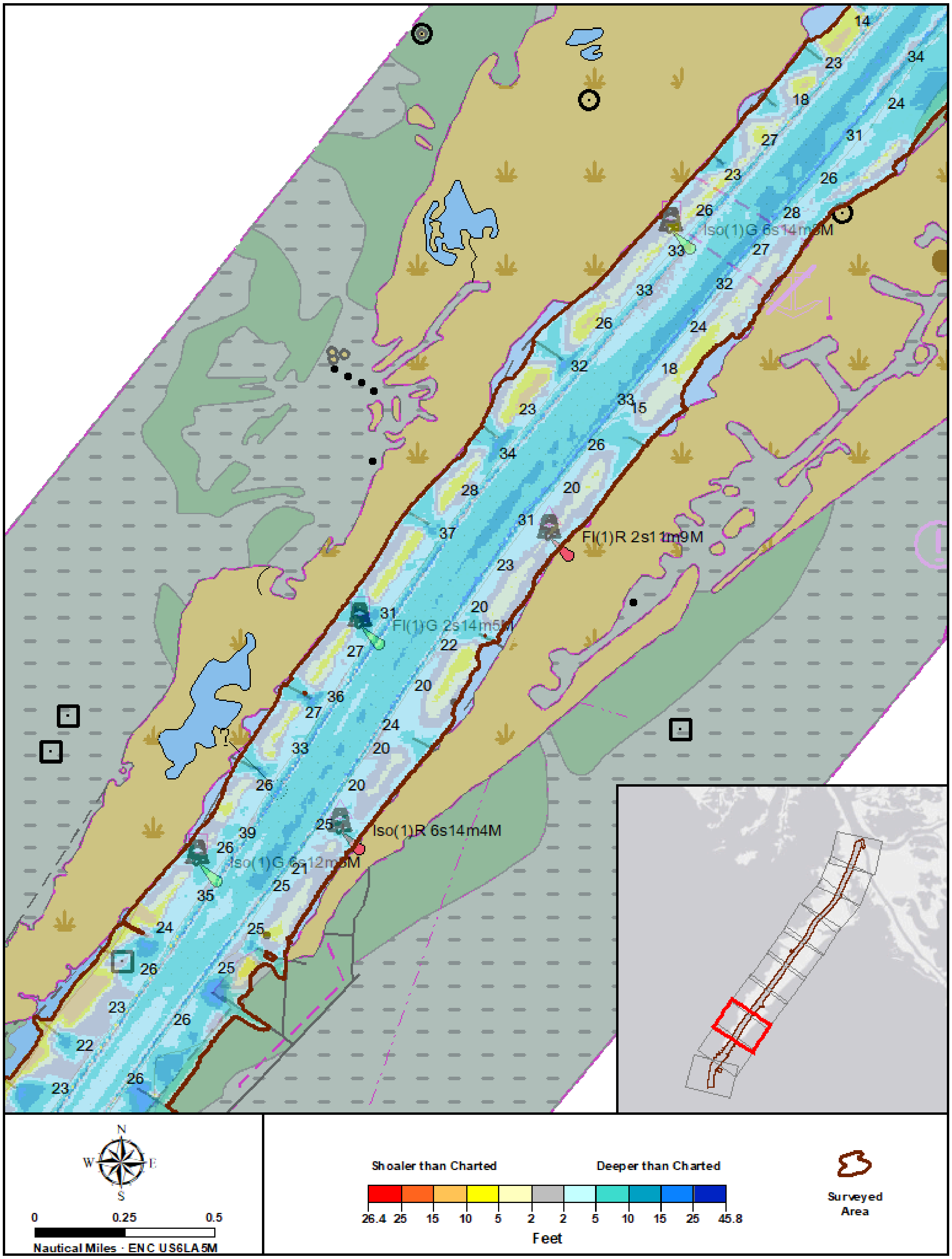


Figure 29: Depth difference between H13212 and chart US6LA5AM, area 8 of 10

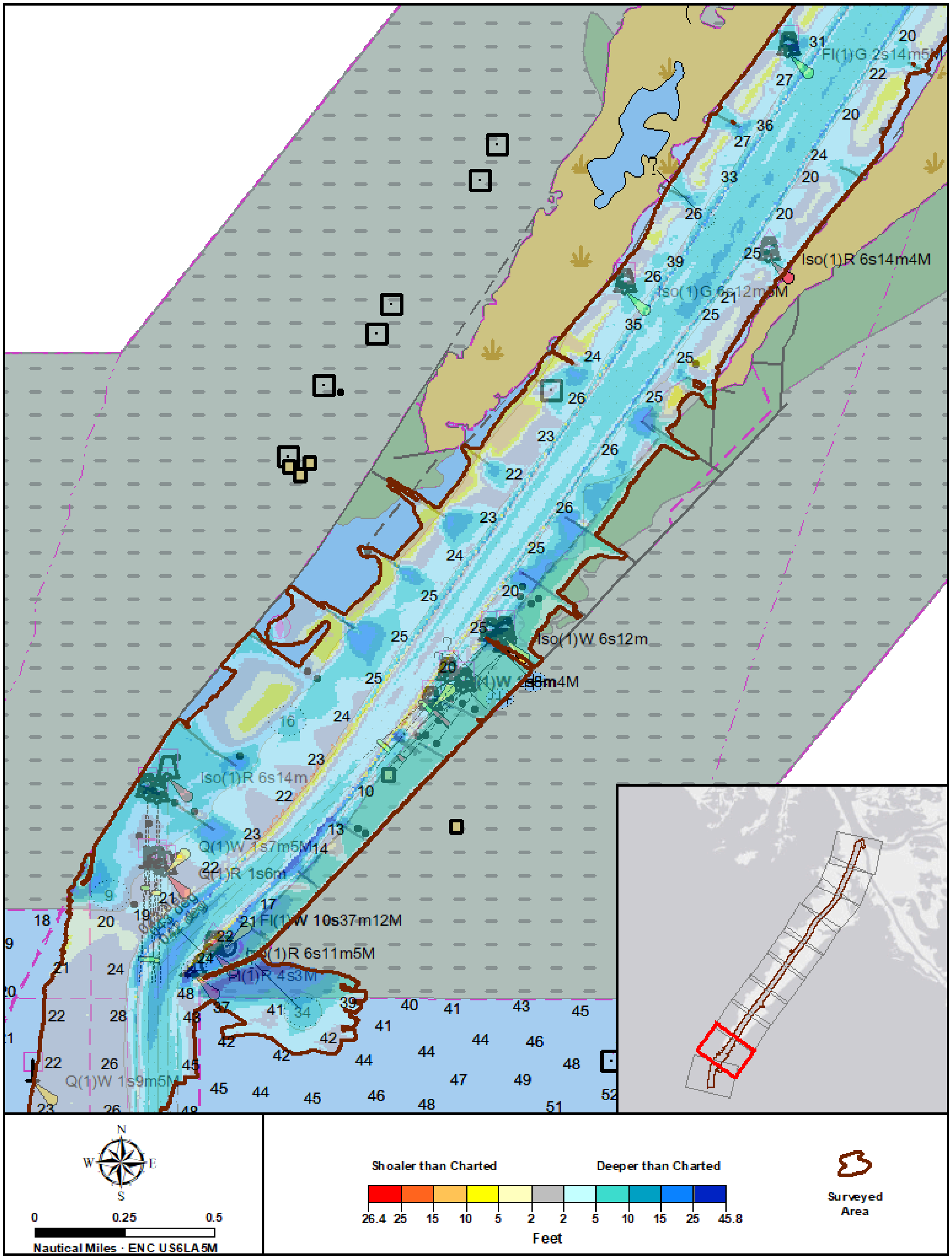


Figure 30: Depth difference between H13212 and chart US6LA5AM, area 9 of 10

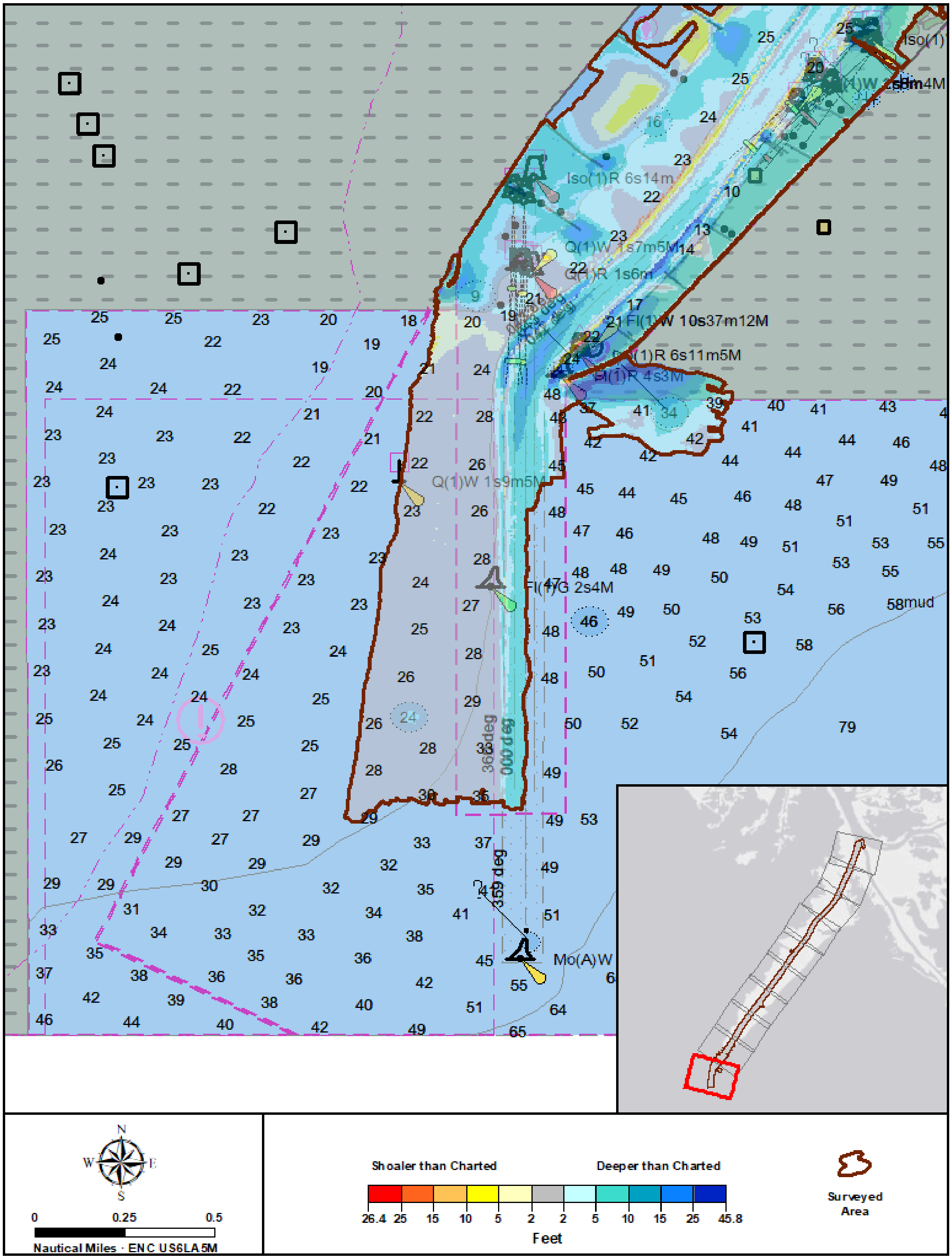


Figure 31: Depth difference between H13212 and chart US6LA5AM, area 10 of 10

D.1.2 Maritime Boundary Points

No Maritime Boundary Points were assigned for this survey.

D.1.3 Charted Features

Numerous charted features exist within the limits of sheet H13212. All assigned features included in the project CSF have been addressed by the survey and are included in the FFF. Due to the large scale of the survey (1:5,000), many charted features have been recommended for deletion to be replaced by new higher resolution features digitized from the survey data. The hydrographer frequently requested guidance from HSD staff on appropriate depiction and attribution of features when the procedures set in the HSSD were insufficient to support the requirements of this precision navigation survey. Copies of this correspondence are included in Appendix II.

The survey area includes numerous charted features labeled as Reported (Rep), Position Approximate (PA), and Position Doubtful (PD).

- The Obstruction PD (Position Doubtful) with least depth unknown charted along the western edge of the Southwest Pass Channel at mile 1.6 BHOP (Below Head of Passes) was disproved by the survey.
- The Pile PA (Position Approximate) charted along the eastern edge of the Southwest Pass Channel at mile 4.9 BHOP was disproved by the survey.
- The Pile PA charted east of the Southwest Pass Channel at mile 9.2 BHOP was disproved by the survey.
- The Obstruction PA with depth unknown charted in the vicinity of Southwest Pass Light 10 at mile 14.2 BHOP was disproved by the survey. A new submerged obstruction was surveyed 21 meters northwest of the charted location.
- The Pile PA charted south of Southwest Pass Light 10 at mile 14.3 BHOP was disproved by the survey.
- The Piles PA charted south of Southwest Pass Light 10 at mile 14.5 BHOP was disproved by the survey. A new submerged pile was surveyed in this position.
- The Pile PA charted east of the Southwest Pass Channel at mile 16.9 BHOP was disproved by the survey.
- The Obstruction PA with least depth unknown charted along the western edge of the Southwest Pass Channel at mile 17.4 BHOP was disproved by the survey.
- The Obstruction PA with depth unknown charted south of Southwest Pass East Jetty End Light 4 has been disproved by the survey. A new obstruction depicted by an area feature was surveyed at this location.
- The 35-foot Obstruction Reported 2008 (exposed pipeline) charted southeast of the Southwest Pass East Jetty End Light 4 was disproved by the survey.

All disproved features have been included in the FFF with a description of ‘Delete’. All new features have been included in the FFF depicting the feature as surveyed and with a description of ‘New.’

Multiple training walls were located in the survey area and surveyed with a mix of multibeam and mobile laser scanner coverage. The majority of the training walls were found in a ruined condition during survey operations; often consisting of sections of interspersed baring and submerged piles. HSD staff provided guidance on the desire to depict the pile dikes as a single line feature rather than multiple lines segments with varying water level effect (WATLEV) attribution. Training walls were digitized following the approximate centerline of the ruined section and may deviate from the surveyed location of individual piles. Least depths of submerged portions of training walls were not designated based on this guidance. A copy of this correspondence is included in Appendix II. All training walls are included in the FFF and include image attribution from photos acquired during survey operations.

D.1.4 Uncharted Features

All uncharted features discovered during survey acquisition are addressed in the FFF. Refer to the FFF for additional information.

D.1.5 Shoal and Hazardous Features

No DtoNs were submitted for this survey. Potential DtoNs are included as new features in the FFF. Because of the significant change that occurred within the project area since the last survey of the Mississippi River, HSD staff advised DEA to limit reporting of Dangers to Navigation to immediate hazards that could cause loss of life or impact waterborne commerce.

D.1.6 Channels

There are no designated anchorages, traffic separation schemes, or pilot boarding areas within the limits of H13212.

The entire extent of H13212 includes and runs along the channel, Southwest Pass, that provides safe transit into the Mississippi River. According to the chart, the controlling depth for the section of the channel is 45 feet. H13212 also includes the northern portion of South Pass, as it approaches Head of Passes, that has a controlling depth of 17 feet. H13212 has multiple areas, mainly encroachment of the shoulders on the cut bank, that are shoaler than the controlling depth. The controlling depths for both channels were included in the chart comparison images contained in section D.1.1 of this report. Warm colors in the channels, representing H13212 surveyed soundings shoaler than controlling depths, can be seen encroaching into the channel on Figures 22, 23, 25, 26, and 31.

A Safety Fairway junctions the south entrance of the survey area with charted Safety Fairway 166.200. The safety fairway was outside of the survey area and was not investigated during survey operations.

There are ten range lines within the survey limits. Range markers were positioned using vessel based lidar surveying techniques and are included in the FFF.

D.1.7 Bottom Samples

No bottom samples were required for this survey.

D.2 Additional Results

D.2.1 Shoreline

Shoreline investigations were completed using lidar survey techniques. Refer to the DAPR for additional information regarding the acquisition and processing of these data. All new and assigned features have been included in the sheet's FFF with appropriate comments and recommendations.

D.2.2 Aids to Navigation

Aids to Navigation (AtoN) were investigated using mobile lidar and visual observations. AtoNs that were missing, damaged, or not serving their intended purpose were reported to the USCG via email on August 23, 2019. Due to the large number of AtoNs requiring reporting, email was used for reporting instead of using the USCG Navigation Center's Online ATON Discrepancy Report as specified in the HSSD. This method was approved by the HSD Project Manager for this hydrographic survey. A copy of the email submittal is included in Appendix II. AtoNs have been included in the sheet's FFF with appropriate comments and recommendations.

The Southwest Pass Head West Range Rear Light, which was included in the CSF as an unassigned feature, was visible in the mobile laser scanner data collected during survey operations. The aid was confirmed to be on station and serving its intended purpose and has been included in the FFF with a description of 'Retain'.

D.2.3 Overhead Features

No overhead features exist for this survey.

D.2.4 Submarine Features

All submarine features were investigated entirely using object detection MBES coverage.

There are nine cable and pipeline areas charted in the survey extents of H13212, where anchoring, trawling, and dragging are restricted. These precautionary areas were surveyed using object detection MBES coverage techniques and carefully reviewed for any pipelines or cables that were exposed and pose a risk to navigation. Survey H13212 has three charted pipelines, attributed as retain in the FFF, and 38 new pipeline sections included in the FFF. All pipelines located within the survey limits were submitted to the Bureau of Safety and Environmental Enforcement (BSEE).

A pipeline report included in Appendix II, was submitted to the BSEE on August 21, 2019, reporting sections of exposed or unburied pipeline visible in the MBES data. The report indicates the positions of the start and end points of sections of what appear to be exposed pipelines based on interpretation of multibeam data. It is possible that some of the reported items include submerged outfalls and other linear features with a signature of a pipeline that are not associated with oil and gas infrastructure. Due to the inability to accurately depict the location and orientation of all exposed pipelines with a single line segment, these features have been included in the FFF should further action be required after survey submittal. It is not the hydrographer's intention that these pipeline features be used as source information for charting without further validation of origin.

D.2.5 Platforms

No platforms exist for this survey.

D.2.6 Ferry Routes and Terminals

No ferry routes or ferry terminals exist for this survey.

D.2.7 Abnormal Seafloor and/or Environmental Conditions

Large and quickly moving sediment waves from sediment migration were observed during acquisition. Refer to section B.2.6 of this report for additional information.

Large sound speed changes were present during survey operations near the mouth of Southwest Pass. This area where the freshwater from the river mixed with the saltwater from the gulf showed changes in the watercolumn exceeding 50 m/s. Refer to section B.2.7 of this report for additional information.

D.2.8 Construction and Dredging

Construction of shoreline features was ongoing during survey operations. This mainly included the building of new shoreline stabilization using boulders placed by cranes. Barges containing boulders and cranes are shown in lidar data. This work was ongoing after survey operations concluded, therefore SLCONS and other shoreline features contained in the FFF may be outdated. Figure 32 shows an example of these ongoing construction operations.

The USACE Mississippi Valley Division, New Orleans District (MVN) had numerous dredging projects during the time of survey operations in H13212 to address the active shoaling in Southwest Pass deposited by long-term high river stages during historic flooding. Bathymetric data was collected before, during, and after dredging activities; resulting in large disagreements of river bottom locations and artifacts in the surface. In addition, dredging operations typically created an extremely turbid water column with suspended sediment that lowered the efficiency of the MBES returns.

The areas of active dredging were surveyed using object detection MBES coverage techniques and carefully reviewed. Dredging areas that created disagreement in the MBES surface were documented in the H13212_Notes_for_Reviewers.hob file with the DRGARE area feature class, submitted in Appendix II of this report.

The following dredging activities were observed during survey operations on this sheet:
- The hopper dredge, Glenn Edwards, was observed actively dredging at Head of Passes to approximately 1 mile BHOP on February 27, 2019.
- The cutter dredge, Captain Frank, was observed actively dredging from approximate miles 4-5 BHOP on April 29, 2019.
- The cutter dredge, R.S. Weeks, was observed actively dredging from approximate miles 5-7 BHOP on March 13, 2019.
- The hopper dredge, Bayport, was observed actively dredging from approximate miles 8-9 BHOP on April 13, 2019.
- The hopper dredge, Stuyvesant, was observed actively dredging from approximate miles 15-17 BHOP on April 20, 2019 and again on April 28, 2019.

Figure 32: Ongoing construction observed during H13212 survey operations

D.2.9 New Survey Recommendation

The hydrographer recommends that this area be resurveyed regularly due to the significant change in depths from sediment migration and dredging activity observed over the project timeline.

D.2.10 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, with the exception of the deficiencies outlined in this report. All records are forwarded for final review and processing to the Processing Branch.

The survey data meets or exceeds requirements as set forth in the NOS Hydrographic Surveys Specifications and Deliverables, Field Procedures Manual, and Letter Instructions. These data are adequate to supersede charted data in their common areas. This survey is complete and no additional work is required.

Report Name	Report Date Sent
Data Acquisition and Processing Report	2019-09-19
Coast Pilot Report	2019-07-11

Approver Name	Approver Title	Approval Date	Signature
Jonathan L. Dasler, PE, PLS, CH	NSPS/THSOA Certified Hydrographer, Chief of Party	09/26/2019	Digitally signed by Jon L. Dasler DN: cn=Jon L. Dasler, o=David Evans and Associates, Inc., ou, email=jld@deainc.com, c=US Date: 2019.09.26 11:25:06 -07'00'
Jason Creech, CH	NSPS/THSOA Certified Hydrographer, Charting Manager / Project Manager	09/26/2019	Digitally signed by Jason Creech DN: cn=Jason Creech, o=David Evans and Associates, Inc., ou, email=jasc@deainc.com, c=US Date: 2019.09.26 11:30:24 -07'00'
Callan McGriff, EIT	IHO Cat-A Hydrographer, Lead Hydrographer	09/26/2019	Digitally signed by Callan McGriff DN: cn=Callan McGriff, o=David Evans and Associates, Inc., ou, email=cemc@deainc.com, c=US Date: 2019.09.26 11:32:58 -07'00'
David T. Moehl, PLS, CH	NSPS/THSOA Certified Hydrographer, Lead Hydrographer	09/26/2019	Digitally signed by Dave Moehl DN: cn=Dave Moehl, o=David Evans and Associates, Inc., ou=Marine Services Division, email=dtm@deainc.com, c=US Date: 2019.09.26 11:34:36 -07'00'

F. Table of Acronyms

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

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

Acronym	Definition
PRF	Project Reference File
PS	Physical Scientist
RNC	Raster Navigational Chart
RTK	Real Time Kinematic
RTX	Real Time Extended
SBES	Singlebeam Echosounder
SBET	Smooth Best Estimate and Trajectory
SNM	Square Nautical Miles
SSS	Side Scan Sonar
SSSAB	Side Scan Sonar Acoustic Backscatter
ST	Survey Technician
SVP	Sound Velocity Profiler
TCARI	Tidal Constituent And Residual Interpolation
TPU	Total Propagated Uncertainty
USACE	United States Army Corps of Engineers
USCG	United States Coast Guard
UTM	Universal Transverse Mercator
XO	Executive Officer
ZDF	Zone Definition File

Jason Creech

From: Jason Creech
Sent: Friday, August 23, 2019 4:02 PM
To: Ussery, James C CIV; Boriskie, Timothy B CIV; Duane, Jesse L BMCS; Shaffer, Jeremy BMC; D08-DG-District-MarineInfo
Cc: Authement, Adam F BOSN3; Martha Herzog (martha.herzog@noaa.gov); Tim Osborn (Tim.Osborn@noaa.gov); Jon Dasler (Jld@deainc.com)
Subject: Mississippi River Aton Discrepancies - Mile 233 AHOP to Mile 22 BHOP
Attachments: H13188_USCG_AtoNs_RM_205_to_233.xlsx; H13189_USCG_AtoNs_RM_180_to_205.xlsx; H13190_USCG_AtoNs_RM_157_to_180.xlsx; H13191_USCG_AtoNs_RM_130_to_157.xlsx; H13192_USCG_AtoNs_RM_104_to_130.xlsx; H13193_USCG_AtoNs_RM_78_to_104.xlsx; H13194_USCG_AtoNs_RM_54_to_78.xlsx; H13196_USCG_AtoNs_RM_26_to_0.xlsx; H13212_USCG_AtoNs_RM_0_to_-22.xlsx

Hi Jim

We've completed our review of charted AtoNs located within our Mississippi River hydrographic project area and have generated AtoN Discrepancies reports for USCG. Similar to the report for Mile 54 AHOP to Mile 26 AHOP submitted on June 26, 2019, each attached spreadsheet includes new and missing ATONs as well any ATON found to be more than 2 meters out of position. All positions (Lat/Long in the spreadsheet) are referenced to NAD83(2011) and were extracted from our vessel mounted mobile mapping system (MMS) which relied on real-time kinematic GPS during acquisition. These surveys are part of NOAA's Precision Navigation initiative for the Mississippi River and will be used to generate new high resolution charts of the river.

I have attached excel spreadsheets listing the ATON discrepancies for each of the NOAA defined survey areas. Mile 54 AHOP to Mile 26 AHOP, which was previously submitted, has not been included.

H13188 - Mile 233 AHOP to Mile 205 AHOP
H13189 - Mile 205 AHOP to Mile 180 AHOP
H13190 - Mile 180 AHOP to Mile 157 AHOP
H13191 - Mile 157 AHOP to Mile 130 AHOP
H13192 - Mile 130 AHOP to Mile 104 AHOP
H13193 - Mile 104 AHOP to Mile 78 AHOP
H13194 - Mile 78 AHOP to Mile 54 AHOP
H13196 - Mile 26 AHOP to Mile 0 AHOP
H13212 - Mile 0 AHOP to Mile 22 BHOP

I've copied Martha Herzog, the NOAA Office of Coast Survey Project Manager for these surveys and Tim Osborn, the NOAA Central Gulf Coast Regional Navigation Manager on this email.

Please let me know if you have any questions.

Thanks,
Jason

Jason Creech, CH | Vice President, Nautical Charting Program Manager
David Evans and Associates, Inc.
2801 SE Columbia Way, Suite 130 | Vancouver, WA, 98661 | www.deainc.com

H13212_USCG_AtoNs_RM_0_to_-22.xlsx

Remarks1	Remarks2	Object name	Latitude	Longitude	Survey Date
LLNR 12855. Charted beacon not observed visually or in Blake laser data.		Chevron Boat Dock Light	29-02-20.871N	089-19-13.195W	2/13/2019
LLNR 12845. Charted beacon not observed visually or in Blake laser data.		Chevron Pier Light	29-02-19.000N	089-19-33.200W	2/13/2019
LLNR 12860. Relocated from charted position. Position surveyed using MMS data.	Beacon has been located approximately 6m north northeast of charted location.	Double Bayou Light 19	29-02-49.196N	089-19-10.224W	2/13/2019
LLNR 12945. Relocated from charted position. Position surveyed using MMS data.	Beacon has been located approximately 8m west southwest of charted location.	Head of Passes Junction Light	29-08-52.651N	089-15-05.845W	2/13/2019
LLNR 12870. Relocated from charted position. Position surveyed using MMS data.	Beacon has been located approximately24m northwest of charted location.	Shell Terminal Loading Dock Light	29-03-24.873N	089-18-29.602W	2/13/2019
LLNR 12870. Relocated from charted position. Position surveyed using MMS data.	Beacon has been located approximately 25m north of charted location.	Shell Terminal Loading Dock Light	29-03-17.568N	089-18-34.377W	2/13/2019
LLNR 12870. Relocated from charted position. Position surveyed using MMS data.	Beacon has been located approximately 65m north northeast of charted location.	Shell Terminal Loading Dock Light	29-03-18.770N	089-18-33.585W	2/13/2019
LLNR 12665. Relocated from charted position. Position surveyed using MMS data.	Beacon has been located approximately 5m west southwest of charted location.	South Pass Light 15	29-08-28.333N	089-15-00.632W	2/13/2019
LLNR 12730. Relocated from charted position. Position surveyed using MMS data.	Beacon has been located approximately 17m southeast of charted location.	Southwest Pass East Jetty End Light 4	28-54-19.893N	089-25-45.445W	2/13/2019
LLNR 12735. Relocated from charted position. Position surveyed using MMS data.	Beacon has been located approximately 44m southwest of charted location.	Southwest Pass East Jetty End Lighted Buoy 4A	28-54-15.373N	089-25-49.448W	2/13/2019
LLNR 12700. Relocated from charted position. Position surveyed using MMS data.	Beacon has been located approximately 10m east southeast of charted location.	Southwest Pass Entrance East Range Front Light	28-54-33.742N	089-25-53.424W	2/13/2019
LLNR 12740. Relocated from charted position. Position surveyed using MMS data.	Beacon has been located approximately 13m east of charted location.	Southwest Pass Entrance Light	28-54-21.349N	089-25-43.008W	2/13/2019
LLNR 12685. Relocated from charted position. Position surveyed using MMS data.	Beacon has been located approximately 5m north northeast of charted location.	Southwest Pass Entrance Range Front Light	28-54-34.621N	089-25-55.144W	2/13/2019
LLNR 12805. Relocated from charted position. Position surveyed using MMS data.	Beacon has been located approximately 4m southwest of charted location.	Southwest Pass Light 10	28-58-35.390N	089-22-23.705W	2/13/2019
LLNR 12810. Relocated from charted position. Position surveyed using MMS data.	Beacon has been located approximately 4m north northeast of charted location.	Southwest Pass Light 11	28-58-51.953N	089-22-30.810W	2/13/2019
LLNR 12815. Relocated from charted position. Position surveyed using MMS data.	Beacon has been located approximately 6m east of charted location.	Southwest Pass Light 12	28-59-28.047N	089-21-38.728W	2/13/2019
LLNR 12820. Relocated from charted position. Position surveyed using MMS data.	Beacon has been located approximately 7m east southeast of charted location.	Southwest Pass Light 14	29-00-07.996N	089-21-04.826W	2/13/2019
LLNR 12825. Relocated from charted position. Position surveyed using MMS data. Beacon has been replaced by a lighted buoy.	Buoy has been located approximately 12m northwest of charted beacon location.	Southwest Pass Light 16	29-00-46.112N	089-20-35.534W	2/13/2019
LLNR 12830. Relocated from charted position. Position surveyed using MMS data.	Beacon has been located approximately 4m southwest of charted location.	Southwest Pass Light 17	29-01-19.410N	089-20-29.743W	2/13/2019
LLNR 12835. Relocated from charted position. Position surveyed using MMS data.	Beacon has been located approximately 3m northwest of charted location.	Southwest Pass Light 18	29-01-23.813N	089-20-06.255W	2/13/2019
LLNR 12890. Relocated from charted position. Position surveyed using MMS data.	Beacon has been located approximately 21m southwest of charted location.	Southwest Pass Light 24	29-05-08.204N	089-16-50.136W	2/13/2019
LLNR 12900. Relocated from charted position. Position surveyed using MMS data.	Beacon has been located approximately 11m east southeast of charted location.	Southwest Pass Light 26	29-06-26.649N	089-16-06.435W	2/13/2019
LLNR 12905. Relocated from charted position. Position surveyed using MMS data.	Beacon has been located approximately 9m south of charted location.	Southwest Pass Light 27	29-07-10.983N	089-16-00.992W	2/13/2019
LLNR 12780. Relocated from charted position. Position surveyed using MMS data.	Beacon has been located approximately 4m north northeast of charted location.	Southwest Pass Light 5	28-56-11.249N	089-24-36.777W	2/13/2019
LLNR 12785. Relocated from charted position. Position surveyed using MMS data.	Beacon has been located approximately 12m southeast of charted location.	Southwest Pass Light 6	28-56-16.227N	089-24-12.523W	2/13/2019
LLNR 12695. Relocated from charted position. Position surveyed using MMS data.	Beacon has been located approximately 31m southwest of charted location.	Southwest Pass Lighted Buoy 1	28-53-40.473N	089-26-01.305W	2/13/2019
LLNR 12870. Relocated from charted position. Position surveyed using MMS data.	Beacon has been located approximately 65m north northeast of charted location.	Shell Terminal Loading Dock Light	29-03-18.770N	089-18-33.585W	2/13/2019
LLNR 12865. Relocated from charted position. Position surveyed using MMS data.	Beacon has been located approximately 3m south southeast of charted location and app	ENERGY PARTNERS OUTFALL LIGHT	29-02-57.106N	089-18-47.285W	2/13/2019
Uncharted, lighted beacon surveyed using Blake laser data. Unable to determined light attribution during day ops.			29-01-47.011N	089-20-07.079W	2/13/2019

Jason Creech

From: Jason Creech
Sent: Friday, August 23, 2019 10:49 AM
To: pipelines@bsee.gov
Cc: Martha Herzog (martha.herzog@noaa.gov); Tim Osborn (Tim.Osborn@noaa.gov); Jon Dasler (Jld@deainc.com); Angie Gobert (angie.gobert@bsee.gov)
Subject: Mississippi River Unburied Pipelines H13212 - Mile 0 AHOP to Mile 22 BHOP
Attachments: H13212_Exposed_Pipelines.zip; H13212_Exposed_Pipelines_for_BSEE.xlsx

Good Afternoon

While performing hydrographic surveys of the Mississippi River for NOAA Office of Coast Survey, David Evans and Associates, Inc. has discovered what appear to be multiple segments of unburied pipelines within survey area H13212 which extends from Mile 0 AHOP to Mile 22 BHOP. I have included a text description if each exposure below and attached two files supporting this report. Attached is a spreadsheet containing the locations of the start and end points of the segments and a zip file containing screen shots from our multibeam sonar data and overview maps of each exposure. This report is based on interpretation of multibeam sonar data. All reported exposures have the signature of a pipeline. All coordinates are relative to NAD83(2011) and listed in degrees minutes seconds (DMS). Angie Gobert, BSEE Chief, Supervisory Petroleum Engineer, Pipeline Section has provided input on the format of the spreadsheet and report.

Please let me know if you have any questions or require additional information. Martha Herzog, the NOAA Project Manager for these surveys, and Tim Osborn, the NOAA Central Gulf Coast Regional Navigation Manager have been copied on this email.

Thank you,
Jason Creech

H13212_Pipelines_01_A is a segment of exposed pipeline approximately 20 feet in length with starting coordinates 28 58 00.216N, 89 22 52.278W and ending at 28 58 00.335N, 89 22 52.451W. The exposed segment has a bearing of 309 degrees and was identified in multibeam echosounder data acquired on April 18, 2019 (DN 108). The pipeline is not located within a charted pipeline area and rises approximately 3 feet above the surrounding river bottom.

H13212_Pipelines_01_B is a segment of exposed pipeline approximately 91 feet in length with starting coordinates 28 57 59.576N, 89 22 51.178W and ending at 28 57 59.605N, 89 22 52.181W. The exposed segment has a bearing of 93 degrees and was identified in multibeam echosounder data acquired on April 18, 2019 (DN 108). The pipeline is not located within a charted pipeline area and rises approximately 3 feet above the surrounding river bottom.

H13212_Pipelines_02_A is a segment of exposed pipeline approximately 135 feet in length with starting coordinates 28 58 15.395N, 89 22 24.373W and ending at 28 58 16.595N, 89 22 23.706W. The exposed segment has a bearing of 207 degrees and was identified in multibeam echosounder data acquired on April 17, 2019 (DN 107). The pipeline is not located within a charted pipeline area and rises approximately 1 foot above the surrounding river bottom.

H13212_Pipelines_02_B is a segment of exposed pipeline approximately 87 feet in length with starting coordinates 28 58 15.269N, 89 22 24.150W and ending at 28 58 15.912N, 89 22 23.495W. The exposed segment has a bearing of 43 degrees and was identified in multibeam echosounder data acquired on April 17, 2019 (DN 107). The pipeline is not located within a charted pipeline area and rises approximately 2 feet above the surrounding river bottom.

H13212_Pipelines_02_C is a segment of exposed pipeline approximately 66 feet in length with starting coordinates 28 58 15.271N, 89 22 23.444W and ending at 28 58 15.880N, 89 22 23.186W. The exposed segment has a bearing of 22 degrees and was identified in multibeam echosounder data acquired on April 17, 2019 (DN 107). The pipeline is not located within a charted pipeline area and rises approximately 2 feet above the surrounding river bottom.

H13212_Pipelines_03 is an area which encompasses many complex pipeline exposures that are difficult to depict with only a start and end point. The area is bounded by the following four coordinates. NW Corner: 29 05 23.714N, 89 16 45.447W NE Corner: 29 05 24.136N, 89 16 29.699W SW Corner: 29 05 15.293N, 89 16 45.155W SE Corner: 29 05 15.714N, 89 16 29.407W.

Jason Creech, CH | Vice President, Nautical Charting Program Manager
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Jason Creech

From: Jason Creech
Sent: Tuesday, June 11, 2019 10:47 AM
To: 'survey.outlines@noaa.gov'
Cc: Martha Herzog (martha.herzog@noaa.gov)
Subject: OPR-J347-KR-18 Survey Outlines
Attachments: H13194_survey_outline.000; H13195_survey_outline.000; H13196_survey_outline.000; H13212_survey_outline.000

Good Morning

I have attached some outlines for completed OPR-J347-KR-18 surveys. Outlines are included for the following surveys:

H13194
H13195
H13196
H13212

Please let me know if you have any questions or feedback on these products.

Thanks,
Jason

Jason Creech, CH | Vice President, Nautical Charting Program Manager
David Evans and Associates, Inc.
2801 SE Columbia Way, Suite 130 | Vancouver, WA, 98661 | www.deainc.com
804.516.7829 | jasc@deainc.com

David Evans and Associates, Inc.
2801 SE Columbia Way, Suite 130
Vancouver, WA 98661
Phone: 360-314-3200
Fax: 360-314-3250

OPR-J347-KR-18
Marine Mammal Trained Observers

Inclusive Dates: 8/9/2018 - 4/30/2019
General Locality: Mississippi River

H Number	Sub Locality	Priority
H13188	Mississippi River, Vicinity of Mile 232.5 to 205	1
H13189	Mississippi River, Vicinity of Mile 205 to 180	2
H13190	Mississippi River, Vicinity of Mile 180 to 156.5	3
H13191	Mississippi River, Vicinity of Mile 156.5 to 130	4
H13192	Mississippi River, Vicinity of Mile 130 to 104.3	5
H13193	Mississippi River, Vicinity of Mile 104.3 to 78	6
H13194	Mississippi River, Vicinity of Mile 78 to 54	7
H13195	Mississippi River, Vicinity of Mile 54 to 26	8
H13196	Mississippi River, Vicinity of Mile 26 to 0	9
H13212	Mississippi River, Southwest Pass	10

Observer	Position	Training Video[1] Date
Brandon Harr	Survey Crew	8/3/2018
Callan McGriff	Survey Crew	7/31/2018
Daniel Prince	Survey Crew	8/20/2018
David Moehl	Survey Crew	8/7/2018
James Guilford	Survey Crew	10/25/2018
Jason Creech	Survey Crew	8/8/2018
Jason Dorfman	Survey Crew	8/22/2018
John Staly	Survey Crew	8/28/2018
Kathleen Slacht	Survey Crew	8/1/2018
Kori Ktona	Survey Crew	8/6/2018
Laura Rajnak	Survey Crew	7/31/2018
Sam Werner	Survey Crew	7/31/2018
Steven Loy	Survey Crew	3/13/2019
Tim McClinton	Survey Crew	8/6/2018
Chris Aaron	Vessel Crew	8/7/2018
George Hopkins	Vessel Crew	8/3/2018
Harry Stutzke	Vessel Crew	8/29/2018
Jarrod Leckich	Vessel Crew	8/3/2018
Jerry David Keith	Vessel Crew	8/3/2018
Ryan Willis	Vessel Crew	8/7/2018
Timothy Kennedy	Vessel Crew	8/3/2018

[1] Marine Species Awareness Training Video: https://www.youtube.com/watch?v=KKo3r1yVBBA

Jason Creech

From: OCS NDB - NOAA Service Account <ocs.ndb@noaa.gov>
Sent: Friday, July 12, 2019 11:30 AM
To: Laura Jeffery - NOAA Federal
Cc: Jason Creech; coast.pilot@noaa.gov; Martha Herzog (martha.herzog@noaa.gov); Richard.Powell@noaa.gov
Subject: Re: OPR-J347-KR-18 Coast Pilot Review Report

The report has been registered by NDB as L-331-2019.

Thanks,
Diane

Nautical Data Branch/Marine Chart Division/
Office of Coast Survey/National Ocean Service/
National Oceanic and Atmospheric Administration
United States Department of Commerce
Contact: ocs.ndb@noaa.gov

On Fri, Jul 12, 2019 at 10:21 AM Laura Jeffery - NOAA Federal <laura.jeffery@noaa.gov> wrote:

> Good morning Jason,
>
> Thank you for your updates - Coast Pilot 5 - Mississippi report. It will be registered and processed soon.
>
> Much appreciated! Have a great day.
>
> On Thu, Jul 11, 2019 at 1:26 PM Jason Creech <Jasc@deainc.com> wrote:
>
>> Good afternoon
>>
>> I have attached the Coast Pilot Review Report for hydrographic survey project OPR-J347-KR-18.
>>
>> Please let me know if you have any questions.
>>
>> Thanks,
>>
>> Jason

Jason Creech, CH | Vice President, Nautical Charting Program Manager

David Evans and Associates, Inc.

2801 SE Columbia Way, Suite 130 | Vancouver, WA, 98661 | www.deainc.com

804.516.7829 | jasc@deainc.com

ENERGY | LAND DEVELOPMENT | MARINE SERVICES | SURVEYING AND GEOMATICS | TRANSPORTATION | WATER AND ENVIRONMENT

--
Laura B. Jeffery
Nautical Publications Branch/NOS
Cartographer/Reviewer
240-533-0073

NOAA-NOS-OCS-NSD-NPB
1315 E. West Hwy
SSMC3, Station 6315
Silver Spring, MD 20910

Jason Creech

From: Martha Herzog - NOAA Federal <martha.herzog@noaa.gov>
Sent: Monday, October 15, 2018 4:43 PM
To: Jason Creech; Jon Dasler
Cc: Kathryn Pridgen - NOAA Federal
Subject: temp nav aids

Hi Jason,

Thanks for your call and updates.

I just double checked and the advice I gave you stands: temporary navigation aids such as those you described to me should **not** be included FFF. Noting them in the DR with any supplemental correspondence you have will suffice. Have you noted anything in any LNMs about the temp lights? (I just checked the latest LNM and didn't see anything about new placement of temp nav aids but did see a note about the first DTON obstruction made it in there.)

As far as laser scanning data, LAS data format will easily work for us.

Martha

From: Martha Herzog - NOAA Federal <martha.herzog@noaa.gov>
Sent: Friday, November 9, 2018 9:47 AM
To: Jason Creech
Cc: Jon Dasler
Subject: Re: MS River sediment migration examples

I spoke with Gene and our consensus was to let CUBE grid as it may and document the sediment migration in the DR. Of course you can always edit or remove soundings if you feel one line or another better represents the seafloor than the gridding algorithm does. For instance in the example of the sediment slump on Across_track_1, based on your observations and knowledge of the environmental conditions, if you feel the sediment fill in will remain, then you can edit the soundings for the grid to represent the shoal.

You can also denote the areas of major changes in the feature file with SNDWAV areas. This would give parity with changed areas in the grid and a heads up to the branch (and mariner) that the depth may be variable.

Martha

On Thu, Nov 8, 2018 at 8:58 AM, Jason Creech <Jasc@deainc.com> wrote:

> Hi Martha
>
> I've attached a few screengrabs from HIPS showing the sediment migration issues we discussed last week during your site visit.
>
> As you can expect this issue is impacting our deliverable surfaces and will show up when AHB runs flier finder or uses other methods to locate line to line disagreement in the survey data. We plan to discuss in the DRs and add some images to make this issue apparent to the reviewer. Let me know if you or Gene have any other suggestions.
>
> Thanks,
>
> Jason
>
> **Jason Creech, CH** | Vice President, Nautical Charting Program Manager
>
> **David Evans and Associates, Inc.**

2801 SE Columbia Way, Suite 130 | Vancouver, WA, 98661 | www.deainc.com

804.516.7829 | jasc@deainc.com

ENERGY | LAND DEVELOPMENT | MARINE SERVICES | SURVEYING AND GEOMATICS | TRANSPORTATION | WATER AND ENVIRONMENT

Jason Creech

From: Martha Herzog - NOAA Federal <martha.herzog@noaa.gov>
Sent: Tuesday, December 18, 2018 5:48 PM
To: Jason Creech
Subject: Mississippi feature questions

Hi Jason,

Thanks for your calls and setting up the meeting. There were a lot of good questions. I just want to ensure I answered all of your questions (aside from bridges.). I've copied your original questions in gray with my answers below in black. Please let me know if I can provide any other clarification.

Happy Holidays,
Martha

1. For SLCONS terminating at the river bank, should we digitize large features (>5m width) as a line or area features? We are not sure where and how to close areas terminating at the shoreline.

For SLCONS > 5m, digitizing them as line or area features is fine as there is no specific distinction in the HSSD about this. Looking at the ENC and speaking with MCD, generally intact piers are digitized as lines. Ruined, submerged, or covers/uncovers are digitized as areas. It is up to your discretion if you follow this logic.

Closing the pier (line or area feature) anywhere inland of the shoreline or at the COALNE is fine. We aren't very picky about this as long there isn't a gap of water between the pier and the shoreline.

2. MORFAC point features exist in the CSF in front of the SLCONS. They are large enough (>5m width) to be created as MORFAC area features. Where a SLCONS (pier) also exists, should we digitize

- a separate, adjacent MORFAC area (that shares an edge with the SLCONS area)
- a single SLCONS area that encompasses the MORFAC area
- a SLCONS area that encompasses the MORFAC area and then also create a MORFAC area on top of the SLCONS area
- Other?

I've gotten a second opinion on what to do with the MORFACs abut piers. It is fine to have the larger pier area include abutting MORFAC into the pier area as in the example.

3. In cases like this, should the SLCONS line features be deleted and redrawn as new or modify?
Should the SLCONS be redrawn as multiple segments that extend only between the MORFAC/SCLONS areas?

The original SLCONS feature should be flagged as "delete" with your surveyed SLCONS as "new."
For a single line SLCONS, it is fine to digitize it through the MORFAC area (especially if the catwalk like structure extends through it) or create separate lines extending through the MORFACs as we don't have a spec for this distinction.

4. Should this set of fenders be digitized split into several sections (A) based on the SLCONS or connected into a single straight line (B)?

For fenders that are co-located with the MORFAC, there is no need for the added fenders. If they differ, then there may be a need depending on the difference in distance.

5. How should we digitize and attribute terminals with conveyors and covered areas?

It is fine to digitize the boathouses and conveyors. I checked the IHO ENC product specification which helps to answer the boathouse question:
https://www.iho.int/iho_pubs/standard/S-57Ed3.1/S-57_AppB.1_AnnA_UOC_e4.0.0_Jun14_EN.pdf
"For covered boathouses, any associated objects should be encoded as they exist in the "real world"; e.g. jetties as SLCONS, pontoons as PONTON, mooring posts as MORFAC. The roofed area may be covered by a BUISGL object of type area, with attribute INFORM = Boathouse or Boatshed. If the service being provided by the structure is known, object classes SMCFAC (see clause 4.6.5) or HRBFAC (see clause 4.6.1) may also be encoded."

AtoNs out of position

6. How far out of position be before we reposition in the FFF?

For non fixed aids such as those on buoys, anything > 5m or greater if that is what the swing radius or how far it may get pushed by current. This can be modified to much less if the hydrographer thinks it is imperative to navigation.

Technically we should be submitting any aid that is incorrectly positioned but we agreed at the start of the project that it would not be necessary to report every that is off by a little and not causing any impact to navigation in order for you not to have to report 1000 lights for each survey. We didn't define a little at the time.

I would definitely report the example in the ppt to the USGC as it is nowhere near the charted or light list location.

7. Should repositioned AtoNs be modify or delete/new?

Delete/New.

8. Should secondary features (fog signals, lights etc.) also be repositioned? In some cases lights on piers appear to be associated with a charted beacons that do not exist. The secondary features are incorrectly charted and the primary features do not exist (*see image for example*).

If you find that it does not exist, flag it as "delete" with an explanation in the remarks.

Subsequent features (fog signal, beacon, etc.) associated with the ATON should follow the position of the ATON. If you can't confirm the secondary feature, the remarks can be something like, "new position of ATON, fog signal not audibly observed at time of survey.

9. Should all repositioned AtoNs be reported to the USCG via the USCG Navigation Center's Online ATON Discrepancy Report?

Yes, for fixed ATONs especially for federal aids or for ATONs positions differing >5m. I'm not sure anyone quite expected this level of mis-positioning. Jason mentioned he would reach out to the USCG to see if reporting can be done in group format instead of by individual ATON. I'll keep asking around here if something else can be done.

I learned a little about the accuracy of light positioning some of which you may already know. While lights should be positioned to 3 decimal places, they often aren't depending on the original source (a zero or two or even three may represent the final decimal positions). For private lights, USCG just take sthe position of what is on the permit which could variable. If the private light position changes and the USCG isn't notified or the light isn't re-permitted, the old position remains in the light list. What is populated in the ENC inform field is often just the comments from the light list. Most USGC districts simply just don't have the funding to validate all of the lights.   If you are finding that the federal nav aids are off, this is problematic as those should be verified more often.

Bridges

10. We are digitizing the footings as surveyed using SLCONS and assume we are required to digitize the bridges depicting the surveyed extents using BRIDGE areas. Bridges charted on the ENCs are broken into multiple segments, each attributed with a clearance height or a value of Unknown.   How should the BRIDGE segments be broken up (one per span, smaller increments for finer resolution clearance identification, other?

11. We plan to report the lowest clearance per BRIDGE area. Typically, the lowest clearance height on a bridge is right at the junction with a bridge pier. Should we use this height for BRIDGE areas junctioning with a pier when it is the lowest clearance value or offset the clearance height search towards the navigable channel?

FYI - the footing areas should be encoded as PYLONS as they are on the chart.
TBD on more guidance on bridges. I've passed on your bridge ppt adding the differing clearance height graphic to Corey who discuss with Rick Brennan and others on how we should proceed on this.

Jason Creech

From: Martha Herzog - NOAA Federal <martha.herzog@noaa.gov>
Sent: Wednesday, February 20, 2019 9:47 AM
To: Jon Dasler
Cc: Jason Creech
Subject: Re: New Orleans District Dredging Update

Jon,

Thanks for the update on the dredging schedule. I assume the dredges are working in the channel and dumping the spoils just outside of the channel. Right now, I agree, continue working and let me know if you see anomalies in the data from the dredging. I've let Corey and others know of the situation, and will let you know if their opinion differs.

Martha

On Tue, Feb 19, 2019 at 5:59 PM Jon Dasler <Jld@deainc.com> wrote:

> Martha,
>
> I was finally able to connect with Michelle Kornick, New Orleans District Chief of Navigation. She relayed that they have been working hard on dredging to keep the channel open since December, primarily from river mile 10.5 Above Head of Passes (AHP) out to the Gulf. Currently there are seven dredges working the area which I have listed below. For reference, Sheet 10 starts at Head of Passes running to the Gulf and river miles are designated as Below Head of Passes (BHP). We have already surveyed to mile 0 at Head of Passes and above.
>
> Hopper dredge river mile 10.0 AHP To 10.5 AHP
>
> Hopper dredge river mile 4.5 AHP To 3.5 AHP
>
> Hopper dredge river mile 3.5 AHP To 2.0 AHP
>
> Cutter dredge river mile 1.5 AHP To 2.0 BHP – any miles designated as BHP are in sheet 10
>
> Hopper dredge river mile 1.0 AHP To 1.5 BHP
>
> Cutter dredge river mile 13.5 BHP To 18.0 BHP – only working problem areas
>
> Hopper dredge alternating between the following areas: river mile 9.5 BHP To 10.5 BHP and 18.0 BHP to 19.5 BHP
>
> Michelle anticipates this are will be worked through the end of high water (end of April, May or June) and they publish these work areas on their website. I have listed her contact information below:
>
> Michelle.s.kornick@usace.army.mil
>
> 504-862-1842

We are inclined to just continue working and move in to Sheet 10 next week but open to discussion. Let us know if you want to discuss this in more detail.

Jon

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Jason Creech

From: Martha Herzog - NOAA Federal <martha.herzog@noaa.gov>
Sent: Monday, April 8, 2019 8:54 AM
To: Jason Creech
Subject: Re: Barges and ATONs

Hi Jason,

I have more info...

4 & 5. Just the master feature (BCNLAT, etc) will suffice as MCD has all the slave attribution. There is no need to include the previous position, but I some info in the remarks whether it is a newly positioned or a brand new ATON would be helpful.

I hope this helps and please let me know if you have any questions.

Martha

On Fri, Apr 5, 2019 at 3:57 PM Martha Herzog - NOAA Federal <martha.herzog@noaa.gov> wrote:

> Hi Jason,
>
> Sorry for the delay, I was trying to get all of the questions fully answered, but here is a start.
>
> 1. Yes, continue digitizing the permanent barges as PONTON areas.
>
> 2. I received further clarification from MCD that is inline with the ENC encoding guide. Categorized the fleeting area as a mooring facility (MORFAC, CATMOR of "tie up wall, WATLEV = floating). You can also use a CTNARE coincident with the MORFAC to highlight it to the mariner, if you choose.
>
> 3. Making the updates to the SLCONS to PONTON is up to your discretion. If you can tell that moves with water level, then PONTON will more accurately represent the feature.
>
> 4.&5 I'm still waiting to hear what would work best for MCD.
>
> 6.& 7. I talked to Jack yesterday and he said he is working on the SEP. Hopefully we'll get it soon.
>
> 8. I think when we talked about the training wall in the past, the question was what to do about the ruined sections and the guidance hasn't changed. They will still be the same SLCONS class but the condition will be ruined. SLCONS, CATSLC=training wall, CONDTN=ruined. Please let me know if this doesn't quite fit with what you are seeing. You can also use WATLEV (always dry, submerged, etc.)
>
> On Tue, Apr 2, 2019 at 3:48 PM Jason Creech <Jasc@deainc.com> wrote:
>
>> Good morning Martha

Thanks for the feedback on these items. We've reviewed and have a few question before we proceed.

1. We have been digitizing barges that are clearly fixed to the shoreline with either piles or with gangways (offices on barges, floating docks) as area features. I just wanted to confirm that both of these feature types should be depicted as PONTON. The project CSF includes some PONTON features from a GC depicting barges fixed to the shoreline with gangways. I have attached a PowerPoint file showing examples of these items which we believe to be permanent/ semi-permanent features.
2. Should we provide a general delineation of areas of barge fleets observed at time of survey? I briefly discussed that as an option when speaking to Captain Brennan at US Hydro. This would allow us to continue to work through the MMS data without delay and would give MCD an idea of where barge fleets were observed during survey operations as they work to determine how best to chart this information. We could include a description of this process in the DRs and attribute the features accordingly. If this is something you'd like us to do, what feature type would you recommend using? These areas would also define areas where barges were observed but we couldn't determine with certainty whether they were permanently fixed along the shoreline.
3. The charts / CSF currently depict some permanent barge piers as SLCONS. Should we update the feature type to PONTON?
4. For the AtoNs, should the .000 file also include the Deleted feature (incorrect position) or will the new (correct) position suffice?
5. Should the AtoNs .000 include the master object only (ex BNCLAT) or master and slave (LIGHTS, DAYMAR) objects?

I also have a few other questions related to the project.

6. Is there any update on a high water datum for the project area? We are currently using the LWRP for all feature heights up river of Head of Passes.
7. Can you provide an estimate for when the new SEP model will be available. We're holding off on scheduling the restart of survey operations until we know when we will have the new model.
8. Did MCD provide any guidance on depictions of the numerous pile dikes / training walls within the survey area. We want to make sure these are properly delineated in the FFF and that we designate these features correctly. We're currently working up some data examples for internal use which I can provide if you like.

That's it for now. Thanks so much for all of your help sorting this out. And let me know if you'd like me to clarify any of our questions.

Jason

From: Martha Herzog - NOAA Federal <martha.herzog@noaa.gov>
Sent: Friday, March 29, 2019 12:53 PM
To: Jason Creech <Jasc@deainc.com>
Subject: Barges and ATONs

Hi Jason,

I finally was about to get a little more information out of MCD for the barges. They are currently looking into a way of delineating the fleeting areas. For barges that are permanent and have piles driven through them, PONTON (floating pier) should work well. Potentially the fleeting areas may be categorized at caution areas, but stand by for the final decision which should happen by the end of next week.

I know it has been a little difficult submitting forms for each ATON that needs repositioning. Could you send me a .000 of the newly position lights per sheet with an indicator (maybe in the INFORM) field of whether they are federally maintained or private? I'll pass these onto MCD who will then poke the USCG about correcting them. Since the USCG is the source authority, MCD will ultimately only take their position.

Thanks,

Martha

Jason Creech

From: Martha Herzog - NOAA Federal <martha.herzog@noaa.gov>
Sent: Tuesday, April 30, 2019 11:19 AM
To: Jason Creech; Jon Dasler
Subject: Follow up to discussion on 4/26

Jason,

Thanks for your call on Friday. I am just following up

WATLEV - I spoke with Stacy, and if you would like to use the 2019 Spec for WATLEV, NOAA would need to issue a modification to the contract. I'm happy to discuss that more and proceed to make a mod if that is convenient for you.

Data under piers - I forwarded the graphics of removing data under the pier to Gene at AHB, He concurs with your method.

For features upriver of Head of Passes, there cannot be any "always dry" features as there is no MHW for the Mississippi. Even baring features at LWRP will have the WATLEV of covers and uncovers.

Training walls - I'm still in the process of double checking the guidance I gave you about the ruined training walls. I'll send a followup email on this.

Martha

Jason Creech

From:	Jack Riley - NOAA Federal <jack.riley@noaa.gov>
Sent:	Friday, May 3, 2019 10:06 PM
To:	Jon Dasler
Cc:	Jason Creech; Rick Brennan; Martha Herzog - NOAA Federal; Corey Allen; Glen Rice
Subject:	Re: FW: Mississippi LWRP Survey Findings PowerPoint
Attachments:	NAD83-LWRP2007_MLLW_Geoid12B.zip

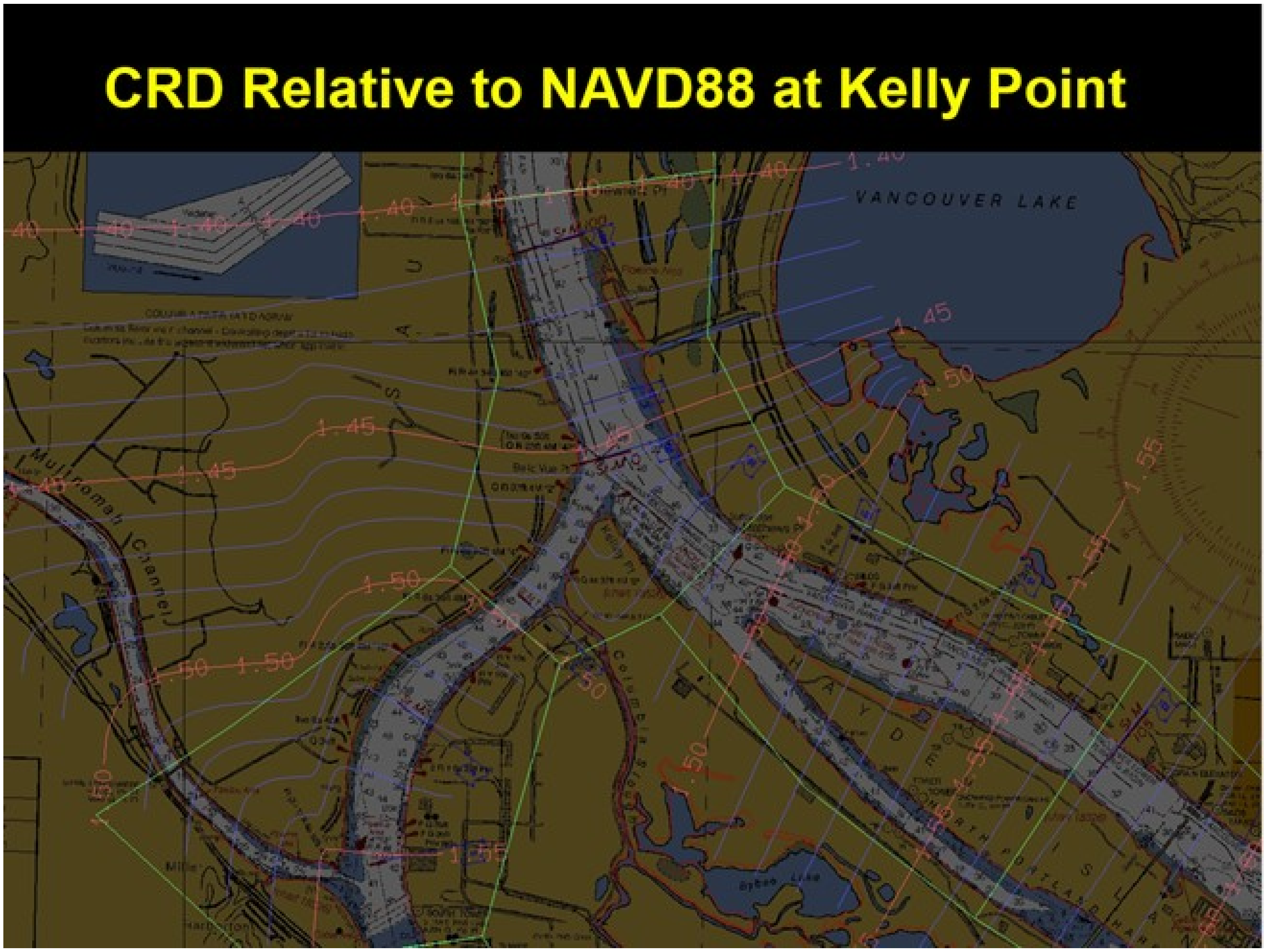
Jon,

See attached for the revised NAD83-LWRP2007/MLLW SEP [m] based upon/incorporating the unadulterated Geoid12B NAVD88, per our discussions through this evening.

Thanks,
Jack
--
Jack L. Riley
Coast Survey Development Lab
240-847-8271

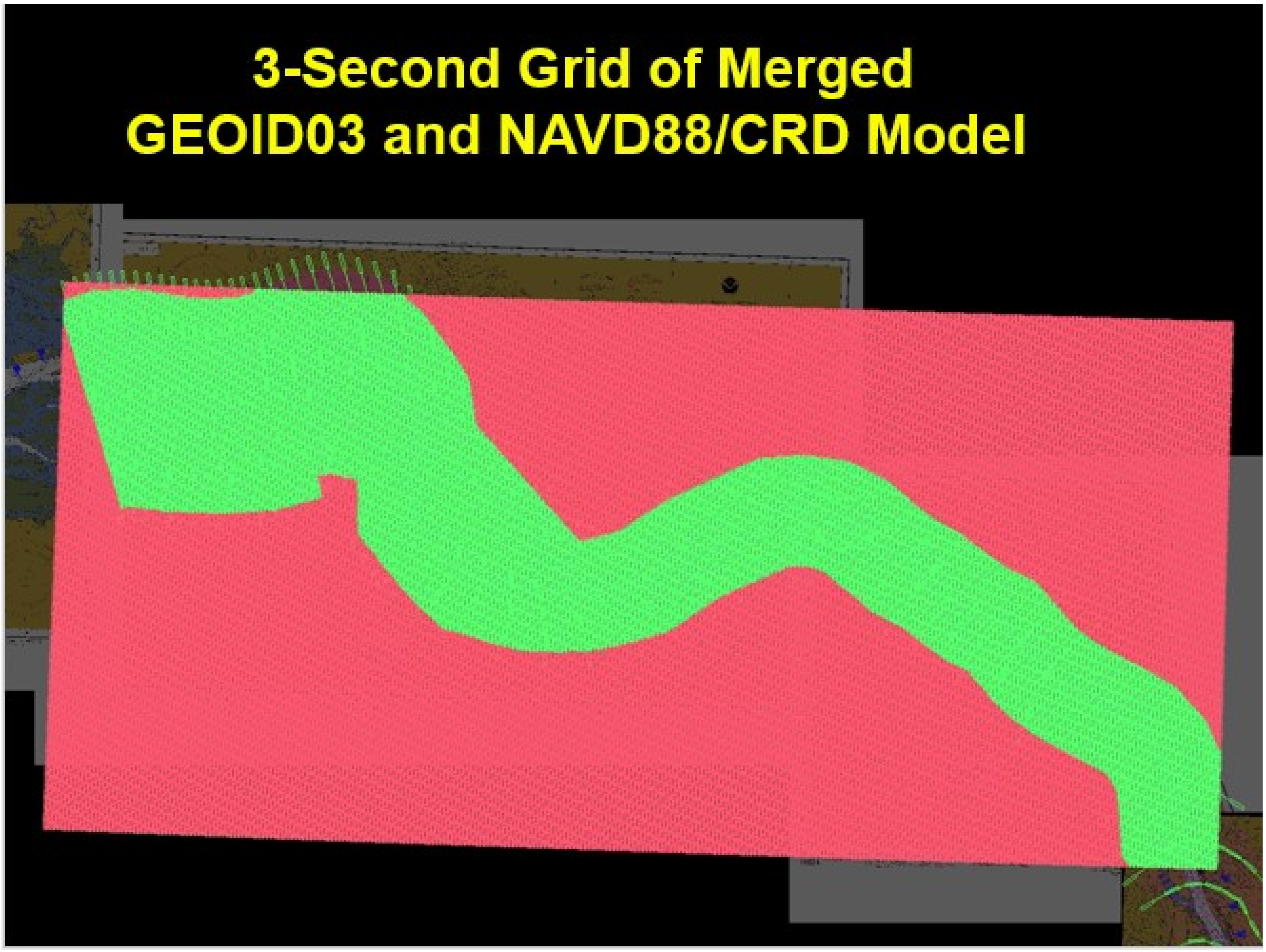
On Fri, May 3, 2019 at 7:48 PM Jon Dasler <Jld@deainc.com> wrote:

> Jack,
>
> I am still in the office if you want to call. I am not sure what you mean by "exclude the 2_D undulations perpendicular to the river". The gradient model should be flat perpendicular to the river and include enough data points to capture geoid undulation when combining with the geoid model (100 meter of 3 arc second grid would be sufficient). Following is and example of the Triangular Irregular Network (TIN) model I generated for the Columbia River.



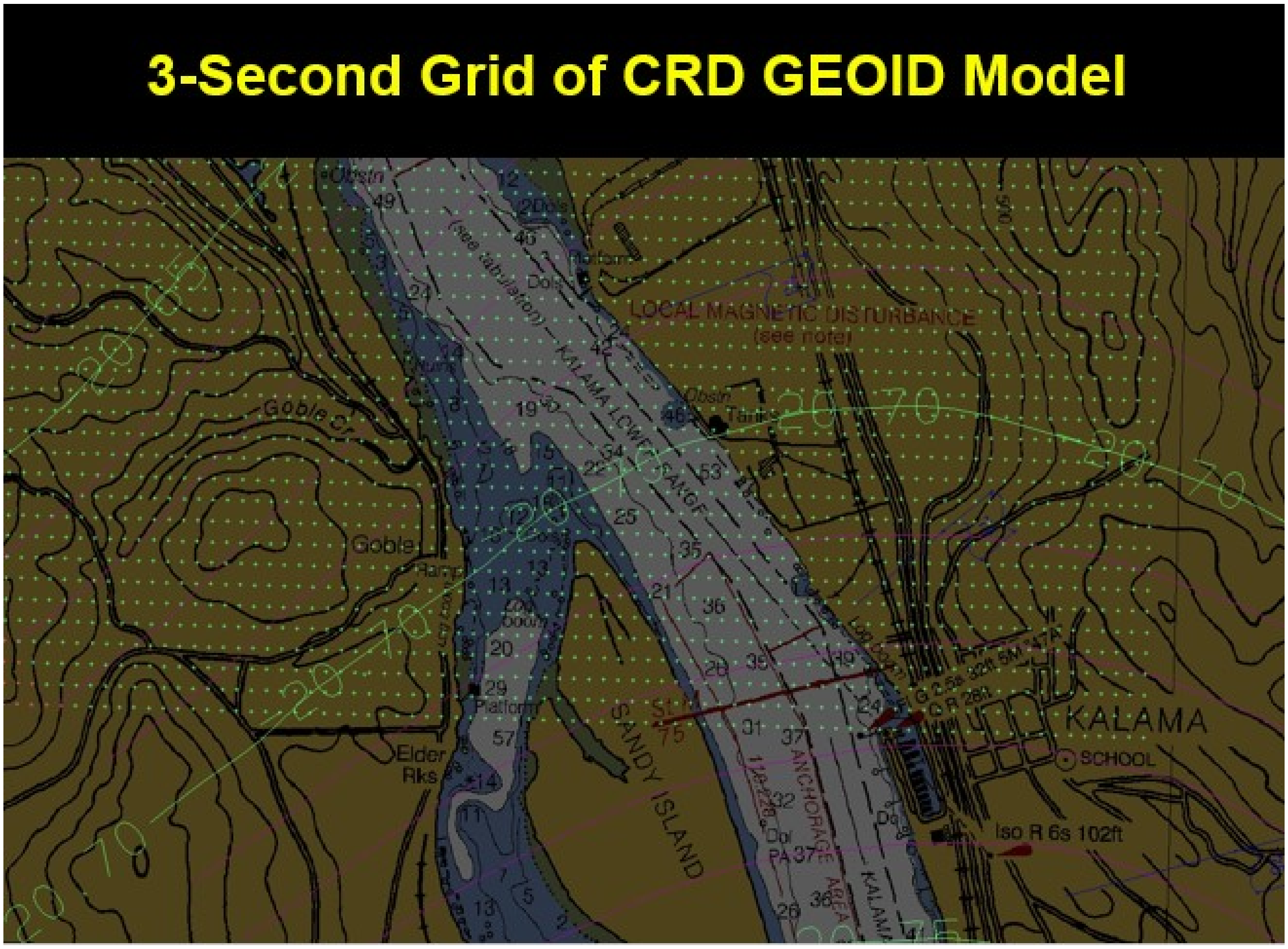
From that surface a 3 arc second grid was generated with values populated from the TIN and those grid values run through the Geoid model to develop

the separation model.



Resultant contours of separation model that incorporates the gradient datum on NAVD88 and the geoid model.

Resolution is sufficient to capture merging channel, river bends, and geoid undulations.



From: Jack Riley - NOAA Federal <jack.riley@noaa.gov>
Sent: Friday, May 03, 2019 4:31 PM
To: Jon Dasler <Jld@deainc.com>
Cc: Jason Creech <Jasc@deainc.com>; Rick Brennan <richard.t.brennan@noaa.gov>; Martha Herzog - NOAA Federal <martha.herzog@noaa.gov>; Corey Allen <corey.allen@noaa.gov>; Glen Rice <glen.rice@noaa.gov>
Subject: Re: FW: Mississippi LWRP Survey Findings PowerPoint

Okay -- the point I missed was the need to include the high-resolution gradient along the river, but [continuing to] exclude the 2-D geoidal undulations perpendicular to the river center line. So while my 2-D LWRP-NAVD88 component is accurate to the hydraulic model (2-D "road" version of the orange line on the plot with the USACE's blue stepped line and SEP -minus- geoid-09 and -12 plot), I need to include more samples to track that gradient path. I can revise and provide a Geoid12B version as well.

I discussed this with HSD today and said I would follow-up with you (per above) and phone call too, if you're available -- anytime is potentially good for me, including through the weekend. We all agreed that the presentation at the meeting next week needs to be simplified in terms of these model details. The slide showing contours on your version of the existing LWRP NOAA Model is inaccurate and comparing the Geoid09-realized LWRP2007 to 12B profiles should be limited to support the argument that's the correct way to go with ellipsoidally-referenced LWRP2007 realization.

Assuming the Geoid12B-version of the revised SEP I will send generates consistent results with the revised comparisons you've computed, we should update that on the slides. LWRP most likely continues to be nearly linear down river from Venice. CO-OPS says LWRP=NAVD88 at HOP (MM 0) and that MLLW=LWRP ~MM 1 on SW Pass & ~MM2 on Pass a Loutre. Our SEP includes the LWRP zero at HOP and continues seaward on MLLW, overriding VDatum by making use of CO-OPS NAVD88 on MLLW corrected values at Pilots Station East (8760922) = +34.8 cm, and Devon Energy Facility (8760417) of +21.7 cm.

Glen Rice (cc'd) will be able to attend the meeting on behalf of NOAA as well. Glen is keen on getting familiar with vertical datum decisions in his primary role with HSTB as Technical Lead on the NOAA National Bathymetric Source Project.

Jack L. Riley

Coast Survey Development Lab

240-847-8271

On Fri, May 3, 2019 at 6:23 PM Jon Dasler <Jld@deainc.com> wrote:

> We did one more exercise to see how we would compare to USACE gauge observations if we backed out the NOAA separation model to obtain the original ellipsoid height observation and applied Geoid12B or Geoid09 and subtracted USACE NAVD88 elevation of LWRP to get LWRP. In general, using Geoid12B reduces the difference from gauges with the exceptions being Baton Rouge, New Orleans (Carrolton), Algiers Locks, and Venice. These difference are likely due to USACE applying LWRP offset to old datums (NGVD29, etc.) Although Venice comparison gets worse, this puts the observation much closer at the CO-OPS gauge at Pilottown which we missed by 0.7 feet. Using Geoid12B should drive this down to 0.2 feet or less. We do not have NAVD88 elevations below RM 11 AHP (Venice) for LWRP or MLLW. It would be good to get the CO-OPS NAVD88 elevations from recent maintenance observations.   Attached is the full spread sheet to see how these values were computed. The text G12b & USACE LWRP implies that we used GEOID12B to get to NAVD88 from original ellipsoid observations and then applied the appropriate USACE NAVD88 elevation of LWRP based on river mile of the gauge to obtain LWRP water surface elevations.

Gauge	Ship Float G12b & USACE LWRP ft	G12b Delta from Ship Float ft	G12b Delta from Gauge ft	Ship Float G09 & USACE LWRP ft	G09 Delta from Ship Float ft	G09 Delta from Gauge ft
Baton Rouge	21.23	0.19	1.17	21.44	-0.02	0.96

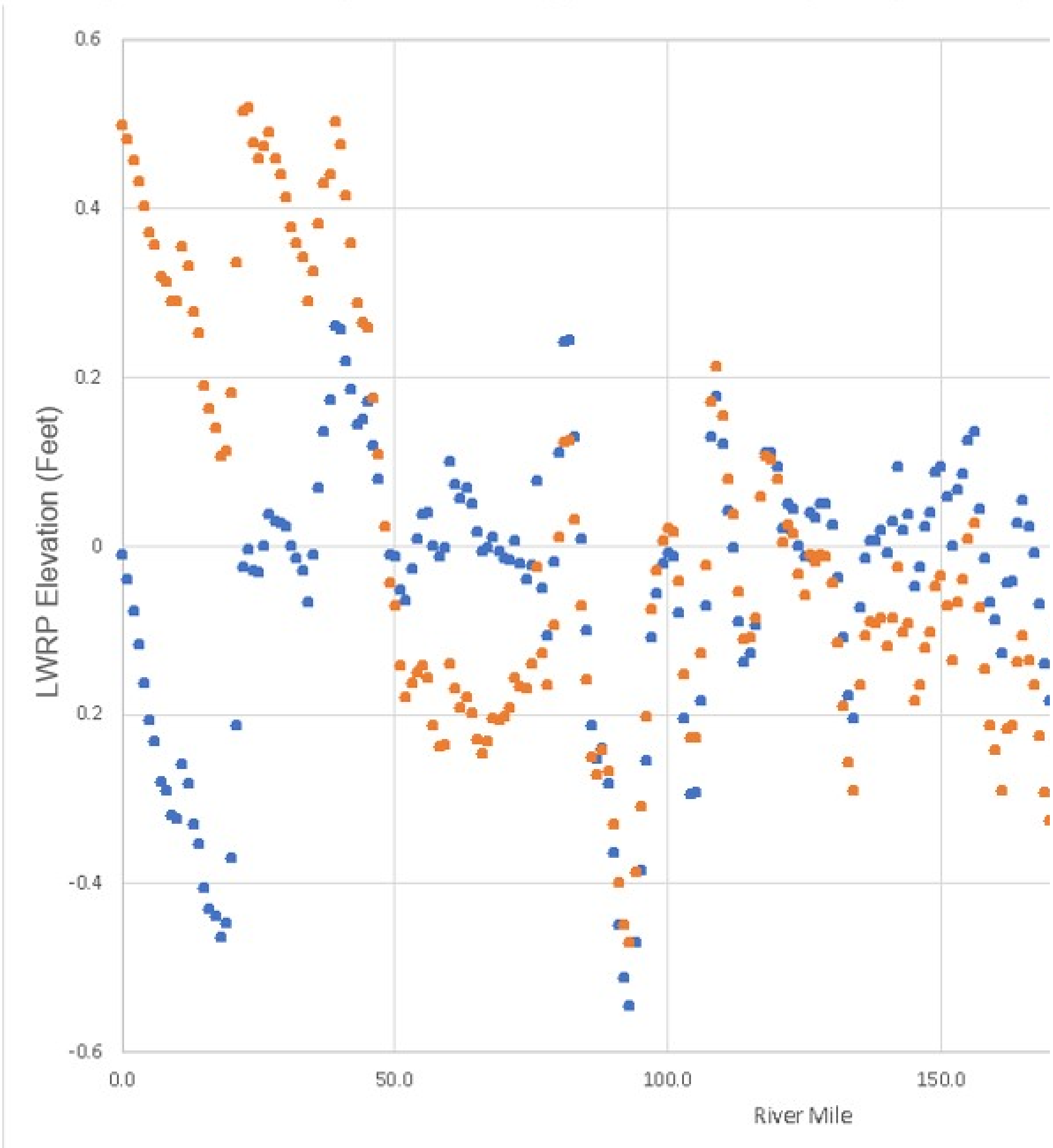
Donaldsonville	15.22	0.04	1.00	15.09	0.17	1.13
Reserve	11.27	-0.11	0.68	11.17	-0.01	0.78
BC NW	11.20	-0.04	0.85	11.13	0.03	0.92
Bonnet Carre	10.43	-0.06	0.65	10.38	-0.01	0.70
New Orleans	9.95	-0.11	0.97	10.00	-0.16	0.92
IHNC Lock	8.79	-0.56	0.39	8.88	-0.65	0.30
Algiers Lock	7.99	-0.21	0.72	7.99	-0.21	0.72
Alliance	4.94	-0.18	0.50	4.69	0.07	0.75
Pt a la Hache	6.36	0.00	0.42	6.33	0.03	0.45
Venice	2.16	0.50	0.40	2.77	-0.11	-0.21

From: Jon Dasler
Sent: Friday, May 03, 2019 1:24 PM
To: Jack Riley - NOAA Federal <jack.riley@noaa.gov>; Jason Creech <Jasc@deainc.com>
Cc: Rick Brennan <richard.t.brennan@noaa.gov>; Martha Herzog - NOAA Federal <martha.herzog@noaa.gov>; Corey Allen <corey.allen@noaa.gov>; Glen Rice <glen.rice@noaa.gov>
Subject: RE: FW: Mississippi LWRP Survey Findings PowerPoint

Below is another example. In this case we took the NAVD88 values at the river mile positions provided by USACE for the LWRP gradient. We computed ellipsoid heights for each point by applying GEOID09 in one test and GEOID12B in another test. We then applied your separation model to the ellipsoid heights (GEOID09 blue points, GEOID12B orange points), which should result in a zero elevation LWRP for at least one of the models. We believe the GEOID12B more accurately defines what we surveyed using NAD83 (2011).

USACE Mississippi LWRP vs N

NOAA Model test using USACE River Mile with NAVD88 elevation of LWRP con
GEOID12B then ellipsoid height converted to LWRP using NOAA Model. All poir
Ellipsoid heights derived using GEOID12B approximates survey using NAD83(2(



From: Jon Dasler
Sent: Friday, May 03, 2019 1:11 PM
To: 'Jack Riley - NOAA Federal' <jack.riley@noaa.gov>; Jason Creech <Jasc@deainc.com>
Cc: 'Rick Brennan' <richard.t.brennan@noaa.gov>; 'Martha Herzog - NOAA Federal' <martha.herzog@noaa.gov>; 'Corey Allen' <corey.allen@noaa.gov>; 'Glen Rice' <glen.rice@noaa.gov>
Subject: RE: FW: Mississippi LWRP Survey Findings PowerPoint

To follow on this discussion and our observations, the data points you used to model LWRP are shown in pink on the attached image with associated NAVD88 height of LWRP and river mile. Note that your river miles are off by approximately 4 miles. Your model values match close to the contours (contours have inverse values labeled) of the model we generated by subtracting the geoid model from your separation values (as they should). The circled points are USACE river miles with the assigned NAVD88 value of LWRP with associated rive mile. My assessment of this difference is that you may have used a low resolution model of the NAVD88 elevations defining LWRP and we are seeing artifacts from the geoid or “hydraulic geoid” you applied. In short, if a survey used a geoid model to obtain an NAVD88 orthometric height (call it 6) and applied the NAVD88 elevation of LWRP (call it 1), when applied 6-1=5. If you have a hydraulic geoid model (call it 7) and apply your model of LWRP (call it 2), when applied you should get the same answer 7-2=5. This should hold true for any point in the model.

From: Jon Dasler
Sent: Friday, May 03, 2019 12:39 PM
To: Jack Riley - NOAA Federal <jack.riley@noaa.gov>; Jason Creech <Jasc@deainc.com>
Cc: Rick Brennan <richard.t.brennan@noaa.gov>; Martha Herzog - NOAA Federal <martha.herzog@noaa.gov>; Corey Allen <corey.allen@noaa.gov>; Glen Rice <glen.rice@noaa.gov>
Subject: RE: FW: Mississippi LWRP Survey Findings PowerPoint

Jack

I am not sure what you are using for a “hydraulic GEOID” or how you derived it but the NAVD88 elevations already define the hydraulic gradient. You just need to apply the geoid model to a high resolution model of the NAVD88 gradient to capture changes in the geoid. You should get the same separation at any point in the model when using an NAVD88 height of LWRP and using a GEOID model, generally how the gauge surveys were conducted. This is how the NAVD88 elevations of LWRP were originally defined, exactly the same as Columbia River Datum using a 3 second arc grid (roughly 100 meter grid) of CRD relative to NAVD88. The model of the river should be constructed first relative to the defining datum (NAVD88) using every point along the profile with equal elevations normal to the centerline profile (similar to a flat road surface). The result is the hydraulic gradient of the river relative to NAVD88. From there a high resolution grid is interpolated from the TIN model and the appropriate standard geoid model applied for a separation model from the appropriate datum, NAD83 (2011) in the case of the Mississippi River where the C4G network is being used for ellipsoid heights, to LWRP. At any point on the river the geoid model should be able to be subtracted to get the originally defined NAVD88 elevation of the LWRP gradient datum. This is exactly how the Columbia River model was generated with repeatable results at any gauge location or benchmark and allows for easy translation between NAVD88 and the gradient datum (CRD or NAVD88). To test this in your model, we took all the centerline data points with NAVD88 elevations of LWRP and added the GEOID09 and GEOID12B as two separate tests to obtain ellipsoid heights. We believe adding GEOID12B would more accurately represent ellipsoid heights relative to our survey ellipsoid heights using NAD83(2011). From those ellipsoid heights (again how the gauges were surveyed) we subtract your separation model. The result is the undulation you see in the profile image attached.

We probably should have a conference call to discuss this in detail and I can pull up examples of Columbia River Datum modeling.

Jon

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DAVID EVANS AND ASSOCIATES INC. MARINE SERVICES

From: Jack Riley - NOAA Federal <jack.riley@noaa.gov>
Sent: Friday, May 03, 2019 12:03 PM
To: Jon Dasler <Jld@deainc.com>; Jason Creech <Jasc@deainc.com>

Cc: Rick Brennan <richard.t.brennan@noaa.gov>; Martha Herzog - NOAA Federal <martha.herzog@noaa.gov>; Corey Allen <corey.allen@noaa.gov>; Glen Rice <glen.rice@noaa.gov>
Subject: Re: FW: Mississippi LWRP Survey Findings PowerPoint

Jon and Jason,

I exported the LWRP2007-NAVD88 component from my TCARI solution and I am not seeing any oscillation in the LWRP profile. I see a monotonically-increasing function. There's also not much athwart variation (mm) in my LWRP -- consistent with a hydraulic datum. The NOAA NAD83-LWRP SEP is similarly hydraulic, where the USACE NAVD88-LWRP2007 values at the "risers" (staircase analogy; "treads" are the [constant] LWRP plateaus) are added to the local NAD83-NAVD88 to change the basis, and that is spatially interpolated (2-D Laplace). You are introducing all this tilt in your analysis when you un-apply the geoid to the *gridded* data. To recover the hydraulic LWRP you need to un-apply a linearly-interpolated "hydraulic geoid" differential surface.

Jack

--

Jack L. Riley

Coast Survey Development Lab

240-847-8271

On Fri, May 3, 2019 at 12:16 PM Jon Dasler <Jld@deainc.com> wrote:

> Jack
>
> Thank you for the response. I will be traveling to New Orleans on Monday at 3PM Pacific and will be at Stennis all day Tuesday. The meeting with New Orleans is at 10AM Central on Wednesday. Feel free to reach out to Jason and we can coordinate a conference call as needed.
>
> Jon

Jon L. Dasler, PE, PLS, CH | Senior Vice President, Director of Marine Services

David Evans and Associates, Inc. | Marine Services Division | www.deamarine.com

t: 360.314.3200 | c: 503.799.0168 | jld@deainc.com

From: Jack Riley - NOAA Federal <jack.riley@noaa.gov>
Sent: Friday, May 03, 2019 8:45 AM
To: Jon Dasler <Jld@deainc.com>
Cc: Rick Brennan <richard.t.brennan@noaa.gov>; Martha Herzog - NOAA Federal <martha.herzog@noaa.gov>
Subject: Re: FW: Mississippi LWRP Survey Findings PowerPoint

Hello Jon,

Yes, I have received the email and downloaded the presentation. I am working to follow-up on things this afternoon leading up to a check-in with the HSD at 1600. We will check-in back with you ASAP afterwards, in advance of the meeting next Wednesday; expect some info this PM with some follow up as needed early next week.

Thanks,

Jack

--

Jack L. Riley

Coast Survey Development Lab

240-847-8271

On Fri, May 3, 2019 at 11:33 AM Jon Dasler <Jld@deainc.com> wrote:

All,

Just checking in to make sure you received my email yesterday and you were able to download the PowerPoint. Following is an image that further illustrates what we are seeing. The dark circles are USACE mile point and black text is the associated NAVD88 elevation of LWRP color coded by difference from NOAA model. The pink dots are points used in the NOAA model with associated NAVD88 elevation of LWRP. The white haloed points are contour labels of NAVD88 inverse values of LWRP. These should match the core centerline mile values. Let us know when you are available for a meeting.

Jon

Jon L. Dasler, PE, PLS, CH | Senior Vice President, Director of Marine Services

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t: 360.314.3200 | c: 503.799.0168 | jld@deainc.com

Jason Creech

From: Martha Herzog - NOAA Federal <martha.herzog@noaa.gov>
Sent: Friday, May 3, 2019 12:58 PM
To: Jason Creech
Cc: Jon Dasler
Subject: Re: OPR-J347-KR-18 Training Walls Southwest Pass

Hi Jason,

I have better guidance for the training walls/pile dikes.

There is no need to mark small segments of the training wall (especially less than 10m) each as submerged, cov/uncov, and dry. For instance, if most of it is ruined with only small, intact sections, you can label the entire thing as ruined.

If a ruined segment has a pile or two seaward and appears to have once to be a part of the training wall extend the ruined segment to the pile. It doesn't make sense to have obstructions at the end of nearly every training wall.

For the ruined training walls that have jogs, continue to mark the training wall with the jog at the least depth of the ruins.

Please let me know if you have questions. I'd be happy to explain run through this with your PowerPoint.

On Fri, Apr 26, 2019 at 1:03 PM Jason Creech <Jasc@deainc.com> wrote:

> Hi Martha
>
> As we work to complete sheet 10 (Southwest Pass) we are looking to finalize our procedures for depicting training walls in our survey data, finalized grids, and final feature file. As expected, there is a lot going on with these structures and we want to make sure we have a firm understanding of requirements and expectations. I've created a PowerPoint deck with some example training walls with images and screengrabs from HIPS subset. I've also added some first cuts at general representation in the FFF.
>
> If possible we'd like to schedule some time to have a web meeting to review and discuss these items. I've added some comments and notes to help explain what we are showing, but think a review in real time would be most beneficial.
>
> Would you be available later this afternoon or first thing next week for a meeting? In the meantime, I'm happy to address any questions you may have about the slides.
>
> Thanks,

Jason Creech

From: Martha Herzog - NOAA Federal <martha.herzog@noaa.gov>
Sent: Wednesday, August 7, 2019 4:33 PM
To: Jason Creech
Subject: Marine mammal/turtle logs

Jason,

I received an answer from our Environmental Compliance Coordinator to your question of whether anything needs to be stated if no marine mammals/turtles were seen - no action or statement is needed.

Martha

--
Martha Herzog
NOAA Operations Team Lead | Operations Branch
Hydrographic Surveys Division | Office of Coast Survey
240-533-0028

Jason Creech

From: Martha Herzog - NOAA Federal <martha.herzog@noaa.gov>
Sent: Wednesday, August 7, 2019 12:39 PM
To: Jason Creech
Subject: Re: OPR-J347-KR-18 Training Walls Southwest Pass

Hi Jason,

Yes that works as attributing the entire thing as ruined.

On Tue, Aug 6, 2019 at 4:28 PM Jason Creech <Jasc@deainc.com> wrote:

> Thanks Martha
>
> Most of these are ruined and composed of sections of baring and submerged piles. We will not designate the submerged sections and will avoid breaking these up so there is a single feature in the FFF for each training wall. See example below to be attributed as ruined.
>
> Jason

From: Martha Herzog - NOAA Federal <martha.herzog@noaa.gov>
Sent: Tuesday, August 6, 2019 4:17 PM
To: Jason Creech <Jasc@deainc.com>
Subject: Re: OPR-J347-KR-18 Training Walls Southwest Pass

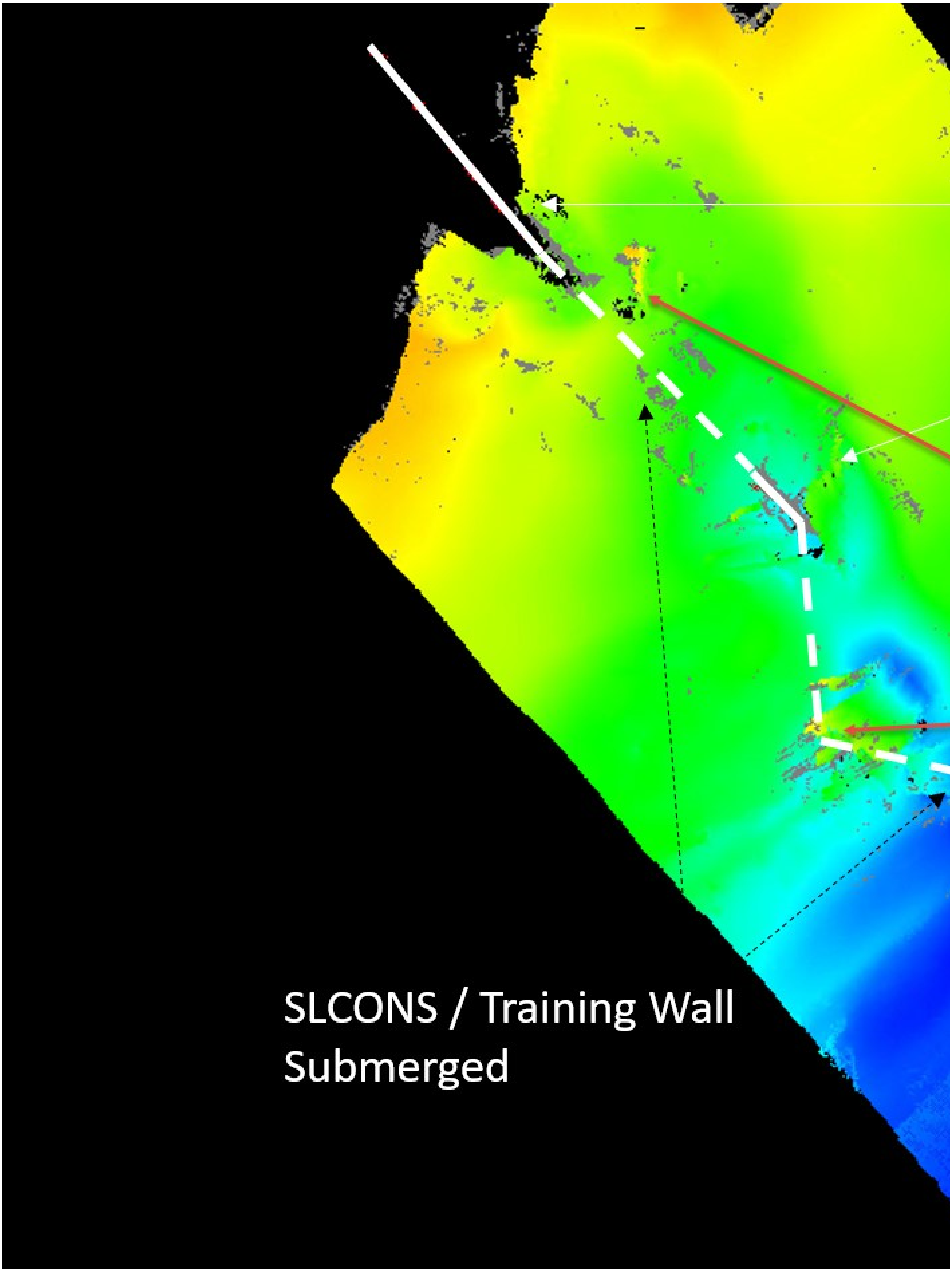
Hi Jason,

There is no need to designate every 2mm at survey scale (and please don't.) The ruined feature should take care of that as it is usually a baring feature.

As I stated in the earlier email above, there is no need to mark each small segment of the training wall as submerged, cov/uncov, and dry. For instance, if most of it is ruined with only small, intact sections, you can label the entire thing as ruined.

On Mon, Aug 5, 2019 at 4:07 PM Jason Creech <Jasc@deainc.com> wrote:

> Hi Martha
>
> We're working on our deliverables for Sheet 10 (SW Pass) and have a follow up question on the guidance you provided on training walls. Should the submerged sections of the training walls be designated so that the surface honors the least depths of the feature? Or does the fact that a ruined line feature is being digitized to depict the training wall put aside any designation requirement?
>
> I've included an example below (using a screengrab included in the slides I attached to this original email).
>
> Thanks for your guidance on this issue.
>
> Jason


SLCONS / Training Wall
Submerged

From: Martha Herzog - NOAA Federal <martha.herzog@noaa.gov>
Sent: Friday, May 3, 2019 12:58 PM
To: Jason Creech <Jasc@deainc.com>
Cc: Jon Dasler <Jld@deainc.com>
Subject: Re: OPR-J347-KR-18 Training Walls Southwest Pass

Hi Jason,

I have better guidance for the training walls/pile dikes.

There is no need to mark small segments of the training wall (especially less than 10m) each as submerged, cov/uncov, and dry. For instance, if most of it is ruined with only small, intact sections, you can label the entire thing as ruined.

If a ruined segment has a pile or two seaward and appears to have once to be a part of the training wall extend the ruined segment to the pile. It doesn't make sense to have obstructions at the end of nearly every training wall.

For the ruined training walls that have jogs, continue to mark the training wall with the jog at the least depth of the ruins.

Please let me know if you have questions. I'd be happy to explain run through this with your PowerPoint.

On Fri, Apr 26, 2019 at 1:03 PM Jason Creech <Jasc@deainc.com> wrote:

> Hi Martha
>
> As we work to complete sheet 10 (Southwest Pass) we are looking to finalize our procedures for depicting training walls in our survey data, finalized grids, and final feature file. As expected, there is a lot going on with these structures and we want to make sure we have a firm understanding of requirements and expectations. I've created a PowerPoint deck with some example training walls with images and screengrabs from HIPS subset. I've also added some first cuts at general representation in the FFF.

If possible we'd like to schedule some time to have a web meeting to review and discuss these items. I've added some comments and notes to help explain what we are showing, but think a review in real time would be most beneficial.

Would you be available later this afternoon or first thing next week for a meeting? In the meantime, I'm happy to address any questions you may have about the slides.

Thanks,

Jason

Jason Creech, CH | Vice President, Nautical Charting Program Manager

David Evans and Associates, Inc.

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804.516.7829 | jasc@deainc.com

ENERGY | LAND DEVELOPMENT | MARINE SERVICES | SURVEYING AND GEOMATICS | TRANSPORTATION | WATER AND ENVIRONMENT

--

Martha Herzog

NOAA Operations Team Lead | Operations Branch

Hydrographic Surveys Division | Office of Coast Survey

240-533-0028

Jason Creech

From: Martha Herzog - NOAA Federal <martha.herzog@noaa.gov>
Sent: Friday, August 9, 2019 4:04 PM
To: Jason Creech
Subject: Re: OPR-J347-KR-18 Training Walls Southwest Pass

Jason,

I'll add that if the ruined training wall has sections that are submerged, covers and uncovers, and dry, (or a combo of 2 of those), attribute the WATLEV with covers and uncovers.

Please let me know if you have any question,
Martha

On Wed, Aug 7, 2019 at 12:38 PM Martha Herzog - NOAA Federal <martha.herzog@noaa.gov> wrote:

> Hi Jason,
>
> Yes that works as attributing the entire thing as ruined.
>
> On Tue, Aug 6, 2019 at 4:28 PM Jason Creech <Jasc@deainc.com> wrote:
>
>> Thanks Martha
>>
>> Most of these are ruined and composed of sections of baring and submerged piles. We will not designate the submerged sections and will avoid breaking these up so there is a single feature in the FFF for each training wall. See example below to be attributed as ruined.
>>
>> Jason

Jason Creech

From:	Martha Herzog - NOAA Federal <martha.herzog@noaa.gov>
Sent:	Tuesday, August 13, 2019 9:31 AM
To:	Jason Creech
Subject:	Re: OPR-J347-KR-18 Submerged area features

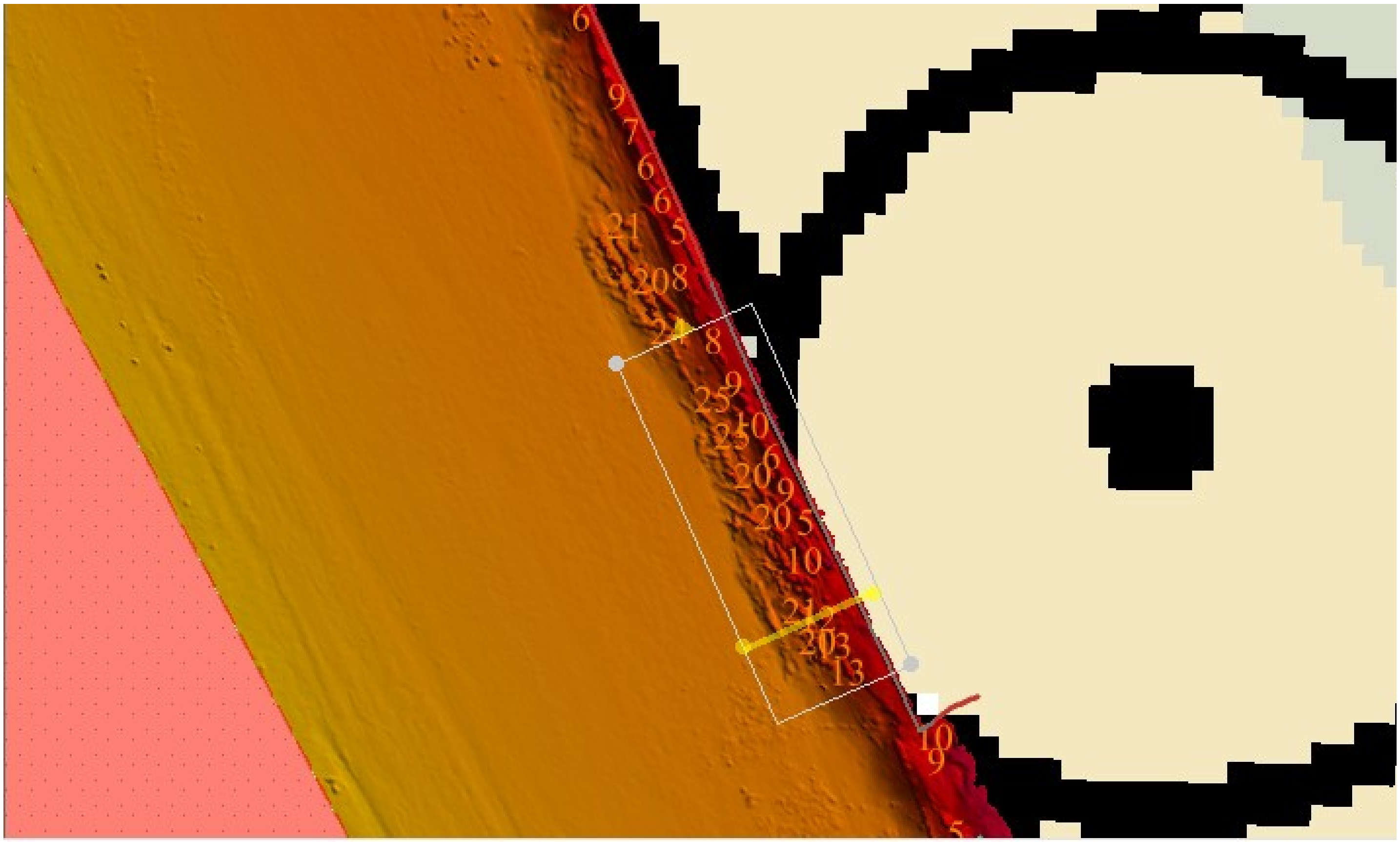
Hi Jason,

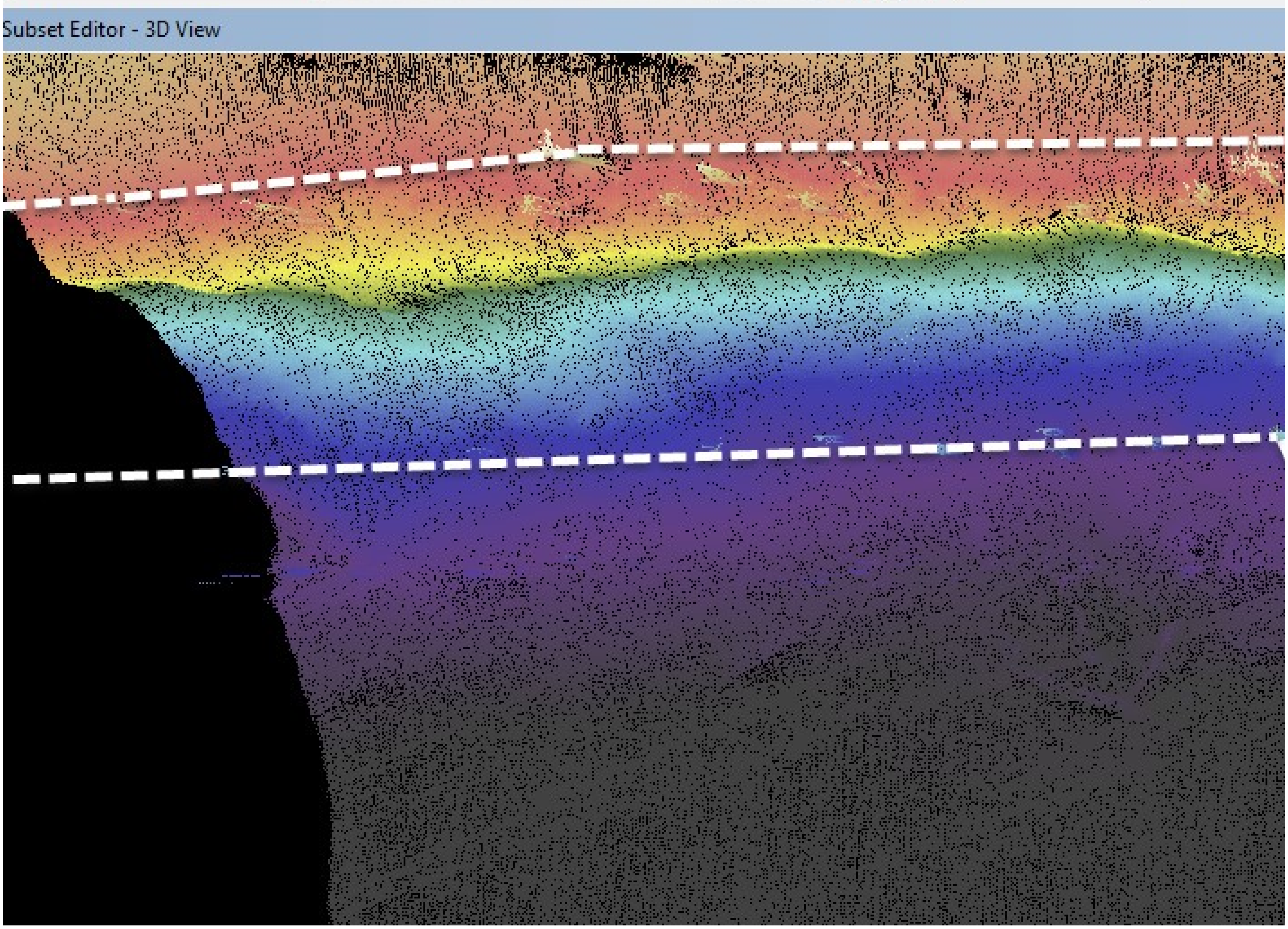
You can delineate an area of submerged piles as an area obstruction, and please only designate one sounding within the area. You can also depict a row of submerged piles with a line obstruction.

Please let me know if you have any other questions,
Martha

On Mon, Aug 12, 2019 at 5:10 PM Jason Creech <Jasc@deainc.com> wrote:

> Hi Martha
>
> We have a few questions regarding the use of submerged area features. We've been following the designated sounding distance specification of 2mm at survey scale (10 m) and minimum area requirement of 1mm (5 m).
>
> 1. When we use an area feature to depict items with horizontal dimensions greater than 5m, are we required to continue to follow the designated sounding rule (2mm at survey scale) or should only the shoalest depth within the area be designated? This impacts most if not all wrecks within our survey data and several potential obstruction areas (see image below).
> 2. We assume that it is acceptable to use obstruction area features to delineate large areas of submerged pilings. I've added some sample line work to depict the extents of a proposed obstruction area to the image below. Is this practice acceptable? This wouldn't be considered foul, as we have surveyed least depths on all of the submerged piles. Can we follow this same practice to depict a single row of submerged piles (not an area) with a line object?
>
> Thanks for the clarification on this.
>
> Jason




Subset Editor - 3D View

APPROVAL PAGE

H13212

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
- Data Acquisition and Processing Report
- Collection of Bathymetric Attributed Grids (BAGs)
- Processed survey data and records
- Geospatial PDF of survey products
- Collection of backscatter mosaics

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

Approved: MCGOVERN.MEGHAN.ELIZABETH.1284020495 Digitally signed by MCGOVERN.MEGHAN.ELIZABETH.1284020495 Date: 2020.06.24 08:33:02 -04'00'

Commander Meghan McGovern, NOAA
Chief, Atlantic Hydrographic Branch