

H13047

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

**DESCRIPTIVE REPORT**

Type of Survey: Navigable Area

Registry Number: H13047

**LOCALITY**

State(s): Texas

General Locality: Between Galveston Bay Entrance and Sabine Bank  
Channels, Texas and Louisiana

Sub-locality: Offshore NE of Galveston Bay Entrance Channel

**2018**

CHIEF OF PARTY  
Christiaan van Westendorp, CDR/NOAA

LIBRARY & ARCHIVES

Date:

**HYDROGRAPHIC TITLE SHEET**

**H13047**

**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): **Texas**

General Locality: **Between Galveston Bay Entrance and Sabine Bank Channels,**

Sub-Locality: **Offshore NE of Galveston Bay Entrance Channel**

Scale: **40000**

Dates of Survey: **05/08/2018 to 05/31/2018**

Instructions Dated: **03/08/2018**

Project Number: **OPR-K371-TJ-18**

Field Unit: **NOAA Ship *Thomas Jefferson***

Chief of Party: **Christiaan van Westendorp, CDR/NOAA**

Soundings by: **Multibeam Echo Sounder**

Imagery by: **Side Scan Sonar and Multibeam Echo Sounder Backscatter**

Verification by: **Atlantic Hydrographic Branch**

Soundings Acquired in: **meters at Mean Lower Low Water**

Remarks:

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

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## Descriptive Report to Accompany Survey H13047

Project: OPR-K371-TJ-18

Locality: Between Galveston Bay Entrance and Sabine Bank Channels, Texas and Louisiana

Sublocality: Offshore NE of Galveston Bay Entrance Channel

Scale: 1:40000

May 2018 - May 2018

**NOAA Ship *Thomas Jefferson***

Chief of Party: Christiaan van Westendorp, CDR/NOAA

### A. Area Surveyed

Survey H13047 extends approximately 40-60 NM southeast of the Galveston Bay Entrance Channel and was conducted in accordance with coverage requirements set forth in the Project Instructions OPR-K371-TJ-18.

#### A.1 Survey Limits

Data were acquired within the following survey limits, (Table 1 and Figure 1):

| Northwest Limit                      | Southeast Limit                      |
|--------------------------------------|--------------------------------------|
| 28° 55' 24.12" N<br>93° 56' 55.63" W | 28° 44' 22.13" N<br>93° 31' 21.87" W |

*Table 1: Survey Limits*

Survey limits were acquired in accordance with the requirements in the Project Instructions and the Hydrographic Surveys Specifications and Deliverables (HSSD) dated April 2018.

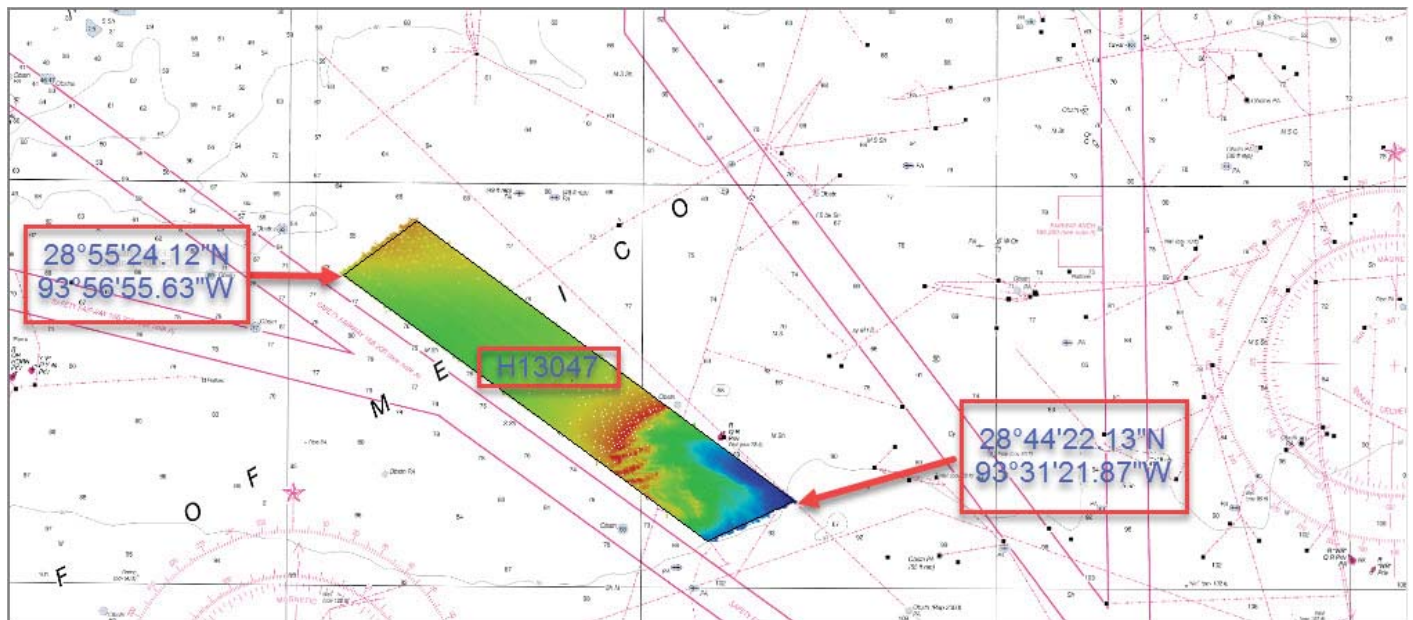


Figure 1: Survey layout for OPR-K371-TJ-18, plotted over RNC 11330\_1.

## A.2 Survey Purpose

The purpose of this project is to provide contemporary surveys to update National Ocean Service nautical charts and products in an area critical to the nation's economy. In 2015, the Port of Houston supported \$137 Billion in trade, ranked first in the nation for foreign tonnage, is the nation's largest importer/exporter of petroleum products and supported 509,000 jobs directly or indirectly. This survey covers approximately 1100 square nautical miles between the Galveston Bay and Sabine Bank Channels in an area which has not been surveyed since 1963. The current chart coverage shows numerous reported wrecks and obstructions with their positions reported to be approximate; these pose a risk to surface navigation. This survey will identify changes to the bathymetry and resolve position uncertainty in known hazards.

## A.3 Survey Quality

The entire survey is adequate to supersede previous data.

## A.4 Survey Coverage

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

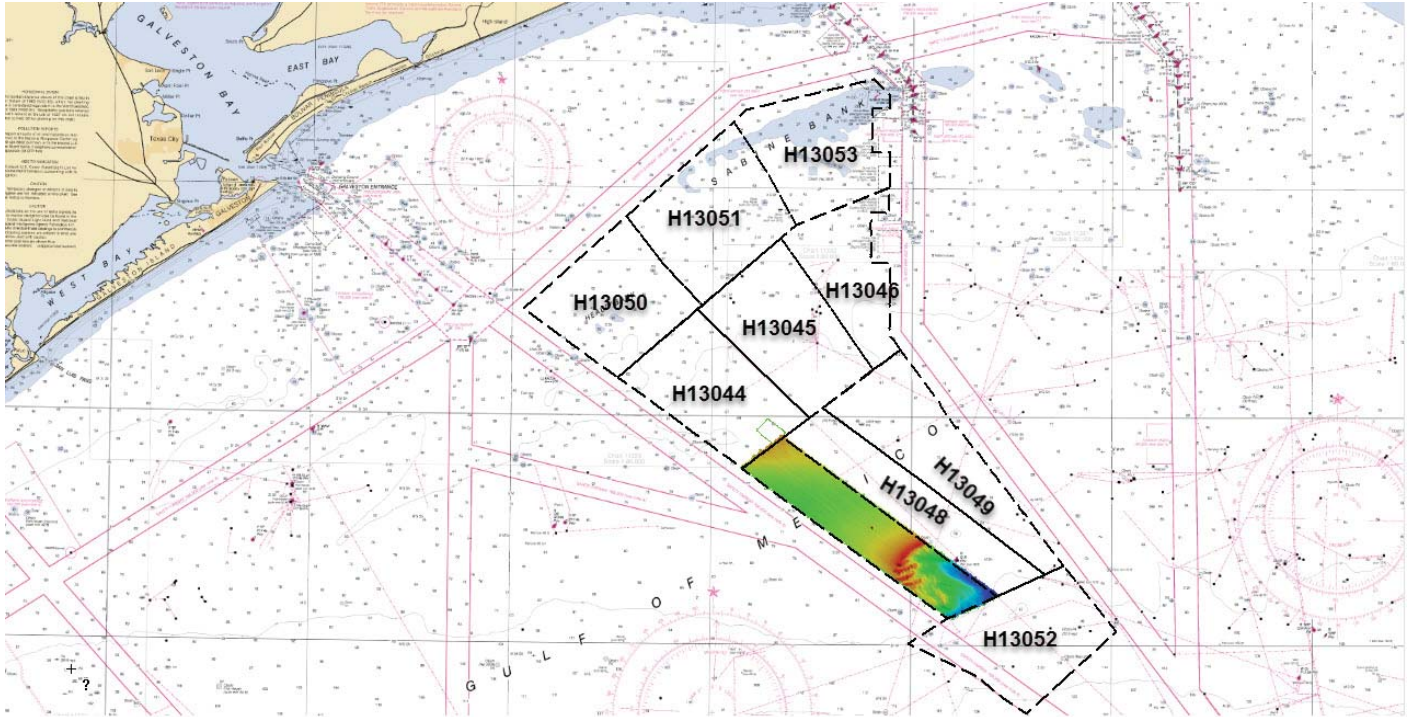
(Table 2):



| Water Depth               | Coverage Required                                 |
|---------------------------|---|
| All waters in survey area | Complete Coverage (refer to HSSD Section 5.2.2.3) |

*Table 2: Survey Coverage*

Survey coverage was in accordance with the requirements listed above and in the HSSD, (Figure 2).



*Figure 2: H13047 in relation to the project area overlaid on RNC 11330.*

## A.6 Survey Statistics

The following table lists the mainscheme and crossline acquisition mileage for this survey, (Table 3):

|   | <b>HULL ID</b>              | <i>S222</i> | <i>Total</i> |
|---|-----------------------------|-------------|--------------|
| <b>LNM</b>  | <b>SBES Mainscheme</b>      | 0           | 0            |
|   | <b>MBES Mainscheme</b>      | 0           | 0            |
|   | <b>Lidar Mainscheme</b>     | 0           | 0            |
|   | <b>SSS Mainscheme</b>       | 0           | 0            |
|   | <b>SBES/SSS Mainscheme</b>  | 0           | 0            |
|   | <b>MBES/SSS Mainscheme</b>  | 1606.41     | 1606.41      |
|   | <b>SBES/MBES Crosslines</b> | 72.47       | 72.47        |
|   | <b>Lidar Crosslines</b>     | 0           | 0            |
| <b>Number of Bottom Samples</b>                     |                             |             | 12           |
| <b>Number Maritime Boundary Points Investigated</b> |                             |             | 0            |
| <b>Number of DPs</b>                                |                             |             | 0            |
| <b>Number of Items Investigated by Dive Ops</b>     |                             |             | 0            |
| <b>Total SNM</b>                                    |                             |             | 97           |

*Table 3: Hydrographic Survey Statistics*

The following table lists the specific dates of data acquisition for this survey, (Table 4):

| <b>Survey Dates</b> | <b>Day of the Year</b> |
|---------------------|------------------------|
| 05/08/2018          | 128                    |
| 05/09/2018          | 129                    |

| <b>Survey Dates</b> | <b>Day of the Year</b> |
|---------------------|------------------------|
| 05/10/2018          | 130                    |
| 05/11/2018          | 131                    |
| 05/13/2018          | 133                    |
| 05/14/2018          | 134                    |
| 05/15/2018          | 135                    |
| 05/24/2018          | 144                    |
| 05/25/2018          | 145                    |
| 05/30/2018          | 150                    |
| 05/31/2018          | 151                    |

*Table 4: Dates of Hydrography*

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

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

Refer to the Data Acquisition and Processing Report (DAPR) for a complete description of data acquisition and processing systems, survey vessels, quality control procedures and data processing methods. Any deviations from the DAPR for this survey are noted in this report.

#### **B.1.1 Vessels**

The following vessels were used for data acquisition during this survey, (Table 5):

| <b>Hull ID</b> | <b>S222</b> | <b>2903</b> |
|----------------|-------------|-------------|
| <b>LOA</b>     | 208 feet    | 28 feet     |
| <b>Draft</b>   | 15 feet     | 5.2 feet    |

*Table 5: Vessels Used*

Data were acquired by NOAA Ship *Thomas Jefferson* (S222) and Hydrographic Survey Launch 2903. NOAA Ship *Thomas Jefferson* acquired Kongsberg EM2040 and Kongsberg EM710 multibeam echosounder soundings (MBES), multibeam backscatter data, Klein 5000 V2 side scan sonar data (SSS), Rolls Royce MVP100 sound velocity profiles, Applanix POS/MV version 5 position and attitude data, and bottom samples. NOAA Launch 2903 acquired bottom samples.

## B.1.2 Equipment

The following major systems were used for data acquisition during this survey, (Table 6):

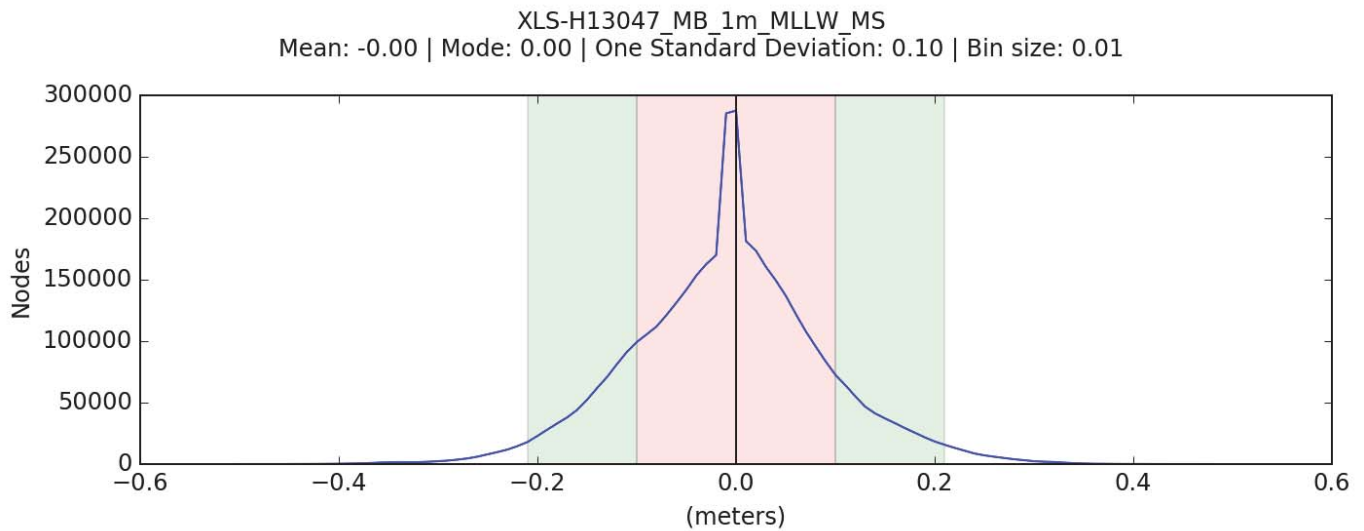
| <b>Manufacturer</b>  | <b>Model</b>  | <b>Type</b>                                    |
|----------------------|---------------|--|
| Kongsberg Maritime   | EM 2040       | MBES   |
| Kongsberg Maritime   | EM 710        | MBES   |
| Klein Marine Systems | 5000 V2       | SSS  |
| Rolls Royce          | MVP100        | Sound Speed System                             |
| AML Oceanographic    | Micro-CTD     | Conductivity, Temperature,<br>and Depth Sensor |
| Applanix             | POS MV 320 v5 | Positioning and<br>Attitude System             |
| Valeport             | Thru-Hull SVS | Sound Speed System                             |

*Table 6: Major Systems Used*

## B.2 Quality Control

### B.2.1 Crosslines

S222 collected 72.47 linear nautical miles of MBES crosslines, equating to 4.51% of mainscheme MBES data. A 1m CUBE surface was created using strictly mainscheme lines, while a second 1m CUBE surface was created using only crosslines. The two surfaces were then differenced; the mean was 0.00m and the standard deviation was 0.10m. Survey H13047 complies with section 5.2.4.2 of the HSSD 2018, (Figure 3).



*Figure 3: Crossline and mainscheme comparison.*

### B.2.2 Uncertainty

The following survey specific parameters were used for this survey, (Table 7 and 8):

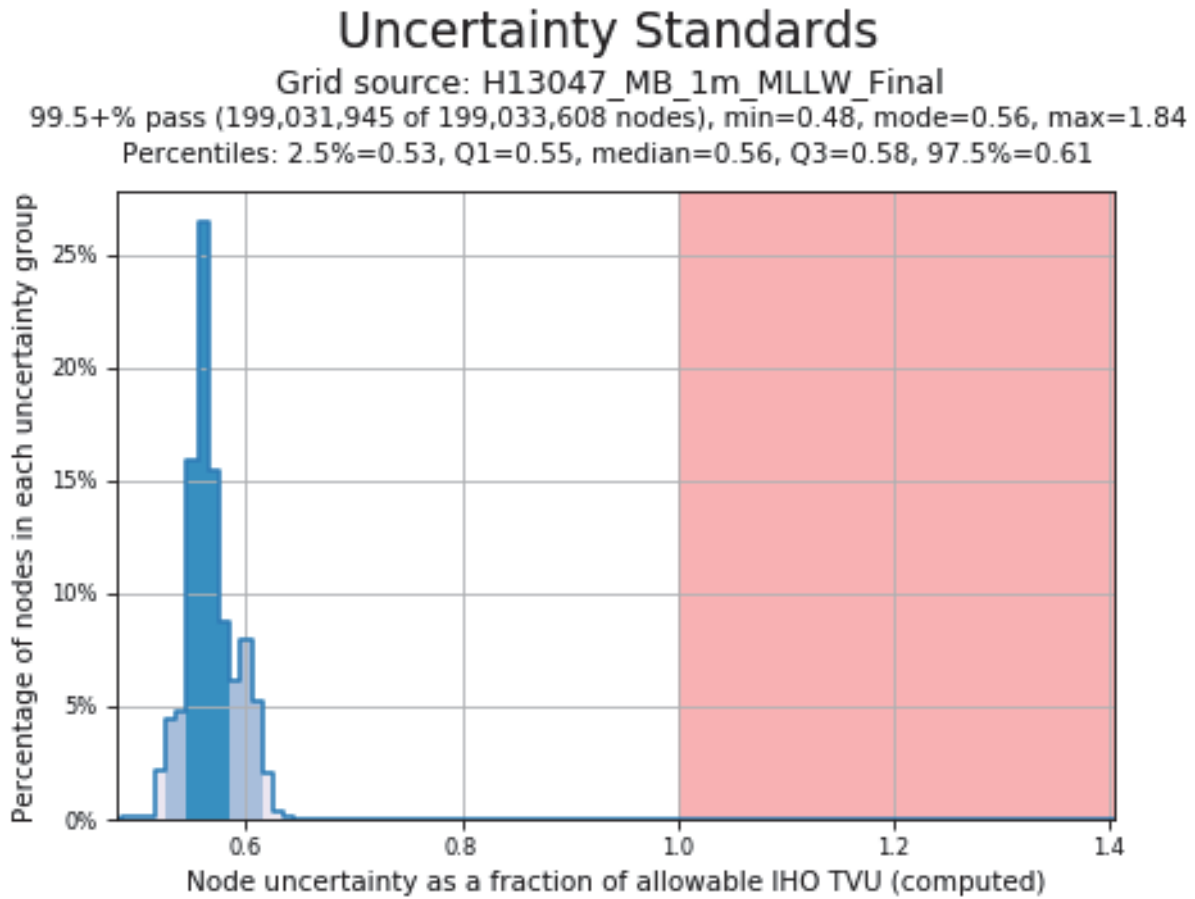
| Method         | Measured    | Zoning      |
|----------------|-------------|-------------|
| ERS via VDATUM | 0.08 meters | 0.13 meters |

*Table 7: Survey Specific Tide TPU Values.*

| Hull ID | Measured - CTD  | Measured - MVP  | Surface             |
|---------|-----------------|-----------------|---------------------|
| S222    | 4 meters/second | 2 meters/second | 0.200 meters/second |

*Table 8: Survey Specific Sound Speed TPU Values.*

The bathymetric surface uncertainty layer showed compliance with HSSD 2018 standards for uncertainty. Over 99.5% of all nodes passed uncertainty standards, (Figure 4).



*Figure 4: Uncertainty Standards of H13047.*

### B.2.3 Junctions

There were a total of five contemporary surveys that junctioned with Survey H13047 including H10874, H10941, H13044, H13048, and H13052. Junction comparisons were not completed for surveys H13044, H13048, and H13052 due to ongoing work. Junction comparisons will be conducted upon completion of each successive survey.

MBES coverage extended less than one full MBES swath width outside of the H13047 sheet limits for sections of the sheet limits that junctioned with prior surveys H10874 and H10941; however, depth sounding data from both H10874 and H10941 extended well into the MBES coverage for H13047 and overlapping depth data was more than adequate to conduct junction comparisons.

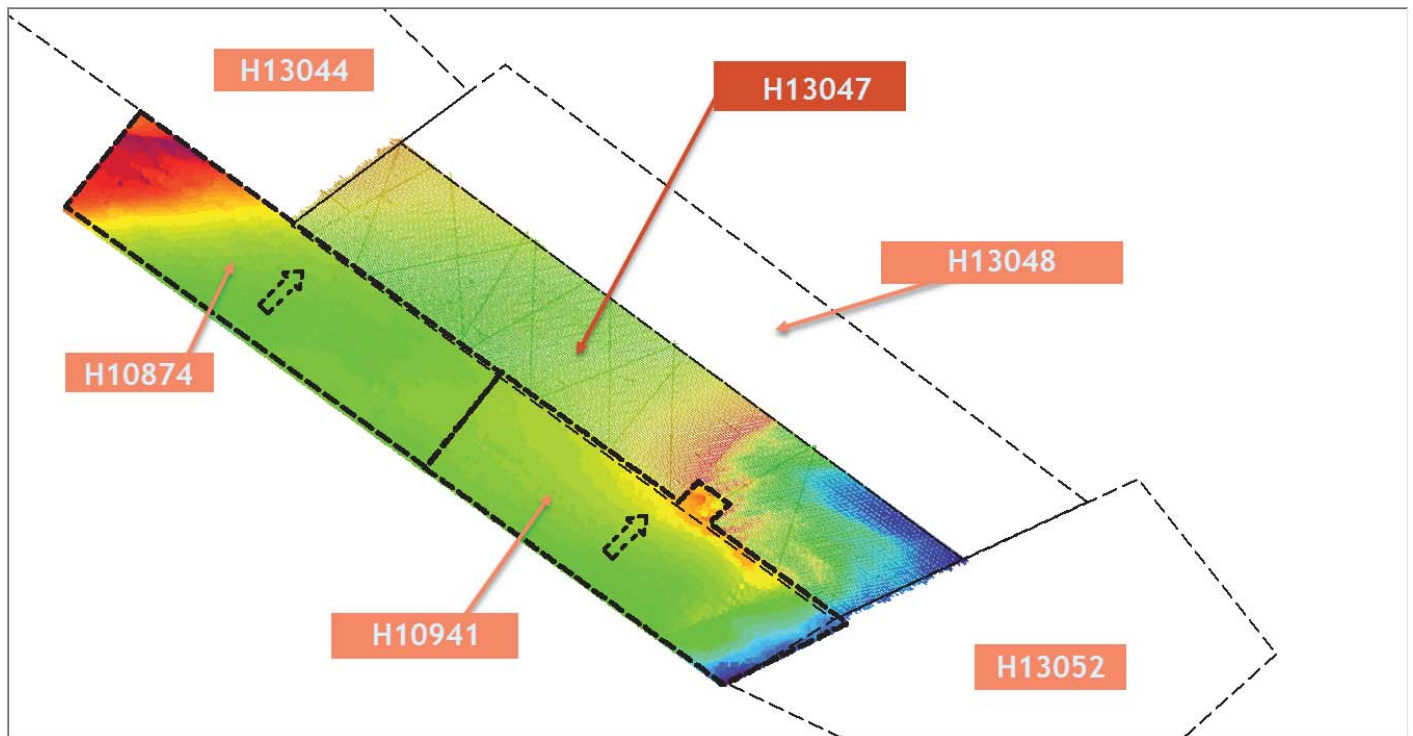


Figure 5: Junction surveys in relation to H13047.

The following junctions were made with this survey, (Table 9, Figure 5):

| Registry Number | Scale   | Year | Field Unit                        | Relative Location |
|-----------------|---------|------|-----------------------------------|-------------------|
| H10874          | 1:20000 | 1999 | SAIC                              | NW                |
| H10941          | 1:20000 | 1999 | SAIC                              | SW                |
| H13044          | 1:40000 | 2018 | NOAA Ship <i>Thomas Jefferson</i> | NW                |
| H13048          | 1:40000 | 2018 | NOAA Ship <i>Thomas Jefferson</i> | NE                |
| H13052          | 1:40000 | TBD  | To be determined(TBD)             | SE                |

Table 9: Junctioning Surveys

#### H10874 and H10941

The difference between survey H13047 and H10874 ranged from -0.6m to 0m. The mean was -0.2m, and the standard deviation was 0.1m, (Figure 6).

The difference between survey H13047 and H10941 ranged from -1.9m to 0.5m. The mean was -0.4m, and the standard deviation was 0.3m, (Figure 7).

The differences seen between H13047 and these two junction surveys may be attributed to the newer water level control methods of VDatum vs. zoned tides, the newer technology of the sonars, weather and/or current driven seafloor dynamics.

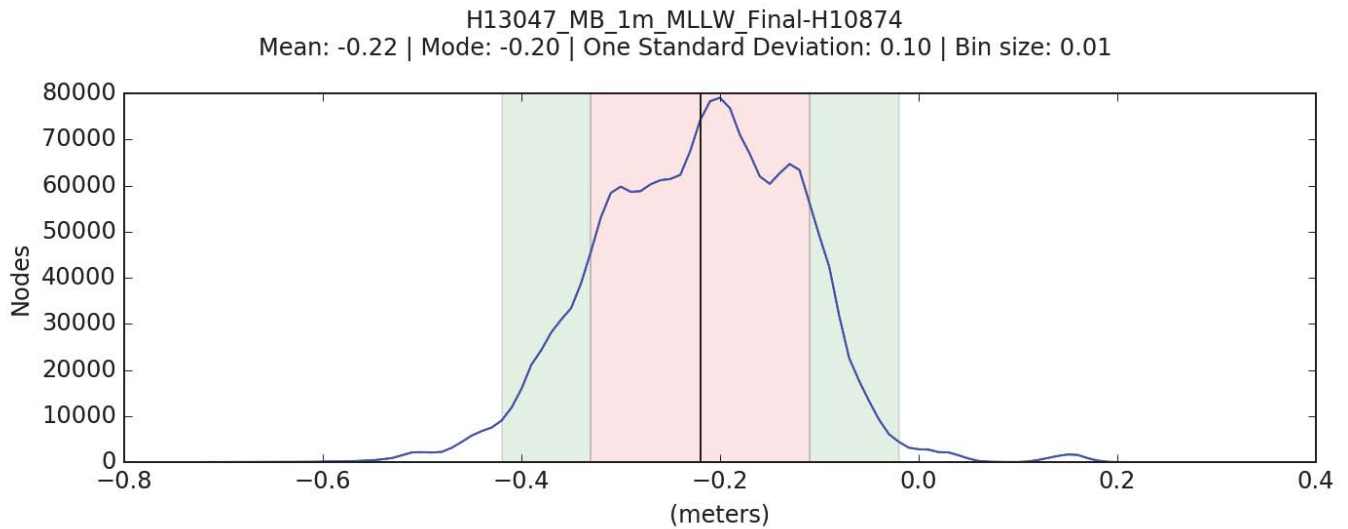


Figure 6: H13047 and H10874 difference surface statistics.

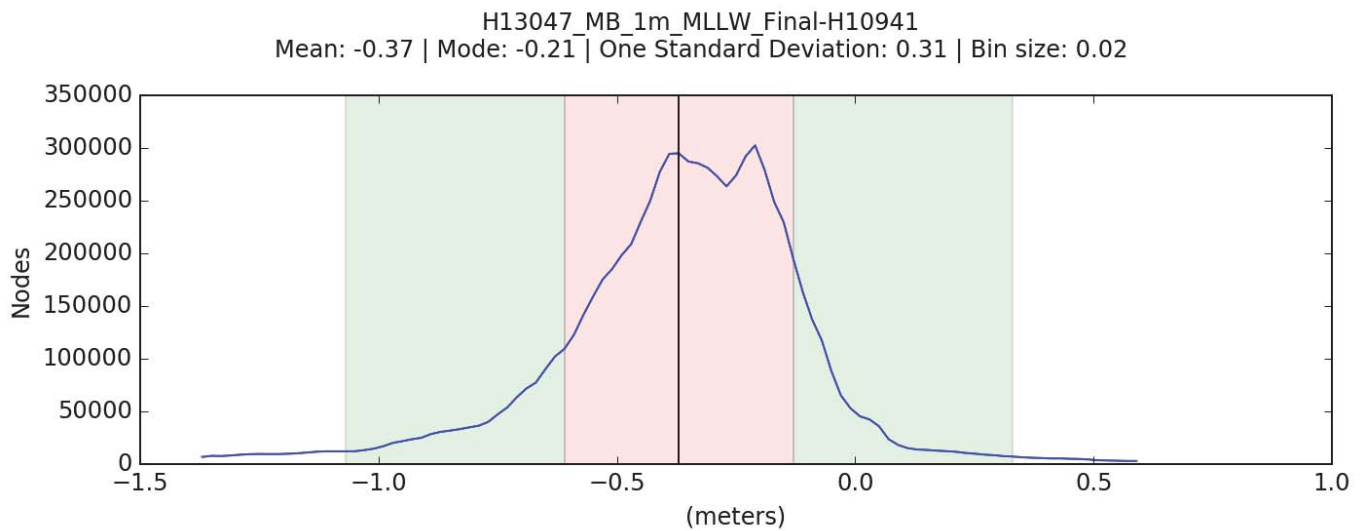


Figure 7: H13047 and H10941 difference surface statistics.



H13044

Junction comparisons will be conducted upon completion of each successive survey.

H13048

Junction comparisons will be conducted upon completion of each successive survey.

H13052

Junction comparisons will be conducted upon completion of each successive survey.

**B.2.4 Sonar QC Checks**

Sonar system quality control checks were conducted as outlined in the DAPR.

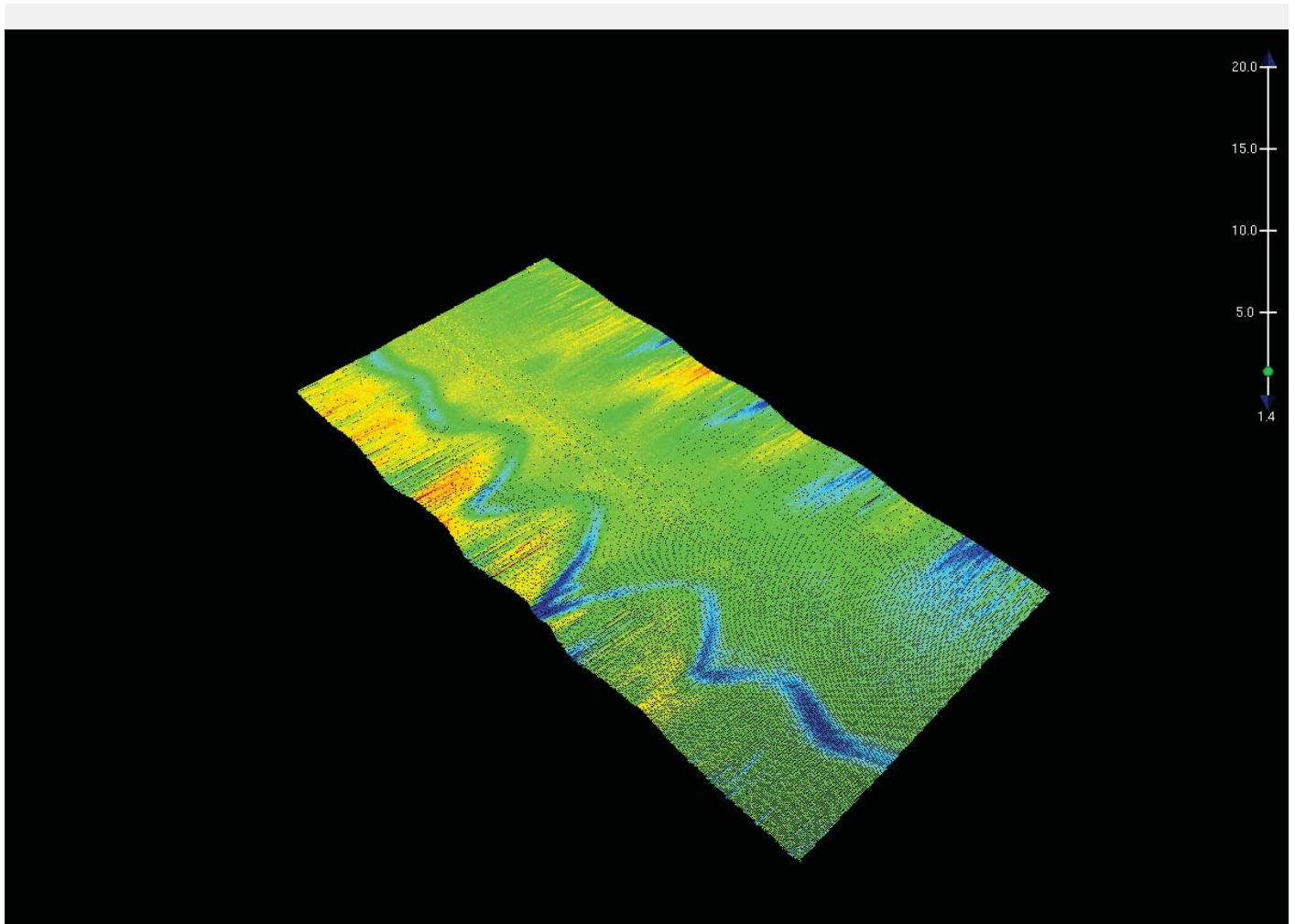
**B.2.5 Equipment Effectiveness**MBES Artifact

For further details on previously identified MBES artifacts refer to the DAPR.

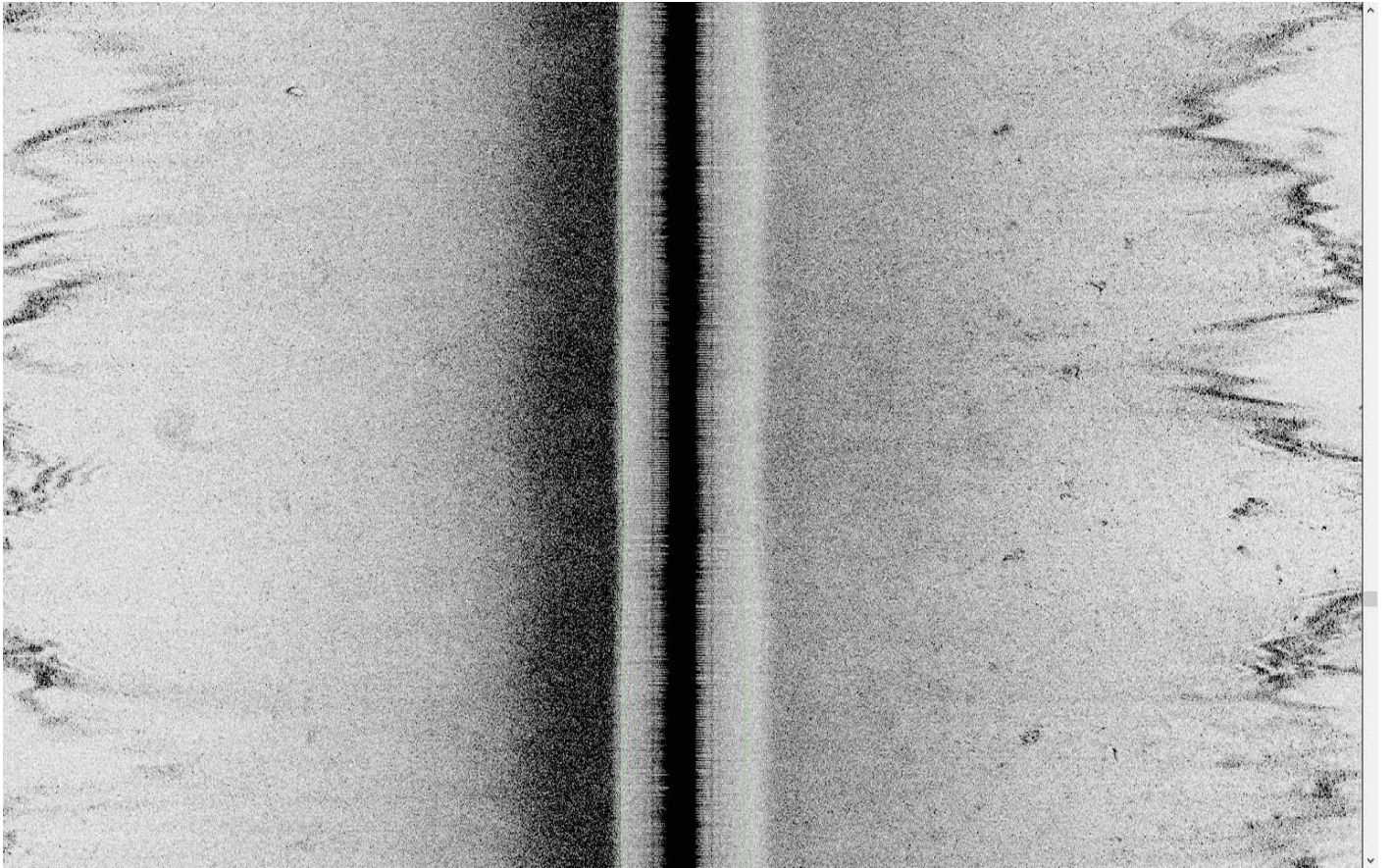
**B.2.6 Factors Affecting Soundings**Oceanographic layering affecting sound speed

Data revealed abundant sound speed artifacts due to a distinctly stratified and variable section of the water column that fluctuated above and below the transducer face. The artifact is realized as a wavy irregularity in the along-track direction of the MBES data. The steepest gradient was frequently located at or near MBES transducer depth. A steep sound velocity gradient regularly migrated throughout the uppermost 12m of the water column and accounted for up to approximately 6m/s differential in sound speed within the water column.

A direct result of the sound speed gradient is also evident in refraction artifacts seen throughout the SSS data. Refraction not only affected the return signal of the backscatter but also the altitude sensor on the SSS towfish. Variations in intensity in the SSS backscatter can be attributed to changes in the pulse length during acquisition to account for refraction and sea floor bottom type, (Figures 8, 9, and 10).



*Figure 8: Wavy MBES data due to sound speed artifact*



*Figure 9: SSS refraction due to sound speed gradient*

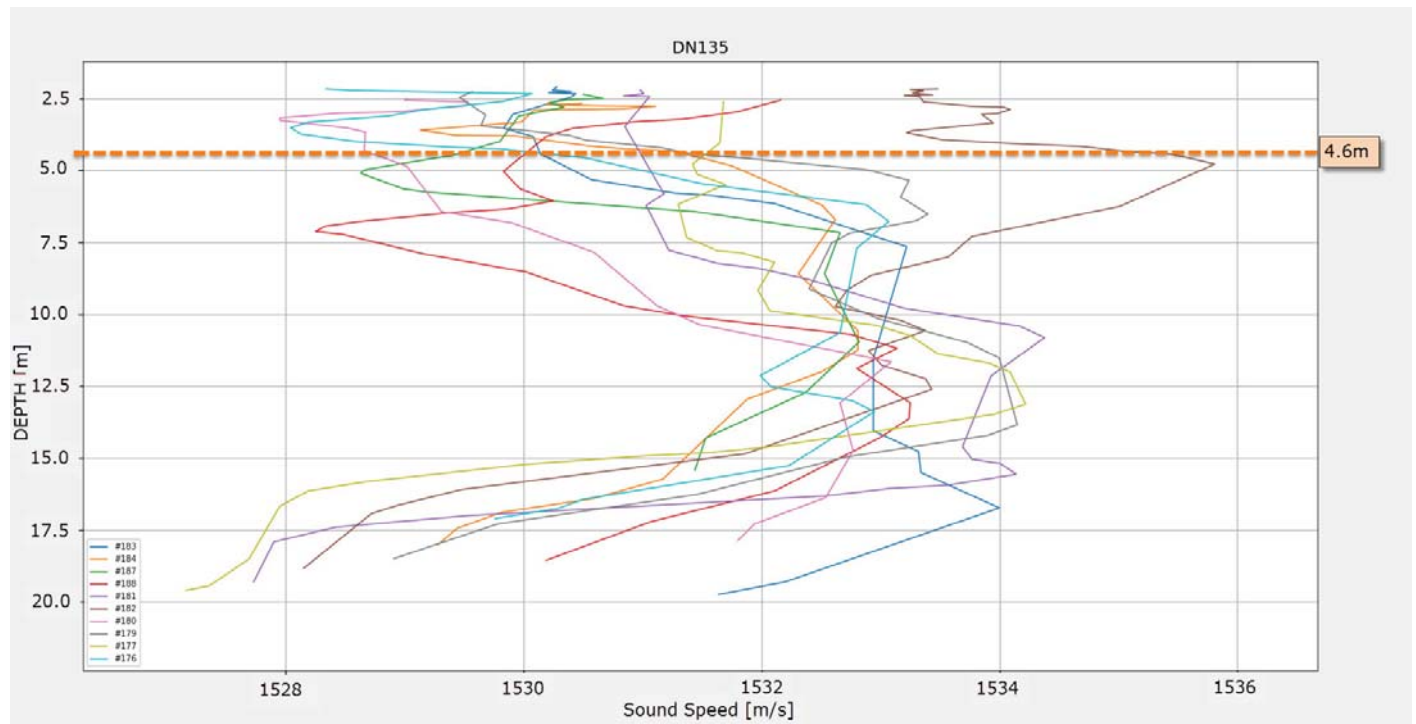
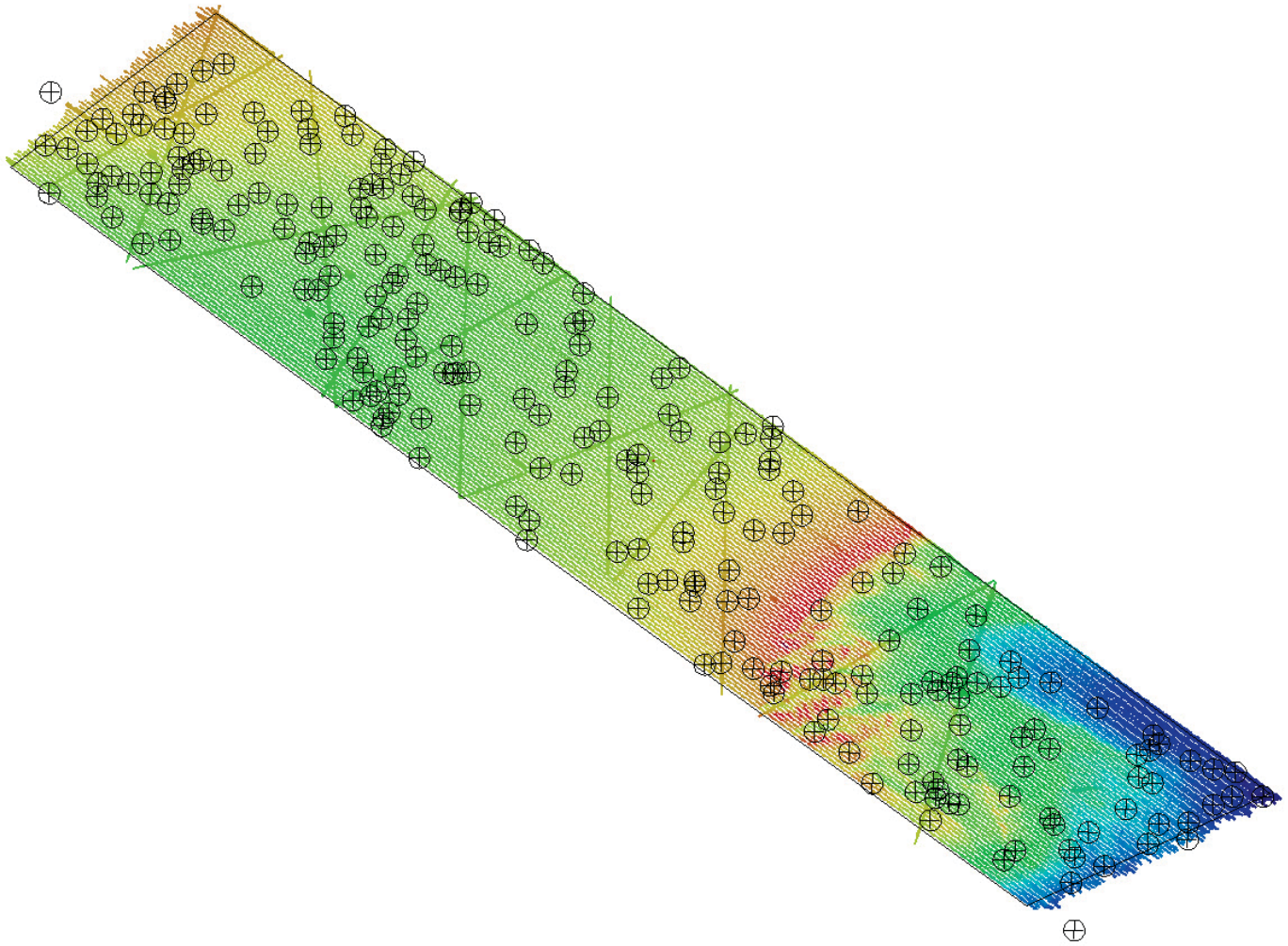


Figure 10: Sound Speed Variation, NOAA Ship *Thomas Jefferson* drafts at approximately 4.6m.

### B.2.7 Sound Speed Methods

Sound Speed Cast Frequency: A total of 249 sound velocity measurements were taken within the boundaries of survey H13047, while 2 casts were not, (see figures 11, 12 and 13 for location and distance from survey boundaries). These casts taken outside of the survey limits provide data representative of the conditions found within the survey area and are appropriate for use. Sound speed profiles were acquired from S222 in accordance with HSSD 2018 standards using a Rolls Royce Brooke Ocean MVP 100 approximately every hour with efforts made to evenly distribute the casts spatially and temporally across the survey area. Comparisons were made by the survey watch to assess sound speed variation in the water column and conduct casts accordingly.

All MVP casts were concatenated into a vessel master file and applied to MBES data in real time.



*Figure 11: MVP cast distribution.*

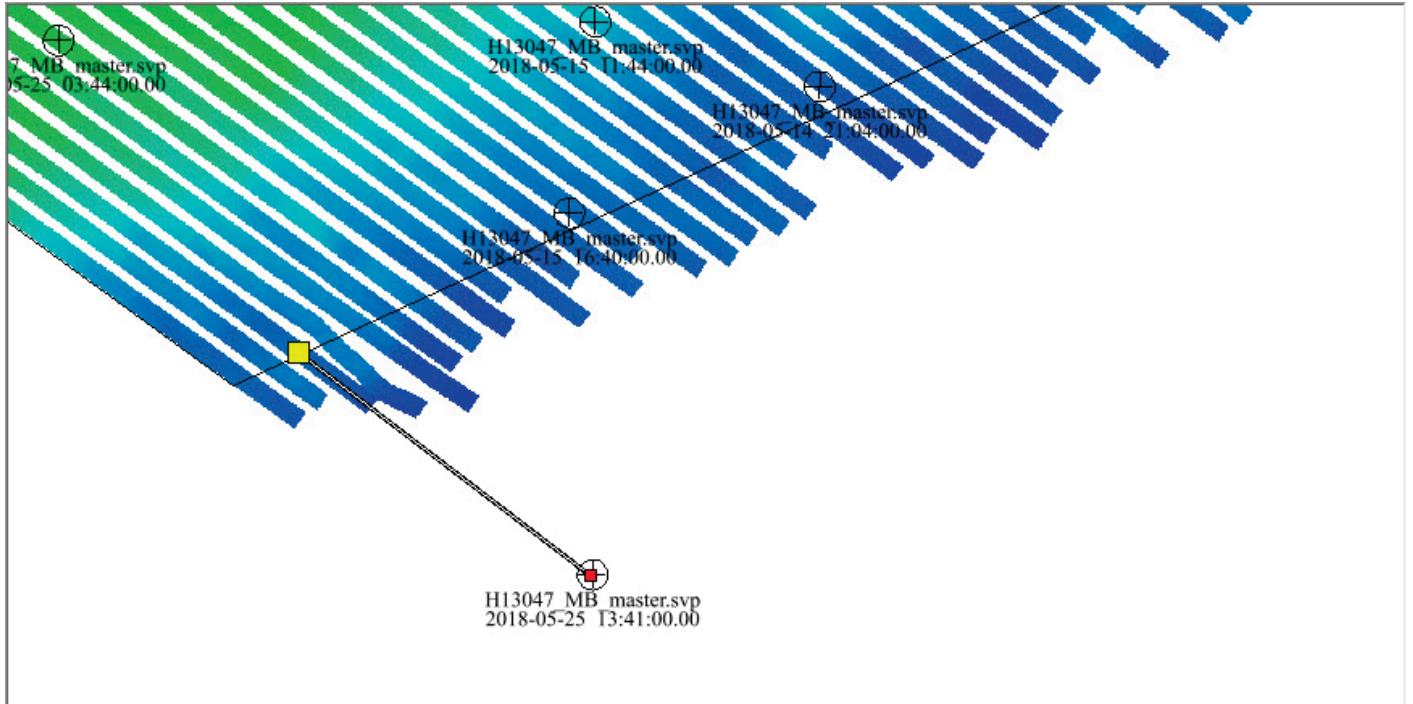


Figure 12: MVP cast was taken about 1600m outside of the survey limits.

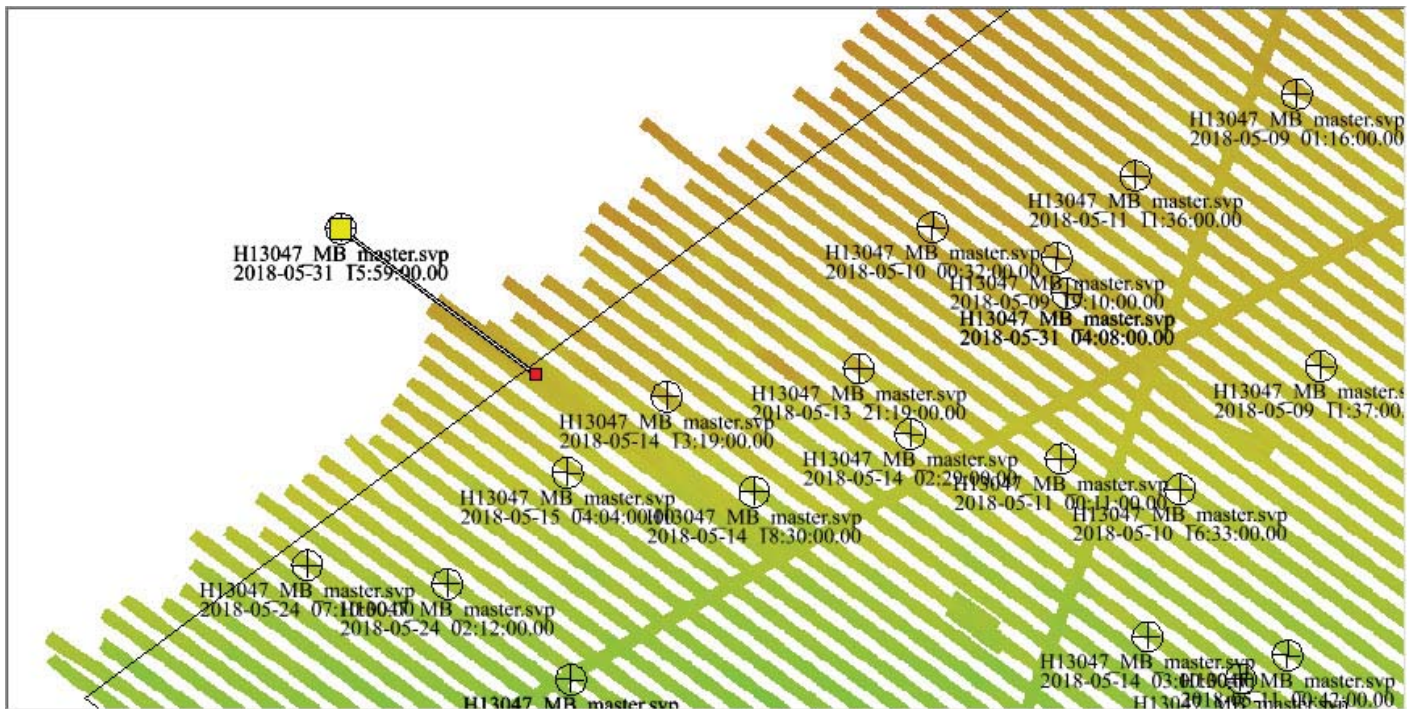


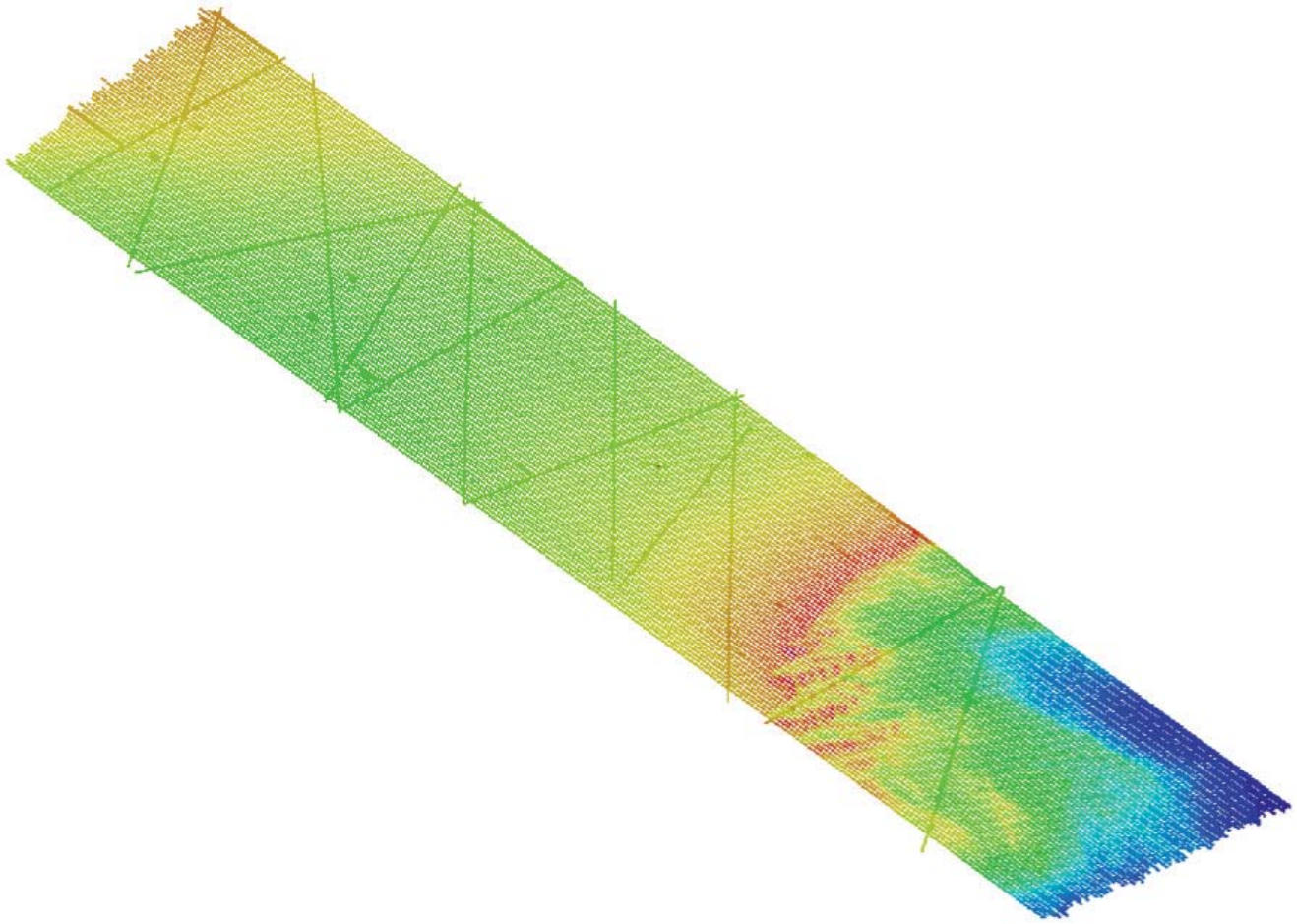
Figure 13: MVP cast was taken about 1300m outside of the survey limits.

### B.2.8 Coverage Equipment and Methods

100% side scan coverage with concurrent MBES was acquired by NOAA Ship *Thomas Jefferson* using a Klein 5000 v2, Kongsberg EM2040 MBES, and Kongsberg EM710 MBES in order to meet the requirements for full coverage of survey H13047, (Figures 14 and 15).



*Figure 14: Klein 5000 v2 Side Scan Sonar coverage mosaic.*



*Figure 15: EM2040 and EM710 MBES coverage CUBE surface.*

## **B.3 Echo Sounding Corrections**

### **B.3.1 Corrections to Echo Soundings**

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

### **B.3.2 Calibrations**

All sounding systems were calibrated as detailed in the DAPR.

## **B.4 Backscatter**

Raw MBES Backscatter was logged as part of the .all file of the Kongsberg systems. Backscatter was processed in QPS FMGT software and the exported geotiff is included in the final processed data.



Backscatter data were collected with EM710 and EM2040. Some gaps in along track backscatter coverage existed in individual sonar backscatter mosaics; however, full along-track backscatter coverage was obtained in the combined backscatter mosaic, (Figures 16-18).



*Figure 16: Backscatter GeoTiff processed from data acquired by the Kongsberg EM710 and EM2040.*



*Figure 17: Backscatter holidays in EM2040 GeoTiff.*



*Figure 18: Backscatter holidays in EM710 GeoTiff.*

## **B.5 Data Processing**

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

The following Feature Object Catalog was used: NOAA Profile V\_5\_7.

The appropriate NOAA profile was used when processing the data in CARIS HIPS and SIPS 10.4.

## B.5.2 Surfaces

The following surfaces and/or BAGs were submitted to the Processing Branch, (Table 10):

| Surface Name                   | Surface Type                | Resolution | Depth Range               | Surface Parameter | Purpose          |
|--------------------------------|-----------------------------|------------|---------------------------|-------------------|------------------|
| H13047_MB_1m_MLLW              | CARIS Raster Surface (CUBE) | 1 meter    | 18.1 meters - 31.2 meters | NOAA_1m           | Complete MBES    |
| H13047_MB_1m_MLLW_Final        | CARIS Raster Surface (CUBE) | 1 meter    | 18.1 meters - 31.2 meters | NOAA_1m           | Complete MBES    |
| H13047_SSSAB_1m_455kHz_1of1    | SSS Mosaic                  | 1 meter    | 0 meters - 0 meters       | N/A               | 100% SSS         |
| H13047_MBAB_6m_S222_70kHz_1of2 | Geotiff                     | 6 meters   | 0 meters - 0 meters       | N/A               | MBES Backscatter |
| H13047_MBAB_1m_S222_300kHz2of2 | Geotiff                     | 1 meter    | 0 meters - 0 meters       | N/A               | MBES Backscatter |

*Table 10: Submitted Surfaces*

Per section 5.2.2.3 of the NOAA HSSD (ed 2018), 100% Side scan with concurrent MBES was acquired in accordance with project requirements for complete coverage. All MBES data was gridded at 1m for survey H13047 in accordance with a single grid resolution waiver (see Project Correspondence for full discussion). All SSS data was mosaiced at 1m resolution.

## C. Vertical and Horizontal Control

Per section 5.1.2.3 of the FPM, no Horizontal and Vertical Control Report has been generated for Survey H13047.

### C.1 Vertical Control

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

#### ERS Methods Used:

ERS via VDATUM

Ellipsoid to Chart Datum Separation File:

OPR-K371-TJ-17\_WGS84-MLLW\_Geoid12B.csar

All soundings submitted as H13047 are reduced to MLLW using VDatum techniques detailed in the DAPR.

## C.2 Horizontal Control

The horizontal datum for this project is World Geodetic System (WGS) 1984.

The projection used for this project is Projected UTM 15N.

## D. Results and Recommendations

### D.1 Chart Comparison

A chart comparison was conducted between survey H13047 soundings and previously charted ENC soundings using both Chart Review and DtoN Scanner tools embedded within Pydro QC Tools 2 v.2.5.21.

#### D.1.1 Electronic Navigational Charts

The following are the largest scale ENCs, which cover the survey area, (Table 11):

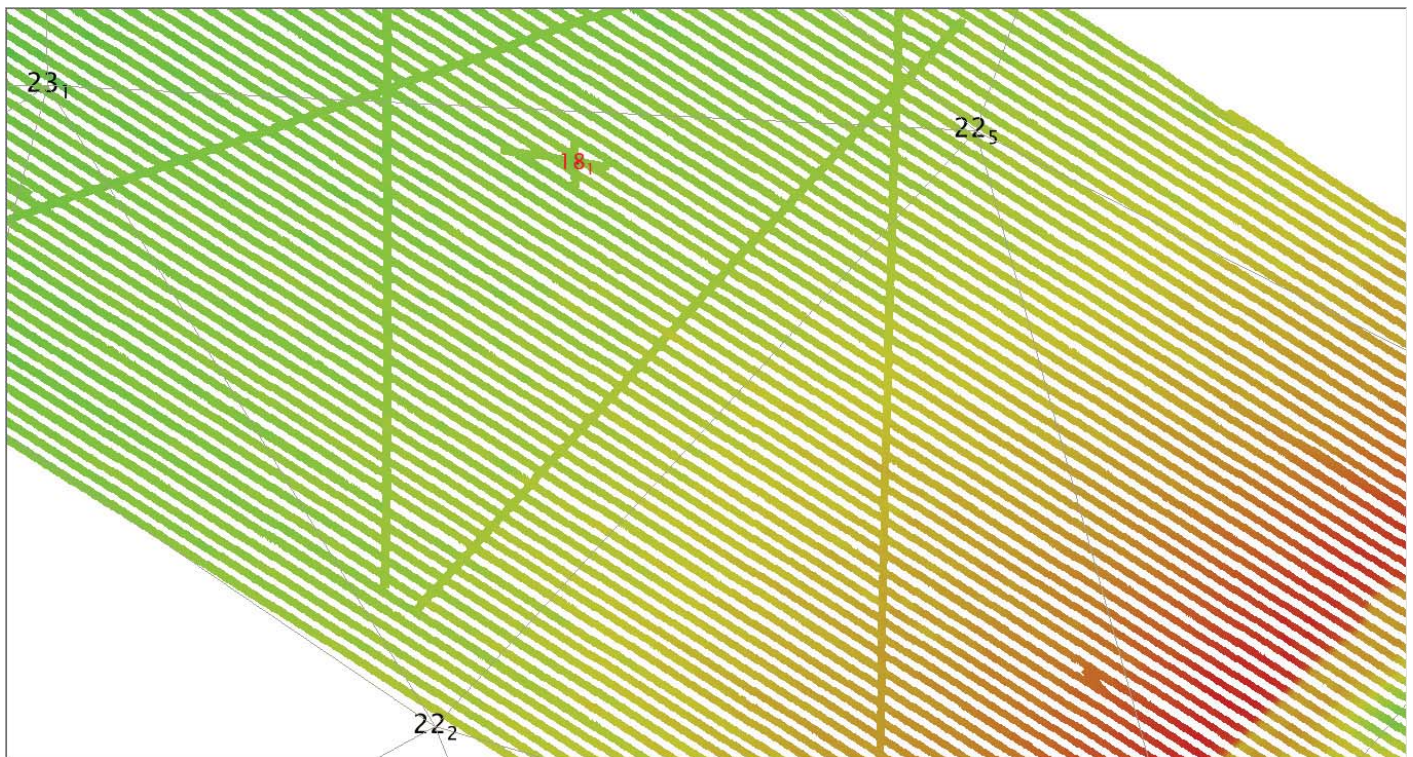
| ENC      | Scale    | Edition | Update Application Date | Issue Date | Preliminary? |
|----------|----------|---------|-------------------------|------------|--------------|
| US3GC02M | 1:250000 | 32      | 05/30/2018              | 05/30/2018 | NO           |

*Table 11: Largest Scale ENCs*

US3GC02M

ENC US3GC02M is the largest scale chart for the area surveyed for H13047.

The comparison between H13047 and US3GC02M found that H13047 soundings are generally deeper or within 1 meter of the charted soundings. Only one sounding was flagged for the results of the chart comparison and it was deemed not to be a DTON. The sounding that is above the 1 meter allowable tolerance is 4 meters shallower than existing charted soundings and is found on an uncharted wreck, (Figure 19).



*Figure 19: Chart comparison between ENC US3GC02M and H13047. The 18.1 meter sounding (shown in red) is 4 meters shallower than the area encompassed by the charted depths (shown in black).*

### **D.1.2 Maritime Boundary Points**

No Maritime Boundary Points were assigned for this survey.

### **D.1.3 Charted Features**

A total of six charted pipelines were investigated. Reference the Final Feature File for Further information.

### **D.1.4 Uncharted Features**

Five uncharted features were discovered including four pipelines and one wreck. Reference the Final Feature File for further information.

### **D.1.5 Shoal and Hazardous Features**

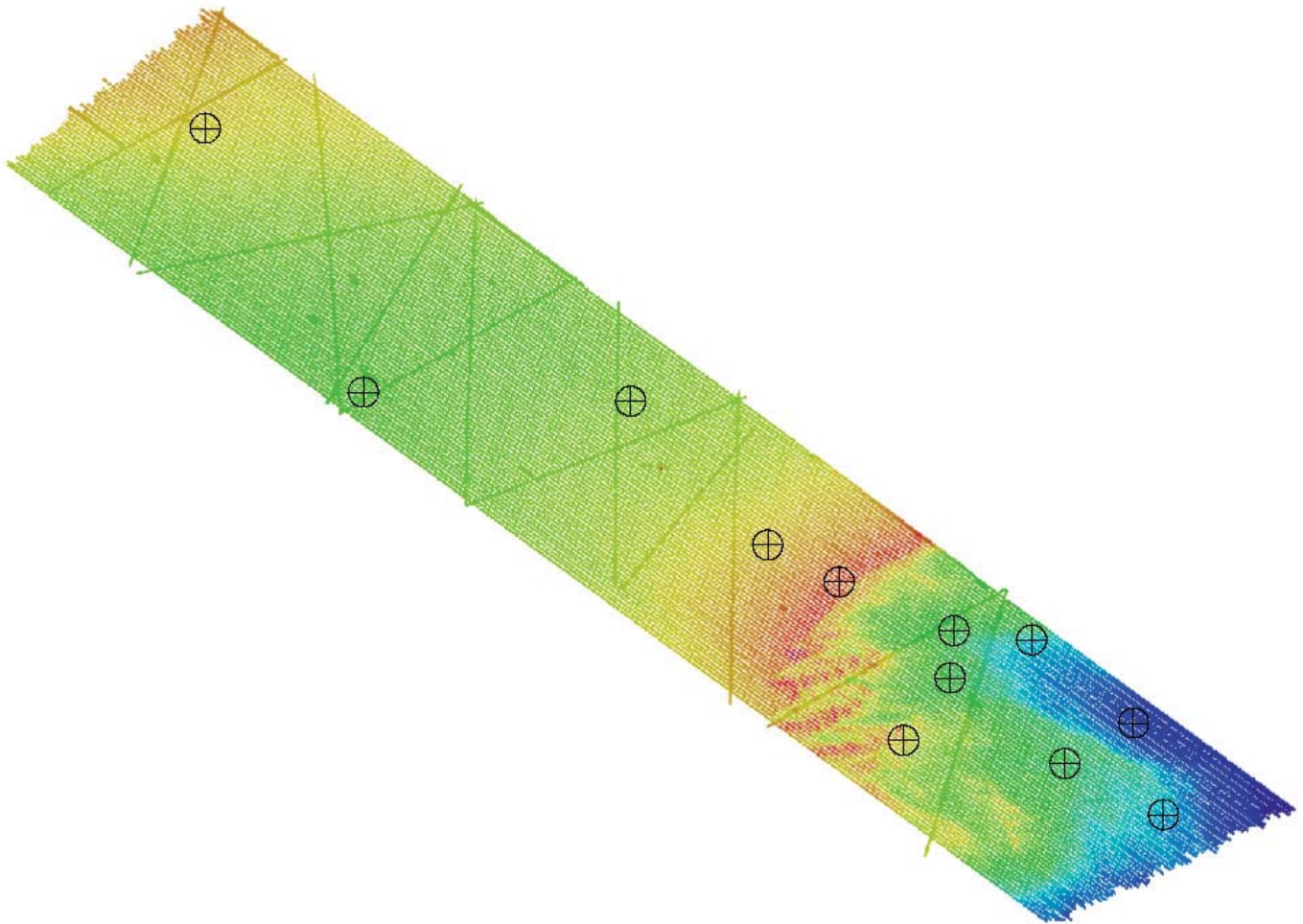
A total of four uncharted features, referencing the four pipelines as stated in section D.1.4, were investigated and determined to be Dangers to Navigation. Reference the Final Feature File and relevant DTON Report documents for further information.

### **D.1.6 Channels**

No channels exist for this survey. There are no designated anchorages, precautionary areas, safety fairways, traffic separation schemes, pilot boarding areas, or channel and range lines within the survey limits.

### **D.1.7 Bottom Samples**

A total of twelve bottom samples were collect by NOAA Ship *Thomas Jefferson* and HSL 2903. The number and distribution of bottom samples were adjusted after an analysis of backscatter and SSS mosaics. The final sample plan was deemed to cover the main distinct bottom type regions present in the survey. Due to a malfunction in the ship's Image Grab Sampler (IGS), images for bottom samples 9-11 were not acquired. Reference the Final Feature File for further information, (Figure 20).



*Figure 20: Bottom sample locations*

## **D.2 Additional Results**

### **D.2.1 Shoreline**

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

### **D.2.2 Prior Surveys**

No prior survey comparisons exist for this survey.

### **D.2.3 Aids to Navigation**

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



**D.2.4 Overhead Features**

No overhead features exist for this survey.

**D.2.5 Submarine Features**

A total of sixteen features that include pipelines and wellheads were investigated. Reference the Final Feature File for further information.

**D.2.6 Platforms**

No platforms exist for this survey.

**D.2.7 Ferry Routes and Terminals**

No ferry routes or terminals exist for this survey.

**D.2.8 Abnormal Seafloor and/or Environmental Conditions**

No abnormal seafloor and/or environmental conditions exist for this survey.

**D.2.9 Construction and Dredging**

No present or planned construction or dredging operations are known to exist within the survey limits.

**D.2.10 New Survey Recommendation**

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

**D.2.11 Inset Recommendation**

No new insets are recommended for this area.

## E. Approval Sheet

As Chief of Party, field operations for this hydrographic survey were conducted under my direct supervision, with frequent personal checks of progress and adequacy. I have reviewed the attached survey data and reports.

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

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

| Approver Name                          | Approver Title           | Approval Date | Signature  |
|--|--------------------------|---------------|--|
| Christiaan van Westendorp,<br>CDR/NOAA | Chief of Party           | 08/10/2018    | <br>VAN<br>WESTENDORP.CHRISTIAAN.HENRY.1012828175<br>c=US, o=U.S. Government, ou=DoD, ou=PKI,<br>ou=NOAA, cn=VAN<br>WESTENDORP.CHRISTIAAN.HENRY.1012828175<br>2018.08.09 15:59:03 -04'00'       |
| Anthony Klemm,<br>LT/NOAA              | Field Operations Officer | 08/10/2018    | <br>Digitally signed by<br>KLEMM.ANTHONY.ROSS.1392701601<br>DN: c=US, o=U.S. Government, ou=DoD,<br>ou=PKI, ou=NOAA,<br>cn=KLEMM.ANTHONY.ROSS.1392701601<br>Date: 2018.08.09 16:26:04 -04'00' |
| Charles Wisotzkey,<br>LT/NOAA          | 4th Officer              | 08/10/2018    | <br>Digitally signed by<br>WISOTZKEY.CHARLES.JUSTIN<br>.1300819660<br>Date: 2018.08.13 13:12:40 Z   |
| HSST Josh Hiteshew                     | Sheet Manager            | 08/10/2018    | HITESHEW.JOSHUA.TAY<br>LOR.1537939652<br>Digitally signed by<br>HITESHEW.JOSHUA.TAYLOR.1537939652<br>Date: 2018.08.13 11:56:11 Z   |

## F. Table of Acronyms

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

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

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

APPENDIX I  
TIDES AND WATER LEVELS

## APPENDIX II

# SUPPLEMENTAL SURVEY RECORDS AND CORRESPONDENCE



Joshua Hiteshew - NOAA Federal <joshua.hiteshew@noaa.gov>

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## Coast pilot review

3 messages

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**Joshua Hiteshew - NOAA Federal** <joshua.hiteshew@noaa.gov> Thu, Aug 16, 2018 at 5:44 PM  
To: OCS NDB - NOAA Service Account <ocs.ndb@noaa.gov>, \_NOS OCS NSD Coast Pilot <coast.pilot@noaa.gov>  
Cc: \_OMAO MOA ChiefST Thomas Jefferson <chiefst.thomas.jefferson@noaa.gov>, \_OMAO MOA OPS Thomas Jefferson <ops.thomas.jefferson@noaa.gov>, Anthony Klemm - NOAA Federal <anthony.r.klemm@noaa.gov>, Charles Wisotzkey - NOAA Federal <charles.j.wisotzkey@noaa.gov>, Douglas Wood - NOAA Federal <douglas.wood@noaa.gov>

To whom it may concern,

Attached is the Coast Pilot review for project OPR-K371-TJ-18.


V/r,

Josh

--

HSST Joshua Hiteshew, NOAA  
NOAA ship Thomas Jefferson  
439 W York St, Norfolk, VA 23510

---

 **OPR-K371-TJ-18\_Coast\_pilot review.pdf**  
2099K

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**Richard Powell - NOAA Federal** <richard.powell@noaa.gov> Thu, Aug 16, 2018 at 6:17 PM  
To: Joshua Hiteshew - NOAA Federal <joshua.hiteshew@noaa.gov>

Josh,

Thanks for the report and noting that you were not able take any current velocity readings.

Sincerely,  
Richard

*Richard Hodge Powell*  
Cartographer / Marine Information  
Nautical Publications Branch  
240-533-0060

National Oceanic and Atmospheric Administration  
National Ocean Service  
Office of Coast Survey

[Quoted text hidden]

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**Douglas Wood - NOAA Federal** <douglas.wood@noaa.gov> Mon, Aug 20, 2018 at 9:20 PM  
To: Joshua Hiteshew - NOAA Federal <joshua.hiteshew@noaa.gov>

Thanks Josh!

On Thu, Aug 16, 2018 at 1:44 PM, Joshua Hiteshew - NOAA Federal <joshua.hiteshew@noaa.gov> wrote:

[Quoted text hidden]



--

Douglas Wood  
Physical Scientist  
Hydrographic Surveys Division  
Office of Coast Survey  
National Oceanic and Atmospheric Administration  
[1315 East West Highway](#)  
[Silver Spring, MD 20910](#)  
240-533-0042



Joshua Hiteshew - NOAA Federal <joshua.hiteshew@noaa.gov>

---

## DTON H13047 OPR-K371-TJ-18

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**OCS NDB - NOAA Service Account** <ocs.ndb@noaa.gov>

Thu, Jul 5, 2018 at 6:43 PM

To: Anthony Klemm - NOAA Federal <anthony.r.klemm@noaa.gov>

Cc: Briana Welton - NOAA Federal <Briana.Hillstrom@noaa.gov>, \_OMAO MOA ChiefST Thomas Jefferson <chiefst.thomas.jefferson@noaa.gov>, \_OMAO MOA CO Thomas Jefferson <co.thomas.jefferson@noaa.gov>, Corey personal cell Allen <corey.allen@noaa.gov>, Douglas Wood <douglas.wood@noaa.gov>, Joshua Hiteshew - NOAA Federal <joshua.hiteshew@noaa.gov>, \_NOS OCS PBA Branch <ocs.pba@noaa.gov>, \_NOS OCS PBB Branch <ocs.pbb@noaa.gov>, \_NOS OCS PBC Branch <ocs.pbc@noaa.gov>, \_NOS OCS PBD Branch <ocs.pbd@noaa.gov>, \_NOS OCS PBE Branch <ocs.pbe@noaa.gov>, \_NOS OCS PBG Branch <ocs.pbg@noaa.gov>, Castle E Parker <Castle.E.Parker@noaa.gov>, Charles Porter - NOAA Federal <charles.porter@noaa.gov>, James M Crocker <James.M.Crocker@noaa.gov>, Ken Forster <Ken.Forster@noaa.gov>, Kevin Jett - NOAA Federal <kevin.jett@noaa.gov>, Matt Kroll <Matt.Kroll@noaa.gov>, Michael Gaeta <Michael.Gaeta@noaa.gov>, Nautical Data Branch <OCS.NDB@noaa.gov>, NSD Coast Pilot <coast.pilot@noaa.gov>, PHB Chief <PHB.Chief@noaa.gov>, Tara Wallace <Tara.Wallace@noaa.gov>, Chris Libeau <Chris.Libeau@noaa.gov>

DD-29650 has been registered by the Nautical Data Branch and directed to Products Branch G for processing.

The Dtons reported are four uncharted pipelines located between Galveston Bay Entrance and Sabine Bank Channels in the Gulf of Mexico.

The following charts are affected:

11330 kapp 195

11340 kapp 49

The following ENC is affected:

US3GC02M

References:

H13047

OPR-K371-TJ-18

This information was discovered and submitted by the crew of the NOAA Ship Thomas Jefferson.

Nautical Data Branch/Marine Chart Division/  
Office of Coast Survey/National Ocean Service/

Contact: [ocs.ndb@noaa.gov](mailto:ocs.ndb@noaa.gov)



On Mon, Jul 2, 2018 at 8:10 AM, Anthony Klemm - NOAA Federal <anthony.r.klemm@noaa.gov> wrote:

[Quoted text hidden]

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**H13047\_DTON.zip**  
2600K



James Miller - NOAA Federal <james.j.miller@noaa.gov>

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## Thomas Jefferson Marine Mammal Reports 30 Apr - 17 May 2018

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Jacquelyn Putnam - NOAA Federal <jacquelyn.putnam@noaa.gov>

Thu, May 17, 2018 at 12:16 PM

To: \_NOS OCS ECC <ocs.ecc@noaa.gov>, Douglas Wood - NOAA Federal <douglas.wood@noaa.gov>, \_NMFS AFSC NMML POP INFORMATION <pop.information@noaa.gov>

Cc: Anthony Klemm - NOAA Federal <anthony.r.klemm@noaa.gov>, James Miller - NOAA Federal <james.j.miller@noaa.gov>

Good Afternoon,

Attached are marine mammal sighting reports from NOAAS *Thomas Jefferson*. These reports cover sightings during our first leg of Approaches to Galveston (30 April - 17 May).

Thank you in advance,

### ENS Jacquelyn Putnam, NOAA

Junior Officer, NOAA Ship *Thomas Jefferson*

Ship Land Line: 757-441-6322










Ship Cell: 757-647-0187

Ship Iridium: 808-434-2706

[Jacquelyn.Putnam@noaa.gov](mailto:Jacquelyn.Putnam@noaa.gov)

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### 9 attachments

-  Thomas Jefferson\_20180430204001\_MARINE\_MAMMAL.txt  
1K
-  Thomas Jefferson\_20180501195840\_MARINE\_MAMMAL.txt  
1K
-  Thomas Jefferson\_20180503215717\_MARINE\_MAMMAL.txt  
2K
-  Thomas Jefferson\_20180507143116\_MARINE\_MAMMAL.txt  
1K
-  Thomas Jefferson\_20180508201956\_MARINE\_MAMMAL.txt  
2K
-  Thomas Jefferson\_20180512190725\_MARINE\_MAMMAL.txt  
1K
-  Thomas Jefferson\_20180512190735\_MARINE\_MAMMAL.txt  
1K
-  Thomas Jefferson\_20180514164218\_MARINE\_MAMMAL.txt  
2K
-  Thomas Jefferson\_20180514164231\_MARINE\_MAMMAL.txt  
2K



Charles Wisotzkey - NOAA Federal <charles.j.wisotzkey@noaa.gov>

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## Survey outline for H13047 OPR-K371-TJ-18

1 message

---

**Anthony Klemm - NOAA Federal** <anthony.r.klemm@noaa.gov>

Fri, Jun 29, 2018 at 12:45 AM

To: \_NOS OCS Survey Outlines <survey.outlines@noaa.gov>

Cc: Douglas Wood <douglas.wood@noaa.gov>, \_OMAO MOA OPS Thomas Jefferson <ops.thomas.jefferson@noaa.gov>, \_OMAO MOA ChiefST Thomas Jefferson <chiefst.thomas.jefferson@noaa.gov>, Joshua Hiteshew - NOAA Federal <joshua.hiteshew@noaa.gov>

Good evening,

Attached is the survey outline for H13047.

Best regards,  
Anthony

LT Anthony Klemm, NOAA  
Field Operations Officer  
NOAA Ship *Thomas Jefferson*  
[439 W York Street](#)  
[Norfolk, VA 23510](#)  
[757-647-0187](#)

Learn about NOAA nautical charts - [www.nauticalcharts.noaa.gov](http://www.nauticalcharts.noaa.gov)

---

 **H13047\_Survey\_Outline.000**  
6K



Charles Wisotzkey - NOAA Federal <charles.j.wisotzkey@noaa.gov>

---

## OPR-K371-TJ-17\_WGS84-MLLW\_Geoid12B SEP

2 messages

---

**Jack Riley - NOAA Federal** <jack.riley@noaa.gov>

Mon, Apr 9, 2018 at 1:08 PM

To: \_OMAO MOA ChiefST Thomas Jefferson <chiefst.thomas.jefferson@noaa.gov>

Cc: \_OMAO MOA OPS Thomas Jefferson <ops.thomas.jefferson@noaa.gov>, Douglas Wood - NOAA Affiliate <douglas.wood@noaa.gov>

Hello Chief Stone,

See attached for the WGS84 version of the K371 MLLW SEP (NAD83 version was delivered earlier via OPS/Doug).

Kind regards,

Jack

--

Jack L. Riley

NOAA Coast Survey

SSMC3 N/CS11 Rm 6601

240-847-8271



**OPR-K371-TJ-17\_WGS84-MLLW\_Geoid12B.zip**

1990K

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**Douglas Wood - NOAA Federal** <douglas.wood@noaa.gov>

Mon, Apr 9, 2018 at 6:37 PM

To: "OPS.Thomas Jefferson - NOAA Service Account" <ops.thomas.jefferson@noaa.gov>, "ChiefST.Thomas Jefferson - NOAA Service Account" <chiefst.thomas.jefferson@noaa.gov>

Hi *TJ* Ops,

thank you for having me last week and I hope that things went well today.

Attached is an updated SEP model (WGS84 - MLLW) from Jack for approaches to Houston.

Let me know if this looks good.

Thank you.

Doug

[Quoted text hidden]

--

Douglas Wood

Physical Scientist

Hydrographic Surveys Division

Office of Coast Survey

National Oceanic and Atmospheric Administration

1315 East West Highway

Silver Spring, MD 20910

240-533-0042



**OPR-K371-TJ-17\_WGS84-MLLW\_Geoid12B.zip**

1990K



**UNITED STATES DEPARTMENT OF COMMERCE**  
**National Oceanic and Atmospheric Administration**  
 Office of Marine and Aviation Operations,  
 Marine Operations Center – Atlantic, NOAA Ship *Thomas Jefferson*  
 Norfolk, Virginia 23510

August 3, 2018

MEMORANDUM FOR: Doug Wood  
 Project Manager, OPR-K371-TJ-18  
 Hydrographic Surveys Division Operations Branch

FROM: Commander Chris van Westendorp, NOAA   
 Commanding Officer, NOAA Ship *Thomas Jefferson*

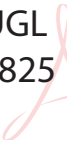
VAN  
 WESTENDORP.CHRISTIAAN.HENRY.1012828175  
 c=US, o=U.S. Government, ou=DoD, ou=PKI,  
 ou=NOAA, cn=VAN  
 WESTENDORP.CHRISTIAAN.HENRY.1012828175  
 2018.08.03 09:43:38 -05'00'

SUBJECT: OPR-K371-TJ-18 waiver request re: HTD 2018-5

*Thomas Jefferson* requests a waiver of Hydrographic Technical Directive 2018-5:  
 Feature Image File Naming Convention for all surveys in project OPR-K371-TJ-  
 18.

Justification

Data acquisition and feature management, including all image naming, commenced  
 on all project surveys at the time of issuance of the HTD.

Decision WOOD.DOUGL  Digitally signed by  
 AS.ALAN.12825 WOOD.DOUGLAS.ALAN.12  
 80698 82580698  
 Date: 2018.08.10 09:04:15  
 -04'00'

Waiver is: Granted Denied

cc: Chief, HSD OPS  
 OPS, *Thomas Jefferson*  
 HCST, *Thomas Jefferson*





**UNITED STATES DEPARTMENT OF COMMERCE**  
**National Oceanic and Atmospheric Administration**  
Office of Marine and Aviation Operations,  
Marine Operation Center-Atlantic, NOAA Ship *Thomas Jefferson*  
Norfolk, Virginia 23510

April 16, 2018

MEMORANDUM FOR: Jay Nunenkamp  
Environmental Compliance Coordinator, NOAA Office of Coast  
Survey

FROM: ENS Jacquelyn Putnam, NOAA  
Junior Officer, NOAA Ship *Thomas Jefferson*

SUBJECT: Recipients of Marine Species Awareness Training

The following personnel of NOAA Ship *Thomas Jefferson* completed the required Marine Species Awareness Training (MSAT) on April 4, 2018:

- LCDR Meghan McGovern
- LT Anthony Klemm
- LT Charles Wisotzkey
- ENS Dale Gump
- ENS Sydney Catoire
- ENS Garrison Grant
- ENS Jacquelyn Putnam
- ENS Taylor Krabiell
- JUE Sharon Gilliam
- EU Andy Medina
- WP Michael Wilson
- ET Thomas Loftin
- ET Richard Conway
- CHST Allison Stone
- HST Kim Glomb
- HST Joshua Hiteshew
- HST Tracey McMillan
- HAST Kevin Brown
- CB Bernard Pouser
- BGL Robert Bayliss
- SS Francine Grains
- SS James Brzostek



- AB Patrick Osborn
- AB Tom Bascom
- AB Stephen Lovett
- GVA Joshua Thompson
- CC Ace Burke
- 2C Patrick Fennel
- 2C Nester Poblete





Charles Wisotzkey - NOAA Federal <charles.j.wisotzkey@noaa.gov>

---

## Environmental compliance letter for Approaches to Galveston

1 message

---

**Douglas Wood - NOAA Federal** <douglas.wood@noaa.gov>

Tue, Mar 6, 2018 at 8:30 AM

To: "OPS.Thomas Jefferson - NOAA Service Account" <ops.thomas.jefferson@noaa.gov>, "ChiefST.Thomas Jefferson - NOAA Service Account" <chiefst.thomas.jefferson@noaa.gov>, CO Thomas Jefferson <co.thomas.jefferson@noaa.gov>

Hi TJ,

I just received the signed environmental review for OPR-K371.  
Please take some time to review it.

Thank you

Doug

--

Douglas Wood  
Physical Scientist  
Hydrographic Surveys Division  
Office of Coast Survey  
National Oceanic and Atmospheric Administration  
1315 East West Highway  
Silver Spring, MD 20910  
[240-533-0042](tel:240-533-0042)

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 **Env Review - Houston-Galveston 2018.pdf**  
3048K



Charles Wisotzkey - NOAA Federal <charles.j.wisotzkey@noaa.gov>

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## Waiver request for HTD issued after commencement of data acquisition and processing

1 message

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**Charles Wisotzkey - NOAA Federal** <charles.j.wisotzkey@noaa.gov> Sun, Aug 5, 2018 at 8:09 PM  
To: Douglas Wood - NOAA Federal <douglas.wood@noaa.gov>  
Cc: \_OMAO MOA OPS Thomas Jefferson <ops.thomas.jefferson@noaa.gov>

Doug,

Please see attached.

--

LT Charles J. Wisotzkey, NOAA  
NOAA Ship Thomas Jefferson (S-222)

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**OPR-K371-TJ-18 HTD 2018-5 waiver request.pdf**  
163K



Anthony Klemm - NOAA Federal <anthony.r.klemm@noaa.gov>

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## OPR-K37-TJ-18 NCEI Sound Speed Data

1 message

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**Charles Wisotzkey - NOAA Federal** <charles.j.wisotzkey@noaa.gov>

Wed, Aug 8, 2018 at 6:56 PM

To: NODC.submissions@noaa.gov

Cc: \_OMAO MOA OPS Thomas Jefferson <ops.thomas.jefferson@noaa.gov>, \_OMAO MOA ChiefST Thomas Jefferson <chiefst.thomas.jefferson@noaa.gov>, Douglas Wood - NOAA Federal <douglas.wood@noaa.gov>, Martha Herzog - NOAA Federal <martha.herzog@noaa.gov>, Jacquelyn Putnam - NOAA Federal <jacquelyn.putnam@noaa.gov>, Joshua Hiteshew - NOAA Federal <joshua.hiteshew@noaa.gov>, Sydney Catoire - NOAA Federal <sydney.catoire@noaa.gov>, Kevin Brown - NOAA Federal <kevin.w.brown@noaa.gov>, James Miller - NOAA Federal <james.j.miller@noaa.gov>, Julia Wallace - NOAA Affiliate <julia.wallace@noaa.gov>

All,

Please attached zip file containing sound speed data from project OPR-K37-TJ-18. The zip file contains all casts for sheets H13044, H13045, H13047, and H13048.

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LT Charles J. Wisotzkey, NOAA  
NOAA Ship Thomas Jefferson (S-222)



**OPR-K37-TJ-18.zip**


4084K



UNITED STATES DEPARTMENT OF COMMERCE  
 National Oceanic and Atmospheric Administration  
 Office of Marine and Aviation Operations  
 NOAA Ship *Thomas Jefferson* (S222)  
 439 West York St, Norfolk, VA 23510

19 June 2018

MEMORANDUM FOR: Doug Wood  
 Project Manager, OPR-K371-TJ-18  
 Hydrographic Surveys Division Operations Branch

FROM: Commander Chris van Westendorp, NOAA   
 Commanding Officer, NOAA Ship *Thomas Jefferson*

SUBJECT: Waiver request – Submission of single resolution depth surface

VAN  
 WESTENDORP.CHRISTIAAN.HENRY.1012828175  
 c=US, o=U.S. Government, ou=DoD, ou=PKI,  
 ou=NOAA, cn=VAN  
 WESTENDORP.CHRISTIAAN.HENRY.1012828175  
 2018.06.19 19:46:30 -0500

*Thomas Jefferson* requests a waiver of the HSSD 2018 Section 5.2.2.3: Complete coverage multibeam surface grid-resolution thresholds requirement. *Thomas Jefferson* requests approval to submit a single 1m resolution CUBE multibeam surface for surveys in Project OPR-K371-TJ-18, in spite of depths ranging both shallower and deeper than 20m.

Justification

The grid nodes with a depth greater than 20m in sheet H13047 have an average sounding density of 84 soundings per node, with 99.5% having greater than or equal to 5 soundings per node, which is sufficient to meet minimum required sounding density requirements at the 1m grid size.

Decision

PRIDGEN.KATHRYN. Digitally signed by  
 GRABOWSKI.13925 PRIDGEN.KATHRYN.GRABOWSKI.1  
 392550549  
 50549 Date: 2018.06.20 09:06:12 -04'00'

Waiver is: Granted Denied

cc: Chief, HSD OPS  
 OPS, *Thomas Jefferson*  
 HCST, *Thomas Jefferson*





APPROVAL PAGE

H13047

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

The following products will be sent to NCEI for archive

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

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

Approved: \_\_\_\_\_

**Commander Briana W. Hillstrom, NOAA**  
Chief, Atlantic Hydrographic Branch