H12331

NOAA FORM 76-35A
U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL OCEAN SERVICE

DESCRIPTIVE REPORT

Type of Survey: Hydrographic Multibeam & 200% Sidescan

Project No. : OPR-K354-KR-11

Registry No. : H12331

LOCALITY

State: Louisiana

General Locality: Gulf of Mexico

Sub-locality: 12 NM S of West Ship Shoal

2012

CHIEFS OF PARTY
Scott Croft, Tara Levy

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NOAA FORM 77-28 (11-72) U.S. DEPARTMENT OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

HYDROGRAPHIC TITLE SHEET

REGISTRY NUMBER: H12331

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:	**Louisiana**		
General Locality:	**Gulf of Mexico**		
Sub-Locality:	**12 NM S of West Ship Shoal**		
Scale:	**1:40,000**	Date of Survey:	**11 Sep to 11- 29 Dec 2011**
Instructions Dated:	**June,2011**	Project Number:	**OPR-K354-KR-11**
Vessel:	*M/V Inez McCall*		
Chief of Party:	**Sc**ott Croft, Tara Levy		
Surveyed by:			C&C Technologies Personel
Soundings by:	**Simrad EM3002 Multibeam Echo sounder**		
Graphic record scaled by:	**N/A**		
Graphic record checked by:	**N/A**		
Protracted by:	**N/A**	Automated Plot:	**N/A**
Verification by:	***Atlantic Hydrographic Branch***		
Soundings in:	**Feet at MLLW**		

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. Revisions and Rednotes were generated during office processing. The processing branch concurs with all information and recommendations in the DR unless otherwise noted. Page numbering may be interrupted or non-sequential. All pertinent records for this survey, including the Descriptive Report, are archived at the National Geophysical Data Center (NGDC) and can be retrieved via http://www.ngdc.noaa.gov/.

Remarks:

Hydrographic Survey of H12331 (Sheet 2)
Data collected in meters, referenced to MLLW, later converted into feet
200% side scan sonar, with concurrent multibeam coverage
UTC time was used exclusively
4 Grab samples were taken
Tidal Zones: CGM 716, WGM 266, 276, 265, 277, 264
Tidal Station: 8762075 (Port Fourchon, LA)

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~~Appendix V Supplemental Survey Records and Correspondence~~

SEPARATES

Separates I	Acquisition and Processing Logs
Separates II	Sound Speed Data
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DESCRIPTIVE REPORT TO ACCOMPANY HYDROGRAPHIC SURVEY H12331

INTRODUCTION

The purpose of this survey is to provide accurate hydrographic data to NOAA in order to update existing nautical charts in a high commercial traffic area in the Gulf of Mexico near the Louisiana coast.

A. AREA SURVEYED

The survey area is located approximately 12 nautical miles south of West Ship Shoal, Louisiana, in the Gulf of Mexico. Illustrations No.1 and 2 show the layout of H12331 (Sheet 1) of Project OPR-K354-KR-11. Water depths in the survey area range from 11.96 to 23.29 m Mean Lower Low Water. Survey statistics including the total survey line and crossline nautical miles, number of bottom samples, number of investigations and data acquisition dates are shown in Tables No. 1 through 3.

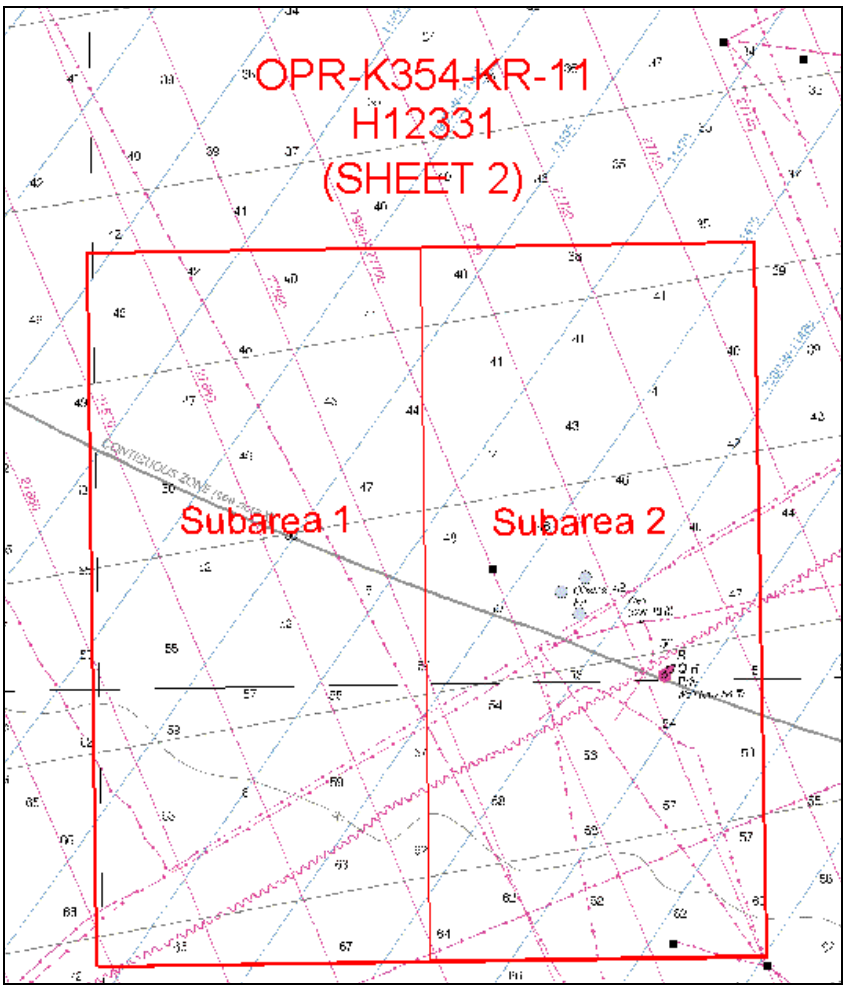


Illustration No. 1. Large scale survey coverage graphic.

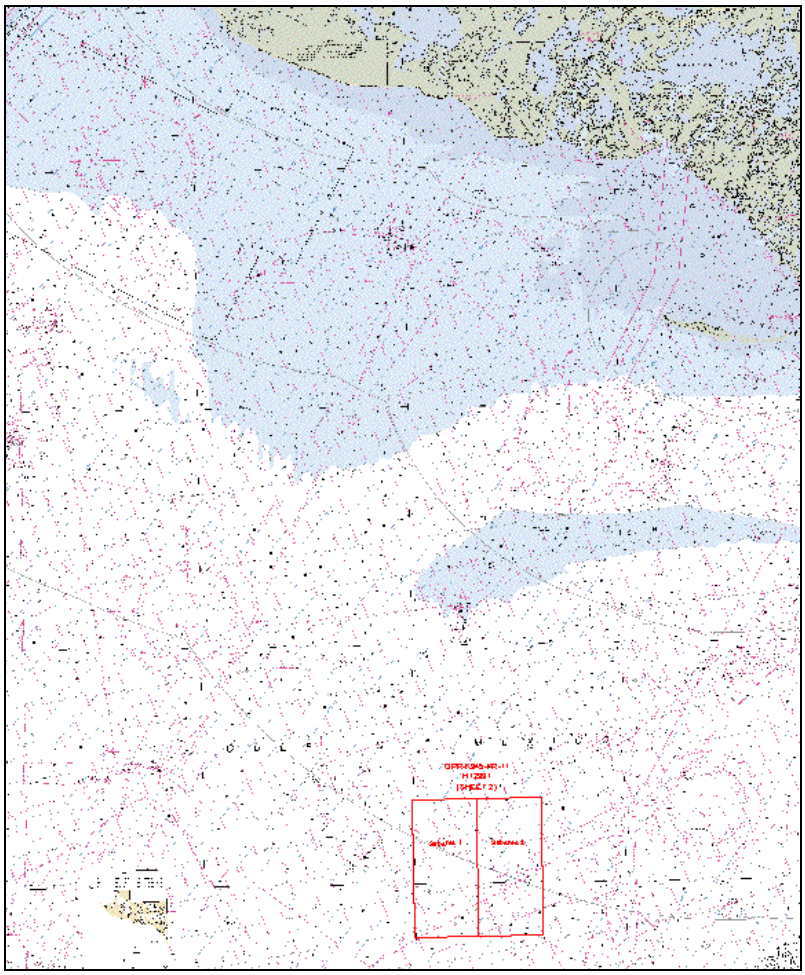


Illustration No. 2. Small scale survey coverage graphic.

Table No. 1. Survey line statistics.

	Inez McCall	Total
LNM Side Scan + Multibeam	706.80	706.80
LNM Crosslines	60.07	60.07
LNM Investigations	6.49	6.49

Table No. 2. Additional survey statistics.

Total square nautical miles of survey area	32.77
Number of bottom samples collected	4
Number of items investigated	15

Table No. 3. Data acquisition dates.

Month	Day	Year
September	11,12,13,22,23,24,25,26,27,29,30	2011
October	3,4,21	2011
December	16,29	2011

B. DATA ACQUISTION AND PROCESSING

Refer to the OPR-K354-KR-11 Data Acquisition and Processing Report (DAPR) for additional information regarding survey systems, operational, processing and quality control procedures. Additional and supplemental information is included in this descriptive report.

B.1. Equipment

Survey operations were conducted from the *M/V Inez McCall*. The vessel is 108 ft (33 m) long and 24 ft (7.3 m) wide with an approximate draft of 8 ft (2.5 m). A central reference point was established prior to the survey from which all relevant offsets were measured. Primary systems and equipment utilized on the *M/V Inez McCall* are listed in Table No 4.

Table No. 4. Equipment list.

System	Manufacturer	Model
Multibeam Echo Sounder	Simrad	EM3002
Side Scan Sonar	Klein	5000
Single Beam Echo Sounder	ODOM	Echotrac DF3200 MK II
Motion Sensor	Applanix	POS MV-320 V.3
Primary Positioning System	CNAV	2050
Secondary Positioning System	CNAV	2050
Tertiary Positioning System	Applanix	POS MV-320 V.3
Sound Speed at Transducer	YSI Electronics	600R
Sound Velocity Profiler	Seabird	SBE19
SSS acquisition	Chesapeake Technology Inc.	SonarWiz Map
Multibeam acquisition	C&C Technologies	Hydromap
SSS Cable Payout Indicator	Subsea Systems, Inc	PI-5600

B.2. Quality Control

B.2.1. Survey Methods

For management purposes, the survey area was divided into two subareas (labeled 1 and 2) with separate line-plans in order to conduct survey operations. The main survey lines were oriented east to west throughout both subareas. Two hundred percent (200%) side scan sonar (SSS) coverage and concurrent set line spacing multibeam echosounder (MBES) data were acquired in accordance with the coverage requirements as stated in the Project Instructions for this survey. Additional high-resolution multibeam developments were conducted over significant features (see section B.4.2 for more details).

The shallowest charted soundings determined survey line spacing and the side scan sonar range scale. In subarea 1 where charted water depths ranged from 40 to 72 feet the side scan sonar was operated with a range of 100 m per channel and a line spacing of 90 m. In subarea

2 where the charted water depths ranged from 41 to 66 feet the side scan sonar was again operated with a range of 100 m per channel and a line spacing of 90 m. The criteria of acquiring 200% SSS coverage for object detection was accomplished using the aforementioned parameters and Technique 1 as set forth in Section 6.1 of the HSSD (2011), in which a single survey was conducted with the tracklines separated by less than one-half the distance required for 100-percent coverage. The SSS tracklines used to generate coverage mosaics were identified by an odd/even numbering system.

B.2.2. Crosslines

Crosslines were run prior to the collection of main line data and perpendicular to the mainscheme lines so that quality control statistics could be performed after each main line was completed. Based on pre-plot calculations, the total crossline miles were 60.07 nm, while the total main line miles were 706.80 nm. The crosslines comprised 8.5 percent of the total data set as compared to the mainscheme lines, compliant with set line spacing crossline requirements of Section 5.2.4.3 of the HSSD (2011), which states that lineal mileage of crosslines will be at least 8% of mainscheme mileage in areas surveyed with set line spacing coverage. Rerun line miles are not included in these totals.

As can be seen in the sample statistics found in Separates V, the main lines and crosslines depth values showed very good agreement. Each main line was compared to all crosslines for which there was overlapping data. The graphs show the mean difference, RMS difference, and confidence interval for each beam.

Crossline comparisons were also performed in CARIS HIPS/SIPS 7.1 using the surface difference tool. Separate 1-m BASE surfaces of the mainscheme lines and crosslines were created for each subarea and a difference BASE surface computed. The difference surface was examined using a color range map in 0.2 m increments from –0.6 to 0.6 m. The difference values between the crosslines and mainlines ranged from -0.51 and 0.55 m, however, the majority of difference values for subarea 1 are within –0.2 to 0.2 m (Illustration No. 3). These values are within the maximum allowable TVU in water depths of 12 to 23 m, which ranges from ±0.52 to ±0.58 m.

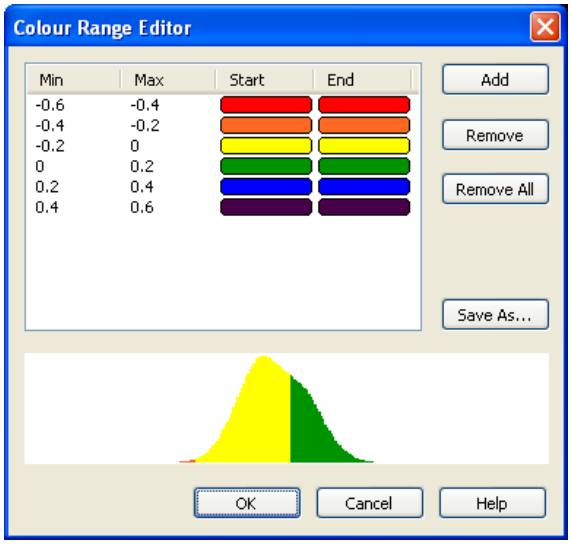


Illustration No. 3. Color range map and histogram used to evaluate the depth differences between mainlines and crosslines for Subarea 1.

Similar crossline comparison results are evident in subarea 2. The difference surface was evaluated using a color range map in 0.2 m increments from –0.6 to 0.6 m, which showed that the majority of difference values ranged between –0.2 and 0.2 m (Illustration No. 4). These values are within the maximum allowable TVU in water depths of 12 to 22 m, which ranges from ±0.52 to ±0.57 m. However, the difference values between the crosslines and mainlines ranged from -0.55 and 0.48 m, the extreme values of which are greater than the maximum allowable TVU. For this reason, the difference surface was further examined with a separate color map to determine the amount of differences that fell between -0.5 and -0.6 m (Illustration No. 5). This value was found to be minimal and occurred in localized areas on the edges of crossline and mainline data overlap. Therefore, the majority of the depth values of the mainlines and crosslines do not differ by more than the maximum allowable TVU in subarea 2.

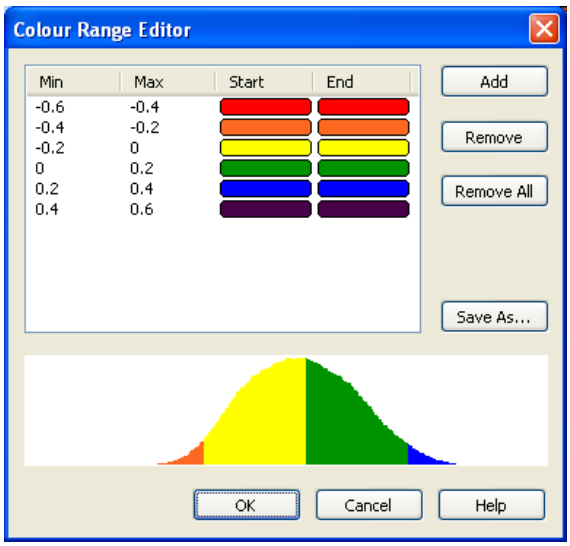


Illustration No. 4. Color range map and histogram used to evaluate the depth differences between mainlines and crosslines for Subarea 2.

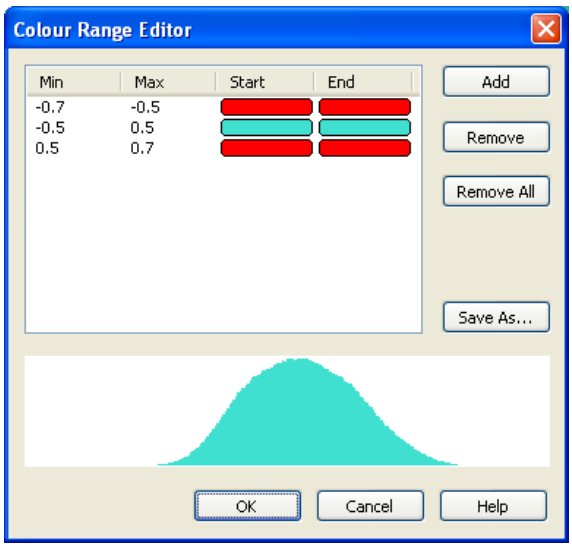


Illustration No. 5. Color range map used to evaluate the extreme depth differences between mainlines and crosslines in Subarea 2.

Statistical crossline information was also generated by comparing each of the crosslines to the depth layer of the 1-m BASE surface of the main survey lines. In general, crossline comparisons showed very good agreement with the mainscheme lines. In general, >99% of crossline soundings were considered to meet IHO Order 1a standards. Crossline comparisons generated with the CARIS QC report utility are shown in Separates IV.

B.2.3. Uncertainty

CARIS HIPS was used to compute the Total Propagated Uncertainty (TPU) for each sounding. The measured tide uncertainty parameter was set to 0.009 m and the zoning parameter set to 0.102 m. The measured sound speed parameter was set to 2 m/s and the surface sound speed parameter to 0.800 m/s. All BASE surfaces were created based upon the IHO Order 1a standards.

B.2.4. Survey Junctions

The survey data for H12331 (Sheet 1) junctions with three surveys; details of these surveys are shown in Table No. 5 and outlined in Illustration No. 6. Although continuous multibeam coverage is not obtained within a survey or between surveys due to the set-line spacing criteria, a CARIS difference surface between the survey (H12331) and its adjacent surveys were computed to ensure general agreement of depths where overlap of sounding data occurred. Difference surfaces were created using the CARIS Surface Difference tool with H12331 as Surface 1 and the adjoining survey as Surface 2. The difference surfaces were initially evaluated with a user-defined color range map in 0.2 m increments from –0.6 to 0.6 m. A summary of each junction follows.

Table No. 5. H12331 Survey junctions.

Registry Number	Scale	Year	Platform	Relative Location
H12255	40000	2010	C&C Technologies, Inc.	N
H12332	40000	2011	C&C Technologies, Inc.	W
H12330	40000	2011	C&C Technologies, Inc.	E

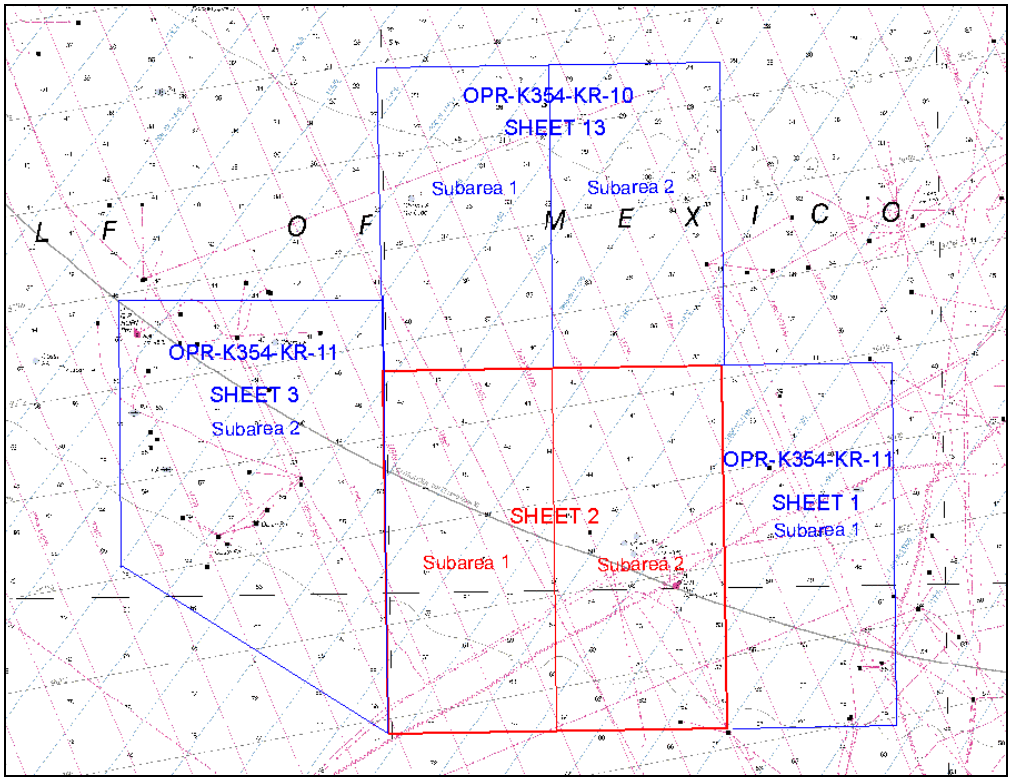


Illustration No. 6. H12331 Survey junctions.

Junction with H12255 (Sheet 11)

A 1-m base surface was created for each subarea in survey H12255, which junctions along the northern margin of H12331. A difference surface was created between each base surface of the two subareas of H12331 and the base surfaces of H12255. For both subareas, crossline data of each survey overlaps the mainline data of the adjoining survey.

The depth differences between subareas 1 of each survey range between -0.38 and 0.94 m (Illustration No. 7). Even though the majority of depth differences range between -0.2 and 0.4 m another color range map and histogram was generated to evaluate the extent of the deviant data. The amount >0.5 m is minimal and is mainly associated with outer swath data overlap (Illustration No. 8). There is one location where the most extreme depth differences occur. This location is where TIE-102-1 from survey H12331 overlaps with mainline 13098-1 from survey H12255 (Illustration No.9). The tieline shows a geological feature that is not evident in the H12255 survey line (Illustration No. 10). The lines were completed approximately 10 months from each other; this could be a potential reason why the bathymetry of the mainline is different.

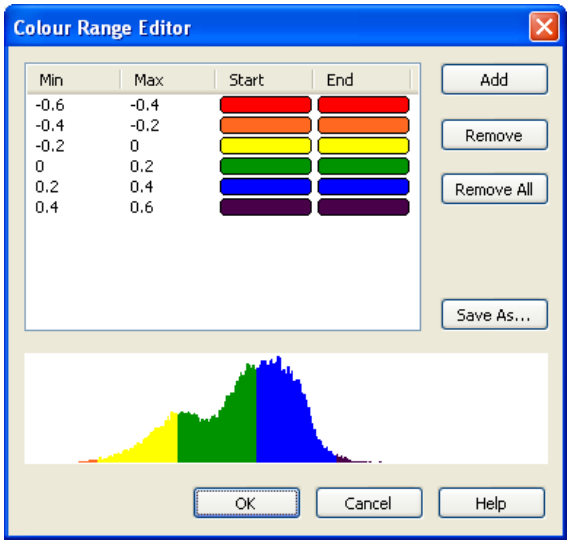


Illustration No. 7. Color range map and histogram used to evaluate the depth differences between the junction of Subarea 1 of H12331 and Subarea 1 of H12255.

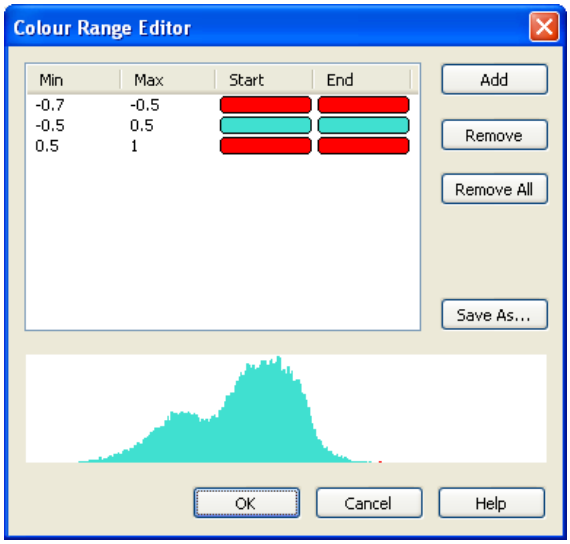


Illustration No. 8. Color range map and histogram used to evaluate the extreme depth differences between the junction of Subarea 1 of H12331 and Subarea 1 of H12255.

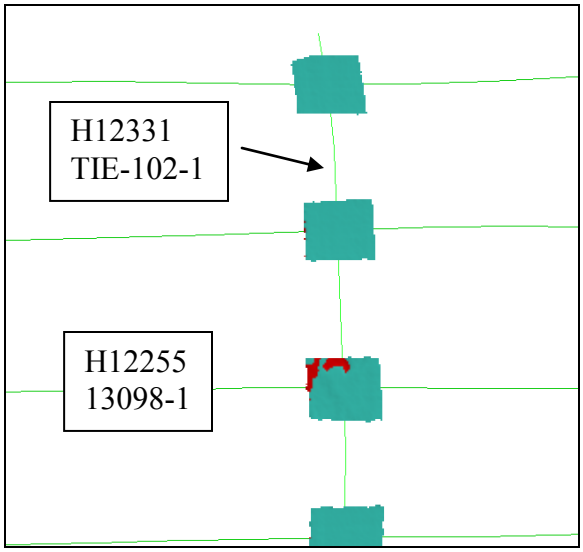


Illustration No. 9. Region of higher depth difference (red) between the tieline of H12331 and the mainline of H12255; associated with a geological feature in the tieline.

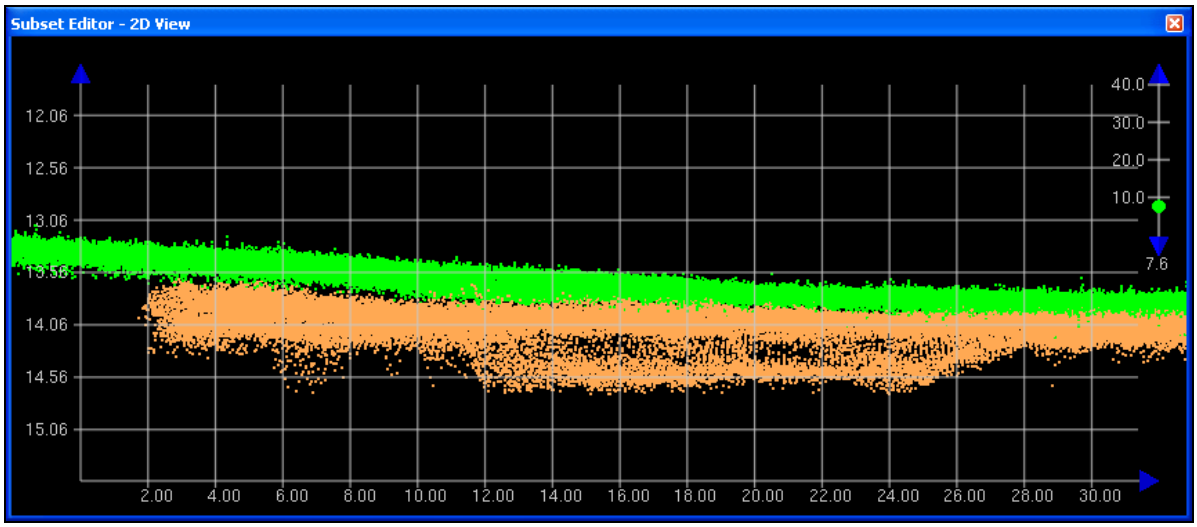


Illustration No. 10. H12331-TIE-102-1 (orange) and mainline H12255-13098-1(green); a geological feature is evident on the tieline but not on the mainline.

The depth differences between subareas 2 of each survey range between -0.25 and 0.82 m. The majority of the differences range between 0 and 0.4 m. A second color range map and histogram was generated to evaluate the extreme depth difference values (Illustration No. 12). In general, the deviant values are associated with outer swath data overlap except one area. The location where H12255 TIE-106-1 intersects with mainline H12331 2120-1 is where the most extreme depth differences occur. This is due to the mainline showing a shallow depression whereas the tieline does not in this area (Illustration No. 13 and 14).

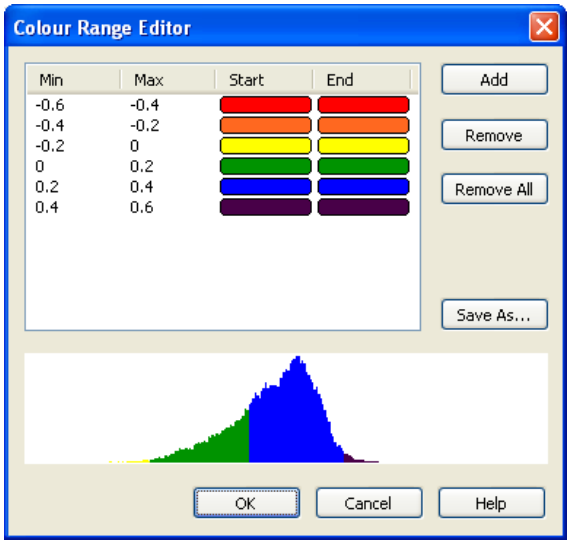


Illustration No. 11. Color range map and histogram used to evaluate the depth differences between the junction of Subarea 2 of H12331 and Subarea 2 of H12255.

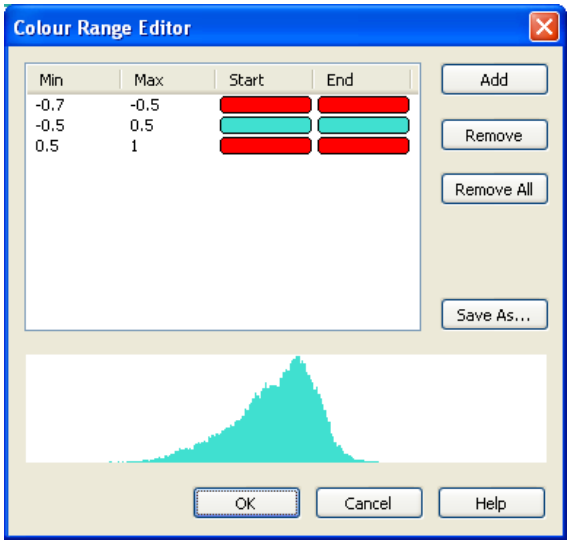


Illustration No. 12. Color range map and histogram used to evaluate the extreme depth differences between the junction of Subarea 2 of H12331 and Subarea 2 of H12255.

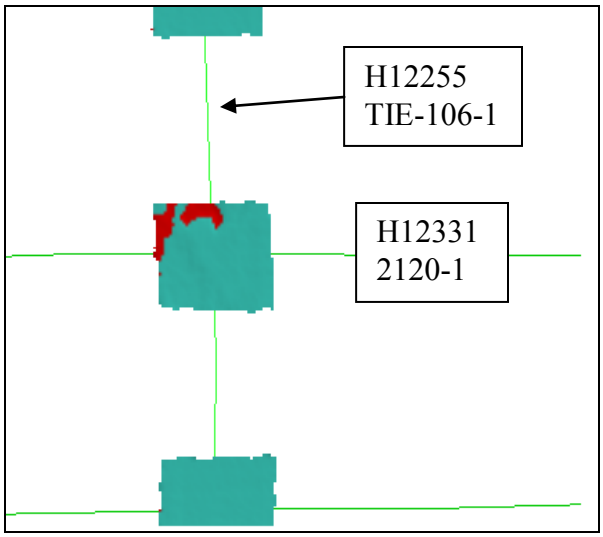


Illustration No. 13. Region of higher depth difference (red) between the tieline of H12255 and the mainline of H12331; associated with a geological feature in the mainline.

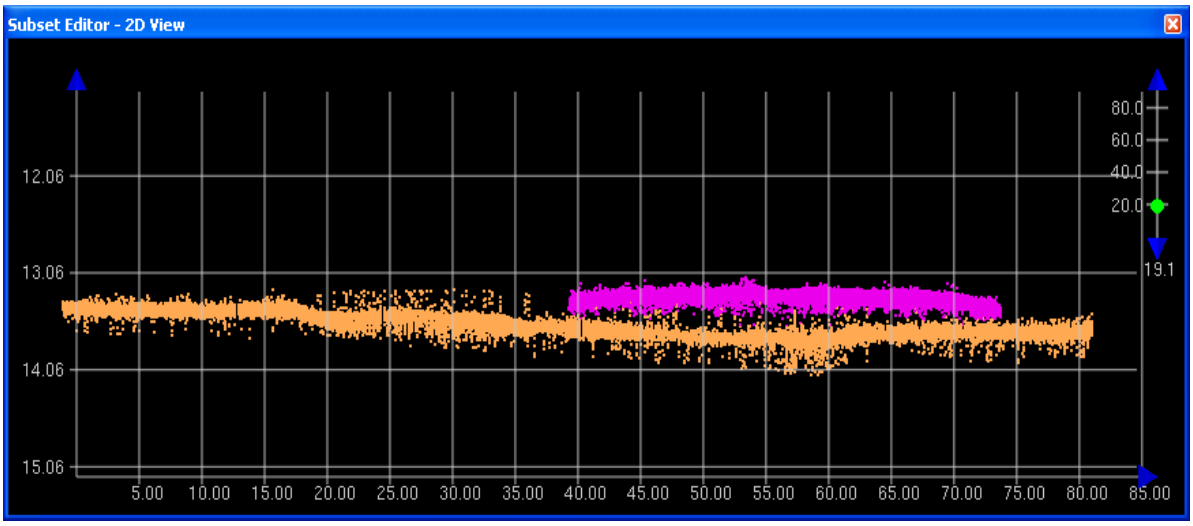


Illustration No. 14. H12255-TIE-106-1 (pink) and mainline H12331-2120-1(orange); a geological feature is evident on the mainline but not on the tieline.

Junction with H12332 (Sheet 3)

A surface was created to evaluate the depth difference between H12332 subarea 2 and H12331 subarea 1. A user-defined color range map was created in 0.2 m increments from -0.6 to 0.6 m. The depth difference values range between –0.55 and 0.58 m (Illustration No. 15). An additional user defined color map was used to evaluate the extreme depth difference values (Illustration No. 16). The more extreme values of 0.5 to 0.7 m were found to concentrate on the outer edges of the swath.

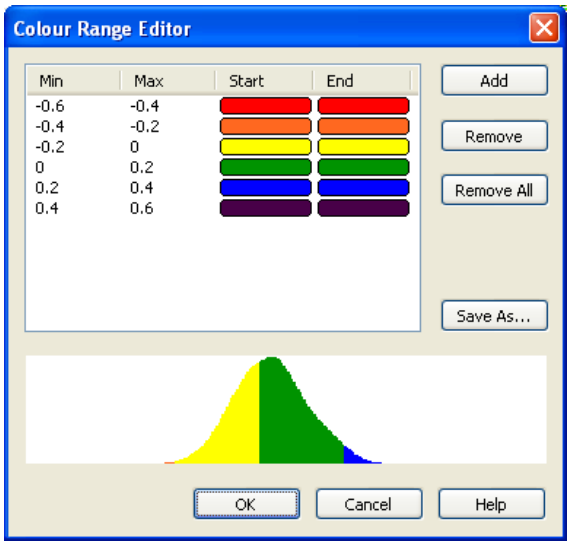


Illustration No. 15. Color range map and histogram used to evaluate the depth differences between the junction of H12331 subarea 1 and H12332 subarea 2.

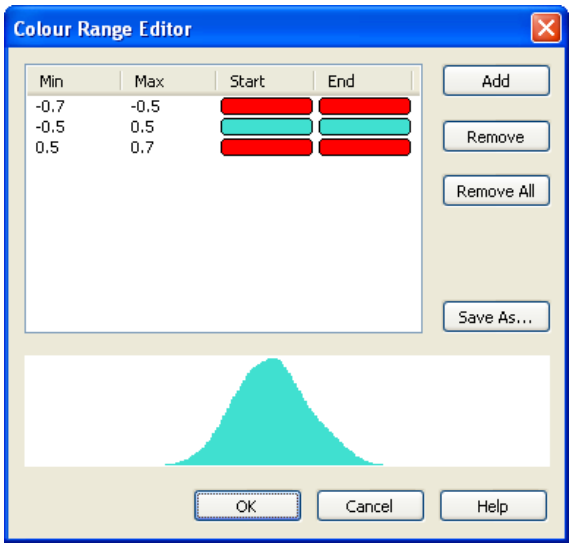


Illustration No. 16. Color range map and histogram used to evaluate the extent of the extreme depth differences between the junction of H12331 subarea 1 and H12332 subarea 2

Junction with H12330 (Sheet1)

A surface was created to evaluate the depth difference between H12331 subarea 2 and H12330 subarea 1. A user-defined color range map was created in 0.2 m increments from -0.6 to 0.6 m. The depth difference values range between –0.79 and 0.39 m (Illustration No. 17). An additional user defined color map of two increments (-0.8 to –0.5 m and –0.5 to 0.5 m) was used to evaluate the extreme depth difference values (Illustration No. 18). The majority of the deviant values of -0.5 to -0.8 m were found to occur on lines in the northern portion of the junction. The first 24 lines in subarea 2 of H12331 show less geology as compared to the first 24 lines in subarea 1 of H12330 survey (Illustrations No. 19). The most extreme difference values occur where H12331 mainline 2121-1 intersects with H12330 mainline 1002-1 (Illustration No. 20).

In addition, where H12331 mainlines 2194-1, 2195-1 and 2196-1 junction with H12330 mainlines 1075-1, 1076-1 and 1077-1 is a localized area of deviant values (Illustration No. 21). After examination of the survey logs, weather may have been issue during the collection of the three mainlines from H12331.

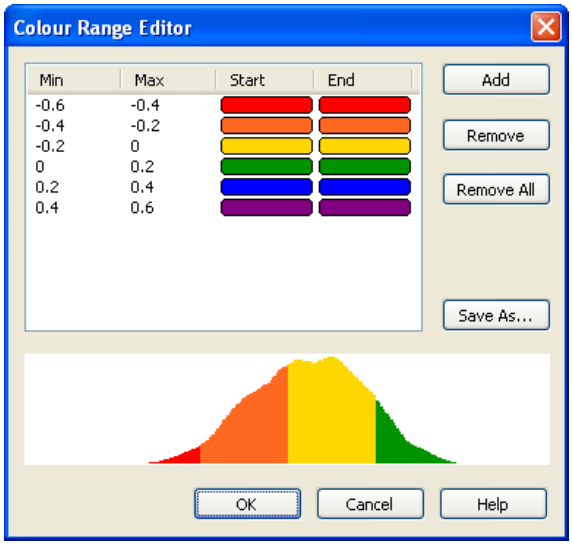


Illustration No. 17. Color range map and histogram used to evaluate the depth differences between the junction of H12331 subarea 2 and H12330 subarea 1.

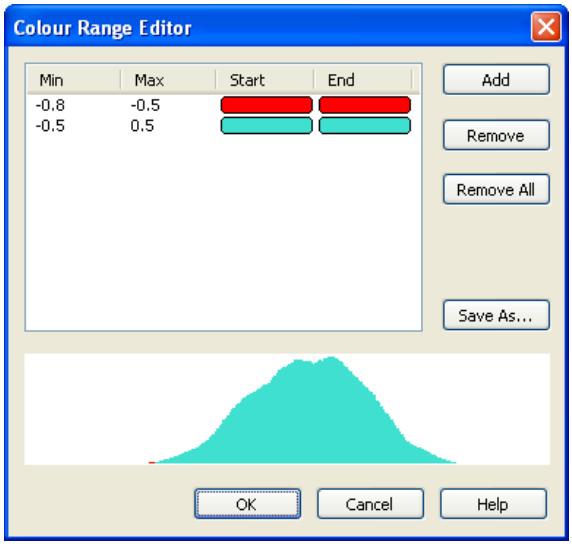


Illustration No. 18. Color range map and histogram used to evaluate the extent of the extreme depth differences between the junction of H12331 subarea 2 and H12330 subarea 1.

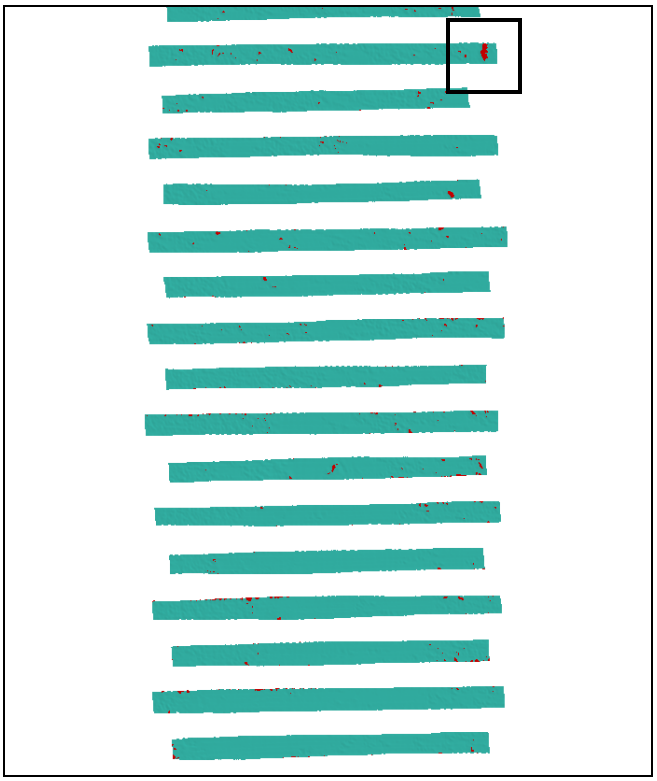


Illustration No. 19. Difference values >0.5m generally occur where the northeast portion of survey H12331 shows less geology than the northwest portion of survey H12330.

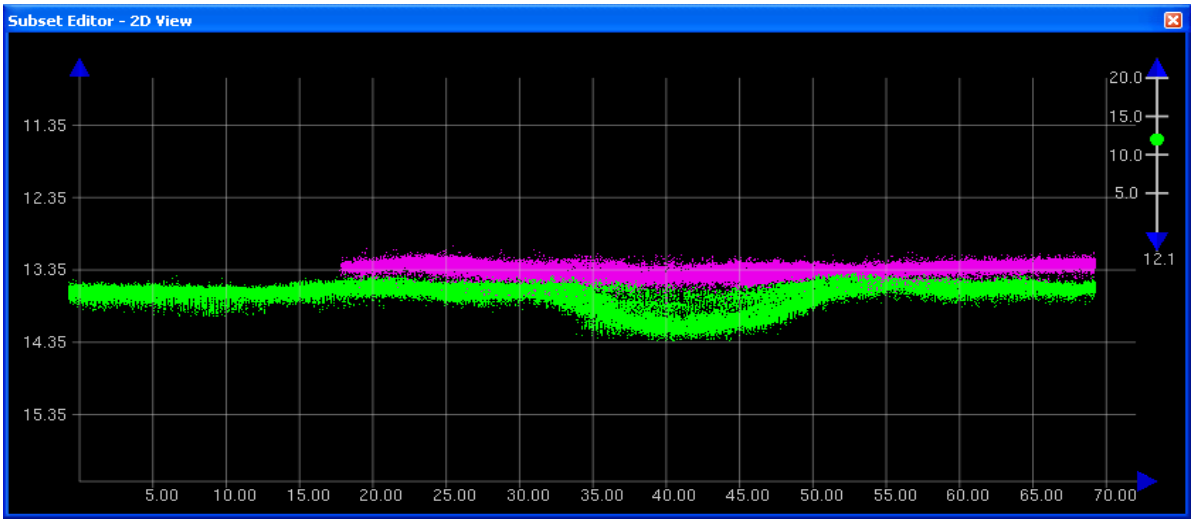


Illustration No. 20. H12331 mainline 2121-1 (pink) and H12330 mainline 1002-1 (green); a geological feature is evident on the H12330 mainline but not on the mainline from the H12331 survey.

Illustration No. 21. Three lines that show higher difference values between H12331 and the junction survey H12330.

B.2.5. Sonar System Quality Control

Prior to the survey, a standard patch test was performed to determine correctors for latency, pitch, roll, and heading. Initially, a patch test was conducted outside of Port Fourchon, LA on the 14th of June 2011. A second patch test was performed south of Cameron, LA on July 30th 2011 as a check on quality of the first calibration; these results were used as the final angular

offsets. The multibeam transducer and cable were replaced on September 21, 2011 due to equipment failure and a new patch test was performed on September 22th, 2011. An additional patch test was conducted on November 11, 2011 due to noticeable data misalignment. The CARIS vessel file was updated and correctors applied for data between September 22 and November 11, 2011. Refer to the Data Acquisition and Processing Report for detailed patch test results.

Draft corrections were verified on a daily basis, mainly in conjunction with the sound speed casts, and entered into the multibeam collection software to be applied in real-time.

An Odom Echotrac MKII single beam echosounder was continuously operated and monitored during the survey as an independent check on the multibeam bottom-detect. In addition, lead line comparisons were conducted daily, when possible, as an independent check on the multibeam bottom-detect. The lead line logs are included in Separates I – Data Acquisition and Processing Logs.

Sea Bird Electronics SBE19 CTDs were used for speed of sound measurements. Casts were performed at least once daily or more often as needed. The multibeam data was corrected for the water column sound speed in real-time. An Endeco YSI sound speed profiler was used to determine the sound speed at the transducer. Refer to the Data Acquisition and Processing Report for a description of sound speed corrections and to Separates II – Sound Speed Data for additional information.

There are several multibeam lines with data gaps that are associated with minor dropouts in navigation and attitude data. These are lines 2011-1, 2012-1 and 2047-1. Fill-in lines were conducted later in the survey and are included in the final BASE surface.

B.2.6. Unusual Conditions/Factors Affecting Soundings/Imagery

B.3. Corrections to Echo Soundings

No additional deviations from the Correction to Echo Soundings section in the Data Acquisition and Processing Report occurred.

B.4. Data Processing

B.4.1. Coverage BASE Surfaces and Mosaics

Multibeam data processing was conducted using CARIS HIPS/SIPS 7.0.2 SP2 on the vessel and CARIS HIPS/SIPS 7.1.1 with SP1 and SPHotFix 1 in the office. Note that the DAPR is based on a format with 2 Subareas per sheet and one CARIS project for each subarea. However, for improved processing and analysis, although the survey data for H12331 was collected as 2 separate subareas, these were combined into one CARIS project of the entire sheet. One BASE surface was generated at a scale of 1:40000 with a resolution of 1 meter, in accordance with Section 5.2.2.2 and 5.2.2.3 of the HSSD (2011), which states that a 1-m

BASE surface will be created for 0 – 20 m water depths. One BASE surface was created for all investigations at a scale of 1:40000 and a resolution of 0.5 m.
Side scan sonar data was processed using Chesapeake Technologies SonarWiz5 V.5.01.0026 software in the field and SonarWiz5 V.5.03.0027 and V.5.04.0031 software in the office. All of the side-scan sonar data collected for this project has been layback corrected. 1-m resolution mosaics were created for each 100% SSS coverage mosaics.

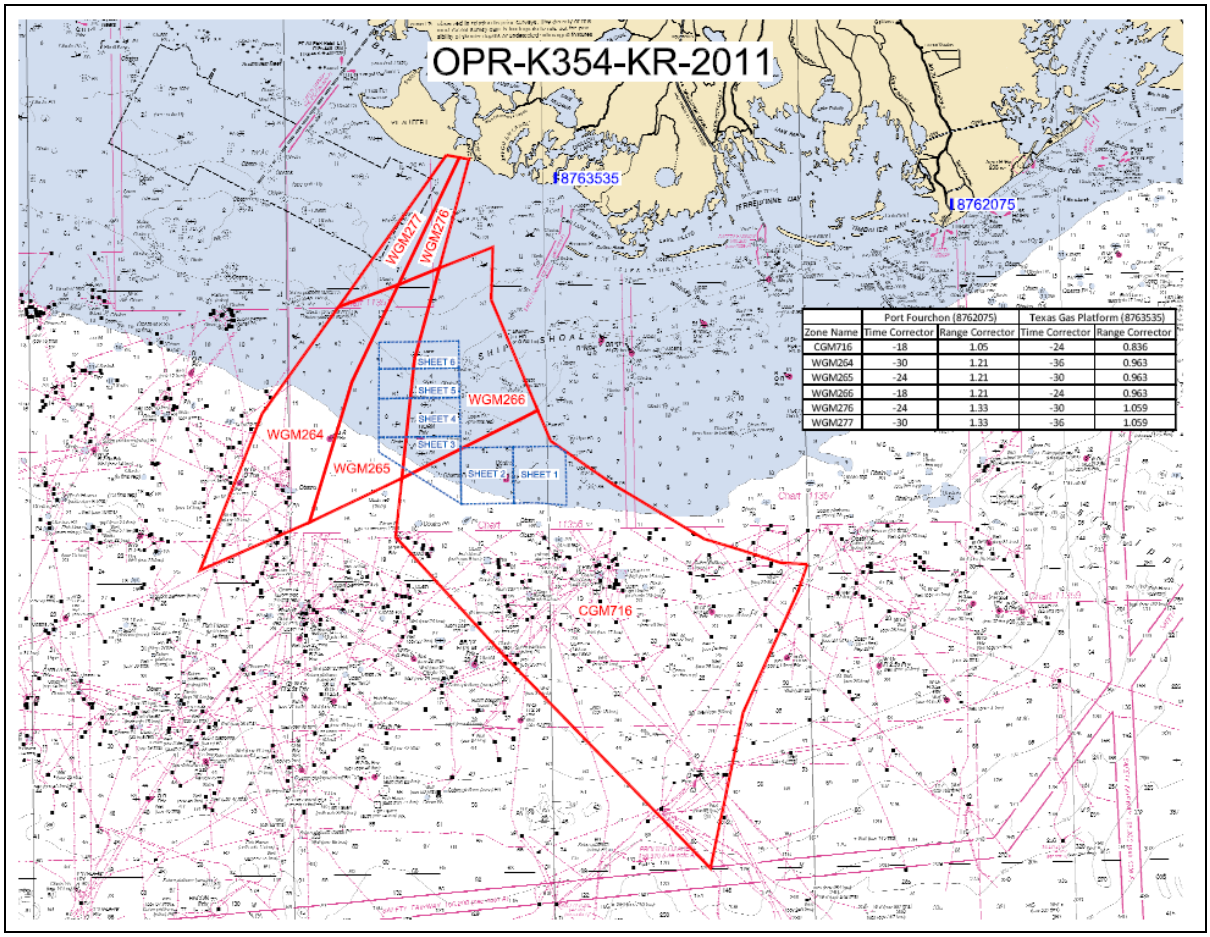
B.4.2. SSS Imagery and Contacts

Side scan sonar data was evaluated twice and all contacts with a shadow identified on each 100% SSS coverage. These contacts were correlated and evaluated in either the CARIS HIPS/SIPS or CARIS Notebook map window with respect to BASE surfaces and charted information. In accordance with Section 6.3.2 of the HSSD (2011), in water depths of less than or equal to 20 m, contacts with heights computed from the shadow length of 1 m or more were considered significant. All significant contacts not fully developed with mainscheme MBES coverage were investigated with additional MBES coverage. A sounding that represented the least depth of each significant contact was designated using CARIS HIPS/SIPS. A list of all side scan sonar contacts is contained in Separates V and significant features are represented and attributed in the S-57 feature file. Refer to the Data Acquisition and Processing Report for details on the side scan sonar contact processing and correlation workflow.

C. VERTICAL AND HORIZONTAL CONTROL

The vertical datum for the soundings is Mean Lower Low Water (MLLW). The horizontal datum for the survey is the North American Datum of 1983 (NAD 83) and the projection is Universal Transverse Mercator (UTM) Zone 15 North.

The NWLON water level station at Port Fourchon, LA (8762075) is the reference station for preliminary data for hydrography for project OPR-K354-KR-11. Final zoning was provided by CO-OPS (Refer to section C.5 of the DAPR). In addition, the water level station Texas Gas Platform (8763535) in Caillou Bay was maintained by C&C Technologies for the duration of survey operations. The NWLON station at Grand Isle, LA (8761724) serves as the datum control for the 8763535 station. Final zoning for the Texas Gas Platform gauge was provided by JOA (Refer to Appendix V). Illustration No. 22 shows the survey area, location of tide zones, tide stations 8762075 and 8763535 and the time/range correctors for those tide stations.



	Port Fourchon (8762075)		Texas Gas Platform (8763535)	
Zone Name	Time Corrector	Range Corrector	Time Corrector	Range Corrector
CGM716	-18	1.05	-24	0.836
WGM264	-30	1.21	-36	0.963
WGM265	-24	1.21	-30	0.963
WGM266	-18	1.21	-24	0.963
WGM276	-24	1.33	-30	1.059
WGM277	-30	1.33	-36	1.059

Illustration No. 22. Location of survey area, tide zones, tide stations 8762075 and 8763535 and the time/range correctors for those tide stations.

The majority of data for survey H12331 was collected between September 11, 2011 and October 5th. 2011; additional investigations and fill-ins were conducted in November and December, 2011. The data logger for station 8763535 was destroyed by Tropical Storm Lee and there is no data between September 2, 2011 at 23:54 UTC and September 16, 2011 at 17:42 UTC. The data from both tide stations shows general agreement in the time frame where most of the survey data was acquired (Illustration No. 23). The time that the data logger for station 8763535 was disabled affects 3 days of data collected in survey H12331 between September 11, 12 and 13, 2011. The data affected was mainly in the northern portion of subarea 1 as well as the crosslines for the subarea (Illustration No 24).

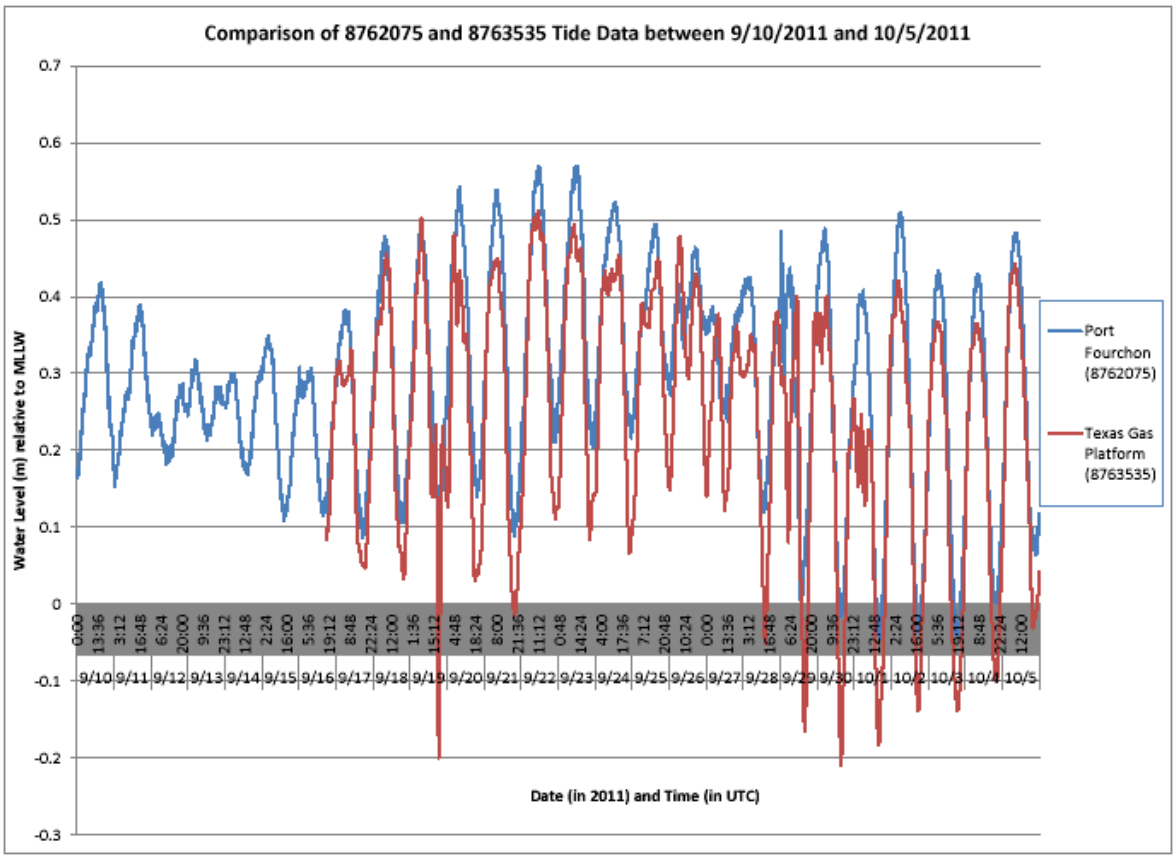


Illustration No. 23. Comparison of tidal data from two tide gauges (8762075 and 8763535) for the majority of data collection (mainlines and crosslines) for survey H12331. Station 8763535 was disabled on September 3, 2011 due to Tropical Storm Lee.

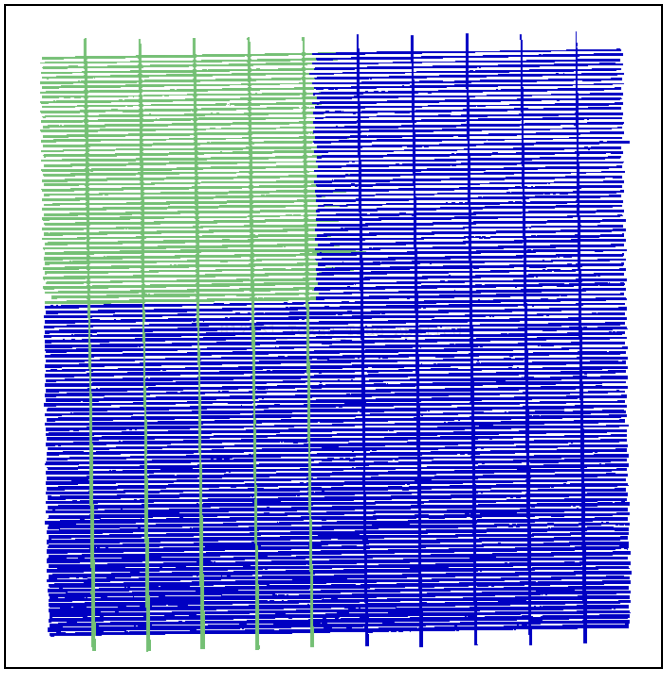


Illustration No. 24. Survey H12331. Green lines indicate lines during the Texas Gas Platform outage.

The data shown in blue in Illustration No. 24 were processed with both the Fourchon tide data and the Texas Gas Platform tide data. Separate 1-m BASE surfaces of the mainscheme and crosslines were created for each data set. A difference surface between the mainline data processed with the two sets of tide data was performed in CARIS HIPS/SIPS 7.1 using the surface difference tool. The mainline surface processed with 8763535 tide data was surface 1 and the mainline surface processed with 8762075 tide data was surface 2. For subarea 1, the differences range from 0.8 to 0.22 m, Illustration No. 25 shows the distribution of values. For subarea 2, the differences range from –0.26 to 0.22 m, Illustration No.26 shows the distribution of values. In general, the data processed with the Fourchon tides were consistently shallower than the data processed with the Texas Gas Platform tide data.

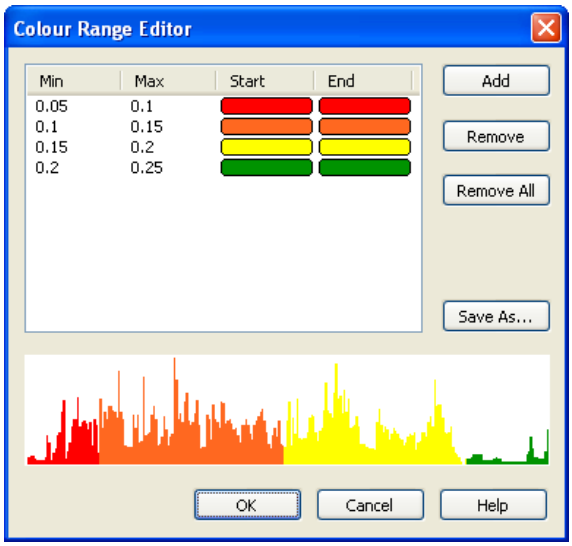


Illustration No. 25. Color range and histogram used to evaluate the differences between the Sub 1 mainlines processed with Texas Gas Platform tide data and Sub 1 mainlines processed with Port Fourchon tide data.

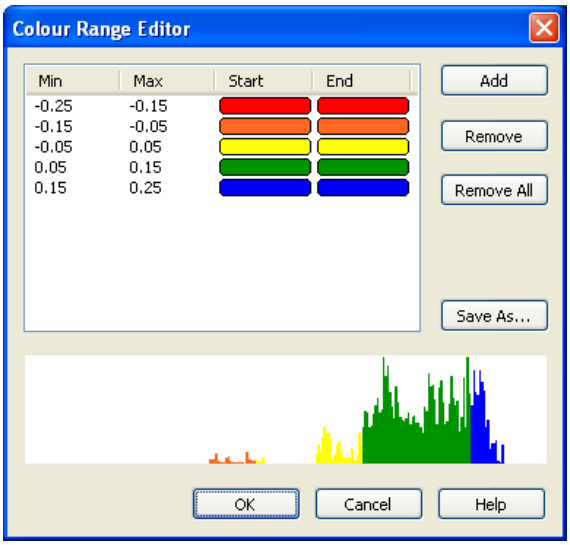


Illustration No. 26. Color range and histogram used to evaluate the differences between the Sub 2 mainlines processed with Texas Gas Platform tide data and Sub 2 mainlines processed with Port Fourchon tide data.

In addition, separate crossline comparisons were generated for the data processed with the Port Fourchon data and the data processed with the Texas Gas Platform data. The data from subarea two was used for crossline to mainline comparison as subarea 1 crosslines were collected during the Texas Gas Tide outage. Difference surfaces between the mainline and crossline data of each tide data set were generated with the CARIS surface difference tool. The difference surfaces were examined using a color range map in 0.2 m increments from -0.6 to 0.6 m. The majority of the depth difference values for the Port Fourchon crossline comparison is within -0.2 and 0.2 m (Illustration No. 27). The majority of depth difference values for the Texas Tide crossline comparison is within -0.2 and 0.2 m (Illustration No. 28). This shows that the majority of the mainline and crossline depth values processed with either tide data do not differ by more than the maximum allowable TVU for water depths of 12 – 23 m, which ranges from ±0.52 to ±0.58 m.

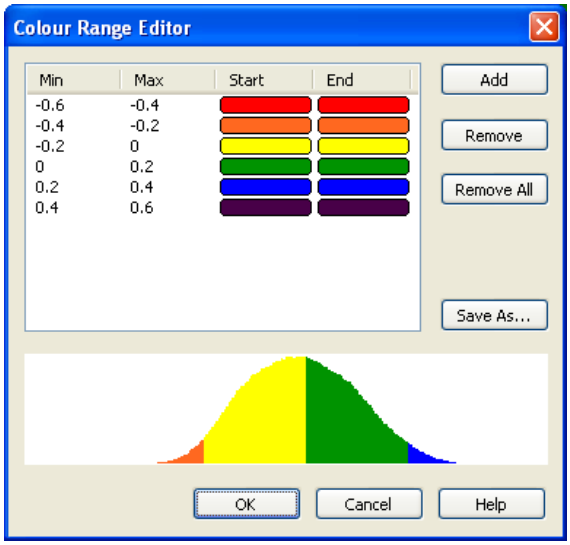


Illustration No. 27. Color range chart and histogram used to evaluate the differences between mainlines and crosslines processed with Fourchon tide data (Subarea 2).

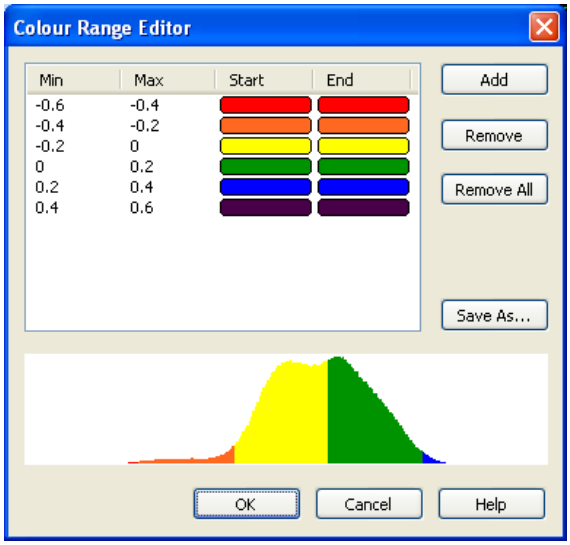


Illustration No. 28. Color range chart and histogram used to evaluate the differences between mainlines and crosslines processed with Texas Gas tide data (Subarea 2).

Survey H12331 has junctions with two contemporary surveys; H12330 and H12332 (Refer to Illustration No. 6 in Section B.2.4). A Preliminary 1-m BASE surface of Subarea 2 of H12330 was created and processed with both Port Fourchon and Texas Gas Platform tidal data. This allowed for preliminary junction analysis in order to determine if any variance exists between the datasets processed with the different tidal data. Using the CARIS difference tool, difference surfaces between H12331 and H12330 processed with Port Fourchon data and difference surfaces between H12331 and H12330 processed with Texas Gas Platform tide data were generated. H12331 was used as surface 1 and the adjoining survey as surface 2. The difference surfaces were then compared to one another and a summary follows.

When the survey junction is processed with the Fourchon tide data the differences range from –0.79 to 0.39 m and the majority are within –0.4 to 0.2 m (Illustration No. 29 and 31). When the data is processed with Texas tide data the differences range from –0.85 to 0.45 m and the majority are within –0.4 to 0.2 m (Illustration No. 30 and 32). In both cases the extreme difference values seem to correspond to changes in bathymetry (Refer to Section B.2.4 for additional information). In addition, there are three lines that show higher differences when processed with Texas tide data and lower difference values when processed with Fourchon data (Illustration No. 33).

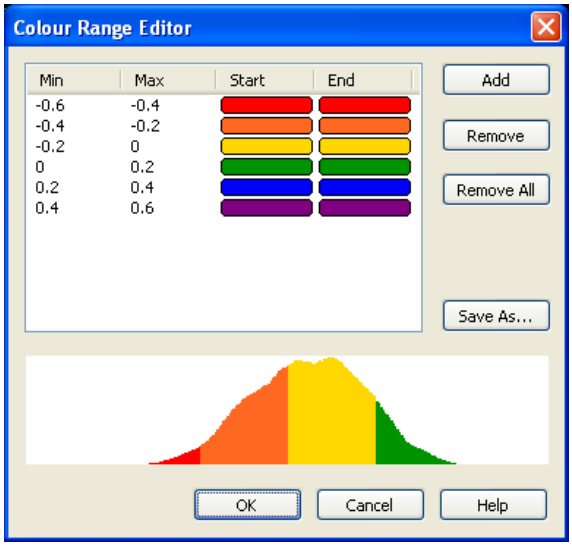


Illustration No. 29. Color range chart and histogram used to evaluate the differences between the survey junction of H12331 subarea 2 and H12330 subarea 1 with Port Fourchon tide data.

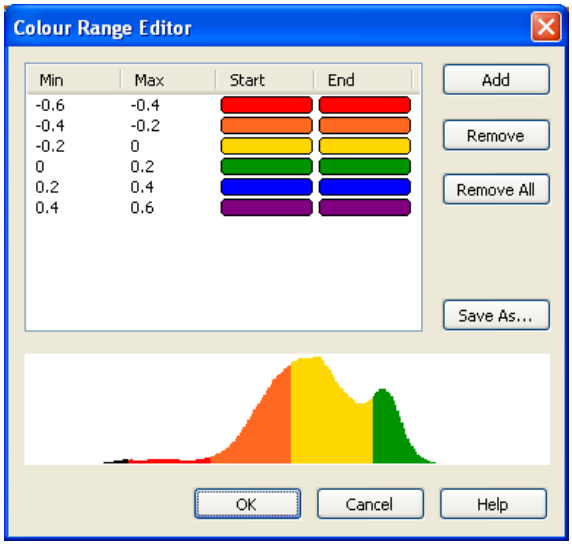


Illustration No. 30. Color range chart and histogram used to evaluate the differences between the survey junction of H12331 subarea 2 and H12330 subarea 1 processed with Texas Gas Platform tide data.

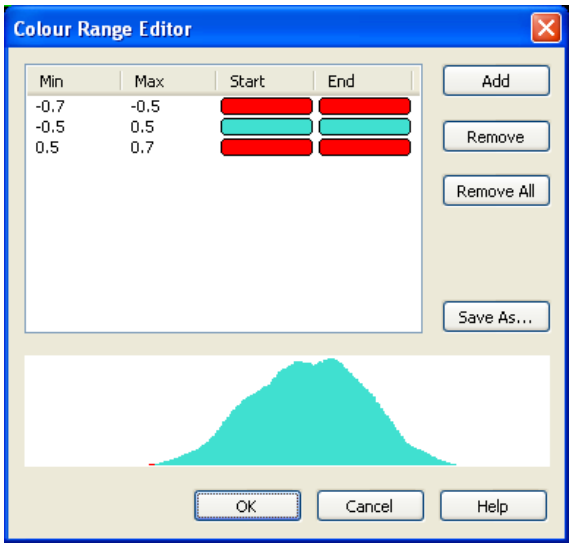


Illustration No. 31. Color range chart and histogram used to evaluate the extent of difference values greater than ±0.5 m between the survey junction of H12331 subarea 2 and H12330 subarea 1 with Port Fourchon tide data.

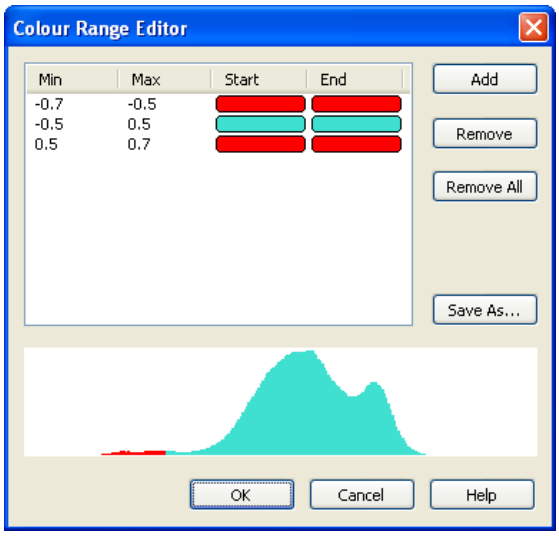


Illustration No. 32. Color range chart and histogram used to evaluate the extent of difference values greater than ±0.5 m between the survey junction of H12331 subarea 2 and H12330 subarea 1 with Texas Gas Platform tide data.

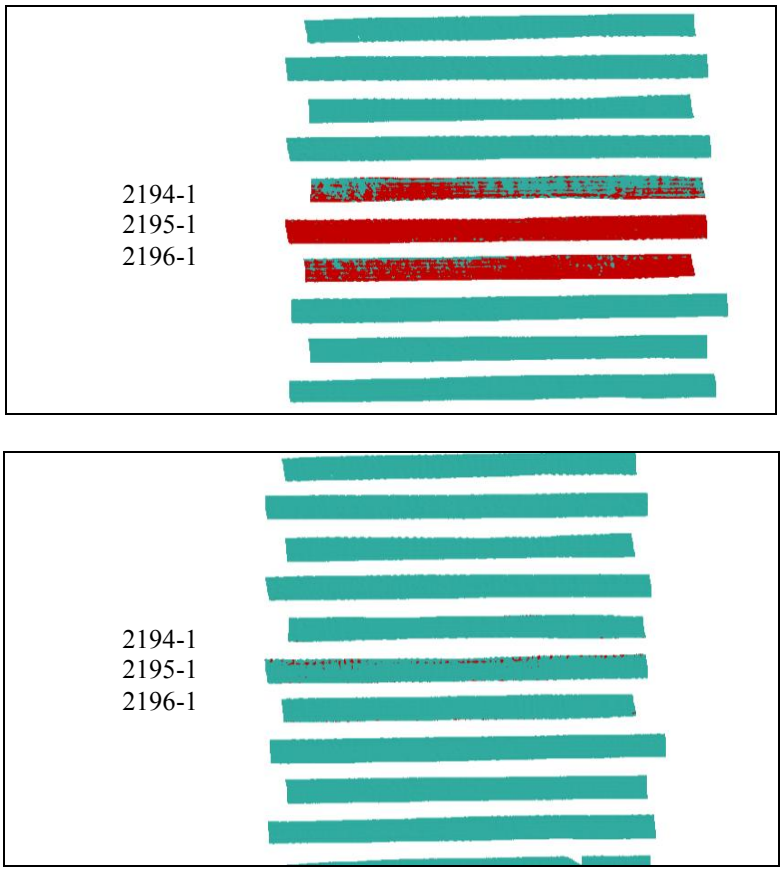


Illustration No. 33. Three lines that show higher differences when processed with Texas tide data and lower difference values when processed with Fourchon tide data. Texas gas tide data is shown first.

Similar junction analysis could not be completed for the junction with H12332 because of the location of data acquired during days that the Texas Gas Platform gauge was disabled; this is shown in yellow in Illustration No. 34. Lines in blue in Illustration No. 34 indicate regions of H12332 and H12331 that can be processed with the Texas Gas Platform tide data. There is no overlap of data processed with the Texas tides, and therefore no comparison can be made to the junction of the data processed with Fourchon data. Because both of the surveys are processed with Fourchon data, refer to Section B.2.4 for information on the junction analysis.

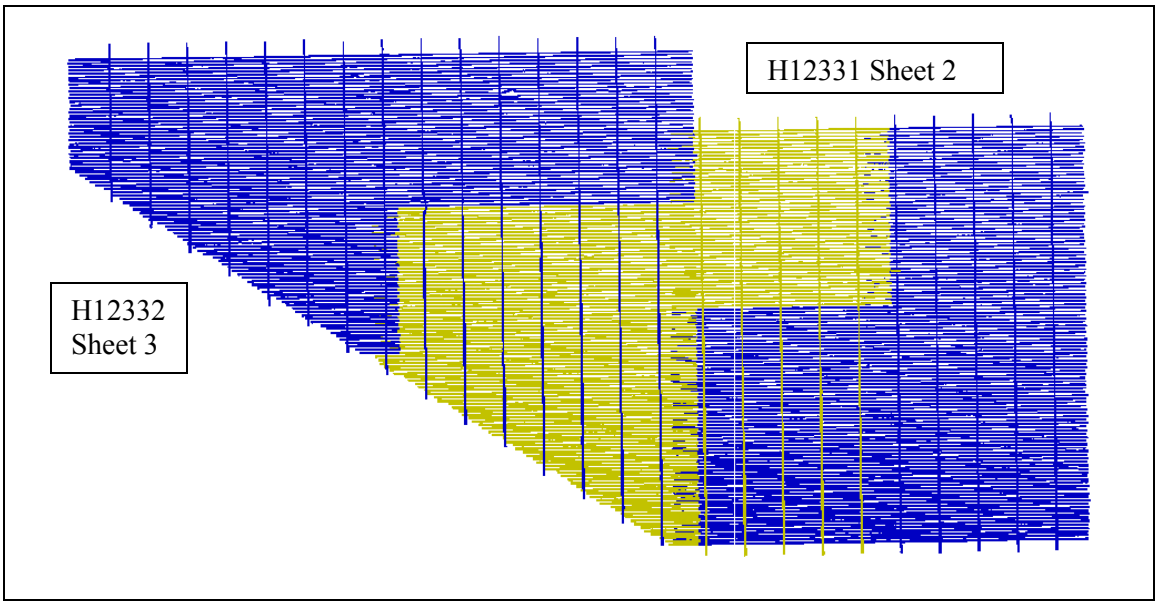


Illustration No. 34. Blue shows the regions of H12232 and H12331 that can be processed with Texas tide data. Yellow shows the data for which there is no Texas tide data.

Based on the crossline comparisons and junction analysis, there is no significant improvement in relative quality of the data using either tide gauge. In addition, there were significant data gaps in the Texas Gas Platform tide data due to Tropical Storm Lee. For these reasons, and in order to remain consistent within the H12331 survey area, Fourchon tide data is used for final data processing of survey H12331.

D. RESULTS AND RECOMMENDATIONS

D.1. Chart Comparison

D.1.1. Charts and Notices to Mariners

Chart comparisons were performed in CARIS HIPS/SIPS 7.1 using the final BASE surfaces of mainscheme and investigation lines, colored depth ranges, and sounding layers. The data was compared to the largest scale chart in this area, summarized in Tables No. 6 and 7.

Table No. 6. Nautical charts used for comparison

Chart Number	Scale	Edition	Edition Date
11356	1:80,000	38	Jun 08

Table No. 7. Nautical chart correction dates

Chart Number	Corrected Through	
	NM	LNM
11356	Jun 14/08	Jun 03/08

The Local Notices to Mariners (LNM) were reviewed for the duration of the survey operations, which took place between September 11 and December 29 of 2011. District 8 LNM 02/12 (January 9th, 2012) was the last notice reviewed for this project.

Six notices to mariners were issued within the survey bounds prior to survey operations (Table No. 8). Three correspond to AWOIS item 14813 assigned to this survey, which was not found during survey operations (See D.1.3.1 for further information about AWOIS items).

Table No. 8. Notices to mariners issued within the survey bounds prior to survey operations.

LNM	Date	Charting Label	Latitude	Longitude	Comments
LNM 38/09 8th Dist	10/1/2009	Obstn PA Chart No. 1:K40	28-40-50.200N	91-05-33.000W	In AWOIS 14813 radius
LNM 42/08 8th Dist	10/24/2008	Obstn PA Chart No. 1:K40	28-40-43.800N	91-05-46.200W	In AWOIS 14813 radius
LNM 40/08 8th Dist	10/8/2008	PA	28-40-32.800N	91-05-36.500W	In AWOIS 14813 radius
LNM 40/08 8th Dist	10/8/2008	PA	28-41-30.100N	91-06-36.00W	None
LNM 23/10 8th Dist	6/16/2010	Obstn PA Chart No. 1: K40	28-41-30.000N	91-06-36.000W	None
LNM 35/10 8th Dist	9/4/2010	Chart No. 1: L10	28-39-40.025N	91-05-17.919W	None

One notice to mariners (District 8 LNM 48/11 – November 21, 2011) was issued within the survey bounds during survey operations. This corresponds with DTON 2, which was submitted as a 36-foot obstruction. Another LNM (District 8 LNM 02/12-January 9th, 2012) was issued within the survey area slightly after survey operations were completed. This corresponds to DTON 3, which was submitted as a 52-foot obstruction. Refer to section D.1.3.3 for more information about these submitted DTONs.

D.1.2. Charted Soundings

Charted soundings were compared to a sounding layer as well as color range maps. The sounding layers were generated from a 1-m BASE surface with a 550-ft single-defined radius for both subareas. (Refer to the Data Acquisition and Processing Report for sounding selection criteria). Depths in the northern portion of the survey area range from 42–49 ft while the middle region ranges from 50-60 ft and the southern part of the survey area ranges from 60-76 ft. The deepest depths are associated with the southwestern corner of the survey area (Illustrations No. 35 and 36).

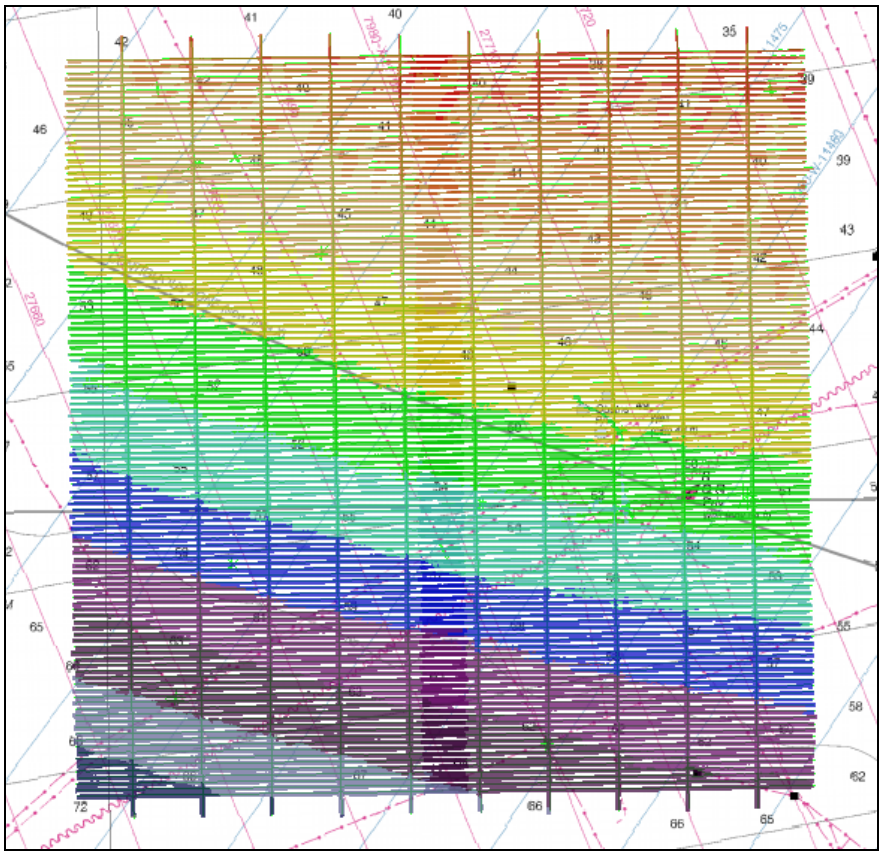
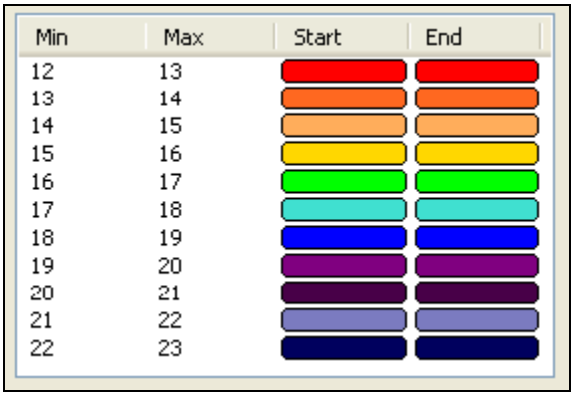


Illustration No. 35. H12331 Survey area with colored depth ranges shown in Illustration No. 36.



Min	Max	Start	End
12	13		
13	14		
14	15		
15	16		
16	17		
17	18		
18	19		
19	20		
20	21		
21	22		
22	23		

Illustration No. 36. CARIS color range map (in meters) used for Illustration No. 35.

In subarea 1 of the survey area, surveyed soundings are generally 1 to 3 feet deeper than charted soundings, except in the northernmost section surveyed; where soundings are up to 4-7 feet deeper than charted 40 feet (Illustration No.37). In addition, an area in the southwest corner has surveyed soundings up to 8 feet deeper than charted soundings of 66 feet (Illustration No. 38).

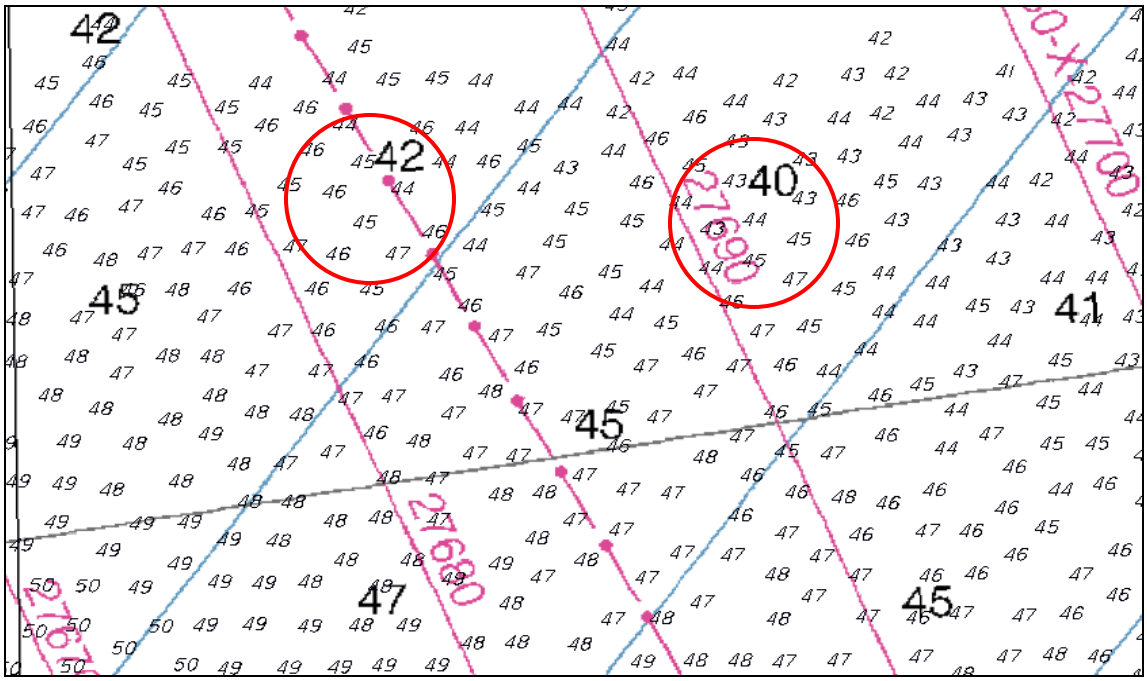


Illustration No. 37. The northern portion of the survey area the surveyed soundings are 5-7 feet deeper than charted soundings of 40 and 42 feet (in red circles).

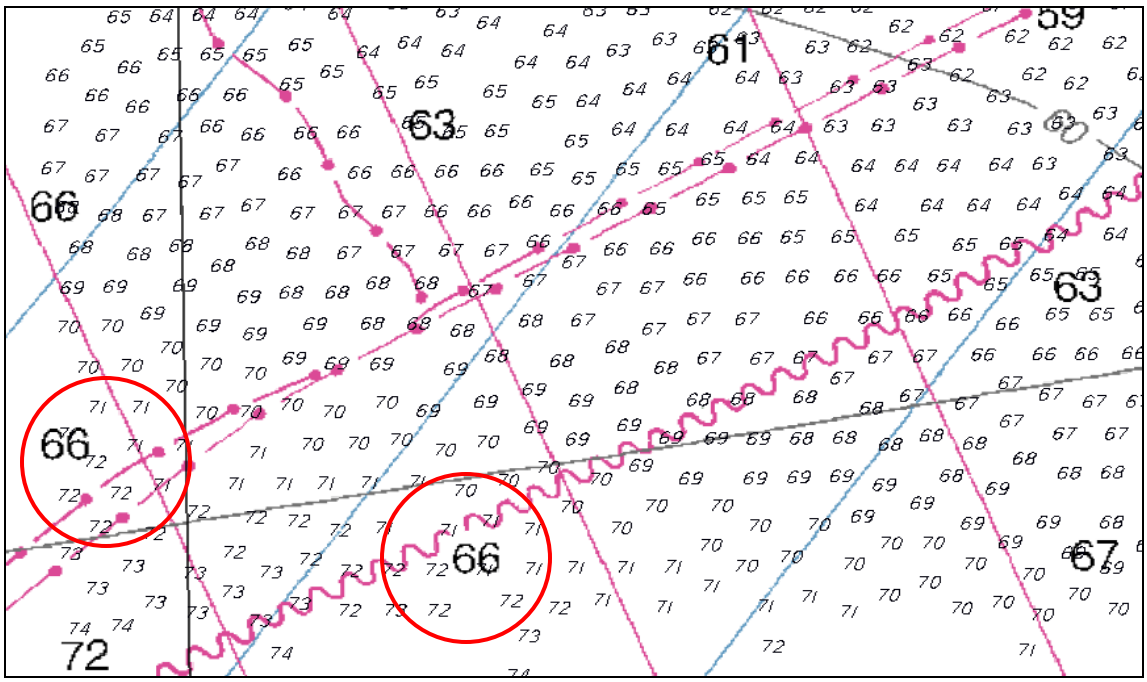


Illustration No. 38. The southwestern corner of the survey is where surveyed soundings are deeper than the charted 66-ft soundings by up to 6 feet (in red circles).

In subarea 2, surveyed and charted soundings are generally within 2 to 4 feet of each other, and the charted soundings are generally shallower. However, there is one area in the northern part of subarea 2 where surveyed soundings are up to 10 feet deeper than the charted sounding of 35 feet (Illustration No.39).

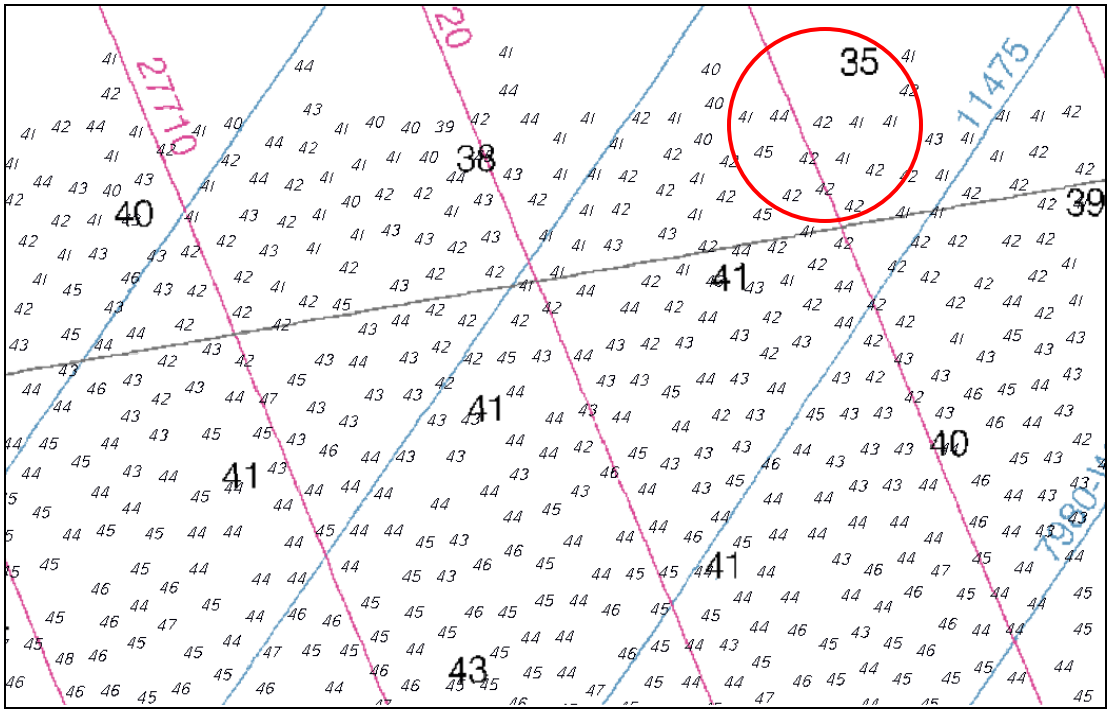


Illustration No. 39. Area in northern part of subarea 2 where surveyed soundings are up to 10 feet deeper than the charted sounding of 35 feet.

The 60 -ft contour is charted from west to southeast through the southern portion of the survey area. In order to evaluate any differences between the contour and surveyed soundings, a color range chart was created in CARIS with soundings of 0 to 18.288 m in red and soundings greater than 18.288 m in blue; 18.288 m represents ~60 -ft (Illustration No. 40). It is evident that there is a smooth transition between the 59 and 60 -ft surveyed depths; however, the charted 60 -ft contour is situated beyond the majority of the 59 -ft surveyed soundings. Examination of the sounding layer confirms this trend.

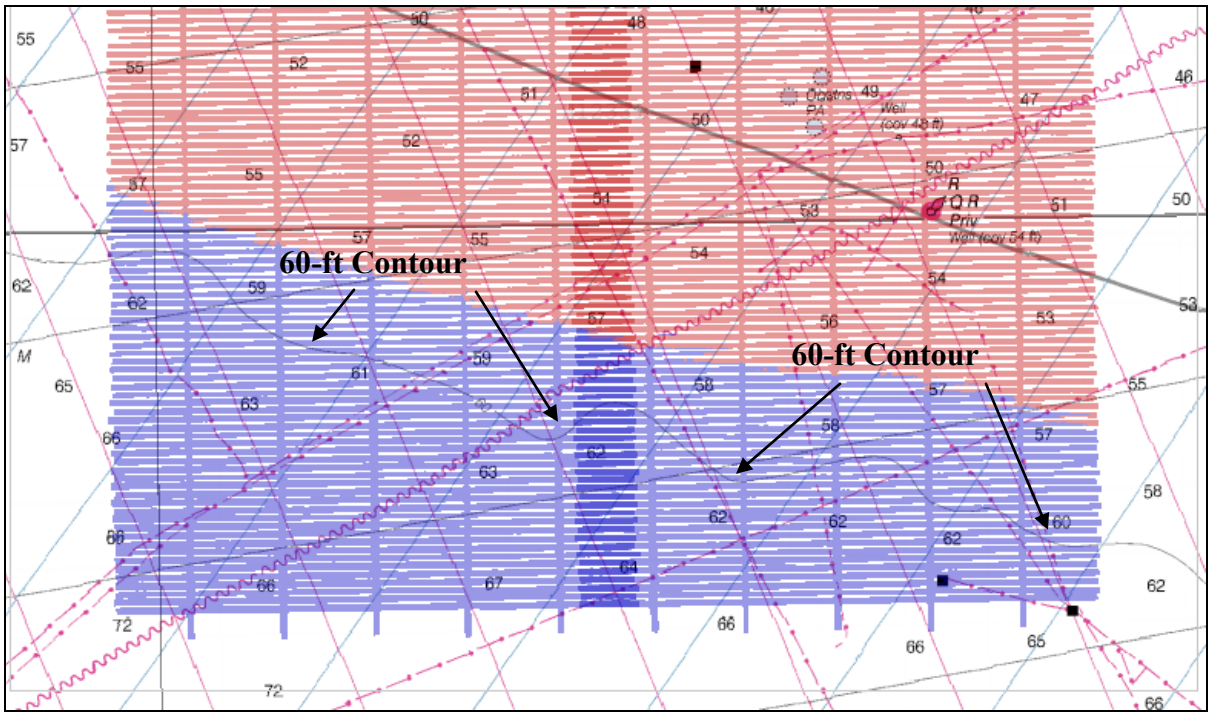


Illustration No. 40. Comparison of charted 60 -ft contour and surveyed soundings. Soundings of 0 to 18.288 m are in red and soundings greater than 18.288 m in blue; 18.288 m represents ~60 -ft.

D.1.3. Charted Features

D.1.3.1. AWOIS

One AWOIS item was assigned for full investigation within the survey area (Table No. 9). No significant contact was found within the AWOIS radius area and the hydrographer recommends that the AWOIS item be removed from chart 11356. Refer to Appendix II: Survey Feature Report: AWOIS Report for more information about this AWOIS item.

Table No. 9. AWOIS item assigned for full investigation.

AWOIS Record	Chart Latitude	Chart Longitude	Chart Action/Comments
14813	28-40-42.999N	91-5-35.002W	Remove from Chart 11356

D.1.3.2. Investigation Items

A total of 15 investigations were conducted in the survey area. Six were exposed pipelines or possible exposed pipelines and are discussed further in Section D.2.3: Additional Infrastructure. The remaining investigations are shown in Table No. 10 and discussed below.

Investigation H31-I-1 was conducted on September 24, 2011 (JD 267). This investigation corresponds to primary SSS contact 267-120030S, which, based on the shadow in the side scan sonar data, measured between 1 and 2 m. The multibeam investigation confirmed the significance of the feature and this contact was submitted to AHB as DTON1 for this survey.

The contact has a least depth of 19.152 m in approximately 21 m of water; the object therefore protrudes at least 1.848 m off the bottom. This feature has been included in the final feature file. (Refer to section D.1.3.3 for more information and Appendix I for a copy of the DTON report).

Investigation H31-1-F of primary SSS contact 256-043304P was conducted on December 16, 2011 (JD 350). Based on the shadow measured from lines 2032-1 and 2033-1, the feature measured between 1 and 1.5 m. After multibeam investigation, the least depth of the feature is 14.083 m in approximately 15 m of water, meaning this feature protrudes 0.917m off the bottom. This feature was not submitted as a DTON as it is not significant (<1m); however it is still a notable feature.

Investigation H31-I-G was conducted based on a potential contact ensonified by the bathymetry of line 2082-1 between fix 17 and 18. The investigation was conducted on December 16th, 2011 (JD 350) and revealed that no real feature exists at this location. The mainscheme multibeam line was cleaned to best represent the bathymetry of the area.

Investigation H31_I_E was conducted based on a potential, significant contact found in the mainscheme multibeam line of 2018-1 at fix 14. The side scan sonar mainlines 2017-1 and 2018-1 confirmed a contact near this location, however the target's measured shadow was not significant. Primary contact 255-184447S was investigated on December 16, 2011 (JD 350) and proven to be insignificant. SSS investigation lines confirmed a target at this location; however, the multibeam investigation lines showed the contact as having no apparent least depth.

Investigation H31_I_D was conducted, on December 16, 2011 (JD 350), based on a potential contact found in the mainscheme multibeam line 2006-1 at fix 10. The mainline side scan sonar collected at this fix showed noise; therefore more data was needed to confirm the existence of this contact. The multibeam and side scan sonar investigation lines disproved this feature. The feature was removed from the mainscheme multibeam line.

Investigation H31-II-H further developed primary contact 270-191516P on December 16, 2011 (JD 350). The contact was located on side scan sonar lines 2191-1 and 2192-1 at fix 37 and considered potentially significant with a height of 1.04 m. The investigation confirmed the significance of the contact with a least depth of 15.830 m in 17.2 m of water. This feature was submitted as DTON3 for this survey and has been included in the final feature file. Refer to Section D.1.3.3 and Appendix 1 for more information.

Investigation H31-II-C of primary contact 270-150506P was conducted on October 4, 2011 (JD 277) which, based on the shadow in the side scan sonar data, measured between 0.8 to 1.0 m. The investigation confirmed the significance of the contact with a least depth of 15.840 m in 16.7 m of water. This feature was not submitted as a DTON due to its location on a charted pipeline however; its least depth has been designated in the CARIS project as well as included in the final feature file as an obstruction.

Investigation H31-II-A of primary contact 268-101332P was conducted on October 4, 2011 (JD 277). The mainline side scan sonar (2126-1) showed a potential significant contact, at fix 41, with a height of 2.12 m. After final evaluation of the investigation data, the contact was deemed significant with a least depth of 10.955 m in 13. 4 m of water and submitted as DTON2. Refer to Section D.1.3.3 and Appendix I for more information.

Investigation H31-II-B of primary contact 270-115743P was conducted on October 4, 2011 (JD 277). The contact was initially located with side scan sonar on survey lines 2180-1 and 2181-1 near fix 23 with a measured height between 0.8 m to 1 m. Further multibeam development of the target confirms the existence of the contact; however, it is insignificant with a least depth of 15.780 m in surveyed water depths of 16.3 m. This investigation is within AWOIS region 14813 (Refer to Section D.1.3.1 and Appendix II).

Investigation H31-II-I of primary contact 277-161922P was conducted on December 16, 2011 (JD 350). The contact was located on side scan sonar lines 2230-1 and 2231-1 between fix 13 and 14. The shadow length of the primary contact did not indicate that the contact was significant however, the mainscheme multibeam lines TIE-107-1 and 2231-1 ensonified a significant feature near these shot points. Further multibeam development confirmed the significance of the contact at a height of 17.942 m in 20 m surveyed water depths. This feature was not submitted as a DTON due to its location on a charted pipeline however; its least depth has been designated in the CARIS project as well as included in the final feature file as an obstruction. Refer to H12331 New Features Report in Appendix II for more information.

Table No. 10. Significant features that required further investigation.

SSS Contact Number	Subarea	Least Depth (m)	Survey Latitude	Survey Longitude	Remarks
267-120030S	1	19.152	28-38-32.196N	91-09-23.585W	Significant, submitted as DTON1
256-043303P	1	14.083	28-41-59.226N	91-08-03.405W	Notable feature, not significant
INV H31-I-G (no sss contact)	1	N/A	N/A	N/A	Disproved by mb
255-184447S	1	N/A	N/A	N/A	Not significant, no apparent least depth
INV H31_I_D (no sss contact)	1	N/A	N/A	N/A	Disproved by mb and sss
270-191516P	2	15.830	28-40-01-218N	91-06-40.378W	Significant, submitted as DTON3
270-150506P	2	15.840	28-40-17.938N	91-05-58.261W	Significant, not submitted as a DTON as it is on top of a charted pipeline
268-101332P	2	10.955	28-43-12.939N	91-04-03.106W	Significant, submitted as DTON2
270-115743P	2	15.780	28-40-34.590N	91-05-25.095W	Not significant, located in AWOIS radius of 14813
277-161922P	2	17.942	28-38-08.174N	91-06-07.669W	Significant, not submitted as a DTON as it is on top of a charted pipeline

D.1.3.3. Danger to Navigation Reports

Three Danger to Navigation Reports were submitted for this survey (Table No. 11). DTONs 1 through 3 correspond to Primary side scan contacts 267-120030S, 268-101332P and 270-191516P, respectively. DTON #1 was rejected as a new obstruction to the chart due to its close proximity to a charted pipeline. The submitted DTON Reports can be found in Appendix I, and all three features have been maintained within the Final Feature File as obstructions. All three DTONs were submitted before the data was reprocessed in CARIS with the correct vessel file (Refer to section B.3 Corrections to Echo Soundings). After final evaluation of the data the DTONs were found to have slightly different depth and position information. Table No. 12 shows the depth and coordinate changes to the submitted DTONs; these least depths have been designated in the CARIS project and used in the .hob Final Feature File.

Table No. 11. Submitted DTON information

Feature	DTON	Depth (ft)	Depth (m)	Survey Latitude	Survey Longitude
Obstruction	DTON 1	62.782	19.136	28-38-32.240N	91-9-23.561W
Obstruction	DTON 2	35.942	10.955	28-43-12.940N	91-4-3.104W
Obstruction	DTON 3	51.936	15.830	28-40-1.217N	91-6-40.377W

Table No. 12. Updates to submitted DTONs

	Depth (ft)	Depth (m)	Survey Latitude	Survey Longitude
DTON #1	62.835	19.152	28-38-32.196N	91-09-23.585W
DTON #2	35.942	10.955	28-43-12.939N	91-04-03.106W
DTON #3	51.936	15.830	28-40-01-218N	91-06-40.378W

D.1.3.4. Existing Infrastructure

The platform in Table No. 13 was found to already be charted. The position of each platform was calculated from the layback corrected primary side scan sonar contact. Refer to the Data Acquisition and Processing Report for details on primary and secondary contacts. No previously uncharted platforms were observed during the present survey.

Table No. 13. Previously Charted Platform

Surveyed Position			
Latitude	Longitude	Platform Name	Chart Action/Comments
28-37-53.684 N	91-04-47.420 W	SS-181C	Remain as charted

Table No. 14 shows a platform that is currently charted, but was not observed during survey operations.

Table No. 14. Charted platform not present at time of survey.

Charted Position		
Latitude	Longitude	Chart Action
28-40-55.234	91-06-23.224	Remove from chart

Near the end of survey operations the side scan sonar mainline 2238-1 ensonified a platform that is outside of the H12331 survey bounds (Illustration No. 41). The platform is associated with primary contact 269-165248P. This platform is discussed further in the H12330 survey and has not been included in the final feature file for this project.

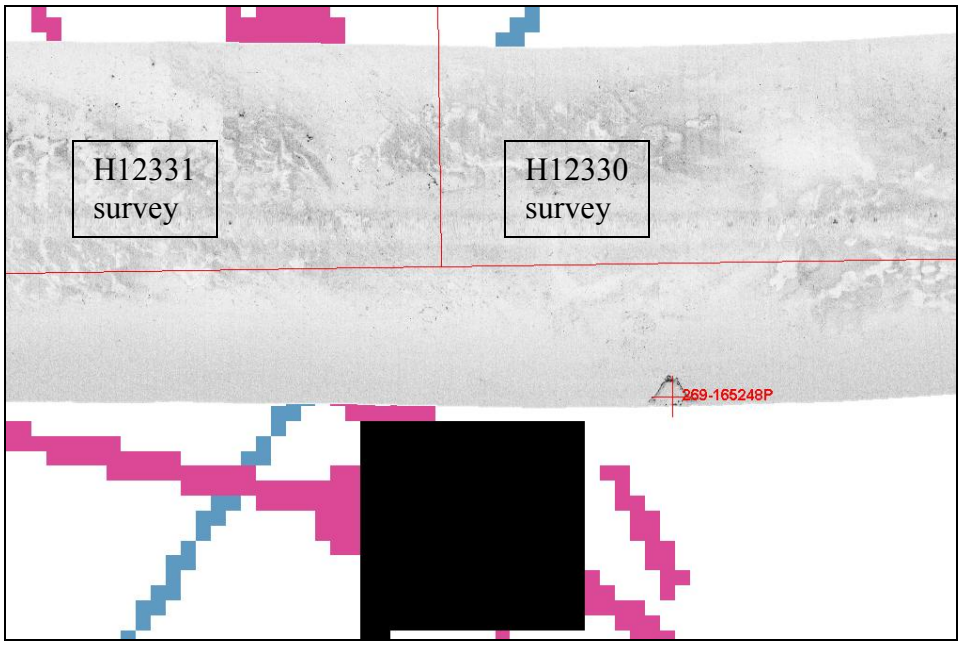


Illustration No. 41. Location of a platform outside of H12331 survey bounds.

D.1.3.5. Feature Report

A Final Feature File for obstructions, oil and gas infrastructure and bottom samples has been submitted as a CARIS .hob file in a CARIS Notebook project.

D.2. Additional Results

D.2.1. Prior Surveys

Refer to Section B.2.4 for information on survey junctions and Section D.1 for comparison to nautical chart 11356.

D.2.2. Aids to Navigation

There is one charted buoy that is associated with a well (cov 54 ft) in the middle section of the survey area (Table No. 15 and Illustration No. 42). This buoy was not observed during survey operations. It is recommended that this buoy be removed from the chart.

Table No. 15. Charted buoy not present at time of survey.

Charted Position			
Latitude	Longitude	Buoy Description	Chart Action
28-40-02-680N	91-04-50.336W	Lighted buoy, red, Q R, (privately maintained)	Remove from chart

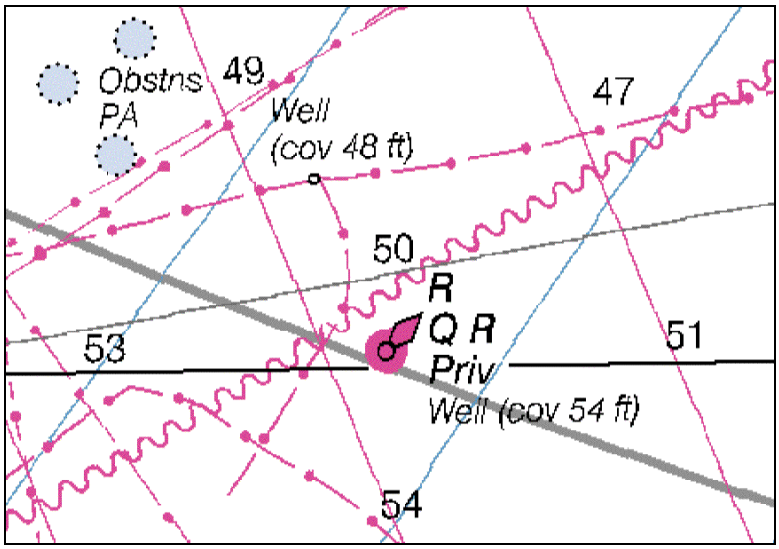


Illustration No. 42. Location of buoy in H12331 survey area on chart 11356; disproved.

D.2.3. Additional Infrastructure

A number of submarine pipelines are charted within the survey area, several of which have unburied sections. All the pipelines observed in the side scan sonar data were investigated. The pipeline investigations are shown in Table No.16.

Table No. 16. Investigations of exposed pipelines.

Primary SSS Contact Number	Investigation Name	Least Depth (m)	Survey Latitude of least depth	Survey Longitude of least depth	Remarks
255-180043P	H31_I_J	13.852	28-42-45.204N	91-08-47.814W	Charted, existence confirmed
266-200329P	H31-1-K	15.228	28-39-39.368N	91-07-00.507W	Charted, existence confirmed
270-194047P	H31-II-L	16.527	28-39-58403N	91-05-26.038W	Charted, existence confirmed
272-100925S	H31-II-M	16.740	28-39-55.768N	91-05-22.273W	Charted, existence confirmed
270-183523S	H31-II-N	N/A	N/A	N/A	Not seen in MB

Primary contact 255-180043P is located on a charted pipeline and further developed with multibeam data during investigation H31_I_J on December 16, 2011. The investigation confirmed the existence of this contact.

Primary contact 266-200329P is located on a charted pipeline and was further developed with multibeam data during investigation H31-I-K on December 16, 2011. The investigation confirmed the existence of this contact.

Two pipelines were investigated and their existence confirmed with investigations H31-II-L and H31-II-M on December 16. 2011. Investigation H31-II-L ensonified primary contact

270-194047P while investigation H31-II-M developed primary contact 272-100925S (Illustration No. 43).

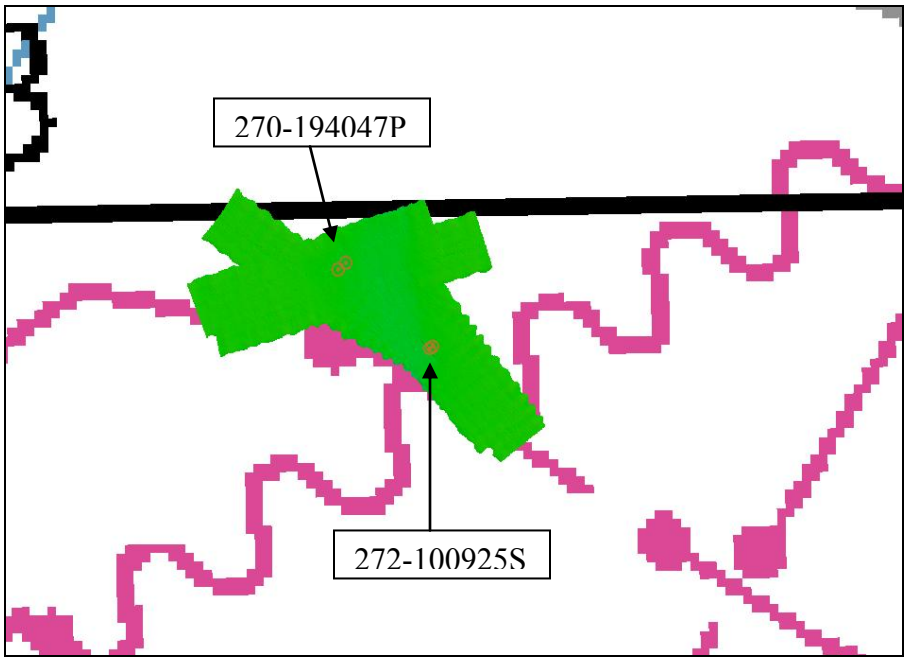


Illustration No. 43. Location of exposed pipelines ensonified by investigations H31-II-L and H31-II-M.

Primary contact 270-183523S was a linear object that was potentially an uncharted pipeline. This contact was developed on December 29, 2011 (JD363). This potential pipeline was not evident in the side scan sonar or multibeam data of the investigation.

D.2.4. Significant Scientific/Practical Findings

A large-scale feature is evident in the side scan sonar and bathymetry data of subarea 2 (Illustration No. 44). The feature begins in the radius of AWOIS item 14813 and extends south of the subarea; it is evident in lines 2175-1 to 2220-1. The side scan sonar and multibeam data show a long, linear depression (Illustration No. 45).

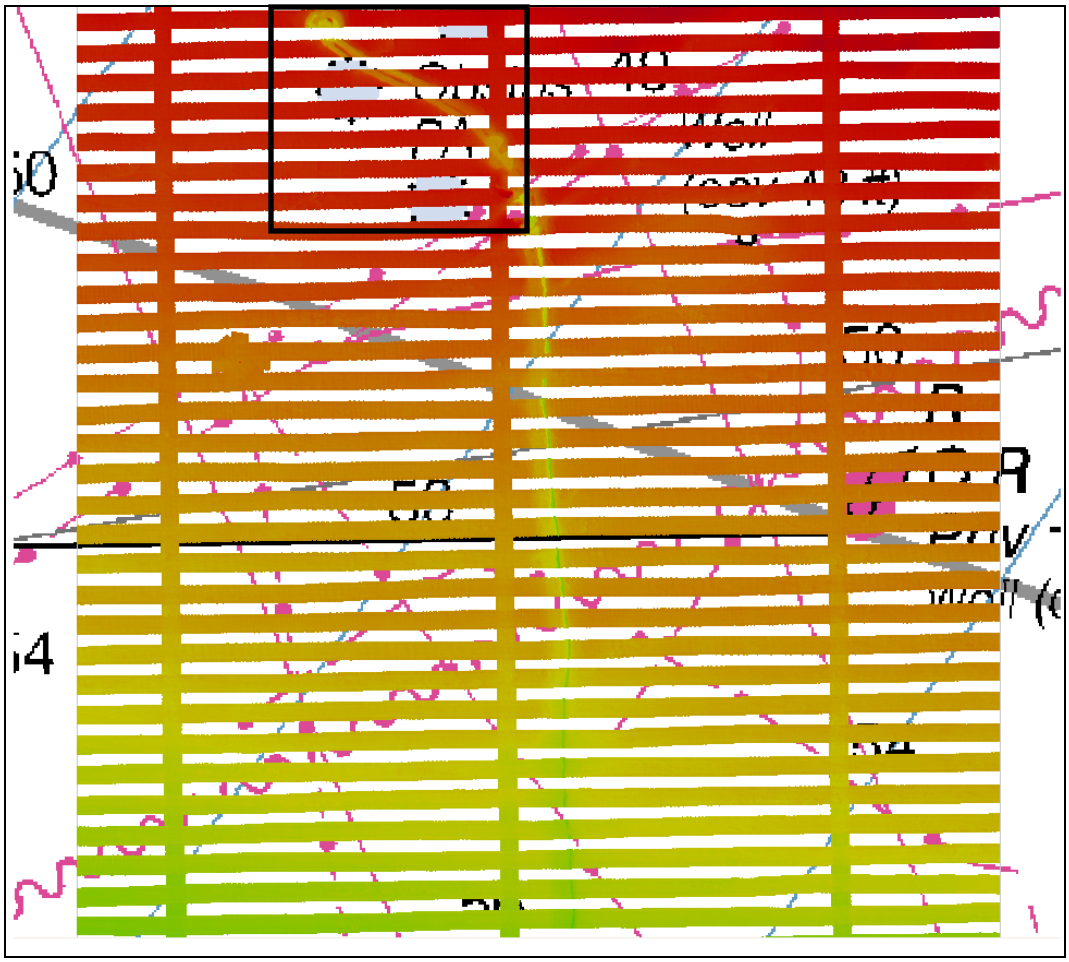


Illustration No. 44. Feature that begins in the middle of subarea 2 and extends to the bottom of the survey area. Illustration No. 45 shows greater detail of area in black box.

Illustration No. 45. Greater detail of feature located in subarea 2.

E. APPROVAL SHEET

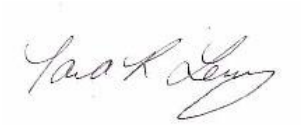
LETTER OF APPROVAL

REGISTRY NUMBER H12331

This report and the accompanying smooth sheet are respectfully submitted.

Field operations contributing to the accomplishment of the survey H12331 were conducted under my direct supervision with frequent personal checks of progress and adequacy. This report and CARIS project have been closely reviewed and are considered complete and adequate as per the Statement of Work.

This report is accompanied by the Data Acquisition and Processing Report for project OPR-K354-KR-11.



Tara Levy
Chief of Party
C&C Technologies
May 2012

APPENDIX I

Tides and Water Levels

The verified tidal data applied to all multibeam echo sounder data was downloaded from the following website for Port Fourchon, LA, tide station 8762075:

http://tidesandcurrents.noaa.gov/station_retrieve.shtml?type=Historic%20Tide%20Data&state=Louisiana&id1=876

ABSTRACT OF TIMES OF HYDROGRAPHY

Project: OPR-K354-KR-11
Contractor Name: C & C Technologies, Inc.
Inclusive Dates: September 11th, 2011 to December 29th, 2011
Registry No.: H12331
Date: May, 2012
Sheet Number: 2
Field Work is Complete
Time (UTC)

Date	Julian Day	Start	End	Year
11/9/2011	254	1816	1824	2011
11/9/2011	254	1910	2400	2011
12/9/2011	255	0000	0318	2011
12/9/2011	255	0351	0419	2011
12/9/2011	255	0620	0927	2011
12/9/2011	255	1101	1932	2011
12/9/2011	255	1952	2400	2011
13/9/2011	256	0000	0236	2011
13/9/2011	256	0254	0957	2011
13/9/2011	256	1011	1058	2011
13/9/2011	256	1115	1615	2011
22/9/2011	265	2345	2400	2011
23/9/2011	266	0000	0924	2011
23/9/2011	266	0945	1648	2011
23/9/2011	266	1730	2245	2011
23/9/2011	266	2308	2348	2011
24/9/2011	267	0000	0945	2011
24/9/2011	267	1009	2335	2011
24/9/2011	267	2335	2354	2011
25/9/2011	268	0034	0611	2011
25/9/2011	268	0624	0950	2011
25/9/2011	268	1010	2334	2011
26/9/2011	269	0001	0451	2011
26/9/2011	269	0506	0929	2011
26/9/2011	269	0946	1124	2011
26/9/2011	269	1134	1350	2011
26/9/2011	269	1651	1955	2011
26/9/2011	269	2220	2400	2011
27/9/2011	270	0000	0514	2011
27/9/2011	270	0603	0926	2011
27/9/2011	270	0945	1748	2011
27/9/2011	270	1808	1956	2011
29/9/2011	272	0953	1239	2011
30/9/2011	273	0957	1619	2011
3/10/2011	276	1529	1841	2011
4/10/2011	277	0319	0944	2011
4/10/2011	277	1000	1807	2011

4/10/2011	277	1830	1953	2011
21/10/2011	294	1803	1957	2011
16/12/2011	350	0711	0813	2011
16/12/2011	350	1331	1925	2011
29/12/2011	363	1301	1335	2011

Tidal Zoning for Texas Gas Platform, Caillou Bay (876-3535)

JOA Surveys, LLC
SURVEYING GPS TIDES HYDROGRAPHY

2000 E. Dowling Road, Suite 10
Anchorage, AK 99507
(907) 561-0136 Phone
(907) 561-0143 Fax
www.joasurveys.com

Tidal Zoning Report for OPR-K354-KR2011

5/1/2012

JOA Surveys, LLC
Mike Zieserl
mike@joasurveys.com

C & C Technologies (C & C) requested that JOA Surveys, LLC (JOA) revise the preliminary tidal zoning provided by CO-OPS for hydrographic survey OPR-K354-KR2011. CO-OPS provided preliminary tidal zoning using MLLW water level data from NOAA NWLON 876-2075 Port Fourchon, LA. JOA revised the tidal zoning to use MLLW water level data from the tertiary station 876-3535 Texas Gas Platform, Caillou Bay, LA. The tidal zoning geometry was not edited.

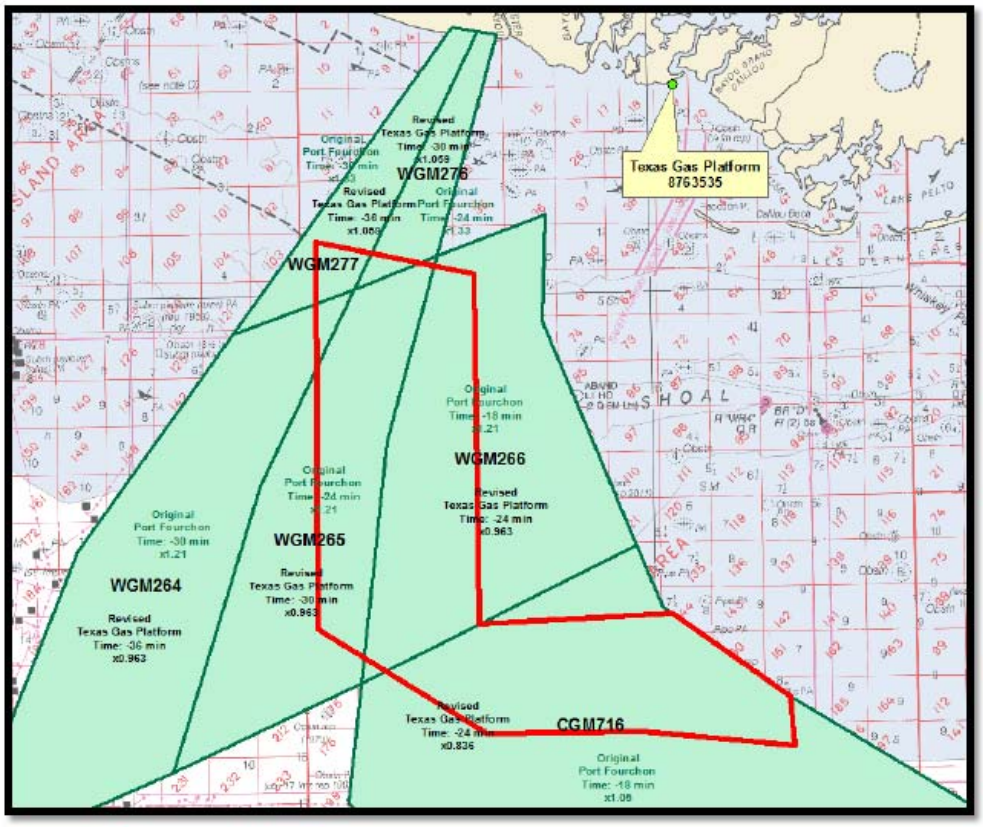
To create the revised zoning factors, one year of MLLW water level data from Texas Gas Platform and Port Fourchon were compared using a least squares best fit algorithm. The range ratio and time offset determined from this comparison were used to convert the preliminary CO-OPS tidal zoning from Port Fourchon to Texas Gas Platform. The results of the least squares comparison are listed below:

```
LSQ ZONING RESULTS
Best fit Texas Gas Platform data to Port Fourchon
Range Ratio:      0.796
Time Offset:      -6.0 minutes
Mean:             0.000 m
1 sigma:          0.067 m
2 sigma:          0.132 m
```

To convert the preliminary CO-OPS zoning from Port Fourchon to Texas Gas Platform, the preliminary tidal zoning range ratio was multiplied by 0.796 and 6 minutes was subtracted from the time offset. The original and revised zoning factors are listed in the table below. In addition, one year of original and revised zoned MLLW data were differenced to determine the 2 sigma of the difference.

	Port Fourchon		Texas Gas Platform		
Zone Name	Original Range Ratio	Original Time Offset	Revised Range Ratio	Revised Time Offset	2 sigma of difference
WGM265	1.21	-24 min	0.963	-30 min	0.159 m
WGM266	1.21	-18 min	0.963	-24 min	0.159 m
CGM716	1.05	-18 min	0.836	-24 min	0.138 m

A map of the preliminary (green font) and revised (black font) tidal zoning is shown below. The preliminary survey area is shown in red, this survey area is approximate.



[ZONE_DEF_VERSION_2]

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28.734720,-90.992780
28.658449,-90.872902
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28.519663,-90.553010
28.516196,-90.501009

[ZONE]
WGM264,7
28.968641,-91.399733
29.005056,-91.282961
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28.522274,-91.674134
28.788473,-91.550173
28.968641,-91.399733

[ZONE]
WGM265,7
29.005056,-91.282961
29.032404,-91.203049
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28.674869,-91.281683
28.601696,-91.461815
28.841561,-91.375255
29.005056,-91.282961

[ZONE]
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29.032404,-91.203049
29.066476,-91.098476
28.977116,-91.103401
28.786847,-91.016701
28.674869,-91.281683
28.876853,-91.254013
29.032404,-91.203049

[ZONE]
WGM276,5
29.220308,-91.160837
29.217374,-91.142446
29.032404,-91.203049

```
29.005056,-91.282961
29.220308,-91.160837

[ZONE]
WGM277,5
29.224709,-91.185916
29.220308,-91.160837
29.005056,-91.282961
28.968641,-91.399733
29.224709,-91.185916

[TIDE_ZONE]
CGM716,8763535,PRIM,-24,0.836
WGM264,8763535,PRIM,-36,0.963
WGM265,8763535,PRIM,-30,0.963
WGM266,8763535,PRIM,-24,0.963
WGM276,8763535,PRIM,-30,1.059
WGM277,8763535,PRIM,-36,1.059

[TIDE_STATION]
8762075,29.115000,-90.206700
8763535,29.173333,-90.975000

[TIDE_AVERAGE]
CGM716,8763535,8763535
WGM264,8763535,8763535
WGM265,8763535,8763535
WGM266,8763535,8763535
WGM276,8763535,8763535
WGM277,8763535,8763535

[OPTIONS]
Outage, 30
Interval, 360
```

APPENDIX II

Supplemental Survey Records and Correspondence

Tide Correspondence

Hi Tara,

I just spoke with Carolyn Lindley in co-ops to clarify what we are requesting with zoning for OPR-K354-KR-11. CO-OPS has not received a zoning package from JOA since they were not subcontracted to do zoning for Texas Gas Platform subordinate gauge. What they need from C&C is either 1) a new zoning package to include zoning that uses the Texas Gas Platform gauge and the Port Fourchon (8762075) NWLON station; or 2) a justification of why the addition of the Texas Gas Platform gauge was not needed to achieve vertical accuracy standards for the survey. This justification should include your methods for determining the difference in vertical accuracy between the use of just the Port Fourchon gauge vs. the use of both gauges. An example of methods could be a difference surface of your data reduced with one gauge vs. both.

If you have any questions regarding zoning or need more specifics you may contact Carolyn Lindley directly, but be sure to cc me on any emails sent back and forth between C&C and co-ops.

As for documentation, please include a copy of this email (and any subsequent emails that might provide further clarification) in Appendix V. of the DR for the remaining OPR-K354-KR-11 surveys that you have not yet submitted to AHB (H12330, H12331, H12332, and H12333). For the surveys you have already submitted to the branch (H12334 and H12335), AHB will include a copy of this email in Appendix V (so no need to resubmit any DRs or the DAPR if it is determined that the zoning difference is acceptable).

-Kathleen

--
Kathleen Jamison
Physical Scientist, Operations Branch
Hydrographic Surveys Division
Office of Coast Survey
NOAA National Ocean Service
Kathleen.Jamison@noaa.gov
301.713.2700 x126

Kathleen,

Tara is in the field getting the 2012 survey started up so I am following up on this for her. We had in fact contracted JOA to provide the zoning package for the Texas Gas Platform. We have received the zoning information back from them and it is attached with this e-mail. We will also include it with the final deliverables.

We will be doing the following to include with the reporting:

- Comparison of the tide data at Port Fourchon and Texas Gas Platform.
- Comparison of the general bathy data in the survey using both gauges.
- Comparison of the cross line statistics data in the survey using both gauges.
- Discussion of our choice for the final primary gauge and why it was used.

Please let us know if there is any other information needed on this. We want to be sure we provide all you need on this, sorry on the confusion.

Regards,
Nikki

--
Nicole Kuenzel
Geoscientist
C&C Technologies, Inc.
Lafayette, LA
email: nicole.kuenzel@cctechnol.com

APPENDIX III

Feature Report

AWOIS: ONE
DTONs: ONE
MARITIME BOUNDARY: NONE
WRECKS: NONE

H12331 AWOIS Feature Report

Registry Number: H12331
State: Louisiana
Locality: Gulf of Mexico
Sub-locality: 12 NM S of West Ship Shoal
Project Number: OPR-K354-KR-11
Survey Date: 12/29/2011

Charts Affected

Number	Edition	Date	Scale (RNC)	RNC Correction(s)*
11356	38th	06/01/2008	1:80,000 (11356_1)	[L]NTM: ?
11340	73rd	08/01/2008	1:458,596 (11340_1)	[L]NTM: ?
1116A	73rd	08/01/2008	1:458,596 (1116A_1)	[L]NTM: ?
411	52nd	09/01/2007	1:2,160,000 (411_1)	[L]NTM: ?

* Correction(s) - *source: last correction applied (last correction reviewed--"cleared date")*

Features

No.	Name	Feature Type	Survey Depth	Survey Latitude	Survey Longitude	AWOIS Item
1.1	AWOIS 14813 - UNKNOWN Obstn's PA disproved	AWOIS	[no data]	[no data]	[no data]	---

1 - AWOIS Features

1.1) AWOIS #14813 - AWOIS 14813 - UNKNOWN Obstn's PA disproved

No Primary Survey Feature for this AWOIS Item

Search Position: 28° 40' 32.8" N, 091° 05' 36.5" W

Historical Depth: [None]

Search Radius: 500

Search Technique: S2, MB

Technique Notes: [None]

History Notes:

LNM41/08--8th CGD, 10/8/08; The Rig Pride Wyoming has reportedly broken up, due to recent storms. A portion of the rig has been reported in Ship Shoal Area, Block 156, in

the Gulf of Mexico in approximate position 28-40-32.8N 091-05-36.5W. The submerged obstruction is reportedly not marked. (KSJ 7/19/10)

Survey Summary

Charts Affected: 11356_1, 1116A_1, 11340_1, 411_1

Remarks:

Not observed during survey, either visually or within survey data: AWOIS 14813

Feature Correlation

Source	Feature	Range	Azimuth	Status
AWOIS_EXPORT	AWOIS # 14813	0.00	000.0	Primary

Hydrographer Recommendations

Remove from chart 11356

S-57 Data

[None]

Office Notes

SAR: Ensonified with 200% SSS and set line spacing. No evidence of the feature was found.

Compilation: Concur. Delete charted dangerous obstructions PA.

H12331 DTONs Feature Report

Registry Number: H12331
State: Louisiana
Locality: Gulf of Mexico
Sub-locality: 12 NM S of West Ship Shoal
Project Number: OPR-K354-KR-11
Survey Date: 05/17/2012

Charts Affected

Number	Edition	Date	Scale (RNC)	RNC Correction(s)*
11356	38th	06/01/2008	1:80,000 (11356_1)	[L]NTM: ?
11340	73rd	08/01/2008	1:458,596 (11340_1)	[L]NTM: ?
1116A	73rd	08/01/2008	1:458,596 (1116A_1)	[L]NTM: ?
411	52nd	09/01/2007	1:2,160,000 (411_1)	[L]NTM: ?

* Correction(s) - *source: last correction applied (last correction reviewed--"cleared date")*

Features

No.	Name	Feature Type	Survey Depth	Survey Latitude	Survey Longitude	AWOIS Item
1.1	DToN#3 52 ft Obstruction	Obstruction	15.83 m	28° 40' 01.2" N	091° 06' 40.4" W	---

1 - Dangers To Navigation

1.1) US 0000153689 00001 / H12331_DTONs_export.000

DANGER TO NAVIGATION

Survey Summary

Survey Position: 28° 40' 01.2" N, 091° 06' 40.4" W

Least Depth: 15.83 m (= 51.94 ft = 8.656 fm = 8 fm 3.94 ft)

TPU (±1.96σ): **THU (TPEh)** [None] ; **TVU (TPEv)** [None]

Timestamp: 2012-138.18:45:42.000 (05/17/2012)

Dataset: H12331_DTONs_export.000

FOID: US 0000153689 00001(0226000258590001)

Charts Affected: 11356_1, 1116A_1, 11340_1, 411_1

Remarks:

OBSTRN/remrks: Obstruction was located with side scan sonar and further developed using a multibeam echosounder. Feature submitted as DTON3. Corresponds with primary sss contact 270-191516P.

Feature Correlation

Source	Feature	Range	Azimuth	Status
H12331_DTONs_export.000	US 0000153689 00001	0.00	000.0	Primary

Hydrographer Recommendations

It is recommended that this item be charted as an obstruction

Cartographically-Rounded Depth (Affected Charts):

52ft (11356_1)

8 ½fm (1116A_1, 11340_1, 411_1)

S-57 Data

Geo object 1: Obstruction (OBSTRN)

Attributes: NINFOM - Add Obstrn

QUASOU - 6:least depth known

SORDAT - 20111229

SORIND - US,US,graph,H12331

TECSOU - 2,3:found by side scan sonar,found by multi-beam

VALSOU - 15.830 m

WATLEV - 3:always under water/submerged

Office Notes

SAR: Ensonified with 200% SSS and oject detection MBES. Feature is real. Chart at surveyed location.

Compile: Delete charted dangerous obstruction, least depth 52 feet. Add dangerous obstruction, least depth 52 ft at the survey position.

Feature Images

Figure 1.1.1

Figure 1.1.2

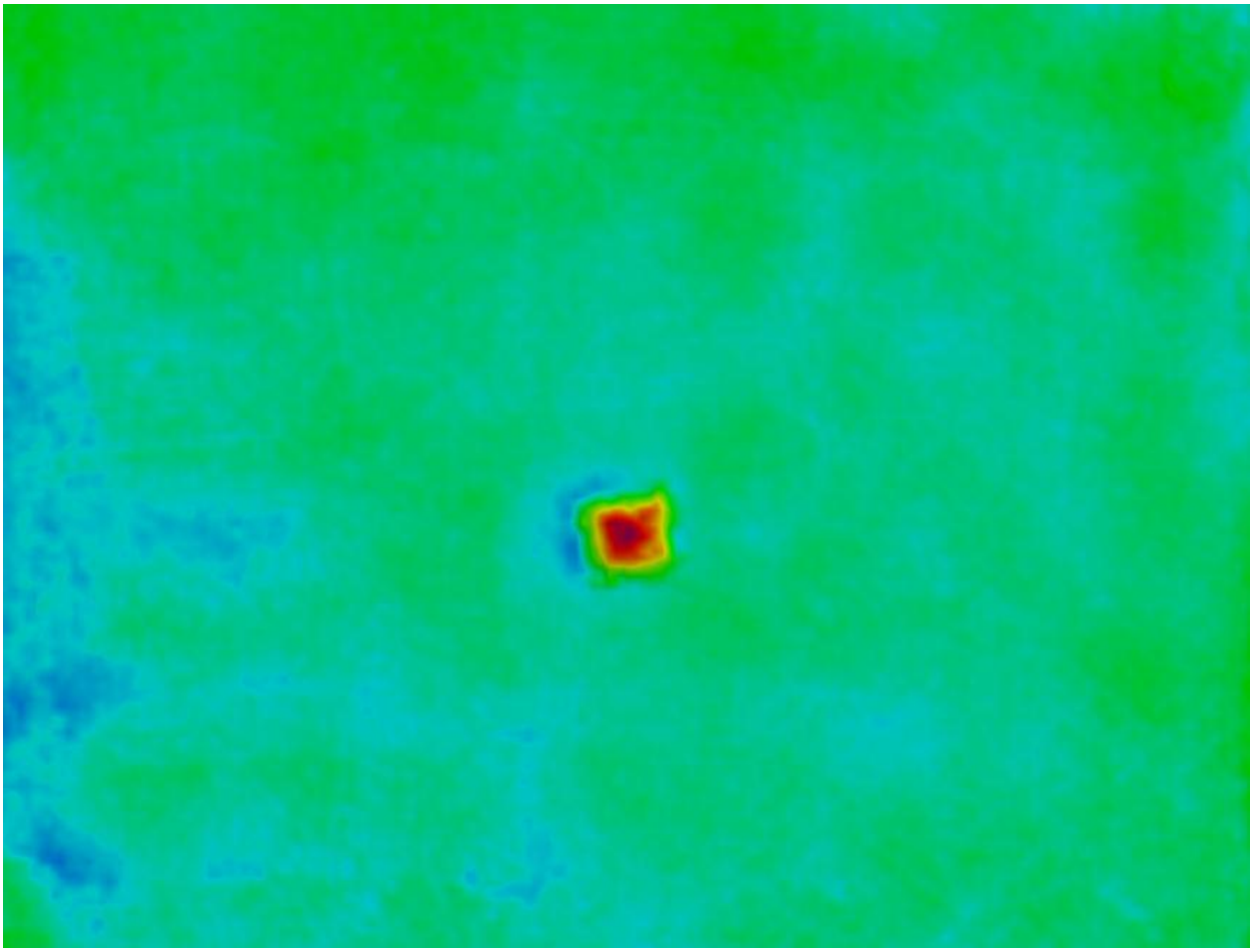

Figure 1.1.3

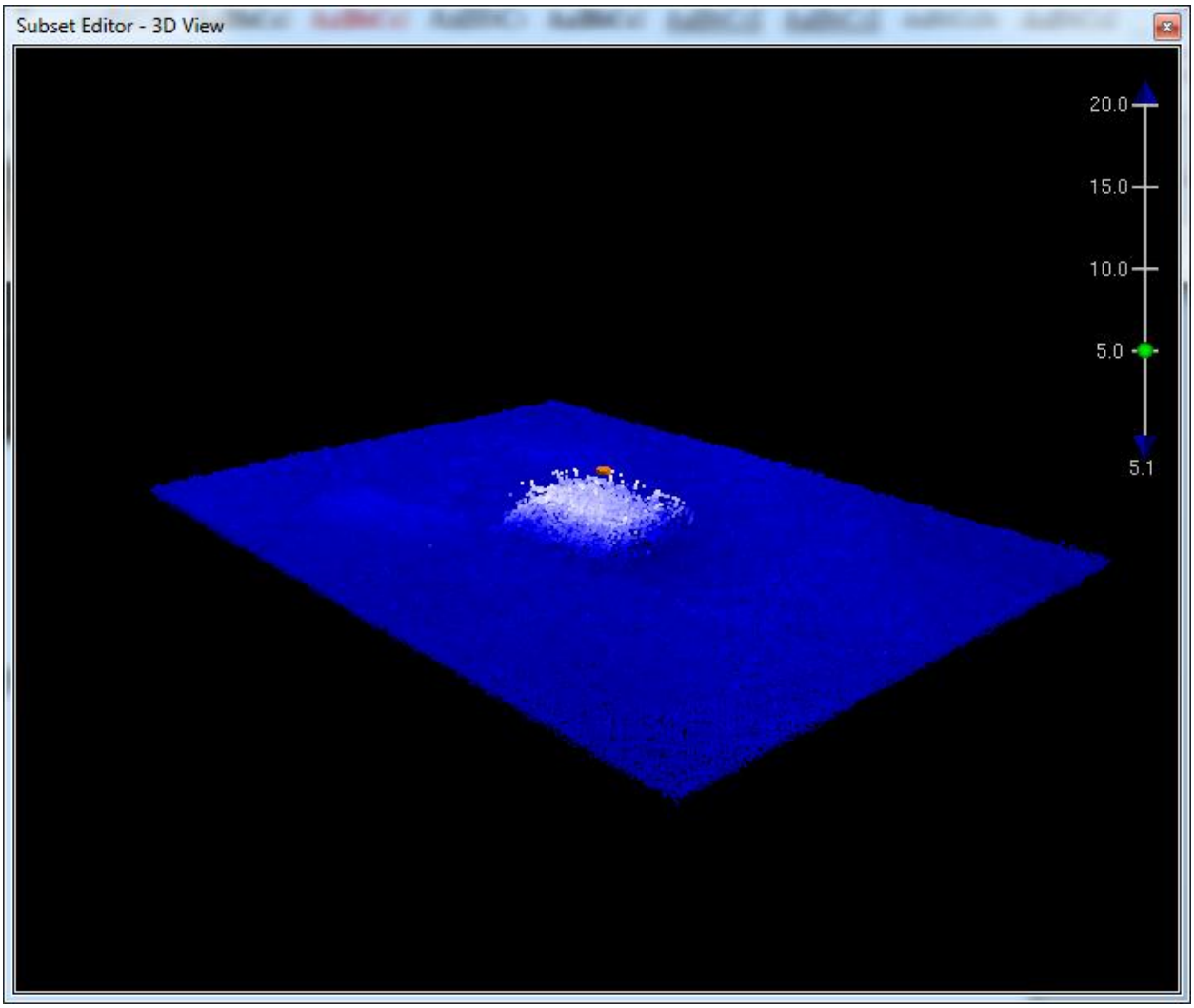

Figure 1.1.4

APPROVAL PAGE

H12331

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 NGDC for archive

- H12331_DR.pdf
- Collection of depth varied resolution BAGS
- Processed survey data and records
- H12331_GeoImage.pdf

The survey evaluation and verification has 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.

HIGGINS.ABIGAIL.SARAH.1
267671750
2013.01.13 19:47:05 -05'00'

Approved: _____

LT Abigail Higgins
Chief, Atlantic Hydrographic Branch