

H12252

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-10

Registry No. : H12252

LOCALITY

State: Louisiana

General Locality: Gulf of Mexico

Sublocality: 4 NM S of Central 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 No: H12252
		FIELD NUMBER: Sheet 10
State: <u>Louisiana</u>		
General Locality: <u>Gulf of Mexico</u>		
Locality: <u>4 NM S of Central Ship Shoal</u>		
Scale: <u>1:40,000</u> Date of Survey: <u>September 2010 to December 2011</u>		
Instructions Dated: <u>May 2010</u> Project Number: <u>OPR-K354-KR-10</u>		
Vessels: <u>M/V Inez McCall</u>		
Chiefs of Party: <u>Scott Croft, Tara Levy</u>		
Surveyed by: <u>C&C Technologies Personnel</u>		
Soundings taken by echosounder, hand lead line, or pole: <u>Simrad EM3002 Multibeam Echo sounder</u>		
Verification by: <u>C&C Technologies Personnel</u>		
Soundings in: Feet: <u>X</u> Fathoms: _____ Meters: _____ at MLW: _____ MLLW: <u>X</u>		
Remarks: <u>Hydrographic Survey of Sheet 10 (H12252)</u> <u>Data collection in meters, referenced to MLLW, later converted into feet</u> <u>200% side scan sonar, with concurrent multibeam coverage</u> <u>UTC time was used exclusively</u> <u>Grab samples were not taken</u> <u>Tidal Zones: CGM 716, 717, 718, 732, 733, WGM 266, 414, 415, 416</u> <u>Tidal Station: 8762075 (Port Fourchon, LA)</u>		

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 Red notes 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/>.

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- Appendix III Reserved
- Appendix IV Tides and Water Levels
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- Separates II Sound Speed Data
- Separates III Hydrographic Survey Project Instructions and Statement of Work
- Separates IV Crossline Comparisons
- Separates V Side Scan Contact Listing and Images of Significant Contacts

DESCRIPTIVE REPORT TO ACCOMPANY HYDROGRAPHIC SURVEY H12252

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 4 NM south of Central Ship Shoal in the Gulf of Mexico. Illustrations No. 1 and 2 show the layout of H12252 (Sheet 10) of Project OPR-K354-KR-10. Water depths in the survey area range from 6.31 m to 13.79 m Mean Lower Low Water. Survey statistics including the total survey line and crossline nautical miles, number of investigations and acquisition dates are shown in Tables No. 1 – 3.

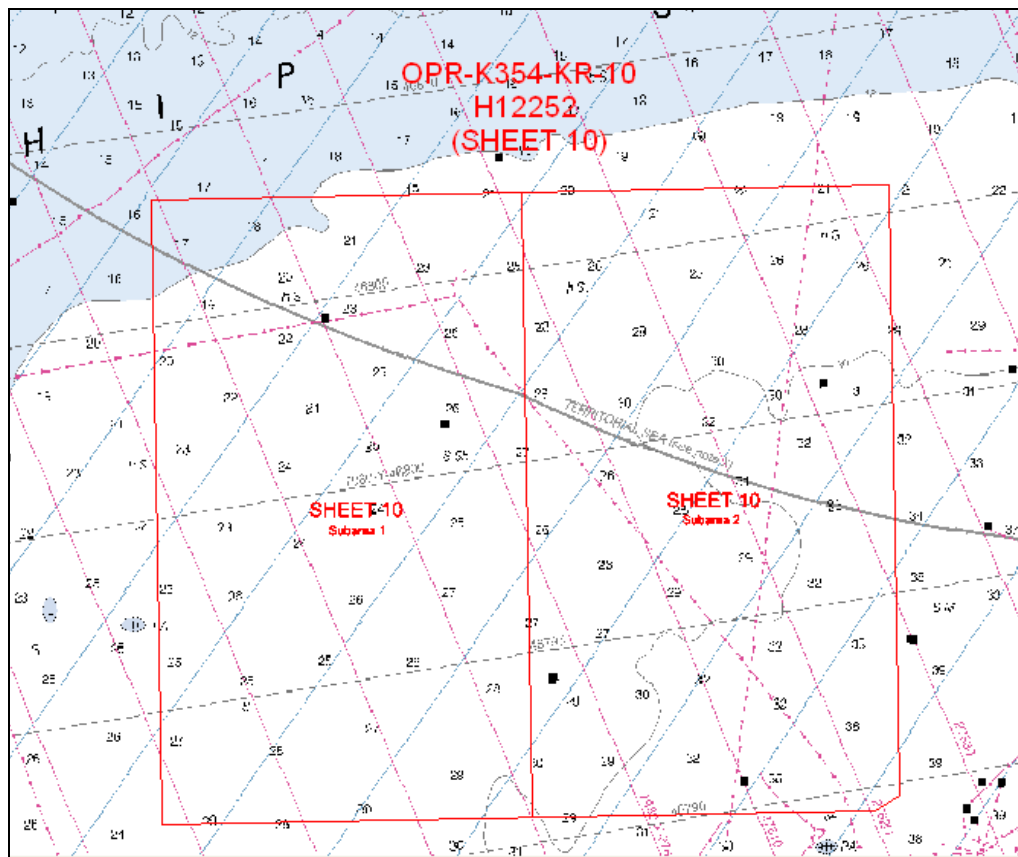


Illustration No. 1. Large Scale Survey Outline Graphic.

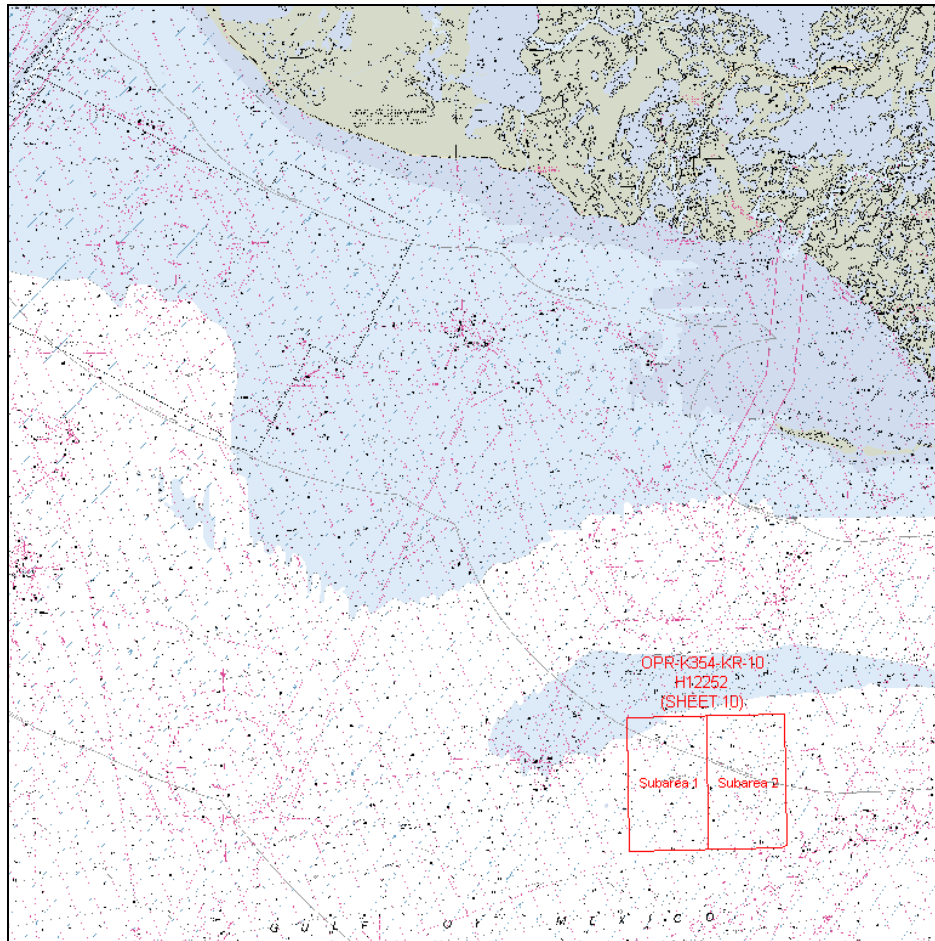


Illustration No. 2. Small Scale Survey Outline Graphic.

Table No. 1. Survey Line Statistics

	<i>Inez McCall</i>	Total
LNM Side Scan + Multibeam	605.10	605.10
LNM Crosslines	30.62	30.62
LNM Investigations	4.62	4.62

Table No. 2. Additional Survey Statistics

Total square nautical miles of survey area	27.19
Number of items investigated	3

Table No. 3. Data acquisition dates

Month	Day	Year
September	29, 30	2010
October	1, 7 – 13, 15, 16	2010
February	17	2011
May	27	2011
November	22*	2011
December	30*	2011

*SSS fill-in/re-run only

B. DATA ACQUISITION AND PROCESSING

Refer to the OPR-K354-KR-10 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 33.5 meters long and 7.5 meters wide with draft of 2.75 meters. 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 Speed Profiler	Seabird	SBE19
SSS collection	Chesapeake Technology Inc.	SonarWiz Map
Multibeam collection	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. A small region in the upper northern portion of Subarea 1 encompasses a portion of Ship Shoal and charted water depths range from 17 to 21 feet. The line spacing was set to 60 m and the SSS was operated with a range of 75 m. The majority of charted water depths in Subarea 1 range from 19 to 30 feet and the line spacing was set to 90 m and the SSS was operated with a range of 100 m. Charted water depths in Subarea 2 range from 21 to 36 feet



and the line spacing in the entire subarea was set to 90 m and the SSS was operated with a range of 100 m.

The criteria of acquiring 200% SSS coverage for object detection was accomplished using the aforementioned parameters and Technique 2 as set forth in Section 6.1 of the HSSD (2010). The SSS tracklines used to generate coverage mosaics were identified by an odd/even numbering system.

B.2.2. Crosslines

Crosslines were run perpendicular to the mainscheme lines so that quality control statistics could be performed. Based on pre-plot calculations, the total crossline miles were 30.62 nm, while the total main line miles were 605.10 nm. The cross lines comprised 5.1 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 (2010), which states that lineal mileage of crosslines will be at least 4% 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 mainline and cross line depth values generally showed agreement. Each main line was compared to all cross lines 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 surfaces were examined using a color range map in 0.2 m increments from -0.6 to 0.6 m.

The majority of difference values for Subarea 1 are within -0.4 to 0.2 m (Illustration No. 3). These values are within the maximum allowable TVU (total vertical uncertainty) for water depths of 6.31 to 11.87 m, which ranges from ± 0.51 to ± 0.52 m. However, the difference values between the mainlines and crosslines ranges from -0.66 to 0.51 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 colormap to evaluate the differences between -0.66 and -0.5 m. The majority of the extreme values occurred in a localized area of the edge of crossline H12252-TIE-102 (Illustration No. 4) where a brief multibeam malfunction between main survey lines 10076-1 and 10077-1 caused the portside to slope down and the starboard side to slope up more than the actual seafloor in the area (Illustration No. 5).

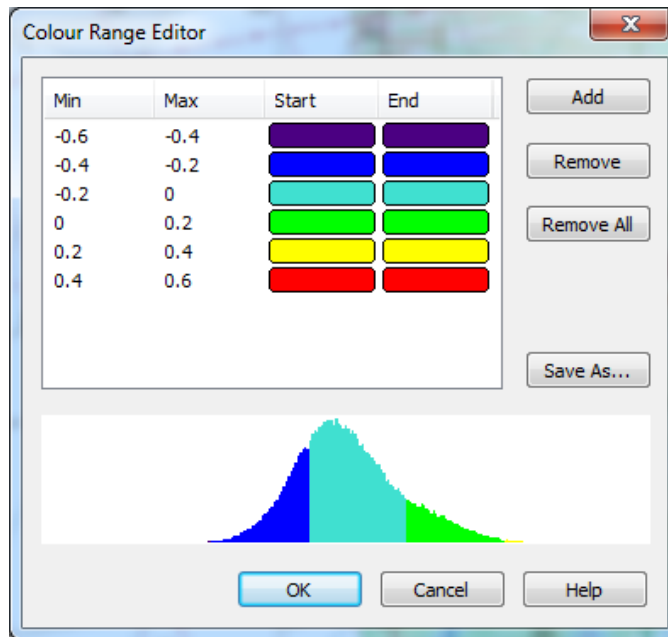


Illustration No. 3. Color range map and histogram used to evaluate the depth differences between mainlines can crosslines for Subarea 1.

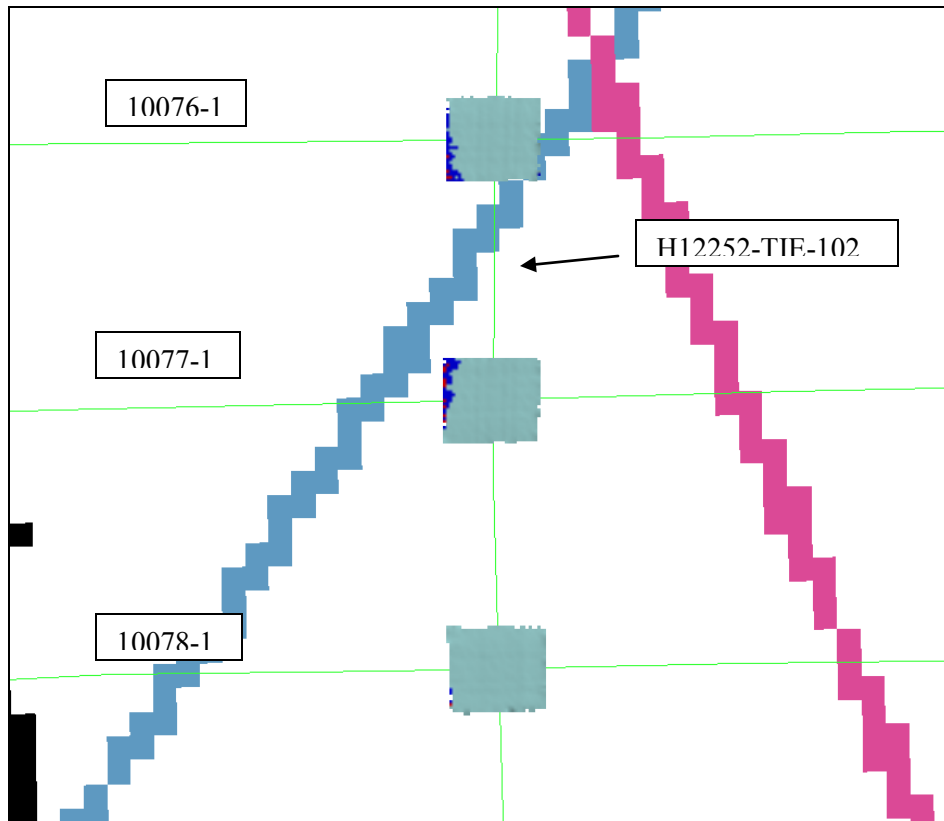


Illustration No. 4. Region where the majority of extreme values are located. Light blue indicates regions where the differences are between -0.5 and 0.5 m, blue indicates regions that are between -0.5 and -0.6 m and red indicates regions between -0.6 and -0.66 m.

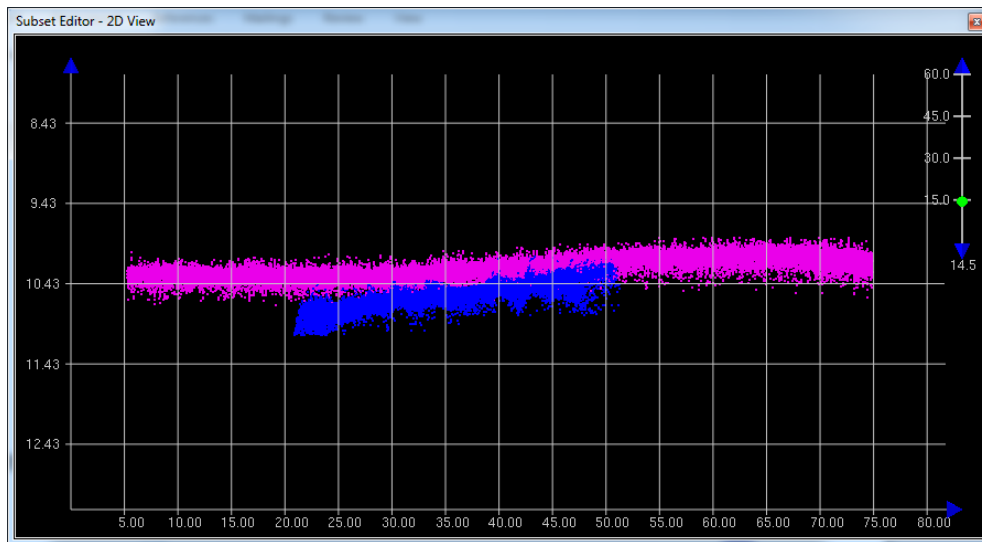


Illustration No. 5. Purple line is 10076-1 and blue line is H12252-TIE-102; the portside of the tieline slopes down and the starboard side to slopes up more than the actual seafloor in the area.

The majority of depth difference values between the mainlines and crosslines in Subarea 2 are within -0.40 to 0.2 m (Illustration No. 6). These values are within the maximum allowable TVU for water depths of 7.12 and 13.79 m, which ranges from ± 0.51 to ± 0.53 m. However, the difference values range from -0.66 to 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 colormap to evaluate the differences between -0.66 and -0.5 m (Illustration No. 7). This value was found to constitute a small amount and occurred in localized areas on the edges of crossline and mainline data overlap and mainly along crossline H12252-TIE-106 between mainlines 10149-1 and 10154-1 (Illustration No. 8).

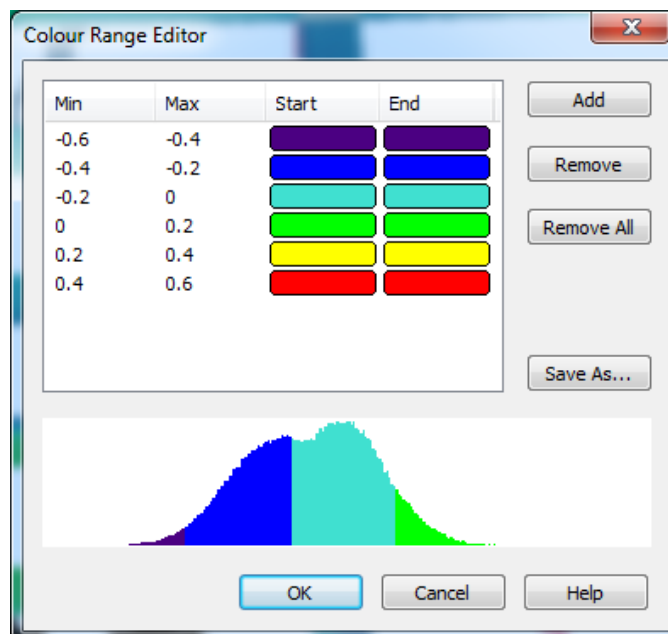


Illustration No. 6. Color range map and histogram used to evaluate the depth differences between mainlines and crosslines for Subarea 2.

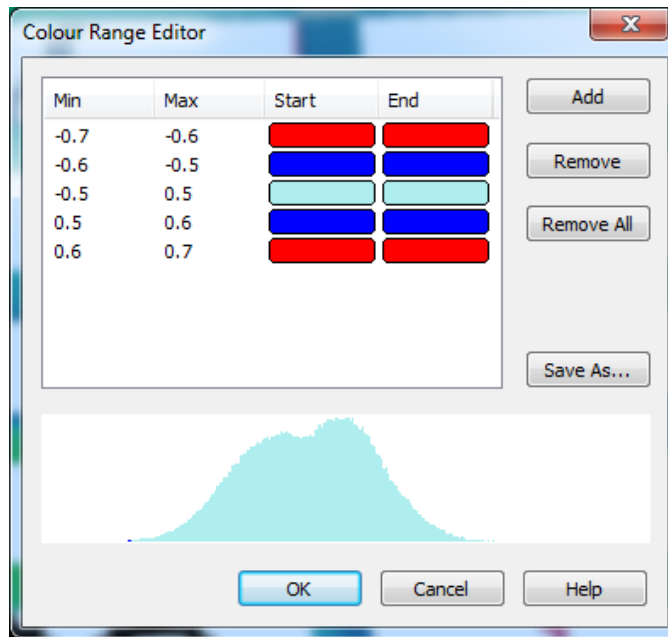


Illustration No. 7. Color range map used to evaluate the extreme depth differences between mainlines and crosslines in Subarea 2.

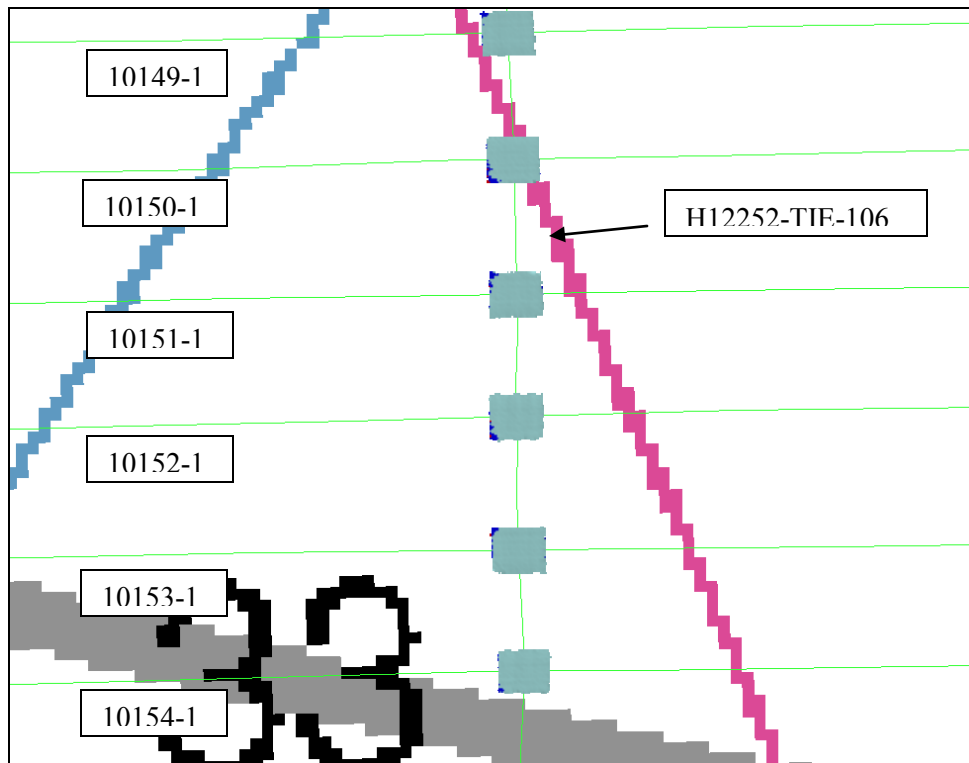


Illustration No. 8. Region where the majority of extreme values are located. Light blue indicates regions where the differences are between -0.5 and 0.5 m, blue indicates regions that are between -0.5 and -0.6 m and red indicates regions between -0.6 and -0.66 m.



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, >99% of crossline soundings were considered to meet IHO Order 1a standards. Crossline comparisons generated with the CARIS QC report utility are shown in Separate 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

Survey H12252 has four contemporary OPR-K354-KR-10 survey junctions and one small junction with H12121 (Sheet J) of OPR-K354-KR-09. Details of these surveys are shown in Table No. 5 and outlined in Illustration No. 9. Although continuous multibeam coverage is not obtained within a survey or between surveys due to the set-line spacing multibeam survey operations, a CARIS difference surface between the 1-m BASE surfaces of the junction surveys and the 1-m BASE surfaces of survey H12252 was computed to ensure general agreement of depths where overlap of sounding data occurred. Difference surfaces were created with the CARIS Difference Surface tool with H12252 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 analysis follows. It should be noted that the previous survey junctions with H12252 were completed before the depth data for H12252 was adjusted (Refer to Section B.3); therefore it is expected that there will be some differences in the junction analyses that follow as compared to previous analyses.

Table No. 5. H12252 Survey Junctions.

Registry Number	Scale	Year	Sublocality
H12249	40000	2010	Central Ship Shoal
H12251	40000	2010	3 NM S of East Ship Shoal
H12253	40000	2010	Southwest Ship Shoal
H12254	40000	2010	8 NM S of Central Ship Shoal
H12121	10000	2010	17 NM S of Isles Dernieres

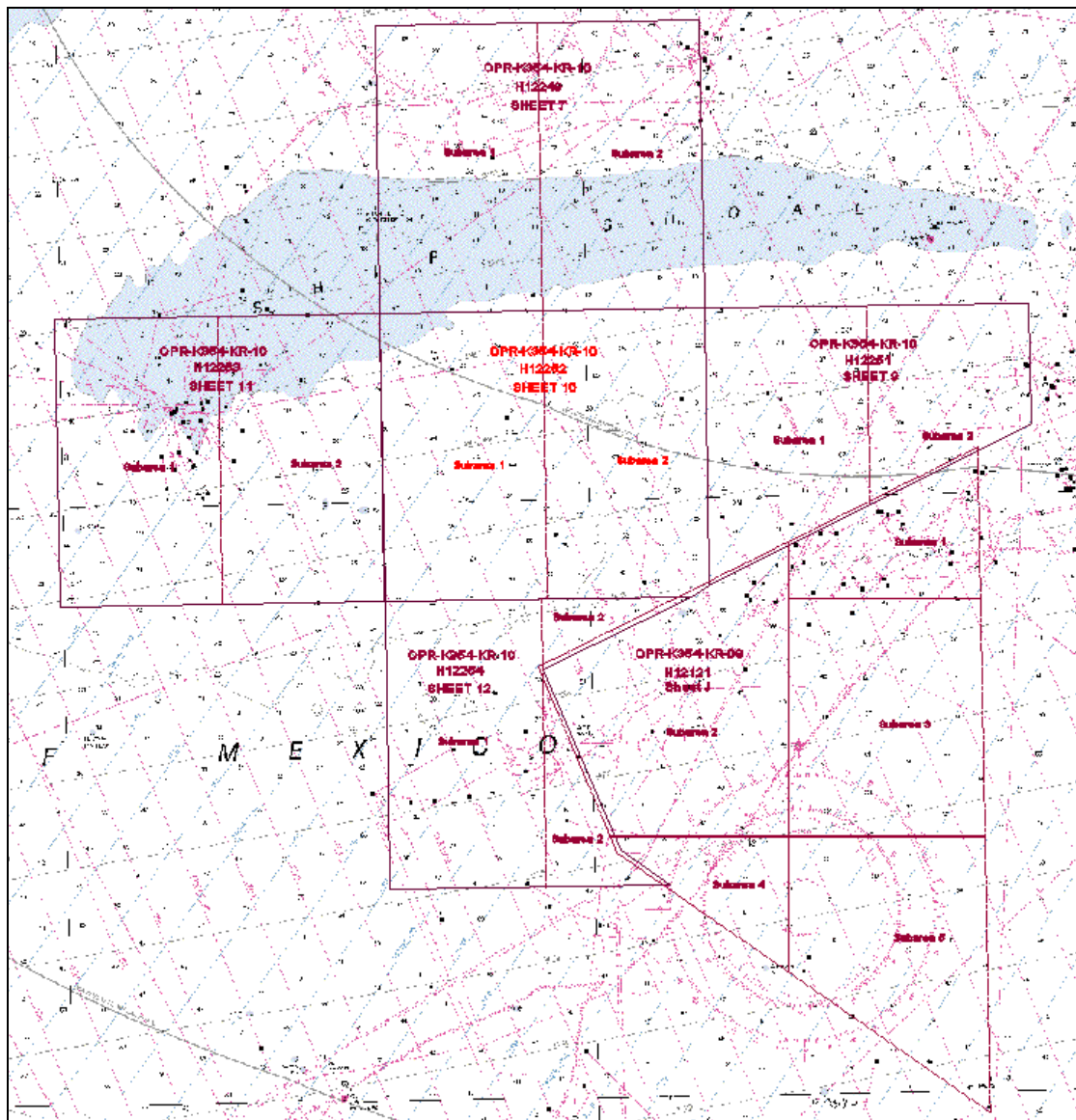


Illustration No. 9. H12252 Survey Junctions.

Junction with H12249

The northern margin of survey H12252 has a junction with the southern margin of survey H12249. Subareas 1 and 2 of each survey overlap one another and crossline data from each survey overlaps mainline data of the adjoining survey. The 1-m BASE surfaces of H12252 were compared to the finalized 1-m BASE surfaces of H12249. The depth differences between Subareas 1 of each survey range between -0.45 and 0.48 m and the majority of depth differences range between -0.2 and 0.2 m (Illustration No. 10). The depth differences between Subareas 2 of each survey range between -0.36 and 0.55 m and the majority of depth differences range either between -0.2 and 0 m and 0.2 and 0.4 m (Illustration No. 11). This likely occurs because the data of Subarea 2 of each survey is neither consistently deeper nor

shallower than the adjoining survey, instead, the crosslines of each survey are deeper than the mainlines of the adjoining survey.

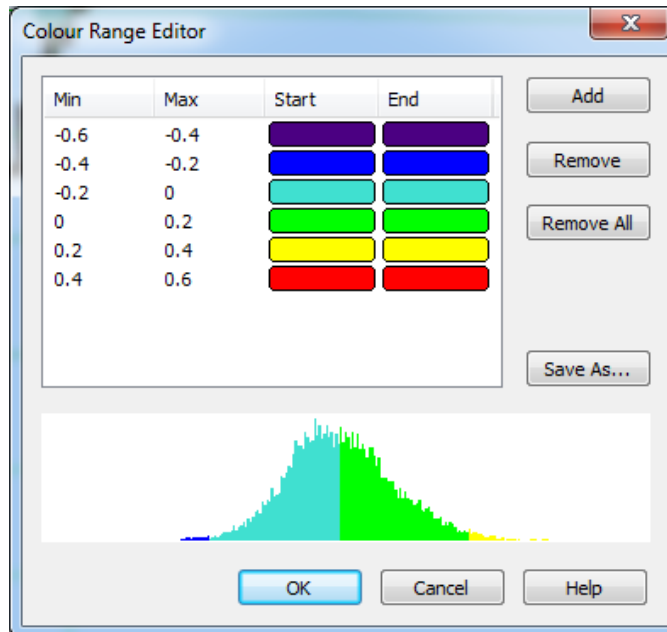


Illustration No. 10. Color range map and histogram used to evaluate the depth differences between the junction of Subarea 1 of H12252 and Subarea 1 of H12249.

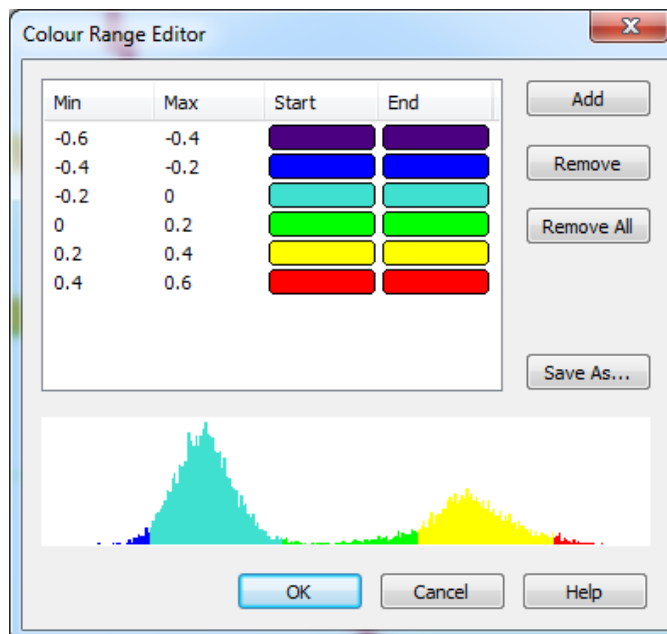


Illustration No. 11. Color range map and histogram used to evaluate the depth differences between the junction of Subarea 2 of H12252 and Subarea 2 of H12249.

Junction with H12251

The eastern margin of Subarea 2 of survey H12252 junctions with the western margin of Subarea 1 of survey H12251 and there is mainline to mainline data overlap; the 1-m BASE surface of H12252 was compared to the 1-m BASE surface of H12251. The majority of depth differences range between -0.4 and 0.2 m (Illustration No. 12). However, the depth differences between the two surveys range from -0.62 to 0.58 m. The more extreme difference values are limited and occur on the outer edges of swath overlap and near areas of seafloor slope changes.

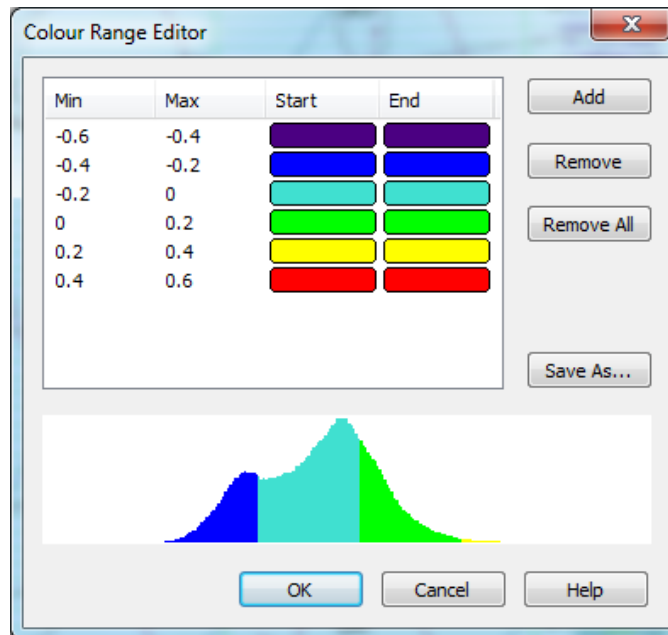


Illustration No. 12. Color range map and histogram used to evaluate the depth differences between the junction of Subarea 2 of H12252 and Subarea 1 of H12251.

Junction with H12253

The western margin of survey H12252 junctions with the eastern margin of survey H12253 and there is mainline to mainline overlap. A preliminary 1-m BASE surface was generated for Subarea 2 of H12253 to which Subarea 1 of H12252 was compared; any changes to this analysis will be addressed in the Descriptive Report of survey H12253. The majority of depth difference values are between -0.4 and 0.4 m (Illustration No. 13). However, the depth difference values range from -0.62 and 0.69 m and a separate colormap was used to evaluate the more extreme difference values (Illustration No. 14). The values greater than ± 0.5 m constitute a small amount of the differences and were found to be located on the edges of swath data overlap or in areas of bathymetric change (Illustration No. 15 and 16) that generally appears more prominent in survey data of H12252. In addition, H12252 data is generally deeper than that of H12253.

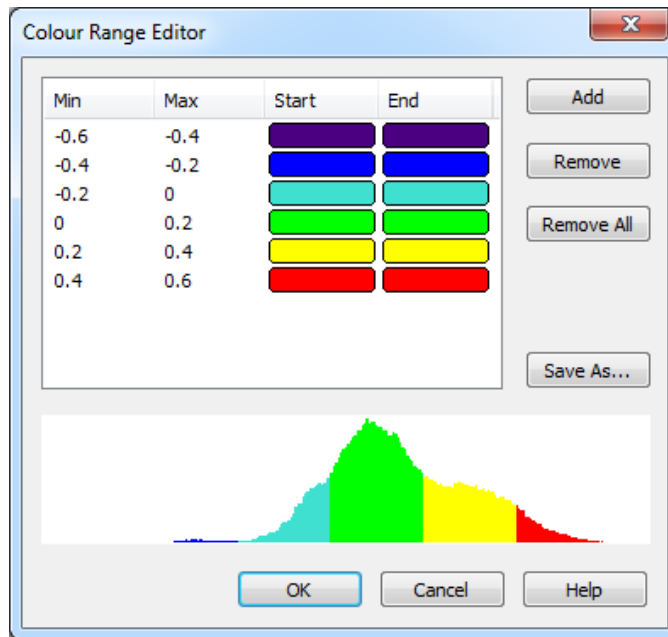


Illustration No. 13. Color range map and histogram used to evaluate the depth differences between Subarea 1 of H12252 and Subarea 2 of H12253.

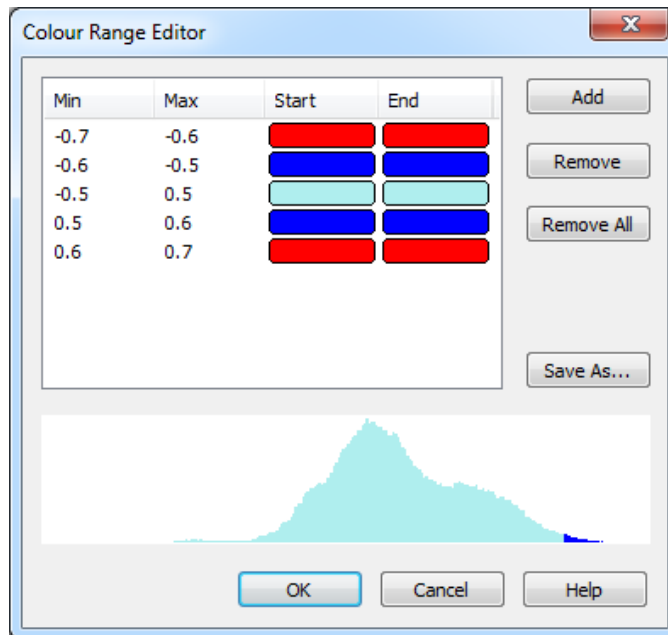


Illustration No. 14. Color range map and histogram used to evaluate the more extreme depth difference values between Subarea 1 of H12252 and Subarea 2 of H12253.

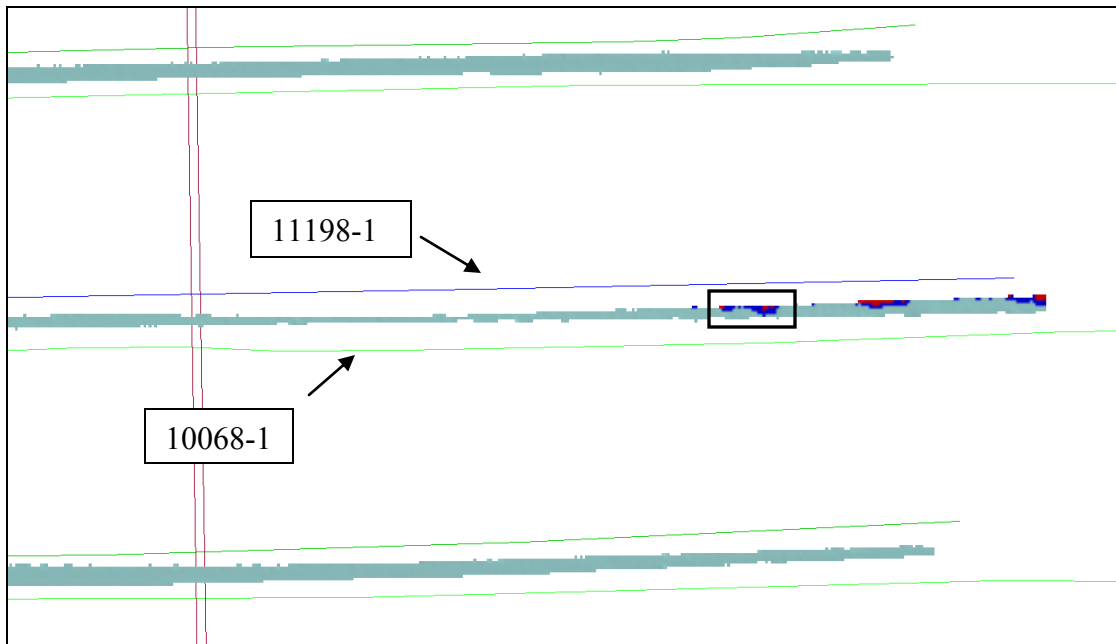


Illustration No. 15. Sample region of more extreme difference values. Light blue indicates regions where the differences are between -0.5 and 0.5 m, blue indicates regions that are between -0.5 and -0.6 m and red indicates regions between -0.6 and -0.66 m.

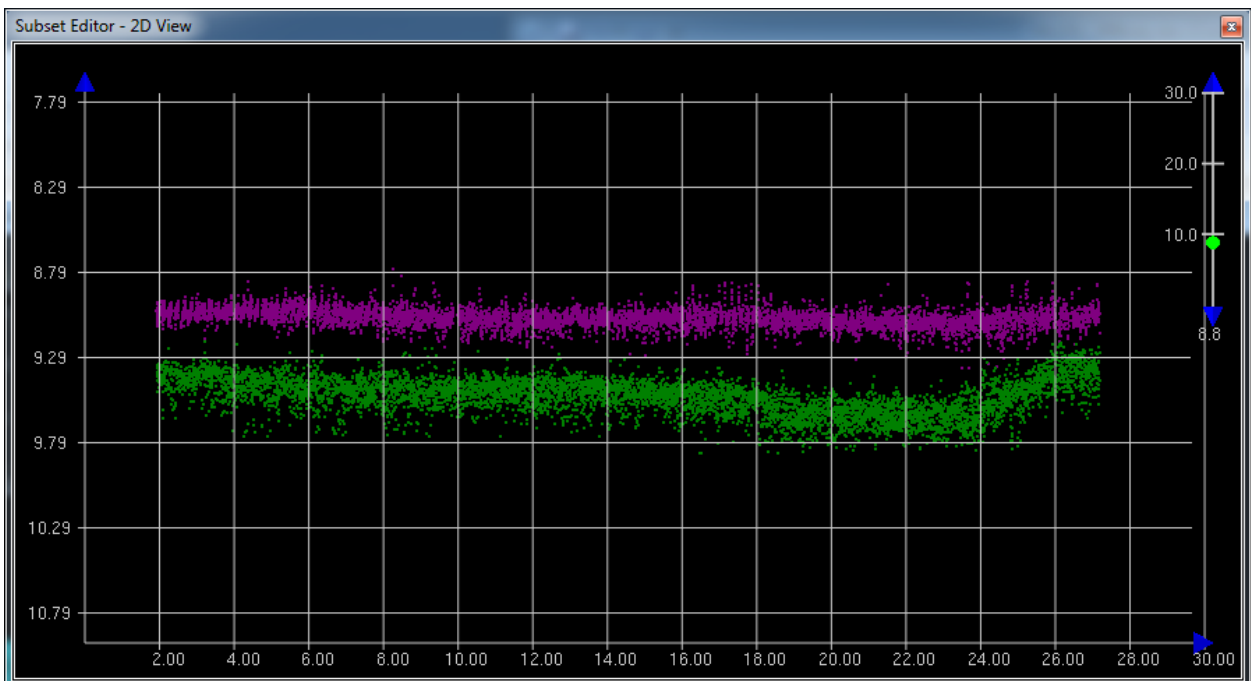


Illustration No. 16. 2D Subset Editor view of region in black box of Illustration No. 15; blue line is 11198-1 (H12253) and purple line is 10068-1 (H12252). There is a depression in the 10068-1 line that does not appear in the 11198-1 line. Viewing the data in 3D and Swath Editor also confirms that the bathymetric change is more prominent in the data of survey H12252.

Junction with H12254

The southern margin of survey H12252 has a junction with the northern margin of survey H12254. Subareas 1 and 2 of each survey overlap one another and crossline data from each survey overlaps mainline data of the adjoining survey. The 1-m BASE surfaces of H12252 were compared to the finalized 1-m BASE surfaces of H12254. The depth differences between Subareas 1 of each survey range between -0.25 and 0.49 m (Illustration No. 17) and the majority of depth differences between Subareas 2 of each survey range between 0.0 and 0.4 m (Illustration No. 18). However, the depth difference values between Subareas 2 of each survey range between -0.17 and 0.65 m. Because there is a significant amount of difference values greater 0.4 m, a separate colormap was used to evaluate these differences (Illustration No. 19). The difference values between 0.5 and 0.65 m are located where the outer swaths of H12252 crosslines 104, 105 and 106 overlap mainline data from H12254. In addition, the H12252 crosslines are consistently deeper than the H12254 mainlines.

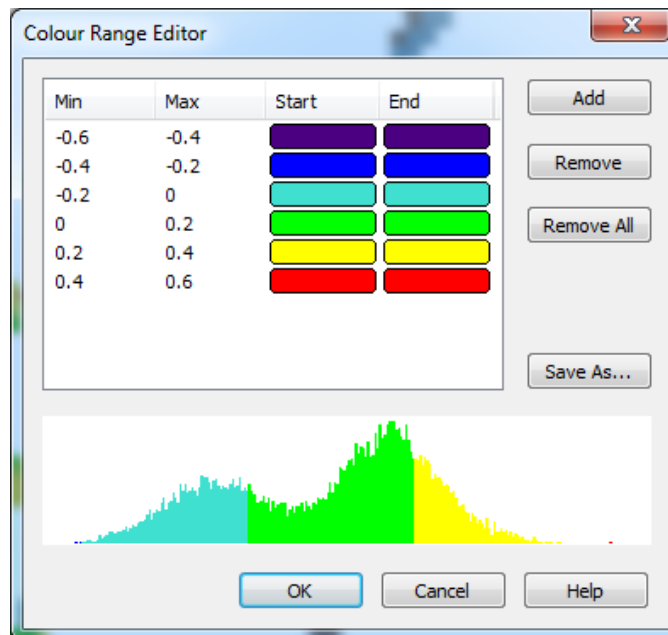


Illustration No. 17. Color range map and histogram used to evaluate the depth differences between the junction of Subarea 1 of H12252 and Subarea 1 of H12254.

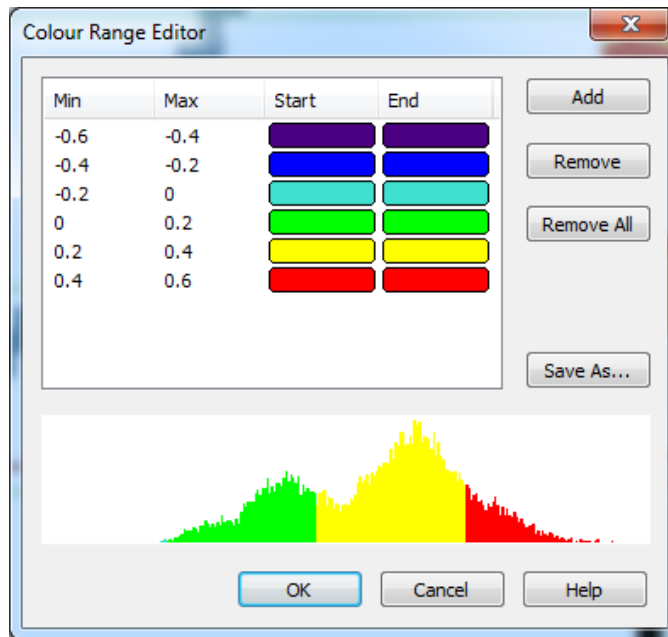


Illustration No. 18. Color range map and histogram used to evaluate the depth differences between the junction of Subarea 2 of H12252 and Subarea 2 of H12254.

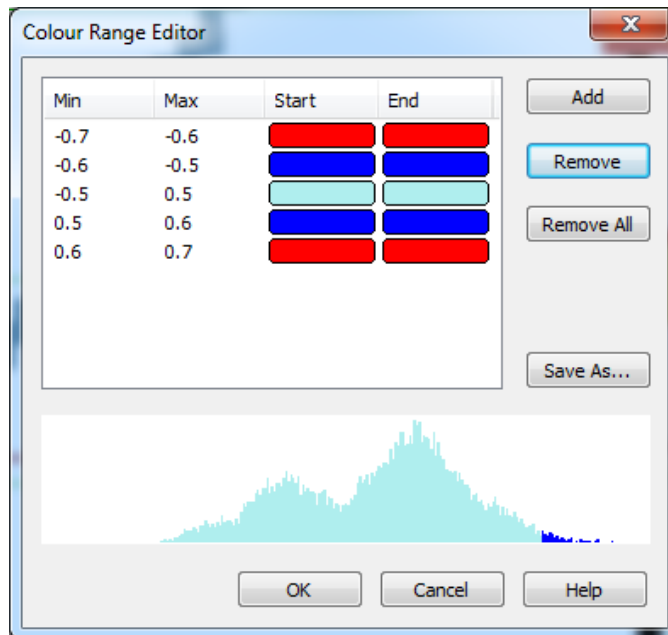


Illustration No. 19. Color range map and histogram used to evaluate the more extreme depth difference values between Subarea 2 of H12252 and Subarea 2 of H12254.

Junction with H12121

The southeast corner of H12252 junctions with Subarea 2 of survey H12121 and mainline data from each survey overlaps. A 1-m BASE surface was generated for Subarea 2 of H12121 for comparison to survey H12252. The difference values range from -0.55 to 0.47 m and the majority ranges between -0.2 and 0.0 m (Illustration No. 20).

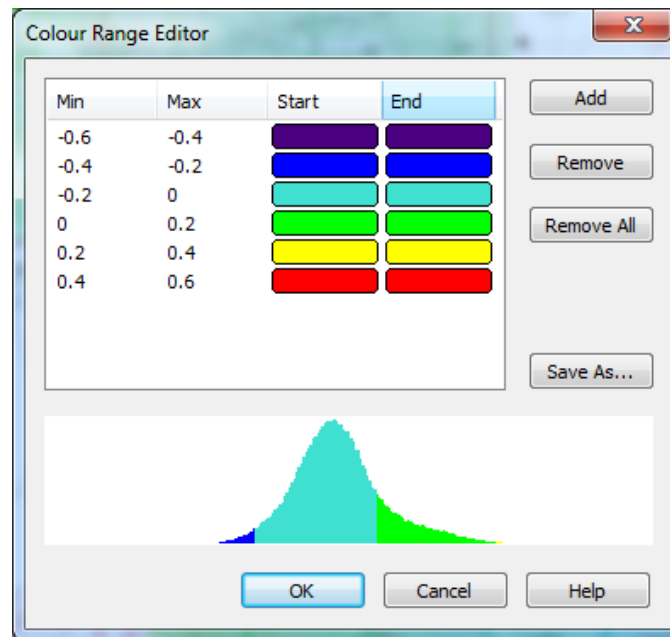


Illustration No. 20. Color range map and histogram used to evaluate the depth difference values between Subarea 2 of H12252 and Subarea 2 of H12121.

B.2.5. Sonar System Quality Control

Calibration

A total of five patch tests were performed to calibrate the multibeam system. An initial patch test took place south of Cameron, LA on June 7, 2010 (Table No. 6). Another four patch tests were performed; the first outside of Port Fourchon, LA on the 14th of June 2011, the second was south of Cameron, LA on June 30th, 2011, a third on September 22th, 2011 outside Port of Fourchon, LA and the fourth south of Port Fourchon, LA, on November 11, 2011.

On June 14th, 2011 a patch test was performed for the commencement of the 2011 NOAA project OPR-K354-KR-11. A second test was done as a check on the quality of the first calibration. The results from the June 30th patch tests (Table No. 7) were used as the final angular offsets. This was done because of concerns with the accuracy of the heading results.

On September 22th, 2011, the EM3002 stopped working. After troubleshooting the topside and connections, it was determined that the problem was below the waterline, either with the cable or with the transducer. The boat was put into dry dock; the transducer and cable were replaced and a new patch test was performed. Results are shown in Table No. 8.



On November 11, 2011 another patch test was conducted after noticing misalignment in investigation multibeam data in CARIS. Results are shown in Table No. 9. The vessel file in CARIS was updated and correctors applied for data between September 22 and November 11, 2011.

Table No. 6: Patch test results (June 7, 2010 – south of Cameron, LA)

Roll	Pitch	Heading
-0.236°	2.440°	358.430°

Table No. 7: Patch test results (June 30, 2011 – south of Cameron, LA)

Roll	Pitch	Heading
-0.125°	4.463°	-1.665°

Table No. 8: Patch test results (September 22, 2011 – south of Port Fourchon, LA)

Roll	Pitch	Heading
-0.117°	4.755°	-1.569°

Table No. 9: Patch test results (November 11, 2011 – south of Port Fourchon, La)

Roll	Pitch	Heading
-0.17°	3.72°	2.521°

The angular sector on the multibeam was set so that the criterion of two times water depth, as well as all accuracy, resolution, and detection criteria as set forth in Sections 5.2 and 5.3 of the “Specifications and Deliverables” document, were met.

Field Procedures

Leadlines were conducted daily, when possible, to assess whether draft corrections needed to be applied in the multibeam collection software. The lead line logs are included in Separate I – Data Acquisition and Processing Logs.

An Odom Echotrac MKII single beam echosounder was used as an independent check on the multibeam system. Sound velocity was imported daily into the echo sounder.

Sound velocity casts were performed daily to measure the sound speed in the water column. Often casts were performed more than once to ensure accurate multibeam bottom detection. The water column sound speed was compared to the sound speed at the transducer, which was measured with an Endeco YSI sound speed profiler. 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.

Multibeam Data

Line 10009-1 was first collected on October 12, 2010 and then both multibeam and side scan sonar re-run of the entire line (10009-2) conducted on October 15, 2010. Upon data review, however, it was concluded that the data quality of line 10009-1 was better than 10009-2 and so 10009-2 was removed from the project.

There are several lines (H12252-TIE-103, 10031-2 and 10014-1 in Subarea 1 and 10148-1 in Subarea 2) that have data overlap at the beginning of the lines that is associated with navigation and attitude data gaps. This is thought to have occurred when a line was stopped and a new line run but not re-named, which caused the original data to be over-written improperly.

In addition to the survey junctions outlined in Section B.2.4, a CARIS difference surface between the 1-m BASE surfaces of Subareas 1 and 2 of the survey was generated to ensure general agreement of depths where overlap of sounding data occurred. Difference surfaces were created with the CARIS Difference Surface tool with Subarea 1 as Surface 1 and Subarea 2 as Surface 2. The difference surface was initially evaluated with a user-defined color range map in 0.2 m increments from -0.6 to 0.6 m and the majority of difference values are between -0.4 and 0.4 m (Illustration No. 21). However, the difference values range from -0.7 to 0.7 m and a separate color map was used to evaluate these more extreme differences (Illustration No. 22). The more extreme difference values are found where outer swath data overlaps, particularly on lines shown in Table No. 10; an example is shown in Illustration No. 23. These differences may in part be due to a slight roll artifact that was noticed in the multibeam data during post-processing. After careful review of the notes and equipment offsets, there was no evident reason for the artifact and because the majority of the differences between the BASE surfaces are within the maximum TVU for IHO Order 1a specifications (between ± 0.51 to ± 0.53 m) there was no basis to correct it. In addition, this artifact was not noticed in subsequent surveys processed with the same vessel file.

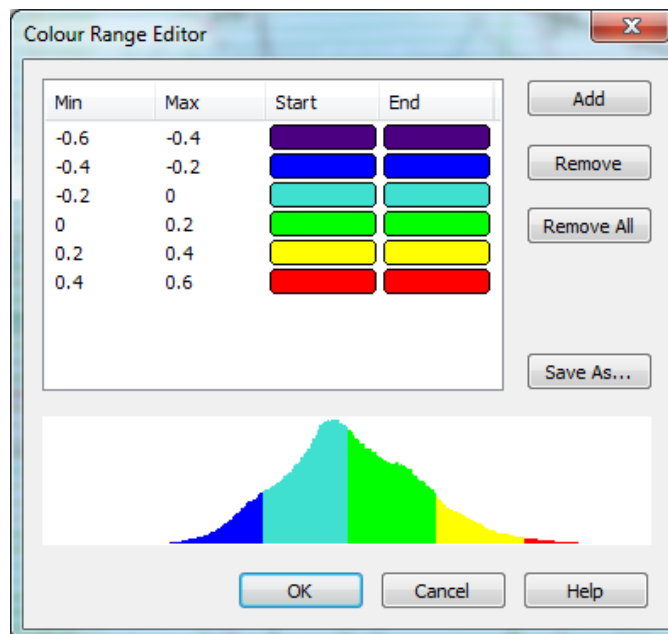


Illustration No. 21. Color range map and histogram used to evaluate the depth difference values between Subareas 1 and 2 of H12252.

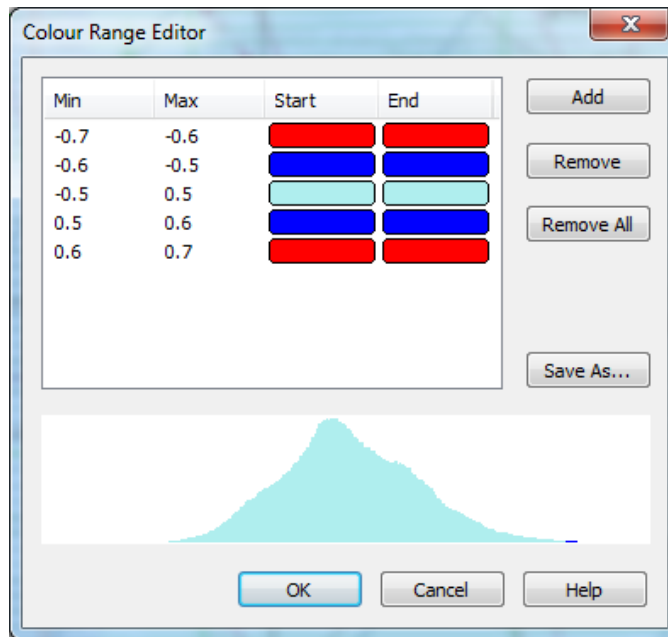


Illustration No. 22. Color range map and histogram used to evaluate the more extreme difference values between Subareas 1 and 2 of H12252.

Table No. 10. Lines that show more extreme depth difference values where outer swath data overlap.

Subarea 1 line	Adjoining Subarea 2 line
10020-1	10119-1
10022-1	10121-1
10052-1 – 10058-1	10151-1 – 10157-1

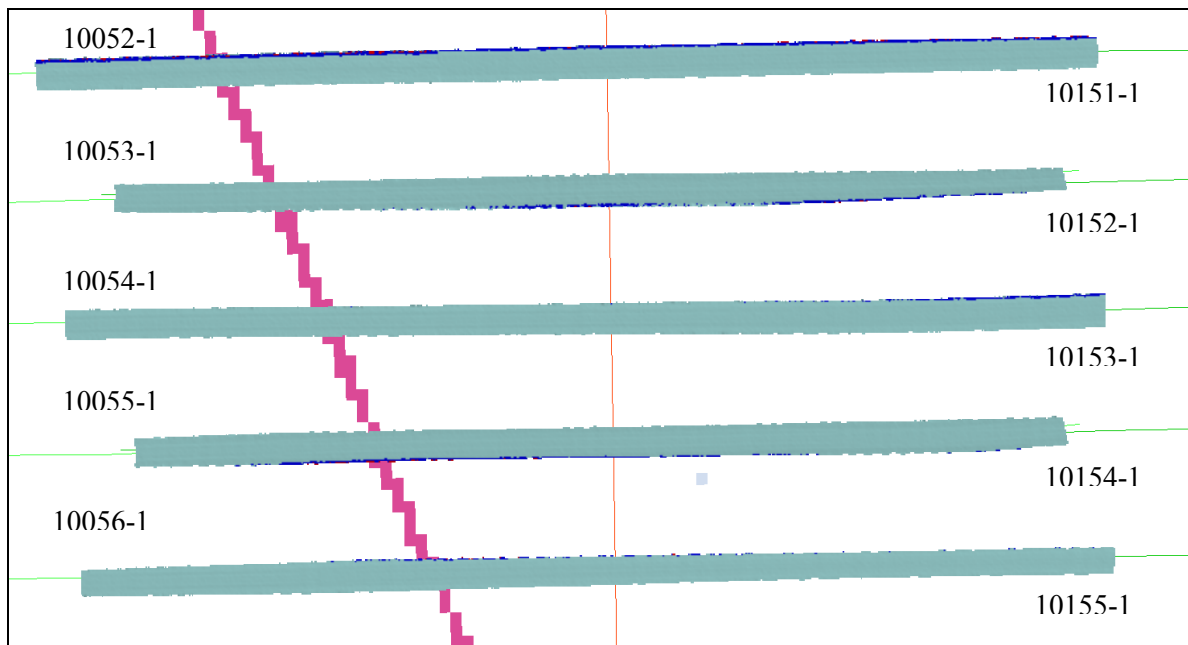


Illustration No. 23. Illustration showing overlap of Subarea 1 and Subarea 2 multibeam lines (vertical red line shows the boundary between the two subareas). Color scheme corresponds to the color range map in Illustration No. 18.



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

Fish and debris were observed when reviewing the side scan sonar data post-processing. Additional factors that had the potential to impact the side scan sonar imagery include shallow and warm water, the presence of thermoclines and a soft bottom. The quality of the side scan sonar was monitored closely and the height of the tow fish manually adjusted to obtain the best possible data.

B.3. Corrections to Echo Soundings

Positional and Angular Offsets

Data collection began on September 28, 2010 and at 0746 UTC on September 30, 2010, the vessel transited to the dock. The waterline to CRP value during this time interval was 1.2 m. The vessel stayed in dock until October 7, 2010 and the computer for the EM3002 control software was swapped out due to hardware failure. At this time, the positional and angular EM3002 mounting offsets in the control software (SIS) were also changed. No change should have been made to the offsets and all future data was collected using the incorrect values. To correct this error, the HIPS vessel file was updated with a second entry under Swath 1. The angular offsets were corrected with the patch test results from June 30th, 2011 (Refer to Section B.2). This was done because after testing, the roll value from this patch test better corrected the data. This entry, beginning on October 7th (2010-280), uses the HVF correction values found in Tables No. 11 and No. 12 below to adjust the data.

Due to the shallow water in the area, the angular, along track, and across track values entered after the multibeam control software was changed went unnoticed. However, a vertical offset was noticed when the lead line was performed prior to data collection on 2010-280. This error was corrected for in the multibeam control software as a subtraction to the waterline to CRP (draft) value. However, although the logs state that a 0.4 m correction was made, it was determined that the vertical offset of 0.398 m was only partially accounted for because the waterline to CRP value was reduced to 1.05 m, which is only 0.15 m less than the 1.2 m value used prior to transiting to the dock. The waterline to CRP value should have been changed to 0.8 m initially and for this reason, a 0.25 m vertical offset was entered into the HIPS vessel file for 2010-280 through 02:30 UTC on 2010-289. An additional -0.2 m waterline to CRP correction was made on October 18, 2010 during H12249 survey operations to bring the waterline to CRP value to 0.85 m. Because of these real-time corrections, the 0.398-meter vertical offset is not entered in the HIPS vessel file and only the HVF file for Sheet 10 (H12252) was corrected.

On November 11, 2011 another patch test was conducted after noticing misalignment in investigation multibeam data in CARIS. The vessel file in CARIS was updated and correctors applied for data between September 22 and November 11, 2011. In addition, the vessel file was also updated for data collected after November 11 with the correct heading value, which was not corrected for in SIS.



Table No. 11: Multibeam positional offsets (from CRP)

	Y (Forward)	X (Starboard)	Z (Vertical)
Correct value (in SIS)	14.518 m	0.170 m	3.048 m
Incorrect value (in SIS)	14.80 m	0.00 m	2.65 m
HVF correction	-0.282	0.170	0.00

Table No. 12: Multibeam angular offsets

	Roll (Positive starboard down)	Pitch (Positive bow up)	Heading (Positive clockwise)
Correct value (in SIS)	-0.125	4.463	358.335 (-1.665)
Incorrect value (in SIS)	0.10	9.3	3.28
HVF correction	-0.225	-4.837	-4.945

Tide Data

On October 12, 2010 (JD 285) between 1400 and 1600 UTC, there is an irregularity in the tidal data from Port Fourchon (Station 8762075) (Illustration No. 24). This potentially affects several lines collected in Subarea 1. However, there are irregularities in tidal data from several other tide stations that were evaluated, including Grand Isle (Station 8761724), Amerada Pass (Station 8764227), and the Texas Gas Platform in Caillou Bay (Station 8763535), which was maintained by C&C Technologies for the duration of the survey as a back-up gauge. Because several tide stations show irregularities (example from the Texas Gas Platform gauge shown in Illustration No. 25), to remain consistent, tidal data from Port Fourchon was applied to all multibeam data with final tidal zoning.

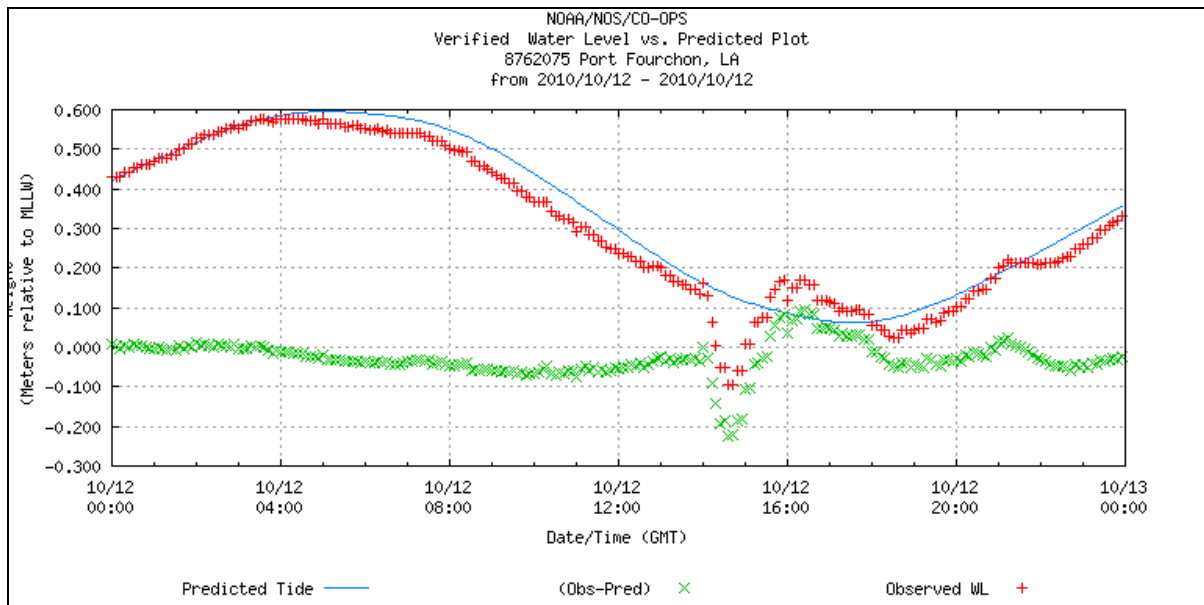


Illustration No. 24. Verified tidal data from Port Fourchon on October 12, 2010; image from NOAA Tides and Currents website.

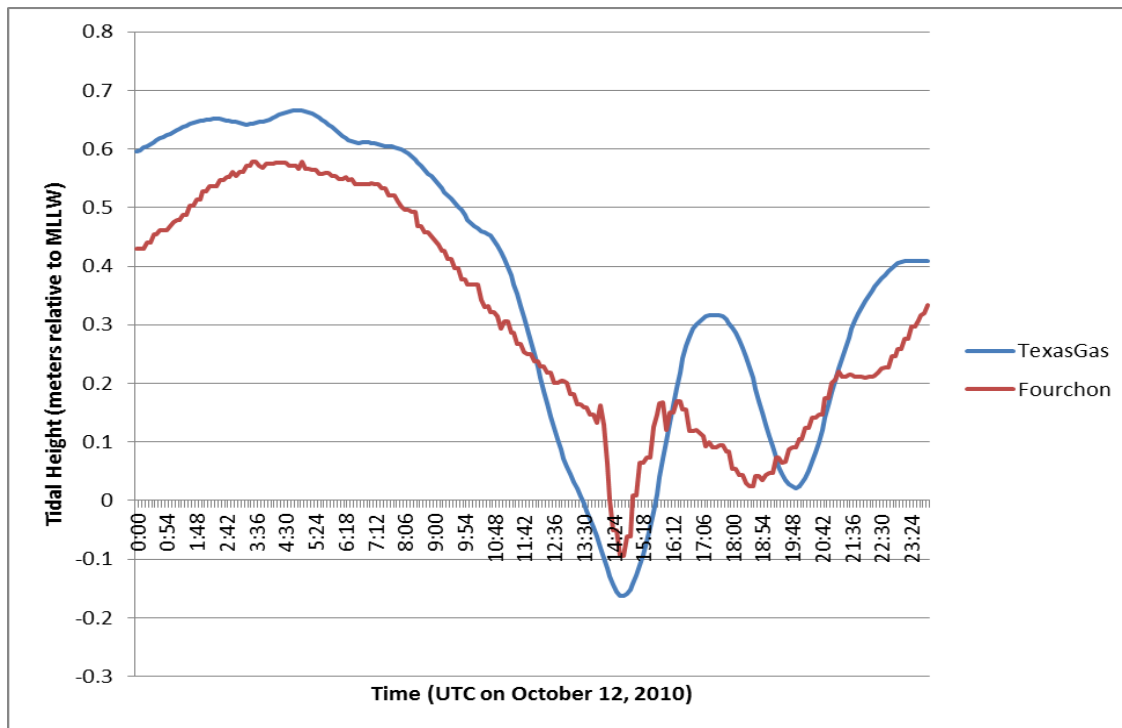


Illustration No. 25. Comparison of tidal data from Port Fourchon (red) and Texas Gas Platform (blue) for October 12, 2010.

B.4. Data Processing

B.4.1. Coverage BASE Surfaces and Mosaics

Multibeam data processing was conducted using CARIS HIPS/SIPS 6.1 SP2 on the vessel and CARIS HIPS/SIPS 7.1.1 with SP1 and SP1Hotfix1 in the office. One BASE surface was created for each subarea at a scale of 1:40000 with a resolution of 1 m, in accordance with Section 5.2.2.2 and 5.2.2.3 of the HSSD (2010), which states that a 1-m BASE surface will be created for 0 – 20 m water depths. One BASE surface was created for investigations at a scale of 1:40000 and a resolution of 0.5 m.

Side scan sonar data was processed using Chesapeake Technologies SonarWiz4 V.4.04.0118. All of the side-scan sonar data collected for this project has been layback corrected. 1-m resolution mosaics were created for even and odd lines in each subarea to ensure 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 (2010), 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 Separate 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 contact correlation workflow.

C. VERTICAL AND HORIZONTAL CONTROL

The vertical datum for the soundings is Mean Lower Low Water (MLLW). Tide and water level corrections were determined and applied in accordance with the CO-OPS Statement of Work. Data from Port Fourchon, LA (8762075) was used as the source of tides. Verified tides with final tide zoning were applied to the data.

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.

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. 13 and 14.

Table No. 13. Nautical Charts used for Comparison

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

Table No. 14. 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 for which the majority of data was collected (between September 29 and October 16, 2010). No Notice to Mariners was issued within the survey bounds during this time. However, additional investigation data was collected on February 17 and May 27, 2011, and the Local Notice to Mariners was further reviewed. LMN 51/10 8th Dist was added on 12/18/2010 as an Obstruction in Feet as 28-51-41.00N and 090-58-44.98W. This obstruction would be located on main survey line 10134-1 between shot points 24 and 25 and is not evident in either the side scan or multibeam data.

Also, because additional side scan sonar fill-in data was collected in November and December of 2011, the Local Notice to Mariners was further evaluated. LNM 24/11 8th Dist deleted a Sounding in Feet (obstruction) at 28-49-26.22N, 091-03-17.75W and added an Obstruction in Feet at 28-49-22.40N, 091-03-22.32W on 6/13/2011 within the survey area. The added Obstruction corresponds to the submitted DTON for this survey (refer to Section D.1.3.3 for more information).

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 500-ft single-defined radius for both subareas. (Refer to the Data Acquisition and Processing Report for sounding selection criteria). Depths in the survey area range from 20 to 45 feet and there is a general deepening from northwest to southeast (Illustrations No. 26 and 27).

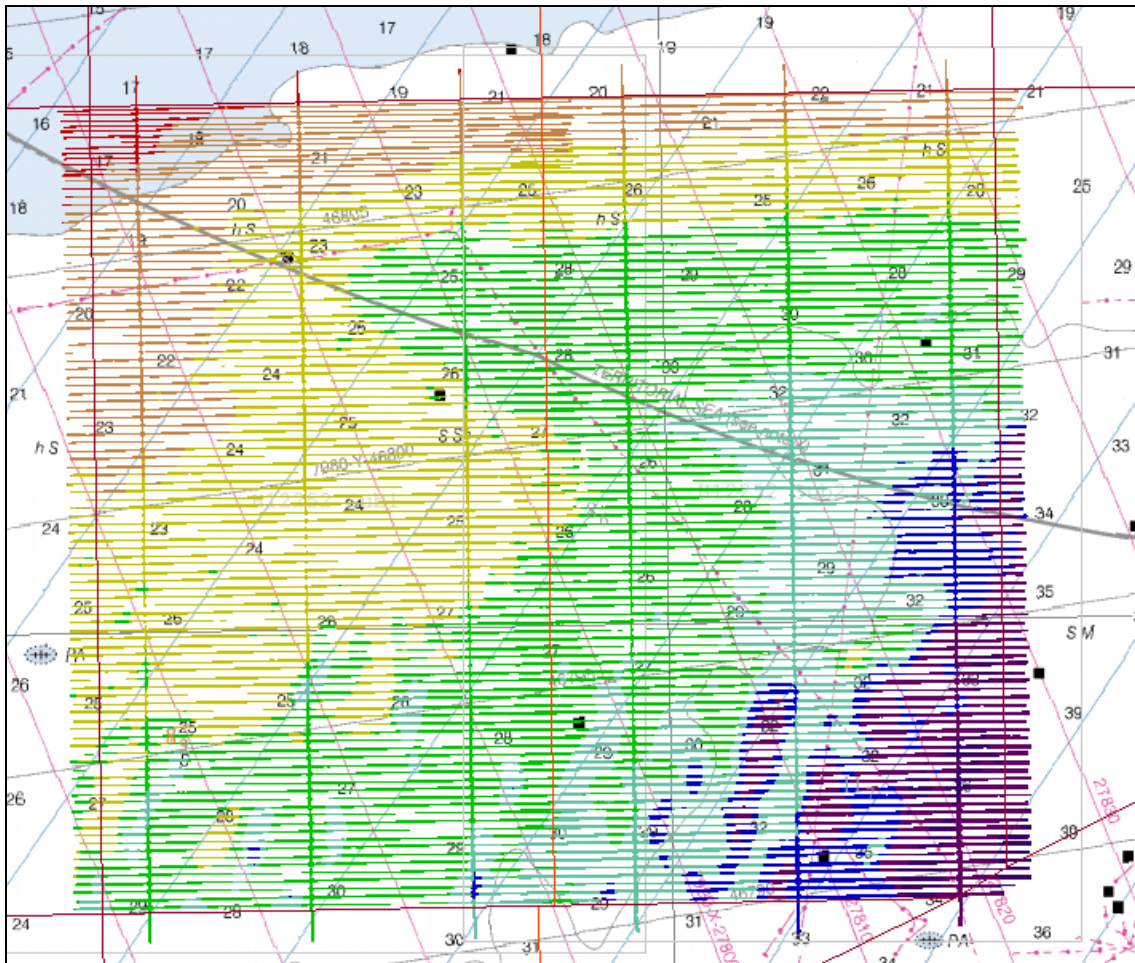


Illustration No. 26. H12252 survey area with colored depth ranges shown in Illustration No. 27.


Min	Max	Start	End
6	7		
7	8		
8	9		
9	10		
10	11		
11	12		
12	13		
13	14		

Illustration No. 27. CARIS color range map (in meters) used for Illustration No. 26.

Surveyed soundings are consistently deeper than charted depths by 1 – 5 feet. The most extreme differences are found within the southeast corner of the survey area where surveyed soundings are up to 9 feet deeper than charted depths (Illustration No. 28).

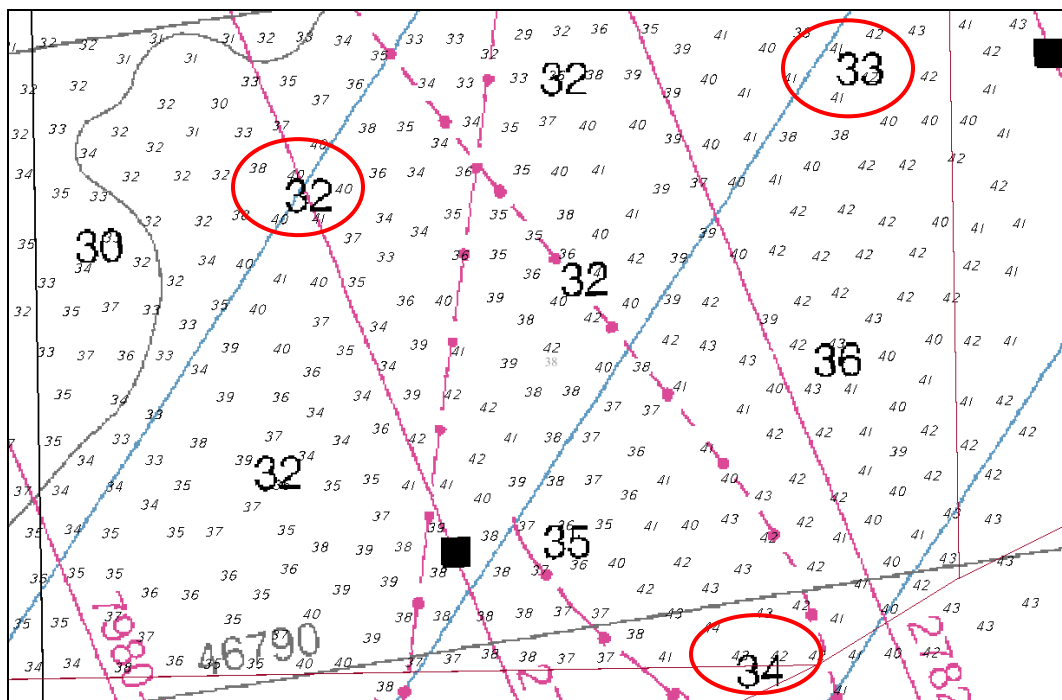


Illustration No. 28. Southeast portion of the survey area where surveyed soundings are 7 – 9 feet deeper than charted depths (examples shown in red circles). Dark red line shows the border of the survey area.

A small portion of the charted Ship Shoal is located in the northwest corner of the survey area and is bounded by the 18-ft contour. However, there are no surveyed soundings less than 20 feet within the survey area, including the Ship Shoal region (Illustration No. 29).

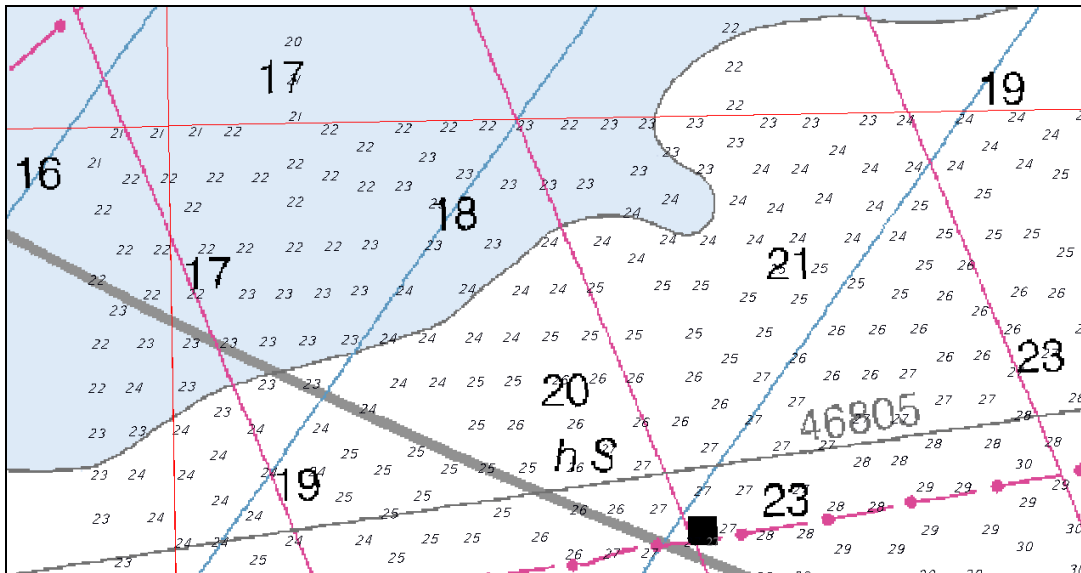


Illustration No. 29. Northwest corner of the survey area occupied by a portion of Ship Shoal showing no surveyed soundings less than 20 feet; red lines show survey boundaries.

In addition to the 18-ft contour that bounds Ship Shoal in the northwest corner of the survey area, the 30-ft contour extends non-linearly from the northwest to the southeast, mainly in Subarea 2. In order to evaluate differences between the charted contour and surveyed soundings, a color range chart was created in CARIS with soundings of 0 – 9.144 m in red and soundings greater than 9.144 m in blue; 9.144 m represents ~ 30 feet. It is evident that the majority of surveyed soundings that are 30 feet and greater extend west of the charted 30-ft contour (Illustration No. 30) and examination of the user-generated sounding layer confirms this trend.

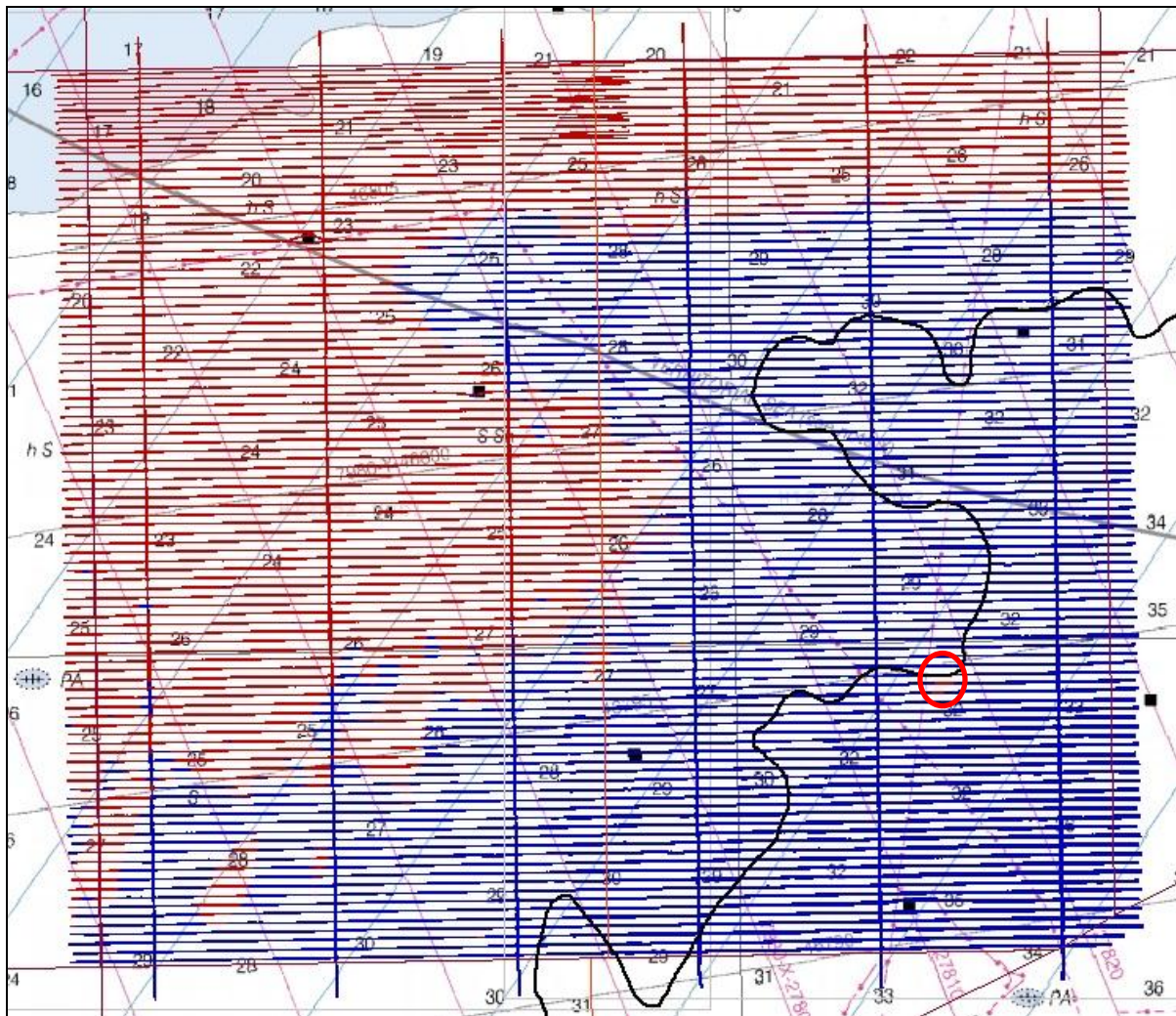


Illustration No. 30. Comparison of charted 30-ft contour and surveyed soundings. Soundings of 0 – 9.144 m are in red and soundings greater than 9.144 m are in blue; 9.144 m represents ~30 ft. The majority of surveyed soundings 30 feet and greater extend west of the charted 30-ft contour; one exception is highlighted with the red circle. The 30-ft contour has been traced in black for clarity.

D.1.3. Charted Features

D.1.3.1. AWOIS

A portion of the search area of AWOIS item 8360 that was assigned for full investigation falls within the H12252 survey area. However, the majority of the search radius of this AWOIS falls mostly within the H12253 survey area and will be discussed in detail only in the H12253 Descriptive Report. However, no evidence of this AWOIS item was found within the H12252 survey area. Refer to Appendix II: Survey Feature Report for more information.

D.1.3.2. Investigation Items

Three investigations were conducted in the survey area (Table No. 15).

Investigation H52-I-A of primary SSS contact 284-063057P was initially conducted on October 16, 2010 (JD 289) and additional data was collected on May 27, 2011. This contact is in close proximity to Platform SS 110A and bubbles near the platform were noted in the project logs for May 27, 2011. Correspondence with Stone Energy indicates that the bubbles are from naturally occurring gas in locations where they normally occur. (Refer to Appendix V for supplemental correspondence).

Investigation H52-I-B was initially conducted on February 17, 2011 (JD 048) and additional data was collected on May 27, 2011 (JD 147). These investigated Primary SSS contact 282-230014S, which, based on the shadow in the side scan sonar data, measured between 2 and 3 m. Both multibeam investigations confirmed the significance of the feature and this contact was submitted to AHB as a DTON. Only the most recent investigation data was used for submission of the DTON, which showed the contact with a least depth of 8.287 m in 10 m of water; the object therefore protrudes at least 1.713 m off the bottom. (Refer to section D.1.3.3 for more information and Appendix I for a copy of the DTON report). However, inclusion of the February data shows the feature with a least depth of 7.476 m, and this is the height that has been designated in the final BASE surface of the investigations.

Investigation H52-II-A of Primary SSS contact 280-232948S was initially conducted on October 13, 2010 (JD 286) and several additional lines of data were collected on May 27, 2011 (JD 147). The feature appears to protrude from a depression in the seafloor and has a least depth of 8.664 m. Although the feature protrudes from the bottom of the depression over 2 m, the seafloor depths surrounding the depression are around 9.5 m, and the feature was not submitted as a DTON.

Table No. 15. Investigation Items.

INV Name	Subarea	Least Depth (m)	Investigation Latitude (N)	Investigation Longitude (W)	Remarks
H52-I-A	1	N/A	28°51'22.507*	091°01'32.758*	Naturally occurring gas
H52-I-B	1	8.287	28°49'22.402	091°03'22.315	Submitted as a DTON
H52-II-A	2	8.664	29 28°50'40.682	091°00'28.595	Proved insignificant by multibeam investigation

*From multibeam data that has been cleaned out of the data but represents the gas location.

D.1.3.3. Danger to Navigation Reports

One Danger to Navigation Report was issued for survey H12252 resulting from the investigation of Primary contact 282-230014S. The H12252 Danger to Navigation is shown in Table No. 16 and a copy of the report is included in Appendix I. However, inclusion of the February data shows the feature with a least depth of 7.476 m, and this is the height that has been designated in the final BASE surface of the investigations. An update of this designated

sounding is found in Table No. 17. It should be noted that the Final Feature File shows the updated DTON information.

Table No. 16. Danger to Navigation summary.

Feature	Depth (ft)	Depth (m)	Survey Latitude (N)	Survey Longitude (W)
Obstruction	27.188	8.287	28°49'22.402	091°03'22.315

Table No. 17. Update to Danger to Navigation

Feature	Depth (ft)	Depth (m)	Survey Latitude (N)	Survey Longitude (W)
Obstruction	24.528	7.476	28° 49'22.481	91°03'22.160

D.1.3.4. Existing Infrastructure

The structures in Table No. 18 were found as charted. The position of each structure was obtained from the layback corrected primary sidescan 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 survey. Table No. 19 shows a structure that is currently charted, but was no longer present at the time of the survey. The position of this platform was obtained from Chart 11356.

Table No. 18. Structures found as charted

Surveyed Position			
Latitude (N)	Longitude (W)	Structure Name	Chart Action/Comments
28°52'13.786	91°02'34.376	SGY SS 982	Remain as charted
28°51'23.535	91°01'32.312	SGY SS 110A	Remain as charted
28°48'36.467	91°58'58.459	SS120 #1	Remain as charted
28°51'39.751	90°58'13.267	SS 111 #1	Remain as charted

Table No. 19. Charted platforms not present at time of survey.

Charted Position		
Latitude	Longitude	Chart Action
28°49'25.786 N	91°00'37.382 W	Remove from chart

D.1.3.5. Feature Report

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

D.2. Additional Results

D.2.1. Prior Surveys

Survey H12252 has one small junction with survey H12121 from OPR-K354-KR-09 (Refer to section B.2.4).

D.2.2. Aids to Navigation

No Aids to Navigation are charted within the survey area and none were found during survey operations.

D.2.3. Additional Infrastructure

Although there are several charted submarine pipelines within the survey area, these were not observed within the multibeam or side scan sonar data.

D.2.4. Significant Scientific/Practical Findings

Large scale bathymetric troughs are evident in the multibeam data in the southern portion of the survey area, especially in the southeast corner. In Subarea 1 these regions have darker side scan sonar returns while have brighter returns in Subarea 2. Unusual bathymetric features are also found along the eastern margin of the survey area (Illustration No. 31), which are also evident in the side scan sonar data. A comparison of survey H12251 that overlaps the eastern margin of H12252 corroborates the existence of the unusual bathymetry.

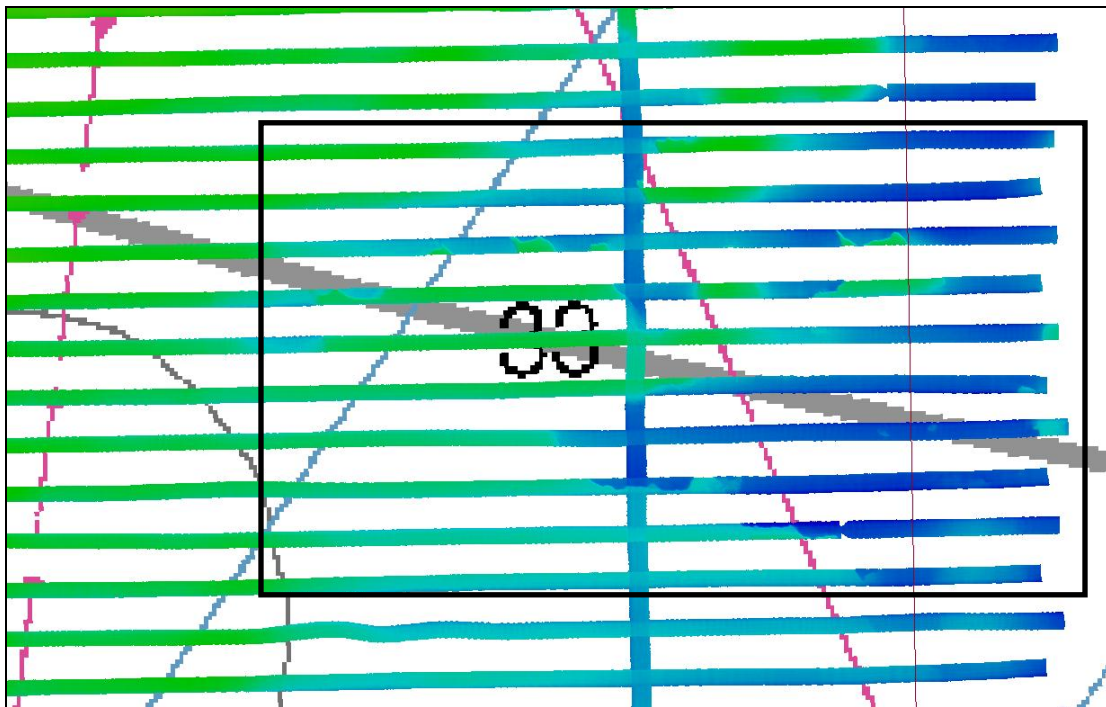


Illustration No. 31. Region of unusual bathymetry (mainly in black box) in the eastern portion of the survey area.



E. APPROVAL SHEET

LETTER OF APPROVAL

REGISTRY NUMBER H12252

This report and the accompanying smooth sheet are respectfully submitted.

Field operations contributing to the accomplishment of the survey H12252 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-10.

A handwritten signature in black ink, appearing to read 'Tara Levy'.

Tara Levy
Chief of Party
C&C Technologies
April 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-10

Contractor Name: C & C Technologies, Inc.

Inclusive Dates: September 29, 2010 - December 30, 2011

Registry No.: H12252

Date: April 2012

Sheet Number: 10

Field Work is Complete

Time (UTC)

Date	Julian Day	Start	End	Year
9/29/2010	272	1158	1830	2010
9/29/2010	272	1933	2047	2010
9/29/2010	272	2142	2400	2010
9/30/2010	273	0000	1500	2010
9/30/2010	273	1522	2059	2010
9/30/2010	273	2123	2328	2010
9/30/2010	273	2358	2400	2010
10/1/2010	274	0000	0327	2010
10/1/2010	274	0400	0746	2010
10/7/2010	280	0940	2335	2010
10/8/2010	281	0002	0955	2010
10/8/2010	281	1033	2400	2010
10/9/2010	282	0000	0700	2010
10/9/2010	282	0824	2400	2010
10/10/2010	283	0000	0157	2010
10/10/2010	283	0223	0828	2010
10/10/2010	283	0859	1802	2010
10/10/2010	283	1832	2400	2010
10/11/2010	284	0000	0958	2010
10/11/2010	284	1015	2400	2010
10/12/2010	285	0000	0202	2010
10/12/2010	285	1417	1503	2010
10/12/2010	285	1518	1923	2010
10/12/2010	285	2036	2400	2010
10/13/2010	286	0000	0601	2010
10/15/2010	288	1812	2400	2010

Descriptive Report to Accompany Hydrographic Survey H12252



10/16/2010	289	0000	0226	2010
2/17/2011	047	0957	1050	2011
5/27/2011	147	1158	1354	2011
11/22/2011	326	0748	0823	2011
12/30/2011	364	1927	1936	2011

APPENDIX II

SUPPLEMENTAL SURVEY RECORDS AND CORRESPONDENCE



Original Message -----

Subject:Fwd: RE: Pictures at SS110 "A"

Date:Thu, 12 Jan 2012 14:04:59 -0600

From:Jason Duplechin <jrd@cctechol.com>

To:trlevy@cctechol.com

Stone's Response

~~~~~  
Jason Duplechin  
Geospatial Data Manager  
Phone: 337.210.0000 - DID: 337.735.3716  
Fax: 337.261.0192 - Mobile: 337.298.5854  
[www.cctechol.com](http://www.cctechol.com)  
~~~~~

For a FREE, on-line GoM GIS Viewer, visit [CCGIS Map™](#).

----- Original Message -----

Subject:RE: Pictures at SS110 "A"

Date:Fri, 27 May 2011 19:55:48 +0000

From:Pantaleo, John <PantaleoJR@StoneEnergy.com>

To:Savoy, Carolyn <SavoyCM@StoneEnergy.com>, Matthews, Neil
<MatthewsNF@StoneEnergy.com>, Deville, Michael
<DevilleMD@StoneEnergy.com>, Hurst, Kevin <HurstKG@StoneEnergy.com>,
'jrd@cctechol.com' <jrd@cctechol.com>, Lege, Corey <LegeCJ@StoneEnergy.com>

We have a long history of naturally occurring gas bubbles in this field. These have been investigated numerous times in the past. Based upon discussion with the field this morning, these bubbles are in areas where they normally occur.

Thanks for the notification. Thanks



From: Savoy, Carolyn
Sent: Friday, May 27, 2011 2:53 PM
To: Matthews, Neil; Pantaleo, John; Deville, Michael; Hurst, Kevin; 'jrd@cctechnol.com'
Subject: Fw: Pictures at SS110 "A"

Thanks Jason!

Sent from my Blackberry Wireless Handheld

From: Jason Duplechin [<mailto:jrd@cctechnol.com>]
Sent: Friday, May 27, 2011 02:16 PM
To: Savoy, Carolyn
Subject: Pictures at SS110 "A"

Carolyn,

Here are some pictures at SS110 "A" taken at about 12:00 this afternoon. I hope this helps.

--

~~~~~  
Jason Duplechin  
Geospatial Data Manager  
C&C Technologies, Inc.  
Phone: 337.210.0000 - DID: 337.735.3716  
Fax: 337.261.0192 - Mobile: 337.298.5854  
[www.cctechnol.com](http://www.cctechnol.com) - [www.ccgismap.com](http://www.ccgismap.com)

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For a FREE, on-line GoM GIS Viewer, visit [CCGIS Map™](http://www.ccgismap.com).

APPENDIX III

SURVEY FEATURES REPORT

H12252_DtoN

Registry Number:

State:

Locality:

Sub-locality:

Project Number:

Survey Date: 12/30/2011

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	7.4m OBSTRN	Obstruction	7.48 m	28° 49' 22.5" N	091° 03' 22.2" W	---

1.1) 7.4m OBSTRN

DANGER TO NAVIGATION

Survey Summary

Survey Position: 28° 49' 22.5" N, 091° 03' 22.2" W
Least Depth: 7.48 m (= 24.53 ft = 4.088 fm = 4 fm 0.53 ft)
TPU ($\pm 1.96\sigma$): THU (TPEh) [None] ; TVU (TPEv) [None]
Timestamp: 2011-364.00:00:00.000 (12/30/2011)
Dataset: H12252_DtoN_Compiled.000
FOID: US 0001311323 00001(02260014025B0001)
Charts Affected: 11356_1, 1116A_1, 11340_1, 411_1

Remarks:

OBSTRN/remrks: SAR: OBSTRN observed in survey data. Currently charted as 27ft OBSTRN. Update depth to 24ft OBSTRN. Submitted as DTON1. Corresponds to Primary SSS contact 282-230014S

Feature Correlation

Source	Feature	Range	Azimuth	Status
H12252_DtoN_Compiled.000	US 0001311323 00001	0.00	000.0	Primary

Hydrographer Recommendations

Add to chart

Cartographically-Rounded Depth (Affected Charts):

24ft (11356_1)

4fm (1116A_1, 11340_1, 411_1)

S-57 Data

Geo object 1: Obstruction (OBSTRN)
Attributes: NINFOM - Add Obstruction
 QUASOU - 6:least depth known
 SORDAT - 20111230
 SORIND - US,US,graph,H12252

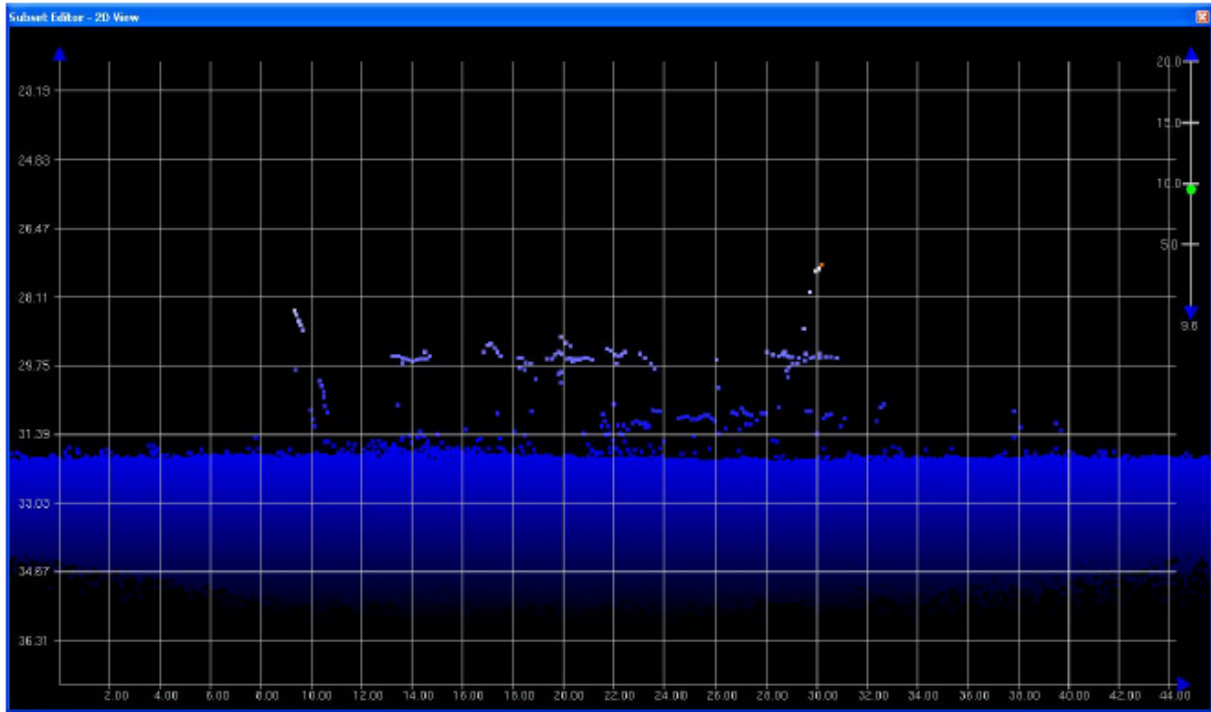
VALSOU - 7.476 m

WATLEV - 3:always under water/submerged

Office Notes

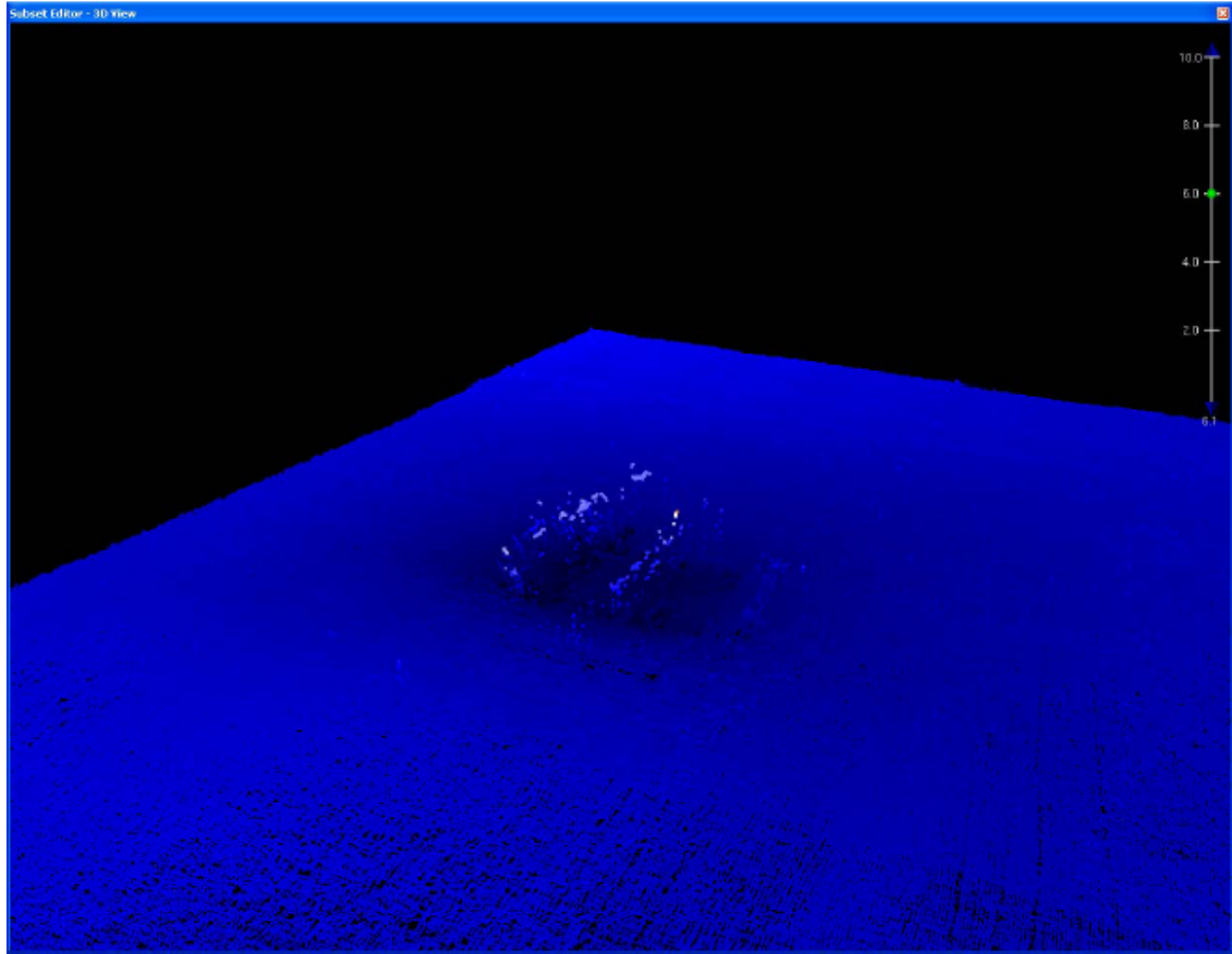
SAR- 7.4m obstruction observed in MB and SSS. Compile: Add 7.4m obstruction

Feature Images



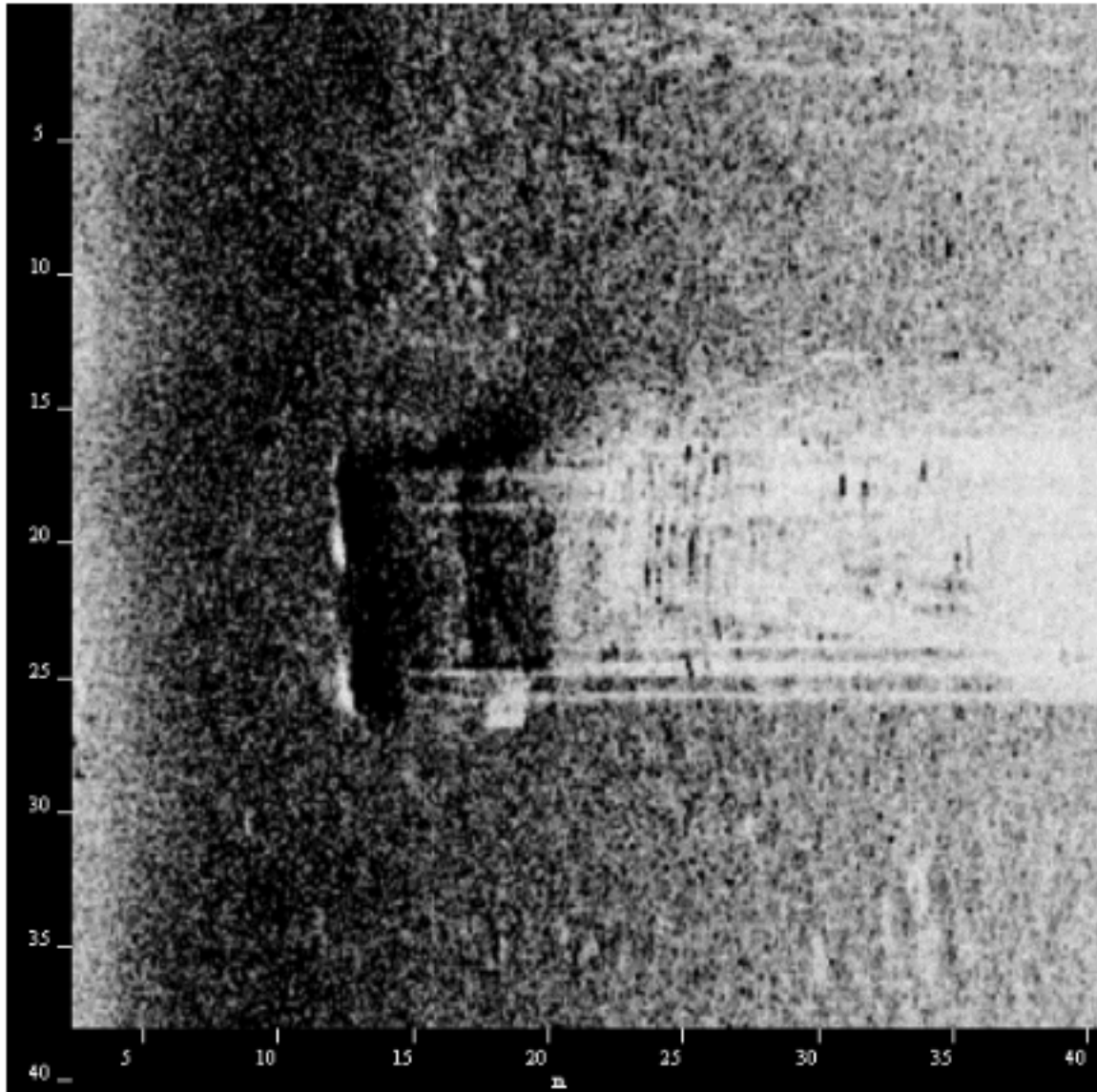
Multibeam profile view in CARIS HIPS and SIPS

Figure 1.1.1



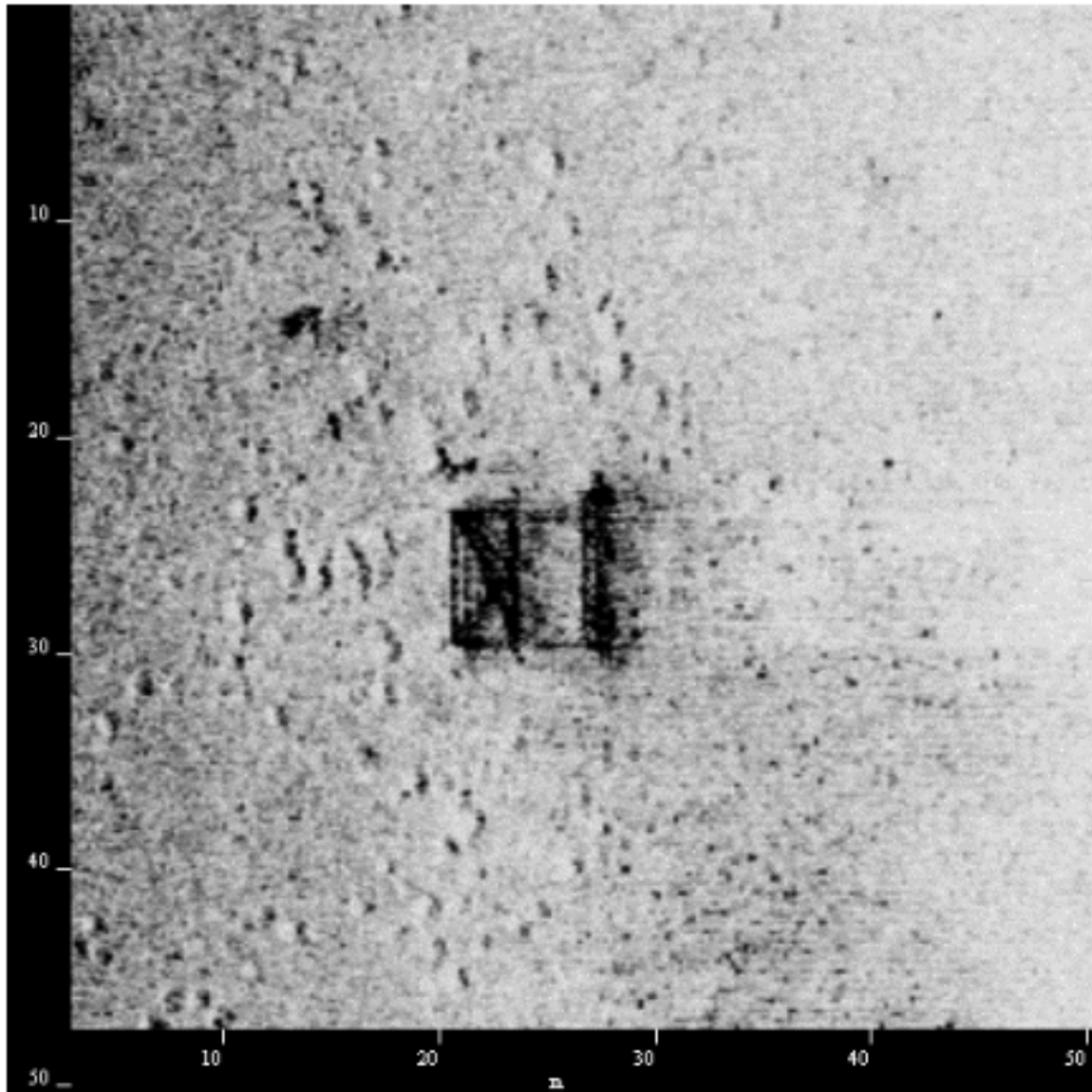
Multibeam 3D view in CARIS HIPS and SIPS

Figure 1.1.2



Sidescan Sonar image in Sonarwiz MAP

Figure 1.1.3



Sidescan Sonar image in Sonarwiz MAP

Figure 1.1.4

APPROVAL PAGE

H12252

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

- H12252_DR.pdf
- Collection of depth varied resolution BAGS
- Processed survey data and records
- H12252_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.

Approved: _____

LT Abigail Higgins
Chief, Atlantic Hydrographic Branch