

H12250

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. : H12249

LOCALITY

State: Louisiana

General Locality: Gulf of Mexico

Sublocality: Central Ship Shoal

2012

CHIEFS OF PARTY
Scott Croft, Tara Levy

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DATE: _____

NOAA FORM 77-28 (11-72)	U.S. DEPARTMENT OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION HYDROGRAPHIC TITLE SHEET	REGISTRY No: H12249
		FIELD NUMBER: Sheet 7
State: <u>Louisiana</u>		
General Locality: <u>Gulf of Mexico</u>		
Locality: <u>Central Ship Shoal</u>		
Scale: <u>1:40,000</u> Date of Survey: <u>10/17/2010 to 12/30/2011</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: _____ Fathoms: _____ Meters: <u>X</u> at MLW: _____ MLLW: <u>X</u>		
Remarks: <u>Hydrographic Survey of Sheet 7 (H12249)</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 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/>.

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DESCRIPTIVE REPORT TO ACCOMPANY HYDROGRAPHIC SURVEY H12249

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 in the vicinity of Central Ship Shoal in the Gulf of Mexico. Illustrations No. 1 and 2 show the layout of Sheet 7 (H12249) of Project OPR-K354-KR-10. Water depths in the survey area range from 11 to 35 feet Mean Lower Low Water. Survey statistics including the total survey line and crossline nautical miles, number of investigations, and data acquisition dates are shown in Tables No. 1 – 3.

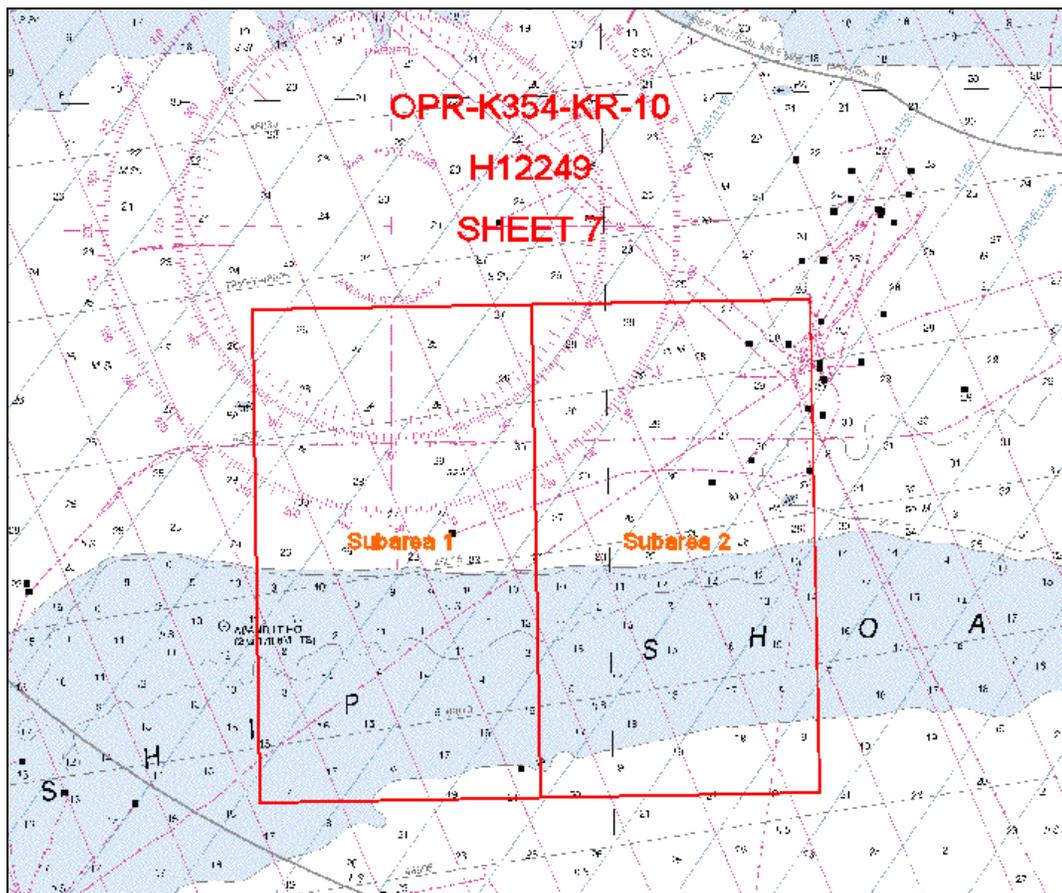


Illustration No. 1: Large Scale Survey Coverage Graphic

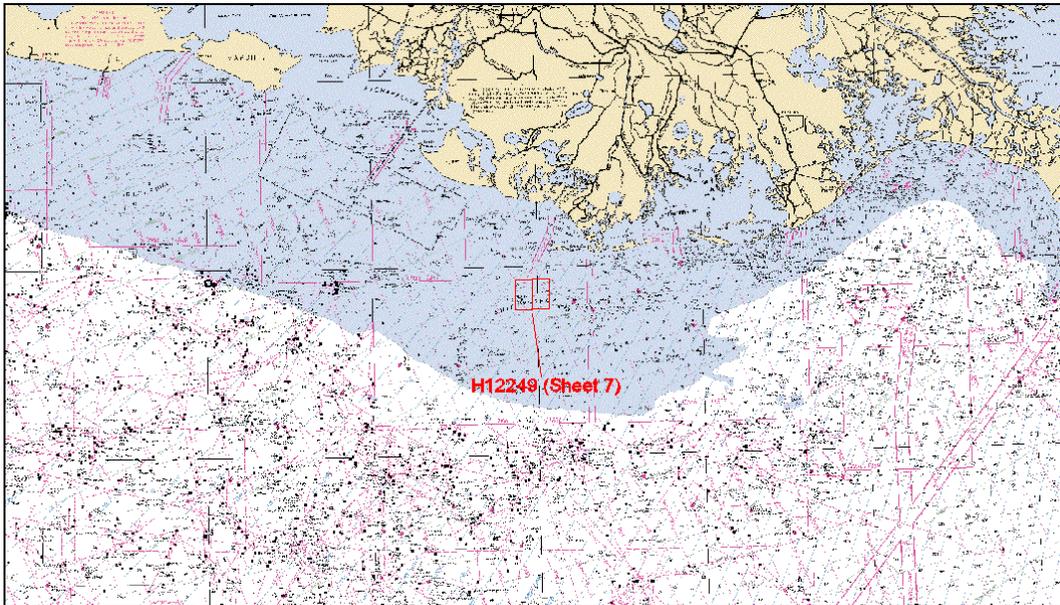


Illustration No. 2: Small Scale Survey Coverage Graphic

Table No. 1: Survey Statistics

	<i>Inez McCall</i>	Total
LNM Side Scan + Multibeam	970.95	970.95
LNM Crosslines	40.82	40.82
LNM Investigations	3.32	3.32

Table No. 2: Additional survey line statistics

Number of items investigated	7
Total square nautical miles	27.67

Table No. 3: Data acquisition statistics

Month	Day	Year
October	17-22	2010
November	7	2010
December	28	2010
January	4,15,16,22,23,27-31	2011
February	1,6	2011
March	12,13	2011
April	8	2011
May	9,12,17,27	2011
September	30	2011
November	22	2011
December	30	2011

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 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

Side scan sonar and multibeam data were acquired in accordance with the coverage required for this survey. To ensure quality control specific field procedures were conducted as well as a variety of data analyzing tools to validate the data. These methods are briefly outlined below. Refer to the DAPR for additional data acquisition, processing and quality control procedures.

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 the northern portion of subarea 1 where charted waters ranged from 25 to 30 feet the side scan sonar was operated at a range of 75 m per channel and a line spacing of 60 m. The middle and southern sections of subarea 1 cover Ship Shoal. The middle region of the survey area is where the shallowest charted waters are located, ranging from 9 to 14 feet. Here the side scan sonar was operated at a range of 50 m per channel and a line spacing of 40 m. The southern portion of the survey area was operated at the same range and line spacing as the northern portion.

Subarea 2 follows a different pattern of sonar range/line spacing. From the northern edge to the middle of the survey area, where charted waters range from 13-30 feet, the side scan sonar range was operated at 100 m per channel and the line spacing set at 90 m. The middle region, where charted waters were the shallowest (10-14 feet), the side scan range was set at 50 m and a set line spacing of 40 m was implemented. The southern portion of the survey area (except the last three lines) was operated at 75 m per channel and a line spacing of 60 m. The bottom three lines were set at 90 m line spacing and operated at 100m sonar range. The criteria of acquiring 200% SSS coverage for object detection was accomplished using the aforementioned parameters. Coverage mosaics were developed using an odd/even numbering system to check that sufficient coverage was obtained.

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 40 nautical miles, while the total main line miles were 970.95 nautical miles. The cross lines comprised 4.1 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 crossline statistics in Separates V, the main lines and crosslines depth values 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 surface was examined using a color range map in 0.2 m increments from -0.6 to 0.6 m. In subarea 1 the majority of the differences between the mainscheme lines and the crosslines are between -0.4 and 0.2 m (Illustration No. 3). The depth range for the crossline comparison surface is -0.66 m therefore another histogram was created to evaluate the extent and location of the high depth difference. Generally, the depth values of the mainlines and crosslines do not differ by more than the maximum allowable TVU for IHO order 1a surveys in water depths

of 3-10 m, which ranges from ± 0.50 to ± 51 m. The high depth difference values are only associated with TIE-101 and their extent is small (Illustration No. 4).

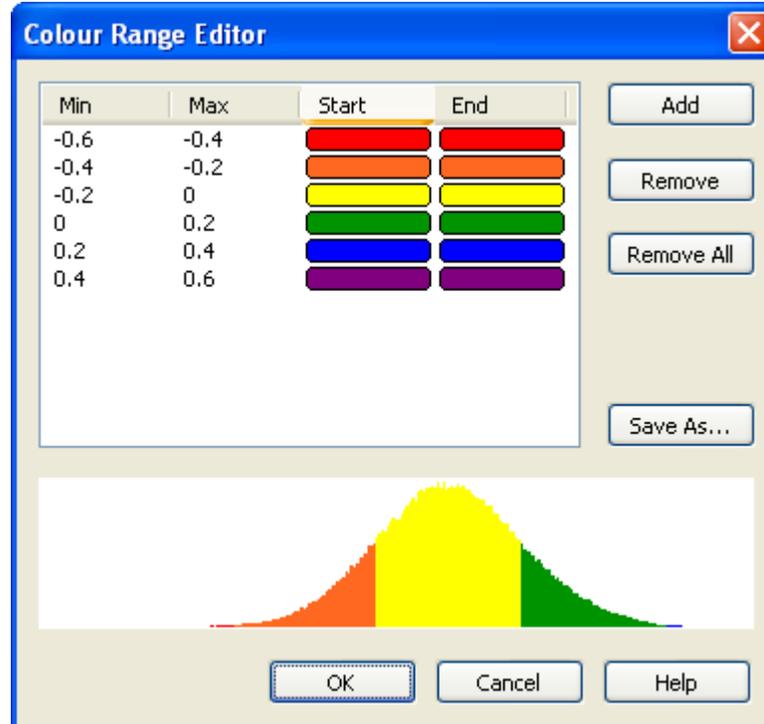


Illustration No. 3: Color range map and histogram used to evaluate the depth differences between mainline and crosslines for Subarea 1.

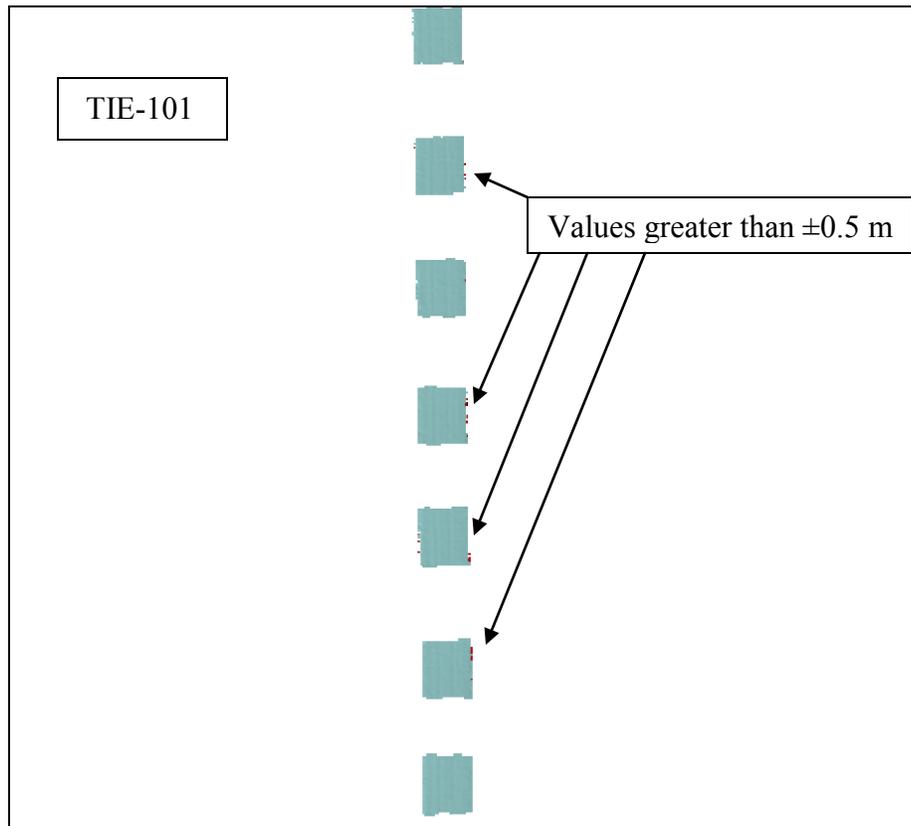


Illustration No. 4: Overlap of TIE-101-1 and mainlines from survey H12249 subarea 1; red indicates difference values greater than ± 0.5 m.

In subarea 2 the majority of the differences between the mainscheme lines and crosslines are between -0.4 and 0.4 m (Illustration No. 5). The depth values of the mainlines and crosslines in this region do not differ by more than the maximum allowable TVU, which ranges from ± 0.50 to ± 0.52 m in water depths of 4 to 11 m.

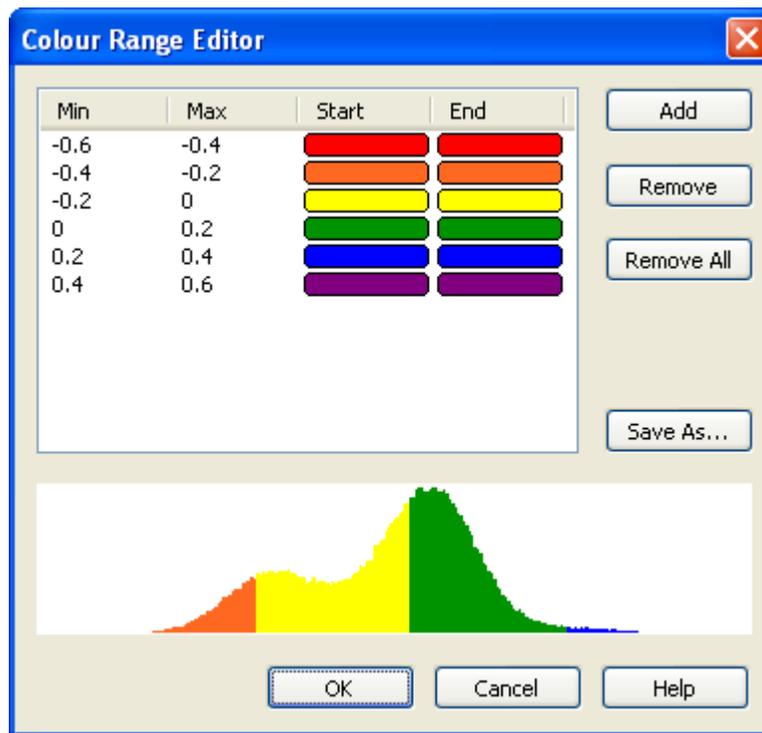


Illustration No. 5: Color range map and histogram used to evaluate the depth differences between mainline and crosslines for Subarea 2.

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, >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

The survey data for H12249 (Sheet 7) junctions with data collected from four other Sheets in the OPR-KR354-KR-10 project. 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 (H12249) 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 H12249 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 H12249 Survey Junctions

Registry Number	Scale	Relative Location
H12250	40000	Northwest Ship Shoal
H12245	40000	5 NM SW of Raccoon Point
H12248	40000	East Ship Shoal
H12252	40000	4 NM S of Central Ship Shoal

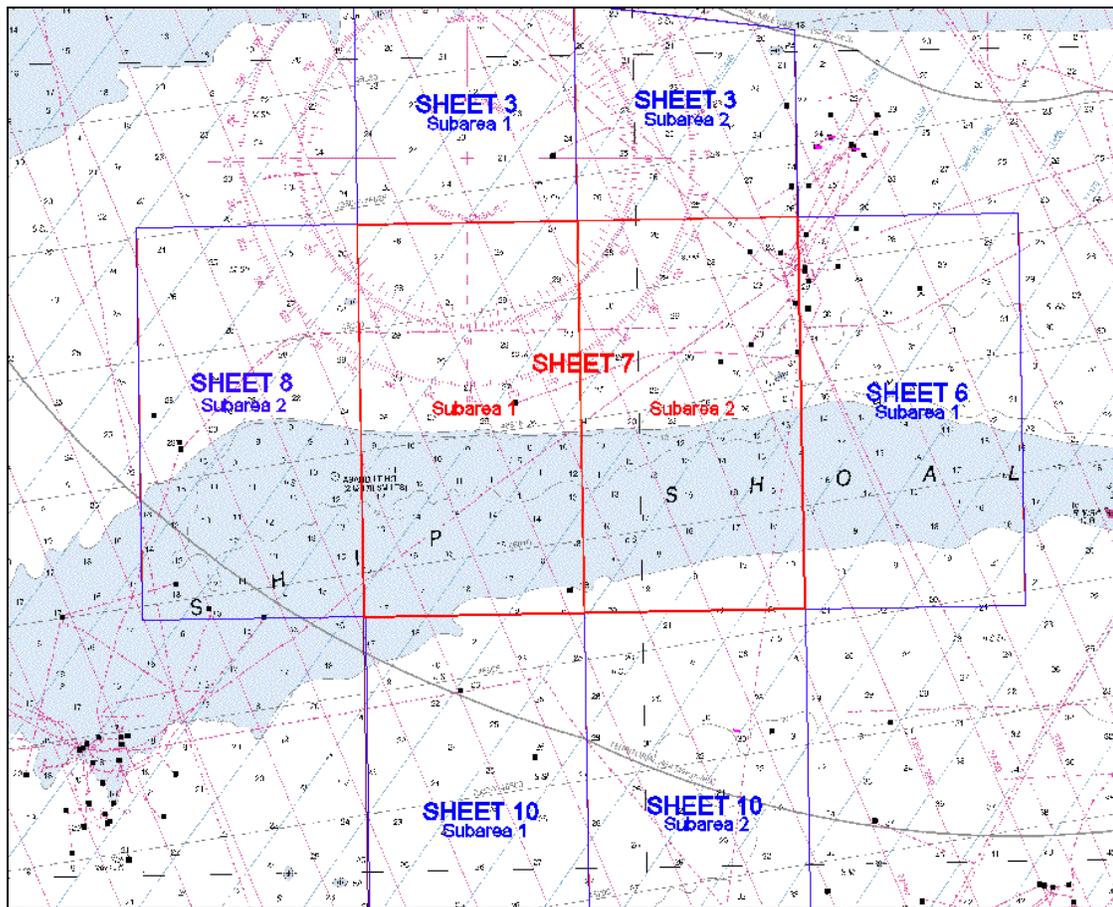


Illustration No. 6: H12249 survey junctions in the OPR-K354-KR-10 project

Junction with H12250 (Sheet 8)

H12249 subarea 1 junctions with H12250 subarea 2 along the eastern edge of the survey area and there is mainline to mainline data overlap. The depth difference values range from -0.58 to 0.47 m (Illustration No. 7). An additional user defined colormap was used to evaluate the depth differences values with increments of -0.6 to -0.5 m, -0.5 to 0.5 m and 0.5 to 0.6 m. The more extreme values of -0.5 to -0.6 m were found to be concentrated where mainlines 7349-1 and 7352-1 intersect with mainlines 8145-1 and 8143-1. These values are also on the outer edges of the swath (Illustration No. 8). In general, data from survey H12249 is shallower than H12250.

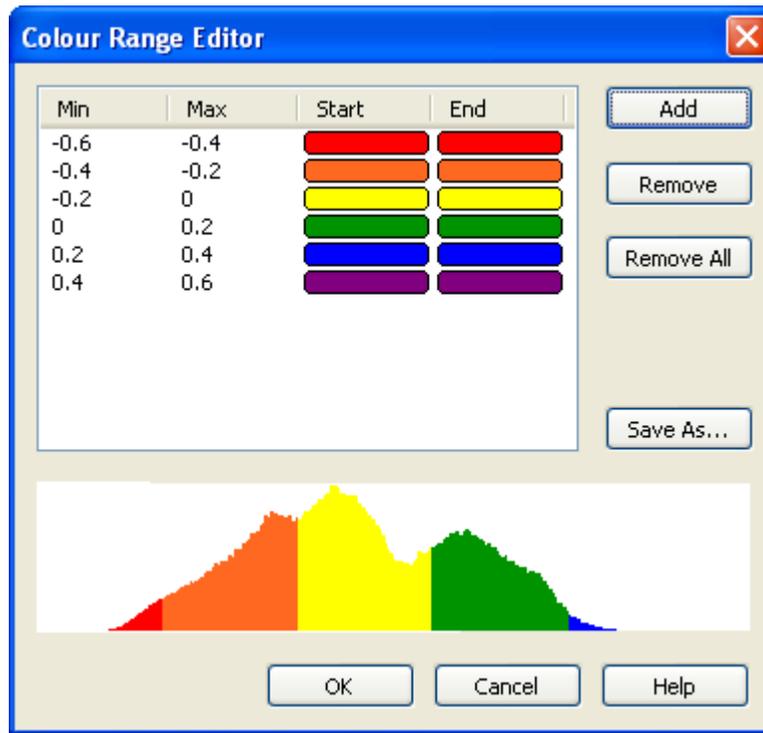


Illustration No. 7: Color range map and histogram used to evaluate the depth difference between H12249 (subarea 1) and the junction with H12250 (subarea 2).

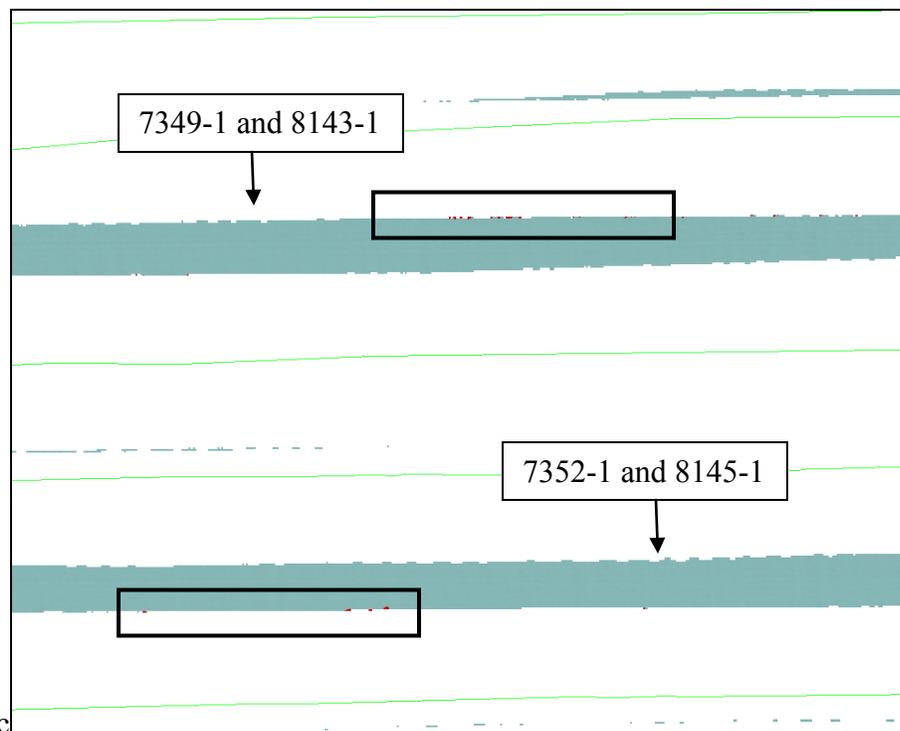


Illustration No. 8: Overlap of adjacent mainlines from survey H12249 subarea 1 and from survey H12250 subarea 2; red (example in black boxes) indicates difference values that exceed -0.5 m.

Junction with H12245 (Sheet 3)

A 1-m base surface was created for each subarea in survey H12245, which junctions along the northern margin of H12249. A difference surface was created between each base surface of the two subareas of H12249 and the base surfaces of H12245. For both subareas, crossline data of each survey overlaps the mainline data of the adjoining survey (example shown in Illustration No. 9).

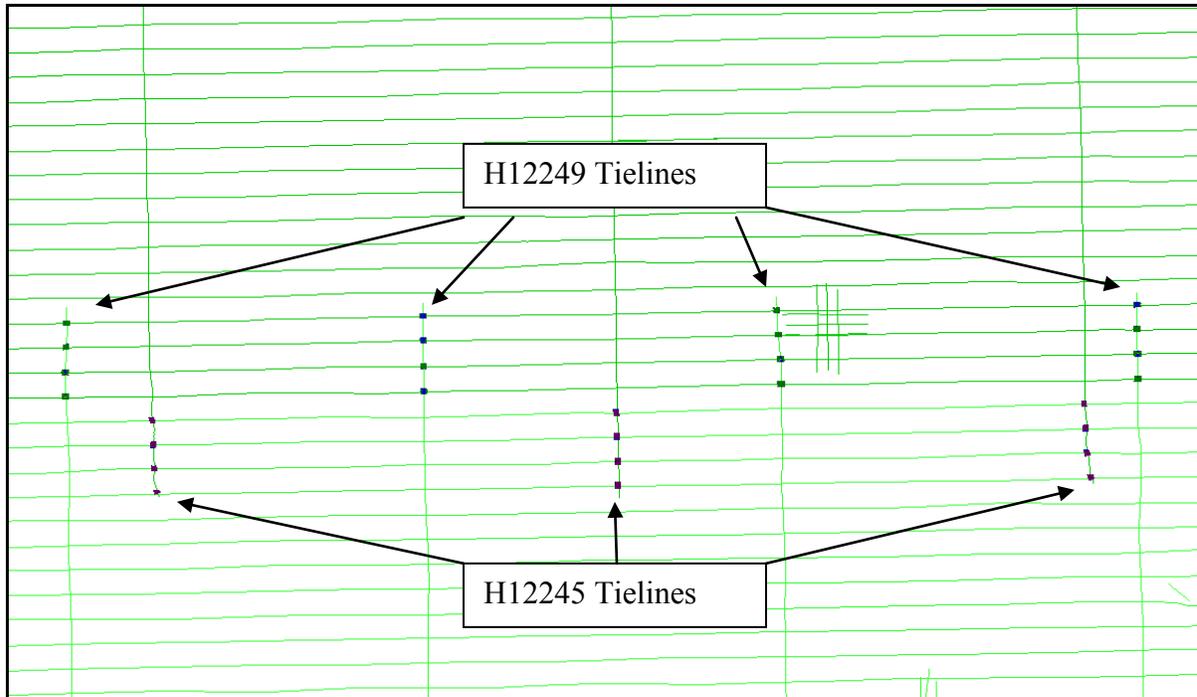


Illustration No. 9: Data overlap from Subarea 2 of H12249 and Subarea 2 of H12245. Crossline data of each subarea overlaps with mainline data of the adjoining survey.

The depth difference between subarea 1 of H12249 and subarea 1 of survey H12245 ranges between -0.22 and 0.56 m; the histogram in Illustration No. 10 shows the range of depth difference values. Another histogram was generated to evaluate the extent of the depth difference values >0.5 m. Only a small amount of data between the two surveys shows deviance. The extreme difference values were found only on the outer edges of the swath where TIE-101-1 from survey H12249 junctions with line 3070-1 from survey H12245 (Illustration No. 11).

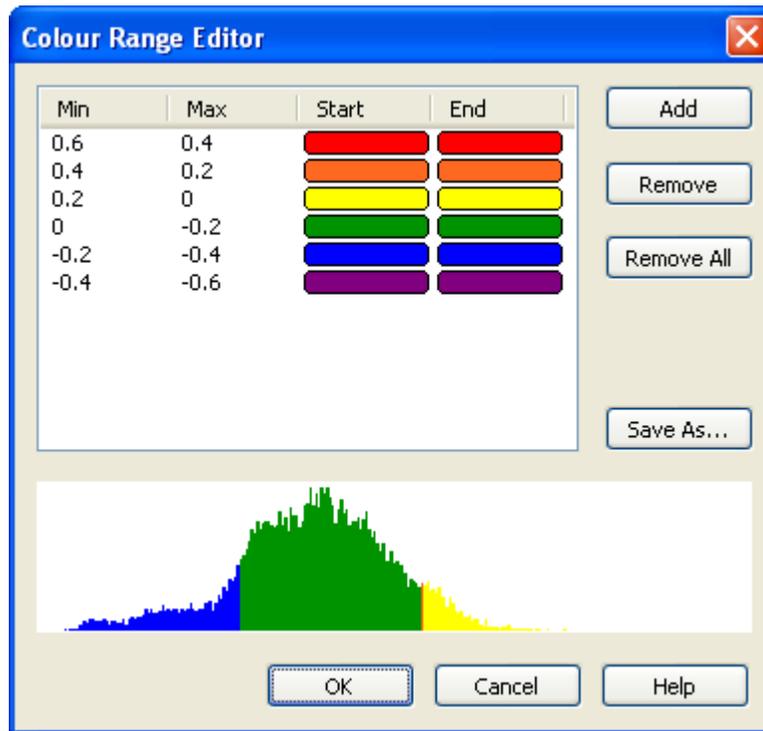


Illustration No. 10: Color range map and histogram used to evaluate the depth difference between H12249 (subarea 1) and the junction with H12245 (subarea 1).

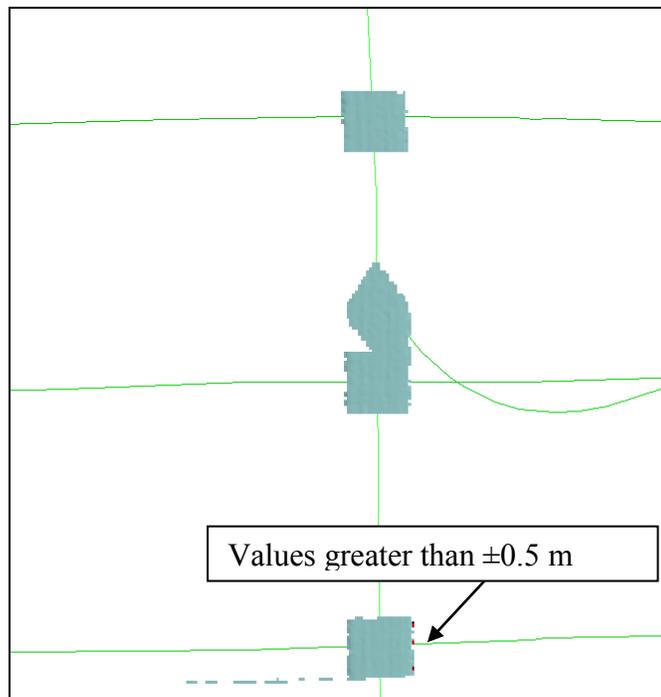


Illustration No. 11. Overlap of TIE-101-1 from survey H12249 subarea 1 and line 3070-1 from survey H12245 subarea 1; red indicates difference values greater than ±0.5 m.

The differences in depth found in subarea 2 of H12249 and subarea 2 of H12245 range between -0.49 and 0.29 m (Illustration No. 12). The crosslines of H12245 are generally deeper than mainlines in H12249 (Illustration No. 13). However, there is minimal disparity between the crosslines of H12249 and the mainscheme lines of survey H12245. This is shown in subset editor 2D view (Illustrations No. 14).

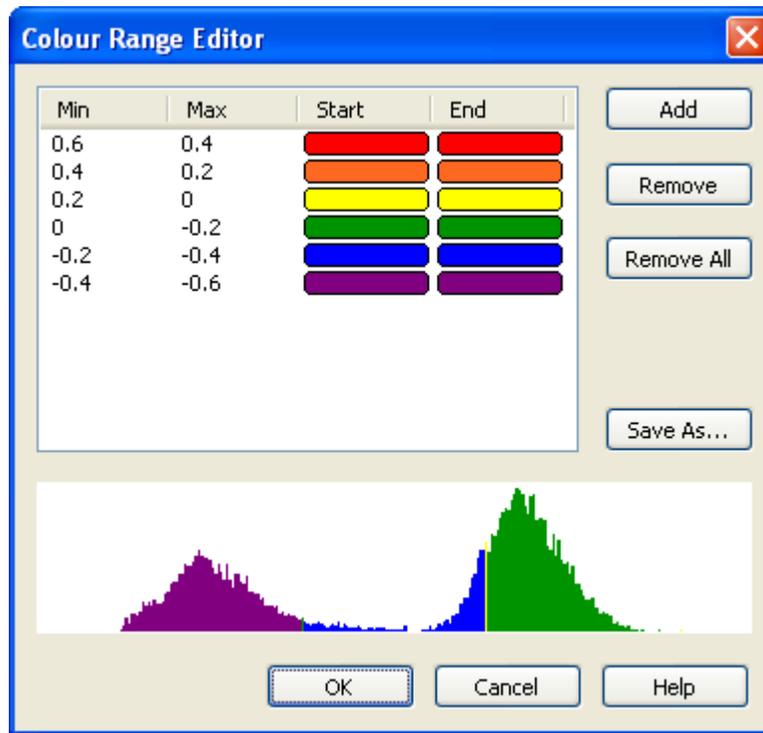


Illustration No. 12: Color range map and histogram used to evaluate the depth difference between H12249 (subarea 2) and the junction with H12245 (subarea 2).

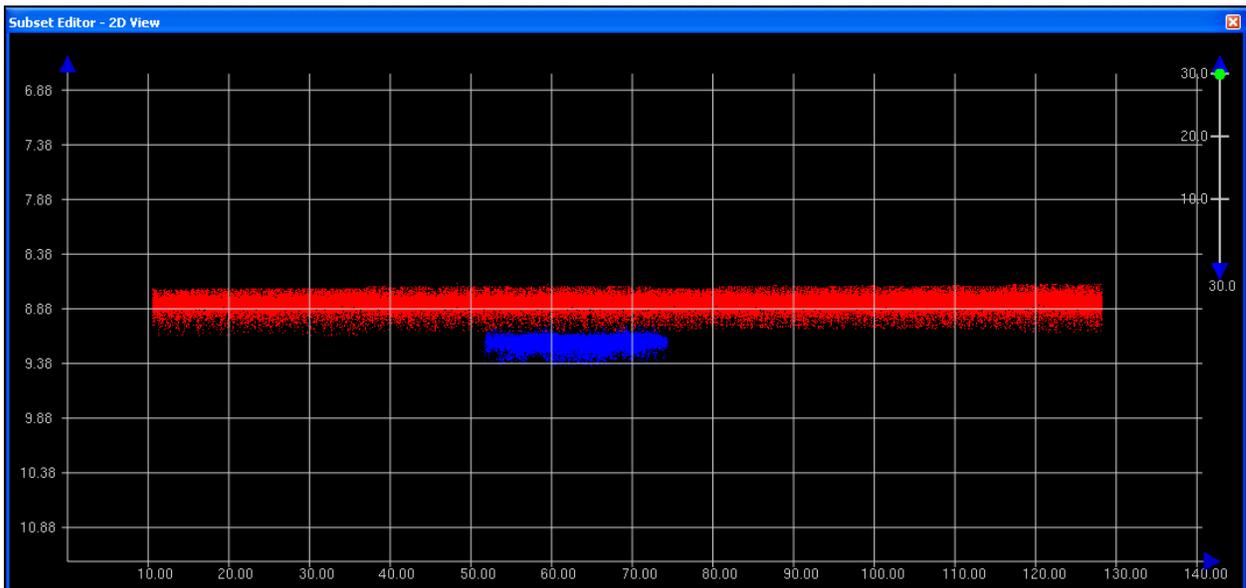


Illustration No. 13: Region of overlap between the crossline of H12245-Tie-104-1 (blue) and line 7138-1(red). The crossline is deeper than the mainline.

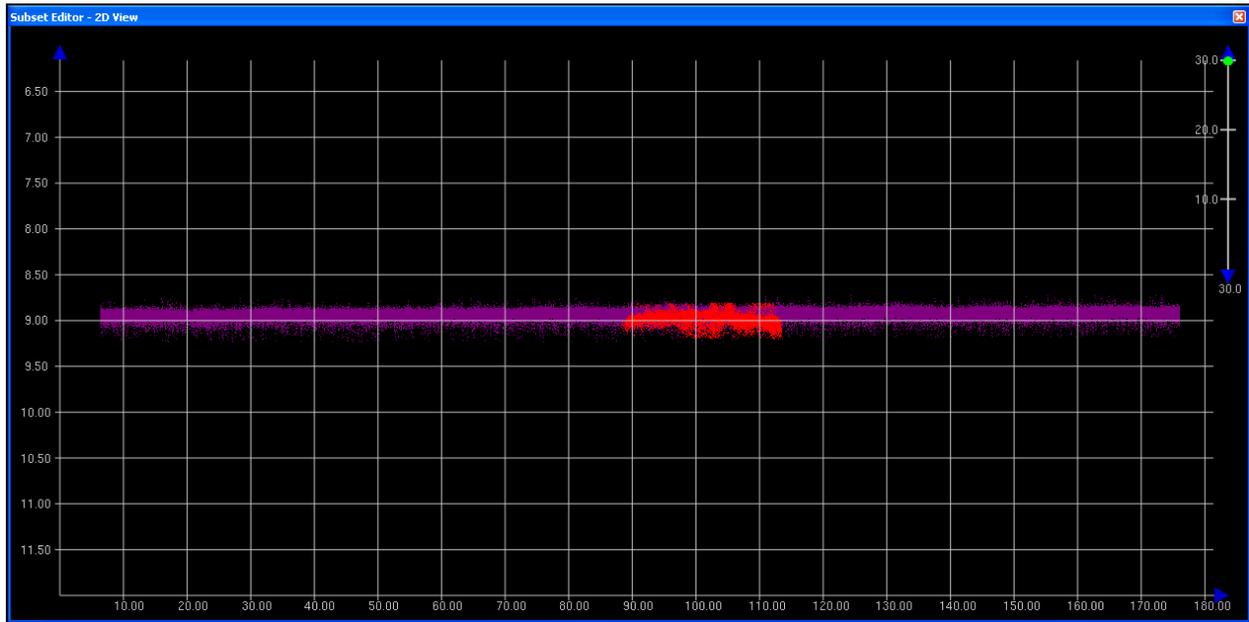


Illustration No. 14. Region of overlap between the crossline of H12249-Tie-105-1 (red) and 3125-1line (purple). The crossline and mainline show good agreement.

Junction with H12248 (Sheet 6)

Subarea 2 of survey H12249 has a junction with subarea 1 of H12248 along the eastern margin of H12249 and there is mainline to mainline data overlap. The majority of overlap occurs in the northern portion of the junction (Illustration No. 15) and the difference values range from -0.50 to 0.66 m. However, the majority of the difference values are between -0.4 and 0.4 m (Illustration No. 16). In an effort to evaluate the extreme difference value of -0.66, an additional color map was used with ranges defined between -0.7 and -0.5. The more extreme difference values were found to be on the edges of swath overlap (Illustration No. 17).

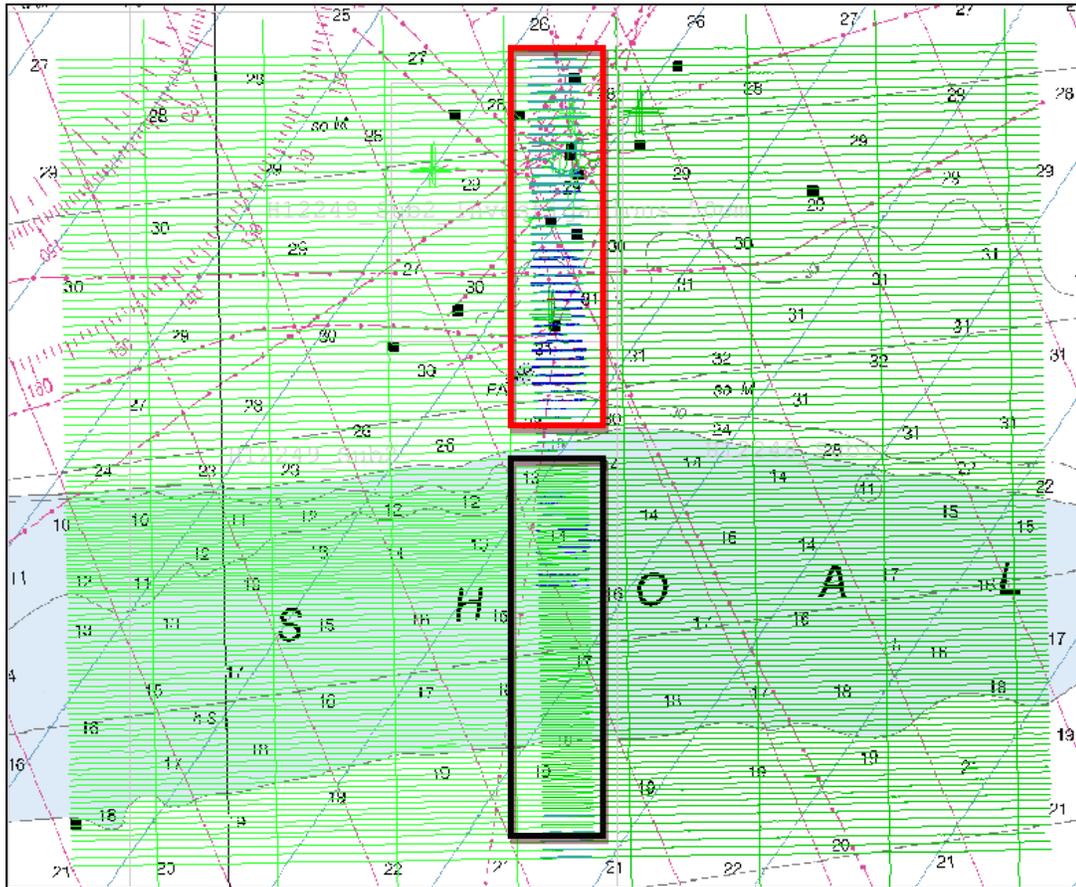


Illustration No. 15: Survey lines of H12248 (to the right) and H12249 (to the left). The survey lines overlap in the upper portion of the junction (red box), but there is minimal overlap in the lower portion of the junction (black box).

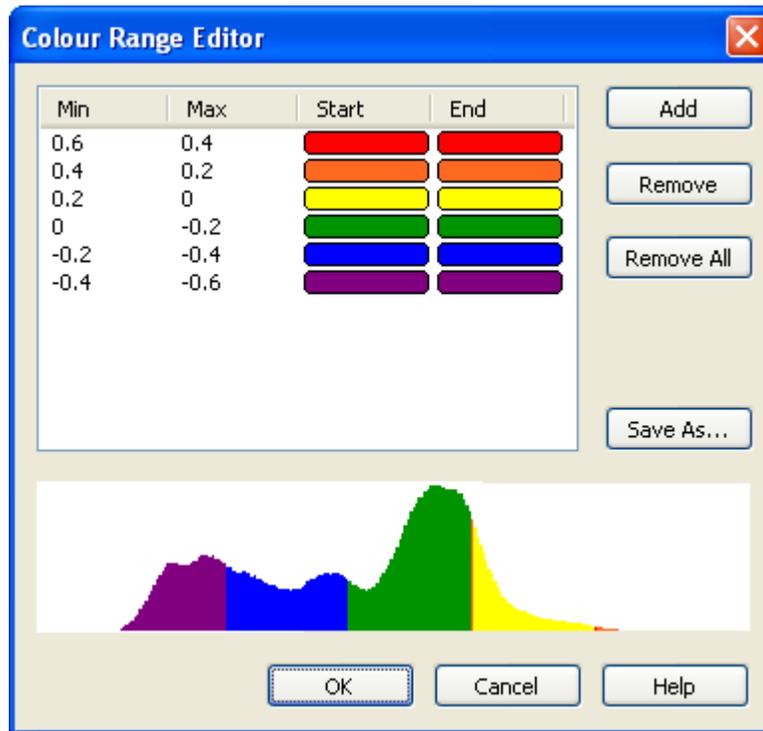


Illustration No. 16: Color range map and histogram used to evaluate the depth difference between H12249 (subarea 2) and the junction with H12248 (subarea 1).

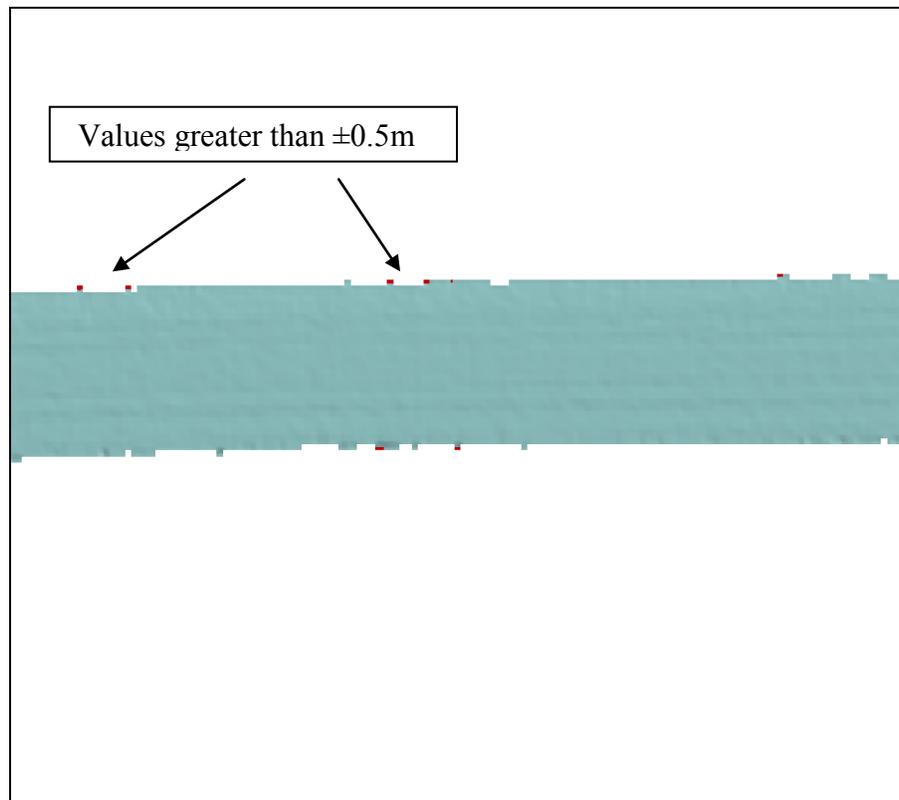


Illustration No. 17: Overlap of adjacent mainlines 7196-1 and 6035-1; red indicates difference values greater than $\pm 0.5\text{ m}$.

Junction with H12252 (Sheet 10)

A preliminary 1-m base surface was created for each subarea in survey H12252, which junctions along the southern margin of H12249. A difference surface was created between each base surface of the two subareas of H12249 and the base surfaces of H12252. For both subareas, crossline data of each survey overlaps the mainline data of the adjoining survey (Illustrations No. 18 and 19).

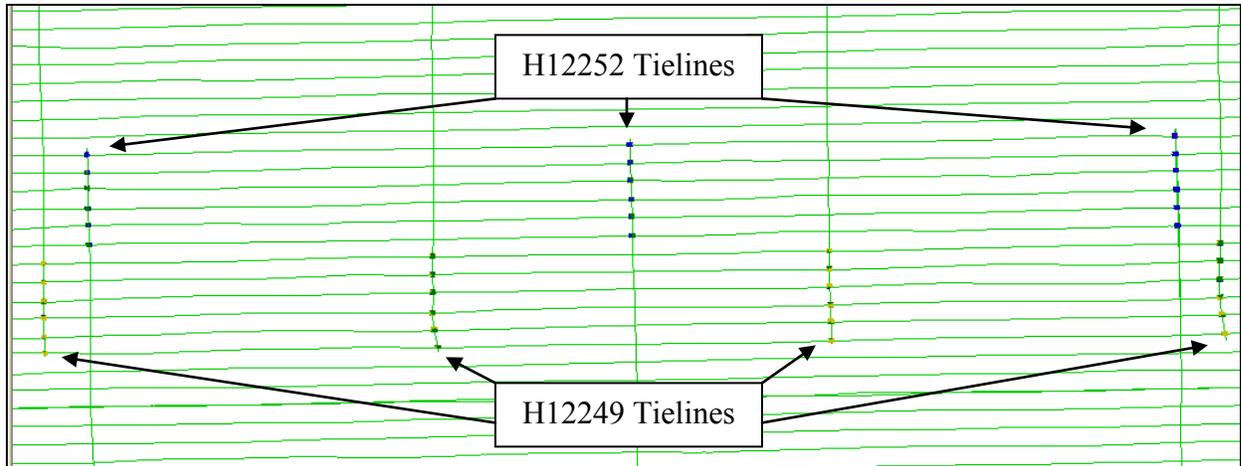


Illustration No. 18: Data overlap from Subarea 1 of H12249 and Subarea 1 of H12252. Crossline data of each subarea overlaps with mainline data of the adjoining survey.

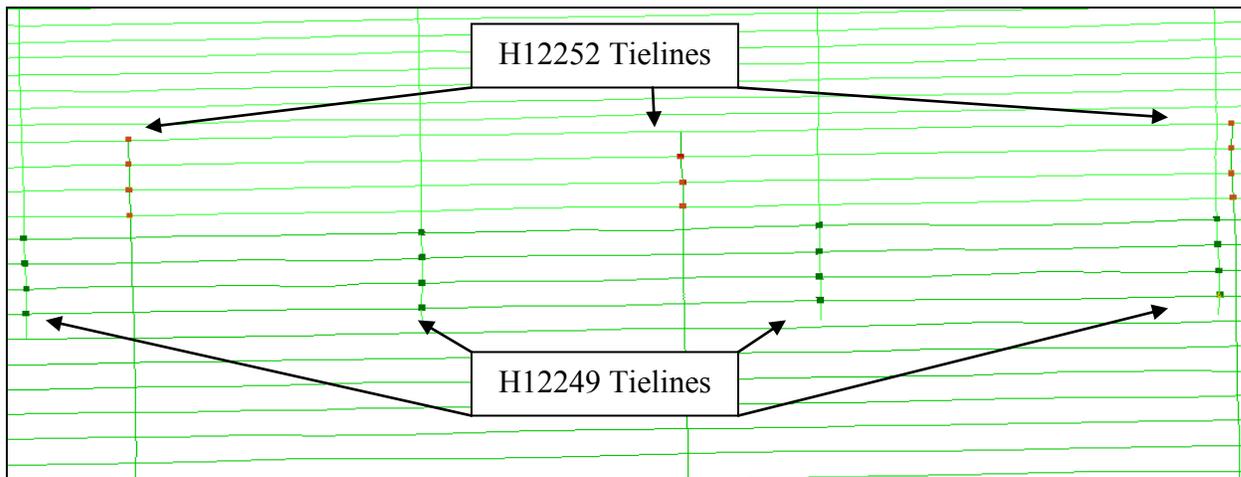


Illustration No. 19: Data overlap from Subarea 2 of H12249 and Subarea 2 of H12252. Crossline data of each subarea overlaps with mainline data of the adjoining survey.

The depth difference between subarea 1 of H12249 and subarea 1 of survey H12252 ranges between -0.31 and 0.66 m; the histogram in Illustration No. 20 shows the range of depth difference values. Another histogram was generated to evaluate the extent of the depth difference values >0.5 m. Only a small amount of data between the two surveys is deviant. The extreme difference values were found only on the outer edges of the swath where TIE-101-1 from survey H12249 junctions with lines 10001-1 to 10061-1 from survey H12252 (Illustration No. 21).

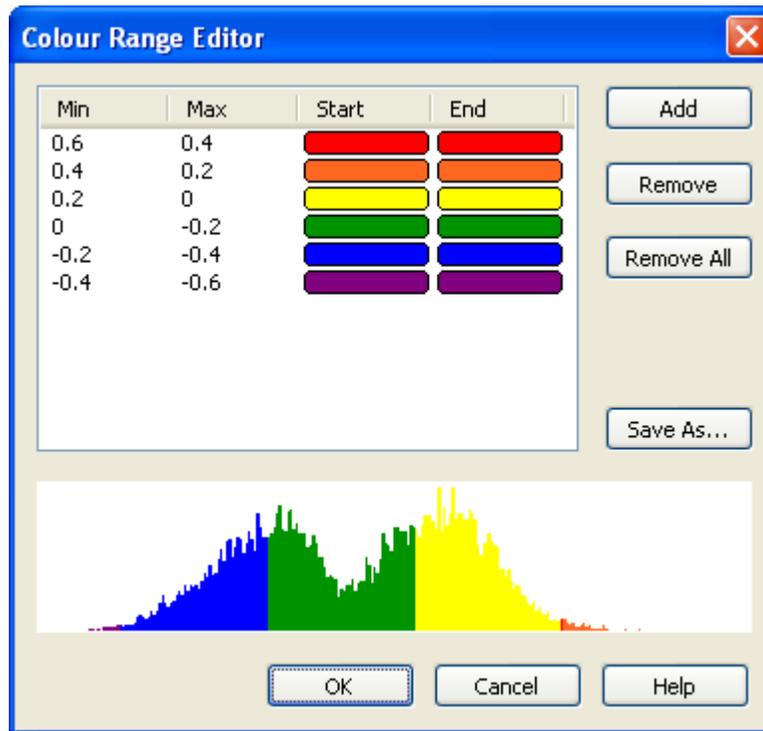


Illustration No. 20: Color range map and histogram used to evaluate the depth difference between H12249 (subarea 1) and the junction with H12252 (subarea 1).

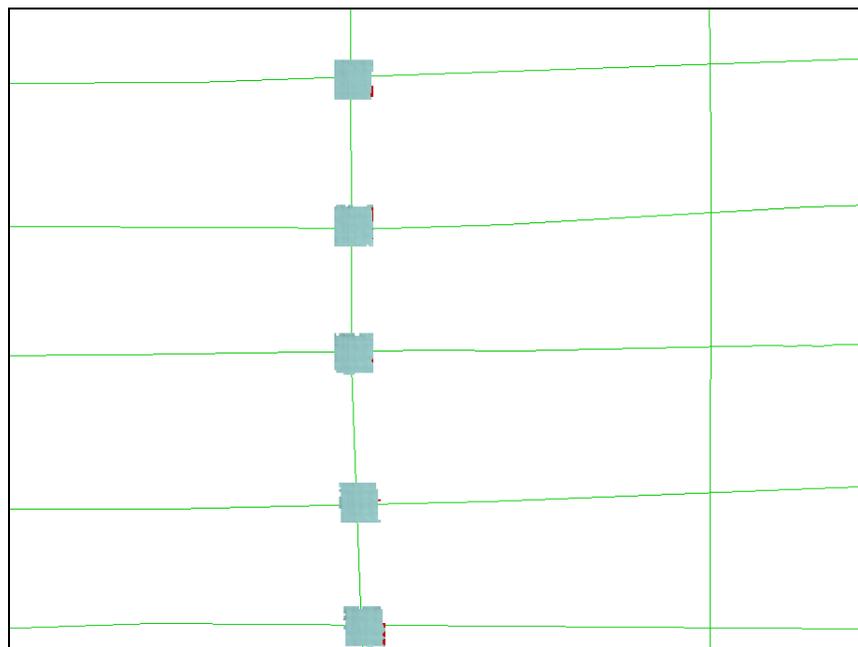


Illustration No. 21: Overlap of adjacent TIE101 with mainlines from survey H12252; red indicates difference values greater than ± 0.5 m.

The depth difference between subarea 2 of H12249 and subarea 2 of survey H12252 ranges between -0.59 and 0.35 m; the histogram in Illustration No. 22 shows the range of depth difference values. Another histogram was generated to evaluate the extent of the depth difference values >-0.5 m. Only a small amount of data between the two surveys is deviant. The extreme difference values were found where H12252 TIE-105 junctions with line 7289-1 from survey H12249. In general, the tielines from both surveys are deeper than mainlines; and the tielines from Survey H12252 show greater depth difference values than the tielines from H12249 when compared to the mainlines.

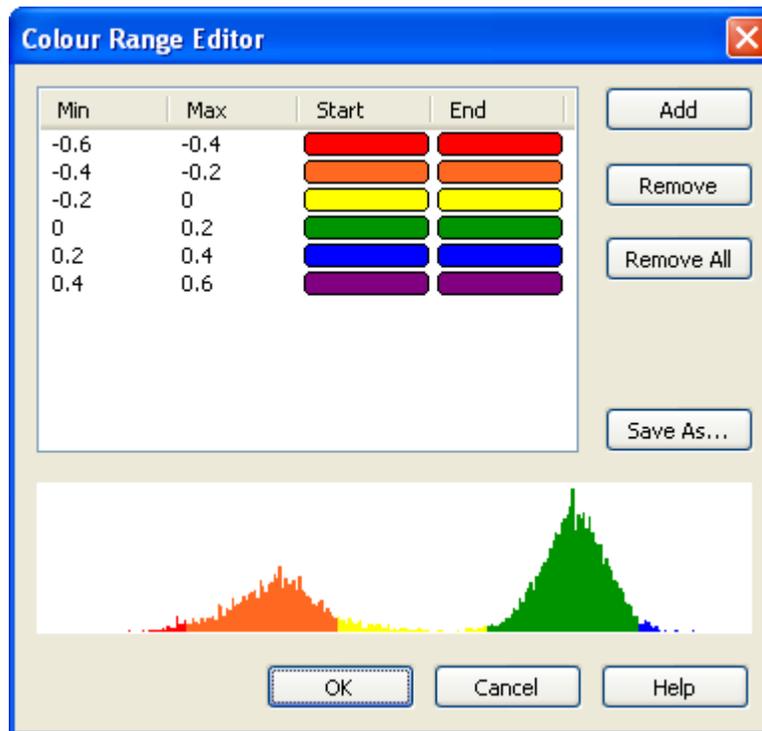


Illustration No. 22: Color range map and histogram used to evaluate the depth difference between H12249 (subarea 2) and the junction with H12252 (subarea 2).

B.2.5 SONAR SYSTEM QUALITY CONTROL

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 were used as the final angular offsets. This was done because of concerns with the accuracy of the heading results (Table No. 7).

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.

Leadlines were conducted daily, when possible, to assess whether draft corrections needed to be applied to 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. 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.

B.2.6 UNUSUAL CONDITIONS/FACTORS AFFECTING SOUNDINGS

Shallow water was a factor that affected sonar imagery in this survey area. The quality of the side scan sonar was monitored closely and the height of the tow fish adjusted to keep it flying as high as possible in the water column.



Another factor concerns a geological feature (Ship Shoal). The multibeam data collected over this feature was very noisy as evident by the standard deviation layers for the survey area. In addition, particularly where the shallowest surveyed soundings are collected in subarea 1, there is irregular bathymetry that is evident in the BASE survey depth layer as well as the standard deviation layer. This bathymetry may represent bedforms, such as sandwaves, however, it is also possible that it is in part an artifact in the data, which is exacerbated by collecting data in waters over the shoal (4 – 5 m).

B.3 CORRECTIONS TO ECHO SOUNDINGS

Prior to data collection on October 7th 2010, the computer for the EM3002 control software was swapped out due to a 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 these incorrect values.

To correct this error, the HIPS vessel file was updated with a second entry under Swath 1. This entry, beginning on October 7th (2010-280), uses the HVF correction values found in tables No. 10 and No. 11 below to adjust the data.

Due to the shallow water in the area, the angular, along track, and across track values went unnoticed. The vertical offset of nearly 0.4 meters was noticed right away when the lead line performed prior to data collection on 2010-280 was off by 0.4 meters. This error was corrected for in the multibeam control software as a subtraction to the waterline to CRP (draft) value. Because of this real-time correction, the 0.398-meter vertical offset is not entered in the HIPS vessel file.

To correct the angular offsets, the patch test results from June 30th, 2011 were used (Refer to Section B.2). This was done because after testing, the roll value from this patch test better corrected the data.

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. Refer to the DAPR for a more detailed explanation.

Table No. 10: Multibeam positional offsets (from CRP)

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

**Table No. 11: Multibeam angular offsets**

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

B.4 DATA PROCESSING

Refer to the Data Acquisition and Processing Report for further details on the side scan sonar and multibeam processing.

B.4.1 COVERAGE BASE SURFACE AND MOSAICS

Multibeam data processing was conducted using CARIS HIPS/SIPS 6.1 on the vessel and CARIS HIPS/SIPS 7.1.0 with Hot Fixes 1 and 2 in the office. One BASE surface was created for each subarea at a scale of 1:40000 with a resolution of 1 meter, in accordance with the project instructions for this survey, which states that a 1-m BASE surface will be created for 0-22 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 software in the field and in the office. All of the side-scan sonar data collected for this project has been layback corrected. Mosaics at 1-m resolution were created for even and odd lines in each subarea to check for 100% SSS coverage.

B.4.2 SSS IMAGERY AND CONTACTS

SSS 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 investigated 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.

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. 12 and 13.

The following chart was used for comparison purposes.

Table No. 12: Nautical Charts used for Comparison

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

The following table shows the last corrected NM and LNM for each digital chart.

Table No. 13: 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 to May 27, 2011 in which the majority of data had been collected. The last Notice to Mariners reviewed was LNM 20/11 8th Dist on 5/24/2011. No Notice to Mariners was issued within the survey bounds during survey operations. In addition, because additional data was acquired September through December 2011, the Local Notice to Mariners was further evaluated; no Notice to Mariners was issued within the survey area between May 27 and December 30, 2011.

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 450-ft single-defined radius for both subareas (Refer to the Data Acquisition and Processing Report for sounding selection criteria). Generally, the middle section of the survey area is the shallowest with water depths surveyed at 4 – 6 m. North of this shoal region is generally deeper than the southern region of the survey area, with depths 8 to 10 m as compared to 6 to 8 m. The depth transitions are regular throughout the survey (Illustration No. 23). However, there is a section in subarea 2 in the northeast quadrant where the deepest depths are observed at 10 to 11 m.

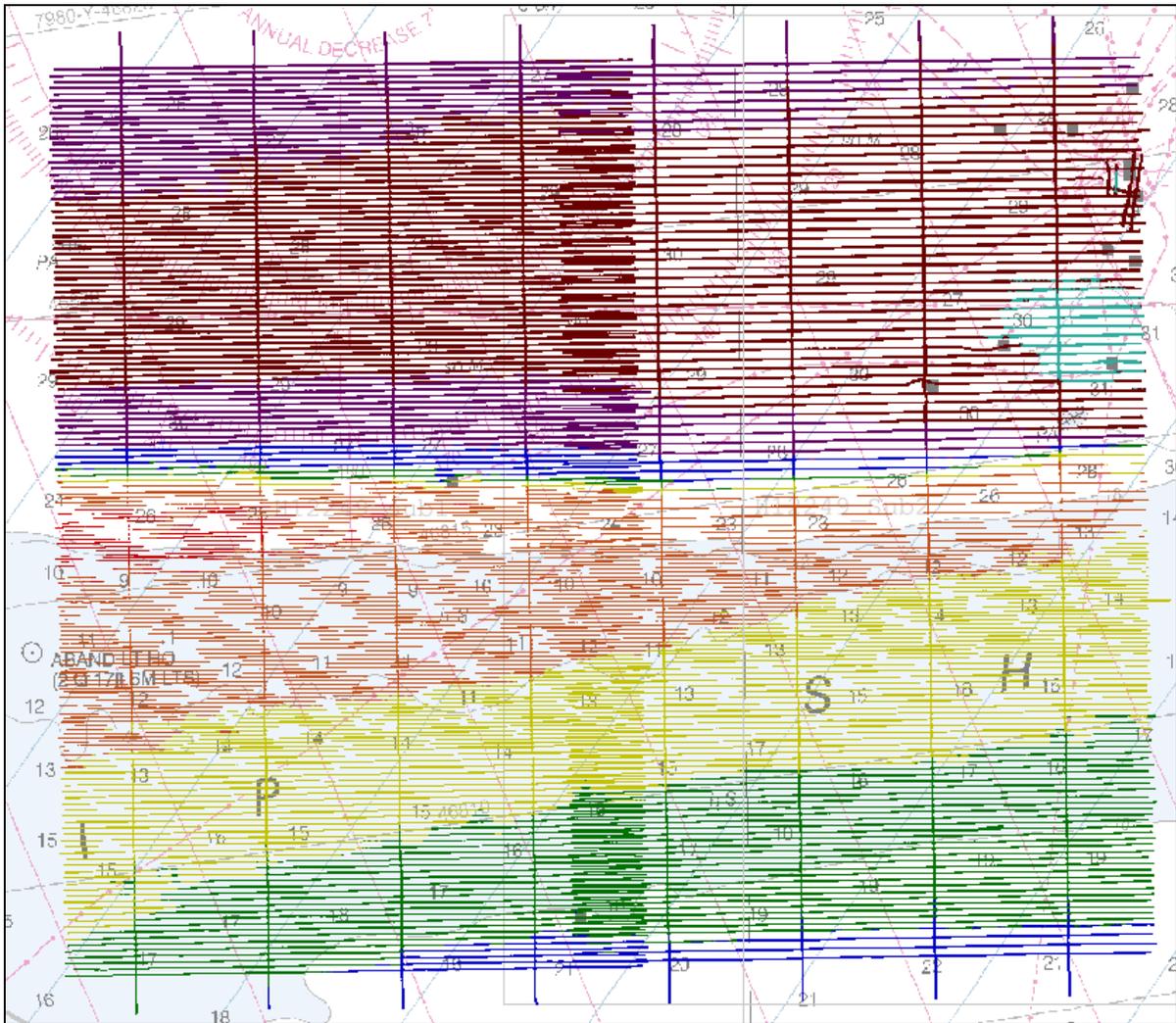


Illustration No. 23: H12249 survey area with colored depth ranges shown in Illustration No. 24.

Min	Max	Start	End
3	4		
4	5		
5	6		
6	7		
7	8		
8	9		
9	10		
10	11		

Illustration No. 24: CARIS color range map (in meters) used for Illustration No. 23.

Ship Shoal occupies a significant portion of the survey area, mainly the southern half of both subareas. The Shoal is delineated by the 18-ft contour. In order to evaluate differences and similarities between the charted contour and surveyed soundings, a color range chart was created in CARIS with soundings of 0 to 5.486 m in red and soundings greater than 5.486 m in blue; 5.486 m represents ~18 feet (Illustration No. 25). Surveyed soundings less than 18 feet extend north of the charted 18-ft contour. This is evident in the sounding layer as well, where surveyed soundings to the north of the currently charted Shoal are up to 11 feet shallower than charted depths (Illustrations No. 26 and 27). Surveyed soundings greater than 18 feet are within the charted 18-ft contour in the southern portion of the Shoal. In the southernmost section, surveyed soundings are generally 3 to 4 feet deeper than charted depths (Illustration No. 28).

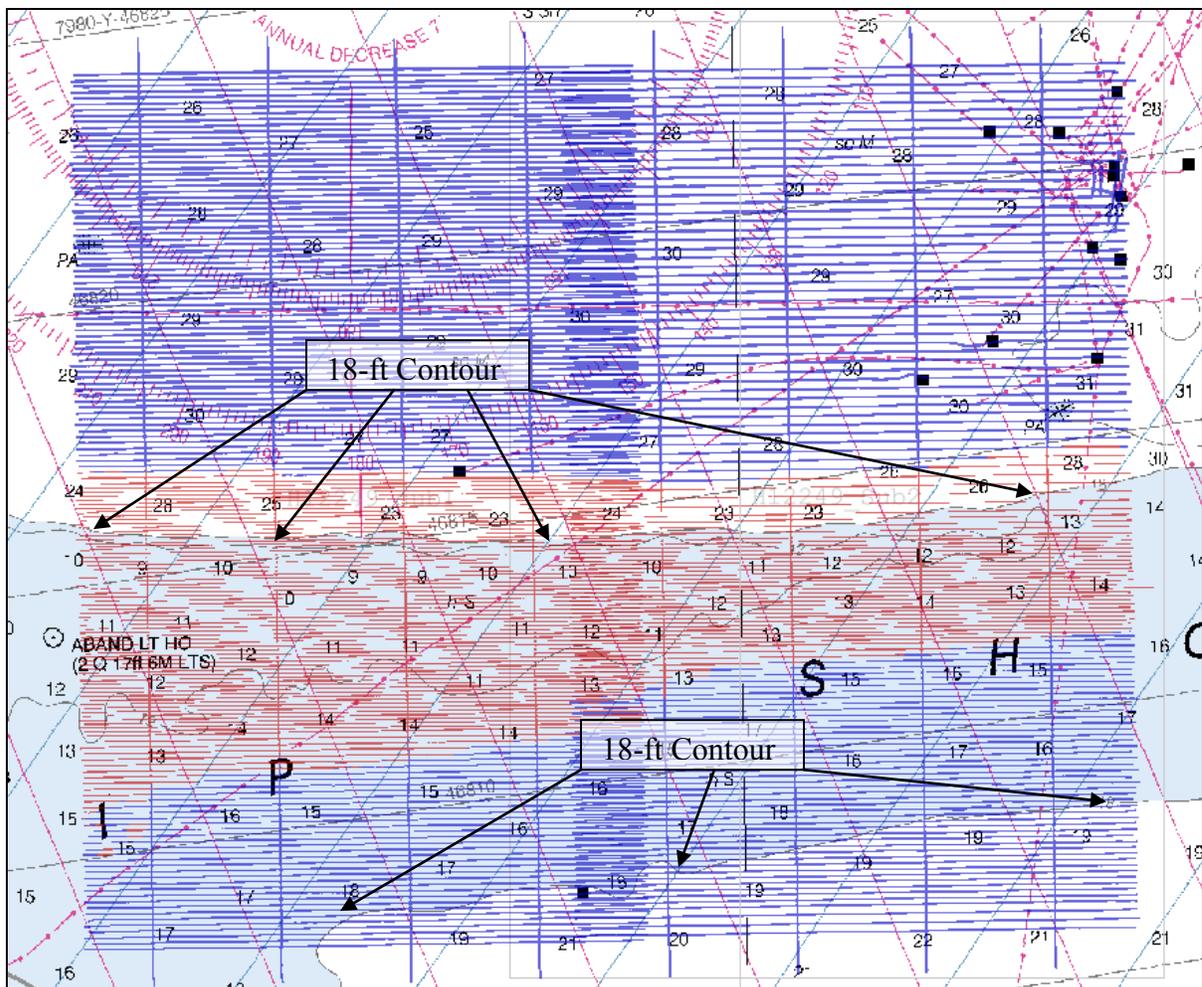


Illustration No. 25: Comparison of charted 18-ft contour and surveyed soundings. Soundings of 0 to 5.486m are in red and soundings greater than 5.486m in blue; 5.486m represents ~18 ft.

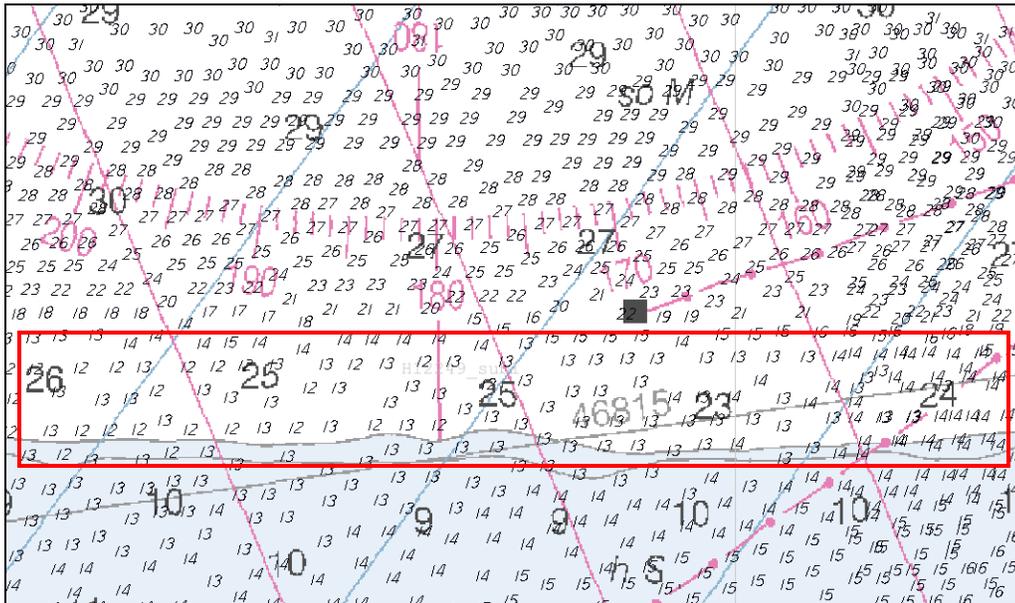


Illustration No. 26: Surveyed soundings to the north of the currently charted Shoal, in Subarea 1, are up to 10 feet deeper than charted soundings (outlined in red).

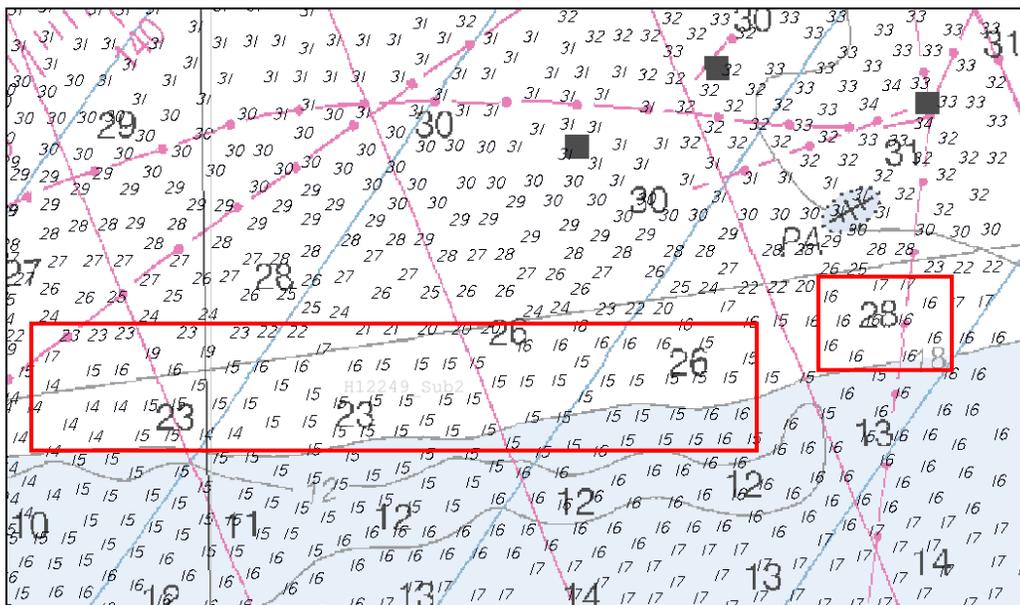


Illustration No. 27: Surveyed soundings to the north of the currently charted Shoal, in Subarea 2, are up to 11 feet deeper than charted soundings (outlined in red).

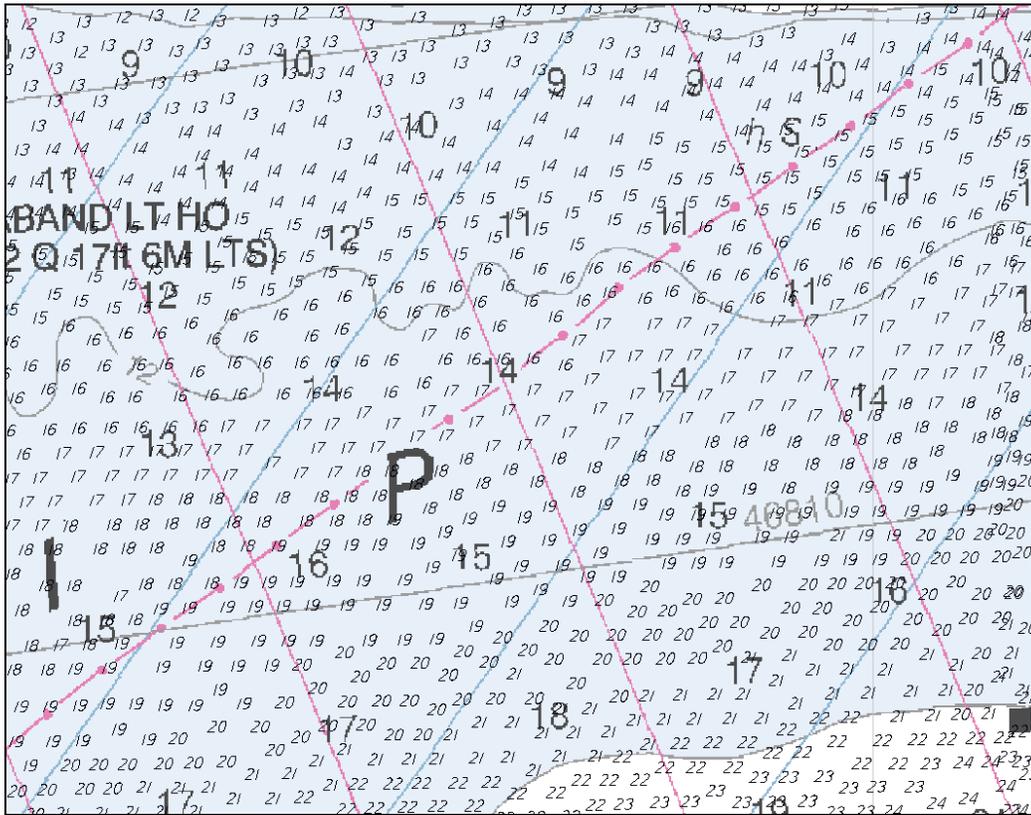


Illustration No. 28: Surveyed soundings in the southernmost area of the Shoal that was surveyed are generally 3 – 4 feet deeper than charted depths.

A shallower portion of the Shoal is also delineated by the 12-ft contour. Evaluation of the sounding layer shows that the majority of the surveyed soundings within the 12-ft contour are greater than 12 feet by 3 – 5 feet (Illustrations No. 29 and 30).

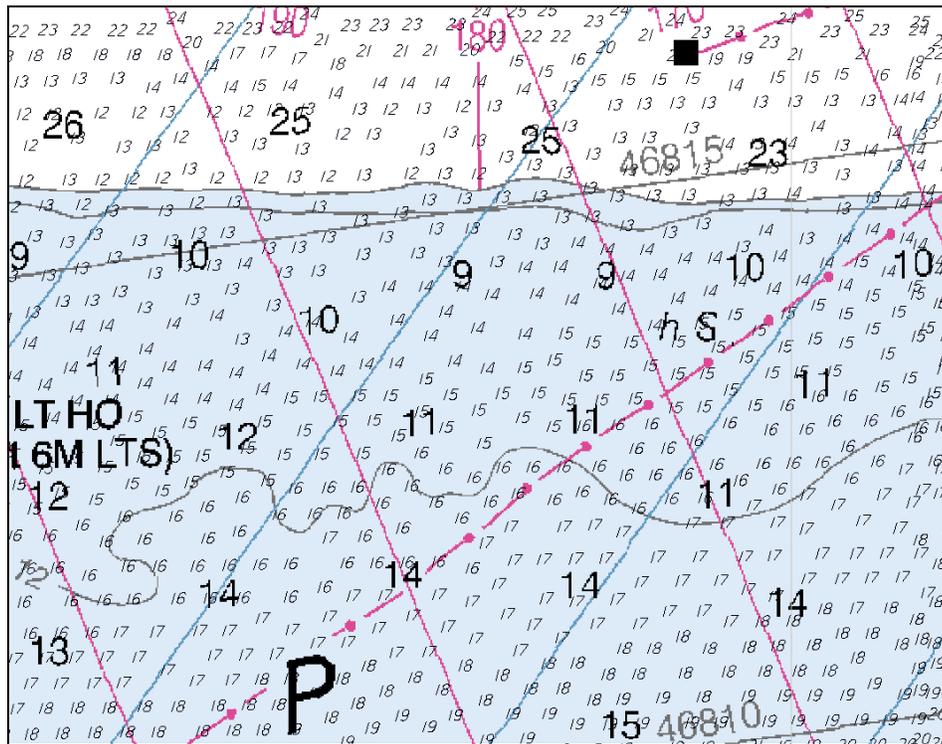


Illustration No. 29: Surveyed soundings within the 12-ft contour are deeper than charted depths by 3 - 5 feet; area shown is Subarea 1.

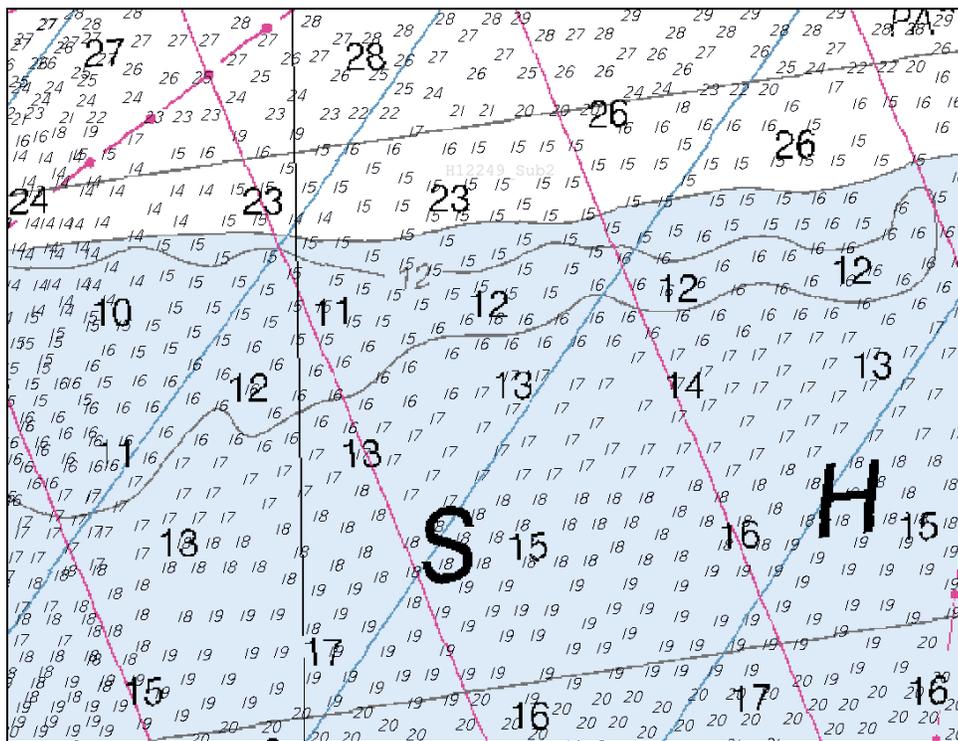


Illustration No. 30: Surveyed soundings within the 12-ft contour are deeper than charted depths by 4 - 5 feet; area shown is Subarea 2.

In the northern portion of the survey area charted depths and surveyed soundings are more comparable and generally agree within 1 – 3 feet. This area is also the deepest; a wide band of surveyed soundings 30 feet or greater cross this section. A color range chart was created in CARIS with soundings of 0 to 9.144 m in red and soundings greater than 9.144 m in blue; 9.144 m represents ~30 feet (Illustration No. 31).

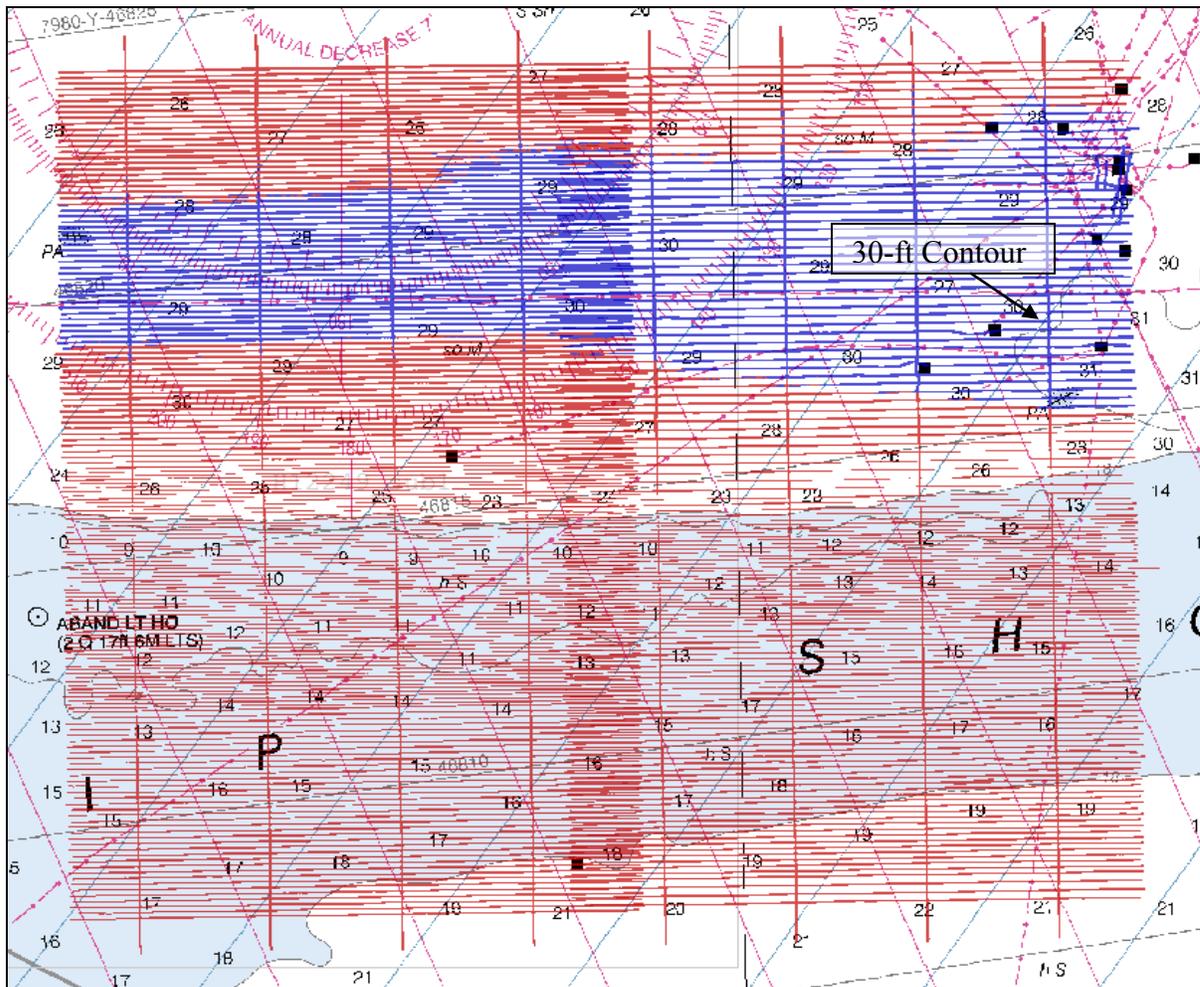


Illustration No. 31: Comparison of charted 30-ft contour and surveyed soundings. Soundings of 0 to 9.144m are in red and soundings greater than 9.144m in blue; 9.144 m represents ~30 ft.

D.1.3 CHARTED FEATURES

D.1.3.1 AWOIS

There are two AWOIS items assigned for full investigation within the survey area (Table No. 14). The AWOIS search radius for item #8467 overlaps with survey H12250. The SSS data from H12250 has been included with this project to complete the full coverage search of its radius. No significant contact was found within the AWOIS radius area and the hydrographer recommends that the AWOIS item be removed from chart 11356.



The AWOIS search radius for item #8442 overlaps with survey H12248. SSS data from H12248 has been included to complete the full coverage of the AWOIS item. One object was detected within its search radius. However, the object is not significant and is located on a charted pipeline. The hydrographer recommends that the AWOIS item be removed from chart 11356. Refer to Appendix II: Survey Feature Report for details on both AWOIS items.

Table No. 14: AWOIS items assigned for full investigation.

AWOIS Record	Chart Latitude	Chart Longitude	Chart Action/Comments
8467	28° 57' 00.831"	-091° 04' 00.340"	Remove from chart 11356
8442	28° 56' 00.841"	-090° 58' 00.329"	Remove from chart 11356

D.1.3.2 INVESTIGATION ITEMS

A total of seven investigations were conducted in the survey area, all located in Subarea 2 (Table No. 15). Additional information regarding these contacts is logged in the Side Scan Sonar Contact list in Separate V. There are two separate investigations named H49-II-B and two separate investigations named H49-II-C: on March 14th, 2011 primary targets 362-095127P and 290-224619P were investigated. These investigations were called H49-II-B and H49-II-C, respectively. On September 30th, 2011 primary targets 291-025712S and 291-013249S were investigated. These investigations were also called H49-II-B and H49-II-C, respectively.

Primary target 291-114625P was found on line 7170-1 at shotpoint 35, 15 m from nadir. The target is located within the search radius of AWOIS item # 8442 and after investigation (H49-II-A) found to be insignificant. This contact and investigation have been discussed further in Appendix II: Survey Feature Report.

Primary target 291-025712S was found on line 7158-1 near event 33, 30 m from nadir. The contact is a section of exposed pipeline that extends from event 33 to 34. Investigation data (H49-II-B) determined that the target was significant at 0.98 m off the bottom. However the pipeline is charted and the feature did not protrude off the bottom at least half the water depth; therefore a DTON was not submitted. Line H49-II-B3 ensonified another charted, exposed pipeline that was also observed in mainline acquisition. More information about contacts 291-014526P and 291-025734P can be found in Appendix V-Side Scan Contact Listing and Images of Significant Contacts.

Primary target 291-013249S is located on line 7150-1 near event 35, 4 m from nadir. There are seven contacts in close proximity and one is significant in the side scan sonar data. After further multibeam investigation (H49-II-C), the primary target 291-013249S was determined to be insignificant. Lines C2, C3 and C4 captured the contact at nadir whereas on line C1 the target was caught on the outer edge of the swath. Lines C2, C3, and C4 were thought to best represent the target and C1 was cleaned appropriately in Subset editor. Least depth information about the two other objects ensonified by this investigation (contacts 291-013255P and 362-130531P) and (362-130945P and 362-130530P) can be found in Appendix V-Side Scan Contact Listing and Images of Significant Contacts.

Primary target 291-001835S is located on line 7149-1 near event 35, 15 m from nadir. The SSS image for this target showed it as a C-shaped object. After further investigation with SWMB (H49-II-D), two insignificant targets were ensonified. The contact with the shallowest depth has been summarized in Table No. 15.

Primary target 290-224227P was found on line 7146-1 near shotpoint 33, 20 m from nadir. The target is located on the charted platform SS-72N. The SSS image correlated with this target shows that it is either an exposed pipeline or debris that is protruding from the platform. The target was investigated September 30th, 2011 (H49-II-E). However, with its close proximity to the platform only one line of SWMB was able to be acquired. With the data acquired, the object is not significant.

Primary target 290-224619P is located on line 7146-1 at event 36, 18 m from nadir. In SSS, the contact was measured as insignificant (0.43 m) but an investigation was carried out because the water depth was shallow (9.5 m). SWMB collected (H49-II-C) confirmed that the object was insignificant. During the investigation an exposed, charted pipeline that was also observed in mainline SSS acquisition was ensonified. In addition, an insignificant contact was seen on investigation line H49-II-C2-2 that was not observed during mainline data acquisition. This contact has an examined sounding displayed in the CARIS project for this survey. More information about the least depth of pipeline contact 290-224629P can be found in Appendix V-Side Scan Contact Listing and Images of Significant Contacts.

Primary target 362-095127P is located on line 7152-1 at event 26, 25 m from nadir. The contact is an exposed pipeline located approximately 60 m from a charted pipeline. The investigation confirmed that the target is not significant.

Table No. 15: Significant features that required further investigation.

Primary SSS Contact Number	INV Name	Least Depth (m)	Survey Latitude	Survey Longitude	Remarks
291-114625P	H49-II-A	9.666	28° 56' 21.951"	-090°57'47.000"	In AWOIS #8442 search radius, not significant
291-025712S	H49-II-B	9.002	28° 56' 55.543"	-090°57'54.940"	Located on a charted pipeline
291-013249S	H49-II-C	9.128	28° 57' 19.856"	-090°57'43.915"	Not significant
291-001835S	H49-II-D	9.080	28° 57' 23.580"	-090°57'48.971"	Not significant, located on charted pipelines
290-224227P	H49-II-E	9.012	28° 57' 31.934"	-090°57'58.578"	Located close to a charted platform, unable to get more than 1 line of MB over it
290-224619P	H49-II-C	9.167	28° 57' 32.418"	-090°57'37.283"	Not significant
362-095127P	H49-II-B	8.988	28° 57' 14.947"	-090°58'33.026"	Not significant

D.1.3.3 DANGER TO NAVIGATION REPORTS

No Danger to Navigation Reports were submitted for this survey.

D.1.3.4 EXISTING INFRASTRUCTURE

The platforms in Table No. 16 were found as charted. The position of each platform was calculated 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 present survey. Table No. 17 shows a list of structures that are currently charted, but were no longer present at the time of the survey. The positions of these platforms were obtained from Chart 11356.

Table No. 16: Platforms found as charted

Surveyed Position			
Latitude	Longitude	Platform Name	Chart Action/Comments
28°53'26.664	-091°01'01.312	SS 97 #1	Remain as charted
28°56'12.737	-090°58'51.436	SS-87M	Remain as charted
28°56'24.665	-090°58'26.778	SS-87 Moxy 12349	Remain as charted
28°56'17.541	-090°57'45.866	SS-87 B	Remain as charted
28°57'32.055	-090°57'59.002	SS-72 N	Remain as charted
28° 57' 13.867	-90° 57' 39.239	PE SS 72 'LQ'	Although observed in this survey, is addressed in the appropriate registry (H12248) deliverables
28° 57' 17.424	-90° 57' 37.843	PE SS 72 'J'	Although observed in this survey, is addressed in the appropriate registry (H12248) deliverables
28° 57' 15.682	-90° 57' 38.538	SS72 'OF'	Although observed in this survey, is addressed in the appropriate registry (H12248) deliverables

Table No. 17: Charted Platforms not present at time of survey

Charted Position		
Latitude	Longitude	Chart Action
28°55'45.281" N	91°01'43.716" W	Remove from chart
28°57'33.567" N	90°58'24.758" W	Remove from chart
28°56'55.122" N	90°57'46.962" W	Remove from chart

D.1.3.5 FEATURE REPORT

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



D.2 ADDITIONAL RESULTS

D.2.1 PRIOR SURVEYS

Survey H12249 does not junction with surveys prior to 2010. Refer to Section B.2.4 for information on contemporary survey junctions and Section D.1 for comparison to nautical chart 11356.

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

There are a number of charted pipelines in the area, and many of these pipelines have unburied sections. If deemed significant in the sidescan sonar, these exposures were developed with multibeam, and discussed in section D.1.3.2. All other exposed pipelines are included in the sidescan sonar contact spreadsheet found in Separates V.



E. APPROVAL SHEET

LETTER OF APPROVAL

REGISTRY NUMBER H12249

This report and the accompanying smooth sheet are respectfully submitted.

Field operations contributing to the accomplishment of the survey H12249 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
February 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: October 17th, 2010 -December 30th, 2011

Registry No.: H12249 (Sheet 7)

Date: February 2012

Sheet Number: 7

Field Work is Complete

Time (UTC)

Date	Julian Day	Start	End	Year
10/17/2010	290	0510	1535	2010
10/17/2010	290	1635	2400	2010
10/18/2010	291	0000	0505	2010
10/18/2010	291	0530	2400	2010
10/19/2010	292	0000	0707	2010
10/19/2010	292	0726	2400	2010
10/20/2010	293	0000	0838	2010
10/20/2010	293	1522	1728	2010
10/20/2010	293	1745	2022	2010
10/20/2010	293	2128	2400	2010
10/21/2010	294	0000	0938	2010
10/21/2010	294	1009	2134	2010
10/22/2010	295	0715	0930	2010
10/22/2010	295	0941	1456	2010
10/22/2010	295	1525	1623	2010
11/7/2010	311	1938	2323	2010
12/28/2010	362	0845	1311	2010
12/28/2010	362	1358	1938	2010
12/28/2010	362	2042	2056	2010
1/4/2011	004	0655	1114	2011
1/4/2011	004	1132	1525	2011
1/4/2011	004	1623	1919	2011
1/4/2011	004	2040	2151	2011
1/15/2011	015	2112	2251	2011
1/16/2011	016	0851	1930	2011
1/22/2011	022	0513	0708	2011
1/22/2011	022	1515	1749	2011
1/22/2011	022	2137	2400	2011
1/23/2011	023	0000	0351	2011
1/23/2011	023	0731	1301	2011
1/27/2011	027	0255	0331	2011
1/27/2011	027	0443	0814	2011
1/27/2011	027	0851	0922	2011
1/27/2011	027	0958	1034	2011
1/27/2011	027	1127	1203	2011
1/27/2011	027	1240	2146	2011
1/28/2011	028	1526	1657	2011



1/28/2011	028	1722	1927	2011
1/29/2011	029	0842	1213	2011
1/29/2011	029	1402	2400	2011
1/30/2011	030	0000	1004	2011
1/30/2011	030	1155	1229	2011
1/30/2011	030	1249	2400	2011
1/31/2011	031	0000	0016	2011
1/31/2011	031	0037	0210	2011
1/31/2011	031	0523	2143	2011
1/31/2011	031	2204	2400	2011
2/1/2011	032	0000	0528	2011
2/6/2011	037	0126	0347	2011
3/12/2011	071	0127	0359	2011
3/12/2011	071	0430	0517	2011
3/12/2011	071	1239	2400	2011
3/13/2011	072	0000	0133	2011
3/13/2011	072	1000	1242	2011
3/13/2011	072	1336	1500	2011
3/13/2011	072	1625	2042	2011
4/8/2011	098	0101	0133	2011
5/9/2011	129	1415	1625	2011
5/12/2011	132	1123	1340	2011
5/17/2011	138	0143	1202	2011
5/27/2011	147	1537	1619	2011
5/27/2011	147	1739	1801	2011
9/30/2011	273	1930	2032	2011
11/22/2011	326	0733	0904	2011
12/30/2011	364	1748	1805	2011

APPENDIX II

SUPPLEMENTAL SURVEY RECORDS
AND CORRESPONDENCE

This survey does not include any supplemental survey records or correspondence

APPENDIX III

SURVEY FEATURES REPORT

- 0 - Danger to Navigation features
- 0 - AWOIS features
- 0 - Wrecks
- 0 - Maritime Boundary items

APPROVAL PAGE

H12249

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

- H12249_DR.pdf
- Collection of depth varied resolution BAGS
- Processed survey data and records
- H12249_GeoImage.pdf

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

Approved: _____

LT Abigail Higgins, NOAA
Chief, Atlantic Hydrographic Branch