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Data Acquisition and Processing Report

Navigation Response Team 2
 Chief of Party: Erik H. Anderson
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 Version: 1
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A Equipment

A.1 Survey Vessels

A.1.1 S-1210

<i>Name</i>	S-1210
<i>Hull Number</i>	SAMA#0847E797
<i>Description</i>	<p>NOAA launch 1210, a 30-foot SeaArk with an 8.5-foot beam and draft of 0.5 meters, was used to collect all survey data. Launch 1210 is equipped with a J-arm to deploy the side scan sonar. An electric winch controls the tow-fish height during side scan acquisition. The operator maintains the proper depth for the best coverage at the sonar scale. There were no unusual vessel configurations or problems encountered with the vessel.</p> <p>Launch 1210 is equipped with a 3PS Inc SD-41 counter that measures the side scan towfish tow cable by counting revolutions of the towing block (IS-.3K-002 Rev C-) on the J-Arm. The length of cable deployed is computed automatically and output to Edgetech D2.</p> <p>Launch 1210 is equipped with a POS MV Applanix system for heave, pitch and roll corrections, as well as vessel position and speed.</p> <p>Launch 1210 is equipped with a R2 Sonic 2024 MBES system, on a USM pole mount , located on the starboard quarter.</p> <p>Coastal Oceanographic Hypack Max is used for survey navigation, Detached Positioning (DP), and VBES data logging bathymetry. Discover 2 is used for on line acquisition of side scan sonar.</p> <p>The PCs running Hypack and Sonar Pro are automatically synchronized to UTC time from the NMEA-0183 (zda) GPS messages. The time update occurs during the start and stop logging messages on the Hypack computer.</p>

<i>Utilization</i>	Hydrographic Surveys, and Emergency Response work	
<i>Dimensions</i>	<i>LOA</i>	9.144 meters
	<i>Beam</i>	2.59 meters
	<i>Max Draft</i>	0.5 meters
<i>Most Recent Full Static Survey</i>	Full static survey was not performed.	
<i>Most Recent Partial Static Survey</i>	Partial static survey was not performed.	
<i>Most Recent Full Offset Verification</i>	<i>Date</i>	2013-06-26
	<i>Method Used</i>	Laser level, Tapes, Laser range tape
	<i>Discussion</i>	Minor correction noted and made, as well as the addition of the MBES system offsets.
<i>Most Recent Partial Offset Verification</i>	Partial offset verification was not performed.	
<i>Most Recent Static Draft Determination</i>	<i>Date</i>	2014-01-15
	<i>Method Used</i>	POS PAC
	<i>Discussion</i>	Mean working load draft.
<i>Most Recent Dynamic Draft Determination</i>	<i>Date</i>	2014-01-15
	<i>Method Used</i>	POS PAC
	<i>Discussion</i>	Conducted for 0-12 knots

Figure : S-1210 on trailer

A.2 Echo Sounding Equipment

A.2.1 Side Scan Sonars

A.2.1.1 EdgeTech 4125-P

<i>Manufacturer</i>	EdgeTech			
<i>Model</i>	4125-P			
<i>Description</i>	The 4125 utilizes EdgeTech's Full Spectrum® CHIRP technology which provides higher resolution imagery.			
<i>Serial Numbers</i>	<i>Vessel Installed On</i>	S-1210		
	<i>TPU s/n</i>	sn: 40256		
	<i>Towfish s/n</i>	sn:40425		
<i>Specifications</i>	<i>Frequency</i>	400 kilohertz		900 kilohertz
	<i>Along Track Resolution</i>	<i>Resolution</i>	7.9 centimeters	<i>Resolution</i> 4.7 centimeters
		<i>Min Range</i>	20 meters	<i>Min Range</i> 20 meters
		<i>Max Range</i>	150 meters	<i>Max Range</i> 120 meters
	<i>Across Track Resolution</i>	2.3 centimeters		1.5 centimeters
<i>Max Range Scale</i>	150 meters		120 meters	
<i>Manufacturer Calibrations</i>	Manufacturer calibration was not performed.			

A.2.2 Multibeam Echosounders

A.2.2.1 R2 Sonic 2024

<i>Manufacturer</i>	R2 Sonic	
<i>Model</i>	2024	
<i>Description</i>	60kHz Wideband Signal Processing; Focused 0.5° Beam Width; 200-400 kHz adjustable; 10-160° Selectable swath sector; Range to 500m; Equiangular or Equidistant Beams; Roll Stabilized; Rotatable Swath Sector.	
<i>Serial Numbers</i>	<i>Vessel Installed On</i>	S-1210
	<i>Processor s/n</i>	103413
	<i>Transceiver s/n</i>	NA
	<i>Transducer s/n</i>	NA
	<i>Receiver s/n</i>	10041
	<i>Projector 1 s/n</i>	800264
	<i>Projector 2 s/n</i>	None

<i>Specifications</i>	<i>Frequency</i>	330 kilohertz		
	<i>Beamwidth</i>	<i>Along Track</i>	1.0 degrees	
		<i>Across Track</i>	0.5 degrees	
	<i>Max Ping Rate</i>	60 hertz		
	<i>Beam Spacing</i>	<i>Beam Spacing Mode</i>	Equiangular	
		<i>Number of Beams</i>	256	
	<i>Max Swath Width</i>	160 degrees		
	<i>Depth Resolution</i>	1.25 centimeters		
<i>Depth Rating</i>	<i>Manufacturer Specified</i>	100 meters		
	<i>Ship Usage</i>	25 meters		
<i>Manufacturer Calibrations</i>	Manufacturer calibration was not performed.			
<i>System Accuracy Tests</i>	<i>Vessel Installed On</i>	S-1210		
	<i>Methods</i>	Conducted patch test over flat bottom, steep slope and an active buoy block approx. 1m cubed.		
	<i>Results</i>	Excellent. Pitch=0° // Roll=0.60° // Yaw=0°		
<i>Snippets</i>	Sonar has snippets logging capability.			

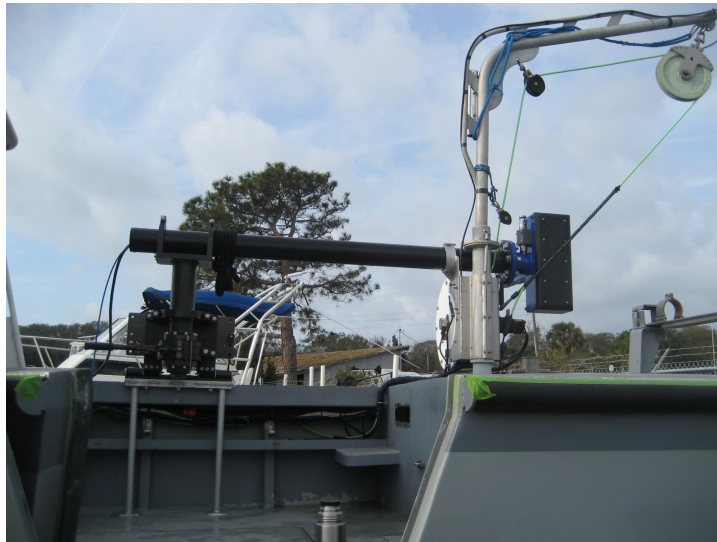


Figure : MBES Mount

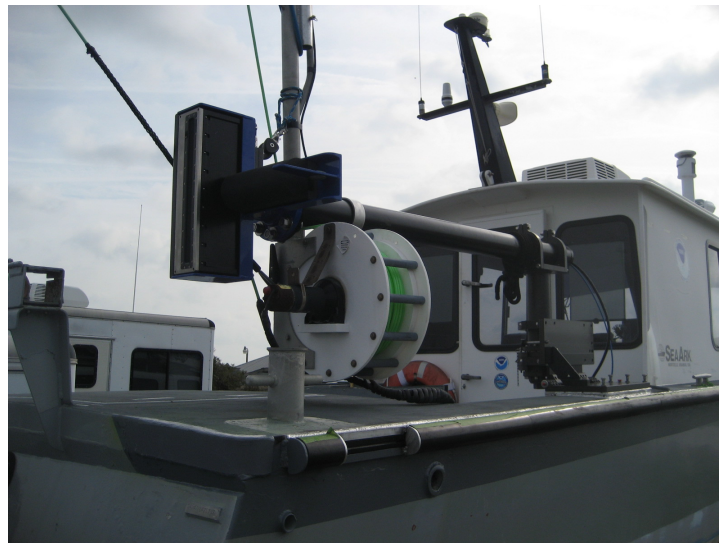


Figure : MBES Head

A.2.3 Single Beam Echosounders

A.2.3.1 Odom CV-2

<i>Manufacturer</i>	Odom		
<i>Model</i>	CV-2		
<i>Description</i>	Dual Freq sounder only using Hi-Freq transducer at 200Khz.		
<i>Serial Numbers</i>	<i>Vessel</i>	S-1210	
	<i>Processor s/n</i>	sn:23031	
	<i>Transducer s/n</i>	1751935	
<i>Specifications</i>	<i>Frequency</i>	200 kilohertz	
	<i>Beamwidth</i>	<i>Along Track</i>	9 degrees
		<i>Across Track</i>	9 degrees
	<i>Max Ping Rate</i>	20 hertz	
	<i>Depth Resolution</i>	0.01 meters	
	<i>Depth Rating</i>	<i>Manufacturer Specified</i>	200 meters
<i>Ship Usage</i>		60 meters	

<i>Manufacturer Calibrations</i>	Manufacturer calibration was not performed.
<i>System Accuracy Tests</i>	System accuracy test was not performed.

A.2.4 Phase Measuring Bathymetric Sonars

No phase measuring bathymetric sonars were utilized for data acquisition.

A.2.5 Other Echosounders

No additional echosounders were utilized for data acquisition.

A.3 Manual Sounding Equipment

A.3.1 Diver Depth Gauges

No diver depth gauges were utilized for data acquisition.

A.3.2 Lead Lines

<i>Manufacturer</i>	NOAA NRT-2	
<i>Model</i>	standard 13m with mushroom anchor	
<i>Description</i>	created as per specs.	
<i>Serial Numbers</i>	S-1210	
<i>Calibrations</i>	<i>Serial Number</i>	S-1210
	<i>Date</i>	2014-03-05
	<i>Procedures</i>	Checked tick marks with steel tape
<i>Accuracy Checks</i>	No accuracy checks were performed.	
<i>Correctors</i>	Correctors were not determined.	

<i>Non-Standard Procedures</i>	Non-standard procedures were not utilized.
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A.3.3 Sounding Poles

No sounding poles were utilized for data acquisition.

A.3.4 Other Manual Sounding Equipment

No additional manual sounding equipment was utilized for data acquisition.

A.4 Positioning and Attitude Equipment

A.4.1 Applanix POS/MV

<i>Manufacturer</i>	Applanix			
<i>Model</i>	MV-320			
<i>Description</i>	POS MV-5 System			
<i>PCS</i>	<i>Manufacturer</i>	Applanix		
	<i>Model</i>	POS MV V-5		
	<i>Description</i>	model 320		
	<i>Firmware Version</i>	V5		
	<i>Software Version</i>	7.60		
	<i>Serial Numbers</i>	<i>Vessel Installed On</i>	S-1210	
	<i>PCS s/n</i>	5805		
<i>IMU</i>	<i>Manufacturer</i>	Applanix		
	<i>Model</i>	IMU TOP HAT		
	<i>Description</i>	New IMU installed		
	<i>Serial Numbers</i>	<i>Vessel Installed On</i>	S-1210	
		<i>IMU s/n</i>	2422_424340	
	<i>Certification</i>	<i>IMU s/n</i>	2422_424340	
<i>Certification Date</i>		2013-06-26		

<i>Antennas</i>	<i>Manufacturer</i>	Trimble		
	<i>Model</i>	57970-00 DC5024		
	<i>Description</i>	GNSS Capability		
	<i>Serial Numbers</i>	<i>Vessel Installed On</i>	S-1210	
		<i>Antenna s/n</i>	1441021179	
		<i>Port or Starboard</i>	Starboard	
		<i>Primary or Secondary</i>	Primary	
	<i>Manufacturer</i>	Trimble		
	<i>Model</i>	57970-00 DC5024		
	<i>Description</i>	GNSS Capability		
<i>Serial Numbers</i>	<i>Vessel Installed On</i>	S-1210		
	<i>Antenna s/n</i>	1441132512		
	<i>Port or Starboard</i>	Port		
	<i>Primary or Secondary</i>	Secondary		
<i>GAMS Calibration</i>	<i>Vessel</i>	S-1210		
	<i>Calibration Date</i>	2014-01-15		
<i>Configuration Reports</i>	<i>Vessel</i>	S-1210		
	<i>Report Date</i>	2014-01-22		

A.4.2 DGPS

<i>Description</i>	Trimble SPS 361, used to provide RTCM correctors from USCG Beacon Stations.
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<i>Antennas</i>	<i>Manufacturer</i>	Trimble		
	<i>Model</i>	SPS MSK		
	<i>Description</i>	Beacon receiver DGPS combo		
	<i>Serial Numbers</i>	<i>Vessel Installed On</i>	S-1210	
		<i>Antenna s/n</i>	14757	
<i>Receivers</i>	<i>Manufacturer</i>	Trimble		
	<i>Model</i>	SPS-361		
	<i>Description</i>	Provides DGPS correctors.		
	<i>Firmware Version</i>	N/A		
	<i>Serial Numbers</i>	<i>Vessel Installed On</i>	S-1210	
<i>Antenna s/n</i>		5330K63697		

A.4.3 Trimble Backpacks

<i>Manufacturer</i>	Trimble		
<i>Model</i>	Geo-XH		
<i>Description</i>	Handheld L1-L2 Receiver		
<i>Serial Numbers</i>	None		
<i>Antennas</i>	<i>Manufacturer</i>	Trimble	
	<i>Model</i>	39105-00 DC4921	
	<i>Description</i>	Zephyr external	
	<i>Serial Numbers</i>	60287788	
<i>Receivers</i>	<i>Manufacturer</i>	Trimble	
	<i>Model</i>	GeoXH	
	<i>Description</i>	Handheld DGPS GIS System	
	<i>Firmware Version</i>	Terra Sync 5.01	
	<i>Serial Numbers</i>	4928419767	
<i>Field Computers</i>	No field computers were utilized for data acquisition.		
<i>DQA Tests</i>	DQA test was not performed.		

A.4.4 Laser Rangefinders

<i>Manufacturer</i>	Laser Technology Inc.
<i>Model</i>	Truepluse 360B (5/2011)
<i>Description</i>	Hand held laser positioning device for direct feed into Hypack Survey System. Unit is used for verification on non-approachable items on the water, it is not used to establish any survey quality position at present.
<i>Serial Numbers</i>	044667
<i>DQA Tests</i>	DQA test was not performed.

A.4.5 Other Positioning and Attitude Equipment

No additional positioning and attitude equipment was utilized for data acquisition.

A.5 Sound Speed Equipment

A.5.1 Sound Speed Profiles

A.5.1.1 CTD Profilers

No CTD profilers were utilized for data acquisition.

A.5.1.2 Sound Speed Profilers

A.5.1.2.1 Odom Hydrographic DigiBar-Pro

<i>Manufacturer</i>	Odom Hydrographic
<i>Model</i>	DigiBar-Pro

<i>Description</i>	Primary Sound Speed Profiler	
<i>Serial Numbers</i>	<i>Vessel Installed On</i>	S-1210
	<i>Sound Speed Profiler s/n</i>	98295
<i>Calibrations</i>	<i>Sound Speed Profiler s/n</i>	98295-010412
	<i>Date</i>	2014-02-27
	<i>Procedures</i>	Shipped to MFN for annual service and calibration

A.5.1.2.2 Odom Hydrographic Digibar-Pro

<i>Manufacturer</i>	Odom Hydrographic	
<i>Model</i>	Digibar-Pro	
<i>Description</i>	Secondary profiler for comparisons	
<i>Serial Numbers</i>	<i>Vessel Installed On</i>	S-1210
	<i>Sound Speed Profiler s/n</i>	98376
<i>Calibrations</i>	<i>Sound Speed Profiler s/n</i>	98376-122313
	<i>Date</i>	2014-03-05
	<i>Procedures</i>	Manufacturer Calibration

A.5.2 Surface Sound Speed

A.5.2.1 AML Micro-X

<i>Manufacturer</i>	AML		
<i>Model</i>	Micro-X		
<i>Description</i>	R2 Sonic MBES Head feed of Surface SV		
<i>Serial Numbers</i>	<i>Vessel Installed On</i>	S-1210	S-1210
	<i>Sound Speed Sensor s/n</i>	010314	203523

<i>Calibrations</i>	<i>Sound Speed Sensor s/n</i>	010314	203523
	<i>Date</i>	2013-06-09	2013-04-09
	<i>Procedures</i>	Manufacturer	manufacturer

A.6 Horizontal and Vertical Control Equipment

A.6.1 Horizontal Control Equipment

No horizontal control equipment was utilized for data acquisition.

A.6.2 Vertical Control Equipment

No vertical control equipment was utilized for data acquisition.

A.7 Computer Hardware and Software

A.7.1 Computer Hardware

<i>Manufacturer</i>	Dell		
<i>Model</i>	Precision T3500		
<i>Description</i>	Survey Data Processing PC		
<i>Serial Numbers</i>	<i>Computer s/n</i>	CD0001281213	
	<i>Operating System</i>	WIN 7 64bit	
	<i>Use</i>	Processing	

<i>Manufacturer</i>	3PS Inc		
<i>Model</i>	SD-41 cable counter		
<i>Description</i>	SSS Tow cable payout counter system, feeds directly into PC port.		
<i>Serial Numbers</i>	<i>Computer s/n</i>	JF1J2H1 (ESC42268426309)	
	<i>Operating System</i>	NA	
	<i>Use</i>	Acquisition	

<i>Manufacturer</i>	Dell		
<i>Model</i>	Precision T3500		

<i>Description</i>	Survey Data Processing PC	
<i>Serial Numbers</i>	<i>Computer s/n</i>	CD0001670307
	<i>Operating System</i>	Win 7
	<i>Use</i>	Processing

<i>Manufacturer</i>	Dell	
<i>Model</i>	Precision T5500	
<i>Description</i>	Acquisition	
<i>Serial Numbers</i>	<i>Computer s/n</i>	CD0004098575
	<i>Operating System</i>	Win 7
	<i>Use</i>	Acquisition

<i>Manufacturer</i>	Dell	
<i>Model</i>	Latitude E6530	
<i>Description</i>	Acquisition and processing laptop	
<i>Serial Numbers</i>	<i>Computer s/n</i>	CD0004100973
	<i>Operating System</i>	Win 7
	<i>Use</i>	Acquisition and Processing

A.7.2 Computer Software

<i>Manufacturer</i>	Caris
<i>Software Name</i>	BDB
<i>Version</i>	4
<i>Service Pack</i>	0
<i>Hotfix</i>	11
<i>Installation Date</i>	2014-06-23
<i>Use</i>	Processing
<i>Description</i>	na

<i>Manufacturer</i>	Caris
<i>Software Name</i>	HIPS/SIPS
<i>Version</i>	8
<i>Service Pack</i>	1
<i>Hotfix</i>	7

<i>Installation Date</i>	2014-04-15
<i>Use</i>	Processing
<i>Description</i>	NA

<i>Manufacturer</i>	NOAA
<i>Software Name</i>	Pydro
<i>Version</i>	14.6
<i>Service Pack</i>	1
<i>Hotfix</i>	r4683
<i>Installation Date</i>	2014-06-10
<i>Use</i>	Processing
<i>Description</i>	NA

<i>Manufacturer</i>	Coastal Oceanographic
<i>Software Name</i>	Hypack
<i>Version</i>	13
<i>Service Pack</i>	
<i>Hotfix</i>	
<i>Installation Date</i>	2014-01-21
<i>Use</i>	Acquisition
<i>Description</i>	NA

<i>Manufacturer</i>	Pitney Bowes
<i>Software Name</i>	Mapinfo Pro
<i>Version</i>	11
<i>Service Pack</i>	0
<i>Hotfix</i>	4
<i>Installation Date</i>	2011-01-01
<i>Use</i>	Processing
<i>Description</i>	NA

<i>Manufacturer</i>	Trimble
<i>Software Name</i>	Pathfinder Office
<i>Version</i>	4.20
<i>Service Pack</i>	

<i>Hotfix</i>	9
<i>Installation Date</i>	2011-01-01
<i>Use</i>	Processing
<i>Description</i>	NA

<i>Manufacturer</i>	Trimble
<i>Software Name</i>	Terra Sync
<i>Version</i>	5.0.1
<i>Service Pack</i>	
<i>Hotfix</i>	
<i>Installation Date</i>	2011-01-01
<i>Use</i>	Acquisition
<i>Description</i>	NA

<i>Manufacturer</i>	Odom Hydrographic
<i>Software Name</i>	Digibar Pro
<i>Version</i>	3.0
<i>Service Pack</i>	0
<i>Hotfix</i>	3
<i>Installation Date</i>	2011-01-01
<i>Use</i>	Processing
<i>Description</i>	NA

<i>Manufacturer</i>	Trimble
<i>Software Name</i>	MV POSVIEW
<i>Version</i>	7.6
<i>Service Pack</i>	
<i>Hotfix</i>	
<i>Installation Date</i>	2014-01-21
<i>Use</i>	Acquisition
<i>Description</i>	na

<i>Manufacturer</i>	Odom Hydrographic
<i>Software Name</i>	e-Chart
<i>Version</i>	1.4

<i>Service Pack</i>	
<i>Hotfix</i>	
<i>Installation Date</i>	2011-01-01
<i>Use</i>	Acquisition
<i>Description</i>	4.09/4.02 1.22/1.22

<i>Manufacturer</i>	R2 Sonic
<i>Software Name</i>	R2 Sonic
<i>Version</i>	04/11/2012
<i>Service Pack</i>	rc2
<i>Hotfix</i>	
<i>Installation Date</i>	2012-04-23
<i>Use</i>	Acquisition
<i>Description</i>	MBES controller software for R@ Sonic 2024 SIM

A.8 Bottom Sampling Equipment

A.8.1 Bottom Samplers

A.8.1.1 Custum Clam Shell

<i>Manufacturer</i>	Custum
<i>Model</i>	Clam Shell
<i>Description</i>	4" penetration grab sample.



Figure : Bottom Sampler

B Quality Control

B.1 Data Acquisition

B.1.1 Bathymetry

B.1.1.1 Multibeam Echosounder

As per manufacture and NOAA protocols within the FPM and Specs and Deliverables.

At present this system is being used , primarily for development of contacts, and areas of specific interest.

This instrument is currently being validated for acceptance.

B.1.1.2 Single Beam Echosounder

As per manufacture and NOAA protocols within the FPM and Specs and Deliverables.

This is the primary sounding instrument being used. It is operated on 200kHz selection, 9° beam, and adjusted to provide best data quality.

B.1.1.3 Phase Measuring Bathymetric Sonar

Phase measuring bathymetric sonar bathymetry was not acquired.

B.1.2 Imagery

B.1.2.1 Side Scan Sonar

As per manufacture and NOAA protocols within the FPM and Specs and Deliverables. Primary instrument being used is the Edgetech4125. Operated normally on the 50-75m range scale and processing 900kHz data. 400kHz data is logged it is only processed and used where warranted by better quality data than the HF.

B.1.2.2 Phase Measuring Bathymetric Sonar

Phase measuring bathymetric sonar imagery was not acquired.

B.1.3 Sound Speed

B.1.3.1 Sound Speed Profiles

As per manufacture , and NOAA protocols within the FPM and Specs and Deliverables. Normal operation for VBES work are 1 cast acquired during each survey day, with a dual cast taken once per week for quality control method of "Compare 2 cast".

When MBES work is being conducted an opening day cast is taken, then a cast is taken each hour during operations, unless a more frequent interval is needed due to changing conditions, locations, or deviation of surface speed by more than 2m/s is noted.

Figure : NA

B.1.3.2 Surface Sound Speed

As per manufacture , and NOAA protocols within the FPM and Specs and Deliverables.

B.1.4 Horizontal and Vertical Control

B.1.4.1 Horizontal Control

Horizontal control data were not acquired.

B.1.4.2 Vertical Control

Vertical control data were not acquired.

B.1.5 Feature Verification

As per manufacture , and NOAA protocols.

Normal verification of existing features are performed by Hypack DP's. Items requiring High Accuracy position verification are positioned with the Trimble hand held GeoXH Receiver and the data is then imported into Pathfinder Office software, CORS corrected and exported.

B.1.6 Bottom Sampling

Bottom sample density is determined by the PI.

B.1.7 Backscatter

Backscatter data is logged when collecting MB and included in raw project data for branch processing.

B.1.8 Other

No additional data were acquired.

B.2 Data Processing

B.2.1 Bathymetry

B.2.1.1 Multibeam Echosounder

As per manufacture , and NOAA protocols within the FPM and Specs and Deliverables. The processing work flow example, is listed on the attached Processing Work Sheet used by NRT2. True Heave data is

applied during the SVP application process. When reviewing MBES data in 3-D editor a SSS.000 file is loaded as a background, created as a .000 export from Pydro of the SSS imagery contacts to help better ascertain the true contact position.

The raw data is converted and navigation and attitude data are examined in their respective editors. All correctors are applied (True Heave, Tides, Sound Velocity, Merged, then TPU). A base surface is created and tiles are created for validating the reviewed areas. Data is reviewed and edited within Subset editor, in both 2D and 3D views to remove flyers in the data sets not attributed to hard SSS contacts. At this point the "Find Designated Sounding" function is used over the contacts to flag the least depth obtained. Survey Bases are updated throughout the survey. Finalized Base Surfaces are created prior to submittal.

Figure : NA

B.2.1.2 Single Beam Echosounder

NOAA protocols, Field Procedures, and Specs and Deliverables were used as guidelines. The processing work flow example, is listed on the attached Processing Work Sheet used by NRT2.

Survey data for single beam is transferred to a removable hard drive on the launch and entered into the post processing system in the Office trailer. Vertical Beam sonar data is converted from Hypack format to CARIS format using the CARIS "Hypack" data converter. After conversion the data is opened in CARIS Attitude Editor, Navigation Editor, and Single Beam Editor. Vessel navigation data is manually checked for errors which are rejected with break interpolation. Attitude data are checked for errors or gaps. Sounding data are checked for irregular pings.

Survey personnel scan raw VBES soundings in CARIS Single Beam Editor. Any sounding questions are then compared directly to the sounders graphic record file (.bin) for edits required to validate or correct the values in question. Once VBES soundings are scanned the raw data is corrected by applying sound velocity, tides, and true heave then TPE values are applied and merged. The tide data is applied either by Pydro via TCARI, or Caris by a ZDF file.

Figure : NA

B.2.1.3 Phase Measuring Bathymetric Sonar

Phase measuring bathymetric sonar bathymetry was not processed.

B.2.1.4 Specific Data Processing Methods

B.2.1.4.1 Methods Used to Maintain Data Integrity

Consistent processing steps and review of all data continually through the survey. At the end of the Survey a final detailed review is conducted of all data for errors.

B.2.1.4.2 Methods Used to Generate Bathymetric Grids

VBES data only required one 4m base surface, uncertainty selected. A Finalized Base is generated to reflect critical soundings.

MBES data is processed as per NOAA 2013 FPW & HSSD's using CUBEParams_NOAA. A 0.5m base is generated and submitted with the survey.

B.2.1.4.3 Methods Used to Derive Final Depths

<i>Methods Used</i>	Surface Computation Algorithms
<i>Description</i>	No filtering was used during survey work processing for VBES or MBES. Records were compared to the BIN files for direct visual comparison to digital data and edits were made to correct any errors noted such as minor bottom loss or blowouts caused by biological, tidal, or man-made noise.

B.2.2 Imagery

B.2.2.1 Side Scan Sonar

All side scan sonar imagery is converted from JSF formats to CARIS format using CARIS JSF converters.

After conversion the data is opened in CARIS Navigation Editor, Attitude Editor, and Side Scan Editor. Survey personnel then check vessel attitude, cable out, gyro, and sonar height. Due to the higher rate of current data logging of position 25-50Hz some minor noise is present in the speed data, these are left unedited due to their insignificance. Data showing speed jumps may be rejected with interpolation. After confirming the validity of the vessel navigation, cable out, and towfish depth values survey personnel then use the "recompute towfish navigation" function to calculate towfish position. Side scan sonar data is examined in CARIS Side Scan Editor. Survey personnel correct errors in bottom tracking, slant range correct the imagery at 0.02m resolution and scan the data for significant contacts. Mosaics are then generated to show coverage at 30cm resolution. A 1m mosaic is created for submission.

Figure : None

B.2.2.2 Phase Measuring Bathymetric Sonar

Phase measuring bathymetric sonar imagery was not processed.

B.2.2.3 Specific Data Processing Methods

B.2.2.3.1 Methods Used to Maintain Data Integrity

Direct comparison between the 100% and 200% coverage, as well as MBES & VBES data.

B.2.2.3.2 Methods Used to Achieve Object Detection and Accuracy Requirements

NOAA protocols, Field Procedures, and Specs and Deliverables were used as guidelines.

B.2.2.3.3 Methods Used to Verify Swath Coverage

Mosaics generated overlaid on red chart background for any gaps. Typical line layout allows for 15-20m overlap

B.2.2.3.4 Criteria Used for Contact Selection

Hydrographer judgment and NOAA protocols, Field Procedures, and Specs and Deliverables were used as guidelines.

B.2.2.3.5 Compression Methods Used for Reviewing Imagery

No compression methods were used for reviewing imagery.

B.2.3 Sound Speed

B.2.3.1 Sound Speed Profiles

Sound Velocity profiles are acquired using two SVP profilers. Data quality assurance tests were performed by the “Compare two Profiles” method of two casts acquired at the same time with two different instruments.

Cast data is processed via Velocipy and the cast data is extended using "most probable slope" method. The cast to be used for the survey data is then exported to a Caris SVP file, concatenated and applied within Caris process " Apply SVP Cast".

B.2.3.1.1 Specific Data Processing Methods

B.2.3.1.1.1 Caris SVP File Concatenation Methods

By Survey Number. Each Survey has one SVP file named as the master file such as " H12345.SVP" which would contain all SVP cast for that survey.

Figure : None

B.2.3.2 Surface Sound Speed

Surface sound speed data were not processed.

B.2.4 Horizontal and Vertical Control

B.2.4.1 Horizontal Control

Horizontal control data were not processed.

B.2.4.2 Vertical Control

Vertical control data were not processed.

B.2.5 Feature Verification

NOAA protocols, Field Procedures, and Specs and Deliverables were used as guidelines.

Features assigned in the AFF are loaded into Hypack and processed in BDB.

Figure : None

B.2.6 Backscatter

Backscatter data were not processed.

B.2.7 Other

No additional data were processed.

B.3 Quality Management

NOAA protocols, Field Procedures, and Specs and Deliverables were used as guidelines. All data is reviewed by the Team Lead during and at the end of the survey for errors and completeness.

B.4 Uncertainty and Error Management

NOAA protocols, Field Procedures, and Specs and Deliverables were used as guidelines.

B.4.1 Total Propagated Uncertainty (TPU)

B.4.1.1 TPU Calculation Methods

Caris applied

B.4.1.2 Source of TPU Values

vessel config file entries (data obtained from NOAA and Manufacturers sources).

B.4.1.3 TPU Values

<i>Vessel</i>	NRT2_1210_SB		
<i>Echosounder</i>	Odom Hydrographic CV-2 200 kilohertz		
<i>TPU Standard Deviation Values</i>	<i>Motion</i>	<i>Gyro</i>	0.025 degrees
		<i>Heave</i>	5.000 % Amplitude
			0.050 meters
		<i>Pitch</i>	0.020 degrees
	<i>Roll</i>	0.020 degrees	
<i>Navigation Position</i>	1.000 meters		

	<i>Timing</i>	<i>Transducer</i>	0.000 seconds
		<i>Navigation</i>	0.010 seconds
		<i>Gyro</i>	0.010 seconds
		<i>Heave</i>	0.005 seconds
		<i>Pitch</i>	0.005 seconds
		<i>Roll</i>	0.005 seconds
	<i>Offsets</i>	<i>x</i>	0.01 meters
		<i>y</i>	0.01 meters
		<i>z</i>	0.01 meters
	<i>MRU Alignment</i>	<i>Gyro</i>	0.200 degrees
		<i>Pitch</i>	0.050 degrees
		<i>Roll</i>	0.050 degrees
	<i>Vessel</i>	<i>Speed</i>	0.030
		<i>Loading</i>	0.010 meters
		<i>Draft</i>	0.010 meters
		<i>Delta Draft</i>	0.010 meters
<i>Vessel</i>	NRT2_1210_R2_2024_MB		
<i>Echosounder</i>	R2 Sonic 2024 330 kilohertz		
<i>TPU Standard Deviation Values</i>	<i>Motion</i>	<i>Gyro</i>	0.025 degrees
		<i>Heave</i>	5.000 % Amplitude
			0.050 meters
		<i>Pitch</i>	0.020 degrees
	<i>Roll</i>	0.020 degrees	
	<i>Navigation Position</i>	0.5000 meters	
	<i>Timing</i>	<i>Transducer</i>	0.005 seconds
		<i>Navigation</i>	0.005 seconds
		<i>Gyro</i>	0.005 seconds
		<i>Heave</i>	0.005 seconds
		<i>Pitch</i>	0.005 seconds
<i>Roll</i>		0.005 seconds	
<i>Offsets</i>	<i>x</i>	0.01 meters	
	<i>y</i>	0.01 meters	
	<i>z</i>	0.01 meters	

<i>MRU Alignment</i>	<i>Gyro</i>	0.200 degrees
	<i>Pitch</i>	0.050 degrees
	<i>Roll</i>	0.050 degrees
<i>Vessel</i>	<i>Speed</i>	0.030
	<i>Loading</i>	0.010 meters
	<i>Draft</i>	0.010 meters
	<i>Delta Draft</i>	0.010 meters

B.4.2 Deviations

There were no deviations from the requirement to compute total propagated uncertainty.

Additional Discussion

All Tpu values for the "NRT2_1210_DP" vessel file are the same as the "SB" vessel file.

C Corrections To Echo Soundings

C.1 Vessel Offsets and Layback

C.1.1 Vessel Offsets

C.1.1.1 Description of Correctors

All Offsets are applied by the vessel config file values during processing.

C.1.1.2 Methods and Procedures

Caris process functions apply all correctors and offsets.

C.1.1.3 Vessel Offset Correctors

<i>Vessel</i>	NRT2_1210_SB
<i>Echosounder</i>	Odom Hydrographic CV-2 200 kilohertz
<i>Date</i>	2012-04-25

<i>Offsets</i>	<i>MRU to Transducer</i>	<i>x</i>	-0.186 meters
		<i>y</i>	2.175 meters
		<i>z</i>	0.343 meters
		<i>x2</i>	
		<i>y2</i>	
		<i>z2</i>	
	<i>Nav to Transducer</i>	<i>x</i>	-0.186 meters
		<i>y</i>	2.070 meters
		<i>z</i>	0.176 meters
		<i>x2</i>	
		<i>y2</i>	
		<i>z2</i>	
	<i>Transducer Roll</i>	<i>Roll</i>	0.000 degrees
		<i>Roll2</i>	
	<i>Vessel</i>	NRT2_1210_R2_2024_MB	
<i>Echosounder</i>	R2 Sonic 2024 330 kilohertz		
<i>Date</i>	2014-01-21		
<i>Offsets</i>	<i>MRU to Transducer</i>	<i>x</i>	1.554 meters
		<i>y</i>	0.726 meters
		<i>z</i>	0.775 meters
		<i>x2</i>	
		<i>y2</i>	
		<i>z2</i>	
	<i>Nav to Transducer</i>	<i>x</i>	1.554 meters
		<i>y</i>	0.726 meters
		<i>z</i>	1.194 meters
		<i>x2</i>	
		<i>y2</i>	
		<i>z2</i>	
	<i>Transducer Roll</i>	<i>Roll</i>	0.60 degrees
		<i>Roll2</i>	

C.1.2 Layback

Layback correctors were not applied.

C.2 Static and Dynamic Draft

C.2.1 Static Draft

C.2.1.1 Description of Correctors

Normal working load static draft value is entered into the vessel config file.

C.2.1.2 Methods and Procedures

Applied during standard application of the vessel config file to survey data.

C.2.2 Dynamic Draft

C.2.2.1 Description of Correctors

Post Processed in POSPAC

C.2.2.2 Methods and Procedures

Applied during standard application of the vessel config file to survey data. 4th order polynomial was used.

C.2.2.3 Dynamic Draft Correctors

<i>Vessel</i>	NRT2_1210_SB																
<i>Date</i>	2014-01-15																
<i>Dynamic Draft Table</i>	<i>Speed</i>	0	0.5	1	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5	6.0	6.5	7.0	7.5
	<i>Draft</i>	0 meters	0.01 meters	0.02 meters	0.03 meters	0.04 meters	0.05 meters	0.06 meters	0.07 meters	0.08 meters	0.09 meters	0.10 meters	0.11 meters	0.12 meters	0.13 meters	0.14 meters	0.15 meters

C.3 System Alignment

C.3.1 Description of Correctors

Hypack latency Test was conducted for the VBES.

C.3.2 Methods and Procedures

Derived value was entered into the Hypack Survey .ini file for direct application, as there is no corrector entry in Caris for this value. No change from previous year.

C.3.3 System Alignment Correctors

<i>Vessel</i>	NRT2_1210_R2_2024_MB
---------------	----------------------

<i>Echosounder</i>	R2 Sonic 2024 330 kilohertz	
<i>Date</i>	2014-01-21	
<i>Patch Test Values</i>	<i>Navigation Time Correction</i>	0 seconds
	<i>Pitch</i>	0 degrees
	<i>Roll</i>	0.60 degrees
	<i>Yaw</i>	0 degrees
	<i>Pitch Time Correction</i>	0 seconds
	<i>Roll Time Correction</i>	0 seconds
	<i>Yaw Time Correction</i>	0 seconds
	<i>Heave Time Correction</i>	0 seconds

C.4 Positioning and Attitude

C.4.1 Description of Correctors

Pos Pac data and true heave logged. Only the True Heave data were applied to all sounding data.

C.4.2 Methods and Procedures

Applied to post processed sounding data , by Caris process " Apply True Heave" function, during Apply SVP process.

C.5 Tides and Water Levels

C.5.1 Description of Correctors

TCARI and or ZDF zoning were used for all surveys, provided by COOP.

C.5.2 Methods and Procedures

Verified Tide at MLLW were applied to all sounding data by either Pydro or Caris.

C.6 Sound Speed

C.6.1 Sound Speed Profiles

C.6.1.1 Description of Correctors

All SVP cast were taken with a Digibar. These instruments are calibrated annually.

C.6.1.2 Methods and Procedures

Cast data is processed through Velocipy. The cast data is then exported to a single Survey SVP cast (Concatenated) and is applied by closest in time. Sound speed TPU was applied according to the 2013 FPM and HSSD. 4 m\|s was used because of the frequency of casts.

C.6.2 Surface Sound Speed

C.6.2.1 Description of Correctors

An AML Hydrographic Micro-X sound speed probe is attached to the outside of the R2Sonic MBES head.

C.6.2.2 Methods and Procedures

0.5 m\|s was used for surface sound speed TPU due to the manufacturer's recommendation.

