U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL OCEAN SERVICE

# Data Acquisition & Processing Report

*Type of Survey* HYDROGRAPHIC

*Project Number* OPR-B-301-NRT5-11

*Time Frame* APRIL-NOVEMBER

LOCALITY

*State:* RHODE ISLAND

*General Locality* Narragansett Bay

2011

CHIEF OF PARTY
LTJG MATTHEW NARDI, NOAA

LIBRARY & ARCHIVES

DATE

| NOAA FORM 77-28 U.S. DEPARTMENT OF COMMERCE (11-72) NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION | PROJECT NUMBER: |
|---|---|
| **HYDROGRAPHIC TITLE SHEET** | **OPR-OPR-B-301-NRT5-11** |

INSTRUCTIONS: The Hydrographic Sheet should be accompanied by this form, filled in as completely as possible, when the sheet is forwarded to the Office.

*State*: **Rhode Island**

*General Locality*: **Narragansett Bay**

*Sub-Locality*:

*Scale*: **1:10,000**

*Date of Survey*:
*Instructions Dated*: **4/11/2011**

*Project Number*: **OPR-OPR-B-301-NRT5-11**

*Vessel*: **NOAA NRT5, S3002**

*Chief of Party* : **LTJG Matthew Nardi, NOAA**

*Surveyed by*: **NOAA Navigation Response Team 5 Personnel**

*Soundings by*: **Kongsberg Simrad EM 3002 Multibeam Echosounder**

*Verification by*: **Pacific Hydrographic Branch Personnel**

*Soundings in*: **Meters at MLLW**

Remarks:
***1) All Times are UTC.***
***2) Projection is UTM Zone 19.***

# Table of Contents

APPENDICES

# DATA ACQUISITION & PROCESSING REPORT

OPR-OPR-B-301-NRT5-11
NOAA Navigation Response Team 5
LTJG Matthew Nardi, Team Lead, Processing and Submittal

## A. EQUIPMENT

### A.1. Vessels

A.1.1. S3002

NRT5 operated a single vessel, S3002 (see Fig. 1), a 30-foot (overall), gray, aluminum-hull SeaArk Commander. NOAA Survey Vessel S3002 is powered by dual 200-horse power Honda outboards. A Kohler 7.5e generator supplied AC power. A rack-mount APC Smart-UPS (uninterruptable power supply) provided battery backup for the survey-system electronics.

**Figure 1: NOAA S3002 (NRT5)**

*A.1.1.1. Calibration & Configuration*

See section C.1.1 for a description of the full vessel survey.

### A.2. Depth Measurement Equipment

A.2.1. Kongsberg Simrad EM3002 Multibeam Echosounder

S3002 is equipped with a hull-mounted Kongsberg EM3002 multibeam, which is located directly beneath the IMU. The EM3002 is a 300 kHz (nominal) system with a characteristic operating depth range of 1 to 150 meters water depth. Under ideal, cold water conditions, the range may extend to 200 meters. The swath width is 130°, and the nadir beam is 1.5° x 1.5°. The system has a maximum ping rate of 40 Hz. The processing unit (PU) performs beam forming and bottom detection and automatically controls transmit power, gain, and ping rate. The sonar processor incorporates real time surface sound speed measurements for initial beam forming and steering. SVP correction is also performed in real time. The Seafloor Information System (SIS) application, designed to run under Microsoft Windows, provides control and monitoring of the EM3002.

*A.2.1.1. Calibration & Configuration*

The installation and runtime parameter configuration files are included in Appendix IV (Electronic Appendix). See section C.1.3 for a description of the calibration patch test.

## A.3. Vessel Position and Orientation Equipment

A.3.1. <u>POS/MV Position & Orientation Sensor</u>

S3002 is equipped with an Applanix POS/MV 320 version 4. The POS/MV consists of dual Trimble BD960 GPS receivers (with corresponding Zephyr antennas), an inertial motion unit (IMU), and a POS computer system (PCS). The two antennas are mounted approximately 1.5 meters apart atop the launch cabin (see Fig. 2). The primary receiver (on the port side) is used for position and velocity, and the secondary receiver is used to provide heading information as part of the GPS azimuthal measurement sub-system (GAMS).


**Figure 2: POS/MV Antenna Installation**

The IMU contains three solid-state linear accelerometers and three solid state gyros, which together provide a full position and orientation solution. The IMU is mounted on the top of the sonar housing, beneath a removable deck plate (see Fig. 3).

**Figure 3: IMU Installation**

*A.3.1.1. Calibration & Configuration*

A GAMS calibration was performed on 5/26/2011, prior to data acquisition. The GAMS calibration report is included in Appendix II.

The POS/MV is configured, operated, and monitored via the POS/MV controller software, which is installed on the S3002 acquisition computer. The primary GPS-to-reference point lever arm was accounted for in the POS/MV controller. A POS/MV configuration file detailing lever arms, input/output settings, and operational settings is contained in Appendix IV (Electronic Appendix).

A.3.2. Trimble DSM212L DGPS Receiver

The POS/MV receives differential (RTCM) correctors from a Trimble DSM212L GPS receiver that includes a dual-channel low-noise MSK beacon receiver, capable of receiving U.S. Coast Guard (USCG) differential correctors. The DSM212L can also accept RTCM messages from an external source such as a user-established DGPS reference station, however, no such stations were established for OPR-B-301-NRT5-11.

*A.3.2.1. Calibration & Configuration*

Trimble's TSIP Talker was used to configure the DSM212L. The DGPS receiver was manually set to receive corrections from Acushnet, MA (306 kHz). The DSM212L is configured to go off-line if the age of DGPS correctors exceeds 20 seconds, and to exclude satellites with an altitude below eight degrees.

## A.4. Side Scanning Imagery Sonar

A.4.1. L-3 Klein System 3000

The L-3 Klein System 3000 includes the Model 3210 towfish with 300 PSI pressure sensor, 35m of

Kevlar reinforced tow cable, the Transceiver and Processing Unit (TPU) with VX Works operating system, and a Klein PC workstation with SonarPro. The Model 3210 towfish (fig 3) operates at a nominal frequency of 100/500 kHz and has a vertical beam angle of 40 degrees. Klein TPU contains a network card for transmission of the sonar data to the Klein acquisition computer. The acquisition software (SonarPro) is capable of saving raw data in SDF and/or XTF format.


**Figure 4: Klein 3000**

The SSS towfish is deployed from a davit arm located on starboard quarter using a Dayton electric winch spooled with approximately 30 meters of cable. Tow cable is lead from the winch upward along the davit arm. The tow cable at the winch is connected electro-mechanically to a deck cable through a slip ring assembly. Cable out is controlled manually and is computed by the DynaPro cable counter by the number of revolutions of the cable drum sheave. The cable counter data is transmitted to the SonarPro acquisition computer via serial connection.

Line spacing for side scan sonar (SSS) operations is determined by range scale. A towfish altitude of 8-20% of the range scale is maintained during data acquisition. Altitude is adjusted by cable out, and vessel speed.

Confidence checks are performed daily by observing changes in linear bottom features extending to the outer edges of the digital side scan image, features on the bottom in survey area, and by passing aids to navigation. Daily rub tests are also conducted.

## A.5. Sound Speed Equipment

S3002 is equipped with an Odom Digibar Pro surface sound speed sensor to measure surface sound speed, which is used in beam forming computations by the Kongsberg flat-face multibeam transducer head. For water column sound speed profiles NRT5 used an Odom Digibar Pro sound speed sensor and a Seabird SBE19+ CTD profiler. Speed of sound through water is determined by a minimum of one cast every four hours, in accordance with the NOS Specifications and Deliverables for Hydrographic Surveys. Daily Quality Assurance tests (DQA) between the surface and profile sound speed probes were performed using Velociwin. Full cast comparisons were also performed periodically.

### A.5.1. <u>Odom Digibar Pro – Surface Sound Speed</u>

Odom Digibar Pro serial# 98214 provided surface sound speed data to the flat-face EM3002 for beam steering and beam forming. The unit is mounted in a removable pole that is inserted into a bracket mounted on the transom between the two motors (see Fig. 5). The unit is configured to output an AML datagram to SIS, which is installed on the acquisition computer (see wiring diagram in Appendix II).

**Figure 5: Surface Sound Speed Digibar Installation**

### A.5.2. <u>Odom Digibar Pro – Profile Sound speed</u>

Odom Digibar Pro serial #98212, which has 25 meters of cable, is used to obtain sound speed profiles in water depths up to 25 meters. First, the Digibar profile data file is uploaded to the acquisition computer using Digibar software and processed using NOAA Velociwin software. The processing creates a series of files, including an *.asvp file, which is loaded into SIS for real-time sound speed ray tracing.

### A.5.3. <u>Seabird SBE19+ CTD Profiler</u>

Seabird SBE19+ serial #4835 is used to obtain sound speed profiles in waters deeper than 25 meters.

The raw profile data file is uploaded and processed with the acquisition computer using the NOAA Velociwin software. Velociwin generates an *.asvp file, which is loaded into SIS for real-time ray tracing. POST PROCESSING OF SOUND SPEED WAS NOT PERFORMED UNDER THE ACQUISITION SCHEME FOR OPR-B-301-NRT5-11.

A.5.4. Calibration & Configuration

Calibration reports for all three sound speed sensors are included in Appendix III.

## A.6. Data Acquisition Software

A complete list of software and versions is included in Appendix I.

A.6.1. Hypack Hysweep

Hypack Hysweep was used for all data logging, real-time data display, and navigation. Hypack and Hysweep hardware configuration files are included in Appendix IV (Electronic Appendix).

A.6.2. Applanix PosView

The Applanix POSView software was used to configure and monitor the Applanix PosMV, and to log PosPac files for post processing. The PosMV configuration file, which is created using POSView, is located in Appendix IV (Electronic Appendix).

A.6.3. Kongsberg SIS-Seafloor Information System

SIS was used to control the EM3002 MBES, which performed real-time motion and SVP correction.

A.6.4. SonarPro

SonarPro was used to control the Klein 3000, and to log side scan data, including cable out, position, and towfish depth.

## A.7. Data Processing Software

A.7.1. Caris HIPS

Caris HIPS was used to process all MBES data including tide correction, merging with navigation data, TPU calculation, data cleaning, and CUBE BASE surface creation. The Caris HVF file, which contains offsets and correctors applied in Caris, is located in Appendix IV (Electronic Appendix).

A.7.2. Caris SIPS

Caris SIPS was used to process all SSS data, including towfish height, slant range correction, recomputing towfish navigation, and selecting contacts. The Caris HVF file, which contains offsets and correctors applied in Caris, is located in Appendix IV (Electronic Appendix).

A.7.3. Hypack ENC Editor

Hypack ENC Editor was used for feature management and quality assurance.

A.7.4. Velociwin

Velociwin was used to process SVP casts, and for DQA tests. The .asvp files created by Velociwin were applied to the MBES data in real-time using SIS software.

A.7.5. Pydro
Pydro was used for feature management, DTON report generation, and tides requests.

# B. QUALITY CONTROL

## B.1. Multibeam Echosounder Data

B.1.1. Acquisition Operations
Mainscheme multibeam data were acquired using either planned lines, or a “paint-the-bottom,” or adaptive-line-steering approach, whereby the coxswain viewed a real-time coverage map in Hysweep and accordingly adjusted line steering to ensure adequate overlap. When gaps in coverage were found, holiday line plans were created using Mapinfo and exported as Hypack line files.

Sound speed casts were acquired as per HSSD section 5.2.3.3. The EM3002 system is designed to apply sound speed and attitude data in real-time. Because sound speed is applied real-time, a sound speed profile must be loaded into SIS before data acquisition. Currently, post-processing sound speed data in Caris is not possible.

B.1.2. MBES Processing Workflow
Multibeam processing for OPR-B-301-NRT5-11 was based on the BASE surface/directed-editing paradigm described in FPM section 5.2, Bathymetry Processing. The multibeam processing workflow had four main components: conversion, preliminary processing, surface generation, and surface review/data cleaning (see Fig. 6). Note that the surface generation and surface review/data cleaning steps are iterative.

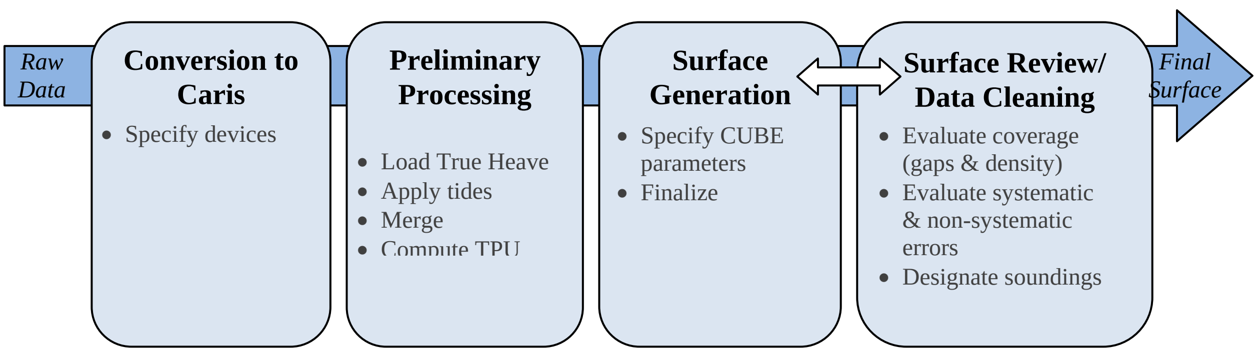


**Figure 6: Multibeam Processing Workflow**

*B.1.2.1. Conversion*

Raw multibeam .HSX data were converted to HDCS format in Caris HIPS. Device conversion parameters are shown in Figure 7.

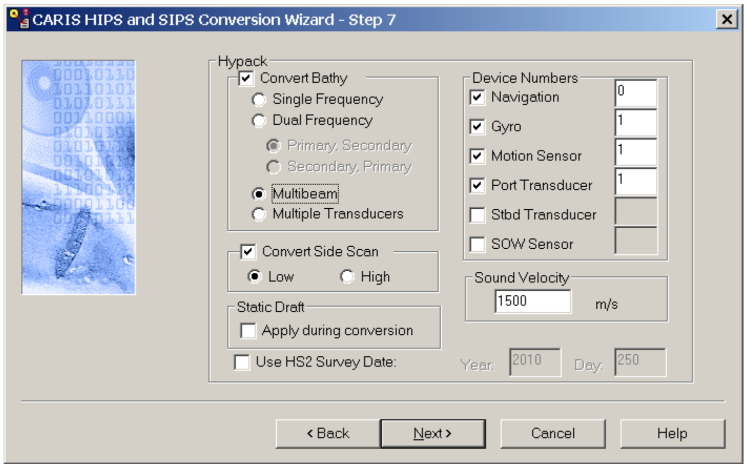


**Figure 7: Device Conversion Parameters**

*B.1.2.2. Preliminary Processing*

After conversion, preliminary processing consisted of applying True Heave, tide, merging, and computing total propagated uncertainty (TPU). Unlike with traditional NOAA hydrographic processing schemes, the converted data for OPR-B-301-NRT5-11 were corrected for sound speed in real time, and not in Caris post processing. The only correctors that were applied in Caris were True Heave, dynamic draft, patch test biases, and tide.

*Loading True Heave*

True Heave was loaded for each day of data. Occasionally the True Heave files need to be fixed using the Fix-True-Heave utility.

*Applying Tides*

Tide correction was performed using the TCARI grid method in Pydro. See section C.3 for a detailed description of the tide correctors for OPR-B-301-NRT5-11.

*Merging*

The merge process in Caris combines the observed depths (created during conversion) with the loaded tide file, the navigation data, the HVF draft sensor (containing dynamic draft values), and the HVF swath1 sensor (containing patch test biases) to compute the final processed depths. The "Apply refraction coefficients" and "Apply GPS tide" options were not checked, and no smoothed sensors were applied during the merge process.

*Computing TPU*

The TPU computation process assigns each sounding a horizontal and vertical uncertainty, or estimate of error, based on the uncertainties of the various data components, such as position, sound speed, and loading conditions. Table 1 lists the HVF TPU values used for OPR-B-301-NRT5-11.

**Table 1: TPU Values**

| *Data Component* | *TPU Value* | *Data Component* | *TPU Values* |
|---|---|---|---|
| Motion Gyro | 0.02° | X, Y, & Z Offsets | 0.01 m |
| Heave % Amplitude | 5% | Vessel Speed | 0.03 m/s |
| Heave | 0.05 m | Loading | 0.03 m |
| Roll | 0.02° | Draft | 0.03 m |
| Pitch | 0.02° | Delta Draft | 0.03 m |
| Position Nav | 1 m | MRU Align StdDev gryo | 0.2° |
| Timing Transducer | 0.01 s | MRU Align StdDev Roll/Pitch | 0.2° |
| Nav Timing | 0.01 s | Sound Speed Surface | 0.5 m/s |
| Gyro Timing | 0.01 s | Sound Speed Profile | 2.0 m/s |
| Heave Timing | 0.01 s | Tide measured | N/A* |
| Pitch Timing | 0.01 s | Tide zoning | N/A* |
| Roll Timing | 0.01 s | | |

*Note: Loading TCARI tides inserts the tidal uncertainty into the HDCS directory

*B.1.2.3. Surface Generation*

The multibeam sounding data were modeled using the CUBE BASE surface algorithm implemented in Caris HIPS. CUBE BASE surfaces were generated using the parameters outlined in Hydrographic Surveys Technical Directive 2009-02 (CUBE Parameters). The resolutions of the finalized surfaces were based on the complete MBES coverage resolution requirements specified in the Specs and Deliverables (5.2.2.2). The deeper limit of certain ranges was extended to avoid gaps between surfaces on particularly steep slopes.

*B.1.2.4. Surface Review/Data Cleaning*

Rather than a traditional line-by-line review and a full subset-cleaning, the data cleaning/quality review process for OPR-B-301-NRT5-11 consisted of a combination of the directed-editing approach described in FPM section 4.2.4.3, and a full subset-review (not full subset-cleaning). All the sounding data were viewed in subset, but unlike in the traditional workflow, where every sounding deemed to be “noise” is rejected, only the soundings that negatively impacted the CUBE surface were rejected. Surface review also consisted of evaluating achieved coverage and sounding density, checking for systematic errors, and designating soundings. Sounding designation was in accordance with Specs and Deliverable section 5.2.1.2.

## B.2. Sidescan Sonar Data

### B.2.1. <u>SSS Processing Workflow</u>

SSS processing for OPR-B-301-NRT5-11 was performed using Caris SIPS.

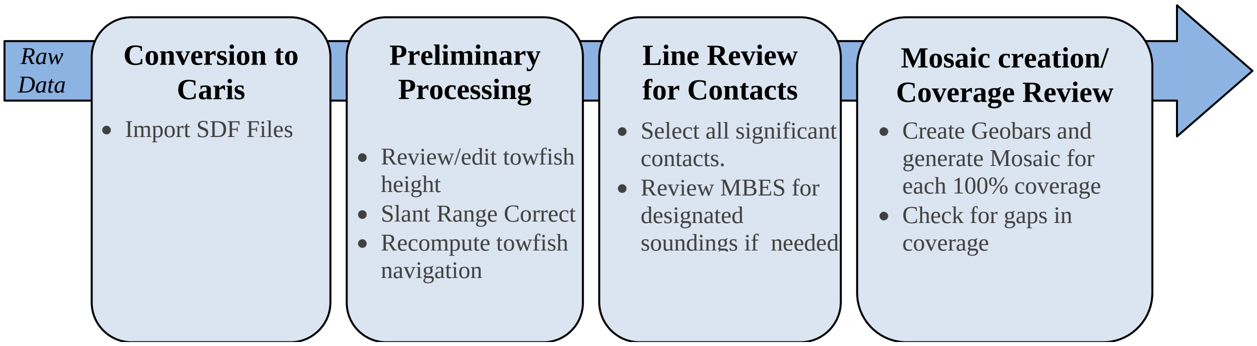


**Figure 8: SSS Processing Workflow**

#### *B.2.1.1. Data Conversion*

The SDF lines logged by SonarPro were brought into Caris SIPs using the Conversion wizard. Parameters selected are shown in the figure below.

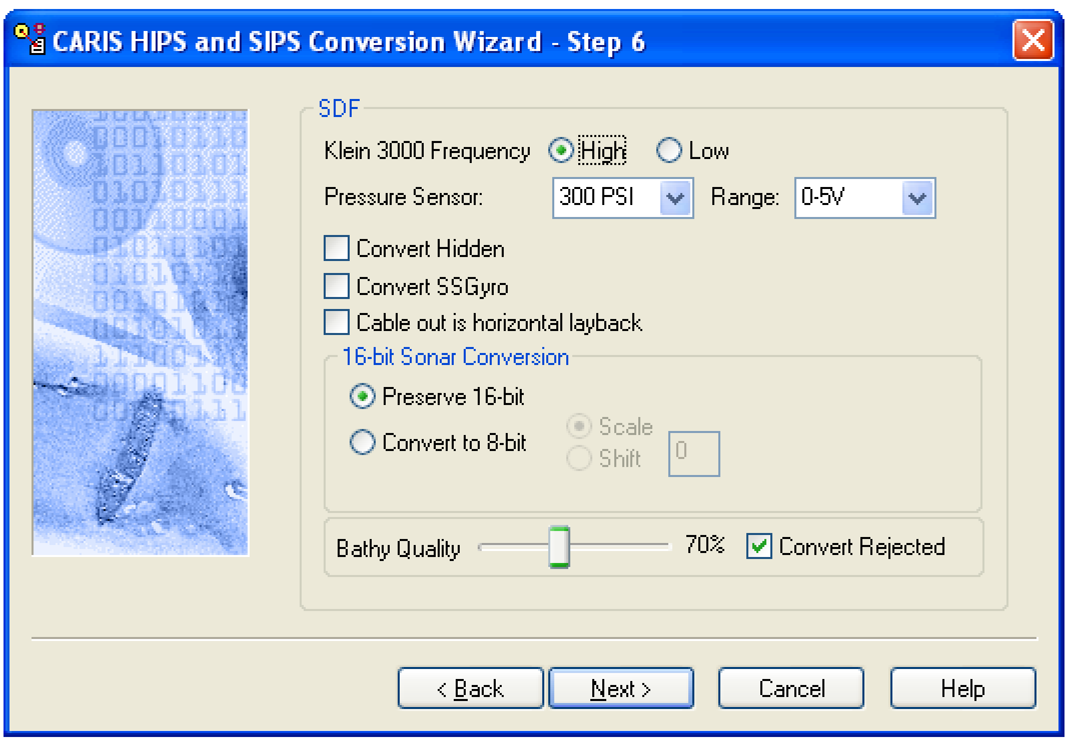


**Figure 9: Caris Conversion Wizard**

*B.2.1.2. Towfish height Digitization*

The towfish bottom tracking was reviewed for each line, and redigitized where needed.

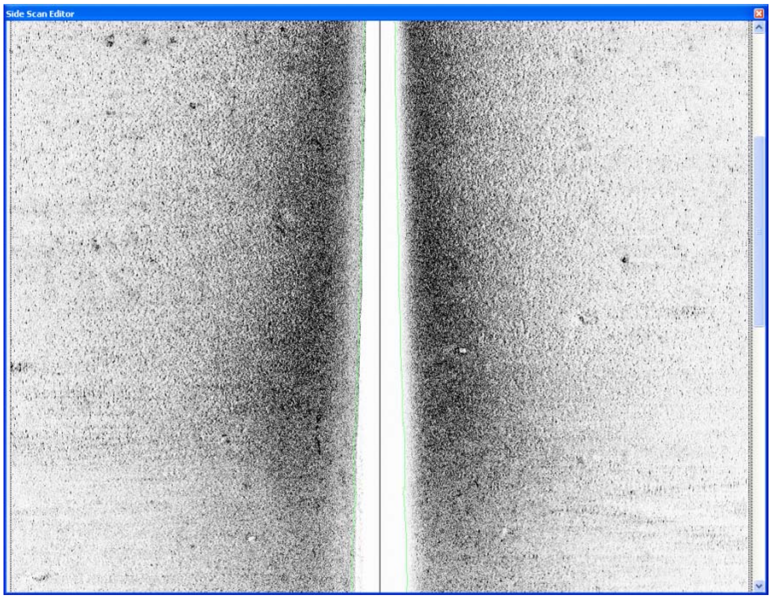


**Figure 10: Digitizing Towfish Height**

*B.2.1.3. Recompute Towfish Navigation*

Along with the sidescan imagery, SonarPro logs ship's navigation, cable-out, and towfish depth data. Recompute towfish navigation combines these three sensors to compute the position of the towfish in relation to the vessel. The process is needed for accurate positioning of contacts, and georeferencing of mosaics.

*B.2.1.4. SIPS Template Wizard*

SIPS Template wizard was used to batch process slant range correction, and the creation of geobars for each survey line. Once slant range corrected, the geographical position of contacts can be determined in Sidescan Editor.

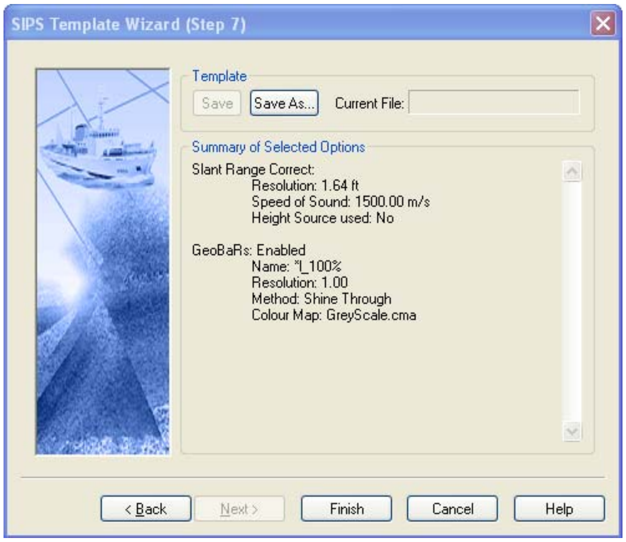


**Figure 11: SIPS Template Wizard**

*B.2.1.5. Line Review and Contact Selection*

Each line of SSS data was reviewed for possible contacts. Significant contacts were selected and exported to Pydro for correlation with MBES data.

*B.2.1.6. Creation of Mosaics*

The mosaics generated using SIP Template Wizard were combined to create mosaics. The mosaics were reviewed to determine areas that required additional coverage.

## B.3. Feature Data

Feature management consisted of one main workflow depicted in Figure 12. Bottom Samples, Designated Soundings and SSS contacts from Caris, Detached Positions from Hypack, and Digitized Features from Hypack ENC Editor were all inserted into Pydro as Features. Once in Pydro, each feature was evaluated, correlated with other features if appropriate, and given S-57 attribution.

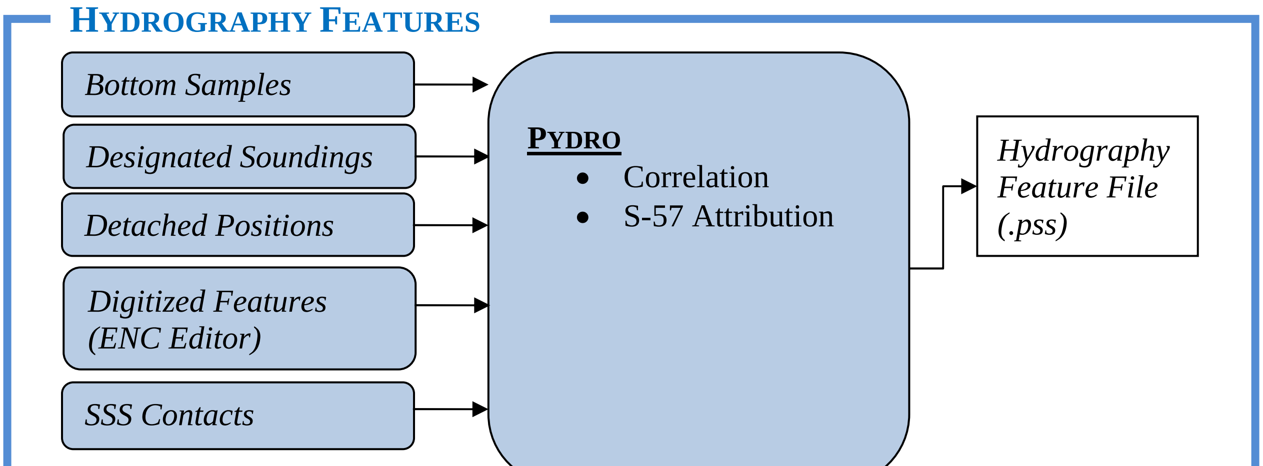


**Figure 12: Feature Management Workflow**

B.3.1. <u>Hydrography Features</u>

*B.3.1.1. Bottom Samples*

Bottom sample positions and attributes were acquired as Targets in Hypack, and then imported into Pydro as Features.

*B.3.1.2. Designated Soundings*

The least depth of charted features and significant uncharted features were flagged “designated” in Caris HIPS to ensure that the depth was portrayed in the final BASE surface. Soundings that were flagged designated were then imported into PYDRO as bathymetric features. Once in PYDRO, these bathymetric features were correlated with ENC GPs, and given the appropriate S-57 attribution.

*B.3.1.3. Detached Positions (DPs)*

Features for which the least depth or position could not be derived from the bathymetry data were defined based on a range and bearing, or detached position (DP), relative to the vessel position. DPs were created as Hypack targets and then imported into Pydro.

*B.3.1.4. Digitized Features*

New or modified area features were digitized in Hypack ENC Editor, and inserted into Pydro as ENC GPs

*B.3.1.5. SSS Contacts*

Significant SSS contacts imported into Pydro from Caris SIPS are typically correlated with a MBES least depth designated sounding.

B.3.2. <u>Shoreline Features</u>

Shoreline point features were acquired as Hypack DPs, and inserted into Pydro. Submerged ruins which fell within MBES coverage were digitized manually in Hypack ENC Editor, and then inserted into Pydro.

## C. CORRECTIONS TO ECHO SOUNDINGS

The following section describes the determination and evaluation of the three main categories of corrections to echosoundings: vessel, sound speed, and water level correctors.

### C.1. Vessel Correctors

Vessel correctors include static offsets, dynamic offsets, and patch test biases. The various correctors are applied to echo soundings at different points throughout the data pipeline, which is detailed in the sections below.

C.1.1. <u>Static Offsets</u>

*C.1.1.1. Vessel Lever-Arms*

The National Geodetic Survey conducted a full vessel survey on 8/4-8/5/09 in Newport, RI (see Appendix II for the NGS report). The primary-GPS-to-Reference-Point lever arm is accounted for in the POS/MV controller. The Reference-Point-to-Multibeam-Transducer lever arm is accounted for in Caris.

*C.1.1.2. Static Draft*

A static draft measurement was performed in May 2011 in Newport, RI. To determine the static draft (i.e., the height of the waterline above/below the reference point), a straight rod long enough to overhang the boat on each side was laid across the gunwales directly above the IMU. Measurements were taken with a tape measure from the rod to the water line on each side of the boat, and from the rod to the top of the IMU (RP). The port and starboard water line measurements were averaged, and then subtracted from the rod-to-IMU measurement to determine the separation between the reference point and water line.

**Figure 13: Static Draft Measurement**

C.1.2. Dynamic Offsets

The dynamic draft values were obtained in May 2011 prior to data acquisition. The dynamic draft measurements were obtained with an optical level positioned on shore using the methods described in section 1.4.2.1.2.1 of the NOAA Field Procedures Manual. Two independent tests conducted on different days, 5/17/2011 and 5/27/11, showed excellent correlation, and the average of the two tests were taken as the final values. The dynamic correctors are summarized in Table 2. A positive draft corrector implies that the boat moved down.

**Figure 14: Dynamic Draft Optical Level Setup**

**Table 2: 2011 Dynamic Draft Values**

| Speed (m/s) | Draft Correction (m) |
|---|---|
| 1.055 | 0.001 |
| 1.556 | -0.018 |
| 2.907 | 0.019 |
| 3.408 | 0.015 |
| 4.308 | 0.056 |
| 5.723 | -0.006 |

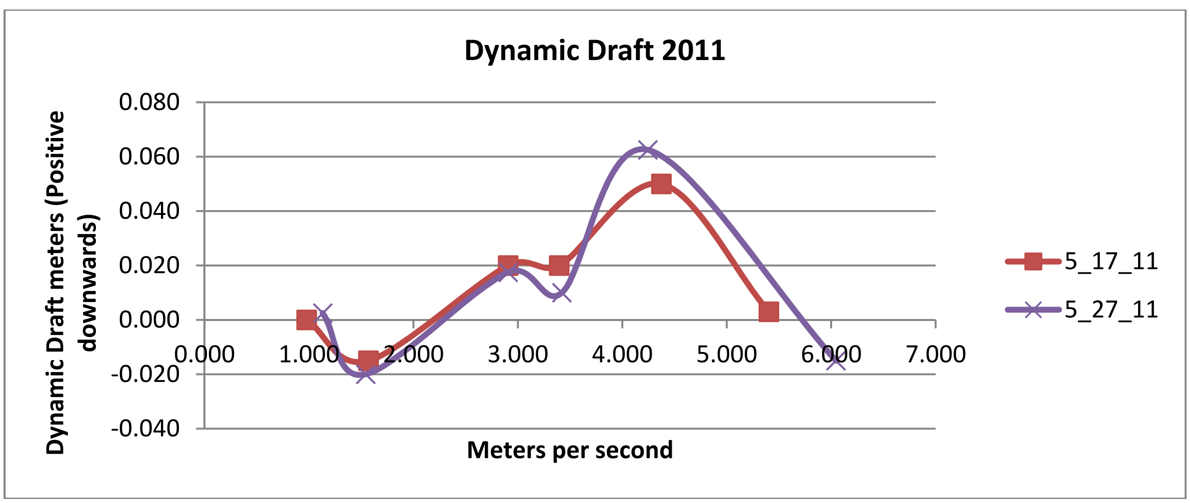


**Figure 15: Dynamic Draft Plot**

C.1.3. Patch Test Biases

A patch test was performed on 5/26/11 (DN 146), in the East Passage near Newport, RI (see Fig. 10). A charted wreck in 107 ft of water was located and used as the calibration target. The timing offset was determined using the conventional method, rather than the “precise timing” method. The derived biases (summarized in Table 3), were entered into the Swath1 sensor of the Caris HVF and therefore were applied to the data during the merge step of post-processing.

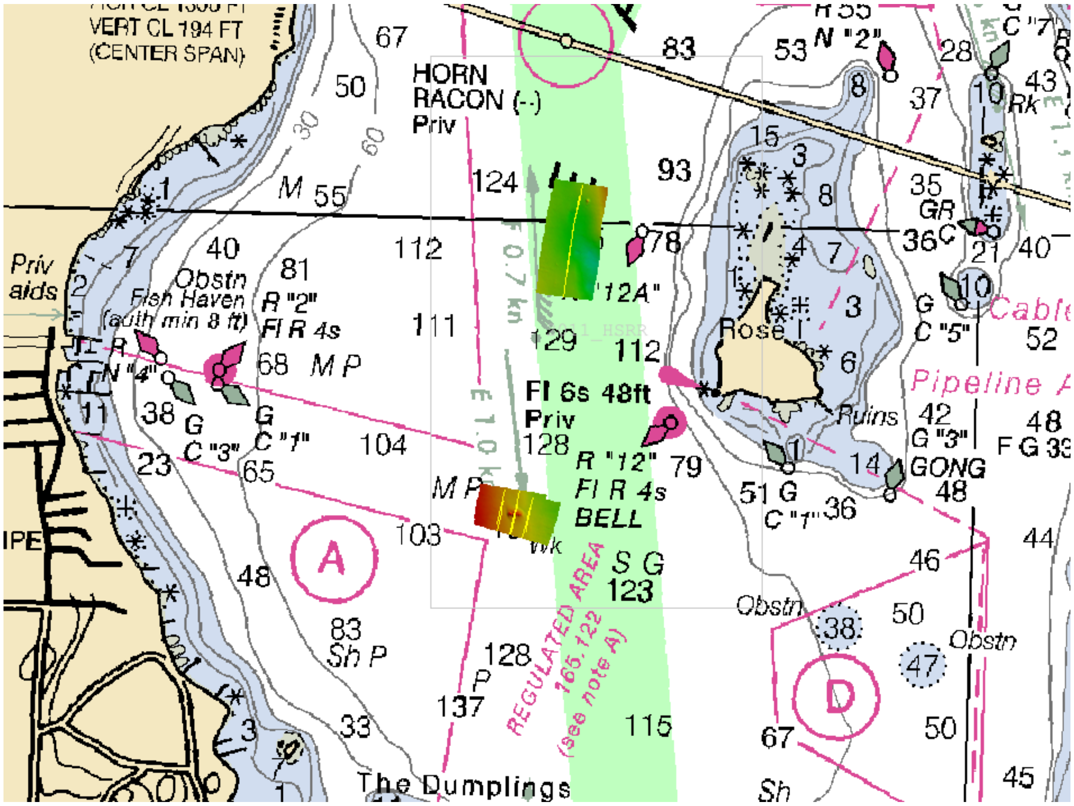

**Figure 16: Patch Test Location (Charted depths are in feet)**

**Table 3: Patch Test Values**

| Bias | Estimate |
|---|---|
| *Navigation Timing* | 0.000 |
| *Pitch* | 0.020 |
| *Roll* | -0.081 |
| *Heading (Yaw)* | -0.740 |

## C.2. Sound Speed

Sound speed corrections were performed in real-time by the EM3002 controller software, SIS. Casts were taken, at a minimum, every four hours as per NOS Specifications and Deliverables for Hydrographic Surveys.

## C.3. Water Level Corrections

Tide corrections for OPR-B-301-NRT5-11 were applied using the TCARI grid file B301NRT52011.tc in Pydro, in accordance with the TCARI SOP provided with the project instructions.

Tide data were downloaded automatically from the Center for Operational Oceanographic Products and Services (CO-OPS) using the Download WL data function in Pydro, and applied to the Caris Hips PVDL lines.

APPROVAL SHEET

**Data Acquisition & Processing Report**
**Navigation Response Team 5**

As Chief of Party, I have ensured that surveying and processing procedures were conducted in accordance with the Field Procedures Manual and that the submitted data meet the standards contained in the 2011 Hydrographic Surveys Specifications and Deliverables.

I acknowledge that all of the information contained in this report is complete and accurate to the best of my knowledge.

Respectfully,

Matthew Nardi
I attest to the accuracy and integrity of this document
2012.05.02 19:58:10 -04'00'

LTJG Matthew Nardi
Team Lead, NOAA NRT-5

# Appendices

# Appendix I – System Tracking

## Hydrographic Vessel Inventory

Field Unit: NRT5

Effective Date: 15-April-2009

Updated Through: 17-MAY-2011

| SURVEY VESSEL | |
|---|---|
| Vessel Name | NOAA NRT5 |
| Hull Number | S3002 |
| Call Letters | |
| Manufacturer | SeaArk Marine Inc., Portobello AK |
| Year of Construction | 2003 |
| Type of Construction | Welded Aluminum |
| Length Overall | 9.65 m (31'8") |
| Beam | 2.58 m (8'6") |
| Draft | |
| Date of Effective Full Vessel Static Offset Survey | 1-Jan-09 |
| Organization which Conducted the Effective Full Offset Survey | NGS |
| Date of Last Partial Survey or Offset Verification & Methods Used | |
| Date of Last Static Draft Determination & Method Used | May-2010 Tape Measure |
| Date of Last Settlement and Squat Measurements & Method Used | 17-MAY-2011 - Optical Method |
| Additional Information | |

# Hydrographic Hardware Inventory

Field Unit: NRT5

Effective Date: 15-Apr-09

Updated Through: 1-Jun-10

| Equipment Type | Manufacturer | Model | Serial Number | Firmware and/or Software Version | Version Install Date | Date of last Calibration | Date of last Service | Additional Information |
|---|---|---|---|---|---|---|---|---|
| **SONAR & SOUNDING EQUIPMENT** | | | | | | | | |
| Multibeam Echosounder | Kongsberg Simrad | EM3002 | 563 | SIS | | | | 256 Beams 1.5° x 1.5° Resolution |
| Side Scan Sonar | Klein | System 3000 | TPU:348, Towfish: 457 | SonarPro 11.3 | | | | |
| Verticalbeam Echosounder | Odom | Echotrac CV-200 | 23034 | Odom Controller | | | | |
| | | | | | | | | |
| **POSITIONING & ATTITUDE EQUIPMENT** | | | | | | | | |
| GPS Aided Inertial Naviation | Applanix | POS/MV 320 V4 | | | | | | |
| DGPS Reciever | Trimble | DSM212L | O220309909 | | | | | |
| | | | | | | | | |
| **SOUND SPEED MEASUREMENT EQUIPMENT** | | | | | | | | |
| Sound Speed Profiler | Odom | Digibar Pro | 98212 | | | | | |
| Surface Sound Velocimeter | Odom | Digibar Pro | 98214 | | | | | |
| CTD | | | | | | | | |
| **TIDES & LEVELING EQUIPMENT** | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| **HORIZONTAL AND VERTICAL CONTROL EQUIPMENT** | | | | | | | | |
| GPS Handheld | Trimble | GeoXH | 4928419535 | 5.2.6 (Build 912) | 5-Feb-09 | n/a | n/a | CPU Type: Marvell, ARM920T-PXA27x; RAM:128MB; GPS |
| GPS External Antenna | Trimble | Zephyr | 60269191 | n/a | n/a | n/a | n/a | P/N: 39105-00 DC 4921 |
| | | | | | | | | |
| **OTHER EQUIPMENT** | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

## Hydrographic Software Inventory

Field Unit: **NRT5**
Effective Date: **15-Apr-09**
Updated Through: **10-Nov-10**

| **COMPUTERS** | | | | | | |
|---|---|---|---|---|---|---|
| **Machine Name** | NOAA-46BD3724C | OCS-W-NSD613020 | OCS-W-NSD670262 | OCS-S-NSD716664 | CD0001755358 | OCS-W-NSD716701 |
| Location | Office Trailer | Office Trailer | Office Trailer | Office Trailer | Office Trailer | S3002 |
| Make/Model | Dell Precision WorkStation T3400 | Dell Precision WorkStation T3400 | Dell XPS 630i | Dell PowerVault NF 100 | Dell Latitude D820 | Dell XPS 630i |
| Date Purchased | 2008* | 2008* | 2010* | 2009* | 2006* | 2010* |
| Processor, Speed | Intel®Core™2 Quad CPU, 2.66GHz | Intel®Core™2 Quad CPU, 2.66GHz | Intel®Core™2 Q9650, 3.00GHz | Intel®Celero®2 CPU, 1.66GHz | Intel®Core™2 CPU, 2.16GHz | Intel®Core™2 Q9650, 3.00GHz |
| RAM | 3070MB | 3070MB | 3326MB | 2048MB | 2046MB | 3326MB |
| Video Card | NVIDIA Quadro FX 1700 | NVIDIA Quadro FX 1700 | NVIDIA GeForce GTX 285 | Standard VGA Graphics Adapter | NVIDIA GeForce Go 7300 | NVIDIA GeForce GTX 285 & 8400 GS |
| Video RAM | 512MB | 512MB | 1024MB | none | 256MB | 1024MB |
| Service Tag # | 6F9YDG1 | 28PJ2H1 | 664MMK1 | J6C1WK1 | 422MRB1 | |
| Comments | | | | | | |
| **OPERATING SYSTEM:** | | | | | | |
| Windows XP | Version 2002, SP3 | Version 2002, SP3 | Version 2002, SP3 | | Version 2002, SP3 | Version 2002, SP3 |
| Windows Server | | | | Version 2003 | | |
| **ACQUISITION SOFTWARE:** | | | | | | |
| Hypack 2010 | n/a | n/a | n/a | n/a | n/a | |
| Kongsberg SIS | n/a | n/a | n/a | n/a | n/a | |
| SonarPro | v11.2 | v11.3 | not installed | not installed | v9.6 | |
| Odom Controller | n/a | n/a | n/a | n/a | n/a | |
| Velociwin | | | | | | |
| **PROCESSING SOFTWARE** | | | | | | |
| CARIS HIPS and SIPS | v7.0.2, SP2 | v7.0.2, SP2 | v7.0.2, SP2 | not installed | v7.0.1, SP1 | |
| MapInfo | v9.0.2 | v10.0.1 | v10.0.1 | not installed | v10.0.1 | |
| Pydro | v10.9 (r3020) | v10.9 (r3020) | v10.9 (r3020) | not installed | v10.9 (r3020) | |
| Applanix POSPac MMS | v5.3 | v5.3 | v5.3 | not installed | not installed | |
| **SUPPORT SOFTWARE** | | | | | | |
| Office Suite | Office 2007 | Office 2007 | Office 2007 | not installed | Office 2000 | Office 2007 |
| Adobe Acrobat 8 | installed | installed | installed | not installed | installed | not installed |
| **SOFTWARE LICENSES** | | | | | | |
| Odom Digibar Pro Log | n/a | n/a | n/a | n/a | n/a | |
| SeaTerm | n/a | n/a | n/a | n/a | n/a | |
| **Processing** | | | | | | |
| Caris | Caris Key Serial Numbers: CW9604114, CW9604216, CW9605759 (HQ's key) | | | | | |
| Pydro | c240b6cdda43aaed64 | c240b6cdd8d3193876 | 2129f804f649b10c74 | not installed | b2c61c7b7de351f18b | not installed |
| GPS Pathfinder Office | Installation Code: 001615-00300-10258-E73100AD | | | | | |
| MapInfo | Serial Number: MINWEU0900013988 | | | | | |
| Applanix POSPac MMS | Key Serial Number: 2797 (this is a 2-key set, with the other USB key numbered 7959) | | | | | |

# Hydrographic Personnel Roster

Field Unit: NRT5
Effective Date: 15-Apr-09
Updated Through: 1-Jun-11

## Team Members

| Name and Grade | Current Position | Years of Hydro Experience | Notes |
|---|---|---|---|
| Matt Nardi LTJG | Team Lead | 3.0 | |
| Matt Andring | PST | 3.0 | Honorary Son of Moose Island |
| Philip Sparr | PST | 3.0 | |
| | | | |
| | | | |

## NOTES:

# Appendix II - Vessel Reports, Offsets, and Diagrams

# Appendix III – Calibration

# Appendix IV – Electronic Appendix

The Electronic Appendix contains digital files meant to accompany the report body. It is submitted as a .zip file located in the *Appendix4-ElectronicAppendix* folder.