

NOAA FORM 76-35A U.S. DEPARTMENT of COMMERCE NATIONAL OCEANIC and ATMOSPHERIC ADMINISTRATION NATIONAL OCEAN SERVICE Horizontal and Vertical Control Report
<i>Type of Survey:</i> <u>Multibeam and Side Scan Sonar</u> <i>Project No.</i> <u>OPR-C303-KR-06</u> <i>Time Frame:</i> <u>3 May 2006 – 15 September 2006</u>
LOCALITY <i>State:</i> <u>New Jersey</u> <i>General Locality:</i> <u>Atlantic Ocean</u> <u>2006</u> CHIEF of PARTY <i>Paul L. Donaldson</i> <u>Science Applications International Corporation</u>
LIBRARY & ARCHIVES DATE: _____

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A. VERTICAL CONTROL

For H11536, the NOAA tide station in Atlantic City, NJ (8534720) was the source for verified water level heights for the Mid-Atlantic Corridor, Coast of New Jersey surveys. All preliminary and verified tides obtained for the 2006 survey season were downloaded from the National Oceanic and Atmospheric (NOAA) Tides and Currents website (<http://tidesandcurrents.noaa.gov/>). All tide data are annotated with Coordinated Universal Time (UTC).

Final water level files for each tide zone were created from downloaded verified tide data using the **SABER Create Water Level Files** tool. Water level files contained water level heights that were algebraically subtracted from depths to correct the sounding for tides and water levels. These water level files were applied to the multibeam data using the **SABER Apply Tides** program.

When it was necessary to apply updated tide correctors such as verified water levels to the GSF files, the program removed the previous tide corrector and applied the new corrector. Each time a processing routine was run on the GSF multibeam data file, a history record was appended to the end of the GSF file. For quality assurance, the **Check Tides** program was run on all GSF files to confirm that the appropriate water level corrector had been applied to the GSF file.

For all sheets, the primary means for analyzing the adequacy of zoning was observing zone boundary crossings in the navigated swath editor, SAIC's **Multi View Editor (MVE)**. In addition, sun illuminated coverage plots were examined on screen for adequacy of zoning. Grid display color change intervals were set to draw out any significant, unnatural changes in depth across zone boundaries due to water level correction errors, unusual currents, storm surges, etc. Cross line comparisons were used to analyze zoning for the influence of wind and weather.

H11536 survey was entirely within the water level zones for Atlantic City, NJ (8534720). Analysis of the H11536 multibeam data in the **SABER Multi-View Editor** and in depth grids revealed minimal depth jumps across the junction of the zones. A spreadsheet analysis of the correctors for each zone (summarized in Table A-1) also confirmed the adequacy of zoning correctors based on Atlantic City, NJ (8534720). Observed verified water levels from 3 May 2006 through 15 September 2006 for station Atlantic City, NJ (8534720) were entered in the spreadsheet. Correctors were computed at 6-minute intervals for each zone. Differences were computed zone to zone. As a result, the NOAA provided preliminary zone boundaries and zoning parameters for Atlantic City (8534720) were accepted as final and applied to all multibeam data for H11536. Therefore, the NOAA zoning parameters were used to develop the water level correctors for soundings on sheet H11536. The zoning parameters applied on sheet H11536 are presented in Table A-2.

Table A-1. Summary of Verified Tide Correctors at Zone Boundaries for Atlantic City (8534720)

Zones	13-14	14-15	15-16	16-13
Maximum	0.640	0.717	0.077	0.430
Minimum	-0.473	-0.400	-0.009	-0.651
Average	-0.042	0.008	0.033	0.000
Standard Deviation	0.039	0.032	0.018	0.052

Table A-2. Water Level Zoning Parameters Applied on Sheet H11536

Zone	Time Corrector (minutes)	Range Ratio	Reference Station
SA13	-12	1.02	8534720
SA14	-6	1.07	8534720
SA15	0	1.06	8534720

B. HORIZONTAL CONTROL

The survey data were collected in horizontal datum NAD-83, using geodetic coordinates, while data display and products used the UTM Zone 18 projection. The following equipment was used for positioning on the *M/V Atlantic Surveyor*:

- TSS POS/MV, Serial Number 314
- Trimble 4000 DS GPS Receiver, Serial Number 3504A09516

All antenna and transducer offsets were measured relative to the Position Orientation System/Marine Vessel (POS/MV) Inertial Measurement Unit (IMU). Offsets from the Reson 8101 transducer were then computed from these measurements. The POS/MV offsets Reference to Vessel are the same as the Reference to Reson 8101 transducer so that the vessel positions in the GSF multibeam files are the position of the transducer. Therefore, vessel offsets to the Trimble GPS antenna and to the A-Frame Tow Block are entered in the ISS-2000 as offsets from the Reson 8101 transducer. Tow Block Z is entered as height above the water for use in computing the tow fish layback. During the remobilization of the *M/V Atlantic Surveyor* in 2006, all antenna and transducer offsets were re-measured. The 2006 results are depicted in Table B-1 and Figure B-1.

Table B-1. 2006 M/V Atlantic Surveyor Antenna and Transducer Offsets (measurements in meters with 68% CI measurement errors)

Sensor	Offset in ISS-2000		Offset in POS/MV	
Multibeam Reson 8101 Transducer Hull Mount (Ref to vessel lever arm)			X	-0.34 ±0.05
			Y	-0.12 ±0.05
			Z	+1.64 ±0.05
Reference to Heave (Ref to IMU lever arm)			X	0.00
			Y	0.00
			Z	0.00
POS/MV GPS Master Antenna (Ref to primary GPS lever arm)			X	4.24 ±0.05
			Y	-0.66 ±0.05
			Z	-6.37 ±0.05
Reference to Vessel			X	-0.34 ±0.05
			Y	-0.12 ±0.05
			Z	+1.64 ±0.05
Trimble GPS Antenna	X	+4.59 ±0.05		
	Y	+0.46 ±0.05		
	Z	-8.02 ±0.05		
A-Frame Tow Block (Z = Height above the Water)	X	-19.56 ±0.15		
	Y	+0.52 ±0.15		
	Z	-4.87 ±0.15		

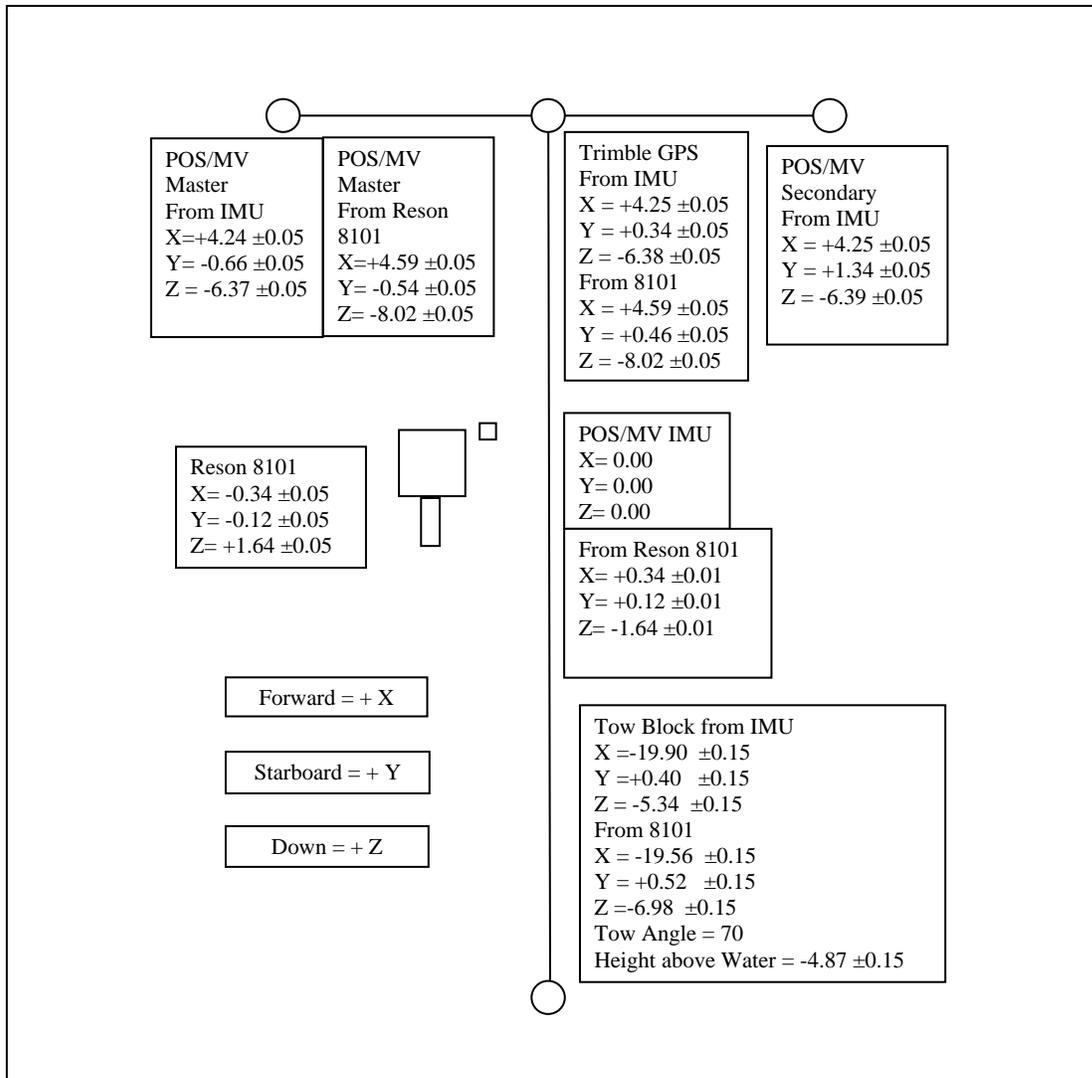


Figure B-1. 2006 Configuration and Offsets of the M/V Atlantic Surveyor Sensors (measurements in meters with 68% CI measurement errors)

Daily position confidence checks were made by comparing the DGPS position from the POS/MV with the Trimble DGPS position. A real-time monitor automatically issued an alarm when the two DGPS positions differed by more than 10 meters horizontally. Positioning confidence checks were well within an inverse distance of 5 meters.

Differential correctors used for H11536 online data were from the U.S. Coast Guard Stations at Annapolis, MD, Reedy Point, DE, and Sandy Hook, NJ. The differential receiver was set to only receive data from these three corrector stations. No other stations were reported or used by the POS/MV during H11536 data collection.

Table B-2. Positional Difference between vessel positions determined by the POS/MV and the Trimble 4000 on the *M/V Atlantic Surveyor*

Year	Julian Day	Sheet ID	Time of Day (UTC)	Positional Difference (m)
2006	123	L	0639	0.84
2006	124	L	0206	0.63
2006	125	L	1957	0.71
2006	126	L	0600	0.59
2006	127	L	0602	1.00
2006	128	L	0201	0.42
2006	130	L	2235	0.58
2006	131	L	0153	0.75
2006	133	L	0400	0.82
2006	134	L	0205	0.69
2006	135	L	0228	1.30
2006	136	L	0400	0.97
2006	137	L	0410	1.54
2006	138	L	0200	0.93
2006	139	L	0401	0.90
2006	140	L	0420	1.15
2006	141	L	0204	0.45
2006	143	L	0937	0.56
2006	144	L	0145	0.89
2006	145	L	0141	0.96
2006	146	L	0354	1.24
2006	147	L	0354	1.28
2006	148	L	0200	1.55
2006	149	L	0442	0.63
2006	250	L	0400	0.87
2006	251	L/A/B	1134	1.34
2006	258	L	0334	0.44

C. APPROVAL SHEET

07 August 2007

LETTER OF APPROVAL

REGISTRY NUMBER: H11536

This Horizontal and Vertical Control report for project OPR-C303-KR-06, Mid-Atlantic Corridor, Coast of New Jersey Project is respectfully submitted.

Field operations and data processing contributing to the accomplishment of this survey, H11536 were conducted under supervision of myself and lead hydrographer Gary R. Davis with frequent personal checks of progress and adequacy. This report has been closely reviewed and is considered complete and adequate as per the Statement of Work.

Reports concurrently submitted to NOAA for this project include:

<u>Report</u>	<u>Submission Date</u>
Descriptive Report	07 August 2007
Data Acquisition and Processing Report	07 August 2007

SCIENCE APPLICATIONS INTERNATIONAL CORPORATION

Paul L. Donaldson
Lead Hydrographer
Science Applications International Corporation
07 August 2007