

## **TIDES AND WATER LEVELS**

NOAA tide station in Atlantic City (8534720), NJ was the source of final verified water level heights for the Mid-Atlantic Corridor, Coast of New Jersey surveys. Preliminary and verified tide data for this station were downloaded from the NOAA CO-OPS web page (<http://co-ops.nos.noaa.gov>). All tide data in meters were 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 within the **SABER** software.

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 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.

After confirmation that verified water levels were applied to all multibeam data, grids were created and analyzed using various color change intervals. The color intervals provided a means to check for significant, unnatural changes in depth across zone boundaries due to water level correction errors, unusual currents, storm surges, etc.

The primary means for analyzing the adequacy of zoning was observing zone boundary crossings in the navigated swath editor, SAIC's **MVE**. In addition, cross line analysis using SAIC's **Analyze Crossings** software was used to identify possible depth discrepancies resulting from the applied water level corrector. Discrepancies were further analyzed to determine if they were the result of incorrect zoning parameters or weather (wind) conditions between the tide station and the survey area. The NOAA provided preliminary zone boundaries and zoning parameters are presented in Table C-6.

**Table C-6. Preliminary Tide Zone Parameters**

Zone	Time Corrector (mins)	Range Ratio	Reference Station
SA13	-36	0.87	8531680
SA14	-36	0.91	8531680
SA15	-36	0.91	8531680
SA16	-30	0.88	8531680
SA17	0	1.01	8534720
SA18	+12	0.97	8534720
SA21	0	0.97	8534720
SA22	-12	0.97	8534720

**Final Tide Note**

H11455 survey was entirely within the water level zones for Atlantic City, NJ (8534720). Analysis of the H11455 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 C-7) also confirmed the adequacy of zoning correctors based on Atlantic City, NJ (8534720). Observed verified water levels from 01 August 2005 through 30 November 2005 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 H11455.

**Table C-7. Summary of Verified Tide Correctors at Zone Boundaries for Atlantic City (8534720)**

Zones	17-18	16-17	15-16	14-15	13-14
Maximum	0.173	0.005	0.019	0.177	0.104
Minimum	-0.226	-0.021	-0.083	-0.154	-0.024
Average	-0.031	-0.008	-0.031	-0.008	0.039
Standard Deviation	0.018	0.048	0.018	0.030	0.075

Analysis of the H11456 multibeam data in the SABER Multi-View Editor and in depth grids revealed significant depth jumps across the junction of zones based on Atlantic City, NJ (8534720) and the zones based on Sandy Hook, NJ (8531680).

The Draft Statement of Work for OPR-C303-KR-06 provided new NOAA zoning correctors for zones SA13, SA14, SA15, and SA16 with correctors based on Atlantic City, NJ (8534720) instead of Sandy Hook (8531680) as shown in Table C-8 below.

**Table C-8. Preliminary Tide Zone Parameters Compared to Parameters from Draft Statement of Work for OPR-C303-KR-06 for Atlantic City (8534720)**

Zone	Time Corrector (minutes)	Range Ratio	Reference Station
SA13	-12	1.02	8534720
	-36	0.87	8531680
SA14	-6	1.07	8534720
	-36	0.91	8531680
SA15	0	1.06	8534720
	-36	0.91	8531680
SA16	0	1.02	8534720
	-30	0.88	8531680

A spreadsheet was constructed to compare the two sets of NOAA preliminary zoning parameters. The results are summarized in Table C-9. Verified water levels from 01 August 2005 through 30 November 2005 for stations at Sandy Hook, NJ (8531680) and Atlantic City, NJ (8534720) were entered in the spreadsheet. Correctors were computed at 6-minute intervals for each zone. Differences (Table C-9) were computed for each zone on Atlantic City, NJ (8534720) compared to the same zones computed on Sandy Hook, NJ (8531680). In addition the differences between zones 17 computed on Atlantic City, NJ (8534720) and 16 computed on Sandy Hook, NJ (8531680) are shown.

**Table C-9. Comparison of Water Level Correctors with Zoning Parameters for Stations 8534720 and 8531680**

Zone	16	15	14	13	17-16
Maximum	0.527	0.645	0.610	0.531	0.531
Minimum	-0.639	-0.561	-0.609	-0.633	-0.633
Average	0.005	-0.036	0.108	0.014	0.014
Standard Deviation	0.083	0.088	0.106	0.125	0.108

This verified the significant difference in verified water level correctors at the zone boundaries depending on the stage of the tide and environmental factors (wind, rain). As a result of this analysis the water level zoning correctors based entirely on Atlantic City, NJ (8534720) were applied to all multibeam data for H11456 and H11495.