

Water Level Data Quality Assurance Report

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Introduction

In accordance with Work Statement, Rev. 3.0, describing the analysis and interpretation of the Biscayne Bay data base, the first deliverable is a Quality Assurance Report (QAR). Accordingly, a report was submitted on September 9, 1999, describing the suitability of the acoustic doppler profiler, water level recorder and weather station data that were collected during the June 1997 to June 1998 field study.

After submitting the QAR, we learned that only the first four months of the water level data had been concatenated from individual monthly files, and considerably more data were available from each of the 12 stations. During the past five months, after receiving a second set of CD-ROM disks, we concatenated the full water level time series for each station. This second QAR deals only with the water level records and summarizes the amount and suitability of the water level data available for validating the hydrodynamic model of Biscayne Bay, Card Sound and Barnes Sound.

The editing involved in the QA/QC involved checking the monthly time series for gaps in the records, for redundant observations and for inconsistent time annotations (EST vs. EDT). Gaps were found in most of the time series, and they were patched when they were less than one day. Interpolation was by eye, guided by the nature of the tide just prior to and following the gap.

An unusual feature of several of the time series was a missing observation in early to mid July, 1997. Time annotations on the raw and datum-adjusted time series did not indicate missing data. The one-hour gap became apparent when the data were plotted, however. Also, harmonic analysis of 29-day time series before and after the gap revealed inconsistencies in the phase angles of the principal tidal constituents. Harmonic constants (local phase angles) from nearby National Ocean Service study sites provided guidance for determining the location and length of the missing data.

For each station, we present a plot of low-pass filtered water level data. In the accompanying caption, we note the start and end times, as well as the number of observations, of each data segment. Following the 12 plots, we include a table that contains the harmonic constants of the principal tidal constituents at each location.

Figure 1. Analog plot of low-pass filtered water levels (in meters, relative to NVGD29) from Station TG-1 (**Manatee Bay**), June 6, 1997 to June 30, 1998. Due to breaks in the record, the plot is in three parts: June 6, 1997 to February 14, 1998 (6080 observations); February 17 to March 29, 1998 (960 observations) and April 1 to June 30, 1998 (2172 observations). Quarter-hourly water levels were sub-sampled to obtain a time series of hourly values, and hourly values were low-pass filtered to remove the rise and fall of the tide. As a result of the filtering process 63 hours are lost from both ends of each segment.

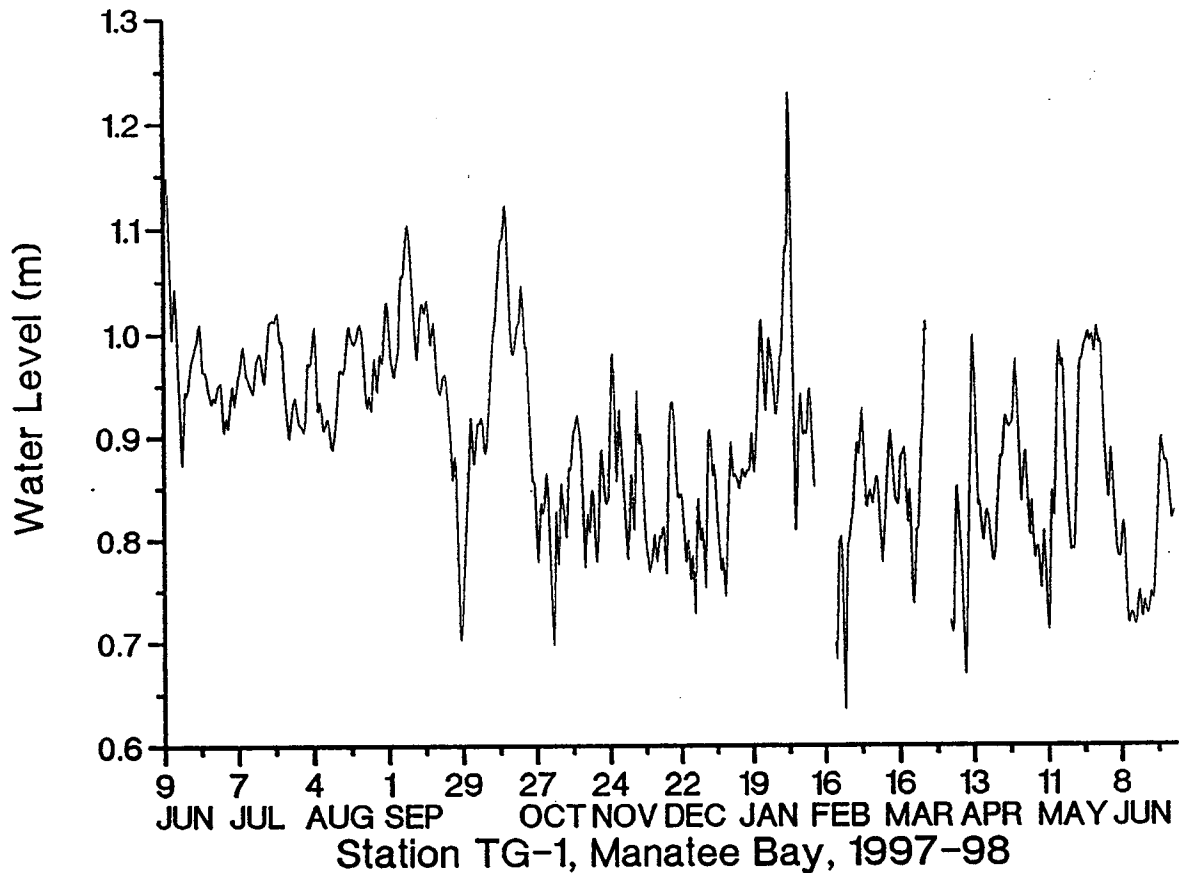


Figure 2. Analog plot of low-pass filtered water levels (in meters, relative to NVGD29) from Station TG-2 (**Card Sound Bridge**), June 13, 1997 to June 30, 1998. Due to a break in the record, the plot is in two parts: June 13, 1997 to February 14, 1998 (5913 observations) and February 17 to June 30, 1998 (3203 observations). Quarter-hourly water levels were sub-sampled to obtain a time series of hourly values, and hourly values were low-pass filtered to remove the rise and fall of the tide. As a result of the filtering process 63 hours are lost from both ends of each segment.

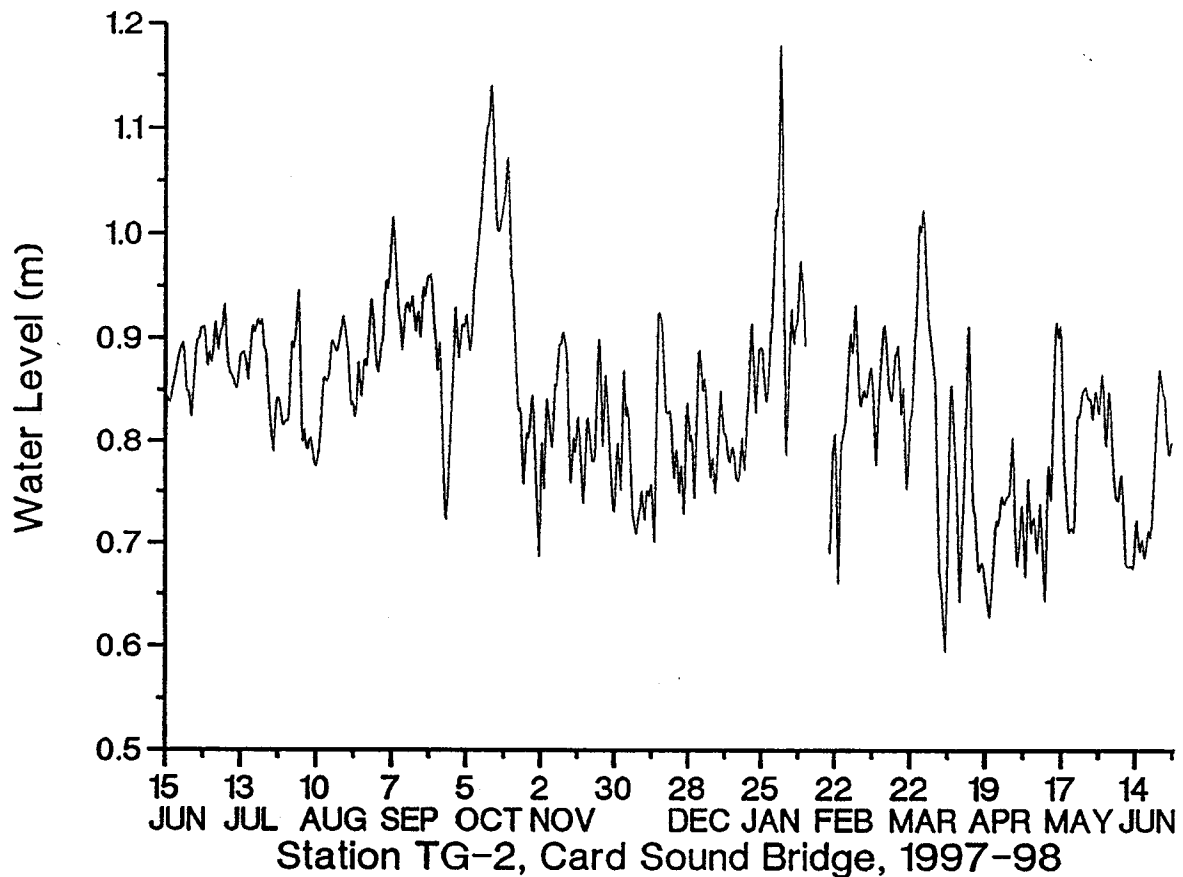


Figure 3. Analog plot of low-pass filtered water levels (in meters, relative to NVGD29) from Station TG-3 (Angelfish Creek), June 6, 1997 to June 30, 1998. Due to a break in the record, the plot is in two parts: June 6, 1997 to January 24, 1998 (5564 observations) and February 18 to June 30, 1998 (3178 observations). Quarter-hourly water levels were sub-sampled to obtain a time series of hourly values, and hourly values were low-pass filtered to remove the rise and fall of the tide. As a result of the filtering process 63 hours are lost from both ends of each segment.

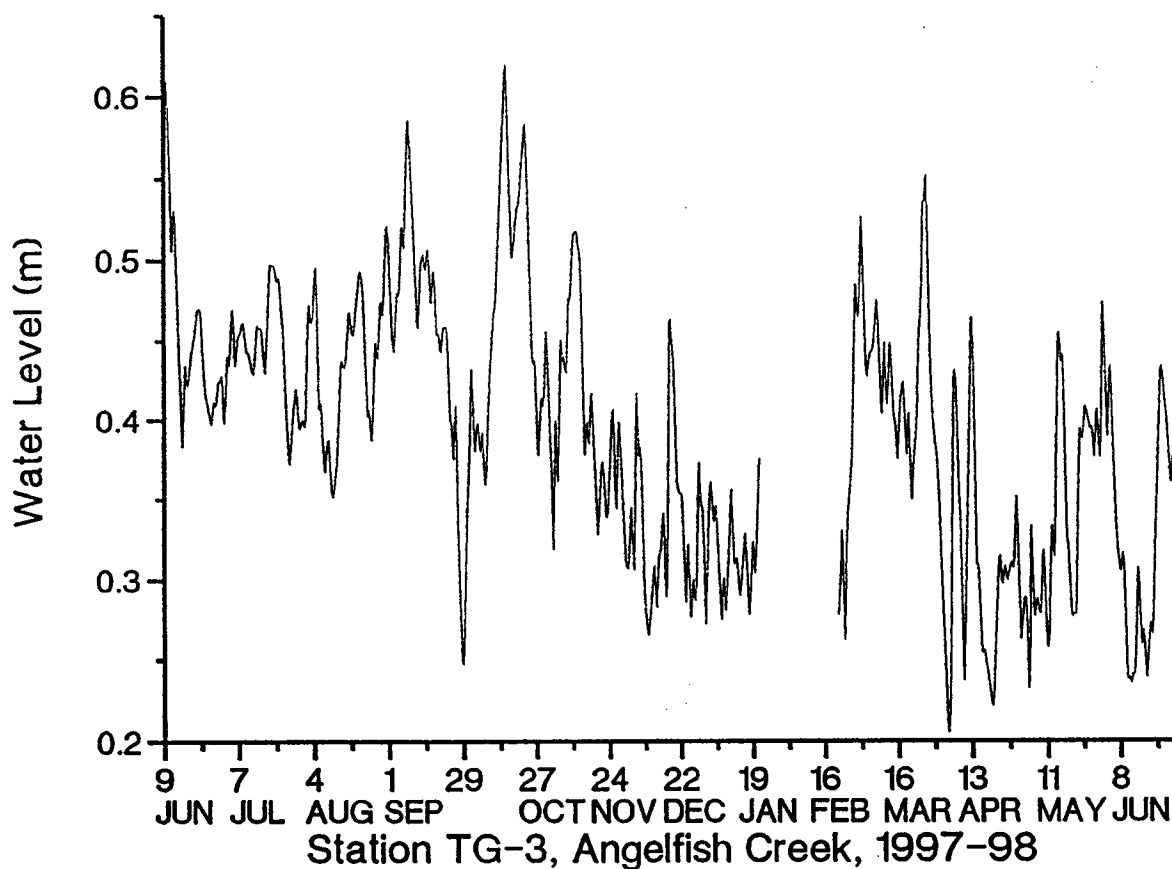


Figure 4. Analog plot of low-pass filtered water levels (in meters, relative to NVGD29) from Station TG-4 (**Military Canal - East**), June 6, 1997 to June 30, 1998. Due to a break in the record, the plot is in two parts: June 6 to December 8, 1997 (4437 observations) and January 7 to June 30, 1998 (4189 observations). Quarter-hourly water levels were sub-sampled to obtain a time series of hourly values, and hourly values were low-pass filtered to remove the rise and fall of the tide. As a result of the filtering process 63 hours are lost from both ends of each segment.

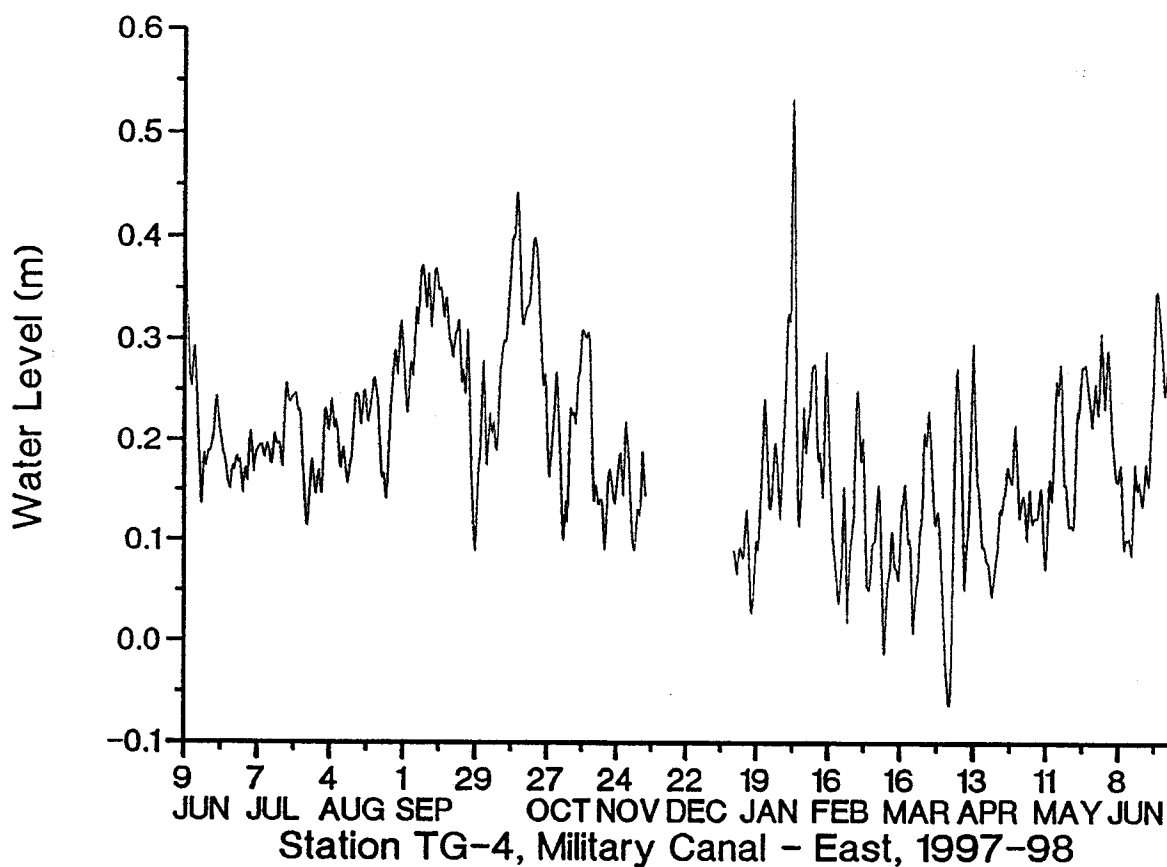


Figure 5. Analog plot of low-pass filtered water levels (in meters, relative to NVGD29) from Station TG-5 (**Military Canal - West**), July 10, 1997 to June 30, 1998. Due to a break in the record, the plot is in two parts: July 10, 1997 to March 28, 1998 (6260 observations) and April 1 to June 30, 1998 (2170 observations). A short, four-day segment of the record (June 6-10, 1997), prior to a June 10 to July 10 break, was ignored. Quarter-hourly water levels were sub-sampled to obtain a time series of hourly values, and hourly values were low-pass filtered to remove the rise and fall of the tide. As a result of the filtering process 63 hours are lost from both ends of each segment.

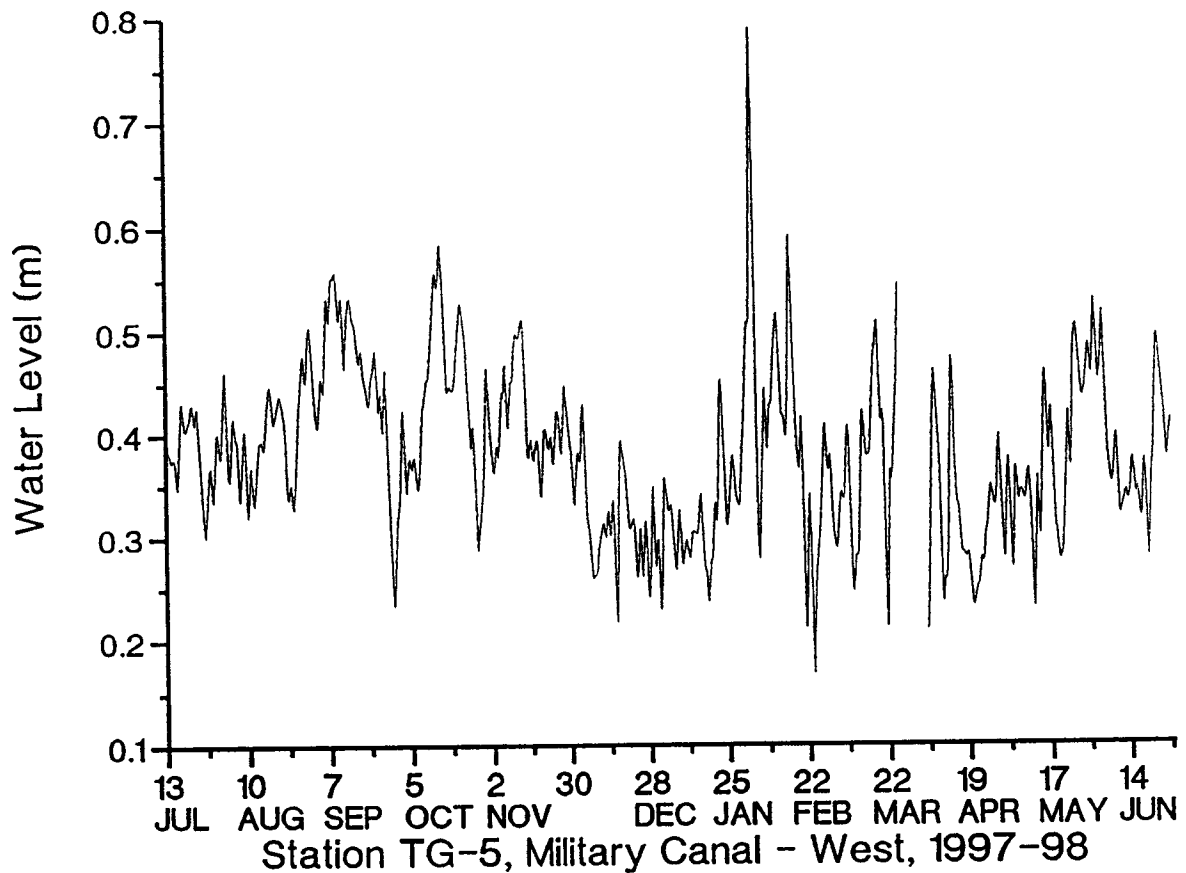


Figure 6. Analog plot of low-pass filtered water levels (in meters, relative to NVGD29) from Station TG-6 (Marker 8 - Black Point) June 6, 1997 to July 30, 1998. There are no breaks in this record, and the 9346 observations are continuous. Quarter-hourly water levels were sub-sampled to obtain a time series of hourly values, and hourly values were low-pass filtered to remove the rise and fall of the tide. As a result of the filtering process 63 hours are lost from both ends of each segment.

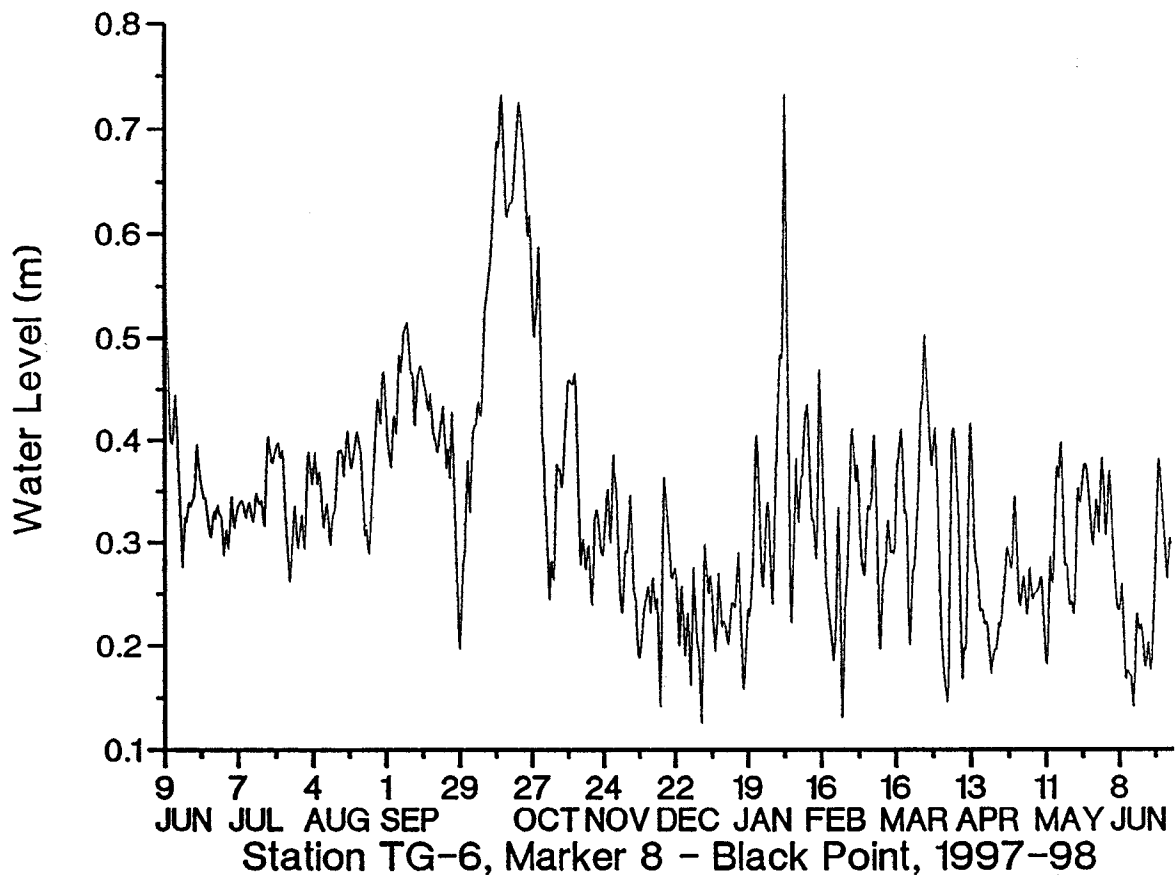


Figure 7. Analog plot of low-pass filtered water levels (in meters, relative to NVGD29) from Station TG-7 (**Snapper Creek**), July 10, 1997 to June 30, 1998. Due to breaks in the record, the plot is in three parts: July 10-29, 1997 (456 observations), September 10, 1997 to February 2, 1998 (3487 observations) and February 6 to June 30, 1998 (3469 observations). Quarter-hourly water levels were sub-sampled to obtain a time series of hourly values, and hourly values were low-pass filtered to remove the rise and fall of the tide. As a result of the filtering process 63 hours are lost from both ends of each segment.

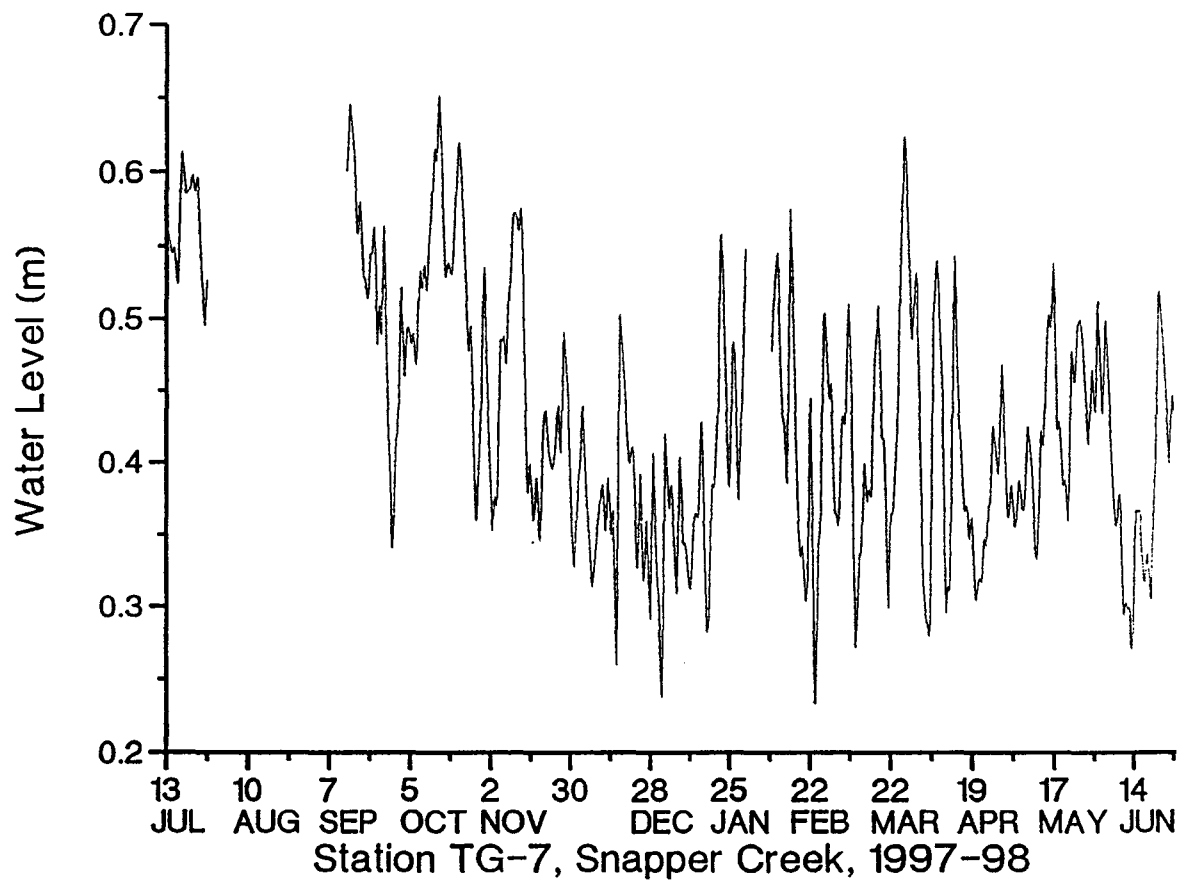


Figure 8. Analog plot of low-pass filtered water levels (in meters, relative to NVGD29) from Station TG-8 (**Gables by the Sea**), June 12, 1997 to June 29, 1998. Due to a break in the record, the plot is in two parts: June 12, 1997 to March 18, 1998 (6696 observations) and March 26 to June 29, 1998 (2281 observations). Quarter-hourly water levels were sub-sampled to obtain a time series of hourly values, and hourly values were low-pass filtered to remove the rise and fall of the tide. As a result of the filtering process 63 hours are lost from both ends of each segment.

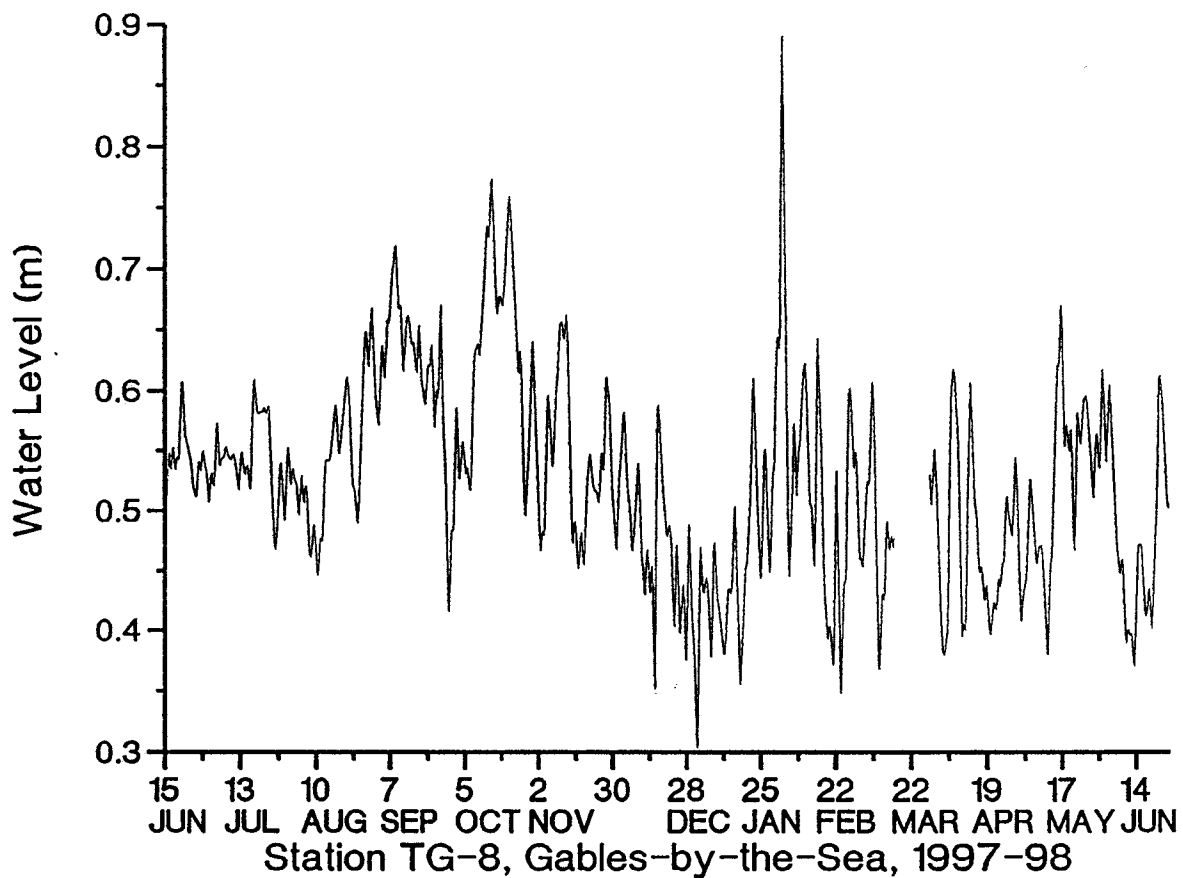


Figure 9. Analog plot of low-pass filtered water levels (in meters, relative to NVGD29) from Station TG-9 (Biscayne Channel - Marker 10), June 12, 1997 to June 29, 1998. There are no breaks in this record, and the 9167 observations are continuous. Quarter-hourly water levels were sub-sampled to obtain a time series of hourly values, and hourly values were low-pass filtered to remove the rise and fall of the tide. As a result of the filtering process 63 hours are lost from both ends of each segment.

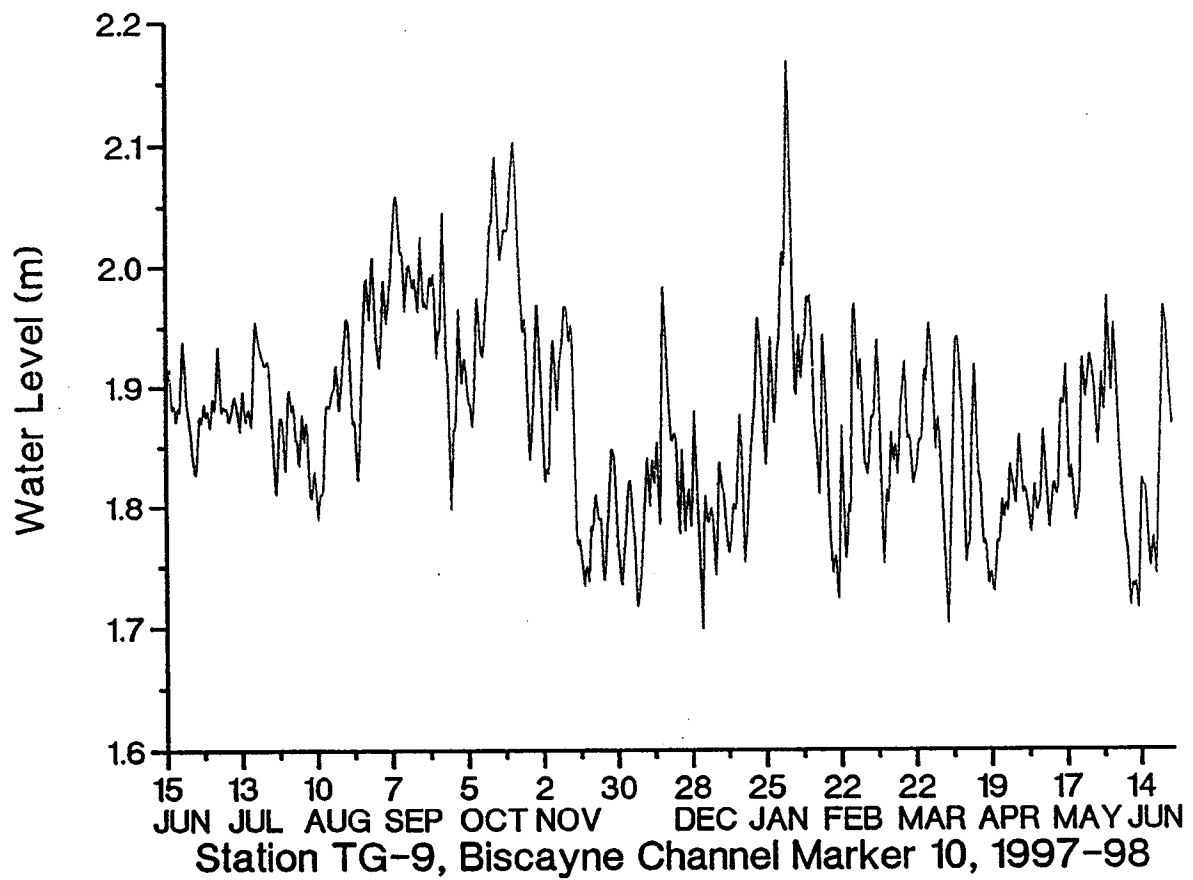


Figure 10. Analog plot of low-pass filtered water levels (in meters, relative to NVGD29) from Station TG-10 (**Miami River**), December 15, 1997 to June 25, 1998. There are no breaks in this record and the 4605 observations are continuous. Quarter-hourly water levels were sub-sampled to obtain a time series of hourly values, and hourly values were low-pass filtered to remove the rise and fall of the tide. As a result of the filtering process 63 hours are lost from both ends of each segment.

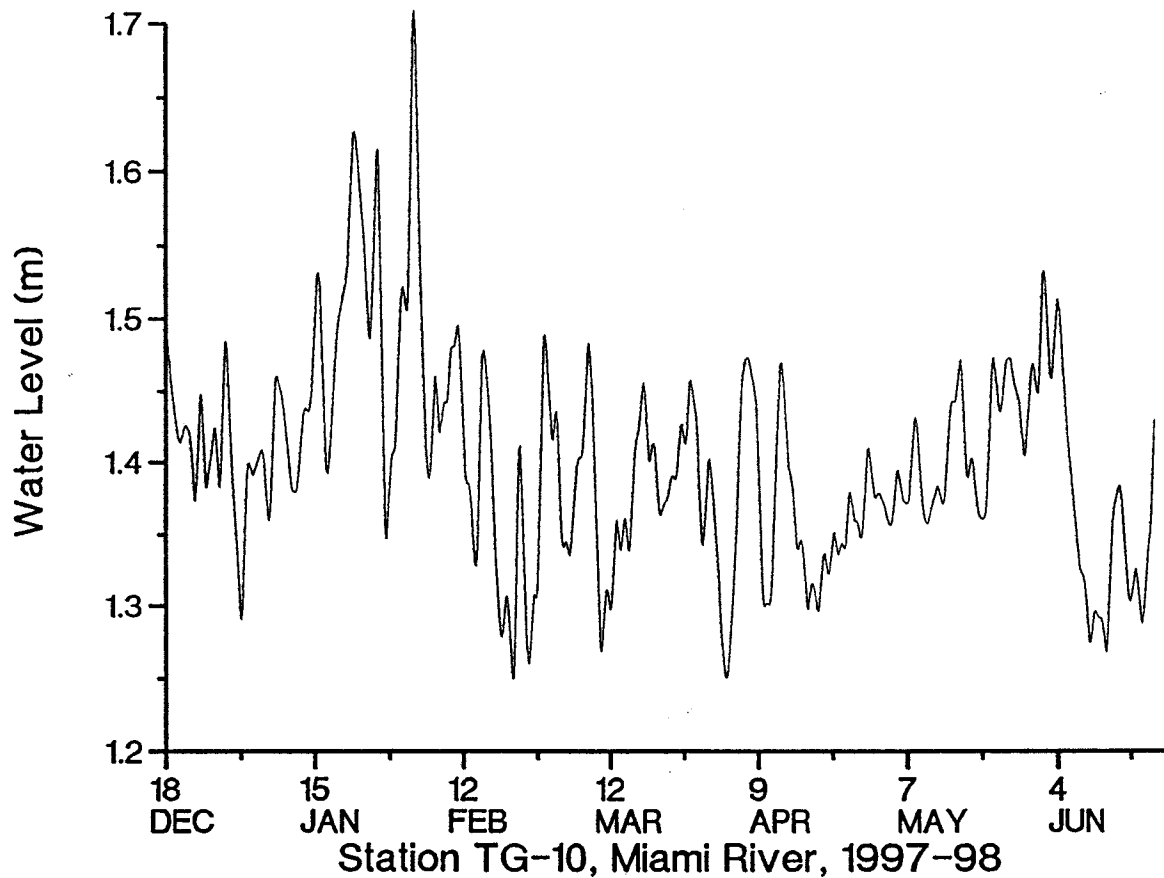


Figure 11. Analog plot of low-pass filtered water levels (in meters, relative to NVGD29) from Station TG-11 (**Julia Tuttle Causeway - Marker 35**) August 1, 1997 to June 30, 1998. Due to breaks in the record, the plot is in two parts: August 1 to December 3, 1997 (2974 observations) and January 27 to June 30, 1998 (3707 observations). Quarter-hourly water levels were sub-sampled to obtain a time series of hourly values, and hourly values were low-pass filtered to remove the rise and fall of the tide. As a result of the filtering process 63 hours are lost from both ends of each segment.

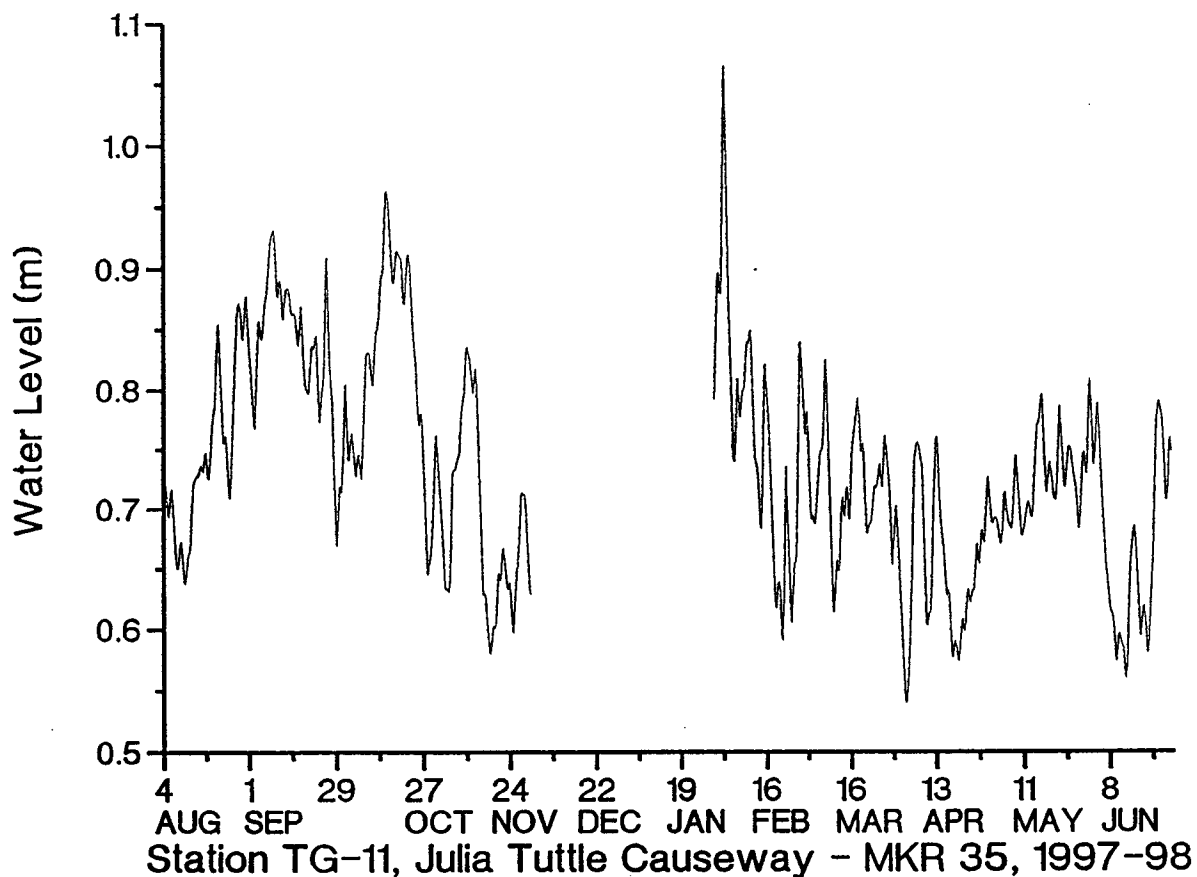


Figure 12. Analog plot of low-pass filtered water levels (in meters, relative to NVGD29) from Station TG-12 (**Broad Causeway - Marker 13**), June 18, 1997 to June 25, 1998. There were no breaks in the record, and the 8926 observations are continuous. Quarter-hourly water levels were sub-sampled to obtain a time series of hourly values, and hourly values were low-pass filtered to remove the rise and fall of the tide. As a result of the filtering process 63 hours are lost from both ends of each segment.

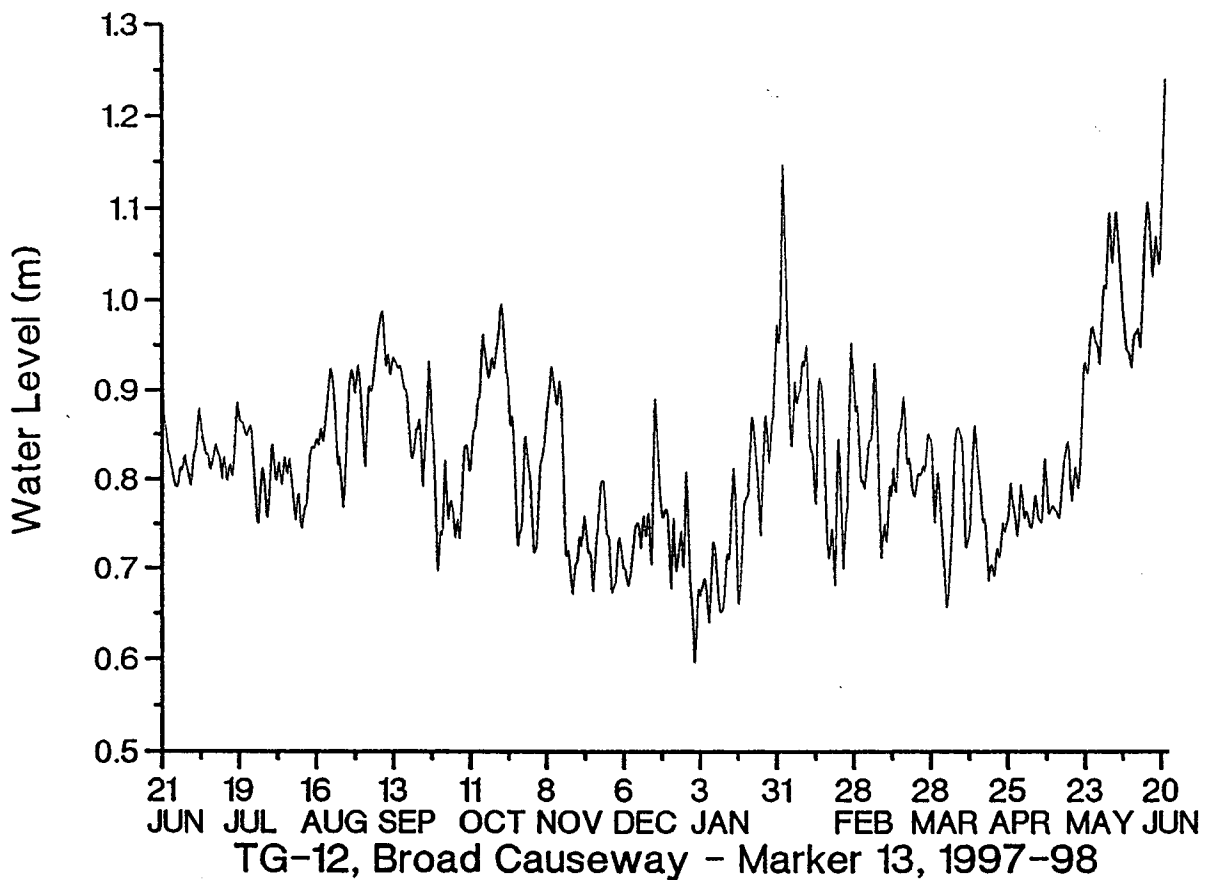


Table 1. Harmonic constants (Amplitude/Phase) of the principal tidal constituents at each of the twelve water level stations. Amplitudes are in meters; local phase angles are in degrees.

Station	Tidal Constituent				
	M ₂	S ₂	N ₂	K ₁	O ₁
TG-1	0.061 / 019	0.009 / 029	0.010 / 360	0.011 / 287	0.009 / 315
TG-2	0.083 / 330	0.016 / 353	0.015 / 311	0.013 / 257	0.010 / 276
TG-3	0.101 / 308	0.016 / 342	0.018 / 291	0.016 / 246	0.013 / 260
TG-4	0.217 / 287	0.035 / 335	0.041 / 270	0.028 / 229	0.021 / 239
TG-5	0.193 / 293	0.034 / 324	0.039 / 275	0.021 / 217	0.015 / 234
TG-6	0.220 / 284	0.035 / 321	0.041 / 266	0.024 / 216	0.021 / 233
TG-7	0.260 / 260	0.041 / 295	0.050 / 239	0.029 / 195	0.026 / 218
TG-8	0.274 / 251	0.048 / 283	0.055 / 232	0.029 / 192	0.025 / 210
TG-9	0.297 / 232	0.053 / 260	0.063 / 210	0.032 / 175	0.028 / 195
TG-10	0.311 / 236	0.049 / 264	0.065 / 216	0.034 / 180	0.031 / 198
TG-11	0.308 / 249	0.049 / 283	0.063 / 230	0.035 / 185	0.031 / 208
TG-12	0.296 / 259	0.046 / 297	0.057 / 243	0.032 / 189	0.028 / 210