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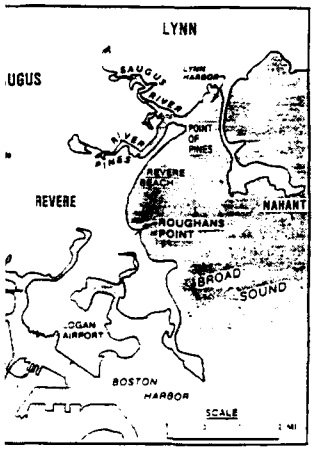
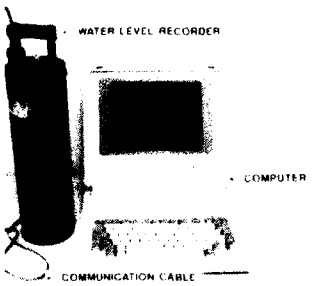
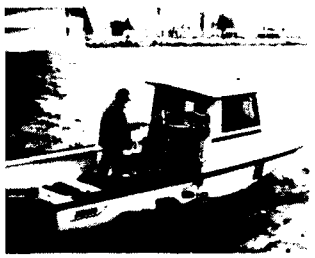
US Army Corps of Engineers

FIELD DATA COLLECTION REPORT SAUGUS RIVER AND TRIBUTARIES FLOOD DAMAGE REDUCTION PROJECT, LYNN, MALDEN, REVERE, AND SAUGUS, MASSACHUSETTS







by

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Final Report

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HYDRAULICS LABORATORY

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Water level, current speed and direction, and suspended sediment and salinity concentrations were measured in the Saugus River system from 30 October to 8 December 1990. The data obtained will provide information for use in hydrodynamic modeling of the area and a permanent record of the instrumentation and techniques employed in the data collection.

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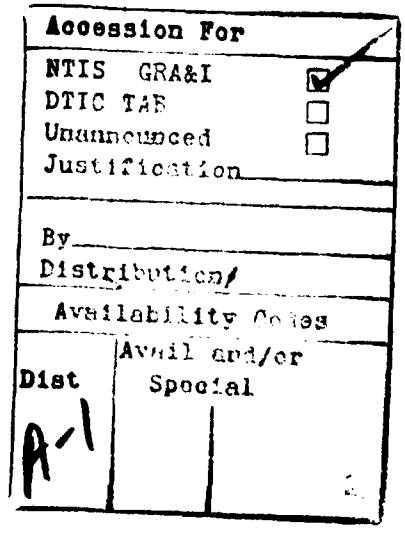
PREFACE

The field investigation reported herein was conducted from 30 October to 8 December 1990 by the US Army Engineer Waterways Experiment Station (WES), Vicksburg, MS, to provide the necessary data for support of the US Army Engineer Division, New England (NED), Saugus River Flood Damage Reduction Project in Lynn, Malden, Revere, and Saugus, MA. This effort was funded by the New England Division under the management of Mr. Charles Wener of NED's Hydraulics and Water Quality Branch.

Personnel of the WES Hydraulics Laboratory (HL) Estuaries Division (ED) Estuarine Processes Branch (EPB) performed the work under the general supervision of Messrs. Frank A. Herrmann, Jr., Chief, HL; Richard A. Sager, Assistant Chief, HL; William H. McAnally, Jr., Chief, ED; and George M. Fisackerly, Chief, EPB. The data collection program was designed by Messrs. Fisackerly and Timothy L. Fagerburg, EPB. Data reduction was performed by Ms. Clara J. Coleman and Messrs. Fagerburg and Joseph W. Parman, EPB. This report was prepared by Mr. Fagerburg and Ms. Coleman.

COL Larry B. Fulton, EN, was the Commander and Director of WES during the field investigation and data analysis. Dr. Robert W. Whalin was the Technical Director.



CONTENTS

CONVERSION FACTORS, NON-SI TO SI (METRIC)
UNITS OF MEASUREMENT

Non-SI units of measurements used in this report can be converted to SI (metric) units as follows:

Multiply	By	To Obtain
acres	4046.873	square metres
feet	0 3048	metres
feet per second	0.038	metres per second
inches	2.540	centimetres
miles (U.S. statute)	1.609347	kilometres
miles per hour	1.609347	kilometres per hour
pounds per square inch (absolute)	6894.757	pascals
square miles	2.589998	square kilometres
yards	0.9144	metres

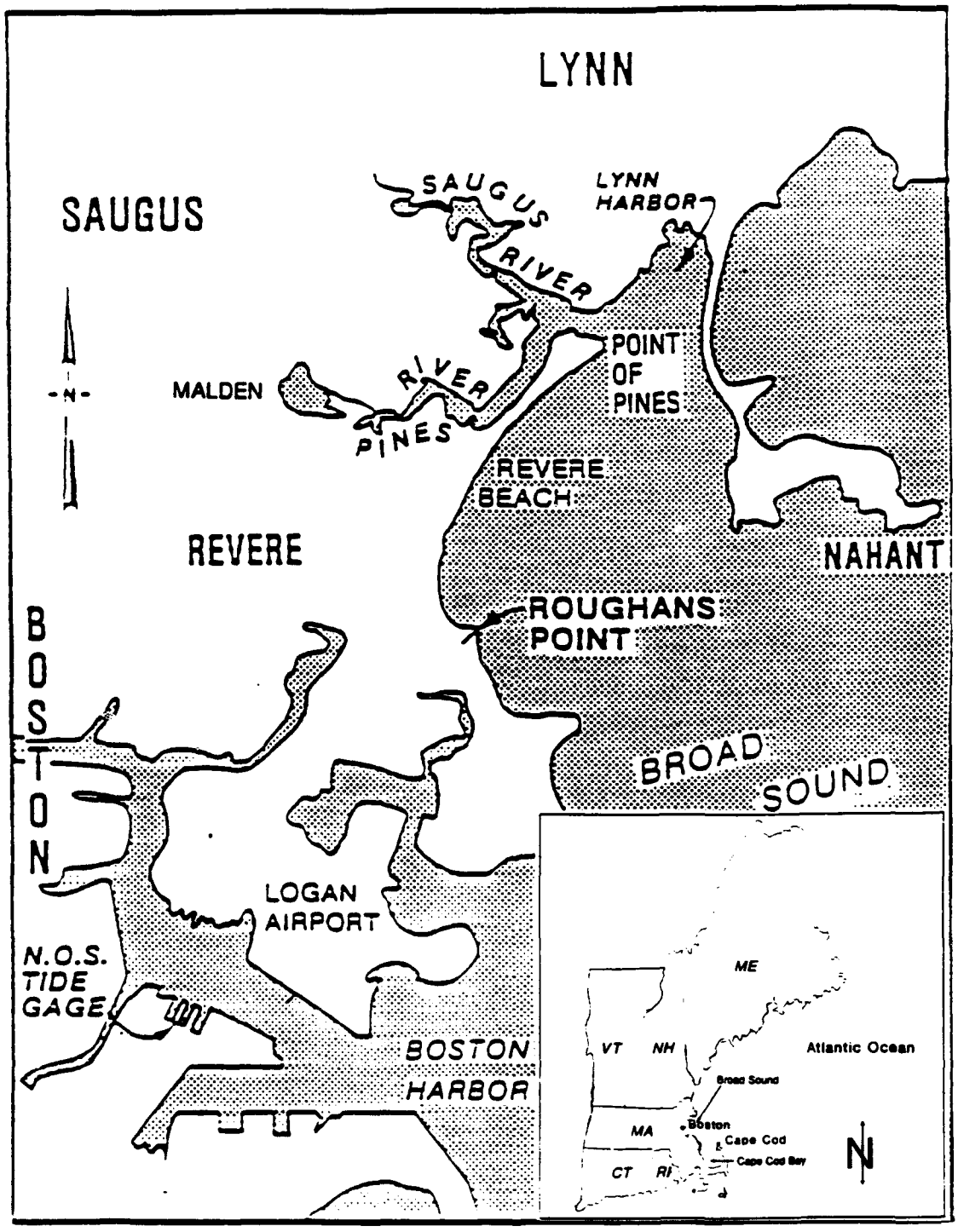


Figure 1. Study area vicinity map

FIELD DATA COLLECTION REPORT
SAUGUS RIVER AND TRIBUTARIES FLOOD DAMAGE REDUCTION PROJECT
LYNN, MALDEN, REVERE, AND SAUGUS, MASSACHUSETTS

PART I: INTRODUCTION

Background

1. The Saugus River system is located along the Atlantic Ocean coast approximately 10 miles* north of Boston, MA, near the cities of Lynn, Malden, and Revere, plus the town of Saugus (see Figure 1). The Saugus River and its tributaries, including the Pines River, comprise a 47-square-mile watershed area which drains into a tidal estuary at the mouth of the river. These estuaries and the adjacent saltwater marshes total approximately 1660 acres. The flows from the Saugus and Pines Rivers are relatively small, because of the sluggish characteristics of the watershed and the channel conveyance limits. They are also dependent on the tide. Storm-water drainage is temporarily stored in many areas in surface ponding when the tide is high followed by drainage when the tide is falling.

2. Because of the topography and tidal hydraulics of the Saugus River area, storm events that increase the tide levels significantly create a potential for flooding. In 1978 the eastern New England coastline was struck by a storm that created the occurrence of the 100-year surge event. The storm caused widespread, record-setting flooding of residential, commercial, and transportation areas within the Saugus River system. A plan was developed by the New England Division to provide flood damage reduction against the Standard Project Northeaster (SPN) event for nearly the entire study area. The principal component of this plan is construction of tidal floodgates at the mouth of the Saugus River. These floodgates will prevent tidal surges from entering the river and reduce flooding within the study area. The floodgates will be constructed so as to maintain both safe passage for navigation and natural tide levels and flushing patterns in the estuary. The gates will only

* A table of factors for converting non-SI units of measurement to SI (metric) units is presented on page 3.

be closed when projected tide levels are expected to cause significant damages.

Purpose

3. The purpose of the Saugus River field monitoring program described herein was to collect synoptic data on water-level elevations, current speeds and directions, and suspended sediment and salinity concentrations at various stations throughout the system for use in hydrodynamic modeling of the area. The purpose of this report is to provide a permanent record of the instrumentation and techniques employed during the data collection survey and to make the data available for use in long-term numerical and physical modeling studies for design of the floodgate, for assuring the natural tide levels and flushing patterns in the estuary, and for maintaining safe passage of local navigation.

Scope

4. This report presents representative results of the field data collection program in the Saugus River project area during October-December 1990. Measurements consisted of the following:

a. Water-level elevations at eleven locations.

b. Current speed and direction at nine ranges.

c. Suspended sediment and salinity concentrations.

5. This report describes the field investigation methods used to collect the data, displays the results of the data reduction efforts, and summarizes the results of the data analysis.

PART II: DATA COLLECTION PROGRAM

6. Data were collected in the Saugus River project area from 30 October through 8 December 1990. Water-levels recorders and moored current meters were in place throughout the period. An intensive data collection program (a 14-hr survey conducted on 3 November 1990) was performed with the deployment of the recording instruments. During this 14-hr data collection period, current speed and direction measurements were obtained concurrently with water-level measurements. The data collection effort is described in subsequent sections of this report.

Equipment

Water-level recorders

7. Water-level elevation measurements at several locations were recorded using Microtide (solid state measurement) water-level recorders similar to that shown in Figure 2. The Microtide water-level recorder contains a

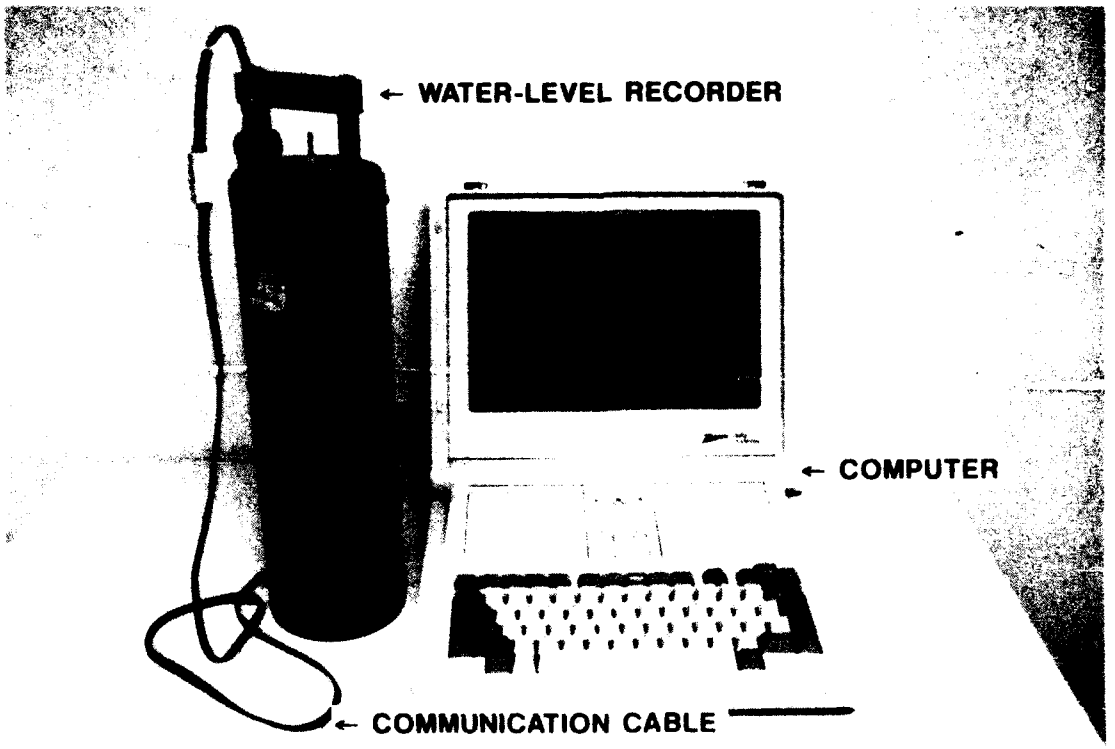


Figure 2. Water-level recorder

strain-gage-type pressure transducer housed in a subsurface case which records the absolute pressure of the column of water above the case. The pressure transducer is not vented to the atmosphere; therefore, an extra unit is required to be strategically positioned in the study area to record atmospheric pressure changes. The water column pressure is measured for the desired sample interval, and an average value is computed and stored on an internal RAM data logger. The stated accuracy of the Microtide is ±0.1 percent of full scale (25 psia). The sampling time interval can be set from 1 min to 24 hr. A 10-min sampling interval was chosen for this study.

Water-temperature sensors

8. The Microtide water-level recorder also measures temperature by means of a built-in YSI thermilinear thermistor. The thermistor has a range of -5° C to +45° C, with a stated accuracy of ±0.1° C. The data from each recorder are stored on an accessible RAM located in the waterproof subsurface unit which also contains the d-c power supply.

Moored current meters

9. Three InterOceans Model S-4 electromagnetic current meters were deployed at various locations in the study area to obtain a continuous recording of current speed and direction at fixed depths. The S-4 meter, shown in Figure 3, is a 10-in.-diameter sphere that is suspended in the water column with a submerged flotation device and anchored to the bottom by a heavy concrete block and anchor arrangement. This deployment technique is illustrated in Figure 4. The S-4 meter measures the velocity of the water current by means of an electromagnetic field that senses current induced by the movement of water through the field. An internal microprocessor coupled with an internal flux-gate compass computes the velocity vectors, which are then stored in the solid state memory. The accuracy of the S-4 meter in measuring current speed is ±0.2 cm/sec.

Measurement Locations

10. Eleven water-level recorders and three S-4 current meters were deployed throughout the study area as shown in Figure 5. The water-level recorder locations are identified as Stations S0.1, S0.6, S1.5, S2.1, S4.2, S4.4, S5.8, S7.4, S9.1, S9.3, and S9.5. The locations were chosen to satisfy modeling requirements and for the availability of a mounting structure in

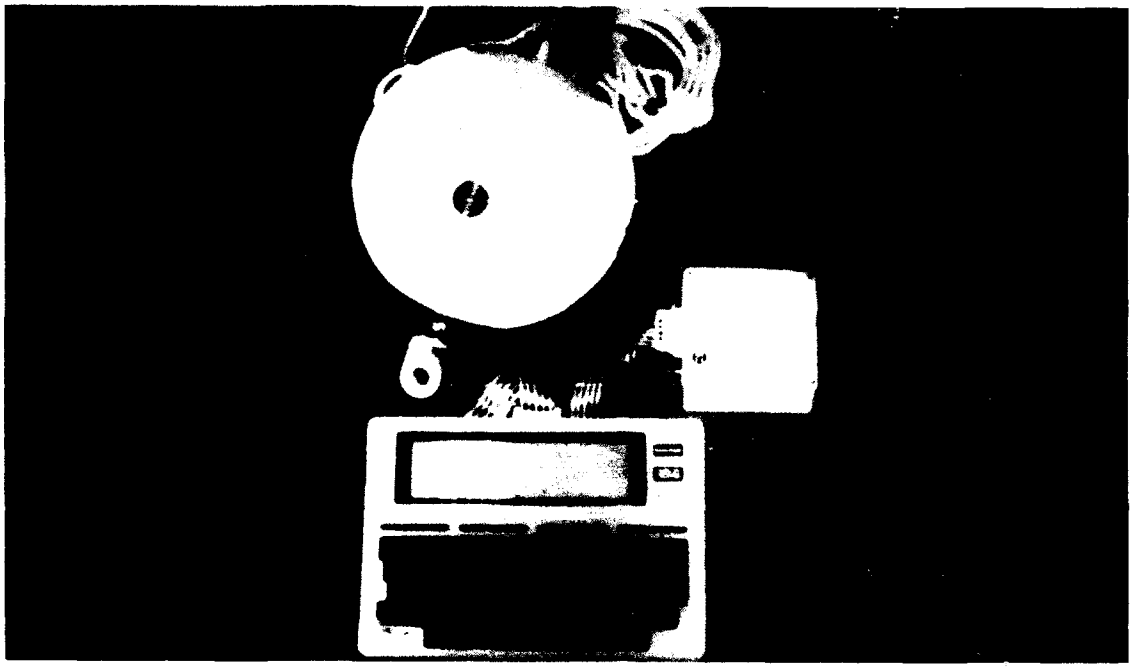


Figure 3. InterOceans S-4 current meter

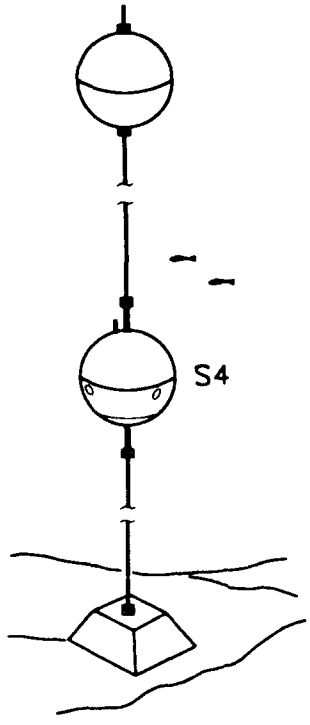


Figure 4. S-4 current meter deployment method

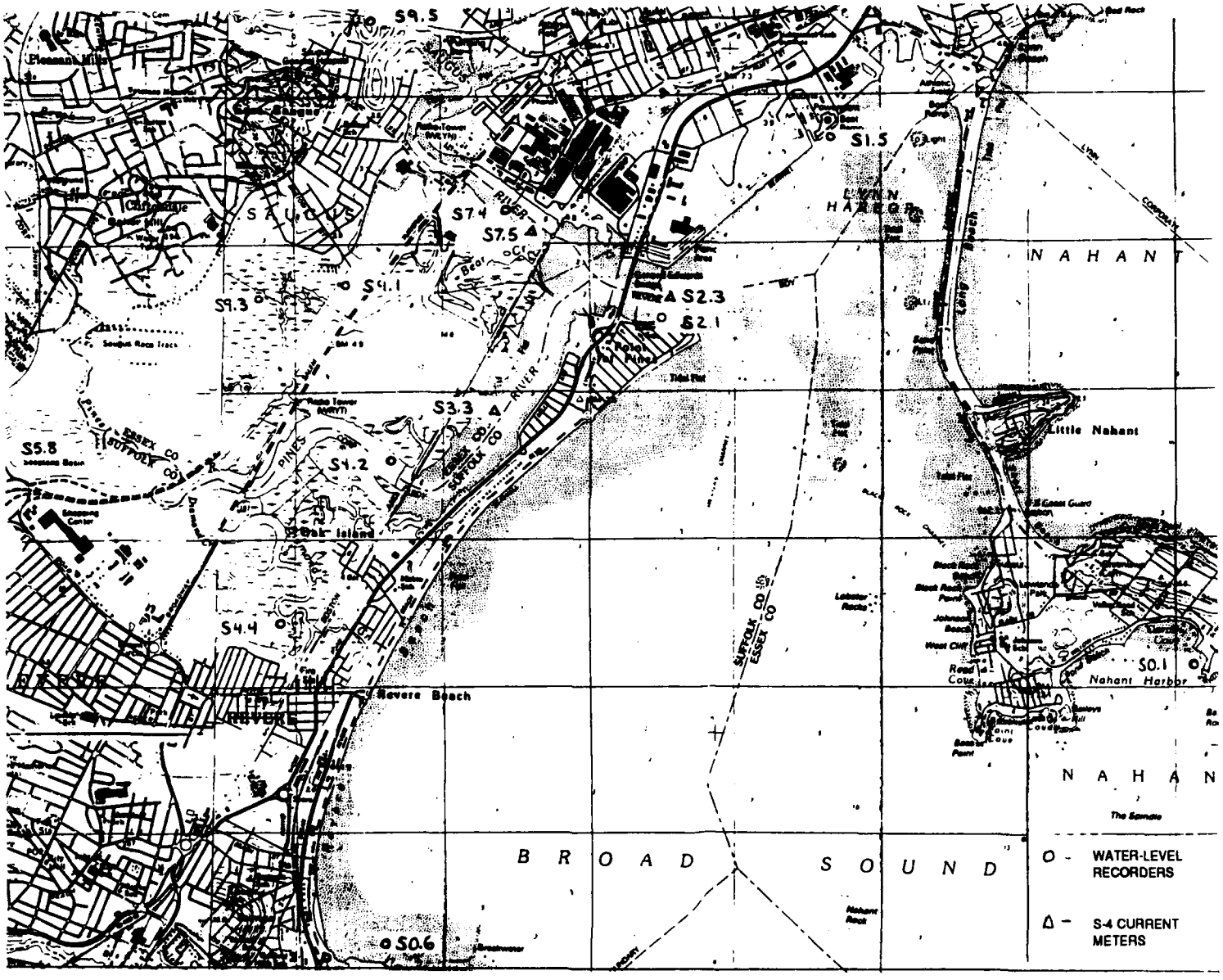


Figure 5. Water-level recorder and S-4 current meter locations

Broad Sound, Saugus River, Pines River, and the surrounding marsh areas. The locations adequately covered the total study area and provided information on differences in time of peak tides and range of tides. Each tide gage location was referenced to National Geodetic Vertical Datum (NGVD) elevations. The locations of the continuous recording current meters are designated as Stations S2.3, S3.3, and S7.5. All S-4 current meters were deployed with the sensor located 2 ft above the bottom.

Intensive (14-hr) Survey Data Collection

Current speed and direction equipment

11. Three boats were equipped to deploy instruments over-the-side using the portable equipment setup shown in Figure 6 Collapsible aluminum frames were used to support the equipment, and winches (with 1/8-in. wire rope) were used to raise and lower the velocity and direction equipment. An indicator on the winch displayed the depth of the instruments below the water surface. A Gurley Model 665 vertical-axis cup-type impeller velocity meter with direct velocity read-out capabilities was used to measure current speeds. These meters have a threshold speed of less than 0.2 fps and an accuracy of ±0.1 fps for velocities less than 1 fps (+5 percent for speeds greater than 1 fps)*. Current directions were monitored with a magnetic directional indicator mounted above the velocity meter on a solid suspension bar. This entire assembly was connected to a streamlined lead weight that held the sensors in a vertical position and oriented them into the direction of the flow. The signal cables from each instrument were raised and lowered with the equipment and were connected to display units located on the deck of the boat. The details of the system are shown in Figure 7.

Measurement locations

12. For the 14-hr data collection period in the Saugus River study area, nine data collection ranges were selected for measurements. A data collection range is a line that is perpendicular to the axis of the channel at a particular geographical location. Along this line several points or stations are established for collecting the various measurements. The general

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* McAnally, W. H., Jr. 1978. "Calibration of Harbor Entrance Branch Prototype Current Measurement Equipment," Memorandum for Record, US Army Engineer Waterways Experiment Station, Vicksburg, MS.

Figure 6. Over-the-side deployment of velocity measuring equipment

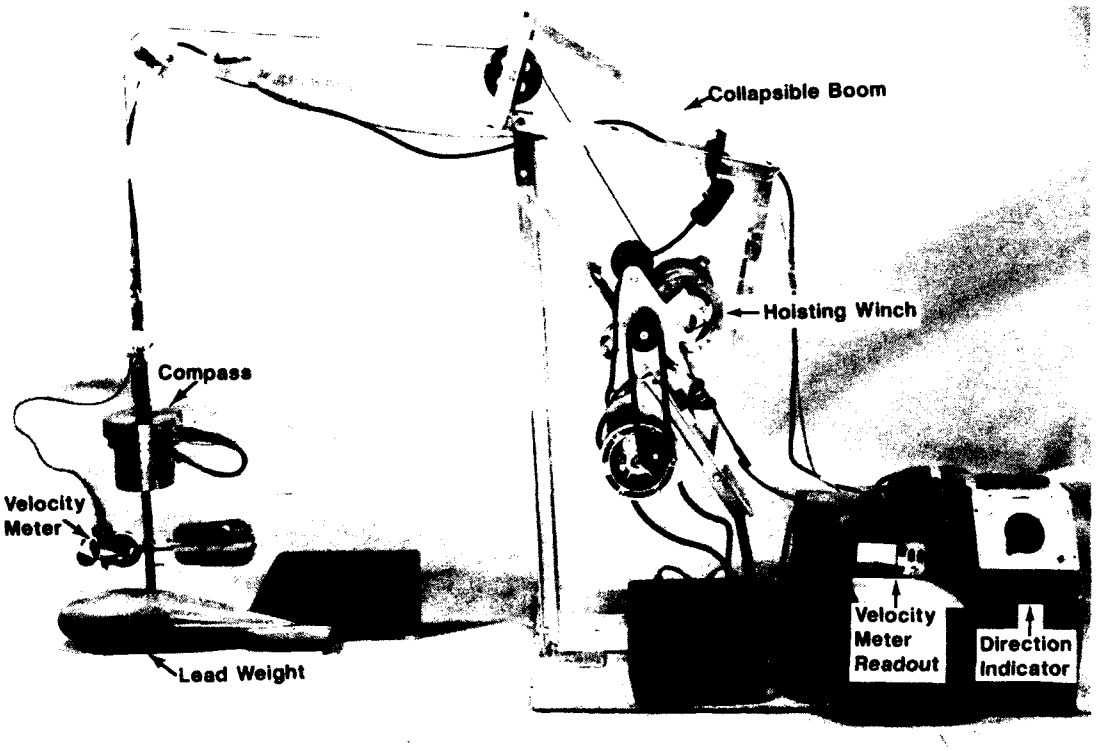

Figure 7. Components of the field instrument assembly

locations of these ranges are shown in Figure 8. Range R1.0, located in Broad Sound immediately below the channel entrance light, had two stations, R1.0A and R1.0B. Stations R1.0A and R1.0B were at the centerline of two channels, Western Channel and Black Rock Channel, respectively, that enter Lynn Harbor from Broad Sound. Range R2.0, in the mouth of the Saugus River approximately 200 yd from the entrance into Broad Sound, also had two stations (R2.0A and R2.0B) equally spaced across the range. Range R3.0, in the Pines River approximately 200 yd upstream of its confluence with the Saugus River, had one station (R3.0B) at the channel centerline. Range R4.0 was in the Pines River approximately 100 yd downstream of the Boston and Maine Railroad Bridge. A centerline station only (R4.0B) was used at this range. Range R5.0 was at the centerline of the cut made between the I-95 roadway berm and the adjacent marsh area. Range R6.0 was upstream of Range R5.0 just below the entrance to the Seaplane Basin. A single centerline station location (R5.0B and R6.0B) at these two ranges was used. Range R7.0 was approximately 50 yd downstream of the Boston and Maine Railroad Bridge crossing the Saugus River. Range R8.0 was in the Saugus River approximately 150 yd downstream of the Fox Hill Bridge. Range R9.0 was in the Saugus River approximately 0.2 mile upstream of the Fox Hill Bridge. Ranges R7.0, R8.0, and R9.0 each had a single station (R7.0B, R8.0B, and R9.0B, respectively) located at the channel centerline.

Procedures

13. Prior to the beginning of the 14-hr survey, the boats assigned to each range deployed anchors and mooring lines at each of the stations. The mooring lines were attached to large inflated buoys for retrieving the anchor lines during each sampling period. The boat moved into position at each of the buoys and used the anchored line to hold a steady position in the current. The boat propellers were not powered while the data were being collected. At each station, the velocity data were measured at three depths: bottom, mid-depth, and surface for each hour of the survey period. The bottom measurement was made at a distance of 2 ft from the actual bottom. The middepth data were obtained at the calculated middepth. The surface measurement was obtained at a distance of 2 ft below the water surface.

Conditions of the survey

14. The 14-hr intensive data collection period encompassed an entire tide cycle during a spring tidal range. The tidal range measured during the survey was 13.13 ft. Mostly clear skies existed at the time of the survey,

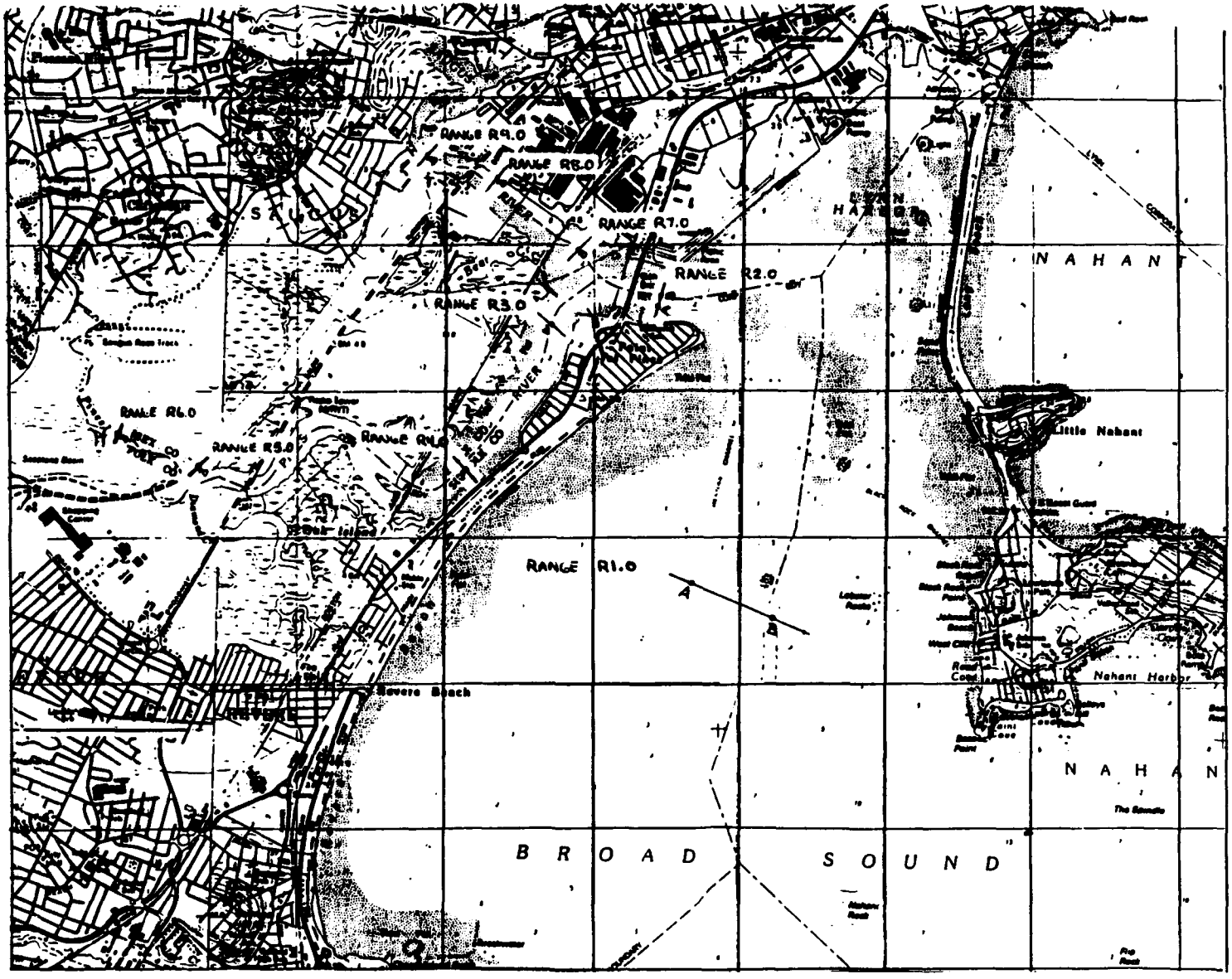

Figure 8. Ranges and locations for 14-hr data collection

and wind conditions ranged from a slight breeze to light winds of 4 to 5 mph.

Post-Survey Procedures

15. Immediately following the intensive data collection survey, the water-level recorders and continuous recording S-4 current meters were serviced to retrieve the collected data. The data were transferred to computer diskettes using an RS232 communication cable for each piece of equipment and a portable computer. Each sensor was then reinitialized to begin recording data for the following 30-day period from 8 November to 8 December 1990. Physical measurements from the water surface to established reference points for determination of depth of submergence of the sensor were made for verification of readings prior to the installation and removal of the sensor.

Laboratory Analysis of Water Samples

Suspended sediments

16. The samples collected at the individual sampling stations during the survey were analyzed in the laboratory at WES. Total suspended materials were determined by filtration of the samples through Nuclepore (registered trademark) polycarbonate filters with 0.4-micron pore size. They were desiccated and preweighed, then a vacuum system was used to draw the sample through the filter. After the filters and holders were washed with distilled water, the filters were dried at 105° C for 1 hr and reweighed. The total suspended materials were calculated based on the weight of the filter and the volume of the filtered sample.

Salinities

17. These same water samples obtained at each range during the survey were measured for salinities in the laboratory. An AGE Instruments, Incorporated, Model 2100 MINISAL salinometer with automatic temperature and cell constant compensation was used for these analyses. The salinometer was calibrated with standard seawater and was accurate to within ±0.003 ppt.

PART III: DATA PRESENTATION

Intensive Survey Water-Level Data

18. The tidal variations of the water-surface elevations observed immediately prior to, during, and immediately following the intensive survey are shown in Tables 1-11. Plots of the water-surface data for periods of 31 October-8 November are shown in Plates 1-11. All the water-level recorders functioned properly during the period immediately prior to and following the survey.

19. The data from Station S0.6 were used as reference for comparison with the data from the other stations in order to estimate tidal phase and range differences between the Broad Sound and the upper boundaries of the study area. This comparison illustrated that only a slight difference was observed in the maximum tidal range: 13.12 ft at S0.6 and 12.57 ft at S9.5 as measured on 3 November 1990. The comparison also showed the tide phase difference was 0.5 hr between Stations S0.6 and S9.5, occurring on 3 November 1990 (between 1030 and 1100 EST) at the time of high water. The time lag between the high water in the sound at Station S0.6 and the high water in the marsh at Station S9.3 was 2.0 hr (between 1030 and 1230 EST). During the ebb phase period, the time lag between the low water reading at the marsh Station S9.3 (2100 EST) and at sound Station S0.6 (2010 EST) was 0.83 hr. The wetting and drying of the water-level recorders in the marsh areas, S4.4, S5.8, S9.1, and S9.3, provide an accurate measurement of the time interval of the arrival, retention, and departure of the tide waters. However, the accuracy of the water-level elevations is questionable due to the extremes of temperature fluctuations as the water-level recorder is alternately exposed to the air and water. These temperature changes introduce a slight drift in the pressure readings over time as the sensor adjusts to the changing temperature. Physical measurements of the submergence depth of the sensor for correlation with sensor reading to determine this effect were not possible for these locations especially at the high water levels.

Over-the-Side Current Speed and Direction Data

20. Tables 12-22 are time series listings of the over-the-side current

speed data obtained at nine ranges as described in paragraph 11. Plates 12-22 are plots of the velocity data for each range for the cycle of the tide (ebb and flood) during the survey period. The maximum velocity observed at the lower range, at Station R0.1A, in the channel was 1.8 fps at the middepth. The maximum velocity observed in the Saugus River channel at Station R2.0A was 3.9 fps at the surface. The maximum velocity in the channel of the Pines River at the I-95 berm opening at Station R5.0B was 6.3 fps at the surface. The freshwater inflow from the rivers local to this area did not contribute significantly to the flow in the channel. As a result, there were no large variations, other than tidal, in the magnitude and direction of the currents. Eddies and unusual flow circulation patterns created by change in the tidal periods were observed; however, the changes within the system were not always detectable using hourly observation periods representative of this study.

Moored (S-4) Current Meter Data

21. Plates 23 and 24 show the time history plots of the continuously recorded current speeds in the ebb and flood directions by the S-4 current meters. The S-4 meter deployed at location S7.5 did not record any data due to a faulty internal power pack. This problem was not evident until the meter was retrieved on 7 November when attempts were made to retrieve the data. This problem was corrected prior to the redeployment of the meter for the long-term data recording period (8 November to 8 December). The maximum velocity recorded during the intensive data collection period by these instruments was 2.1 fps at location S2.3 during the ebb cycle of the tide. The data from these instruments indicated that the strongest currents occur during the falling tide. These measurements from the moored current meters correlate well with the data obtained from the over-the-side velocity measurements.

Suspended Sediment and Salinity Data

22. The suspended sediment and salinity concentration data obtained from the analyses of the water samples are listed in Tables 23-31. The suspended sediment concentrations were found to be low during the survey period. The highest recorded concentration was 97 mg/l at Station R9.0B for the sample taken very near the time of the low tide for the afternoon of 3 November 1990.

23. The salinity values as they varied with time indicated very little change over the tidal cycle. The maximum salinity change for Ranges R1.0-R6.0 was approximately 2 ppt. The maximum salinity changes at Ranges R7.0 and R8.0 were 5 ppt and 6 ppt, respectively. The greatest change observed was 12 ppt at Station R9.0B during the low tide occurring at 1700 EST.

Long-Term Water Level and Current Speed Data

Water-level data

24. The eleven water-level recorders were left in place to obtain a 30-day record of tide fluctuations for the Saugus River/Broad Sound system. Plates 25-35 illustrate the changes in tide levels over the long-term period from 8 November to 8 December 1990. One significant storm event was known to have occurred on 4 December 1990 during this data collection period. The effect of the storm on the maximum tide level is reflected on all the tide records shown in the plates. The predicted high tide for this particular date was 7.3 ft NGVD, and the actual measured high tide was 8.15 ft NGVD on tide gage S1.5 located at Lynn Harbor at the north end of Broad Sound.

Current speeds and directions

25. Plates 36-43 are time history plots of the recorded current speeds at the locations of the three S-4 current meters deployed for the 30-day period following the intensive data collection period. There were no significant surges or increases in current speeds detected during the long-term deployment period. The current meter at Station S3.3 ceased data collection on 26 November 1990 as indicated in Plate 40. The maximum recorded velocity by these instruments was 2.0 fps and occurred at Station S2.3.

PART IV: SUMMARY

26. The data presented herein were collected from the intensive survey and longer term sampling efforts within the Saugus River system from 30 October to 8 December 1990. The following observations were made of the data:

a. There appears to be a slight decrease in the tidal range (approximately 0.5 ft) from the lower bay water-level recorder, S0.6, as compared with the upper Saugus River water-level recorder, S9.5.

b The time lag between the peak water levels of the lower bay and upper river is approximately 30 min. A much longer time lag of 2 hr is present between the lower bay and marsh areas. This may be attributed to the highway embankment separating the two areas and the small opening which fills and drains the marsh area.

c. The maximum velocities observed during the survey occurred at the strength of ebb of the tidal cycle. The maximum recorded velocity was 6.3 fps at Station R5.0B.

d. The suspended sediment concentrations measured during the intensive data collection were low with a maximum observed concentration of 97 mg/l.

e. Salinity values indicated that the entire system is well mixed.

BIBLIOGRAPHY

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US Army Engineer Division, New England. 1989. "Saugus River and Tributaries Flood Damage Reduction Study," Water Resources Investigation Feasibility Report, Waltham, Massachusetts.

Table 1

Saugus River Tide Data

at Station S0.1

Julian Date	Hour EST	Water-Level Elevation ft. NGVD	Julian Date	Hour EST	Water-Level Elevation ft. NGVD
306	00:00	1.92	306	07:10	2.32
306	00:10	1.56	306	07:20	2.76
306	00:20	1.16	306	07:30	3.22
306	00:30	0.75	306	07:40	3.66
306	00:40	0.36	306	07:50	4.02
306	00:50	-0.06	306	08:00	4.49
306	01:00	-0.50	306	08:10	4.85
306	01:10	-0.91	306	08:20	5.27
306	01:20	-1.33	306	08:30	5.55
306	01:30	-1.77	306	08:40	5.80
306	01:40	-2.18	306	08:50	6.05
306	01:50	-2.57	306	09:00	6.31
306	02:00	-2.92	306	09:10	6.52
306	02:10	-3.27	306	09:20	6.70
306	02:20	-3.61	306	09:30	6.77
306	02:30	-3.87	306	09:40	6.75
306	02:40	-4.10	306	09:50	6.79
306	02:50	-4.28	306	10:00	6.72
306	03:00	-4.47	306	10:10	6.63
306	03:10	-4.58	306	10:20	6.56
306	03:20	-4.67	306	10:30	6.42
306	03:30	-4.67	306	10:40	6.24
306	03:40	-4.67	306	10:50	6.01
306	03:50	-4.60	306	11:00	5.73
306	04:00	-4.51	306	11:10	5.43
306	04:10	-4.35	306	11:20	5.11
306	04:20	-4.17	306	11:30	4.79
306	04:30	-3.93	306	11:40	4.42
306	04:40	-3.68	306	11:50	3.98
306	04:50	-3.36	306	12:00	3.59
306	05:00	-3.08	306	12:10	3.15
306	05:10	-2.71	306	12:20	2.73
306	05:20	-2.34	306	12:30	2.27
306	05:30	-1.95	306	12:40	1.76
306	05:40	-1.60	306	12:50	1.32
306	05:50	-1.17	306	13:00	0.82
306	06:00	-0.82	306	13:10	0.36
306	06:10	-0.38	306	13:20	-0.15
306	06:20	0.01	306	13:30	-0.68
306	06:30	0.47	306	13:40	-1.19
306	06:40	0.89	306	13:50	-1.63
306	06:50	1.39	306	14:00	-2.14
306	07:00	1.83	306	14:10	-2.62

(Continued)

Table 1 (Continued)

Julian Date	Hour EST	Water-Level Elevation ft. NGVD	Julian Date	Hour EST	Water-Level Elevation ft. NGVD
306	14:20	-3.06	306	22:00	5.48
306	14:30	-3.47	306	22:10	5.55
306	14:40	-3.84	306	22:20	5.52
306	14:50	-4.19	306	22:30	5.52
306	15:00	-4.51	306	22:40	5.41
306	15:10	-4.81	306	22:50	5.36
306	15:20	-5.07	306	23:00	5.22
306	15:30	-5.23	306	23:10	5.04
306	15:40	-5.41	306	23:20	4.85
306	15:50	-5.48	306	23:30	4.60
306	16:00	-5.60	306	23:40	4.39
306	16:10	-5.57	306	23:50	4.05
306	16:20	-5.57	307	00:00	3.72
306	16:30	-5.43	307	00:10	3.40
306	16:40	-5.37	307	00:20	3.06
306	16:50	-5.16	307	00:30	2.73
306	17:00	-4.95	307	00:40	2.34
306	17:10	-4.67	307	00:50	1.97
306	17:20	-4.44	307	01:00	1.58
306	17:30	-4.12	307	01:10	1.14
306	17:40	-3.84	307	01:20	0.68
306	17:50	-3.47	307	01:30	0.24
306	18:00	-3.15	307	01:40	-0.20
306	18:10	-2.76	307	01:50	-0.68
306	18:20	-2.39	307	02:00	-1.17
306	18:30	-2.00	307	02:10	-1.63
306	18:40	-1.58	307	02:20	-2.02
306	18:50	-1.14	307	02:30	-2.46
306	19:00	-0.73	307	02:40	-2.85
306	19:10	-0.34	307	02:50	-3.22
306	19:20	0.13	307	03:00	-3.59
306	19:30	0.61	307	03:10	-3.91
306	19:40	1.09	307	03:20	-4.21
306	19:50	1.51	307	03:30	-4.44
306	20:00	1.99	307	03:40	-4.70
306	20:10	2.41	307	03:50	-4.83
306	20:20	2.82	307	04:00	-4.97
306	20:30	3.19	307	04:10	-5.04
306	20:40	3.59	307	04:20	-5.00
306	20:50	3.98	307	04:30	-4.97
306	21:00	4.28	307	04:40	-4.88
306	21:10	4.58	307	04:50	-4.79
306	21:20	4.83	307	05:00	-4.56
306	21:30	5.02	307	05:10	-4.40
306	21:40	5.22	307	05:20	-4.10
306	21:50	5.36	307	05:30	-3.89

(Continued)

Table 1 (Continued)

Julian Date	Hour EST	Water-Level Elevation ft. NGVD	Julian Date	Hour EST	Water-Level Elevation ft. NGVD
307	05:40	-3.52	307	13:30	1.92
307	05:50	-3.22	307	13:40	1.39
307	06:00	-2.83	307	13:50	0.89
307	06:10	-2.39	307	14:00	0.33
307	06:20	-2.00	307	14:10	-0.20
307	06:30	-1.58	307	14:20	-0.71
307	06:40	-1.14	307	14:30	-1.19
307	06:50	-0.68	307	14:40	-1.72
307	07:00	-0.20	307	14:50	-2.20
307	07:10	0.31	307	15:00	-2.67
307	07:20	0.77	307	15:10	-3.13
307	07:30	1.23	307	15:20	-3.59
307	07:40	1.69	307	15:30	-4.03
307	07:50	2.18	307	15:40	-4.42
307	08:00	2.66	307	15:50	-4.74
307	08:10	3.15	307	16:00	-5.02
307	08:20	3.59	307	16:10	-5.27
307	08:30	4.05	307	16:20	-5.48
307	08:40	4.49	307	16:30	-5.60
307	08:50	4.92	307	16:40	-5.73
307	09:00	5.32	307	16:50	-5.80
307	09:10	5.69	307	17:00	-5.80
307	09:20	5.99	307	17:10	-5.76
307	09:30	6.29	307	17:20	-5.67
307	09:40	6.54	307	17:30	-5.53
307	09:50	6.75	307	17:40	-5.39
307	10:00	6.93	307	17:50	-5.18
307	10:10	7.00	307	18:00	-4.93
307	10:20	7.12	307	18:10	-4.65
307	10:30	7.14	307	18:20	-4.30
307	10:40	7.12	307	18:30	-4.03
307	10:50	7.07	307	18:40	-3.66
307	11:00	6.95	307	18:50	-3.27
307	11:10	6.84	307	19:00	-2.85
307	11:20	6.70	307	19:10	-2.44
307	11:30	6.49	307	19:20	-2.11
307	11:40	6.29	307	19:30	-1.65
307	11:50	6.01	307	19:40	-1.26
307	12:00	5.73	307	19:50	-0.75
307	12:10	5.39	307	20:00	-0.27
307	12:20	4.97	307	20:10	0.17
307	12:30	4.65	307	20:20	0.66
307	12:40	4.23	307	20:30	1.14
307	12:50	3.82	307	20:40	1.65
307	13:00	3.33	307	20:50	2.09
307	13:10	2.92	307	21:00	2.55
307	13:20	2.43	307	21:10	3.01

(Continued)

Table 1 (Continued)

Julian Date	Hour EST	Water-Level Elevation ft. NGVD	Julian Date	Hour EST	Water-Level Elevation ft. NGVD
307	21:20	3.45	308	05:00	-4.42
307	21:30	3.84	308	05:10	-4.44
307	21:40	4.23	308	05:20	-4.42
307	21:50	4.55	308	05:30	-4.35
307	22:00	4.85	308	05:40	-4.21
307	22:10	5.20	308	05:50	-3.98
307	22:20	5.45	308	06:00	-3.77
307	22:30	5.62	308	06:10	-3.52
307	22:40	5.75	308	06:20	-3.27
307	22:50	5.87	308	06:30	-2.94
307	23:00	5.99	308	06:40	-2.57
307	23:10	5.96	308	06:50	-2.25
307	23:20	5.92	308	07:00	-1.79
307	23:30	5.92	308	07:10	-1.40
307	23:40	5.87	308	07:20	-0.98
307	23:50	5.73	308	07:30	-0.57
308	00:00	5.59	308	07:40	-0.15
308	00:10	5.39	308	07:50	0.31
308	00:20	5.15	308	08:00	0.77
308	00:30	4.88	308	08:10	1.23
308	00:40	4.60	308	08:20	1.67
308	00:50	4.28	308	08:30	2.20
308	01:00	3.98	308	08:40	2.66
308	01:10	3.66	308	08:50	3.12
308	01:20	3.31	308	09:00	3.61
308	01:30	2.89	308	09:10	4.09
308	01:40	2.50	308	09:20	4.49
308	01:50	2.06	308	09:30	4.95
308	02:00	1.65	308	09:40	5.36
308	02:10	1.26	308	09:50	5.73
308	02:20	0.75	308	10:00	6.05
308	02:30	0.31	308	10:10	6.35
308	02:40	-0.20	308	10:20	6.58
308	02:50	-0.64	308	10:30	6.84
308	03:00	-1.10	308	10:40	7.07
308	03:10	-1.54	308	10:50	7.25
308	03:20	-1.95	308	11:00	7.32
308	03:30	-2.32	308	11:10	7.42
308	03:40	-2.71	308	11:20	7.42
308	03:50	-3.06	308	11:30	7.37
308	04:00	-3.40	308	11:40	7.35
308	04:10	-3.68	308	11:50	7.28
308	04:20	-3.93	308	12:00	7.12
308	04:30	-4.10	308	12:10	6.93
308	04:40	-4.23	308	12:20	6.70
308	04:50	-4.35	308	12:30	6.42
			308	12:40	6.15

(Continued)

Table 1 (Concluded)

Julian Date	Hour EST	Water-Level Elevation ft. NGVD	Julian Date	Hour EST	Water-Level Elevation ft. NGVD
308	12:50	5.80	308	18:30	-5.80
308	13:00	5.43	308	18:40	-5.57
308	13:10	5.11	308	18:50	-5.34
308	13:20	4.67	308	19:00	-5.02
308	13:30	4.23	308	19:10	-4.72
308	13:40	3.79	308	19:20	-4.37
308	13:50	3.33	308	19:30	-4.05
308	14:00	2.87	308	19:40	-3.68
308	14:10	2.34	308	19:50	-3.34
308	14:20	1.86	308	20:00	-2.92
308	14:30	1.35	308	20:10	-2.50
308	14:40	0.82	308	20:20	-2.09
308	14:50	0.31	308	20:30	-1.63
308	15:00	-0.22	308	20:40	-1.19
308	15:10	-0.80	308	20:50	-0.75
308	15:20	-1.37	308	21:00	-0.27
308	15:30	-1.88	308	21:10	0.22
308	15:40	-2.44	308	21:20	0.70
308	15:50	-2.87	308	21:30	1.19
308	16:00	-3.31	308	21:40	1.62
308	16:10	-3.73	308	21:50	2.09
308	16:20	-4.17	308	22:00	2.52
308	16:30	-4.58	308	22:10	2.94
308	16:40	-4.90	308	22:20	3.36
308	16:50	-5.20	308	22:30	3.72
308	17:00	-5.41	308	22:40	4.05
308	17:10	-5.64	308	22:50	4.32
308	17:20	-5.85	308	23:00	4.60
308	17:30	-5.99	308	23:10	4.85
308	17:40	-6.10	308	23:20	5.11
308	17:50	-6.10	308	23:30	5.29
308	18:00	-6.08	308	23:40	5.41
308	18:10	-6.03	308	23:50	5.50
308	18:20	-5.94			

Table 2

Saugus River Tide Data

at Station S0.6

Julian Date	Hour EST	Water-Level Elevation ft. NGVD	Julian Date	Hour EST	Water-Level Elevation ft. NGVD
306	00:00	1.86	306	07:10	2.30
306	00:10	1.54	306	07:20	2.74
306	00:20	1.15	306	07:30	3.18
306	00:30	0.76	306	07:40	3.62
306	00:40	0.29	306	07:50	4.01
306	00:50	-0.12	306	08:00	4.42
306	01:00	-0.54	306	08:10	4.84
306	01:10	-0.98	306	08:20	5.25
306	01:20	-1.37	306	08:30	5.55
306	01:30	-1.83	306	08:40	5.78
306	01:40	-2.22	306	08:50	5.99
306	01:50	-2.61	306	09:00	6.27
306	02:00	-3.01	306	09:10	6.50
306	02:10	-3.35	306	09:20	6.68
306	02:20	-3.67	306	09:30	6.75
306	02:30	-3.95	306	09:40	6.78
306	02:40	-4.20	306	09:50	6.73
306	02:50	-4.37	306	10:00	6.66
306	03:00	-4.50	306	10:10	6.64
306	03:10	-4.69	306	10:20	6.50
306	03:20	-4.76	306	10:30	6.36
306	03:30	-4.71	306	10:40	6.22
306	03:40	-4.74	306	10:50	5.97
306	03:50	-4.71	306	11:00	5.74
306	04:00	-4.57	306	11:10	5.42
306	04:10	-4.39	306	11:20	5.07
306	04:20	-4.27	306	11:30	4.75
306	04:30	-4.04	306	11:40	4.38
306	04:40	-3.74	306	11:50	3.96
306	04:50	-3.44	306	12:00	3.55
306	05:00	-3.12	306	12:10	3.15
306	05:10	-2.77	306	12:20	2.72
306	05:20	-2.41	306	12:30	2.28
306	05:30	-1.99	306	12:40	1.77
306	05:40	-1.64	306	12:50	1.24
306	05:50	-1.23	306	13:00	0.78
306	06:00	-0.79	306	13:10	0.34
306	06:10	-0.44	306	13:20	-0.17
306	06:20	-0.05	306	13:30	-0.74
306	06:30	0.41	306	13:40	-1.23
306	06:40	0.87	306	13:50	-1.67
306	06:50	1.31	306	14:00	-2.17
306	07:00	1.82	306	14:10	-2.64

(Continued)

Table 2 (Continued)

Julian Date	Hour EST	Water-Level Elevation ft. NGVD	Julian Date	Hour EST	Water-Level Elevation ft. NGVD
306	14:20	-3.12	306	22:00	5.44
306	14:30	-3.58	306	22:10	5.51
306	14:40	-3.91	306	22:20	5.53
306	14:50	-4.20	306	22:30	5.44
306	15:00	-4.55	306	22:40	5.42
306	15:10	-4.94	306	22:50	5.32
306	15:20	-5.22	306	23:00	5.18
306	15:30	-5.38	306	23:10	5.00
306	15:40	-5.47	306	23:20	4.77
306	15:50	-5.59	306	23:30	4.56
306	16:00	-5.73	306	23:40	4.28
306	16:10	-5.77	306	23:50	4.01
306	16:20	-5.66	307	00:00	3.66
306	16:30	-5.50	307	00:10	3.39
306	16:40	-5.50	307	00:20	3.02
306	16:50	-5.34	307	00:30	2.67
306	17:00	-5.08	307	00:40	2.32
306	17:10	-4.74	307	00:50	1.89
306	17:20	-4.55	307	01:00	1.54
306	17:30	-4.25	307	01:10	1.05
306	17:40	-3.93	307	01:20	0.64
306	17:50	-3.56	307	01:30	0.16
306	18:00	-3.21	307	01:40	-0.24
306	18:10	-2.82	307	01:50	-0.77
306	18:20	-2.47	307	02:00	-1.23
306	18:30	-2.11	307	02:10	-1.71
306	18:40	-1.60	307	02:20	-2.13
306	18:50	-1.18	307	02:30	-2.54
306	19:00	-0.77	307	02:40	-2.89
306	19:10	-0.42	307	02:50	-3.26
306	19:20	0.06	307	03:00	-3.65
306	19:30	0.52	307	03:10	-4.02
306	19:40	1.03	307	03:20	-4.30
306	19:50	1.49	307	03:30	-4.53
306	20:00	1.89	307	03:40	-4.78
306	20:10	2.37	307	03:50	-4.99
306	20:20	2.76	307	04:00	-5.08
306	20:30	3.18	307	04:10	-5.10
306	20:40	3.55	307	04:20	-5.13
306	20:50	3.89	307	04:30	-5.10
306	21:00	4.24	307	04:40	-4.94
306	21:10	4.52	307	04:50	-4.92
306	21:20	4.82	307	05:00	-4.69
306	21:30	5.00	307	05:10	-4.44
306	21:40	5.14	307	05:20	-4.20
306	21:50	5.30	307	05:30	-3.95

(Continued)

Table 2 (Continued)

Julian Date	Hour EST	Water-Level Elevation ft. NGVD	Julian Date	Hour EST	Water-Level Elevation ft. NGVD
307	05:40	-3.65	307	13:30	1.89
307	05:50	-3.24	307	13:40	1.35
307	06:00	-2.87	307	13:50	0.82
307	06:10	-2.50	307	14:00	0.27
307	06:20	-2.06	307	14:10	-0.31
307	06:30	-1.62	307	14:20	-0.81
307	06:40	-1.18	307	14:30	-1.25
307	06:50	-0.77	307	14:40	-1.76
307	07:00	-0.26	307	14:50	-2.29
307	07:10	0.25	307	15:00	-2.75
307	07:20	0.76	307	15:10	-3.19
307	07:30	1.17	307	15:20	-3.63
307	07:40	1.63	307	15:30	-4.14
307	07:50	2.07	307	15:40	-4.55
307	08:00	2.60	307	15:50	-4.85
307	08:10	3.11	307	16:00	-5.08
307	08:20	3.59	307	16:10	-5.36
307	08:30	3.98	307	16:20	-5.61
307	08:40	4.42	307	16:30	-5.73
307	08:50	4.86	307	16:40	-5.77
307	09:00	5.28	307	16:50	-5.84
307	09:10	5.65	307	17:00	-5.91
307	09:20	5.95	307	17:10	-5.87
307	09:30	6.22	307	17:20	-5.80
307	09:40	6.50	307	17:30	-5.66
307	09:50	6.68	307	17:40	-5.45
307	10:00	6.89	307	17:50	-5.27
307	10:10	6.96	307	18:00	-5.08
307	10:20	7.01	307	18:10	-4.71
307	10:30	7.10	307	18:20	-4.39
307	10:40	7.08	307	18:30	-4.02
307	10:50	7.03	307	18:40	-3.77
307	11:00	6.96	307	18:50	-3.40
307	11:10	6.75	307	19:00	-2.91
307	11:20	6.61	307	19:10	-2.47
307	11:30	6.50	307	19:20	-2.13
307	11:40	6.20	307	19:30	-1.81
307	11:50	5.97	307	19:40	-1.28
307	12:00	5.67	307	19:50	-0.84
307	12:10	5.37	307	20:00	-0.31
307	12:20	4.95	307	20:10	0.13
307	12:30	4.54	307	20:20	0.59
307	12:40	4.19	307	20:30	1.05
307	12:50	3.78	307	20:40	1.59
307	13:00	3.32	307	20:50	2.09
307	13:10	2.83	307	21:00	2.51
307	13:20	2.35	307	21:10	3.02

(Continued)

Table 2 (Continued)

Julian Date	Hour EST	Water-Level Elevation ft. NGVD	Julian Date	Hour EST	Water-Level Elevation ft. NGVD
307	21:20	3.41	308	05:00	-4.48
307	21:30	3.85	308	05:10	-4.53
307	21:40	4.19	308	05:20	-4.60
307	21:50	4.49	308	05:30	-4.48
307	22:00	4.84	308	05:40	-4.30
307	22:10	5.12	308	05:50	-4.11
307	22:20	5.44	308	06:00	-3.91
307	22:30	5.62	308	06:10	-3.61
307	22:40	5.74	308	06:20	-3.31
307	22:50	5.83	308	06:30	-3.05
307	23:00	5.88	308	06:40	-2.68
307	23:10	5.97	308	06:50	-2.27
307	23:20	5.95	308	07:00	-1.90
307	23:30	5.85	308	07:10	-1.46
307	23:40	5.85	308	07:20	-1.04
307	23:50	5.67	308	07:30	-0.63
308	00:00	5.53	308	07:40	-0.21
308	00:10	5.37	308	07:50	0.29
308	00:20	5.09	308	08:00	0.78
308	00:30	4.86	308	08:10	1.17
308	00:40	4.49	308	08:20	1.59
308	00:50	4.19	308	08:30	2.09
308	01:00	3.94	308	08:40	2.65
308	01:10	3.62	308	08:50	3.11
308	01:20	3.25	308	09:00	3.55
308	01:30	2.90	308	09:10	4.01
308	01:40	2.46	308	09:20	4.45
308	01:50	1.95	308	09:30	4.86
308	02:00	1.54	308	09:40	5.32
308	02:10	1.17	308	09:50	5.72
308	02:20	0.76	308	10:00	6.06
308	02:30	0.20	308	10:10	6.31
308	02:40	-0.24	308	10:20	6.55
308	02:50	-0.72	308	10:30	6.80
308	03:00	-1.11	308	10:40	7.01
308	03:10	-1.58	308	10:50	7.19
308	03:20	-2.04	308	11:00	7.31
308	03:30	-2.45	308	11:10	7.33
308	03:40	-2.80	308	11:20	7.35
308	03:50	-3.12	308	11:30	7.28
308	04:00	-3.49	308	11:40	7.26
308	04:10	-3.86	308	11:50	7.26
308	04:20	-4.07	308	12:00	7.10
308	04:30	-4.25	308	12:10	6.91
308	04:40	-4.37	308	12:20	6.61
308	04:50	-4.48	308	12:30	6.38
			308	12:40	6.08

(Continued)

Table 2 (Concluded)

Julian Date	Hour EST	Water-Level Elevation ft. NGVD	Julian Date	Hour EST	Water-Level Elevation ft. NGVD
308	12:50	5.76	308	18:30	-6.03
308	13:00	5.37	308	18:40	-5.75
308	13:10	4.98	308	18:50	-5.50
308	13:20	4.61	308	19:00	-5.15
308	13:30	4.15	308	19:10	-4.80
308	13:40	3.73	308	19:20	-4.48
308	13:50	3.25	308	19:30	-4.14
308	14:00	2.81	308	19:40	-3.81
308	14:10	2.30	308	19:50	-3.42
308	14:20	1.77	308	20:00	-3.03
308	14:30	1.29	308	20:10	-2.59
308	14:40	0.78	308	20:20	-2.17
308	14:50	0.27	308	20:30	-1.71
308	15:00	-0.28	308	20:40	-1.23
308	15:10	-0.81	308	20:50	-0.84
308	15:20	-1.41	308	21:00	-0.35
308	15:30	-2.01	308	21:10	0.11
308	15:40	-2.50	308	21:20	0.64
308	15:50	-2.96	308	21:30	1.12
308	16:00	-3.37	308	21:40	1.61
308	16:10	-3.84	308	21:50	2.00
308	16:20	-4.25	308	22:00	2.42
308	16:30	-4.67	308	22:10	2.90
308	16:40	-5.13	308	22:20	3.32
308	16:50	-5.38	308	22:30	3.66
308	17:00	-5.54	308	22:40	4.01
308	17:10	-5.70	308	22:50	4.31
308	17:20	-5.91	308	23:00	4.54
308	17:30	-6.07	308	23:10	4.79
308	17:40	-6.14	308	23:20	5.05
308	17:50	-6.19	308	23:30	5.23
308	18:00	-6.19	308	23:40	5.42
308	18:10	-6.19	308	23:50	5.42
308	18:20	-6.14			

Table 3

Saugus River Tide Data

at Station S1.5

Julian Date	Hour EST	Water-Level Elevation ft. NGVD	Julian Date	Hour EST	Water-Level Elevation ft. NGVD
306	00:00	2.10	306	07:10	2.24
306	00:10	1.66	306	07:20	2.77
306	00:20	1.29	306	07:30	3.21
306	00:30	0.99	306	07:40	3.62
306	00:40	0.56	306	07:50	4.04
306	00:50	0.07	306	08:00	4.43
306	01:00	-0.34	306	08:10	4.87
306	01:10	-0.71	306	08:20	5.29
306	01:20	-1.13	306	08:30	5.68
306	01:30	-1.57	306	08:40	5.86
306	01:40	-1.98	306	08:50	6.02
306	01:50	-2.42	306	09:00	6.30
306	02:00	-2.77	306	09:10	6.58
306	02:10	-3.16	306	09:20	6.78
306	02:20	-3.50	306	09:30	6.90
306	02:30	-3.80	306	09:40	6.92
306	02:40	-4.13	306	09:50	6.85
306	02:50	-4.33	306	10:00	6.83
306	03:00	-4.50	306	10:10	6.74
306	03:10	-4.59	306	10:20	6.65
306	03:20	-4.70	306	10:30	6.51
306	03:30	-4.82	306	10:40	6.32
306	03:40	-4.77	306	10:50	6.14
306	03:50	-4.68	306	11:00	5.93
306	04:00	-4.63	306	11:10	5.56
306	04:10	-4.52	306	11:20	5.24
306	04:20	-4.31	306	11:30	4.92
306	04:30	-4.08	306	11:40	4.52
306	04:40	-3.90	306	11:50	4.15
306	04:50	-3.60	306	12:00	3.72
306	05:00	-3.20	306	12:10	3.32
306	05:10	-2.84	306	12:20	2.91
306	05:20	-2.49	306	12:30	2.45
306	05:30	-2.10	306	12:40	1.99
306	05:40	-1.70	306	12:50	1.50
306	05:50	-1.27	306	13:00	0.95
306	06:00	-0.87	306	13:10	0.49
306	06:10	-0.41	306	13:20	0.07
306	06:20	-0.07	306	13:30	-0.39
306	06:30	0.28	306	13:40	-0.97
306	06:40	0.79	306	13:50	-1.47
306	06:50	1.32	306	14:00	-1.91
306	07:00	1.78	306	14:10	-2.33

(Continued)

Table 3 (Continued)

Julian Date	Hour EST	Water-Level Elevation ft. NGVD	Julian Date	Hour EST	Water-Level Elevation ft. NGVD
306	14:20	-2.79	306	22:00	5.49
306	14:30	-3.27	306	22:10	5.72
306	14:40	-3.76	306	22:20	5.63
306	14:50	-4.15	306	22:30	5.56
306	15:00	-4.40	306	22:40	5.49
306	15:10	-4.70	306	22:50	5.42
306	15:20	-5.05	306	23:00	5.40
306	15:30	-5.40	306	23:10	5.10
306	15:40	-5.58	306	23:20	4.96
306	15:50	-5.58	306	23:30	4.73
306	16:00	-5.58	306	23:40	4.45
306	16:10	-5.65	306	23:50	4.18
306	16:20	-5.79	307	00:00	3.79
306	16:30	-5.67	307	00:10	3.53
306	16:40	-5.47	307	00:20	3.16
306	16:50	-5.26	307	00:30	2.84
306	17:00	-5.17	307	00:40	2.47
306	17:10	-4.93	307	00:50	2.10
306	17:20	-4.59	307	01:00	1.69
306	17:30	-4.27	307	01:10	1.25
306	17:40	-4.01	307	01:20	0.86
306	17:50	-3.67	307	01:30	0.37
306	18:00	-3.30	307	01:40	-0.07
306	18:10	-2.90	307	01:50	-0.51
306	18:20	-2.49	307	02:00	-0.97
306	18:30	-2.12	307	02:10	-1.45
306	18:40	-1.73	307	02:20	-1.87
306	18:50	-1.22	307	02:30	-2.30
306	19:00	-0.71	307	02:40	-2.70
306	19:10	-0.37	307	02:50	-3.04
306	19:20	-0.02	307	03:00	-3.41
306	19:30	0.37	307	03:10	-3.76
306	19:40	0.99	307	03:20	-4.20
306	19:50	1.55	307	03:30	-4.50
306	20:00	1.99	307	03:40	-4.73
306	20:10	2.33	307	03:50	-4.89
306	20:20	2.77	307	04:00	-5.07
306	20:30	3.21	307	04:10	-5.19
306	20:40	3.58	307	04:20	-5.14
306	20:50	4.02	307	04:30	-5.10
306	21:00	4.29	307	04:40	-5.00
306	21:10	4.59	307	04:50	-4.89
306	21:20	4.89	307	05:00	-4.73
306	21:30	5.12	307	05:10	-4.59
306	21:40	5.26	307	05:20	-4.29
306	21:50	5.31	307	05:30	-4.01

(Continued)

Table 3 (Continued)

Julian Date	Hour EST	Water-Level Elevation ft. NGVD	Julian Date	Hour EST	Water-Level Elevation ft. NGVD
307	05:40	-3.73	307	13:20	2.54
307	05:50	-3.41	307	13:30	2.08
307	06:00	-3.02	307	13:40	1.64
307	06:10	-2.54	307	13:50	1.13
307	06:20	-2.12	307	14:00	0.56
307	06:30	-1.73	307	14:10	-0.02
307	06:40	-1.29	307	14:20	-0.55
307	06:50	-0.83	307	14:30	-1.06
307	07:00	-0.37	307	14:40	-1.45
307	07:10	0.12	307	14:50	-1.91
307	07:20	0.69	307	15.00	-2.42
307	07:30	1.18	307	15:10	-2.93
307	07:40	1.62	307	15:20	-3.37
307	07:50	2.03	307	15:30	-3.78
307	08:00	2.56	307	15:40	-4.27
307	08:10	3.12	307	15:50	-4.77
307	08:20	3.65	307	16:00	-5.14
307	08:30	4.04	307	16:10	-5.37
307	08:40	4.48	307	16:20	-5.53
307	08:50	4.87	307	16:30	-5.72
307	09:00	5.33	307	16:40	-5.88
307	09:10	5.75	307	16:50	-5.90
307	09:20	6.05	307	17:00	-5.90
307	09:30	6.28	307	17:10	-5.93
307	09:40	6.53	307	17:20	-5.88
307	09:50	6.81	307	17:30	-5.77
307	10:00	6.99	307	17:40	-5.56
307	10:10	7.11	307	17:50	-5.33
307	10:20	7.15	307	18:00	-5.14
307	10:30	7.15	307	18:10	-4.93
307	10:40	7.20	307	18:20	-4.63
307	10:50	7.18	307	18:30	-4.24
307	11:00	7.08	307	18:40	-3.85
307	11:10	6.95	307	18:50	-3.50
307	11:20	6.76	307	19:00	-3.18
307	11:30	6.60	307	19:10	-2.70
307	11:40	6.42	307	19:20	-2.17
307	11:50	6.14	307	19:30	-1.75
307	12:00	5.79	307	19:40	-1.47
307	12:10	5.52	307	19:50	-1.04
307	12:20	5.15	307	20:00	-0.41
307	12:30	4.71	307	20:10	0.12
307	12:40	4.34	307	20:20	0.58
307	12:50	3.97	307	20:30	0.99
307	13:00	3.58	307	20:40	1.50
307	13:10	3.02	307	20:50	2.08

(Continued)

Table 3 (Continued)

Julian Date	Hour EST	Water-Level Elevation ft. NGVD	Julian Date	Hour EST	Water-Level Elevation ft. NGVD
307	21:00	2.59	308	04:40	-4.40
307	21:10	2.96	308	04:50	-4.45
307	21:20	3.42	308	05:00	-4.52
307	21:30	3.92	308	05:10	-4.52
307	21:40	4.22	308	05:20	-4.52
307	21:50	4.52	308	05:30	-4.52
307	22:00	4.82	308	05:40	-4.52
307	22:10	5.17	308	05:50	-4.29
307	22:20	5.49	308	06:00	-4.01
307	22:30	5.68	308	06:10	-3.73
307	22:40	5.86	308	06:20	-3.41
307	22:50	5.93	308	06:30	-3.09
307	23:00	5.95	308	06:40	-2.79
307	23:10	6.07	308	06:50	-2.49
307	23:20	6.05	308	07:00	-2.00
307	23:30	5.93	308	07:10	-1.52
307	23:40	5.91	308	07:20	-1.11
307	23:50	5.84	308	07:30	-0.69
308	00:00	5.65	308	07:40	-0.30
308	00:10	5.42	308	07:50	0.19
308	00:20	5.24	308	08:00	0.69
308	00:30	5.05	308	08:10	1.25
308	00:40	4.66	308	08:20	1.59
308	00:50	4.32	308	08:30	1.96
308	01:00	3.95	308	08:40	2.54
308	01:10	3.76	308	08:50	3.16
308	01:20	3.49	308	09:00	3.60
308	01:30	3.02	308	09:10	3.95
308	01:40	2.66	308	09:20	4.43
308	01:50	2.22	308	09:30	4.92
308	02:00	1.69	308	09:40	5.31
308	02:10	1.25	308	09:50	5.72
308	02:20	0.99	308	10:00	6.09
308	02:30	0.56	308	10:10	6.39
308	02:40	-0.02	308	10:20	6.60
308	02:50	-0.55	308	10:30	6.83
308	03:00	-0.97	308	10:40	7.08
308	03:10	-1.34	308	10:50	7.29
308	03:20	-1.73	308	11:00	7.41
308	03:30	-2.21	308	11:10	7.45
308	03:40	-2.67	308	11:20	7.45
308	03:50	-3.00	308	11:30	7.41
308	04:00	-3.30	308	11:40	7.36
308	04:10	-3.60	308	11:50	7.34
308	04:20	-4.01	308	12:00	7.32
308	04:30	-4.27	308	12:10	7.08

(Continued)

Table 3 (Concluded)

Julian Date	Hour EST	Water-Level Elevation ft. NGVD	Julian Date	Hour EST	Water-Level Elevation ft. NGVD
308	12:20	6.76	308	18:10	-6.23
308	12:30	6.51	308	18:20	-6.07
308	12:40	6.23	308	18:30	-5.95
308	12:50	5.95	308	18:40	-5.86
308	13:00	5.63	308	18:50	-5.65
308	13:10	5.17	308	19:00	-5.33
308	13:20	4.80	308	19:10	-4.98
308	13:30	4.36	308	19:20	-4.63
308	13:40	3.95	308	19:30	-4.29
308	13:50	3.49	308	19:40	-3.90
308	14:00	3.02	308	19:50	-3.50
308	14:10	2.54	308	20:00	-3.16
308	14:20	2.03	308	20:10	-2.74
308	14:30	1.52	308	20:20	-2.26
308	14:40	1.04	308	20:30	-1.80
308	14:50	0.56	308	20:40	-1.34
308	15:00	0.05	308	20:50	-0.87
308	15:10	-0.48	308	21:00	-0.39
308	15:20	-1.04	308	21:10	0.05
308	15:30	-1.61	308	21:20	0.56
308	15:40	-2.21	308	21:30	1.09
308	15:50	-2.72	308	21:40	1.62
308	16:00	-3.14	308	21:50	2.06
308	16:10	-3.53	308	22:00	2.45
308	16:20	-3.97	308	22:10	2.84
308	16:30	-4.40	308	22:20	3.37
308	16:40	-4.84	308	22:30	3.81
308	16:50	-5.28	308	22:40	4.04
308	17:00	-5.65	308	22:50	4.29
308	17:10	-5.79	308	23:00	4.57
308	17:20	-5.81	308	23:10	4.82
308	17:30	-5.93	308	23:20	5.08
308	17:40	-6.18	308	23:30	5.38
308	17:50	-6.34	308	23:40	5.49
308	18:00	-6.36	308	23:50	5.49

Table 4

Saugus River Tide Data

at Station S2.1

Julian Date	Hour EST	Water-Level Elevation ft. NGVD	Julian Date	Hour EST	Water-Level Elevation ft. NGVD
306	00:00	2.13	306	07:10	2.11
306	00:10	1.76	306	07:20	2.62
306	00:20	1.37	306	07:30	3.10
306	00:30	1.03	306	07:40	3.52
306	00:40	0.61	306	07:50	3.93
306	00:50	0.17	306	08:00	4.32
306	01:00	-0.27	306	08:10	4.74
306	01:10	-0.68	306	08:20	5.18
306	01:20	-1.07	306	08:30	5.55
306	01:30	-1.47	306	08:40	5.80
306	01:40	-1.93	306	08:50	5.99
306	01:50	-2.34	306	09:00	6.22
306	02:00	-2.69	306	09:10	6.49
306	02:10	-3.06	306	09:20	6.70
306	02:20	-3.40	306	09:30	6.86
306	02:30	-3.75	306	09:40	6.89
306	02:40	-4.05	306	09:50	6.82
306	02:50	-4.26	306	10:00	6.82
306	03:00	-4.44	306	10:10	6.72
306	03:10	-4.56	306	10:20	6.63
306	03:20	-4.65	306	10:30	6.52
306	03:30	-4.74	306	10:40	6.31
306	03:40	-4.72	306	10:50	6.12
306	03:50	-4.70	306	11:00	5.94
306	04:00	-4.60	306	11:10	5.57
306	04:10	-4.49	306	11:20	5.22
306	04:20	-4.30	306	11:30	4.90
306	04:30	-4.12	306	11:40	4.53
306	04:40	-3.89	306	11:50	4.19
306	04:50	-3.61	306	12:00	3.75
306	05:00	-3.29	306	12:10	3.33
306	05:10	-2.92	306	12:20	2.92
306	05:20	-2.55	306	12:30	2.48
306	05:30	-2.16	306	12:40	2.02
306	05:40	-1.77	306	12:50	1.51
306	05:50	1.37	306	13:00	0.98
306	06:00	-0.94	306	13:10	0.50
306	06:10	-0.52	306	13:20	0.10
306	06:20	-0.15	306	13:30	-0.34
306	06:30	0.22	306	13:40	-0.87
306	06:40	0.66	306	13:50	-1.42
306	06:50	1.21	306	14:00	-1.86
306	07:00	1.67	306	14:10	-2.27

(Continued)

Table 4 (Continued)

Julian Date	Hour EST	Water-Level Elevation ft. NGVD	Julian Date	Hour EST	Water-Level Elevation ft. NGVD
306	14:20	-2.71	306	22:00	5.39
306	14:30	-3.24	306	22:10	5.55
306	14:40	-3.68	306	22:20	5.62
306	14:50	-4.10	306	22:30	5.55
306	15:00	-4.37	306	22:40	5.48
306	15:10	-4.67	306	22:50	5.36
306	15:20	-5.00	306	23:00	5.29
306	15:30	-5.27	306	23:10	5.11
306	15:40	-5.48	306	23:20	4.92
306	15:50	-5.60	306	23:30	4.69
306	16:00	-5.62	306	23:40	4.42
306	16:10	-5.64	306	23:50	4.14
306	16:20	-5.73	307	00:00	3.84
306	16:30	-5.69	307	00:10	3.52
306	16:40	-5.53	307	00:20	3.17
306	16:50	-5.34	307	00:30	2.83
306	17:00	-5.16	307	00:40	2.50
306	17:10	-4.95	307	00:50	2.11
306	17:20	-4.70	307	01:00	1.72
306	17:30	-4.37	307	01:10	1.28
306	17:40	-4.07	307	01:20	0.82
306	17:50	-3.75	307	01:30	0.36
306	18:00	-3.43	307	01:40	-0.08
306	18:10	-3.01	307	01:50	-0.50
306	18:20	-2.64	307	02:00	-0.96
306	18:30	-2.27	307	02:10	-1.44
306	18:40	-1.88	307	02:20	-1.90
306	18:50	-1.42	307	02:30	-2.32
306	19:00	-0.94	307	02:40	-2.71
306	19:10	-0.57	307	02:50	-3.06
306	19:20	-0.20	307	03:00	-3.43
306	19:30	0.20	307	03:10	-3.75
306	19:40	0.75	307	03:20	-4.12
306	19:50	1.33	307	03:30	-4.46
306	20:00	1.79	307	03:40	-4.70
306	20:10	2.20	307	03:50	-4.88
306	20:20	2.62	307	04:00	-5.04
306	20:30	3.06	307	04:10	-5.16
306	20:40	3.42	307	04:20	-5.18
306	20:50	3.84	307	04:30	-5.13
306	21:00	4.21	307	04:40	-5.06
306	21:10	4.46	307	04:50	-4.93
306	21:20	4.74	307	05:00	-4.76
306	21:30	5.02	307	05:10	-4.63
306	21:40	5.18	307	05:20	-4.37
306	21:50	5.25			

(Continued)

Table 4 (Continued)

Julian Date	Hour EST	Water-Level Elevation ft. NGVD	Julian Date	Hour EST	Water-Level Elevation ft. NGVD
307	05:30	-4.14	307	13:20	2.43
307	05:40	-3.84	307	13:30	1.97
307	05:50	-3.52	307	13:40	1.51
307	06:00	-3.17	307	13:50	1.03
307	06:10	-2.71	307	14:00	0.47
307	06:20	-2.27	307	14:10	-0.06
307	06:30	-1.88	307	14:20	-0.64
307	06:40	-1.44	307	14:30	-1.10
307	06:50	-1.03	307	14:40	-1.54
307	07:00	-0.61	307	14:50	-1.95
307	07:10	-0.10	307	15:00	-2.46
307	07:20	0.43	307	15:10	-2.97
307	07:30	0.96	307	15:20	-3.38
307	07:40	1.42	307	15:30	-3.80
307	07:50	1.83	307	15:40	-4.23
307	08:00	2.34	307	15:50	-4.70
307	08:10	2.89	307	16:00	-5.11
307	08:20	3.40	307	16:10	-5.36
307	08:30	3.86	307	16:20	-5.55
307	08:40	4.28	307	16:30	-5.73
307	08:50	4.67	307	16:40	-5.90
307	09:00	5.16	307	16:50	-5.96
307	09:10	5.55	307	17:00	-6.01
307	09:20	5.87	307	17:10	-6.03
307	09:30	6.12	307	17:20	-5.99
307	09:40	6.38	307	17:30	-5.90
307	09:50	6.65	307	17:40	-5.71
307	10:00	6.86	307	17:50	-5.50
307	10:10	7.00	307	18:00	-5.30
307	10:20	7.02	307	18:10	-5.09
307	10:30	7.05	307	18:20	-4.79
307	10:40	7.09	307	18:30	-4.44
307	10:50	7.09	307	18:40	-4.05
307	11:00	6.98	307	18:50	-3.68
307	11:10	6.89	307	19:00	-3.31
307	11:20	6.70	307	19:10	-2.90
307	11:30	6.52	307	19:20	-2.39
307	11:40	6.38	307	19:30	-1.97
307	11:50	6.08	307	19:40	-1.65
307	12:00	5.73	307	19:50	-1.26
307	12:10	5.43	307	20:00	-0.68
307	12:20	5.09	307	20:10	-0.15
307	12:30	4.65	307	20:20	0.29
307	12:40	4.23	307	20:30	0.73
307	12:50	3.89	307	20:40	1.23
307	13:00	3.49	307	20:50	1.76
307	13:10	2.96	307	21:00	2.29

(Continued)

Table 4 (Continued)

Julian Date	Hour EST	Water-Level Elevation ft. NGVD	Julian Date	Hour EST	Water-Level Elevation ft. NGVD
307	21:10	2.71	308	04:50	-4.58
307	21:20	3.17	308	05:00	-4.63
307	21:30	3.63	308	05:10	-4.63
307	21:40	4.02	308	05:20	-4.63
307	21:50	4.35	308	05:30	-4.65
307	22:00	4.65	308	05:40	-4.63
307	22:10	4.97	308	05:50	-4.44
307	22:20	5.29	308	06:00	-4.23
307	22:30	5.52	308	06:10	-3.93
307	22:40	5.71	308	06:20	-3.61
307	22:50	5.80	308	06:30	-3.31
307	23:00	5.85	308	06:40	-2.99
307	23:10	5.94	308	06:50	-2.67
307	23:20	5.96	308	07:00	-2.27
307	23:30	5.89	308	07:10	-1.81
307	23:40	5.80	308	07:20	-1.37
307	23:50	5.73	308	07:30	-0.96
308	00:00	5.55	308	07:40	-0.57
308	00:10	5.36	308	07:50	-0.10
308	00:20	5.16	308	08:00	0.40
308	00:30	4.90	308	08:10	0.91
308	00:40	4.60	308	08:20	1.30
308	00:50	4.21	308	08:30	1.72
308	01:00	3.84	308	08:40	2.23
308	01:10	3.61	308	08:50	2.83
308	01:20	3.36	308	09:00	3.31
308	01:30	2.94	308	09:10	3.70
308	01:40	2.50	308	09:20	4.16
308	01:50	2.09	308	09:30	4.62
308	02:00	1.56	308	09:40	5.06
308	02:10	1.14	308	09:50	5.48
308	02:20	0.84	308	10:00	5.85
308	02:30	0.43	308	10:10	6.15
308	02:40	-0.10	308	10:20	6.38
308	02:50	-0.61	308	10:30	
308	03:00	-1.07	308	10:40	6.86
308	03:10	-1.44	308	10:50	7.09
308	03:20	-1.84	308	11:00	7.21
308	03:30	-2.27	308	11:10	7.28
308	03:40	-2.71	308	11:20	7.30
308	03:50	-3.10	308	11:30	7.25
308	04:00	-3.40	308	11:40	7.21
308	04:10	-3.68	308	11:50	7.16
308	04:20	-4.03	308	12:00	7.14
308	04:30	-4.33	308	12:10	6.95
308	04:40	-4.51	308	12:20	6.70

(Continued)

Table 4 (Concluded)

Julian Date	Hour EST	Water-Level Elevation ft. NGVD	Julian Date	Hour EST	Water-Level Elevation ft. NGVD
308	12:30	6.40	308	18:20	-6.26
308	12:40	6.10	308	18:30	-6.10
308	12:50	5.80	308	18:40	-5.96
308	13:00	5.43	308	18:50	-5.78
308	13:10	5.04	308	19:00	-5.53
308	13:20	4.62	308	19:10	-5.20
308	13:30	4.23	308	19:20	-4.86
308	13:40	3.79	308	19:30	-4.51
308	13:50	3.33	308	19:40	-4.12
308	14:00	2.87	308	19:50	-3.77
308	14:10	2.39	308	20:00	-3.43
308	14:20	1.86	308	20:10	-3.03
308	14:30	1.37	308	20:20	-2.57
308	14:40	0.89	308	20:30	-2.09
308	14:50	0.40	308	20:40	-1.65
308	15:00	-0.10	308	20:50	-1.19
308	15:10	-0.61	308	21:00	-0.75
308	15:20	-1.17	308	21:10	-0.27
308	15:30	-1.70	308	21:20	0.22
308	15:40	-2.30	308	21:30	0.75
308	15:50	-2.80	308	21:40	1.26
308	16:00	-3.24	308	21:50	1.74
308	16:10	-3.61	308	22:00	2.13
308	16:20	-4.03	308	22:10	2.57
308	16:30	-4.46	308	22:20	3.08
308	16:40	-4.86	308	22:30	
308	16:50	-5.27	308	22:40	3.84
308	17:00	-5.62	308	22:50	4.09
308	17:10	-5.83	308	23:00	4.35
308	17:20	-5.94	308	23:10	4.60
308	17:30	-6.06	308	23:20	4.86
308	17:40	-6.22	308	23:30	5.16
308	17:50	-6.40	308	23:40	5.32
308	18:00	-6.47	308	23:50	5.36
308	18:10	-6.40			

Table 5

Saugus River Tide Data

at Station S4.2

Julian Date	Hour EST	Water-Level Elevation ft. NGVD	Julian Date	Hour EST	Water-Level Elevation ft. NGVD
306	00:00	2.36	306	07:10	1.53
306	00:10	2.03	306	07:20	2.03
306	00:20	1.71	306	07:30	2.52
306	00:30	1.37	306	07:40	3.03
306	00:40	1.02	306	07:50	3.46
306	00:50	0.67	306	08:00	3.88
306	01:00	0.28	306	08:10	4.27
306	01:10	-0.11	306	08:20	4.71
306	01:20	-0.46	306	08:30	5.08
306	01:30	-0.80	306	08:40	5.40
306	01:40	-1.17	306	08:50	5.61
306	01:50	-1.52	306	09:00	5.82
306	02:00	-1.91	306	09:10	6.07
306	02:10	-2.26	306	09:20	6.30
306	02:20	-2.56	306	09:30	6.51
306	02:30	-2.88	306	09:40	6.67
306	02:40	-3.16	306	09:50	6.74
306	02:50	-3.43	306	10:00	6.69
306	03:00	-3.69	306	10:10	6.67
306	03:10	-3.94	306	10:20	6.63
306	03:20	-4.15	306	10:30	6.53
306	03:30	-4.33	306	10:40	6.44
306	03:40	-4.49	306	10:50	6.26
306	03:50	-4.63	306	11:00	6.09
306	04:00	-4.66	306	11:10	5.89
306	04:10	-4.63	306	11:20	5.59
306	04:20	-4.56	306	11:30	5.29
306	04:30	-4.38	306	11:40	4.96
306	04:40	-4.19	306	11:50	4.62
306	04:50	-3.96	306	12:00	4.27
306	05:00	-3.66	306	12:10	3.86
306	05:10	-3.34	306	12:20	3.49
306	05:20	-3.00	306	12:30	3.07
306	05:30	-2.67	306	12:40	2.66
306	05:40	-2.33	306	12:50	2.26
306	05:50	-1.96	306	13:00	1.83
306	06:00	-1.59	306	13:10	1.37
306	06:10	-1.20	306	13:20	0.95
306	06:20	-0.78	306	13:30	0.56
306	06:30	-0.39	306	13:40	0.17
306	06:40	0.00	306	13:50	-0.25
306	06:50	0.47	306	14:00	-0.67
306	07:00	1.00	306	14:10	-1.08

(Continued)

Table 5 (Continued)

Julian Date	Hour EST	Water-Level Elevation ft. NGVD	Julian Date	Hour EST	Water-Level Elevation ft. NGVD
306	14:20	-1.50	306	22:00	5.26
306	14:30	-1.86	306	22:10	5.40
306	14:40	-2.23	306	22:20	5.59
306	14:50	-2.60	306	22:30	5.59
306	15:00	-2.95	306	22:40	5.54
306	15:10	-3.25	306	22:50	5.45
306	15:20	-3.53	306	23:00	5.36
306	15:30	-3.80	306	23:10	5.29
306	15:40	-4.10	306	23:20	5.13
306	15:50	-4.38	306	23:30	4.89
306	16:00	-4.63	306	23:40	4.66
306	16:10	-4.82	306	23:50	4.39
306	16:20	-5.03	307	00:00	4.11
306	16:30	-5.21	307	00:10	3.81
306	16:40	-5.37	307	00:20	3.51
306	16:50	-5.42	307	00:30	3.19
306	17:00	-5.26	307	00:40	2.84
306	17:10	-5.12	307	00:50	2.50
306	17:20	-4.93	307	01:00	2.10
306	17:30	-4.68	307	01:10	1.73
306	17:40	-4.38	307	01:20	1.37
306	17:50	-4.06	307	01:30	0.97
306	18:00	-3.76	307	01:40	0.58
306	18:10	-3.43	307	01:50	0.19
306	18:20	-3.09	307	02:00	-0.18
306	18:30	-2.74	307	02:10	-0.55
306	18:40	-2.40	307	02:20	-0.94
306	18:50	-2.05	307	02:30	-1.36
306	19:00	-1.63	307	02:40	-1.73
306	19:10	-1.22	307	02:50	-2.07
306	19:20	-0.78	307	03:00	-2.42
306	19:30	-0.34	307	03:10	-2.74
306	19:40	0.07	307	03:20	-3.06
306	19:50	0.56	307	03:30	-3.36
306	20:00	1.16	307	03:40	-3.66
306	20:10	1.69	307	03:50	-3.96
306	20:20	2.13	307	04:00	-4.19
306	20:30	2.54	307	04:10	-4.45
306	20:40	2.98	307	04:20	-4.68
306	20:50	3.37	307	04:30	-4.84
306	21:00	3.81	307	04:40	-4.93
306	21:10	4.18	307	04:50	-4.96
306	21:20	4.48	307	05:00	-4.86
306	21:30	4.78	307	05:10	-4.73
306	21:40	5.01	307	05:20	-4.56
306	21:50	5.15	307	05:30	-4.36

(Continued)

Table 5 (Continued)

Julian Date	Hour EST	Water-Level Elevation ft. NGVD	Julian Date	Hour EST	Water-Level Elevation ft. NGVD
307	05:40	-4.08	307	13:30	2.86
307	05:50	-3.78	307	13:40	2.43
307	06:00	-3.48	307	13:50	2.03
307	06:10	-3.13	307	14:00	1.60
307	06:20	-2.76	307	14:10	1.11
307	06:30	-2.37	307	14:20	0.67
307	06:40	-1.98	307	14:30	0.26
307	06:50	-1.59	307	14:40	-0.18
307	07:00	-1.20	307	14:50	-0.53
307	07:10	-0.76	307	15:00	-0.92
307	07:20	-0.30	307	15:10	-1.31
307	07:30	0.26	307	15:20	-1.73
307	07:40	0.81	307	15:30	-2.14
307	07:50	1.34	307	15:40	-2.46
307	08:00	1.80	307	15:50	-2.79
307	08:10	2.29	307	16:00	-3.11
307	08:20	2.86	307	16:10	-3.39
307	08:30	3.37	307	16:20	-3.71
307	08:40	3.81	307	16:30	-3.96
307	08:50	4.23	307	16:40	-4.22
307	09:00	4.62	307	16:50	-4.52
307	09:10	5.06	307	17:00	-4.70
307	09:20	5.40	307	17:10	-4.91
307	09:30	5.70	307	17:20	-5.12
307	09:40	6.00	307	17:30	-5.28
307	09:50	6.26	307	17:40	-5.39
307	10:00	6.49	307	17:50	-5.39
307	10:10	6.67	307	18:00	-5.28
307	10:20	6.83	307	18:10	-5.09
307	10:30	6.93	307	18:20	-4.89
307	10:40	6.95	307	18:30	-4.66
307	10:50	6.97	307	18:40	-4.33
307	11:00	6.99	307	18:50	-3.96
307	11:10	6.95	307	19:00	-3.59
307	11:20	6.86	307	19:10	-3.29
307	11:30	6.67	307	19:20	-2.93
307	11:40	6.53	307	19:30	-2.49
307	11:50	6.39	307	19:40	-2.07
307	12:00	6.19	307	19:50	-1.73
307	12:10	5.89	307	20:00	-1.36
307	12:20	5.63	307	20:10	-0.87
307	12:30	5.33	307	20:20	-0.34
307	12:40	4.96	307	20:30	0.17
307	12:50	4.57	307	20:40	0.65
307	13:00	4.20	307	20:50	1.16
307	13:10	3.86	307	21:00	1.73
307	13:20	3.44	307	21:10	2.26

(Continued)

Table 5 (Continued)

Julian Date	Hour EST	Water-Level Elevation ft. NGVD	Julian Date	Hour EST	Water-Level Elevation ft. NGVD
307	21:20	2.70	308	05:00	-4.01
307	21:30	3.19	308	05:10	-4.19
307	21:40	3.63	308	05:20	-4.31
307	21:50	4.02	308	05:30	-4.38
307	22:00	4.36	308	05:40	-4.45
307	22:10	4.71	308	05:50	-4.47
307	22:20	5.01	308	06:00	-4.33
307	22:30	5.26	308	06:10	-4.10
307	22:40	5.52	308	06:20	-3.85
307	22:50	5.70	308	06:30	-3.53
307	23:00	5.77	308	06:40	-3.20
307	23:10	5.86	308	06:50	-2.93
307	23:20	5.93	308	07:00	-2.63
307	23:30	5.98	308	07:10	-2.28
307	23:40	5.93	308	07:20	-1.86
307	23:50	5.82	308	07:30	-1.45
308	00:00	5.75	308	07:40	-1.06
308	00:10	5.59	308	07:50	-0.64
308	00:20	5.40	308	08:00	-0.20
308	00:30	5.22	308	08:10	0.28
308	00:40	4.99	308	08:20	0.81
308	00:50	4.71	308	08:30	1.30
308	01:00	4.36	308	08:40	1.73
308	01:10	4.04	308	08:50	2.24
308	01:20	3.74	308	09:00	2.82
308	01:30	3.46	308	09:10	3.33
308	01:40	3.12	308	09:20	3.76
308	01:50	2.70	308	09:30	4.23
308	02:00	2.29	308	09:40	4.66
308	02:10	1.85	308	09:50	5.03
308	02:20	1.46	308	10:00	5.40
308	02:30	1.11	308	10:10	5.73
308	02:40	0.77	308	10:20	6.03
308	02:50	0.35	308	10:30	6.28
308	03:00	-0.07	308	10:40	6.49
308	03:10	-0.48	308	10:50	6.72
308	03:20	-0.87	308	11:00	6.93
308	03:30	-1.22	308	11:10	7.06
308	03:40	-1.56	308	11:20	7.16
308	03:50	-2.00	308	11:30	7.18
308	04:00	-2.33	308	11:40	7.20
308	04:10	-2.67	308	11:50	7.16
308	04:20	-2.97	308	12:00	7.16
308	04:30	-3.23	308	12:10	7.16
308	04:40	-3.55	308	12:20	7.04
308	04:50	-3.80	308	12:30	6.79

(Continued)

Table 5 (Concluded)

Julian Date	Hour EST	Water-Level Elevation ft. NGVD	Julian Date	Hour EST	Water-Level Elevation ft. NGVD
308	12:40	6.56	308	18:20	-5.39
308	12:50	6.30	308	18:30	-5.56
308	13:00	6.07	308	18:40	-5.60
308	13:10	5.77	308	18:50	-5.63
308	13:20	5.43	308	19:00	-5.60
308	13:30	5.08	308	19:10	-5.39
308	13:40	4.71	308	19:20	-5.09
308	13:50	4.27	308	19:30	-4.75
308	14:00	3.81	308	19:40	-4.40
308	14:10	3.37	308	19:50	-4.01
308	14:20	2.96	308	20:00	-3.66
308	14:30	2.45	308	20:10	-3.32
308	14:40	2.01	308	20:20	-2.97
308	14:50	1.55	308	20:30	-2.58
308	15:00	1.13	308	20:40	-2.14
308	15:10	0.70	308	20:50	-1.73
308	15:20	0.26	308	21:00	-1.29
308	15:30	-0.13	308	21:10	-0.85
308	15:40	-0.53	308	21:20	-0.34
308	15:50	-0.96	308	21:30	0.14
308	16:00	-1.40	308	21:40	0.70
308	16:10	-1.82	308	21:50	1.25
308	16:20	-2.21	308	22:00	1.76
308	16:30	-2.56	308	22:10	2.20
308	16:40	-2.88	308	22:20	2.61
308	16:50	-3.18	308	22:30	3.12
308	17:00	-3.48	308	22:40	3.51
308	17:10	-3.78	308	22:50	3.88
308	17:20	-4.03	308	23:00	4.18
308	17:30	-4.29	308	23:10	4.46
308	17:40	-4.52	308	23:20	4.71
308	17:50	-4.77	308	23:30	4.94
308	18:00	-4.96	308	23:40	5.22
308	18:10	-5.19	308	23:50	5.36

Table 6

Saugus River Tide Data

at Station S4.4

Julian Date	Hour EST	Water-Level Elevation ft. NGVD	Julian Date	Hour EST	Water-Level Elevation ft. NGVD
306	00:00	2.73	306	07:10	-0.17
306	00:10	2.39	306	07:20	0.34
306	00:20	2.07	306	07:30	0.89
306	00:30	1.72	306	07:40	1.44
306	00:40	1.40	306	07:50	2.02
306	00:50	1.07	306	08:00	2.57
306	01:00	0.77	306	08:10	3.08
306	01:10	0.50	306	08:20	3.54
306	01:20	0.22	306	08:30	4.00
306	01:30	-0.08	306	08:40	4.44
306	01:40	-0.36	306	08:50	4.79
306	01:50	-0.61	306	09:00	5.04
306	02:00	-0.63	306	09:10	5.23
306	02:10	-0.63	306	09:20	5.36
306	02:20	-0.63	306	09:30	5.50
306	02:30	-0.61	306	09:40	5.64
306	02:40	-0.61	306	09:50	5.80
306	02:50	-0.61	306	10:00	5.96
306	03:00	-0.61	306	10:10	6.08
306	03:10	-0.61	306	10:20	6.17
306	03:20	-0.61	306	10:30	6.22
306	03:30	-0.61	306	10:40	6.24
306	03:40	-0.59	306	10:50	6.24
306	03:50	-0.61	306	11:00	6.20
306	04:00	-0.61	306	11:10	6.10
306	04:10	-0.61	306	11:20	5.99
306	04:20	-0.61	306	11:30	5.90
306	04:30	-0.61	306	11:40	5.78
306	04:40	-0.61	306	11:50	5.64
306	04:50	-0.59	306	12:00	5.48
306	05:00	-0.59	306	12:10	5.30
306	05:10	-0.59	306	12:20	5.11
306	05:20	-0.59	306	12:30	4.88
306	05:30	-0.59	306	12:40	4.60
306	05:40	-0.59	306	12:50	4.23
306	05:50	-0.59	306	13:00	3.87
306	06:00	-0.59	306	13:10	3.43
306	06:10	-0.59	306	13:20	2.97
306	06:20	-0.59	306	13:30	2.43
306	06:30	-0.56	306	13:40	1.90
306	06:40	-0.56	306	13:50	1.42
306	06:50	-0.56	306	14:00	0.96
306	07:00	-0.56	306	14:10	0.52

(Continued)

Table 6 (Continued)

Julian Date	Hour EST	Water-Level Elevation ft. NGVD
306	14:20	0.13
306	14:30	-0.22
306	14:40	-0.56
306	14:50	-0.77
306	15:00	-0.77
306	15:10	-0.80
306	15:20	-0.80
306	15:30	-0.80
306	15:40	-0.82
306	15:50	-0.82
306	16:00	-0.84
306	16:10	-0.84
306	16:20	-0.84
306	16:30	-0.84
306	16:40	-0.84
306	16:50	-0.84
306	17:00	-0.84
306	17:10	-0.84
306	17:20	-0.84
306	17:30	-0.82
306	17:40	-0.82
306	17:50	-0.82
306	18:00	-0.82
306	18:10	-0.82
306	18:20	-0.82
306	18:30	-0.84
306	18:40	-0.84
306	18:50	-0.84
306	19:00	-0.84
306	19:10	-0.84
306	19:20	-0.84
306	19:30	-0.84
306	19:40	-0.84
306	19:50	-0.84
306	20:00	-0.77
306	20:10	-0.24
306	20:20	0.34
306	20:30	0.94
306	20:40	1.49
306	20:50	2.02
306	21:00	2.57
306	21:10	3.03
306	21:20	3.50
306	21:30	3.91
306	21:40	4.28
306	21:50	4.56
306	22:00	4.76
306	22:10	4.88
306	22:20	5.00
306	22:30	5.11
306	22:40	5.18
306	22:50	5.23
306	23:00	5.25
306	23:10	5.23
306	23:20	5.16
306	23:30	5.06
306	23:40	4.93
306	23:50	4.79
307	00:00	4.60
307	00:10	4.35
307	00:20	4.10
307	00:30	3.75
307	00:40	3.38
307	00:50	3.01
307	01:00	2.64
307	01:10	2.25
307	01:20	1.88
307	01:30	1.51
307	01:40	
307	01:50	0.80
307	02:00	0.47
307	02:10	0.15
307	02:20	-0.17
307	02:30	-0.45
307	02:40	-0.73
307	02:50	-0.77
307	03:00	-0.77
307	03:10	-0.77
307	03:20	-0.77
307	03:30	-0.77
307	03:40	-0.77
307	03:50	-0.77
307	04:00	-0.77
307	04:10	-0.77
307	04:20	-0.77
307	04:30	-0.75
307	04:40	-0.77
307	04:50	-0.75
307	05:00	-0.75
307	05:10	-0.75
307	05:20	-0.75

(Continued)

Table 6 (Continued)

Julian Date	Hour EST	Water-Level Elevation ft. NGVD	Julian Date	Hour EST	Water-Level Elevation ft. NGVD
307	05:30	-0.77	307	13:20	5.23
307	05:40	-0.77	307	13:30	5.02
307	05:50	-0.77	307	13:40	4.76
307	06:00	-0.77	307	13:50	4.44
307	06:10	-0.77	307	14:00	4.05
307	06:20	-0.77	307	14:10	3.66
307	06:30	-0.77	307	14:20	3.20
307	06:40	-0.77	307	14:30	2.69
307	06:50	-0.75	307	14:40	2.18
307	07:00	-0.73	307	14:50	1.63
307	07:10	-0.73	307	15:00	1.14
307	07:20	-0.73	307	15:10	0.68
307	07:30	-0.73	307	15:20	0.24
307	07:40	-0.70	307	15:30	-0.13
307	07:50	-0.66	307	15:40	-0.47
307	08:00	-0.08	307	15:50	-0.77
307	08:10	0.50	307	16:00	-0.75
307	08:20	1.10	307	16:10	-0.73
307	08:30	1.67	307	16:20	-0.73
307	08:40	2.27	307	16:30	-0.73
307	08:50	2.85	307	16:40	-0.75
307	09:00	3.38	307	16:50	-0.77
307	09:10	3.87	307	17:00	-0.77
307	09:20	4.33	307	17:10	-0.77
307	09:30	4.70	307	17:20	-0.77
307	09:40	4.97	307	17:30	-0.77
307	09:50	5.18	307	17:40	-0.77
307	10:00	5.34	307	17:50	-0.77
307	10:10	5.48	307	18:00	-0.73
307	10:20	5.69	307	18:10	-0.75
307	10:30	5.90	307	18:20	-0.75
307	10:40	6.08	307	18:30	-0.77
307	10:50	6.22	307	18:40	-0.77
307	11:00	6.38	307	18:50	-0.77
307	11:10	6.49	307	19:00	-0.77
307	11:20	6.56	307	19:10	-0.77
307	11:30	6.59	307	19:20	-0.77
307	11:40	6.56	307	19:30	-0.75
307	11:50	6.45	307	19:40	-0.75
307	12:00	6.36	307	19:50	-0.75
307	12:10	6.24	307	20:00	-0.73
307	12:20	6.13	307	20:10	-0.73
307	12:30	6.01	307	20:20	-0.73
307	12:40	5.87	307	20:30	-0.73
307	12:50	5.73	307	20:40	-0.73
307	13:00	5.57	307	20:50	-0.68
307	13:10	5.41	307	21:00	-0.20

(Continued)

Table 6 (Continued)

Julian Date	Hour EST	Water-Level Elevation ft. NGVD	Julian Date	Hour EST	Water-Level Elevation ft. NGVD
307	21:10	0.36	308	04:50	-0.68
307	21:20	1.00	308	05:00	-0.68
307	21:30	1.58	308	05:10	-0.68
307	21:40	2.16	308	05:20	-0.68
307	21:50	2.71	308	05:30	-0.68
307	22:00	3.24	308	05:40	-0.70
307	22:10	3.68	308	05:50	-0.70
307	22:20	4.10	308	06:00	-0.70
307	22:30	4.49	308	06:10	-0.70
307	22:40	4.76	308	06:20	-0.70
307	22:50	4.97	308	06:30	-0.70
307	23:00	5.13	308	06:40	-0.68
307	23:10	5.25	308	06:50	-0.68
307	23:20	5.34	308	07:00	-0.68
307	23:30	5.41	308	07:10	-0.68
307	23:40	5.48	308	07:20	-0.66
307	23:50	5.55	308	07:30	-0.66
308	00:00	5.57	308	07:40	-0.66
308	00:10	5.55	308	07:50	-0.66
308	00:20	5.53	308	08:00	-0.68
308	00:30	5.43	308	08:10	-0.68
308	00:40	5.32	308	08:20	-0.70
308	00:50	5.23	308	08:30	-0.50
308	01:00	5.09	308	08:40	0.04
308	01:10	4.90	308	08:50	0.61
308	01:20	4.67	308	09:00	1.14
308	01:30	4.40	308	09:10	1.74
308	01:40	4.07	308	09:20	2.32
308	01:50	3.73	308	09:30	2.87
308	02:00	3.31	308	09:40	3.38
308	02:10	2.87	308	09:50	3.89
308	02:20	2.43	308	10:00	4.35
308	02:30	1.97	308	10:10	4.70
308	02:40	1.56	308	10:20	4.97
308	02:50	1.17	308	10:30	5.18
308	03:00	0.80	308	10:40	5.36
308	03:10	0.43	308	10:50	5.53
308	03:20	0.10	308	11:00	5.69
308	03:30	-0.22	308	11:10	5.92
308	03:40	-0.50	308	11:20	6.15
308	03:50	-0.73	308	11:30	6.36
308	04:00	-0.70	308	11:40	6.56
308	04:10	-0.70	308	11:50	6.70
308	04:20	-0.70	308	12:00	6.77
308	04:30	-0.70	308	12:10	6.84
308	04:40	-0.70	308	12:20	6.89
			308	12:30	6.86

(Continued)

Table 6 (Concluded)

Julian Date	Hour EST	Water-Level Elevation ft. NGVD	Julian Date	Hour EST	Water-Level Elevation ft. NGVD
308	12:40	6.75	308	18:20	-0.84
308	12:50	6.59	308	18:30	-0.84
308	13:00	6.45	308	18:40	-0.84
308	13:10	6.29	308	18:50	-0.84
308	13:20	6.15	308	19:00	-0.86
308	13:30	5.99	308	19:10	-0.84
308	13:40	5.85	308	19:20	-0.86
308	13:50	5.69	308	19:30	-0.86
308	14:00	5.53	308	19:40	-0.86
308	14:10	5.36	308	19:50	-0.89
308	14:20	5.18	308	20:00	-0.89
308	14:30	4.93	308	20:10	-0.89
308	14:40	4.67	308	20:20	-0.91
308	14:50	4.37	308	20:30	-0.91
308	15:00	3.98	308	20:40	-0.91
308	15:10	3.54	308	20:50	-0.91
308	15:20	3.08	308	21:00	-0.91
308	15:30	2.60	308	21:10	-0.91
308	15:40	2.07	308	21:20	-0.91
308	15:50	1.53	308	21:30	-0.91
308	16:00	1.03	308	21:40	-0.91
308	16:10	0.54	308	21:50	-0.73
308	16:20	0.10	308	22:00	-0.17
308	16:30	-0.26	308	22:10	0.43
308	16:40	-0.61	308	22:20	1.03
308	16:50	-0.91	308	22:30	1.58
308	17:00	-0.89	308	22:40	2.13
308	17:10	-0.86	308	22:50	2.69
308	17:20	-0.84	308	23:00	3.20
308	17:30	-0.84	308	23:10	3.59
308	17:40	-0.84	308	23:20	3.98
308	17:50	-0.84	308	23:30	4.30
308	18:00	-0.84	308	23:40	4.56
308	18:10	-0.84	308	23:50	4.76

Table 7

Saugus River Tide Data

at Station S5.8

Julian Date	Hour EST	Water-Level Elevation ft. NGVD	Julian Date	Hour EST	Water-Level Elevation ft. NGVD
306	00:00	3.85	306	07:10	1.15
306	00:10	3.52	306	07:20	1.65
306	00:20	3.20	306	07:30	2.18
306	00:30	2.88	306	07:40	2.69
306	00:40	2.58	306	07:50	3.25
306	00:50	2.28	306	08:00	3.78
306	01:00	1.98	306	08:10	4.28
306	01:10	1.65	306	08:20	4.77
306	01:20	1.38	306	08:30	5.30
306	01:30	1.08	306	08:40	5.74
306	01:40	0.80	306	08:50	6.08
306	01:50	0.55	306	09:00	6.36
306	02:00	0.27	306	09:10	6.57
306	02:10	-0.03	306	09:20	6.73
306	02:20	-0.31	306	09:30	6.94
306	02:30	-0.61	306	09:40	7.12
306	02:40	-0.88	306	09:50	7.28
306	02:50	-1.18	306	10:00	7.42
306	03:00	-1.39	306	10:10	7.49
306	03:10	-1.71	306	10:20	7.49
306	03:20	-1.74	306	10:30	7.49
306	03:30	-1.78	306	10:40	7.44
306	03:40	-1.76	306	10:50	7.35
306	03:50	-1.76	306	11:00	7.24
306	04:00	-1.76	306	11:10	7.08
306	04:10	-1.76	306	11:20	6.94
306	04:20	-1.76	306	11:30	6.75
306	04:30	-1.76	306	11:40	6.57
306	04:40	-1.76	306	11:50	6.34
306	04:50	-1.78	306	12:00	6.08
306	05:00	-1.76	306	12:10	5.81
306	05:10	-1.76	306	12:20	5.48
306	05:20	-1.76	306	12:30	5.16
306	05:30	-1.78	306	12:40	4.79
306	05:40	-1.78	306	12:50	4.45
306	05:50	-1.71	306	13:00	4.08
306	06:00	-1.48	306	13:10	3.68
306	06:10	-1.07	306	13:20	3.31
306	06:20	-0.81	306	13:30	2.92
306	06:30	-0.49	306	13:40	2.55
306	06:40	-0.08	306	13:50	2.18
306	06:50	0.29	306	14:00	1.82
306	07:00	0.68	306	14:10	1.47

(Continued)

Table 7 (Continued)

Julian Date	Hour EST	Water-Level Elevation ft. NGVD	Julian Date	Hour EST	Water-Level Elevation ft. NGVD
306	14:20	1.15	306	22:00	5.99
306	14:30	0.78	306	22:10	6.13
306	14:40	0.45	306	22:20	6.22
306	14:50	0.13	306	22:30	6.36
306	15:00	-0.19	306	22:40	6.45
306	15:10	-0.45	306	22:50	6.48
306	15:20	-0.81	306	23:00	6.41
306	15:30	-1.14	306	23:10	6.27
306	15:40	-1.41	306	23:20	6.15
306	15:50	-1.69	306	23:30	6.06
306	16:00	-1.92	306	23:40	5.90
306	16:10	-1.90	306	23:50	5.69
306	16:20	-1.90	307	00:00	5.48
306	16:30	-1.90	307	00:10	5.23
306	16:40	-1.90	307	00:20	4.95
306	16:50	-1.90	307	00:30	4.65
306	17:00	-1.90	307	00:40	4.35
306	17:10	-1.92	307	00:50	4.01
306	17:20	-1.92	307	01:00	3.71
306	17:30	-1.92	307	01:10	3.38
306	17:40	-1.92	307	01:20	3.04
306	17:50	-1.92	307	01:30	2.67
306	18:00	-1.92	307	01:40	2.35
306	18:10	-1.92	307	01:50	2.02
306	18:20	-1.92	307	02:00	1.68
306	18:30	-1.92	307	02:10	1.33
306	18:40	-1.92	307	02:20	1.03
306	18:50	-1.85	307	02:30	0.75
306	19:00	-1.55	307	02:40	0.45
306	19:10	-1.23	307	02:50	0.15
306	19:20	-0.86	307	03:00	-0.12
306	19:30	-0.49	307	03:10	-0.45
306	19:40	-0.08	307	03:20	-0.75
306	19:50	0.29	307	03:30	-1.05
306	20:00	0.73	307	03:40	-1.32
306	20:10	1.24	307	03:50	-1.60
306	20:20	1.79	307	04:00	-1.85
306	20:30	2.30	307	04:10	-1.92
306	20:40	2.78	307	04:20	-1.92
306	20:50	3.31	307	04:30	-1.92
306	21:00	3.80	307	04:40	-1.92
306	21:10	4.31	307	04:50	-1.92
306	21:20	4.77	307	05:00	-1.92
306	21:30	5.16	307	05:10	-1.90
306	21:40	5.53	307	05:20	-1.90
306	21:50	5.81	307	05:30	-1.92

(Continued)

Table 7 (Continued)

Julian Date	Hour EST	Water-Level Elevation ft. NGVD	Julian Date	Hour EST	Water-Level Elevation ft. NGVD
307	05:40	-1.92	307	13:30	4.84
307	05:50	-1.90	307	13:40	4.63
307	06:00	-1.90	307	13:50	4.47
307	06:10	-1.90	307	14:00	4.12
307	06:20	-1.90	307	14:10	3.87
307	06:30	-1.90	307	14:20	3.11
307	06:40	-1.85	307	14:30	3.25
307	06:50	-1.53	307	14:40	2.83
307	07:00	-1.18	307	14:50	2.37
307	07:10	-0.84	307	15:00	2.12
307	07:20	-0.45	307	15:10	2.12
307	07:30	-0.05	307	15:20	1.77
307	07:40	0.39	307	15:30	1.56
307	07:50	0.85	307	15:40	1.40
307	08:00	1.35	307	15:50	1.01
307	08:10	1.88	307	16:00	0.71
307	08:20	2.42	307	16:10	0.68
307	08:30	2.97	307	16:20	0.32
307	08:40	3.55	307	16:30	-0.12
307	08:50	4.15	307	16:40	-0.12
307	09:00	4.70	307	16:50	-0.26
307	09:10	5.16	307	17:00	-0.38
307	09:20	5.62	307	17:10	-0.28
307	09:30	6.04	307	17:20	-0.38
307	09:40	6.31	307	17:30	-0.12
307	09:50	6.57	307	17:40	-0.01
307	10:00	6.78	307	17:50	0.32
307	10:10	7.01	307	18:00	-1.62
307	10:20	7.19	307	18:10	0.13
307	10:30	7.38	307	18:20	0.27
307	10:40	7.49	307	18:30	0.39
307	10:50	7.58	307	18:40	0.71
307	11:00	7.65	307	18:50	-1.58
307	11:10	7.65	307	19:00	0.71
307	11:20	7.63	307	19:10	0.02
307	11:30	7.58	307	19:20	0.71
307	11:40	7.47	307	19:30	1.01
307	11:50	7.19	307	19:40	1.24
307	12:00	7.01	307	19:50	1.75
307	12:10	5.99	307	20:00	2.37
307	12:20	6.61	307	20:10	2.76
307	12:30	6.43	307	20:20	3.20
307	12:40	6.24	307	20:30	3.78
307	12:50	5.58	307	20:40	4.15
307	13:00	5.37	307	20:50	4.40
307	13:10	5.28	307	21:00	4.88
307	13:20	5.09	307	21:10	5.35

(Continued)

Table 7 (Concluded)

Julian Date	Hour EST	Water-Level Elevation ft. NGVD	Julian Date	Hour EST	Water-Level Elevation ft. NGVD
307	21:20	5.71	308	00:40	7.95
307	21:30	6.11	308	00:50	7.84
307	21:40	6.48	308	01:00	7.63
307	21:50	6.91	308	01:10	7.40
307	22:00	7.21	308	01:20	7.03
307	22:10	7.81	308	01:30	6.73
307	22:20	8.07	308	01:40	6.43
307	22:30	8.62	308	01:50	6.20
307	22:40	8.67	308	02:00	5.92
307	22:50	8.87	308	02:10	5.64
307	23:00	8.87	308	02:20	5.35
307	23:10	8.71	308	02:30	5.09
307	23:20	8.99	308	02:40	4.72
307	23:30	8.92	308	02:50	4.38
307	23:40	9.01	308	03:00	3.89
307	23:50	8.60	308	03:10	3.66
308	00:00	8.48	308	03:20	3.52
308	00:10	8.30	308	03:30	3.15
308	00:20	8.23	308	03:40	2.74
308	00:30	8.14	308	03:50	2.51

Table 8

Saugus River Tide Data

at Station S7.4

Julian Date	Hour EST	Water-Level Elevation ft. NGVD	Julian Date	Hour EST	Water-Level Elevation ft. NGVD
306	00:00	2.28	306	07:10	1.93
306	00:10	1.93	306	07:20	2.46
306	00:20	1.56	306	07:30	2.95
306	00:30	1.20	306	07:40	3.41
306	00:40	0.85	306	07:50	3.85
306	00:50	0.46	306	08:00	4.26
306	01:00	0.02	306	08:10	4.66
306	01:10	-0.40	306	08:20	5.09
306	01:20	-0.79	306	08:30	5.49
306	01:30	-1.20	306	08:40	5.81
306	01:40	-1.62	306	08:50	5.99
306	01:50	-2.03	306	09:00	6.18
306	02:00	-2.45	306	09:10	6.41
306	02:10	-2.84	306	09:20	6.71
306	02:20	-3.19	306	09:30	6.89
306	02:30	-3.56	306	09:40	7.01
306	02:40	-3.86	306	09:50	6.94
306	02:50	-4.13	306	10:00	6.85
306	03:00	-4.34	306	10:10	6.78
306	03:10	-4.48	306	10:20	6.71
306	03:20	-4.57	306	10:30	6.62
306	03:30	-4.69	306	10:40	6.48
306	03:40	-4.73	306	10:50	6.27
306	03:50	-4.69	306	11:00	6.09
306	04:00	-4.59	306	11:10	5.81
306	04:10	-4.50	306	11:20	5.49
306	04:20	-4.36	306	11:30	5.12
306	04:30	-4.18	306	11:40	4.75
306	04:40	-3.95	306	11:50	4.40
306	04:50	-3.70	306	12:00	4.03
306	05:00	-3.40	306	12:10	3.60
306	05:10	-3.03	306	12:20	3.20
306	05:20	-2.66	306	12:30	2.81
306	05:30	-2.29	306	12:40	2.35
306	05:40	-1.92	306	12:50	1.93
306	05:50	-1.53	306	13:00	1.43
306	06:00	-1.13	306	13:10	0.92
306	06:10	-0.72	306	13:20	0.50
306	06:20	-0.33	306	13:30	0.09
306	06:30	0.07	306	13:40	-0.42
306	06:40	0.46	306	13:50	-0.88
306	06:50	0.94	306	14:00	-1.43
306	07:00	1.43	306	14:10	

(Continued)

Table 8 (Continued)

Julian Date	Hour EST	Water-Level Elevation ft. NGVD	Julian Date	Hour EST	Water-Level Elevation ft. NGVD
306	14:20	-2.33	306	22:00	5.46
306	14:30	-2.77	306	22:10	5.63
306	14:40	-3.26	306	22:20	5.74
306	14:50	-3.72	306	22:30	5.72
306	15:00	-4.09	306	22:40	5.63
306	15:10	-4.43	306	22:50	5.49
306	15:20	-4.71	306	23:00	5.42
306	15:30	-5.01	306	23:10	5.30
306	15:40	-5.31	306	23:20	5.12
306	15:50	-5.47	306	23:30	4.89
306	16:00	-5.52	306	23:40	4.63
306	16:10	-5.52	306	23:50	4.33
306	16:20	-5.61	307	00:00	4.06
306	16:30	-5.66	307	00:10	3.73
306	16:40	-5.52	307	00:20	3.41
306	16:50	-5.31	307	00:30	3.04
306	17:00	-5.10	307	00:40	2.72
306	17:10	-4.94	307	00:50	2.37
306	17:20	-4.71	307	01:00	2.00
306	17:30	-4.43	307	01:10	1.59
306	17:40	-4.11	307	01:20	1.20
306	17:50	-3.81	307	01:30	0.76
306	18:00	-3.46	307	01:40	0.32
306	18:10	-3.10	307	01:50	-0.10
306	18:20	-2.75	307	02:00	-0.51
306	18:30	-2.36	307	02:10	-0.97
306	18:40	-1.96	307	02:20	-1.43
306	18:50	-1.57	307	02:30	-1.87
306	19:00	-1.13	307	02:40	-2.31
306	19:10	-0.67	307	02:50	-2.70
306	19:20	-0.26	307	03:00	-3.07
306	19:30	0.11	307	03:10	-3.44
306	19:40	0.57	307	03:20	-3.81
306	19:50	1.10	307	03:30	-4.18
306	20:00	1.63	307	03:40	-4.48
306	20:10	2.10	307	03:50	-4.73
306	20:20	2.56	307	04:00	-4.92
306	20:30	2.97	307	04:10	-5.03
306	20:40	3.41	307	04:20	-5.10
306	20:50	3.80	307	04:30	-5.08
306	21:00	4.17	307	04:40	-4.99
306	21:10	4.49	307	04:50	-4.87
306	21:20	4.79	307	05:00	-4.73
306	21:30	5.05	307	05:10	-4.59
306	21:40	5.26	307	05:20	-4.39
306	21:50	5.37	307	05:30	-4.16

(Continued)

Table 8 (Continued)

Julian Date	Hour EST	Water-Level Elevation ft. NGVD	Julian Date	Hour EST	Water-Level Elevation ft. NGVD
307	05:40	-3.86	307	13:30	2.46
307	05:50	-3.53	307	13:40	2.03
307	06:00	-3.21	307	13:50	1.54
307	06:10	-2.80	307	14:00	1.08
307	06:20	-2.38	307	14:10	0.57
307	06:30	-1.96	307	14:20	0.04
307	06:40	-1.55	307	14:30	-0.49
307	06:50	-1.13	307	14:40	-0.95
307	07:00	-0.70	307	14:50	-1.41
307	07:10	-0.26	307	15:00	-1.85
307	07:20	0.25	307	15:10	-2.33
307	07:30	0.80	307	15:20	-2.84
307	07:40	1.33	307	15:30	-3.30
307	07:50	1.80	307	15:40	-3.74
307	08:00	2.26	307	15:50	-4.20
307	08:10	2.76	307	16:00	-4.64
307	08:20	3.32	307	16:10	-5.03
307	08:30	3.80	307	16:20	-5.26
307	08:40	4.29	307	16:30	-5.45
307	08:50	4.68	307	16:40	-5.61
307	09:00	5.07	307	16:50	-5.73
307	09:10	5.53	307	17:00	-5.79
307	09:20	5.88	307	17:10	-5.82
307	09:30	6.18	307	17:20	-5.82
307	09:40	6.41	307	17:30	-5.73
307	09:50	6.69	307	17:40	-5.56
307	10:00	6.92	307	17:50	-5.40
307	10:10	7.10	307	18:00	-5.15
307	10:20	7.19	307	18:10	-4.94
307	10:30	7.19	307	18:20	-4.69
307	10:40	7.19	307	18:30	-4.39
307	10:50	7.22	307	18:40	-4.02
307	11:00	7.17	307	18:50	-3.63
307	11:10	7.06	307	19:00	-3.28
307	11:20	6.89	307	19:10	-2.91
307	11:30	6.71	307	19:20	-2.47
307	11:40	6.55	307	19:30	-2.03
307	11:50	6.36	307	19:40	-1.64
307	12:00	6.06	307	19:50	-1.27
307	12:10	5.74	307	20:00	-0.83
307	12:20	5.42	307	20:10	-0.33
307	12:30	5.05	307	20:20	0.20
307	12:40	4.63	307	20:30	0.67
307	12:50	4.22	307	20:40	1.15
307	13:00	3.87	307	20:50	1.68
307	13:10	3.43	307	21:00	2.21
307	13:20	2.95	307	21:10	2.72

(Continued)

Table 8 (Continued)

Julian Date	Hour EST	Water-Level Elevation ft. NGVD	Julian Date	Hour EST	Water-Level Elevation ft. NGVD
307	21:20	3.18	308	05:00	-4.41
307	21:30	3.64	308	05:10	-4.41
307	21:40	4.06	308	05:20	-4.39
307	21:50	4.43	308	05:30	-4.43
307	22:00	4.75	308	05:40	-4.46
307	22:10	5.05	308	05:50	-4.34
307	22:20	5.39	308	06:00	-4.11
307	22:30	5.65	308	06:10	-3.81
307	22:40	5.88	308	06:20	-3.51
307	22:50	5.97	308	06:30	-3.21
307	23:00	5.99	308	06:40	-2.86
307	23:10	6.04	308	06:50	-2.61
307	23:20	6.09	308	07:00	-2.24
307	23:30	6.11	308	07:10	-1.83
307	23:40	6.02	308	07:20	-1.41
307	23:50	5.93	308	07:30	-0.97
308	00:00	5.81	308	07:40	-0.56
308	00:10	5.65	308	07:50	-0.14
308	00:20	5.44	308	08:00	0.32
308	00:30	5.21	308	08:10	0.83
308	00:40	4.93	308	08:20	1.33
308	00:50	4.59	308	08:30	1.75
308	01:00	4.22	308	08:40	2.21
308	01:10	3.89	308	08:50	2.74
308	01:20	3.66	308	09:00	3.32
308	01:30	3.36	308	09:10	3.80
308	01:40	2.95	308	09:20	4.22
308	01:50	2.53	308	09:30	4.70
308	02:00	2.07	308	09:40	5.14
308	02:10	1.61	308	09:50	5.53
308	02:20	1.22	308	10:00	5.90
308	02:30	0.90	308	10:10	6.25
308	02:40	0.48	308	10:20	6.52
308	02:50	-0.03	308	10:30	6.76
308	03:00	-0.49	308	10:40	6.99
308	03:10	-0.97	308	10:50	7.22
308	03:20	-1.34	308	11:00	7.42
308	03:30	-1.76	308	11:10	7.54
308	03:40	-2.20	308	11:20	7.54
308	03:50	-2.61	308	11:30	7.47
308	04:00	-2.98	308	11:40	7.42
308	04:10	-3.33	308	11:50	7.33
308	04:20	-3.65	308	12:00	7.36
308	04:30	-3.97	308	12:10	7.29
308	04:40	-4.25	308	12:20	7.03
308	04:50	-4.39	308	12:30	6.73
			308	12:40	6.43

(Continued)

Table 8 (Concluded)

Julian Date	Hour EST	Water-Level Elevation ft. NGVD	Julian Date	Hour EST	Water-Level Elevation ft. NGVD
308	12:50	6.16	308	18:30	-5.91
308	13:00	5.88	308	18:40	-5.77
308	13:10	5.53	308	18:50	-5.66
308	13:20	5.09	308	19:00	-5.47
308	13:30	4.70	308	19:10	-5.15
308	13:40	4.26	308	19:20	-4.78
308	13:50	3.85	308	19:30	-4.41
308	14:00	3.39	308	19:40	-4.02
308	14:10	2.93	308	19:50	-3.67
308	14:20	2.46	308	20:00	-3.30
308	14:30	1.96	308	20:10	-2.96
308	14:40	1.50	308	20:20	-2.54
308	14:50	0.99	308	20:30	-2.10
308	15:00	0.57	308	20:40	-1.64
308	15:10	0.07	308	20:50	-1.20
308	15:20	-0.40	308	21:00	-0.74
308	15:30	-0.97	308	21:10	-0.30
308	15:40	-1.50	308	21:20	0.18
308	15:50	-2.03	308	21:30	0.73
308	16:00	-2.56	308	21:40	1.26
308	16:10	-3.03	308	21:50	1.80
308	16:20	-3.46	308	22:00	2.23
308	16:30	-3.90	308	22:10	2.65
308	16:40	-4.34	308	22:20	3.11
308	16:50	-4.78	308	22:30	3.60
308	17:00	-5.17	308	22:40	3.99
308	17:10	-5.49	308	22:50	4.29
308	17:20	-5.63	308	23:00	4.54
308	17:30	-5.73	308	23:10	4.79
308	17:40	-5.86	308	23:20	5.05
308	17:50	-6.07	308	23:30	5.33
308	18:00	-6.21	308	23:40	5.53
308	18:10	-6.21	308	23:50	5.65
308	18:20	-6.09			

Table 9

Saugus River Tide Data

at Station S9.1

Julian Date	Hour EST	Water-Level Elevation ft. NGVD	Julian Date	Hour EST	Water-Level Elevation ft. NGVD
306	00:00	2.98	306	07:10	0.21
306	00:10	2.59	306	07:20	0.21
306	00:20	2.22	306	07:30	0.49
306	00:30	1.87	306	07:40	0.98
306	00:40	1.57	306	07:50	1.51
306	00:50	1.25	306	08:00	2.04
306	01:00	0.95	306	08:10	2.57
306	01:10	0.68	306	08:20	3.05
306	01:20	0.42	306	08:30	3.49
306	01:30	0.21	306	08:40	3.88
306	01:40	0.17	306	08:50	4.16
306	01:50	0.17	306	09:00	4.41
306	02:00	0.17	306	09:10	4.60
306	02:10	0.17	306	09:20	4.76
306	02:20	0.19	306	09:30	4.90
306	02:30	0.19	306	09:40	4.99
306	02:40	0.19	306	09:50	5.10
306	02:50	0.19	306	10:00	5.22
306	03:00	0.19	306	10:10	5.31
306	03:10	0.19	306	10:20	5.43
306	03:20	0.19	306	10:30	5.50
306	03:30	0.19	306	10:40	5.59
306	03:40	0.19	306	10:50	5.66
306	03:50	0.19	306	11:00	5.73
306	04:00	0.19	306	11:10	5.75
306	04:10	0.19	306	11:20	5.75
306	04:20	0.19	306	11:30	5.68
306	04:30	0.17	306	11:40	5.61
306	04:40	0.19	306	11:50	5.52
306	04:50	0.17	306	12:00	5.45
306	05:00	0.17	306	12:10	5.36
306	05:10	0.17	306	12:20	5.24
306	05:20	0.17	306	12:30	5.13
306	05:30	0.17	306	12:40	4.99
306	05:40	0.17	306	12:50	4.85
306	05:50	0.17	306	13:00	4.64
306	06:00	0.19	306	13:10	4.39
306	06:10	0.19	306	13:20	4.04
306	06:20	0.19	306	13:30	3.61
306	06:30	0.19	306	13:40	3.10
306	06:40	0.21	306	13:50	2.59
306	06:50	0.21	306	14:00	2.13
306	07:00	0.21	306	14:10	1.67

(Continued)

Table 9 (Continued)

Julian Date	Hour EST	Water-Level Elevation ft. NGVD
306	14:20	1.25
306	14:30	0.88
306	14:40	0.49
306	14:50	0.19
306	15:00	0.01
306	15:10	-0.02
306	15:20	-0.02
306	15:30	-0.02
306	15:40	-0.02
306	15:50	-0.02
306	16:00	-0.02
306	16:10	-0.02
306	16:20	-0.02
306	16:30	-0.02
306	16:40	-0.02
306	16:50	-0.02
306	17:00	-0.02
306	17:10	-0.02
306	17:20	-0.02
306	17:30	0.01
306	17:40	0.01
306	17:50	0.01
306	18:00	0.03
306	18:10	0.01
306	18:20	0.03
306	18:30	0.03
306	18:40	0.03
306	18:50	0.03
306	19:00	0.01
306	19:10	0.01
306	19:20	0.01
306	19:30	0.03
306	19:40	0.01
306	19:50	0.01
306	20:00	0.01
306	20:10	0.01
306	20:20	0.05
306	20:30	0.56
306	20:40	1.09
306	20:50	1.62
306	21:00	2.13
306	21:10	2.61
306	21:20	3.05
306	21:30	3.44
306	21:40	3.79
306	21:50	4.04
306	22:00	4.23
306	22:10	4.39
306	22:20	4.53
306	22:30	4.67
306	22:40	4.74
306	22:50	4.83
306	23:00	4.87
306	23:10	4.92
306	23:20	4.94
306	23:30	4.94
306	23:40	4.90
306	23:50	4.80
307	00:00	4.74
307	00:10	4.62
307	00:20	4.48
307	00:30	4.30
307	00:40	4.04
307	00:50	3.65
307	01:00	3.26
307	01:10	2.77
307	01:20	2.31
307	01:30	1.87
307	01:40	1.48
307	01:50	1.11
307	02:00	0.79
307	02:10	0.47
307	02:20	0.19
307	02:30	-0.02
307	02:40	-0.04
307	02:50	-0.02
307	03:00	-0.02
307	03:10	-0.02
307	03:20	-0.02
307	03:30	-0.02
307	03:40	-0.02
307	03:50	-0.02
307	04:00	-0.02
307	04:10	-0.02
307	04:20	-0.02
307	04:30	-0.02
307	04:40	-0.02
307	04:50	-0.02
307	05:00	0.01
307	05:10	0.01
307	05:20	0.01
307	05:30	0.01

(Continued)

Table 9 (Continued)

Julian Date	Hour EST	Water-Level Elevation ft. NGVD	Julian Date	Hour EST	Water-Level Elevation ft. NGVD
307	05:40	0.03	307	13:30	5.31
307	05:50	0.03	307	13:40	5.17
307	06:00	0.03	307	13:50	5.06
307	06:10	0.03	307	14:00	4.87
307	06:20	0.03	307	14:10	4.71
307	06:30	0.05	307	14:20	4.48
307	06:40	0.05	307	14:30	4.20
307	06:50	0.05	307	14:40	3.84
307	07:00	0.05	307	14:50	3.35
307	07:10	0.05	307	15:00	2.89
307	07:20	0.05	307	15:10	2.41
307	07:30	0.05	307	15:20	1.97
307	07:40	0.08	307	15:30	1.57
307	07:50	0.08	307	15:40	1.18
307	08:00	0.08	307	15:50	0.81
307	08:10	0.17	307	16:00	0.44
307	08:20	0.63	307	16:10	0.17
307	08:30	1.18	307	16:20	-0.02
307	08:40	1.76	307	16:30	-0.04
307	08:50	2.34	307	16:40	-0.02
307	09:00	2.87	307	16:50	-0.02
307	09:10	3.35	307	17:00	-0.02
307	09:20	3.72	307	17:10	-0.02
307	09:30	4.04	307	17:20	-0.02
307	09:40	4.32	307	17:30	-0.02
307	09:50	4.53	307	17:40	0.01
307	10:00	4.69	307	17:50	0.01
307	10:10	4.83	307	18:00	0.01
307	10:20	4.97	307	18:10	0.01
307	10:30	5.08	307	18:20	0.01
307	10:40	5.17	307	18:30	0.01
307	10:50	5.31	307	18:40	0.01
307	11:00	5.40	307	18:50	0.01
307	11:10	5.52	307	19:00	0.01
307	11:20	5.61	307	19:10	0.03
307	11:30	5.73	307	19:20	0.03
307	11:40	5.82	307	19:30	0.03
307	11:50	5.87	307	19:40	0.03
307	12:00	5.91	307	19:50	0.03
307	12:10	5.91	307	20:00	0.03
307	12:20	5.87	307	20:10	0.03
307	12:30	5.82	307	20:20	0.05
307	12:40	5.75	307	20:30	0.05
307	12:50	5.66	307	20:40	0.05
307	13:00	5.59	307	20:50	0.05
307	13:10	5.50	307	21:00	0.05
307	13:20	5.40	307	21:10	0.12

(Continued)

Table 9 (Continued)

Julian Date	Hour EST	Water-Level Elevation ft. NGVD	Julian Date	Hour EST	Water-Level Elevation ft. NGVD
307	21:20	0.63	308	05:00	0.05
307	21:30	1.16	308	05:10	0.05
307	21:40	1.71	308	05:20	0.05
307	21:50	2.24	308	05:30	0.05
307	22:00	2.77	308	05:40	0.05
307	22:10	3.21	308	05:50	0.05
307	22:20	3.61	308	06:00	0.05
307	22:30	3.93	308	06:10	0.05
307	22:40	4.18	308	06:20	0.05
307	22:50	4.39	308	06:30	0.05
307	23:00	4.55	308	06:40	0.08
307	23:10	4.69	308	06:50	0.08
307	23:20	4.80	308	07:00	0.08
307	23:30	4.92	308	07:10	0.08
307	23:40	4.99	308	07:20	0.08
307	23:50	5.08	308	07:30	0.08
308	00:00	5.13	308	07:40	0.05
308	00:10	5.20	308	07:50	0.05
308	00:20	5.24	308	08:00	0.05
308	00:30	5.24	308	08:10	0.05
308	00:40	5.17	308	08:20	0.05
308	00:50	5.13	308	08:30	0.03
308	01:00	5.06	308	08:40	0.05
308	01:10	4.97	308	08:50	0.17
308	01:20	4.85	308	09:00	0.65
308	01:30	4.74	308	09:10	1.18
308	01:40	4.57	308	09:20	1.76
308	01:50	4.34	308	09:30	2.34
308	02:00	4.04	308	09:40	2.84
308	02:10	3.65	308	09:50	3.33
308	02:20	3.21	308	10:00	3.72
308	02:30	2.71	308	10:10	4.04
308	02:40	2.20	308	10:20	4.30
308	02:50	1.74	308	10:30	4.48
308	03:00	1.32	308	10:40	4.64
308	03:10		308	10:50	4.78
308	03:20	0.56	308	11:00	4.90
308	03:30	0.28	308	11:10	5.01
308	03:40	0.10	308	11:20	5.10
308	03:50	0.03	308	11:30	5.24
308	04:00	0.03	308	11:40	5.36
308	04:10	0.05	308	11:50	5.47
308	04:20	0.05	308	12:00	5.59
308	04:30	0.05	308	12:10	5.70
308	04:40	0.05	308	12:20	5.84
308	04:50	0.05	308	12:30	5.94
			308	12:40	6.00

(Continued)

Table 9 (Concluded)

Julian Date	Hour EST	Water-Level Elevation ft. NGVD	Julian Date	Hour EST	Water-Level Elevation ft. NGVD
308	12:50	6.07	308	18:30	-0.16
308	13:00	6.07	308	18:40	-0.16
308	13:10	6.07	308	18:50	-0.16
308	13:20	6.00	308	19:00	-0.16
308	13:30	5.94	308	19:10	-0.16
308	13:40	5.87	308	19:20	-0.13
308	13:50	5.82	308	19:30	-0.16
308	14:00	5.75	308	19:40	-0.16
308	14:10	5.64	308	19:50	-0.16
308	14:20	5.54	308	20:00	-0.16
308	14:30	5.43	308	20:10	-0.16
308	14:40	5.31	308	20:20	-0.16
308	14:50	5.17	308	20:30	-0.16
308	15:00	5.06	308	20:40	-0.16
308	15:10	4.87	308	20:50	-0.16
308	15:20	4.69	308	21:00	-0.16
308	15:30	4.50	308	21:10	-0.16
308	15:40	4.25	308	21:20	-0.16
308	15:50	3.93	308	21:30	-0.16
308	16:00	3.54	308	21:40	-0.16
308	16:10	3.05	308	21:50	-0.16
308	16:20	2.59	308	22:00	-0.13
308	16:30	2.13	308	22:10	0.12
308	16:40	1.74	308	22:20	0.68
308	16:50	1.37	308	22:30	1.18
308	17:00	1.00	308	22:40	1.71
308	17:10	0.65	308	22:50	2.27
308	17:20	0.31	308	23:00	2.73
308	17:30	0.05	308	23:10	3.14
308	17:40	-0.11	308	23:20	3.51
308	17:50	-0.16	308	23:30	3.81
308	18:00	-0.16	308	23:40	4.04
308	18:10	-0.16	308	23:50	4.23
308	18:20	-0.16			

Table 10

Saugus River Tide Data

at Station S9.3

Julian Date	Hour EST	Water-Level Elevation ft. NGVD	Julian Date	Hour EST	Water-Level Elevation ft. NGVD
306	00:00	3.53	306	07:10	0.76
306	00:10	3.06	306	07:20	0.76
306	00:20	2.67	306	07:30	0.87
306	00:30	2.30	306	07:40	1.33
306	00:40	1.98	306	07:50	1.84
306	00:50	1.68	306	08:00	2.37
306	01:00	1.40	306	08:10	2.90
306	01:10	1.17	306	08:20	3.39
306	01:20	1.03	306	08:30	3.80
306	01:30	0.94	306	08:40	4.17
306	01:40	0.92	306	08:50	4.47
306	01:50	0.90	306	09:00	4.70
306	02:00	0.87	306	09:10	4.86
306	02:10	0.85	306	09:20	4.98
306	02:20	0.85	306	09:30	5.07
306	02:30	0.83	306	09:40	5.16
306	02:40	0.83	306	09:50	5.23
306	02:50	0.80	306	10:00	5.28
306	03:00	0.80	306	10:10	5.37
306	03:10	0.80	306	10:20	5.44
306	03:20	0.80	306	10:30	5.51
306	03:30	0.78	306	10:40	5.58
306	03:40	0.78	306	10:50	5.65
306	03:50	0.76	306	11:00	5.69
306	04:00	0.76	306	11:10	5.74
306	04:10	0.76	306	11:20	5.79
306	04:20	0.76	306	11:30	5.81
306	04:30	0.76	306	11:40	5.83
306	04:40	0.76	306	11:50	5.81
306	04:50	0.76	306	12:00	5.76
306	05:00	0.73	306	12:10	5.72
306	05:10	0.76	306	12:20	5.67
306	05:20	0.73	306	12:30	5.63
306	05:30	0.73	306	12:40	5.56
306	05:40	0.73	306	12:50	5.49
306	05:50	0.73	306	13:00	5.39
306	06:00	0.73	306	13:10	5.30
306	06:10	0.73	306	13:20	5.19
306	06:20	0.73	306	13:30	5.03
306	06:30	0.73	306	13:40	4.82
306	06:40	0.73	306	13:50	4.56
306	06:50	0.76	306	14:00	4.26
306	07:00	0.76	306	14:10	3.85

(Continued)

Table 10 (Continued)

Julian Date	Hour EST	Water-Level Elevation ft. NGVD	Julian Date	Hour EST	Water-Level Elevation ft. NGVD
306	14:20	3.41	306	22:00	4.52
306	14:30	2.97	306	22:10	4.66
306	14:40	2.60	306	22:20	4.77
306	14:50	2.30	306	22:30	4.86
306	15:00	2.07	306	22:40	4.93
306	15:10	1.89	306	22:50	4.98
306	15:20	1.73	306	23:00	5.05
306	15:30	1.61	306	23:10	5.09
306	15:40	1.52	306	23:20	5.14
306	15:50	1.43	306	23:30	5.16
306	16:00	1.36	306	23:40	5.16
306	16:10	1.29	306	23:50	5.12
306	16:20	1.22	307	00:00	5.09
306	16:30	1.17	307	00:10	5.03
306	16:40	1.10	307	00:20	4.96
306	16:50	1.08	307	00:30	4.84
306	17:00	1.03	307	00:40	4.68
306	17:10	0.99	307	00:50	4.45
306	17:20	0.99	307	01:00	4.10
306	17:30	0.94	307	01:10	3.62
306	17:40	0.94	307	01:20	3.04
306	17:50	0.90	307	01:30	2.53
306	18:00	0.87	307	01:40	2.10
306	18:10	0.87	307	01:50	1.73
306	18:20	0.85	307	02:00	1.43
306	18:30	0.85	307	02:10	1.17
306	18:40	0.83	307	02:20	1.01
306	18:50	0.80	307	02:30	0.94
306	19:00	0.80	307	02:40	0.87
306	19:10	0.78	307	02:50	0.83
306	19:20	0.78	307	03:00	0.80
306	19:30	0.76	307	03:10	0.78
306	19:40	0.76	307	03:20	0.76
306	19:50	0.76	307	03:30	0.73
306	20:00	0.73	307	03:40	0.71
306	20:10	0.73	307	03:50	0.69
306	20:20	0.73	307	04:00	0.69
306	20:30	1.01	307	04:10	0.69
306	20:40	1.50	307	04:20	0.67
306	20:50	2.00	307	04:30	0.67
306	21:00	2.51	307	04:40	0.67
306	21:10	2.97	307	04:50	0.67
306	21:20	3.41	307	05:00	0.64
306	21:30	3.78	307	05:10	0.64
306	21:40	4.10	307	05:20	0.64
306	21:50	4.33	307	05:30	0.64

(Continued)

Table 10 (Continued)

Julian Date	Hour EST	Water-Level Elevation ft. NGVD	Julian Date	Hour EST	Water-Level Elevation ft. NGVD
307	05:40	0.64	307	13:30	5.81
307	05:50	0.64	307	13:40	5.76
307	06:00	0.64	307	13:50	5.69
307	06:10	0.64	307	14:00	5.63
307	06:20	0.64	307	14:10	5.56
307	06:30	0.64	307	14:20	5.46
307	06:40	0.64	307	14:30	5.37
307	06:50	0.64	307	14:40	5.26
307	07:00	0.64	307	14:50	5.12
307	07:10	0.64	307	15:00	4.93
307	07:20	0.64	307	15:10	4.75
307	07:30	0.64	307	15:20	4.49
307	07:40	0.67	307	15:30	4.22
307	07:50	0.64	307	15:40	3.92
307	08:00	0.64	307	15:50	3.60
307	08:10	0.67	307	16:00	3.23
307	08:20	1.06	307	16:10	2.90
307	08:30	1.56	307	16:20	2.63
307	08:40	2.12	307	16:30	2.40
307	08:50	2.67	307	16:40	2.21
307	09:00	3.20	307	16:50	2.07
307	09:10	3.64	307	17:00	1.93
307	09:20	4.03	307	17:10	1.84
307	09:30	4.36	307	17:20	1.77
307	09:40	4.56	307	17:30	1.73
307	09:50	4.75	307	17:40	1.68
307	10:00	4.86	307	17:50	1.63
307	10:10	4.98	307	18:00	1.59
307	10:20	5.05	307	18:10	1.54
307	10:30	5.14	307	18:20	1.52
307	10:40	5.21	307	18:30	1.47
307	10:50	5.28	307	18:40	1.45
307	11:00	5.35	307	18:50	1.40
307	11:10	5.44	307	19:00	1.40
307	11:20	5.53	307	19:10	1.36
307	11:30	5.58	307	19:20	1.36
307	11:40	5.67	307	19:30	1.33
307	11:50	5.74	307	19:40	1.29
307	12:00	5.83	307	19:50	1.29
307	12:10	5.90	307	20:00	1.27
307	12:20	5.95	307	20:10	1.24
307	12:30	5.99	307	20:20	1.22
307	12:40	5.99	307	20:30	1.20
307	12:50	5.97	307	20:40	1.17
307	13:00	5.95	307	20:50	1.15
307	13:10	5.90	307	21:00	1.10
307	13:20	5.86	307	21:10	1.10

(Continued)

Table 10 (Continued)

Julian Date	Hour EST	Water-Level Elevation ft. NGVD	Julian Date	Hour EST	Water-Level Elevation ft. NGVD
307	21:20	1.22	308	05:00	0.94
307	21:30	1.63	308	05:10	0.92
307	21:40	2.12	308	05:20	0.90
307	21:50	2.67	308	05:30	0.87
307	22:00	3.13	308	05:40	0.85
307	22:10	3.55	308	05:50	0.83
307	22:20	3.92	308	06:00	0.80
307	22:30	4.22	308	06:10	0.80
307	22:40	4.47	308	06:20	0.80
307	22:50	4.63	308	06:30	0.78
307	23:00	4.77	308	06:40	0.80
307	23:10	4.89	308	06:50	0.78
307	23:20	4.98	308	07:00	0.76
307	23:30	5.05	308	07:10	0.76
307	23:40	5.12	308	07:20	0.76
307	23:50	5.16	308	07:30	0.76
308	00:00	5.23	308	07:40	0.76
308	00:10	5.28	308	07:50	0.76
308	00:20	5.35	308	08:00	0.73
308	00:30	5.37	308	08:10	0.73
308	00:40	5.39	308	08:20	0.73
308	00:50	5.39	308	08:30	0.71
308	01:00	5.35	308	08:40	0.71
308	01:10	5.33	308	08:50	0.71
308	01:20	5.26	308	09:00	1.10
308	01:30	5.19	308	09:10	1.59
308	01:40	5.09	308	09:20	2.14
308	01:50	5.00	308	09:30	2.70
308	02:00	4.86	308	09:40	3.20
308	02:10	4.66	308	09:50	3.62
308	02:20	4.38	308	10:00	4.01
308	02:30	3.94	308	10:10	4.33
308	02:40	3.39	308	10:20	4.54
308	02:50	2.83	308	10:30	4.68
308	03:00	2.37	308	10:40	4.82
308	03:10	2.00	308	10:50	4.91
308	03:20	1.70	308	11:00	4.98
308	03:30	1.52	308	11:10	5.05
308	03:40	1.36	308	11:20	5.12
308	03:50	1.24	308	11:30	5.19
308	04:00	1.17	308	11:40	5.28
308	04:10	1.10	308	11:50	5.35
308	04:20	1.06	308	12:00	5.44
308	04:30	1.01	308	12:10	5.51
308	04:40	0.99	308	12:20	5.60
308	04:50	0.97	308	12:30	5.72
			308	12:40	5.83

(Continued)

Table 10 (Concluded)

Julian Date	Hour EST	Water-Level Elevation ft, NGVD	Julian Date	Hour EST	Water-Level Elevation ft, NGVD
308	12:50	5.99	308	18:30	2.07
308	13:00	6.09	308	18:40	1.98
308	13:10	6.18	308	18:50	1.89
308	13:20	6.23	308	19:00	1.82
308	13:30	6.23	308	19:10	1.80
308	13:40	6.18	308	19:20	1.75
308	13:50	6.13	308	19:30	1.70
308	14:00	6.09	308	19:40	1.66
308	14:10	6.04	308	19:50	1.63
308	14:20	5.99	308	20:00	1.59
308	14:30	5.93	308	20:10	1.56
308	14:40	5.88	308	20:20	1.52
308	14:50	5.81	308	20:30	1.52
308	15:00	5.72	308	20:40	1.50
308	15:10	5.65	308	20:50	1.47
308	15:20	5.58	308	21:00	1.45
308	15:30	5.49	308	21:10	1.43
308	15:40	5.39	308	21:20	1.43
308	15:50	5.33	308	21:30	1.40
308	16:00	5.21	308	21:40	1.38
308	16:10	5.07	308	21:50	1.38
308	16:20	4.93	308	22:00	1.36
308	16:30	4.75	308	22:10	1.36
308	16:40	4.52	308	22:20	1.47
308	16:50	4.31	308	22:30	1.75
308	17:00	4.08	308	22:40	2.19
308	17:10	3.80	308	22:50	2.67
308	17:20	3.55	308	23:00	3.11
308	17:30	3.25	308	23:10	3.50
308	17:40	2.95	308	23:20	3.83
308	17:50	2.72	308	23:30	4.10
308	18:00	2.53	308	23:40	4.33
308	18:10	2.35	308	23:50	4.47
308	18:20	2.19			

Table 11

Saugus River Tide Data

at Station S9.5

Julian Date	Hour EST	Water-Level Elevation ft. NGVD	Julian Date	Hour EST	Water-Level Elevation ft. NGVD
306	00:00	2.03	306	07:10	1.45
306	00:10	1.73	306	07:20	1.93
306	00:20	1.40	306	07:30	2.40
306	00:30	1.03	306	07:40	2.90
306	00:40	0.67	306	07:50	3.34
306	00:50	0.34	306	08:00	3.76
306	01:00	-0.03	306	08:10	4.15
306	01:10	-0.49	306	08:20	4.56
306	01:20	-0.90	306	08:30	4.98
306	01:30	-1.30	306	08:40	5.37
306	01:40	-1.69	306	08:50	5.65
306	01:50	-2.08	306	09:00	5.76
306	02:00	-2.49	306	09:10	5.93
306	02:10	-2.89	306	09:20	6.25
306	02:20	-3.23	306	09:30	6.55
306	02:30	-3.58	306	09:40	6.69
306	02:40	-3.93	306	09:50	6.69
306	02:50	-4.25	306	10:00	6.50
306	03:00	-4.48	306	10:10	6.43
306	03:10	-4.66	306	10:20	6.43
306	03:20	-4.73	306	10:30	6.36
306	03:30	-4.80	306	10:40	6.27
306	03:40	-4.89	306	10:50	6.06
306	03:50	-4.99	306	11:00	5.83
306	04:00	-4.87	306	11:10	5.63
306	04:10	-4.71	306	11:20	5.37
306	04:20	-4.62	306	11:30	5.00
306	04:30	-4.43	306	11:40	4.63
306	04:40	-4.20	306	11:50	4.29
306	04:50	-3.95	306	12:00	3.94
306	05:00	-3.72	306	12:10	3.53
306	05:10	-3.37	306	12:20	3.09
306	05:20	-3.00	306	12:30	2.65
306	05:30	-2.61	306	12:40	2.30
306	05:40	-2.26	306	12:50	1.84
306	05:50	-1.92	306	13:00	1.40
306	06:00	-1.53	306	13:10	0.92
306	06:10	-1.13	306	13:20	0.44
306	06:20	-0.70	306	13:30	-0.03
306	06:30	-0.33	306	13:40	-0.40
306	06:40	0.04	306	13:50	-0.86
306	06:50	0.41	306	14:00	-1.32
306	07:00	0.92	306	14:10	-1.85

(Continued)

Table 11 (Continued)

Julian Date	Hour EST	Water-Level Elevation ft. NGVD
306	14:20	-2.31
306	14:30	-2.70
306	14:40	-3.12
306	14:50	-3.56
306	15:00	-3.97
306	15:10	-4.36
306	15:20	-4.64
306	15:30	-4.82
306	15:40	-5.01
306	15:50	-5.22
306	16:00	-5.36
306	16:10	-5.42
306	16:20	-5.47
306	16:30	-5.54
306	16:40	-5.63
306	16:50	-5.61
306	17:00	-5.29
306	17:10	-5.06
306	17:20	-5.03
306	17:30	-4.78
306	17:40	-4.36
306	17:50	-4.02
306	18:00	-3.74
306	18:10	-3.46
306	18:20	-3.12
306	18:30	-2.70
306	18:40	-2.31
306	18:50	-1.96
306	19:00	-1.57
306	19:10	-1.09
306	19:20	-0.63
306	19:30	-0.28
306	19:40	0.07
306	19:50	0.53
306	20:00	1.10
306	20:10	1.68
306	20:20	2.10
306	20:30	2.44
306	20:40	2.88
306	20:50	3.32
306	21:00	3.71
306	21:10	4.06
306	21:20	4.36
306	21:30	4.61
306	21:40	4.86
306	21:50	5.05
306	22:00	5.10
306	22:10	5.16
306	22:20	5.37
306	22:30	5.56
306	22:40	5.42
306	22:50	5.19
306	23:00	5.07
306	23:10	5.07
306	23:20	4.96
306	23:30	4.68
306	23:40	4.36
306	23:50	4.13
307	00:00	3.85
307	00:10	3.55
307	00:20	3.20
307	00:30	2.88
307	00:40	2.56
307	00:50	2.21
307	01:00	1.84
307	01:10	1.47
307	01:20	1.06
307	01:30	0.67
307	01:40	0.25
307	01:50	-0.19
307	02:00	-0.60
307	02:10	-1.02
307	02:20	-1.43
307	02:30	-1.89
307	02:40	-2.36
307	02:50	-2.75
307	03:00	-3.14
307	03:10	-3.49
307	03:20	-3.83
307	03:30	-4.18
307	03:40	-4.52
307	03:50	-4.80
307	04:00	-5.01
307	04:10	-5.10
307	04:20	-5.24
307	04:30	-5.29
307	04:40	-5.24
307	04:50	-5.10
307	05:00	-4.96
307	05:10	-4.78
307	05:20	-4.69

(Continued)

Table 11 (Continued)

Julian Date	Hour EST	Water-Level Elevation ft. NGVD	Julian Date	Hour EST	Water-Level Elevation ft. NGVD
307	05:30	-4.48	307	13:20	2.95
307	05:40	-4.11	307	13:30	2.47
307	05:50	-3.81	307	13:40	1.96
307	06:00	-3.49	307	13:50	1.54
307	06:10	-3.19	307	14:00	1.10
307	06:20	-2.77	307	14:10	0.64
307	06:30	-2.36	307	14:20	0.11
307	06:40	-1.94	307	14:30	-0.37
307	06:50	-1.55	307	14:40	-0.88
307	07:00	-1.13	307	14:50	-1.36
307	07:10	-0.70	307	15:00	-1.83
307	07:20	-0.23	307	15:10	-2.24
307	07:30	0.30	307	15:20	-2.68
307	07:40	0.85	307	15:30	-3.12
307	07:50	1.36	307	15:40	-3.58
307	08:00	1.75	307	15:50	-3.99
307	08:10	2.19	307	16:00	-4.39
307	08:20	2.74	307	16:10	-4.73
307	08:30	3.32	307	16:20	-4.99
307	08:40	3.80	307	16:30	-5.15
307	08:50	4.17	307	16:40	-5.29
307	09:00	4.56	307	16:50	-5.40
307	09:10	5.00	307	17:00	-5.47
307	09:20	5.42	307	17:10	-5.56
307	09:30	5.76	307	17:20	-5.61
307	09:40	6.02	307	17:30	-5.66
307	09:50	6.23	307	17:40	-5.68
307	10:00	6.50	307	17:50	-5.63
307	10:10	6.73	307	18:00	-5.38
307	10:20	6.87	307	18:10	-5.10
307	10:30	6.89	307	18:20	-4.92
307	10:40	6.85	307	18:30	-4.73
307	10:50	6.87	307	18:40	-4.36
307	11:00	6.94	307	18:50	-3.93
307	11:10	6.85	307	19:00	-3.51
307	11:20	6.66	307	19:10	-3.23
307	11:30	6.48	307	19:20	-2.91
307	11:40	6.29	307	19:30	-2.43
307	11:50	6.13	307	19:40	-1.94
307	12:00	5.95	307	19:50	-1.62
307	12:10	5.58	307	20:00	-1.27
307	12:20	5.26	307	20:10	-0.83
307	12:30	4.93	307	20:20	-0.30
307	12:40	4.59	307	20:30	0.25
307	12:50	4.10	307	20:40	0.71
307	13:00	3.69	307	20:50	1.15
307	13:10	3.39	307	21:00	1.66

(Continued)

Table 11 (Continued)

Julian Date	Hour EST	Water-Level Elevation ft. NGVD	Julian Date	Hour EST	Water-Level Elevation ft. NGVD
307	21:10	2.23	308	04:50	-4.64
307	21:20	2.72	308	05:00	-4.73
307	21:30	3.09	308	05:10	-4.62
307	21:40	3.57	308	05:20	-4.62
307	21:50	3.99	308	05:30	-4.64
307	22:00	4.31	308	05:40	-4.69
307	22:10	4.56	308	05:50	-4.73
307	22:20	4.89	308	06:00	-4.55
307	22:30	5.23	308	06:10	-4.13
307	22:40	5.49	308	06:20	-3.79
307	22:50		308	06:30	-3.49
307	23:00	5.70	308	06:40	-3.19
307	23:10	5.70	308	06:50	-2.89
307	23:20	5.74	308	07:00	-2.63
307	23:30	5.83	308	07:10	-2.26
307	23:40	5.83	308	07:20	-1.83
307	23:50	5.65	308	07:30	-1.34
308	00:00	5.51	308	07:40	-0.95
308	00:10	5.44	308	07:50	-0.56
308	00:20	5.21	308	08:00	-0.14
308	00:30	4.93	308	08:10	0.30
308	00:40	4.73	308	08:20	0.85
308	00:50	4.45	308	08:30	1.36
308	01:00	4.06	308	08:40	1.73
308	01:10	3.66	308	08:50	2.14
308	01:20	3.39	308	09:00	2.77
308	01:30	3.20	308	09:10	3.39
308	01:40	2.90	308	09:20	3.76
308	01:50	2.40	308	09:30	4.13
308	02:00	1.96	308	09:40	4.63
308	02:10	1.54	308	09:50	5.07
308	02:20	1.08	308	10:00	5.42
308	02:30	0.69	308	10:10	5.79
308	02:40	0.39	308	10:20	6.13
308	02:50	-0.00	308	10:30	6.36
308	03:00	-0.51	308	10:40	6.55
308	03:10	-1.02	308	10:50	6.78
308	03:20	-1.46	308	11:00	7.01
308	03:30	-1.80	308	11:10	7.22
308	03:40	-2.19	308	11:20	7.24
308	03:50	-2.63	308	11:30	7.17
308	04:00	-3.05	308	11:40	7.08
308	04:10	-3.44	308	11:50	7.03
308	04:20	-3.74	308	12:00	7.01
308	04:30	-3.99	308	12:10	7.06
308	04:40	-4.34	308	12:20	6.94
			308	12:30	6.59

(Continued)

Table 11 (Concluded)

Julian Date	Hour EST	Water-Level Elevation ft, NGVD	Julian Date	Hour EST	Water-Level Elevation ft, NGVD
308	12:40	6.23	308	18:20	-5.79
308	12:50	5.93	308	18:30	-5.84
308	13:00	5.74	308	18:40	-5.84
308	13:10	5.42	308	18:50	-5.72
308	13:20	5.05	308	19:00	-5.72
308	13:30	4.61	308	19:10	-5.52
308	13:40	4.20	308	19:20	-5.06
308	13:50	3.80	308	19:30	-4.64
308	14:00	3.34	308	19:40	-4.29
308	14:10	2.90	308	19:50	-3.97
308	14:20	2.51	308	20:00	-3.63
308	14:30	2.03	308	20:10	-3.30
308	14:40	1.57	308	20:20	-2.93
308	14:50	1.08	308	20:30	-2.52
308	15:00	0.60	308	20:40	-2.06
308	15:10	0.14	308	20:50	-1.60
308	15:20	-0.33	308	21:00	-1.16
308	15:30	-0.79	308	21:10	-0.72
308	15:40	-1.32	308	21:20	-0.28
308	15:50	-1.83	308	21:30	0.23
308	16:00	-2.33	308	21:40	0.74
308	16:10	-2.84	308	21:50	1.29
308	16:20	-3.26	308	22:00	1.77
308	16:30	-3.67	308	22:10	2.21
308	16:40	-4.09	308	22:20	2.56
308	16:50	-4.46	308	22:30	3.02
308	17:00	-4.76	308	22:40	3.57
308	17:10	-5.03	308	22:50	3.92
308	17:20	-5.24	308	23:00	4.08
308	17:30	-5.36	308	23:10	4.33
308	17:40	-5.45	308	23:20	4.63
308	17:50	-5.52	308	23:30	4.89
308	18:00	-5.61	308	23:40	5.16
308	18:10	-5.72	308	23:50	5.37

Table 12

Current Data Observed at Station R1.0A, 3 November 1990

Hour EST	Depth ft	Speed fps	Direction deg*
		Surface**	
0617	3.0	0.7	210
0702	3.0	0.5	185
0732	3.0	0.9	180
0800	3.0	0.8	185
0832	3.0	0.5	180
0903	3.0	0.7	195
0941	3.0	0.4	210
1014	3.0	0.5	220
1046	3.0	0.6	350
1203	3.0	0.6	315
1243	3.0	0.3	355
1303	3.0	0.8	350
1336	3.0	1.0	10
1401	3.0	1.3	15
1502	3.0	1.5	15
1533	3.0	1.6	10
1604	3.0	1.3	20
1635	3.0	0.8	50
1703	3.0	0.5	45
1803	3.0	0.5	160
1904	3.0	0.8	155
2002	3.0	0.7	165
		Middepth	
0616	4.9	0.5	180
0701	6.0	0.7	180
0731	6.7	0.7	150
0759	7.6	0.8	160
0831	7.8	0.6	170
0902	8.7	0.4	180
0940	9.7	0.6	160
1013	9.3	0.7	200
1045	9.6	0.6	190
1202	9.0	0.3	15
1242	8.2	0.5	330
1302	7.7	0.6	359
1335	7.0	0.7	10
1400	6.7	1.1	10
1501	5.0	1.3	15
1532	4.5	1.8	10
1603	4.0	1.2	20
1634	3.7	0.7	45

(Continued)

* Directions are degrees from true north from which the current was flowing.
** Surface measurements were obtained 3.0 ft below top of water surface.

Table 12 (Concluded)

Hour EST	Depth ft	Speed fps	Direction deg
		Middepth (Continued)	
1702	3.7	0.7	30
1802	4.0	0.5	165
1903	5.0	0.7	160
2001	6.2	0.7	170
		Bottom+	
0613	7.8	0.5	180
0700	10.0	0.7	165
0730	11.5	0.4	152
0758	13.2	0.7	130
0830	13.7	0.5	150
0901	15.5	0.5	185
0939	16.5	0.5	155
1012	16.6	0.6	120
1044	17.2	0.4	125
1201	16.0	0.9	300
1241	14.5	0.5	190
1301	13.5	0.4	5
1334	12.0	0.6	5
1359	11.5	0.5	10
1500	8.0	1.4	10
1531	7.0	1.1	20
1602	6.0	1.1	30
1633	5.5	0.5	70
1701	5.5	0.5	5
1801	6.0	0.3	170
1902	8.0	0.8	160
2000	10.5	0.7	175

+ Bottom measurements were obtained 2.0 ft above actual bottom.

Table 13

Current Data Observed at Station R1.0B, 3 November 1990

Hour EST	Depth ft	Speed fps	Direction deg*
		Surface**	
0629	3.0	0.8	160
0708	3.0	0.9	165
0738	3.0	0.5	165
0806	3.0	0.6	260
0836	3.0	0.8	150
0910	3.0	0.6	170
0946	3.0	0.6	210
1021	3.0	0.7	250
1053	3.0	0.5	230
1210	3.0	0.8	325
1247	3.0	0.7	345
1311	3.0	1.1	350
1340	3.0	1.1	20
1407	3.0	1.3	5
1508	3.0	1.3	5
1538	3.0	1.0	20
1609	3.0	1.1	20
1641	3.0	1.0	70
1708	3.0	0.3	60
1813	3.0	0.6	155
1909	3.0	0.8	165
2007	3.0	0.6	150
		Middepth	
0628	8.5	1.1	155
0707	8.7	0.8	155
0737	11.5	0.6	195
0805	11.0	1.1	160
0835	11.8	0.7	160
0909	12.1	0.7	170
0945	12.2	0.7	130
1020	12.3	1.0	165
1052	12.7	0.8	130
1209	11.6	0.7	359
1246	11.0	0.8	10
1310	10.5	0.9	350
1339	10.0	0.8	10
1406	9.4	1.1	20
1507	7.5	1.2	10
1537	7.2	1.2	20
1608	7.0	0.7	20

(Continued)

* Directions are in degrees from true north from which the current was flowing.

** Surface measurements were obtained 3.0 ft below top of water surface.

Table 13 (Concluded)

Hour EST	Depth ft	Speed fps	Direction deg
		Middepth(Continued)	
1640	6.7	0.7	90
1707	6.7	0.3	45
1812	7.8	0.6	145
1908	8.5	0.6	160
2006	9.7	0.7	165
		Bottom+	
0627	15.0	0.7	170
0706	17.4	0.5	125
0736	19.0	0.4	155
0804	20.0	0.8	120
0834	21.6	0.5	-90
0908	22.2	0.5	130
0944	22.5	0.6	180
1019	22.7	0.8	170
1051	23.5	0.9	150
1208	21.2	0.5	330
1245	20.0	0.5	5
1309	19.0	0.6	340
1338	18.0	0.9	355
1405	16.8	0.8	10
1506	13.0	0.6	15
1536	12.5	1.0	15
1607	12.0	0.6	15
1639	11.5	0.8	170
1706	11.5	0.3	30
1811	13.7	0.5	140
1907	15.0	0.7	180
2005	17.5	0.6	170

+ Bottom measurements were obtained 2.0 ft above actual bottom.

Table 14

Current Data Observed at Station R2.0A, 3 November 1990

Hour EST	Depth ft	Speed fps	Direction deg*
		Surface**	
0642	3.0	2.3	95
0717	3.0	2.7	100
0747	3.0	2.5	105
0816	3.0	2.5	100
0847	3.0	2.0	100
0922	3.0	2.0	100
0957	3.0	1.5	105
1032	3.0	0.7	100
1114	3.0	0.2	25
1220	3.0	1.6	294
1253	3.0	2.6	300
1322	3.0	2.5	290
1350	3.0	2.5	285
1422	3.0	3.8	285
1518	3.0	3.9	285
1547	3.0	3.2	290
1623	3.0	2.6	290
1651	1.4	1.4	292
1719	3.0	0.8	305
1830	3.0	1.2	100
1922	3.0	2.2	100
2015	3.0	2.7	100
		Middepth	
0641	8.1	2.3	105
0716	9.3	2.6	110
0746	9.5	2.3	100
0815	10.5	2.3	90
0846	11.3	1.9	100
0921	11.7	1.9	90
0956	12.2	1.4	100
1031	11.7	0.6	90
1113	12.5	0.4	240
1219	11.8	1.6	278
1252	11.2	2.5	290
1321	10.5	2.6	282
1349	10.0	2.4	275
1421	9.0	2.6	290
1517	8.0	2.6	272
1546	7.0	2.8	295
1622	6.7	2.3	300

(Continued)

* Directions are in degrees from true north from which the current was flowing.

** Surface measurements were obtained 3.0 ft below top of water surface.

Table 14 (Concluded)

Hour EST	Depth ft	Speed fps	Direction deg
		Middepth (Continued)	
1650	5.5	1.5	290
1718	6.3	0.9	290
1829	6.7	1.1	100
1921	7.9	2.0	100
2014	9.1	2.5	100
		Bottom+	
0639	14.3	1.3	105
0715	16.6	1.6	120
0745	16.9	1.5	90
0814	19.1	1.6	90
0845	20.6	1.4	90
0920	21.5	1.3	90
0955	22.5	1.1	100
1030	19.5	0.3	120
1112	23.0	0.2	20
1218	21.7	1.6	280
1251	20.5	1.8	280
1320	19.0	2.5	298
1348	18.0	2.2	290
1420	16.0	2.4	290
1516	14.0	2.7	270
1545	12.0	2.0	290
1621	11.5	1.5	294
1649	9.0	1.1	310
1717	10.7	0.8	290
1828	11.5	0.9	80
1920	13.8	1.7	105
2013	16.2	2.2	100

+ Bottom measurements were obtained 2.0 ft above actual bottom.

Table 15

Current Data Observed at Station R2.0B, 3 November 1990

Hour EST	Depth ft	Speed fps	Direction deg*
		Surface**	
0654	3.0	2.1	100
0721	3.0	3.0	100
0752	3.0	2.4	100
0821	3.0	2.3	105
0851	3.0	2.0	100
0927	3.0	1.6	100
1003	3.0	1.4	100
1037	3.0	0.7	91
1126	3.0	0.4	340
1226	3.0	2.3	286
1256	3.0	2.5	300
1327	3.0	2.3	292
1354	3.0	2.9	280
1437	3.0	3.4	285
1523	3.0	2.8	285
1552	3.0	2.4	290
1627	3.0	1.1	280
1655	3.0	0.8	300
1724	3.0	0.3	340
1834	3.0	1.4	100
1928	3.0	2.2	102
2020	3.0	2.9	100
		Middepth	
0653	7.9	2.3	110
0720	8.8	2.7	105
0751	9.0	2.4	115
0820	9.8	2.5	105
0850	11.2	1.9	90
0926	11.7	1.8	100
1002	11.7	1.6	100
1036	12.3	0.5	80
1127	12.8	0.5	340
1225	11.7	1.8	288
1255	11.2	2.3	275
1326	10.5	2.5	288
1353	9.5	3.0	280
1436	8.5	3.5	295
1522	8.0	3.2	300
1551	7.0	2.4	280
1626	7.0	1.0	275

(Continued)

* Directions are in degrees from true north from which the current was flowing.

** Surface measurements were obtained 3.0 ft below top of water surface.

Table 15 (Concluded)

Hour EST	Depth ft	Speed fps	Direction deg
		Middepth (Continued)	
1654	6.5	0.5	270
1723	6.5	0.2	268
1833	6.2	1.4	100
1927	7.3	2.2	110
2019	8.6	2.7	105
		Bottom+	
0652	13.8	1.3	102
0719	15.3	2.0	117
0750	16.0	1.3	90
0819	17.6	1.9	100
0849	20.3	1.5	80
0925	20.5	1.5	90
1001	21.5	0.6	60
1035	22.6	0.2	70
1128	23.2	0.4	355
1224	21.5	1.9	252
1254	20.5	1.9	280
1325	19.0	2.4	295
1352	17.0	2.6	300
1435	15.0	2.6	280
1521	14.0	2.5	295
1550	12.0	2.5	282
1625	12.0	1.7	290
1653	11.0	0.7	275
1722	11.0	0.4	270
1832	10.5	1.1	100
1926	12.6	1.7	120
2018	15.3	2.3	110

+ Bottom measurements were obtained 2.0 ft above actual bottom.

Table 16

Current Data Observed at Station R3.0B, 3 November 1990

Hour EST	Depth ft	Speed fps	Direction deg*
		Surface**	
0639	3.0	1.7	40
0735	3.0	2.4	30
0831	3.0	2.4	36
0948	3.0	2.0	30
1037	3.0	0.7	55
1129	3.0	0.5	270
1229	3.0	2.2	275
1324	3.0	3.0	255
1420	3.0	3.7	252
1525	3.0	4.0	280
1551	3.0	4.2	255
1619	3.0	3.4	255
1642	3.0	2.8	255
1724	3.0	1.2	260
1750	3.0	0.2	210
1821	3.0	0.9	22
1845	3.0	1.5	30
1920	3.0	1.6	25
1947	3.0	1.5	32
2027	3.0	2.1	34
		Middepth	
0638	5.2	1.7	38
0734	6.7	2.5	22
0830	8.0	2.4	30
0946	9.5	2.0	28
1036	9.9	1.2	80
1128	9.1	0.8	252
1228	8.3	2.0	270
1323	7.3	2.7	260
1419	6.0	3.2	262
1524	4.5	3.6	270
1550	4.0	3.6	255
1618	3.6	3.1	255
1820	4.0	0.8	30
1845	4.2	1.3	32
1919	5.0	1.6	28
1946	5.6	1.6	32
2026	6.4	2.1	36

(Continued)

* Directions are in degrees from true north from which the current was flowing.

** Surface measurements were obtained 3.0 ft below top of water surface.

Table 16 (Concluded)

Hour EST	Depth ft	Speed fps	Direction deg
		Bottom+	
0637	8.5	0.6	58
0733	11.4	1.9	20
0829	14.0	1.8	35
0945	17.0	1.4	12
1035	17.8	0.5	118
1127	16.2	0.5	242
1227	14.6	1.1	260
1322	12.6	2.0	270
1418	10.0	2.5	262
1522	7.0	2.9	260
1550	6.0	3.1	250
1618	5.2	2.6	250
1642	4.4	2.4	260
1723	4.4	1.2	260
1749	4.4	0.4	210
1819	6.0	0.7	30
1844	6.4	1.1	30
1917	8.0	1.2	20
1946	9.2	1.2	22
2025	10.8	1.8	26

+ Bottom measurements were obtained 2.0 ft above actual bottom.

Table 17

Current Data Observed at Station R4.0B, 3 November 1990

Hour EST	Depth ft	Speed fps	Direction deg*
		Surface**	
0654	3.0	2.0	65
0744	3.0	2.1	70
0840	3.0	2.0	78
0955	3.0	1.7	65
1045	3.0	1.1	78
1139	3.0	0.2	292
1238	3.0	2.1	290
1334	3.0	1.8	295
1432	3.0	2.3	300
1519	3.0	3.9	91
1546	3.0	2.6	82
1619	3.0	3.0	85
1647	3.0	3.0	94
1725	1.0	2.3	87
1931	3.0	1.8	269
2005	3.0	2.0	265
2050	3.0	2.2	268
		Middepth	
0649	4.0	2.0	78
0743	5.2	2.1	68
0839	6.7	2.0	78
0954	7.8	1.7	58
1044	8.0	1.4	90
1138	8.1	0.2	285
1237	7.3	2.2	292
1333	6.2	1.6	295
1431	5.0	1.8	298
1518	3.9	2.7	83
1546	3.3	2.6	77
1931	3.5	1.9	270
2004	4.2	1.7	266
2049	5.2	2.2	266
		Bottom+	
0648	6.0	1.5	72
0742	8.3	1.9	70
0838	11.4	1.6	70
0953	13.6	1.1	60

(Continued)

* Directions are in degrees from true north from which the current was flowing.

** Surface measurements were obtained 3.0 ft below top of water surface.

\+ Bottom measurements were obtained 2.0 ft above actual bottom.

Table 17 (Concluded)

Hour EST	Depth ft	Speed fps	Direction deg
		Bottom (Continued)	
1043	14.0	0.9	90
1137	14.2	0.3	48
1236	12.6	1.1	295
1332	10.4	1.3	290
1430	8.0	1.9	278
1518	5.7	2.0	79
1545	4.5	2.5	80
1618	3.5	2.5	89
1646	3.1	2.2	88
1724	2.7	2.0	89
1930	5.0	1.6	279
2003	6.4	2.0	271
2048	8.3	2.1	270

Table 18

Current Data Observed at Station R5.0B, 3 November 1990

Hour EST	Depth ft	Speed fps	Direction deg*
		Surface**	
0632	3.0	2.5	352
0638	3.0	3.4	350
0701	3.0	4.0	346
0733	3.0	4.9	340
0802	3.0	6.3	335
0832	3.0	6.1	333
0902	3.0	5.1	347
0938	3.0	4.0	330
1002	3.0	4.0	335
1031	3.0	3.3	340
1102	3.0	2.8	341
1131	3.0	0.9	1
1202	3.0	1.9	142
1232	3.0	3.0	143
1302	3.0	4.1	142
1332	3.0	5.0	143
1402	3.0	5.6	143
1432	3.0	5.5	141
1502	3.0	5.7	137
1532	3.0	5.6	135
1602	3.0	5.7	134
1632	3.0	4.8	132
1702	3.0	3.7	141
1755	3.0	2.1	154
1833	1.0	0.7	344
1946	3.0	2.9	330
2015	3.0	3.7	328
2039	3.0	5.7	325
		Middepth	
0701	3.8	4.0	342
0732	4.1	4.3	339
0801	5.1	4.9	334
0831	6.3	6.2	335
0901	6.8	5.2	350
0937	7.7	3.6	327
1001	7.5	3.8	329
1031	8.2	3.3	352
1101	8.0	2.4	351
1131	8.2	0.6	13
1201	8.8	1.6	138

(Continued)

* Directions are in degrees from true north from which the current was flowing.

** Surface measurements were obtained 3.0 ft below top of water surface.

Table 18 (Concluded)

Hour EST	Depth ft	Speed fps	Direction deg
		Middepth (Continued)	
1231	8.3	2.9	149
1301	8.4	3.3	147
1331	7.6	4.5	147
1401	7.4	4.2	153
1431	6.6	4.7	140
1501	5.9	4.9	139
1531	5.4	5.0	139
1601	5.5	4.6	139
1632	4.9	4.0	135
1701	3.8	3.7	142
1754	3.6	2.1	141
2014	3.6	3.5	327
2038	3.8	4.4	330
		Bottom+	
0631	4.1	2.1	6
0638	4.0	2.7	349
0700	5.6	3.1	351
0731	6.3	3.7	331
0800	8.1	3.3	331
0830	10.6	3.4	341
0900	11.6	2.7	358
0935	13.4	1.9	245
1000	12.9	2.0	340
1030	14.4	1.9	325
1100	14.0	1.8	355
1130	14.4	0.6	262
1200	15.5	0.9	159
1230	14.6	1.4	80
1300	14.7	2.8	110
1330	13.2	3.0	119
1400	12.8	2.4	156
1430	11.1	3.1	137
1500	9.7	1.9	157
1530	8.7	2.1	167
1600	8.9	1.2	154
1630	7.8	0.6	133
1700	5.6	1.4	155
1753	5.2	0.8	147
1833	1.5	0.6	350
1945	4.0	2.7	327
2013	5.1	2.2	330
2037	5.6	2.6	325

+ Bottom measurements were obtained 2.0 ft above actual bottom.

Table 19

Current Data Observed at Station R6.0B, 3 November 1990

Hour EST	Depth ft	Speed fps	Direction deg*
		Surface**	
0619	3.0	0.4	312
0647	3.0	1.6	306
0708	3.0	2.1	307
0739	3.0	3.0	307
0809	3.0	2.9	302
0837	3.0	3.5	307
0912	3.0	3.1	307
0943	3.0	1.6	309
1013	3.0	1.6	321
1039	3.0	1.1	321
1110	3.0	0.8	310
1137	3.0	0.2	85
1207	3.0	0.8	122
1237	3.0	1.3	128
1307	3.0	1.5	121
1342	3.0	2.2	120
1408	3.0	2.4	120
1437	3.0	2.4	125
1509	3.0	2.5	122
1538	3.0	2.7	120
1609	3.0	2.5	123
1638	3.0	2.4	125
1709	3.0	1.5	123
1809	3.0	0.4	110
1855	3.0	0.5	329
1953	3.0	1.5	302
2033	3.0	2.6	300
		Middepth	
0619	4.0	0.7	304
0647	5.1	1.5	301
0708	5.1	2.1	300
0738	6.2	2.8	303
0808	6.8	3.3	303
0836	7.6	3.4	290
0911	8.4	2.9	268
0942	9.2	2.2	285
1012	9.7	1.6	312
1038	9.6	1.6	301
1109	10.0	1.0	313
1137	10.2	0.1	7

(Continued)

* Directions are in degrees from true north from which the current was flowing.

** Surface measurements were obtained 3.0 ft below top of water surface.

Table 19 (Concluded)

Hour EST	Depth ft	Speed fps	Direction deg
		Middepth (Continued)	
1206	9.8	0.7	110
1237	9.6	0.9	130
1306	9.9	1.5	124
1341	8.1	2.1	121
1407	7.6	2.2	124
1436	7.1	2.4	123
1508	6.7	2.9	119
1537	6.2	2.7	117
1608	5.2	2.3	123
1637	4.7	2.3	123
1708	4.6	1.8	113
1809	3.9	0.5	111
1855	4.3	0.4	327
1952	4.5	1.6	300
2032	5.1	2.6	294
		Bottom+	
0618	6.0	0.7	302
0646	8.2	1.1	290
0707	8.2	1.9	293
0737	10.5	2.7	301
0807	11.6	3.2	291
0836	13.2	3.2	288
0910	14.7	2.6	274
0942	16.4	1.6	283
1011	17.4	1.1	306
1037	17.2	1.2	278
1108	18.0	0.9	285
1136	18.4	0.2	355
1205	17.6	0.5	169
1236	17.2	0.9	109
1306	17.9	1.0	129
1341	14.1	1.6	119
1406	13.2	1.9	115
1436	12.1	2.1	117
1507	11.3	2.2	110
1537	10.4	2.6	119
1607	8.4	2.2	121
1637	7.4	2.1	121
1708	7.1	1.6	105
1808	5.8	0.5	113
1854	6.5	0.3	330
1952	7.0	1.5	307
2031	8.1	2.5	291

+ Bottom measurements were obtained 2.0 ft above actual bottom.

Table 20

Current Data Observed at Station R7.0B, 3 November 1990

Hour EST	Depth ft	Speed fps	Direction deg*
		Surface**	
0630	3.0	0.6	160
0728	3.0	1.4	150
0823	3.0	0.9	190
0942	3.0	0.5	240
1032	3.0	0.2	330
1123	3.0	0.3	340
1224	3.0	1.3	350
1319	3.0	1.4	358
1416	3.0	1.7	348
1519	3.0	2.0	358
1547	3.0	1.2	350
1615	3.0	0.6	20
1639	3.0	0.3	20
1719	3.0	0.2	65
1746	3.0	0.5	90
1816	3.0	0.4	140
1843	3.0	0.8	180
1914	3.0	0.8	186
1944	3.0	0.9	180
2020	3.0	1.3	135
		Middepth	
0629	7.8	1.1	230
0727	9.0	1.6	180
0823	10.3	1.3	175
0941	11.5	0.7	180
1031	11.4	0.4	280
1122	8.3	0.2	5
1223	8.0	1.0	355
1318	8.6	1.3	1
1415	7.6	1.8	346
1517	5.7	2.0	350
1546	4.8	1.4	355
1614	5.8	0.4	45
1638	5.8	0.2	54
1718	5.9	0.1	90
1746	5.8	0.5	115
1815	6.0	0.8	140
1842	5.2	0.8	200
1913	5.9	0.7	208

(Continued)

* Directions are in degrees from true north from which the current was flowing.

** Surface measurements were obtained 3.0 ft below top of water surface.

Table 20 (Concluded)

Hour EST	Depth ft	Speed fps	Direction deg
		Middepth (Continued)	
1943	6.7	0.8	178
2019	7.5	1.3	132
		Bottom+	
0628	13.5	0.8	280
0726	16.0	1.0	214
0822	18.6	0.8	190
0940	21.0	0.3	90
1030	20.8	0.3	280
1121	14.6	0.2	35
1222	14.0	0.7	358
1317	15.2	0.7	10
1414	13.2	1.4	10
1516	9.4	1.4	1
1545	7.6	0.9	2
1613	9.6	0.2	30
1638	9.6	0.1	5
1717	9.8	0.6	102
1745	9.6	0.4	75
1814	10.0	0.7	128
1842	8.4	0.7	190
1912	9.8	0.5	178
1942	11.4	0.5	172
2018	13.0	0.9	68

(Continued)

+ Bottom measurements were obtained 2.0 ft above actual bottom.

Table 21

Current Data Observed at Station R8.0B, 3 November 1990

Hour EST	Depth ft	Speed fps	Direction deg*
		Surface**	
0619	3.0	0.7	110
0722	3.0	1.3	114
0817	3.0	1.1	136
0934	3.0	0.6	110
1022	3.0	0.1	212
1117	3.0	0.1	350
1217	3.0	0.9	325
1313	3.0	1.0	310
1408	3.0	1.2	340
1513	3.0	1.4	330
1544	3.0	0.9	8
1609	3.0	0.6	350
1634	3.0	0.1	30
1713	3.0	0.1	1
1741	3.0	0.1	38
1809	3.0	0.5	115
1836	3.0	0.4	90
1909	3.0	1.1	132
1939	3.0	1.0	112
2014	3.0	1.5	130
		Middepth	
0618	5.2	0.8	90
0720	7.2	1.5	98
0816	8.6	1.2	102
0929	9.2	0.8	112
1020	11.6	0.4	240
1116	10.5	0.1	20
1216	8.8	0.8	347
1312	7.9	1.0	312
1407	6.5	1.3	350
1512	5.0	1.2	328
1543	4.7	0.9	2
1608	3.5	0.8	342
1634	4.0	0.1	45
1809	4.7	0.7	130
1835	5.7	0.8	80
1908	5.7	0.9	135
1938	6.0	1.4	115
2013	6.6	1.3	122

(Continued)

* Directions are in degrees from true north from which the current was flowing.

** Surface measurements were obtained 3.0 ft below top of water surface.

Table 21 (Concluded)

Hour EST	Depth ft	Speed fps	Direction deg
		Bottom+	
0617	8.5	1.1	72
0719	12.4	1.3	70
0815	15.3	0.4	106
0928	16.3	0.7	130
1018	20.6	0.7	155
1115	19.0	0.4	8
1215	15.6	0.9	2
1311	13.8	0.8	305
1406	11.0	0.9	342
1510	8.0	1.2	312
1542	7.4	0.3	330
1607	5.0	0.4	340
1633	6.0	0.1	30
1711	4.5	0.1	350
1740	4.4	0.1	30
1808	7.4	0.3	230
1834	9.4	0.4	75
1907	9.4	0.7	165
1937	10.0	1.2	102
2012	11.2	0.9	108

+ Bottom measurements were obtained 2.0 ft above actual bottom.

Table 22

Current Data Observed at Station R9.0B, 3 November 1990

Hour EST	Depth ft	Speed fps	Direction deg*
		Surface**	
0610	3.0	0.9	85
0705	3.0	0.7	92
0806	3.0	0.3	90
0905	3.0	0.2	90
1013	3.0	0.2	116
1109	3.0	0.2	300
1212	3.0	0.9	305
1308	3.0	0.9	309
1402	3.0	1.3	318
1503	3.0	1.1	302
1539	3.0	1.0	300
1604	3.0	0.8	295
1630	3.0	0.4	270
1701	3.0	0.2	115
1735	3.0	0.1	110
1804	3.0	0.3	115
1831	3.0	0.4	90
1901	3.0	0.9	90
1931	3.0	1.1	110
2005	3.0	0.7	114
		Middepth	
0606	4.7	0.7	90
0704	6.2	0.7	96
0804	7.2	0.9	84
0904	8.8	0.6	90
1012	9.7	0.2	78
1108	9.9	0.2	335
1211	9.1	0.8	300
1307	8.2	0.9	312
1401	6.8	1.3	308
1501	5.4	0.9	312
1538	4.7	0.9	300
1603	4.0	0.8	294
1630	3.6	0.5	265
1700	3.5	0.1	100
1735	3.7	0.2	102
1803	3.8	0.5	115
1830	4.2	0.6	102
1901	4.5	0.8	118

(Continued)

* Directions are in degrees from true north from which the current was flowing.

** Surface measurements were obtained 3.0 ft below top of water surface.

Table 22 (Concluded)

Hour EST	Depth ft	Speed fps	Direction deg
		Middepth (Continued)	
1930	5.2	0.8	102
2004	6.1	0.8	114
		Bottom+	
0605	7.5	0.6	95
0703	10.5	0.7	85
0803	12.5	0.9	80
0903	15.6	0.6	98
1011	17.4	0.5	80
1107	17.8	0.1	335
1210	16.2	0.5	318
1306	14.4	0.3	310
1400	11.6	1.0	309
1500	8.8	0.8	312
1537	7.4	1.0	308
1602	6.0	0.7	302
1629	5.2	0.2	260
1700	5.0	0.1	118
1734	5.4	0.4	125
1802	5.7	0.4	98
1830	6.4	0.4	120
1900	7.0	0.3	120
1930	8.4	0.5	105
2003	10.2	0.6	110

+ Bottom measurements were obtained 2.0 ft above actual bottom.

Table 23

Suspended Sediment and Salinity Concentrations

Observed at Range R1.0, 3 November 1990

Hour EST	Suspended Sediment mg/l	Salinity ppt
	Station R1.0A	
0618	3	31.5
0701	2	31.8
0759	3	32.0
0902	5	31.6
1013	8	31.5
1202	4	31.9
1302	2	31.8
1400	8	31.5
1501	14	31.1
1603	32	30.3
1703	20	29.6
1802	4	31.5
1903	3	31.9
2001	4	32.0
	Station R1.0B	
0628	3	31.4
0707	2	32.0
0805	2	32.0
0909	5	32.0
1020	3	31.9
1209	2	32.0
1310	4	32.1
1406	4	31.9
1507	7	31.6
1608	12	31.7
1707	2	32.0
1812	3	32.0
1908	3	31.7
2006	1	31.8

NOTE: All data were taken at middepth.

Table 24

Suspended Sediment and Salinity Concentrations

Observed at Range R2.0, 3 November 1990

Hour EST	Suspended Sediment mg/l	Salinity ppt
	Station R2.0A	
0640	5	30.8
0716	5	31.3
0815	3	31.9
0921	4	31.9
1031	4	31.8
1219	2	31.6
1321	7	31.4
1421	19	30.9
1517	28	30.2
1622	33	29.6
1718	18	29.4
1828	10	29.5
1923	12	30.3
2014	10	31.6
	Station R2.0B	
0653	6	30.9
0720	5	31.3
0820	5	31.5
0926	0	31.6
1036	6	31.7
1225	4	31.6
1326	5	31.3
1438	18	30.8
1522	20	30.0
1625	23	29.4
1723	19	29.4
1833	11	29.6
1927	10	30.3
2019	8	31.4

NOTE: All data were taken at middepth.

Table 25

Suspended Sediment and Salinity Concentrations

Observed at Range R3.0, 3 November 1990

Hour EST	Suspended Sediment mg/l	Salinity ppt
	Station R3.0B	
0638	7	30.0
0734	8	31.1
0830	5	31.5
0946	3	31.7
1036	2	31.7
1128	4	31.7
1228	2	31.6
1323	7	31.5
1419	17	31.0
1524	34	30.4
1618	39	29.9
1724	19	29.7
1820	14	29.7
1919	15	29.6
2026	10	31.2

NOTE: All data were taken at middepth.

Table 26

Suspended Sediment and Salinity Concentrations

Observed at Range R4.0, 3 November 1990

Hour EST	Suspended Sediment mg/l	Salinity ppt
	Station R4.0B	
0650	8	28.9
0743	10	30.6
0839	7	31.3
0954	4	31.6
1044	2	31.7
1138	2	31.7
1237	9	31.5
1333	15	31.1
1431	25	30.5
1518	32	30.0
1619	28	29.7
1724	24	29.4
1931	15	29.6
2004	15	29.6
2049	10	30.9

NOTE: All data were taken at middepth.

Table 27

Suspended Sediment and Salinity Concentrations

Observed at Range R5.0, 3 November 1990

Hour EST	Suspended Sediment mg/l	Salinity ppt
	Station R5.0B	
0632	11	28.4
0701	11	28.8
0732	14	29.0
0801	16	29.0
0901	10	30.5
1001	8	31.1
1101	5	31.4
1201	5	31.3
1301	7	30.4
1401	20	30.2
1501	17	29.8
1701	19	29.2
1754	25	29.2
2014	13	29.3
2038	17	29.5

NOTE: All data were taken at middepth.

Table 28

Suspended Sediment and Salinity Concentrations

Observed at Range R6.0, 3 November 1990

Hour EST	Suspended Sediment mg/l	Salinity ppt
	Station R6.0B	
0619	15	28.3
0708	15	28.5
0738	14	28.8
0808	17	28.9
0911	12	30.3
1012	7	31.0
1109	7	31.3
1206	5	31.1
1306	7	29.7
1407	8	29.6
1508	7	29.6
1608	6	29.4
1708	25	29.6
1809	67	29.2
1855	24	29.1
2032	18	29.4

NOTE: All data were taken at middepth.

Table 29

Suspended Sediment and Salinity Concentrations

Observed at Range R7.0, 3 November 1990

Hour EST	Suspended Sediment mg/l	Salinity ppt
	Station R7.0B	
0630	12	29.5
0727	8	30.4
0823	5	31.3
0941	5	31.5
1031	3	31.6
1122	2	31.1
1223	3	31.5
1318	4	31.1
1415	10	29.7
1517	22	27.9
1614	25	26.5
1718	20	26.5
1815	16	29.6
1912	11	29.4
2019	17	30.7

NOTE: All data were taken at middepth.

Table 30

Suspended Sediment and Salinity Concentrations

Observed at Range R8.0, 3 November 1990

Hour EST	Suspended Sediment mg/l	Salinity ppt
	Station R8.0B	
0619	9	26.0
0720	9	29.2
0818	11	30.5
0929	4	31.2
1020	3	31.4
1116	3	31.4
1216	5	31.3
1312	5	30.3
1407	18	28.7
1510	34	26.5
1608	22	24.2
1717	20	22.0
1809	19	24.9
1908	16	27.6
2013	16	29.0

NOTE: All data were taken at middepth.

Table 31

Suspended Sediment and Salinity Concentrations

Observed at Range R9.0, 3 November 1990

Hour EST	Suspended Sediment mg/l	Salinity ppt
	Station R9.0B	
0606	13	24.2
0704	12	27.7
0805	11	29.5
0904	8	30.7
1012	4	31.3
1108	3	31.3
1211	3	31.0
1307	5	29.8
1401	15	28.2
1501	31	25.7
1603	36	22.3
1701	97	19.2
1803	19	21.2
1901	16	24.5
2003	18	28.2

NOTE: All data were taken at middepth.

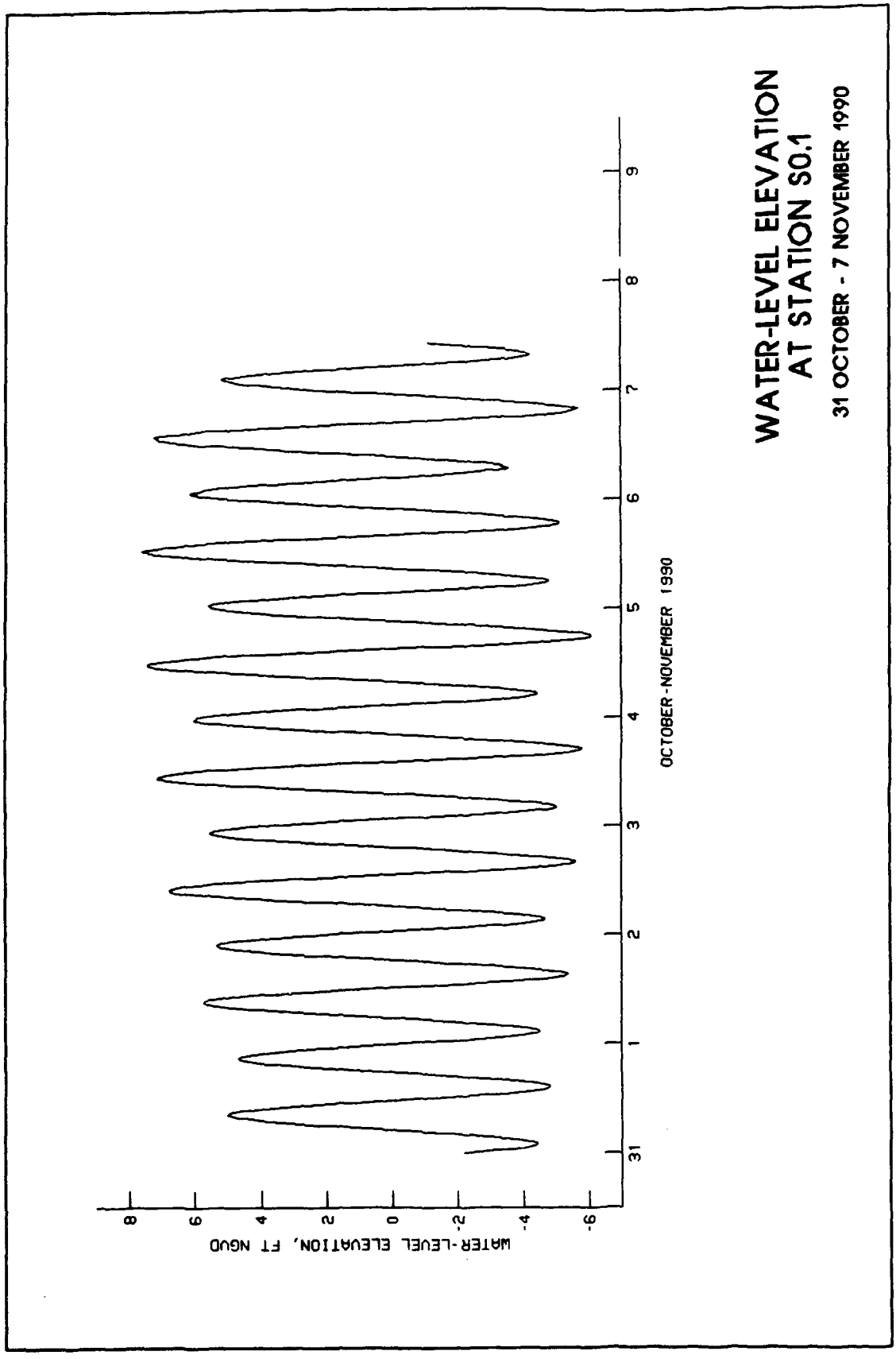

WATER-LEVEL ELEVATION
AT STATION S0.1
31 OCTOBER - 7 NOVEMBER 1990
WATER-LEVEL ELEVATION, FT NGVD
8
6
4
2
0
-2
-4
-6
31
1
2
3
4
5
6
7
8
9
OCTOBER-NOVEMBER 1990

PLATE 1

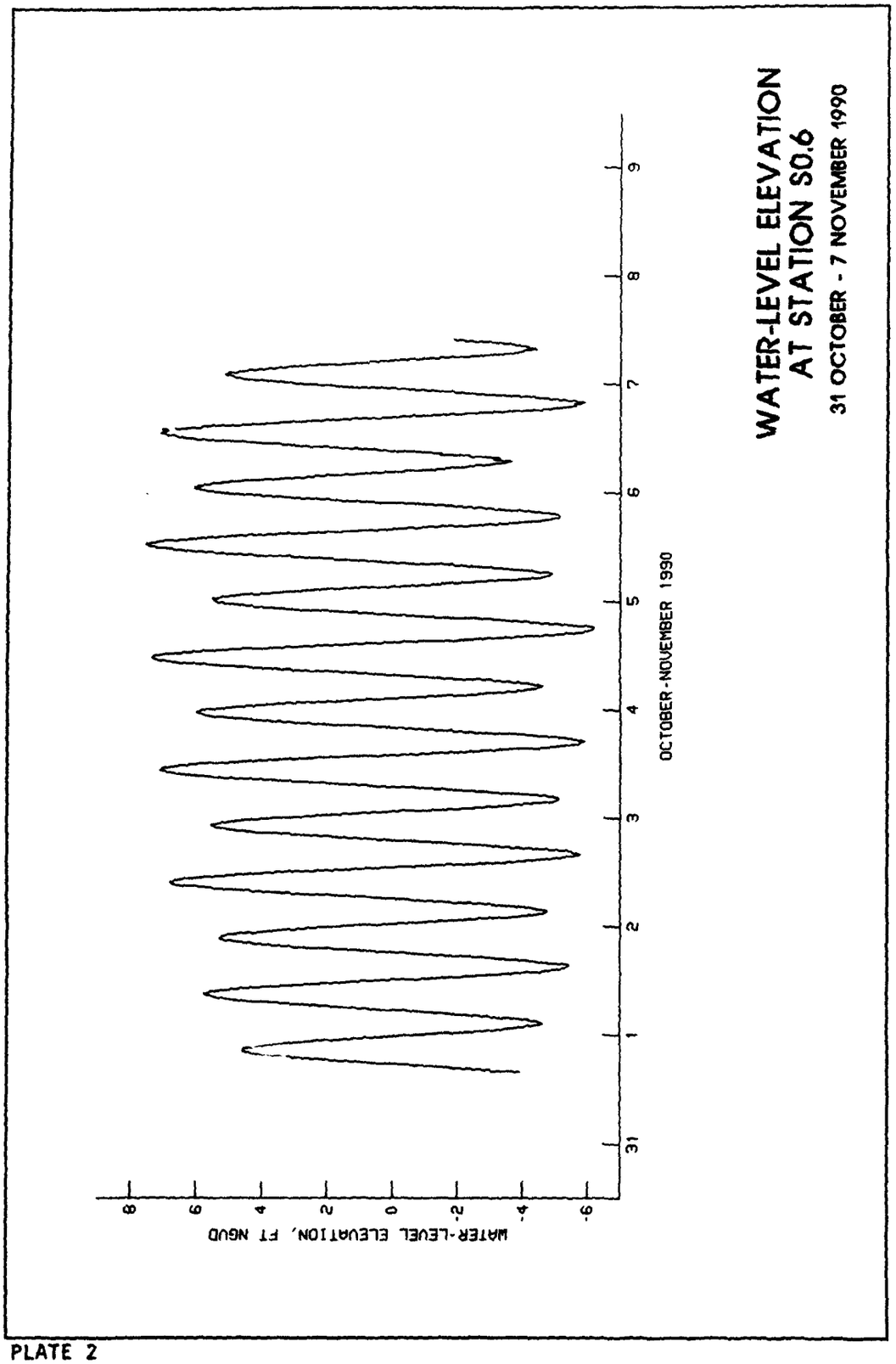
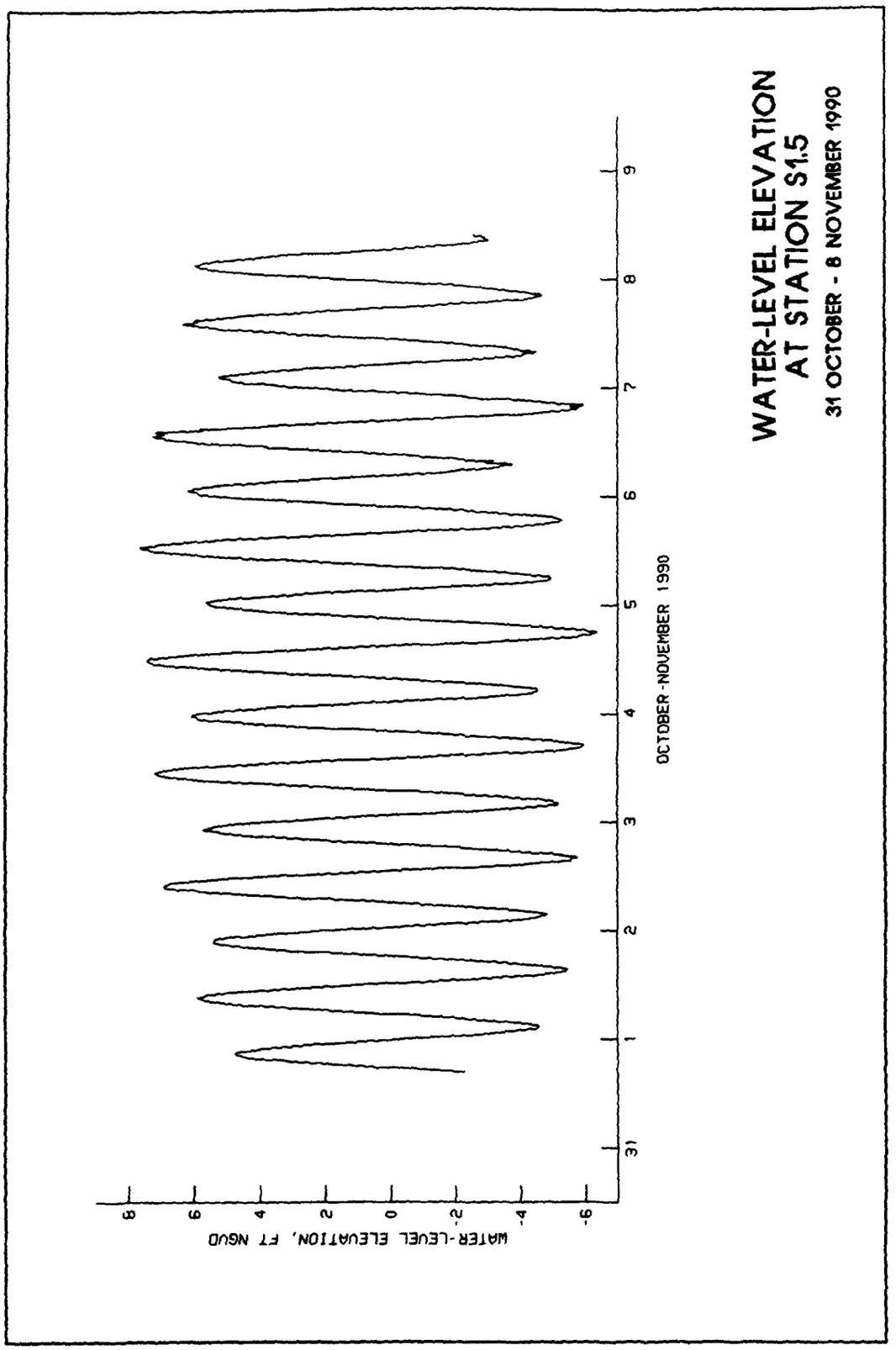

WATER-LEVEL ELEVATION
AT STATION S0.6
31 OCTOBER - 7 NOVEMBER 1990
WATER-LEVEL ELEVATION, FT NGVD
8
6
4
2
0
-2
-4
-6
31
1
2
3
4
5
6
7
8
9
OCTOBER-NOVEMBER 1990

PLATE 2


WATER-LEVEL ELEVATION
AT STATION S1.5
31 OCTOBER - 8 NOVEMBER 1990
WATER-LEVEL ELEVATION, FT NGVD
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6
4
2
0
-2
-4
-6
31
1
2
3
4
5
6
7
8
9
OCTOBER-NOVEMBER 1990

PLATE 3

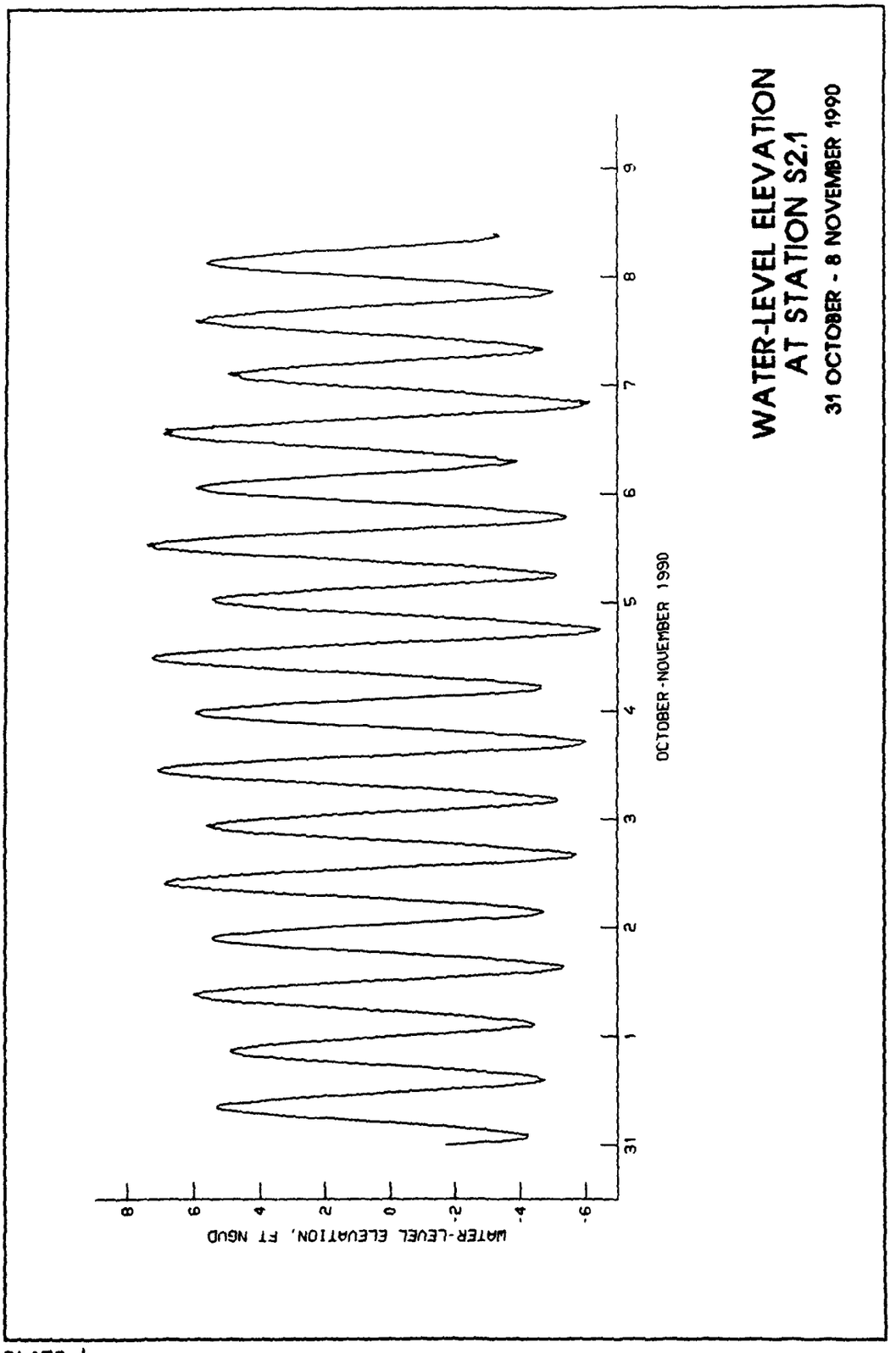
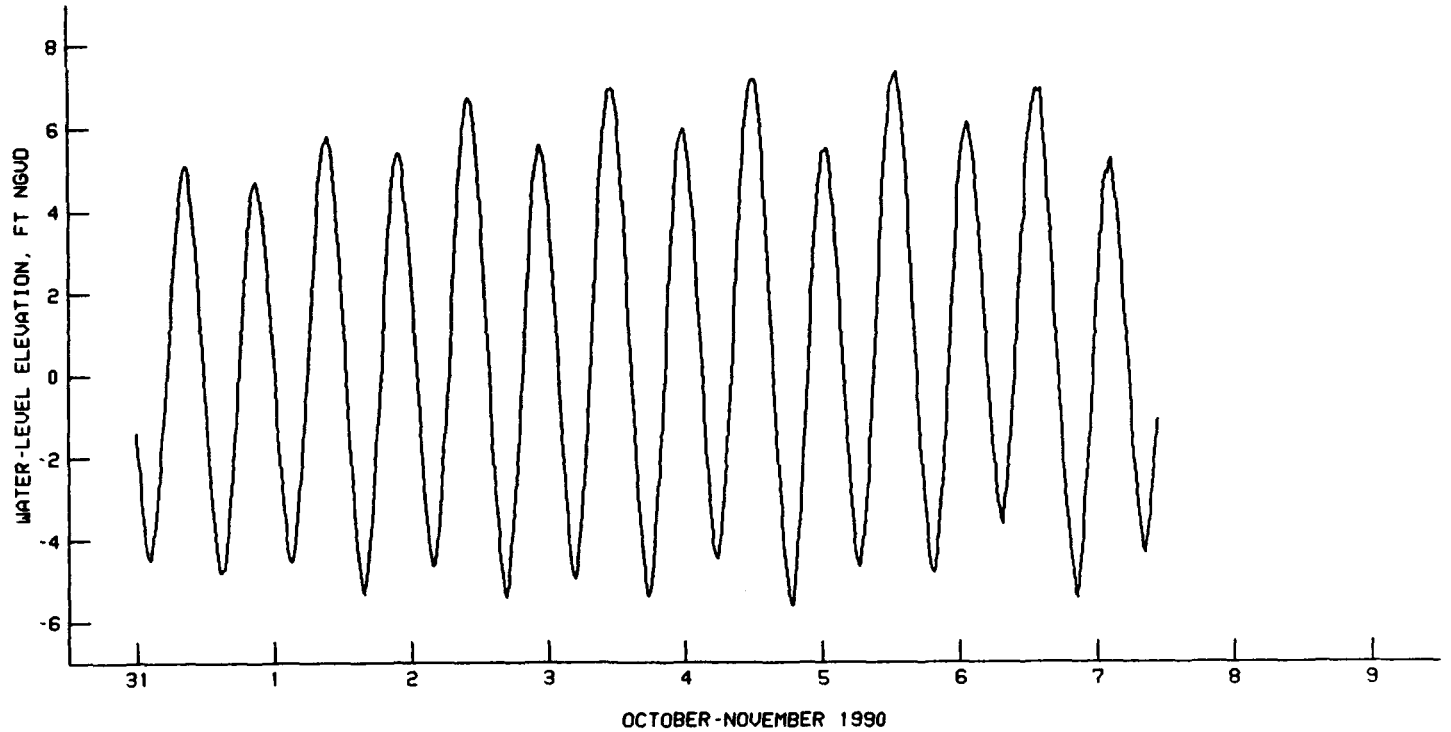

WATER-LEVEL ELEVATION
AT STATION S2.1
31 OCTOBER - 8 NOVEMBER 1990
WATER-LEVEL ELEVATION, FT NGVD
8
6
4
2
0
-2
-4
-6
31
1
2
3
4
5
6
7
8
9
OCTOBER-NOVEMBER 1990

PLATE 4



WATER-LEVEL ELEVATION AT STATION S4.2

31 OCTOBER - 7 NOVEMBER 1990

PLATE 5

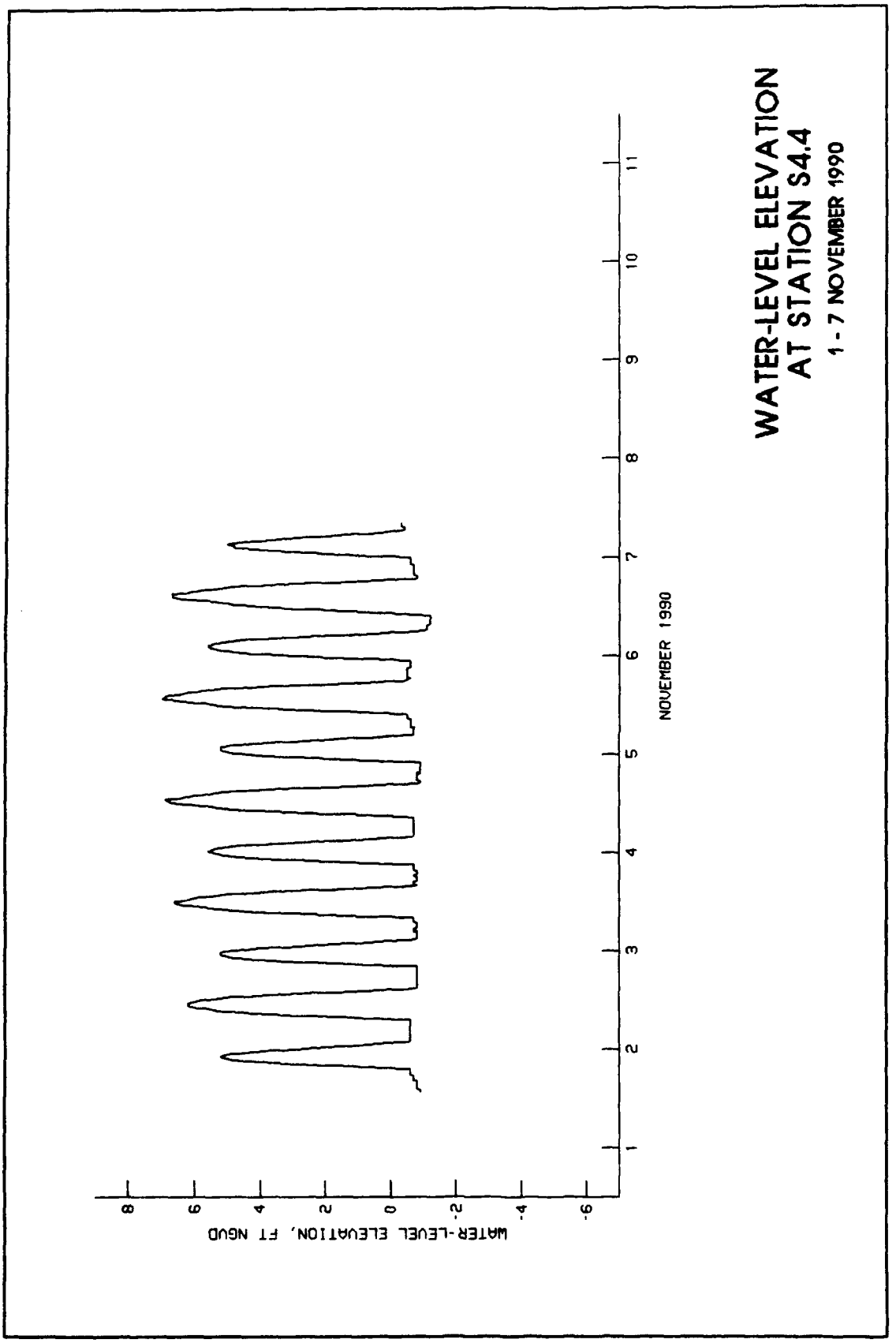

WATER-LEVEL ELEVATION
AT STATION S4.4
1 - 7 NOVEMBER 1990
WATER-LEVEL ELEVATION, FT NGVD
8
6
4
2
0
-2
-4
-6
1
2
3
4
5
6
7
8
9
10
11
NOVEMBER 1990

PLATE 6

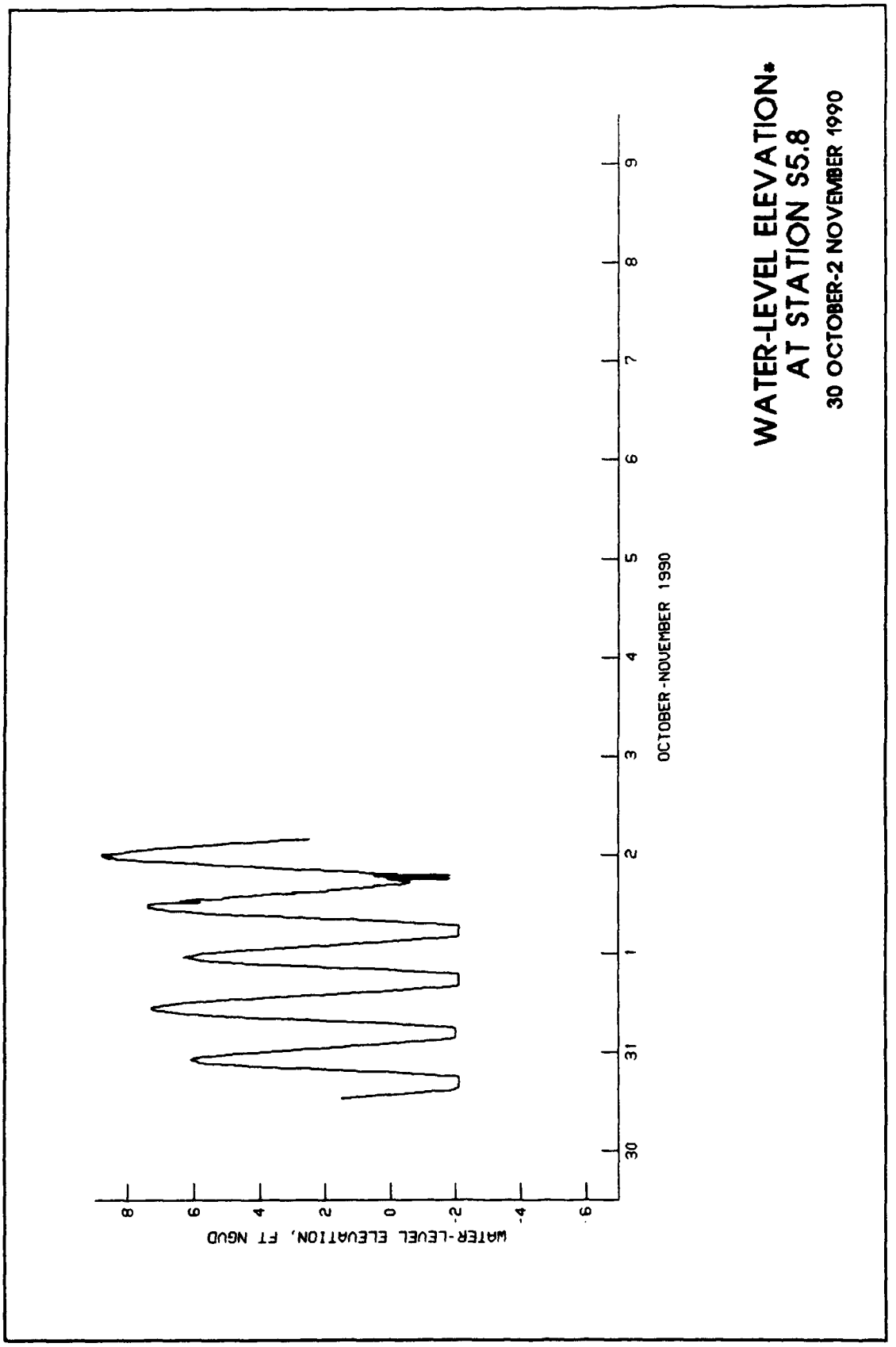
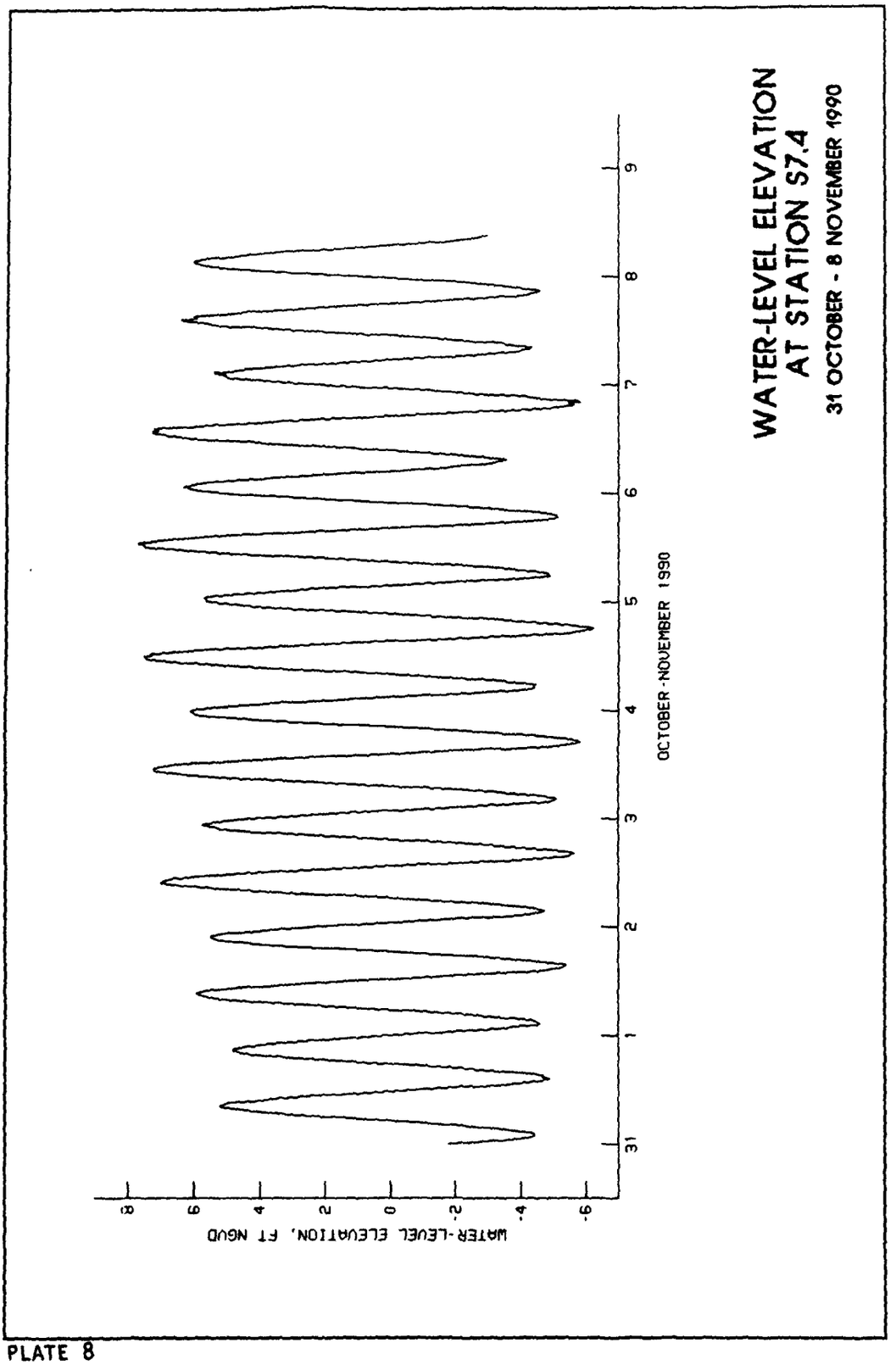

WATER-LEVEL ELEVATION*
AT STATION S5.8
30 OCTOBER-2 NOVEMBER 1990
WATER-LEVEL ELEVATION, FT NGVD
8
6
4
2
0
-2
-4
-6
30
31
1
2
3
4
5
6
7
8
9
OCTOBER-NOVEMBER 1990

PLATE 7


WATER-LEVEL ELEVATION
AT STATION S7.4
31 OCTOBER - 8 NOVEMBER 1990
WATER-LEVEL ELEVATION, FT NGVD
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6
4
2
0
-2
-4
-6
31
1
2
3
4
5
6
7
8
9
OCTOBER-NOVEMBER 1990

PLATE 8

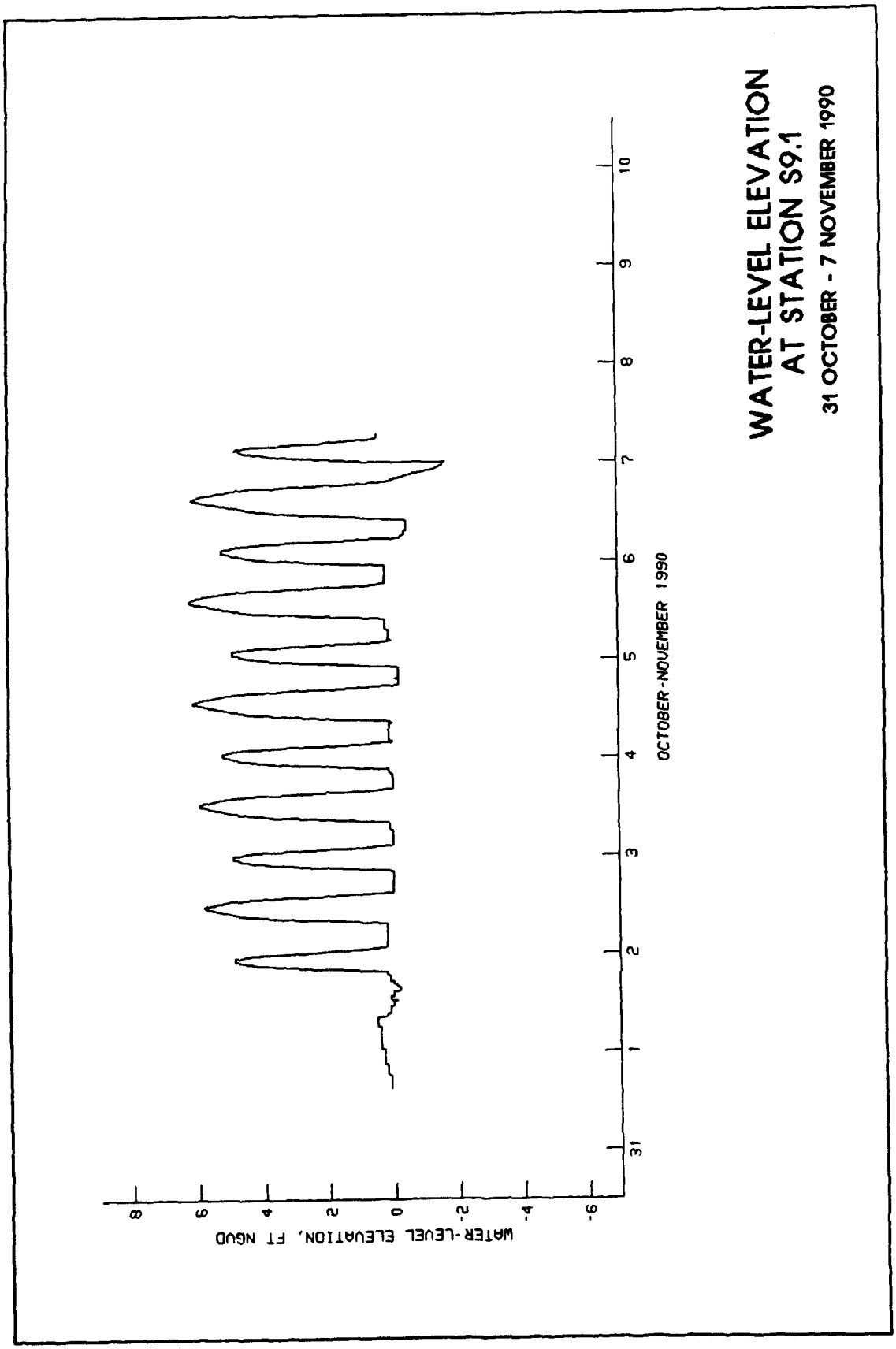

WATER-LEVEL ELEVATION
AT STATION S9.1
31 OCTOBER - 7 NOVEMBER 1990
WATER-LEVEL ELEVATION, FT NGVD
8
6
4
2
0
-2
-4
-6
31
1
2
3
4
5
6
7
8
9
10
OCTOBER-NOVEMBER 1990

PLATE 9

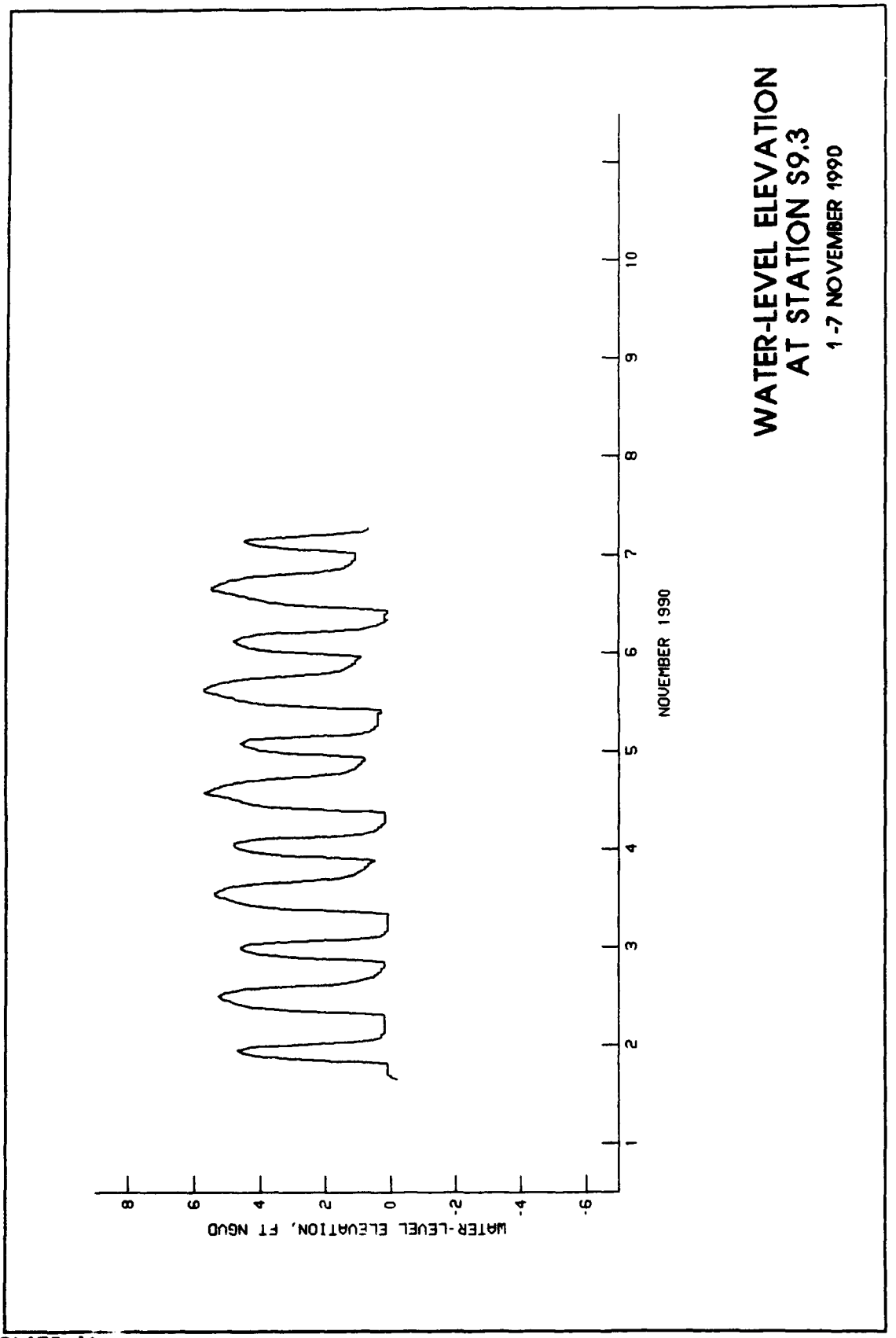

WATER-LEVEL ELEVATION
AT STATION S9.3
1-7 NOVEMBER 1990
WATER-LEVEL ELEVATION, FT NGVD
8
6
4
2
0
-2
-4
-6
1
2
3
4
5
6
7
8
9
10
NOVEMBER 1990

PLATE 10

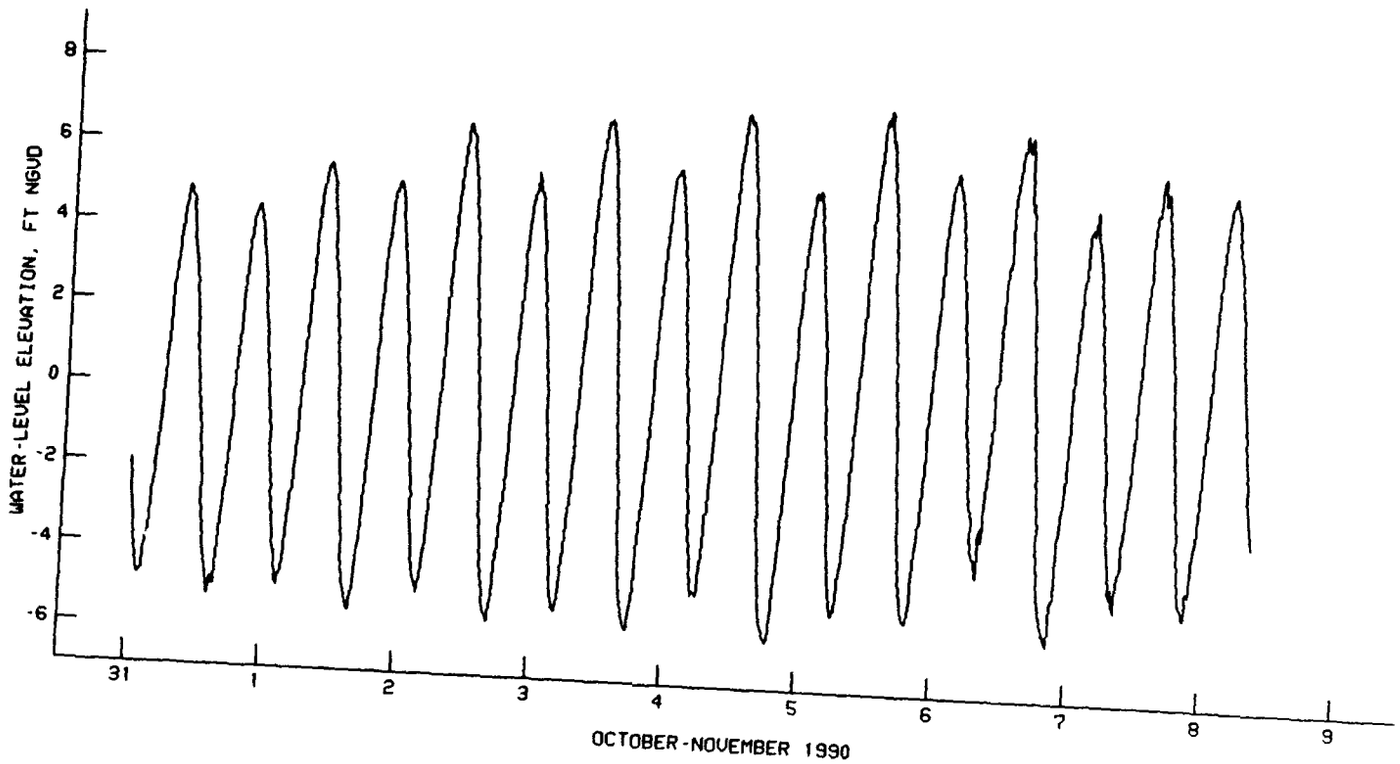
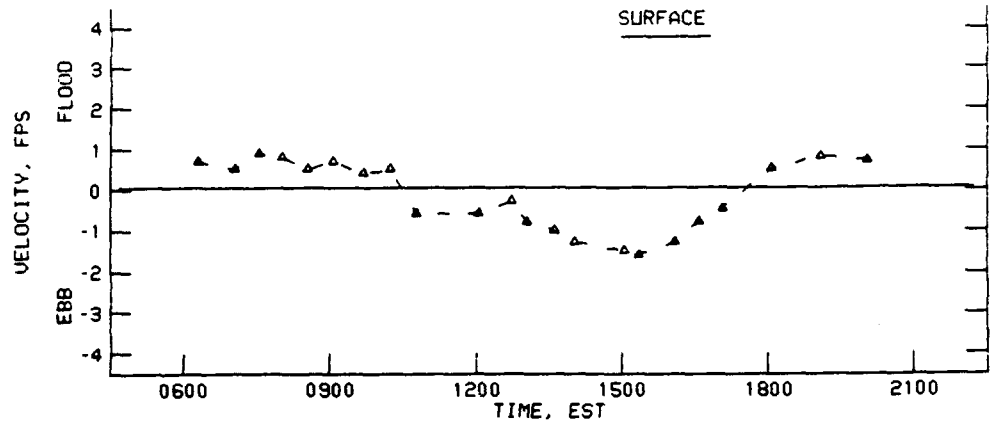
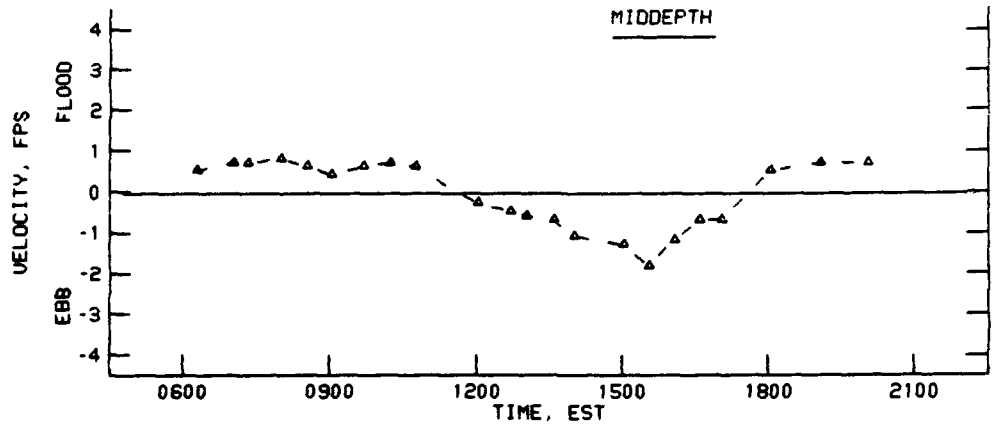


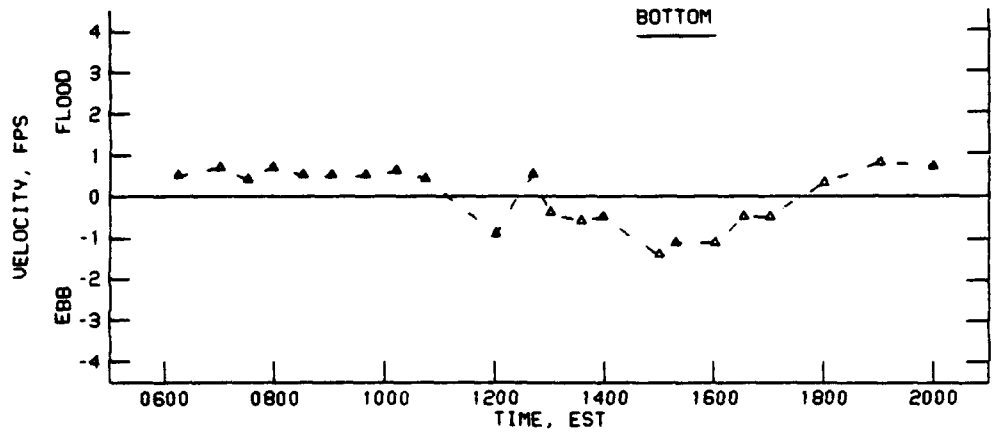
PLATE 11

WATER-LEVEL ELEVATION AT STATION S9.5

31 OCTOBER - 8 NOVEMBER 1990



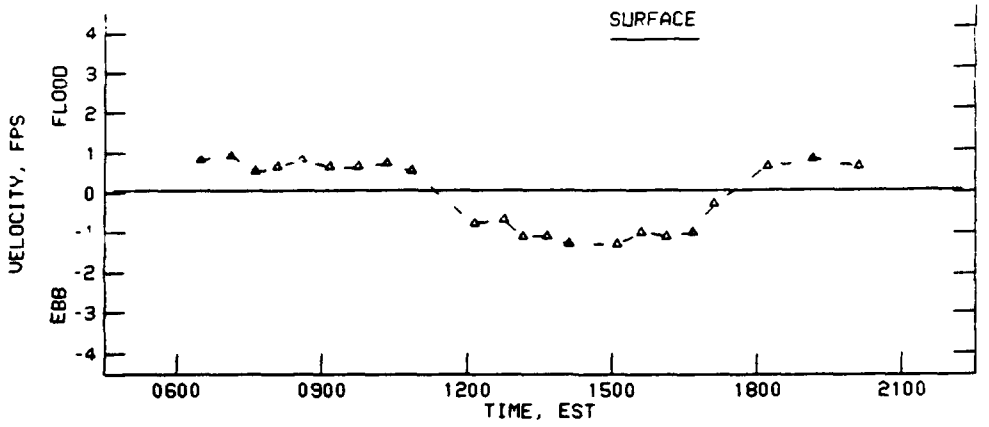


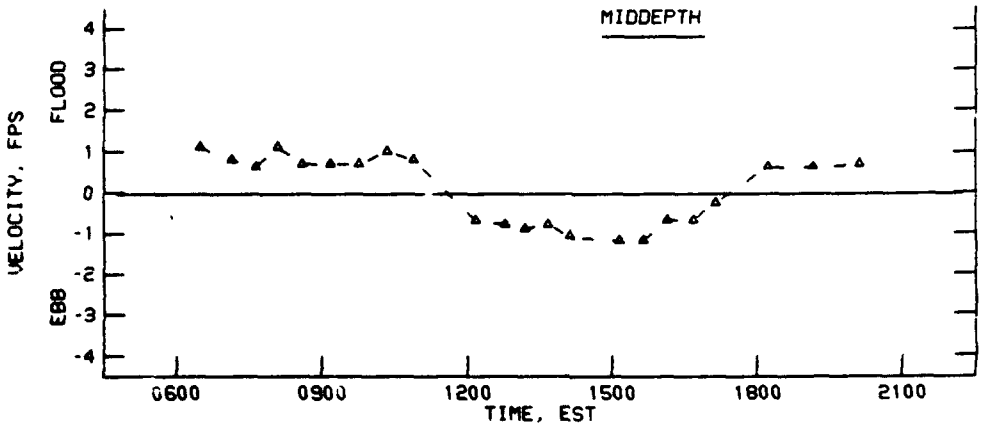


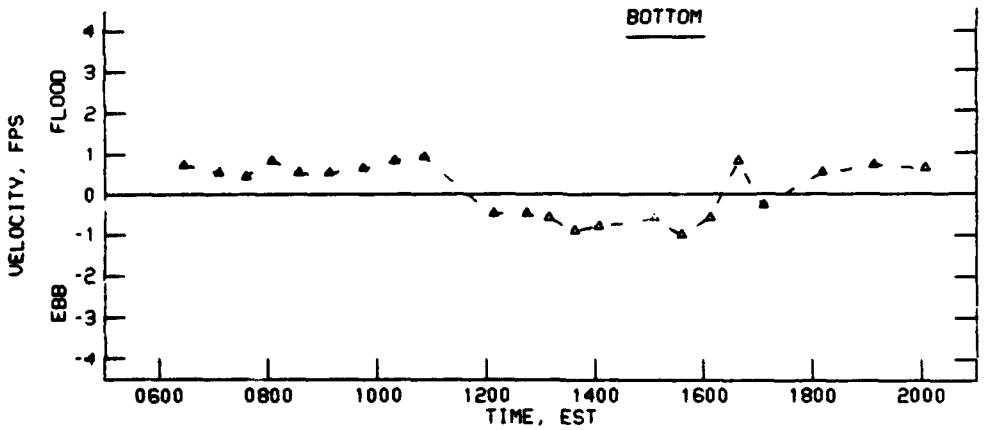
VELOCITIES AT STATION R1.0A

3 NOVEMBER 1990

PLATE 12



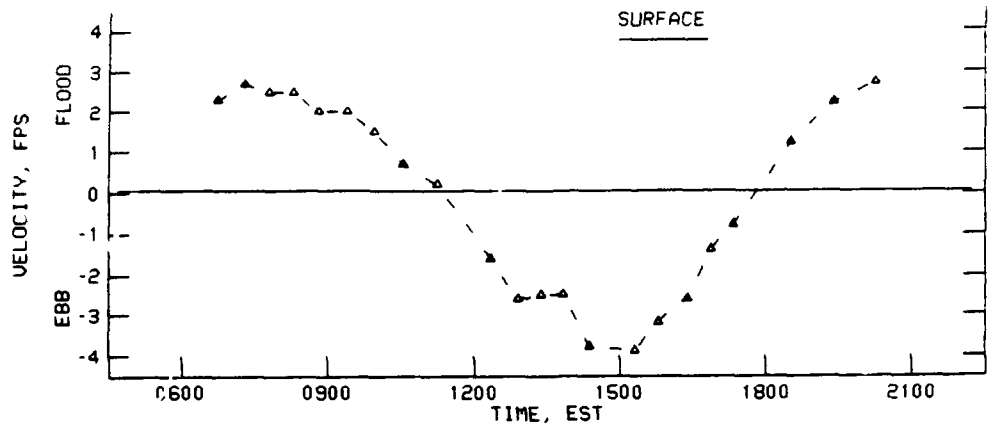


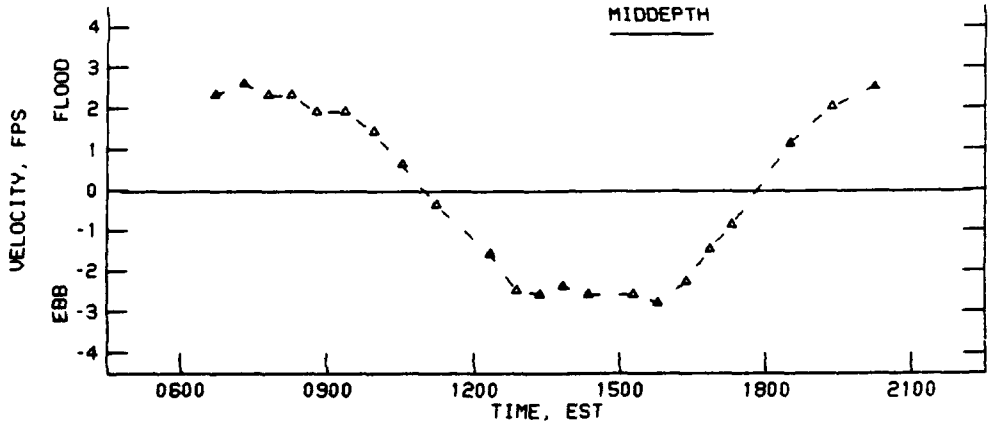


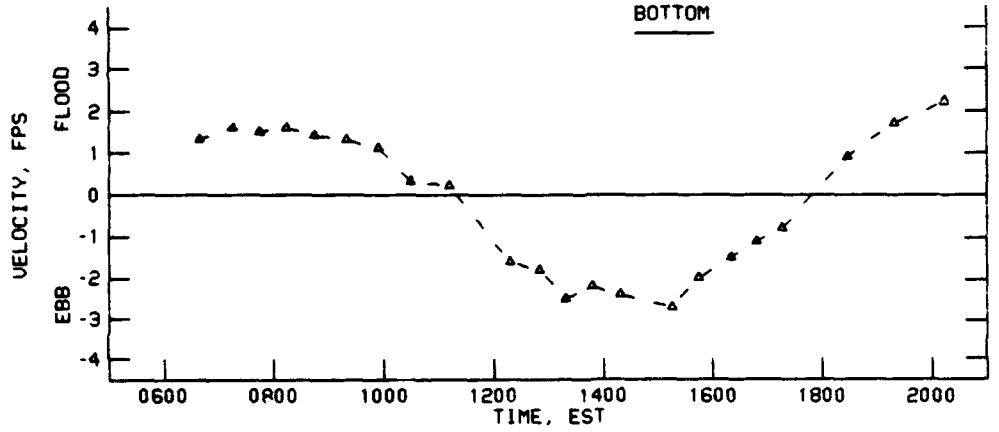
VELOCITIES AT STATION R1.0B

3 NOVEMBER 1990

PLATE 13



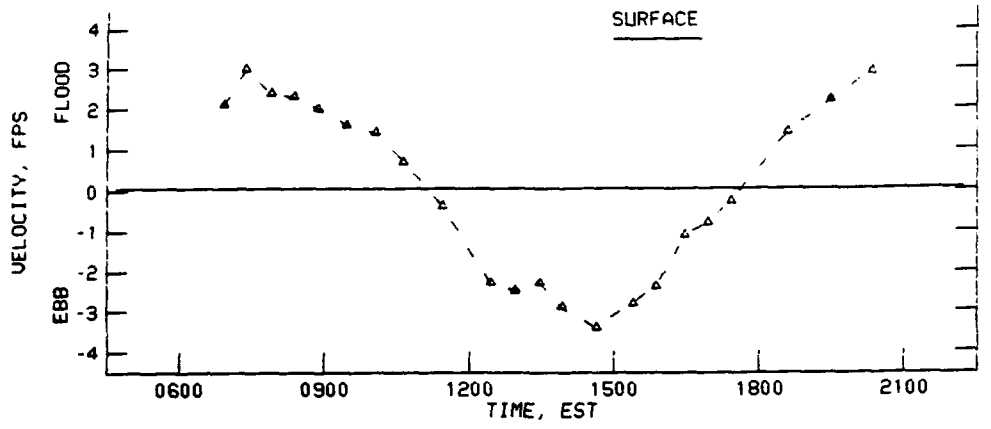


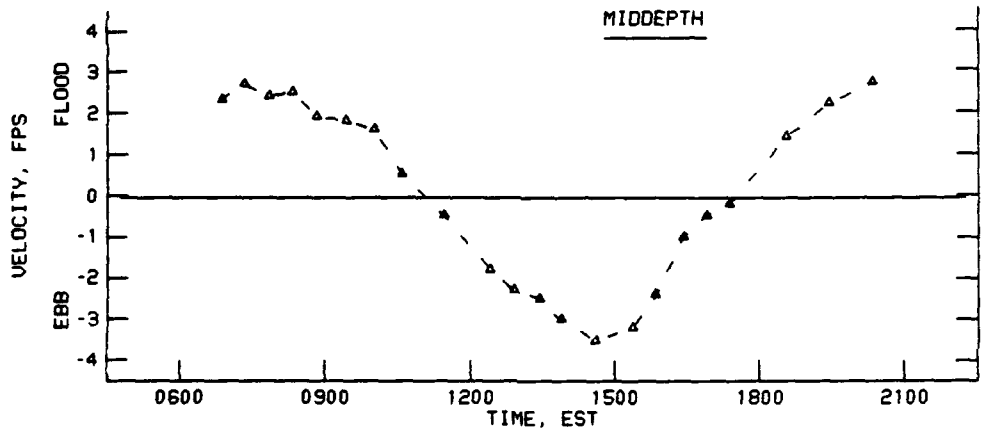


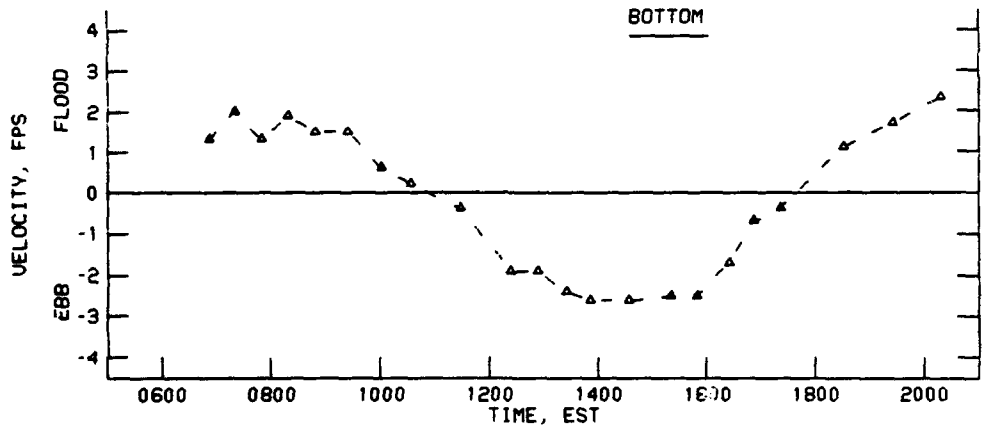
VELOCITIES AT STATION R2.0A

3 NOVEMBER 1990

PLATE 14

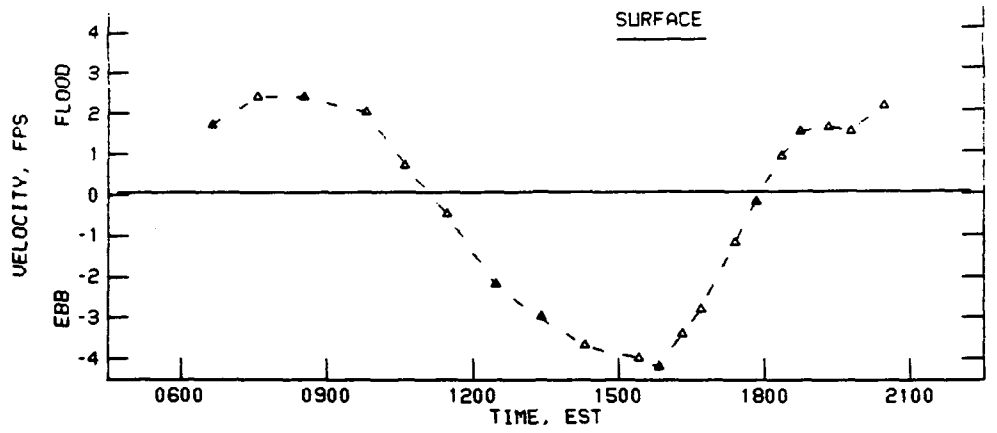


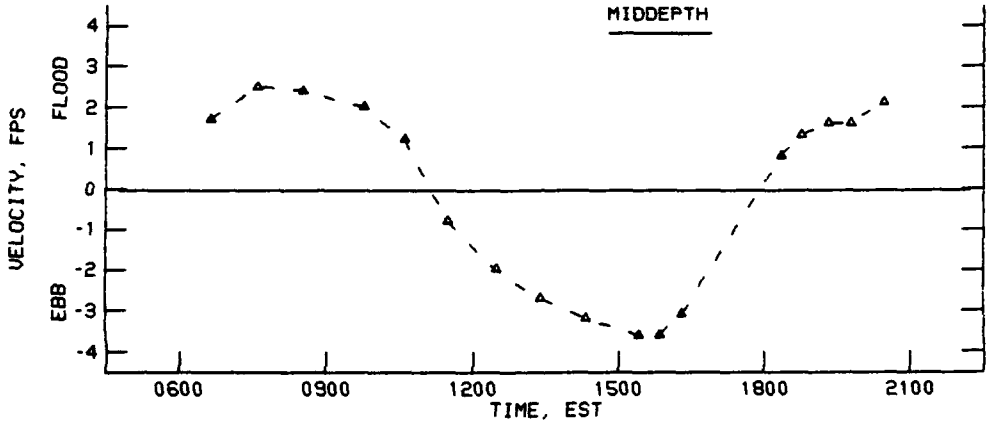


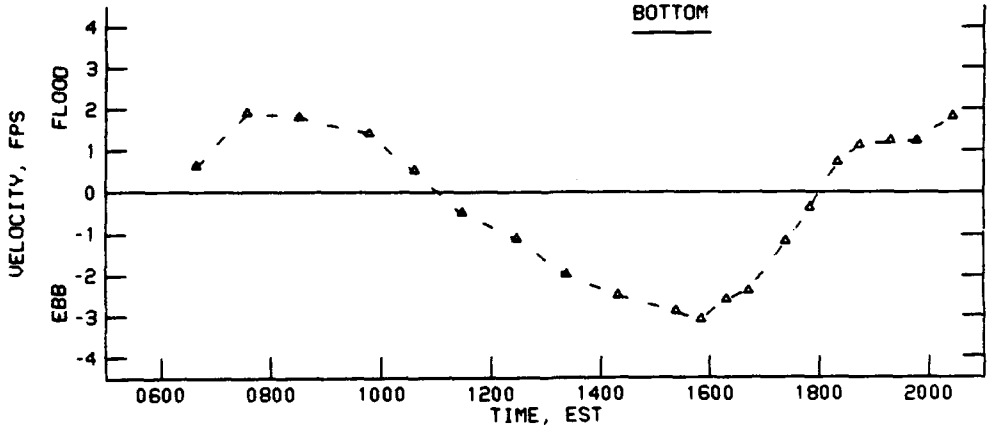


VELOCITIES AT STATION R2.0B
3 NOVEMBER 1990

PLATE 15

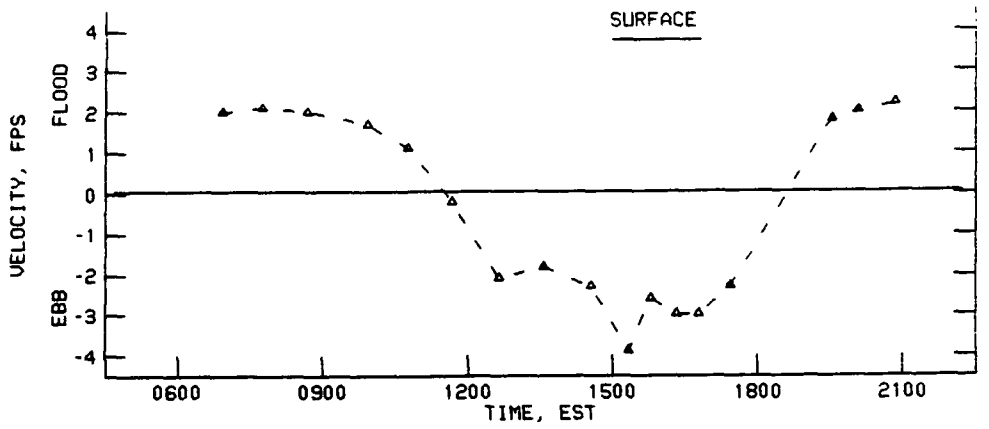


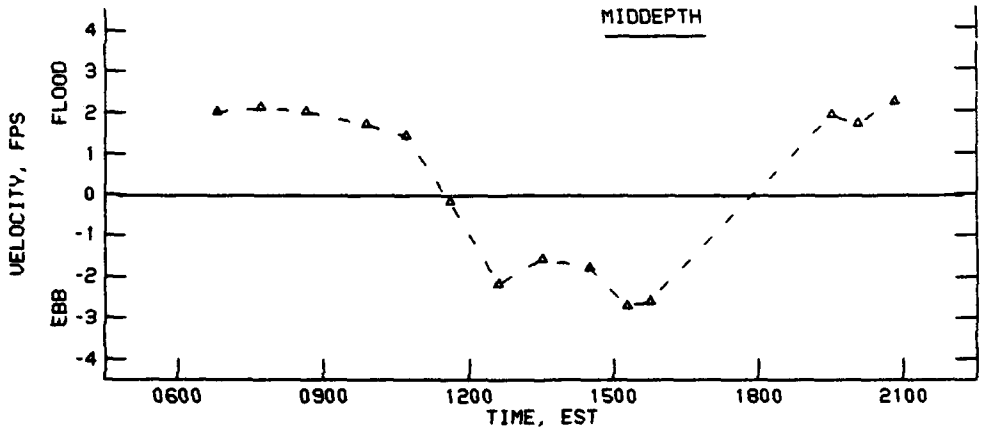


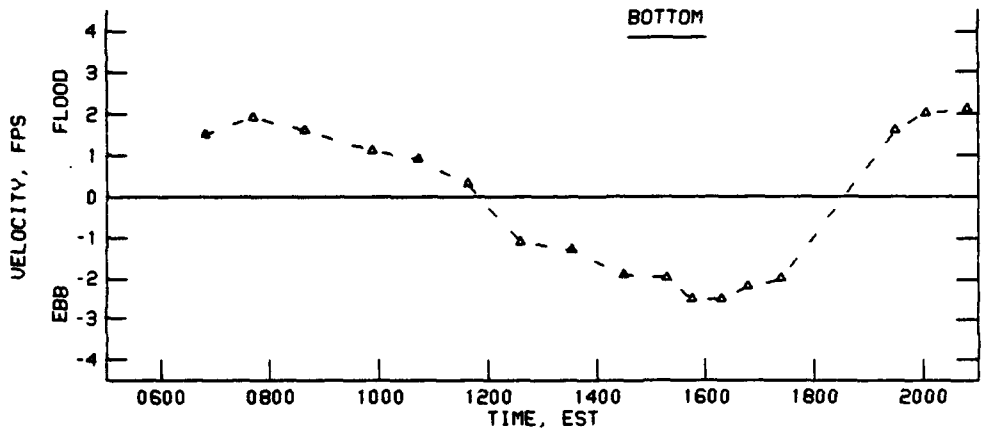


VELOCITIES AT STATION R3.0B
3 NOVEMBER 1990

PLATE 16



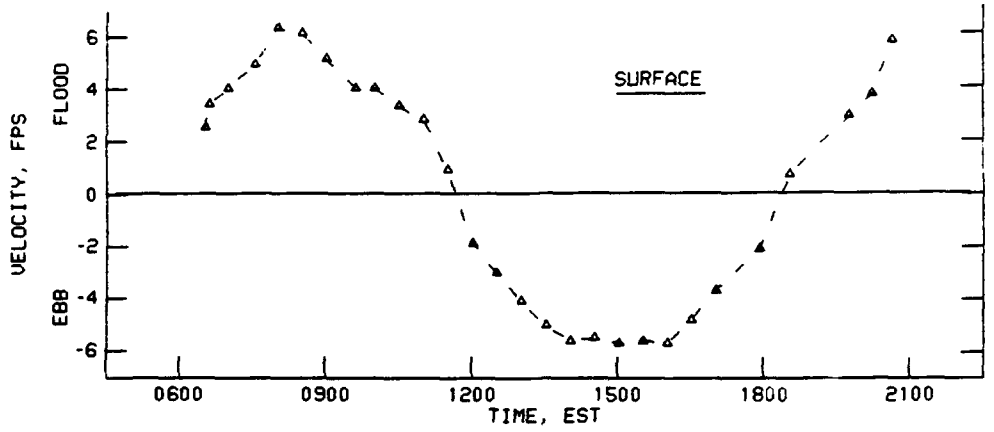


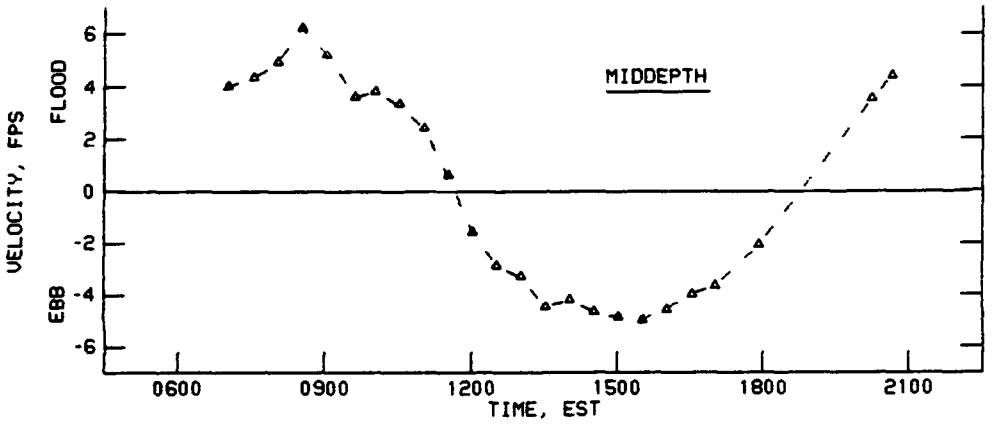


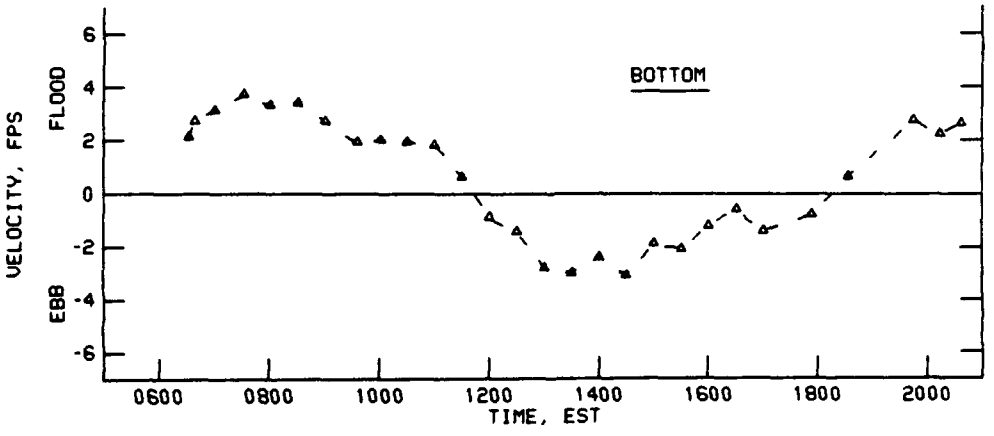
VELOCITIES AT STATION R4.0B

3 NOVEMBER 1000

PLATE 17



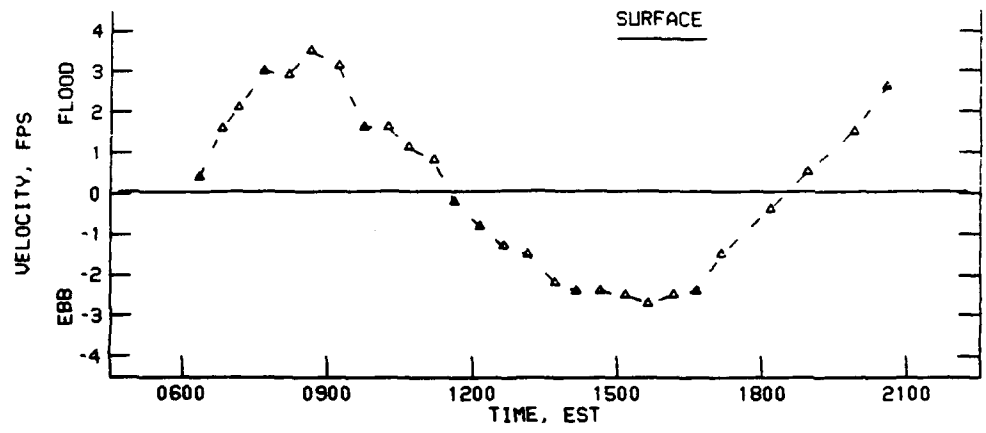


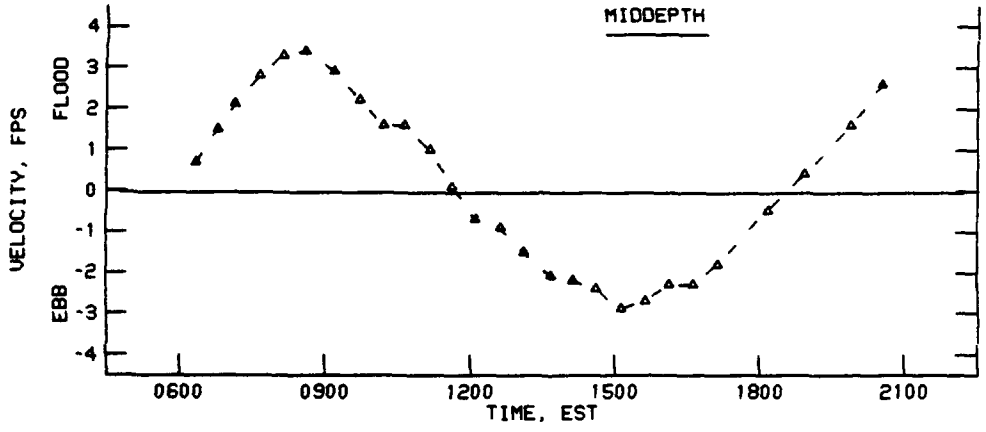


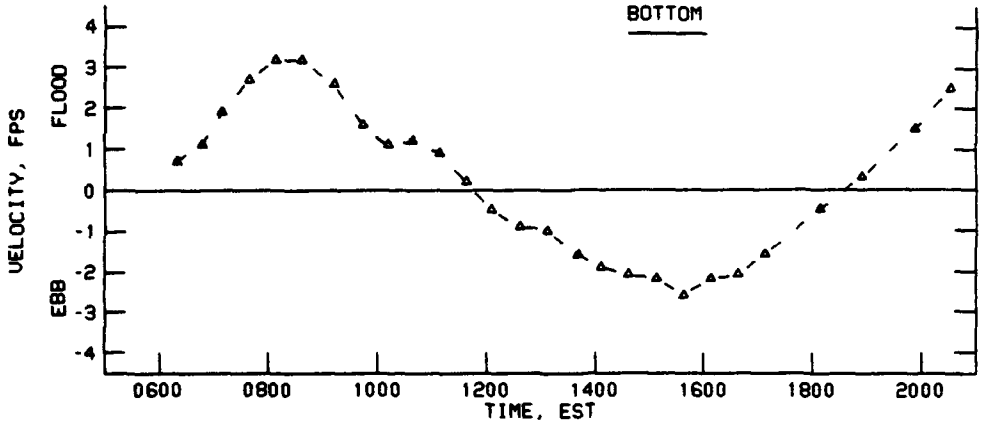
VELOCITIES AT STATION R5.0B

3 NOVEMBER 1990

PLATE 18



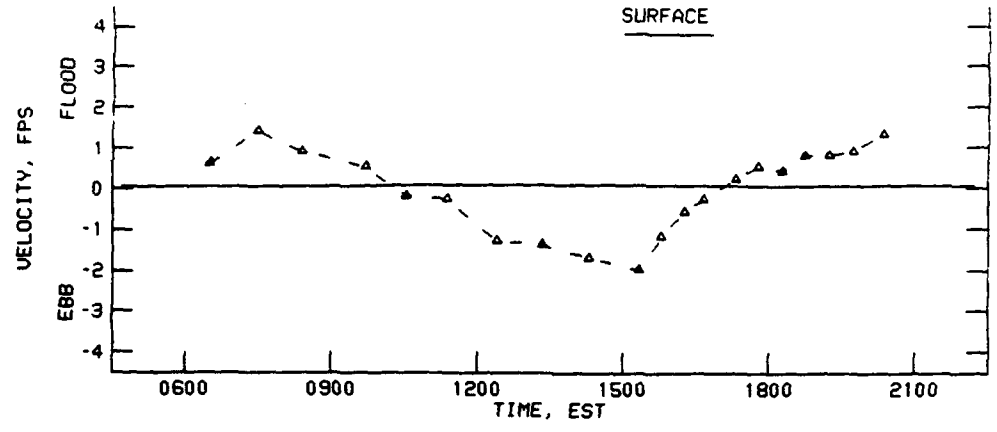


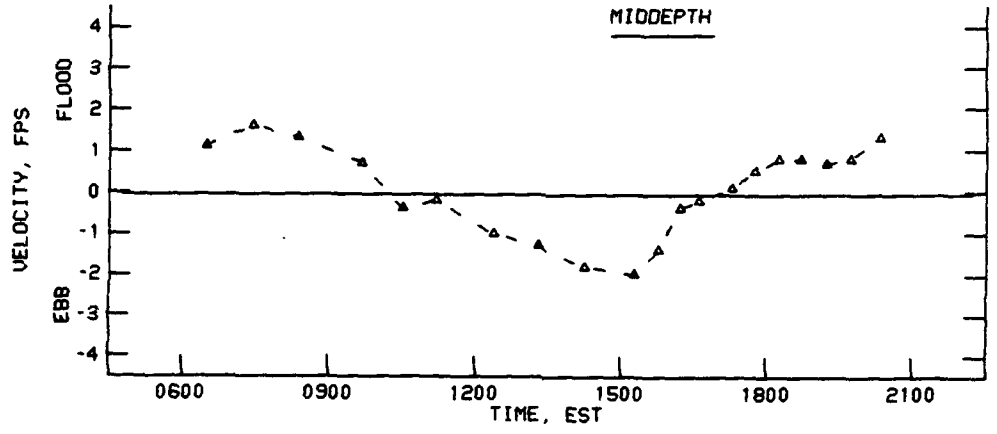


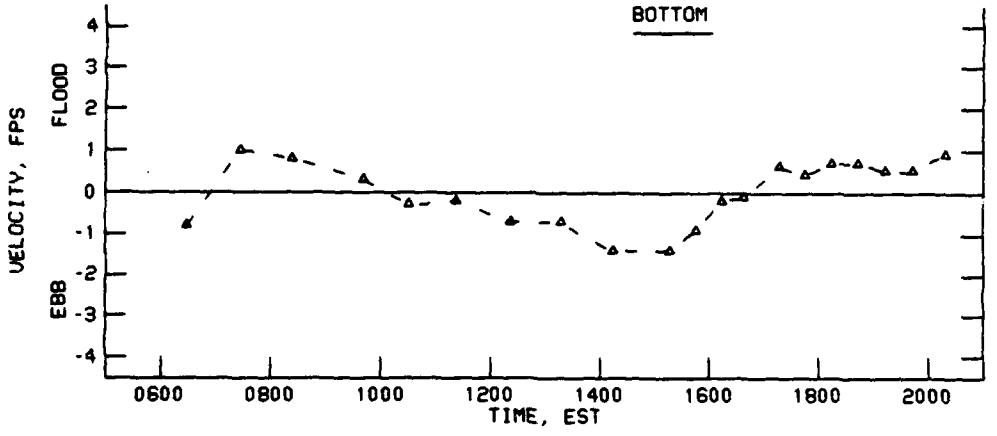
VELOCITIES AT STATION R6.0B

3 NOVEMBER 1990

PLATE 19

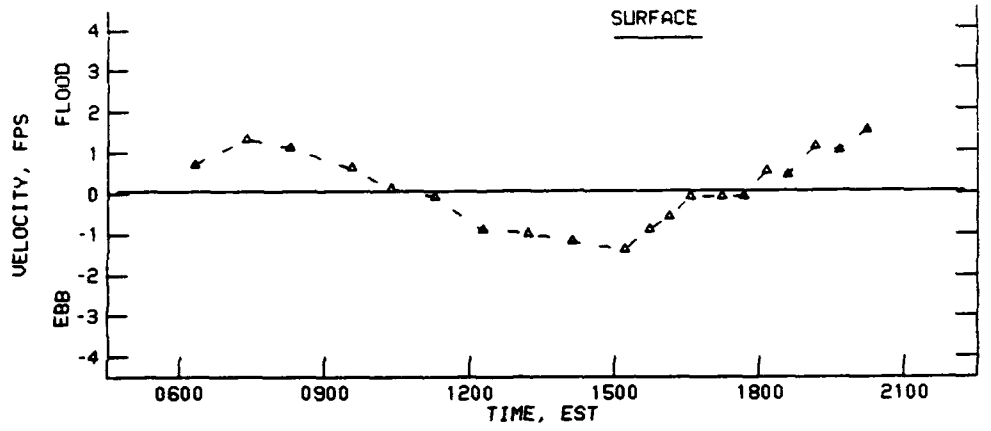


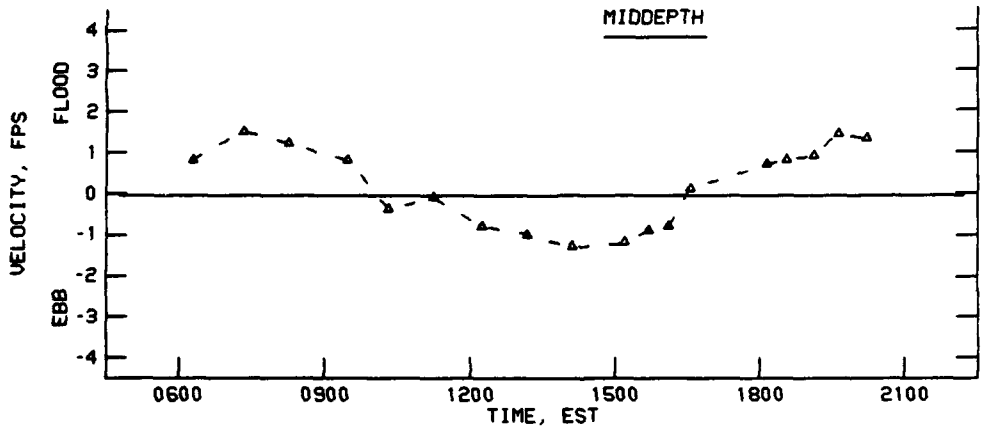


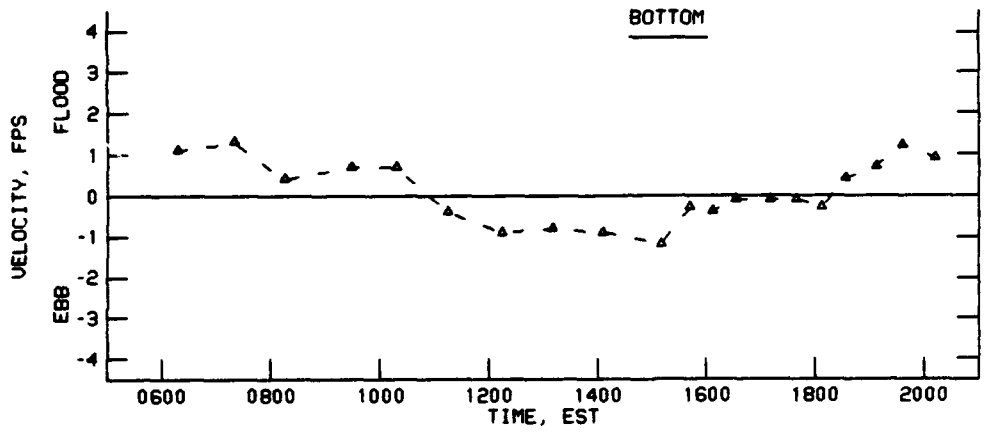


VELOCITIES AT STATION R7.0B
3 NOVEMBER 1990

PLATE 20



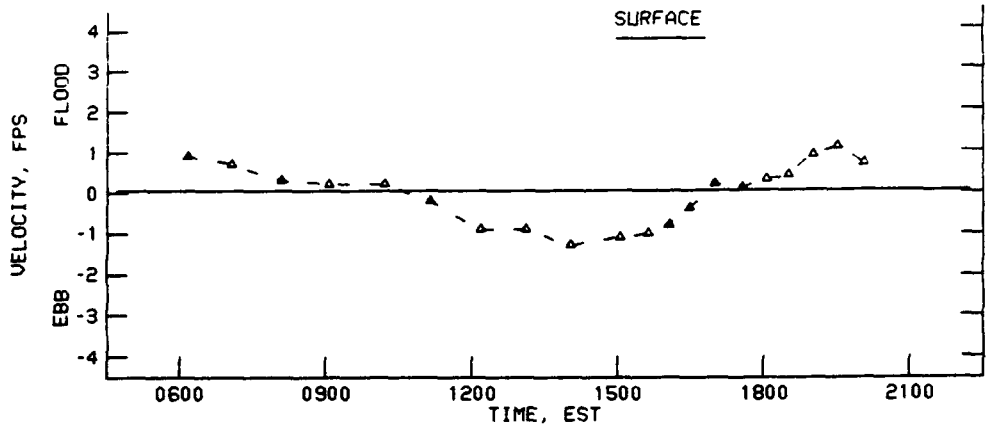


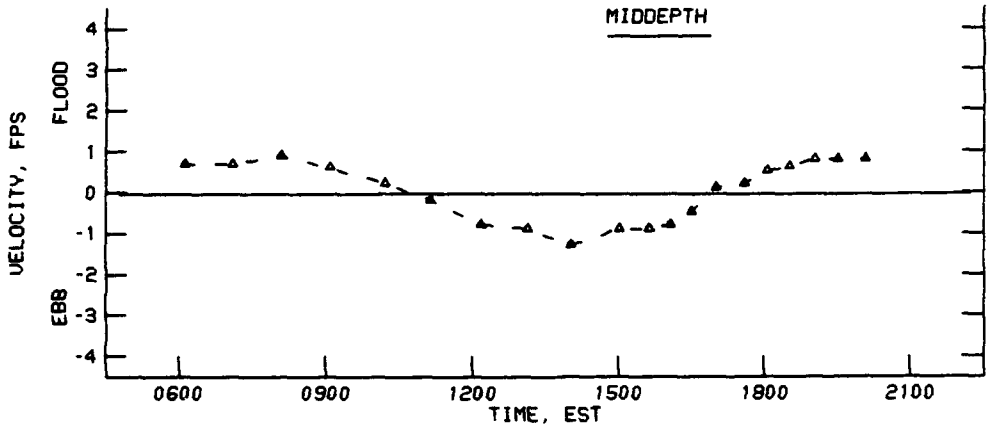


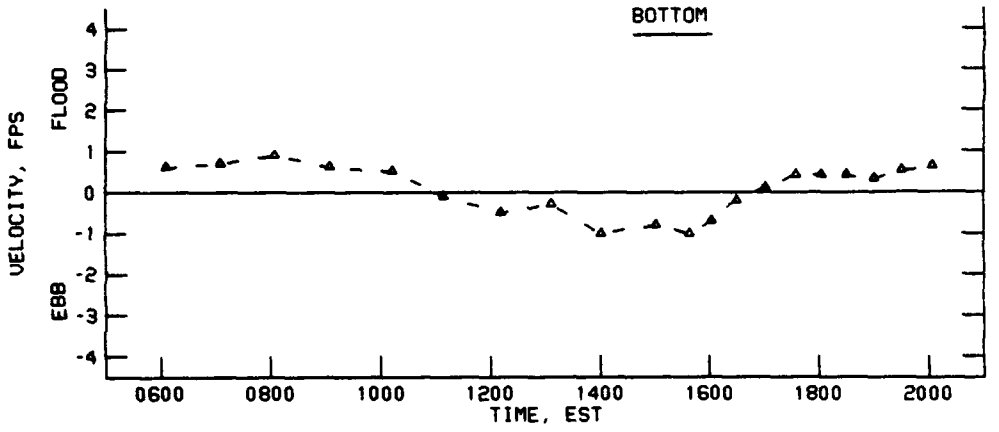
VELOCITIES AT STATION R8.0B

3 NOVEMBER 1990

PLATE 21







VELOCITIES AT STATION R9.0B

3 NOVEMBER 1990

PLATE 22

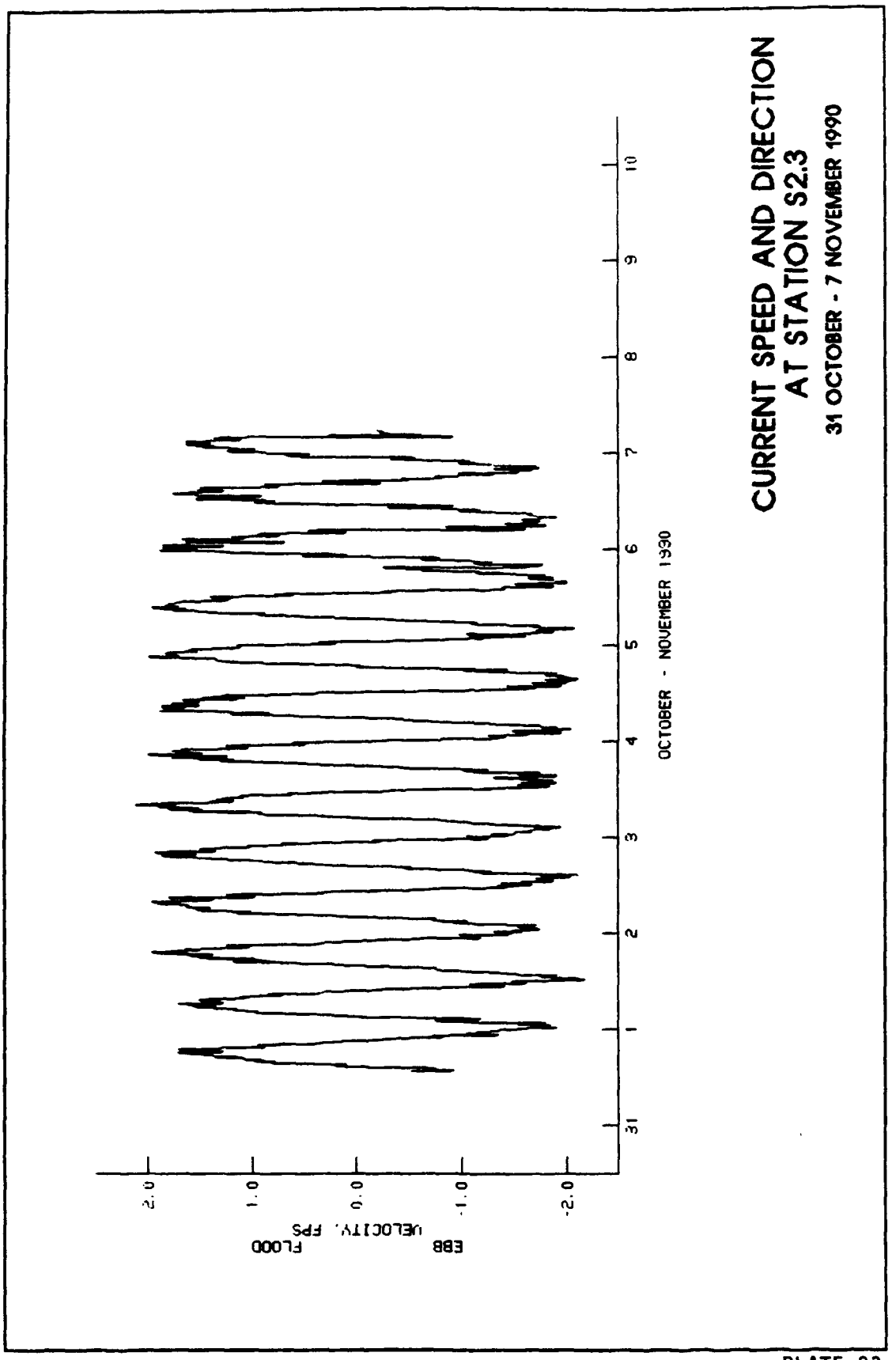

CURRENT SPEED AND DIRECTION
AT STATION S2.3
31 OCTOBER - 7 NOVEMBER 1990
OCTOBER - NOVEMBER 1990
31
1
2
3
4
5
6
7
8
9
10
2.0
1.0
0.0
-1.0
-2.0
VELOCITY, FPS
EBB
FLOOD

PLATE 23

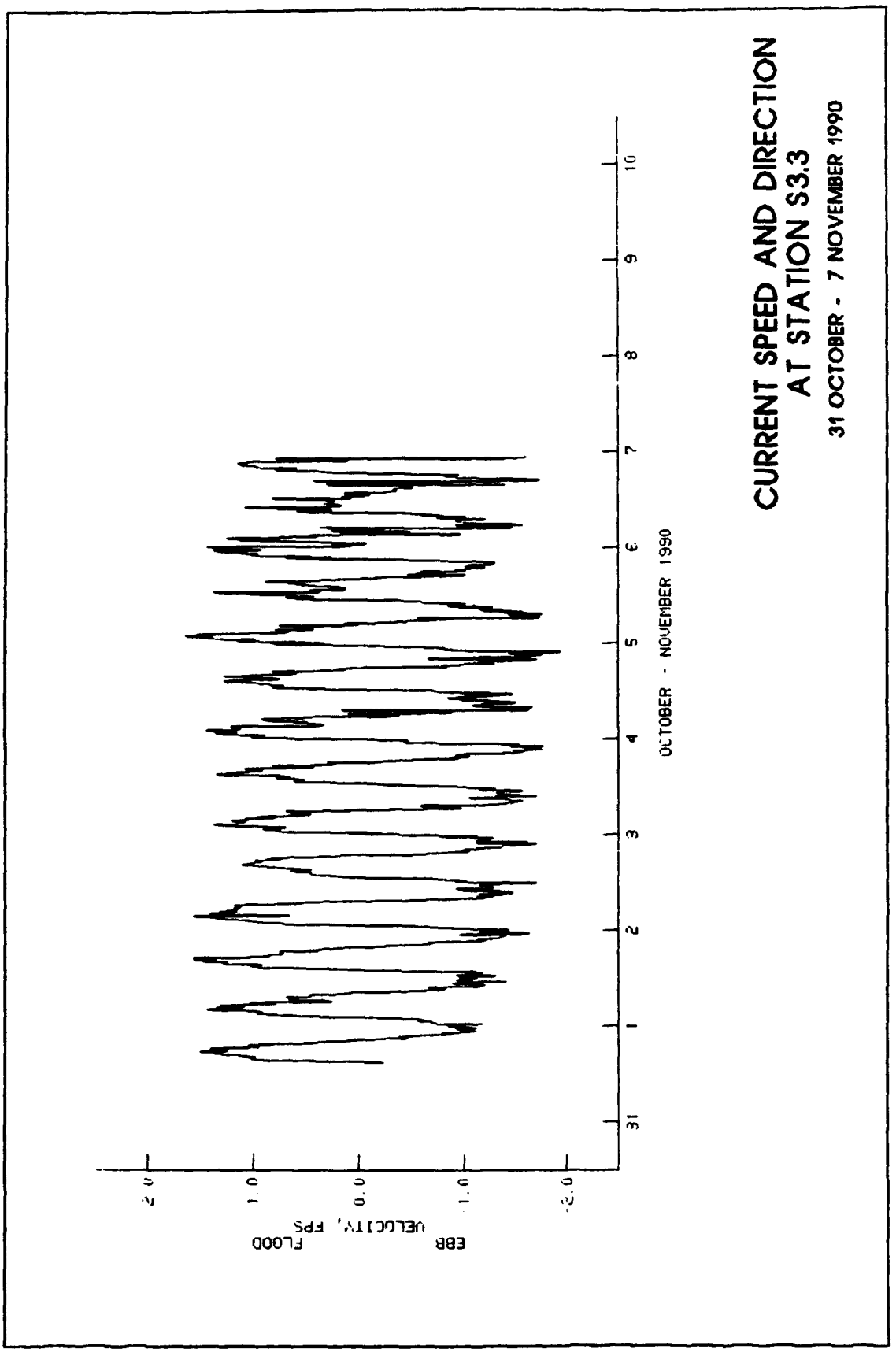
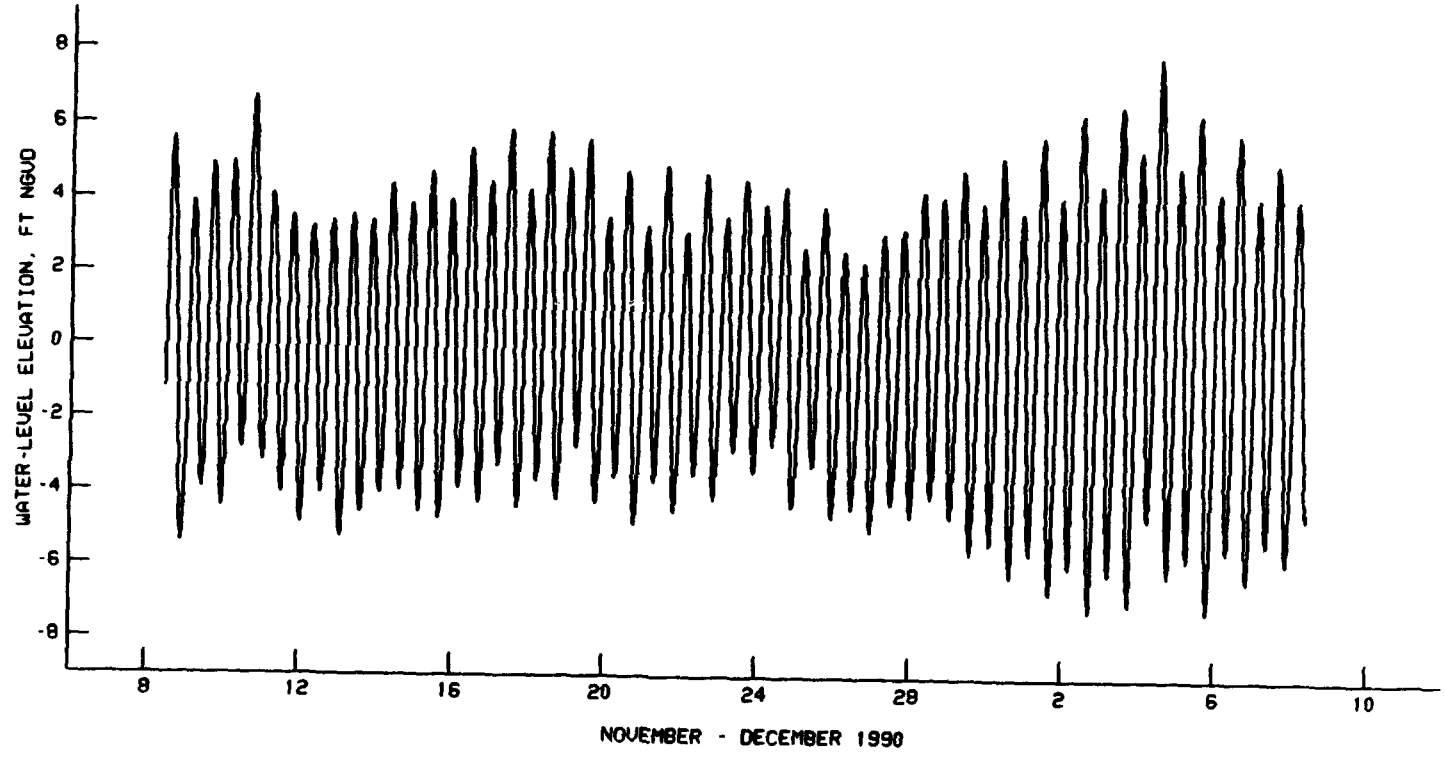

CURRENT SPEED AND DIRECTION
AT STATION S3.3
31 OCTOBER - 7 NOVEMBER 1990
OCTOBER - NOVEMBER 1990
31
1
2
3
4
5
6
7
8
9
10
2.0
1.0
0.0
-1.0
-2.0
VELOCITY, FPS
EBB
FLOOD

PLATE 24



WATER-LEVEL ELEVATION AT STATION S0.1

8 NOVEMBER - 8 DECEMBER 1990

PLATE 25

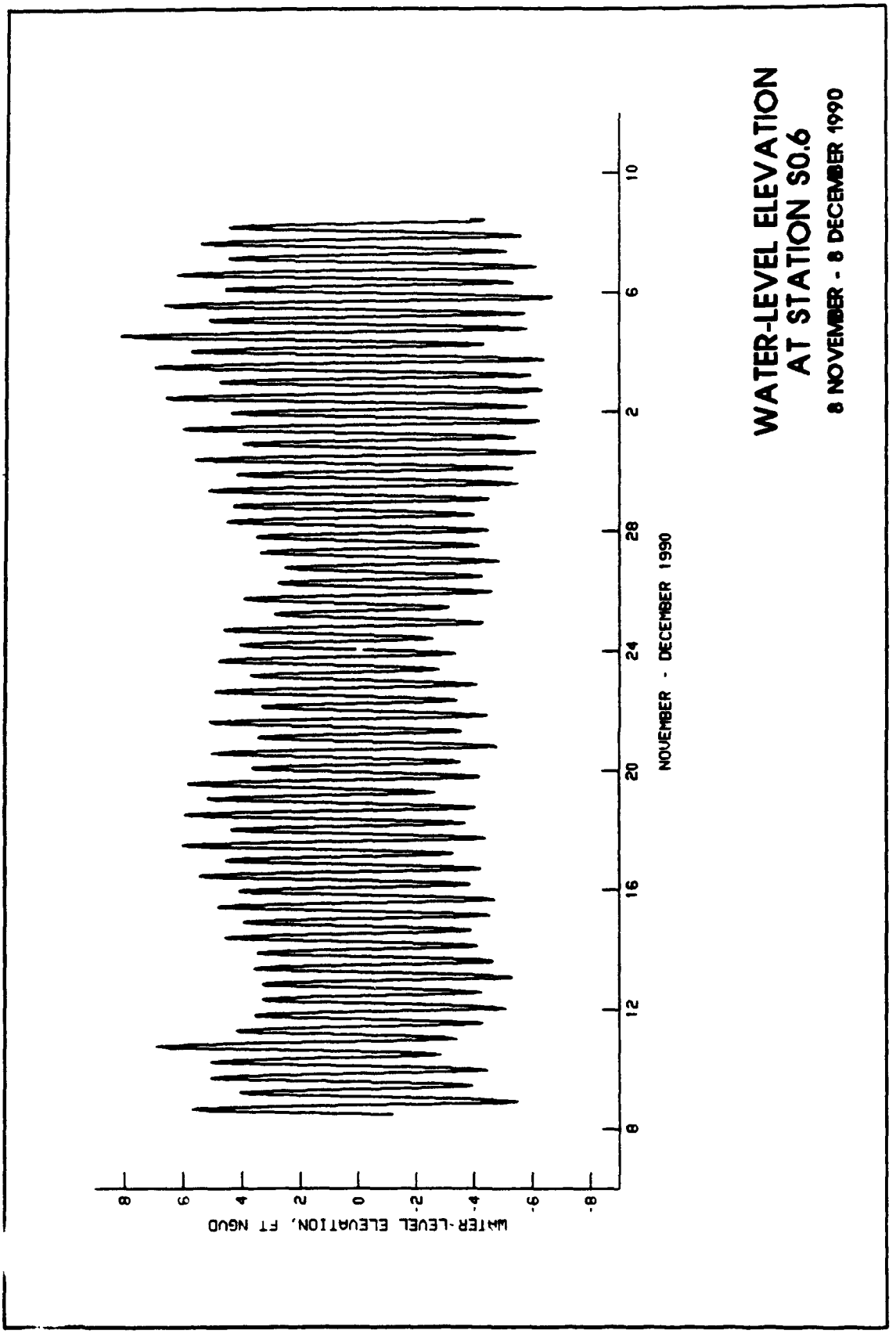

WATER-LEVEL ELEVATION
AT STATION S0.6
8 NOVEMBER - 8 DECEMBER 1990
WATER-LEVEL ELEVATION, FT NGVD
8
6
4
2
0
-2
-4
-6
-8
8
12
16
20
24
28
2
6
10
NOVEMBER - DECEMBER 1990

PLATE 26

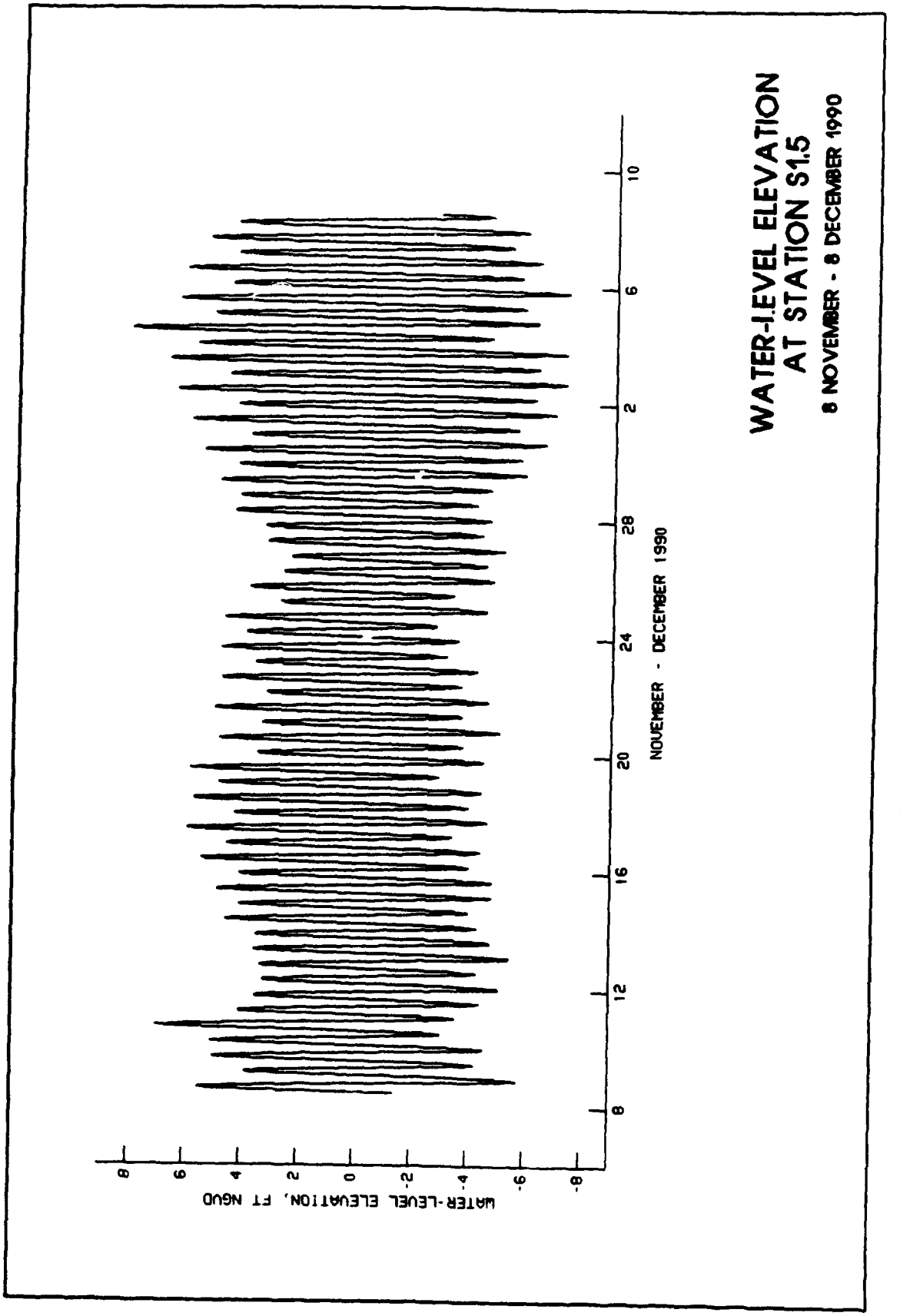

WATER-LEVEL ELEVATION AT STATION S1.5
8 NOVEMBER - 8 DECEMBER 1990
WATER-LEVEL ELEVATION, FT NGVD
8
6
4
2
0
-2
-4
-6
-8
8
12
16
20
24
28
2
6
10
NOVEMBER - DECEMBER 1990

PLATE 27

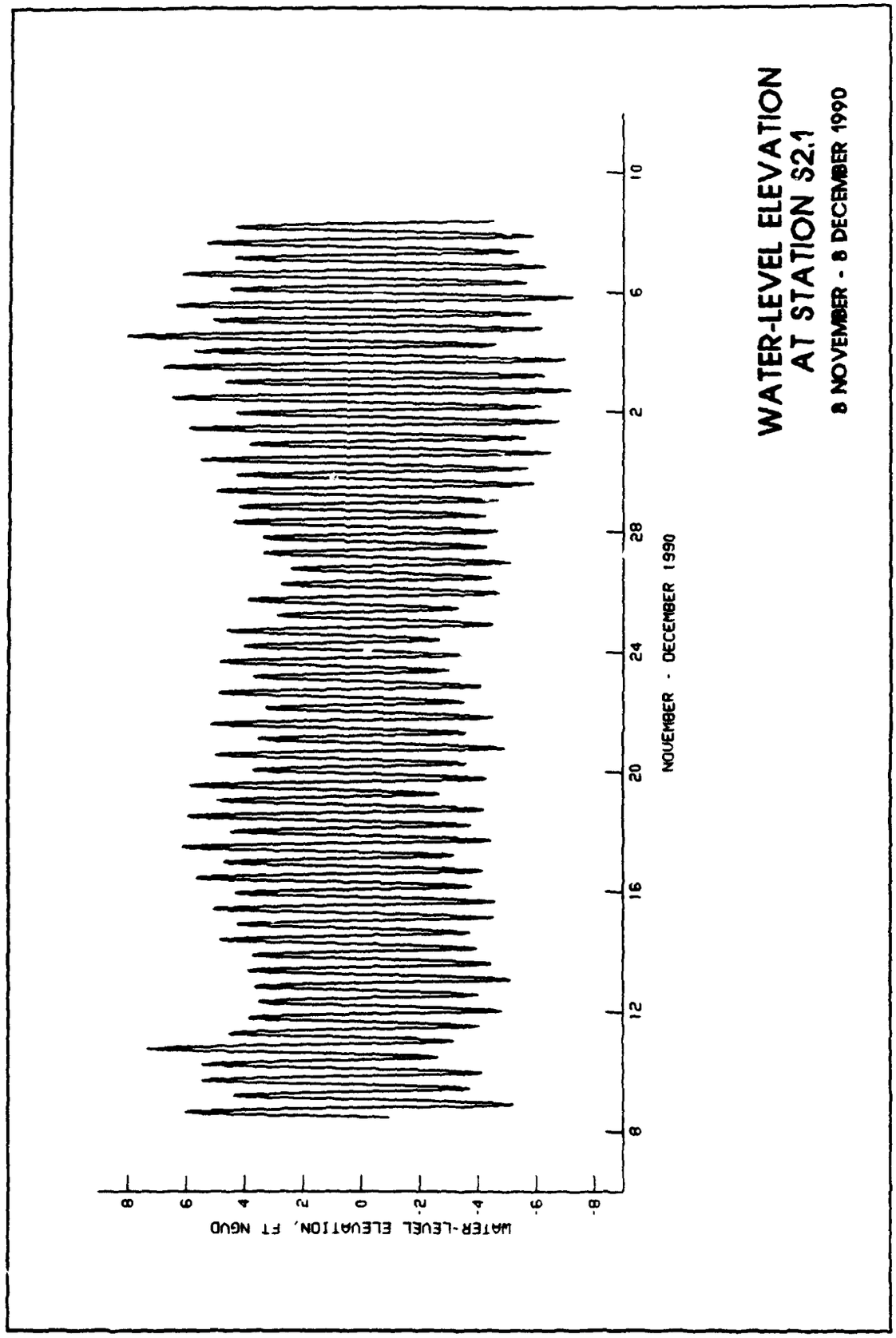

WATER-LEVEL ELEVATION
AT STATION S2.1
8 NOVEMBER - 8 DECEMBER 1990
WATER-LEVEL ELEVATION, FT NGVD
8
6
4
2
0
-2
-4
-6
-8
8
12
16
20
24
28
2
6
10
NOVEMBER - DECEMBER 1990

PLATE 28

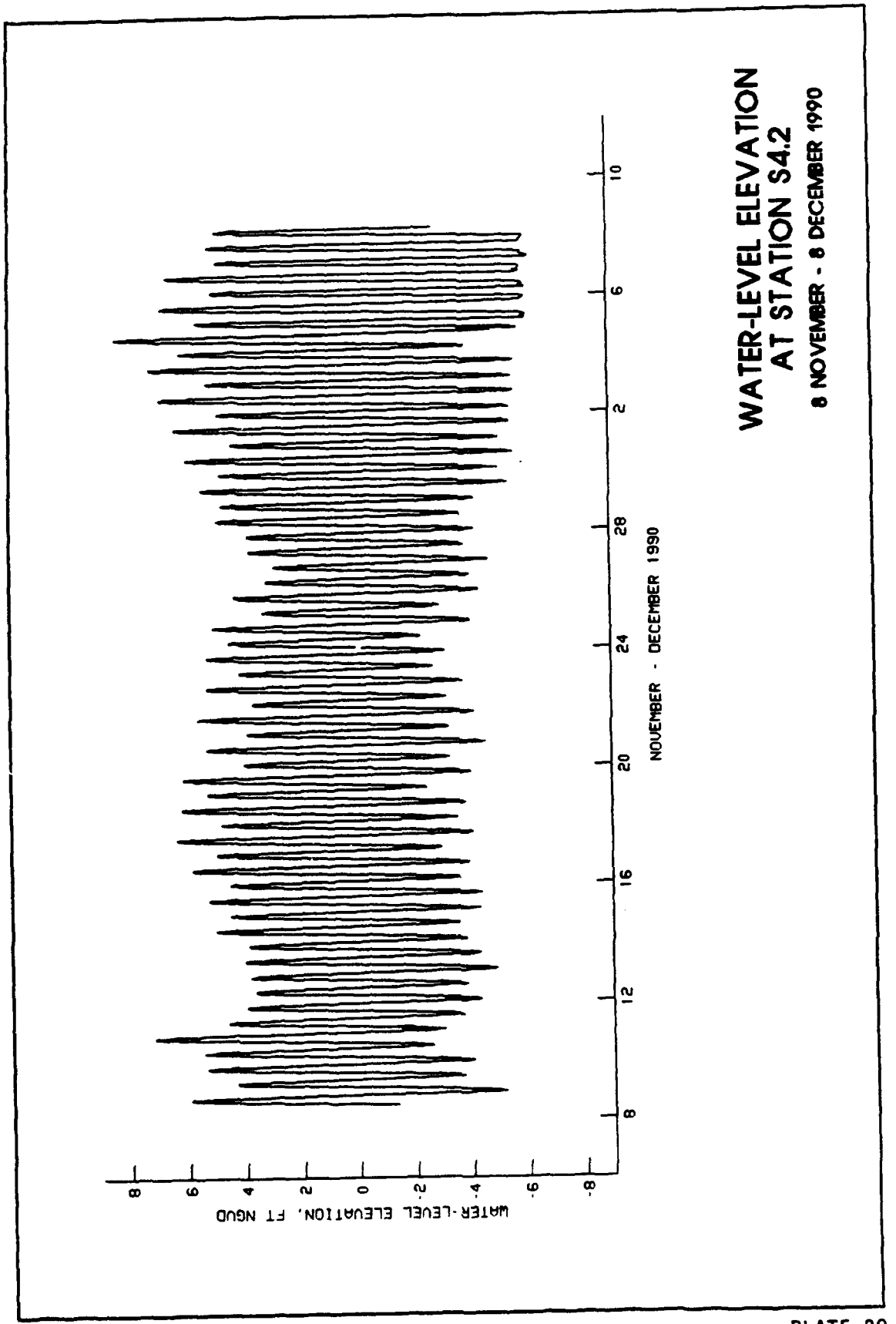

WATER-LEVEL ELEVATION
AT STATION S4.2
8 NOVEMBER - 8 DECEMBER 1990
WATER-LEVEL ELEVATION, FT NGVD
8
6
4
2
0
-2
-4
-6
-8
8
12
16
20
24
28
2
6
10
NOVEMBER - DECEMBER 1990

PLATE 29

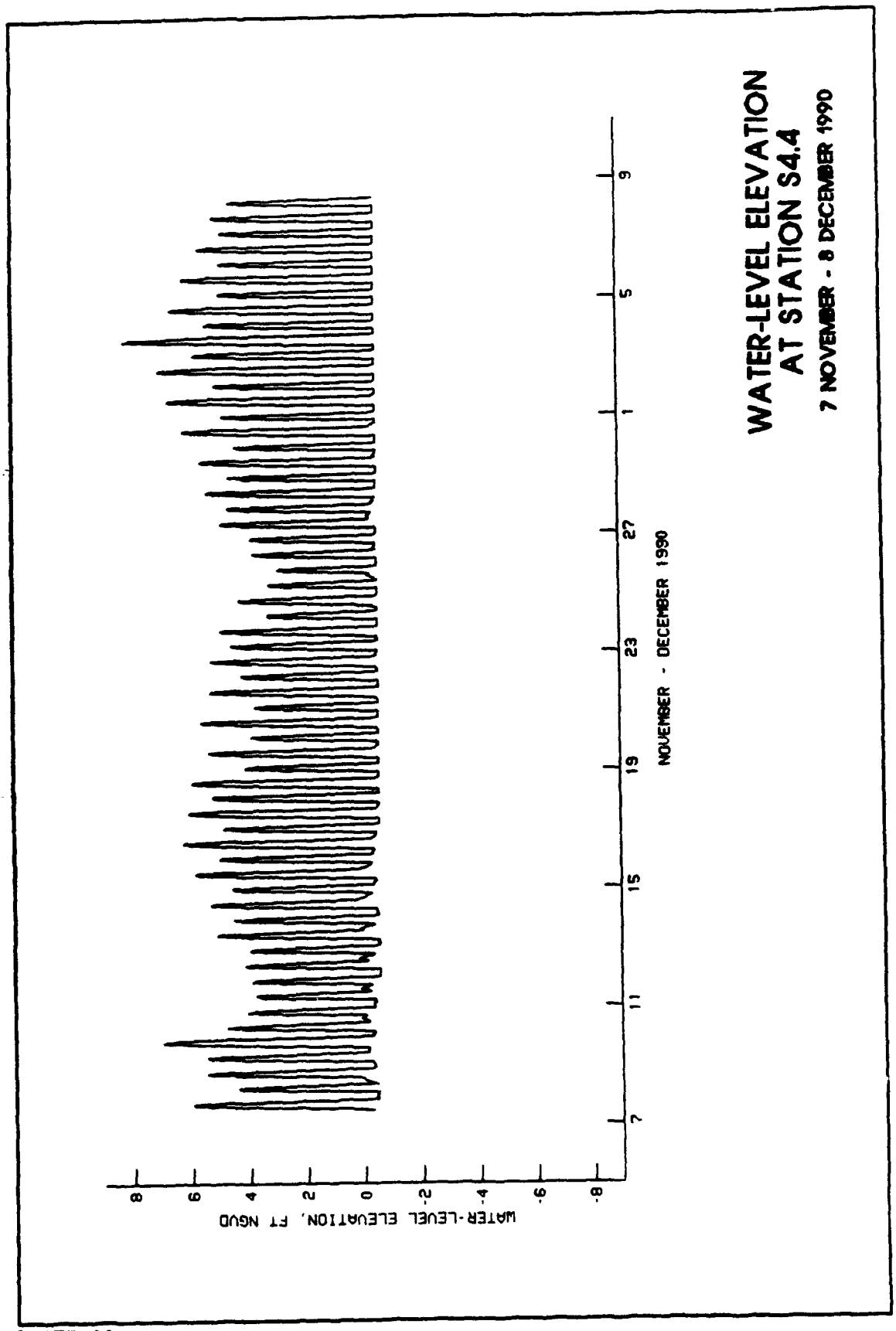

WATER-LEVEL ELEVATION
AT STATION S4.4
7 NOVEMBER - 8 DECEMBER 1990
WATER-LEVEL ELEVATION, FT NGVD
8
6
4
2
0
-2
-4
-6
-8
7
11
15
19
23
27
1
5
9
NOVEMBER - DECEMBER 1990

PLATE 30

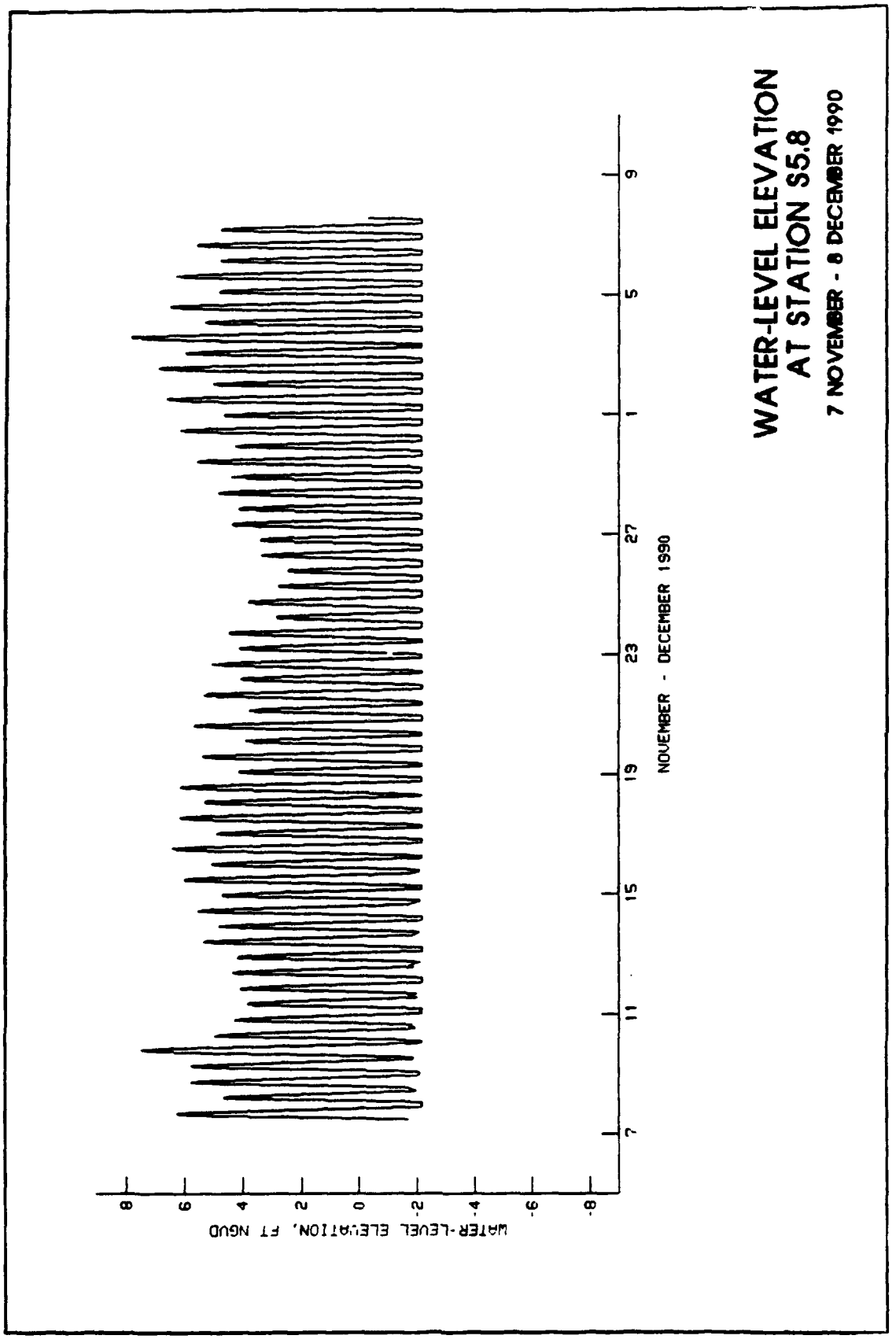

WATER-LEVEL ELEVATION AT STATION S5.8
7 NOVEMBER - 8 DECEMBER 1990
WATER-LEVEL ELEVATION, FT NGVD
8
6
4
2
0
-2
-4
-6
-8
7
11
15
19
23
27
1
5
9
NOVEMBER - DECEMBER 1990

PLATE 31

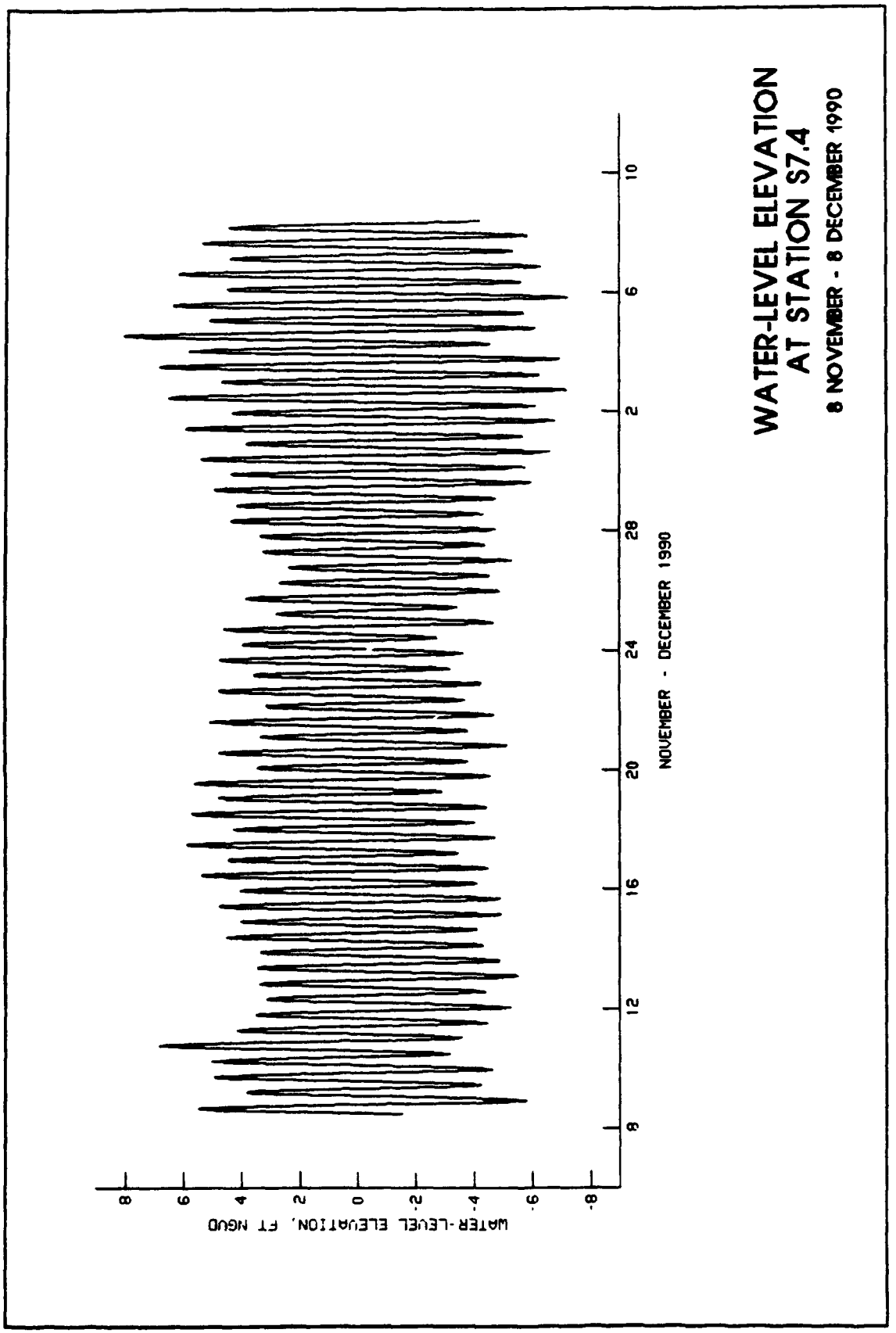
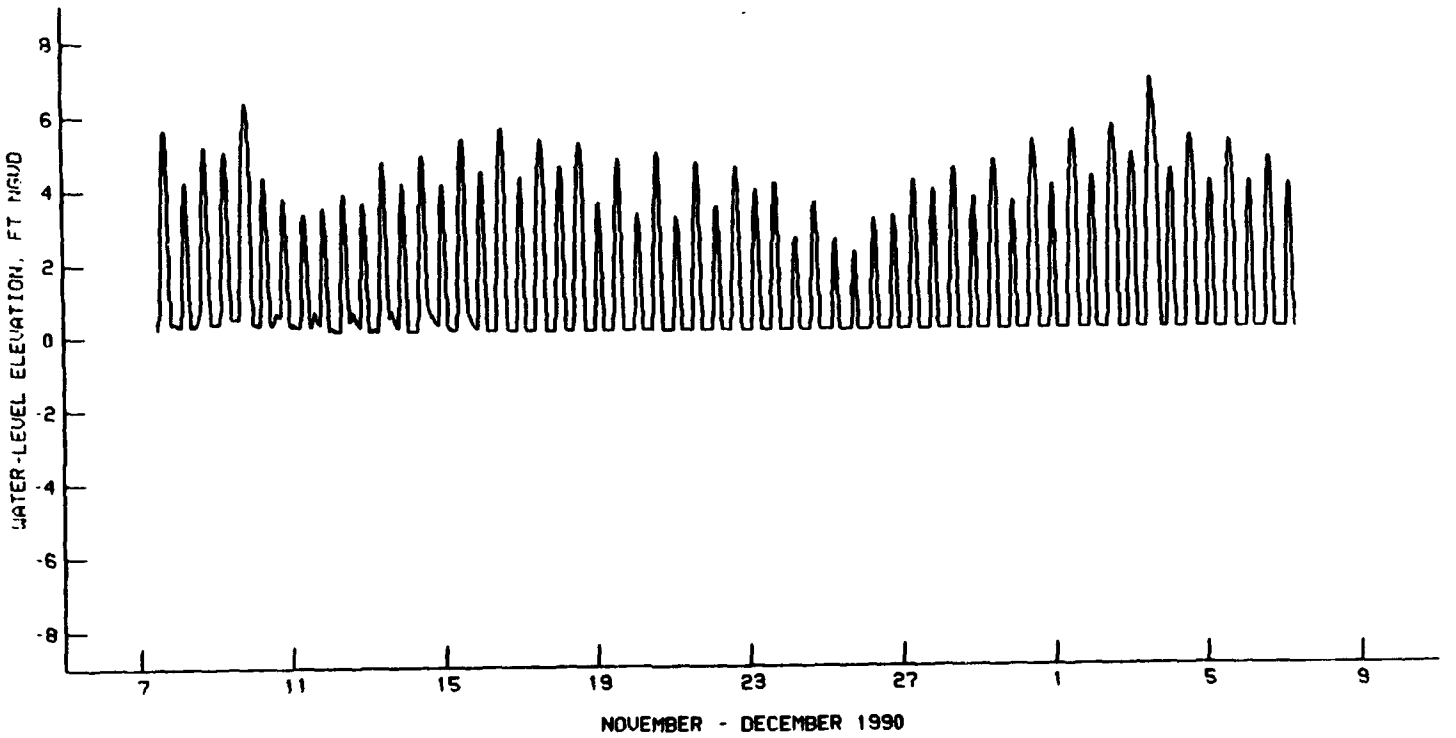

WATER-LEVEL ELEVATION
AT STATION S7.4
8 NOVEMBER - 8 DECEMBER 1990
WATER-LEVEL ELEVATION, FT NGVD
8
6
4
2
0
-.2
-.4
-.6
-.8
8
12
16
20
24
28
2
6
10
NOVEMBER - DECEMBER 1990

PLATE 32



WATER-LEVEL ELEVATION AT STATION S9.1

7 NOVEMBER - 8 DECEMBER 1990

PLATE 33

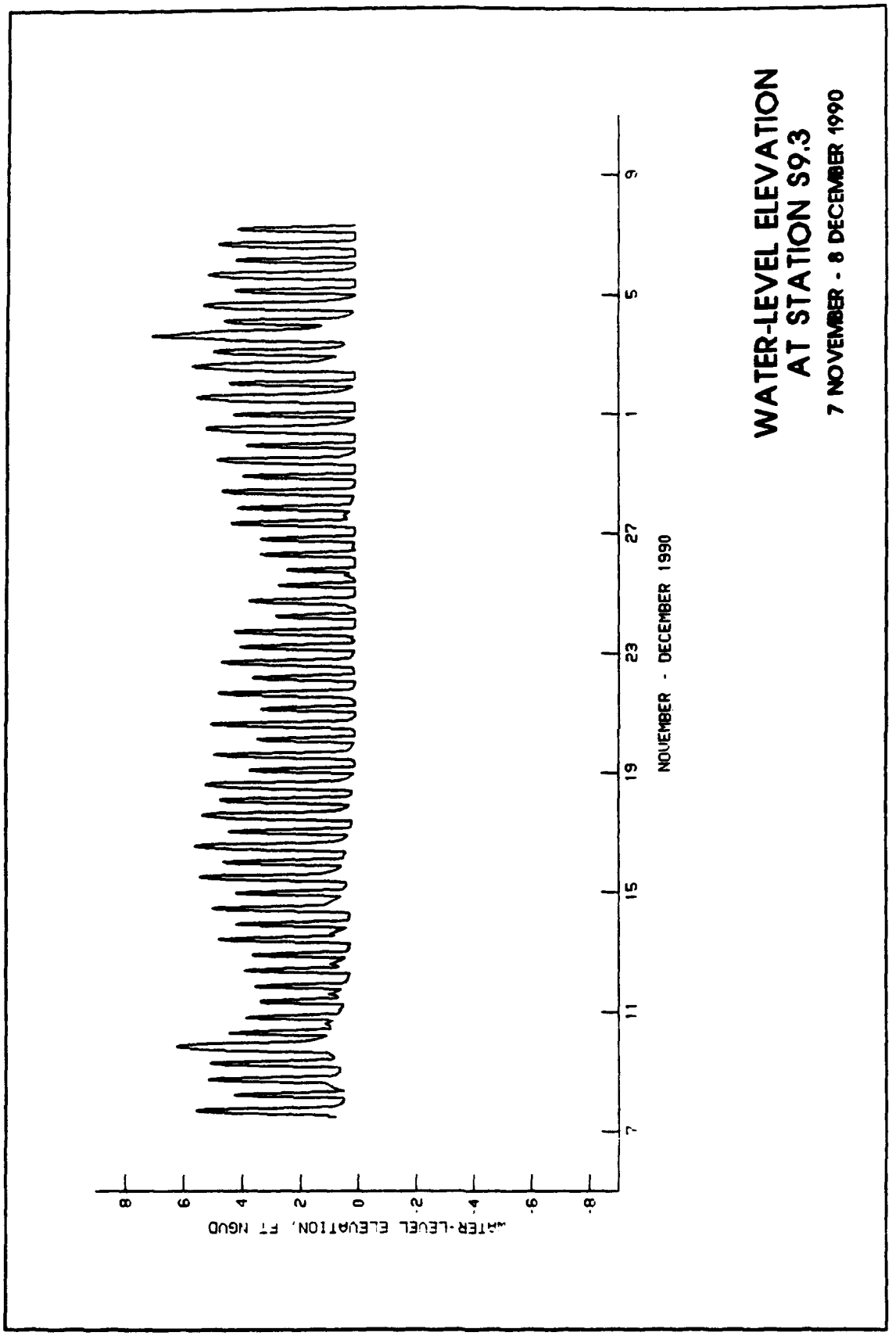
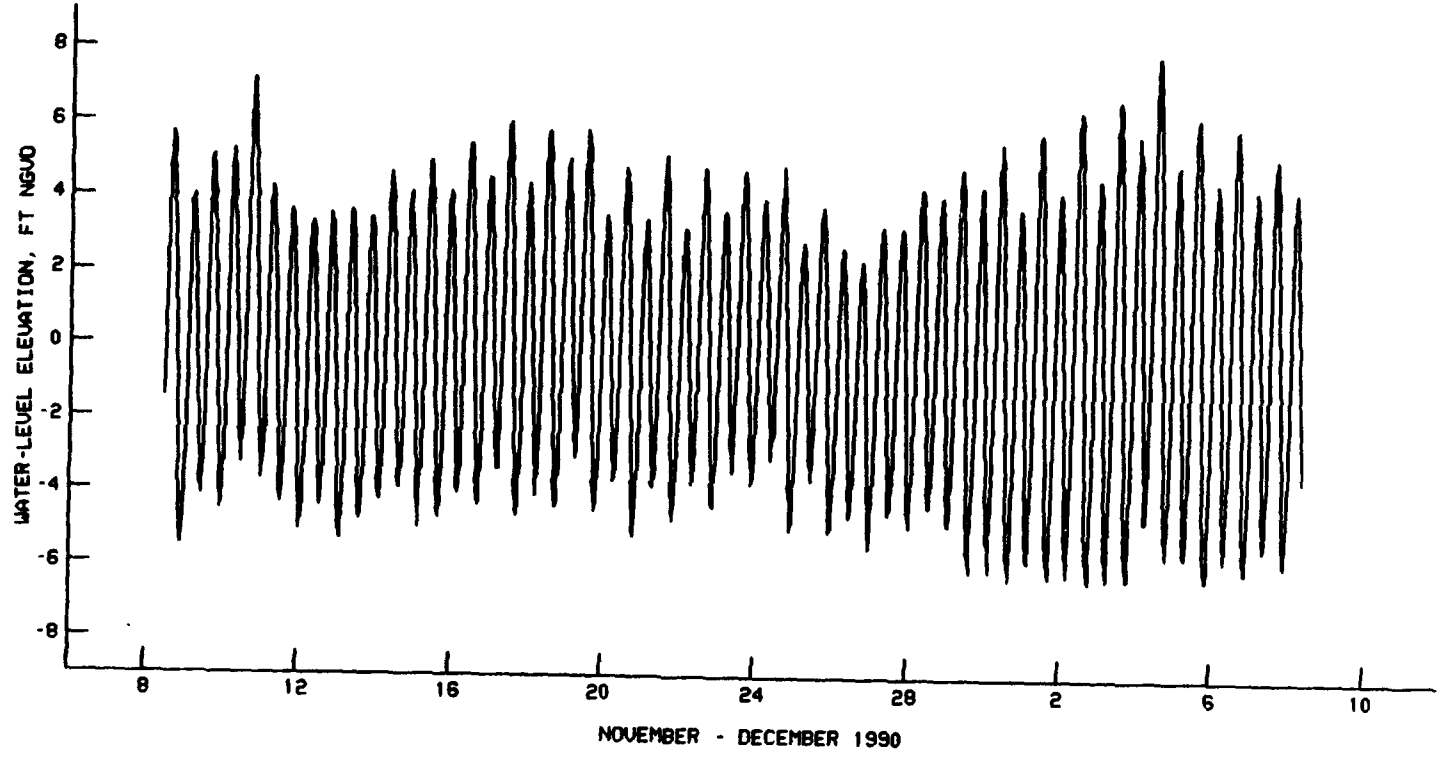

WATER-LEVEL ELEVATION
AT STATION S9.3
7 NOVEMBER - 8 DECEMBER 1990
WATER-LEVEL ELEVATION, FT NGVD
.8
.6
.4
.2
0
2
4
6
8
7
11
15
19
23
27
1
5
9
NOVEMBER - DECEMBER 1990

PLATE 34



WATER-LEVEL ELEVATION AT STATION S9.5

8 NOVEMBER - 8 DECEMBER 1990

PLATE 35

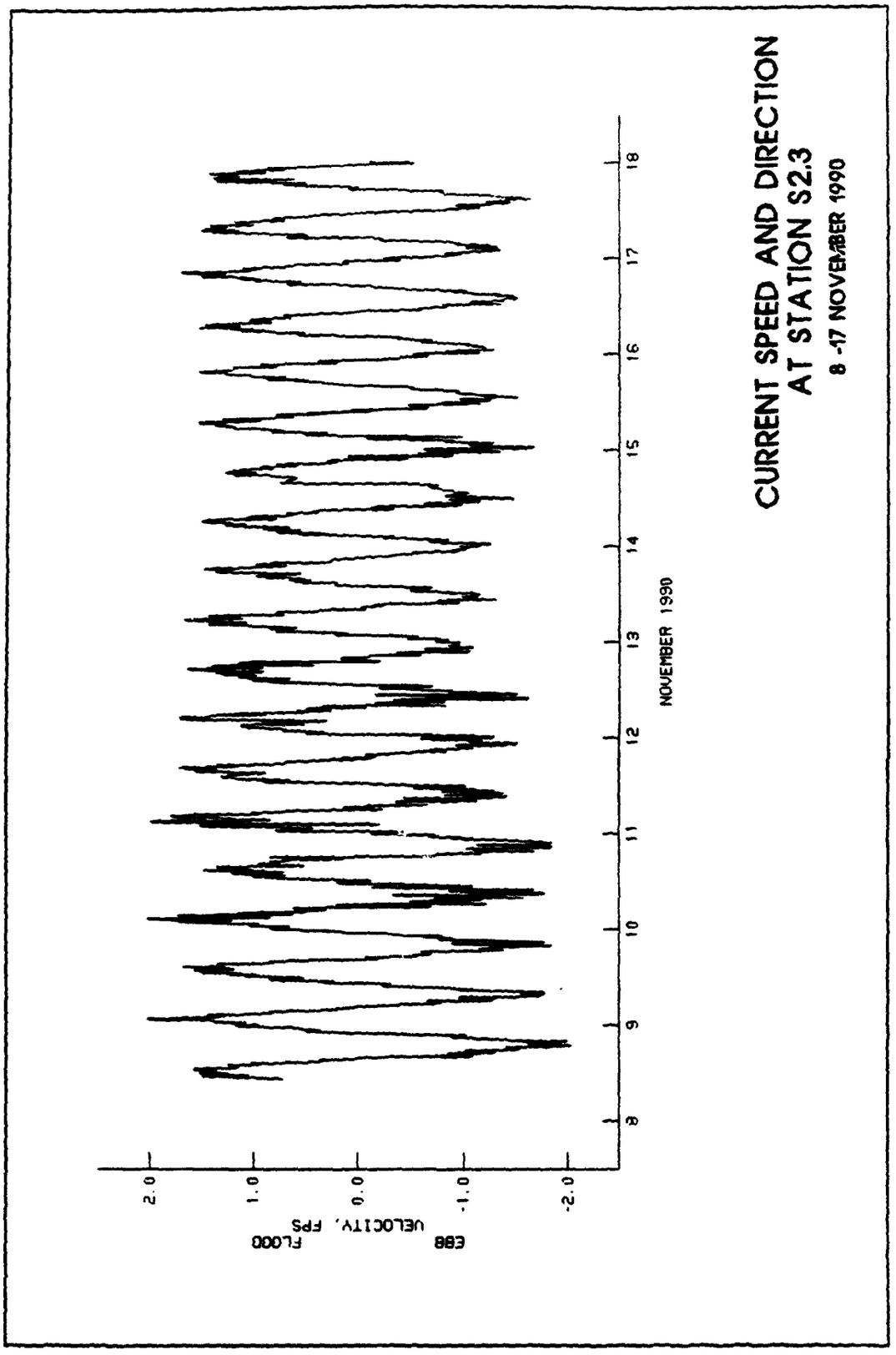
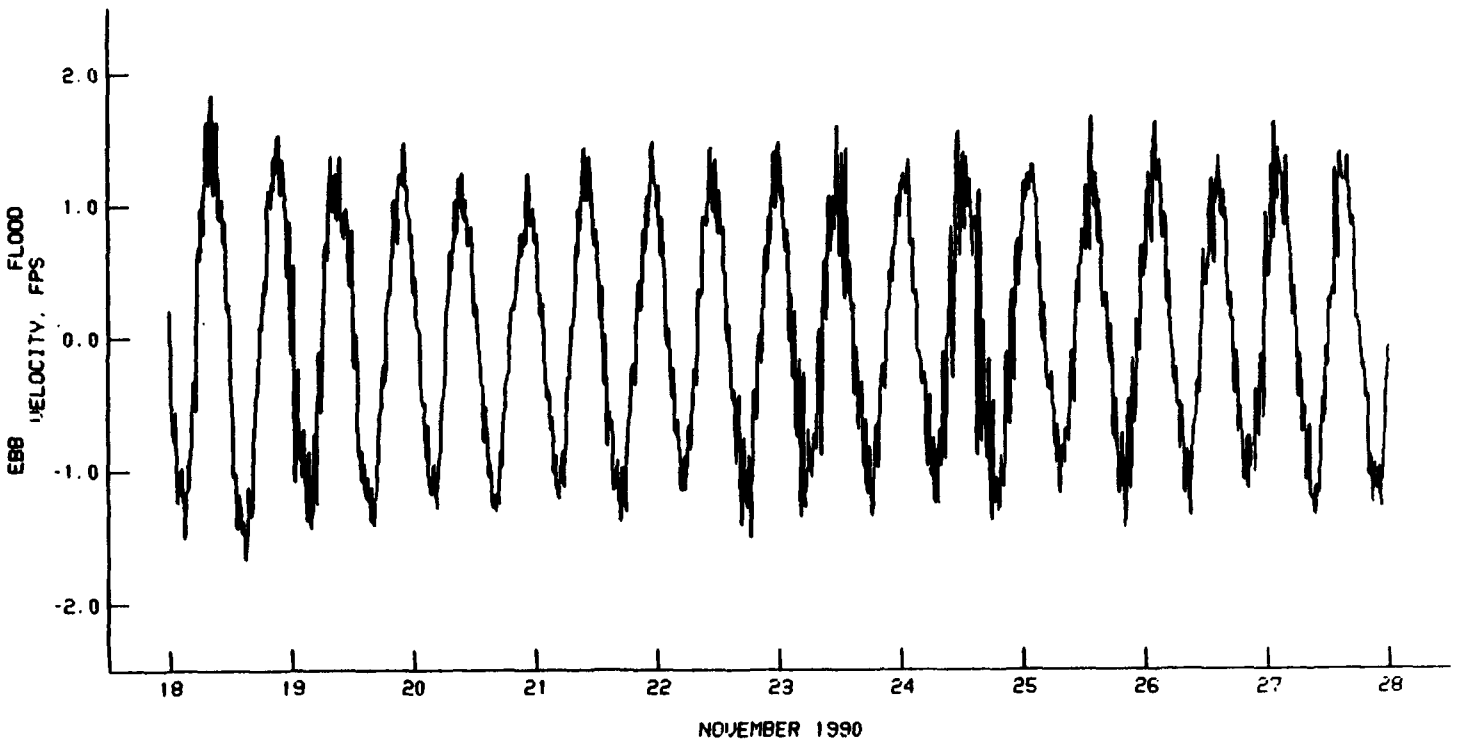

CURRENT SPEED AND DIRECTION
AT STATION S2.3
8 -17 NOVEMBER 1990
NOVEMBER 1990
8
9
10
11
12
13
14
15
16
17
18
2.0
1.0
0.0
-1.0
-2.0
VELOCITY, FPS
EBB
FLOOD

PLATE 36



CURRENT SPEED AND DIRECTION AT STATION S2.3

18 - 27 NOVEMBER 1990

PLATE 37

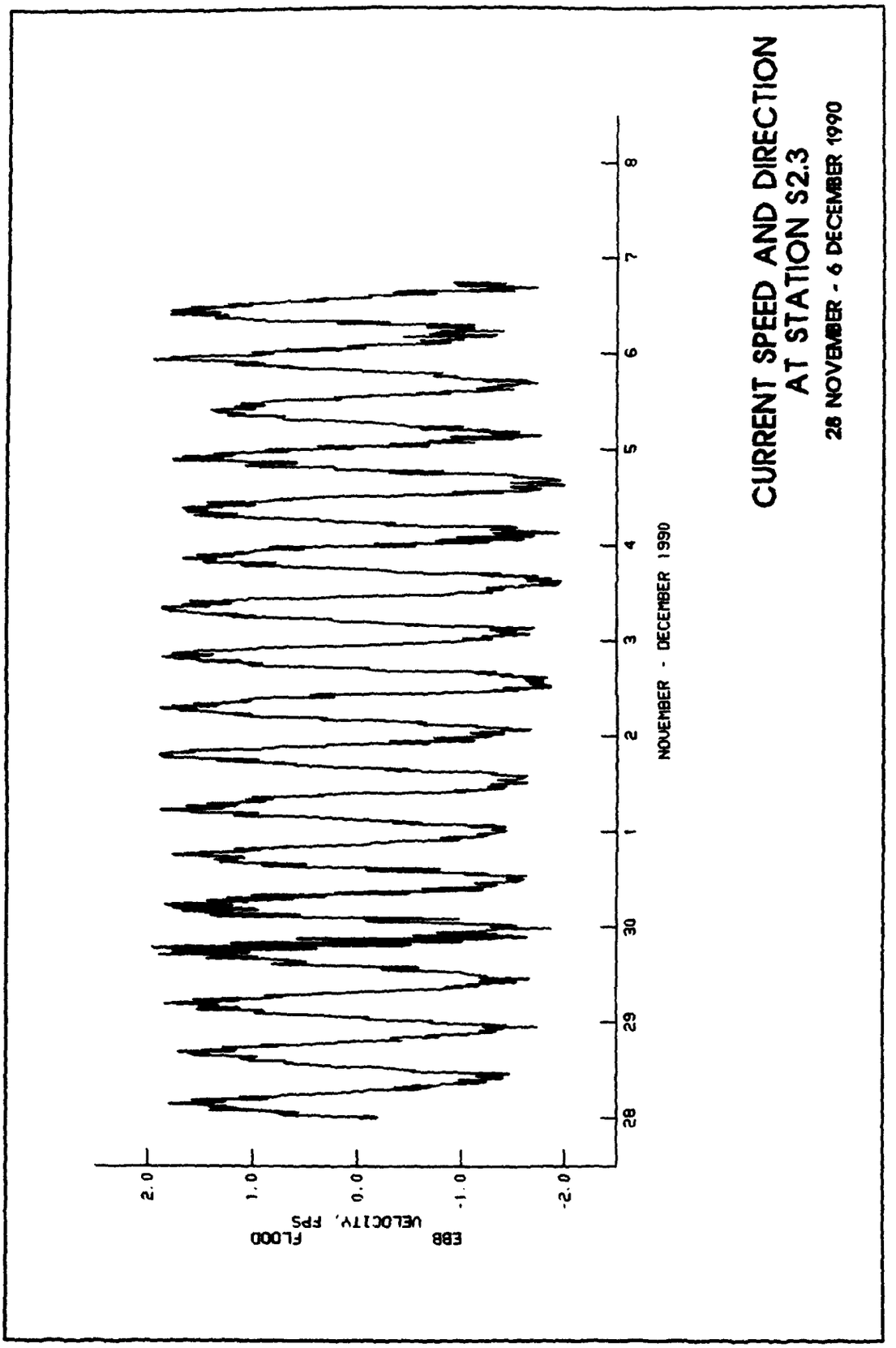

CURRENT SPEED AND DIRECTION
AT STATION S2.3
28 NOVEMBER - 6 DECEMBER 1990
NOVEMBER - DECEMBER 1990
28
29
30
1
2
3
4
5
6
7
8
2.0
1.0
0.0
-1.0
-2.0
VELOCITY, FPS
EBB
FLOOD

PLATE 38

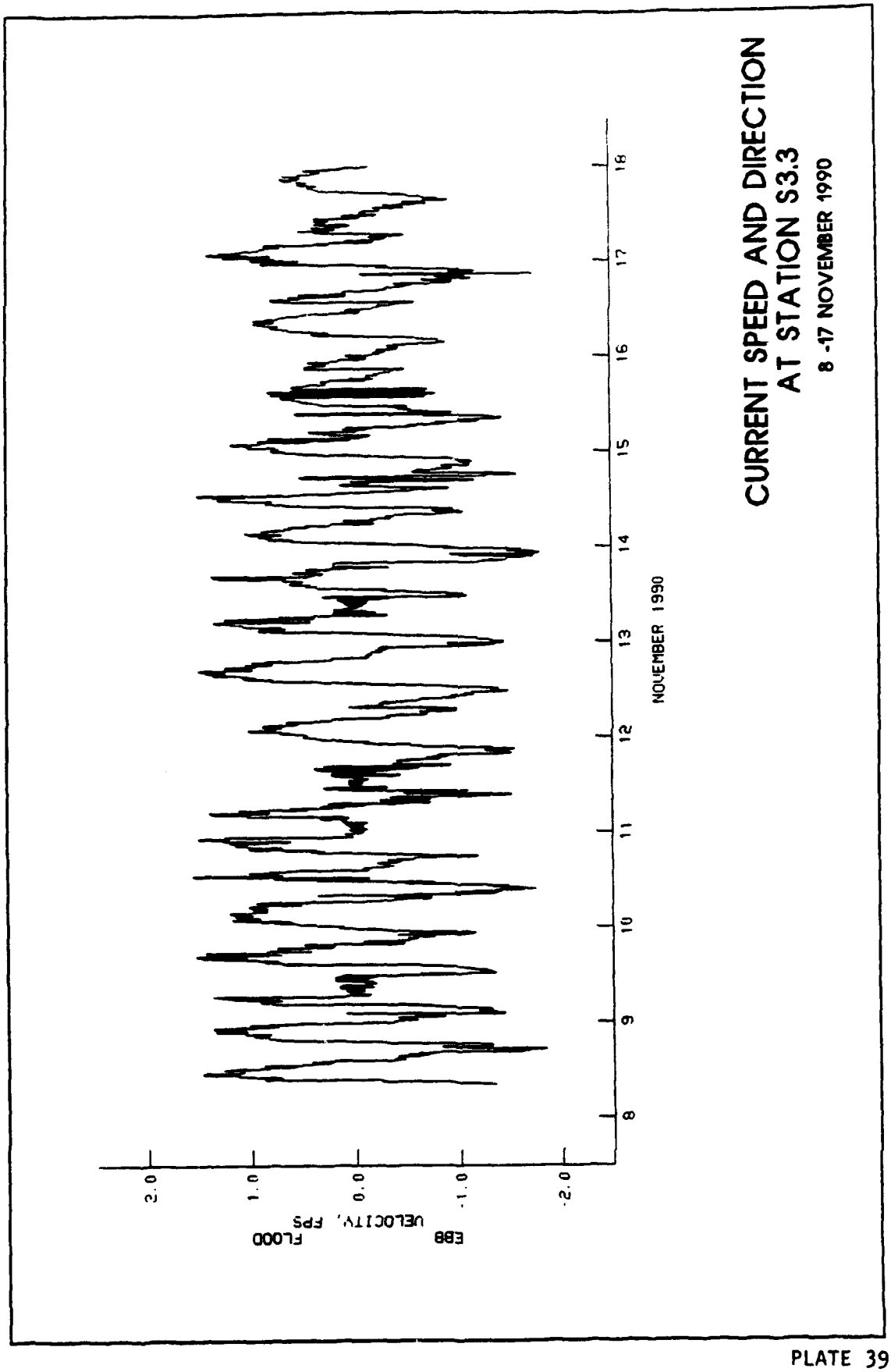
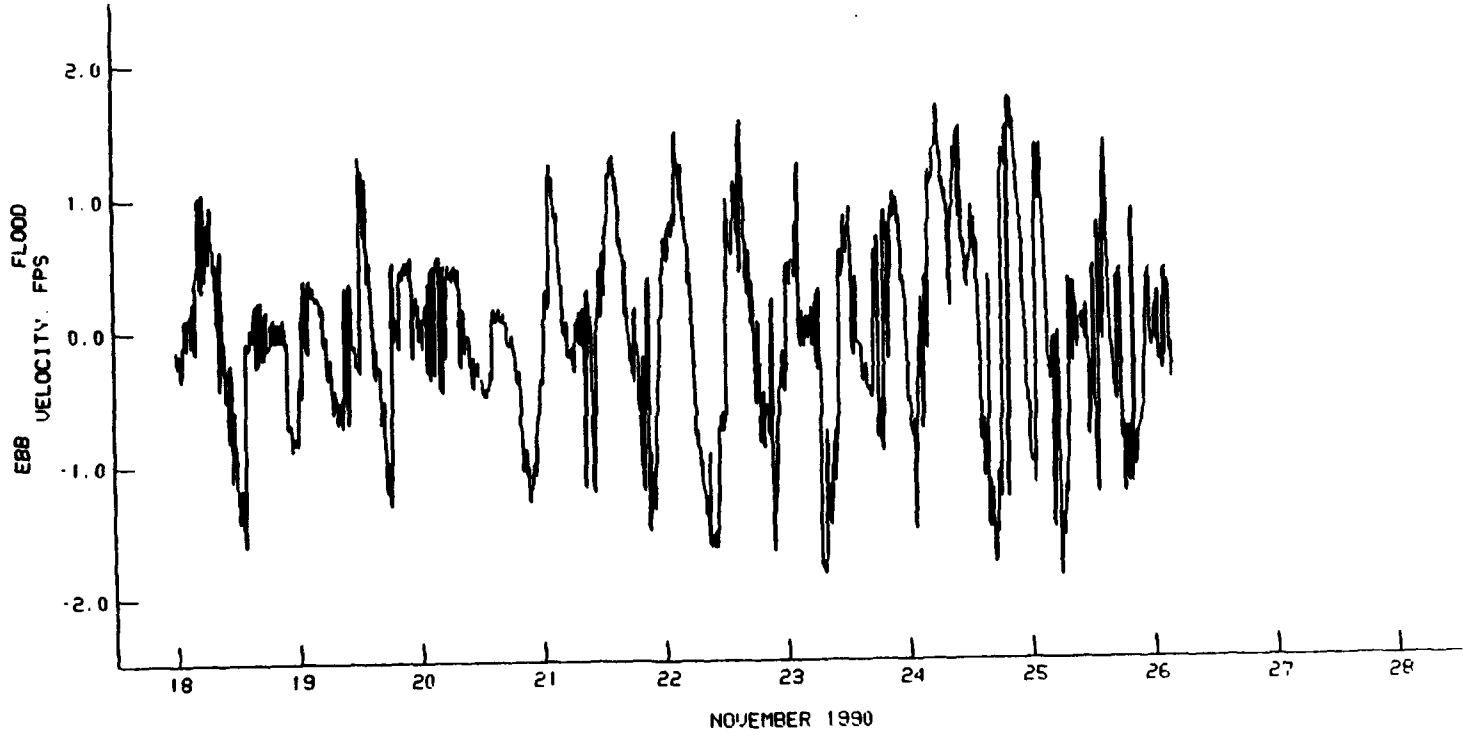

CURRENT SPEED AND DIRECTION
AT STATION S3.3
8 -17 NOVEMBER 1990
NOVEMBER 1990
8
9
10
11
12
13
14
15
16
17
18
2.0
1.0
0.0
-1.0
-2.0
VELOCITY, FPS
EBB
FLOOD

PLATE 39

PLATE 40



CURRENT SPEED AND DIRECTION AT STATION S3.3

18 - 26 NOVEMBER 1990

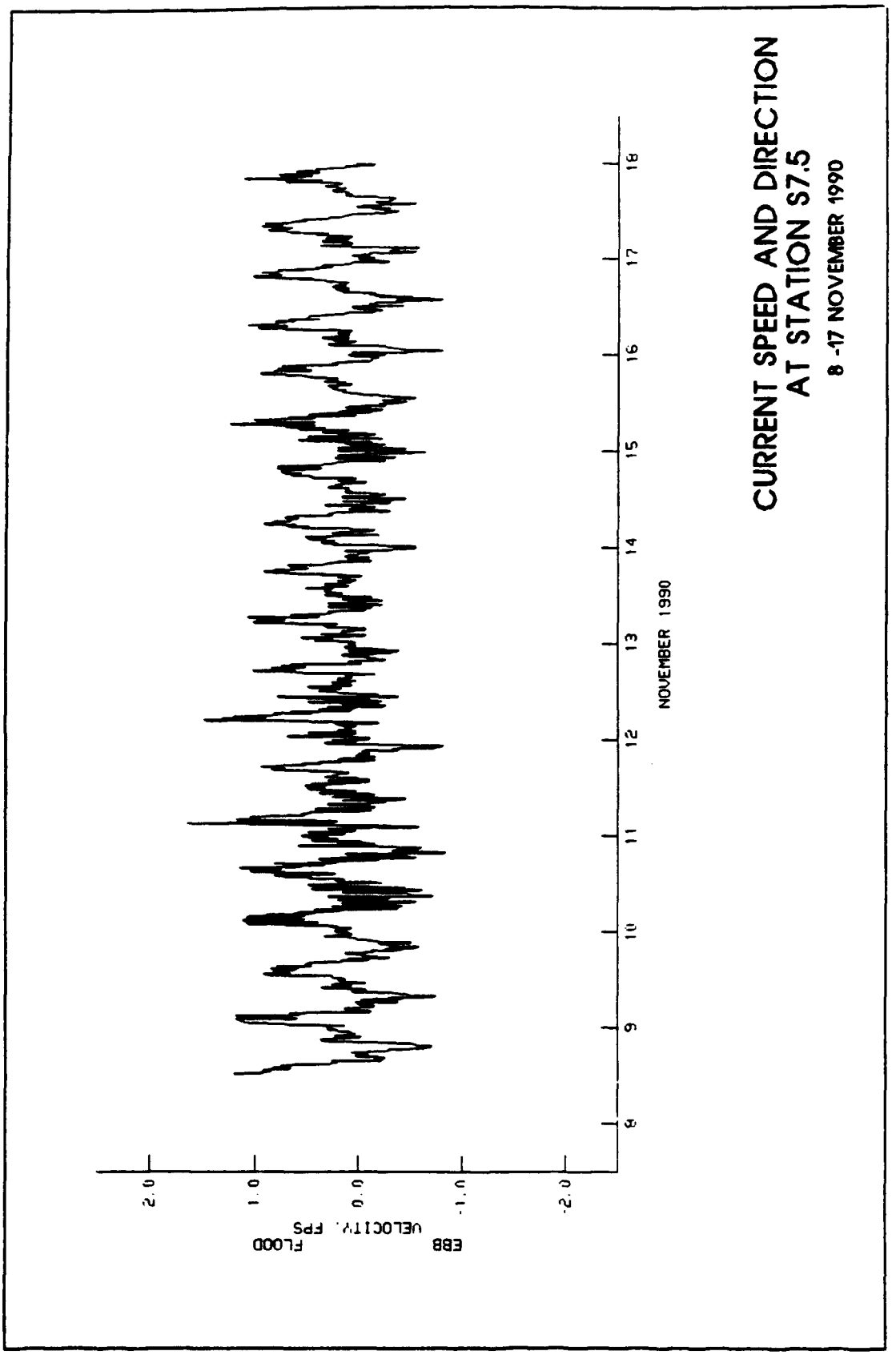
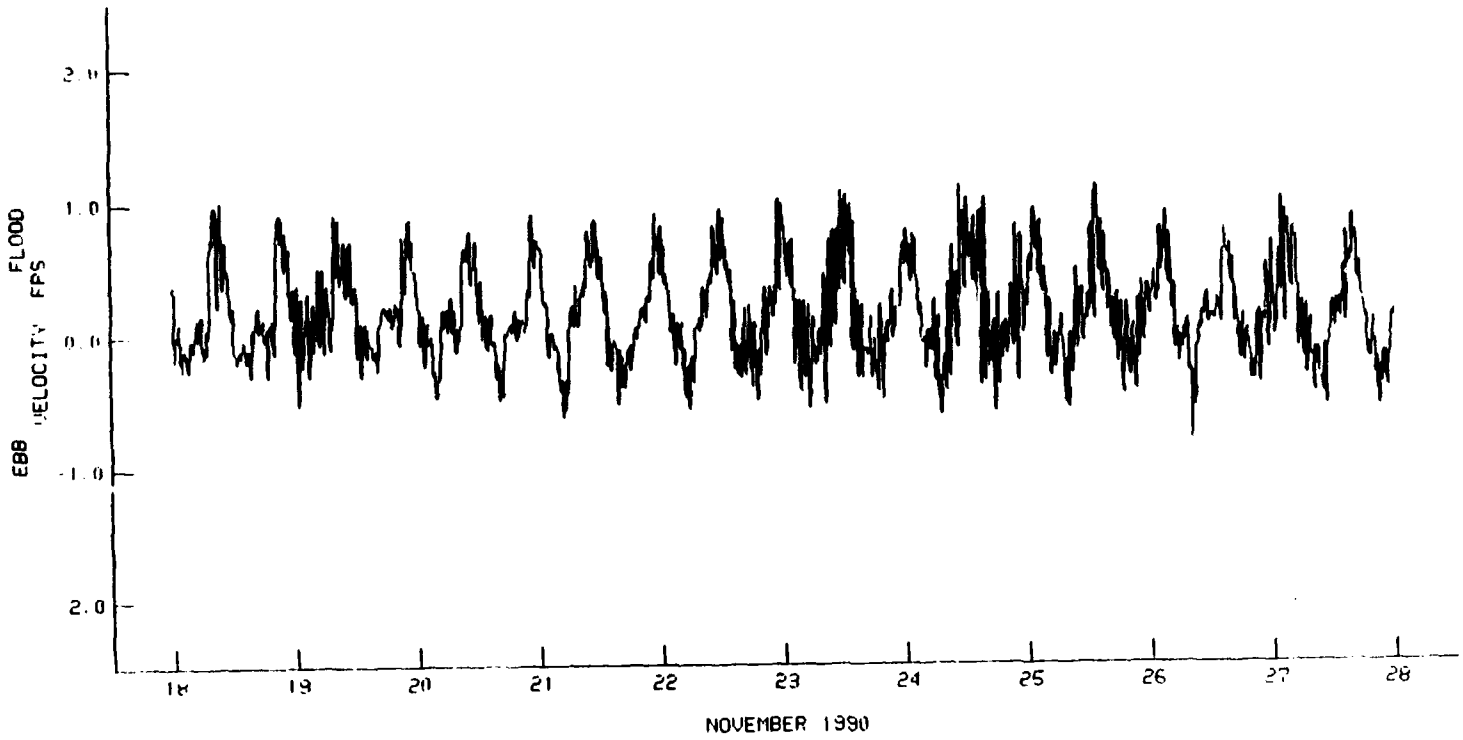

CURRENT SPEED AND DIRECTION
AT STATION S7.5
8 -17 NOVEMBER 1990
NOVEMBER 1990
8
9
10
11
12
13
14
15
16
17
18
2.0
1.0
0.0
-1.0
-2.0
VELOCITY, FPS
FLOOD
EBB

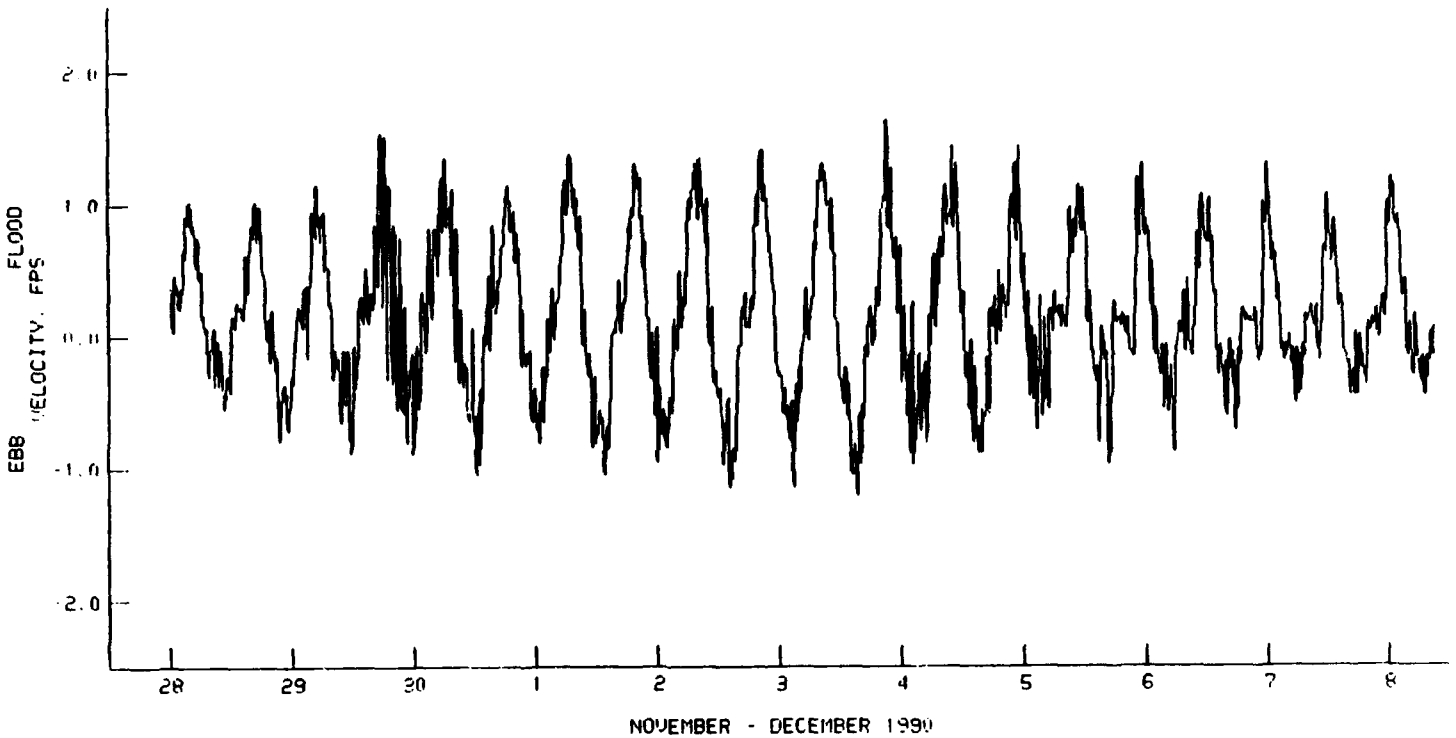
PLATE 41

PLATE 42



CURRENT SPEED AND DIRECTION AT STATION S7.5

18 - 27 NOVEMBER 1990



CURRENT SPEED AND DIRECTION AT STATION S7.5

28 NOVEMBER - 8 DECEMBER 1990

PLATE 43