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MISCELLANEOUS PAPER CERC-90-1

HURRICANE GILBERT STORM SURGE DATA

by

Andrew W. Garcia

Coastal Engineering Research Center

DEPARTMENT OF THE ARMY

Waterways Experiment Station, Corps of Engineers
3909 Halls Ferry Road, Vicksburg, Mississippi 39180-6199



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Preface

The data presented herein were assembled by the Episodic Events Work Unit of the Coastal Field Data Collection Program. The Coastal Field Data Collection Program is executed by the US Army Engineer Waterways Experiment Station (WES), Coastal Engineering Research Center (CERC). Messrs. John H. Lockhart, Jr.; John G. Housley; James Crews; and Charles W. Hummer are the Technical Monitors, Headquarters, US Army Corps of Engineers. Mr. J. Michael Hemsley, CERC, is Program Manager of the Coastal Field Data Collection Program.

This report was prepared by Mr. Andrew W. Garcia under the general supervision of Dr. James R. Houston, Chief, CERC, and Mr. Charles C. Calhoun, Jr., Assistant Chief, CERC; and under the direct supervision of Mr. William L. Preslan, Chief, Prototype Measurement and Analysis Branch (PMAB), and Mr. Thomas W. Richardson, Chief, Engineering Development Division, CERC. The poststorm survey in Texas was conducted by Messrs. Ralph E. Ankeny and C. Ray Townsend, PMAB. This report was edited by Ms. Lee T. Byrne of the Information Technology Laboratory, CERC.

Commander and Director of WES during report publication was COL Larry B. Fulton, EN. Technical Director was Dr. Robert W. Whalin.

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Conversion Factors, Non-SI to SI (Metric)
Units of Measurement

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

<u>Multiply</u>	<u>By</u>	<u>To Obtain</u>
feet	0.3048	metres
knots (international)	0.5144444	metres per second
miles (US statute)	1.609347	kilometres
millibars	100.0000	pascals

HURRICANE GILBERT STORM SURGE DATA

Introduction

1. Hurricane Gilbert is the most intense Atlantic hurricane on record. Although Gilbert did not make landfall on the US coastline, because of its intensity it no doubt will be carefully studied. To those investigating storm surges, wave setup, and other coastal processes, hydrographic data from such a storm obtained at exposed coastal sites are of significant value.

2. Contained herein are hydrographs acquired at 16 coastal sites during the passage of Gilbert through the Gulf of Mexico.* A brief meteorological description of Gilbert also is included.** A poststorm inspection was conducted by a Coastal Engineering Research Center (CERC) field team in the vicinities of Corpus Christi and Port Isabel, Texas. Coastal erosion and damage in these areas were minimal considering the severity of the hurricane. Selected representative photographs taken during the survey are also included.

Meteorological Discussion

3. Gilbert was designated a tropical depression on 9 September 1988 when it was located about 400 miles† east of Barbados. It intensified very rapidly attaining tropical storm status late on the afternoon of the ninth and hurricane status on the evening of 10 September 1988. Between 11 September and 13 September, Gilbert moved on a west-northwest track while slowly but steadily intensifying. During this period, Gilbert passed over the island of Jamaica as a Category 3 hurricane (Saffir-Simpson Scale). The Kingston weather office, the only Jamaican weather office to measure maximum winds during the storm, reported sustained winds of 110 knots and gusts to 122 knots with a minimum central pressure of 960 mb.

* Hydrograph data were provided by the National Ocean Service (NOS) under a NOS/US Army Corps of Engineers (CE) agreement sponsored by the Episodic Events Work Unit.

** Meteorological data are excerpted from the "Preliminary Report, Hurricane Gilbert," by Gilbert B. Clark, National Hurricane Center, National Oceanic Atmospheric Administration.

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

4. During the next 24 hr (13 September), Gilbert underwent an extremely rapid intensification with the central pressure falling from 960 to 885 mb, the lowest sea level pressure ever recorded in the western hemisphere, and measured sustained winds of 160 knots. Meanwhile, Gilbert passed just to the south of Grand Cayman Island, where a wind gust of 136 knots was recorded. Shortly after noon on 14 September, Gilbert made landfall on the Yucatan Peninsula as a Category 5 hurricane, the first such storm to make landfall in the Western Hemisphere since Hurricane Camille of 1969.

5. Upon emerging from the Yucatan Peninsula into the Gulf of Mexico, the central pressure had risen to 950 mb. Gilbert continued on a west-northwest track across the Gulf of Mexico, where it made landfall near La Pesca, Mexico, late on 16 September. There were no official landbased measurements of maximum winds near the center of the hurricane as it made landfall in Mexico. Figure 1 shows the track of Gilbert. Table 1 contains the preliminary best track data.

Poststorm Survey

6. The CERC field team conducted a poststorm inspection in the vicinities of Corpus Christi and Port Isabel, Texas, shortly after the storm made landfall. Although there was some significant erosion along the exposed shoreline of south Padre Island, damage to most coastal reaches in south Texas was minimal. The storm's southerly track and rapid transit (about 48 hr) across the Gulf of Mexico undoubtedly helped minimize coastal erosion and damage.

7. Photos 1 through 7 were taken in the vicinity of Port Isabel, Texas, where a maximum surge elevation of approximately 3.6 ft above mean sea level (MSL) was recorded. Photo 8 was taken in the vicinity of Corpus Christi, Texas, where a maximum surge elevation of approximately 4.7 ft was recorded. Plates 1 through 15 contain hydrographs acquired at coastal locations extending from Port Isabel, Texas, to Dauphin Island, Alabama.

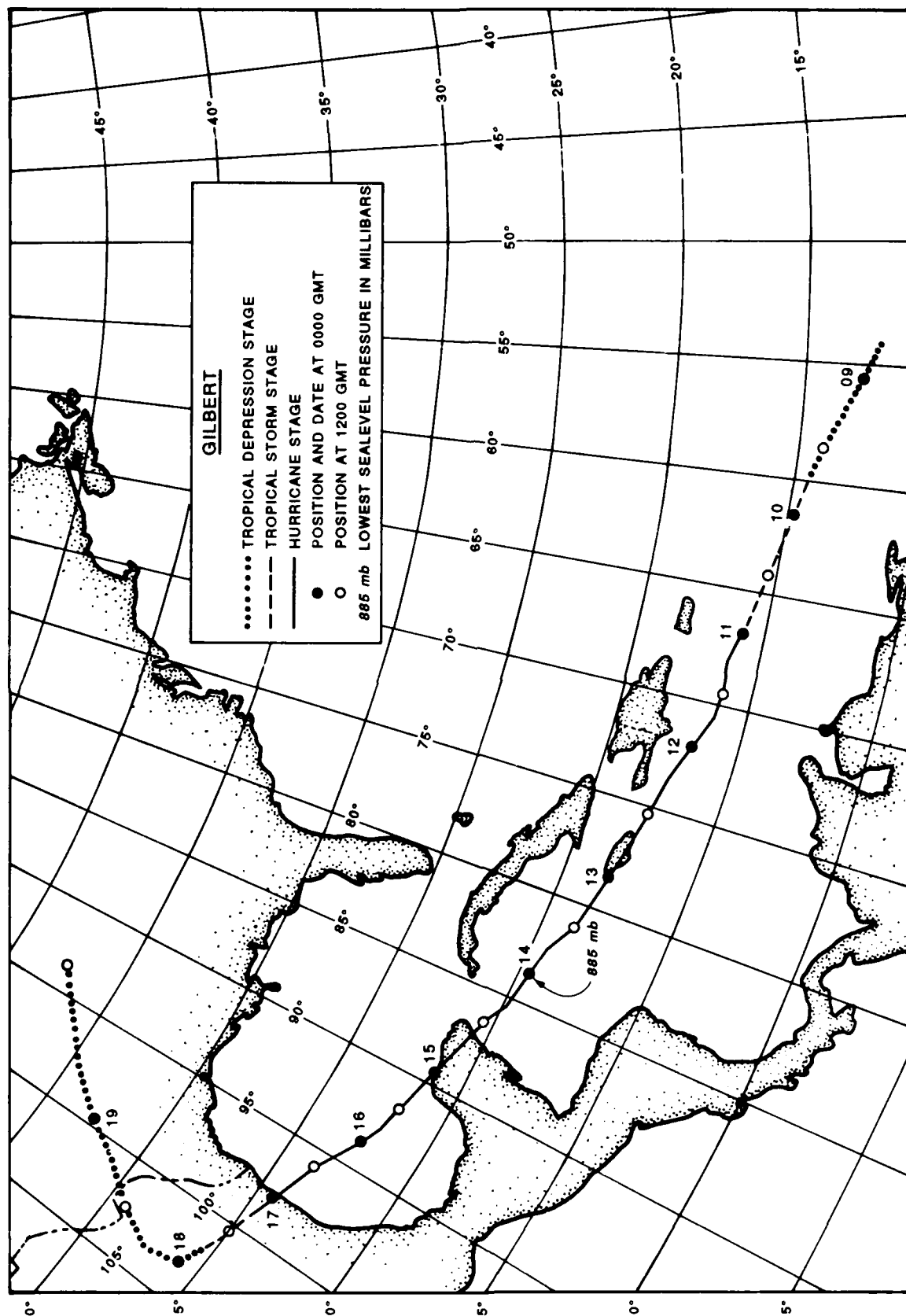


Figure 1. Track of Hurricane Gilbert, September 1988

Table 1

Preliminary Best Track, Hurricane Gilbert, 8-19 September 1988

Date/Time UTC	Position		Pressure mb	Wind Speed knots	Stage
	lat.	lon.			
08/1800	12.0	54.0	1008	25	Tropical Depression
09/0000	12.7	55.6	1007	25	Tropical Depression
0600	13.3	57.1	1006	30	Tropical Depression
1200	14.0	58.6	1005	30	Tropical Depression
1800	14.5	60.1	1004	35	Tropical Storm
10/0000	14.8	61.5	1002	40	Tropical Storm
0600	15.0	62.8	998	45	Tropical Storm
1200	15.3	64.1	995	50	Tropical Storm
1800	15.7	65.4	992	55	Tropical Storm
11/0000	15.9	66.8	989	65	Hurricane
0600	16.2	68.0	982	80	Hurricane
1200	16.1	69.5	975	95	Hurricane
1800	16.2	70.7	970	100	Hurricane
12/0000	16.8	72.0	964	105	Hurricane
0600	17.3	73.7	962	110	Hurricane
1200	17.6	75.3	960	110	Hurricane
1800	17.9	76.9	960	110	Hurricane
13/0000	18.2	78.5	960	110	Hurricane
0600	18.5	79.7	952	115	Hurricane
1200	18.8	81.1	934	125	Hurricane
1800	19.4	82.5	905	140	Hurricane
14/0000	19.7	83.8	885	160	Hurricane
0600	19.9	85.3	886	155	Hurricane
1200	20.4	86.5	892	145	Hurricane
1800	20.9	87.8	925	130	Hurricane
15/0000	21.3	89.5	944	100	Hurricane
0600	21.6	90.7	949	90	Hurricane
1200	21.9	91.7	950	85	Hurricane
1800	22.1	92.8	950	90	Hurricane
16/0000	22.5	93.8	949	100	Hurricane
0600	22.9	94.8	946	110	Hurricane
1200	23.7	95.9	948	115	Hurricane
1800	23.9	97.0	950	115	Hurricane
17/0000	24.4	98.2	964	80	Hurricane
0600	24.8	99.3	988	50	Tropical Storm
1200	25.0	100.5	996	35	Tropical Storm
1800	25.4	101.9	1000	30	Tropical Depression
18/0000	26.0	103.2	1002	30	Tropical Depression
0600	27.6	103.7	1004	30	Tropical Depression
1200	29.3	102.6	1005	25	Tropical Depression
1800	30.9	101.1	1005	25	Tropical Depression
19/0000	32.7	99.7	1005	25	Tropical Depression
0600	34.5	98.0	1002	25	Tropical Depression
1200	37.5	93.5	1001	25	Tropical Depression

(Continued)

Table 1 (Concluded)

Date/Time	Position		Pressure	Wind Speed	Stage
UTC	lat.	lon.	mb	knots	
Landfall:					
12/1700	17.8	76.8	960	115	Hurricane
14/1500	20.7	87.0	900	140	Hurricane
16/2200	24.2	97.8	955	110	Hurricane

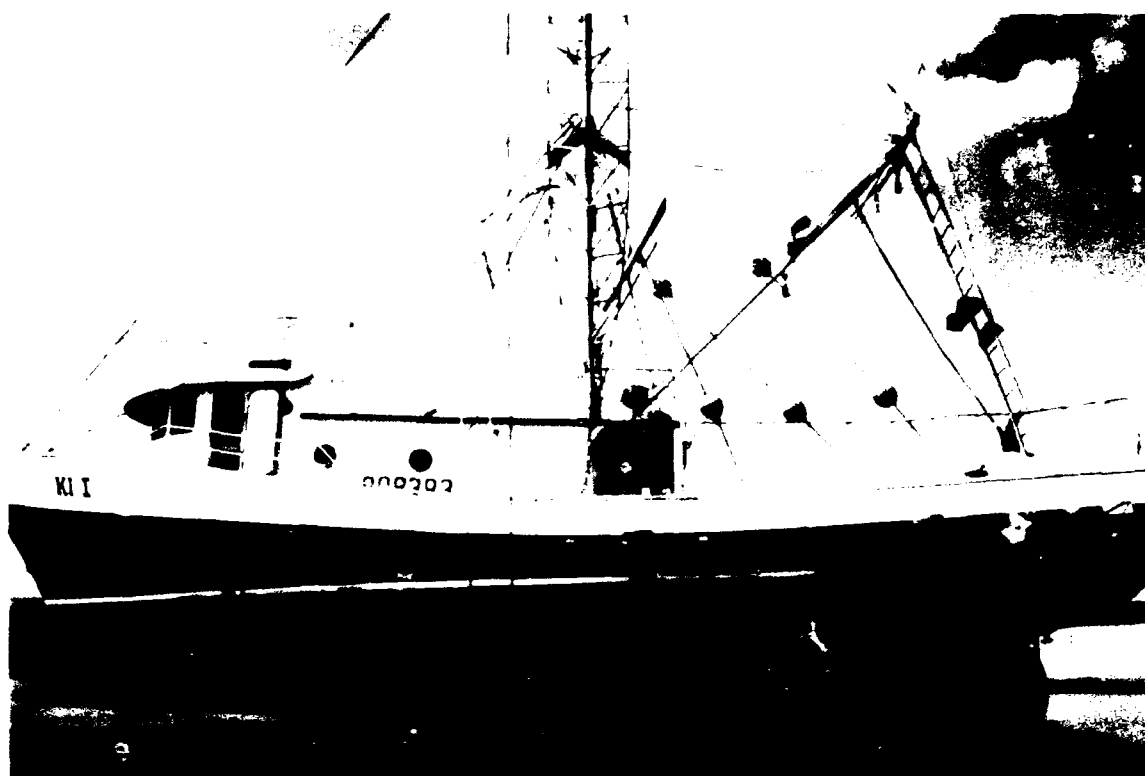


Photo 1. Fishing trawler aground at South Padre Island
near Port Isabel, Texas



Photo 2. Hull of wrecked vessel exposed during Hurricane Gilbert,
South Padre Island, Texas



Photo 3. Debris of floating docks in Queens Point Marina,
Port Isabel, Texas



Photo 4. Sediment filled abandoned vehicle, South Padre Island, Texas

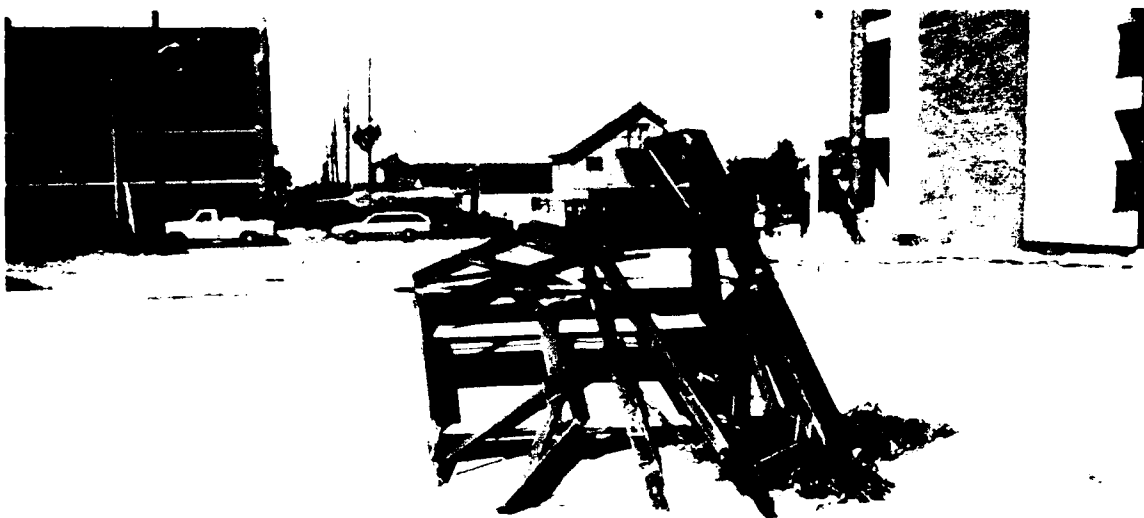


Photo 5. Damaged walkway, South Padre Island, Texas



Photo 6. Evidence of wind blown sand, looking north,
South Padre Island, Texas



Photo 7. Evidence of wind blown sand, point of road closure,
South Padre Island, Texas

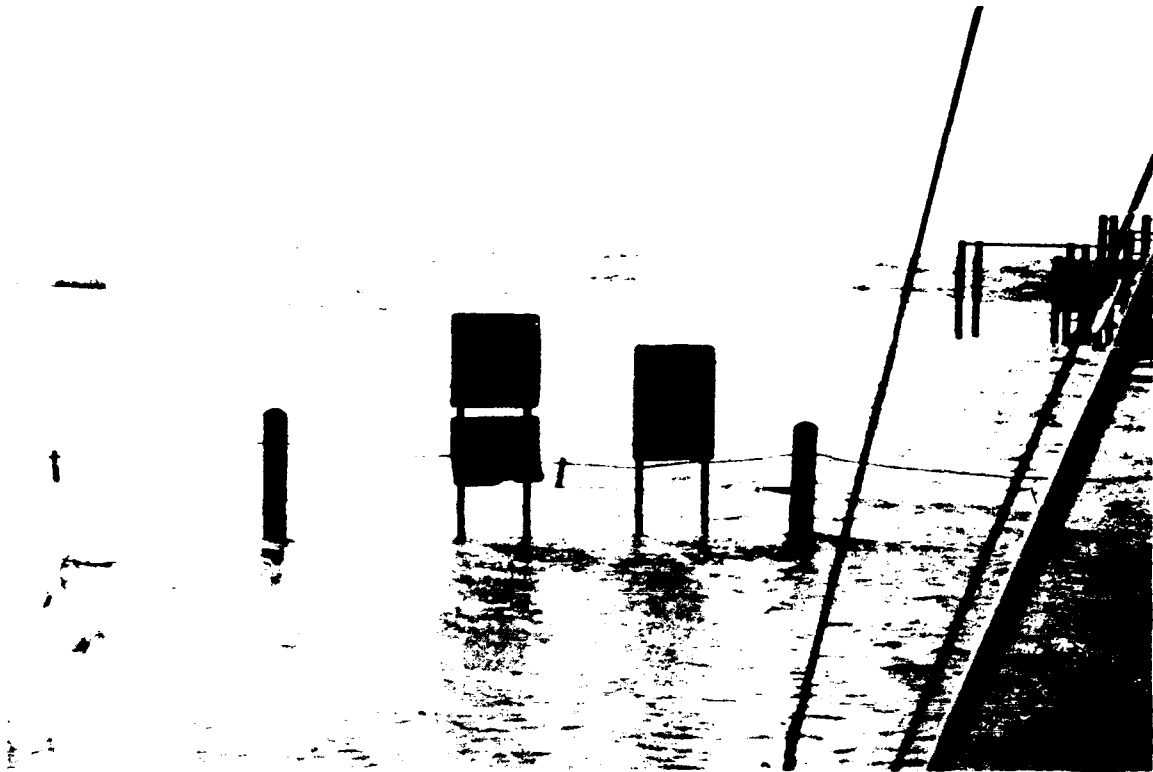
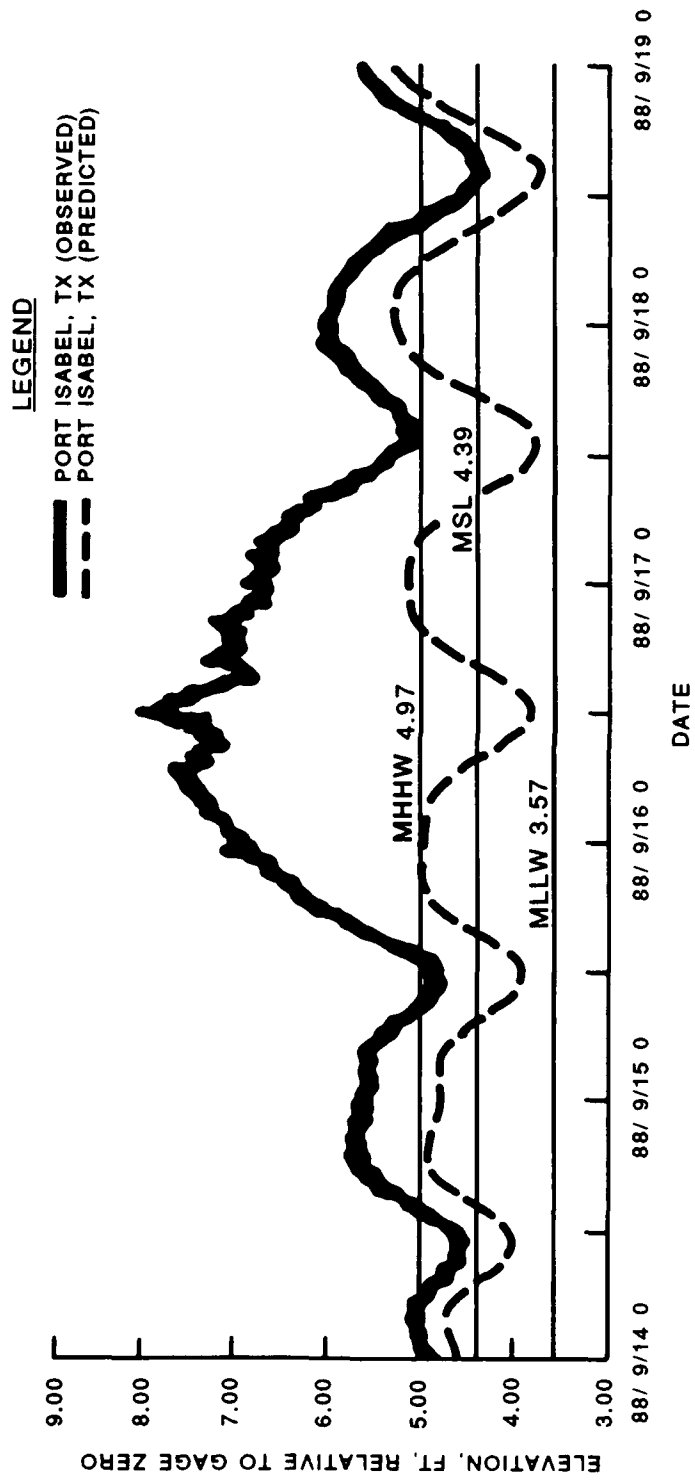
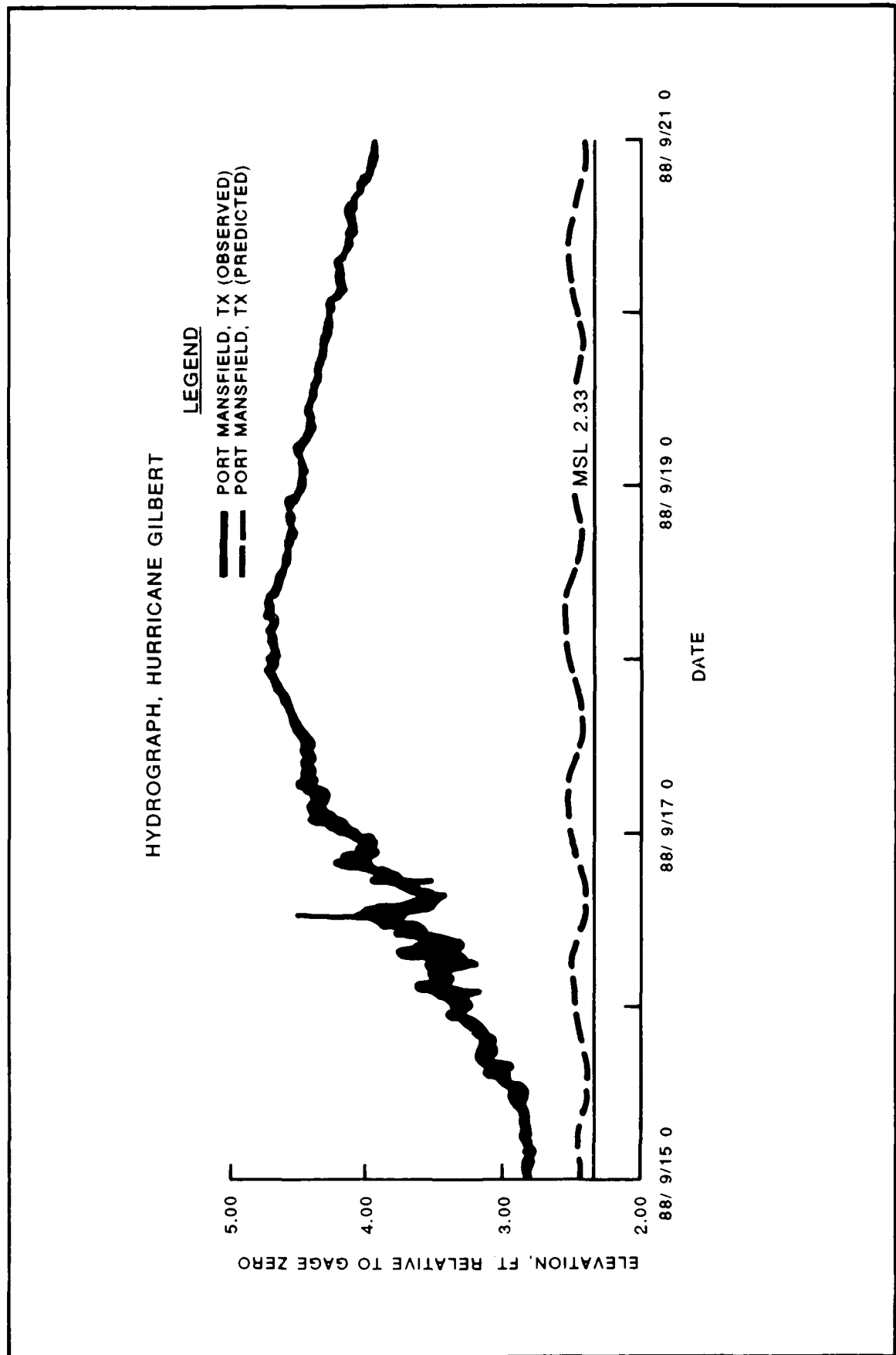


Photo 8. High water in Corpus Christi Bay caused by Hurricane Gilbert,
Corpus Christi, Texas

HYDROGRAPH, HURRICANE GILBERT

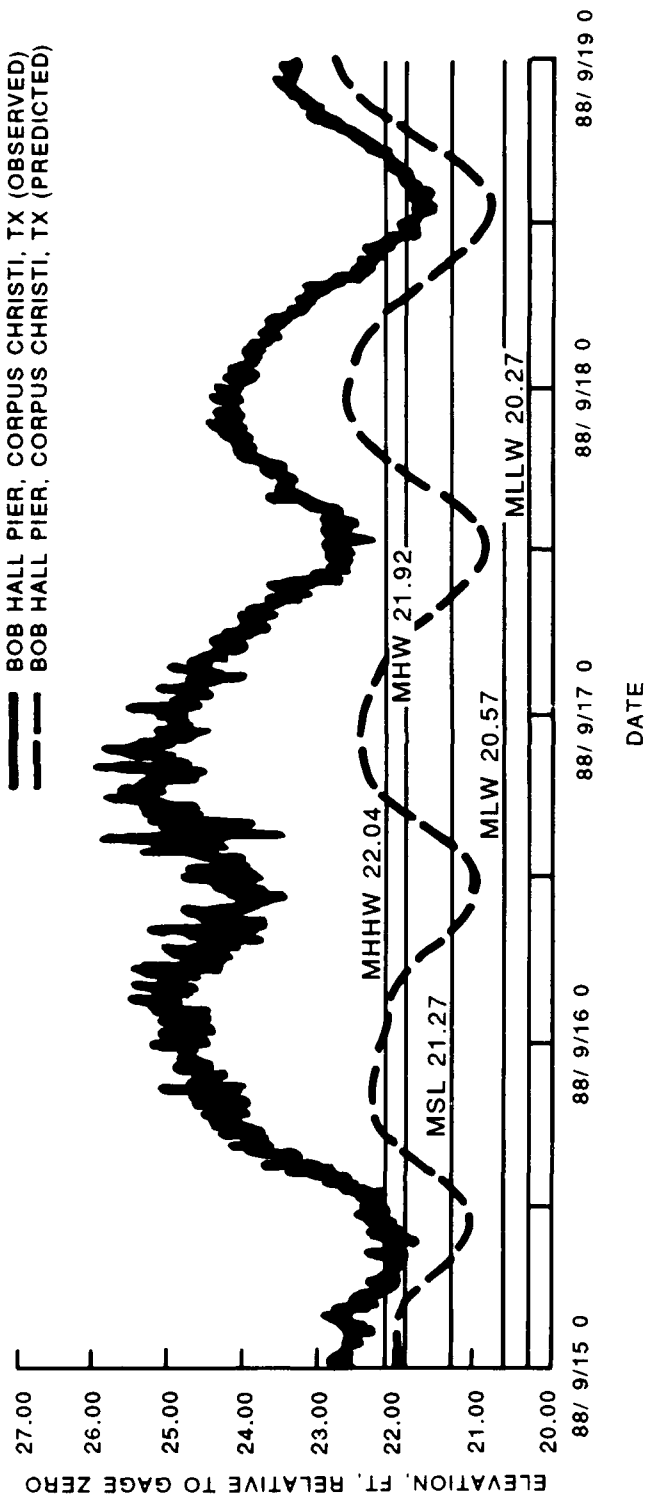




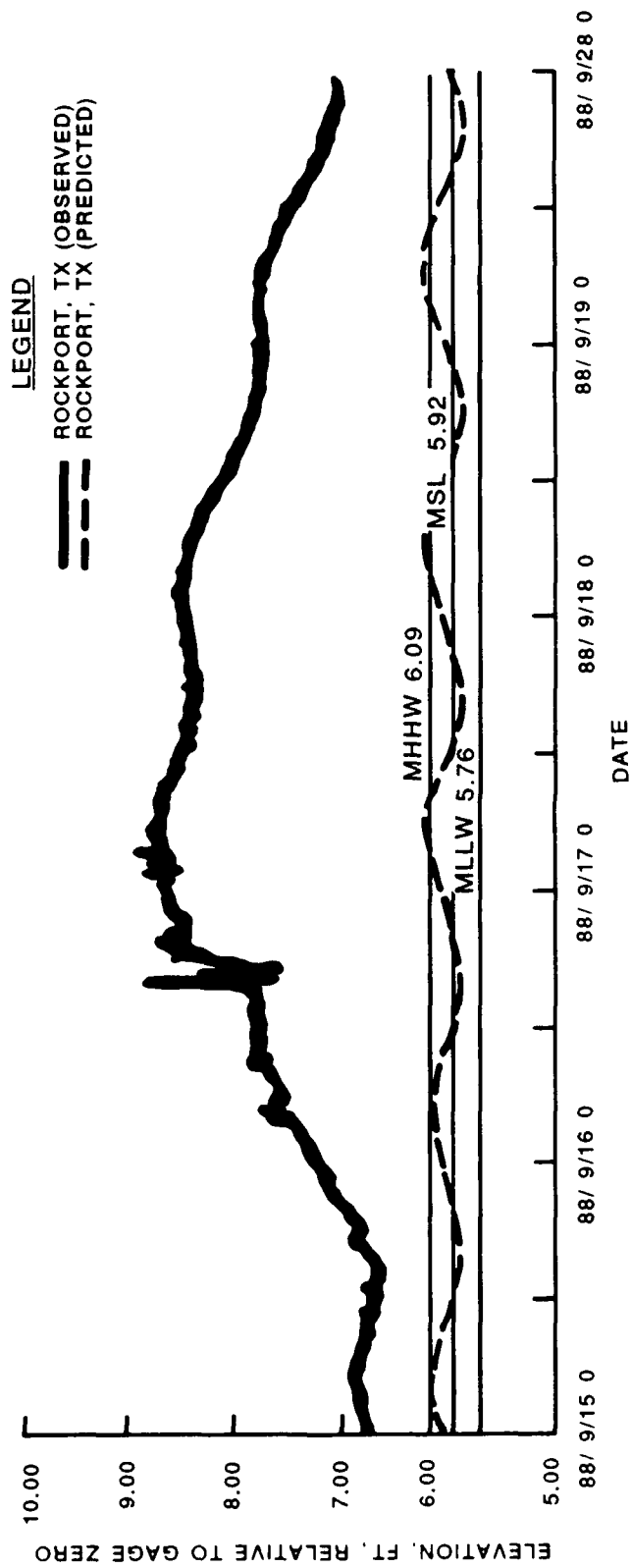
HYDROGRAPH, HURRICANE GILBERT

LEGEND

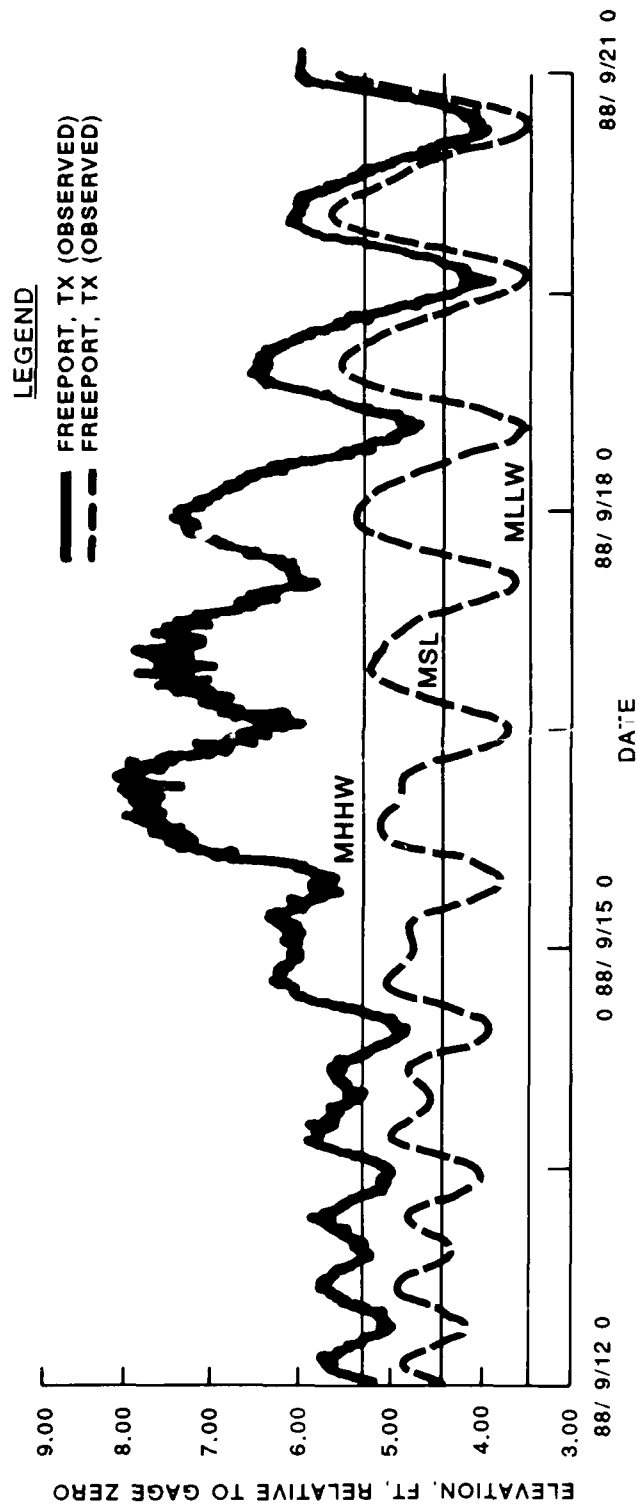
- BOB HALL PIER, CORPUS CHRISTI, TX (OBSERVED)
- - - BOB HALL PIER, CORPUS CHRISTI, TX (PREDICTED)



HYDROGRAPH, HURRICANE GILBERT



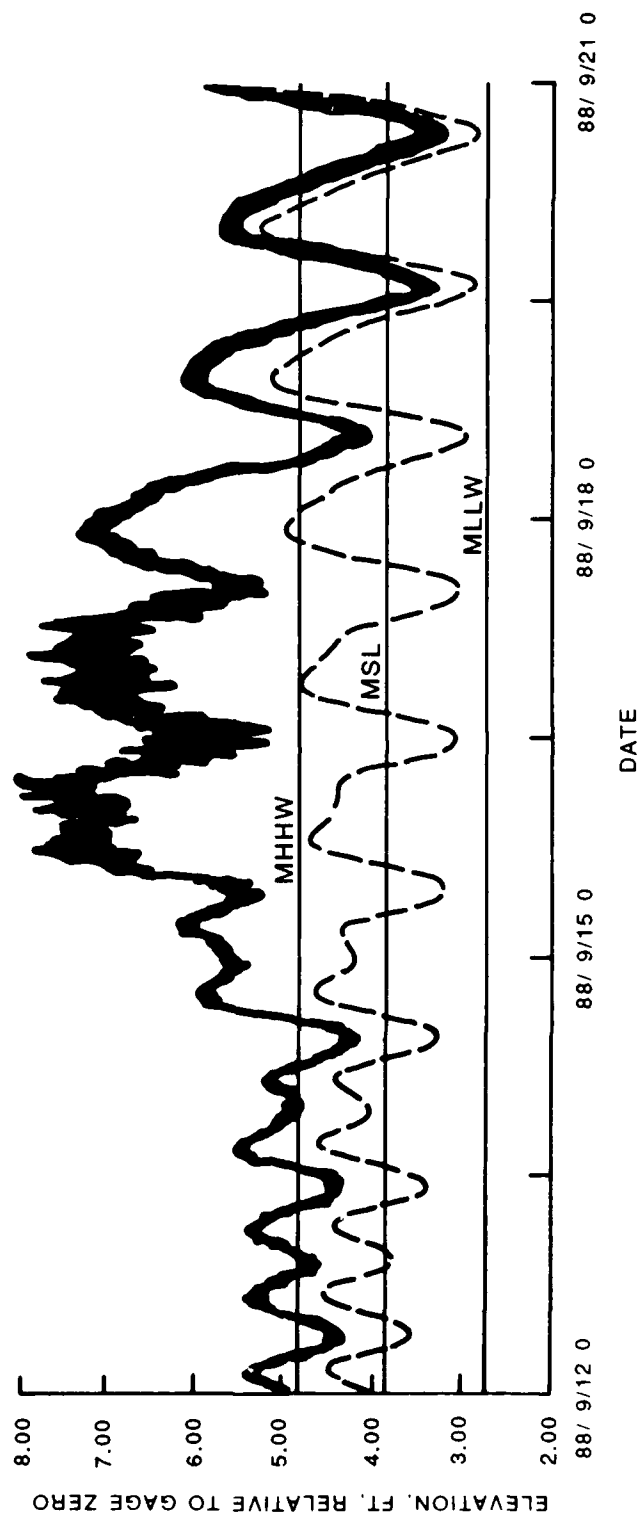
HYDROGRAPH, HURRICANE GILBERT



HYDROGRAPH, HURRICANE GILBERT

LEGEND

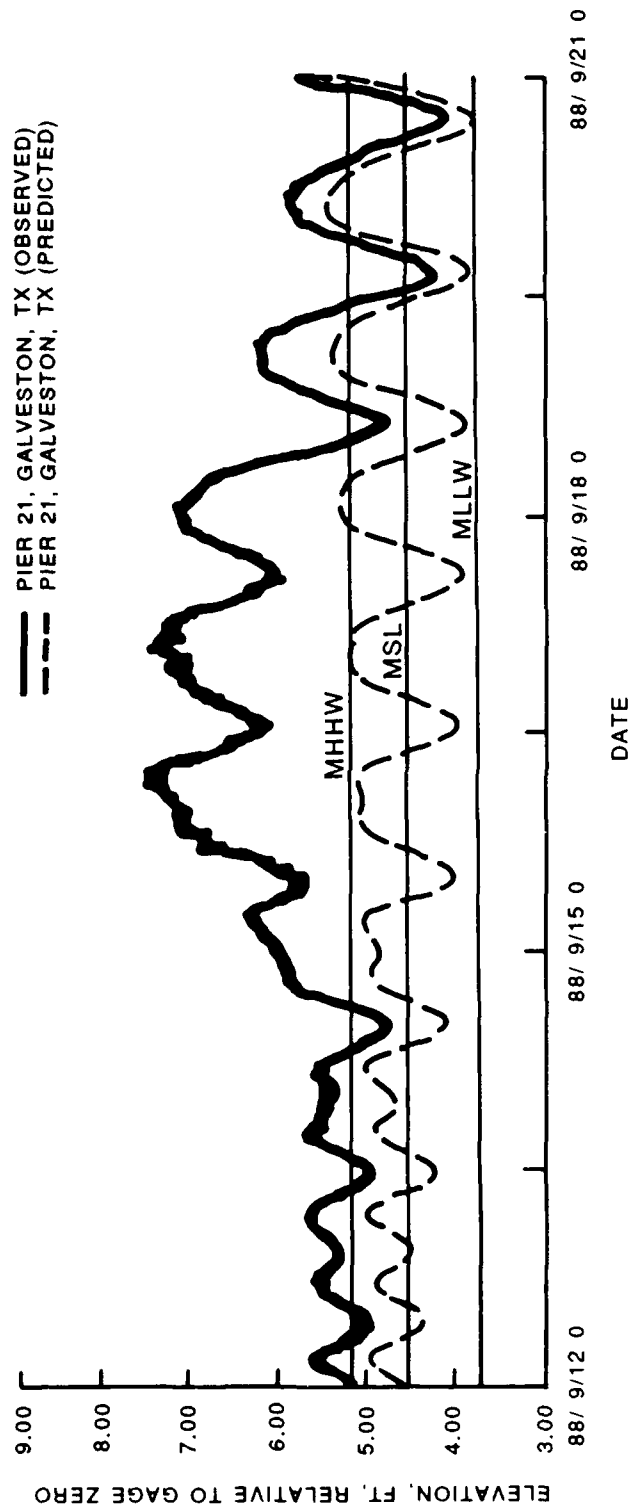
- PLEASURE PIER, GALVESTON, TX (OBSERVED)
- - - PLEASURE PIER, GALVESTON, TX (PREDICTED)



HYDROGRAPH, HURRICANE GILBERT

LEGEND

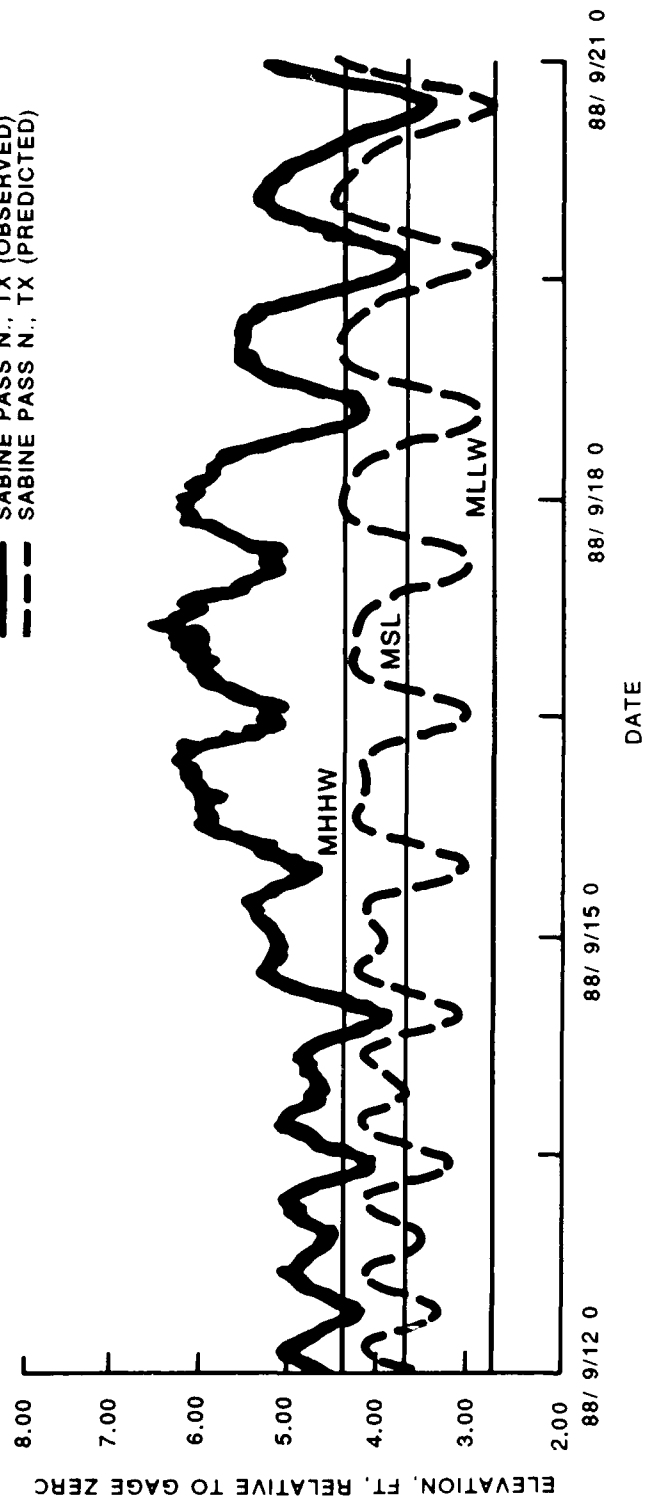
- PIER 21, GALVESTON, TX (OBSERVED)
- - - PIER 21, GALVESTON, TX (PREDICTED)



HYDROGRAPH, HURRICANE GILBERT

LEGEND

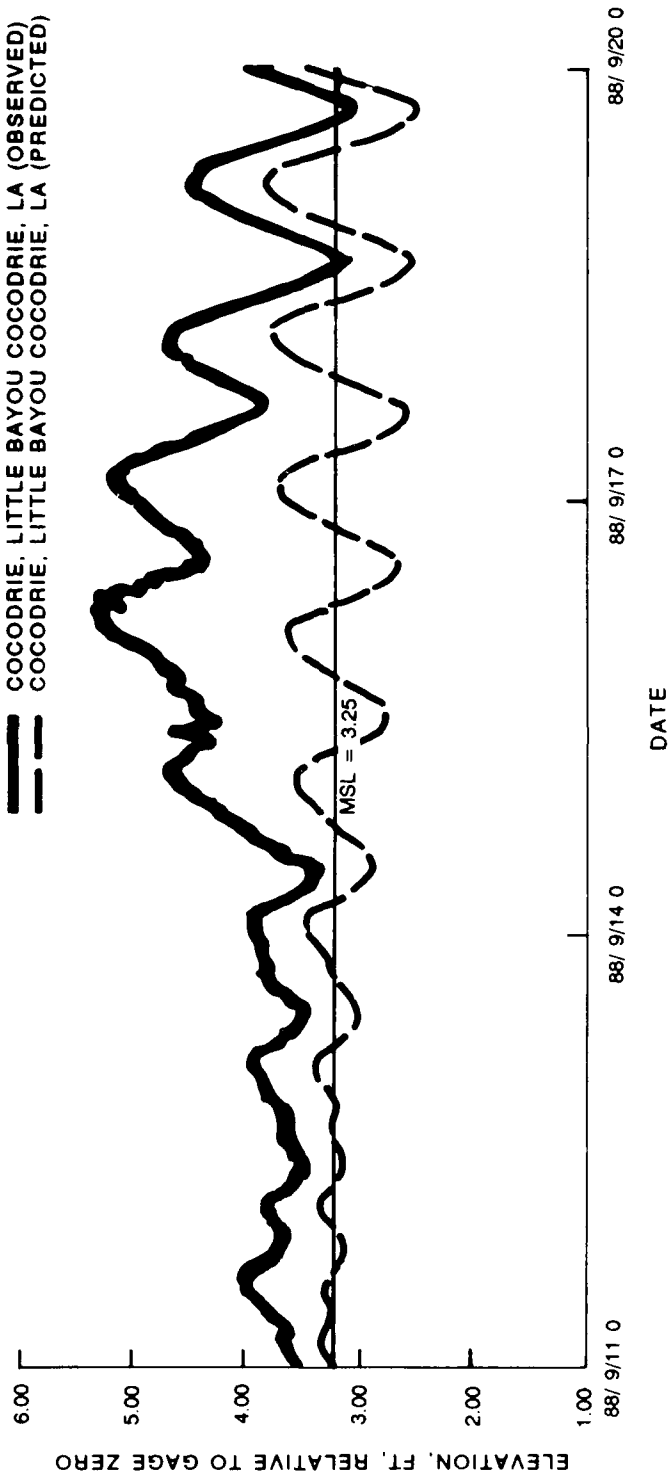
- SABINE PASS N., TX (OBSERVED)
- - - SABINE PASS N., TX (PREDICTED)



HYDROGRAPH, HURRICANE GILBERT

LEGEND

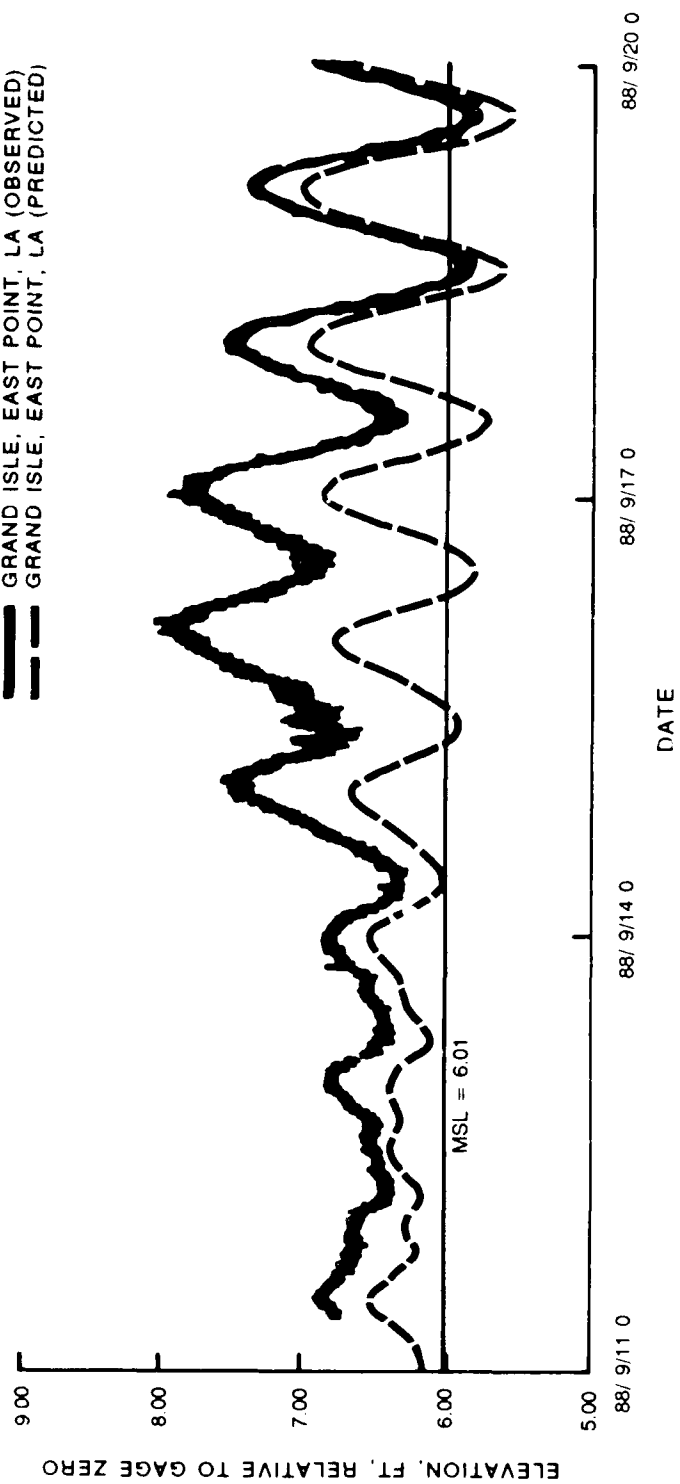
- COCODRIE, LITTLE BAYOU COCODRIE, LA (OBSERVED)
- - COCODRIE, LITTLE BAYOU COCODRIE, LA (PREDICTED)



HYDROGRAPH, HURRICANE GILBERT

LEGEND

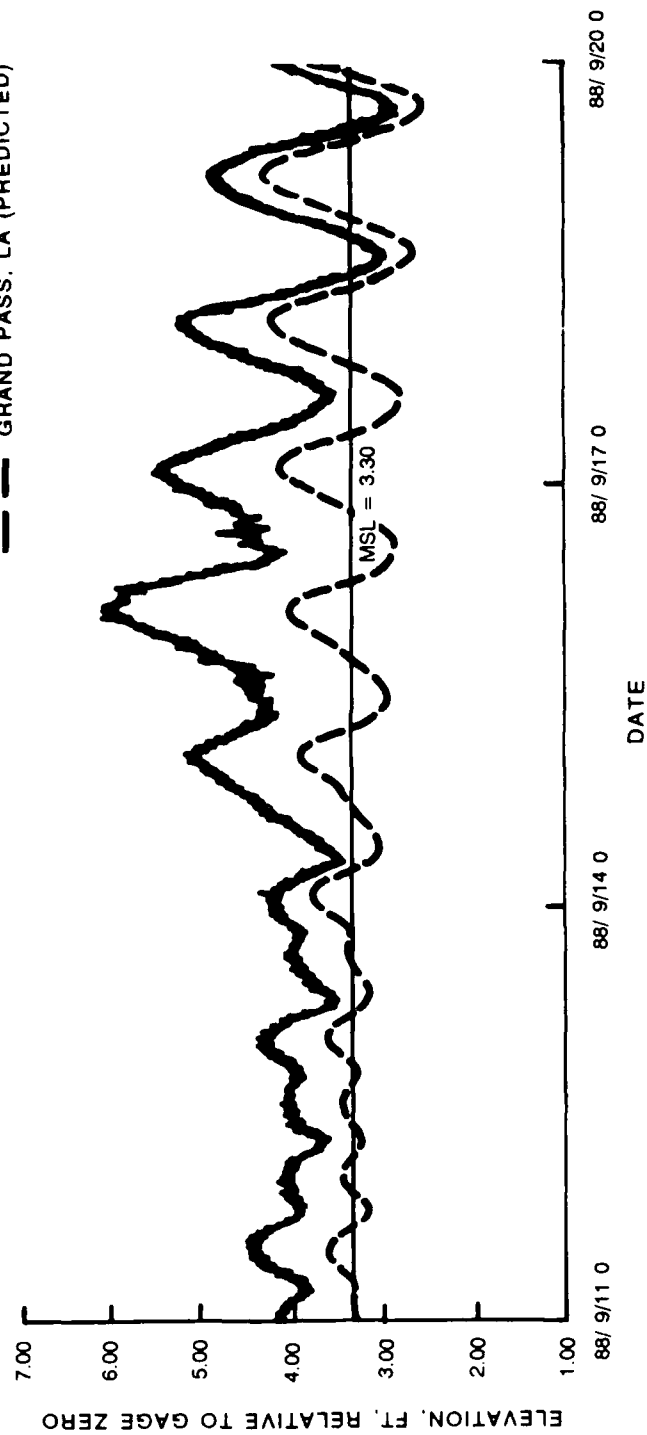
- GRAND ISLE, EAST POINT, LA (OBSERVED)
- - - GRAND ISLE, EAST POINT, LA (PREDICTED)



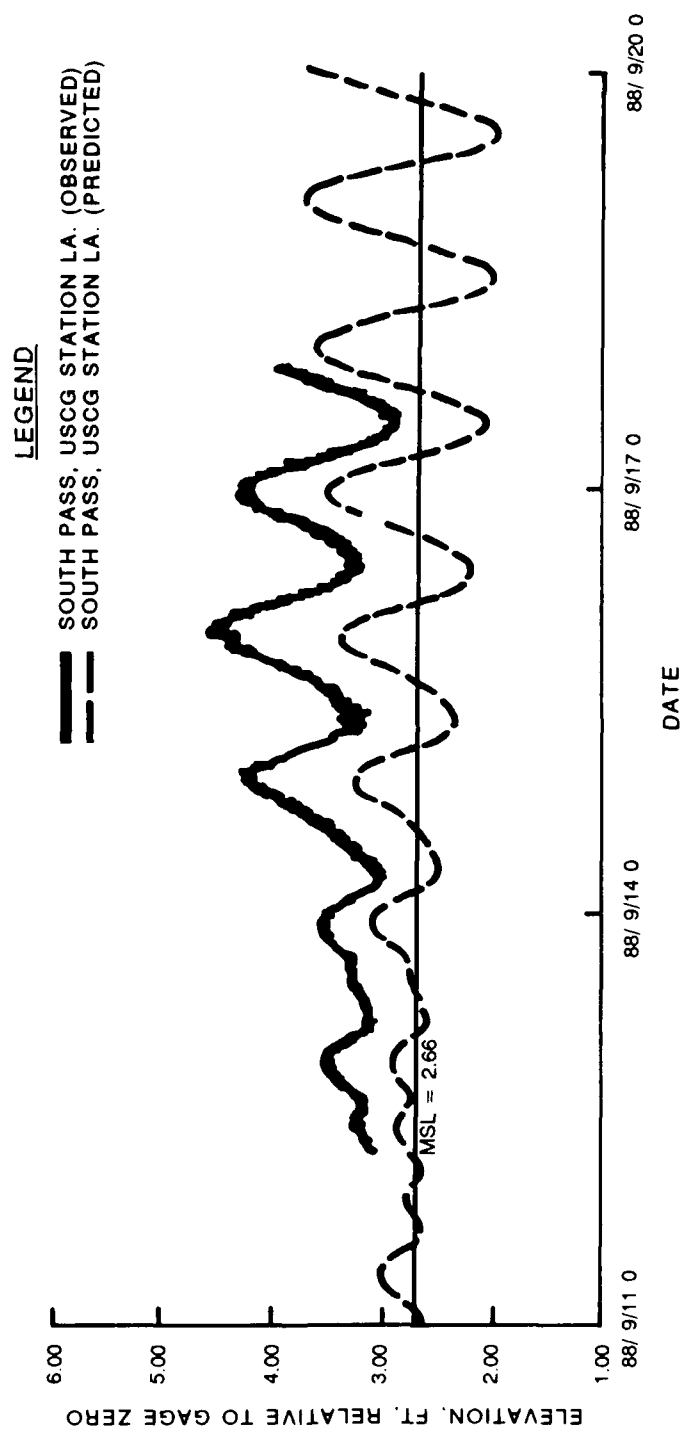
HYDROGRAPH, HURRICANE GILBERT

LEGEND

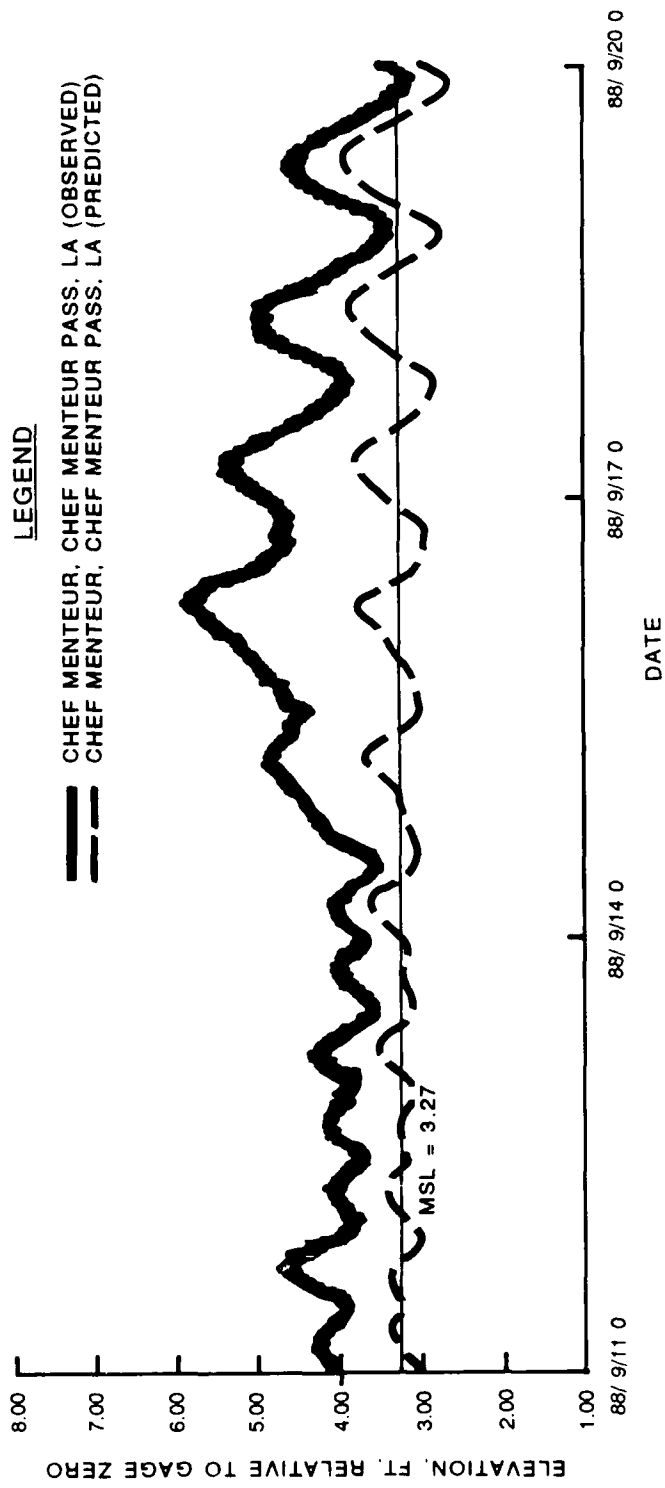
- GRAND PASS, LA (OBSERVED)
- - - GRAND PASS, LA (PREDICTED)



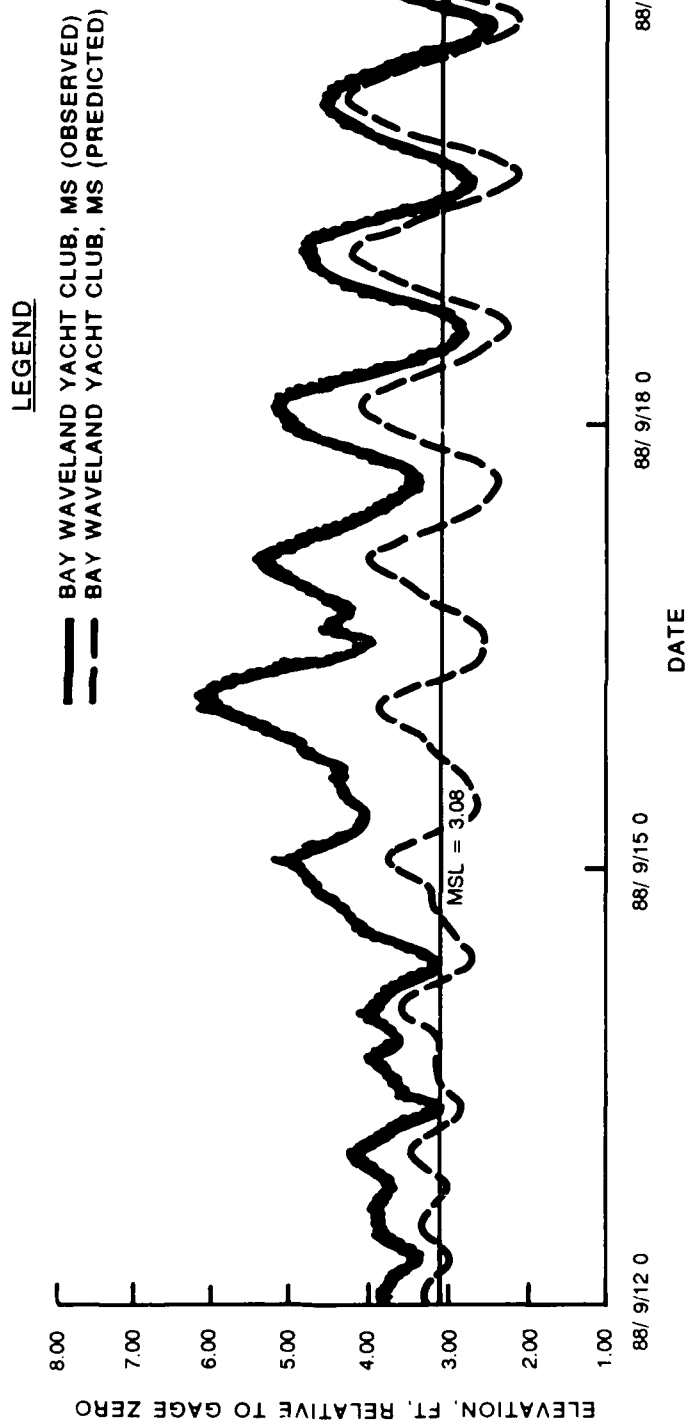
HYDROGRAPH, HURRICANE GILBERT



HYDROGRAPH, HURRICANE GILBERT



HYDROGRAPH, HURRICANE GILBERT



HYDROGRAPH, HURRICANE GILBERT

LEGEND

- DAUPHIN ISLAND, AL (OBSERVED)
- - - DAUPHIN ISLAND, AL (PREDICTED)

