PRELIMINARY DATA SUMMARY

August 1985

U.S. Army Engineer Waterways Experiment Station
Coastal Engineering Research Center
Field Research Facility
Duck, North Carolina

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This report provides a summary of basic oceanographic, meteorological and bottom profile data for the month. The data were obtained as part of the Field Research Facility Measurement and Analysis Work Unit at the U.S. Army Engineer Waterways Experiment Station, Coastal Engineering Research Center's Field Research Facility in Duck, North Carolina. The data were collected and the analyses performed by the FRF staff. These summaries are intended to make the data readily available to all FRF users, and comments on their content and usefulness are invited.

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I. INTRODUCTION

The U.S. Army Engineer Waterways Experiment Station, Coastal Engineering Research Center's (CERC) Field Research Facility (FRF) is located on the Outer Banks of North Carolina, near the village of Duck (Fig.1).

The FRF research program provides a means for obtaining high-quality field data, particularly during storms, in support of the U.S. Army Corps of Engineers' coastal engineering research missions. The FRF consists of a 561-m (1,840 ft) long concrete research pier supported on 0.91 m (3 ft) diameter steel piles. The pier deck is 6.1 m (20 ft) wide, 7.74 m (25.4 ft) above mean sea level (MSL), and extends from behind the dunes to approximately the 7.6 m (25 ft) depth contour. In addition, a main building contains offices, an instrument repair shop, and a data acquisition room.

One of the responsibilities of the FRF research program is the collection, analysis and dissemination of data on local oceanographic and meteorological conditions. Bottom profiles along both sides of the pier and periodic bathymetric surveys are also performed.

This summary is intended to provide basic data as soon as possible after they are obtained. Most of the data are daily observations or the results of preliminary data analysis. In many instances, continuous analog records and more extensive analyses will be made available later by the CERC Coastal Engineering Information and Analysis Center (CEIAC).

Table 1 is a list of instruments used, their status during the month, and the data collection status. Figure 2 identifies the location of the instruments. The water depth at the wave gages and current meters vary and may best be determined from the information contained in Figure 8. Other installation information is contained in Table 1. All times unless otherwise specified are referenced to Eastern Standard Time (EST).

Section II presents the meteorological data; Sections III through VI, oceanographic data; Section VII, nearshore profiles and bathymetry; and Section VIII, if included, documents special events that occurred at the FRF during the month.

Questions and/or comments concerning the data may be directed to Mr. H. Carl Miller at (919) 261-3511.

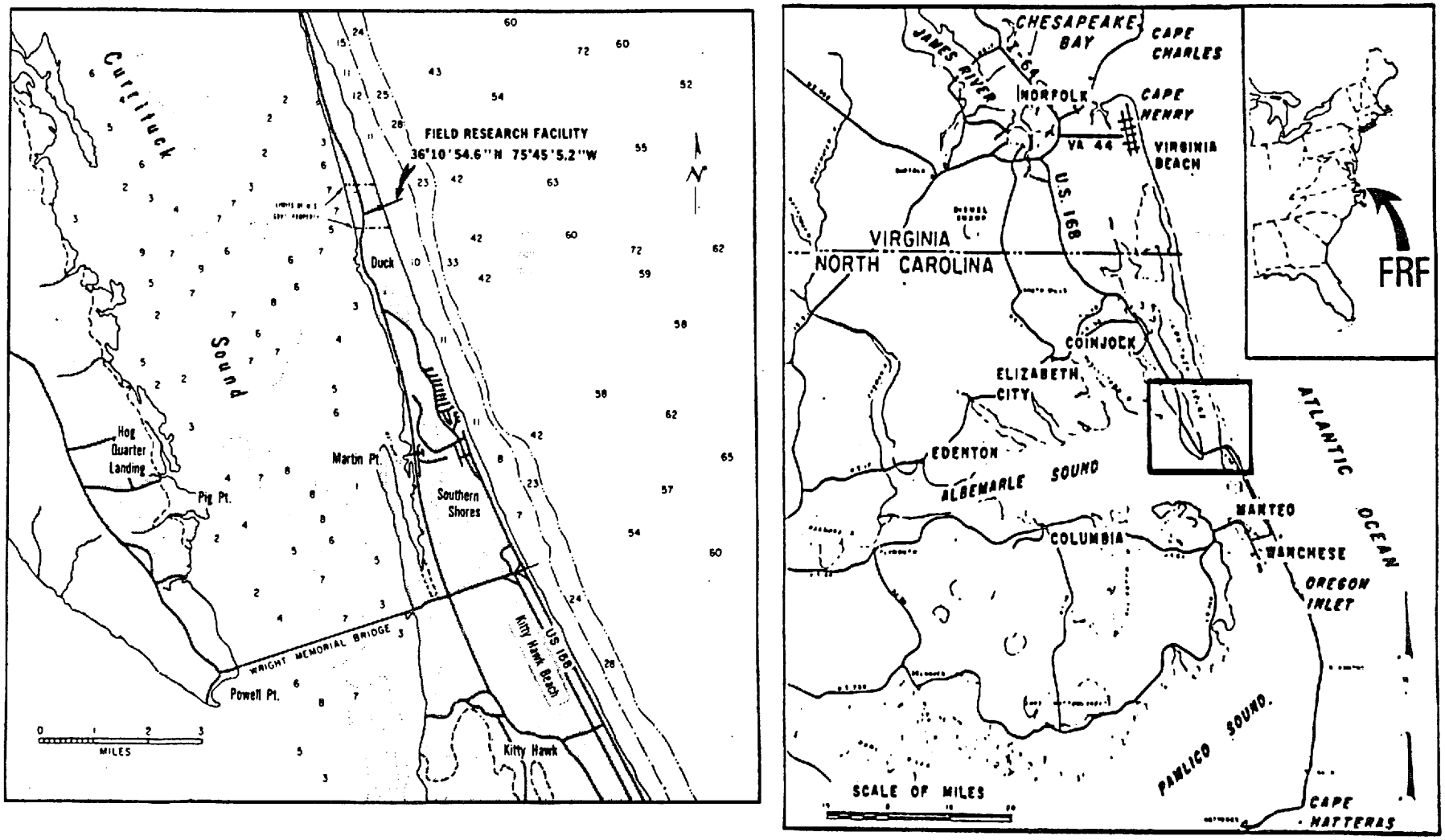


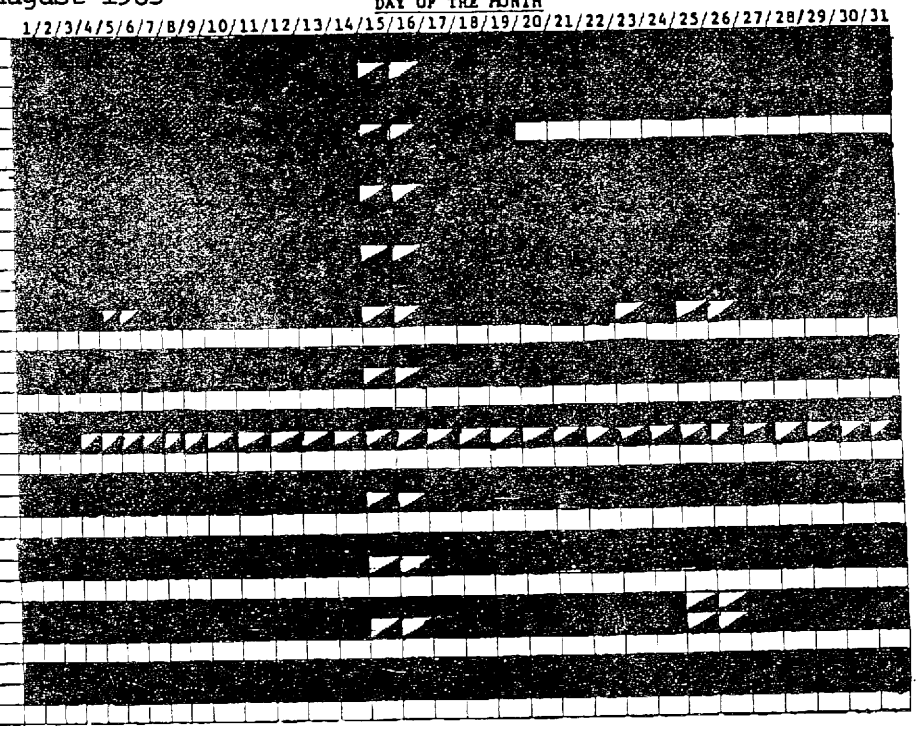
Figure 1. FRF Location Map

TABLE 1
INSTRUMENT STATUS/DATA AVAILABILITY

August 1985

DAY OF THE MONTH

GAGE NUMBER	DESCRIPTION/REMARKS	DEPTH AT SENSOR	
	Barometric Pressure		Instrument Status
			Data Collected
			Analog Record
	Precipitation		Instrument Status
			Data Collected
			Analog Record
	Air Temperature		Instrument Status
			Data Collected
			Maximum/Minimum
	Anemometer on Lab Bldg - Elevation 19m (MSL)		Instrument Status
			Data Collected
			Analog Record
645	Baylor staff located at station 7+80 on FRF pier	See profile data	Instrument Status
			Data Collected
625	Baylor staff located at station 19+00 on FRF pier	See profile data	Instrument Status
			Data Collected
640	Waverider buoy located 1.0 km from shore	Approx. 8.5 m. MSL	Instrument Status
			Data Collected
630	Waverider buoy located 6.0km from shore	Approx. 18 m. MSL	Instrument Status
			Data Collected
639	Current meter at station 14+20 on FRF pier	See profile data	Instrument Status
			Data Collected
679	Current meter 300M south (0.5km offshore)	Approx. 6 m MSL	Instrument Status
			Data Collected
865-1370	NOAA primary tide station located at seaward end of FRF pier		Instrument Status
			Data Collected



Instrument Status: Operational ■ - Daily Observation: YES ■
Data Collected: ALL ■ , SOME ◪

Analog Record: ALL ■ , PARTIAL ◪
Preliminary Analysis: ALL ■ , SOME ◪

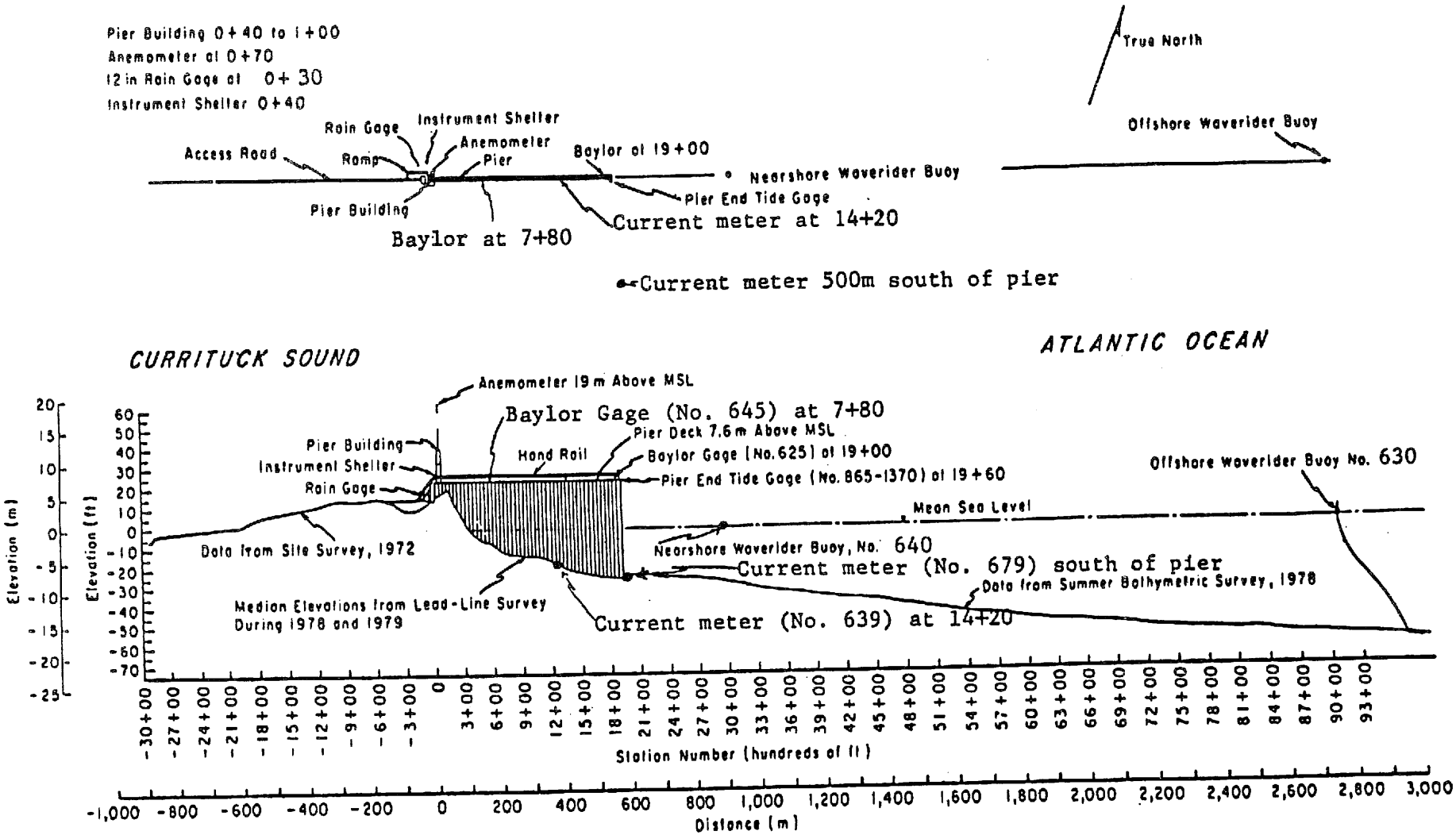


Figure 2. Instrument locations at FRF.

II. METEOROLOGICAL DATA

A variety of instruments have been installed at the FRF (Fig. 2) to monitor the meteorological conditions. The data presented in Table 2 are collected and stored on magnetic tape using a Data General NOVA-4 computer. For each instrument identified in Table 1 as having analog outputs, chart records are obtained, a log is maintained and the records are stored for future reference.

The wind measurements are obtained from a Weather Measure Skyvane located on the FRF laboratory building (Fig. 2), 19.1 m above mean sea level (MSL).

The high and low temperatures are obtained from daily readings of NWS maximum and minimum thermometers and represent the extreme temperature values since the last reading.

The following may be useful for converting the data in Table 2 to other frequently used units of measurement:

1. Millimeters (mm) to inches (in) -
   mm x .03937 = in

2. Millibars (mb) to inches of mercury (in Hg) -
   mb x 0.02953 = in Hg

3. Degrees Celcius (C) to degrees Fahrenheit (F) -
   (C x 9/5) + 32 = F

4. Meters per second (m/s) to knots (kn) -
   m/s x 1.943 = kn

TABLE 2: METEOROLOGICAL DATA

PART 1

AUGUST 1985

DAY	HOUR	WIND SPEED (M/S)	WIND DIRECTION (DEG TN)	TEMPERATURE (DEG C)	ATM PRESSURE (MB)	PRECIPITATION (MM)
1	100	7	225	25.1	1012.0	0
	700	5	237	26.0	1011.4	0
	1300	3	49	24.8	1010.8	0
	1900	9	32	22.9	1010.7	0
2	100	12	35	21.0	1011.9	10
	700	5	45	21.9	1013.0	5
	1300	10	43	23.8	1016.6	0
	1900	10	36	22.3	1018.5	0
3	100	9	39	21.6	1019.8	0
	700	11	38	21.8	1020.9	0
	1300	9	37	23.4	1021.8	0
	1900	7	36	21.8	1021.1	0
4	100	6	51	21.2	1021.0	0
	700	7	42	22.1	1021.3	0
	1300	7	43	24.0	1022.4	0
	1900	7	45	22.5	1021.5	0
5	100	6	123	21.8	1021.5	0
	700	3	11	23.0	1022.1	0
	1300	6	59	25.3	1022.4	0
	1900	5	67	23.1	1021.1	0
6	100	3	72	22.8	1020.9	0
	700	1	44	23.5	1021.3	0
	1300	4	86	27.7	1021.2	0
	1900	6	119	23.9	1020.1	0
7	100	2	149	23.1	1020.2	0
	700	2	171	24.7	1019.8	0
	1300	8	128	28.1	1019.6	0
	1900	4	160	25.0	1017.4	0
8	100	3	163	23.8	1016.3	0
	700	3	177	25.8	1016.0	0
	1300	3	158	26.0	1015.1	0
	1900	1	116	23.3	1014.5	0
9	100	0		22.5	1014.6	0
	700	3	355	23.2	1014.8	0
	1300	3	37	26.8	1015.4	0
	1900	5	46	24.3	1014.1	0
10	100	6	45	24.0	1013.5	0
	700	8	60	24.9	1013.0	0
	1300	7	42	26.2	1012.4	0
	1900	6	42	24.3	1012.5	0
11	100	7	34	24.2	1012.6	0
	700	8	10	25.1	1013.3	0
	1300	8	5	27.0	1015.1	0
	1900	5	40	24.4	1014.5	0
12	100	1	32	22.7	1015.6	0
	700	3	264	25.2	1016.6	0
	1300	3	69	30.1	1017.1	0
	1900	3	73	25.1	1017.4	0
13	100	3	79	24.4	1018.6	0
	700	4	109	24.7	1019.2	0
	1300	5	134	28.6	1019.9	0
	1900	6	135	26.5	1018.8	0
14	100	4	186	26.0	1019.8	0
	700	5	254	25.7	1019.5	0
	1300	3	221	31.7	1019.8	0
	1900	4	199	27.8	1018.7	0
15	100	5	235	26.0	1018.5	0
	700	5	260	26.7	1018.8	0
	1300	4	232	31.3	1017.8	0
	1900				1016.5	0
16	100				1016.5	0
	700	8	243	25.7	1016.8	0
	1300	5	241	31.1	1015.5	0
	1900	7	9	25.5	1015.1	0

TABLE 2: METEOROLOGICAL DATA PART 2

AUGUST 1985

DAY	HOUR	WIND SPEED (M/S)	WIND DIRECTION (DEG TN)	TEMPERATURE (DEG C)	ATM PRESSURE (MB)	PRECIPITATION (MM)
17	100	5	221	25.3	1015.7	0
	700	3	332	24.9	1016.2	0
	1300	4	56	27.9	1017.2	0
	1900	5	60	24.9	1016.9	0
18	100	5	73	24.6	1016.4	0
	700	4	144	23.6	1016.0	0
	1300	6	137	25.3	1015.3	0
	1900	5	169	25.5	1013.5	0
19	100	6	175	26.2	1012.7	0
	700	4	231	24.7	1013.2	0
	1300	6	11	27.5	1014.4	0
	1900	5	38	25.2	1014.2	0
20	100	4	56	25.1	1015.1	0
	700	6	72	25.5	1016.0	0
	1300	6	57	26.0	1016.3	0
	1900	6	53	25.0	1015.0	0
21	100	4	336	24.0	1015.0	0
	700	5	303	22.9	1015.8	0
	1300	3	53	26.0	1014.5	0
	1900	4	40	24.6	1014.4	0
22	100	3	280	22.7	1015.0	15
	700	8	32	23.2	1015.4	0
	1300	5	27	24.9	1016.2	0
	1900	7	22	23.3	1016.5	0
23	100	4	31	23.1	1017.6	0
	700	6	17	23.7	1018.8	0
	1300	5	15	24.4	1020.4	0
	1900	4	57	22.7	1019.7	0
24	100	0		18.4	1020.1	0
	700	2	290	22.9	1020.3	0
	1300	4	103	26.4	1020.3	0
	1900	6	133	23.9	1018.2	0
25	100	3	159	23.4	1017.7	0
	700	4	193	25.5	1018.2	0
	1300	7	178	28.4	1017.8	0
	1900	5	186	25.7	1018.1	0
26	100	4	197	24.9	1019.3	0
	700	7	231	25.6	1021.4	0
	1300	5	202	30.4	1022.2	0
	1900	8	207	28.1	1022.0	0
27	100	6	229	25.7	1023.8	0
	700	5	222	24.9	1024.7	0
	1300	7	243	29.5	1024.2	0
	1900	3	254	27.5	1023.0	0
28	100	0		23.7	1023.4	0
	700	4	292	24.9	1023.5	0
	1300	2	55	27.6	1023.6	0
	1900	2	57	24.7	1021.9	0
29	100	2	237	23.4	1022.4	0
	700	3	289	24.2	1022.2	0
	1300	3	89	29.3	1021.0	0
	1900	4	167	25.5	1019.9	0
30	100	6	236	25.4	1018.5	0
	700	5	221	24.8	1017.8	0
	1300	8	213	29.8	1014.9	0
	1900	10	221	24.0	1012.7	0
31	100	7	233	23.4	1011.1	0
	700	6	286	22.0	1012.3	0
	1300	6	354	23.9	1014.2	0
	1900	6	55	23.0	1016.1	0

III. WAVE DATA

Wave data were collected from two Baylor staff gages (CERC gage Nos. 625 and 645) and Waverider buoys (CERC gage Nos. 630 and 640, Table 1 and Figure 2). The data were collected, analyzed, and stored on magnetic tape using a Data General NOVA-4 computer.

The NOVA-4 is programmed to sample the wave gages every 6 hours near 0100, 0700, 1300, and 1900 EST at a sampling rate of four times per second, collecting data in 20- minute records.

Wave height (Hmo) is an energy-based statistic equal to four times the standard deviation of the sea surface elevations. The wave period is identified from the computation of a variance (energy) spectrum using a Fast Fourier Transform of 4096 data points (1024 sec). The period (Tp) is that associated with the maximum energy density in the spectrum. When this analysis is complete, the data are written to magnetic tape and entered into the CERC data base.

Table 3 presents the wave heights and periods for each wave record obtained during the month. The monthly means shown in Table 3 are an average of the values computed for all data records collected. The monthly standard deviations are standard deviations from the monthly mean of values for each record.

Figure 3 is a time history of the Hmo and Tp values for the Waverider 6 km from shore (630) and the Baylor gage at pier station 19+00 (625).

Differences in wave periods between wave gages (Table 4 and Figure 3) may be due to wave breaking or reformation, or the presence of multiple wave trains containing nearly equal energy.

TABLE 3: WAVE DATA PART 2

AUGUST 1985

GAGE		645 Baylor at 7+80		625 Baylor at 19+00		640 Nearshr Wvrdr		630 Farshr Wvrdr	
DAY	TIME	Hmo(m)	T(sec)	Hmo(m)	T(sec)	Hmo(m)	T(sec)	Hmo(m)	T(sec)
17	1	.24	9.75	.33	9.75	**		.39	9.75
	7	.24	8.83	.29	8.83	.33	9.75	.39	9.75
	13	.33	9.75	.38	8.83	.39	8.83	.37	9.75
	19	.48	8.83	.56	2.95	**		.70	4.53
18	1	.62	4.53	.84	5.02			.85	4.76
	7	.53	8.83	.63	4.76	.85	9.75	.77	8.83
	13	.56	3.51	.74	5.31	.92	3.38	.77	5.31
	19	.58	5.31	.71	3.95	**		.79	8.83
19	1	.57	5.31	.76	5.31			.94	4.32
	7	.69	5.99	.71	5.99	.79	6.40	1.07	5.99
	13	.45	6.87	.57	7.42	.60	9.75	.67	6.40
	19	.51	7.42	.56	8.83	**		.65	7.42
20	1	.45	16.79	.55	8.06			.67	8.83
	7	.52	4.76	.64	7.42	.77	3.64	.75	7.42
	13	.52	2.95	.61	2.86	.76	3.15	.68	3.51
	19	.51	8.06	.72	4.53	**		.82	5.99
21	1	.49	8.06	.61	7.42			.78	8.06
	7	.57	7.42	.71	7.42	.92	6.87	.88	6.87
	13	.48	6.40	.60	3.95	.77	6.40	.68	6.87
	19	.43	4.76	.59	4.32	**		.68	7.42
22	1	.53	4.32	.68	4.53			.79	4.53
	7	.75	5.02	1.04	4.32	1.09	4.53	1.19	5.02
	13	.76	5.31	.88	6.40	.96	5.99	.98	5.02
	19	.63	8.06	.84	8.06	**		.94	6.87
23	1	.58	8.06	.79	7.42			.92	5.31
	7	.63	7.42	.86	7.42	.92	8.83	.86	8.06
	13	.58	3.95	.75	8.83	.93	8.83	.85	8.06
	19	*		.64	6.87	**		.70	8.06
24	1	.46	8.83	.68	8.06			.77	7.42
	7	.49	8.83	.65	8.83	.72	9.75	.78	8.83
	13	.53	8.83	.49	8.06	.68	8.83	.71	8.83
	19	.45	9.75	.54	9.75	**		.71	8.06
25	1	.44	8.83	.44	8.83			.79	16.79
	7	.47	16.79	.50	16.79	.66	16.79	.68	8.83
	13			.79	16.79	.94	16.79	.80	8.06
	19	*		.84	16.79	**		.85	16.79
26	1			.77	16.79			.76	16.79
	7			.77	16.79	.71	16.79	.78	16.79
	13	.56	16.79	.69	14.22	.72	14.22	.72	16.79
	19	.60	14.22	.54	14.22	**		.82	16.79
27	1	.49	16.79	.57	14.22			.66	14.22
	7	.40	14.22	.50	14.22	.58	14.22	.66	16.79
	13	.44	14.22	.56	14.22	.59	14.22	.60	14.22
	19	.50	14.22	.42	14.22	**		.57	14.22
28	1	.49	14.22	.64	14.22			.58	14.22
	7	.34	14.22	.46	14.22	.58	14.22	.58	14.22
	13	.35	14.22	.47	14.22	.49	14.22	.51	14.22
	19	.37	14.22	.44	14.22	**		.51	12.34
29	1	.33	14.22	.49	12.34			.55	14.22
	7	.39	14.22	.45	12.34	.65	14.22	.56	14.22
	13	.42	14.22	.57	14.22	.73	12.34	.61	8.83
	19	.58	8.83	.58	8.83	**		.68	10.89
30	1	.44	9.75	.55	9.75			.66	9.75
	7	.43	9.75	.45	9.75	.52	8.83	.59	8.83
	13	.40	9.75	.47	9.75	.55	8.83	.66	8.83
	19	.46	8.83	.49	9.75	**		.82	9.75
31	1	.24	10.89	.34	8.83			.49	8.06
	7	.30	6.87	.36	9.75	.39	8.83	.47	9.75
	13	.52	3.79	.36	12.34	.77	3.95	.77	3.79
	19	.67	5.02	.36	5.02	.80	4.53	.85	4.76
	MEAN	.54	8.37	.74	8.87	.91	8.77	.86	8.57
	STD	.22	3.38	.33	3.04	.42	3.01	.35	3.11

*=Electronic problem.
**=Unknown signal interference.

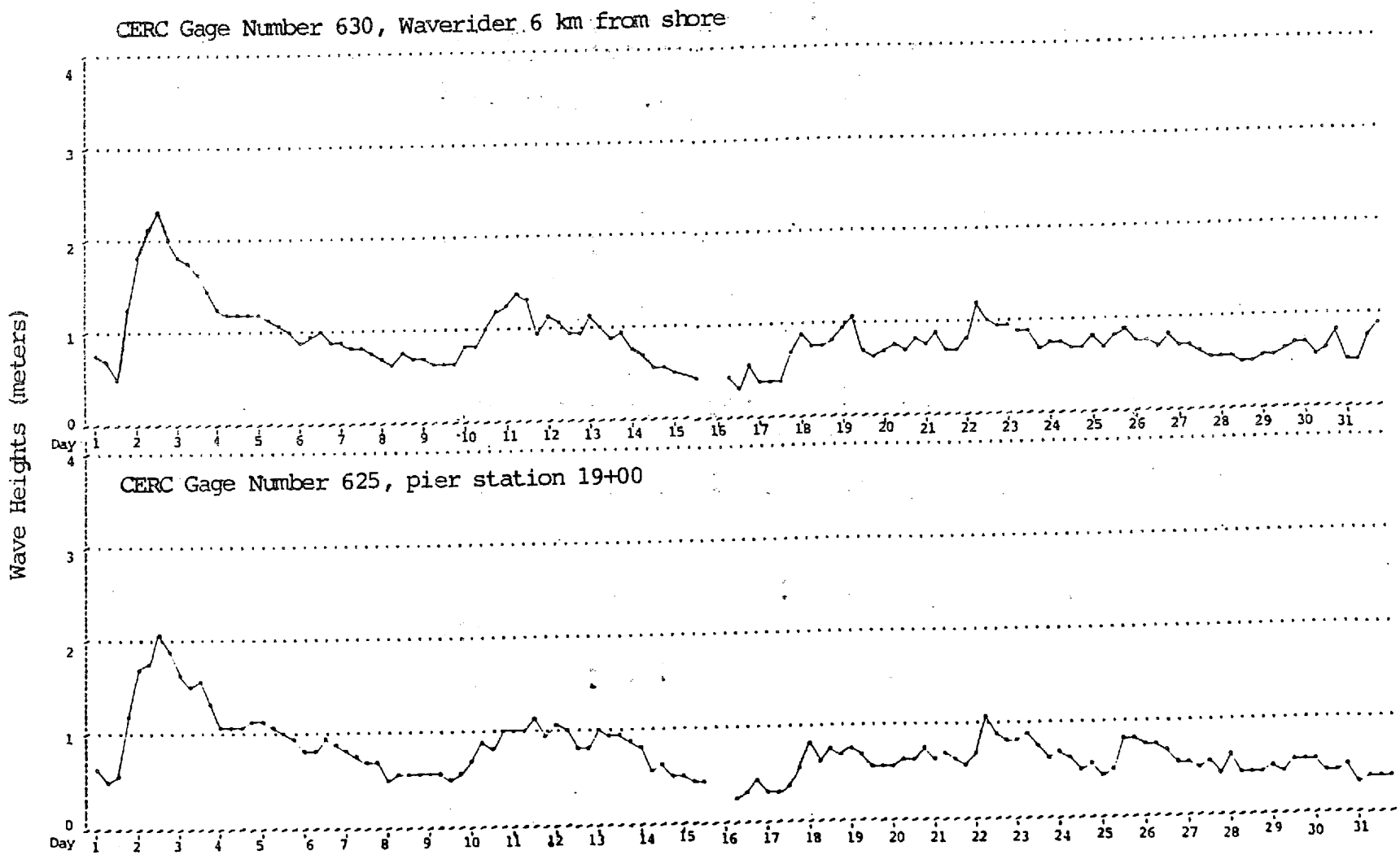


FIGURE 3. Time History of Wave Heights and Periods - August 1985 Part I: Heights

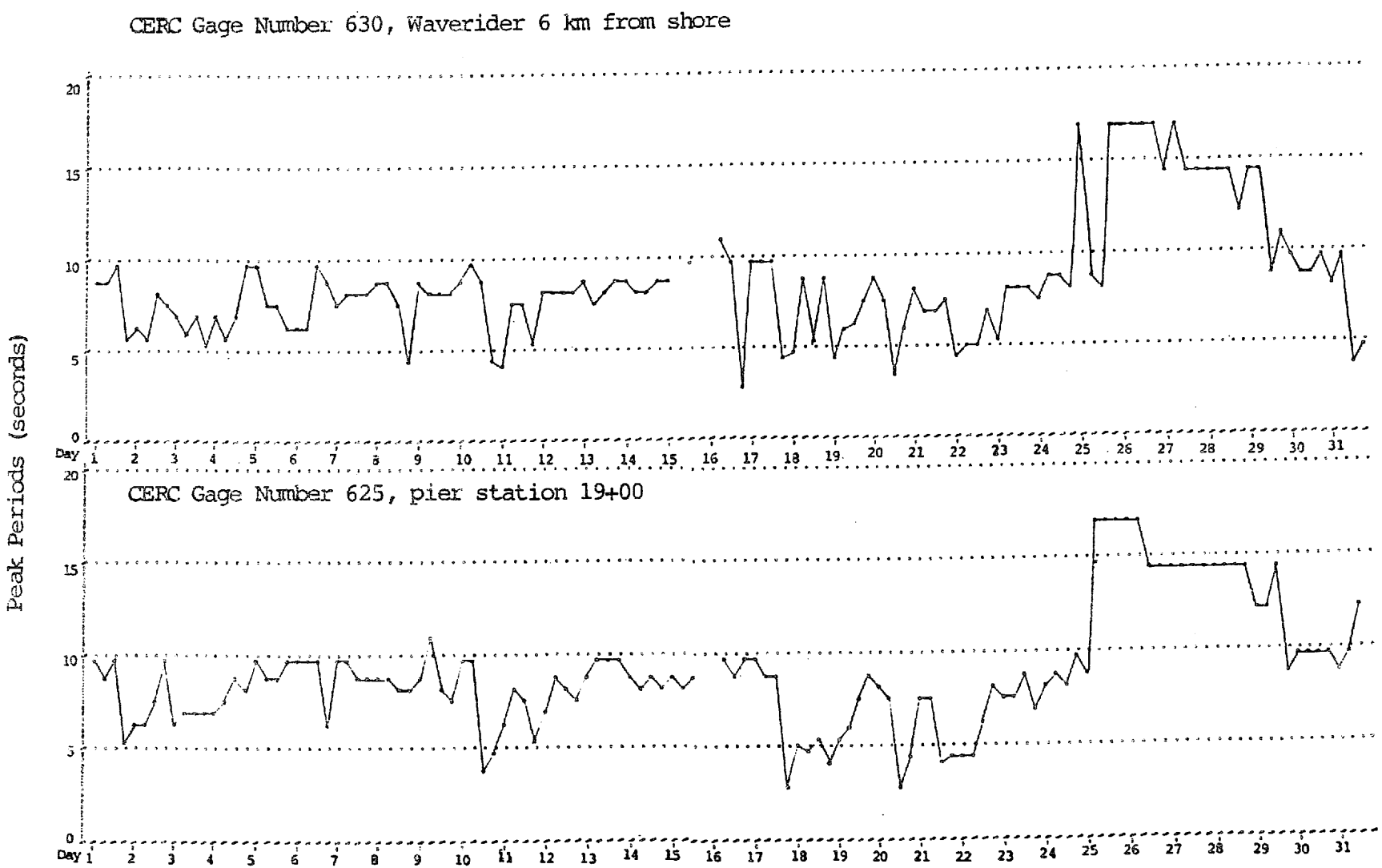


FIGURE 3. Time History of Wave Heights and Periods - August 1985 Part II: Periods

IV. CURRENT DATA

Current data (Table 4) are collected from two Marsh-McBirney electromagnetic biaxial current meters (Table 1 and Figure 2) and by visually observing the movement of dye on the water surface in the surf and at the seaward end of the pier, as well as 500 m updrift of the pier 12 m offshore.

Since the shoreline orientation is approximately N20W, alongshore currents flow either toward 340 (i.e. northward) or toward 160 (i.e. southward). Similarly, cross-shore currents are either onshore (westward) or offshore (eastward).

All current speeds are given in centimeters per second.

TABLE 4: CURRENT DATA
(SPEEDS IN CM/SEC)
August 1985

		PIER MEASUREMENTS								BEACH MEASUREMENTS (500 UPDRIFT)				
		DYE AT 19+00 (579m) (SURFACE)		CURRENT METER AT 14+20 (433m) I.D.#639 (DEPTH -4.2m MSL)		DYE AT MID-SURF ZONE (SURFACE) DIST. FROM				DYE 12M OFFSHORE (SURFACE)			CURRENT METER AT SOUTH TRIPOD (DEPTH -4.8m MSL) I.D.#679	
DAY	TIME	SPEED	DIR	SPEED	DIR	BASELINE(M)	SPEED	DIR		LOCATION	SPEED	DIR	SPEED	DIR
1	0100-Alongshore			3	N								2	N
	Cross-shore			0									0	
	Resultant			3	340								2	340
1	0700-Alongshore	2	N	3	N		36	N			60	N	0	
	Cross-shore	8	Off	0		128	13	Off		South			1	ON
	Resultant	8	57	3	340		38	359					1	250
1	1300-Alongshore			1	S								10	S
	Cross-shore			0									0	
	Resultant			1	160								10	160
1	1900-Alongshore			3	S								20	S
	Cross-shore			3	ON								4	ON
	Resultant			4	201								21	172
2	0100-Alongshore			4	S								25	S
	Cross-shore			3	ON								10	ON
	Resultant			5	194								27	181
2	0700-Alongshore	38	S	5	S		76	S			6	S	27	S
	Cross-shore	19	On	5	ON	237	38	On		North			12	ON
	Resultant	43	186	7	206		85	187					30	184
2	1300-Alongshore			6	S								27	S
	Cross-shore			1	ON								13	ON
	Resultant			7	171								30	186
2	1900-Alongshore			5	S								25	S
	Cross-shore			6	ON								12	ON
	Resultant			8	212								28	184
3	0100-Alongshore			4	S								25	S
	Cross-shore			4	ON								13	ON
	Resultant			6	205								28	187
3	0700-Alongshore	36	S	4	S		55	S			63	S	20	S
	Cross-shore	0	0	3	ON	201	41	On		North			9	ON
	Resultant	36	160	5	202		69	197					22	184
3	1300-Alongshore			5	S								22	S
	Cross-shore			5	ON								12	ON
	Resultant			8	204								25	187
3	1900-Alongshore			1	S								14	S
	Cross-shore			2	ON								9	ON
	Resultant			3	224								16	193
4	0100-Alongshore			1	S								18	S
	Cross-shore			2	ON								10	ON
	Resultant			2	219								21	190
4	0700-Alongshore	23	S	0			61	S			15	S	11	S
	Cross-shore	7	On	1	ON	150	0	0		North			5	ON
	Resultant	24	143	1	250		61	160					12	182
4	1300-Alongshore			2	S								17	S
	Cross-shore			2	ON								6	ON
	Resultant			3	209								18	180
4	1900-Alongshore			1	N								12	S
	Cross-shore			2	ON								8	ON
	Resultant			2	274								14	194
5	0100-Alongshore			2	N								11	S
	Cross-shore			1	ON								4	ON
	Resultant			2	312								12	180
5	0700-Alongshore	0	0	5	N		23	N			35	N	3	N
	Cross-shore	0	0	1	ON	140	0	0		South			3	OF
	Resultant	0	0	5	329		23	340					4	31
5	1300-Alongshore			2	N								11	S
	Cross-shore			1	ON								3	ON
	Resultant			2	308								12	177
5	1900-Alongshore			4	N								0	
	Cross-shore			1	ON								1	ON
	Resultant			4	332								1	250
6	0100-Alongshore			2	N								0	
	Cross-shore			1	ON								1	OF
	Resultant			2	309								1	70
6	0700-Alongshore	11	N	4	N		44	N			52	N	5	N
	Cross-shore	3	On	1	ON	140	0	0		South			3	OF
	Resultant	11	323	4	333		44	340					6	12
6	1300-Alongshore			5	N								0	
	Cross-shore			1	OF								1	OF
	Resultant			5	350								1	70
6	1900-Alongshore			4	N								3	S
	Cross-shore			1	OF								2	ON
	Resultant			4	347								3	199

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TABLE 4: CURRENT DATA
(SPEEDS IN CM/SEC)

		PIER MEASUREMENTS								BEACH MEASUREMENTS (500 UPDRIFT)				
		DYE AT 19+00 (579m) (SURFACE)		CURRENT METER AT 14+20 (433m) I.D.#639 (DEPTH -4.2m MSL)		DYE AT MID-SURF ZONE (SURFACE) DIST. FROM				DYE 12M OFFSHORE (SURFACE)			CURRENT METER AT SOUTH TRIPOD (DEPTH -4.8m MSL) I.D.#679	
DAY	TIME	SPEED	DIR	SPEED	DIR	BASELINE(M)	SPEED	DIR	LOCATION	SPEED	DIR	SPEED	DIR
7	0100-Alongshore			11	N							1	N
	Cross-shore			1	ON							0	
	Resultant			11	337							1	340
7	0700-Alongshore	28	N	17	N		25	N		31	N	2	N
	Cross-shore	0	0	0		140	0	0	South			1	OF
	Resultant	27	340	17	340		25	340				2	357
7	1300-Alongshore			18	N							1	S
	Cross-shore			0								0	
	Resultant			18	340							1	160
7	1900-Alongshore			18	N							10	N
	Cross-shore			1	ON							3	OF
	Resultant			18	338							10	358
8	0100-Alongshore			19	N							7	N
	Cross-shore			1	ON							2	OF
	Resultant			19	337							7	0
8	0700-Alongshore	30	N	20	N		28	N		28	N	6	N
	Cross-shore	5	Off	1	ON	149	7	Off	South			2	OF
	Resultant	31	349	20	338		29	354				6	356
8	1300-Alongshore			11	N							3	N
	Cross-shore			1	ON							1	OF
	Resultant			11	335							3	348
8	1900-Alongshore			9	N							3	N
	Cross-shore			1	ON							2	OF
	Resultant			9	336							4	19
9	0100-Alongshore			19	S							2	N
	Cross-shore			1	ON							3	OF
	Resultant			19	162							4	28
9	0700-Alongshore	3	N	18	S		41	N		23	N	2	N
	Cross-shore	5	On	1	ON	140	0	0	South			1	OF
	Resultant	5	280	18	163		41	340				3	7
9	1300-Alongshore			14	S							0	
	Cross-shore			4	OF							7	OF
	Resultant			14	143							7	70
9	1900-Alongshore			16	S							5	N
	Cross-shore			1	ON							4	OF
	Resultant			16	164							6	22
10	0100-Alongshore			16	S							3	N
	Cross-shore			1	ON							4	OF
	Resultant			16	162							5	32
10	0700-Alongshore	4	S	16	S		9	N		37	S	3	S
	Cross-shore	3	On	2	ON	152	2	On	North			1	ON
	Resultant	5	197	16	166		10	326				4	182
10	1300-Alongshore			15	S							5	S
	Cross-shore			1	ON							0	
	Resultant			15	164							5	160
10	1900-Alongshore			19	S							17	S
	Cross-shore			7	ON							8	ON
	Resultant			20	180							19	184
11	0100-Alongshore			19	S							14	S
	Cross-shore			1	ON							6	ON
	Resultant			19	163							15	181
11	0700-Alongshore	34	S	18	S		55	N		45	N	16	S
	Cross-shore	0	0	6	ON	149	0	0	South			4	ON
	Resultant	34	160	19	178		55	340				17	174
11	1300-Alongshore			18	S							11	S
	Cross-shore			1	ON							10	ON
	Resultant			18	163							14	202
11	1900-Alongshore			23	S							14	S
	Cross-shore			1	ON							8	ON
	Resultant			23	164							16	190
12	0100-Alongshore			20	S							2	S
	Cross-shore			1	ON							3	ON
	Resultant			20	163							4	214
12	0700-Alongshore	10	S	21	S		61	N		86	N	5	S
	Cross-shore	6	On	6	ON	141	21	On	South			3	ON
	Resultant	11	191	22	177		65	321				5	191
12	1300-Alongshore			20	S							2	S
	Cross-shore			1	ON							0	
	Resultant			20	163							2	160
12	1900-Alongshore			20	S							1	N
	Cross-shore			2	ON							0	
	Resultant			20	167							1	340

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TABLE 4: CURRENT DATA
(SPEEDS IN CM/SEC)

		PIER MEASUREMENTS								BEACH MEASUREMENTS (500 UPDRIFT)				
		DYE AT 19400 (579m) (SURFACE)		CURRENT METER AT 14420(433m) I.D.#639 (DEPTH -4.2m MSL)		DYE AT MID-SURF ZONE (SURFACE) DIST. FROM BASELINE(M)				DYE 12M OFFSHORE (SURFACE)			CURRENT METER AT SOUTH TRIPOD (DEPTH -4.8m MSL) I.D.#679	
DAY	TIME	SPEED	DIR	SPEED	DIR		SPEED	DIR	LOCATION	SPEED	DIR	SPEED	DIR
13	0100-Alongshore			19	S							4	N
	Cross-shore			1	ON							1	OF
	Resultant			19	164							4	356
13	0700-Alongshore	9	N	19	S		122	N		55	N	3	S
	Cross-shore	0	0	1	ON	140	43	On	South			3	ON
	Resultant	9	340	19	164		129	321				4	202
13	1300-Alongshore			5	S							4	N
	Cross-shore			1	ON							1	OF
	Resultant			5	167							4	354
13	1900-Alongshore			2	S							6	N
	Cross-shore			1	OF							3	OF
	Resultant			3	133							7	8
14	0100-Alongshore			2	S							7	N
	Cross-shore			1	ON							4	OF
	Resultant			2	177							7	8
14	0700-Alongshore	7	N	1	S		51	N		2	N	4	N
	Cross-shore	2	Off	0		130	69	Off	South			4	OF
	Resultant	8	357	1	160		85	33				5	22
14	1300-Alongshore			7	N							7	N
	Cross-shore			1	OF							7	OF
	Resultant			7	352							10	24
14	1900-Alongshore			8	N							8	N
	Cross-shore			2	OF							4	OF
	Resultant			9	350							8	5
15	0100-Alongshore			9	N							6	N
	Cross-shore			2	OF							3	OF
	Resultant			10	350							6	7
15	0700-Alongshore	10	N	9	N		38	N		33	N	1	N
	Cross-shore	3	Off	1	ON	130	2	Off	South			0	
	Resultant	11	357	9	335		38	343				1	340
15	1300-Alongshore			10	N							5	N
	Cross-shore			0								5	OF
	Resultant			10	340							7	27
15	1900-Alongshore												
	Cross-shore												
	Resultant												
16	0100-Alongshore												
	Cross-shore												
	Resultant												
16	0700-Alongshore	8	S	10	N		12	N		2	N	3	N
	Cross-shore	8	Off	0		126	7	Off	South			2	OF
	Resultant	10	25	10	340		14	11				4	8
16	1300-Alongshore			7	N							6	N
	Cross-shore			0								2	OF
	Resultant			7	340							7	2
16	1900-Alongshore			11	N							9	N
	Cross-shore			5	OF							10	OF
	Resultant			12	7							13	27
17	0100-Alongshore			10	N							3	N
	Cross-shore			1	ON							2	OF
	Resultant			10	337							3	7
17	0700-Alongshore	11	S	10	N		6	S		4	S	3	S
	Cross-shore	6	On	1	OF	125	1	On	North			0	
	Resultant	13	187	10	343		6	169				3	160
17	1300-Alongshore			9	N							3	S
	Cross-shore			4	OF							3	OF
	Resultant			10	1							4	114
17	1900-Alongshore			11	N							5	N
	Cross-shore			0								2	OF
	Resultant			11	340							5	2
18	0100-Alongshore			10	N							2	S
	Cross-shore			0								0	
	Resultant			10	340							2	160
18	0700-Alongshore	30	S	11	N		24	S		10	N	6	S
	Cross-shore	0	0	0		183	0	0	North			2	OF
	Resultant	30	160	11	340		24	160				7	139
18	1300-Alongshore			10	N							3	S
	Cross-shore			3	ON							1	OF
	Resultant			10	324							3	146
18	1900-Alongshore			10	N							2	N
	Cross-shore			3	ON							1	ON
	Resultant			10	323							2	304

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TABLE 4: CURRENT DATA
(SPEEDS IN CM/SEC)

		PIER MEASUREMENTS								BEACH MEASUREMENTS (500 UPDRIFT)			CURRENT METER AT SOUTH TRIPOD (DEPTH -4.8m MSL) I.D.#679	
		DYE AT 19+00 (579m) (SURFACE)		CURRENT METER AT 14+20(433m) I.D.#639 (DEPTH -4.2m MSL)		DYE AT MID-SURF ZONE (SURFACE) DIST. FROM				DYE 12M OFFSHORE (SURFACE)				
DAY	TIME	SPEED	DIR	SPEED	DIR	BASELINE(M)	SPEED	DIR	LOCATION	SPEED	DIR	SPEED	DIR
19	0100-Alongshore			10	N							1	N
	Cross-shore			0								0	
	Resultant			10	340							1	340
19	0700-Alongshore	5	N	11	N		38	N		19	N	4	N
	Cross-shore	10	Off	1	OF	119	15	Off	South			3	OF
	Resultant	11	43	11	345		41	2				5	18
19	1300-Alongshore			8	N							1	S
	Cross-shore			0								1	OF
	Resultant			8	340							2	121
19	1900-Alongshore			11	N							2	N
	Cross-shore			1	ON							3	OF
	Resultant			11	335							4	38
20	0100-Alongshore			11	N							1	N
	Cross-shore			1	ON							0	
	Resultant			11	334							1	340
20	0700-Alongshore	5	N	10	N		30	N		16	N	3	N
	Cross-shore	0	0	1	ON	125	0	0	South			2	OF
	Resultant	5	340	10	334		30	340				4	12
20	1300-Alongshore			8	N							1	S
	Cross-shore			3	ON							0	
	Resultant			8	322							1	160
20	1900-Alongshore			11	N							2	N
	Cross-shore			2	ON							1	OF
	Resultant			11	330							2	1
21	0100-Alongshore			10	N							2	S
	Cross-shore			4	ON							1	ON
	Resultant			11	321							2	197
21	0700-Alongshore	22	S	11	N		44	N		9	N	0	
	Cross-shore	0	0	2	ON	128	13	E	South			0	
	Resultant	22	160	11	328		45	357				1	0
21	1300-Alongshore			3	S							6	S
	Cross-shore			2	ON							0	
	Resultant			4	192							6	160
21	1900-Alongshore			10	N							4	S
	Cross-shore			3	ON							2	ON
	Resultant			11	323							5	190
22	0100-Alongshore			10	N							4	S
	Cross-shore			5	ON							2	ON
	Resultant			11	315							4	191
22	0700-Alongshore	23	S	10	N		76	1		40	S	4	S
	Cross-shore	5	On	4	ON	126	0	0	North			2	ON
	Resultant	23	171	11	318		76	157				4	183
22	1300-Alongshore			8	N							3	S
	Cross-shore			4	ON							2	ON
	Resultant			9	316							4	189
22	1900-Alongshore			10	N							1	S
	Cross-shore			3	ON							1	ON
	Resultant			10	326							1	198
23	0100-Alongshore			10	N							3	S
	Cross-shore			4	ON							2	ON
	Resultant			10	318							3	195
23	0700-Alongshore	21	S	10	N		11	S		130	S	1	S
	Cross-shore	0	0	3	ON	136	18	E	North			0	
	Resultant	29	160	10	320		21	102				1	160
23	1300-Alongshore			9	N							3	S
	Cross-shore			4	ON							1	ON
	Resultant			10	316							3	179
23	1900-Alongshore			9	N							1	S
	Cross-shore			1	ON							0	
	Resultant			9	336							2	160
24	0100-Alongshore			9	N							1	S
	Cross-shore			2	ON							0	
	Resultant			9	327							1	160
24	0700-Alongshore	17	S	9	N		20	N		83	N	0	
	Cross-shore	2	W	4	ON	152	3	W	South			1	OF
	Resultant	18	166	10	314		21	331				1	70
24	1300-Alongshore			8	N							0	
	Cross-shore			1	ON							2	OF
	Resultant			8	330							2	70
24	1900-Alongshore			9	N							3	N
	Cross-shore			2	ON							2	OF
	Resultant			9	329							4	18

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TABLE 4: CURRENT DATA
(SPEEDS IN CM/SEC)

		PIER MEASUREMENTS								BEACH MEASUREMENTS (500 UPDRIFT)				
		DYE AT 19+00 (579m) (SURFACE)		CURRENT METER AT 14+20(433m) I.D.#639 (DEPTH -4.2m MSL)		DYE AT MID-SURF ZONE (SURFACE) DIST. FROM BASELINE(M)				DYE 12M OFFSHORE (SURFACE)			CURRENT METER AT SOUTH TRIPOD (DEPTH -4.8m MSL) I.D.#679	
DAY	TIME	SPEED	DIR	SPEED	DIR		SPEED	DIR	LOCATION	SPEED	DIR	SPEED	DIR
25	0100-Alongshore			8	N							4	N
	Cross-shore			2	ON							2	OF
	Resultant			9	329							5	11
25	0700-Alongshore	21	N	6	N		87	2		72	N	4	N
	Cross-shore	5	E	2	ON	137	0	0	South			3	OF
	Resultant	22	354	6	324		87	342				6	17
25	1300-Alongshore			1	S							200	N
	Cross-shore			1	ON							4	OF
	Resultant			1	193							200	341
25	1900-Alongshore			1	S								
	Cross-shore			1	ON								
	Resultant			1	209								
26	0100-Alongshore			1	S								
	Cross-shore			0									
	Resultant			1	160								
26	0700-Alongshore	0	0	1	S		61	N		36	N		
	Cross-shore	25	E	1	ON	130	6	E	South				
	Resultant			2	216		61	346					
26	1300-Alongshore			1	S								
	Cross-shore			0									
	Resultant			1	160								
26	1900-Alongshore			1	S							11	N
	Cross-shore			1	OF							5	OF
	Resultant			1	106							12	6
27	0100-Alongshore			1	S							7	N
	Cross-shore			0								3	OF
	Resultant			1	160							8	1
27	0700-Alongshore	3	N	1	S		76	N		55	N	2	N
	Cross-shore	6	E	1	ON	130	30	E	South			0	
	Resultant	7	45	1	199		82	2				2	340
27	1300-Alongshore			1	S							11	N
	Cross-shore			0								4	OF
	Resultant			1	160							12	0
27	1900-Alongshore			1	S							8	N
	Cross-shore			1	OF							3	OF
	Resultant			1	116							8	4
28	0100-Alongshore			1	S							6	N
	Cross-shore			1	ON							2	OF
	Resultant			1	190							6	2
28	0700-Alongshore	0	0	1	S		55	N		13	N	0	
	Cross-shore	0	0	2	ON	140	0	0	South			1	ON
	Resultant	0	0	2	225		55	340				1	250
28	1300-Alongshore			1	S							5	N
	Cross-shore			0								4	OF
	Resultant			1	160							6	17
28	1900-Alongshore			1	S							6	S
	Cross-shore			3	ON							5	ON
	Resultant			3	237							8	201
29	0100-Alongshore			1	S							3	S
	Cross-shore			3	ON							1	OF
	Resultant			3	238							3	146
29	0700-Alongshore	38	S	1	S		68	N		3	N	6	S
	Cross-shore	0	0	2	ON	136	0	0	South			5	ON
	Resultant	16	160	2	228		68	340				8	196
29	1300-Alongshore			1	S							7	S
	Cross-shore			2	ON							2	ON
	Resultant			2	233							7	179
29	1900-Alongshore			1	S							0	
	Cross-shore			2	ON							1	ON
	Resultant			2	231							1	250
30	0100-Alongshore			1	S							6	N
	Cross-shore			1	ON							1	OF
	Resultant			1	213							6	350
30	0700-Alongshore	18	N	1	S		30	N		44	N	9	N
	Cross-shore	9	E	1	ON	123	177	E	South			1	OF
	Resultant	20	7	1	213		179	60				9	348
30	1300-Alongshore			1	S							14	N
	Cross-shore			1	ON							0	
	Resultant			1	211							14	340
30	1900-Alongshore			1	S							16	N
	Cross-shore			3	OF							2	OF
	Resultant			3	88							17	348
31	0100-Alongshore			1	S							11	N
	Cross-shore			1	ON							1	OF
	Resultant			1	207							11	344
31	0700-Alongshore	5	S	1	S		25	N		26	N	4	N
	Cross-shore	3	E	2	ON	128	6	E	South			1	OF
	Resultant	6	129	2	226		26	354				4	353
31	1300-Alongshore			1	S							11	S
	Cross-shore			3	ON							1	ON
	Resultant			3	236							11	166
31	1900-Alongshore			1	S							2	N
	Cross-shore			1	ON							5	OF
	Resultant			1	201							5	47

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SUPPLEMENTAL OBSERVATIONS
August 1985

DAY	TIME	WAVE APPROACH ANGLE AT PIER END (° from True N) PRIMARY	SECONDARY	RADAR WAVE ANGLE (° from True N)	WIDTH OF SURF ZONE (M)	WATER CHARACTERISTICS AT PIER END TEMP (°C)	DENSITY (g/cc)	SECCI VIS (M)
1	0750	100			43	20.3	1.0240	2.4
2	0815	50		60	271	23.7	1.0222	1.8
3	0635	50		60	208	23.1	1.0217	0.9
4	0715	80	60	80	114	23.0	1.0207	1.2
5	0715	85	65	80	82	23.4	1.0205	0.6
6	0735	80			68	24.1	1.0205	1.5
7	0750	80	60	80	67	24.0	1.0216	1.8
8	0750	80			61	23.7	1.0223	1.8
9	0740	90		80	61	23.7	1.0225	3.0
10	0700	50	80	90	67	25.3	1.0222	2.7
11	0800	105		95	85	25.5	1.0198	1.2
12	0815	90		80	67	25.8	1.0205	1.8
13	0915	90		80	61	26.5	1.0202	1.8
14	0710	90		80	48	25.5	1.0214	1.2
15	0725	100		80	31	24.5	1.0222	2.1
16	0505			70	15	23.0	1.0230	1.5
17	0645	70			21	25.0	1.0224	4.6
18	0815	40	115		9	25.8	1.0208	4.3
19	0720	115	115	80	29	25.0	1.0221	3.3
20	0700			70	42	26.0	1.0220	5.2
21	0705	95	40	80	40	25.7	1.0209	3.7
22	0705	65		60	46	26.0	1.0201	4.3
23	0715	65		65	40	25.5	1.0204	3.7
24	0700	90	40		58	25.2	1.0200	4.3
25	0710	115			45	25.4	1.0206	3.0
26	0700			60	42	23.5	1.0253	1.8
27	0700	70	120	60	31	21.9	1.0231	1.5
28	0725	95			42	25.6	1.0216	4.6
29	0955	90		70	26	26.5	1.0192	4.8
30	0730	110		60	14	25.1	1.0218	5.1
31	0530	75			27	23.9	1.0240	2.1

VI. WATER LEVELS

The National Ocean Services (NOS) has established a primary tide station (No. 865- 1370) at the seaward end of the FRF pier. A Leupold-Stevens digital recording float-type tide gage is used to collect data every 6 minutes throughout the month.

Figure 4 shows the range of each cycle while Figure 5 shows the variation in mean water levels computed over a tidal cycle period (12.42 hours), and contains a list of selected mean and extreme values. This presentation is useful in identifying effects on both meteorological and astronomical forces on the open coast water levels.

Table 6 contains the time of the center of each sampling interval and the range, high, low, and mean water levels during each tidal cycle.

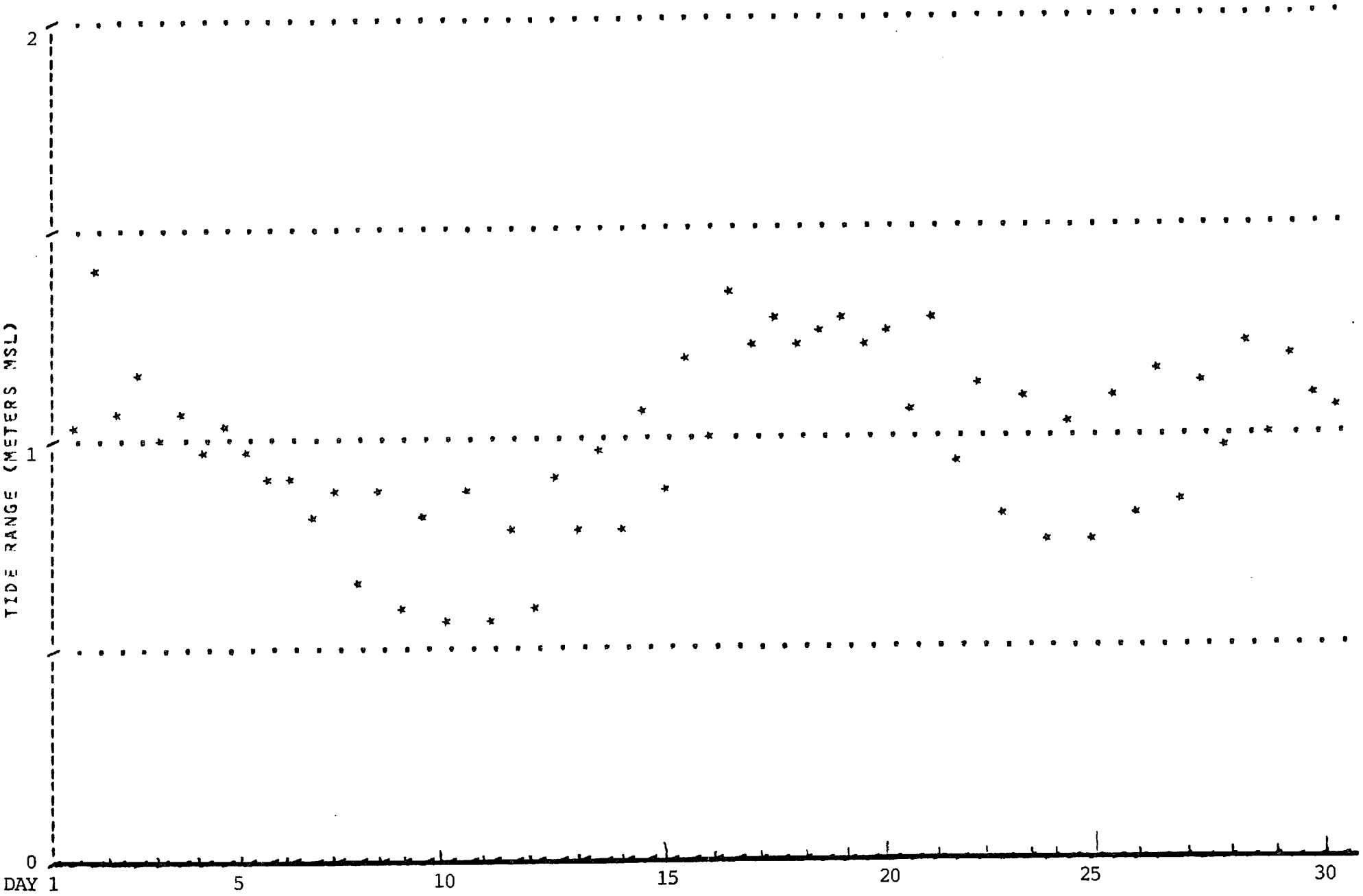

FIGURE 4. Time History of Tide Range, August 1985 (Gage No. 865-1370)

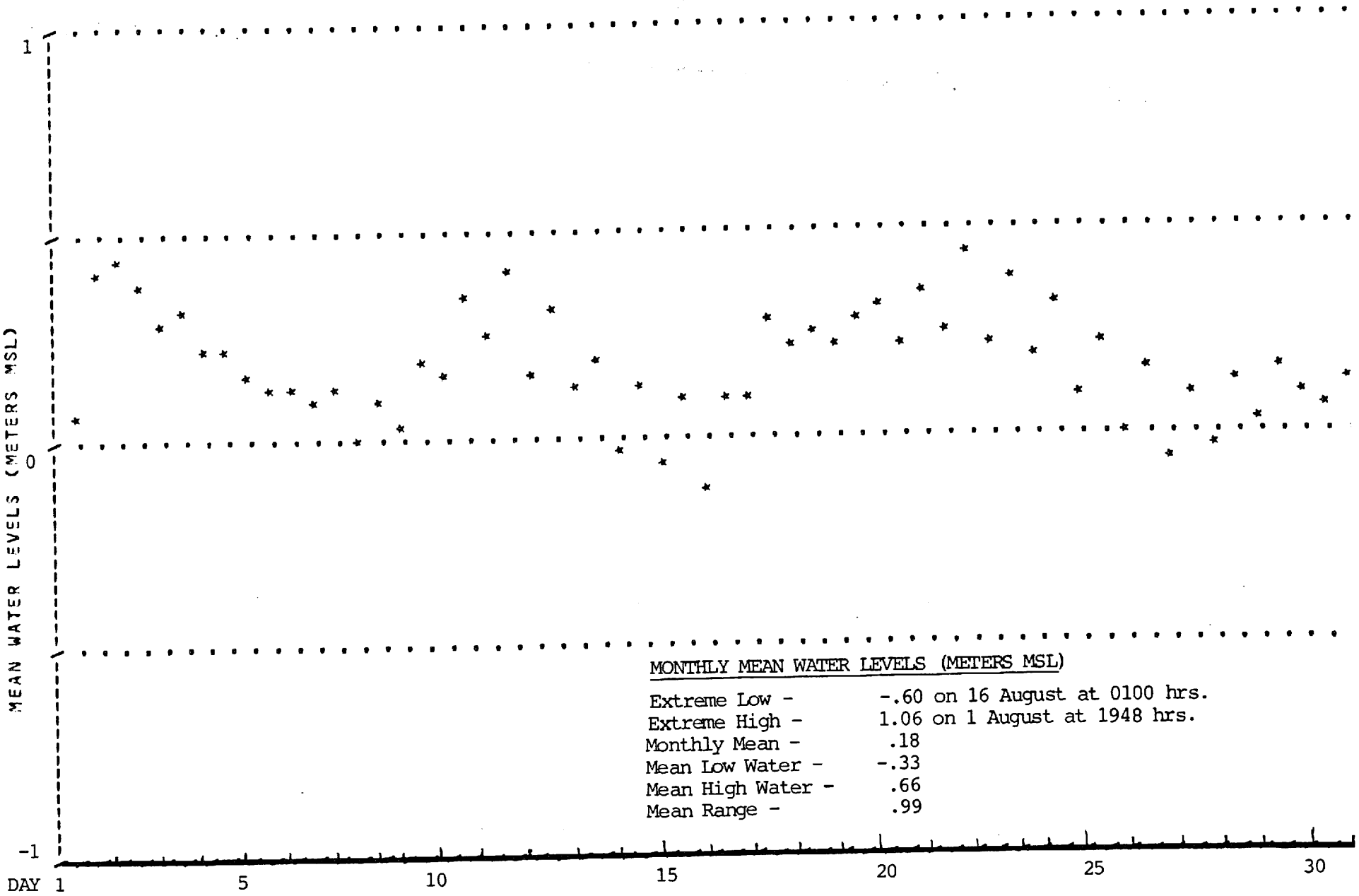

FIGURE 5. Time History of Mean Water Levels, August 1985 (Gage No. 865-1370)

TABLE 6

WATER LEVELS (METERS MSL)
Tidal Characteristics
August 1985

MID-CYCLE DAY	TIME	LOW	HIGH	MEAN	RANGE
1	612	-.47	.57	.05	1.04
1	1837	-.35	1.06	.41	1.42
2	702	-.14	.94	.42	1.07
2	1928	-.20	.97	.39	1.17
3	753	-.20	.80	.29	1.00
3	2018	-.22	.83	.31	1.05
4	843	-.23	.73	.22	.96
4	2108	-.29	.74	.23	1.02
5	934	-.37	.60	.14	.97
5	2159	-.32	.58	.13	.91
6	1024	-.35	.56	.14	.91
6	2249	-.33	.48	.09	.82
7	1114	-.34	.54	.13	.88
7	2340	-.35	.32	.00	.67
8	1205	-.37	.49	.10	.86
9	30	-.25	.33	.04	.58
9	1255	-.28	.54	.20	.81
10	120	-.13	.43	.16	.56
10	1346	-.11	.77	.36	.88
11	211	-.02	.54	.24	.56
11	1436	-.01	.78	.40	.79
12	301	-.14	.47	.16	.61
12	1526	-.18	.74	.31	.91
13	352	-.28	.50	.12	.78
13	1617	-.31	.65	.19	.96
14	442	-.41	.38	-.03	.79
14	1707	-.44	.64	.11	1.08
15	532	-.51	.38	-.07	.89
15	1758	-.53	.66	.09	1.19
16	623	-.60	.41	-.11	1.00
16	1848	-.59	.75	.08	1.34
17	713	-.53	.69	.11	1.23
17	1938	-.38	.91	.28	1.29
18	804	-.38	.83	.23	1.21
18	2029	-.38	.87	.26	1.26
19	854	-.41	.87	.23	1.28
19	2119	-.33	.89	.28	1.22
20	944	-.34	.92	.31	1.26
20	2210	-.32	.75	.22	1.08
21	1035	-.32	.95	.34	1.28
21	2300	-.20	.73	.26	.93
22	1125	-.16	.98	.44	1.14
22	2350	-.18	.64	.23	.82
23	1216	-.20	.87	.37	1.08
24	41	-.22	.55	.18	.77
24	1306	-.24	.80	.31	1.05
25	131	-.28	.47	.10	.75
25	1356	-.35	.74	.23	1.09
26	222	-.38	.42	.01	.80
26	1447	-.44	.71	.16	1.15
27	312	-.46	.37	-.05	.84
27	1537	-.50	.64	.09	1.14
28	402	-.49	.48	-.02	.97
28	1628	-.51	.71	.12	1.22
29	453	-.48	.52	.03	1.00
29	1718	-.46	.73	.14	1.19
30	543	-.46	.62	.08	1.09
30	1808	-.45	.61	.08	1.06
31	634	-.54	.72	.14	1.26

VII. NEARSHORE PROFILES

A. Nearshore Profiles. In order to document profile response away from the pier, surveys of four profile lines extending 900 to 1,000 m from shore and located 489 and 581 m north and 517 and 608 m south of the FRF pier are conducted bi-weekly, after storms, and during more complete bathymetric surveys.

These profiles are obtained using the CRAB-Zeiss surveying system; a Zeiss Elta-2 first-order, self-recording electronic theodolite distance meter in combination with the Coastal Research Amphibious Buggy (CRAB), a 10.7 m high, self-powered, mobile tripod on wheels.

Figure 6 shows the last survey in July and the two surveys taken during August on profile line 188, located 517 m south of the pier. Major changes during August were restricted to the nearshore (80-200 m) where a small bar present during July initially moved 40 m seaward (160 m) then reversed direction later in August and migrated 60 m shoreward (120 m). Only minor changes are visible on the remainder of the profile.

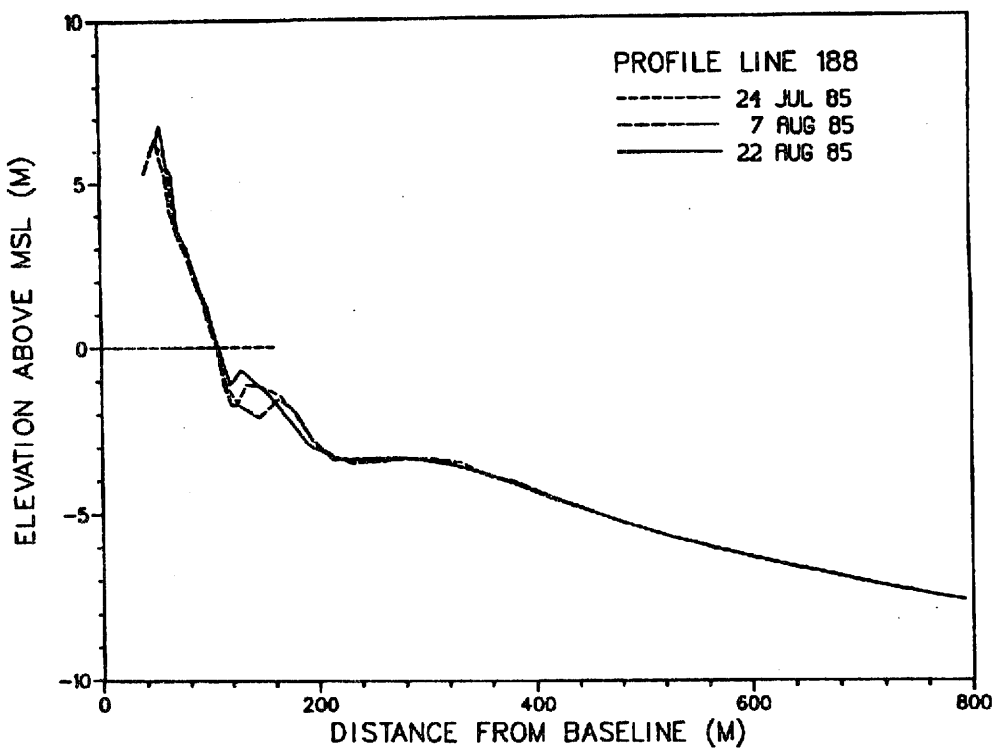

Figure 6. Monthly CRAB profiles on profile 188 - 517 meters south of pier.

The profile envelope (Figure 7) reflects the maximum changes which occurred on the profile between January and August. Only minor changes are visible (150 m) on the envelope.

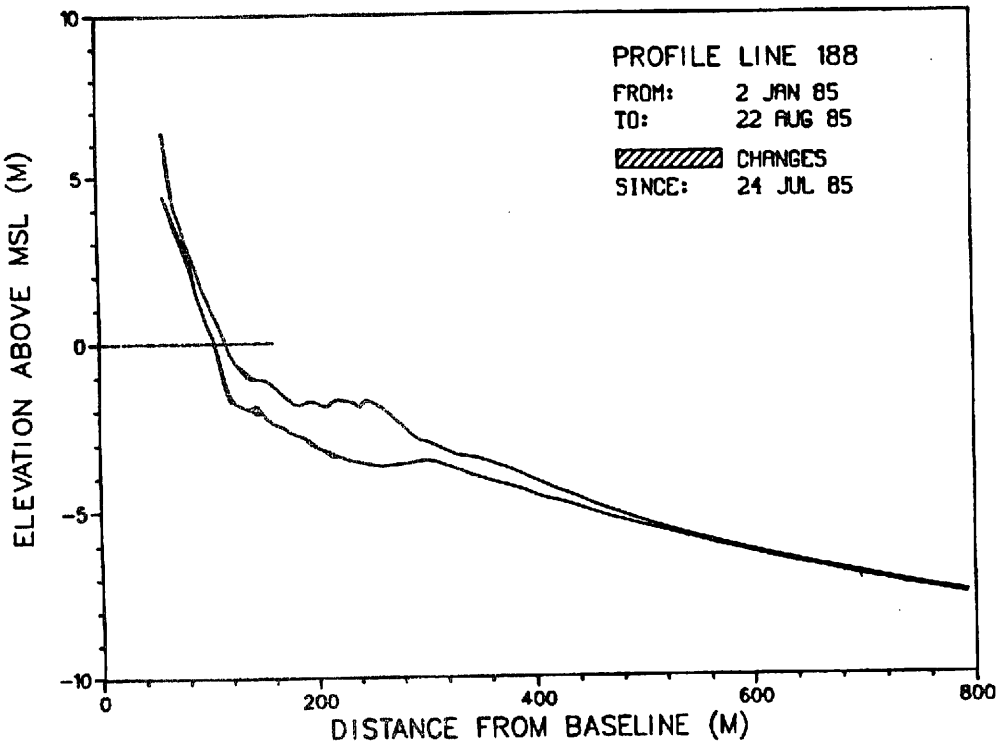

Figure 7. CRAB profile envelope - profile 188.

B. Bathymetry. The results of the bathymetric survey completed on 21 August 1985 are shown in Figure 8. The contours are generally shore parallel except for two anomalous shoals. The deeper shoal is between 100 to 400 m north of the pier at depths from 3.5 to 4.0 m, while the other is located under the landward end of the pier between depths of 1.5 to 2.5 m. These shoals and the asymmetry of the trough under the pier being deeper to the north are typically associated with predominantly southerly waves as experienced during the month.

All significant changes since the last survey on 15 July 1985 occurred in water depths less than 3 m deep. Up to 0.5 m of erosion occurred north of the pier between 175 and 300 m offshore with up to a meter of deposition on the beach out to -1.5 m. This indicated a shift of material onshore similar to the changes shown in Figure 6 for line 188. Additional accretion (up to 0.25 m) occurred immediately north of the pier about 275 m offshore.

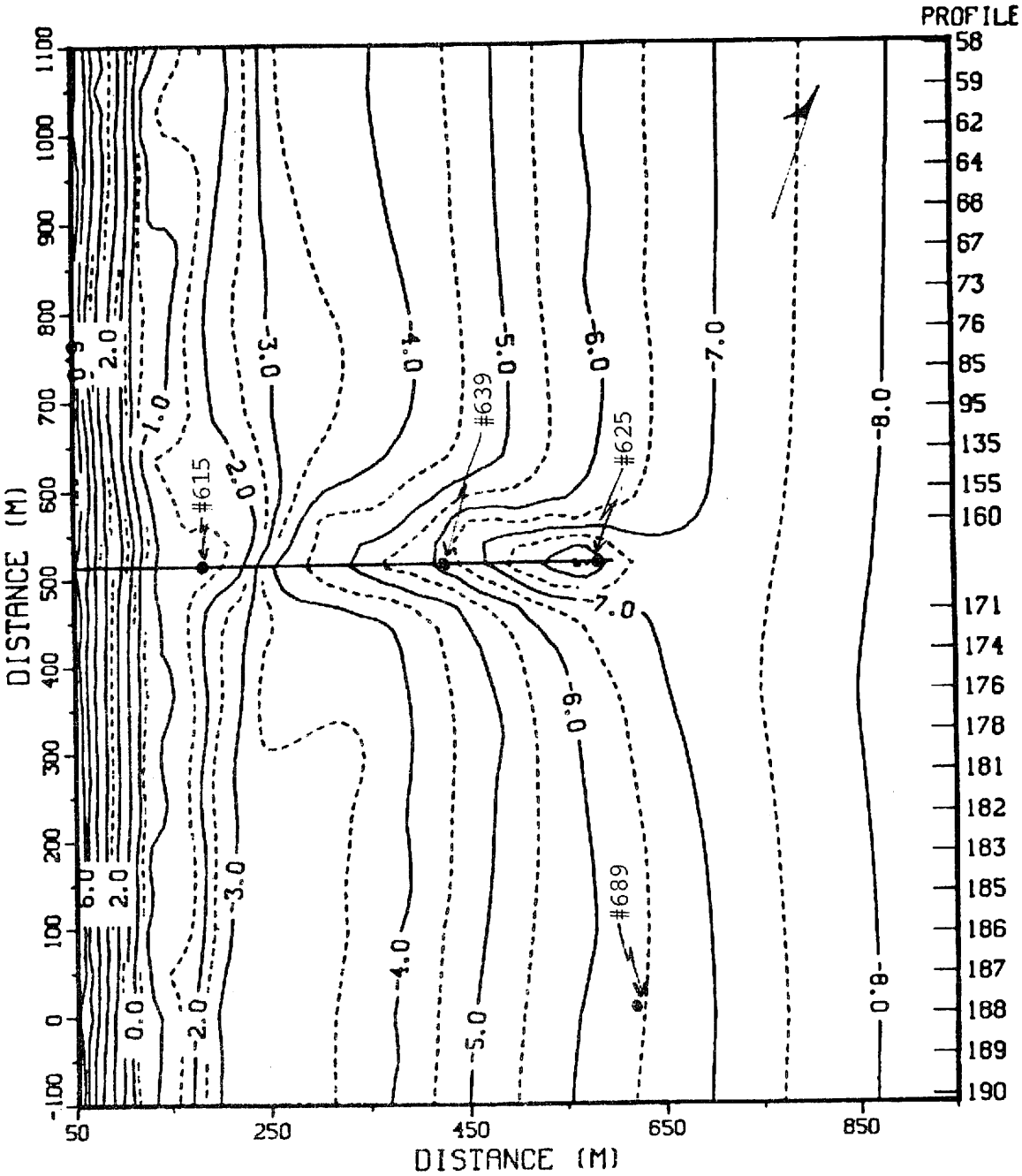

FIGURE 8. FRF BATHYMETRY 21 AUG 85

CONTOURS IN METERS

VIII. SPECIAL EVENTS

Storm Data Collection. The following list identifies times when the wave height at the seaward end of the pier (i.e. as measured by the Baylor gage #625 at pier station 19+00) exceeded 2 m and wave records were obtained every hour:

Start	End
2 Aug (0800)	2 Aug (1300)

Distribution List

Government Agencies:

OCE
BERH
NAO
NASA/Wallops Flight Center
NOAA (NOS, NWS)
SAD
SAW
U.S. Geological Survey
U.S. National Park Service
U.S. Naval Academy
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Florida Inst. of Tech.
NC State University
Old Dominion University
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Rutgers University
Scripps Inst. of Oceanography
Stockton State College
Texas A&M University
University of Akron
University of Delaware
University of Florida
University of Maryland
University of North Carolina
University of Northern Colorado
University of Rhode Island
University of Virginia
Virginia Inst. of Marine Science

Others:

City of Va. Beach, VA
Coastal Barge Corporation
Coastal and Est. Res., Inc.
Coastal Science & Eng., Inc.
Dr. Galvin
GEOMET, Inc.
Greenhorne & O'Mara, Inc.
Dr. Hylton
Ms. Johnson
Mary Marr, Inc.
Masonite Corporation
Moffatt & Nichol, Eng.
Offshore Coastal Technologies
Mr. Rowland
Mr. Savage
Sea Port Supply Corp.
Shell Development
Sohio Petroleum Co.
Mr. & Mrs. Valpey
WCTI-TV

Foreign:

W. F. Baird & Asso. Coastal Engineers, Ltd (Canada)
Ministry of Construction, Coastal Division (Japan)
Norwegian Hydrodynamic Laboratories (Norway)
University of New South Wales (Australia)
University of Sydney (Australia)