

PRELIMINARY REPORT ON
RAINSTORM OF APRIL 23-26, 1982

by

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I. Description of the Torrential Rainstorm of April 23-26, 1982

For the second time in less than a month, residents of two mobile home parks in West Palm Beach and Lake Worth were driven from their homes by heavy rains and floodwaters which heavily damaged their homes and cars. These heavy rains and thunderstorms, with gusty winds up to 80 miles per hour (mph), covered most parts of the lower east coastal area of Florida. In Broward County, a small tornado touched down west of Pompano Beach at about 11:10 AM, April 24, 1982 according to the Broward County Sheriff's Department. Awnings were twisted and trees were uprooted.

Golfball-size hail fell in northwest Miami according to Metro-Dade Officer Armando Perez. A Florida Power and Light spokesman said about 8,000 customers were without power in Dade County during this rainstorm. An estimated 1,500 homes were without electricity in Broward and Palm Beach Counties. Two areas on the lower east coast of Florida were hit hard by this torrential rainstorm. They are the coastal area of Palm Beach, and the greater Miami area.

A maximum rainfall of 12.40 inches was reported at 2552 Bahia Road, about one mile south of Forest Hill Boulevard and Florida Mango Road. A maximum rainfall intensity of 6.7 inches was measured between 9 AM and 11 AM, April 24, 1982 at the same site. Between 12.50 to 15.0 inches of rainfall were reported in the area west of south Miami. This torrential rainstorm was the result of a warm front moving north from the Straits of Florida at 10 mph while a very large high pressure system, located off the coast of the Carolinas on April 23-24, 1982, generated a strong easterly flow.

In general, this rainstorm was caused by normal frontal activity, however, it was not exactly the same as the rainstorm of March 28-29, 1982, which was caused by a slow moving low pressure system in the Gulf of Mexico interacting with a high pressure system off the coast of the Carolinas.

II. Rainfall Distribution

The rainfall began in the early afternoon of April 23, 1982 and was over by the afternoon of April 24. The rainfall readings for this storm event were spread out from two to four days, however, due to the fact that many gauges were not read over the weekend until the following Monday (April 26). Table 1 shows the daily rainfall values at various locations which are available at this report time (May 6, 1982). The greater Miami area received 9 to 15 inches which was the highest intensity rainfall. Eastern Palm Beach County, especially the area east of Military Trail received the second highest intensity rainfall during this event. The coastal area of the upper east coast received 2 to 3 inches. Lake Okeechobee and the Everglades Agricultural Area received 0 to 2.5 inches. The remainder of the District area received less than one inch. Figure 1 shows the general rainfall distribution of this rainstorm over central and southern Florida. As one can observe, this rainstorm missed Lake Okeechobee and the water conservation areas almost completely.

The areas of highest rainfall intensity during this rainstorm occurred along the coastal area of West Palm Beach, Lake Worth, Lantana, Boynton Beach, and Delray Beach. Martin Gauthier (2552 Bahia Road, West Palm Beach) reported over 12.40 inches of rainfall as measured from his farm raingauge. The gauge overflowed at 10:15 AM, April 24, 1982, and his record indicated that 3.5 inches was measured between 6:00 PM, April 23, through 9:00 AM, April 24, and a value of 6.7 inches of rain was measured between 9:00 AM through 11:00 AM, April 24, 1982. Steve Lin at 4444 Regency Drive, Lake Worth, reported 11.34 inches of rain for this rainstorm, of which about 6.0 inches was measured between 8:40 AM and 12:00 PM, April 24, 1982.

TABLE 1. DAILY RAINFALL VALUES AT VARIOUS LOCATIONS DURING RAINSTORM OF
APRIL 23-26, 1982

Lower East Coast

<u>Station Name</u>	<u>4-23</u>	<u>4-24</u>	<u>4-25</u>	<u>4-26</u>	<u>Total</u>	<u>Reading Time</u>
4434 Fuscia Cir.So.(PBGdns)	0.15	4.70	0.05	0.14	5.04	6 PM
419 Sequoia Dr.(WPB)	0	3.97	2.49	0.20	6.66	7 AM
4444 Regency Dr.(LW)	0	4.77	6.00	0.57	11.34	8:40
11601 Taft(Broward)	0	1.25	0.10	0.20	1.55	12 PM
2552 Bahia Rd (WPB)	1.0	10.7*	0.70	-	12.40	10:15 Overflowed
178 Drawdy Rd (WPB)	0.20	2.07	0.12	0.11	2.50	6 PM
Lake Worth Drainage District	x	6.48A	x	.40A*	6.88	8 AM
Pratt Whitney	0.00	0.23	0.00	1.00	1.23	6 AM
WPB Field Station	0	x	x	9.20A	9.20	7 AM
Jupiter Fire Station	0	2.45	0.72	T	3.17	8 AM
Greenacres City	x	x	x	3.80A	3.80	8 AM
S-5A	0.0	x	x	0.12A	0.12	7 AM
Lake Worth Rd & E1	0	x	x	1.88A	1.88	8 AM
Boynton Rd & Mil.Tr1	0	x	x	5.00A	5.00	8 AM
Range Line & L-38	0	x	x	5.70A	5.70	8 AM
Boca Rd & Range Rd	0	x	x	2.80A	2.80	8 AM
Delray Rd & E-2	0	x	x	5.30A	5.30	8 AM
Mil.Tr1 & L-38	0	x	x	2.70A	2.70	8 AM
Lantana Airport		8.00	0.70		8.70	11 AM
Manalapan Water Plant	1.80	6.6	0.54	0.24	9.19	12 AM
Loxahatchee WB	0	.65	.54	0	1.19	
Margate	0	x	x	3.74A	3.74	9 AM
Miami Field Station	0	x	x	8.72A	8.72	7 AM
Homestead Field Station	0	3.20	0.35	0.08	3.63	6:30 AM
Miami Airport	0.05	7.25	0.78	0.91	8.99	12 AM
Flamingo Ranger Station	0	0.69	0.91	1.01	2.61	2 PM
WPB Airport	1.91	3.63	0.60	0.30	6.44	Every 3 Hours
Royal Palm Ranger Station	.20	4.00	0.65	0.96	5.81	2 PM
Broward Field Station	0	x	x	2.58A	2.58	7 AM
Tamiami 40 Mile Bend	0	1.29	0.02	1.09	2.40	2 PM
S-9	0	x	x	0.42	0.42	7 AM
S-13	0	x	x	6.43A	6.43A	7 AM
Pompano Farmer's Market	0	2.66	0	0.67	3.33	4 PM
Boca Raton	0.51	4.01	0.89	0.20	5.61	7 AM

TABLE 1 (continued)

Lower East Coast

<u>Station Name</u>	<u>4-23</u>	<u>4-24</u>	<u>4-25</u>	<u>4-26</u>	<u>Total</u>	<u>Reading Time</u>	
S-20F	0.62	2.29	0.05	1.78	4.74		
S-20	0	1.57	0.65	3.25	5.47		
Key West Airport	0	0.80	0.84	0.03	1.67		Midnight
Homestead Exp. Station (DC1)	T	1.25	0.30	0.99	2.54	5	PM
General Port Cement (DC8)	x	x	x	2.60A	2.60	8	AM
Wheeler Frye	x	x	8.75A	1.15	9.90	8	AM
58th St. Yard (DC73)	1.50	6.00	0.60	0.40	6.20		Midnight
Ira Ebersole (DC95)	0	0.53	0.60	0.43	1.56	7	AM
L.T. Cope (DC83)	5.90	5.15	x	1.45A	12.50	8	AM
Metro Fire Station #16(D104)	0.05	0.07	3.00	0.06	3.18	7	AM
Homestead Gen. Airport(D97)	0	0.01	2.08	0.40	2.49	7	AM
Tamiami Airport (D98)	x	2.30A	7.20	0.62	10.12		Midnight
Det. Center (D26)	0	x	x	4.50A	4.50	11	AM
Golden Isles (D2)	3.75	0.90	0.30	1.15	6.10		
H.U.D. (D17)	0	x	x	3.00A	3.00		Noon
Miami Turf (D5)	0	x	x	5:00A	5:00	9	AM
Surkin (D105)	0	1.15	2.44	.53	4.12	8	AM
R. Young (D86)	4.09	10.25	0.07	1.41	15.82	7	AM
Interama (31 NW 8th St.)	0.06	3.00	0.15	1.10	4.25	11	PM
West Kendall (D25)	0.06	4.72	0.77	0.75	6.30	7	PM
Miami Beach	0	1.00	0.47	1.52	2.99	7	PM
North Dade County	0.11	4.31	0.16	0.76	5.34	7	PM

Lower West Coast

S-79	0	0	2.59	0.25	2.84	8	AM
S-78	0.05	0	0.03	0.43	0.51	8	AM
S-77	0.04	0	0.05	0.28	0.37	8	AM
Everglades City	0	0	2.30	0.20	2.50	8	AM
Oasis	0	0.60	0.13	0.46	1.19	2	PM
La Belle	0	0	0.47	0.80	1.27	8	AM
Corkscrew	0	0	0.55	0.50	1.05	7	AM

Everglades Agricultural Area

S-4	0	x	x	0.20A	0.20	7	AM
HGS-4	0	x	x	0.00A	0	7	AM

TABLE 1 (continued)

Everglades Agricultural Area (continued)

<u>Station Name</u>	<u>4-23</u>	<u>4-24</u>	<u>4-25</u>	<u>4-26</u>	<u>Total</u>	<u>Reading Time</u>	
HGS-3	0	x	x	0.02A	0.02	7	AM
S-5A	0	x	x	0.12A	0.12	7	AM
Clewiston Field Station	0	x	x	0.27A	0.27	6:30	AM
S-6	0	x	x	2.75A	2.75	7	AM
S-7	0	x	x	0.25A	0.25	7	AM
S-8	0	x	x	0.17A	0.17	7	AM
Devils Garden	0	0	1.01	0.30	1.31	7	AM
<u>Upper & Lower Kissimmee Basins</u>							
Kissimmee Field Station	0	x	x	0.48A	0.48	7	AM
S-61	0	x	x	0.83A	0.83	7	AM
Clermont (6SSW)	0	.14	.15	.19	0.49	6	PM
S-65	0.02	x	x	0.60A	0.62	7	AM
S-65A	0.07	x	x	0.68A	0.75	7	AM
S-65B	0	x	x	0.70A	0.70	7	AM
S-65C	0.80	x	x	0.65A	1.45	7	AM
S-65D	0.05	x	x	0.20A	0.25	7	AM
S-65E	0	x	x	0.55A	0.55	7	AM
S-68	0	x	x	0.37A	0.37	7	AM
<u>Upper East Coast</u>							
Fort Pierce Field Station	0.24	x	x	2.46A	2.70	7:25	AM
Stuart 1N	0.56	1.28	T	0.13	1.97	4:30	PM
S-80	0	0.25	2.36	0	2.61	8	AM
S-308	0.17	0.02	0	0.01	0.20	8	AM
S-135	0.32	x	x	0.15A	0.47	7	AM
Melbourne	0	0.06	0	0.95	1.01	3 Times	Daily
<u>Lake Okeechobee</u>							
S-135	0.32	x	X	0.15A	0.47	7	AM
S-308	0.17	0.02	0	0.01	0.20	8	AM
S-133	0.20	x	x	0.11A	0.31	7	AM
Okeechobee Field Station	0.05	x	x	0.19A	0.24	7	AM
S-127	1.19	x	x	1.25A	2.44	7	AM
S-129	0.10	x	x	0.80A	0.90	7	AM

TABLE 1 (continued)

Lake Okeechobee (continued)

<u>Station Name</u>	<u>4-23</u>	<u>4-24</u>	<u>4-25</u>	<u>4-26</u>	<u>Total</u>	<u>Reading Time</u>	
S-131	0.05	x	x	2.05A	2.10	7	AM
S-77	0.04	0	0.05	0.28	0.37	8	AM
S-4	0	x	x	0.20A	0.20	7	AM
HGS-4	0	x	x	2.00A	0	7	AM
HGS-3	0	x	x	0.02	0.02A	7	AM
Canal Point	0	0	0.90	0.03	0.93		

Note: x = data accumulated to the following date

A = accumulated total

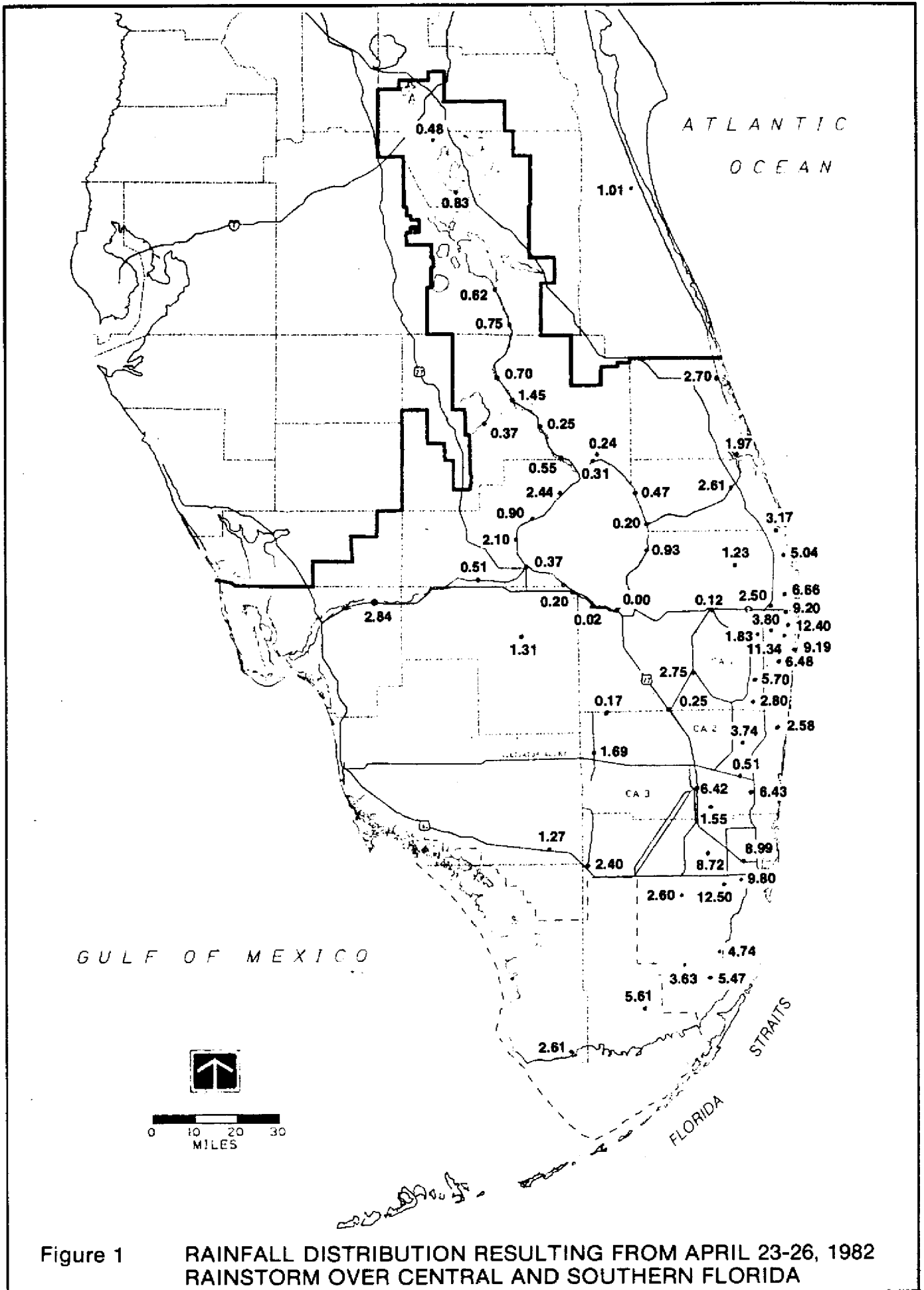


Figure 1

RAINFALL DISTRIBUTION RESULTING FROM APRIL 23-26, 1982 RAINSTORM OVER CENTRAL AND SOUTHERN FLORIDA

Figure 2 shows the isohyetal map of rainfall resulting from this rainstorm in eastern Palm Beach County. The areas of next highest rainfall intensities were the areas west and southwest of Miami, including the Cities of Miami, Miami Springs, Hialeah, South Miami, etc. Total rainfall of 8 to 15 inches was reported in this area. Figure 2A shows the isohyetal map of rainfall distribution resulting from this rainstorm in this area. The return frequency of the measured rainfall (maximum two days) was compared with frequency analysis presented in the District Technical Publication 81-3 entitled "Frequency Analysis of Rainfall Maximum for Central and Southern Florida". The highest rainfall area, which included Lake Clarke Shores, Palm Springs, Lake Worth along Congress Avenue, and eastward to the Atlantic Ocean was on the order of between a one in 10 and a one in 25 year event. The greater Miami area which includes Miami, Miami Springs, Hialeah, and the area between the Miami International Airport, Coral Gables and Sweetwater had rainfall on the order of a one in 5 to one in 10 year event. An approximately five square mile area, including the western portion of South Miami, was on the order of one in 25 to 50 year event.

III. Antecedent Conditions

A. Rainfall

Rainfall deficiencies existed in most parts of the District except the lower east coast area of Palm Beach and Martin Counties. Figure 3 shows the rainfall distribution in April prior to this rainstorm. Most of the District area had received less than 1.0 inch of rain, except the area between Lake Tohopekaliga and S-65B which had about 3 to 5.7 inches. Even though the rainfall received in eastern Palm Beach County was less than 1.0 inch, the antecedent soil moisture condition in the area was still very wet and standing water existed in many places due to the severe rainstorm of March 28-29, 1982. This contributed to the flooding situation resulting from this storm. The antecedent soil moisture condition in south Dade was far dryer than the area

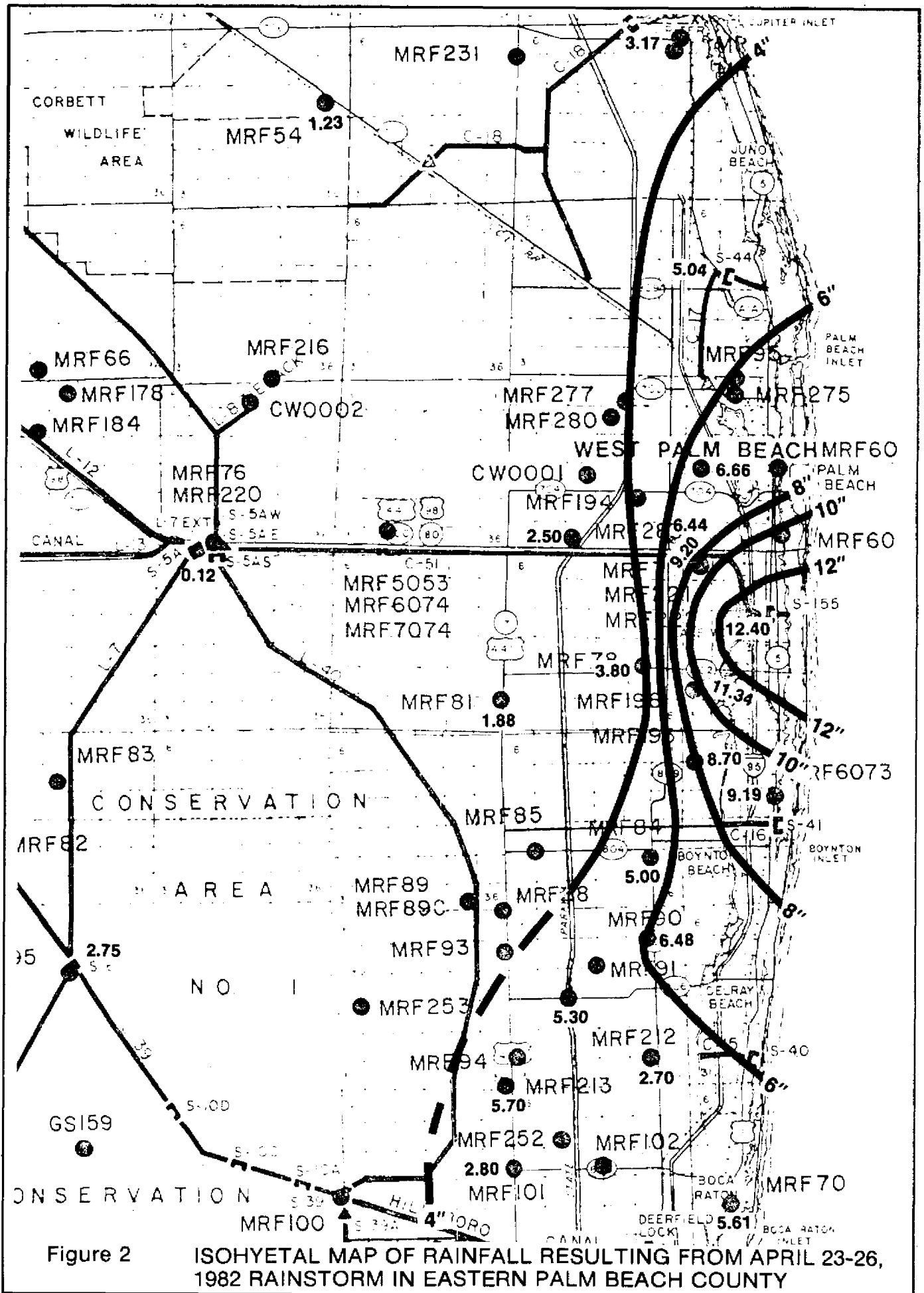


Figure 2 ISOHYETAL MAP OF RAINFALL RESULTING FROM APRIL 23-26, 1982 RAINSTORM IN EASTERN PALM BEACH COUNTY

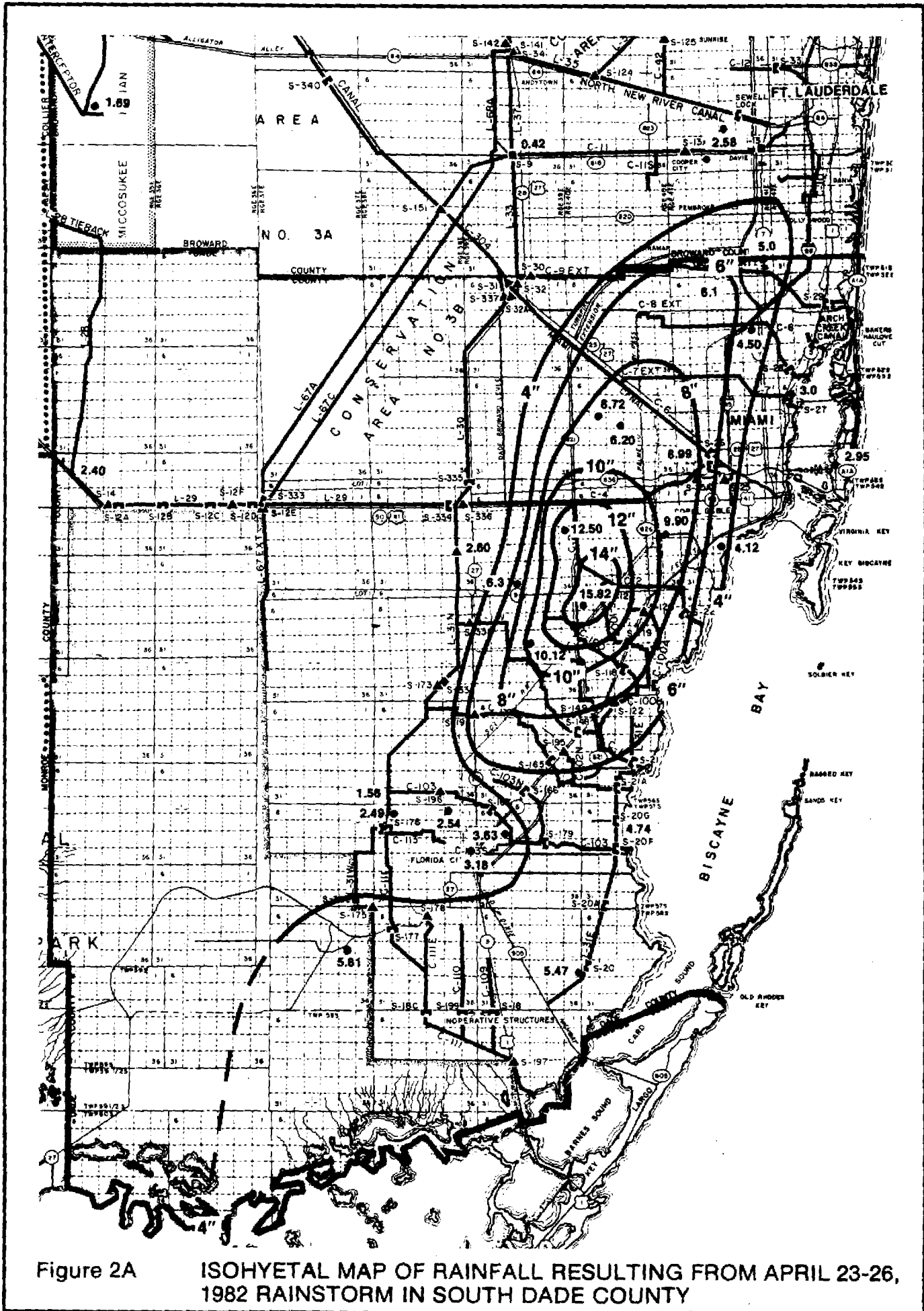


Figure 2A ISOHYETAL MAP OF RAINFALL RESULTING FROM APRIL 23-26, 1982 RAINSTORM IN SOUTH DADE COUNTY

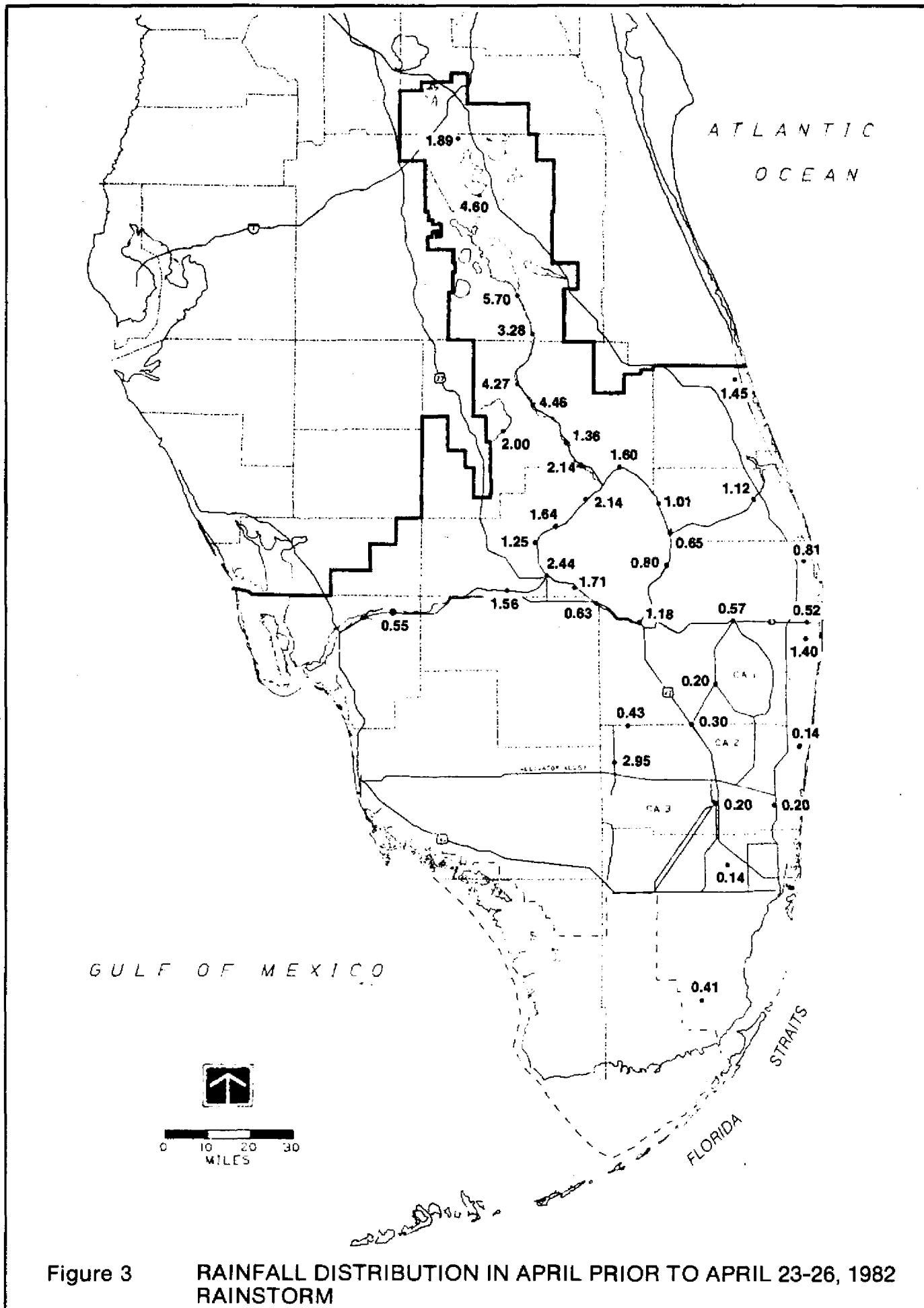


Figure 3

RAINFALL DISTRIBUTION IN APRIL PRIOR TO APRIL 23-26, 1982 RAINSTORM

of eastern Palm Beach County; therefore, no severe flooding was reported in this rainstorm for Miami and Dade County areas.

B. Water Level Conditions

Due to District-wide extended drought conditions and the current dry season condition, water levels in the coastal structures were generally maintained slightly above their normal optimum stages. Table 2 presents the antecedent water level condition on April 22, 1982 as compared to optimum stages in Palm Beach County and S-26 in the City of Miami.

Table 2. Water Level Conditions on April 22, 1982 as Compared to Optimum Stages

Structure	Headwater Stage (ft msl)	Current Optimum State (ft msl)	Normal Optimum Stage (ft msl)
S-40	7.92	9.00	8.50
S-41	8.18	9.00	8.50
S-44	7.45	7.70	7.10
S-26	2.32	2.5 to 3.0	2.50
Palm Beach Lock	8.08	8.60	8.50

The selection of these structures was based on the fact that these are the areas where heavy rainfall occurred during this rainstorm. The stages at the headwater of these structures, with the exception of S-44, were slightly below their normal optimum stages.

IV. Discussion of Project Performance

A. Flooded Areas

Waterview Mobile Home Park, 2156 Okeechobee Boulevard, West Palm Beach, and Sunshine Mobile Village, 2765 - 10th Avenue North, Lake Worth, were severely flooded for the second time in less than a month. Sunshine Mobile Village experienced more severe flooding during this recent event due to the fact that a higher rainfall intensity than last time occurred in the area. Waterview experienced less severe flooding, even though the rainfall amount was

about the same as last March. The floodwater was about 2.3 feet lower than in March, due to much lower flood stages in the West Palm Beach Canal. The heavy rains caused flooding, forcing the evacuation of some residents from their homes along South Swinton Circle, Delray Beach. Several streets in the area from Boynton Beach to Boca Raton were flooded. The fire department of Delray Beach closed the roads to these neighborhoods at 11:30AM, April 24, 1982 and ordered the electricity turned off. Joe Reardon, 338 SW 4th Avenue in Boynton Beach, was flooded for the second time this year and the third time in three years according to a local newspaper.

Flooding was also reported in several sections of suburban Lake Worth, and the Lake Worth Bridge was closed for several hours on the morning of April 24, 1982.

The following high water marks (refer to Figure 3A for locations) were surveyed on April 29, 1982 as compared to the high water marks for the March 28-29, 1982 and September 17-18, 1960 rainstorms.

	Sept. 17-18 1960 (ft. msl.)	Mar. 28-29 1982 (ft. msl.)	Apr. 23-26 1982 (ft. msl.)
Waterview Mobile Home Park	+15.00*	13.50	11.22
Bridge at Australian Ave., crossing the stub canal	13.30	12.71	11.58
Bridge at Belvedere Blvd., crossing the stub canal	13.30	12.13	-
Bridge at So. Congress Ave., crossing LWDD Lateral 14	-	12.35	10.14
WPB Canal at Summit Blvd.	-	11.03	10.23
WPB Canal at Field Station	-	11.66	10.58
WPB Canal at Forest Hill Blvd.	11.30	-	-
WPB Canal at Lock	10.15	10.68	9.88

*Congress Avenue peak was 16.20 ft. msl.

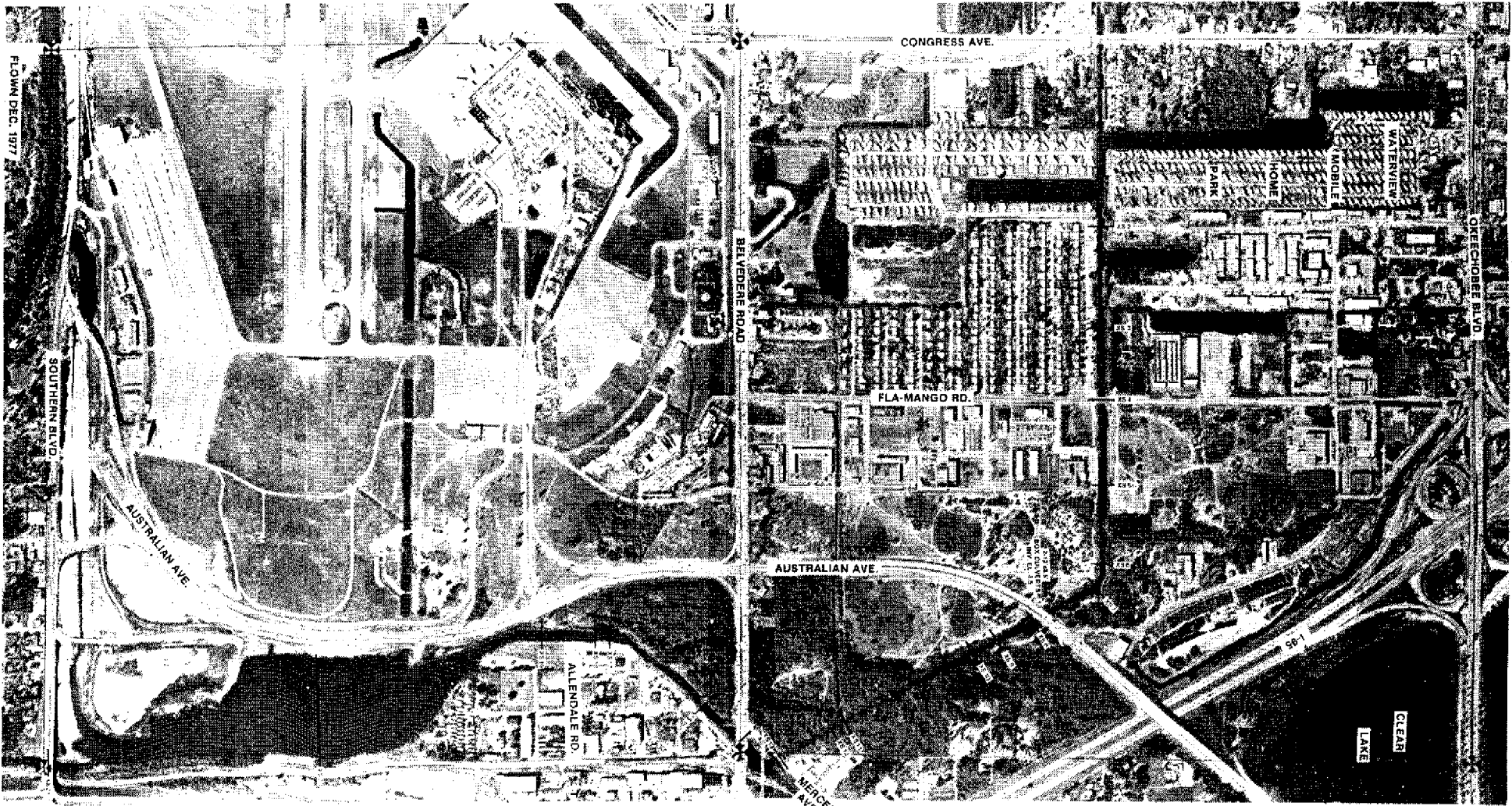


Figure 3A

The manager of the Recreation Department of John Prince Park, Lake Worth, was queried on the morning of April 26, 1982 regarding the high water condition in the park as compared to last month's rainstorm. The manager indicated that the high water condition in Lake Osborne was at least two feet lower than last month's rainfall and that they did not have to evacuate trailers from their campsites.

It should be noted that the high water mark at the Australian Avenue Bridge crossing the stub canal was 0.4 feet higher than at Waterview Mobile Home Park during this rainstorm. This has been checked twice to be sure that the water level did approximate this elevation at Australian Avenue. The possible explanation for this is that water must have spilled over the spillway from Clear Lake into the stub canal downstream of Australian Avenue during this rainstorm, together with discharge from the Palm Beach Lakes south area. This amount of water may have caused a momentary backwater to this site long enough to leave a high water mark.

The historic high water mark in the area of Waterview Mobile Home Park, about 15.00 ft msl, resulted from the September 17-18, 1960 rainstorm. This compares to 13.50 ft msl and 11.22 ft msl from the March and April 1982 rainstorms. This mobile home park did not exist prior to 1962. The rainfall for September 17-18, 1960 was 8.79 inches as reported by Palm Beach International Airport which was about 0.4 inch less than the heavy rainstorm of 1982.

The improvement of the stub canal after 1971, to provide fill for future six-laning of SR80, plus a +1 foot lower stage at the inflow point to the West Palm Beach Canal, reduced the flood stage in the area substantially as indicated in the same table. This improvement included the relocation of the stub canal entering the West Palm Beach Canal from a location just east of Congress Avenue to a point approximately 200 feet above Summit Boulevard. The District criteria for the stub canal has a design capacity of 588 cfs, which consisted of 250 cfs from Clear Lake and 338 cfs from a 5.2 square mile

area to the west. Under the existing canal cross-section and the new automatic gated spillway, now under contract to replace the existing old lock, the 30 year design stage at Summit Boulevard will be +12.30 ft msl and the 10 year stage could approximate 11.3 ft msl. Therefore, the Waterview Mobile Home Park will probably continue to have flooding problems even with the completion of the new structure with any event equal to or greater than a one in 10 year event.

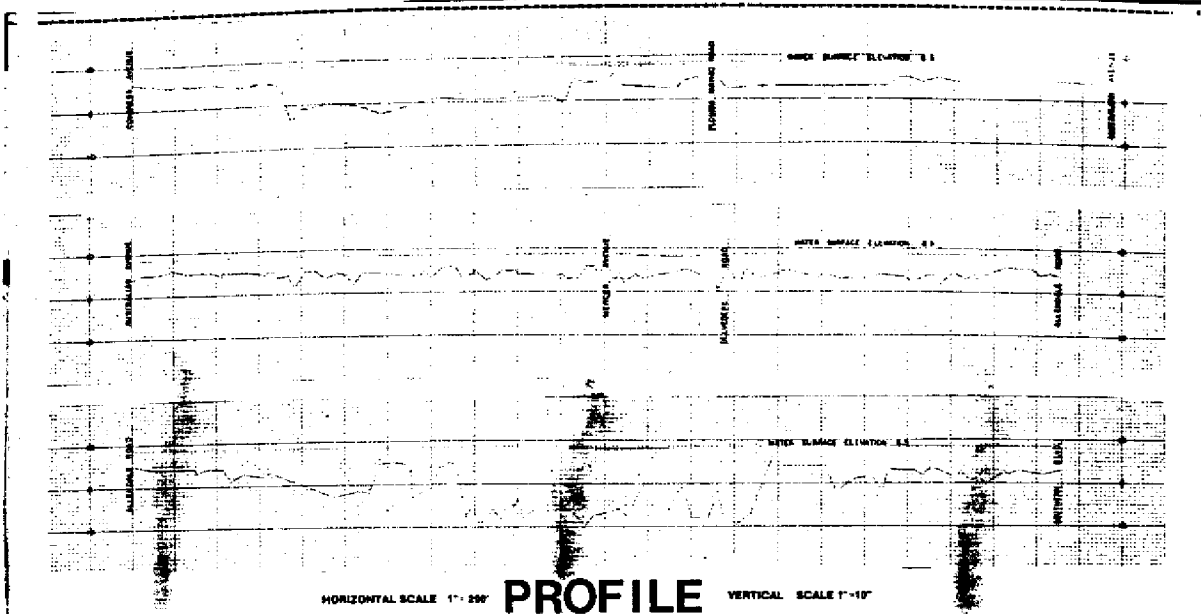
The District and Palm Beach County are at the present time investigating the drainage problems of the area. The following factors, in addition to those mentioned, appear significant based on field inspection.

- a). This mobile home park is located on a relatively low land area. The ground elevation at the southwest corner of the park, on a catch basin, is at 9.76 ft msl, and the centerline of Manor Street at 1616 Manor, is at 10.90 ft msl. In general, the ground elevation of the area is below the 15.0 ft msl contour line. Therefore, this area receives runoff from its surrounding area which is a raised and paved industrial area. The primary drainage canal for this area is Lateral 2 and the Stub Canal as mentioned previously. With a peak stage of 10.2 ft msl at Summit Boulevard and over 6 inches of rainfall in this event, this area was bound to be flooded.
- b). The new industrial park located to the east and southeast of Waterview Mobile Home Park and north of the Palm Beach International Airport has raised the ground elevation and paved it - doubling the runoff into the area - and reducing the available storage for flood water.
- c). Inadequate channel capacity - The existing cross-section of the Stub Canal in the reach between Australian Avenue and the downstream reach of Belvedere Road has been shoaled due to sedimentation. The expansion and construction in the area, especially the industrial park, has

increased the erosion problem in the area. The existing cross-section no longer can handle its design capacity. The survey of the channel cross-section along the Stub Canal is shown in Figure 3B.

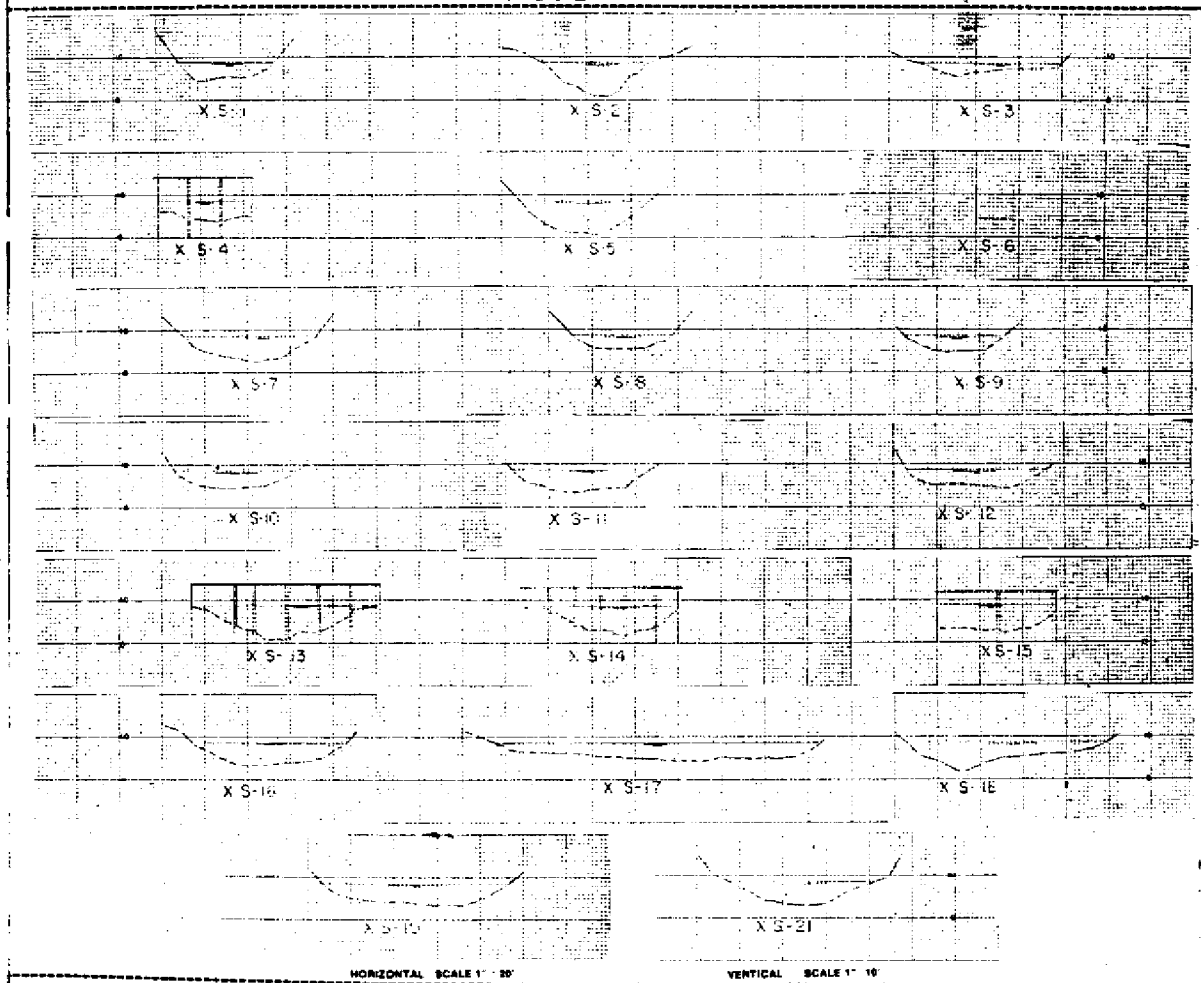
B. Project Performance

During this rainstorm, most of the flooded areas mentioned previously were not directly caused by deficiencies of the project design or function of the District facilities. However, one of the main gates on Structure 41 was out of service due to normal maintenance. This gate was reinstalled and back in service by 8PM, April 24, 1982. It did create a temporary backwater during the hours before 8PM.



HORIZONTAL SCALE 1" = 200' VERTICAL SCALE 1" = 10'

PROFILE



HORIZONTAL SCALE 1" = 20' VERTICAL SCALE 1" = 10'
 HORIZONTAL SCALE 1" = 100' VERTICAL SCALE 1" = 10'

X-SECTIONS

Figure 3B

1. Palm Beach Lock - Figure 4 shows the hourly stage hydrograph during this rainstorm. The gate on the lock was closed until 9 AM April 24, 1982 and opened on automatic at 9:15 AM. The headwater stage was at 8.98 ft msl. At the same time, the service crew was on the way to pull the boards. The crew started pulling boards at ±11 AM and finished at ±12:15 PM. At 12:15 PM the structure was full open, all boards out, and the stage at the lock reached its peak (9.88 ft msl). The peak discharge at the lock was at 5100 cfs with an average flow, during April 24, 1982, at 4200 cfs. The peak stage was about 0.80 feet less than last month's rainstorm. The peak stage in the West Palm Beach Canal at the District's Field Station was 10.58 ft msl (at ±12 noon April 24, 1982). The high water mark at the Summit Boulevard crossing of the West Palm Beach Canal was 10.23 ft msl. In other words, due to the operation of the system and the rainfall from this event, stages in the system were about one foot below the high water mark during the March 28-29, 1982 rainstorm. The boards in the lock were pulled out more quickly than during the March storm, which took over five hours of effort during the night of March 28-29, 1982.

2. S-41 - This structure maintains and drains the C-16 Basin which covers the area of Boynton Beach, Lake Worth, Lantana, Hypoluxo, Atlantis, etc. This basin was again severely hit by a rainstorm for the second time within a month.

Figure 5 shows the hourly stage hydrograph at S-41 headwater during this rainstorm. As briefly mentioned previously, one of the main gates on this structure was undergoing maintenance. Therefore only one gate was in operation until 8 PM April 24, 1982, when the second gate was put back in service. The stage reached a short term peak of 10.94 ft msl at 8 PM April 24, 1982. Reinstallation of the gate was prompted by a forecast of 80% chance of rainfall. The stage rose from 9.32 to 10.94 in 30 minutes, due to the need to close the gate on the structure to reinstall the second gate for service. The stage

STRUCTURE PALM BEACH LOCK

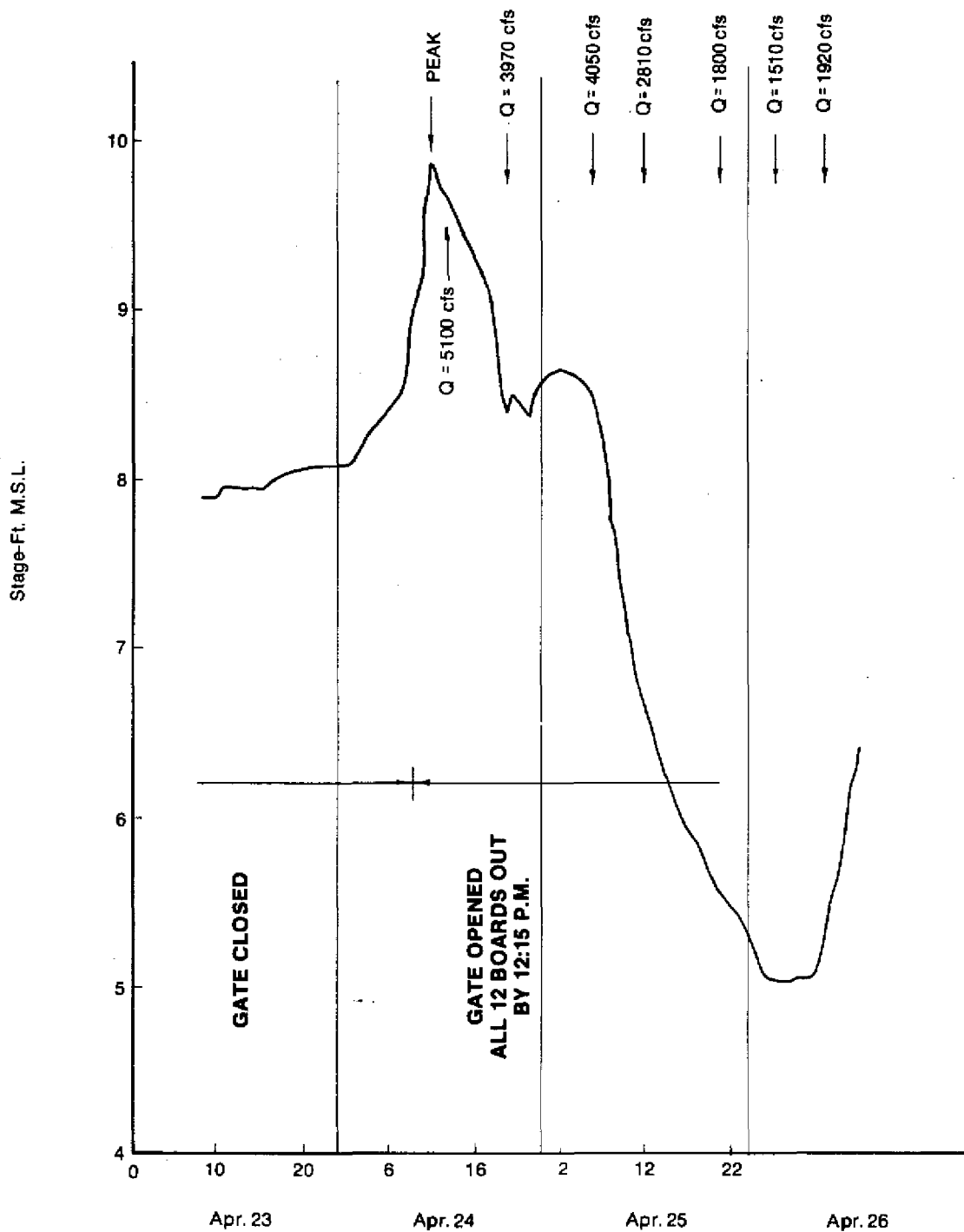


Figure 4 HOURLY STAGE HYDROGRAPH AT PALM BEACH LOCK DURING RAINSTORM OF APRIL 23-26, 1982

STRUCTURE S-41

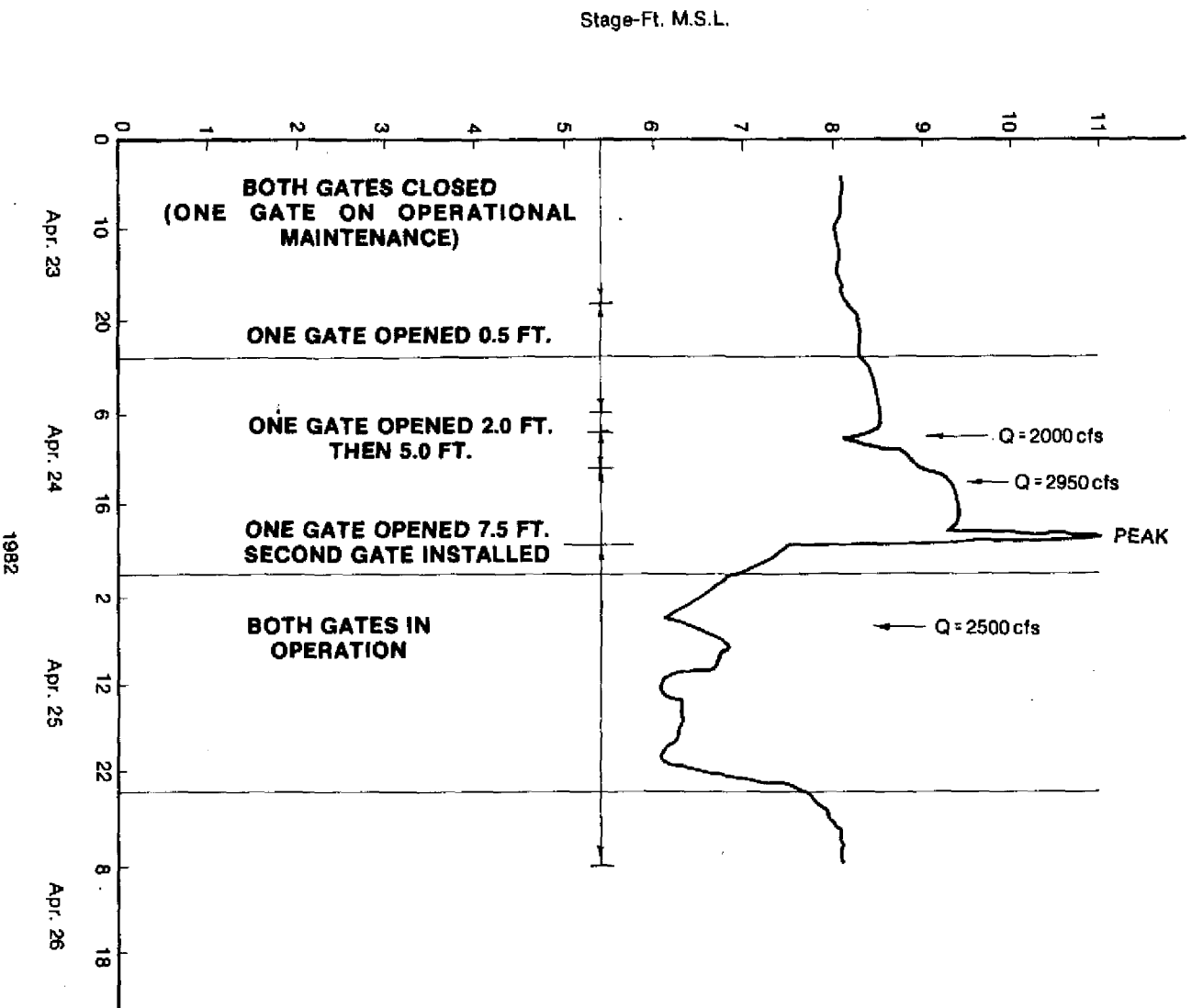


Figure 5 HOURLY STAGE HYDROGRAPH AT S-41 HEADWATER DURING RAINSTORM OF APRIL 23-26, 1982

dropped to 7.94 ft msl at 8:30 PM right after both gates on the structure were open full. The headwater stage was at 9.32 ft msl for several hours between 2 PM and 8 PM April 24, 1982 due to only one gate being in operation. This represents the actual storm peak. This may have provided less hydraulic head availability for the drainage from the secondary system in the area. However, the high water stage in John Prince Park at the Congress Avenue crossing of Lake Worth Drainage District Lateral Canal 14 was about 10.15 ft msl, which was about 2.20 feet below the high water mark caused by the March 28-29, 1982 storm. It is interesting to note that the discharge during the night and early morning of April 24-25, 1982 was 2500 to 3000 cfs, comparable to the 2500 cfs discharge later in the day with both gates in operation. The possible explanations are restriction of inflow from the secondary drainage system, and much less rainfall this time than last month.

3. S-40 - This structure maintains and drains the C-15 Basin which covers the City of Delray Beach. Figure 6 shows the hourly stage hydrograph at S-40 headwater during the rainstorm. Both gates were in operation during this rainstorm. The stage was maintained between 4.5 and 8.0 ft msl during this storm. The flooding in some streets and homes was due to inadequate secondary or tertiary drainage system capacity, maintenance, or operation.

4. S-44 - This structure maintains stages and drains the C-17 Basin. This basin received 5 to 8 inches of rainfall with intensive rainfall at the upstream portion of the basin. Figure 7 shows the hourly stage hydrograph during this rainstorm. The stage was maintained between 5.7 and 7.7 ft msl during the rainstorm. One death was reported to be the result of a flooded street and canal draining into C-17 across Palm Beach Lakes Boulevard. A sheetpile wier located downstream of 45th Street (West Palm Beach) in C-17 is suspected to have resulted in a backwater condition and is under investigation by the District.

STRUCTURE S-40

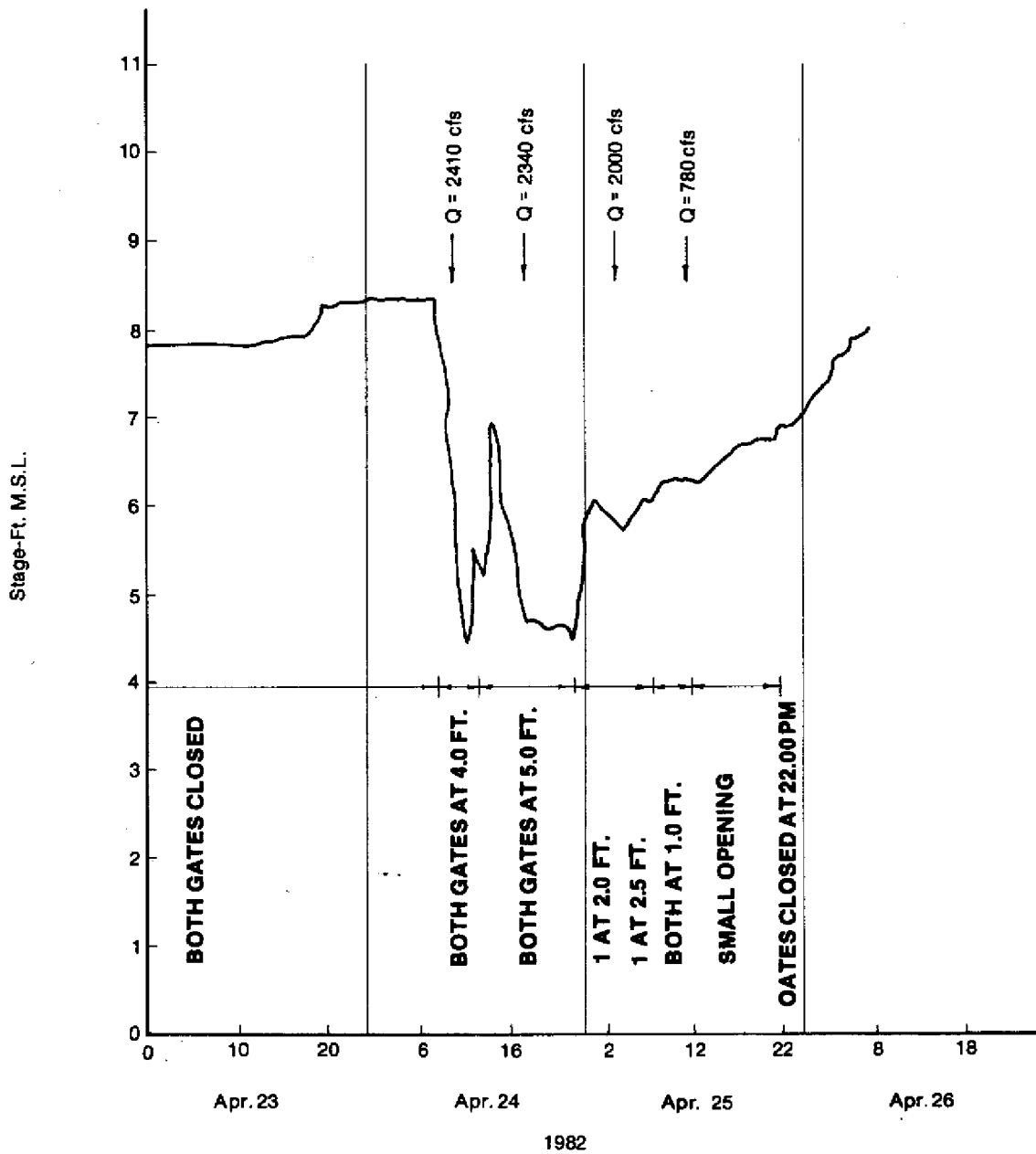


Figure 6

HOURLY STAGE HYDROGRAPH AT S-40 HEADWATER DURING RAINSTORM OF APRIL 23-26, 1982

STRUCTURE S-44

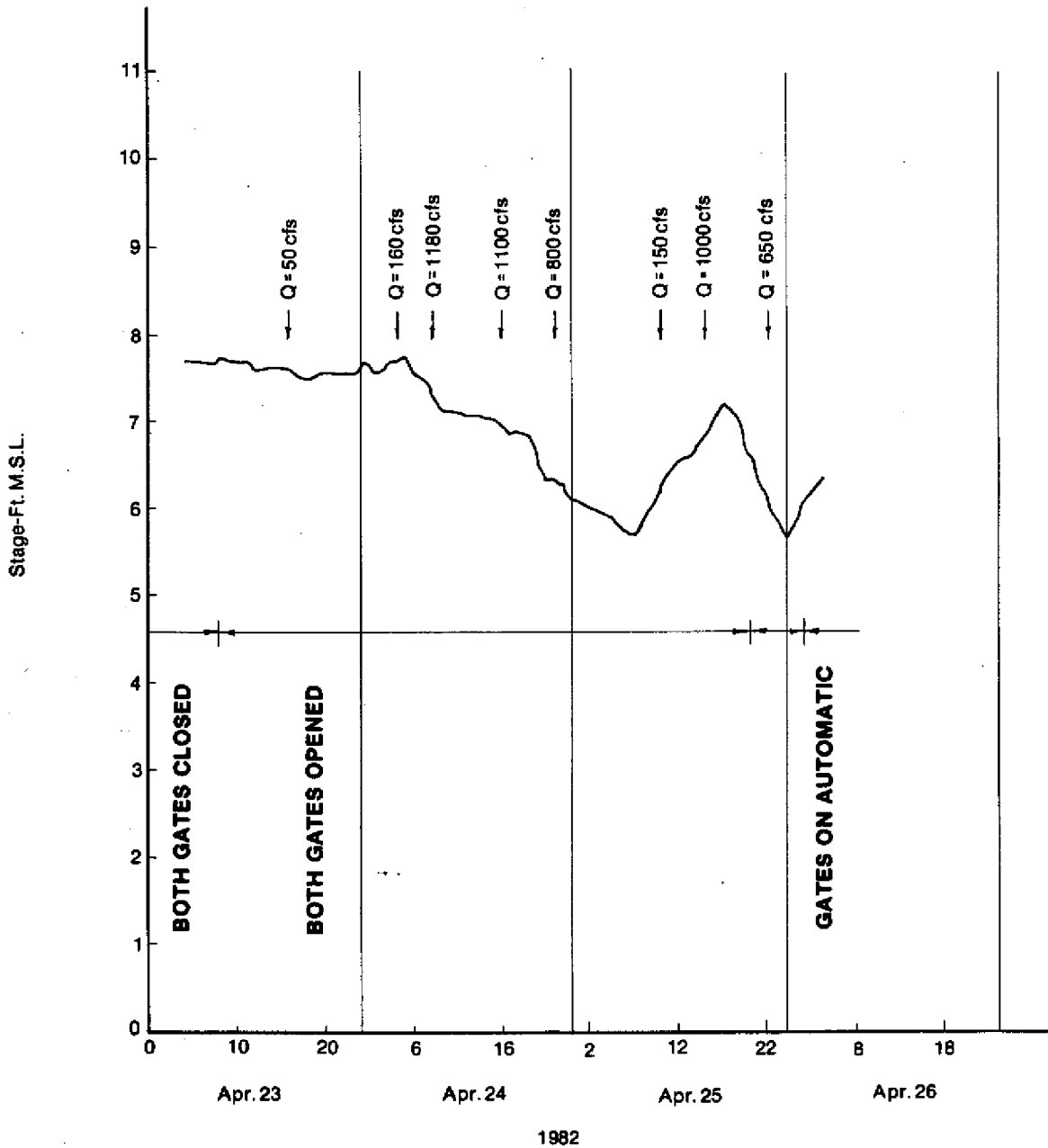


Figure 7 HOURLY STAGE HYDROGRAPH AT S-44 HEADWATER DURING RAINSTORM OF APRIL 23-26, 1982

5. S-26 - This structure, located in the City of Miami at the 36th Street crossing of the Miami canal, is a reinforced concrete, gated spillway, with discharge controlled by two cable operated, vertical lift gates. Operation of the gates is automatically controlled to maintain the optimum headwater elevation of 2.50 ft msl. As mentioned previously, the rainfall in this area was reported to be 8.99 inches at Miami International Airport and 8.75 at the District's Miami Field Station. The operation of S-26 has a direct and indirect impact on the area's drainage. Figure 8 shows the hourly stage hydrograph at S-25 headwater during this rainstorm. The gates were operated at 5 AM April 24, 1982 when stage reached 2.80 ft msl. The stage at this structure was maintained between 2.25 and 3.12 ft msl. The stage reached slightly over 3.0 feet in two periods: one at 6 AM through 11 AM April 24, 1982 and one between 9 PM and 11 PM April 24, 1982. No severe flooding was reported in this basin, although golfball-size hail was observed.

V. Rainfall Comparison

Table 3 presents rainfall comparisons of past rainfall events with this rainstorm at Hypoluxo, Greenacres City, West Palm Beach Airport, Boca Raton, and Miami International Airport. The result indicated that this rainstorm was of lower intensity than last month's storm, and that there were several heavier rainfalls in the past 80 years. As mentioned in the preliminary report of March 28-29, 1982 rainstorm, a severe rainstorm can occur in any part of the year. We cannot eliminate the possibility of the reoccurrence of heavier storms this year also.

STRUCTURE S-26

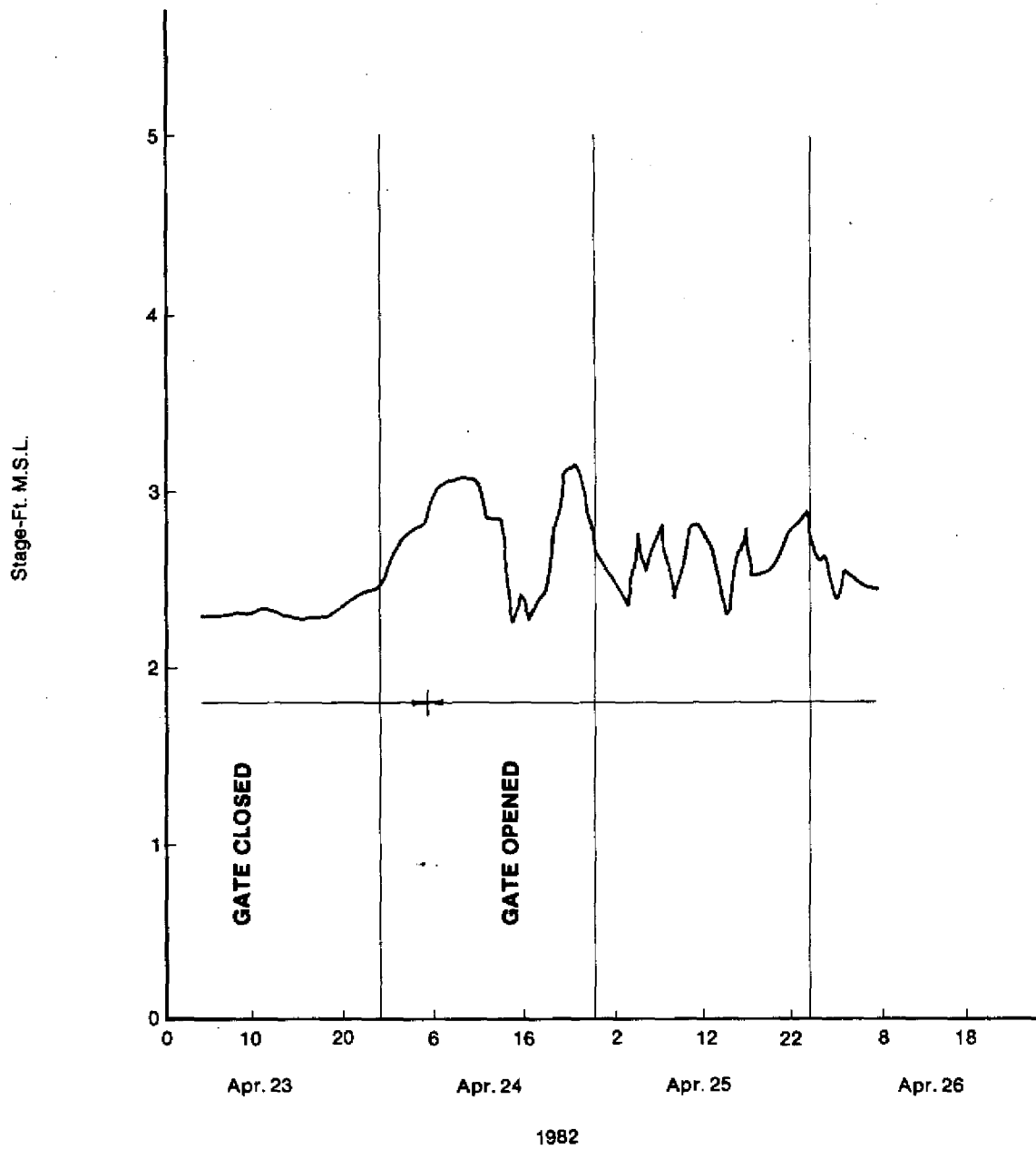


Figure 8

HOURLY STAGE HYDROGRAPH AT S-26 HEADWATER DURING RAINSTORM OF APRIL 23-26, 1982

TABLE 3. TWO-DAY RAINFALL COMPARISON OF PAST RAINFALL EVENTS AT HYPOLUXO (1901-1959), GREENACRES CITY (1955-82), WEST PALM BEACH AIRPORT (1939-82), BOCA RATON (1948-82), and MIAMI INTERNATIONAL AIRPORT (1939-82)

Rainfall - Inches

<u>Date</u>	<u>Hypoluxo</u>	<u>Greenacres</u>	<u>WPB AP</u>	<u>Boca Raton</u>	<u>Miami AP</u>
Jun.11-12,1901	14.06	-	-	-	-
Oct.18-19,1924	9.71	-	-	-	-
Sep.06-07,1931	10.57	-	-	-	-
Sep.10-11,1932	11.32	-	-	-	-
Apr.16-17,1942	16.80	-	15.41	-	19.32
Oct.05-06,1948	10.15	-	7.43	11.99	10.43
Oct.14-15,1965	-	12.05	9.61	14.70	8.28
Apr.24-25,1979	±13.0*	8.34	7.53	±13.0*	16.24
Mar.28-29,1982	±13.0*	10.55	9.24	± 3.20*	1.40
Apr.23-24,1982	± 9.10*	3.80	9.20	5.61	8.99

Note: * = Estimated

VI. Summary

The torrential rainstorm that occurred during April 23-24, 1982 was the second heavy rainstorm within a month that caused flooded houses and mobile homes, forced the closing of streets, and caused electric power loss in thousands of homes in the lower east coast area. Maximum rainfalls of 12.4 inches were reported at 2552 Bahia Road, West Palm Beach, located about one mile south of Forest Hill Boulevard near Florida Mango Road, and 15.82 inches reported by Richard Young, a cooperater of Dade County, located at 9495 SW 92nd Avenue, Miami. The most intensive rainfall occurred between 9 AM and 11 AM April 24, 1982 during which over 6.0 inches of rainfall was measured at Bahia Road, West Palm Beach. Rainfall in the vicinity of Lake Clarke Shores, Palm Springs, Lake Worth along Congress Avenue, and eastward to the Atlantic Ocean was on the order of a one in 10 year and a one in 25 year occurrence. Rainfall in the greater Miami area, including Miami, Miami Springs, Hialeah, areas between Hialeah Gardens and Sweetwater west of Miami International Airport, and Coral Gables was on the order of a one in 5 to 10 year event. Rainfall in the area south of Sweetwater and the area west of South Miami were on the order of about a one in 25 to 50 year event. This torrential rainstorm was the result of a warm front moving north from the Straits of Florida at 10 mph, in conjunction with a very large high pressure system located off the coast of the Carolinas.

Waterview Mobile Home Park, West Palm Beach, and Sunshine Mobile Village, Lake Worth, were severely flooded for the second time in a month. Conditions at Sunshine Mobile Village were worse than during last month's flood due to more intensive rainfall in this area this time. Several streets such as South Swinton Circle in Delray Beach, several sections of suburban Lake Worth, and the Lake Worth Bridge were flooded and were closed for several hours. The flood waters had receded from most of the flooded areas in the morning of April 25, 1982. The flooding in several areas was worse than that

caused by last month's storm even though the total rainfall was less. This was due to the most intensive rain occurring in a rather short time (9 AM through 11 AM April 24, 1982), and the fact that many secondary and tertiary drainage systems had not been cleaned out after the March 28-29, 1982 storm and were clogged with debris and sedimentation. However, the survey of high water marks after this rainstorm indicated that peak stages were at least one or two feet below the high water marks created from last month's storm.

An analysis of project system performance during this rainstorm indicated three potential problem areas:

1. S-41 (Boynton Canal Structures)

One gate at S-41 was undergoing maintenance at the West Palm Beach Field Station and was out of service until 8 PM April 24, 1982. A forecast of 80% rainfall probability prompted reinstallation of the gate. The peak headwater stage resulting directly from the storm was 9.3 ft msl and occurred prior to the installation. During installation of the second gate, a short term peak stage of 10.94 ft msl resulted from the need to briefly close the remaining gate. The effects of the brief peak were not severe.

2. Palm Beach Locks (West Palm Beach Canal Structures)

The boards in Palm Beach Lock were pulled out at 12:15 PM April 24, 1982. A peak stage of 9.88 ft msl at the lock was reached at 12 noon. This peak was the second highest stage since 1960 and also the second highest stage in this dry season. The return frequency of this stage is about one in 11 to 12 years. The peak stage at Summit Boulevard and the District's Field Station are 10.23 ft msl and 10.58 ft msl, respectively. These readings are about one foot lower than last month's readings (March 28-29, 1982 storm).

The events of March and April have vividly demonstrated the inadequacy of this antiquated structure, which is not responsive to the needs of an urban watershed. The replacement structure, S-155, is under contract by the Corps of Engineers.

3. S-44 (Earman River Canal Structure)

This structure was able to handle the discharge from the C-17 Basin without difficulty. The intense rainfall in the southern portion of this basin resulted in significant flooding. An existing sheetpile weir, which maintains dry season waterlevels, may have caused a backwater condition and is under investigation by the District.

The analysis of project system performance presented here clearly indicates that many areas flooded in this storm were primarily caused by the inadequate secondary or tertiary drainage system capacities, maintenance, and operation, plus very intensive rainfall occurring in a rather short period of time (for example, 6.7 inches in 2 hours between 9 AM through 11 AM April 24, 1982 at 2552 Bahia Road). The debris and sedimentation were not cleaned from many local drainage systems after the severe rainstorm of March 28-29, 1982.

The flood water in the Waterview Mobile Home Park reached 11.22 ft msl for the April storm, which was about 2.3 feet lower than the March 28-29, 1982 rainstorm and was about 4.0 feet lower than the September 17-18, 1960 rainstorm. The rainfall at Palm Beach International Airport was 9.20, 9.34, and 8.79 inches for these events, respectively. The improvement of the Stub Canal after 1971 and the operations of the Palm Beach Lock have had a great impact on reducing the flood stage in the drainage basin of the Stub Canal. The lower flood stage in the West Palm Beach Canal for the April Storm was due to the fact that the District crew was able to pull the boards out of the structure within two hours and that there was less inflow into the West Palm Beach Canal from the south. The new automatic gated spillway structure to be constructed in the near future to replace the existing outdated lock will not completely relieve the flood problem for the Waterview Mobile Home Park. Portions of the existing cross-section in the Stub Canal are inadequate due to sedimentation from the expansion of the industrial park and construction in the area. In addition, the mobile home park is located in a relatively low land area. Currently, Palm Beach County

and the District are investigating the drainage problem in this area.

The storm covered areas of eastern Palm Beach and Dade Counties, but provided little rainfall to Lake Okeechobee and the water conservation areas. It did help take the edge off the drought condition, but was by no means sufficient to end the District-wide rainfall deficiency.