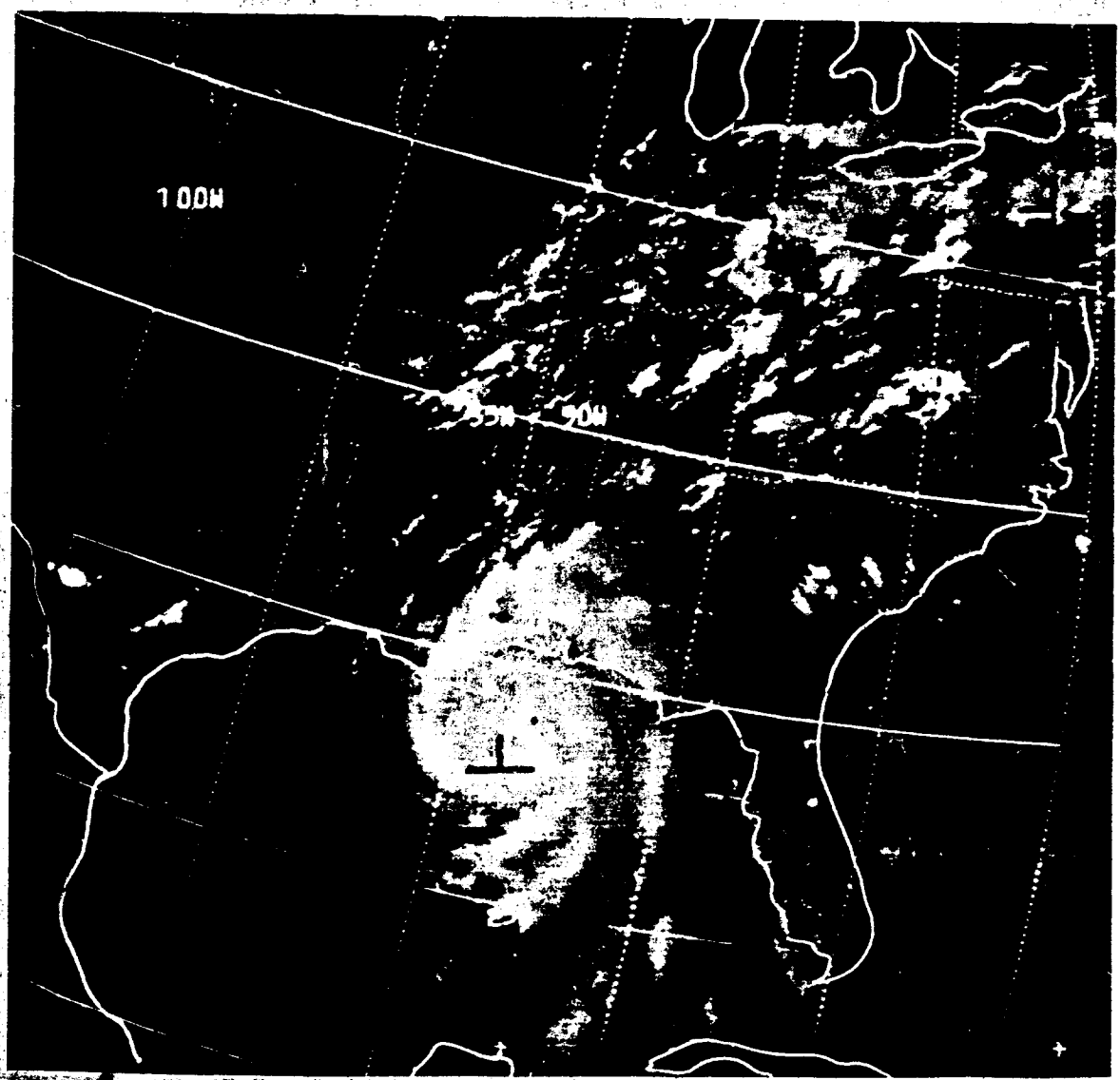
HURRICANE CAMILLE

14 - 22 AUGUST 1969



U. S. ARMY ENGINEER DISTRICT, MOBILE
CORPS OF ENGINEERS
MOBILE, ALABAMA

MAY 1970

REPORT ON

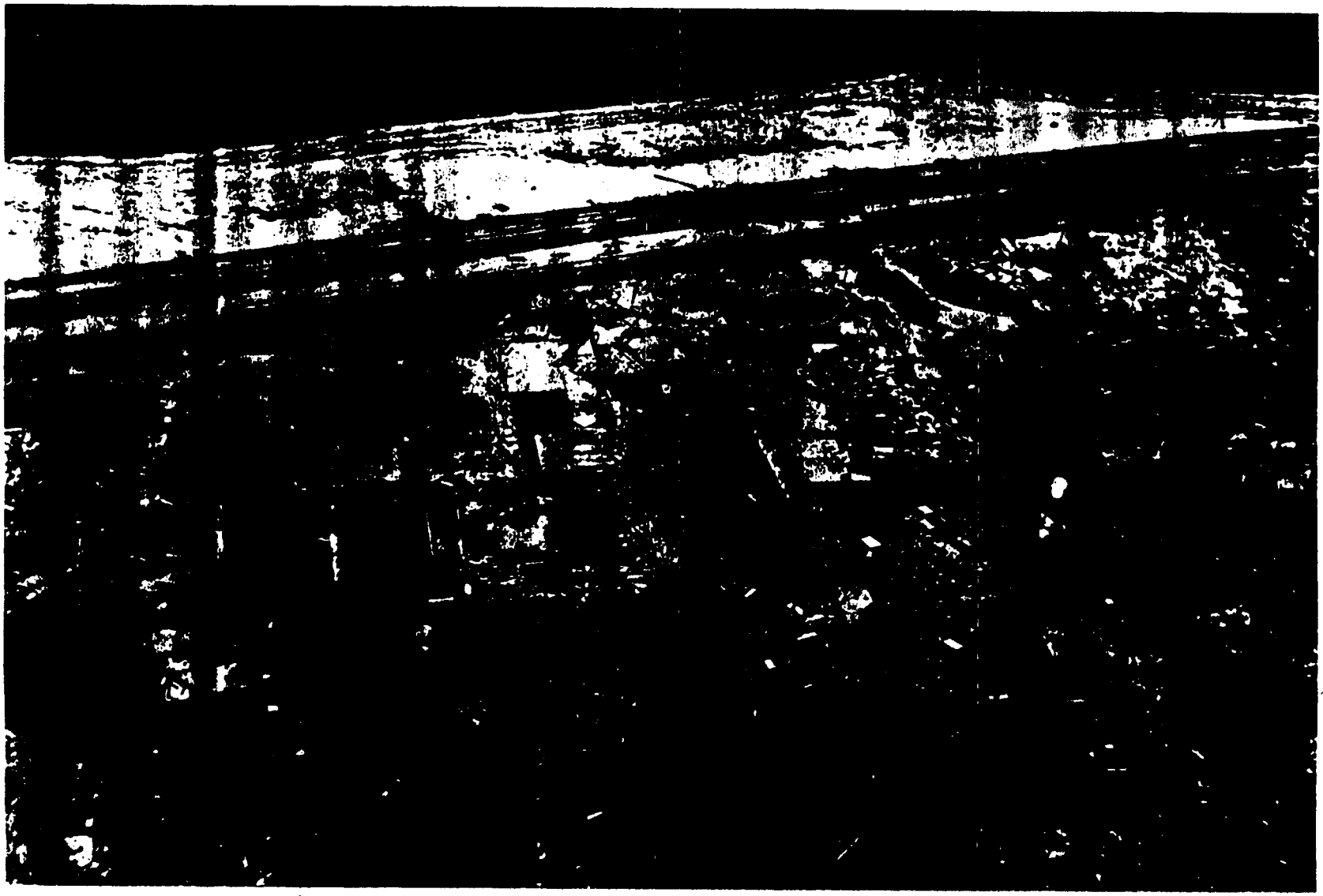
HURRICANE CAMILLE

14-22 AUGUST 1969

U.S. ARMY ENGINEER DISTRICT, MOBILE

CORPS OF ENGINEERS

MOBILE, ALABAMA



BUILDINGS LEVELED BY CAMILLE - BILOXI

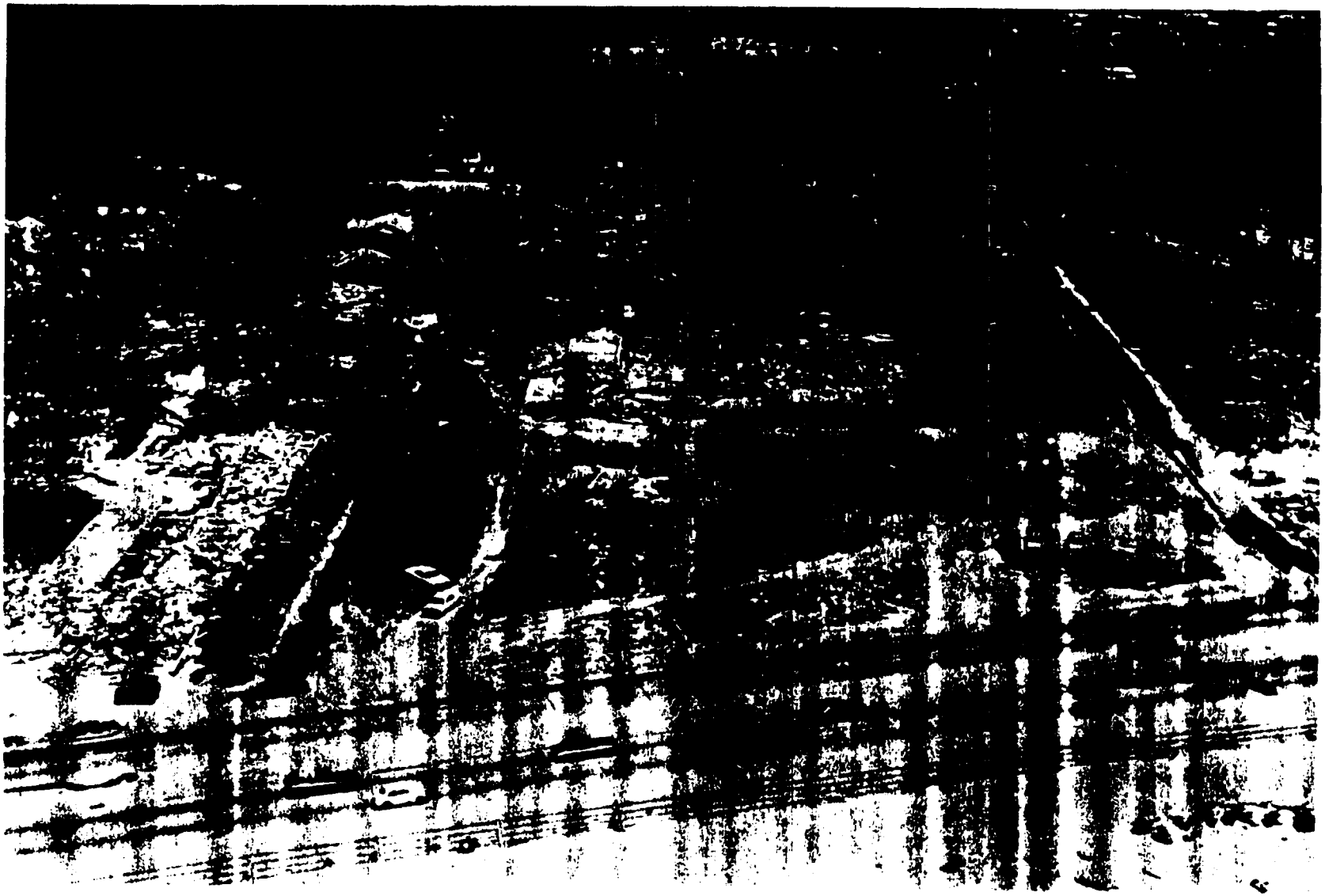
FOREWORD

Hurricane Camille, a tightly knotted and said to be the most intense hurricane on record to enter the United States mainland, was first reported as a tropical storm which formed rapidly from a tropical wave in the Caribbean near Grand Cayman Island on 14 August 1969. The storm took a north-northwestward forward movement increasing in intensity as it moved toward land. When the center was 140 miles southeast of New Orleans, central pressure was measured at 26.61 inches of mercury, third lowest in history, and surface winds were calculated at 201.5 m.p.h. The eye crossed the Mississippi coast near Bay St. Louis about 11:30 PM CDT on 17 August 1969. At landfall, winds approaching 200 m.p.h. and tides ranging up to 22 feet above normal devastated the Mississippi coast, killing 137 persons, leaving tens of thousands homeless, and inflicting over one half billion dollars in damages in Mississippi and Alabama alone.

From landfall, Camille moved north across Mississippi, weakening as she continued her destructive path inland. Heavy rains fell as she crossed Tennessee, Kentucky, West Virginia, and Virginia, creating flash floods and mud slides along the foothills of the Blue Ridge Mountains. A record high flood was produced on the James River, wrecking most of the river towns from Lynchburg to Richmond.

In its trek across the United States, Camille killed 262 persons and reduced thousands of buildings to rubble. The true economic loss will probably never be known but estimates so far aggregate nearly one billion dollars.

This report contains the meteorologic and hydrologic phenomena of the hurricane and describes and evaluates its effect on areas within the U. S. Army Engineer District, Mobile. The data presented in the report have been derived from the most reliable sources of information available at the time.



THE MERRY MANSION, MISSISSIPPI CITY, REDUCED TO RUBBLE BY CAMILLE

REPORT
ON
HURRICANE CAMILLE
14-22 AUGUST 1969
IN THE
U. S. ARMY ENGINEER DISTRICT, MOBILE

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REPORT
ON
HURRICANE CAMILLE
14-22 AUGUST 1969
IN THE
U. S. ARMY ENGINEER DISTRICT, MOBILE

I - INTRODUCTION

1. AUTHORITY

This post-hurricane report on meteorological data and damages associated with hurricane "Camille" has been prepared in accordance with instructions contained in ER 500-1-1, dated 1 September 1967. The report was authorized by second indorsement from the Chief of Engineers dated 27 August 1969, subject: "Preliminary Appraisal Report on Hurricane Camille." After-action activities performed under authority of Public Law 81-875 and 84-99 are described in a separate report.

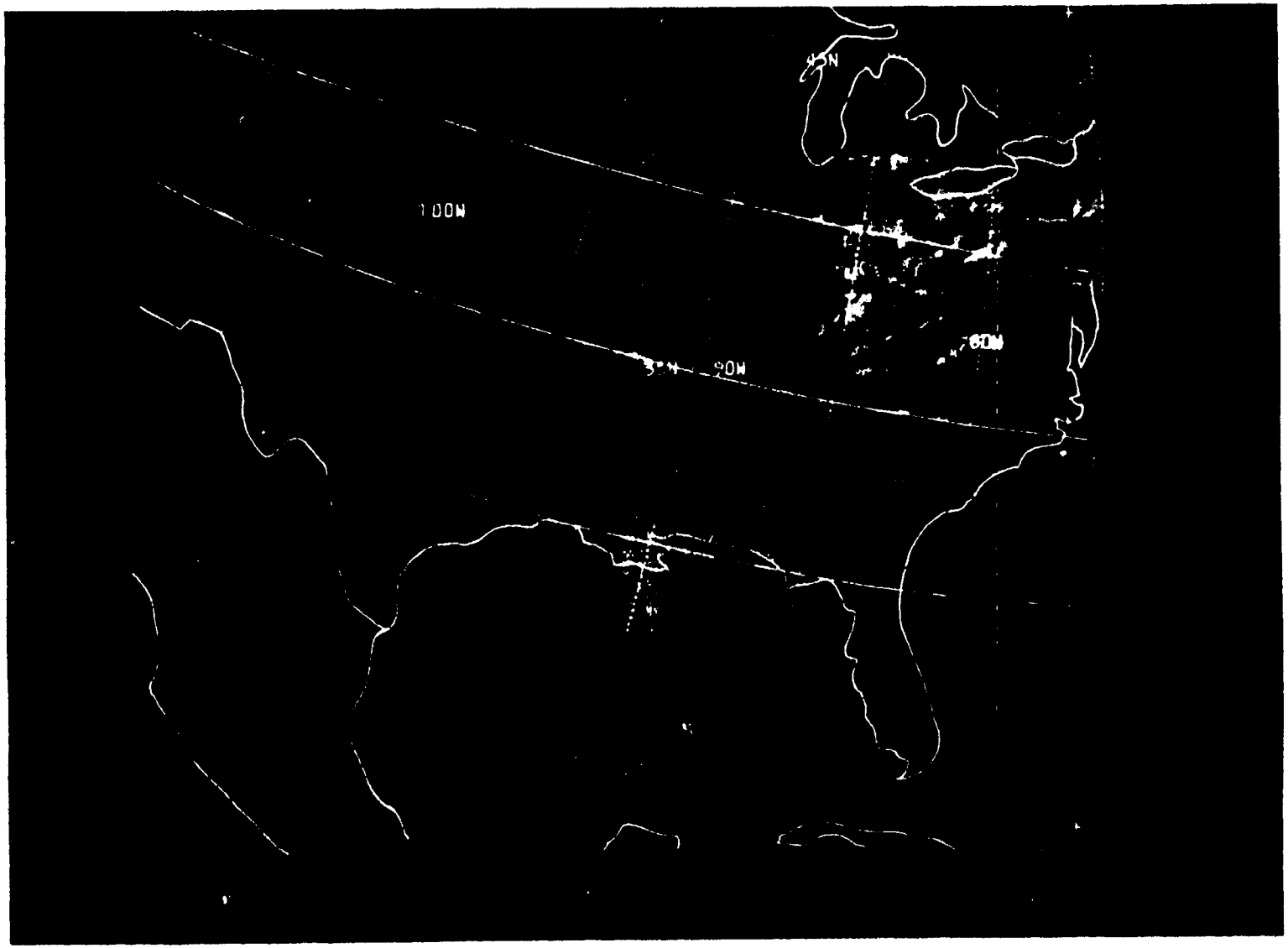
2. PURPOSE AND SCOPE

The report covers the meteorological history of hurricane "Camille" and its effect on those counties in Mississippi and Alabama within the Mobile Engineer District that were declared to be disaster areas by the President. A comprehensive survey was conducted within the areas of tidal inundation to collect data on damages and meteorology for use in the Corps of Engineers mission with respect to hurricane protection projects. Areas not flooded were covered in less detail. The portion of southeast Louisiana within the Mobile District is being covered in a similar report by the New Orleans District.

II - HISTORY AND DESCRIPTION OF HURRICANE

3. ORIGIN

A tropical wave that was later to intensify into "Camille" was verified by weather satellite pictures off the coast of Africa on 5 August 1969. This inverted "V" cloud pattern traveled westward and was recognized as a tropical disturbance on 9 August, about 480 miles east of the northern Leeward Islands. The tropical disturbance rapidly deepened as it proceeded westward. On 14 August the pilot of a Navy reconnaissance plane witnessed the birth of Camille as a tropical storm about 60 miles west of Grand Cayman Island in the western Caribbean or 480 miles south of Miami. Observations during the reconnaissance flight disclosed a central pressure of 29.50 inches of mercury and surface winds of 55 m.p.h.



CAMILLE PHOTOGRAPH BY ESSA 9 SATELLITE 17 AUGUST 1969 AT 2:57 PM CDT

4. INTENSIFICATION

Early Friday morning, 15 August, Camille developed into a small but potent hurricane pursuing a northwesterly track at about 9 m.p.h. Havana's weather radar located Camille about 60 miles south-southeast of Pinar del Rio. As Camille moved toward western Cuba on Friday afternoon, her winds had already reached 115 m.p.h. with gales extending out 125 to 150 miles to the north of the center and 50 miles to the south. Friday evening, Camille weakened as she moved across Cuba, generating 92 m.p.h. winds at Guane and spreading 10-inch rains over western sections of the island.

Upon reaching the warm Gulf of Mexico waters Camille began to regain her strength. She was moving at about 10 m.p.h. in a north-northwestward direction. Early Saturday morning, 16 August, with Camille located about 420 miles south of Panama City, Florida, a hurricane watch was ordered for the Gulf coast from Biloxi, Mississippi, to St. Marks, Florida.

By 11 o'clock Saturday morning, the winds were back up to 115 m.p.h. with hurricane force winds extending out about 40 miles from the center and gales extending out 150 miles. At this time, hurricane warnings were issued for the northwest Florida coast from Fort Walton Beach, Florida, to St. Marks. Late Saturday afternoon reconnaissance aircraft indicated the storm had slowed and was rapidly intensifying. Maximum winds were estimated at 150 m.p.h. near the center, which was then located about 380 miles south of Fort Walton Beach. Saturday evening, Camille increased in forward speed to about 12 m.p.h., generating 160 m.p.h. winds near her center and hurricane force winds out to 50 miles in all directions.

By early Sunday morning, 17 August, Camille was located 250 miles south of Mobile, Alabama. Hurricane warnings, which were already in effect for the Florida panhandle, were extended to include the Alabama and Mississippi coasts to Biloxi. Camille continued to move toward the mouth of the Mississippi River and by 9 o'clock in the morning hurricane warnings were issued for all the Mississippi coast and as far west as New Orleans and Grand Isle. At 3 o'clock Sunday afternoon, warnings east of Apalachicola, Florida, were discontinued. At this time the storm was located about 120 miles southeast of New Orleans and was expected to pass close to the mouth of the Mississippi River late in the afternoon.

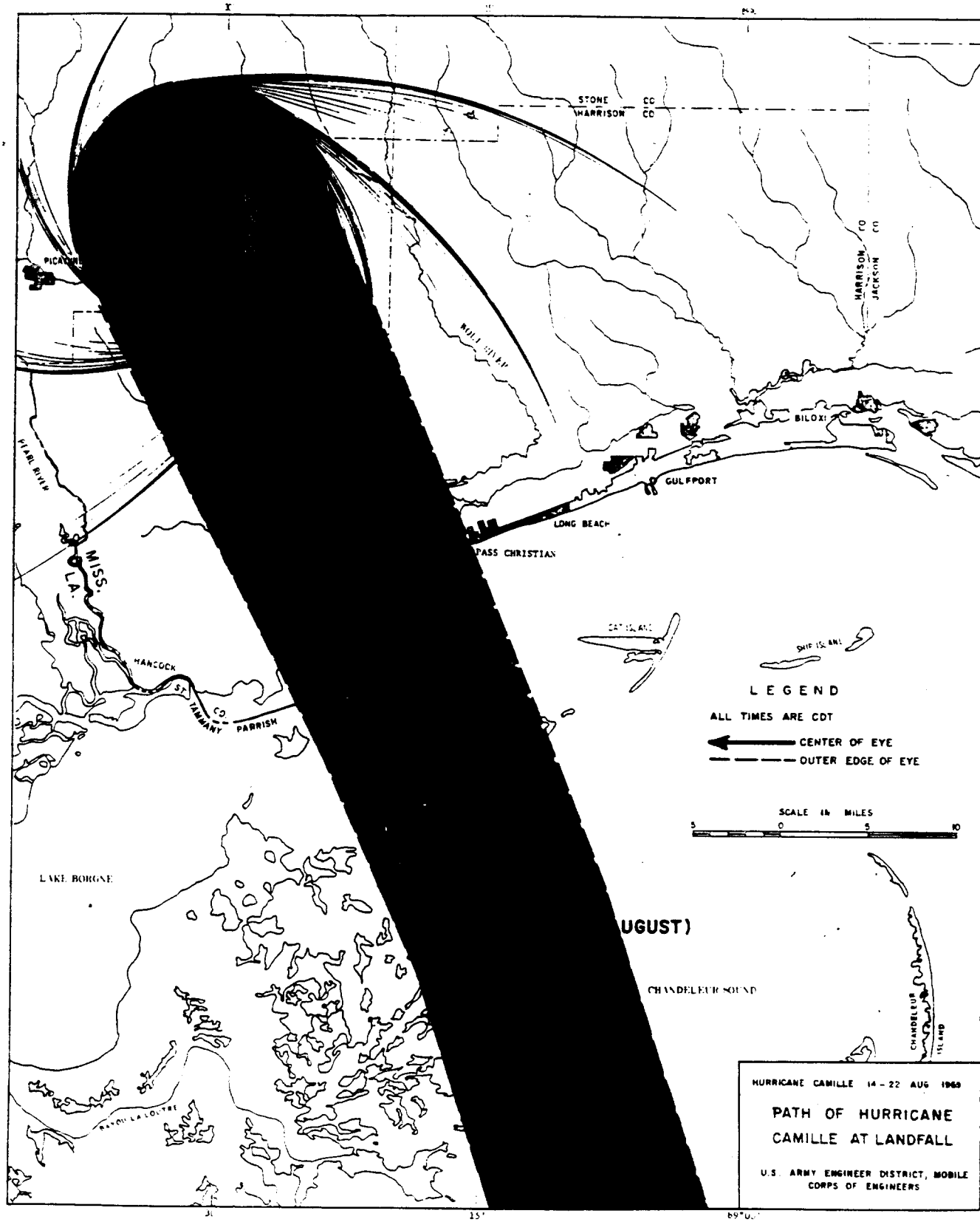
Early Sunday afternoon, the last reconnaissance flight was made and the crew of this flight recorded a central pressure of 26.61 inches and clocked maximum winds at more than 200 m.p.h. near the center. Hurricane force winds extended out 60 miles from the center and gales outward about 180 miles. The storm was now at its peak and located less than

100 miles from the mouth of the Mississippi River. By 7 o'clock Sunday night, Camille was 60 miles south of Gulfport, moving north-northwest about 15 m.p.h. and expected to move inland near Gulfport that evening.

5. LANDFALL

The center of Camille made landfall shortly before midnight in the Bay St. Louis area. U. S. Weather Bureau reports indicate that the eye of the storm at landfall was about 12 miles in diameter and, as near as can be determined, that the center of the eye crossed directly over the town of Waveland at a forward speed of 15 m.p.h. The wall of highest winds east of the eye struck between Pass Christian and Long Beach, Mississippi. Destruction in this area was virtually complete, resembling more the effect of a tornado than a hurricane. There were no records of winds near the center at landfall but estimates ranged up to 190 m.p.h. The tidal surge reached an unprecedented height of 22.6 feet above m.s.l. at Pass Christian and was nearly 6 feet above m.s.l. as far east as Gulf Shores, Alabama. Near the west end of the Bay St. Louis bridge a pressure of 26.85 inches was recorded. Rainfall over southern Mississippi, southeastern Louisiana, and southwestern Alabama averaged from 2 to 6 inches with maximums of about 10 inches in Hancock County and 10.6 inches at Hattiesburg.

TYPICAL DESTRUCTION IN AREA OF MAXIMUM WINDS


STONE CO
HARRISON CO
HARRISON CO
JACKSON CO
PICAYUNE
MOBILE BAY
BILOXI
GULFPORT
LONG BEACH
PASS CHRISTIAN
PEARL RIVER
MISS.
LA.
HANCOCK CO
ST. TAMMANY PARISH
CAT ISLAND
SHIP ISLAND
LEGEND
ALL TIMES ARE CDT
CENTER OF EYE
OUTER EDGE OF EYE
SCALE IN MILES
5 0 5 10
LAKE BORGNE
UGUST)
CHANDELEUR SOUND
CHANDELEUR ISLAND
BAYOU LA LOUTRE
HURRICANE CAMILLE 14 - 22 AUG 1969
PATH OF HURRICANE CAMILLE AT LANDFALL
U.S. ARMY ENGINEER DISTRICT, MOBILE
CORPS OF ENGINEERS

COMPLETE DESTRUCTION OF BEACH FRONT BUILDINGS - LONG BEACH

6. OVERLAND

The small but intense storm began to weaken as it moved northward across Mississippi, passing close to Columbia, Jackson, Canton, and Greenwood, Mississippi. Early on the 18th, as Camille passed 10 miles to the east of Jackson, the pressure fell to 28.93 inches with winds gusting to 67 m.p.h. Identifiable circulation continued into southern Quitman County. Thereafter, the storm weakened rapidly and was a tropical depression before reaching the northern Mississippi border.

As a depression, Camille moved north-northeastward through western Tennessee, east-northeastward through central Kentucky, and eastward through extreme southern West Virginia and southern Virginia. Late Tuesday evening, 19 August, the remnants of the storm produced torrential rainfall that caused flash floods and landslides along the eastern slopes of the Blue Ridge Mountains and record flooding along the James River system. By Wednesday afternoon the storm moved off the Atlantic coast east of Norfolk and, moving eastward, regained circulation and tropical storm intensity. However, by Friday, 22 August, it merged with a frontal system and lost its identity as a tropical storm some 175 miles southeast of Cape Race, Newfoundland. A summary of Weather Bureau advisories and bulletins is given in table 1. The path of the hurricane is shown on Plate 1.

Table 1

Summary of Weather Bureau advisories and bulletins

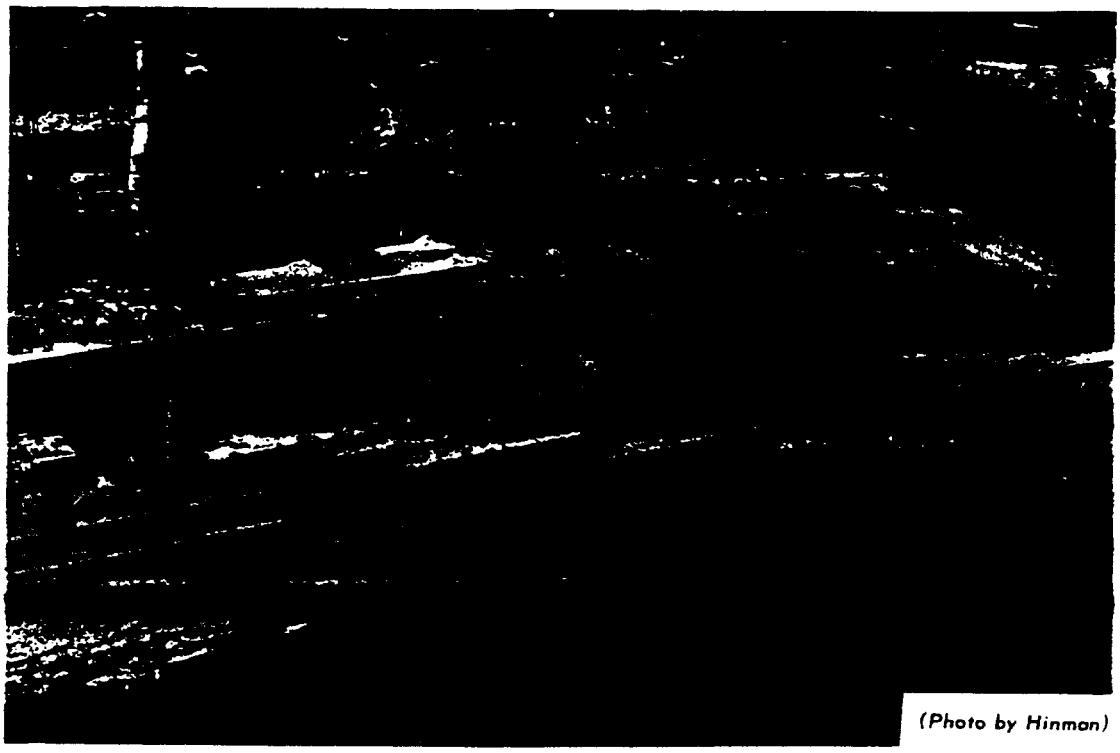
Advisory No.	Time & Date August (CDT)		Max. wind Velocity (mph)	Forward movement Direction	Forward movement Speed (mph)	Position Lat. North	Position Long. West	Hurricane warning area
1	12noon	14	60	W-NW	12-14	19.3	82.3	
Bulletin	2 p.m.	14	50-60	NW	12-14	19.5	82.5	Precautions for Is. of Pines
2	5 p.m.	14	60-65	NW	12	19.9	83.0	Precautions for Is. of Pines & west. Cuba
Bulletin	8 p.m.	14	60-65	NW	10	20.3	83.4	Precautions for Is. of Pines & west. Cuba
3	11 p.m.	14	60-65	N	10	20.3	82.4	Precautions for Is. of Pines & west. Cuba
Bulletin	2 a.m.	15	65	N-NW	10	20.5	83.0	Precautions for Is. of Pines & west. Cuba
4	5 a.m.	15	70	NW	10	20.8	83.7	Precautions for Is. of Pines & west. Cuba
Bulletin	8 a.m.	15	90	NW	8	20.9	83.9	Cuba, west of Pinar del Rio
5	11 a.m.	15	100	N-NW	9	21.2	83.9	Cuba, west of Pinar del Rio
Bulletin	2 p.m.	15	115	N-NW	6-7	21.2	84.2	Southwest coast of Cuba
6	5 p.m.	15	115	N-NW	7	21.5	84.4	Extreme western tip of Cuba
Bulletin	8 p.m.	15	90	NW	10	22.0	84.5	Extreme western tip of Cuba
Bulletin	10 p.m.	15	100	N-NW	10	22.5	84.6	Extreme western tip of Cuba
7	11 p.m.	15	100	N-NW	10	22.6	84.6	Gales; Marquesas Keys and Dry Tortugas
Bulletin	2 a.m.	16	100	N-NW	10	23.2	85.0	Gales; Marquesas Keys and Dry Tortugas
8	5 a.m.	16	100	N-NW	10	23.7	85.3	Gales; Dry Tortugas
9	8 a.m.	16	100	N-NW	10	24.1	85.8	Watch; Biloxi, Miss. to St. Marks, Fla.
10	11 a.m.	16	115	N-NW	10	24.5	86.0	Fort Walton to St. Marks, Fla.
Bulletin	1 p.m.	16	115	N-NW	10	24.7	86.1	Fort Walton to St. Marks, Fla.
Bulletin	3 p.m.	16	115	Stalled		24.7	86.5	Fort Walton to St. Marks, Fla.
11	5 p.m.	16	150	Stalled		24.8	86.7	Fort Walton to St. Marks, Fla.
Bulletin	7 p.m.	16	150	Stalled		25.0	86.9	Fort Walton to St. Marks, Fla.
Bulletin	9 p.m.	16	150	N-NW	12	25.4	87.3	Fort Walton to St. Marks, Fla.
12	11 p.m.	16	160	N-NW	12	25.8	87.4	Fort Walton to St. Marks, Fla.
Bulletin	1 a.m.	17	160	N-NW	12	26.2	87.5	Fort Walton to St. Marks, Fla.
Bulletin	3 a.m.	17	160	W-N	12	26.7	87.6	Fort Walton to St. Marks, Fla.
13	5 a.m.	17	160	W-N	12	26.9	87.9	Biloxi, Miss. to St. Marks, Fla.

Table 1 (Cont'd)

Summary of Weather Bureau advisories and bulletins

Advisory No.	Time & Date August (CDT)	Max. wind Velocity (mph)	Forward movement Direction	Forward movement Speed (mph)	Position Lat. North	Position Long. West	Hurricane warning area
Bulletin	7 a.m. 17	160	W-N	12	27.2	88.1	Biloxi, Miss. to St. Marks, Fla.
14	9 a.m. 17	160	N-NW	12	27.4	88.4	New Orleans, La. to St. Marks, Fla.
15	11 a.m. 17	160	N-NW	12	27.6	88.5	New Orleans, La. to St. Marks, Fla.
Bulletin	1 p.m. 17	160	N-NW	12-15	28.1	88.6	New Orleans, La. to St. Marks, Fla.
16	3 p.m. 17	190	N-NW	15-18	28.6	88.8	New Orleans, La. to Apalachicola, Fla.
17	5 p.m. 17	190	N-NW	15	29.0	88.9	New Orleans, La. to Apalachicola, Fla.
Bulletin	7 p.m. 17	190	N-NW	15	29.5	89.1	New Orleans, La. to Apalachicola, Fla.
Bulletin	9 p.m. 17	190	N	15	29.9	89.1	New Orleans, La. to Apalachicola, Fla.
18	11 p.m. 17	150	N	15	30.3	89.1	New Orleans, La. to Apalachicola, Fla.
Bulletin	1 a.m. 18	140	N	15	30.6	89.5	New Orleans, La. to Apalachicola, Fla.
Bulletin	3 a.m. 18	120	N	15	31.2	89.8	New Orleans, La. to Apalachicola, Fla.
19	5 a.m. 18	100	N	15	31.5	90.0	New Orleans, La. to Apalachicola, Fla.
Bulletin	8 a.m. 18	80	N	18	32.3	90.0	New Orleans, La. to Apalachicola, Fla.
20	11 a.m. 18	50	N	18	33.0	90.1	Warnings discontinued
Bulletin	2 p.m. 18	45	N	17	33.5	90.1	Heavy rains and flash flooding
Bulletin	5 a.m. 21	50	E	20-25	-	-	Gaining strength in Atlantic
Bulletin	8 a.m. 21	50	E	20	35.0	68.0	None
21	11 a.m. 21	55-60	E	22	37.5	68.0	Concern only to shipping
22	5 p.m. 21	65-70	E	35	37.5	62.0	Concern only to shipping
23	11 p.m. 21	65-70	NE	35	40.5	59.5	None
24	5 a.m. 22	55	NE	35	42.0	56.0	None
25	11 a.m. 22	45	-	-	44.0	52.0	Loses identity

APARTMENT COMPLEX LEVELED - LONG BEACH



(Photo by Hinmon)

SHOPPING CENTER AND APARTMENTS DEMOLISHED BY CAMILLE - PASS CHRISTIAN

SCALE IN MILES
25 0 25 50

HURRICANE CAMILLE 14-22 AUG. 1969

DISASTER AREA

U.S. ARMY ENGINEER DISTRICT, MOBILE
CORPS OF ENGINEERS
MOBILE, ALABAMA

7. AREAS AFFECTED IN THE MOBILE DISTRICT

As Camille moved inland over Mississippi, winds of hurricane force struck the coast in the Mobile District from its western boundary eastward to the vicinity of Pascagoula, Mississippi. Gusts up to 75 m.p.h. extended eastward along the coast to Mobile Bay and inland to just south of Jackson, Mississippi. Wind squalls occurred over extreme southwest Alabama and central and western Mississippi. The static tide rose to about 15 or 16 feet above m.s.l. along the Mississippi coast eastward to Ocean Springs with tidal surges up to 22.6 feet above m.s.l. in the immediate area of landfall. About 421,000 acres were flooded along the Mississippi and Alabama coasts. Virtually all the coastal strip in Mississippi was submerged. The tide dropped eastward to 6 feet above m.s.l. at Gulf Shores, Alabama, and to about normal near the eastern boundary of the District.

A reconnaissance of the storm-ridden area disclosed that the major concentration of damage and destruction was in Mississippi and southeast Louisiana. The populous Gulf coast section of southern Mississippi received the brunt of the storm, with the towns of Pass Christian and Long Beach being virtually destroyed. Major damages were sustained from Louisiana to as far east as Baldwin County, Alabama.

At the request of Governor John Bell Williams, Mississippi was declared a disaster area by President Nixon on 18 August 1969. The Mississippi counties listed below were determined by Office of Emergency Preparedness to be eligible for Federal assistance under the provisions of Public Law 81-875.

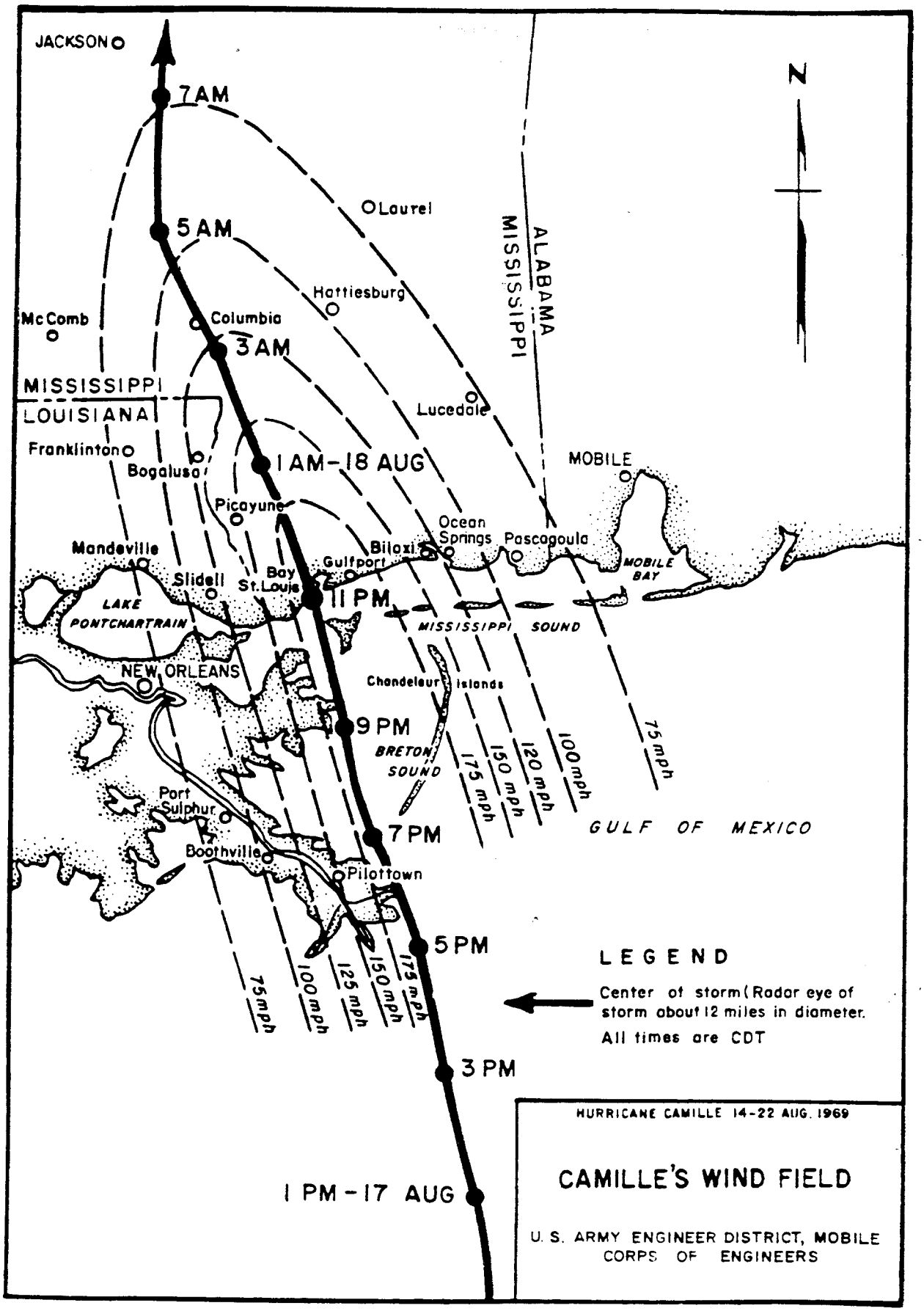
Amite	Harrison	Lincoln	Smith
Copiah	Jackson	Marion	Stone
Covington	Jasper	Pearl River	Walthall
Forrest	Jefferson Davis	Perry	Wayne
George	Jones	Pike	Wilkinson
Greene	Lamar	Rankin	
Hancock	Lawrence	Simpson	

Two counties in Alabama, Mobile and Baldwin, were declared a disaster area by the President on 7 November 1969 at the request of Governor Albert Brewer.

III - METEOROLOGICAL AND HYDROLOGICAL DATA

8. WIND

Based on observed winds at reconnaissance flight level and measured surface pressure, the U. S. Weather Bureau calculated maximum surface winds at 201.5 m.p.h. close to the center early in the afternoon of


JACKSON
7AM
5AM
3AM
1AM-18 AUG
11PM
9PM
7PM
5PM
3PM
1PM-17 AUG
Laurel
Hattiesburg
McComb
Columbia
MISSISSIPPI
LOUISIANA
Franklinton
Bogalusa
Picayune
Lucedale
ALABAMA
MISSISSIPPI
MOBILE
Ocean Springs
Pascagoula
Biloxi
Gulfport
Bay St. Louis
Mandeville
Slidell
LAKE PONTCHARTRAIN
MISSISSIPPI SOUND
MOBILE BAY
NEW ORLEANS
Chandeleur Islands
BRETON SOUND
Port Sulphur
Boothville
Pilottown
GULF OF MEXICO
75 mph
100 mph
120 mph
125 mph
150 mph
175 mph
N
LEGEND
Center of storm (Radar eye of storm about 12 miles in diameter.
All times are CDT
HURRICANE CAMILLE 14-22 AUG. 1969
CAMILLE'S WIND FIELD
U. S. ARMY ENGINEER DISTRICT, MOBILE
CORPS OF ENGINEERS

17 August. At this time the storm was centered about 140 miles southeast of New Orleans. The calculation represents the maximum winds ever observed in a hurricane and based on something more than pure estimation (ESSA's Climatological Data, National Summary, Vol. 20, No. 8, 1969).

The highest wind speed actually measured was recorded on an Easterline Angus wind speed recorder on a Transworld Drilling Company rig in the Gulf of Mexico 15 miles east of Camille's path. Extreme gusts of 172 m.p.h. were recorded before the paper jammed and the trace was lost. At Boothville, Louisiana, the Weather Bureau office reported gusts of 107 m.p.h. at 7 PM Sunday, before power failure.

Accurate wind measurements were almost impossible to obtain at landfall due to Camille's intensity. Highest winds near the center were estimated at 160 m.p.h. with gusts to 190 m.p.h. An Air National Guard Weather Flight stationed at Gulfport Municipal Airport estimated sustained winds in excess of 100 m.p.h. and gusts of 150-175 m.p.h. Keesler Air Force Base at Biloxi measured winds at 81 m.p.h. with gusts to 129 m.p.h. The Mississippi Test Facility near Picayune estimated sustained winds of 140 m.p.h. and gusts to 160 m.p.h. At New Orleans, winds ranged from 42 to 64 m.p.h. with maximum gusts to 85 m.p.h. At Slidell, Louisiana, the maximum sustained winds were estimated at 125 m.p.h. with peak gusts to 160 m.p.h.

Gusts of hurricane force winds extended as far east as Mobile Bay and inland to just south of Jackson, Mississippi. The Weather Bureau office at the municipal airport in Mobile measured sustained winds at 44 m.p.h. with gusts to 74 m.p.h. As the eye passed 10 miles east of Jackson, winds were below hurricane intensity with gusts to 67 m.p.h. The map on page 12 shows the approximate area affected by sustained hurricane force winds. Maximum hurricane winds and peak gusts for various locations are shown in table 2.

9. BAROMETRIC PRESSURE

Early Sunday afternoon, 17 August, an Air Force reconnaissance plane flew into the eye of the storm and reported a central pressure of 26.61 inches. Insofar as the North Atlantic and Gulf are concerned, this pressure was second only to that of the Labor Day hurricane of 1935 during which a 26.35-inch pressure was recorded in the Florida Keys. The world record low pressure was recorded at 25.90 inches during typhoon Ida in the Pacific on 24 September 1958.

As Camille moved inland shortly before midnight Sunday, the lowest land pressure of 26.85 inches was recorded at Bay St. Louis a few blocks from the west end of Bay St. Louis bridge. Other reported low pressure readings included 27.90 inches at St. Stanislaus College in

Table 2

Records of pressure, wind, and precipitation[1]
17-18 August 1969

Station	Lowest barometric pressure		Date	Wind, mph		Storm Rainfall[3] inches
	Inches	Time (CDT)		Fastest Mile[2]	Peak Gust	
Louisiana						
Boothville Weather Bureau Office	28.34	7:40 p.m.	17	-	107[5]	-
Garden Island Bay Plant Site on Dennis Pass	27.80	5:55 p.m.	17	-	150[4]	-
New Orleans Weather Bureau	29.14	11:15 p.m.	17	52	85	1.69
New Orleans International Airport	29.23	11:02 p.m.	17	42	59	1.00
Slidell	28.56	11:40 p.m.	17	125[4]	160[4]	5.03
Mississippi						
Bay St. Louis						
West end of bridge	26.85	-	-	-	-	-
St. Stanislaus College	27.90[5]	11:50 p.m.[4]	17	-	140[5,6]	-
Biloxi (Keesler AFB)	28.96	10:30 p.m.	17	81	129	-
Hattiesburg	-	-	-	-	-	10.60
Jackson Weather Bureau Office	28.93	7:56 a.m.	18	-	67	2.92
Meridian Weather Bureau Office	29.47	7:08 a.m.	18	24	41	2.17
Picayune (Miss. Test Facility)	28.06	12:40 a.m.	18	140[4]	160[4]	10.06
Pascagoula	29.26	11:45 p.m.	17	81	-	5.48
Purvis	29.40	2:00 a.m.	18	150[4]	-	4.00
Alabama						
Mobile Weather Bureau Office	29.44	10:56 p.m.	17	44	74	6.05
Montgomery Weather Bureau Office	29.79	3:00 a.m.	18	23	35	0.81

[1] Preliminary data published by the U. S. Weather Bureau
[2] Average velocity over a period of at least 1 minute
[3] Cumulative rainfall for a 32-hour period, August 17-18, 1969
[4] Estimated
[5] From incomplete records
[6] Probably exceeded

Bay St. Louis, 28.06 inches at Mississippi Test Facility, near Picayune, Mississippi, and 27.80 inches at Garden Island, Louisiana. Minimum barometric pressures recorded at various locations, along with the times of the readings, are included in table 2.

10. RAINFALL

As Camille moved inland, she spread an average of 2 to 6 inches of rain over southeast Louisiana and Mississippi, southwest Alabama, and northwest Florida. Average precipitation was about 5 inches within the area 20 miles west and 80 miles east of the hurricane path, from southeast Louisiana to Jackson, Mississippi. Locations in Mississippi receiving extreme rainfall were Hattiesburg with 10.60 inches and Mississippi Test Facility with 10.06 inches. Rainfall of 3 to 5 inches occurred in Tennessee, 2 to 3 inches in Kentucky, 2 to 4 inches over West Virginia, and up to 27 inches in Virginia. The greater part of this rain fell within a period of 8 hours. Plate 2 shows the isohyetal pattern for the Gulf Coast states affected and table 2 shows rainfall records for selected recording stations.

11. TEMPERATURE

Temperature data covering the four-day period 16-19 August are shown for selected locations in table 3. No substantial deviation from normal temperatures for these stations was associated with the hurricane. However, most locations in or adjacent to the storm center experienced a lowering of from 9 to 13 degrees in the daily maximum temperature during the actual storm period.

12. TIDES

At landfall, Camille produced the highest hurricane surge ever recorded within the boundaries of the Mobile District. This unprecedented surge destroyed most of the tide gages and records within the immediate areas of landfall. Within this area tide elevations had to be developed from a survey of high-water marks. High-water elevations are listed in table 4 and a profile of the surge heights along the Mississippi-Alabama coast is shown on plate 7.

The maximum static tide within the area of landfall was determined from off-shore high-water marks to be 15 to 16 feet above m.s.l. Still-water elevations reached 14.7 feet in Fort Massachusetts on Ship Island, 16.3 feet in a building on Cat Island, and 15.5 feet at the outer end of the Gulfport Harbor pier. As it moved inland to higher land, the tidal surge built up to as much as 22.6 feet m.s.l. Surge heights in excess of 10 feet above m.s.l. extended all the way from the Mississippi River delta eastward to near the Mississippi-Alabama line, tapering down to about normal at St. Marks, Florida. Maximum hurricane surges of

Table 3

Temperatures

16-19 August 1969

Station	Date (Aug.)	Recorded temperatures			Departure from Normal[1]
		Maximum	Minimum	Average	
Jackson, Miss.	16	96	72	84	+3
	17	93	70	82	+1
	18	83	74	79	-2
	19	93	76	85	+4
McComb, Miss.	16	93	68	81	-
	17	87	71	79	-
	18	91	70	81	-
	19	93	75	84	-
Meridian, Miss.	16	93	66	80	-1
	17	90	69	80	-1
	18	84	74	79	-2
	19	93	75	84	+3
Mobile, Ala.	16	92	74	83	+1
	17	82	78	80	-2
	18	89	77	83	+1
	19	92	80	86	+4
Pensacola, Fla.	16	89	78	84	+2
	17	82	76	79	-3
	18	86	79	83	+1
	19	89	78	84	+2

[1]Normal temperature based on 30 years of record (1931-1960).

15 feet or more above m.s.l. extended from Waveland to Ocean Springs with tidal surges of 20 feet or more above m.s.l. concentrated in an area from Bay St. Louis eastward to Mississippi City. A maximum hurricane surge of 22.6 feet was measured as a still-water high-water mark inside the Veterans of Foreign Wars Clubhouse at Pass Christian, Mississippi. This is a record high for the area. Still-water heights of 22.3 and 22.5 feet were also measured at other locations in Pass Christian.

Frequency of high storm tides along the Mississippi Gulf coast was derived by the U. S. Geological Survey from a statistical evaluation of the tidal records from the Biloxi recording gage which has been in continuous operation since before 1900. According to the evaluation at Biloxi, the Hurricane Camille tides are estimated to have a recurrence interval of about 170 years. Hurricane Betsy tides are estimated to have a recurrence interval of 30 years and the September 1947 hurricane, 60 years. The frequency data are applicable only for the gage site; however, it may be assumed that frequency of a particular high tide may also apply to nearby beach areas.

BEACH FRONT - PASS CHRISTIAN. BUILDING AT EXTREME RIGHT IS SITE OF HIGHEST INSIDE HIGH-WATER MARK, 22.6 FEET ABOVE M.S.L.

Table 4

High water elevations, Hurricane Camille

Location	Elevation (Ft., m.s.l.)	Description
MISSISSIPPI		
Pearlington	7.0	Trash line under U. S. Highway 90 bridge across W. Pearl River
Pearlington	8.2	Stage recorder on U. S. Highway 90 bridge over E. Pearl River
Pearlington	11.2	Seed lines on several trees
Kiln	12.2	Seed line on abutment of Highway 603 bridge over Jourdan River
Clermont Harbor	15.7	Mark inside garage on Ioor Avenue
Waveland	19.4	Mark inside house on Nicholson Ave.
Bay St. Louis	19.6	Mark inside boiler room of St. Stanislaus College
Bay St. Louis	21.7	Seed line inside building 300 feet west of Beach Blvd.
Bay St. Louis	19.0	Drift line beside I-10 north of St. Louis Bay
Bay St. Louis	17.0	Mark inside residence at Cedar Point on St. Louis Bay
Cuevas	17.0	Debris line inside switch box of Rouse bridge over Wolf River
Henderson Point	17.2	Mark inside dormitory at Baptist Missionary Home
Pass Christian	22.2	Mark inside ticket office of Avalon Theatre
Pass Christian	22.5	Mark inside house on E. Beach Blvd.
Pass Christian	22.6[1]	Mark inside V.F.W. Club
Pass Christian	22.9	Trash line in yard 500 feet N. of Highway 90 near Menge Ave.
Pass Christian	24.2	Drift line on lawn of residence near Menge Avenue
Pass Christian	24.6	Trash line behind fence at Menge Ave. and E. Beach Blvd.
Long Beach	21.6	Mark inside residence on Long Ave.
Cat Island	16.4	Mark inside house on Cat Island
Gulfport Harbor	15.5	Mark inside warehouse on dock
Gulfport	21.0	Mark outside house on Second St.
Gulfport	20.7	Mark inside boiler room of Eastward School
Ship Island	14.7	Mark inside Old Fort Massachusetts
Mississippi City	20.4	Marks inside and outside house on Beach Drive
Edgewater	19.9	Mark inside well house at S. W. corner of Edgewater Plaza

Table 4 (Cont'd)

High water elevations, Hurricane Camille

Location	Elevation (Ft., m.s.l.)	Description
Biloxi	19.5	Mark inside garage on Miramar Ave.
Biloxi	16.0	Seed line inside garage on Kelleys Place Street near Central High School
D'Iberville	15.7	Mark inside service station on Central Ave. near North Gate Shopping Center
Ocean Springs	15.9	Mark inside basement of house on Beach Drive
Fountainbleau	14.2	Mark inside junked automobile in Junk yard
Gautier	12.7	Mark inside basement of house on Park Drive
Pascagoula	11.8	Debris line on old Mobile Highway bridge over Bayou Chico
Pecan	9.2	Seed line inside house near L&N Railroad
ALABAMA		
Bayou La Batre	8.5	Mark inside Fire Station
Dauphin Island	9.2	Mark inside room near Casino on south shore
Dauphin Island	5.8	Recorder gage on north shore of island
Bellefontaine	8.3	Mark inside house on Raner Street
Mobile	7.4	Recorder gage on Pier A at Alabama State Docks
Mobile	6.8	(Causeway) - Mark inside garage of radio station
Gulf Shores	9.1	(Beach) - Mark inside motel on beach
Perdido Pass	4.2	Recorder gage on bridge across Perdido Pass
FLORIDA		
Pensacola	4.8	Recorder gage on State Highway 292 bridge over GIWW
Panama City	3.0	Recorder gage on Massalena Bayou
Apalachicola	3.3	Recorder gage on Gorrie Bridge over Apalachicola River
St. Marks	1.9	Recorder gage on St. Marks River at St. Marks, Fla.

[1] Maximum elevation measured in an inclosed building.

13. COMPARATIVE METEOROLOGICAL DATA

From the standpoint of barometric pressure, wind velocities, and tidal surge, Camille was the most intense hurricane to strike the mainland along or near the coast in the Mobile District. A comparison of Camille's winds with previous maximums recorded along the Louisiana, Mississippi, and Alabama coasts is given in table 5.

Table 6 compares parameters of the most severe hurricanes that have affected the Alabama and Mississippi coasts. Table 7 contains a comparison of tides generated by Camille with previous record highs.

Table 5

Comparative wind speeds, - Hurricane Camille and other selected Gulf Coast hurricanes

Station	Hurricane Camille		Previous hurricanes	
	Fastest Mile (mph)	Gusts (mph)	Maximum (mph)	Date
Port Sulphur, La.	60	90	136	Betsy 1965
Grand Isle, La.	45	65	105[1]	Betsy 1965
New Orleans, La. (WBO)	52	85	125[1]	Betsy 1965
New Orleans, La. (WBAS)	42	59	112	Betsy 1965
Bay St. Louis, Miss.	160[1]	190[1]	120[1]	Betsy 1965
Gulfport, Miss.	100[1]	175[1]	100[1]	Betsy 1965
Biloxi, Miss.	81	129	90	Sept. 1906
Pascagoula, Miss.	81	104[1]	85	Sept. 1947
Mobile, Ala.	44	74	97[2]	Oct. 1916

[1] Estimated

[2] From early published records, with estimated anemometer correction applied

Table 6

Comparative data on severe hurricanes affecting the Gulf Coast within Mobile District

Date of landfall	Landfall	Heaviest rainfall: Inches	Heaviest rainfall: Location	Highest winds: Speed (mph)	Highest winds: Location	Highest storm tide: Feet (msl)	Highest storm tide: Location	Lowest cent. press.: Inch. of merc.	Lowest cent. press.: Location
27 Sept. 1906	Pascagoula, Miss.	14.2	Molino, Fla.	90	Biloxi, Miss.	11.8	Gulf Shores, Ala.	28.10	Biloxi, Miss.
29 Sept. 1915	Grand Isle, La.	14.4	Franklin, La.	124	Burrwood, La.	12.8	Pass Christian, Miss.	28.01	New Orleans, La.
5 July 1916	Gulfport, Miss.	24.5	Bonifay, Fla.	81	Mobile, Ala.	10.8	Mobile, Ala.	28.08	Biloxi, Miss.
20 Sept. 1926	Pensacola, Fla.	18.5	Bay Minette, Ala.	114	Pensacola, Fla.	9.4	Pensacola, Fla.	28.20	Perdido Beach, Ala.
19 Sept. 1947	New Orleans, La.	9.6	Whitesand, Miss.	110	New Orleans, La.	15.2[4]	Bay St. Louis, Miss.	28.57	New Orleans, La.
9 Sept. 1965 (Betsy)	Grand Isle, La.	5.8	Schriever, La.	136	Port Sulphur, La.	15.7	Bohemia, La.	28.00	Grand Isle, La.
17 Aug. 1969 (Camille)	Waveland, Miss.	10.6[1]	Hattiesburg, Miss.	160[2,5]	Long Beach, Miss.	22.6	Pass Christian, Miss.	26.85[3]	Bay St. Louis, Miss.

[1] Estimated 27 inches fell over Virginia's Blue Ridge Mountains after Camille lost hurricane intensity

[2] Estimated gusts of 190+ mph along coast from Bay St. Louis to Gulfport

[3] Low of 26.61 was recorded by Air Force reconnaissance plane when Camille was located about 140 miles southeast of New Orleans

[4] Camille tide measured in same building was 19.6 ft. msl

[5] Estimated

Table 7

Comparison of Camille tides with previous record highs

Location	Mean high tide	Camille (el. msl)	Previous record high Elev. msl	Date
Bay St. Louis, Miss.	1.2	21.7	15.2	Sept. 1947
Pass Christian, Miss.	1.2	22.6	13.4	Sept. 1947
Long Beach, Miss.	1.2	21.6	14.0	Sept. 1947
Gulfport, Miss.	1.2	21.0	14.0	Sept. 1947
Biloxi, Miss.	1.3	19.5	11.1	Sept. 1947
Pascagoula, Miss.	1.1	11.8	9.0	Sept. 1947
Bayou La Batre, Ala.	1.2	8.5	8.2	Sept. 1947
Dauphin Island, Ala.	1.0	9.2	7.7	July 1916
Mobile, Ala.	1.2	7.4	10.8	July 1916
Gulf Shores, Ala.	1.2	9.1	11.8	Sept. 1906

IV - INUNDATED AREAS

14. DESCRIPTION OF COASTAL COUNTIES AFFECTED

Those coastal counties in the Mobile District affected by the hurricane surge were, from west to east, Hancock, Harrison, and Jackson Counties in Mississippi and Mobile and Baldwin Counties, Alabama.

In Mississippi, length of the coastline, which runs generally east and west, is 75 miles. The coastal area is bounded on the west by the Pearl River, on the east by the Alabama line, and on the south by Mississippi Sound. The latter is a partially protected body of water averaging 8 to 10 miles wide and separated from the Gulf of Mexico by a series of five barrier sand islands with rather large gaps or passes between them. Four of the five islands lie off the Mississippi coast. Proceeding from west to east the five are: Cat Island, Ship Island, Horn Island, Petit Bois Island, and Dauphin Island. The Gulf Intracoastal Waterway, project dimensions 12 by 150 feet, traverses deep water in Mississippi Sound a few miles from the mainland shore. The mainland shore is broken by the entrances to St. Louis Bay between Bay St. Louis and Pass Christian, and Biloxi Bay between Biloxi and Ocean Springs. U. S. Highway 90 traverses the area a few miles inland except in Harrison County, where it closely borders the coastline. Two major rivers empty into Mississippi Sound, the Pearl River, which forms the boundary between Mississippi and Louisiana, and the Pascagoula River, which traverses Jackson County and enters the sound at Pascagoula. Coastal elevations vary generally from low-lying marsh reaches at the eastern and western extremities to relatively high ground near shore in the central portion. Major towns along the coast are, from west to east, Waveland, Bay St. Louis, Pass Christian, Long Beach, Gulfport, Mississippi City, Biloxi, Ocean Springs, and Pascagoula.

DUE TO IMPAIRMENT OF DRAINAGE FACILITIES, FLOODED CONDITIONS REMAINED SEVERAL DAYS AFTER CAMILLE - VIEW NEAR CLERMONT HARBOR

GASOLINE STORAGE TANK FLOATED OVER 1,000 FEET FROM LOCATION - BILOXI

Hancock County, with a 1960 population of 14,000, is the least populous of the three Mississippi counties. The western half of its 20-mile long coast is composed of low-lying salt marshes traversed by a number of small creeks and streams. The eastern half, which includes the towns of Bay St. Louis and Waveland, is afforded some protection by seawalls constructed along the Mississipppi Sound shore by local interests at various times between 1915 and 1928. A paved highway adjoins the wall throughout. Most of the county lies below elevatin 25 feet, although some of the inland pine hills rise to almost 250 feet. The Louisiana marshes, which enclose the western end of Mississippi Sound about 5 miles offshore, consist of innumerable tidal marsh islands of varying sizes separated by interconnecting bays and passages. The coastal area of Hancock County is separated from Harrison County by St. Louis Bay, an arm of Mississippi Sound.

The coast of Harrison County extends for 27 miles between St. Louis and Biloxi Bays, and is urbanized throughout. Principal coastal towns are Pass Christian, Long Beach, Gulfport, Mississippi City, and Biloxi. The relatively straight shore is protected by a concrete step-type seawall constructed in 1926-28. The seawall was rehabilitated and an artificial beach constructed along its seaward face in 1951, with Federal aid provided under authority of the 1948 River and Harbor Act (Harrison County Shore Protection Project). Except for about 1½ miles at 5 feet, the top elevation of the seawall is either at elevation 8 or 11 feet above mean sea level, depending on the general elevation of the backshore area. The seawall and beach protects adjacent U. S. Highway 90. Cat Island and Ship Island lie about 10 miles off the coast; Deer Island, a long narrow sand island in Mississippi Sound just offshore from Biloxi partially shelters the eastern part of that town as well as the mouth of Biloxi Bay. Back Bay of Biloxi, a landlocked, mile-wide westward continuation of Biloxi Bay, parallels the coast for about 10 miles. Separating it from Mississippi Sound is a peninsula about 2 miles wide occupied on the eastern end by the City of Biloxi.

The 28-mile coastline of Jackson County is bisected by the Pascagoula River, which empties into Mississippi Sound through an estuary just west of the City of Pascagoula. The only coastal towns of any size are Ocean Springs on the east shore of Biloxi Bay, Pascagoula, on the east bank of the lower 3 miles of the Pascagoula River, and Moss Point, adjoining Pascagoula on the north. The south section of Pascagoula faces Mississippi Sound and is protected to some extent by a low concrete seawall. A considerable portion of the coastal area of the county consists of low-lying salt marshes, which extend in places as much as 4 miles inland. U. S. Highway 90 follows generally high ground a few miles inland and crosses the Pascagoula River delta by a 3-mile-long causeway and bridge. Horn Island and Petit Bois Island, both National Wildlife Refuges, lie about 10 miles offshore.

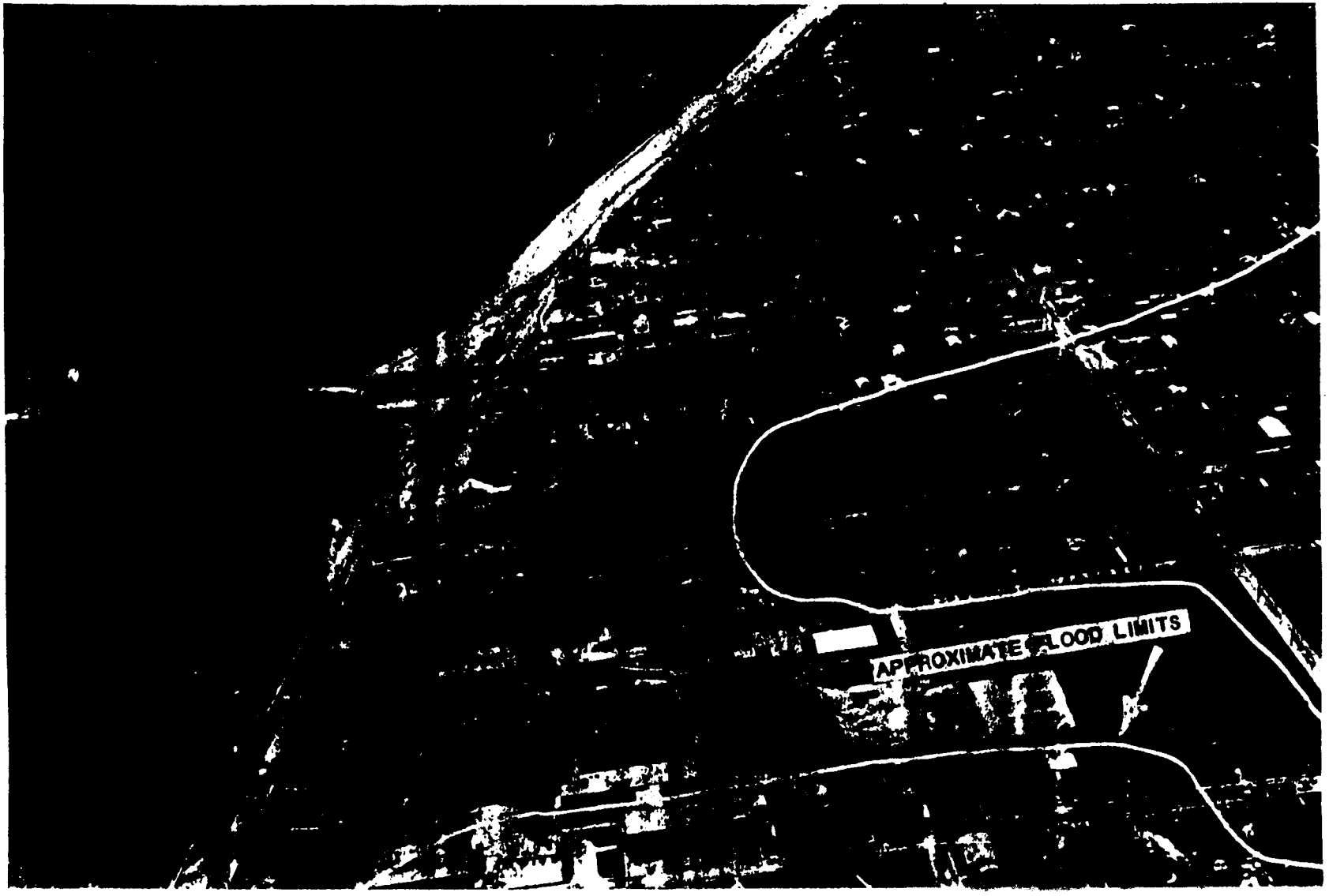
In Alabama, Mobile and Baldwin Counties border the Gulf coast. The two counties are separated by Mobile River and by Mobile Bay, which is 30 miles long and varies in width from 8 miles at the upper end to 20 miles at the lower end. The entrance to the bay is constricted by a narrow peninsula that extends westward from the southern tip of Baldwin County to within 3 miles of the east end of Dauphin Island, practically inclosing Mobile Bay and its arms. Dauphin Island, about 14 miles long and 1 mile wide at its widest point, lies about 4 miles offshore. The island is being developed as a beach resort area. Estimated summer population is about 2,600. The western 10-mile portion of the island is a low-lying sand spit ranging up to one-fourth mile wide with elevations up to about 5 feet m.s.l. The eastern 4-mile portion, where most of the development is concentrated, is wooded, with elevations generally 5 to 10 feet above mean sea level. Sand dunes along the Gulf side of this portion of the island range up to 40 feet in height. The island is the easternmost of the chain of barrier beaches bordering Mississippi Sound.

The shoreline of Alabama is about 135 miles long, including bays and sounds. East of Mobile Bay the coastline is characterized by white sandy beaches. A few hundred feet from the shore lies a dune line with an average elevation of 10 to 15 feet. West of the bay, which is the eastern limit of Mississippi Sound, the mainland shore is low and marshy with numerous bayous and tidal flats. Bayou La Batre, Coden, and other fishing villages are located on some of these bayous. The shoreline of the west and north side of Mobile Bay is generally low and marshy, while that on the east side is considerably higher.

The principal communities affected by the hurricane tide and waves are Mobile and its environs, Bayou La Batre, Coden, Dauphin Island, Gulf Shores, and several other small beach communities and fishing villages.

15. ACREAGES FLOODED

Widespread tidal flooding of the coastal lowlands occurred as the storm moved inland. Inundated areas in the Mobile District are shown on plates 18 through 39. The three coastal Mississippi counties comprise a land area of 1,161,000 acres of which 211,900 acres were flooded. Along the two coastal Alabama counties, 209,100 acres, a large part consisting of low-lying marshland, were flooded out of a total land area of 1,827,200 acres. Maximum overland penetration of 8 miles occurred in Hancock County, Mississippi, in the Waveland-Bay St. Louis area. Along the lower Pascagoula and Jourdan River estuaries, the flood extended about 20 miles upstream. In the Mobile River delta, the flood tide extended about 30 miles above U. S. Highway 90 causeway at the head of Mobile Bay.



BAY ST. LOUIS, WITH WAVELAND IN BACKGROUND. WHITE LINE DENOTES APPROXIMATE FLOOD LIMITS

Populations (1960 census) of the Mississippi and Alabama coastal counties are 189,000 and 364,000, respectively. Residents in the flooded area number 53,300 in Mississippi and 7,500 in Alabama. Statistics on populations and acreages flooded, by counties are listed in table 8. Total land area flooded along the mainland and the offshore barrier islands aggregated 433,700 acres, a large portion of which consisted of low-level uninhabited swampland or marshland.

Table 8

Areas flooded by Hurricane Camille

County	Total land area (acres)	Estimated area flooded[1] (acres)	Total population (1960)	Estimated population in flooded area
Hancock, Miss.	310,400	72,100	14,039	11,000
Harrison, Miss.	374,400	35,300	119,489	37,200
Jackson, Miss.	476,200	104,500[2]	55,522	5,100
Subtotal, Miss.	1,161,000	211,900	189,050	53,300
Mobile, Ala.	794,900	82,400[3]	314,301	3,000
Baldwin, Ala.	1,032,300	126,700[3]	49,088	4,500
Subtotal, Ala.	1,827,200	209,100	363,389	7,500
Total, Miss. & Ala.	2,988,200	421,000	552,439	60,800

[1] Excludes all offshore islands, which are shown in table 9

[2] Includes Pascagoula River delta marshland

[3] Includes Mobile River delta marshland

All the islands along the Mississippi and Alabama coasts were completely covered by the flood waters except Dauphin Island, which experienced about 70 percent inundation. Table 9 lists the acreages flooded and areas eroded, by islands. The investigation disclosed that 542 acres were lost by erosion. The U. S. Coast and Geodetic Survey reported that Pelican Island, a low sand bar in the Gulf opposite Dauphin Island, completely disappeared. Some of the islands have regained a portion of the loss as a result of natural accretion.

Table 9

Effect on offshore islands

Island	Total area (acres)	Inundated area (acres)	Area lost (acres)
Sand	112	112	(1)
Pelican	59	59	59
Dauphin	3,852	2,790	-
Isle Aux Herbes	691	691	-
Round	56	56	-
Horn	3,612	3,612	89
Petit Bois	1,329	1,329	3
Ship	1,172	1,172	251
Cat	2,344	2,344	140
Deer	518	518	-
Total	13,745	12,683	542

(1) Area increased by about 8 acres due to accretion

OLD FORT MASSACHUSETTS ON SHIP ISLAND, 12 MILES FROM THE MAINLAND. HIGH WATER MARK WAS 14.7 FEET M.S.L. INSIDE THIS STRUCTURE

V - EMERGENCY ACTIVITIES

16. ADVANCE PREPARATION

The hurricane season begins 1 June and extends to 30 November. During the season, District elements are placed on an alert status. Dredging and other equipment used in maintenance operations along Federal project waterways in coastal areas are especially vulnerable to hurricanes, requiring precautionary measures and emergency planning. Detailed plans for evacuation of floating plant and equipment to pre-selected safe mooring areas have been established and are revised from time-to-time, as needed.

Forecasts of tropical disturbances that indicate possible emergency conditions are readily available at the District Office through teletype and facsimile services leased from the U. S. Weather Bureau. These facilities and the District radio net enable operating officials at area offices and on floating plant to be promptly informed of existing or impending severe weather conditions. When it became known that Camille would possibly enter the Gulf of Mexico, Mobile District emergency and protective plans were reviewed and emergency equipment checked for readiness and proper operation.

17. EMERGENCY ACTIVITIES

Receipt of U. S. Weather Bureau Advisory No. 1 on 14 August 1969 alerted Mobile District of the possible hurricane emergency. Close observation of the path and potential of the hurricane was commenced at that time. On 14 August, Phase I of Mobile District Hurricane Plan was initiated. Based on U. S. Weather Bureau advisories, path of the storm was plotted and rate of progress computed. Locations of all items of floating plant were noted and work schedules reviewed. Protective plans and emergency equipment were re-checked for readiness and reliability. All contractor-owned plant engaged in work on Corps of Engineers contracts were informed of the direction and potential of the storm.

Review of advisories on 16 August indicated Camille was changing from a northwestward to a more northerly course and would most probably go inland somewhere in the Mobile District. At 11 AM CDT, 16 August, Phases II and III of the hurricane plan were placed into effect. Phase II required that constant communication be maintained between District and Area Offices, and with masters of floating plant until the emergency condition no longer existed. All inactive floating plant were moved to pre-selected safe mooring areas and standby watches were set up. Storm advancement and emergency activities were monitored. Emergency power supplies were given last minute checks to assure proper operation if needed. Phase III activities began when all Government-owned floating

plant and appurtenant equipment were ordered to safe harbors for the duration of the storm. All contractor-owned floating plant engaged in Corps of Engineers work were released to seek refuge from the storm.

On 17 August, due to the predicted course of the storm, a 24-hour watch was established for designated elements in the District Office and the coastal area offices. All floating plant and appurtenant equipment had been secured in safe mooring areas by noon on that date. Plans were prepared to have appropriate teams ready for dispatch into storm area after the storm moved inland. By late evening on 17 August, Camille was headed directly for the Mississippi coast with record breaking wind velocities and tides. Beginning at approximately 11 PM CDT the Mississippi coast experienced the full impact of the storm as it moved inland near Bay St. Louis, Mississippi.

18. POST HURRICANE ACTIVITIES

At 7 AM CDT 18 August, an emergency operations center was established and eleven survey teams were later dispatched to the affected areas in order to inspect and report on damages and determine the need for assistance. An inspection and photographic mission was also made by helicopter. Damages east of Mobile were reported to be light. Damages were observed to be progressively worse west of Mobile to Waveland, Mississippi, about where the center of the hurricane moved inland. Early reports of death and massive destruction along the coast were numerous.

ROLLS OF PAPER AND OTHER STORED ITEMS WASHED INLAND FROM GULFPORT HARBOR - LONG BEACH

Notification was received 19 August from the Office of Emergency Preparedness (OEP) that the President had declared portions of Mississippi and Louisiana to be major disaster areas and therefore eligible for Federal assistance under Public Law 875, 81st Congress. OEP's authority included coordination of relief and rehabilitation activities of all Federal agencies involved. Under its statutory authority, OEP requested Mobile District to initiate action within the District on cleanup, debris removal, and temporary repairs to public facilities not included in the responsibilities of other Federal agencies.

Other work performed by the District under the Corps' statutory authority included surveys of Federal harbors, channels, and basins to determine extent of shoaling and hazards to navigation such as debris and wrecked vessels. Contracts were awarded to remove shoaling and other obstructions to navigation. A more detailed description and account of the Mobile District's participation in the rehabilitation and relief activities in the aftermath of Camille, together with activities of other Federal agencies, is presented in a separate "after action" report.

19. EVACUATION

The U. S. Weather Bureau first advised evacuation of low-lying areas along the Gulf Coast early on the morning of 17 August. Residents of coastal Mississippi and Alabama were aware of the dangers of a hurricane since most of them still remembered the destruction brought about by Hurricane Betsy (1965) and many recalled the much greater disaster in Mississippi caused by the hurricane of September 1947. Preparations were commenced and by the time Camille reached landfall, evacuation of the lower portions of Plaquemines and St. Bernard Parishes in Louisiana was almost 100 percent complete, and from the beach front of Mississippi and Alabama, over 90 percent.

Residents of low-lying and exposed areas sought refuge in approximately 263 shelters in twenty-five counties and parishes in Alabama, Mississippi, and Louisiana. Also, an undetermined number sought commercial lodging or refuge with friends or relatives who lived further inland. Table 10 summarizes the number of evacuees, by counties, along the Mississippi coast. The number of persons evacuated refers to those who sought protection outside the county, whereas the number of persons sheltered refers to the number of people who sought shelter within the county. No official data are available on evacuation efforts in coastal Alabama. However, the Red Cross estimated that evacuees there numbered between 5,000 and 10,000 persons. It is estimated that, in all, about 200,000 people along the Gulf coastsof Louisiana, Mississippi, and Alabama, sought refuge from the storm in some sort of shelter.

Table 10

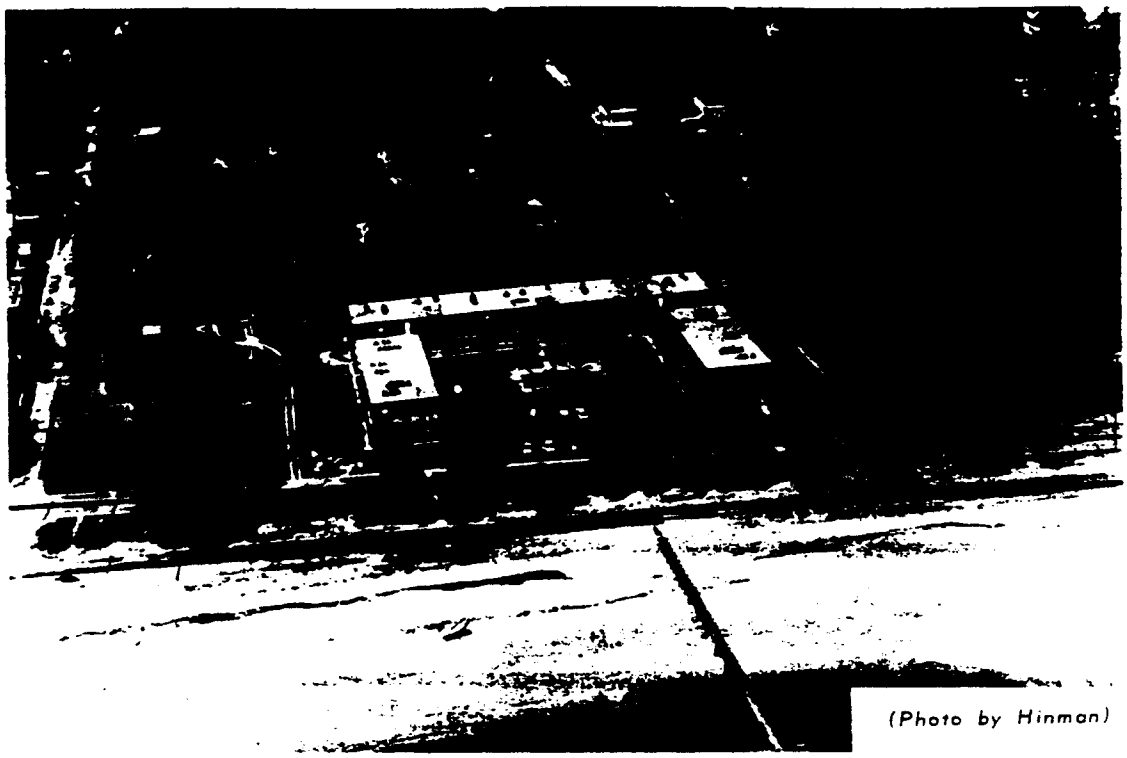
Summary of evacuees
(Mississippi coastal counties)

County	Number of evacuees	Number of persons sheltered
Hancock	1,000	2,500
Harrison	50,000	15,652
Jackson	5,000	26,000
Total	56,000	44,152

20. RELIEF ACTIVITIES

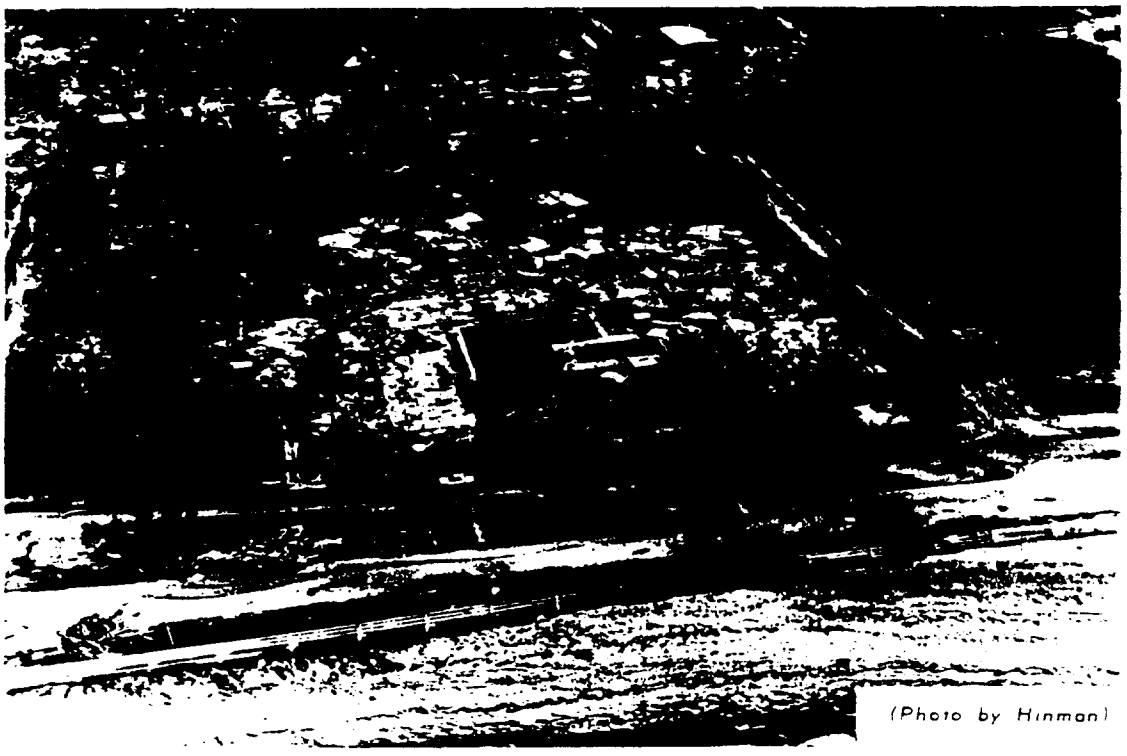
Before noon on the morning following landfall of the storm, many agencies and volunteer groups had moved in to aid the thousands of residents whose homes were destroyed or severely damaged. The task faced by relief agencies, volunteer groups, and individuals who offered assistance to victims of Camille was of major proportions. Thousands of displaced persons were provided shelter, food, clothing, and medicine by various Federal, state, and local agencies and by donations through relief organizations and individuals. Inoculations and other precautionary measures were taken to prevent spread of disease.

DEBRIS DEPOSITED BY CAMILLE AT EAST END OF ST. LOUIS BAY BRIDGE - HENDERSON POINT



(Photo by Hinman)

RICHELIEU APARTMENTS BEFORE CAMILLE - PASS CHRISTIAN



(Photo by Hinman)

RICHELIEU APARTMENTS AFTER CAMILLE
(23 PERSONS CHOSE NOT TO LEAVE ONLY 3 SURVIVED)

VI - DAMAGE APPRAISAL

21. SCOPE AND ACCURACY OF INVESTIGATION

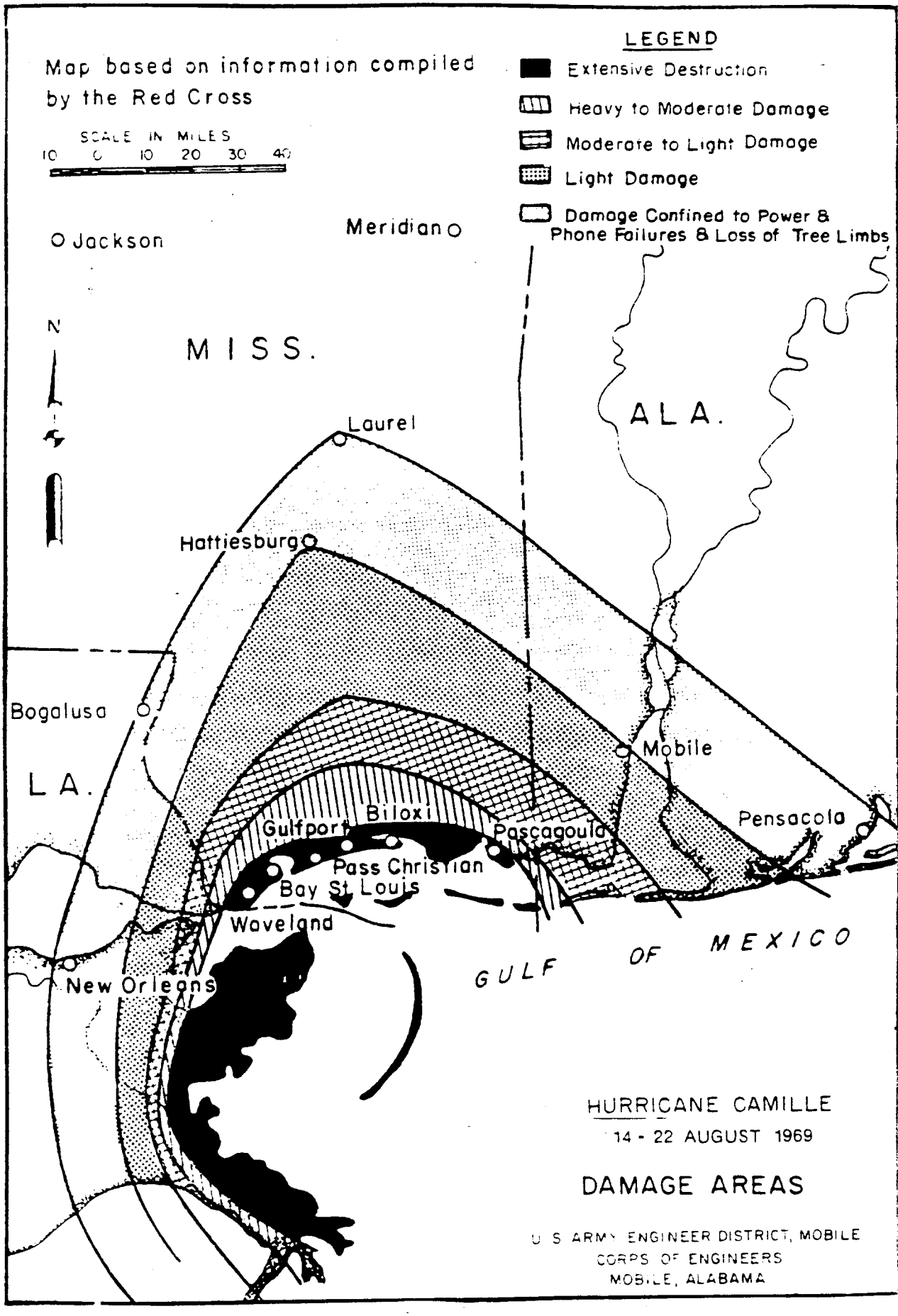
A detailed damage survey was conducted as soon as practicable following the landfall of Camille. Survey teams, dispatched from the Mobile District office, covered the area affected within the Mobile District. The survey was comprehensive in scope insofar as inundated areas in the coastal counties of Mississippi and Alabama are concerned. Areas not flooded were surveyed in less detail.

The data collected and presented herein are evaluations of physical damage sustained by all types of real and personal properties, economic losses to commercial and industrial establishments, and cost of relief and rehabilitation. Accuracy of the data is the maximum possible that could be attained within the time frame of the survey and the capability of experienced personnel engaged in the study. Since it was impossible to interview all property owners, inaccuracies due to sampling errors undoubtedly resulted. In many cases the prestorm values of structures could not be definitely ascertained because often nothing was left upon which to base an estimate. Tax assessors records were used wherever practicable but the ratio between assessed value and fair market value was not the same in all cases.

22. DAMAGE SURVEY PROCEDURE

The field survey teams made a street-by-street inspection within the flooded area, interviewing whenever possible the owners of homes and businesses, industry officials, and representatives of governmental agencies and relief or charitable organizations to estimate or collect data on the extent of damages. The data so obtained were recorded on forms designed to permit classification of damages by categories and separation of direct damages from indirect losses. Separation of damages to structures in the flooded area by causes, such as wind, waves, or tidal overflow, was impracticable since the sequence of destruction was unknown. There was no reliable method to determine whether a structure was damaged by the surge alone or was blown apart before the surge reached it, whether the surge weakened it enough to permit the wind to blow it apart, whether the damage was caused by floating or windblown debris, or whether a combination of two or more of these agents was the cause.

Wind damages to structures outside the areas of tidal surges were estimated by representative sampling. Local, Federal, and state agency officials furnished data upon which to base damage estimates to agriculture, roads and bridges, schools, hospitals, and other public buildings and facilities.


Map based on information compiled by the Red Cross
SCALE IN MILES
10 0 10 20 30 40
LEGEND
Extensive Destruction
Heavy to Moderate Damage
Moderate to Light Damage
Light Damage
Damage Confined to Power & Phone Failures & Loss of Tree Limbs
Jackson
Meridian
N
MISS.
ALA.
Laurel
Hattiesburg
Bogalusa
LA.
Mobile
Pensacola
Gulfport
Biloxi
Pascagoula
Pass Christian
Bay St Louis
Waveland
New Orleans
GULF OF MEXICO
HURRICANE CAMILLE
14 - 22 AUGUST 1969
DAMAGE AREAS
U S ARMY ENGINEER DISTRICT, MOBILE
CORPS OF ENGINEERS
MOBILE, ALABAMA

23. DEFINITION OF DAMAGE CATEGORIES

Damage data were divided into 13 major categories. The estimates for each category, where applicable, were broken down into direct damages and indirect losses. Direct losses are those sustained as a result of physical damage to the structure or its contents. Indirect losses include costs of such items as interruption of business, evacuation, emergency flood fighting, emergency quarters, subsistence, and clean-up. Each of the major categories contains items of similar or related nature, which, if listed separately, would produce an unmanageable array of information. Items included under each category are as follows:

Damage category	Items included
Residential	Homes, apartments, mobile homes, and detached buildings.
Commercial	Retail, wholesale, and service establishments; Motels and hotels; civic and recreational club facilities.
Industrial	Manufacturing and processing plants.
Schools	Private and public school buildings.
Churches	Sanctuary, educational buildings, and assembly halls.
Hospitals	Hospitals, nursing homes, and medical centers (except doctors' and dentists' offices).
Transportation	Motor vehicles, railroads, highways, streets and bridges.
Government (Federal)	Federal buildings and property, Federal projects including navigation channels, navigation aids, shore protection.
Government (Non-Federal)	Public buildings and property, utilities provided by local government, and miscellaneous expenditures by non-Federal agencies not covered elsewhere.
Marine	Piers, docks, harbor facilities, recreational boats and commercial vessels (except channels maintained as Federal projects).

Damage category	Items included
Agriculture	Crops, livestock, pasture, timberland, orchards, stored crops, farm houses and detached buildings, fences, and equipment.
Debris removal	Debris removed from both public and private property; clearance of drainage facilities.
Utilities	Telephone service, electricity, and gas not furnished by local governmental entities.

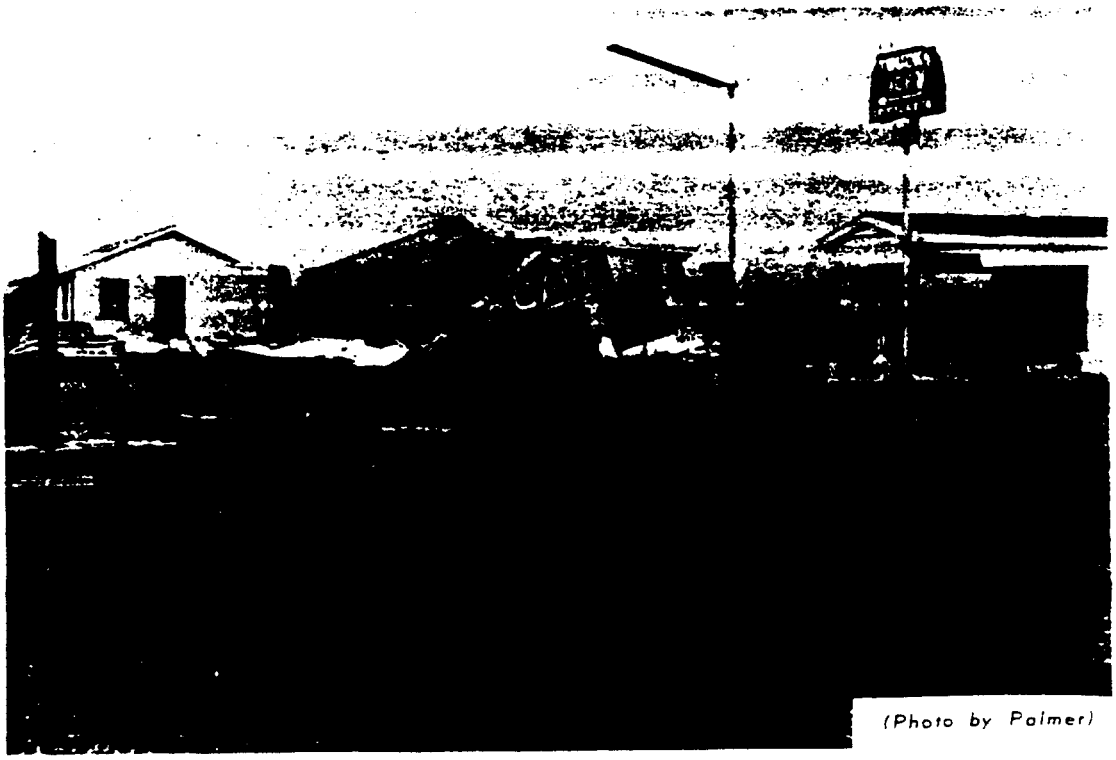
24. GENERAL DESCRIPTION

For the entire length of the Mississippi coast and for some three or four blocks inland the destruction was nearly complete. Residences, motels, apartments, restaurants, and other buildings were swept off their foundations, demolished, and deposited in piles of scrap lumber and rubble together with felled trees, ruined automobiles, and grounded boats. Hardest hit were the communities of Clermont Harbor, Lakeshore, Waveland, Bay St. Louis, Pass Christian, Long Beach, and the beach front at Gulfport, Mississippi City, and Biloxi. Many residential developments in low-lying areas were flooded to depths of as much as 15 feet or more. Inland areas such as residential sections in West Gulfport and North Biloxi (D'Iberville) also felt the destructive effects of the storm surge. U. S. Highway 90, the main coastal thoroughfare, was blocked by debris and sand, and the paving broken up in many sections. In the flooded area alone, over 3,800 homes and businesses were completely wiped out and nearly 16,000 sustained damages.

ASSORTED DEBRIS - PASS CHRISTIAN

In Alabama, greatest damage was to the causeway (U. S. Highway 90) across upper Mobile Bay, linking Mobile with Baldwin County, and to the seafood villages of Bayou La Batre and Coden. Extensive damages were sustained by the many motels, restaurants, service stations, and fishing camps lining the causeway. In Mobile, power and telephone service was disrupted and many streets littered by fallen trees and limbs. Sections of roadways in south Mobile County and on Dauphin Island were washed out or covered with sand.

As the storm moved inland, major damages occurred outside the flooded area as a result of wind, windblown objects, falling trees, and rain. Outside the flooded area in the coastal counties of Mississippi and Alabama, over 26,000 homes and 1,000 businesses were destroyed or damaged, and agricultural damage was heavy, particularly timberland, pecan and tung orchards, and row crops. Inland counties in the Mississippi disaster area suffered mainly from residential damage and agricultural losses. Electric power failure occurred throughout 16 Mississippi and Alabama counties and the disruption in both power and telephone service along the coast lasted for many days.



(Photo by Palmer)

DAMAGE ON MOBILE BAY CAUSEWAY - MOBILE

TYPICAL SCENE OF DEVASTATION BETWEEN PASS CHRISTIAN AND HENDERSON POINT

RESIDENTIAL DAMAGE - LONG BEACH

In the tabular data presented herein, damages are shown for flooded areas separate from those in non-flooded areas. Data on inland counties are also segregated from that applicable to the coastal counties.

25. RESIDENTIAL DAMAGES

Table 11 lists the number of residential units, including mobile homes, in the Mississippi and Alabama coastal counties damaged or destroyed. More than 17,400 units in the flooded area of the three Mississippi coastal counties were damaged. Over 3,500 of these were a total loss, while damages to others varied from near destruction to light. Residential damage was particularly severe in the towns of Lakeshore, Clermont Harbor, Waveland, and Bay St. Louis in Hancock County, and Pass Christian and Long Beach in western Harrison County. Lakeshore and Clermont Harbor and most of the residential sections of the remaining towns were totally submerged, with water depths over the ground ranging up to about 15 feet. Outside the flooded area, nearly 26,000 homes were damaged and 302 destroyed.

In many cases where the buildings were not directly on the waterfront or were only partly flooded, the first floor framing remained in place, supporting the relatively undamaged second floor. Seaward ends of a number of apartments and motels were destroyed by wave action while the rest of the structure remained relatively intact. In general, wood frame structures withstood wind and water damage better than those of unreinforced concrete block and brick masonry construction.

FIRST FLOOR OF THIS APARTMENT WASHED OUT, LEAVING THE FRAMING TO SUPPORT SECOND FLOOR

The combination of wave action, tidal flooding, and wind accounted for nearly $139,000,000 in residential damages within the flooded areas of Mississippi and Alabama, including about $15,626,000 classified as indirect losses. Outside the flooded area, residential damages aggregated over $33,000,000 of which nearly $26,000,000 was sustained in the coastal counties.

26. COMMERCIAL DAMAGES

The Harrison County shore is closely bordered by many commercial establishments such as hotels, motels, restaurants, retail shopping centers, and seafood processing houses. For this reason greater commercial damages were sustained there than in the other counties investigated, with 380 establishments damaged and 261 destroyed in the flooded area. The seafood processing houses lining the Mississippi Sound shore at the east end of the Biloxi peninsula were virtually wiped out in spite of the partial protection afforded by Deer Island, a barrier beach lying a short distance offshore. All motels and restaurants in Biloxi south of the beach boulevard were either demolished or left

SEAFOOD PROCESSING HOUSES ON BILOXI'S SOUTH WATERFRONT WERE EITHER DESTROYED OR EXTENSIVELY DAMAGED

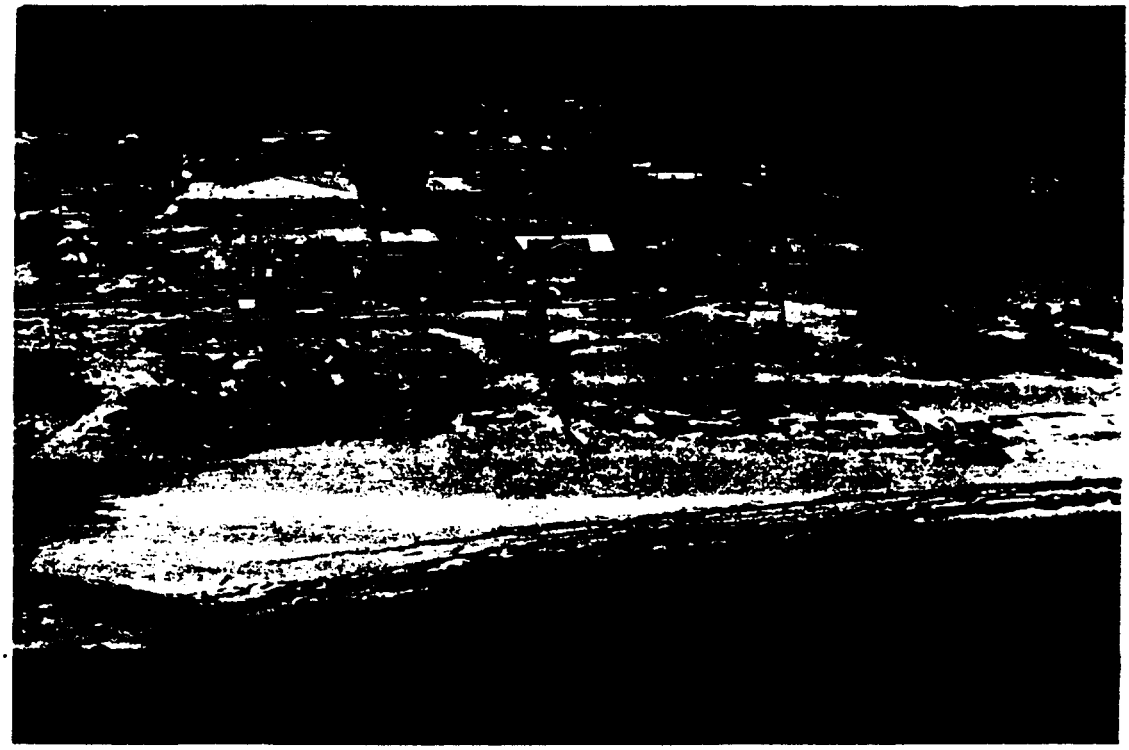
Table 11

Summary of residential units damaged or destroyed, coastal counties

County	Flooded areas		Non-flooded areas		Total	
	No. of homes destroyed	No. of homes damaged	No. of homes destroyed	No. of homes damaged	No. of homes destroyed	No. of homes damaged
Hancock, Miss.	936	4,067	58	1,516	994	5,583
Harrison, Miss.	2,347	8,603	244	16,176	2,591	24,779
Jackson, Miss.	276	1,232	-	8,150	276	9,382
Subtotal, Miss.	3,559	13,902	302	25,842	3,861	39,744
Mobile, Ala.	7	861	1/	1/	7	861
Baldwin, Ala.	0	1,487	1/	1/	0	1,487
Subtotal, Ala.	7	2,348	1/	1/	7	2,348
GRAND TOTAL Mobile District	3,566	16,250	302	25,842	3,868	42,092

1/ Not reported

as empty shells. In Hancock County 150 businesses were damaged and 52 destroyed in the flooded area, while Jackson County was least affected, with 57 businesses damaged and only 4 destroyed. Total damages to commercial establishments in the Mississippi flooded areas exceeded $75,000,000, including about $15,117,000 in indirect losses. In Alabama, 3 businesses were destroyed and 157 damaged, resulting in over $2,000,000 in direct damages and $708,000 in indirect losses. Most of the damages occurred to buildings along the Mobile Bay causeway. Table 12 summarizes the number of commercial establishments damaged or destroyed in the Mississippi and Alabama coastal counties. Total damages to commercial establishments in Mississippi and Alabama, both within and outside the flooded areas amounted to $88,468,500.



MOTELS AND RESTAURANTS SOUTH OF BEACH BOULEVARD AT BILOXI WERE LEVELED OR GUTTED

(Photo by Hinman)

(Photo by Hinman)

BEFORE AND AFTER SCENES OF A SHOPPING CENTER
ON U. S. HIGHWAY 90 AT LONG BEACH

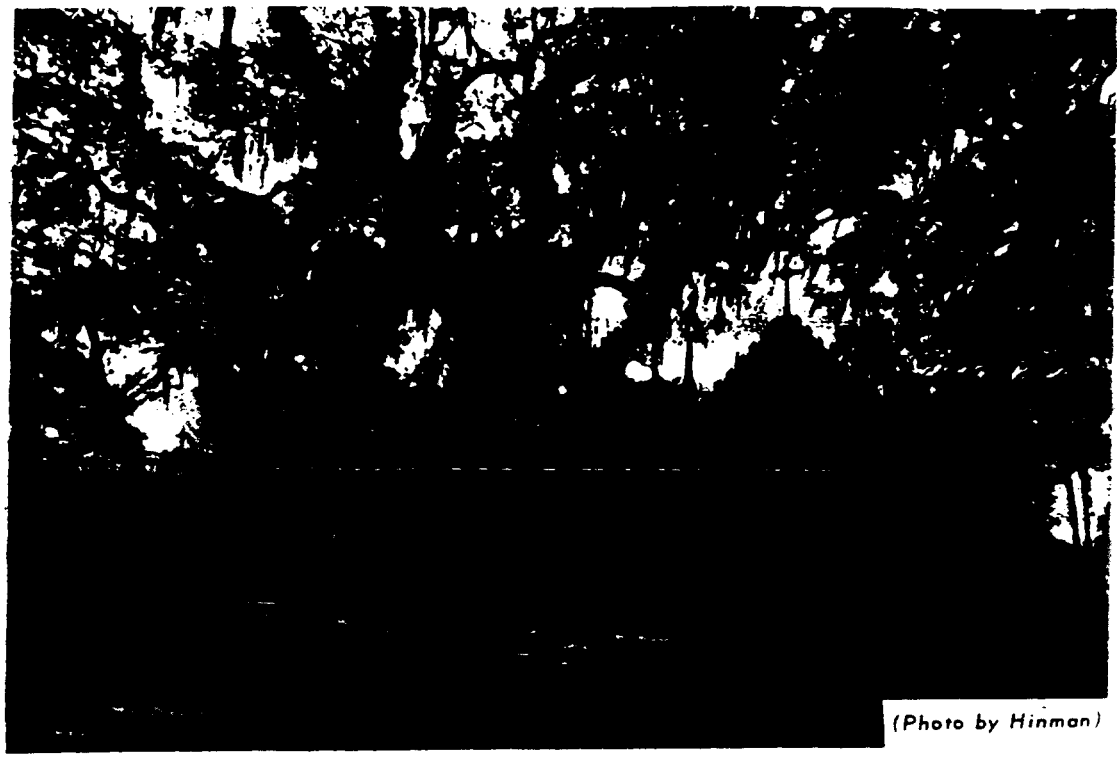
DAMAGED BUSINESS DISTRICT ALONG WATERFRONT AT BAY ST. LOUIS

Table 12

Summary of commercial establishments damaged or destroyed, coastal counties

County	Flooded areas		Non-flooded areas		Total	
	Number of businesses destroyed	Number of businesses damaged	Number of businesses destroyed	Number of businesses damaged	Number of businesses destroyed	Number of businesses damaged
Hancock, Miss.	52	150	5	37	57	187
Harrison, Miss.	261	380	1/	665	261	1,045
Jackson, Miss.	4	57	-	379	4	436
Subtotal, Miss.	317	587	5	1,081	322	1,668
Mobile, Ala.	1	100	1/	1/	1	100
Baldwin, Ala.	2	57	1/	1/	2	57
Subtotal, Ala.	3	157	-	-	3	157
GRAND TOTAL Mobile District	320	744	5	1,081	325	1,825

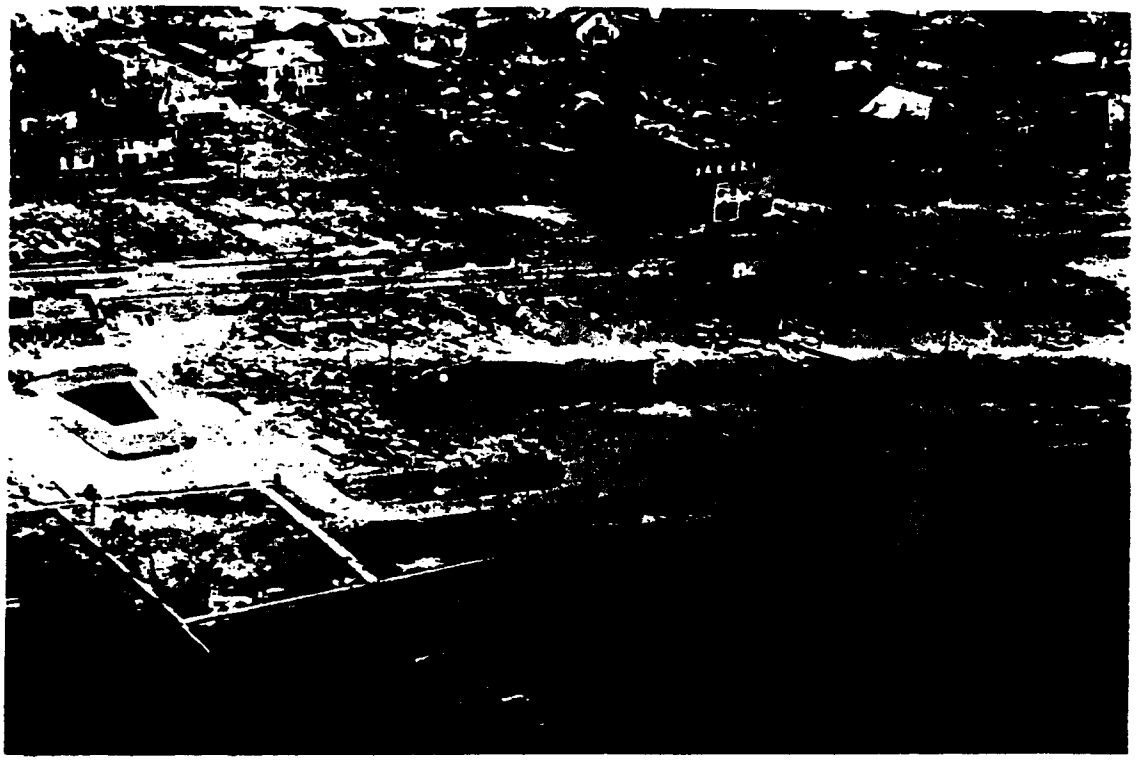
1/ Not reported



(Photo by Hinman)

(Photo by Hinman)

BEFORE AND AFTER SCENES OF TRINITY EPISCOPAL CHURCH
AT PASS CHRISTIAN, BUILT IN 1849



BUSINESSES DESTROYED BY CAMILLE - BILOXI

27. INDUSTRIAL DAMAGES

Seventeen industries in Hancock County, 36 in Harrison County and 20 in Jackson County sustained a total damage of $23,509,700, including $3,360,000 in indirect losses, in the flooded area, while in Mobile and Baldwin Counties, Alabama, 19 industrial plants were damaged. Evaluated damages for the flooded areas in the Alabama coastal counties amounted to $502,600, including $128,000 in indirect losses. In the non-flooded areas industrial damage was light, totaling $876,000.

28. DAMAGES TO SCHOOLS AND CHURCHES

Schools in the flooded area sustained damages amounting to $7,812,000 in the Mississippi coastal counties and $280,700 in the Alabama coastal counties. Damages outside the flooded area aggregated $4,249,400. Several historic churches along the Mississippi coast were either demolished or extensively damaged. An Episcopal church at Pass Christian which has withstood all storms since it was built in 1849 was completely washed away. The historic church at Biloxi where Jefferson Davis worshipped was extensively damaged. Church damages throughout Mississippi and Alabama aggregated over $8,000,000.

(Photo by Hinman)

(Photo by Hinman)

BEFORE AND AFTER SCENES - CHURCH OF THE REDEEMER, EPISCOPAL CHURCH - BILOXI

29. HOSPITAL DAMAGES

The two Veterans Administration hospitals in Harrison County suffered a total damage of $10,110,000. The Biloxi hospital, though damaged, remained in operation. At the Gulfport hospital, located in a more exposed area bordering Mississippi Sound, all 729 patients were evacuated. Other hospitals in the flooded area of the coastal Mississippi counties sustained an aggregate of $593,300 in damages, of which $168,000 were classified as indirect losses. No damages to hospitals in the coastal Alabama counties were reported. Outside the flooded area, damages totaled about $312,400.

VETERANS ADMINISTRATION HOSPITAL - GULFPORT

HIGHWAY 90 NEAR GULFPORT

EASTBOUND LANE OF U. S. HIGHWAY 90 - PASS CHRISTIAN

30. TRANSPORTATION

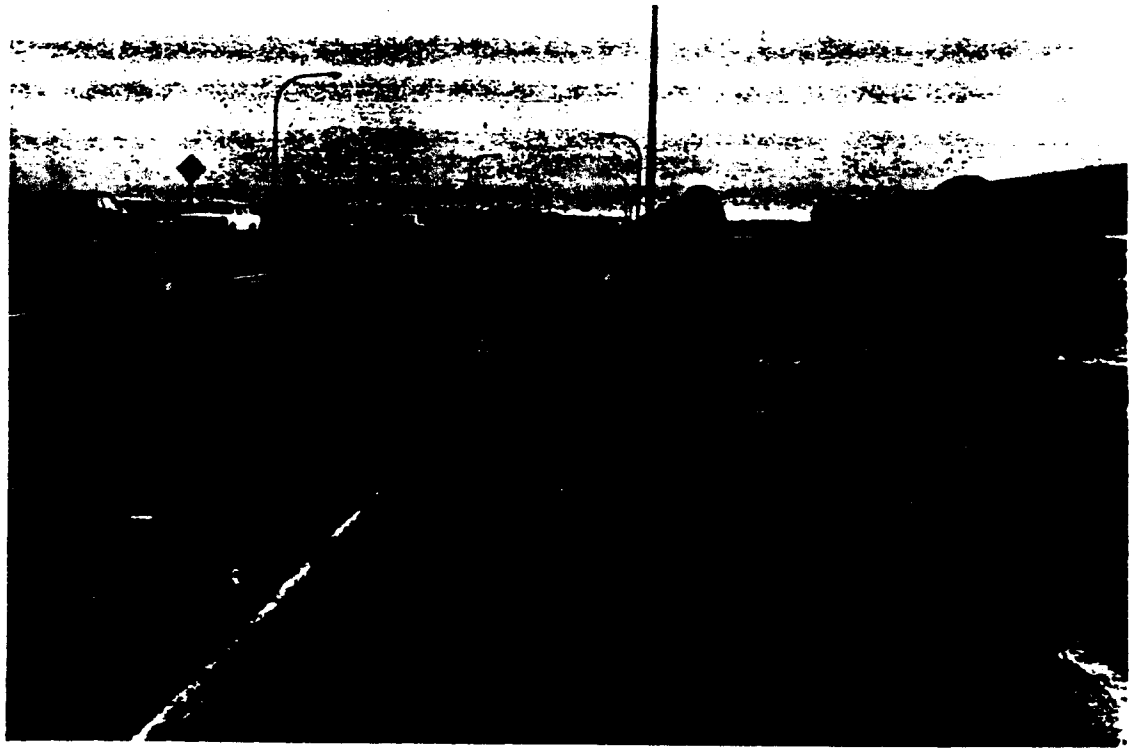
The eastbound (south) lane of U. S. Highway 90, in Harrison County, which abuts or is close to the seawall throughout most of its length, sustained extensive damages. Most of the roadway was flooded to depths varying from 6 to 12 feet. Wave impact broke up the paving and washed out backfill in the eastbound (south) lane along about 35% of the distance between Biloxi and Henderson Point. Damage to the westbound (north) lane was minor (5%) and traffic was resumed shortly after the storm. Highway damages reported herein represent those to roads varying from light-duty county roads to heavy-duty Federal highways.

Highway damages in the flooded area amounted to $246,100 in Hancock County, $4,898,400 in Harrison County and $125,200 in Jackson County. In Harrison County, highway damages include the cost of repairing drainage outfalls across the artificial beach. These outfalls were originally installed as a part of the Harrison County Shore Protection project. Damages totaling $1,326,000 were reported for the flooded highways in the Alabama coastal areas of which $1,103,700 was for Mobile County and $222,300 for Baldwin County. Damage estimates do not include the cost for clean-up and debris removal.

EROSION OF FRONT ROAD AT BAY ST. LOUIS
L & N RAILROAD BRIDGE IN BACKGROUND

On U. S. Highway 90, about one-third of the bridge across St. Louis Bay and one-half of the bridge across Biloxi Bay were damaged when tides lifted the prestressed concrete slabs composing the individual spans off their supporting piers and moved them up to 3 or 4 feet off center. Estimated repair costs amounted to $899,000 and $1,200,000, respectively. Estimated damage to all bridges in the flooded area, including the two bridges referred to above, amounted to $1,028,000 for Hancock County, $1,609,800 for Harrison County, and $43,500 for Jackson County. Five bridges in southern Mobile County suffered minor structural damages entailing an aggregate of about $36,000 in repair costs. No bridge damage was reported for Baldwin County.

DISPLACED CONCRETE DECK SLABS ON U.S. HIGHWAY 90 BRIDGE ACROSS BILOXI BAY

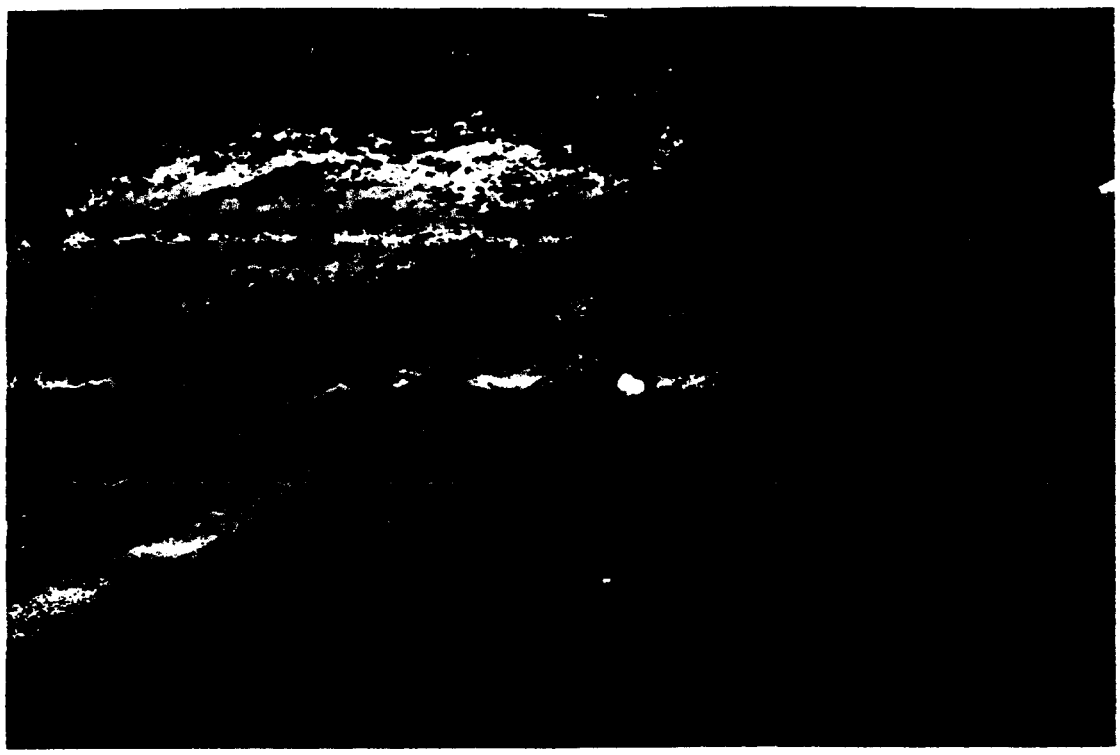


CLOSEUP OF DISPLACED SLABS ON U.S. HIGHWAY 90 BRIDGE, BILOXI BAY

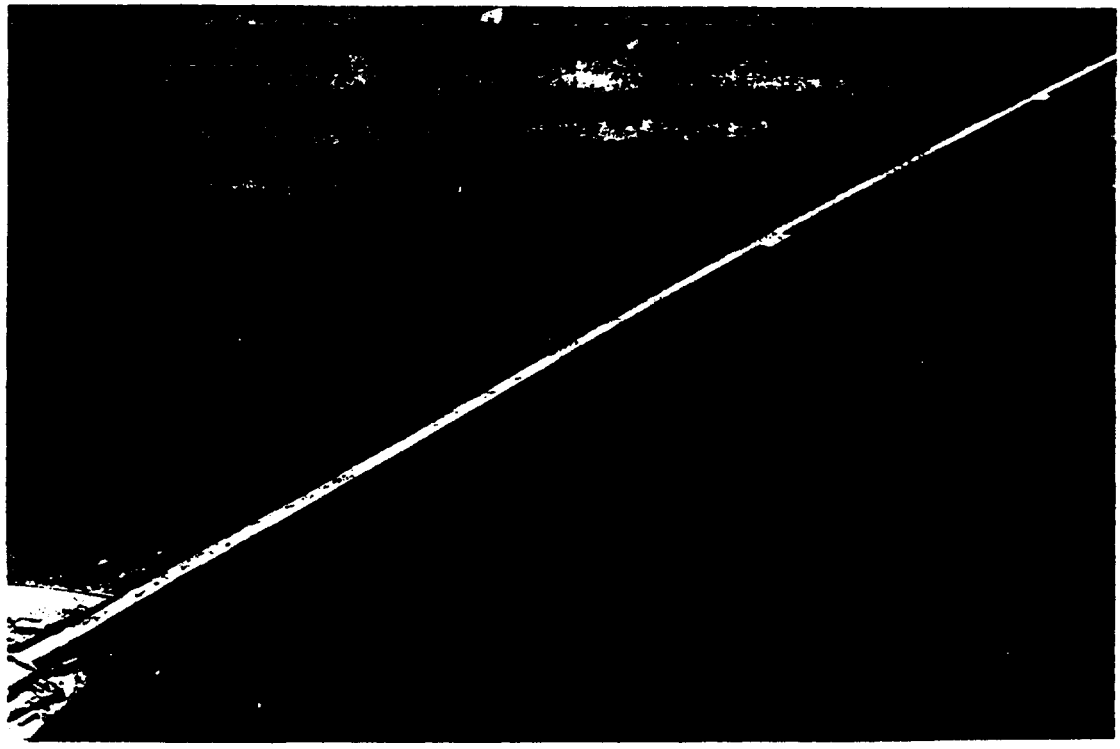
Damages to the Louisville and Nashville Railroad in Mississippi and Louisiana reportedly amounted to $3,200,000. A total of about 23 miles of track was washed out on the main line in the marshlands and coastal lowlands of Hancock and Jackson Counties. Track, ties, and ballast washed off the new concrete bridge across St. Louis Bay. Washouts occurred along the Illinois Central Railroad tracks serving the ocean terminals at Gulfport Harbor, estimated repair costs amounting to $80,800.

A review of insurance claims and interviews with various insurance representatives indicated that motor vehicles in the flooded area of the coastal Mississippi counties incurred total damages of $10,520,000. The number of vehicles involved could not be ascertained. An estimate of damages to vehicles in Alabama is not available but the amount is not believed to be significant.

Total damage estimate for all items included under the transportation category amounted to $23,113,800 for the flooded areas and $1,915,000 in inland areas not subject to tidal overflow.



RAILROAD DAMAGE, TRACK WASHED FROM ROADBED NEAR CLERMONT HARBOR



RAILROAD BRIDGE OVER ST. LOUIS BAY, TRACKS AND TIES WASHED FROM BRIDGE

31. GOVERNMENT (FEDERAL)

Thirteen Federal navigation projects in the Mobile District were affected by the hurricane. The various channels and harbors were damaged by shoaling and deposits of debris. Siltation volume in all the channels aggregated about 10,212,000 cubic yards, incurring a restoration cost of $3,471,500. Table 13 summarizes damages and shoaling in the navigation projects. In addition, $30,000 was expended to remove shoaling and debris from non-project channels in Bayou Caddy and Mulatto Bayou, Mississippi.

Table 13

Damage estimates for Mobile District navigation projects

Project	Estimated damage[1]	Shoaling caused by Camille (cubic yards)
Pearl River, Miss. & La.	$ 92,500	-
East Pearl River, Miss.	11,500	50,000
Wolf & Jordan Rivers, Miss.	46,000	200,000
Pass Christian Harbor, Miss.	34,500	-
Gulfport Harbor, Miss.	1,265,000	3,550,000
Biloxi Harbor, Miss.	153,700	375,000
Pascagoula Harbor, Miss.	856,800	2,130,000
Bayou La Batre, Ala.	65,500	200,000
Bayou Coden, Ala.	17,800	11,000
Dauphin Island Bay, Ala.	21,200	46,000
Mobile Harbor, Ala.	734,500	3,150,000
Perdido Pass Channel, Ala.	34,500	100,000
Gulf Intracoastal Waterway	138,000	400,000
Total	$3,471,500	10,212,000

[1] Includes cost for snagging and debris clearance

In addition to the restoration costs shown in table 13, the Mobile District expended $28,500 on surveys and establishments of markers and control structures necessary to determine the extent of damages to the navigation projects. The U. S. Coast Guard estimated that the cost of replacing navigation aids which were destroyed or moved off station will reach $1,200,000. Damages to miscellaneous GSA maintained buildings amounted to $10,000, all in Harrison County. Keesler Air Force Base in Biloxi suffered damages estimated at $4,844,600, including

about $345,000 in indirect losses. About $5,000 in damages was sustained by the U. S. Air Force radar station on Dauphin Island in Mobile County.

Principal damage to the Harrison County Shore Protection project was to the outfall drains across the beach. Also, the top riser of the stepped slab was broken off along about 80 feet at Gulfport and 27 feet at Pass Christian. The damage at Gulfport occurred as a result of operations in connection with refloating a barge which had grounded on the median strip of U. S. Highway 90. The damage at Pass Christian was apparently due to wave driven debris. Along about 35 percent of the seawall's length, backfill in varying amounts was washed out. Most of the repair costs have been included in the estimate for U. S. Highway 90 under the transportation category. A survey of the artificial beach and calculations based on comparison thereof with previous surveys indicate that little, if any, loss of material took place. However, "troughing" action of the waves scoured out a trench at the junction of the beach with the wall along some reaches.

Total damages to Federal Government facilities described in the foregoing paragraphs are estimated at $9,589,600 within the flooded area. In addition, damages outside the flooded area amounted to nearly $15,000,000, almost all to the Naval Construction Battalion installation at Gulfport. Disaster relief activities by Federal agencies, both within and without the flooded area, described in Section VII, cost an estimated $25,647,700. About two-thirds of this expense was for mobile homes provided by HUD. The latter costs are not separable by areas. Total cost to the Federal Government thus amounted to over $50,000,000.

TYPICAL SMALL BOAT DAMAGE - GULFPORT

U.S. HIGHWAY 90 AND SEAWALL - PASS CHRISTIAN
NEAR HENDERSON POINT

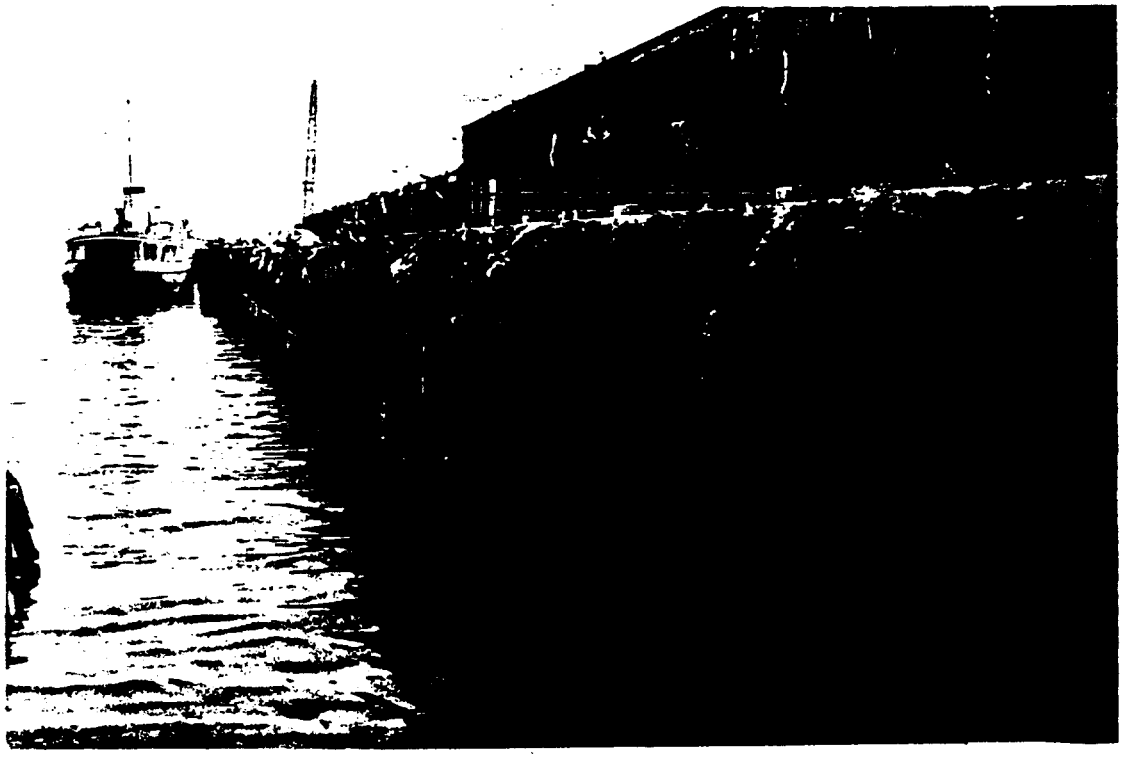
32. GOVERNMENT (NON-FEDERAL)

Public buildings and property not covered in other categories sustained damages amounting to $1,689,000 in Mississippi coastal counties and $4,900 in the Alabama coastal counties. Municipally owned or operated utilities accounted for an additional damage figure of $1,709,500 in the Mississippi coastal counties and $29,200 in Alabama coastal counties. In Pass Christian, the water and sewer system was practically destroyed and, at the request of the town officials with OEP approval, restoration was accomplished by the Corps of Engineers. Non-Federal governmental damages outside the flooded area are estimated at $303,000.

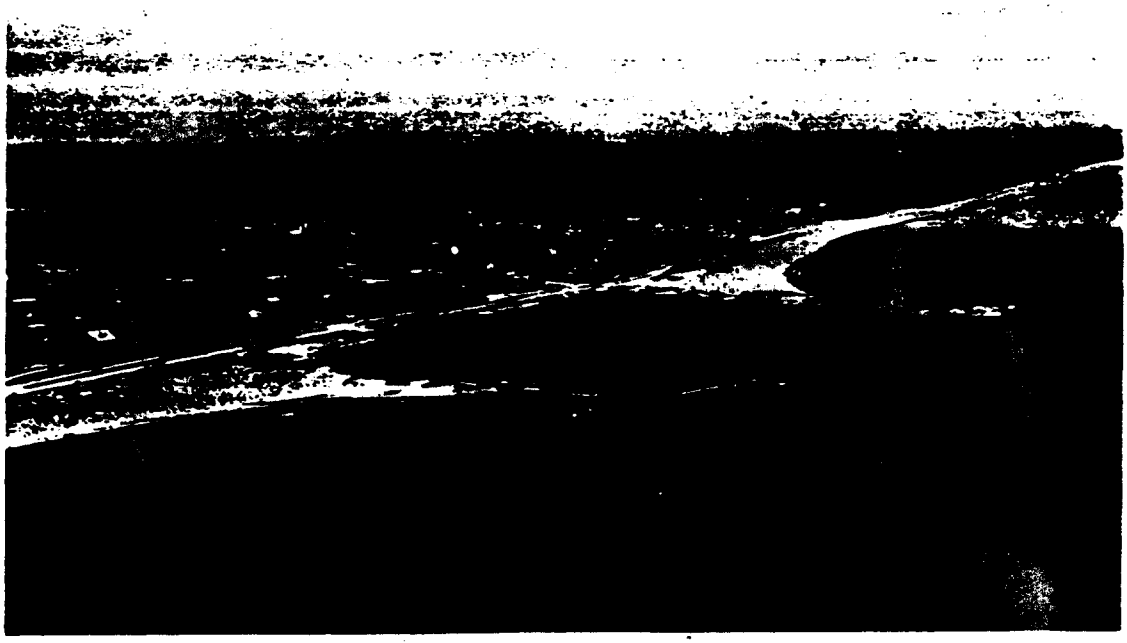
33. MARINE DAMAGES (NON-FEDERAL)

This category includes damages to port terminal and transfer facilities, miscellaneous docks and piers for recreational and commercial fishing vessels, fishing piers, merchant vessels, barges, commercial fishing and recreational craft, and expenses incurred in moving vessels to safe harbors. The estimated damages are summarized in table 14. Total damages in this category amounted to $15,623,100.

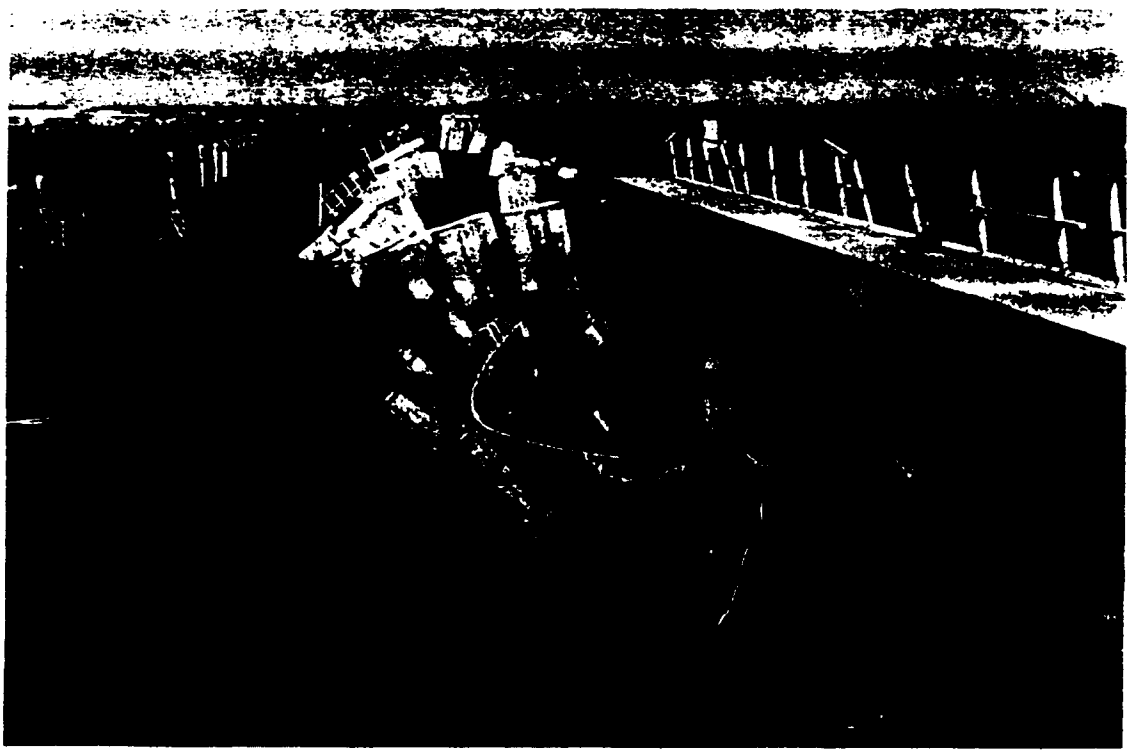
Virtually all piers extending into Mississippi Sound and the Gulf along the Mississippi-Alabama coast were destroyed and many in northwest Florida were damaged. Warehouses and port terminal facilities at Gulfport Harbor sustained over $5,000,000 in damages. At the banana wharf on the east side of the basin, all the sheet metal was stripped from the warehouses but most of the framework was left intact. On the west side of the harbor most of the damage was to the lower walls of the buildings, which were battered by debris and stored cargo. Roofs, doors, and electrical equipment were also hard hit. Commercial fishing docks in the commercial small craft harbor and the docks and piers in the Bert Jones Yacht Basin, both adjacent to the ship basin, were extensively damaged. At Pass Christian Harbor a large portion of the outer breakwater overturned, all docks were damaged, and the yacht club building leveled.



DAMAGE TO PORT FACILITIES AT GULFPORT HARBOR. THE WHARF WAS BATTERED BY THE SHIPS WHICH BROKE THEIR MOORINGS DURING THE STORM



SMALL CRAFT HARBOR - PASS CHRISTIAN



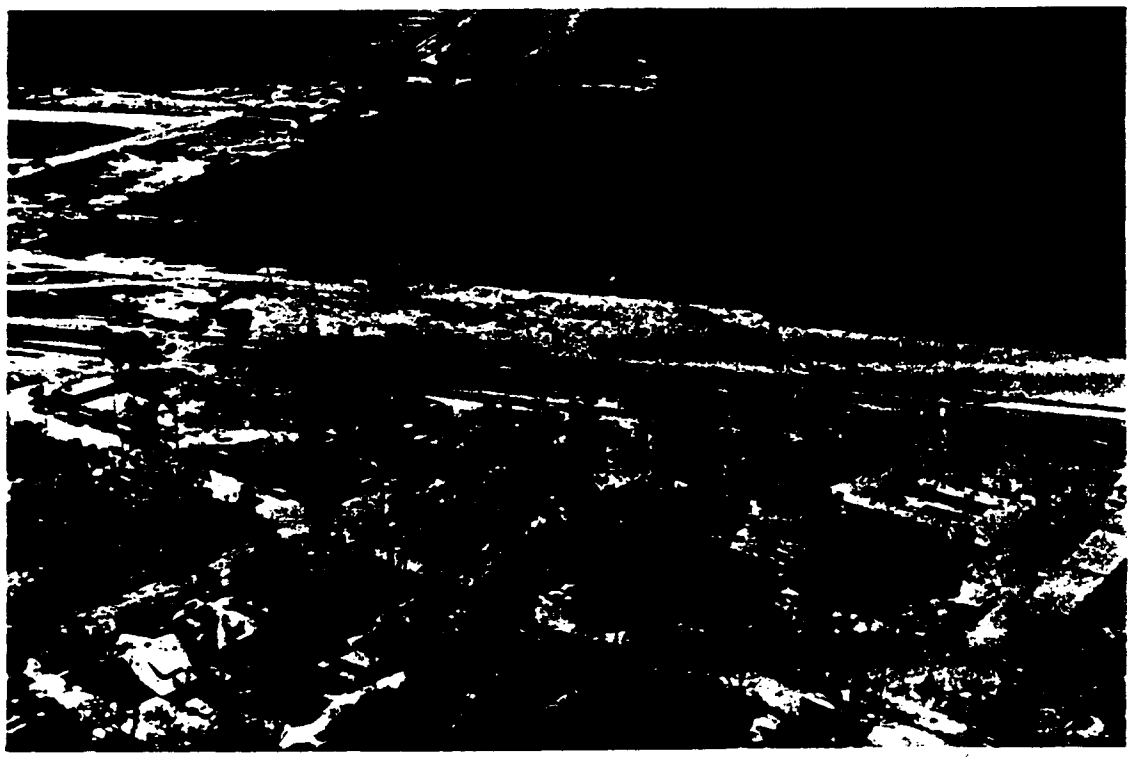
DAMAGE TO THE OUTER BREAKWATER AT PASS CHRISTIAN HARBOR.
TOP ELEVATION OF BREAKWATER IS 11.0 FEET M.S.L.

THREE MERCHANT VESSELS, *THE HULDA, SILVER HAWK* AND *ALAMO VICTORY*
GROUNDED AS A RESULT OF CAMILLE - GULFPORT

At Gulfport Harbor, three merchant vessels, the HULDA, SILVER HAWK, and ALAMO VICTORY, broke their moorings during the height of the storm, battered and severely damaged the wharves, and grounded in a cluster at the north end of the basin. The ALAMO VICTORY was refloated, repaired, and returned to service. However, it was determined to be more economical to scrap the other two ships in place. Estimated net loss to the three vessels amounted to $1,850,000.

Several barges of varying sizes were beached during the storm along with numerous commercial fishing and pleasure craft. Estimated cost to refloat the barges amounted to about $100,000. A 600-foot cargo-liner, the MORMACSUN, broke loose from an outfitting dock at Pascagoula and was beached. Cost for freeing the vessel and returning it to the shipyard is included in the lump sum estimate for industrial damages reported for Jackson County shown in table 15.

Damages to commercial fishing vessels and recreational craft amounted to $3,707,000 for the three Mississippi coastal counties. In addition, $1,583,300 was expended by owners and operators to move small craft to harbors of refuge. Information on these damages is not available for Alabama.



BARGE BEACHED BY CAMILLE ON U.S. HIGHWAY 90 - GULFPORT

Table 14

Marine damages

Item	Estimated damages
MISSISSIPPI	
Pass Christian Harbor	$ 380,000
Gulfport Harbor	5,126,000
Biloxi Harbor	331,400
Harrison County Industrial Waterway	14,500
Pascagoula Harbor	209,000
Miscellaneous small craft docks and piers	1,397,900
Deep draft ships	1,850,000
Barges	100,000
Small craft (commercial and recreational)	3,707,000
Moving small craft to safe harbors	1,583,300
Total, Mississippi	14,699,100
ALABAMA	
Miscellaneous small craft docks and piers	924,000
GRAND TOTAL	15,623,100

34. AGRICULTURAL DAMAGE

Most of the farmland within the inundated area is located away from the coast and not subject to wave attack or deep flooding. Agricultural losses were the result mainly of the action of wind. Tung and pecan orchards and timberland suffered the greatest loss. About 35,000 to 40,000 acres of tung trees were destroyed. Damages to pecan trees and crops were extensive. According to the U. S. Forest Service, of the 3.8 million acres of commercial forestland in southern Mississippi, about 1.9 million acres in the 15 southernmost counties sustained damages in varying degrees. Most of the damage was confined to Harrison, Hancock, Pearl River, and Lamar counties. The Forest Service estimated damage to Mississippi's growing stock at 290 million cubic feet, including 1.2 billion board feet of sawtimber, one-tenth of the timber inventory in the 15 affected counties. Estimates by the Forest Service indicate that about 95 percent of the total damaged-tree volume is salvable for pulpwood and more than 85 percent of the sawtimber is salvable.

35. DEBRIS REMOVAL

Removal of debris from the coastal counties, particularly within the flooded area, was a task of major proportions. The area was littered with felled trees, rubble from damaged or destroyed buildings, and countless other objects. Streets and highways were impassable for many days. Drainage canals and structures were also blocked by debris and silt.

Generally, in order to restore traffic and communications, the debris was first pushed to the side of the traffic lanes by the most expeditious method available. Following this, contracts were let and debris was removed from the roadway areas, public property, utility rights-of-way, and drainage structures, and disposed of in "burn" areas or by other means. Debris was also removed from private property and protective beaches in cases where such debris was certified by proper authorities as constituting a public health hazard. A total of nearly 700,000 tons of debris was removed and over 2,400 miles of roads and streets restored to use.

Cost of debris removal from the flooded areas was $5,250,300 for Hancock County, $9,131,500 for Harrison County, and $472,900 for Jackson County. Cost involved in debris removal for Alabama was estimated at $48,800 for Mobile County and $7,700 for Baldwin County. Cost for the non-flooded areas was $6,227,700. Grand total was nearly $21,000,000.

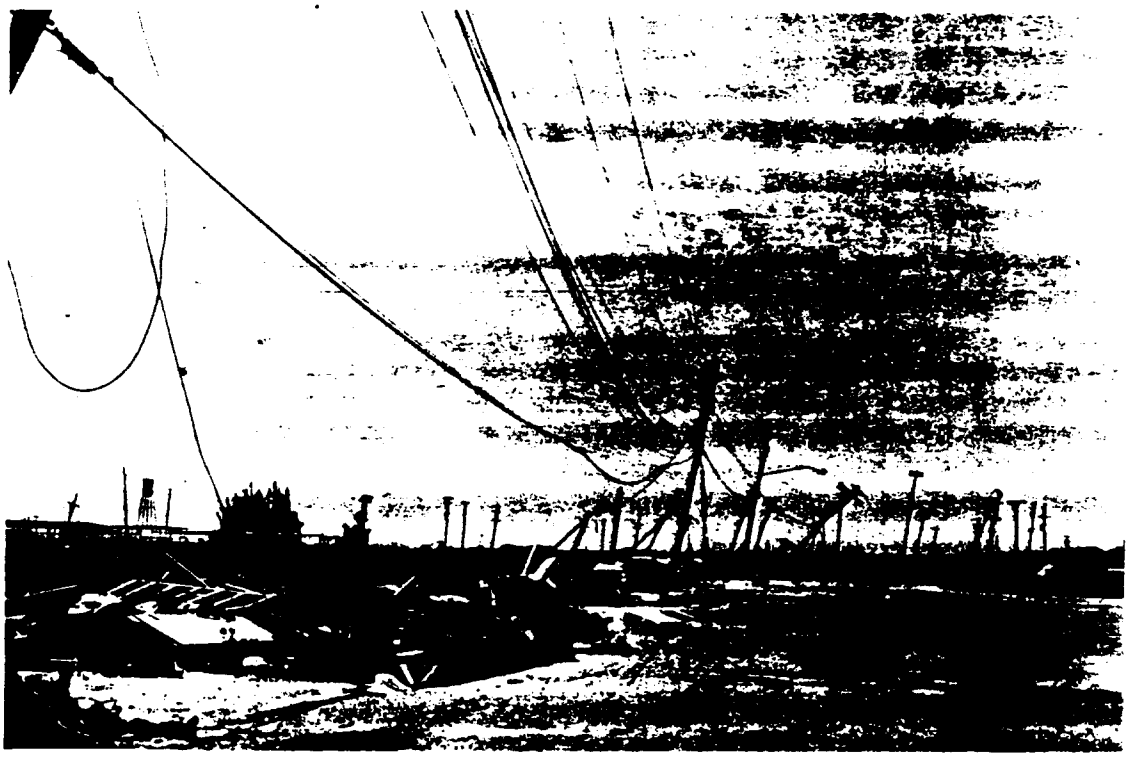
TYPICAL SCENE OF DEBRIS FROM DESTROYED BUILDINGS

STREETS CLEARED BY PUSHING DEBRIS TO THE SIDE - BILOXI

DEBRIS BLOCKS CITY STREETS - PASS CHRISTIAN

36. UTILITIES

Electric power failure was widespread, affecting 20 counties in Mississippi and 2 in Alabama. In some sections service was disrupted for as much as 15 days. The Mississippi Power Company had to almost completely rebuild its distribution system, and its transmission network was badly damaged. Streets and rights-of-way were blocked by fallen trees and debris, impeding restoration of both power and telephone lines. Of Mississippi's 765,000 telephones, about 15 percent were out of service and on the Gulf coast this figure was 67 percent.



TYPICAL UTILITY LINE DAMAGE - GULFPORT

37. SUMMARY OF DAMAGES BY CATEGORY, FLOODED AREA

Property damages and indirect losses within the flooded area aggregated $350,282,800, of which $337,242,500 occurred in Mississippi and $13,040,300 in Alabama. Table 15 summarizes the damages by county and damage category.

Table 15

Summary of estimated damages within inundated areas (in $1,000)

Category	Hancock County	Harrison County	Jackson County	Mobile County	Baldwin County	State Totals		Grand Totals
						Miss.	Ala.	
Residential	$26,280.8	$93,478.1	$15,839.5	$1,473.8	$1,851.2	$135,598.4	$3,325.0	$138,923.4
Commercial	6,599.1	67,697.1	1,478.5	1,266.3	1,452.2	75,774.7	2,718.5	78,493.2
Industrial	601.5	8,685.1	14,223.1	488.6	14.0	23,509.7	502.6	24,012.3
Schools	1,276.9	5,604.0	931.1	280.7	-	7,812.0	280.7	8,092.7
Churches	1,444.8	5,119.1	923.2	8.1	-	7,487.1	8.1	7,495.2
Hospitals	-	10,701.3	2.0	-	-	10,703.3	-	10,703.3
Transportation	6,124.1	13,339.0	2,288.7	1,139.7	222.3	21,751.8	1,362.0	23,113.8
Government (Federal)	260.1	6,854.4	1,192.2	1,167.1	115.8	8,306.7	1,282.9	9,589.6
Government (Non-Federal)	414.0	2,667.1	317.4	29.2	4.9	3,398.5	34.1	3,432.6
Marine	876.2	11,987.0	1,835.9	230.0	694.0	14,699.1	924.0	15,623.1
Agriculture	6,232.0	528.0	100.0	200.0	1,500.0	6,860.0	1,700.0	8,560.0
Debris Removal	5,250.3	9,131.5	472.9	48.8	7.7	14,854.7	56.5	14,911.2
Utilities	1,090.0	4,690.5	706.0	790.9	55.0	6,486.5	845.9	7,332.4
TOTALS	56,449.8	240,482.2	40,310.5	7,123.2	5,917.1	337,242.5	13,040.3	350,282.8

38. SUMMARY OF DAMAGES, NON-FLOODED AREAS

Outside the flooded area in the coastal counties and in the inland counties included in the disaster area, property damages and indirect losses aggregated over $183,000,000 of which nearly 50 percent occurred to agriculture. Total damages by county are listed below. Damages by category are summarized in table 16.

Mississippi	
Amite	Negligible
Copiah	Negligible
Covington	$1,646,800
Forrest	7,714,200
George	2,833,700
Greene	265,400
Hancock	19,910,000
Harrison	68,574,700
Jackson	10,709,800
Jasper	191,700
Jefferson Davis	1,557,000
Jones	2,110,000
Lamar	12,116,800
Lawrence	Negligible
Lincoln	Negligible
Marion	2,588,800
Pearl River	36,534,500
Perry	153,200
Pike	Negligible
Rankin	483,000
Simpson	1,085,700
Smith	1,490,500
Stone	2,216,300
Walthall	589,300
Wayne	174,100
Wilkinson	Negligible
Total, Mississippi	172,945,500
Alabama	
Baldwin	$4,505,700
Mobile	6,109,700
Total, Alabama	10,615,400
Total, Mississippi and Alabama	183,560,900

Table 16

Summary of estimated damages, by categories, outside flooded areas (in $1,000)

Category	Hancock County	Harrison County	Jackson County	Inland Miss. Counties	Mobile County	Baldwin County	Totals
Residential	$1,890.4	$22,559.2	$1,539.0	$7,569.0	NOT REPORTED	NOT REPORTED	$33,557.6
Commercial	691.5	6,055.0	281.8	2,947.0			9,975.3
Industrial	750.0	-	-	126.0			876.0
Schools	700.0	-	1,301.3	2,248.1			4,249.4
Churches	66.6	425.0	41.6	85.0			618.2
Hospitals	197.3	17.4	95.9	1.8			312.4
Transportation	-	-	-	1,915.0			1,915.0
Government (Federal)	-	14,925.5	-	1.3			14,926.8
Government (Non-Federal)	-	-	45.6	158.9	$96.0	$2.5	303.0
Agriculture	14,540.5	12,661.0	1,832.0	49,165.0	5,800.0	4,500.0	88,498.5
Debris Removal	766.2	2,237.1	703.6	2,303.9	213.7	3.2	6,227.7
Utilities	307.5	9,694.5	4,869.0	7,230.0	NEGLIGIBLE		22,101.0
TOTALS	19,910.0	68,574.7	10,709.8	73,751.0	6,109.7	4,505.7	183,560.9

VII - RELIEF AND MISCELLANEOUS EXPENDITURES

39. DEFINITION

Expenditures described in this section are those incurred by various relief and charitable organizations, such as the American Red Cross and Salvation Army, and certain Federal and non-Federal governmental agencies. These expenditures are not separable by areas; however, the major portion was incurred in Harrison and Hancock Counties.

40. RELIEF EXPENDITURES

The Red Cross established 29 relief centers to provide financial assistance and service to the disaster victims. In addition, 27 Red Cross mobile units and seven army field kitchens loaned to the Red Cross by the Third Army provided food service throughout the disaster area. Red Cross relief expenditures in the Gulf coast area as of the end of the year 1969 amounted to about $15,000,000. The Salvation Army, with its staff and volunteer workers, provided food and essential items to the disaster victims. Cost of services rendered by the organization amounted to $689,000. Value of food and supplies furnished to disaster victims exceeded $5,000,000.

41. FEDERAL AGENCIES

Many agencies of the Federal Government responded to requests for assistance and, under available statutory authority, furnished personnel and supplies to aid the disaster victims and help them in recovery operations. Data on expenditures incurred by those agencies as described herein are not complete; however, estimates of principal expenditures are described in this section. Commitments through Office of Emergency Preparedness, Small Business Administration, or other agencies to reimburse local political subdivisions for property damages or make rehabilitation loans are not presented since these figures are accounted for under damage appraisals elsewhere in this report. Expenditures listed here for those agencies involved in reimbursing local entities or making rehabilitation loans are primarily administrative costs.

As of 28 February 1970 the Mobile District expended $1,751,400 to cover personnel, overhead, and miscellaneous costs associated with the administration of programs assigned them under Public Laws 81-875, 84-99, and 91-79, and related activities. Personnel and overhead expenses of the Small Business Administration relative to the processing of loans amounted to about $30,800 as of 28 February 1970. This figure will undoubtedly increase as SBA continues to make loans to disaster victims. The Department of Housing and Urban Development provided services and emergency housing for disaster victims. Five thousand mobile homes were moved into the disaster areas to provide temporary housing for the homeless. Over 3,000 of these were dispatched to Mississippi. Estimated cost

associated with this program amounted to $15,000,000. The Economic Development Administration, Department of Commerce, provided $584,000 in technical assistance funds with which to plan and coordinate redevelopment in Mississippi.

Over 350 homeless boys of the Neighborhood Youth Corps assisted local government units in Mississippi in recovery tasks such as unloading and distributing supplies. Activities of the Youth Corps were financed through a $100,000 allocation from the Department of Labor's Manpower Training Fund. The Department of Labor also allocated $104,000 to the Mississippi Employment Security Agency to cover the cost for additional staff members and for related needs. The Department of Health, Education and Welfare contributed materials, services and funds. Estimated expenditures amounted to $4,250,000 for affected areas along the Gulf coast and in Virginia, the majority being spent in Mississippi. Supplies from General Services Administration's depots were rushed to all sectors of the disaster area. Cost of logistical support by GSA is estimated at over $500,000. The National Aeronautical and Space Administration's Marshall Space Flight Center in Huntsville, Alabama, dispatched disaster teams, a 200-bed civil defense packaged hospital, and essential supplies to the stricken area. Estimated cost of this operation was about $40,000. Employees and contractors of MSFC contributed over $230,000 in money and services. NASA's Mississippi Test Facility served as an emergency shelter for about 1,500 persons. Equipment and personnel from the facility were also dispatched to aid in recovery operations along the Mississippi coast. Heavy equipment, trucks, medicines, food, and other supplies were either loaned or donated. The estimated expenditures incurred by the Mississippi Test Facility for the recovery operation was slightly over $2,000,000. The Office of Economic Opportunity granted over $325,000 to agencies to establish methods for poor people to utilize available food assistance programs.

The Bureau of Accounts, Department of the Treasury, established an office in Gulfport to expedite disbursement of loans from the Small Business Administration. Estimated cost of the emergency service was $16,000. Supplies furnished by the Office of Civil Defense to emergency shelters in Gulfport and Biloxi alone amounted to about $88,000. About $125,000 was expended by the Post Office Department to repair damaged postal facilities and restore postal services. The Soil Conservation Service assisted in timber salvaging operation at an estimated cost of $22,200. In addition, the U. S. Forest Service incurred $480,000 additional expense for fire control. Above normal administrative expense to the Civil Service Commission in personnel reassignment activities amounted to $1,300. Many military units supplied equipment and manpower necessary to expedite the clean-up and rehabilitation operations. No information is available as to the extraordinary expenses incurred by these units. Other Federal agencies furnished assistance, absorbing the cost in their normal operating budget.

42. NON-FEDERAL AGENCIES

Under Public Law 81-875, many of the expenditures by state and local agencies were reimbursed by the Federal government. To be eligible for reimbursement, the expenditures for personnel, supplies, and services must be over and above those expenses normally incurred during routine operations. Expenditures reimbursed under Public Law 81-875 are included under Government (non-Federal) in the damage appraisal section of this report. Those non-Federal expenditures not accounted for elsewhere in this report, aggregating $813,000, include principally the cost of emergency medical supplies and salaries required for carrying out the State's health program, additional policing activities not reimbursed by OEP as of the date of this report, and miscellaneous items. Admittedly, some expenditures by local and state agencies would not have been reimbursed or possibly may have been overlooked. However, these expenses are considered insignificant in comparison to the overall picture.

43. SUMMARY

Estimated expenditures by various Governmental agencies and relief organizations, not separable by areas, are summarized as follows:

Federal agencies	$25,647,700
Non-Federal agencies	813,000
Relief organizations	20,689,000
Total	47,149,700

SMALL CRAFT WASHED INLAND BY HIGH TIDES

VIII - SUMMARY OF DAMAGES AND DISASTER RELIEF EXPENDITURES

44. MOBILE DISTRICT

Table 17 summarizes all estimated damages and expenditures incurred within the Mobile District.

Table 17

Summary of estimated damages, Mobile District

Location	Damages
Hancock County	$76,359,800
Harrison County	309,056,900
Jackson County	51,020,300
Inland Counties of Mississippi	73,751,000
Total, Mississippi	510,188,000
Mobile County	13,232,900
Baldwin County	10,422,800
Total, Alabama	23,655,700
Inseparable	47,149,700
TOTAL	580,993,400

45. TOTAL ESTIMATED STORM DAMAGES

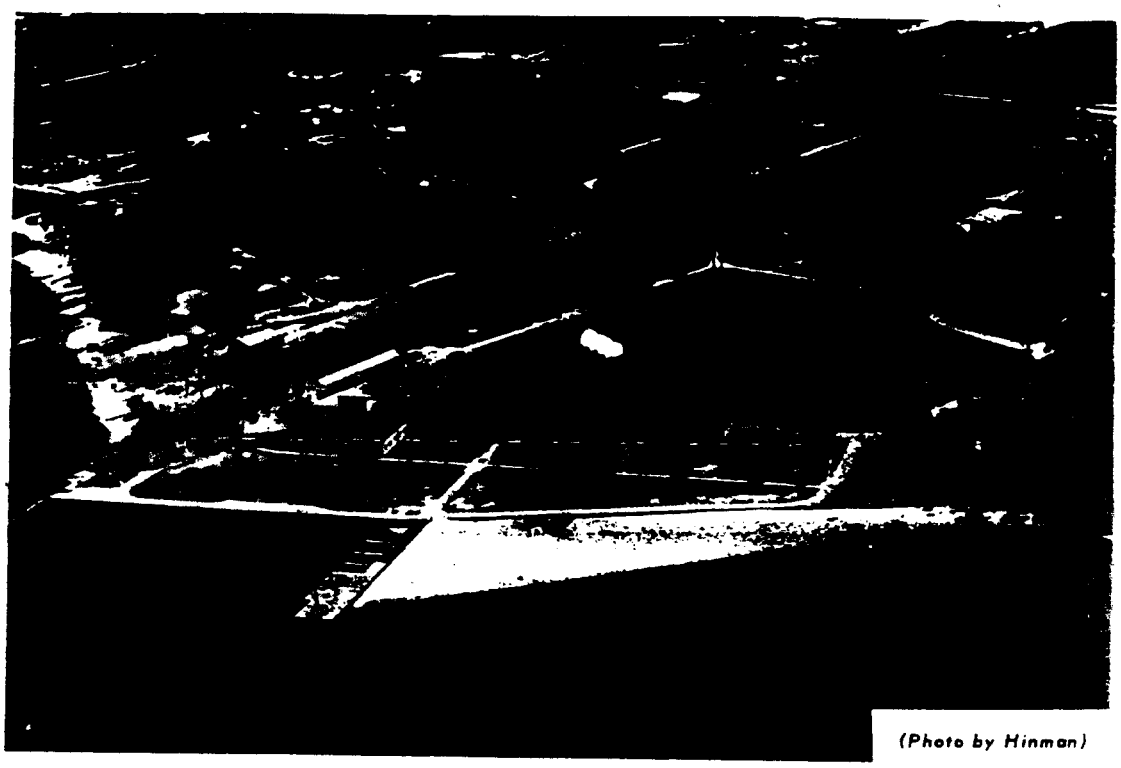
Detailed estimates of damages have been made by the Mobile and New Orleans Districts and preliminary estimates by the Norfolk District, the latter for river flooding primarily in Virginia and adjacent areas. Damages by district are summarized as follows:

Mobile District	$581,000,000
New Orleans District	250,000,000
Norfolk District (Preliminary)	140,000,000
Total	971,000,000

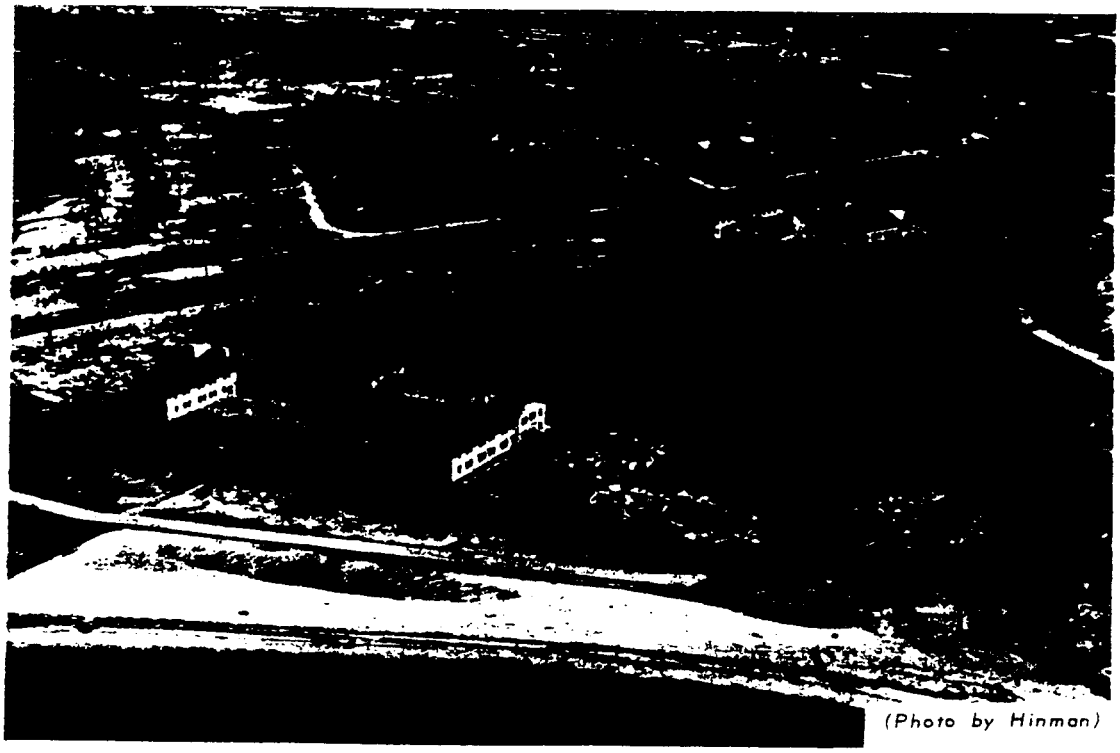
IX - FATALITIES

The fatalities enumerated below are slight considering the intensity of Hurricane Camille. Continued, ample, and insistent warnings from the U. S. Weather Bureau, which made possible the evacuation of thousands of persons from the danger area, greatly aided in preventing additional casualties. Storm casualties listed are in accordance with the latest statistics as reported by the American Red Cross.

Mississippi	137
Louisiana	9
Virginia	114
West Virginia	2
Total	262

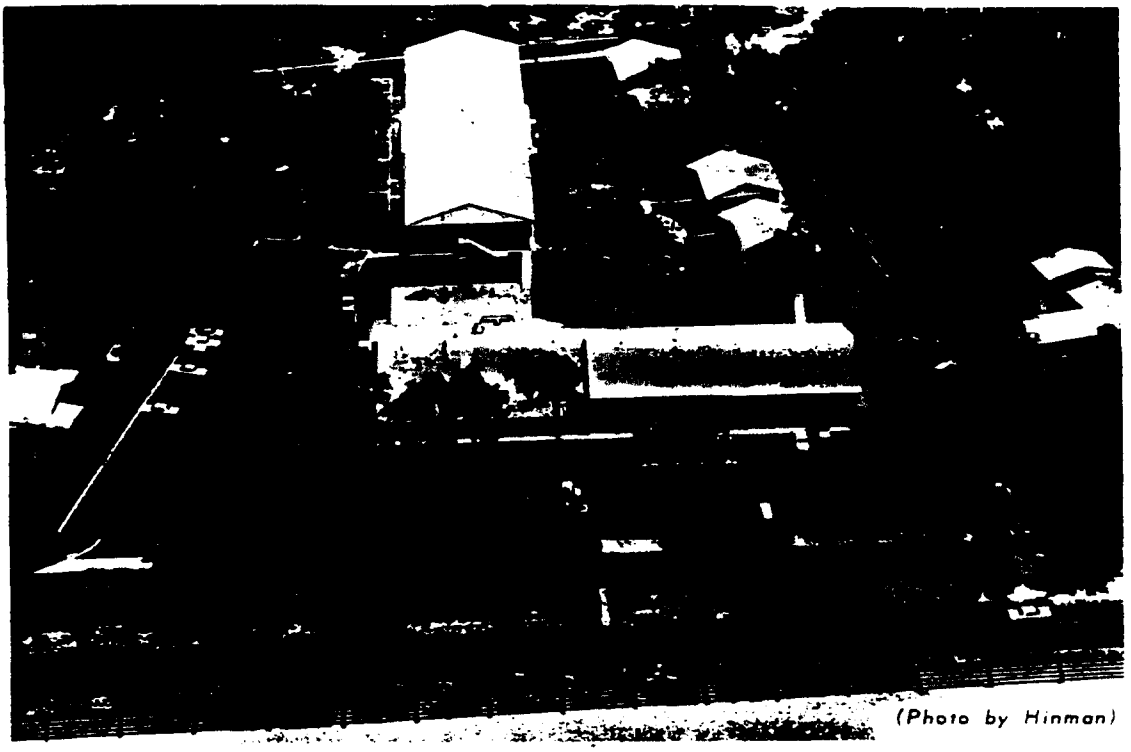


(Photo by Hinman)

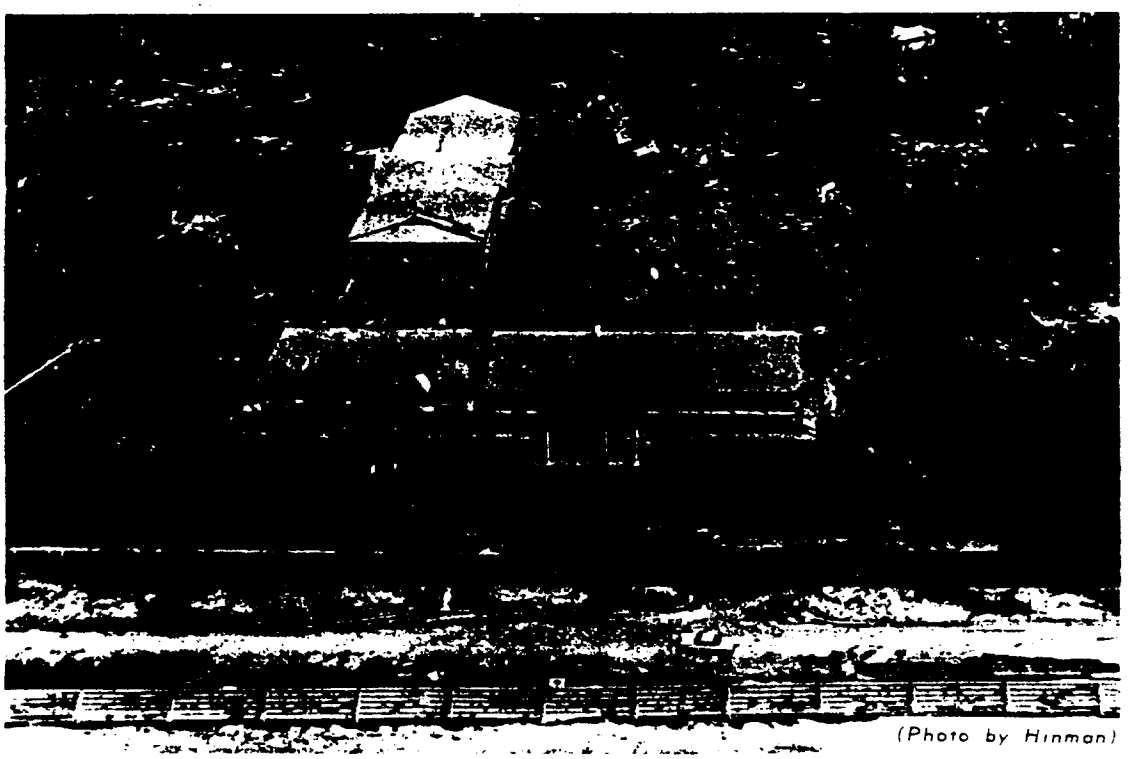


(Photo by Hinman)

GULFSHORE BAPTIST ASSEMBLY BEFORE AND AFTER CAMILLE - HENDERSON POINT

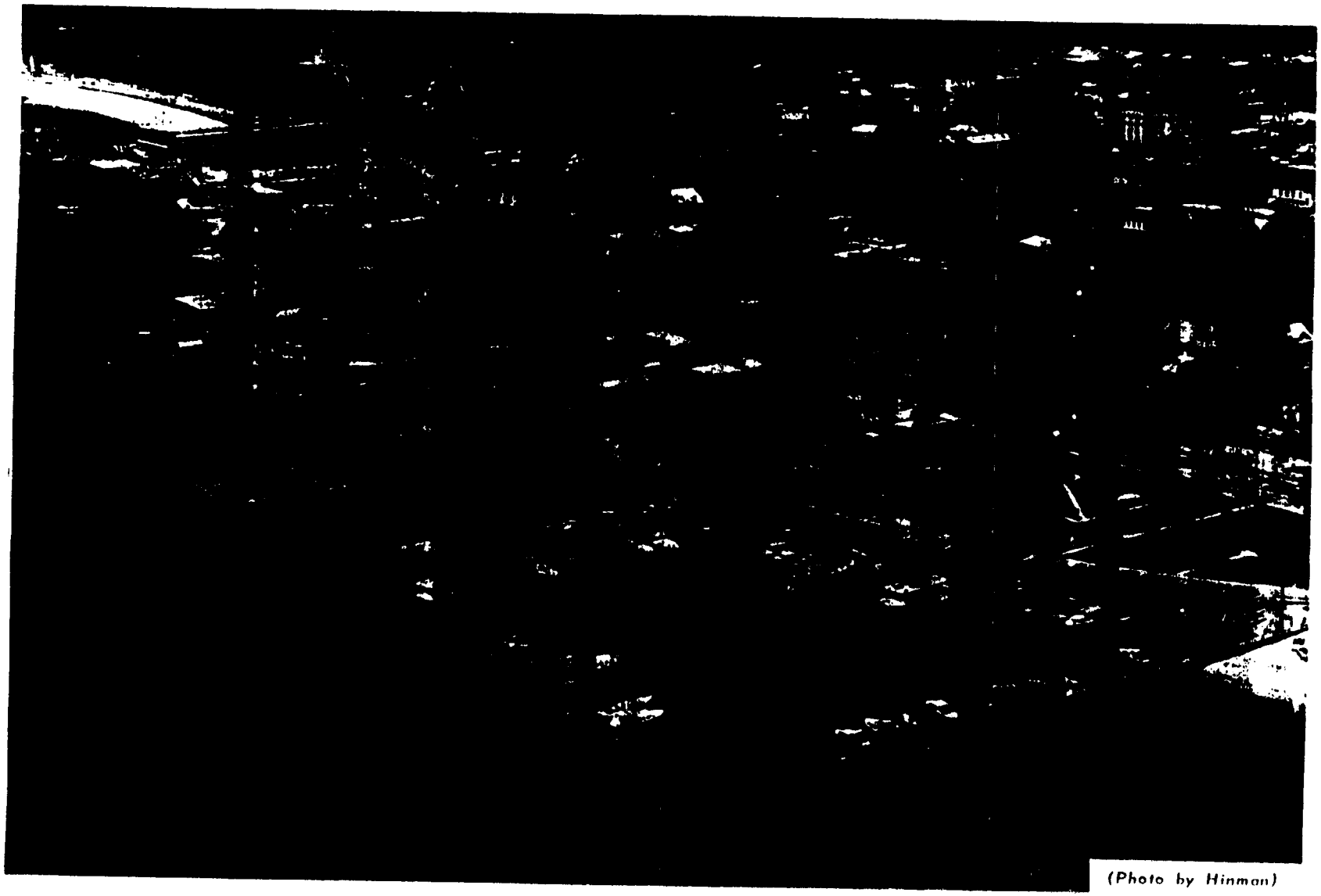


(Photo by Hinman)



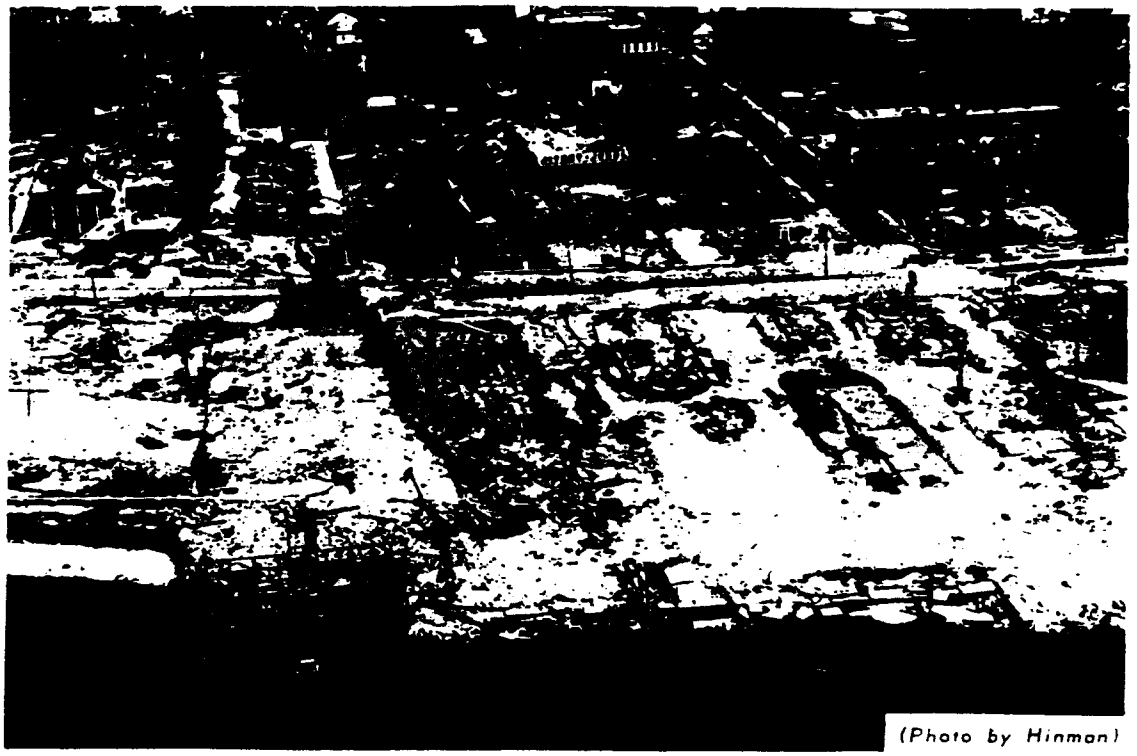
(Photo by Hinman)

MOTEL ON U.S. HIGHWAY 90 BEFORE AND AFTER CAMILLE - LONG BEACH

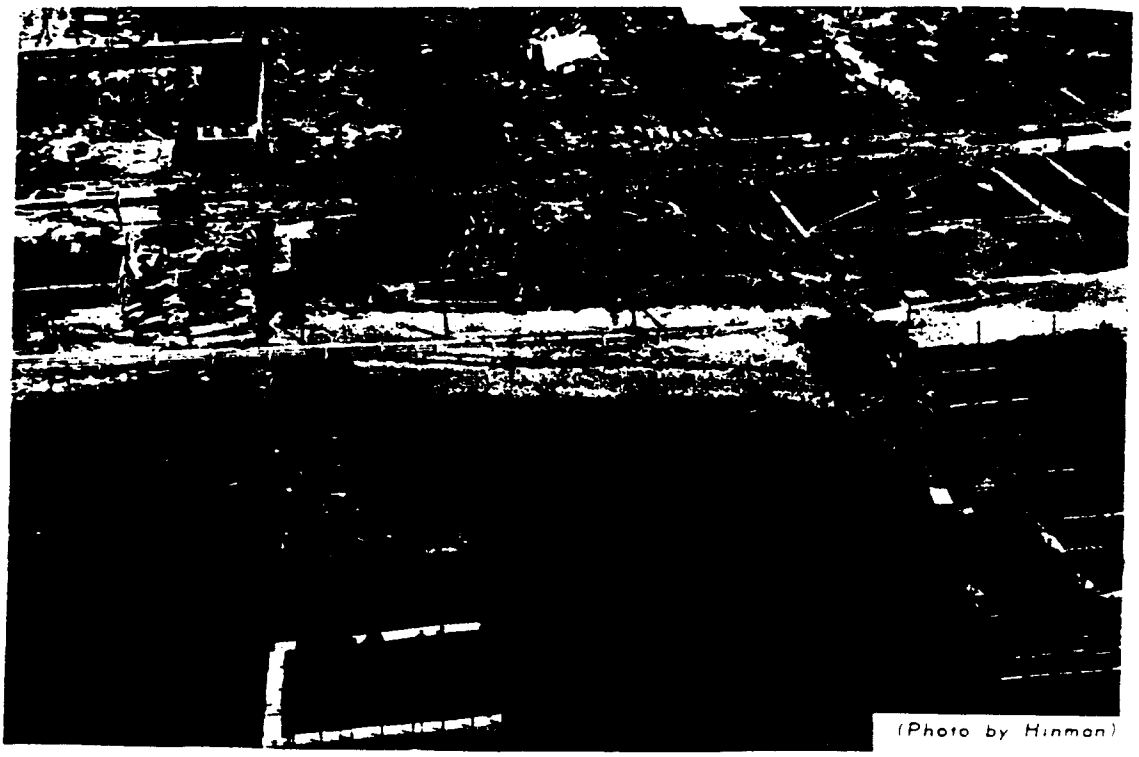


(Photo by Hinman)

BILOXI BEACH FRONT BEFORE CAMILLE

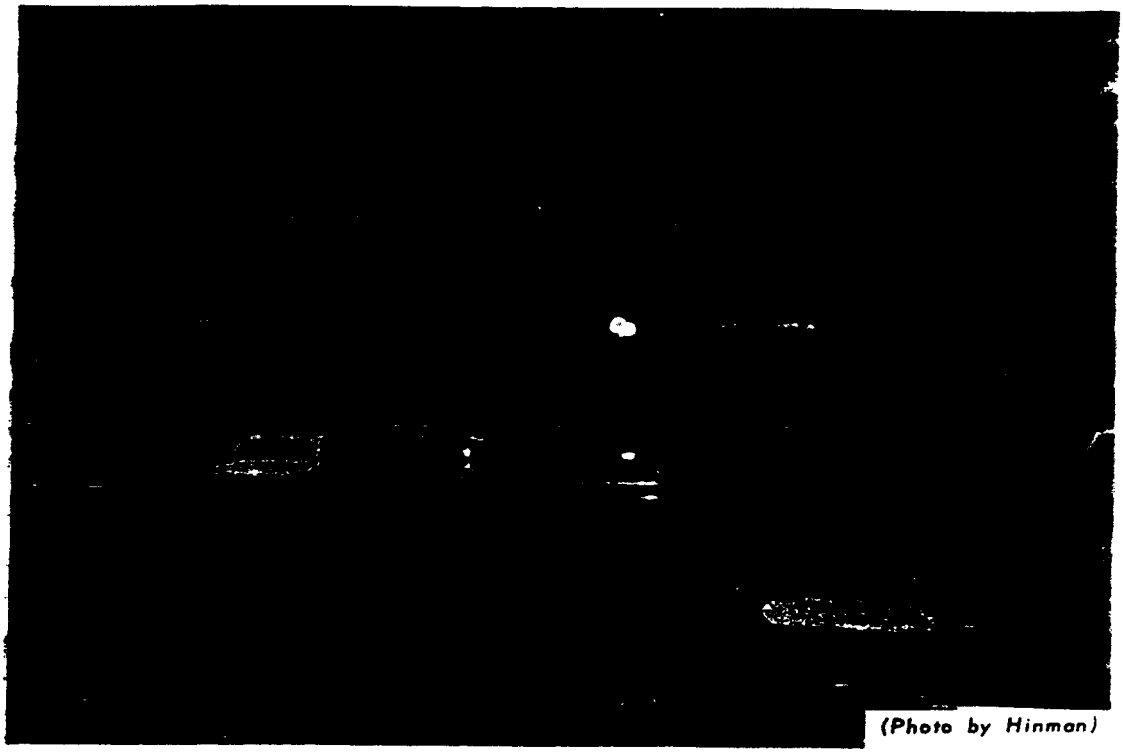


(Photo by Hinman)

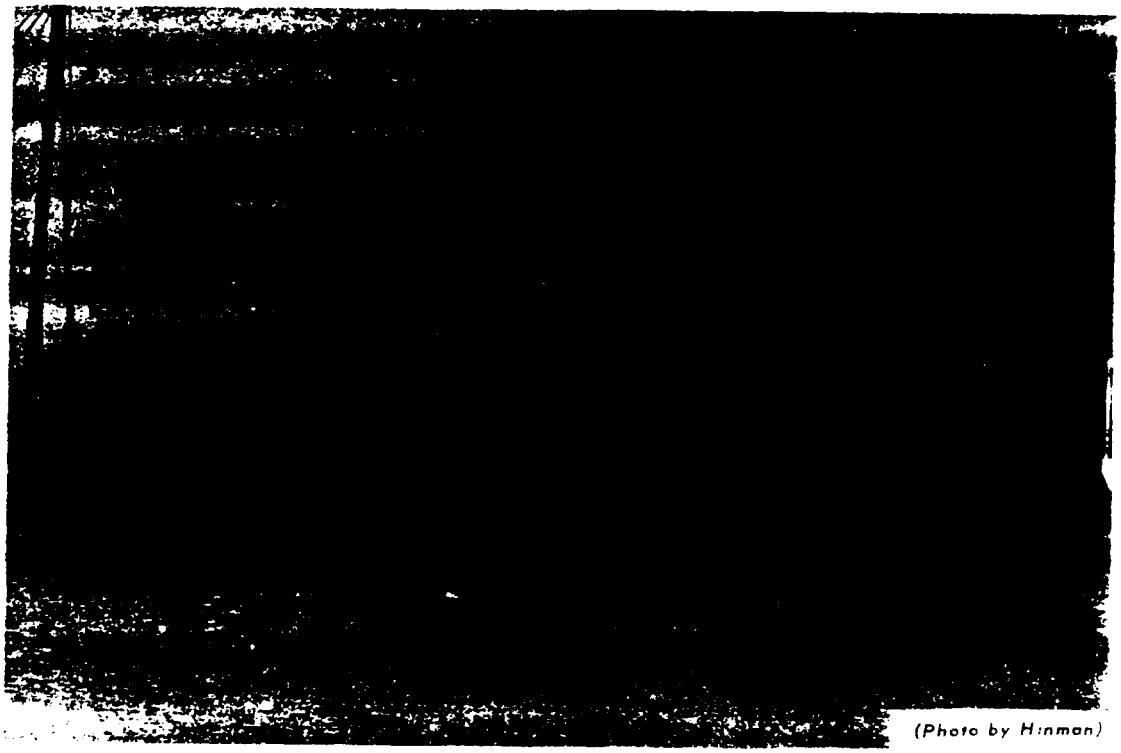


(Photo by Hinman)

BILOXI BEACH FRONT AFTER CAMILLE

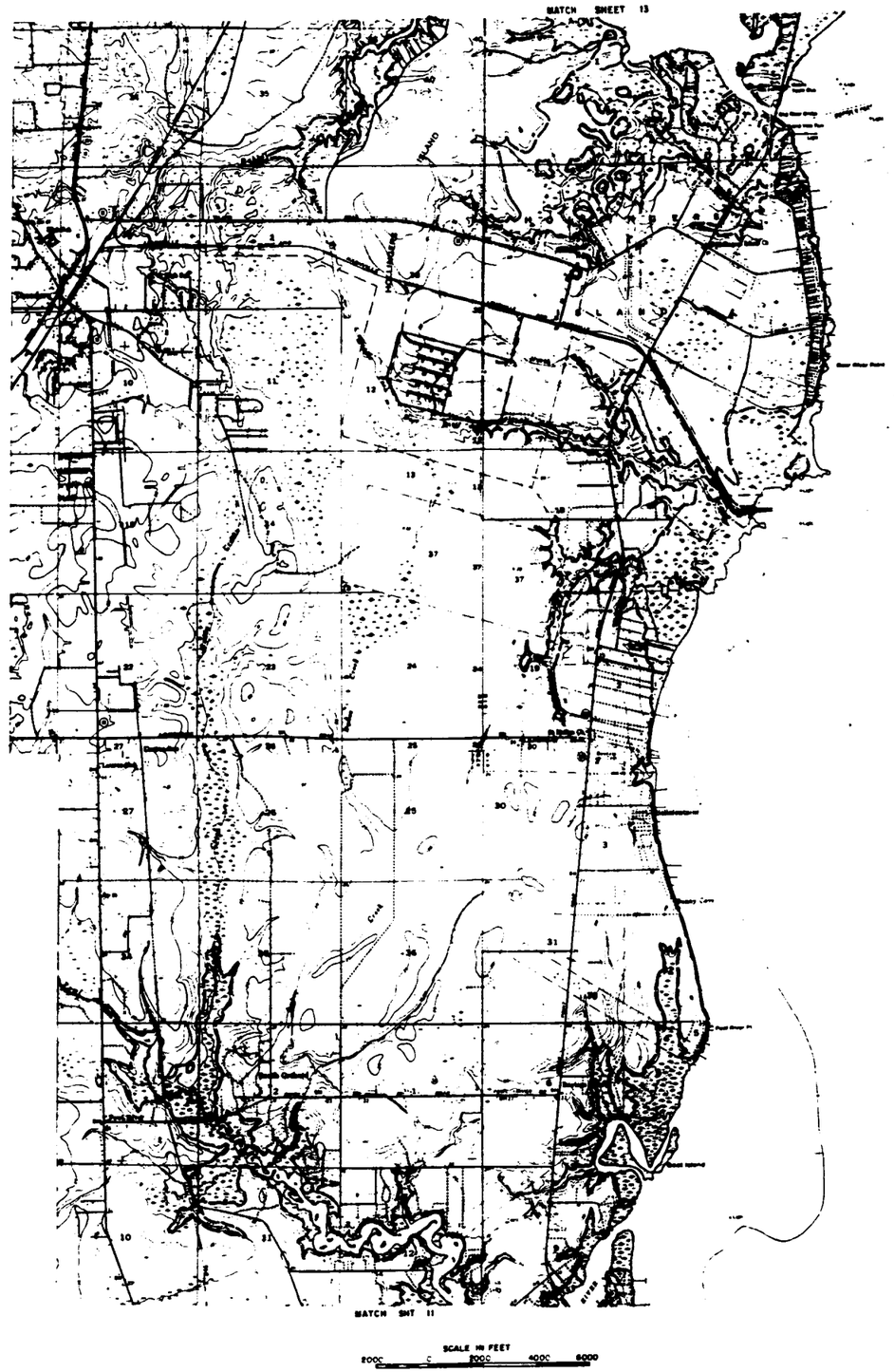


(Photo by Hinman)



(Photo by Hinman)

RESTAURANT BEFORE AND AFTER CAMILLE - BILOXI



HURRICANE CAMILLE
17-19 AUGUST 1969

DETAIL OF INUNDATED AREA
ALABAMA COAST

IN 21 SHEETS SHEET NO 12
U S ARMY ENGINEER DISTRICT MOBILE
MOBILE, ALABAMA 1969

PLATE 30

HURRICANE CAMILLE
17 - 19 AUGUST 1969

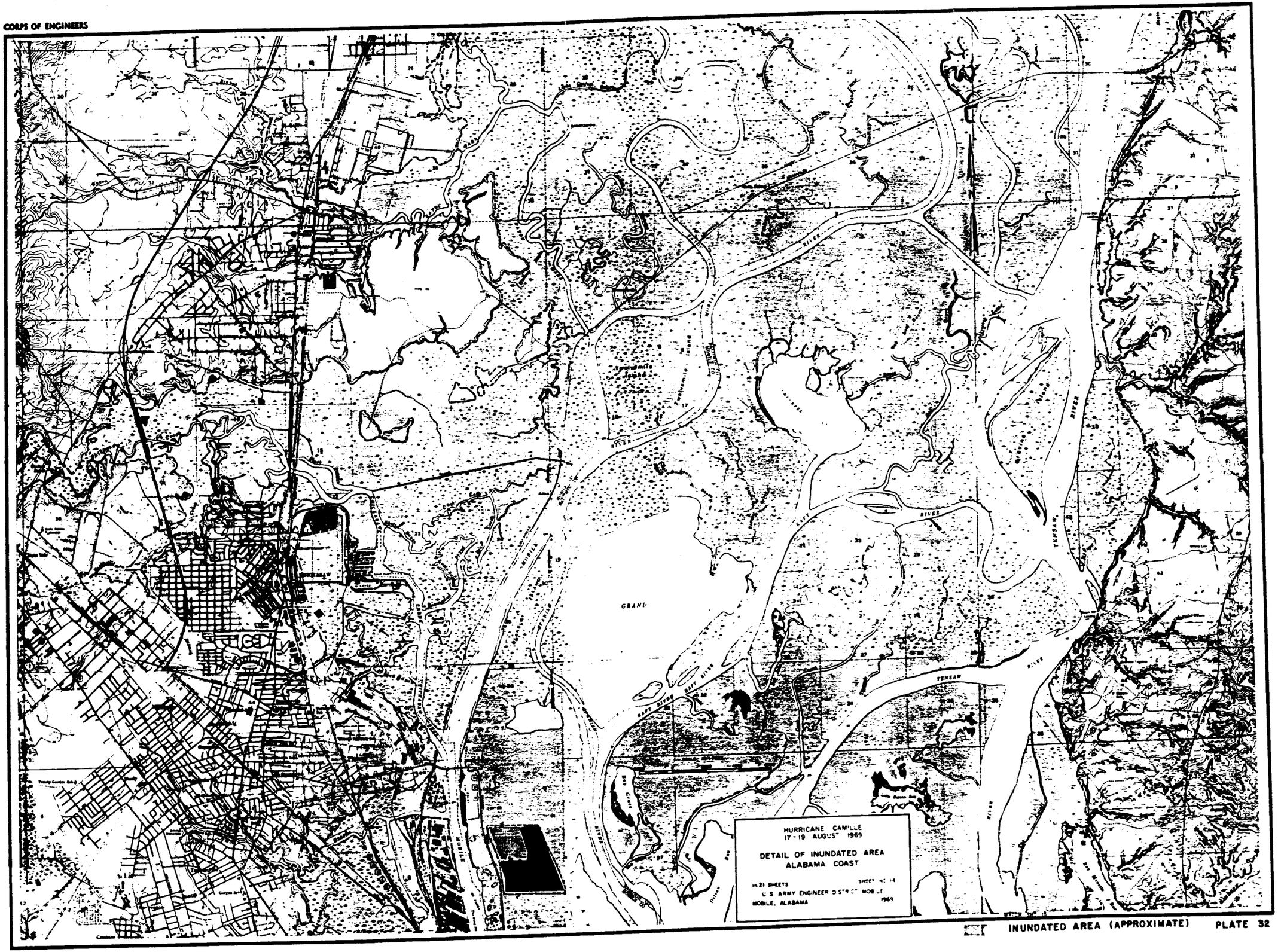
DETAIL OF INUNDATED AREA
ALABAMA COAST

IN 21 SHEETS SHEET NO. 13
U. S. ARMY ENGINEER DISTRICT, MOBILE
MOBILE, ALABAMA 1969

PLATE 31

U. S. ARMY

CORPS OF ENGINEERS



INUNDATED AREA (APPROXIMATE)

PLATE 32

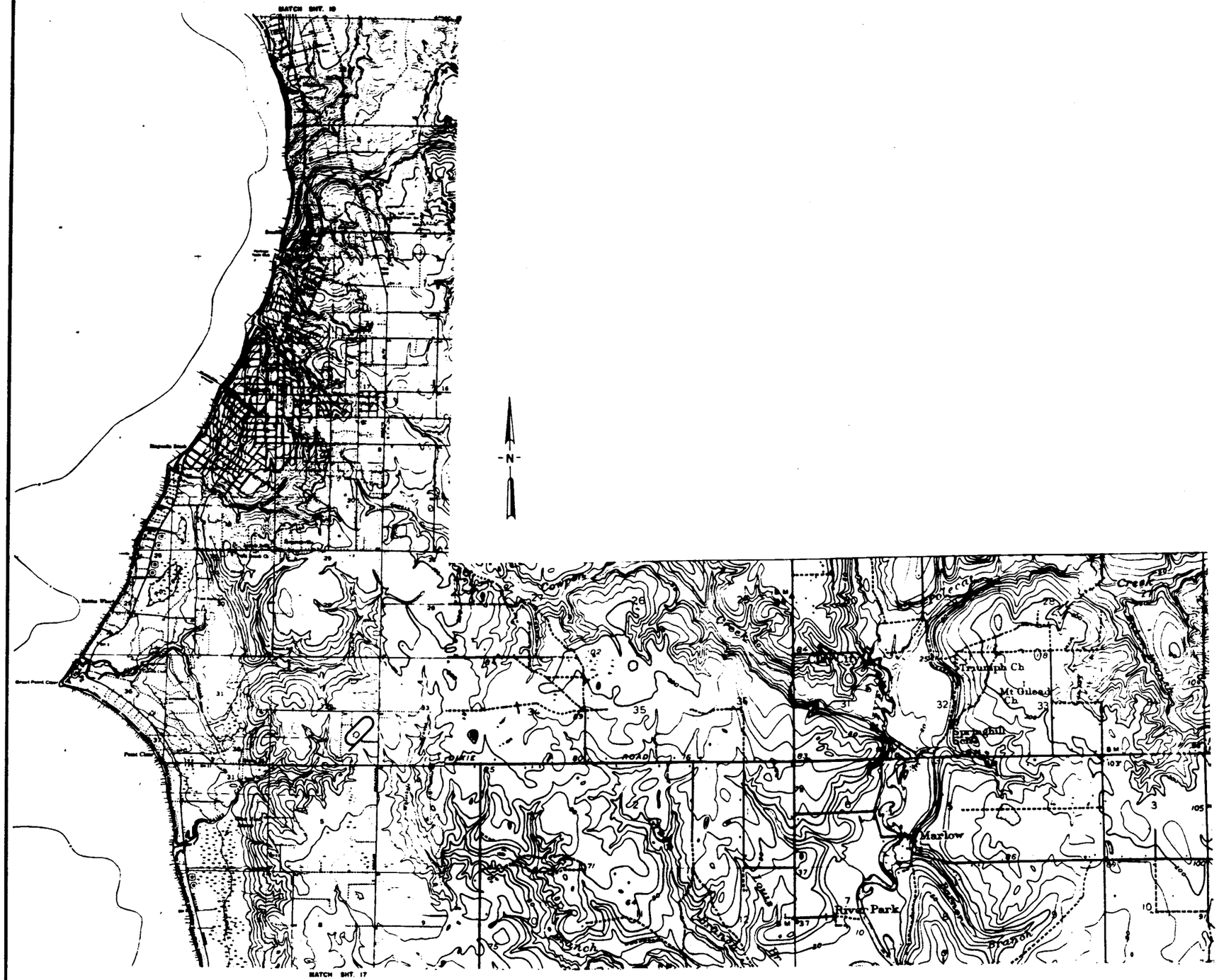
HURRICANE CAMILLE
17-19 AUGUST 1969

DETAIL OF INUNDATED AREA
ALABAMA COAST

IN 21 SHEETS SHEET NO. 15
U. S. ARMY ENGINEER DISTRICT MOBILE
MOBILE, ALABAMA 1969

CORPS OF ENGINEERS

U. S. ARMY



HURRICANE CAMILLE
17-19 AUGUST 1969

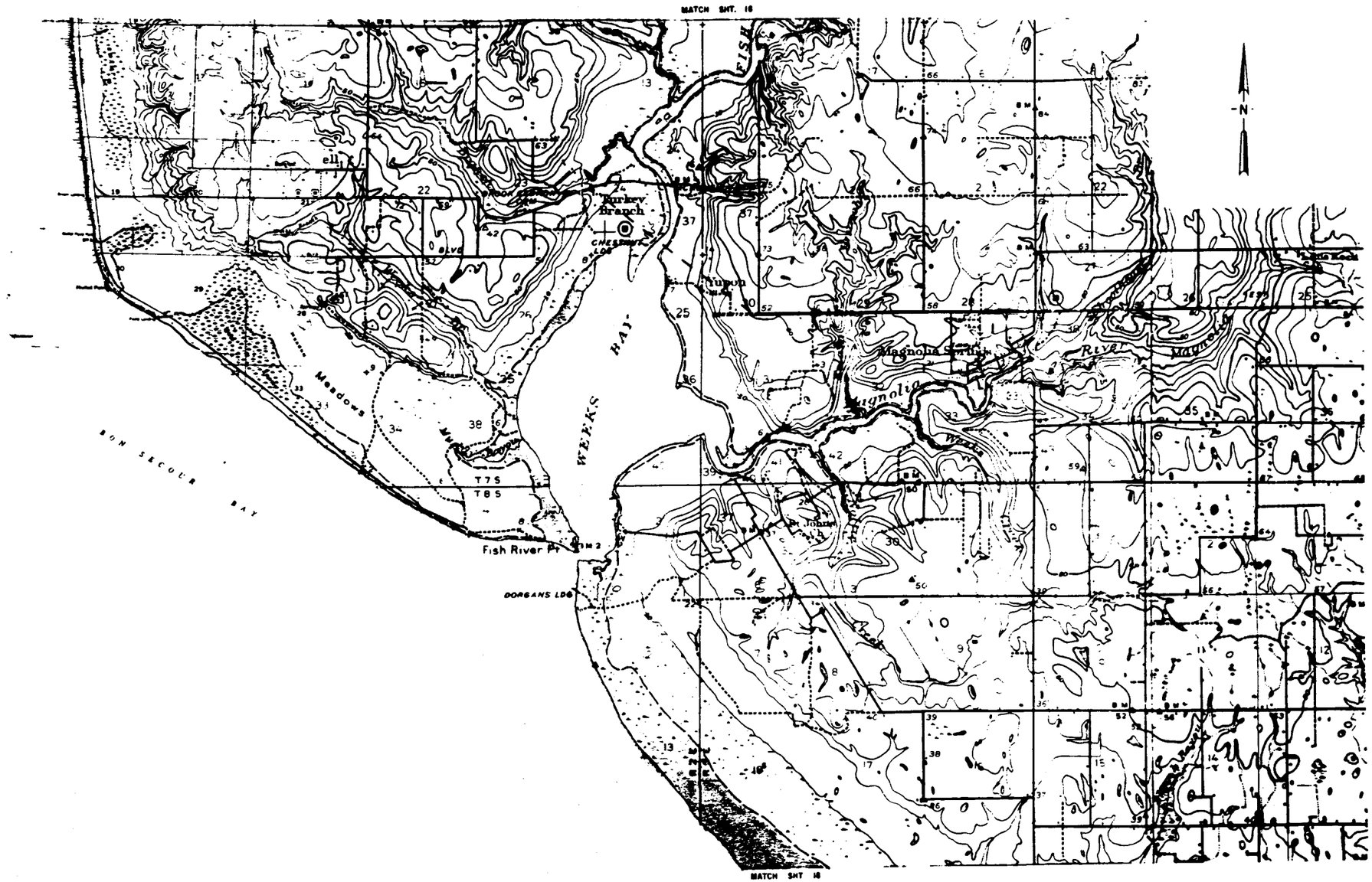
DETAIL OF INUNDATED AREA

ALABAMA COAST

IN 21 SHEETS SHEET NO 16

U S ARMY ENGINEER DISTRICT MOBILE
MOBILE, ALABAMA 1969

PLATE 34



HURRICANE CAMILLE
17 - 19 AUGUST 1969

DETAIL OF INUNDATED AREA

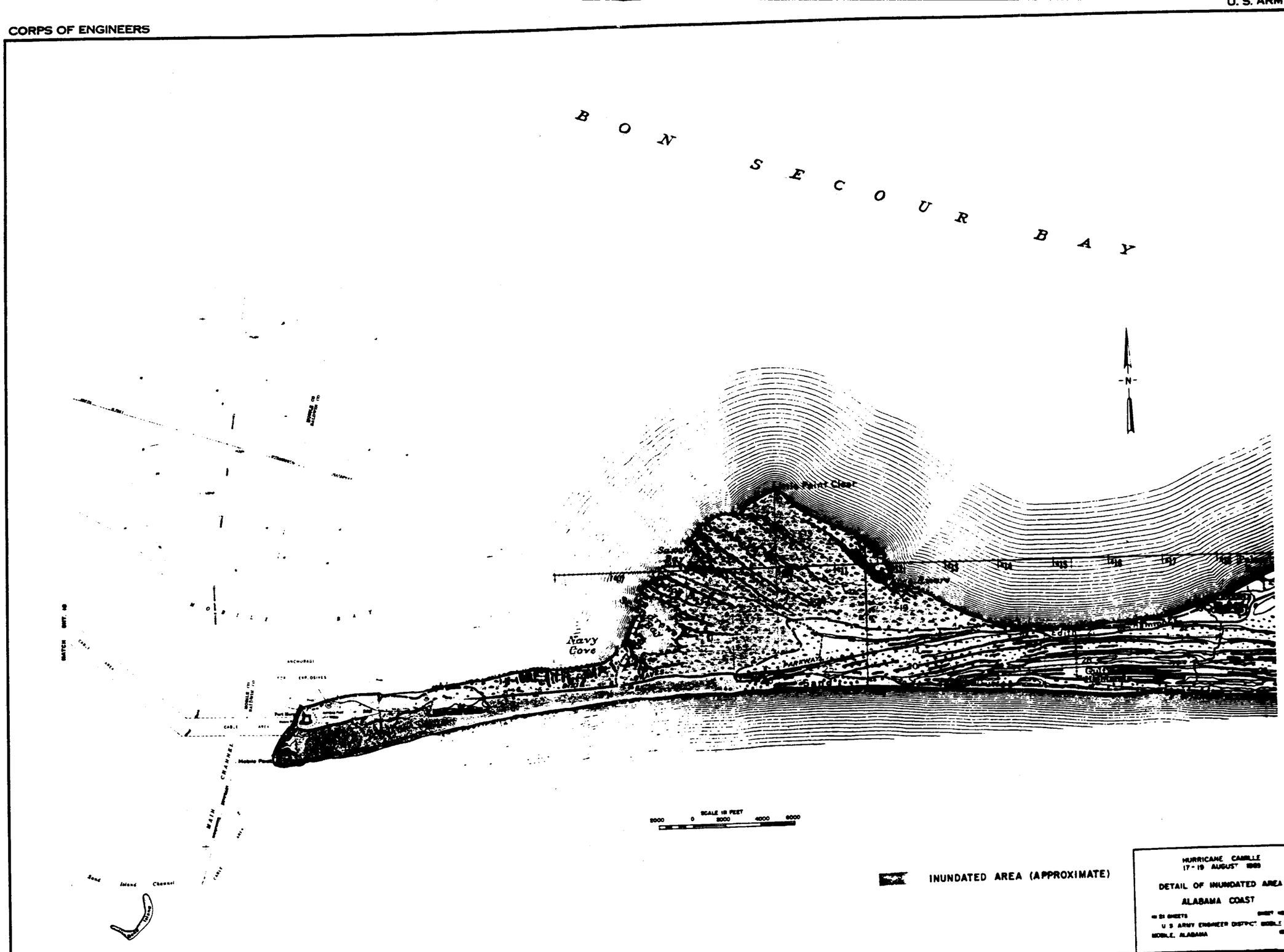
ALABAMA COAST

IN 21 SHEETS SHEET NO. 17

U S ARMY ENGINEER DISTRICT, MOBILE
MOBILE, ALABAMA 1969

PLATE 35

CORPS OF ENGINEERS



INUNDATED AREA (APPROXIMATE)

HURRICANE CAMILLE
17 - 19 AUGUST 1969

DETAIL OF INUNDATED AREA

ALABAMA COAST

SHEET NO. 6

U S ARMY ENGINEER DISTRICT MOBILE
MOBILE, ALABAMA

PLATE 36

SCALE IN FEET
2000 0 2000 4000 6000

INUNDATED AREA (APPROXIMATE)

HURRICANE CAMILLE
17 - 19 AUGUST 1969

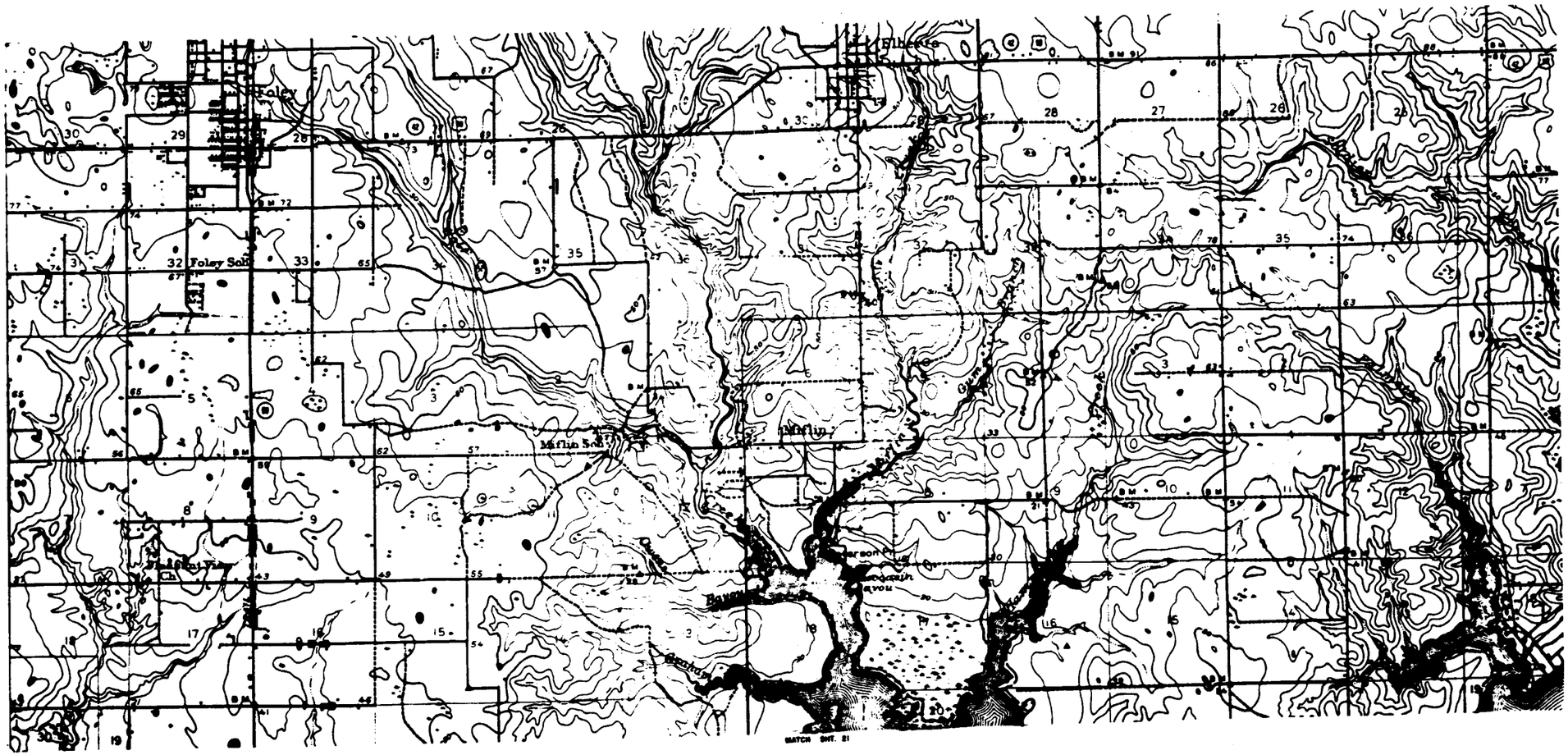
DETAIL OF INUNDATED AREA

ALABAMA COAST

SHEET 18 OF 21 SHEETS

U S ARMY ENGINEER DISTRICT MOBILE
MOBILE, ALABAMA 1969

PLATE 37



INUNDATED AREA (APPROXIMATE)

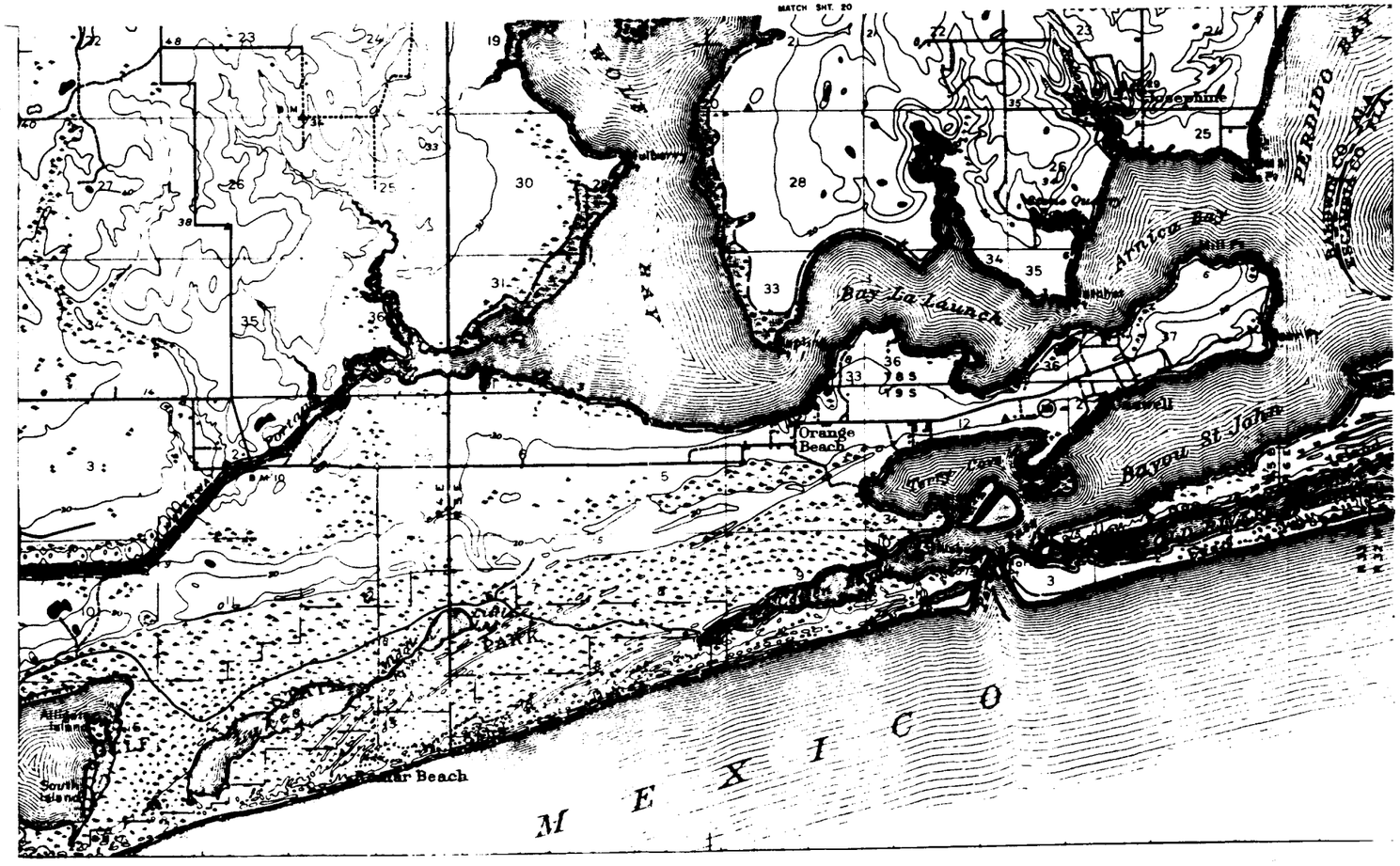
HURRICANE CAMILLE
17 - 19 AUGUST 1969

DETAIL OF INUNDATED AREA

ALABAMA COAST

SHEET 40 OF 55
OF 21 SHEETS
U S ARMY ENGINEER DISTRICT, MOBILE
MOBILE, ALABAMA

PLATE 35



N

SCALE IN FEET
2000 0 2000 4000 6000

INUNDATED AREA (APPROXIMATE)

HURRICANE CAMILLE
17-19 AUGUST 1969

DETAIL OF INUNDATED AREA

ALABAMA COAST

IN 2 SHEETS SHEET NO 2

U S ARMY ENGINEER DISTRICT MOBILE
MOBILE, ALABAMA 1969

PLATE 39

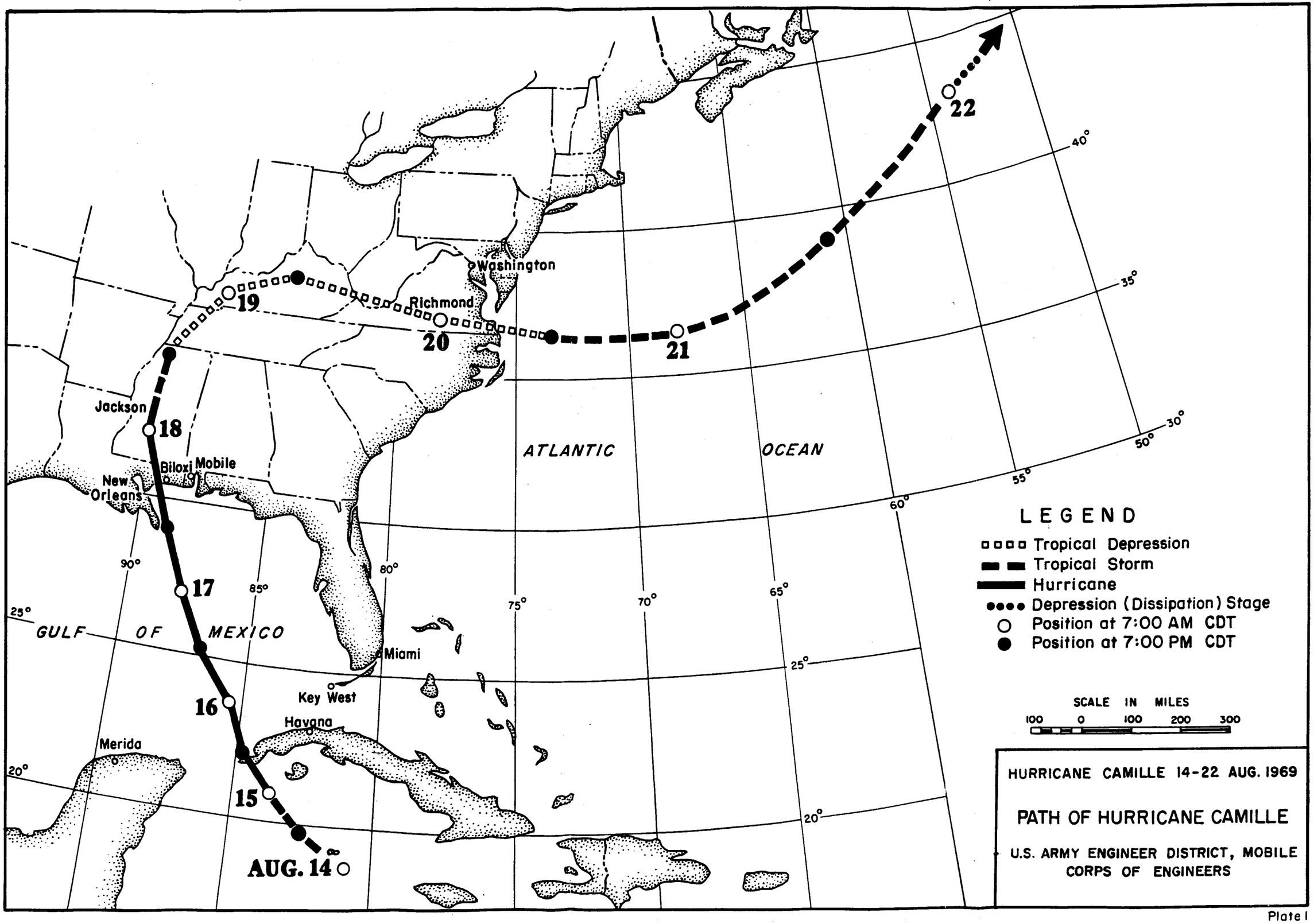
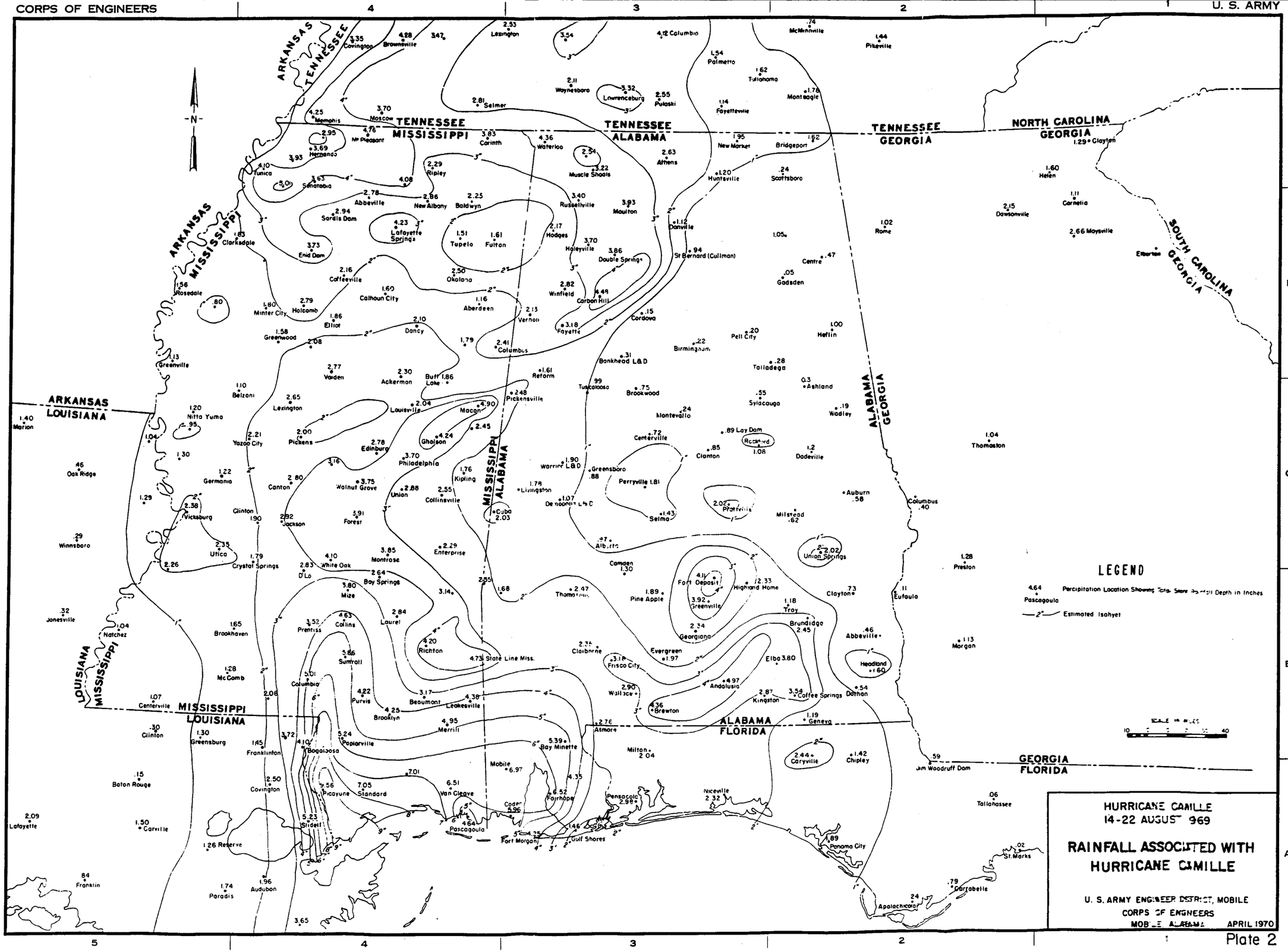

Washington
Richmond
19
20
21
22
Jackson
18
Biloxi
Mobile
New Orleans
17
16
15
AUG. 14
Miami
Key West
Havana
Merida
ATLANTIC
OCEAN
GULF OF MEXICO
90°
85°
80°
75°
70°
65°
60°
55°
50°
40°
35°
30°
25°
20°
LEGEND
Tropical Depression
Tropical Storm
Hurricane
Depression (Dissipation) Stage
Position at 7:00 AM CDT
Position at 7:00 PM CDT
SCALE IN MILES
100 0 100 200 300
HURRICANE CAMILLE 14-22 AUG. 1969
PATH OF HURRICANE CAMILLE
U.S. ARMY ENGINEER DISTRICT, MOBILE
CORPS OF ENGINEERS

Plate I

CORPS OF ENGINEERS

U. S. ARMY



LEGEND

4.64 Pascagoula — Percipitation Location Showing Total Storm Rainfall Depth in Inches

—2"— Estimated Isohyet

SCALE IN MILES 10 0 10 20 30 40

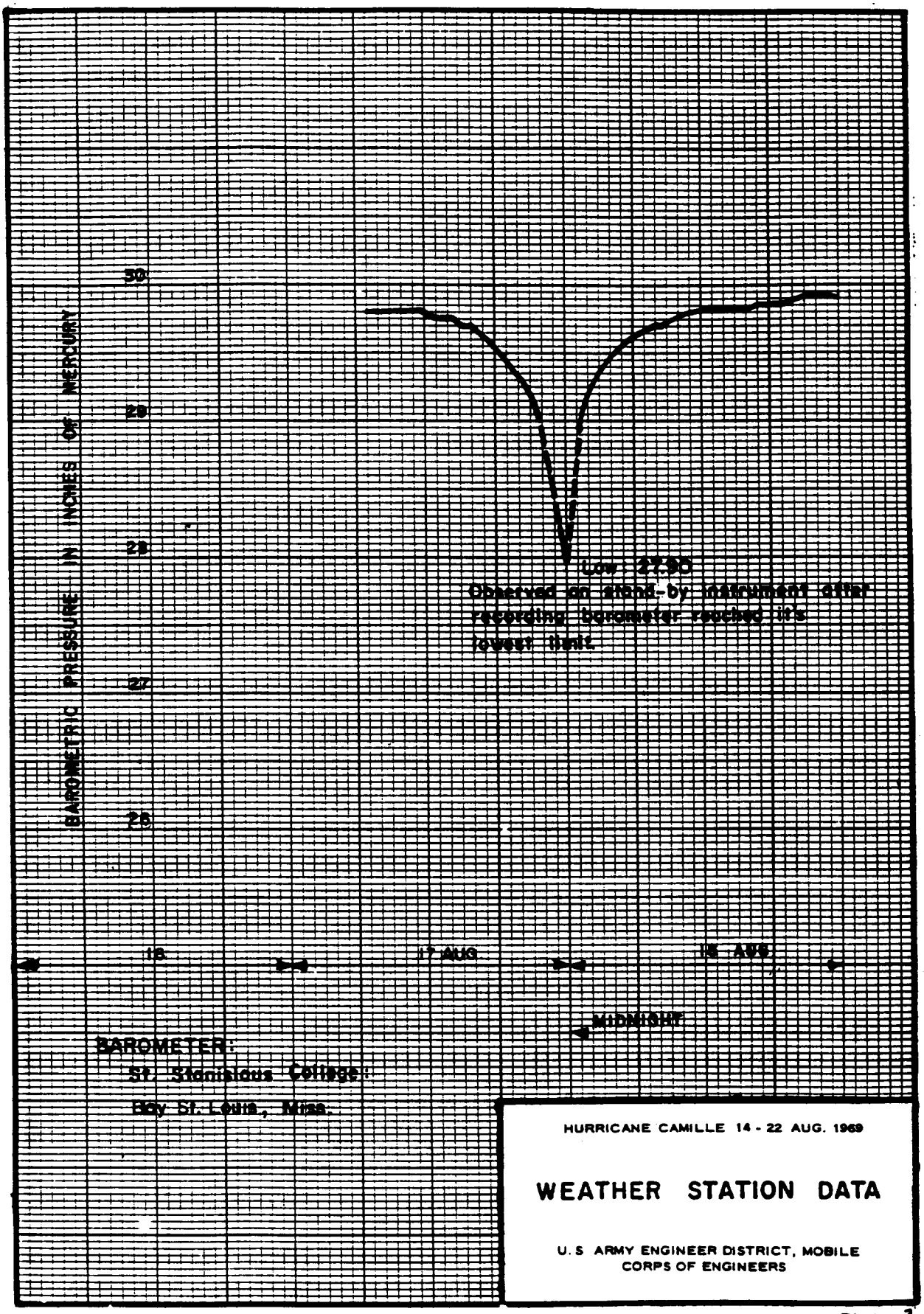
HURRICANE CAMILLE
14-22 AUGUST 969

RAINFALL ASSOCIATED WITH HURRICANE CAMILLE

U. S. ARMY ENGINEER DISTRICT, MOBILE
CORPS OF ENGINEERS
MOBILE ALABAMA

APRIL 1970

Plate 2

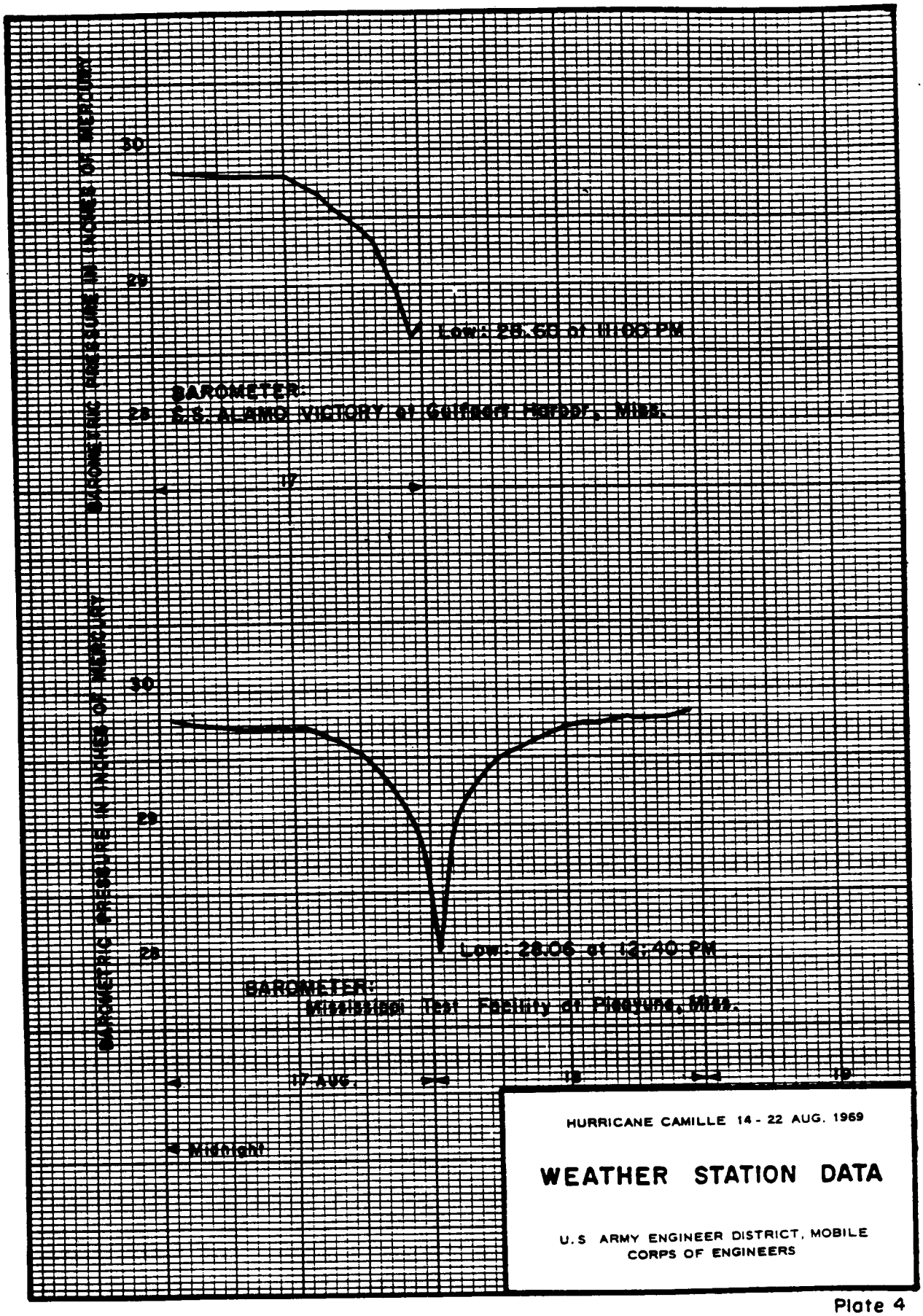


HURRICANE CAMILLE 14 - 22 AUG. 1969

WEATHER STATION DATA

U. S ARMY ENGINEER DISTRICT, MOBILE
CORPS OF ENGINEERS

Plate 3



HURRICANE CAMILLE 14 - 22 AUG. 1969

WEATHER STATION DATA

U.S ARMY ENGINEER DISTRICT, MOBILE
CORPS OF ENGINEERS

Plate 4

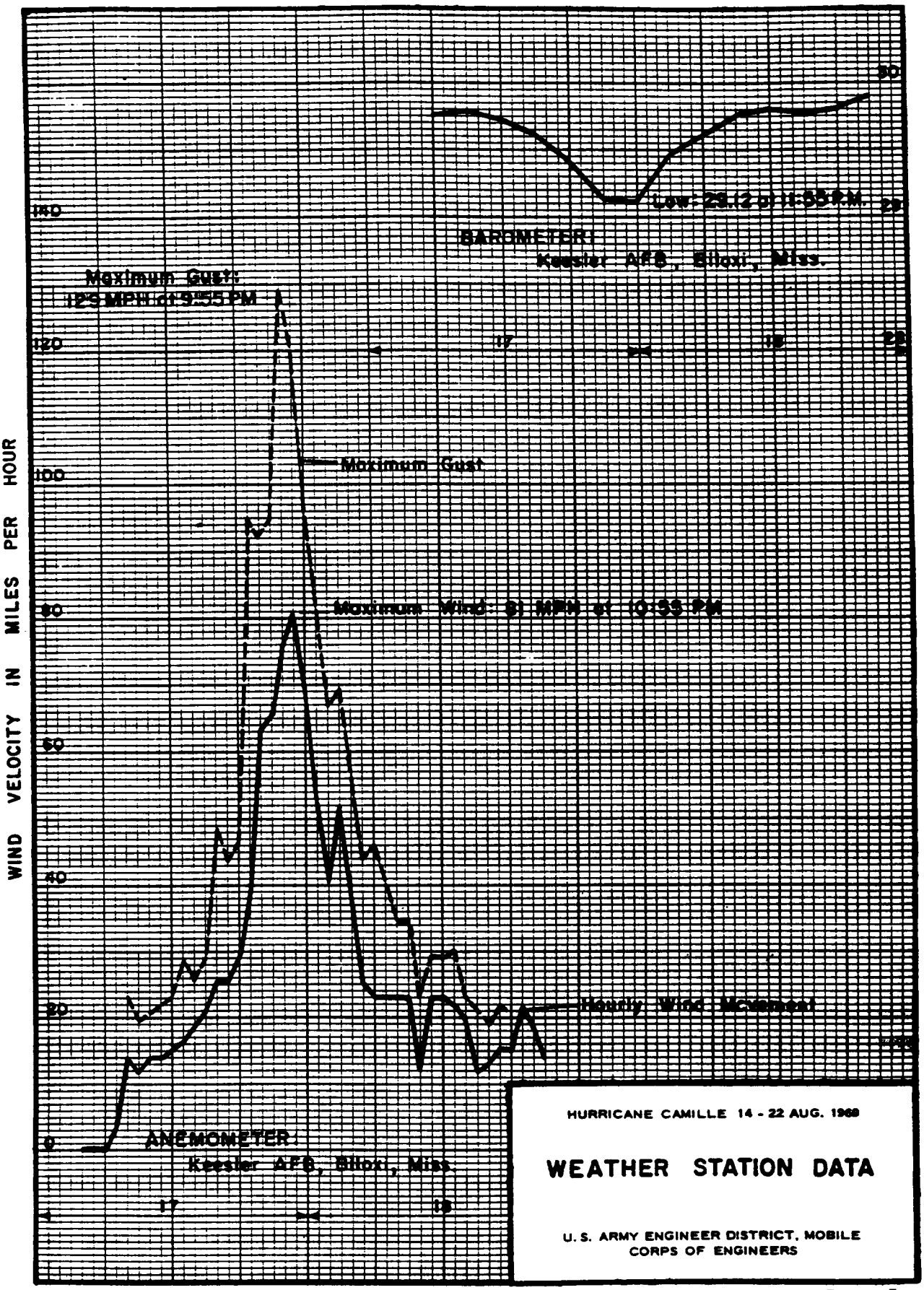

WIND VELOCITY IN MILES PER HOUR
120
100
80
60
40
20
0
Maximum Gust:
125 MPH at 9:55 PM
Maximum Gust
Maximum Wind: 81 MPH at 10:55 PM
Hourly Wind Movement
ANEMOMETER:
Keesler AFB, Biloxi, Miss.
17
18
BAROMETER:
Keesler AFB, Biloxi, Miss.
17
18
30
29
Low: 29.12 at 11:55 P.M.
HURRICANE CAMILLE 14 - 22 AUG. 1969
WEATHER STATION DATA
U. S. ARMY ENGINEER DISTRICT, MOBILE
CORPS OF ENGINEERS

Plate 5

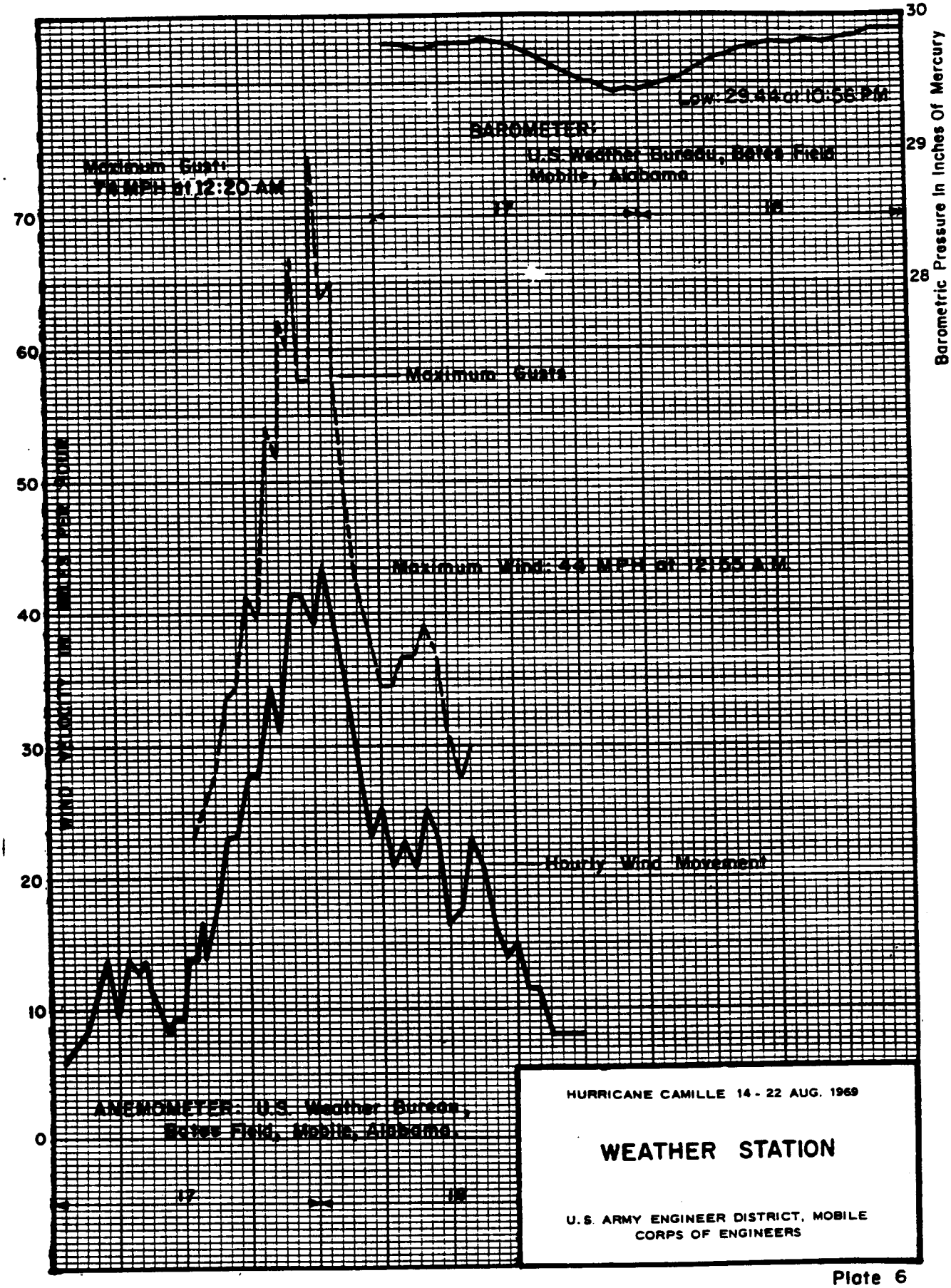
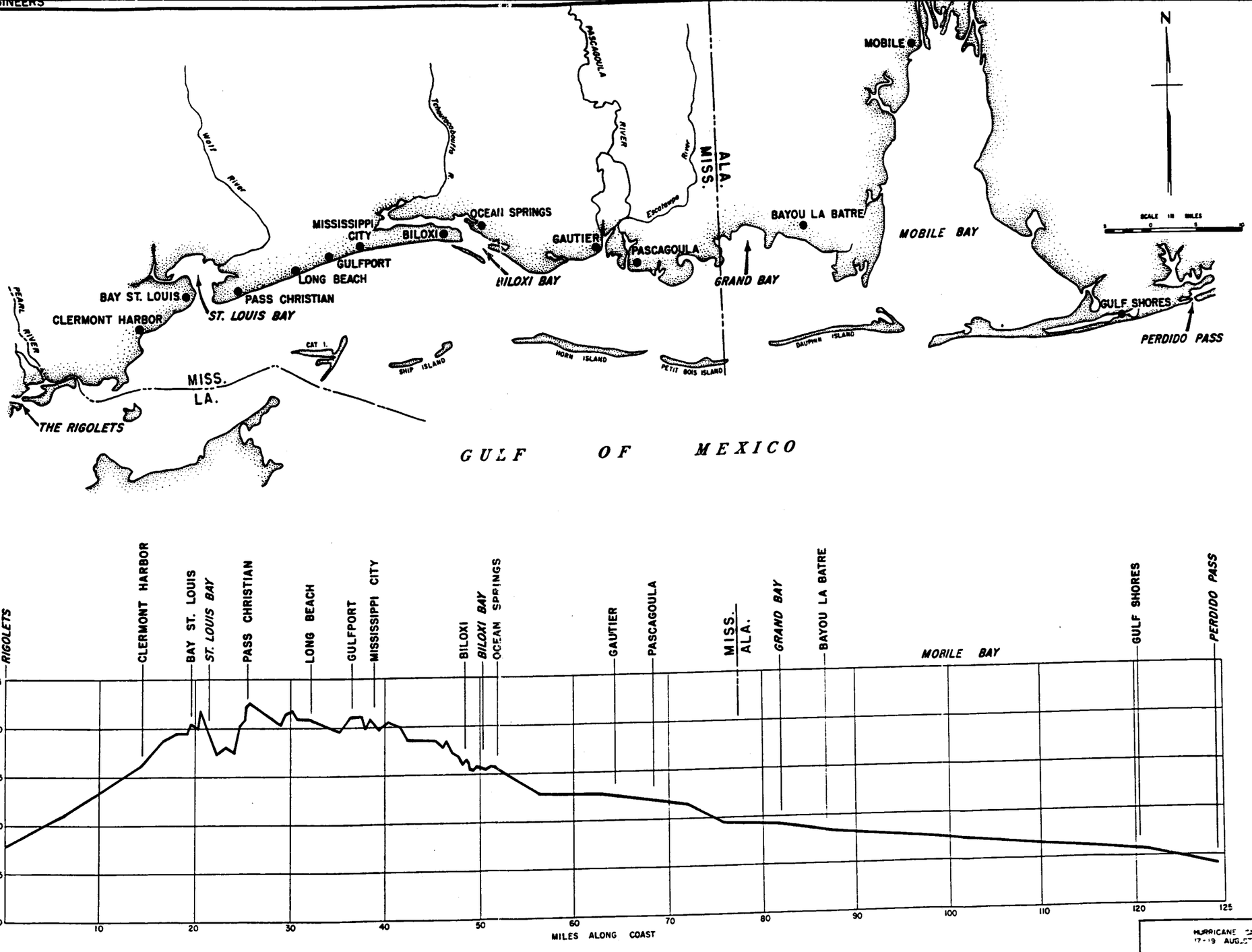

Maximum Gust:
76 MPH at 12:20 AM
BAROMETER:
U.S. Weather Bureau, Bates Field
Mobile, Alabama
Low: 29.44 at 10:55 PM
Maximum Gusts
Maximum Wind: 44 MPH at 12:55 A.M.
Hourly Wind Movement
ANEMOMETER: U.S. Weather Bureau,
Bates Field, Mobile, Alabama.
Barometric Pressure In Inches Of Mercury
30
29
28
70
60
50
40
30
20
10
0
17
18
HURRICANE CAMILLE 14 - 22 AUG. 1969
WEATHER STATION
U.S. ARMY ENGINEER DISTRICT, MOBILE
CORPS OF ENGINEERS

Plate 6

CORPS OF ENGINEERS



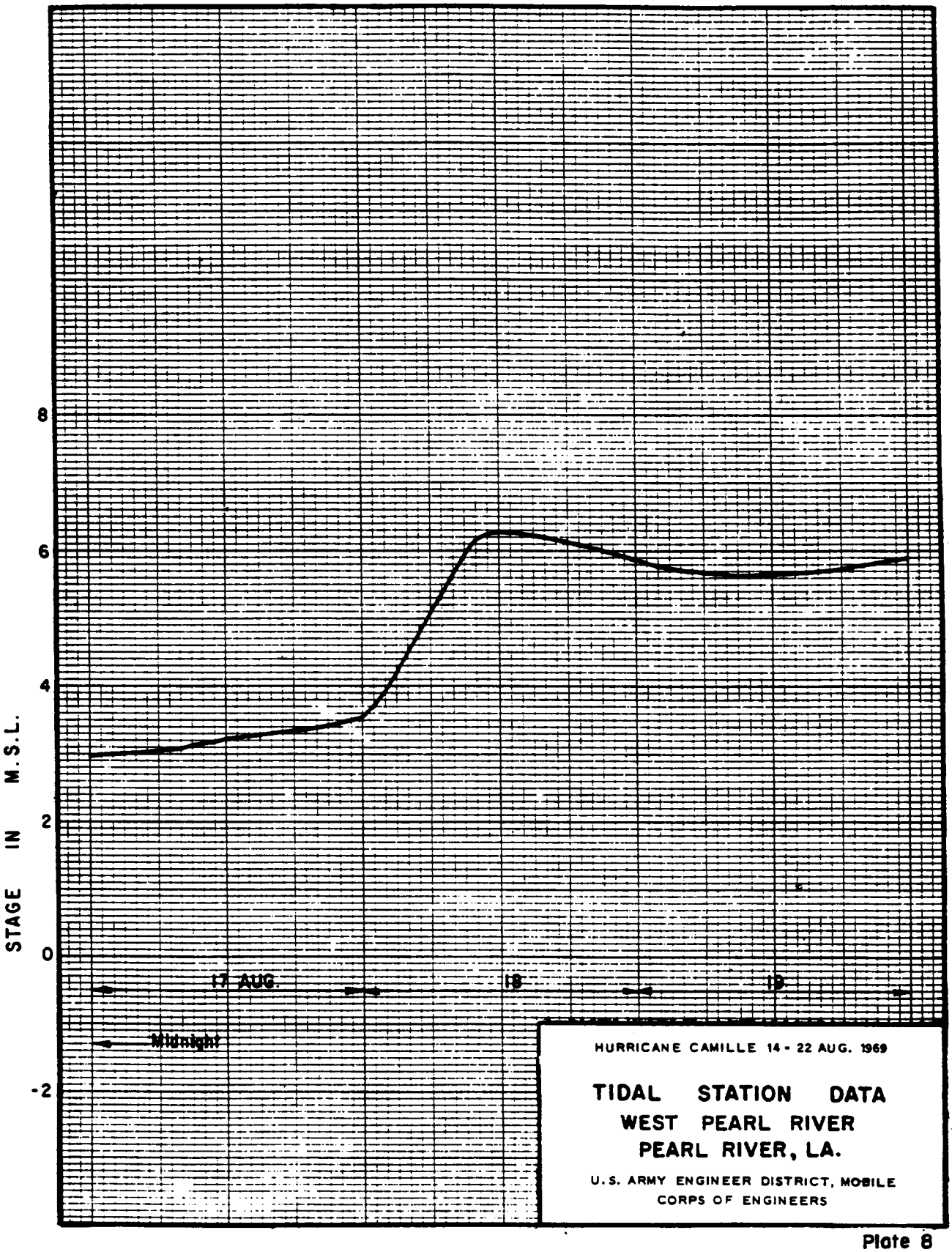
HURRICANE CAMILLE
17-19 AUGUST 1969

HIGH WATER PROFILE

IN SHEETS SHEET NO

U.S. ARMY ENGINEER DISTRICT, MOBILE
MOBILE, ALABAMA 1969

Plate 7

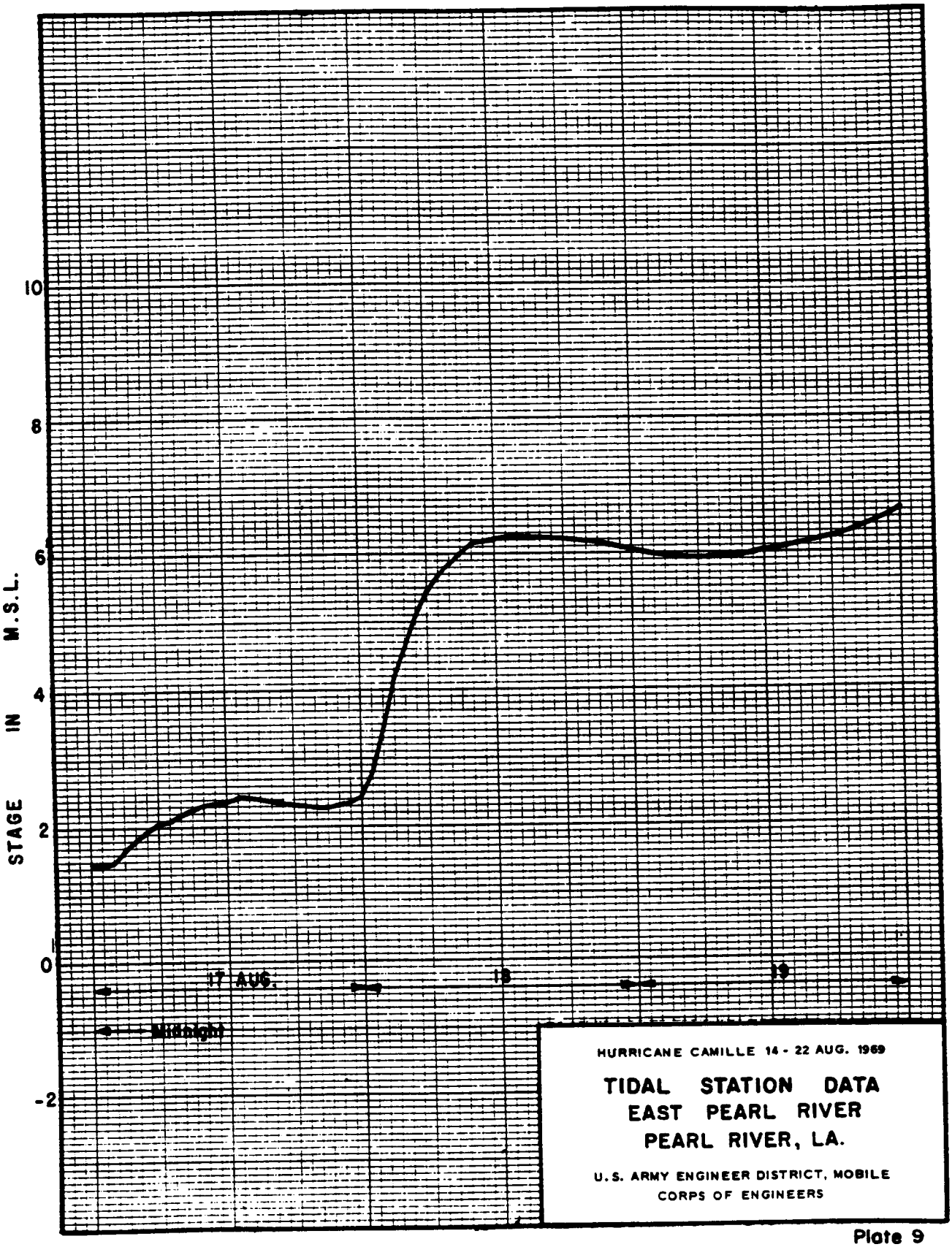


HURRICANE CAMILLE 14 - 22 AUG. 1969

TIDAL STATION DATA
WEST PEARL RIVER
PEARL RIVER, LA.

U.S. ARMY ENGINEER DISTRICT, MOBILE
CORPS OF ENGINEERS

Plate 8

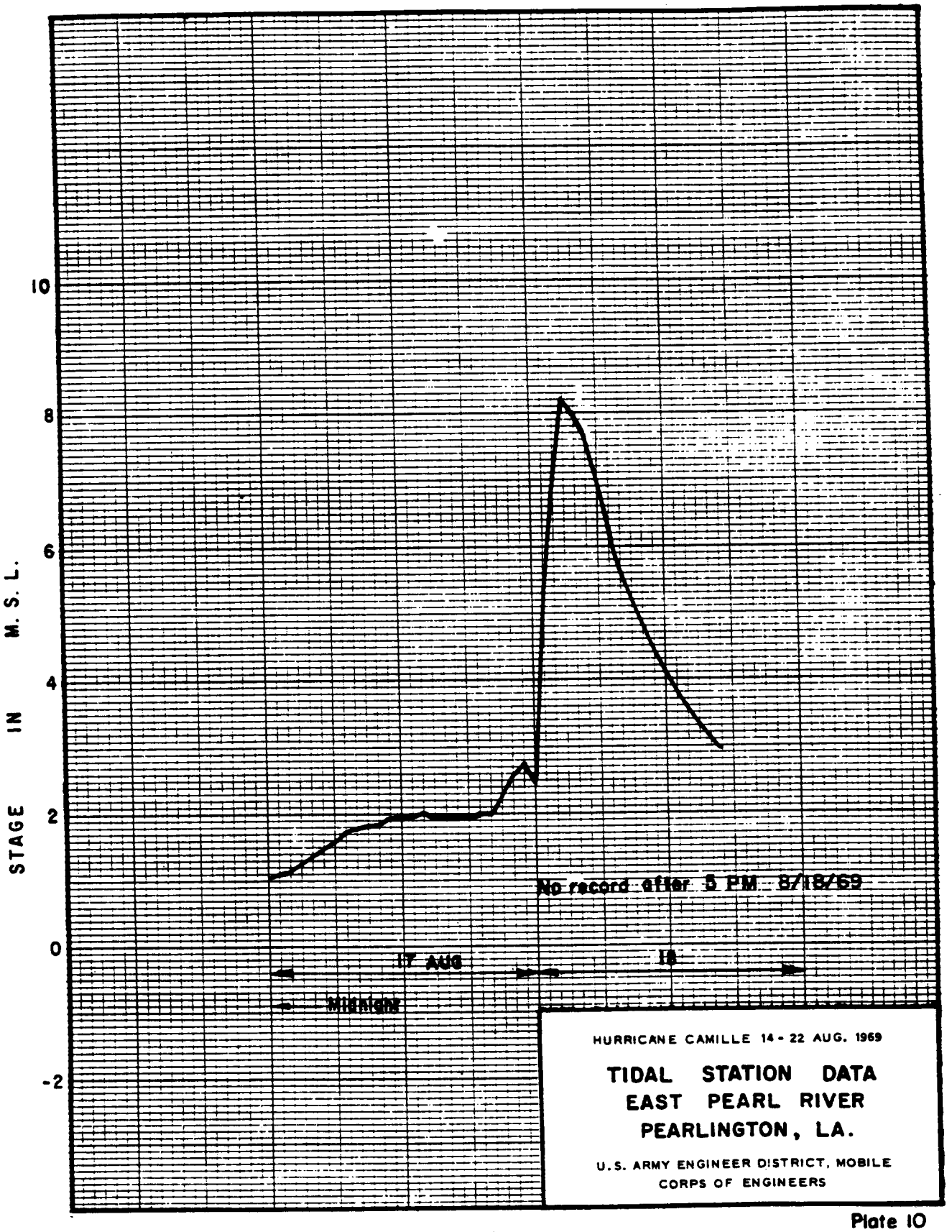


HURRICANE CAMILLE 14 - 22 AUG. 1969

TIDAL STATION DATA
EAST PEARL RIVER
PEARL RIVER, LA.

U.S. ARMY ENGINEER DISTRICT, MOBILE
CORPS OF ENGINEERS

Plate 9

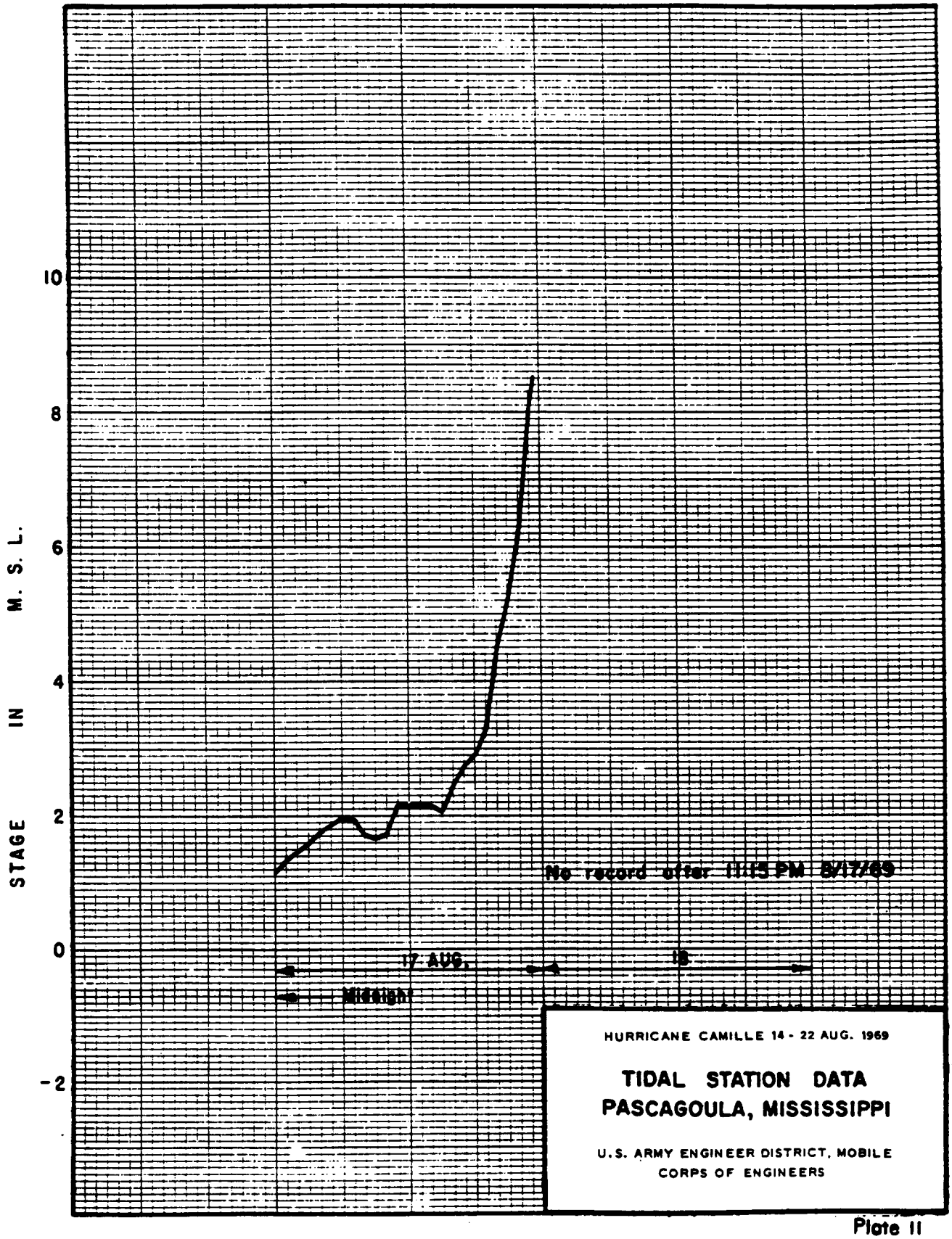


HURRICANE CAMILLE 14 - 22 AUG. 1969

TIDAL STATION DATA
EAST PEARL RIVER
PEARLINGTON, LA.

U.S. ARMY ENGINEER DISTRICT, MOBILE
CORPS OF ENGINEERS

Plate 10

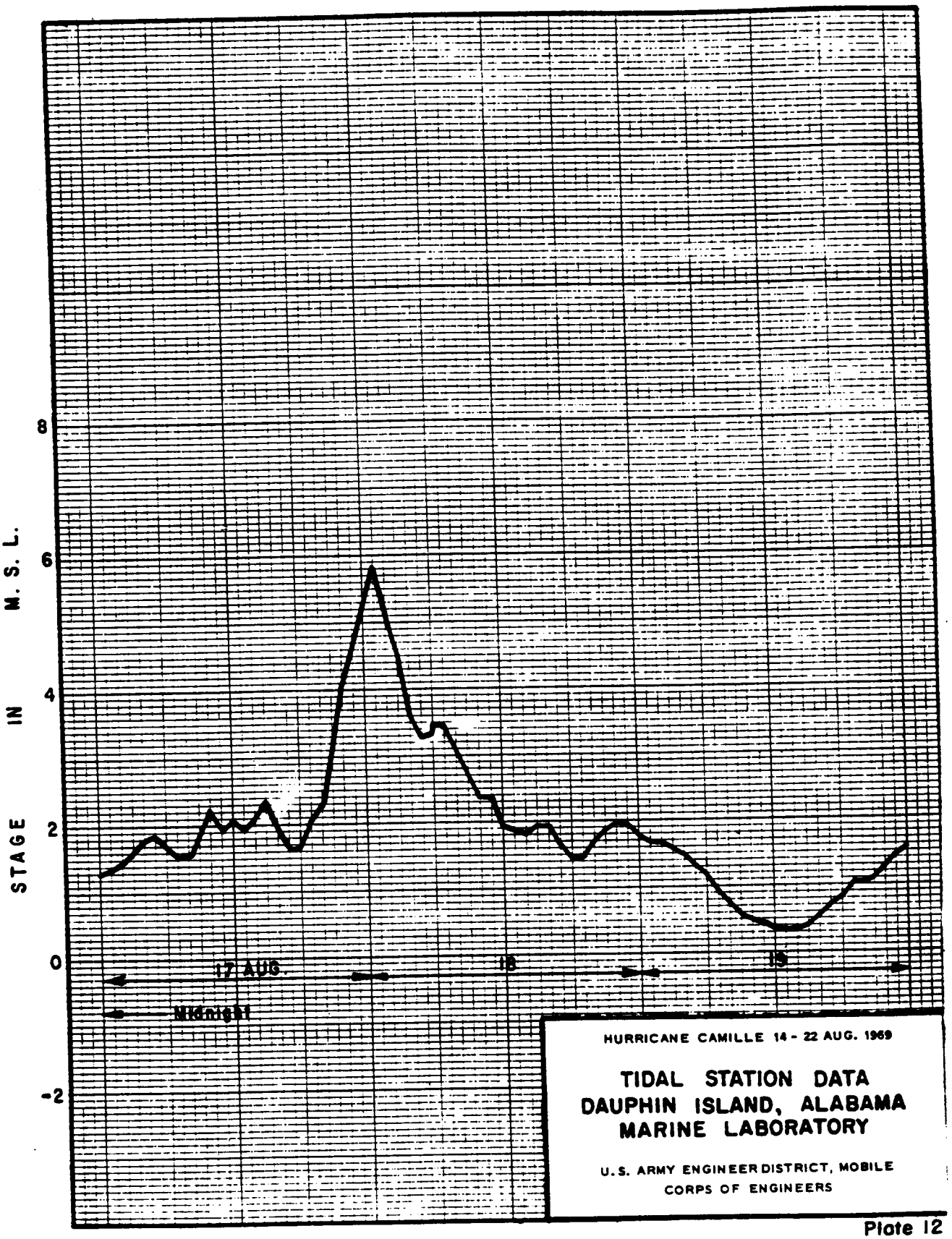


HURRICANE CAMILLE 14 - 22 AUG. 1969

TIDAL STATION DATA
PASCAGOULA, MISSISSIPPI

U.S. ARMY ENGINEER DISTRICT, MOBILE
CORPS OF ENGINEERS

Plate 11

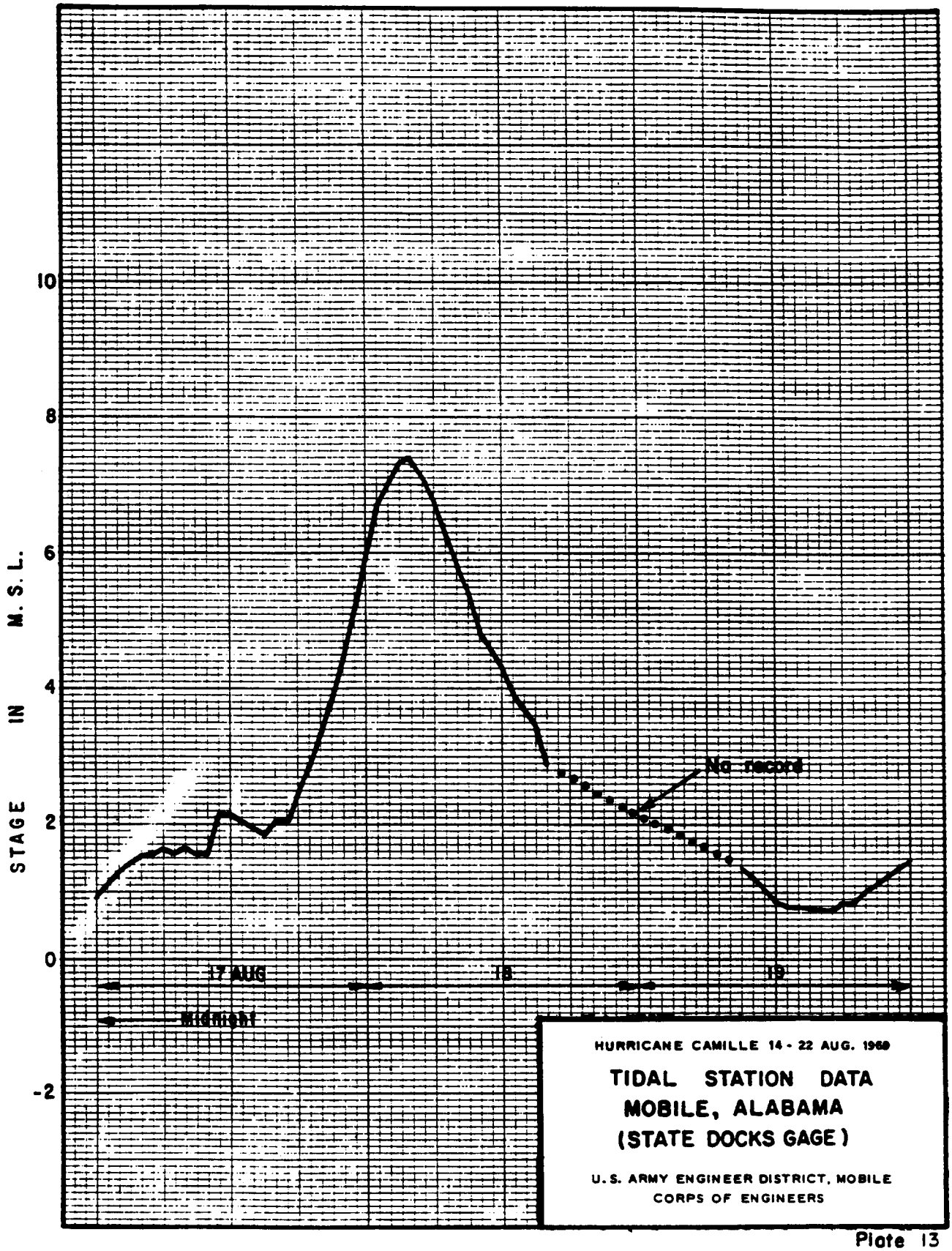


HURRICANE CAMILLE 14 - 22 AUG. 1969

TIDAL STATION DATA
DAUPHIN ISLAND, ALABAMA
MARINE LABORATORY

U.S. ARMY ENGINEER DISTRICT, MOBILE
CORPS OF ENGINEERS

Plate 12

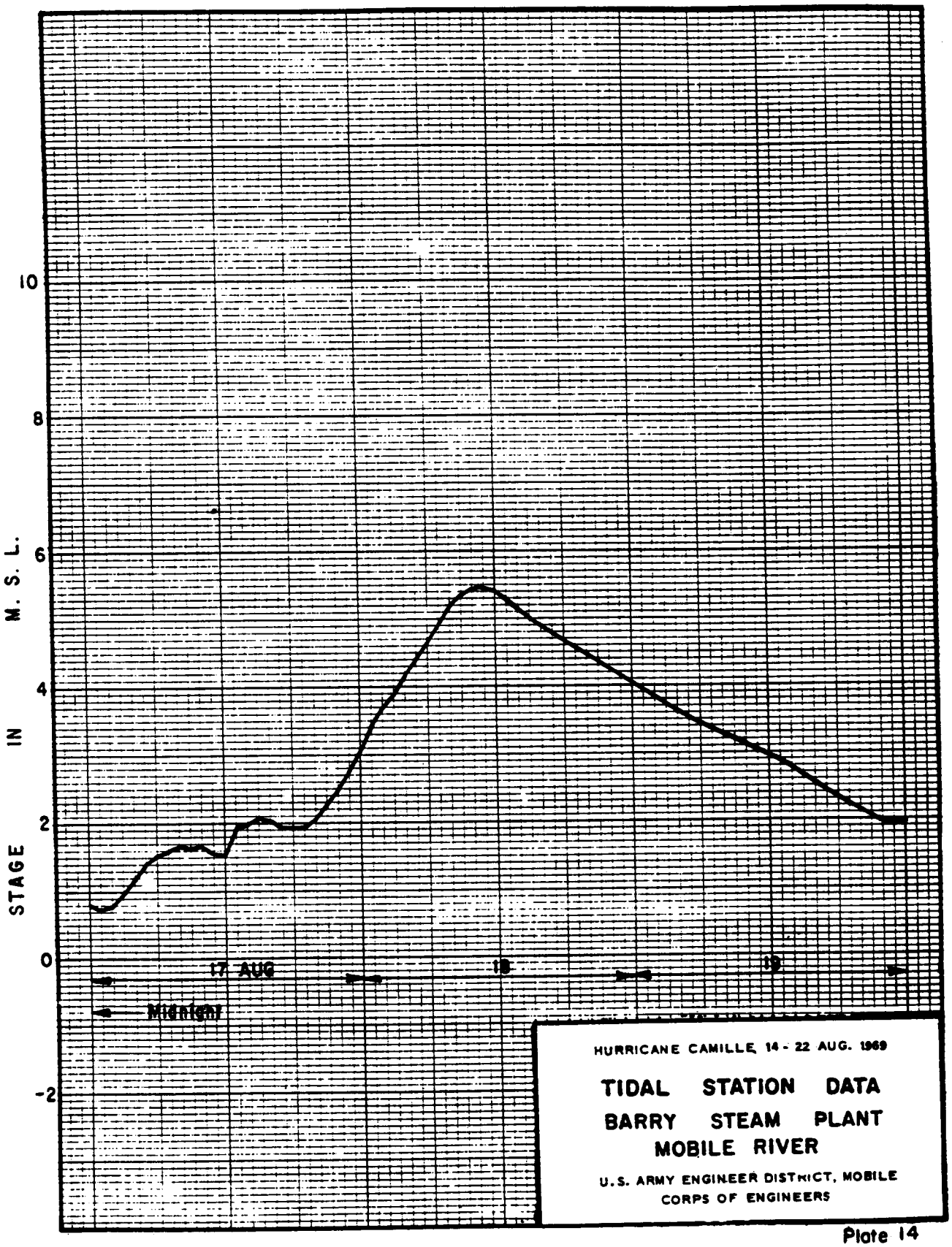


HURRICANE CAMILLE 14 - 22 AUG. 1969

TIDAL STATION DATA
MOBILE, ALABAMA
(STATE DOCKS GAGE)

U. S. ARMY ENGINEER DISTRICT, MOBILE
CORPS OF ENGINEERS

Plate 13

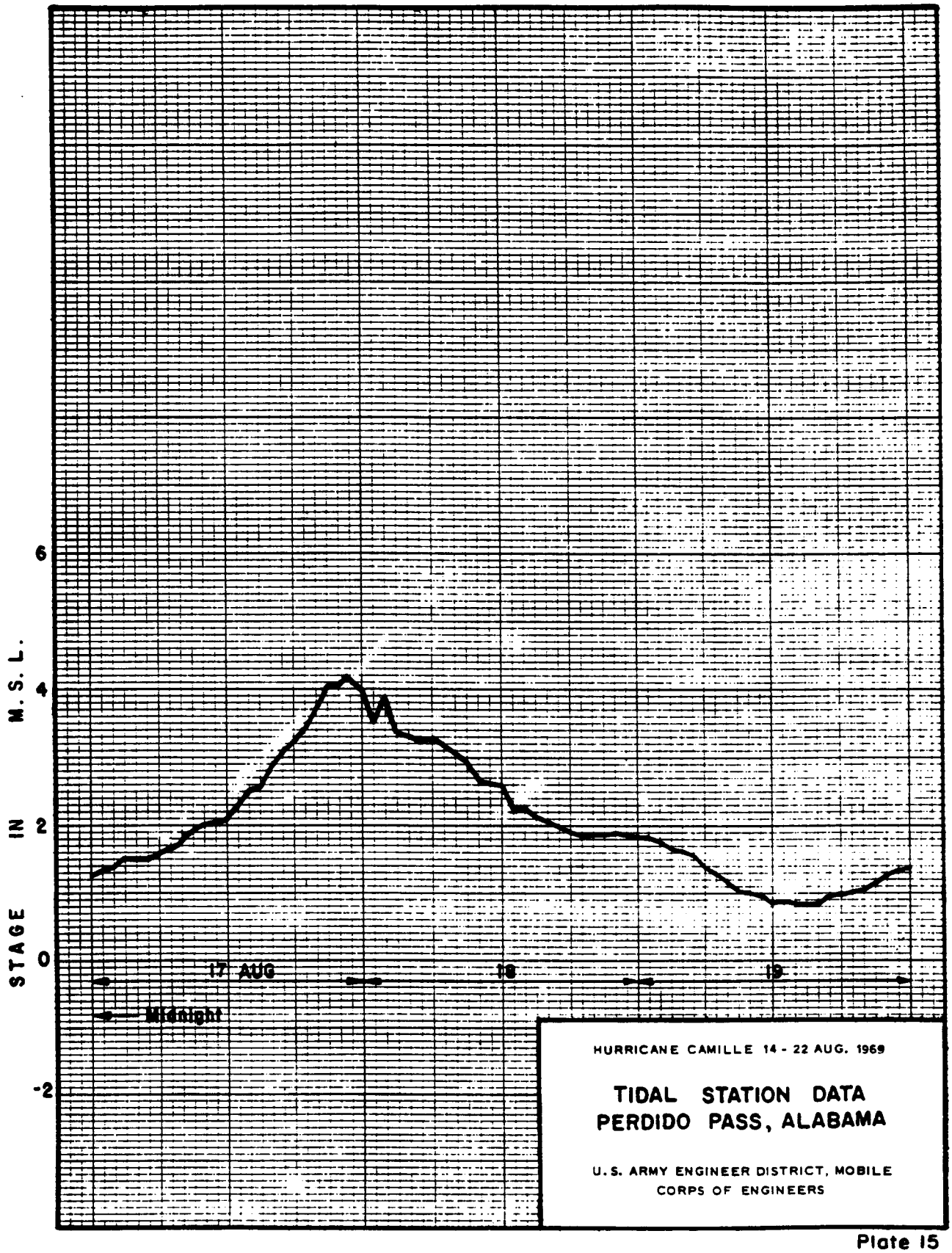


HURRICANE CAMILLE, 14 - 22 AUG. 1969

TIDAL STATION DATA
BARRY STEAM PLANT
MOBILE RIVER

U.S. ARMY ENGINEER DISTRICT, MOBILE
CORPS OF ENGINEERS

Plate 14

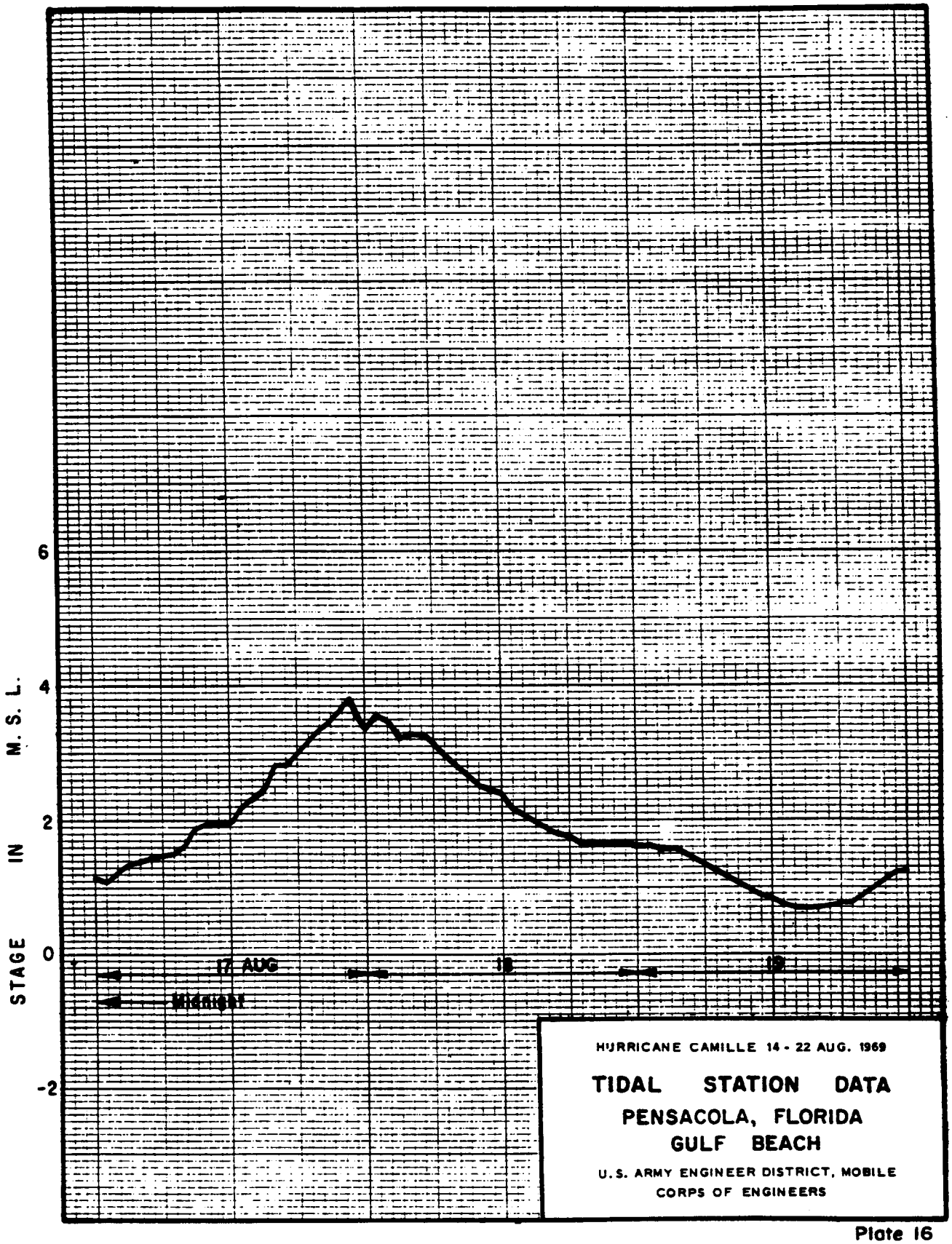


HURRICANE CAMILLE 14 - 22 AUG. 1969

TIDAL STATION DATA
PERDIDO PASS, ALABAMA

U.S. ARMY ENGINEER DISTRICT, MOBILE
CORPS OF ENGINEERS

Plate 15



HURRICANE CAMILLE 14 - 22 AUG. 1969

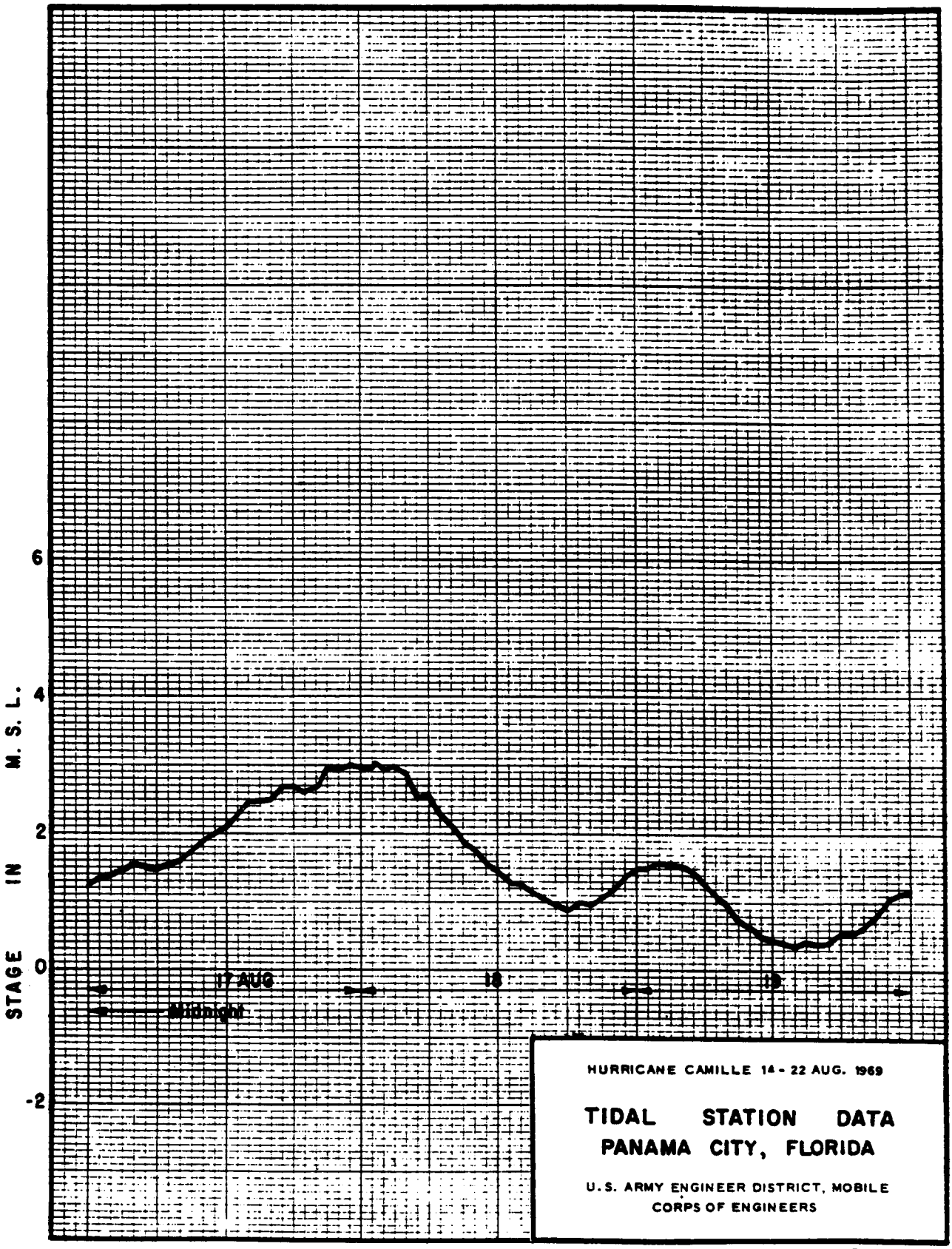
TIDAL STATION DATA

PENSACOLA, FLORIDA

GULF BEACH

U.S. ARMY ENGINEER DISTRICT, MOBILE
CORPS OF ENGINEERS

Plate 16



HURRICANE CAMILLE 14 - 22 AUG. 1969

TIDAL STATION DATA
PANAMA CITY, FLORIDA

U. S. ARMY ENGINEER DISTRICT, MOBILE
CORPS OF ENGINEERS

Plate 17

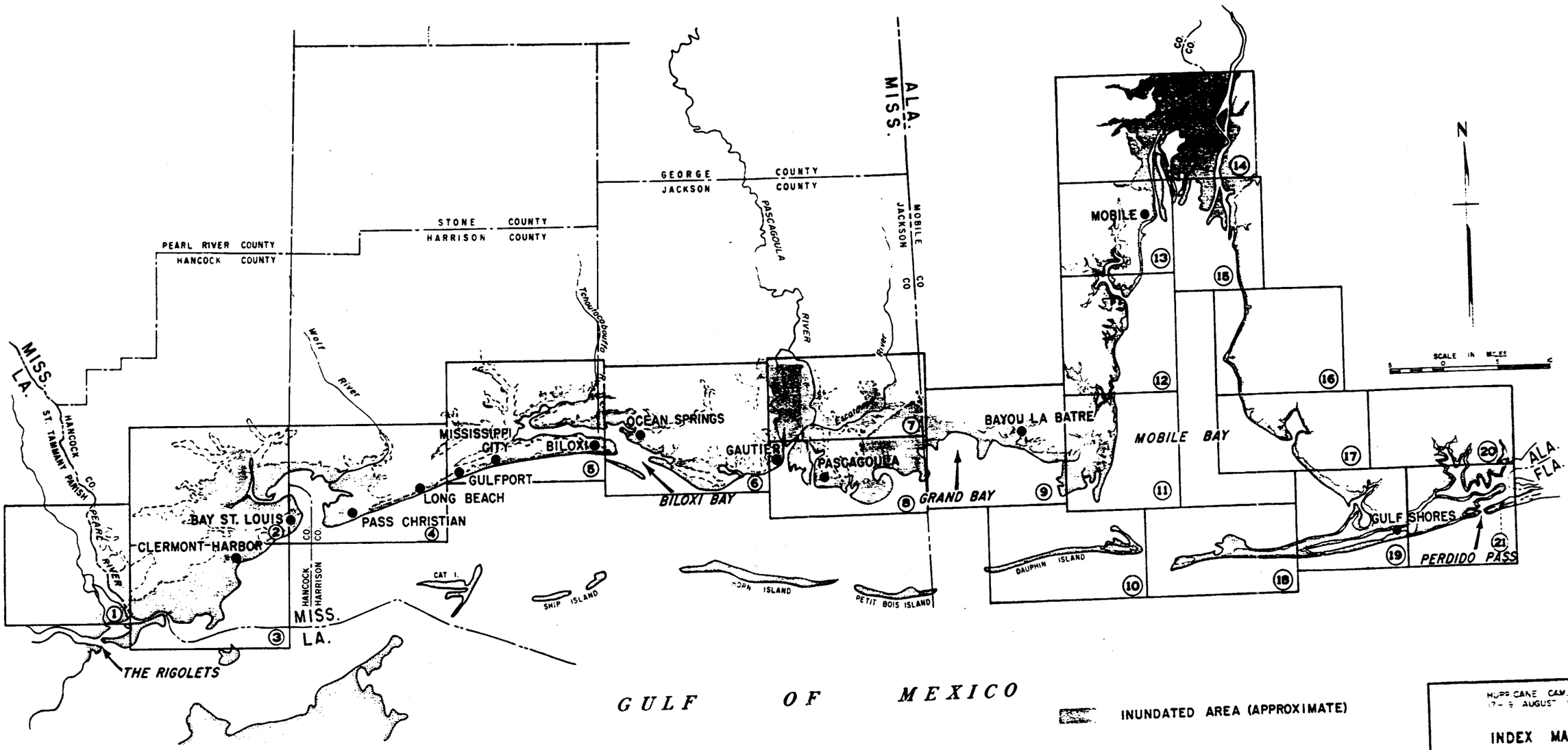
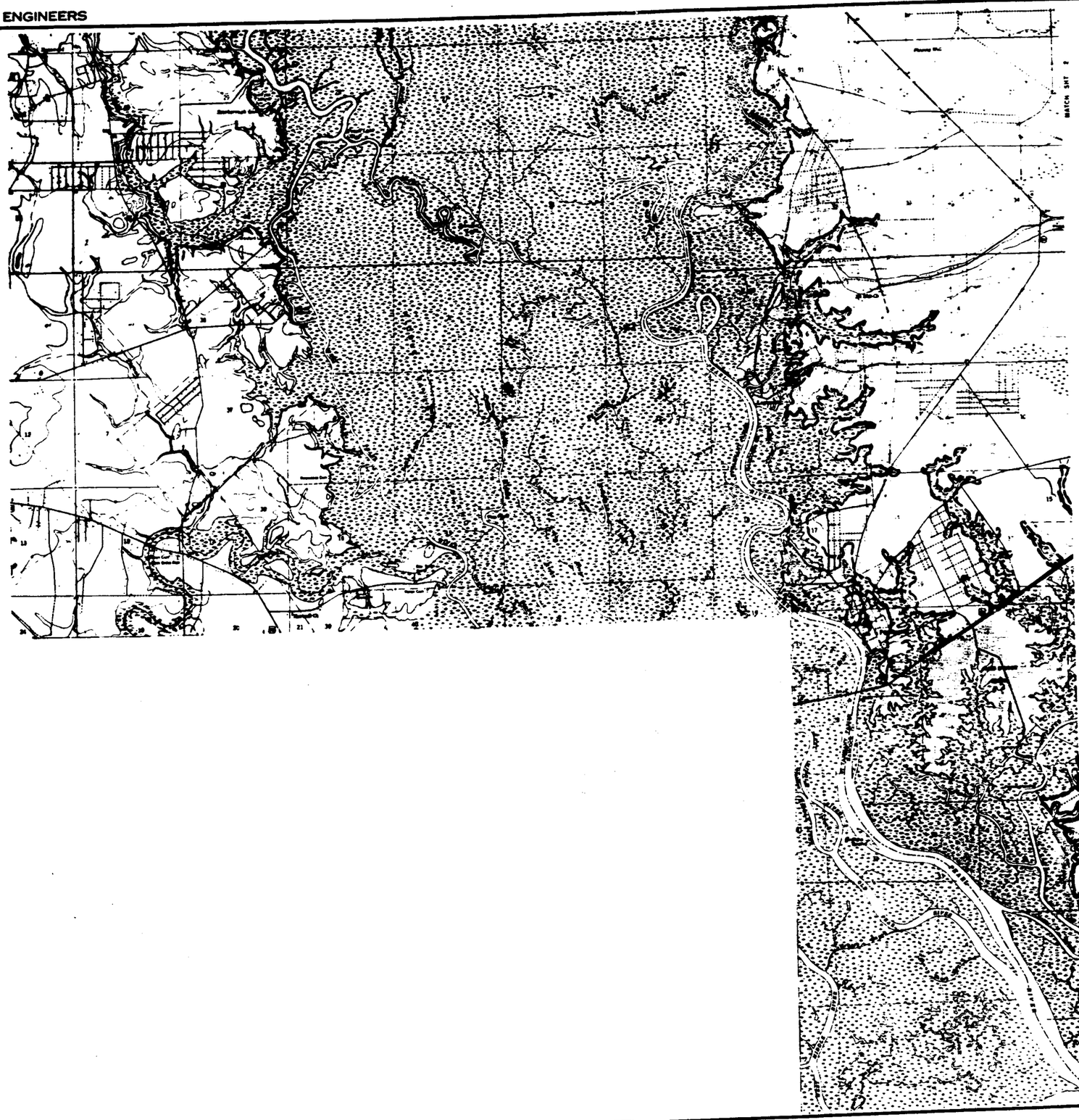

PEARL RIVER COUNTY
HANCOCK COUNTY
STONE COUNTY
HARRISON COUNTY
GEORGE COUNTY
JACKSON COUNTY
MOBILE CO
JACKSON CO
ALA.
MISS.
MISS.
LA.
ST. TAMMANY PARISH
HANCOCK CO
PEARL RIVER
HANCOCK CO
HARRISON CO
MISS.
LA.
Wolf River
Tchoutacabouffa River
PASCAGOULA RIVER
Escatawpa River
MISSISSIPPI CITY
BILOXI
OCEAN SPRINGS
GAUTIER
PASCAGOULA
BAYOU LA BATRE
MOBILE BAY
GULFPORT
LONG BEACH
PASS CHRISTIAN
BAY ST. LOUIS
CLERMONT HARBOR
BILOXI BAY
GRAND BAY
DAUPHIN ISLAND
GULF SHORES
PERDIDO PASS
ALA.
FLA.
CAT I.
SHIP ISLAND
HORN ISLAND
PETIT BOIS ISLAND
THE RIGOLETS
MOBILE
GULF OF MEXICO
INUNDATED AREA (APPROXIMATE)
N
SCALE IN MILES
HURRICANE CAMILLE
17-18 AUGUST 1969
INDEX MAP
U.S. ARMY ENGINEER DISTRICT MOBILE
MOBILE, ALABAMA 1970

PLATE 18

CORPS OF ENGINEERS



-N-

SCALE IN FEET

INUNDATED AREA (APPROXIMATE)

HURRICANE CAMILLE
17 - 19 AUGUST 1969

DETAIL OF INUNDATED AREA
MISSISSIPPI COAST

IN 21 SHEETS SHEET NO.

U S ARMY ENGINEER DISTRICT MOBILE
MOBILE, ALABAMA 1969

PLATE 19

U. S. ARMY

CORPS OF ENGINEERS

HURRICANE CAMILLE
17 - 19 AUGUST 1969

DETAIL OF INUNDATED AREA
MISSISSIPPI COAST

IN 21 SHEETS SHEET NO 8
U. S ARMY ENGINEER DISTRICT, MOBILE
MOBILE, ALABAMA 1969

INUNDATED AREA (APPROXIMATE)

N

SCALE IN FEET

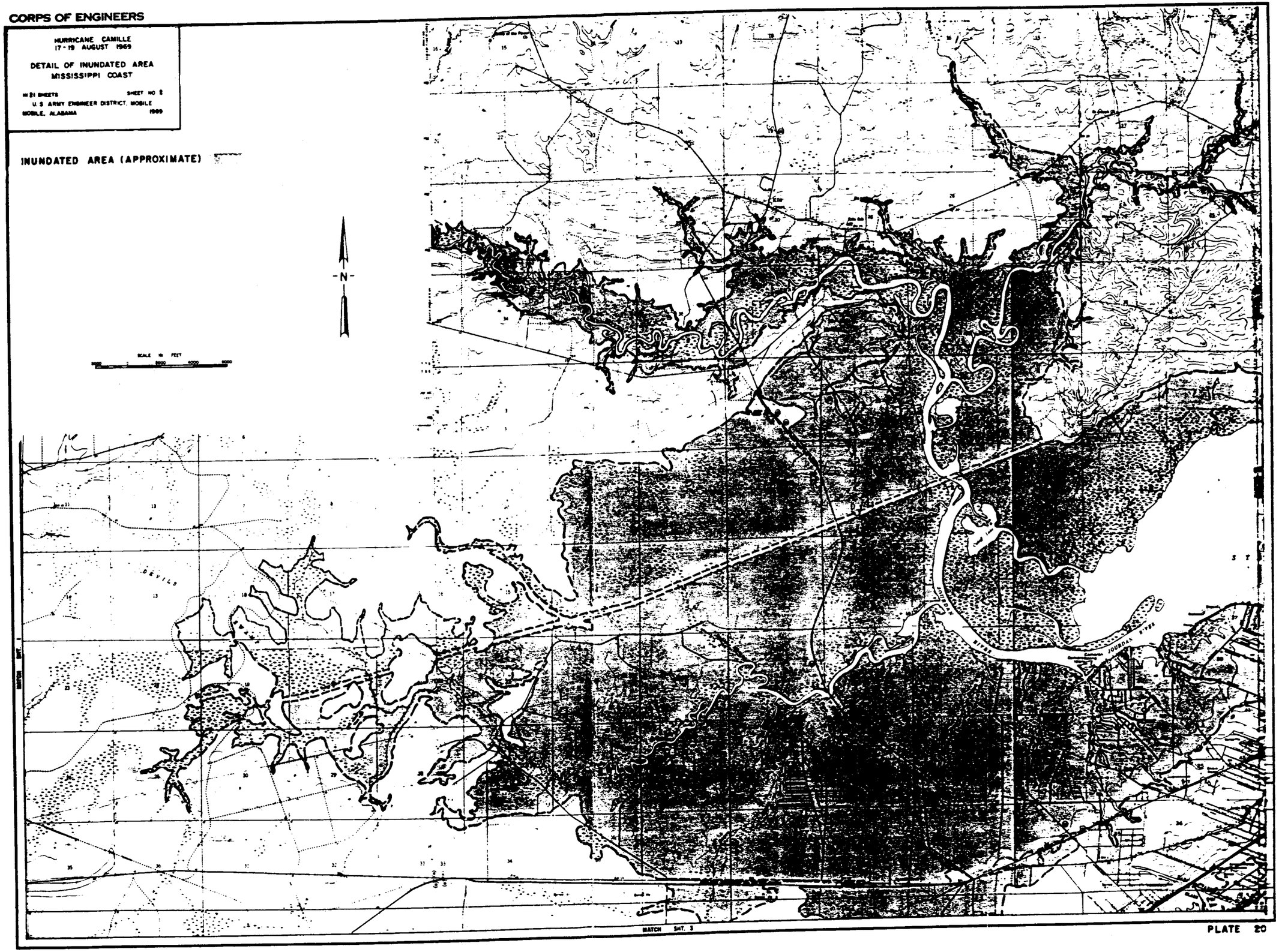
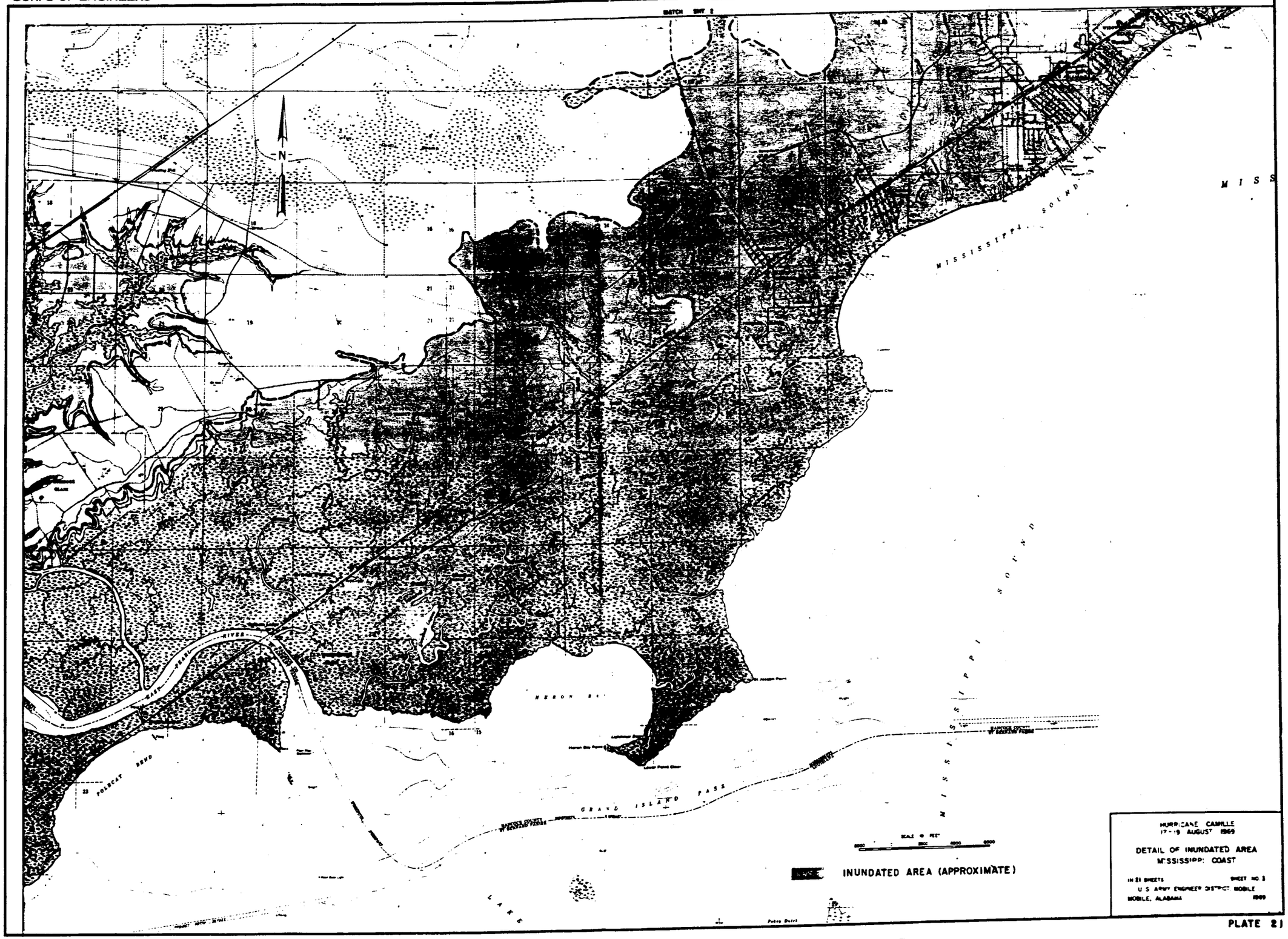


PLATE 20

CORPS OF ENGINEERS

U. S. ARMY



HURRICANE CAMILLE
17 - 19 AUGUST 1969

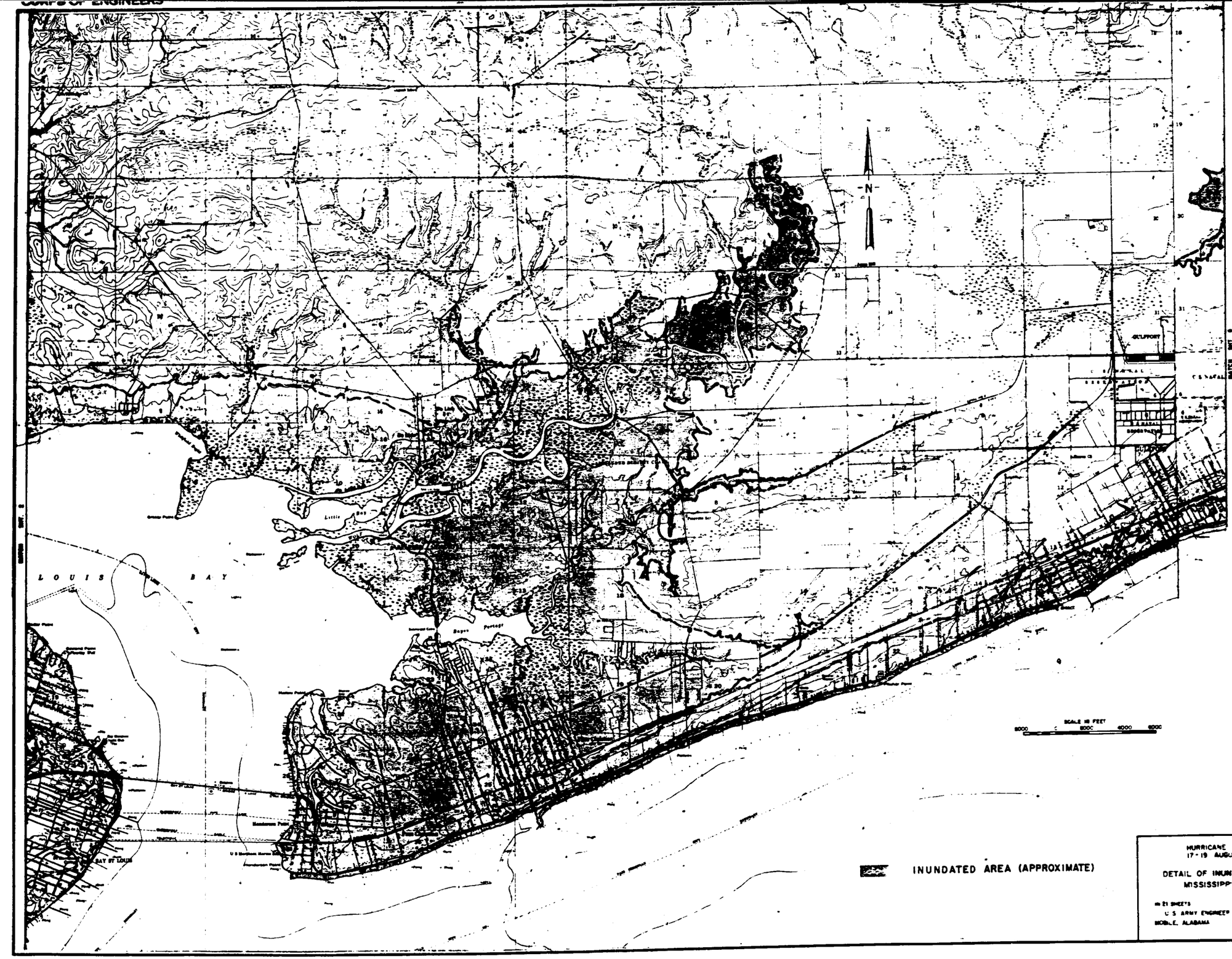
DETAIL OF INUNDATED AREA
MISSISSIPPI COAST

IN 21 SHEETS SHEET NO. 2

U. S. ARMY ENGINEER DISTRICT, MOBILE
MOBILE, ALABAMA 1969

PLATE 21

CORPS OF ENGINEERS



INUNDATED AREA (APPROXIMATE)

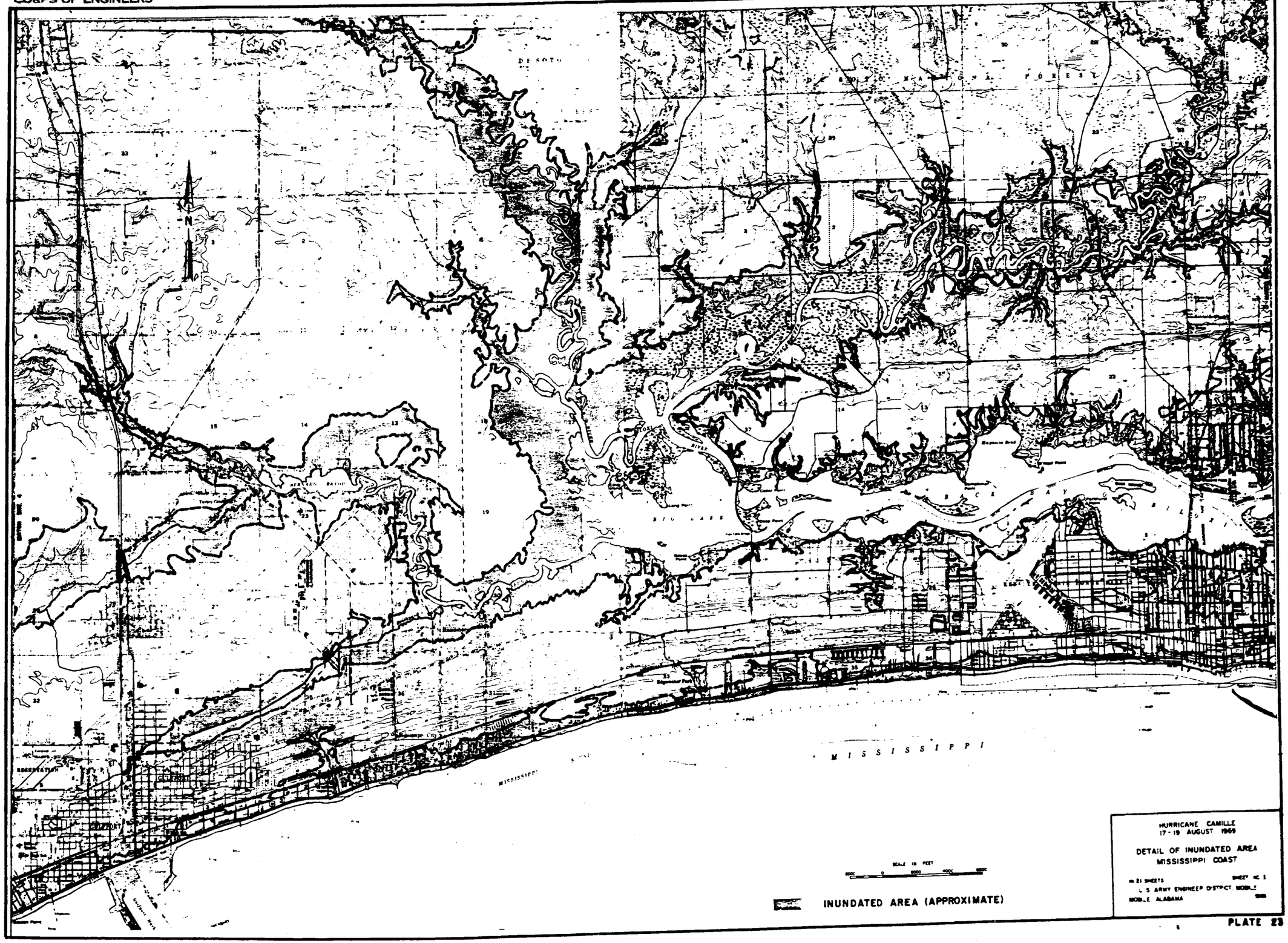
HURRICANE CAMILLE
17-19 AUGUST 1969

DETAIL OF INUNDATED AREA
MISSISSIPPI COAST

SHEET NO. 4
IN 21 SHEETS
U.S. ARMY ENGINEER DISTRICT, MOBILE
MOBILE, ALABAMA

PLATE 22

CORPS OF ENGINEERS

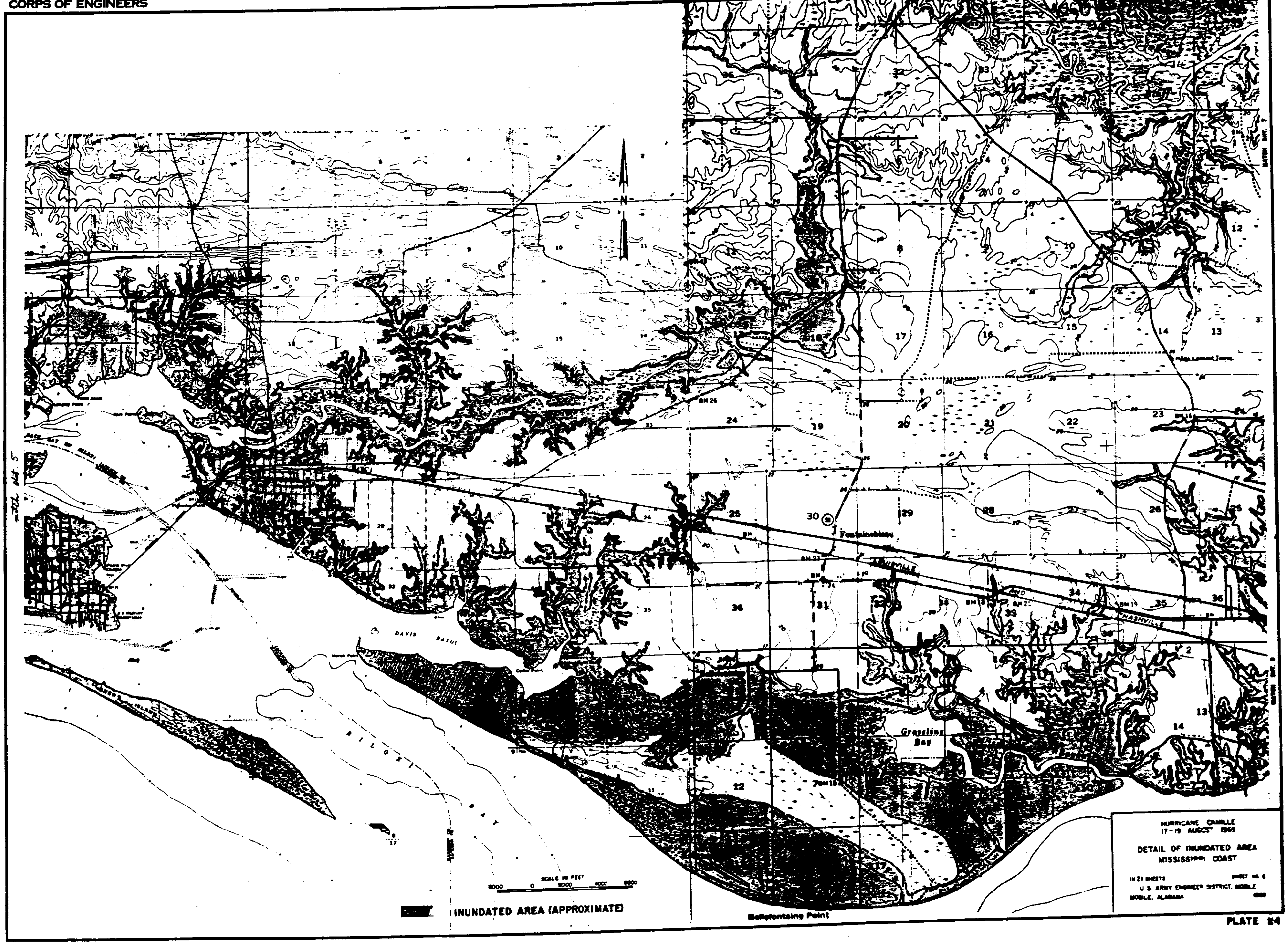


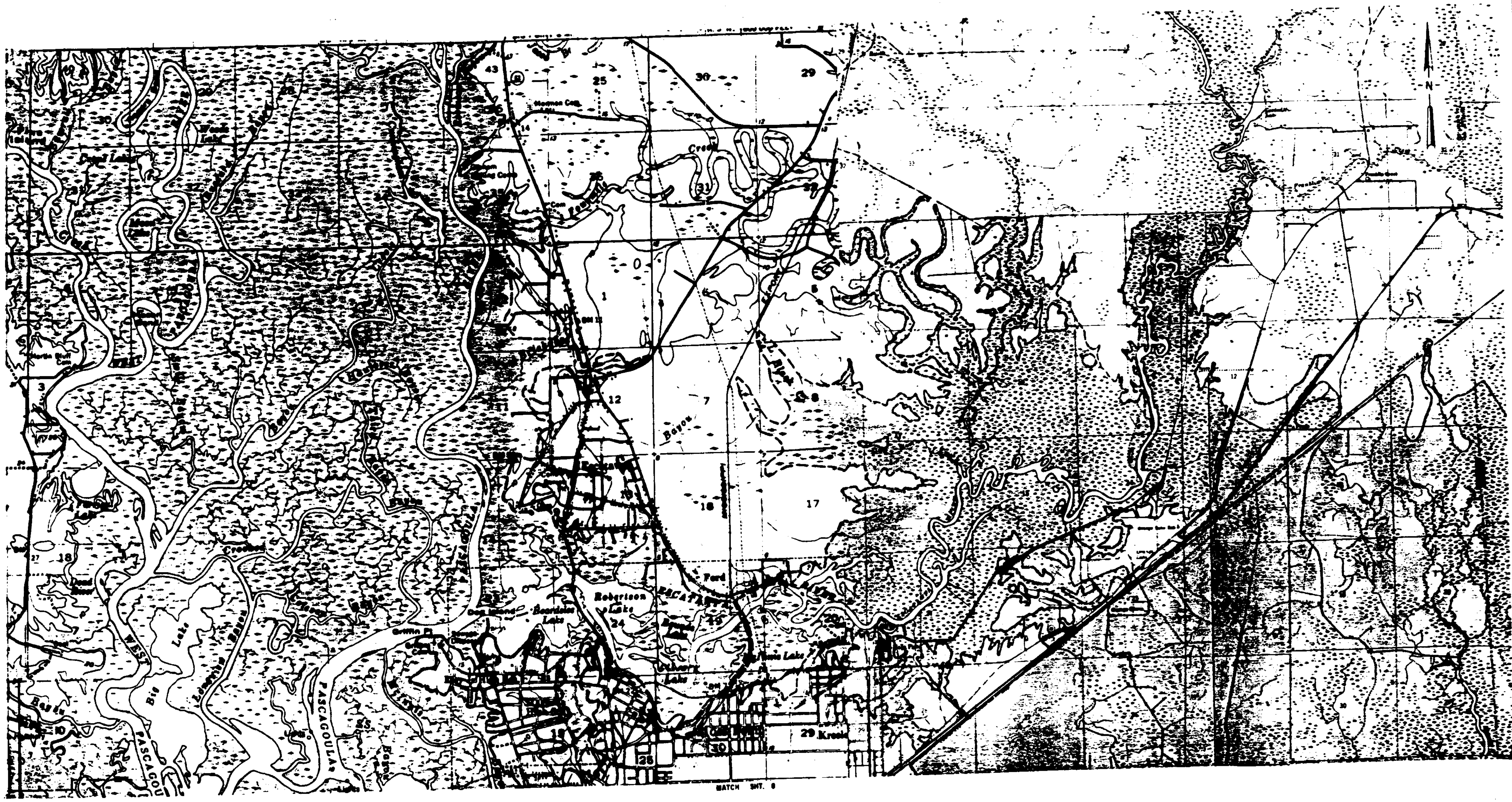
HURRICANE CAMILLE
17 - 19 AUGUST 1969

DETAIL OF INUNDATED AREA
MISSISSIPPI COAST

in 21 SHEETS SHEET NO. 5
U. S. ARMY ENGINEER DISTRICT, MOBILE
MOBILE, ALABAMA

PLATE 23


N
DAVIS BAYOU
BILOXI BAY
Fontainebleau
NASHVILLE
Graveline Bay
Bellefontaine Point
SCALE IN FEET
2000 0 2000 4000 6000
INUNDATED AREA (APPROXIMATE)
HURRICANE CAMILLE
17 - 19 AUGUST 1969
DETAIL OF INUNDATED AREA
MISSISSIPPI COAST
IN 21 SHEETS
U. S. ARMY ENGINEER DISTRICT, MOBILE
MOBILE, ALABAMA

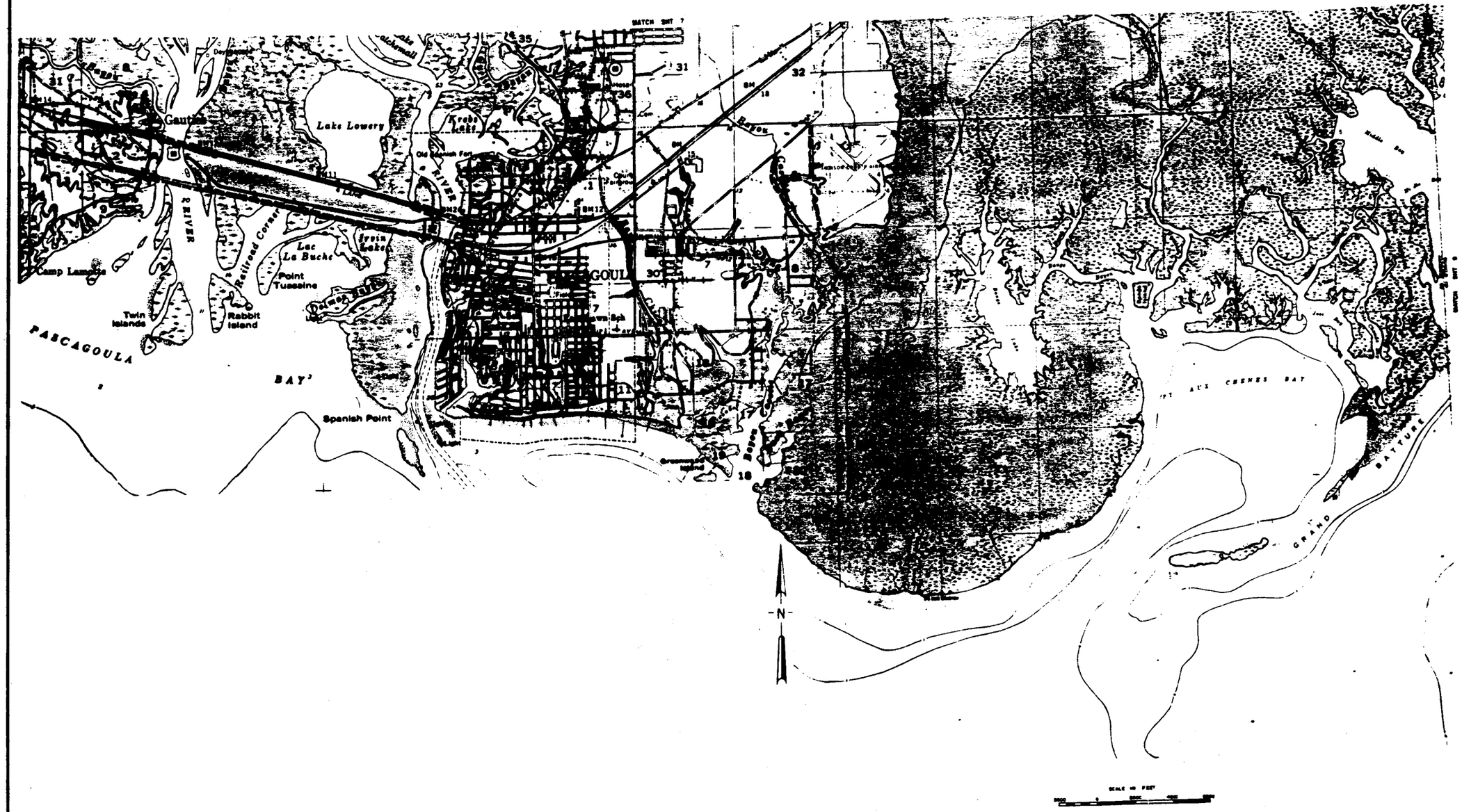


INUNDATED AREA (APPROXIMATE)

HURRICANE CAMILLE
17 - 19 AUGUST 1969

DETAIL OF INUNDATED AREA
MISS. - ALA. COAST

IN 21 SHEETS SHEET NO. 7
U S ARMY ENGINEER DISTRICT MOBILE
MOBILE, ALABAMA 1969



INUNDATED AREA (APPROXIMATE)

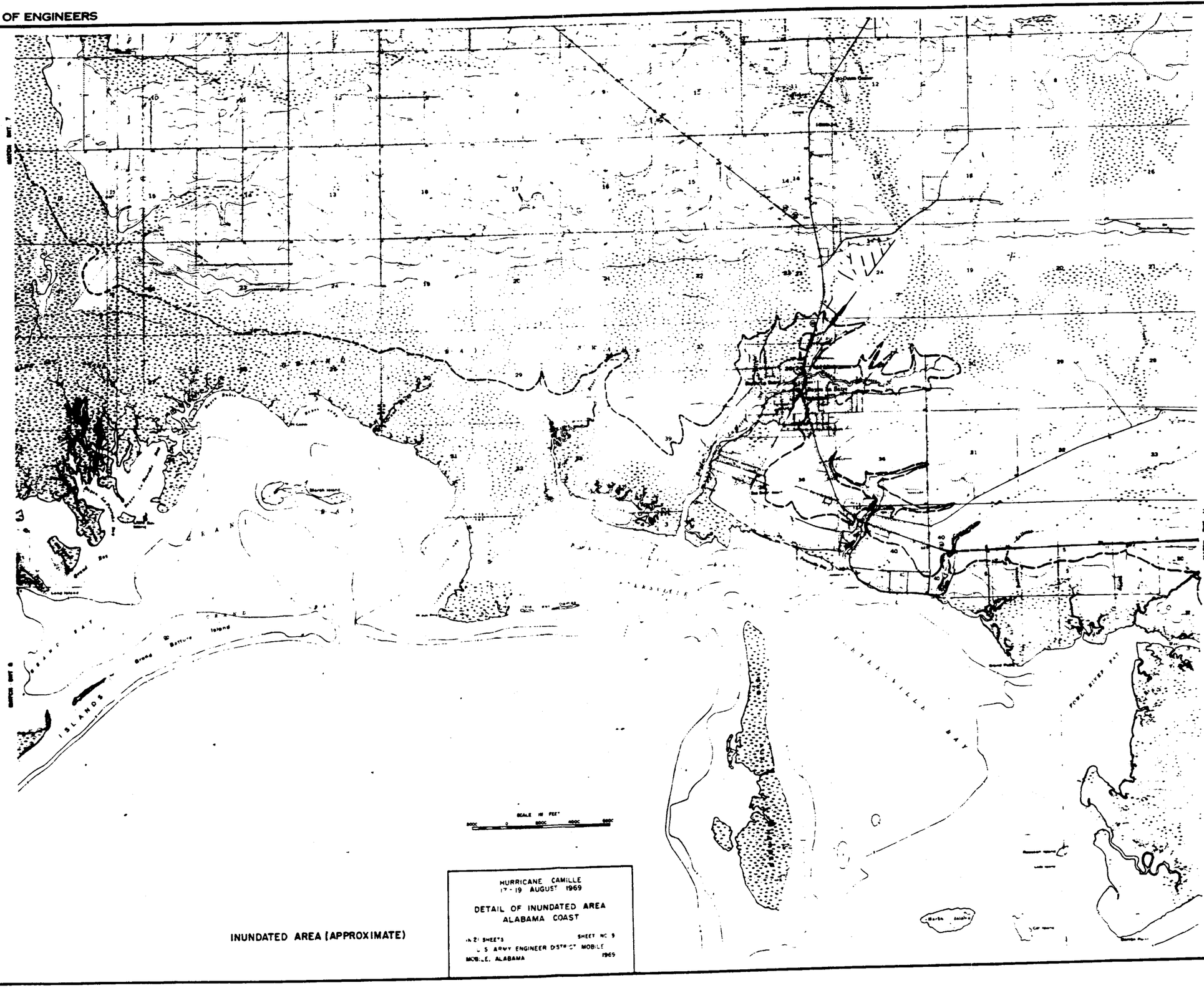
HURRICANE CAMILLE
17 - 19 AUGUST 1969

DETAIL OF INUNDATED AREA
MISSISSIPPI COAST

SHEET NO. 5
U. S. ARMY ENGINEER DISTRICT MOBILE
MOBILE, ALABAMA

PLATE 26

CORPS OF ENGINEERS



INUNDATED AREA (APPROXIMATE)

HURRICANE CAMILLE
17 - 19 AUGUST 1969

DETAIL OF INUNDATED AREA
ALABAMA COAST

IN 21 SHEETS SHEET NO. 9
U. S. ARMY ENGINEER DISTRICT MOBILE
MOBILE, ALABAMA 1969

PLATE 27

CORPS OF ENGINEERS

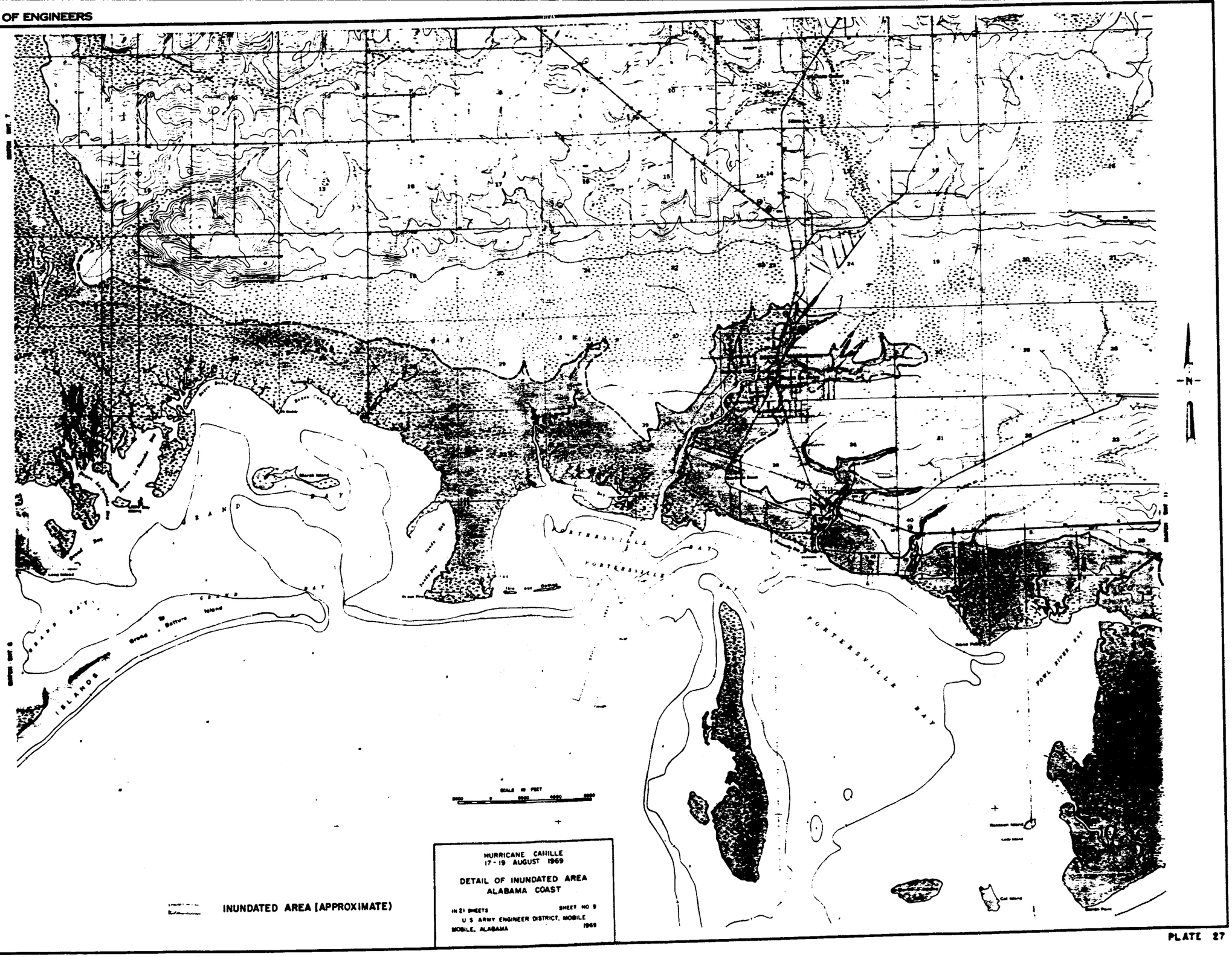
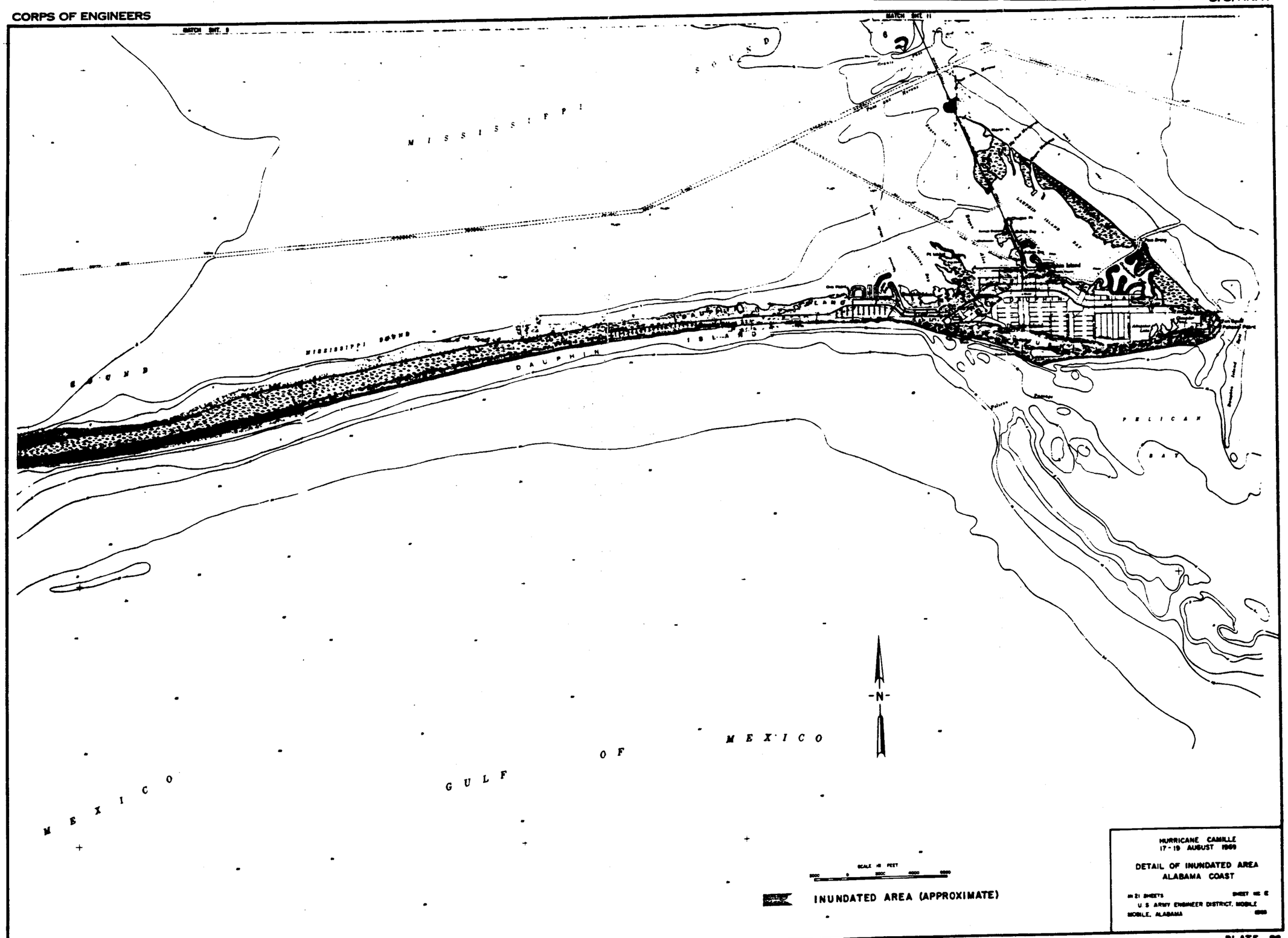


PLATE 27

CORPS OF ENGINEERS

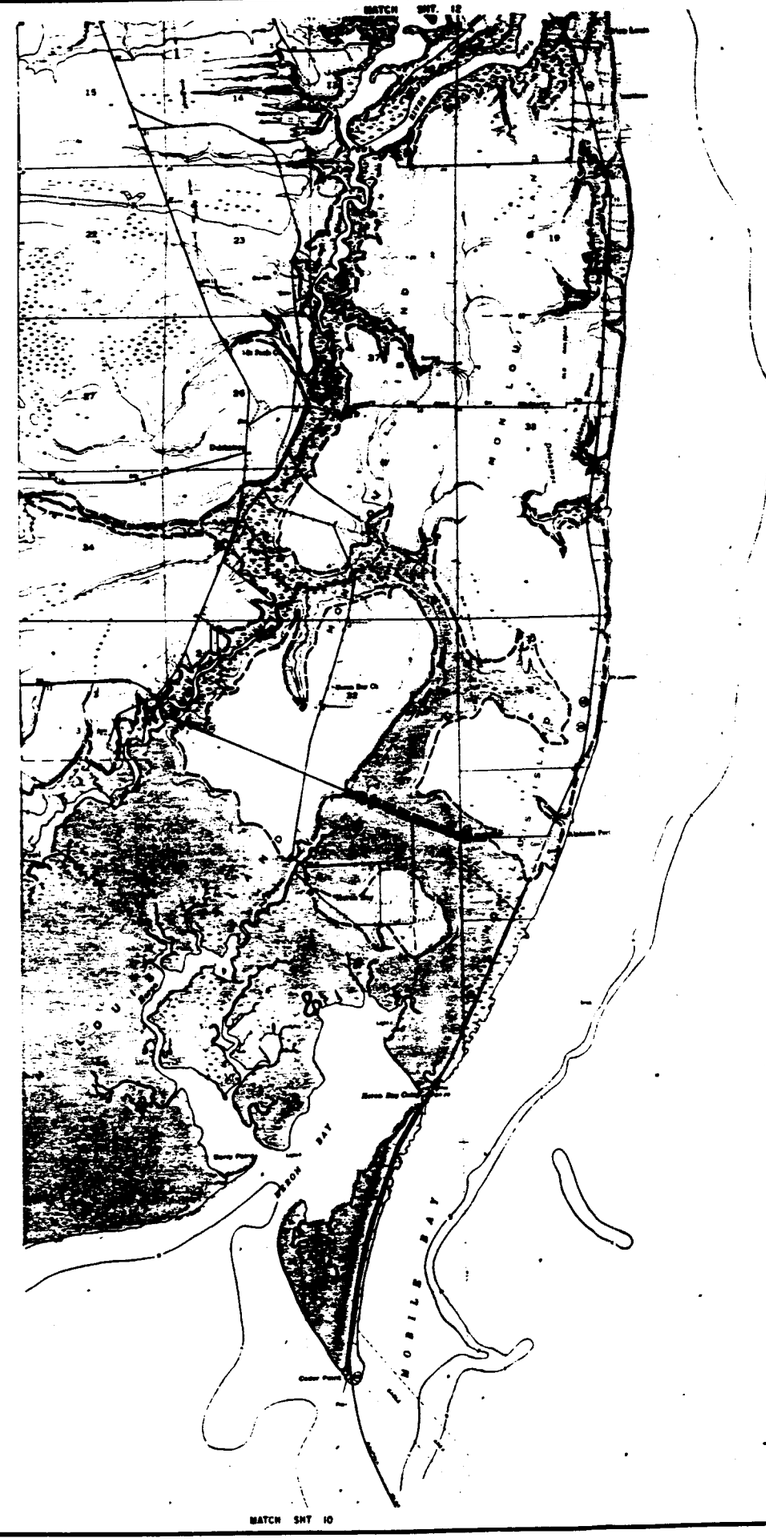


HURRICANE CAMILLE
17 - 19 AUGUST 1969

DETAIL OF INUNDATED AREA
ALABAMA COAST

SHEET NO. 6
OF 21 SHEETS
U. S. ARMY ENGINEER DISTRICT, MOBILE
MOBILE, ALABAMA

PLATE 28



HURRICANE CAMILLE
17 - 19 AUGUST 1969

DETAIL OF INUNDATED AREA
ALABAMA COAST

SHEET 4C
U. S. ARMY ENGINEER DISTRICT, MOBILE
MOBILE, ALABAMA

PLATE 29