



## DEPARTMENT OF THE ARMY

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IN REPLY REFER TO  
SAMEN-PD

28 July 1967

OPERATIONS PROGRESS REPORT  
DISASTER ACTIVITIES  
In connection with Hurricane "Betsy"  
(Final Report)

1. This report is submitted pursuant to instruction by OCE in letter ENG CW-OE dated 13 June 1967, subject: "Operations Progress Report on Disaster Activities in Connection with Hurricane Betsy-Mobile District." It covers emergency repair work to public facilities in Mississippi coastal areas, as directed by the Office of Emergency Planning, under general authority of Public Law 875, 81st Congress.
2. Hurricane "Betsy", one of the most destructive storms of record in the United States, was first reported as a tropical depression near the Windward Islands on 27 August 1965. It moved generally northwestward and increased to hurricane intensity near San Juan, Puerto Rico, on 29 August. The hurricane then followed an erratic course, including two loops, during the next seven days. On 6 and 7 August it passed through the northern Bahamas, then skirted the tip of the Florida mainland and entered the Gulf of Mexico on 8 September. Moving at speeds as high as 22 miles per hour, the storm followed a curving westward to northwestward track and crossed the Louisiana coast near Grand Isle on the night of 9 September. The center then passed 35 miles southwest of New Orleans and moved through northern Louisiana on the 10th. It was one of the fastest moving storms ever recorded in the Gulf of Mexico.
3. Grand Isle reported winds up to 160 miles per hour in gusts, while winds in downtown New Orleans were estimated to reach 125 miles per hour. Maximum winds on the Mississippi coast were estimated at 120 miles per hour at Bay St. Louis and 60 miles per hour at Pascagoula.
4. The tidal surge accompanying the hurricane raised water levels to 8.8 feet above mean sea level at Grand Isle, Louisiana, 15.2 feet at Point a la Hache and 10.2 to 12.4 feet at New Orleans. Tides along the Mississippi coast varied from 12.7 feet mean sea level at Waveland, near the western limit, to 6.4 feet at Pascagoula. Mean high tide in this area varies from 1.1 to about 1.3 feet above mean sea level.
5. Extensive damage was inflicted by winds, high tides and wave action in southern Louisiana and along the Mississippi Gulf coast, the latter being within the Mobile Engineer District and comprising the area covered by this report. Mississippi was designated a disaster area in the Presidential declaration of 25 September 1965, and the three coastal counties (Hancock, Harrison and Jackson), along with

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several others, were named by the Office of Emergency Planning as eligible to receive aid under the provisions of Public Law 81-875. OEP promptly established a field office at Gulfport, Mississippi, to expedite and coordinate disaster relief activities.

6. Immediately following the hurricane, the Mobile District made field surveys to appraise the damage and determine the need for assistance, and was prepared to commit District resources for disaster relief at OEP request. The first such request was dated 6 October 1965, and four others followed during the same month. In compliance, surveys were made and cost estimates submitted on ten eligible projects, for which the total cost was estimated at about \$1.5 million. Three of the larger projects were later accomplished under contracts awarded by the District Engineer, with engineering design and inspection services provided until their completion. Six of the other recommended projects were accomplished by local interests with "grant-in-lieu" assistance from OEP. Final inspections were performed by the Mobile District on these and five additional grant-in-lieu projects at the request of the Mississippi Civil Defense Department. Activities performed in response to individual OEP requests are described briefly in following paragraphs. Locations of major features and political subdivisions of the affected area are shown on the attached map.

7. OEP Request No. 1, 6 October 1965, requested recommendation of all eligible projects in the disaster area in the categories of debris clearance, dikes, levees and drainage ditches. Under this authority, surveys were accomplished and cost estimates were prepared and submitted for six projects, as follows:

- a. Harrison County shore line - debris removal.
- b. Pass Christian harbor - repairs to breakwater and public facilities.
- c. Waveland - debris removal from drainage structures.
- d. Gulfport Yacht Club - repair of access walkway to navigation light.
- e. Jackson County seawall - repairs and debris removal.
- f. Hancock County shore line - debris removal.

The action recommended under item a was authorized by OEP Request No. 2 and was accomplished by contract. Items b, c, and e, were accomplished by local interests with the aid of OEP grants-in-lieu. Completion of item d was not requested by local interests and no further action was required. Completion of item f was authorized by OEP Request No. 5 and was accomplished by contract.

8. OEP Request No. 2, 14 October 1965, authorized removal of debris adjacent to U. S. Highway No. 90 in Harrison County, Mississippi, repairs to the seawall at the same location, and replenishment of the sand beach protecting the seawall. Supplement No. 1 to this request, dated 21 October 1965, deleted the authorization for seawall repairs and

beach replenishment. The debris removal was accomplished by contract awarded 12 November 1965 and was completed 15 December 1965..

The project involved removal of 74,722 cubic yards of debris which had been deposited along the shore line in drifts ranging up to five feet in depth. A considerable amount of this material was brought in from off-shore islands by the hurricane. Since it contained many carcasses of animals, fish and snakes, its removal from public and private property was justified under PL 81-875 as the elimination of a menace to public health. Disposal areas and suitable haul roads were provided by local interests. The material was destroyed by burying or burning.

9. OEP Request No. 3, dated 14 October 1965, requested a survey of damage and estimate of eligible repair cost for the entire length of seawall at Bay St. Louis, Mississippi (Hancock County). The final pre-contract cost estimate was submitted to OEP on 30 March 1966. However, accomplishment of the repair work had been previously authorized, in October 1965, by OEP Request No. 5.

10. OEP Request No. 4, dated 25 October 1965, requested inspection of damage and estimates of repair or replacement cost on projects involving Biloxi Port Commission facilities, Gulfport harbor facilities, and the Harrison County Industrial Seaway. Estimates on the three projects were furnished to OEP on 26 November 1965. The projects were subsequently accomplished by local interests with OEP grant-in-lieu assistance.

11. OEP Request No. 5, dated 27 October 1965, authorized emergency repair of the Hancock County Seawall and the removal of debris along its length from U. S. Highway No. 90 in Bay St. Louis to the end of the seawall south of Waveland. A negotiated contract for removal of the debris was awarded 4 January 1966 and removal was completed 11 March 1966. The type of material and method of disposition were similar to those described for Harrison County in paragraph 8.

12. The Hancock County seawall provides partial protection from hurricane tides for approximately 11.5 miles of shore line. It is predominantly step type and its top elevation ranges from about 3 to 11 feet above mean sea level. It was built by local interests during the years 1915 to 1920 and 1926 to 1928. Field investigation following Hurricane Betsy disclosed evidence of progressive deterioration of joints in the concrete curtain wall and around drains and culverts. These defects allowed leaching of backfill over the years, creating voids beneath the seawall and the adjoining sidewalk and highway. Leaching was accelerated during the hurricane, causing sections of paving and sidewalk to collapse. Nine 28-foot monoliths of the seawall were also damaged due to failure of bearing piles.

13. OEP directed that the seawall repair project would include repairs to all failures likely to cause major damage in the near future, but that such repairs would be designed to provide only temporary protection until permanent repairs could be made by local interests.

A design guideline of 10-year tide frequency (about 6 feet above mean sea level) was adopted. General features of the final plan are as follows:

a. Placing of steel sheet piling behind failed sections of wall and capping with concrete.

b. Extension of existing storm drains through wall, using wood or steel sheet piling on larger drains and bituminous coated corrugated metal pipe on all others.

c. Placing of a protective sand fill with berm width of 50 feet, against the face of the wall along a length of about six miles, material to be obtained by hydraulic pipe-line dredge from borrow areas in Mississippi Sound.

14. Subsurface investigations disclosed adequate quantities of suitable fill material along the 6-mile reach. Placement of the hydraulic fill required the removal of piling remaining from more than 100 damaged piers. This removal was accomplished by local interests. The plan was approved by OEP 15 April 1966. The contract for repair of the seawall was awarded 1 July 1966 and repairs were completed 5 March 1967. The completed project was transferred to the Hancock County Board of Supervisors for future operation and maintenance by letter dated 16 March 1967.

15. All engineering services requested by the Office of Emergency Planning in connection with Hurricane Betsy have been completed. All contracts administered by the Mobile District have been completed and final payments have been made to contractors. All grant-in-lieu projects recommended by the District have been completed and final inspection accomplished.

16. The total cost of PL 81-875 activities performed under District supervision has amounted to \$1,524,475. Reimbursement in the amount of \$1,412,975 has been requested and received from OEP, and \$111,500 from OCE. The cost of engineering, design, supervision and administration has amounted to \$186,732, or about 12.25 percent of the total cost. Sixty-one regular District employees and five extra employees were engaged at various times in post-hurricane disaster activities. Summary of operations and costs is given in the following tabulation:

SUMMARY OF OPERATIONS UNDER AUTHORITY OF PUBLIC LAW 875

| Item                                    | Cost as of<br>30 June 1967 |
|---|----------------------------|
| Current program estimates . . . . .     | \$1,524,475                |
| Est. cost, work completed . . . . .     | 1,524,475                  |
| Est. value, work accomplished . . . . . | 1,524,475 <sup>1/</sup>    |
| Percent of program completion . . . . . | 100                        |
| Number of contracts . . . . .           | 3                          |
| Completed . . . . .                     | 3                          |
| In progress . . . . .                   | 0                          |
| Number of work locations . . . . .      | 3                          |
| Completed . . . . .                     | 3                          |
| In progress . . . . .                   | 0                          |

PL 875 WORK COMPLETED: 175 TO BE COMPLETED

| Location               | Activity                           | Cost                           |
|------------------------|------------------------------------|--------------------------------|
| Harrison County, Miss. | debris removal<br>from beach       | \$231,598 <sup>2/</sup>        |
| Hancock County, Miss.  | debris removal<br>along shore line | 52,880 <sup>3/</sup>           |
| Hancock County, Miss.  | Seawall repair                     | <u>1,239,997</u> <sup>4/</sup> |
| Total for District     |                                    | 1,524,475 <sup>5/</sup>        |

- 1/ Includes \$186,732 for EDS and A.
- 2/ Includes \$223,312 reimbursement by OEP.
- 3/ Includes \$45,924 reimbursement by OEP.
- 4/ Includes \$1,143,739 reimbursement by OEP.
- 5/ Includes \$1,412,975 total reimbursement by OEP.

17. General remarks: This is the final Operations Progress Report on disaster activities under P.L. 875 authority in connection with Hurricane Betsy. The post-hurricane report now in preparation will contain a more detailed description of hurricane phenomena and damages as well as District activities under both P.L. 99 and P.L. 875 authority. The report is scheduled for completion in September 1967.