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FACT SHEET
DAUPHIN ISLAND EROSION ISSUES

ISSUE: Dauphin Island, particularly the eastern end from Fort Gaines to the vicinity of the public fishing pier, has been undergoing erosion for a number of years. Although the issue has been raised a number of times in the past, the relationship between the Mobile Harbor project and the erosion came to the surface in 1991 when the facilities around the fishing pier became unsafe due to erosion and the swimming area at Fort Gaines had to be closed due to a number of drownings. The issue was raised most recently in response to a Public Notice dated 13 June 1995 announcing our request to renew State Water Quality Certification for the Mobile Harbor Federal Navigation Project as required by Section 401 of the Clean Water Act. As part of this recertification all dredged material from the bay channel and the bar channel are placed in the Mobile North Ocean Dredged Material Disposal Site, approximately 3 miles south of Dauphin Island, as directed by WRDA 86. In response to the public notice, 16 letters were received which claimed that the continued maintenance of the project was an integral component of the erosion of Dauphin Island and either requested a public hearing on the issue or that we modify our maintenance practice to include placement of sand on the island. The State water quality certification and coastal zone consistency for the Mobile Harbor project expired 3 July 1995. ADEM issued a 90-day extension of certification on 6 July and a second extension on 23 October 1995. Failure to resolve the issue to the satisfaction of ADEM could severely limit our ability to provide adequate navigation depths at Mobile.

HISTORY: Shoreline change on Dauphin Island is not new and in fact comparison of historic maps of the island indicate a general trend of erosion along the gulf shoreline and accretion on the western end. The earliest known maps indicate that around 1717 Dauphin and Petit Bois Islands were connected. At some later date, this island was breached and the two separate entities were formed. Between 1909 and 1917, Dauphin Island was breached by a hurricane and it was not until 1942 that maps indicated the breach was filled. The island was again breached by a hurricane in September 1948 and aerial photos taken in March 1950 indicate the island was rejoined. Hurricane Frederic in 1979 caused massive washover of the west end but total breaching did not occur. Studies of the shoreline change between the period 1942 and 1974 indicate gulf shore erosion rates of 6.3 feet per year. Accretion of the west end between 1917 and 1974 accounted for the addition of 1.8 miles of gulf shoreline.

The erosion/accretion of Dauphin Island is controlled in large part by geologic and physical forces. The entrance to Mobile Bay is not jettied, in contrast to many of those in Florida such as Pensacola and Panama City. A large ebb tidal

shoal extends along the east side of the bar channel from Fort Morgan along 'Dixie Bar' seaward to the vicinity of the Sand Island Lighthouse. On the west side, the shoal extends along the remnants of the Sand Island-Pelican Island complex to the vicinity of the public fishing pier. In fact, Sand and Pelican Islands are subaerial portions of the shoal. This large shoal forms a natural 'sand by-passing plant' for littoral material with a predominantly east to west drift. Material passes across the inlet at a point where the seaward flowing currents are reduced in velocity. The material is then deposited on the western shoulder of the shoal and eventually returned to the nearshore littoral drift system of Dauphin Island. All of the islands fronting the Mississippi Sound tend to migrate to the west in the direction of the predominant littoral drift. The east ends of Petit Bois and Ship Islands have in fact eroded at much higher rates than Dauphin Island, and there are no dredged channels immediately updrift of these islands. The erosion of the eastern end of Dauphin Island is probably a result of a combination of factors including waves generated from offshore as well as currents associated with the outflow of waters from Mobile Bay.

Mans' activities obviously play some role in modifying the sand transport system. In the early 1900's the eastern end of Dauphin Island was armored to prevent the erosion/destruction of Fort Gaines. This has prevented the sand resource which is the eastern end of Dauphin Island from entering the sand transport system and has artificially fixed the eastern end to a point in space. It has been estimated that one-half mile or more of the east end of the island would currently be open water had the armoring not taken place.

In addition, the maintenance of the bar channel portion of the Mobile Harbor project removes sand which would naturally be distributed along the western portion of the ebb tidal shoal and places it in water depths which are greater than that required for littoral sand transport. Although the 1902 River and Harbor Act provided for a 32-foot channel across the bar, it is believed that only limited dredging in this area was required until the channel was deepened in the late 1950's in response to the 1954 Act which provided for a 42-foot channel.

Much of the Mobile inlet is naturally deep water as evidenced by the fact that no dredging is required in the channel from just south of the Gulf Intracoastal Waterway in Mobile Bay to a point approximately one-half mile north of the Sand Island Lighthouse in the Gulf of Mexico. The maintenance requirement for the bar channel is restricted to a one and one-half mile reach at the lighthouse and southward. Approximately 420,000 cubic yards of sandy material is removed from this area every other year by hopper dredge and transported to the ocean disposal site approximately 3 miles south of Dauphin Island in water depths in excess of 30 feet. Our records indicate that since 1970 approximately 8.3 million cubic yards of maintenance

material has been removed from the bar channel and 6.7 million cubic yards of new work was removed from channel between 1988-90. The maintenance material would be that material which would have been in the littoral drift system and trapped in the channel. Movement of this material without and with the Mobile Harbor entrance channel is depicted on the attached schematic. To put these quantities in perspective, it has been estimated that the ebb tidal shoal contains approximately 1.2 billion cubic yards of sand and that the net annual littoral transport to the west is about 196,000 cubic yards/year. Although the Corps is removing the entire net annual littoral transport quantity, the significance of this activity is not known due to the large amount of material in the ebb tidal shoal and the natural variability of the coastal system.

The construction and subsequent maintenance of the Fort Gaines Channel (a man made cut through the east end of Dauphin Island) has also interrupted the transport of sandy sediments along the western side of Mobile Bay to the east end of Dauphin Island. This activity has also been interpreted by some to play a role in the erosion process. Since the late 1980's we have routinely placed the maintenance material along the southeastern shore of the island, however the quantity is very small and the dredging requirement infrequent. We are currently advertising a public notice to provide emergency dredging in the land portion of the Fort Gaines Channel (Government Cut). As a result of Hurricane Opal the disposal area along the northern side of the cut was breached with the material being deposited in the channel. We propose to repair the breach as part of the maintenance of the channel to provide protection of the channel from shoaling. To date we have received no comments on the Public Notice.

In 1978, the Mobile District completed a feasibility report entitled "Mobile County, Alabama Beach Erosion Control and Hurricane Protection". The results of this report indicated that with one exception, there were no alternatives which were either economically feasible or would be supported by the general public. The one exception was the modification of the current (at that time) practice for the maintenance of the Mobile Harbor bar channel. A number of unsupported assumptions were used to determine that the erosion of the 11 western most miles of Dauphin Island (beginning at the location of the public fishing pier) were the result of increasing sea level and the removal of sand from the littoral drift system through maintenance dredging. The conclusion of the report that the authority for this modification rested with the Chief of Engineers and that since no areas of local responsibility for the project would be affected that total responsibility for implementation and associated costs were a Federal responsibility. According to our files the report was never approved by South Atlantic Division nor was it transmitted to Congress.

In 1980, the Mobile District improved the Fort Gaines channel from the Billy Goat Hole on Dauphin Island eastward to the main ship channel under a request from the Federal Emergency Management Agency. This channel was required to accommodate ferry service to Dauphin Island while the bridge was under construction. Approximately 500,000 cubic yards of sandy material was placed in the groin field at the eastern end of the island. In the intervening 15 years this material has been removed from this area as part of the littoral drift and distributed westward along the island and southward into Pelican Bay. The shoreline fronting property owned by the Marine Environmental Sciences Consortium (Sea Lab), the US Coast Guard, and the Audubon Bird Sanctuary are now showing loss due to the erosion of this material.

In 1986 the National Underwater Berm Demonstration Program was initiated by the Corps to investigate the feasibility and effectiveness of constructing underwater berms with dredged material for providing shore protection. In March 1987, a "feeder" berm was constructed with 656,000 cubic yards of material from the bar channel. This berm was placed in an area on the southern flank of the Sand Island shoal in 14 to 18 feet of water. The demonstration had three purposes: 1) determine the effectiveness of shallow draft split-hull hopper dredges in maintaining this channel; 2) determine the costs associated with the action; 3) determine whether placement of material in these depths of water would be beneficial in supplying sand to the littoral system. Results of the monitoring showed that over time the 'structure' melded into the Sand Island shoal so that it was no longer identifiable. Shallow draft split-hull dredges (Island Class) can perform the required activities, however there are only 2 in operation in the U.S. and they are owned by the same company. Increase in costs over that currently expended for this part of the channel would be approximately $294,000.00.

In 1992/93, the Mobile District in partnership with the Dauphin Island Park and Beach Board and the State refurbished the armor protection around Fort Gaines and placed hard protective structures around the public fishing pier under Section 14 authority. In addition to these activities, the suggestion was made to also reorient the detached offshore breakwaters parallel to the shoreline (currently they are perpendicular) in an effort to provide protection to the Sea Lab and Coast Guard property. A cost sharing partner was not forthcoming, however and this activity was not constructed. Both the Section 14 activities undertaken at this time have been successful at their intended purpose of protecting existing public facilities.

A public forum was held on Dauphin Island, 24 October 1995. Over 102 interested individuals attended the meeting which was intended as an information exchange opportunity. Of those present 22 provided written or oral statements to a court reporter. The majority of the written statements indicate that those individuals believe that the maintenance of the ship

channel is the cause of the erosion on the eastern end of the island and that the Federal Government should pay for the damages that it is causing. We do believe however, that a number of attendees left the meeting with a better understanding of the coastal processes and that the main issue is deciding how to provide protection to Dauphin Island and not trying to lay blame on the government. Many of the participants urged the Corps to place the material on the Sand Island shoals even though they understood that this would not 'fix' the erosion problems.

CURRENT STATUS: District staff have had a number of brainstorming sessions since the public forum to try to formulate a positive position. Based on these discussions and review of Corps policy and regulations, we do not believe that we can change our method of maintaining the bar channel segment of the project without additional cost sharing. The baseline for maintenance of the channel is the Federal Standard which is roughly the least costly, environmentally acceptable, engineeringly feasible alternative. The Federal Standard for Mobile Harbor is the transport of all dredged material to the ocean disposal site.

Section 933 of WRDA 86 provides that placement of dredged material on downdrift beaches is a viable alternative to the Federal Standard provided that a non-Federal entity pick up 50% of the additional costs and that the incremental increase in cost is offset by national economic development benefits. Based on the results of the feeder berm demonstration, the non-Federal entity would be responsible for approximately $147,000 per dredging cycle for the placement of material on the Sand Island shoal. This would allow the resumption of the natural transport of sand in the littoral system but would not provide immediate (or possibly even longterm) relief to the erosive areas on the eastern end of the island. What is not certain however is whether we could find NED benefits to offset the increase in costs as per our regulations. Other authorities, such as Section 111 or Section 204 are not as attractive - to either the Corps or the locals due to cost sharing or future maintenance requirements.

The obvious question which can be raised is how removal of all the sand within the net littoral drift can be considered environmentally acceptable. Man's understanding of the processes at work in this area is minimal, however it is felt that what we do is subsumed within the impacts caused by the natural processes. As an example, 600,000 cubic yards of material was removed from the bar channel during September - October 1985 as a direct result of the multiple passages of Hurricane Elena. From a natural resource management standpoint, on the other hand, it appears the wisest approach would be to place the material in an area which would allow the resumption of the natural process. Although the cost of implementing such an option is not excessive considering the Mobile Harbor project alone, if this type

approach was taken at a number of coastal civil works projects the total cost to the government could be excessive. Therefore in our discussions with interested public and agencies the District has relied on the Federal Standard and the possibility of a Section 933 activity.

A separate but equally important factor to consider it that placement of maintenance material on the Sand Island shoals is not going to solve the erosion problem on the east end of Dauphin Island, but will merely over the long term allow the resource to migrate in the littoral transport system as if the channel were not in place. As an effort to help alleviate the erosion of the east end of the island, the District has suggested to the Mayor of Dauphin and the Alabama Department of Economic and Community Affairs staff the possibility of a Section 22 study (Planning Assistance to States) as a means of determining the best alternative means of providing relief for existing eroded areas and some protection for the future.

IMPACT TO MOBILE HARBOR NAVIGATION PROJECT: As indicated in the issues paragraph the maintenance of the Mobile Harbor project is being certified by ADEM via 90-day extensions of the expired water quality certification. Although we do not believe that ADEM will deny certification, they are in a touchy position in that the coastal zone program calls for the beneficial use of dredged material wherever possible and they believe the potential of a legal challenge to the certification is increased if nothing is changed. Ultimately ADEM would like for the Corps to be able to place the bar channel dredged material on the Sand Island shoals if at all possible but also understand the regulations that we work under. We believe they would be willing to support any effort to return material to the natural sediment transport process. Discussions with the ADEM point of contact on 30 November indicated that they plan to transmit a letter to the District requesting that we place the material dredged from the bar channel in a more environmentally beneficial location and that we provide a plan of work and cost estimate for a Section 22 study.

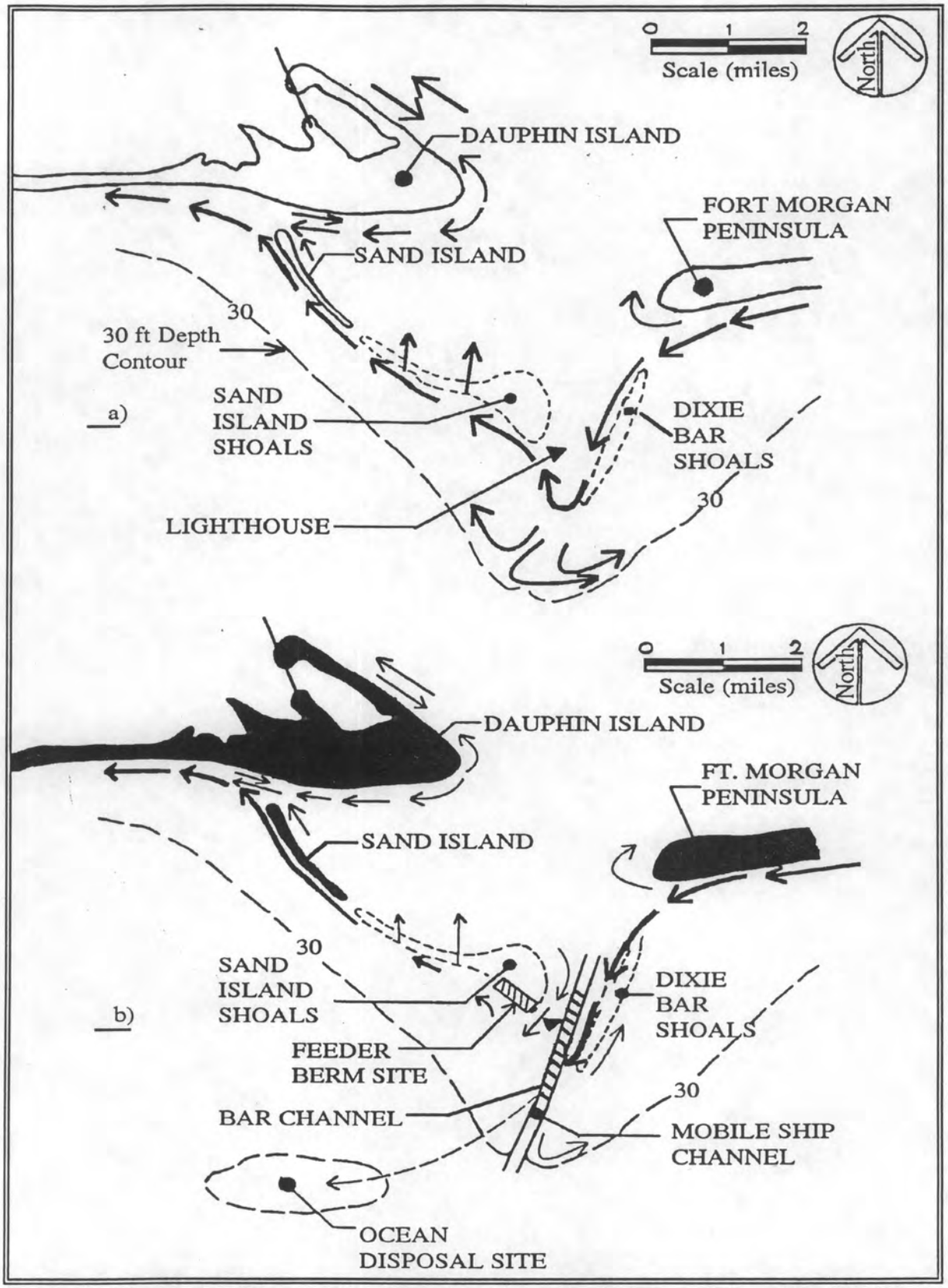

Figure 1: Net sand transport path: a) pre-dredging, b) present conditions (Modified from Douglass and Haubner (1992))

Dredging Quantity & Cost Data
Mobile Bar Channel

(Historical Average Annual Basis)

Alternative	Dredging Quantity Cubic Yards	Preliminary Estimates				
		Unit Cost $ /CY	Total Cost	Federal Cost	Local Cost	
Ocean Site via Hopper Dredge	210,000	$1.30	$273,000	$273,000	$0	1
Littoral Zone via Hopper Dredge	210,000	$2.00	$420,000	$346,500	$73,500	2
Dauphin Is. via Hopper Dredge	210,000	$5.50	$1,155,000	$714,000	$441,000	3
Littoral Zone via Pipeline Dredge	210,000	$4.75	$997,500	$635,250	$362,250	4
Dauphin Is. via Pipeline Dredge	210,000	$6.50	$1,365,000	$819,000	$546,000	5

Actual Quantity and Frequency is 402,270 cubic yards on 23 month frequency

1 CURRENT OPERATION UTILIZES A DEEP DRAFT HOPPER DREDGE AS PART OF TOTAL MAINTENANCE OF THE MOBILE HARBOR PROJECT

2 PLACEMENT OF BAR CHANNEL MATERIAL ON SAND ISLAND SHOALS USING AN ISLAND CLASS HOPPER DREDGE

3 PLACEMENT OF BAR CHANNEL MATERIAL DIRECTLY ON EASTERN END OF DAUPHIN ISLAND USING DEEP DRAFT HOPPER DREDGE AND A SINGLE POINT MOORING DISCHARGE SYSTEM

4 PLACEMENT OF BAR CHANNEL MATERIAL ON SAND ISLAND SHOALS USING A PIPELINE DREDGE RIGGED FOR OPERATION IN DEEP WATER

5 PLACEMENT OF BAR CHANNEL MATERIAL DIRECTLY ON EASTERN END OF DAUPHIN ISLAND USING A PIPELINE DREDGE RIGGED FOR OPERATION IN DEEP WATER