2. The EIS has been expanded to better address the wetlands located within the proposed Brookley Expansion area. See response to EPA Comment Number 4. The impacts associated with loss of wetlands and bay bottom are recognized and considered to be adequately discussed in the FEIS.

3. A discussion of alternative port expansion plans has been added to Appendix 5, Section D, of the Corps Report and Section 6 of the EIS. Alternative locations mentioned in your comment have been addressed; however, the Brookley Expansion Area remains the recommended plan to meet port expansion needs.

4. Executive Order 11990 pertains to the protection of wetlands. Field surveys indicate that about 70 acres of marsh exist within the proposed Brookley disposal area. These wetlands have voluntarily established along the fringe of a manmade fill area. It is assumed that a well designed wetlands establishment plan for the proposed project would adequately mitigate the wetlands loss. Executive Order 11990 states that each agency shall avoid undertaking or providing assistance for new construction located in wetlands unless the head of the agency finds (1) that there is no practicable alternative to such construction, and (2) that the proposed action include all practical measures to minimize harm to wetlands. In making this finding, the head of the agency may take into account economic, environmental, and other pertinent factors. We feel that the planning efforts discussed in the feasibility report and EIS demonstrate compliance with Executive Order 11990.

5. According to Corps of Engineers regulations, an EQ plan must make a net positive contribution to the EQ account when compared to the without project condition. When this cannot be accomplished, the "least environmentally damaging" plan must be identified as was the case with the Mobile Harbor study. The inconsistencies in terminology in the Technical Report (Appendix 5) have been corrected to reflect that a least environmentally damaging plan was identified. This is considered to be in accordance with Corps of Engineers regulations and the objectives of Principles and Standards.

Specific Comments

Technical Report

Page B-44

6 Only two small cultural surveys have been conducted. Due to the high potential for cultural resources in the Bay area and the magnitude of potential impact, we agree with the need for a survey (see Appendix 1, page 35). The survey should be made in consultation with the Alabama State Historic Preservation Officer and the results included in the final environmental statement.

Page B-61, Paragraph 88

7 Only a few of the grasses that are found in the upper bay are mentioned. In his paper regarding submerged grassbed communities in Mobile Bay, Borom indicates that eleven species of submerged aquatic vegetation are dominant in Mobile Bay. Those found in the upper bay include tape grass (Vallisneria americana), redhead grass (Potamogeton perfoliatus), coontail (Ceratophyllum demersum), water stargrass (Heteranthera dubia), horned pondweed (Zannichellia palustris), bushy pondweed (Najas guadalupensis) Eurasian watermilfoil (Myriophyllum spicatum), elodea (Egeria sp.), and muskgrass (Nitella spp.). These species of aquatic vegetation should also be included in this discussion.

Page C-6, Paragraph 10

8 A proposed spoil disposal site located on Pinto Island consists of approximately 180 acres of fresh marsh and 17 acres of water bottoms. This paragraph should, therefore, explain that all disposal sites are not uplands and that these wetlands and water bottoms on Pinto Island are proposed to be filled.

Page D-112, Paragraph 200

9 This paragraph should explain how and where marshes and waterfowl habitat will be created. It should also discuss the criteria used to determine the amount of marsh acreage that would be created.

Environmental Impact Statement

Appendix 1

Page 9, Paragraph 2.14

10 It is stated that the bulk of the salt marsh of the bay is associated with Deer, Fowl, and Dog Rivers. However, according to Stout in his paper regarding marshes of the Mobile Bay Estuary, true salt marshes, dominated by Spartina alterniflora and Juncus roemerianus, occur only

6. Agree, an archeological survey would be required for the proposed channel cut and disposal area. This is discussed in the EIS. However, the surveys could be conducted during post authorization studies.

7. The paragraph has been expanded to include the additional species of aquatic vegetation.

8. The paragraph has been rewritten to indicate that wetlands will be destroyed when Pinto Pass is utilized for disposal of maintenance material from the existing River Channel.

9., See response to your Comment Number 1. The Technical Report and EIS have been expanded to better address the loss of wetlands and appropriate mitigation features. The proposed plan provides in-kind mitigation for the loss of approximately 70 acres of wetlands along the Brookley shoreline. The mitigation plan would provide for the establishment of approximately 70 acres of marsh on the southern end of the Brookley Expansion area.

10. Agree, appropriate clarification has been added to the paragraph.

in lower Mobile Bay near Main Pass. The marshes of Little Dauphin Island, the east end of Dauphin Island, Fort Morgan Peninsula, and Oyster Bay have borders of Spartina alterniflora with the higher interiors covered with stands of Juncus roemerianus. The remainder of the marsh areas within the bay are brackish in nature and include such species as Spartina cynosuroides, Spartina patens, Cladium jamaicense Sagittaria lancifolia, Scirpus validus, Zizania aquatica, Zizaniopsis miliacea, and Phragmites communis. The specific locations of salt marsh should be identified and discussed in this paragraph.

Page 10, Paragraph 2.17

1 1 The commercial landing values are based on 1974 figures and should be updated to the most recent values provided by the National Marine Fisheries Service.

Page 22, Paragraph 4.29

1 2 The degree of impact of increased turbidities on fishes is greatly influenced by the season of the year. During peak spawning periods, adult fishes may be able to avoid the increased turbidities; however, eggs, larvae, fry and juvenile fishes could be severely affected. Therefore, the seasonal impacts of turbidities on finfishes and shellfishes should be discussed.

Page 33, Paragraph 4.44

1 3 The impacts of increased salinities west of the ship channel on oyster production should be addressed.

Page 35, Paragraph 4.48

1 4 Evaluations of significance for the National Register should be made in accordance with the National Historic Preservation Act of 1966, as amended (Public Law 89-665), rather than the Archeological and Historic Preservation Act of 1974 (Public Law 93-291). The further requirements of 36 C.F.R Park 800 should then be followed, as necessary.

Page 35, Paragraph 4.49

1 5 Action, if any, that has been taken by the Corps of Engineers to assure this project will not adversely impact endangered or threatened species should be discussed.

11. Updated landings statistics have been added to the EIS and Technical Report.

12. Seasonal impacts are discussed in paragraph 4.30. Also, the impacts of dredging upon eggs and larve, as well as other developmental stages, are discussed in paragraph 4.29.

13. Initial model tests, discussed in Section 6 of the EIS, were with a low freshwater inflow of 15,500 cubic feet per second (cfs). As shown in Table 2, for tests most nearly representing the proposed plan, Figure 16, cedar point and Klondike areas would be considered approaching the threshold of impact (cedar point + 0.8 °/oo / klondike - 1.6 °/oo). Section 4 of the EIS has been expanded to better illustrate the changes occurring with mean freshwater inflow of 63,500 cfs. The changes occurring at mean flow would not be considered as critical as low flow changes. Further model tests would have to be conducted for the proposed plan during post authorization studies to determine the effects of the 55-foot deep channel and required mechanisms for offsetting significant adverse hydraulic effects of the enlarged channel. This will include further coordination with the environmental agencies.

14. Agree, the paragraph has been appropriately rewritten.

15. Proper contact has been made with the Fish and Wildlife Service implementing coordination procedures in accordance with the Endangered Species Act of 1973. By letter of 14 October 1980 (included in the pertinent correspondence section of this appendix), the Fish and Wildlife Service, Jackson, Mississippi, indicates that "although several Federally listed species may occur within the project area, they would not be affected by the proposed activity." The EIS has been expanded to include this discussion.

Summary

The Fish and Wildlife Service views the selected alternative (Brookley Expansion and Gulf Disposal Plan 1 (modified)) as being extremely detrimental to fish and wildlife resources. Primary concerns include no consideration of alternative port expansion sites that could prevent destroying 1,700 acres of shallow-water bottoms and 10 acres of tidal marshes, the lack of an EQ Plan, and no proposed mitigation as a modification feature for past project damages. Unless the project is modified to satisfy these deficiencies, severe damages will occur to fish and wildlife resources within the Mobile Bay area.

In view of this potential damage, the Fish and Wildlife Service recommends that any plan involving the deposition of dredged material in Mobile Bay
16 be dropped from further consideration in project planning. The Service also recommends that unless more environmentally sound disposal methods are identified, all future dredged material should be taken to approved deep Gulf sites. An EQ Plan, as required by the Water Resource Council's Principles and Standards, should be developed for future planning purposes.

The Fish and Wildlife Service is presently preparing a Fish and Wildlife Coordination Act report that will outline specific modifications to reduce adverse fish and wildlife impacts of the existing and proposed Mobile Harbor project.

We appreciate the opportunity to review and comment on this draft environmental impact statement and technical report.

Sincerely yours,

James H. Lee

Regional Environmental Officer

16. Your specific comments which are summarized here have been responded to in previous paragraphs. A copy of your Fish and Wildlife Coordination Act Report will be forwarded through channels with the Technical Report and EIS.

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE

Duval Building
9450 Koger Boulevard
St. Petersburg, Fl 33702

August 17, 1979 FSE61RJH

TO: Richard Lehman, EC

FROM: William H. Stevenson, FSE

SUBJECT: Comments on the Draft Environmental Impact Statement-Technical Report on Mobile Harbor, Alabama (DEIS #7907.01)(COE)

The draft environmental impact statement for Technical Report on Mobile Harbor, Alabama that accompanied your memorandum of July 5, 1979, has been received by the National Marine Fisheries Service for review and comment.

The statement has been reviewed and the following comments are offered for your consideration.

General Comments

We have serious reservations regarding the Brookley Expansion Plan (BEP) and channel enlargement. The BEP would result in the direct filling of 1710 acres of upper Mobile Bay bottoms which constitute approximately 5% of the bay's bottom less than 6 feet deep. Moreover, 700 acres of bay bottom and 520 acres of nearshore bottom would be committed to channel enlargement, and 1300 acres of bay bottom may be subject to extensive mud flow.

1

As stated in the DEIS and 404(b) evaluation, the upper part of Mobile Bay remains productive even though it is subject to more stress than other areas of the bay. The proposed loss combined with previous unmitigated losses would substantially reduce fishery productivity of the area. Previous comments on maintenance dredging of the harbor identified our concern with the losses and requested a mitigation plan be developed[1/]

1/ June 27, 1979. Regional Office letter to Col Charlie Blalock, Mobile District COE, concerning FP79-ME01-10 dated May 16, 1979.

RESPONSE TO THE NATIONAL MARINE FISHERIES SERVICE, Page 1

1. Your 27 June 1979 letter was commenting on the Corps of Engineers Public Notice for continued maintenance dredging of the Mobile Harbor project. As you are aware, the Mobile District Corps of Engineers do not have the authority to provide mitigation for the existing project. Continuing investigations concerning the upper harbor maintenance will require further coordination with the environmental agencies and other interests. Resolution of that issue is beyond the scope of this EIS.

Mitigation measures have been included for future modifications to the project under the recommended plan. The EIS has been expanded to more clearly address the mitigation features.

2 Although impacts resulting from channel enlargement are less severe chan the BEP, if the channel can be justified without the Brookley Expansion area, certain mitigation can be incorporated to offset the impacts.

We support deep gulf disposal of all future maintenance and new material.

Specific Comments

3 Page B-10, paragraph 12 through page B-28, paragraph 27, Port Development. We believe t' at considerable development can occur on Blakeley, Pinto, and McDuffie Islands. Accompanied with total use of Theodore Industrial Park it seems possible to reduce the size, or eliminate the need for the BEP.

4 Page C-6, paragraph 10, Disposal of Dredged Material. We are pleased with the statement that the current practice for disposal of dredged maintenance material from Mobile River is to use diked upland disposal areas. Accordingly, we conclude that the 110 acres of intertidal wetlands and 17 acres of shallow-water habitat at Pinto Pass will be excluded from disposal plans advertised under Public Notice FP79-MH01-10 dated May 16, 1979.

5 Pages C-12 and C-13, Physical Alterations of Mobile Bay. The direct removal of 1772 acres of tidal wetlands and contiguous shallows, the open water disposal related to channel construction and maintenance, and the presence of the channels and saltwater intrusion have impacted Mobile Bay. This damage has occurred without mitigation or enhancement of estuarine resources. Port development should be compatible with these resources and mitigation should be performed to offset the damages caused by earlier Federal projects. If unalterable, to minimize losses, future projects should also be fully mitigated.

6 Page D-15, paragraphs 15 and 16. The formulation of an overall EQ plan should contain all mitigation measures listed in paragraph 16 and Appendix 1, paragraph 6.13. While the draft technical report discusses EQ plans, it apparently fails to identify one that has been accepted. We are available to assist you in its development.

7 Page D-96, paragraph 165. In addition to the 1710 acres directly filled for the Brookley expansion plan, 1300 acres of bay bottom may also be impacted by mud flow. Many of these losses would be avoidable by Gulf disposal of dredged material and use of existing upland areas.

2. As stated in the EIS, further studies would need to be conducted for the enlarged channel. This will include further coordination with the environmental agencies and other interests. We acknowledge your support of total gulf disposal.

3. See response to the Department of the Interior Comment Number 3.

4. Your conclusion is incorrect since the current practice for disposal of maintenance material from the River Channel is to use diked upland areas known as the North and South Blakely Island sites. However, future plans do require the use of Pinto Pass for disposal and the paragraph has been accordingly clarified.

5. See response to your Comment Number 1.

6. All of the listed items will be carried into the post authorization studies. The EIS has been expanded to clarify this point. A review of your project files should reveal that suggestions made by the National Marine Fisheries Service and other environmental agencies were included in developing the mitigation features and EQ plan. We will continue to keep your agency informed during further studies for the project.

7. Total gulf disposal would avoid the environmental losses associated with the Brookley Expansion area at the expense of further degradation to the offshore disposal area. As indicated in the Technical Report, there are no suitable upland areas available for disposal of the large quantities of dredged material. Also, as documented in the report, many factors, including economics and the environment, were considered in arriving at the recommended plan. However, we recognize your position and it is herewith documented.

Page D-112, paragraph 200. The discussion of establishing
8 marshes and waterfowl habitat should be addressed in the EQ and mitigation plan.

Page E-21, paragraph 28. We concur that the Gulf disposal
9 alternative would create less adverse environmental impacts than continued open-water disposal in the bay.

Page E-23, paragraph 33. Mitigation should be incorporated into an overall EQ plan that will offset the previous permanent damage as well as proposed permanent damage.
10 Permanent damage can occur to areas other than fill areas. For example, a channel subject to regular use and maintenance dredging will not achieve and maintain previous productivity levels. We further believe this damage should be mitigated.

Appendix 1 - DEIS

Pages 14-37, paragraphs 4.01-4.57. Whereas we generally agree with the assessment of the proposed action on the environment, the rationale of justifying the selected plan based upon the future impacts being less than the present impacts should be
11 fully substantiated. Agencies such as NMFS, FWS, and EPA have been requesting Gulf disposal for years. Benefits resulting from Gulf disposal alone should justify its use for maintenance dredging. Although efforts are being made to cease open bay disposal, this does not necessarily justify the permanent elimination of 1710 acres of bay bottom.

Section 6.01

Page 39. We recommend a full investigation of the potential
12 to completely use available upland habitat for alternative port development. Upland sites such as Blakeley, Pinto, and McDuffie Islands can be used to handle many shipping needs.

Page 57, paragraph 7.02. This paragraph should expand its mitigation plan to include other measures to enhance long-term productivity, i.e., improving Bay circulation, filling old dredged holes, etc. (see Appendix 1, para. 6.13). Also,
13 a long-term increase in biological productivity for the Bay could occur from Gulf disposal without a decrease in productivity resulting from the BEP. The statement is not clear on this issue.

Appendix 2 - Section 404(b) Evaluation

Page 2, paragraph 2a(1). It is our understanding an estimated
14 10 acres of fringe wetlands covered under the 404(b) wetland definition exist along the shoreline proposed to be filled.

Page 7, paragraph 6d(2) and (3). These paragraphs should
15 include impacts to larval, post larval, and juvenile fishes

8. The Report and EIS have been expanded to more fully discuss the wetland establishment plan.

9. The statement was made assuming that continued disposal would be associated with project modifications and the ensuing larger quantities of dredged material. As noted in the EIS for the existing project and the EIS for the proposed modifications, studies to date indicate that the present practice of disposal of maintenance material adjacent to the channel results in a relatively minor biological impact considered to be well within the resiliency of the estuarine system. The most significant concern with the larger quantities of material from project modifications would be the possibility of buildup and physical fate of the material. For this reason, and due to environmental agency acceptability, continued open bay disposal of maintenance material was not included in the recommended plan. However, one purpose of the Mississippi Sound Study is to further investigate continued open water disposal of maintenance material in lower Mobile Bay since there is presently no significant buildup of material in that area.

10. See response to your Comments 1 and 6 in regard to mitigation.

11. The suggested rational was not used to justify the recommended plan. See response to your Comment 9 for the rational in selecting the Gulf disposal plan. However, selection of the proposed plan would ultimately result in discontinuance of open water disposal of maintenance material from the ship channel into the bay. This is considered beneficial to the estuarine ecosystem at the expense of degradation to the offshore environment. However, through application of the Section 103 Guidelines, an environmentally acceptable offshore site could be selected.

12. See response to the Department of the Interior's Comment Number 3.

13. See response to your comments numbered 6 and 11.

14. See response to the Environmental Protection Agency Comment Number 4.

15. The paragraph has been expanded to include those discussions in paragraphs 4.29 - 4.31 of the EIS.

and invertebrates. Impacts to be addressed under this section do not necessarily mean adults are only considered by 404(b).

16 Page 8, paragraph 6d(10). If existing upland areas are incorporated into the Master Plan, then fast land creation could be substantially decreased if not eliminated.

17 Page 9, paragraph 9(a). We cannot concur with the statement that alternatives to the proposed discharge are impracticable and would have a greater adverse impact on the aquatic and semi-aquatic ecosystem. We suggest alternatives as discussed in the above comments should be considered.

18 Page 9, paragraph 9(b). We feel the elimination of 1710 acres of bay bottom which constitutes 5% of all bottom in the bay less than 6 feet is an unacceptable impact on the Mobile Bay estuary.

CLEARANCE: SIGNATURE AND DATE:

F7:KRRoberts AUG 23 1979

16. See the response to your Comment Number 7.

17. Your position is recognized and responses have been provided for your specific comments.

18. Your position is recognized and has been taken into consideration.

AUG 1 1979

UNITED STATES DEPARTMENT OF COMMERCE
Maritime Administration
Central Region Office
No. 2 Canal Street
New Orleans, La. 70130

July 30, 1979

Mr. Paul E. Hemmann
Secretarial Representative
Office of the Secretary
U. S. Department of Commerce
Federal Region IV
1365 Peachtree St.
Suite 300
Atlanta, GA 30309

Dear Mr. Hemmann:

After review of the Technical Report concerning the proposed dredging of a deeper channel in Mobile Bay, the Maritime Administration approves and endorses the project as proposed in Plan 1 (modified). This proposes a 55-foot channel with dredge material utilized to enlarge the Brookley facility for future port expansion. The balance of the material is to be disposed of in the offshore area designated.

In addition to providing the required economic benefits to the Port of Mobile, it also appears to have minimal detrimental effect on the environment of the Bay.

A deeper channel depth is necessary at this time in view of the anticipated completion of the Tombigbee Waterway. Cargo tonnage generated by the waterway will require larger ocean ships presently restricted by the channel depth.

Sincerely,

G. T. BORNKESSEL
Region Port Development
Officer

RESPONSE TO THE US DEPARTMENT OF COMMERCE, MARITIME ADMINISTRATION

The comments are acknowledged, no response is necessary.

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

SOUTHERN REGION
P. O. BOX 20636
ATLANTA, GEORGIA 30320

July 6, 1979

Mr. Lawrence R. Green
Chief, Planning Division
Mobile District Corps of Engineers
Post Office Box 2288
Mobile, Alabama 36628

Re: Draft Technical Report and Environmental Statement for Channel Improvements to Mobile Harbor, Alabama

Dear Mr. Green:

This will acknowledge your letter of July 2, 1979, advising that the Mobile District Corps of Engineers is studying a proposal to make channel improvements to Mobile Harbor, Alabama.

We have reviewed the project with respect to potential environmental impact for which this agency has expertise. Our review indicates there will be no significant adverse effects to the existing or planned air transportation system as a result of this project.

Thank you for the opportunity to review and comment on this proposal.

Sincerely,

BENNY C. FRAZIER
Chief, Planning and Appraisal Staff

RESPONSE TO THE FEDERAL AVIATION ADMINISTRATION

The comment is acknowledged. No response is necessary.

DEPARTMENT OF TRANSPORTATION
UNITED STATES COAST GUARD

ADDRESS REPLY TO
COMMANDER (dpl)
EIGHTH COAST GUARD DISTRICT
HALE BOGGS FEDERAL BLDG
500 CAMP ST
NEW ORLEANS, LA 70130
(504)589-2961
(FTS)682-2961

16475
09 AUG 1979

District Engineer
Mobile District, Corps of Engineers
P.O. Box 2288
Mobile, AL 36628

Re: Draft Technical Report on
Mobile Harbor, June 1979

Dear Sir:

Coast Guard District and Captain of the Port of Mobile staffs have reviewed the subject report. The Coast Guard has no comments or objections to your proposed port development plan.

The Captain of the Port of Mobile and the District Aids to Navigation Branch are prepared to assist you in any way in the implementation of this harbor development plan.

Sincerely,

P.L. COLLOM
Commander, U.S. Coast Guard
District Planning Officer
By direction of the Commander,
Eighth Coast Guard District

Copy: Captain of the Port of Mobile
U.S. Coast Guard Group Mobile
Commander, Eighth Coast Guard District (oan)
Commandant (G-WEP-7)

RESPONSE TO UNITED STATES COAST GUARD

The comments are acknowledged, no response is necessary.

United States Department of Agriculture
Soil Conservation Service
P. O. Box 311
Auburn, Alabama
36830

July 24, 1979

Mr. Lawrence R. Green
Chief, Planning Division
Mobile District, Corps of Engineers
Department of the Army
P. O. Box 2288
Mobile, Alabama 36628

Dear Mr. Green:

We have reviewed the Draft Tech[illegible] Report for Channel Improvements to Mobile Harbor, Alabama, as requested, but have no comments or suggestions to offer. As always, we appreciate having an opportunity to review documents of this sort.

Sincerely,

W B Lingle

W. B. Lingle
State Conservationist

RESPONSE TO THE US DEPARTMENT OF AGRICULTURE

The negative reply is acknowledged, no response is necessary.

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
REGION IV
101 MARIETTA TOWER , Suite 1503
ATLANTA, GEORGIA 30323

September 11, 1979

OFFICE OF THE
Principal Regional Official

HEW-943-9-79

Colonel Charles L. Blalock
District Engineer
U. S. Army Engineer District, Mobile
Corps of Engineers
P. O. Box 2288
Mobile, Alabama 36628

Subject: Draft Technical Report and Draft Environmental Impact Statement, Channel Enlargement for Navigation, Mobile Harbor, Alabama

Dear Colonel Blalock:

We have reviewed the subject Technical Report and Draft Environmental Statement. Based upon the data contained in the draft, this Department's concerns have been adequately addressed except for the impact on the University of South Alabama Brookley Center.

The University of South Alabama Br ɔkley Center has been developed on a 293.41 acre portion of Brookley AFB conveyed by the Departmenc's Federal Property Assistance Program, Public Law 81-152. Under the terms and conditions of the Department's conveyance instrument the University's title to the property could be jeopardized if the approved program of educational utilization does not continue. The University pays the Federal Government for the property by an earned credit for each year of educational utilization.

Additional ınformation should be included in the Final Environmental Impact Statement to indicate what extent the proposed action will impact upon the campus and mitigation measures to prevent any adverse effects upon the educational programs being conducted.

We appreciate the opportunity to review the DEIS and would like to receive a copy of the Final Environmental Impact Statement.

Sincerely yours,

James E. Yarbrough

James E. Yarbrough
Regional Environmental Officer

RESPONSE TO THE DEPARTMENT OF HEALTH EDUCATION AND WELFARE

The proposed Brookley Expansion area would not be expected to have any adverse effects upon the University of South Alabama educational program. Land use immediately adjacent to the proposed fill area includes a small paved road and a golf course. The proposed fill area may be aesthetically displeasing to people at these locations.

STATE OF ALABAMA

WATER IMPROVEMENT COMMISSION

Ira L. Myers, M.D.
Chairman, State Health Officer

Richard A. Forster
Vice Chairman
Commissioner, Department of
Conservation and Natural Resources

Perry Hill Office Park
3815 Interstate Court
Montgomery, Alabama

James W. Warr
Director

Commission Members
Dr. Robert M. Bucher, Mobile
Charles O. Cargile, Hueytown
David L. Thomas, Montgomery
Taney A. Brazeal

Mailing address:
State Office Building
Montgomery, AL 36130

Telephone 205/277-3630

August 30, 1979

Mr. Lawrence R. Green
Chief, Planning Division
Corps of Engineers
P. O. Box 2288
Mobile, Alabama 36628

Dear Mr. Green:

This office is in receipt and has completed its review of the Draft Environmental Impact Statement and accompanying materials concerning channel improvements for Mobile Harbor, Alabama. It is our understanding that in view of overall evaluation, design criteria, and planning objectives, it is the Corps' opinion that alternative Brookley Expansion Area and Gulf Disposal Plan No. 1 (modified) is considered the best plan for solving existing problems, as defined by the Corps, and meeting the needs of the study area. Based on our review, we would like to submit the following comments.

1 The alternative as discussed in the DEIS calls for the filling of approximately 1,710 acres of upper Mobile Bay bottom. Problems associated with physical alterations to the Bay, as cited in the Draft Technical Report, support the contention that the creation of this fast land would undoubtedly result in water quality degradation and poor water circulation. An example of the effects of such physical alterations to the Bay are illustrated by the problems associated with the Garrow's bend area resulting from the construction of the connective causeway to McDuffie Island. Construction of, and modifications to, the Mobile Ship Channel itself have resulted in the reduction of normal circulation in the upper bay and has contributed to dissolved oxygen deficits in the Bay's bottom waters. Disposal of dredged material for the creation of fast land off Brookley would also result in increased turbidity and suspended solids which according to the DEIS could last for a period of

RESPONSE TO THE STATE OF ALABAMA WATER IMPROVEMENT COMMISSION, Page 1

1. Construction of the Brookley Expansion area could worsen the poor flushing conditions in the Garrows Bend area. In order to improve circulation in the area, the recommended plan includes consideration of constructing an opening in the causeway which connects McDuffie Island to the mainland. Also, the configuration of the north end of the disposal area would be such that it would allow maximum flushing in the Garrows Bend area.

Impacts of maintenance of the existing channel are addressed in an EIS prepared by the Mobile District Corps of Engineers and filed with the President's Council on Environmental Quality in March 1976. Discussions related to bay circulation and dissolved oxygen depletion are contained in that EIS and have been referenced and appropriately summarized in this EIS.

Transfer type facilities, such as grain, container, and general cargo handling, would be expected to establish on the Brookley Expansion area. These commodities are not generally associated with critical spills and pollution problems. Adequate legislative controls are available to the regulatory agencies for the control of point and nonpoint sources of pollution.

several years and impact up to approximately 1,300 acres of water bottoms west of the ship channel off Brookley in addition to the 1,710 acres of Bay bottom which would be claimed by disposal, for a total of over 3,000 acres. In addition, if Brookley were expanded the potential for increased pollution to Mobile Bay via spills, and additional point and non-point source discharges, would be greater.

2 In addition to the creation of the Brookley expansion area, it is our understanding that the plan as proposed provides for the deepening and widening of the entrance channel and the main Bay channel, an anchorage area near the upper limits of the main Bay channel, and the construction of a turning basin opposite McDuffie Island. From the information submitted, it appears that these improvements may be warranted based on the arguments presented; but, as stated in the DEIS, we are in agreement with the Corps that further studies need to be conducted utilizing additional physical and mathematical models to more accurately determine the effects of deepening and widening channels on dissolved oxygen concentrations, overall circulation patterns, salinity, turbidity, and suspended solids. Of particular concern are the unanswered questions involving possible increased turbidities along the eastern shore, possible alteration of the flushing characteristic of Mobile Bay, possible increased frequency of closure of shellfish harvesting of Bon Secour Bay, and a decrease in the waste assimilative capacity within the Mobile River.

3 It is noted that under the Brookley Expansion Area and Gulf Disposal Plan No. 1 (modified), new work material from the lower Bay and entrance channels would be transported with dump scows to the Gulf of Mexico for deep water disposal. While this office is in agreement with gulf disposal of dredged material, it is our opinion that before a site is chosen, as a minimum, studies should be conducted to analyze those factors as enumerated in Appendix 1, page 24 of the DEIS. In addition to these, it is felt that sufficient data for the determination of long-range effects of disposal on bottoms should be collected; hydrodynamics, to include water circulation, sediment transport and long-term fate of dredged materials should be studied, and biological surveys of bottoms addressing location of prime harvest areas, migratory routes, spawning and nursery areas should be made. After careful consideration of accumulated data, the most appropriate gulf disposal site could then be determined.

2. Further model studies would be conducted as a part of post authorization studies. Data collected from construction of the Theodore Ship Channel project will be utilized to update the physical model.

3. The Environmental Protection Agency is responsible for designation of an offshore disposal area. As discussed in the EIS, site designation would be accomplished in accordance with the 11 January 1977 Ocean Dumping Criteria developed pursuant to the Marine Protection, Research, and Sanctuaries Act of 1972, PL 92-534. The guidelines require that sufficient studies be conducted to determine an environmentally acceptable disposal area. The EPA has concurred in our selection of potential offshore disposal areas. Detailed site specific evaluations would be conducted during post authorization studies. We are maintaining coordination with the EPA relative to the site designation requirements and procedures are being established for further disposal site evaluations.

Based on the materials submitted and on the above discussion, it is the opinion of this office that the Gulf Disposal Plan alternative as discussed in the June 1979, Draft Technical Report is the most appropriate choice. This plan allows for the study and possible implementation of the proposed channel modifications, 4 provides for long-term increased biological productivity and water quality in the Bay due to the discontinued practice of open water disposal of maintenance material in the Bay, and is consistent with the scope and planning objectives of the on-going dredged material disposal study concerning the Mississippi Sound and adjacent areas.

Should you have any questions on this or related matters, please do not hesitate to contact Mr. Robert W. Cooner of this office.

Sincerely,

James W. Warr
Director
Water Improvement Commission

JWW-RWC/gdo

cc: Mr. Tod Gail, AWIC
Mobile Office

4. The comment is acknowledged. No response is necessary.

STATE OF ALABAMA

FOB JAMES
GOVERNOR

BOBBY A. DAVIS
DIRECTOR

OFFICE OF STATE PLANNING AND FEDERAL PROGRAMS

3734 ATLANTA HIGHWAY
MONTGOMERY, ALABAMA 36130
(205) 832-6963/6964

October 1, 1979

TO: Mr. Lawrence R. Green
Chief, Planning Division
Department of the Army
Mobile District, Corps of Engineers
Post Office Box 2288
Mobile, Alabama 36628

FROM: Michael R. Amos, Administrator
State Clearinghouse
State Planning Division

SUBJECT: DRAFT ENVIRONMENTAL IMPACT STATEMENT

Applicant: Mobile Corps of Engineers

Project: Draft Environmental Impact Statement for a Technical Report on Mobile Harbor

State Clearinghouse Control Number: OSP-020-79

The Draft Environmental Impact Statement for the above project has been reviewed by the appropriate State agencies in accordance with Office of Management and Budget Circular A-95, Revised.

The comments received from the reviewing agencies are attached.

Please contact us if we may be of further assistance. Correspondence regarding this proposal should refer to the assigned Clearinghouse Number.

A-95/05
Attachments
Agencies contacted for comment.
South Alabama Regional Planning Commission
Historical Commission
Geological Survey of Alabama
State Planning - Stevenson

REQUEST FOR REVIEW OF PROJECT NOTIFICATION

TO: Mr. Richard D. Pruitt
South Ala Reg Plng Commission

CH Number: OSP-020-79

Applicant: Mobile Corps of Engineers

Program: Draft Environmental Impact Statement for a Technical Report on Mobile Harbor

DATE: July 25, 1979

Return Prior to: ASAP
Date

Please review the attached Environmental Impact Statement and indicate your comment with respect to any environmental impact involved.

Comments: (Please check one block.)

No comment (Environmental Impact Statement is in order and no additional comments are offered.)

Comments (Elaborate below.)

Comment here:

Signature

Please Return Original to:

Office of State Planning
and Federal Programs
3734 Atlanta Highway
Montgomery, Alabama 36130

FORM CH-2a
8/71

SOUTH ALABAMA
REGIONAL PLANNING COMMISSION

INTERNATIONAL TRADE CENTER
250 N. WATER STREET

MAIN OFFICE 205 433 6541
AREA AGENCY ON AGING
205 431 7417

MAILING ADDRESS
P. O. BOX 1668
MOBILE, ALABAMA 36601

RICHARD D. PRUITT
EXECUTIVE DIRECTOR

NORMAN J. WALTON, CHAIRMAN
NEIL LAUDER, GENERAL VICE-CHAIRMAN
J. C. DAVIS, JR., PROJECT REVIEW VICE-CHAIRMAN
W. M. MCGOUGH, SECRETARY
DEVON WIGGINS, TREASURER

September 25, 1979

Mr. Lawrence R. Green
Chief, Planning Division
Department of the Army
Mobile District Corps of Engineers
P. O. Box 2288
Mobile, Alabama 36628

Re: Technical Report on Mobile Harbor, Draft

Dear Mr. Green:

In accordance with the Office of Management and Budget Circular, A-95, revised, the South Alabama Regional Planning Commission, Regional Clearinghouse, has reviewed the above referenced application. This review indicated that the proposed application is consistent with current areawide plans, programs, and objectives. Accordingly, the Commission concurs with the application and recommends that it be approved.

If we can be of further assistance to you concerning this or other programs that your agency sponsors, please advise.

Sincerely,

Don Pruitt

Don Pruitt
Executive Director

RDP:js

cc: Mike Amos, Office of State Planning and Federal Programs
SARPC File No. 79-199-1

REQUEST FOR REVIEW OF PROJECT NOTIFICATION

TO: Mr. Tom Joiner
Geological Survey of Alabama

CH Number: OSP-020-79

Applicant: Mobile Corps of Engineers

Program: Draft Environmental Impact Statement for a Technical Report on Mobile Harbor

DATE: July 25, 1979

Return Prior to: ASAP
Date

Please review the attached Environmental Impact Statement and indicate your comment with respect to any environmental impact involved.

Comments: (Please check one block.)

No comment (Environmental Impact Statement is in order and no additional comments are offered.)

X Comments (Elaborate below.)

Comment here:

The only obvious long-term effect on the water resources of this area from this proposed project would be the increased salt wedge intrusion of the Mobile River. The Corps of Engineers is aware of this effect and suggests in the proposal that additional modeling tests are needed to determine the full ramifications of such a change. We concur completely in this approach.

Signature
Thomas J. Joiner, State Geologist

Please Return Original to:

Office of State Planning
and Federal Programs
3734 Atlanta Highway
Montgomery, Alabama 36130

FORM CH-2a
8/71

REQUEST FOR REVIEW OF PROJECT NOTIFICATION

TO: Dr. A. Russell Mortensen
Historical Commission

CH Number: OSP-020-79

Applicant: Mobile Corps of Engineers

Program: Draft Environmental Impact Statement for a Technical Report on Mobile Harbor

DATE: July 25, 1979

Return Prior to: ASAP
Date

Please review the attached Environmental Impact Statement and indicate your comment with respect to any environmental impact involved.

Comments: (Please check one block.)

No comment (Environmental Impact Statement is in order and no additional comments are offered.)

Comments (Elaborate below.)

Comment here:

The Alabama Historical Commission has reviewed the above referenced Draft Environmental Impact Statement and finds that it inadequately addresses the protection of cultural resources. The Draft should include plans for a full scale magnetometer survey of Mobile Harbor followed by an underwater investigation of potentially significant avonilier recorded. The Draft should also include plans for a cultural resource assessment of all land disturbance activities associated with improvements to Mobile Harbor

RECEIVED
AUG 21 1979
Alabama State Clearinghouse

Jeanette E. Barnett
Signature

Please Return Original to:

Office of State Planning
and Federal Programs
3734 Atlanta Highway
Montgomery, Alabama 36130

FORM CH-2a
8/71

RESPONSE TO ALABAMA OFFICE OF STATE PLANNING AND FEDERAL PROGRAMS

The specific agency comments are acknowledged. No response is necessary except for comments made by the Alabama Historical Commission. We agree that further cultural resources surveys are necessary. However, there will be sufficient time to conduct the surveys during post authorization studies. These efforts will be fully coordinated with the Alabama Historical Commission.

Mobile County Health Department

P. O. BOX 2867 MOBILE, ALABAMA 36601 (205) 690-8158

Alfred R Stumpe, M.D., M.P.H.
Health Officer

L. Gerald Lightsey, M.P.H.
Assistant Health Officer

August 21, 1979

Department of the Army
Mobile District, Corps of Engineers
Attn: SAMPD-EE
P. O. Box 2283
Mobile, AL 36628

Gentlemen:

Reference is made to your letter dated July 2, 1979, requesting comments on the Draft Environmental Impact Statement (DEIS), concerning channel improvements for Mobile Harbor, Alabama. Our recommendations for changes have been incorporated in a rewrite of the affected parts of the report, and are enclosed.

If you have any questions regarding these comments, please contact Mr. Danny Herrin at (205) 690-8112.

Sincerely,

Alfred R. Stumpe, M.D., M.P.H.
Health Officer

ARS/pag

Attachment

Page B-81 - AIR QUALITY.

114. Remains unchanged.

115. An extensive air quality monitoring program has been conducted since 1972 by the Mobile County Health Department, Division of Air Pollution Control. A network of 9 ambient monitoring stations contributing data to the program, operates in Mobile County. Emphasis of the program has been placed primarily on suspended particulate matter, sulfur dioxide and photochemical oxidants values since these have been recognized as the primary concern for Mobile County in attainment and maintenance of Federal ambient air quality standards. Mobile County is an Air Quality Maintenance Area for particulates.

116. Annual trends for area-wide total suspended particulate levels in suburban, urban and composite categories are illustrated in Figure B-17 for the interval 1972 through 1977. Values for urban stations correspond to those in the immediate Mobile area; the remaining stations are designated suburban. This data shows that particulate levels for Mobile County have declined significantly since 1972. Some urban stations exceeded the primary ambient air quality standard, therefore, a section of downtown Mobile is designated as not meeting the primary standard for total suspended particulates. Sulfur dioxide was monitored continuously through 1977 at an urban and suburban station. For both stations, levels were lower than the secondary national ambient air quality standard.

117. Data was obtained for photochemical oxidants at two suburban stations during 1978. It was found that the 1-hour oxidant standard of 160 ug/m^3 was exceeded 134 times. Mobile County is currently listed as not meeting the primary national ambient air quality standards for photochemical oxidants.

Page D-87 - Air Pollution.

146. Remains unchanged.

Page 11 - Appendix 1.

2.20 Air Quality. Air pollution exists in Mobile County to the point of violating ambient air quality standards for photochemical oxidants and particulates. The entire county of Mobile is a non-attainment area for photochemical oxidants, that is ozone, and one sub-county area is non-attainment for total suspended particulates. The "downtown area" of Mobile violates the primary total suspended particulates standard. Photochemical oxidants are the product of a complex series of chemical reactions involving oxides of nitrogen, hydrocarbons, and sunlight. A significant portion of the photochemical oxidants within Mobile County are transported from other areas by wind. Within Mobile County, the main source of hydrocarbons is automobile exhaust and petroleum handling operations; the main source of oxides of nitrogen are automobile exhaust and other combustion sources Additional coverage of air quality can be found in paragraphs 114 through 117 within Section B of the Survey Report.

Page 36 - Appendix 1.

4.56 Remains unchanged. This is a duplication of page D-87, paragraph 146, Air Pollution.

RESPONSE TO THE MOBILE COUNTY HEALTH DEPARTMENT

The Technical Report and EIS have been rewritten to incorporate your recommended changes.

INDUSTRIAL DEVELOPMENT BOARD OF THE CITY OF MOBILE
MOBILE, ALABAMA

REPLY TO:
P. O. BOX 2187

July 31, 1979

U. S. Army Engineer
District, Mobile
Attn: Environment and
Resources Branch
Post Office Box 2288
Mobile, Alabama 36628

Re: Draft Environmental Impact Statement (DEIS) and Draft Technical Report Concerning Channel Improvements for Mobile Harbor Alabama

Dear Sir:

We have reviewed the referenced materials furnished by you regarding the improvement of the Mobile Harbor which has been under study for some twelve years. This Board has long been interested in the economic and industrial development of the Mobile area. It is a land owner in Mobile County and is greatly concerned with the enrichment of quality of life for the people of Mobile.

A review of the Draft Technical Report and the DEIS substantiate to us the fact that while there will be primary and secondary impacts on the environment which may be unwanted, these impacts would be more than offset by the direct transportation savings which would occur through the increased use of larger, more economical vessels and land enhancement which would develop from the creation of fast lands adjacent to the Mobile Area Industrial Complex.

It would seem that this detailed technical report would clearly justify the adoption of a plan which would provide for the Brookley Expansion Area and for Gulf Disposal. The question of whether to adopt Plan No. 1 as modified or Plan No. 2 would seem to devolve into the relative value of having fast land of approximately 1,700 acres as opposed to fast land of approximately 1,000 acres at Brookley. This Board suggests that the additional land will prove to be of value and should be developed as part of this Harbor Improvement Project.

RESPONSE TO THE INDUSTRIAL DEVELOPMENT BOARD OF THE CITY OF MOBILE

The comments are acknowledged. No response is necessary.

The environmental concerns expressed in the DEIS must, and should, be clearly and adequately addressed, but must be addressed in the context of the best interest of all parties.

The Corps of Engineers is to be commended for developing a comprehensive, competent study of this complex question.

Sincerely,

THE INDUSTRIAL DEVELOPMENT BOARD
OF THE CITY OF MOBILE, ALABAMA

E. FRANK SCHMIDT
President

RESPONSE TO INDUSTRIAL DEVELOPMENT BOARD OF THE CITY OF MOBILE

The comments are acknowledged. No further response is necessary.

STATE
OF
ALABAMA

FOB JAMES
GOVERNOR

BOBBY A. DAVIS
DIRECTOR

OFFICE OF STATE PLANNING
AND FEDERAL PROGRAMS

3734 ATLANTA HIGHWAY
MONTGOMERY, ALABAMA 36130
(205) 832-6963/6964

August 22, 1979

Colonel Robert H. Ryan
District Engineer
Mobile District
Corps of Engineers
P. O. Box 2288
Mobile, Alabama 36628

Dear Colonel Ryan:

This Office has completed its review of [illegible] submitted Corps of Engineers report "Technical Report on Mobi[illegible]bama." We find the report to be comprehensive in the eva[illegible] alternatives identified and considered. This Office concurs [illegible] with the selected plan identified in the study. In order for the Port o[illegible] to remain a viable outlet for export and import to world markets the modifications suggested by this report are necessary.

We recommend the selected plan be forwarded for further action and consideration. This Office also suggests continued coordination and cooperation with the Alabama State Docks Department.

If we can be of further assistance in this very important matter, please let us know.

Sincerely,

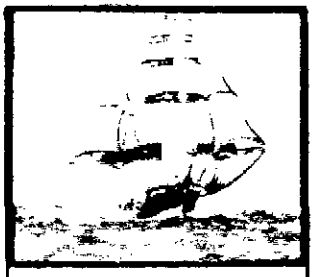
Bobby A. Davis
Director

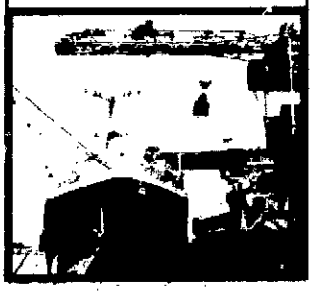
BAD/ws:b

RESPONSE TO ALABAMA OFFICE OF STATE PLANNING AND FEDERAL PROGRAMS

The comments are acknowledged, no response is necessary.

MOBILE UNITED





*Committee Chairmen
†Committee Co-Chairmen

October 5, 1979

Colonel Robert H. Ryan
District Engineer
U. S. Army
Corps of Engineers
P. O. Box 2288
Mobile, Alabama 36628

Dear Colonel Ryan:

I have enclosed a report supporting in general the improvements to the Mobile Harbor as outlined in your Environmental Impact Statement.

This was unanimously passed by the Mobile United at its general membership meeting held October 2, 1979.

We are looking forward to your active participation as a member of Mobile United.

Sincerely,

R. J. PEARSON, JR.
Executive Director

Enclosure

RJPjr/nsp

71 St. Michael St., P. O. Box 1243, Mobile, Ala. 36601 Telephone (205) 432-1638

RESPONSE TO MOBILE UNITED

The support of Mobile United is acknowledged. Responses to specific comments are contained on following pages.

STATEMENT
BY
SUB-COMMITTEE OF THE JOINT ECONOMIC DEVELOPMENT/
NATURAL RESOURCES COMMITTEES
OF
MOBILE UNITED

concerning the Technical Report
on
Mobile Harbor Alabama

by
U.S. Army Corps of Engineers
dated
July 2, 1979

This report is a statement reflecting, as accurately as possible, the opinions of those attending meetings of the Joint Economic/ Natural Resources Committee and its Sub-committee. At these meetings the merits of the four plans presented by the Corps were discussed.

This statement is divided into three parts as follows:

1. Those items on which there is full agreement
2. Those items on which there is conditional agreement
3. Those items on which there is not substantial agreement.

Item 1. Those items on which there is full agreement

All parties agree that the following elements of the four plans presented should be carried out and perhaps expedited.

a. widening of the entrance channel

b. widening of the main ship channel

c. provide a turning basin in the McDuffie Island Area

d. provide an anchorage for ships in the upper bay

RESPONSE TO STATEMENT BY MOBILE UNITED, Page 1

1. All of the listed features are included in the recommended plan. Recommended early action items include channel widening in the upper bay, a turning and anchorage area at the head of the bay, and a passing lane in the central area of the bay.

Item 2. Those items on which there is conditional agreement

(a) dispcsal of new spoil and maintenance spoil to the Gulf

There appears to be strong reason to suppose that disposal of new and maintenance spoil to the Gulf in future projects is the method of choice. It is highly unlikely that open water (Bay) disposal of new or maintenence spoil will find any or very little support. The single exception to this is the Brookley Plan for new spoil which is discussed more fully in section 3. The above initial statement, however, is completely conditional on the necessary biological testing of the Gulf disposal sites for adverse effects. Short term effects ie. one or two years to full recovery would not be objectionable, but permanent adverse effects on the biological populations would not be acceptable. It is recommended that a test or tests on this disposal method be initiated in timely fashion to decide best locations and prevent adverse effects before final decisions on the overall project become necessary.

2

(b) Deepening of the Channels to 55'

There is general agreement that deepening of the channels should be undertaken when this becomes necessary to protect our competitive position in world trade, and to move bulk cargoes basic to the economic development of Alabama, such as coal, iron, and oil. This statement, however, is conditional on

3

1. dredge spoil is deposited in an environmentally sound location in the offshore Gulf of Mexico.

4

2. Coastal resources of the Bay including oyster reefs will be monitored before, during, and after completion of the project,

2. See response to EPA Comment Number 8 and Alabama Water Improvement Commissions Comment Number 3.

3. See response to your Comment Number 2.

4. Post authorization studies will be conducted to more specifically delineate possible impacts of the modified channel for the purpose of developing plans which will include features for protection of the oyster reefs and other natural resources of the bay. Further coordination with the environmental agencies and other interests will be necessary in order to accomplish this goal.

and the Corps will ensure that the present levels of coastal resourecs and plants and animals are maintained in the Bay.

3. The Corps will use sand from the entrance channel to restore eroded beaches on Dauphin Island and Fort Morgan peninsulas.

4. Ridges along the upper bay ship channel will be removed and the material will be used for erosion protection along the western shore of Mobile Bay, as well as to fill depressions in Mobile Bay that cause stratification of bay waters and oxygen depletion.

5. Additional oyster beds will be established in Bon Secour Bay and other areas of the bay.

6. Openings in the causeway can be created to improve the circulation in the bay north of U.S. Highway 90 by restoring tidal action to Chacaloochee and Polecat Bays, and thereby minimizing the effect of the salt wedge on circulation patterns in the bay. It is recommended that tests with the Mobile Bay Model be used to guide decisions on ways to minimize the salt wedge effects of deepening the channel to 55'.

Item 3. Those items on which there is not substantial agreement

The items are (a) Japanese Industry Subsidy

(b) Brookley Plan

(a) Japanese Industry

There is a minority opinion that shipments of coal to Japan are not in the short or long-term national interest, as it amounts to making coal supplies cheaper to Japan and uses up non-renewable fossil fuels that America may well need in the future. This is a very large question of national policy that most participants feel

5. The Corps of Engineers current maintenance practice allows for disposal of the sandy bar channel material for beach nourishment when equipment is available. This would continue to be the policy for future maintenance of the channel. The use of new work material from the entrance channel for beach nourishment will be further investigated during post authorization studies.

6. All of your recommendations will be carried forward into post authorization studies.

should be addressed in the Natural Energy Policy which Congress has so-far, failed to formulate. In effect we would be preempting Congress in this question if we take a position at this time.

(b) Brookley Plan

This plan involves the use of new spoil to build dikes for eventually creating 1700 acres of new land for expansion of the State docks All are agreed that provision for expansion of the State Docks is essential but opinions differ on how this is to be accomplished. Some would use the land in the present Brookley Industrial Park in place of creating new land. This would, in their opinion, leave the unfilled area for a possible barge assembly area when this becomes necessary.

The other side of this discussion maintains that there is no feasible alternate plan to the one proposed to fill in at Brookley Because of the wide discrepancy in views here it is suggested that Mobile United press for further study of alternates to the present Brookley plan and also press for initiation of state and action so as to be prepared properly for the completion of the Tenn-Tom project including State Docks expansion and coordination of State, City and County planning in support of the State Docks expansion.

If further complete study of this question results in the Brookley Plan as being the only feasible alternate plan then Mobile United would support the Corps in the Brookley Plan for the docks expansion.

Appendix 3
46

7. See response to the Department of the Interior's Comment Number 3.

LEAGUE OF WOMEN VOTERS
OF BALDWIN COUNTY
BOX 937
FAIRHOPE, ALABAMA 36532

August 29, 1979

U.S. Army Engineer Distr., Mobile
Corps of Engineers
Mobile, Alabama

Subject: Draft, Mobile Harbor, June 1979

Dear Sirs:

The Baldwin County League of Women Voters has worked for many years in the area of water quality, specifically the enhancement of water quality in Mobile Bay.

1 While many studies have been conducted by the U.S. Engineers, 208 Water Quality Program, E.P.A. and others over a number of years, Mobile Bay is still a stressed body of water. Any harbor expandion and channel enlargement should be conducted in such a manner that the Bay will not be further stressed. There are areas in the Bay that do not meet the water classification standards and further, the prospects do not look encouraging that they ever will if we continue to employ such practices as open water disposal.

This Technical report lacks basic research information upon which to base a decision as to the best choice of plan for harbor improvements and channel widening. More information is needed regarding flushing action, various man made chemistry systems, sediment loads with respect to submerged aquatic vegetation.

2 Before any further irreversible alterations a re made to Mobile Bay, integrated studies should be done to provide a predictive capacity to determine the bearing load of pollutants and silt in rela tion to the effec ts on the ecosystem, on organisms and on human health. More research is needed in the area of Virology and Bacteriology with respect to resuspended dredge material and other pollutants.

Very truly yours,
Marie Herman
Marie Herman, President
Baldwin Co. LWV

RESPONSE TO LEAGUE OF WOMEN VOTERS OF BALDWIN COUNTY

1. Open water disposal under the recommended plan would not be expected to result in violation of State water quality standards.

2. We believe the environmental studies referenced and discussed in the EIS, and the proposed post authorization studies are sufficient for project purposes. Your other referenced studies would be beyond the scope of the EIS.

OTHER PERTINENT CORRESPONDENCE

UNITED STATES DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE
200 EAST PASCAGOULA STREET, SUITE 300
JACKSON, MISSISSIPPI 39201
October 14, 1980

Colonel Robert H. Ryan
District Engineer
Mobile District, Corps of Engineers
P.O. Box 2288
Mobile, Alabama 36628

Dear Colonel Ryan:

This is in response to a letter dated October 1, 1980, from your office requesting a list of endangered, threatened, or proposed species that may occur in the area of the Mobile Harbor Ship Channel Project (Log no. 4-3-81-008).

Although several Federally listed species may occur within the project area, they would not be affected by this proposed activity.

Please advise if we can provide additional assistance.

Sincerely,

Gary L. Hickman
Area Manager

cc: RD, FWS, Atlanta, Georgia (ARD-FA/SE)
ES, FWS, Bay St. Louis, Mississippi
Department of Conservation and Natural Resources, Montgomery, Alabama

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IV
345 COURTLAND STREET
ATLANTA, GEORGIA 30308

MAR 11 1980

REF: 4E-FA

Colonel Robert H. Ryan
District Engineer
U. S. Army, Corps of Engineers
P. O. Box 2288
Mobile, Alabama 36628

Dear Colonel Ryan:

In your letter dated October 4, 1979, you requested a statement of concurrence on the availability of a Gulf of Mexico dredge disposal site within reasonable distance to Mobile Bay. It is our understanding that the 16-mile limit shown on drawing D-14 of your draft report represents the proposed disposal area.

As you are aware, the information you submitted concerning this disposal site was furnished to our Washington office for review and on January 7, 1980, we met in your offices to discuss their findings. From this meeting and memorandum dated January 25 from T. A. Wastler, Chief, Marine Protection Branch, EPA, Washington, we are able to concur in the selection of this proposed site for further study.

The supplemental information prepared by TerEco Corporation for the Mobile District is adequate for site evaluation purposes and disposal area recommendation. This recommended disposal area should next be investigated in detail on a site specific basis. The inclusion of the site environmental assessment data to be gathered during this site specific investigation in the post authorization phase EIS supplemental will enable EPA to meets its voluntary EIS requirements for final site designation.

A copy of the above mentioned memorandum is attached for your information and use.

Sincerely yours,

Rebecca Hanmer

Rebecca W. Hanmer
Regional Administrator

Enclosure

cc: T. A. Wastler
Marine Protection Branch

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON D C 20460

MEMORANDUM

SUBJECT: Mobile Harbor Project - Disposal Site Designation

FROM: T. A. Wastler, Chief
Marine Protection Branch (WH-546)

TO: Howard D. Zeller, Deputy Director
Enforcement Division, Region IV

This office has reviewed the Draft Environmmental Impact Statement (DEIS) and supplemental environmental data on the subject proposed project and provide herewith our comments on the disposal site information. As we agreed at the meeting in Mobile, these comments may be incorporated into your overall comments on the DEIS.

The supplemental information prepared by TerEco Corporation for the Mobile District is very adequate for site evaluation purposes and disposal area recommendations. These recommended disposal areas should next be site specifically investigated in detail according to guidelines contained in Section 228.13 of the January 11, 1977 Ocean Dumping Regulations and Criteria supplemented by the forthcoming Guideline for baseline Surveys of Dredged Material Ocean Disposal Sites to be published by the Corps Waterways Experiment Station. These surveys will provide sufficient environmental assessment on the disposal site that this office will be able to designate the site in the FEDERAL REGISTER in accordance with Section 228.4.

The conduct of these baselines surveys during the Pre Authorization and Post Authorization phase of the project would be in the timeframe that we could designate the site prior to the construction phase when dredging and disposal would commence. Performance of these baseline surveys during these phases, and inclusion of the site environmental assessment data in the Post Authorization Phase EIS Supplemental would enable us to meet our voluntary EIS requirements for site designation and also be in line with the Council of Environmental Quality's (CEQ's) EIS guidelines.

As we have in the past, we will maintain contact with the District personnel and be available to them for advice or consultation on any disposal site matters.

ALABAMA STATE DOCKS DEPARTMENT
MOBILE

Robert M. Hope
Director

P. O. Box 1588
MOBILE, AL. 36601

May 17, 1979

Col. Charlie L. Blalock
District Engineer
U. S. Army Corps of Engineers
P. O. Box 2288
Mobile, Alabama 36628

Dear Col. Blalock:

This letter is in response to recent discussions with your staff regarding the Corps' study of modifications to the existing Federal navigation project for Mobile River.

We understand that the benefits that may be achieved from improvement of Mobile Harbor will occur primarily from the bulk movements of coal, ores and grains. We further understand that the present capacities and planned locations for future State-related public terminals will have a significant bearing upon the extent of benefits realized. In this respect, I would like to take this opportunity to relate to you the present status of the State's bulk facilities and the established long-range plans for the provision of additional facilities as they are required.

The Alabama State Docks' present coal exporting terminal was constructed on State property near the mouth of Mobile River on the southern portion of McDuffie Island in 1975. This facility was constructed with an initial throughput capacity of about 4.8 million tons annually and is presently being expanded to handle about 10.2 million tons annually. Future development plans provide for triple the original capacity. The McDuffie terminal is a modern facility located below the harbor's tunnel and bridge restrictions and has been planned with sufficient expansion area to fully meet all foreseeable coal export needs through the Port of Mobile.

The Alabama State Docks' existing public ore handling facility is located at the junction of Three Mile Creek and Mobile River. This facility was initially constructed in 1927. Through the years the facility has been renovated and modernized and

presently has a practical annual throughput capacity of from 5 to 6 million tons. The facility is presently operating very close to this capacity. The Mobile River tunnels effectively limit navigable water depths to this terminal to the present 40 feet. This constraint along with limited access and storage seriously limits the potential for any significant additional expansions of this terminal's capability. In view of these constraints the State Docks' development plan has identified a site on the north end of McDuffie Island for the construction of an additional ore terminal. Construction of such a terminal is presently included in the State's Phase 1 near term development program. The State has recently acquired 143 acres of additional adjoining property at a cost of $11,000,000 to assure adequate storages, expansion and backup space for this new facility.

The State's public grain facility is located on Mobile River above the existing tunnels. This facility is presently being modernized and expanded. Upon completion of the ongoing program in 1980, the throughput capacity of the grain facility is expected to be expanded from its present 2.5 million tons to about 3½ million tons annually. Annual throughput of grains by our grain facility in recent years, with only a few exceptions, has been determined by the storage capacity of our facility. On the basis of contacts and negotiations presently underway with grain shippers now using our facility and new interests, we expect this condition to essentially continue and the expanded capacity (3½ million tons) of our facility to again be reached by 1981. With adequate funds, we feel the existing grain facility could be expanded to about a 10.5 million tons annually. Due to the water depth limitations and access and congestion problems at the present facility site, its expansion potential significantly beyond that presently being installed will be seriously limited. In view of these limitations the State's development plan has identified a site in the vicinity of the Garrows Bend-Brookley Industrial Complex for the construction of future grain facilities. These facilities are included in the State's Phase 2 intermediate term development program. However, the State has already initiated several property transactions and negotiations to facilitate these developments when the need arises.

The above programs have been planned by the State of Alabama to meet the Port of Mobile's anticipated dry bulk shipping

needs and are being actively pursued by the Alabama State Docks Department. The necessity of the new facilities to be located below the tunnels is envisioned regardless of Federal channel improvements. However, full realization of maximum benefits from these facilities through use of larger vessels will not be possible without enlarged channels. Accordingly, the Alabama State Docks fully supports the plans presently being considered by the Corps of Engineers to provide a deeper channel with additional turning and anchorage areas in Mobile Harbor.

Yours very truly,

R. M. Hope

R. M. Hope

RMH/mh

ALABAMA STATE DOCKS DEPARTMENT
MOBILE

Reuben E. Wheelis
Director

P.O. Box 1588
MOBILE, ALABAMA

November 20, 1975

Colonel Drake Wilson
District Engineer
Department of the Army
Mobile District
Corps of Engineers
P. O. Box 2288
Mobile, AL 36628

Dear Colonel Wilson:

Due to the size of vessels now calling at the Port of Mobile, we urgently request that consideration be given to increasing the width of the Mobile Ship Channel from Beacon #38 to Beacon #44 from 400 feet wide to 600 feet wide.

A case in point, we had a vessel Sunday, November 16, 1975, drawing 40 feet. This vessel was 830 feet long by 128 feet beam. It was necessary to order three tugs to meet the vessel at Beacon #38 to assist the vessel in navigating this stretch of the channel.

This vessel was loaded with 70,600 long tons of iron ore destined for Birmingham steel mills.

The Bar Pilots have constantly reminded me that this is a dangerous stretch of the channel. In view of the increasing number of the larger vessels calling at the Port of Mobile and the increasing activity of ships at the McDuffie Terminals which causes further restrictions on large vessels navigating through this area, widening of the channel from Beacon #38 to Beacon #44 is necessary for safe passage of the larger vessels.

We will appreciate your giving this matter your immediate attention.

Sincerely,

Reuben E. Wheelis

bsg
cc: Capt. D. J. McColl
Mobile Bar Pilots Association
P. O. Box 831, Mobile, AL 36601

ALABAMA STATE DOCKS DEPARTMENT

MOBILE

Reuben E. Wheelis
Director

P.O. Box 1588
MOBILE, ALABAMA

October 6, 1975

Colonel Drake Wilson
District Engineer
Department of The Army
Mobile District, Corps of Engineers
P. O. Box 2288
Mobile, Alabama 36628

Dear Drake:

The urgency for immediate construction of anchorage areas in Mobile Harbor has been pointedly brought to the attention of shipping circles as a result of two recent events:

(a) Hurricane ELOUISE which found some 22 ships in port, and

(b) The return in the past few days of a number of ships back to the Gulf for anchorage while awaiting berths at the State Docks facilities.

It is without question that had Hurricane ELOUISE continued on her predicted course, with 22 vessels in port there would have been utter chaos and enormous damage to both shipping and facilities as a result of dockside berthing.

It is academic that the cost of shipping is magnified when a vessel is required to drop anchor in the Gulf some 35 miles from the port's loading berths. For a vessel to have come into the harbor and then have been required to return to the Gulf is even worse.

I respectfully urge that, in the public interest, the matter of adequate anchorage in Mobile Harbor be severed from any

other project to which it may be attached, and that special and prompt consideration be given to the processing of the anchorage proposals as a special case for immediate approval and construction.

Thank you for your continued support.

Sincerely,

Reuben E. Wheelis

REW:lb

ALABAMA STATE DOCKS DEPARTMENT AN AGENCY OF THE STATE OF ALABAMA
TWX 810 741 7748
P.O.BOX 1588
MOBILE,ALABAMA 36601

November 1, 1974

Colonel Drake Wilson
District Engineer
U. S. Corps of Engineers
P. O. Box 2288
Mobile, Alabama 36628

Dear Colonel Wilson:

I have read with interest and concern the letter dated October 25, 1974, from the United States Environmental Protection Agency, Region IV, addressed to you, their reference 4AE:HDZ, and would like to refer specifically to the second paragraph of Page 2 of this letter.

As you are aware from previous discussions, the Department is interested in considering Area 2 as a possible location for future expansion of the Department's terminal facilities. It is our feeling that this is a most desirable area particularly for handling of large ships, such as Lash and Seabee types, and for large container ships operated by other carriers. Also, we feel that this area is desirable for future use in handling of ships with drafts exceeding 40 feet. So you see, our interest in this area is two-fold - expansion and receiving of maintenance spoil material which is suitable for use as industrial site fill material.

The Department would like to pursue a course of development in this area which is most logical. Therefore, it would be helpful to us in making this determination if the Corps could, within the framework of their authority, assist in making any studies in this area, including use of the hydraulic model at Vicksburg, which would give useful information concerning alternate schemes for development in this area.

Please have the proper people on your staff look into this matter and advise us if the Corps can assist in any way in helping us determine alternate schemes which would be least harmful to the environment, most useful, and at the same time best utilize the area for Port expansion.

Very truly yours,

W. H. Black, Jr.
Chief Engineer

WHB/md

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IV
1421 PEACHTREE ST., N. E.
ATLANTA, GEORGIA 30309

RE: 4AE:HDZ

OCT 25 1974

Colonel Drake Wilson, District Engineer
U. S. Army Engineer District, Mobile
P. O. Box 2288
Mobile, Alabama 36628

Dear Colonel Wilson:

Reference is made to our letter of September 6, 1974, and our comments on the draft environmental impact statement on the Mobile Harbor maintenance dredging project and the recent field reconnaissance and meetings held with you and members of your staff on October 7, 8 and 9, 1974, to inspect available dredge spoil disposal sites.

Based on the discussions held and our field investigations of the eight sites proposed and the pressing need to establish spoil disposal areas for immediate Harbor dredging, we reluctantly concur with the use of area I-B, known as Pinto Island, including Pinto Pass; area III in its entirety; and area I-A, known as Blakeley Island, modified to include continued use of the existing spoil area south of the Alcoa Aluminum Company dikes and a portion of the area to the north of the Alcoa dikes. The designated northern area on Blakeley Island would generally include an area with dikes extending easterly from the northern Alcoa dike to the point where it intersects with the old spoil dike, extending north following the old dike line to the old east-west dike at the northern extent and then to the existing Corps dike running north and south to the northern bounds of the proposed spoil area, as shown on page 35 of the draft environmental impact statement dated July 1974. The attached map roughly delineates the areas described and is intended to only generally outline the disposal site. It is our understanding that these sites will be adequate for spoil disposal for approximately 12 years.

Alternative IV presently owned by State Docks, areas V, VI, and VII, the Jacintoport area, and area VIII, the upper Blakeley Island area, are considered to be too environmentally valuable to be utilized as spoil disposal sites now or in the future.

Area II, located southwesterly from McDuffie Island, adjacent to Brookley Air Force Base, is considered to be an area of environmental value and unsuitable for spoiling at this time. We do recommend, however, that further studies be made on this area, including hydraulic modeling, to determine the effects of circulation in the McDuffie Island area as well as base line biological studies to quantify resource values and the effect of previous open water spoiling at this site. Use of this site for spoiling cannot be considered until such time as an adequate data base to determine the full environmental impact is developed.

You should be aware that approval of the areas indicated above for spoil deposition was agreed to as representing the least environmentally damaging alternative to the Mobile Bay ecosystem. Approval as such is based on the assumption that these areas will be used to the fullest capacity for spoil disposal, and we would encourage early attention toward engineering design which will provide for maximum dike elevation and long-term storage capacity. In accordance with the discussion at the meeting on October 9, we again strongly urge that you continue and, if necessary, expand on-going investigations and studies of other techniques for disposal of dredged spoil. With the proposed expansion of the Port facilities and the continued need for areas suitable for spoil disposal, it is imperative that methods and technology be developed concurrently with the use of the existing areas so that future problems are resolved without losses of additional environmentally valuable areas. We would welcome the opportunity to participate with you in these studies to the extent possible to completely explore the technology and methods available for final resolution of this problem.

We appreciate the facilities provided to EPA for the field reconnaissance. The approach to this problem through a coordinated effort of all of the State and Federal agencies involved is desirable and effective for resolution of problems of this nature.

Should you require any additional clarification of the areas described or any further discussion, please contact either Arthur G. Linton or Howard Zeller in the Enforcement Division.

Sincerely,

John C. White

for Jack E. Ravan
Regional Administrator

Enclosure

cc: Mr. James Warr, Chief Administrative Officer
Alabama Water Improvement Commission

Mr. Ken Black, Regional Director
Fish and Wildlife Service

Mr. William H. Stevenson, Regional Director
National Marine Fisheries Service

Mr. William Black, Chief Engineer
Alabama State Docks Department

Mr. Claude D. Kelley, Commissioner
Alabama Department of Conservation and
Natural Resources

UNIVERSITY of SOUTH ALABAMA

OFFICE OF THE PRESIDENT

MOBILE, ALABAMA 36688
TEL. 205/460-6111

December 5, 1979

Col. Robert H. Ryan
District Engineer
Dept. of the Army
Mobile District
Corps of Engineers
P. O. Box 2288
Mobile, Alabama 36628

RE: Navigational Improvements for Mobile Harbor, Inc.

Dear Col. Ryan:

This letter is in response to your letter of September 27, 1979, and will further reiterate and clarify those concerns expressed by the University of South Alabama regarding the recommended plan for the subject improvements, referred to as Brookley Expansion Area Gulf Disposal Plan I (Modified).

The University supports and recognizes the importance of establishing and building additional facilities for the State Docks, which expansion will benefit the community and State. However, we remain concerned that the University had no interaction with the involved agencies regarding the proposal to create fast land that would be adjacent to and extend the property of the University of South Alabama into Mobile Bay.

A major concern which has yet to be answered by the Corps of Engineers is the effect that such creation of additional land will have on the present property and utilization of such property by the University of South Alabama. As noted in my letter to you of August 31, the University provides adult educational programs and seminar activities at the Brookley Campus, as well as providing public housing at that location. The Brookley Conference Center has been and continues to be an ideal location for continuing education conferences with its setting on the Bay and with the availability of other necessary facilities compatible with the educational purposes and concepts of a continuing education conference center. Much of this environment would suffer a negative impact by the creation of the fast land which is suggested in Gulf Disposal Plan I (Modified).

It is understood that the Plan would add fast land in the amount of 1600 acres for harbor development onto the property of the University of South Alabama, thereby extending University property to the east and into the Bay. Our concern continues to be one of impact on the University and its educational activities.

As a part of the community, the University of South Alabama continues to support positive developments that will have affirmative impact for social and economic growth. The further development of the State Docks facilities and the educational complex of the University are necessarily compatible and of vital import to the citizenry of Mobile and of the State. I am certain that such harmony can be achieved through diligent efforts on the part of all entities involved in the subject plans.

As the University and its Board of Trustees continue to review these matters, I will keep you apprised. At this time I appreciate your response to my earlier letter, and your continuation of advising of any future study developments that may affect the University.

Sincerely,

Frederick P. Whiddon

FPW/krl

COASTAL AREA BOARD

POST OFFICE BOX 755
DAPHNE, ALABAMA 36526
205--626-1880

EXECUTIVE DIRECTOR
E BRUCE TRICKEY

PLEASE ADDRESS REPLY TO: P.O. Box 755

June 9, 1980

MEMORANDUM

TO: Colonel Robert H. Ryan, District Engineer

FROM: E. Bruce Trickey, Executive Director

We have recieved Statements of Consistency from the U.S. Army Corps of Engineers regarding four alternatives for expansion of the Mobile Ship Channel. The Coastal Area Board has reviewed each of the alternatives (consistency decisions attached) and ranked each alternative based upon its acceptability related to environmental impacts and economic benefits to the area. For clarification, each of these alternatives are discussed below in this ranked order. These alternatives, ranked in order of preference, are entitled:

(1) Gulf Disposal Plan
(2) Brookley Expansion Area and Gulf Disposal Plan no. 1, Modified
(3) Brookley Expansion Area and Gulf Disposal Plan no. 2, Modified
(4) Widen Channel

Proposed Project

The first three alternatives provide for the same objective:

(a) Deepen Gulf Entrance Channel to 57 feet, Widen to 700 feet;
(b) Deepen Bay Channel to 55 feet, Widen to 550 feet;
(c) Establish a 55-foot deep anchorage area near upper limits of the channel;and
(d) Establish a 55-foot deep turning basin opposite McDuffie Island.

The fourth alternative, Widen Channel, provides for widening the existing channel to 450 feet while maintaining its existing depth.

The difference between the first three alternatives involves where the dredged materials are disposed:

(1) Gulf Disposal Plan - All new work (220,773,000 c.y.) and maintenance (5,400,000 c.y. annually) will be deposited in Gulf disposal sites.

(2) Brookley Expansion Area and Gulf Disposal Plan No. 1, Modified - A portion of the new work material (65,300,000 c.y.) from upper bay will be deposited in area adjacent to Brookley to construct 1,047 acres of land to 17.5 feet above mean low water and 663 acres to 15 feet above mean low water. All other new work (155,473,000 c.y.) and all maintenance material (5,400,000 c.y. annually) will be deposited in approved Gulf disposal sites.

(3) Brookley Expansion Area and Gulf Disposal Plan No. 2, Modified - Maintenance material in lower bay channel would be deposited adjacent to lower channel (2,700,000 c.y. annually) and new work material (65,400,000 c.y.) will be deposited at Brookley to create 1,047 acres of land to 17.5 feet above mean low water and 663 acres to 15 feet above mean low water. All other new work (153,473,000 c.y.) and maintenance materials (2,700,000 c.y. annually) will be deposited in approved Gulf disposal sites.

(4) Widen Channel - All new work (7,000,000 c.y.) and maintenance (4,200,000 c.y. annually) will be deposited in approved Gulf disposal sites.

Impacts

(1) Gulf Disposal Plan - With this alternative there exists the probability that circulation patterns within the bay will be altered mainly due to changes in salt wedge. While it is expected that these changes will have far reaching effects, this cannot be quantified at this time. In addition, bay bottoms will be lost as nursery and habitat areas.

This alternative will provide for the transportation of the present amount of cargo at a $28 million savings and eliminate traffic delays which could cost $16 million per year.

Impacts on the area of open water disposal in Gulf have not been quantified.

(2) Brookley Expansion Area and Gulf Disposal Plan no. 1, Modified - With this alternative there exists the probability that circulation patterns within the bay will be altered mainly due to changes in salt wedge. While it is expected that these changes will have far reaching effects, this cannot be quantified at this time. In addition, bay bottoms will be lost as nursery and habitat areas.

This alternative will have additional impacts mainly related to disposal within the Bay. By creating the land at Brookley, 2.7 square miles committed to the disposal area would result in permanent loss of estuarine habitat and recreational fisheries use of that portion of the bay. About 70 acres of wetlands would be destroyed.

Impacts on the area of open water disposal in the Gulf have not been quantified.

This alternative also provides an area for additional port expansion at the Brookley site.

(3) Brookley Expansion Area and Gulf Disposal Plan No. 2, Modified - With this alternative, there exists the probability that circulation patterns within the bay will be altered mainly due to changes in salt wedge. While it is expected that these changes will have far reaching effects, this cannot be quantified at this time. In addition, bay bottoms will be lost as nursery and habitat areas.

This alternative will have additional impacts mainly related to disposal within the Bay. By creating the land at Brookley, 2.7 square miles committed to the disposal area would result in permanent loss of estuarine habitat and recreational fisheries use of that portion of the bay. About 70 acres of wetlands would be destroyed.

This alternative would have the additional impacts associated with the deposition of 2.7 million cubic yards of maintenance material adjacent to the lower portion of the bay. The most significant concern involves the physical fate of the material. The Corps has determined that this material does not cause changes along the lower portion of the channel, but is scattered over a large area due to wind, wave, and tidal action. While this may be a valid assumption, no in depth studies have been carried out to support this assumption.

This alternative also provides an area for additional port expansion at the Brookley site.

Impacts on the area of open water disposal in the Gulf have not been quantified.

(4) Channel Widening - With this alternative there exists the probability that circulation patterns within the bay will be altered mainly due to changes in salt wedge. While it is expected that these changes will have far reaching effects, this cannot be quantified at this time. In addition, bay bottoms will be lost as nursery and habitat areas. These impacts would probably not be as significant since the channel would not be deepened and would be widened to only 450 feet instead of 500 feet.

Impacts on the area of open water disposal in the Gulf have not been quantified.

This alternative would not provide for deeper draft vessels, although it would help to reduce current traffic delays.

Summary of Impacts

In the opinion of the staff, each of the four alternatives present potential degradation of coastal resources through the following impacts:

a. The two Brookley spoil disposal alternatives will result in the permanent loss of 2.7 square miles of bay bottoms.

b. The two Brookley spoil disposal alternatives will result in the loss of 70 acres of viable wetlands.

c. Brookley Plan no. 2 will result in the open water disposal of 2.7 million cubic yards of spoil material annually in the lower part of the bay.

d. Open water Gulf disposal will have impacts. These impacts have not been tested.

e. Each of the four proposed alternatives are expected to alter circulation patterns in the bay. The impacts of these changes in the circulation patterns are assumed by the Corps to be not significant. However, these must still be tested in the bay in order to be proven correct.

Staff Recommendation

Because of the potentially serious impacts of the four alternatives summarized above, it is recommended that the four alternatives be certified consistent with the management program with the conditions listed in the following section.

General Conditions

Because of the expected adverse impacts caused by the proposed project, the applicant will prepare a plan(s) to be approved by the Coastal Area Board to address the impacts of the chosen alternative.

Two important general criteria must be met by the plan(s). First, the plan must protect present levels of biological resources to the maximum extent practicable. Second, the measures taken to protect the biological resources or to mitigate adverse project impacts must be economically reasonable.

Because the loss of 1200 acres of bay bottoms in the two Brookley alternatives is considered to be of great consequence to the Coastal Area Board, we strongly urge the Corps to evaluate the use of the present Brookley Complex for future docks expansion before selecting either Alternatives 2 or 3 (Brookley Expansion Area and Gulf Disposal Plan No. 1, Modified or Brookley Expansion Area and Gulf Disposal Plan No. 2, Modified) which involves the loss of 1200 acres of bay bottoms.

Specific Conditions

(1) Alternative Plan #1 - Gulf Disposal Plan

a. The applicant will prepare a plan during post-authorization studies: 1) to assess the biological impacts of open gulf disposal and select disposal methods and sites which will minimize the impacts, and 2) to minimize the impact of the project on the biology of the Coastal Area. If the Corps assumptions concerning circulation patterns are unfounded and the biology is seriously impacted, the applicant will prepare a plan to carry out actions to mitigate these impacts.

(2) Alternative Plan #2 - Brookley Expansion Area and Gulf Disposal Plan No. 1, Modified.

a. The applicant will prepare a plan during post-authorization studies: 1) to assess the biological impacts of open gulf disposal and select disposal methods and sites which will minimize these impacts, 2) to minimize the impact of the project on the biology of the Coastal Area. If the Corps assumptions concerning circulation patterns are false and the biology is seriously impacted, the applicant will prepare a plan to carry out actions to mitigate these impacts, 3) to minimize and/or mitigate the impacts resulting from the loss of bay bottoms as disposal areas for spoil disposal at the Brookley site, 4) to minimize and/or mitigate the loss of wetlands due to disposal of dredged materials at the Brookley site, e.g., identify alternative disposal sites, create additional wetlands, etc.

(3) Alternative Plan #3 - Brookley Expansion Area and Gulf Disposal Plan No. 2, Modified

a. The applicant will prepare a plan during post-authorization studies: 1) to assess the biological impacts of open gulf disposal and select disposal methods and sites which will minimize the impacts, 2) to minimize the impact of the project on the biology of the Coastal Area. If the Corps assumptions concerning circulation patterns are false and the biology is seriously impacted, the applicant will prepare a plan to carry out actions to mitigate these impacts, 3) to minimize and/or mitigate the impacts resulting from the loss of bay bottoms as disposal areas for spoil disposal at the Brookley site, identify mitigation alternatives etc., 4) to minimize and/or mitigate the loss of wetlands due to disposal of dredged materials at the Brookley site, e.g., identify alternative disposal sites, create additional wetlands, etc., and 5) to assess the biological impacts of open water disposal of dredged material in the bay and

select disposal methods and sites which will minimize these impacts.

(4) Alternative Plan #4 - Widen Channel

a. The applicant will prepare a plan during post-authorization studies: 1) to assess the biological impacts of open gulf disposal and select disposal methods and sites which will minimize the impacts, and 2) to minimize the impact of the project on the biology of the Coastal Area. If the Corps assumptions concerning circulation patterns are false, and the biology is seriously impacted, the applicant will prepare a plan to carry out actions to mitigate these impacts.

COASTAL AREA BOARD
CERTIFICATION OF CONSISTENCY APPROVAL ACTION
FOR A FEDERAL PROJECT OR ACTIVITY

TO: Colonel Robert H. Ryan, Mobile District Corps of Engineers
SAMPD-EC

FROM: Alabama Coastal Area Board
P. O. Box 755
Daphne, Alabama 36526
(205) 626-1880

CAB Reference # COEP-80-05

1. Application Number (assigned by federal agency) Date of Receipt of Application

January 24, 1980

2. Name and Address of Applicant

Name Colonel Robert H. Ryan, Mobile District C. of E.
Street or Box P. O. Box 2288
City, State, Zip Mobile, AL 36628
Home Phone Business Phone

3. Category of Project or Activity (e.g. road construction):

Mobile Ship Channel Expansion - Brookley Expansion Area and Gulf Disposal Plan No. 1, Modified Alternative #2

4. /X/ The Coastal Area Board has reviewed this federal project or activity and Certification of Consistency and has found it to be consistent with the Coastal Area Management Program. This approval is conditional upon continued compliance with the management program and the following conditions:

General Conditions

Because of the expected adverse impacts caused by the proposed project, the applicant will prepare a plan(s) to be approved by the Coastal Area Board to address the impacts of the chosen alternative.

Two important general criteria must be met by the plan(s). First, the plan must protect present levels of biological resources to the maximum extent practicable. Second, the measures taken to protect the biological resources or to mitigate adverse project impacts must be economically reasonable.

Because the loss of 1200 acres of bay bottoms in each of the two Brookley alternatives is considered to be of great consequence to the Coastal Area Board, we strongly urge the Corps to evaluate the use of the present Brookley Complex for future docks expansion before selecting either Alternative 2 or 3 (Brookley Expansion Area and Gulf Disposal Plan No. 1, Modified or Brookley Expansion Area and Gulf Disposal Plan No. 2, Modified) which involves the loss of 1200 acres of bay bottoms.

Specific Conditions

The applicant will prepare a plan during post-authorization studies: 1) to assess the biological impacts of open gulf disposal and select disposal methods and sites which will minimize these impacts, 2) to minimize the impact of the project on the biology of the Coastal Area. If the Corps assumptions concerning circulation patterns are false and the biology is seriously impacted, the applicant will prepare a plan to carry out actions to mitigate these impacts, 3) to minimize and/or mitigate the impacts resulting from the loss of bay bottoms as disposal areas for spoil disposal at the Brookley site, 4) to minimize and/or mitigate the loss of wetlands due to disposal of dredged materials at the Brookley site, e.g., identify alternative disposal sites, create additional wetlands, etc.

/__/ The Coastal Area Board has reviewed this federal project or activity and Certification of Consistency and has found it to be inconsistent with the Coastal Area Management Program. The reasons and supporting details for the objection and alternative means suggested by the CAB to conduct the use in compliance with the management program are attached. A copy of this notice of objection will be sent to the Assistant Administrator for Coastal Zone Management, NOAA.

Date 6/10/90 E. Bruce Trickey

E. Bruce Trickey, Executive Director

COASTAL AREA BOARD
CERTIFICATION OF CONSISTENCY APPROVAL ACTION
FOR A FEDERAL PROJECT OR ACTIVITY

TO: Colonel Robert H. Ryan, Mobile District Corps of Engineers
SAMPD-EC

FROM: Alabama Coastal Area Board
P. O. Box 755
Daphne, AL 36526
(205) 626-1880

CAB Reference # COEP-80-05

1. Application Number (assigned by federal agency) Date of Receipt of Application

January 24, 1980

2. Name and Address of Applicant

Name Colonel Robert H. Ryan, Mobile District C. of E.
Street or Box P. O. Box 2288
City, State, Zip Mobile, AL 36628
Business Phone Home Phone

3. Category of Project or Activity (e.g. road consturction):

Mobile Ship Channel Expansion - Brookley Expansion Area and Gulf Disposal Plan No. 2, Modified Alternative #3

4. /X/ The Coastal Area Board has reviewed this federal project or activity and Certification of Consistency and has found it to be consistent with the Coastal Area Management Program. This approval is conditional upon continued compliance with the management program and the following conditions:

General Conditions

Because of the expected adverse impacts caused by the proposed project, the applicant will prepare a plan(s) to be approved by the Coastal Area Board to address the impacts of the chosen alternative.

Two important general criteria must be met by the plan(s). First, the plan must protect present levels of biological resources to the maximum extent practicable. Second, the measures taken to protect the biological resources or to mitigate adverse project impacts must be economically reasonable.

Because the loss of 1200 acres of bay bottoms in the two Brookley alternatives is considered to be of great consequence to the Coastal Area Board, we strongly urge the Corps to evaluate the use of the present Brookley Complex for future docks expansion before selecting either Alternative 2 or 3 (Brookley Expansion Area and Gulf Disposal Plan No. 1, Modified or Brookley Expansion Area and Gulf Disposal Plan No. 2, Modified) which involves the loss of 1200 acres of bay bottoms.

Specific Conditions

The applicant will prepare a plan during post-authorization studies: 1) to assess the biological impacts of open gulf disposal and select disposal methods and sites which will minimize the impacts, 2) to minimize the impact of the project on the biology of the Coastal Area. If the Corps assumptions concerning circulation patterns are false and the biology is seriously impacted, the applicant will prepare a plan to carry out actions to mitigate these impacts, 3) to minimize and/or mitigate the impacts resulting from the loss of bay bottoms as disposal areas for spoil disposal at the Brookley site, identify mitigation alternatives, etc. 4) to minimize and/or mitigate the loss of wetlands due to disposal of dredged materials at the Brookley site, e.g., identify alternative disposal sites, create additional wetlands, etc., and 5) to assess the biological impacts of open water disposal of dredged material in the bay and select disposal methods and sites which will minimize these impacts.

/__/ The Coastal Area Board has reviewed this federal project or activity and Certification of Consistency and has found it to be inconsistent with the Coastal Area Management Program. The reasons and supporting details for the objection and alternative means suggested by the CAB to conduct the use in compliance with the management program are attached. A copy of this notice of objection will be sent to the Assistant Administrator for Coastal Zone Management, NOAA.

Date 6/16/80 E. Bruce Trickey, Executive Director

COASTAL AREA BOARD
CERTIFICATION OF CONSISTENCY APPROVAL ACTION
FOR A FEDERAL PROJECT OR ACTIVITY

TO: Colonel Robert H. Ryan, Mobile District, Corps of Engineers
SAMPD-EC

FROM: Alabama Coastal Area Board
P. O. Box 755
Daphne, Alabama 36526
(205) 626-1880

CAB Reference # COEP-80-05

1. Application Number (assigned by federal agency) Date of Receipt of Application

January 24, 1980

2. Name and Address of Applicant

Name Colonel Robert H. Ryan, Mobile District C.of E.
Street or Box P. O. Box 2288
City, State, Zip Mobile, AL 36628
Home Phone Business Phone

3. Category of Project or Activity (e.g. road construction):

Mobile Ship Channel Expansion - Gulf Disposal Plan
Alternative #1

4. /X/ The Coastal Area Board has reviewed this federal project or activity and Certification of Consistency and has found it to be consistent with the Coastal Area Management Program. This approval is conditional upon continued compliance with the management program and the following conditions:

General Conditions

Because of the expected adverse impacts caused by the proposed project, the applicant will prepare a plan(s) to be approved by the Coastal Area Board to address the impacts of the chosen alternative.

Two important general criteria must be met by the plan(s). First, the plan must protect present levels of biological resources to the maximum extent practicable. Second, the measures taken to protect the biological resources or to mitigate adverse project impacts must be economically reasonable.

Specific Conditions

The applicant will prepare a plan during post-authorization studies: 1) to assess the biological impacts of open gulf disposal and select disposal methods and sites which will minimize the impacts, and 2) to minimize the impact of the project on the biology of the Coastal Area. If the Corps assumptions concerning circulation patterns are unfounded and the biology is seriously impacted, the applicant will prepare a plan to carry out actions to mitigate these impacts.

/__/ The Coastal Area Board has reviewed this federal project or activity and Certification of Consistency and has found it to be inconsistent with the Coastal Area Management Program. The reasons and supporting details for the objection and alternative means suggested by the CAB to conduct the use in compliance with the management program are attached. A copy of this notice of objection will be sent to the Assistant Administrator for Coastal Zone Management, NOAA.

Date 6/16/80 E. Bruce Trickey

E. Bruce Trickey, Executive Director

COASTAL AREA BOARD
CERTIFICATION OF CONSISTENCY APPROVAL ACTION
FOR A FEDERAL PROJECT OR ACTIVITY

TO: Colonel Robert H. Ryan, Mobile District Corps of Engineers
SAMPD-EC

FROM: Alabama Coastal Area Board
P. O. Box 755
Daphne, Alabama 36256
(205) 626-1880

CAB Reference # COEP-80-05

1. Application Number (assigned by federal agency) Date of Receipt of Application

January 24, 1980

2. Name and Address of Applicant

Name Colonel Robert H. Ryan, Mobile District C. of E.
Street or Box P. O. Box 2288
City, State, Zip Mobile, AL 36628
Home Phone Business Phone

3. Category of Project or Activity (e.g. road construction):

Mobile Ship Channel Expansion - Widen Channel
Alternative #4

4. /X/ The Coastal Area Board has reviewed this federal project or activity and Certification of Consistency and has found it to be consistent with the Coastal Area Management Program. This approval is conditional upon continued compliance with the management program and the following conditions:

General Conditions

Because of the expected adverse impacts caused by the proposed project, the applicant will prepare a plan(s) to be approved by the Coastal Area Board to address the impacts of the chosen alternative.

Two important general criteria must be met by the plan(s). First, the plan must protect present levels of biological resources to the maximum extent practicable. Second, the measures taken to protect the biological resources or to mitigate adverse project impacts must be economically reasonable.

Specific Conditions

The applicant will prepare a plan during post-authorization studies: 1) to assess the biological impacts of open gulf disposal and select disposal methods and sites which will minimize the impacts, and 2) to minimize the impact of the project on the biology of the Coastal Area. If the Corps assumptions concerning circulation patterns are

false, and the biology is seriously impacted, the applicant will prepare a plan to carry out actions to mitigate these impacts.

/__/ The Coastal Area Board has reviewed this federal project or activity and Certification of Consistency and has found it to be inconsistent with the Coastal Area Management Program. The reasons and supporting details for the objection and alternative means suggested by the CAB to conduct the use in compliance with the management program are attached. A copy of this notice of objection will be sent to the Assistant Administrator for Coastal Zone Management, NOAA.

Date 6/16/80 E. Bruce Trickey

E. Bruce Trickey, Executive Director

ALABAMA STATE DOCKS DEPARTMENT

MOBILE

Robert M. Hope
Director

P. O. Box 1588
MOBILE, AL. 36601

November 3, 1980

Col. Robert H. Ryan
District Engineer
U. S. Army Corps of Engineers
P. O. Box 2288
Mobile, Alabama 36628

Dear Sir:

The Department has received and reviewed the proposed agreement between the United States of America and the Alabama State Docks Department for local cooperation at Mobile Harbor which was enclosed with your letter of October 16, 1980.

On Page 2 of the draft of the agreement, the Department objects to Paragraph (i) of Section 1, which would require the Department to retain fee ownership of all lands created, etc. The Department hereby requests that this requirement be deleted in that the creation of this land from fill is not required to accommodate traffic to support the benefits of the project. Further, if the Department is to be required to make contributions for special local benefits deriving from land enhancement due to land fill, the Department should be able to utilize the land as it sees fit without restriction as proposed in Paragraph (i) of Section 1.

The Department is not agreeable to Section 2 on Page 2 of the draft agreement and concurs with the Governor's statement as made in his letter dated October 27, 1980, addressed to you. The Department finds the remainder of the draft acceptable, and we are looking forward to working with you on the implementation of this project.

Yours very truly,

R. M. Hope

R. M. Hope

RMH/mh

STATE OF ALABAMA

GOVERNOR'S OFFICE

MONTGOMERY 36130

FOB JAMES
GOVERNOR

October 27, 1980

Colonel Robert H. Ryan
District Engineer
U. S. Army Corps of Engineers
P. O. Box 2288
Mobile, Alabama 36628

Dear Colonel Ryan:

I was most pleased to hear in your letter of October 16, 1980 of your decision to recommend authorization of expansion of Mobile Harbor. I was also pleased you are recommending the alternative plan referred to as the Brookley Expansion Area and Gulf Disposal Plan No. 1 (Modified). This is the alternative plan I had suggested earlier and I still fully support.

In reference to your invitation for the State of Alabama to participate in the cost-sharing for non-vendible projects called for in the President's water policy message in 1978, I must decline the offer. Until such time that clarification by Congress of the cost-sharing issues is made, I feel projects such as the Mobile Harbor improvements should move forward under the existing law of the Nation which does not require cost sharing on vendible and non-vendible projects. I would suggest the proposed improvement to Mobile Harbor would not only benefit Alabama but would greatly benefit the region and the Nation. I also feel the proposed new cost-sharing proposals do not properly recognize the cost sharing currently in existence as the "non-federal" part of major water projects. On this project for example the majority of the non-federal cost will be the responsibility of the State of Alabama.

Again, I would like to make my position clear, I completely endorse this project as proposed with the exception of the additional cost sharing. This project when completed will help the Nation to improve its position in the area of world commerce and trade.

I look forward to working with you and others to see this project approved and constructed.

Sincerely,

Fob James

db

FISH AND WILDLIFE COORDINATION ACT REPORT

APPENDIX 4

UNITED STATES DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE
200 EAST PASCAGOULA STREET, SUITE 300
JACKSON, MISSISSIPPI 39201

May 20, 1980

District Engineer
U.S. Army, Corps of Engineers
P.O. Box 2288
Mobile, AL 36628

Dear Sir:

The Fish and Wildlife Service has prepared the accompanying report relative to fish and wildlife impacts associated with the Mobile Harbor, Alabama project. The study of the existing project was requested by a House of Representatives, Public Works Committee's resolution adopted June 24, 1965. This report is submitted in accordance with the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.).

Channel enlargement and disposal methods conducted under the existing project have greatly altered the natural physical, chemical and biological characteristics of the Mobile Bay estuary. These previous alterations impose a continuing adverse influence on this estuarine system. Primary impacts resulting from previous channel construction include the alteration of salinity and circulation patterns, increased turbidities and the destruction of benthic organisms. The qualitative impacts of these changes on the bay as well as measures to improve existing adverse conditions are addressed in the attached report.

Of the following four proposed plans being considered for modifying the existing navigation project, the first is currently designated as the selected plan.

1. Brookley Expansion Area and Gulf Disposal Plan 1 (Modified)
2. Brookley Expansion Area and Gulf Disposal Plan 2 (Modified)
3. Gulf Disposal Plan
4. Channel Widening Plan

Each of these plans requires modification of the existing navigation channel and will further result in the physical, chemical and biological alterations of Mobile Bay. Our major concern is that the selected plan, as well as the Brookley Expansion Area and Gulf Disposal Plan 2 (Modified) require that approximately 1,700 acres of shallow bay bottom and 10 acres of tidal marsh be filled for port facilities. This water bottom and marsh provide ecological functions which complement this productive estuarine system. The inability to manage shallow water bottoms precludes compensation of fish and wildlife losses occurring from either of the alternatives for the Brookley Expansion. Consequently, the Service urges consideration of other port expansion sites.

In view of past damages from the existing project and considering the adverse impacts of the proposed modifications, the Service is especially concerned that an environmental quality plan has not been developed as required by Principles and Standards for Planning Water and Related Land Resources. As reflected by the selected plan, limited consideration has been given to restoring and enhancing the quality of Mobile Bay. Considering the past and potential future damages to fish and wildlife from this project, we view the absence of an environmental quality plan as a serious planning deficiency.

In conclusion, the Fish and Wildlife Service views the proposed plan as being environmentally unsound. Impacts and deficiencies of major concern include the loss of 1,710 acres of productive shallow estuarine habitat, no identification of environmentally sound alternatives for port expansion and the absence of an environmental quality plan. In view of the potential to modify this project in a manner that could significantly reduce expected adverse environmental impacts, the Service offers the following recommendations.

1. The proposed filling of bay bottoms and wetlands should be deleted from the selected plan.

2. Unless more environmentally sound disposal areas are identified, dredged material should be taken to approved deep gulf sites.

3. Studies should be conducted to identify environmentally sound areas for port expansion.

4. An environmental quality plan should be developed in accordance with Principles and Standards.

This report has been reviewed and concurred in by the Division of Marine Resources, Alabama Department of Conservation and Natural Resources and the National Marine Fisheries Service. A copy of their letters are attached.

If we can be of further assistance, please contact us.

Sincerely yours,

Robert Misso

Acting

Area Manager

Attch a/s

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Duval Building
9450 Koger Boulevard
St. Petersburg, FL 33702

March 25, 1980

F/SER61/WMT
893-3503

Mr. J. Paul Smith, Field Supervisor
U.S. Fish and Wildlife Service
Division of Ecological Services
National Space Technology Lab.
NSTL Station, MS 39529

Dear Mr. Smith:

This is in reply to your letter dated February 4, 1980, wherein you requested our comments on the proposed Fish and Wildlife Service report on Mobile Harbor Expansion, Mobile Bay, Alabama, as proposed by the Corps of Engineers, Mobile District.

The report clearly identifies fishery resources of Mobile Bay as well as impacts resulting from proposed modifications of the existing project. However, information regarding flood and hurricane damage to the oyster reefs in 1979 as well as restoration plans would be beneficial if incorporated into the report. We suggest that you contact Mr. Bill Eckmayer, Alabama Department of Conservation and Natural Resources for assistance in this matter.

We feel the environmental quality plan should also include the removal of dredged spoil bars along the channel and suggest including this in your recommendations (page 17) for additional study needs.

We are enclosing a copy of our comments dated August 17, 1979, on the Corps Draft Environmental Impact Statement - Technical Report on Mobile Harbor (DEIS #7907.01) for your information.

Sincerely yours,

William H. Stevenson
Regional Director

Enclosure

STATE OF ALABAMA

DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES

P. O. Box 188

DAUPHIN ISLAND, ALABAMA 36528

FOB JAMES
GOVERNOR

RICHARD A. FORSTER
COMMISSIONER

HUGH A. SWINGLE, DIRECTOR
DIVISION OF MARINE RESOURCES

January 23, 1980

Mr. Tom Thornhill
U. S. Fish and Wildlife Service
National Space Technology Laboratories
U. S. Department of the Interior
NSTL Station, Mississippi 39529

Dear Tom:

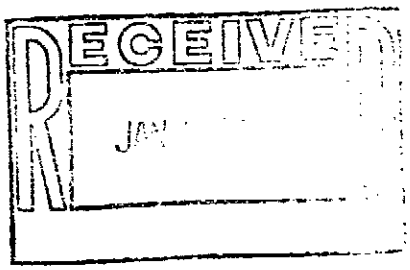
I have reviewed the draft report on the Mobile Harbor, Alabama which pertains to the proposed widening of the Mobile Ship Channel. The draft adequately accesses the alternatives to the spoil disposal problem from this project.

Thank you for the opportunity to review this document.

Sincerely,

Hugh A. Swingle, Director
Marine Resources Division

HAS/sh



MOBILE HARBOR, ALABAMA

A Fish and Wildlife Coordination Act Report

Submitted to:

Mobile District

U.S. Army, Corps of Engineers

Mobile, Alabama

Prepared By:

Field Office

U.S. Fish and Wildlife Service

Division of Ecological Services

National Space Technology Laboratories

NSTL Station, Mississippi

Released From:

Jackson Area Office

Jackson, Mississippi

February 1980

MOBILE HARBOR, ALABAMA

TABLE OF CONTENTS

List of Figures

AREA SETTING

Mobile Bay is approximately 30 miles long and up to 20 miles wide (Figure 1). It is bordered on the north by the Battleship Causeway, which separates the bay from the Mobile River Delta; on the west by the industrial and urban areas of Mobile, as well as the Theodore industrial area and various rural communities; on the east by the residential and farming communities of Daphne and Fairhope; on the southwest by Mississippi Sound and on the south by Dauphin Island, Fort Morgan Peninsula and the Gulf of Mexico. The U.S. Fish and Wildlife Service operates the Bon Secour National Wildlife Refuge located on Fort Morgan Peninsula.

Mobile Bay receives freshwater inflow from several sources, but the major contributors are the Mobile and Tensaw Rivers. The outflow of Mobile Bay occurs at two passes. Approximately 72 percent flows directly into the Gulf of Mexico through Main Pass between Dauphin Island and Fort Morgan Peninsula. The remainder discharges into Mississippi Sound through Pass Aux Herons between Dauphin Island and Cedar Point (Austin 1954).

Mobile Bay contains approximately 264,000 acres of open water. The major portion of the bay (146,000 acres) has depths ranging from 6 to 10 feet. The northern portion of the bay and the shoreline include about 61,000 acres with depths less than 6 feet. The remaining 57,000 acres range from 10 to over 30 feet deep (Crance 1971).

The overall circulation patterns within the bay are controlled by river discharge, tides, winds and the bathymetric and geomorphic characteristics of the bay. The bathymetry east of the navigation channel in the upper-middle bay is significantly different from that portion west of the channel. At mean low water (mlw), the east side has an average depth of 12 feet and a maximum depth of 21 feet. The western side is basically flat and has an average depth of about 9 feet mlw and a maximum depth of 12 feet mlw. The major barrier to east-west movement of water is the north-south spoil bank on the west side of the main ship channel east and south of Dog River. In the southern half of the bay the old spoil bank associated with the main ship channel is virtually nonexistent (Schroeder and Lysinger 1979). The east-west running spoil banks associated with Hollingers Island Channel cause the isolation of bottom waters in the area east of Dog River. Spoil banks in association with the Gulf Intracoastal Waterway in south Bon Secour Bay are also partially isolating bottom waters in that area (Schroeder 1979).

Story et al. (1974) found that the spoil banks along the navigation channel in the northern section of the bay were not only altering bottom water circulation patterns but were also affecting surface circulation. He found that the spoil banks had directed the fresh water down the navigation channel 6 miles south of the river's mouth. After leaving the channel, the flow proceeded along the western shore of the bay as previous studies had indicated.

Salinity values ranging from 0 to 36 parts per thousand (ppt) have been observed in the lower bay while upper bay ranges are 0 to 24 ppt (Schroeder and Lysinger 1979). The lowest salinities occur from February through May due to normal high river discharges. The highest salinities occur during the low flow periods between August and November. McPhearson (1970) showed that salinity stratification was more pronounced on the east side of the channel, indicating that circulation of saline water from the gulf was restricted from the western side of the bay. Salinity stratification and restricted water circulation have caused various areas of the bay to become void of dissolved oxygen during the summer (Loesch 1960; May 1973).

PROJECT DESCRIPTION

Existing Project

The existing Mobile Harbor project provides a 42-foot deep by 600-foot wide gulf entrance channel, a 40-foot deep by 400-foot wide by 29-mile long bay channel from the gulf to the mouth of the Mobile River, a 40-foot deep by 500- to 775-foot wide channel extending 4.6 miles up the Mobile River, and several branch channels and turning basins. The project also provides a 32-foot deep, 100-foot wide and 2,000-foot long anchorage area near McDuffie Island. The Mobile River and Mobile Bay channels are maintained by hydraulic pipeline dredge and the bar channel across Mobile Bay at the gulf entrance is maintained by hopper dredge. Approximately 1,055,000 cubic yards of dredged material are removed annually from Mobile River and placed in diked disposal areas. Annual maintenance dredging of the Mobile Bay channel produces approximately 3,800,000 cubic yards of dredged material, which is discharged over 20,000 acres of water bottoms adjacent to the channel. Approximately 260,000 cubic yards of dredged material are removed annually from the bar channel and placed in the gulf disposal site south of Dauphin Island.

Proposed Modifications of Existing Project

Brookley Expansion Area and Gulf Disposal Plan No. 1, (Modified) - This alternative (Figure 1) requires the enlargement of the existing channel to a depth of 57 feet and a width of 700 feet from the 57-foot contour of the gulf for a distance of 7.4 miles to the eastern end of Dauphin Island. The channel through Mobile Bay would be enlarged to a depth of 55 feet and a width of 550 feet for a distance of 27 miles between the gulf entrance and a point about 3.6 miles south of the mouth of Mobile River and then be widened to 650 feet for a distance of about 4.2 miles. An anchorage basin 55 feet deep, 1,150 feet wide and 4,000 feet long would be constructed east of McDuffie Island. A turning basin 55 feet deep, 1,500 feet wide and 1,500 feet long is also proposed just north of the anchorage area. The total length of the channel would be 38.6 miles. Approximately 1,700 acres of shallow bay bottom and 10 acres of tidal marsh adjacent to the Brookley Industrial Complex would be filled to about 17 feet above mlw for use as port facilities. About 700 acres of bay bottoms and 520 acres of near shore bottoms (bar channel) would be lost to channel enlargement.

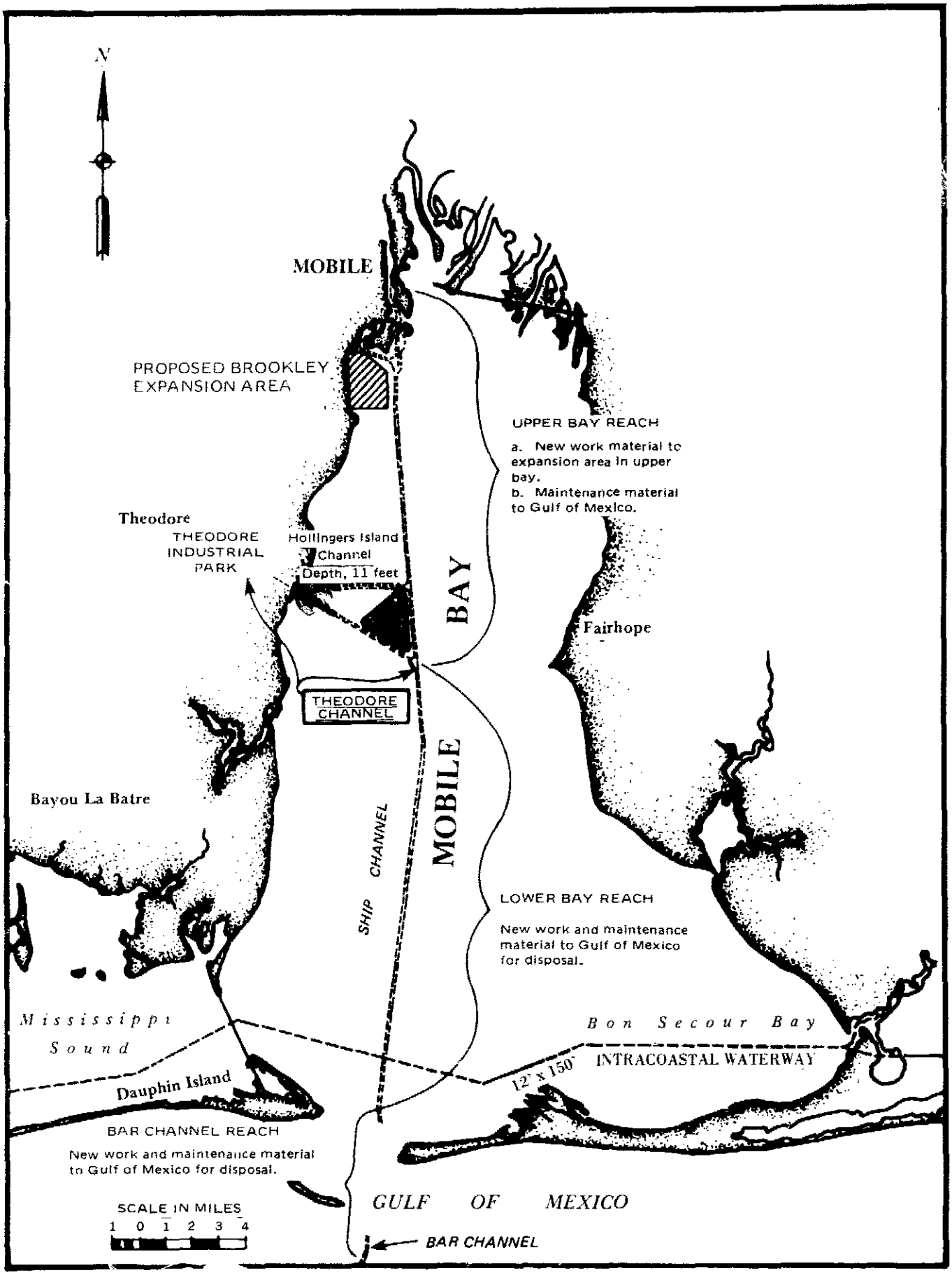


Figure 1. Brookle nsion Area and Gulf Disposal Plan No. 1 (Modified)

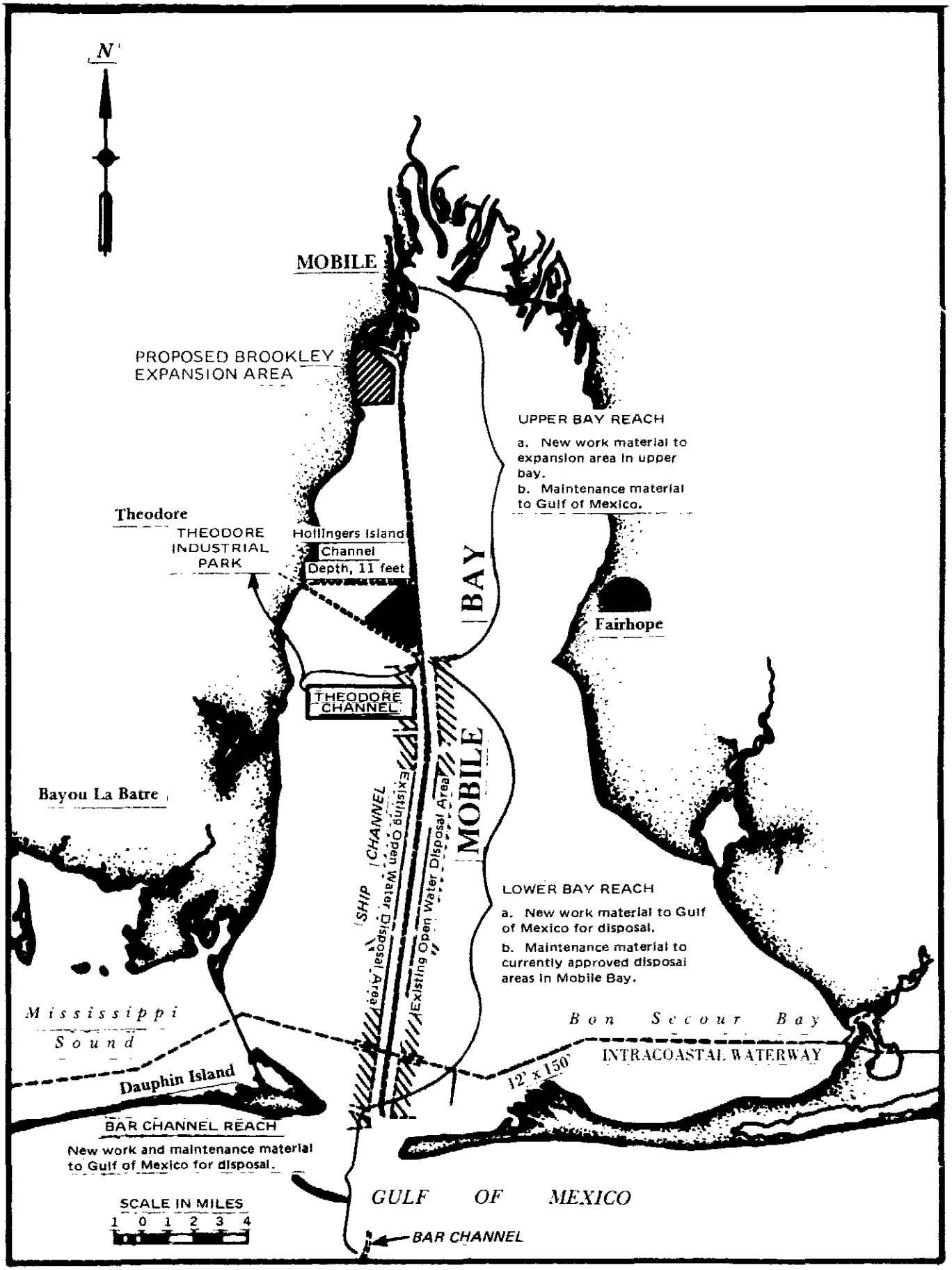


Figure 2. Brookley Expansion Area and Gulf Disposal Plan No. 2 (Modified)

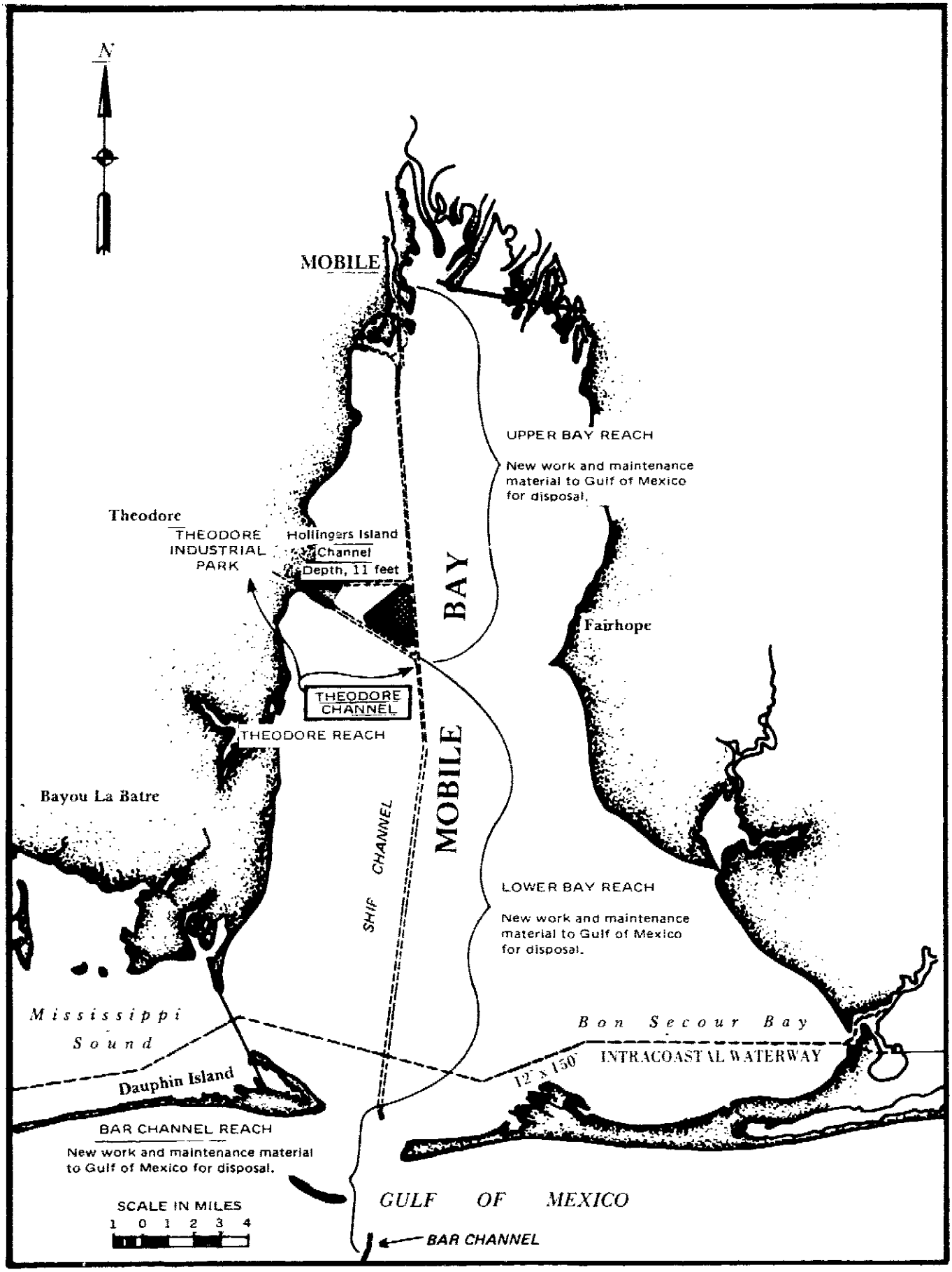


Figure 3. Gulf Disposal Plan

New-work dredged material (40 million cubic yards) from the upper 7.4 miles of bay channel, the anchorage area and turning basin would be utilized to construct dikes along the perimeter of the Brookley disposal area and for filling the Brookley Expansion site. Additional fill (24 million cubic yards) would come from the next 6 miles of channel down to the intersection of the Theodore Ship Channel. All new-work dredged material from the lower bay and entrance channels would be transported by dump scows for disposal in the gulf. Approximately 79 million cubic yards of new-work material and an average of 4.7 million cubic yards of annual maintenance material would be taken to gulf disposal sites.

Brookley Expansion Area and Gulf Disposal Plan No. 2 (Modified) - This plan (Figure 2) is designated the National Economic Development Plan and requires the same construction features as Plan 1 with exception of maintenance disposal methods. As in Plan 1, all new-work dredged material from the lower bay reach would be loaded in dump scows by hydraulic dredge and transported to the gulf for disposal. Maintenance dredged material from the upper bay would also be transported to the gulf for disposal. However, 2.7 million cubic yards of annual maintenance dredged material from the lower bay navigation channel would be dumped adjacent to the channel.

Gulf Disposal Plan - This plan (Figure 3) requires the enlargement of the navigation channel and construction of the anchorage and turning basins as proposed under each of the Brookley Expansion alternatives. This plan differs in that all new work and maintenance dredged material would be transported by dump scows to approved gulf sites. This plan does not require the filling of approximately 1,700 acres of shallow water bottoms and 10 acres of tidal marsh in the Brookley Expansion site.

Channel Widening Plan - This plan is designated by the Corps as the least environmentally damaging plan. Under this alternative the width of the main bay channel would be increased from 400 feet to 450 feet. Approximately 7 million cubic yards of new-work dredged material and 4.2 million cubic yards of annual maintenance dredged material would be taken to gulf sites. Unlike the Gulf Disposal and Brookley Expansion alternatives, this plan does not provide future deep draft navigation benefits.

FISH AND WILDLIFE RESOURCES

Wetlands

The shallow water bottoms, grassbeds and tidal marshes within Mobile Bay provide vital spawning and nursery habitat for a major portion of the marine and freshwater finfishes and shellfishes that inhabit the Alabama Coastal Zone. Marshes and forested wetlands within the Mobile Delta are extensively utilized by fish and wildlife and are important wintering waterfowl areas.

Eleven species of submerged aquatic vegetation are predominant in the waters of Mobile Bay (Borom 1979). These are tape grass (Vallisneria americana), redhead grass (Potamogeton perfoliatus), coontail (Ceratophyllum demersum), water stargrass (Heteranthera dubia), horned pondweed (Zannichellia palustris), bushy pondweed (Najas guadalupensis), Eurasian watermilfoil (Myriophyllum spicatum), elodea (Egeria sp.), widgeon grass (Ruppia maritima), shoal grass (Halodule wrightii), and muskgrass (Nitella spp.). The slightly brackish waters of the upper bay and lower delta support all but widgeon grass and shoal grass.

Vittor and Stout (1975) determined that the total coastal area of Alabama contained over 27,000 acres of marshes. Within the Mobile Bay area there are over 200 acres of fresh-mixed marsh, 2,100 acres of brackish-mixed marsh and 1,100 acres of salt marsh (Stout 1979). The majority of the fresh-mixed marsh is located in the Dog River area. Brackish marsh is found mainly south of the latitude of Dog River and salt marsh is found primarily in the Little Point Clear, Fort Morgan Peninsula and Dauphin Island areas. The Mobile-Tensaw Delta contains over 20,000 acres of open water (Crance 1971) and approximately 10,450 acres of fresh-mixed marsh (Stout 1979).

Forested wetlands are also present in the lower reaches of the Mobile River Delta. Dominant species in this forest community include black gum (Nyssa biflora), white bay (Magnolia glauca), cypress (Taxodium distichum), red maple (Acer rubrum), tupelo gum (Nyssa aquatica), ash (Fraxinus spp.), cottonwood (Populus heterophylla) and black willow (Salix nigra).

Fisheries Resources

According to Swingle (1971) 233 species of fish occur in Mobile Bay. Major marine fishes that depend upon the estuarine waters of Mobile Bay during some period of their life and are of commercial importance in Alabama include: Atlantic croaker (Micropogonias undulatus), spotted seatrout (Cynoscion nebulosus), sand seatrout (Cynoscion arenarius), southern flounder (Paralichthys lethostigma), spot (Leiostomus xanthurus), gulf menhaden (Brevoortia patronus), and striped mullet (Mugil cephalus).

The Atlantic croaker is an important commercial finfish in Alabama and utilizes the upper portion of Mobile Bay as a nursery area (Nelson 1967 and Swingle 1971). In 1975, commercial fishermen harvested over 19,000 pounds of croaker from inshore waters of Alabama (Swingle 1977). Swingle (1971) found larger numbers of both juvenile and adult croaker in upper Mobile Bay and Delta channels than in lower and mid-bay channels during the months of December through March. This indicates that the upper bay area is extensively utilized as a wintering area by adult croaker and as a nursery area by juvenile croaker.

In 1975, the Alabama commercial landings of spotted seatrout from inshore and offshore waters of Alabama was over 28,000 pounds (Swingle

1977). Spotted seatrout spawn in deeper saline waters but prefer shallow submerged vegetation as nursery grounds (Futch 1970, Guest and Gunter 1958, Mahood 1974). If the non-migratory spotted seatrout population of a particular estuarine area is lost, damage could be long-lasting, since adequate recruitment from other areas would be unlikely (U.S. Dept. of Commerce, National Marine Fisheries Service 1973). Swingle (1971) found that juvenile sand seatrout enter Mobile Bay from April through July. During June, trout were most abundant in the middle and upper portion of Mobile Bay, indicating that these areas serve as nursery grounds. The Alabama Department of Conservation and Natural Resources reports that the Brookley Area is extensively utilized by recreational and commercial fishermen during the winter months.

Other commercially important fishes, such as southern flounder, spot and striped mullet, also exhibit similar use of the shallow, low salinity areas of northern Mobile Bay (Swingle 1976).

Major shellfish species that are dependent upon the estuarine waters of Mobile Bay and are of commercial importance in Alabama include shrimp (Penaeus spp.), blue crab (Callinectes sapidus) and oyster (Crassostrea virginica).

The shrimp fishery is economically the most important commercial fishery in Alabama (Heath 1979). Since the Mobile Bay estuarine system represents nearly 75 percent of the Alabama estuarine area, its importance to the shrimping industry is obvious. Fifteen species of shrimp are found in the Mobile Bay system. Of these, brown shrimp (Penaeus aztecus), white shrimp (Penaeus setiferus) and pink shrimp (Penaeus duorarum) are of greatest commercial value. Loesch (1965) found that both white and brown shrimp were more abundant on the western side of Mobile Bay with juveniles of both species concentrating in the shallow nearshore waters. White shrimp concentrated at the extreme shoreward edge of the bay in water 2 feet or less, and brown shrimp were most abundant in water less than 4 feet in depth. According to Swingle (1971), the average catch of white shrimp in the Mobile Delta was more than five times that of other sampling stations in Mobile Bay, Mississippi Sound, Perdido Bay and Little Lagoon.

The blue crab is dependent upon estuarine habitats in certain periods of its life cycle. The upper bay is well known for its abundance of soft-shell crabs which indicates its importance as a crab nursery. Commercial landings of blue crab in Alabama from 1970-1977 show the annual harvest was 1,754,860 pounds (Tatum 1979).

Currently there are approximately 3,000 acres of public oyster reefs in Mobile Bay. The major reefs include Klondike, Whitehouse, Bon Secour and Cedar Point (Figure 4). Over 90 percent of the oyster landings come from the Cedar Point Reef (Eckmayer 1979). Bon Secour Bay oyster reefs were depleted primarily through overfishing. Oysters can tolerate a wide range of salinity but are generally abundant in waters whose salinities range between 10 to 20 ppt. Seasonal variations in salinity are an important ecological factor and determine the success of the oyster populations.

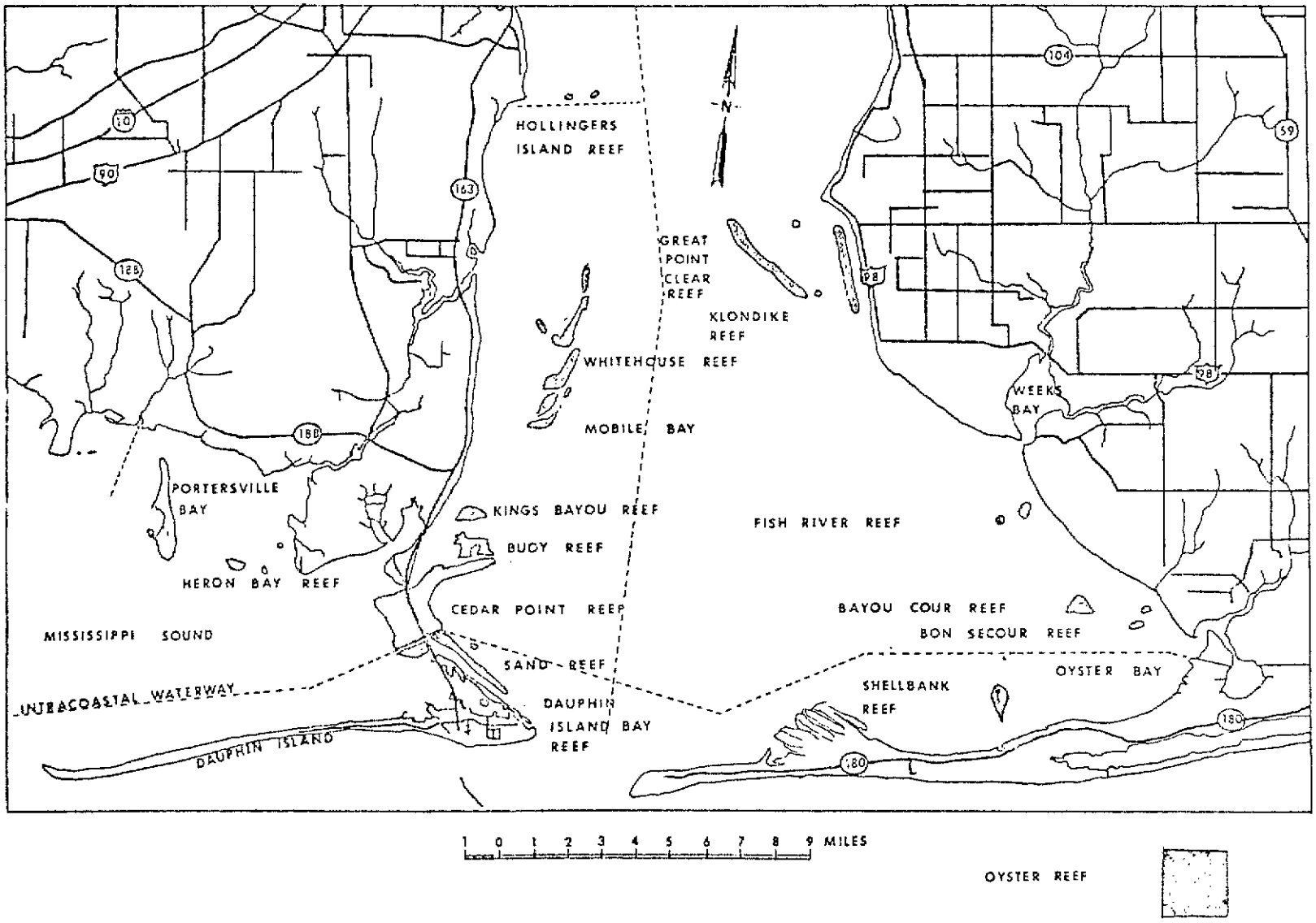


Figure 4. Locations of oyster reefs in Secour Bay, Mississippi Sound and Mobile Bay, Alabama, (from Eckmayer 1979.)

In 1976, the shrimp, crab and oyster fisheries reportedly provided $31,000,000 to the state's economy (U.S. Dept. of Commerce, National Marine Fisheries Service 1977). In 1978 the dockside value of Alabama's commercial fisheries was over $35,000,000.

Recreational fishing in the coastal waters of Alabama also provides additional revenue to Mobile and Baldwin counties. In 1975 an estimated 308,045 recreational saltwater fishing trips occurred in Alabama's coastal waters resulting in the expenditure of nearly $5,000,000 (Wade 1977). Approximately 63 percent of the trips occurred within the inshore waters of Mobile and Baldwin Counties. Major inshore sportfish species include spotted seatrout, sand seatrout, red drum, Atlantic croaker and striped mullet.

Recreational shrimping is also popular among Mobile and Baldwin County residents. It was estimated that 4,961 recreational 16-foot trawls were used to harvest 277,051 lbs., 204,577 lbs. and 290,541 lbs. of shrimp in 1972, 1973 and 1974, respectively (Heath 1979). Although no statistics are available on recreational shrimping since 1974, it is suspected that harvest efforts have risen substantially.

At least 115 species of fish are found in the Mobile Delta (Tucker 1979). Most of the fishing in this area is recreational; however, a good commercial fishery also exists. Fishes occurring in the delta that are of primary interest to fishermen include bluegill (Lepomis macrochirus), redear sunfish (Lepomis microlophus), warmouth (Lepomis gulosus), Largemouth bass (Micropterus salmoides), spotted bass (Micropterus punctulatus), black crappie (Pomoxis nigromaculatus), white crappie (Pomoxis annularis), white bass (Morone chrysops), yellow bass (Moronè mississippiensis), striped bass (Morone saxatilis), channel catfish (Ictalurus punctatus), blue catfish (Ictalurus furcatus), flathead catfish (Pylodictis olivaris) alligator gar (Lepisosteus spatula), bowfin (Amia calva) and striped mullet (Mugil cephalus).

A creel census conducted in 1964 estimated that fishing pressure in the delta was 1.6 trips/acre (Tucker 1979). By 1980 it is projected that demand will increase to 5 trips/acre (Auburn University 1973).

Wildlife Resources

The coastal area of Alabama supports one of the largest varieties of wildlife of any region of the state. The beaches, marshes, swamps, and open water bodies of Mobile Bay and Delta provide a diversity of wildlife habitat.

Many species of terrestrial mammals inhabit the project area and include raccoon (Procyon lotor), nutria (Myocastor coypus bonariensis), bobcat (Lynx rufus floridanus), river otter (Lutra c. canadensis), mink (Mustella vison mink), red fox (Vulpes f. fulva), Louisiana muskrat (Ondatra zibethicus), beaver (Castor canadensis carolinensis) and marsh rabbit (Sylvilagus p. palustris). The river otter, mink and bobcat are the most important fur-bearing mammals indigenous to the state.

The Atlantic bottle-nosed dolphin (Tursiops truncatus) is an aquatic mammal that regularly resides in the coastal waters of Alabama. Other aquatic mammals which occasionally occur in the area include the Florida manatee (Trichechus manatus) and whales.

Several species of reptiles and amphibians are also found within the project area. The American alligator (Alligator mississippienis) is known to inhabit the marshes and other wetlands in the bay and delta.

Over 130 species of birds occur within the Alabama coastal zone (U.S. Dept. of Commerce 1979). These include the white pelican (Pelecanus erythrorhynchos) and various species of rails, terns, gulls, herons and egrets. Many species of migratory waterfowl also utilize the bay and delta areas. The most commonly occurring species include canvasback (Aytha valisineria), gadwall (Anas strepera), lesser scaup (Aythya affinis), pintail (Anas acuta), green-winged teal (Anas carolinensis), American wigeon (Anas americana), mallard (Anas platyrhynchos) and coot (Fulica americana).

According to Beshears (1979) wintering populations generally average about 50,000 birds. These waterfowl provide many man-days of public enjoyment. Over 95 percent of the people who hunt in the lower delta are residents of Mobile and Baldwin Counties. In 1975, migratory bird stamps sales totaled 1,861 in these two counties.

Federally Listed Endangered and Threatened Species

The federally listed endangered American alligator is present in the project area and other listed species may also be present. The Service has contracted a study with Dr. Robert Chabreck of Louisiana State University to evaluate by January 1980 the status of the American alligator in Mobile and Baldwin Counties, Alabama.

To be in compliance with the Endangered Species Act of 1978, your agency should request a list of endangered and threatened species from the Regional Director, U.S. Fish and Wildlife Service, Richard B. Russell Federal Building, 75 Spring Street, S.W., Atlanta, Georgia 30303. This action is necessary to initiate the endangered species process which will assist you in meeting your responsibilities under the Act. Section 7(c) of the Endangered Species Act Amendments of 1978 requires Federal agencies to provide biological assessments for the species which are likely to be affected. The biological assessment shall be completed within 180 days after the date on which initiated, before any contract for construction is entered into and before construction is begun. Project environmental impact statements may suffice in part or in total as the biological assessment. Further information regarding the requirements of the biological assessment will be provided with the listing.

ENVIRONMENTAL QUALITY PLANNING

As a result of the existing project, the natural character of the Mobile Bay ecosystems has been altered. Current dredge and disposal methods have changed circulation patterns and salinity regimes. Wetlands in the Mobile Bay area are still being selected as dredged material disposal sites. The proposed expansion of the Mobile Harbor port facility also poses a threat to wetlands and associated wildlife resources.

Considering the potential to enhance and restore environmental quality of the Mobile Bay area, an EQ plan should be developed as required under Principals and Standards. The Channel Widening Plan was originally designated as the EQ plan but is now called the least environmentally damaging plan. Relative to fish and wildlife resources, the EQ plan should include but not be limited to the following objectives:

1. Land should be acquired and managed to maximize fish and wildlife benefits.

2. Areas that have low fish and wildlife potential should be selected for port expansion purposes.

3. Water circulation between Mobile Bay and Delta could be improved by creating openings in the causeway.

4. Water quality within Mobile Bay could be improved by providing better circulation through cuts or removal of spoil levees along the existing navigation channel.

5. Environmentally sound areas for disposal of dredged material should be designated. These would include deep-gulf sites and non-wetlands of low fish and wildlife value.

EXISTING PROJECT IMPACTS

Dredge and disposal methods currently conducted under the existing Mobile Harbor project have adversely affected fish and wildlife resources within Mobile Bay and Mobile Delta. Channel widening and open bay disposal have altered the natural physical, chemical and biological conditions of Mobile Bay. Approximately 3,800,000 cubic yards of dredged maintenance material are deposited annually along 15 sites adjacent to the bay channel. This material covers approximately 20,000 acres of bay bottom. Chermock (1974) concluded that natural circulation and salinity patterns within the more shallow upper third of the bay have been altered as a result of dredged material disposal along the navigation channel and construction of land-filled causeways. Water bottom depressions caused by shell dredging activities are also prevalent throughout the bay. Fish and wildlife losses resulting from these physical and chemical alterations have not been quantitatively assessed.

Disposal of dredged maintenance material from the Mobile River portion of this project has resulted in the destruction of over 1,772 acres of wetlands. Most of this loss occurred from the creation of Blakeley, Pinto, Little Sand and McDuffie Islands.

PROPOSED PROJECT IMPACTS

Adverse impacts on fish and wildlife resources would occur from each of the proposed channel modification plans. The construction of the turning and anchorage basins and channel enlargement as required under each of the Brookley Expansion Plans as well as the Gulf Disposal Plan would result in the loss of 700 acres of productive shallow waters within Mobile Bay. An additional 520 acres would be lost from dredging through the gulf entrance and bar channel. Enlarging the navigation channel would extend the salinity wedge farther up Mobile River. Model tests conducted for a 50-foot deep by 500-foot wide channel showed that the denser salt water would restrict southward flow of the Mobile River and divert 4 percent of the mean flow through the eastern distributaries. This would result in the freshening of the eastern section of the bay. Further studies are needed to determine the specific impact of this diversion. Circulation patterns would also be altered by channel enlargement. Model studies, conducted to date, are not adequate for quantitative assessments of these impacts on fish and wildlife resources.

Adverse impacts from dredged material disposal vary among the proposed alternatives. Approximately 1,700 acres of shallow water bottom and 10 acres of tidal marsh would be destroyed by either of the Brookley Expansion area and Gulf Disposal alternatives. Approximately 1,300 acres of water bottom would also be covered by mud flows extending from the Brookley disposal area.

Deep gulf disposal as proposed under each alternative, is currently recognized as being a more preferred method of disposal than spoiling in shallow water bottoms and wetlands. The elimination of shallow bay disposal would benefit fish and wildlife resources.

As evident from existing project losses and the proposed Brookley Expansion alternatives, hundreds of acres of fish and wildlife habitat could be destroyed from port expansion. Alabama State Docks is the largest component of the port, and requires about 2,500 acres in five separate locations (U. S. Dept. of Commerce, 1979). Of the approximately 35 million tons of cargo that passed through the port in 1976 approximately 60 percent (21 million tons) were handled by the State Docks. Table C-1 in the Draft Technical Report on Mobile Harbor shows that from 1975 to the year 2044 the annual volume of commerce moving in deep-draft vessels through the Port of Mobile will increase from approximately 17 million tons to about 65 million tons. It is also anticipated that the Tennessee-Tombigbee Waterway and Black Warrior-Tombigbee Waterway projects will increase the current 15 million tons of barge traffic between Mobile and Demopolis to about 55 million tons by the year 2000 (Public Involvement

in Planning, September 1977). As a result of these projects, the combined annual commerce moving through Mobile Harbor could approach 120 million tons. Whereas, State Docks now requires 2,500 acres to handle 21 million tons of annual cargo, it is apparent that extensive expansion will occur. These demands are currently threatening highly productive water bottoms and marsh habitat in the Brookley area and unless more environmentally sound sites are located, this expected expansion could result in extensive fish and wildlife losses.

Because specific impacts vary among the proposed alternatives, each is discussed separately.

Brookley Expansion Area and Gulf Disposal Plan 1 (Modified)

Implementing this disposal plan would result in the filling of approximately 1,700 acres of aquatic habitat less than 6 feet deep, and approximately 10 acres of tidal marsh. Another 1,300 acres of shallow water bottom would be adversely affected by mud flows extending from the Brookley disposal area. High populations of benthic invertebrate fauna, benthic flora, phytoplankton and zooplankton would be lost. Each of these biological components adds to the productivity of the estuarine system. Shallow water zones serve as nursery grounds for juvenile marine fishes and shellfishes, and provide feeding areas for juvenile and adult fishes and shellfishes. A major portion of the commercial and recreational estuarine dependent fish and shellfish species would be adversely affected by the loss of this shallow water habitat.

Channel enlargement resulting in the loss of 700 acres of bay bottom and 520 acres of nearshore bottom (bar channel) would destroy lower food chain benthic organisms and further alter salinity and circulation patterns in the bay. Model studies conducted for a 50- by 500-foot channel have shown that channel enlargement will increase the salt wedge in the navigation channel and Mobile River. This more dense saline water would divert approximately 4 percent of the Mobile River down the eastern side of the bay. This, along with the possibility that the enlarged channel will prevent the movement of the salt wedge toward Bon Secour Bay, would result in increased freshening of this area. Salinity changes could alter both the flora and fauna within the bay. Freshening of the Bon Secour Bay area could improve oyster production by decreasing oyster drill population, however, higher salinities on the west side of the channel could result in an increase of oyster drills. Further model studies would be required to determine specific impacts of a 55- by 550-foot channel.

The proposed project would increase suspended sediment in Mobile Bay waters. Other activities including maintenance of existing projects and shell dredging will also add to bay turbidity. Accumulatively these activities could adversely impact aquatic resources. A primary factor determining the degree of impacts is the time of year dredging is conducted. Dredging is more damaging when conducted during peak spawning periods in the spring and early summer.

Brookley Expansion Area and Gulf Disposal Plan 2 (Modified 1)

Fish and wildlife impacts resulting from this plan would be similar to those experienced under the Brookley Expansion Area and Gulf Disposal Plan 1 (Modified). However, this plan requires the disposal of approximately 2.7 million cubic yards of dredged material over 12,000 acres of bay bottom adjacent to the channel below the Theodore Ship Channel. This bay disposal would continue to adversely alter physical, chemical and biological conditions of the bay.

Gulf Disposal Plan

Because this alternative requires the same channel enlargement features as the Brookley Expansion alternatives, impacts on fish and wildlife would be similar to those discussed under the Brookley Expansion Area and Gulf Disposal Plan 1 (Modified). These include further destruction of water bottoms, increased turbidity and altered salinity regimes. The elimination of shallow bay disposal would improve water quality within the bay.

This alternative does not require the filling of approximately 1,700 acres of shallow water bottom and 10 acres of marsh for port expansion, and is therefore much less damaging to fish and wildlife than the Brookley Expansion alternatives.

Channel Widening Plan

Like the Gulf Disposal Plan, this alternative does not require the filling of approximately 1,700 acres of shallow water bottom and 10 acres of marsh. Since this alternative requires only widening the channel from 400 to 450 feet, it would be the least damaging alternative. Primary impacts would result from the destruction of shallow bay bottom, increased turbidities and altered salinity regimes. The removal of all dredged material to deep gulf sites would improve water quality within the bay.

DISCUSSION

Implementing the Brookley Expansion and Gulf Disposal alternatives would destroy approximately 1,700 acres of bay bottoms and 10 acres of tidal marsh. This would eliminate approximately 5 percent of Mobile Bay less than 6 feet deep. Estuarine shallow water provides vital nursery and feeding habitat for a major portion of the commercial and sport fishes and shellfishes common to the Alabama coastal zone. Although these losses cannot be expressed in quantified terms, the removal of 1,700 acres of bay bottoms and 10 acres of marsh would reduce the bay's capacity for supporting fish and wildlife resources. Because of the inability to evaluate and compensate shallow water bottoms, our normal evaluation procedures (HEP) were not applied. In view of the significant uncompensable fish and wildlife losses that could occur from the proposed project and considering that no mitigation has been provided for previous damages of the existing project, the additional filling of water bottoms and wetlands should be deleted from the selected plan.

As evident from the Brookley Expansion alternative, the need to identify long-term environmentally sound port expansion sites is urgent and could significantly reduce expected impacts of future navigation projects. Instead of filling additional water bottoms and wetlands for port needs, studies should be conducted to determine the feasibility of using existing disposal sites. Areas south of the causeway tunnels such as Blakeley Island, Pinto Island and McDuffie Island provide hundreds of acres of potential port expansion area. By the time this project is constructed, these sites should be filled to capacity and could be converted into port facilities. The use of the Theodore Industrial Park for deep draft shipping could eliminate the need for additional channel widening and reduce maintenance north of Theodore. Another alternative presented at the July 31, 1979 Public Meeting for the Mobile Harbor project, suggested the construction of a deep water dry bulk handling port to handle coal, iron ore and other bulk cargo. Environmentally sound alternatives should be identified and evaluated in terms of their potential utility for fulfilling port expansion needs.

The value of wetlands has been recognized by President Carter in his Executive Order 11990 (Preservation of Wetlands). This order directs Federal agencies to "...provide leadership and take action to minimize the destruction, loss or degradation of wetlands, and to preserve and enhance the natural and beneficial values of wetlands in carrying out the agency's responsibilities...." This order further states that "...each agency, to the extent permitted by law, shall avoid undertaking or providing assistance for new construction located in wetlands unless the head of the agency finds: (1) that there is no practicable alternative to such construction, and (2) that the proposed action includes all practicable measures to minimize harm to wetlands which may result from such use." The Service does not believe that the Brookley Expansion and Gulf Disposal Plans 1 and 2 (Modified) comply with this executive mandate because other alternatives exist that could prevent wetland destruction while satisfying future navigational needs.

The existing Mobile Harbor, Alabama Project and causeway construction have altered circulation patterns in the Mobile Bay and Delta. Water quality within this area could be improved by modifying these previous construction features. Removal of existing spoil piles adjacent to the navigation channel could improve circulation and water quality. Better tidal exchange between the upper bay and delta could also be achieved through providing openings in the Battleship Causeway. Openings in the causeway between McDuffie Island and the mainland could also improve water quality in the Garrows Bend area.

Deep-gulf disposal as proposed for this project could provide a solution to the continuous spoiling problems in the bay and delta. As conducted under the EPA's ocean dumping regulations, this method would be preferred over current disposal practices. The elimination of spoiling adjacent to the navigation channels would improve water quality to the benefit of fish and wildlife resources. Unless more environmentally sound disposal methods are developed, deep-gulf disposal should not be merely a feature of the proposed project but should be employed as soon as possible for maintenance of the existing project.

RECOMMENDATIONS

Based on the foregoing review of the Mobile Harbor, Alabama project, the Fish and Wildlife Service recommends that:

1. The filling of bay bottoms and wetlands should be deleted from the selected plan.

2. Unless more environmentally sound disposal areas are identified, dredged material should be taken to approved deep gulf sites.

3. Studies should be conducted to identify environmentally sound areas for port expansion.

4. An environmental quality plan should be developed in accordance with Principles and Standards.

5. Water quality within Mobile Bay could be improved by providing better circulation through cuts or removal of spoil levees along the existing navigation channel.

Literature Cited

Auburn University. 1973. Fishing in Alabama. Agricultural Experiment Station. 89 p.

Austin, G. B. Jr. 1954. On the circulation and tidal flushing of Mobile Bay, Alabama. Texas Agr. and Mech. Coll. Proj. 24. 28 p.

Beshears, W. W. Jr. In Press. Waterfowl in the Mobile Estuary. Proc. Symp. Natural Resources of the Mobile Estuary, Mobile, AL, May 1979.

Borom, J. L. In Press. Submerged grassbed communities in Mobile Bay, Alabama. Proc. Symp. Natural Resources of the Mobile Estuary, Mobile, Alabama, May 1979.

Chermock, R. L. 1974. The environment of offshore and estuarine Alabama. Alabama Geol. Survey. Infor. Ser. 51:135 p.

Crance, J. H. 1971. Description of Alabama estuarine areas - cooperative Gulf of Mexico estuarine inventory. Alabama Marine Res. Bull. 6:85 p.

Eckmayer, W. J. In Press. The oyster fishery in Mobile Bay, Alabama. Proc. Symp. Natural Resources of the Mobile Estuary, Mobile, Alabama, May 1979.

Futch, C. R. 1970. The spotted seatrout. Marine Research Laboratory, Florida Dept. Nat. Res. Salt Water Fisheries Leaflet 11:11 p.

Guest, W. O. and G. Gunter. 1958. The seatrout or weakfishes (genus Cynoscion) of the Gulf of Mexico. Gulf States Marine Fish. Comm. Tech. Summary 1:40 p.

Heath, S. R. In Press. Shrimp assessment and management in the Mobile estuary. Proc. Symp. Natural Resources of the Mobile Estuary, Mobile, Alabama, May 1979.

Loesch, H. 1960. Sporadic mass shoreward migrations of demersal fish and crustaceans in Mobile, Bay, Alabama. Ecology 41:292-298.

Loesch, H. 1965. Distribution and growth of penaeid shrimp in Mobile Bay, Alabama. Pub. Inst. Marine Sci. Univ. Texas 10:41-58.

Mahood, R. K. 1964. Seatrout of the Genus Cynoscium in coastal waters of Georgia. Georgia Dept. Nat. Res., Game and Fish Div.

May, E. B. 1973. Extensive oxygen depletion in Mobile Bay, Alabama. Limnology and Oceanography. 18:353-366.

McPhearson, R. M. 1970. The hydrography of Mobile Bay and Mississippi Sound, Alabama. Marine Sci. Jour. 1(2):83 p.

Nelson, W. R. 1967. Studies on the croaker, Micropogon undulatus Linnaeus, and the spot, Leiostomus xanthurus Lacepede, in Mobile Bay, Alabama. Univ. Alabama Marine Sci. Inst. Marine Sci. Jour. 1(1):96 p.

Schroeder, W. W. and W. R. Lysinger. In Press. Hydrography and circulation of Mobile Bay. Proc. Symp. Natural Resources of the Mobile Estuary, Mobile, Alabama, May 1979.

Schroeder, W. W. In Press. Th dissolved oxygen puzzle of Mobile estuary. Proc. Symp. Natural Resources of the Mobile Estuary, Mobile, Alabama, May 1979.

Story, A. H., R. M. McPhearson and J. L. Gaines. 1974. Use of florescent dye tracers in Mobile Bay. Water Poll. Con. Fed. Jour. 46:657-665.

Stout, J. P. In press. Marshes of the Mobile Bay Estuary: Status and Evaluation. Proc. Symp. Natural Resources of the Mobile Estuary, Mobile, AL, May 1979.

Swingle, H. A. 1971. Biology of Alabama estuarine areas - Cooperative Gulf of Mexico Estuarine Inventory Alabama Marine Resource Bull. 5:123 p.

Swingle, H. A. , D. G. Bland and W. M. Tatum. 1976. Survey of the 16-foot trawl fishery of Alabama, Alabama Marine Resource Bull. 11:51-57.

Swingle, H. A. 1977. Coastal Fishery Resources of Alabama. Alabama Marine Resource Bull. 12:31-58.

Tatum, W. M. In Press. The blue crab fishery of Alabama. Proc. Symp. Natural Resources of the Mobile Estuary, Mobile, Alabama, May 1979.

Tucker, W. H. In Press. Freshwater fish and fisheries resources of the Mobile Delta. Proc. Symp. Natural Resources of the Mobile Estuary, Mobile, alabama, May 1979.

U. S. Army Corps of Engineers. September 1977. Public involvement in planning. Civil Work Studies of the U.S. Army Corps of Engineers with Particular Reference to Black Warrior-Tobmigbee Waterway. U.S. Engineer District, Mobile.

U.S. Dept. of Commerce, National Marine Fisheries Service. 1973. South Florida ecological study, Appendix - E, Estuarine-dependent marine fishes. Gulf Coast Fisheries Center, St. Petersburg, Beach, Florida. 98 p.

U.S. Dept. of Commerce, National Marine Fisheries Service. 1977. Alabama Landings, Annual Summary 1976. Current Fisheries Statistics No. 7220:4 p.

U.S. Dept. of Commerce, National Oceanic and Atmospheric Administration Office of Coastal Zone Managment and Alabama Coastal Area Board. August 1979. The Alabama Coastal Area Management Program and Final Environmental Impact Statement.

Vittor, B. A. and J. P. Stout. 1975. Delineation of ecological critical areas in the Alabama Coastal Zone. Dauphin Island Sea Lab, Report No. 75-002.

Wade, W. C. 1977. Survey of the commercially important marine finfish landings of Alabama. Completion Report Proj. 2-251-R. 35 p.

DEPARTMENT OF THE ARMY
OFFICE OF THE CHIEF OF ENGINEERS
WASHINGTON, D.C. 20314

REPLY TO
ATTENTION OF:

DAEN-CWP-A

SUBJECT: Mobile Harbor, Alabama

TH eCRETARY OF THE ARMY

1. I submit for transmission to Congress my report on Mobile Harbor, Alabama. It is accompanied by reports of the Board of Engineers for Rivers and Harbors and the District and Division Engineers. These reports are in response to a resolution adopted 24 June 1965 by the Committee on Public Works of the United States House of Representatives. The Committee requested the Board to review the reports on Mobile Harbor, Alabama, and other reports with a view to determining whether the existing navigation project should be modified.

2. The District and Division Engineers recommend that the existing project for Mobile Harbor, Alabama, be modified to provide deep-draft navigation improvements. Their recommended plan provides for deepening and widening existing channels to accommodate large ocean-going bulk cargo vessels transporting coal and iron ore and for the disposal of all maintenance dredged material from the existing and proposed project in the Gulf of Mexico. Dredged material for proposed new works in the entrance channel to Mobile Bay and in the lower bay ship channel would also be placed in the Gulf while new work dredged material from the upper bay would be placed in a 1,710-acre confined disposal area. Measures to mitigate the loss of wetlands and bay bottom productivity are included as part of the selected plan. Major components of the plan are:

a. Deepen and widen entrance channel over the bar to 57 by 700 feet, a distance of about 7.4 miles.

b. Deepen and widen Mobile Bay Channel from mouth of bay to south of Mobile River, 55 by 550 feet, a distance of about 27.0 miles.

c. Deepen and widen an additional 4.2 miles of Mobile Bay Channel to 55 by 650 feet.

d. Provide 55-foot deep anchorage area and turning basin in vicinity of Little Sand Island.

e. Construct a 1,710-acre dredged material disposal area adjacent to the Brookley industrial complex.

The cost of these modifications is estimated by the reporting officers at $338,072,000, based on August 1980 price levels. The non-Federal portion of the cost is estimated at $42,578,000, which includes a cash contribution by the State of Alabama. The benefit-cost ratio is 1.6.

3. The Board of Engineers for Rivers and Harbors concurs generally with the views and recommendations of the reporting officers. The Board believes that the recommended channel improvements are needed, are technically sound, and are economically feasible. The Board notes the opposition to the Brookley expansion disposal area by the U.S. Fish and Wildlife Service, National Marine Fisheries Service, Environmental Protection Agency, and various local interests. The opposition is based on the supposition that this project feature would adversely impact on: wetlands which fringe the project area, commercial and recreational fisheries, esthetic values, and existing land uses along the Brookley waterfront. The Gulf Disposal Plan No. 1 shown in the feasibility report, which would avoid these adverse impacts by placing all new construction dredged material in the Gulf of Mexico, is the alternative preferred by these Federal and local interests. Additionally, the Alabama Coastal Area Board has certified the recommended plan specifically conditioned on mitigation of adverse effects associated with the Brookley disposal area.

4. The Board carefully examined the environmental and economic trade-offs between the respective dredged material disposal alternatives. The 1,710-acre site of the Brookley disposal area consists of 5 percent of the total shallow-water area of Mobile Bay i.e., those areas less than 6 feet deep which are generally considered important to the production of shrimp and other estuarine dependent species. While past dredged material disposal, sanitary waste disposal practices, and natural sedimentary processes have adversely affected the ecological integrity of this sector of the Bay, the Board believes that this area does possess moderate recreation and commercial fishing values which must be properly considered in project formulation, including the development of necessary mitigation measures.

5. The Board finds that the anticipated adverse impacts resulting from establishment of the Brookley disposal area can be offset to a large extent by planned and potential environmental mitigation measures. Among these are:

a. Gulf disposal of all maintenance dredged material over the life of the project.

b. Restoration of circulation and improving water quality in the channel behind McDuffie Island by providing openings in the McDuffie Island causeway which has made this area a closed cul-de-sac.

c. Creating marshes adjacent to the southern boundary of Brookley disposal area to replace the estimated 70-acre loss of wetlands presently fringing the shoreline in that area.

d. Restoration of tidal action to Chacaloochee Bay and Big Ilteau Bay by providing openings in the Mobile Delta causeway.

The total cost of all recommended mitigation elements is estimated at $2,900,000.

6. In addition to these mitigation measures, the Board concurs with the reporting officers that other potential environmental improvement measures be studied prior to project implementation to determine their technical feasibility and cost-effectiveness. The objective of such study would be to develop an environmental quality plan capable of improving environmental conditions in Mobile Bay and related waterways above without project levels. Potential environmental improvement measures include:

a. Improving circulation in Mobile Bay by creating openings in existing ridges of dredged material which parallel the main ship channel from Dog River to the mouth of Mobile River.

b. Filling natural depressions in Mobile Bay which are believed to contribute to adverse water quality conditions.

c. Establishing a recycling plan to remove dredged material from existing Blakeley and Pinto Islands dredged material disposal areas.

d. Establishing oyster beds in Bon Secour Bay which preliminary model studies indicate may be beneficially affected by the deepening project.

7. It was the view of the Board that the recommended environmental improvement measures provide an effective and efficient way to mitigate for loss of resource values and ecological damages due to establishment of the Brookley disposal area. Also, according to the reporting officers, Gulf Disposal Plan No. 1 would entail an additional first cost of about $100 million due to higher

dredging and haulage costs involved with total Gulf disposal. Furthermore, elimination of the Brookley disposal area would result in economic opportunities foregone due to land enhancement estimated at about $2,700,000 annually. After weighing the overall environmental impacts of considered alternative dredged material disposal methods against their financial and economic costs, the Board concludes that it is in the public interest to adopt the reporting officers' selected disposal plan.

8. The Board also notes that commodity projections for deep-draft movements of iron ore, coal imports, and metallurgical coal exports are derived essentially from studies and data available in 1975. Based on more current information, it appears that future demand for these commodities will be lower than estimated in the feasibility report. Conversely, the report analysis did not reflect the substantial growth in worldwide demand for steam coal which has developed in recent years in response to spiraling increases in world petroleum prices. Accordingly, the Board requested the reporting officers to reassess the projected commerce and to provide a reevaluation of navigation benefits taking into account information developed in 1980 by the President's Interagency Coal Export (ICE) Task Force and other sources pertaining to the future outlook for steam coal exports. The Board also requested updated information concerning plans by local interests for new or expanded bulk commodity handling facilities to accommodate deep-draft vessels. Based on this reevaluation, including recontacts with prospective shippers and port interests, average annual benefits decreased for some categories and increased for others in comparison with the feasibility report, thereby resulting in a net increase in navigation benefits from $50,061,000 to $51,614,000.

9. The Board finds that estimated land enhancement benefits and associated local contributions were based on outdated data. Recomputation using August 1980 price levels and 7-3/8 percent interest rate resulted in revised land enhancement benefits of $2,742,000. Accordingly, 5 percent (percent land enhancement benefits to total benefits) of Federal construction cost, currently estimated at $17,300,000, has been allocated to local interests as part of the non-Federal contribution to the project.

10. Based on its review of estimated dredging costs in the report, the Board believes that costs for dredging the upper bay channel should be increased by about 20 percent, or $15,216,000. Also, existing berthing facilities will have to be modified to accommodate a 55-foot navigation channel. Cost of such modifications are a local responsibility and are presently estimated at about $4,000,000. The Board also notes some differences in the feasibility report concerning the amount of material required and costs

for constructing necessary retaining dikes for the Brookley disposal area. The cost of dike construction, also a local responsibility, is based on the difference in cost of dredging with and without containment, presently estimated at 0.5 percent of the cost of dredged material to be placed in the disposal area, or about $460,000. With these adjustments by the Board, costs for the proposed deepening project based on August 1980 prices and the presently prescribed 7-3/8 percent interest rate are summarized as follows:

	Costs		
Item	Federal	Non-Federal 1/	Total
First cost	$313,000,000	$50,400,000	$363,400,000
Annual cost	29,800,000	5,000,000	34,800,000

1/ Includes 5 percent contribution per President's 1978 proposed cost-sharing policy.

Based on revised total annual benefits of $54,356,000, the benefit-cost ratio remains at 1.6.

11. I concur in the findings, conclusions, and recommendations of the Board.

J. K. BRATTON
Lieutenant General, USA
Chief of Engineers

DEPARTMENT OF THE ARMY
BOARD OF ENGINEERS FOR RIVERS AND HARBORS
KINGMAN BUILDING
FORT BELVOIR, VIRGINIA 22060

REPLY TO
ATTENTION OF:

BERH-PLN

18 March 1981

SUBJECT: Mobile Harbor, Alabama

Chief of Engineers
Department of the Army
Washington, DC 20314

Summary of Board Action

The Board finds that navigation improvements in the Mobile Harbor, Alabama, area are advisable. The improvements are needed and, on balance, are economically, engineeringly, and environmentally feasible and are socially acceptable. The Board concurs with the reporting officers' plan to widen and deepen Mobile Harbor channels. The channels would be generally deepened from 40 to 55 feet and widened from 400 to 550 feet. Material from initial dredging of the entrance channel and lower bay channel would be placed in the Gulf of Mexico. New work dredged material from the upper bay channel would be placed in a 1,710-acre shoreline disposal area adjacent to the Brookley industrial complex. All material dredged during maintenance of the existing and proposed project would be transported to the Gulf of Mexico for disposal. The total first cost of the project is estimated at $363,400,000. The non-Federal portion of the cost is estimated at $50,400,000, which includes a cash contribution by the State of Alabama of 5 percent of the total project cost. The benefit-cost ratio is 1.6.

Summary of Report Under Review

1. Authority. This report is in response to a resolution adopted 24 June 1965 by the United States House of Representatives Public Works Committee. The resolution authorizing the study is quoted in the District Engineer's report.

2. Description of the study area. The focus of the study is on the existing Federal navigation project at Mobile Harbor extending from the entrance channel in the Gulf of Mexico to the mouth of Mobile River. The study area is located in the extreme southwest corner of Alabama. It includes Mobile and Baldwin Counties and

Mobile Bay. The southern borders of Mobile and Baldwin Counties lie on Mississippi Sound and the Gulf of Mexico, and contain all of Alabama's coastal area. Mobile Bay and its northern delta divide Mobile and Baldwin Counties. The City of Mobile is on the west bank of the Mobile River near its mouth. The 1974 population of Mobile and Baldwin Counties was approximately 334,000 and 66,000, respectively.

3. Economic development. Principal products handled through the Port of Mobile include iron and aluminum ores, coal and lignite, basic chemicals, crude petroleum, soybeans, sand, gravel, and crushed rock. Since 1951, total commerce at the Port has increased at a rate of about 6 percent annually. Commerce moving in deep-draft vessels through the Port of Mobile amounted to 17,300,000 tons in 1978.

4. Existing improvements. The existing Federal deep-draft navigation project is about 41.7 miles long and consists of the following major elements:

a. A 42- by 800-foot channel about 1.5 miles long across Mobile Bar.

b. A 40- by 400-foot channel about 30.6 miles long in Mobile Bay to the mouth of Mobile River.

c. A 40-foot deep channel about 4.6 miles long in Mobile River to the Cochrane Highway Bridge, the width varying from 500 to 775 feet.

d. A 25-foot deep channel about 3.0 miles long from Cochrane Bridge into Chickasaw Creek, the width varying from 500 feet in Mobile River to 350 feet in Chickasaw Creek.

e. Two turning basins in Mobile River opposite Alabama State Docks and Three Mile Creek, respectively.

Additionally, the Theodore Ship Channel is under construction to provide access from the main Mobile Bay Channel to the Theodore Industrial area. The Theodore Ship Channel Project includes: (1) a 40-by 400-foot channel, about 5.3 miles long, to the west shore of Mobile Bay; (2) a 40- by 300-foot channel, about 1.9 miles long from shoreline inland to a turning basin; and (3) a 12- by 100-foot barge channel extending inland from the turning basin for a distance of 6,000 feet.

5. Problems and needs. There is a need for improving the deep-water channels serving Mobile Harbor. Based on present trends to larger size bulk cargo vessels, economic efficiency can be realized by transport of bulk cargo in deeper-draft vessels. World demand for coal, particularly steam coal, is expected to increase substantially in the future. Projections of export coal through Mobile Harbor are similarly expected to increase substantially. Therefore, the number of vessel trips with loaded drafts requiring depths exceeding the existing channel depths will increase.

6. Improvements desired. Local interests have requested navigation improvements to accommodate large vessels transporting coal, iron ore, and other bulk commodities.

7. Alternatives considered. To meet developmental and environmental quality objectives, following alternative structural and nonstructural plans were considered in the plan formulation and evaluation process along with a no-action alternative:

a. Deepening existing channels serving the Port of Mobile and to the Theodore industrial area to depths of 45, 50, 55, or 60 feet.

b. A widening only plan for the main ship channel in Mobile Bay.

c. A plan providing for offshore transshipment terminals for handling liquid and slurry bulk commodities.

Alternative disposal plans for new work and maintenance dredged material encompassed disposal in the open waters of Mobile Bay to removal of material from the Bay estuarine system for disposal in either upland areas, diked or bulkheaded facilities located in Mobile Bay, or to Gulf of Mexico disposal areas. An open water disposal plan, whereby all new work and maintenance material from channel enlargement would be deposited along existing channels in Mobile Bay, was found to be least expensive of all disposal plans investigated. However, this plan was dismissed as being entirely unacceptable from an environmental standpoint. An upland disposal plan, whereby new work and maintenance dredged material would be pumped to diked upland sites, was also dismissed because of socio-economic effects associated with the large land area required for storage purposes as well as adverse environmental effects associated with introduction of marine waters to upland, fresh-water systems.

8. Plan of improvement. The plan selected by the District Engineer to best meet the navigation needs in Mobile Harbor

provides for deepening and widening existing channels. Material dredged initially for the proposed new work in the entrance channel and lower bay channel would be placed in the Gulf of Mexico. Material dredged initially from the upper bay channel would be placed in a 1,710-acre shoreline disposal area adjacent to the Brookley industrial complex. All maintenance dredged material for the existing and proposed project would be transported to the Gulf of Mexico for disposal. Major components of his selected plan are:

a. Deepening and widening the entrance channel over the bar to 57 by 700 feet, a distance of about 7.4 miles.

b. Deepening and widening Mobile Bay Channel to 55 by 550 feet, from the mouth of the bay to a point about 3.6 miles south of Mobile River, a distance of about 27.0 miles.

c. Deepening and widening an additional 4.2 miles of Mobile Bay Channel to 55 by 650 feet.

d. Providing a 55-foot deep anchorage area and turning basin in the vicinity of Little Sand Island.

e. Constructing a 1,710-acre dredged material disposal area adjacent to the Brookley industrial complex.

9. Economic evaluation. The District Engineer's estimate of construction cost (first cost) of the proposal is about $338,072,000, based on August 1980 price levels. The non-Federal portion of that cost, $42,578,000, would include a cash contribution from the State of Alabama of 5 percent of the construction costs. Annual charges and benefits are based on a 50-year period for economic analysis and a 7-3/8 percent interest rate. Annual charges are estimated at $32,613,000, of which $2,723,000 is for annual maintenance. The non-Federal portion of annual maintenance is estimated at $512,000. Average annual benefits, which are predominately transportation savings, are estimated at $52,803,000. The benefit-cost ratio is 1.6.

10. Recommendation of the reporting officers. The District Engineer recommends that the existing project for deep-draft navigation in Mobile Harbor, Alabama, be modified to provide for navigation improvements in accordance with plans described in his report and subject to certain items of local cooperation. The Division Engineer concurs.

Review by the Board of Engineers for Rivers and Harbors

11. General. The Board's review was conducted to assure that overall technical aspects of the proposals were engineeringly and economically feasible, environmental consequences of the project were not unreasonable, and that the proposals were in the general public interest. The study and report were examined to determine compliance with applicable administrative and legislative policies and guidelines and to assure that the study was conducted so that all interested parties had adequate opportunity for input and comment.

12. Responses to the Division Engineer's public notice. The Division Engineer issued a public notice on 6 November 1980 stating the recommendations of the reporting officers and inviting public comment to the Board. The comment period was extended to 9 January 1981 in response to a request. Eleven letters were received in response to the public notice. Six letters opposed the project on general environmental grounds or expressed specific opposition to the 1,710-acre Brookley dredged material disposal area. These letters were from the U. S. Environmental Protection Agency, U. S. National Marine Fisheries Service, President of the Mobile Bay Audubon Society, a Director of Mobile County Wildlife and Conservation Association and Alabama Wildlife Federation, and from a private individual. One letter in opposition comprised a petition signed by 12 local residents. The Board has considered the objections to the project, and its findings are presented herein.

13. A letter was also received from the General Manager of the Port of Chickasaw, Alabama, stating that there are significant omissions to the report regarding the upper portion of Mobile Harbor. The Port of Chickasaw, a private enterprise, dredged Chickasaw Creek Channel to a depth of 35 feet. The letter requested that this study address the need for assuming Federal maintenance of that channel and other needs in the upper harbor. The Board notes that the District Engineer, on two occasions during the study, informed Port of Chickasaw representatives of the need for an appropriate public entity to sponsor and to provide necessary local assurances for any modification. The Board believes that when an appropriate local entity is identified to provide assurances for Port of Chickasaw modifications, the needs can be addressed through the normal Corps General Investigations Program.

14. Alternative Plans.

a. Environmental quality plan.

(1) The reporting officers have not designated an Environmental Quality (EQ) Plan as provided for in the Water

Resources Council's Principles and Standards for Planning Water and Related Land Resources. The Board notes the interest of the U.S. Fish and Wildlife Service and other Federal agencies in the development of an EQ plan which would result in net beneficial environmental effects on Mobile Bay and its associated waterways.

(2) Determination of net environmental effects requires the weighing of both beneficial and adverse impacts of water resource development. Subjective judgment must, of necessity, be employed in this weighing process which in the case of Mobile Harbor is made particularly difficult by the large scale of the project and by the magnitude and diversity of the physical impacts involved. In evaluating planning alternatives, the reporting officers acknowledged the anticipated adverse effects of channel deepening and establishing the Brookley disposal area. Their evaluation also indicates potential ameliorating and compensating effects associated with recommended mitigation measures and various other environmental improvements to be studied prior to project implementation. The latter are identified in the feasibility report and include:

(a) Improving circulation in Mobile Bay by creating openings in existing ridges of dredged material which parallel the main ship channel from Dog River to the mouth of Mobile River.

(b) Filling natural depressions in Mobile Bay which are believed to contribute to adverse water quality conditions.

(c) Establishing a recycling plan to remove dredged material from existing Blakeley and Pinto Islands dredged material disposal areas.

(d) Establishing oyster beds in Bon Secour Bay which preliminary model studies indicate may be beneficially affected by the deepening project.

The reporting officers have not specifically recommended the foregoing measures for inclusion in the project at this stage of planning because their design and technical feasibility must be determined through model studies, and their cost-effectiveness further examined. The Board believes that the recommended fish and wildlife mitigation measures will be sufficient to offset anticipated adverse project effects on such resources. However, the Board concurs with the reporting officers that development of an EQ plan, which will make definite, positive contributions to the environment of Mobile Bay and its associated waterways, should be further pursued prior to project implementation.

b. Nonstructural plan. A primarily nonstructural plan was not carried forward to the final stage of planning. However,

nonstructural measures were considered during the course of the study and found to be infeasible. The Board believes that the recommended plan properly meets the study objectives.

15. Brookley disposal area. The Board notes opposition to the Brookley disposal area by the U.S. Fish and Wildlife Service, National Marine Fisheries Service, Environmental Protection Agency, and various local citizens and environmental interests. Opposition is based on the belief that this project feature would adversely impact wetlands which fringe the project area, commercial and recreational fisheries, esthetic values, and existing land uses along the Brookley waterfront. The considered Gulf Disposal Plan No. 1, which would avoid these adverse impacts by placing all construction dredged material in the Gulf of Mexico, is the alternative preferred by these Federal and local entities. Additionally, the Alabama Coastal Area Board has certified the recommended plan under provisions of the Coastal Zone Management Act of 1972, specifically conditioned on mitigation of adverse effects associated with the Brookley disposal area.

16. Because of the controversial nature of the Brookley disposal area, the Board has carefully examined the environmental and economic trade-offs between the respective dredged material disposal alternatives. The 1,710-acre site of the Brookley disposal area comprises 5 percent of the total shallow-water area of Mobile Bay, i.e., those areas less than 6 feet deep which are generally considered important to the production of shrimp and other estuarine dependent species. While past dredged material disposal, sanitary waste disposal practices, and natural sedimentary processes have adversely affected the ecological integrity of this sector of the Bay, it does possess moderate recreation and commercial fishing values which must be properly considered in project formulation, including the development of necessary mitigation measures.

17. In this regard, the Board finds that the anticipated adverse impacts resulting from establishment of the Brookley disposal area can be offset by planned and potential environmental mitigation measures identified in the feasibility report. Among these are:

a. Gulf disposal of all maintenance dredged material over the life of the project (the present unconfined disposal of maintenance material in Mobile Bay, plus associated mudflows, subjects large expanses of the Bay to recurrent stress because of regular dredging requirements).

b. Restoring circulation and improving water quality in the channel behind McDuffie Island by providing openings in the McDuffie Island causeway which has made this area a closed cul-de-sac.

c. Creating marshes adjacent to the southern boundary of Brookley disposal area to replace the estimated 70-acre loss of wetlands presently fringing the shoreline in that area.

d. Restoring tidal action to Chacaloochee and Big Bateau Bays by providing openings in the Mobile Delta causeway.

The latter measure would restore natural estuarine processes which were curtailed when Chacaloochee and Big Bateau Bay (total area 2,400 acres) were physically separated from Mobile Bay proper upon construction of the causeway in 1928. The cost of measure (d), which is not part of the reporting officers' specific recommendation, is estimated at $430,000. The total cost of all recommended mitigation elements is about $2,900,000.

18. It is the view of the Board that the recommended environmental improvement measures provide an effective and efficient way to mitigate for loss of resource values and ecological damages due to establishment of the Brookley disposal area. However, other impacts associated with this feature, namely esthetic degradation and interference with existing land use patterns along the Brookley waterfront, are not readily capable of mitigation. Although much of the existing Brookley area is already dedicated to industrial purposes, use of the disposal site for harbor development purposes may not be compatible with the residential, educational (Brookley campus of University of South Alabama), and recreational uses which also take place there. While aware of opposition expressed by affected local citizens and organizations, and comments submitted by the President of the University of South Alabama, the Board notes that the recommended plan has been determined to be compatible with State, regional, and local plans. According to the reporting officers, Gulf Disposal Plan No. 1 would entail an additional first cost of about $100 million due to higher dredging and haulage costs involved with total Gulf disposal. Furthermore, elimination of the Brookley disposal area would result in economic opportunities foregone due to land enhancement estimated to be about $2,700,000 annually. After weighing the overall environmental impacts of considered alternative dredged material disposal plans against their financial and economic costs, the Board concludes that it is in the public interest to adopt the reporting officers' selected disposal plan.

19. Benefit analysis. Commodity projections for deep-draft movements of iron ore, coal imports, and metallurgical coal

exports were derived essentially from studies and data available in 1975. Based on more current information, it appears that future demand for these commodities will be lower than estimated in the feasibility report. Conversely, the report analysis does not reflect the substantial growth in worldwide demand for steam coal which has developed in recent years in response to spiraling increases in world petroleum prices. Accordingly, the Board requested the reporting officers to reassess the projected commerce and to provide a reevaluation of navigation benefits taking into account information developed in 1980 by the President's Inter-agency Coal Export (ICE) Task Force and other sources pertaining to the future outlook for steam coal exports. The Board also requested updated information concerning plans by local interests for new or expanded bulk commodity handling facilities to accommodate deep-draft vessels.

20. The reevaluation made by the reporting officers included recontacts with prospective shippers and port interests. Also, reevaluated projections do not assume diversion of commodities from other ports because of the recommended project. Based on this reevaluation, the Board believes the following revisions to be appropriate.

a. Projected iron ore import tonnage likely to benefit from the proposed navigation improvements is estimated at 3 million tons annually. If present sources of ore supply remain unchanged, average annual benefits are estimated at $5,706,000. However, if current negotiations between U.S. importing interests and overseas suppliers result in longer ocean hauls because of changes in future sources of supply to more distant locations, transportation savings for iron ore are estimated at $10,940,000 annually.

b. Annual benefits of $3,098,000 for projected imports of steam coal contained in the feasibility report should be deleted. Companies involved in importation of coal through Mobile Harbor advise that present contracts may not be renewed upon expiration in 1986.

c. Projected growth in exports of metallurgical coal to Japan and other Far East destinations has been excluded in the benefit reanalysis because of current uncertainities regarding the long-range demand for United States exports to these areas. Annual exports of metallurgical coal to Italy, Europe, and South America are projected to remain constant after 1986 at 4.8 million tons, as shown in the feasibility report. Average annual benefits for metallurgical coal exports are reduced from $34,492,000 to $14,970,000.

d. Because of the increased world demand for steam coal, existing coal loading facilities on McDuffie Island are presently

being expanded to provide annual throughput capacity of about 15 million tons. This facility is designed to accommodate bulk carriers larger than 100,000 dead weight tons. Local interests have recently announced plans to increase throughput capacity to 23 million tons by 1983 and further advise that sufficient area is available to double this capacity as the need arises. Modifications of bulk handling facilities located upstream of the I-10 highway tunnels will expand existing capacity in that area by 50 percent. Commodities which are expected to utilize this expanded capacity at upstream facilities are deleted the benefit analysis because vessel drafts will be restricted by the 40-foot depth channel in Mobile River.

e. Based on current estimates provided by proprietary interests, contracts for 6.5 million tons of export steam coal through Mobile Harbor will begin in 1981 and increase to 10.4 million tons per year by 1985. All export coal tonnage is expected to be loaded at the McDuffie Island facility. Average annual benefits for currently estimated steam coal exports of 10.4 million tons are $30,938,000.

f. Computation of land enhancement benefits and the total contribution, as contained in the feasibility report, are based on outdated data. Recomputation of benefits using August 1980 price levels and 7-3/8 percent interest rates result in land enhancement benefits of $2,742,000 annually. Accordingly, 5 percent (the percent of land enhancement benefits to total benefits) of Federal construction cost has been assigned to local interests. That cost, presently estimated at about $17,300,000, would be contributed in cash by the local sponsor.

g. Total average annual benefits, based on 1980 prices and the prescribed 7-3/8 percent interest rate, are summarized as follows:

	Feasibility Report 1/	Reanalysis	
Navigation benefits:			
Iron Ore imports	$12,472,000	$5,706,000 2/	$10,940,000 3/
Coal imports	3,098,000	-	-
Coal exports:			
Metallurgical	34,492,000	14,970,000	14,970,000
Steam	-	30,938,000	30,938,000
Total navigation benefits	$50,061,000	$51,614,000	$56,848,000
Land enhancement	2,742,000	2,742,000	2,742,000
Total annual benefits	$52,803,000	$54,356,000	$59,590,000

1/ Updated August 1980, Attachment No. 1 of Summary Report.
2/ Assumes 75 percent from Venezuela and 25 percent from Brazil.
3/ Assumes 100 percent from Brazil, 1995-2044.

21. Project costs. Unit dredging costs were reviewed using projects under construction as a basis for comparison. The dredging costs are generally reasonable; however, costs for dredging the upper bay channel should be increased from $1.21 to $1.45 per cubic yard. Additionally, modifications of existing berthing facilities will be necessary to accommodate the 55-foot channel. The costs of those modifications, which would be a local responsibility, is estimated at $4,000,000. With cost adjustments made as part of the Board's review, revised estimated first costs and annual costs are as shown on page 12. Non-Federal costs include a contribution from the State amounting to 5 percent of project costs.

22. Diking costs. There are some differences in the report regarding the amount of material and the cost of necessary retaining dikes for the Brookley disposal area. The increased cost of dike construction, a local responsibility, was based on the difference in the cost of dredging so as to contain the material in the disposal area and the cost of dredging and disposal without the need for containment. That difference is estimated at 0.5 percent of the cost of dredged material to be placed in the disposal area. Therefore, the costs to be assigned to local interests for dike construction is estimated at about $460,000.

23. Revised total costs, based on 1980 prices, and average annual costs, based on 50-year period for economic analysis and a 7-3/8 percent interest rate are as follows:

	Federal	Non-Federal	Total
First costs	$313,000,000	$50,400,000	$363,400,000
Annual costs	29,800,000	5,000,000	34,800,000
Benefit-cost ratio	1.6		

24. Cost sharing. The Board notes that the Governor of Alabama declines to participate in the recommended cost sharing, which requires the State to provide a cash contribution of 5 percent of the project first cost. He believes that since the President's 1978 proposed cost-sharing policy has not received Congressional approval, it is contrary to existing law. The Governor declines to participate in the recommended cost-sharing until such time as this policy issue is clarified by the Congress. The Alabama State Docks Department, as local sponsor of the project, is generally agreeable to the recommended local cooperation that it would be required to fulfill, including a cash contribution for special local benefits deriving from land enhancement due to landfill. The Department also concurs with the Governor's views regarding additional cost sharing by the State of Alabama.

25. Findings and conclusions. The Board of Engineers for Rivers and Harbors concurs generally with the views and recommendations of the reporting officers. The report essentially complies with applicable policies and guidelines, and the items of local cooperation are reasonable. The recommended plan is technically sound and economically justified. There are expected to be some adverse environmental effects of the project. However, those effects, most of which will be mitigated as part of the plan, do not outweigh the added cost of a total Gulf disposal plan for the new construction.

26. Recommendation. The Board recommends that the existing project for Mobile Harbor, Alabama, be modified generally in accordance with the plan of the reporting officers, with such modifications as in the discretion of the Chief of Engineers may be advisable, and with the President's 1978 proposed cost-sharing policy. The estimated first cost to the United States for implementation is $313,000,000. This recommendation is made with the provision that, prior to implementation, State and local interests will, in addition to the general requirements of law for this type of project, agree to comply with the following requirements:

a. The State of Alabama will provide a cash contribution equal to 5 percent of the total first cost of the project;

b. Local interests will:

(1) Provide without cost to the United States all lands, easements, and rights-of-way necessary for implementation and maintenance of the project and for aids to navigation upon the request of the Chief of Engineers, including suitable areas determined by the Chief of Engineers to be required in the general public interest for initial and later disposal of dredged material, and including necessary retaining dikes, weirs, bulkheads, and embankments therefor, or the costs of such retaining works;

(2) Hold and save the United States free from damages due to construction and later maintenance of the project, not including damages due to the fault or negligence of the United States or its contractors;

(3) Accomplish without cost to the United States all alterations and relocations of buildings, transportation facilities, storm drains, utilities, and other structures and improvements made necessary by the construction;

(4) Provide and maintain without cost to the United States adequate depths in vessel berthing areas and local access channels serving the terminals;

(5) Prohibit erection of any structure within 175 feet of the project channel as authorized;

(6) Provide and maintain without cost to the United States adequate public terminal and transfer facilities open to all on equal terms;

(7) Provide a cash contribution based on the final first cost allocated to special local benefits deriving from land enhancement due to landfill; and

(8) Share in the cost of fish and wildlife mitigation feature, in the same ratio as the remaining costs of the navigation feature.

c. The Board further recommends that:

(1) Work may be accomplished in separable units or features and that the written agreement with non-Federal interests

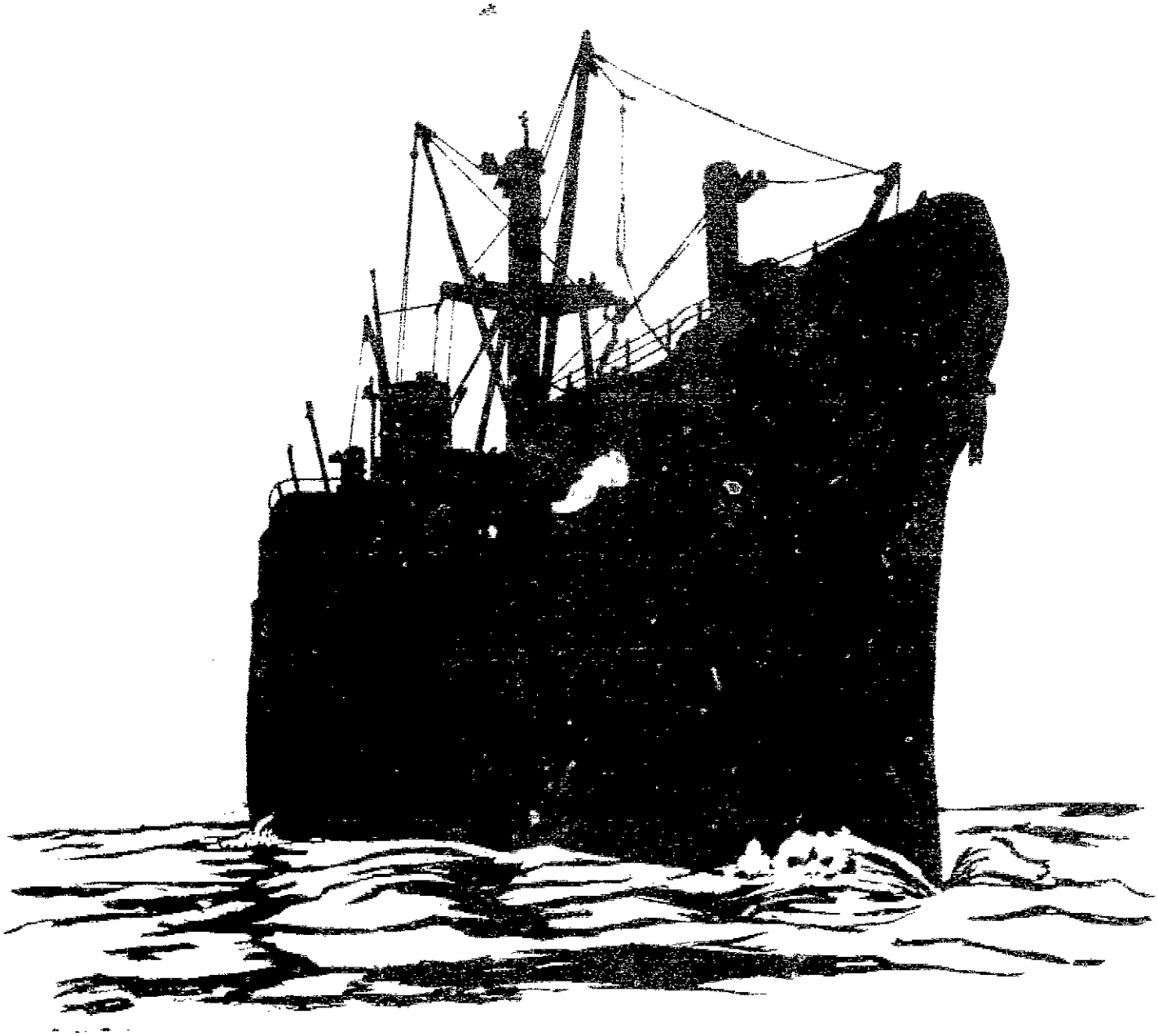
required by Section 221 of the Flood Control Act of 1970, Public Law 91-611, may be obtained in compatible increments; and

(2) Tidal action be restored to Chacaloochee and Big Bateau Bay by providing openings in Mobile Delta causeway.

FOR THE BOARD:

William R. Wray

WILLIAM R. WRAY
Major General, USA
Chairman



OCTOBER 1980

VOL. 2

SURVEY REPORT

on

Mobile Harbor, Alabama

United States Army
Corps of Engineers
...Serving the Army
...Serving the Nation

Mobile District

COPY NO. 119

FOREWORD

This feasibility report presents a recommended plan and detailed alternatives for navigation improvements at Mobile Harbor, Alabama. All plans are compared based on October 1978 cost and benefit data. The cost and benefits of the recommended plan have been updated to August 1980 price levels and construction time shown as four and one-half years. This information is available in attachment 1 of the Summary Report.

MOBILE HARBOR, ALABAMA

FEASIBILITY REPORT

CHANNEL DEEPENING FOR NAVIGATION

VOLUME INDEX

TECHNICAL REPORT

APPENDIX 5

MOBILE HARBOR, ALABAMA
FEASIBILITY REPORT
CHANNEL ENLARGEMENT FOR NAVIGATION

APPENDIX 5 - TECHNICAL REPORT

PREPARED BY
MOBILE DISTRICT, CORPS OF ENGINEERS
DEPARTMENT OF THE ARMY

SECTION A

THE STUDY AND REPORT

THE STUDY AND REPORT

TABLE OF CONTENTS

LIST OF TABLES

SECTION A

THE STUDY AND REPORT

1. This section of the report presents background and institutional information to introduce the study and to describe its presentation in the report.

PURPOSE AND AUTHORITY

2. The purpose of this study is to determine the need and justification for modification, in any way, of the existing Federal navigation project for deep-draft shipping at Mobile Harbor, Alabama. The total water and related land resources problems and needs and their relationship to the navigation system serving Mobile Harbor have been studied to ensure that all measures relating to these problems and needs will be properly considered in the formulation of water resource plans. Recommendations of the study are presented in the main report.

3. The study and the report are in compliance with the following resolution adopted 24 June 1965 by the Public Works Committee, United States House of Representatives:

RESOLVED BY THE COMMITTEE ON PUBLIC WORKS OF THE HOUSE OF REPRESENTATIVES, UNITED STATES, That the Board of Engineers for Rivers and Harbors is hereby requested to review the reports of the Chief of Engineers on Mobile Harbor, Alabama, published as House Document Numbered 74, Eighty-third Congress, first session, and other reports with a view to determining whether the existing project should be modified in any way at this time.

SCOPE OF THE STUDY

4. The geographical scope of the study is limited to Mobile Bay and Delta and the counties of Mobile and Baldwin which comprise the land mass which surrounds the bay and delta regions. The study is limited to the investigation of the water and related land resources problems of this region while the impacts and effects of plans will be investigated without regard to geographical boundaries.

5. This study is designed to assess the overall water and related land resources problems and needs of Mobile Harbor and to assess the capability of the navigation facilities of Mobile Harbor to accommodate existing and projected navigation traffic. Plans were formulated to meet the identified problems and needs, and costs and benefits were estimated for the various plans. An assessment was made of the economic, environmental, and social impacts of final plans and a plan of action was selected. The depth and detail of the study were commensurate with the objective of selecting the most suitable plan and establishing its feasibility and acceptability.

6. An earlier interim report established the feasibility of providing a ship channel into the Theodore Industrial Complex. A 40- x 400-foot channel was authorized in 1970. The need for this channel was reinvestigated and was reestablished in March 1976 and reauthorized by Congress in October 1976. The authorized Theodore Ship Channel is considered to be in place for the purpose of this study. Since the Mobile Ship Channel limited the consideration of ship channels in excess of 40 feet to Theodore, this overall study of Mobile Harbor addresses the need for enlarged channel dimensions to the Theodore Industrial complex in conjunction with the overall study of Mobile Harbor.

PLANNING OBJECTIVES

7. The "Principles and Standards for Planning Water and Related Land Resources" requires that Federal and federally assisted water and related land planning be directed to achieve National Economic Development and Environmental Quality as equal national objectives. Principles and Standards also requires that the impacts of proposed actions be measured and the results displayed or accounted for in terms of contributions to four accounts: National Economic Development, Environmental Quality, Regional Development, and Social Well-Being.

8. Specific planning objectives for this study derive from Mobile Harbor's need to more efficiently and safely accommodate the large vessels desiring to call at the port. To achieve these ends it it necessary to widen and deepen the ship channels, and to provide additional turning basins, archorages, and auxiliary facilities. Also sought is a long-range solution to dredged material disposal from the Mobile River and Bay sections of Mobile Harbor, and the investigation of measures for shoreline erosion protection which could be implemented in conjunction with plans for improving navigation facilities at Mobile Harbor. In conjunction with these goals it is the local citizenry's desire to preserve and enhance the ecologic and recreational integrity of Mobile Bay.

STUDY PARTICIPANTS AND COORDINATION

9. The Corps of Engineers was responsible for the conduct and coordination of the study, the formulation of a plan, and the preparation of the feasibility report to present that plan. At the District level, a multi-disciplinary team was used to conduct the study and to prepare the report. Major team members consisted of a study manager, regional economist, transportation economics analyst, sociologist, ecologist, and

an environmental resources analyst. Additional assistance was rendered by soils engineers, structural engineers, hydraulics engineers, dredging engineers, cost estimators, and other District staff as required. The Waterways Experiment Station of the U.S. Army Corps of Engineers constructed and verified a physical hydraulic model of Mobile Bay. This model was used to evaluate the effects that alternative plans for dredged material disposal had on salinity regimens in Mobile Bay. These model tests and studies were conducted under the supervision of the Waterways Experiment Station with coordination and guidance from Mobile District personnel.

10. Reynolds, Smith and Hill, Architects-Engineers-Planners, Incorporated was selected as the consultant to conduct a preliminary engineering and economic study of various practical dredging and spoil disposal techniques for Mobile Harbor. The Gulf South Research Institute prepared a report which identified existing social, economic, and environmental conditions in the area of Mobile Harbor and projected possible future conditions without major improvements to existing harbor facilities. Water and Air Research, Incorporated conducted an investigation to determine the effects of maintenance dredging of the Mobile Bay Ship Channel upon the distribution of coliform bacteria and on the benthic invertebrates and plankton biota in the bay.

11. Study activities were also coordinated with several key governmental entities and agencies on a continuing and as needed basis. These included the Alabama State Docks Department, the city of Mobile, the county of Mobile, the Alabama Development Office, the Alabama Department of Conservation and the Natural Resources, and the South Alabama Regional Planning Commission. The Alabama State Docks Department and the South Alabama Regional Planning Commission also furnished substantial amounts of data and information used in the study. The Mobile Bar Pilots Association provided a continual source of information on the navigation and safety problems and needs for Mobile Harbor.

12. Sincere efforts were extended throughout the course of the study to provide opportunities for active participation and involvement by all segments of the public. The initial public meeting for the study was held on 15 April 1967 for the purpose of informing the public about the study and to obtain their views as to desired modifications to the existing project for Mobile Harbor. Study efforts were directed for the next several years to the authorization and advanced engineering and design studies for the Theodore Ship Channel and are not reported here. Early in 1975, a special committee which became known as the Mobile Harbor Advisory Committee was formed for the purpose of providing access to the planning process for a wide cross-section of the various publics in the Mobile region. Membership on the committee was comprised of individuals from the following interest groups:

- Individual citizens
- Business and commerce
- Local government
- Environmental interests
- State Government
- Port interests
- Organized labor
- Fish and wildlife interests

Several workshop meetings were held with this committee during the major stages in plan formulation. This committee served a vital role to assess the public response to alternative plans and to provide a public contact point through key stages in the plan formulation process.

13. On 22 November 1976, a plan formulation public meeting was held on the Mobile Harbor, Alabama, study. The purpose of this meeting was to present the identification of tentative plans to be carried into the final detail phase of the study.

14. (Paragraph on coordination of the draft report).

THE REPORT

15. This report has been arranged as a main report and two appendices. The main report is a presentation of the feasibility study for modification of the existing Federal navigation project for Mobile Harbor, Alabama. The main report includes a description of the study area and an assessment of the resource base for the study area; an assessment of the needs and problems of the region from both environmental and economic viewpoints; a description of the process of formulation of a plan to meet these needs; a summary of the environmental, social, and economic effects of the detail plans to meet the needs; a description of the selected plan and the rationale for its selection; a summary of project economics indicating benefits, costs, and economic justification of the selected plan; the division of plan responsibilities between Federal and non-Federal interests; and the recommendations for implementing the selected plan.

16. Appendix 1 is the Environmental Impact Statement. Appendix 2 contains the pertinent correspondence on the report and gives the views and comments of those who reviewed the report in draft stage.

PRIOR STUDIES AND REPORTS

17. Dredging to provide a navigation channel in Mobile Bay and Mobile River began as a result of enactment of the River and Harbor Act of 20 May 1826 by the U.S. Congress. Subsequently, further modifications to the channel were authorized and the original Federal project was enlarged by the addition of the Arlington, Garrows Bend, and Hollingers Island Channels within the bay, a channel into Chickasaw Creek from the Mobile River, and maintenance snagging in Three Mile Creek.

18. The report published as House Document Number 74, 83rd Congress, 1st Session, recommended modification of the existing project to provide a 42- by 600-foot channel about 1.5 miles long across Mobile Bay; a 40- by 400-foot channel in Mobile Bay to the mouth of Mobile River; a 40-foot channel in Mobile River to the Cochrane Bridge, varying in width from 500 to 775 feet; and several branch channels, turning basins and anchorages. The improvement was authorized by the River and Harbor Act approved 3 September 1954. The existing project was completed in 1965.

19. Due to a request by local interests to expedite studies of the Theodore Ship Channel, the Chief of Engineers authorized an interim report limited to consideration of that project on 6 March 1968. The Senate Public Works Committee on 16 July 1970 and the House Public Works Committee on 15 December 1970, under provision of Section 201 of the 1965 Flood Control Act, authorized a 40- by 400-foot channel, branching from the main ship channel and extending through a land cut to the Theodore Industrial Park. A shoreline turning basin and anchorage area are also included in the authorization. Construction was authorized in October 1976.

20. The various authorizing legislations for Mobile Harbor are listed in Tables A-1 through A-8.

TABLE A-1 AUTHORIZATION OF FEDERAL IMPROVEMENT AT MOBILE HARBOR

ACTS DATED	LOCATION	WORK AUTHORIZED MOBILE RIVER	DOCUMENT AND REPORT
Riv. & Har. Act of 20 May 1826	Mobile River & Bay	A channel 10 feet deep dredged through the shoals in Mobile Bay up to the city of Mobile. Construction 1826-1857.	NA
Riv. & Har. Act of 11 July 1870	Mobile River & Bay	Channel depth increased to 13 feet. Construction 1870-1876.	NA
Riv. & Har. Act of 3 March 1879	Mobile River & Bay	Project adopted to provide a channel 17 feet deep and 200 feet wide.	NA
Riv. & Har. Act of 11 August 1888	Mobile River & Bay	Modified to provide a 23-foot depth.	NA
Riv. & Har. Act of 1890	Mobile River & Bay	Modified to provide a top width of 280 feet.	NA
Riv. & Har. Act of 1899	Mobile River	Provide a 23- by 100-foot channel from the entrance of the bay to the mouth of Chickasaw Creek.	NA

TABLE A-1 AUTHORIZATION OF FEDERAL IMPROVEMENT AT MOBILE HARBOR (Cont'd)

ACTS DATED	LOCATION	WORK AUTHORIZED MOBILE RIVER	DOCUMENT AND REPORT
Riv. & Har. Act of 13 June 1902	Mobile River	Removal of sunken obstructions as part of maintenance work.	NA
Riv. & Har. Act of 25 June 1910	Mobile River	Provide a channel width of 300 feet and depth of 27 feet.	
Riv. & Har. Act of 8 August 1917	Mobile River	Provide a channel of 30 feet x 300 feet	H. D. 1763, 64th Cong., 2d Sess.
Riv. & Har. Act of 3 July 1930	Mobile River	Provide a channel 32 feet deep x 500 feet wide from the mouth to a point about 5,000 feet below the mouth of Threemile Creek, and 300 feet wide thence to the highway bridge; and easing the bends at the mouth and about 3,000 feet above, with the new head of the improvement to be at the highway bridge about 1,000 feet below the mouth of Chickasaw Creek.	H. D. 26, 71st Cong., 2d Sess.

TABLE A-1 AUTHORIZATION OF FEDERAL IMPROVEMENT AT MOBILE HARBOR (Cont'd)

ACTS DATED	LOCATION	WORK AUTHORIZED MOBILE RIVER	DOCUMENT AND REPORT
Riv. & Har. Act of 26 August 1937	Mobile River	Provide extension of the 500-foot-wide channel in Mobile River to the highway bridge at mile 4.6.	H. D. 44, 75th Cong.
Riv. & Har. Act of 2 March 1945	Mobile River	Provide a channel 700 feet wide in Mobile River from the mouth to the first bend, 775 feet wide through the first bend, and 600 feet wide thence to Alabama State Docks Pier A, south, and a turning basin opposite the Alabama State Docks about 2,500 feet long, 800 feet wide at the lower end, and 1,000 feet wide at the upper end, all to a depth of 32 feet.	H. D. 739, 79th Cong., 2d Sess.
Riv. & Har. Act of 3 Sep 1954		Provide a 40-foot channel in Mobile River to the highway bridge, the width varying from 500 to 775 feet.	H. D. 74, 83rd Cong., 1st Sess.

TABLE A-1 AUTHORIZATION OF FEDERAL IMPROVEMENT AT MOBILE HARBOR (Cont'd)

ACTS DATED	LOCATION	WORK AUTHORIZED MOBILE RIVER	DOCUMENT AND REPORT
Riv. & Har. Act of 3 Sep 1954	Mobile River	Provide a turning basin 40 feet deep, 2,500 feet long, and 800 to 1,000 feet wide, opposite the Alabama State Docks.	H. D. 74, 83rd Cong., 1st Sess.
Riv. & Har. Act of 3 Sep 1954	Mobile River	Provide a turning basin 40 feet deep, 800 feet wide, and 1,400 feet long opposite Magazine Point.	H. D. 74, 83rd 1st Sess. 2d Sess.

TABLE A-2 AUTHORIZATION OF FEDERAL IMPROVEMENT AT MOBILE HARBOR

ACTS DATED	LOCATION	WORK AUTHORIZED MOBILE BAY	DOCUMENT AND REPORT
Riv. & Har. Act of 20 May 1826	Mobile River & Bay	A channel 10 feet deep dredged through the shoals in Mobile Bay up to the city of Mobile. Construction 1826-1857.	NA
Riv. & Har. Act of 11 July 1970	Mobile River & Bay	Channel depth increased to 13 feet. Construction 1870-1876.	NA
Riv. & Har. Act of 3 March 1879	Mobile River & Bay	Project adopted to provide a channel 17 feet deep and 200 feet wide.	NA
Riv. & Har. Act of 11 August 1888	Mobile River & Bay	Modified to provide a 23-foot depth.	NA
Riv. & Har. Act of 1890	Mobile River & Bay	Modified to provide a top width of 280 feet.	NA
Riv. & Har. Act of 25 June 1910	Mobile Bay	Provide a channel width of 200 feet and depth of 27 feet.	NA

TABLE A-2 AUTHORIZATION OF FEDERAL IMPROVEMENT AT MOBILE HARBOR (Cont'd)

ACTS DATED	LOCATION	WORK AUTHORIZED MOBILE BAY	DOCUMENT AND REPORT
Riv. & Har. Act of 8 March 1917	Mobile Bay	Provide a channel of 30 feet x 300 feet.	H. D. 1763, 64th Cong., 2d Sess.
Riv. & Har. Act of 3 July 1930	Mobile Bay	Provide a channel of 32 feet x 300 feet through the bay to the Quarantine Station, and 350 feet wide thence to the mouth of the river; a basin 32 feet deep, 200 feet wide and 1,000 feet long, on the west side of the channel at the Quarantine Station.	H. D. 26, 71st Cong., 2d Sess.
Riv. & Har. Act of 2 March 1945	Mobile Bay	Provide an anchorage area 32 feet deep, 200 feet wide and about 2,000 feet long on the west side of Mobile Bay Channel at the Quarantine Station by extending the existing anchorage southward 500 feet and northward to an intersection with the Mobile River Channel.	H. D. 739, 79th Cong., 2d Sess.

TABLE A-2 AUTHORIZATION OF FEDERAL IMPROVEMENT AT MOBILE HARBOR (Cont'd)

ACTS DATED	LOCATION	WORK AUTHORIZED MOBILE BAY	DOCUMENT AND REPORT
Riv. & Har. Act of 3 Sep 1954	Mobile Bay	Provide a 40-- by 400-foot channel in Mobile Bay to the mouth of Mobile River (widen along west side).	H. D. 74, 83rd Cong., 1st Sess.
Riv. & Har. Act of 3 Sep 1954		Provide for an anchorage area 32 feet deep, 100 feet wide, and 2,000 feet long opposite the site formerly occupied by the U.S. Quarantine Station at McDuffie (Sand) Island prior to widening the Mobile Bay Channel as authorized in 1954, the Quarantine Station anchorage was maintained to a project width of 200 feet.	H. D. 74, 83rd Cong., 1st Sess.

TABLE A-3 AUTHORIZATION OF FEDERAL IMPROVEMENT AT MOBILE HARBOR

ACTS DATED	LOCATION	WORK AUTHORIZED MOBILE BAR	DOCUMENT AND REPORT
Riv. & Har. Act of 13 June 1902	Mobile Bar Channel	Provide 30 feet x 300 feet across the bar.	
Riv. & Har. Act of 8 March 1917	Mobile Bar Channel	Provide 33 feet x 450 feet across the bar.	H. D. 1763, 64th Cong., 2d Sess.
Riv. & Har. Act of 3 July 1930	Mobile Bar Channel	Provide 36 feet x 450 feet across the bar.	H. D. 26, 71st Cong., 2d Sess.
Riv. & Har. Act of 3 Sep 1954	Mobile Bar Channel	Provide 42-foot x 600-foot channel about 1.5 miles long across Mobile Bar.	H. D. 74, 83rd Cong., 1st Sess.

TABLE A-4 AUTHORIZATION OF FEDERAL IMPROVEMENT AT MOBILE HARBOR

ACTS DATED	LOCATION	WORK AUTHORIZED ARLINGTON & GARROWS BEND	DOCUMENT AND REPORT
Riv. & har. Act of 7 Oct 1940	Garrows Bend	Provide a channel 27 feet deep and 125 feet wide from the Mobile River Channel at its mouth through Garrows Bend to and including a turning basin of like depth 250 feet wide and 800 feet long opposite National Gypsum Company Plant.	H. D. 221, 76th Cong., 1st Sess.
Riv. & Har. Act of 7 Oct 1940	Garrows Bend	Provide channel extension 27 feet deep and 125 feet wide to and including a turning basin of like depth 600 feet wide and 800 feet long adjacent to Arlington River.	H. D. 282, 76th Cong., 1st Sess.
Riv. & Har. Act of 2 Mar 1945	Garrows Bend	Provide existing channel through Garrows Bend from Choctaw Point to Arlington Pier, 27 feet deep and 150 feet wide with two turning basins, one 250 feet by 800 feet and the other 600 feet by 800 feet, both 27 feet deep.	H. D. 739, 79th Cong., 2d Sess.
Riv. Har. Act of 2 Mar 1945	Arlington Channel	Adoption of the channel, dredged during the 2nd World War, as an emergency measure alongside Arlington Pier from Mobile Bay Channel to the turning basin at the inner end of the Garrows Bend Channel, 27 feet deep and 150 feet wide.	H. D. 739, 79th Cong., 2d Sess.

TABLE A-4 AUTHORIZATION OF FEDERAL IMPROVEMENT AT MOBILE HARBOR (Cont'd)

ACTS DATED	WORK AUTHORIZED ARLINGTON & GARROWS BEND	DOCUMENT AND REPORT
Riv. & Har. Act of 3 Sep 1954	Construction by local interest of a solid-fill causeway across the Garrows Bend Channel between McDuffie Island and the mainland is also provided under the existing project. Provide a 27- by 150-foot channel from Mobile Bay Channel along Arlington Pier to a turning basin 800 feet long and 600 feet wide opposite Brookley AFB Ocean Terminal, and continuing thence to a turning basin 250 wide and 800 feet long in Garrows Bend, thence a 27- by 150-foot channel to the causeway linking McDuffie Island to the mainland. (1965 Report)	Sec. 104, Act of 3 Sep 1954

TABLE A-5 AUTHORIZATION OF FEDERAL IMPROVEMENT AT MOBILE HARBOR

ACTS DATED	LOCATION	WORK AUTHORIZED CHICKASAW CREEK	DOCUMENT AND REPORT
Congressional Act 27 July 1917		No existing project for improvement except for occasional removal of water hyacinths from the lower 4 miles.	
Riv. & Har. Act of 30 August 1935		Provide a channel 18 feet deep and 150 feet wide extending from the mouth about 2-1/8 miles to Chickasaw Slips.	H. D. 47, 73rd Cong., 1st Sess.
Riv. & Har. Act of 2 March 1945	Chickasaw Cr.	Provide a channel 25 feet deep and generally 500 feet wide in Mobile River from the highway bridge to the mouth of Chickasaw Creek to a point 400 feet below the mouth of Shell Bayou.	H. D. 739, 79th Cong., 2d Sess.

TABLE A-6 AUTHORIZATION OF FEDERAL IMPROVEMENT AT MOBILE HARBOR

ACTS DATED	WORK AUTHORIZED THREEMILE CREEK	DOCUMENT AND REPORT
26 August 1937	For improvement of Threemile Creek by snagging from Mobile River to the Industrial Canal.	Rivers and Harbor Committee Doc. 69, 74th Cong., 1st Sess.

TABLE A-7 AUTHORIZATION OF FEDERAL IMPROVEMENT AT MOBILE HARBOR

ACTS DATED	WORK AUTHORIZED HOLLINGERS ISLAND CHANNEL	DOCUMENT AND REPORT
1943 Military Authorization	Federal Government dredged the Hollingers Island (Theodore) Channel and turning basin connecting the Mobile Bay Channel with terminal facilities on the western shore of the bay about 9 miles below the mouth of Mobile River. The channel is about 4 miles long and was dredged to a depth of 32 feet and a width of 175 feet. Construction was as a military project with no provisions for regular maintenance.	NA
Riv. & Har. Act of 1945	In 1948 the channel was redredged with emergency funds provided under authority of Section 3 of the 1945 River and Harbor Act.	

TABLE A-8 AUTHORIZATION OF FEDERAL IMPROVEMENT AT MOBILE HARBOR

ACTS DATED	WORK AUTHORIZED THEODORE SHIP CHANNEL	DOCUMENT AND REPORT
Flood Control Act of 1965	Existing Project: Provides for a channel 40 feet wide, branching from the main ship channel in Mobile Bay at a point about 2.8 miles north of Mobile Bay Light and extending northwesterly about 5.3 miles to the shore of Mobile Bay, thence via land cut 40 feet deep, 300 feet wide, and about 1.9 miles long, to and including a trapezoidal turning basin 40 feet deep and approximately 42 acres in area within the Theodore Industrial Park, and an anchorage basin 40 feet deep, 300 feet wide, and 1,200 feet long located adjacent to the proposed channel near the bay shoreline. The existing project was authorized by the Senate Public Works Committee on 16 July 1970 and the House Public Works Committee on 15 December 1970 under provision of Section 201 of the 1965 Flood Control Act.	H. D. 91-335 91st Cong., 2d Sess.
Riv. & Har. Act of 1976	The project for navigation improvements on Mobile Harbor, Theodore Ship Channel, Alabama, authorized by the House Public Works Committee on 15 December 1970 was modified to provide an additional turning basin adjacent to shoreline and a barge channel extension. Progress: Construction was initiated in the spring of 1979.	H. D. 95-376 95th Cong., 2d Sess.

SECTION B

RESOURCES AND ECONOMY OF STUDY AREA

RESOURCES AND ECONOMY

OF

STUDY AREA

TABLE OF CONTENTS

TABLE OF CONTENTS Cont'd

LIST OF TABLES

LIST OF TABLES Cont'd

LIST OF FIGURES

LIST OF ATTACHMENTS

SECTION B

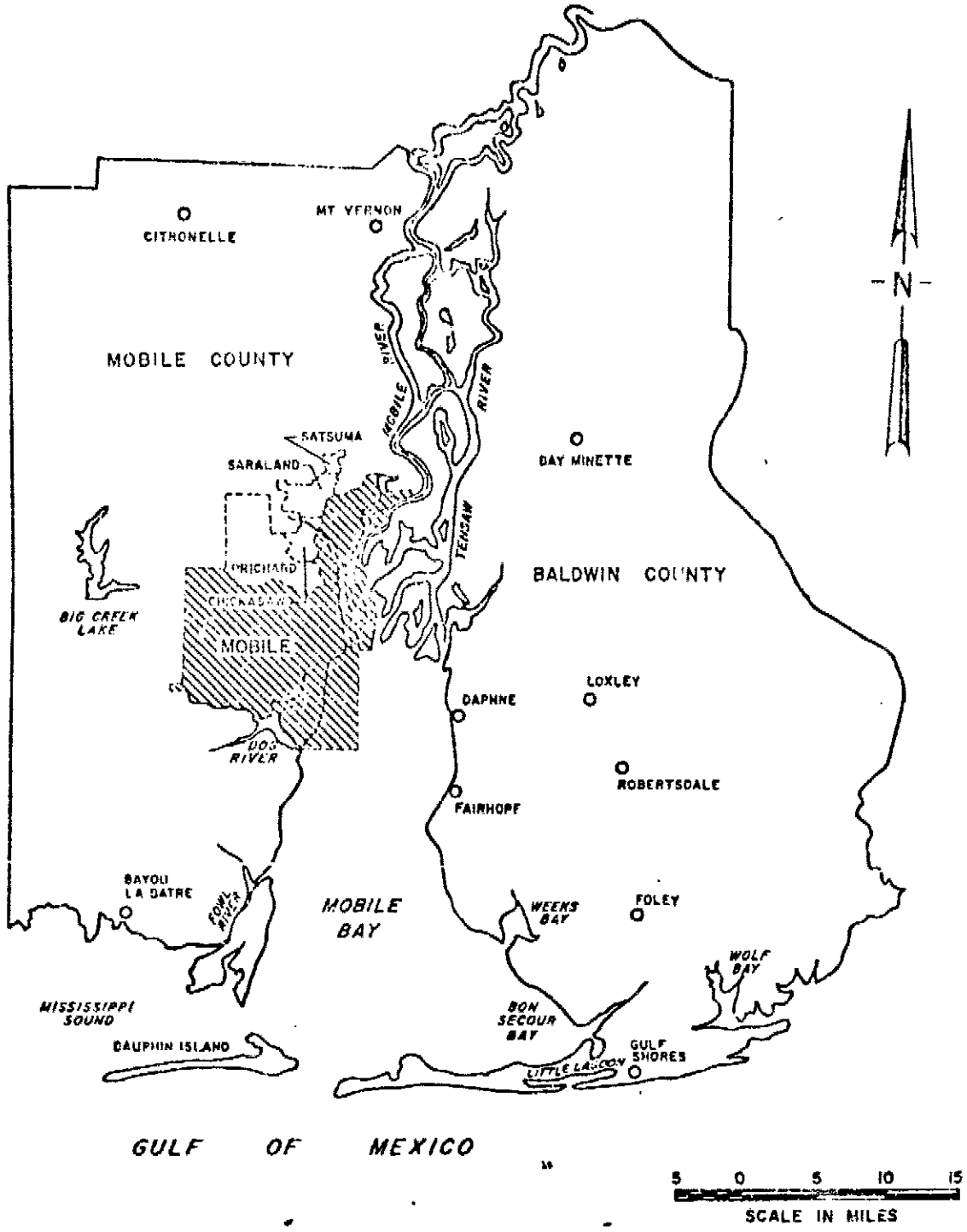
RESOURCES AND ECONOMY OF THE STUDY AREA

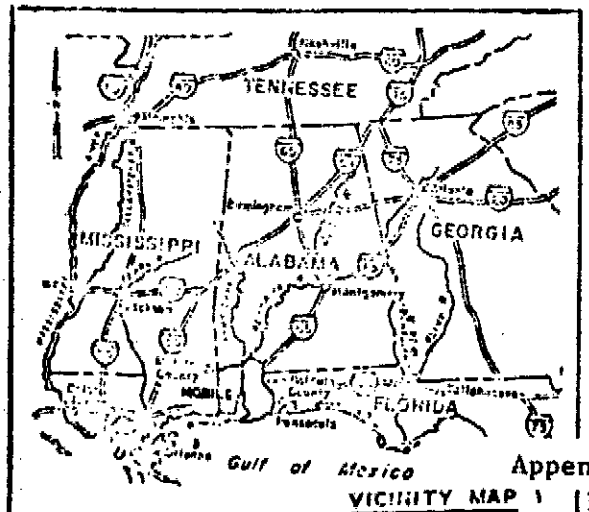
1. This section presents an economic, social, and environmental profile of the Mobile study area, outlining key factors which define the area's resource development, social patterns, economy, and environment. Industrial expansion, transportation, port development, and existing land uses are examined, as well as the region's human resources. Where applicable and within the limits of data availabilty, conditions are defined for the immediate counties of Mobile and Baldwin, and compared with similar statistics for the State of Alabama and the nation. The region's environmental setting and natural resources are also reviewed. These existing conditions are presented to provide a base line against which the effects of alternative actions will be evaluated.

DEVELOPMENT AND ECONOMY

GEOGRAPHICAL DESCRIPTION

2. The study area is located in the extreme southwest corner of Alabama, bordering Mississippi on the west and Florida on the southeast. It includes Mobile County, Baldwin County, and Mobile Bay. The southern borders of Mobile and Baldwin Counties lie on Mississippi Sound and the Gulf of Mexico and contain all of Alabama's coastal area. Mobile Bay and the northern delta divide Mobile and Baldwin Counties. These two counties form the Mobile Standard Metropolitan Statistical Area (SMSA). See Figure B-1 for a general map of the study area. Mobile Bay is situated at the mouth of an extensive river system which drains approximately 45,000 square miles within Alabama, Mississippi, Georgia, and Tennessee. Mobile Harbor is located at the mouth of the Mobile River, and the City of Mobile is on the west bank of the river near its mouth. The southern end of Mobile Bay opens into the Gulf of Mexico. The entrance to the bay is 46 miles west of Pensacola, Florida, and 104 miles northeast of the mouth of the Mississippi River.





VICINITY MAP

SURVEY REPORT
ON
MOBILE HARBOR, ALABAMA
STUDY AREA MAP

Figure B-1

PRINCIPAL ECONOMIC ACTIVITIES

3. The economy of the Mobile SMSA is based on its port and port-related activities, its natural resources and their use by industry, and the growing non-commodity producing, service-oriented industries. In 1977 the Port of Mobile ranked twelfth among U. S. port in "total all traffic," both foreign and domestic . Principal products handled through the port included iron and aluminum ores, coal and lignite, basic chemicals, crude petroleum, soybeans, and sand, gravel, and crushed rock. Since 1951 total commerce at the port has increased at a rate of about 6 percent annually.

4. An industry is considered basic if it exports products outside a region, making it a source of non-local income. Five of the major manufacturing industries in the study are are considered basic, including paper and allied products, shipbuilding and repair, chemicals and allied products, textiles and apparel, and lumber and wood products. In addition to bringing in non-local income, basic industries generate related secondary economic activites. Secondary industries account for 5 percent or more of the sales to, or purchases from, the basic industries. Broadly defined, the five major manufacturing industries embrace a complex of sub industries. The interrelationship among basic industries and related secondary industries in the study area is presented in table B-1.

5. OBERS projections (see table B-2), present earnings by industry for the United States, the State of Alabama, and the Mobile SMSA. The table refers to historical and estimated figures for the period 1962 to 1976. During these years the nation's total earnings by industry increased 85 percent, while the State of Alabama experienced a 78 percent growth rate, and the study area, a 55 percent growth rate. In contrast, the study area led the state and nation for the period 1970 to 1976 with a growth rate of 31 percent while the state and nation followed with 30 and 28 percent growth

Table B-1

Basic Industries and Related Secondary Industries

Basic Industries	Secondary Industries
Paper and Allied Products	Printing and Publishing Food and Kindred Products. Lumber and Wood Products. Wholesale and Retail Trade. Transportation and Warehousing. Chemicals and Selected Products.
Shipbuilding and Repair	Primary Iron and Steel Manufacturing. Transportation and Warehousing Wholesale and Retail Trade. Electrical Industrial Equipment and Apparatus. General Industrial Machines. Primary Nonferrous Metals. Heating, Plumbing and Structural Products. Engines and Turbines. Lumber and Wood Products.
Chemicals and Allied Products	Plastics and Synthetic Materials. Petroleum Refining. Other Agricultural Products. Drug, Cleaning, and Toilet Products.
Textile and Apparel Products	Plastics and Synthetic Materials.
Lumber and Wood Products	New Construction. Forestry and Fishery Products. Paper Products, excluding Boxes. Household Furniture. Electric, Gas, Water, and Sanitation Services.
Fisheries	

Source: The Economy and Population of the South Alabama Region, South Alabama Regional Planning Commission, June, 1975.

rates respectively. In 1976, estimated earnings by industry in the study area totaled $945.4 million. The manufacturing sector produced the highest earnings, $233 million, followed by wholesale and retail trade at $173.2 million, services at $168.6 million and government at $141.4 million.

INDUSTRIAL DEVELOPMENT

6. For the purpose of this study, industrial development will be evaluated by considering employment and capital expenditures. In 1974, an estimated 18,000, or 13 percent of the total work force of the Mobile SMSA, were employed by manufacturing industries closely allied with or dependent upon the port and related waterways. An additional 2,800 persons were employed in water transportation and transportation services which were directly related to port and waterway associated activities. A large percentage of the 3,000 employees involved in railroad, motor freight, and warehousing activities work at jobs connected with the port and waterways.

7. Total SMSA employment grew slightly during the decade from 1960 to 1970 from 121,400 to 123,100. These figures reflect the impact on the area of the phase out of Brookley Air Force Base in the mid-1960's. In 1970 the wholesale and retail trade sector employed the greatest numbers, 25,400, closely followed by the manufacturing industries with 24,700 workers. The government was the third most important employer with 17,200 employees. The remaining industries employed 32,700 persons. In 1974, with employment at 151,900, the unemployment rate in the study area reached 3.7 percent versus a State of Alabama rate of 4.0 percent, and a national unemployment rate of 5.6 percent.

TABLE B-2

EARNINGS BY INDUSTRY FOR SELECTED YEARS

MOBILE SMSA, STATE OF ALABAMA, AND UNITED STATES
(In Thousands of 1967 Dollars)

Industry Sector	1962 United States	1962 Alabama	1962 Mobile SMSA	1970 United States	1970 Alabama	1970 Mobile SMSA	1976[2] United States	1976[2] Alabama	1976[2] Mobile SMSA
Total Earnings	389,993,433	5,187,847	609,155	562,311,127	7,101,139	721,448	721,032,198	9,233,892	945,354
Agriculture, Forestry and Fisheries	18,462,090	324,274	11,009	19,640,721	320,695	14,329	20,508,427	347,635	20,333
Mining	4,908,611	75,928	-	5,647,503	70,809	804	6,099,942	80,061	2,232
Contract Construction	22,990,095	282,517	30,235	34,457,902	380,676	55,674	44,824,600	528,615	75,177
Manufacturing	115,576,458	1,442,654	113,496	156,291,199	2,069,953	186,328	190,400,192	2,630,122	223,048
Transportation, Comm. and Public Utilities	28,694,815	341,044	61,550	39,925,053	443,134	75,750	51,124,624	579,156	92,308
Wholesale and Retail Trade	67,565,645	819,771	103,286	93,080,363	1,066,328	136,997	116,984,836	1,364,958	173,179
Finance, Insurance and Real Estate	19,805,660	207,371	25,396	28,880,241	277,231	32,511	40,664,052	404,406	48,472
Services	52,608,614	623,263	78,641	85,077,671	922,580	117,401	122,705,584	1,324,883	168,579
Government	59,386,445	1,071,022	179,795	99,310,475	1,249,753	101,653	127,719,936	1,973,861	141,446

[1] Straight line interpolation using 1959-1970 rate of growth

[2] Straight line interpolation using 1971-1980 rate of growth

Source: Projections of Economic Activity in Alabama, U. S. Department of Commerce, Bureau of Economic Analysis, December 1925
1972 Obers Projections Economic Activity in the U. S., U. S. Department of Commerce, Bureau of Economic Analysis, April 1974.

8. Capital investment for new plants and equipment reflects an industry's effort to avoid obsolescence, and is an important indicator of past and future growth. Published annual studies by the Bureau of Census on capital expenditures for the United States, the State of Alabama, and the Mobile SMSA have been prepared by the Bureau of the Census and are presented in table B-3. In 1972, capital expenditures in the study area amounted to $33.7 million compared with $45 million in 1971 and $48.6 million in 1970. The total investment in the 1963-1972 period amounted to $360.7 million. The Alabama Development Office has published data which announces investments by new and expanding industries in the Mobile SMSA. More than $714.3 million in estimated investment has been announced for the years 1973-1975, Mobile County receiving $693.6 million and Baldwin County $20.7 million. The announced investments indicate the relative importance of chemicals and allied products, which account for 82 percent of the study area's projected growth. Approximately 5,800 additional industrial jobs would be generated by the 1973-1975 growth.

TABLE B-3

CAPITAL EXPENDITURES BY MANUFACTURING FIRMS
IN THE UNITED STATES, STATE OF ALABAMA, AND MOBILE SMSA
($1,000,000)

	United States	State of Alabama	Mobile SMSA
1963	$11,370.0	$147.4	$18.2
1964	13,294.3	282.2	43.1
1965	16,615.0	371.9	40.2
1966	20,235.8	423.7	20.8
1967	21,503.0	378.9	27.5
1968	20,613.1	347.1	50.4
1969	22,291.4	382.8	32.9
1970	22,164.3	417.2	48.6
1971	20,940.7	355.5	45.0
1972	24,077.7	355.1	33.7

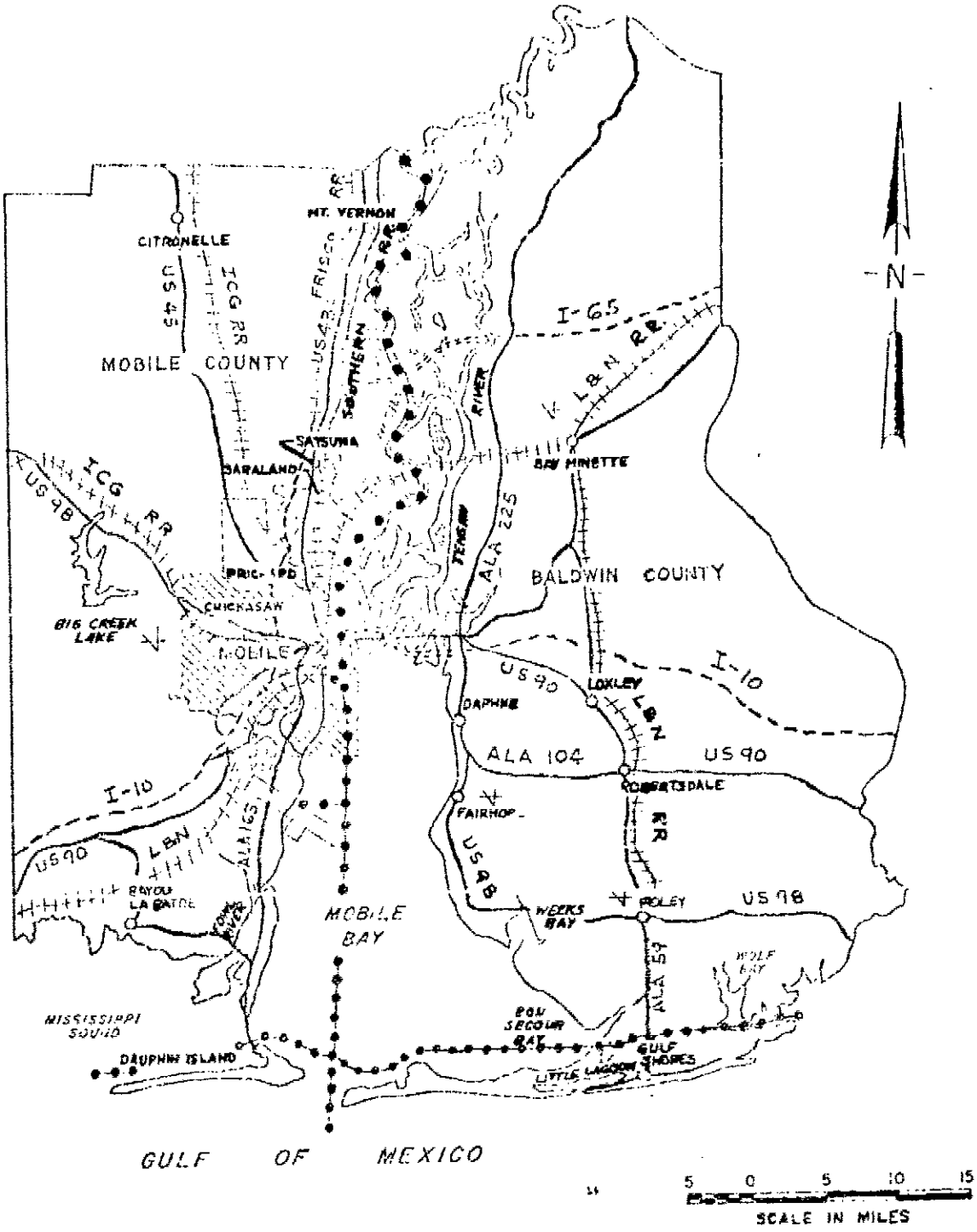
Annual Surveys of Manufactures and Census of Manufactures, U. S. Department of Commerce, Bureau of the Census - manufacturing employment and capital expenditures.

Although the announced investments are influenced to some extent by the inflated costs of capital goods, it is noteworthy that the 1973-1975 total of $714.3 million far exceeds the actual capital expenditures of $360.7 million invested by industry in the Mobile SMSA for the decade from 1963-1972.

TRANSPORTATION

9. A well developed system of transportation is essential to an area's economic well-being. The Mobile SMSA is served by an integrated network of highway, air, rail, and water transportation facilities. The study area's highway system consists of six U. S. highways, two interstate routes, and a secondary system composed of state and county roads. These highways provide access within the area and connect it to major cities outside the region. However, several of the roads are inadequate to handle the existing traffic volume. Interstate highways I-65 and I-10 are nearing completion. The I-10 bridge across Mobile Bay is under construction with completion expected in May 1978. The I-65 bridges across the delta are scheduled for completion in 1982.

10. Commercial and private air transportation are available at the municipally-owned Bates Field and Brookley Aerospace Center. Airlines serving the area include Eastern, National, and Southern. A total of thirty flights are made daily to or from Mobile carrying freight, mail and passengers. Charter flights, air ambulances service, aircraft repair, and hanger storages are provided by several independent flying services. Eight other municipal or private airfields also serve the study area. The railroads providing transportation service in the area are the Illinois



LEGEND

- EXISTING INTERSTATE
- PROPOSED INTERSTATE
- MAJOR HIGHWAYS
- RAILWAY SYSTEM
- MUNICIPAL AIRPORT
- WATERWAYS
- PROPOSED WATERWAY

SURVEY REPORT
ON
MOBILE HARBOR, ALABAMA

TRANSPORTATION NETWORK

Figure B-2

Central Gulf (ICG), the St. Louis-San Francisco (Frisco), the Southern, and the Louisville and Nashville (L&N). The L&N is the only through line. It serves the Theodore Industrial Complex and has spur tracks which extend from Bay Minette to Foley in Baldwin County. The others terminate in Mobile. The Alabama State Docks Terminal Railway connects these railroads to portside tracks, other marine terminal facilities, and industries near the Alabama State Docks. The area is also linked to all major cities in the United States by 55 common freight carriers which serve the study region.

11. The study area is also served by a well developed system of waterways. Deep draft facilities are provided by a 36.5 mile channel extending from the entrance to the bay, northward into the Mobile River. It is 40 feet deep and varies in width from 400 feet in the bay to 500 to 1,000 feet in the river section. A plan for constructing the Theodore Ship Channel to a 40-feet depth and 400-foot width has been authorized by Congress. Barge traffic in the area is accommodated by the Mobile-Tombigbee-Black Warrior River system, the Mobile-Alabama-Coosa River system and the Gulf Intracoastal Waterway which extends east-west across the southern part of the bay. The Tennessee-Tombigbee River Project is now under construction and is expected to be completed in 1986. It will connect a 16,000 mile inland waterway system, located in 23 states, with the Gulf of Mexico at the port of Mobile. Figure B-2 outlines the area's transportation network.

PORT DEVELOPMENT

12. Existing Federal Project - The first Federal project for Mobile Harbor was authorized by Congress in 1826. Since that year numerous modifications and extensions to the harbor channels have been authorized and constructed. The existing Federal project includes both completed facilities and facilities that have been authorized and have not been constructed. The completed portion of the project, authorized by the 1954 River and Harbor Act, is comprised of the following features:

a. A 42- by 600-foot channel about 1.5 miles long across Mobile Bar;

b. A 40- by 400-foot channel in Mobile Bay to the mouth of Mobile River;

c. A 40-foot channel in Mobile River to the highway bridge, the width varying from 500 to 775 feet;

d. A 25-foot channel from the highway bridge to and up Chickasaw Creek to a point 400 feet south of the mouth of Shell Bayou, the widths being 500 feet in Mobile River and 250 feet in Chickasaw Creek;

e. A turning basin 40 feet deep, 2,500 feet long, and 800 to 1,000 feet wide, opposite the Alabama State Docks;

f. A turning basin 40 feet deep, 1,000 feet wide, and 1,600 feet long opposite Three Mile Creek;

g. A 27- by 150-foot channel from the mouth of Mobile River to and including a turning basin 250 feet wide and 800 feet long in Garrows Bend, and continuing thence to a turning basin 800 feet long and 600 feet wide opposite Brookley Field ocean terminal, thence a 27- by 150-foot channel along Arlington pier to the Mobile Bay Channel; and

h. Maintenance by snagging Threemile Creek from its intersection with the Industrial Canal to Mobile River.

13. The project also provides for an anchorage area 32 feet deep, 100 feet wide, and 2,000 feet long opposite the site formerly occupied by the U. S. Quarantine Station at McDuffie Island. Construction by local interests of a solid-fill causeway across the Garrows Bend Channel between McDuffie Island and the mainland is also provided for under the existing project.

14. The Theodore Ship Channel feature of the Mobile Harbor, Alabama project was authorized by the Water Resources Development Act of 22 October 1976. The authorization provides for a channel 40 feet deep and 400 feet wide branching from the main ship channel in Mobile Bay at a point 2.8 miles north of Mobile Bay Light and extending northwesterly about 5.3 miles to the western shore of Mobile Bay, thence via land cut 40 feet deep, 300 feet wide, and about 1.9 miles long generally along the route of the existing barge canal to a trapezoidal turning basin about 42 acres in an area within the Theodore Industrial Park. The plan also includes an anchorage area 40 feet deep, 300 feet wide, and 1,200 feet long adjacent to the south side of the channel near the bay shoreline; and a turning basin 40 feet deep, 1,200 feet wide, and 2,200 feet long to be located adjacent to the channel near the bay shoreline. The authorized plan includes a barge channel extension 12 feet deep, 100 feet wide, and approximately 6,000 feet long extending in a westerly direction to a turning basin approximately two acres in area. Construction of the Theodore Ship Channel is scheduled to start in the spring of 1979 with completion scheduled in 1982.

15. Project Maintenance - The Mobile River and Mobile Bay channels are maintained by hydraulic pipeline dredge and the channel across Mobile Bar is maintained by hopper dredge. The dredged material from Mobile River is currently being placed in approved upland disposal areas. This includes maintenance from Chickasaw Creek channel. The dredged material from Mobile Bay is currently being disposed of in the open waters of Mobile Bay in approved areas. The material from the Mobile Bar channel is being disposed of in the Gulf of Mexico in an approved area. The annual quantities of dredged maintenance material experienced over the 10-year period ending 30 June 1975 are as follows:

	Cubic Yards Per Annum
Mobile River (including Chickasaw Creek)	1,054,000

	Cubic Yards Per Annum
Mobile Bay	3,743,000
Mobile Bar Channel	264,000

16. Existing Commerce - A comparative statement of commerce for Mobile Harbor, Alabama for the 10-year period from 1966-1975 is shown in table B-4. As shown in the table, total commerce for the harbor has shown a steady increase. The increase in internal barge traffic has been the most significant source of the increase. Foreign and coastwise traffic (deep-draft) have shown a somewhat less significant increase in commerce. The major increase in deep-draft movements has been in the export of coal and coastwise shipments of crude petroleum.

17. Vessel Traffic. Waterborne commerce at Mobile Harbor is transported in liquid and dry bulk carriers and general cargo ships having drafts up to 40 feet, and in barge tows, commercial fishing boats, and other miscellaneous vessels having drafts up to about 18 feet. Some vessels which could have loaded drafts in excess of 40 feet call on Mobile Harbor with partial loads. Table B-5 contains trips and drafts of vessels using Mobile Harbor during the 10-year period from 1966-1975 as reported in the publication "Waterborne Commerce of the United States". As can be seen in the table, shallow draft commerce has increased substantially for the 10-year period. Trips of deep-draft vessels have actually exhibited an actual decline for the 10-year period while commerce for the 10-year period has shown an increase. This indicates the trend in using larger ships to transport deep-draft cargo.

18. Existing and Planned Port Facilities - There are 26 general cargo berths owned and operated by the Alabama State Docks Department. These facilities are located on the west bank of Mobile River between Cochrane Bridge and the area where Bankhead and I-10 Highway Tunnels cross the Mobile River. These general cargo berths vary from relatively modern

Table B-4

Comparative Statement of Commerce
1966-1975
(Short Tons)

Year	Total	Foreign		Domestic				
				Coastwise		Internal		
		Imports	Exports	Receipts	Shipments	Receipts	Shipments	Local
1966	22,307,913	9,359,294	2,020,096	423,279	2,617,096	3,250,843	3,430,300	1,207,005
1967	21,283,786	8,873,419	1,873,620	236,509	1,877,269	3,510,211	3,584,823	1,327,935
1968	22,326,318	8,884,717	2,236,133	158,643	1,600,918	4,109,143	3,950,758	1,386,006
1969	23,162,341	8,206,210	2,503,868	69,154	2,173,344	4,774,682	4,113,566	1,332,617
1970	23,829,585	8,777,034	2,940,323	33,236	1,837,661	5,009,713	3,983,712	1,247,906
1971	24,919,228	8,527,252	2,325,097	15,469	1,773,663	6,086,307	4,963,965	1,227,505
1972	27,921,063	6,674,404	3,053,760	170,806	3,025,715	7,975,690	5,220,933	1,169,755
1973	30,518,422	7,909,649	3,856,377	554,381	4,670,406	6,351,757	6,001,289	1,174,563
1974	33,153,954	9,415,532	3,962,579	447,610	3,770,903	7,148,739	7,016,646	1,391,925
1975	32,452,912	7,895,820	5,404,733	363,652	3,013,583	7,559,129	6,832,326	1,383,669

Table B-5

Trips and Drafts of Vessels
1965-1974

Year	Total trips	Draft in feet	
		18 and less	19 and above
1966	20,706	18,218	2,488
1967	23,049	20,572	2,477
1968	25,609	23,208	2,401
1969	23,867	21,644	2,223
1970	23,314	21,077	2,237
1971	26,696	24,761	1,935
1972	27,429	25,393	2,036
1973	25,992	23,747	2,245
1974	29,059	27,069	1,990
1975	29,805	27,939	1,966

to 50 year old docks. The old facilities are still usable although they lack modern design features. General cargo berth utilization is low with an average utilization rate of 27 percent. The tonnage handled through these facilities was 1,400,000 tons in 1976, representing an average usage of 55,000 tons per berth. Both tonnage and berth utilization figures indicate there is not a need for additional general cargo berths. With timely renovation of the old berths and the anticipated construction of new, modern berths, these facilities will be adequate for anticipated future general cargo commerce. Figure B-3 gives a view of the general cargo berths at Mobile.

19. A public grain elevator, owned and operated by the Alabama State Docks Department, is located on the west bank of Mobile River above the I-10 tunnels. Prior to 1975, the elevator had a capacity of 1.1 million bushels giving a throughput capability of 2.5 million tons annually, Subsequent to 1975, the State Docks embarked on a series of modernization programs. The first program involved the construction of an annex to the present elevator, increasing the storage capacity to 2.5 million bushels. This expansion was completed in September of 1975. The expenditure for this expansion of the elevator was $6.0 million. Another expansion program currently underway involves the construction of a new dump truck and scales and a new shipping system complete with a 40,000 bushel per hour elevator leg and cleaning system. This will be a $5.8 million venture. All these improvements will be linked directly to the existing grain elevator. Upon completion of latest expansion of the elevator, it is estimated the annual throughput capacity will be over 3.5 million tons. Figure B-4 gives a pictoral view of the public grain elevator at Mobile.

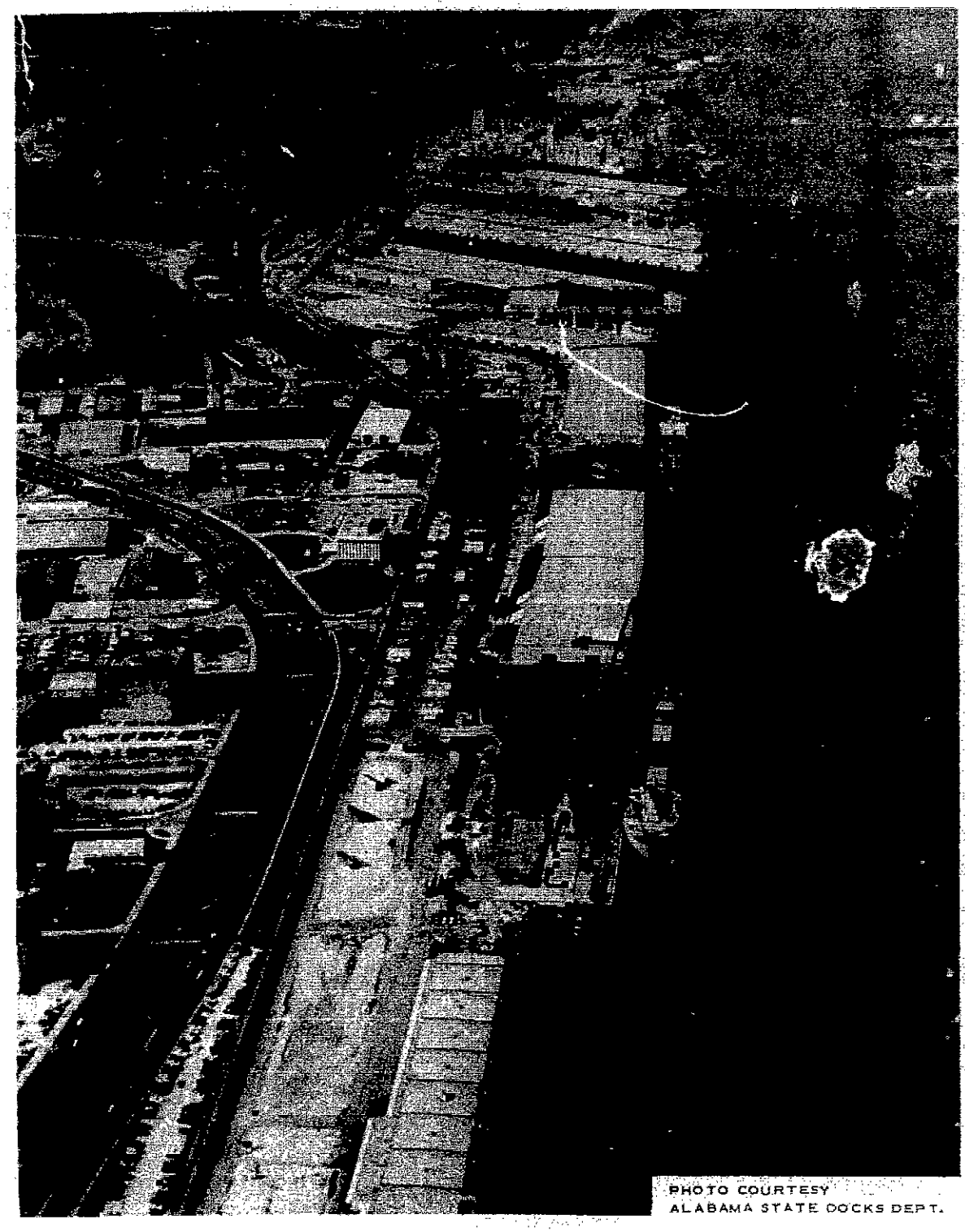


FIGURE B-8 - AERIAL VIEW OF GENERAL CARGO TERMINALS OWNED AND OPERATED BY THE ALABAMA STATE DOCKS

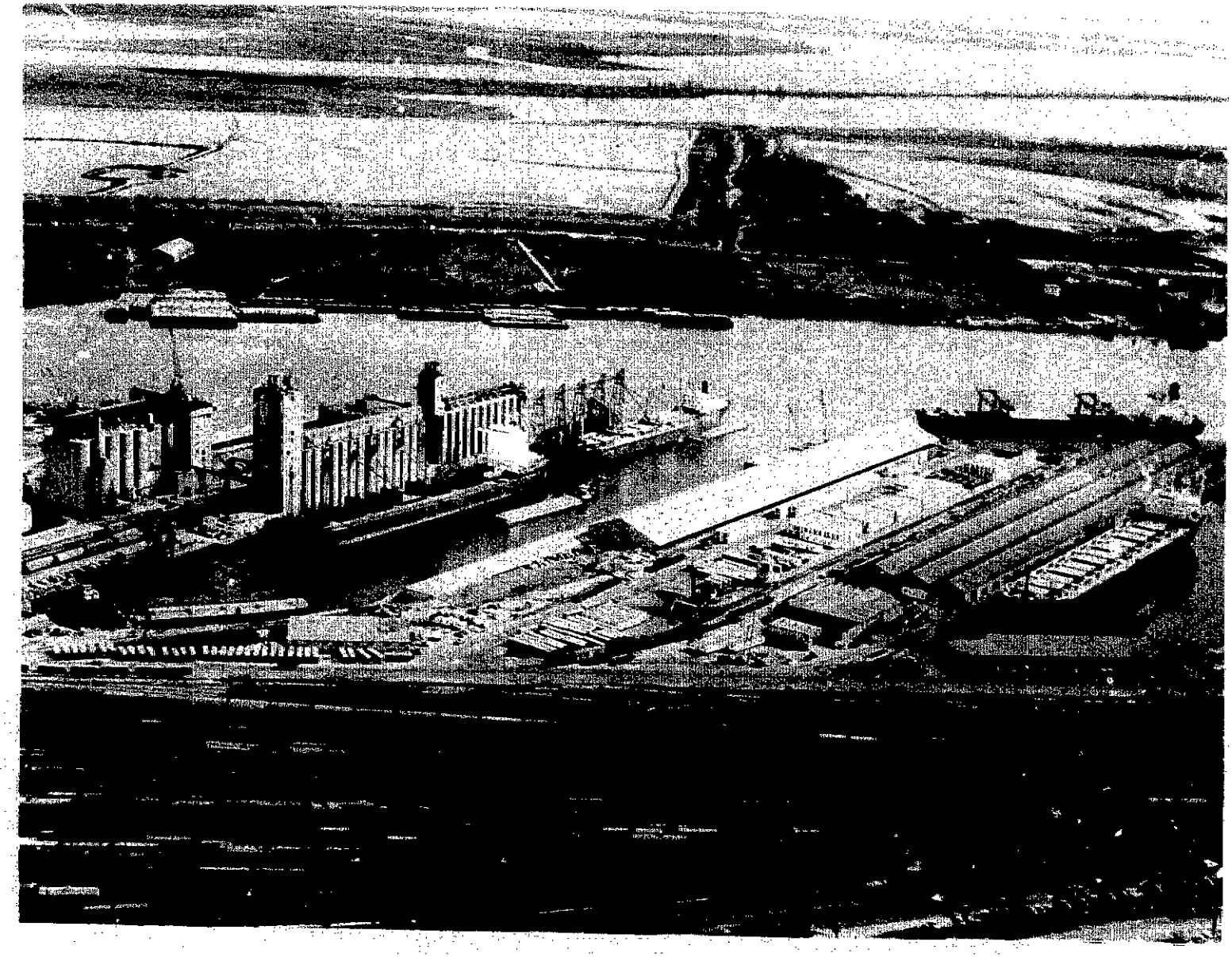


FIGURE B-4 - AERIAL VIEW OF THE PUBLIC GRAIN ELEVATOR
OWNED AND OPERATED BY THE ALABAMA STATE DOCKS

20. A Dry-Bulk Handling Terminal, owned and operated by the Alabama State Docks, is located on Three Mile Creek. This plant was constructed in 1927. The facility has been renovated several times since initial construction to accommodate larger vessels and provide more storage space. About 13 acres of dry-bulk storage is presently available with berths able to accommodate two ships. The annual throughput capacity of this terminal is 5.0 to 6.0 million tons. It is being operated near capacity at the present time. The principal commodities being handled consist of bauxite, coal (imports), iron ore, and other miscellaneous ores. Coal exports previously moving through this facility are now being exported through McDuffie Terminal. A view of this facility is shown in figure B-5.

21. McDuffie Coal Terminal is located on McDuffie Island at the mouth of Mobile River below the I-10 Highway Tunnels. This terminal is designed to handle coal for export from barges and rail cars to large dry-bulk carriers. There is a 16.5 acre live storage area for approximately 175,000 tons. This facility is owned and operated as a public coal terminal by the Alabama State Docks. The terminal began operation in 1975. The present facility has a maximum rated throughput of 4.8 million tons per year. With completion of improvements now under construction by the Alabama State Docks, the throughput will be increased to 10.2 million tons annually. Long-range plans by the Alabama State Docks indicate additional facilities will be provided as needed. Figure B-6 shown an overall view of the McDuffie Island Coal Terminal. The stacker-reclaimer moves the coal to storage as it is being unloaded from barge or rail. It is also used to transfer coal from stockpile to ships at the rate of 4,000 tons per hour. A view of this equipment is shown in figure B-7. Coal is unloaded from barges by a ladder-type bucket unloader with a rated unloading capacity of 3,000 tons per hour. This facility is shown in figure B-8. A ship loader located along the dockside can load ships at the rate of 4,000 tons per hour. A view of the ship-loading equipment is shown in figure B-9. Figure B-10 shows an overall view of the port facilities at Mobile.

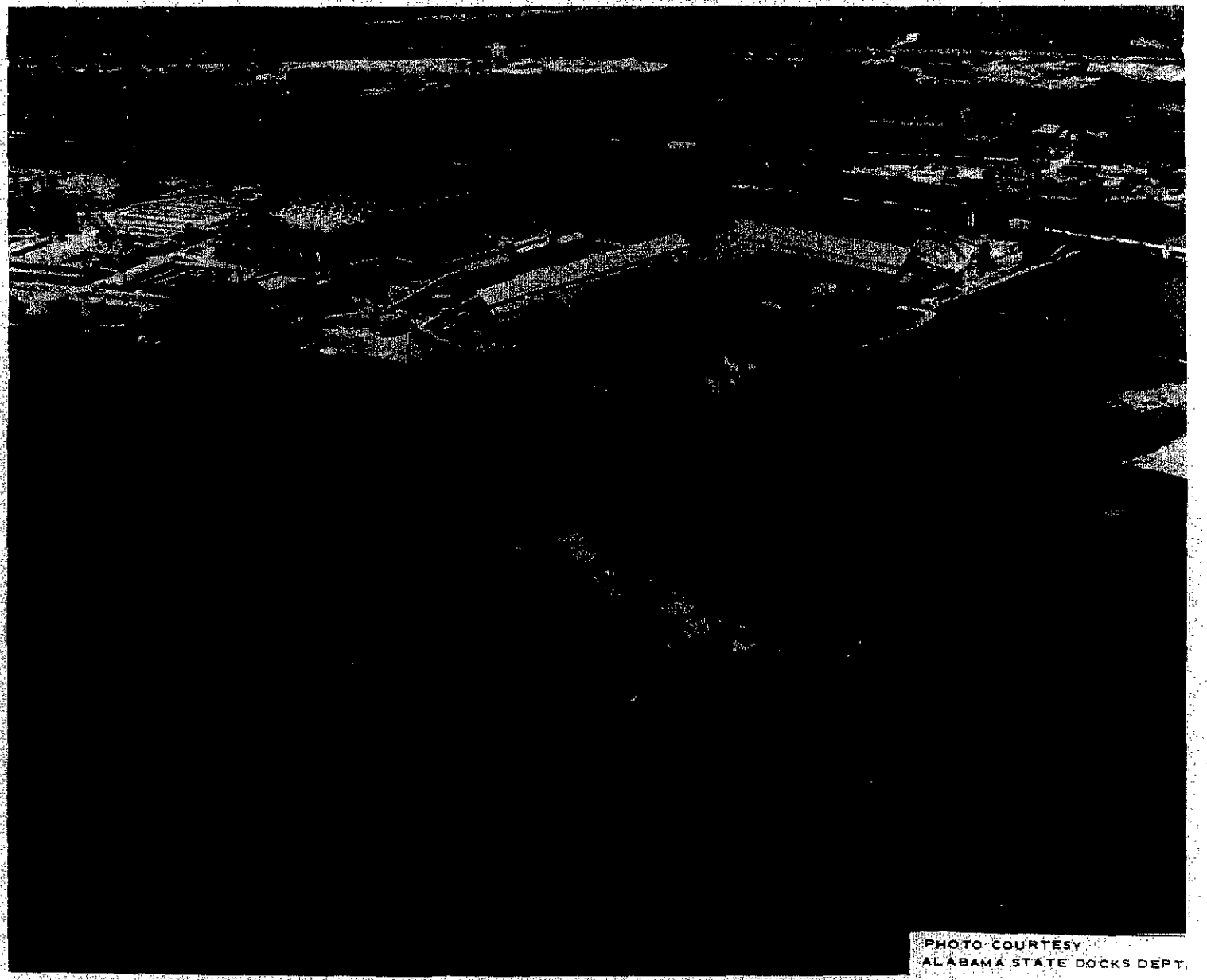


FIGURE B-5 - AERIAL VIEW OF THE BULK HANDLING PLANT (TIPPLE) LOCATED AT THREE MILE CREEK OWNED AND OPERATED BY THE ALABAMA STATE DOCKS

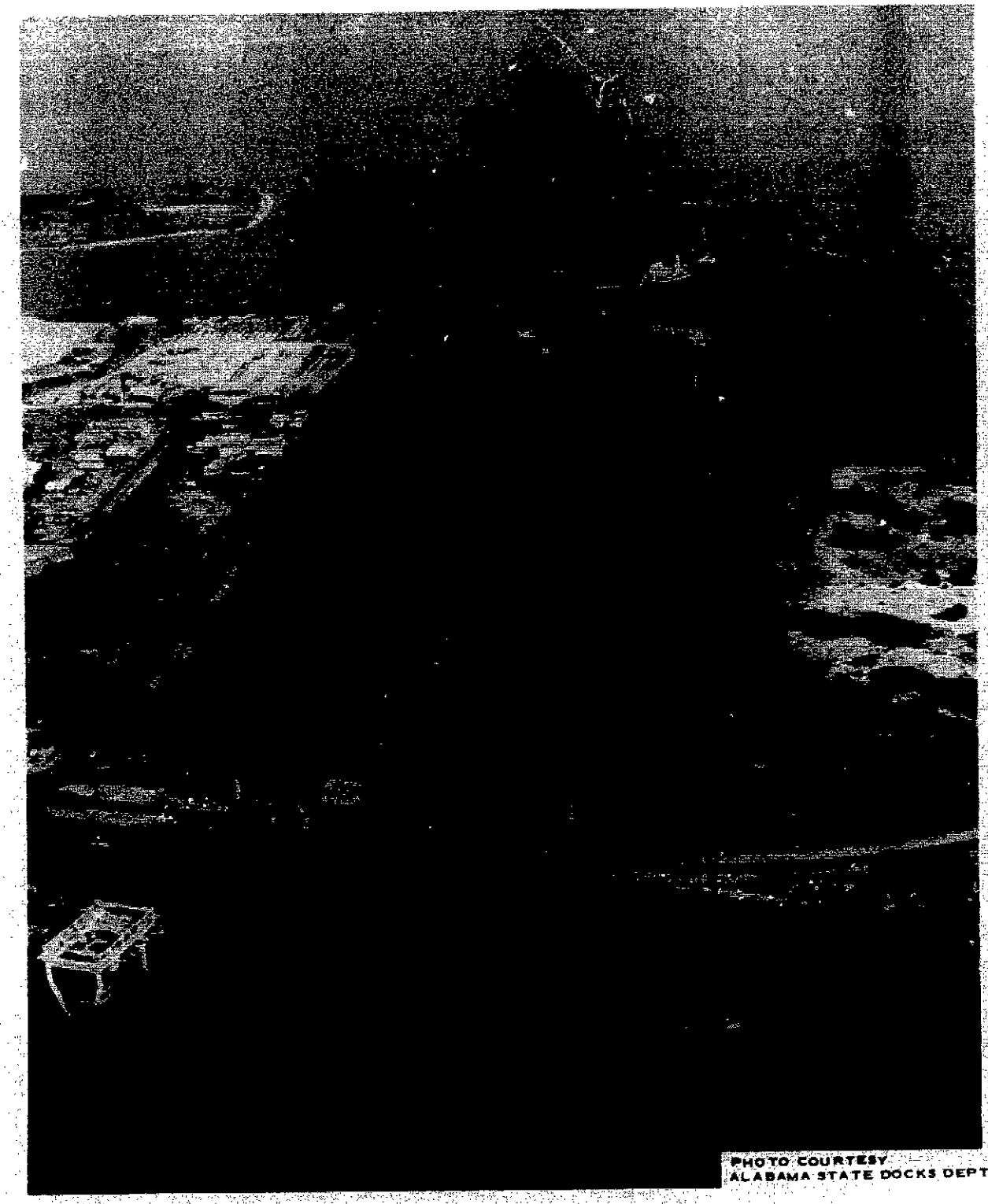


FIGURE B-6 - McDUFFIE ISLAND COAL TERMINAL LOCATED AT MOUTH OF MOBILE RIVER

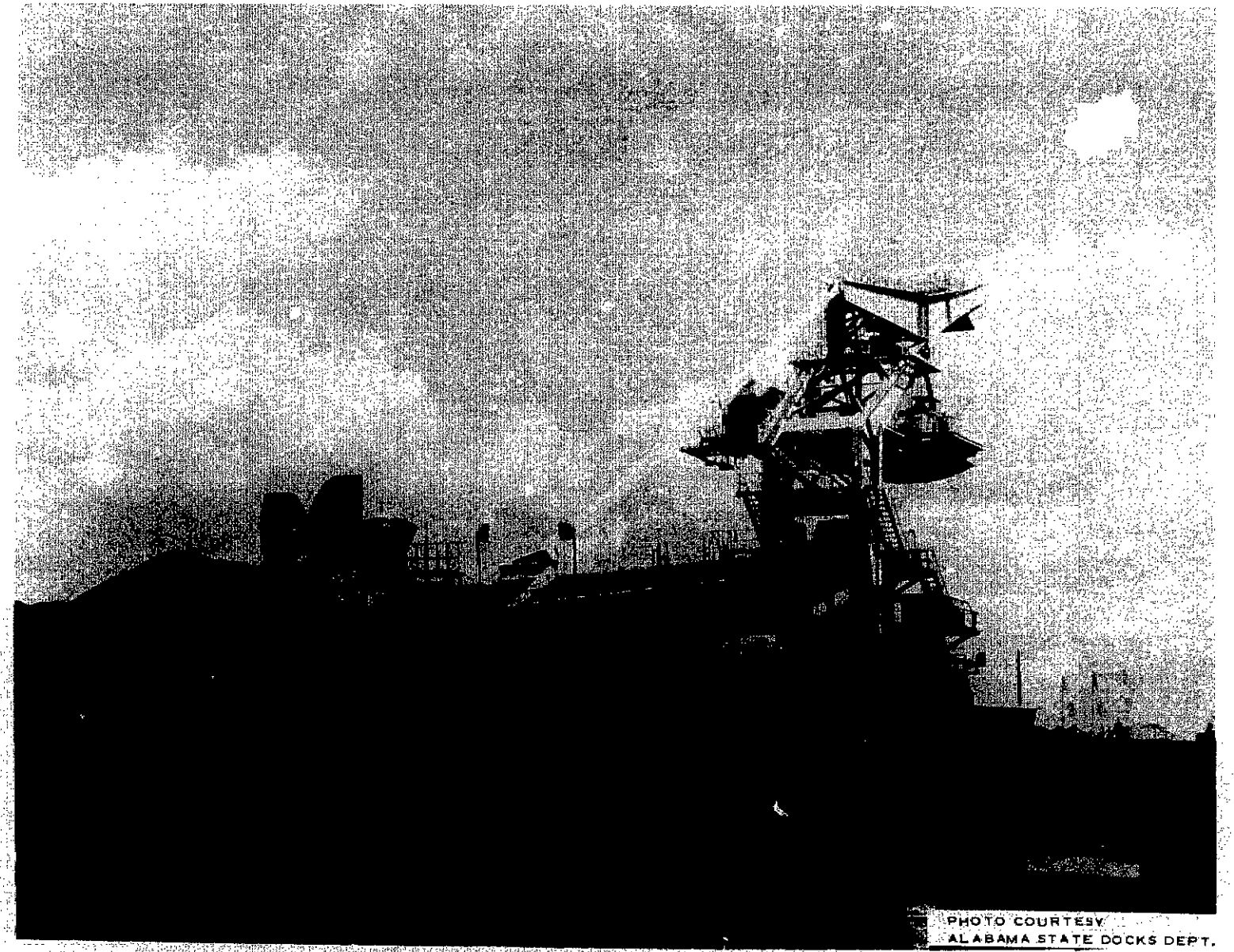


FIGURE B-7 - STACKER-RECLAIMER USED TO TRANSFER COAL FROM RAIL/BARGE TO SHIP AT McDUFFIE COAL TERMINAL

PHOTO COURTESY
ALABAMA STATE DOCKS DEPT.

FIGURE B-8 - BARGE UNLOADING FACILITY AT McDUFFIE COAL TERMINAL

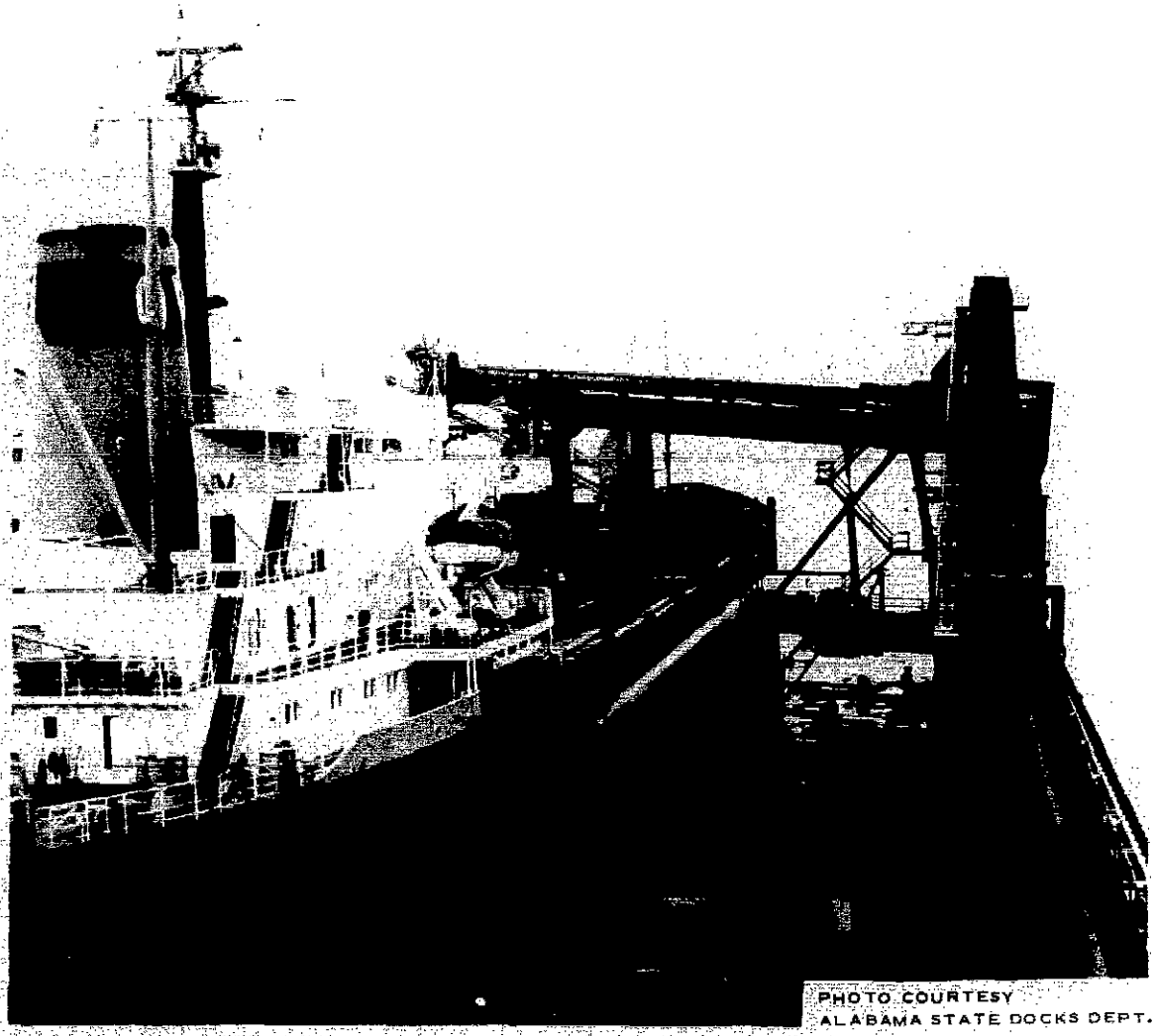


FIGURE B-9 - VESSEL LOADING COAL AT McDUFFIE COAL TERMINAL

FIGURE B-10 - OVERALL VIEW OF TERMINAL FACILITIES AT THE PORT OF MOBILE

22. Other plans of improvement being considered by the Alabama State Docks include a long-range program to provide bulk terminal facilities and ship berths below the I-10 tunnels. The areas under consideration for development are located adjacent to the bay side of the old Brookley Field area currently known as the "Mobile Aerospace Industrial Complex" and an area adjacent to Mobile River and McDuffie Island recently pruchased by the Alabama State Docks from the Illinois Central Gulf Railroad. This newly purchased property is a 143-acre parcel is located adjacent to the 600 acres already owned by the A.S.D. on McDuffie Island. The acquisition as shown on figure B-11 includes a rail yard and gives the Docks all railroad rights of way and switching rights formerly held by the ICG in the Frascati and McDuffie area.

23. The private dock facilities for handling deep-draft vessels located at Mobile are: Amerada-Hess Terminal and Storage Facilities, Citmoco Services Dock, Chevron Asphalt Refinery, Texaco Terminal, Pinto Island Metals, Pro Rico Industries, Argon Terminal, and TCI Marine Bulk Handling Terminal. There are numerous other small docks, primarily used for loading and unloading barges. The Amerada-Hess and Citmoco Terminals and docks are located on west bank of the Mobile River between Cochrane Bridge and Three Mile Creek. These facilities are used to store crude oil gathered by pipelines from northwest Florida, central Mississippi, and north Mobile County oil fields. The crude oil is shipped from storage, by tankers, to the Atlantic Seaboard and Texas Gulf Coast areas. Chevron Asphalt Refinery Docks located on Blakeley Island on the east bank of Mobile River are used for receiving crude oil by tanker and barge and shipping asphalt by barge. Texaco Terminal and Dock, located on the west bank of Mobile River north of McDuffie Coal Terminal, is used for receiving refined petroleum products by small tankers. Pinto Island Metal Docks, located on the east bank of Mobile River below the Alabama Dry Docks and Shipbuilding Company, export small quantities of scrap iron. Pro Rico Industries is located on the west bank of Mobile River above the McDuffie

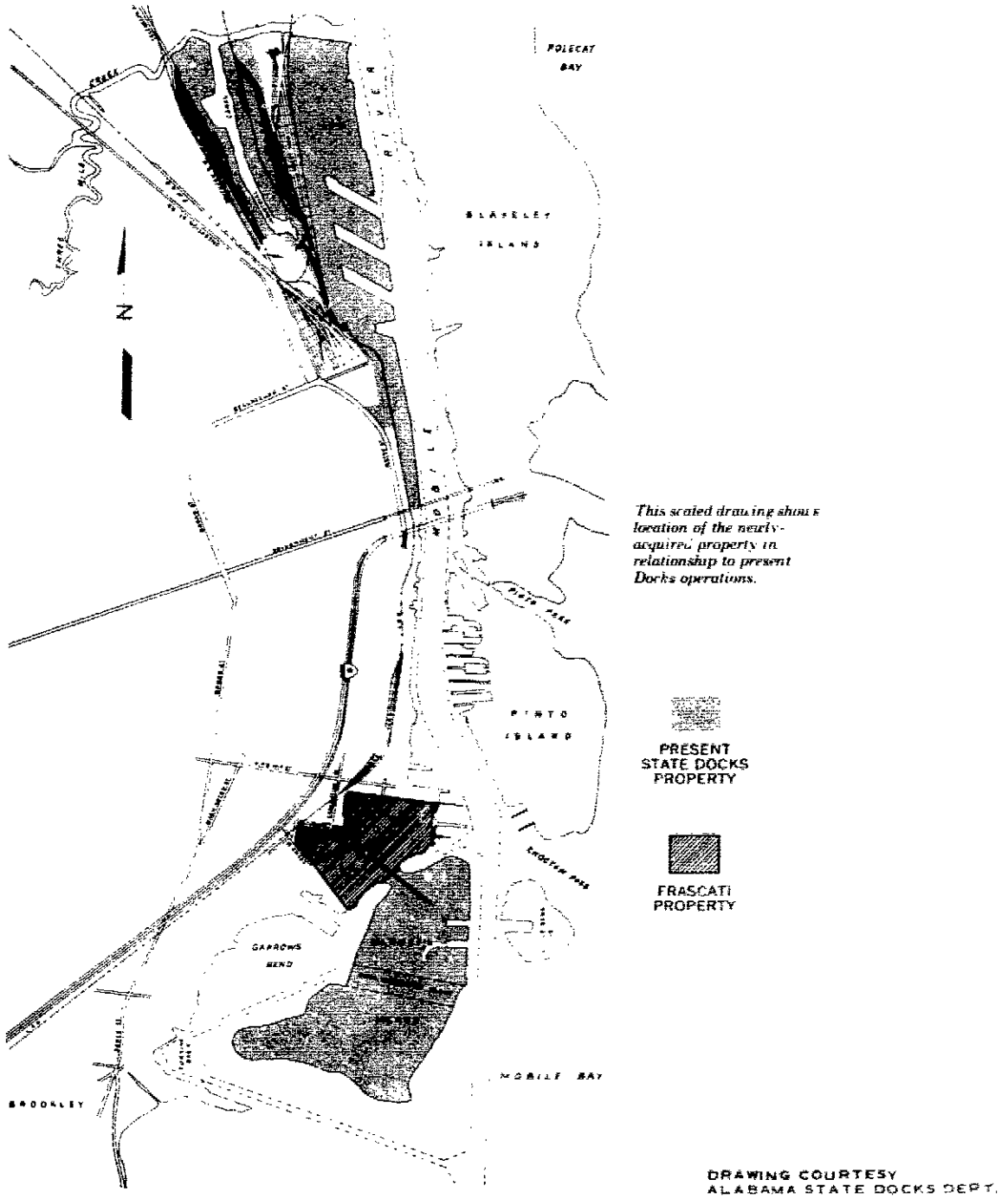


FIGURE B-11 - LAND RECENTLY PURCHASED BY THE ALABAMA STATE DOCKS TO BE USED FOR PORT EXPANSION

Island Coal Terminal. It is used for importing blackstrap molasses in small tankers. Argon Terminal Dock is located on Blakeley Island and used for unloading petroleum products and chemicals primarily from barges.

24. The TCI Marine Bulk Handling Terminal and Dock is located on the west bank of Mobile River below the I-10 Highway Tunnels. This facility is used for unloading iron ore from large dry bulk carriers and reloading it into barges and rail cars. They have a limited storage capacity with most of the iron ore being transferred directly from ship to barge.

25. The Alabama State Docks is committed to provide a public deep-water liquid terminal and dock at Theodore in conjunction with completion of the 40-foot channel into the Theodore Industrial Complex. This facility will be used primarily for unloading crude oil from tankers.

26. Other private terminals at Theodore are the proposed docks of Ideal Basic Industries and the existing docks of New Autlan Manganese Corp. Kerr-McGee Chemical and Degussa Alabama, Inc. will have barge docks on the barge channel extension when it is completed. Ideal Basic Industries will handle cement by deep-draft bulk carriers and inbound products such as coal, limestone, and other raw material for cement production. Airco will handle manganese ore and ferro alloys over their docks. Kerr-McGee and Degussa will handle various chemical products over their barge docks.

27. Figure B-10 gives a view of all the port facilities at Mobile. The overall view of the port facilities at Mobile, looking south from the Cochrane Bridge to McDuffie Island in the upper portion of the picture, shows that most of the berths are located on the west bank of the river.

DEVELOPMENT TRENDS

28. A summary of existing land use in the Mobile SMSA and the state of Alabama is presented in table B-6. In both Mobile and Baldwin counties forest and agricultural lands comprise the predominant land use, occupying 72.8 percent of the total acreage. Water and wetlands follow with 11.3 percent of the area. The classification, other (8.4 percent), applies to undeveloped dry land (8.1 percent) and other resources (.3 percent). The category, urban and developed (7.5 percent) includes residential. industrial, roads, transportation, communications and utilities, commercial, public lands, and culture, recreation and entertainment. Urban and developed occupies 11.4 percent of the total land in Mobile County versus 0.4 percent in Baldwin County.

TABLE B-6

EXISTING LAND USE IN THE MOBILE SMSA AND THE STATE OF ALABAMA (1970)

	Mobile County	Baldwin County	Mobile SMSA	State of Alabama
Urban and Developed	91,193	35,974	127,167	519,668
Agriculture	136,077	218,153	354,230	9,051,256
Forest	406,259	480,671	886,930	22,491,065
Water	19,448	41,427	60,875	737,664
Wetlands	76,722	55,755	132,477	120,008
Other	72,886	70,531	143,417	110,099
Total	802,585	902,511	1,705,096	33,029,760

Source: South Alabama Regional Planning Commission, November 1976. Alabama Development Office

HUMAN RESOURCES

ARCHAEOLOGICAL AND HISTORICAL BACKGROUND

29. Mobile Bay's location and the area's mild climate have contributed greatly to the region's long and varied history. Throughout aboriginal times a variety of cultures converged in the region. Although only a limited amount of archeological investigation has been conducted in the study area, archeologists believe that people first entered the region about 8000 years ago, beginning the Archaic, or prepottery, period. This period is not well known in the area. Pottery appeared about 1500 B.C. at the beginning of the Woodland culture, and continued until the Mississipian culture, which began with the advent of shell tempered pottery about 1000 A. D. Pottery types taken from shell middens and shell mounds present some of the earliest records for the region. When the first Europeans arrived in the Mobile area the main aboriginal inhabitants were the Tohone and the Naniaba Indian tribes. The Mobile, also known as the Mabila or Mavila, were the largest and strongest of these groups and their language, closely related to the Choctaw, became the trade jargon for a wide area. When the French settlement was established it became a center for trade and attracted many Indian tribes.

30. In 1519 the Spanish explorer, Alonzo Alvarez de Pineda, sailed into Mobile Bay naming it Rio del Espiritu Santo. Other Spanish explorers, including DeSoto in 1540, followed de Pineda and in 1559 a sand and log fort was built at what is now know as Fort Morgan. Although the Spanish first explored the territories surrounding Mobile Bay, the first formal colony was established by the French. In 1702 Jean Baptiste Le Moyne Sieur de Bienville was commissioned by his brother, Iberville, to build Fort Louis de la Mobile, the French capital of Louisiana, at Twenty-Seven Mile Bluff, due north of the present Mobile urban area. In 1711, after yellow fever epidemics and a serious flood, the settlers were forced to move Fort Louis down the river to the present site of Mobile. In 1763 as a result of the French and Indian War, the French territories east of the Mississippi River including Mobile were ceded to the British. The British subsequently lost Mobile to the Spanish in 1780 and the area became a part of Spanish Florida. The Spanish continued to hold Mobile despite U. S. efforts to include it in the Louisiana Purchase. In the War of 1812 the United States was able to force the Spanish out and Mobile was added to the Mississippi territory. In 1819 Alabama was admitted to the Union and Mobile was granted a city charter. The city was an important agricultural trade center for the area and became an international port in the 1830's when a shipping channel was dredged in the bay. The city continued to grow and in the 1850's had a population of 30,000. Mobile was second only to New Orleans as a cotton shipping port.

31. In 1861 Alabama seceded from the Union and was known as the Republic of Alabama until it became a part of the Confederacy. Mobile was an important Confederate port and for three years the Union Navy blockaded the city in an attempt to stop trade. The Union victory at the Battle

of Mobile Bay on August 5, 1864 closed Mobile to the Gulf and led to the final surrender of the city to Union forces on April 12, 1865. After the Civil War the study area was part of the effort to overcome the post-war economic depression and to rebuild the economy of the South. By the turn of the century manufacturing activities had grown but agriculture was still dominant. In 1923 the Alabama State Docks opened at the port of Mobile, and increased the city's importance as a shipping center. During the 1940's and 1950's the population grew as manufacturing and service trades became dominant forces in the economy. Today the area is experiencing another surge of growth as the popularity of the South as the "sun belt" attracts residents and tourists alike.

DEMOGRAPHY

32. Changes in population in the Mobile SMSA, the state of Alabama, and the nation are presented in table B-7. It can be seen that the study area's population more than doubled between 1940 and 1960 while the state and nation experienced growth rates of 15 percent and 36 percent respectively. During the 1960 to 1970 period the growth rate in the study area fell dramatically to 3.7 percent, lower than the state (5.4 percent) and the nation (13.3 percent). This was primarily due to the phase out of Brookley Air Force Base during the late 1960's when southern Alabama had a significant out-imigration of 42,000 people. Provisional figures for 1974 indicate that between 1970 and 1974 the study area's population increased by 5.4 percent while the state and nation experienced a 4 percent growth rate. It is interesting to note that in 1970, 52 percent of the study area's total population resided in the city of Mobile.

33. Data pertaining to the general characteristics of the population of the Mobile SMSA are presented in table B-8. On the basis of these data it can be seen that in 1970, 72.2 percent of the study area's population was white and 51.9 percent was female. Nearly half the population was

TABLE B-7

TOTAL POPULATION IN THE MOBILE SMSA
STATE OF ALABAMA, AND THE UNITED STATES 1940-1974

	1940	1950	1960	1970	1974*
Mobile SMSA	174,298	272,102	363,389	376,690	396,400
Mobile County	141,974	231,105	314,301	317,308	333,600
Baldwin County	32,324	40,997	49,088	59,382	65,800
State of Alabama	2,832,961	3,061,743	3,266,740	3,444,165	3,577,000
United States	132,164,569	151,325,798	179,323,175	203,211,926	211,390,000

* Provisional

Source: Economic Abstract of Alabama 1975 - December 1975

TABLE B-8

GENERAL CHARACTERISTICS OF THE POPULATION MOBILE SMSA

MOBILE AND BALDWIN COUNTIES - 1970

PERCENT

	Total Population	Racial Composition		Sex		Age		
		Black and Other	White	M	F	Under 25 Years	25-64 Years	65 and Over
Mobile County	317,308	32.9	67.1	48.0	52.0	49.5	42.7	7.8
Baldwin County	59,382	12.8	82.2	48.9	51.1	46.9	42.4	10.7
Mobile SMSA	376,690	27.8	72.2	48.1	51.9	49.0	42.8	8.3
State of Alabama	3,444,165	26.4	73.6	48.3	51.7	47.5	42.9	9.4
United States	203,857,864	12.4	87.6	49.0	51.0	44.2	46.1	9.8

Source: The Economy and Population of the South Alabama Region, South Alabama Regional Planning Commission, June 1975.

under 25 years of age, 8.3 percent was age 65 and over 42.8 percent fell between these two age groups.

SKILLS AND OCCUPATIONS

34. The occupational profile of an area's labor force indicates its diversity of industries as well as the levels of skill available. In 1970, 41 percent of the employed persons residing in the study area were classified as white collar workers. Blue collar workers comprised 41.6 percent of the work force. The service workers category contains 14 percent of the employed. About 4 percent of the area's employed are farm workers. Comparing the study area's employment with the occupational profile for the state of Alabama and the nation in 1970 reveals that the Mobile SMSA had more blue collar jobs (41.6 percent) than the state (39 percent) or the nation 35.3 percent). The study area and the state each have fewer white collar jobs (41 percent) than the nation (48.3 percent.. Farm and service workers were employed in the study area at near national and statewide percertage levels. However, the farm sector in Mobile County at 1.2 percent, in contrast to Baldwin County's 6.1 percent, reflects the importance of farming in Baldwin County.

PERSONAL INCOME

35. Data on historic and estimated per capita income for the United States, the state of Alabama, and the Mobile SMSA are contained in table B-9. In 1970 the study area's per capita income was $2,501. Although this represented a 30 percent increase over the 1962 figure of $1,918 it was approximately $1,000 less than the national per capita income in that year. Based on estimated figures for 1976, the state and the study area continued to lag behind the nation for the period 1970-1976 in per capita income, but had surpassed the nation in rate of growth of income.

TABLE B-9

PER CAPITA INCOME FOR THE UNITED STATES, THE STATE OF ALABAMA AND THE MOBILE SMSA FOR SELECTED YEARS
(in 1967 $)

	1962	1970	1976[1]
United States	2,585	3,476	4,186
State of Alabama	1,745	2,565	3,127
Mobile SMSA	1,918	2,501	3,087

[1] Straight line interpolation using 1971 - 1980 rate of growth

Source: 1972 OBERS Projections Economic Activity in the U. S., U. S. Department of Commerce, Bureau of Economic Analysis, April 1974.

EDUCATION

36. Education in the study area is provided by a system composed of public and private schools. In addition to elementary and high schools, there are two colleges, one university, two junior colleges, and a mix of vocational, technical and training schools.

37. Data on the educational achievement of the population 25 years old and over, in the study area, the state of Alabama, and the United States is shown in table B-10. State percentages closely parallel study area statistics except for 1960 figures for elementary and high school years completed. In 1960 the study area led the state in high school graduates by 5.6 percent and nearly equaled the nation in this category. By 1970 the State of Alabama approached the study area's percentage of high school graduates, however, both lagged behind the nation at this level of education. If those who attended one or more years of college are combined with high school graduates the gap between the study area the state and the nation climbs to 12.9 to 14.0 percent.

TABLE B-10

POPULATION 25 YEARS OLD AND OVER

BY YEARS OF SCHOOL COMPLETED

UNITED STATES AND MOBILE SMSA BY COUNTY

	1960 Percent	1970 Percent		1960 Percent	1970 Percent
Mobile SMSA	100.0	100.0	United States	99.9	100.1
Elementary	41.5	34.1	Elementary	39.6	27.8
High School: 1 to 3 years	21.6	23.6	High School: 1 to 3 years	19.2	17.1
High School: 4 years	24.3	27.2	High School: 4 years	24.6	34.0
College: 1 to 3 years	7.0	7.8	College: 1 to 3 years	8.8	10.2
College: 4 years or more	5.6	7.3	College: 4 years or more	7.7	11.0
Mobile County	100.0	99.9	State of Alabama	100.0	99.9
Elementary	40.4	33.7	Elementary	49.3	36.8
High School: 1 to 3 years	21.7	23.6	High School: 1 to 3 years	20.3	21.9
High School: 4 years	25.1	27.2	High School: 4 years	18.6	25.9
College: 1 to 3 years	7.1	7.9	College: 1 to 3 years	6.1	7.5
College: 4 years or more	5.7	7.5	College: 4 years	5.7	7.8
Baldwin County	100.0	100.0			
Elementary	48.9	36.2			
High School: 1 to 3 years	20.9	23.2			
High School: 4 years	18.8	26.7			
College: 1 to 3 years	6.4	7.4			
College: 4 years or more	5.0	6.5			

Source: General Social and Economic Characteristics, U. S. Department of Commerce, Bureau of the Census, 1960 and 1970.

HOUSING

38. Housing data for the study area is presented in Table B-11. In 1970 there were 121,244 housing units available in the SMSA. In Baldwin County 78 percent were owner occupied while in Mobile County the owner occupancy rate was 66 percent. The remainer were rented. The median number of rooms per unit in the study area was 5.1. More than one person per room, per unit is indicative of overcrowding. More than 1.51 persons per room is regarded as severe overcrowding. Twelve percent of the housing units in the study area experienced some degree of overcrowding, 4 percent were severely overcrowed. The median value of the owner occupied, one-family unit in Baldwin County was $11,100 versus $12,900 in Mobile County. In Baldwin County 35 percent of the houses were built after 1959, 26 percent from 1950-1959, and 39 percent before 1950. In Mobile County the corresponding figures are 26 percent (1960+), 31 percent (1950-1959), and 43 percent (before 1950).

COMMUNITY COHESION

39. Community cohesion refers to the relationships among people who have resided in an area for a sufficient period of time to have created a sense of identity as a group. The study area encompasses 2,855 square miles and a 1970 population figure of 376,690. Mobile County covers 1,242 square miles and had a 1970 population of 317,308. Eighty-one percent of the people live in urban areas, with 59 percent, 190,026, living in the city of Mobile. In contrast Baldwin County is characterized by an urban population comprising only 40 percent of the County's population of 59,382. Its largest town is Bay Minette with 6,727 people.

40. The study area is rich in history and a segment of the region's population traces its ancestry back to the early colonists. Economic development is a force at work in the study area. The area experienced an economic setback when Brookley Air Force Base closed in the mid-1960's.

TABLE B-11

CHARACTERISTICS OF HOUSING UNITS IN THE MOBILE SMSA

MOBILE AND BALDWIN COUNTIES - 1970

	Baldwin County	Mobile County	Mobile SMSA
Owner occupied	13,793	60,952	74,745
Renter occupied	3,928	30,817	34,745
Total housing units	21,803	99,441	121,244
Median number of rooms	4.9	5.1	5.1
Persons per room			
1.00 or less	15,545	80,310	95,855
1.01 to 1.50	1,423	7,598	9,021
1.51 or more	753	3,861	4,614
Median value, owner occupied, 1-family	$11,100	$12,900	$12,700
Median rent	$ 72	$ 73	$ 73
Built 1960 or later	7,299	26,108	33,407
Built 1950-1959	5,492	30,126	35,618
Built before 1950	8,091	42,575	50,666

The effects were not only felt by those who lost their jobs directly but also by the businesses and workers who lost profits and wages because of the decrease in purchasing power in the community. The Mobile area Chamber of Commerce, representing 3600 members and 1600 of the study area's 6,093 business establishments, is seeking to attract a mix of industry to the region to provide the area greater economic security.

41. Historically the bay has been a focal point for people living in the area. It has provided transportation, water for industrial development and recreational activities, and natural resources for commercial pursuits. The climate makes the area attractive to many, especially retirees. A question which draws interest and opinions from the region's citizens is how to best utilize and yet protect Mobile Bay. The business community is a force for economic development in the area and regards the bay as an economic asset to be developed. The environmental action groups warn that development without regard for the ecological ramifications could lead to the degradation of the bay for all interests.

CULTURAL RESOURCES

42. Mobile Bay has been the site of considerable navigational activity primarily since the French arrival in 1699, although the bay was discovered perhaps as early as 1519. The bay experienced several phases of navigation from this period to the present, each capable of producing significant cultural resources, such as sunken steamboats, ferrys, ships and obstructions placed to block the channel during the Civil War. Table B-12 lists known shipwrecks in the bay. Approximately 17 identified wrecks, ballist dumps or obstructions have been reported on Mobile Bay navigation charts from 1850 to 1976. Each of th are potential significant cultural resources. Table B-13 list proper s in the area included on the the National Register.

TABLE B-12

KNOWN SHIPWRECKS IN THE BAY

Wreck	Date	Cause
Arkansas	1827	snagged
Emeline	March 8, 1827	burned
Elizabeth	May 30, 1827	burned
General Brown	February 24, 1830	burned
Helen McGregor	December 23, 1832	collided with Herald
Herald	December 23, 1832	collided with Helen McGregor
Ben Franklin	March 13, 1836	exploded, 20 lives lost
Wanderer	November 11, 1836	snagged
Bouge Homer	1837	snagged
Vincennes	February 10, 1838	snagged
Andrew Jackson	May 16, 1838	snagged
Plough Boy	January 14, 1839	snagged
Emblem	April 18, 1839	foundered, 5 lives lost
William Hulburt	July 26, 1839	burned, 2 lives lost
Mary Express	1840	burned
Dover	April 1, 1840	snagged

Wreck	Date	Cause
Fox	August 6, 1840	snagged
Ivanhoe	August 6, 1840	snagged
Sun	August 6, 1840	stranded
Chippewa	March 25, 1841	snagged
Choctaw	February 5, 1842	snagged
Neptune	February 10, 1842	burned
Juniata	October 11, 1842	snagged
Charles L. Bass	November 22, 1842	snagged
Despatch	December 30, 1842	stranded
Gainesville	March 31, 1843	collided
Rowena	March 20, 1844	burned
Norma	June 1, 1846	snagged
Lion	October 5, 1846	burned
Eagle	October 15, 1846	burned
Penelope	October 15, 1846	burned
Tuscaloosa	January 29, 1847	exploded, 12 lives lost
Robert Emmet	May 26, 1847	snagged
Native	April 4, 1848	foundered
Belle Poule	July 2, 1849	snagged
Norfolk	July 2, 1849	snagged
Little Harriet	August 2, 1849	snagged
E. D. King	April 1, 1850	stranded
Irene	April 1, 1850	sank
Motive	June 26, 1850	snagged
Ambassador	February 25, 1854	burned
Sam Dale	February 25, 1854	burned
Daniel Pratt	October 26, 1854	exploded, 3 lives lost
Helen	May 12, 1855	burned
Wade Allen	July 30, 1855	burned, 1 life lost
Sunny South	October 1, 1855	snagged
Correo	May 20, 1856	snagged
Alamo	June 1, 1856	sank
Arkansas No. 5	June 5, 1856	snagged
Emperor	July 1, 1856	stranded
Sallie Spann	October 1, 1856	burned
Ben Lee	December 13, 1856	snagged
Canonchet	October 16, 1857	burned
Southern Belle	October 16, 1857	burned
Emma Watts	September 22, 1858	snagged
Enterprise	September 22, 1858	snagged
South Carolina	January 15, 1859	wrecked on Mobile Bar
F. M. Streck	October 6, 1859	snagged
Osceola	December 8, 1859	snagged
Baltic	November 3, 1860	exploded, 20 lives lost
Lecompte	March 27, 1861	burned
Josephine	March 5, 1863	ran aground (blockade runner)

Wreck	Date	Cause
Isabel	May 18, 1863	burned (blockade runner)
Ivanhoe	June 30, 1864	burned (blockade runner)
U.S.S. Tecumseh	August 5, 1864	torpedo, 93 lives lost
C.S.S. Gaines	August 5, 1864	lost in battle
U.S.S. Phillipi	August 5, 1864	lost in battle
Kate Dale	May 25, 1865	burned
R. B. Taney	October 27, 1865	stranded
Thomas Sparks	January 12, 1866	stranded
Natchez	March 10, 1866	foundered
Sir William Wallace	March 27, 1866	burned
Flirt	July 18, 1867	burned
Jewess	December 28, 1868	snagged
May Flower	October 1870	burned
Seneca	November 23, 1870	burned, 13 lives lost
Salmon	1873	snagged
Mary Shaw	November 3, 1900	snagged
Gamma	September 26, 1906	foundered
Mary	September 27, 1906	foundered
Lady Grace	September 27, 1906	stranded in hurricane
Josephine	September 27, 1906	collided with Black Diamond
Black Diamond	September 27, 1906	collided with Josephine
Edgar Randall	December 14, 1906	collided with Delta
Laura L. Sprague	March 18, 1913	stranded on Mobile Bar
American	April 4, 1915	burned
Sunny South	April 20, 1916	foundered
Harry Morse	July 5, 1916	collided, 8 lives lost
Dean E. Brown	September 17, 1917	foundered, 9 lives lost
Stranger	April 22, 1923	burned
Bay Queen	March 27, 1929	burned
Elizabeth	June 7, 1930	burned

TABLE B-13

NATIONAL REGISTER PROPERTIES IN MOBILE AREA

Fort Morgan
U.S.S. Tecumseh
Sand Island Lighthouse
Mobile Point Light Station Keeper's Quarters
Middle Bay Light
Fort Gaines

43. To date, two small cultural resource surveys of submerged resources have been conducted in the Bay, one for the Theodore Channel and the other for the Pinto Pass disposal area. Unevaluated magnetic anomalies were located in both surveys.

NATURAL RESOURCES

PHYSIOGRAPHY

44. South Alabama lies within parts of two major physiographic provinces; The East Gulf Coast Section of the Coastal Plain Province, and the Mississippi-Alabama Shelf Section of the Continental Shelf Province. Coastal Alabama lies within the Southern Pine Hills and the Coastal Lowlands subdivisions of the East Gulf Coast Section.

45. The Southern Pine Hills are a moderately dissected, southward-sloping plain underlain by sediments of Miocene to Pleistocene age. Undifferentiated Miocene sediments are exposed in the northern part of the subdivision while sediments of the Citronelle Formation Characterize the southern part.

46. The Southern Pine Hills comprise the elevated divides between the Escatawpa, Mobile-Tensaw,, and Perdido Rivers. This section ranges in elevation from about 100 feet near the coast to about 300 feet in the northern parts of Baldwin and Mobile Counties. Relief is greatest in the northern part where stream valleys are incised as much as 200 feet; but to south the topography is more subdued. Numerous shallow saucerlike depressions, which hold water most of the year, are scattered over the nearly level divide.

47. The Coastal Lowlands is an essentially flat to gently undulating plain extending along the coast adjacent to Mississippi Sound, along the margins of Mobile and Perdido Bays, and lying behind the coastal beaches in southern Baldwin County (Cooke, 1939). The lowlands area merges inland with the alluvial-deltaic plains of the Mobile-Tensaw and Perdido fluvial systems and smaller streams of the area. The Lowlands area ranges in width from almost zero to approximately 10 miles and in elevation from sea level to about 30 feet and is indented by many tidewater creeks and rivers and fringed by tidal marshes. Alluvial, deltaic, estuarine, and coastal deposits of Holocene and Pleistocene age underlie the Coastal Lowlands.

48. The Mobile Bay estuarine system occupies 466 square miles, including the lower Mobile River delta, and, it is the northernmost estuary interfacing with the Gulf of Mexico (Crance 1971). The third largest runoff volume in the continental United States (73,077 cfs annual average) enters Mobile Bay from a drainage area covering 43,560 square miles (Ryan 1969; Chermock, 1974). The long-term average of monthly discharge is strongly seasonal with the period of greatest runoff occuring during the late winter and early spring. Discharge is least during late summer and early fall. The range of recorded discharge has been from a maximum of 590,000 cfs to a minium of about 5,100 cfs (U. S. Army Corps of Engineers, 1975).

49. Mobile Bay is 31 miles in length (not including 12.6 miles of delta) and has an average width of 10.8 miles (Tanner, 1970). Within the estuarine zone, including the lower Mobile delta, are 6,224 acres of tidal marsh, 12,000 acres of freshwater lakes, 15,127 acres in bayous, rivers, and connecting bays, and 249,343 acres in the bay itself. The total shoreline length of 162 miles is constantly changing as a result of: (1) deposition of sediments in the Mobile-Tensaw River delta; (2) the accumulation of tidally-introduced sand along the southern boundary of the bay; and (3) wind-caused erosion of the eastern and western bay margins.

50. The average depth of Mobile Bay is 9.7 feet and the maximum is about 60 feet off Fort Morgan near the Gulf entrance to the bay. Two dredged navigation channels cross the bay, the Mobile Ship Channel from north to south and the Gulf Intracoastal Waterway from east to west. Other dredged channels intersect either the eastward or westward shore line. These include: Sea Cliff Yacht Club Channel, Fly Creek, Fowl River and Arlington Channel. An underwater levee parallels the sides of approximately the upper-third of the 40-foot deep ship channel and a 3,500-foot wide scoured tidal pass exists between Mobile Point and Dauphin Island. A submerged tidal delta covers 16 square miles on the seaward side of the pass, while shoaling on the landward side of the pass has reduced depths to as little as two feet.

HYDROLOGY

51. More data exist on the hydrology of Mobile Bay than for any other set of parameters. Extensive studies of circulation, salinity, temperature, dissolved oxygen, and other estuarine water quality variables have been performed by Austin (1954), Ryan (1969), and McPhearson (1970), Bault (1972), May (1973), and Schroeder (1976). Additional testing on a hydraulic model has been conducted by the Corps of Engineers at Vicksburg, Mississippi. Mathematical modeling has been conducted by Hill and April (1972, 1974 ng and April (1976), Pitts and Farmer (1976), and Game, et.al. (1978). The general characteristics of the Mobile Bay system indicated that the hydrology (circulation, currents, salinity, density, layers, etc.) reflects a situation that fluctuates seasonally while being greatly influenced by a variable volume of stream discharge, wind, and tidal conditions. Intermittently, perhaps daily, each of these variables will have a dominant influence on the hydrologic characteristics of the estuary.

52. The L-shaped morphology of Mobile Bay is significant in regard to the movement of water and sediment by both tides and wind. The long axis of Mobile Bay, as a continuation of the Mobile River flood plain and delta, is significant in regard to movement of freshwater floods from the Mobile River. This 31-mile fetch is also important in the generation of waves from either the north or south. The restricted outlet into the Gulf of Mexico between Dauphin Island and Mobile Point (3 miles in width) exerts significant control on the movement of water and sediment by both wind- and tidal-generated currents.

53. Tidal movement into Mobile Bay is a continuation of the Gulf of Mexico tide. The estuary has a tidal cycle which is diurnal, with one high and one low in a ' iour period. During the bi-weekly neap tides, however, two highs or two lo , occur within one day. The mean diurnal range in the bayous and inlets along the Alabama coast varies from 1.8 feet to approximately 0.6 foot. The mean range in Mobile Bay varies from 1.5 feet at the head of the bay to 1.2 feet at the entrance. Mean low water in the winter varies from 1.0 to 0.5 foot below that of the summer. The weighted mean tidal range

of the bay, 1.4 feet, and the surface area of the bay, produce a tidal prism volume of 330,575 acre feet. The flushing time, under a relatively low river inflow condition of 12,262 cfs, is between 45 and 54 days (Austin, 1954).

54. Although astronomical tides in the Mobile Bay region are relatively small, winds can induce larger variations. Strong northers can blow water out of the bay and result in current velocities of several knots at the bay's mouth. Water levels as much as 1.9 feet below mean low water have been recorded under these conditions (U. S. Army Corps of Engineers, 1975). An opposite condition occurs when the steadier and more prevailing southeast and southwest winds pile up water in the head of the bay. Data furnished by the Alabama State Highway Department indicate that portions of the east-bound lane (the most susceptible to tidal flooding at elevation +2.6 feet mlw) of Battleship Parkway have been closed on an annual average of 11 occasions since 1971. This indicates the frequency of abnormal wind-driven waves and water setup resulting from south and southeast winds. Hurricane tides have varied from -10.5 msl to 10.8 msl (McPhearson, 1970).

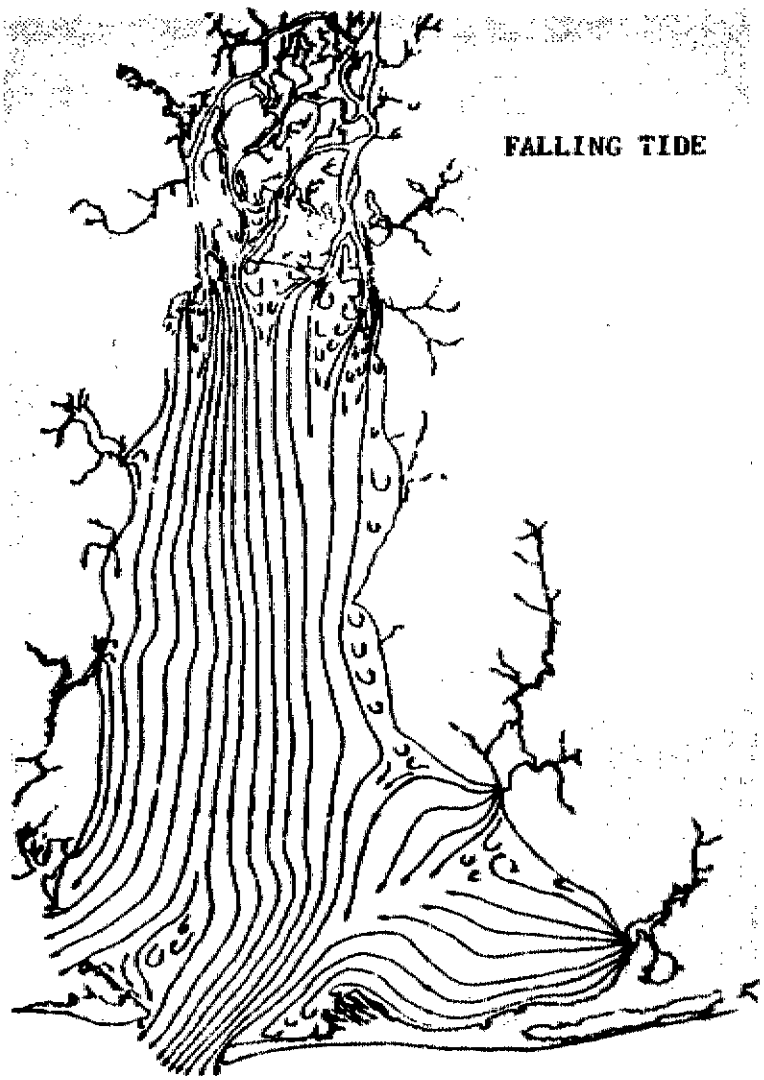
55. In addition to wind and astronomical tides, some bay tides are affected by floods in the drainage basin of the rivers emptying into Mobile Bay. This portion of Alabama is humid and receives an average annual (66 inches) rainfall which produces high river discharges into Mobile Bay. The principal drainage into Mobile Bay is from the Mobile, Tensaw, Alabama, and Tombigbee Rivers.

56. According to Crance (1971), highest river discharges occur in late winter to early spring, while the lowest occur in early summer and late fall. During low stream flow, salt water intrudes as much as 21 miles up the Mobile River (Corps of Engineers, 1949). The relationship between river discharge and salinity along the ship channel was defined by McPhearson (1970). Even in the southernmost parts of the bay, high river discharge can depress average surface salinity values from 20 $^{o}/_{oo}$ to nearly zero, while the bottom strata are largely unaffected. These high flows result in a

high hydrostatic head which produces higher tides and currents than normal at the bay's mouth. Under extremely high flows, a southernly surface flow continues even during flood tides.

57. Salinities in Mobile Bay change rapidly and over a wide range, from zero to 35 ^{o}/oo. Major fluctuations in river discharge have an immediate effect upon salinity in all parts of Mobile Bay; although, if short-lived, the effects are usually expressed only in the surface portions of the water column. Although salinities in Mobile Bay are characteristically lower than adjacent open Gulf values, even the Gulf waters are generally lower than most coastal areas along the northern Gulf. This results from the transport of low salinity, turbid water from the Mississippi River passes on the east side of the delta which trends towards Mississippi Sound and the Alabama coast most of the year (Scruton and Moore, 1953). These flows of water from the Mississippi plus the periodic high discharge from Alabama's rivers create a permanently lowered salinity regimen, which eliminates many animals common to the higher (and more normal) salinity areas of the Gulf coast (Parker, et al, 1974).

58. The tidal circulation of Mobile Bay has been investigated by Austin (1954) during a period of unusually low river discharge (figure B-12). The following description of ebb and flood tide behavior was postualted from non-synoptic data. On a flood tide, the incoming current from the Gulf of Mexico enters through the pass between Dauphin Island and Mobile Point. Part of the water flows up the west side of the bay and part flows into Mississippi Sound. Within four hours this latter flow reverses and water enters Mobile Bay from Mississippi Sound (Chermock, 1974; U. S. Army Corps of Engineers, 1977). Another part of the water entering from the Gulf flows to the east into Bon Secour Bay before turning back to the west, where the flow joins the generally northward movement of water into the central part of the bay. Eddies develop in Bon Secour Bay and between Great Point Clear and Mullet Point.



Source: Austin, 1954 as given in Chermock, 1974

FIGURE B-12

TIDAL FLOW PATTERNS IN MOBILE BAY

59. In the northern part of the bay during the flood tide the flow from the Mobile River continues southward on the surface along the western side of the bay. The tidal flow from the south is pushed to the east side of the bay creating a counterclockwise circulation pattern.

60. On an ebb tide (figure B-12), the movement of water in the main part of Mobile Bay is uniformly to the south. Flows in Bon Secour Bay are toward the mouth of Mobile Bay with the pattern affected by discharges from Weeks Bay and the Bon Secour River. About 28 percent of the water passes into Mississippi Sound with the remainder leaving the bay through the main pass (Austin, 1954).

61. The short-term salinity structure of the Bay can vary considerably depending on the progression of tidal amplitude and short-term variations in discharge of the Mobile River. As a result, conditions in Mobile Bay represent a wide range of mixing or stratified salinity conditions. Mixing between the surface and bottom water layers of the Bay is not yet well studied. Factors that have altered natural circulation patterns include the construction of deep navigation channels with associated disposal areas and landfill causeways (Chermock, 1974; U.S. Army Corps of Engineers, 1977).

62. Typical surface isohalines show outflows of low salinity water along the west side of Mobile Bay, with higher salinity water entering from Mississippi Sound. During certain periods (November-December) high-salinity surface waters characterize Bon Secour Bay. Bottom water masses are sharply divided by the Mobile Ship Channel which contains higher salinity Gulf waters. This results in the division of the bay into two cells of fresher bottom water. Generally higher salinity values are found along the eastern shore of the bay.

63. According to Bault (1972), during January and February surface waters are nearly isothermal, while considerable differences in water temperatures exist between the head and mouth of the bay in November and December.

64. A more recent conception of Mobile Bay circulation has been prepared by Schroeder (1974). His concept of flood tide circulation, with inflow spreading evenly into the bay from both the Gulf and Mississippi Sound differs considerably from that of Austin (1954). Turbulent mixing occurs northeast of Dauphin Island and along the southwest shore of the bay, where tidal waters meet river water flowing out. Ebb tide circulation, as depicted by Schroeder (1974), is even more simple--showing rapid movement directly out of the bay, through the mouth and also into the Mississippi Sound. This study is in general agreement with that generated by the Mobile Bay physical model. In the model the only irregularity in flow is the pile-up of water at Dauphin Island, where it is deflected southeast and northwest along Little Dauphin Island.

GEOMORPHOLOGY AND SEDIMENTOLOGY

65. The geomorphic characteristics of the Mobile Bay estuarine system are due to the processes of sediment deposition and erosion that have altered the estuary during its 3,500-year history (Tanner, 1970). The estuarine system is the drowned mouth of a river valley, possibly a graben, that is filling with sediments introduced by the Mobile River system. The gently curving, steep-sided shorelines on the east and west sides of Mobile Bay have been modified by wave erosion and deposition of sediment. The irregular shoreline of the north end of the bay is the result of the deposition of sediment in the Mobile-Tensaw River delta as it has progressed southward into the bay. The southern shoreline and tidal inlet have been modified by the deposition and removal of sand by marine longshore currents moving from east to west. This deposition has progressively narrowed the seaward opening of the estuary, and created the interconnected Mobile Bay-Mississippi Sound systems.

66. An annual average of 4.7 million tons of suspended sediment and an unknown quantity of bed load are currently being transported into the estuary (Ryan 1969). As the sediments encounter the increased salinity and decreased water velocity of the bay, many of the suspended particles flocculate and settle, gravitating toward holes, channels, and basins within the bay, leveling and stabilizing the bay floor. As shown by figure B-13, the bay bottom is composed mostly of silty clays and clays; while coarser inorganic sands encircle the bay near its shores. About 1.4 million tons annually pass through the estuary and are deposited to the south and west of the tidal inlet.

67. May (1976) determined a range of deposition of 3 to 21 centimeters per century during the past 5,000 years from buried oyster shell within the bay. Ryan (1969) calculated a baywide sedimentation rate of 56 cm during the past century from bathymetery changes in the bay. This suggests that the rate of filling has increased.

68. Ryan (1969) reported a crescent-shaped tidal delta of clean sand immediately south of the tidal inlet between Fort Morgan and Alabama Point. Seaward of the tidal delta, in water depths usually greater than 12 to 18 feet, is a region of sand-silt-clay which reflects the mixing of shelf sands with silts and clays from the estuary. Most of the fine-grained sediment from the Mobile Bay system is deposited to the south and southwest of the tidal inlet in response to the predominant littoral drift. However, during the summer months, an eastward component of the littoral drift system causes some of the silts and clays to move eastward. Gorsline (1966) estimated a total net littoral transport at Gulf Shores, Florida, of 196,000 yd^3/yr. Garcia (1977) accepts this value and has further calculated total net littoral transport seaward of the breaker zone at Dauphin Island to be 27,737 yd^3/yr. Toward the east the shelf sands are progressively coarser and better sorted. Influence of the Mississippi River sediments is also reflected south and west of Mobile Bay.

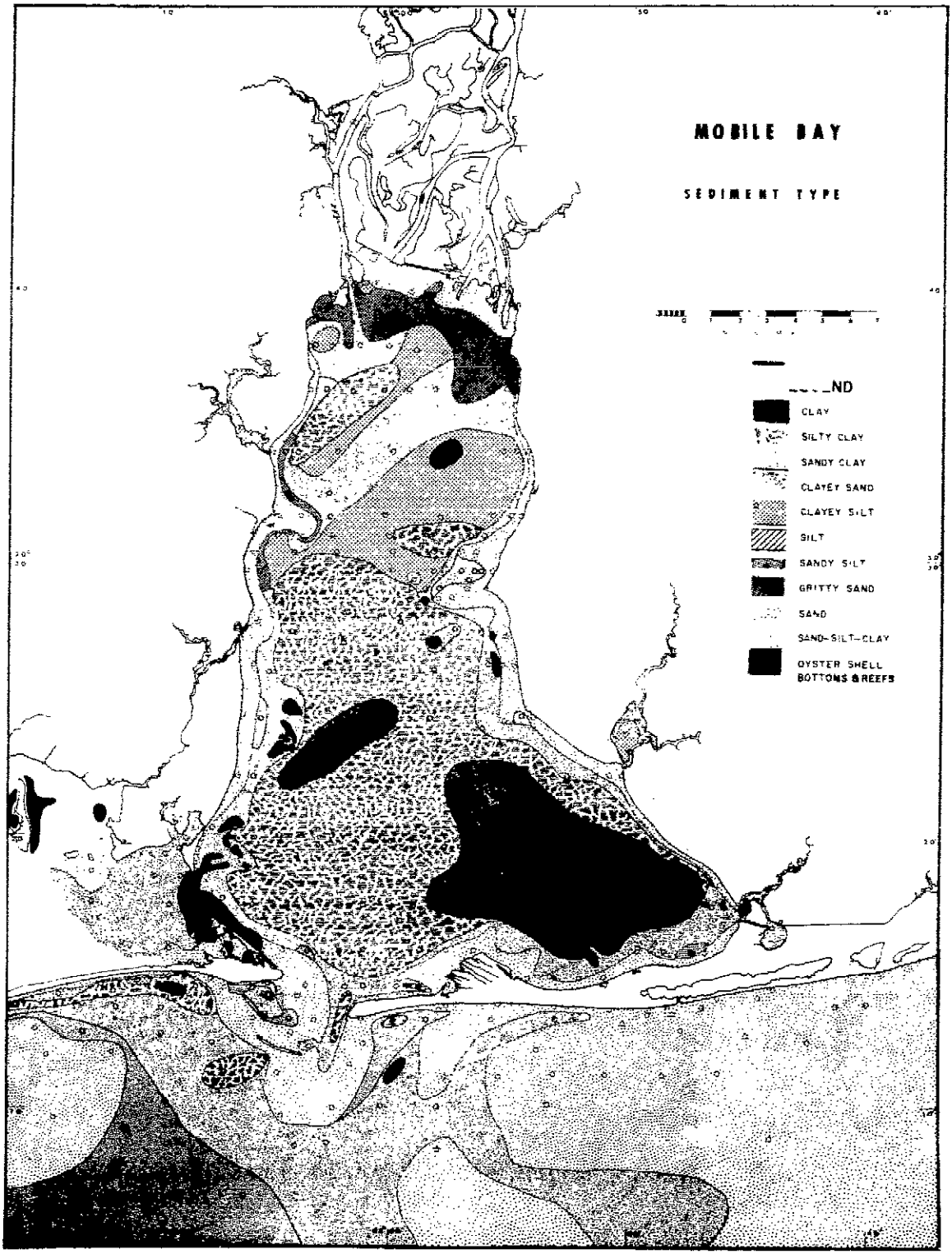


FIGURE B-13 SEDIMENT TYPES IN MOBILE BAY AND ADJACENT AREAS

69. The study of the bottom sediments of Mobile Bay and the harbor channels has been fairly well documented in recent years (Tech. Comm. Anal. Mobile Bay Dredging 1972 and Chermock, 1974). The Technical Committee for Analysis of Mobile Bay Dredging, 1972, collected sediment samples from 33 stations in the Mobile Bay area, including 17 stations located in the bay proper. The sediment samples were analyzed for volatile solids, COD, TKN, Phosphorous, Chromium, Zinc, Lead, Copper, and Mercury. Results of the study indicated that:

a. The concentrations for all parameters analyzed were generally higher in the clay, silty-clays, and clayey silts, rather than the sand and silty sand bottom;

b. Considering a simple circulation pattern from the Mobile-Tensaw river system southward along the western side of the ship channel through the mouth of Mobile Bay, thence re-entry through the mouth on the flood tide to the eastern shore in a northeasterly direction (Ryan, 1969), the concentrations of the materials generally appear to increase with distance from the causeway;

c. the relationship of concentration with depth varied from station to station with no discernible pattern. However, most often no change was exhibited with depth.

According to Chermock (1974), sediments in northern Mobile Bay are prodeltaic silts, clayey silts and delta front sands and silty sands. In the southern part of the bay, sediments are estuarine silty clay and clay. Toward the periphery of the bay are bay - margin sands and clayey-sands. Oyster shell accummulations occur locally forming oyster shell bottoms and reefs. Holocene sediments are from 15 to 20 feet in thickness in the western parts of the bay.

70. The Alabama Highway Department conducted extensive subsurface investigations in connection with the bridge crossing of Interstate Highway 10 at the delta front. As a result of the analyses, it was found that the trace metals in the sediments are stratified and increase with depth. Surface lead, zinc, and mercury west of the Tensaw River nearer the city of

Mobile were higher than to the east. Mercury values were within the natural range, but average lead and zinc concentrations were higher than in the open bay (May, 1973) or in the sediments with depth, which suggests that there may be an anthropogenic source for the higher level (May, 1976).

71. The Mobile District Corps of Engineers collected sediment samples from the harbor portion of the bay in 1971 and 1974. Locations of the sampling stations and the characteristics of the sediment are shown in Attachment B-1. The 1971 program consisted of analysis of the bulk content of surface layer samples collected from three locations in Mobile Harbor.

72. Although the bulk analysis method is not considered a good indicator of the potential for sediments to release chemical contaminants when disturbed, it does illustrate the nature of the sediments in respect to the exisiting project area. Physically, the surface layer sediments of the ship channels range from sand and silt to inorganic silts and clays, most having the latter classification. The deeper sediments are somewhat coarser-grained with the upper bay channel containing large amounts of sand. Generally, the Corps of Engineers findings for the ship channel sediments were similar to the conclusions reached by the Technical Committee regarding bay sediments. However, in respect to depth, the overall average concentrations of the deeper sediments of the Mobile Ship Channel were less than that of the surface layer sediments. This possibly indicates that minor cultural enrichment has occurred during the last century.

UPLAND ECOSYSTEMS

73. Several upland communities are found in the Mobile and Baldwin County area. The four donimant communities are the longleaf pine-oaks community, pine savannah community, bay forest community, and the large floodplain forest community of the Mobile River Delta (Gemborys and Hodgkins, 1970; J. B. Converse and Company, Inc., 1975). These natural communities have been removed or altered considerably by man's activities in the area,

74. The bay forest community occurs on the floodplains of most of the small and moderate size streams of Mobile and Baldwin Counties (Gemborys and Hodgkins, 1970). The dominant trees are mostly hardwoods and include slash pine (Pinus elliottii), yellow poplar (Liriodendron tulipifera), sweetgum (Liquidambar styraciflua), water oak (Quercus nigra) black tupelo (Nyssa sylvatica var. biflora), sweetbay magnolia (Magnolia virginiana), and red maple (Acerrubrum). Fire is rare in this community.

75. In a mature bay forest, the evergreen canopy is well developed so that the understory is poorly developed. However, more open portions can have dense growths of swamp Cyrilla (Cyrilla racemiflora), black titi (Cliftonia monophylla), cane (Arundinaria), black willow (Salix nigra), wax myrtle (Myrica cerifera), and hazel alder (Alnus serrulata).

WETLAND ECOSYSTEMS

76. A floodplain forest is found in the Mobile River delta. Important species in this forest community include black gum (Nyssa biflora), white bay (Magnolia glauca), cypress (Taxodium distichum), red maple (Acer rubrum), tupelo gum (Nyssa uniflora), ash (Fraxinus spp.), cottonwood (Populus heterophylla), red bay (Persea pubescens), and black willow (Salix nigra).

77. Three general types of wetland communities are found in Mobile and Baldwin Counties. These are freshwater marshes, low salinity brackish water marshes, and higher salinity saltmarshes. All these marshes receive some tidal influence.

78. Tidal marshes are most extensive in the Mobile Delta and the northern shore of Mississippi Sound. Chermock (1974), using photographs taken by the Earth Resources Technology Satellite on 28 December 1972, calculated 30,207 acres of marsh in coastal Alabama. Crance (1971) give 34,614 acres as shown in the following tabulation. The principal difference lies in estimates in Mobile Bay. Vittor and Stout (1975) have determined a value of 27,346 for Alabama's total coastal zone. Although this latest report contains site specific errors, it is probably the best available estimate of Alabama's coastal wetlands.

especially by farming in the southern portions of the counties, by management of lands for pulpwood production in the northern part of the area, and by logging activities and suppression of fires.

79. Within the longleaf Pine-Oaks Community the longleaf pine (Pinus palustris), is dominant. Species comprising the community are adapted to survive periodic ground fires, which eliminate competing hardwood species. Where these natural fires still occur or controlled burning is used to keep out the shrub layer, this community has a very open character with an extensive herbaceous ground layer of little bluestem (Andropogon scoparius), A. tener, broomsedge (A. virginicus), windmill grass (Gymnopogon spp.), dropseed grass (Sporobolus junceus) sensitive briar (Schrankia microphylla), Lupinus diffuses, Helianthus radula, Chrysopsis graminifolia, Coreopsis major, and blazing star (Liatris spp.). When fires are suppressed, a thick understory of oaks and shrubs develops. On moister soils these include the laurel oak (Quercus lemispherica), southern red oak (Quercus falcata), sparkleberry (Vaccinium arboreum), and winged sumac (Rhus capallina). On well drained sites the turkey oak (Quercus laevis), blue jack oak (Quercus incana), and sand post oak (Quercus margaretta) are found in greater numbers.

80. The pine savannah community is found on wet, poorly drained soils. Longleaf pine is the dominant tree. Associated is a fairly dense understory, that includes gallberry (Ilex glabra), wax myrtle (Myrica cerifera), and saw palmetto (Serenoa repens). The ground cover of herbs and grasses include Muhlenbergia expansa, Panicum spretum, Rhynchospora spp., Scleria Lycopodium alopecuroides, Rhexia Aletris spp., Eriocaulon spp., Pogonia ophioglossides, Calopogon Pulchellus, and Xyris spp. The wettest areas support pitcher plant bogs, which contain insectivorous plants such as sundews (Drosera spp.), butterwort (Pinguicula spp.), bladderwort (Ultricularia spp.), and pitcherplant (Sarracenia spp.).

Areas of Tidal Marsh

(After Crance, 1971)

Mississippi Sound	11,762 acres
Mobile Bay	6,224 acres
Mobile Delta	15,257 acres
Perdido Bay	1,072 acres
Little Lagoon	299 acres
Total	34,614 acres

81. These values, however, make no distinction between the various salinity regimens which bathe the marshes and, in turn, determine the wetland's overall value and contribution to the Mobile estuarine system. This aspect has been examined by Vittor and Stout (1975) with the following results:

Wetland Habitat Acreage in the Alabama Coastal Zone

Habitat	Total Acres	Percent Occuring in Mobile Bay and Mobile Delta
Saltmarsh	2,330	43.0
Brackish-mixed marsh	13,512	8.4
Saltbush	111	0
Saltflat	162	0
Fresh-mixed marsh	11,231	63.4
	27,346	

82. In Mississippi Sound, there are large areas of tidal marsh along the northern shore and including the marsh islands. These marshes are usually bordered along the water's edge by a strip of salt marsh grass, Spartina alteriflora, with scattered stands of S. cynosuroides, S. patens, Distichlis spicata, and Phragmites communis. The majority of the marsh within Alabama is composed mostly of Juncus roemerianus (Swingle, 1971). The small areas of marsh, primarily S. patens, still present along the northern shore of Dauphin Island are being increasingly threatened by development.

83. The bulk of Mobile Bays' saltmarsh is associated with Deer, Fowl, and Dog Rivers. In the southeastern part of the bay, marshes are found at Little Point Clear on the north shore of Fort Morgan Peninsula and around the edge of Oyster Bay. These are similar to those found in Mississippi Sound. The peripheral border of Spartina alterniflora grades into almost pure stands of Juncus roemerianus. On higher ground occur stands of Spartina patens, Fimbristylis sp., Spartina cynosuroides, Phragmites communis, and Borrichia frutescens.

84. Lueth (1963) delineated the marsh areas of the lower Mobile Delta. The tidal marshes were described as occurring in a zone varying from a few inches below mean low tide to about a foot above it. Plants growing in this fringe were classified as tidal emergents. Although some species, such as Juncus, found here are able to tolerate brackish waters, the majority are essentially freshwater forms.

DEVELOPED AREAS

85. Urban and/or industrial lands are located within the metropolitan and residential areas of towns and larger cities. These lands are concentrated along the eastern shore of Mobile Bay and areas immediately south of the Mobile metropolitan area. Smaller areas occur on Dauphin Island, Fort Morgan Peninsula, and the community of Bayou La Batre. Vegetation in these areas consists mainly of unconsolidated plantings used in landscaping. Included within this designation are numerous recreational areas, municipal parks, and small wildlife sanctuaries. The National Audubon Society maintains a 150-acre wildlife sanctuary on Dauphin Island. The area is used intensely by migrating birds during the spring and fall. Tracts such as these, although small, combine to offer valuable wildlife habitat and represent significant economic investment in terms of land use and other resources. There are approximately 5,280 acres of this designation in Mobile County and 5,760 acres in Baldwin County.

ESTUARINE ECOSYSTEMS

86. Phytoplankton are microscopic single-celled plants that float freely in the water. They often serve as an important food source to many estuarine animals. Thirteen species of blue-green algae and 24 species of green algae have been identified from Mobile Bay. No data are available on their abundance, distribution within the bay or seasonal pattern of occurrence.

87. Macroscopic attached algae are not particularly common in Mobile Bay because of the lack of suitable hard substrates for attachment and the somewhat turbid conditions (U.S. Army Corps of Engineers, 1977). Some are found on oyster reefs and man-made objects such as pilings and jetties. In the higher salinity waters of the Alabama coast, attached algae were most diverse and abundant during late winter and early spring (Morrill, 1959, as summarized in Chermock, 1974).

88. The types and occurrences of submerged macroscopic plants have been studied most in the Mobile delta and in Mississippi Sound. Few data are available from the estuarine waters of Mobile Bay (Chermock, 1974). In the low salinity waters of the upper bay near the causeway aquatic species may include tape grass (Vallisneria americana), redhead grass (Potamogeton perfoliatus), coontail (Ceratophyllum demersum), water stargrass (Heteranthera dubia), horned pondweed (Zannichellia palustris), bushy pondweed (Najas quadalupensis), Eurasian watermilfoil (Myriophyllum spicatum), elodea (Egeria sp.), and muskgrass (Nitella spp.). Vallisneria often occurs in beds southward to Fairhope according to Chermock (1974). However, more recent indications are that these Vallisneria beds have disappeared in recent years.

89. Benthic seagrasses occur in the higher salinity shallow waters of coastal Alabama. Turtle grass (Thalassia), manatee grass (Syringodium), and shoal grass (Halodule) are the most common (Chermock, 1974).

90. No data on the zooplankton of Mobile Bay are readily available. Some copepod species commonly found in Mississippi Sound include Acartia tonsa, Labidocera aestiva, Oithona brevicornis, Temora turbinata, and Centropages hamatus (Perry, 1975). The relatively high salinity of Mississippi Sound makes it similar only to the southern portions of Mobile Bay. The lower salinity areas of the upper bay are likely to have a different assemblage of species than found in the sound.

91. Few quantitative data are available on the abundance or seasonal variation in species dominance of the larger macroinvertebrate animals that live in or on the bottom sediments of Mobile Bay. Parker (1960) has briefly characterized the faunal assemblages of the bottom of Mobile Bay. His more recent work developed during review of the Mobile Bay environmental study prepared by the Alabama Geological Survey indicates that four molluscan faunal assemblages are traversed by the Mobile Ship Channel. Diversity increases markedly from the river mouth to bay entrance and offshore. Only four species of mollusks are commonly found in the upper bay area and near the delta (river-influenced, low-salinity assemblage), while 11 species are found in similar sediments, but with higher salinities of the open sound or open bay center habitat. The number of typical species increases to 26 along the higher-salinity bay margins. The inlet and inner-shelf habitats of the Mississippi-Alabama area are characterized by 20 and 18 species, respectively but only the common species are given. Another 20 or 30 uncommon species of mollusks might be taken from both habitats by dredging with a fine-mesh shell dredge. The surf zone is expected to have only four species, since it is a rigorous habitat for molluscan life.

92. Oysters are an important part of the commercial fishery of the Mobile Bay region. Presently, there are 3,064 acres of natural living oyster reefs in Mobile Bay (table B-14), most of which are found in the southern half of the bay (figure B-14). Other oyster areas that are used for growing oysters include about 1,050 acres of riparian bottoms and 924 acres of State-owned bottoms.

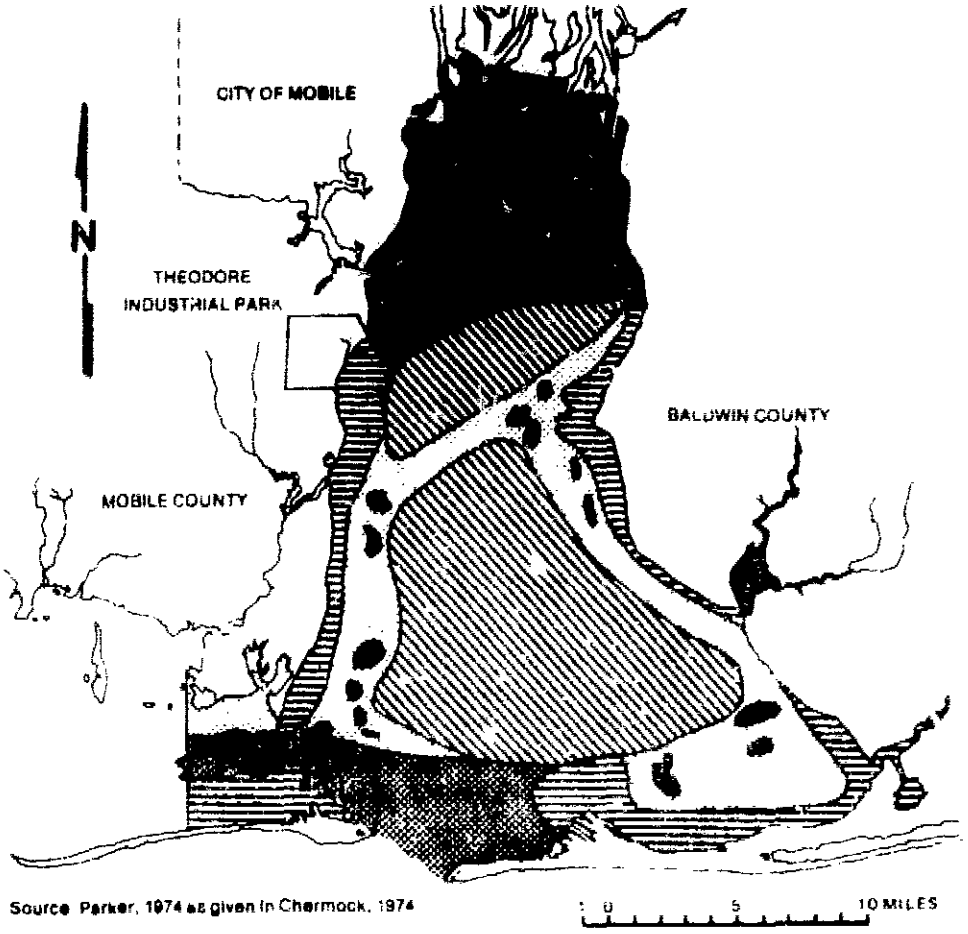


FIGURE B-14
BENTHIC MACROINVERTEBRATE COMMUNITIES IN MOBILE BAY, ALABAMA

TABLE B-14

LIVING NATURAL OYSTER REEFS IN THE MOBILE BAY AREA.

REEF	AREA (acres)
Dauphin Island Bay	8.7
Cedar Point	1411.7
Heron Bay	143.6
Sand	28.1
Buoy	207.8
Kings Bayon	68.6
White House	452.6
Hollingers Island[1/]	12.2
Point Clear	205.8
Klondike	160.7
Fish River	105.5
Bayou Cour	67.1
Bon Secour	31.7
Shellbank	149.0
Total Area	3063.1

Source: Chermock, 1974

1/ This reef has been reportedly destroyed to present illegal harvest and sale of poiluted oysters.

93. The density of oysters on most reefs is less than 4,000 3-inch oysters per acre. Only 882 acres of reef have over 7,000 3-inch oysters per acres, the minimum density necessary for profitable commercial harvesting with hand tongs (Chermock, 1974). These reefs are Kings Bayou Reef, Cedar Point A and F, and Hollinger Island Reef. The latter is permanently closed to commercial harvesting because of year-round coliform bacterial contamination of that part of Mobile Bay and has been reportedly destroyed. All other oyster reefs are usually closed during periods of high freshwater discharge.

94. Shrimp are an important part of the commercial fishery of the entire Gulf Coast (Gulf Coast Research Laboratory, 1974, 1976; Etzold and Christmas, 1977). Three species, brown shrimp (Penaeus aztecus), white shrimp (Penaeus setiferus), and pink shrimp (Penaeus duorarum) utilize coastal estuarine waters such as Mobile Bay as nursery areas for the growth and maturation of the younger life stages.

95. Spawning of adults occurs during the winter in the high salinity and more stable environment of the coastal Gulf of Mexico waters. The free-floating young larval stages are eventually carried into the lower salinity estuarine areas, brown shrimp beginning in February with peak movement in March and April, white and pink shrimp from June through September. Upon entering the estuary the post larvae become bottom dwellers with white shrimp generally seeking out lower salinity areas than brown or pink shrimp. Growth is rapid during the warm months, but actual survival and growth rate is strongly influenced by environmental conditions experienced during this time. As the juvenile shrimp get larger they move to deeper parts of the bay and eventually move offshore into the coastal gulf waters.

96. Blue crabs, another commercially important species, are also dependent on both the estuarine and gulf areas for their total life cycle (Chermock, 1974; Gulf Coast Research Laboratory, undated). Mating of adult crabs occurs in the low salinity waters of Mobile Bay from March through November,

after which the females migrate to the high salinity Gulf waters, where spawning occurs. The planktonic larvae are eventually carried back into the bay, where they mature.

97. A total of 233 species of fish representing 173 genera and 80 families has been documented as occurring in the Mobile Bay area (Swingle, 1971). Swingle utilized both seines and trawls in assessing the fish fauna of this region. The most abundant fish taken by seine, according to Swingle (1971), are herring-like, anchovies, croaker-like, Silversides, and mullet. The most abundant species representing these groups are as follows: Brevoortia patronus (Gulf Menhaden), Anchoa mitchilli (Bay anchovy), Leiostomus xanthurus (spot), Menidia beryllina (Tidewater Silverside), Membras martinica (rough silverside) and Mugil cephalus (striped mullet). The most numerous families and species taken by trawl are basically the same as those taken by seine. Recent studies conducted in the Mobile Bay area by researchers from the Dauphin Island Sealab and the University of South Alabama (1974-1978) indicate that large numbers of Menhaden, Croaker-like fish, Jacks, Sea robins, and flounder are frequently taken by trawl. The fisheres represented by the aforementioned groups are Longspine Porgy, Pinfish, Sand Perch, Rock Sea Bass, Rough Blackfin Searobin and Dusky Flounder. These fishes, while abundant in Mobile Bay and the surrounding Gulf waters, are numerically less abundant in the Mobile Bay ship channel; however, Swingle (1971) determined that the total number of species found in the ship channel is higher than that of the adjacent areas in the bay since, the high salinity water is conducive to the existence of many of of the inshore gulf fish species. He also reported that eight species were collected only in the Mobile ship channel, which suggests that these species may be moving into the bay on the incoming tide. Further information presented by Swingle (1971) on Alabama commercial fisheries landings between 1964 and 1968 indicate that (Striped Mullet), (Atlantic Croaker), (Kingfish), (Gulf and Southern Flounder) are the most valuable estuarine-dependent species along the Alabama coast.

98. Swingle (1976) stated that 106 species of fish and eleven species of invertebrates are classified as commercial species in Alabama. Most of the seafood is landed in Mobile County at Bayou la Batre which ranked as the tenth port in the nation in value of seafood landed during the past few years. Commercial landings have increased from about 8 million pounds in 1961 to 34 million pounds in 1974 while showing an eight-fold increase in dockside value to over 16 million dollars. Swingle (1976) also calculated the economic value of the seafood industry to the local economy of south Alabama to be in excess of $70 million and an economic value to the state and Nation in excess of $120 million annually.

99. Although almost all of this catch is estuarine dependent, much is caught in waters either offshore of Alabama of in adjacent areas in Mississippi orLouisiana. Although, catches made in Mobile Bay probably are much less, they are still highly valuable. The fisheries landings from Mobile Bay during the period 1963-1975 are summarized in table B-15. During this period fish and shellfish landings have fluctuated around an average of four million pounds with about $740,000 at the dock. Colberg and Windham (1965) have determined an economic multiplier of four for oysters in Apalachicola Bay. Utilization of this multiplier suggests an annual value from Mobile Bay in excess of $2.8 million.

Table B-15

Fishery Landings from Mobile Bay
During the Period 1963 - 1975

Year	Fish (lbs)	Shellfish (lbs)	Total Value (Dollars)	Total (lbs)
1963	1,374,700	3,366,100	800,355	4,740,800
1964	1,042,400	2,188,500	599,946	3,230,900
1965	1,296,200	1,781,600	471,829	3,077,800
1966	1,116,500	1,993,800	627,920	3,110,300
1967	3,748,300	3,811,900	1,197,280	7,560,200
1968	3,351,700	2,696,700	854,219	6,048,400
1969	3,065,800	1,751,500	746,504	4,817,300
1970	2,939,200	1,302,800	571,897	4,242,000
1971	2,168,600	1,257,500	495,970	3,426,100
1972	1,317,700	1,557,600	694,028	2,875,300
1973	2,435,300	1,381,900	780,248	3,817,200
1974	1,672,300	1,323,800	847,640	2,996,100
1975	1,293,900	1,300,400	934,328	2,594,300

100. Table B-16 illustrates the historical shellfish harvest from Mobile Bay. Catches in all four catagories, shrimp, oysters, crabs, and squid are highly variable. No clear trend in the crab harvest is evident. However, the shrimp catch has declined significantly. The decline can be attributed to either of two causes, a decrease in fishing effort or an actual decline in abundance of the resource. Swingle (1976) has attributed the decreased catch from Mobile Bay to changes in the fishing effort. Between 1964 and 1971, the number of bay boats--those less than five tons in displacement--has decreased 27%, while the offshore fleet has nearly doubled. During the same period the catch data (expressed as pounds per trip) decline at an average value of 2 percent annually while the number of trips declined 5 percent annually. The average catch per trip during the same period has fluctuated moderately about an average of 367 pounds (See table B-17).

101. Table B-16 also presents oyster catches from the bay. With the exception of 1967 in which the harvesting of undersize oyster was permitted, catches are down in Mobile Bay. However, the bulk of the state's oyster harvest occurs just west of the Dauphin Island Bridge and is consequently credited in the fisheries statistics to Mississippi Sound. Inspection of these data indicated a highly fluctuating oyster harvest with no apparent trend. However, when the data are coupled with that from Mobile Bay, an overall shift in principal oyster harvest into the sound is strongly indicated.

ENDANGERED AND THREATENED SPECIES

102. As the result of a 1975 symposium at the University of Alabama, the State of Alabama has designated species of plants and animals(including crayfishes, shrimps, gastropods, naiod mollusks, fishes, amphibians, reptiles, birds and mammals) that are considered endangered, threatened or of special concern in the state. Three catagories are now recognized and are defined as follows:

Endangered Species - those species whose prospects for survival are in immediate jeopardy (in danger of extinction) throughout all or a significant protion of their range in Alabama.

Threatened species - those species which are likely to become endangered in the forseeable future throughout all or a signigicant protion of their range in Alabama.

Species of special concern - species which must be continually monitored because imminent degrading factors. The limited distribution of these species in Alabama or other physical and biological characters may cause them to become threatened or endangered in the forseeable future.

In addition, the United States Department of the Interior, Fish and Wildlife Service maintains a list of endangered and Threatened Wildlife and Plants within the United States as required under the Endangered Species Act of 1973 (16 U.S.C. 1531 - 1543; 87 Stat. 884).

103. The U.S. Department of the Interior, Fish and Wildlife Service, includes in their list of "Endangered and Threatened Wildlife and Plants" of 14 July 1977, six mammals, eight birds, and four reptiles that may occur in South Mobile County (see Attachment B-2). Of these mammals, birds and reptiles only four mammals (Felis concolor coryi Florida panther, Balaenoptera physalus finback whole and Physeter catodon sperm whole), five birds (Falco peregrinus tundrius artic peregrial flacon, Pelecanus occidentolis brown pelican, Vermivora bachamanii bachman's warbler, Campephilus principals ivory-billed woodpecker and Picoides borpolis redcockoded woodpecker) and four reptiles Alligator mississippaensis American alligator Lepidochelys kempir Atlantic ridley sea turtle, enotmochelys imbricata. Hawkshill turtle and Dermochelys cariocea leatherback turtle have been reported in the immediate project area.

104. Endangered and Threatened Plants and Animals of Alabama published by the Alabama Museum of Natural History, 15 October 1976, lists an additional 40 plants, 6 fishes, 14 amphibians and reptiles, and 15 birds from the Mobile Bay area as endangered, threatened, or of special concern in Alabama;

however, only a few of these occur in the project area and these are: Scaphirhynchus sp. Alabama shovelnose sturgeon, Acipenser Oxyrhynchus Atlantic sturgeon, Caretta caretta Atlantic luggerhead turtle, Chelonia mydas green sea turtle, Desmochelys coriacea leatherback sea turtle, Alligator mississippiensis American alligator, Pseudemys alabamensis Alabama red-bellied turtle, Rana heckscherii river frog, Siren lacertina greater siren, Pelecanus occidentalis brown pelican, Felis concolor coryi Florida panther, and Ursus americanus floridanus Florida black bear.

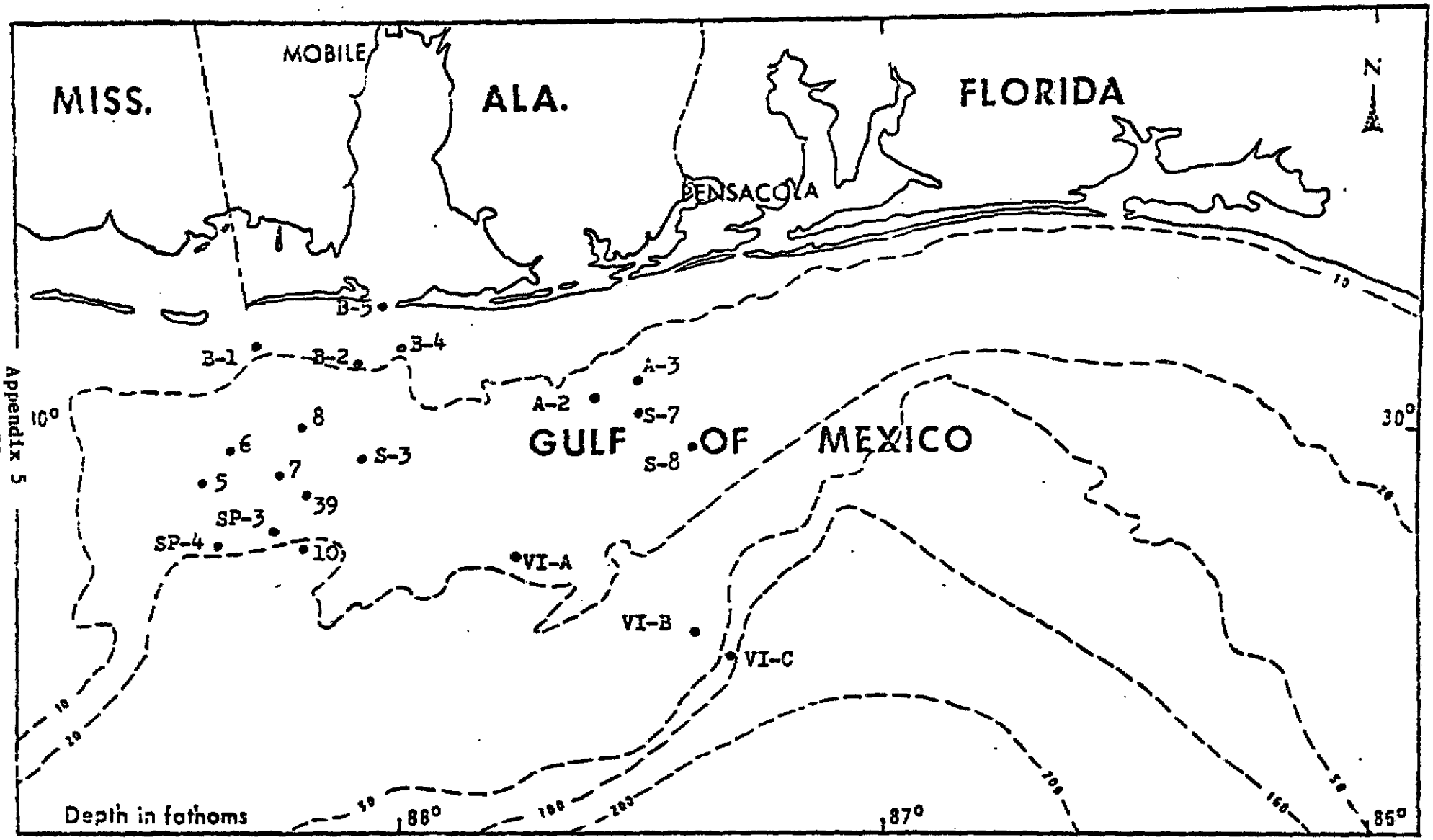


Figure B-15 Locations of sampling sites

TABLE B-16

SHELLFISH HARVEST FROM MOBILE BAY
FROM 1963 THROUGH 1974 (IN 1,000's LBS)[1/]

Year	Shrimp	Oysters	Crabs
1963	2,373	324	730
1964	1,223	349	613
1965	1,086	21	675
1966	1,028	237	728
1967	1,726	1,123[2/]	962
1968	1,395	279	1,062
1969	1,000	72	680
1970	725	42	535
1971	543	52	643
1972	722	239	596
1973	343	129	987

[1/] Data supplied by Mr. Orville Allen, National Marine Fisheries Service.

[2/] This value reflects the harvest of undersize oysters to supply cannery operation.

TABLE B-17

CHANGES IN ALABAMA'S SHRIMP FEET AND CATCH

Year	Shrimp Boats Under 5 Tons	Fishermen on Boats	Shrimp Vessels Over 5 Tons	Fishermen on Vessels	Average Catch per Trip from Mobile Bay lbs (heads off)
1964	231	380	230	582	362
1965	206	335	295	706	317
1966	203	311	366	882	368
1967	174	279	397	961	481
1968	139	227	467	1,164	420
1969	129	188	506	1,283	300
1970	149	174	448	1,143	294
1971	169	171	456	1,160	363

1/ Adapted from Swingle (1976).

OFFSHORE BENTHIC HABITATS

105. Data on the offshore benthic habitats are limited for Alabama waters. Four stations have been sampled in recent years within the 10-fathom curve, while 13 samples have been taken between the 10- and 20-fathom curve (Figure B-15). This effort represents roughly one sample per 100 square miles of water bottoms that are less than 20 fathoms in depth. Although much additional data are required prior to accurately describing the various benthic habitats characterizing Alabama's coastline, the following paragraphs represent the available data.

106. Within the area lying shoreward of the 10-fathom curve (Stations B-1, B-2, B-4, and B-5), the benthic community is not as numerous south of Dauphin Island as it is south of Perdido Bay. Sediment type influenced the abundance of macro-infauna. Smaller numbers of organisms were found in fine sand and clay substrates, but the individual size of each orgamism was larger. This relationship suggests that in the fine sand-clay substrates bivalves dominated, while polychaetes dominated the coaser substrates.

107. Much of the area between the 10- and 20- fathom curve is located in the Mississippi-Alabama-Florida sand sheet. The particle size generally increases with distance from the shore as increasing amounts of shell hash are revealed. Stations 6, 7, 8, and S-3 relate to this study. Substrate at stations S-3 and 8 is coarse sand, while median sand was encountered at stations 6 and 7. Medium and coarse sand supported a much higher standing crop of benthic infauna. Much of this difference can be attributed to the increased contribution of non-polychaetes, such as mollusks, arthropods, and echinoderms to the community.

WATER QUALITY

108. Mixing of the various water masses that enter Mobile Bay at regular intervals produces an infinitely varying combination of chemical and physical gradients. The range and mean of selected water quality parameters in Mobile Bay are given in table B-8. Generally, the bay's water temperatures range from about

10° in January to about 31° C in August, while the average annual temperature is about 22° C (Bault, 1972). Salinity varies markedly within the bay as a result of the large freshwater runoff from the Mobile River System and the tidal influx of gulf waters. Occasionally, these salinity variations are of sufficient magnitude to stress biological communities. Floods from the Mobile River occur at irregular intervals. McPhearson (1970) and Bault (1972) each contend that during these periods of high river discharge, a jet-like flow from the rivers in the eastern delta deflects the flow of the Mobile River to the southwest. This effectively concentrates the fresh water discharge over the state's principal oyster reefs and shortens the time of travel from Mobile greatly. Story, et al (1974) determined a 41-hour time of travel from Mobile River to a point near Cedar Point Reef at a flood discharge of 337,600 cfs.

109. Since the bay is so large individual pollution sources have little effect on the overall water quality of the bay except in highly localized areas. Nonetheless, Mobile Bay has been subject to a slow but steady degradation. In some areas, notably Garrow's Bend, there is evidence that this trend has been reversed in recent years.

110. The most wide ranging and serious pollution impact has been the closing of oyster reefs for harvesting (South Alabama Regional Planning Commission 1978). An area encompassing 72,370 acres in the northern section of the bay has been permanently closed to the harvest of oysters and other bivalves because of high coliform levels. The recent adoption of fecal coliform criteria could result in a reopening of some of this area to oyster harvest. However, Presnell (personal communication) in an annual study on indicator bacterial organisms and Salmonella found an average most probable number (mpn) of 680 fecal coliforms per 100 ml at a station off Dog River. During the entire year a total of 45 samples were taken and Salmonella, a pathogenic bacterium, was isolated on four occassions. Under these conditions it is highly doubtful that waters of the upper bay could be repoened since values in excess of 14 mpn/100ml result in harvest prohibitions.

Table B-18

Range and Mean of Water Quality Parameters
Mobile Bay, Alabama

Parameter	Range	Mean
Surface temperature	4.7 - 32.2° C	20.5° C
Bottom temperature	7.1 - 31.9° C	20.3° C
Surface salinity	0.2 - 27.6°/oo	11.3°/oo
Bottom salinity	0.1 - 34.0°/oo	17.1°/oo
Surface dissolved oxygen	2.2 - 12.7 ppm	7.7 ppm
Bottom dissolved oxygen	1.4 - 11.9 ppm	7.9 ppm
Surface turbidity	1 - 39 JTU	15.1 JTU
Bottom turbidity	2 - 250 JTU	29.5 JTU
Surface pH	5.89 - 8.44	7.06
Bottom pH	2.30 - 8.32	7.01
Surface nitrate	0.00 - 53.38 g-at/1	
Bottom nitrate	0.00 - 51.46 g-at/1	
Surface nitrite	0.00 - 0.69 g-at/1	0.5 g-at/1
Bottom nitrite	0.00 - 1.15 g-at/1	0.8 g-at/1
Surface orthophosphate	0.00 - 10.86 g-at/1	1.80 g-at/1
Bottom orthophosphate	0.00 - 25.68 g-at/1	1.98 g-at/1
Surface total phosphorus	0.00 - 12.01 g-at/1	
Bottom total phosphorus	0.00 - 91.4 g-at/1	91.4 g-at/1

Source: Bault (1972)

°C = Degrees centigrade
°/oo = Parts per thousand
ppm = Parts per million
g - at/1 = Microgram atoms per liter
JTU = Jackson turbidity units

111. A comprehensive planning document on the area's water quality has been recently completed by the South Alabama Regional Planning Commission (SARPC, 1978). The planning area included portions of Mobile and Baldwin Counties that comprise the Mobile Standard Metropolitian Statistical Area. Within this area are 21 municipally owned treatment facilities, 36 industrial facilities and 49 semi-public and private systems. Collectively these facilities discharge approximately 194 million gallons of wastewater per day. Additionally the Barry Steam Plant of the Alabama Power Company discharges 1,170 million gallons per day (MGD) of cooling water. Although this plan is still under review and has not been approved by the Environmental Protection Agency, specific recommendations have been made to achieve the greatest improvement of water quality at the least expenditure of funds. These recommendations are displayed in table B-19. A total of $582 million would be required for plan implementation through the year 2000.

112. Localized severe degradation of water quality has been documented in Chickasaw Creek, Three Mile Creek, and Dog River. Detailed discussion of these water bodies can be found in recent 208 reports for Mobile and Baldwin Counties (SARPC, 1978). Chickasaw and Three Mile Creek were identified as the most significent municipal wastewater treatment needs within the immediate Mobile area in these reports. The next most significant need was the elimination of the numerous package treatment plants which discharge directly into the water along the Mobile Causeway. The primary industrial wastewater treatment needs identified were associated with industries which discharge into Chickasaw and Three Mile Creeks. Outside the immediate area discharge from the seafood industries in Coden, Bayou la Batre, and Bon Secour were identified as significant needs.

113. As seen in figure B-16, Alabama coastal waters are classified for a variety of uses by the Alabama Water Improvement Commission according to water quality. In general, water quality improves with distance from the Mobile urban center. A large portion of the bay (including Bon Secour Bay) is classified for swimming and for fish and wildlife. About two-thirds of the bay is classified for shellfish harvesting in addition to swimming and fish and wildlife. The northwestern corner of the bay is classified for fish and wildlife. The portion of Chickasaw Creek included in the project

TABLE B-19

COST OF IMPLEMENTING WATER QUALITY MANAGEMENT PLAN
FOR MOBILE AND BALDWIN COUNTIES UNTIL THE YEAR 2000

Waste Source	Cost
Municipal Point Sources	$182,916,542
Industiral Point Sources	139,209,962
Residual Waste	80,580,700
Urban Stormwater	163,200,575
Nonpoint Source	16,037,000
Total	$581,944,77

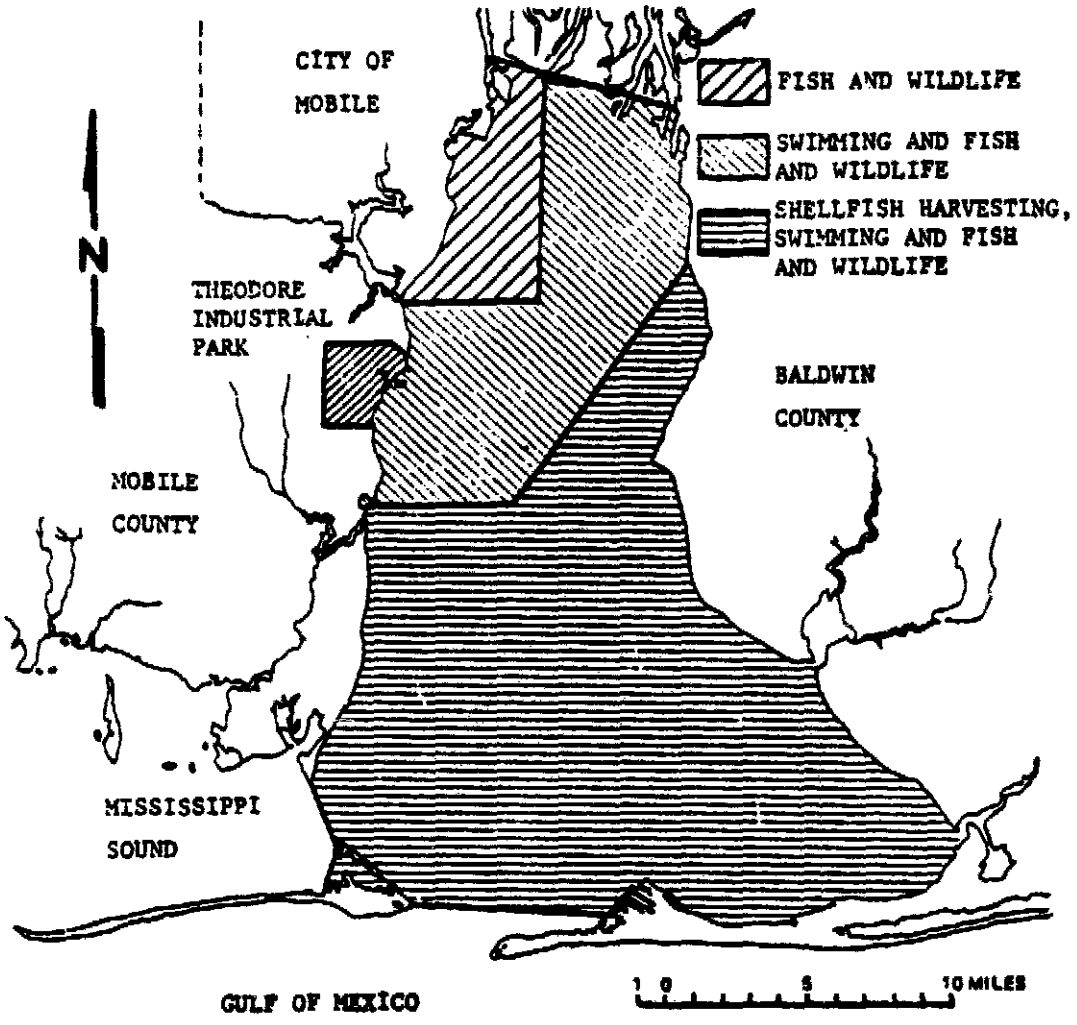


FIGURE B-16
WATER QUALITY CLASSIFICATION OF
MOBILE BAY, ALABAMA

is classified for fish and wildlife but carries a lower dissolved oxygen criteria than the standard fish and wildlife classification (AWIC).

AIR QUALITY

114. Current Ambient Air Quality Standards are presented in table B-20. The primary standard is intended for the protection of human health; the secondary standard is intended to protect public welfare.

115. An extensive air quality monitoring program has been conducted since 1972 by the Mobile County Health Department, Division of Air Pollution Control. A network of 9 ambient monitoring stations contributing data to the program, operates in Mobile County. Emphasis of the program has been placed primarily on suspended particulate matter, sulfur dioxide and photochemical oxidants values since these have been recognized as the primary concern for Mobile County in attainment and maintenance of Federal ambient air quality standards. Mobile County is an Air Quality Maintenance Area for particulates.

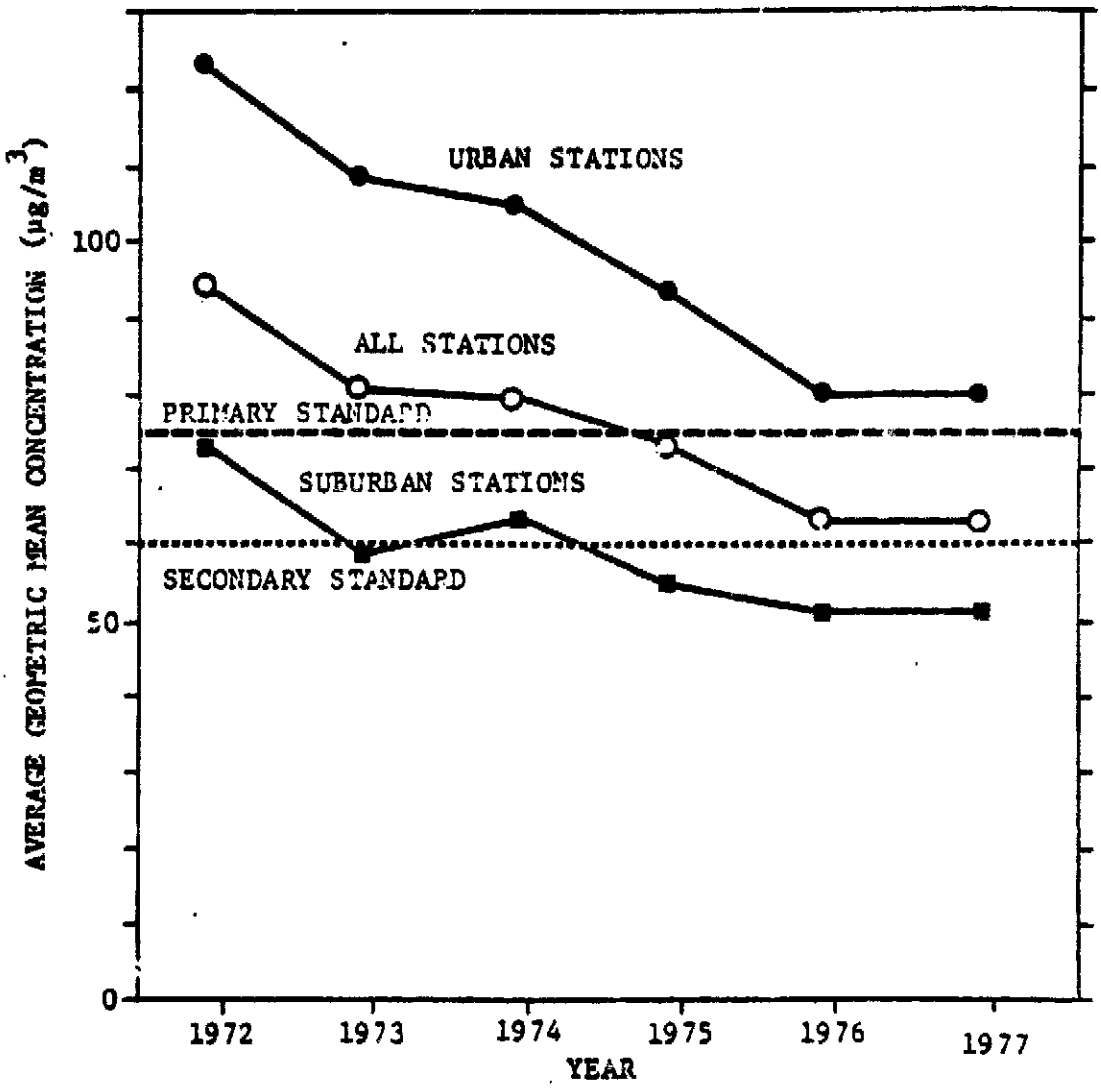
116. Annual trends for area-wide total suspended particulate levels in suburban, urban and composite categories are illustrated in Figure B-17 for the interval 1972 through 1977. Values for urban stations correspond to those in the immediate Mobile area; the remaining stations are designated suburban. These data show that particulate levels for Mobile County have declined significantly since 1972. Some urban stations exceeded the primary ambient air quality standard, therefore, a section of downtown Mobile is designated as not meeting the primary standard for total suspended particulates. Sulfur dioxide was monitored continuously through 1977 at an urban and suburban station. For both stations, levels were lower than the secondary national ambient air quality standard.

TABLE B-20

NATIONAL AMBIENT AIR QUALITY STANDARDS
($\mu g/m^3$ except as noted)

POLLUTANT	PRIMARY	SECONDARY
SULFUR OXIDES		
Annual Arithmetic Mean	80	
24-Hour Maximum[a]	365	
3-Hour Maximum[a]		1,300
SUSPENDED PARTICULATE MATTER		
Annual Geometric Mean	75	60
24-Hour Maximum[a]	260	150
CARBON MONOXIDE		
8-Hour Maximum[a], mg/m^3	10	
1-Hour Maximum[a], mg/m^3	40	
HYDROCARBONS		
3-Hour (6:00 to 9:00 a.m.) Maximum[a]	160	160
NITROGEN DIOXIDE		
Annual Arithmetic Mean	100	100
PHOTOCHEMICAL OXIDANTS		
1-Hour Maximum[a]	160	160

[a]Not to be exceeded more than once per year.



Source: U.S. Environmental Protection Agency, 1973

FIGURE B-17

AREAWIDE TOTAL SUSPENDED PARTICULATE MATTER, MOBILE COUNTY, 1972-1977

117. Data were obtained for photochemical oxidants at two suburban stations during 1978. It was found that the 1-hour oxidant standard of 160 ug/m^3 was exceeded 134 times. Mobile County is currently listed as not meeting the primary national ambient air quality standards for photochemical oxidants.

NOISE

118. The most commonly used unit of noise measurement is the decibel, a logarithmic term representing the amount of power behind a sound-producing wavefront. In terms of everyday noises, levels range from about 50 decibels for background sounds in a typical office, to about 70 decibels for freeway traffic at a distance of 50 feet, to 100 decibels for a jet takeoff at 2,000 feet. Contributions to hearing impairments begin around 70 decibels, or at the noise level associated with freeway traffic. In 1970, the Occupational Safety and Health Act (OSHA) included standards to define the permissible durations of exposure of employees to various noise levels. Exposure time decreases from 8 hours per day for sound levels of 90 decibels to 15 minutes per day for 115 decibels. The office of the Department of Labor-Occupational Safety and Health investigates industries which are suspected of violating these standards with regard to their employees. In the area surrounding the bay, truck and automobile traffic as well as the heavy machinery associated with loading and unloading at the docks are the major sources of noise. While this noise may be annoying to persons passing through the area it does not pose a health problem and does not approach the levels set as standards by the OSHA.

DESCRIPTIVE PUBLICATIONS

119. Published maps of the study area include the National Ocean Survey Chart No. 11376 at a scale of 1:80,000. This chart provides information needed by Navigational interests for Mobile Bay and its entrances and for coastal Alabama. The two-county study area is covered by U. S. Geological Survey 7.5 and 15 minute series quadrangle maps. These maps provide topographic information, The urban areas are covered by the 7.5 minute series at a scale of 1:24,000. The remainder of the study area is covered by the 15 minute series quadrangle maps at a scale of 1:62,500.

120. Following is a bibliography of significant publications that contain material descriptive of the study area some of which were used or consulted in the preparation of this section of the technical appendix.

BIBLIOGRAPHY

Austin, G. B. 1954. On the circulation and tidal flushing of Mobile Bay, Alabama, pt. 1. Texas A&M Univ., Dept. Oceanogr., College Res. Found., Proj. 24, Tech. Rept. 12. 28 pp.

Baldwin, William P. 1957. An inspection of waterfowl habitats in the Mobile Bay area. Special Report No. 2, Alabama Department of Conservation, 41 pp.

Baldwin, W. P. 1956. An inspection of waterfowl habitats in the Mobile Bay area. Alabama Dept. Conserv., Game and Fish Div., Fed. Aid Wildl. Restoration, Spec. Rept. 2:41 pp.

Bault, E. I. 1972. Hydrology of Alabama estuarine areas--cooperative Gulf of Mexico estuarine inventory. Alabama Mar. Resources, Bull. 7:36 pp.

Chermock, R. L. 1974. The environment of offshore and estuarine Alabama Information Series 51. Alabama Geological Survey. 135 pp.

Colberg, M. R. and D. M. Windham. 1965. The oyster based economy of Franklin County, Florida. Florida State University, Tallahassee, Florida.

Cooke, C. W. 1939. Scenery of Florida: Florida Department of Conservation. Geol. Bull. 17, 118 pp.

Crance, J. H. 1971. Description of Alabama estuarine areas--cooperative Gulf of Mexico estuarine inventory. Alabama Mar. Res., Bull. 6:85 pp.

Garcia, A. W. 1977. Dauphin Island Littoral Transport Calculations. MP-H-77-11, USAE Waterways Experiment Station, Vicksburg, MS.

Gorsline, D. S. 1966. Dynamic Characteristics of West Florida Gulf Coast Beaches. Marine Geology, Vol. 4, pp. 187-206, 1966.

Humm, H. J. 1973. Seagrasses, In: Jones, J. I. and others, eds., A summary of knowledge of the eastern Gulf of Mexico 1973: Florida State Univ. Inst. Oceanography, 10 pp.

Jones, E. E. 1974. Protozoa of Mobile Bay, University of South Alabama. Monograph No. 1. Mobile, Alabama.

Lackey, J., T. Duncan, J. Fox, J. Mackey, J. Sullivan. 1973. A study of the effects of maintenance dredging in Mobile Bay, Alabama, on selected biological parameters. Final Rept., Contract No. DACW01-73-C-140, Mobile District, Corps of Engineers. 54 pp.

Leithead, H. L., L. L. Yarlett, and T. N. Shifley. 1971. 100 native forage grasses in 11 southern states. U. S. Dept. Agric., SCS, Agric. Handbook No. 389, U. S. Govt. Print. Off. 216 pp.

Loesch, H. 1960. Sporadic mass shoreward migrations of demersal fish and crustaceans in Mobile Bay, Alabama. Ecology 41: 292-298.

Lueth, F. X. 1963. Mobile Delta water-fowl and muskrat research. Alabama Dept. Conserv., Montgomery, Alabama, Pittman-Robinson Proj. 7-R. 86 pp. (final rept.).

May, E. B. 1971. A survey of the oyster and oyster shell resources of Alabama. Alabama Mar. Resources, Bull. 4:53 pp.

May, E. B. 1973. Extensive oxygen depletion in Mobile Bay, Alabama. Limnol. and Oceanogr. 18(3):353-366.

McPhearson, R. M., Jr., 1970. The hydrography of Mobile Bay and Mississippi Sound, Alabama. Univ. Alabama Marine Sci. Inst., Mar. Sci. Jour. 1(2):83 pp.

Parker, R. H. 1960. Ecology and distributional patterns of marine macro-invertebrates, northern Gulf of Mexico. In: Shepard, F. P., F. B. Phleger, and Tj. H. van Andel (eds.) Recent sediments, northwest Gulf of Mexico. Amer. Assoc. Petrol. Geol., Tulsa, Okla. pp. 302-337.

Parker, R. H., G. R. High, L. E. Alderson and H. H. Bryant. 1974. Environmental Inventory and Assessment of Lower Mobile Bay Complex in Light of Proposed Drilling Activities by Mobil Oil Corp. Coastal Ecosystems Management, Inc. Fort Worth, Texas.

Richmond, E. A. 1962. The fauna and flora of Horn Island, Mississippi. Gulf Res. Repts. 1(2):59-106.

Ryan, J. J. 1969. A sedimentologic study of Mobile Bay, Alabama. Florida State Univ., Dept. of Geol., Sedimentological Res. Lab. Contrib. No. 30:110 pp.

Schroeder, W. W. 1974. Physical oceanography of the Mobil drilling site. In: Parker, R. H., et al. Environmental inventory and assessment of lower Mobile Bay complex in light of proposed drilling activities by Mobil Oil Corporation. Coastal Ecosystems Management, Inc.

Schroder, W. W. 1976. Physical Environmental Atlas of Coastal Alabama. Mississippi-Alabama Sea Grant Program, MASGP-76-034.

Scruton, P. D., and D. G. Moore. 1953. Distribution of surface turbidity off Mississippi Delta. Amer. Assoc. Petrol. Geol., Bull. 37(5):1067-1074.

Shaw, S. P. and C. G. Fredine. 1971. Wetlands of the United States - Their Extent and Their Value to Waterfowl and Other Wildlife. U. S. Dept. of the Interior, Fish and Wildl. Service Circular 39:67 pp.

Stern, A. H. R. M. McPhearson, Jr., and d. L. Gaines. 1974. Use of Flourescent Dye Tracers in Mobile Bay. Journal Water Pollution Control, Vol. 46, No. 4, April 1974.

Swingle, H. A. 1971. Biology of Alabama estuarine areas--cooperative Gulf of Mexico estuarine inventory. Alabama Mar. Resources Bull. 5:123 pp.

Swingle, H. A. 1977. Coastal Fishery Resources of Alabama. Alabama Marine Resources Bull. 12:31-58 pp.

Tanner, W. F., C. E. Brett, J. Ryan, and F. Stapor. (Undated) Mobile Bay estuarine system-case study. In: Case studies of estuarine sedimentation and its relation to pollution of the estuarine environment, Gulf Universities Research Consortium, Houston, Texas. pp. C-1 to C-46.

Taylor, W. R. 1954. Sketch of the character of the marine algal vegetation of the shores of the Gulf of Mexico. In: Gulf of Mexico, Its origin, waters and marine life. Fish. Bull. 89, U. S. Dept. Interior. pp. 177-192.

U. S. Army Corps of Engineers, "Comparative Statement of Traffic for Calender Year 1973," (Unpublished, December 18, 1974).

U. S. Army Corps of Engineers. 1949. Determination of salinity line in Mobile River and its tributaries. Government Printing Office. 44 pp. + 24 plates.

U. S. Army Corps of Engineers. 1963. Report on the flood of February-March 1961 in the Mobile District. Mobile District Office, 26 pp.

U. S. Army Corps of Engineers, Lower Mississippi Valley Division. 1973. Report on Gulf Coast deep water port facilities, Texas, Louisiana, Mississippi, Alabama, and Florida: Appendix F, environmental assessment, eastern Gulf. U. S. Army Corps of Engineers, Vicksburg, Miss. Vol. 1; 202 pp.

U. S. Congress. 1975. Report on endangered and threatened plant species of the United States. 94th Congress, 1st Session. House Document No. 94-51. Government Printing Office. 200 pp.

Vittor, B. A., Al. B. Stout. 1975. Delineation of Ecological Critical Areas in the Alabama Coastal Zone. Dauphin Island Sea Lab, Report No. 75-002.

Wade, G. W. 1977. Survey of the Alabama Marine Recreational Fishery. Alabama Marine Resource Bull. 12:1-22 pp.

ATTACHMENT B-1

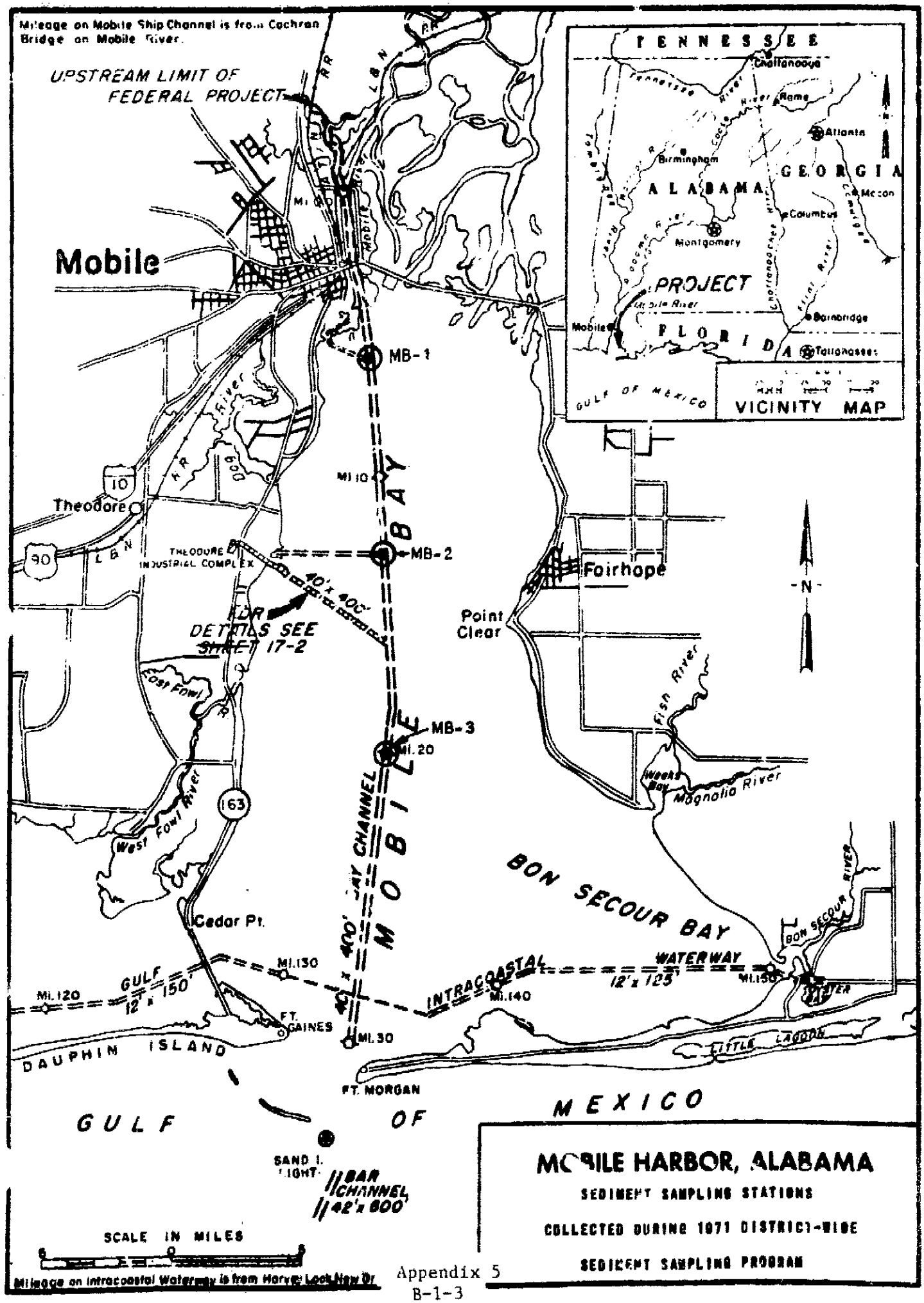
SEDIMENT SAMPLES

1971

SEDIMENT SAMPLING

DATA

(Surface Layer Sediments)


Mileage on Mobile Ship Channel is from Cochran Bridge on Mobile River.
UPSTREAM LIMIT OF FEDERAL PROJECT
Mobile
MB-1
MB-2
MB-3
MOBILE BAY
MOBILE BAY CHANNEL 400' x 40'
Theodore
Theodore Industrial Complex
40' x 400'
FOR DETAILS SEE SHEET 17-2
Fairhope
Point Clear
Fish River
Weeks Bay
Magnolia River
West Fowl River
East Fowl River
Cedar Pt.
BON SECOUR BAY
Bon Secour River
INTRACOASTAL WATERWAY
12' x 125'
GULF 12' x 150'
Mi.120
Mi.130
Mi.140
Mi.150
FT. GAINES
Mi.30
DAUPHIN ISLAND
LITTLE LAGOON
FT. MORGAN
GULF OF MEXICO
SAND I. LIGHT
BAR CHANNEL 42' x 600'
SCALE IN MILES
Mileage on Intracoastal Waterway is from Harvey Lock, New Or
TENNESSEE
Chattanooga
Rome
Atlanta
Birmingham
ALABAMA
GEORGIA
Macon
Columbus
Montgomery
PROJECT
Mobile River
Bainbridge
Mobile
FLORIDA
Tallahassee
GULF OF MEXICO
VICINITY MAP
N
MOBILE HARBOR, ALABAMA
SEDIMENT SAMPLING STATIONS
COLLECTED DURING 1971 DISTRICT-WIDE
SEDIMENT SAMPLING PROGRAM

CHEMICAL, HEAVY METALS, AND PESTICIDES
ANALYSES OF SEDIMENT SAMPLES
MOBILE HARBOR, ALABAMA

Parameter (dry weight basis)	Station (see map) MB-1	MB-2	MB-3
T.V.S. Formula (%)	7.60	7.55	7.90
Volatile Solids (%)	12.74	11.61	12.88
Total Organic Carbon (mg/kg x 10^3)	27.6	40.5	57.3
Chemical Oxygen Demand (mg/kg x 10^3)	64.1	63.6	67.1
Total Kjeldahl Nitrogen (mg/kg N)	2,370.0	2,830.0	2,650.0
Oil and Grease (mg/kg)	3,800.0	0.0	2,600.0
Lead (mg/kg)	32.0	37.0	21.0
Zinc (mg/kg)	179.0	250.0	97.0
Mercury (mg/kg)	0.26	0.41	0.64
Lindane (mg/kg)	ND	ND	ND
Heptachlor (mg/kg)	ND	ND	ND
Aldrin (mg/kg)	ND	ND	ND
Heptachlor Epoxide (mg/kg)	ND	ND	ND
Dieldrin (mg/kg)	ND	T	ND
Endrin (mg/kg)	ND	ND	ND
DDE (mg/kg)	ND	0.07	0.06
DDD (mg/kg)	0.02	0.03	0.03
DDT (mg/kg)	0.02	ND	0.02
Chlordane (mg/kg)	ND	ND	ND
Methoxychlor (mg/kg)	ND	ND	ND
Toxaphene (mg/kg)	ND	ND	ND
PCB (mg/kg)	0.1	0.1	0.1
Organo-Phosphate (mg/kg)	ND	ND	--

ND= None detected
T = Trace amount detected (0.001 ppm)
- = Not analyzed
PCB= polychlorinated biphenyls (Aroclor 1254)

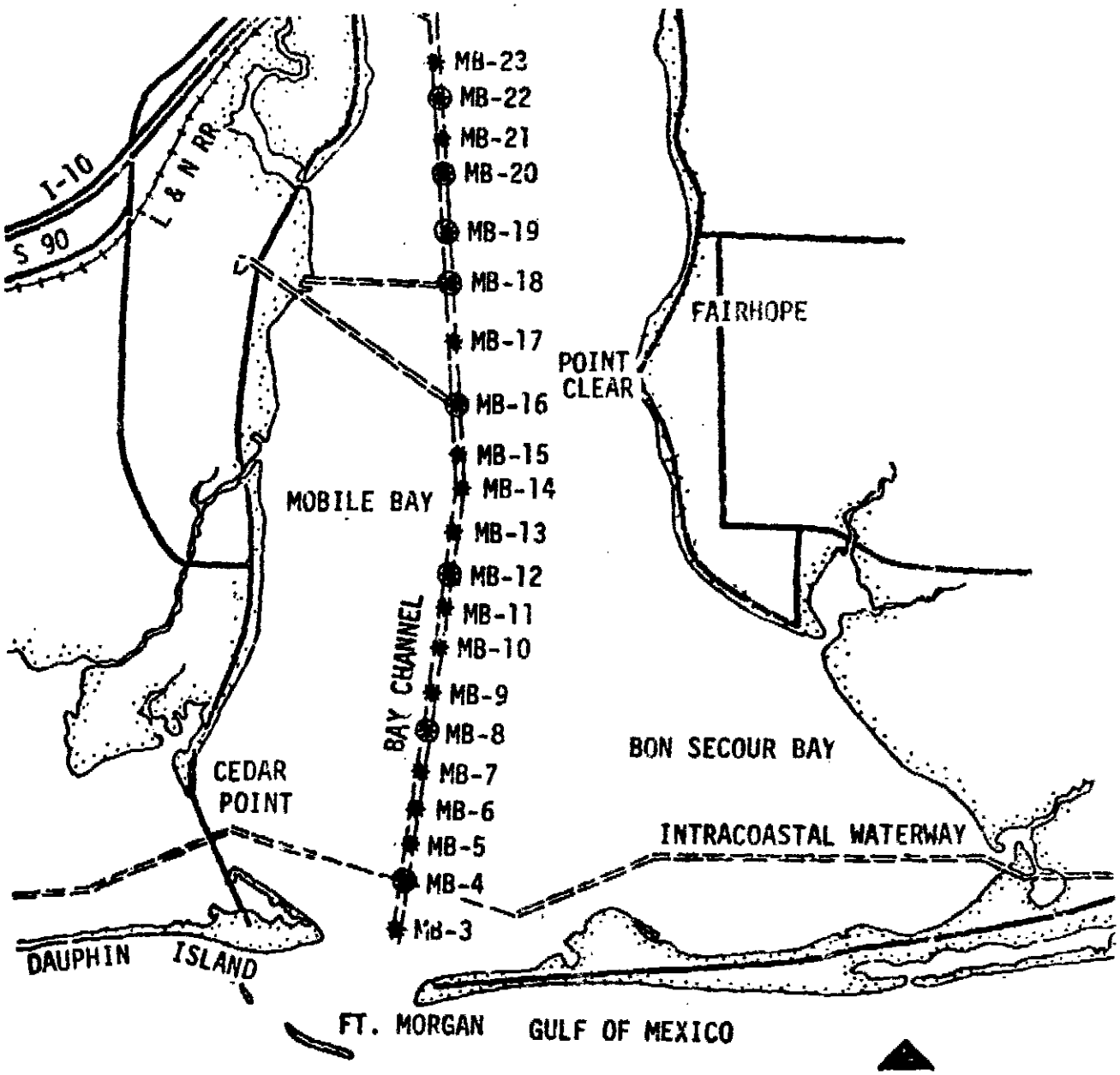
1974

SEDIMENT SAMPLING

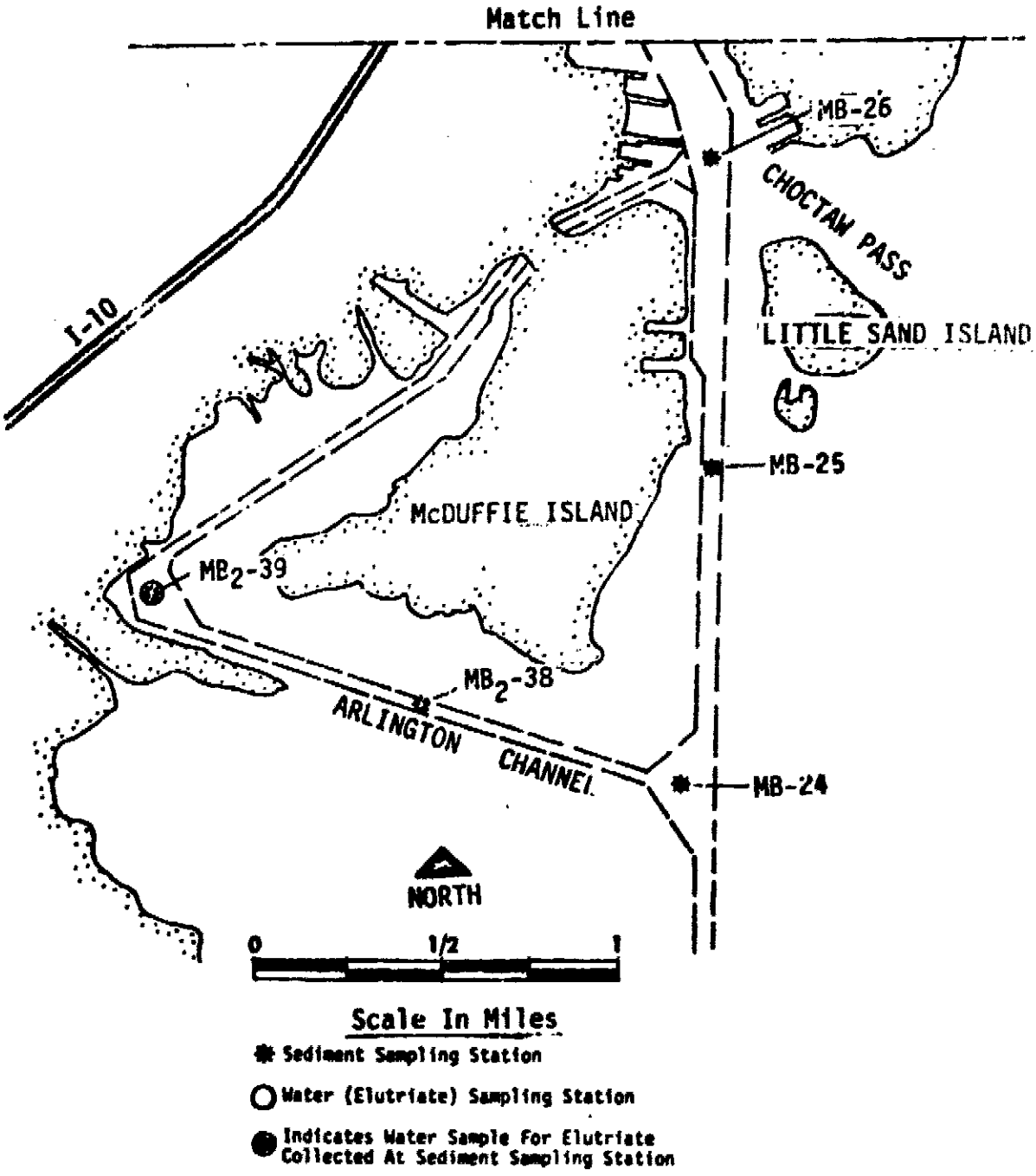
DATA

(Surface Layer Sediments

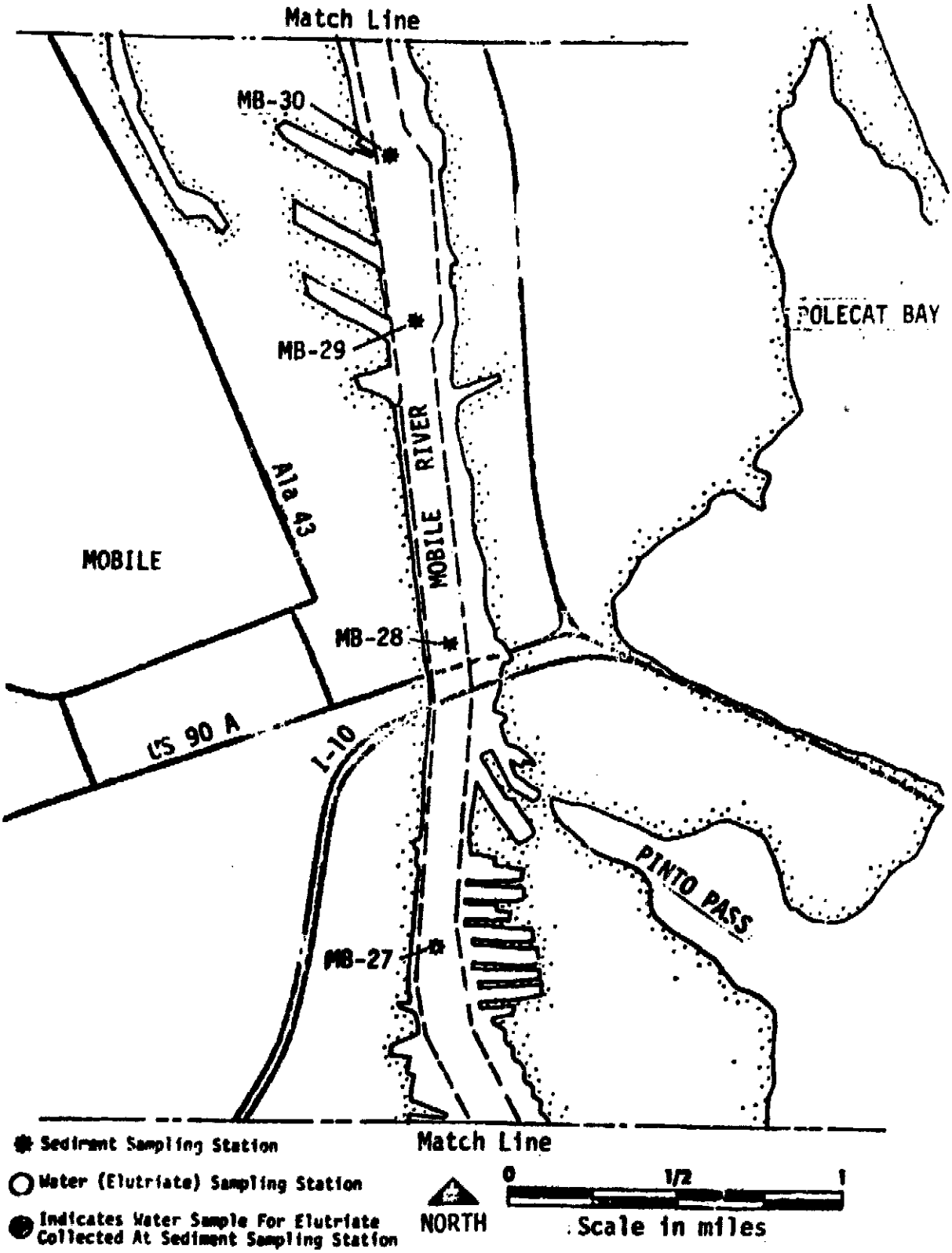
LOCATIONS OF SEDIMENT AND WATER SAMPLING STATIONS,
MOBILE HARBOR, ALABAMA



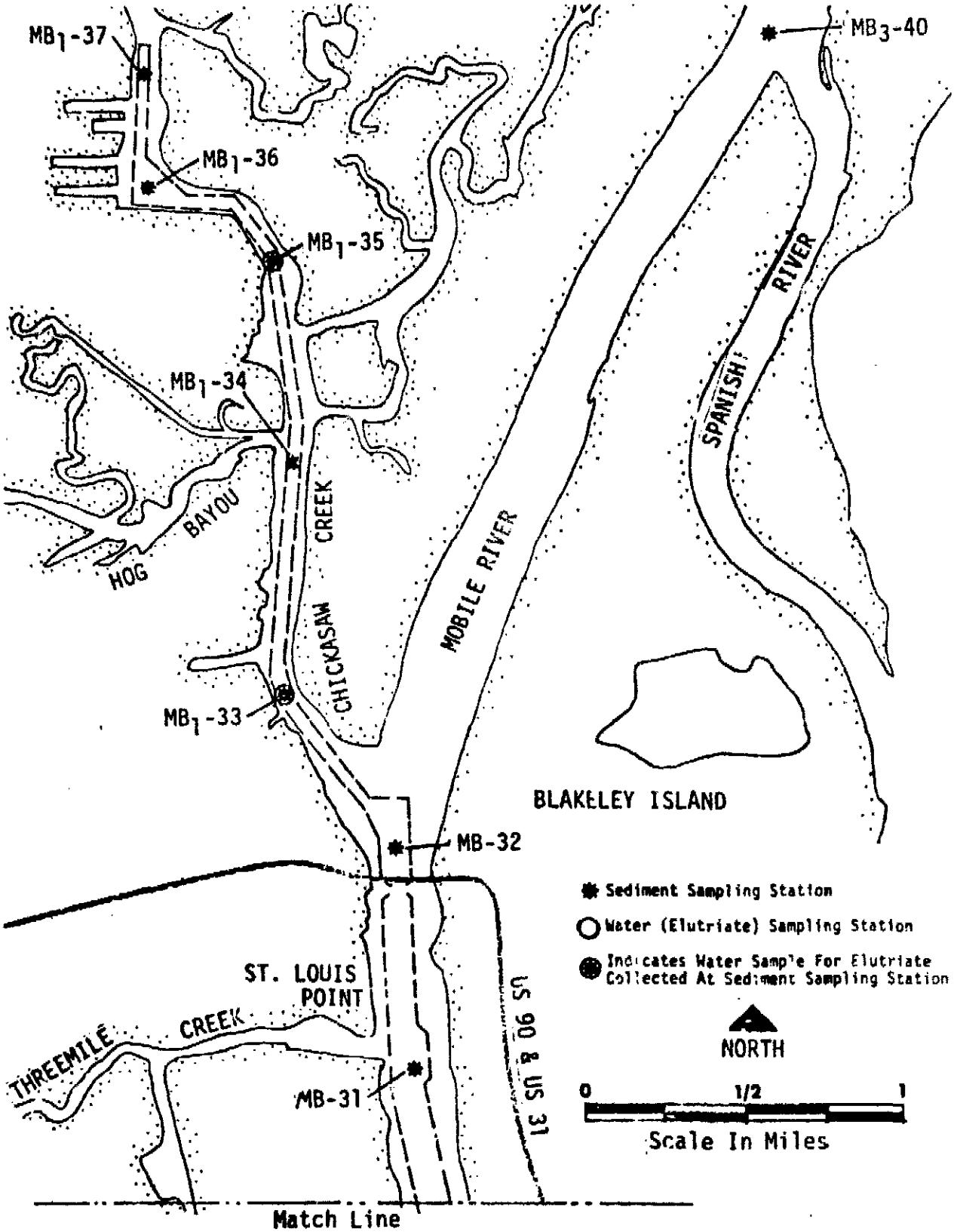
LOCATIONS OF SEDIMENT AND WATER SAMPLING STATIONS,
MOBILE HARBOR, ALABAMA



LOCATIONS OF SEDIMENT AND WATER SAMPLING STATIONS,
MOBILE HARBOR, ALABAMA

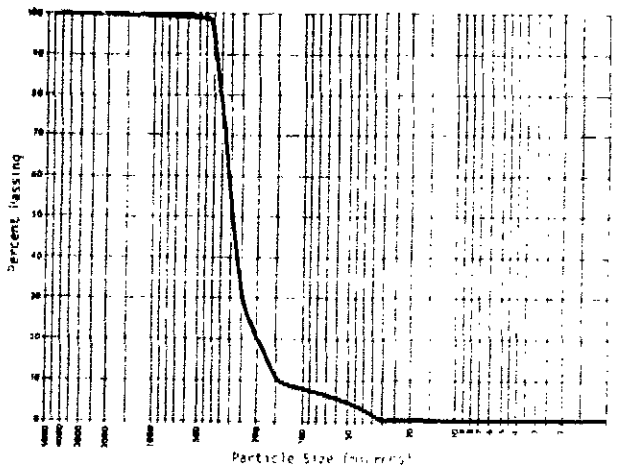


LOCATIONS OF SEDIMENT AND WATER SAMPLING STATIONS,
MOBILE HARBOR, ALABAMA



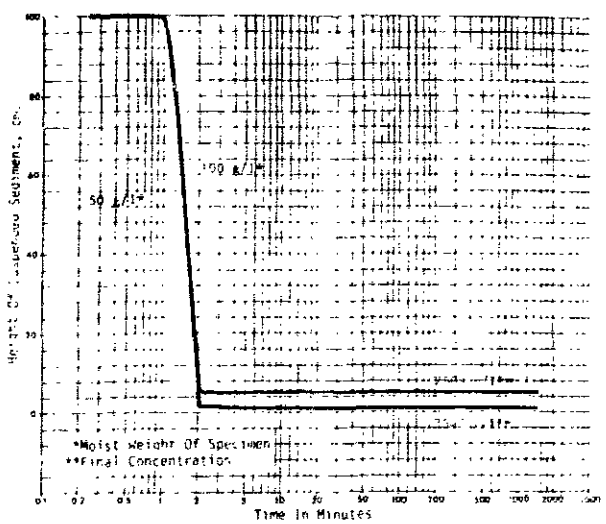
PHYSICAL ANALYSES OF SEDIMENT SAMPLES,
MOBILE HARBOR, ALABAMA

FIGURE 1-a



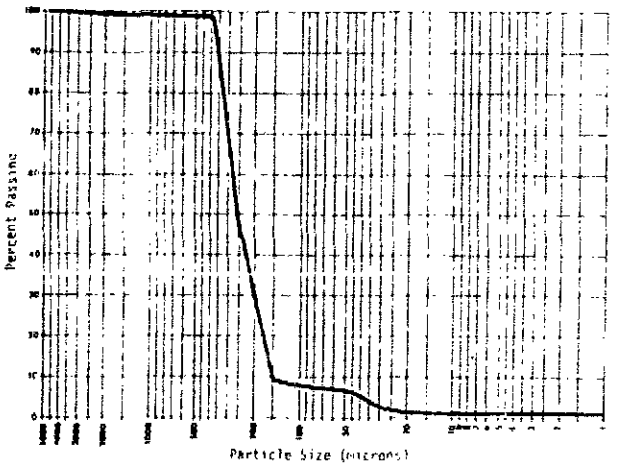
SAMPLE #	SPECIFIC GRAVITY
DATE	STANDARD CLASSIFICATION
TIME	FIELD DESCRIPTION OF SEDIMENT
WATER DEPTH (FT.)	

FIGURE 1-b



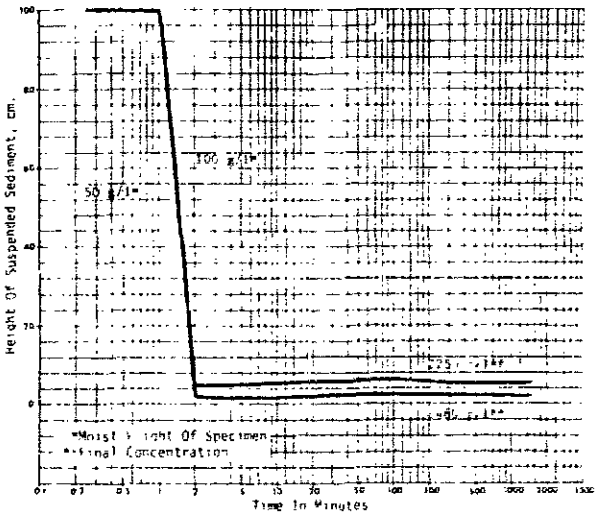
FORMAL SAMPLE #	MB-1
WATER SAMPLE #	MB-1

FIGURE 2-a



SAMPLE #	SPECIFIC GRAVITY
DATE	STANDARD CLASSIFICATION
TIME	FIELD DESCRIPTION OF SEDIMENT
WATER DEPTH (FT.)	

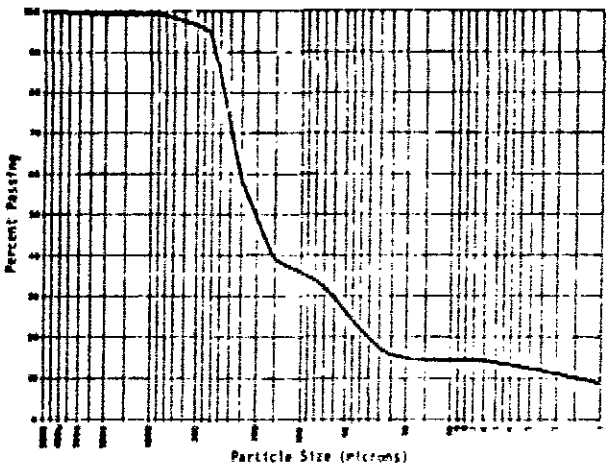
FIGURE 2-b



SEDIMENT SAMPLE #	MB-2
WATER SAMPLE #	MB-2

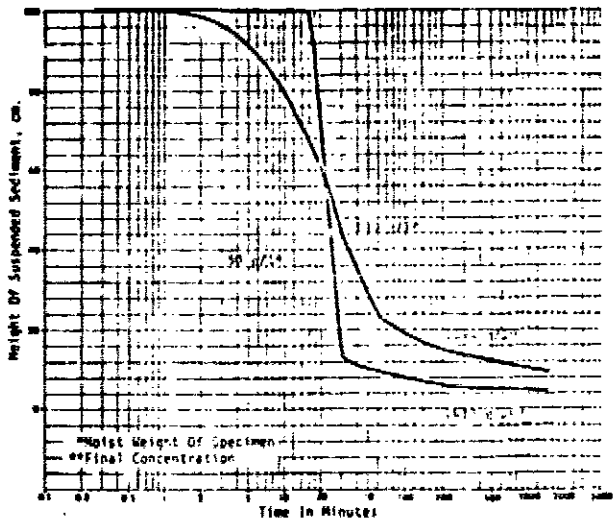
PHYSICAL ANALYSES OF SEDIMENT SAMPLES,
MOBILE HARBOR, ALABAMA

FIGURE 3-a



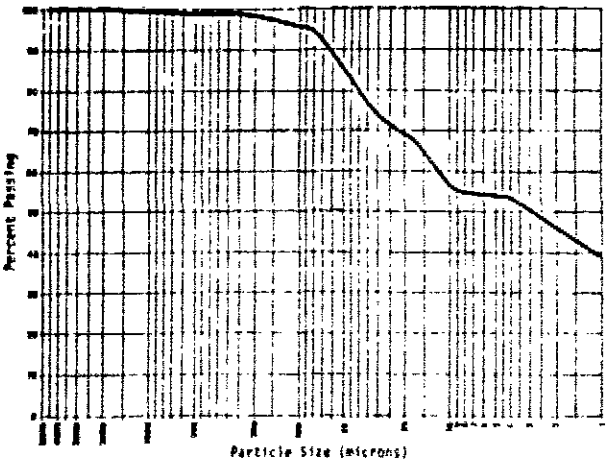
SAMPLE # MB-3	SPECIFIC GRAVITY 2.72
DATE 28 July 76	STANDARD CLASSIFICATION SM
TIME 1350	FIELD DESCRIPTION OF SEDIMENT SOFT BLK
WATER DEPTH (ft) 45	silty ooze with some sand

FIGURE 3-b



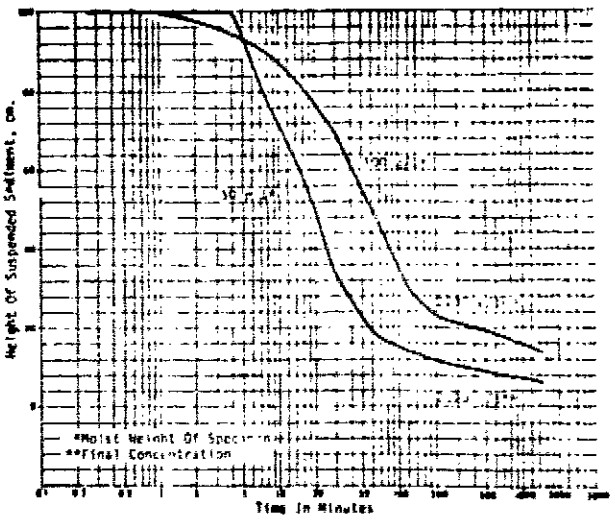
SEDIMENT SAMPLE # MB-3	
WATER SAMPLE # MB-3	

FIGURE 4-a



SAMPLE # MB-4	SPECIFIC GRAVITY 2.71
DATE 28 July 76	STANDARD CLASSIFICATION SM
TIME 1313	FIELD DESCRIPTION OF SEDIMENT SOFT BLACK
WATER DEPTH (ft) +0	silty ooze

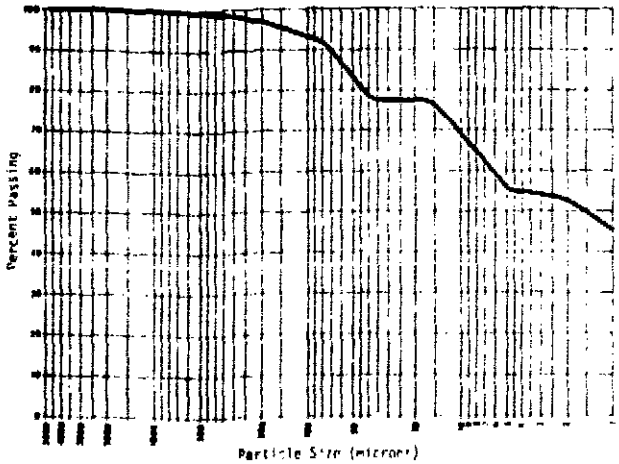
FIGURE 4-b



SEDIMENT SAMPLE # MB-4	
WATER SAMPLE # MB-4	

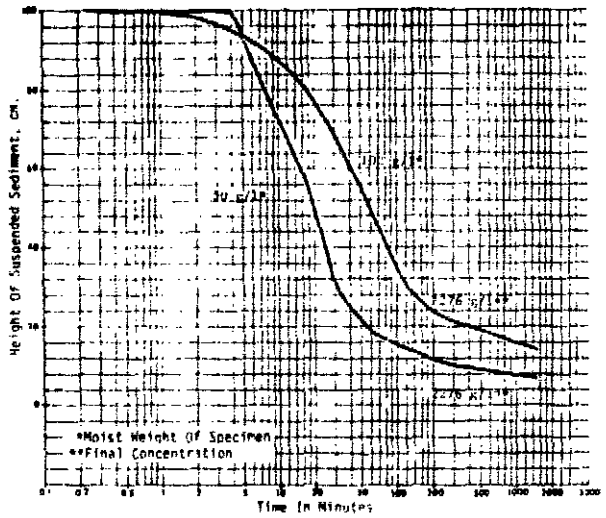
PHYSICAL ANALYSES OF SEDIMENT SAMPLES,
MOBILE HARBOR, ALABAMA

FIGURE 5-a



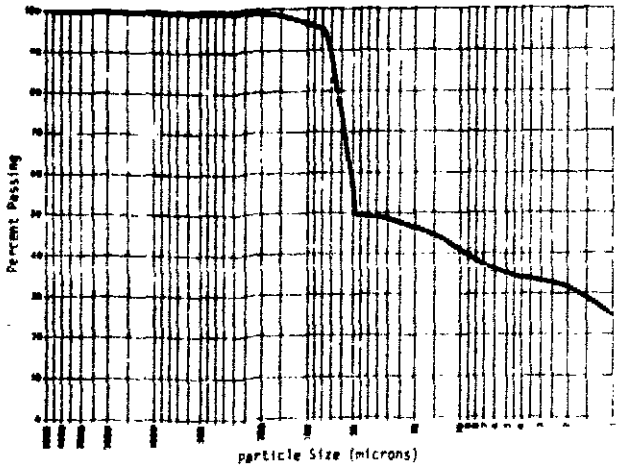
SAMPLE # MB-5	SPECIFIC GRAVITY 2.69
DATE 28 July 74	STANDARD CLASSIFICATION [illegible]
TIME 1125	FIELD DESCRIPTION OF SEDIMENT Soft brown
WATER DEPTH (FT.) 61	silty ooze

FIGURE 5-b



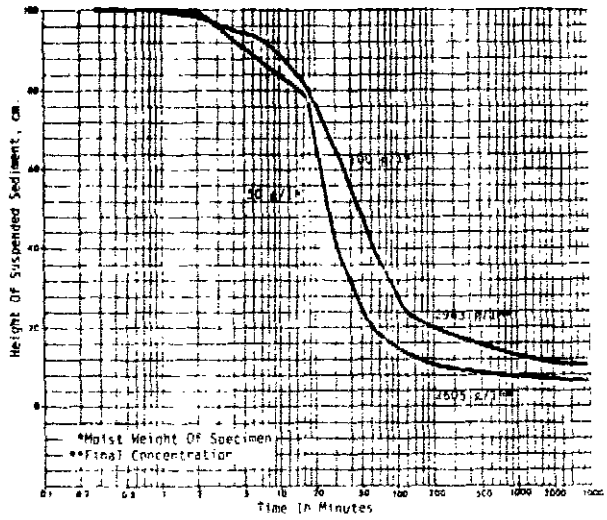
SEDIMENT SAMPLE # MB-5	
WATER SAMPLE # MB-5	

FIGURE 6-a



SAMPLE # MB-6	SPECIFIC GRAVITY 2.93
DATE 28 July 74	STANDARD CLASSIFICATION MH
TIME 1115	FIELD DESCRIPTION OF SEDIMENT Soft grey
WATER DEPTH (ft) 43	silty ooze

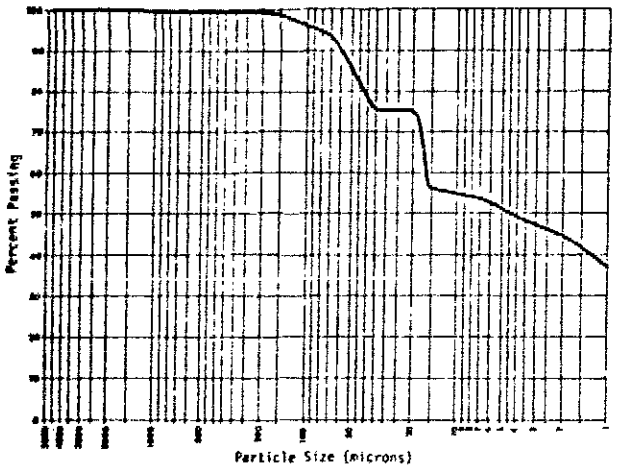
FIGURE 6-b



SEDIMENT SAMPLE # MB-6	
WATER SAMPLE # MB-6	

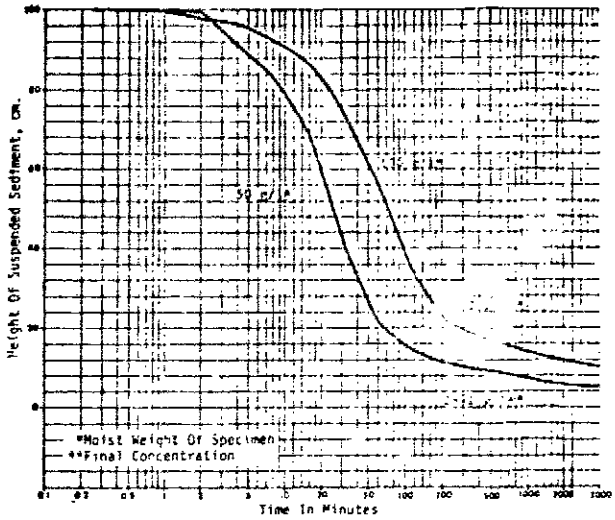
PHYSICAL ANALYSES OF SEDIMENT SAMPLES,
MOBILE HARBOR, ALABAMA

FIGURE 7-a



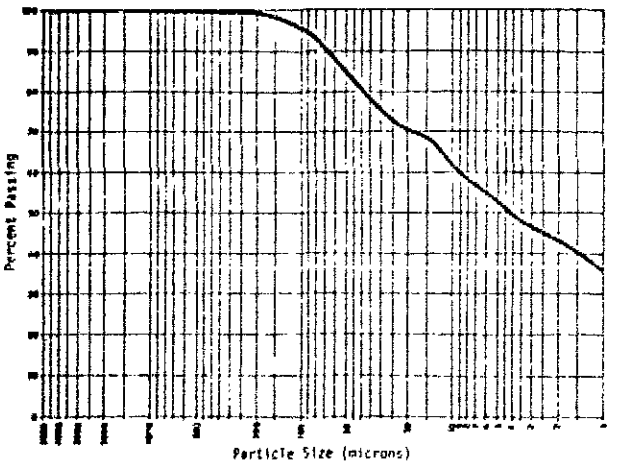
SAMPLE # MB-7	SPECIFIC GRAVITY 2....
DATE 28 July 74	STANDARD CLASSIFICATION MH-OL
TIME 1107	FIELD DESCRIPTION OF SEDIMENT Soft gray
WATER DEPTH (ft.) 42	silty ooze

FIGURE 7-b



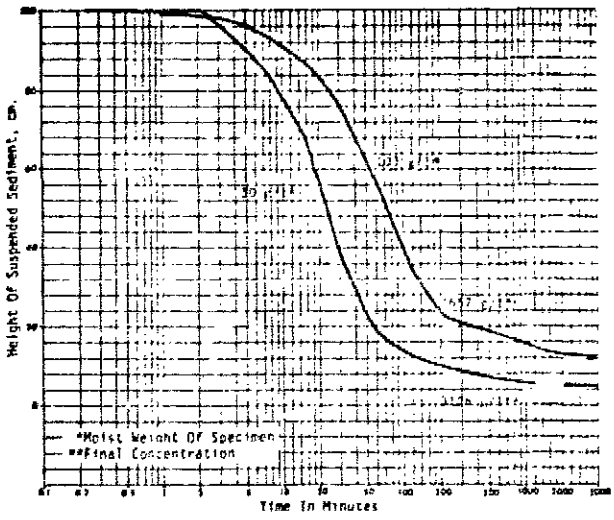
SEDIMENT SAMPLE # MB-7	
WATER SAMPLE # MB-7	

FIGURE 8-a



SAMPLE # MB-8	SPECIFIC GRAVITY 2.76
DATE 30 July 74	STANDARD CLASSIFICATION MH-CL
TIME 0849	FIELD DESCRIPTION OF SEDIMENT Soft brown
WATER DEPTH (ft.) 43	silty ooze

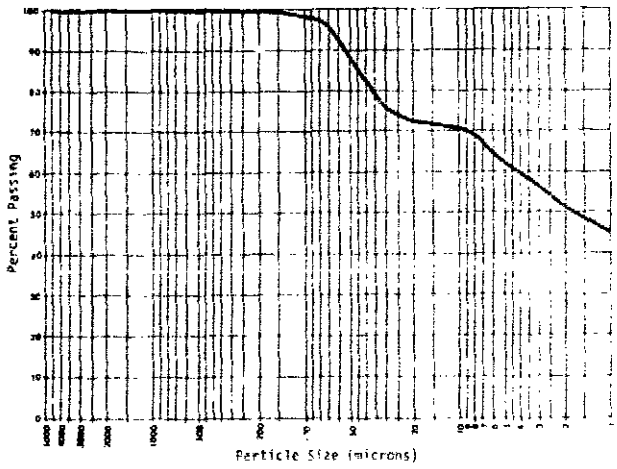
FIGURE 8-b



SEDIMENT SAMPLE # MB-8	
WATER SAMPLE # MB-8	

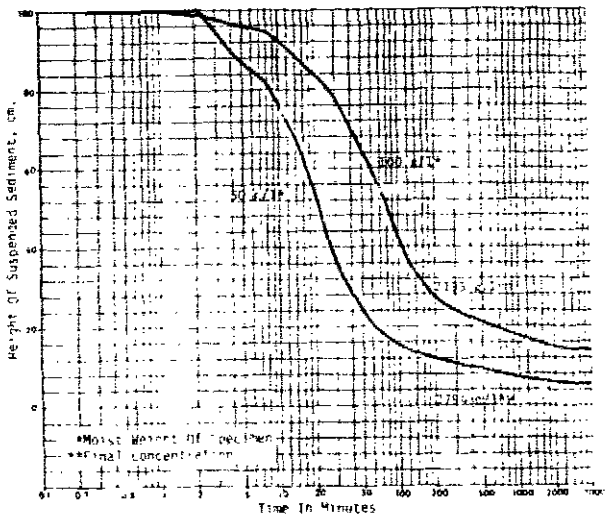
PHYSICAL ANALYSES OF SEDIMENT SAMPLES,
MOBILE HARBOR, ALABAMA

FIGURE 9-a



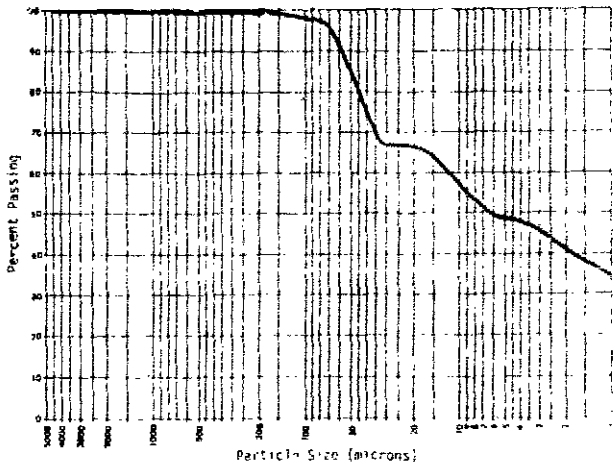
SAMPLE # MB-9	SPECIFIC GRAVITY 2.80
DATE 18 Apr. 74	STANDARD CLASSIFICATION ML-CL
TIME 1320	FIELD DESCRIPTION OF SEDIMENT soft grey
WATER DEPTH (ft.) 44	ooze

FIGURE 9-b



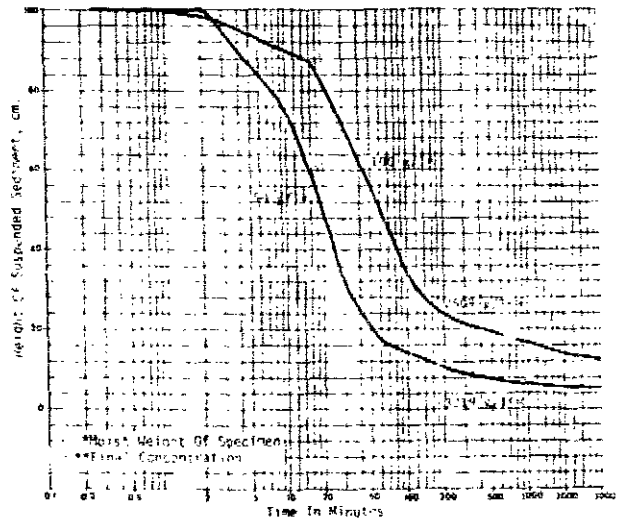
SEDIMENT SAMPLE # MB-9	
WATER SAMPLE # MB-9	

FIGURE 10-a



SAMPLE # MB-10	SPECIFIC GRAVITY 2.89
DATE 30 Apr. 74	STANDARD CLASSIFICATION ML-CL
TIME 0930	FIELD DESCRIPTION OF SEDIMENT Soft brown
WATER DEPTH (ft.) 46	silt

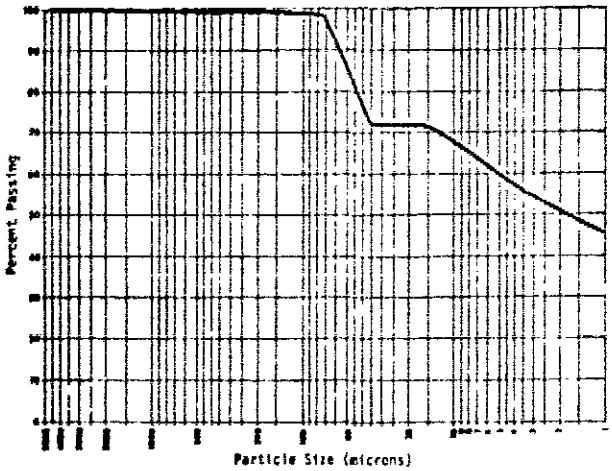
FIGURE 10-b



SEDIMENT SAMPLE # MB-10	
WATER SAMPLE # MB-10	

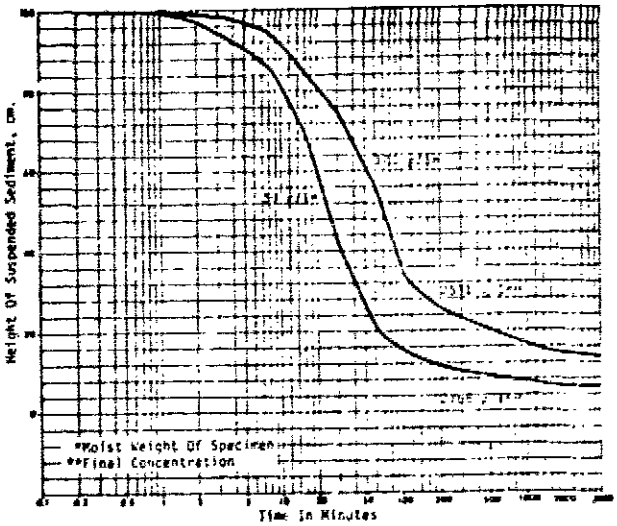
PHYSICAL ANALYSES OF SEDIMENT SAMPLES,
MOBILE HARBOR, ALABAMA

FIGURE 11-a



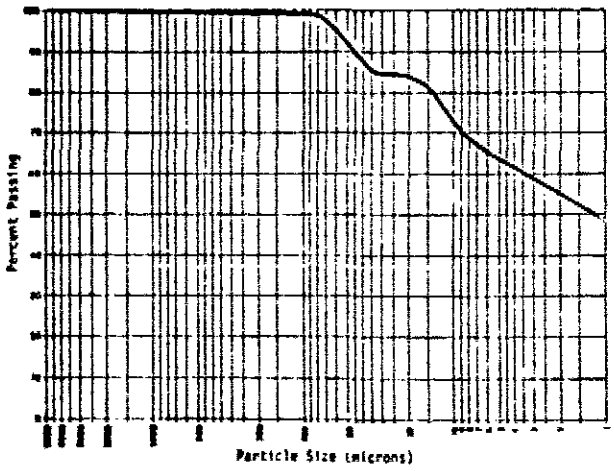
SAMPLE # MB-11	SPECIFIC GRAVITY 2.75
DATE 30 July 74	STANDARD CLASSIFICATION MH-CH
TIME 0940	FIELD DESCRIPTION OF SEDIMENT Soft brown
WATER DEPTH (Ft.) 40	silt

FIGURE 11-b



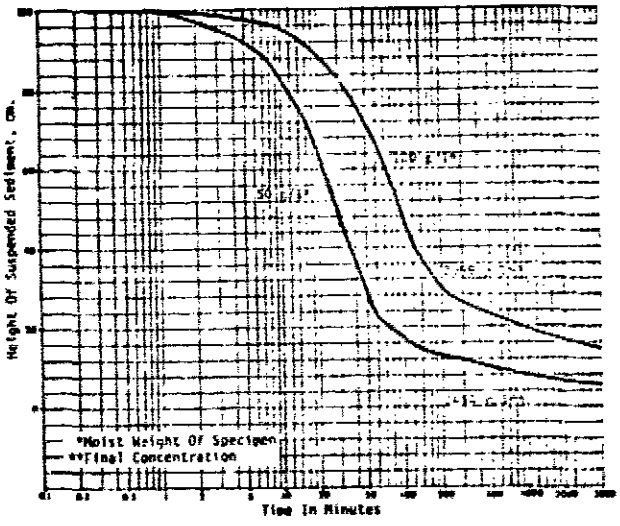
SEDIMENT SAMPLE # MB-11	
WATER SAMPLE # MB-11	

FIGURE 12-a



SAMPLE # MB-12	SPECIFIC GRAVITY 2.75
DATE 30 July 74	STANDARD CLASSIFICATION MH-CH
TIME 0945	FIELD DESCRIPTION OF SEDIMENT Soft brown
WATER DEPTH (Ft.) -1	silt

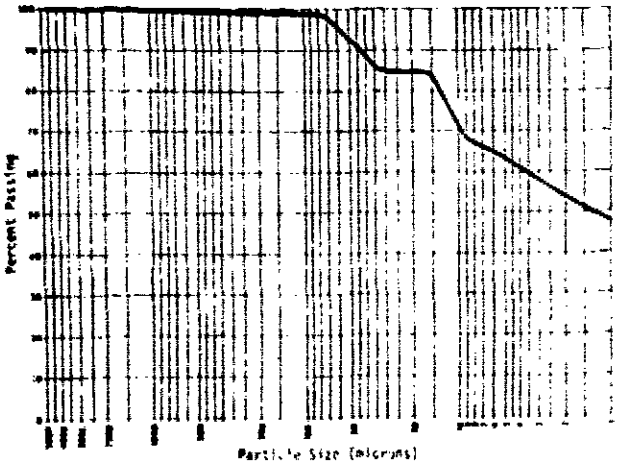
FIGURE 12-b



SEDIMENT SAMPLE # MB-12	
WATER SAMPLE # MB-12	

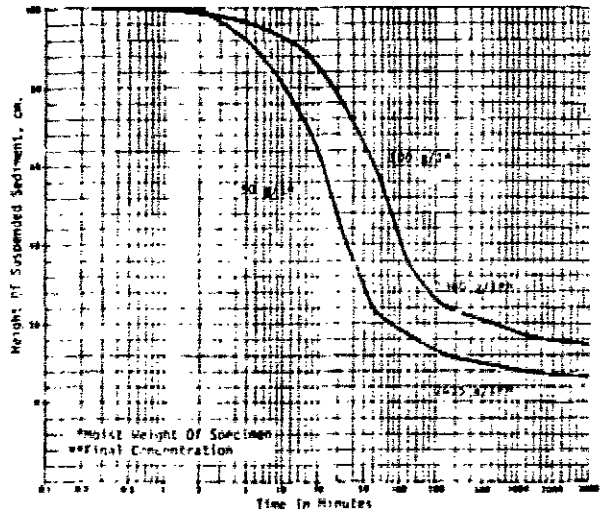
PHYSICAL ANALYSES OF SEDIMENT SAMPLES,
MOBILE HARBOR, ALABAMA

FIGURE 13-a



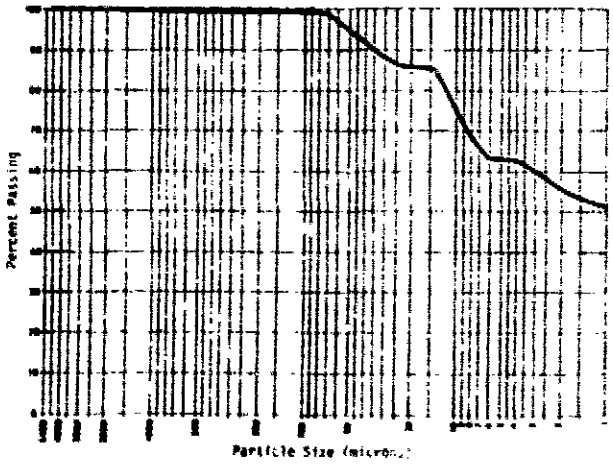
SAMPLE #	SPECIFIC GRAVITY 2.75
DATE	STANDARD CLASSIFICATION
TIME	FIELD DESCRIPTION OF SEDIMENT Soft brow
WATER DEPTH (ft.)	silt

FIGURE 13-b



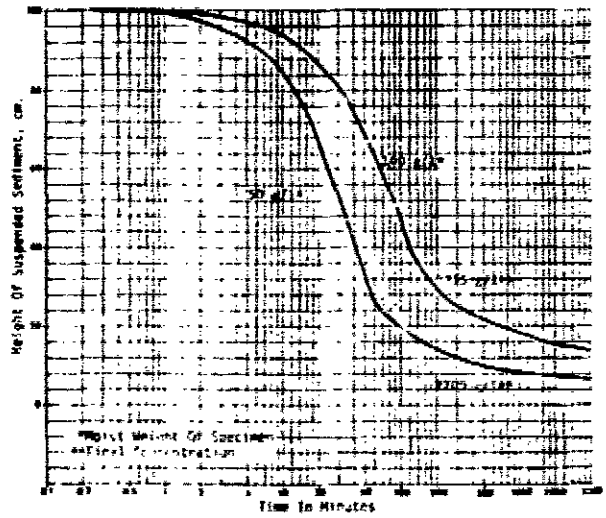
SEDIMENT SAMPLE #	MB-13
WATER SAMPLE #	MB-13

FIGURE 14-a



SAMPLE # MB-14	SPECIFIC GRAVITY 2.68
DATE 30 July 74	STANDARD CLASSIFICATION SM-SP
TIME 1025	FIELD DESCRIPTION OF SEDIMENT Soft brownish
WATER DEPTH (ft.) 43	gray silty sand

FIGURE 14-b



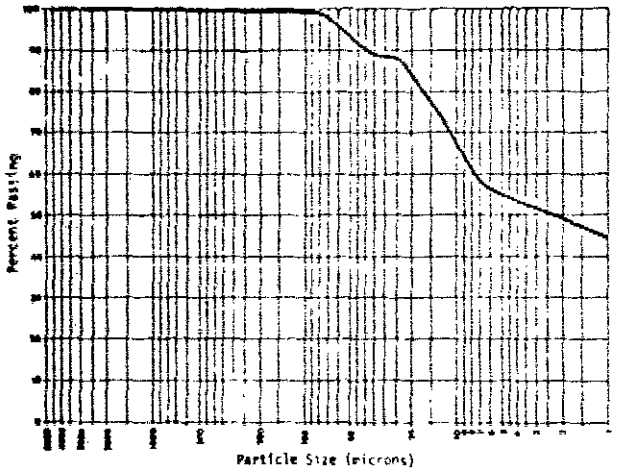
SEDIMENT SAMPLE #	MB-14
WATER SAMPLE #	MB-14

Appendix 5

B-1-16

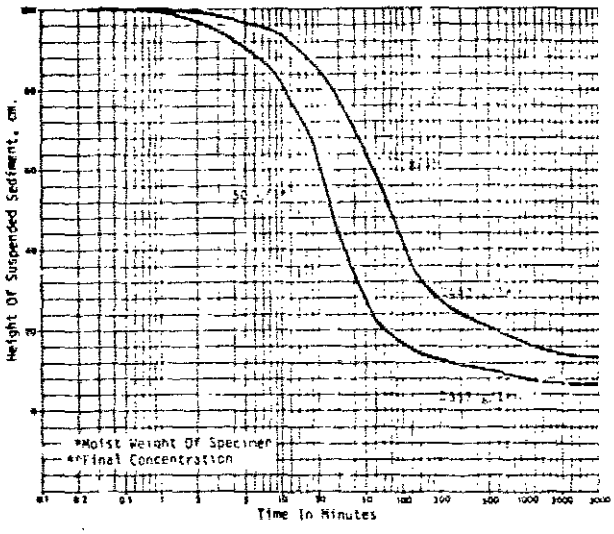
PHYSICAL ANALYSES OF SEDIMENT SAMPLES,
MOBILE HARBOR, ALABAMA

FIGURE 15-a



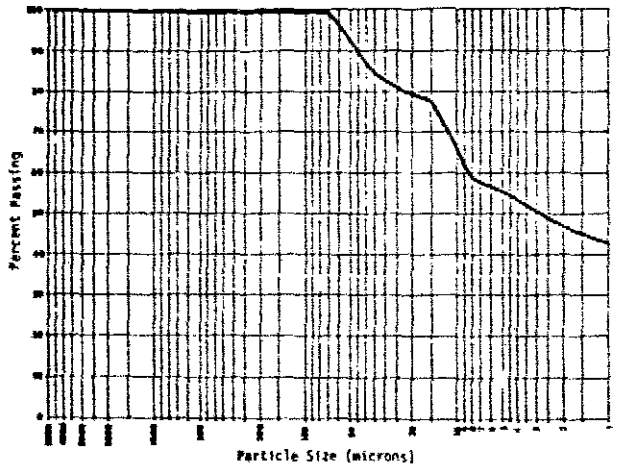
SAMPLE # MB-15	SPECIFIC GRAVITY 2.63
DATE 30 July 74	STANDARD CLASSIFICATION MH-CL
TIME 1140	FIELD DESCRIPTION OF SEDIMENT Brown silty
WATER DEPTH (Ft.) 42	with some grey soft clay

FIGURE 15-b



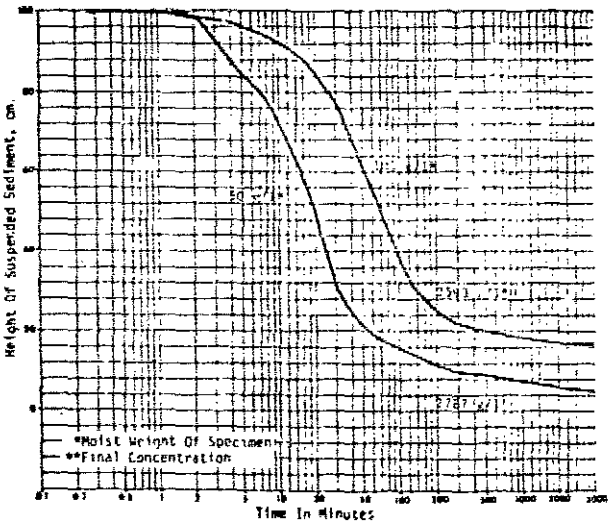
SEDIMENT SAMPLE # MB-15	
WATER SAMPLE # MB-15	

FIGURE 16-a



SAMPLE # MB-16	SPECIFIC GRAVITY 2.63
DATE 30 July 74	STANDARD CLASSIFICATION ML-CL
TIME 1203	FIELD DESCRIPTION OF SEDIMENT Soft brownish
WATER DEPTH (Ft.) 43	grey silty clay

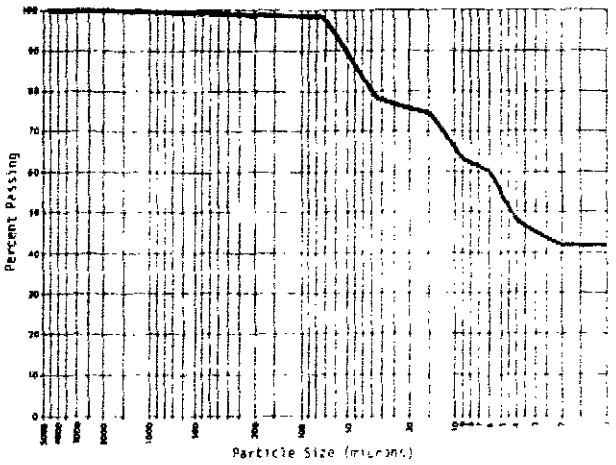
FIGURE 16-b



SEDIMENT SAMPLE # MB-16	
WATER SAMPLE # MB-16	

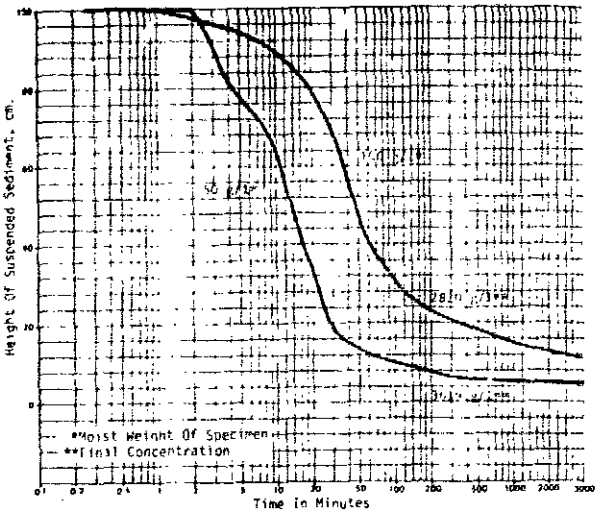
PHYSICAL ANALYSES OF SEDIMENT SAMPLES,
MOBILE HARBOR, ALABAMA

FIGURE 17-a



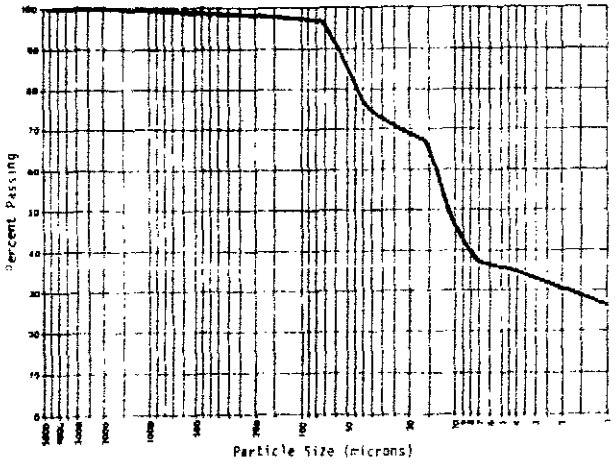
SAMPLE # MB-17	SPECIFIC GRAVITY 2.95
DATE 30 July 74	STANDARD CLASSIFICATION MH-CH
TIME 1224	FIELD DESCRIPTION OF SEDIMENT Soft brown
WATER DEPTH (Ft.) 47	grey ooze

FIGURE 17-b



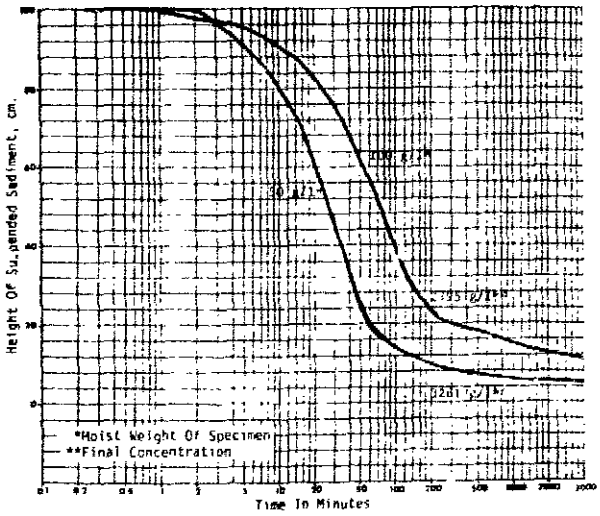
SEDIMENT SAMPLE # MB-17	
WATER SAMPLE # MB-17	

FIGURE 18-a



SAMPLE # MB-18	SPECIFIC GRAVITY 2.64
DATE 30 July 74	STANDARD CLASSIFICATION MH
TIME 1431	FIELD DESCRIPTION OF SEDIMENT Soft black
WATER DEPTH (ft.) 49	silty ooze

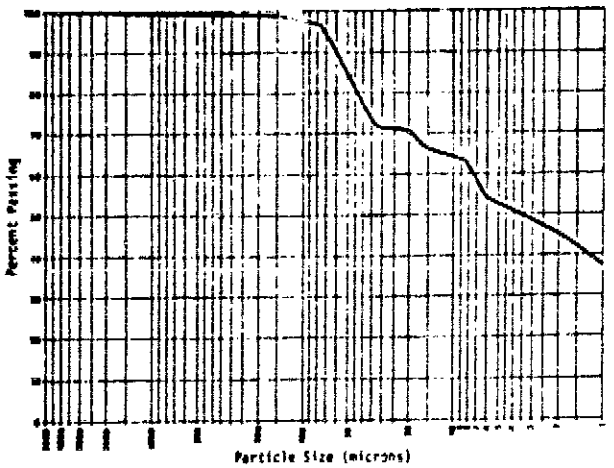
FIGURE 18-b



SEDIMENT SAMPLE # MB-18	
WATER SAMPLE # MB-18	

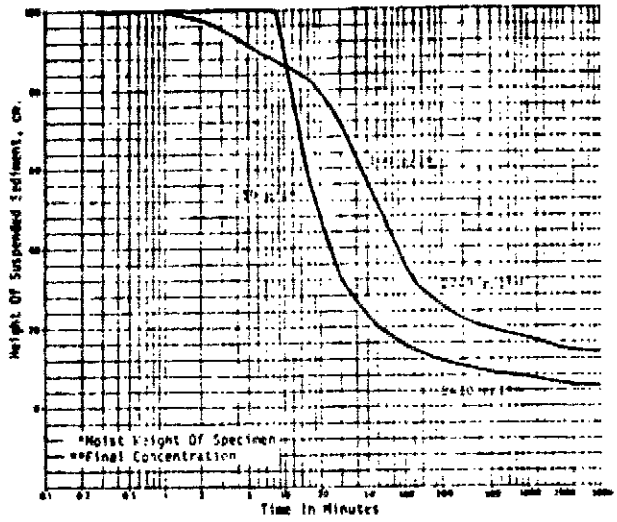
PHYSICAL ANALYSES OF SEDIMENT SAMPLES,
MOBILE HARBOR, ALABAMA

FIGURE 19-a



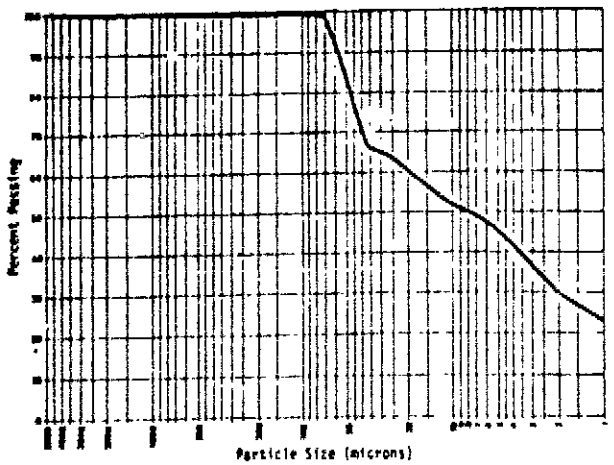
SAMPLE # MB-19	SPECIFIC GRAVITY 2.63
DATE 30 July 74	STANDARD CLASSIFICATION MH-CL
TIME 1300	FIELD DESCRIPTION OF SEDIMENT Soft brown
WATER DEPTH (FT.) 42	silty ooze

FIGURE 19-b



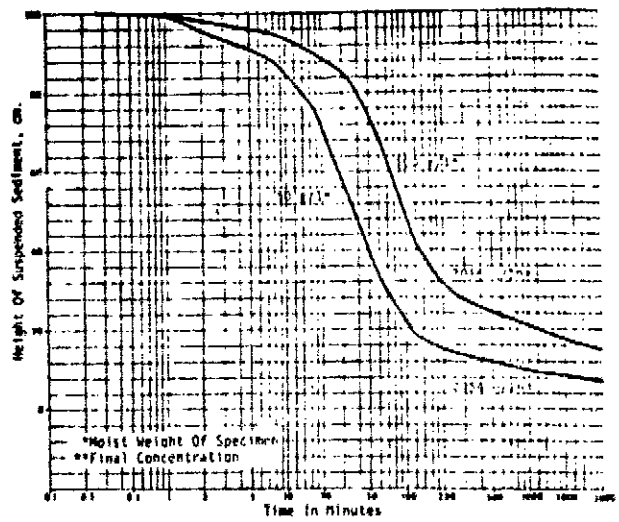
SEDIMENT SAMPLE # MB-19	
WATER SAMPLE # MB-19	

FIGURE 20-a



SAMPLE # MB-20	SPECIFIC GRAVITY 2.61
DATE 30 July 74	STANDARD CLASSIFICATION MH
TIME 1454	FIELD DESCRIPTION OF SEDIMENT Soft brown
WATER DEPTH (FT.) 41	ooze

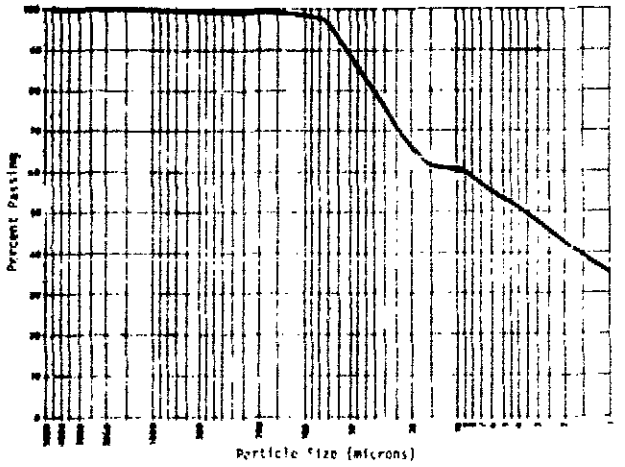
FIGURE 20-b



SEDIMENT SAMPLE # MB-20	
WATER SAMPLE # MB-20	

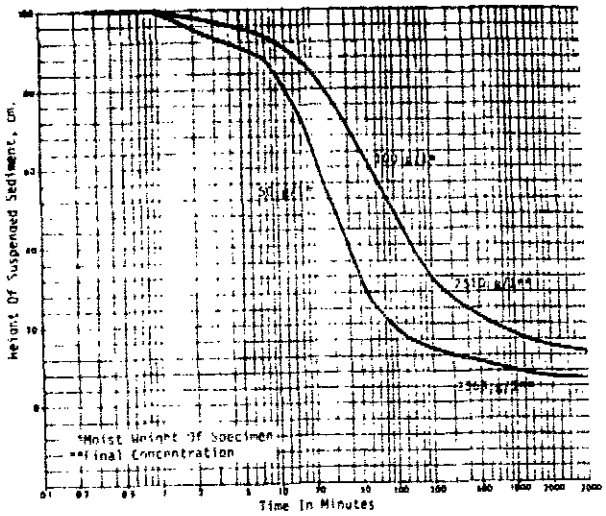
PHYSICAL ANALYSES OF SEDIMENT SAMPLES,
MOBILE HARBOR, ALABAMA

FIGURE 21-a



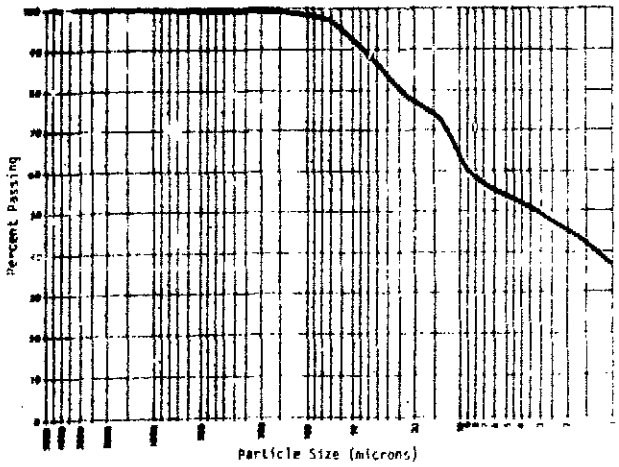
SAMPLE # MB-21	SPECIFIC GRAVITY 2.64
DATE 31 July 74	STANDARD CLASSIFICATION ML-CL
TIME 1100	FIELD DESCRIPTION OF SEDIMENT Brownish grey
WATER DEPTH (FT.) 44	silty mud

FIGURE 21-b



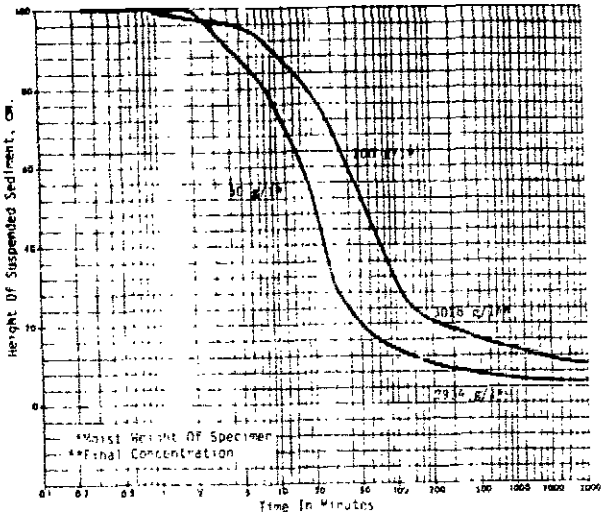
SEDIMENT SAMPLE # MB-21	
WATER SAMPLE # MB-21	

FIGURE 22-a



SAMPLE # MB-22	SPECIFIC GRAVITY 2.69
DATE 31 July 74	STANDARD CLASSIFICATION ML-CL
TIME 1125	FIELD DESCRIPTION OF SEDIMENT Soft brownish
WATER DEPTH (FT.) 42	grey silt

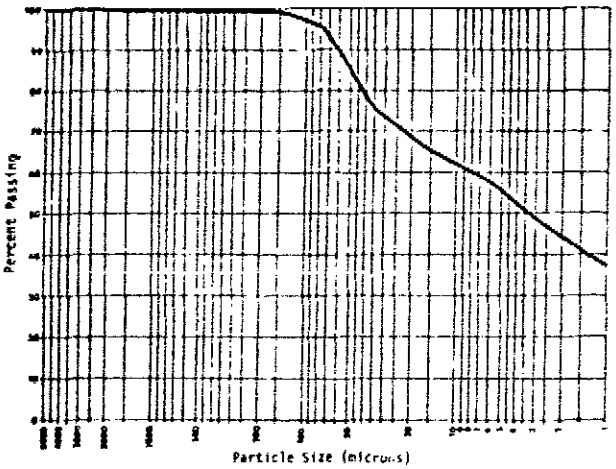
FIGURE 22-b



SEDIMENT SAMPLE # MB-22	
WATER SAMPLE # MB-22	

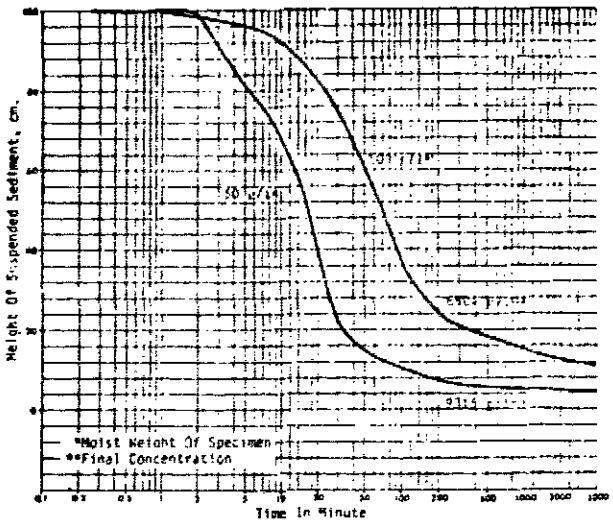
PHYSICAL ANALYSES OF SEDIMENT SAMPLES,
MOBILE HARBOR, ALABAMA

FIGURE 23-a



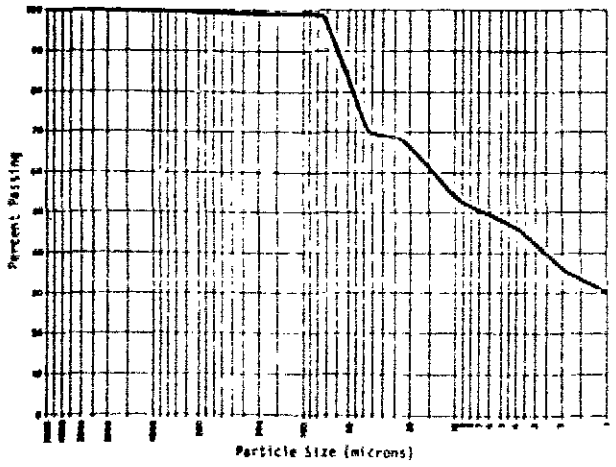
SAMPLE # MH-23	SPECIFIC GRAVITY 2.75
DATE 31 July '74	STANDARD CLASSIFICATION MH-CL
TIME 1150	FIELD DESCRIPTION OF SEDIMENT Soft brownish
WATER DEPTH (ft.) -9	grey silt

FIGURE 23-b



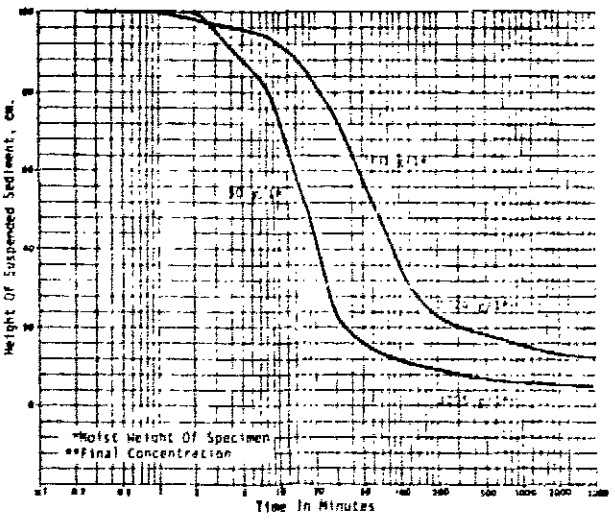
SEDIMENT SAMPLE # MH-23	
WATER SAMPLE # MH-23	

FIGURE 24-a



SAMPLE # MH-24	SPECIFIC GRAVITY 2.71
DATE 31 July 74	STANDARD CLASSIFICATION MH-CL
TIME 1201	FIELD DESCRIPTION OF SEDIMENT Soft brownish
WATER DEPTH (ft.) -41	grey silt

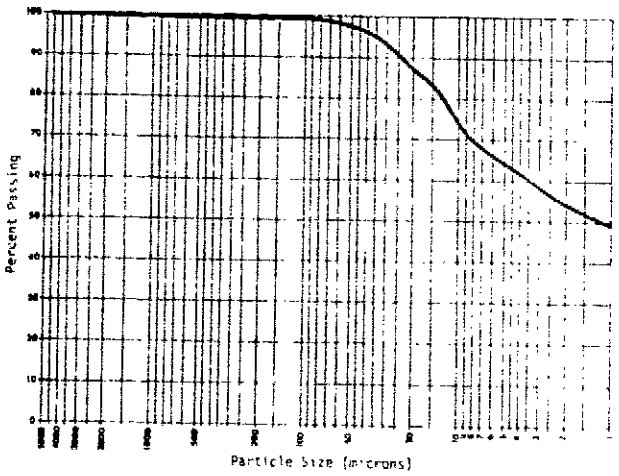
FIGURE 24-b



SEDIMENT SAMPLE # MH-24	
WATER SAMPLE # MH-24	

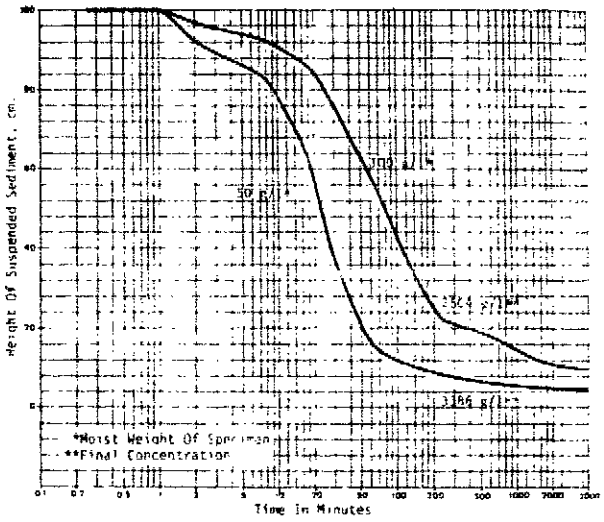
PHYSICAL ANALYSES OF SEDIMENT SAMPLES,
MOBILE HARBOR, ALABAMA

FIGURE 25-a



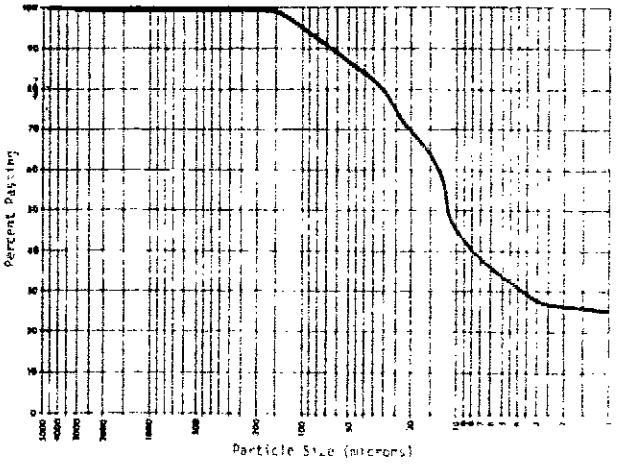
SAMPLE # MB-25	SPECIFIC GRAVITY 2.68
DATE 31 July 74	STANDARD CLASSIFICATION MH-CL
TIME 1242	FIELD DESCRIPTION OF SEDIMENT Soft dark
WATER DEPTH (ft.) 46	brown silty ooze

FIGURE 25-b



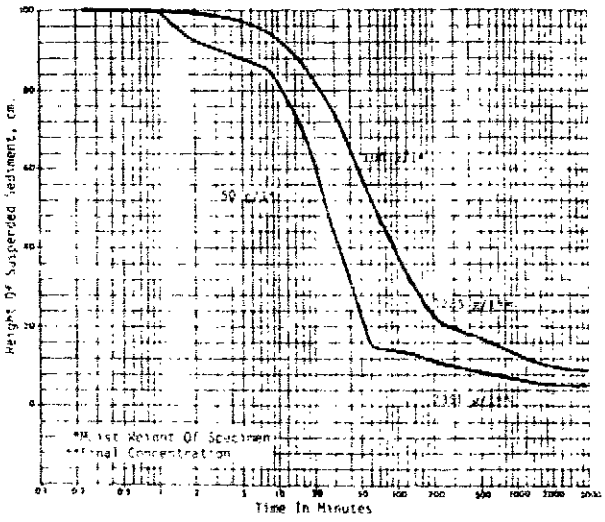
SEDIMENT SAMPLE # MB-25	
WATER SAMPLE # MB-25	

FIGURE 26-a



SAMPLE # MB-26	SPECIFIC GRAVITY 2.70
DATE 31 July 74	STANDARD CLASSIFICATION MH
TIME 1303	FIELD DESCRIPTION OF SEDIMENT Dark brown
WATER DEPTH (ft.) 48	silty crust with black ooze below

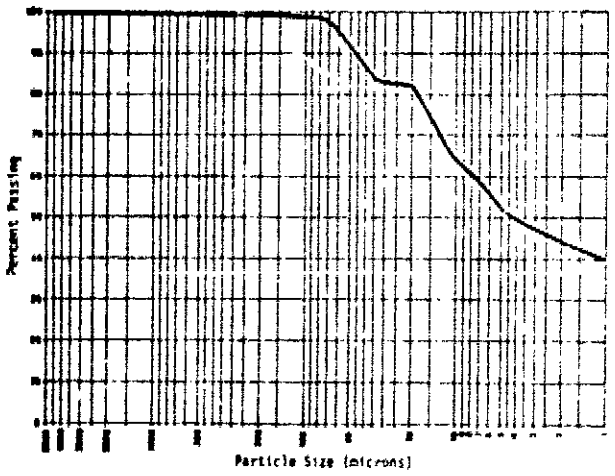
FIGURE 26-b



SEDIMENT SAMPLE # MB-26	
WATER SAMPLE # MB-26	

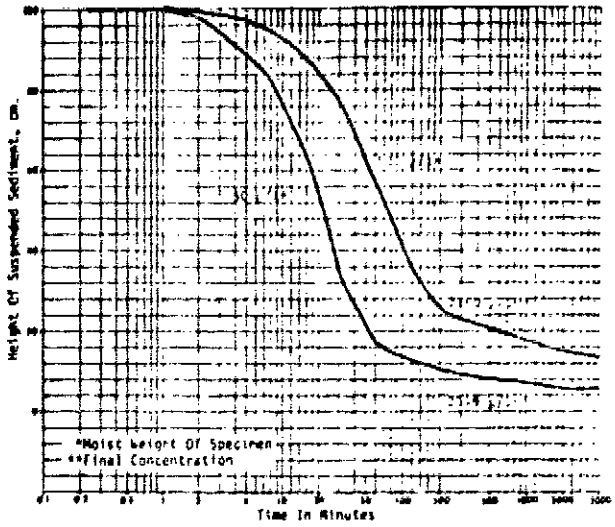
PHYSICAL ANALYSES OF SEDIMENT SAMPLES,
MOBILE HARBOR, ALABAMA

FIGURE 27-a



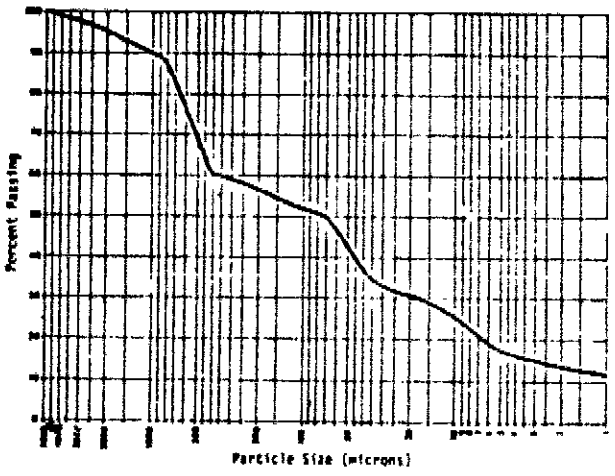
SAMPLE # MH-27	SPECIFIC GRAVITY 2.58
DATE 21 July 76	STANDARD CLASSIFICATION MH-CH
TIME 1310	FIELD DESCRIPTION OF SEDIMENT Thin green silty crust with medium textured dark grey clay beneath
WATER DEPTH (Ft.) 42	

FIGURE 27-b



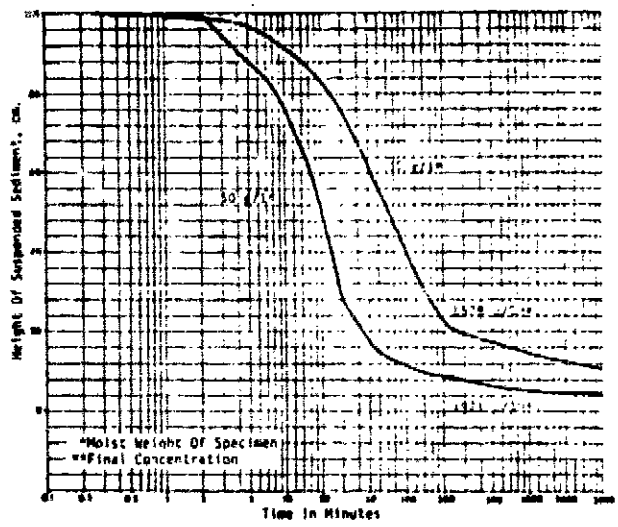
SEDIMENT SAMPLE # MH-27	
WATER SAMPLE # MH-27	

FIGURE 28-a



SAMPLE # MH-28	SPECIFIC GRAVITY 2.64
DATE 31 July 76	STANDARD CLASSIFICATION SM
TIME 1321	FIELD DESCRIPTION OF SEDIMENT Black silt
WATER DEPTH (Ft.) 45	with some sand

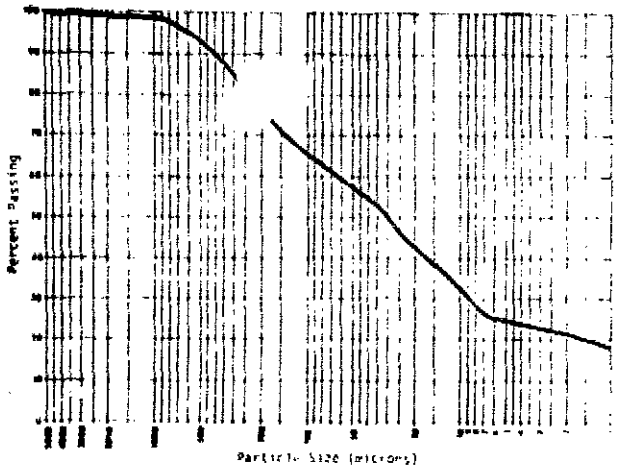
FIGURE 28-b



SEDIMENT SAMPLE # MH-28	
WATER SAMPLE # MH-28	

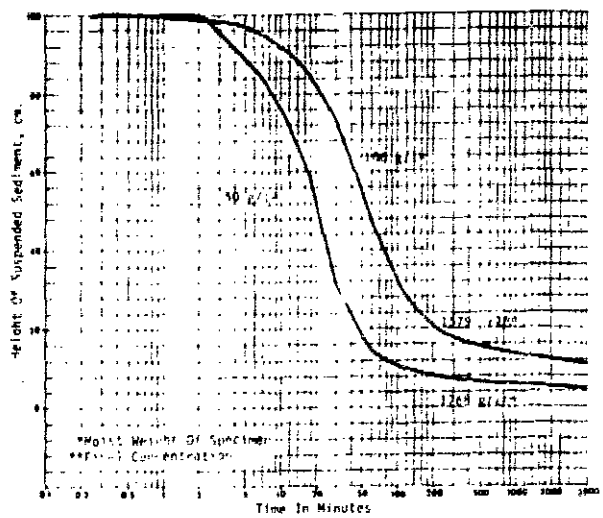
PHYSICAL ANALYSIS OF SEDIMENT SAMPLES,
MOBILE HARBOR, ALABAMA

FIGURE 29-a



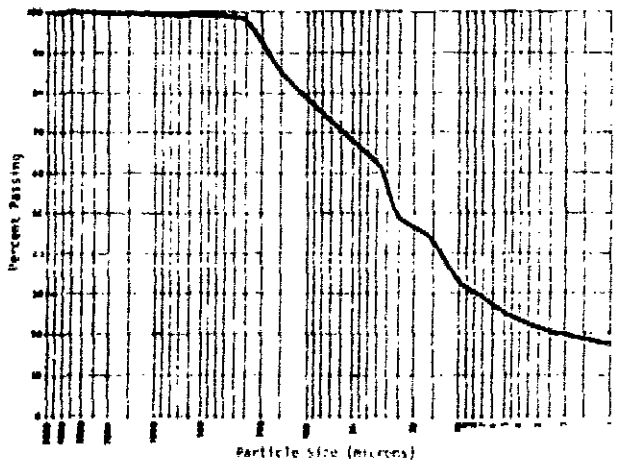
SAMPLE # MB-29	SPECIFIC GRAVITY 2.71
DATE 31 July 76	STANDARD CLASSIFICATION SP
TIME 1400	FIELD DESCRIPTION OF SEDIMENT Soft silty
WATER DEPTH (ft) 42	black silty very fine sand

FIGURE 29-b



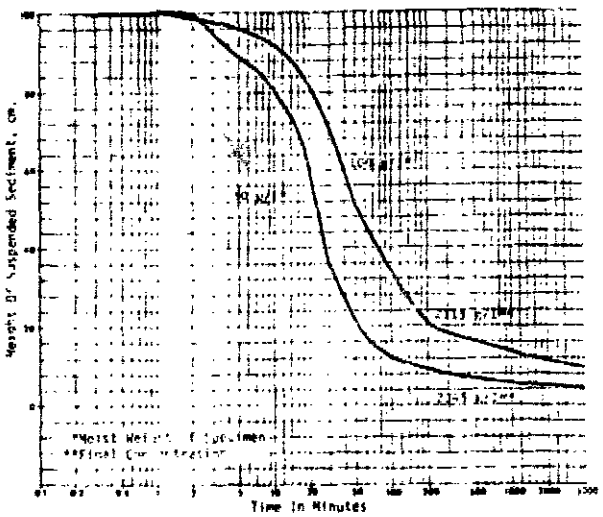
SEDIMENT SAMPLE # MB-29	
WATER SAMPLE # MB-29	

FIGURE 30-a



SAMPLE # MB-30	SPECIFIC GRAVITY 2.61
DATE 31 July 76	STANDARD CLASSIFICATION SM-SC
TIME 1430	FIELD DESCRIPTION OF SEDIMENT Soft black
WATER DEPTH (ft) 42	silty ooze

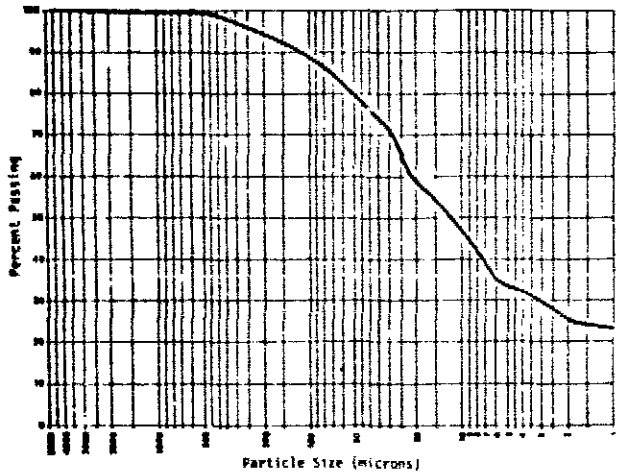
FIGURE 30-b



SEDIMENT SAMPLE MB-30	
WATER SAMPLE # MB-30	

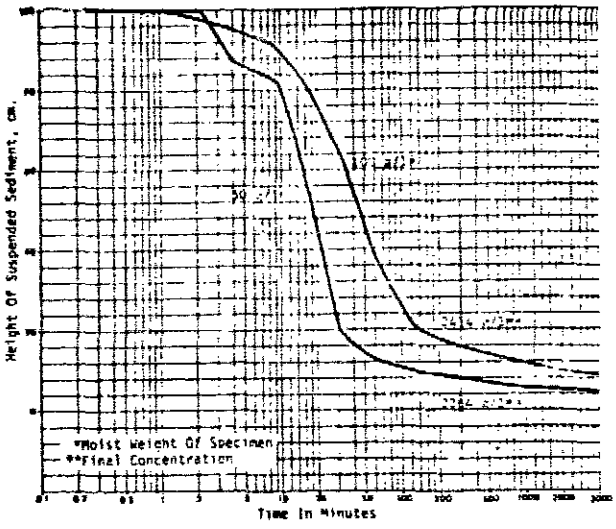
PHYSICAL ANALYSES OF SEDIMENT SAMPLES,
MOBILE HARBOR, ALABAMA

FIGURE 31-a



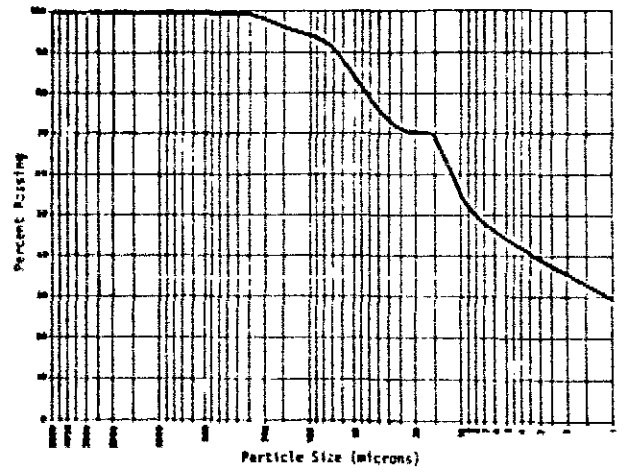
SAMPLE # MR-31	SPECIFIC GRAVITY 2.50
DATE 31 July 74	STANDARD CLASSIFICATION CL-ML
TIME 1335	FIELD DESCRIPTION OF SEDIMENT Soft black ooze with clumps of brown mud
WATER DEPTH (ft.) 38	

FIGURE 31-b



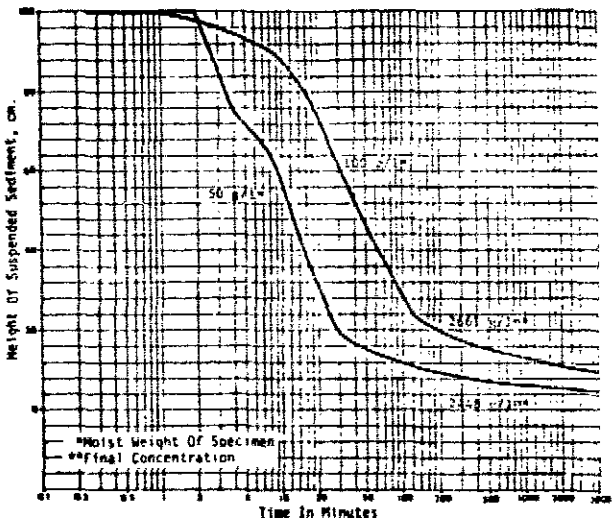
SEDIMENT SAMPLE # MR-31	
WATER SAMPLE # MR-31	

FIGURE 32-a



SAMPLE # MR-32	SPECIFIC GRAVITY 2.55
DATE 31 July 74	STANDARD CLASSIFICATION ML-CL
TIME 1404	FIELD DESCRIPTION OF SEDIMENT Soft oily brownish black silt above with dark clay below
WATER DEPTH (Ft.) 30	

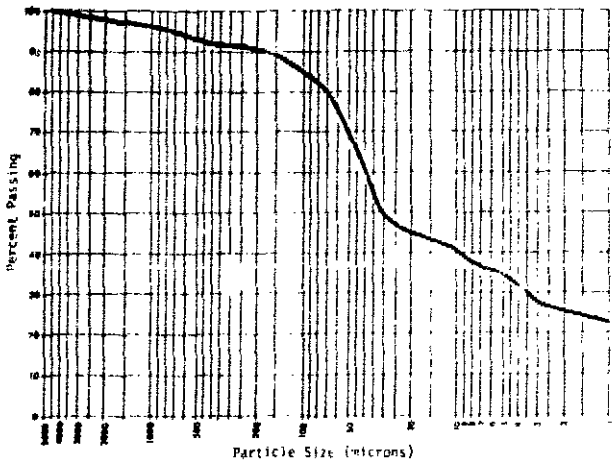
FIGURE 32-b



SEDIMENT SAMPLE # MR-32	
WATER SAMPLE # MR-32	

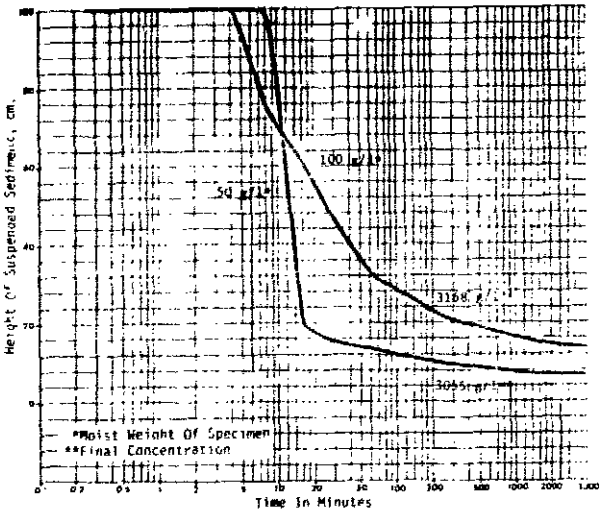
PHYSICAL ANALYSES OF SEDIMENT SAMPLES,
MOBILE HARBOR, ALABAMA

FIGURE 33-a



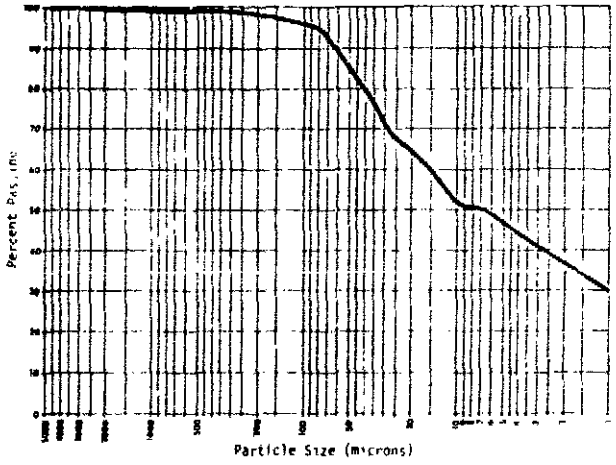
SAMPLE # MB1-33	SPECIFIC GRAVITY 2.58
DATE 31 July 74	STANDARD CLASSIFICATION MH-OH
TIME 1452	FIELD DESCRIPTION OF SEDIMENT Black oily silt above and brown ooze below
WATER DEPTH (Ft.) 4	

FIGURE 33-b



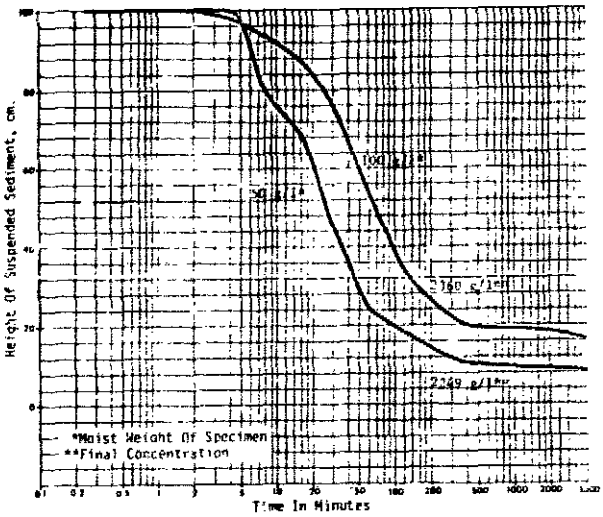
SEDIMENT SAMPLE # MB1-33	
WATER SAMPLE # MB1-33	

FIGURE 34-a



SAMPLE # MB1-34	SPECIFIC GRAVITY 2.69
DATE 31 July 74	STANDARD CLASSIFICATION MH-OH
TIME 1506	FIELD DESCRIPTION OF SEDIMENT Soft black oily silty ooze on surface with brown ooze beneath
WATER DEPTH (Ft.) 36	

FIGURE 34-b



SEDIMENT SAMPLE # MB1-34	
WATER SAMPLE # MB1-34	