

ENVIRONMENTAL APPENDIX C

ATTACHMENT C-2

DRAFT 404(b)(1) EVALUATION REPORT

Draft Section 404(b)(1) Evaluation Report for the Mobile Harbor General Reevaluation Report

Mobile County, Alabama

DESCRIPTION OF THE AUTHORIZED AND EXISTING FEDERAL PROJECT

The authorized dimensions of all segments of the Mobile Harbor Project have not been constructed. A summary of both the authorized and the existing maintained dimensions are listed in **Table 1**. The maintained dimensions of the bay channel are 45' by 400' and the outer bar channel is 47' by 600'. Each of these areas is maintained to a depth that is 10 feet less than the authorized depth. Several additional features of the authorized project have not been constructed at this time. The anchorage areas that would be located south of the mouth of the Mobile River have not been constructed, and the bay channel and the bar channel, have not been widened. The new Mobile Harbor Turning Basin (MHTB) opposite McDuffie Island, between Pinto Island and Little Sand Island was constructed in 2010.

Table 1. Authorized and Existing Dimensions for Mobile Harbor

Channel	Authorized Dimensions	Existing Dimensions
<i>Outer Bar Channel (a.)</i>	57' x 700'	47' x 600'
<i>Bay Channel (b.)</i>	55' x 550'	45' x 400'
<i>Anchorage Area (c.)</i>	55' x 750' x 4,000'	<i>Not Constructed</i>
<i>Turning Basin (d.)</i>	55' x 1,500' x 1,500'	45' x 755' x 1,320'
<i>River Channel (e.)</i>	40' x 500'-700'	<i>As Authorized</i>
<i>Turning Basin (f.)</i>	40' x 800' – 1,000' x 2,500'	<i>As Authorized</i>
<i>Turning Basin (g.)</i>	40' x 1,000' x 1,600'	<i>As Authorized</i>

Approval for advanced maintenance for the Federal Mobile Harbor navigation project was received from South Atlantic Division in the mid-1990s as per the Navigation Regulations ER1130-2-530, 29 November 1996. As such, the navigation channels have associated advanced maintenance to accomplish dredging in an efficient, cost-effective, and environmentally responsible manner. In addition to the federally-authorized channel dimensions providing for navigation, two (2) sediment basins in the Mobile River and three (3) sediment basins in the bay channel, have been previously authorized and approved. These sediment basins are to provide improved channel maintenance efficiency. Each of these basins are several thousand feet long and have depths ranging from four (4) to ten (10) feet lower than the existing navigation channel bottom. The basins decrease frequency of dredging to provide a more cost effective and reliable channel. In addition to sediment basins, an advanced widening feature is authorized for the bar channel.

II. DESCRIPTION OF THE PROPOSED ACTION:

Mobile Harbor, Alabama, is located in the southwestern part of the state, at the junction of the Mobile River with the head of Mobile Bay. The port is approximately 28 nautical miles north of the Bay entrance from the Gulf of Mexico and approximately 170 nautical miles east of New Orleans, Louisiana. The navigation channel dredging in Mobile Bay and Mobile River began in 1826 with enactment of the River and Harbors Act of 1826. Over subsequent years, the federal project at Mobile River and Mobile Bay was expanded to include adjoining channels within the bay. Section 104 of the River and Harbors Act of 1954 (House Document 74, 83rd Congress, First Session, as amended, and previous acts) authorized a 40-foot channel. Improvements to the existing federal project were authorized in the Water Resources Development Act (WRDA) of 1986 (PL 99 – 662, Ninety-ninth Congress, Second Session), which was approved November 17, 1986, and amended by Section 302 of the WRDA of 1996.

Multiple 404(b)(1) evaluations have been completed for varying aspects of the overall Mobile Harbor Federal Navigation Project. In 2012, a 404(b)(1) evaluation, dated April 18, 2012, was completed for routine operation and maintenance (O&M) dredging and placement activities. An updated 40(b)(1) evaluation was completed on July 25, 2014, for the inclusion of in-bay open water placement of O&M dredged material from the Mobile Harbor Federal Navigation Project.

The Mobile Harbor Project is divided into three (3) general areas: the river channel section, the bay channel section, and the bar channel section. Dredging activities include placement of dredged material originating from the project into previously-approved disposal areas. The description of the proposed action is presented below, and the project features are illustrated in **Figure 4.1** of the Main Report.

The currently proposed Tentatively Selected Plan (TSP) consists of dredging and placement activities for approximately 27,000,000 cubic yards (cys) of new work material associated with the GRR improvements of Mobile Harbor, and subsequent future O&M dredging and placement activities. The TSP consists of: deepening the existing Mobile Harbor Bay and Bar channels an additional 5 feet (existing 45-foot deep channel in the bay to 50 feet and existing 47-foot deep channel in the bar to 52 feet); adding an additional 100 feet of widening for a distance of approximately three (3) miles beginning at the upper end of the bend area at the 50-foot depth contour; including bend easing with the deepening at the upper end of the bar channel; and, modification to the Choctaw Pass turning basin to ensure safe operation at the 50-foot depth contour. For preparation of the Draft GRR and Draft Supplemental Environmental Impact Statement, the District conducted extensive modeling of a "maximum potential impacts" scenario with potential environmental effects equal to or greater than the TSP (i.e. dredging to a depth of 50 feet with widening of a five-mile channel section by 100 feet). It should be noted that the actual TSP represents conditions less than the modeled channel dimensions. The proposed dredging operations and placement activities are required to continually provide for safe navigation and maintain the Mobile Bay channels to the federally authorized

dimensions. The action is a result of normal rates of shoaling and a need existing to maintain full commercial shipping capacity for the Port of Mobile.

a. General Description of the Dredged or Fill Material. A geotechnical investigation was conducted to determine the physical characteristics of the material contained in the proposed project area. A summary of the findings are discussed below. The sediment proposed for excavation was also sampled and tested for possible contaminants. A summary of this investigation is also summarized below.

(1) Geotechnical Investigation: In general, maintenance sediments from both Mobile River and Mobile Bay were found to be predominantly silt + clay, ranging from 46.9% to 97.7% silt + clay. The grain size of sediments from the Mobile Bar Channel were variable with two locations composed of more than 90% sand and two locations composed of roughly 50% sand and 50% silt+clay. New work material grain sizes, associated with the Mobile Harbor GRR improvements, varied based on the area of study. New work material in the turning basin was sandier, with as much as 90% percent being classified as sand. From the upper limits of the project down to around Gaillard Island, the new work material is predominantly sand (approximately 70%). Clays and silts are more present in the southern part of this stretch. From Gaillard Island to about 1 mile north of the Gulf Intracoastal Waterway, borings indicate that this material is 100% clay, however, pockets of sand may be present. Cores taken for the sediment analysis of proposed widening new work material were comprised of fractions of sand, silts, and clays. The upper portions of the widener (DU's 1 through 3) were mainly comprised of 10-50% sand, 65% silt, and 70% clay. DU's 4 and 5 were comprised of approximately 50% sand, 30% silts, and 30% clays. The new work soils in the bar channel (DU's 6 and 7) are comprised of approximately 50% clays and 50% silts.

(2) Sediment Contaminant Analyses: Sampling results of recent studies (MHTB 2008, O&M 2010, and Limited Reevaluation Report (LRR) 2014) form a baseline for comparison to future new work sediment analyses during the PED phase of the Mobile Harbor GRR. Sediment samples were analyzed for physical characteristics (grain size determination, specific gravity, and percent solids), bulk sediment analysis, standard and modified elutriate testing, water column bioassays, whole sediment bioassays, and bioaccumulation studies of sediment samples to determine material suitability for placement in the Mobile ODMDS under Section 103 of the Marine Protection, Research, and Sanctuaries Act (MPRSA) of 1972 (full Tier III analyses). Sampled areas included the proposed dredge sites, a reference site for comparison, and also at the Mobile ODMDS. For greater detail and descriptions of the proceeding discussion, refer to the Mobile Harbor GRR Environmental Appendix C attached to the Mobile Harbor GRR Integrated SEIS, which includes references to the sediment evaluation reports for Mobile Harbor testing events.

In the MHTB, sediment chemical analyses indicated that within the upper portion (0-10 feet below the surface) of sampled material, four metals, four polycyclic aromatic hydrocarbons (PAHs), total polychlorinated biphenyls (PCBs) concentrations, and four chlorinated pesticides were detected between the threshold effects level (TEL) and probable effects level (PEL) values, but did not exceed critical thresholds. Each of the

detected analytes were present in at least one of the sediments from MHTB. One insecticide slightly exceeded the PEL at only one location in the MHTB. Similarly, sediments from the MHTB lower portion (10-52 feet below the surface) of sampled material, four metals (arsenic, copper, mercury, and nickel), five PAHs, total PCB concentrations, and four chlorinated pesticides were detected between the threshold effects level (TEL) and probable effects level (PEL) values, but did not exceed critical thresholds. Each of the detected analytes were present in at least one of the sediments from MHTB. Two insecticides exceeded the PEL value at multiple sampling locations and one composited sample location.

Mobile Harbor O&M material was sampled in 2010, and included analyses for concentrations of metals, chlorinated pesticides, Semi-volatile Organic Compounds (SVOC)s, PAHs, PCB congeners, ammonia, cyanide, total sulfide, Total Kjeldahl Nitrogen (TKN), total phosphorus, nitrate, nitrite, AVS/SEM (sediment only), and total organic carbon (TOC) were identified in sediment, site water, standard and effluent elutriate samples. Concentrations of analytes detected in the sediments from Mobile Harbor were generally higher than concentrations of analytes detected at the reference site. None of the 101 chemical constituents detected in the Mobile Harbor sediments exceeded EPA PEL values. Three metals had concentrations exceeding EPA TEL values by factors ranging from 1.0 to 1.8. PAH levels in Mobile River and Bay sediments were below the TEL value of 1,684 µg/kg. Total PCB concentrations were detected at one sampling location in the upper Bay channel between the TEL and PEL values. One pesticide and gamma-BHC (lindane) were detected in Mobile River and Mobile Bay sediment samples at concentrations that exceeded the TEL value by factors ranging from 1.0 to 2.0. Dioxin and furan congeners were detected at low concentrations, and dioxin toxicity quotients (TEQs) ranged from 5.81 to 19.1 ng/kg.

On April 20, 2010 *The Deepwater Horizon* exploded in the Gulf of Mexico while drilling on the Macondo oil well approximately 41 miles southeast of Louisiana. Oil spilled into the Gulf of Mexico until it was capped on July 15, 2010. A sampling effort was conducted on behalf of USACE, Mobile District in late-November and early-December 2010 to determine if surface sediment quality in the Mobile Harbor Federal Navigation Channels had been impacted by the oil spill. Based on results of PAH and total petroleum hydrocarbon (TPH) testing of surface sediments collected in the Mobile Lower Ship Channel, Mobile Bar Channel, U.S. Environmental Protection Agency (EPA)-designated reference site, and the Mobile ODMDS, there were no discernable changes observed in the sediment quality that could be attributed to the *Deepwater Horizon* Oil Spill.

Mobile Harbor LRR material (proposed widening an approximately 7-mile stretch of channel) was sampled in 2014 and sediments from the Lower Bay Channel. A total of 21 discrete sample locations were then composited in to seven analytical samples for analysis. Two metals were detected between TEL and PEL values, with no metals exceeding PEL values. The majority of organic constituents (PAHs, PCB congeners, chlorinated pesticides, and SVOCs) were detected at concentrations estimated below the laboratory reporting limit in the Lower Bay Channel sediments. However, two chlorinated

pesticides were detected above the reporting limit in one Lower Bay Channel composite sample.

c. General Description of the Discharge Sites.

(1) Location. Mobile Harbor, Mobile, Alabama. Maps illustrating the location of the existing channels and disposal areas are presented in the Mobile Harbor GRR Environmental Appendix C attached to the Mobile Harbor GRR Integrated SEIS.

(2) Type of Habitat. Previously-approved upland disposal areas (i.e., North Blakeley, ALCOA Mud Lakes, South Blakeley and North Pinto) located in the upper harbor area and the Gaillard Island disposal area are existing upland and confined disposal sites that are approved to accept materials that contain sand and fine-grained sediments. The Mobile ODMDS is a previously designated ocean disposal site and is approved to accept material from this project. The approved open water placement will impact approximately 3,750 acres of bay bottoms predominantly composed of mud flats. These areas were historically utilized, prior to 1990, for the maintenance of the bay channel and provide sufficient time for benthic recovery. The material will be moved in a strategic fashion so that the areas used are in the more expansive portions of the bay. The SIBUA is part of the ebb tidal shoal associated with the mouth of Mobile Bay. This sediment is characterized as predominantly fine to medium quartz sand. This zone is a very dynamic environment that changes drastically as a function of currents and wave conditions. The direction of the littoral transport in this location is from east to west. Due to the dynamic nature of this environment, the benthic community generally consists of opportunistic invertebrates. The constantly shifting sediments do not allow aquatic vegetation to become rooted or attached to the unconsolidated sandy substrate.

(3) Timing and Duration of Discharge. Discharge could occur at any time in the year at any disposal location. This proposed action is merely a recertification of an authorized action.

d. Disposal Method. Placement of materials in the approved upland disposal sites (North Blakeley, ALCOA Mud Lakes, South Blakeley and North Pinto) will be accomplished by hydraulic dredge with a pipeline or hopper. Also, placement of materials in the Gaillard Island site will be accomplished by hydraulic pipeline. It is expected that some support equipment such as bull dozers, marsh buggies, etc. may be necessary to redistribute the sediment within these sites. Sediment placed in the SIBUA and Mobile ODMDS will likely be accomplished using a hopper dredge or scow. Emergency pipeline dredging operations will extend from the northern limit of the bay channel south to the mouth of Mobile Bay.

III. FACTUAL DETERMINATIONS.

a. Physical Substrate Determinations.

(1) Substrate elevation and slope. Substrates placed in approved upland placement sites, open water in-bay placement, as well as the ODMDS, will be confined

within those placement areas. The elevation of the approved upland placement sites ranges from 21 feet to 46 feet. The intent of the SIBUA is to keep sandy materials in the littoral system. The materials placed will be redistributed by local currents and waves to a more natural configuration consistent with the ebb tidal shoal.

Previous studies of open water placement in Mobile Bay by Nichols (1978), show that disposal initially raised the bed approximately 30 cm and increased the average bed slope from 1:3000 to 1:2000. After placement, mud consolidates, bulk density increases and slopes decrease. Between disposal operations, the placement area bathymetry returns to broad swells and troughs with maximum relief of two (2) feet representing topography modified by waves and tidal currents. Very little long-term mounding has resulted from the disposal of maintenance material in the bay. Significant mounding has occurred in the Upper Mobile Bay as a result of disposal of new work material from channel deepening in the 1960's. Continued disposal of maintenance material in the upper bay has not added to that mounding.

(2) Sediment type. Approximately 5.9 million cys of current maintenance dredged material would be removed from the river, bay and bar channel(s) on an annual basis. New work material grain sizes, associated with the Mobile Harbor GRR improvements, varied based on the area of study. New work material in the turning basin was sandier, with as much as 90% percent being classified as sand. From the upper limits of the project down to around Gaillard Island, the new work material is predominantly sand (approximately 70%). Clays and silts are more present in the southern part of this stretch. From Gaillard Island to approximately 1 mile north of the Gulf Intracoastal Waterway, borings indicate that this material is 100% clay, however, pockets of sand may be present. Cores taken for the sediment analysis of proposed widening new work material were comprised of fractions of sand, silts, and clays. Portions of the widener area were mainly comprised of 10-50% sand, 30-65% silt, and 30-70% clay. New work sediments in the bar channel are comprised of approximately 50% clays and 50% silts.

(3) Dredged/fill material movement. Dredge material placed in the approved upland disposal area sites will be confined. The intent of the SIBUA is to keep sandy material in the natural littoral transport system. The materials placed will be redistributed by local currents and waves to a more natural configuration consistent with the ebb tidal shoal. Salinity associated with the Mobile ODMDS is high enough to promote rapid settling of finer particles. Current velocities range from approximately 8 inches per second (in/s) to 16 in/s at the Mobile ODMDS. The directions of the currents measured during tide conditions moved towards the east while flood tide conditions moved to the north-northwest.

(4) Physical effects on benthos. Within the open-water disposal sites, SIBUA and the ODMDS some benthic organisms would be destroyed by the proposed action; however, due to the constant movement of material by currents, benthic organism diversity and abundance would appear to be low. Research conducted by the USACE, ERDC under the Dredged Material Research Program (DMRP) (Berkowitz *et al.*, 2018

(included in reference list for the Mobile Harbor GRR)) suggests that the benthic community is adapted to a wide range of naturally occurring environmental changes and that no significant or long-term changes in community structure or function are expected.

Bottom organisms include polychaete worms, crabs, shrimp, mollusks, and enchinoderms. Non-motile species are directly covered by the dredged material, engulfed by mud flow or covered by heavy siltation within 1,200 feet of the dredge discharge. Responses of benthic infauna to large scale disturbance by dredge material placement were studied in areas around Corpus Christi, Texas. The study looked at biological responses to dredged material disturbance that were linked to both pre-disturbance conditions and differences between disturbed and neighboring undisturbed areas. Results for this study area indicated that benthic communities are poised to respond relatively quickly to disturbances given their historical exposure to impacts and resultant colonization by opportunistic species. The impacts of the dredged material placement were evident for less than a year. The response of benthic communities to disposal of dredged material was assessed at three (3) sites in Mississippi Sound in 2006. The findings indicated that adults re-colonized the newly deposited sediments either through vertical migration or later immigration from adjacent areas within a period of three (3) to 10 months. A related study conducted in Mississippi Sound associated with the Gulfport Federal navigation project indicated benthic recovery rates to predisposal conditions occurred within 12 months.

A major factor influencing benthic recovery rates is the prior disturbance history of a particular area. Studies indicate that benthic recovery occurs more rapidly in relatively shallow areas, such as Mobile Bay, where the resident benthic communities are already adapted to dynamic conditions and shifting sediments. Being that Mobile Bay is a depositional shallow water body with dynamic sediment processes, it would be expected that benthic recovery would be consistent with that shown by previous studies.

(5) Other effects. Effects of harbor deepening (such as those proposed for the Mobile GRR) on benthic macrofauna due to salinity intrusion are predicted to be negligible, with minimal effects on higher trophic levels, such as fish, because prey availability and distributions are unlikely to be affected (Berkowitz *et al.*, 2018). No other significant effects due to movement of the physical substrate are noted.

(6) Actions taken to minimize impacts. No actions, which would further reduce impacts due to the placement of the dredged material are deemed necessary.

b. Water Circulation/Fluctuation, and Salinity Determination.

(1) Water

(a) Salinity. No significant effects.

(b) Water chemistry. Sampling results of recent studies (2008, 2010, and 2014) of the elutriate analyses indicate little, to no discernable changes, on

water chemistry for the proposed action.

(c) Clarity. Water clarity may locally be decreased slightly during the proposed placement of dredged material, but this would not be significant.

(d) Color. No effects.

(e) Odor. No effects.

(f) Taste. No effects.

(g) Dissolved gases. No effects.

(h) Nutrients. No effects.

(i) Eutrophication. No effects.

(2) Current Patterns and Circulation

(a) Current patterns and flow. Changes in water circulation and flow due to placement of dredged material in upland sites, the SIBUA, relic mined placement (oyster holes), and the Mobile ODMS are not expected to occur. Natural currents and flow will occur during tidal, wave, and storm activities.

(b) Velocity. No significant effects.

(c) Stratification. No effects.

(d) Hydrologic effects. No significant effects.

(3) Normal Water Level Fluctuations. No effects.

(4) Salinity Gradients. No significant effects.

(5) Actions That Will Be Taken To Minimize Impacts. No other actions that would minimize impacts on water circulation/fluctuation and salinity are deemed necessary.

c. Suspended Particulate/Turbidity Determinations.

(1) Expected changes in suspended particulate and turbidity levels in the vicinity of the disposal site. The suspended particulate and turbidity levels are expected to undergo minor increases during dredging and placement activities; however, suspended sediment of this type will quickly return to normal conditions. No significant effects would occur as a result of these increases.

(2) Effects on the chemical and physical properties of the water column.

(a) Light penetration. Increased turbidity levels in the project area as a result of the placement of dredged material would reduce the penetration of light into the water column only slightly and would be a minor short-term impact.

(b) Dissolved oxygen. No significant effects greater than those experienced under current project conditions are anticipated (Berkowitz *et al.*, 2018).

(c) Toxic metals and organics. No significant effects.

(d) Pathogens. No effects.

(e) Aesthetics. The placement of dredged material would likely decrease the aesthetic qualities of the project area for a short period of time during and shortly after placement. The disposal areas equilibrate and rapidly return to normal upon exposure to the wave climate.

(f) Others as appropriate. None appropriate.

(3) Effects on biota.

(a) Primary production, photosynthesis. No significant effects greater than those experienced under current project conditions are anticipated.

(b) Suspension/filter feeders. Some local increases in suspended particulates may be encountered during the dredging and disposal actions, but these increases would not cause significant impacts to these organisms unless they are directly covered with sediment. If directly covered with dredged material, it is expected that some organisms will be destroyed. Rapid recruitment of these organisms will promote a rapid recovery to normal populations. Overall, the impact to these organisms is expected to be minor and insignificant.

(c) Sight feeders. Sight feeders would avoid impacted areas and return when conditions are suitable. However, it is difficult to relate the presence or absence of sight feeders in an area to the placement of dredged material. Sight feeders, particularly fishes, may vary in abundance as a result of temperature changes, salinity changes, seasonal changes, dissolved oxygen level changes, as well as other variables. No significant impacts are expected to occur on sight feeders.

(4) Actions taken to minimize impacts. No further actions are deemed appropriate.

d. Contaminant Determination. No significant effects. Sampling results of recent chemical analysis studies (2008, 2010, and 2014) indicated that a few metals and PAHs, pesticides, and insecticides were detected in Mobile Harbor sediments, but did not exceed critical thresholds (PEL levels). Also, based on post oil-spill testing results from 2010, PAH and TPH testing of surface sediments collected in the Mobile Lower Ship Channel, Mobile Bar Channel, EPA-designated reference site, and Mobile ODMS in

November and December 2010, there are no discernable changes in the sediment quality that are attributable to the *Deepwater Horizon* Oil Spill.

e. Aquatic Ecosystem and Organism Determinations.

(1) Effects on plankton. No significant effects greater than those experienced under current project conditions are anticipated (Berkowitz *et al.*, 2018).

(2) Effects on benthos. Benthic organisms would be destroyed by the deposition of dredged material below the waterline in the open water placement areas, but no significant effects are expected on the benthic community as a result of the proposed action.

(3) Effects on nekton. No significant effects greater than those experienced under current project conditions are anticipated (Berkowitz *et al.*, 2018).

(4) Effects on aquatic food web. No significant effects greater than those experienced under current project conditions are anticipated (Berkowitz *et al.*, 2018).

(5) Effects on special aquatic sites.

(a) Sanctuaries and refuges. Not applicable

(b) Wetlands. As a result, project implementation is not expected to negatively impact wetlands within the study area. No significant effects greater than those experienced under current project conditions are anticipated (Berkowitz *et al.*, 2018).

(c) Mud flats. Not applicable.

(d) Vegetated shallows. No significant effects greater than those experienced under current project conditions are anticipated (Berkowitz *et al.*, 2018).

(e) Coral reefs. Not applicable.

(f) Riffle and pool complexes. Not applicable.

(6) Threatened and endangered species. The project area is host to fisheries and wildlife on the State and Federal protected species list. Of particular concern in the proposed project vicinity are sea turtles, Florida manatee, and Gulf sturgeon.

Potential impacts on the five species of listed sea turtles and Gulf sturgeon from hopper dredging activities were assessed in the 2003 Gulf Regional Biological Opinion (GRBO). In the opinion, NMFS concluded that sea turtles and Gulf sturgeon can be adversely affected by hopper dredges. The Gulf sturgeon is a subspecies of the Atlantic sturgeon. The proposed project area may be used by Gulf sturgeon for foraging during

their migration periods. However, Mobile Bay is not within designated Gulf Sturgeon critical habitat.

The Florida manatee is a subspecies of the West Indian Manatee. Although rare, manatee sightings have been documented in Mobile Bay and/or its tributaries for the past several years, during the period May through December. In the unlikely event that a manatee would be located in the vicinity of the nearshore project site, and U.S. Fish and Wildlife Service (USFWS) "Standard Manatee Construction Conditions" would be implemented.

The USACE, Mobile District, does not anticipate sperm, blue, fin, humpback, or sei whales would be adversely affected by the varying dredging methods (i.e. hydraulic, hopper, and/or mechanical) described by the proposed action along the entire proposed action area. Given their likely absence, feeding habits, and very low likelihood of interaction, the USACE, Mobile District, does not anticipate the proposed actions identified in this EA will affect these species.

The piping plover, red knot, and least tern occur along the Gulf Coast and also may occur on Sand Island or other nearby land forms. Since this project is located over water and away from any land forms, it is highly unlikely that these birds would be disrupted by the continued maintenance dredging and placement activities would have no impact on them. Due to high bird nesting use, material to be placed in Gaillard Island would only occur in accordance with the *Migratory Bird Treaty Act* and any associated regulatory agency agreements

The USACE has determined that the proposed action may affect but is not likely to adversely affect the species discussed above.

(7) Other wildlife. No significant effects.

(8) Actions to minimize impacts. No other actions to minimize impacts on the aquatic ecosystem are deemed appropriate.

f. Proposed Disposal Site Determination.

(1) Mixing zone determinations. The Alabama Department of Environmental Management (ADEM) delineates mixing zones on a case-by-case basis. Any requirements placed on the project would be followed to the maximum extent practicable.

(2) Determination of compliance with applicable water quality standards. Preliminary findings show that action would be in compliance to the maximum extent practicable, with all applicable water quality standards.

(3) Potential effects on human use characteristics.

(a) Municipal and private water supply. No significant effects greater than

those experienced under current project conditions are anticipated (Berkowitz *et al.*, 2018).

(b) Recreational and commercial fisheries. No significant effects greater than those experienced under current project conditions are anticipated (Berkowitz *et al.*, 2018).

(c) Water-related recreation. No significant effects greater than those experienced under current project conditions are anticipated (Berkowitz *et al.*, 2018).

(d) Esthetics. No significant effects.

(e) Parks, national and historic monuments, national seashores, wilderness areas, research sites, and similar preserves. Not applicable.

g. Determination of Cumulative Effects on the Aquatic Ecosystem. No significant cumulative effects on the aquatic ecosystem would occur as a result of the proposed action.

h. Determination of Secondary Effects on the Aquatic Ecosystem. No significant effects.

III. FINDING OF COMPLIANCE.

a. Adaptation of Section 404(b)(1) Guidelines. No significant adaptations to the guidelines were made relative to this evaluation.

b. Alternatives. The proposed action discussed in this EA and Section 404(b)1 only encompasses the recertification of an ongoing maintenance project. Therefore, only 'Action' and 'No Action' alternatives have been evaluated in this assessment. It is believed that greater negative economic and environmental impacts will result from not re-issuing certification of continual maintenance dredging and disposal activities. Other Alternatives for dredging and disposal were evaluated in the 1980 EIS for Mobile Harbor Channel Improvements.

c. Compliance with State Water quality Standards. A Clean Water Act (CWA), Section 401 Water Quality Certification is required for the proposed action. Certification will be coordinated with ADEM for the proposed action.

d. Compliance with Applicable Toxic Effluent Standard or Prohibition under Section 307 of the Clean Water Act. The action is consistent with the Alabama Coastal Program to the maximum extent practicable. Recertification of the existing project will be coordinated through and approved by the State of Alabama.

e. Compliance with Endangered Species Act. The proposed activity is not

expected to harm federally-protected species. No critical habitats of any federally-protected species exist within the project area. Regarding potential impacts to federally-protected species, coordination with the appropriate Federal agencies will be initiated through a Public Notice and completed. Sufficient safeguards exist to protect federally-protected species which may enter into the project area.

f. Compliance with Specific Protection Measures for Marine Sanctuaries Designated by the Marine Protection, Research, and Sanctuaries Act. The proposed activity would not result in any significant adverse effects on human health or welfare, including municipal or private water supplies, recreation and commercial fishing, plankton, fish, shellfish, and wildlife. The life stages of aquatic life and other wildlife would not be adversely affected. Significant adverse effects on aquatic ecosystem diversity, productivity and stability, and recreational, esthetic, and economic values would not occur. No wetlands would be impacted by the proposed action.

g. Evaluation of Extent of Degradation of the Waters of the United States. The proposed fill plan is specified as complying with the requirements of these guidelines.

h. Appropriate and Practicable Steps Taken to Minimize Potential Adverse Impacts of the Discharge on the Aquatic Ecosystem. The proposed fill plan is specified as complying with the requirements of these guidelines.

i. On the Basis of the Guidelines, the proposed Disposal Site for the Discharge of Dredged Material. Specified as complying with the requirements of these guidelines.

DATE: _____

Diana M. Holland
Brigadier General, U.S. Army
Commanding

ENVIRONMENTAL APPENDIX C

ATTACHMENT C-3 AIR QUALITY ANALYSIS

APPENDIX C-1

AIR QUALITY IMPACT ANALYSIS

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1.0 INTRODUCTION

This appendix presents a discussion of how air quality is defined, the regulatory approach used to evaluate potential impacts as a result of operations within the Port of Mobile (the port) as shown in Figure 1, and a determination of impact significance.

Air quality can be affected by air pollutants produced by mobile sources, such as vehicular traffic and non-road equipment used for port material handling activities, vessels, and by fixed or immobile facilities, referred to as “stationary sources.” Stationary sources can include coal piles, stationary combustion exhaust stacks, and other sources.

1.1 AIR QUALITY STANDARDS AND REGULATIONS

1.1.1 National Ambient Air Quality Standards

The U.S. Environmental Protection Agency (USEPA), under the requirements of the 1970 Clean Air Act (CAA), as amended in 1977 and 1990 (Clean Air Act Amendments), has established National Ambient Air Quality Standards (NAAQS) for six contaminants, referred to as criteria pollutants (40 Code of Federal Regulations [CFR] 50). These six criteria pollutants are:

- Carbon monoxide (CO)
- Nitrogen dioxide (NO₂)
- Ozone (O₃), with nitrogen oxides (NO_x) and volatile organic compounds (VOCs) as precursors
- Particulate matter (PM₁₀—less than 10 microns in particle diameter; PM_{2.5}—less than 2.5 microns in particle diameter)
- Lead (Pb)
- Sulfur dioxide (SO₂)

[Table 1](#) presents a description of the criteria pollutants and their effects on public health and welfare.

The NAAQS are comprised of primary and secondary standards, as shown in [Table 2](#). The primary standards were established to protect human public health. Typical sensitive land uses and associated sensitive receptors protected by the primary standards include publicly accessible areas, such as residences, hospitals, libraries, churches, parks, playgrounds, and schools. The secondary standards were established to protect the environment, including plants and animals, from adverse effects associated with pollutants in the ambient air.

The air emissions that may result from the proposed action are addressed in this study for all criteria pollutants with the exception of lead. As a result of regulatory efforts, levels of lead in the air have been reduced 98 percent from 1980 to 2014. Much of this reduction is a result of federal programs to control vehicle emissions by eliminating the use of lead-containing fuel. Ozone is a regional pollutant that is not usually addressed on a project basis; however, one of its precursor's emissions (NO_x) representing NO₂ is quantified in this study.

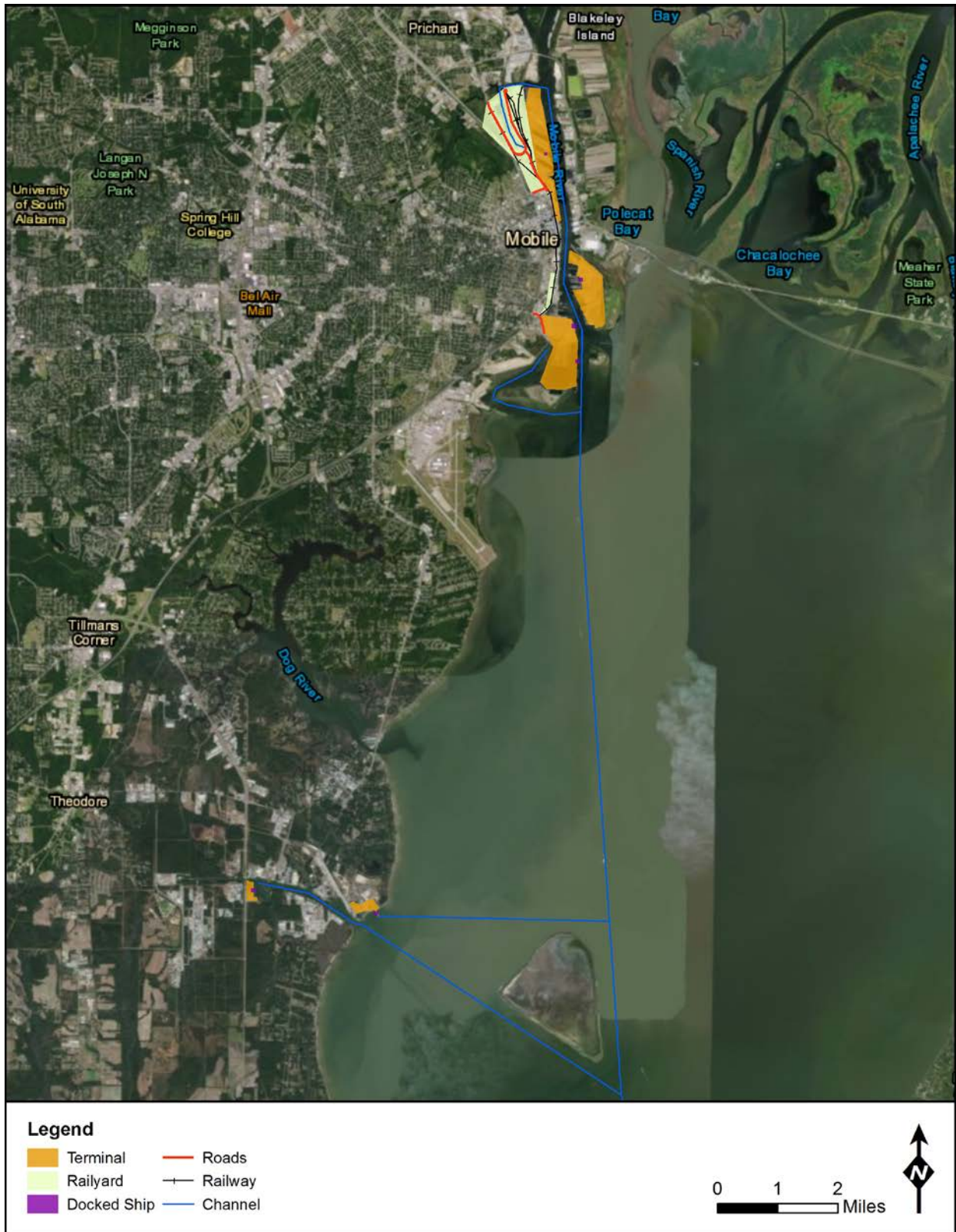


Figure 1 - Port of Mobile

Table 1. Criteria Pollutants - Sources and Impacts

Pollutants and Their Sources	Health and Environmental Impacts
<p>Ozone (O₃): a gas composed of three oxygen atoms. It is not usually emitted directly into the air, but is created at ground level by a chemical reaction between nitrogen oxides (NO_x) and volatile organic compounds (VOC) in the presence of heat and sunlight. Ground-level O₃ is known as smog. O₃ has the same chemical structure whether it occurs miles above the earth or at ground level and can have positive or negative effects, depending on its location in the atmosphere. Most O₃ (about 90%) occurs naturally in the stratosphere approximately 10 to 30 miles above the earth's surface. It forms a layer that protects life on earth by absorbing most of the biologically damaging ultraviolet sunlight. In the earth's lower atmosphere, O₃ comes into direct contact with living organisms. High levels of ground-level O₃ can cause toxic effects, detailed in the adjacent column.</p> <p>VOC + NO_x + Heat + Sunlight = O₃: Motor vehicle exhaust and industrial emissions, gasoline vapors, and chemical solvents are some of the major sources of NO_x and VOC that help to form O₃. Sunlight and hot weather cause ground-level O₃ to form in harmful concentrations in the air. As a result, it is considered an air pollutant, particularly in summer. Many urban areas tend to have high levels of O₃, but rural areas are also subject to increased O₃ levels because wind carries O₃ and associated pollutants hundreds of miles away from their original sources.</p>	<p>Health Problems:</p> <p>O₃ can irritate lung airways and cause inflammation much like sunburn. Other symptoms include wheezing, coughing, pain when taking a deep breath, and breathing difficulties during exercise or outdoor activities. People with respiratory problems are most vulnerable, but even healthy people that are active outdoors can be affected when O₃ levels are high. Repeated exposure to O₃ pollution for several months may cause permanent lung damage. Anyone who spends time outdoors in the summer is at risk, particularly children and other people who are active outdoors.</p> <p>Even at very low levels, ground-level O₃ triggers a variety of health problems including aggravated asthma, reduced lung capacity, and increased susceptibility to respiratory illnesses like pneumonia and bronchitis.</p> <p>Plant and Ecosystem Damage:</p> <p>Ground-level O₃ interferes with the ability of plants to produce and store food, which makes them more susceptible to disease, insects, and harsh weather.</p> <p>Aesthetic Damage:</p> <p>O₃ damages the leaves of trees and other plants, injuring them and impacting the appearance of cities, national parks, and recreation areas.</p> <p>Agricultural Damage:</p> <p>O₃ reduces crop and forest yields and increases plant vulnerability to disease, pests, and harsh weather.</p>

Table 1. Criteria Pollutants - Sources and Impacts

Pollutants and Their Sources	Health and Environmental Impacts
<p>Carbon Monoxide (CO): a colorless, odorless gas that is formed when carbon in fuel is incompletely burned. It is a component of motor vehicle exhaust, which contributes about 56% of all CO emissions nationwide. Non-road engines and vehicles (such as construction equipment and boats) contribute about 22% of all CO emissions nationwide. Higher levels of CO generally occur in areas with heavy traffic congestion. In cities, 85 to 95% of all CO emissions may come from motor vehicle exhaust.</p> <p>Other sources of CO emissions include industrial processes (e.g., metals processing and chemical manufacturing), residential wood burning, and natural sources such as forest fires. Woodstoves, gas stoves, cigarette smoke, and unvented gas and kerosene space heaters are sources of CO indoors. The highest levels of CO in the outside air typically occur during the colder months of the year when inversion conditions are more frequent and pollutants are trapped near the ground beneath a layer of warm air.</p>	<p>Health Problems: CO can cause harmful health effects by reducing oxygen delivery to the body’s organs (e.g., heart, brain) and tissues.</p> <p>Cardiovascular Effects – The health threat from lower levels of CO is greatest for those who suffer from heart disease (e.g., clogged arteries, congestive heart failure). For a person with heart disease, a single exposure to CO at low levels may cause chest pain and reduce their ability to exercise; repeated exposures may contribute to other cardiovascular effects.</p> <p>Central Nervous System Effects – Even healthy people can be affected by high levels of CO. People who breathe high levels of CO can develop vision problems, reduced ability to work or learn, reduced manual dexterity, and difficulty performing complex tasks. At extremely high levels, CO is poisonous and can cause death.</p> <p>Smog – CO contributes to the formation of smog (ground-level O₃), which can trigger serious respiratory problems.</p>

Table 1. Criteria Pollutants - Sources and Impacts

Pollutants and Their Sources	Health and Environmental Impacts
<p>Sulfur Dioxide (SO₂): SO₂ belongs to the family of sulfur oxide gases (SO_x). These gases dissolve easily in water. Sulfur is prevalent in raw materials, including crude oil, coal, and ore that contains common metals like aluminum, copper, zinc, lead, and iron.</p> <p>SO_x gases are formed when fuel containing sulfur, such as coal and oil, is burned, when gasoline is extracted from oil, or when metals are extracted from ore. SO₂ dissolves in water vapor to form acid, and interacts with other gases and particles in the air to form sulfates and other products that can be harmful to people and the environment.</p> <p>Over 65% of SO₂ released to the air, or more than 13 million tons per year, comes from electric utilities, especially those that burn coal. Other sources of SO₂ are industrial facilities that derive their products from raw materials like metallic ore, coal, and crude oil, or that burn coal or oil to produce process heat. Examples are petroleum refineries, cement manufacturing, and metal processing facilities. Also, locomotives, large ships, and some non-road diesel equipment currently burn high sulfur fuel and release SO₂ emissions to the air in large quantities.</p>	<p>SO₂ causes a wide variety of health and environmental impacts because of the way it reacts with other substances in the air. Particularly sensitive groups include people with asthma who are active outdoors, children, the elderly, and people with heart or lung disease.</p> <p>Health Problems:</p> <p>Respiratory Effects from Gaseous SO₂ – High levels of SO₂ in the air can cause temporary breathing difficulty for people with asthma who are active outdoors. Longer-term exposures to high levels of SO₂ gas and particles cause respiratory illness and aggravate existing heart disease.</p> <p>Respiratory Effects from Sulfate Particles – SO₂ reacts with other chemicals in the air to form tiny sulfate particles. When these are breathed in, they collect in the lungs and are associated with increased respiratory symptoms and disease, difficulty in breathing, and premature death.</p> <p>Plant and Ecosystem Damage:</p> <p>Acid Rain – SO₂ and NO_x react with other substances in the air to form acids, which fall to earth as rain, fog, snow, or dry particles. Some may be carried by the wind for hundreds of miles.</p> <p>Plant and Water Damage – Acid rain damages forests and crops, changes the makeup of soil, and makes lakes and streams acidic and unsuitable for fish and other aquatic life. Continued exposure over a long time changes the community of plants and animals in an ecosystem.</p> <p>Visibility Impairment:</p> <p>Haze occurs when light is scattered or absorbed by particles and gases in the air. Sulfate particles are the major cause of reduced visibility in many parts of the United States.</p> <p>Aesthetic Damage:</p> <p>SO₂ accelerates the decay of building materials and paints, including monuments, statues, and sculptures.</p>

Table 1. Criteria Pollutants - Sources and Impacts

Pollutants and Their Sources	Health and Environmental Impacts
<p>Nitrogen Oxides (NO_x): the generic term for a group of highly reactive gases, all of which contain nitrogen and oxygen in varying amounts. Many of the NO_x are colorless and odorless. However, one common pollutant, nitrogen dioxide (NO₂), along with particles in the air can often be seen as a reddish-brown layer over many urban areas.</p> <p>NO_x forms when fuel is burned at high temperatures, as in a combustion process. The primary sources of NO_x are motor vehicles, electric utilities, and other industrial, commercial, and residential sources that burn fuels.</p>	<p>NO_x causes a wide variety of health and environmental impacts because of various compounds and derivatives in the family of NO_x, including NO₂, nitric acid, nitrous oxide (N₂O), nitrates, and nitric oxide.</p> <p>Health Problems:</p> <p>Ground-level O₃ (smog) is formed when NO_x and VOCs react in the presence of heat and sunlight. Children, people with respiratory difficulties (e.g., asthma), and people who work or exercise outside are susceptible to adverse effects such as damage to lung tissue and reduction in lung function. O₃ can be transported by wind currents and cause health impacts far from original sources. Millions of Americans live in areas that do not meet the health standards for O₃.</p> <p>Particles – NO_x reacts with ammonia, moisture, and other compounds to form nitric acid and related particles. Human health concerns include effects on the respiratory system, tissue damage, and premature death. Small particles penetrate deeply into sensitive parts of the lungs and can cause or worsen respiratory diseases such as emphysema and bronchitis, and aggravate existing heart disease.</p> <p>Toxic Chemicals – In the air, NO_x reacts readily with common organic chemicals and even O₃, to form a wide variety of toxic products. Examples of these chemicals include the nitrate radical, nitroarenes, and nitrosamines.</p>

Table 1. Criteria Pollutants - Sources and Impacts

Pollutants and Their Sources	Health and Environmental Impacts
<p>Nitrogen Oxides (NO_x) – continued</p>	<p>Plant and Ecosystem Damage:</p> <p>Acid Rain – NO_x and SO₂ react with other substances in the air to form acids that fall to earth as rain, fog, snow, or dry particles, which can be carried by wind for hundreds of miles. Acid rain causes lakes and streams to become acidic and unsuitable for fish and other aquatic life.</p> <p>Water Quality Deterioration – Increased nitrogen loading in water bodies, particularly coastal estuaries, upsets the chemical balance of nutrients used by aquatic plants and animals. Additional nitrogen accelerates eutrophication, which leads to oxygen depletion and reduces fish and shellfish populations.</p> <p>Global Warming – One of the NO_x, N₂O, is a greenhouse gas. It accumulates in the atmosphere with other greenhouse gasses causing a gradual rise in the earth’s temperature. This leads to increased risks to human health, a rise in sea level, and other adverse changes to plant and animal habitats.</p> <p>Visibility Impairment:</p> <p>Nitrate particles and NO₂ can block the transmission of light, reducing visibility in urban areas and on a regional scale in other areas.</p> <p>Aesthetic Damage:</p> <p>Acid rain damages cars, buildings, and historical monuments.</p>

Table 1. Criteria Pollutants - Sources and Impacts

Pollutants and Their Sources	Health and Environmental Impacts
<p>Particulates (PM₁₀ and PM_{2.5}): Particulate matter (PM) is the term for particles found in the air, including dust, dirt, soot, smoke, and liquid droplets. Particles can be suspended in the air for long periods of time. Some particles are large or dark enough to be seen as soot or smoke. Others are so small that individually they can only be detected with an electron microscope.</p> <p>Some particles are directly emitted into the air. They come from a variety of sources such as cars, trucks, buses, factories, construction sites, tilled fields, unpaved roads, stone crushing, and burning of wood. Other particles may be formed in the air from the chemical change of gases. They are indirectly formed when gases from burning fuels react with sunlight and water vapor. These can result from fuel combustion in motor vehicles, at power plants, and in other industrial processes.</p>	<p>Health Problems: Many scientific studies have linked breathing PM to a series of significant health problems, including: aggravated asthma, increases in respiratory symptoms (e.g., coughing; difficult or painful breathing etc.), chronic bronchitis, decreased lung function, and Premature death.</p> <p>Plant and Ecosystem Damage: PM can be carried over long distances by wind, settling on ground or water. The effects of this atmospheric deposition include contributing to acidification of water bodies, changing the nutrient balance in coastal waters and large river basins, depleting the nutrients in soil, and damaging sensitive forests and farm crops.</p> <p>Visibility Impairment: PM is the major cause of reduced visibility (haze) in parts of the United States.</p> <p>Aesthetic Damage: Soot, a type of PM, stains and damages stone and other materials, including monuments and statues.</p>

Legend: CO = carbon monoxide; NO_x – nitrogen oxides; NO₂ = nitrogen dioxide; N₂O = nitrous oxide; O₃ = ozone; PM = particulate matter; SO₂ = sulfur dioxide; SO_x = sulfur oxides; VOC = volatile organic compound.

Source: USEPA 2012b.

Table 2. National and Alabama Ambient Air Quality Standards for Criteria Pollutants

Pollutant		Primary/ Secondary	Averaging Time	Level	Form
Carbon Monoxide		Primary	8-hour	9 ppm	Not to be exceeded more than once per year
			1-hour	35 ppm	
Lead		primary and secondary	Rolling 3-month average	0.15 µg/m ³⁽¹⁾	Not to be exceeded
Nitrogen Dioxide		Primary	1-hour	100 ppb	98 th percentile, averaged over 3 years
		primary and secondary	Annual	53 ppb ⁽²⁾	Annual mean
Ozone		primary and secondary	8-hour	0.070 ppm ⁽³⁾	Annual fourth-highest daily maximum 8-hr concentration, averaged over 3 years
Particulate Matter	PM _{2.5}	Primary	Annual	12 µg/m ³⁽⁴⁾	Annual mean, averaged over 3 years
		Secondary	Annual	15 µg/m ³	Annual mean, averaged over 3 years
		primary and secondary	24-hour	35 µg/m ³	98 th percentile, averaged over 3 years
	PM ₁₀	primary and secondary	24-hour	150 µg/m ³	Not to be exceeded more than once per year on average over 3 years
Sulfur Dioxide		Primary	1-hour	75 ppb ⁽⁵⁾	99 th percentile of 1-hour daily maximum concentrations, averaged over 3 years
		Secondary	3-hour	0.5 ppm	Not to be exceeded more than once per year

Legend: ppm = parts per million; ppb = parts per billion; µg/m³=micrograms per cubic meter.

Notes: ¹Final rule signed October 15, 2008. The 1978 lead standard (1.5 µg/m³ as a quarterly average) remains in effect until one year after an area is designated for the 2008 standard, except that in areas designated nonattainment for the 1978 standard, the 1978 standard remains in effect until implementation plans to attain or maintain the 2008 standard are approved.

²The official level of the annual nitrogen dioxide standard is 0.053 ppm, equal to 53 ppb, which is shown here for the purpose of a clearer comparison to the 1-hour standard.

³ Final rule signed October 1, 2015, and effective December 28, 2015. The previous (2008) O₃ standards additionally remain in effect in some areas. Revocation of the previous (2008) O₃ standards and transitioning to the current (2015) standards will be addressed in the implementation rule for the current standards.

⁴Final rule signed January 15, 2013. The primary annual fine particle (PM_{2.5}) standard was lowered from 15 to 12 µg/m³.

⁵Final rule signed June 2, 2010. The 1971 annual and 24-hour sulfur dioxide standards were revoked in that same rulemaking. However, these standards remain in effect until one year after an area is designated for the 2010 standard, except in areas designated nonattainment for the 1971 standards, where the 1971 standards remain in effect until implementation plans to attain or maintain the 2010 standard are approved.

Source: USEPA 2016.

1.1.2 Attainment Status and Area Classification and Clean Air Act Conformity

Areas where concentration levels are below the NAAQS for a criteria pollutant are designated as being in “attainment.” Areas where a criteria pollutant level equals or exceeds the NAAQS are designated as being in “nonattainment.” Based on the severity of the pollution problem, nonattainment areas are categorized as marginal, moderate, serious, severe, or extreme. Where insufficient data exist to determine an area’s attainment status, it is designated as either unclassifiable or in attainment.

The CAA, as amended in 1990, mandates that state agencies adopt State Implementation Plans that target the elimination or reduction of the severity and number of violations of the NAAQS in a nonattainment area. State Implementation Plans set forth policies to expeditiously achieve and maintain attainment of the NAAQS. For those nonattainment areas that are redesignated attainment, the state is required to develop a 10-year maintenance plan to ensure that the areas remain in attainment status for the same pollutant.

The CAA, as amended in 1990, also expands the scope and content of the act's conformity provisions in terms of their relationship to the State Implementation Plan. Under Section 176(c) of the CAA, a project is in “conformity” if it corresponds to State Implementation Plans’ purpose of eliminating or reducing the severity and number of violations of the NAAQS and achieving their expeditious attainment. Conformity further requires that such activities would not:

- Cause or contribute to any new violations of any standards in any area
- Increase the frequency or severity of any existing violation of any standards in any area
- Delay timely attainment of any standard or any required interim emission reductions or other milestones in any area

The USEPA published final rules on general conformity (40 CFR Parts 51 and 93) in the Federal Register on November 30, 1993 and subsequently revised the rules on March 24, 2010. The rules apply to federal actions in nonattainment or maintenance areas for any of the applicable criteria pollutants. The rules specify *de minimis* emission levels by pollutant to determine the applicability of conformity requirements for a project on a local level. A conformity applicability analysis is the first step of a conformity evaluation and assesses if a federal action must be supported by a conformity determination. However, the rules do not apply in unclassifiable/attainment areas for the NAAQS.

The area where the port is located is considered in attainment for all criteria pollutants; therefore, the rules do not apply to the implementation of the Tentatively Selected Plan (TSP) and a general conformity applicability analysis is not required.

1.1.3 Stationary Source Permitting Regulation

Stationary sources of air emissions include combustion turbines, boilers, generators, and storage piles. The 1990 amendments to the CAA set permit rules and emission standards for pollution sources of certain sizes. An air permit application is submitted by the prospective owner or operator of an emitting source in order to obtain approval of the source construction permit. A construction permit generally specifies a time period within which the source must be constructed. Permits are reviewed for any modifications to the site or the air emissions sources to determine permit applicability.

The USEPA oversees the programs that grant stationary source operating permits (Title V of the CAA) and new or modified major stationary source construction and operation permits. The New Source Review program requires new major stationary sources or major modifications of existing major stationary sources of pollutants to obtain permits before initiating construction. The New Source Performance Standards apply to sources emitting criteria pollutants, while the National Emission Standards for hazardous air pollutants apply to sources emitting hazardous air pollutants.

Hazardous air pollutants, also known as toxic air pollutants, are chemicals that can cause adverse effects to human health or the environment. The 1990 amendments to the CAA directed the USEPA to set standards for all major sources of air toxics. Thus, the USEPA established a list of 187 hazardous air pollutants. This list includes substances that cause cancer, neurological, respiratory, and reproductive effects.

The Title V major source thresholds for pollutant emissions are:

- 100 tons per year for any criteria pollutant
- 25 tons per year total hazardous air pollutants
- 10 tons per year for any one hazardous air pollutant

The USEPA also established Prevention of Significant Deterioration (PSD) regulations to ensure that air quality in attainment or unclassified areas does not significantly deteriorate as a result of construction and operation of major stationary sources. A PSD increment is the maximum allowable increase in concentration of a pollutant that is allowed to occur above a baseline concentration. A typical major PSD source is classified as any source of air pollutant emissions with the potential to emit 250 tons per year of any regulated pollutant in an attainment area. However, for several types of major source operations, including fossil fuel-fired steam electric plants of more than 250 million British Thermal Units (BTUs) per hour heat input, 100 tons per year is the major PSD threshold.

Because the implementation of the TSP would not involve installation of any permanent stationary combustion sources on-port, no adverse air quality impacts from these sources would occur. Since the underlying supposition of the General Reevaluation Report (GRR) and associated Supplemental Environmental Impact Statement (SEIS) is based on the anticipated increase in commodities at the port over the next 50 years and the fact that the coal terminal has limited options for expansion, implementation of the TSP is not anticipated to increase the capacity of on-terminal combustion source operations and the throughput of stationary coal piles more than already anticipated over the next 50 years. However, due to specific concerns expressed by local communities during scoping and in individual Focus Group meetings, the potential operating emissions from on-port point sources such as terminal exhaust stacks and coal transport operations were quantified.

1.1.4 Mobile Sources Regulation

Mobile sources to be affected by the proposed action include:

- Drayage, Cargo handling equipment, and on-terminal activities
- Harbor craft
- Ocean going vessels including

- Ships at terminal
- Ships underway along the channels
- Roadway vehicles including trucks in and out of the port
- Rail road and rail yard

The emissions from these mobile sources are regulated under Title II of the CAA, which establishes emission standards that manufacturers must achieve. Therefore, unlike stationary sources, no permitting requirements exist for operating mobile sources.

1.2 METHODOLOGY AND IMPACT DETERMINATION

Since the localized air quality condition can be correlated with the close proximity of major emission sources, sensitive receptors (e.g., individuals with respiratory conditions) that are close to major emission sources generally tend to have more air quality concerns than those located far from emission sources.

Because port operational activities are mostly associated with mobile source operations conducted around port terminals and river channels within a relatively large geographic area, the air quality impact analysis selected for this SEIS purpose estimates emissions that occur on-port from operational activities under both baseline 2011 conditions and the future 2035 no action and build alternatives. The sources of criteria pollutant emissions evaluated include those identified within the port boundary and depicted in Figures 2 and 3.

Based on the USEPA's overall emission inventory evaluation process, in general, air emissions are calculated by determining the size of the engine, the amount of time the engine is used, the load upon the engine, and the emission rate for a specific type of pollutant. There are many details which can affect the final calculated emission value, including age of the engine and the type of fuel that it burns, etc. the USEPA has implemented such an evaluation process in developing 2011 baseline on-port emissions for many US ports including the port using the C-TOOLS modeling system. The inputs and outputs established by the USEPA for the port were used as the basis for establishing both baseline 2011 and future 2035 emissions inventories. For those source categories that were not included or not well defined for emission estimate purposes in the C-TOOLS model, such as emissions from on-port truck running and coal storage piles, additional USEPA-developed analysis tools or documents were used in emissions estimate. The available vessel counts provided by the port and the projected vessel calls provided by the Corps were further used to prorate the 2011 emission levels and derive the emissions under the 2035 no action condition.

In C-TOOLS program, the representative criteria pollutants of the greatest concern to human health have been identified and quantified by the USEPA and include NO₂ (presented in terms of NO_x), CO, SO₂ and PM_{2.5}. The PM₁₀ emissions in this appendix for those C-PORT module-identified combustion source categories, vessels, locomotives, and nonroad equipment were predicted using the approximate ratio of 9% difference between PM₁₀ and PM_{2.5} applicable for typical ship diesel engines using Marine Residual Oil (RO) fuel taken from the USEPA's *Current Methodologies in Preparing Mobile Source Port-related Emission Inventories* (USEPA 2009).

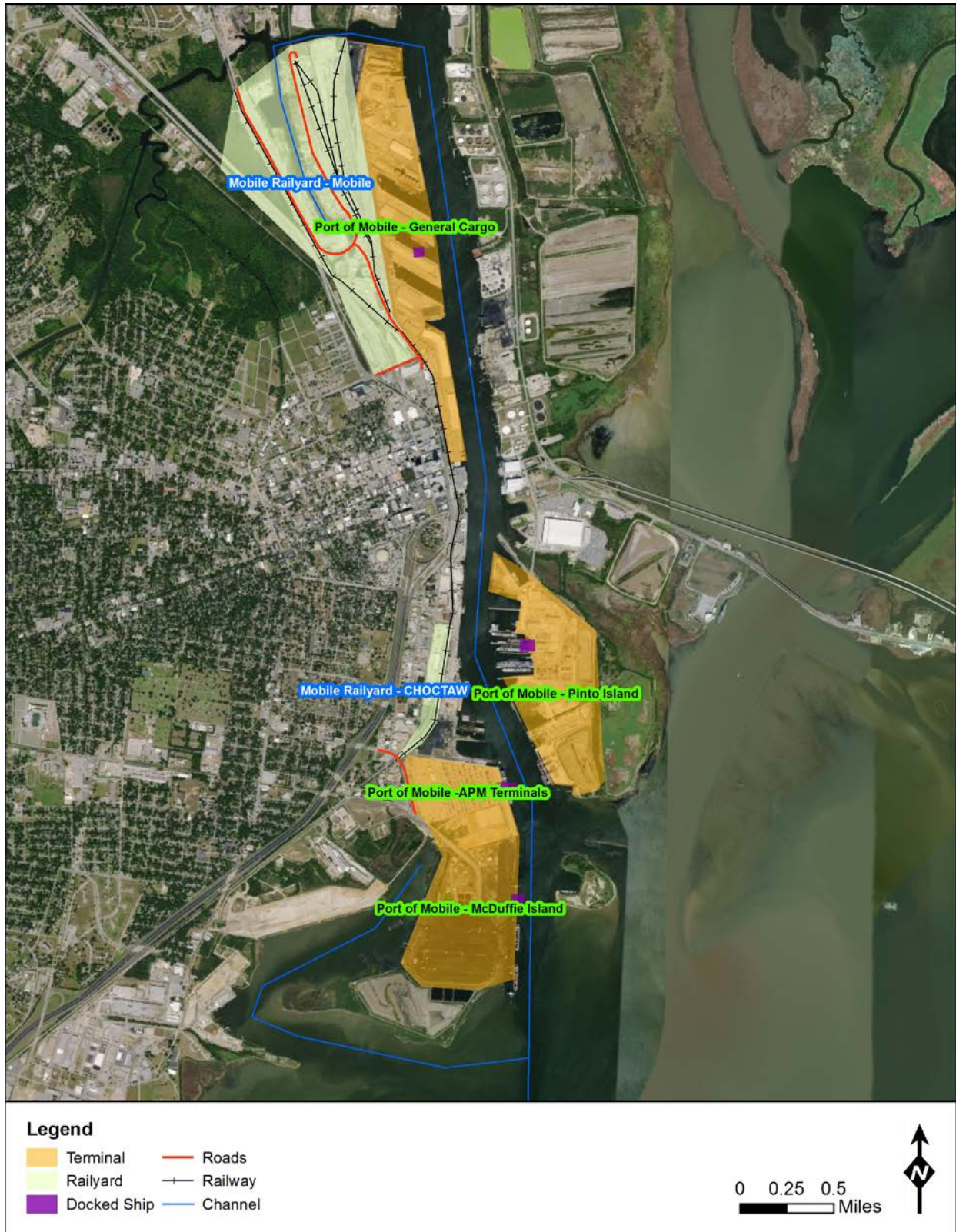


Figure 2 – Emission Sources at Port of Mobile_ Part 1

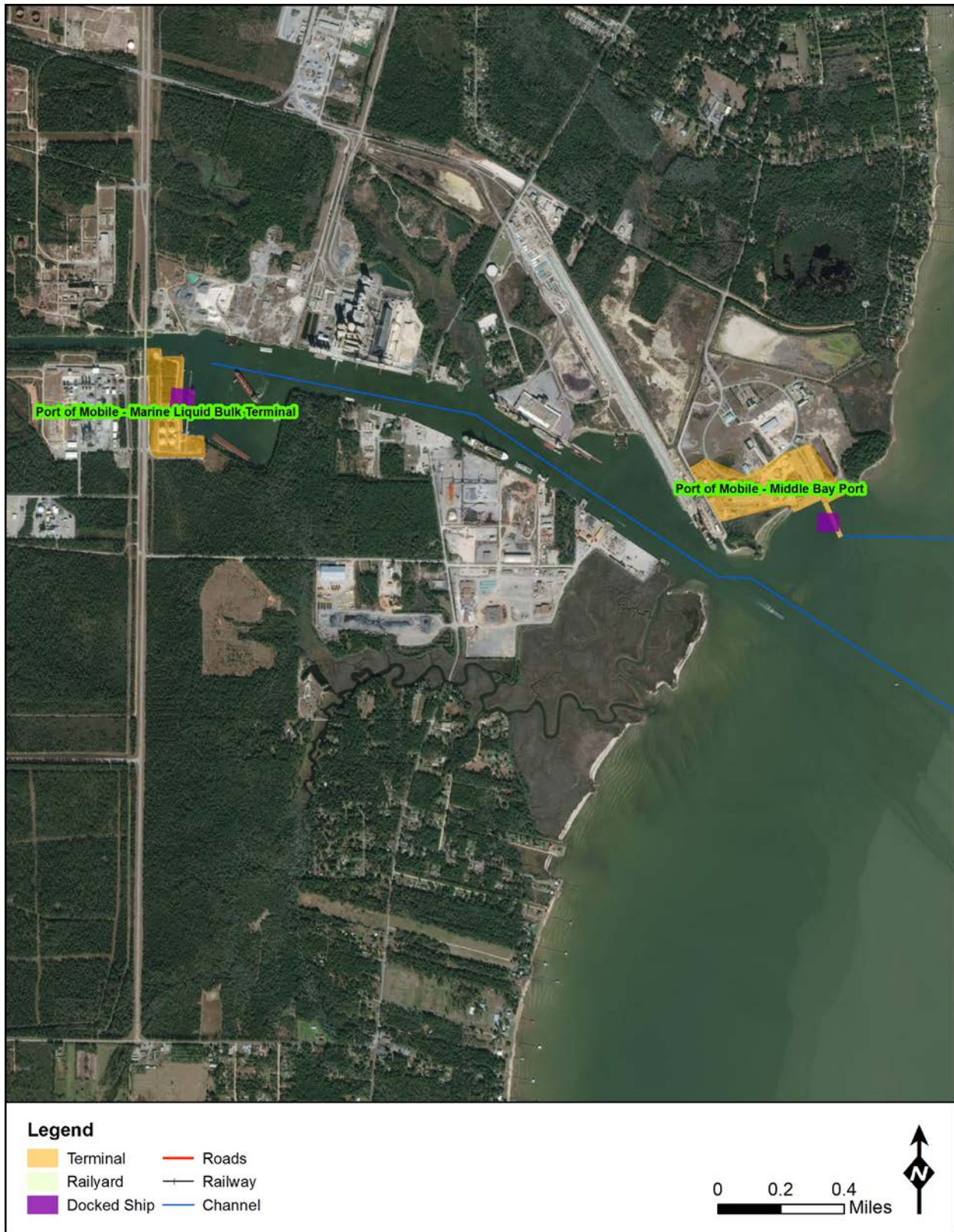


Figure 3 – Emission Sources at Port of Mobile_ Part 2

Given essentially similar purposes of widening and deepening the port channel proposed under the Charleston Harbor Navigation Improvement Project, to improve harbor mobility and cargo transporting efficiency, it is anticipated that implementation of the TSP would improve emission inventory at the port similar to that of the Charleston Harbor Navigation Improvement Project (USACE 2014).

Under the with project conditions, the Corps expects the total number of vessels to decrease within the Harbor of Mobile with deepening, as vessels will be able to load more efficiently under the improved conditions. As a result, the proposed action would not affect the number of containers that move through the areas that surround the port. The economic benefits of implementation of the TSP would result from the use of larger, more cost-effective container ships, not an increase in the number of containers. Therefore, future build alternative emission levels would likely be reduced as compared to the no action alternative as a result of improved mobility in harbor traffic and approximately a four-percent reduction in total vessel counts - a similar trend as shown in the Charleston Harbor Navigation Improvement Project. The future emission trends predicted by the Charleston Harbor Navigation Improvement Project are used as the reference in discussing potential emission impacts as a result of proposed action in the port.

The estimated change in emissions compared with the future no action condition are compared against the thresholds established in the CAA's PSD program on a local level to evaluate the extent of potential localized air quality impacts.

The areas around the port are considered attainment for all criteria pollutants. When emissions associated with a federal action would occur in areas that are in attainment, the CAA general conformity rule is not applicable, but NEPA and its implementing regulations require analysis of the significance of air quality impacts from these sources. However, neither NEPA nor its implementing regulations have established *de minimis* emission thresholds to determine potential significance of air quality impacts in attainment areas on a local level as compared to an area that is nonattainment. To determine air quality impacts for the implementation of the TSP, the "major stationary source" definition is used as explained below.

Under the CAA general conformity rule applicable to nonattainment areas, the USEPA uses the major stationary source definition under the New Source Review program as the *de minimis* levels to separate presumably exempt actions from those requiring a positive conformity determination on a project level, but not on a regional level. Because implementation of the TSP would occur in an area that is in attainment for all criteria pollutants, the major stationary source definition of 250 tons was selected as a comparable project-level significant impact threshold for this SEIS.

1.3 CRITERIA POLLUTANT EMISSIONS ANALYSIS

The air emissions analysis was performed for 2011 baseline condition and 2035 future no action and build conditions.

1.3.1 2011 Baseline Emissions

The USEPA developed the 2011 on-port emissions for the port using C-LINE and C-PORT modules within C-TOOLS suite of models for those source categories depicted in Figures 2 and 3. Although these models

were developed primarily for comprehensive pollutant dispersion modeling purposes, they offer emission levels for identified on-port sources over terminals, truck routes, rail road, rail yard, vessel channels, etc. The 2011 criteria pollutant emission levels considered in these models for the port are used as the basis to project future 2035 emissions for the purpose of this SEIS.

The C-LINE module is used for roadway emissions and the C-PORT module adds more sources associated with the port operations such as rail, port terminals including nonroad equipment and stationary exhaust stacks, and ships.

Within the C-LINE module, specific emissions for each road line are calculated by combining national database information on annual average daily traffic (AADT) volume and fleet mix with emission factors predicted using the USEPA's MOtor Vehicle Emissions Simulator (MOVES) modeling system (USEPA 2015). For link-specific parameters, given the complex operational and meteorological conditions that affect vehicle exhaust, tail pipe and tire wear emission factors, C-LINE only provides the user with traffic volumes and speeds that can then be used for emission estimate purposes. Therefore, to predict emissions along those C-LINE identified on-port truck route emissions, the most recent emission factor model, MOVES2014a, was used in association with the national default county-specific input parameters to predict on-port truck emission factors along those C-LINE links with available 2011 truck volumes and speeds.

Within the C-PORT module which builds upon C-LINE, various source categories, as shown in Figures 2 and 3, are modeled as:

- Area sources
 - nonroad equipment such as drayage, cargo handling equipment within terminals and the USEPA's National Emissions Inventory (NEI) 2011 emissions are spatially allocated over terminals
 - Rail yard
- Line sources
 - harbor craft along port channels
 - ships underway along shipping channels representing a path to the terminal from the sea based on ACE shipping lane segments with freight activity
- Point sources
 - ships at the terminal
 - stationary combustion sources within the port

In addition to the USEPA-established 2011 point-, line-, and area-specific emissions for the port, dust emissions from coal pile operations at the port were also considered in the SEIS for the 2011 processing capacity and estimated using USEPA emission factors (USEPA 2005) in association with average wind speed data in the area.

1.3.1.1 C-PORT-predicted Emissions

Table 3 summarizes the C-Port-predicted port-wide 2011 emissions from each of the model considered operational source categories on-port.

Table 3. C-PORT Predicted Annual Port-wide Operational Emissions

<i>Source Category</i>	<i>NO_x (tons)</i>	<i>CO (tons)</i>	<i>SO₂ (tons)</i>	<i>PM_{2.5} (tons)</i>	<i>PM₁₀ (tons)</i>
Ships and Harbor Craft along Channels (line sources)	1151.6	448.1	107.2	35.5	38.7
Terminal Areas and Railyards (area and point sources)	2122.5	411.1	69.5	67.0	73.0
Railways (line sources)	45.5	6.3	0.4	1.4	1.5

1.3.1.2 On-port Truck Emissions

The USEPA’s MOVES2014a emission factor model (USEPA 2015) was used to predict emission factors for on-port short haul trucks along each link identified in the C-LINE module for the port shown in Figures 2 and 3. The national default model input parameters applicable to Mobile County, where the port is located, were used. The predicted link-specific 2011 truck emission factor was multiplied by the truck traffic volume and corresponding link length to derive truck emissions on an annual basis as presented in Table 4.

Table 4. Truck Annual Emissions

<i>Source Category</i>	<i>NO_x (tons)</i>	<i>CO (tons)</i>	<i>SO₂ (tons)</i>	<i>PM_{2.5} (tons)</i>	<i>PM₁₀ (tons)</i>
On-Port Trucks	21.8	10.8	0.0	1.8	2.5

1.3.1.3 Coal Handling and Storage Pile PM Emissions

PM emissions from a storage pile material handling process result from:

- Loading of materials onto storage piles (batch or continuous drop operations)
- Equipment traffic in storage area
- Wind erosion of pile surfaces and ground areas around piles
- Loadout of materials for shipment or for return to the process stream (batch or continuous drop operations)

The following formula was used to calculate PM emission factors from material handling within storage piles caused by wind erosion effects (USEPA 1995):

$$E = k (0.0032) (U/5)^{1.3} / (M/2)^{1.4} \text{ (pound/ton)}$$

Where:

- E = Emission factor in pounds of pollutant per ton of material processed
- k = particle size multiplier
- U = mean wind speed in meters per second

- M = material moisture content as a percentage

The mean wind speed over the past five years in the city of Mobile and the mean moisture content available for western surface coal mining were used in applying the equation. The emission factors were then applied to the 2011 annual throughput of coal handled at the McDuffie terminals and the bulk material handling plant to predict annual PM emissions.

To account for several drops made during each complete coal transport cycle, approximately 10 drops per loading and unloading cycle were assumed. This number likely include transporting coal to and from ships, barges, rail dumps, stackers and reclaimers, piles, etc. The calculated PM emissions were further adjusted by the average number of drops for loading and unloading during each transporting cycle. Since water spray is utilized around coal to suppress dust, a typical water suppression control efficiency of 50% was applied to the results as summarized in Table 5.

Table 5. Coal Storage Pile PM Emissions

<i>Annual Coal Throughput (tons)</i>	<i>Mean Wind Speed (mph)</i>	<i>Moisture Content (%)</i>	<i>Control from Watering</i>	<i>Number of Load/Upload Processes</i>	<i>PM_{2.5} Emissions (tons)</i>	<i>PM₁₀ Emissions (tons)</i>
13,498,389	6.4	6.9	50%	0.70	0.70	4.6

1.3.1.4 2011 On-port Emission Inventory

The total combined 2011 emissions inventory for each criteria pollutant of concern on-port is presented in Table 6.

Table 6. 2011 Baseline Annual Emissions

<i>Source Category</i>	<i>NO_x (tons)</i>	<i>CO (tons)</i>	<i>SO₂ (tons)</i>	<i>PM_{2.5} (tons)</i>	<i>PM₁₀ (tons)</i>
All	3,341.4	876.3	177.1	106.4	120.3

1.3.2 2035 Projected Port Emissions

The future port operational emissions are directly proportional to the port processing capacity driven by the number and size of vessels coming in and out of the harbor. The historic vessel/tug counts and future projected vessel calls provided in Table 7 were used to prorate the 2011 baseline emission inventory to derive the 2035 emission inventory.

Table 7. Vessel/Tug Counts and Vessel Calls Records/Forecasts

<i>Year</i>	<i>Vessel/Tug Counts (in and out)NO_x</i>	<i>Vessel Calls/Counts (without Project)</i>	<i>Vessel Counts (with Project)</i>
2011	1876	1002 ¹	--
2012	1823	--	--
2013	1567	--	--
2014	1904	1017	--
2015	1868	--	--
2016	2097	--	--
2017	2315	--	--
2025	--	1487	1439
2035	--	1781	1711

^{1.} Estimated based on available ratio from 2014 calls and vessel counts

1.3.2.1 No Action Alternative

As shown in Table 7, the vessel calls projected under the 2035 no action condition would increase approximately by 78 percent over the 2011 condition. This ratio of increase in vessel traffic was applied to the 2011 emissions inventory to predict the 2035 emission inventory under the no action alternative as presented in Table 8. It should be noted that this predicted inventory is considered to be conservatively high because future combustion engines used for vessels, trucks, locomotives, and nonroad equipment would be cleaner as a result of implementation of emission control programs on both federal and state levels. The use of cleaner engines would partially offset the adverse emission impacts from an increased demand of harbor operational activities in the future.

Table 8. Projected 2035 No Action Alternative Annual Emissions

<i>Source Category</i>	<i>NO_x (tons)</i>	<i>CO (tons)</i>	<i>SO₂ (tons)</i>	<i>PM_{2.5} (tons)</i>	<i>PM₁₀ (tons)</i>
All	5939.2	1557.6	314.8	189.1	213.8

1.3.2.2 Tentatively Selected Plan

The proposed deepening and widening of approximately 39 miles of harbor channel would be a major construction project requiring certain large dredges to be used over several years. These dredges are currently used for channel maintenance dredging activities. Since the deepening activity emissions would not take place along the channel at the same location for a long duration, they are considered temporary resulting in less than significant air quality impacts to the community along the channel.

Under the channel deepening operational condition, the overall throughput levels at the port would not change as compared to the no action alternative. A slight reduction of overall vessel counts would occur and certain amount of larger ships would have access to the port resulting in an improvement of cargo transporting efficiency with less delay than anticipated under the no action alternative. Therefore, it is predicted that the short-duration (e.g., worst-case) daily emissions at the port including vaporized VOC emissions released during the fueling process between larger ships and fuel farms could increase, but the overall annual emissions would likely be less under the implementation of the TSP than the No Action Alternative.

Given the uncertainty of the mix and size of vessels using the port and the change in vessel travel time in the future after channel deepening, a precise calculation of the change in annual emissions under the proposed action is not feasible. However, the on-port operational activities that would be affected by the channel deepening and widening are anticipated to be similar to those under the Charleston Harbor Navigation Improvement Project (USACE 2014). According to the emissions forecasted for the Charleston Harbor deepening project, the alternative with the largest deepening from a no action depth of 45/45 to the 2037 build alternative with a deepening of 52/48 depth would result in emission reduction ratios ranging from approximately 1 to 3 percent for the criteria pollutants as shown in Table 9. Given the similarity of the proposed harbor navigation improvement scheme at both harbors, these ratios were applied to roughly estimate the changes in emissions in 2035 as summarized in Table 9.

Table 9. Projected Changes in 2035 Emissions under Channel Deepening Alternative

Source Category	NO_x (tons)	CO (tons)	SO₂ (tons)	PM_{2.5} (tons)	PM₁₀ (tons)
Emissions Reduction Ratio from Charleston Harbor Deepening Project 2037 No Action to Build (%)	-1.1	-0.8	-3.4	-1.0	-1.0
Estimated Likely Change from 2035 No Action Alternative to Build Alternative from Mobile Harbor Deepening Project	-65.3	-12.5	-10.7	-1.9	-2.1
PSD Threshold	250	250	250	250	250

Reasonably foreseeable changes in emissions associated with the implementation of the proposed action were estimated and compared to the 250 tons per year threshold on an annual basis to determine potential air quality impacts. If the total emissions exceed the PSD threshold, a further

evaluation of the emissions resulting from the proposed action should be conducted to assess the emissions impact on sensitive land uses to determine the potential significance of air quality impacts.

As indicated in Table 9, the proposed action would result in a net emission reduction for each criteria pollutant and therefore, the proposed action would result in less than significant air quality impacts.

1.4 REFERENCES

- USACE. (2014). *Charleston Harbor Post 45, Charleston South Carolina, Final Feasibility Report and Environmental Impact Study, Air Emissions Inventory, Appendix D*. October 2014. Retrieved from <http://www.sac.usace.army.mil/Portals/43/docs/civilworks/post45/mainreport/Appendix%20-%20Air%20Emission%20Inventory.pdf>
- USEPA. (1992). *Procedures for Emission Inventory Preparation, Volume IV: Mobile Sources* (No. EPA420-R-92-009). Retrieved from <http://www.epa.gov/otaq/models/nonrdmdl/r92009.pdf>
- USEPA. (1995). *Compilation of Air Pollutant Emission Factors, AP-42*.
- ICF Consulting (2006, January). *Current Methodologies and Best Practices in Preparing Port Emission Inventories*, prepared for EPA, January 2006.
- USEPA. (2009). *Current Methodologies in Preparing Mobile Source Port-related Emission Inventories. Final Report*. Prepared by ICF International. Retrieved from <http://epa.gov/cleandiesel/documents/ports-emission-inv-april09.pdf>
- USEPA. (2015). MOVES (Motor Vehicle Emission Simulator). *Modeling and Inventories*. Retrieved from <http://www.epa.gov/otaq/models/moves/>
- USEPA. (2012). Six Common Air Pollutants. *Air & Radiation*. Retrieved June 27, 2014, from <http://www.epa.gov/air/urbanair/>
- USEPA. (2016). National Ambient Air Quality Standards (NAAQS). Retrieved December 5, 2017, from <https://www.epa.gov/criteria-air-pollutants/naaqs-table>

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ENVIRONMENTAL APPENDIX C

**ATTACHMENT C-4
COORDINATION LETTERS
FOR
THREATENED AND ENDANGERED SPECIES
&
ESSENTIAL FISH HABITAT**

**FINAL FISH AND WILDLIFE COORDINATION ACT
REPORT (FWCAR)**



REPLY TO
ATTENTION OF

DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS, MOBILE DISTRICT
P.O. BOX 2288
MOBILE, AL 36628-0001

November 9, 2018

Coastal Environment Team
Environment and Resources Branch

Mr. Brandon Howard
National Marine Fisheries Service
Habitat Conservation Division
Louisiana State University,
Military Sciences Building, Room 266
South Stadium Road
Baton Rouge, Louisiana 70803

Dear Mr. Howard:

Pursuant to the requirements of the Magnuson–Stevens Fishery Conservation and Management Act, the U.S. Army Corps of Engineers (USACE), Mobile District has prepared a comprehensive Essential Fish Habitat (EFH) assessment, which fully assesses the potential impacts for proposed modifications to the existing Mobile Harbor Federal Navigation channel as described in Mobile Harbor, Mobile, Alabama Draft Integrated General Reevaluation Report with Supplemental Environmental Impact Statement, Mobile County, Alabama (Draft GRR/SEIS). The proposed modifications consist of deepening the existing Bar, Bay (including the Choctaw Pass Turning Basin), and River Channels by 5 feet to project depths of 52, 50, and 50 feet, respectively, with an additional 2 feet for advanced maintenance plus 2 feet of allowable overdepth for dredging (total depths of 56, 54, and 54 feet, respectively), widening a segment of the lower channel by 100 feet for 3 miles including bend easing with deepening at the upper end of the bar channel, and expanding the existing turning basin.

The enclosed EFH assessment analyzes the potential direct, indirect and cumulative effects associated with the dredging and placement activities in Mobile Harbor. Based on our assessment of the proposed action and incorporated conservation measures, the USACE, Mobile District has determined that the proposed actions are not likely to adversely affect EFH. We request your concurrence with our determination on this matter. Your cooperative support of this activity, in accordance with the Magnuson–Stevens Fishery Conservation and Management Act, is greatly appreciated. If we can be of any further assistance to you, please contact Mr. Larry Parson at (251) 690-3139 or larry.e.parson@usace.army.mil.

Sincerely,

Curtis M. Flakes
Chief, Planning and Environmental
Division

Enclosure



UNITED STATES DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

NATIONAL MARINE FISHERIES SERVICE

Southeast Regional Office

263 13th Avenue South

St. Petersburg, Florida 33701-5505

<http://sero.nmfs.noaa.gov>

September 7, 2018 F/SER46/BH:jk
225/389-0508

Ms. Jennifer L. Jacobson
Planning and Environment Division
Mobile District Environmental Branch
U.S. Army Corps of Engineers
Post Office Box 2288
Mobile, Alabama 86628-0001

Dear Ms. Jacobson:

NOAA's National Marine Fisheries Service (NMFS) has reviewed the Draft Integrated General Reevaluation Report with Supplemental Environmental Impact Statement (SEIS), dated July 24, 2018, on the "**Mobile Harbor Navigation Project.**" The U.S. Army Corps of Engineers (USACE) proposes to conduct maintenance dredging and placement activities. The maintenance dredging includes a navigation channel from the Gulf of Mexico to turning basins near the Cochrane Bridge, Alabama State Docks, and McDuffie Island. The following is provided in accordance with provisions of the Fish and Wildlife Coordination Act (16 U.S.C. 661 et seq.) and 600.920 of the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act; P.L. 104-297).

The NMFS provided comments to the public notice for the project by letter dated January 25, 2017, recommending the beneficial use of dredge material. The USACE responded by letter dated February 21, 2017, acknowledging the comments. The maintenance dredging will generate approximately 5.5 million cubic yards of sediment annually. As proposed in the Public Notice, the sediment would be disposed at the Mobile Offshore Dredged Material Disposal Site (ODMDS), open bay thin-layer disposal areas, the Sand Island Beneficial Use Area (SIBUA), Blakely Island, and Gilliard Island.

Section 2.5.4 of the SEIS confirms little change to water quality parameters such as turbidity, salinity, and dissolved oxygen will result from the project. Due to NMFS' early involvement as a cooperating agency and close coordination with USACE, the project has been designed in such a way as to not have a substantial adverse effect on EFH or federally managed fishery species in Mobile Bay and surrounding waters. The NMFS Habitat Conservation Division does not object to the project as proposed and agrees with USACE's determination the project will not adversely affect EFH.

We appreciate your consideration of our comments. If you wish to discuss this project further or have questions concerning our recommendations, please contact Brandon Howard at (225) 389-0508, extension 203.

Sincerely,

Virginia M. Fay
Assistant Regional Administrator
Habitat Conservation Division



c:
FWS, Paul_Necaise@fws.gov
F/SER46, Swafford
F/SER4, Dale, Fay, Silverman
Files



REPLY TO
ATTENTION OF

DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS, MOBILE DISTRICT
P.O. BOX 2288
MOBILE, AL 36628-0001

November 9, 2018

Coastal Environment Team
Environmental Resources Branch

Mr. William Pearson
U.S. Fish and Wildlife Service
1208-B Main Street
Daphne, Alabama 36526

Dear Mr. Pearson:

The U.S. Army Corps of Engineers (USACE), Mobile District is proposing modifications to the existing Mobile Harbor Federal Navigation channel as specified in the Mobile Harbor, Mobile, Alabama Draft Integrated General Reevaluation Report with Supplemental Environmental Impact Statement, Mobile County, Alabama (Draft GRR/SEIS). The Mobile Harbor Federal Navigation Project is divided into three general areas: the River Channel section, the Bay Channel section, and the Bar Channel section. The Tentatively Selected Plan (TSP) consists of: dredging and placement activities for approximately 27,000,000 cubic yards (cys) of new work material associated with the improvements of Mobile Harbor, and subsequent future operations and maintenance dredging and placement activities. It also consists of deepening the existing Bar, Bay (including the Choctaw Pass Turning Basin), and River Channels by 5 feet to project depths of 52, 50, and 50 feet, with an additional 2 feet for advanced maintenance plus 2 feet of allowable overdepth for dredging (total depths of 56, 54, and 54 feet, respectively); adding an additional 100 feet of widening for a distance of three miles beginning at the upper end of the bend area at the 50 foot depth; including bend easing with the deepening at the upper end of the bar channel; and, modification to the Choctaw Pass Turning Basin to ensure safe operation at the 50 foot depth (see Figures 1-9). Material dredged during the improvements will be placed at a relic shell mined area and the Mobile Ocean Dredged Material Disposal Site (ODMDS). Any suitable bar channel new work material dredged in sufficient quantity to warrant placement at the Sand Island Beneficial Use Area (SIBUA) will be accomplished accordingly. Future material from channel maintenance will be placed at those previously noted disposal sites, with the exception of the relic shell mined area, in addition to open-water sites adjacent to the channel, the northwestern SIBUA expansion, and/or previously approved upland disposal sites.

The most recent Section 7 coordination occurred in December 2016 when the USACE, Mobile District sought consultation for the continued operations and maintenance of the existing Mobile Harbor Federal Navigation Project, Mobile County. In January 2017, the U.S. Fish and Wildlife Service concurred with the USACE's determination that the continued operations and maintenance of the Mobile Harbor Federal Navigation Project may affect, but is not likely to adversely affect federally listed species.

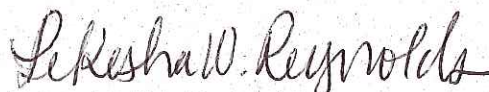
Analysis of Effects

The U.S. Fish and Wildlife Service lists the following species as either threatened and/or endangered that may occur within the project area: Bald eagle, Wood stork, Piping plover, Red knot, Alabama heelsplitter, Atlantic sturgeon, Loggerhead sea turtle, Eastern indigo snake, Black pine snake, Gopher tortoise, Southern clubshell, Alabama sturgeon, West Indian manatee, Hawksbill sea turtle, Leatherback sea turtle, Kemp's ridley sea turtle, and the Alabama red-bellied turtle.

The species of particular concern for the Mobile Harbor Federal Navigation Improvements Project includes the Alabama red bellied turtle, Gulf sturgeon, sea turtles and the West Indian manatee. For this project, the sea turtles and Gulf sturgeon fall under the National Marine Fisheries Service jurisdiction. For sea turtles and Gulf sturgeon, the USACE will refer to the National Marine Fisheries Service issued Gulf Regional Biological Opinion for Dredging of Gulf of Mexico Navigation Channels and Sand Mining Areas Using Hopper Dredges by COE Galveston, New Orleans, Mobile, and Jacksonville Districts (Consultation Number F/SER/2000/01287) dated November 19, 2003 and subsequent revisions. The Alabama red bellied turtle is known to inhabit certain areas within the Mobile Harbor project, especially the River channel and the upper reaches of the upper channel. Dredging and disposal operations within the maintained channels and existing upland disposal areas have not been identified in the past as actions that would be threatening to this species. West Indian manatees are known to exist throughout the entire project area. The USACE has historically agreed to implement "Standard Manatee Construction Conditions" during dredging and disposal operations in Alabama. The USACE anticipates that if these measures are implemented there will be no adverse impact to West Indian manatees.

Based on this information, the USACE, Mobile District finds that the proposed modification activity is not likely to adversely affect any listed endangered and/or threatened species or their associated critical habitat. Under Section 7 coordination of the Endangered Species Act, the USACE, Mobile District requests your concurrence with the determination for the channel improvements of the Mobile Harbor Federal Navigation Project. If we can be of any further assistance to you, please contact Mr. Larry Parson at (251) 690-3139 or larry.e.parson@usace.army.mil.

Sincerely,



Lekesha W. Reynolds
Chief, Coastal Environment Team

Enclosures



United States Department of the Interior

FISH AND WILDLIFE SERVICE
1208-B Main Street
Daphne, Alabama 36526

IN REPLY REFER TO:

2016-CPA-0130

DEC 21 2018

Lekesha W. Reynolds
Chief, Coastal Environment Team
Department of the Army
Mobile District, Corps of Engineers
P.O. Box 2288
Mobile, AL 36628

Dear Ms. Reynolds:

Thank you for your letter received by our office on November 20, 2018, requesting Endangered Species Act (ESA) Section 7 concurrence on the Army Corps of Engineers (USACE) effects determination for the Mobile Harbor Federal Navigation Project Draft Integrated General Reevaluation Report with Supplemental Environmental Impact Statement. The project is located in Mobile County, Alabama. Our comments are provided in accordance with provisions of the Endangered Species Act of 1973 (87 Stat. 884, as amended; 16 U.S.C. 1531 et seq.).

We understand that you determined this project may affect, but is not likely to adversely affect the following federally listed species:

West Indian manatee (*Trichechus manatus*) – Threatened
Wood stork (*Mycteria americana*) - Threatened
Piping plover (*Charadrius melodus*) – Threatened
Red knot (*Calidris canutus rufa*) – Threatened
Southern clubshell (*Pleurobema decisum*) - Endangered
Inflated heelsplitter (*Potamilus inflatus*) – Threatened
Gopher tortoise (*Gopherus polyphemus*) – Threatened
Eastern indigo snake (*Drymarchon corais couperi*) – Endangered
Black pine snake (*Pituophis melanoleucus lodingi*) – Threatened
Alabama red-bellied turtle (*Pseudemys alabamensis*) - Endangered

We are concerned about the potential indirect or direct physical impact on manatees that may be migrating through the project area during the proposed dredging operation. Direct impacts could occur from either boat, barge, cutterhead, or hydraulic pipeline strikes. Because manatees are known to seasonally occur in the Mobile channel, and could be affected by this activity, we believe that a “may affect” situation exists for the manatee.

You have proposed to implement our "Standard Manatee Construction Conditions" for this project. We believe that if these conditions can be implemented, then there will be no adverse impact to this species and further consultation will not be required for the manatee. If these steps cannot be exercised, or there is an occurrence of collision with and/or injury to a manatee, because of the proposed project, then further consultation may be required.

Based upon a review of our records and the information provided in your letter, we concur with your determination that the project actions may affect, but are not likely to adversely affect the species listed above.

We also understand that, for this project, Gulf sturgeon and sea turtles fall under the jurisdiction of the National Marine Fisheries Service (NMFS). USACE will utilize the NMFS issued Gulf Regional Biological Opinion for Dredging of Gulf of Mexico Navigation Channels and Sand Mining Areas Using Hopper Dredges by USACE Galveston, New Orleans, Mobile, and Jacksonville Districts (Consultation Number F/SER/2000/01287).

Thank you for the opportunity to provide ESA Section 7 concurrence for your project. For further discussion, please contact Mr. Josh Rowell of my staff at (251) 441-5836. Please refer to the reference number located at the top of this letter in future phone calls or written correspondence.

Sincerely,



William J. Pearson
Field Supervisor
Alabama Ecological Services Field Office



United States Department of the Interior

FISH AND WILDLIFE SERVICE
1208-B Main Street
Daphne, Alabama 36526

APR 01 2019

IN REPLY REFER TO:
2016-CPA-0130

Colonel Sebastian P. Joly, District Commander
U.S. Army Corps of Engineers, Mobile District
P.O. Box 2288
Mobile, AL 36628-0001

Dear Colonel Joly:

We are providing your agency with a Fish and Wildlife Coordination Act Report (FWCAR) for the Mobile Harbor Draft Integrated General Reevaluation Report with Supplemental Environmental Impact Statement (Draft GRR/SEIS) in fulfillment of Section 2(b) of the Fish and Wildlife Coordination Act (FWCA) (48 Stat. 401, as amended; 16 U.S.C. § 661 *et seq.*). The purpose of the GRR/SEIS is to evaluate plans that would expand the navigation system and improve its safety and efficiency. We submit the following comments and recommendations under the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. § 1531 *et seq.*), the Migratory Bird Treaty Act (49 Stat. 755, as amended; 16 U.S.C. § 702 *et seq.*), and the FWCA.

We provided these comments on the GRR/SEIS to support USACE's decision regarding the Mobile Harbor Navigation Project, and it is our understanding that the Corps intends to include this FWCAR as an appendix to the final EIS. A separate consultation will occur regarding the potential impacts of the USACE's proposal on federally listed species protected under the ESA. A version of the FWCAR will be distributed to the Alabama Department of Conservation and Natural Resources and National Ocean Atmospheric Administration.

If you have any questions, please contact me at (251) 441-5870, or Alabama Ecological Services Field Office staff biologist Josh Rowell at (251) 441-5836.

Sincerely,

William J. Pearson
Field Supervisor
Alabama Ecological Services Field Office

Enclosure

Fish and Wildlife Coordination Act Report

On

**The U.S. Army Corps of Engineers Mobile Harbor General
Reevaluation Report**

**Prepared by:
Alabama Ecological Services Field Office
Daphne, Alabama**

**U.S. Fish and Wildlife Service
Southeast Region
Daphne, Alabama
March 29, 2019**



EXECUTIVE SUMMARY

Mobile Harbor lies at the northwest end of Mobile Bay, located at Mobile, Alabama (Mobile County). Construction at Mobile Harbor was initially dredged in 1994. U.S. Army Corps of Engineers (USACE) currently proposes to dredge and modify harbor channels and the entrance channel to accommodate larger vessels, increase efficiencies and increase safety while abiding by USACE environmental principles.

The U.S. Fish and Wildlife Service (USFWS) prepared this Fish and Wildlife Coordination Act Report (CAR) with funds transferred from the USACE under the National Letter of Agreement between the agencies for funding of Fish and Wildlife Coordination Act (FWCA) activities. The Report is authorized by the Fish and Wildlife Coordination Act (16 U.S. Code Sections 661 through 667e; the Act of March 10, 1934; Ch. 55; 48 Stat. 401). FWCA provided the basic authority for the USFWS's involvement in evaluating impacts to fish and wildlife from proposed water resource development projects.

USACE's Tentatively Selected Plan (TSP), comprises deepening the existing Bar, Bay and River Channels by five feet to project depth of 52, 50, and 50 feet, respectively, with an additional two feet for advanced maintenance plus two feet of allowable overdepth for dredging (total depths of 56, 54, and 54 feet, respectively). The Bay Channel would be widened from 400 feet to 500 feet from the mouth of Mobile Bay northward for three nautical miles to provide a two-way traffic area for passing. The Choctaw Pass Turning Basin would be expanded 250 feet to the south (at a depth of 50 feet) to better accommodate safe turning of the design vessel and other large vessels.

Dredged material would be placed in a combination of upland, open water site within the bay, including the Sand Island Beneficial Use Area (SIBUA), and the Ocean Dredged Material Disposal Site (ODMDS). The existing SIBUA and ODMDS would continue to be used for routine maintenance with or without the expansion of the shipping channel taking place.

Resources that may be affected by the proposed action include tidal freshwater and brackish wetlands; Essential Fish Habitats including the estuarine water column, hardbottom, and subtidal softbottom; fishes including species managed under the Magnuson-Stevens Fishery Conservation and Management Act; species protected by state jurisdictions and/or the Endangered Species Act of 1973 ("ESA"); and migratory birds.

USFWS does not oppose this project, but has concerns that the project may be dredged more deeply than is absolutely necessary, and that opportunities to avoid and minimize impacts are being overlooked by not selecting a dredge depth that is shallower. Increasing harbor and channel depths and widths more than necessary increases not only impacts to unconsolidated subtidal habitats, but also increases indirect impacts to tidal freshwater and oligohaline wetlands due to upstream salinity intrusion and decreased dissolved oxygen (DO) levels in surface waters, particularly during periods of drought and high seasonal water temperatures. Tidally influenced freshwater wetlands would be adversely affected by increases in salinity, which may result in the

gradual replacement of freshwater and oligohaline plant species with more salt-tolerant plant species, possibly causing a commensurate shift in fish and macroinvertebrate populations upstream.

Although USACE contractors will utilize best management practices (BMPs) during project construction, direct and indirect impacts to valuable fish and wildlife populations and habitats are likely to occur. USFWS recommends that USACE allow dredging to occur only during seasonal windows that would decrease the risk of death and injury to marine mammals, fishes, and shellfish (eggs, larvae, and adults), as well as sea turtles, and also not interfere with recreational fishing opportunities near the inlet and bridges used by gamefish. Protected species monitoring protocols on dredge vessels will also be required under Section 7 of the ESA.

Finally, USFWS requests continued coordination with federal and state natural resource agencies regarding beneficial uses of dredged material that could benefit Mobile Bay and its resources.

Additional recommendations to USACE for this project's potential effects on species protected under the ESA has been detailed during Section 7 consultation. A Biological Opinion is not anticipated to be issued by USFWS.

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INTRODUCTION

Authority

Modifications to the Mobile Harbor Federal Navigation project were authorized by the Water Resources Development Act in 1986. The Upper and Lower Bay Channels were authorized to 55-foot depth by 550-foot width. The Entrance Channel was authorized at 57-foot depth by 700-foot width. Construction of Mobile Harbor was completed in 1994, but with reduced dimensions due to funding. Currently, the Upper and Lower Bay Channel dimensions stand at 45-foot by 400-feet. The Entrance Channel stands at 47-foot by 600-feet.

The Service's involvement in this project is authorized by the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. et seq.) (FWCA). The FWCA establishes fish and wildlife conservation as a co-equal purpose or objective of federally-funded or permitted water resource development proposals or projects. This Fish and Wildlife Coordination Act Report (CAR) constitutes the report of the Secretary of the Interior as required by Section 2(b) of the FWCA.

Purpose and Scope

The Corps proposes to expand the Mobile Harbor Ship Channel to the previously authorized dimensions. Due to changes in traffic, vessels have begun to experience delays into and out of the port as traffic is limited to one-way when larger ships used the channel. The existing channel dimensions limit vessel size, cargo capacity, and sometimes limit transit to daylight only. The Alabama State Port Authority (ASPA) requested that the Corps undertake additional studies to determine the feasibility of deepening and widening the channel to its fully authorized dimensions. However, the Corps' planning process has considered cost, project benefits and associated environmental effects to allow the selection of a plan that produces the greatest benefits while minimizing environmental impacts.

This CAR evaluates existing and future fish and wildlife resources within the Mobile Harbor project area and affected areas, provides the USFWS analysis of project impacts and mitigation plans, and provides the USFWS position. The CAR is based on the information currently available

FWCA Agency Coordination

A copy of the draft report has been sent to the Alabama Department of Conservation and Natural Resources (ADCNR), and the National Oceanic Atmospheric Administration (NOAA).

Prior Studies and Reports

- Department of the Army, Assistant Secretary of the Army (Civil Works). (1986). *A Report of the Chief of Engineers, Department of the Army, on Mobile Harbor, Alabama, Together with Other Pertinent Reports 99th Congress, 2d Session, House Document 99-241*. Washington: U.S. Government Printing Office.
- U.S. Army Corps of Engineers. (1975). *Final Environmental Impact Statement, Mobile Harbor (Maintenance Dredging) Mobile County, Alabama*. Mobile: U.S. Army Corps of Engineers, Mobile District.
- U.S. Army Corps of Engineers. (1977). *Special Report, Mobile Harbor, Alabama, Theodore Ship Channel (approved as General Design Memorandum-Phase I)*. Mobile: U.S. Army Corps of Engineers, Mobile District.
1. Army Corps of Engineers. (1977). *Theodore Ship Channel & Barge Channel Extension, Mobile Harbor, Alabama, Phase II, General Design Memorandum, Design Memorandum No.* Mobile: U.S. Army Corps of Engineers, Mobile District.
- U.S. Army Corps of Engineers. (1984). *Draft Supplemental Environmental Impact Statement, Mobile Harbor, Alabama, Channel Improvements, Offshore Dredged Material Disposal*. Mobile: U.S. Army Corps of Engineers, Mobile District.
- U.S. Army Corps of Engineers. (1985). *General Design Memorandum, Mobile Harbor Deepening, Alabama, General Design Memorandum No. 1, Main Report*. Mobile: U.S. Army Corps of Engineers, Mobile District.
- U.S. Army Corps of Engineers. (1985). *Mobile Harbor, Alabama Channel Improvements, Offshore Dredged Material Disposal, Environmental Impact Statement*. Mobile: U.S. Army Corps of Engineers, Mobile District.
- U.S. Army Corps of Engineers. (1986). *General Design Memorandum, Mobile Harbor Deepening, Alabama, Design Memorandum No. 1, Appendix H, Design Analysis*. Mobile: U.S. Army Corps of Engineers, Mobile District.
- U.S. Army Corps of Engineers. (1991). *Mobile Harbor Deepening, Design Supplement No. 1, General Design Memorandum, Turning Basin Basin Development Plan*. Mobile: U.S. Army Corps of Engineers, Mobile District.
- U.S. Army Corps of Engineers. (1995). *Mobile Harbor Deepening, Design Supplement No. 2, General Design Memorandum, Turning Basin Basin Development Plan*. Mobile: U.S. Army Corps of Engineers, Mobile District.
- U.S. Army Corps of Engineers. (1997). *Limited Reevaluation Report, Mobile Harbor Project Extension*. Mobile: U.S. Army Corps of Engineers, Mobile District.
- U.S. Army Corps of Engineers. (2000). *Mobile Harbor 2100-foot Project Extension, Limited Reevaluation Report*. Mobile: U.S. Army Corps of Engineers, Mobile District.

U.S. Army Corps of Engineers. (2004). *Final Environmental Impact Statement for Choctaw Point Terminal Project, Mobile, Alabama*. Mobile: U.S. Army Corps of Engineers, Mobile District.

DESCRIPTION OF THE STUDY AREA

Study Area Overview and History

Mobile Harbor (**Figure 1**) is a natural estuary located in the southwestern part of Alabama, at the junction of the Mobile River and Mobile Bay. Located in the City of Mobile, the port is about 28 nautical miles north of the bay entrance from the Gulf of Mexico, and about 150 miles from the state capital of Montgomery. Commodities include: containers, coal, metals, lumber, frozen poultry, paper, laminate, flooring, soybeans, cement, and chemicals (ASPA 2015). The current dimensions of the existing navigation channel are: 47 feet deep by 600 feet at Mobile Bar; 45 feet deep by 400 feet wide in Mobile Bay; and 45 feet deep by 730 feet wide in the Mobile River to a point one mile below the Interstate 10 highway tunnel. The channel then becomes 40 feet deep and proceeds north over the Interstate 10 and Highway 90 tunnels to the Cochrane Bridge. Mobile was originally settled 27 miles upstream by Jean Baptiste Le Moyne, Sieur d’Bienville, as the capital of French Louisiana in 1702. The fort was named Fort Louis de la Louisiane de Mobile after King Louis the XIV. The town was relocated in 1711 due to several reasons, including flooding and disease outbreaks. A new fort, Fort Conde, was established, and the town that grew around it is now present day Mobile.

Today, the city of Mobile has a population of approximately 194,000 and more than 600,000 living in the metropolitan area (Mobile Chamber of Commerce). Tourism, business, ship and aircraft manufacturing, and educational institutions comprise major portions of the economy of the area.

Outdoor recreational opportunities and natural resources near Mobile are important features in the study area. In addition to the nearby Gulf of Mexico, there is an expanse directly north of Mobile Bay, within a broad river valley that leads northward to the confluence of the Tombigbee and Alabama Rivers. This vast area is known as the Mobile-Tensaw Delta, or simply the delta. This region is home to some of the most diverse wildlife in Alabama, and indeed in the entire United States. Its wetlands, aquatic habitats and recreational lands are considered a valuable natural resource in the southern portion of the state.

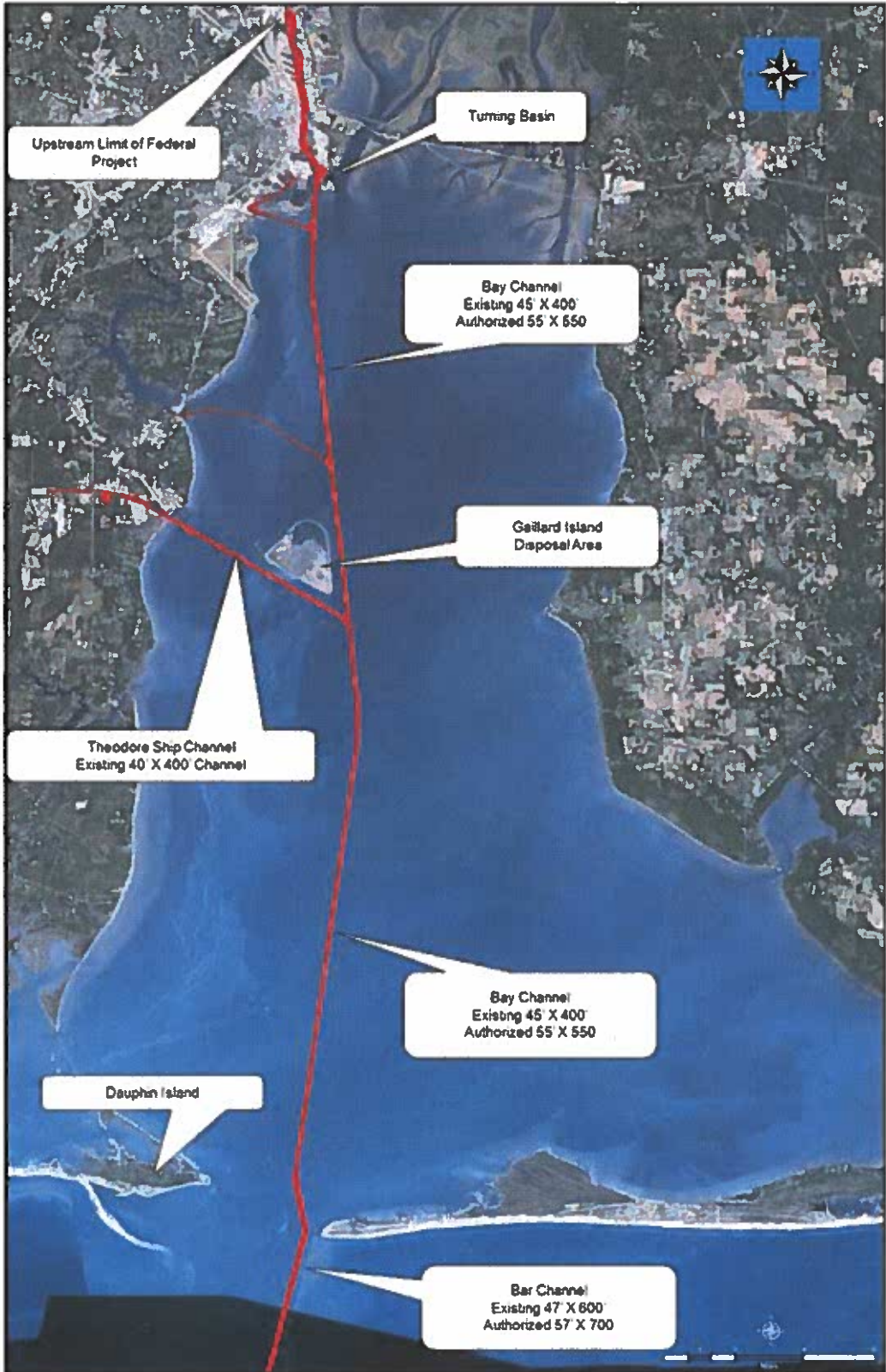


Figure 1. Mobile Harbor Location and Configuration

FISH AND WILDLIFE RESOURCES

Protected/ Managed Lands

Mobile-Tensaw Delta (MTD)

The majority of the MTD has been protected in recent years, and is managed by the Alabama Department of Conservation and Natural Resources (ADCNR). The MTD estuary is made up of a series of rivers, shallow bays, and numerous interconnecting marshes and streams. Averaging about 11 feet in water depth and with 20,323 acres of open water, there are 55.4 miles of bay shoreline and 10,000 acres of tidal marsh in the estuary. The tidally influenced MTD north of Mobile Bay is the state's largest wetland, and ranges from five to 10 miles wide along its 40-mile length (ADCNR 2015). The MTD does not resemble a typical delta because it is bounded on the east and west by high ground. It consists of rich alluvial soils deposited downstream of the confluence of the Tombigbee and Alabama rivers.

Weeks Bay Reserve

Weeks Bay National Estuarine Research Reserve is located on the eastern shore of Mobile Bay near the town of Fairhope, Baldwin County. It is managed by ADCNR and the National Oceanic and Atmospheric Administration (NOAA), with support from the nonprofit Weeks Bay Foundation and individual volunteers. The reserve was established in 1986 to preserve a representative portion of Mobile Bay's estuarine habitat for research and educational programming.

Weeks Bay Reserve is the only preserve in Alabama within the National Estuarine Research Reserve System (NERRS), a nationwide network of 28 coastal reserves managed for long-term research and education and interpretative programs on estuarine habitats. The goal of NERRS is to establish and manage, through cooperative arrangements between federal and state agencies, a nationwide system of reserves representing the different coastal regions and estuarine ecosystems that exist in the United States.

Weeks Bay is a small estuarine embayment off Mobile Bay that consists of more than 6,000 acres of water and land adjacent to Mobile Bay. Weeks Bay is fringed with marsh (*Spartina* spp. and *Juncus* spp.) and swamp (oak, maple, cypress and others). Forested wetlands form an extensive strip between floodplain swamps and upland pine-oak forest. Weeks Bay is a critical nursery for fish, crustaceans and shellfish. It is also classified as an Outstanding Alabama Water, and is designated a Habitat Area of Particular Concern (HAPC) by the Gulf of Mexico Fishery Management Council.

Bon Secour National Wildlife Refuge

Bon Secour National Wildlife Refuge (BSNWR) was established by Congress in 1980 for the protection of neotropical migratory bird habitat and threatened and endangered species. It is managed by the U.S. Fish and Wildlife Service. BSNWR represents an important stopover habitat for neotropical migratory songbirds during the fall and spring migration along the Alabama coastline. Migratory birds utilize this area for resting and building fat reserves critical to successful migration.

The refuge also provides crucial habitat for the endangered Alabama beach mouse that inhabits the beach dune and scrub/shrub habitats found along the Fort Morgan Peninsula. Loggerhead, green, and Kemp's ridley sea turtles are known to nest along the refuge's natural beach.

Wetlands

The Mobile River basin occupies the largest area in Alabama, draining about 65 percent of the state and flowing southward into Mobile Bay via the MTD. The MTD is considered the state's largest wetland. Large areas of swamp and marsh border the major rivers, especially along the lower Tombigbee and lower Alabama rivers, and the vast MTD coastal wetlands along Mobile Bay and the Gulf of Mexico (ADCNR 2015).

At the upper end of the MTD, along the Tombigbee and Alabama Rivers, is an extensive area of seasonally flooded natural levee bottomland hardwoods. Moving south, this flooded forest community type grades into alluvial forests of bald cypress and tupelo gum. These deep-water swamps contain some water most all of the growing season, with water levels varying seasonally and annually. Common shrubs include swamp privet, fetterbush, black willow, buttonbush, and common alder. Water lilies, swamp lilies, and golden club are typical herbaceous species found here.

Oak dominated bottomland hardwood forests occur further in from the river channels where flooding is more temporary. These forest types are characterized by a greater diversity of hardwood species. These include overcup oak, river birch, red maple, green ash and laurel oak. Non-woody species found here include jewelweed, lizard's tail and ferns.

Transitional areas into uplands, called upper hardwood swamps or flats, occur between the swamps and true uplands. Here the elevation profile is intermediate to the system, having standing water less than 25 percent of the growing season, flood no more than 50 percent of the years with a 100-year cycle, and have a water table that is below the soil surface (Alabama Wildlife Federation, 2016). Trees found here include those of hardwood bottoms as well as American elm, willow oak, sweetgum, swamp chestnut oak, sycamore, and water oak. Tree composition can include more upland species due to their tolerance for periodically saturated soils. Vines such as greenbrier, poison ivy, and trumpet creeper can be found here, as well as holly, wax myrtle, pawpaw and saw palmetto.

The lower end of the MTD becomes a network of marshes, creeks, bayous, and other streams

bisecting the areas between the major rivers. The high water table and low relief are conducive to the development of acidic organic layers that are saturated almost year-round. Tidal freshwater marshes are found near the mouth of Mobile Bay. These marshes occur in large expanses in the flats, usually being the first plant community to establish in the shallow depositional areas. The marsh type shifts into more salt-tolerant communities, with a lower diversity of plant species, as the transition continues into Mobile Bay and the Mississippi Sound. The saline marshes in this area are made up of smooth cordgrass (*Spartina alterniflora*), black needlerush (*Juncus roemerianus*) and salt grass (*Distichlis spicata*).

Mobile Bay and the MTD are linked ecologically and hydrologically. This association can be defined in economic terms due to the importance of the downstream fishery of Mobile Bay. The crab, shrimp, oyster, and fish populations of Mobile Bay rely on a healthy MTD. The upstream wetland complexes retain floodwaters, control sediments, and large amounts of freshwater that could negatively affect the downstream estuary. Organic matter is produced in the upstream forested wetlands of the upper MTD. This rich organic material provides important nutrients for the aquatic food chain.

Essential Fish Habitats and Managed Species

The 1996 Congressional amendments to the Magnuson-Stevens Fishery Conservation and Management Act (PL 94-265) set forth requirements for the National Marine Fisheries Service (NMFS), regional fishery management councils, and other Federal agencies to identify and protect important marine and anadromous fish habitat. These amendments established procedures for the identification of Essential Fish Habitat (EFH) and a requirement for interagency coordination to further the conservation of federally managed fisheries. EFH is defined in the act as “those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity.” The definition of EFH may include habitat for an individual species or an assemblage of species, whichever is appropriate within each Fisheries Management Plan (FMP). HAPC are also considered EFH.

Some species that may occur in the project-area habitats may be covered by a FMP. Those within the snapper-grouper complex include snappers (*Lutjanus sp.*), groupers (*Mycteroperca sp.*), jack crevalle (*Caranx hippos*), and sheepshead (*Archosargus probatocephalus*). Coastal migratory pelagics include mackerels (*Scomberomorus sp.*), and cobia (*Rachycentron canadum*).

Other Fish and Shellfish

There are many commercially and recreationally important fish species that rely on this estuary. Sciaenids (drums) are some of the most sought after fish in the area. These include the red drum (*Sciaenop ocellatus*), spotted sea trout (*Cynoscion nebulosus*), sand seatrout (*C. arenarius*), southern kingfish (*Menticirrhus americanus*), Atlantic croaker (*Micropogonias undulates*), and black drum (*Pogonias cromis*). Other locally important species are mullets (*Mugil sp.*) and the southern flounder (*Paralichthys lethostigma*).

The Mobile Harbor area also supports populations of white shrimp, brown shrimp, and blue crab, which are harvested both recreationally and commercially. These invertebrates, which are an important prey species for many finfishes, rely on the tidal marshes for an important stage of their life cycle.

Eastern oysters (*Crasostrea virginica*) are found in the estuary, tidal marshes, mudflats, and bays. They typically form intertidal reefs and once settled, are sessile throughout life. Aside from being economically important, oysters help to form part of a broad food-web that is necessary for supporting the diverse groups of fish and wildlife found throughout the MTD and Mobile Bay. Increases in salinity and changes in water quality resulting from the project have the potential to impact oyster reefs throughout Mobile Bay.

Three commercially important species of shrimp are found in Mobile Bay and vicinity: the white shrimp (*Penaeus setiferus*), pink shrimp (*Penaeus duorarum*), and the brown shrimp (*Penaeus aztecus*). The blue crab (*Callinectes sapidus*) is also a popular recreational species, as well as commercial.

Protected Species

Alabama red-belly turtle (*Pseudemys alabamensis*)

This species is listed as endangered due to habitat degradation in the form of water pollution and siltation from mining, forestry, agriculture and industrial and municipal sewage effluents. Listed on June 16, 1987, the species is a large (carapace length reaching 13 inches) freshwater, herbivorous, diurnal, and non-migratory turtle. It inhabits streams, lakes, and sloughs associated with the lower part of the MTD and streams adjacent to Mobile Bay. Extensive beds of submerged and emergent aquatic vegetation are considered to be the principal habitats of the species. Destruction of nesting habitat, sand banks and beaches is the primary cause for the decline in species numbers. Other threats are disturbances from human activities, loss of aquatic vegetation, and collection for food and pets.

Sea turtles

There are three species of sea turtles that are known to nest or occur in Alabama waters: loggerhead (*Caretta caretta*), green (*Chelonia mydas*), and Kemp's ridley (*Lepidochelys kempii*). The loggerhead sea turtle is perhaps the most common of the sea turtles and the only one that still regularly nests on Alabama beaches, although the others can occur in the waters of Mobile Bay and the Mississippi Sound. Dauphin Island and the Fort Morgan Peninsula lie to the west and east of the Mobile Ship Channel, and are known nesting areas for sea turtles. Nesting occurs from late April through October, with a peak in June and July. Females come out of the water to lay their eggs on sand beaches at night. Noise, lights, and beach obstructions are disruptive to nesting areas and threaten the reproductive cycle of sea turtles

Gulf Sturgeon (*Acipenser oxyrinchus desotoi*)

This species was listed as threatened on September 30, 1991. The gulf sturgeon is an anadromous fish with a sub-cylindrical body embedded with bony plates or scutes. Adults can reach up to 14 feet in length. The gulf sturgeon spends eight to nine months each year in rivers, and three to four months in estuary or gulf waters. From November through January, gulf sturgeon reside in estuaries and near shores, where they feed on amphipods, isopods, midges, crabs and shrimp (Mettee et. al. 1996). Upstream spawning usually begins in February. Sturgeon less than two years old may remain in riverine and estuarine habitats throughout the year. It is believed that preferable riverine habitat consists of deep channels or holes with sand, gravel, cobble or rock substrates.

West Indian Manatee (*Trichechus manatus*)

The West Indian manatee is one of four remaining marine mammals in the order Sirenia. Manatees were originally listed as endangered throughout their range in 1967. The Florida manatee, a geographically distinct population, is currently Federally listed as endangered only in Florida, Georgia, Puerto Rico, Mexico and the Caribbean but occurs as far west as Texas in the summer and early fall. Manatees undertake large seasonal migrations with distribution controlled by temperature. In the summer and fall, manatees seek shallow grass beds with ready access to deep channels as preferred feeding areas in coastal and riverine habitats, including secluded canals, creeks, embayments, and lagoons, particularly near the mouths of coastal rivers and sloughs. Artificial sources of fresh water are also attractive to manatees. Manatees are herbivores and forage on submerged aquatic vegetation (SAV), especially undersea grasses. These grasses typically grow at three to six feet in depth. However, manatees have been documented in water as shallow as one and a half feet and in deeper waters during coastal and other migrations to SAV areas. Areas with SAV are particularly important to manatee conservation. In the winter, manatees from the Gulf Coast typically return to Florida, congregating en masse around warm water springs and effluent discharges such as those below power plants.

Increasing numbers of manatees are found in Alabama waters in the summer. They are known to utilize the Mobile Ship Channel extensively as they migrate throughout Mobile Bay and into the adjacent rivers. A major threat to the manatee, accounting for more than one third of all death of adults, is watercraft strikes. Water control structures and navigation aides also are significant causes of deaths, as are red tides and incidents of freezing. Some manatees are also believed to die as a result of poor nutritional status when the underwater vegetation they feed on is killed by salinity changes or pollution.

Piping Plover (*Charadrius melodus*) and rufa red knot (*Calidris canutus rufa*)

Piping plovers are small, stocky, sandy-colored migratory shorebirds that spend 6-9 months on

southeastern U.S. beaches and sandflats. Primary threats to the species are modification and destruction of habitat, and disturbance of nesting adults and chicks. Specific examples of habitat modification include: recreational or commercial development, dune stabilization, beach nourishment, and erosion prevention devices such as seawalls.

The rufa red knot is a medium-sized shorebird that migrates annually between its breeding grounds in the Canadian Arctic and several wintering regions, including the Southeast United States. During both the northbound (spring) and southbound (fall) migrations, red knots use stopover areas along the Alabama coastline.

Although these two species do not nest in Alabama, stopover and foraging habitat could be found near the Mobile Harbor entrance channel along the shores of Dauphin Island and the Fort Morgan peninsula.

Paddlefish (Polyodon spathula)

Paddlefish have long been prized as a food fish and for their roe being used as caviar. In 1987, the Alabama Game and Fish Division banned paddlefish harvesting due to overfishing. Since then, the population has seen a bit of recovery, and in 2013 the ADCNR implemented a limited provisional season for the commercial harvest of paddlefish in specific parts of the Alabama River. However, the species' distribution and abundance over its historic range has been reduced, and paddlefish have been extirpated from four states and listed as endangered, threatened, or of special concern by 11 others.

Paddlefish are migratory, and their historic movements within the Alabama River have been hindered by the construction of Millers Ferry and Claiborne Locks and Dams. Mettee et. al (2005) found that the MTD is an important summer refuge for large numbers of paddlefish. Paddlefish are known to occur in upper Mobile Bay when salinity is reduced and transition into the MTD and lower Alabama and Tombigbee as salinity increases. Therefore, this species could be negatively affected should salinities in the MTD increase as a result of the proposed action.

Migratory Birds

As previously mentioned, the project area provides habitat to more than 300 different species of songbirds, waterfowl, shorebirds, raptors, etc. Coastal habitats provide important resting and foraging areas for migratory birds as they prepare to cross the Gulf of Mexico on their way to Central and South America. Sanctuaries, located on Dauphin Island and BSNWR at Fort Morgan, not only provide habitat for migratory species, but many other species utilize the sanctuaries and other areas within and near the project area. For these birds, the surrounding coastal habitats such as tidal flats, mud flats, and beaches provide roost and forage areas during the winter months.

Migratory bird species using sand/beach and mudflat habitats for nesting adjacent to navigational

channels and waterways may be particularly sensitive to human disturbance. During such times, disturbance could cause unsuccessful nesting and/or death to chicks. Terns, pelicans, willet and skimmers typically nest from April through July. Plovers may use habitats adjacent to the harbor or channels for feeding and roosting, and could be disturbed by vessels, construction, or other human activities. Increased turbidity associated with sediment removal and placement operations could temporarily decrease foraging success of diving and plunging birds that feed in Mobile Bay.

PROBLEMS AND OPPORTUNITIES

The USACE project delivery team identified the following problems and opportunities in coordination with ASPA.

Problem

The principal navigation problem is that vessels are experiencing delays leaving and arriving at port facilities and their cargo capacities are limited. This problem is a result of increasing number and size of vessels entering and departing the port. In the last five years, the Alabama State Port Authority has added two new facilities at the lower end of the Mobile River (at the upper portion of Mobile Bay) -- the Choctaw Point container terminal and the Pinto Island Terminal. Both facilities have increased the amount of traffic into the port. The existing channel depths and widths limit vessel cargo capability, restrict many vessels to one-way traffic and in some reaches limit transit operations to daylight only. Therefore, evaluation of deepening and widening the Entrance and Bay channels over a combined distance of approximately 37 miles to their fully authorized dimensions through a GRR has been proposed.

Opportunity

Since 2000, the total value of international trade has risen by more than 40 percent and it is becoming a larger part of our national economy. The combined value of foreign trade (imports and exports) represented 13 percent of Gross Domestic Product (GDP) in 1990, rising to nearly 22 percent in 2006. If this trend continues, it is projected that the value of U.S. foreign trade will be equivalent to 35 percent of the Nation's GDP in 2020 and 60 percent in 2030. Marine transportation will become even more important to our economy as 95 percent of America's foreign trade is moved by ship. The bottom line: to sustain expected growth, it is estimated the U.S. must expand its overall port capacity by 10 percent annually. This would require port expansion, mainly on the West Coast, Gulf Coast and South Atlantic. That is the equivalent of adding capacity equal to the Port of Oakland every year.

Mobile Harbor's ranking as a global trading port is consistently in the top twelve nationally. In 2013, the Mobile Harbor ranked twelfth (out of 200 deep-draft ports) in cargo value, and ninth (out of 80 container ports) in container traffic.

Shipping trends in Mobile show adherence to projections for considerable growth in ship size, in all three dimensions, draft, beam, and length. As economies of scale and improved vessel technologies have driven ship sizes larger, the world's port infrastructure must be rapidly expanded in channel depths, widths, and terminal capacity to accommodate larger ships. The number of ports able to handle larger vessels around the world is growing, and most importantly, the Panama Canal has expanded lock capacity to handle ships of 25 percent greater draft (up to 50 ft), 52 percent greater beam (up to 160 feet), and 30 percent greater length (up to 1250 feet). Ships have been under construction for several years to utilize the new canal capacity when the new Panama Canal locks opened in 2016.

There is opportunity to deepen and widen the navigation channel at Mobile Harbor to accommodate larger vessels. Particularly important is the great increase in the deployment of those vessels, which is occurring now and expected to increase. These larger vessels, commonly referred to in the shipping industry as the "Super Post-Panamax" vessels, are expected to comprise greater percentages of vessel fleet composition over the next several decades. This transition to larger vessels is expected to occur rapidly and current Panamax vessels are expected to no longer be used in the Asia service by 2024. Additional depth would be required to serve existing users of Mobile Harbor by that time, as the transition from the current Panamax fleet is complete.

The McDuffie coal shipments are currently utilizing Cape/Post-Panamax size vessels. At the current channel depth, vessels cannot fully utilize vessel capacity. Coal shippers forecast that the availability of deeper drafts along with an expanded Panama Canal would increase the US coal competitiveness in Asia.

In addition to the economic opportunities afforded by a larger channel, potential environmental opportunities may also occur. A larger channel would also improve port safety, decreasing the hazards of traffic moving in and out of the port as well as navigation features of the channel. Also, sediment material obtained from channel dredging could have beneficial use for future projects.

PLANNING OBJECTIVES AND CONSTRAINTS

Planning objectives are statements that describe the desired results of the planning process by solving or alleviating the above problems and taking advantage of or realizing the opportunities. The following planning objectives were determined:

Problem #1: Larger size vessels experience transit delays due to existing width of channel.

Objective 1. Reduce vessel congestion.

Objective 2. Improve the efficiency of operations for containerships, tankers, bulk carriers and general cargo vessels within Mobile Harbor.

Problem #2: Existing channel depths limit vessel cargo capacity.

Objective 1. Accommodate current and anticipated growth in containerized and bulk cargo and vessel traffic.

Objective 2. Allow more efficient use of containerships and bulk carriers.

Problem #3: Existing traffic congestion has increased safety concerns.

Objective 1. Provide navigation improvements for increased vessel safety,

Constraints are restrictions that limit the planning process. Constraints could include resources, legal, or policy constraints. Plan formulation involves meeting the study objectives while not violating constraints. Constraints which are applicable to this study, are:

- a. There must be adequate disposal area capacity
- b. Dredge material for ODMDS and open water placement must meet state and federal suitability criteria
- c. Avoid or minimize to the extent practicable negative environmental impacts to:
 1. Protected species
 2. Submerged Aquatic Vegetation
 3. Essential Fish Habitat
 4. Existing Natural Resources (marshes, wetlands, and bay bottoms)
 5. Cultural Resources
- d. Avoid or minimize to the extent practicable negative impacts to coastal and sediment transport processes
- e. Avoid or minimize to the extent practicable shoreline erosion

ALTERNATIVES / SELECTED PLAN

The Mobile Harbor Draft GRR/SEIS included evaluation of a future Without-Project condition that would not include any changes to the current channel dimensions. The PDT screened the measures considered to develop an initial array of alternatives to be analyzed to develop a focused array of alternatives. In addition to the non-structural measures, an array of structural measures was identified to address the planning objectives and included modifications to the Bay and Bar Channels, bend easing, and the turning basin. Specifically, this included:

- Deepening – Based on the study objectives, the alternative depths to screen for analysis ranged from 46 to 55 feet with an additional two feet of depth in the Bar Channel.

- Widening - Based on the study objectives, the alternative depths screened for analysis were 500 and 550 feet to allow for two-way traffic within the Bay Channel for up to 15 nautical mile length.
- Bend Easing – Based on study objectives, widening of the two sharpest bends in the Bar Channel would be considered to conform with engineering guidance would allow for 24-hour operations.
- Turning Basin - Based on study objectives, modifications to the turning basin would be considered to conform to proposed design depth alternatives and the proposed design vessel.

Tentatively Selected Plan

The Bar, Bay and River (lower 1,850 feet below station 226+16) Channels of the Mobile Harbor Federal Navigation Project are currently 47, 45, and 45 feet deep, respectively, (as shown in Figure 1-1) with an additional two feet for advanced maintenance plus two feet of allowable overdepth for dredging (total depths of 51, 49, and 49 feet, respectively). Those same channel segments are currently 600, 400, and 600 feet wide, respectively. In addition, the Choctaw Pass Turning Basin, located at the northern limit of the Bay Channel, is currently 45 feet deep by approximately 1,570 feet long (including the 400-foot width of the existing Bay Channel) by 715 feet wide at its easternmost extent. It also contains a 100- foot widener/transition section about 3,500 feet in length along the eastern edge of the existing Bay Channel immediately south of the basin to improve basin access, reduce the basin size needed for turning, and increase vessel maneuverability.

Modifications to these channel features, as recommended in the TSP, are as follows:

- Deepen the existing Bar, Bay (including the Choctaw Pass Turning Basin), and River Channels (south of station 226+16) by five feet to project depths of 52, 50, and 50 feet, respectively, with an additional two feet for advanced maintenance plus two feet of allowable overdepth for dredging (total depths of 56, 54, and 54 feet, respectively).
- Incorporate minor bend easings at the double bends (at stations 1857+00 and 1775+26) in the Bar Channel approach to the Bay Channel.
- Widen the Bay Channel from 400 feet to 500 feet from the mouth of Mobile Bay northward for three nautical miles to provide a two-way traffic area for passing.
- Expand the Choctaw Pass Turning Basin 250 feet to the south (at a depth of 50 feet) to better accommodate safe turning of the design vessel and other large vessels.

PROJECT IMPACTS

Impacts due to the proposed action include direct and indirect impacts. From among the project area resources outline above, specific impacts to the following resources were addressed by USACE: water quality, hydrodynamics, sediment transport, wetlands, submerged aquatic vegetation, oysters, benthic invertebrates, and fisheries.

The USACE Engineer Research and Development Center (ERDC) has conducted modeling and aquatic resource impact assessments for each of these resources. These efforts to evaluate potential impacts from proposed channel modifications are based on deepening the channel to 50 feet, plus two feet of advanced maintenance and two feet of allowable overdepth with a five-mile widener in the lower bay. USACE anticipates the project as-built will likely be something less than those dimensions. Therefore, it is reasonable to assume these habitat assessments represent a worst-case scenario.

Wetlands

Changes in the salinity level of a wetland can alter the vegetative composition function of the system. These effects would occur within tidal freshwater systems, as these systems are not typically adapted to experience high salinity concentrations for increased frequencies or durations. ERDC conducted a detailed study to determine potential effects of the proposed channel expansion on the wetland communities that occur throughout Mobile Bay and MTD (Berkowitz et al., 2018). The areas identified as having the highest likelihood of potential impacts due to the project were the central and southern portions of the MTD.

Tidally influenced freshwater marshes (0-0.5 ppt salt) usually exhibit greater species richness, with mesohaline (5-18 ppt salt) and polyhaline (18-30 ppt salt) having lower species richness. The study concluded that 636 of the 3525 wetland features displaying potential salinity increases > 0.5 ppt. This represents 9.8% of the 72,505-acre study area (Berkowitz et al., 2018). Using mortality threshold data, the study determined that maximum estimated increase in salinity for each vegetative community would not exceed salinity thresholds that would result in mortality.

Wetland productivity during winter, spring, summer, and fall was also analyzed using the ideal growth tolerances developed by the U.S. Department of Agriculture. These salinity ranges represent levels required to result in 10% reduction in plant productivity. As a result, none of the estimated salinity increases within the project area exceeded the tolerance threshold ranges, suggesting no impacts to the productivity of wetland communities.

Submerged Aquatic Vegetation

Potential impacts by salinity increases on SAV communities within Mobile Bay were also reviewed by ERDC. Similar to wetland communities, salinity tolerance thresholds were identified through published literature. The results of their hydrodynamic model indicated that

salinity changes due to project implementation would be less than 2 ppt during the months of January-June. This would increase in July, and peak in October. After considering these predicted increases in salinity, it was determined that the majority of SAV habitat was not predicted to be impacted by salinity changes due to the channel deepening.

Benthic Invertebrates

Benthic invertebrates are an important food source for bottom feeding fishes and other higher trophic organisms. Saltwater intrusion into upstream habitats could affect benthic invertebrates and the species that prey on them.

The area for this study was divided into three zones: estuarine, transitional, and freshwater. Benthic invertebrates were sampled in October 2016 and May 2017. Samples were collected at 40 stations within each zone. Model results were then used to characterize projected salinities following project construction. The study concluded that there is no indication that the freshwater transition point will be affected by the deeper channel (Berkowitz et al., 2018). The distribution and availability of benthic invertebrate prey is unlikely to be affected, thus limiting impact to fish and other species.

Benthic invertebrates, and other bottom dwelling species, could be impacted by dredging or the physical placement of sediment in disposal areas. USACE states that affected areas would recover within 18 months through vertical and lateral migration of remaining individuals. Furthermore, benthic recovery occurs more rapidly in shallow areas, such as Mobile Bay, where resident benthic communities are adapted to dynamic conditions and shifting sediments.

Essential Fish Habitat

The USACE states the Mobile District will implement environmental protection measures to reduce and avoid potential impacts to EFH, as well as other significant resources. Adverse effects to wetlands, SAV, and oyster reefs are expected to be minimum. It is reasonable to assume that benthic and pelagic fauna would be physically affected by dredging and placement activities. However, long term impacts are not anticipated as a result of the TSP. Dredging and placement operations will increase water column turbidity in the localized areas of construction. The USACE considers the overall impact to fisheries resources to be negligible, due to the limited occurrence of EFH in the general vicinity of the project and the temporary and localized nature of the impact.

Fish

According to USACE, salinity tolerance guilds of the fish community in Mobile Bay study areas were identified. Guilds included freshwater only, freshwater entering estuary, resident estuary, marine entering estuary, and marine only. Guilds representing species that are anadromous, catadromous, and freshwater introduced were not included. A total of 162 species were recorded and used by ERDC for the model analysis.

Two of the guilds showed a narrow salinity tolerance range. The Marine guild showed between 20-33 ppt and freshwater only less than five ppt. USACE states that both of these guilds were rarely collected in Mobile Bay. The remaining guilds displayed a much wider range of salinity utilization, suggesting that only large changes in salinity would impact this groups of species.

Berkowitz et al., 2018 concludes that the freshwater entering estuary guild would be the most susceptible to changes in salinity. However, the range this guild occupies suggests the differences between baseline and post-project would have to be much greater than the model suggests.

Sports fish potentially occurring within the project area include red drum (*Sciaenops ocellatus*), spotted seatrout (*Cynoscion nebulosus*), black drum (*Pogonias cromis*), southern flounder (*Paralichthys lethostigma*), and red snapper (*Lutjanus campechanus*). Other common fisheries include striped mullet (*mugil cephalus*), sheepshead (*archosargus probatocephalus*), Atlantic croaker (*Micropogonia undulates*), and hardhead catfish (*Arius felis*). Shellfish include blue crab (*Callinectes sapidus*), American oyster (*Crassostrea virginica*) and three shrimp species (*Penaeus spp.*). Dredging activities suspend sediments and increase turbidity in the water column, and can cause temporary impacts to fish that inhabit the area. Increased suspended sediments in turbid waters can affect all feeding, avoidance, territoriality, and homing behaviors. Wilber and Clarke (2001) noted that changes in fish cough reflex, erratic swimming and pronounced gill flaring can occur due to suspended sediments. The impacts are usually temporary, as fish have the capability to leave the area and return when impacts have subsided.

Protected Species

Below is a list of threatened and endangered species found within the project area. The official designations are also included after the species names including; T- threatened, E- endangered.

Gulf sturgeon (*Acipenser oxyrhynchus desotoi*) – T
Alabama red-bellied turtle (*Psuedemys alabamensis*) - E
West Indian manatee (*Trichechus manatus*) - E
Green sea turtle (*Chelonia mydas*) - T
Leatherback sea turtle (*Dermochelys comacea*) - E
Kemp's ridley sea turtle (*Lepidochelys kempii*) - E
Loggerhead sea turtle (*Caretta caretta*) - T

The USACE states that proposed channel improvements are within the congressionally authorized project dimensions; therefore, the USACE, Mobile District will implement terms and conditions for sea turtles and Gulf sturgeon identified in NMFS-PRD's *Gulf Regional Biological Opinion for Dredging of Gulf of Mexico Navigation Channels and Sand Mining Areas Using Hopper Dredges by COE Galveston, New Orleans, Mobile, and Jacksonville Districts (Consultation Number F/SER/2000/01287)* (GRBO) dated November 19, 2003 (amended 2005 and 2007). These protective measures will be utilized if a hydraulic hopper dredge constructs the

improvement features or performs routine future maintenance of the navigation channel. The project area is outside of designated Gulf sturgeon critical habitat and placement of material will not breach the water surface. Thus, based upon this previous coordination, NMFS-PRD concluded these activities will not likely jeopardize the continued existence of these species.

The endangered Alabama red-bellied turtle inhabits streams, lakes, and sloughs associated with the lower part of the MTD and streams adjacent to Mobile Bay. Extensive beds of submerged and emergent aquatic vegetation are considered to be the principal habitats of the species. Nesting habitat is found along sandy banks and beaches. The USFWS does not anticipate any impacts to this species as a result of the project.

Manatees are known to utilize the Mobile Ship Channel as they migrate throughout Mobile Bay and adjacent rivers. The potential exists for indirect or direct physical impact on manatees which may be migrating through the project area during dredging and material placement activities. The USACE has stated that they will implement the “Standard Manatee Construction Conditions” that have been used for dredging projects in Alabama. The USFWS believes that if these conditions are implemented, there will be no adverse impact to the manatee.

Water Quality

Dissolved Oxygen

USACE performed hydrographic and water quality modeling throughout the project area. ERDC assessed the results of simulations comparing the Without-and With-project conditions of the bay and surrounding waters. The results of the modeling analyses show that no impact from the project is predicted for DO levels in surface or bottom waters and that daily averaged dissolved oxygen conditions would remain unchanged post-project.

Turbidity

Dredging and placement activities will result in a temporary increase in turbidity. The USACE states that during hopper dredging operation, fine sediments (silt, clays, and fine sands) are allowed to wash overboard to maximize the load of sediment for transport to the placement area. This process is one source of turbidity plumes and sedimentation. The distance that plumes may extend is dependent upon other factors such as type of dredge, how it is operated, currents, and the nature of the sediments within the dredged area. Cutterhead suction dredges generate turbidity on at the seafloor by the cutterhead when sediment are suspended.

The Alabama Department of Environmental Management (ADEM) requires USACE to implement appropriate best management practices to minimize turbidity under the ADEM Section 401 Water Quality Certification conditions. Under these conditions, turbidity must not cause substantial visible contrast nor result in an increase of more than 50 Nephelometric Turbidity Units (NTU) above background turbidity levels in state waters. Daily inspections

should ensure that turbidity resulting from dredging and placement activities will not cause the discharge of sediment into wetlands, substantial visible contrast with the receiving waters greater than 400 feet from the activity or result in an increase of 50 NTUs. If these conditions are exceeded at any time, USACE would cease operations and notify ADEM.

Placement Areas

Several sites were evaluated for potential placement of new work material for the TSP. These included six relic shell-mining areas, the ODMDS, and the SIBUA (**Figure 2**).

Relic Shell Mined Area. The Relic Shell Mined Area is located to the Northeast of Gaillard Island on the eastern side of the ship channel. The proposed placement within this site is the result of beneficial use discussions with the cooperating agencies. The agencies suggested that the USACE, Mobile District conduct open bay placement of the dredged material in strategic areas of the bay in an effort to improve bay bottom conditions. One of the primary concerns expressed by the group pertained to the conditions of the bay bottom in the northeastern portion of the bay where oyster dredging operations were conducted prior to 1982. These operations resulted in an overall deepening of the bay bottom and are believed to be the cause of decreased ecological productivity resulting from hypoxia during certain times of the year.

USACE states that placement of new work material in the Relic Shell Mined area would result in some unavoidable impacts. While most of the immobile organisms within the upper reaches of Mobile Bay area are quite adaptable to seasonal changes in temperature, salinity, DO, water clarity and water level fluctuations due to the tidal cycle and weather conditions, the direct placement of the dredged material would destroy some sediment dwelling organisms. Although there would be some destruction of benthos, disturbance of aquatic organisms, reduced aesthetics, and increase in turbidity, the adverse impacts would be minimal and temporary in nature.

SIBUA. The WRDA 1996 authorized practices for beneficial use of dredge material from the ODMDS. The USACE then coordinated with the ADEM to designate an area on the western side of the Bar Channel in which suitable material could be placed when any opportunity arose. Designation of the SIBUA was completed in 1998 and placement of the sandy bar channel maintenance material at this site became the preferred placement option from the bar channel.

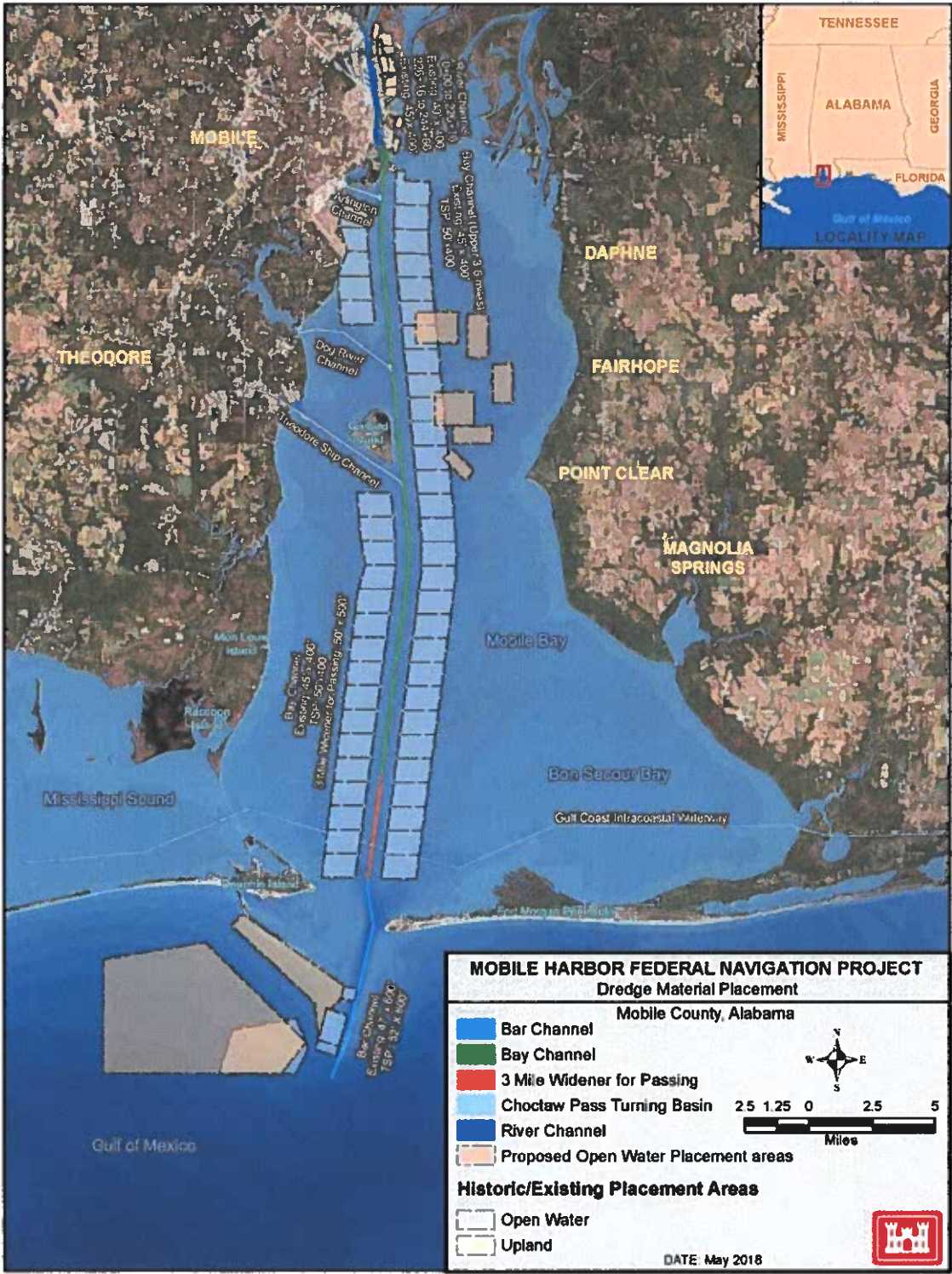


Figure 2. Dredge Material Placement Areas

Currently, no new work material from the Bar Channel is anticipated to be placed in the SIBUA or the northwest extension as part of the TSP. The new work material in the Bar Channel is predominately clays and silts with some intermixed sands. The geotechnical information obtained to-date, indicates that this material does not meet the suitability criteria for placement in SIBUA. Placement of new work material in SIBUA will be considered in the future if sandy material is identified during additional geotechnical investigations of the Bar Channel. Beneficial use of sandy material dredged from the modification other channel segments, if found suitable will be coordinated with the Cooperating Agencies and the interested public.

Under a separate O&M action to increase the long-term capacity of maintenance dredged material, the SIBUA will be expanded to the north and west which follows the shoal and pathway of sediment transport towards Dauphin Island. Doing so provides an effective means of continued bypassing of sand dredged from the Bar Channel to the downdrift littoral system.

ODMDS. The WRDA 1986 authorization for the Mobile Harbor Project required that, all dredged material from the project shall be disposed of in open-water in the Gulf of Mexico in accordance with all provisions of Federal law. Since that time, the 1994 and 1996 WRDA authorizations included language that allowed placement options of suitable material in the SIBUA as well as open water (thin layer) placement within the bay adjacent to the channel. The EPA Region 4 is pursuing the proposed ODMDS expansion pursuant to Section 102 of the MPRSA.

There will likely be some temporary and localized impacts resulting from the ODMDS placement. Placement operations will result in the temporary increase of suspended sediments and nutrients, loss of benthic organisms, and bathymetric changes in the ocean bottom. The increase in turbidity will reduce light penetration through the water column, thereby, reducing photosynthesis, surface water temperatures, and aesthetics.

Mitigation

The USACE states that based on the minimal level of impacts determined for the implementation of the TSP and future project maintenance and operations, no compensatory mitigation is proposed for this action. ERDC models predict no loss of wetlands, SAV, oysters, and recreational and/or commercial fisheries. The USACE does not anticipate significant adverse effects to ESA-listed species or marine mammals based on their analyses.

Several avoidance and minimization measures are proposed to ensure that impacts are insignificant; these include the following:

- 1) Comply with all water quality standards and conditions issued in the water quality certification and adhere to monitoring protocols in the water quality monitoring plan.
- 2) Dredge practices will adhere to the GRBO (2003, and amended in 2005 and 2007).

- 3) Implement additional conservation measures required by NMFS and USFWS for ESA-listed species.
- 4) Beneficial placement strategies for new work material.
- 5) Continue working with cooperating agencies during the planning, preliminary engineering and design, and construction phases.

FISH AND WILDLIFE CONSERVATION MEASURES AND RECOMMENDATIONS

The USACE has requested section 7 consultation with the USFWS or NMFS. The USFWS provides the following suggestions regarding protected species, as undertaking these measures will also afford benefits to fish and wildlife species using the same habitats:

- USACE must make all practicable efforts to avoid collisions between dredging equipment (and support vessels) and West Indian manatee, particularly during construction activities occurring during summer months, and engage measures to minimize the risks of collisions. USACE is expected to implement the “Standard Manatee Construction Condition for Projects in Alabama” that USFWS has recommended in the past for similar projects.
- USACE must make all practicable efforts to avoid collisions, entrainment in dredging equipment, and other disturbances affecting Gulf sturgeon, loggerhead, green, leatherback, and Kemp's ridley sea turtles. The USACE must implement the terms and conditions in the GRBO dated November 19, 2003 (amended 2005 and 2007)
- USACE must make all practicable efforts to avoid effects to piping plover and red knot due to dredging and disposal activities (noise and other disturbances, as well as habitat alteration) within or near potential wintering areas, and adopt measures to minimize the risk of such effects.
- During nighttime dredging activities, all lighting necessary for equipment and support vessel operation should be directed downward to minimize effects on migratory birds.
- USACE should continue coordination with federal, state, and local resource agencies to explore the beneficial use of suitable dredged material to restore coastal habitats in Mobile Bay or MTD. Where appropriate, dredged material should be placed such that it contributes to downdrift littoral systems.

Pursuant to the Magnuson-Stevens Act, USFWS recommends the following:

- USACE should seek consultation with NMFS if EFH is adversely affected, and develop EFH avoidance and minimization measures. Restoration for lost EFH or improvements to existing EFH should be considered where avoidance and minimization is not feasible.

USFWS POSITION

Implementation of the TSP may impact fish and wildlife resources directly and indirectly as a result of dredging and placement activities. The fish and wildlife resources likely to be directly and indirectly affected include the estuarine water column, tidal wetlands, EFH, fish and shellfish, and protected species. USFWS does not oppose implementation of the TSP, but is still concerned that the project may be dredged more deeply than is absolutely necessary. Further minimization of impacts could be accomplished by dredging to a shallower depth. Protection of recreational opportunities (i.e., fishing) is another priority for USFWS, and avoiding dredging near sportfish congregating and spawning areas during critical periods is strongly encouraged. Finally, USFWS recommends the development of a comprehensive environmental monitoring program to verify that project impacts do not exceed model predictions. We encourage USACE to continue to work with resource agencies, and others, to develop beneficial use projects that protect recreational opportunities within Mobile Bay and MTD.

LITERATURE CITED

Alabama Department of Conservation and Natural Resources. 2015. Division of Wildlife and Freshwater Fisheries. Alabama Wildlife Action Plan.

Alabama State Port Authority, 2015. <http://www.asdd.com/>

Alabama Wildlife Federation (AWF) 2016. <http://www.alabamawildlife.org/>

Berkowitz, J.F., Altman, S., Reine, K., Wilbur, D., Kjelland, M.E., Gerald, T., ... Saltus, C.L. 2018. Environmental Monitoring of Mobile Bay Aquatic Resources and Potential Impacts of the Mobile Harbor General Reevaluation Report. U.S. Army Engineer Research and Development Center. 303pp.

Mettee, M.F., P.E. O'Neil, and J.M. Pierson. 1996. Fishes of Alabama and the Mobile Basin. Oxmoor House, Inc., Birmingham, Alabama. 820pp.

Mettee, M.F., P.E. O'Neil, T.E. Shepard, S.W. McGregor, and W.P. Henderson, Jr. 2005. Paddlefish Movement in the Alabama River, 2001-2005. Open-File Report 0523. Geological Survey of Alabama.

Mobile Bay National Estuary Program, 1997, Hard Rain: A Report from the Mobile Bay National Estuary Program. http://www.mobilebaynep.com/site/new_pubs/Publications/

Wilber, D.H., and Clarke, D.G. 2001. "Biological effects of suspended sediments: A review of suspended sediment impacts on fish and shellfish with relation to dredging activities in estuaries," *North American Journal of Fisheries Management* " 21(4):855-875.

ENVIRONMENTAL APPENDIX C

ATTACHMENT C-5

TRANSPORTATION ANALYSIS

SECTION 1. Affected Environment

1.1. Transportation

This section describes an overview of existing transportation resources within the project area, and the potential impacts on these transportation resources that would be associated with the Proposed Action and No Action alternative. Components of transportation resources that are analyzed include roads, traffic, railroads and airports.

1.1.1. Highways and Roadways

1.1.1.1. Interstate Highways

Interstate (I-) 10 is the most southern major highway connector in the United States; it travels in an east-west direction, linking Florida to California. In the southeastern United States, I-10 stretches from Jacksonville, Florida, to Houston, Texas, covering a majority of the coastline of the Gulf of Mexico. Along the Gulf, major seaports, including Pensacola, Florida; Mobile, Alabama; Gulfport, Mississippi; New Orleans, Louisiana; and Houston, Texas, are linked. Mobile is located at approximately the halfway point between Houston, Texas, and Jacksonville, Florida. I-10 in the vicinity of the Mobile Harbor is a multi-lane (6 to 8 lanes), divided interstate level highway with controlled access. The speed limit is signed for 65 to 70 miles per hour (mph) ([USACE 2003](#)).

To the west of the harbor, I-10 has numerous interchanges with the Mobile Central Business District (CBD) and then crosses under the Mobile River by means of the Wallace Tunnels, a four-lane facility. Hazardous truck cargoes must bypass the tunnels by exiting at Water Street and detouring to cross the Mobile River via the Cochrane-Africatown USA Bridge to the north. I-10 then crosses the Mobile Bay by the four-lane I-10 Bayway to the Eastern Shore (Daphne in Baldwin County). I-10 continues east to Florida.

The I-10 tunnels cross the proposed activities at Mobile Harbor and are in close proximity to the northern portion of the proposed channel activities. The three closest interchanges on the west side of the harbor are located at Broad Street, Virginia Street, and Texas Street. In 2016, the average daily traffic count was 71,940 on I-10 between Broad Street and Texas Street ([Alabama Department of Transportation \[ALDOT\] 2016](#)). The closest interchange to the harbor on the east side is at Battleship Parkway/US-90. The ALDOT reports that in 2016, 75,320 vehicles travelled through the George C Wallace tunnel crossing the channel daily ([ALDOT 2016](#)).

In Mobile, about 5 miles west of the proposed Mobile Harbor and Channel activities, I-10 has a major interchange with I-65 providing easy access to the north. I-65 is routed north to Montgomery, where it intersects with I-85 northeast to Atlanta, Georgia; continuing to Birmingham, I-65 intersects with I-59 and I-20; and then to Huntsville and major cities to the north in the Midwest region of the United States. I-165 connects downtown Mobile with I-65 approximately 5 miles northwest of where the I-10 tunnels cross the Mobile River ([Google Earth](#)

2018a, FHA and ALDOT 2014). Currently, trucks carrying hazardous materials are detoured off the I-10 at either the I-65 or I-165 interchanges, or along surface streets. Trucks then travel north to cross the Mobile River on the Cochrane-Africatown Bridge (FHA and ALDOT 2014).

The I-10 Wallace Tunnels are currently nearing their capacity and have congestion during peak hours of use. However, a project to increase capacity for the I-10 corridor crossing of the Mobile River and Mobile Bay is currently proposed. The project is designated as the I-10 Mobile River Bridge and Bayway Widening (Project DPI-0030(005)). The Proposed Action includes eleven miles of improvements to the I-10 corridor from Broad Street in Mobile County to just east of the US 98 interchange in Daphne, Baldwin County, Alabama. The proposed improvements consist of: the widening of I-10 from Broad Street eastward to the proposed bridge; deletion of the existing Texas Street interchange; modification of the existing Virginia Street interchange; construction of a six-lane, cable-stayed bridge with 190 feet of vertical clearance over the Mobile River navigation channel; widening the I-10 Bayway by two lanes to the inside (resulting in a total of eight lanes); and tapering the eight lanes from the Bayway into the existing I-10 corridor in the vicinity of the existing US 98 interchange in Daphne (ALDOT/FHWA 2003). The proposed Mobile River I-10 Bridge will provide for additional capacity with acceptable level of service through the design year 2025. Additionally, a detour to the Cochrane-Africatown Bridge for hazardous truck cargoes will no longer be required. The Wallace Tunnels will remain as a “business” connector to the downtown area. Traffic studies and modelling associated with the I-10 bridge and bayway project revealed that by the year 2030, most of the interchanges in the Mobile Harbor area would be operating at level of service (LOS) D or F during peak hours (FHA and ALDOT 2014).

1.1.1.2. Surface Streets

Direct access for the Mobile Harbor to I-10 and its connecting network can be made by Broad Street and Virginia Street to their interchanges with I-10. A variety of other surface streets provide access to the harbor including Old Water Street, Water Street and State Docks Road (Google Earth 2018a). Currently, Broad Street and Virginia Street are two-lane roadways between the harbor and I-10.

1.1.1.3. Harbor-Related Truck Traffic

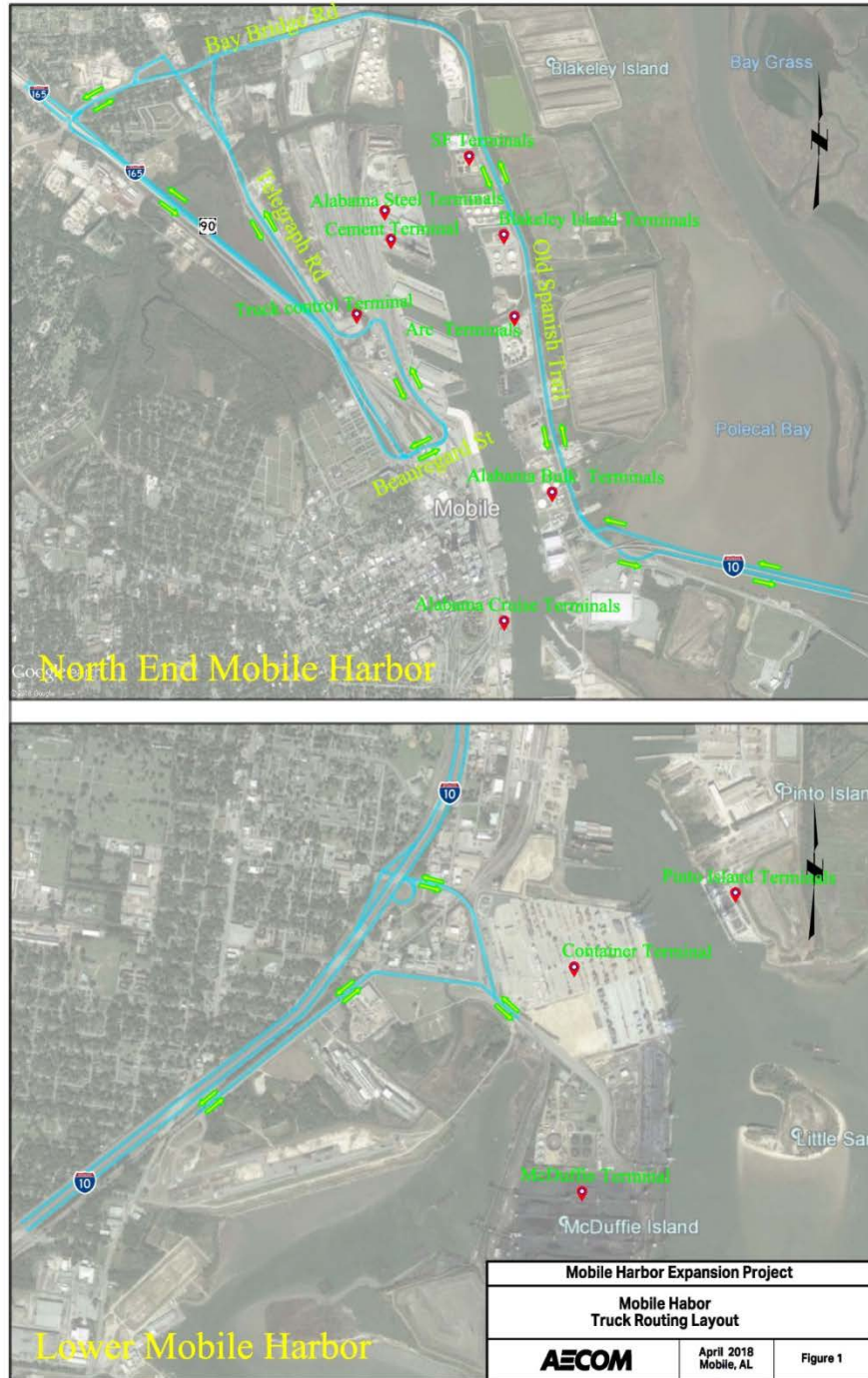
Traffic patterns for cargo at the North End of Mobile Harbor are different from the Lower End of Mobile Harbor. The North End of the Mobile Harbor moves petroleum, asphalt, metals, forest products and poultry. For terminals located on Blakeley Island off of Old Spanish Trail, freight will either travel south to I-10 or north to I-165 using the Cochran Africatown USA Bridge and New Bay Bridge Road. Terminals located off of Telegraph Road travel south to Beauregard Street and then to I-165 or north to Conception Street, New Bay Bridge Road and then to I-165. A map of the north end truck routes is shown in Figure X-1 (AECOM 2018).

Lower Mobile Harbor consists of three terminals:

- Container Terminal

- McDuffie Coal Terminal
- Pinto Terminal

Figure X-1. Mobile Harbor Truck Routes



The Container Terminal is served by ship, truck and rail. The McDuffie Coal Terminal and Pinto Terminal only move cargo through ship, rail or barge. Only service vehicles and employees utilize the roadway system from these two terminals. There is terminal to terminal movement for vehicles along Baker Street and terminal to I-10 movement along Ezra Trice Boulevard to Virginia Street. A Map of the lower harbor truck routes is shown in [Figure X-1](#) (AECOM 2018).

1.1.1.4. Annual Average Daily Traffic Counts

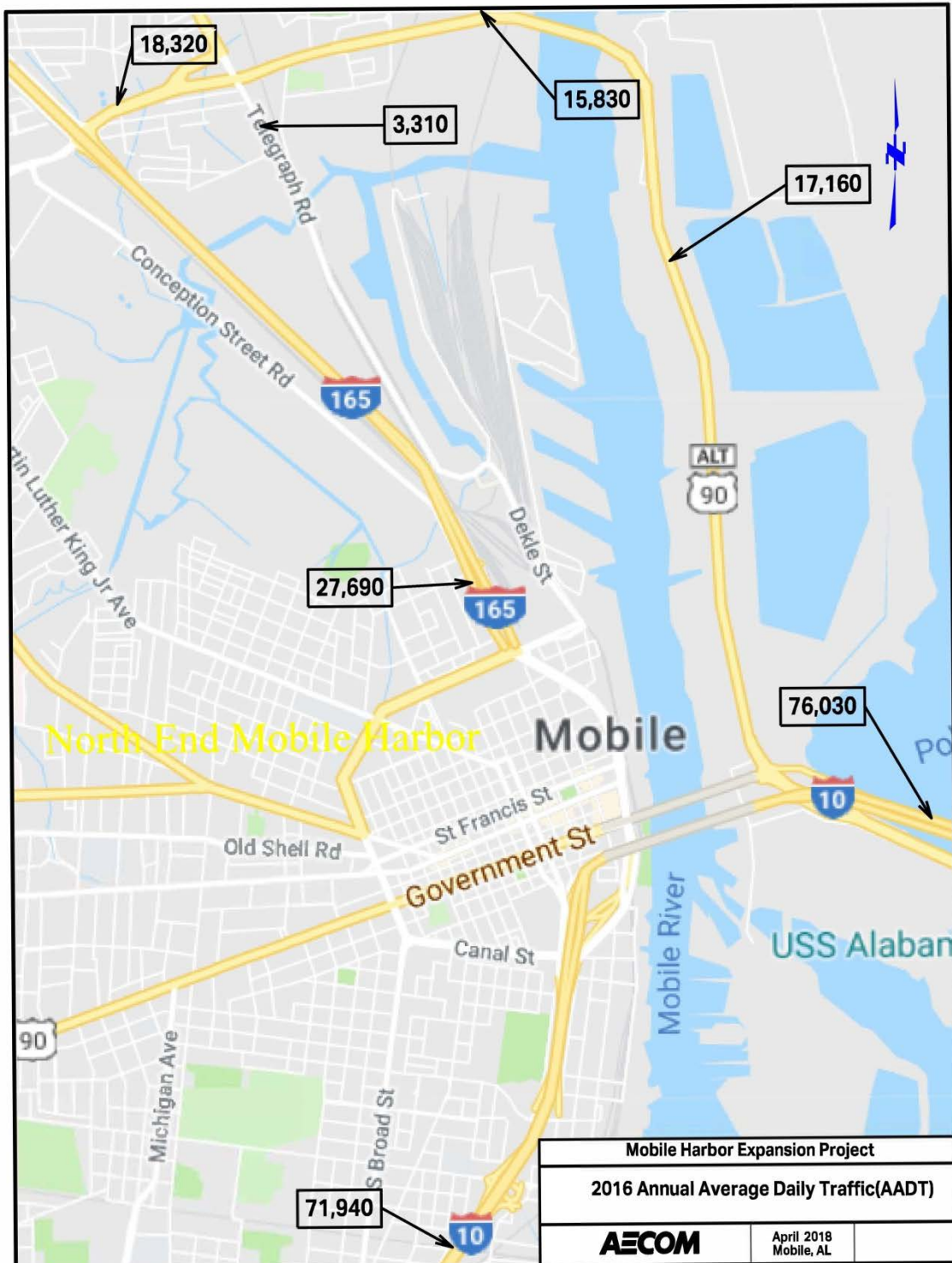
Annual average daily traffic counts (AADT) were collected by ALDOT in 2016 and are presented in [Table X-1](#). Generally, traffic levels are highly variable in the vicinity of the port, depending on which roads are examined. Overall, the freeways (I-10, I-65, and I-165) are more travelled than the smaller surface roads and State Highways (ALDOT 2016). [Figure X-2](#) shows a map of the AADT traffic counts for 2016.

Table X-1: AADT in the vicinity of Mobile Harbor

Intersection/Segment	2016 AADT
Bay Bridge Road/Peter Lee Street	19,370
Cochrane-Africatown Bridge - West	15,830
Cochrane-Africatown Bridge -East	16,650
Baybridge Road/US-90	18,320
US-90/Beauregard Street	27,690
Beauregard Street/US-90	11,410
US-98/St. Emanuel Street	23,290
I-10 between Texas and Canal Streets	64,890
I-10 at Baltimore Street	71,940
I-10 Bayway - West	76,030
US-90 Bayway - West	16,990
US-90 north of I-10 - West	17,160
Telegraph Road/Edwards Street	8110
Telegraph Road/Traffic Street	3110

Source: [ALDOT 2016](#)

Figure X-2: ALDOT Traffic counts for 2016 near the Port of Mobile.



18,320

3,310

15,830

17,160

27,690

76,030

71,940

ALDOT does not analyze LOS unless a particular project calls for a traffic study. The FHA and ALDOT completed a Draft EIS for the construction of a bridge over the Mobile River and the widening of the I-10 Bayway. A traffic study was completed during this analysis. Part of this study was a projection of LOS in 2030 on portions of the existing I-10. Table X-2 presents the conclusions from this analysis. The predictions reveal that by 2030, most of the I-10 in the vicinity of Mobile Harbor would be operating at an LOS of D or worse during peak conditions (FHA and ALDOT 2014). LOS is calculated in different ways for different road types. Generally, for a typical freeway segment, LOS F occurs when there are more than 28 vehicles per lane per kilometer (Mathew and Rao 2006).

Table X-2: Predicted 2030 LOS in the vicinity of Mobile Harbor

Roadway	Location	Direction	2030 Peak Hour LOS
I-10 West of Project	West of Duval Street	Eastbound	D
		Westbound	D
I-10 Mobile	Between Broad St. and Virginia St.	Eastbound	E
		Westbound	E
I-10 Wallace Tunnels	Under Mobile River	Eastbound	F
		Westbound	F
I-10 Bayway	Between Mid-Bay Interchange and US 90/98	Eastbound	F
		Westbound	F
I-10 East of Project	East of US 98	Eastbound (2 lanes)	F
		Eastbound (3 lanes)*	D
		Westbound (2 lanes)	F
		Westbound (3 lanes)*	D
Cochrane Africatown Bridge	Over Mobile River	Eastbound	D
		Westbound	D
Bankhead Tunnel	Under Mobile River	Eastbound	F
		Westbound	F

*ALDOT has an approved project to widen I-10 to three lanes, to the east in both directions, between the I-10/US 98 interchange and SR 181.

Source: FHA and ALDOT 2014

The Florida Department of Transportation (FDOT) developed LOS tables for future roadway planning purposes by looking at travel lanes available, AADT, and speed limit within urbanized or rural areas. These tables were utilized to estimate the existing and future roadway capacity in the area of the Mobile Port. A LOS “D” which consists of a high density but stable traffic flow is considered an acceptable level for urban design purposes. Table X-3 summarizes the vehicle capacity of the existing roadway system (AECOM 2018).

Table X-3: Existing Roadway Capacity

Route	Roadway Laneage	Existing Capacity (LOS D)	2016 ADT	Under Capacity	% Trucks	Speed Limit
AI 13 (Telegraph Rd)	4 lane undivided	24,300	3,310	yes	18%	30
AL 16 (Old Spanish Trail)	4 lane undivided	29,850	17,160	yes	13%	55

Table X-3: Existing Roadway Capacity

Route	Roadway Laneage	Existing Capacity (LOS D)	2016 ADT	Under Capacity	% Trucks	Speed Limit
AL 16 (Baybridge Rd)	4 lane divided	39,800	15,830	yes	14%	45
AL 16 (New Baybridge Rd)	4 lane divided	39,800	18,320	yes	16%	40
I-10	4 lane Interstate	77,900	76,030	yes	15%	65
I-10	8 Lane Interstate	154,300	71,940	yes	13%	65
I-165	6 lane Interstate	116,600	27,690	yes	8%	65

1.1.1.5. Rail Transportation

The public terminals at the Mobile Port are connected to two interstate systems (I-10 and I-65) and five Class I railroads- CSX, Canadian National, Burlington Northern Santa Fe (Alabama & Gulf Coast Railroad), Norfolk Southern, and Kansas City Southern. All-water, rail connections into Mexico's national railroad system is offered by C.G. Railway every four days between Mobile and Coatzacoalcos, Mexico ([Alabama Department of Commerce 2016](#)).

1.1.2. Air Transportation

1.1.2.1. Mobile Downtown Airport

Mobile Downtown Airport, previously and locally known as Brookley Field, is located approximately 2.75 miles southwest of the Mobile Harbor turning basin. This facility is a former U.S. Air Force Base. The closing of Brookley Field was initiated in 1964, and the City of Mobile accepted ownership on July 3, 1969. Management of the facility was transferred to the Mobile Airport Authority in 1982. The facility is now managed by the Mobile Airport Authority as a public facility, with private aviation and non-aviation light industrial companies located on the property ([USACE 2003](#)). The airport currently also houses the Mobile Aeroplex at Brookley ([Mobile Aeroplex at Brookley 2018](#))

Airport services include the availability of 100LL JET-A fuel, hangars, tiedowns, major airframe repair, and major power plant service and repair. Other services available include air cargo, charter flights, flight instruction, aircraft rental, and aircraft sales ([SkyVector 2018](#)).

The Mobile Downtown Airport has two major runways as follows:

- Runway 14/32 – 9618x150 feet with precision instrument and high-intensity edge and approach lighting, and
- Runway 18/36 – 7800x150 feet with medium intensity edge lighting ([SkyVector 2018](#)).

Currently, there are 31 aircraft based at the field with a breakdown as shown in Table [X-4](#).

Table X-4: Aircraft based in the Mobile Downtown Airport

Classification	Number
Single engine airplanes	21
Multi-engine airplanes	4
Jet airplanes	5
Helicopters	1

Source: [SkyVector 2018](#)

In 2017, there were 1,774 commercial aircraft operations, 42,095 military operations, 2,792 air taxi operations, 4,710 local operations, and 10,451 itinerant operations ([SkyVector 2018](#)).

Sufficient additional capacity for flights at the field is available to support additional intermodal transfer of containerized cargo if needed. Space is also available for development of support facilities for such shipping. In addition, the Mobile Downtown Airport is very accessible to transfer containerized cargo from the Alabama State Port Authority (ASPA) Choctaw Point Terminal by truck using I-10 or surface streets or, if necessary, by rail ([USACE 2003](#)).

1.1.2.2. Mobile Regional Airport

Mobile Regional Airport is the primary commercial passenger airport serving the Mobile area. It is located approximately 11 miles west of the Mobile Harbor turning basin and does not have rail access. The primary highway routes between the harbor and the airport are I-10, I-65, and Airport Boulevard ([Google Earth 2018b](#)).

1.1.3. Water Transportation

The USACE tracks port and dock facilities throughout the country. The Master Docks list available at <http://www.navigationdatacenter.us/ports/ports.htm>, lists 433 docks in the City of Mobile at 147 facilities owned by 55 different entities. Of these docks, 386 are capable of handling cargo. Table X-5 shows the docks owned by the State of Alabama at the Port of Mobile ([USACE 2018](#)).

Table X-5: Docks facilities owned by ASPA

Navigation Unit ID	City	Facility Location	Facility Owner Name	Facility Type	Cargo Handling Ability
38773	Mobile	Alabama Shipyard, Pier L	Alabama Shipyard, Inc.	Dock	Yes
28262	Mobile	Alabama State Docks Department	Alabama State Docks Department	Dock	Yes
28262	Mobile	Farmers Grain Dock, Alabama State Docks	Alabama State Docks Department	Dock	Yes

Table X-5: Docks facilities owned by ASPA

Navigation Unit ID	City	Facility Location	Facility Owner Name	Facility Type	Cargo Handling Ability
28262	Mobile	Pier 2	Alabama State Docks Department	Dock	Yes
28262	Mobile	Pier 3	Alabama State Docks Department	Dock	Yes
28262	Mobile	Pier 4	Alabama State Docks Department	Dock	Yes
28262	Mobile	Pier 5	Alabama State Docks Department	Dock	Yes
28262	Mobile	Pier 6	Alabama State Docks Department	Dock	Yes
28262	Mobile	Pier 7	Alabama State Docks Department	Dock	Yes
28262	Mobile	Pier 8	Alabama State Docks Department	Dock	Yes
28262	Mobile	Pier A River	Alabama State Docks Department	Dock	Yes
28262	Mobile	Pier A North	Alabama State Docks Department	Dock	Yes
28262	Mobile	Pier A South	Alabama State Docks Department	Dock	Yes
28262	Mobile	Pier River B	Alabama State Docks Department	Dock	Yes
28262	Mobile	Pier North B	Alabama State Docks Department	Dock	Yes
28262	Mobile	Pier South B	Alabama State Docks Department	Dock	Yes
28262	Mobile	Pier River C	Alabama State Docks Department	Dock	Yes
28262	Mobile	Pier North C	Alabama State Docks Department	Dock	Yes
28262	Mobile	Pier South C	Alabama State Docks Department	Dock	Yes
28262	Mobile	Pier D	Alabama State Docks Department	Dock	Yes
28262	Mobile	Pier D-2	Alabama State Docks Department	Dock	Yes
28262	Mobile	South D	Alabama State Docks Department	Dock	Yes

Table X-5: Docks facilities owned by ASPA

Navigation Unit ID	City	Facility Location	Facility Owner Name	Facility Type	Cargo Handling Ability
30644	Mobile	Alabama State Docks Department, Pier B and Slip C End Wharf.	Alabama State Docks Department.	Dock	Yes
30646	Mobile	Alabama State Docks Department, Pier D South Grain Elevator Wharf.	Alabama State Docks Department.	Dock	Yes
30650	Mobile	Alabama State Docks Department, Pier A North Wharf and Slip B End Wharf.	Alabama State Docks Department.	Dock	Yes
30343	Mobile	Jordan Pile Driving, South Bank Mooring.	Alabama State Docks Department.	Dock	Unknown
30443	Mobile	Alabama State Docks Department, Industrial Canal North Wharf.	Alabama State Docks Department.	Dock	Yes
30444	Mobile	Alabama State Docks Department, Industrial Canal South Wharf.	Alabama State Docks Department.	Dock	Yes
30463	Mobile	Alabama State Docks Department, McDuffie Terminal Barge-Cleanup Wharf.	Alabama State Docks Department.	Dock	Yes
30463	Mobile	Alabama State Docks Department, McDuffie Terminal Barge-Cleanup Wharf.	Alabama State Docks Department.	Dock	Yes
30464	Mobile	Alabama State Docks Department, McDuffie Terminal Ship Wharf No. 1.	Alabama State Docks Department.	Dock	Yes
30464	Mobile	Alabama State Docks Department, McDuffie Terminal Ship Wharf No. 1.	Alabama State Docks Department.	Dock	Yes
30482	Mobile	Alabama State Docks Department, McDuffie Terminal Ship Wharf No. 2.	Alabama State Docks Department.	Dock	Yes
30560	Mobile	Alabama State Docks Department, McDuffie Terminal Barge Mooring.	Alabama State Docks Department.	Dock	Yes
30560	Mobile	Alabama State Docks Department, McDuffie Terminal Barge Mooring.	Alabama State Docks Department.	Dock	Yes

Table X-5: Docks facilities owned by ASPA

Navigation Unit ID	City	Facility Location	Facility Owner Name	Facility Type	Cargo Handling Ability
37366	Mobile	Central Gulf Railway (CGI), Choctaw Point	Alabama State Docks Department.	Dock	Yes
38252	Mobile	P & H Construction Corp., Mobile Dock	Alabama State Docks Department.	Dock	Yes
38252	Mobile	P & H Construction Corp., Mobile Dock	Alabama State Docks Department.	Dock	Yes
38253	Mobile	University Of South Alabama, Boathouse Slip	Alabama State Docks Department.	Dock	No
38254	Mobile	Radcliff/economy marine services, pier no. 4	Alabama State Docks Department.	Dock	Yes
37366	Mobile	Alabama State Docks Choctaw Point	Alabama State Docks Department.	Dock	Yes
38257	Mobile	Crescent Towing & Salvage Co., River A Wharf	Alabama State Docks Department.	Dock	No
38264	Mobile	Term R/W ALA State Docks Dept E Side Transfer BR	Alabama State Docks Department.	Dock	Yes
38775	Mobile	Damrich Coatings, Mobile Wharf	Alabama State Docks Department.	Dock	No
38795	Mobile	International Paper Co Industrial Canal Dock	Alabama State Docks Department.	Dock	No
38795	Mobile	International Paper Co Industrial Canal Dock	Alabama State Docks Department.	Dock	No
38797	Mobile	Alabama State Docks Dept Industrial Canal Mooring	Alabama State Docks Department.	Dock	No
38798	Mobile	Dana Marine Service Industrial Canal Dock	Alabama State Docks Department.	Dock	No
38799	Mobile	Glenn Towing, Industrial Canal Wharf	Alabama State Docks Department.	Dock	No
38258	Mobile	Term Railway ALA STATE Dock West Side Transfer BRG	Alabama State Docks Department.	Dock	Yes
38796	Mobile	H&B Welding Service, Industrial Canal Dock	Alabama State Docks Department.	Dock	No
38796	Mobile	H&B Welding Service, Industrial Canal Dock	Alabama State Docks Department.	Dock	No
37366	Mobile	Mobile Container Terminal, LLC	Alabama State Docks Department.	Dock	Yes

Table X-5: Docks facilities owned by ASPA

Navigation Unit ID	City	Facility Location	Facility Owner Name	Facility Type	Cargo Handling Ability
30650	Mobile	Alabama State Docks Department, Pier A North Wharf and Slip B End Wharf.	Alabama State Docks Department; and Mobile Bay Towing, a Hvide Marine Co.	Dock	Yes
28259	Mobile	McDuffie Terminal No. 3	Alabama State Docks Dept McDuffie Term Ship Wharf	Dock	Yes
28259	Mobile	McDuffie Terminal No. 3	Alabama State Docks Dept McDuffie Term Ship Wharf	Dock	Yes
28259	Mobile	Alabama State Docks Dept McDuffie Term Ship Wharf	Alabama State Docks Dept McDuffie Term Ship Wharf	Dock	Yes
28259	Mobile	Alabama State Docks Dept McDuffie Term Ship Wharf	Alabama State Docks Dept McDuffie Term Ship Wharf	Dock	Yes
28259	Mobile	Corus Direct Reduced Iron (DRI)	Alabama State Docks Dept McDuffie Term Ship Wharf	Dock	Yes
28259	Mobile	Corus Direct Reduced Iron (DRI)	Alabama State Docks Dept McDuffie Term Ship Wharf	Dock	Yes
28259	Mobile	McDuffie Terminal No. 1	Alabama State Docks Dept McDuffie Term Ship Wharf	Dock	Yes
28259	Mobile	McDuffie Terminal No. 1	Alabama State Docks Dept McDuffie Term Ship Wharf	Dock	Yes
28259	Mobile	McDuffie Terminal No. 2	Alabama State Docks Dept McDuffie Term Ship Wharf	Dock	Yes
28259	Mobile	McDuffie Terminal No. 2	Alabama State Docks Dept McDuffie Term Ship Wharf	Dock	Yes

1.1.4. Public Transportation

The Wave Transit System, funded by the City of Mobile, is the largest fixed-route transit system in the region. It provides service within Mobile limits, limited service into Prichard to the north, and paratransit service, in accordance with the Federal Transit Authority mandated 3/4 of a mile to those who qualify and neighborhood curb-to-curb service in predefined areas. Wave Transit operates a network of 14 fixed routes and one downtown circulator in Mobile. According to the Mobile Transit Development Plan, all fixed-route services operate Monday through Saturday, with weekday operations beginning between 5 a.m. and 6 a.m. Nine weekday routes in the Wave Transit system end at 7:25 p.m. or earlier, with the remaining weekday routes ending between 9:55 p.m. and 10:25 p.m. Weekend service routes begin between 6 a.m. and 7 a.m., ending around the same time as weekday service routes. All fixed-route services operate on a

60-minute frequency with the exception being *moda!*, a fare-free downtown circulator that arrives every 10 to 20 minutes (SARCOR et al. 2014).

Some populations have a higher propensity to take public transit than the national average. These populations include the young, elderly, low income, those with no access to personal vehicles, and minorities. Downtown, northwest of downtown along I-165 into Prichard, and southwest along I-10 just north of the Brookley Aeroplex are the areas with the highest propensity for transit. These areas currently have fixed route bus service from Routes 5, 9, 11, and 16 (SARCOR et al. 2014). These areas are also close to the Port of Mobile.

Less than one percent of the working population, ages 16 and older, use public transportation for their commute in Mobile and Mobile County. Of those without access to a vehicle, only 7.6 percent of individuals and 8.6 percent of individuals, respectively, use public transportation to commute. Even though the majority of the jobs are located within the city, many workers do not use public transportation. This could be attributed to living outside of the public transportation service area, the commute is during hours when transit is out of service, or the frequency of the transit is not sufficient for adequate travel times (SARCOR et al. 2014).

Most bus routes converge on the CBD which is immediately west of the Port of Mobile. The routes traveling along the active port area include 5, 9, 11, and 16 (SARCOR et al. 2014).

1.2. No Action Alternative

The available annual average daily traffic (AADT) volumes from the street system surrounding the port were used to estimate past traffic growth by calculating the linear growth between the years 2011 to 2016. The vehicular growth is shown in Table X-6 (AECOM 2018).

Table X-6 Projected AADT Growth

Route	Growth Rate per Year	2016 ADT	2015 ADT	2014 ADT	2013 ADT	2012 ADT	2011 ADT
AI 13 (Telegraph Rd)	-8.0%	3,310	3,230	3,170	5,780	5,730	5,033
AL 16 (Old Spanish Trail)	8.4%	17,160	16,750	16,420	11,420	11,330	11,440
AL 16 (Baybridge Rd)	1.5%	15,830	15,450	15,150	15,150	-	-
AL 16 (New Baybridge Rd)	-0.2%	18,320	17,880	17,530	18,480	18,330	18,520
I-10	0.4%	76,030	75,500	77,000	75,180	-	
I-10	-0.9%	71,940	79,430	75,520	73,630	-	75,350
I-165	4.9%	27,690	26,100	21,400	21,060	20,850	21,780

Population growth of Mobile and Baldwin Counties was also considered. 2010 Census data and population predictions from the University of Alabama's Center for Business and Economic

Research for a 6.2 percent increase between 2010 and 2014 were used to estimate the yearly growth rate. The population growth rate is shown in **Table X-7** (AECOM 2018).

Table X-7: Population Growth Rate

2010 Census Data	2040 UA Research	Growth Rate per Year	2066 Estimated
412,992	438,598	0.2%	461,885

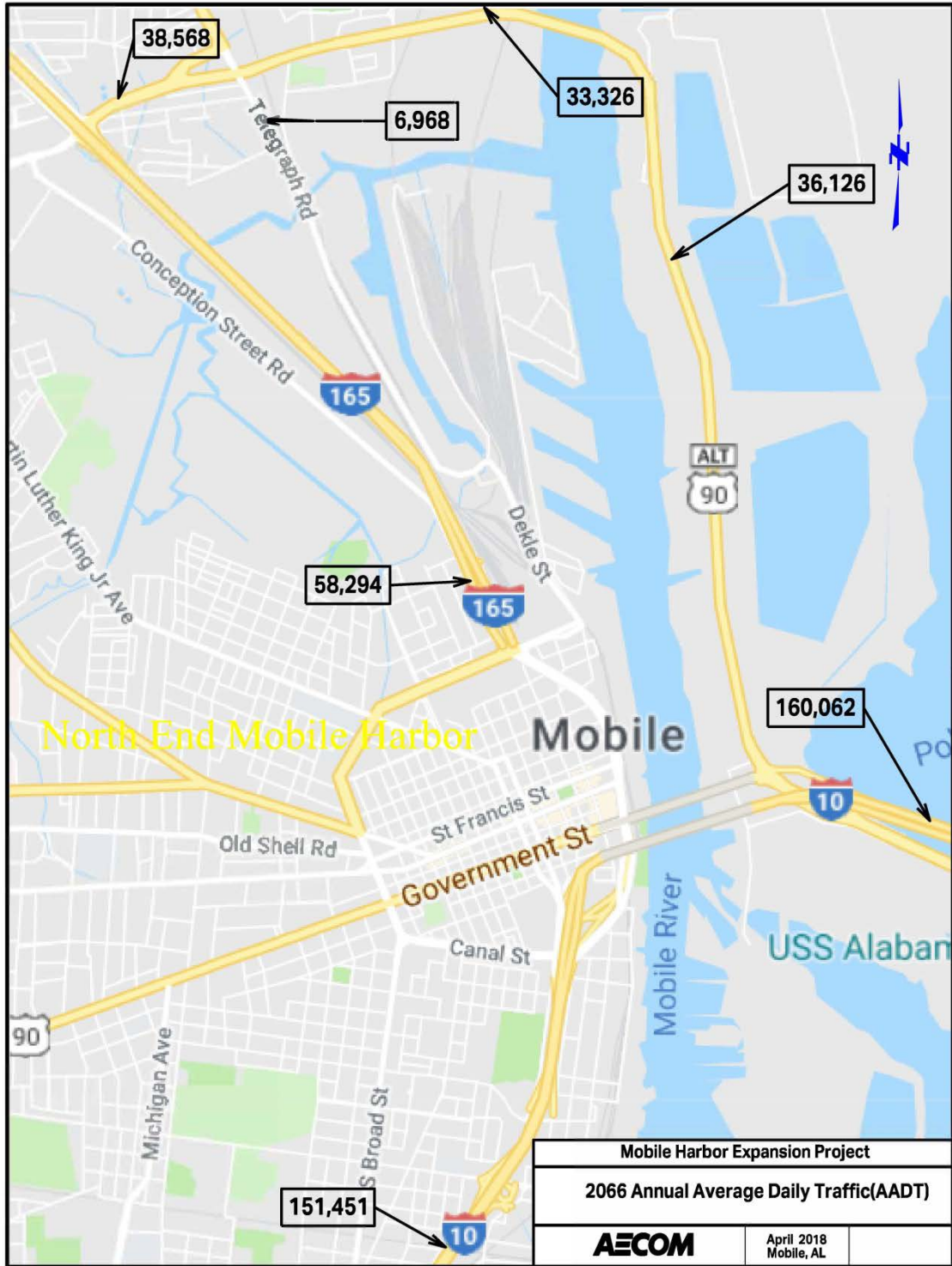
The traffic volumes on Telegraph Road and Old Spanish Trail varied greatly over the last 5 years while Baybridge Road and I-10 remained fairly consistent. Interstate I-165 showed an increase in traffic especially in year 2016 and 2017. Traffic predictions are generally forecasted for a 20 year period for roadway improvement projects and past growth can be a good indication of future growth. However, for the 50 year timeframe used in this study, the low population growth prediction was considered. Rather than apply negative growth rates to some of the roadways and high growth rates to others over a 50 year period, a conservative 1.5 percent growth rate from the base year of 2016 was applied (AECOM 2018). **Table X-8** shows calculated future traffic volumes and capacities.

Table X-8. Future Traffic Volumes

Route	Existing Capacity (LOS D)	Under Capacity 2066	2066 ADT	2016 ADT	Estimated Growth Rate
AI 13 (Telegraph Rd)	24,300	Yes	6,968	3,310	1.5%
AL 16 (Old Spanish Trail)	29,850	No	36,126	17,160	1.5%
AL 16 (Baybridge Rd)	39,800	Yes	33,326	15,830	1.5%
AL 16 (New Baybridge Rd)	39,800	Yes	38,568	18,320	1.5%
I-10 (4 lanes)	77,900	No	160,062	76,030	1.5%
I-10 (8 lanes)	154,300	Yes	151,451	71,940	1.5%
I-165	116,600	Yes	58,294	27,690	1.5%

Old Spanish Trail and I-10 from Battleship Parkway to US 90/98 east of the port are expected to exceed capacity by 2,066 without roadway improvements. The I-10 Mobile River Bridge is identified and included for expansion from four lanes to eight lanes on the 2040 Long Range Transportation Plan. Other roadway improvements may be required within the corridor to maintain acceptable traffic flow. The 2066 AADT volumes are shown on the map in **Figure X-3**.

Figure X-3. 2066 Annual Average Daily Traffic (AADT)



SECTION 2. Environmental Consequences

This section describes the potential impacts to transportation resources should the Proposed Action or No Action alternative be implemented.

2.1. Transportation

2.1.1. No Action Alternative

Under the No Action Alternative, no changes to the current transportation system would occur. Maintenance dredging of the harbor and channel would continue. Over the next 50 years, channel traffic and harbor operations may increase independently of a deepening and widening project. This could potentially lead to increased traffic on local roads, railroads and airports. Therefore, under the No Action Alternative, traffic volumes in the channel, harbor and local transportation systems may increase slightly, but this increase would be insignificant. If proposed road improvements are made on the I-10, these impacts would be further reduced.

Indirect impacts to transportation in the Mobile Harbor area are possible under the No Action Alternative. At current depths, carriers and shippers cannot fully utilize available vessel capacity. If channel improvements are not made, it is possible that vessel traffic would call on other deep water ports that provide shipping efficiencies at a lower cost. Over time, this may result in less maritime, rail and vehicular traffic associated with the port.

2.1.2. Proposed Action Alternative - Tentatively Selected Plan

The Tentatively Selected Plan (TSP) consists of: deepening the existing channel an additional 5 feet (existing 45 foot deep channel in the bay to 50 feet and existing 47 foot deep channel in the Bar Channel to 52 feet); adding an additional 100 feet of widening for a distance of three miles beginning at the upper end of the bend area at the 50 foot depth; including bend easing with the deepening at the upper end of the bar channel; and, modification to the Choctaw Pass turning basin to ensure safe operation at the 50 foot depth.

2.1.2.1. Construction

During construction, harbor operations are expected to continue without construction related interruption. Dredge activity would be halted and moved to accommodate vessel traffic. Currently, two dredges operate in the harbor and the channels for maintenance activities. The construction of the TSP would only require one additional dredge. Therefore, no significant change to existing transit methods and routes of goods entering and exiting the harbor are anticipated. Only an additional 34 workers would be required, which would not impact existing road traffic characteristics in the area. No change in surface transportation routes used to and from the harbor are anticipated as a result of construction. Under the proposed action, direct impacts to harbor traffic and surrounding transportation systems would be minor.

Indirect impacts to transportation as a result of construction activity in the harbor would be insignificant. Dredging equipment would yield to vessel traffic, minimizing any associated

change in the water or land transportation patterns. The increase of approximately 34 workers travelling to and from dredge crew boat landing spots would not increase traffic on roads in the area.

2.1.2.2. Operation and Maintenance

Port traffic, including a 25 percent increase in truck traffic associated with build-out of the container terminal, is included in the existing traffic volumes and in the 1.5 percent growth rate applied to the future volumes and includes the expected increase in truck traffic associated with the build-out of the container terminal.

Direct impacts to transportation over the long term are possible. Although the harbor and channel enlargement is not predicted to increase the volume of products being shipped through the harbor, the method of transportation (in larger vessels) could change. The larger container ships would transport larger volumes at once. This may lead to a minor increase in traffic on local roads during loading/unloading operations as more longshoremen may be required loading/unloading of the larger vessels. Fewer un-loadings would occur, but each unloading would require more transportation vehicles than currently needed; however, this increase in vehicles is accounted for in the 1.5 percent growth rate applied to future volumes.

Overall, changes to transportation could occur under the proposed alternative, such as short term increased traffic during loading/unloading operations. However, with proper management by the ASPA, these impacts would be minimized and would result in the same LOS currently available in the area. As stated above, possible local and interstate roadway improvements would also decrease the possible negative impacts to transportation in the port area.

Indirect impacts to transportation could occur under the proposed action over the long term. If larger vessels could use Mobile Harbor, these vessels may choose Mobile over other ports. Additionally, a general reduction in the number of large shipping vessels could occur over time as shipping larger volumes at once is more efficient. Shipping companies may elect to retire their existing vessels in favor of larger ones. Overall, switching from more smaller vessels to fewer larger vessels would not be considered a significant indirect impact to transportation.

References

AECOM. 2018. AECOM Memo regarding Traffic Analysis for Mobile Harbor Port Expansion. April 19, 2018.

Alabama Department of Commerce. 2016. "Made in Alabama," Alabama Year In Trade. 2016 Edition.

ALDOT. 2016. Alabama Traffic Data GIS portal. Accessed on 2/27/18 at:
<https://aldotgis.dot.state.al.us/atd/default.aspx>

FHA and ALDOT. 2014. Draft Environmental Impact Statement. Project No. DPI-0030(005) I-10 Mobile River Bridge and Bayway Widening, Mobile and Baldwin Counties, Alabama.

- FHWA-AL-EIS-14-01-D. Available at: https://mobileriverbridge.com/wp-content/uploads/2016/02/Draft_EIS.pdf. July 2014.
- Google Earth. 2018a. Mobile Transportation Map. Image ©2018 TerraMetrics. © 2018 Google.
- Google Earth. 2018b. Mobile Transportation Map. Image ©2018 TerraMetrics. © 2018 Google.
- Mathew, Tom V. and Rao, K V Krishna. 2007. Chapter 35: Capacity and Level of service from Introduction to Transportation Engineering. Accessed at: <https://nptel.ac.in/courses/105101087/downloads/Lec-35.pdf>. May 3, 2007.
- Mobile Aeroplex at Brookley. 2018. Mobile Downtown Airport Overview. Accessed 2/27/18 at: <http://www.mobileaeroplex.org/page/Mobile-Downtown-Overview>
- SARCOR, Nelson\Nygaard Consulting Associates Inc., and Metro P+E. 2014. Transit Development Plan, Mobile Wave Transit. Accessed at: <https://mobilempo.org/Publications/MOBILE%20Wave%20Transit%20TDP%20Final%20Report.pdf>. September 2014.
- SkyVector. 2018. Mobile Downtown Airport. Accessed on 2/27/18 at: <https://skyvector.com/airport/BFM/Mobile-Downtown-Airport>
- USACE. 2003. Draft Environmental Impact Statement for Choctaw Point Terminal Project Mobile, Alabama. Available at: http://www.sam.usace.army.mil/Portals/46/docs/planning_environmental/docs/EA/Draft_EA_MHTB_Expansion%20_2.pdf. October 2003.
- USACE. 2018 Ports and Waterways Facilities. Accessed on 2/28/18 at: <http://www.navigationdatacenter.us/ports/ports.htm>

ENVIRONMENTAL APPENDIX C

ATTACHMENT C-6

COOPERATING AGENCY MEETINGS



DEPARTMENT OF THE ARMY
MOBILE DISTRICT, CORPS OF ENGINEERS
P.O. BOX 2288
MOBILE, ALABAMA 36628-0001

REPLY TO
ATTENTION OF:

CESAM-PD-EC

9 June 2016

MEMORANDUM FOR RECORD (MFR)

SUBJECT: Agency Meeting for Mobile Harbor General Reevaluation Report (GRR) and Supplemental Environmental Impact Statement (SEIS) Agency Meeting

1. On March 31, 2016 the U.S. Army Corps of Engineers (USACE), Mobile District hosted an agency meeting for the Mobile Harbor GRR and associated SEIS. The meeting was a continuation of the previously initiated agency scoping meeting held on December 9, 2015 as part of the Mobile Bay interagency working group. The purpose of the meeting was to convene the team of cooperating federal and state agencies that require close involvement with this study and continue the process of soliciting agency participation and guidance. The primary goal of this meeting was to:

- Identify natural resources of concern
- Consideration of baseline assessments, identify existing information, and data gaps
- Identify desired inputs to tools/models necessary to evaluate effects on resources
- Discuss numerical modeling efforts

The meeting participants included representatives from the following agencies:

- Alabama State Port Authority (ASPA)
- U.S. Army Corps of Engineers, Mobile District (Corps)
- U.S. Army Corps of Engineers Corps, Engineer Research and Development Center (ERDC)
- Alabama Dept. of Environmental Management (ADEM), Mobile Field Office
- ADEM, Water Quality Branch
- Alabama Dept. of Conservation and Natural Resources (ADCNR), State Lands Division
- ADCNR, Marine Resources Division (MRD)
- Geological Survey of Alabama (GSA)
- Alabama Department of Transportation (ALDOT)
- U.S. Fish and Wildlife Service (FWS)
- National Marine Fisheries Service (NMFS), Habitat Conservation Division (HCD)

- Environmental Protection Agency (EPA)
- U.S. Geological Survey (USGS)
- Mobile Bay National Estuarine Preserve (MBNEP)

The meeting agenda and attendance list are attached. A sign-in sheet was circulated among the group in which the participants indicated their specific areas of interest and expertise. This information will be used to establish sub-groups for future meetings dealing with specific issues that do not require assembling the entire agency team.

2. The meeting opened with a round of introductions followed by opening remarks by Curtis Flakes, Chief of Mobile District's Planning and Environmental Division. Mr. Flakes reminded the group that this meeting was the third opportunity for agency engagement. The first opportunity occurred with involvement in the Charette held January 2015 in which the agencies provided insight into the Smart Planning – 3x3x3 compliance decision. Many of the agencies also attended the Public Scoping Meeting held in January of 2016. Mr. Flakes emphasized the importance of this meeting for the agencies' help and guidance in identifying the environmental considerations that must be addressed in the integrated GRR and SEIS. Improving and maintaining the Mobile Harbor navigation project is important but must be accomplished in an environmentally sound manner.

3. The meeting continued with a brief presentation by Larry Parson of the Mobile District summarizing results of previous agency involvement. A copy of the presentation slides are attached. After reiterating the meeting purpose and goals, the group was reminded of project constraints along with agency concerns as defined by the previous agency involvement. The environmental project constraints include:

- Avoid or minimize negative impacts on coastal and sediment transport processes
- Avoid or minimize shoreline erosion.
- Avoid or minimize negative impacts to:
 - Protected Species
 - Submerged Aquatic Vegetation
 - Essential Fish Habitat
 - Existing Natural Resources (marshes, wetlands, and bay bottoms)
 - Water Quality
 - Cultural resources
- Must have adequate Disposal Area Capacity
- Dredge material for ODMDS and open water placement must meet suitability criteria

As a result of the Charette and initial scoping meeting, a list of preliminary agency concerns were compiled which provided the Mobile District a good indication of the environmental issues that needed to be addressed in the early planning activities. The concerns previously identified by the agencies include but are not limited to the following:

- Effects on Physical Parameters
 - Water circulation
 - Salinity
 - Dissolved Oxygen
 - Sedimentation
 - Shoreline Erosion
 - Storm Surge
- Beneficial Use Opportunities
- Accurately Capturing Baseline Conditions
- Natural Resources
 - Fisheries
 - Essential Fish Habitat
 - Submerged Aquatic Vegetation
 - Oysters
 - Marshes and Wetlands
 - Protected Species
 - Shoreline Erosion
- Cultural Resources

One of the main purposes of this meeting was to revisit and expand on the above preliminary list to further capture more specific issues, how they should be addressed, and types of models and tools that can be used to evaluate them. This was done by utilizing “electronic flipcharts” to capture the information. These flip charts consist of a spreadsheet with multiple tabs for each discipline identified. This way, the information can be recorded and/or modified in real time in a way that is less cumbersome than using conventional paper flipcharts.

4. Next, David Newell from the Mobile District provided the group with an overview of the GRR process. His presentation focused on the project background describing the authorized project dimensions as well as other harbor improvements that have been implemented. Mr. Newell also spoke about the screening criteria in the planning process which considers cost, project benefits, and associated environmental effects to allow the selection of a plan that produces the greatest net benefits while minimizing environmental impacts at the least possible cost. As a result of the Alternative Milestone analysis, an array of focused alternatives have been identified to be evaluated during the course of this study which include:

- Deepening of the channel from 47'-53'
- Inclusion of an anchorage area up to 4,000' length
- Existing Bar Channel width + 5 miles in Bay Channel @ 500'
- Existing Bar Channel width + 10 miles in Bay Channel @ 500'
- Existing Bar Channel width + 15 miles in Bay Channel @ 500'
- Existing Bar Channel width + 5 miles in Bay Channel @ 550'
- Existing Bar Channel width + 10 miles in Bay Channel @ 550'
- Existing Bar Channel width + 15 miles in Bay Channel @ 550'
- 700' Bar Channel width + 5 miles in Bay Channel @ 500'
- 700' Bar Channel width + 10 miles in Bay Channel @ 500'
- 700' Bar Channel width + 15 miles in Bay Channel @ 500'
- 700' Bar Channel width + 5 miles in Bay Channel @ 550'

- 700' Bar Channel width + 10 miles in Bay Channel @ 550'
- 700' Bar Channel width + 15 miles in Bay Channel @ 550'

The next critical milestones in the GRR include the determination of the Tentatively Selected Plan (spring of 2018) and the Agency Decision Milestone (fall of 2018) where the agencies provide an endorsement of the recommended plan based on the Draft SEIS scheduled to be released during the summer of 2018. A copy of Mr. Newell's presentation slides are attached.

5. The meeting continued with group discussions on the various baseline and associated impacts assessments that should be considered during course of this study. It should be noted that the discussions were captured in the electronic flipchart which is included along with this MFR. The following is a summary of the considerations addressed during the group discussions.

Water Quality. Of the water quality concerns, saltwater intrusion was identified as the primary consideration consisting of changes within the Bay and underlying aquifers. The water quality parameters identified includes:

- dissolved oxygen
- nutrients
- sediment transport/turbidity
- water circulation
- temperature
- potential release of contaminants from dredged material
- potential contaminants release from Shipping industry
- total organic carbon
- algae and chlorophyll
- climate change/sea level rise
- changes in freshwater discharge
- increased ship waves
- effects on Dauphin Island drinking water

It was recommended that modeling efforts be conducted on a multiple year level for water quality impacts under various hydrological conditions and that the wet or dry hydrologic scenarios should also meet the needs for conducting habitat impact assessments. Baseline conditions have been conducted dating back to 1981. A more complete and detailed listing of the water quality considerations can be seen in the accompanying electronic flipchart.

Sedimentation. The primary concern with changes of sedimentation patterns within the bay is related to salinity regime changes associated with saltwater intrusion. As the sediments carried down the rivers meets and mixes with the higher saline waters of the bay, suspended sediment flocculate and begin dropping out of suspension. Depending on the degree of salinity change and water circulation patterns, this could result in changes to the sedimentation patterns within the Bay, navigation channel, and could also reach up into the river deltas. Based on these processes the group identified the

following as concerns associated with changes in sedimentation that may result from expansion of the navigation channel:

- change in sediment transport patterns
- increased turbidity
- change in sedimentation rates in both bay and navigation channel
- change in sediment quality/characteristics
- ship wake turbidity concerns
- bank and bay bottom instability
- increase in head-cutting processes upriver

It should be noted that any beneficial use possibilities will be driven by the sediment quality. See the electronic flipchart for a more detailed listing of these concerns.

Water Circulation. The group felt that water circulation such as flushing, exchange rates, salinity, and dissolved oxygen are closely tied to water quality issues. The numerical modeling being conducted for this evaluation should consider seasonality changes of the existing and the future water circulation patterns. There should be a focus on critical times that may have an effect on the resources such as oyster and shrimp spawning that depend on water circulation and several water quality parameters. A complete list of the concerns relating to water circulation as identified by this group can be obtained in the electronic flipchart.

Shoreline Changes. Among the concerns on effects to shorelines, increased ship wakes were discussed as being the biggest contributor. Another potential issue that must be considered are the impacts to the littoral processes feeding the Alabama/Mississippi barrier island chain resulting from expansion of the bar channel. This could potentially have an effect on the Dauphin Island shorelines. It was discussed that the ongoing National Fish and Wildlife Foundation (NFWF) for the Alabama barrier island restoration will be useful in addressing impacts to Dauphin Island due to the widening and deepening. A more detailed list of concerns can be found in the electronic flipchart.

Protected Species. There are several protected species that reside within and around Mobile Bay area that could potentially be effected from the widening and deepen action. Effects could be short-term from the actual construction of the project or more long-term from impacts to water quality, sedimentation, and hydrodynamic processes. A complete list of the species of concern can be found in the electronic flipchart.

Cultural Resources. Allen Wilson, Mobile District's Maritime Archeologist, summarized the nature of historically significant resources in the vicinity of the Mobile Harbor project. These resources are protected under the Section 106 of the National Historic Preservation Act and NEPA. In addition, when dealing with military ship wrecks, activities must also be in compliance with the Sunken Military Craft Act. This law states that any military ship wrecks discovered from another nation are considered property of that nation and requires international coordination. Cultural resources surveys were conducted in the 1980's as part of the Mobile Harbor re-authorization studies. The surveys conducted at that time utilized technologies that are now considered out of date

and much less reliable than today's technology. As a result, there is a need to reevaluate studies within the authorized channel and possibly conduct updated surveys to identify resources such as resources the older technology could not detect, unexploded ordinance, tribal resources, and submerged prehistoric artifacts and human remains. With possible shoreline changes at Fort Gaines due to increased ship wakes, surveys may also need to be conducted in that vicinity as well. A more comprehensive list of historic resources concerns are included in the electronic flipcharts.

Natural Resources. There is a variety of natural resources associated with Mobile Bay that are within the influence of the navigation project. As discussed earlier, modifications to the navigation channel may result in impacts to water quality, sedimentation, and hydrodynamic characteristics which in turn may have effects on the Bay's resources. The main resources identified during these discussions that must be addressed in this study include but not necessarily limited to:

- Fisheries
- Submerged aquatic vegetation
- Oysters
- Crabs
- Shrimp
- Finfish
- Managed species and essential
- Benthic communities

A more complete list of resources and other resources considerations are included in the accompanying electronic flip chart.

5. The next part of the meeting dealt with discussions regarding the use of models and tools for conducting resource impact assessments. The consensus of the group was that comprehensive modeling should be conducted in order to have a high degree of confidence in performing impact assessments and mitigation analysis. At this point in the study, the Corps is evaluating what type of models and/or tools are available that perform resource impact assessments. First, the pertinent background parameters representing baseline conditions must be identified, gathered, and used by numerical models such that the predicted changes in conditions can be made available to the models/tools used to evaluate resource impact. It would be most beneficial to select models that are already approved and certified. The desired parameters for such models are listed in electronic flipchart under the MODEL_TOOLS_PARAMETERS tab. Also included are some habitat models and tools appropriate for this study.

The group stressed that it's important to obtain baseline data as complete as possible. There are many existing sources such as studies completed by the Mobile Bay NEP that has already compiled high resolution resource mapping data that will continually be updated. The Mobile District requested that participants compile a list of data sources that their agencies can provide for use in the baseline determination. Establishing an accurate and comprehensive baseline will be important in evaluating resource impacts and conducting appropriate mitigation assessments.

6. The meeting continued with Elizabeth Godsey leading discussions on the numerical modeling that will be conducted. She provided an overview of proposed modeling tools that could be used to predict changes in the system due to modifications to the navigation channel and she discussed leveraging available modeling tools developed for other studies in the area (MsCIP, Regional Sediment Management, and Alabama Barrier Island Restoration). She then led a group discussion on the capabilities, limitations, and uncertainties in the various potential models and how those could be used to address specific areas of concern (e.g. changes in salinity, temperature, sediment transport pathways, etc.). For example, there are several water quality (WQ) models in existence. CEQUAL-ICM is an example of one existing model used in the Gulf that predicts 36 parameters and simulates the system to mimic Water Circulation to generate outputs that can be used by other tools in determining resource impacts. However, other models exist that have similar capabilities (LSPC-EFDC-WASP) and have been used in Mobile Bay for previous studies. Therefore, the group agreed it's necessary to organize a separate sub-workgroup specifically dealing with modeling to select the appropriate model for this study. A list of existing numerical models and their functions discussed by the group are included in the electronic flipchart is included under the NUMERICAL_MODELING tabs.

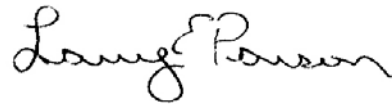
After compiling the list of models, the group revisited the previously discussed issues that were captured in the electronic flipchart. A column (titled "model") was added for those areas of concern that will rely on the numerical modeling to provide the appropriate information needed to conduct impact assessments. The added column indicates what model(s) would be appropriate to address that particular concern. See the electronic flipchart to review the listing of models that were identified for each area of concern indicating the appropriate model for each area of concern.

Since the agency meeting, a follow-on in-house meeting was held on May 10, 2016 at ERDC in Vicksburg, MS to discuss what is required for conducting habitat modeling.

7. Also include as part of the discussions was the need to prepare a monitoring and adaptive management plan that includes 5 – 10 years of monitoring. This is necessary to verify accuracy of the models and provide a means of ensuring project goals are met. This is something that EPA will be looking for in future draft documents. It was also mentioned that noise and air quality must be part considered in the study.

8. It is envisioned that agency meetings will be held on a regular basis to help guide and provide inputs to this study. In many cases, meetings do not have to involve the whole team, in which case sub-group meetings can be conducted via conference calls and webinars with only those who have indicated a specific area of interest.

9. Please address any questions, comments, or concerns pertaining to this meeting to Larry Parson at (251) 690-3139 or larry.e.parson@sam.usace.army.mil.



Larry E. Parson
U.S. Army Corps of Engineers, Mobile District
Coastal Environment Team

Draft copies furnished for comment to:

Allen Phelps – ADEM
Amanda Howell – EPA
Jacob Berkowitz – Corps ERDC
Bill Pearson – FWS
Bob Harris – ASPA
Barry Bunch – Corps ERDC
Carl Ferraro – ADCNR
Ray Chapman – Corps ERDC
Chris Johnson – ADEM
Glenn Fernandez – EPA
Earl Hayter – Corps ERDC
Jeff Powell – FWS
Joe Long – USGS
John Mareska – MRD
Josh Rowell – FWS
Judy Adams – ASPA
Lena Weiss – EPA
Ntale Kajumba – EPA
Patric Harper – FWS
Kevin Reine – Corps ERDC
Roberta Swann – MBNEP
Rusty Swafford – NMFS-HCD
Scott Brown – ADEM
Steve Jones – GSA
Dottie Tillman – Corps ERDC
Dan Holliman – EPA
Andrew Wood – ALDOT
James Moody – ADEM
Justin Rigdon – ADEM
Jenny Jacobson – Corps
Elizabeth Godsey – Corps
Justin McDonald – Corps
David Newell – Corps
Allen Wilson – Corps
Jackie Wittman - Corps

**Agency Meeting
for the
Mobile Bay General Reevaluation Report (GRR)
Supplemental Environment Impact Statement
International Trade Center – Killian Room
Mobile, Alabama
March 31, 2016
9:00 – 3:30**

MEETING AGENDA

Introductions

Mobile Harbor GRR Overview

Natural Resources of Concern and Associated Questions/Investigations

Species (Threatened and Endangered, Fisheries, etc.)

Habitats (Wetlands, Oyster Reefs, Submerged Aquatic Vegetation, Water Quality, etc.)

Resources Assessments (Species/Habitats)

Baseline Assessments

Existing Data/ Data Gaps

Assessment Tools/Models Input

Numerical Modeling

Hydrodynamics

Water Quality

Sediment Transport

Other Discussions

**Mobile Harbor General Reevaluation Report - Agency Meeting
March 31, 2016**

	NAME	AGENCY	PHONE	EMAIL	SUB-TEAM EXPERTISE	INTEREST/EXPERTISE CATEGORIES
1	Dan Holliman	USEPA	404-562-9331	Holliman.Daniel@epa.gov	2b,c,4,5	Please indicate your areas of interest and expertise for participation in future coordination and meetings. Choose from the following (you can indicate multiple categories):
2	Kevin Reine	USACE - ERDC	601-634-3736	Kevin.J.Reine@usace.army.mil	1, 2d, 3a, 7	
3	Elizabeth Godsey	USACE - Mobile District		elizabeth.godsey@usace.army.mil	5, 6, 7	
4	JEFF POWELL	US Fish & Wildlife Service	251-441-5858	JEFF.POWELL@FWS.GOV	1, 2,	
5	BILL PEARSON	US Fish & Wildlife Service	251-441-5870	bill.pearson@fws.gov	1, 2,	
6	Josh Kowell	US Fish & Wildlife Service	251-441-5856	josh.kowell@fws.gov	1, 2	1. Threatened & Endangered Species
7	Patric Harger	"	228-475-0765	patric.harger@fws.gov	1, 2, 7	2. Habitat Resources
8	Andrew Wood	Alabama DOT	251-470-8300	awood@dot.state.al.us	1, 2, 7	a. oysters
9	CHARLETTA	ADCNR - State Lands - Coastal	251-621-1116	Charletta@adcnr.al.gov	2b,c,7	b. SAV's
10	Ignorweiss	USEPA	404-562-9888	weiss.terina@epa.gov	7	c. marshes/wetlands
11	Dana Pitzer	EBR	601-624-3647	dana.pitzer@usace.army.mil	5, 6	d. benthic
12	Earl Hunter	ERDC	661-656-5947	Earl.Hunter@usace.army.mil	C	3. Resource Assessments
13	Dorothy (Cofie) Tillman	ERDC	601-634-2676	dorothy.h.tillman@usace.army.mil	6	a. data
14	RACHAELMAN	ERDC	601-634-3178	RACHAELMAN@usace.army.mil	6	b. tools and models
15	ALLEN PHELPS	ADEM	251-304-1176	cap@adem.state.al.us	2c, 5	4. Cultural Resources
16	J. Scott Brown	ADEM - Mobile Field Office	251-304-1176	jsb@adem.state.al.us	2, 7	5. Water Quality
17	Roberta Swann	MBNEP	251-380-7940	rswann@mobilebayrep.com	3, 5	6. Numerical Modeling
18	John Mareski	ADNR / Marine Resources	251-841-2882	john.mareski@dnr.alabama.gov	1a, 2d, 3a, 7	7. Beneficial Use of Dredged Material
19	Ruth Spivey	ADNR Fisheries	904-766-3699	Ruth.Spivey@dnr.al.gov	3, 7	
20	Justin McDonald	USACE	251-690-3514	Justin.McDonald@usace.army.mil	5, 6, 7	
21	Joe Long	USGS	737-503-8034	jlong@usgs.gov	3a, 3b, 6	
22	JUNNY JACOBSON	USACE	251-690-2721	junny.jacobson@usace.army.mil	1, 2, 5, 7	
23	Stephen C Jones	Employed Survey of AL	205-247-3601	sjones@gsu.alabama.gov	2c, 3a, 5, 7	
24	Jacob Ben Kowitz	USACE-ERDCO	601-529-3115	Jacob.B.Kowitz@usace.army.mil	2c, 3a, 3b, 7	
25	James Mooney	ADEM	334-394-4351	jmooney@adem.state.al.us	5, 6	
26	Justin Rigdon	ADEM	334-271-4100	jrigoon@adem.state.al.us	5, 6	Wants read into river data
27	Chris Johnson	ADEM Water Quality Branch	334-271-7827	cjohnson@adem.state.al.us	5, 6	
28	Larry Pearson	USACE	251-690-3139	larry.pearson@usace.army.mil	5, 6	
29	Jackie Withmann	USACE	251-690-3559	jackie.withmann@usace.army.mil	5, 6	
30	Judith Adams	USPIT	251-441-7005	jadams@usace.army.mil	4	Wants read local speaker
31	Alla Wilson	USACE	251-694-3867	alla.wilson@usace.army.mil	4	
32	Rick Harts	ASPA				
33	Gloria Fernandez	EPA (urbanair/plume)		Fernandez.Gloria@epa.gov	5, 6	
34	Annarcha Howell	EPA (urbanair/plume)	404-562-8017	Annarcha.Howell@epa.gov	5, 6	
35	Ashley Knjumba	EPA (urbanair/plume)	251-690-2328	ashley.knjumba@epa.gov	5, 6	
36	David Nezeal	USACE		david.nezeal@usace.army.mil		
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DEPARTMENT OF THE ARMY
MOBILE DISTRICT, CORPS OF ENGINEERS
P.O. BOX 2288
MOBILE, ALABAMA 36628-0001

REPLY TO
ATTENTION OF:

CESAM-PD-EC

16 November 2016

MEMORANDUM FOR RECORD (MFR)

SUBJECT: Agency Meeting/Webinar for Mobile Harbor General Reevaluation Report (GRR) and Supplemental Environmental Impact Statement (SEIS) regarding modeling and aquatic resources assessment scopes – 22 Sept 2016.

1. On September 22, 2016 the U.S. Army Corps of Engineers (USACE), Mobile District hosted an agency meeting in the form of a webinar as part of the ongoing agency scoping activities for the Mobile Harbor GRR and integrated SEIS. The purpose of the meeting was to reconvene the team of cooperating federal and state agencies to present an overview of the study approach being taken for modeling and aquatic resources assessments for the study. The primary goal was to provide an opportunity for agencies to ask questions and air concerns they may have for these efforts. Follow up coordinations as appropriate will be conducted to resolve questions and issues that were raised.

The meeting participants included representatives from the following agencies:

- Alabama State Port Authority (ASPA)
- U.S. Army Corps of Engineers, Mobile District (Corps)
- U.S. Army Corps of Engineers Corps, Engineer Research and Development Center (ERDC)
- Alabama Dept. of Environmental Management (ADEM), Mobile Field Office
- ADEM, Water Quality Branch
- Alabama Dept. of Conservation and Natural Resources (ADCNR), State Lands Division
- ADCNR, Marine Resources Division (MRD)
- U.S. Fish and Wildlife Service (FWS)
- National Marine Fisheries Service (NMFS), Habitat Conservation Division (HCD)
- Environmental Protection Agency (EPA)

The agenda, participation list, meeting slides are included below.

2. After a round of introductions and GRR status update presented by David Newell, the meeting proceeded with Elizabeth Godsey presenting on overview of the hydrodynamic, water quality, and sediment transport modeling that's being performed for the study (see meeting slides). The modeling will be conducted for a one year simulation period using representative conditions from January thru December for the year 2010. Modeling will also be done to assess changes in ship wakes associated with channel modifications.

Hydrodynamic Modeling: The **C**oastal **S**torm **M**odeling **S**ystem (CSTORM) and **A**Dvanced **C**IRCulation Model (ADCIRC) models are being used to provide offshore elevation boundary conditions for the nearshore hydrodynamic and sediment transport modules. The **S**Teady State Spectral **W**AVE **F**ull **P**lain (STWAVE-FP) model is being used to provide wave fields to the nearshore hydrodynamic and sediment transport modules. The Geophysical Scale Transport Modeling System (GSMB) - **M**ulti-**B**lock **C**urvilinear **H**ydrodynamics in **3**-**D**imensions-**W**aterways **E**xperiment **S**tation (MB-CH3D-WES) models provide water levels and current velocities to the water quality, estuarine sediment transport and habitat assessment modules.

Water Quality Modeling: GSMB-CE-QUAL-ICM model will be utilized for the water quality portion of the modeling effort. This model will assess potential changes in water quality including changes in flushing, salinity, dissolved oxygen, temperature, total suspended solids, nutrients and chlorophyll a as a result of channel improvements. Outputs from the model will provide water quality constituents (i.e. salinity, temperature, dissolved oxygen, total suspended solids etc.) for will be essential in the conducting habitat assessments.

Sediment Transport: GSMB-SEDZLJ is the model being used to assess relative changes in sedimentation rates as a result of channel improvements and will assess the change in the sedimentation rates and pathways within the bay resulting from the channel improvements. Delft3D (Flow, SWAN and Morph modules) modeling will be used to quantify relative changes in sediment pathways and morphological response of the adjacent nearshore environment as a result of proposed channel modifications.

Ship Wake Model Tool: The model will quantify relative changes in ship wake energy from associated with proposed channel improvement measures.

The question was raised if the ship wake modeling will be used to predict channel scouring? This will only be addressed if the analysis shows there's a potential for scouring to occur. At that point, the modeling may be extended to considering potential scouring.

Concerns with the simulation period were expressed by EPA as to why we are not using existing information to look at a 3-year simulation period. The Mobile District expressed that the project in on a strict schedule and budget and these restrictions prevent the study from conducting simulations beyond one year. A question was also asked if the District considered using a watershed study as part of the water quality assessment.

The study will be utilizing information from the watershed studies being prepared by the Mobile Bay NEP, but only for the 1-year 2010 simulation period.

It was expressed that using 10-layers in the 3-D simulation seems to be a very fine resolution. The District responded that the model is capable to perform to that resolution and feels that it is necessary given the size and depths in the study area.

Another concern raised by the agencies is that does that Mobile District have confidence the conditions represented in the 2010 simulation period adequately represent seasonal conditions. The 2010 simulation period is considered to be indicative of an average year with some high and low flow periods and considered to represent a typical year.

EPA raised the issue of information being made available for validation points. Is calibration being done for one or multiple locations and how long are the records? ADEM stated that they have a lot of information in the delta that can be provided to help with validation. The Mobile District will provide details of the calibration and validation process. A follow up meeting with the modeling sub-group can be organized if deemed necessary.

3. The next part of the meeting continued with presentations from ERDC on the approaches for conducting the baseline and impact assessments for the various aquatic resources that exist in the bay and extending up into the lower delta. The assumption has been made that biggest influence from parameters contributing to the aquatic impacts will be fluctuations in salinity resulting from saltwater intrusion. The attached slides provide a summary of the approaches that were developed towards evaluating impacts associated with salt water intrusion. The studies will be assessing the effects on wetlands, submerged aquatic vegetation (SAV), oysters, benthic communities, and fish.

Potential Impacts to Wetlands: A phased approach will be utilized as outlined in the attached slides. The general approach for wetland resource assessments will include assessment of existing resources and analysis of potential impacts based upon water quality and sediment modeling outputs under “without” project condition and proposed channel modification alternatives. The assessment will rely on the outputs from the water quality and hydrodynamics modeling results to evaluate potential future impacts to wetlands in the project area.

Submerged Aquatic Vegetation: A phased approach as, outlined in the attached slides, has been prepared to document the current distribution of SAV in the region, assess the spatial variability in SAV distributions in Mobile Bay, and identify potential changes in SAV resources associated with a future “without” project condition, and alternative project designs. The general approach will include an assessment of existing resources, an assessment of historic habitat variability, and an analysis of potential impacts based upon water quality and sediment modeling outputs under “without” project condition and proposed alternatives analysis. The assessment will rely on the outputs of water quality

and hydrodynamics modeling results to evaluate potential future impacts to SAV in the project area.

Follow on discussions revealed that additional SAV mapping is scheduled for 2017.

Oyster Reef Connectivity: An approach to determine how channel modifications will impact the current distribution of oysters in the region has been prepared to assess how the spatial variability in reef locations can best be used to maximize potential oyster recruitment, and identify potential changes in oyster resources associated with a future “without” project condition, and alternative project designs as summarized in the attached slides. The general approach will include an assessment of existing resources, an assessment of historic oyster resources, and an analysis of potential impacts based upon water quality and particle-tracking (for oyster larvae) under “without” project condition and proposed alternatives analysis. The assessment will rely on the outputs of water quality and hydrodynamics modeling results to evaluate potential future impacts to oysters in the project area. The modeling will include more than just particulate transport but will also include vertical migration. A habitat suitability model will also be incorporated.

A concern was raised if the oyster assessment will take into consideration the potential of increased dermo infection in oysters. Dermo infections have been linked to increases in salinity and temperatures and has been addressed in a feasibility study conducted by the Galveston District for Matagorda ship channel in Texas in which a methodology was developed to assess the potential of increased dermo infections. The existing model will take into account salinity variations but does not have the ability to consider the dermo infection potential. The Mobile District will contact the Galveston District to learn more about the methodology used in their study.

In addition to the modeling, it was noted that GIS shape files for mapping oyster reefs in the Bay are available through the MRD.

Potential Impacts to Benthic Invertebrates: Benthic invertebrates will be sampled, once in Fall 2016 and once in Spring 2017. A total of 180 benthic samples will be collected: 90 samples in September 2016 and 90 samples in February/March 2017. Samples will be collected at 30 stations in each zone (Freshwater, Transition and Estuarine (upper bay)). Samples will be taken by ponar grab. Sampling the delta bays may require the use of a core sampler if water depths are too shallow to be accessed by boat. If a core sampler is used in the shallow, three (3) samples will be the equivalent of one ponar grab sample. Successful samples require a minimum penetration depth of 10 cm into bottom sediments. Samples will be sieved in the field using a 0.5 mm mesh to remove excess sediment, placed in individual fabric bags, and preserved in 10% buffered formalin. All samples will be collected by ERDC personnel with the assistance of personnel from the USACE: Mobile District (boat and operator).

It was recommended to consider expanding the season for conducting benthic sampling. The concern is that early spring sampling may not be representative of

typical spring conditions. It is possible that seasonal variations in DO would not be captured for the actual spring conditions. A recommendation would be to shift the Feb/March sampling to later in the spring. The Mobile District PDT will take a look at this to see if it can be accommodated in the schedule.

There was a concern that a more detailed work plan for benthic sampling was not provided to the agency team to review and comment. It was felt this should have been done for the habitat assess data collection efforts. A more detailed work plan for the benthic sampling effort is included below.

Potential Impacts to Fish: Fish will be collected seasonally with multiple gears in the three areas encompassing the Mobile Bay ecosystem: marine, brackish, and freshwater. Collections will occur late summer/early fall 2016 to evaluate recruitment and growth, and spring 2017 to evaluate the spawning period and young-of-year survival. Within each of the three study areas, a minimum of five sampling sites will be established representing the variability in physical habitat features. Final site selection will be coordinated with Mobile District and resource agencies. Number of individual sampling sites per season will be at least 15 (3 areas x5 sites).

- With the sampling being conducted in early spring, there is a concern that the sampling could occur under high freshwater flow conditions and the typical seasonal changes in salinities may not be captured. In order to capture and evaluate salinity fluctuations and tolerances, it was recommended that salinity profiles be collected. It was also recommended that the spring sampling times be shifted to later in the spring and possibly move sampling locations further south into the bay. The District PDT will take a look at this to see if it can be accommodated in the schedule.

As with the benthic sampling scope, there was a concern that a more detailed work plan for fish sampling was not provided to the agency team to review and comment. A more detailed work plan for the fish sampling effort is included below.

4. The following actions will be taken in order to satisfy questions and concerns associated with the modeling and habitat resources assessments:

- The Mobile District will provide details of the calibration and validation process.
- ADEM to provide information from delta to help with validation.
- GIS shape files for mapping oyster reefs in the Bay to be provided by MRD.
- Work plans for the benthic and fish sampling to be provided by the Mobile District to the agencies.

5. Please address any questions, comments, or concerns pertaining to this meeting to Larry Parson at (251) 690-3139 or larry.e.parson@sam.usace.army.mil.

Larry E. Parson
U.S. Army Corps of Engineers, Mobile District
Coastal Environment Team

Draft copies were furnished for comment to all meeting participants.

**Agency Meeting
Mobile Bay General Reevaluation Report (GRR)
Supplemental Environment Impact Statement (SEIS)
Conference Call/Webinar
Mobile, Alabama
September 22, 2016
1:00 – 3:00 Central**

Agenda

Introductions

Mobile Harbor GRR/SEIS Update

Study Approach

- Numerical Modeling
 - Hydrodynamics
 - Water Quality
 - Sediment Transport

- Aquatic Resources Assessments
 - Wetlands
 - Submerged Aquatic Vegetation
 - Oysters
 - Benthic
 - Fish

Other Discussions

Next Steps

Mobile Harbor GRR Agency Webinar – List of Participants

Agencies

Bob Harris (ASPA)
Carl Ferraro (ADCNR)
John Mareska (ACDNR, MRD)
Scott Brown (ADEM)
Allen Phelps (ADEM)
Justin Rigdon (ADEM)
Chris Johnson (ADEM)
Dan Holliman (EPA)
Calista Mills (EPA)
Amanda Howell (EPA)
Josh Rowell (FWS)
Rusty Swafford (NMFS)
Brandon Howard (NMFS)

Corps of Engineers - ERDC

Kevin Reine
Barry Bunch
Earl Hayter
Ray Chapman
Christina Saltus
Todd Slack
Sung-Chan Kim
Matthew Balazik
Todd Swannack
Kevin Philley
Candice Piercy

Corps of Engineers – Mobile District

Elizabeth Godsey
Justin McDonald
David Newell
Richard Allen
Nate Lovelace
Angelia Lewis
Ashley Kleinschrodt
Rita Perkins
Larry Parson

Mobile Harbor General Reevaluation Report

Agency Webinar Meeting

Numerical Modeling and Resource Assessments

U.S Army Corps of Engineers
Mobile District

September 22, 2016
Mobile, Alabama

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Agenda



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Introductions

Mobile Harbor GRR/SEIS Update

Study Approach

Numerical Modeling

Hydrodynamics

Water Quality

Sediment Transport

Aquatic Resources Assessments

Wetlands

Submerged Aquatic Vegetation

Oysters

Benthic

Fish

Other Discussions

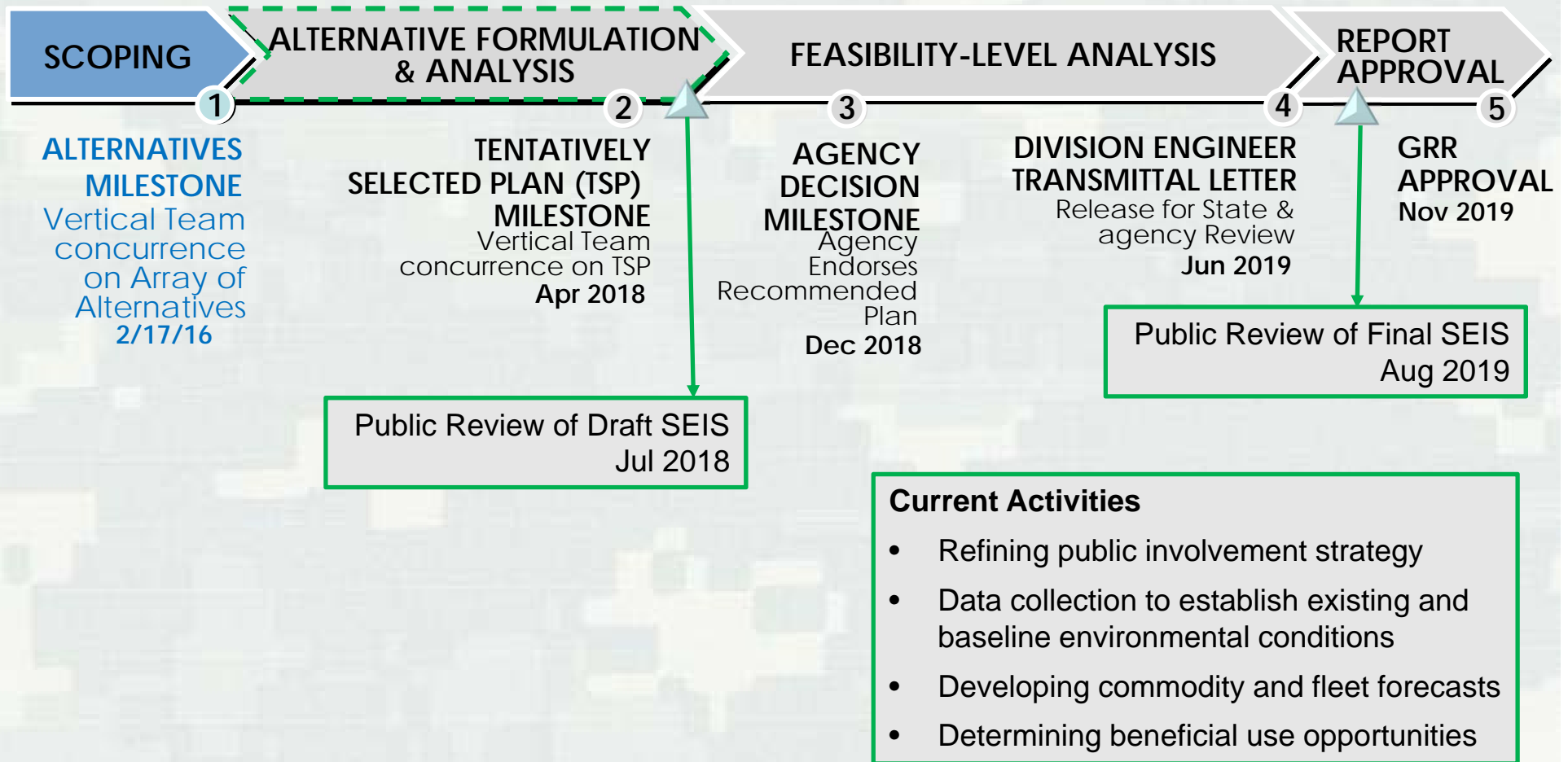
Next Steps



GENERAL REEVALUATION REPORT SCHEDULE (48 MONTHS)



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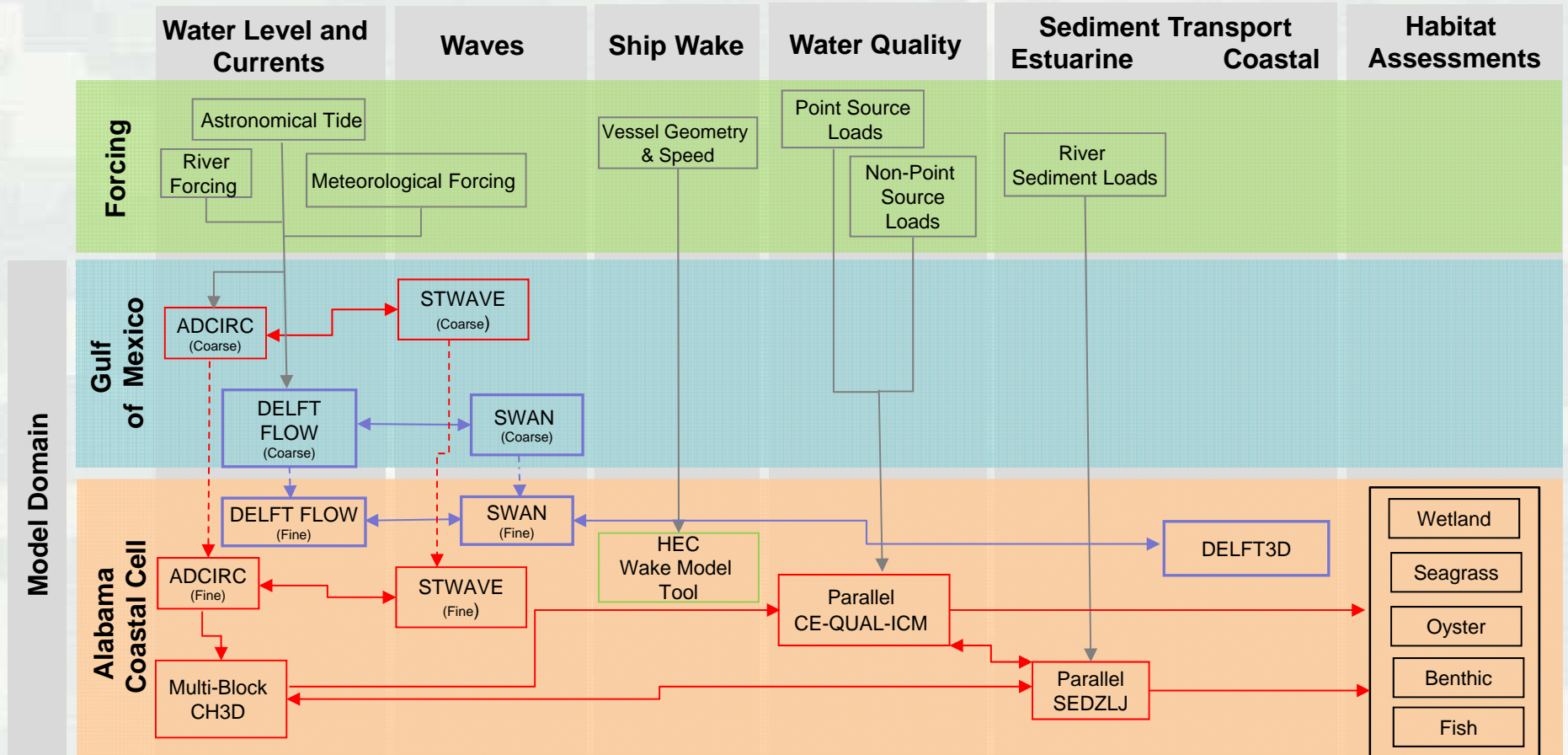




Flow Diagram of Assessment Tools



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Hydrodynamic (Water Levels and Current Velocities)



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Coastal Storm Modeling System (CSTORM) – ADvanced CIRCulation Model (ADCIRC)

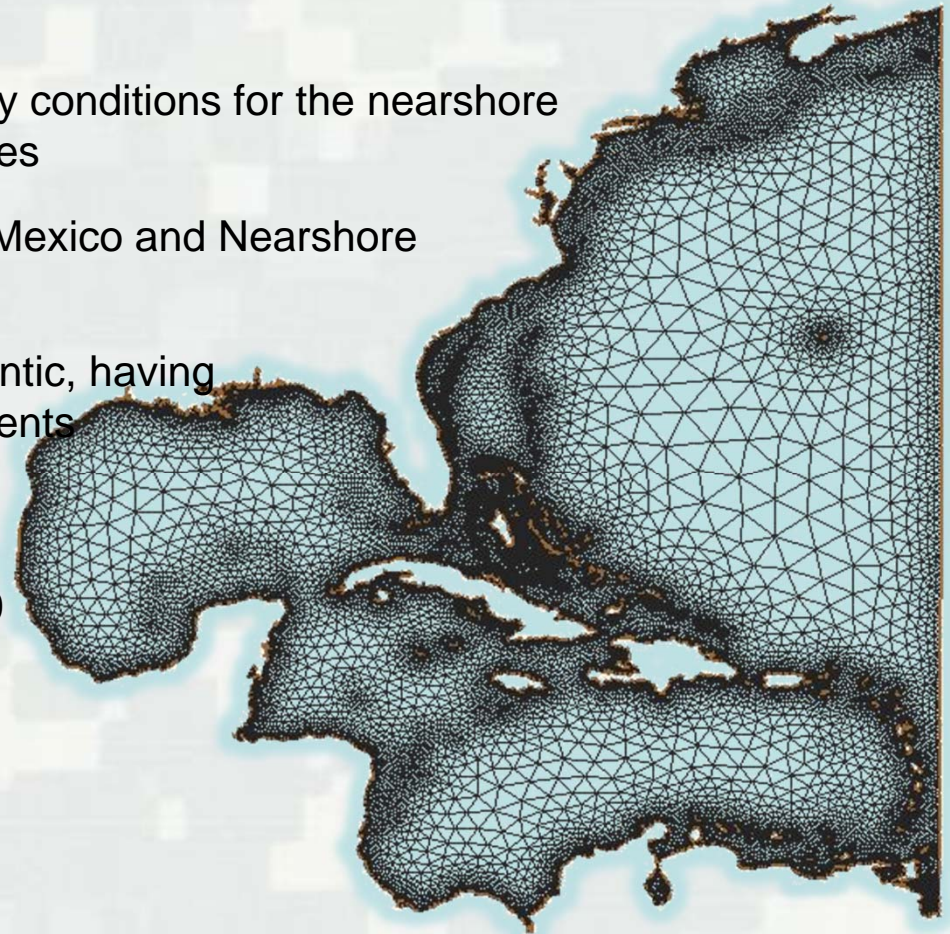
Purpose: Provide offshore elevation boundary conditions for the nearshore hydrodynamic and sediment transport modules

Spatial Domain: Atlantic, Caribbean Gulf of Mexico and Nearshore Coastal Alabama

Grid Resolution: Largest elements in the Atlantic, having nodal spacing of about 20 km, smallest elements resolve the Mobile Bay navigation channel, with nodal spacing ~ 60 m

Simulation Period: January - December 2010

Model Output: Water surface elevation and current velocity fields





Hydrodynamic (Waves)



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CSTORM – **S**teady State Spectral **W**AVE **F**ull **P**lain (STWAVE-FP)

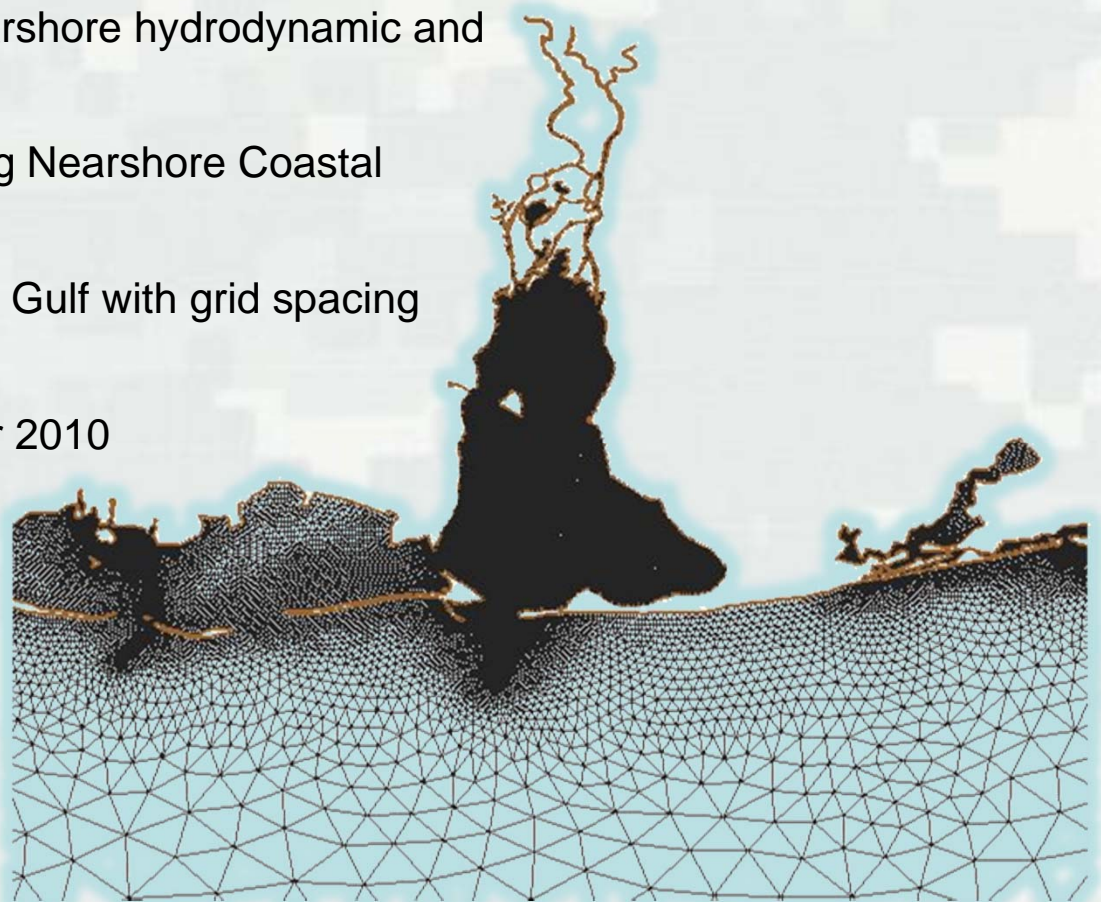
Purpose: Provide wave fields to the nearshore hydrodynamic and sediment transport modules

Spatial Domain: Gulf of Mexico including Nearshore Coastal Alabama and Mobile Bay

Grid Resolution: Largest elements in the Gulf with grid spacing of ~200 m.

Simulation Period: January – December 2010

Model Output: Significant wave height, peak period and mean direction. Radiation stress gradients.





Hydrodynamic (Water Levels and Current Velocities)



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Geophysical Scale Transport Modeling System (GSMB) - **Multi-Block Curvilinear Hydrodynamics in **3-D**imensions-Waterways Experiment Station (MB-CH3D-WES)**

Purpose: Provide water levels and current velocities to the water quality, estuarine sediment transport and habitat assessment modules

Spatial Domain: East of Pensacola Bay, FL at the eastern boundary to Lake Ponchartrain, LA at the western boundary.

Grid Resolution: 10 layers in the vertical within every grid cell. Smallest elements resolve the Mobile Bay navigation channel, with nodal spacing of ~ 28 m with the maximum cell width elsewhere in the bay of ~350 m and maximum grid edge of the model domain is ~3000 m.

Simulation Time Period: January – December 2010

Model Output: Water levels, currents, salinity and temperature



Water Quality



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GSMB - CE-QUAL-ICM

Purpose: To assess potential changes in water quality including changes in flushing, salinity, dissolved oxygen, temperature, total suspended solids, nutrients and chlorophyll a as a result of channel improvements. Provide water quality constituents (i.e salinity, temperature, dissolved oxygen, total suspended solids ect.) for habitat assessments.

Spatial Domain: East of Pensacola Bay, FL at the eastern boundary to Lake Ponchartrain, LA at the western boundary.

Grid Resolution: 10 layers in the vertical within every grid cell. Smallest elements resolve the Mobile Bay navigation channel, with nodal spacing of ~ 28 m with the maximum cell width in the bay of ~ 350 m and maximum grid edge in model domain of ~3000 m.

Simulation Period: January – December 2010

Model Output:

Temperature	Dissolved Organic Nitrogen (DON)
Salinity	Particulate Organic Nitrogen (PON)
Suspended Solids	Dissolved Inorganic Phosphorus (DIP)
Coliforms	Dissolved Organic Phosphorus (DOP)
Dissolved Oxygen	Particulate Organic Phosphorus (POP)
Algae	Dissolved Organic Carbon (DOC)
Nitrate (NO ₃ -N)	Labile Particulate Organic Carbon (LPOC)
Ammonia (NH ₄ -N)	Refractory Particulate Organic Carbon (RPOC)



Estuarine Sediment Transport



BUILDING STRONG

GSMB - SEDZLJ

Purpose: To assess relative changes in sedimentation rates as a result of channel improvements

Spatial Domain: Nearshore Coastal Alabama, Mobile Bay and Delta.

Grid Resolution: 10 layers in the vertical within every grid cell. Smallest elements resolve the Mobile Bay navigation channel, with nodal spacing of ~ 28 m with the maximum cell width in the bay of ~ 350 m and maximum grid edge in model domain of ~3000 m.

Simulation Time Period: January – December 2010

Model Output: Sedimentation rates and pathways



Estuarine Sediment Transport



BUILDING STRONG

GSMB - SEDZLJ

Purpose: To assess relative changes in sedimentation rates as a result of channel improvements

Spatial Domain: Nearshore Coastal Alabama, Mobile Bay and Delta.

Grid Resolution: 10 layers in the vertical within every grid cell. Smallest elements resolve the Mobile Bay navigation channel, with nodal spacing of ~ 28 m with the maximum cell width in the bay of ~ 350 m and maximum grid edge in model domain of ~3000 m.

Simulation Time Period: January – December 2010

Model Output: Sedimentation rates and pathways



Coastal Nearshore Sediment Transport



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Delft3D (Flow, SWAN and Morph modules)

Purpose: Quantify relative changes in sediment pathways and morphological response of the adjacent nearshore environment as a result of proposed channel modifications.

Spatial Domain: Northern Gulf of Mexico, Nearshore Coastal Alabama (Ebb Tidal Shoal and Dauphin Island)

Grid Resolution: Smallest elements resolve the nearshore, with grid spacing of approximately 20m in the longshore and 5 meters in the crossshore

Simulation Period: Reduced full wave climate of the coastal region to a set of representative wave wind conditions, which will be ran over a smaller time scales (ie tidal cycles) with its effect on the morphology multiplied by a Morpfac value.

Model Output: Sediment transport pathways and morphological response



Ship Wake



BUILDING STRONG

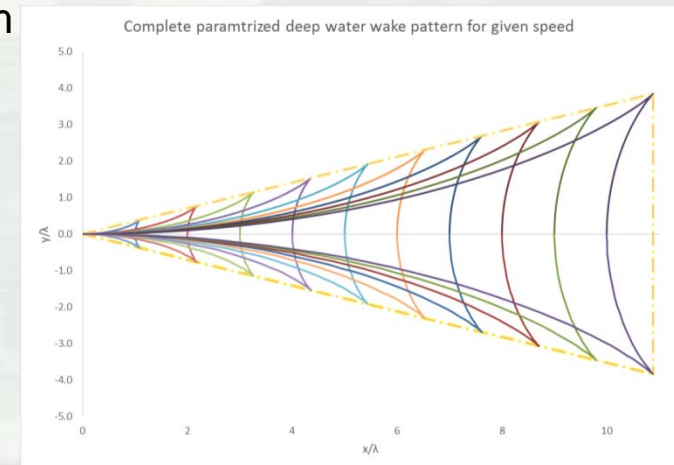
Wake Model Tool

Purpose: Quantify relative changes in ship wake energy from proposed channel improvement measures.

Spatial Domain: Navigation channel and distance off the sailing line of the navigation channel (i.e. points of Interest along the western shoreline)

Simulation Period: Simulated for a select number of representative vessels and vessel speeds.

Model Output: Diverging and transverse wave propagation and spatial determination of wave period, individual and group celerity, and individual and cumulative wave energy





Predictive Analysis of Potential GRR Impacts to Wetlands



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- Off site data collection - review existing mapping including current efforts
- Identify data gaps and finalize field study design
- Execute field study: 1) verify mapping and address data gaps, 2) describe wetland communities (soils, vegetation, hydrology), 3) link in-channel water quality (e.g., salinity) with wetland pore water data
- Develop plant community data/distribution tables
- Link wetland community type with salinity and water quality tolerance intervals
- Utilize water quality and sediment modeling results to predict potential impacts including spatial extent, degree, duration
- Develop draft report for review and comment from SAM and interagency team followed by comment response, final approval, and publication



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Predictive Analysis of Salt Water Intrusion to Submerged Aquatic Vegetation



BUILDING STRONG

- **Identification/Examination of Existing Data:**

- Use historic, current and ongoing SAV maps, GIS layers, etc.
- Establish the current state and extent of SAV resources within the project area
- Initiated August 2016

- **Field Verification:**

- Conduct field verification/ground-truth data to improve resolution in transition zones
- Locations and spatial extent based on gaps in current SAV map and field efforts
- SAVews (echo sounder) and/or visual transects focused on transition zones
- October 2016 (initial site scoping, September 2016)

- **Evaluate habitat variability:**

- Use historic SAV distribution data to determine habitat variation over time
- Potential datasets include

- | | |
|---------------------------|-------------------------------------|
| • 1957 (Baldwin) | • 2002 (Vittor & Associates) |
| • 1963 (Lueth) | • 2008 & 2009 (Vittor & Associates) |
| • 1980 (Stout and Lelong) | • 2015 & 2016 (Vittor & Associates) |

- Focus on estuarine transition zones
- Use spatial statistics to quantify historic variation in estuarine, brackish, freshwater zones

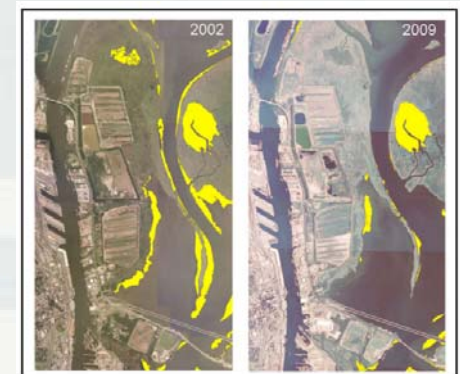


Figure 3-1. SAV coverage (shaded yellow) in the Mobile Quadrangle comparing the 2009 and 2002 surveys.

Vittor and Associates, 2009



Predictive Analysis of Salt Water Intrusion to Submerged Aquatic Vegetation



BUILDING STRONG

- **Evaluate environmental tolerances:**

- Review existing literature and current research efforts
- Identify tolerance of SAV plant species to changes in water quality parameters
- Establish ecological tolerance thresholds



Mobile Bay National Estuary Program

- **Analysis of water quality model outputs and evaluation of alternatives:**

- Use ecological tolerance thresholds to predict impacts on SAV from changes in hydrodynamics and water quality.

- **Reporting:**

- Prepare data report on findings.

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Predictive Analysis of Oyster Reef Connectivity



BUILDING STRONG

- **Spatial data:** Collect all relevant GIS files pertaining to oyster reefs within Mobile Harbor: October 2016 through January 2017 .
- **Define hydrodynamic variables** to be passed to a larval transport model such as velocities, temperature and salinity as well as water levels. October 2016 through June 2017
- **Develop post-processing tools** to generate required 3-D hydrodynamic information from MB model in the format required to interface with the larval transport model (e.g. PTM). Determine duration for simulation and time interval for hydrodynamic information update. January 2017 through March 2017
- **Develop biological behavior library** for larval tracking October 2016 through April 2017
- **Evaluate larval tracking library** and run baseline simulations
- **Utilize water quality model** and hydrodynamic model outputs to identify potential impacts based on tolerance levels and variability of oyster recruitment reef locations habitats
- **Predictive Analysis (Saltwater Intrusion Impacts).** Impacts to benthos from saltwater intrusion based on salinity values obtained through water quality modeling. 1) increases in salinity will increase species richness, 2) increased in salinity variability will reduce species diversity and 3) increases in salinity will result in higher benthic biomass and abundance.
- **Reporting:** Prepared data report on findings.

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Predictive Analysis of Salt Water Intrusion to Benthic Invertebrates



BUILDING STRONG

- **Field Work:** Collect 90 Samples by Ponar Grab per season: October 2016, Feb/March 2017 .
- **Sampling Locations:** samples will be collected in three zone: estuarine, brackish and freshwater
- **Sediments and TOC:** Sediment sample taken at each site to assess: Grain Size Distribution, Total Organic Content, % Moisture.
- **Processing of benthos (stage 1):** Wash samples in the field, preserve with 10% buffered formalin.
- **Collect Physiochemical Data:** Collect water quality data at each sampling station to include: salinity, DO, DO %sat, temperature, etc.
- **Processing of benthos (stage 2).** At the lab, transfer samples to 70% isopropyl alcohol, stain with Rose Bengal. Enumerate samples from debris.
- **Taxonomy:** Taxonomic Identification to lowest practical identification level.
- **Biomass:** process biomass for major groups to include: Annelids, Arthropods, Mollusca, Echinoderms, Miscellaneous)
- **Statistical Analysis:** Compared abundance, taxa and diversity 1) between zones, 2) between areas with different substrates within zones, and 3) by water quality parameters.
- **Fish Distribution/Food Resources:** Correlate fish distribution to benthic invertebrates in all three zones.
- **Predictive Analysis (Saltwater Intrusion Impacts).** Impacts to benthos from saltwater intrusion based on salinity values obtained through water quality modeling. 1) increases in salinity will increase species richness, 2) increased in salinity variability will reduce species diversity and 3) increases in salinity will result in higher benthic biomass and abundance.
- **Reporting:** Prepare data report on findings.

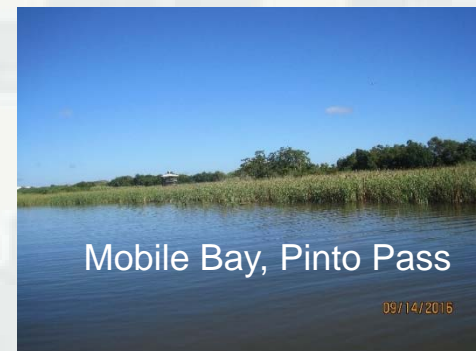
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Predictive Analysis of Salt Water Intrusion to Fish



- **Objective:** Evaluate relationships between salinity and fish assemblage structure to predict potential environmental impacts
- **Field Work:** Collect fish in late summer 2016 and spring 2017 using two gear types: seining and trawling
- **Sampling Locations:** Samples will be collected in three zones: estuarine, brackish and freshwater
- **Habitat Data:** Water quality collected including salinity
- **Database:** Data received from Alabama Marine Resource Division and includes the Fisheries Assessment and Monitoring Program (FAMP) data. Field data collected as part of the current study used to validate statistical models
- **Categorize fish assemblage according to their salinity tolerance**
- **Develop statistical relationships between guild abundance (dependent variable) and salinity (independent variable)**
- **Physical models developed by Mobile District will be used to predict changes in salinity gradients for baseline and alternatives.**
- **Output will be provided as Habitat Units and will identify gains and losses in habitat for each functional guild.**





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BENTHIC INVERTEBRATE MONITORING PLAN

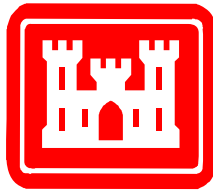
TO ASSESS THE POTENTIAL IMPACTS TO BENTHIC MACROINVERTEBRATES RESULTING FROM SALTWATER INTRUSION POST-DEEPENING OF THE FEDERAL NAVIGATION CHANNEL IN MOBILE BAY, ALABAMA

**Submitted to the Mobile District
109 St. Joseph Street
Mobile, AL 36602**

27 September 2016

Prepared by:

**Kevin J. Reine
Research Marine Biologist
Environmental Laboratory
Engineer Research and Development Center**



U. S. Army Corps of Engineers



INTRODUCTION

As part of an investigation of potential environmental effects of widening and deepening of the Federal navigation channel, the U.S. Army Corps of Engineers Mobile District requests the assistance of the Wetlands and Coastal Ecology Branch (W&CEB) of the U. S. Army Engineer Research and Development Center (ERDC) to assess potential impacts to benthic infauna and sediments in locations potentially impacted by saltwater intrusion. Characterizations of benthic assemblages (taxa, diversity and abundance) in estuarine, transitional (brackish), and freshwater environments are important to establish a baseline of the benthic community prior to channel deepening and potential impacts from saltwater intrusion. A key component of the current study is to document changes to benthic habitat along the salinity continuum moving upriver and estimate how far upriver changes may occur after the navigation channel is widened and deepened to its new authorized depth. The current depth and width measures 45 foot deep by 400 foot wide channel in the bay and a 47-foot deep by 600-foot wide channel across the bar. Elevated salinities upriver and in adjacent marshes have raised concerns among resource managers because of potentially undesirable impacts to the marshes and their biological resources. Benthic invertebrates are a critical part of both estuarine and riverine food webs, providing forage for economically and ecologically important finfish and shellfish species, which are identified as an important indicator of potential effects, and are routinely monitored as part of environmental assessments. Annelids, polychaetes, nematodes, clams and crustaceans that inhabit the bottom substrate of estuarine and riverine systems are collectively called benthic macroinvertebrates. These organisms may be infauna, living within the bottom substrate or sediment or epifauna, living on or just above the bottom substrate. These organisms play a vital role in maintaining sediment and water quality and are an important food source for bottom feeding fish, shrimp, ducks, and marsh birds. Some examples of commercially or recreationally important fish species that feed on benthic invertebrates include: Atlantic Croaker, Southern Kingfish or Ground Mullet, Spot, and Flounder. Many other fish species located in the Mobile estuary feed primarily on epifauna, crustaceans and mollusks, include crabs, crayfish, snails, clams, etc. The Alabama Shad is a freshwater species that feeds almost exclusively on benthic invertebrates. Benthic communities are often used as indicators of perturbations in the environment because they are relatively immobile, and therefore cannot avoid environmental disturbances. The responses of benthic communities to habitat alterations (e.g. hypoxia) are often expressed as changes in community structure, density and diversity. Benthic populations and community characteristics are sensitive indicators of contaminants, dissolved oxygen stress, and salinity fluctuations.

1.0 PURPOSE: Sediment/benthic samples are collected for a variety of reasons including chemical, physical, toxicological and biological analysis. The current study plan is to assess and characterize the benthic assemblage (taxa, diversity and abundance), sediment characteristics and water quality in three primary zones: estuarine, brackish (transitional) and freshwater prior to deepening the Federal navigation channel in Mobile Bay. This assessment will establish a baseline dataset, especially in areas where little or no data is currently available. Although all three zones could experience changes in salinity resulting from salt water intrusion, the freshwater environment is an area where saltwater intrusion resulting from the widening and deepening of the Mobile Bay Federal Navigation Channel may have the greatest impact. Saltwater intrusion is the influx of seawater into an area that is not normally exposed to high saline levels. Saltwater intrusion includes the inflow of seawater into a freshwater wetland or a freshwater riverine system. In addition to salinity, dissolved oxygen concentrations (mg/L), water depth, temperature (°C) substrate type (e.g., sand, silt etc.) and organic content all affect benthic invertebrate communities.

2.0 STUDY SITE: Mobile Bay, Alabama is formed by the Fort Morgan Peninsula to the east and Dauphin Island, a barrier island on the west. Mobile Bay is 413 square miles (1,070 km²) in area. It is 31 miles (50 km) long with a maximum width of 24 miles (39 km). The deepest (75 feet, 23 m) areas of the Bay are located within the federal navigation channel, which serves Alabama's only port for ocean-going vessels, but the average depth of the bay is around 10 feet (3 m). The Mobile Bay watershed is the sixth largest river basin in the United States and the fourth largest in terms of streamflow. It drains water from three-fourths of Alabama as well as portions of Georgia, Tennessee and Mississippi into Mobile Bay. Both the Mobile River and Tensaw River empty into the northern end of the Bay. Several smaller rivers: Dog River, Deer River, and Fowl River, on the western side of the Bay and the Fish River on the eastern side also

empty into the Bay, making it an estuary. A feature of all estuaries is a transition zone, where the freshwater from the rivers mixes with the tidally-influenced salt water of the Gulf of Mexico.

3.0 Data Quality Objectives

- Establish baseline data for comparison to results/output from the modeling component of the study.
- Obtain pre-existing data for benthic stations in Mobile Bay, the delta and freshwater sites,
- Collected data will be used to determine changes in the benthic assemblage due to changes in salinities resulting from the widening and deepening of the Mobile Federal Navigation Channel.
- The Mobile District with input from various state and federal resources agencies will use this data to choose the most suitable option to achieve project goals while protecting valuable resources and habitat.
- All samples will be collected with the assistance of Mobile District personnel and vessels provided by the Mobile District.
- The Wetlands and Coastal Ecology Branch of the Environmental laboratory will be responsible for processing all samples collected.
- Number of samples to be collected is provided below.
- Schedule of sampling events and data processing is located in Tables 1-3.
- Statistical analysis, to include Univariate and Multivariate procedures, are provided in greater details in Section 6.
- Number of samples equals 30 per zone for a total of 90 samples taken during each sampling event. Sample locations are displayed on Figures 1 through 3.
- Water quality profiles (surface to bottom) will be taken at each site.
- A sediment sample will be taken at each site to obtain information on sediment grain size and total organic content.
- Quarterly progress reports will be provided to the Mobile District for review and comment.
- A data report will be presented to the Mobile District and Resource Agencies for Review and Comment.
- A final report will be submitted to the Mobile District after the incorporation of review comments.
- An ERDC Technical Report shall be submitted for publication through ERDC's Dredging Operation and Technical Support (DOTS) Program.
- All data will be entered into an electronic database (i.e. Excel). Output results from PRIMER-E as well as any maps plotting results will be put into PowerPoint for easy viewing. A hard copy of all the data records, including Chain of Custody forms shall be kept and archived at ERDC.
- All data, both hardcopies and electronic versions shall be sent to the District upon request.

4.0 Field Methods

Data collection: Benthic invertebrates will be sampled during the fall of 2016 and spring of 2017. A total of 90 benthic samples will be collected during each of the two sampling events ($n = 180$). Thirty samples will be collected in each of three zones: estuarine (Zone A), brackish (transitional, Zone B) and freshwater (Zone C) (Figure 1). A layout of sampling station by within each zones is located in Figures 2 through 4. Sampling stations are plotted in the Captain's Software v8 on NOAA Charts 11376 to 11380, and linked to a diff GPS Trimble Navigation System. GPS coordinates are provided in Appendix A.

- Spring sample measures recruitment of benthic invertebrates.
- Summer sampling can evaluate the response to presence/absence, taxa and abundance due to hypoxic periods. (Option)
- Fall Samples typically maximizes abundance, number of taxa, and biomass, most notably in areas that do not experience hypoxic conditions.

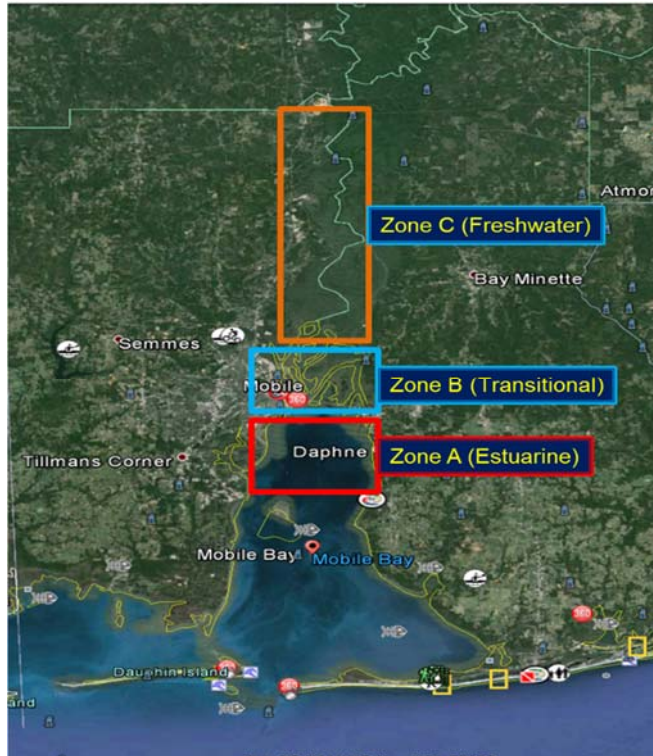


Figure 1. Sampling zones.



Figure 2. Benthic sampling stations in Zone A (estuarine zone).

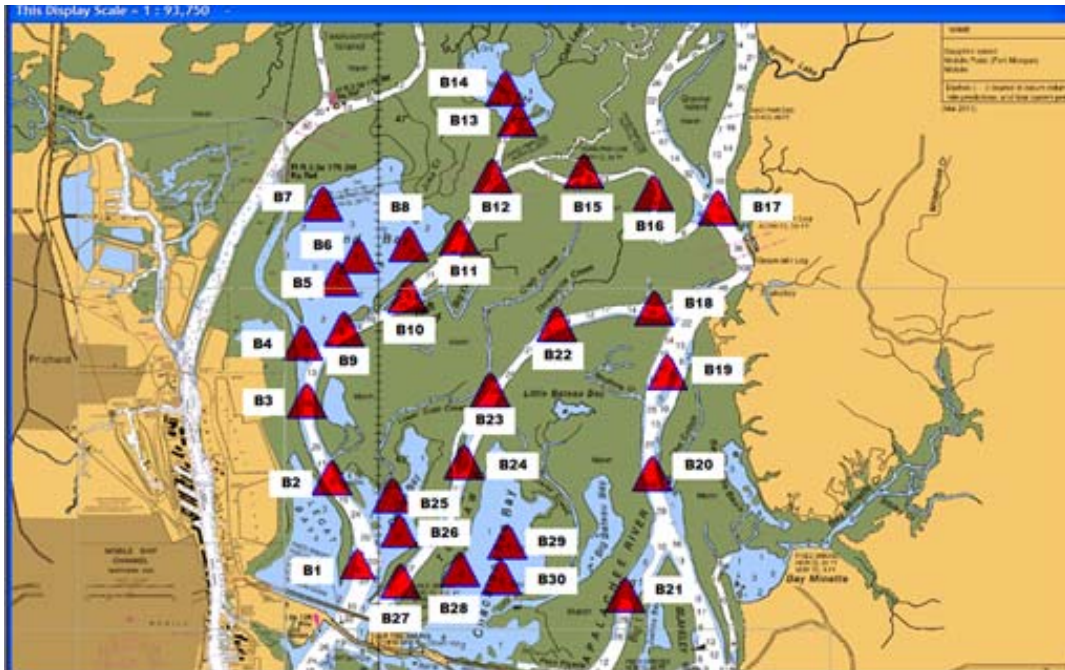


Figure 3. Benthic sampling stations in Zone B (brackish or transitional zone).

There is no NOAA Chart for this region of the Mobile River. These stations will have to be navigated to using the boat's navigation system. The other stations can be navigated to using the Captain Software.

C1 thru C5 are located on NOAA Chart

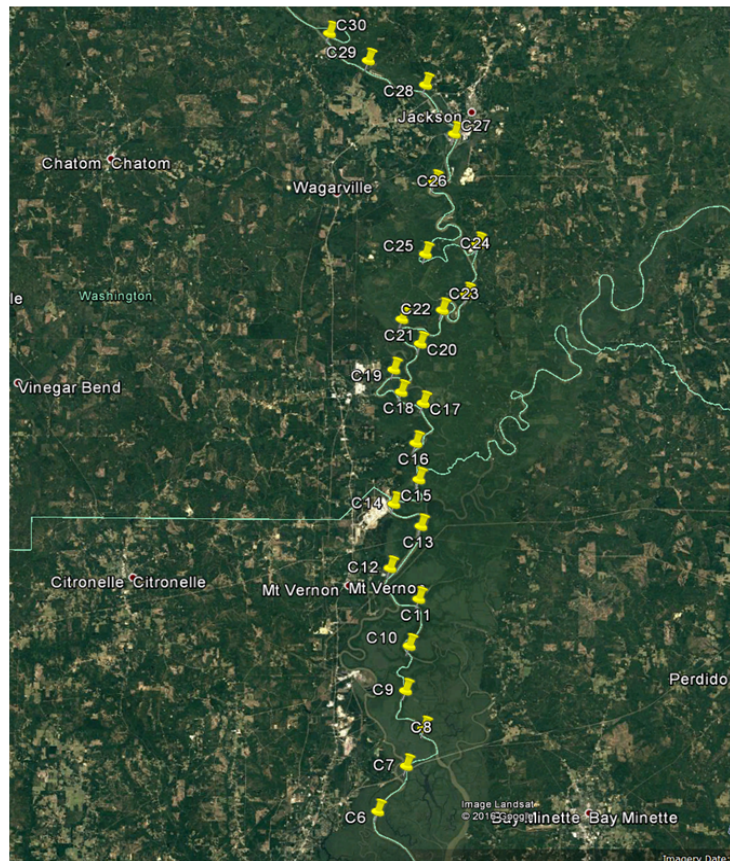


Figure 4. Sampling stations located in Zone C (freshwater zone).

4.1 Water Column: Water quality vertical profiles (surface to bottom) will be collected at each sampling station. Dissolved Oxygen (mg/l), Temperature (°C), pH, Salinity (ppt), Specific Conductance (uS/Cm @ 25C), and Depth (m) will be measured with a Hydrolab M S5 Sonde manufactured by Hatch Corporation.

- Sampling at sites < 2 m, every 0.5 m interval
- Typical depths: sites > 2 m and less than 10 m, interval 1 m.
- Deep sites (> 10 m)-every 1 – m interval from surface to near bottom. Half m intervals in the lower 3 m of the bottom.
- Two profiles will be recorded, one while the instrument is being raised, the other during lowering.
- An example water quality data sheet is found in Appendix B.

Dates	Vessel	Location	Samples Collected	Type Sample or Activity
June 2016	n/a	n/a	n/a	Literature review for salinity ranges of benthos found in Mobile Bay
October 11th	Wallace	Irvington Field Office	N/A	Mob Equip./ Travel to Mobile
Field Work, October 11 th -14 th	Wallace	Estuarine (Zone A)	30 each type	Benthic Substrate Water Quality
Field Work, October 15 th – 17 th	Wallace	Freshwater (Zone C)	30 each type	Benthic Substrate Water Quality
Field Work, October 18 th – 21 st	Carolina Skiff	Brackish Zone B)	30 each type	Benthic Substrate Water Quality
October 21 st	Carolina Skiff	TBD	N/A	Demob Equipment/Travel back to ERDC
October 22 nd – 25 th		ERDC Lab	90 total	Wash Samples/Transfer to 70% Alcohol Stain with Rose Bengal
Oct 26 th and 27 th		ERDC Lab	90 total	Let samples stain for a minimum of 2 days
November 2016		ERDC Lab	90 total	Processing of fall samples; separating animals from sample debris
December 1 st		ERDC	90 total	Ship samples to Dr. Gary Ray
December 2 nd – 22 nd		HX5	90 total	Taxonomic IDs
Dec 23 rd – Jan 7 th				Christmas Break
Jan 9 th to Jan 17 th		ERDC	450 max subsamples	Calculate biomass for Annelids Calculate biomass for Anthropods Calculate biomass for Echnoderms Calculate biomass for Mossusca Calculate biomass for Miscellanoeus

Note 1: Generally a spring sampling event (March 2017) would occur to assessment recruitment in the sampled area. The District and Resource Agencies have one of three options in addition to the fall sampling event: 1) conduct a spring sampling only as originally proposed in the SOW to assessment recruitment and salt water intrusion to recruitment, 2) conduct summer sampling to evaluate benthos under hypoxic conditions, or 3) conduct both a spring and summer sampling. The summer sampling event would be used to characterize benthos during low DO conditions as well as the added stress placed on the benthic community due to changes associated with salt water intrusion.

Dates*	Vessel	Location	Samples Collected	Type Sample/ Activity
March 6th		Irvington Field Office	n/a	Travel/Mob equipment
March 7th – 11th	Wallace	Estuarine (Zone A)	30 each type	Benthic Substrate Water Quality
March 11th – 14th	Wallace	Freshwater (Zone C)	30 each type	Benthic Substrate Water Quality
March 15th – 18th	Carolina Skiff	Brackish Zone B)	30 each type	Benthic Substrate Water Quality
March 18th	Carolina Skiff	TBD	N/A	Demob Equipment
March 18-22nd	N/A	ERDC's Coastal Lab	90 total	Wash Samples/Transfer to 70% Alcohol Stain with Rose Bengal
March 22 nd and 23 rd	B/A	ERDC's Coastal Lab	90 total	Let samples stain for a minimum of 2 days
March 23-April 24 nd	N/A	ERDC's Coastal Lab	90 total	Processing of fall samples; separating animals from sample debris
April 24 rd	N/A	ERDC's Coastal Lab	90 total	Ship samples to Dr. Gary Ray, Benthic Ecologist (retired ERDC employee)
April 24 th – May 14 th	N/A	HX5	90 total	Taxonomic IDs

May 14 th – 26 th	N/A	ERDC Coastal Lab	450 max subsamples	Calculate biomass for Annelids Calculate biomass for Anthropods Calculate biomass for Echnoderms Calculate biomass for Mossusca Calculate biomass for Miscellaneous
May 26 th – Jun 9 th	N/A	ERDC/HX5		Statistical Analysis of benthic and sediment results
June 10 th – 23 rd	N/A	ERDC/HX5		Correlation of fish distribution to benthic invertebrates
June 24 th Jul 31 st	N/A	ERDC/HX5		Predictive Analysis (Impacts from saltwater intrusion)
August 1 st	N/A	ERDC/HX5		Deliver Draft Report to Mobile District and Resource Agencies
Aug 2 nd -16 th	N/A	ERDC/HX5		Incorporate comments from Mobile District and Resource Agencies
August 17 th	N/A	ERDC/HX5		Final Report Delivered

Note 2: Currently fall of 2016 and spring of 2017 are reported in the Scope of Work for the collection of benthic invertebrate samples due to the extreme logistical constraints imposed by the 3x3x3 study. Given the deadline as to when a final report must be turned over to the District a late summer sampling event will not provide adequate time for processing and analyses of the data, unless there is a change in the stipulation that the final report is due by August 17th.

4.2 Sediment and Benthic Community Collection: The Ponar Sampler, or 'Grab Sampler', is widely used in fresh and estuarine environments for taking sediment samples from hard bottoms such as sand, gravel, consolidated marl or clay (Reine et al, 2014; 2013) . The Standard Ponar is deliberately heavy device for biting deep into the bottom and has proven success at invertebrate recovery. When the scoops strike the bottom, their tapered cutting edges penetrate well with very little sample disturbance. Removable screens on top of each scoop allow water to flow through as it descends. Constructed of 316 Stainless Steel and weighing 34kg when full, it is typically connected to a davit and lifted by winch to the surface. Some benefits include: center pivot for low bottom disturbance, tapered scoop edges for a clean cut, heavy duty hinges for high impact work, removable stainless steel top screens and a self-releasing pinch pin. It weighs 23 kg (50 lbs) empty and 34 kg (75 lbs) full. It has a sampling area of 229 by 229 mm. This grab type samples an area of 0.052 m² and has a maximum penetration depth of 15.2 cm. A successful grab has a relatively level, intact sediment over the entire area of the sampler to a minimum depth of 10 cm.

4.2.1 Processing of Benthic Samples

- Collect 30 benthic samples with each of the three zones (n = 90) using a 0.052-m² Ponar grab sampler. Benthic samples will be noted as quality, substrate type, and odor. Samples will then be sieved with a 0.5 mm mesh screen.
- Material retained on the screen will be placed in a HUBCO 485-5x7 Geological Sample Bay 5" x 7" and placed into a 5-gallon bucket for storage. Nalgene bottle may also be used for storage and transport.
- Sample will be preserved in 10% buffered formalin and stained with rose Bengal to facilitate sorting.
- Samples will be transported to ERDC's Coastal Ecology Lab for processing. Samples will be transferred from formalin to 70% alcohol.
- Samples are then processed based on currently accepted practices in benthic ecology (e.g. Holme and McIntyre, 1971) and on specific protocols described in the EMAP-E Lab Methods Manual (U. S. EPA 2001; 1995).
- Animals are then sorted from sample debris under a dissection microscope.

4.2.2 Quality Control

- A representative number of samples (10%) shall be selected at random and reprocessed to determine if all benthic organisms were separated from sediment and debris upon initial processing.
- If 10% of the total number of organisms were missed during the initial processing of the samples, all samples will be re-processed.

4.2.3 Total Organic Content (TOC).

- Stainless steel utensils will be used to remove a portion of the sediment sample for total organic content.
- The subsection of the substrate sample will be placed in a 24 oz. (710 ml) whirl-pac, sealed and placed in an ice cooler to remain cold.
- Analysis of TOC will be conducted at ERDC's sediment processing laboratory.
- A total of 90 substrate samples (30 from each zone) will be processed to determinant TOC.
- One substrate sample is collected at each benthic sampling station.
- Organic content will be measured as weight loss upon ignition following the procedures listed below.
- Measure duplicate aliquots (~ 2 gram wet-weight).
- Dry aliquots at 100 °C for 12 hours.
- Re-weigh aliquots after cooling in a drying chamber.
- Place in muffle furnace at 500 °C for 12 hours.
- Allow sample to cool in drying chamber.
- Organic content will be calculated between aliquot ash-free and dry-weights.

4.2.4 Grain Size Distribution:

- GSD can have significant effects on the distribution of benthic species. Higher percentages of sand, for example, may provide greater numbers of microhabitats for interstitial species to exist and could increase sediment permeability allowing greater exchange of oxygen and nutrients at depths in the sediment (Hyland et al. 1991), Weston 1988).
- All substrate samples will undergo processing for Grain Size Distribution at ERDC's sediment Processing Laboratory.
- GSD will be processed using a combination of wet-sieving, floatation procedures and coulter counter techniques.

4.2.4.1 Processing of sediment for Grain Size Distribution

- Soak samples in 20% sodium hexametaphosphate solution to disaggregate silt and clay fractions.
- Agitate sample in sonic bath for several minutes.
- If sediment contains gravel it must be sieved in successively smaller sieves to determine size.
- The sand and silt/clay fraction are then run through the coulter counter.
- Grain size analysis will be performed using Gradistat v8.0 (Blott and Pye 2001), which takes the results obtained from the coulter counter and sieve data (gravel) to calculate a variety of grain size parameters as well as the percentages of sediments in individual grain size categories.
- Grain size parameters and description will be based on the methods by Folk and Ward (1957) and Folk (1966).

4.2.5 Considerations for proper measurement and handling of sediment samples:

- Records on sampling, including field measurements will be taken and maintained (Appendix B).
- The appropriate field measurements and any information peculiar to the sample will be supplied to the laboratory along with the sample.
- The samples will be stored into Whirp-pac bags which resist puncturing.
- To obtain a representative sample for GSD, consideration of lateral and vertical variability in grab samples must be assessed in the field. Collect larger samples from poorly sorted sediment; smaller samples from well sorted sediment.
- To prevent the growth of organics within a sample, refrigeration in an ice cooler is necessary during the entire field data collection trip. Excessive evaporation must also be avoided, especially if the samples are marine and it is necessary to correct for salt content.
- All analyses will be performed within 1 month of arrival at ERDC Labs.

4.2.6 Sample Labeling - All sample containers will be labeled with:

- the site name as it appears on the laboratory submission form.
- the date and time of the sample collection
- the name of the sample collector or other information specified by the laboratory.

4.2.7 Sample Handling and Shipment

- Sample containers- Nalgene bottle can be placed in a standard ice cooler for shipment.
- Sediment cloth bags will be stored in a tightly sealed 5-gallon bucket with 10% buffered formalin.
- All sediment samples will be chilled and stored in coolers or similar containers at 4 °C..
- A description of how the samples were packed in the field, what preservatives were used and how they were shipped to the Lab will be recorded.
- A chain of custody form (Appendix B) will accompany each sample shipment.

4.2.8 Field observation recorded during benthic and sediment sampling.

- Weather conditions to include skies, seas, wind and direction and speed and air temperature, will be recorded at every sampling site
- Habitat/water body type as well as submerged aquatic vegetation (SAV) and presence of marine debris will be documented.
- The benthic sediment will also be characterized for grab quality, substrate type, and odor.
- Water depth (m) will be recorded for each sample taken.

5.0 Taxonomic identification and biomass of benthic invertebrates.

- Species separated under the above tasks will be enumerated by LPIL (lowest practical identification level) taxa using a high-powered microscope.
- Wet-weight biomass will be determined after combining LPIL taxa into higher-order taxa (Annelids, Arthropods, Mollusca, Echinodermata, and Miscellaneous).
- Taxonomic ID will be performed by Dr. Gary Ray, Marine Benthic Ecologist, HX5 Corporation
- Wet-weight biomass will be performed at ERDC's Coastal Ecology Lab.
- Wet-weight biomass will be determined after combining LPIL taxa into higher-order taxa (Annelids, Arthropods, Mollusca, Echinodermata, and Miscellaneous).
- Given that each sample ($n = 90$ per sampling event) can be subdivided into 5 categories for a maximum total of 450 possible benthic subsamples.
- Wet-weight biomass will be calculated for each subsample. Note: Not all samples will have representative in each of the five major taxa categories.

6.0 Procedures for determining wet-weight biomass.

- Place filter on manifold apparatus and attach glassware.
- Rinse filter with distilled water.
- Using a vacuum pump remove excess water.
- Place wet filter in number glass container
- Weight filter and container on mass balance scale.
- Remove filter and replace back on manifold.
- Reattach glassware.
- Empty sample into glassware and wash with distilled water.
- Remove excess water with a vacuum pump.
- Remove filter with benthic invertebrates and place into glass container for weighing.
- Weight sample on mass balance scale.
- Record measurement.
- Subtract weight of wet filter and container from container with benthic invertebrates.
- Remove animals from filter and stored in vial with 70% alcohol as reference.

7.0 Statistical Analysis: Trends in benthic assemblages are generally evaluated by some combination of three analytical methods: univariate statistics, multivariate statistics and benthic indices. Less common approaches include examination of functional groups (Wilber and Stern, 1992). Species within families share functional roles; therefore aggregation of abundance data at the family level is useful when conducting impacts analyses (Sommerfield and Clarke, 1995). Benthic macrofaunal abundance data will be aggregated at the family level and transformed, as needed, to increase the contribution of the less abundant species to the analysis.

7.1 Univariate Analyses: Univariate measures include commonly reported parameters such as, total abundance, taxa richness, and total biomass. Analysis of Variance (ANOVA) tests will be used to compare these parameters among:

- Within Zones
- Between sampling periods.

7.1.1 Purpose: This univariate technique will provide an overview of spatial and temporal trends within the system.

7.2 Multivariate Statistics: Multivariate analyses will be conducted on the benthic infaunal abundance data to determine differences between

- Zones, (e.g. brackish vs. estuarine)
- Within Zones (e.g. freshwater sites on the upper (north) end of the sampling stations to freshwater sites located downriver (south)).
- Time periods.

- Community species composition will be analyzed by non-metric multi-dimensional scaling (nMDS) ordinations.
- After completion of nMDS data will be analyzed using Analysis of Similarity (ANOSIM) using PRIMER-E software (Clarke and Gorley, Clarke et al., 2014).
- Non-metric multi-dimensional scaling ordinations (nMDS) will be generated using ranked similarity matrices based on Bray-Curtis similarity measures of data that most likely will be $\log(x+1)$ transformed to reduce the importance of abundant taxa and permit taxa with low or rare occurrences to contribute to similarity groupings of the samples.
- ANOSIM test will test for difference among zones/time periods.
- SIMPER will be used to identify taxa that contributed the most to distinctions among groups.

7.2.1 Purpose: Necessary to determine what key factors are having the greatest impact to abundance, taxa richness, etc., within and between zones.

8.0 Correlation of Fish Distribution/Food Resources to the benthic community

- The aforementioned statistical techniques that we be applied to the benthic data will be used to examine associations between fish distributions and the salinity/sediment gradient within the system.
- In addition, analyses will be conducted to determine whether fish distributions are correlated with benthic prey resources.
- The benthic team will work closely with the fish team to obtain the necessary baseline data to complete the correlation of fish distribution and the benthic community.

8.1 Purpose: To determine impacts to the fish community structure due to changes in benthic diversity, taxa richness and abundance. Reduce costs by not having to collect fisheries data twice, one for the fish team analysis and the other for this task of the benthic study.

9.0 Predictive Analysis

- Upon completion of the above tasks, comparisons among zones will be completed assessing the presence/absence, abundance, taxa, and diversity of benthic invertebrates related to the physical conditions (i.e. salinity, substrate, organic content, depth and dissolved oxygen, within each zone).
- Results of the water quality model will generate predicted changes in salinity concentrations.
- Model results will include not only mean salinity values, but the expected variance in salinity, which is an important factor affecting the benthic community stability.
- Changes to the taxonomic composition of benthic communities in the different salinity zones will be predicted based on the empirical results of the aforementioned tasks.
- Taxonomic composition of benthic assemblages can be predicted from other studies (See Table 4 from Pollock et al., 2009), however, the baseline *in situ* will provide the most relevant data.
- In addition to the data that will be collected in fall 2016 and spring 2017, the overall predictive assessment will include other relevant studies to include (Junot et al., 1983; Lercari and Defeo, 2006; Pollack et al., 2009; Van Diggelen and Montagna, 2016).

9.1 Potential effects of salt water intrusion on the benthic community.

- Will increases in salinity increase species richness?
- Will increases in salinity variability reduced species diversity?
- Will increases in salinity results in higher benthic biomass and abundance?

9.2 Potential effects on the fish community due to changes in the benthic community?

- How will changes in species composition affect the benthic fish community?
- Will the lower abundance of certain species of invertebrates, for example, affect commercially and recreationally important species due to a reduction in available food resources?

9.3 Purpose:

To determine changes in the benthic assemblage due to changes in salinity zones due to salt water intrusions from the deepening project. The locations where salinity zones change and the resultant changes to benthic community composition will be determined when baseline benthic sampling results can be applied to the water quality model.

Taxa	Range	Average	
<i>Streblospio benedicti</i>	15-35	27	Mesohaline
<i>Paraprionospio pinnata</i>	16-35	27	Meso-Polyhaline
<i>Maranzellaria viridis</i>	ND		Oligo-Mesohaline
<i>Axiothella mucosa</i>	19-35	30	Polyhaline
<i>Hobsonia florida</i>	ND		Oligo-Mesohaline
<i>Melinnia maculata</i>	1-34	27	Meso-Polyhaline
<i>Pectinaria gouldii</i>	1-35	27	Meso-Polyhaline
<i>Mediomastus sp.</i>	ND		Meso-Polyhaline
<i>Heteromastus filiformis</i>	18-35	29	Mesohaline
<i>Capitella capitata</i>	15-35	28	Mesohaline
<i>Leitoscoplos fragilis</i>	ND		Mesohaline
<i>Aricidea spp</i>	18-35	31	Polyhaline
<i>Allita succinea</i>	3-35	26	Meso-Polyhaline
<i>Laeoneris culveri</i>	1-35	24	Meso-Polyhaline
<i>Gyptis vittata</i>	18-34	27	Meso-Polyhaline
<i>Diopatra cuprea</i>	9-35	27	Meso-Polyhaline
<i>Hypereteone fauchaldi</i>	51-34	26	Meso-Polyhaline
<i>Sigambra spp</i>	11-35	27	Meso-Polyhaline
<i>Glycera spp</i>	16-35	27	Meso-Polyhaline

10.0 Data Management.

- The Wetland and Coastal ecology Branch (W&CEB) will serve as the central repository for all data collected during the baseline assessment.
- W&CEB will ensure that the status of all study components are updated regularly, providing quality control assessment and identification of problem or logistical constraints in any individual component.
- Data management will include coordination of standardized data entry and storage requirements, spreadsheets formats, and data archival and statistical analysis functions.
- W&CEB will be responsible for periodically tracking disposition of samples through the collection, processing and analysis states.
- After biomass is calculated for each major taxonomic group by sample, the species identified will be preserved in 70% alcohol and stored in archive as a future reference collection or in the event results (i.e. taxonomic species identification) are questioned.
- All data shall be turned over to the Mobile District upon request.

11.0 Report findings of the assessment

- W&CEB will verbally report progress through frequent contact with the Mobile District's technical representatives.

- W&CEB will prepare a written draft report entitled: “*Predictive analysis of potential impacts to benthic invertebrate and fish assemblages result from salt water intrusion*”.
- The Mobile District and resource agencies will have 30 days to review the draft report and to respond with questions or concerns.
- W&CEB will then have 10 days in which to submit the revised final report.
- Although the data report is the only requirement for reporting findings, the W&CEB will publish the data report in as an ERDC Technical Report.
- The ERDC Technical Report will be submitted to the district (after the initial year of the 3x3x3 study) for approval of publication and release.
- W&CEB will assist with interagency coordination where requested by the Mobile District.

12.0 References

Blott, S. J. and Pye, K. (2001). GRADISTAT: a grain size distribution and statistics package for the analysis of unconsolidated sediments. *Earth Surface Processes and Landforms* 26: 1237-1248.

Clarke, K. R. and R. N. Gorley. 2015. PRIMER v7: user manual/tutorial. PRIMER-E Ltd., Plymouth, United Kingdom.

Clarke, K. R., Gorley, R. N., Somerfield, P. J., and R. M. Warwick. 2014. Change in marine communities: an approach to statistical analysis and interpretation. 2nd edition. PRIMER-E, Plymouth, United Kingdom.

Folk, R. L. (1966). A review of grain-size parameters. *Sedimentology* 6: 73-93.

Folk, R. L. and W. C. Ward. (1957). Brazos River bar: A study in the significance of grain-size parameters. *Journal of Sedimentary Petrology* 27: 3-26.

Holme, N. A., and A. D. McIntyre. 1971. Methods for the Study of Marine Benthos. IBP Handbook no 16. Blackwell Scientific Publication, Oxford, 334 p.

Hyland, J., E. Baptiste, J. Cambell, J. Kenedy, R. Kroop, and S. Williams. 1991. Macroinfaunal communities of the Santa Monica Basin on the California Outer Continental Shelf and Slope. *Marine Ecology Progress Series* 78: 147-161.

Junot, J. A., M. A. Poirrier and T. M. Soniat. 1983. Effects of saltwater intrusion from the Inner Harbor Navigation Canal on the benthos of Lake Pontchartrain, Louisiana. *Gulf Research Reports* 7: 247-254.

Lercari, D. and O. Defeo. 2006. Large-scale diversity and abundance trends in sandy beach macrofauna along full gradients of salinity and morphodynamics. *Estuarine, Coastal and Shelf Science* 68: 27-36.

Pollack, J. B., J. W. Kinsey, and P. A. Montagna. 2009. Freshwater Inflow Biotic Index (FIBI) for the Lavaca-Colorado Estuary, Texas. *Environmental Bioindicators* 4:2 153-169.

Reine, K. J., Clarke, D., Ray, G. and C. Dickerson. (2013). Fishery resource utilization of a restored estuarine borrow pit: A beneficial use of dredged material case study. *Marine Pollution Bulletin*: (73) 115-128.

Reine, K. J., Clarke, D. and G. Ray. (2014). Fishery Resource Utilization of an Estuarine Borrow Pit in Mobile Bay, Alabama. Engineer Research and Development Center, Environmental Laboratory Technical Report TR-14-10.

Sommerfield, P. J. and K. R. Clarke (1995). Taxonomic levels in marine community studies revisited. *Marine Ecology progress Series* Vol. 127 p. 113-119.

U. S. EPA. 1995. Environmental Monitoring and Assessment Program (EMAP): Laboratory Methods Manual-Estuaries, Volume 1: Biological and Physical Analysis. United States Environmental Protection Agency, Office of Research and Development, Narragansett, R.I. EPA/620/R-95/008.

U.S. EPA. 2001. Environmental Monitoring and Assessment Program (EMAP): National Coastal Assessment Assurance Project Plan 2001-2004. United States Environmental Protection Agency, Office of Research and Development, National Health and Environmental Effects Research Laboratory, Gulf Ecology Division, Gulf Breeze, FL EPA/620/R-01/002.

Van Diggelen, A. D. and P. A. Montagna. 2016. Is salinity variability a benthic disturbance in estuaries? *Estuaries and Coasts* 39: 967-980.

Weston, D. P. 1998. Macro-benthos-sediment relationships on the continental Shelf off Cape Hatteras, North Carolina – *Continental Shelf Research* 8(3): 267 – 286.

Wilber, P. and Stern, M. (1992). "A re-examination of infaunal studies that accompany beach nourishment projects." *Proceedings of the 5th Annual National Conference on Beach Preservation Technology, New Directions in Beach Management*, Florida Shore and Beach Preservation Association, Tallahassee, FL, pp. 242-257.

APPENDIX A

Lat	Lon	Name	Area	Real Lat	Real Lon
30° 39.677' N	087° 59.608' W	Mobile	A1	30.6612818	-87.9934675
30° 39.109' N	088° 00.265' W	Mobile	A2	30.6518148	-88.004409
30° 39.178' N	087° 58.523' W	Mobile	A3	30.652972	-87.9753755
30° 38.495' N	087° 59.179' W	Mobile	A4	30.6415779	-87.986317
30° 38.228' N	087° 57.960' W	Mobile	A5	30.6371271	-87.966006
30° 38.008' N	087° 57.061' W	Mobile	A6	30.6334684	-87.9510221
30° 37.324' N	087° 58.174' W	Mobile	A7	30.622072	-87.9695634
30° 38.298' N	088° 00.412' W	Mobile	A8	30.6382923	-88.0068704
30° 37.440' N	088° 01.002' W	Mobile	A9	30.6239987	-88.016698
30° 36.698' N	088° 01.162' W	Mobile	A10	30.6116333	-88.0193667
30° 37.394' N	087° 59.769' W	Mobile	A11	30.6232333	-87.99615
30° 36.408' N	087° 59.313' W	Mobile	A12	30.6068	-87.98855
30° 37.023' N	087° 56.781' W	Mobile	A13	30.61705	-87.94635
30° 36.525' N	087° 56.633' W	Mobile	A14	30.60875	-87.9438833
30° 35.643' N	087° 58.670' W	Mobile	A15	30.59405	-87.9778333
30° 35.875' N	088° 00.506' W	Mobile	A16	30.5979167	-88.0084333
30° 35.365' N	087° 59.876' W	Mobile	A17	30.5894167	-87.9979333
30° 36.420' N	087° 57.624' W	Mobile	A18	30.607	-87.9604
30° 35.678' N	087° 56.754' W	Mobile	A19	30.5946333	-87.9459
30° 36.570' N	087° 55.561' W	Mobile	A20	30.6095	-87.9260167
30° 35.944' N	087° 55.574' W	Mobile	A21	30.5990667	-87.9262333
30° 34.948' N	087° 56.727' W	Mobile	A22	30.5824667	-87.94545
30° 34.925' N	087° 58.054' W	Mobile	A23	30.5820833	-87.9675667
30° 34.739' N	087° 59.984' W	Mobile	A24	30.5789833	-87.9997333
30° 33.927' N	088° 00.212' W	Mobile	A25	30.56545	-88.0035333
30° 34.100' N	087° 54.877' W	Mobile	A26	30.5683333	-87.9146167
30° 34.183' N	087° 56.499' W	Mobile	A27	30.5697167	-87.94165
30° 35.167' N	087° 55.306' W	Mobile	A28	30.5861167	-87.9217667
30° 33.092' N	087° 59.957' W	Mobile	A29	30.5515333	-87.9992833
30° 33.903' N	087° 58.657' W	Mobile	A30	30.56505	-87.9776167
30° 42.116' N	087° 59.716' W	Mobile	B2	30.7019333	-87.9952667
30° 42.539' N	087° 59.810' W	Mobile	B3	30.7089833	-87.9968333
30° 41.994' N	087° 58.282' W	Mobile	B4	30.6999	-87.9713667
30° 41.675' N	087° 58.912' W	Mobile	B5	30.6945833	-87.9818667
30° 41.363' N	087° 56.721' W	Mobile	B6	30.6893833	-87.94535
30° 42.058' N	087° 56.278' W	Mobile	B7	30.7009667	-87.9379667

Appendix A (continued).

30° 41.531' N	087° 59.709' W	Mobile	B8	30.6921833	-87.99515
30° 42.932' N	087° 58.853' W	Mobile	B9	30.7155333	-87.9808833
30° 42.747' N	088° 00.620' W	Mobile	B10	30.71245	-88.0103333
30° 44.333' N	088° 01.009' W	Mobile	B12	30.7388833	-88.0168167
30° 45.086' N	088° 00.540' W	Mobile	B11	30.7514333	-88.009
30° 45.357' N	088° 00.267' W	Mobile	B13	30.75595	-88.00445
30° 44.495' N	088° 00.453' W	Mobile	B14	30.7415833	-88.00755
30° 44.889' N	087° 59.615' W	Mobile	B15	30.74815	-87.9935833
30° 45.566' N	087° 58.925' W	Mobile	B16	30.7594333	-87.9820833
30° 43.772' N	087° 58.510' W	Mobile	B17	30.7295333	-87.9751667
30° 44.623' N	087° 57.457' W	Mobile	B18	30.7437167	-87.9576167
30° 47.314' N	087° 58.310' W	Mobile	B19	30.7885667	-87.9718333
30° 46.956' N	087° 58.148' W	Mobile	B20	30.7826	-87.9691333
30° 46.354' N	087° 57.760' W	Mobile	B21	30.7725667	-87.9626667
30° 45.704' N	087° 55.877' W	Mobile	B22	30.7617333	-87.9312833
30° 44.743' N	087° 56.320' W	Mobile	B23	30.7457167	-87.9386667
30° 44.268' N	087° 57.988' W	Mobile	B24	30.7378	-87.9664667
30° 41.571' N	087° 58.363' W	Mobile	B25	30.69285	-87.9727167
30° 45.966' N	088° 00.736' W	Mobile	B26	30.7661	-88.0122667
30° 45.496' N	087° 59.596' W	Mobile	B27	30.7582667	-87.9932667
30° 46.330' N	087° 56.373' W	Mobile	B28	30.7721667	-87.93955
30° 43.644' N	088° 00.944' W	Mobile	B29	30.7274	-88.0157333
30° 46.289' N	087° 58.484' W	Mobile	B30	30.7714833	-87.9747333
30° 48.673' N	087° 59.288' W	Mobile	C1	30.8112167	-87.9881333
30° 49.159' N	087° 58.055' W	Mobile	C2	30.8193174	-87.9675871
30° 50.096' N	087° 56.661' W	Mobile	C3	30.8349306	-87.9443566
30° 51.091' N	087° 57.479' W	Mobile	C4	30.85151	-87.9579751
30° 51.830' N	087° 58.953' W	Mobile	C5	30.8638333	-87.98255

Chain of Custody Form																			
Engineer Research & Development Center USACE Waterways Experiment Station 3909 Halls Ferry Road										EL Project # _____ State Where Samples Collected:									
REPORTS RESULTS TO:										TURNAROUND TIME									
Name:										Date Results Needed By:									
Company										Standard (2 weeks) <input type="checkbox"/>									
Address										1 Week <input type="checkbox"/>				72 Hrs <input type="checkbox"/>					
City										48 Hrs <input type="checkbox"/>				24 Hrs <input type="checkbox"/>					
State Zip										Approved By:									
TEL																			
FAX																			
Sampled By: (Signature)										Date of Shipment:									
Identification		Matrix							Sample Preservation			Analysis Needed							
Sample #	Sample ID	Comp	Grab	Water	Soil	Air	Sludge	Other	Formalin	ICE	Other	DATE	TIME	NTU	TSS	TOC	SGS	% Moisture	
Released By:		Date & Time Released:					Delivery Method					Received By:							
Agency		Condition Noted:					Date & Time Received :					Comments:							
Reporting Format:								Standard <input type="checkbox"/>			Results and QC <input type="checkbox"/>			Reduced Deliverables <input type="checkbox"/>			Disk <input type="checkbox"/>		

Mobile Bay Deepwater Navigation - Fishery Assessment Field Protocol and Statistical Analysis

Background and Objectives

A deep water navigation channel is proposed for Mobile Bay harbor. Changes in depth may alter salinity patterns in the surrounding estuarine ecosystem and impact fish and other faunal groups. The objectives of the fishery assessment is to establish baseline conditions in the project area including species distribution and abundance, and evaluate relationships between salinity and fish assemblage structure to predict potential environmental impacts.

Field Sampling

Fish will be collected during fall 2016 and spring 2017 using trawls and seines in the three areas encompassing the Mobile Bay ecosystem: marine, brackish, and freshwater. In order to utilize existing data collected in Mobile Bay, we will adopt the same collecting techniques used by the Alabama Marine Resource Division for the Fisheries Assessment and Monitoring Program (FAMP) database. The FAMP is a fishery-independent database for shrimp, crab, and finfish started in 1980 and continues to the present. Sample sites for this study will correspond to FAMP locations in Mobile Bay, and will be expanded to include the transitional and freshwater zones.

A two-seam, 16-ft otter trawl will be used to sample benthic fish over a range of water depths. A minimum of two trawl samples will be taken at each site. The body of the trawl is made of 1 $\frac{3}{8}$ -inch webbing and the cod end liner is 3/16-inch mesh to retain smaller bodied individuals. Trawling will occur in water depths ranging from 5 to over 30 ft. The length of the tow lines will be about three-times the water depth to ensure that the footrope of the trawl remains along the bottom. A tickler chain will be attached to the footrope to disrupt the substrate and increase catch efficiency of benthic organisms. The net will be deployed from the bow followed by the otter boards as the boat slowly backs up. Any twists or crossing of the ropes will be corrected during deployment. A float line is tied to the cod end in case the trawl becomes entangled on underwater obstructions. If entangled, a trailer boat will grab the float line and slowly back up lifting the trawl from the obstruction; the sample is usually discarded. A GPS will record average speed and distance travelled during a 10-minute trawl sample, which is the duration used for the FAMP data. The trawl will be retrieved after completion of the sample and contents of the cod end will be emptied into a sorting container.

A 50 x 4 ft., 3/16-inch mesh knotless bag seine will be used to sample shoreline fish and shellfish. One seine haul will be taken per site. Two people will carry the seine out from the shoreline 60-ft, then move parallel to the shore a short distance to avoid disrupting the sample area. The 60-ft distance will be confirmed by a person with a range finder standing along the shoreline. The seine will be unfurled and hauled towards the shoreline ensuring that the lead line is in full contact with the substrate. In structurally-complex areas (e.g., vegetation), a third person will be located behind the mid-section of the seine in case the lead line becomes entangled on a snag. If entangled, the third person will reach down and pull back the lead line usually freeing the net from the snag. If the seine cannot be readily freed, the sample will be

discarded and an adjacent site will be sampled. Once the shoreline has been reached by the seiners, the wings of the seine will be shaken down until all organisms are in the bag area where they can be removed.

All organisms collected by trawl and seine will be identified to species or the lowest practical taxon, enumerated, and measured. Large-bodied fish and shellfish will be released at the point of capture after processing. Smaller bodied fish, shellfish, and other invertebrates will be preserved in 10% formaldehyde and processed in the laboratory. A label will be placed in each sample container including location, date, and sample number. Total length will be measured for all fish. Weights for adults will be calculated from length-weight relationships calculated from the FAMP data. Carapace or disc width will be measured for crabs, anemone, and other shellfish. Mantle length will be measured for squids.

Water quality, depth, substrate type, surface velocity, and relative abundance of aquatic vegetation will be measured at each sampling site to characterize habitat conditions. Surface and bottom water quality will be measured using a calibrated YSI multi-parameter meter and includes temperature, pH, conductivity, salinity, and dissolved oxygen. Depth and surface velocity will be measured along a representative transect and will include a minimum of five vertical locations to obtain mean, maximum, and coefficient of variation values. Depth will be recorded from boat-mounted transducers in deeper waters or using a stadia rod in shallower waters. Substrate type (i.e., sand or mud/silt) will be visually assessed from otter boards or using the stadia rod to probe the bottom. Surface velocity will be measured using a Marsh-McBirney or SonTek flow meter. The relative percentage and species of aquatic vegetation encompassing the sampling site will also be recorded. GPS locations will be recorded to develop maps of sampling effort and allow us to utilize extant data on vegetation coverage, bathymetry, shoreline configurations, and other factors that may account for variability in fish distribution and abundance.

Statistical Analysis

Data collection will be consistent with the FAMP protocols and comparable to the Louisiana Dept. of Wildlife and Fisheries, Marine Fisheries Division database collected over a 30-year period. Both of these databases include species abundance based on trawls and seines, and in most cases, a select set of habitat variables (i.e., depth and salinity) measured concurrently with fish collections. Therefore, we will merge these databases with the baseline assessment being conducted for this study to conduct the analysis. Tables will be prepared summarizing seasonal species abundance at each area. Statistical analysis, including ordination, will be performed to evaluate correlations between fish assemblage, sampling areas, and environmental variables using Statistical Analysis System 9.4 and Primer 7.0. All analysis will be coordinated with state fishery personnel and other disciplines including benthic and wetland assessments.

The seasonal and spatial variation of the fish assemblage in the Mobile Bay study area, with emphasis on salinity, will be described, classified, and analyzed for alternative analysis using a four step process:

1. Develop guilds separating species into the three major study reaches: marine/estuarine, transitional, and freshwater. Following the conceptual model by Elliott et.al (2007)¹, functional categories of feeding areas, nursery areas, refugia, and migration routes will be assigned to each species within each of the three major habitat types. This results in 12 guild cells, although some may not contain any species while others will overlap with the same species. However, the guild cells characterize the entire fish community and will be used as dependent metrics in the correlation analysis.
2. Statistical relationships between guild abundance (dependent variable) and salinity (independent variable) will be evaluated using various curve-fitting techniques in SAS 9.4 and the output standardized as suitability index curves ranging from 0 to 1.
3. Physical models developed by Mobile District will be used to predict changes in salinity gradients for baseline and alternatives. These data will be included in a GIS framework to calculate acres of habitat by salinity classification (e.g., 0 to 5 ppt – freshwater; 5 to 10 ppt – transitional, 10-20 ppt – estuarine, and >20 ppt marine).
4. Habitat Units will be calculated for the study area by species guild using the following equation: $\text{Suitability Index}_{\text{salinity}} * \text{Acres}_{\text{salinity classification}} = \text{Habitat Units}$. Habitat Units will be determined for baseline and each alternative. Changes in Habitat Units will indicate impacts or benefits of the project alternatives to the fish community.

¹ Elliott, M., A. K. Whitfield, I. C. Potter, S. J. M. Blaber, D. P. Cyrus, F. G. Nordlie, and T. D. Harrison. The guild approach to categorizing estuarine fish assemblages: a global review. *Fish and Fisheries* 8: 241-268.

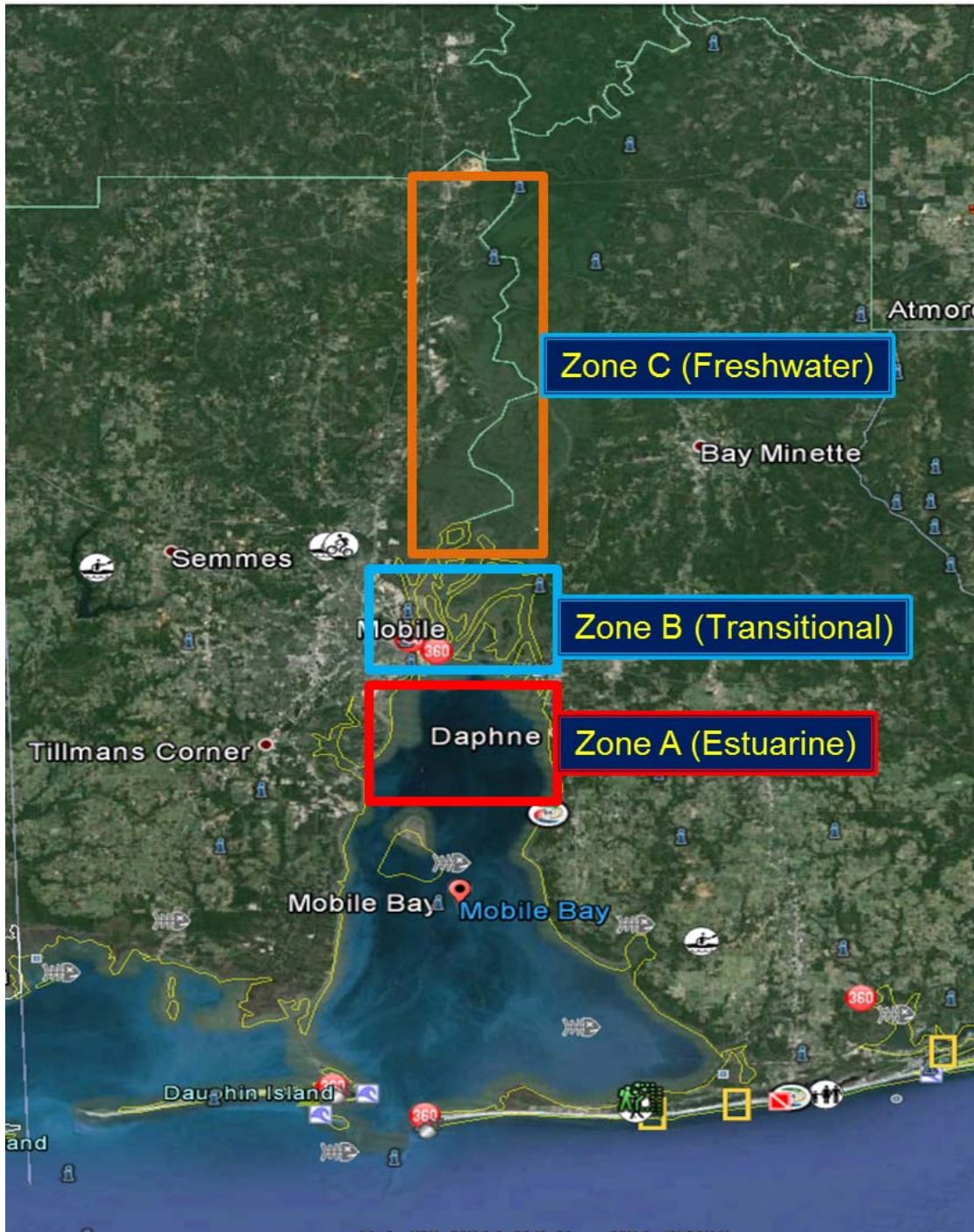


Figure 1. Study site depicting estuarine, transitional and freshwater zones.



DEPARTMENT OF THE ARMY
MOBILE DISTRICT, CORPS OF ENGINEERS
P.O. BOX 2288
MOBILE, ALABAMA 36628-0001

REPLY TO
ATTENTION OF:

CESAM-PD-EC

March 2, 2017

MEMORANDUM FOR RECORD (MFR)

SUBJECT: Agency Meeting/Webinar for Mobile Harbor General Reevaluation Report (GRR) and Supplemental Environmental Impact Statement (SEIS) regarding aquatic resources assessment preliminary results – 2 February 2017.

1. On February 2, 2017 the U.S. Army Corps of Engineers (Corps), Mobile District hosted a teleconference/webinar with the cooperating agencies as part of the ongoing agency scoping activities for the Mobile Harbor GRR and integrated SEIS. The purpose of the meeting was to reconvene the team of cooperating federal and state agencies to present preliminary results of aquatic resources assessments being conducted by the Engineering Research and Development Center (ERDC) for the study. This meeting was a follow up to the September 22 webinar in which the Corps and ERDC team presented an overview of the study approach that was developed for the aquatic resources assessments.

The meeting participants included representatives from the following agencies:

- Alabama State Port Authority (ASPA)
- U.S. Army Corps of Engineers, Mobile District (Corps)
- U.S. Army Corps of Engineers, Charleston District
- U.S. Army Corps of Engineers Corps, Engineer Research and Development Center (ERDC)
- Alabama Dept. of Environmental Management (ADEM), Mobile Field Office
- ADEM, Water Quality Branch (WQB)
- Alabama Dept. of Conservation and Natural Resources (ADCNR), State Lands Division
- U.S. Fish and Wildlife Service (FWS)
- National Marine Fisheries Service (NMFS), Habitat Conservation Division (HCD)
- Environmental Protection Agency (EPA)
- U.S. Geological Survey (USGS)

The agenda, participation list, meeting slides are included below.

2. After a round of introductions, representatives from the ERDC team involved in the study efforts gave presentations on the status and preliminary results from the ongoing aquatic resource assessments. A copy of the presentation slides are included at the end of this MFR.

3. Following the presentations, the meeting was opened to questions and discussion. The ADCNR, State Lands Division had provided some of the data sets for the SAV mapping efforts and recommended discarding the SAV data for fall of 2015. There is speculation that weather conditions prior to conducting the surveys acted to detach the tops of the seagrasses, resulting in the appearance that no seagrasses were present. However, it is believed that rhizomes were still present in the sediment, but not detectable. ADCNR also expressed concerns that the 1994 data appears to be distorted in the middle part of the bay. It was recommended overlaying the 2000 or 2015 shape files over the 1994 data in an attempt to quantify the amount of distortion. It is likely at this point that there may not be any SAV surveys conducted for 2016. The State is waiting on RESTORE funds which is not expected to be received in time for 2016 surveys.

4. A question was asked by EPA on why there are no surveys and data collection being conducted for wetlands and SAVs in the lower bay. Representatives from ERDC explained that resources in the lower bay are already salt tolerant and would not be significantly affected by changes resulting from the channel modifications. Also, the southern region of the bay is routinely covered by various studies and therefore much data already exists. The GRR studies are being focused on transition areas that would be more sensitive to variations in the water quality regimes.

5. Pertaining to the studies underway in the oyster shell mining areas, ADCNR inquired if there are any apparent differences in the benthic communities between the mining areas compared to other areas included in the study? Such information will be useful in determining if the benthic communities in the oyster mining areas continue to be depressed. ERDC indicated that the samples collected in these areas have not yet been completely processed to a point to make a determination at this time. The sampling plan in the oyster mining areas was set up to differentiate between areas of known disturbance and undisturbed (control) areas.

6. Corps representatives expressed the concern that the species of phragmites observed during the wetland field verification work is not the common species addressed widely in the local literature. In many cases, the common species is considered invasive. This differentiation between the species will need to be addressed in the study. ERDC pointed out that there are genetic and morphological differences between the tropical and common species. What was predominantly observed during the field verification work was the tropical species which is considered to be native species. Will need to confirm if there are native versus non-native species. The tropical species is considered to be native, while the common species is invasive. It was recommended that the study examine areas where there are large stands of phragmites to see if there are morphological differences to be able to differentiate which species is

predominant. The ASPA acknowledged that this is an important issue and we need to do what it takes to resolve.

7. Please address any questions, comments, or concerns pertaining to this meeting to Larry Parson at (251) 690-3139 or larry.e.parson@sam.usace.army.mil.

/s/ Larry E. Parson
U.S. Army Corps of Engineers, Mobile District
Coastal Environment Team

**Agency Meeting
Mobile Bay General Reevaluation Report (GRR)
Supplemental Environment Impact Statement (SEIS)
Conference Call/Webinar
February 2, 2017
1:00 – 3:00 Central**

**Aquatic Resources Assessment - Preliminary Results
Agenda**

Introductions

Aquatic Resources Assessments Updates

Wetlands
Submerged Aquatic Vegetation
Oysters
Benthic
Fish

Questions and Discussion

Next Steps

Mobile Harbor GRR Agency Webinar – List of Participants

Agencies

Bob Harris (ASPA)
Judy Adams (ASPA)
Carl Ferraro (ADCNR)
Scott Brown (ADEM)
Allen Phelps (ADEM)
Justin Rigdon (ADEM-WQB)
Chris Johnson (ADEM-WQB)
James Mooney (ADEM-WQB)
Dan Holliman (EPA)
Calista Mills (EPA)
Ntale Kajumba (EPA)
Patric Harper (FWS)
Josh Rowell (FWS)
Rusty Swafford (NMFS)
Brandon Howard (NMFS)
Michelle Myers (USGS)

Corps of Engineers - ERDC

Jacob Berkowitz
Safra Altman
Todd Slack
Todd Swannack
Kevin Philley
Jack Killgore
Candice Piercy
Carra Carrillo
Dara Wilber

Corps of Engineers – Mobile District

Elizabeth Godsey
Justin McDonald
David Newell
Richard Allen
Nate Lovelace
Rita Perkins
Joe Paine
Larry Parson
LeKesha Reynolds
Jennifer Jacobson
Susan Rees
Joe Givhan

Corps of Engineers – Charleston District

Mark Messersmith

Update: Aquatic Resources Assessment of Mobile Bay

Interagency team webinar - February 02, 2017

- Jacob F. Berkowitz - wetlands
- Kevin Reine - benthics
- Safra Altman - SAV
- Todd Swannack - oysters
- Jack Killgore - fish

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US Army Corps of Engineers, Engineer
Research and Development Center,
Vicksburg, MS



Objectives

1. Evaluate aquatic resources within Mobile Bay
 1. Wetlands, benthics, SAV, oysters, fish
2. Incorporate findings of water quality models
3. Determine potential aquatic resource impacts from Navigation projects conducted by SAM.

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Mobile Bay Wetland Community Classification

DRAFT

Jacob Berkowitz, Kevin Philley USACE – ERDC
Environmental Laboratory

Wetlands and Coastal Ecology Branch

Photos: Nathan Beane



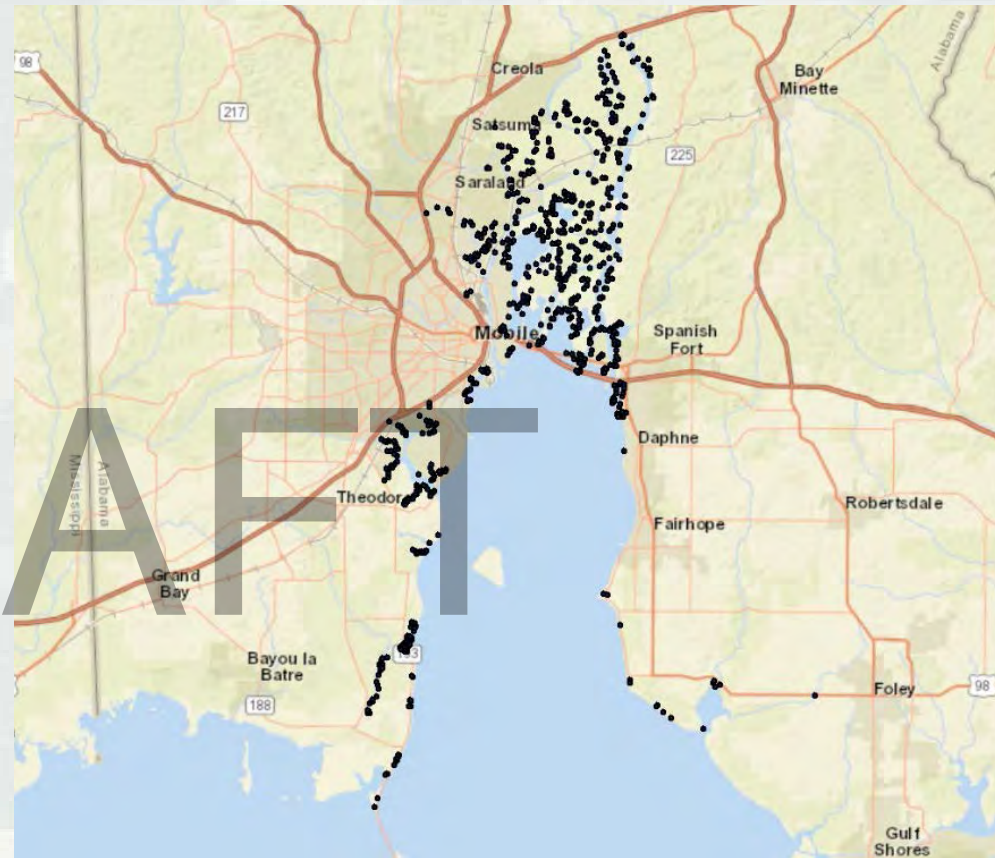
Project Objectives

- Map the distribution of wetland communities within the Mobile Bay survey area
- Establish tolerances to salinity and other parameters based upon published literature
- Determine potential impacts to wetland resources based upon water quality modeling outputs



■ Methods

- ▶ Sampled ~800 unique locations
- ▶ Descriptive data points
 - Dominant species composition recorded based on visual estimate
 - ▷ Ex. “Big cordgrass/Switchgrass”
- ▶ Established vegetation plots
 - Representative locations within wetland communities
 - Recorded species richness, abundance, and structure



- Mapping utilized remote sensing tools images (growing season and late season) to capture multi-seasonal changes in vegetation color and texture
 - USDA – National Agriculture Inventory Program (NAIP) 2015
 - 2014 High resolution orthoimagery
 - Google Earth imagery
- 40 preliminary classes
 - ▶ Some will be merged based on extent, shared water quality tolerance



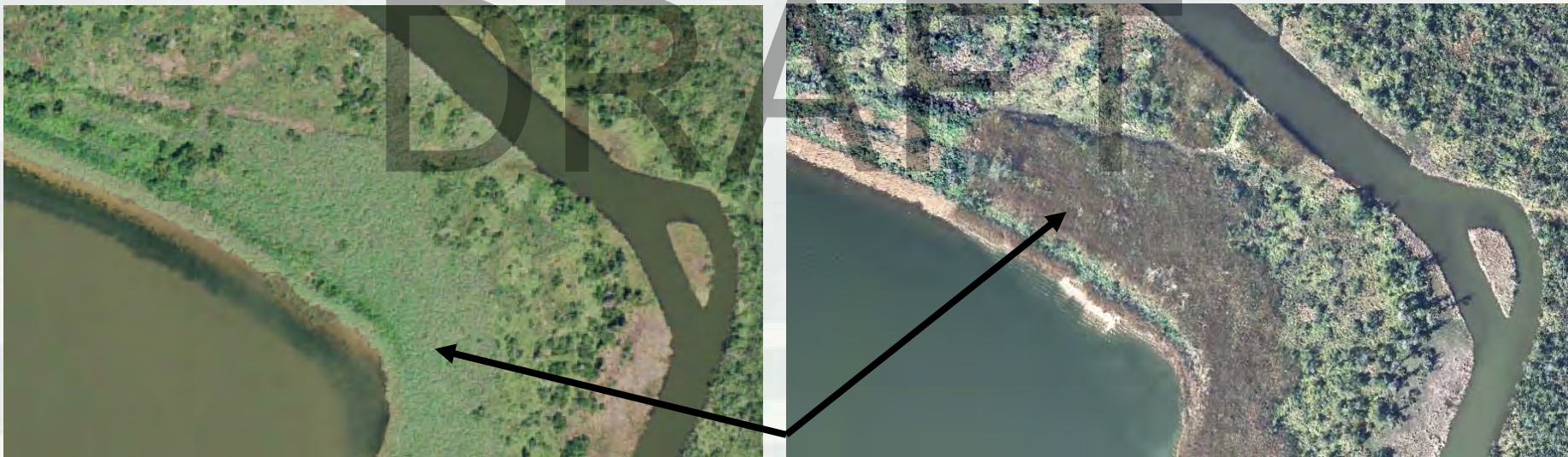
Common communities

- *Phragmites karka*
(Tropical reed)
 - ▶ Considered native to the Gulf Coast
 - ▶ Frequently forms large monotypic stands
 - ▶ Distinctive signature in both winter and growing season photos



Common communities

Phragmites often appears globular or linear in shape and parallel to water features. Light green, coarse texture during growing season, and darkened during late season.



Phragmites



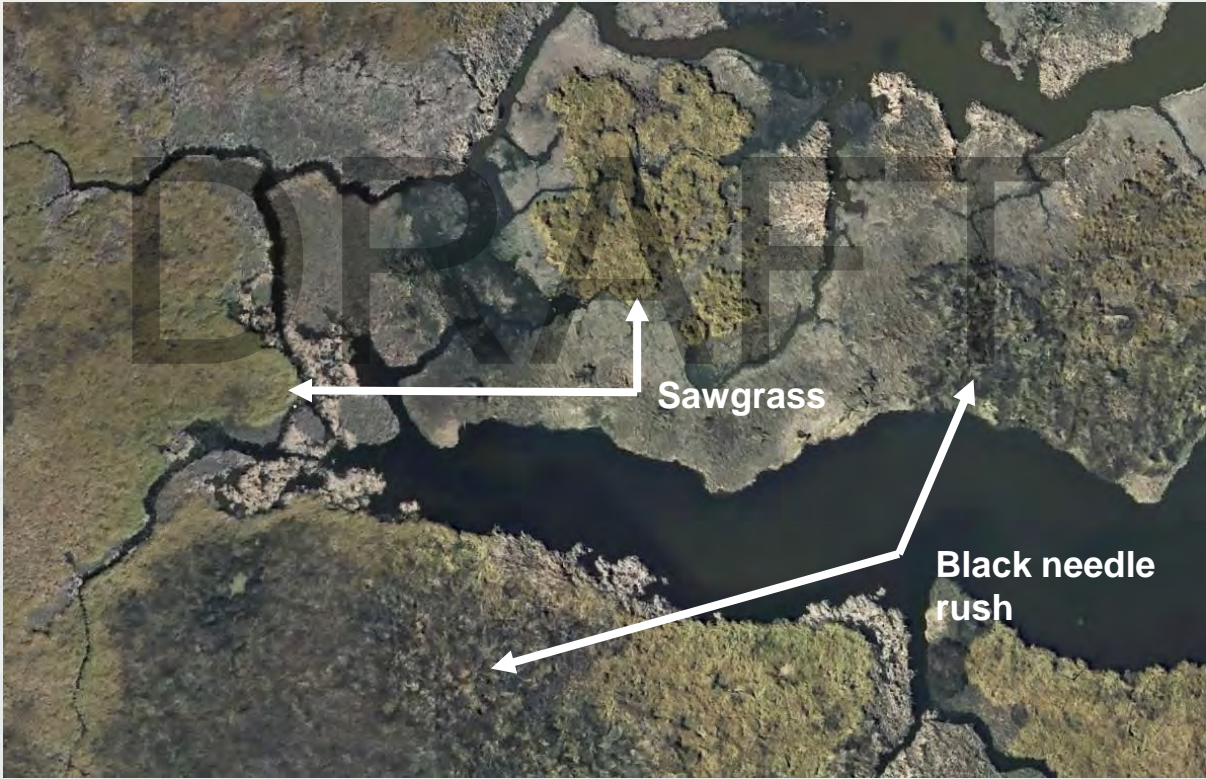
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Common communities

- Sawgrass - (*Cladium jamaicense*)
 - ▶ Typically forming near monotypic stands
 - ▶ Often adjacent to black needlerush (*Juncus roemerianus*)
 - ▶ Distinctive texture and yellow-green color in late season aerial photographs



Common communities



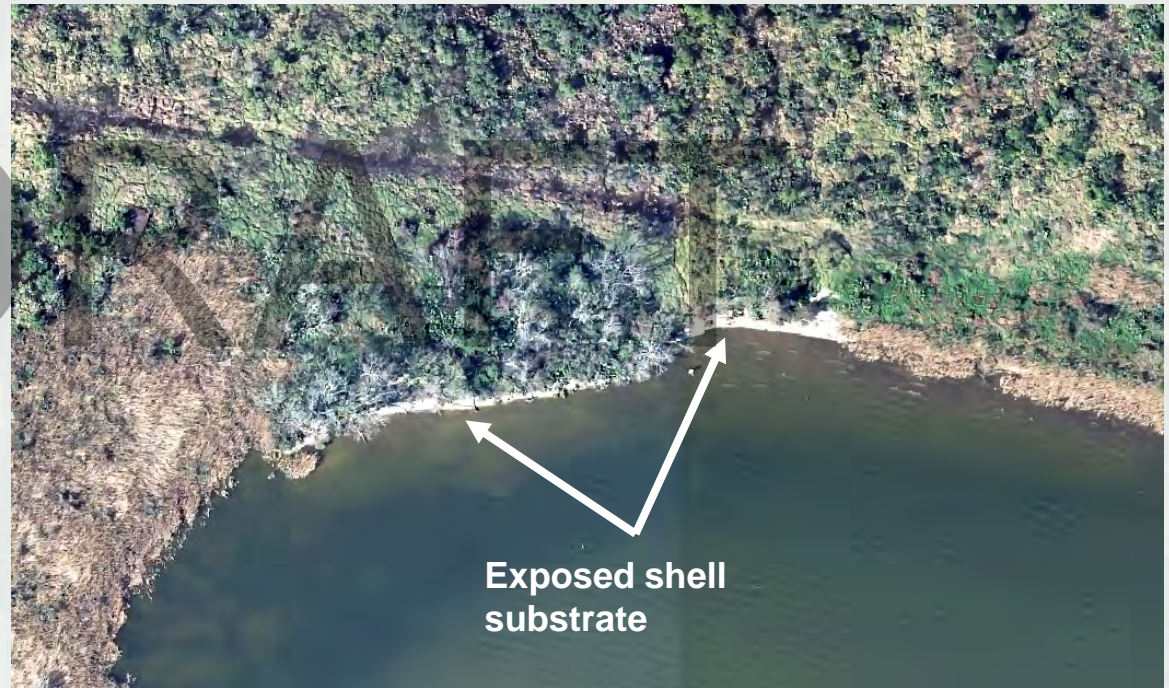
Unique communities

- Shell middens
 - ▶ Floristically unique communities on substrate of discarded shells
 - ▶ Often small (<1 ha), with portions not likely meeting wetland criteria
 - ▶ Habitat for rare plants
 - Small flower mock buckthorn (*Sageretia minutiflora*); Christmas berry (*Lycium carolinianum*); both state listed species in AL)
 - ▶ Archaeological significance



Unique communities

Shell midden
located along the
northern shore of
Grand Bay.



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Unique communities



Florida Soapberry (*Sapindus marginatus*) – tree restricted to coastal hammocks and shell middens of AL, FL, GA, and MS (Weakley, 2015).



Southern sedge (*Cyperus thrysiflorus*) collected from a midden on the Tensaw River. This was only the fourth collection of this species from AL.



Aquatic bed communities

- ▶ Formed large stands or narrow bands in shallow channel margins and bays.

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Yellow pond-lily (*Nuphar* sp.) – bright green “halo”



Water lotus (*Nelumbo lutea*) - distinct blue-green color



Preliminary Wetland
Community Map
completed

Continuing tasks

- Refine map

- Determine if
additional data
needed

- Compile additional
supporting literature

Future tasks

- Obtain water quality
model outputs

- Determine potential
impacts to wetlands



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Mobile Bay wetland assessment



The USACE Mobile District provided funding for the efforts. Special thanks to Richard Allen and Nathan Beane for assistance with field data collection.

Questions or comments should be submitted to Dr. Jacob Berkowitz - Jacob.F.Berkowitz@usace.army.mil



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Benthic Invertebrate Update Summary

Overview

- 180 samples were collected by Ponar Grab in October 2016.
- Samples were collected in four zones (A-D).
- Water quality data was collected at each sampling station.
- One sediment sample was collected at each sampling station to assess: 1) Grain Size Distribution (GSD), % Percent Moisture and Total Organic Content (TOC).
- Positioning data was collected for mapping purposes

Zones A-C (Estuarine, Transition and Freshwater Zones)

- Thirty benthic, water quality and substrate samples were collected in each of the three zones.
- Status: Benthic samples transferred from 10% buffered formalin to 70% alcohol and stained with Rose Bengal (awaiting processing).
- Water quality data entered into Excel database ready for analysis. (Data entry 100% completed).
- Substrate samples processed for GSD and TOC. (100% completed).
- Data being prepared for statistical analysis.



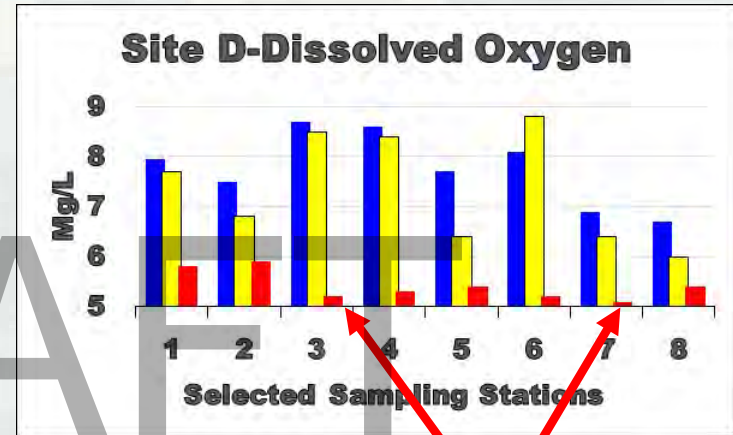
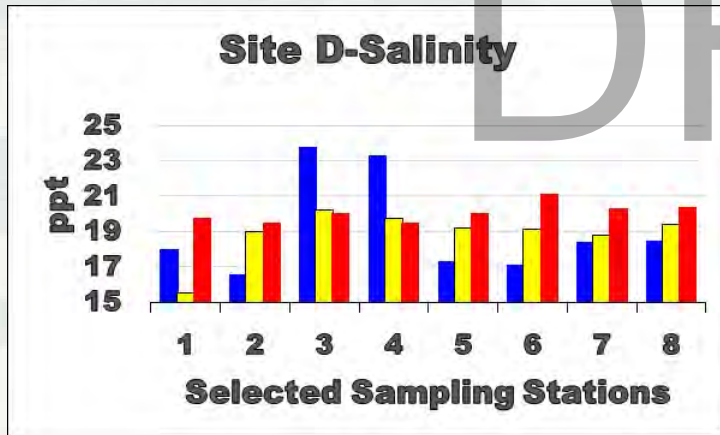
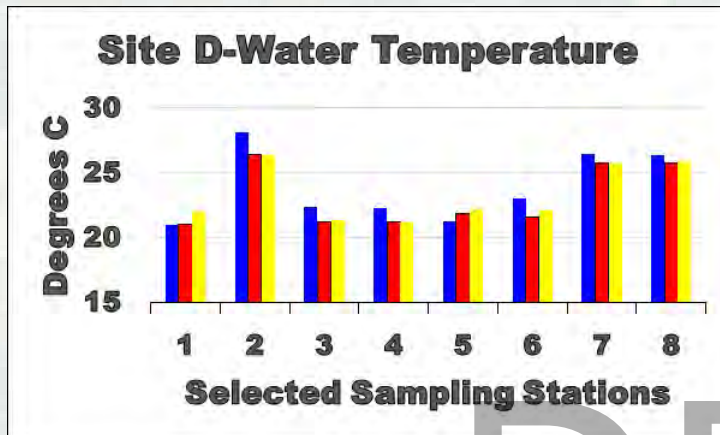
Benthic Invertebrate Update Summary

Zone D (Beneficial Uses Site-Oyster Holes)

- Ninety (90) samples were collected from Zone D.
- Zone D was divided into four primary areas to include 1) Baseline, 2) Control, 3) Impact and 4) Placement area.
- Note: that Placement Area samples were collected at a site where thin-layer placement had previously occurred
- The impact area includes the oyster holes and immediate area surrounding the holes.
- All water quality data and substrate data has been processed.
- 100% of all Zone D benthic samples have been processed.
- Preliminary Results and Observations
 - Substrate Data
- The majority of samples were comprised of silt to sandy silt.
- Less than 10% of all samples were pure sand.
- A significant number of the beneficial uses site (Zone D) samples characterized by the presence of shell hash.
- Most samples had large amounts of organic debris (exception: samples with mostly sand or large amount of shell hash).



Benthic Invertebrate Update Summary Water Quality



Dissolved oxygen (D), Mg/L) levels at some sampling sites were at 5 Mg/L.

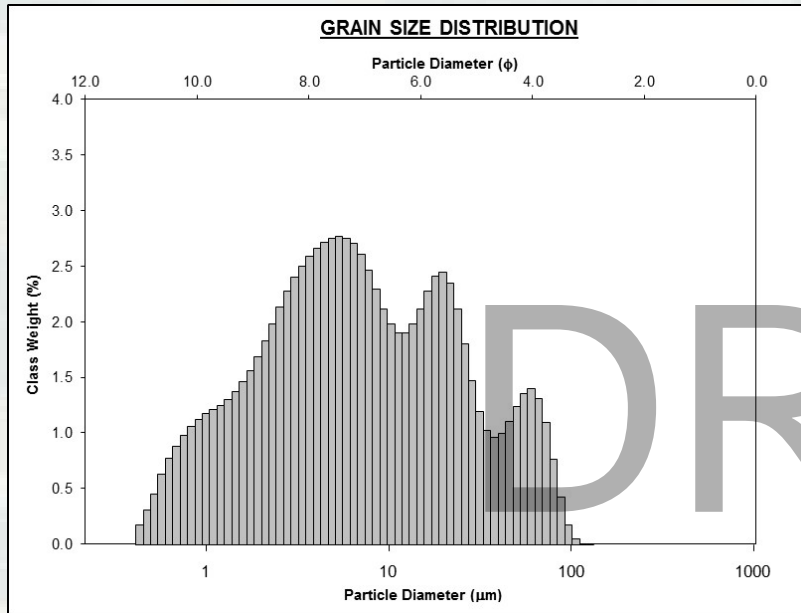


DO (Mg/L) would most likely go hypoxic during summer months.

Note: Measurements taken at surface (blue column); mid-water (yellow column) and bottom water depths (red columns)



Site D--Clay-Silt Substrate Example

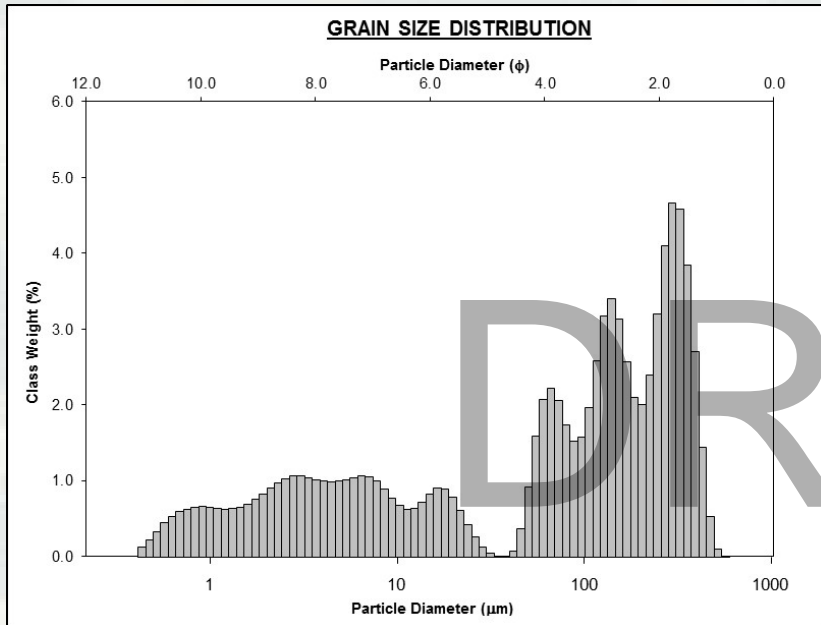


SAMPLE STATISTICS						
SAMPLE IDENTITY:			ANALYST & DATE: KJR			
SAMPLE TYPE: Trimodal, Poorly Sorted			TEXTURAL GROUP: Mud			
SEDIMENT NAME: Fine Silt						
			GRAIN SIZE DISTRIBUTION			
MODE 1:	μm	ϕ	GRAVEL: 0.0%	COARSE SAND: 0.0%		
MODE 2:	5.361	7.545	SAND: 4.2%	MEDIUM SAND: 0.0%		
MODE 3:	19.79	5.661	MUD: 95.8%	FINE SAND: 0.0%		
D ₁₀ :	60.60	4.046		V FINE SAND: 4.2%		
MEDIAN of D ₅₀ :	1.229	4.617	V COARSE GRAVEL: 0.0%	V COARSE SILT: 8.8%		
D ₅₀ :	6.516	7.262	COARSE GRAVEL: 0.0%	COARSE SILT: 15.9%		
D ₉₀ :	40.75	9.668	MEDIUM GRAVEL: 0.0%	MEDIUM SILT: 15.9%		
(D ₅₀ / D ₁₀):	33.16	2.094	FINE GRAVEL: 0.0%	FINE SILT: 20.6%		
(D ₉₀ - D ₁₀):	39.52	5.051	V FINE GRAVEL: 0.0%	V FINE SILT: 17.1%		
(D ₇₅ / D ₂₅):	6.613	1.472	V COARSE SAND: 0.0%	CLAY: 17.4%		
(D ₇₅ - D ₂₅):	15.45	2.725				
			METHOD OF MOMENTS		FOLK & WARD METHOD	
	Arithmetic	Geometric	Logarithmic	Geometric	Logarithmic	Description
	μm	μm	ϕ	μm	ϕ	
MEAN (\bar{x}):	14.32	6.869	7.186	6.750	7.211	Fine Silt
SORTING (σ):	18.35	3.534	1.821	3.720	1.895	Poorly Sorted
SKEWNESS (S_k):	2.088	0.022	-0.022	0.038	-0.038	Symmetrical
KURTOSIS (K):	7.101	2.240	2.240	0.925	0.925	Mesokurtic

- 90% of all samples collected at Site D had GSD comprised mostly of silt-clay
- Approximately 5% of the sample was Very Fine Sand
- Less than 10% of all sample had small amounts of shell hash.
- 75% of samples had organic debris



Site D—Example of a Sandy Substrate



SAMPLE STATISTICS						
SAMPLE IDENTITY: D58			ANALYST & DATE: KJR			
SAMPLE TYPE: Polymodal, Very Poorly Sorted			TEXTURAL GROUP: Muddy Sand			
SEDIMENT NAME: Fine Silty Medium Sand						
	μm	ϕ	GRAIN SIZE DISTRIBUTION			
MODE 1:	140.3	2.835	GRAVEL: 0.0%	COARSE SAND: 0.1%		
MODE 2:	66.52	3.912	SAND: 59.8%	MEDIUM SAND: 23.6%		
MODE 3:	6.460	7.276	MUD: 40.2%	FINE SAND: 20.8%		
D ₁₀ :	2.008	1.588	V FINE SAND: 15.3%			
MEDIAN or D ₅₀ :	101.6	3.300	V COARSE GRAVEL: 0.0%	V COARSE SILT: 4.9%		
D ₉₀ :	332.7	8.960	COARSE GRAVEL: 0.0%	COARSE SILT: 4.2%		
(D ₉₀ / D ₁₀):	165.7	5.644	MEDIUM GRAVEL: 0.0%	MEDIUM SILT: 5.8%		
(D ₉₀ - D ₁₀):	330.7	7.373	FINE GRAVEL: 0.0%			
(D ₇₅ / D ₂₅):	31.69	3.427	V FINE GRAVEL: 0.0%			
(D ₇₅ - D ₂₅):	233.2	4.986	V COARSE SAND: 0.0%			
			METHOD OF MOMENTS		FOLK & WARD METHOD	
	Arithmetic	Geometric	Logarithmic	Geometric	Logarithmic	Description
	μm	μm	ϕ	μm	ϕ	
MEAN (\bar{x}):	134.1	44.97	4.475	46.88	4.415	Very Coarse Silt
SORTING (σ):	130.0	7.234	2.855	7.425	2.892	Very Poorly Sorted
SKEWNESS (S_k):	0.686	-0.728	0.728	-0.539	0.539	Very Fine Skewed
KURTOSIS (K):	2.264	2.141	2.141	0.697	0.697	Platykurtic

- Approximately 60% of the sample is sand.
- 40% of the sample ranged from clay to very coarse silt.
- A few samples collected closer to the shore had a higher sand fraction.



Benthic Invertebrate Update Summary

- **Benthic Taxa - Taxonomic IDs have not been completed. Data below represents preliminary observations.**
- **Dominate taxa (thus far) are Polychaetes Annelids. Of the 8000 species the majority are found in marine water. A few species occur in brackish and freshwater.**
- **Dominate Bivalve, *Macoma Mitchelli*, a species of salt water clam.**
- **Two species of Nematodes (roundworms) were present in most all samples.**



Predictive Analysis of Salt Water Intrusion to Submerged Aquatic Vegetation

- **Identification/Examination of Existing Data:**

- Use historic, current and ongoing SAV maps, GIS layers, etc.
- Establish the current state and extent of SAV resources within the project area
- Initiated August 2016

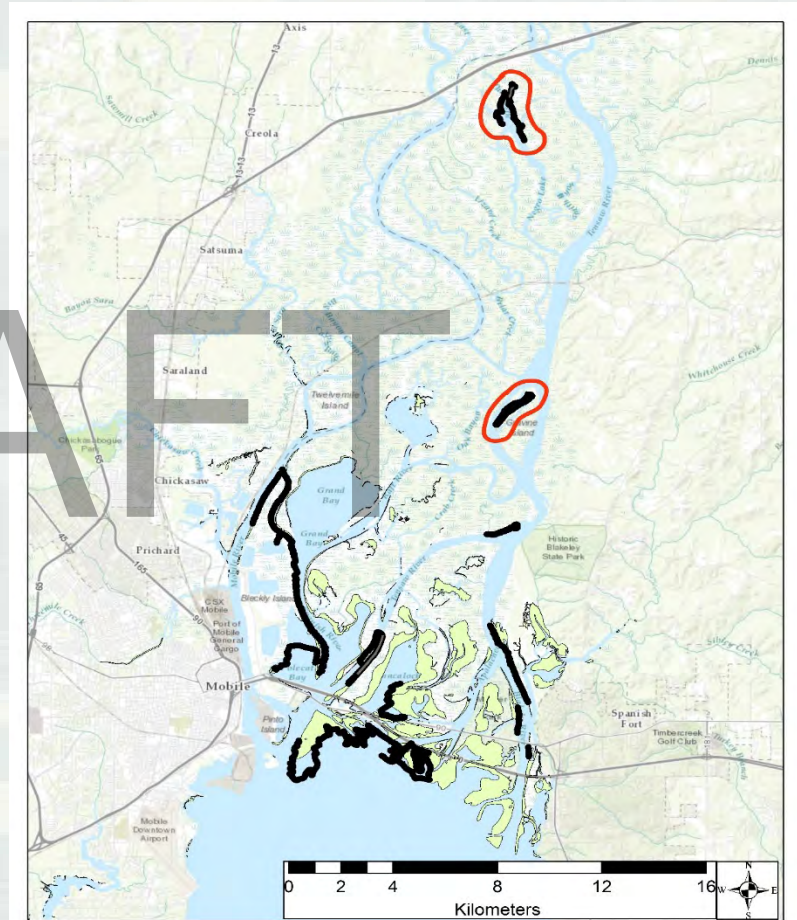
- **Field Verification:**

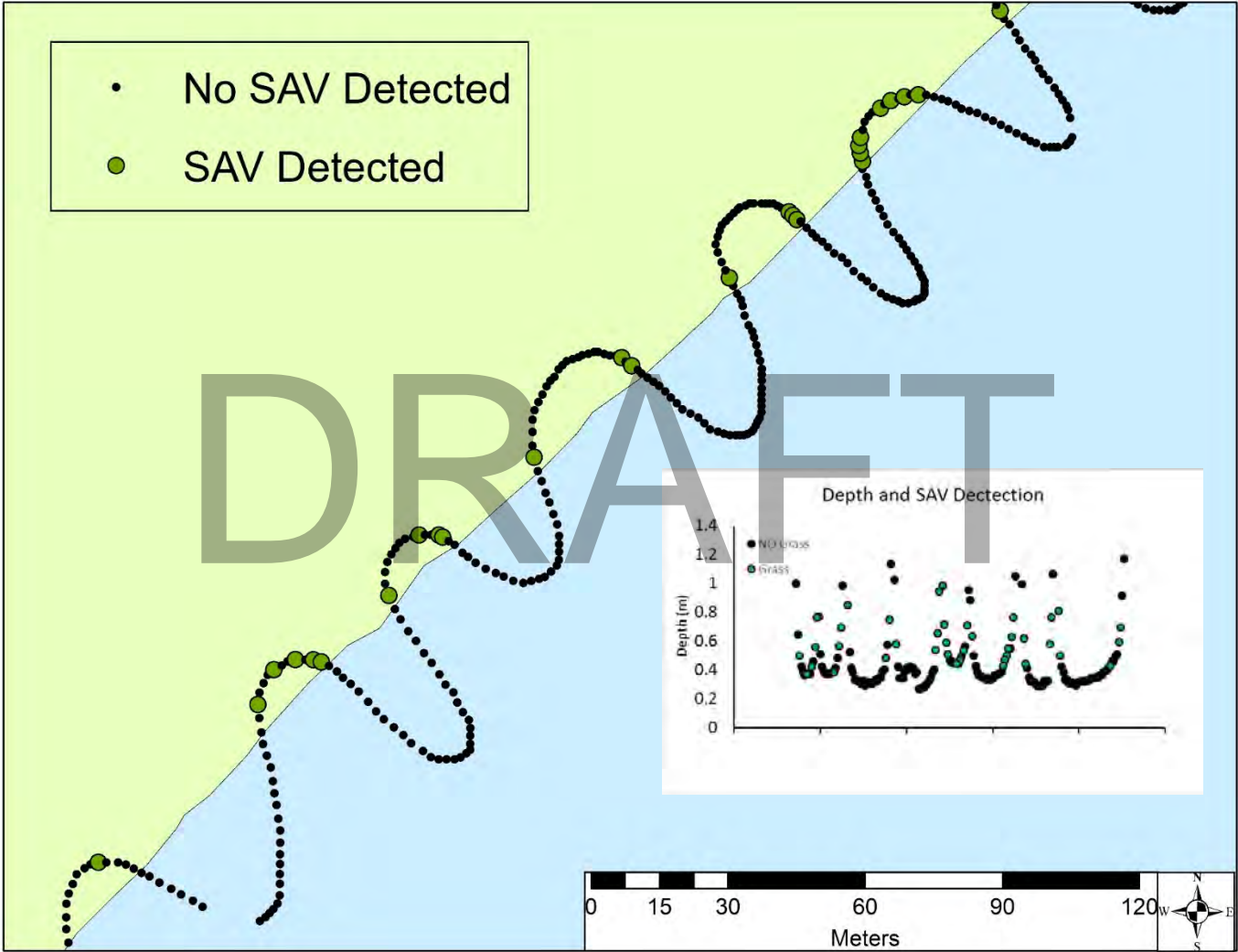
- Conduct field verification/ground-truth data to improve resolution in transition zones
- Locations and spatial extent based on gaps in current SAV map and field efforts
- Submersed Aquatic Vegetation Early Warning System (SAVews, downward aimed echo sounder) and/or visual identification focused on transition zones



Field Verification

- SAVews data collection occurred October 25-27, 2016
- Total of 31864 points
 - Display Points about 1 m apart
 - 1788 of points determined to be SAV
- Technical Issues
 - Depth
 - In shallow water with tall SAV, “clogged” the transducer
 - Creates problems with some species (Vallisneria and Myriophyllum)
 - Scan fall of 2016, compared to fall of 2015 polygon data
 - Plan to update with 2016 polygon data when available





■ Percent agreement between Scan and Fall 2015 Polygons

- ▶ Fall 2015: 85% agreement
- ▶ 8% of points showed SAV present in areas that did not have mapped SAV patches
 - Median distance from known patches was ~8m
 - May be due to annual variation
- ▶ Remaining 7% of points
 - in areas possibly outside extent of fall 2015 data
 - along river channel detected in summer 2015 but not fall 2015 data.



Predictive Analysis of Salt Water Intrusion to Submerged Aquatic Vegetation

- **Evaluate habitat variability:**

- Use historic SAV distribution data to determine habitat variation over time
- Use spatial statistics to quantify historic variation in estuarine, brackish, freshwater zones
- Determined positive agreement between Field verification points and SAV polygons

1994: 34% agreement

2002: 66% agreement

2009: 33% agreement

Summer 2015: 89% agreement

Fall 2015: 85% agreement

- **Evaluate environmental tolerances:**

- Review existing literature and current research efforts
- Identify tolerance of SAV plant species to changes in water quality parameters
- Establish ecological tolerance thresholds

- **Analysis of water quality model outputs and evaluation of alternatives:**

- Use ecological tolerance thresholds to predict impacts on SAV from changes in hydrodynamics and water quality.

- **Reporting:**

- Prepare data report on findings.

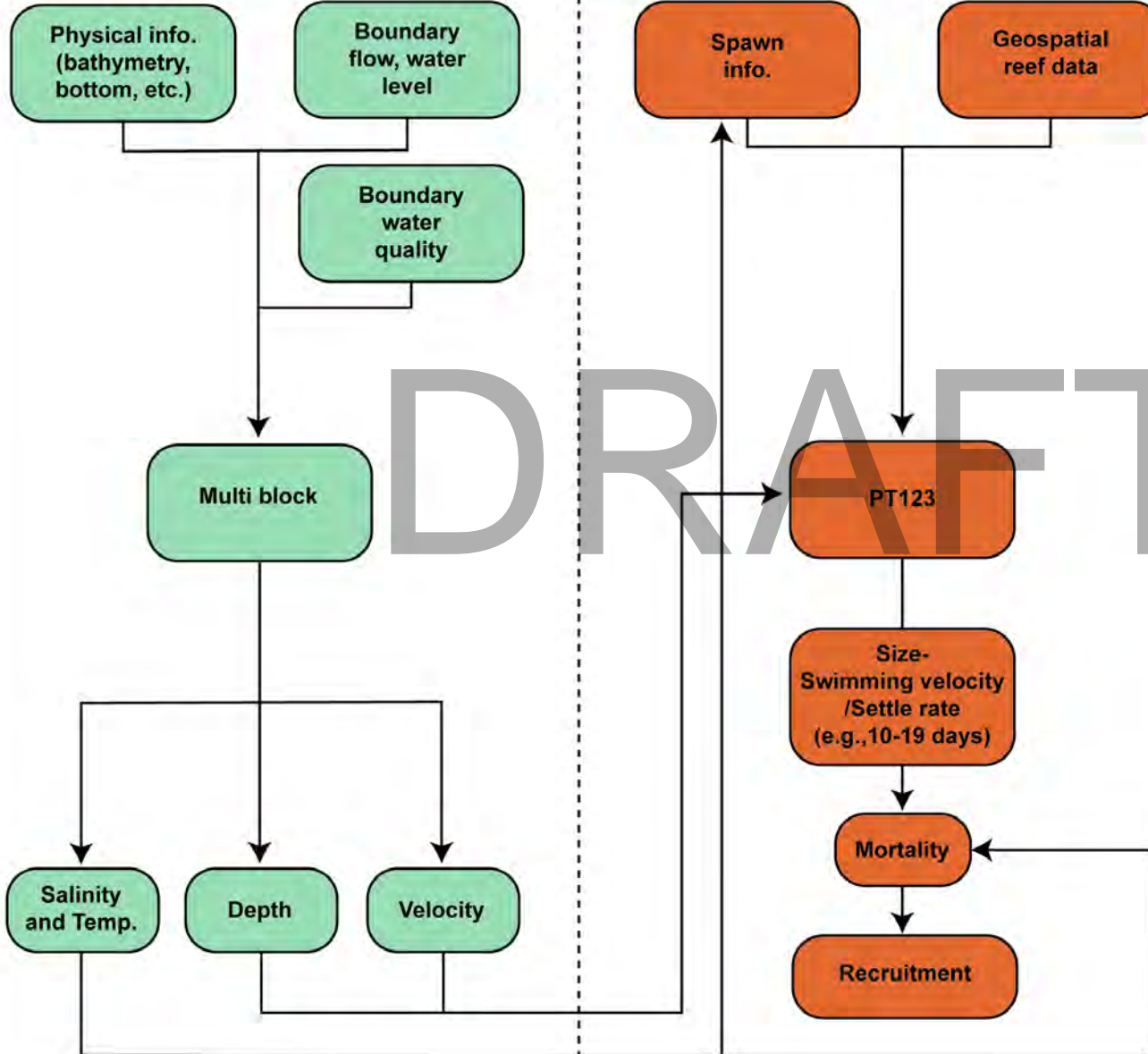


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Mobile Bay Oyster Conceptual Model

Hydrodynamic model

Larval tracking model



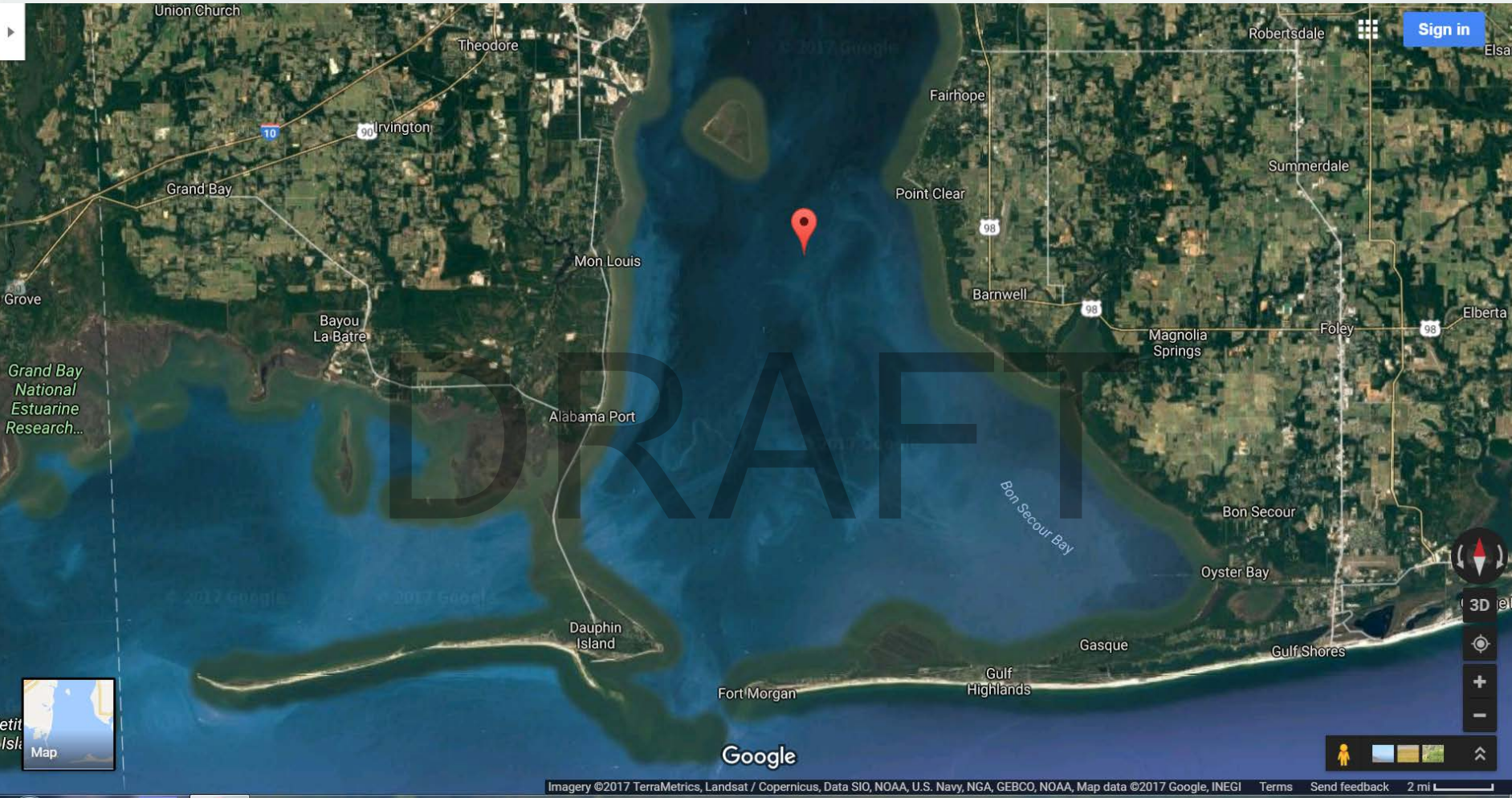
0 4 8 16 Kilometers



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Mobile Bay Deepwater Navigation - Fishery Assessment

Todd Slack and Jack Killgore

ERDC-EL

Vicksburg, MS

Objectives

- Establish baseline conditions in the project area
- Quantify relationships between salinity and fish assemblage structure to predict potential environmental impacts.
- Compare alternatives



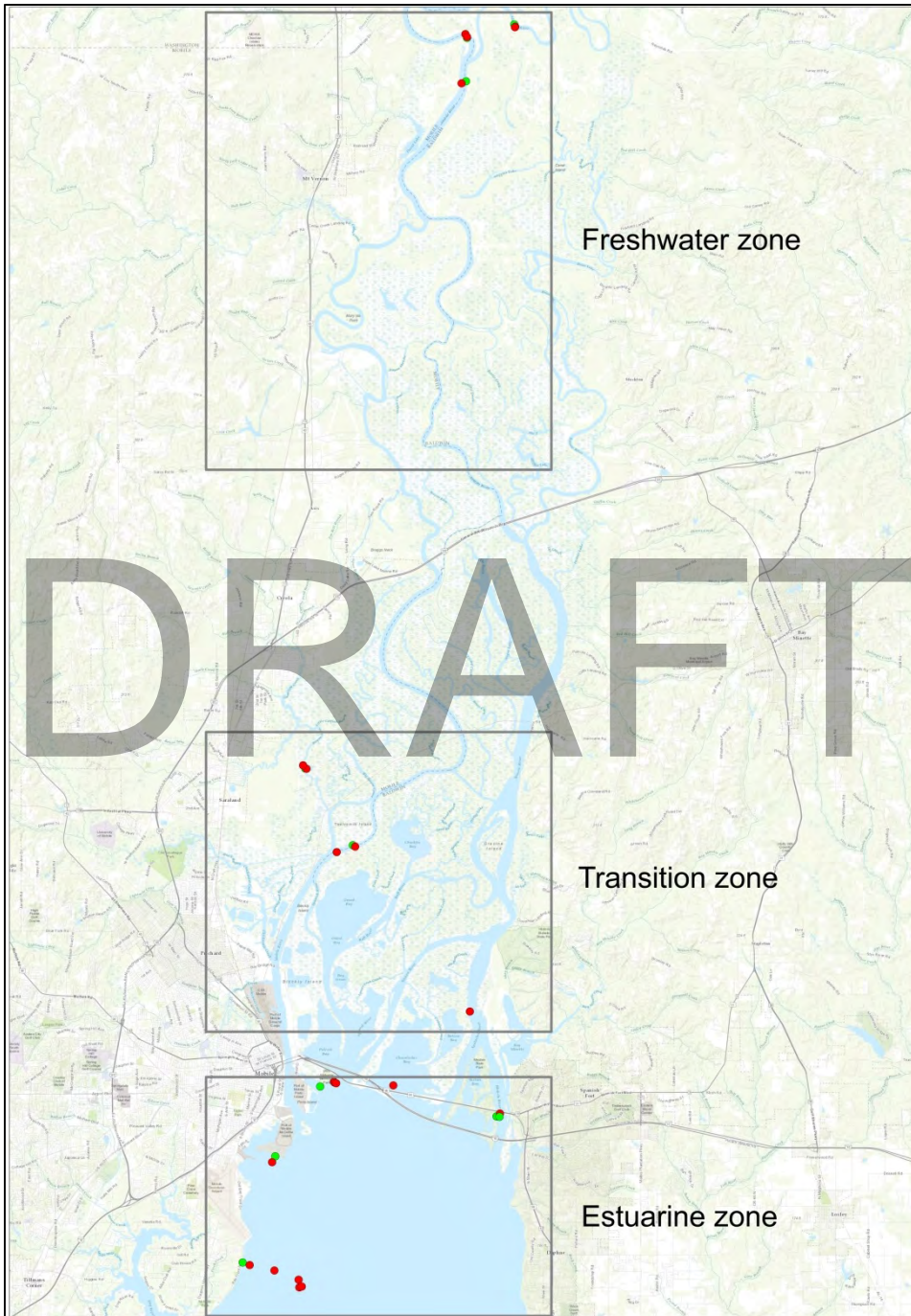
**US Army Corps
of Engineers®**

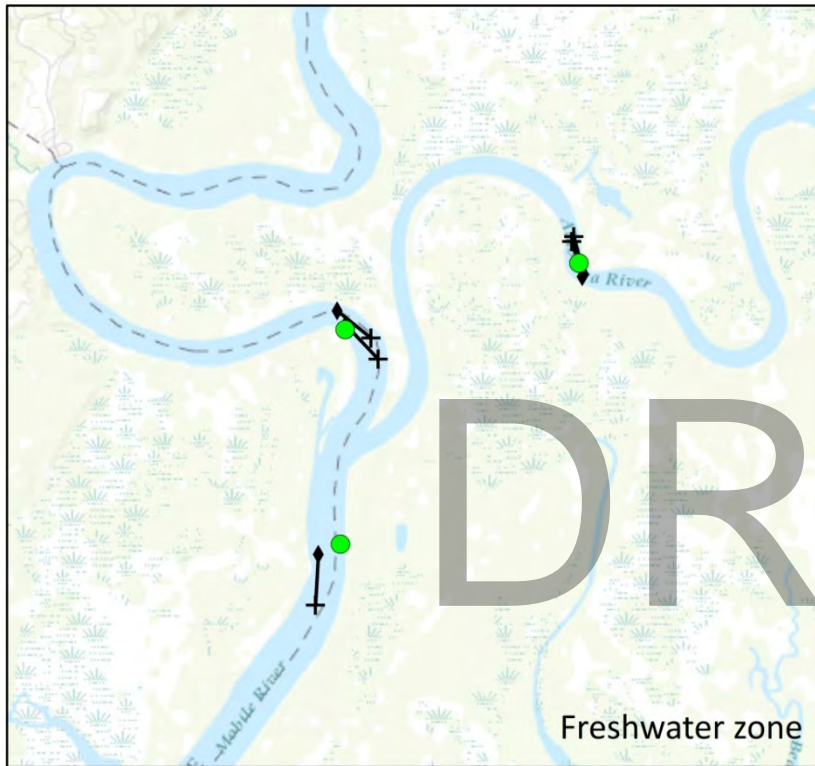


Methods

- Fish collected seasonally with two gears in the three areas encompassing the Mobile Bay ecosystem: marine, brackish, and freshwater.
- Collections will occur late summer/early fall 2016 to evaluate recruitment and growth, and spring 2017 to evaluate the spawning period and young-of-year survival.

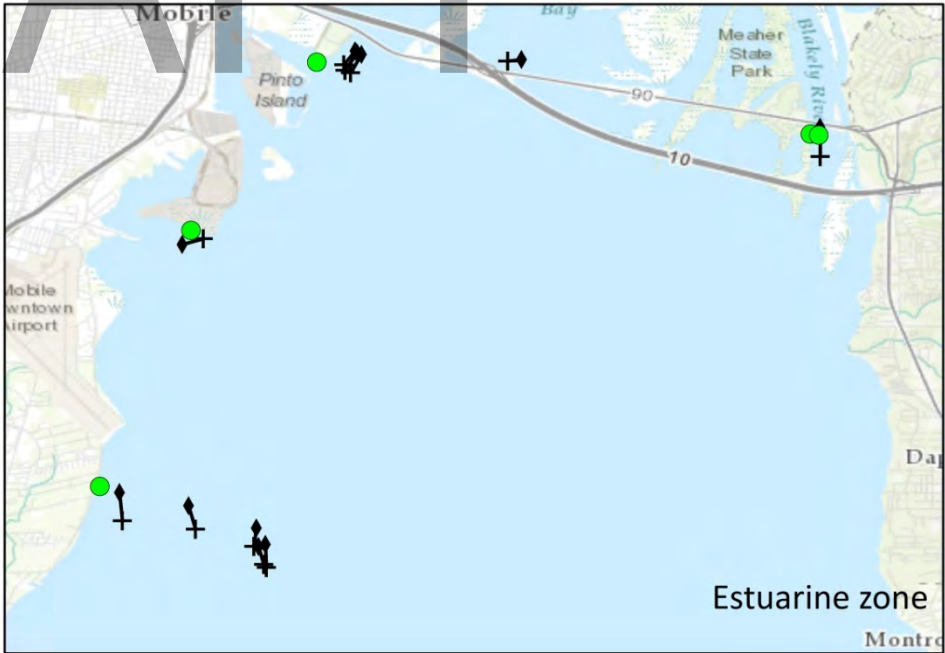
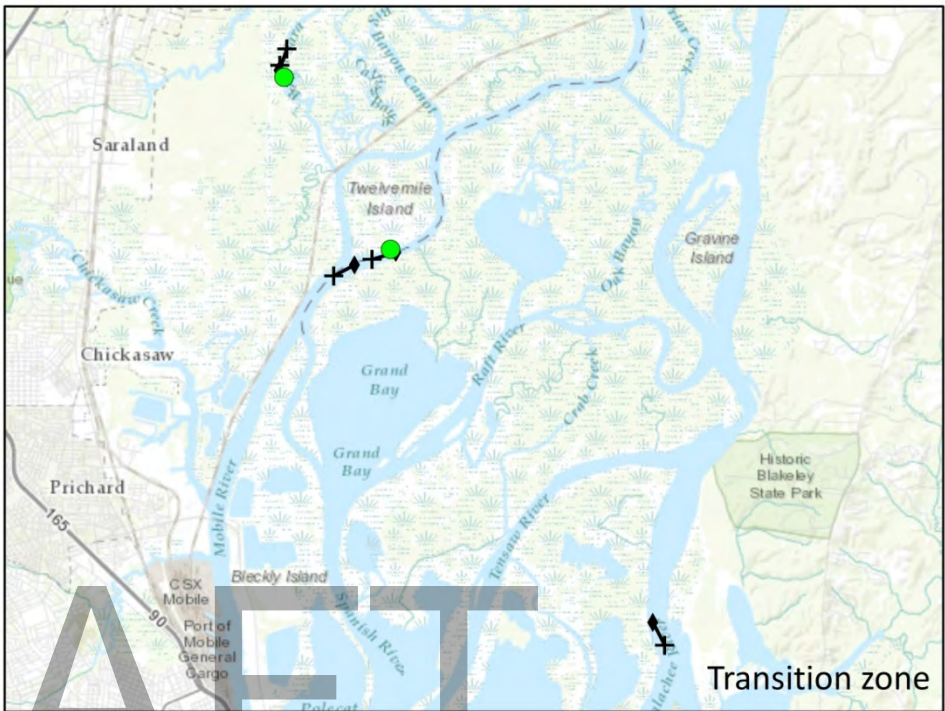






Sampling gear

- Seine
- ◆ Trawl start point
- + Trawl end point
- Trawl transect



COMMON NAME	HABITAT	COMMON NAME	HABITAT
Euryhaline			
Gizzard shad	Freshwater entering estuary	Sand seatrout	Marine entering estuary
Threadfin shad	Freshwater entering estuary	Spot	Marine entering estuary
Atlantic stingray	Marine entering estuary	Atlantic croaker	Marine entering estuary
Gulf menhaden	Marine entering estuary	Bay whiff	Marine entering estuary
Hardhead catfish	Marine entering estuary	Bay anchovy	Resident estuarine
Gafftopsail catfish	Marine entering estuary	Inland silverside	Resident estuarine
Inshore lizardfish	Marine entering estuary	Gulf killifish	Resident estuarine
Striped mullet	Marine entering estuary	Rainwater killifish	Resident estuarine
Atlantic needlefish	Marine entering estuary	Spotted seatrout	Resident estuarine
Gulf pipefish	Marine entering estuary	Highfin goby	Resident estuarine
Leatherjacket	Marine entering estuary	Freshwater goby	Resident estuarine
Pinfish	Marine entering estuary	Hogchoker	Resident estuarine

Freshwater Entering Estuary

Smallmouth buffalo
 Blue catfish
 Channel catfish
 Bluegill
 Longear sunfish
 Redear sunfish
 Redspotted sunfish
 Largemouth bass
 Black crappie

Freshwater Only

Slender blacktail shiner
 Mississippi silvery minnow
 Mobile chub
 Silver chub
 Emerald shiner
 Silverside shiner
 Fluvial shiner
 Crystal darter
 Freshwater drum

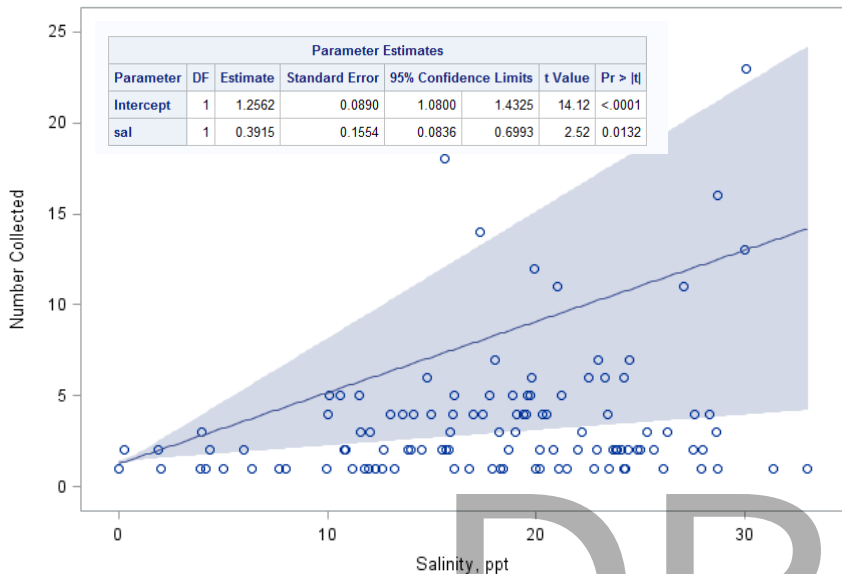
Marine Entering Estuary

Bighead searobin
 Atlantic bumper
 Bluntnose jack
 Atlantic moonfish
 Silver perch
 Banded drum
 Harvestfish
 Blackcheek tonguefish



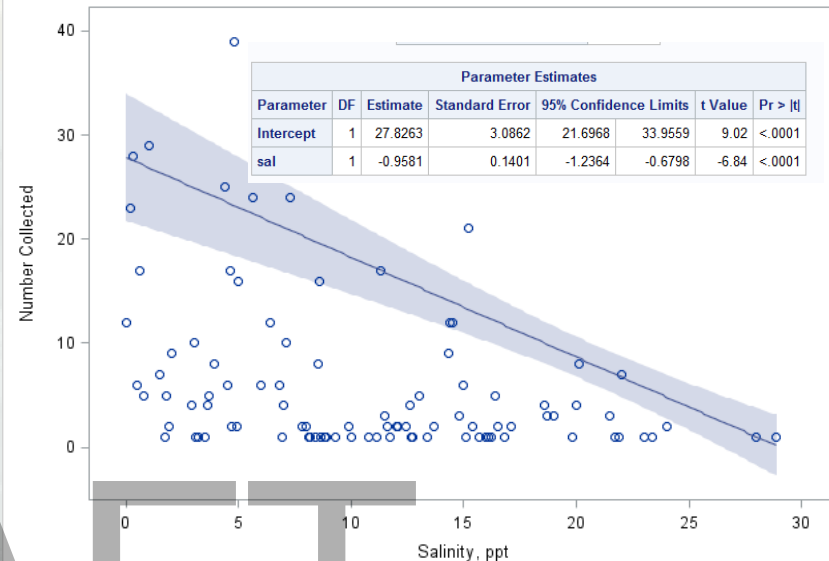
Ladyfish season=fall

Fit at Quantile Level 0.9 for num
With 95% Confidence Limits



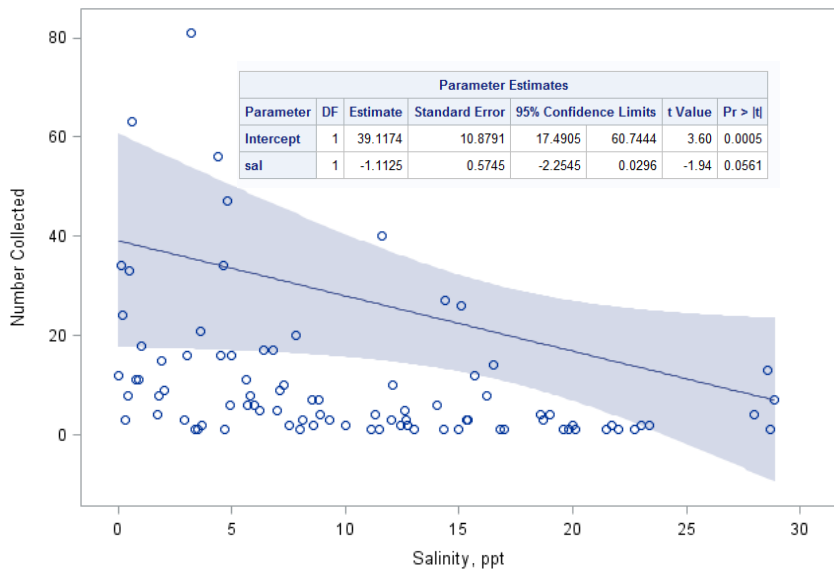
Spotted Seatrout season=spring

Fit at Quantile Level 0.9 for num
With 95% Confidence Limits



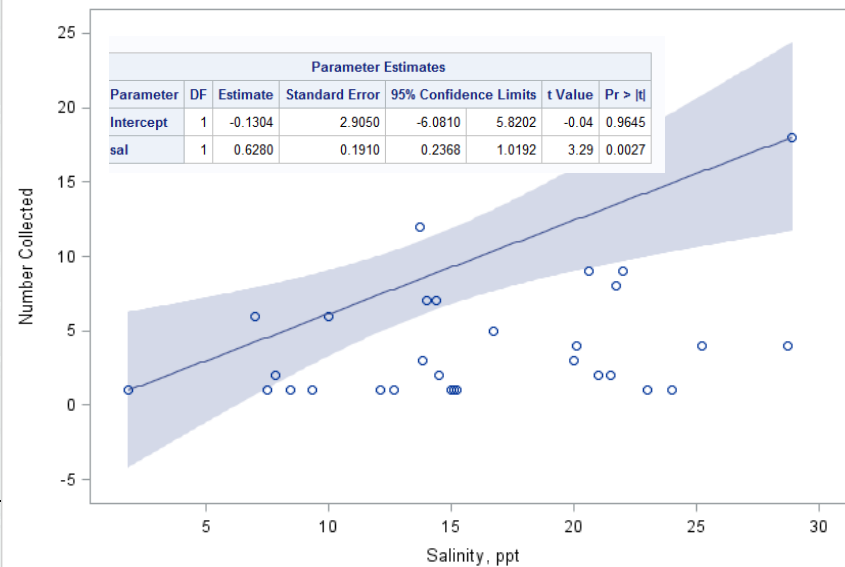
Atlantic Croaker season=spring

Fit at Quantile Level 0.9 for num
With 95% Confidence Limits



Spanish Mackerel season=spring

Fit at Quantile Level 0.9 for num
With 95% Confidence Limits



Questions and comments

Jacob.F.Berkowitz@usace.army.mil



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ERDC

Innovative solutions for a safer, better world



DEPARTMENT OF THE ARMY
MOBILE DISTRICT, CORPS OF ENGINEERS
P.O. BOX 2288
MOBILE, ALABAMA 36628-0001

REPLY TO
ATTENTION OF:

CESAM-PD-EC

3 October 2017

MEMORANDUM FOR RECORD (MFR)

SUBJECT: Agency Meeting/Webinar for Mobile Harbor General Reevaluation Report (GRR) and Supplemental Environmental Impact Statement (SEIS) regarding channel dimensions selected for initial modeling.

1. On September 13, 2017 the U.S. Army Corps of Engineers (USACE), Mobile District hosted an agency webinar meeting as part of the ongoing agency scoping activities for the Mobile Harbor GRR and integrated SEIS. The purpose of the meeting was to reconvene the team of cooperating federal and state agencies to present the deepening and widening alternative selected in which the initial modeling will be conducted. Updates on the progress of the modeling and aquatic resources assessments were also presented.

The meeting participants included representatives from the following agencies:

- Alabama State Port Authority (ASPA)
- U.S. Army Corps of Engineers, Mobile District (Corps)
- U.S. Army Corps of Engineers Corps, Engineer Research and Development Center (ERDC)
- Alabama Dept. of Environmental Management (ADEM), Mobile Field Office
- ADEM, Water Quality Branch
- Alabama Dept. of Conservation and Natural Resources (ADCNR), State Lands Division
- ADCNR, Marine Resources Division (MRD)
- Geological Survey of Alabama (GSA)
- U.S. Fish and Wildlife Service (FWS)
- National Marine Fisheries Service (NMFS), Habitat Conservation Division (HCD)
- Environmental Protection Agency (EPA)
- Mobile Bay National Estuary Program (MBNEP)

The agenda, participation list, meeting slides, and draft preliminary resources maps are included below.

2. The meeting opened with a round of introductions after which Julie McGuire presented a summary of the economic analysis conducted to determine the feasibility of channel improvements. Two main problems were identified in this study. The first being is that vessels are light loading, meaning vessels carry less cargo tons than maximum capacity because of sailing draft constraints (channel depth). The second was vessels delays due to one way traffic for vessels over a certain size. Alternative plans were developed in response to these problems which were channel deepening of 47'-55' and widening for up to 550' for 15 miles.

The purpose of the economic analysis is to determine the most efficient plan. Channel deepening alternatives allow for increased cargo loads for vessels using the channel. Channel widening would allow larger vessels to meet and reduce delay times for vessels waiting offshore or at the dock. The project benefits are reduction in transportation costs for goods shipped through Mobile Harbor with deepening and or widening. The economic analysis considers many components including types, volumes, origins and destinations of commodities coming into and being exported through Mobile Harbor. The composition of the historic, existing and future fleet expected to call the harbor was determined. It is the maximum net National Economic Development (NED) benefits that are used as the primary determinant of the most efficient plan, and would likely be recommended from an economic standpoint. The NED for the deepening analysis was a channel depth of 51 feet. However, ASPA considers a channel depth of 50 feet as the most reasonable from a cost sharing standpoint.

As illustrated in the attached slides, the channel dimensions selected from the economic analysis consists of deepening of the navigation channel from about a mile south of the tunnels, including the turning basin, extending south to the mouth of the bay to a depth of 50 feet. The turning basin will also be widened 250 feet to the south. Widening of 100 feet to a width of 500 feet is being considered from the mouth of the bay northward for 5 miles. The entrance channel extending from the mouth of the bay southward into the Gulf will be deepened to 52 feet including a bend easing in the mouth of the bay. Additional deepening (up to 4 feet) beyond the economically justified channel depths of 50 and 52 feet will occur to account for advanced maintenance (2 feet) and allowable overdepth (2 feet).

3. The meeting continued with a summary of the modeling approach presented by Justin McDonald which is included in the attached slides. In support of the modeling effort, significant field data collection has been conducted at various locations in the upper bay and delta. The data collected for the study includes water levels, salinity, temperature, turbidity, suspended sediments, and ship wake measurements to help characterize existing conditions. The data collected is valuable to increase the confidence levels of model outputs.

Hydrodynamic modeling is being conducted using Coastal Storm Modeling System (CSTORM) and ADvanced CIRCulation Model (ADCIRC) to provide offshore elevation boundary conditions for the nearshore hydrodynamic and sediment transport modules. The STeady State Spectral WAVE Full Plain (STWAVE-FP) model is being used to

provide wave fields to the nearshore hydrodynamic and sediment transport modules. The Geophysical Scale Transport Modeling System (GSMB) - Multi-Block Curvilinear Hydrodynamics in 3-Dimensions-Waterways Experiment Station (MB-CH3D-WES) model provides water levels and current velocities to the water quality, estuarine sediment transport, and habitat assessment modules.

Water quality modeling is utilizing the GSMB-CE-QUAL-ICM model which will assess potential changes in water quality including changes in flushing, salinity, dissolved oxygen, temperature, total suspended solids, nutrients and chlorophyll a as a result of channel modifications. Outputs from the model will provide water quality constituents (i.e. salinity, temperature, dissolved oxygen, total suspended solids etc.) that will be used in the conducting the aquatic habitat impact assessments.

The sediment transport modeling is using the GSMB–SEDZLJ model to assess relative changes in sedimentation rates and pathways within the bay as a result of channel modifications. Delft3D (Flow, SWAN and Morph modules) modeling will be used to quantify relative changes in sediment pathways and morphological response along the barrier islands and ebb tidal shoal as a result of the increased channel dimensions. Ship wake analysis is also being done to assess changes in ship wakes from the vessels utilizing the larger channel dimensions.

A concern was raised by ADEM that the modeling capture maximum conditions by including advanced maintenance and overdepth dimensions. The Corps confirmed that those additional depths will be included in the model grids. ADEM requested copies of the channel dimensions and grid files to add to their model grids. Elizabeth Godsey will be coordinating this effort with ADEM. It is anticipated that the modeling of this initial alternative will be completed in approximately one month. At that time, results from the modeling will be turned over to the habitat evaluation team to begin the impact assessments.

4. A status of the aquatic resource assessments being conducted by the ERDC team for the baseline and impact assessments for the various aquatic resources was presented. The assumption has been made that biggest influence from parameters contributing to the aquatic impacts will be fluctuations in salinity resulting from saltwater intrusion.

Wetlands. Field verifications were completed for remote sensing and field data sets being used to map the distribution of wetlands. The wetland vegetation distribution maps are being finalized. Preliminary maps of the wetland vegetation were presented to the group and included with this MFR. Salinity tolerances have been determined for each of the observed species. This information will be compared to outputs from the water quality model to conduct potential impact assessments.

The question was asked concerning how the salinity tolerances were being determined and if the ranges are for preferred or maximum? In response, it was indicated that the

tolerance levels are being compiled using existing studies and literature. The tolerances are being considered for average salinity conditions.

Submerged Aquatic Vegetation (SAV). Field verifications of existing data sets have been completed and SAV and maps are being finalizing showing species distributions in the study area. Salinity tolerances for observed species have been compiled which will be compared to water quality and hydrodynamic model outputs for the potential impact assessment of existing resources. This effort is also examining historic habitat variability.

Oysters. The team has requested and received oyster reef distribution information from the MRD and are preparing maps of oyster reef distributions throughout the bay. The study will use numerical modeling to determine the potential effects of larvae distribution associated with changes in the channel dimensions. Outputs from the water quality and hydrodynamic modeling will examine changes to dissolved oxygen and other water quality parameters to determine potential impacts to existing reefs.

A concern was raised if the oyster assessment will take into consideration the potential of increased dermo infection in oysters. Dermo infections have been linked to increases in salinity and temperatures. The MRD indicated that they have had discussions with the Corps regarding salinity and the effects from dermo and oyster drills. Will need to wait on results from modeling to determine these effects.

Benthic Invertebrate Communities. Summer and spring benthic sampling has been completed within the zones identified as areas that would likely be impacted by increased channel dimensions. These zones consist of areas exhibiting estuarine, transitional, and freshwater conditions. Sediment grain size and TOC analysis has also been completed for each sample location. All taxonomic identification has been completed and statistical analyses and data interpretation is in progress. The data from the benthic analysis will be compared to results of the water quality model to determine effects on benthic communities.

Fish. Summer and spring field data collection has been completed and has been coordinated with MRD on the approach used for data collection and analysis. Based on the information from the field analysis the team is determining relationships between salinity and fish populations to evaluate recruitment and growth and evaluate the spawning period and young-of-year survival. Results from the water quality and hydrodynamic models will be used to determine effects to fish populations.

5. Discussion

ADEM expressed the concern of using the year 2010 conditions and how valid interpretations of drought and wet years will be accomplished. The Corps has determined that conditions represented by year 2010 is representative of a typical average year. However, 2010 also has periods of both high and low flow conditions that

will be used to extract non-average conditions. These periods representing non-average conditions (high and low flow) will be used to indicate and evaluate critical stress conditions for the habitats of concern, i.e. wetland vegetation, SAVs, oysters, fish, and benthic invertebrate communities.

Another concern was raised by EPA pertaining model calibration using the 2010 data. The Corps is evaluating 2016 data that was collected to get an indication of representative conditions such as salinities during that time to be able to validate model outputs.

It was pointed out that any impacts resulting from the 2010 oil spill be considered in the study. The Corps conducted sediment analysis shortly after the spill within the navigation channel to assess the presence of oil in the sediments. The results of this testing will be considered in the study.

It was requested that presentation slides and read ahead material be provided to the agencies prior to future meetings. It was also suggested that a Doodle Poll be conducted for more efficient planning of the next meeting.

6. Next Steps. Once the results of the modeling are available, outputs will be provided to the aquatic resources assessment team. The information will be compared against the without project conditions to determine impact assessments for the aquatic resources being considered. When the impacts assessments are completed, a follow up meeting with the cooperating agencies will be scheduled to present the preliminary results. This meeting will likely be a face-to-face workshop format in Mobile. At that time, the significance of impacts will be evaluated to determine if other alternative modeling runs will be necessary in efforts to avoid or minimize impacts. The meeting will also be a forum to begin considering appropriate mitigation requirements, if needed. It is anticipated that this meeting will be scheduled for late October or early November of this year.

7. Please address any questions, comments, or concerns pertaining to this meeting to Larry Parson at (251) 690-3139 or larry.e.parson@sam.usace.army.mil.

/s/ Larry E. Parson
U.S. Army Corps of Engineers, Mobile District
Coastal Environment Team

Draft copies were furnished for comment to all meeting participants.

**Agency Meeting
Mobile Bay General Reevaluation Report (GRR)
Supplemental Environment Impact Statement (SEIS)
Conference Call/Webinar
September 13, 2017
9:00 – 10:30 Central**

**Initial Modeling Dimensions and Study Updates
Agenda**

Introductions

Selection of Initial Modeling Dimensions

Modeling Approach

Update of Aquatic Resources Assessments

Wetlands

Submerged Aquatic Vegetation

Oysters

Benthic

Fish

Questions and Discussion

Next Steps

Mobile Harbor GRR Agency Webinar – List of Participants

Agencies

Bob Harris (ASPA)
Carl Ferraro (ADCNR)
John Mareska (ACDNR, MRD)
Stephen Jones (GSA)
Allen Phelps (ADEM)
Justin Rigdon (ADEM)
Chris Johnson (ADEM)
James Mooney (ADEM)
Lena Weiss (EPA)
Dan Holliman (EPA)
Calista Mills (EPA)
Amanda Howell (EPA)
Ntale Kajumba (EPA)
Josh Rowell (FWS)
Patric Harper (FWS)
Rusty Swafford (NMFS)
Tom Herder (MBNEP)

Corps of Engineers - ERDC

Kevin Reine
Barry Bunch
Ray Chapman
Todd Swannack
Safra Altman

Corps of Engineers – Mobile District

Colonel James DeLapp
Julie McGuire
Justin McDonald
David Newell
Joe Paine
Richard Allen
Ashley Kleinschrodt
Susan Rees
Joe Givhan
Larry Parson

MOBILE HARBOR GRR

With Integrated Supplemental
Environmental Impact Statement

Cooperating Agency Update
September 13, 2017



**Cooperating Agency Meeting
Mobile Bay General Reevaluation Report (GRR)
Supplemental Environment Impact Statement (SEIS)**

**Initial Modeling Dimensions and Study Updates
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Introductions

Selection of Initial Modeling Dimensions

Modeling Approach

Update of Aquatic Resources Assessments

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Fish

Discussion

Next Steps



Corps Economic Analysis for Mobile Harbor



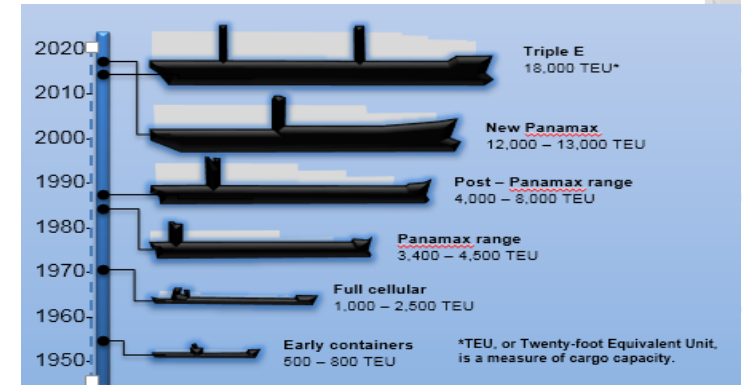
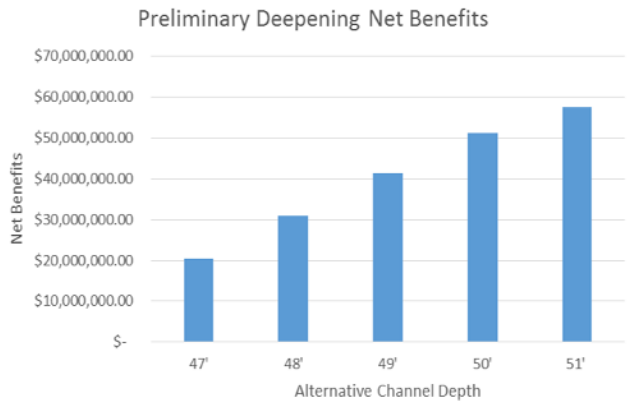
Concepts behind Mobile Harbor Economic Analysis:

- Deeper channels allow for greater vessel loading resulting in trade route efficiency
- Total voyage distance and amount of cargo are main determinants of vessel operating costs
- The project benefits are reduction in transportation costs for goods (imports/exports) shipped through the Mobile Harbor with deepening/widening



Evolution of container ships

Post-Panamax ships make up 16 percent of the world's container fleet today, but carry 45 percent of the cargo. New Panamax ships will be the largest that can pass through the new locks in 2016.



MOBILE HARBOR GRR ALTERNATIVES

Initial

- Deepening: 47 to 55 feet Including Turning Basin
- Bend Easing
- Widener: 100 and 150 feet 5, 10,15 miles in length

Proposed for Impact Assessment

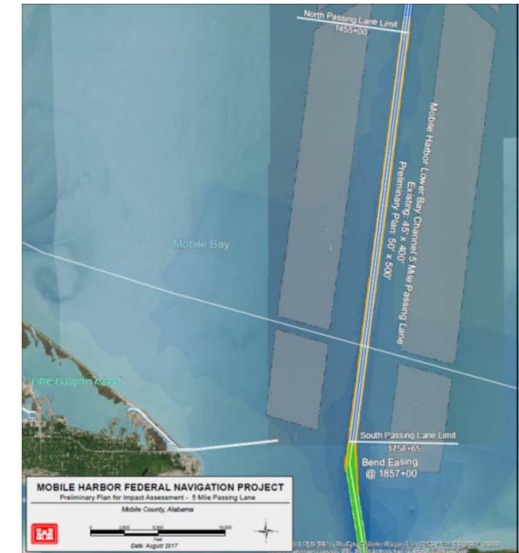
- Deepening: 50 feet Including Turning Basin
- Bend Easing
- Widener: 100 feet 5 miles in length





US Army Corps of Engineers

MOBILE HARBOR PROJECT



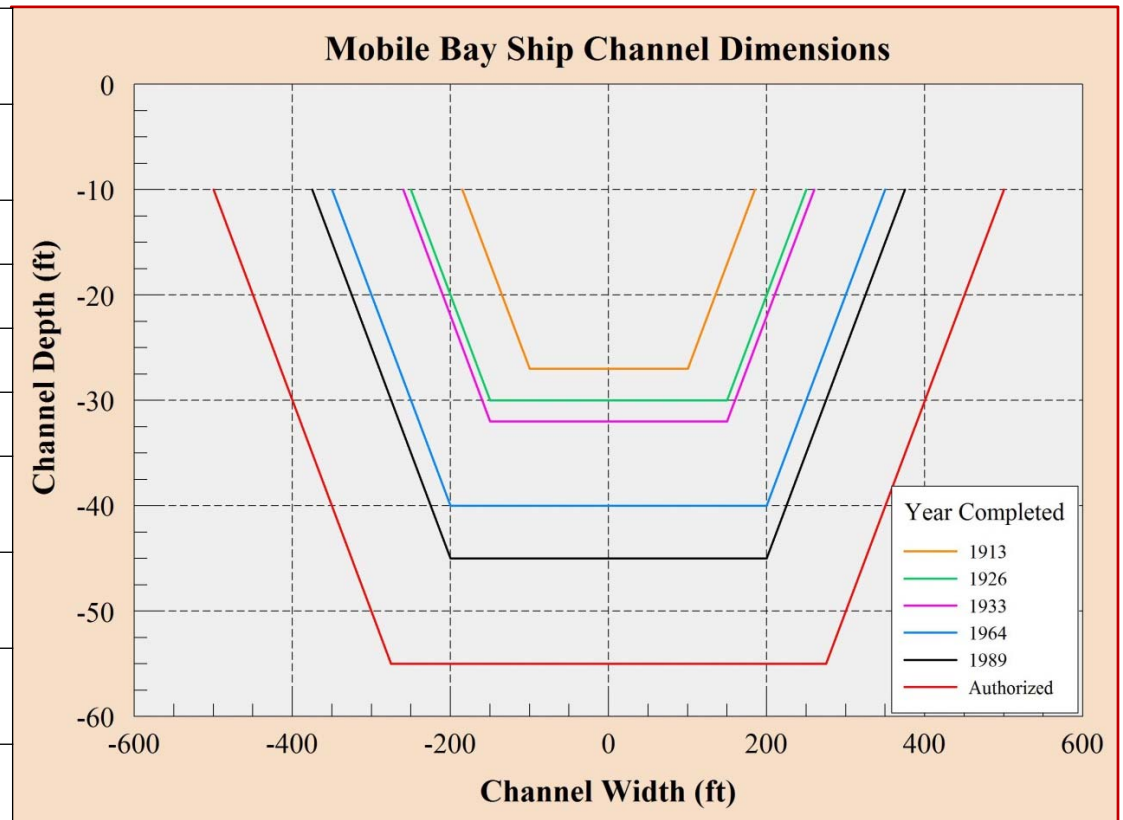
MOBILE HARBOR GRR BACKGROUND

Mobile Entrance Channel:

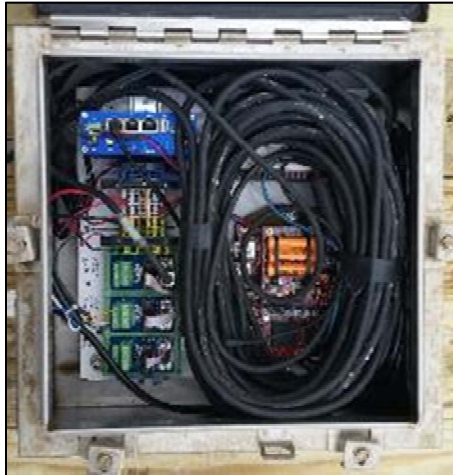
Channel Dimension (ft)	New Work Dredging Dates
30 x 300	May 1904 to October 1913
33 x 300	October 1913 to June 1924
36 x 450	June 1924 to August 1934
36 x 450	August 1934 to July 1965
42 x 450	July 1965 to April 1990
42 x 600	April 1990 to September 1999
47 x 600	September 1999 to June 2006

Mobile Bay Channel:

Channel Dimensions (ft)	New Work Dredging Dates
13 x 200	September 20, 1870 to September 1876
17 x 200	February 19, 1881 to June 30, 1885
23 x 280	October 1888 to October 3, 1895
23 x 100	June 26, 1899 to July 12, 1909
27 x 200	January 6, 1911 to August 15, 1913
30 x 300	September 10, 1918 to July 25, 1926
32 x 300	FY 1932 to July 19, 1933
40 x 400	January 27, 1956 to November 10, 1964
45 x 400	October 24, 1987 to July 3, 1989



Continuously Operating Data Collection Platforms



File Name

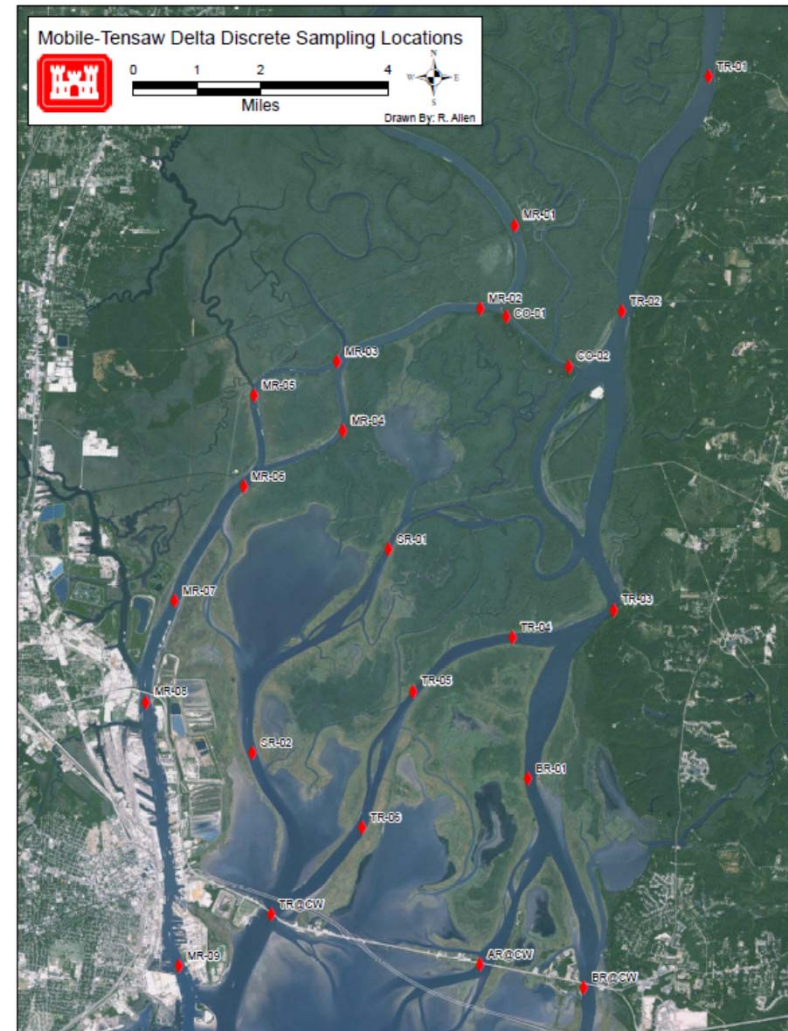
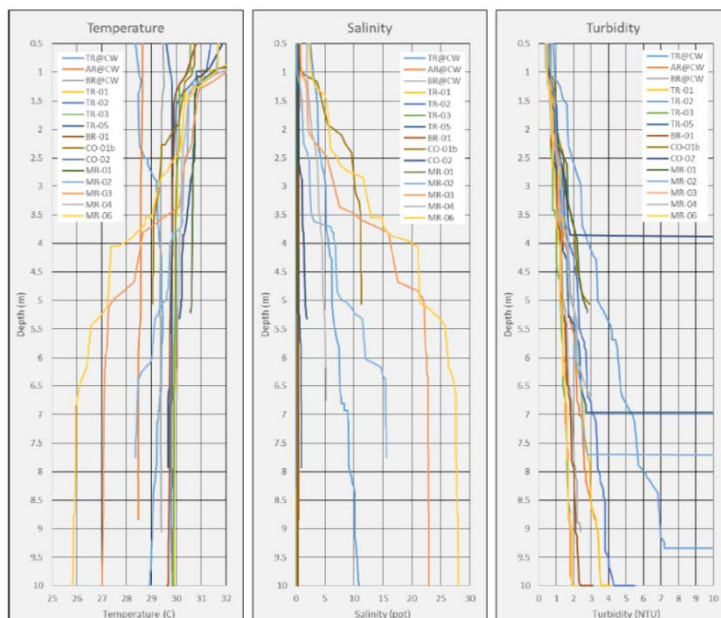
Mobile-Tensaw Delta Discrete Sampling Locations

Discrete Sampling – June and September 2016

Acoustic Doppler Current Profile (ADCP) measurements and depth measurements at discrete locations along the rivers

Vertical profiles of temperature, turbidity, & conductivity at discrete locations

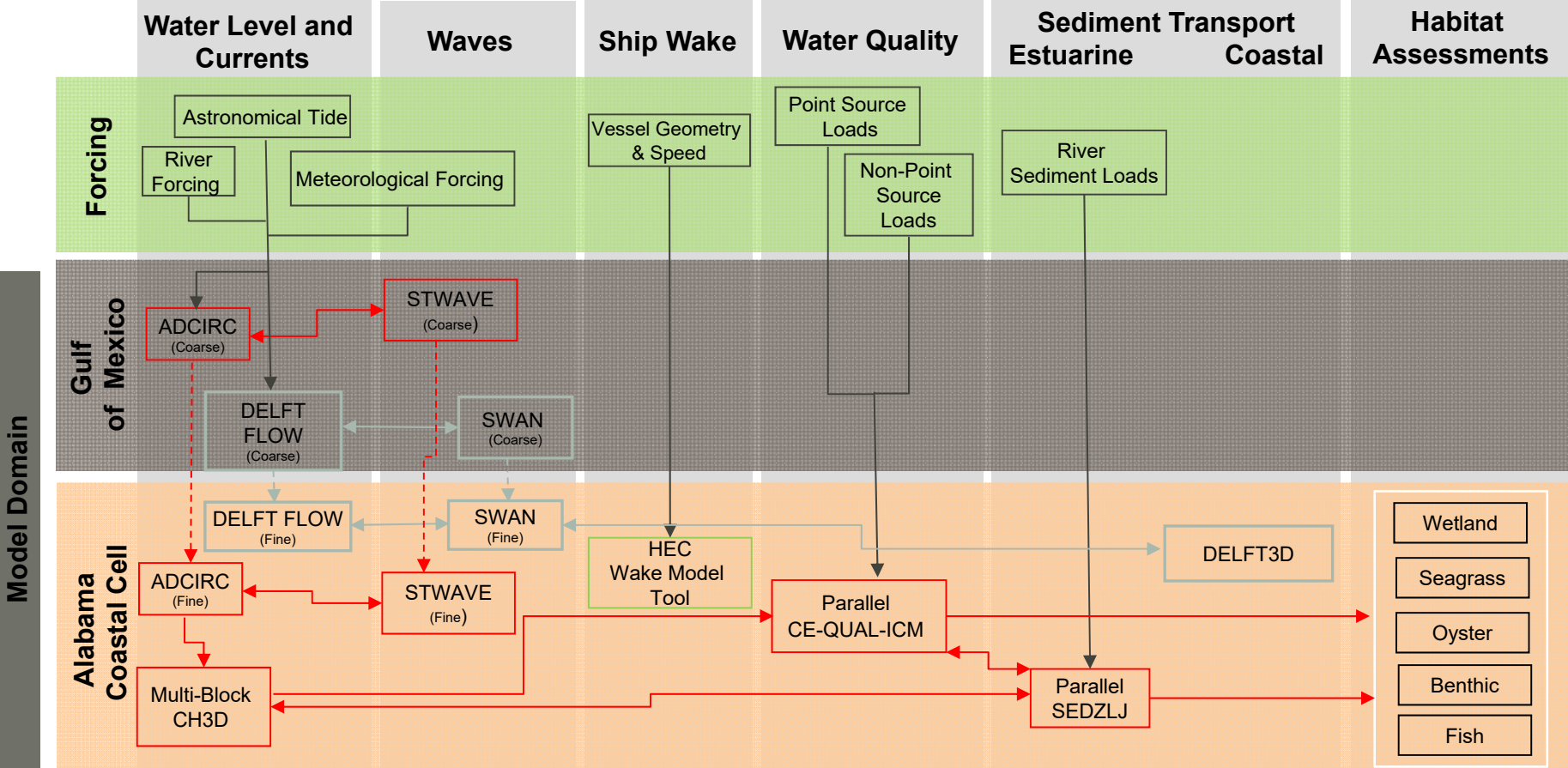
Suspended Sediment Samples at discrete locations



File Name

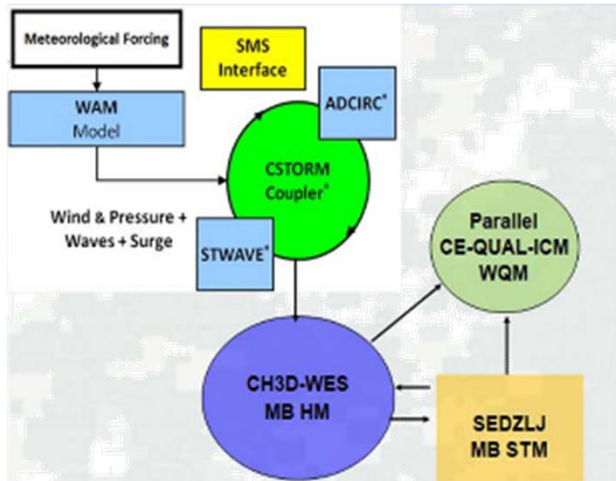


Flow Diagram of Assessment Tools

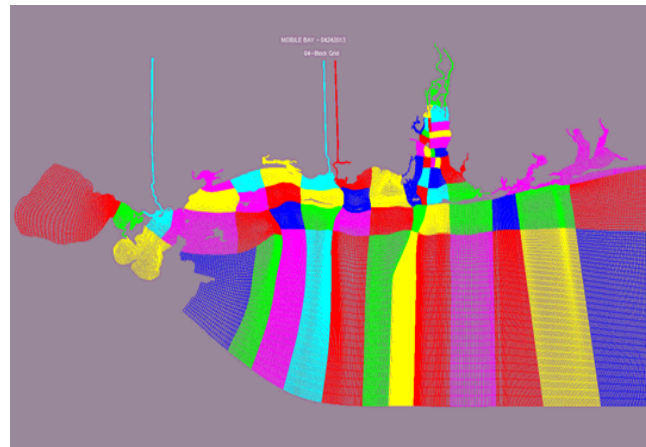


GSMB Hydrodynamic Modeling and WQM Linkage

Geophysical Modeling System Multi-Block



Model Domain



Forcing

- Wind and Atmospheric Pressure
- River Flow
- ADCIRC Tidal Elevation Boundary
- STWAVE Wave Input

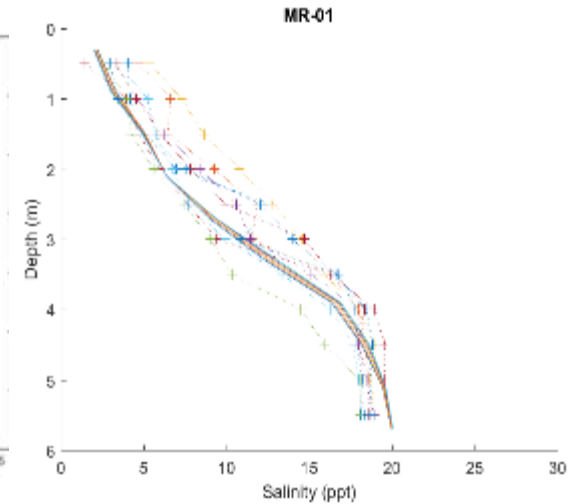
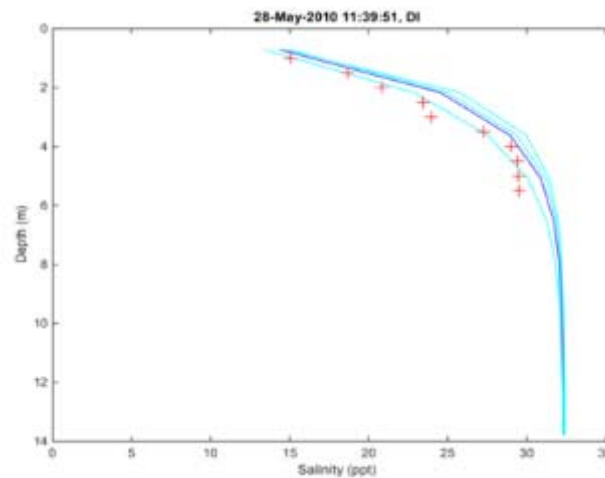
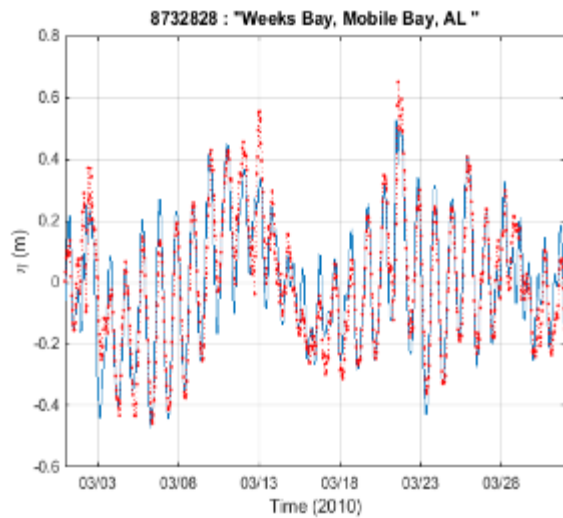
WQM Linkage Support

- MB Hydro To WQM Mapping
- Grid Geometry
- Flow
- Vertical Mixing Coefficient

Model Evaluation

- NOAA Tide Gages
- 2010 & 2016 Salinity
- Measurements in Bay and Delta

Model Evaluation



GSMB CE-QUAL-ICM Water Quality Modeling

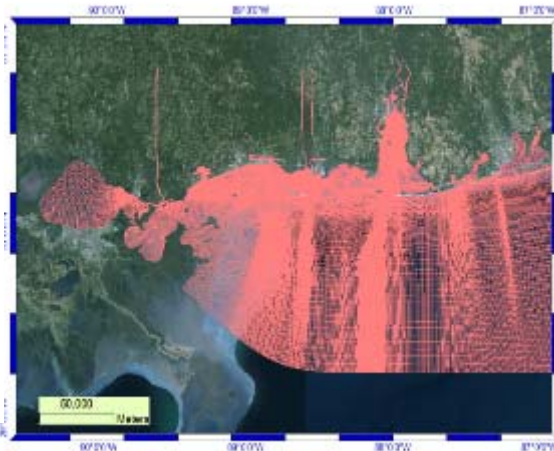
CE-QUAL-ICM

PARALLEL VERSION ICM
 RUNS & POST-PROCESS ON HPC
 FULL SUITE OR WQ STATE VARIABLES & PROCESSES

ICM STATE VARIABLES

TEMPERATURE	DO	TOTAL PHOSPHATE
AMMONIUM	SALINITY	POP
NITRATE	ALGAE	DISSOLVED SILICA
DON	DOC	SUSPENDED SOLIDS
PON	POC	

Model Domain



Hydro and Linkage

Utilizes GSMB Concatenated Multi Block Grid Hydrodynamics

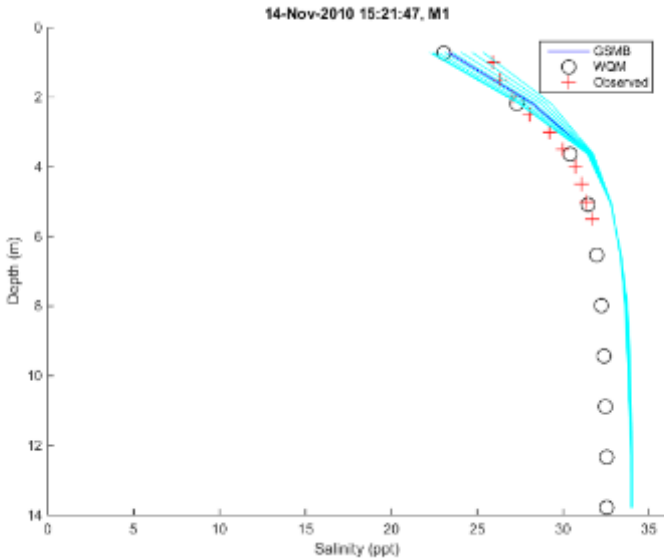
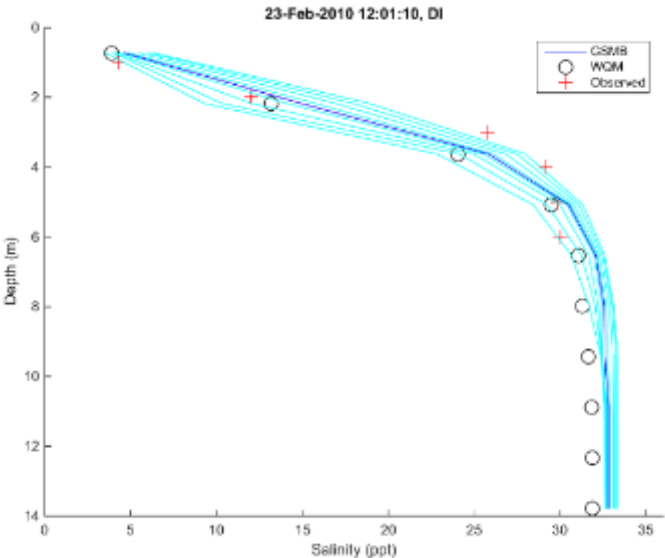
Proper Linkage to GSMB Investigated and Demonstrated Using:

- A. Volume Conservation Test
- B. Mass Conservation Test
- C. Transport Comparisons

Boundary Conditions

Using 2010 Observed Data and Mobile Airport Met Data

Model Evaluation



GSMB Sediment Transport Modeling

Simulates 3-dimensional transport of multiple cohesive and noncohesive sediment size classes. Suspended load and bedload transport, deposition, erosion and bed armoring are simulated.

Grid:

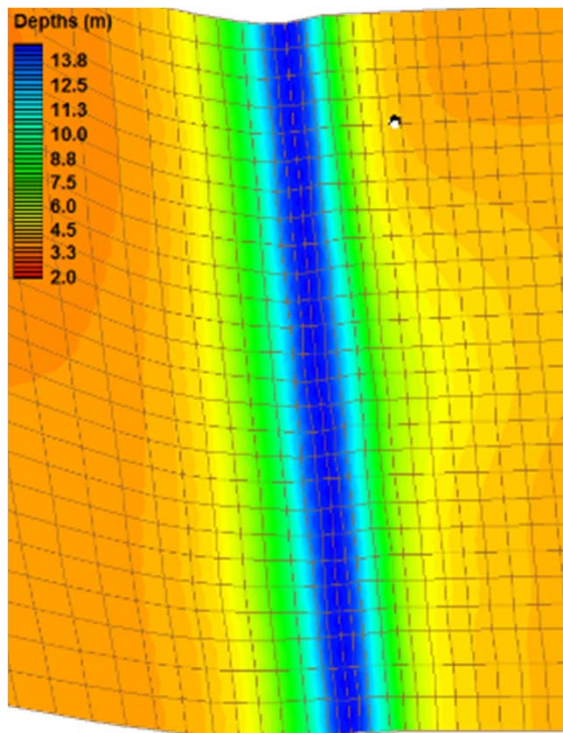
Fine resolution in the navigation channel (channel and side slopes are 12 cells wide – 30 m in width in the channel) being used to simulate intra-channel longitudinal and lateral transport.

Boundary Conditions (BCs):

Suspended Sediment Concentrations (SSC) measured during field study in the upper bay were used to adjust discharge – SSC rating curve that is used for the Mobile and Tensaw Rivers BCs.

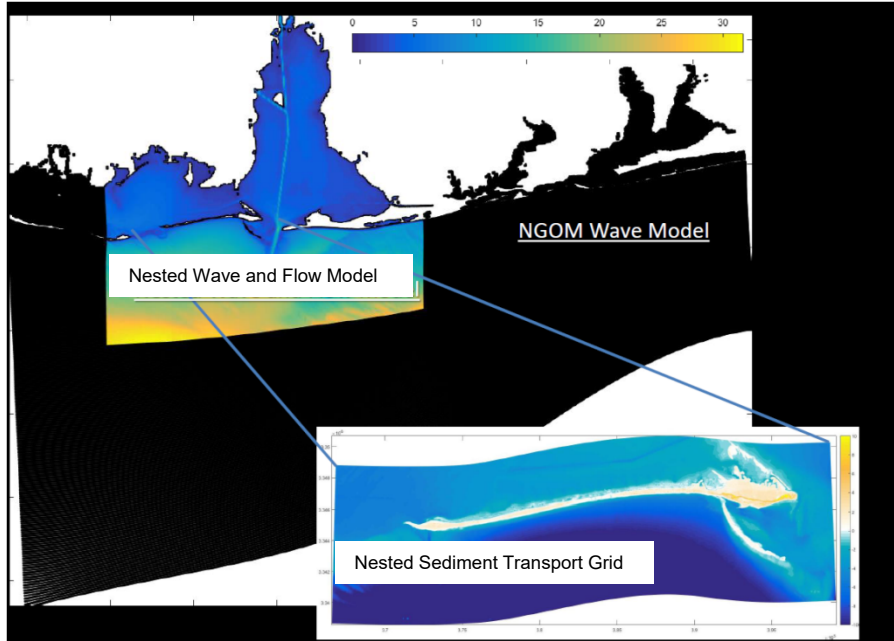
Model Evaluation:

Dredged volumes from different sections of the navigation channel (see figure below) were used to calibrate and validate the STM.



Delft 3D Sediment Transport Modeling

Modeling Domain

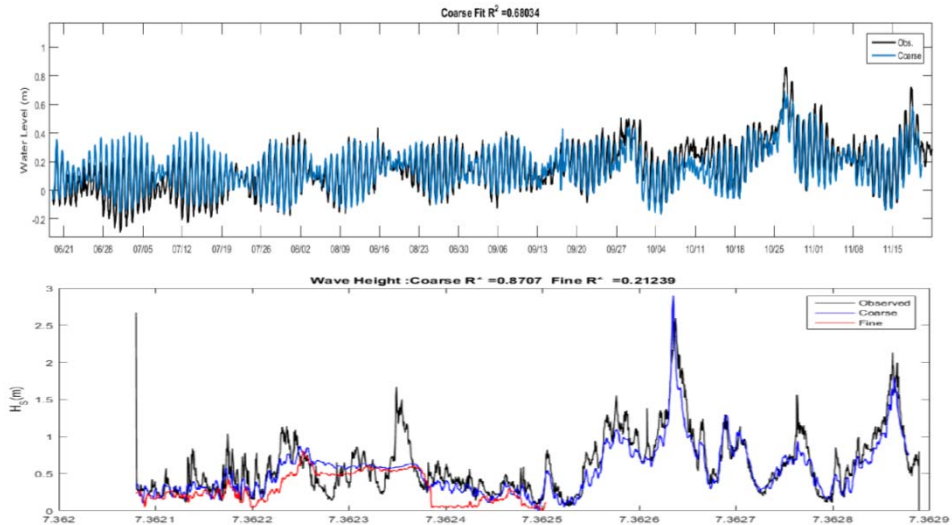
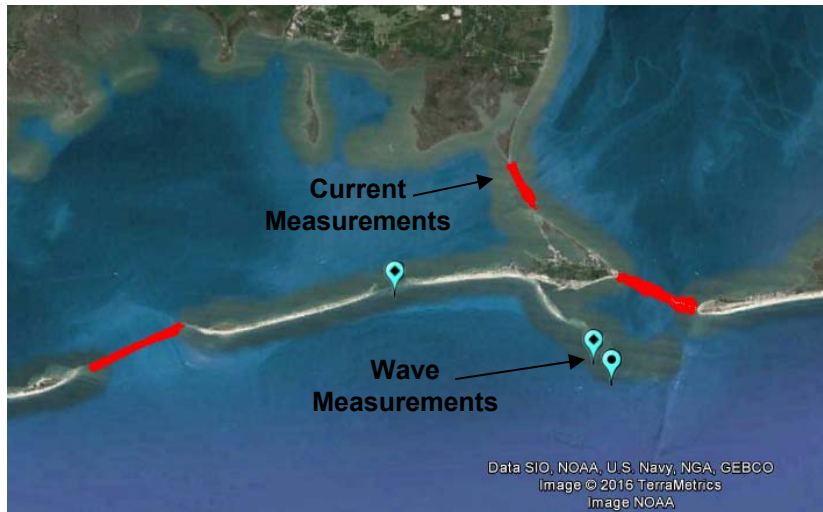


Forcing

- Wind and Atmospheric Pressure
- River flow
- 10 year Wave Climatology

Model Evaluation

- NOAA Tide Gages
- 2015 Waves and Current Measurements
- Historic Topographic and Bathymetric change Measurements



AQUATIC RESOURCES ASSESSMENTS

ERDC

Wetlands

- ✓ Completed field verification of existing data
- ✓ Finalizing mapping for vegetation distributions
- ✓ Determining salinity tolerances for observed species
- ✓ Compare tolerances with WQ model outputs

Submerged Aquatic Vegetation (SAV)

- ✓ Completed field verifications of existing data sets
- ✓ Finalizing mapping showing species distributions
- ✓ Determining salinity tolerances for observed species
- ✓ Compare tolerances with WQ model outputs

Oysters

- ✓ Received oyster reef distributions information from MRD
- ✓ Preparing maps of oyster reef distributions
- ✓ Numerical modeling to determine oyster larvae distribution
- ✓ Use WQ model results to determine potential impacts to existing reefs – dissolved oxygen

Benthic Communities

- ✓ Completed spring & summer sampling
- ✓ Sediment grain size and TOC complete
- ✓ Statistical analysis and interpretation in progress
- ✓ Use WQ model results to determine effects on benthic communities

Fish

- ✓ Completed data collection for spring & summer sampling
- ✓ Coordinated with MRD on approach used for data collection and analysis
- ✓ Determining relationships between salinity and fish populations
- ✓ Use WQ model results to determine effects to fish populations



MOBILE HARBOR GRR

With Integrated Supplemental Environmental Impact Statement

DISCUSSION



US Army Corps
of Engineers



U.S. ARMY

Classifications and Mapping of Mobile Bay Wetland Communities

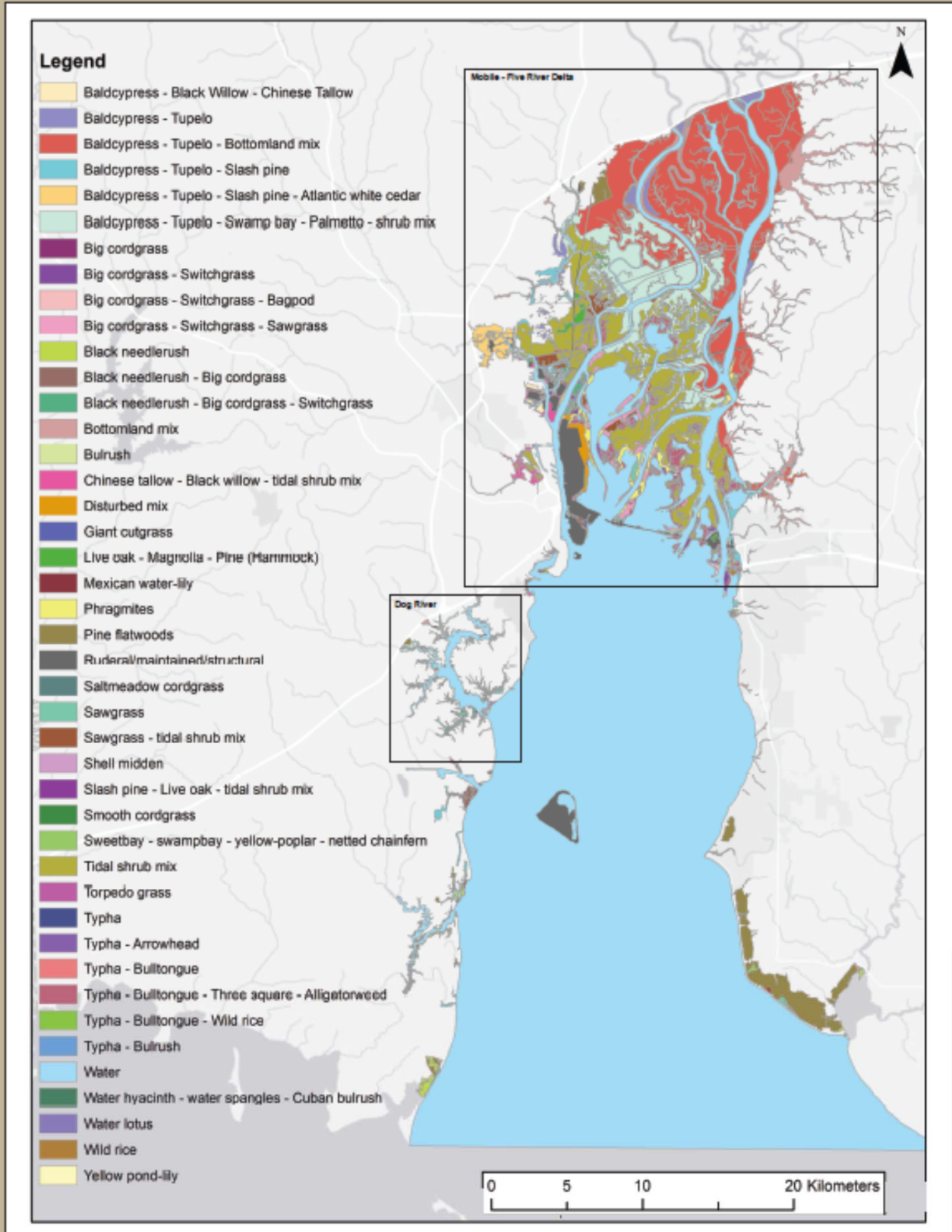


Kevin Philley and Jacob F. Berkowitz

US Army Corps of Engineers, Engineer Research and Development Center



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Acknowledgements: The US Army Corps of Engineers Mobile District provided funding for this project. Nathan Beane, Steven Currie, and Richard Allen provided assistance with field data collection and preliminary mapping.
Contact Information: Jacob.F.Berkowitz@usace.army.mil 601-634-5218 or Kevin.D.Philley@usace.army.mil 601-634-5411

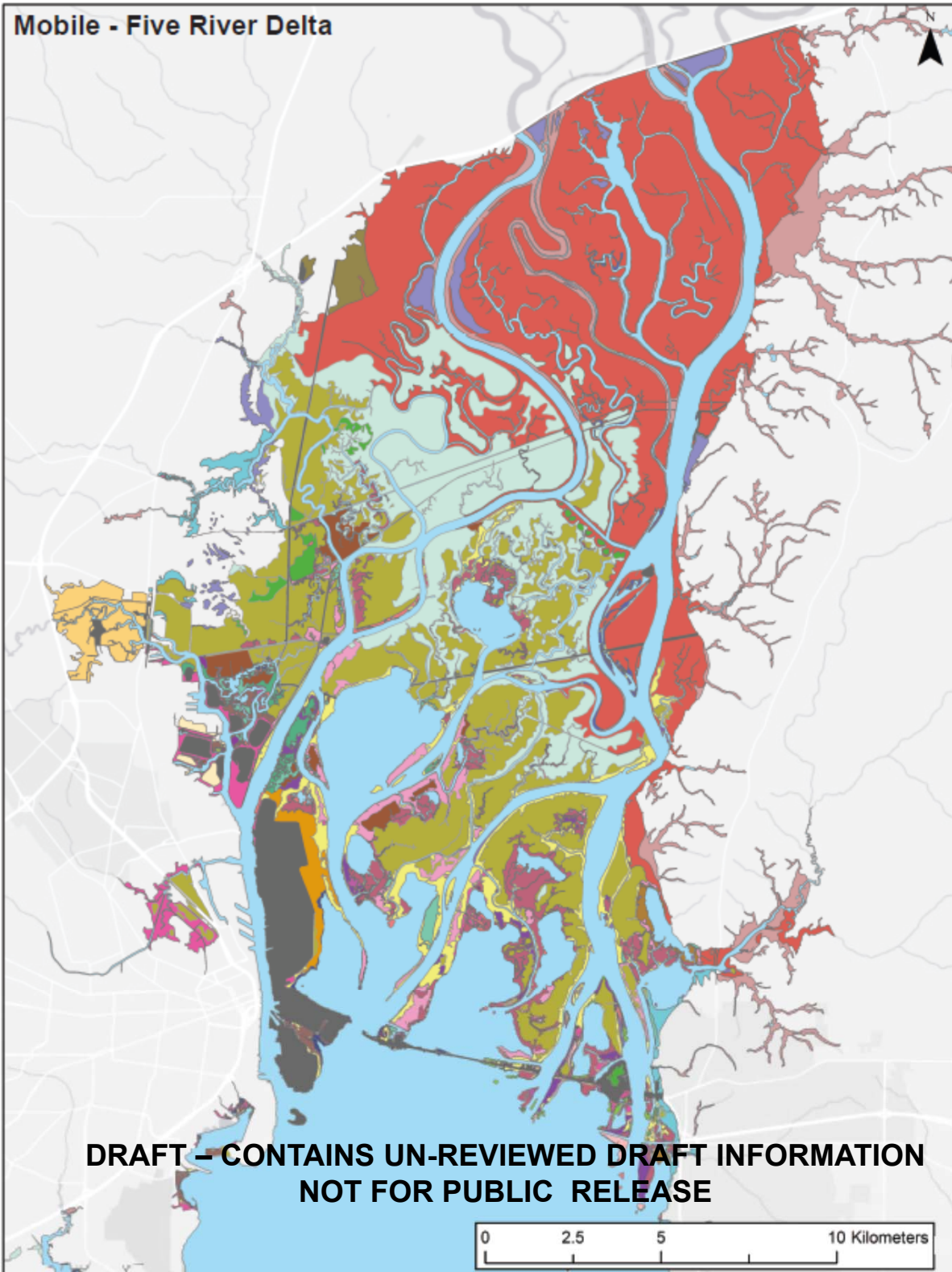
Classifications and Mapping of Mobile Bay Wetland Communities



Kevin Philley and Jacob F. Berkowitz
US Army Corps of Engineers, Engineer Research and Development Center



Mobile - Five River Delta

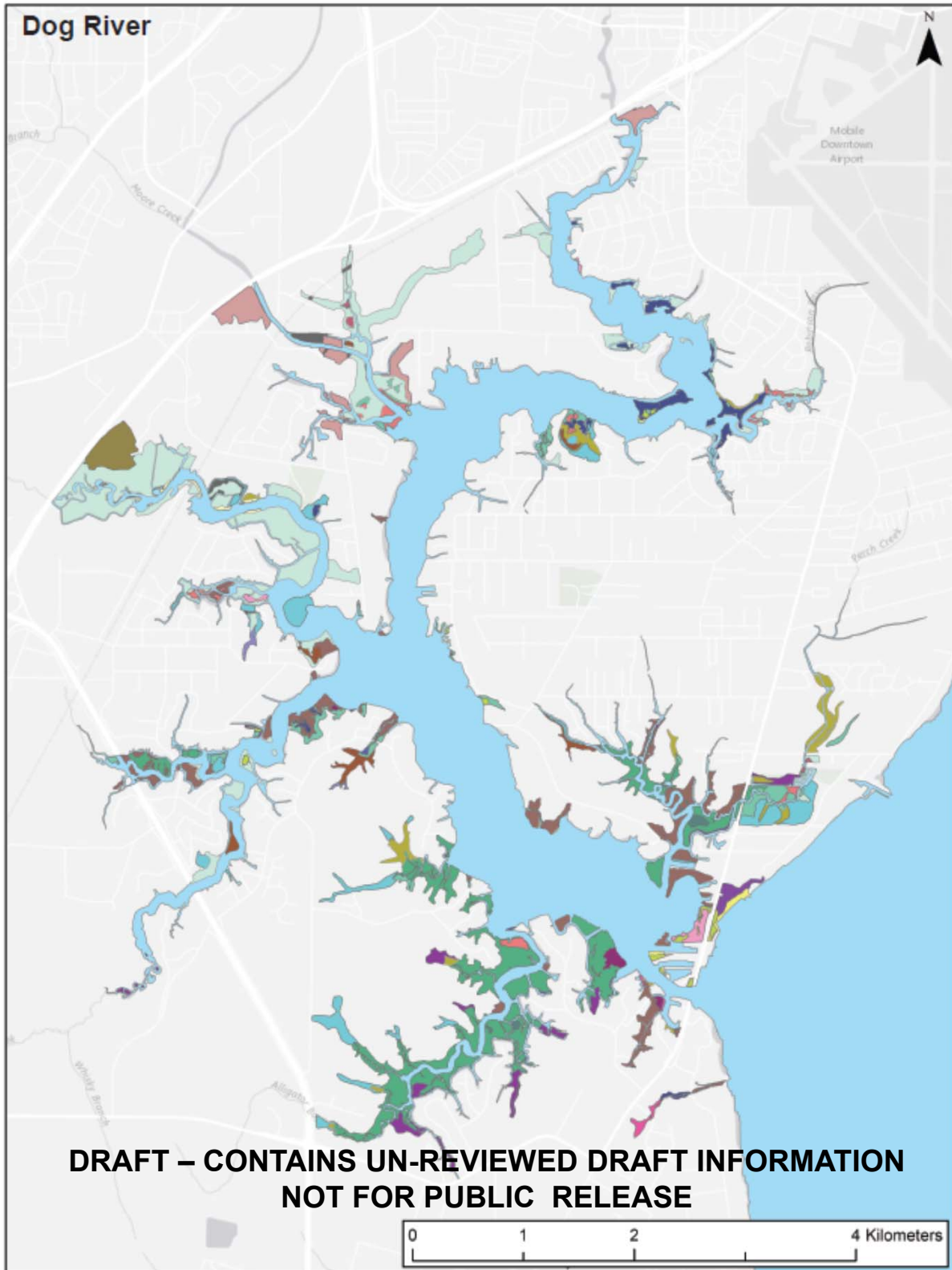


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Classifications and Mapping of Mobile Bay Wetland Communities

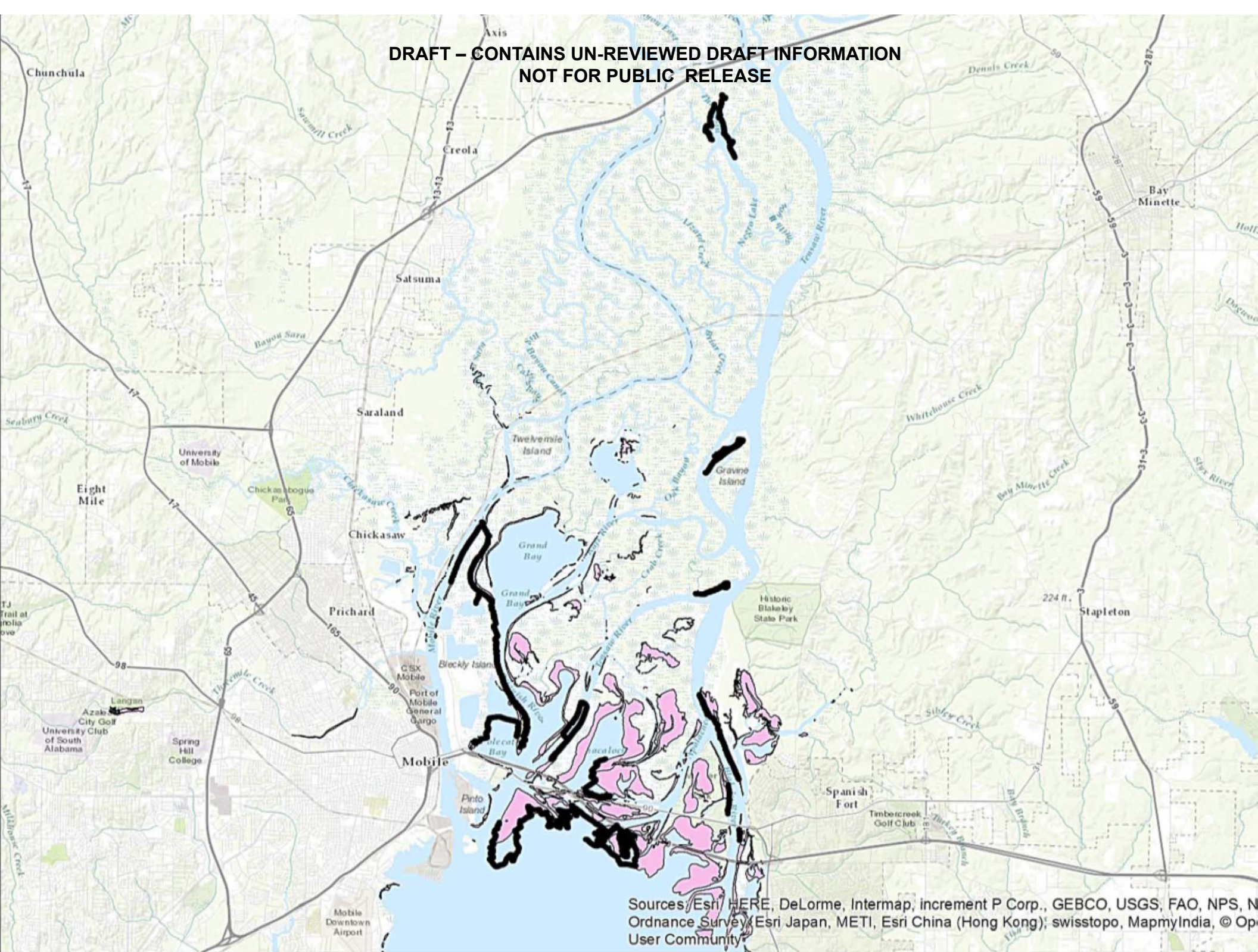


Kevin Philley and Jacob F. Berkowitz
US Army Corps of Engineers, Engineer Research and Development Center



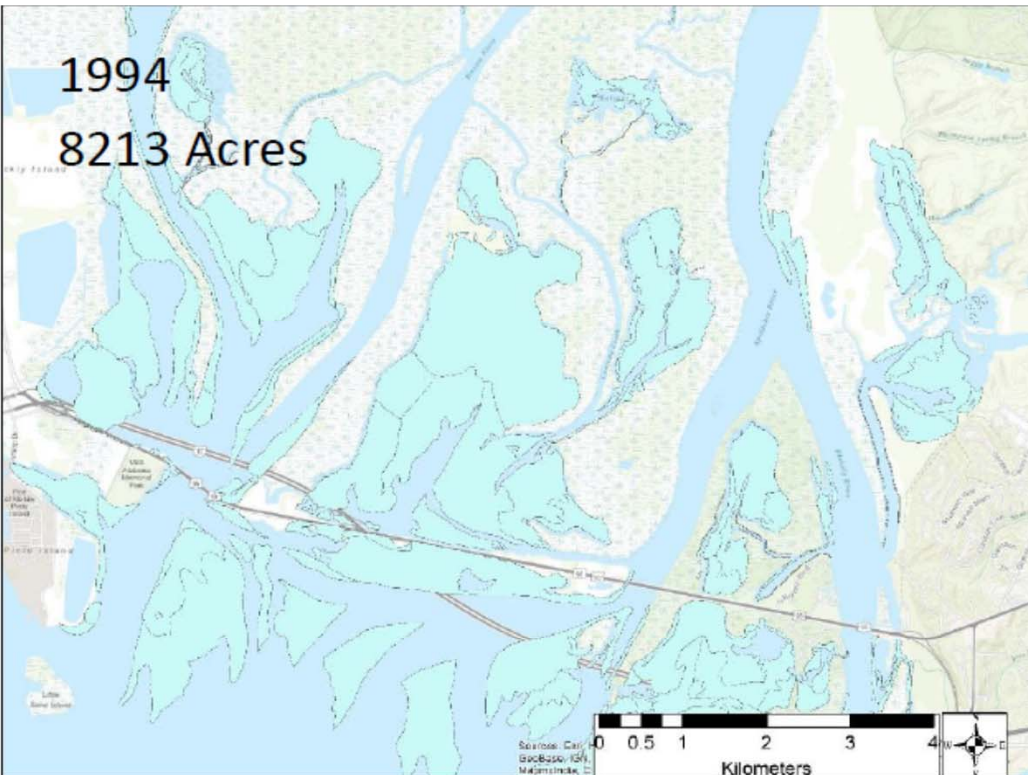
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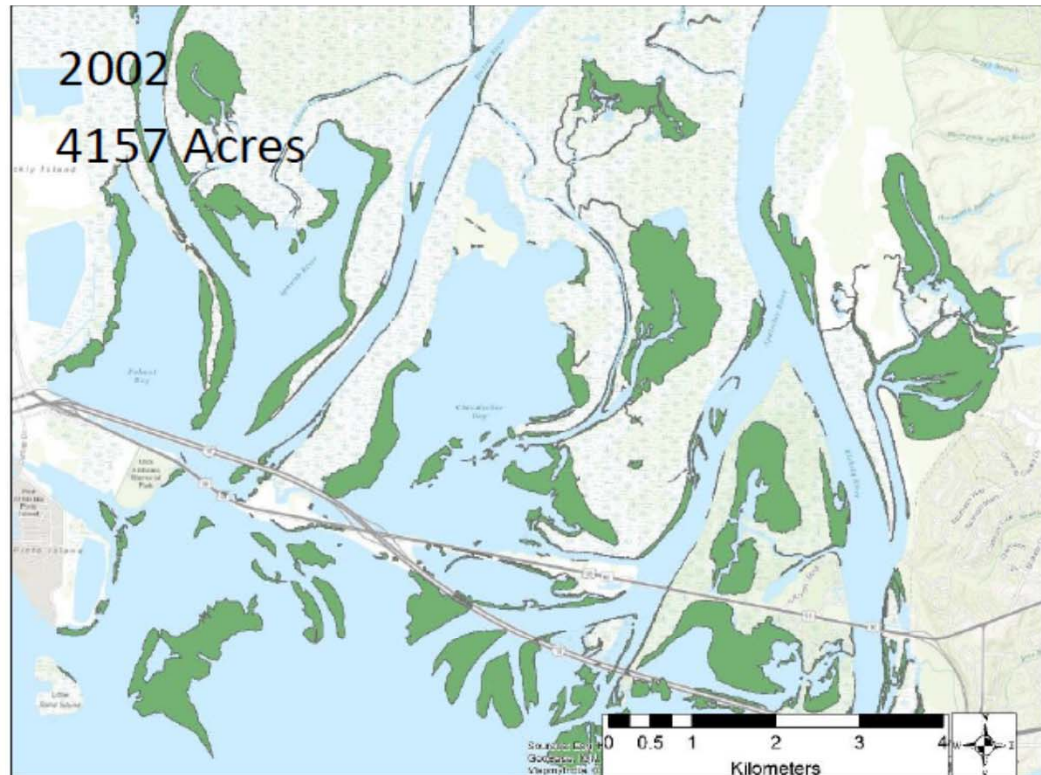


Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, N
Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © Op
User Community

1994
8213 Acres

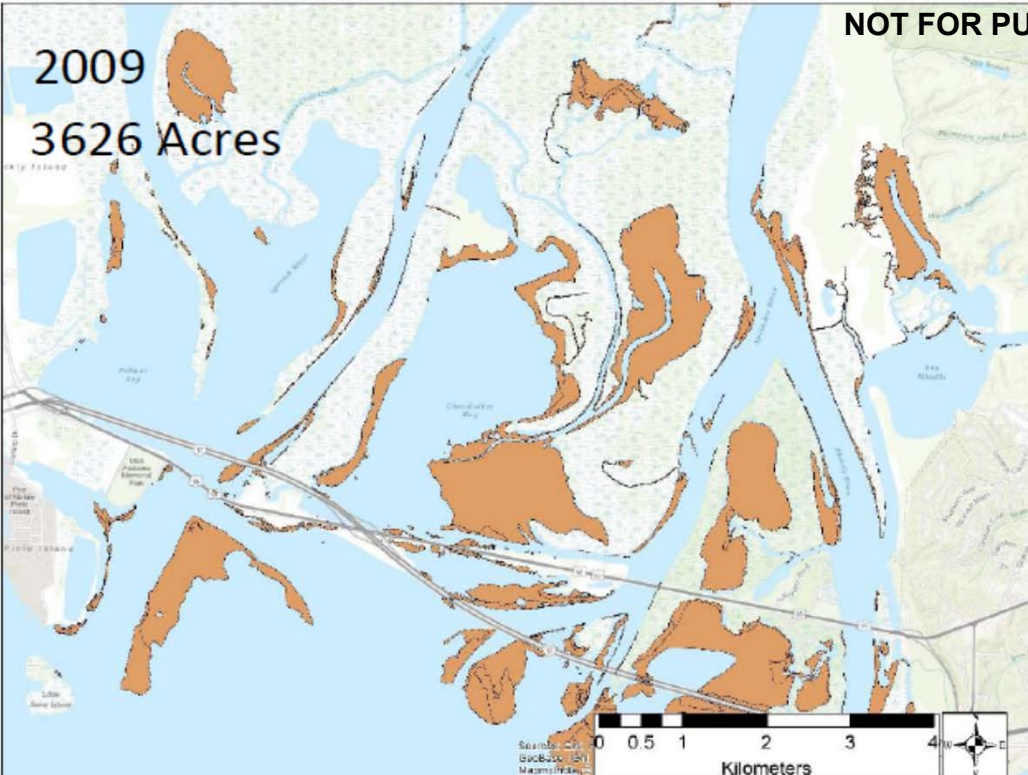


2002
4157 Acres

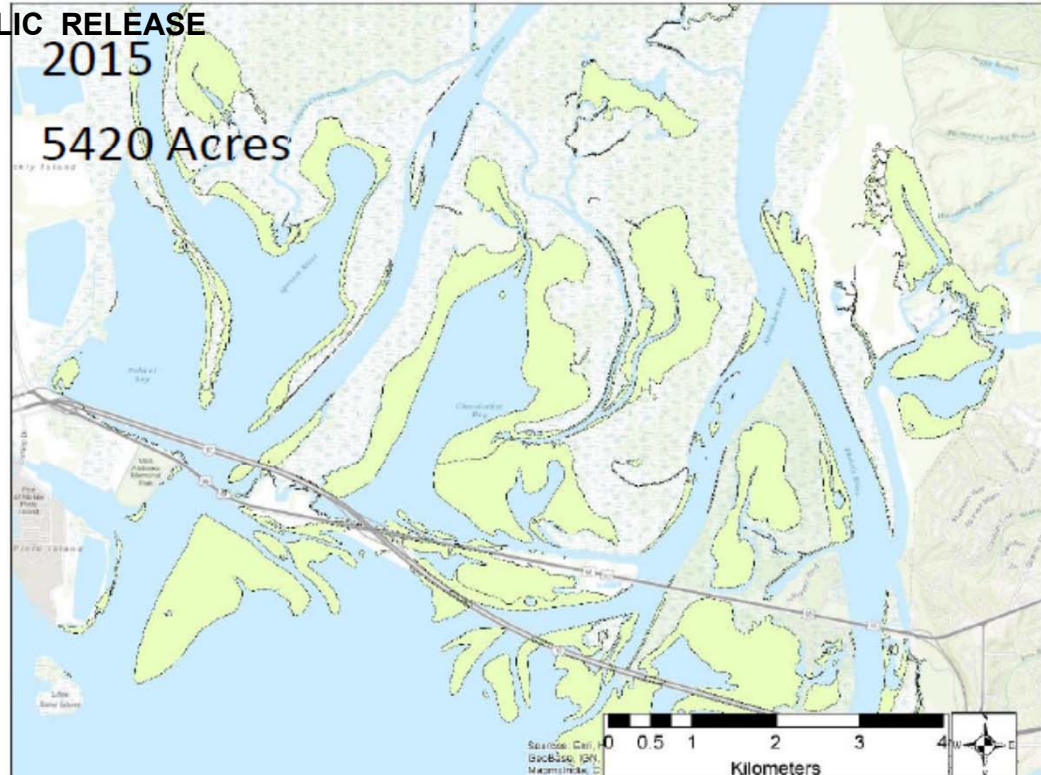


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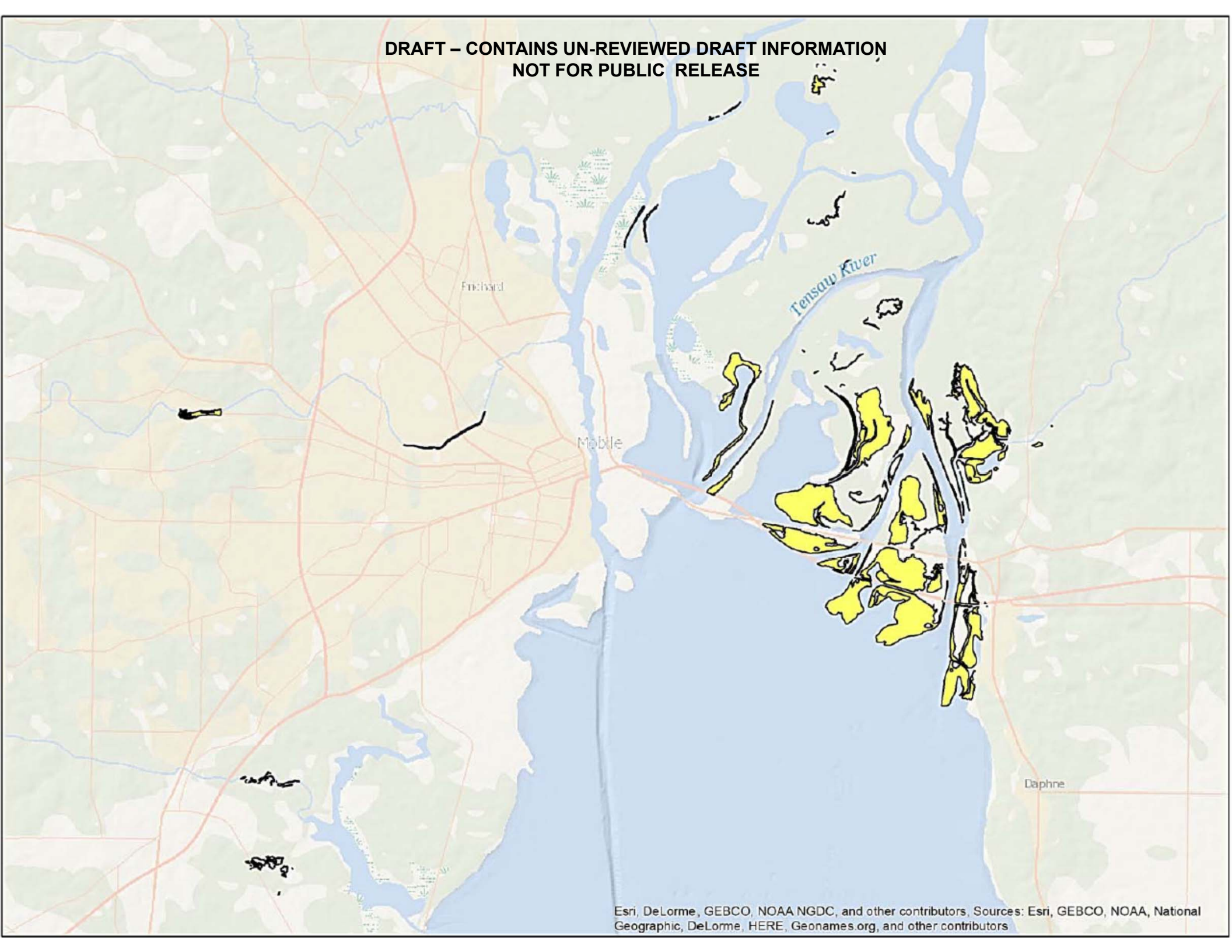
2009
3626 Acres



2015
5420 Acres



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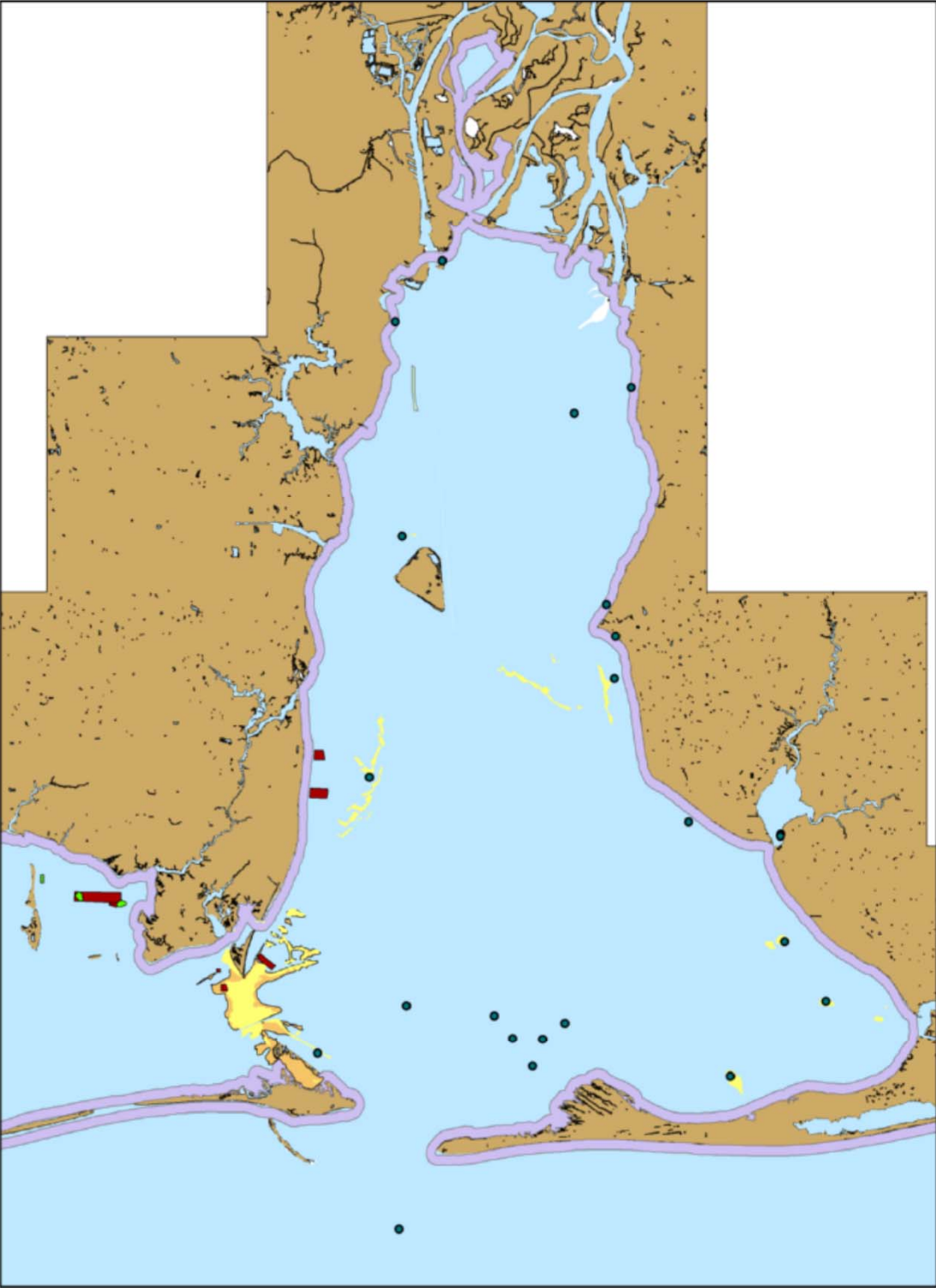
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Legend

- Alabama_Public_Reefs
- Brookley_Reef
- Oyster_reefs_1968
- oyster_reef_2001
- oyster_planting_ADCNR2009_13
- oyster_zones
- Oyster_1995_survey
- al_right_Ind_pub_wat_gat_oyst
- AL_oyster_classification_GA14

Land or Water

- Land
- Water

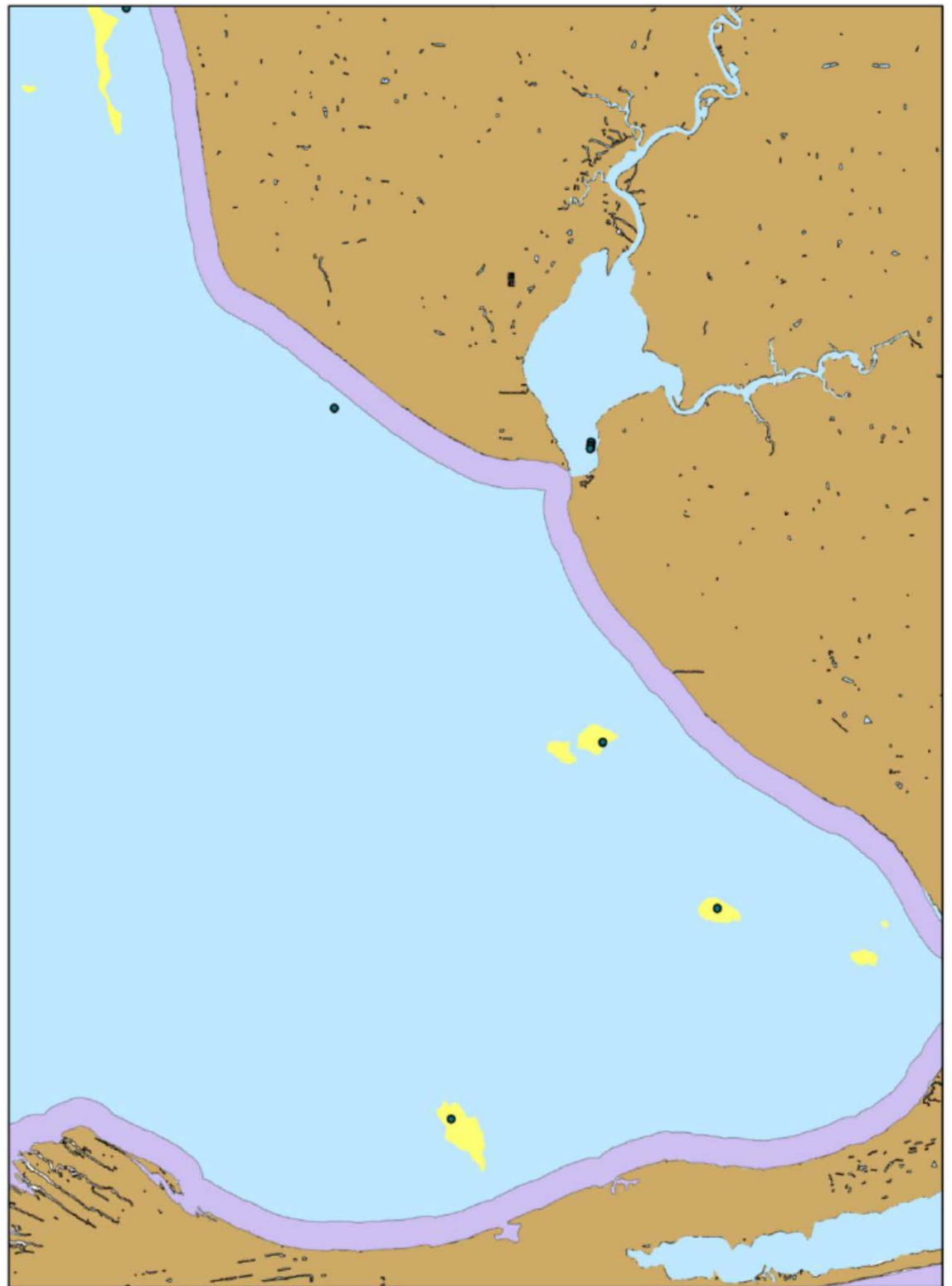


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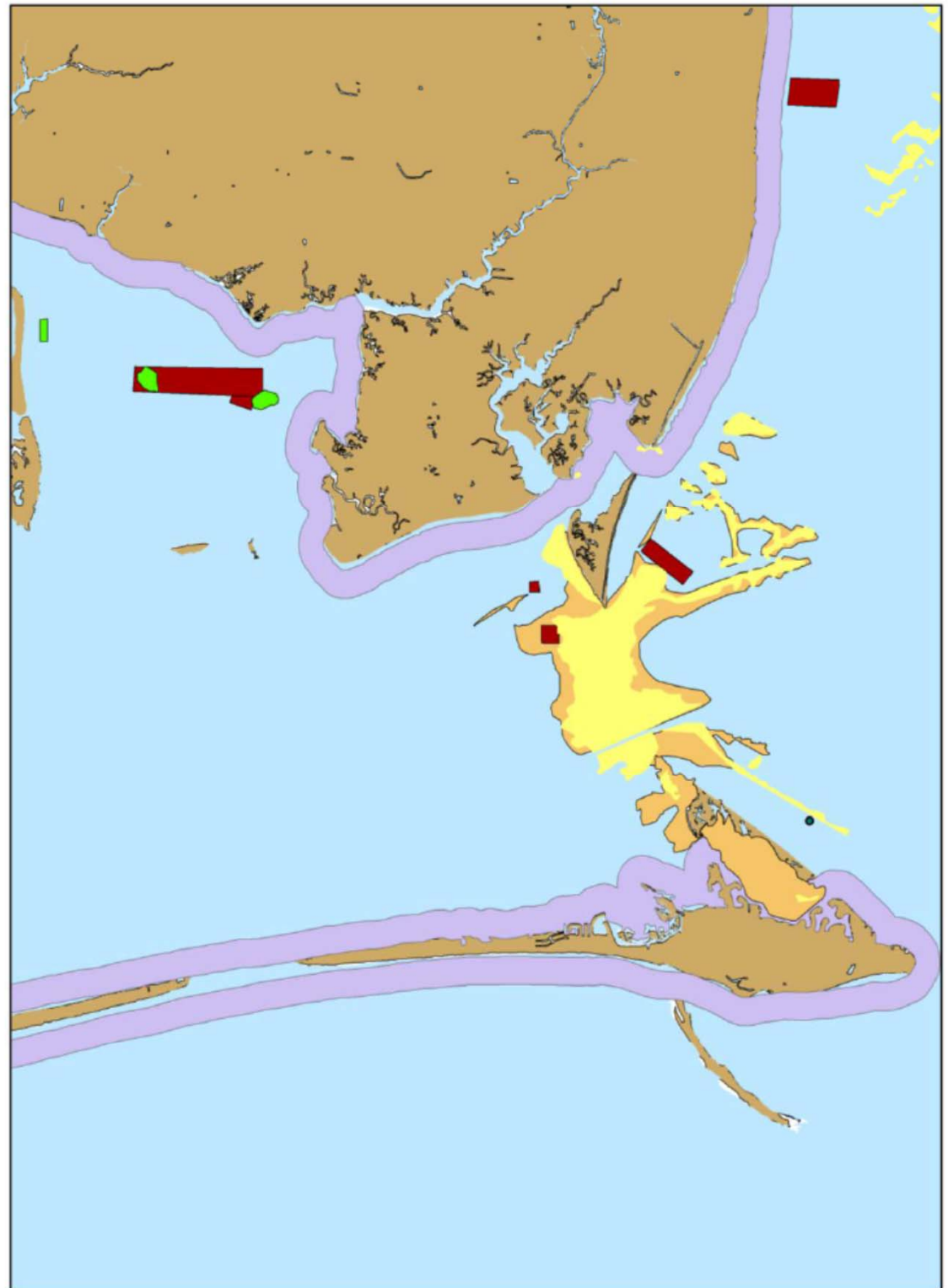
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Land or Water

- Land
- Water

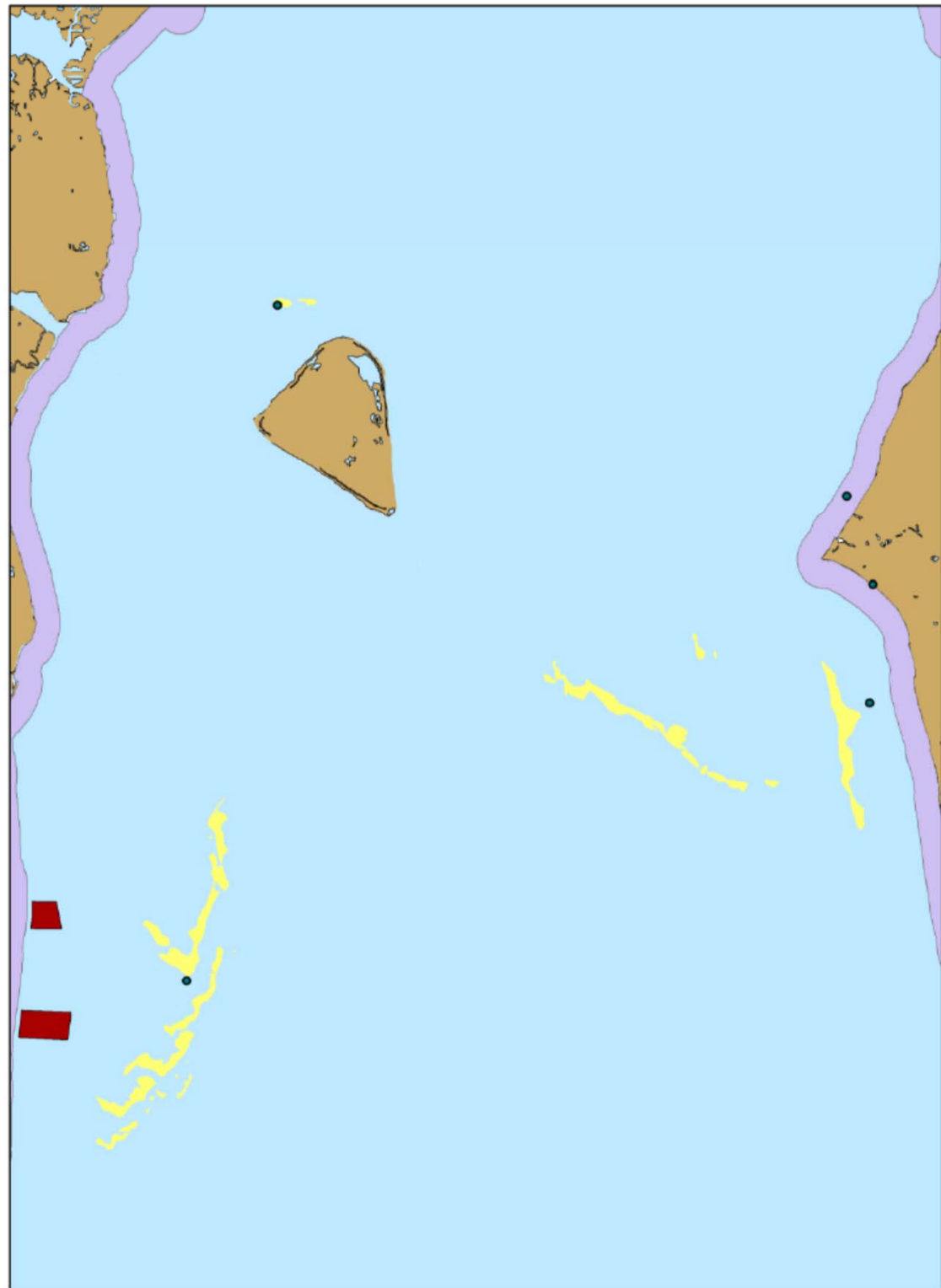


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Land or Water

- Land
- Water



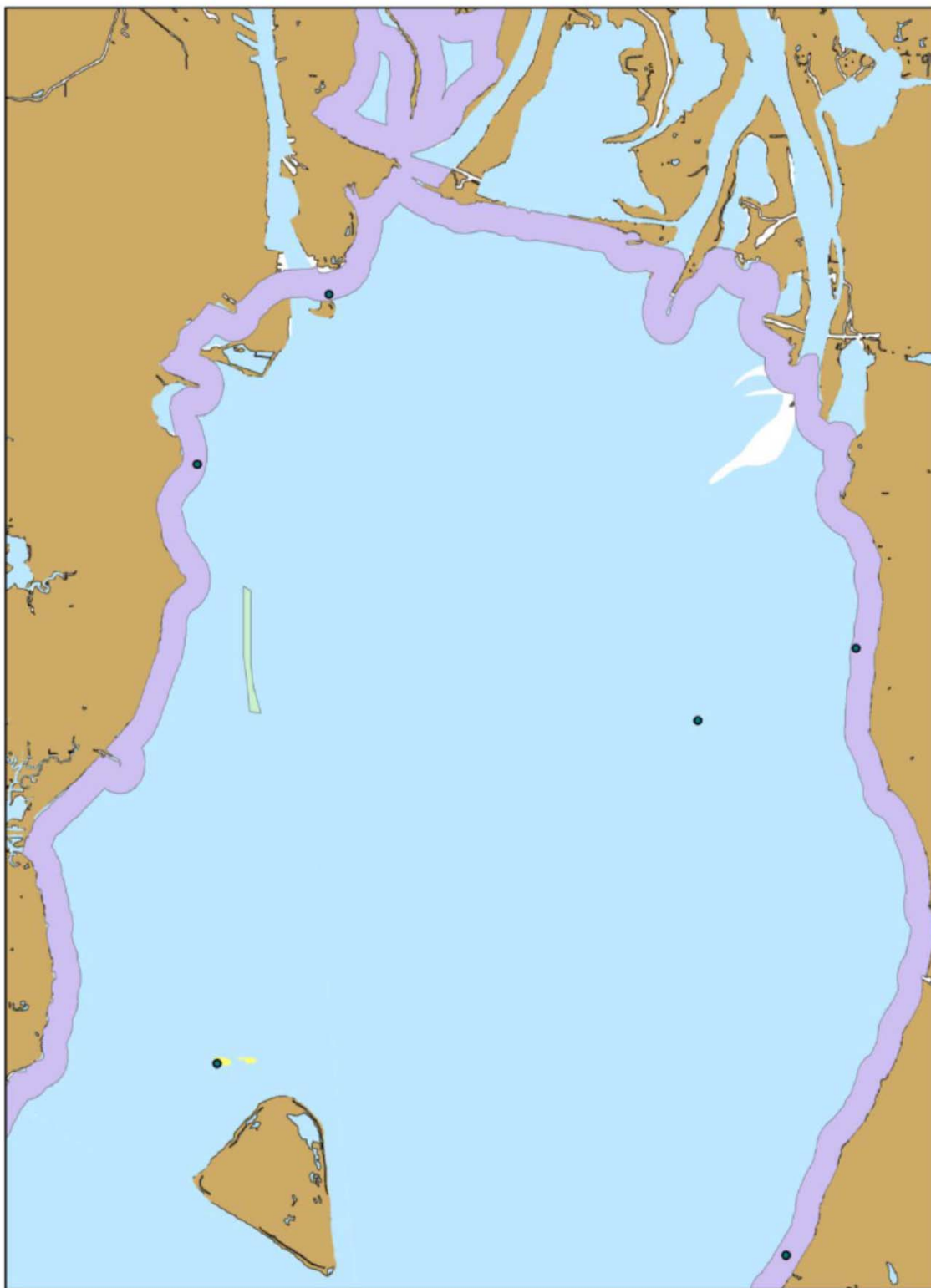
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Land or Water

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- Water





DEPARTMENT OF THE ARMY
MOBILE DISTRICT, CORPS OF ENGINEERS
P.O. BOX 2288
MOBILE, ALABAMA 36628-0001

REPLY TO
ATTENTION OF:

CESAM-PD-EC

29 March 2018

MEMORANDUM FOR RECORD (MFR)

SUBJECT: Agency Meeting for Mobile Harbor General Reevaluation Report (GRR) and Supplemental Environmental Impact Statement (SEIS) regarding preliminary impact assessments

1. On February 15, 2018 the U.S. Army Corps of Engineers (USACE), Mobile District hosted an agency webinar meeting as part of the ongoing agency scoping activities for the Mobile Harbor GRR and integrated SEIS. The purpose of the meeting was to reconvene the team of cooperating federal and state agencies to present and discuss preliminary results for the modeling efforts and aquatic resources impact assessments.

The meeting participants included representatives from the following agencies:

- Alabama State Port Authority (ASPA)
- U.S. Army Corps of Engineers, Mobile District (USACE)
- U.S. Army Corps of Engineers Corps, Engineer Research and Development Center (ERDC)
- U.S. Army Corps of Engineers Corps, ECO-PCX
- Alabama Dept. of Environmental Management (ADEM), Mobile Field Office
- ADEM, Water Quality Branch
- Alabama Dept. of Conservation and Natural Resources (ADCNR), Marine Resources Division (MRD)
- Geological Survey of Alabama (GSA)
- U.S. Fish and Wildlife Service (FWS)
- National Marine Fisheries Service (NMFS), Habitat Conservation Division (HCD)
- Environmental Protection Agency (EPA Region 4)
- Mobile Bay National Estuary Program (MBNEP)
- U.S. Geological Survey (USGS)

The agenda, participation list, and meeting slides are included below.

2. Larry Parson opened the meeting with statements identifying the intent to present and discuss the preliminary results from the modeling efforts and impacts assessments to aquatic resources. After a round of introductions, a project overview was presented

to the group by David Newell which is included in the slides attached below and states that approximately two thirds of the vessels calling on the Port are restricted in some manner and is one of the primary issues for the need of the channel expansion. The study budget and schedule is defined by the USACE's Smart Planning process in which the Mobile District was able to implement an exemption process to increase the time and funds necessary to conduct the necessary modeling and environmental assessments. The GRR/SEIS is a 4 year study with the Draft SEIS to be released for public review in June 2018.

The economic analyses included dimensional ranges from 48 to 50 feet in the main bay channel and 50 to 52 feet at entrance. The study also proposes bend easing with a 3-mile widener of 100 feet in the lower channel and expansion of the turning basin in the upper bay channel just south of the mouth of the Mobile River. The modeling to evaluate potential impacts from proposed channel modifications are based on deepening the channel to 50 feet, plus 2 feet of advanced maintenance and 2 feet of allowable overdepth with a 5-mile widener in the lower bay. Since the actual plan will likely be something less than those dimensions, the USACE feels the habitat assessments represents a worst-case scenario.

Steve Jones from GSA asked why a change in the proposed dimensions? It was stated that modeling was begun prior to completion of the economic analysis. Modifications used in the modeling were considered the most reasonable and likely maximum dimensions. The economic assessment showed the costs to construct a 5-mile widener would exceed the required benefits, however, the project with a 3-mile widener showed economic benefits would be justified. The widener must also be safe and supported by the pilots. Currently, economics justify a NED plan of 51 feet, however, based on a variety of considerations, the maximum depth is not anticipated to exceed 50 feet.

3. Mr. Newell presented three placement sites being proposed for the new work material. A significant volume (5 – 7 million cubic yards) of material from the upper reaches of the channel is being proposed for placement in an area in the northeastern part of the bay where past relic oyster shell mining operations were conducted, resulting in a deepening and degradation of the bay bottom in that area. Larry Parson clarified that the relic mined areas was also one of those previous sites identified in the past during beneficial use discussions with the agencies. The site is considered a beneficial use site but is also the least cost option for the Upper Mobile Bay Material. Placement would be accomplished with a maximum thickness of approximately 3 feet due to the characteristics of the new work material. Volume estimates are based on an average thickness of approximately 1 foot.

Any significant amount of sandy material from the entrance channel would be placed in the Sand Island Beneficial Use Areas (SIBUA) or the Sand Island/Pelican Island complex site. Justin McDonald noted that in the current geotechnical borings there is very little suitable sand in this area. **It is intended that the vast majority of the new work material would be placed within the Ocean Dredged Material Disposal Site (ODMDS)**

However, to accommodate the new work material, the ODMDS site must be expanded from its current 4.7-nmi² area to the proposed 24-nmi² area. The USACE is in the process of coordinating the expansion with EPA.

From a geotechnical aspect, we have a considerable amount of existing data down to -50 feet with some gaps in the southern part of the bay. The USACE will likely have to collect about 15 additional borings during the study phase but will conduct more borings during the Pre-construction Engineering Design (PED) phase of the project.

Rusty Swafford raised the concern if the USACE has considered how to place various material types in order to address fishermen's concerns regarding mobilization of the finer material compared to clays. Dredging of the material to be placed in the relic oyster mined areas would start at the northern limits and then placed closest to the dredging site. If the USACE sees a need to modify the placement strategy during construction, it will be considered further as appropriate.

Molly Martin from EPA asked if the material being beneficially used in the relic oyster mining area will be tested. The Corps responded that all of the new work material will be tested according to the ocean testing manual to assure that it meets ocean disposal criteria.

4. The meeting proceeded to the Modeling portion of the agenda. Justin McDonald gave an overview of the modeling efforts and presented the approach for developing the modeling tools and assessments that was then provided to the environmental group for conducting aquatic resource impact assessments. The modeling conducted includes hydrodynamic, water quality, and estuarine and coastal sediment transport as well as ship wake analysis; some of which is still ongoing.

Hydrodynamic Modeling. Ray Chapman and Sung-Chan Kim of ERDC presented the hydrodynamic modeling and preliminary results. The modeling slides are included below. The purpose of conducting hydrodynamic modeling is to generate water levels, current velocities, and salinities to provide to the water quality and estuarine sediment transport modules. The model also provides a time-averaged salinity to support habitat assessments. The modeling was conducted using a group of models including the Coastal Storm Modeling System (CSTORM) and ADvanced CIRculatION Model (ADCIRC) for regional model forcing to the nearshore modules. The STeady State Spectral WAVE Full Plain (STWAVE-FP) model was used to provide wave fields to the nearshore hydrodynamic and sediment transport modules. The Geophysical Scale Transport Modeling System (GSMB) - Multi-Block Curvilinear Hydrodynamics in 3-Dimensions-Waterways Experiment Station (MB-CH3D-WES) model provided water levels and current velocities.

The model was calibrated for a one-year period of 2010. Additional data from September 2016 from field data collected by USACE, Mobile District within the delta was used to demonstrate the validity of the vertical profiles established to support the environmental assessments.

The information generated and output from the hydrodynamic model required a significant post-processing effort to translate and provide information being used by the environmental team in conducting the aquatic resources impact assessments.

Information generated from the hydrodynamic model was also linked to the oyster larvae transport modeling.

Water Quality. Barry Bunch from ERDC presented the preliminary results of the water quality modeling effort. The purpose is to assess potential changes in water quality including changes in flushing, salinity, dissolved oxygen, temperature, total suspended solids, nutrients and chlorophyll a as a result of the proposed channel improvements. The information generated from this effort was provided to the habitat team for the aquatic resources assessments. This modeling effort utilized the GSMB-CE-QUAL-ICM model which assessed potential changes in water quality parameters listed above.

The model utilized a years-worth of hydrological data from the year 2010 which represents a typical year including periods of both high and low flow conditions used to extract non-average conditions. The results and figures are included in the slides below.

Differences predicted between existing and project water quality conditions are the result of changes in hydrodynamic conditions between the two cases. When there are no quantifiable differences indicated between existing and project conditions, it is reasonable to make the determination that there is no project impact on water quality. Existing and Project simulations were also conducted considering a 0.5 meter sea level rise (SLR) scenario which indicated little to no difference in salinity and water quality conditions when comparing project and existing conditions. This agreement in existing and project conditions occur through the duration of the year-long simulation and is, therefore, reasonable to expect that the project water quality will be similar to the existing conditions.

Several questions were raised concerning the water quality modeling:

- The first question was concerning the depth of the grid in the Bay. The grid has 10 vertical layers so the depth of each layer 1/10 of the total depth in a particular location.
- Is this 2010 data representing a calendar year or water year? The modeling was conducted using data from the 2010 calendar year.
- Does the density flow capture the salt wedge salinity wedge in the bay? Yes the model is set up to capture the salt wedge.
- With the project being modeled at a 54 foot depth (including the 2+2) with the 5 mile widener at 100 foot wide, are there any concerns with a reduced project dimension that will likely be selected as the TSP? The USACE would rather consider the worse-case scenario in determining potential impacts.

- Amanda Howell with EPA asked if they could be provided additional information on the calibration of the Water Quality Model? The USACE will coordinate a separate meeting to more specifically discuss the model calibration.

Barry Bunch informed the group that water quality modeling is slower to evolve compared to hydrodynamic modeling which can be done on an hourly basis if needed. Water quality modeling is looking at many more parameters (6 x more) compared to hydrodynamics.

Sediment Transport. Earl Hayter from ERDC presented the preliminary finding from the sediment transport modeling effort within the bay. The sediment transport slides are included below. The purpose of this effort is to assess relative changes in sedimentation rates within the channel, dredged material placement and surrounding areas as a result of channel improvements within the bay representing a simulation period of 2010. The sediment transport modeling utilizes the GSMB–SEDZLJ model to assess relative changes in sedimentation rates and pathways within the bay as a result of channel modifications.

The modeling also incorporated field data collected in 2016 and 2017 by Richard Allen which included suspended sediment concentrations. The data were used to refine and improve on sediment discharge relationships. The dredging records from 2009-2011 were used to determine the sedimentation rates for that time period. These rates were used to calibrate the model. The calibrated model simulated a shoaling volume of 2.5% less than the historic dredged volume. Increases in average annual shoaling vary from 5 to 15% along the navigation channel with project channel depths.

Joe Long and Davina Passeri from the USGS presented preliminary findings from the coastal sediment transport modeling (Delft 3D modeling) being used to evaluate the potential effects of widening and/or deepening of the navigation channel on the ebb tidal shoal and adjacent nearshore coastal areas considering with and without project conditions. The model used a wave climatology derived from hindcast wave model output covering the time period of 1998 to 2016 that consists of representative bins based upon wave height and direction.

There was a good agreement made between observed and modeled wave and water levels near the island and ebb/flood velocities through the passes adjacent to Dauphin Island. The model captured patterns of erosion and accretion along the edge of the channel, near Dixie Bar, and by Pelican Island. Additional sensitivity tests (Hurricane Ivan) were conducted to evaluate tropical storm influence on widespread erosion between the 5 and 10 m contours. The simulations indicated that the difference in bed level changes between project and existing conditions was minimal in the bay and ebb-tidal shoal.

Ship Wake. The ship wave analysis modeling effort was presented by Richard Allen from the Mobile District. The purpose of the ship wake study is to determine vessel

generated wave energy propagation from the Federal Navigation Channel for vessel classes having an overall length greater than 400 feet to assess potential impacts to shorelines within Mobile Bay as a result of proposed channel improvements using statistical comparisons of the current and forecasted fleets and channel geometries. Doing this type of study is challenging because there is no existing literature specific to Mobile Bay considering the complex bathymetry and distance from the channel. Vessel generated waves do not follow common wave theories.

Wave gages were installed at 5 sites and were able to collect information for a period of 62 days (11/18/2017 to 01/19/2018) as shown in the slides below. Information was also collected from the Coast Guard for specific vessel input/output.

After processing the existing data, the next steps will look at statistical differences and anticipated changes in vessel fleet calling upon the port. The analysis will compute the correlation between dimensionless vessel parameters and vessel generated wave energy, spatial orientation, vessel direction, speed, and climatology. This will then be used to develop a “predictive” method to forecast future vessel generated wave energy and determine the statistical difference in vessel generated wave energy and background wave energy. Statistical comparisons of current and forecasted vessel wave energy will then be developed.

Other general discussions related to the analysis included how the ships in general are using the channel. Mobile Harbor channel is basically restricted to one-way traffic. Passing is allowed in some incidents, however, engineering evaluations become challenging when three or more vessels are being brought in a rapid succession. The pilots currently have rules that 2 panamax are not permitted to pass. Under the specific circumstances, some ships do pass but the rules become more restrictive with increase ship sizes. Patric Harper of the FWS expressed concerns about possible erosion along the mid-bay shoreline and possible impacts to property owners and living shorelines due increases in ship sizes. John Mareska from the ADCNR, MRD expressed concerns of erosion on the shoreline of Little Dauphin Island.

Economic analyses has shown that the future fleet will continue to come without the project but will access the Port by light-loading. Demand stays the same with the project but ships will be able to access the Port without having to light-load, which may result in less ships calling on the Port. Rusty Swafford from NMFS pointed out that a deeper channel in theory will also cause displacement of more water.

5. Habitat Impact Assessments. The next portion of the meeting pertained to discussions on preliminary results of impact assessments conducted for the aquatic resources of concern associated with the proposed channel modifications. The slides presented during the meeting are included below. Jacob Berkowitz from EDRC oversaw this effort and presented the results of this effort and led subsequent discussions. Outputs from the models described above were used by the ERDC team to assess impacts to resources which included wetlands, submerged aquatic vegetation

(SAV), oysters, benthic invertebrates, and fisheries. This is an extensive collaborative effort to compile existing data and field data observations and ground truthing information. Significant assistance from the State of Alabama providing vital communications, information on state-listed species encountered in field mapping efforts, GIS data files on wetland and SAV mapping efforts, water quality data, and information from their fish assessment and monitoring program (FAMP). As a result of guidance received from past agency meetings, it was determined that the study should focus on the five resources listed above. The assessments of these resources utilized the outputs from all the previously described modeling and also considered the effects of SLR.

Considering the results of the models, a grid of the study area was established consisting of 30 blocks. The blocks were further divided into cells totaling 48,000 cells over the entire study area. The resource assessments also considered a SLR scenario of 0.5 meters over a 50-year period. Each resource was approached differently, for instance, the SAV considered bottom salinities and while wetlands considered upper water column conditions. The study considered the average salinities using data for the year 2010. Conditions over the 75th percentile were also considered in order to capture the more extreme conditions over the course of the year.

Wetlands. The wetland assessments compared existing and project conditions with and without SLR. The effort mapped 43 wetland community types utilizing existing data and 800 on-site samples to generate high resolution mapping of 77,000 acres of wetland within the project area. All products produced from this study will be available to the agencies as well as other organizations. Once the mapping was completed, each species was evaluated for water quality tolerances (particularly salinity) to identify their environmental thresholds. This was accomplished through a literature review. A tiered approach first considered long term studies conducted within the local area then followed by long term studies anywhere outside the study area. Salinity tolerances were assessed to determine if mortality of plants or reduced productivity would occur as a result of the proposed channel modifications. When considering the delta areas as shown in the slides, there are no significant salinity changes predicted in the upper reaches and a potential increase of 1 part per thousand (ppt) in the lower reaches, which is well within tolerance for those species. This block was selected because it is considered to be the most sensitive to these types of changes.

The wetland assessments looked at the upper 1/3 of the water column and upper foot. Based upon anticipated depth, wetland losses are not anticipated based on average conditions. Looking at the 75th percentile approach for the extreme conditions, which is considered a conservative approach, there is a potential for a minor and temporary vegetation shift within some wetlands of approximately 600 acres based on a short term productivity reduction. It must be considered that these wetlands are not monotypic but rather have multiple species. Thus, there would be no losses in wetland or wetland functions anticipated resulting from project conditions. There does exist a potential over time to see a 10% reduction of productivity of some species within a wetland type. This

reduction would likely be filled by another species within that wetland vegetation type. Therefore, there would be no shift in wetland types (freshwater to estuarine, etc.) but there may be some vegetation changes overtime within a wetland type. When applying the 0.5m SLR scenario, it becomes apparent that there will be inundation of wetlands, however, when adding the project on top of the projected SLR the differences are negligible.

Rusty Swafford from NMFS stated that the results seen from this study are consistent with that seen from the Houston Ship Channel expansion. There have not been any observed losses of wetlands due to salinity and no mitigation was recommended based on predicted salinity changes.

Submerged Aquatic Vegetation. The approach used for evaluating the SAVs was similar to that used for the wetlands. Historic mapping efforts and field ground truthing was used to create an updated map of the SAVs for Mobile Bay. The SAV salinity tolerances were established based upon literature review. When examining tolerances from different areas, if the data showed that salinity in the Mobile Bay was different from other areas, the values for Mobile Bay were used. The maps generated identify where the various species of SAVs are located but are not able to specify the mixture of species. Subsequently, where there are beds of mixed SAV species, the most sensitive species are identified and used to evaluate potential impacts of salinity changes. The study assessed the impacts using a georeferenced database by identifying areas where the “with project” increased salinity above baseline adjusted tolerances. Preliminary results indicate that SAV tolerances were not exceeded when considering project conditions. There were some impacts predicted for the Eurasian watermilfoil which is considered an invasive species and not of particular concern. Potential minor effects were predicted for approximately 13 acres of wild celery and coon’s tail over short time periods. Other sources have documented that the wild celery can tolerate salinities up to 25 ppt and the coon’s tail can tolerate salinities of up to 12 ppt in pulses of less than 7 days in duration. The monthly salinity data is being evaluated to see if these conditions were exceeded.

Although the study looked at the whole year, the information presented at this meeting represents the month of October because this month exhibits the most extreme salinity ranges for that year, and would have the largest impact on species distribution. The figures show mapped SAV beds from fall 2015.

Dissolved oxygen (DO) would only have an impact if there were areas with very low, persistent DO that caused stress to the SAVs. Preliminary results indicate that DO with the project does not get low enough to have an impact.

There were subsequent discussions on evaluating SLR as compared to the baseline and project conditions. Evaluations were conducted considering the effects of SLR on the SAVs. No differences were predicted between the existing and project conditions on top of SLR. SLR alone would likely cause a shift in SAVs, however, the project on top of the SLR did not indicate any differences. Patric Harper raised a concern that the

impacts of the project on top of SLR could cause a tipping point. The preliminary results has not predicted any tipping point thresholds.

Justin McDonald clarified that the USACE is considering the relative SLR of 0.5 meters based off USACE intermediate curve projections over a 50-year horizon. If something greater than that were used, then SLR would drown out any impacts that the project could ever cause.

John Mareska of DMR expressed that SLR would anticipate a large increase in the influx of freshwater rivers from melting of polar cap. A discussion followed that if there could actually be an increase or decrease in salinity due to SLR. At this point in the study, the USACE does not see any difference between the existing and project conditions with SLR. Justin Rigdon from the ADEM Water Quality branch stated that it's not surprising that we are not seeing much changes in salinity because the channel depth increase being modeled is not that great. We're not starting with a bay without a channel and building a brand new channel, we already have a bay with a channel and modifying it a little.

Oysters. The meeting continued with presenting the preliminary results of the oyster impact assessment. This assessment used an integrated models that included hydrodynamics, water quality, and oyster behavior models to conduct oyster larvae particle release and fate simulations for determining potential oyster mortality and flushing of larvae from Mobile Bay. The analysis includes both the Brookley Reef and Cedar Point Reef which are considered to be the most vulnerable and sensitive reefs in the bay.

The study also considered minimum existing levels of DO and if there were any circumstances where DO levels were outside the oyster tolerances. The oyster larvae particle tracking model predicted zero mortality under all salinity scenarios and DO levels stayed well above minimum oyster tolerances as a result of post-project conditions. SLR scenarios also predicted no oyster mortality with no increases in larvae flushing between project and existing conditions.

The models are currently running with a release of 42 particles (oyster larvae) to determine the particle settlement and mortality. The models predict that 41 of the particles are able to settle and not be lost from the bay. The agencies expressed the concern that it doesn't make sense that there was a release of 42 particles and 41 of those particles settle and attach. It was explained that attachment does not necessarily mean settling to the bottom and becoming an adult oyster. It simply means that those particles were not flushed and were retained in the bay. The agencies also requested that the number of days that the oysters are transferring/not attached needs to be included in the results.

Kevin Anson from MRD expressed that the SLR scenario also predicts no oyster mortality. There is a concern that higher salinity conditions favor the oyster drill and

drought conditions, salinities may be more favorable to the oyster drills which prey on oysters. Could SLR provide conditions that are more favorable to the oyster drill that could change mortality rates for adult oysters? Overall oyster model includes behavior such as how many oysters will die and it is recognized that there are other factors.

Benthic Invertebrates. The macro-benthic invertebrate sampling and analyses took advantage of the various works that already existed for Mobile Bay. 240 benthic samples were collected in three different habitat zones representing freshwater, transitional, and upper bay habitats in the fall of 2016 and spring of 2017. Sampling within these habitat zones ensured that information was collected for the most sensitive habitats that could potentially be effected by the proposed channel modifications. The statistical analyses examined whether benthic macrofauna differed among habitat types and determined how the macrofauna were related to salinity in these zones. Locations of changes in macrofauna communities were identified in correlation to the habitat types. Salinity changes associated with the channel deepening and widening were modeled for each sampling station and predicted changes were evaluated for the fall and spring conditions. At the most basic level, habitats with a saltwater influence are dominated by polychaete worms and freshwater habitats are dominated by oligochaete worms and insects.

The modeling shows that the degree of freshwater inputs from the rivers rather than saltwater influx from the bay dictates the species transition locations for the habitat types and that the location of transition to a freshwater benthic community (orange ovals shown on slide) will remain similar to baseline conditions. The modeling did not identify any benthic impacts due to changes in DO. Subsequently, there will not be a significant shift in the benthic communities associated with the project. Additionally, impacts to higher trophic levels (e.g., fish) associated with prey availability appear negligible because prey distributions are unlikely to be affected.

A question was raised concerning the effects of the benthic communities in open water placement areas such the relic oyster shell mining area. A similar situation was encountered associated with the Houston Ship Channel. Studies were conducted by ERDC and Galveston Lab and determined that the benthic communities typically recover within 18 to 24 months. Similar results were seen from thin-layer studies conducted in Mobile Bay and Mississippi Sound.

Fish. The fisheries evaluations are built upon data provided by the MRD over a 10-year period from the FAMP. ERDC used the FAMP data supplemented with additional targeted sampling in the bay, delta, and river habitats. A 500 meter buffer was established at each sample station from existing sites with a model grid for evaluating bottom and mean salinity values. Using this approach, the sampling included approximately 98,000 individual fish comprised of 140 species.

The habitat types and salinity tolerances were considered for each species which linked salinity and abundance of species to baseline conditions. The preliminary results of the modeling and analysis predicts that there would be no impacts expected from the

project due to salinity increases of less than 5 ppt and that no impacts would be expected due to freshwater or euryhaline species habitat availability upstream. For resident estuarine or euryhaline species, no impacts would be expected due to the high range of species utilization across salinity gradients. Considering marine species entering the bay and resident marine species, no impact are expected due to available bay and marine environments.

The MRD identified a potential issue concerning some of the samples they provided were only taken in one period of time, specifically during summer season. ERDC will be coordinating this with the MRD

Summary of Aquatic Resources Assessments. In summary, the baseline resources were identified across the five aquatic resources including wetlands, SAVs, oysters, benthic invertebrates, and fish. Water quality thresholds were established for each resource within the different habitat zones (freshwater, transitional, and estuarine). The modeling and impact assessments have predicted no major impacts (i.e., loss of resources) anticipated under the post-project conditions. Additionally, post-project impacts remain negligible under 0.5 meter SLR scenario.

6. The meeting proceeded by querying the participating cooperating agencies if they feel the USACE is going in the right direction with the study and if they perceive that there is anything we need to address prior to the release of the draft report. Generally, the agencies concur with the approach taken on the modeling and resource assessments. However, some concerns were raised that should be addressed prior to finalizing certain aspects of the study.

The MRD expressed concerns regarding the presentation of the DO data coming out of the water quality modeling. The MRD has data from 2015 and 2016 that indicates DO levels associated with existing oyster reefs at 5 sites in Mobile Bay. These data are not consistent with the DO outputs from the water quality model. MRD will be providing the data to the USACE. The USACE will look into this issue and coordinate with the MRD.

The MRD also expressed that the public would want to see impacts on the lower bay and that they would be interested in salinity and effects on shoreline. The USACE explained that they did not sample in the lower portion of the bay because the lower bay already exhibits full salinity rages and the resources are already subject to high salinity conditions.

There are concerns about the shoreline effects on properties resulting from the potential of increased ship wakes. The USACE should at least convey that they are evaluating such impacts to shorelines. When USACE has completed the ship wake analysis, the energy tolerances for resources such as wetlands and SAVs should be addressed. USACE is still in the process of conducting the ship wake study and will consider impacts to wetlands and SAVs in the final analysis.

Kevin Anson from MRD expressed concerns of the 0.5 meter SLR defined over a 50-year period. He would like to see if there is a way to shorten this timeframe because some of the population is not concerned with looking that far in advance. The USACE responded that the study goal is to look at impacts from the proposed deepening and widening of the channel and are required to include impacts from SLR since it is accepted that it will occur regardless.

7. Larry Parson concluded the meeting with final discussions on potential mitigation requirements base on the results presented at this meeting. Based on the minor predicted impacts relating to changes in the hydrodynamics, water quality, and sediment transport, the cooperation agencies in attendance felt that mitigation measures would not be necessary. Similar impacts were observed for other studies where there was the potential for a minor shift of vegetation within a specific wetland type but no real loss to the wetland. It would not be reasonable to pull out the specific impacts within that specific wetland type and mitigation was not required. The group recommended that the results of the ship wake analysis be fully considered for potential effects on shorelines and resources before a final determination on mitigation requirements can be made.

8. Please address any questions, comments, or concerns pertaining to this meeting to Larry Parson at (251) 690-3139 or larry.e.parson@sam.usace.army.mil.

/s/ Larry E. Parson
U.S. Army Corps of Engineers, Mobile District
Coastal Environment Team

Draft copies were furnished for comment to all meeting participants.

**Cooperating Agency Meeting
Mobile Bay General Reevaluation Report (GRR)
Supplemental Environment Impact Statement (SEIS)**

**February 15, 2018
9:30 – 3:00 Central
International Trade Center
Mobile, Alabama**

**Preliminary Results for the Modeling and Impact Assessments
Agenda**

Introductions

Project Overview

Preliminary Modeling Results and Discussions

Hydrodynamics

Water Quality

Sediment Transport

Ship Wake

Habitat Impact Assessment Preliminary Results and Discussions

Wetlands

Submerged Aquatic Vegetation

Oysters

Benthic

Fish

Mitigation Concepts

Next Steps

Mobile Harbor GRR Agency Webinar – List of Participants

Cooperating Agencies

Bob Harris (ASPA)
Judy Adams (ASPA)
John Mareska (ACDNR, MRD)
Scott Bannon (ACDNR, MRD)
Kevin Anson (ACDNR, MRD)
Stephen Jones (GSA)
Allen Phelps (ADEM)
Justin Rigdon (ADEM)
James Mooney (ADEM)
Glen Higdon (ADEM)
Molly Martin (EPA)
Amanda Howell (EPA)
Ntale Kajumba (EPA)
Josh Rowell (FWS)
Patric Harper (FWS)
Rusty Swafford (NMFS)
Tom Herder (MBNEP)
Joe Long (USGS)
Michelle Myers (USGS)
Davina Passeri (USGS)

Corps of Engineers ECO-PCX

Nate Richards
Greg Miller

Corps of Engineers - ERDC

Jacob Berkowitz
Dara Wilbur
Barry Bunch
Ray Chapman
Earl Hayter
Todd Swannack
Safra Altman
Sung-Chan Kim

Corps of Engineers – Mobile District

Curtis Flakes
Lekesha Reynolds
Jennifer Jacobson
Justin McDonald
David Newell
Elizabeth Godsey
Richard Allen
Joe Givhan
Larry Parson

Harbor General Reevaluation Report Overview

15 February 2018



US Army Corps
of Engineers®



MOBILE HARBOR DEEPENING AND WIDENING



“Modernizing the Port of Mobile is necessary because 2/3^{rds} of the Port of Mobile’s vessel traffic today is restricted or delayed directly impacting shipper costs and competitiveness.”

- James K. Lyons, ASPA Director

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- ✓ 10th Largest in the U.S.
- ✓ 58M+ Tons of Cargo Handled Port-wide

Growth Steadily Climbs

- ✓ Record 2017 20% Container Growth
- ✓ Ranked #2 Steel Port in U.S.
- ✓ Ocean Carriers continue to add service

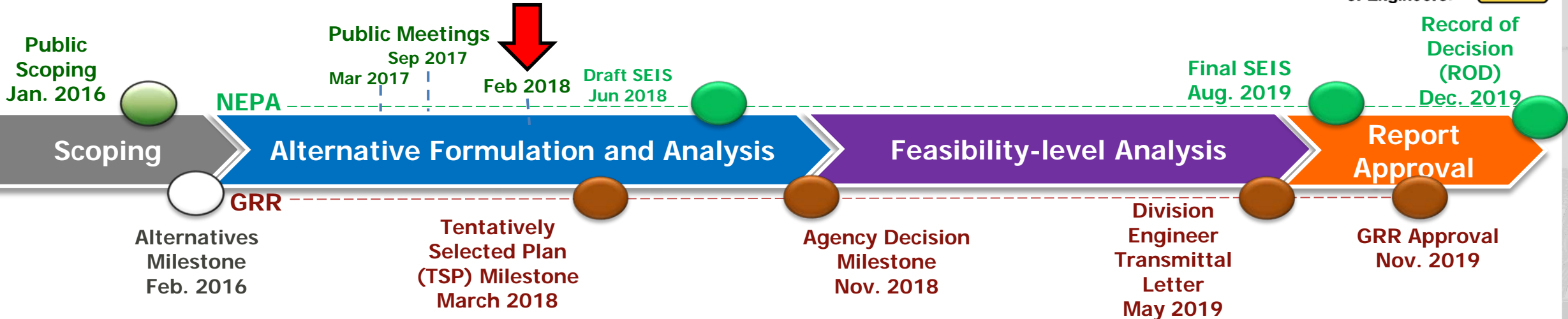
Strong Exporter of U.S Materials and Goods

Contributes Significantly to the Economy

- ✓ 153,000+ Jobs
- ✓ \$25.1B in economic value



GENERAL REEVALUATION REPORT SCHEDULE



- Identify study objectives
- Define problems & opportunities
- NEPA scoping
- Inventory & forecast
- Formulate alternative plans
- Evaluate alternatives & identify reasonable array

- Develop the "Future without Project Condition"
- Analyze, evaluate and compare alternatives to identify TSP
- Prepare the Draft Integrated GRR and SEIS
- Vertical team concurrence on tentatively selected plan
- Release Draft Integrated GRR/SEIS report review (Public, Agency, HQ)

- Respond to comments in the SEIS
- Agency consultation activities
- Agency endorsement of recommended plan
- Prepare the Final Integrated GRR and SEIS
- Final integrated report package transmitted to Corps Headquarters

- Headquarters' review of final report
- Final SEIS; Alabama state and Federal agency review
- GRR approval
- Record of Decision signed

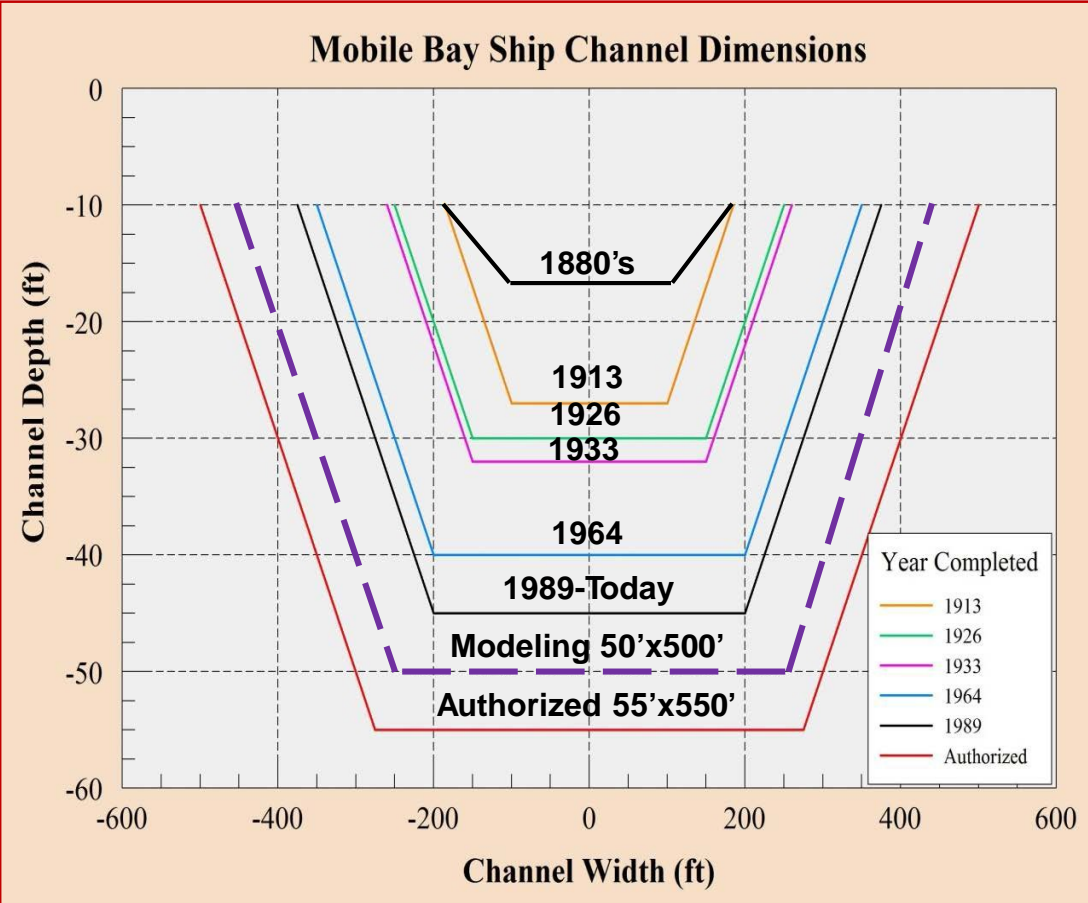
MOBILE HARBOR GENERAL REEVALUATION REPORT



4-year \$7.8M STUDY
Began Nov 2015 Complete Nov 2019

Current Measures Under Consideration

- Deepening: 48' to 50' (50' to 52' at entrance)
- Widener: 100' (3 miles)
- Bend Easing
- Turning Basin Modification



Tentatively Proposed Placement Locations

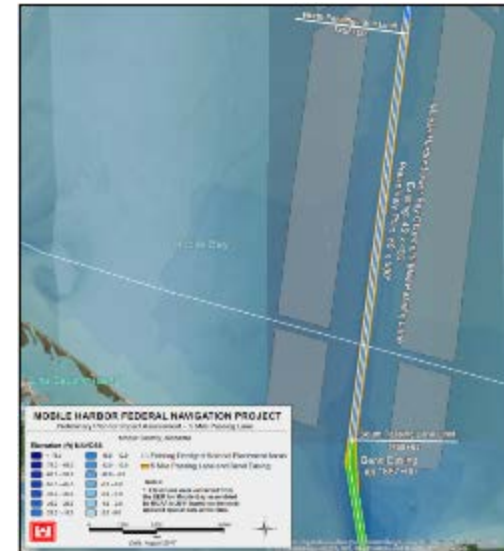
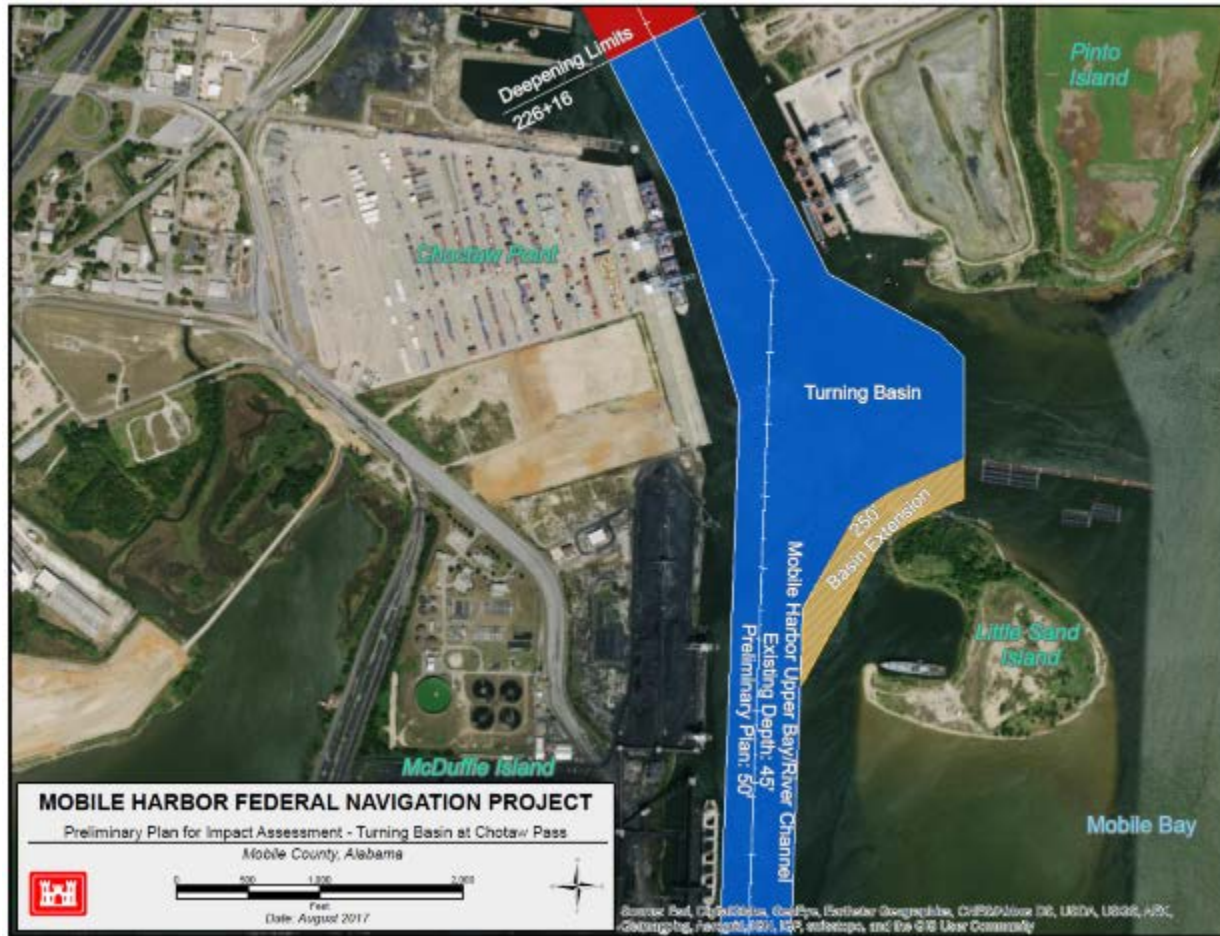
- Formerly mined relic shell area
- Sand Island Beneficial Use Area (SIBUA)
- Pelican/San Island Complex
- Ocean Dredged Material Disposal Area Site (ODMDS)



Release of Draft Supplemental Environmental Impact Statement scheduled for June 2018

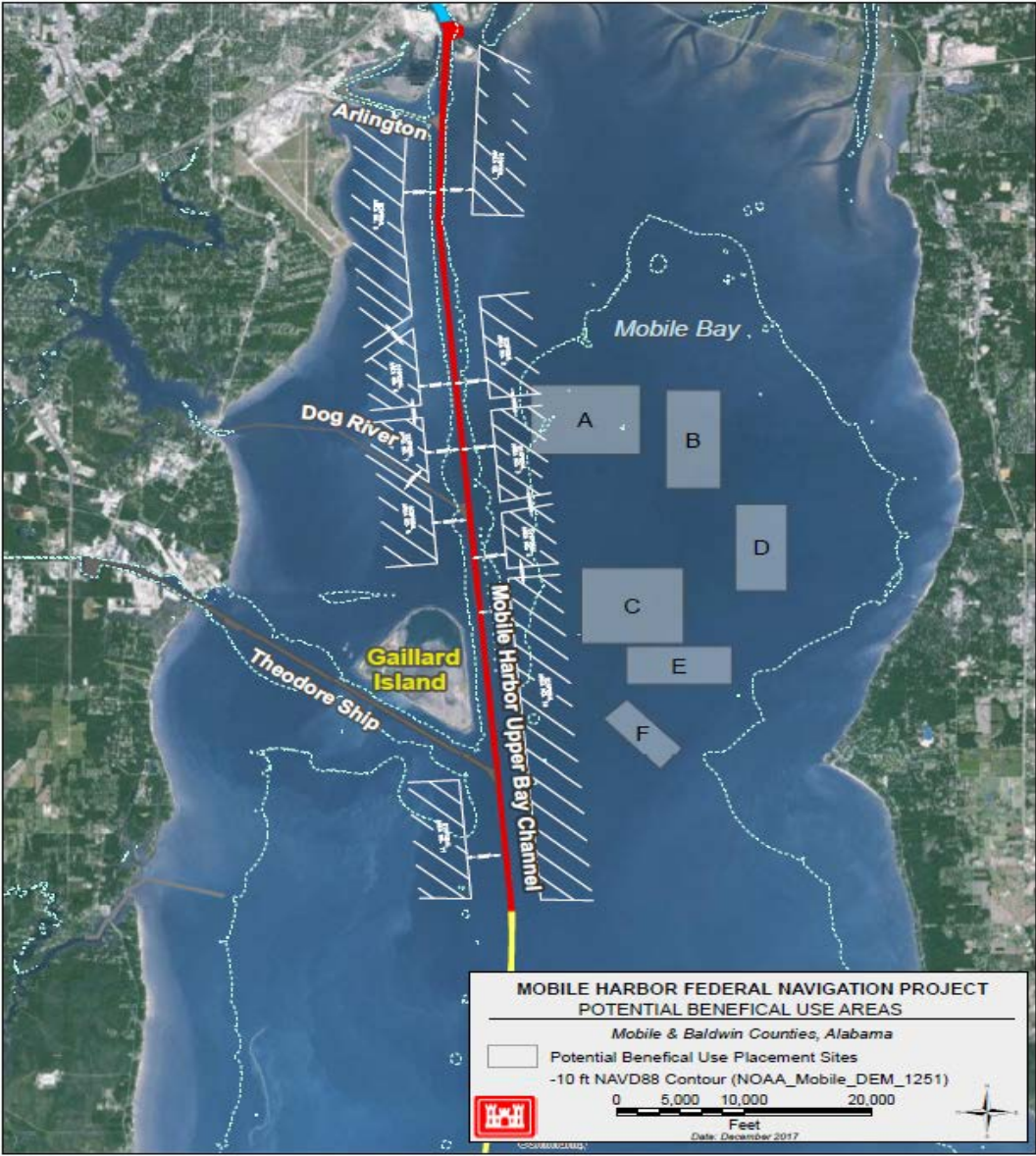


MOBILE HARBOR PROJECT





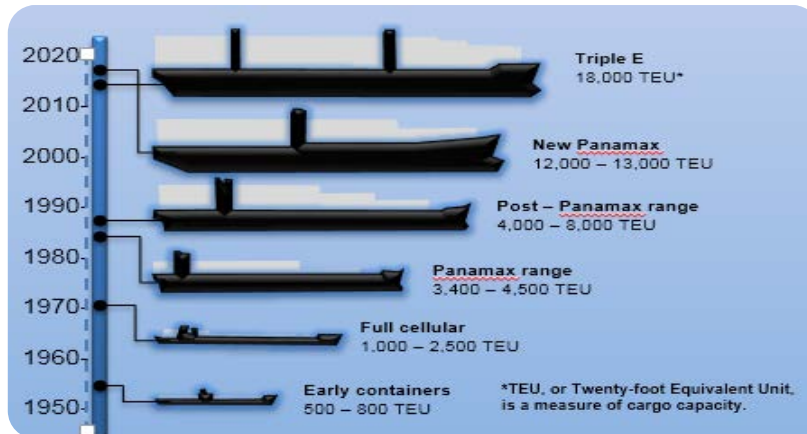
MOBILE HARBOR PROJECT



ECONOMIC CONSIDERATIONS



Mobile Harbor Trade Routes



Evolution of container ships

Post-Panamax ships make up 16% of the world's container fleet today, but carry 45% of the cargo. New Panamax ships are the largest that can pass through the new locks in 2016.

Concepts Behind Mobile Harbor Economic Analysis

- With and without the project, the same volume of cargo is assumed to move through the Port of Mobile
- Growth is assumed only to the capacity of the facilities
- Deeper channels allow vessels to load more efficiently
- Channel widening reduces transit delays/wait times to gain efficiencies
- The project benefits are reduction in transportation costs

Commodity Forecast

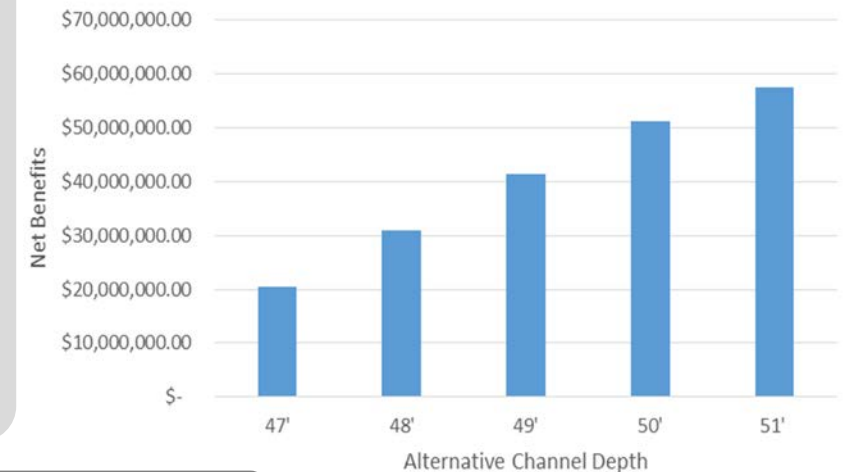
World Fleet Forecast

Major Components of Mobile Harbor Economic Analysis

Mobile Fleet Forecast

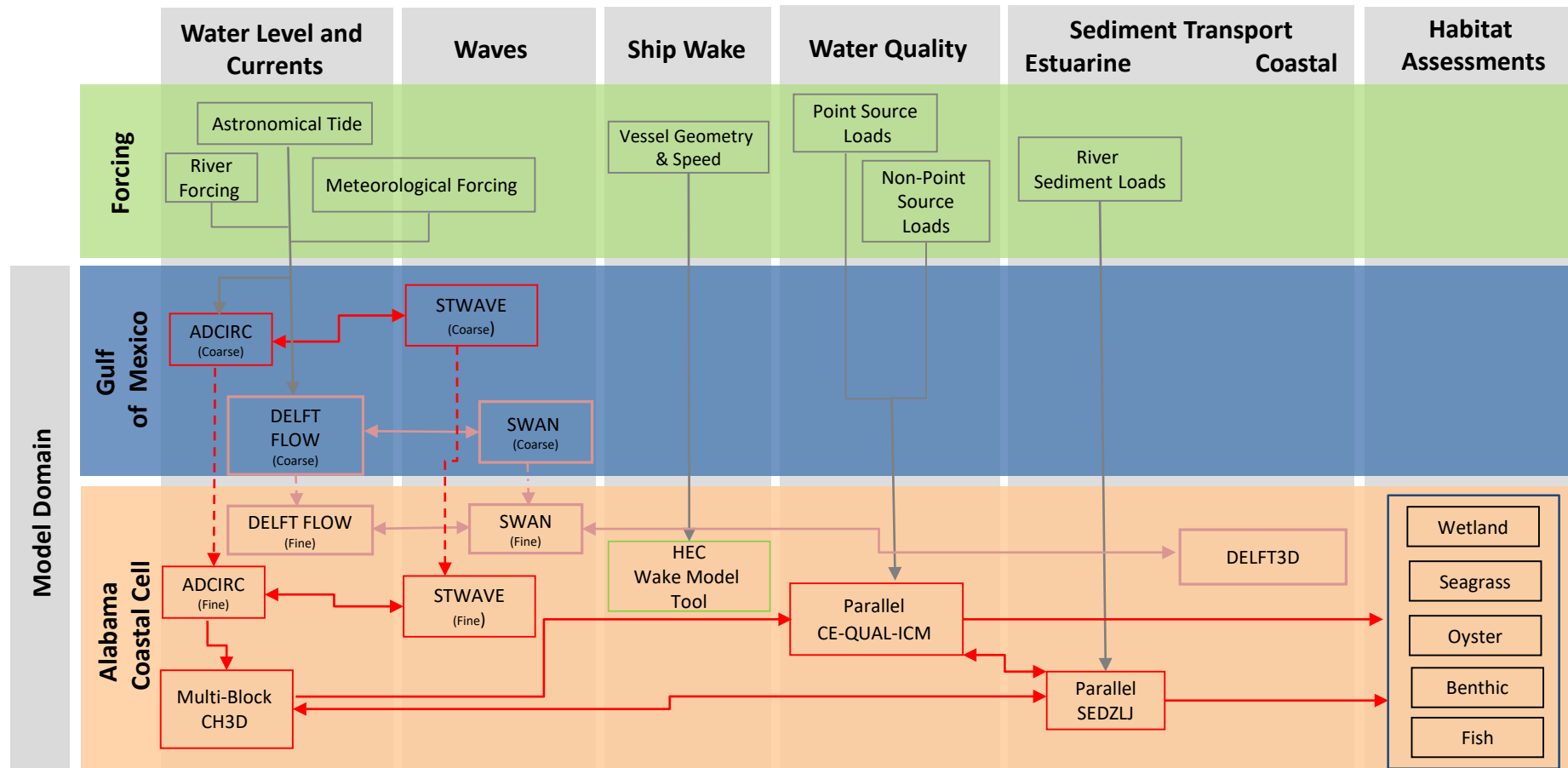
Historic Vessel Calls

Preliminary Deepening Net Benefits



National Economic Development (NED) Plan reasonably maximizes net benefits at 51 foot depth

FLOW DIAGRAM OF ASSESSMENT TOOLS

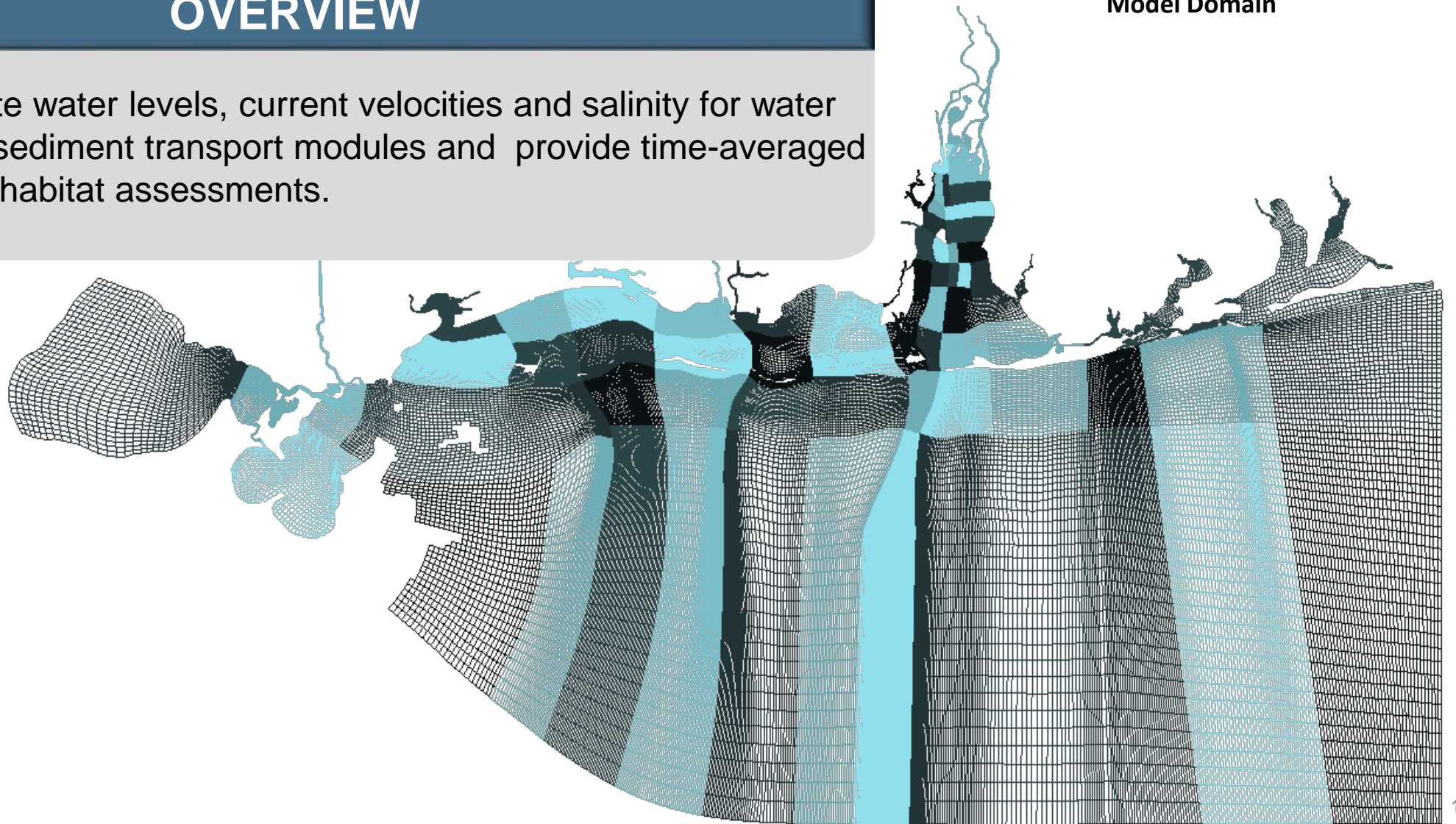


HYDRODYNAMIC MODELING

OVERVIEW

Purpose: Generate water levels, current velocities and salinity for water quality, estuarine sediment transport modules and provide time-averaged salinity to support habitat assessments.

Model Domain



HYDRODYNAMIC MODELING

APPROACH

Model(s): Simulations made using Geophysical Scale Transport Modeling System (GSMB). Components of GSMB include: two-dimensional (2D) deep water wave model WAM, STWAVE nearshore wave model, large scale 2D ADCIRC and regional scale CH3D-MB hydrodynamic modules.

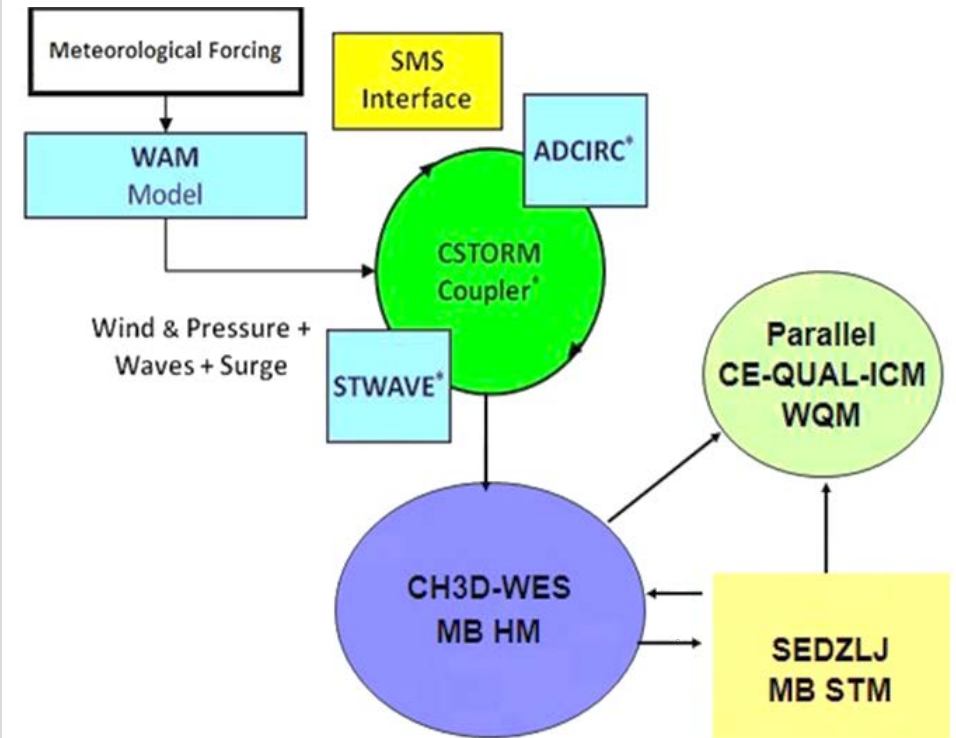
Simulation Time Period: January – December 2010

Simulated Conditions: Existing, with project and 0.5 meter relative rise in sea level.

Forcings: Wind and Atmospheric Pressure, River Flow, ADCIRC Tidal Elevation Boundary, and STWAVE Wave Input

Model Evaluation: Made using 2010 water surface elevations and 2010 and 2016 water quality data.

Geophysical Modeling System Multi-Block

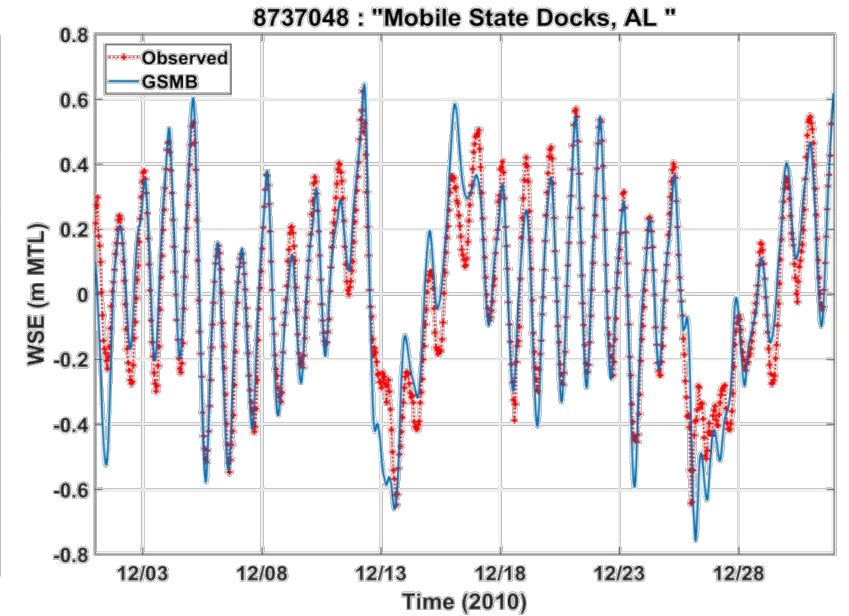
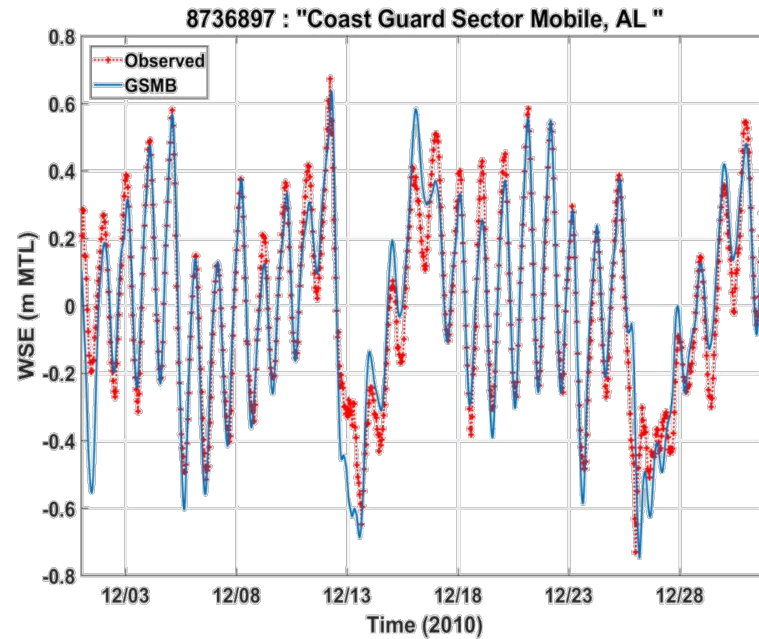
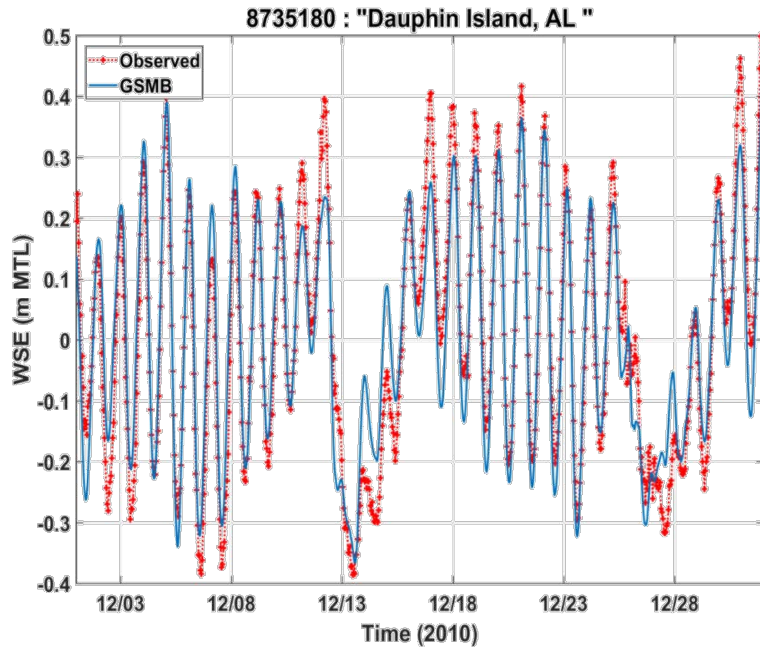


HYDRODYNAMIC MODELING

MODEL PERFORMANCE

Comparison of Water Surface Elevations at NOAA Tide Gages

Water Surface Elevations Observed Versus Modeled



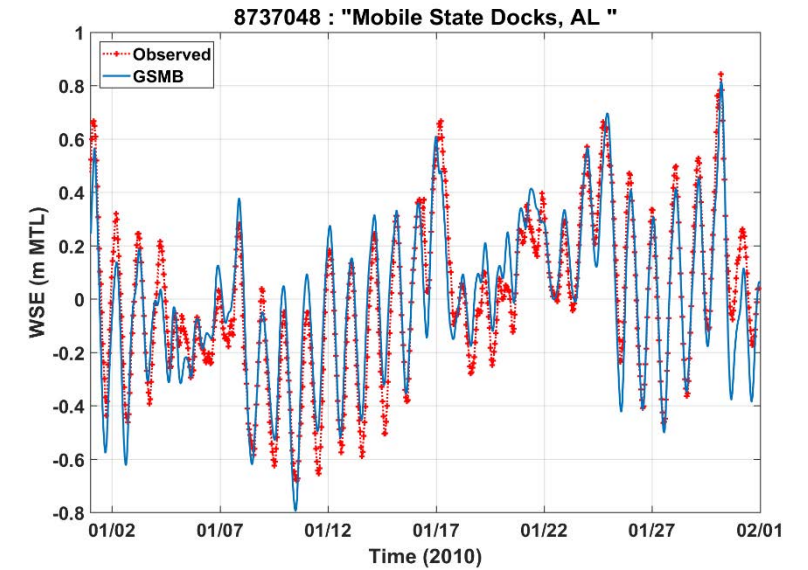
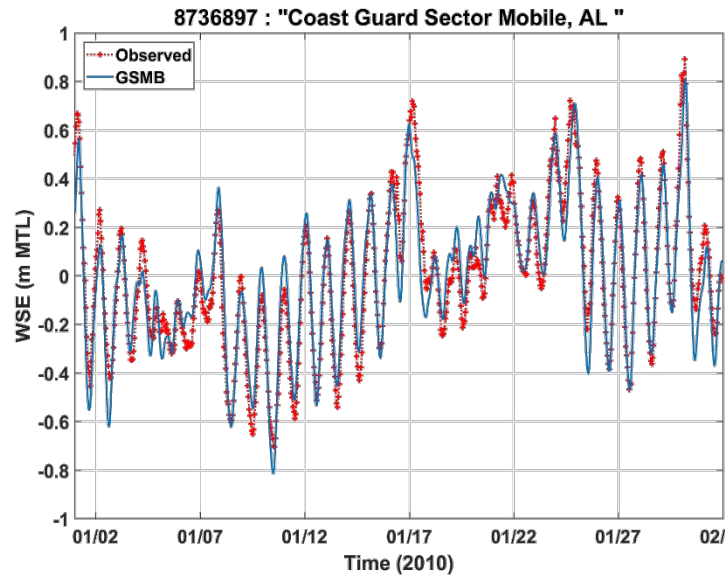
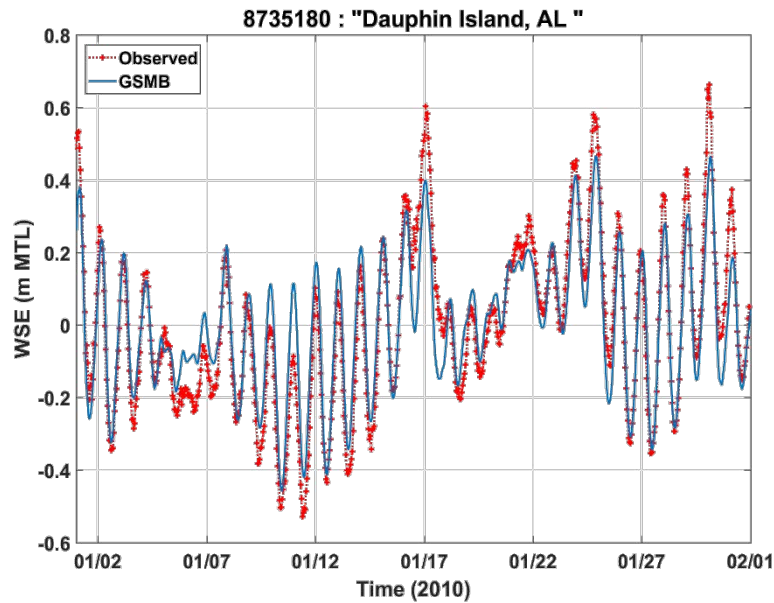
Daily Average Flows Ranged at and Below Normal (less than 25 percentile)

HYDRODYNAMIC MODELING

MODEL PERFORMANCE

Comparison of Water Surface Elevations at NOAA Tide Gages

Water Surface Elevations Observed Versus Modeled



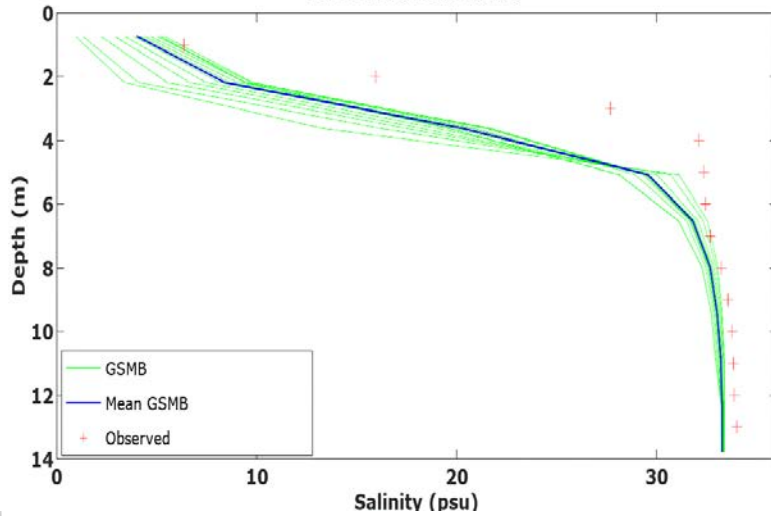
Daily Average Flows Above Normal (greater than 75 percentile)

HYDRODYNAMIC MODELING

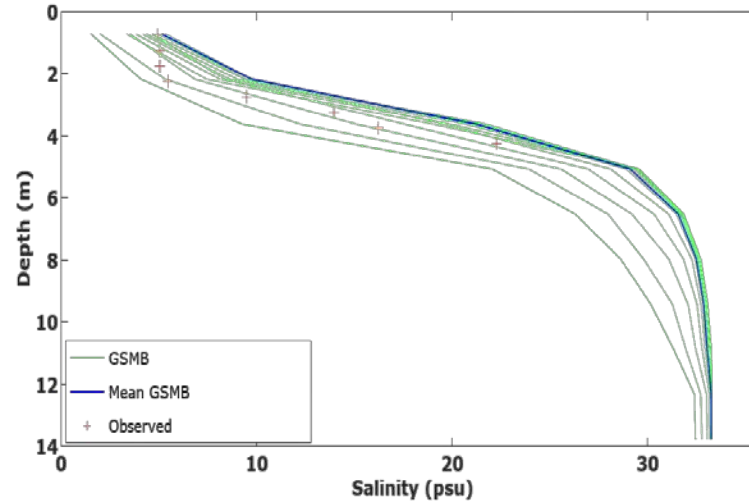
MODEL PERFORMANCE

Comparisons of 2010 NOAA Salinity Measurements in the Bay

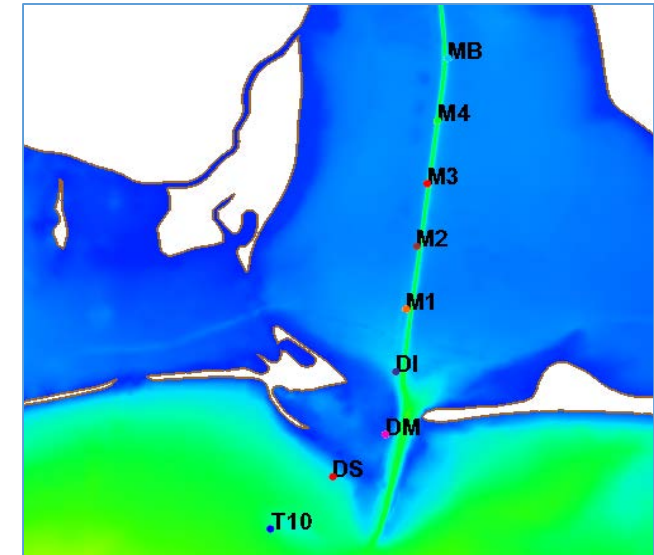
DI March 30 2010



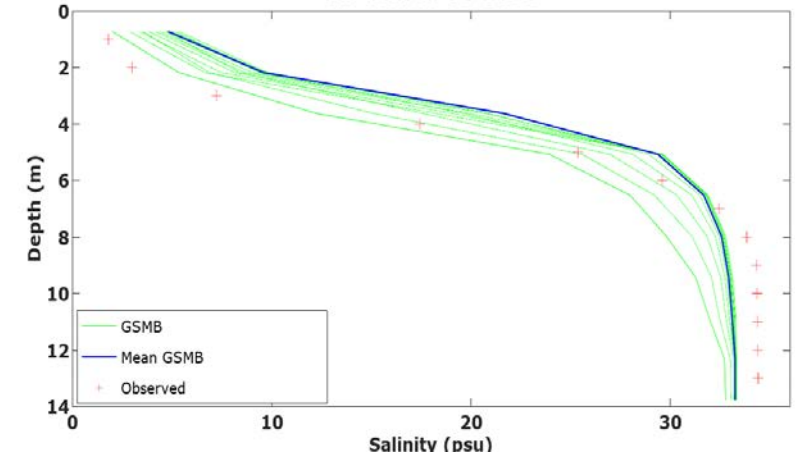
M2 March 30 2010



Observed Versus Modeled Salinity



M4 March 30 2010

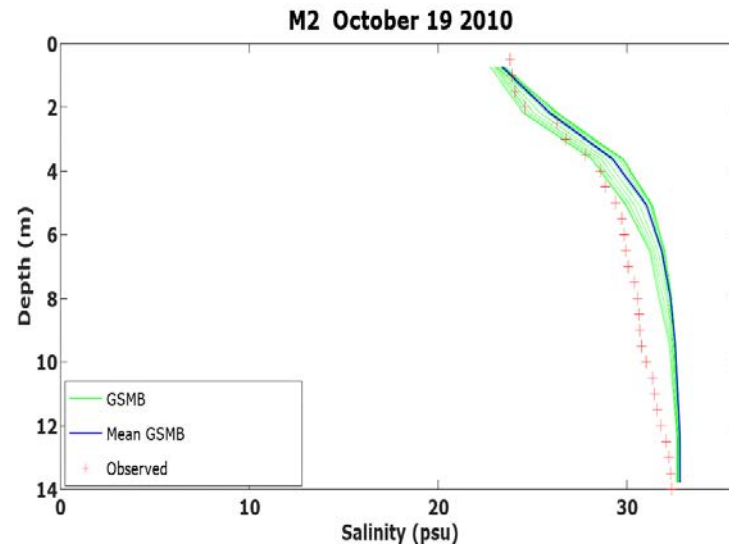
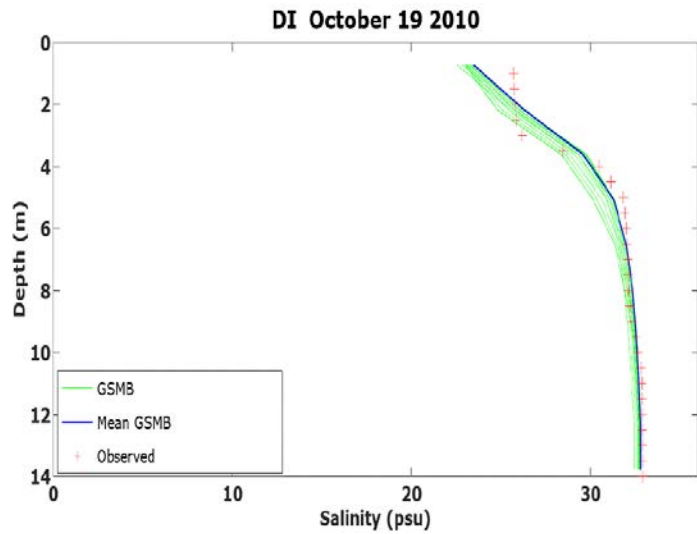


Daily Average Flows Above Normal (Exceeded 75 percentile)

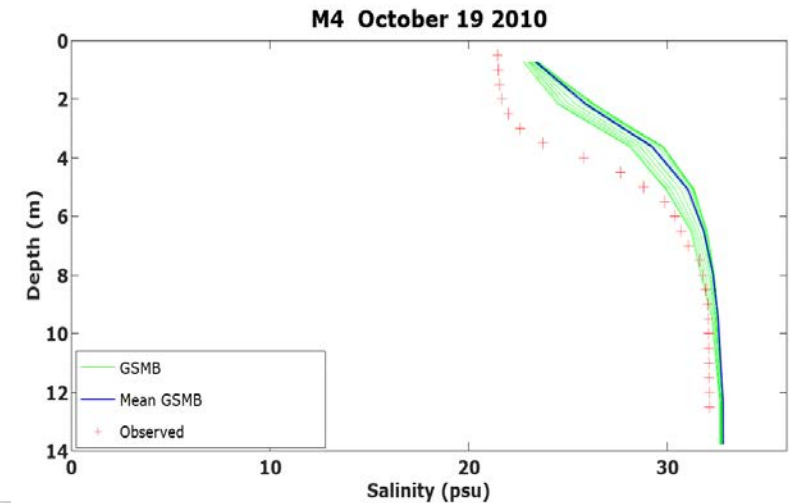
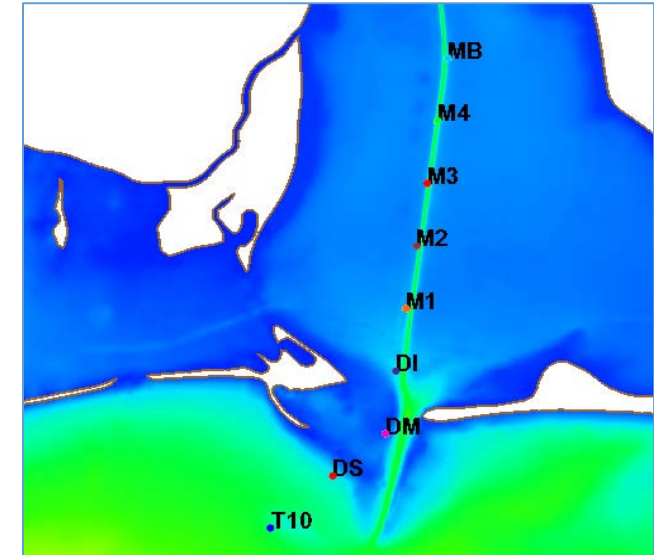
HYDRODYNAMIC MODELING

MODEL PERFORMANCE

Comparisons of 2010 NOAA Salinity Measurements in the Bay



Observed Versus Modeled Salinity



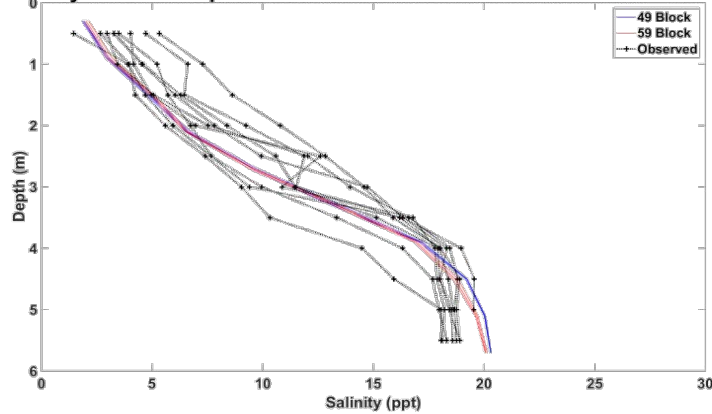
Daily Average Flows Below Normal (less than 25 percentile)

HYDRODYNAMIC MODELING

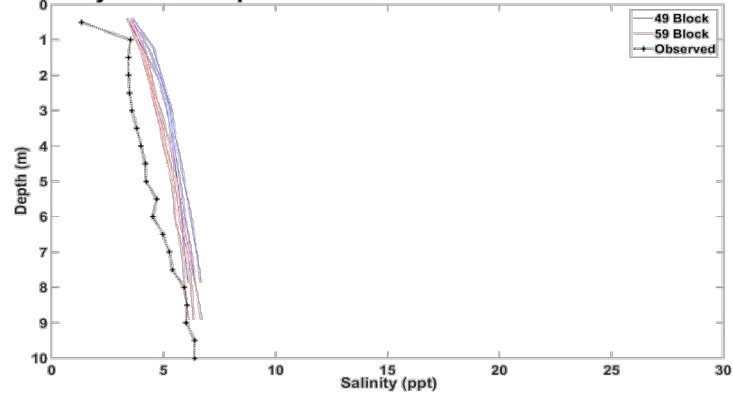
MODEL PERFORMANCE

Comparisons 2016 USACE Salinity Measurements the Delta

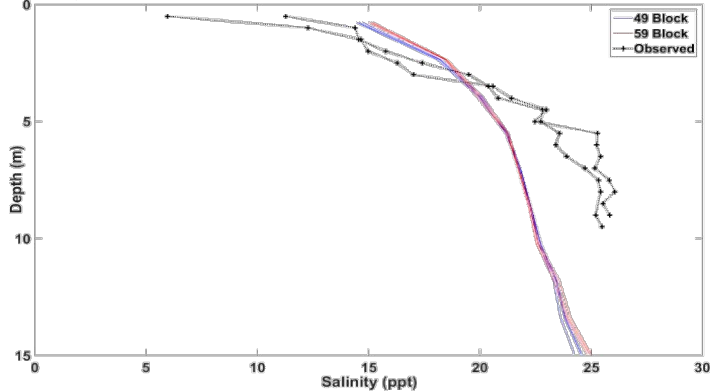
Salinity Profile Comparison of Simulations and Measurements - MR-01



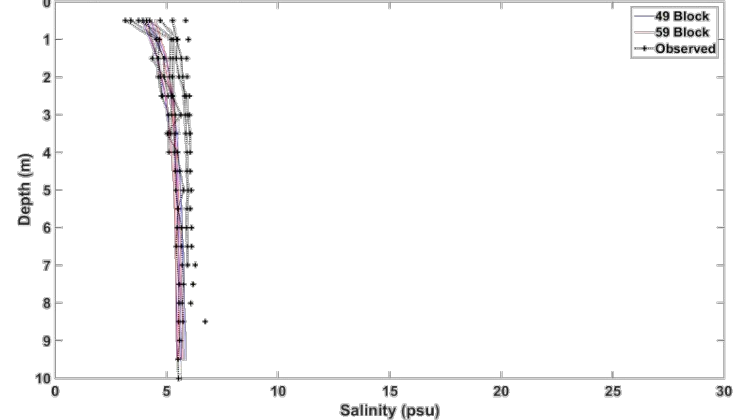
Salinity Profile Comparison of Simulations and Measurements - TR-03



Salinity Profile Comparison of Simulations and Measurements - MR-09



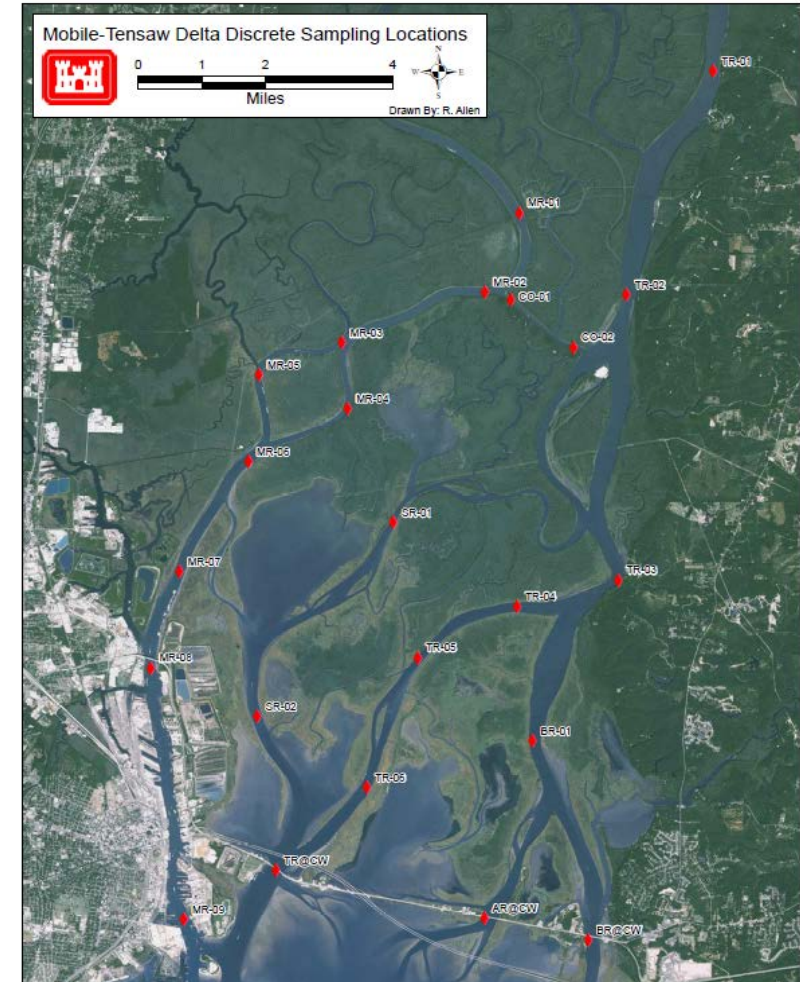
Salinity Profile Comparison Simulations and Measurements - AR@CW



Daily Average Flows Below Normal (less than 25 percentile)



September 2016 Observed Versus Modeled Salinity



HYDRODYNAMIC MODEL POSTPROCESSING



POSTPROCESSING FOR OYSTER MODELING

At 42868 nodes

Hourly surface elevation

At 42868 nodes × 3 levels (surface, mid depth, and bottom)

3-D currents (East-West, North-South, and vertical velocities)

POSTPROCESSING FOR HABITAT ASSESSMENTS

Using 30 blocks out of 59 blocks

For layers

Depth-average

Bottom 3-layers

Surface

Bottom

Top 3-layers

Monthly statistics for salinity

Mean

Maximum

Standard deviation

Minimum

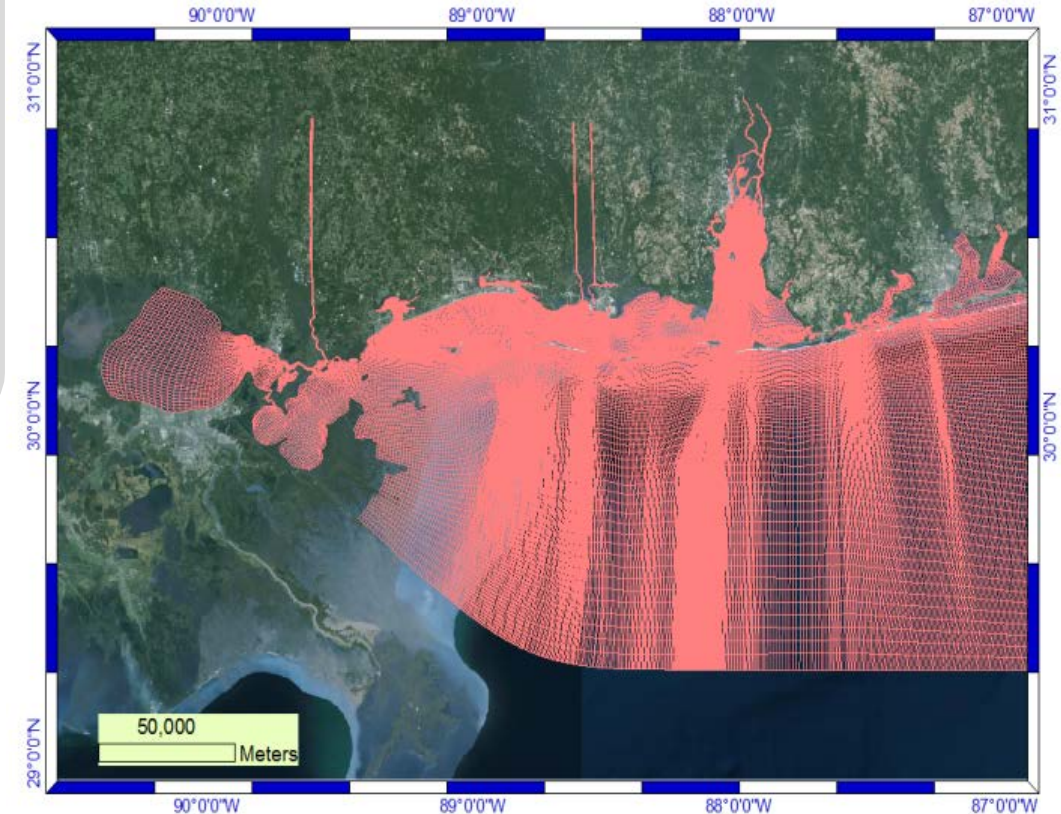
Percentiles – 1, 5, 10, 25, 50 (median), 75, 90, 95, and 99

WATER QUALITY MODELING

OVERVIEW

Purpose: To assess potential changes in water quality including changes in flushing, salinity, dissolved oxygen, temperature, total suspended solids, nutrients and chlorophyll a as a result of channel improvements. Provide water quality constituents (i.e salinity, temperature, dissolved oxygen, total suspended solids ect.) for habitat assessments.

Model Domain



WATER QUALITY MODELING

APPROACH

Model: Simulation made using GSM CE-QUAL-ICM module.

Simulation Period: January – December 2010

Simulated Conditions: Existing, with project and 0.5 meter relative rise in sea level.

Model Forcing and Boundary Conditions: Meteorological data from Mobile Airport, Point Source loads from State records, and boundary conditions from observation and published information

Model Evaluation: Made using 2010 and 2016 water quality data.

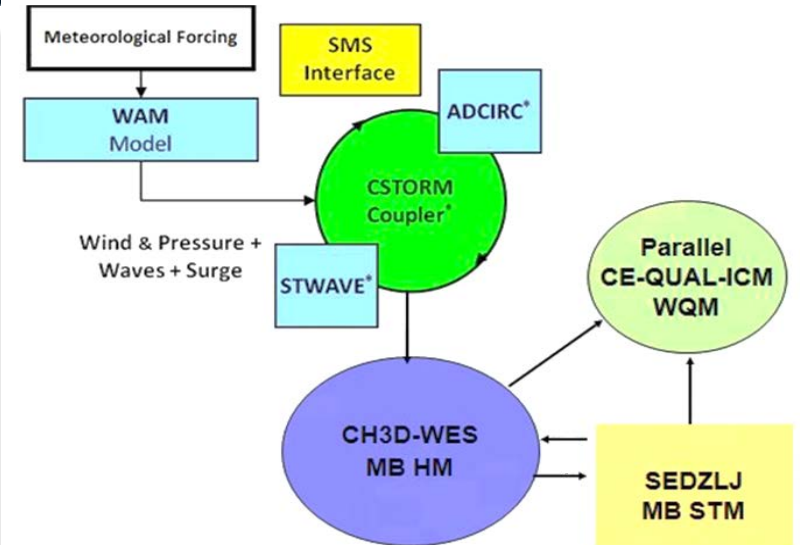
Output: Results output as daily averages for all constituents for locations of interest.

Time series plot:

Surface, mid-depth, and bottom concentrations differences
Differences in Existing and Project or Existing with SLR and Project with SLR

Profile plots of whole water column

Geophysical Modeling System Multi-Block



**PARALLEL VERSION ICM
RUNS & POST-PROCESSES ON HPC
FULL SUITE OR WQ STATE VARIABLES & PROCESSES**

ICM STATE VARIABLES

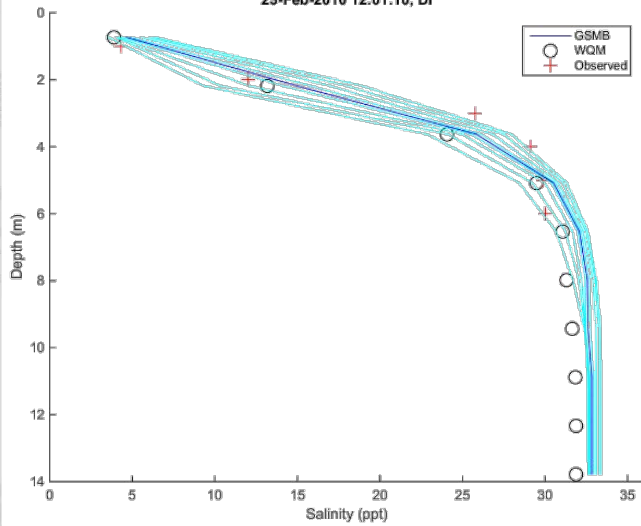
TEMPERATURE	DO	TOTAL PHOSPHATE
AMMONIUM	SALINITY	POP
NITRATE	ALGAE	DISSOLVED SILICA
DON	DOC	SUSPENDED SOLIDS
PON	POC	

WATER QUALITY MODELING

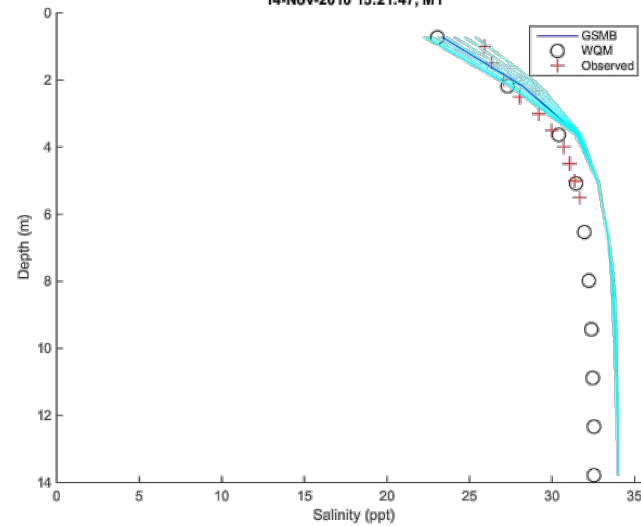
MODEL PERFORMANCE

Comparisons of 2010 NOAA salinity measurements in the bay and USACE 2016 salinity measurements in the delta

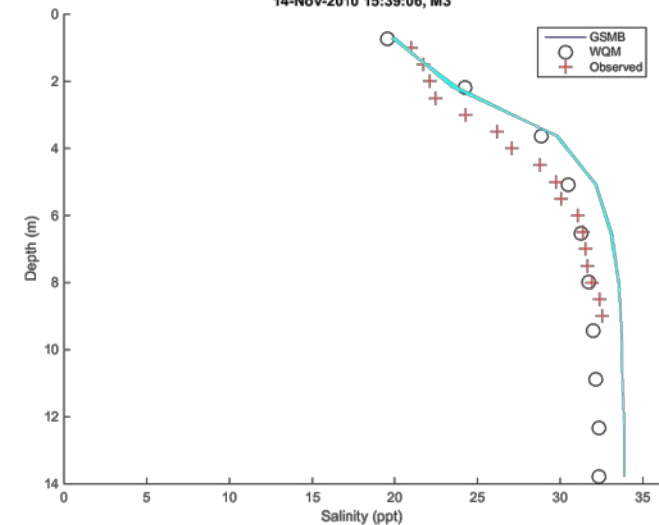
23-Feb-2010 12:01:10, DI



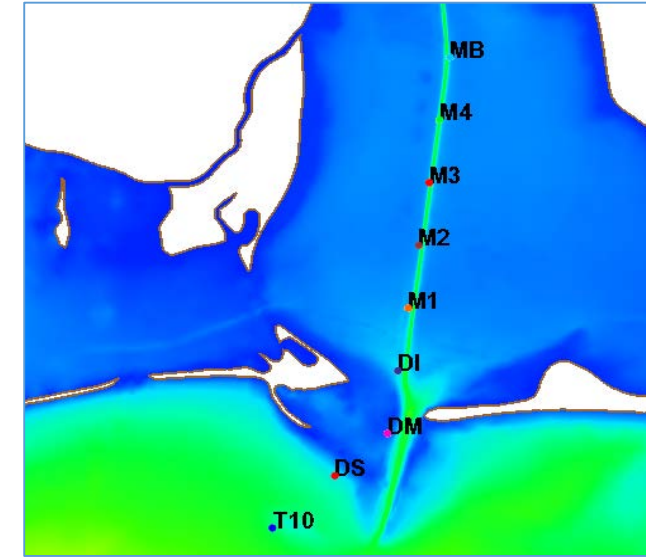
14-Nov-2010 15:21:47, M1



14-Nov-2010 15:39:06, M3



Observed Versus Modeled Salinity

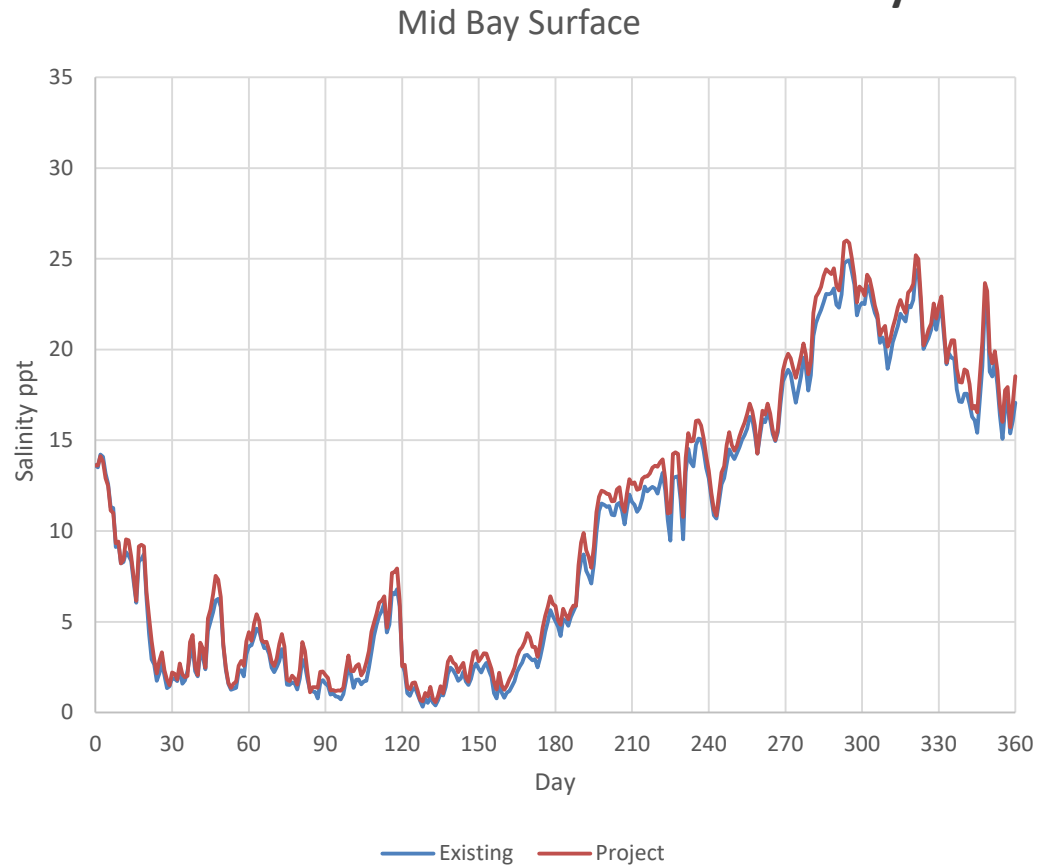


WATER QUALITY MODELING

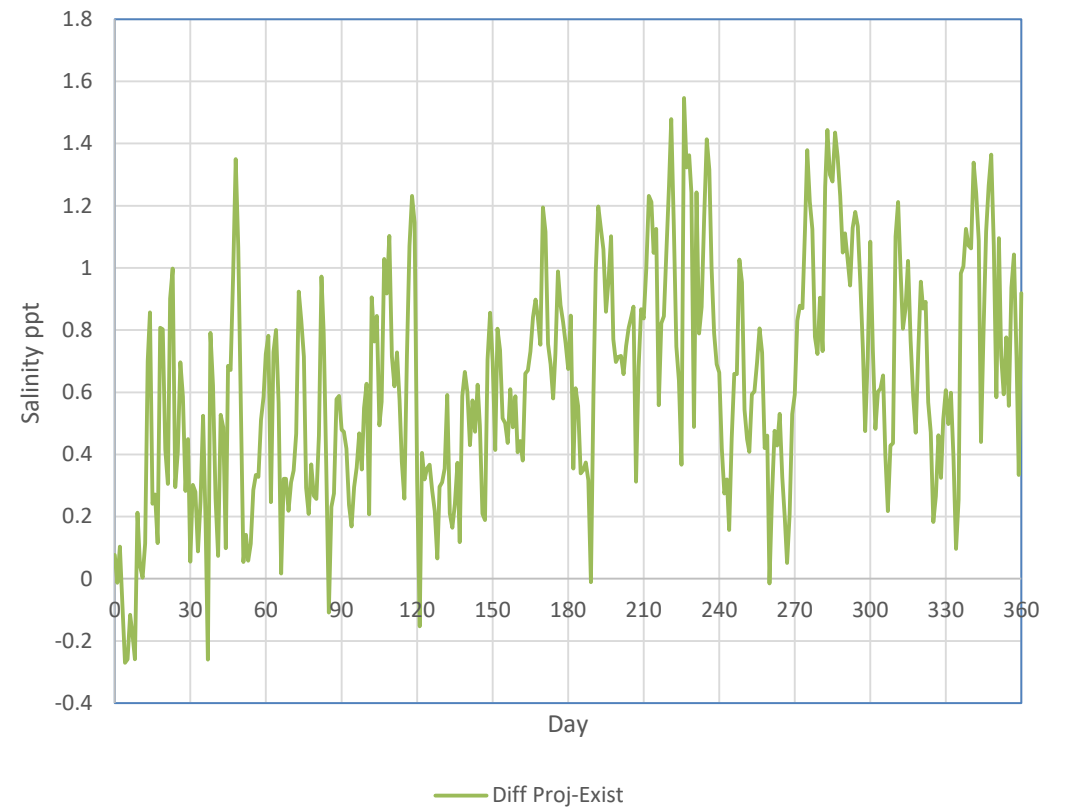
TYPICAL RESULTS

Salinity Time Series and Difference Plots

Mid Bay Station Salinity Surface



Mid Bay Surface Differences

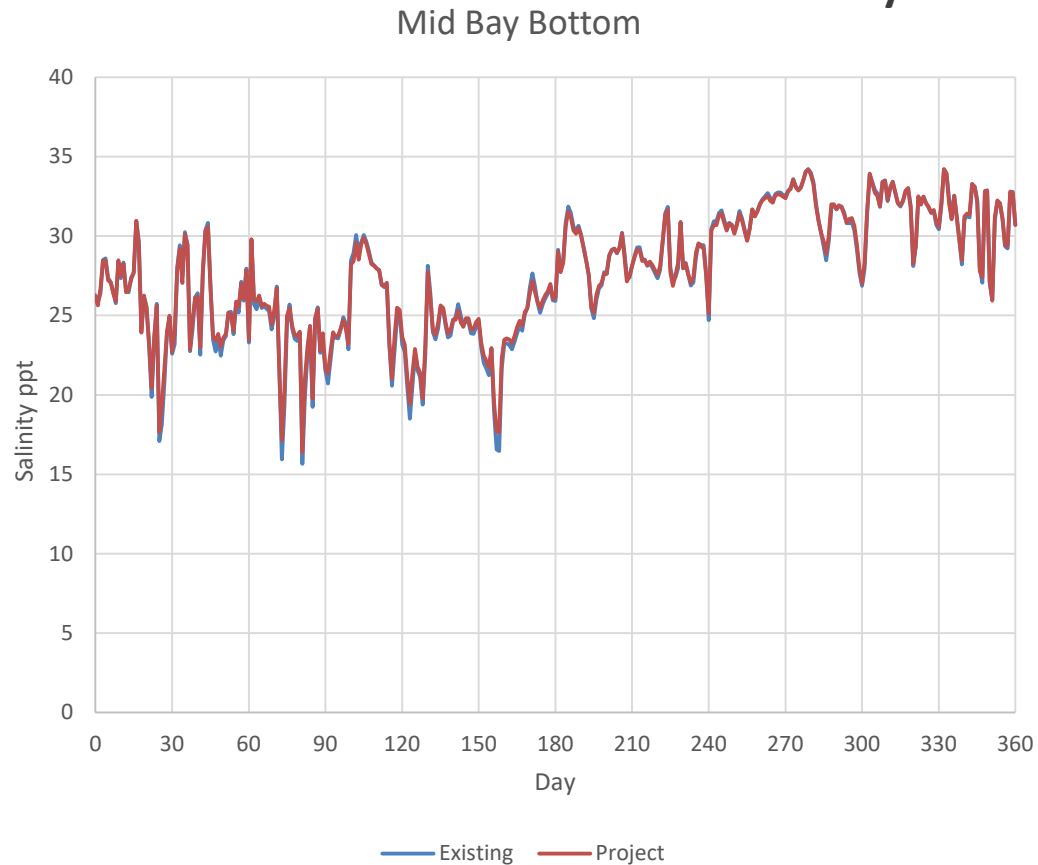


WATER QUALITY MODELING

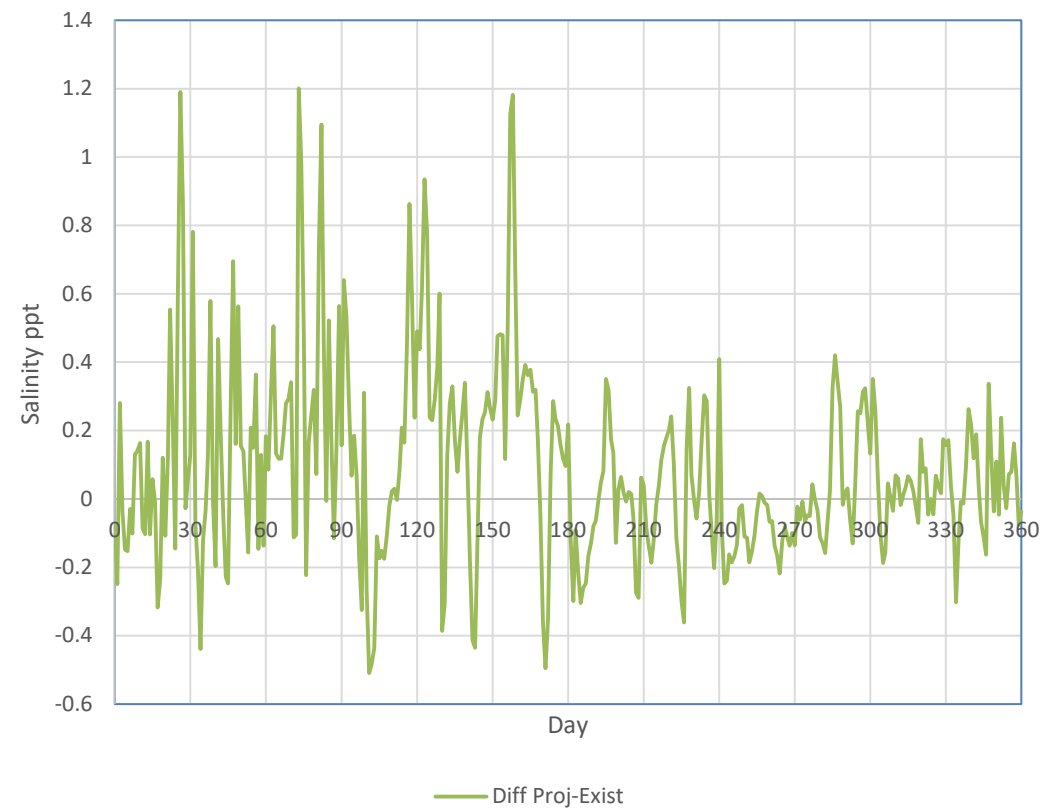
TYPICAL RESULTS

Salinity Time Series and Difference Plots

Mid Bay Station Salinity Bottom



Mid Bay Bottom Differences

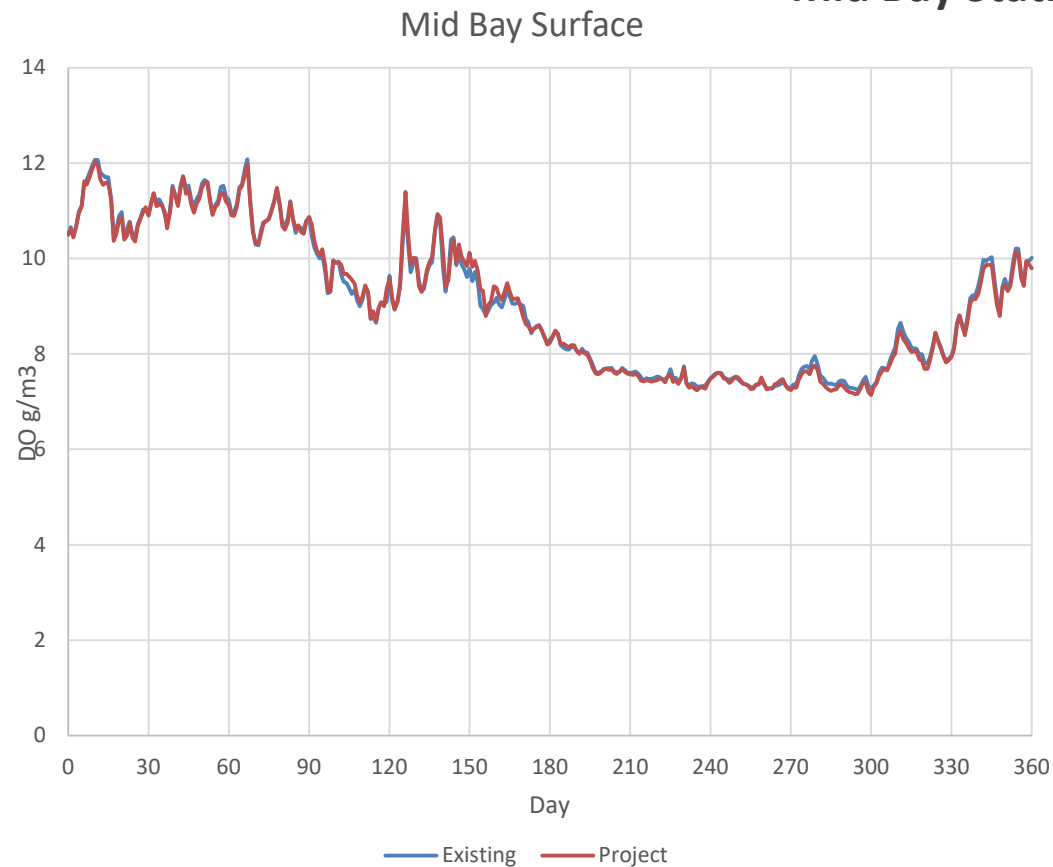


WATER QUALITY MODELING

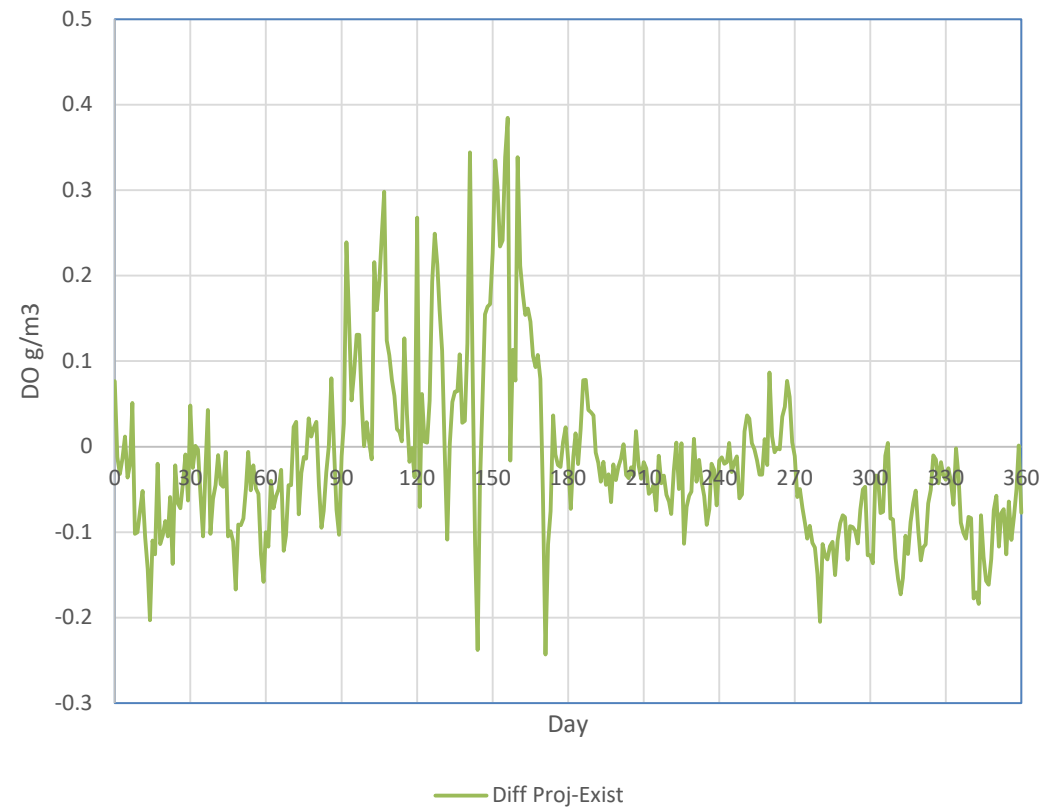
TYPICAL RESULTS

Dissolved Oxygen Time Series and Difference Plots

Mid Bay Station DO Surface



Mid Bay Surface Differences

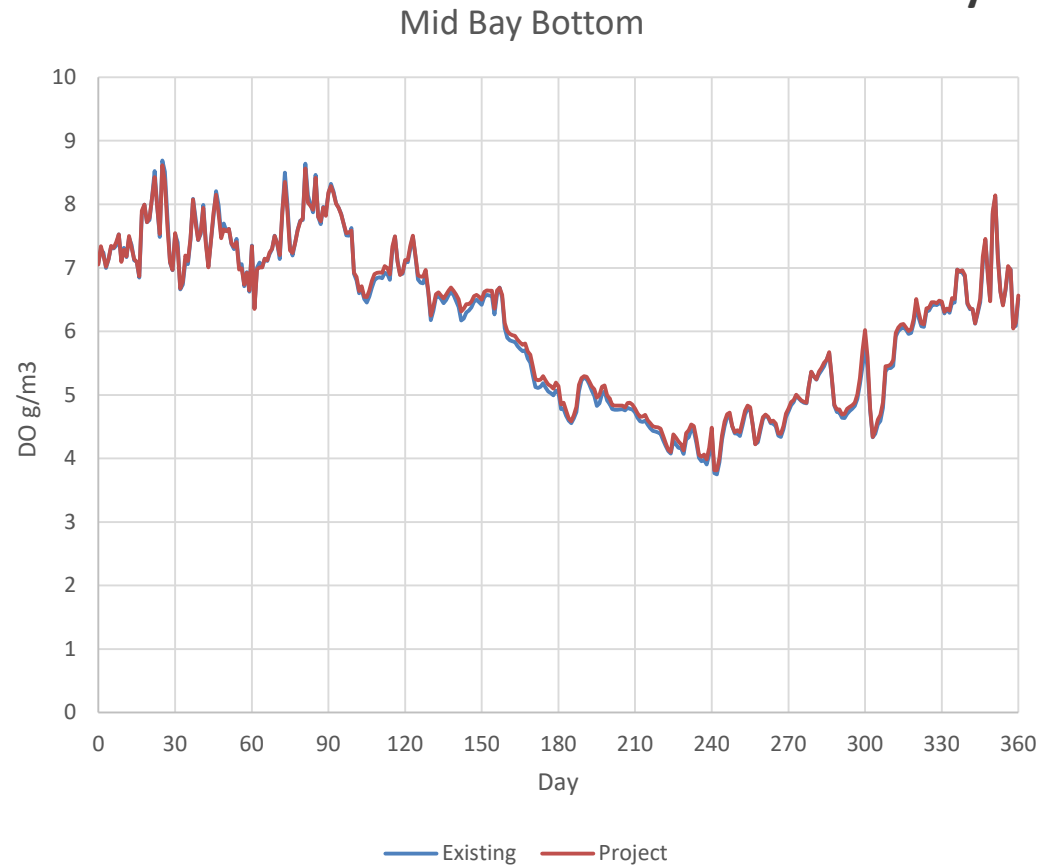


WATER QUALITY MODELING

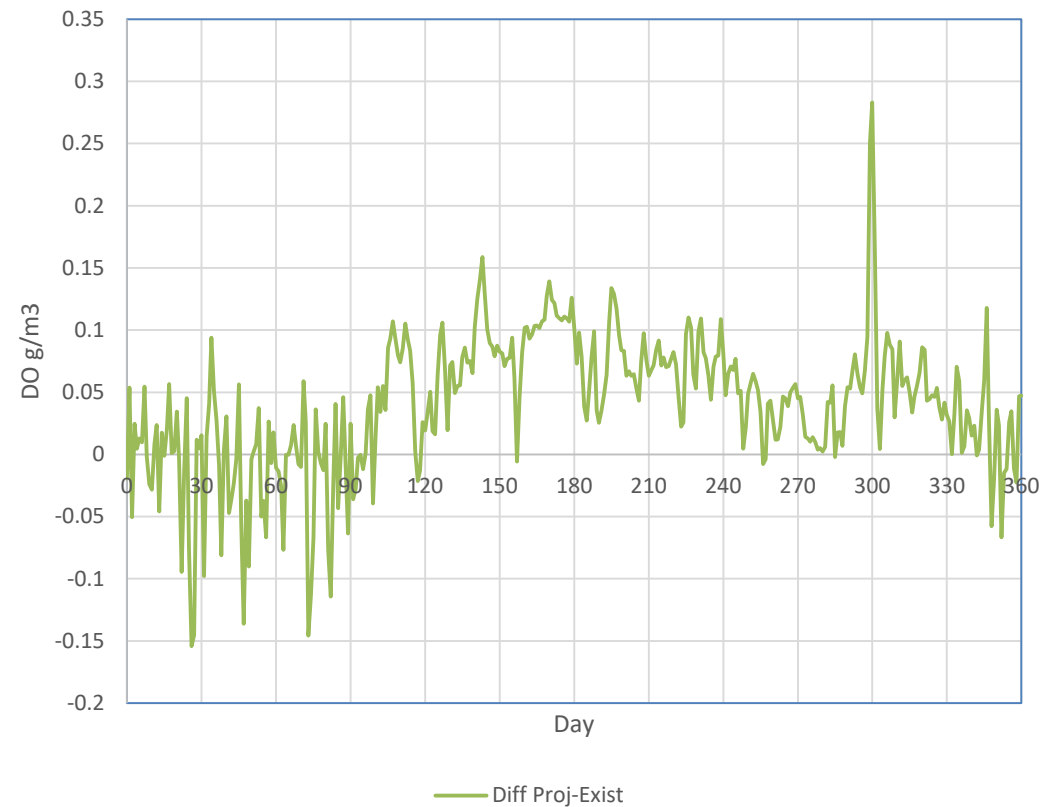
TYPICAL RESULTS

Dissolved Oxygen Time Series and Difference Plots

Mid Bay Station DO Bottom



Mid Bay Bottom Differences



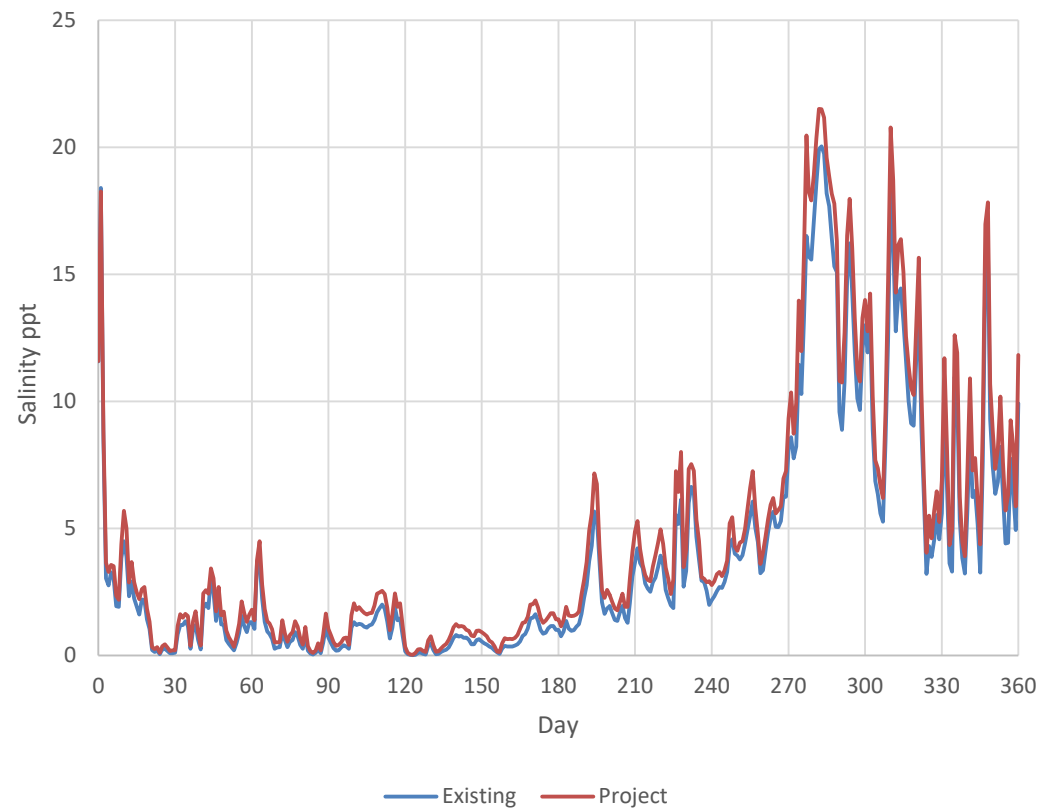
WATER QUALITY MODELING

TYPICAL RESULTS

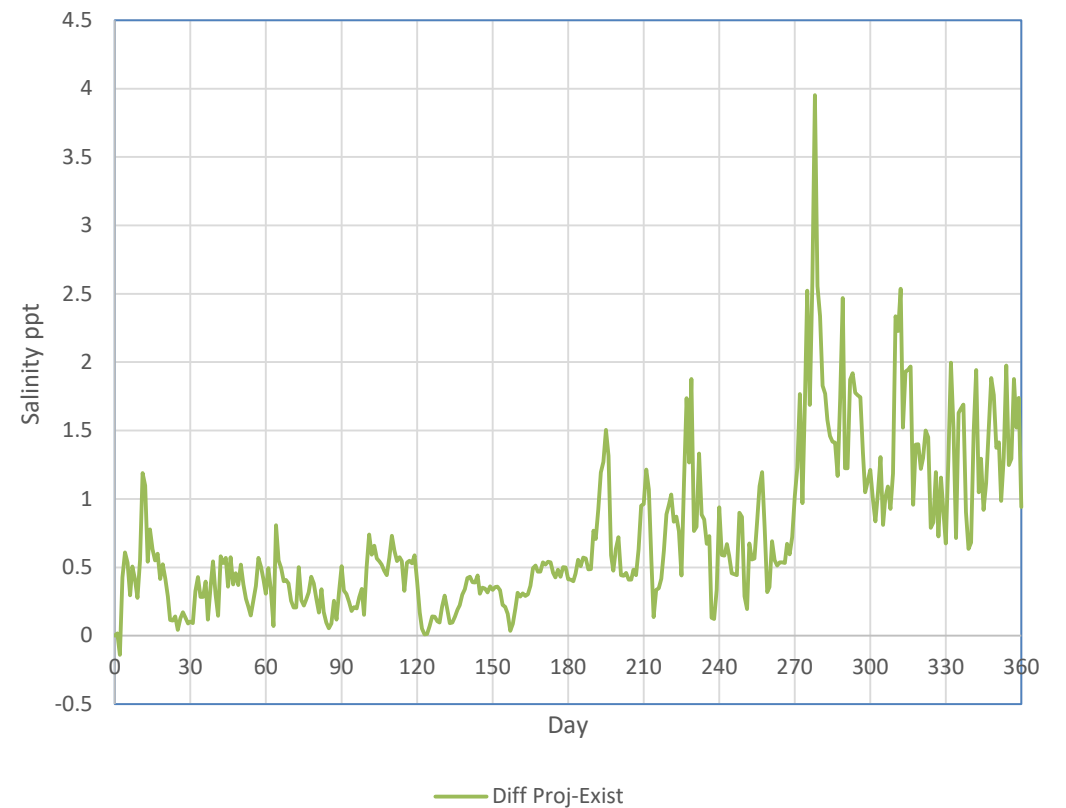
Salinity Time Series and Difference Plots

Channel – 1A Salinity Surface

Channel 1-A Surface



Channel 1-A Surface Differences



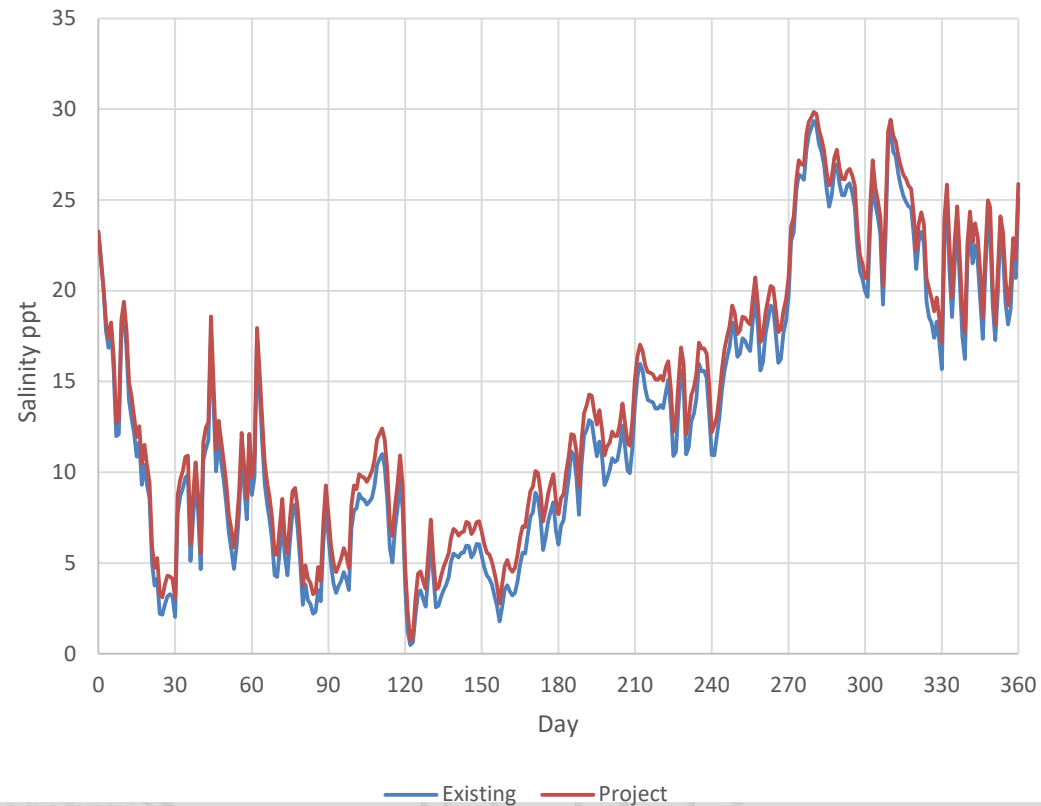
WATER QUALITY MODELING

TYPICAL RESULTS

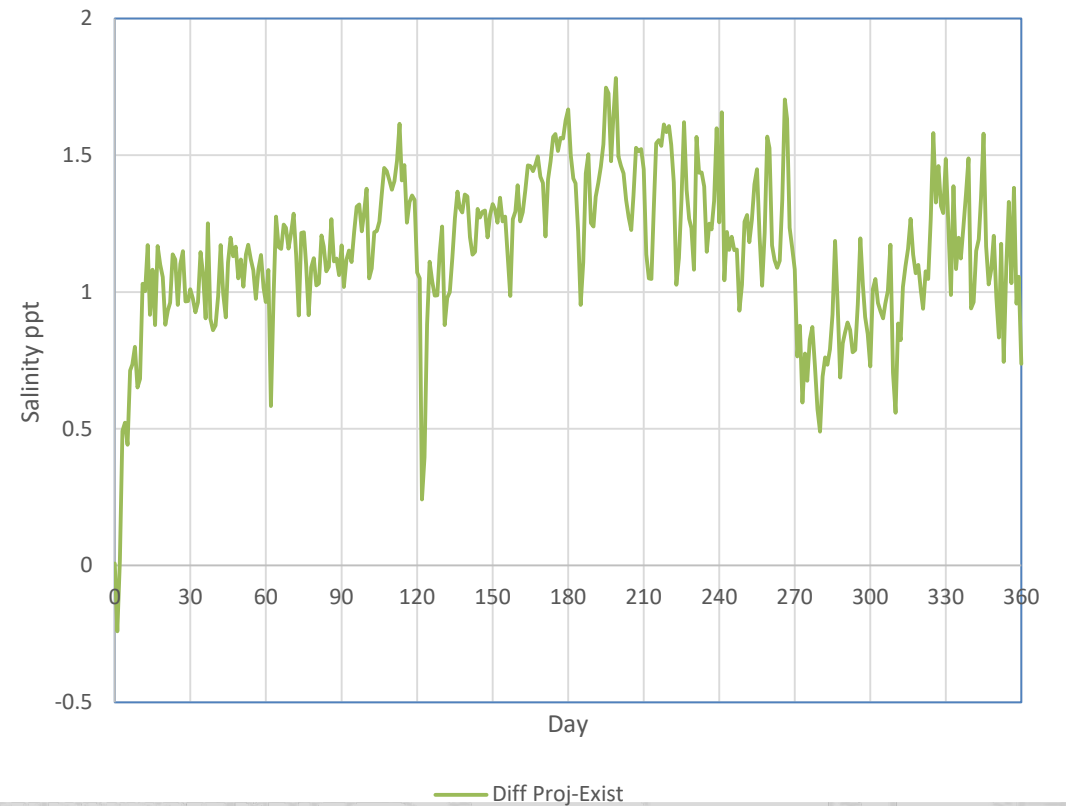
Salinity Time Series and Difference Plots

Channel – 1A Salinity Bottom

Channel 1-A Bottom



Channel 1-A Bottom Differences



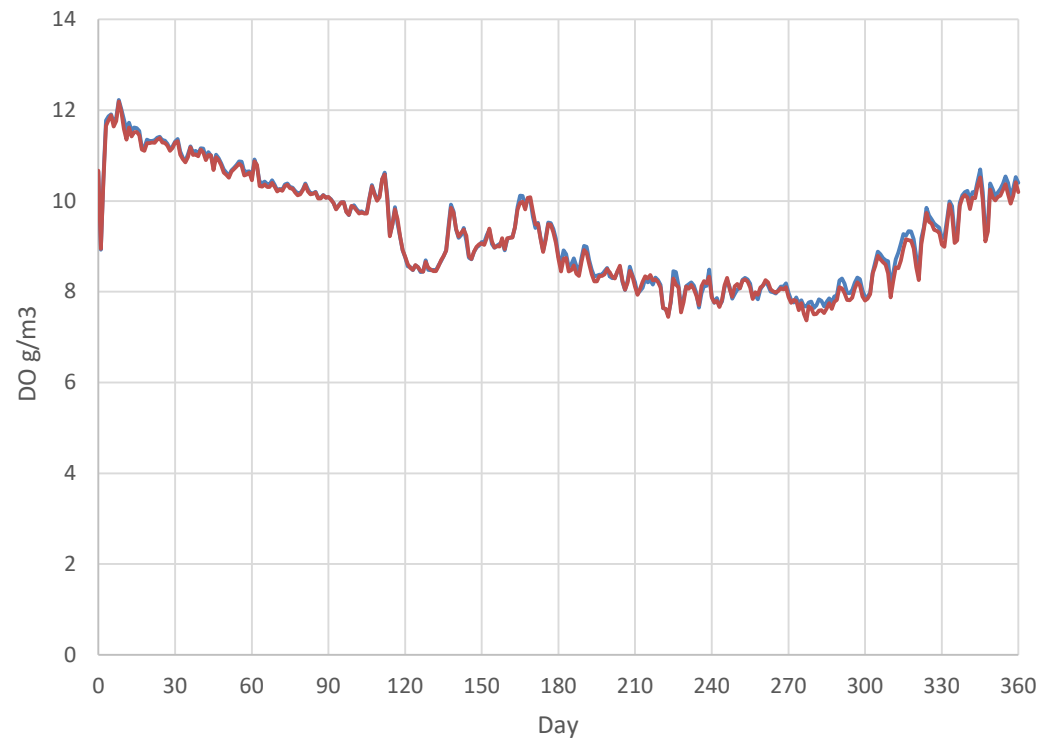
WATER QUALITY MODELING

TYPICAL RESULTS

Dissolved Oxygen Time Series and Difference Plots

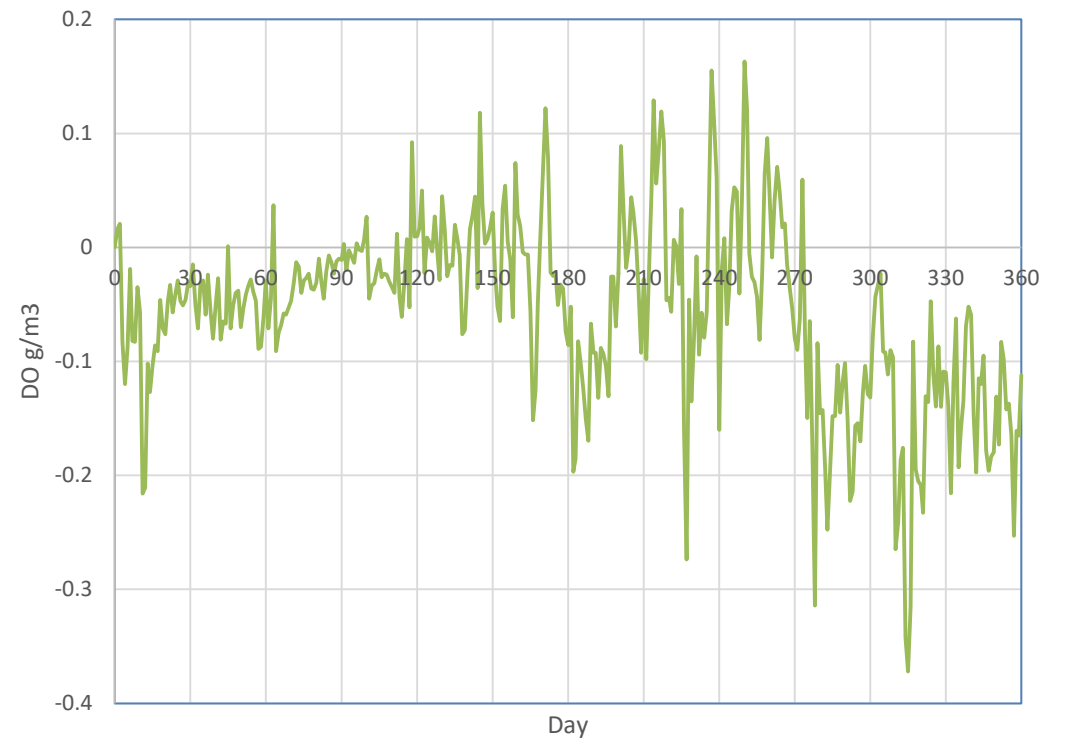
Channel – 1A Surface DO

Channel 1-A Surface



— Existing — Project

Channel 1-A Surface Differences



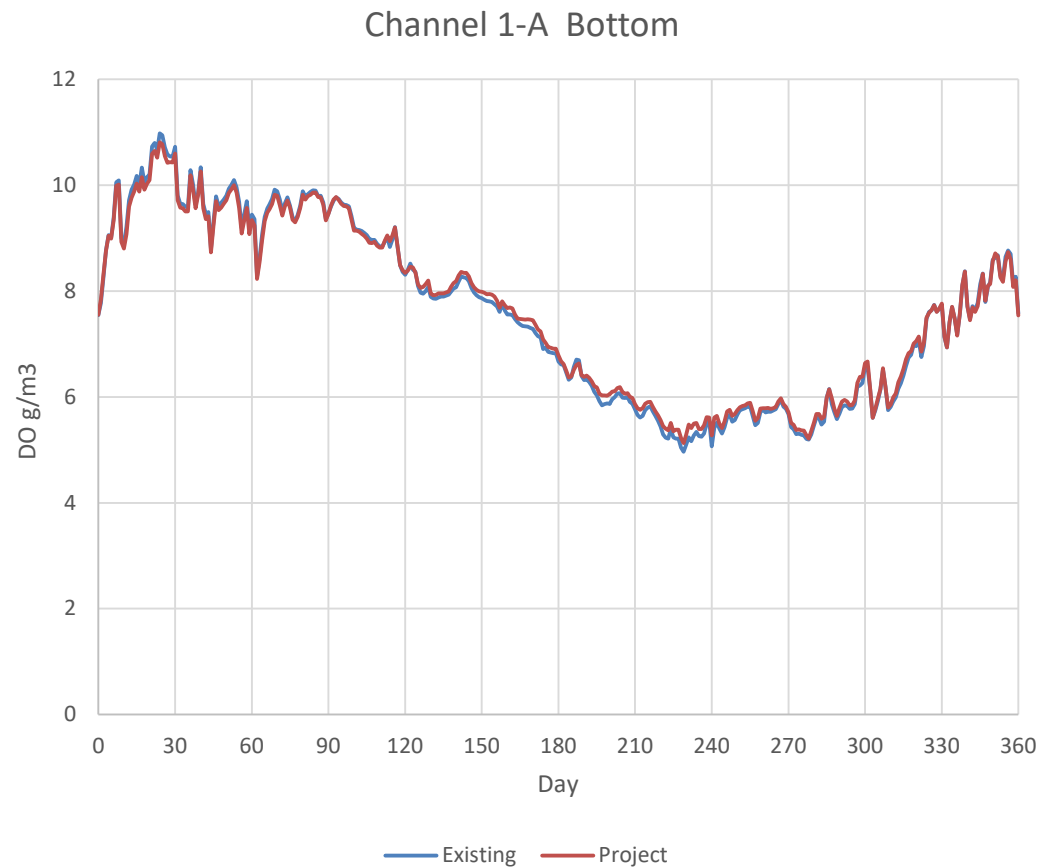
— Diff Proj-Exist

WATER QUALITY MODELING

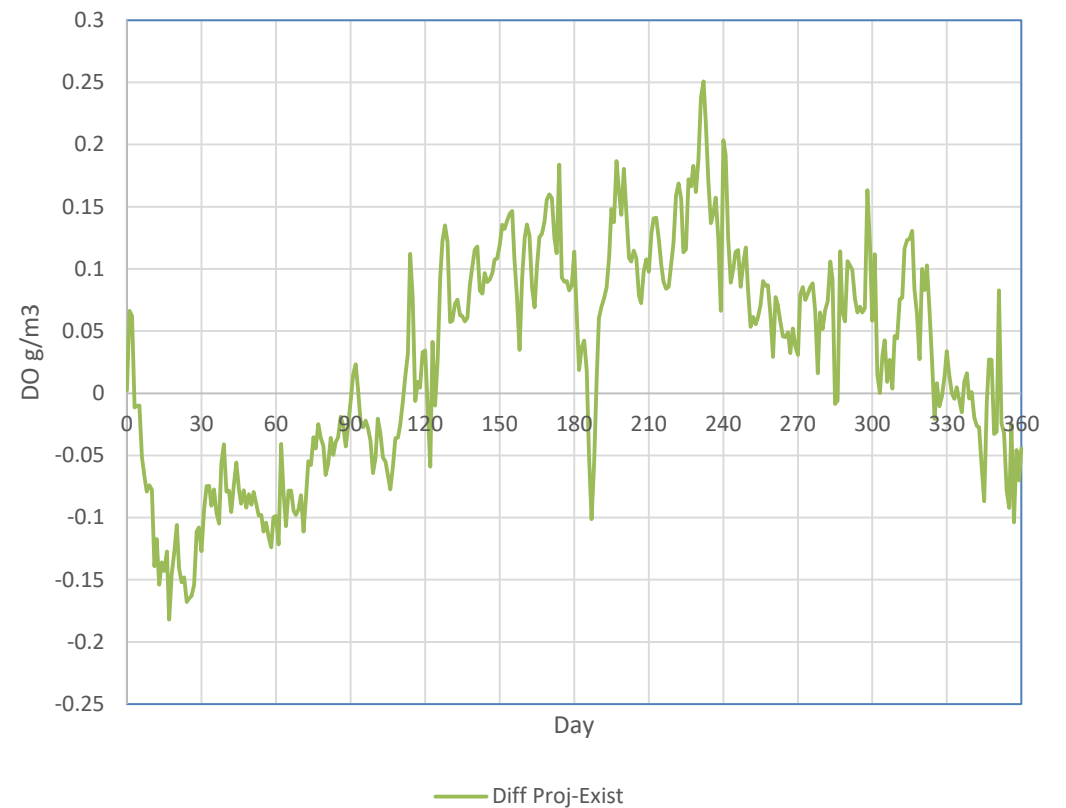
TYPICAL RESULTS

Dissolved Oxygen Time Series and Difference Plots

Channel -1A Bottom DO



Channel 1-A Bottom Differences



WATER QUALITY MODELING



RESULTS SUMMARY

Existing and project conditions are set up identically EXCEPT for hydrodynamic information. Any differences predicted between **Existing** and **Project** water quality conditions are the result of **changes** in **hydrodynamic conditions** in the two cases.

When **no differences** are indicated between existing and project conditions then it is reasonable to believe that there is **no project impact** upon water quality.

Existing and Project simulations with Sea Level Rise show similar behavior: Little to no difference in salinity and water quality conditions.

This agreement in existing and project conditions occur during the duration of the year long simulation.

Therefore it is reasonable to expect that the project water quality will be similar to the existing conditions.

HYDRODYNAMIC MODEL POSTPROCESSING



POSTPROCESSING FOR OYSTER MODELING

At 42868 nodes × 3 levels (surface, mid depth, and bottom)
Daily Salinity, temperature, and dissolved oxygen

POSTPROCESSING FOR HABITAT ASSESSMENTS

Using 413020 cells out of 826830 cells

For layers

Depth-average	Bottom 3-layers
Surface	Bottom
Top 3-layers	

Monthly statistics for dissolved oxygen

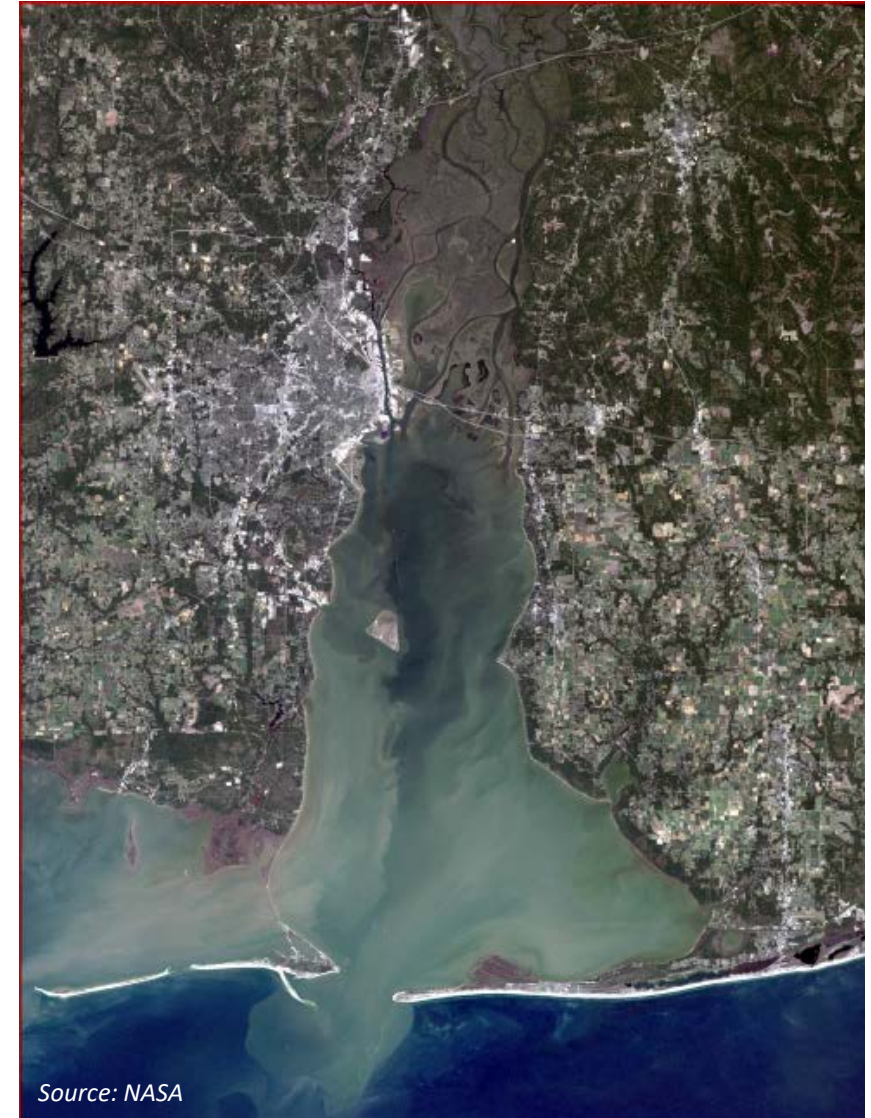
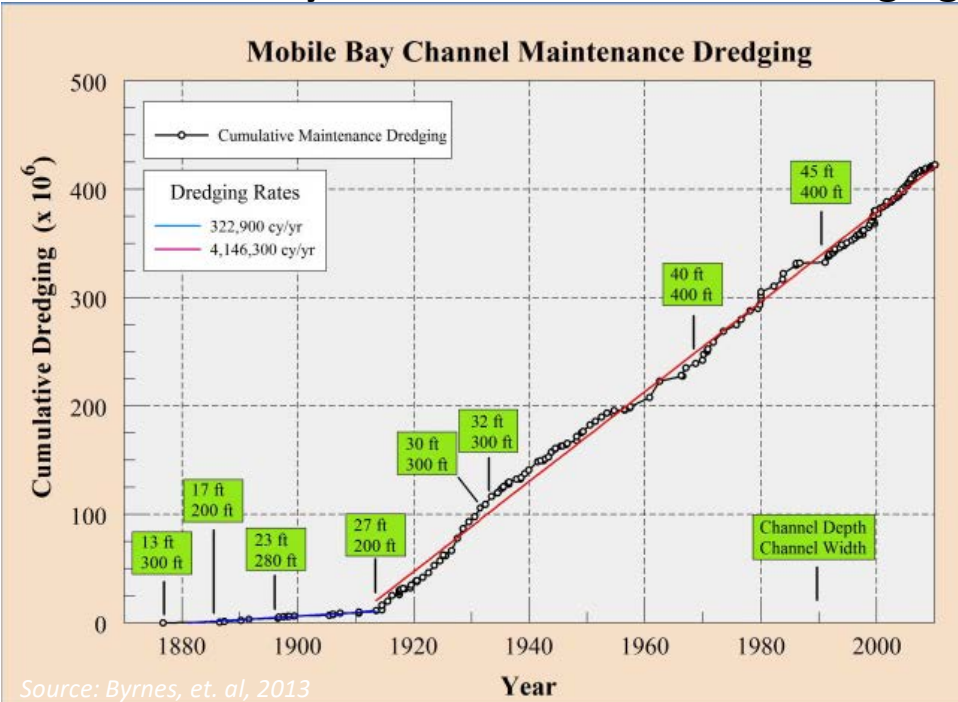
Mean	Minimum
Standard deviation	Maximum
Percentiles – 1, 5, 10, 25, 50 (median), 75, 90, 95, and 99	

ESTUARINE SEDIMENT TRANSPORT MODELING

OVERVIEW

Purpose: To assess relative changes in sedimentation rates within the channel, dredged material placement and surrounding areas as a result of channel improvements within the bay.

Cumulative Bay Channel Maintenance Dredging



ESTUARINE SEDIMENT TRANSPORT MODELING

APPROACH

Model: Simulations made using GSM SEDZLJ MB STM module.

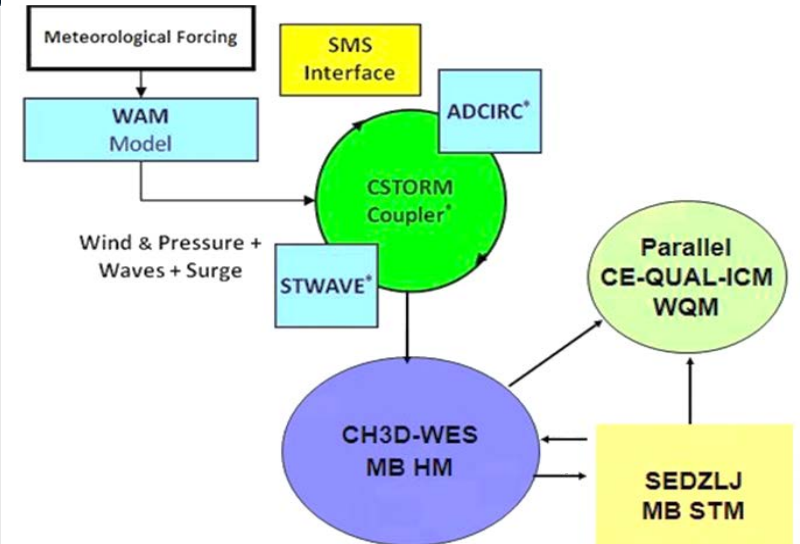
Simulation Period: January – December 2010

Simulated Conditions: Existing, with project and 0.5 meter relative rise in sea level.

Forcing: Wind and Atmospheric Pressure, River Flow, ADCIRC Tidal Elevation Boundary, and STWAVE Wave Input

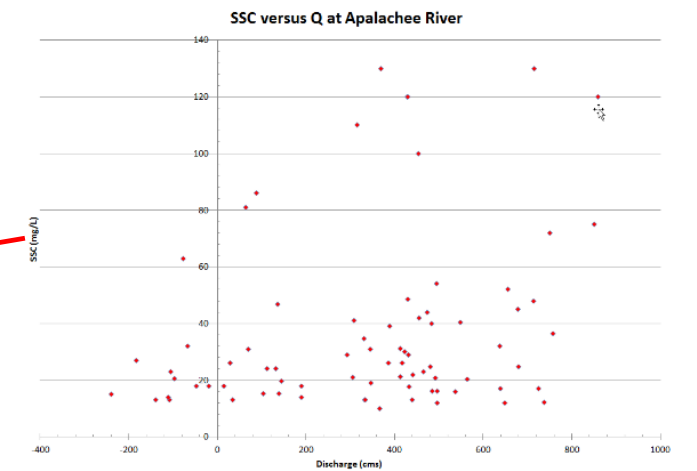
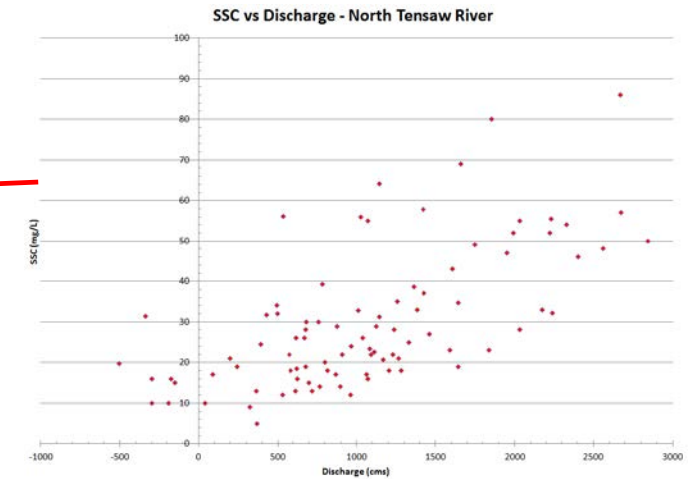
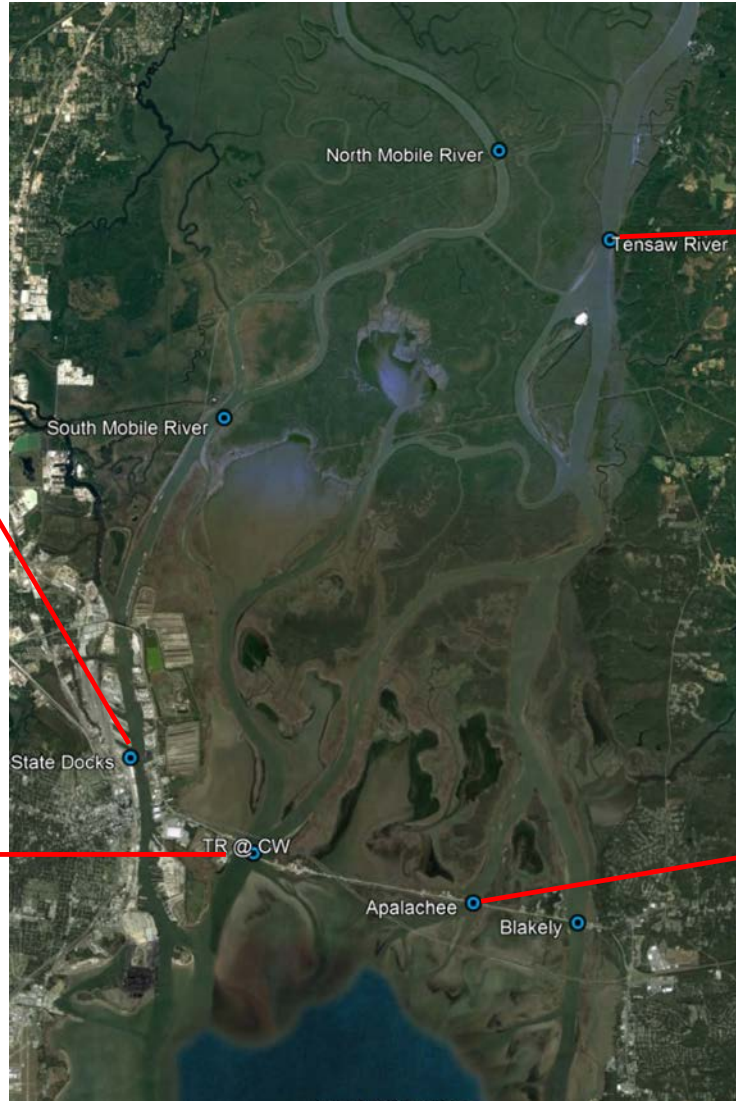
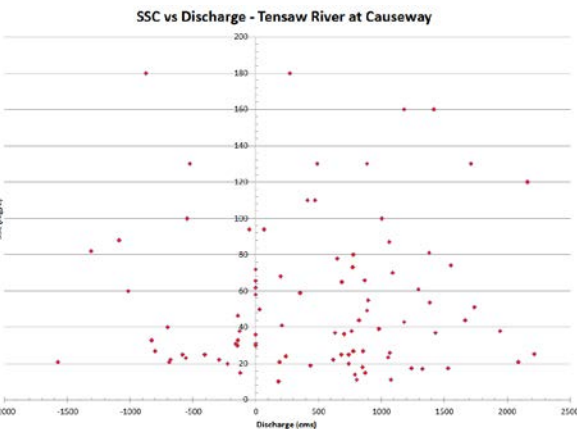
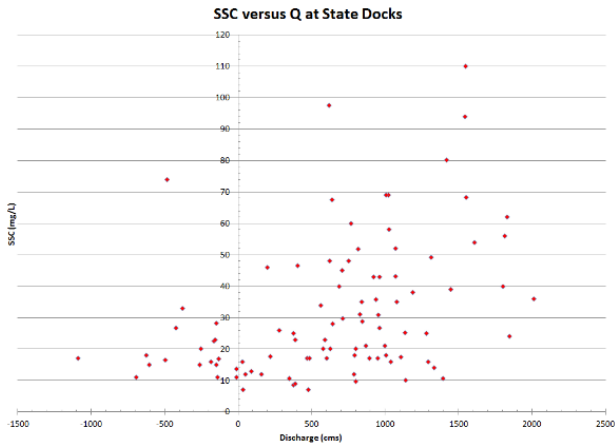
Model Evaluation: Made using 2009-2011 Dredging Records and TSS measurements collected in 2016-2017.

Geophysical Modeling System Multi-Block

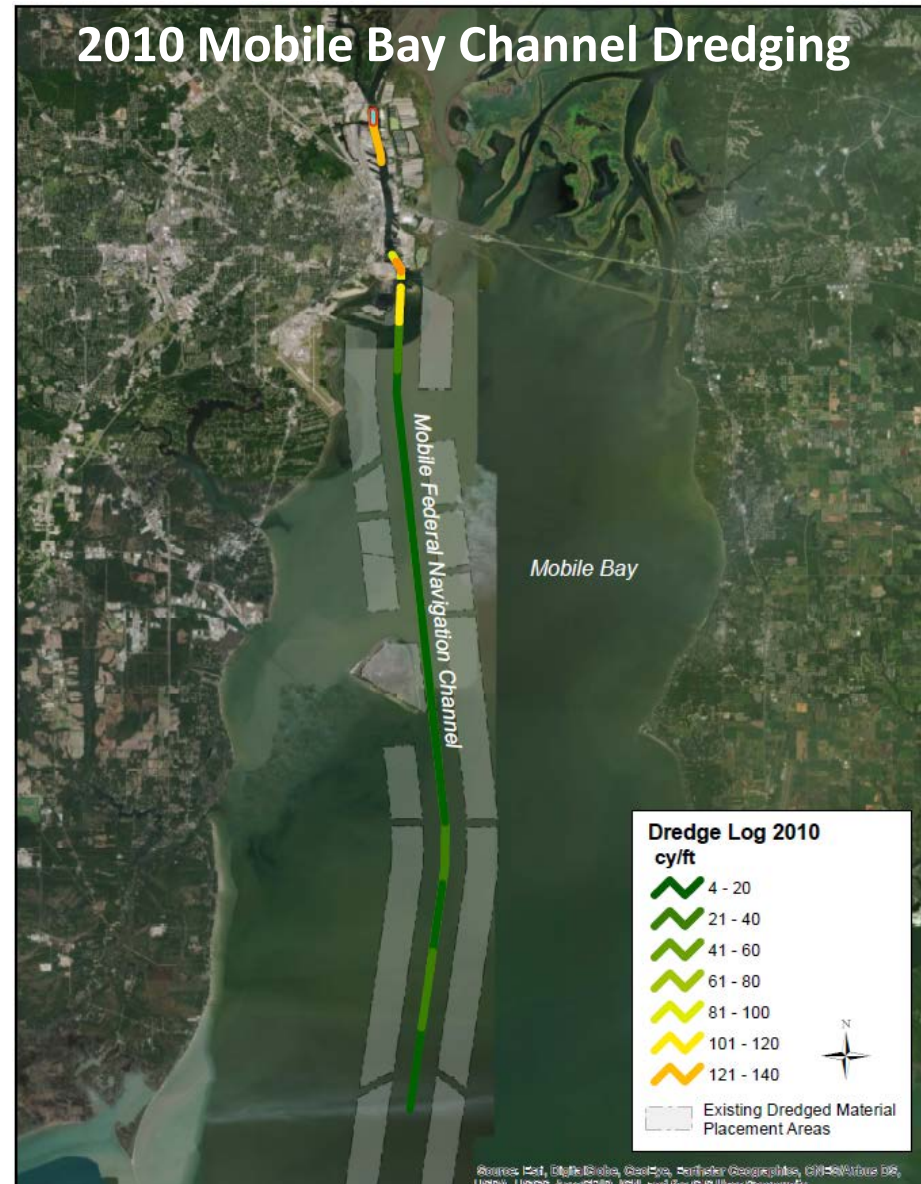


ESTUARINE SEDIMENT TRANSPORT MODELING

Locations of Suspended Sediment Concentrations in 2016-2017



ESTUARINE SEDIMENT TRANSPORT MODELING

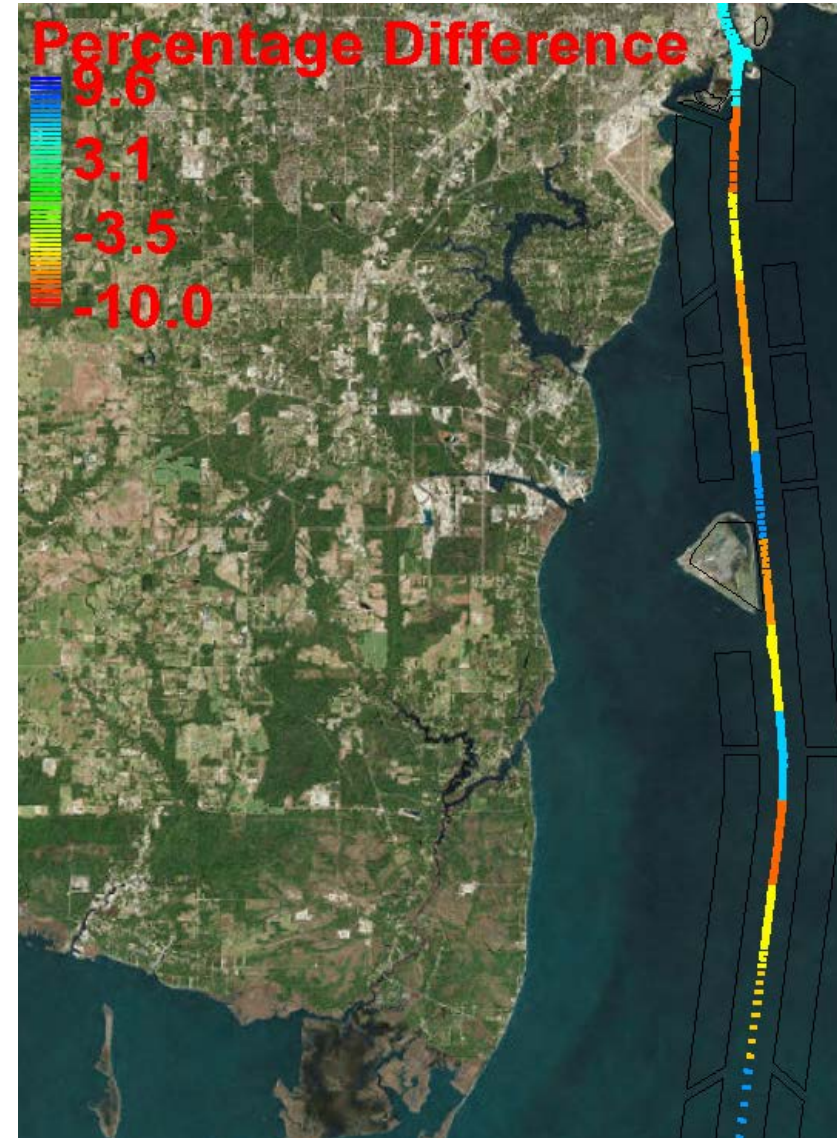


ESTUARINE SEDIMENT TRANSPORT MODELING

MODEL PERFORMANCE

Percentage difference between measured and simulated shoaling rate in the navigation channel with existing channel depths.

Channel simulated shoaling volume 2.5% less than historic dredged volume.



ESTUARINE SEDIMENT TRANSPORT MODELING



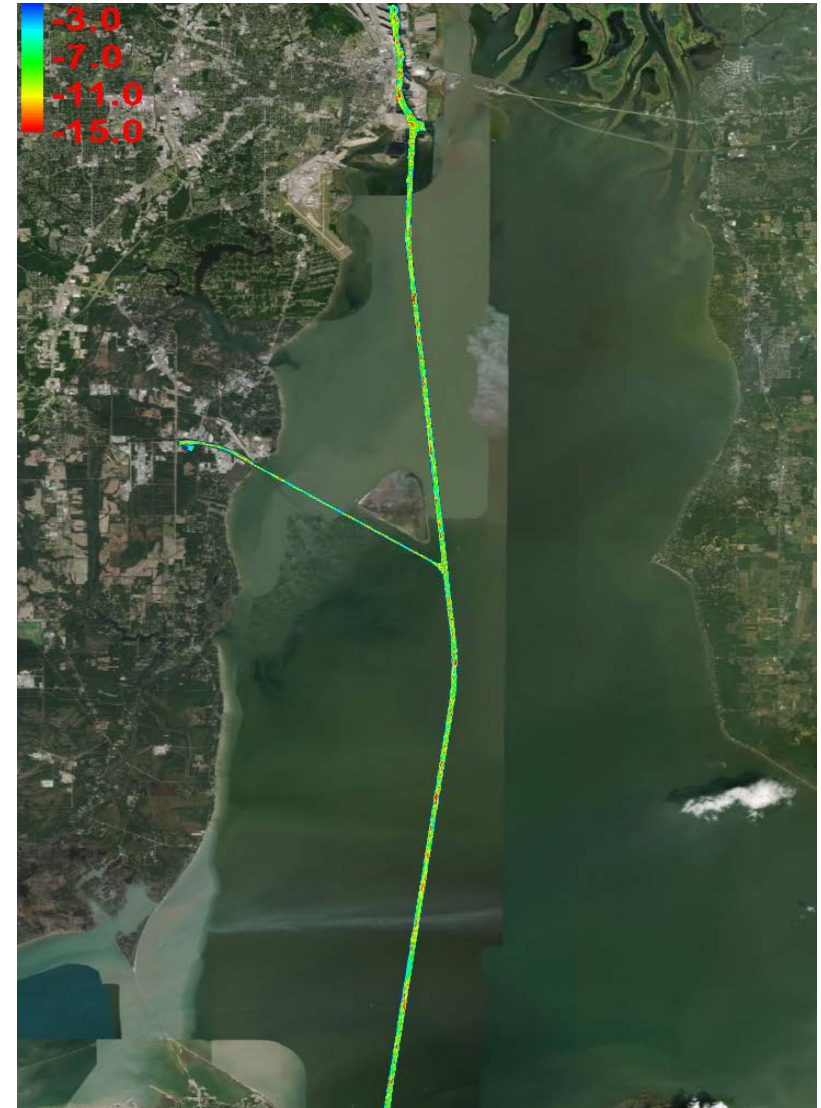
US Army Corps
of Engineers



RESULTS SUMMARY

Increases in average annual shoaling vary from 5 to 15% along the navigation channel with Project channel depths.

Percent Increase in Channel Shoaling

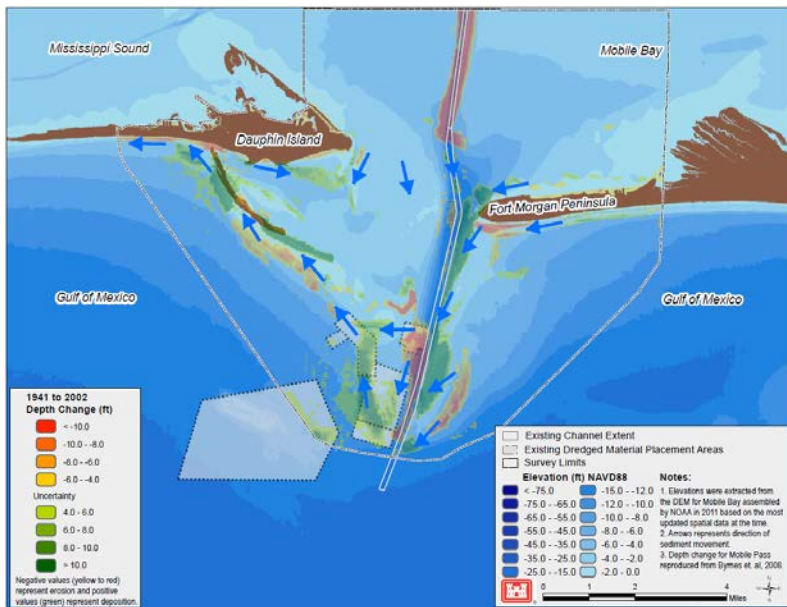


COASTAL SEDIMENT TRANSPORT MODELING

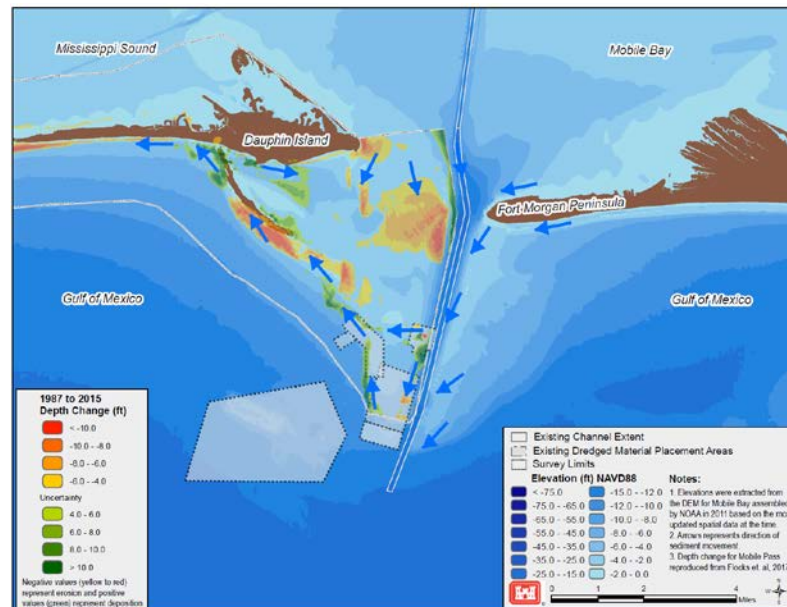
OVERVIEW

Purpose: To evaluate possible effects of widening and/or deepening the Mobile Harbor Navigation Channel on the ebb tidal shoal and adjacent nearshore coastal areas.

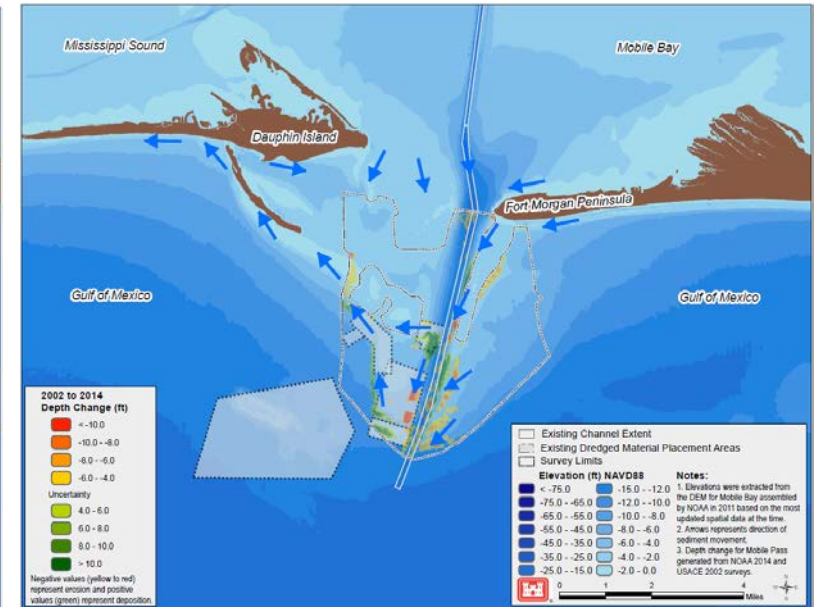
Mobile Pass Bed Level Change 1941 to 2002
(+/- Erosion/Deposition, ft)



Mobile Pass Bed Level Change 1987 to 2015
(+/- Erosion/Deposition, ft)



Mobile Pass Bed Level Change 2002 to 2014
(+/- Erosion/Deposition, ft)



Depth change reproduced from Byrnes et. al, 2008 "Evaluation of Channel Dredging on Shoreline Response at and Adjacent to Mobile Pass, Alabama"

Depth change reproduced from Flocks, et. al, 2017 "Analysis of Seafloor Change around Dauphin Island, Alabama, 1987-2015" Open-File Report 2017-1112.

Depth change generated from USACE 2002 and NOAA 2014 surveys.

COASTAL SEDIMENT TRANSPORT MODELING



APPROACH

Model: Simulations made using Delft3D.

Simulation Period: 10 years

Simulated Conditions: Existing, with project and 0.5 meter relative rise in sea level.

Forcing: 10 year wave climatology derived from data spanning from 1998-2016

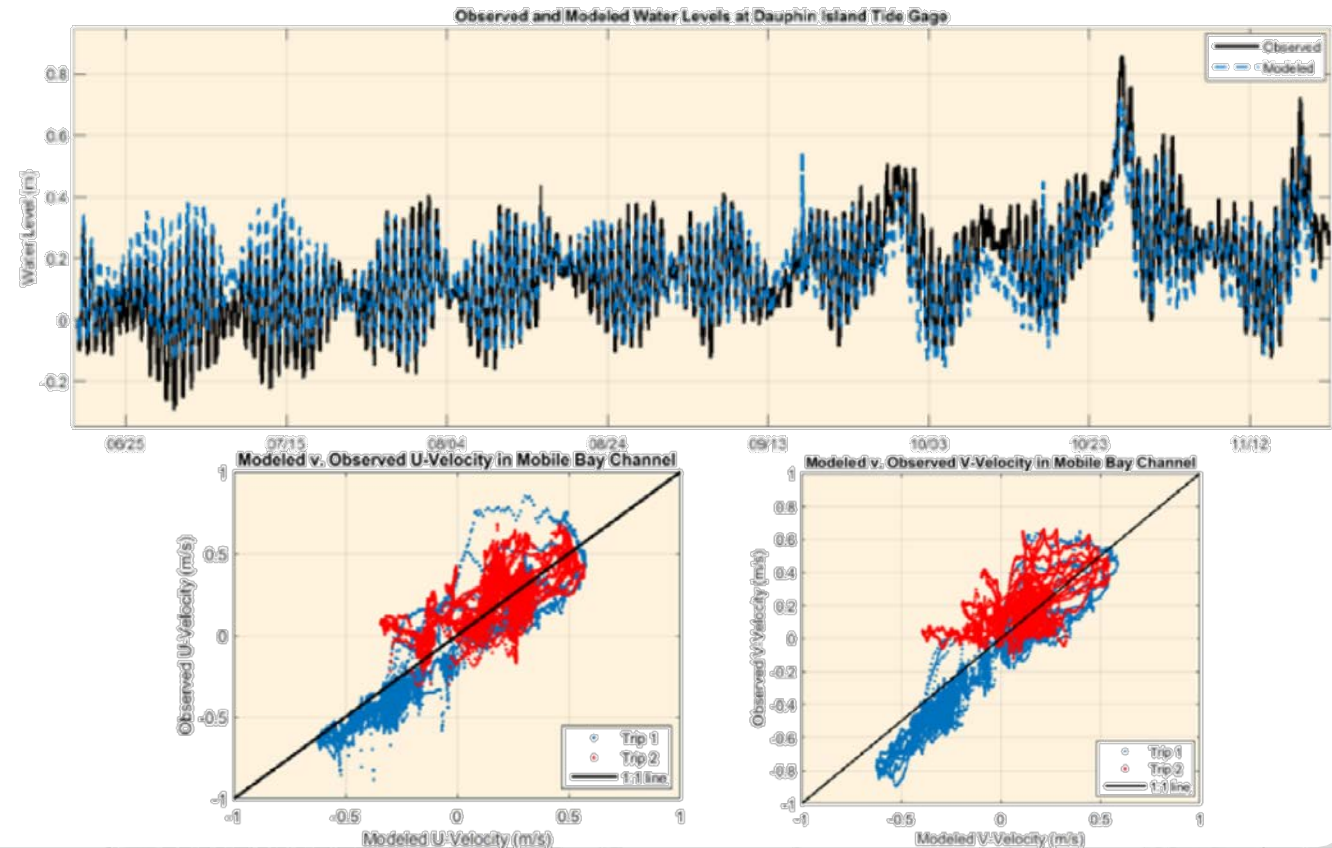
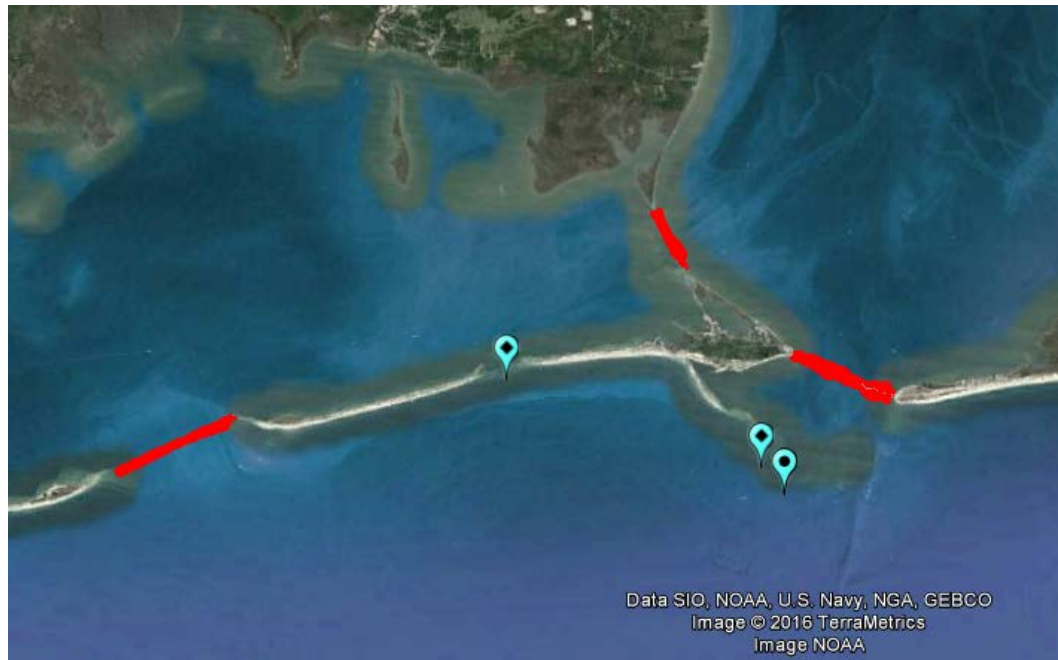
Model Evaluation: Made using NOAA tide gages, 2015 waves and current measurements and historic topographic and bathymetric change measurements

COASTAL SEDIMENT TRANSPORT

MODEL PERFORMANCE

Good agreement made between observed and modeled wave and water levels near the island and ebb/flood velocities through the passes adjacent to Dauphin Island.

Comparison: Observed Water Level and Currents Versus 2015 Observed



COASTAL SEDIMENT TRANSPORT

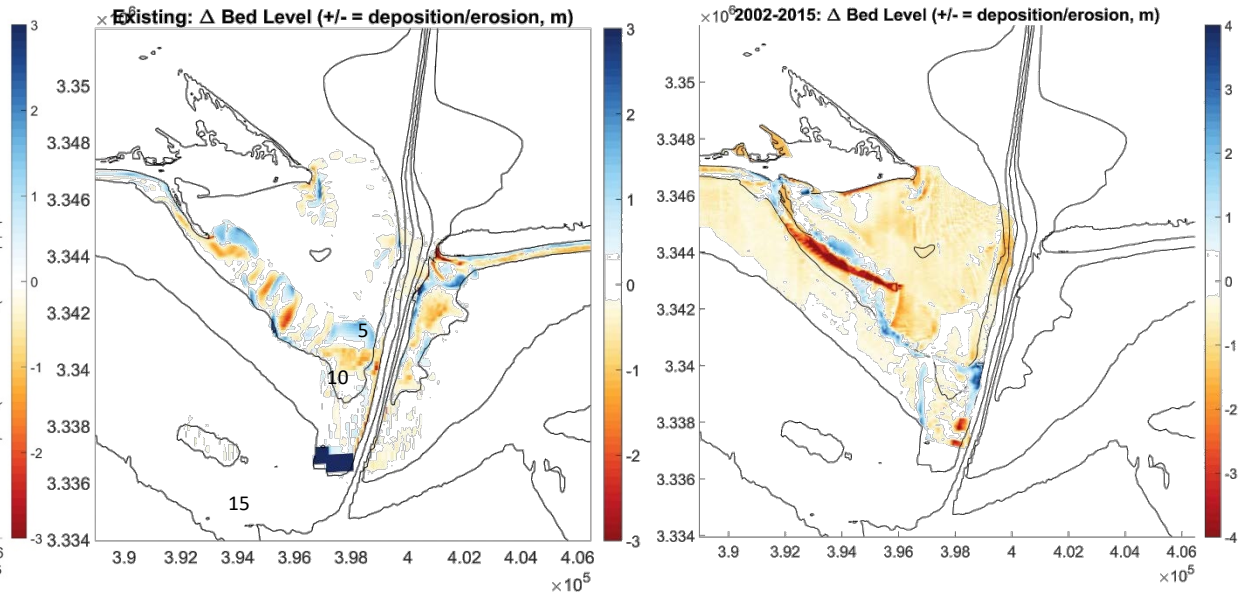
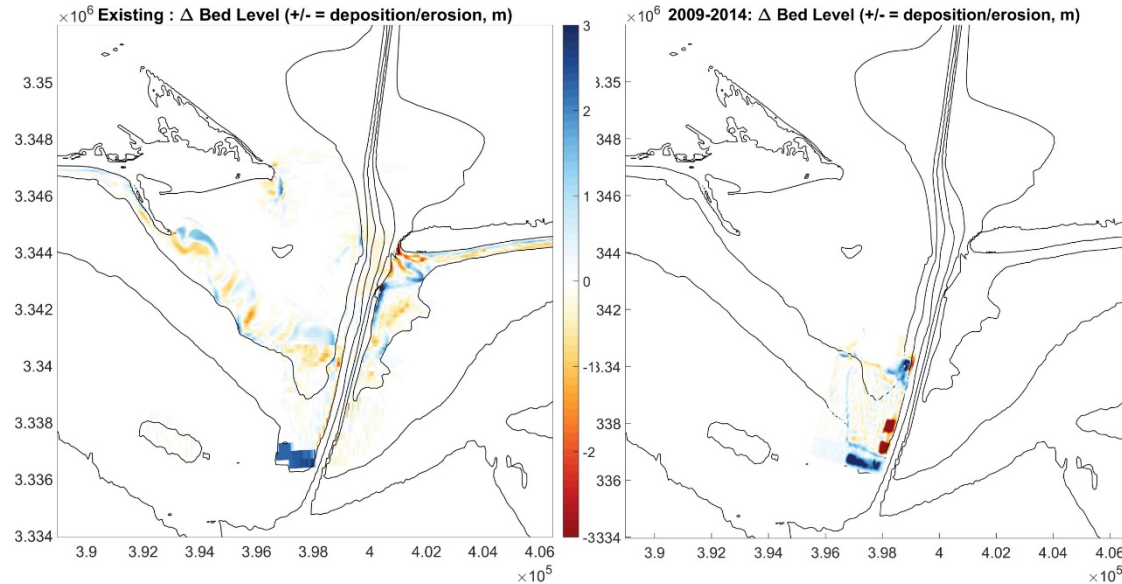
MODEL PERFORMANCE

Model captured patterns of erosion and accretion along the edge of the channel, near Dixie Bar and by Pelican Island.

Additional sensitivity tests (Hurricane Ivan) ran to evaluate tropical storm influence on widespread erosion between the 5 and 10 m contours.

Comparison: 5-year Modeled vs. 2009 to 2014 Observed

Comparison: 10-year Modeled vs. 2002 to 2015 Observed



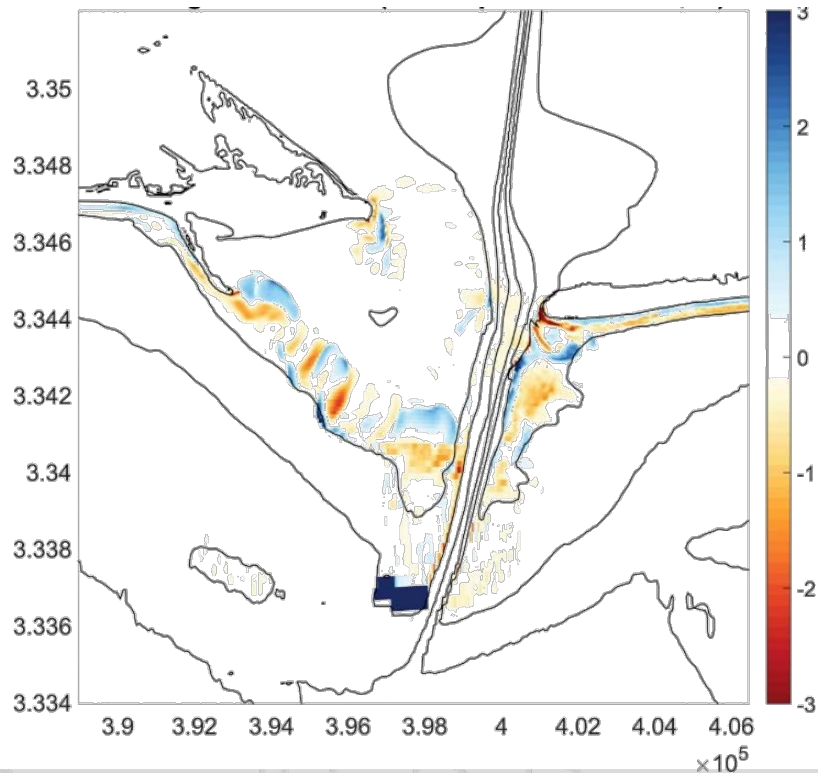
COASTAL SEDIMENT TRANSPORT

RESULTS SUMMARY

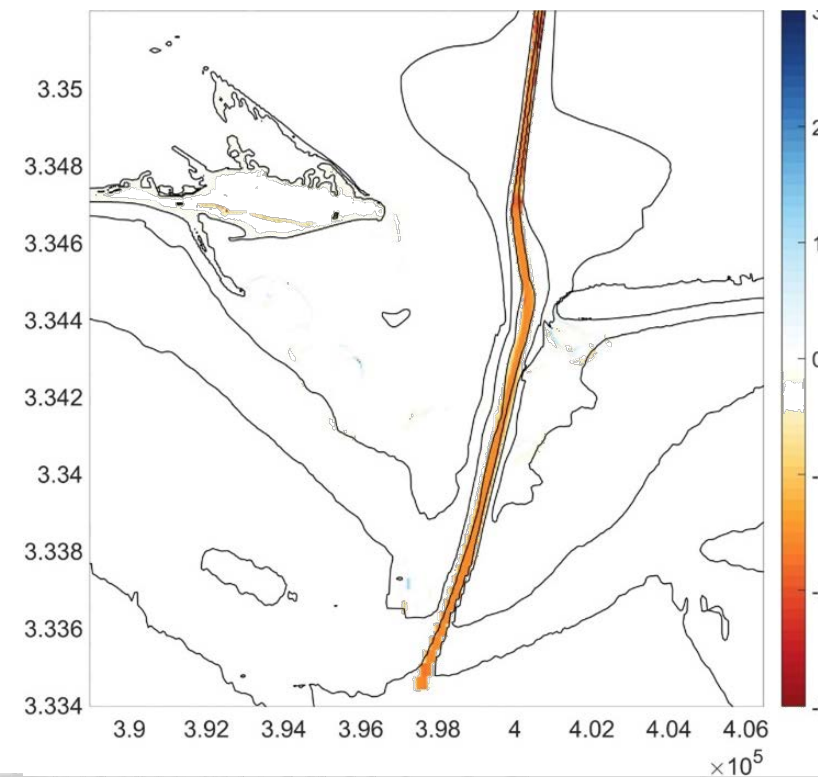
Minimum bed level changes between with project and existing conditions estimated in the bay and ebb-tidal shoal.

Mobile Pass Sediment Transport Modeling (Delft 3D)

With Project Condition 10 Year Simulation
Bed Level Change (+/- Erosion/Deposition, m)



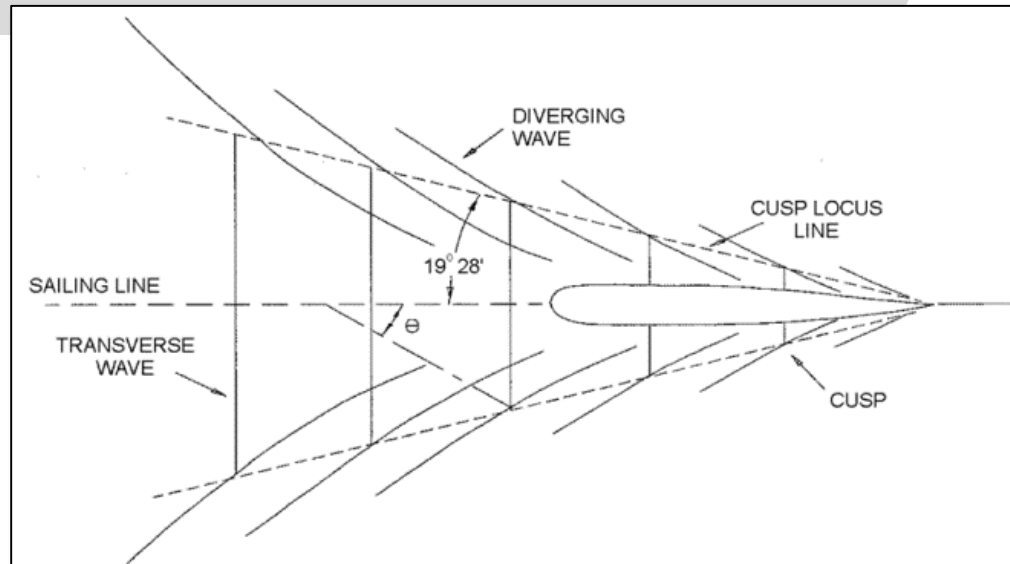
With Project – Existing Condition
Bed Level Change (+/- Erosion/Deposition, m)



VESSEL GENERATED WAVE ENERGY

OBJECTIVE

Determine vessel generate wave energy propagation from the Federal Navigation Channel for vessel classes having an overall length greater than 400 feet to assess potential impacts to shorelines within Mobile Bay as a result of proposed channel improvements using statistical comparisons of the current and forecasted fleets and channel geometries.



$$SW = f(V_L, V_B, V_D, V_S, V_{Dir}, d_c, D_s)$$

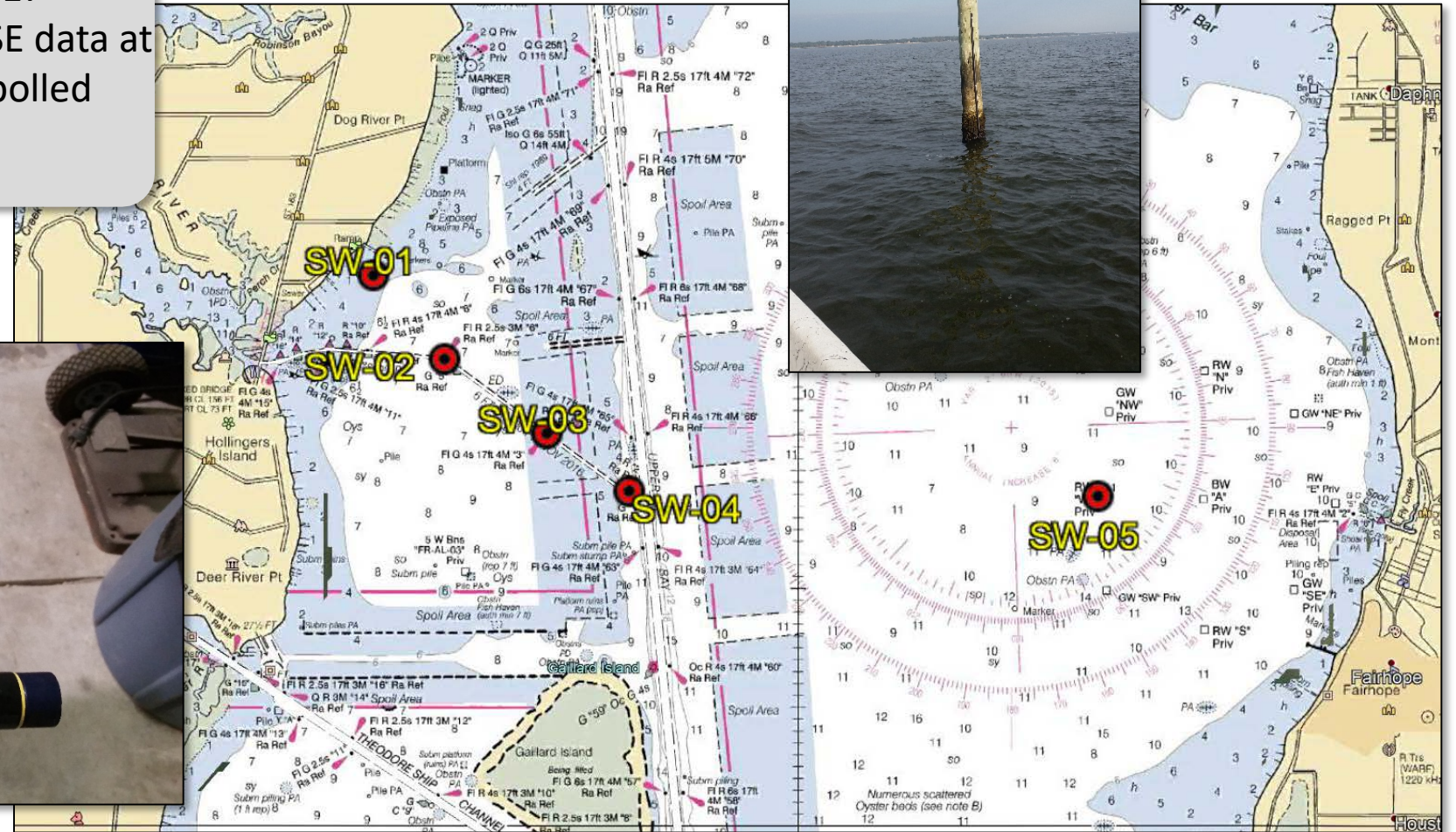
CHALLENGE

1. No literature specific to Mobile Bay available.
2. Complex bathymetry and distance from channel unaccounted for in literature.
3. Methods to quantify vessel generated waves as wave height not useful for analysis.
4. Vessel generated waves do not follow common wave theories.

VESSEL GENERATED WAVE ENERGY

DATA COLLECTION

5 sites operated for 62 days (11/18/2017 – 01/19/2018) collecting continuous WSE data at 8Hz (8 samples per second). AIS data polled from USCG for vessel characteristics.

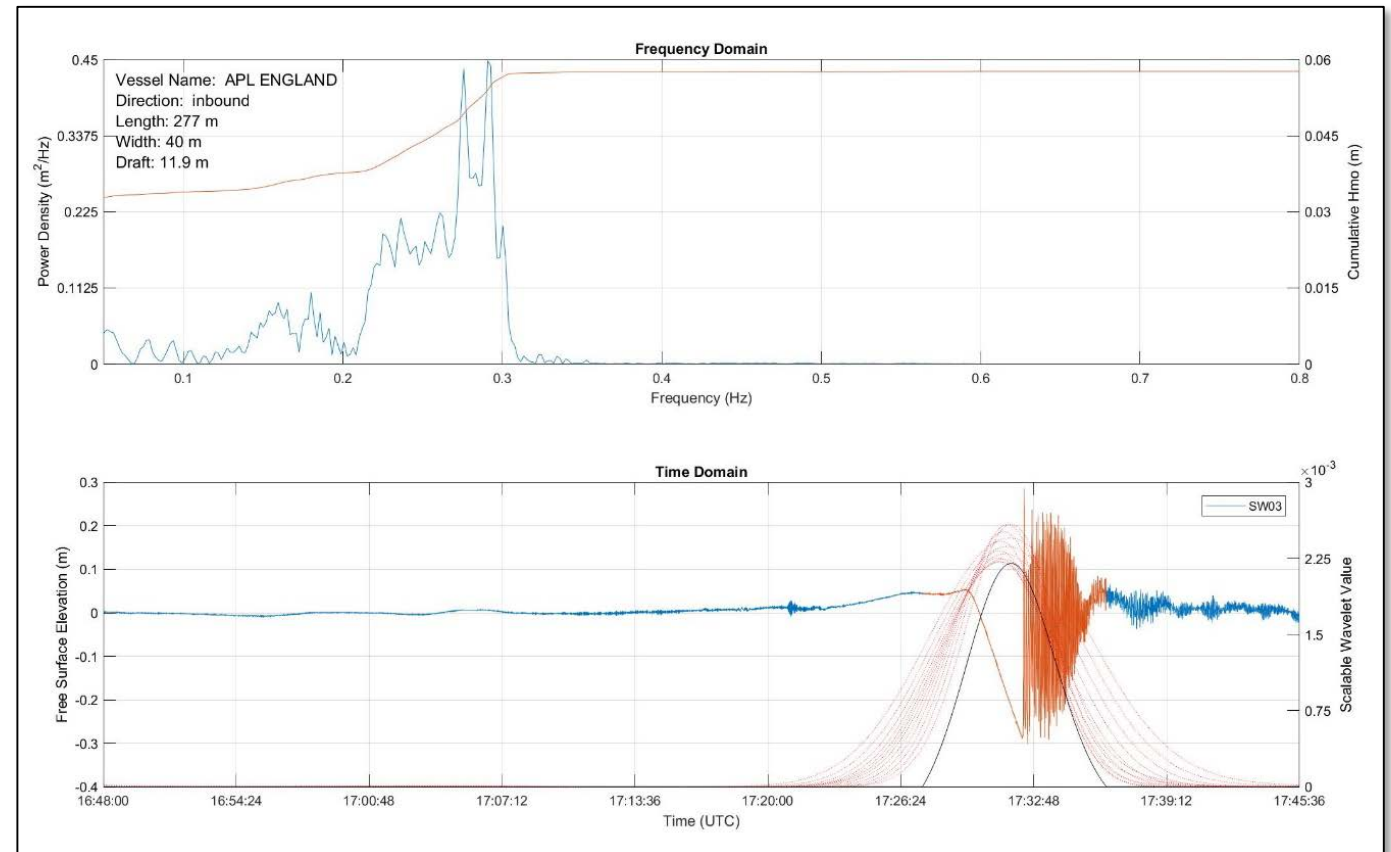


VESSEL GENERATED WAVE ENERGY

DATA PROCESSING

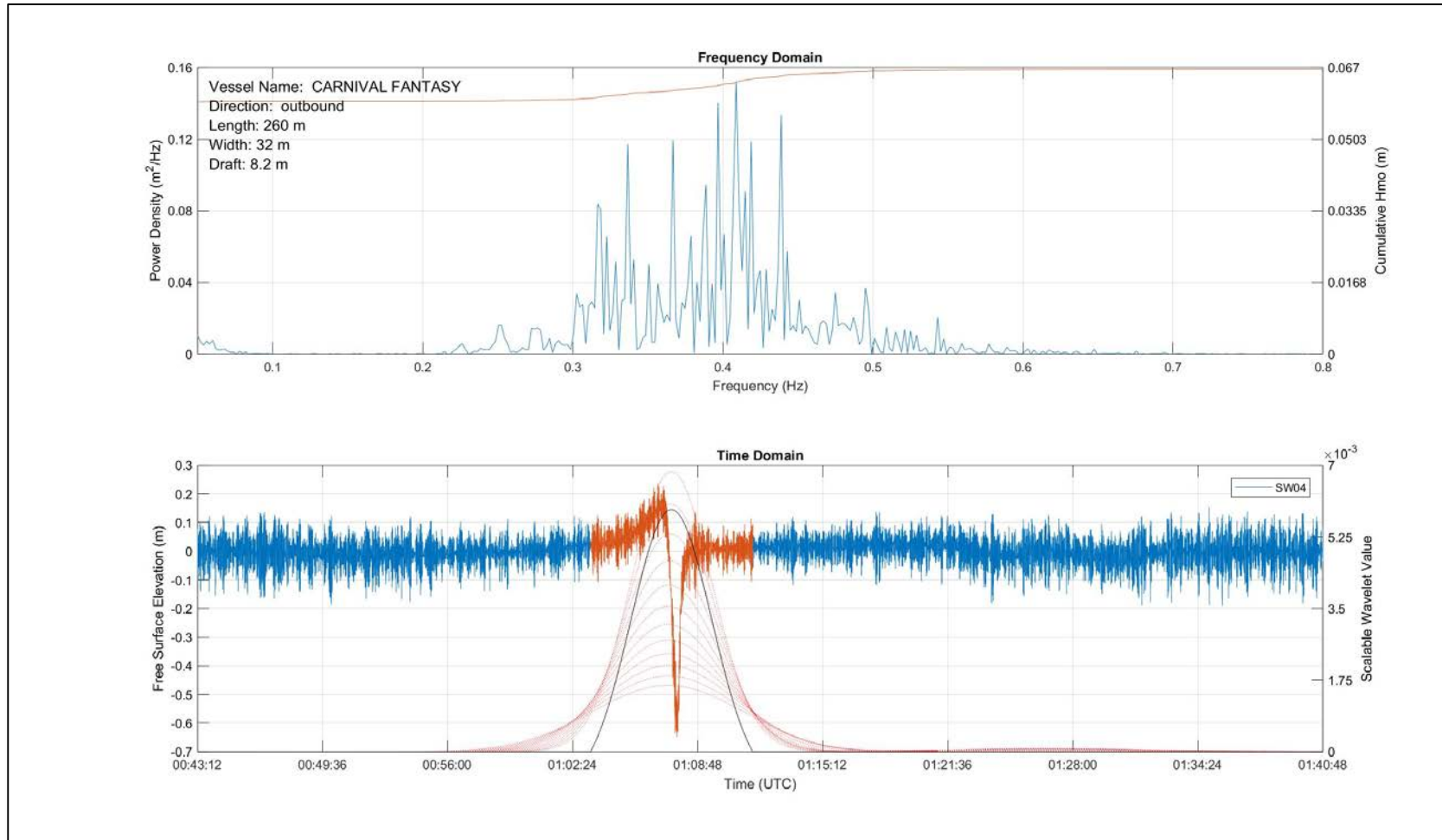
Steps:

1. Subsample WSE time series using AIS record.
2. Compute continuous wavelet transform to identify event and duration.
3. Compute Fourier Transformation on wavelet.
4. Integrate under the power vs. frequency plot for spectrally significant wave height (H_{mo}).
5. Compute dimensionless parameters of vessels based on dependencies identified in literature



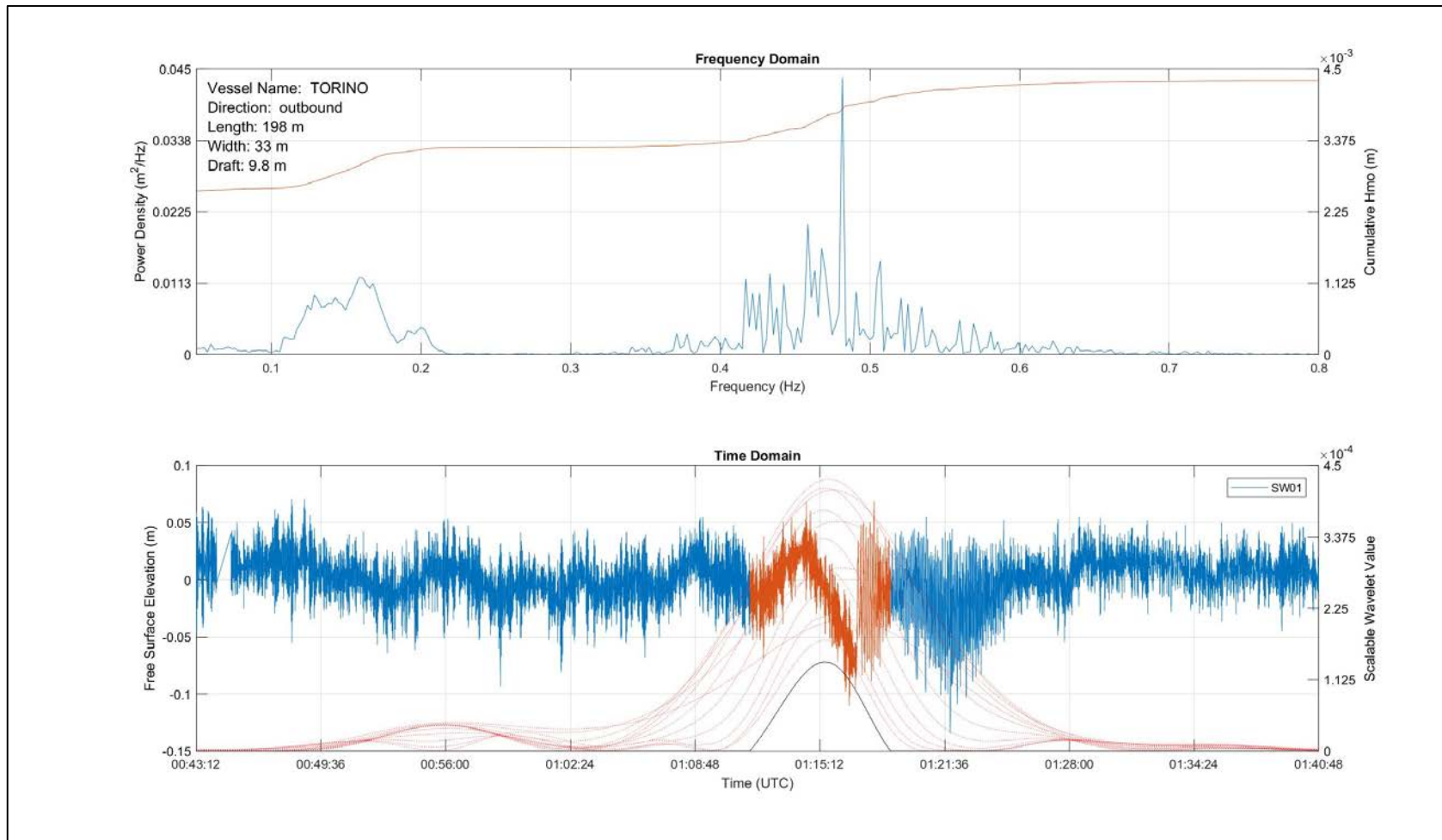
VESSEL GENERATED WAVE ENERGY

DATA PROCESSING



VESSEL GENERATED WAVE ENERGY

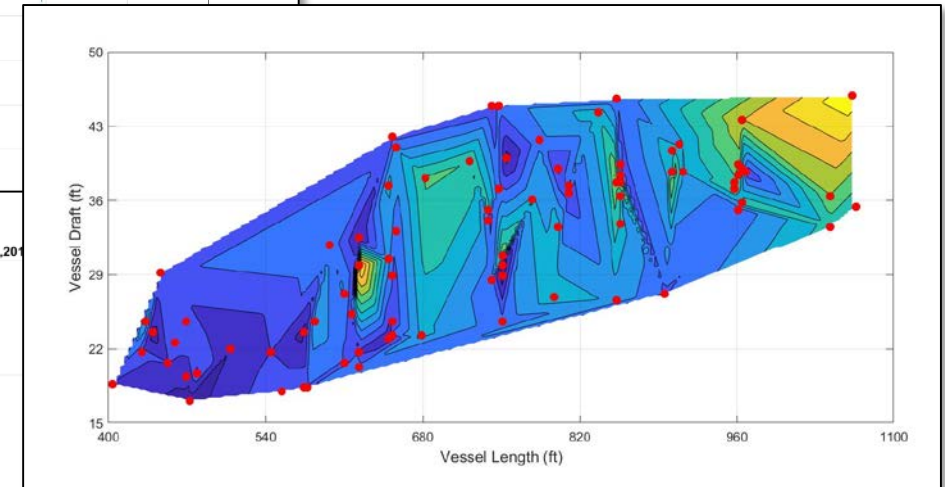
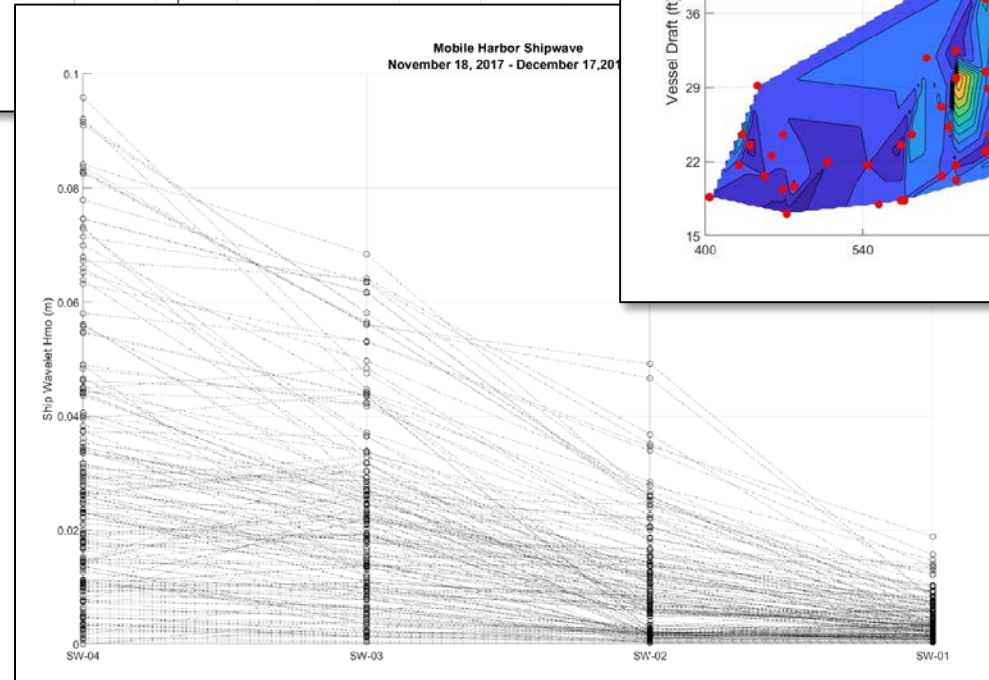
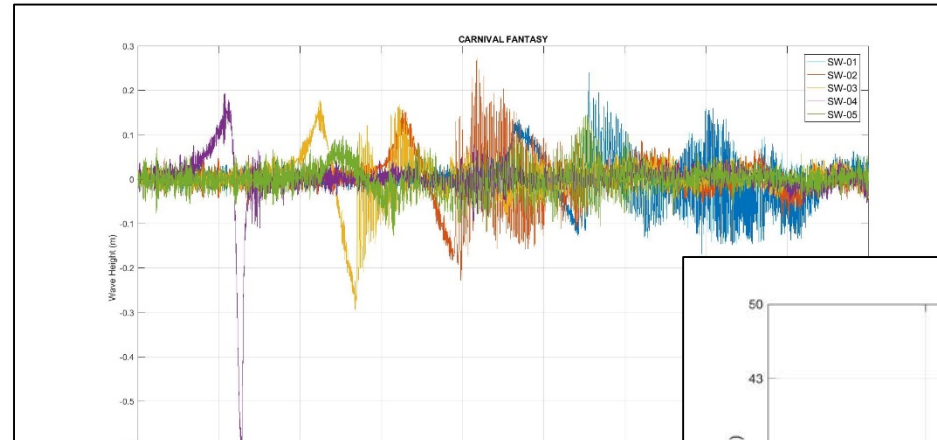
DATA PROCESSING



VESSEL GENERATED WAVE ENERGY

ANALYSIS

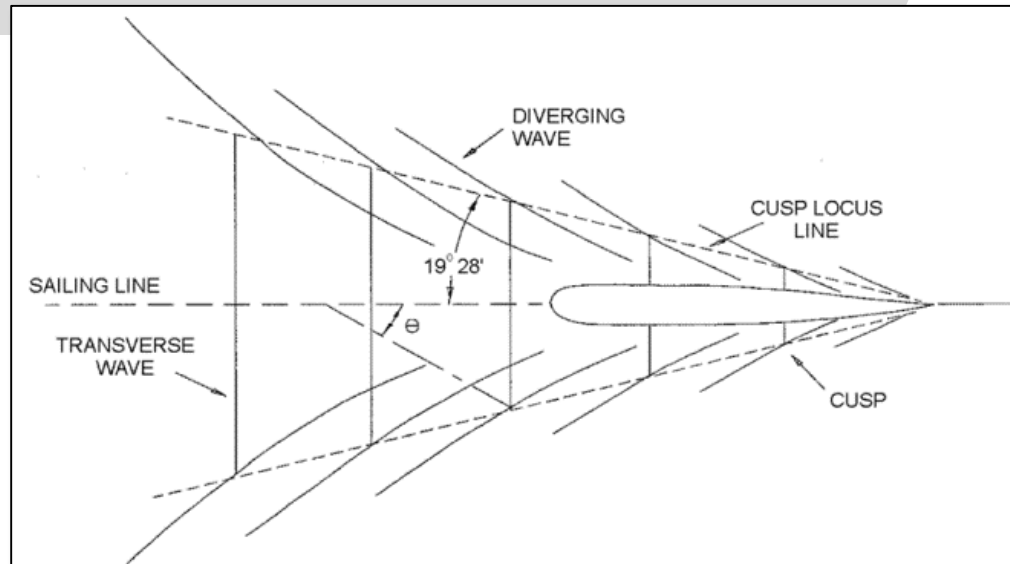
1. Compute correlation between dimensionless vessel parameters and vessel generated wave energy w.r.t. spatial orientation, vessel direction, speed, and climatology.
2. Use correlation to develop a “predictive” method to forecast future vessel generated wave energy.
3. Determine statistical difference in vessel generated wave energy and background wave energy.
4. Develop statistical comparisons of current and forecasted vessel wave energy.



VESSEL GENERATED WAVE ENERGY

OBJECTIVE

Determine vessel generated wave energy propagation from the Federal Navigation Channel for vessel classes having an overall length greater than 400 feet to assess potential impacts to shorelines within Mobile Bay as a result of proposed channel improvements using statistical comparisons of the current and forecasted fleets and channel geometries.



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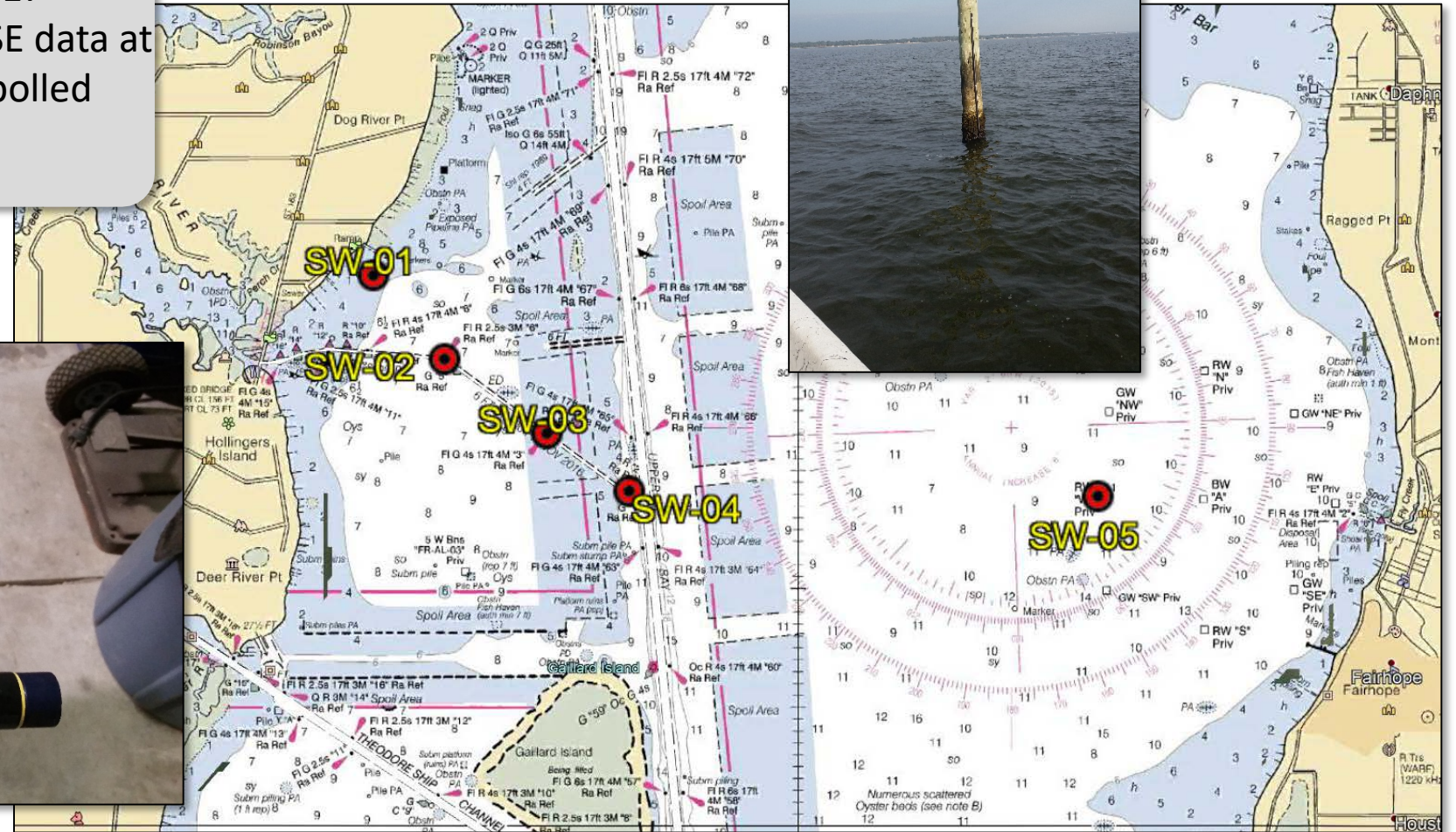
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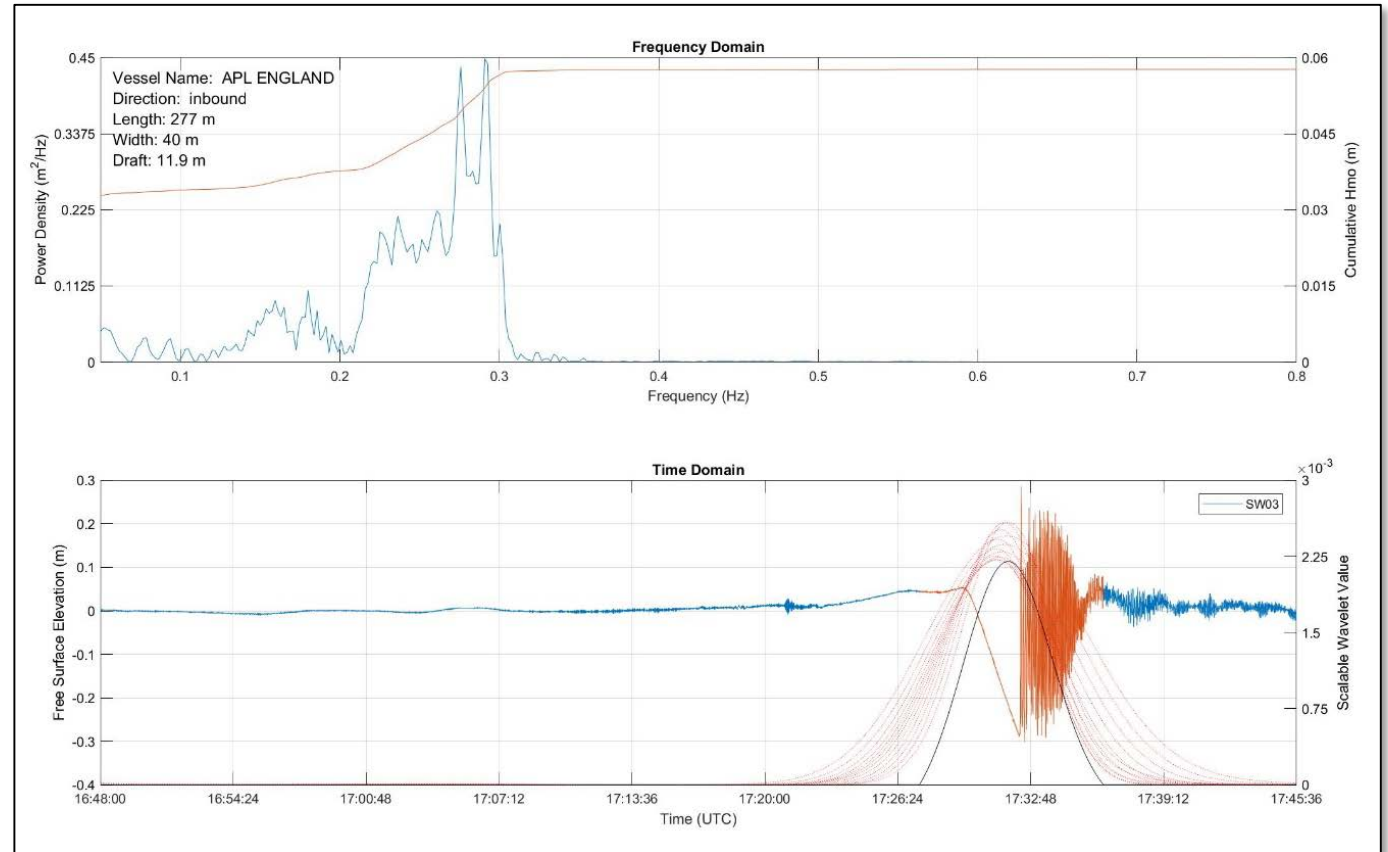


VESSEL GENERATED WAVE ENERGY

DATA PROCESSING

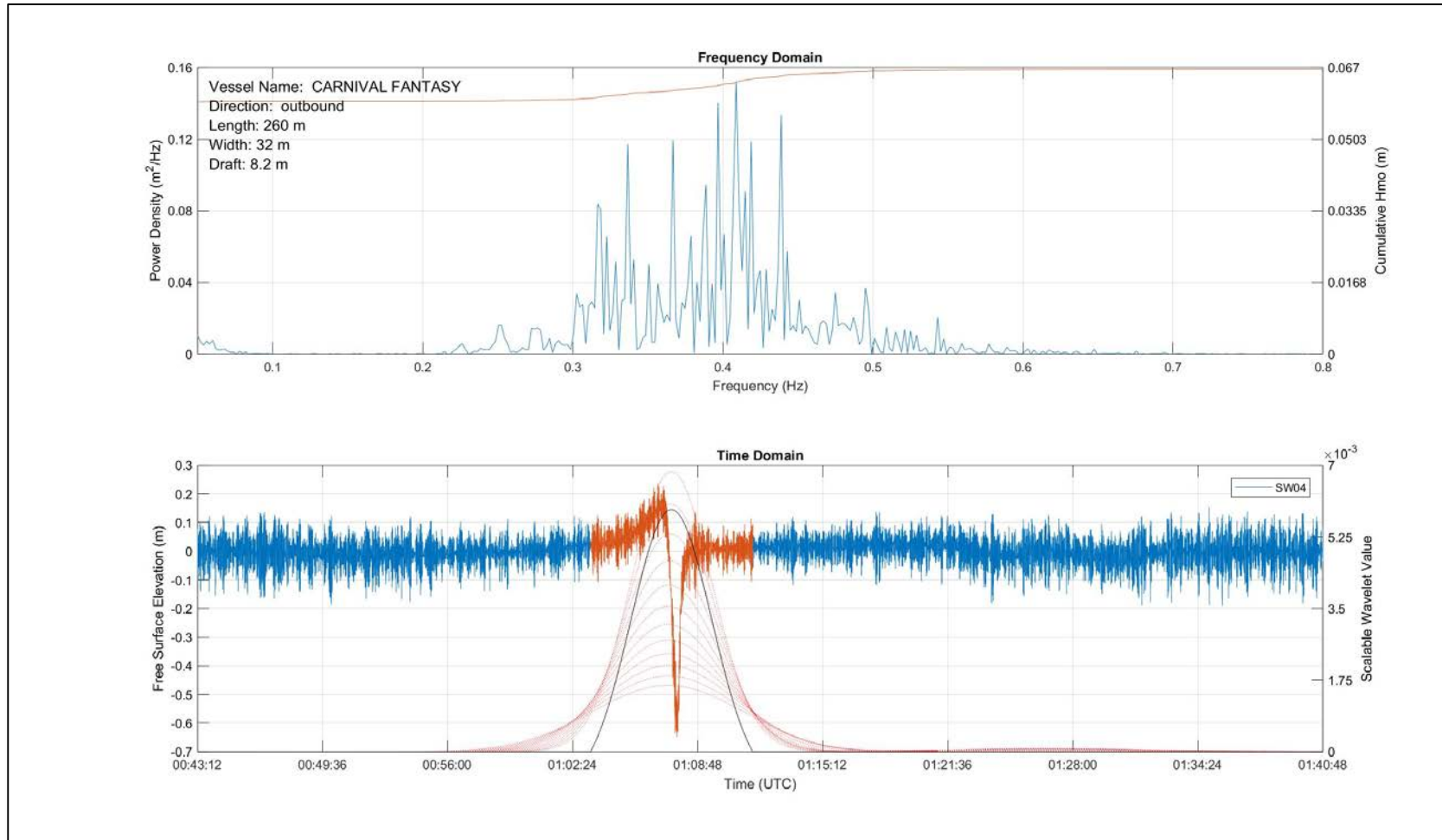
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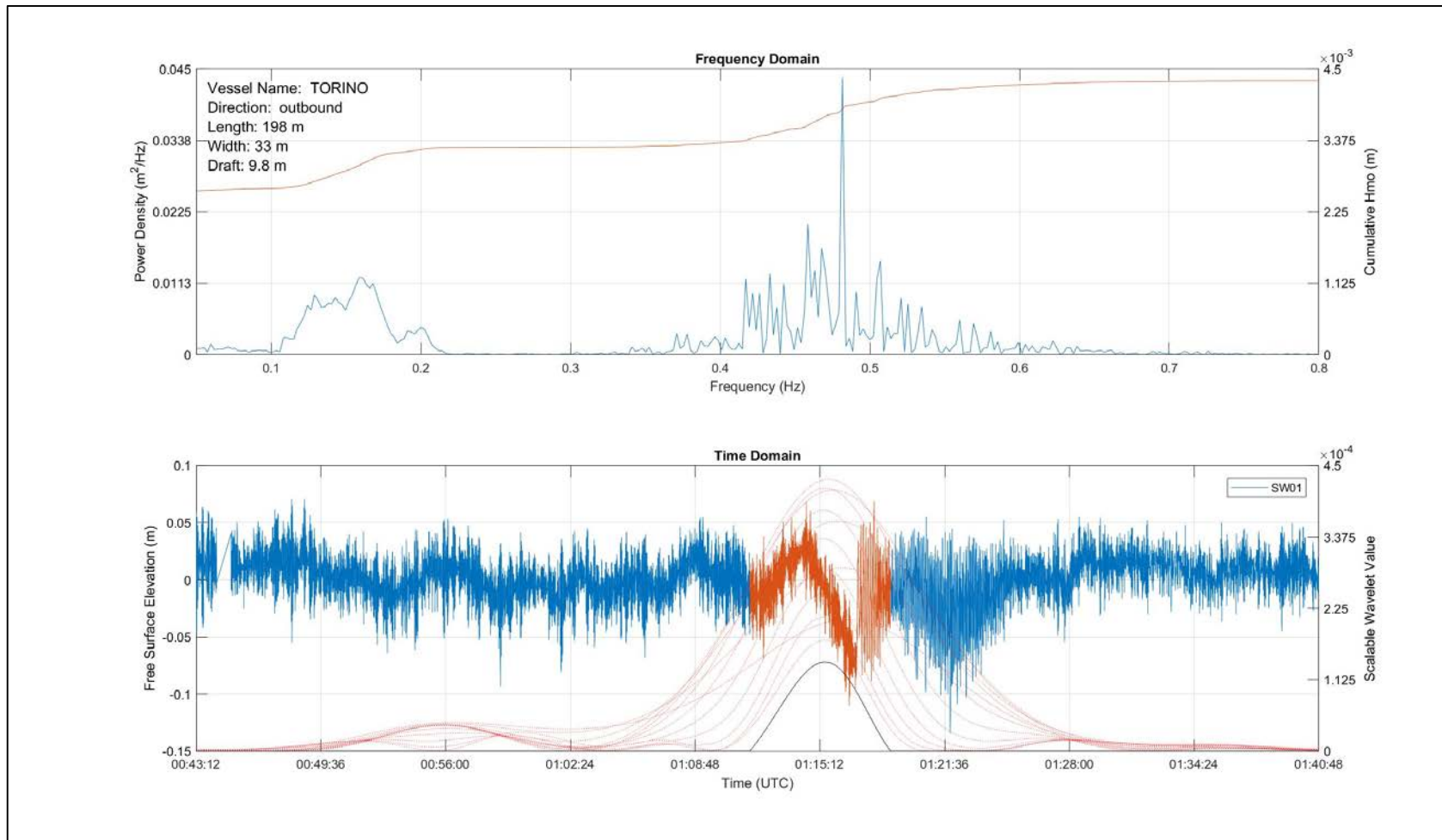
VESSEL GENERATED WAVE ENERGY

DATA PROCESSING



VESSEL GENERATED WAVE ENERGY

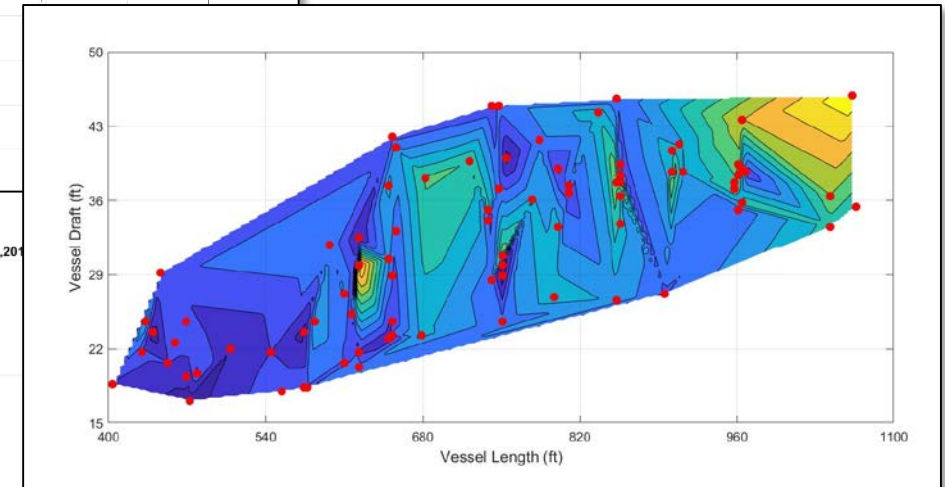
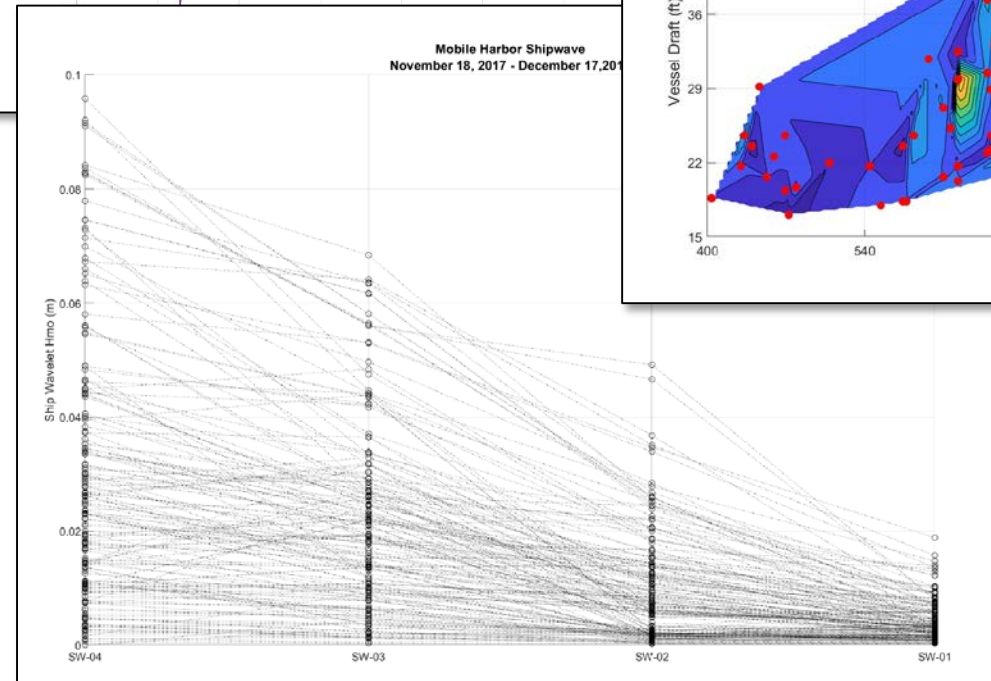
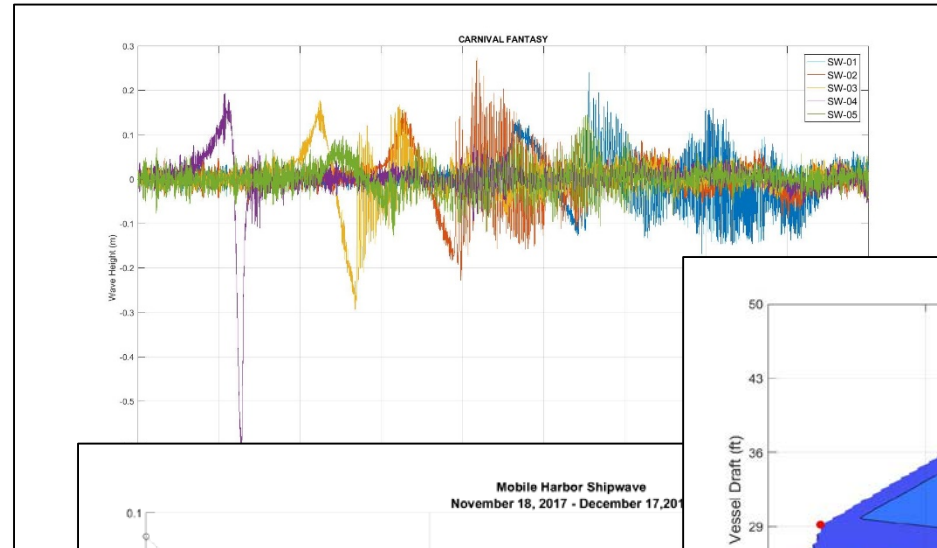
DATA PROCESSING



VESSEL GENERATED WAVE ENERGY

ANALYSIS

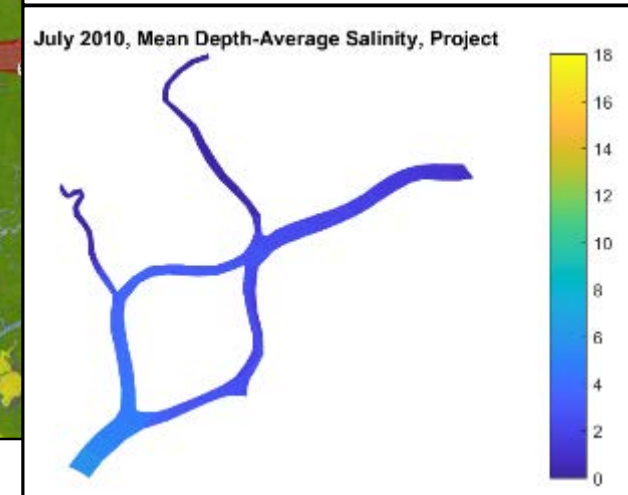
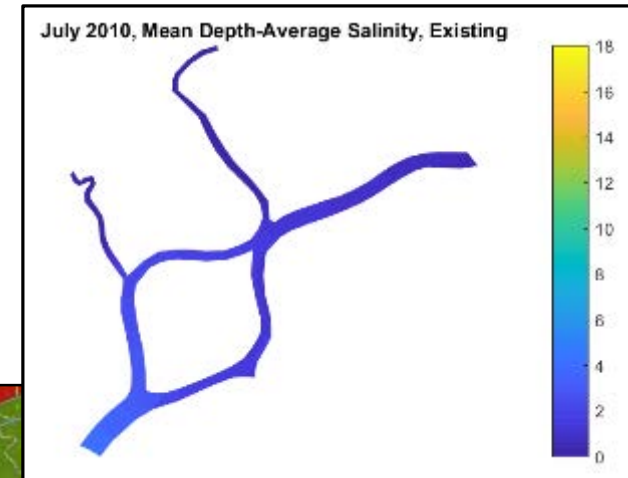
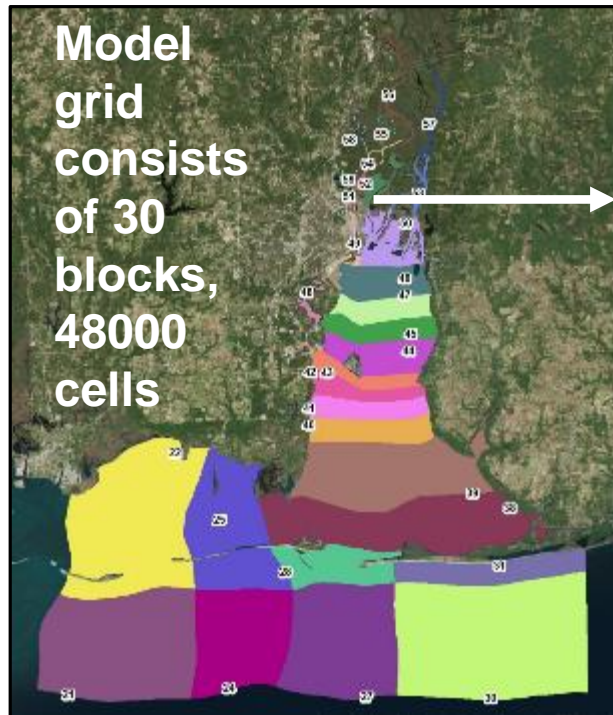
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MOBILE HARBOR GRR

AQUATIC RESOURCES ASSESSMENT - OVERVIEW

Assessing potential impacts to wetlands, SAV,
benthic invertebrates, oysters, fish
Model outputs compare water quality using
existing and post-project conditions
Sea level rise scenario - 0.5 meter



AQUATIC RESOURCES ASSESSMENT

Data from State Resources

- Wetlands - State of AL
Communications on existing data and shared locality information on state- listed species encountered in field mapping efforts.
- SAV – Mobile Bay National Estuary Program
Shape files for 2008-2009, 2015 (via Vittor and Associates)
- Oysters – AL Department of Marine Resources
Communications on and exchange of water quality data
- Fish – AL Department of Marine Resources
Fisheries Assessment and Monitoring Program data from 2005-2015

SUBMERGED AQUATIC VEGETATION MAPPING IN MOBILE BAY AND ADJACENT WATERS OF COASTAL ALABAMA IN 2015



MOBILE HARBOR GRR

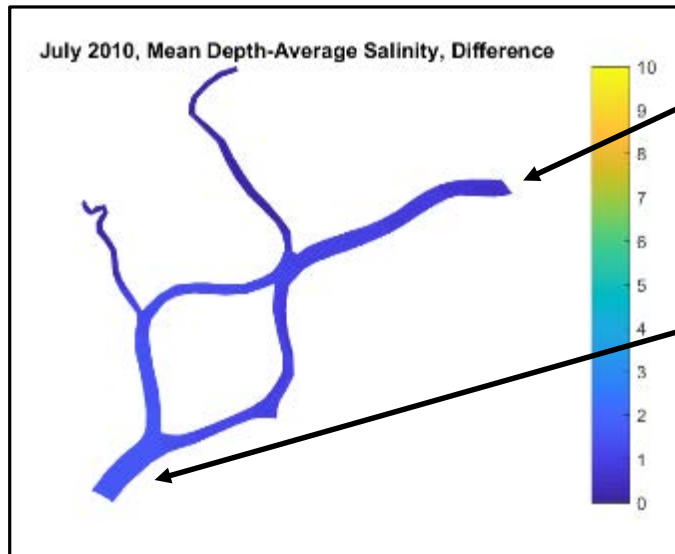
AQUATIC RESOURCES ASSESSMENT - WETLANDS

Assessment approach:

Wetland mapping → 43 community types;
 >800 on-site samples

Salinity tolerances derived from literature
 Evaluated average (likely outcome) and
 75th percentile (conservative) salinity
 increases

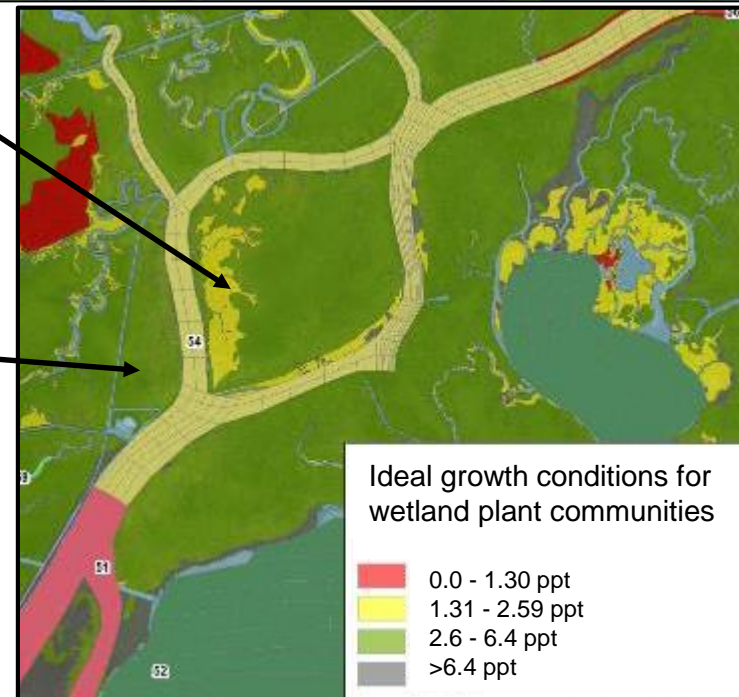
Assessed potential exceedance of salinity
 thresholds (ideal growth and mortality)



No salinity
 change in
 upper reach.

Projected
 increase of
 ~1 ppt in lower
 reach

Wetland plant
 communities
 adapted to
 predicted
 post-project
 salinity levels



MOBILE HARBOR GRR

AQUATIC RESOURCES ASSESSMENT - WETLANDS

Assessment results:

High resolution mapping of 77,000 ac within the project area

No wetland losses anticipated based upon post-project salinity

No vegetation mortality thresholds surpassed

No wetlands exceed ideal growth condition under expected conditions

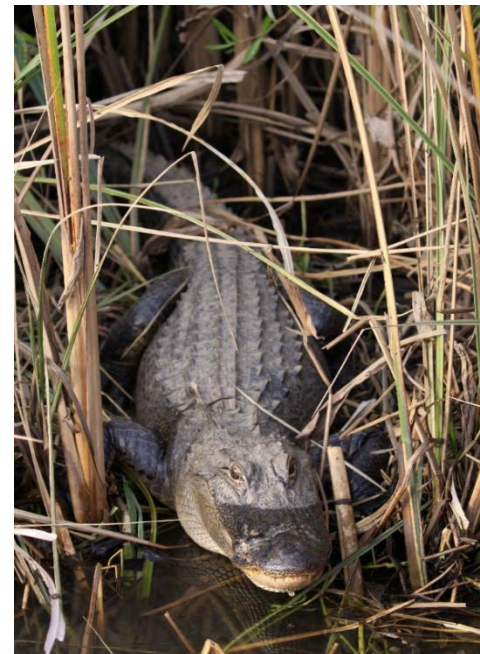
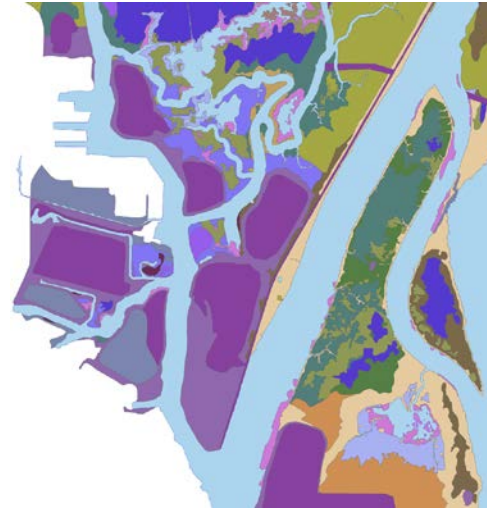
At the 75th percentile salinity - potential for minor vegetation shift in some wetlands (600 ac) based upon short term productivity reduction

–No anticipated decrease in function

–No shift between community types (freshwater, estuarine, saltwater)

Sea level rise will result in substantial inundation of existing wetlands

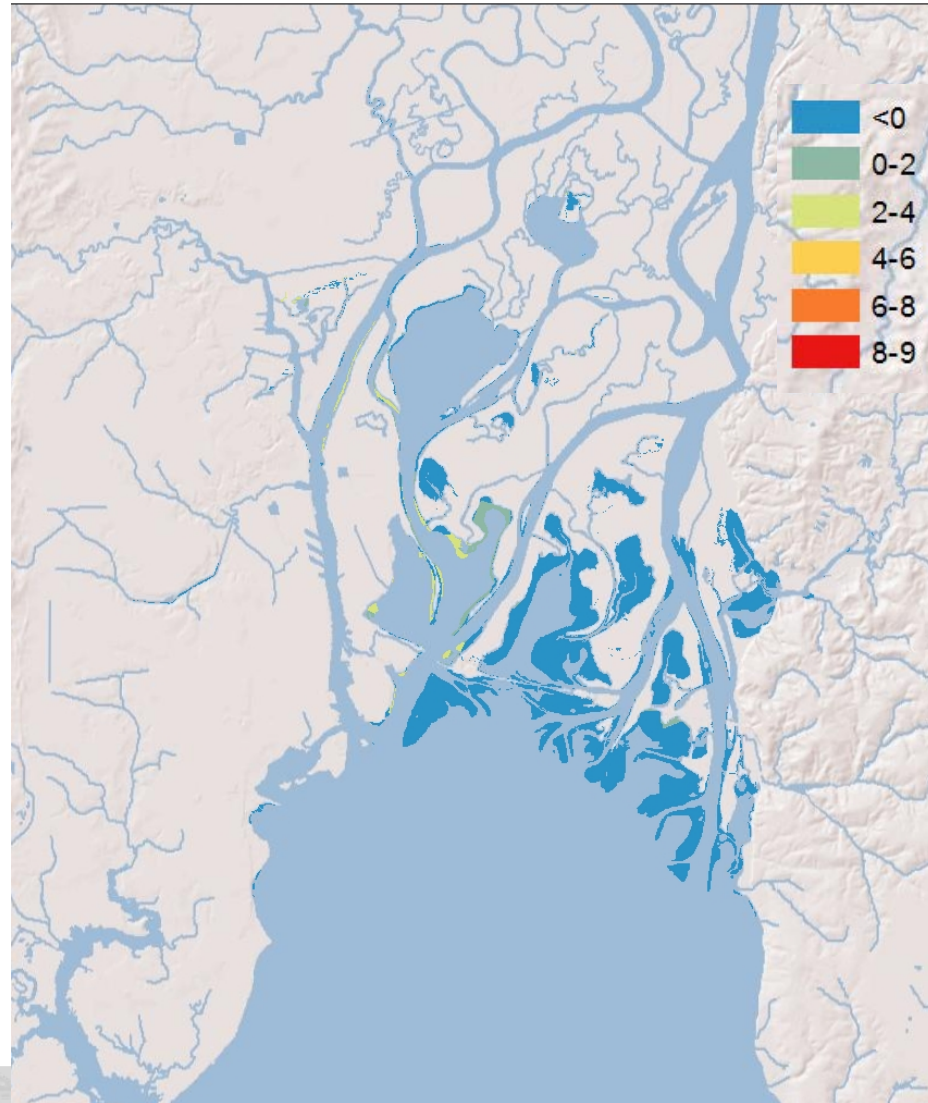
Project impacts remain negligible under 0.5 meter sea level rise scenario



Aquatic resource assessment – SAV

With Project
Mean increase in salinity above
tolerance threshold values

- Salinity tolerances established from literature and adjusted to baseline conditions
- Salinity conditions for SAV patches outside of hydrodynamic model domain estimated using mean of nearest adjacent cells
- Assess impacts within georeferenced database by identifying areas where project increases salinity above baseline adjusted tolerance thresholds



With Project Salinity (ppt) above SAV tolerance threshold

Range	Mean Acres	75th Percentile Acres
<0	7307	7217
0-1	212	0
1-2	47	53
2-3	121	218
3-4	35	76
4-5	11	22
5-6		106
6-7		33
7-8		7



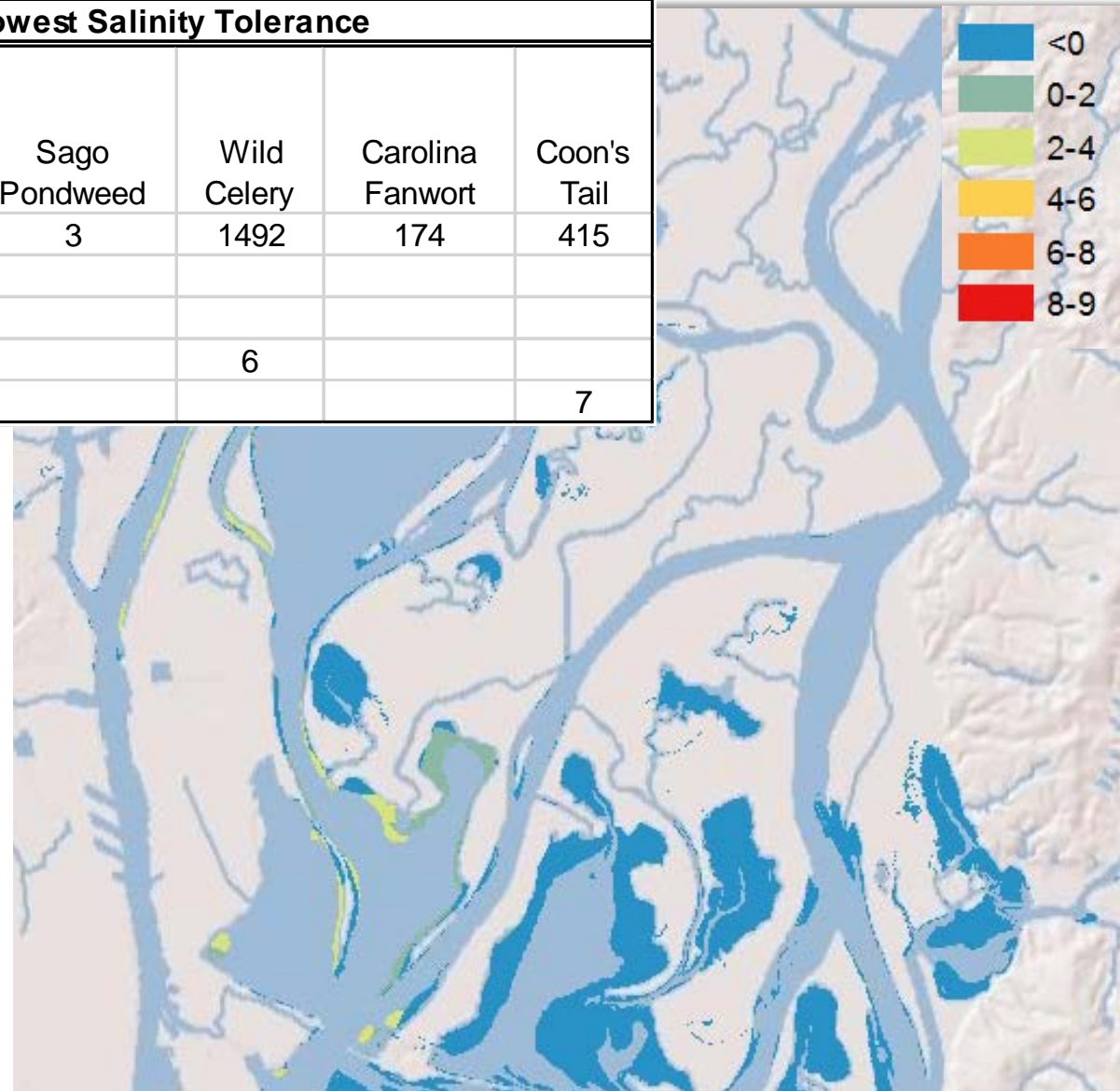
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Aquatic resource assessment – SAV

Species within SAV Bed with lowest Salinity Tolerance								
With Project Salinity (ppt) above SAV tolerance threshold	Water Star Grass	Eurasian Watermilfoil	Southern Naiad	Widgeon Grass	Sago Pondweed	Wild Celery	Carolina Fanwort	Coon's Tail
<0	2494	2300	307	23	3	1492	174	415
0-1		212						
1-2		47						
2-3		110				6		
3-4		38						7

- Three species show potential with project impacts due to increased salinity
- **Eurasian Watermilfoil** – Aquatic invasive species
- **Wild Celery** and **Coon's Tail**
 - Duration of elevated salinity is critical
 - Wild Celery can survive salinity up to 25ppt in pulses of less than 7 days (Fraser et al. 2006)
 - Coon's Tail can survive 12ppt for 7 days (Hinojosa-Garro et al. 2008)

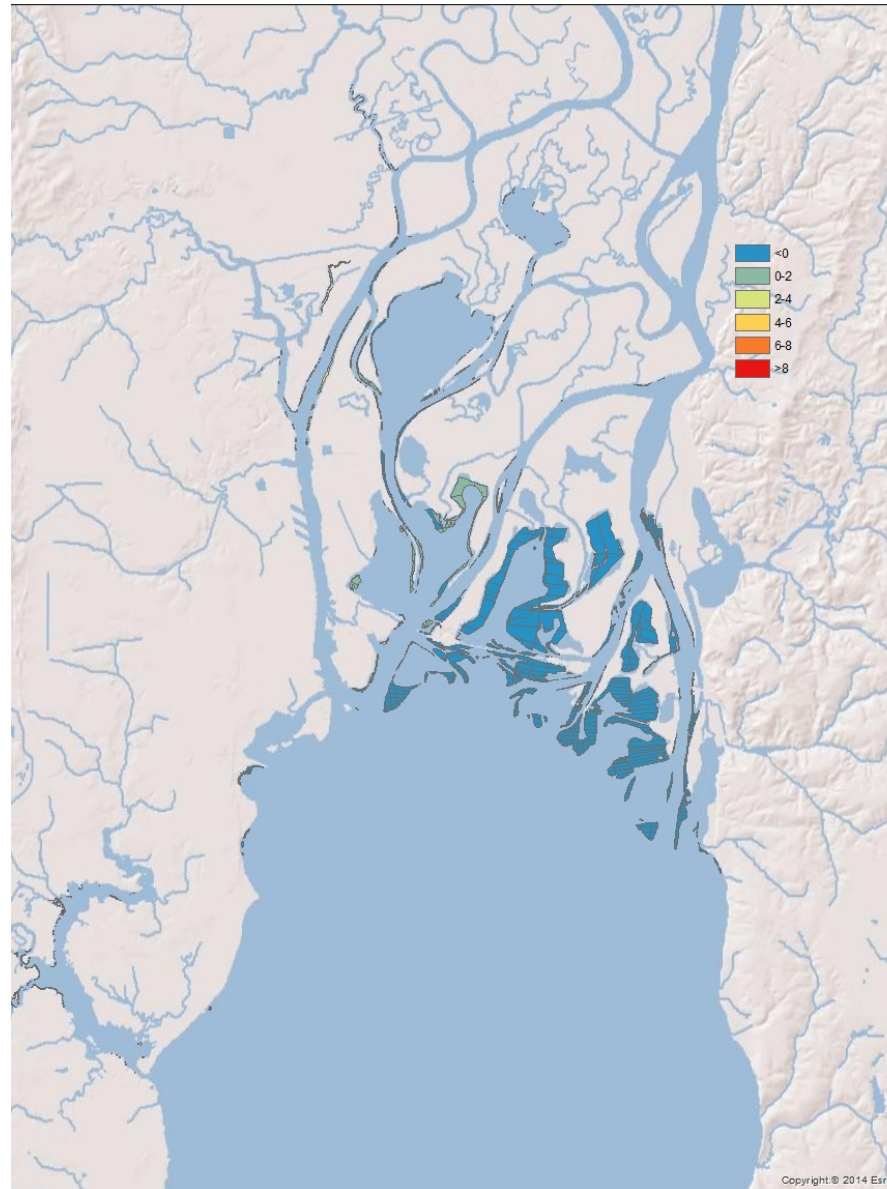


MOBILE HARBOR GRR

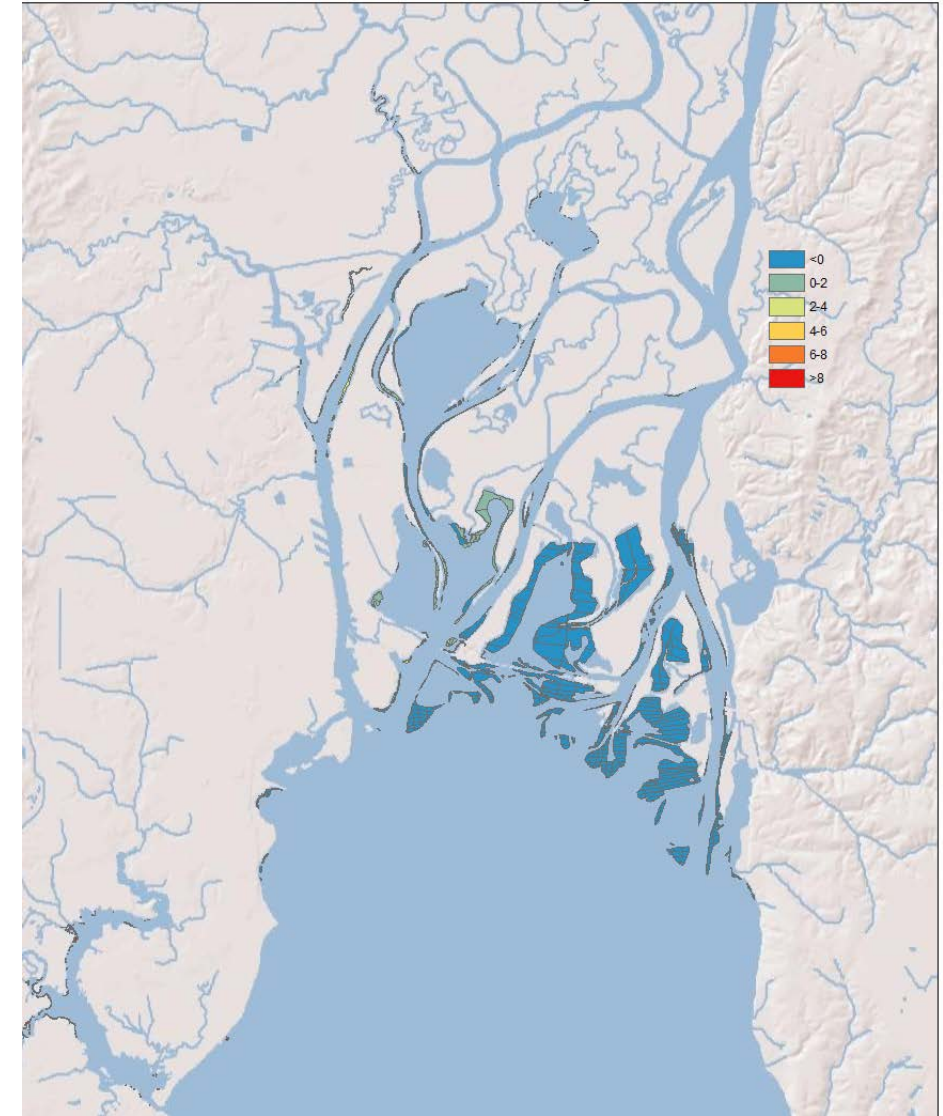
AQUATIC RESOURCES ASSESSMENT - SAV

SLR Baseline

Under 0.5 meter sea-level rise scenario, No major differences seen between baseline and post-project conditions.



SLR With Project



MOBILE HARBOR GRR

AQUATIC RESOURCES ASSESSMENT - OYSTERS

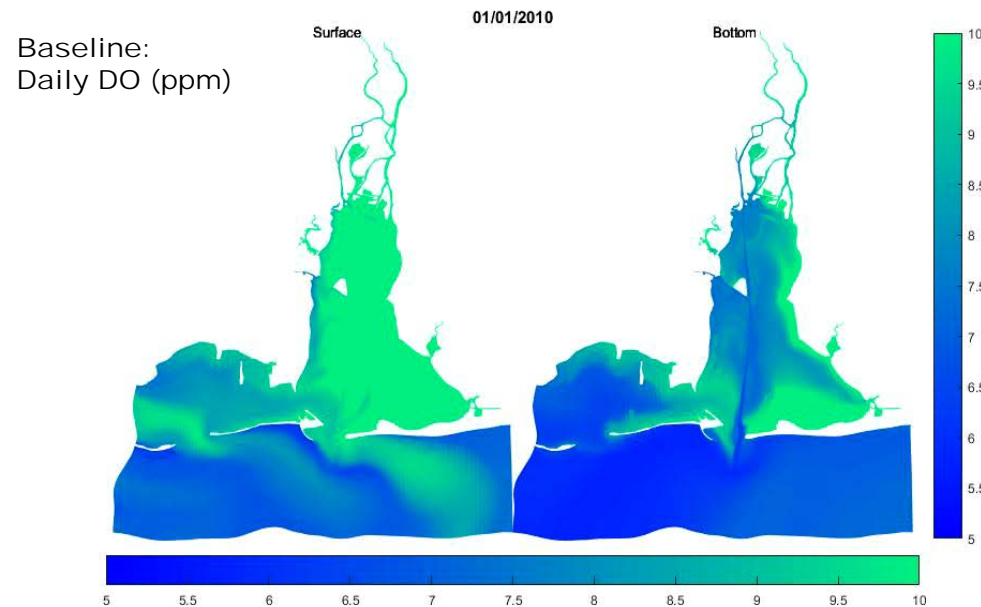
Assessment approach:

Integrated hydrodynamic, water quality, and oyster behavior models

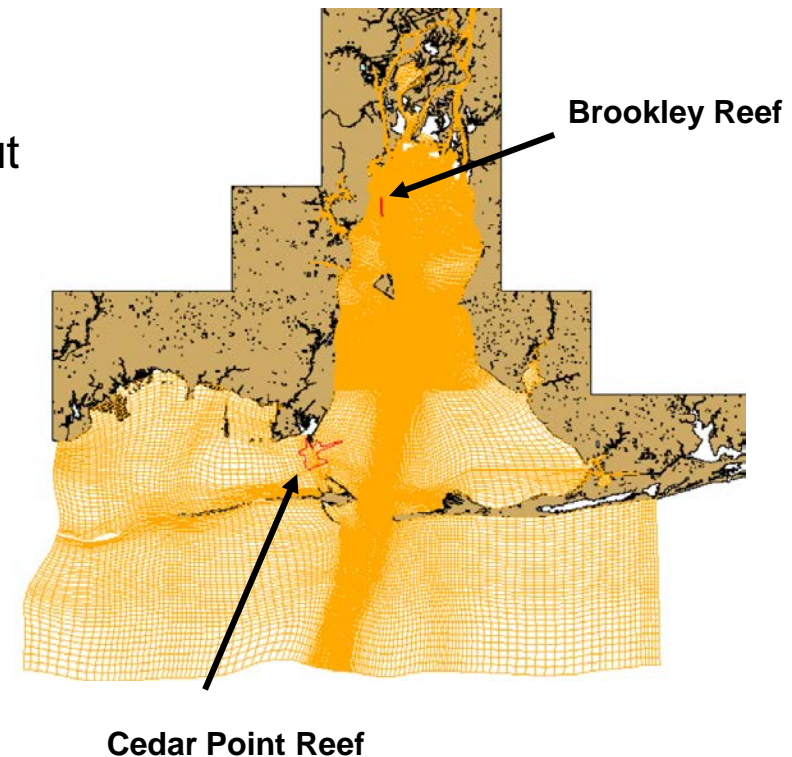
Completed oyster particle release and fate simulations

Determined potential oyster mortality

Modeled larval particles potentially flushed out of Mobile Bay



Oyster Larvae Tracking Domain



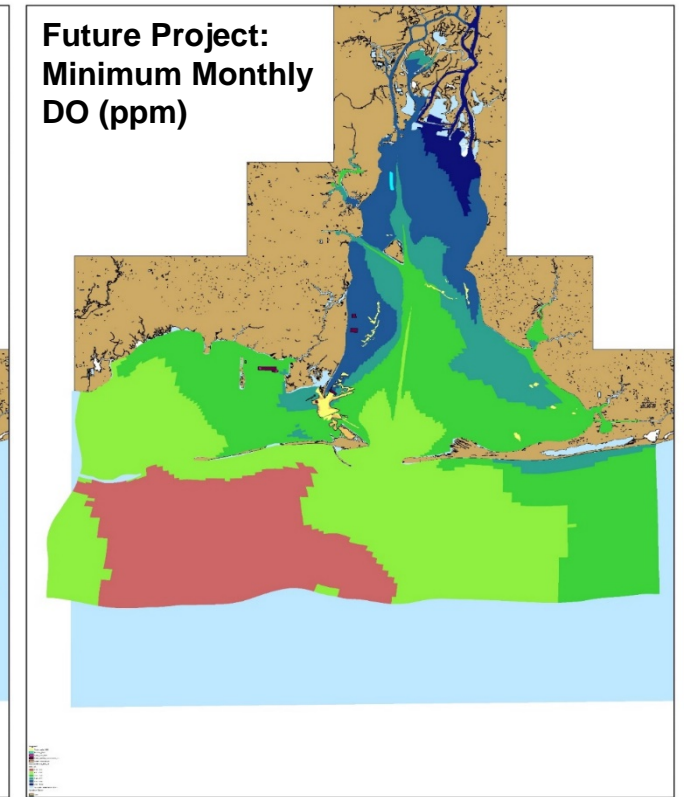
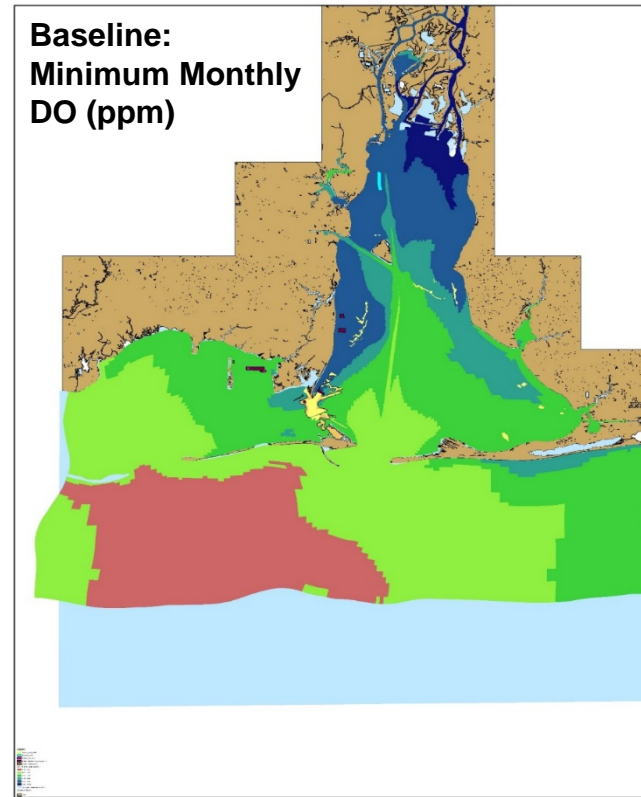
MOBILE HARBOR GRR

AQUATIC RESOURCES ASSESSMENT - OYSTERS

Assessment results:

Dissolved oxygen levels stay well above minimum oyster tolerances under post-project conditions

Oyster larvae particle tracking model displays zero mortality under all scenarios



	Number of Runs	Number of Oyster Larvae Deaths
Baseline	5	0
Project	5	0
Baseline (SLR)	3	0
Project (SLR)	3	0

MOBILE HARBOR GRR

AQUATIC RESOURCES ASSESSMENT - OYSTERS

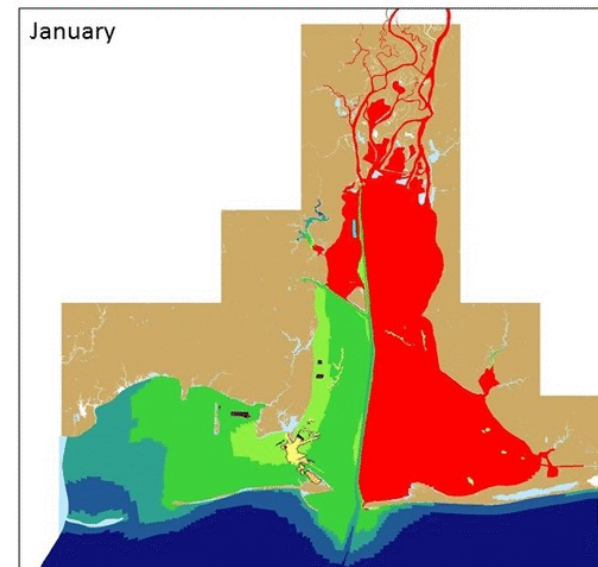
Assessment results:

Salinity data from all scenarios within minimum and maximum oyster tolerance thresholds post-project

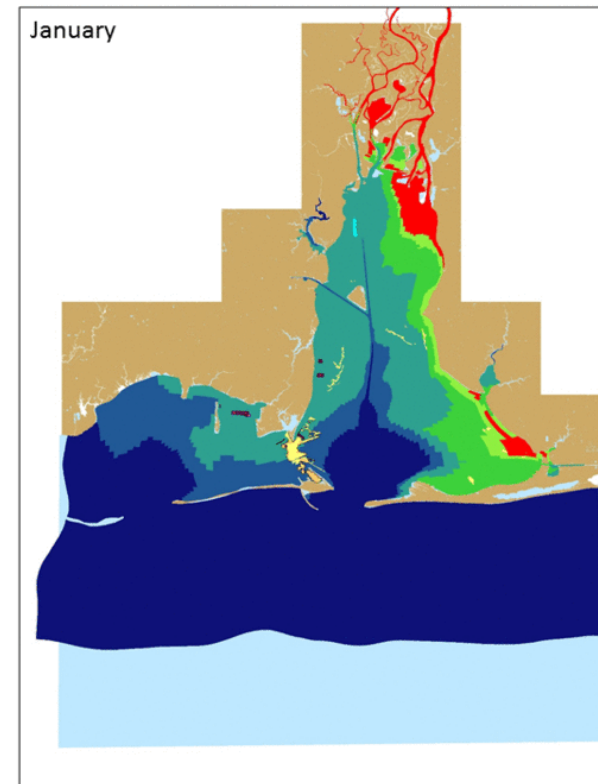
Sea-level rise scenario also predicts no oyster mortality

Oyster model predicts no increase in larvae flushing

Scenario	Particles released	Particles flushed	Particles attached	Particle mortality
Baseline	42	1	41	0
Baseline with sea level rise	42	0	42	0
Post-project	42	1	41	0
Post-project with sea level rise	42	0	42	0



Minimum salinity post-project



Maximum salinity post-project

MOBILE HARBOR GRR

AQUATIC RESOURCES ASSESSMENT - BENTHIC INVERTEBRATES

Assessment approach:

Sampling:

- Benthic samples (n = 240) taken in freshwater, transitional, and upper bay habitats in the fall and spring
- All individuals sorted and identified

Analysis:

- Statistical tests examined whether benthic macrofauna differed among habitat types,
- Tests determined how macrofauna were related to salinity,
- Locations of changes in macrofauna communities were identified.

Interpretation:

- Salinity changes due to deepening project were modeled for each benthic station
- Potential changes to macrofauna distributions were determined for fall and spring

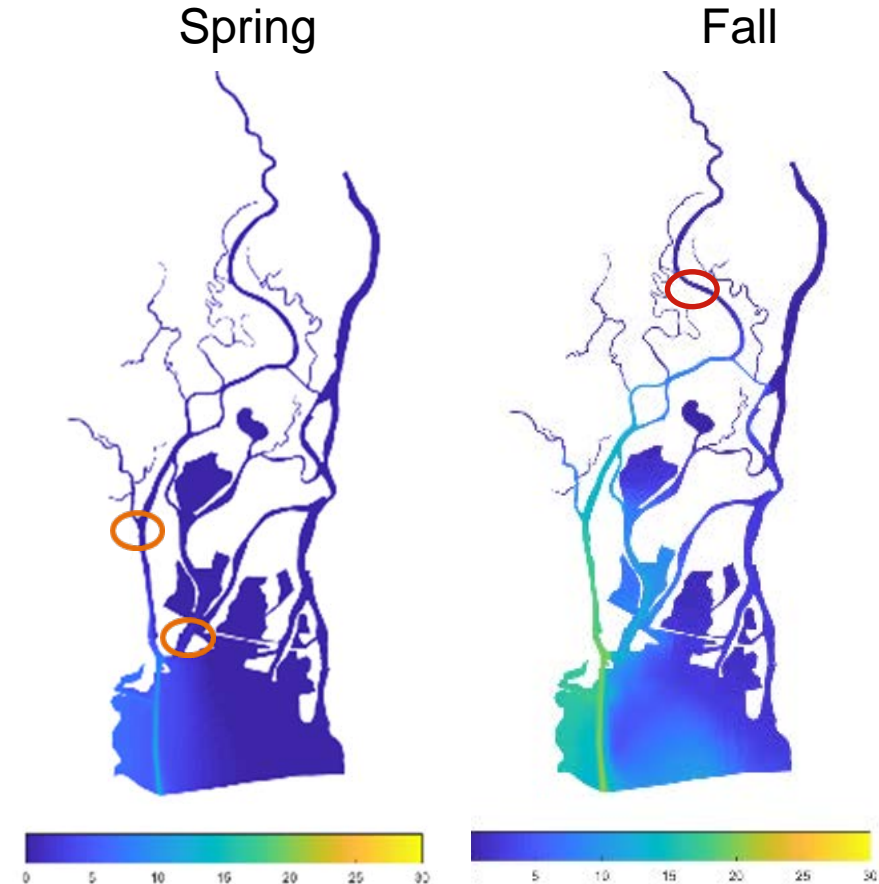


MOBILE HARBOR GRR

AQUATIC RESOURCES ASSESSMENT - BENTHIC INVERTEBRATES

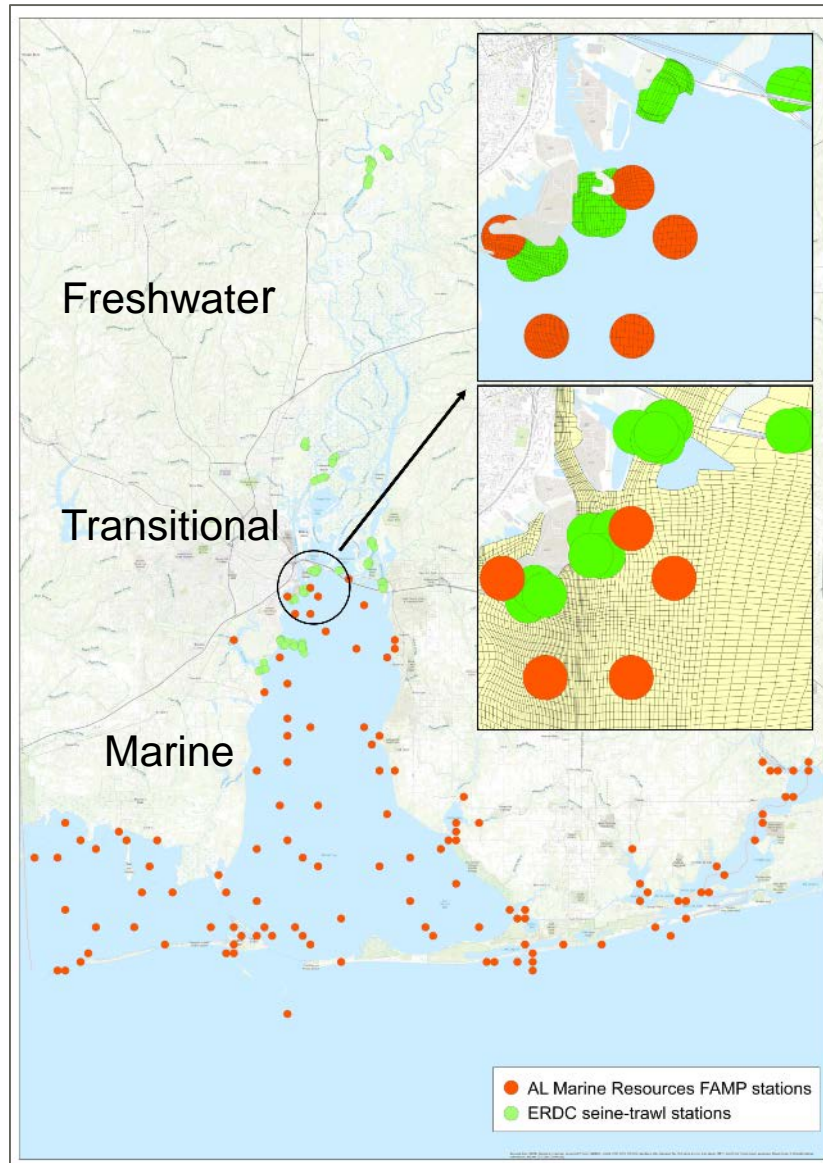
Assessment results:

- Habitats with a saltwater influence are dominated by polychaete worms.
- Freshwater habitats are dominated by oligochaete worms and insects.
- Degree of freshwater inputs dictates species transition locations
- Model results suggest the locations of a transition to a freshwater benthic community (orange ovals) will remain similar to baseline conditions.
- Impacts to higher trophic levels (e.g., fish) via prey availability appear negligible because prey distributions are unlikely to be affected.



MOBILE HARBOR GRR

AQUATIC RESOURCES ASSESSMENT - FISH



Assessment approach:

Distribution of fisheries assessment and monitoring program (FAMP) stations sampled by AL Marine Resources (2005-2015).

FAMP data supplemented with ERDC sampling in bay, delta, and river habitats (2016-2017).

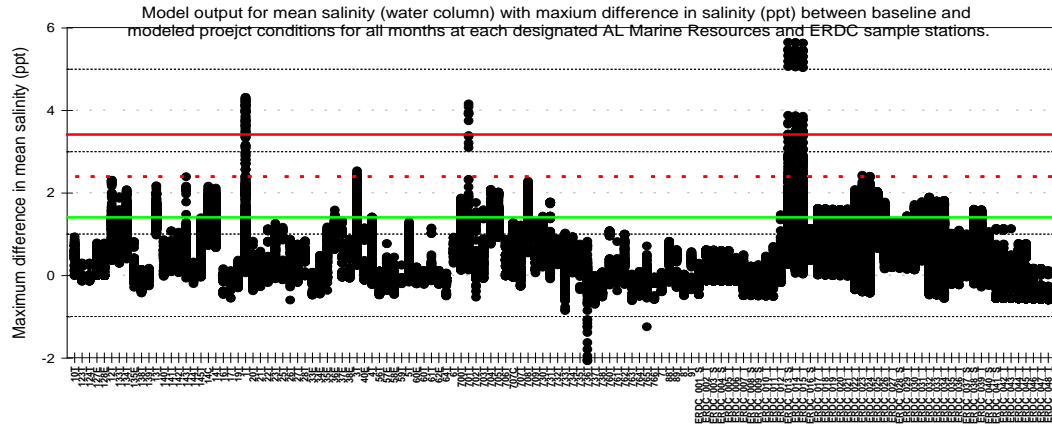
Stations plotted with 500 m buffer in ArcMap and layered with model grid for bottom and mean salinity values.

Intersecting cells from model grid and station buffer were extracted for evaluation.

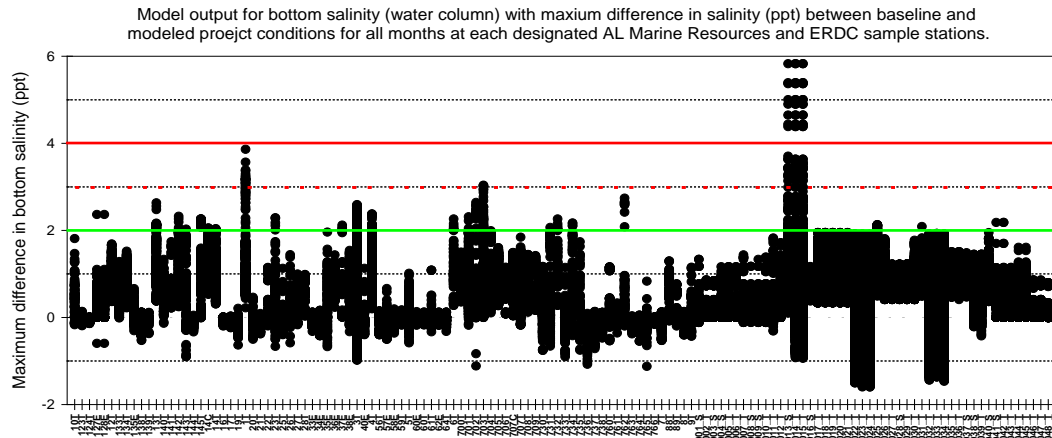
98,000 individual fish, 140 species in assessment database

MOBILE HARBOR GRR

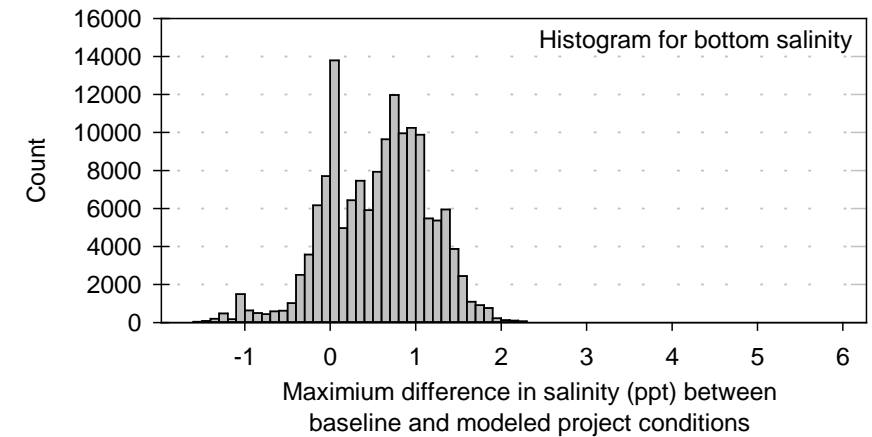
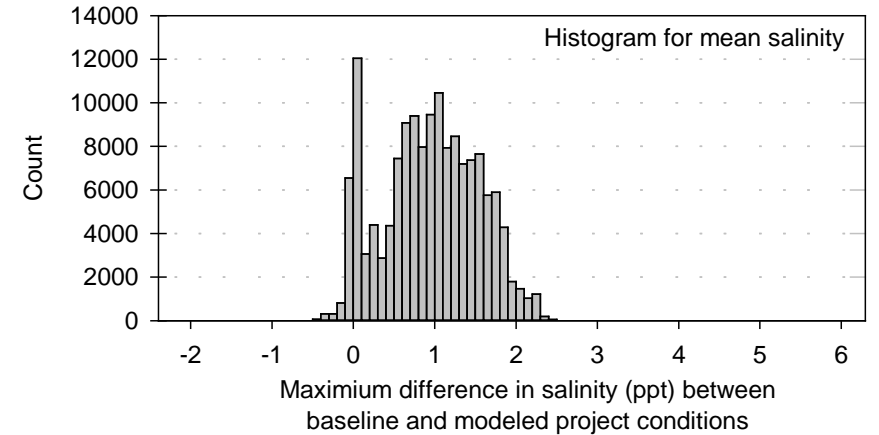
AQUATIC RESOURCES ASSESSMENT - FISH



Station and Gear
(Trawl/Seine)

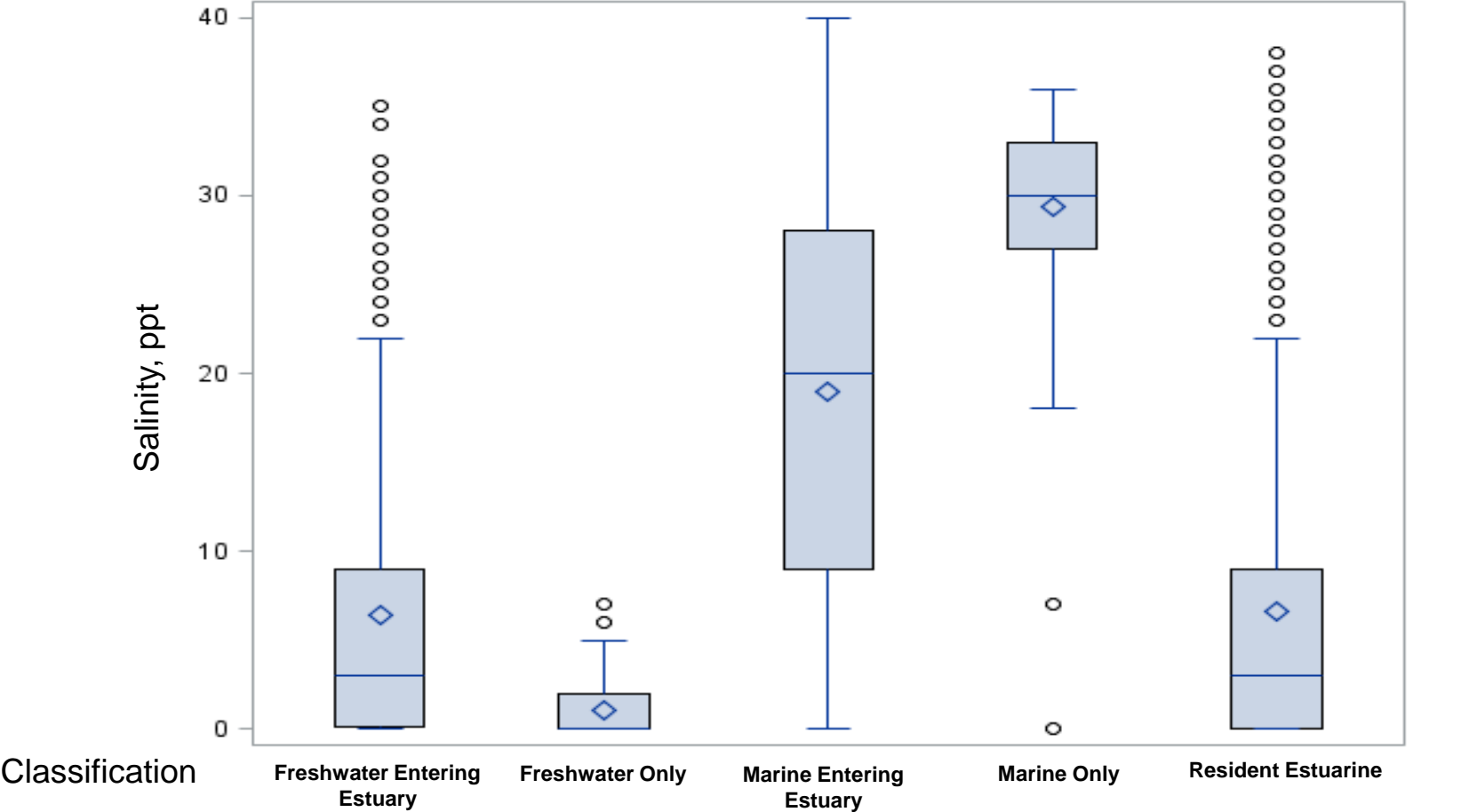


Station and Gear
(Trawl/Seine)



Aquatic resource assessment - Fish

Weighted Distribution of Salinity by Tolerance Classification



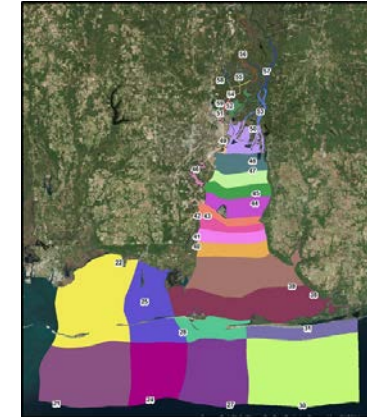
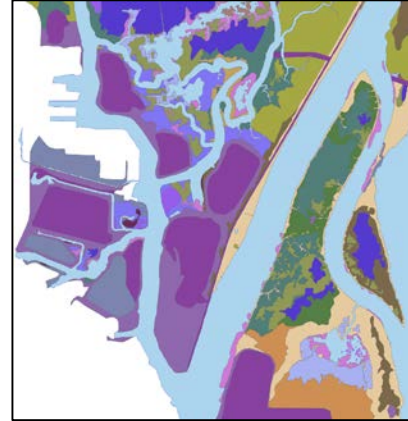
MOBILE HARBOR GRR AQUATIC RESOURCES ASSESSMENT - SUMMARY

Baseline resources identified across five aquatic resources

Water quality thresholds established

No major impacts (i.e., loss of resources) anticipated under post-project conditions

Project impacts remain negligible under 0.5 meter sea level rise scenario

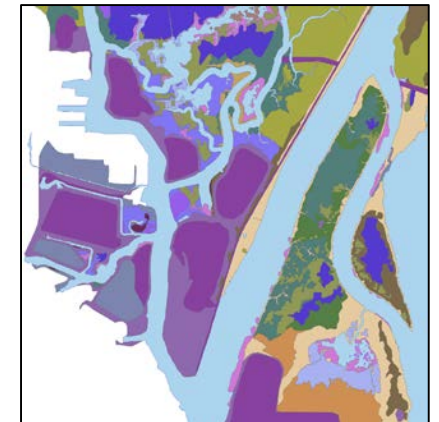
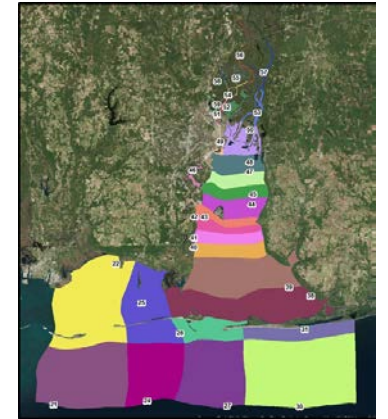


US Army Corps
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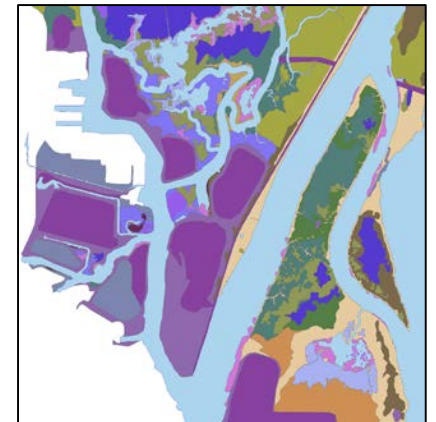
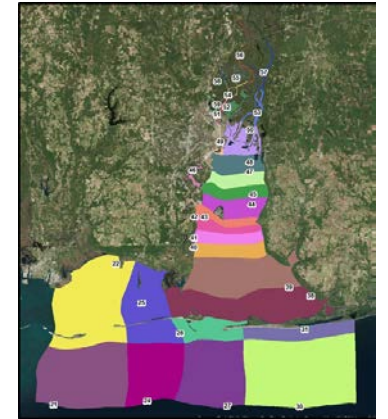
MOBILE HARBOR GRR MITIGATION DISCUSSIONS

- Mitigation planning three major steps
 - Avoid Impacts, reduce Impacts, replacement/Compensation
- Mitigation can include
 - Restoration, enhancement, establishment, and preservation
 - Should offset impacts, be practicable, and environmentally preferable
- Hierarchy for mitigation alternatives
 - Mitigation Bank credits
 - In-Lieu fee program credits
 - Mitigation under a watershed approach
 - On-site mitigation
 - Off-site mitigation
- Should the determination be made that a project does not require mitigation:
 - State that no mitigation required because adverse effects of the project on resources are negligible
 - Provide rationale for determination



MOBILE HARBOR GRR MITIGATION DISCUSSIONS

- No major impacts (i.e., loss of resources) anticipated under post-project conditions
- Wetlands
 - Potential for minor vegetation shift in some wetlands based upon short term productivity reduction
- SAVs
 - Potential with project impacts due to increased salinity (invasive species)
 - Potential shift in species composition (short term)
- What level of impacts will require mitigation?
- 404 Regulatory Process
 - Beyond the scope of what would be considered routine impacts (filling, clearing, draining or converting from one wetland form (forested) to another (emergent))
- Impacts here are potential of minor shift or reduction in productivity
 - Not captured by any SAD District Regulatory Mitigation Standard Operating Procedure





DEPARTMENT OF THE ARMY
MOBILE DISTRICT, CORPS OF ENGINEERS
P.O. BOX 2288
MOBILE, ALABAMA 36628-0001

REPLY TO
ATTENTION OF:

CESAM-PD-EC

14 February 2017

MEMORANDUM FOR RECORD (MFR)

SUBJECT: Agency Beneficial Use Sub-group Webinar for Mobile Harbor General Reevaluation Report (GRR) Consideration of Beneficial Use Alternatives

1. On January 5, 2017 the U.S. Army Corps of Engineers (Corps), Mobile District hosted an agency beneficial use (BU) sub-group meeting/webinar for the Mobile Harbor GRR. As a follow up to the BU subgroup webinar held May 17, 2016, the study is at a point where the beneficial use options are being refined, especially those that can be considered as part of the project least cost alternatives. The purpose of the webinar was to discuss those potential placement options that factor into the least cost options, specifically placement in the historic oyster shell mining areas and the Sand Island/Pelican Island complex, both of which were included as potential BU options at the May 17, 2016 meeting. The status of the other options were also addressed.

The meeting participants included representatives from the following agencies:

- U.S. Army Corps of Engineers, Mobile District
- U.S. Army Corps of Engineers Corps, Engineer Research and Development Center (ERDC)
- Alabama State Port Authority (ASPA)
- Alabama Dept. of Environmental Management (ADEM)
- Alabama Dept. of Conservation and Natural Resources (ADCNR), State Lands Division
- Environmental Protection Agency (EPA)
- National Marine Fisheries Service (NMFS)

A list of the BU sub-group participants and the slides presented during the webinar are attached.

2. The meeting opened with a round of introductions from the meeting participants. To open discussions, a summary of potential dredged material volumes were presented in order to put the potential volumes in perspective. The lower and upper volume bounds were presented for the Mobile River, Mobile Bay, and Mobile bar channel reaches. In summary, the total combined volumes could be as little as 13.7 million cubic yards (MCY) for the lower bounds and as much as 37.2 MCY for the upper bounds. A break

out of the sediment type for each of the reaches can be found in the attached presentation slides. A question was raised on the sand quantities and what data set was used to derive the volume information? The material percentages and classifications were derived from a number of investigations conducted by the Corps, Mobile District dating back to 1964. The investigations consisted of both vibracore and standard penetration test (SPT) sampling. Visual and lab classifications were used to make the determination on material type and information from the SPT sampling were used to gage the density of the material. The term “sand” encompasses anything that was greater than 50% sand and includes silty sands, clayey sands, and clean sands. Within some areas, the sediment exhibited interbedded layers of clay which may make it difficult segregate the material in the dredging process. The historical data show that the upper bay has a consistent layers of sand which includes silty and clayey sands in the upper layers and becomes more of clean sand with depth. This most consistent stretch of material, which is predominantly soft clays spans from the middle bay down to the lower bay.

3. The meeting continued with a list of beneficial use options that were identified by the BU subgroup during the May 17, 2016 webinar which can be reviewed in the attached presentation slides. At that point, the Corps identified the oyster shell mining areas in the upper bay and Sand Island/Pelican Island complex as the beneficial use options evaluated as the preferred dredged material placement options. These sites were chosen as they have the greatest placement capacity that can also be considered as a potential least cost alternative. As presented in the attached slides, potential beneficial use areas were identified in the areas where fossilized oyster shell mining occurred prior to 1982. The potential placement areas were where laid out in sections where there were disturbances with 15-foot depths or greater based on surveys from 1960/61 and 1984/87. These areas are believed to become hypoxic during summer conditions as discussed during the May 17, 2016 meeting. Assuming a layered placement in these areas, it has been calculated that there is capacity of approximately 8.74 MCY. Existing depths at these potential sites generally range from 10 to 14 feet.

With the oyster mining area being considered as a potential BU placement area, the area was incorporated into benthic sampling being conducted. The map presented in the attached slides lays out benthic sampling locations with in the middle bay region where the shell mining occurred. Samples were laid out at locations in areas where there was known disturbance of the bay floor. The primary focus of impacts were in the areas chosen based on proximity to channel, dredge cut depth greater than 20 feet and at least 4 data points greater than 20 feet for spatial extent. Control sites were placed in two areas which did not exhibit disturbance of the bay bottom based on review of the 1960/61 and 1984/87 surveys. Other areas were gridded generally following the grid pattern selected for the benthic study. Sampling was conducted this past summer/fall to establish a baseline of the area. The information collected is summarized in the attached slides

There were further discussions pertaining to the history of the dredged fossilized oyster shell areas. According to state and federal records the first permit allowing commercial

dredging of fossilized oyster reef shell was issued in 1946. Reports indicate that during the time period of 1947 through 1968 a total of 40 million cubic yards of shell were removed from the bay. Permitted dredging of shell deposits continued until 1982, at which time operations halted due to environmental concerns following observations that the mined areas were not filling back in at the rates predicted and that the depressions were areas containing high salinity and hypoxic to anoxic conditions.

Some questions were raised pertaining to the similarity of past placement and fill actions such as Brookley and how it compares in depth to the oyster mining areas? The depth of Brookley Hole prior to filling with dredged material from the upper Mobile Bay channel was approximately 20 to 25 feet. Unlike Brookley Hole, the region of fossilized oyster shell mining were partially backfilled during mining operations and have filled in with silts and clays over time leaving regions of depressions. In contrast, the intent Brookley Hole was direct placement of sediment to fill the hole up the elevations of the surrounding bay bottom whereas placement of new work material in the oyster shell mining areas will be done in layers over a broader area.

Issues were also discussed pertaining to the potential of mudflow resulting from placement of the new work material over areas of highly fluidized mud. It was discussed that mud flows will be dependent on the type and consolidation of the material found within the distributed areas proposed for placement of dredged material with thicknesses of 1 to 2 feet. Missouri University of Science and Technology, while testing electrical resistivity tools within an area approximately 3.1 miles east of Gaillard Island, found that the areas of mining had been filled in with approximately 20 feet of clayey silt that was overlaid with a thin layer of approximately 3 feet of clay. Recent observations made this fall by the Corps, while conducting probing and grab samples in some of the areas with the largest disturbance (20 feet or greater), found one prominent area where there was little resistance to penetration. In this region the team was unable to find the bottom of the hole. In this area we may need to avoid direct placement over the region of greatest disturbance to prevent the possibility of mud flow. It should be understood that placement would not be conducted in a manner that would target the holes specifically, but would be conducted in layers over larger areas which is believed to minimize the potential of mud flows.

4. Another potential BU opportunity that factors into the project least cost alternatives involves returning sandy material to the Sand Island/Pelican Island complex. The group recommended during May 17, 2016 meeting that this action be considered particularly using the predominantly sandy material removed during any widening or deepening of the entrance channel. This option would involve optimizing placement areas accelerating the return of sediment for maintenance of the Sand Island/Pelican Island complex which in turn may provide downdrift sediment transport to Dauphin Island. The presentation slides shows historic placement sites in this area and their potential capacities for this action. The Mobile Harbor GRR will leverage information derived from tools being developed under the current Nation Fish and Wildlife Foundation (NFWF) study which will help inform optimized placement areas. Work being conducted under NFWF includes development of a sediment budget using updated

topographic/bathymetric change maps (baseline is Byrnes et al., 2010 & 2012) highlighting new regions of erosion/deposition as well as volumetric change and sediment transport pathways. The study is also evaluating hydrodynamic and morphological change utilizing a Delft3D model being developed by the USGS under NFWF to conduct a comprehensive analysis of waves, tides, and sediment transport.

5. A brief status of the other BU options identified from the May 17, 2016 meeting were discussed. Although not considered as part of the least cost alternatives, the other options identified in the meeting slides have not been completely removed from consideration. However, if not part of the least alternatives for the study at this point, additional BU actions must be conducted either under separate authorities with a co-sponsor for costs above normal dredging, or funded as part of another existing project, or an action that may be considered as part of satisfying mitigation requirements, if applicable. The Corps will be coordinating with agencies and other stakeholders and is open to any existing and ongoing projects that may be applicable as BU options

A question was raised to what are the limiting distances and other factors that would make a particular option considered to be uneconomical? One criteria is the distance that sediment needs to be transported to a BU site. When pumping material through the use of cutter head dredges, 5 miles is a reasonable distance. After that, a booster pump must be used which increases the dredging and placement costs. Another criteria considered is containment of the sediment. Having to construct containment structures to accept BU material drastically increases the cost of a BU action. Such measures may be justified under different authorities to cover additional costs for potential mitigation requirements if found necessary.

7. In closing discussions, Corps representatives asked the group that considering the information presented and discussions during this meeting, does the BU subgroup feel that the assumptions being made to progress the study are valid towards meeting dredged material placement and BU objectives?

ADEM expressed that the agency is not opposed to those options that keep the sediment in the natural system, but still encourages the consideration of the other options that have been identified.

NMFS suggested that the Corps remain open to options such as using clays to build up elevations and capping with coarser material in the context of oyster restoration.

The EPA stated that they are likely to require grain size information at placement sites and new work material, total organic contentment (TOC), as well as other sediment quality information. The Corps responded that grain size and TOC information is already being collected as part of the benthic study. Limited grain size information is also available for the new work material from the previous authorization studies.

Other than the above concerns expressed, the BU subgroup did not provide any further objections to the assumptions and direction the project is moving to satisfy the placement of dredged material and BU objectives.

8. Please address any questions, comments, or concerns pertaining to this meeting to Larry Parson at (251) 690-3139 or larry.e.parson@sam.usace.army.mil.

/s/ Larry Parson
U.S. Army Corps of Engineers, Mobile District
Coastal Environment Team
Planning and Environmental Division

Mobile Harbor GRR Beneficial Use (BU) Sub-group Webinar Participants

Larry Parson – U.S. Army Corps of Engineers, Mobile District
Jennifer Jacobson - U.S. Army Corps of Engineers, Mobile District
Elizabeth Godsy - U.S. Army Corps of Engineers, Mobile District
Nathan Lovelace - U.S. Army Corps of Engineers, Mobile District
Ashley Kleinschrodt - U.S. Army Corps of Engineers, Mobile District
David Newell - U.S. Army Corps of Engineers, Mobile District
LeKasha Reynolds - U.S. Army Corps of Engineers, Mobile District
Joe Paine - U.S. Army Corps of Engineers, Mobile District
Joe Givhan - U.S. Army Corps of Engineers, Mobile District
Ashley Kleinschrodt - U.S. Army Corps of Engineers, Mobile District
Jacob Berkowitz - Engineer Research and Development Center
Bob Harris – Alabama State Port Authority
Scott Brown - Alabama Dept. of Environmental Management
Allen Phelps - Alabama Dept. of Environmental Management
Rusty Swafford – National Marine Fisheries Service
Lena Weiss – U.S. Environmental Protection Agency
Dan Holliman – U.S. Environmental Protection Agency

Mobile Harbor GRR Beneficial Use Subgroup Meeting

U.S. Army Corps of Engineers, Mobile District
January 5, 2017

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Today and Tomorrow*

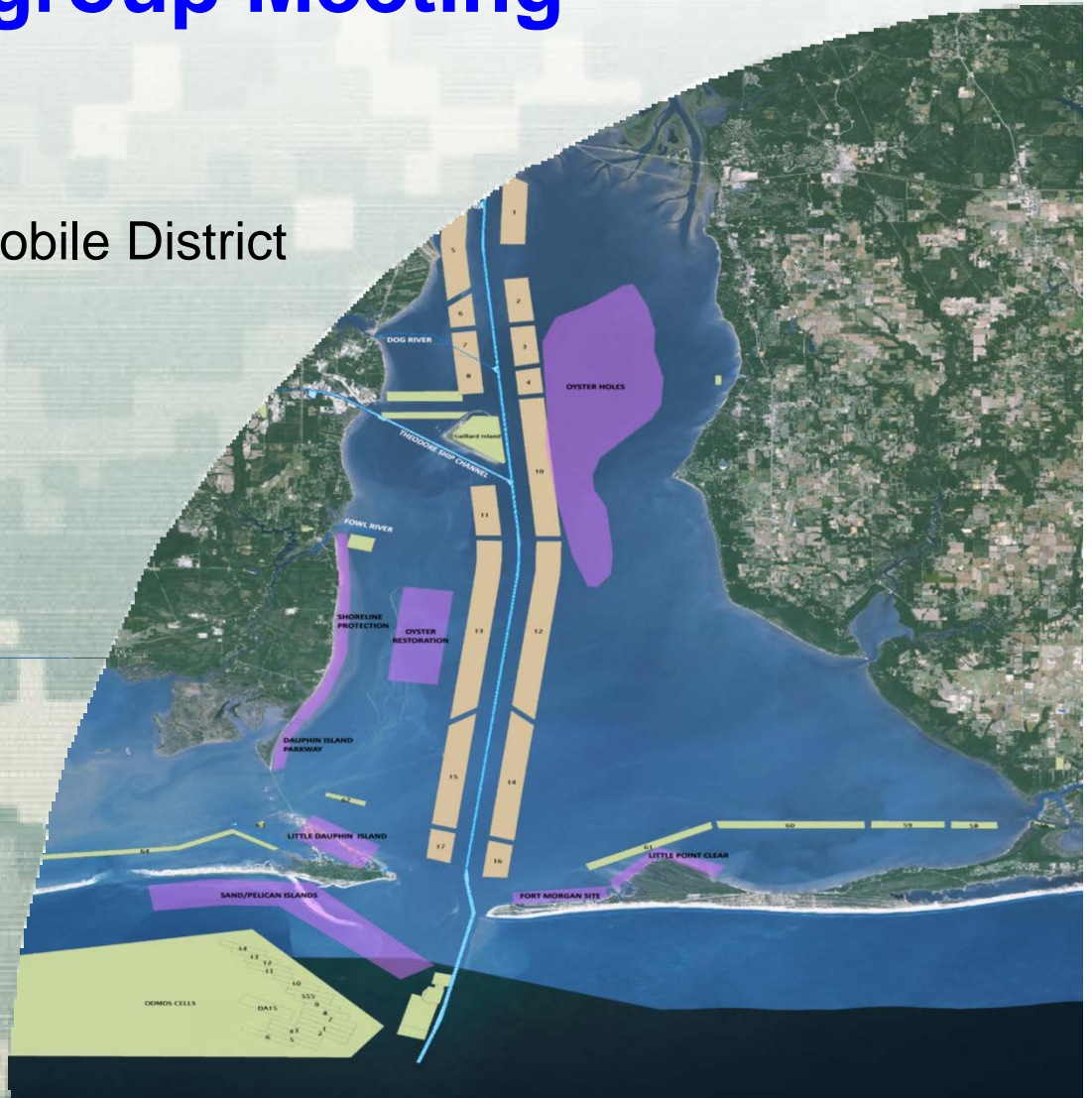


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MOBILE HARBOR GRR



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Potential New Work Volume (CY)	General Classification of Material Type	Mobile River Reach	Mobile Bay Reach	Mobile Bar Reach
Lower Bound	Sand	140,000	2,789,000	1,151,000
	Firm Clay	16,000	411,000	1,087,000
	Soft Clay	0	6704000	1405000
	Total	156,000	9,904,000	3,643,000
Upper Bound	Sand	382,000	8,422,000	2,770,000
	Firm Clay	42,000	1,961,000	2,970,000
	Soft Clay	0	16956000	3726000
	Total	424,000	27,339,000	9,466,000

Note: All values shown are general rough order magnitude estimates for purposes of initial alternative screening only and are subject to change. The lower bound assumes a minimum 2 ft of deepening and the upper bound assumes a 7 ft of deepening.

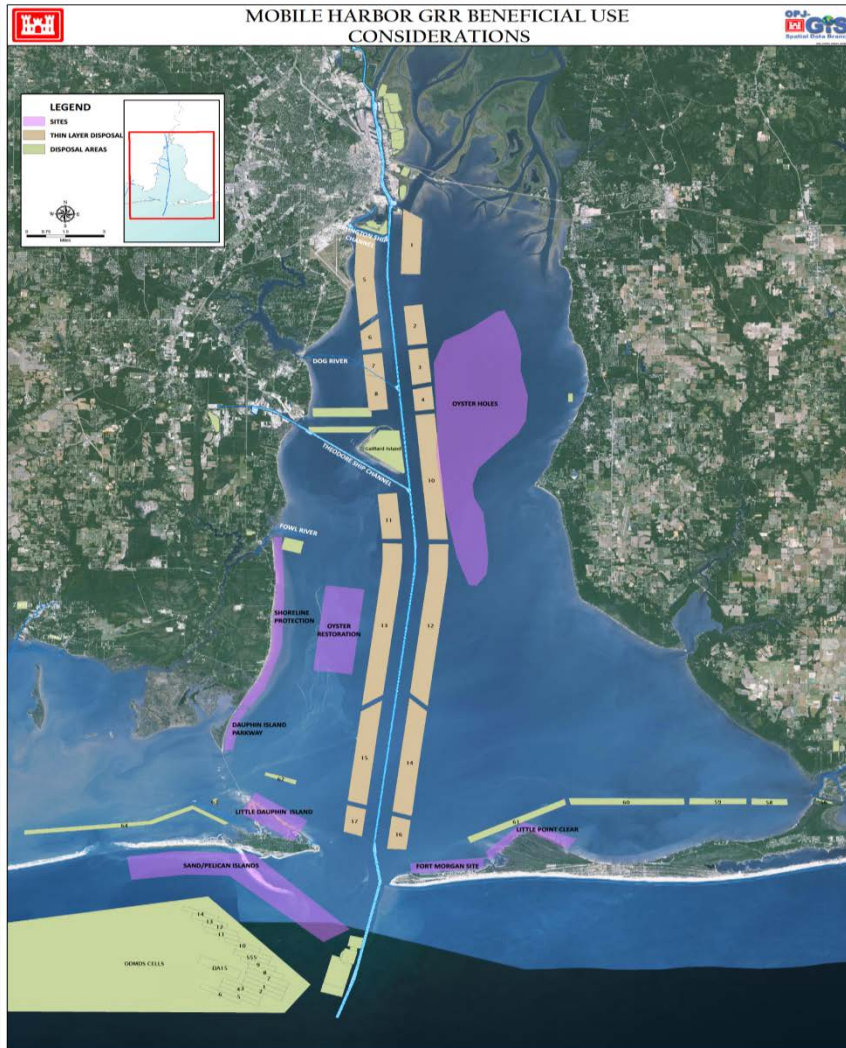
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BU Options - Summary



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- Fort Morgan Peninsula – north shore
 - Owned by Alabama State Historic Commission
 - Restore to historic dimensions
- Sand Island/Pelican Island Complex
 - Return sandy material to littoral system
- Little Dauphin Island and Little Point Clear
 - Bon Secour National Wildlife Refuge
 - Protect and conserve sensitive habitats
- Dauphin Island Causeway
 - Natural shoreline associated with protection of roadway
- Creation of in-bay/nearshore reefs or containment structures
 - Use of cohesive clay material - chunks
- Thin-layer placement to reduce hypoxia
 - Areas of oyster shell mining operations
- Use if existing thin-layer placement sites
 - Already considered environmentally acceptable for maintenance material

POTENTIAL BENEFICIAL USE SITES FOSSILIZED SHELL MINING AREAS



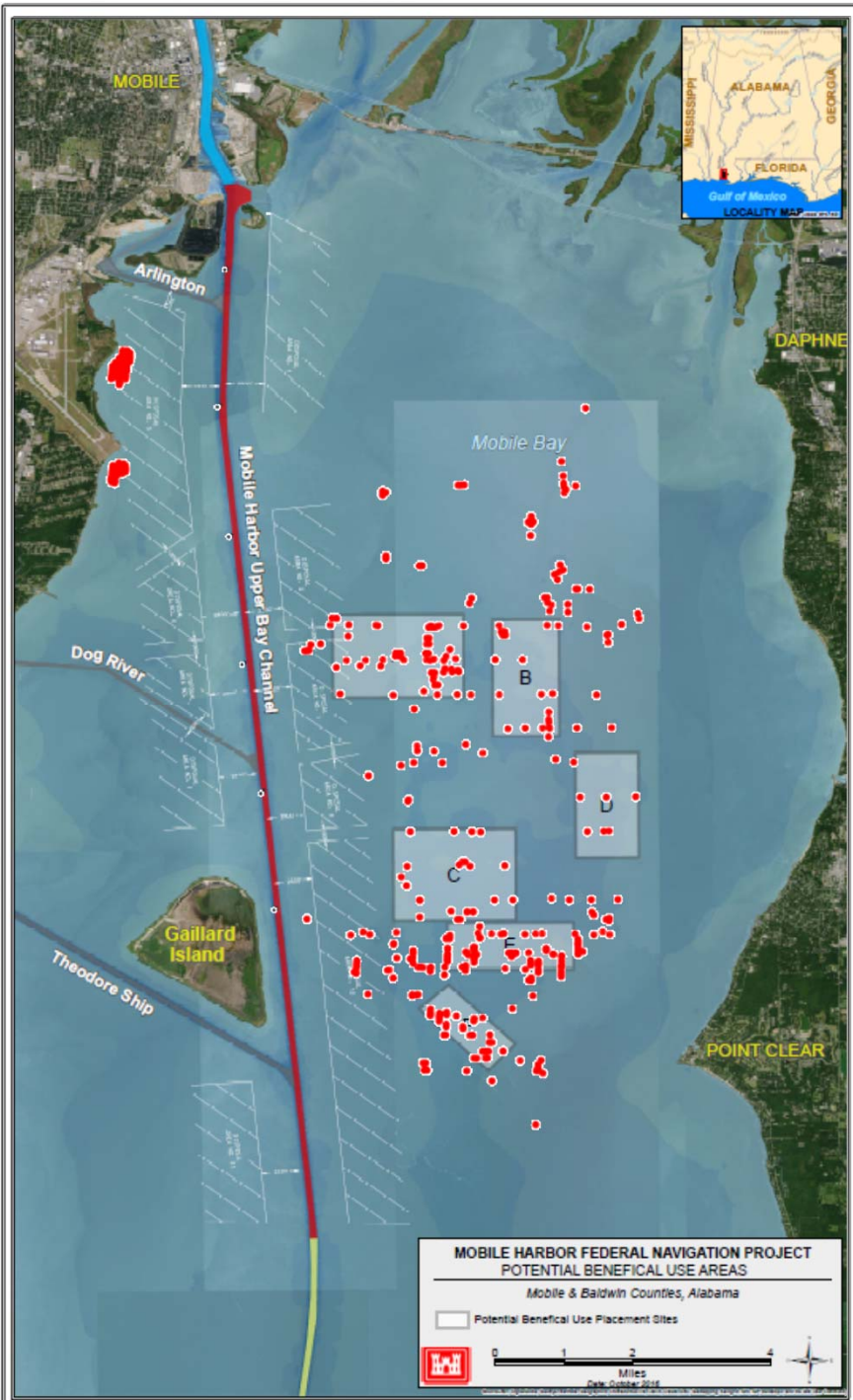
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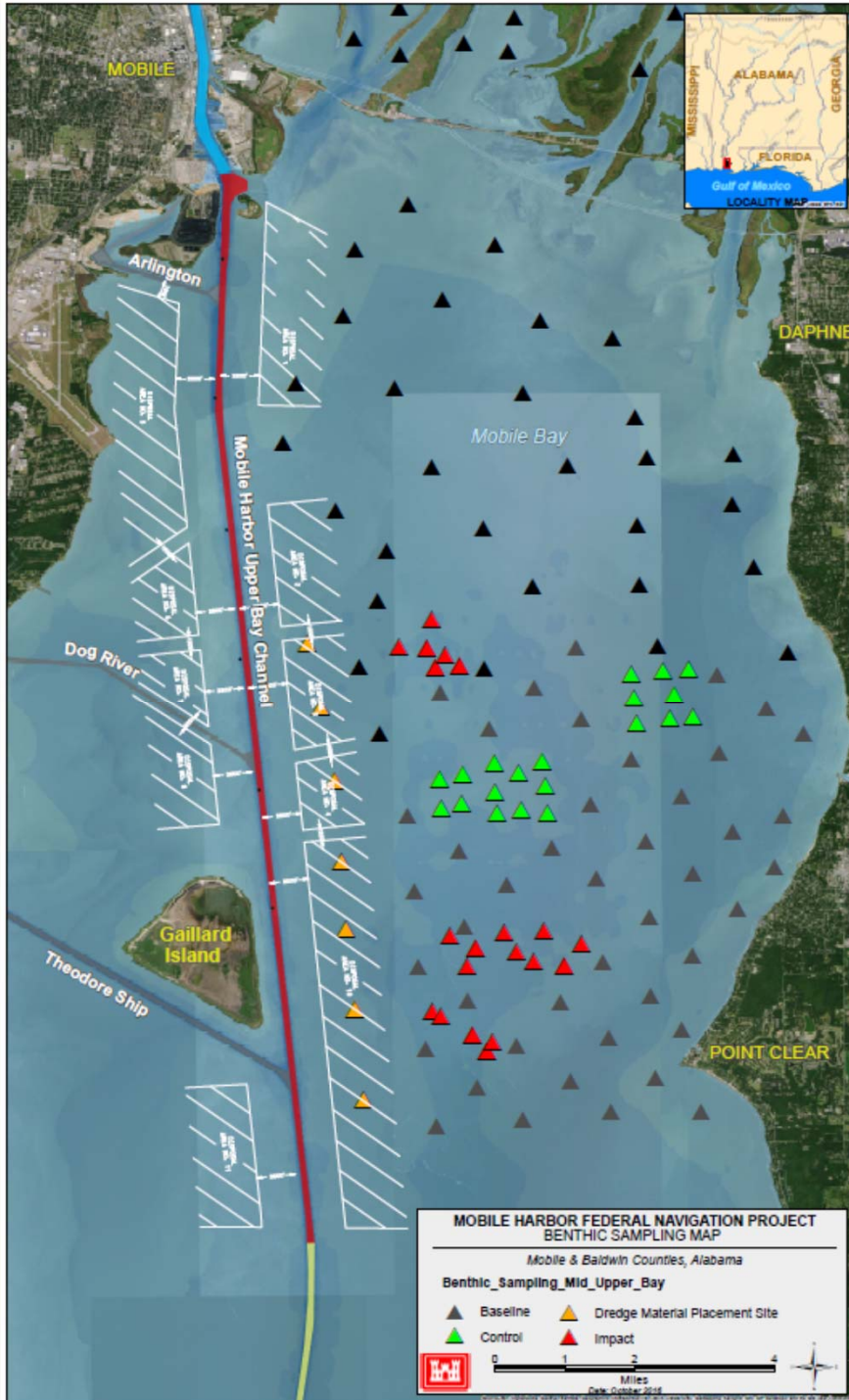
**Placement Volume (cy)
Placement Thickness
assumed 1 foot**

	Area (acres)	Placement Volume (cy)
A	1281	2,067,000
B	920	1,484,000
C	770	2,106,000
D	1306	1,243,000
E	702	1,133,000
F	403	650,000
Total	5382	8,683,000

Note: All values shown are general rough order magnitude estimates for purposes of initial alternative screening only and are subject to change.

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BENTHIC SAMPLING



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- Benthic invertebrates were sampled during the fall of 2016.
- 90 samples were collected in the mid region of the bay and 30 samples in the upper region of the bay.
- Water quality vertical profiles (surface to bottom) were collected at each sampling station. Dissolved Oxygen (mg/l), Temperature (°C), pH, Salinity (ppt), Specific Conductance (uS/Cm @ 25C), and Depth (m) were measured with a Hydrolab M S5 Sonde manufactured by Hatch Corporation.
- Surface sediment and Benthic communities were collected with a Ponar Sampler, or 'Grab Sampler.
- Samples are being processed based on currently accepted practices in benthic ecology (e.g. Holme and McIntyre, 1971) and on specific protocols described in the EMAP-E Lab Methods Manual (U. S. EPA 2001; 1995).

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HISTORIC SAND ISLAND/EBB SHOAL PLACEMENT SITES



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	Area (acres)	Estimated Site Capacity 2015*
Sand Island		
Light house	200	1,500,000
Feeder Berm	100	2,000,000
Feeder Berm II	350	4,000,000
Sand Island BU	600	10,000,000
Total	650	5,500,000

Note: All values shown are general rough order magnitude estimates for purposes of initial alternative screening only and are subject to change. Capacity assumes sites can be filled to -10 ft MLLW outside of the lighthouse area which assume previous 2011 placement volume. Optimized placement zone for new work material will be determined based on capacity, updated sediment budget analysis, hydrodynamic and sediment transport modeling and costs.

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Other Site Considerations



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- If not part of the least alternatives for the study:
 - ▶ Must be conducted under separate authority with co-sponsor for costs above normal dredging costs, or
 - ▶ Could be conducted and funded as part of another existing project, or
 - ▶ Could be considered under mitigation requirement if applicable



DEPARTMENT OF THE ARMY
MOBILE DISTRICT, CORPS OF ENGINEERS
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MOBILE, ALABAMA 36628-0001

REPLY TO
ATTENTION OF:

CESAM-PD-EC

2 March 2017

MEMORANDUM FOR RECORD (MFR)

SUBJECT: Teleconference between the U.S. Army Corps of Engineers (Corps), Mobile District and EPA Region 4 on Beneficial Use (BU) Sediment Suitability and Cumulative Impacts for the Mobile Harbor General Reevaluation Report GRR and SEIS.

1. On January 26, 2017 the U.S. Army Corps of Engineers (Corps), Mobile District hosted a teleconference with the EPA Region 4 to discuss sediment suitability requirements for the potential BU options for the Mobile Harbor GRR. The approach for the Cumulative Impacts section for the SEIS was also addressed. The BU discussions were carry-over issues from the BU agency sub-group meeting held on January 5, 2017 where EPA expressed their concerns regarding the suitability of the dredged material being placed in the BU sites. The focus on the Cumulative Impacts approach was initiated out of the need to address concerns and issues that have been raised by a specific public coalition. The Cumulative Impacts section will be the forum for addressing their issues and concerns.

The teleconference participants from EPA Region 4 included: Dan Holliman, Calista Mills, Lena Weiss, and Ntale Kajumba. Participants from the Corps included: David Newell, Joe Paine, Elizabeth Godsey, Rita Perkins, Michael Creswell, Katherine Rooney, and Larry Parson.

2. The Corps expressed the need to revisit concerns voiced by EPA during the January 5, 2017 BU webinar where sediment suitability must be considered in the placement areas, specifically pertaining to grain size and chemical testing. EPA suggested that the Corps should follow the testing procedures according to the Marine Protection, Research and Sanctuaries Act (MPRSA) for the new work dredge material, which is used for placement criteria of material in the ODMDS that includes grain size analysis and toxicity testing. MPRSA Section 103 testing will occur on any new work and O&M sediments going to the ocean. It was acknowledged that chemical testing could be very costly and is dependent on the volume of material proposed to be dredged. It is for this reason that the Corps will determine the sediment testing needs based on the selected alternative. This will enable concentrating sediment testing efforts in the areas where dredging of new material is most likely to occur.

In addition to the chemical testing according to the MPRSA, Section 404 of the Clean Water Act (CWA) addresses suitability of sediments at disposal sites, which would apply to both the oyster shell mining areas and placement at the Sand/Pelican Island complex. Material such as that intended to be used beneficially will also need to undergo testing based on the procedures in the Inland Testing Manual (ITM). The intent of placement in the shell mining areas is not to match the dredged material to the current sediment characteristics in those areas, but rather to improve the sediment quality for enhancement of benthic communities and reduction of hypoxic conditions. However, placement of dredged material into the Sand/Pelican Island complex is intended to return similar sandy material for a more natural maintenance of the littoral sediment transport process to Dauphin Island. Placement of the sandy material in the Sand/Pelican Island complex would be done similarly to placement of maintenance material from the bar channel into the Sand Island Beneficial Use Area (SIBUA). Material placed in SIBUA has up to approximately 30% fines but is predominantly sand. The finer grained sediment is winnowed out during the dredging and placement process.

EPA's main concern with placement in the oyster shell mining area is the organic content of the sediment and the ability to support benthic recovery. EPA inquired if the Corps had any previous experience and examples of dredged sediment being placed to fill holes in Mobile Bay. The Corps pointed out that an area known as Brookley Hole is a good example of maintenance dredged material from the upper bay navigation channel that was used to fill a borrow hole. The borrow material was used during the construction of the Brookley Air Field. A baseline study and monitoring was conducted. The hole, as deep as 26 feet in the deepest portion of the basin, was filled twice to bring the bottom elevation up to the surrounding bay bottom. The intent was to alleviate hypoxic/anoxic conditions and restore the area to more productive bay bottom. A Technical Report was prepared summarizing the baseline and monitoring efforts. The Corps will provide a copy of the report to EPA.

Although placing sediment in the oyster shell mining areas is similar but not necessarily directly comparable to filling Brookley Hole, the smaller holes in the oyster shell mining areas have already filled in with fine-grained material through natural processes. However, the mining process resulted in an overall deepening of that area of the bay. The purpose of sediment placement in the oyster shell mining area is to generally raise the bed elevation in that portion of the Bay to relieve hypoxic conditions believed to exist during warm water conditions.

Another concern that was discussed was the placement of hard clay new work material into the oyster shell mining areas. The Corps expressed that only material north of the Theodore Ship Channel would be placed in the oyster mining areas. Borings from a geotechnical study from the previous Mobile Harbor reauthorization indicated that there are some hard clay present and that it would be nearly impossible to avoid all hard clay that are intermixed. The Corps will provide information from the geotechnical report to the EPA team. The Corps and EPA will continue to coordinate for the material to be placed in these areas as to clay content. The Corps also explained that because these

areas are being considered as a potential BU placement area, it was included into benthic sampling being conducted. The intent of placing the material in these areas was to improve environmental conditions and productivity of the bay bottom. Representatives from the Alabama Department of Environmental Management (ADEM) had expressed concerns that these areas exhibit hypoxia under the warm summer conditions.

Both the EPA and Corps concluded that it would be acceptable for placement of new work material from north of the Theodore Ship channel being placed in the oyster mining areas as long as efforts were made to minimize hard clay material and that proper testing of the sediments were conducted. It was suggested that EPA follow-up with the Corps after reviewing geotechnical report. The Corps will be providing the latest water quality information to EPA.

3. The remainder of the meeting dealt with the approach for the cumulative impacts section of the SEIS. Prior to the meeting, the Corps prepared a table of contents for this section and provided a copy to EPA. The focus on the cumulative impacts approach was initiated out of the need to address concerns and issues that have been raised by a specific public coalition concerning the effects of past actions on Dauphin Island. The Cumulative Impacts section will be the forum for addressing their issues and concerns. Although this study does not include the authorization to mitigate for any past impacts, this section should acknowledge effects of the navigation project from past, present, and reasonably perceived future actions. EPA advised the Corps that previous reports prepared by the Corps such as the 1978 report referenced in public comment letters should be acknowledged. EPA also recommended that the cumulative impacts section capture and acknowledge ongoing studies conducted under the Natural Resources Damage Assessment (NRDA), National Fish and Wildlife Foundation (NFWF), and RESTORE.

Letters and comments received from a component of the public were also concerned with the BU project being proposed in the upper Mobile Bay and funded under RESTORE. It was recommended that this project also be addressed in the cumulative impacts section. Past, present, and future placement activities at the SIBUA should also be acknowledged and discussed. If these elements are included in the cumulative impacts section, this may alleviate some of the concerns that the public has pertaining to impacts to Dauphin Island.

One last recommendation from EPA was to be sure that the area of impact be well defined. The Corps identified this area as all of Mobile and Baldwin Counties from the coastal regions extending north into the delta. By taking measures to incorporate the recommendations discussed during this meeting, the EPA concurred with the Corps' cumulative impacts approach.

4. Please address any questions, comments, or concerns pertaining to this meeting to Larry Parson at (251) 690-3139 or larry.e.parson@sam.usace.army.mil.

/s/ Larry Parson
U.S. Army Corps of Engineers, Mobile District
Coastal Environment Team
Planning and Environmental Division



DEPARTMENT OF THE ARMY
MOBILE DISTRICT, CORPS OF ENGINEERS
P.O. BOX 2288
MOBILE, ALABAMA 36628-0001

REPLY TO
ATTENTION OF:

CESAM-PD-EC

23 June 2016

MEMORANDUM FOR RECORD (MFR)

SUBJECT: Agency Sub-group Webinar for Mobile Harbor General Reevaluation Report (GRR) for Beneficial Use Opportunities

1. On May 17, 2016 the U.S. Army Corps of Engineers (USACE), Mobile District hosted an agency beneficial use (BU) sub-group meeting/webinar for the Mobile Harbor GRR. As a follow up to the agency meeting held for the Mobile Harbor GRR on March 31, 2016 the sub-group was established that included agency team members who indicated an interest in BU considerations. The purpose of the meeting was to begin the process of identifying realistic beneficial use opportunities associated with the proposed widening and deepening activities. The meeting participants included representatives from the following agencies:

- U.S. Army Corps of Engineers, Mobile District
- U.S. Army Corps of Engineers Corps, Engineer Research and Development Center (ERDC)
- Alabama Dept. of Environmental Management (ADEM)
- Alabama Dept. of Conservation and Natural Resources (ADCNR), State Lands Division
- ADCNR, Marine Resources Division (MRD)
- Geological Survey of Alabama (GSA)
- U.S. Fish and Wildlife Service (FWS)
- Environmental Protection Agency (EPA)
- Mobile Bay National Estuarine Preserve (MBNEP)

A list of the BU sub-group participants is attached.

2. The meeting opened with a round of introductions from the meeting participants. A brief summary of the Mobile Harbor existing and authorized channel dimensions including a table listing the focused array of potential alternatives being considered in the GRR was presented. Also included was a list of BU opportunities that was prepared by the agencies during the January 2015 Charrette and revisited in the initial December 2015 agency scoping meeting. The slides presented to the group are attached. The list of initial BU opportunities include:

- Shoreline protection measures such as living shorelines
- Oyster reef restoration
- Creation of islands
- Thin-layer placement in strategic areas to reduce hypoxia
- Thin-layer placement for marsh conservation and restoration
- Raising bottom elevation in strategic locations to promote productivity
- Strategic placement of berms for shoreline protection

The following captures specific discussions of realistic BU opportunities the group felt merits further consideration for this study.

3. Discussions of beneficial use opportunities began with an alternative that was considered during the preparation of the Limited Re-evaluation Report (LRR) for channel improvements in the lower bay navigation channel. This option considered placement of material on the northern shoreline of the Fort Morgan Peninsula just east of the western tip of Fort Morgan known to be exhibiting rapid shoreline recession. The area consists of 40 to 80 acres in which approximately 250,000 to 500,000 cubic yards of material could potentially be placed to restore the shoreline to historic dimensions. It is intended that sandy material be used to re-establish the position of the shoreline with finer grained material use to backfill and create tidal marsh. The area is owned by the Alabama State Historic Commission, who at the time this was being considered for the LRR, was receptive to this action. Not only would this option restore the eroding shoreline and marshes, it could also serve to protect the historically significant resources that exist in the area. A map of this proposed option is attached.

4. Another potential BU opportunity involves returning sandy material to the Sand Island/Pelican Island complex. The group recommended that this action be considered particularly using the predominantly sandy material removed during any widening or deepening of the entrance channel. This option would involve placement of sand around the Sand Island Lighthouse as was done during the Sand Island 406 Oil Mitigation efforts where 2 million cubic yards of sand was placed around the lighthouse and Sand Island in an effort to prevent submerged oil from entering the mouth of the bay. This option is considered to provide an excellent opportunity towards accelerating the return of sediment into the local littoral system consistent with regional sediment management approaches. It is anticipated that this approach would promote natural sediment transport and maintenance of the Sand Island/Pelican Island complex which in turn would provide downdrift sediment transport to Dauphin Island.

5. Placement of material on Little Dauphin Island and Little Point Clear around the areas associated with the Bon Secour National Wildlife Refuge was discussed as an option. This option includes the placement of feeder berms to return sediment to the natural system as well as provide needed protection of the adjacent shorelines which protect and conserve sensitive habitats. Preliminary communications with the refuge staff indicated that they would be open to pursuing this option.

6. Yet another option mentioned by the group was the use of the material removed from the channel expansion for the shoreline restoration activities being planned for the Dauphin Island Causeway project. This would provide opportunities to create a more natural shoreline associated with protection of the roadway.

7. When excavating certain segments of the expanded channel, some of the material will likely consist of highly cohesive and consolidated clay sediment. If removed using large clamshell dredging equipment, it may be possible to excavate large chunks of the cohesive clays that may be suitable for various beneficial uses. One consideration could be to use the large chunks for the creation of in-bay or nearshore reefs. Over time, the consolidated clay material could become encrusted, thus creating a more stable and productive reef. A second consideration discussed for utilizing large chunks of cohesive clay is the potential to use the material in the formation of containment structures or berms that could be used to increase bay bottom elevations for oyster restoration. Containment structures of this nature could also be used for other applications where containment of sediment is required for options like marsh restoration. It was pointed out that the equipment required to remove the material in large chunks may be restricted for certain applications by water depth.

8. Discussions were also directed to conducting open bay thin-layer placement of the dredged material in strategic areas of the bay to reduce hypoxic conditions. One of the primary concerns expressed by the group were the areas in the northeastern portion of the bay where oyster dredging operations were conducted to mine relict oyster shell deposits. These operations were conducted as early as the late 1800's and continued into the 1970's. These operations have resulted in an overall deepening of the bay bottom in that area and believed to be the cause of decreased ecological productivity resulting from hypoxia during certain times of the year. A map of the oyster dredging area is attached. Placement of dredged material into portions of this area would not only potentially help to increase the ecologically productivity of the bay bottom areas, but in general, would also keep the sediment within the system.

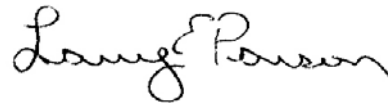
It was discussed that the Corps, under the regional sediment management program, is currently examining the areas where the mining operations occurred to evaluate the nature of the sediments that filled the holes resulting from these activities. Preliminary results thus far have indicated that the holes have filled with a fine-grained fluidized sediment that may not be conducive to benthic productivity. One of the study objectives is to determine if there may be some restorative measures that can be taken to use dredged material to increase the productivity of the bay bottom in these areas. A possible follow on to the RSM study may be a Section 204 study under the Continuing Authorities Program to further evaluate restoration possibilities. Results from a Section 204 study can be leveraged to help make decisions on BU opportunities in these areas.

9. In 2014 the Corps added the open bay thin-layer disposal as a permanent option for disposal of dredged material from the maintenance of the Mobile Bay navigation channel. This was done as a result of extensive modeling and monitoring of a demonstration action to show how the material behaves once placed on the bay bottom

in this fashion. Results of the studies indicated that once placed, the material is remobilized into the water column and re-enters the bay's natural sediment system. Based on this information and the success of the thin-layer placement actions currently in practice, the group recommended that the thin-layer placement areas re-established for maintenance dredged material be considered as a placement opportunity for some of the new work material from the channel expansion. The main benefit is that this is already considered as an environmentally acceptable alternative that returns the sediment back to the natural system.

10. It is envisioned that this beneficial use sub-group will meet as needed to help guide and provide inputs to the beneficial use alternatives being considered. As a result of this meeting, the USACE study team will screen the beneficial use options recommended by the sub-group for those alternatives that are considered reasonable and should receive further consideration for the project. The USACE will present the findings of the screening process to the sub-group for their continued input and guidance in this process.

11. Please address any questions, comments, or concerns pertaining to this meeting to Larry Parson at (251) 690-3139 or larry.e.parson@sam.usace.army.mil.

A handwritten signature in black ink that reads "Larry E. Parson". The signature is written in a cursive style with a large, stylized 'L' and 'P'.

Larry E. Parson
U.S. Army Corps of Engineers, Mobile District
Coastal Environment Team

Mobile Harbor GRR Beneficial Use (BU) Sub-group Meeting Participants

Larry Parson – U.S. Army Corps of Engineers, Mobile District
Elizabeth Godsy - U.S. Army Corps of Engineers, Mobile District
Nathan Lovelace - U.S. Army Corps of Engineers, Mobile District
Ashley Kleinschrodt - U.S. Army Corps of Engineers, Mobile District
David Newell - U.S. Army Corps of Engineers, Mobile District
Christine VanZomeran - U.S. Army Corps of Engineers, Mobile District, ERDC
Scott Brown - Alabama Dept. of Environmental Management
Allen Phelps - Alabama Dept. of Environmental Management
Carl Ferraro - Alabama Dept. of Conservation and Natural Resources, State Lands
Division
John Mareska - Alabama Dept. of Conservation and Natural Resources, Marine
Resources Division
Steve Jones - Alabama Geological Survey
Patric Harper - U.S. Fish and Wildlife Service
Josh Rowell - U.S. Fish and Wildlife Service
Calista Mills – U.S. Environmental Protection Agency

Potential BU Option on the north shore of the Fort Morgan Peninsula



ENVIRONMENTAL APPENDIX C

ATTACHMENT C-7

**DRAFT
PROGRAMMATIC AGREEMENT
AMONG
THE U.S. ARMY CORPS OF ENGINEERS,
THE ALABAMA STATE HISTORIC PRESERVATION
OFFICER, AND THE ADVISORY COUNCIL ON
HISTORIC PRESERVATION REGARDING THE MOBILE
HARBOR, MOBILE ALABAMA, GENERAL
REEVALUATION STUDY**

**PROGRAMMATIC AGREEMENT
AMONG
THE U.S. ARMY CORPS OF ENGINEERS,
THE ALABAMA STATE HISTORIC PRESERVATION OFFICER, AND THE
ADVISORY COUNCIL ON HISTORIC PRESERVATION REGARDING THE
MOBILE HARBOR, MOBILE ALABAMA, GENERAL REEVALUATION STUDY**

WHEREAS, the U.S. Army Corps of Engineers, Mobile District (Corps), is making navigation improvements to federally authorized Mobile Harbor navigation project (Project) as authorized in the in Section 201(a) of the Water Resources Development Act (WRDA) of 1986, as amended by Section 302 of the WRDA of 1996; and

WHEREAS, the Project is being developed to improve Mobile Harbor and reduce navigation risks within the Mobile River, Upper Bay, Lower Bay, and Entrance Channels in Mobile Harbor; and

WHEREAS, the Corps proposes to deepen the existing channel an additional 5 feet (existing 45-foot deep channel in the bay to 50 feet and existing 47-foot deep channel in the bar to 52 feet); adding an additional 100 feet of widening for a distance of 3 miles beginning at the upper end of the bend area at the 50-foot depth; including bend easing with the deepening at the upper end of the bar channel; and modification to the Choctaw Pass turning basin to ensure safe operations at the 50-foot depth, and disposal of new work dredged material in the relict shell mined area, the Mobile Ocean Dredged Material Disposal Site (ODMDS), and in the Sand Island Beneficial Use Area (SIBUA) Expansion should any bar channel material be identified in sufficient quantity to warrant placement; and

WHEREAS, the Project comprises both the development and implementation of the Project, and the Corps will be the Lead Federal Agency for compliance with 54 U.S.C. § 306108 (NHPA Section 106); and

WHEREAS, the Corps has determined that improvements to Mobile Harbor constitutes an Undertaking, as defined in 36 C.F.R. § 800.16(y), and therefore is subject to Section 106 of the National Historic Preservation Act (NHPA); and

WHEREAS, the Corps has determined that the Mobile Harbor General Reevaluation Report (GRR) with an Integrated Supplemental Environmental Impact Statement (SEIS) has the potential to affect properties that could be eligible for listing in the National Register of Historic Places (NRHP) and have consulted with the Alabama State Historic Preservation Officer (SHPO) pursuant to the NHPA; and

WHEREAS, the Corps has determined that the Project's Area of Potential Effects (APE) includes areas within Mobile Bay and Harbor including a 5.3 hectare area of the Choctaw Basin, the Bay Channel, the Bar Channel, the relict shell mined areas within Mobile Bay, the ODMDS, and the SIBUA Extension as described and depicted on maps in Appendix A to this agreement; and

WHEREAS, the Corps has identified at least 2 potential historic properties in the channel widening portion of the APE, that may be affected by the undertaking; and

WHEREAS, the Corps has identified a landform sensitive for pre-Contact Native American inundated sites in the channel bend easing portion of the APE; and

WHEREAS, the Corps as lead federal agency, with the concurrence of SHPO, has decided to comply with Section 106 of the NHPA for the Undertaking through the execution and implementation of a Programmatic Agreement (Agreement), following § 800.14(b); and

WHEREAS, the Alabama State Port Authority (ASPA) is the non-Federal sponsor for the Project and has been invited to be a Concurring Party to this Agreement; and

WHEREAS, in accordance with 36 C.F.R. § 800.2(c)(2)(ii)(A), 800.3(f)(2), and 800.14(b)(2)(i), the Corps has contacted federally recognized Native American Tribes, via letter(s), phone call(s), email(s) and meetings, to invite them to consult on the Mobile Harbor GRR with an Integrated SEIS and this Agreement, including the Absentee-Shawnee Tribe of Oklahoma, the Alabama-Coushatta Tribes of Texas, the Alabama-Quassarte Tribal Town, the Caddo Nation of Oklahoma, the Catawba Indian Nation, the Cherokee Nation, the Chickasaw Nation, the Chitimacha Tribe of Louisiana, the Choctaw Nation of Oklahoma, The Coushatta Tribe of Louisiana, Eastern Band of the Cherokee Nation, the Eastern Shawnee Tribe of Oklahoma, the Jena Band of Choctaw Indians of Louisiana, the Kialegee Tribal Town of Oklahoma, the Miccosukee Tribe of Indians of Florida, the Mississippi Band of Choctaw Indians, Muscogee (Creek) Nation, the Poarch Band of Creek Indians, the Quapaw Tribe of Indians of Oklahoma, Shawnee Tribe of Oklahoma, the Seminole Nation of Oklahoma, the Seminole Tribe of Florida, the Thlopthlocco Tribal Town, Tunica-Biloxi Indian Tribe of Louisiana, and the United Keetoowah Band of Cherokee Indians in Oklahoma; and

WHEREAS, in accordance with 36 C.F.R. §§ 800.2(c)(5), the Corps has contacted additional interested parties via letter(s), phone call(s), email(s), and meetings, to invite them to consult on the Mobile Harbor GRR with an Integrated SEIS and this Agreement, including other non-Federally listed Tribes and Native American individuals and other interested parties; and

WHEREAS, in accordance with 36 C.F.R. § 800.14(b)(3), the Corps, will notify and invite the Advisory Council on Historic Preservation (ACHP) per 36 C.F.R. § 800.6(a)(1)(C) to participate in consultations to resolve potential adverse effects of the Mobile Harbor Improvement Project, including development of this Agreement; and

WHEREAS, in accordance with 36 C.F.R. § 800.6(a)(4) and 36 C.F.R. § 800.14(b)(2)(ii), the Corps held a series of public meetings to notify the public of the Mobile Harbor GRR with an Integrated SEIS and provide an opportunity for members of the public to comment on the Project and the Section 106 process. These were conducted on March 16, 2017, September 16, 2017, and February 22, 2018 in Downtown Mobile, South Mobile County, and Daphne, Alabama; and

NOW, THEREFORE, the signatories agree that the Undertaking shall be implemented in accordance with the following stipulations in order to take into account the effects of the undertaking on Historic Properties.

STIPULATIONS

The Corps shall ensure that the following measures are carried out:

I. TIME FRAMES AND REVIEW PROCEDURES

A. Document and Deliverable Review. For all documents and deliverables produced in compliance with this Agreement, the Corps will have thirty (30) calendar days to review. After completing its review, the Corps shall provide a hard copy draft document via mail or digital copies via email to the SHPO, Concurring Parties, and tribes, and other interested parties for review. Any written comments provided by the SHPO, Federally Recognized Tribes, and other interested parties within thirty (30) calendar days from the date of receipt shall be considered in the revision of the document or deliverable. The Corps shall document and report the written comments received for the document or deliverable and how comments were addressed. The Corps shall provide a revised final document or deliverable to the SHPO for concurrence. The SHPO shall have thirty (30) calendar days to respond. Failure of the SHPO, Concurring Parties, and Native American interested parties and Tribes to respond within thirty (30) calendar days of any submittal shall not preclude Corps from moving to the next step in this Agreement. A copy of the final document shall be provided to the Signatories and to any consulting parties who request it, as appropriate per **Stipulation X (Confidentiality)**.

B. Disagreement. Should the SHPO, ACHP, Federally Recognized Tribes, or interested party object to the findings of NRHP eligibility and/or findings of effect within the final document or deliverable submitted for concurrence, the Corps, SHPO, ACHP, Federally Recognized Tribes, and interested parties shall consult for a period not to exceed fifteen (15) calendar days following the receipt of SHPO's, ACHP's, a Federally Recognized Tribe's, or an interested party's written objection in an effort to come to agreement on the issues to which the SHPO, ACHP, Federally Recognized tribe, or interested party has objected. Should the SHPO, ACHP, a Federally Recognized Tribe, or interested party be unable to agree on the issues to which the SHPO, ACHP, a federally recognized tribe, or an interested party has objected, the SHPO, ACHP, and the Corps shall proceed in accordance with **Stipulation XI (Dispute Resolution)**, below. The timeframe to consult to resolve a disagreement or objection may be extended by mutual consent of the Signatories.

II. AREA OF POTENTIAL EFFECTS

A. DETERMINATION OF THE AREA OF POTENTIAL EFFECTS. The APE for Project activities has been determined by the Corps as Lead Federal Agency. It includes the portions of Mobile Harbor, portions of the Mobile Harbor Channel, and offshore dredge disposal sites that may be affected by proposed navigation improvement measures. Maps of the APE are provided in Appendix A. If the APE is revised, or if the Corps proposes to use a portion(s) of the ODMDS which may require survey for the presence of historic properties, the Corps shall consult on that revision in accordance with **Stipulation I (Timeframes and Review Procedures)**, and the Corps shall determine the potential for Project activities in a revised APE, or within portion(s) of the ODMDS, to affect potential Historic Properties.

III. IDENTIFICATION, EVALUATION, AND DETERMINATION OF EFFECT

The Corps shall complete any identification and evaluation of Historic Properties prior to proceeding with construction. Much of the APE has already been inventoried utilizing current remote sensing methods and equipment. Specifically, remote sensing surveys of the Choctaw Basin, the Bay Channel, the Bar Channel, the relict shell mined areas within Mobile Bay, and the SIBUA Extension portions of the APE have recently been completed. These identified various potential historic properties which will be subjected to a Phase II investigation and evaluation. The ODMDS was subjected to a remote sensing survey in 1983 and a portion of this large disposal area has been in continuous use since 1970.

A. Identification of Historic Properties. Pursuant to 36 CFR § 800.4 and in consultation with the Signatories and consulting parties of this agreement the Corps shall conduct Phase I remote sensing surveys to identify historic

properties when the APE boundaries are revised to include areas that have not been surveyed and when the Corps proposes to utilize unused portions of the ODMS. Prior surveying these areas, the Corps shall coordinate with the SHPO, Federally Recognized Tribes, and other interested parties according to **Stipulation II (Area of Potential Effect)** of this Agreement. The scope of the Phase I inventory and contents of the survey report are listed below:

1. Submit a scope of work (SOW) for Phase I fieldwork for review and approval by the SHPO.
2. Conduct archival research to determine the known history and pre-Contact history of the area prior to fieldwork.
3. Conduct an underwater remote sensing survey to locate potentially NRHP eligible objects, vessels, or sites in the entire APE utilizing a magnetometer, sidescan sonar, sub-bottom profiler, GPS, and depth finder.
4. Prepare a survey report that includes the nature of the project, methods, pre-Contact and historic contexts, and an inventory of anomalies, an evaluation of all anomalies for significance and integrity, conclusions, and recommendations. A draft and draft final survey report will be submitted to the SHPO, Tribes, and other interested parties for review and comment following **Stipulation I (Timeframes and Review Procedures)** of this Agreement.

B. Evaluation and Determination of Effect. Anomalies and acoustic contacts determined to potentially be cultural resources will be assessed by a qualified professional for their eligibility for listing in the NRHP consistent with the *Secretary of Interior's Standards for Evaluation*, 36 C.F.R. § 60.4. If during the Phase I remote sensing survey of the APE, magnetic anomalies, acoustic contacts, and reflectors are detected which could represent historic properties, these magnetic anomalies, acoustic contacts, and reflectors could be subjected to a Phase II evaluation to determine if they are NRHP eligible resources. The scope of Phase II evaluations along with a description of the contents of the evaluation report are listed below:

1. Submit a SOW for Phase II fieldwork for review and approval by the SHPO.
2. Phase II Objectives: The objective of the Phase II evaluation is to collect data regarding site significance and integrity from which determinations of NRHP eligibility can be made. Field methods for the Phase II investigation could include additional remote-sensing work to capture more detailed data on magnetic anomalies, acoustic contacts, and reflectors and the use

of archaeological divers to assess previously identified anomalies and contacts for NRHP eligibility.

3. Rational: Completed Phase I Remote-Sensing surveys of the Mobile Harbor APE identified two (2) potential historic properties and a natural landform sensitive for inundated pre-Contact Native American sites in the Channel widening and bend easing portions of the APE. However, as these are all submerged, the integrity and NRHP eligibility of these resources are currently unknown. Further investigation is therefore required to determine if implementation of the Project will impact any historic properties.
4. A draft Phase II Survey, Evaluation, and Determination of Effects report will be prepared within 60 days following the completion of the fieldwork. The draft report will include a description of project purposes, specific methods guiding the Phase II resource survey work including the results of fieldwork with site descriptions and locational data. The report will also contain evaluations of site significance using NRHP eligibility criteria and determinations of effects. Specific sites requiring mitigation measures will also be identified in this report. The Corps shall prepare and submit the draft and final Phase II Survey, Evaluation, and Determination of Effects Reports in accordance with **Stipulation I (Timeframes and Review Procedures)**.

If SHPO, any Federally Recognized Tribes, or other interested parties disagree with the Corps' determinations of NRHP eligibility and effects, the Corps shall notify all Signatories, Federally Recognized Tribes, and other parties of the dispute and consult with the SHPO. If the dispute cannot be resolved, the Corps shall seek a formal determination of eligibility from the Keeper of the National Register. The Keeper's determination will be final in accordance with 36 CFR 63.4.

Avoidance of adverse effects to Historic Properties is always the preferred treatment approach. However, it may not be possible to redesign the Project in order to avoid resources within the APE. The Corps will apply the criteria of adverse effect, pursuant to 36 C.F.R. § 800.5(a)(1), to all Historic Properties within the APE. If the Corps determines that Historic Properties will be adversely affected, **Stipulation IV. (Historic Properties Treatment Plan)**, below, will be followed.

IV. HISTORIC PROPERTIES TREATMENT PLAN

If it is determined that project activities will result in adverse effects, USACE, in consultation with the SHPO, Concurring Parties, tribes, and other interested parties shall develop a Historic Properties Treatment Plan (HPTP) to resolve all adverse effects resulting from the Project, which would be appended to this PA.

The HPTP shall outline the minimization and mitigation measures necessary to resolve the adverse effects to Historic Properties. Proposed mitigation measures may include, but are not limited to, oral history, interpretive brochures, data recovery, or publications depending on their criterion for eligibility. Development of appropriate measures shall include consideration of Historic Property types and provisions for avoidance or protection of Historic Properties where possible.

If adverse effects are identified, the HPTP shall be in effect before construction commences. The HPTP may be amended and appended to this PA without amending the PA.

A. Review: The Corps shall submit the Draft HPTP to the SHPO, Federally Recognized Tribes, and other interested parties for review and comment pursuant to **Stipulation I (Timeframes and Review Procedures)**.

B. Reporting: Reports and other data pertaining to archaeological site locations and the treatment of effects to Historic Properties will be distributed to Concurring Parties to this PA, tribes, and other members of the public, consistent with **Stipulation X (Confidentiality)** of this PA, unless parties have indicated through consultation that they do not want to receive a report or data.

C. Amendments/Addendums/Revisions: If a Historic Property that is not covered by the existing HPTP is discovered within the APE subsequent to the initial inventory effort, or if there are previously unexpected effects to a Historic Property, or if Corps and SHPO agree that a modification to the HPTP is necessary, the Corps shall prepare an addendum to the HPTP. The Corps shall then submit the addendum to the SHPO, Federally Recognized Tribes, and other interested parties for review and comment, and if necessary, shall follow the provisions of **Stipulation IX (New Discoveries)**. The HPTP may cover multiple discoveries for the same property type.

D. Data Recovery: When data recovery is proposed, the Corps, in consultation with the SHPO, Federally Recognized Tribes, and other interested parties shall ensure that specific Research Designs are developed consistent with the *Secretary of the Interior's Standards and Guidelines for Archaeology and Historic Preservation* and the ACHP's "Recommended Approach for Consultation on Recovery of Significant Information from Archaeological Sites" (ACHP, May 18, 1999).

V. QUALIFICATIONS

A. Professional Qualifications: All technical work required for historic preservation activities implemented pursuant to this Agreement shall be carried out by or under the direct supervision of a person or persons meeting, at a minimum, the *Secretary of Interior's Professional Qualifications Standards* for

archeology or history, as appropriate (48 FR 44739). “Technical work” here means all efforts to inventory, evaluate, and perform subsequent treatment such as data recovery excavation or recordation of potential Historic Properties that is required under this Agreement. This stipulation shall not be construed to limit peer review, guidance, or editing of documents by SHPO and associated Project consultants.

B. Historic Preservation Standards: Historic preservation activities carried out pursuant to this Agreement shall meet the *Secretary of Interior’s Standards and Guidelines for Archaeology and Historic Preservation* (48 FR 44716-44740), as well as standards and guidelines for historic preservation activities established by the SHPO. The Corps shall ensure that all reports prepared pursuant to this Agreement will be provided to the Signatories, Federally Recognized Tribes, and other interested parties, and are distributed in accordance with **Stipulation X (Confidentiality)**, and meet published standards of the Alabama Historical Commission, Administrative Code, Chapter 460-X-9.02(4) as updated in 2006 (Standards for Reports) and *Preservation Planning Bulletin* Number 4(a), “Archaeological Resources Management Reports (ARMR): Recommended Contents and Format” (December 1989).

C. Archeological Monitor Standards: If archeological monitoring is required for the Project, it shall be carried out by a person meeting, at a minimum, the *Secretary of Interior’s Professional Qualifications Standards* for prehistoric or historic archaeology, as appropriate (48 FR 44739).

VI. CONSULTATION WITH TRIBES AND INTERESTED PARTIES

A. In consultation with Federally Recognized Tribes and other interested Native American parties or individuals, the Corps will make a reasonable and good-faith effort to identify Historic Properties of traditional religious and cultural importance. As the Lead Federal Agency, the Corps shall ensure that consultation regarding site condition assessment, monitoring efforts, and determinations of eligibility and effects with other interested Native American parties and individuals continues throughout the implementation of the Agreement. The Corps shall be responsible for transmitting all relevant documents and deliverables to Federally Recognized Tribes and other interested Native American parties or individuals as part of their tribal consultation responsibility.

B. Federally Recognized Tribes and other interested Native American parties and individuals may choose not to sign this Agreement as a Concurring Party. However, the Corps will make a good faith effort to contact Federally Recognized Tribes and other interested Native American parties and individuals, not acting as Concurring Parties to the Agreement, with potential interest in consulting on site condition assessment efforts and on the proposed treatment of Historic Properties or potential Historic Properties. Efforts to identify these individuals or groups may include using online databases, consultations for previous projects,

and using personal and professional knowledge. The Corps will then contact each identified organization and individual by phone, mail, or email inviting them to consult on additional Phase I efforts, Phase II investigations, site assessment efforts, and proposed treatments of Historic Properties or potential Historic Properties. Consultations may be carried out through either letters of notification, public meetings, environmental assessments/environmental impact statements, and/or other methods requested by a Federally Recognized Tribe or other interested Native American party or individual. Failure of any contacted group or individual to comment within thirty (30) calendar days shall not preclude the Corps from proceeding with the Project.

C. The Corps shall make a reasonable and good-faith effort to ensure that Native American Tribes or other interested parties, acting as either Concurring Parties or those expressing interest in the project, will be invited to participate in the implementation of the terms of this Agreement. Review periods shall be consistent with **Stipulation I (Timeframes and Review Procedures)**. The Corps shall ensure that all reviewers from interested Native American groups and other interested parties shall receive copies of all reports.

VII. TREATMENT OF HUMAN REMAINS

A. In the event that Native American human remains, as well as Native American funerary objects, sacred objects, or objects of cultural patrimony are encountered within the APE during the Project, those remains and objects are subject to the Native American Graves Protection and Repatriation Act (NAGPRA) (25 U.S.C. 3001 *et seq.*) and treatment under NAGPRA's implementing regulations at 43 CFR Part 10. When NAGPRA items are discovered inadvertently, an appropriate Corps official must be notified immediately upon the discovery. The Corps shall follow the requirements of 43 CFR §10.3 for consultation; notification; development of excavation, treatment, and disposition plans as needed; and the requirements of 43 CFR §10.6 for NAGPRA item disposition.

B. In the event non-native human remains or human burials are encountered within the APE, those remains are subject to the Alabama Historical Commission, Administrative Code, Chapter 460-X-10 (Burials) and Alabama's Burial Act, § 13A-7-23.1, as amended. When unmarked human burials or human skeletal remains are inadvertently found, the appropriate Corps official must be notified immediately upon the discovery. The Corps will follow the requirements regarding notification, treatment, and jurisdiction under Chapter 460-X-10(f) (Notification).

VIII. PUBLIC CONSULTATION AND PUBLIC NOTICE

A. The interested public will be invited to provide input during the implementation of this document. The Corps shall carry this out through letters of notification,

public meetings, and environmental assessment/environmental impact statements. The Corps shall ensure that any comments received from members of the public are taken under consideration and incorporated where appropriate. Review periods shall be consistent with **Stipulation I (Timeframes and Review Procedures)**. In seeking input from the interested public, locations of Historic Properties will be handled in accordance with **Stipulation X (Confidentiality)**. In cases where the release of location information may cause harm to the Historic Property, this information will be withheld from the public in accordance with Section 304 of the NHPA (54 U.S.C. § 307103).

IX. NEW DISCOVERIES

A. If new and unanticipated Historic Properties are inadvertently discovered during implementation of the Undertaking, the Mobile District will cease all work in the vicinity of the discovery until it can be evaluated. If the property is determined to be NRHP eligible, the Mobile District shall consult with the SHPO to develop a treatment plan.

B. The Mobile District will implement the treatment plan once it has been approved by SHPO.

X. CONFIDENTIALITY

Confidentiality regarding the specific nature and location of the archaeological sites and any other cultural resource discussed in this Agreement shall be maintained to the extent allowable by law. Dissemination of such information shall be limited to appropriate personnel with the Corps, contractors, Federally Recognized Native American tribes, the SHPO, and those parties involved in planning, reviewing and implementing this Agreement and in accordance with Section 304 of the NHPA (54 U.S.C. § 307103). When information is provided to the Corps by Native American tribes or others who wish to control the dissemination of that information more than described above, the Corps will make a good faith effort to do so, to the extent permissible by law.

XI. DISPUTE RESOLUTION

A. Should any signatory or concurring party to this Agreement object at any time to any actions proposed or the manner in which the terms of this agreement are implemented, the Corps shall consult with such party to resolve the objection. If the Corps determines that such objection cannot be resolved, the Corps will:

1. Forward all documentation relevant to the dispute, including the District's proposed resolution, to the ACHP. The ACHP shall provide the Corps with its advice on the resolution of the objection within thirty (30) days of receiving adequate documentation. Prior to reaching a final decision on the dispute, the Corps shall prepare a written response that takes into account

any timely advice or comments regarding the dispute from the ACHP, Signatories, and Concurring parties to this Agreement, and provide them with a copy of this written response. The Corps will then proceed according to this final decision.

2. If the ACHP does not provide its advice regarding the dispute within the thirty (30) day time period, the Corps may make a final decision on the dispute and proceed accordingly. Prior to reaching such a final decision, the Corps shall prepare a written response that takes into account any timely comments regarding the dispute from the Signatory and Concurring Parties to the Agreement, and provide them and the ACHP with a copy of such written response.
3. The Corps' responsibility to carry out all other actions subject to the terms of this Agreement that are not the subject of the dispute remain unchanged.

B. If, at any time during implementation of the measures stipulated in this Agreement should an objection pertaining to the Agreement be raised by a Federally Recognized Native American Tribe or a member of the public, the Corps shall notify the Signatory and Concurring Parties and take the objection under consideration and consult with the objecting party and should the objecting party request, any of the Signatory and Concurring Parties to this Agreement, for no longer than fifteen (15) calendar days. The Corps shall consider the objection, and in reaching its decision, will consider all comments provided by the other Signatory and Concurring Parties. Within fifteen (15) calendar days following closure of the comment period, the Corps will render a decision regarding the objection and respond to the objecting party. The Corps will promptly notify the other Signatories and Concurring Parties of its decision in writing, including a copy of the response to the objecting party. The Corps' decision regarding resolution of the objection will be final. Following issuance of its final decision, the Corps may authorize the action that was the subject of the dispute to proceed in accordance with the terms of that decision. The Corps' responsibility to carry out all other actions under this Agreement shall remain unchanged.

C. Should any Signatory Party to this Agreement object in writing to the determination of National Register eligibility, the objection will be addressed pursuant to 36 C.F.R. § 800.4(c) (2).

XII. NOTICES

A. All notices, demands, requests, consents, approvals or communications from all parties to this Agreement to other parties to this Agreement shall be either personally delivered, sent by United States Mail, or emailed, and all parties shall be considered in receipt of the materials five (5) calendar days after deposit in the United States mail or the on the day after being emailed.

B. If Signatory and Concurring Parties agree in advance in writing or by email, facsimiles, emails, or copies of signed documents may be used as if they bore original signatures.

C. If the Signatories agree, hard copies and/or electronic communications may be used for formal communication amongst themselves for activities in support of **Stipulation I (Time Frames and Review Procedures)**.

XIII. AMENDMENTS, NONCOMPLIANCE, AND TERMINATION

A. Amendments: Any Signatory to this Agreement may propose that the Agreement be amended, whereupon the Corps shall consult with the Signatories to consider such amendment. This Agreement may be amended when such an amendment is agreed to in writing by all Signatories. The amendment will be effective on the date a copy signed by all of the Signatories is filed with the ACHP.

All attachments to this Agreement, and other instruments prepared pursuant to this agreement including, but not limited to, the maps of the APE may be individually revised or updated through consultation consistent with **Stipulation I (Timeframes and Review Procedures)** and agreement in writing of the Signatories without requiring amendment of this Agreement, unless the Signatories through such consultation decide otherwise. In accordance with **Stipulation VI (Consultations with Tribes and Other Interested Parties)** and **Stipulation VIII (Public Consultation and Public Notice)**, the Concurring Parties, tribes, other interested parties, and interested members of the public, will receive amendments to the Project's description, any Phase I or Phase II survey reports and maps of the APE, and HPTPs, as appropriate, and copies of any amendment(s) to the Agreement.

B. Termination: Any Signatory to this Agreement, including Invited Signatories, may terminate this Agreement. If this Agreement is not amended as provided for in **Stipulation XIII.A. (Amendments)** or if any Signatory proposes termination of this Agreement for other reasons, the Signatory proposing termination shall notify the other Signatories in writing, explain the reasons for proposing termination, and consult with the other Signatories to seek alternatives to termination, within thirty (30) calendar days of the notification.

1. Should such consultation result in an agreement on an alternative to termination, the Signatories shall proceed in accordance with that agreement and amend the Agreement as required.
2. Should such consultation fail, the Signatory proposing termination may terminate this Agreement by promptly notifying the other Signatories and Concurring Parties in writing.

3. Beginning with the date of termination, the Corps shall ensure that until and unless a new agreement is executed for the actions covered by this Agreement, such undertakings shall be reviewed individually in accordance with 36 C.F.R. § 800.4-800.6.

C. Duration: This Agreement shall remain in effect for a period of five (5) years after the date it takes effect and shall automatically expire and have no further force or effect at the end of this five-year period unless it is terminated prior to that time. No later than ninety (90) calendar days prior to the expiration date of the Agreement, the Corps shall initiate consultation to determine if the Agreement should be allowed to expire automatically or whether it should be extended, with or without amendments, as the Signatories may determine. Unless the Signatories unanimously agree through such consultation on an alternative to automatic expiration of this Agreement, this Agreement shall automatically expire and have no further force or effect in accordance with the timetable stipulated herein.

XIV. EFFECTIVE DATE

This Agreement shall take effect on the date that it has been fully executed by the Corps, the SHPO, and the ACHP.

EXECUTION of this Agreement by the Corps, the SHPO, and the ACHP and the implementation of its terms evidence that the Corps has taken into account the effects of this undertaking on historic properties and afforded the ACHP an opportunity to comment.

**PROGRAMMATIC AGREEMENT
AMONG
THE U.S. ARMY CORPS OF ENGINEERS,
THE ALABAMA STATE HISTORIC PRESERVATION OFFICER, AND THE
ADVISORY COUNCIL ON HISTORIC PRESERVATION REGARDING THE
MOBILE HARBOR, MOBILE ALABAMA, GENERAL REEVALUATION STUDY**

SIGNATORIES TO THIS AGREEMENT:

U.S. ARMY CORPS OF ENGINEERS, MOBILE DISTRICT

BY: _____ DATE : _____
Sebastien P. Joly, Colonel, U.S. Army Corps of Engineers, District Commander

ALABAMA STATE HISTORIC PRESERVATION OFFICER

BY: _____ DATE: _____
Lee Anne Wofford, Deputy State Historic Preservation Officer

ADVISORY COUNCIL ON HISTORIC PRESERVATION

BY: _____ DATE: _____
John M. Fowler, Executive Director

**PROGRAMMATIC AGREEMENT
AMONG
THE U.S. ARMY CORPS OF ENGINEERS,
THE ALABAMA STATE HISTORIC PRESERVATION OFFICER, AND THE
ADVISORY COUNCIL ON HISTORIC PRESERVATION REGARDING THE
MOBILE HARBOR, MOBILE ALABAMA, GENERAL REEVALUATION STUDY**

CONCURRING PARTIES:

ALABAMA STATE PORT AUTHORITY

BY: _____ DATE: _____

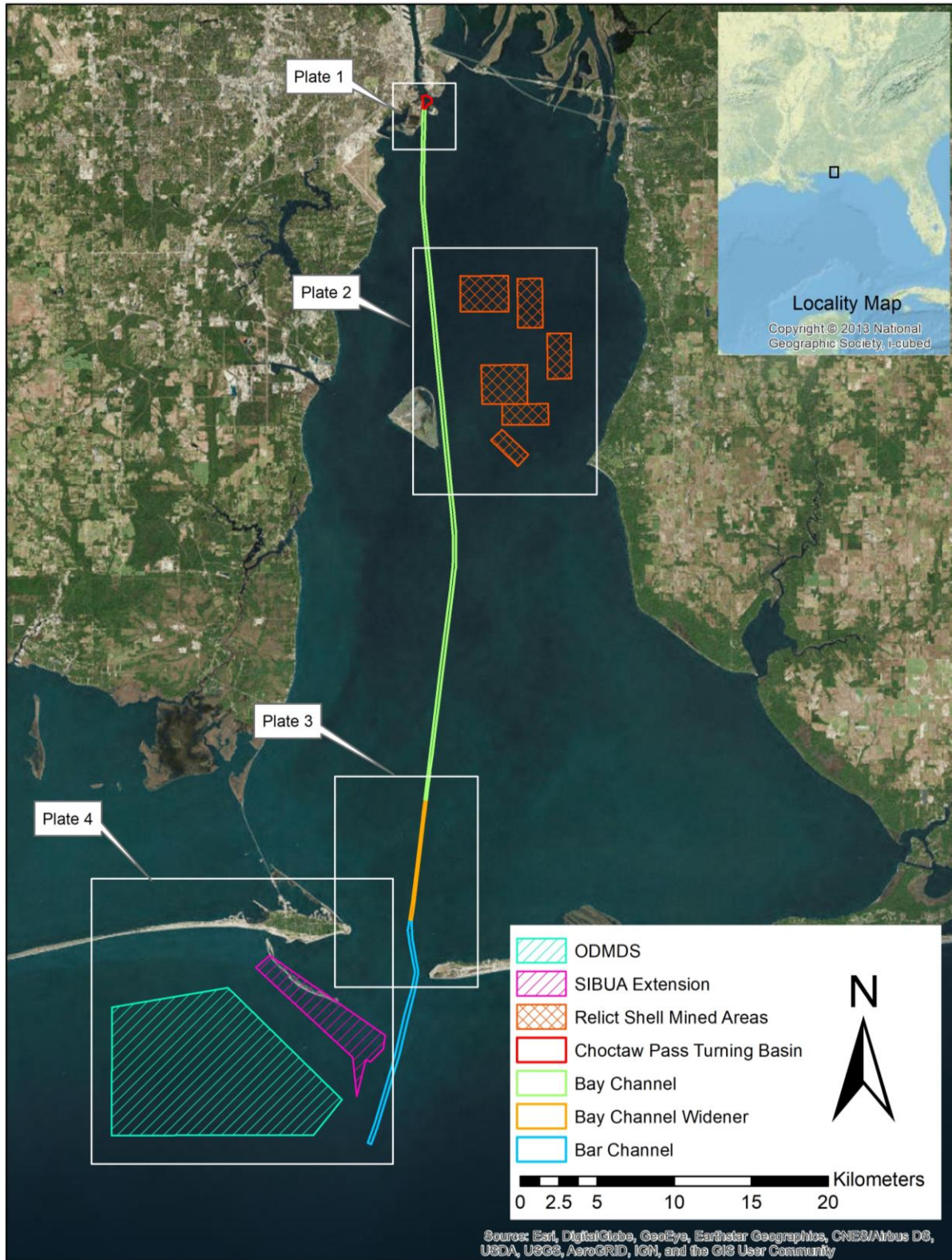
CHOCTAW NATION OF OKLAHOMA

BY: _____ DATE: _____
Mr. Gary Batton, Chief

Draft

Appendix A

Draft



Overview of Mobile Harbor General Reevaluation Study project area.







