Mississippi River Ship Channel, Gulf to Baton Rouge, LA

Integrated General Reevaluation Report & Supplement III to the Final Environmental Impact Statement, Mississippi River Ship Channel, Baton Rouge to the Gulf, Louisiana Project

US Army Corps of Engineers

U.S. Army Corps of Engineers

Mississippi Valley Division

New Orleans District

Final Report
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This Report *Mississippi River Ship Channel Gulf to Baton, LA Final Integrated General Reevaluation Report and Supplemental Environmental Impact Statement* (Final GRR and SEIS) updates and finalizes the draft report of the same title which was released for public review in December of 2016. The report also underwent an Agency Technical Review and an Independent External Peer Review The Draft GRR and SEIS identified a Tentatively Selected Plan which proposed deepening of the MRSC to a depth of 50ft from the Gulf of Mexico through the Port of South Louisiana, but recommended the Port of Baton Rouge remain at the current depth of 45 ft. This Final GRR and SEIS describes additional planning efforts that followed release of the draft report, which took into account comments received on the Draft Report as well as additional engineering and environmental investigations performed to achieve feasibility level of design. These changes resulted in the Recommended Plan.

ABSTRACT

The U.S. Army Corps of Engineers (USACE), in coordination with the non-Federal sponsor (NFS), the Louisiana Department of Transportation and Development (LaDOTD), propose construction to deepen the existing Mississippi River Ship Channel (MRSC), Gulf to Baton Rouge, Louisiana, project. Currently, the project provides deep draft navigation along the lower portion of the Mississippi River from River Mile (RM) 233.8 Above Head of Passes (AHP) to the Gulf of Mexico ending at RM 22 Below Head of Passes (BHP). The MRSC allows for deep draft access to the Louisiana ports of Plaquemines, St. Bernard, New Orleans, South Louisiana, and Baton Rouge. The Supplemental Appropriations Act of 1985, Public Law 99-88 authorized the deepening of the existing channel from its depth, at the time, of 40 feet (ft) to 55 ft in accordance with the Report of the Chief of Engineers dated April 9, 1983, SUBJECT: "Mississippi River Ship Channel, Gulf to Baton Rouge, Louisiana." Construction of the channel was initially planned in three phases. Among other things, the first phase deepened the channel to 45 ft from the Gulf of Mexico beginning at RM 22 BHP to Donaldsonville, LA, and the second phase deepened the channel to 45 ft from Donaldsonville, LA to RM 232.4 AHP. The reach from RM 232.4 to 233.8 AHP was not deepened. The third phase planned to deepen the length of the entire project to 55 ft. At the time of this report, the third phase has not been constructed and it is proposed in this report that full implementation of the project to a depth of 55 ft be addressed in phases beyond the third phase of construction for the project.

The current depth of the MRSC results in the need for vessels such as bulk carriers and tankers to light load to navigate the channel and reach the ports. This results in increased transportation cost. High shoaling rates also result in an increase in sediment deposition, which creates maintenance inefficiencies, and increases dredge cycles. There is an opportunity to reduce transportation costs by increasing the channel depth and minimizing the need for light loading of vessels. There is also the opportunity to increase efficiencies of operation and maintenance.

This integrated general reevaluation report (GRR) and supplemental environmental impact statement (SEIS) was prepared in accordance with the requirements of the National Environmental Policy Act (NEPA). The purpose of the general reevaluation study and accompanying GRR and SEIS is to evaluate alternative plans, including the no-action plan, to examine whether navigation improvements to deepen the existing MRSC from the current depth of 45 ft up to a depth of 50 ft are warranted and in the Federal interest. The report details the planning process by describing the existing problems and opportunities, the development and evaluation of alternatives, and the selection of the National Economic Development (NED) plan. Additionally, the report describes the environmental resources in the project area; evaluates the potential adverse and beneficial direct, indirect, and cumulative environmental effects of the alternative plans; and identifies avoidance, minimization, and mitigation measures. The purpose of this integrated GRR and SEIS is to evaluate any significant changes in environmental baselines (e.g. coastal wetlands, human environment, etc.) that may have occurred since completion of the Feasibility Study and Environmental Impact Statement in 1981, and to ensure the project would still be compliant with all pertinent environmental regulations. The report concludes by identifying a recommended plan for the next phase of construction.

The Recommended Plan provides deep draft navigation to a depth of 50 ft from the Gulf beginning at RM 22 BHP through the Port Baton Rouge ending at RM 232.4 AHP. This would be accomplished by constructing and maintaining the MRSC to -50 ft MLLW in the lower Mississippi from RM 13.4 AHP to RM 22 BHP, and by deepening the twelve regularly maintained crossings located within the Port of South Louisiana and the Port of Baton Rouge to -50 ft LWRP. The material dredged during construction of the RM 13.4 AHP to RM 19.5 BHP reach would be placed in locations designated for beneficial use of dredged material to the extent possible within the limitations established by the Federal Standard regulations. This plan provides net annual benefits of $127,500,000 and has a benefit to cost ratio of 7.2 to 1. All other reaches of the river have depths that are naturally greater than 50 ft. In the present condition these reaches do not require construction or operation and maintenance to provide deep draft access. However it is the intent of the Final Integrated GRR and SEIS that, should existing conditions change in these reaches, the district would exercise its authority to conduct operation and maintenance action to maintain the 50 ft depth and width approved for construction in this report throughout the authorized length of the MRSC project. If, in the future, the project requires dredging in areas outside of those evaluated in this SEIS, additional NEPA analysis could be required.

Notice of Availability of the draft GRR and SEIS appeared in the *Federal Register* on 16 December 2016 (http://www.gpo.gov/fdsys/browse/collection.action?collectionCode=FR). An electronic version of this GRR and SEIS can be found on the USACE New Orleans District website at http://www.mvn.usace.army.mil/About/Mississippi-River-Ship-Channel/.

EXECUTIVE SUMMARY

Description of Report: This report is an integrated general reevaluation report (GRR) and supplemental environmental impact statement (SEIS). This report updates the 1981 feasibility study and environmental impact statement (EIS) entitled "Deep-Draft Access to the Ports of New Orleans and Baton Rouge, Louisiana" prepared for the Mississippi River Ship Channel (MRSC), Gulf to Baton Rouge, LA, dated July 1981 (1981 Feasibility Report and EIS), and as approved by a Chief of Engineers Report dated April 9 1983, SUBJECT: "Mississippi River Ship Channel, Gulf to Baton Rouge, Louisiana" (1983 Chief's Report). The Final GRR and SEIS describe the formulation and evaluation of alternative plans considered to address the navigation needs of the MRSC; economic and environmental conditions and potential effects of the alternative plans; environmental mitigation; and project costs and implementation information.

The MRSC, Gulf to Baton Rouge, LA, project is a deep draft navigation channel, providing deep draft navigation access to ports located along the Mississippi River in Southeast Louisiana. The project area begins near Baton Rouge, Louisiana at river mile (RM) 233.8 Above Head of Passes (AHP) and extends to the Gulf of Mexico ending at RM 22 Below Head of Passes (BHP) (Figure ES-1). The channel services four of the top thirteen ports in the United States: the Port of Greater Baton Rouge (Port of Baton Rouge), the Port of South Louisiana, the Port of New Orleans and the Plaquemines Port, Harbor and Terminal District (Port of Plaquemines). The Port of South Louisiana is the largest port in the nation in terms of tonnage. The project also provide access to the Port of St. Bernard. The non-Federal sponsor (NFS) is the Louisiana Department of Transportation and Development (LaDOTD).

Problems and Need: The 1983 Chief's Report identified the navigation problems resulting from inadequate channel depths and widths to accommodate deep draft vessels. The 1983 Chief's Report identified the need for dry bulk carriers and tankers to light load in order to navigate the channel and reach the ports along the Mississippi, "as smaller, obsolete vessels are replaced with larger and more efficient ships, the percentage of light-loaded traffic will increase under the existing channel dimensions. There is a need to achieve higher economic efficiencies and savings in transportation costs by providing larger navigation channels to the Port of Baton Rouge and the New Orleans." That report serves as the basis for the 1985 authorization to deepen the channel (with the exception of the portion of the channel within the Port of New Orleans which is limited to an authorized depth of 40 ft) to 55 ft, and the implementation of the first and second phase of construction to provide the 45 ft channel depth. Since the completion of the 1983 Chief's Report, projections indicate that fleet and future vessels will continue to grow larger; therefore, the problems and needs identified in the 1983 Chief's Report still apply. The current depths of the MRSC result in the need for ships to light load, which will be further exacerbated as the fleet and vessel size grow. The 1981 Feasibility Report identified the opportunity, "for a substantial savings

in the transportation costs of the oceangoing cargo moving over the Mississippi River by the provision of larger access channels to the facilities in the river." As future vessel and fleet size continue to grow, the same opportunity exists.

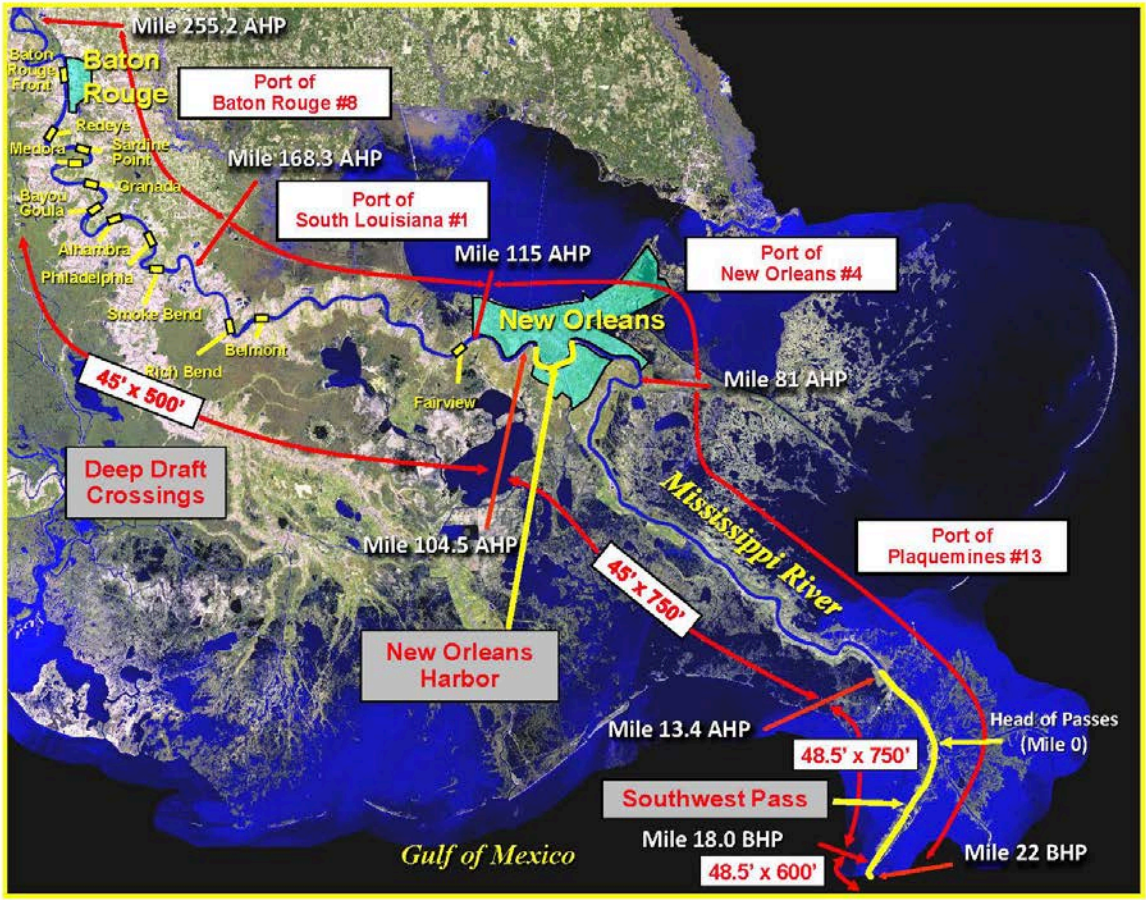

Figure ES-1 Project Vicinity Map (red line does not denote the study area)

The general reevaluation study considers additional problems and opportunities. The first is to reduce safety concerns associated with varying channel width. During times of high shoaling in the river, the channel width in the river may decrease from greater than 750 ft to 500 ft, resulting in additional traffic regulations. Consideration of widening the channel may help reduce safety concerns.

Purpose and Scope: The general reevaluation study will examine whether navigation improvements to deepen the existing Federal project for the MRSC are warranted and in the Federal interest. This will be accomplished by assessing existing and future conditions; evaluating related problems and opportunities; developing potential alternatives, including the no action alternative, and evaluating/comparing the costs, benefits, and feasibility of those alternatives;

writing a supplemental environmental impact statement; and identifying a recommended plan. Prior to proceeding with the next phase of construction, a general reevaluation study and an accompanying GRR, and supplemental environmental impact statement (SEIS) is required due to potential changed conditions and assumptions related to the MRSC depth, economic development, and environmental assessments since the 1983 Chief's Report. The study will consider the effects of the alternative plans, including the no action plan, on the natural system and human environment, including economic development.

History, Authority, Prior Studies: The 1981 feasibility report and EIS recommended that the depth of the Mississippi River navigation channel be increased from 40 ft to 55 ft from Baton Rouge, Louisiana to the Gulf of Mexico, except within the limits of the New Orleans Harbor. The 1983 Chief's Report for the project was signed and the project was authorized for construction by the 1985 Supplemental Appropriations Act. At the time of the 1983 Chief's Report and the 1985 authorization of the project, the cost sharing requirements for the construction and operation, maintenance, repair, rehabilitation and replacement (OMRR&R) of the project was not specified. Section 101 of the Water Resources and Development Act (WRDA) of 1986 (PL 99-662) specified the cost sharing for this and other similar projects. The cost sharing provisions of Section 101(b)1 of WRDA 1986 were amended by Section 2102(b)of the Water Resources Reform and Development Act of 2014, Public Law 113-121, and further amended by Section 1111 of the Water Resources Development Act of 2016.

During pre-construction planning of the authorized project, a sequence was developed that would implement the fully authorized project in three construction phases. Construction of Phase I was completed in December of 1987 and, among other things, provided a depth of 45 ft from Donaldsonville, LA, RM 181.0 AHP, to the Gulf of Mexico, at approximate RM 22 BHP. Construction of Phase II, completed in December 1994, provided a depth of 45 ft from Donaldsonville, LA, (RM 181.0 AHP) through Baton Rouge to RM 232.4 AHP and included dredging eight river crossings to an equivalent depth, as well as other items of work. Phase III, which has not been constructed as of publication of this report, was originally defined as deepening of the MRSC from the Gulf to Baton Rouge from 45 ft to 55 ft.

To proceed with the evaluation of alternatives, the general reevaluation of the current MRSC project was initiated with the issuance of Federal funds, following execution of the Feasibility and Cost Sharing Agreement (FCSA), signed on the 2nd of April 2015 by USACE and LaDOTD, as the NFS.

Within the general reevaluation study, at the request of the NFS, the alternative depths are limited to a depth not to exceed 50 ft. If it is determined that deepening of the channel beyond its presently constructed and maintained depth is justified and in the Federal interest, then the GRR will identify

and define the recommended plan for construction of Phase III of the project, with future construction phases to implement the fully authorized project.

Affected Environment: The study area, which is located in southeastern Louisiana, is the 255.8 mile long Mississippi River Ship Channel from RM 233.8 AHP to RM 22 BHP. The study area includes portions of East and West Baton Rouge, Iberville, Ascension, St. James, St. John the Baptist, St. Charles, Jefferson, Orleans, St. Bernard, and Plaquemines Parishes and other communities and port facilities adjacent to the lower Mississippi River. Four of the nation's top 13 ports for total tonnage occur within the study area and combine for a total of 450 million tons annually.

Land adjacent to the river from Venice, LA, to the Gulf of Mexico is included in the study/project area as there may be opportunities for beneficial use of dredge material to the extent that such beneficial use may be accomplished within the Federal Standard. Corps regulations (33 CFR 335.7) define the Federal Standard for dredge material disposal as "the alternative or alternatives identified by the Corps which represent the least costly alternatives consistent with sound engineering practices and meeting the environmental standards established by the 404(b)(1) evaluation process or ocean dumping criteria." Also included in the scope of the study, is the municipal water supply for all of Plaquemines Parish (above RM 64), which is put at risk for saltwater intrusion at the water intakes along the river during low water events.

Currently, the river is maintained to -48.5 ft Mean Lower Low Water (MLLW) for deep-draft access from RM 22.0 BHP in the Gulf of Mexico to RM 13.4 AHP near Venice, LA. MLLW is the average elevation of the lowest tide recorded at a tide station each day over a 19 year period. There are 12 regularly maintained river crossings between New Orleans, LA, and Baton Rouge, LA. The 12 crossings are maintained at -45 ft Low Water Reference Plane (LWRP) and the material that is dredged is disposed of in deeper parts of the river just downstream or adjacent to each crossing.

The study area also includes 143,207 acres of previously NEPA cleared beneficial use disposal areas from Venice, LA, to the Gulf of Mexico, where dredged material from operation and maintenance of the Mississippi River is used to create coastal habitat to the extent allowable under the Federal Standard in lieu of open water disposal. To date, the US Army Corps of Engineers New Orleans District (CEMVN) has constructed over 14,819 acres of intermediate marsh in the lower delta from beneficial use of Dredge Material.

Project Description: The development of the initial array of alternatives considered alternatives that varied in both depth and width. The alternatives looked at deepening the channel from the existing 45 ft depth to depths of 48 ft and 50 ft, and considered varying widths of the channel between 500 ft and 750 ft. Through the screening process it was determined that the existing

channel widths were sufficient, and widening of the channel was not necessary at this time. Therefore, the alternatives in the final array only considered changes in the channel depth. As alternatives were developed, the alternatives considered the reaches of the project that would require construction and subsequent annual operation and maintenance to provide the recommended depth. This consideration included the following reaches:

The first reach extends Baton Rouge to New Orleans, La beginning at RM 233.8 AHP and ending at RM 115 AHP, it includes a portion of the jurisdictional limits of the Port of Baton Rouge (which extends from RM 255.2 AHP to RM 168.3 AHP) and the jurisdictional limits of the Port of South Louisiana from RM 168.3 AHP to 115 AHP. The channel in this reach is authorized to 55 ft deep by 500 ft wide, but was constructed and is maintained to -45 ft LWRP and a width of 500 ft. Dredging in this area consists of maintaining crossings (locations where the channel crosses the river between bend ways). Of the crossings, 12 require routine maintenance dredging. Three crossings (Fairview, Rich Bend, and Belmont) are located with the jurisdictional limits of the Port of South Louisiana. The remaining 9 crossings (Medora, Smoke Bend, Philadelphia, Alhambra, Bayou Goula, Granada, Sardine Point, Redeye, and Baton Rouge Front),) are located within the jurisdictional limits of the Port of Baton Rouge (identified as Deep Draft Crossings in Figure ES-1).

The second reach lies within the jurisdictional limits of the Port of New Orleans which extends between RM 115 AHP to RM 81.2 AHP (identified as Port of New Orleans in Figure ES-1). In this reach there are two components of the MRSC project. First is the main navigation channel which is authorized to a depth of 55 ft with a width of 750 ft. It is considered naturally deep and wide, and does not require construction, operation and maintenance dredging to provide deep draft access. The second is an approach channel to the New Orleans Harbor, which is outside the limits of the navigation of the channel. The approach channel is dredged annually under the operations and maintenance of the MRSC, in accordance with the 1938 River and Harbor Act. Deepening of the approach channel is not considered in this study.

The third reach extends from New Orleans to the Gulf of Mexico beginning at RM 81.2 AHP and ending at RM 22 BHP. This reach is includes the Port of Plaquemines, whose jurisdictional limits extend from 81.2 AHP to RM 0 at Head of Passes (HoP). From RM 81.2 AHP to RM 13.4 AHP the MRSC is authorized to a depth of 55 ft and a width of 750 ft but is considered naturally deep and wide and does not require construction or maintenance dredging to provide deep draft navigation access. From RM 81.2 AHP to RM 13.4 AHP the MRSC is authorized to a depth of 55 ft and a width of 750 ft but is naturally deep and does not require maintenance dredging to provide deep draft navigation access. Routine maintenance dredging and surveys occur in the reach from 13.4 AHP to RM 22 BHP to provide the approved depth and widths. Within this reach the channel is authorized to depth of 55 ft and width of 750 ft, but during Phase I was constructed

to 45 ft Mean Low Gulf (MLG) and width of 750 ft from RM 13.4 AHP to RM 17.5 BHP and a width of 600 ft from RM 17.5 BHP to RM 22 BHP. Routine maintenance dredging occurs in the lower Mississippi River, extending from Venice, La to the Gulf of Mexico, RM 13.4 AHP to RM 22 BHP to -48.5 ft Mean Lower Low Water (MLLW) (identified as Southwest Pass in Figure ES-1.)

The three reaches, as described above, are dredged annually to maintain deep draft navigation access. Other portions of the river (from RM 13.4 AHP to RM 115 AHP and those areas between RM 115 AHP and RM 232.4 AHP that do not form a part of the 12 routinely maintained crossings) historically have depths in excess of the project authorized depth of 55 ft. The reach from RM 233.8 to RM 232.4 AHP is maintained to -40 ft LWRP. This reach is not considered in the scope of the general reevaluation for deepening beyond the current depth. Evaluation indicates that the present depth condition will remain unchanged through the period of analysis. These naturally deep areas of the authorized navigation project are not considered in the development and evaluation of alternatives for this general reevaluation study. In the present condition, these reaches do not require construction or operation and maintenance dredging to provide deep draft access. However, it is the intent of this report that should existing conditions change in these reaches, the district would exercise its authority to conduct operation and maintenance actions to maintain the constructed depth and width throughout the entire length of the authorized MRSC project, as recommended and approved for construction and maintenance in this report. In that event, an environmental analysis and reassessment of the project may be required as a part of a supplemental decision document.

Alternatives Considered: The following is the final array of alternatives: Each alternative assumes that the current authorized widths of the channel would be maintained and that material dredged for construction from RM 13.4 AHP to RM 22 BHP would be placed in existing designated beneficial use sites as uniformly as possible to create intertidal coastal wetland habitat to the extent possible under the regulations established for the Federal Standard.

- **Alternative 1 (No action/Future Without Project):** This alternative considers maintaining the channel in its current condition by maintaining a depth of -45 ft LWRP for the 12 actively maintained crossings and a -48.5 ft MLLW in the lower Mississippi from RM 13.4 AHP to RM 22 BHP

Alternative 2 and 3 consider providing depths of -48.5 ft and -50 ft, respectively, from the Gulf of Mexico beginning at RM 22 BHP to RM 13.4 AHP, and depths of -48 ft and -50 ft through Baton Rouge ending at RM 233.4 AHP. This would be accomplished by constructing and maintaining the channel as described below.

- **Alternative 2**: The alternative considers construction and maintenance to -48 ft LWRP for the 12 actively maintained crossings and -48.5 ft MLLW in Lower Mississippi River from RM 13.4 AHP to RM 22 BHP

- **Alternative 3**: The alternative considers construction and maintenance to -50 ft LWRP for the 12 actively maintained crossings and -50 ft MLLW in Lower Mississippi River from RM 13.4 AHP to RM 22 BHP

- **Alternative 3d**: The alternative considers construction and maintenance to -50 ft LWRP for the 3 crossings located within the footprint of the Port of South of Louisiana and -50 ft MLLW in the Lower Mississippi River from RM 13.4 AHP to RM 22 BHP. The 9 crossings located within the footprint of the Port of Baton Rouge would remain at 45 ft LWRP.

Additional alternatives were developed to assess and to compare the NED benefit and cost ratios for deepening the river from the lower river through the Port of South Louisiana to -48 ft and to -50 ft LWRP and for deepening the river from the lower river through the Port of Baton Rouge to depths of -48 ft and -50 ft LWRP.

- **Alternative 2a**: The alternative considers construction and maintenance to -48 ft LWRP for the 3 crossings located within the footprint of the Port of South of Louisiana and -48.5 ft MLLW in the Lower Mississippi River from RM 13.4 AHP to RM 22 BHP. The 9 crossings located within the footprint of the Port of Baton Rouge would remain at -45 ft LWRP.

Alternative 3a and 3b consider providing depths of -50 ft MLLW from the Gulf of Mexico beginning at RM 22 BHP through the Port of New Orleans ending at RM 115 AHP, and providing depths of -45 and -48 ft LWRP respectively beginning at the Port of South Louisiana, RM 115 AHP to Baton Rouge ending at RM 232.4 AHP. This would be accomplished by constructing and maintaining the channel as described below.

- **Alternative 3a**: This alternative considers maintenance to - 45 ft LWRP for the 12 actively maintained crossings and construction and maintenance to -50 ft MLLW in the Lower Mississippi River from RM 13.4 AHP to RM 22 BHP;

- **Alternative 3b**: This alternative considers construction and maintenance to -48 ft LWRP for the 12 actively maintained crossings and -50 ft MLLW in the Lower Mississippi River from RM 13.4 AHP to RM 22 BHP.

Alternative 3c and 3d considered providing depths of -50 ft from the Gulf of Mexico beginning at RM 22 BHP through the Port of New Orleans ending at RM 115 AHP, -48 ft and -50 ft respectively through the Port of South Louisiana from RM 115 AHP and ending at RM 168.3 AHP, and maintain the current -45 ft to Baton Rouge from RM 168.3 AHP to RM to RM 232.4 AHP. This would be accomplished by constructing and maintaining the channel as described below.

- **Alternative 3c**: The alternative considers construction and maintenance to -48 ft LWRP for the 3 crossings located within the footprint of the Port of South of Louisiana and -50 ft MLLW in the Lower Mississippi River from RM 13.4 AHP to RM 22 BHP. The 9 crossings located within the footprint of the Port of Baton Rouge would remain at 45 ft LWRP.

- **Alternative 3e**: The alternative considers construction and maintenance to depth of -50 ft LWRP for the 3 crossings located within the footprint of the Port of South of Louisiana and -50 ft MLLW in the Lower Mississippi River from RM 13.4 AHP to RM 22 BHP. And construction and maintenance to -48 ft LWRP for the nine crossings located within the footprint of the Port of Baton Rouge.

Transportation Cost Savings Benefit Analysis: Project benefits were estimated by calculating the reduction in transportation cost for each project depth using the HarborSym Modeling Suite of Tools (HMST) which is a certified model developed by The Institute for Water Resources (IWR). The HMST reflects USACE guidance on transportation cost savings analysis. HarborSym model runs were completed to determine the origin to destination transportation costs to estimate deepening benefits.

Channel improvement modifications result in reduced transportation cost by allowing a more efficient use of vessels. The primary effect from channel deepening that can induce changes in vessel utilization is an increase in a vessel's loading capacity. Channel restrictions can limit a vessel's capacity by limiting its ability to load to its design draft. Deepening the channel can reduce this constraint and the vessel's capacity can increase towards its design capacity if commodities are available to transit, vessel loading practices allow and the weight of the commodity on the vessel will lower it deeper in the water. This increase in vessel capacity utilization can result in fewer trips being required to transport forecasted cargo.

The results of the HarborSym model were used as the basis for the economic comparison of alternatives.

Environmental Consequences: Neither public scoping nor the public comment periods for the Draft GRR and SEIS and the Clean Water Act 404 public notice resulted in negative response to the environmental consequences of proposed project. Based on the results of four models (1D

hydraulic model, 2D hydraulic model, 3D hydraulic model, and Wetland Value Assessment model), and based also on minimization efforts, the Recommended Plan is expected to have net positive environmental impacts. During construction of the Recommended Plan, the beneficial use of dredged material into open water habitat is anticipated to result in approximately 1462 acres (and 576 average annual habitat units) of intermediate marsh. It is anticipated that through the efforts taken to avoid wetlands impacts and the beneficial use of dredged material that functionally compensates for unavoidable remaining impacts, the proposed project would not result in overall adverse cumulative impacts to the aquatic environment and human environment in or near the project area. Additionally, taking a phased approach to construction of the 9 northernmost crossings at a rate of 2-3 per year will not exceed *de minimis* threshold of air quality emissions and the project would comply with Clean Air Act requirements. All other environmental compliance for the project has been achieved and is documented in Appendix A of the main report.

The National Economic Development (NED) Plan: In the evaluation and comparison of project depth alternatives, which is necessary to arrive at the Recommended Plan, NED costs play a critical role. NED costs include both the financial and economic costs associated with a project throughout its lifecycle. Each of these types of costs and their sources are discussed in the report. Additionally, the NED costs for the depth alternatives being considered in this analysis will be identified.

Through the comparison of first construction cost, the increase in annual operations and maintenance cost, and the total average benefits, the NED Plan was identified based on the alternative that provided the greatest net excess benefits to the nation. The NED plan is described in detail below as the recommended plan.

Development of the Draft Report: Alternatives 1 through 3 were carried forward for evaluation in the draft GRR and SEIS, while economics and cost/benefits analysis for all alternatives was developed concurrently. It was recognized that the original alternatives represented the maximum environmental impacts; all additional alternatives reduced the maximum impacts from the three original alternatives. For that reason, the other alternatives 2a, 3a, 3b, 3c, 3d, and 3e were developed, analyzed, and screened based on economic analysis only. The economic analysis screened alternatives 2a, 3a, 3b, 3c, and 3e from further consideration based on their respective net excess benefits; these benefits were fewer than the benefits offered by the other alternatives. The alternative analysis in the draft GRR and SEIS was expanded to include alternative 3d, with the original alternatives, in the consideration for a selection of a TSP. The draft integrated GRR and SEIS was released for public review in December of 2016, and included Alternative 3d as the TSP. The draft SEIS included evaluation of alternatives 1, 2, 3 and 3d.

Public Review and Significant Public Comments: The draft report was released for public review from December 16, 2016 through January 31, 2017. During this time, public hearings were held in New Orleans, LA at the USACE New Orleans District Office on December 14, 2016 and January 26, 2017 to accept public comments to the draft report.

Overall, public comments received both in writing and during the public hearings were supportive of the project. One comment received from industry requested further consideration of an alternative to use connector vessels in lieu of deepening the channel. This alternative was addressed further in the final report. Significant comments from industry and the NFS requesting further review and consideration of the dredging requirements associated with deepening the crossings located within the Port of Baton Rouge, lead to further consideration of alternatives, and lead to the Recommended Plan proposed in the final report, which differs from the TSP as presented in the draft report.

Recommended Plan: Based on the review of significant comments from public on the Draft GRR and SEIS, the results of the Independent External Peer Review (IEPR) and Agency Technical Review (ATR), and results of further hydraulic modeling, the Recommended Plan is Alternative 3. This is the NED plan. This plan provides net annual benefits of $127,500,000 and has a benefit to cost ratio of 7.2 to 1.

The Recommended Plan provides deep draft navigation to a depth of 50 ft from the Gulf beginning at RM 22 BHP through the Port Baton Rouge ending at RM 232.4 AHP. This would be accomplished by constructing and maintaining the MRSC to -50 ft MLLW in the lower Mississippi from RM 13.4 AHP to RM 22 BHP, and by deepening the twelve regularly maintained crossings located within the Port of South Louisiana and the Port of Baton Rouge to -50 ft LWRP. The material dredged during construction of the RM 13.4 AHP to RM 19.5 BHP reach would be placed in locations designated for beneficial use of dredged material. The material would be deposited as uniformly as practicable within the Federal Standard to create intertidal coastal wetland habitat.

All other reaches of the river have depths that are naturally greater than 50 ft. In the present condition these reaches do not require construction or operation and maintenance to provide deep draft access. However it is the intent of the GRR that should existing conditions change in these reaches, the district would exercise its authority to conduct operation and maintenance actions to maintain the constructed depth and width to the extent approved for construction and supported by an executed cost-sharing agreement with the non-Federal sponsor. The purpose of this integrated GRR and SEIS is to evaluate any significant changes in environmental baselines (e.g. coastal wetlands, human environment, etc.) that may have occurred since completion of the Feasibility Study and Environmental Impact Statement in 1985, and to ensure the project would still be compliant with all pertinent environmental regulations. If, in the future, the project requires

dredging in areas outside of those evaluated in this SEIS, additional analysis could be required under NEPA and other environmental laws and regulations.

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LIST OF ACRONYMS, ABBREVIATIONS AND SYMBOLS

AAHUs	Average Annual Habitat Units
ACHP	Advisory Council on Historic Properties
AHP	Above Head of Passes
AM&M	Adaptive Management & Monitoring
ASACW	Assistant Secretary of the Army for Civil Works
ATV	All Terrain Vehicle
BCR	Benefit to Cost Ratio
B/C	Benefit to Cost Ratio
BHP	Below Head of Passes
BLH	Bottomland hardwood
BMP	Best management practices
CAA	Clean Air Act
CEMVN	U.S. Army Corps of Engineers, Mississippi Valley Division, New Orleans District
CEPD	Comprehensive Evaluation of Project Datums
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
cfs	Cubic Feet Per Second
CIAP	Coastal Impact Assistance Program
CRMS	Coastwide Reference Monitoring System
CWA	Clean Water Act
CWPPRA	Coastal Wetlands Planning, Protection and Restoration Act
CY	Cubic Yards
DMMP	Dredge Material Management Plan
DO	Dissolved oxygen
Draft Report	Draft Integrated Feasibility Report and Environmental Impact Statement
EDR	Engineering Documentation Report
EFH	Essential Fish Habitat
EIS	Environmental Impact Statement
EJ	Environmental Justice
EO	Executive Order
EPA	Environmental Protection Agency
EQ	Environmental Quality
ER	Engineering Regulation
ESA	Endangered Species Act
FCSA	Feasibility Cost Sharing Agreement
FEIS	Final Environmental Impact Statement
FEMA	Federal Emergency Management Agency

FHWA	Federal Highway Administration
Final Report	Final Integrated Feasibility Report and Environmental Impact Statement
FPPA	Farmland Protection Policy Act
FRM	Flood risk management
ft	Feet
FWCA	Fish and Wildlife Coordination Act
FWCAR	Fish and Wildlife Coordination Act Report
GIS	Geographic Information System
GIWW	Gulf Intercostal Waterway
GRR	General Reevaluation Report
HDDA	Hopper Dredge Disposal Area
HI	Hydrologic Indices
H.R.	House Record
HMST	HarborSym Modeling Suite of Tools
HoP	Head of Passes
HSI	Habitat Suitability Index
HSDRRS	Hurricane Storm Damage Risk Reduction System
HTRW	Hazardous, Toxic and Radioactive Waste
Hwy	Highway
I-10	Interstate 10
I-55	Interstate 55
IWR	Institute for Water Resources
LA	Louisiana
LaDOTD	Louisiana Department of Transportation and Development
LCA	Louisiana Coastal Area
LDWF	Louisiana Department of Wildlife and Fisheries
LERRD	Lands, Easements, Rights-Of-Way, Relocation, and Disposal Areas
LIDAR	Light Detection and Ranging data
LNHP	Louisiana Natural Heritage Program
LULC	Land Use/Land Cover
LWRP	Low Water Reference Plan
MBI	Mitigation Banking Instrument
MCY	Million Cubic Yards
MLLW	Mean Lower Low Water
MLG	Mean Low Gulf
MLW	Mean Low Water
MOU	Memorandum of Understanding
MR&T	Mississippi River and Tributaries
MRGO	Mississippi River Gulf Outlet Canal
MRSC	Mississippi River Ship Channel
MRL	Mississippi River Levee

MS	Mississippi
NAAQS	National Ambient Air Quality Standards
NAVD	North American Vertical Datum
NED	National Economic Development
NEPA	National Environmental Policy Act
NER	National Ecosystem Restoration
NFS	Non-Federal Sponsor
NGO	Non-Governmental Organizations
NGVD29	National Geodetic Vertical Datum of 1929
NOAA	National Oceanic and Atmospheric Administration
NOLA	New Orleans, Louisiana
NRC	National Research Council
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NWLON	National Water Level Observation Network
OCPR	Office of Coastal Protection and Restoration, Louisiana
OMDDS	Ocean Marine Dredge Disposal Site
O&M	Operation and Maintenance
OMRR&R	Operation, Maintenance, Repair, Rehabilitation and Replacement
OSE	Other Social Effects
PA DMMP	Preliminary Assessment Dredge Material Management Plan
PED	Preconstruction Engineering and Design
PL	Public Law
PMP	Project Management Plan
PPA	Project Partnership Agreement
PPT	Parts Per Thousand
Principles and Guidelines	1983 Economic and Environmental Principles and Guidelines for Water and Related Land Implementation Studies
REC	Recognized Environmental Conditions
RED	Regional Economic Development
REP	Real Estate Plan
RM	River Mile
ROW	Right of way
RSLR	Relative Sea Level Rise
SEIS	Supplemental Environmental Impact Statement
SHPO	State Historic Preservation Office
SLD29	Sea Level Datum of 1929
SLR	Sea Level Rise
SMART	Specific, Measurable, Attainable, Risk Informed, Timely
SWP	South West Pass
SWPPP	Storm Water Pollution Prevention Plan
T&E	Threatened and Endangered
TMDL	Total Maximum Daily Load

TSP	Tentatively Selected Plan
TY	Target Year
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service
USGS	United States Geological Survey
WIK	Work-In-Kind
WMA	Wildlife Management Area
WRDA	Water Resources Development Act
WVA	Wetland Value Assessment
USACE	U.S. Army Corps of Engineers

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This Report *Mississippi River Ship Channel Gulf to Baton, LA Final Integrated General Reevaluation Report and Supplemental Environmental Impact Statement* (Final GRR and SEIS) updates and finalizes the draft report of the same title which was released for public review in December of 2016. The draft report also underwent an Agency Technical Review and an Independent External Peer Review Changes and revisions in this Chapter from the draft report provide better description of the existing project, prior studies, and project authority, including implementation guidance on the Water Resource and Development Act (WRDA) 2016.

1.0 INTRODUCTION

The Mississippi River Ship Channel (MRSC), Gulf to Baton Rouge, LA, project is a deep draft navigation channel, providing deep draft navigation access to ports located along the Mississippi River in Southeast Louisiana. The project area begins near Baton Rouge, LA, at river mile (RM) 233.8 Above Head of Passes (AHP) and extends to the Gulf of Mexico, ending at RM 22 Below Head of Passes (BHP) (Figure 1-1). The channel services four of the top 13 ports in the United States: the Port of Greater Baton Rouge (Port of Baton Rouge), the Port of South Louisiana, the Port of New Orleans, and the Plaquemines Port, Harbor and Terminal District (Port of Plaquemines). The Port of South Louisiana is the largest port in the nation in terms of tonnage. The project area also includes the Port of St. Bernard. For purposes of this report, data for the Port of St. Bernard is included in the data for the Port of New Orleans.

1.1 Project Description

The MRSC provides deep draft navigation from Baton Rouge, LA beginning at RM 233.8 AHP and extends to the Gulf of Mexico ending at RM 22 BHP This is accomplished by routinely dredging three reaches in order to maintain the constructed depths of the navigation project.

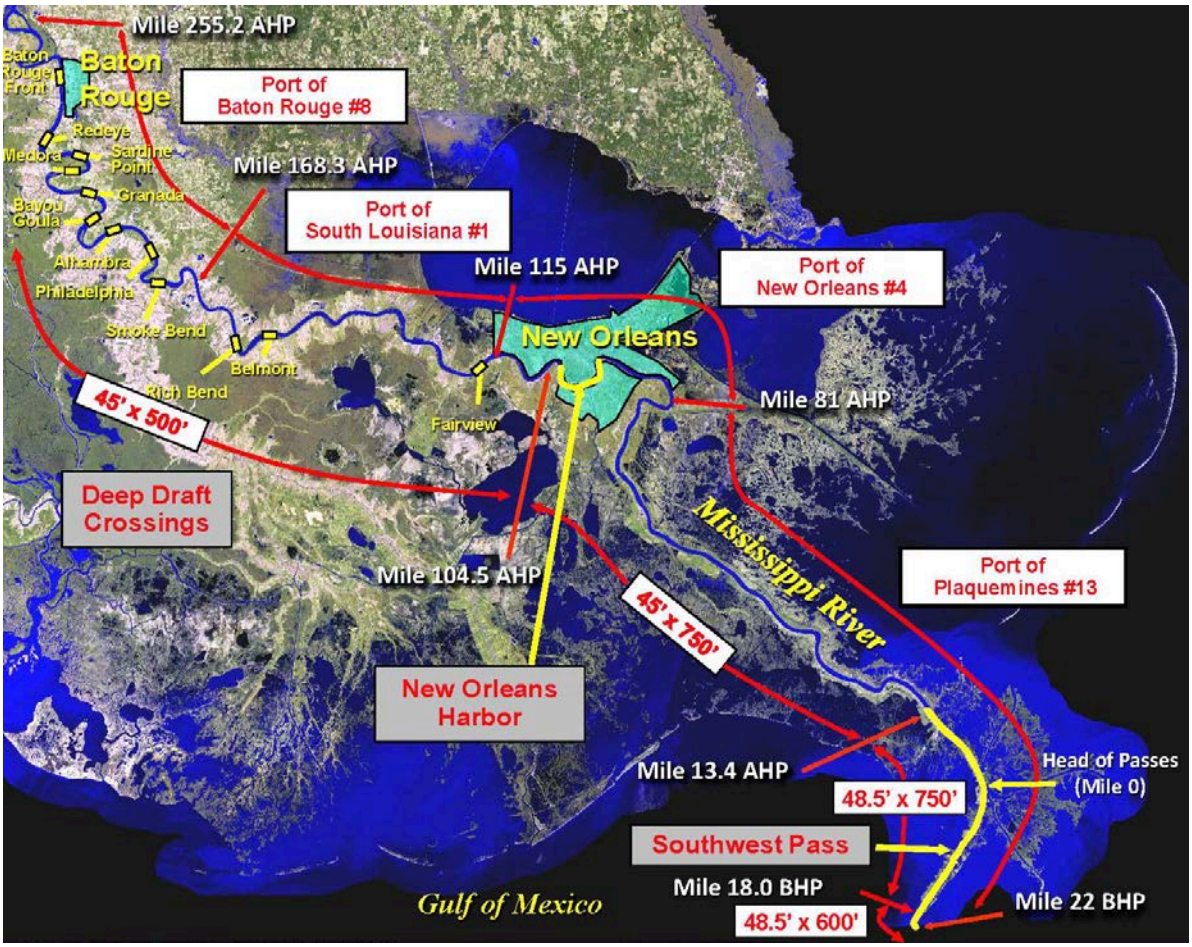


Figure 1-1 Project Vicinity Map (the red line does not indicate the study area)

1.1.1 Baton Rouge to New Orleans

The first reach begins at RM 233.8 AHP and extends to RM 115 AHP. From RM 233.8 AHP to RM 168.3 AHP it covers the a portion of the jursitidicational limits of the Port of Baton Rouge (which extends from RM 255.2 AHP to RM 168.3 AHP) and it includes the jurisdictional limits Port of South Louisiana, which extends from RM 168.3 AHP to RM 115 AHP) (Figure 1-2). Within this reach the project is authorized to a depth of 55 ft and width of 500 ft. The 1983 Chief's Report recommended construction of a turning basin to a depth of 55 ft from RM 233.8 to 232.4 AHP, which was subsequently authorized. However this feature was not implemented and the reach from RM 233.8 to RM 232.4 AHP is maintained to -40 ft measured to the Lower Water Reference Plan (LWRP) datum by 500 ft wide. This reach is not considered in the scope of the general reevaluation for deepening beyond the current depth. Beginning at RM 232.4 AHP to RM 115 AHP the channel is maintained to -45 ft LWRP by 500 ft wide. There are numerous crossings (locations where the channel crosses the river between bendways) within this reach, 12 of which require routine maintenance dredging to provide the 45 ft depth and 500 ft width. Of these 12 crossings, nine (Smoke Bend, Philadelphia, Alhambra, Bayou Goula, Granada, Medora, Sardine

Point, Red Eye, and Baton Rouge Front) are within the footprint of the Port of Baton Rouge. Three crossings, (Fairview, Belmont, and Rich Bend) lie within the footprint of the Port of South Louisiana.

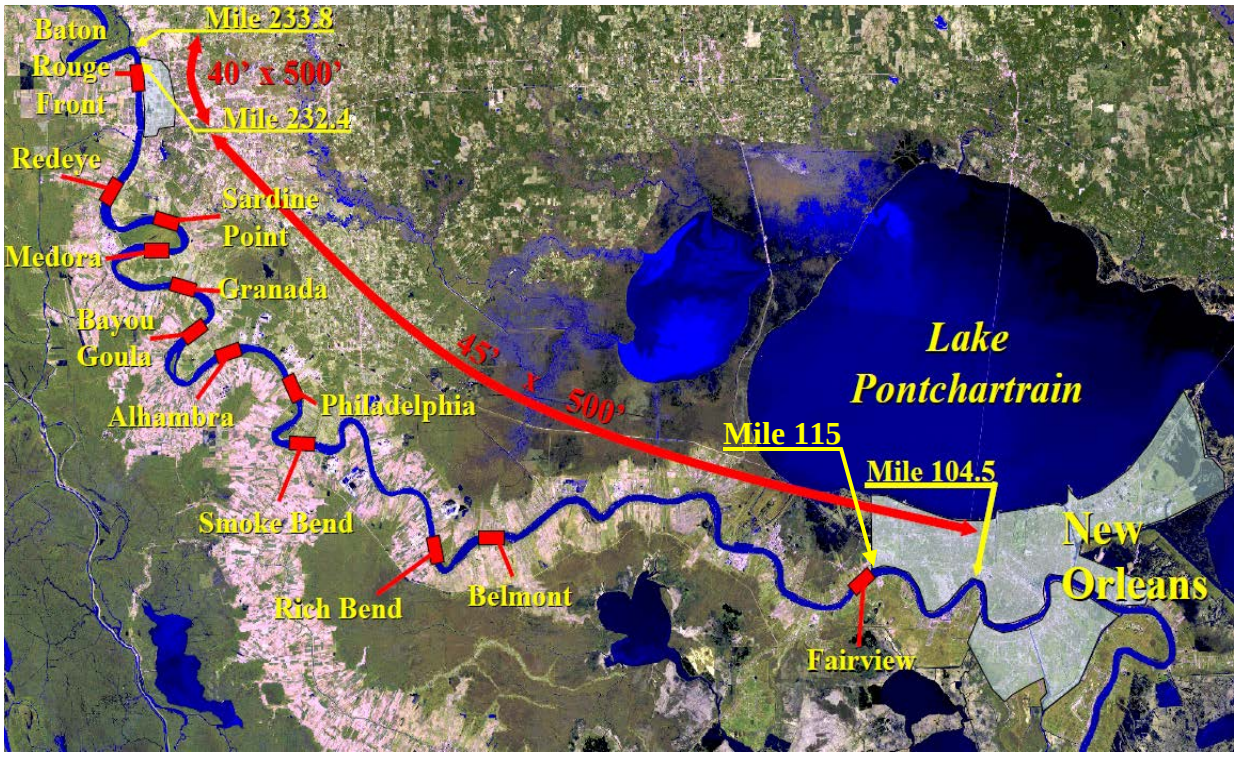


Figure 1-2 Baton Rouge to New Orleans (Deep Draft Crossings)

(Depths in this reach are referenced to Low Water Reference Plane)

Fairview and Rich Bend require maintenance dredging on less than an annual basis, the other 10 crossings are dredged annually. The areas in between the crossings are considered naturally deep and do not require routine maintenance dredging.

1.1.2 The New Orleans Harbor Area

This second reach extends from RM 115AHP to RM 81.2 AHP, which is the is jurisdictional limits of the Port of New Orleans (Figure 1-3). Within this reach, there are two components of the authorized project: (1) the main navigation channel of the MRSC; and (2) the approach channel to New Orleans Harbor Area, located between RM 104.5 AHP to RM 94.6 AHP. In this reach, the main navigation channel of the MRSC is authorized to a depth of 55 ft and width of 750 ft. It is considered naturally deep and wide, and does not require maintenance dredging to provide deep draft navigation access. Under the Water Resource and Development Act (WRDA) of 1986 the approach channel to the New Orleans Harbor is authorized to a depth of 40 ft beginning 200 ft

from the face of the wharves, located on the left descending bank of the river. This project feature was not implemented. The approach channel is maintained to a depth between -15 ft and -35 ft measured to Mean Low Gulf (MLG) (conversion to LWRP is provided in contracts for dredging) beginning at a point 100 ft from the face of the wharves on the left descending bank, as authorized in the The River and Harbors Act of 1938 (1938 RHA). The Chief of Engineer's Report from 1983 and subsequent authority did not include authority to deepen the approach channel beyond the previously authorized 40 ft. Since the approach channel is not authorized to a depth greater than 40 ft, evaluation of deepening of the approach channel is not included in this general reevaluation study. The approach channel to the New Orleans Harbor lies outside the navigation channel and ships may still pass through the main navigation channel at depths greater than 55 ft.

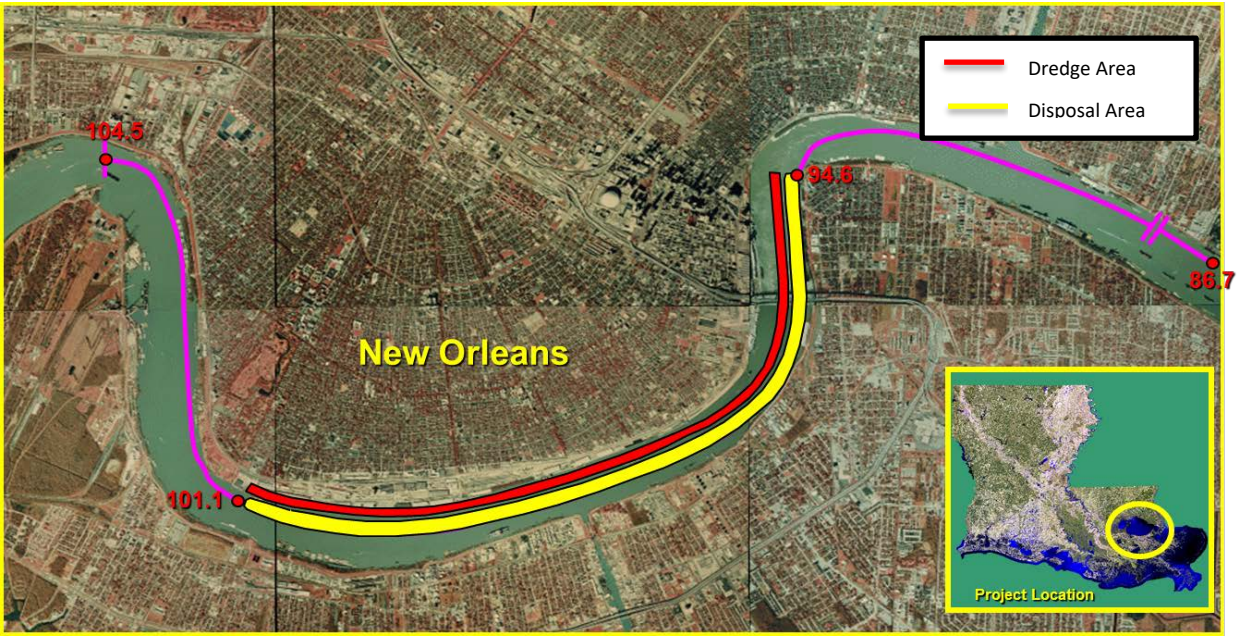


Figure 1-3 New Orleans Harbor

(Depths in this reach are referenced to Mean Low Gulf with a conversion to Low Water Reference Plane)

1.1.3 New Orleans to the Gulf of Mexico (Southwest Pass)

The third reach extends from RM 81.2 AHP to the Gulf of Mexico ending at RM 22 BHP. This reach includes the Port of Plaquemines, whose jurisdictional limits extend from 81.2 AHP to RM 0 at Head of Passes (HoP). From RM 81.2 AHP to RM 13.4 AHP the MRSC is authorized to a depth of 55 ft and a width of 750 ft but is considered naturally deep and wide and does not require maintenance dredging to provide deep draft navigation access. The reach referred to as SWP, begins at RM 0 HoP and extends to the Gulf of Mexico ending at RM 22 BHP, and includes the Southwest Pass Bar Channel from RM 19.5 BHP to the end of the project in the Gulf of Mexico at RM 22 BHP. (Figure 1-4)

During Phase I this reach was constructed to -45 ft MLG and width of 750 ft from RM 13.4 AHP to 17.5 BHP, and a depth of -45 ft MLG and width of 600 ft from RM 17.5 BHP to RM 22 BHP. Continued provision of the constructed channel depth and width is accomplished through routine maintenance dredging, extending from Venice, La to the Gulf of Mexico (RM 13.4 AHP to RM 22 BHP). In this reach of the project, maintenance dredging occurs to -48.5 ft mean lower low water (MLLW), plus additional depth to account for over depth and advance maintenance. This reach is typically dredged from RM 10 AHP to RM 22 BHP, but is surveyed to RM 13.4 AHP, in the event shoaling begins to occur further upriver, and additional dredging is required. Dredging typically occurs from RM 11 AHP to RM 22 BHP, however from RM 13.4 AHP to RM 11 AHP is included in the annual surveys in the event shoaling occurs and additional dredging is required.

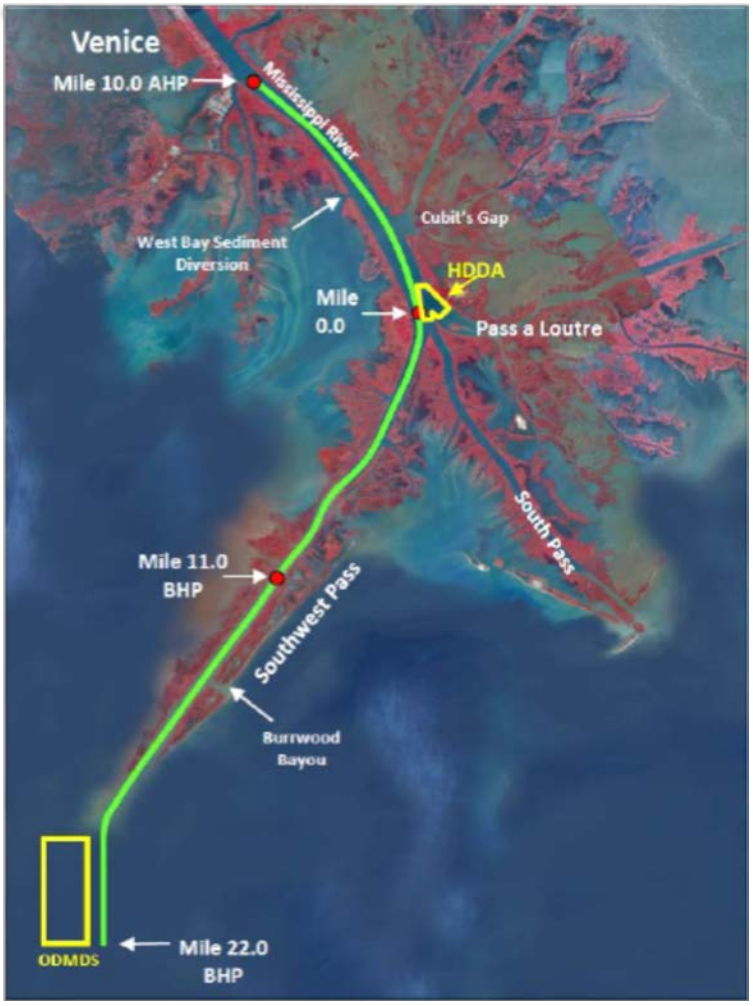


Figure 1-4 New Orleans to the Gulf of Mexico

(Depths in this reach are referenced to Mean Lower Low Water)

The reach known as South Pass is part the authorized MRSC project and is included in the the operation and maintenance of the MRSC. The River and Harbors Act 1945 authorized this reach to a depth of 30 ft. The 1983 Chief's Report and subsequent authority did not recommend deepening to 55 ft. It is therefore not considered in the scope of the general reevaluation study.

The three reaches, as described above, are dredged annually to maintain deep draft navigation. Other portions of the of the navigation channel (from RM 13.4 AHP to RM 115 AHP and those areas between RM 115 AHP and RM 233.8 AHP that do not form a part of the 12 maintained crossings) historically have depths in excess of the project authorized depth of 55 ft. Evaluation indicates that the present depth condition will remain unchanged through the period of analysis. These naturally deep areas of the authorized navigation project are not considered in the development and evaluation of alternatives for this general reevaluation study. In the present condition, these reaches do not require construction or operation and maintenance to provide deep draft access. However, it is the intent of this report that should existing conditions change in these reaches, the district would exercise its authority to conduct operation and maintenance actions to maintain the constructed depth and width throughout the entire length of the authorized MRSC project, as recommended and approved for construction and maintenance in this report. In that event, an environmental analysis and reassessment of the project may be required. In the event the navigation industry indicates a need, hydrographic surveys may be required to determine if shoaling will prevent safe passage of ships. However, this is not a routine scheduled activity, and is only performed as needed. If the surveys indicate shoaling is limiting the channel depth or width, then dredging may be required; however, dredging in these reaches has not been required in the last 10 years.

The map "Mississippi River Ship Channel" (EGIS Map ID 17-005-001 included in the Map Annex) illustrates the sections of the river which are naturally deep, compared to those that are routinely dredged. The maps are based on the hydrographic surveys taken over a period of a year, from September of 2012 to September of 2013. The hydrographic surveys reflect the thalweg, the deepest point, of the MRSC at a discreet point in time. The channel depth, at any given point, may vary throughout the year and may vary across the channel depending on the existing side slopes.

1.2 Project Authority

The River and Harbor Act of 1925: The project, "Mississippi River, Louisiana Between Baton Rouge and New Orleans," described in the report of the Chief of Engineers published as House Document No. 105, Sixty-Ninth Congress was authorized by the River and Harbor Act of 1925. The act provided for a 35 ft by 300 ft channel in the river below Baton Rouge, Louisiana.

The River and Harbor Act of 1938: This Act authorized the project entitled "Mississippi River at and Near New Orleans, Louisiana," as described in the report of the Chief of Engineers,

published as House Document No 597, 75th Congress. The Act provided for a 35 ft by 1000 ft channel between the lower limits of the Port of New Orleans and Head of Passes on the Mississippi River; a 35 ft by 1,500 ft channel through the Port of New Orleans; and a 35 ft by 500 ft channel between Baton Rouge and New Orleans.

The River and Harbor Act of March 1945, 76th Congress, 1st Session: This Act authorized the Mississippi River Baton Rouge to the Gulf of Mexico, Louisiana project. The act provided for the construction of a -35 ft LWRP by 500 ft channel between Baton Rouge and New Orleans; a -35 ft MLG by 1,500 ft channel within the Port of New Orleans; a -40 ft MLG by 1,000 ft channel from the lower limits of the Port of New Orleans to Head of Passes; a -40 ft MLG by 800 ft wide channel in Southwest Pass (SWP); a -40 ft MLG by 600 ft channel in Southwest Pass Lower Jetty and Bar Channel; a -30 ft MLG by 450 ft channel in (SP); and a -30 ft MLG by 500 ft channel in South Pass Bar Channel.

The River and Harbor Act of 1962, Public Law 87-874: This Act authorized the channel from Baton Rouge to the upper limits of the Port of New Orleans to a depth of 40 ft and construction of a 40 ft by 500 ft channel within the existing 35 ft by 1,500 ft channel within the limits of the Port of New Orleans and through the upper limit of the project located at RM 233.0 AHP.

The 1985 Supplemental Appropriations Act: This Act authorized the project for construction as follows:

> "…the Secretary of the Army acting through the Chief of Engineers is authorized and directed to proceed with planning, design, engineering, and construction of the following projects substantially in accordance with the individual report describing such project as reflected in the Joint Explanatory Statement of the Committee of Conference accompanying the Conference Report for H.R. 2577…Mississippi River Ship Channel, Gulf to Baton Rouge, Louisiana…*Provided further*, That the funds appropriated herein shall lapse on June 30, 1986, if the agreement required herein for that project has not been executed..."

As recommended in the 1983 Chief's Report and as authorized in the 1985 Act, no provision was made for the required cost sharing of the project.

<u>The Water Resources and Development Act of 1986 (PL 99-662):</u> Section 101 specified the cost sharing attributable to the construction, operation, maintenance, repair, replacement and rehabilitation (OMRR&R) of general navigation projects such as the MSRC.

Cost Sharing Construction:

> "Payments During Construction: The non-Federal interests for a navigation project for a harbor or inland harbor, or any separable element thereof, on which a contract for physical construction has not been awarded before the date of enactment of this Act shall pay, during the period of construction of the project the following costs associated with general navigation features…(c) 50 percent of the cost of construction of the portion of the project which has a depth in excess of 45 ft."

Cost Sharing of Operation and Maintenance:

> "The Federal share of the cost of operation and maintenance of each navigation project for a harbor or inland harbor constructed pursuant to this Act shall be 100 percent, except that in the case of deep-draft harbor, the non-Federal interest shall be responsible for an amount equal to 50 percent of the excess of the cost of the operation and maintenance of such project over the cost which the Secretary determines would be incurred for operation and maintenance of such project if such project had a depth of 45 ft."

Although the Department of the Army did timely execute an Agreement for Local Cooperation with the State of Louisiana on June 30, 1986 for Phase I (Depth enhancement of 45 ft to RM 181) of the Mississippi River Ship Channel Project From Baton Rouge, Louisiana to the Gulf of Mexico, Congress re-authorized the project in Section 201(a) of WRDA 1986.

Section 201(a) of the Water Resources Development Act of 1986 provided reauthorization of the project as:

Section 201_-- Harbor Development, Deep Draft Harbor Projects, Authorization for Construction:

> "(a) The following projects for harbors are authorized to be prosecuted by the Secretary substantially in accordance with the plans and subject to the conditions recommended in the respective reports designated in this subsection, except as otherwise provided in this subsection:…
>
> Mississippi River Ship Channel, Gulf To Baton Rouge, Louisiana. The project for navigation, Mississippi River Ship Channel, Gulf to Baton Rouge, Louisiana: Report of the Chief of Engineers, dated April 9, 1983, at a total cost of $471,000,000 with an estimated first Federal cost of $178,000,000 and an estimated first non-Federal cost of $293,000,000."

Section 2102(b) of the Water Resource Reform and Development Act of 2014, Public Law 113-121: This Public Law amended the cost sharing requirements of Section 101(b)(1) of WRDA

1985 by increasing the depth at which operation and maintenance of a navigation requires a non-Federal cost share from 45 ft to 50 ft.

Section 1111 of the Water Resource Development Act of 2016, Public Law 113-121: This Public Law further amends Section 101(a) of WRDA 1986 to change the cost sharing for the construction of navigation projects for harbors or inland harbors, or separable elements thereof, for which a contract for physical construction has not been awarded before June 10, 2014. For such projects, or separable elements, the non-federal sponsor is required to provide during construction:

a) 10 percent of the cost of construction of the portion of the project which has a depth not in excess of 20 ft; plus

b) 25 percent of the cost of construction of the portion of the project which has a depth in excess of 20 ft but not in excess of 50 ft; plus

c) 50 percent of the cost of construction of the portion of the project which has a depth in excess of 50 ft.

Pursuant to the implementation guidance for Section 1111, it has been determined that the construction of Phase 3 of the MRSC constitutes a separable element of the MRSC, such that the amended cost sharing provisions of Section 1111 apply to the Phase 3 construction of the project.

1.3 Pertinent Previous Studies and reports

This is not a comprehensive list of all studies and reports related to the MRSC, it provides a summary of decision documents and design memorandums (DM) related to implementation of the project.

Letter from the Chief of Engineers "Mississippi River at and New Orleans, La" dated 19 April 1938 (1938 Chief's Report), this report described among other things dredging within the Port of New Orleans, a channel depth of 35 ft and maximum width of 1,500 ft measured from a line generally 100 ft from the face of the left bank wharves, but not closer than 100 feet to the wharves on the right bank

Letter from the Chief of Engineers "Mouth of the Mississippi River, La" dated 15 March 1939 (1939 Chief's Report authorized under the 1945 RHA), this report described among other a recommendation that the existing projects for the Mississippi River, Baton Rouge to New Orleans; Mississippi River, South Pass; and Mississippi River, Southwest Pass be modified and combined and a project covering Mississippi River from New Orleans to the Head of Passes be added to

provide a single project, Mississippi River, Baton Rouge to the Gulf of Mexico with the following channel dimensions:

- Baton Rouge to New Orleans, 35 feet deep (mean low Gulf) by 500 feet wide.
- Port limits of New Orleans, 35 feet deep (mean low Gulf) by 1,500 feet wide.
- New Orleans to Head of Passes, 40 feet deep (mean low Gulf) by 1,000 feet wide
- Southwest Pass, 40 feet deep (mean low Gulf) by 800 feet wide.
- Southwest Pass Bar Channel, 40 feet deep (mean low Gulf) by 600 feet wide.
- South Pass, 30 feet deep (mean low Gulf) by 450 feet wide.
- South Pass Bar Channel, 30 feet deep (mean low Gulf) by 600 feet wide.

Letter from the Chief of Engineers "Mississippi River, Baton Rouge to the Gulf of Mexico, Louisiana" dated 17 July 1961 (1961 Chief's Report), this report described among other things to provide a channel 40 feet deep and 500 feet wide from 0.1 mile below the Louisiana Highway Commision Bridge at Baton Rouge to the upper limits of the Port of New Orleans, and also (within the main navigation channel) 40 feet deep and 500 feet wide within the presently authorized (approach channel) 35 ft by 1,500 ft channel in the port limits.

The Feasibility Report titled <u>Deep-Draft Access to the Ports of New Orleans and Baton Rouge, Louisiana,</u> dated July 1981 (1981 Feasibility Report): This feasibility report re-evaluated the existing Mississippi River navigation channel between Baton Rouge, Louisiana and the Gulf of Mexico. The report recommended deepening the Mississippi River navigation channel to a 55 ft depth from Baton Rouge to the Gulf of Mexico, with the exception of that portion of the project within South Pass (which was previously authorized to a depth of 30 ft) and within the authorized approach channel for the Port of New Orleans which was recommended and is authorized to a depth of 40 ft (as distinguished from the authorized main navigation channel within the vicinity of the Port of New Orleans which was recommended in the 1981 Feasibility Report, and subsequently authorized, to be constructed to a 55 ft depth) .

The Report of the Chief of Engineers, titled <u>Mississippi River Ship Channel, Gulf to Baton Rouge, Louisiana</u>, dated April 9, 1983 (1983 Chief's Report) substantially approved the recommendations of the 1981 Feasibility Report, and the findings conclusions and recommendatins of the Board of Engineers, dated April 1, 1982, whichidentified the following key features of the project:

- "Enlargement of the existing channel in Southwest Pass from the Head of Passes (mile 0) to deep water in the Gulf of Mexico at about mile 22 Below Head of Passes (BHP) to a project depth of 55 feet and a bottom width of 750 feet;

- Enlargement of the existing channel in the Mississippi River from the Head of Passes (mile 0) to within the Port of Baton Rouge (mile 233.0 AHP) to a project depth of 55 feet and bottom width of 750 feet;

- A turning basin with a project depth of 55 ft, a bottom width of 1,600 feet, and length of 4,000 feet, at the end of the enlarged channel in Baton Rouge (mile 233.0 AHP to 233.8 AHP); (this turning basin has not been constructed and the reach between RM 233.0 AHP to RM 233.8 AHP is maintained to a depth of 40 ft and width of 500 ft as described in the 1961 Chief's Report).

- Enlargement of the existing 35-foot channel along the left bank of the Mississippi River at New Orleans (mile 86.7 AHP to 104.5 AHP) to a project depth of 40 feet at the exisiting 1,500-ft bottom width (this feature of the project was not implemented and the approach channel to the New Orleans Harbor is maintained to a depth of 35 ft beginning 100 ft from the face of the wharves as described in the 1938 Chief's Report);

- River training works in South Pass an Pass a Loutre;

- Creation of about 11,600 acres of wetlands and 11,400 acres of upland habitat through overbank disposal of dredged material in the vicinity of Southwest Pass; and

- Freshwater reservoirs at East Point a la Hache and West Point a la Hache to mitigate for increases saltwater intrusion."

Mississippi River Ship Channel Gulf to Baton Rouge General Design Memorandum and Supplements (in chronological order of completion):

Design Memorandum No. 1 August 1983: This Design Memorandum recommended the following modifications for implementation of the project as recommended in the 1983 Chief's report:

(1) The enlargement of the existing Southwest Pass Bar Channel from a depth of 40 ft over a bottom width of 600 ft from RM 17.8 BHP to the Gulf;

(2) The enlargement of the existing 40 ft channel in the SWP from RM 0 at HoP to RM 17.8 BHP to a project depth of 55 ft over a bottom width of 750 ft; The enlargement of the 40 ft channel from RM 0 at HoP and RM 233.0 to a project depth of 55 ft over a bottom width of 750 ft;

(3) The enlargement of 12 wharf areas of the Mississippi River in New Orleans Harbor between RM 86.7 AHP to RM 104.5 AHP from a depth of 35 ft to a depth of 40 ft

(4) The construction of a submarine sill at RM 64.1 AHP and raw-water storage reservoirs for the East and West Pointe-a-la-Hache treatment plants and the Boothville treatment plant to mitigate for the increased saltwater intrusion.

Design Memorandum No. 1 Supplement No. 1 August 1986 (approved by Mississippi Valley Division Commander on 16 October 1987): This first supplement to the GDM recommended construction of a 45 ft deep channel from Venice, La through New Orleans Harbor up to RM 181 and the enlargement of berthing areas at 12 wharves of the Mississippi River in the New Orleans Harbor between RM 86.7 AHP to RM 104.5 AHP from a 35 depth to a 40 ft depth.

Design Memorandum No. 1 Supplement No. 4 December 1986 (approved by Mississippi Valley Division Commander on 22 December 1986): This supplement concluded that construction of training works in Pass a Loutre and South Pass, as part of the project to deepen SWP to 45 ft, was not warranted; and that further investigation regarding the need and justification for training works in these reaches should be deferred.

Design Memorandum No. 1 Supplement No. 6 May 1990 (approved by the USACE Director of Civil Works on 07 December 1990): This supplement addressed mitigation of increased salt water intrusion below RM 64 AHP caused by the 45 ft channel depth and recommended a change in the previously recommended saltwater intrusion mitigation plan from a reservoir plan to a plan to upgrade the existing water treatment and distribution system in Plaquemines Parish, to be constructed by the local sponsor.

Design Memorandum No. 1 Supplement No. 2 December 1992: This supplement covered Phase 2 of construction of the MRSC for the construction of a 45 ft deep by 500 ft wide channel from RM 181 AHP to RM 232.4 AHP. It showed that Phase II was incrementally justified and provided design for dredging 7 crossings to the project dimensions and implementation of training works in 4 of the seven crossings.

The following provides a summary of remaining DM Supplements which were planned but not completed.

Design Memorandum No. 1 Supplement No. 3: This supplement was intended to address implementation of training works from RM 181 to RM 232.4, this was incorporated and addressed in Supplement No. 2.

Design Memorandum No. 1 Supplement No. 5: This supplement was to consider widening of Jetty Reach in Southwest Pass, but as of the 1990 Supplement No. 6 was identified as “Deferred” and has since not been completed.

As of completion of DM No. 1 Supplement No. 2, and the completion of construction of Phase 2 in 1992, the turning basin as described in the 1983 Chief's Report as 55 ft deep by 4,000 ft long located between RM 233.0 and 233.8 AHP was not constructed. Construction to a depth of 45 ft ended at RM 232.4 AHP, the upstream limit of the crossing identified as Baton Rouge Front. The reach of the project located between RM 232.4 and 233.8 is maintained to a depth 40 ft.

In a letter dated 18 June 1987 from the USACE New Orleans District (CEMVN) District Engineer to the Board of Commissioners of the Port of New Orleans, the District Engineer concurred with a request from the Port of New Orleans to continue maintenance of the approach channel in the New Orleans Harbor Area to a depth of 35 ft beginning 100 ft from the the face of the wharf as authorized in the 1938 RHA. The District Engineer concluded that benefits from the deepening of the channel, would be realized irrespective of the the larger berthing areas, as described in the 1983 Chief's Report were not implemented. To date the approach channel is maintained by CEMVN to a depth between 15 ft and 35 ft beginning 100 ft from the face of the wharf, as described in the 1938 Chief's Report.

1.4 Project Implementation

The 1983 Chief's Report recommended staged construction of the project:

> "Staged Construction of the project would provide a sensible and affordable approach to implementation and earlier realization of the benefits. Such a construction sequence would also minimize disruption of navigation and allow for a gradual increase in the dredging program."

During the pre-construction planning, a construction sequence was developed that would implement the authorized project in three construction phases, to obtain the fully authorized project. Construction of Phase I was completed in December of 1987 and provided -45 ft MLG from Donaldsonville, LA, (RM 181.0) to the Gulf of Mexico. Construction of Phase II completed in December 1994, involved deepening of the MRSC to -45 ft MLG between Donaldsonville, LA, (RM 181.0) to Baton Rouge, LA (RM 232.2), and included dredging river crossings to an equivalent depth.

Phase III, which as of publication of this report is not constructed, was originally planned to achieve the fully authorized project dimensions as described in the 1983 Chief's Report for the MRSC from Baton Rouge to the Gulf of Mexico.

1.5 Purpose for Action

The MRSC project serves the only deep-draft ports on the Mississippi River, including four of the Nation's top 13 ports. The channel is one of the few projects linking the heartland of the US to the

coasts (Figure 1-5). The channel handles 450 million tons per year in bulk export and accounts for 18 percent of U.S. waterborne commerce. Forecasts indicate that the U.S. will remain the single largest participant in the global grain trade and U.S. coal producers will continue to hold a marginal position in the global market. Grain producers forecast shipping most of their exports from the center Gulf of Mexico region around New Orleans, with about one-half of the increase in grain exports transiting the Panama Canal. The Gulf Intracoastal Waterway and the Lower Mississippi River serve ports that accounted for 72 percent of inland waterborne exports in 2010. One-half of the growth in bulk exports within the Gulf of Mexico expect to use the Panama Canal. Projections indicate that the share of exports will increase over the next 10 years. By providing transportation cost savings, deepening the MRSC will improve national economic development benefits associated with these increases,

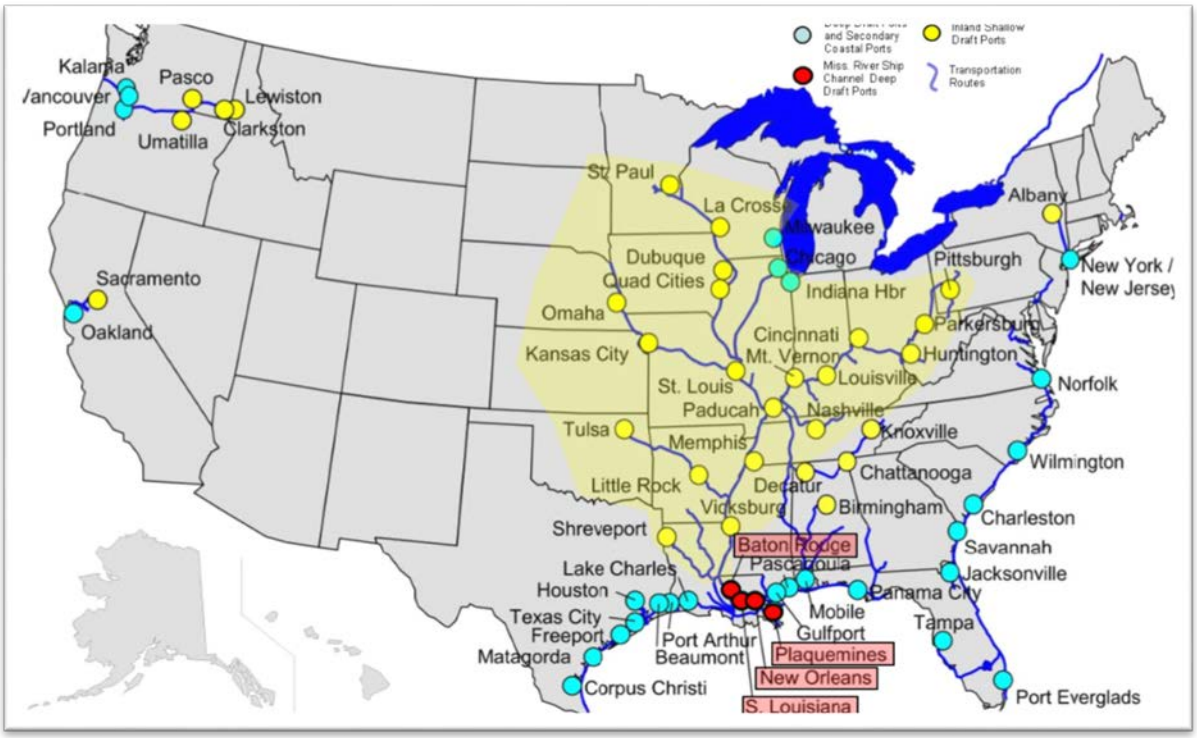


Figure 1-5 Linking the Heartland to the Coast

1.6 Purpose and Scope

Prior to proceeding with construction of Phase III, a general reevaluation study and supplemental environmental impact statement (SEIS), an accompanying Integrated General Reevaluation Report (GRR) and SEIS, is required due to potential changed conditions and assumptions related to the MRSC depth, economic development, and environmental assessments since the 1981 Feasibility Report and Environmental Impact Statement (EIS). The GRR and SEIS present the results of the general reevaluation study conducted as a reanalysis of the previously completed study using

current planning criteria and policies. An evaluation of population growth trends and trade forecasts and examination of the current port capacities is required to determine if there is continued economic justification for deepening the channel. The general reevaluation study may affirm the project as previously authorized, may result in reformulation or modification of the project, or find that no plan is currently justified.

The purpose of the general reevaluation study is to examine whether navigation improvements to the MRSC to deepen the existing Federal project from its current depths continue to be warranted and in the Federal interest based on current conditions. This will be accomplished by assessing existing and future conditions; evaluating related problems and opportunities; developing potential alternatives and evaluating/comparing the costs, benefits, and feasibility of those alternatives; writing a supplemental environmental impact statement; and identifying a Recommended Plan. This GRR and SEIS document the results of the study and will serve as both the U.S. Army Corps of Engineers (USACE) decision document for the project and as the SEIS for the proposed action. The GRR and SEIS update the 1981 Feasibility Report and EIS, and associated Environmental Assessments (EA) prepared for the project "Deep-Draft Access to the Ports of New Orleans and Baton Rouge, Louisiana" (the project was subsequently renamed to Mississippi River Ship Channel, Gulf to Baton, Louisiana, but sometimes also referred to as Mississippi River Ship Channel, Baton Rouge, Louisiana to the Gulf of Mexico project).

The scope of the general reevaluation study includes evaluation of alternatives, including the no action alternative, to provide deep draft access along the MRSC to depths between 45 ft and 50 ft for the next phase of construction. The evaluation of alternatives was limited to a depth of 50 ft at the request of the non-Federal Sponsor. Per USACE Engineer Regulations (ER-1105-2-100) "For harbor and channel deepening studies where the non-Federal sponsor has identified constraints on channel depths it is not required to analyze project plans greater (deeper) than the plan desired by the sponsor." Implementation of the next construction phase is driven by the need to safely pass New Panamax deep draft ships (ships with a draft deeper than 49 ft), without the need for light loading, which results in increased transportation cost. As of publication of this report approximately 0.5% of the vessels calling on the ports located within the MRSC have design drafts of 50 ft or greater. Consideration of implementing construction to a depth greater than 50 ft is not warranted at this time.

In June 2012, the Institute of Water Resources released a report evaluating U.S. ports and discussed the ability/preparedness of these ports to accommodate deeper draft traffic upon completion of the Panama Canal expansion project, which would allow for passage of ships with draft up to 50 ft. A key conclusion was that the ports along the Gulf of Mexico are least prepared. This confirmed what the navigation industry had been postulating, that there was a need for deeper draft along the Gulf Coast. However, the Non Federal Sponsor (NFS) the Louisiana Department of Transportation

and Development (LaDOTD), did not immediately react due to the potential high non-Federal cost of maintenance. Once WRRDA 2014 passed, relieving the NFS of the incremental cost of maintenance for a 50 ft deep channel, they sought to sign an agreement with the USACE to initiate a general reevaluation study regarding the next phase of construction. The USACE and the state signed an agreement for a study that limited evaluations of alternatives and thereby any Recommended Plan to depths not to exceed 50 ft. This depth represents a constraint upon the alternatives examined in this GRR and SEIS.

The general reevaluation study will identify the depth that creates the greatest net benefits, up to a depth of 50 ft. At initiation, the study recognized there was a need to reevaluate the construction phasing of the project. Within the general reevaluation study, the alternative depths are limited to a depth not to exceed 50 ft. Therefore, future construction phases beyond the 3 phases originally planned are required to fully implement the authorized project dimensions.

1.7 Problems, Need, and Opportunities

The 1983 Chief's Report identified the navigation problems resulting from inadequate channel depths and widths to accommodate deep draft vessels. The 1983 Chief's report identified the need for dry bulk carriers and tankers to light load in order to navigate the channel and reach the ports along the Mississippi, "as smaller, obsolete vessels are replaced with larger and more efficient ships; the percentage of light-loaded traffic will increase under the existing channel dimensions. There is a need to achieve higher economic efficiencies and savings in transportation costs by providing larger navigation channels to the Port of Baton Rouge and the Port of New Orleans." That report led to the authorization to deepen the channel to 55 ft, and the implementation of the first and second phase of construction to deepen to 45 ft, with the exception of the access channel to the New Orleans Harbor where the authorized depth remained at 40 ft. The Chief's Report identified the MRSC as only servicing the Port of Baton Rouge and the Port of New Orleans. However, as of 1990, data provided by the Waterborne Commerce Statistics Center (WCSC), refined the ports along the MRSC to also include the Port of South Louisiana and the Port of Plaquemines. Based on this change the general reevaluation study considers all four ports (with data for the Port of St. Bernard included in the evaluation of the Port of New Orleans).

Since the completion of the 1983 Chief's Report, projections of future vessels and fleet size indicate that fleet and future vessels will continue to grow larger; therefore, the problems and needs identified in the 1983 Chief's Report still apply. The current depths of the MRSC result in the need for ships to light load, which will be further exacerbated as the fleet and vessel size continues to grow. The 1981 Feasibility Report identified the opportunity, "for a substantial savings in the transportation costs of the oceangoing cargo moving over the Mississippi River by the provision

of larger access channels to the facilities in the river." As future vessel and fleet size continue to grow, the same opportunity exists today.

The general reevaluation study considers additional problems and opportunities. The first is to reduce safety concerns associated with varying channel width. During times of high shoaling in the river, the channel width in the river may decrease from greater than 750 ft to 500 ft, resulting in additional traffic regulations due to safety concerns. Consideration of widening the channel may help reduce safety concerns.

The second is to reduce inefficiencies in maintenance practices for the crossings. High shoaling rates result in an increase in the sediment deposition, which creates maintenance inefficiencies and more frequent dredging cycles. Consideration of implementing training works in the crossings may help reduce maintenance inefficiencies. In conjunction with the general reevaluation study, current dredging maintenance practices were evaluated to determine if they are sufficient for the current project as well as the recommended plan, the results are documented in a Preliminary Assessment (PA) for a Dredge Material Management Plan (DMMP) (Appendix K).

A variety of different vessel types call on the Ports of the Mississippi River including tankers, containerships, bulk carriers, and general cargo vessels. Of the 10,928 total foreign vessel transits in 2014, approximately 8% of transits were vessels with draft of 20 feet or less, approximately 39% of transits drafted 21-29 feet, approximately 45% of transits drafted 30-40 feet, and approximately 8% of vessel transits drafted 41-48 feet.

There was a total of 10,843 vessel transits drafting greater than 14 feet in 2014.[1] The total number of transits from vessels drafting greater than 14 feet has varied over the period 2010 to 2014 from a high of 10,922 transits in 2012 to a low of 10,353 transits in 2010. In 2014, there was a total of 381 vessel transits that drafted 45 feet or more (a 5% increase from 2010) which suggests vessels are currently utilizing the full existing channel depth on the Lower Mississippi River. Figure 1-6 shows the distribution of sailing drafts for years 2010 through 2014. The distribution shows minimum, average, and maximum number of transits taken from the five-year period; the numbers shown above the bars are the number of transits that were the highest for the draft range for a given year in the five-year period. Figure 1-7 shows the distribution of foreign vessel types calling on the Lower Mississippi River Ship channel. Bulk Carriers made up 46% of the deep draft vessel calls on the lower Mississippi River in 2014. According to the Pilot logs, the largest cargo vessel to call on the channel is a bulk carrier of 168,968 deadweight tons (DWT); tankers were the next largest category.

[1] Channels that can accommodate vessels drafting greater than 14 feet are considered deep draft channels.

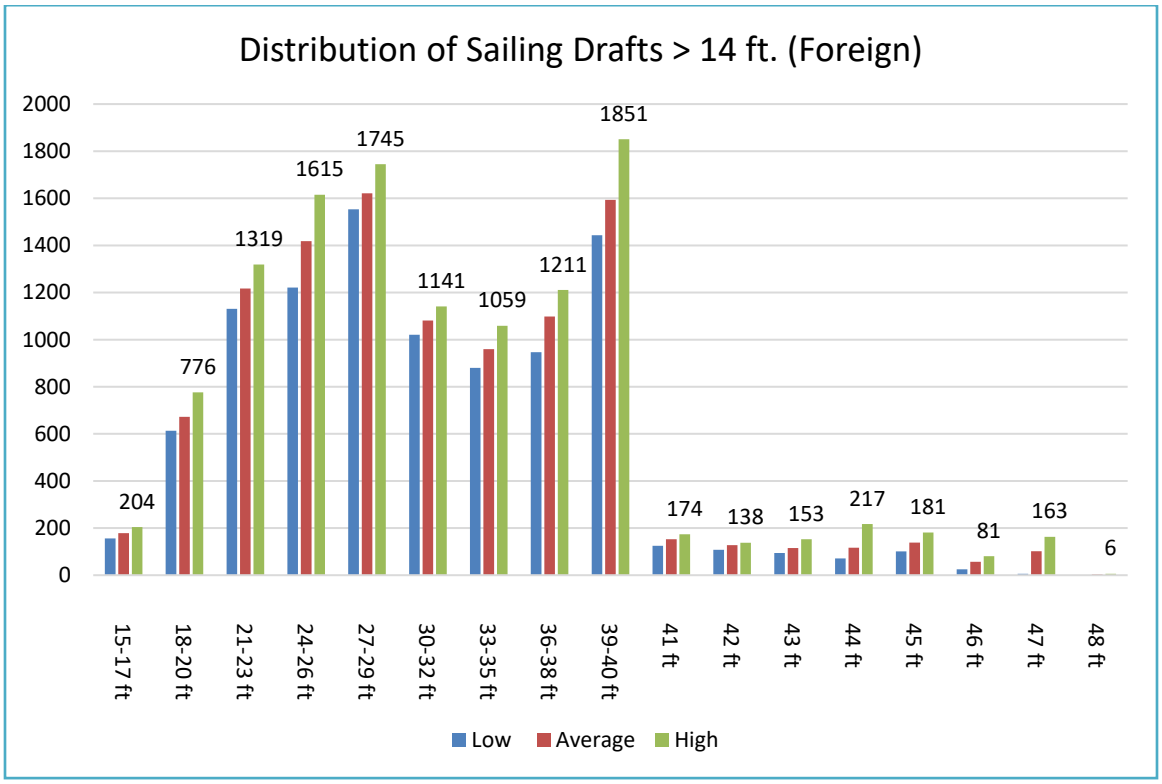


Figure 1-6 Distribution of Sailing Drafts > 14 ft (Foreign)

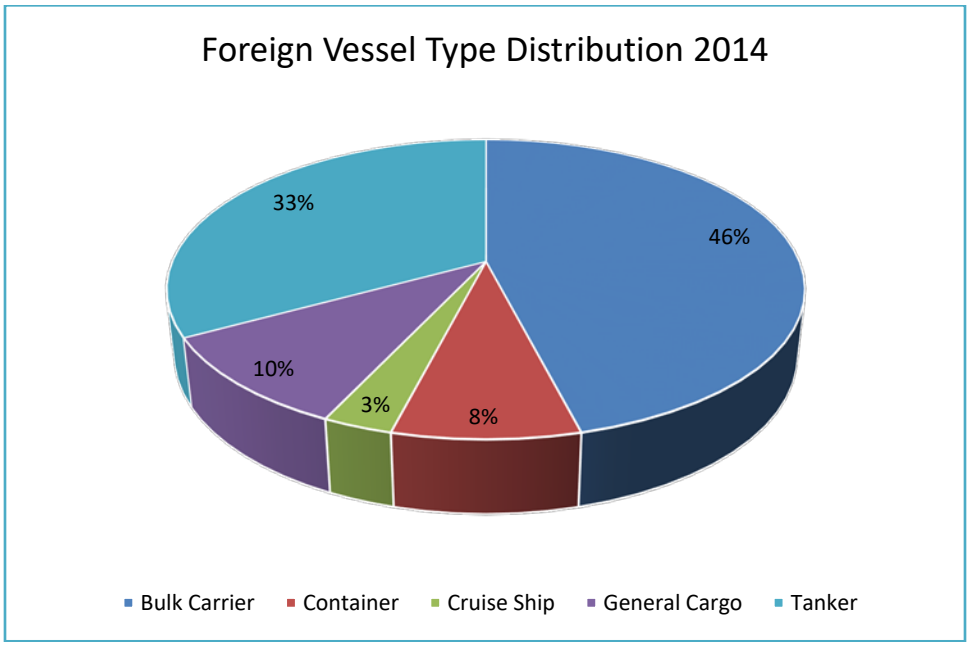


Figure-1-7 Foreign Vessel Type Distribution

An analysis of the existing fleet data for vessels calling on the Ports on the Lower Mississippi River revealed five typical vessel types: (1) containerships, (2) bulk carriers, (3) general cargo, (4) tankers, and (5) cruise ships. Based on the existing fleet, the vessel classes were further categorized into representative sub-classes based on vessel size as measured by deadweight tonnage (DWT). Table 1-1 shows the breakdown of the sub-classes. Vessel classes that have a broad range of DWTs did not have many foreign vessel calls relative to other categories.

Table 1-1 Vessel Classes

Vessel Type	Description	DWT	
		Min	Max
Bulk Carrier	Handysize	5,000	35,000
	Handymax	35,001	60,000
	Panamax	60,001	80,000
	Capesize	80,001	200,000
Products Tanker	Medium	34,000	60,000
	Panamax	60,001	80,000
	Aframax	80,001	120,000
	Suezmax	120,001	200,000
Chemical Tanker	Tanker	4,500	50,000
Containership	Subpanamax	8,000	42,000
	Panamax	42,001	60,000
	Post Panamax Generation 1	60,001	90,000
	Post Panamax Generation 2	90,001	110,000
General Cargo	General Cargo	3,000	55,000
LPG Tanker	LPG Tanker	2,000	45,000
Cruise	Cruise	6,000	12,000

Based upon 2014 data from WCSC for transits of vessels drafting greater than 45 feet, Plaquemines had a total of 44 transits, New Orleans 17 transits, South LA 137 transits, and Baton Rouge 8 transits. The vast majority of these transits with a draft greater than 45 feet are from bulk carriers transporting grain. Of the 206 transits in 2014 with a draft greater than 45 feet, 190 were from bulk carriers (92%). Oil tankers and chemical tankers followed at 6% and 1%, respectively. Numbers are similar when looking at data for years 2012 and 2013 (Table 1-2).

Table 1-2 Number of Vessels Drafting > 45'

Port	2015[1]	2014	2013	2012
Plaquemines				
Bulk Carrier	24	43	40	28
Oil Tanker	-	-	-	-
Chemical Tanker	-	1	1	-
General Cargo	-	-	-	2
New Orleans				
Bulk Carrier	4	12	26	12
Oil Tanker	3	5	11	6
Chemical Tanker	2	-	1	-
General Cargo	-	-	-	-
South LA				
Bulk Carrier	90	129	106	110
Oil Tanker	8	7	7	5
Chemical Tanker	1	1	1	-
General Cargo		-	1	-
Baton Rouge				
Bulk Carrier	4	6	6	6
Oil Tanker	-	1	-	2
Chemical Tanker	-	1	-	-
General Cargo	-	-	-	-
Total	136	206	200	171

1. Data recently made available

Source: WCSC

As the data indicates, vessels drafting greater than the constructed depth of the channel are already calling on the ports of Plaquemines, New Orleans, South Louisiana, and Baton Rouge (probably due to a combination of high water events and advanced maintenance dredging). The vast majority of these vessels are bulk carriers and, to a lesser extent, oil tankers. Data from WCSC showing excess capacity for these vessels as well as conversations with the ports also point to bulk carriers and oil tankers as vessels that will be able to utilize the extra depth of a deeper channel.

Vessels that could utilize extra depth are likely already calling on the 4 ports and are having to light-load to safely traverse the channel. With a greater depth, these vessels will be able to more fully utilize their capacity by loading more cargo which will, in effect, generate efficiencies in cost savings. Thus, a future fleet mostly comprised of larger and deeper-drafting vessels is not

expected; rather, ships' abilities to load closer to their capacities are anticipated to reduce light-loading inefficiencies. Approximately 0.5% of the vessels calling have design drafts 50 feet or greater.

1.8 USACE Civil Works Guidance and Initiatives

The USACE planning process follows the six-step process defined in the Principles and Guidelines (P&G) for Water and Related Land Resources Implementation Studies. This process, used for all planning studies conducted by USACE, provides a structured approach to problem solving, and provides a rational framework for sound decision-making. The six steps are:

Step 1: Identify problems and opportunities

Step 2: Inventory and forecast conditions

Step 3: Formulate alternative plans

Step 4: Evaluate alternative plans

Step 5: Compare alternative plans

Step 6: Select a plan

The study was conducted under the USACE Civil Works Planning modernization process by utilizing the SMART (Specific, Measurable, Attainable, Risk Informed, and Timely) planning to effectively execute and deliver the study in a timely manner. The study also meets the USACE Campaign Plan goals and the USACE Environmental Operating Principles (refer to Chapter 5) by undertaking a proactive public involvement campaign, including a project website, regular stakeholder visits, and targeted stakeholder meetings. Active and responsive public involvement has informed the development of solutions to the problems this study seeks to address and has facilitated the sharing and distribution of data and knowledge. The relationships that the study team has developed with non-governmental organizations (NGOs), local officials, community and special interest groups, the academic community and agency partners has facilitated the consensus-building process to create a mutually supportable economic and environmentally sustainable solution for the nation.

This general reevaluation study started with the issuance of Federal funds to initiate a GRR and SEIS, following execution of the Feasibility Cost Sharing Agreement (FCSA), signed on the 2 April 2015. The study will terminate upon submission of the GRR and SEIS, and approval of the Director's Report by the USACE Director of Civil Works.

The products of the general reevaluation study include the Integrated GRR, and SEIS required under National Environmental Policy Act (NEPA), other environmental documentation, Director's Report, and a Record of Decision.

1.9 Additional Project Considerations - Project Datum

The MRSC project, as authorized by the River and Harbor Acts of 1925, as amended, provided depths based on a tidal datum defined in the River and Harbors Act of 1915. The 1915 Act defined depths of navigation projects within tidal water and tributaries of the Atlantic and Gulf to mean low water (MLW). MLW is the average of all the low water heights observed over the National Tidal Datum Epoch. For the MRSC project, the MLW was computed based on the average of all low water heights observed in the Gulf Mexico, and was therefore called mean low gulf (MLG). MLG has been used as a navigation reference datum in coastal waterways such as the Gulf Intracoastal Waterway (GIWW) and the coastal portion of the MRSC. This datum applies to reaches of the MRSC that are subject to tidal influence. Tidal influence along the river extends from the Gulf of Mexico to the vicinity of New Orleans, La, however for purposes of this report the tidal influence is narrowed to the reach that requires routine operation and maintenance extending from Venice, beginning at RM 13.4 AHP, to the Gulf of Mexico, ending at RM 22 BHP.

Subsequent to the 1925 River and Harbor Act and continuing through the WRDA 1986 authorization, MLG datum was used to define the channel depth. The 1983 Chief's Report, as authorized by subsequent Congressional enactments in 1985 and 1986, recommended a channel depth of 55 ft, substantially in accordance with the recommendations of the 1981 Feasibility Report (which had utilized the MLG datum for depths in the portion of the project that are tidally influenced).

The Water Resource Development Act (WRDA) 1992 amended the required datum, as defined in the River and Harbors Act of 1915, from MLW to MLLW.

USACE Engineer Circular (EC 1110-2-6070), titled "Engineering and Design, Comprehensive Evaluation of Project Datums" dated July 1 2009, provided guidance that all districts perform an assessment called the Comprehensive Evaluation of Project Datums (CEPD) to ensure projects are referenced to the proper nationally recognized vertical datum. Subsequently, a memorandum from the Director of Civil Works dated 24 October 2014, Subject: "Navigation Projects Compliance with Vertical Datum Guidance," stated:

> For federal navigation, projects where the MLLW depth differs from the depths stated in the project authorization, an Engineering Documentation Report (EDR) shall be prepared in accordance with reference 1.d [ER 1110-2-1150], paragraph

8.3 for each project and posted on a navigation home page for each district. The EDR will be of limited scope to document the datum change only.

The statutory directive in WRDA 1992, as well as the cited guidance and subsequent datum policy, resulted in an assessment and conversion of the datum used for the tidally influenced portion of the MRSC project from MLG to MLLW. The results of this conversion are documented in EDR-OD-01 "Mississippi River Venice, Louisiana to the Gulf of Mexico (vicinity of South West Pass)", Revision 1 dated 01 May 2017 (Project Datum Conversion EDR). A copy of the Project Datum Conversion EDR is included in Appendix H of this report. A brief discussion of the findings of this EDR follows; however, for further information regarding the basis of the conversion determination, refer to the Project Datum Conversion EDR.

For purposes of this project, MLG is a local, legacy terrestrial datum that was originally defined relative to local mean sea level as observed at the Biloxi gage in 1899 in the Gulf of Mexico. It has been used as a navigation (and construction) reference datum in coastal waterways such as the GIWW and the coastal portion of the Mississippi River navigation channel. MLLW is a tidal datum that is defined and maintained by the National Oceanic and Atmospheric Administration (NOAA). This tidal datum is defined as the average of the lowest of the two daily low water heights observed over the National Tidal Datum Epoch (which spans a 19-year period). The purpose of the Project Datum Conversion EDR is to document the conversion for the portion of the project from Venice, LA to the Gulf of Mexico from MLG to MLLW.

MLG was intended to represent the low water level of the Gulf of Mexico, and was defined as being 0.78 feet below local mean sea level. At that time, mean sea level was defined by the Sea Level Datum of 1929 (SLD29). In 1973, the name of SLD29 was changed to the National Geodetic Vertical Datum of 1929 (NGVD29). The Survey Section Stream Gaging Unit (SGU) has maintained a series of gages along SWP, which were set and maintained to NGVD29. For ease of use, another series of gages were set to the MLG datum by applying the commonly used 0.78 ft offset. As NGVD29 benchmarks subsided over time, the gages referenced to MLG also subsided. The MLG gages were not maintained, further disassociating this local terrestrial datum from sea level. The project authorized in 1985 was thus constructed and has been maintained to a legacy local terrestrial datum that was disassociated from mean sea level (reference Section 3.1 of the EDR). With the use of MLG, the MRSC project from Venice to the Gulf has been maintained to -45 MLG.

The Project Datum Conversion EDR describes the process for determining the conversion from MLG to MLLW for the reach of the MRSC which extends from the Gulf of Mexico (RM 22 BHP) to Venice (RM 13.4 AHP). The EDR determined that MLG, as referenced and maintained in the project area, is approximately 3.5 ft below MLLW. This EDR further determined that at Southwest

Pass, maintaining the channel at -45 ft MLG is comparable to maintaining the channel at -48.5 ft MLLW. Pursuant to the findings and determinations outlined in the above referenced EDR, the existing condition for the MRSC project reach between RM 13.4 AHP to 22 BHP, which is tidally influenced, is defined as -48.5 ft MLLW.

The datum conversion covers from RM 13.4 AHP to RM 22 BHP it does not cover portions of the river upstream of RM 13.4 AHP. Tidal influence occurs into the vicinity of New Orleans. Contracts for dredging in the reach are referenced to MLG, with a conversion to LWRP provided. An EDR that addresses the MRSC above RM 13.4 AHP to the vicinity of New Orleans may be prepared at a future date. Upstream of the New Orleans Area, to include the crossing with the Port of Baton Rouge and Port of South Louisiana, the datum adjustment from MLG to MLLW does not apply. The crossings, which are located between RM 115 AHP to RM 232.4 AHP, are defined to a depth referenced to a hydraulic datum referred to as the lower water reference plane (LWRP). The LWRP is a hydraulic vertical datum for channel depths represented by a zero foot low water elevation established from long-term observations of the river's stages, discharge rates, and flow duration periods. With no need for a datum adjustment in this area, the existing conditions for the crossings are defined as -45 ft LWRP. For information on the LWRP refer to: http://www.mvn.usace.army.mil/portals/56/docs/engineering/Geospatial/LWRP_White_Paper.pdf

All depths identified in this report are based on a depth below the identified hydraulic datum, and are identified as the depth followed by the reference plane. For example, the nomenclature -45 ft MLLW or -45 ft LWRP, represents a depth of 45 ft below the MLLW or a depth of 45 ft below the LWRP. When identifying depth referenced to a hydraulic datum the (-) is used such as -45 ft MLLW. In instance where the depth is not referenced to a datum it is identified without the (-) such as to a depth of 45 ft. This nomenclature is applied throughout the report.

1.10 Non-Federal Sponsor

LaDOTD is the NFS for the project as authorized in the Supplemental Apportions Act of 1985 and WRDA 1986, and for this general reevaluation study for the project as authorized in those acts. The NFS was an active participant in the development of the scope of the GRR and SEIS, the Project Management Plan (PMP), and the FCSA executed in April 2015.

The PMP defined the scope of this general reevaluation study to consider alternatives up to a depth of 50 ft. The evaluation will consider whether Federal interest exists in implementing additional phases of construction up to a maximum depth of 50 ft. Alternatively, the study may find that the presently constructed depth (as constructed Phase I and II of the project, and subsequently maintained depths), referred to as the "no action" plan, remains the plan which best meets the Federal interest. If it is determined that deepening of the channel beyond its presently constructed

and maintained depth is justified and in the Federal interest, then the GRR and SEIS will identify and define the recommended plan for the next phase of construction.

Since release of the draft GRR and SEIS in December of 2016, this Chapter remains largely unchanged. Changes in this chapter are editorial in nature, intended to better describe the affected environment. The one notable change is that the proposed additional dredge disposal areas for the lower reach if the MRSC have been removed. The draft report identified the potential need for acquisition of additional land for disposal of dredge material in the lower portion of the river from Venice to the Gulf of Mexico. Through completion of a Preliminary Assessment Dredge Material Mangement Plan it was determined that there is sufficient capacity for dredge disposal in existing disposal sites. Therefore reference to the proposed additional dredge disposal areas has been removed. The existing disposal areas consist of 143,264 acres of beneficial use placement areas that were previously cleared under NEPA.

2.0 AFFECTED ENVIRONMENT

2.1 Introduction

This chapter evaluates historic and existing conditions on important resources potentially affected by the alternatives. Impacts of the alternatives on the resources identified in this chapter are evaluated in Chapter 4. Although the future without-project alternative implies taking no action, Alternative 1 incorporates current Operation and Maintenance (O&M) practices in order to keep the river at current dimensions. Topics in this chapter are presented in an order to coincide with the topics of Chapter 4 in which the "future with-project" conditions are considered. Potential impacts on prime and unique farmlands, federally-designated scenic rivers, and state designated scenic streams were considered during the planning process. It was determined that because these resources do not exist in the study area, the proposed action would have no effect on these issues and the topics will not be further discussed in this report.

The Environmental Justice team analyzed the study area of the Mississippi River Ship Channel, Gulf to Baton Rouge, Louisiana Project. The team focused on the two areas of the study, the River between Baton Rouge and New Orleans, Louisiana where dredging would take place (and would be discharged back into the River), and the lower part of the River, and the river in the general vicinity of Venice, Louisiana, where dredging would occur. There are no EJ impacts from the dredging of the river crossings within the Ports of South Louisiana and Baton Rouge since the material would be released into the river south of where it was dredged such that; neither housing nor population would be impacted. The dredge material placement into surrounding marsh and open water south of New Orleans would not cause any adverse impacts to any community, housing or population because of the undeveloped nature of the dredge material placement areas--most of it is open water or marsh. The census data confirmed that there is no housing or population in or

near the vicinity of the project areas. Therefore, further Environmental Justice analysis is not warranted. Based on the available census data, USACE determined that there is no population in the study area that could be adversely affected by the project action.

The study area, which is located in southeastern Louisiana, is the Mississippi River corridor extending from the upstream limits of the Port of Baton Rouge, LA through the river's major navigation channel out into the Gulf of Mexico, Southwest Pass. This 255-mile river corridor begins in the Port of Baton Rouge at RM 233.8 AHP, and extends down river to RM 22, BHP. The study area includes portions of East Baton Rouge, West Baton Rouge, Iberville, Ascension, St. James, St. John the Baptist, St. Charles, Jefferson, Orleans, St. Bernard, and Plaquemines Parishes and other communities and port facilities adjacent to the lower River.

This analysis will not discuss stages or datums in areas where work is not proposed or ongoing. Currently, the area of work in the lower river from RM 13.4 AHP near Venice to the RM 22.0 BHP, where work is proposed, is maintained -48.5 ft MLLW. There are 12 regularly maintained deep draft crossings in the navigation channel that lie north of the Port of New Orleans (within the Ports of South Louisiana and Baton Rouge). Crossings (above New Orleans, LA) are maintained at -45 ft LWRP. The dredged material resulting from maintenance of these crossings at the present constructed depth is disposed of in deeper parts of the river just downstream from each crossing.

Included in the scope of the study is the mitigation for increased saltwater intrusion, including, but not limited to the municipal water supply for all of Plaquemines Parish (above RM 64), which is put at risk for saltwater intrusion at the water intakes along the river during low water events. The study area includes the areas within the river that are currently affected by maintenance practices (dredging and placement methods, shoaling controls, etc.), including major ports (Table 2-1).

Table 2-1 Location of Major Ports and their national rank for annual tonnage

Port / National Rank	Location
Baton Rouge (#8)	Mile 168.5 to 253
South Louisiana (#1)	Mile 114.9 to 168.5
New Orleans (#4)	Mile 81.2 to 114.9
Plaquemines (#13)	Mile 0 to 81.2

The study area also includes 143,264 acres of beneficial use placement areas from Venice, LA, to the Gulf of Mexico that were previously cleared under NEPA (National Environmental Policy Act) and other environmental laws and regulations. These associated NEPA documents are identified in Figure 2-1 and Appendix A-1 and are incorporated here by reference. Dredged material from O&M within this reach of the project is used, up to the limit of the Federal Standard, to create coastal habitat in lieu of open water placement area. Corps regulations at 33 CFR 335.7 define the

Federal Standard for dredge material as “the alternative or alternatives identified by the Corps which represent the least costly alternatives consistent with sound engineering practices and meeting the environmental standards established by the 404(b)(1) evaluation process or ocean dumping criteria." To date, the CEMVN has constructed over 14,819 acres of intermediate marsh in the lower delta through placement of beneficial use of dredge material in previously cleared areas (Figure 2-1, Appendix A-5). CEMVN continues to coordinate with resource agencies to ensure the Project remains in full compliance with all environmental regulations for ongoing Operations and Maintenance activities. The Project remains in full environmental compliance with applicable laws and regulations (Appendix A-1, A-3).

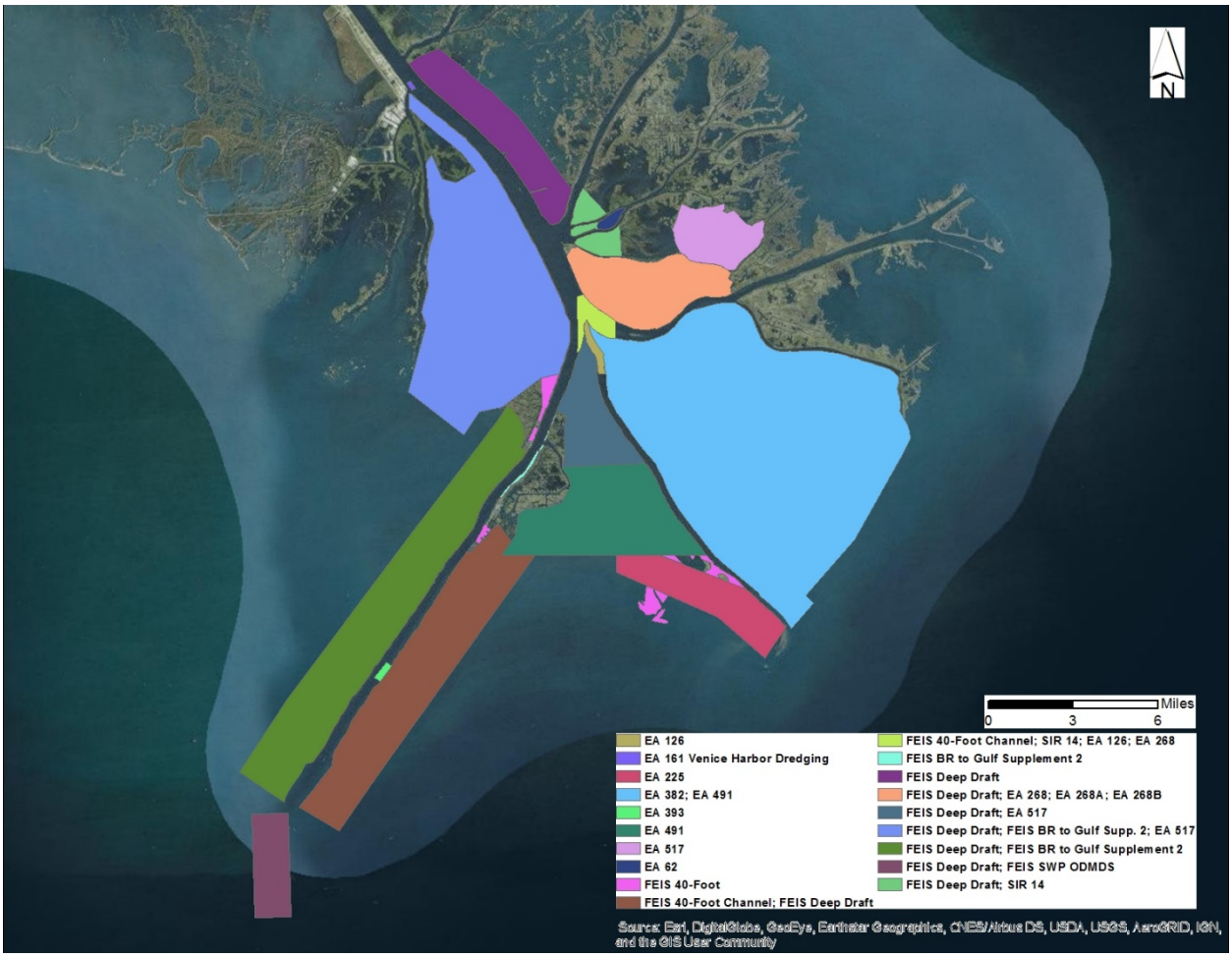


Figure 2-1 Previously cleared beneficial use placement areas available for beneficial use and their associated NEPA documents.

The multiple delineations identify portions of placement areas that have been added to the project via multiple NEPA documents since the original study.

Climate

The climate of the study area is humid, subtropical with a slightly stronger maritime character south of New Orleans, LA. Warm, moist southeasterly winds from the Gulf of Mexico prevail throughout most of the year, with occasional cool, dry fronts dominated by northeast high pressure systems. The influx of cold air occurs less frequently in autumn and rarely occurs in summer. Tropical storms and hurricanes are likely to affect the area 3 out of every 10 years, with severe storm damage approximately once every 2 or 3 decades. The majority of these occur between early June and November. Summer thunderstorms are common, and tornadoes strike occasionally. Average annual temperature in the area is 67 °F, with mean monthly temperatures ranging from 82 °F in August to 52 °F in January. Average annual precipitation is 57.0 inches, varying from a monthly average of 7.5 inches in July, to an average of 3.5 inches in October.

Land Use/Land Cover (LULC)

The only terrestrial environments in the project area occur within the beneficial use placement areas. The most recent available data for land use within the placement areas are from 2011 and are displayed in Figure 2-2. For comparison purposes, Table 2-2 display land use changes within the placement area from 2001, 2006, and 2011 (source: National Land Cover Database). While National Land Cover Database (NLCD) 1992 data are used in discussions and comparisons of LULC change, direct comparisons with subsequent years of NLCD data is not recommended due to differences between legends and mapping methods that may not reflect real changes on the ground. For this reason, NLCD 1992 data was not used in this discussion and comparison of LULC in the Mississippi River Delta.

Table 2-2 Land Use/Land Cover Change in the Mississippi River Delta - 2001, 2006, and 2011

Land Cover/Use Type	2001 (acres)	2006 (acres)	2011 (acres)
Barren Land	7,617	7,864	6,513
Developed, Low Intensity	7	7	8
Developed, Open Space	18	18	19
Emergent Herbaceous Wetlands	46,947	46,359	43,149
Herbaceuous	31	30	23
Open Water	117,725	118,156	118,782
Woody Wetlands	4,644	4,555	4,631

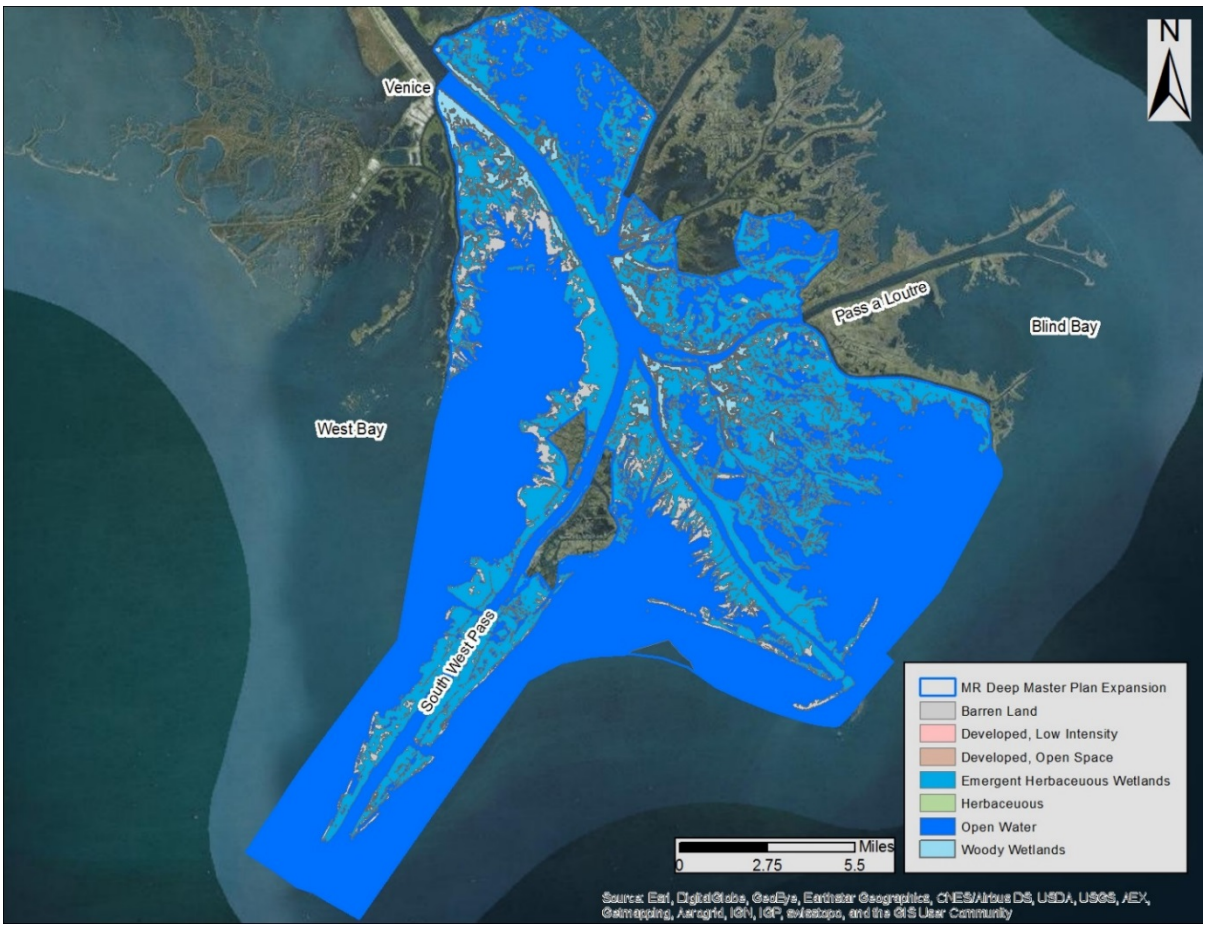


Figure 2-2 2011 land use classifications within the beneficial use placement area long-term plan.

The vast majority of the placement areas in the study area, approximately 118,782 acres, are open water, which increased by 1,057-acres between 2001 and 2011 due to land loss. Table 2-2 illustrates the land loss trend occurring in the Mississippi River Delta and throughout the rest of coastal Louisiana. This land loss trend has been occurring since the early 1900s with commensurate negative effects on Louisiana's coastal ecosystem (USACE 2004). Many factors contribute to land loss along coastal Louisiana, including natural and anthropogenic processes such as subsidence, sea level rise, and tropical storm activity. The study area continues to experience land loss at a steady rate due to subsidence of the land surface and rising sea levels. This process is expected to continue into the future resulting in a loss of surface elevation of the geomorphic features, changes in vegetation types and land cover that characterize the study area, and increased land loss resulting in more open water areas. Between 1932 and 2010, the study area experienced a land loss of approximately 48,110.5 acres and a gain of 8,835.17 acres during the same period. Based on land loss trajectories from USGS aerial photography between 1932 and 2010, the area is projected to continue to lose approximately 32,960 acres over the next 50 years, or approximately

57 percent of existing land in the placement areas (Couvillion et al. 2011). To further illustrate this trend, Figure 2-3 shows land area change from 1932 to 2010.

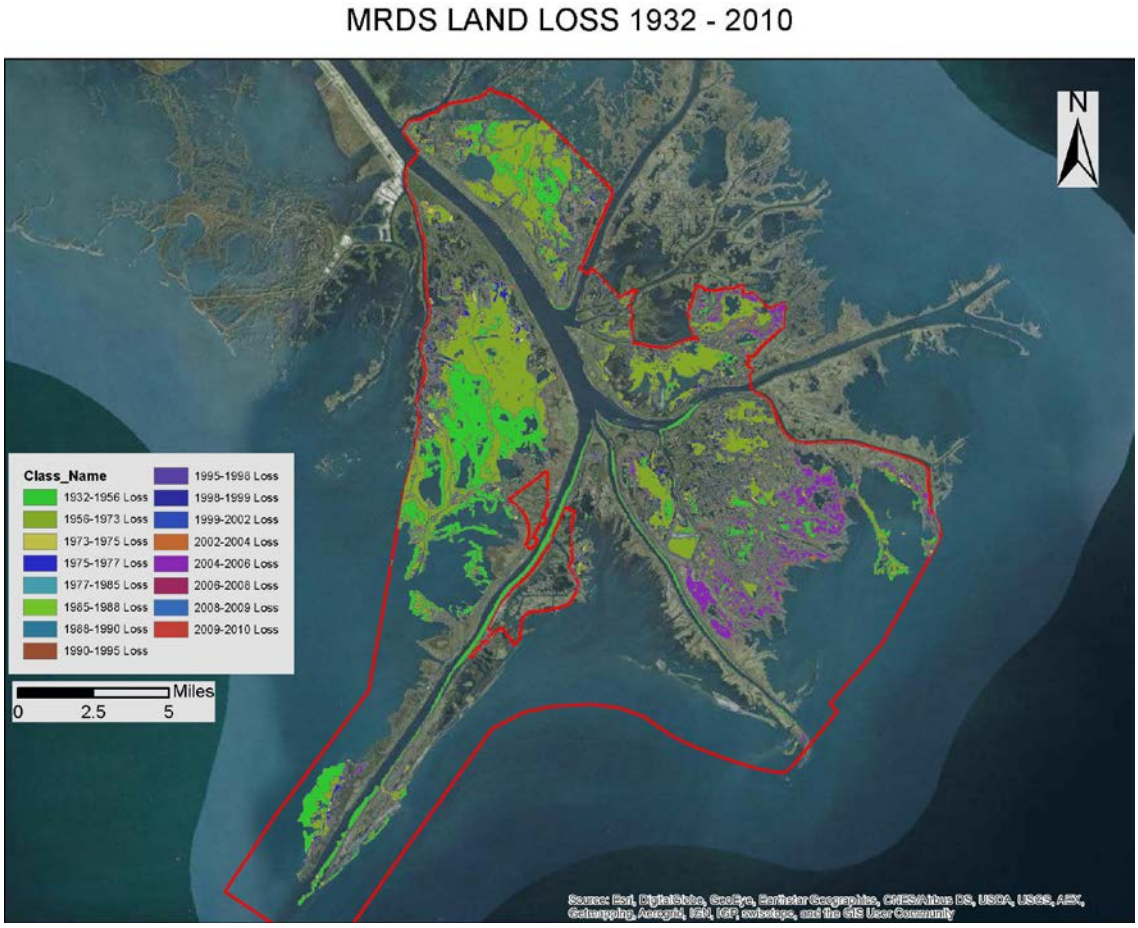


Figure 2-3 Mississippi River Deepening Study land loss within the placement area 1932-2010

2.2 Water Environment

The Mississippi River has the third largest drainage basin in the world, exceeded in size only by the watersheds of the Amazon and Congo Rivers. It drains 41 percent of the 48 contiguous states of the United States. The basin covers more than 1,245,000 square miles, includes all or parts of 31 states and 2 Canadian provinces, and roughly resembles a funnel, which has its spout at the Gulf of Mexico. Waters from as far east as New York and as far west as Montana contribute to flows in the lower river (Figure 2-4). The lower alluvial valley of the Mississippi River is a relatively flat plain of about 35,000 square miles bordering on the river, which would be overflow during time of high water if it were not for human-made protective works. This valley begins just below Cape Girardeau, Missouri, is roughly 600 miles in length, varies in width from 25 to 125 miles, and includes parts of seven states (Missouri, Illinois, Tennessee, Kentucky, Arkansas, Mississippi, and Louisiana).

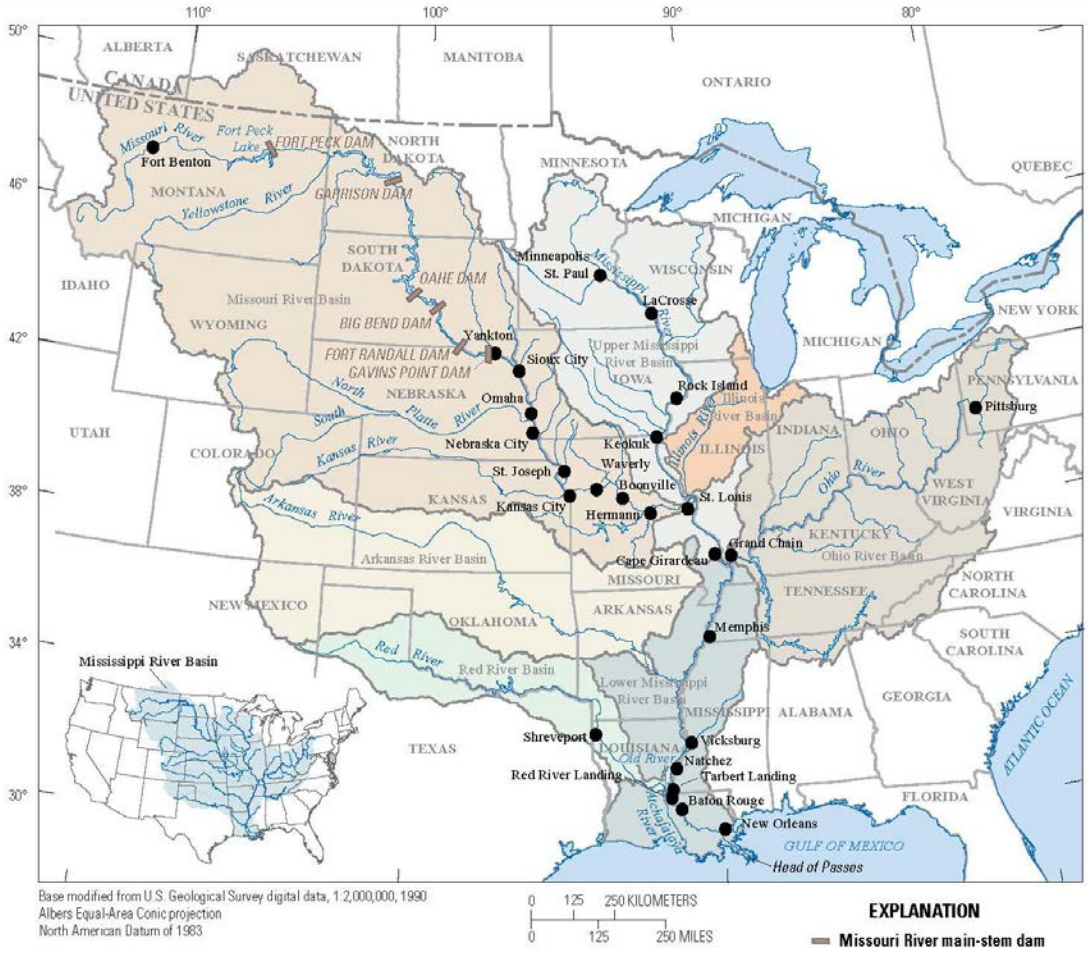


Figure 2-4 Mississippi River Basin, primary tributaries, large main-channel dams, and selected cities along main-stem channels. (USGS 2012)

Normal astronomical tides in Louisiana are diurnal (one high tide and one low tide per day) and can have a spring range of as much as 2 ft. The mean tidal range is approximately 0.51 ft (NOAA 2013a). Amplitudes are influenced by tides, but are generally controlled by meteorological events. Tidal influence has registered as far upstream as the Old River Complex (RM 315) during low water conditions (as in 2012). During flood stage, the operation of the Bonnet Carré Spillway dampens the tidal signal upstream of the structure and the tidal influence is not registered upstream of the Spillway at Reserve, LA, (RM 139).

2.2.1 Mississippi River

Historic and Existing Conditions

The Mississippi River, the largest river system in North America, is the main stem of a 12,350-mile long network of inland navigable waterways and is one of the most engineered and regulated rivers in the world (Walker and Davis 2002; Meade 2004; Finkl et al. 2006; Hudson et al. 2008; Rossi et al. 2008; Horowitz 2010; Allison et al. 2012; Camillo 2013). From the confluence of the Ohio River and Upper Mississippi River at Cairo, Illinois, the Lower Mississippi River has been channelized and shortened by about 143 miles (Baker et al. 1991). The reach of the river in Louisiana is one of the world's most commercially important and intensively managed rivers for navigation.

The Mississippi River, in combination with its largest distributary, the Atchafalaya River, discharges an average of 64,933,400,000 cubic yards (cy) of water into the Gulf of Mexico (Figure 2-5, USGS 2012). About half of the total annual discharge is contributed by the Ohio River alone, which drains the more humid regions of the basin but only constitutes one-sixth of the total basin area (Meade, 1995). Alternatively, the Missouri River drains approximately 43 percent of the MRB, but contributes only about 12 percent of the total annual water discharge. In the Mississippi River basin, the primary sources of sediment and water are decoupled. At its headwaters in Lake Itasca, MN, the average flow rate is 6 cfs. At Upper St. Anthony Falls, MN, the northern most lock and dam, the average flow rate is 12,000 cfs or 89,869 gallons per second. At New Orleans, LA, the average flow rate is 600,000 cfs (https://www.nps.gov/miss/riverfacts.htm).

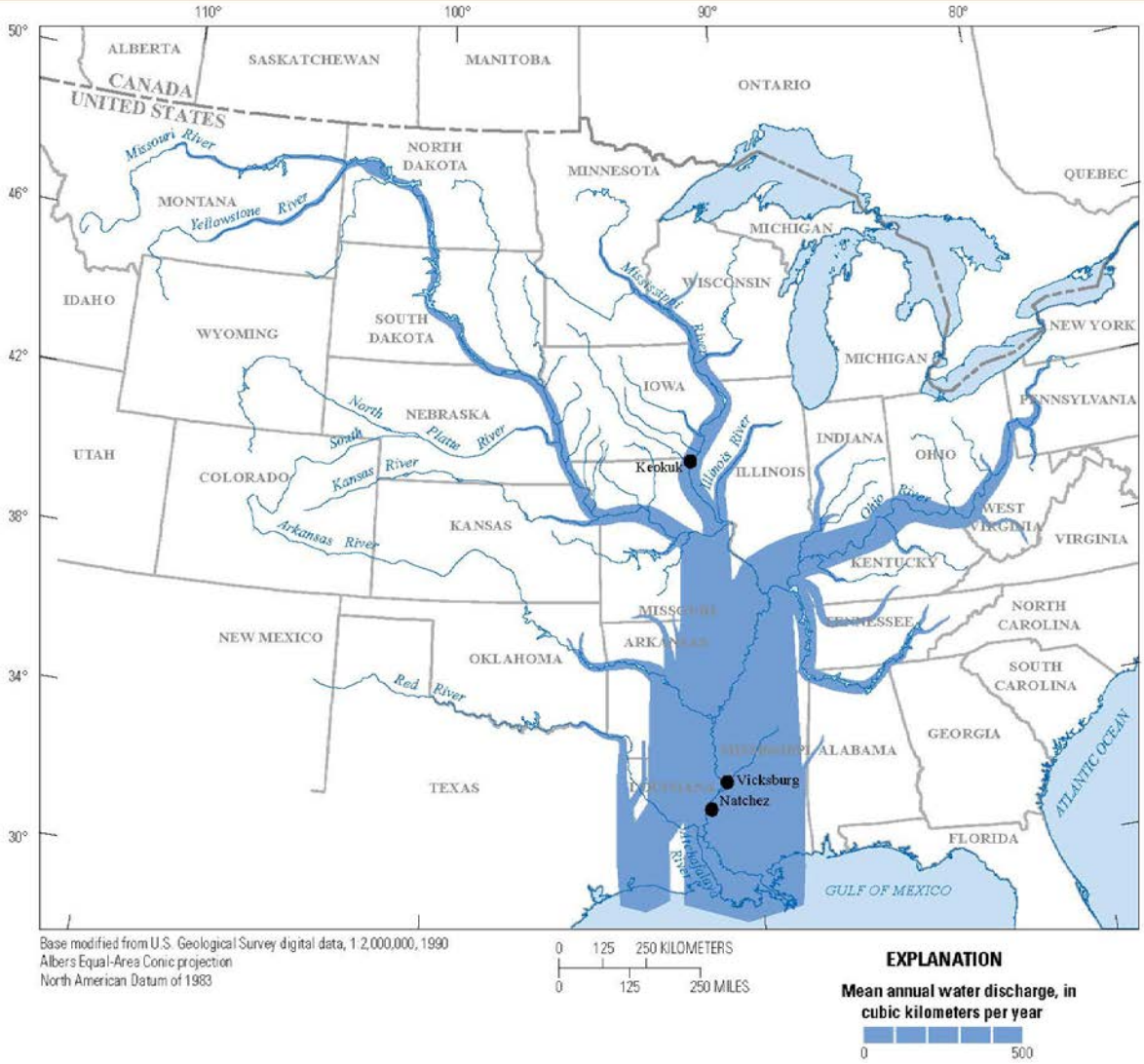


Figure 2-5 Mean annual discharge of Mississippi River and tributaries (USGS 2012)

The "Engineered Section" of the Mississippi River, the reach in Louisiana between Old River and New Orleans, LA, is an elaborate plumbing system of levees augmented by a series of floodways/spillways projects (Camillo 2013). Operation of the Old River Control Complex ensures distribution of 30 percent of the combined Mississippi River and Red Rivers pass through to the Atchafalaya Basin (Figure 2-6).

Per 33 CFR 110.195, " there are various US Coast Guard (USCG) designated anchorage areas along the authorized navigable ship channel. These anchorage areas are naturally deep areas that the USCG has designated to aid in the safe navigation of the MS River.

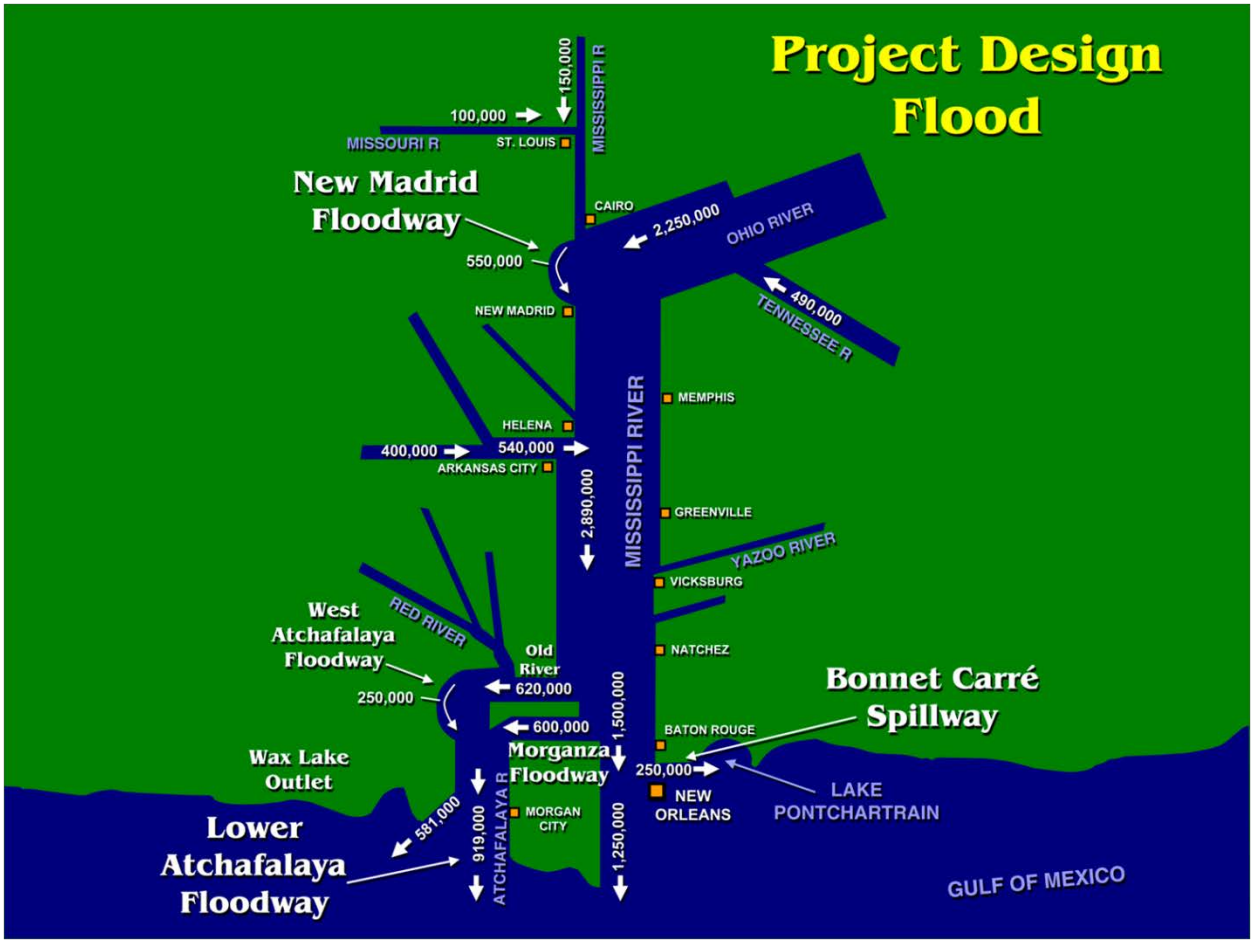
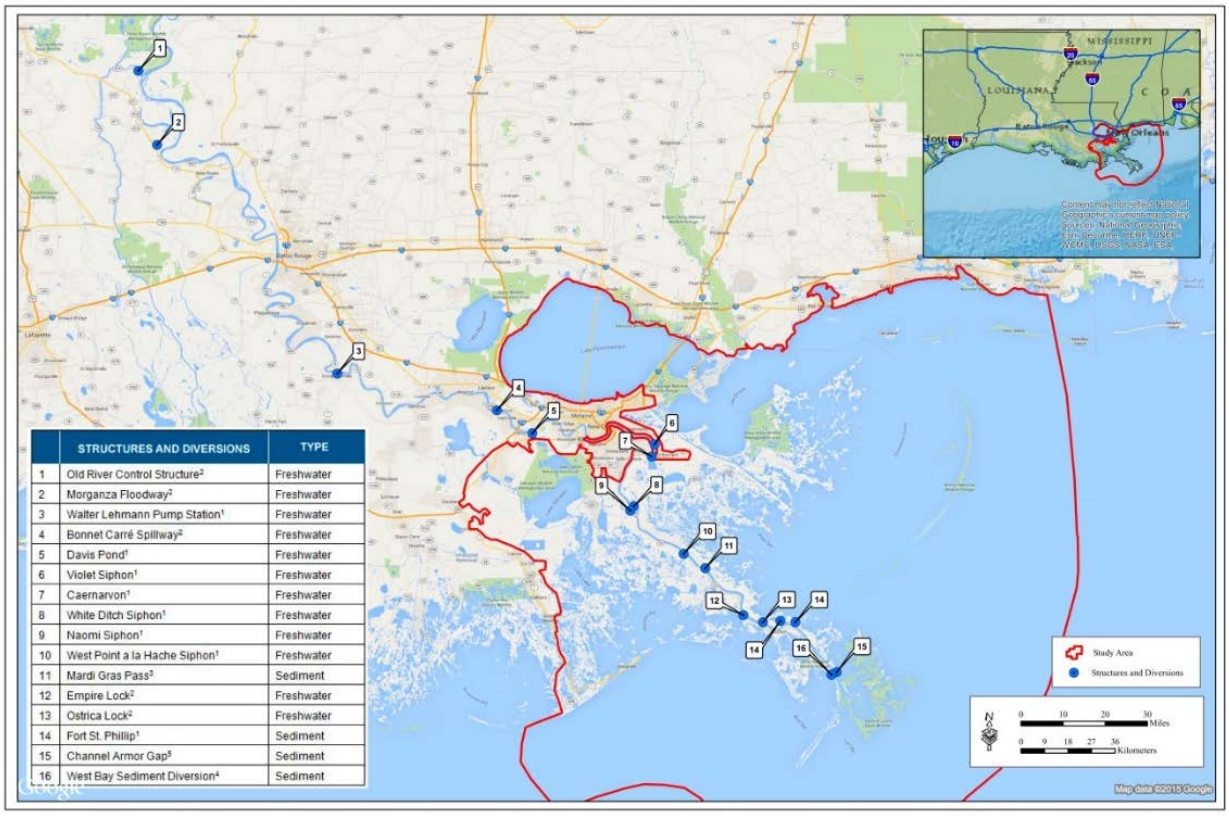


Figure 2-6 The "Engineered Section" of the Mississippi River designed to pass the project flood of 1.25 million cfs past New Orleans, LA

The USGS operates streamgages along streams throughout the U.S. to collect water quantity and quality data for a variety of purposes. Continuous operation of USGS streamgages is essential for our stakeholders. These streamgages have permanent infrastructure and are vulnerable to disruption when nearby construction or dredging occurs in their vicinity. The USGS maintains 2 active streamgages within the Mississippi River Ship Channel project area in addition to 3 active streamgages maintained by the USACE. These gages will be safe-guarded regardless of the alternative implemented and are as follows: # 0737400 -Mississippi River at Baton Rouge, LA (USGS), #07374525 -Mississippi River at Belle Chase, LA (USGS), #07374370- Mississippi River at Bonnet Carre Spillway (USACE), 07374510- Mississippi River at New Orleans, LA (USACE), 07374550 Mississippi River at Venice, LA (USACE).

There are currently 16 diversions south of the Old River Control Structure (Figure 2-7). Within the study area, there are presently 10 freshwater diversions designed to control salinity, and 4 sediment diversions designed to build coastal habitat (Table 2-3).



	STRUCTURES AND DIVERSIONS	TYPE
1	Old River Control Structure[2]	Freshwater
2	Morganza Floodway[2]	Freshwater
3	Walter Lehmann Pump Station[1]	Freshwater
4	Bonnet Carré Spillway[2]	Freshwater
5	Davis Pond[1]	Freshwater
6	Violet Siphon[1]	Freshwater
7	Caernarvon[1]	Freshwater
8	White Ditch Siphon[1]	Freshwater
9	Naomi Siphon[1]	Freshwater
10	West Point a la Hache Siphon[1]	Freshwater
11	Mardi Gras Pass[3]	Sediment
12	Empire Lock[2]	Freshwater
13	Ostrica Lock[2]	Freshwater
14	Fort St. Phillip[1]	Sediment
15	Channel Armor Gap[3]	Sediment
16	West Bay Sediment Diversion[4]	Sediment

Figure 2-7 Existing structures and diversions off the Mississippi River between Old River Complex and Head of Passes (Teal et al. 2012). (This figure is from the Louisiana Coastal Area (LCA) Mississippi River Hydrodynamic and Delta Management (MRHDM) Study. It is included in this report to show the locations of existing structures and diversions along the MRSC main navigation channel. The study area delineated in red in the figure is for the LCA MRHDM study; the delineated area is not the study area for this report.)

Table 2-3 Existing Structures and Diversions along Mississippi River between River Mile 233.8 and Head of Passes (Teal et al. 2012).

Structures and Diversions	Type	Discharge Capacity (cfs)	Study Area Basins
Walter Lehmann Pump Station[1]	Freshwater	300	Barataria
Bonnet Carré Spillway[2]	Freshwater	250,000	Pontchartrain
Davis Pond[1]	Freshwater	10,650	Barataria
Violet Siphon[1]	Freshwater	300	Barataria
Caernarvon[1]	Freshwater	8,800	Breton
White Ditch Siphon[1]	Freshwater	250	Breton
Naomi Siphon[1]	Freshwater	2,100	Barataria
West Point a la Hache Siphon[1]	Freshwater	2,100	Barataria
Mardi Gras Pass[3]	Sediment	2,500	Barataria
Empire Lock[2]	Freshwater	N/A	Barataria
Ostrica Lock[2]	Freshwater	11,000	Breton
Fort St. Philip[1]	Sediment	5,400	Breton
Channel Armor Gap[5]	Sediment	2,500	Mississippi River Delta
West Bay Diversion[4]	Sediment	20,000	Mississippi River Delta

1-diversion; 2-flood control structure; 3-crevasse (Teal et al. (2012) considers this a sediment diversion); 4-uncontrolled diversion; 5-diversion and crevasse

CEMVN O&M

The U.S. Army Corps of Engineers, New Orleans District (CEMVN) has the largest annual channel O&M program in the nation and dredges an average of 77 million cubic yards (mcy) of material annually during maintenance dredging of federal navigation channels, most of which occurs in the Mississippi River, the Calcasieu River, and the Atchafalaya River. Since 1996, river maintenance within the project area has averaged 35,778,303 cy (Appendix A-2). A Dredged Material Management Plan Preliminary Assessment was prepared in 1995 for the Mississippi River, Baton Rouge to the Gulf of Mexico project. This 1995 Assesment superseded the 1992 Long Term Placement Plan prepared for the same project and concluded an additional management plan was not necessary. A preliminary assessment of the existing dredged material management plan (DMMP) for both the current project, and the proposed action was completed and is included in Appendix K. It should be noted that USACE continues to coordinate with resource agencies to ensure the Project remains in full compliance with all environmental laws and regulations for

ongoing Operations and Maintenance activities. The Project remains in full compliance with NEPA and applicable laws and regulations (Appendix A-1, A-3).

Due to either the physical characteristics or the location of the dredged material, not all of the material dredged by the Corps is available for beneficial placement in the coastal ecosystem because of the previously cited Federal Standard. Currently, CEMVN Operations Divisions estimates approximately 530 acres of intermediate marsh on average are annually created by the project maintenance actions. Most recently, the Louisiana Department of Natural Resources, Office of Coastal Management, in a letter dated August 28, 2017 determined that the Gulf to Baton Rouge project was consistent with the Louisiana Coastal Resources Program in accordance with Section 307 (c) of the Coastal Zone Management Act of 1972 (Appendix A-21).

The LCA BUDMAT program also uses dredged material beneficially across the coastal area of state, including the study area, but this effort is not limited by the Federal Standard. The LCA BUDMAT program, paid for the removal and placement of approximately 2.3 million cubic yards of HDDA dredged material in West Bay for coastal habitat development. There are additional planned LCA BUDMAT projects that may use material from the HDDA for beneficial use, one of which is currently being constructed in the vicinity of Tiger Pass, near Venice, Louisiana, which plans to use 1.65 MCY of dredged material from the HDDA for marsh creation. (discussed in Section 2.4). An additional LCA BUDMAT projects will be constructed in the near future within the vicinity of Tiger Pass.

Another 4,108 acres of wetlands have been created by placing HDDA dredged material in shallow open water areas of the Delta National Wildlife Refuge under the O&M program.

O&M of Deep Draft Crossings

Historically, maintenance dredging to -45 ft LWRP (plus 2 ft advance maintenance and 2 ft of allowable over depth) has been performed at 12 deep draft crossings in the Mississippi River channel within the portion of the project that lies within the jursidctional limit of the Ports of Baton Rouge, LA, and South Louisiana (Figure 2-8, Appendix A-3). Since 1996, deep draft crossings have been dredged, as needed, resulting in a combined annual average of 16,403,283 CY in dredged materials (Appendix A-2).

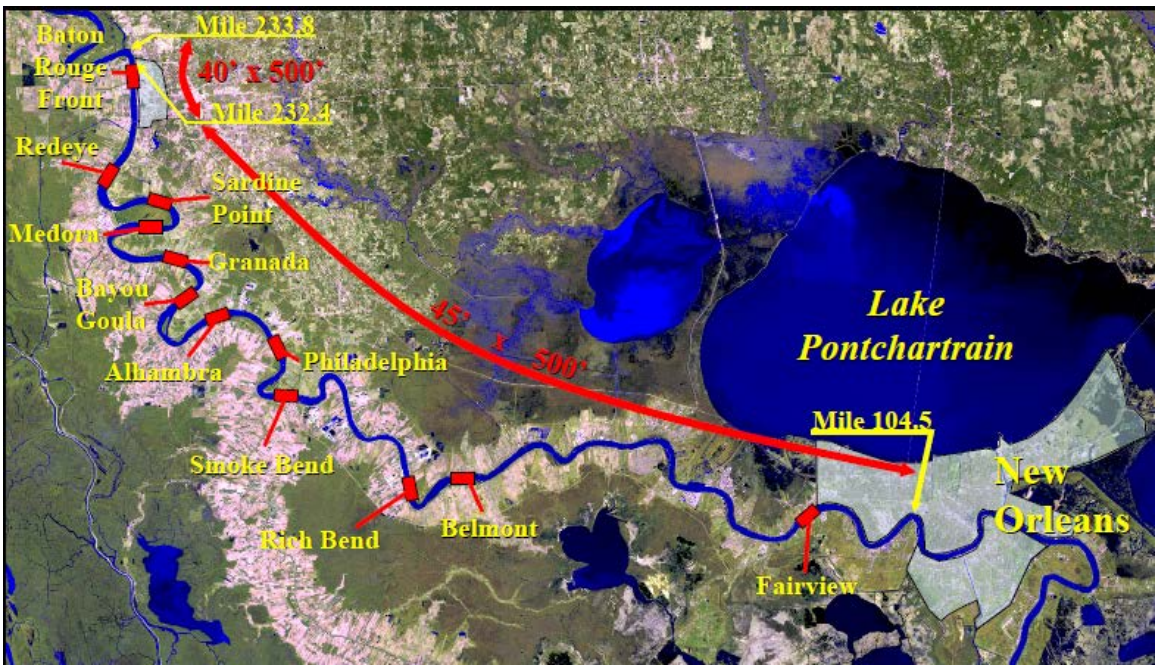


Figure 2-8 Locations of deep draft crossings between New Orleans, LA and Baton Rouge, La

There are 12 crossings that are actively dredged and maintained. Ten crossings are maintained on an annual basis and 2 require less than annual maintenance (Table 2-4). There are two deep water crossings that are mentioned in prior NEPA documents, but no actual dredging records for these crossings can be found: Brilliant Point (mile 162.6-162.9 AHP) and Phoenix (mile 57.0-58.3 AHP). Two of these crossings, Redeye and Medora, also contain two fields of soft dikes (sand-filled geotextile material) in order to reduce additional maintenance dredging needs.

Table 2-4 List of historical deepwater crossings requiring maintenance and their locations

Crossing	Parish(es)	Location
Baton Rouge Front	East & West Baton Rouge	River Mile 232.4-229 AHP
Redeye	East & West Baton Rouge	River Mile 226-221 AHP
Sardine Point	East & West Baton Rouge	River Mile 221-216 AHP
Medora	Iberville	River Mile 214-208 AHP
Granada	Iberville	River Mile 207-202 AHP
Bayou Goula	Iberville	River Mile 199-196 AHP
Alhambra	Iberville	River Mile 193-188 AHP
Philadelphia	Ascension	River Mile 185-181 AHP
Smoke Bend	Ascension	River Mile 179-172 AHP
Rich Bend	St. James	River Mile 160-155 AHP
Belmont	St. James	River Mile 156-151 AHP
Fairview	St. Charles & Jefferson	River Mile 117-111 AHP

Although a combination of dustpan dredges and hopper dredges are typically utilized for this maintenance effort, it is possible that cutterhead dredges or water injection dredges may also be utilized for emergencies. Within that reach of the MRSC project that lies within the jurisdiction of the Ports of Baton Rouge and South Louisiana, the dredging work within the crossings consists of the removal and placement of shoal material above the plane of -45 ft LWRP over a width of 500 ft, plus removal of an additional 2 ft of shoal material as advance maintenance dredging, and removal of an additional 2 ft of shoal material as allowable overdepth dredging.

Annual maintenance of crossings averages 16,403,283 cy of dredged material. The crossings are too far from potential beneficial use placement sites to be economically acceptable by the Federal Standard. Shoal material removed from the deep water crossings is discharged unconfined into the open water of the Mississippi River either downriver of the dredging site or adjacent to the channel. The currents of the Mississippi River transport this shoal material downriver. Dredging is performed annually, typically from April through November, but the schedule is dependent on the occurrence of high water stages in the river. The crossings require dredging during low water after shoaling has occurred. The crossings have a greater amount of water available during high water, thus allowing vessels to pass despite shoaling.

O&M of Lower River / Delta

Maintenance dredging is performed annually in the river in the vicinity of Venice, LA, Southwest Pass, and the Southwest Pass Bar Channel by a combination of hopper dredges and hydraulic cutterhead dredges. Placement of dredged material (e.g. open water placement vs. beneficial use) is determined by the Federal Standard for each dredging event. Annual maintenance averages 18,500,000 cy for the lower river and Southwest Pass and 3,750,000 cy for the Bar Channel. Dustpan dredges are rarely utilized for emergency dredging situations in Southwest Pass. Dredging typically begins in January and is completed by August because Southwest Pass requires dredging during high water season while shoaling is occurring. However, this is dependent on the timing of the Mississippi River high water season. The dredging work consists of the removal and placement of shoal material above the plane of -48 ft MLLW approximately from Venice (RM.13.4 AHP) to the -48 ft contour in the Gulf of Mexico (RM 22.0 BHP). The removal of an additional 6 ft of shoal material as advance maintenance dredging, and removal of an additional 2 ft of shoal material as allowable overdepth dredging has been previously cleared under NEPA from RM 12 AHP to RM 22 BHP (Appendix A-3, Figure 2-9). All other areas in the study area allow for 2 feet of advance maintenance and 2 feet of allowable overdepth.

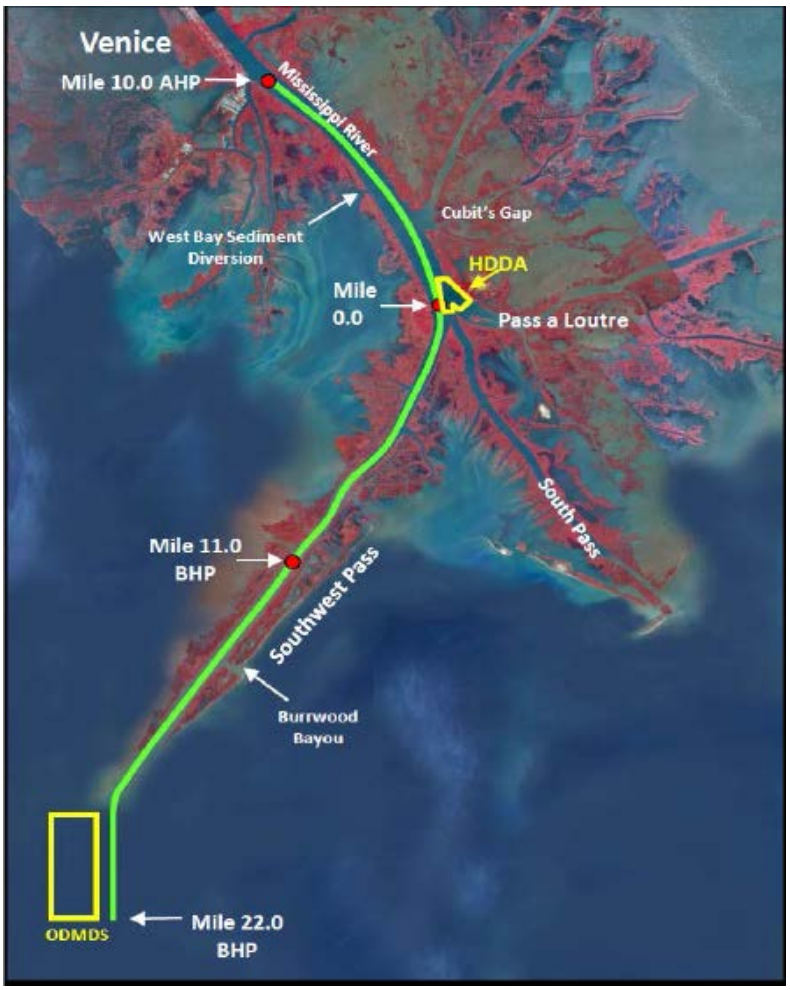


Figure 2-9 Reach of active dredging in the lower Mississippi from Venice to the Gulf of Mexico

Annual dredging typically occurs up to Mile 6.0 AHP. Shoaling in the lower river has shown a trend of migrating upriver towards Venice, LA, approximately 2.5 miles - 6.5 miles over the last 20 years. From about RM 6.0AHP to RM 13.4AHP dredging occurs as needed, but less frequently. However, the uppermost limits of the reach requiring annual dredging has gradually crept upriver over time. For example, as recently as 1986, dredging only went upriver to RM 3.5AHP (Cubit's Gap vicinity). Since then, dredging needs have gradually extended upriver over time as shoaling has dictated. Based on 1D modeling conducted during this study, this is believed to be at least partly due to a combination of relative sea level rise and the deepening of the lower river to its current dimensions (Appendix C).

Hydraulic cutterhead dredges are restricted in their use for Southwest Pass maintenance dredging work because their spudding systems, swing anchors, cables, and discharge pipelines are considered safety hazards in some areas due to their inability to move quickly out of the channel. For these reasons, cutterhead dredges are only used to perform work in the RM 13.4 AHP to RM

1.0 AHP reach, and in the RM 1.0 BHP to RM 19 BHP reach. Cutterhead dredges utilize shallow, open water dredged material placement areas located on either side of the Southwest Pass navigation channel for coastal habitat creation and/or bankline stabilization and restoration within the Federal Standard.

Retention features are not typically constructed for beneficial placement areas, but could be built should they become necessary to prevent dredged material from entering property or waterways located adjacent to placement sites. The exact locations and dimensions of these features would be determined in the field. All earthen closure material would be obtained from within the placement site. From 2009 through 2015, approximately 40,234,782 cubic yards of shoal material (an annual average of approximately 5.8 million cubic yards) were removed from the Southwest Pass navigation channel (RM 13.4 AHP to RM 1.0 AHP reach, and in the RM 1.0 BHP to RM 18.8 BHP reach) by cutterhead dredges. A total of 2,401 acres of wetland habitat were created by placement of this material within the Federal Standard in shallow open water areas adjacent to the channel (Appendix A-5).

Hopper dredges, which are not considered safety hazards, are utilized for maintenance dredging throughout the entire Southwest Pass navigation channel. Hopper dredges provide the mobility and response time that is required during high shoaling periods. During these high shoaling periods, shoals develop in various unpredictable locations from RM 13.4 AHP to RM 22.0 BHP. As the shoals develop, hopper dredges are moved quickly to various assignment locations along the channel in order to restore project dimensions. Cutterhead dredges are incapable of similar rapid mobilization between different dredging assignment locations.

The HDDA is dredged about every 1 to 2 years. Up to 13 million cubic yards of material have been removed during each HDDA dredging event. Cutterhead dredges are used to dredge the HDDA and beneficially place dredged material to create and/or restore coastal habitat to the extent possible under the limitations of the Federal Standard. Coordination with the navigation industry is required for the HDDA dredging if dredged material placement requires a discharge pipeline to cross the river, which necessitates a river closure. The first HDDA maintenance dredging effort occurred in 1998. Since that initial effort, the HDDA has been maintenance dredged 7 additional times, with the latest occurring in 2017. Approximately 66,485,173 cubic yards of material have been removed from the HDDA under these maintenance dredging contracts. Between 1996 – 2017, approximately 121,047,922 cubic yards of dredged material have been placed at the HDDA by hopper dredges working in Southwest Pass. Under the Federal Standard, approximately 3,194 acres of wetlands have been created by placing HDDA dredged material in shallow open water areas of the Delta National Wildlife Refuge and in West Bay.

Hopper dredges working between RM 11.0 BHP and RM 22.0 BHP dredge-and-haul to the EPA designated ocean dredged material disposal site (ODMDS) located adjacent to, and west of, the

bar channel (Appendix A-13). On rare occasions, hopper dredges working upriver of RM 11.0 BHP may utilize the Southwest Pass ODMDS for placement. From 1996 through 2017, a total of approximately 126,216,571 cubic yards of shoal material (an annual average of approximately 4.5 million cubic yards) have been placed in the Southwest Pass ODMDS by hopper dredges. The volume of dredged material placed within the Southwest Pass ODMDS in any given year is highly variable, and fluctuates with river conditions and unpredictable shoaling patterns.

Hopper dredges working in the jetty channel and the bar channel (RM 18 BHP to RM 22.0 BHP) may also perform work in the agitation dredging mode. Agitation dredging involves filling a hopper dredge to capacity and allowing it to overflow. Fine sediments released into surface waters are carried out of the mouth of river to the Gulf of Mexico. Coarser/heavier sediments collect in the hopper and are ultimately hauled to the ODMDS for placement. From 2009 through 2017, hopper dredges only performed agitation dredging in this reach during 2015.

Open Water Placement in Lower River and Ocean Placement in the ODMDS

There are two designated open water (Hopper) dredge placement sites and one ocean placement site south of Venice, LA. These include the HDDA at the Head of Passes, and the ODMDS. The EPA designated ODMDS is 2,975 acres and is located west of and parallel to the SWP bar channel in the Gulf of Mexico beginning at about RM 20.3 BHP. This area will not be expanded as part of this plan. This area typically receives material from the RM 11.0 BHP to RM 22.0 BHP dredging reach.

As part of MVN's annual coordination with EPA Region 6 regarding MVN use of the Southwest Pass ODMDS, the CEMVN provides EPA Region 6 with a determination on the acceptability of Southwest Pass dredged material for placement into the ODMDS. The following information, required for evaluation of dredged materials proposed for ocean disposal, is provided to EPA Region 6, by the CEMVN: 1) dredging project information; 2) dredged material characterization/evaluation; and 3) regulatory compliance evaluation. EPA Region 6 reviews the MVN determination to evaluate the environmental effects of dredged material disposal and to ensure that compliance with the ocean dumping criteria at 40 CFR Parts 220-228 has been demonstrated. EPA Region 6 then informs the CEMVN whether or not it concurs with CEMVN's determination. The Southwest Pass ODMDS Site Management and Monitoring Plan (SMMP) with EPA was orginally issued on December 23, 1996 and revised on June 6, 2017. The most recent Section 103 EPA Concurrence decision for placement of shoal material from Southwest Pass in the Southwest ODMDS was received on February 6, 2017 (Appendix A-13).

The HDDA is 867 acres and is situated at the Head of Passes at RM 0.0 and extends to RM 1.0 in Pass a Loutre, RM 1.0 BHP in Southwest Pass, and RM 2.0 in South Pass. This placement area will not be expanded as part of this plan. This area typically receives material from the RM 13.4

AHP to RM 11.0 BHP dredging reach. Coordination with the Navigation industry is required for the Head of Passes Hopper Dredge Placement Area dredging if dredged material placement requires a discharge pipeline to cross the river which necessitates a river closure.

Figure 2-10 Previously cleared placement areas (yellow) along the lower river include approximately 4,028 combined acres of designated open water and ocean placement and approximately 143,264 acres of beneficial use placement

Beneficial Use of Dredged Material

Approximately 143,264 acres of beneficial use placement areas have been previously cleared via prior NEPA documents (Appendix A-1). Contingent upon river conditions and funding limitations, an average of 528 acres of marsh creation is expected to establish each year from annual O&M. The exact site placement is contingent on river conditions and dredging need, and identification by CEMVN of the Federal Standard. Although placement within the Federal Standard may result in the creation of valuable coastal habit during annual maintenance in lieu of open water placement, it is important to distinguish this (navigation) project is not classified as an ecosystem restoration

project. It is a deep draft navigation channel construction and maintenance project. Any ecosystem restoration that occurs as a result of placement of dredged material is considered an incidental benefit to the objective/goal of the project, which is to maintain a deep draft navigation channel.

Currently, approximately 50 percent of the available material dredged under the O&M program is used beneficially by the project. Due to either the physical characteristics or the location of the dredged material, not all of the material dredged by the Corps is available for beneficial placement in the coastal ecosystem. Based on the refinement of dredge material placement techniques and subsequent beneficial use monitoring between 2009-2016, an approximate average 80 acres of marsh (with a final target elevation of 2 ft or less) per 1,000,000 cubic yards of material dredged from the river has been achieved. Current dredging in the lower river averages 18,500,000 cy. An average of 530 acres of marsh creation is expected to establish each year via beneficial use under the Federal Standard (Figure 2-11, Appendix A-5).

Southwest Pass cutterhead beneficial use sites were identified as bank stabilization & wetland creation sites in the "Mississippi River, Baton Rouge to the Gulf of Mexico, LA Dredge Material Management Plan Preliminary Assessment" dated 1995 and the Mississippi River Ship Channel Gulf of Mexico to Baton Rouge, LA Dredge Material Management Plan Preliminary Assessment" dated November 2017. To date, all Southwest Pass O&M cutterhead dredge placement has occurred within these Federal Standard placement sites. Historically, cutterhead placed dredged material has been used beneficially for either bank stabilization or wetland creation. Specific placement sites for each cutterhead contract are identified during the contract development process and in coordination with state and Federal natural resource agencies.

For wetland creation, dredged material is placed unconfined to elevations suitable for wetlands development in shallow, open water areas located on either side of the channel. The material is deposited as uniformly as practicable at an elevation no higher than approximately +4.5 ft NAVD88 on the west side of the channel, and an elevation no higher than approximately +6.0 ft NAVD88 on the east side of the channel, to achieve an expected final elevation of about +2.0 ft NAVD88. Dredged material is placed to a higher initial elevation on the east side of the channel due to the greater wave erosion environment experienced on this side of the channel. Although no retention features are planned for any of these wetland creation disposal areas, should retention/closure features become necessary to prevent dredged material from entering property or waterways located adjacent to disposal sites, exact locations and dimensions of these features are determined in the field. All earthen retention/closure material would be obtained from within the disposal site. No plantings are necessary as these wetlands placement sites vegetate within a single growing season by colonization from adjacent vegetation.

Beneficial Use Monitoring

CEMVN maintains 13 major navigation channels in Louisiana that require regular maintenance dredging. More than 90 million cubic yards of sediment is dredged annually and CEMVN coordinates with state and federal natural resource agencies to determine the most appropriate methods for the placement of dredged material and, where possible, within the limitations of the Federal Standard, to beneficially use this material to create or enhance wetlands and other habitats. CEMVN has developed long-term placement plans, subject to the Federal Standard limitations, incorporating beneficial use for each of these navigation channels.

In 1994, the CEMVN, working in cooperation with Louisiana State University, implemented a large-scale monitoring program to quantify the amount of new habitat created and to improve dredged material placement techniques to maximize beneficial use within the Federal Standard limits (http://www.mvn.usace.army.mil/About/Offices/Operations/Beneficial-Use-of-Dredged-Material/). From 1995-2002, vertical photography was acquired and digital mosaics are produced for each of the study sites. GIS habitat analysis and field surveys were conducted on only those sites specified by CEMVN. The work products for the sites selected for full monitoring included dredging history maps, habitat maps for the base year, habitat maps for the selected monitoring years, and habitat change maps. From this analysis, coastal change data quantifies the creation of new coastal lands and other habitats at selected navigation channel locations. The field program included ground truthing operations to verify and update the habitat maps and field surveys to collect information about vegetation, and elevations. While CEMVN no longer performs field surveys and habitat analysis due to funding constraints, CEMVN acquires aerial photography each year to measure/track land change at beneficial use sites.

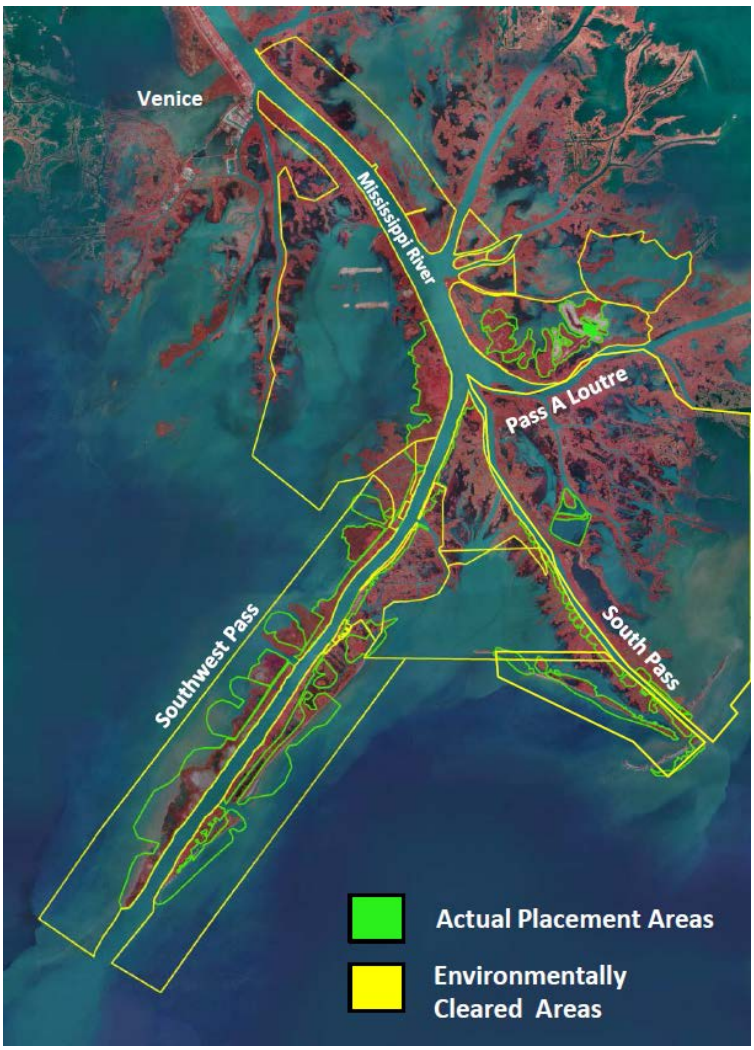


Figure 2-11 environmentally (i.e., NEPA) cleared beneficial use placement and actual placement areas (2014)

Saltwater Wedge

The congressionally authorized enlargement of the Mississippi River's deep-draft channel from -40 ft to -45 ft MLLW, according to USACE (2015a), causes an increase in the duration and extent ofthe salt water intrusion that occurs during annual low water events (However, implementation of the salt water mitigation plan historically has not been required annually.) The bottom profile of the Mississippi River navigation channel is deeper than the Gulf of Mexico water surface level up to RM 350 AHP. Salt water in the Gulf of Mexico is denser than the fresh water flowing in the Mississippi. Therefore, at low river flows, the Gulf's salt water moves upstream along the bottom of the River underneath less dense river fresh water. This poses a problem for the municipal water intakes along the lower Mississippi River. Water plants in Plaquemines Parish must shut down operations as saltwater reaches their water intake facilities. For communities at the lower reaches of the river, this shutdown could last longer than their storage reserves can accommodate.

To correct this problem, among other mitigation measures, a sand sill is constructed to a depth between 45.66 ft and 50.66 ft NAVD88 near Carlisles, LA, RM 64, to reduce saltwater flow and artificially arrest the saltwater wedge when conditions necessitate (Figure 2-12, Appendix A-6, Appendix C). Since completion of the 45 ft channel, a sand sill has been constructed three times (in 1988, in 1999, and in 2012) in order to mitigate for the increased duration and extent of saltwater intrusion above RM 64 AHP. Sill construction requires close coordination with the U.S. Coast Guard and the navigation industry because it typically requires several temporary river closures (USACE 2015a). On the east bank of the river, a community pond at Davant was converted to a storage reservoir and a siphon from river to the reservoir was constructed to keep the reservoir supplied. A water line and booster pump was constructed to connect the reservoir at Davant to a water plant downriver at East Pointe-a-la-Hache. The reservoir at Davant is intended to provide freshwater to the eastbank of Plaquemines Parish if salinity levels get too high at East Point Ala Hache, but only if properly maintained by the non-Federal sponsor. However this reservoir is currently not in a condition to provide water during a low water high salinity event. As a result, in previous low water events USACE has provided raw water via barge to the East Point-a-la-Hache water treatment plant to enable Plaquemines Parish to provide potable water for the east bank of Plaquemines Parish located downstream.

Figure 2-12 Location of emergency saltwater barrier sill south of Belle Chasse, LA

Other features are also included in the saltwater wedge mitigation plan and are described in detail in Chapter 3.

2.2.2 Mississippi River Delta

Historic and Existing Conditions

The U.S. Geological Survey (Couvillion et al. 2011; Olea and Coleman 2014) provide updated estimates of persistent land change and historical land change trends from the 1932 to 2010 period of record for the entire coastal Louisiana area (Figures 2-13, 2-14). Coastal Louisiana has experienced a net decrease of 1,205,120 acres or loss of about 25 percent of the 1932 coastal land area. Land area within the Mississippi River basin experienced a net decrease of -79,385 acres or a loss of about 52% of the 1932 area. Persistent losses account for 95% of this land area decrease. The average rate of loss from 1932 to 2010 was 15,360 acres /yr.

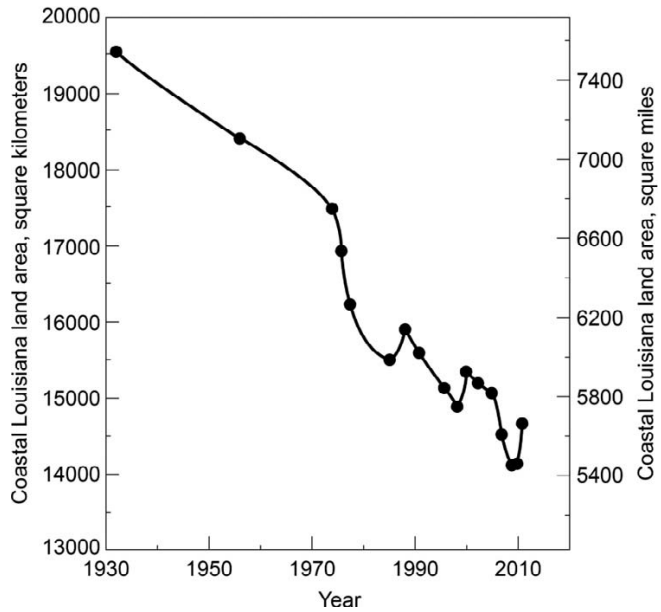


Figure 2-13 Time series of change in coastal Louisiana land area from 1932 to the end of 2010 (Couvillion et al., 2011; Olea and Coleman 2014)

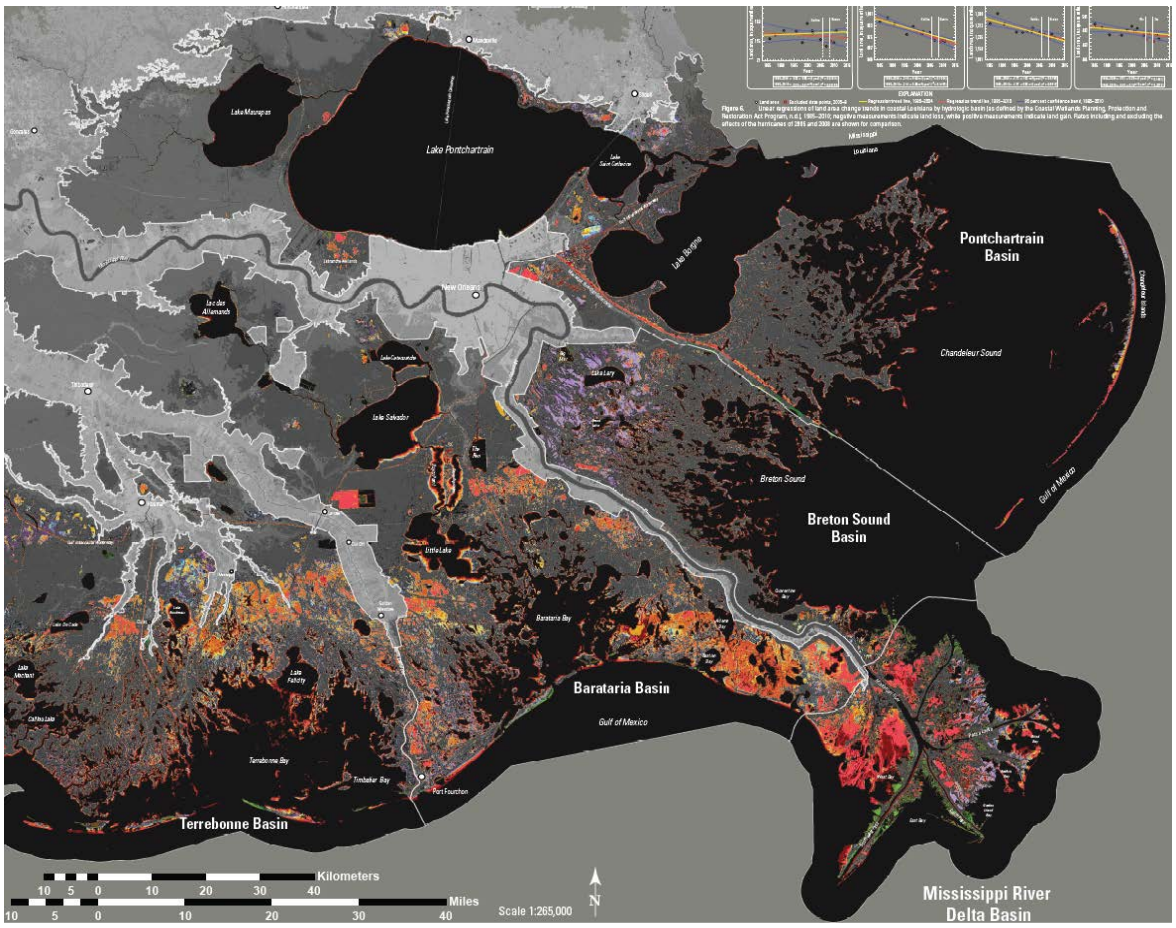


Figure 2-14 Land Area Change within the Mississippi River Basin (Couvillion et al., (2011) determined land area change within the Mississippi River basin experienced a net decrease of 79,385 acres or about 52% of the 1932 area)

Coastal Land Loss

Coastal Louisiana has undergone drastic habitat modification during the last century, including major conversion of wetlands to open water (Barras et al. 2008; Mitsch et al. 2009; Tobin et al. 2014). Driving factors behind these changes include water-level increase, salinity alterations, grazing behavior by native and invasive species, lack of particulate deposition, and oil and gas extraction activities (Gosselink et al. 1998, Penland et al. 2001, Tobin et al. 2014). Most of the present Mississippi River fresh water, with its nutrients and sediment, flows directly into the Gulf of Mexico, largely bypassing the coastal wetlands. Levees have reduced the area of seasonally flooded wetlands along the river. Deprived of land building sediment, the wetlands are damaged by saltwater intrusion and other causative factors associated with sea level change and land subsidence, and will eventually convert to open water. Deprived of the nutrients, the plants that define the surface of the coastal wetlands die off. Once the coastal wetlands are denuded of vegetation, the fragile substrate is left exposed to the erosive forces of waves and currents, especially during tropical storm events.

Couvillion et al. (2013) models for a 2010 to 2060 simulation period under a "future-without-action" condition, determined that coastal Louisiana is at risk of losing between 523,369.2 acres and 1,155,712 acres of land over the next 50 years. The vast majority of the placement areas in the study area is open water (approximately 85,611 acres), which has increased by 1,057-acres since 2001. This illustrates the land loss trend occurring in the Mississippi River Delta and throughout the rest of coastal Louisiana. This land loss trend has been occurring since the early 1900s with commensurate negative effects on Louisiana's coastal ecosystem (USACE 2004). In the last 80 years, coastal Louisiana has lost approximately 1,203,156 acres of land, and another estimated 1,125,071 acres are at risk of being lost over the next 50 years (CPRA, 2012; Bethel et al., 2014). Many factors contribute to land loss along coastal Louisiana, including natural and anthropogenic processes such as subsidence, sea level rise, and tropical storm activity. The study area continues to experience land loss at a steady rate due to subsidence of the land surface and rising sea levels. This process is expected to continue into the future resulting in a loss of surface elevation of the geomorphic features, changes in vegetation types and land cover that characterize the study area, and increased land loss resulting in more open water areas. Between 1932 and 2010, the placement study area experienced a land loss of approximately 48,110.5 acres and a gain of 8,835.17 acres during the same period (Figure 2-15).

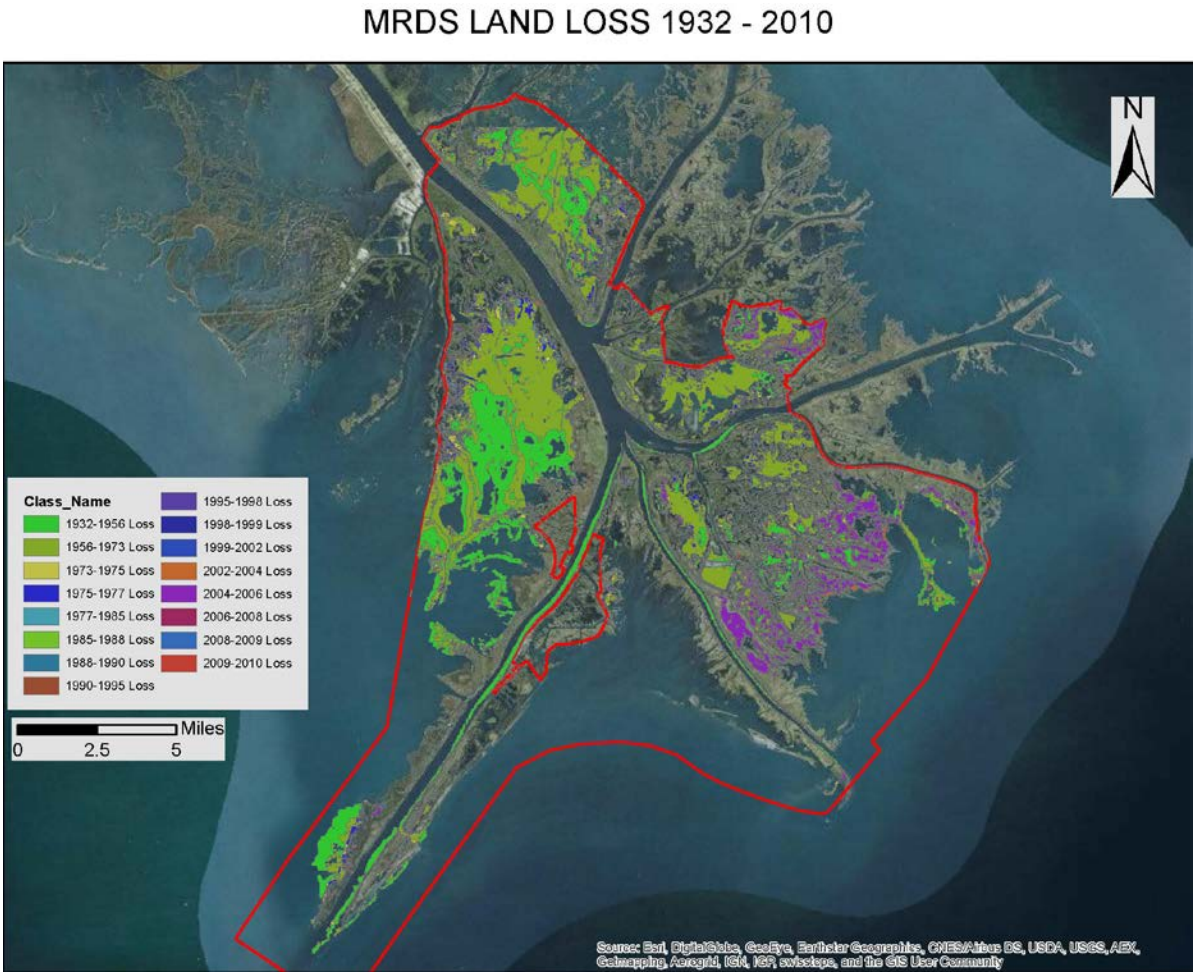


Figure 2-15 Land Loss within the Lower Mississippi River Between 1932 and 2010 (the lower Mississippi River within the Mississippi River Deepening Study (MRDS) experienced a land loss of approximately 48,110 acres and a gain of 8,835 acres during the same period)

Subsidence

Subsidence is the most complex and potentially significant biophysical influence on predictions of project outcomes in southeastern Louisiana. This document outlines a proposal for accounting for uncertainty in subsidence predictions in the Study modeling. USACE (2011) assumes that subsidence is a constant function (both past and future) calculated by subtracting the historical global sea level rise rate from there relative rate measured at the nearest tide gauge. There are only two NOAA Co-ops tide gauges, Grand Isle and Sabine Pass North, in coastal Louisiana that meet the 40-year periods of record for the 40-year benchmark described in USACE (2011). The locations of these gauges are insufficient to represent the range of conditions in coastal Louisiana (Figure 2-16).

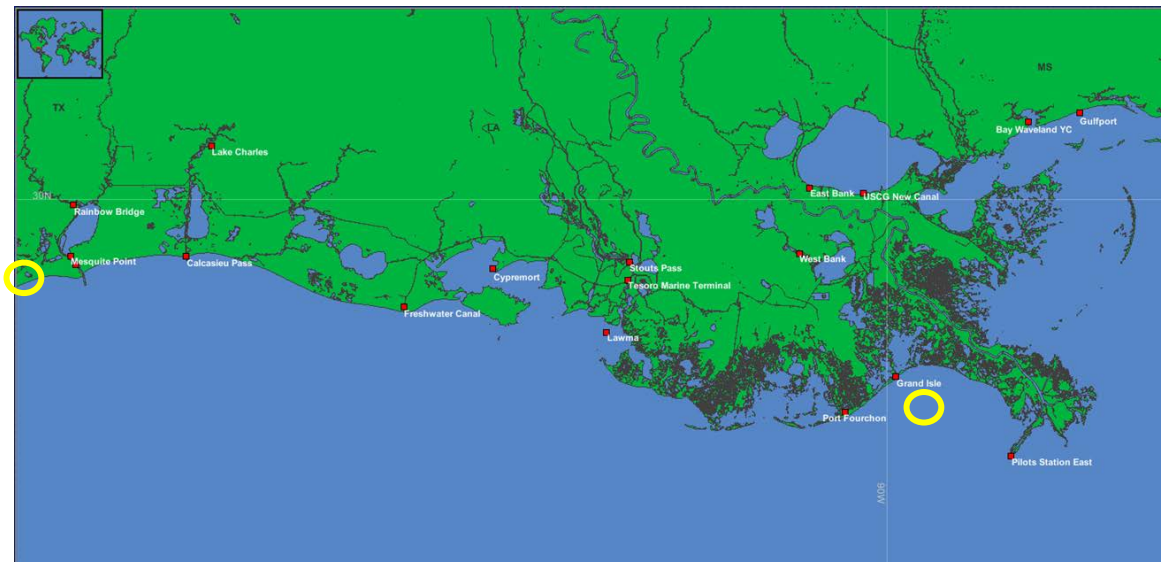


Figure 2-16 NOAA's tide gauge network in Louisiana

Figure 2-16. NOAA's tide gauge network in Louisiana covers multiple geomorphic settings within the State's coastal zone. The two NOAA Co-ops stations with a 40-year record are highlighted by the yellow circles, highlighting the paucity of NOAA stations in coastal Louisiana that meet that benchmark. Note that three NOAA stations are not shown on this map: Carrollton, Crescent City Air Gap, and Huey Long Bridge Air Gap. http://egisws01.nos.noaa.gov/website/co-ops/stations/viewer.htm.

Sea Level Rise

Global sea level change (GSLR), also called eustatic sea level change, is the global change of the oceanic water level. Data indicate that concentrations of greenhouse gases (e.g., carbon dioxide), and global temperatures have increased during the 20th century. As a result, eustatic sea levels are expected to rise in the future at a higher rate than observed during the 20th century. EPA (1995) estimated that climate change is likely to raise global sea levels 5.9 inches (15 cm) by the year 2050 and 13.4 inches by the year 2100 (34 cm). Other experts predict that the level of the world's oceans could rise over 8 inches (20 cm) over the next 50 years.

Relative sea level is defined as the sea level related to the level of the continental crust. Relative sea level changes can thus be caused by absolute changes of the sea level and/or by absolute movements of the continental crust. Potential impacts brought about by various projected rates of relative sea level change must be considered in every USACE coastal activity as far inland as the extent of estimated tidal influence, in the case in the vicinity of New Orleans, La. (ER-1100-2-8162 and ETL 1100-2-1). This was considered during feasibility level design of the Recommended Plan. Fluvial studies that include backwater profiling should also include potential relative sea level change in the starting water surface elevation for such profiles, where appropriate. Planning

studies and engineering designs over the project life cycle, for both existing and proposed projects, will consider alternatives that are formulated and evaluated for the entire range of possible future rates of sea level change represented here by three scenarios of “low,” “intermediate,” and “high” sea level change. The historic rate of sea level change represents the “low” rate.

For this navigation study, USACE assumes a historical 1.7 mm/yr linear rate of GSLR based on data reported in the International Panel on Climate Change 2007 Working Group I report (Bindoff et al. 2007). The Louisiana’s Comprehensive Master Plan for a Sustainable coast sea level rise technical team utilized a historical value of global sea level rise of 3.1 mm/yr, based on a 1993-2003 satellite altimetry dataset cited in IPCC 2007, and DeMarco et al. (2012) outlines the use of 2.4 mm/yr as an estimate for the historical linear trend, based on data through 2011 and on the weight of evidence of both tide gauge and satellite altimetry data.

USACE (2011, 2014) instructs its personnel to model three distinct future scenarios for GSLR:as defined by the National Research Council (NCR) 1) an extension of the linear historical rate at the relevant local tide gauge; 2) NRC (1987) Curve I modified as described in USACE (2011), which equates to 0.5-meters GSLR by 2100, and 3) modified NRC (1987) Curve III, which equates to 1.5-meters GSLR by 2100 (Figure 2-17). For the purposes of this study, simulations were conducted for no eustatic sea level rise and for the rates proposed by the National Research Council (NRC) 1 and NRC 3 curves, 0.5 and 1.5 meter rises at year 2100. Simulation of the no eustatic sea level rise condition represents a worst case for deposition in that channel deepening produces the largest relative change in navigation channel depth. Additionally, modeling a no eustatic sea level rise condition permits identification of sedimentation changes introduced solely by sea level rise in the NRC 1 and 3 simulations.

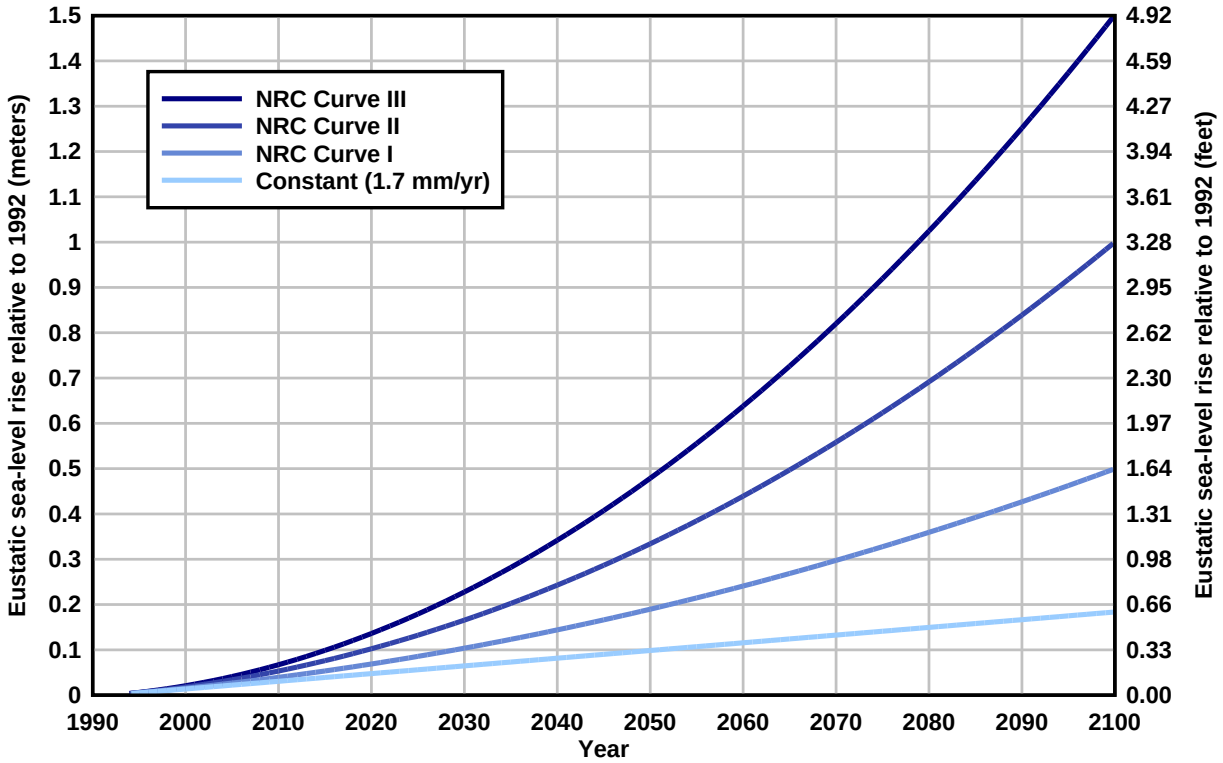


Figure 2-17 Sea level rise scenarios (NRC 1987, https://www.nap.edu/catalog/1006/responding-to-changes-in-sea-level-engineering-implications

Recent Man-made Disasters

On April 20, 2010, the Deepwater Horizon mobile drilling unit exploded, caught fire, and eventually sank, resulting in a massive release of oil and other substances from BP's Macondo well (located approximately 50 miles southeast of Head of Passes). Approximately 3.19 million barrels (134 million gallons) of oil were released into the ocean, by far the largest offshore marine oil spill in U.S. history (NOAA 2016). Aquatic and vegetative habitats contained toxic levels of oil which resulted in extensive injuries across the northern Gulf of Mexico ecosystem. Toxicity levels have decreased substantially since 2010 though lingering effects to aquatic resources may be felt for many years.

Large oil slicks also resulted in impacts to aquatic and vegetative resources in and near the Mississippi River Delta. To help prevent surface oil from reaching vegetated areas, large volumes of sand were dredged from the Mississippi River delta and transported to nearby areas for berm construction. The berms served as a barrier between surface oil in Gulf and the vegetated shoreline

along the deltaic coast. Dredging for the berms occurred in Pass A Loutre at Head of Passes and in a Mississippi River offshore placement site.

In February 2016, NOAA and its Federal and state natural resource trustee agencies released the Final Programmatic Damage Assessment and Restoration Plan and Final Programmatic Environmental Impact Statement (Final PDARP/PEIS) as part of the Natural Resources Damage Assessment. Due to the severity of oil spill impacts across such a broad array of ecosystem resources (i.e. habitats, species, and functions), the Final PDARP/PEIS recommends a comprehensive, integrated ecosystem restoration approach to help offset the ecosystem injuries and impacts. These injuries affected corals, fish and shellfish, wetlands, beaches, birds, sea turtles, mammals, and protected marine life due to three months of oil flow that resulted in an oil slick covering 43,300 square miles (an area roughly equivalent to the size of Virginia) which oiled more than 1,300 miles of shoreline (NOAA 2016). Key findings of the Final PDARP/PEIS include: injuries occurred at all trophic levels; injuries occurred to virtually all marine and estuarine habitats that came in contact with oil, from the deep sea to the shoreline; injuries occurred to species, communities, and ecosystem functions; lost recreation use value is estimated at $693 million dollars.

The preferred restoration alternative primarily focuses on restoring Louisiana coastal marshes. However, a variety of restoration approaches shall be implemented including water quality, nearshore habitats, specific species, and recreation, among others. The preferred alternative is an integrated restoration portfolio that emphasizes the broad ecosystem benefits that can be realized through coastal habitat restoration in combination with resource-specific restoration in the ecologically interconnected northern Gulf of Mexico ecosystem. Restoration will occur over the next several decades (http://www.gulfspillrestoration.noaa.gov/restoration-planning/gulf-plan).

2.2.3 Water Quality

Regulatory Overview

The Clean Water Act (CWA) established a process for states to assess water quality. Section 305(b) requires states to develop a surface water quality monitoring program, and a report describing the water quality status of state waterbodies with respect to support of designated uses. Section 303(d) requires states to develop and list Total Maximum Daily Loads (TMDLs) for impaired waterbodies (waterbodies with water quality unsupportive of one or more designated uses). A TMDL is the maximum amount of the pollutant(s) contributing to impairment that can enter a waterbody from all sources (including nonpoint sources) and still meet water quality criteria. The Louisiana Department of Environmental Quality (LDEQ) implements a watershed-based approach to reduce pollutant loads in the waterbodies where TMDLs have been established, through the Louisiana Pollutant Discharge Elimination System (LPDES) and Louisiana Nonpoint Source (NPS)

programs. For the purpose of state water quality assessment, Louisiana is divided into 12 major basins, which are further divided into waterbodies known as sub segments. The *2014 Louisiana Water Quality Inventory: Integrated Report* is the most recent in the biennial publication prepared by LDEQ on the status of Louisiana waters in accordance with Sections 305(b) and 303(d) (LDEQ 2014).

Historic and Existing Conditions

Groundwater is near the surface throughout most of the Louisiana coastal zone (USACE 2004). The silt and sand rich depositional environments such as point bar, intradelta, natural levee, beach, and nearshore gulf are generally connected hydraulically to the adjacent water body (i.e. river, lake, distributary channel) and the groundwater level in these deposits reflects the level/stage of the adjacent water body (USACE 2004). This is especially true in deposits adjacent to the Mississippi and Atchafalaya Rivers. Any potential connectivity should be investigated to determine its influence on uplift pressures, design of dewatering systems, and groundwater migration (USACE 2004). In addition, it has been proposed that submarine groundwater discharge is an important contributor to geochemical and hydrological fluxes within the deltaic plain (Kolker et al. 2012.

Numerous deep regional aquifers exist in South Louisiana (USGS 2015a). The coastal lowlands aquifer system of Louisiana consists of alternating beds of sand, gravel, silt, and clay deposited under fluvial, deltaic, and marine conditions (USGS 2015a). The aquifer system is comprised of sediment from the late Oligocene age to Holocene that thicken and dip toward the Gulf Coast. The sediments are highly heterogeneous with sand beds that are not traceable for more than a few miles (USGS 2015a). The Chicot aquifer underlies most of southwestern Louisiana and extends from central southwestern Louisiana to the Gulf of Mexico and from Sabine Lake to St. Mary Parish. The Chicot aquifer is up to 800 ft thick at its most northern extent and extends to an unknown depth beneath the Gulf of Mexico. The Southeastern Louisiana aquifer system, also known as the Southern Hills aquifer system, consists of about 30 named aquifers (USACE 2004). The Southeastern aquifer extends approximately from the Mississippi River to the Pearl River in Louisiana. The aquifers range in thickness from 50 to 1,100 ft with thickness increasing toward the south (USGS 2015a).

Mississippi River

River water quality varies due to factors such as seasonality, changing farming practices, and rainfall patterns. As this relates to agricultural runoff and suspended sediment, fertilizer and pesticide concentrations in the river are dependent on their physiochemical properties, timing of application and subsequent rainfall, crop selection, and Federal farm policy, while suspended sediment concentration, load, and grain size distribution are dependent on factors such as river

discharge, time between flood events, and water depth (Meade 1995, Allison et al. 2010, Rosen and Xu 2014).

Anthropogenically-induced changes in Mississippi River water quality are primarily related to population increases within the river's watershed and development practices, including the adoption of agricultural soil conservation practices beginning in the 1930s; the construction of major river engineering works during the 20th century; increasing use of fertilizers and pesticides, particularly for industrial farming; and insufficient regulation of point source pollution prior to effective enforcement of the CWA. Table 2-5, adapted from Garrison (1998), includes a water quality summary for three long-term (periods of record ranging from 1905-1995) monitoring stations in the Mississippi River.

Table 2-5 Mississippi River water quality summary, from Garrison (1998) (BDL = Below Detection Limit)

Group	Parameter	Units	Mississippi River at New Orleans, Louisiana (8)			Mississippi River at Violet, Louisiana (9)			Mississippi River at Belle Chasse, Louisiana (10)		
			Percentile			Percentile			Percentile		
			25th	50th (Median)	75th	25th	50th (Median)	75th	25th	50th (Median)	75th
Physical properties	Specific Conductance	µmhos/cm	346	406	462	324	358	450	332	402	461
	pH	SU	7.3	7.6	7.9	7.4	7.6	7.8	7.3	7.6	7.8
	Water Temperature	°C	11.5	19	28	10.5	17.5	26.2	11	19.2	26.5
	Dissolved Oxygen	mg/L	6.5	8	9.5	7.1	8.1	9.6	6.8	7.9	10.2
	Dissolved Solids		208	245	275	201	220	254	214	249	286
Major cations	Calcium (Dissolved)	mg/L	36	41	45	35	38	44	35	39	43
	Magnesium (Dissolved)		9.7	12	13	9.6	11	13	9.8	12	14
	Sodium (Dissolved)		16	22	28	15	18	26	15	20	28
	Potassium (Dissolved)		2.8	3.3	3.5	2.5	2.9	3.3	2.8	3.3	3.6
Major Anions	Alkalinity (Total, as $CaCO_3$)	mg/L	90	106	118	89	98	115	88	105	120
	Sulfate (Dissolved)		44	53	62	40	46	57	38	48	59
	Chloride (Dissolved)		19	25	30	18	22	29	20	26	32
Nutrients	Ammonia + Organic Nitrogen (Total, as N)	mg/L	0.5	0.7	0.9				0.5	0.7	1
	Nitrate + Nitrite (Total, as N)		0.88	1.2	1.6	0.85	1.2	1.4	1.1	1.4	1.7
	Phosphorus (Total, as P)		0.18	0.24	0.31	0.2	0.24	0.3	0.14	0.2	0.27
Biological Constituents	Fecal coliform	Col/100 mL	170	280	460	2,000	3,100	3,600	140	310	800
	Fecal streptococcus		200	440	880				120	280	750
	Phytoplankton	Cells/mL	760	1,400	2,800				880	1,800	4,100
Metals	Iron (Dissolved)	µg/L	*BDL*	20	40	*BDL*	*BDL*	30	*BDL*	20	29
	Zinc (Dissolved)		*BDL*	*BDL*	20	*BDL*	*BDL*	*BDL*	*BDL*	*BDL*	*BDL*
Organic Compounds	2,4-D (Total)	µg/L	*BDL*	*BDL*	0.2	*BDL*	*BDL*	*BDL*			
	Phenols (Total)					*BDL*	1	2			
	Oil and Grease (Total Recoverable)	mg/L				*BDL*	*BDL*	1			
	Organic Carbon (Total)		3.6	5.6	7.7	6	6.2	8.5	5.2	6.7	8.9

Louisiana Water Quality Inventory

The 2016 Louisiana Water Quality Inventory: Integrated Report (IR) includes the most recent assessment of waterbody subsegments as required by Sections 303(d) and 305(b) of the CWA. Table 2-6 provides 2016 IR information for study area Mississippi River waterbody subsegments. The upper two subsegments (LA070301_00 and LA070401_00) are fully supporting designated uses, while the lower subsegment located in the birdsfoot delta (LA070601_00) is impaired. For the lower subsegment, a TMDL has been completed for the mercury and is planned for fecal coliform, while criteria revisions are planned for low dissolved oxygen. Further background information on water quality may be referenced in Appendix C.

Table 2-6 Mississippi River Waterbody Subsegments

Subsegment Number	Designated Uses					Impaired Use	Suspected Causes of Impairment	Suspected Sources of Impairment
	PCR[1]	SCR[2]	FWP[3]	DWS[4]	OYS[5]			
LA070301	F[1]	F	F	F				
LA070401	F	F	F		F			
LA070601	F	F	F		F	FWP	Mercury in fish tissue	Atmospheric deposition of toxics and unknown source
	F	F	N2		N	FWP	Dissolved oxygen	Natural conditions
	F	F	N		N	OYS	Fecal coliform	On-site treatment systems, waterfowl, and other wildlife

[1] Primary Contact Recreation (swimming),[2] Secondary Contact Recreation (boating),[3] Fish and Wildlife Propagation (fishing),[4] Drinking Water Supply,[5] Oyster Propagation,[6] Fully supporting, and [7] Not supporting

2.2.4 Salinity

Historic and Existing Conditions

Due to the sheer volume of freshwater discharge from the river and its outlets, the coastal area of the delta can be classified as a mixing zone for fresh and salt water. The mixing zone is dynamic and depends on such variable factors as river discharge, tides, and wind. Saltwater intrusion occurs when freshwater flows decrease in volume, allowing saltwater from the gulf, which is heavier than

freshwater, to move inland or "upstream". Saltwater can then infiltrate fresh groundwater and surface water supplies, and damage freshwater ecosystems. The rate of saltwater intrusion depends on the amount of freshwater flows traveling downstream and the water depth in the wetlands, channels, and/or canals. Generally, high-inflow/low-salinity periods occur from late winter to late spring and low-inflow/high-salinity periods from late spring to fall. Saltwater intrusion is a principle factor in the conversion of freshwater habitats to saline habitats.

The salt water in the Gulf of Mexico is denser than the fresh water flowing in the Mississippi. Therefore, at low river flows, the Gulf's salt water migrates upstream along the bottom of the River underneath less dense river fresh water. This wedge is blocked under extreme low water conditions by construction of the aforementioned temporary saltwater barrier/sill at RM 64. Figure 2-18 demonstrates the buoyancy of fresh water above denser saline water.

Based on monitoring data from beneficial use sites, over 95% of the area is classified as intermediate marsh. Chabrek (1972) defined the typical range of intermediate salinity as 2-5 ppt.

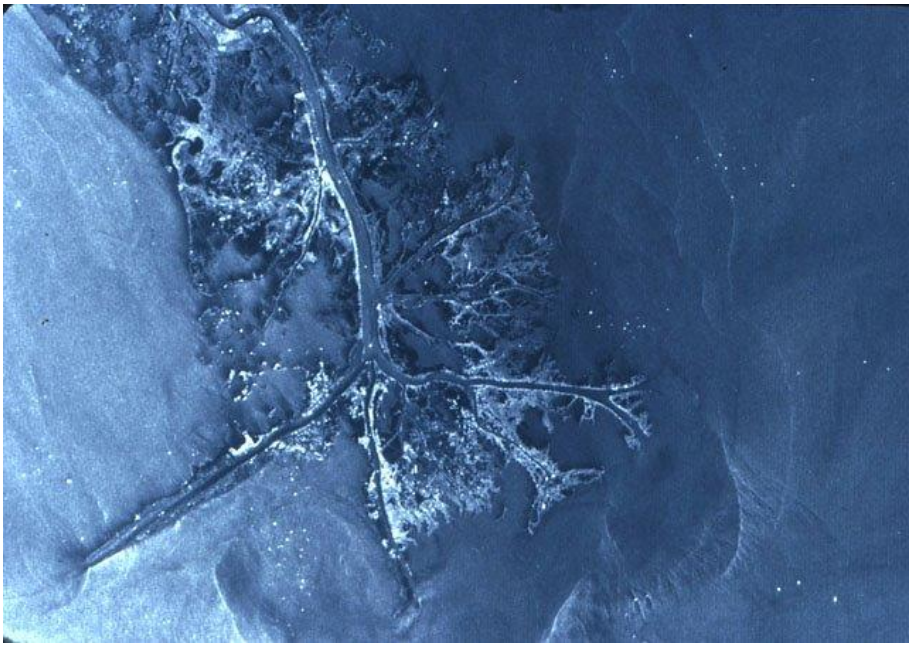


Figure 2-18 Mississippi River Delta, Salinity Front

In the black-and-white synthetic aperture radar (SAR) image of the Mississippi Delta, seen in Figure 2-18, several long, narrow, curving features can be seen in the waters to the east of the delta (at the right of the frame). These are surface waves resulting from the interaction between the outflowing fresh waters of the Mississippi River and the ambient saline waters of the Gulf of Mexico. The less-saline river water is less dense than the Gulf waters, and therefore flows out across the salty sea water at the river mouth. Fresh water can be seen discharging to a distance of

about 5 kilometers out to sea where it blends with Gulf water. (http://www.lpi.usra.edu/publications/slidesets/oceans/oceanviews/slide_28.html)

2.3 Human Environment

2.3.1 Population and Housing

Historic and Existing Conditions

Population

Across the 11 parishes of which the project occurs, a 6 percent population growth from 1.55 million to 1.64 million persons, was observed between the 1990 and 2000. This is significantly lower than the observed national growth of 29% over the same historical period. Six of the parishes within the immediate economic region of the study area have seen a growth in population from 1990, while 5 parishes have seen a decrease in population. The Ascension Parish experienced the highest increase in population from 1990 to 2015 (+75%), while the St. Bernard Parish experienced the greatest decrease in population (-32%) over the same time period (Table 2-7). However, permanent residences do not occur in the open water areas of which work is proposed.

Table 2-7 Population Trends for Selected Louisiana Parishes

Parish	Population				Percentage Change			
	1990[1]	2000[2]	2010	2015[3]	1990 to 2000	2000 to 2010	2010 to 2015	1990 to 2015
Ascension	68,214	76,627	107,215	119,455	12%	40%	11%	75%
East Baton Rouge	285,167	412,852	440,171	446,753	45%	7%	1%	57%
Iberville	31,049	33,320	33,387	33,095	7%	0%	-1%	7%
Jefferson	448,306	455,466	432,552	436,275	2%	-5%	1%	-3%
Orleans	496,938	484,674	343,829	389,617	-2%	-29%	13%	-22%
Plaquemines	25,575	26,757	23,042	23,495	5%	-14%	2%	-8%
St. Bernard	66,631	67,229	35,897	45,408	1%	-47%	26%	-32%
St. Charles	42,437	48,072	52,780	52,812	13%	10%	0%	24%
St. James	25,575	21,216	22,102	21,567	-17%	4%	-2%	-16%
St. John the Baptist	39,996	43,044	45,924	43,626	8%	7%	-5%	9%
West Baton Rouge	19,419	21,601	23,788	25,490	11%	10%	7%	31%
Louisiana	4,219,973	4,468,976	4,533,372	4,670,724	6%	1%	3%	11%
United States	248,709,873	281,421,906	308,745,538	321,418,820	13%	10%	4%	29%

Housing

The 11 parishes have estimated occupancy rates ranging from 75% in Orleans Parish to 93% in both Ascension Parish and St. Charles Parish. An estimated 61% of all residents in the eleven parishes own their home. Orleans Parish has the lowest ownership rate at an estimated 47% and St. Charles Parish has the highest with an estimated 81% of residents owning their home (Table 2-8).

[1] Bureau of the Census, http://www.census.gov/population/www/censusdata/cencounts/files/la190090.txt
[2] Bureau of the Census, http://factfinder.census.gov/faces/nav/jsf/pages/searchresults.xhtml?refresh=t
[3] Bureau of the Census, American Community Survey, Quick Facts

Table 2-8 Estimated Occupancy in Selected Louisiana Parishes

Parish	Owner-Occupied	Renter-Occupied	Vacancy Rate
Ascension	80%	20%	7%
East Baton Rouge	60%	40%	8%
Iberville	76%	24%	13%
Jefferson	63%	53%	10%
Orleans	47%	53%	25%
Plaquemines	71%	29%	16%
St. Bernard	70%	30%	21%
St. Charles	81%	19%	7%
St. James	80%	20%	9%
St. John the Baptist	77%	23%	9%
West Baton Rouge	70%	30%	14%

2.3.2 Employment and Industrial Activity

Historic and Existing Conditions

Louisiana employment in 2014 totaled 2 million. Of the major industry sectors within the state, the health care and social assistance sector employs the most persons (283,000). This industry is followed by retail trade (234,000), educational services (184,000), construction (161,000), manufacturing (160,000), and accommodation and food services (156,000). The parishes in the study region yield fairly similar proportions of workers per sector (all within 5 percent) compared to what was observed at the state level. The one industry exception was manufacturing in St. James Parish and West Baton Rouge Parish. Respectively, 23 percent and 16 percent of workers participated in the manufacturing industry compared to 8 percent at the state level.

2.3.3 Public Facilities and Services

Historic and Existing Conditions

The eleven parishes in the study area contain public facilities and services typical of other American Communities. Public schools, fire and police departments, and public health services are among the services provided by the parishes. Ascension Parish has a public boat ramp operated by the Louisiana Fish and Wildlife services. Iberville Parish, Plaquemines Parish and Orleans Parish have both State and Parish operated Ferry services.

2.3.4 Transportation

Historic and Existing Conditions

The eleven parishes contain five ferry terminals.[4] Three are state-operated and two are parish-operated. A study conducted in 2009 noted the average ridership for ferries in the Jefferson, Orleans, Plaquemines, St. Bernard and St. Tammany Parishes have experienced an average decline of about 1% per year. The decline was attributed, in part, to the effects of Hurricane Katrina on the region's population. In addition to water transportation, the area also has an extensive network of state, county and municipal roads to accommodate vehicle traffic.[5]

2.3.5 Community and Regional Growth

Historic and Existing Conditions

Presently, population numbers have remained largely stable in 8 of the 11 affected parishes. Orleans Parish saw a sharp decline in residents from 2005 to 2010, due to Hurricane Katrina. West Baton Rouge Parish also saw a sharp decline during the same time frame. Ascension Parish has seen a steady increase in residents from 1995 until the present.

2.3.6 Cultural and Historic Resources

Historic and Existing Conditions

The Mississippi River is integral to the history of the United States. In both prehistoric and historic times, the Mississippi River has been a means of transit and an area of rich resources conducive to settlement along its banks. During the growth of the United States and during the Civil War, control of the Mississippi River warranted fortifications. In the industrial age, numerous efforts to control the Mississippi River began and continue with engineered features such as levees, dikes, channel training and similar features. Channel depth and crossings depth have all been examined and coordinated for impacts to natural resources, via multiple NEPA documents. Not all of these areas were subject to cultural resources survey, but studies that have been completed and that discuss these areas, present large agreement that resources are not preserved at the depths in question, both because of the continued dredging that has occurred during the age of navigation, and because of the high velocity and large energy of the Mississippi River at these depths. A remote sensing cultural resources survey within approximately half of Fairview Crossing did not identify cultural resources. Historic maps indicate large scale movement of the channel at Rich Bend and Belmont Crossings, making intact sunken or terrestrial cultural resources very unlikely.

[4] http://wwwapps.dotd.la.gov/operations/ferrystatus/fmbs_map.aspx?PID=F_ALL
[5] http://wwwsp.dotd.la.gov/Inside_LaDOTD/Divisions/Multimodal/Data_Collection/Mapping/Wall%20Map/Official%20Highway%20Map%20(side%201).pdf

Remote Sensing surveys for the West Bay Diversion and for maintenance of Southwest Pass has investigated within much of the Lower Mississippi River, and has not found significant cultural resources within the current project area.

Placement areas are a different discussion but reach a similar conclusion. The vast majority of the currently proposed placement area has already been discussed in previous NEPA documents, from those to dispose of the material acquired by dredging the Venice Harbor, to those expanding placement areas associated with South Pass and Southwest Pass by 51,000 acres. Not all of these NEPA documents contain a cultural resources survey, but they do discuss the natural forces at work that make the existence of intact historic properties unlikely. The placement areas are underlain by several hundred feet of alluvial material which is slowly compressing and causing surface sediments to subside. See Appendix A-1 and Figure 2-1 for a list of previous NEPA documents evaluating the disposal areas.

Environmental coordination with other resource agencies for construction and maintenance of the Channel Crossings and Disposal Areas has a long history and did not always utilize current standards of coordination under Section 106 of the National Historic Preservation Act. In more recent years and in updated NEPA documents as well as in more specific Section 106 studies, many of these areas have been revisited and Section 106 coordination was achieved using current standards that utilize cultural surveys and geologic history of the areas involved. Section 106 compliance throughout the entirety of current project area has been achieved with coordination of USACE's finding of No Historic Properties Affected in a letter to the Louisiana State Historic Preservation Officer (SHPO) dated August 2, 2017 and in letters to Tribes dated August 26, 2017. Agreement with the finding of no historic properties affected was received from SHPO on August 25, 2017. The Tribes did not respond to the August 26, 2017 letter. When deepening was proposed for only three river crossings and the lower river, agreement with the USACE finding of no historic properties affected was received from the Seminole Nation of Oklahoma on January 25, 2017, the Choctaw Nation of Oklahoma and the Jena Band of Choctaw on January 24, 2017, and the Muscogee (Creek) Nation on February 6, 2017. Section 106 Coordination documentation is found in Appendix B.

2.3.7 Aesthetics and Visual Resources

Historic and Existing Conditions

The project area is large and water resources are abundant. Water resources include a large stretch of the Mississippi River and associated tributaries and passes located at the river delta going out into the Gulf of Mexico. There are a plethora of bays and other similar water bodies as well. There are no scenic streams, either state or federally recognized, anywhere near the vicinity of the placement areas.

There are two wildlife management areas in the vicinity of the placement areas. These include Delta National Wildlife Refuge and Pass a Loutre Preserve Wildlife Management Area. There are other recreational, public and institutionally significant lands along the Mississippi River corridor but those will be removed from any potential work associated with this project.

2.3.8 Noise

Historic and Existing Conditions

Generally, noise is a localized phenomenon throughout the study area. Residential homes, apartments, schools, churches, and businesses are in proximity of the river, especially proceeding north from Venice, LA.There are many different noise sources throughout the area including commercial and recreational boats, and other recreational vehicles; automobiles and trucks, and all-terrain vehicles; aircraft; machinery and motors; and industry-related noise. Noise levels vary depending on the time of day and climatic conditions. Automobile, navigation traffic, train traffic, all-terrain vehicle traffic, industry and to a lesser extent air traffic, contribute to the background noise levels.

Pass a Loutre WMAs and the Delta National Wildlife Refuge are located in the vicinity of the lower river and existing placement areas. These public lands are sensitive noise receptors where serenity and quiet are an important public resource. Noise levels around the project area are variable depending on the time of day and climatic conditions. Near developed areas, automobile and train traffic, and to a lesser extent air traffic, contribute to the background noise levels.

2.3.9 Recreation Resources

Historic and Existing Conditions

Primary recreational activities in the study area have been consumptive in nature, including fishing and hunting. Saltwater recreational activities have revolved primarily around saltwater fishing and to a lesser degree recreational shrimping and crabbing. Freshwater-based recreational opportunities have primarily been waterfowl hunting and freshwater fishing.

Placement areas presented in this SEIS are within the active delta of the Mississippi River. Boating and fishing (fresh and saltwater) occur within all placement areas. The study area contains a Federal National Wildlife Refuge (NWR) and a State Wildlife Management Area (WMA) typically used for active and consumptive recreational activities (Table 2-9). The value the public places on recreational resources in the study area, such as boating, fishing, and hunting, can be directly measured by the large number of fishing and hunting licenses sold in the study area, and the large number of recreational boat registrations per capita (Table 2-10). Numerous water bodies in the study area provide boating and fishing opportunities.

Pass a Loutre Wildlife Management Area (WMA): The Pass a Loutre WMA, managed by the Louisiana Department of Wildlife and Fisheries is located in southern Plaquemines Parish, Louisiana, at the mouth of the Mississippi River approximately 10 miles south of Venice and is accessible only by boat. Approximately 115,000 acres in size, this WMA is characterized by river channels, channel banks, bayous, man-made canals, and intermediate and freshwater marshes. Hurricane damage and subsidence have formed large ponds within the marsh complex. Waterfowl and other migratory game bird hunting, rabbit hunting, and archery hunting for deer as well as recreational fishing are permitted on the Pass a Loutre WMA. (LDWF 2014). Several camps, five campgrounds and Port Eads Marina are located in the WMA. Port Eads is a Parish-owned facility operated by a private company. Port Eads is only accessible by boat, but the public can use with payment of fees.

Approximately 64,000 acres of existing placement site area is located within the Pass a Loutre WMA. The nearest public boat launches accessible by land are in Venice, Louisiana. Consumptive recreation uses include hunting for waterfowl, birds, rabbits, and deer; trapping for surplus furbearing animals and alligators; fishing for freshwater and salt water species; and crabbing. Other recreational activities include boating, picnicking, nature study, bird watching, and camping. The WMA has 5 designated tent-camping areas, Port Eads Marina and 3 areas have been designated to allow the mooring of recreational houseboats.

Table 2-9 Recreational Features within the Study Area

Recreational Area	Location	Land Management Agency	Size (acres)	Key Recreational Features
Delta NWR	Plaquemines Parish, LA	USFWS	49,000	• Boat access only • Hunting and fishing
Pass-a-Loutre WMA	Plaquemines Parish, LA	LDWF	115,000	• Boat access only • Hunting and fishing

Delta (NWR): The Delta NWR established in 1935 and is located on the east side of the Mississippi River in Plaquemines Parish 10 miles south of Venice, Louisiana, is under the jurisdiction of the U.S. Fish and Wildlife Service and is located adjacent to portions of the Pass-a-Loutre WMA. The Delta NWR serves as a breeding ground for migratory birds and other wildlife, and as a migratory waterfowl refuge. The refuge lands are accessible only by boat. Despite this limitation, the area has a long record of public use. The majority of this public use has been in the form of consumptive uses such as hunting and fishing (fresh and saltwater). Other public use includes adjacent wildlife observation, bird watching, boating, canoeing and kayaking, and photography. Camping is not

allowed on the refuge. About 8,534 acres of existing placement site area is located within the Delta NWR.

The USFWS states that Habitat Management Goal 1 in the Delta NWR's Comprehensive Conservation Plan (CCP) is to "Manage, conserve, and restore the physical and ecological functions of coastal wetland habitats for fish and wildlife resources" (https://catalog.data.gov/dataset/delta-and-breton-national-wildlife-refuges-comprehensive-conservation-plan) . Discussion under Goal Objective 1.1 discusses a need to continue to maintain quality interior emergent marsh, and initiate a restoration program that focuses on restoration of the Gulf shoreline, which will aid in protecting interior marsh. It states: "The refuge continues to search for other locations and options for marsh creation and protection, one of which is to use beneficial deposition of dredged materials along the Breton Sound and Gulf of Mexico shoreline."

Plan Implementation for the Delta NWR includes the following Habitat Management Project for the Delta NWR: "Use beneficial dredged materials from the Mississippi River to fill an open water bay and create new emergent marsh on the refuge just north of Pass-a-loutre. This partnership with the Army Corps of Engineers can create and restore hundreds of acres lost to erosion and subsidence on the refuge with no cost to the refuge."

Table 2-10 Boater Registrations, Fishing/Hunting License in the Study Area

Parish or County	Fishing License				Hunting License		Boater Registra-tions
	Resident - Freshwater	Resident - Saltwater	Non-Resident - Fresh water	Non-Resident - Saltwater	Resident	Non-Resi-dent	
Jefferson	40,145	38,650	1,151	1,237	14,244	60	18,627
Lafourche	19,656	18,605	290	298	8,742	25	11,878
Orleans	17,145	16,014	637	638	5,899	49	4,171
Plaquemines	4,605	4,488	228	231	2,304	31	4,649
St. Charles	8,230	7,796	83	82	3,725	11	4,343
St. Bernard	5,314	5,196	123	142	2,276	17	2,702
East Baton Rouge	35,334	27,562	640	593	19,648	77	16,145
West Baton Rouge	4,046	2,807	38	19	2,611	2	1,975
Iberville	4,967	3,453	78	52	3,445	8	3,320
Ascension	17,830	14,939	239	215	9,142	30	8,530

St. James	3,852	3,405	36	29	2,221	5	2,135
St. John the Baptist	5,291	4,926	92	92	2,443	4	2,269
Total	157,055	139,838	3,474	3,467	71,813	300	76,067

Source: LDWF 2015

2.3.10 Air Quality

Historic and Existing Conditions

The U.S. Environmental Protection Agency (EPA) Office of Air Quality Planning and Standards has set National Ambient Air Quality Standards (NAAQS) for six principal pollutants, called "criteria" pollutants. They are carbon monoxide, nitrogen dioxide, ozone, lead, particulates of 10 microns or less in size (PM-10 and PM-2.5), and sulfur dioxide. Ozone is the only parameter not directly emitted into the air but forms in the atmosphere when three atoms of oxygen (03) are combined by a chemical reaction between oxides of nitrogen (NOx) and volatile organic compounds (VOC) in the presence of sunlight. Motor vehicle exhaust and industrial emissions, gasoline vapors, and chemical solvents are some of the major sources of NOx and VOC, also known as ozone precursors. Strong sunlight and hot weather can cause ground-level ozone to form in harmful concentrations in the air. The Clean Air Act General Conformity Rule (58 FR 63214, November 30, 1993, Final Rule, Determining Conformity of General Federal Actions to State or Federal Implementation Plans) dictates that a conformity review be performed when a Federal action generates air pollutants in a region that has been designated a non-attainment or maintenance area for one or more NAAQS. A conformity assessment would require quantifying the direct and indirect emissions of criteria pollutants caused by the Federal action to determine whether the proposed action conforms to Clean Air Act requirements and any State Implementation Plan (SIP).

The general conformity rule was designed to ensure that Federal actions do not impede local efforts to control air pollution. It is called a conformity rule because Federal agencies are required to demonstrate that their actions "conform with" (i.e., do not undermine) the approved SIP for their geographic area. The purpose of conformity is to (1) ensure Federal activities do not interfere with the air quality budgets in the SIPs; (2) ensure actions do not cause or contribute to new violations, and (3) ensure attainment and maintenance of the NAAQS.

Orleans, Jefferson, St. James, St. Charles, and Plaquemines Parishes are currently in attainment of all NAAQS, and are operating under attainment status. This classification is the result of area-wide air quality modeling studies. St. Bernard Parish is classified as non-attainment for Sulphur Dioxide (SO_2). East Baton Rouge, West Baton Rouge, Iberville, Livingston and Ascension Parishes are not in attainment of NAAQS.

East Baton Rouge, West Baton Rouge, Iberville, Livingston and Ascension Parishes were designated by the Environmental Protection Agency as ozone non-attainment areas under the 8-hour standard effective June 15, 2004. EPA's final action to redesignate the Baton Rouge 2008 ozone nonattainment area and approve the plan to maintain the standard was published in the Federal Register on December 27, 2016, and became effective January 26, 2017. The five-parish area of West Baton Rouge, East Baton Rouge, Iberville, Ascension and Livingston Parishes are now classified as maintenance status for ozone (O_2). The area is still subject to the 100 tons per year de minimis levels. The five-parish area has been classified as marginal, which is the least severe classification. This classification is the result of area-wide air quality modeling studies, and the information is readily available from Louisiana Department of Environmental Quality, Office of Environmental Assessment and Environmental Services.

The channel crossing deepenings proposed in East Baton Rouge, West Baton Rouge, Iberville, and Ascension Parishes (within the Port of Baton Rouge) are subject to the State's general conformity regulations as promulgated under LAC 33:III.14.A, Determining Conformity of General Federal Actions to State or Federal Implementation Plans. No other proposed work would occur within a non-attainment area. First, a general conformity applicability determination is made by estimating the total of direct and indirect volatile organic compound (VOC) and nitrogen oxide (NOx) emissions which would be caused by the construction of the project. (VOC and NOx are classified as precusors to ozone.) Prescribed de minimis levels of 100 tons per year per pollutant are applicable in the four parishes. Projects that would result in discharges below the de minimis level are exempt from preparation of a general conformity determination and further consultation and development of mitigation plans for reducing emissions.

2.3.11 Hazardous, Toxic and Radioactive Waste (HTRW)

The discharge of dredged material into waters of the United States is regulated under the Clean Water Act (CWA). In the absence of a known Hazardous, Toxic, and Radioactive Waste (HTRW) concern, the proposed action would not qualify for an HTRW investigation.

The USACE Engineer Regulation, ER 1165-2-132, Hazardous, Toxic, and Radioactive Waste (HTRW) for Civil Works Projects, states that dredged material and sediments beneath navigable waters proposed for dredging qualify as HTRW only if they are within the boundaries of a site designated by the EPA or a state for a response action (either a removal or a remedial action) under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), or if they are a part of a National Priority List (NPL) site under CERCLA (NPL is also known as "Superfund").

Dredged material and sediments beneath the navigable waters proposed for dredging shall be tested and evaluated for their suitability for disposal in accordance with the appropriate guidelines and

criteria adopted pursuant to Section 404 of the Clean Water Act and/or Section 103 of the Marine Protection Research and Sanctuaries Act (MPRSA) and supplemented by the Corps of Engineers Management Strategy for Disposal of Dredged Material: Containment Testing and Controls (or its appropriate updated version) as cited in Title 33 Code of Federal Regulations, Section 336.1.

Dredge material disposal areas have historically been associated with oil and gas exploration. A review of state and national environmental and natural resources databases revealed the presence of numerous active, inactive, plugged and abandoned oil and gas wells, injection wells, and oil and gas pipelines within the proposed project area. Although they are not considered to be HTRW concerns, they are considered to be Recognized Environmental Concerns that shall be avoided during construction. Recognized Environmental Concern (REC) is one of the terms used to identify environmental liability within the context of a Phase I Environmental Site Assessment. American Standard Testing Methods (ASTM) defines the recognized environmental condition in the E1527-13 standard as "the presence or likely presence of any hazardous substances or petroleum products in, on, or at a property: (1) due to release to the environment; (2) under conditions indicative of a release to the environment; or (3) under conditions that pose a material threat of a future release to the environment. de minimis conditions are not recognized environmental conditions." Numerous oil and gas pipelines, oil and gas well-heads (active, inactive, and plugged and abandoned), and oil and gas pipelines and related facilities are located within or near the footprint of the project areas. Caution and diligence must be taken to avoid impacts to pipelines or oil and gas wells during construction of all features

Dredge slurry was collected directly from the discharge lines of dustpan dredges performing maintenance on all maintained Deep Draft Crossings during Fiscal Year 2016. The solid and liquid fractions of the slurry were analyzed individually for the presence of EPA priority pollutants including metals, pesticides, PCBs, and semi-volatile organic compounds. Metals were common to both fractions, and were detected at or below background levels in the Mississippi River. Chlordane pesticides and hydrocarbon exhaust products were detected infrequently in the solid samples, but at levels generally at or below 1 part per billion. All contaminant detects in dredge slurry were below regulatory water quality criteria and ecological screening values, and dredging of the crossings is not expected to have a negative impact on human health or the environment (Appendix A-14).

Based upon a review of the NPL, CERCLA, and environmental databases, contaminant sampling data, the probability of encountering HTRW in connection with this project is low. No portion of the project area proposed for dredging and disposal is included in the NPL. The proposed construction and beneficial use-disposal action does not qualify for further HTRW investigation.

2.4 Natural Environment

2.4.1 Soils and Water Bottoms

Historic and Existing Conditions

The project study area consists of a winding river corridor of 254 river miles between Baton Rouge, Louisiana and the Gulf of Mexico via Southwest Pass. Approximately 35% of this corridor requires at least some maintenance dredging to maintain the current channel dimensions. Specifically 28 miles from Venice, LA, to the Gulf of Mexico are dredged at less than an annual occurrence, and 61 combined miles of 12deep draft crossings between Baton Rouge, LA, and New Orleans, LA, require some level of maintenance dredging. On an average annual basis, a combined 3.7 miles between Venice, LA, and the Gulf of Mexico (via Southwest Pass) are maintained. Since 1986, Crossings have required an average of 16,403,283 cubic yards of dredging. By comparison, since 1986 Southwest Pass has required 15,091,427 cubic yards of dredging. Dredged material from below RM 13.4 the Mississippi River is placed in approximately 167,318 acres of existing placement areas in the Mississippi River Delta for the purpose of creating coastal habitat such as emergent and high marsh, bird islands, and deltaic ridges.

There are three soil types identified in the proposed placement areas and include Aquents, Balize and Larose, and Carver/Cancienne/Schriever soils. Aquents are poorly to very poorly drained soils typically formed by human transport such as dredging or on excavated landscapes. Approximately 37% of the soils in the proposed placement areas is Aquent likely resulting from previous dredging and placement activities occurring in the vicinity. Balize and Larose soils are very poorly drained and frequently flooded soils that are commonly associated with marsh landforms. Balize soils are typically associated with a parent material originating from fluid loamy backswamp deposits of silt loam and silty clay loam. Larose soils form from the decay of thin herbaceous organic material over fluid clayey alluvium, developing into muck and mucky clay. Carville, Cancienne, and Schriever soils are somewhat poorly to poorly drained and associated with natural levees, depressions, and backswamps. Profiles typically consist of silt loam, fine sandy loam, and silty clay. None of these soils are identified as prime and/or unique farmlands. More detailed information and descriptions of the soil types is provided in Table 2-11.

Table 2-11 Soil types and descriptions in the proposed placement areas

Soil Symbol	Soil Type and Description	Approximate Acres in Placement Areas	Percentage in Placement Areas
AT	Aquents, dredged, frequently flooded, poorly to very poorly drained	14,789	37%

BA	Balize and Larose soils, frequently flooded, very poorly drained	22,661	57%
CV	Carville, Cancienne, and Schriever soils, somewhat poorly to poorly drained	2,426	6%
	Total	39,876	100%

Water Bottoms

Water bottoms in the study area (Table 2-12) include large shallow estuaries of the Mississippi River Delta and the deep-draft navigation channel of the Mississippi River from Baton Rouge to the Gulf of Mexico. Water bottom soils along the water bottom consist of a mixture of a wide variety of silts, sands and clays that were eroded upstream in the watershed and shoaled within the river. Many other water bottoms in the study area are a result of degraded and collapsing marshes or transgressing and subsiding barrier islands, and areas that were previously wetlands or upland ridges are now subsided below the water surface. The sediments of most of the water bottoms in the study area are composed of fine grain material with a high organic content and a low sand content. Organic content in the soils increases in areas that were formerly coastal marsh and swamp and now form shallow water bottoms.

Table 2-12 Area of water bottoms in the study area

Water Bottom	Approximate Acres
Mississippi River Delta	123,923
Mississippi River	68,033
Total acres	191,956

2.4.2 Vegetation Resources

Historic and Existing Conditions

Vegetation varies considerably along the 254 River Mile corridor between Baton Rouge, Louisiana and the lower delta. Plant assemblages in the study area provide primary productivity and structural stability to terrestrial (supratidal) and aquatic (inter- and subtidal) substrates thereby

creating diverse habitats for a variety of estuarine and coastal fauna (Hester et al. 2005). Plants that tolerate salty Gulf waters form a narrow band along the study area coast line. Inland of this salt marsh are the brackish water species which grade inland into freshwater species (Chabreck 1998).

Based on monitoring of salinity and beneficial use placement site vegetation, it is estimated that over 95% of the study area marshes classify as intermediate marsh, with the remaining areas classifying as fresh marsh (mostly occurring around the Coastal Wetland Planning Protection and Restoration Act (CWPPRA) West Bay Sediment Diversion). Penfound and Hathaway (1938) conducted what many consider the seminal research in describing the plant communities of southeastern Louisiana; their findings are still applicable today. Vegetation zonal communities or plant associations in coastal Louisiana are determined by four major factors: elevation. salinity of soil water and surface water, water level with respect to soil surface including soil water content, and soil organic matter. Vegetation resources in the study area include five main wetland types: fresh, intermediate, brackish, and saline marsh; and swamp forest. These wetlands are distributed not only within the study area, but also within the entire coastal Louisiana area, based on the salinity tolerance of the various plant species (Table 2-13, Chabreck 1988).

Table 2-13 Salinity ranges for the four coastal wetland types

Wetland Type	Range (ppt)	Mean (ppt)	Typical Range (ppt)
Fresh	0.1 – 6.7	<3.0	0 – 3
Intermediate	0.4 – 9.9	3.3	2 – 5
Brackish	0.4 – 28.1	8.0	4 – 15
Saline	0.6 – 51.9	16.0	12 +

(Source: Chabreck, 1972; Louisiana Coastal Wetlands Conservation and Restoration Task Force; and the Wetlands Conservation and Restoration Authority 1998) ppt – parts per thousand

Batture Vegetation

The batture community is a pioneer community which is first to appear on newly formed sand bars and river margins. The area receives sands and silts with each flood and the soils are semi-permanently inundated or saturated. Soil inundation or saturation by surface water or groundwater occurs periodically for a major portion of the growing season, and such conditions typically prevail during spring and summer months with a frequency ranging from 51 to 100 years per 100 years. The total duration of time for the seasonal event(s) normally exceeds 25 % of the growing season (LNHP 2009).

Tidal Intermediate, Brackish, and Salt Marshes

Tidal salt marsh vegetation zonation is strongly influenced by small differences in elevation above the mean high water level. The intertidal zone or low marsh next to the estuary, bay, or tidal creek is dominated by the tall form of smooth cordgrass (*Spartina alterniflora*). In the high marsh, smooth cordgrass gives way to stands of saltmeadow cordgrass (*Spartina patens*) (saltmeadow cordgrass; dominant species in the northern Gulf Coast) mixed with saltgrass (*Distichlis spicata*) and occasional patches of the shrub marsh elder (*Iva frutescens*) and other shrubs. Beyond the saltmeadow cordgrass zone and at normal high tide, black rush (*Juncus roemerianus*) forms pure stands (Mitsch et al. 2009).

Submerged Aquatic Vegetation (SAV)

Fresh and intermediate marshes often support diverse communities of submerged aquatic plants that provide important food and cover to a wide variety of fish and wildlife species. Fresh and intermediate marshes often support more diverse communities of submerged aquatic vegetation (SAV) than brackish marshes. However, in lower salinity marshes, widgeon-grass provides important food and cover for many species of fish and wildlife. Saline marshes typically do not contain an abundance of SAVs. Submerged aquatic vegetation (SAV) persists in shallower, protected areas of the placement area. It is estimated that less than 10 % of the open water portions of placement area contains SAV's (See page 6 of Project Information Fact Sheet in Appendix A-7).

Invasive Plant Species

Invasive plants play a large part in the loss of wetland and coastal habitats. These plants have been introduced into the local environment either purposefully or accidentally. Invasive aquatic plant species often increase and spread rapidly because the new habitat into which they are introduced is often free of insects and diseases that are natural controls in their native habitats (USGS 2000).

The following species are classified as widely established species in coastal Louisiana (Tulane and Xavier 2013): Wild Taro (*Colocasia esculenta*), Brazilian Waterweed (*Egeria densa*), Water Hyacinth (*Eichhornia crassipes*), Hydrilla (*Hydrilla verticillata*), Parrot Feather (*Myriophyllum aquaticum*), Eurasian Watermilfoil (*Myriophyllum spicatum*), Water Lettuce (*Pistia stratiotes*), Common Salvinia (*Salvinia minima*), and Chinese Tallow (*Sapium sebiferum*). Locally Established Species are: Giant Salvinia (*Salvinia molesta*), and Cogongrass (*Imperata cylindrica*) (Tulane and Xavier 2013).

2.4.3 Wildlife

<u>Historic and Existing Conditions</u>

Important wildlife species utilizing the project area (Nyman et al. 2013) include: American alligator (Alligator mississippiensis), nutria (Myocastor coypus), muskrat (Ondatra zibethicus), raccoon (Procyon lotor), waterfowl (Anser spp., Anas spp., Aythya spp., Mergus spp., etc.), woodcock (Scolopax minor), river otter Lutra Canadensis), white-tailed deer (Odocoileus virginianus), mink (Mustela vison), rabbit (Sivilagus spp.), squirrel (Sciurus spp.), and snapping turtle (Macroclemys temmincki) (Nyman et al. 2013). The project area also contains a high diversity of birds and is situated within the Mississippi Flyway. Approximately 40% of all North American migrating waterfowl and shorebirds use this flyway (https://en.wikipedia.org/wiki/Mississippi_Flyway).

The project area is also home to federally and state managed wildlife areas (Figure 2-19). Pass-a-Loutre Wildlife Management Area is located in southern Plaquemines Parish at the mouth of the Mississippi River. This area is managed by the Louisiana Department of Wildlife and Fisheries and encompasses some 115,000 acres. The area is characterized by river channels with attendant channel banks, natural bayous, and man-made canals which are interspersed with intermediate and fresh marshes. Hurricane damage and subsidence have contributed to a major demise of vegetated marsh areas resulting in formation of large ponds. Habitat development is primarily directed toward diverting sediment-laden waters into open bay systems (i.e., creating delta crevasses), which promotes delta growth.

Delta National Wildlife Refuge was established in 1935. Its 49,000 acres were formed by the deposition of sediment carried by the Mississippi River. This area combines the warmth of the Gulf and the wealth of the river. Its lush vegetation is the food source for a multitude of fish, waterfowl and animals. Delta is the winter home for hundreds of thousands of snow geese, coots and ducks.

Invasive Wildlife

Invasive animals have been recognized as playing a large part in the loss of wetland and coastal habitats (USGS 2015c). Nutria and feral swine are the only mammals identified as invasive in Louisiana and are a significant cause of erosion in many areas due to their destructive foraging/rooting. Although nutria are not distributed throughout all of Louisiana, their numbers and environmental impact in southern Louisiana are so great that they warrant consideration as extremely problematic. Feral hogs are also established throughout the southern Louisiana. The problems caused by feral hogs in Louisiana, however, are dwarfed by those caused by nutria. Feral hogs also provide some social and economic benefit for local hunters and trappers, whereas nutria no longer offer any benefit to Louisiana residents (Tulane and Xavier 2005).

2.4.4 Aquatic and Fisheries Resources

Historic and Existing Conditions:

Mississippi River

The Mississippi River plays an important role in the distribution of fishes across the state because it provides suitable habitat for many species and it also divides the state into ecologically different areas (Douglas 1974). Douglas (1974) is one of the first most comprehensive studies on the diversity of freshwater fishes in Louisiana with at least 148 freshwater species in Louisiana's waters. Douglas (1974) attributes the large number of species to the diverse freshwater habitats found in Louisiana (from placid bayous and oxbows of the eastern Mississippi River floodplain to the swift flowing streams of the north, central, and western parishes).

La Roe et al. (1985) study of fish species within the Mississippi River found the river supports one of the most diverse fisheries in the world with at least 183 species of freshwater fish in the Mississippi River Delta. There are three species of mussels, and 13 species of crawfish found within the Mississippi Basin in Louisiana. Minnow (Cyprinidae), darter (Etheostoma and Pecina), perch (*Perca sp.*), sturgeon (Acipenseridae), and paddlefish (*Polyodon spathula*) are the most common fish species in the river (NPS 2014b). Native fish stocks have been declining in number; approximately 6 % of the native fish species in the Delta are found on the endangered, threatened, or special concern lists of the U.S. Fish and Wildlife Service (NPS 2014b).

Delta Fishery and Marine Wildlife Resources

Brackish and saltwater species include spotted seatrout (Cynoscion nebulosus), red drum (Sciaenops ocellatus), flounder *(Paralichthys lethostigma),* sheepshead *Archosargus probatocephalus*, pinfish (*Lagodon rhomboides)*, bottlenose dolphin (Tursiops truncatus) and croaker (*Micropogonias undulatus)*. Shellfish in the study area include blue crab (*Callinectes sapidus)*, white shrimp (Litopenaeus setiferus), brown shrimp (Farfantepenaeus aztecus), Gulf stone crab (Menippe mercenaria), grass shrimp (Palaemonetes pugio), mysid shrimp (*Mysidopsis bahia*), and mud crab (Uca sp.) (O'Connell et al. 2005). Commercially and recreationally important species include blue crab, white and brown shrimp, American oyster (Crassostrea virginica), and the gulf stone crab (Table 2, NMFS 2012).

Three species of crustaceans — brown shrimp, white shrimp, and blue crab — are of major commercial and recreational importance in the coastal waters of Louisiana (Caffey and Schexnayder 2002). Each of these species follows a circular migration, which encompasses a broad range of estuarine salinities. Because commercial harvesting targets the late juvenile and adult stages, productivity is often incorrectly equated with higher salinities. Although higher salinities tend to favor harvestability, Caffey and Schexnayder (2002) indicate they are not directly linked to absolute productivity.

Submerged aquatic vegetation (SAV) persists in approximately 10 % of the shallower, protected areas of the placement areas. The project area is not considered productive oyster habitat. There is currently one oyster lease that overlaps the far western boundary of the existing western placement area along Southwest Pass (http://gis.wlf.la.gov/oystermap/map.html). This lease would not be impacted by the project.

O'Connell et al. (2005) identify the most common commercially and recreationally important aquatic species found in coastal Louisiana that are estuarine dependent (see Table 2-14).

Table 2-14 Common commercially and recreationally important aquatic species found in coastal Louisiana that are estuarine dependent (from O'Connell et al. 2005)

Group Common Name (Scientific Name)	Commercial Significance	Description of Estuarine Dependence
Invertebrates		
brown shrimp (*Farfantepenaeus aztecus*)	Most productive shrimp fishery species in Gulf of Mexico; LA leads Gulf states	Postlarvae and juveniles require inshore nursery habitats, preferably with vegetation
white shrimp (*Litopenaeus setiferus*)	Second most productive shrimp fishery species in Gulf of Mexico; La leads Gulf states	Postlarvae and juveniles require inshore nursery habitats, preferably with vegetation
blue crab (*Callinectes sapidus*)	Most productive commercial crab species in US; LA leads US in landings (31 % of US total)	Juveniles require inshore nursery habits, adults spawn in estuaries
pink shrimp (*Fafante duorarum*)	Third most productive shrimp fishery species in Gulf of Mexico; LA leads Gulf states	Postlarvae require inshore nursery habitats, preferably with vegetation
Vertebrates		
Gulf menhaden (*Brevoortia patronus*)	Most productive finfish fishery in US (all menhaden species); LA leads Gulf States	Larvae and juveniles use inshore nursery habitats
Atlantic croaker (*Micropogonias undulatus*)	Only US finfish in top 10 most abundant species both commercially and recreationally	Larvae and juveniles use inshore nursery habitats
spotted seatrout (*Cynoscion nebulosus*)	Most popular recreational food fish in LA	Larvae and juveniles use inshore nursery habitats; adults spawn in deep passes

Group Common Name (Scientific Name)	Commercial Significance	Description of Estuarine Dependence
spot (*Leiostomus xanthurus*)	Fourth most numerous finfish collected in long term fishery-independent sampling	Larvae and juveniles use inshore nursery habitats
red drum (*Sciaenops ocellatus*)	Species has widespread recreational and culinary interest within LA	Juveniles and adults use shallow barrier island habitats
striped mullet (*Mugil cephalus*)	Small Louisiana commercial fishery; importation prey species	Juveniles use inshore nursery habitats
sand seatrout (*Cynosican arenarius*)	Valuable recreational fishery species	Juveniles use inshore nursery habitats
black drum (*Pogonias cromis*)	Valuable commercial and recreational species throughout Gulf of Mexico	Juveniles use inshore nursery habitats (though tolerant to wide salinity range)
sheepshead (*Achosargus probatocephalus*)	Valuable recreational fishery species	Adults feed in bay and estuaries
southern flounder (*Paralichthys lethostigma*)	Valuable commercial and recreational species throughout Gulf of Mexico	Juveniles use estuaries, brackish water, and freshwater creeks

Invasive Aquatic and Fisheries Species

The State Management Plan for Aquatic Invasive Species in Louisiana (2005) identifies several established finfish and mollusks within the state (Tulane and Xavier 2005). The management plan focuses not on all invasive species in Louisiana, but on those inhabiting aquatic environments and those spread via aquatic pathways. Established finfish include Rio Grande cichlid (*Cichlasoma cyanoguttatum*), common carp (*Cyprinus carpio*), grass carp (*Ctenopharyngodon idella*), silver carp (*Hypophthalmichthys molitrix*), and bighead carp (*Hypophthalmichthys nobilis*). The network

of interconnected waterways within the state makes it easy for fish to relocate, constantly changing their ranges. Two mollusks are known as invasive in Louisiana, the zebra mussel (*Dreissena polymorpha*) and the Asian clam (*Corbicula fluminea*). These species are predominantly freshwater mollusks, and, in general, are confined to river drainages. Zebra mussels and Asian clams are established in the three largest rivers in Louisiana (Mississippi, Red, and Atchafalaya) and, therefore, are considered extensively established. (Tulane and Xavier 2005).

Federally Managed Essential Fish Habitat (EFH)

Louisiana has historically been an important contributor to the Nation's domestic fish and shellfish production, and one of the primary contributors to the Nation's food supply for protein (NMFS 2014b). Due to the abundance of species such as white shrimp, brown shrimp, snapper, and red drum, the beneficial use placement areas as depicted in Figure 2-1 are classified as EFH and protected under the Magnuson-Stevens Fishery Conservation and Management Act (MSA, Appendix A-19). Through the MSA, and its "essential fish habitat" (EFH) provisions, Congress sought to increase the attention fisheries managers and other federal coastal zone stakeholders pay to habitat (Fletcher and Shea 2000).

MSA (50 CFR 600) states that essential fish habitat (EFH) is "those waters and substrate necessary for fish for spawning, breeding or growth to maturity" (16 USC 1802(10); 50 CFR 600.10). The 2005 amendments to the MSA set forth a mandate for the NMFS of the National Oceanic and Atmospheric Administration, regional Fishery Management Councils, and other Federal agencies to identify and protect EFH of economically important marine and estuarine fisheries. A provision of the MSFCMA requires that FMCs identify and protect EFH for every species managed by a Fishery Management Plan 16 USC 1853. The public places a high value on seafood and recreational and commercial opportunities provided by EFH. Specific categories of EFH include all estuarine waters and substrates (mud, sand, shell, rock, and associated biological communities), sub-tidal vegetation (sea grasses and algae), and adjacent intertidal vegetation (marshes and mangroves). The existing emergent wetlands and shallow open water within the basin provide important habitat that may be classified as EFH, including transitional habitat between estuarine and marine environments used by migratory and resident fish, as well as other aquatic organisms for nursery, foraging, spawning, and other life requirements.

The following federally-managed species utilize EFH in some areas of the study area during post larval and juvenile life stages: brown shrimp (*Penaeus aztecus*), white shrimp (*Penaeus setiferus*), red drum (*Sciaenops ocellatus*), lane snapper (*Lutjanus synagris*), and Gray snapper (*Lutjanus griseus*). Each of these species, their life stages, the aquatic systems where they may be found, and EFH are described in detail in Table 2-16. Other economically important marine fishery species in the study area (according to the April 25, 2012 NMFS scoping letter): striped mullet (*Mugil cephalus*), Atlantic croaker (*Micropogonias undulatus*), Gulf menhaden (*Brevoortia patronus*),

spotted and sand seatrout (*Cynoscion nebulosus* and *Cynoscion arenarius*, respectively), southern flounder (*Paralichthys lethostigma*), black drum (*Pogonias cromis*), and blue crab (*Callinectes sapidus*). Some of these species also serve as prey for other fish species managed under the Magnuson-Stevens Act by the Gulf of Mexico Fishery Management Council (GMFMC) (e.g., mackerels, snappers, and groupers) and highly migratory species managed by NMFS (e.g., billfishes and sharks). These designated EFH areas and the species associated with these areas are provided in Table 2-15 below (NMFS 2014a).

Table 2-15 NMFS designated EFH areas for various species in the study area

NMFS Designated EFH Area	Species
Gulf of Mexico - Red Drum	red drum (*Sciaenops ocellatus*)
Gulf of Mexico - Shrimp	brown shrimp (*Penaeus aztecus*)
	white shrimp (*Penaeus setiferus*)
Reef Fish Resources of the Gulf of Mexico	
	gray (mangrove) snapper (*Lutjanus griseus*)
	lane snapper (*Lutjanus synagris*)

Table 2-16 EFH for fishery species within the study area (species managed by the GMFMC)

Species Habitat	Species Common Name	Species Scientific Name
Emergent Marsh	red drum	*Sciaenops ocellatus*
	gray (mangrove) snapper	*Lutjanus griseus*
	brown shrimp	*Penaues aztecus*
	white shrimp	*Penaues setiferus*
	lane snapper	*Lutjanus synagris*
SAV	red drum	*Sciaenops ocellatus*
	lane snapper	*Lutjanus synagris*
	brown shrimp	*Penaues aztecus*
Oyster Reefs	brown shrimp	*Penaues aztecus*
Hard Bottom	red drum	*Sciaenops ocellatus*
	gray (mangrove) snapper	*Lutjanus griseus*
Soft Bottom	red drum	*Sciaenops ocellatus*
	gray (mangrove) snapper	*Lutjanus griseus*
	lane snapper	*Lutjanus synagris*
	brown shrimp	*Penaues aztecus*
	white shrimp	*Penaues setiferus*

Species Habitat	Species Common Name	Species Scientific Name
Sand Shell	red drum	*Sciaenops ocellatus*
	gray snapper	*Lutjanus griseus*
	lane snapper	*Lutjanus synagris*
	brown shrimp	*Penaues aztecus*
	white shrimp	*Penaues setiferus*
Pelagic	red drum	*Sciaenops ocellatus*
	lane snapper	*Lutjanus synagris*
	brown shrimp	*Penaues aztecus*
	white shrimp	*Penaues setiferus*
Shoal-Banks	gray (mangrove) snapper	*Lutjanus griseus*
	lane snapper	*Lutjanus synagris*
Shelf Edge –Slope	lane snapper	*Lutjanus synagris*

2.4.5 Threatened, Endangered and Protected Species

Historic and Existing Conditions

CEMVN coordinates with USFWS and NMFS each fiscal year on Operations and Maintenance Dredging and Disposal Plans for federally-maintained navigation channels in the New Orleans District concerning the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.c. 661 et seq.), the Endangered Species Act of 1973 (87 Stat. 884, as amended; 16 U.S.C. 1531 et seq.), the Bald and Golden Eagle Protection Act of 1940 (54 Stat. 250, as amended, 16 U.S.c. 668a-d), the Marine Mammal Protection Act of 1972, and the Migratory Bird Treaty Act of 1918 (40 Stat. 755, as amended;16 U.S.C. 703 et seq.) at a CEMVN annual Environmental Dredging Conference in order to ensure full compliance with federal law. CEMVN also achieves compliance under the Endangered Species Act for each maintenance dredging contract awarded to ensure full compliance with the Act. Based on discussions with USFWS and the NMFS, the species presented in Table 2-17 are known to occur or occasionally enter the the study area.

Table 2-17 Federally protected species potentially impacted by the proposed project. Only piping plover has designated critical habitat in the study area (LA-6).

Species	Status	Critical habitat
West Indian Manatee (*Trichechus manatus*)	Endangered	No
piping plover (*Charadrius melodus*)	Threatened	Yes
rufa red knot (*Calidris canutus rufa*)	Threatened	No
Green Sea Turtle (*Chelonia mydas*)	Threatened	No
Hawksbill Sea Turtle (*Eretmochelys imbricata*)	Endangered	No
Kemps Ridley Sea Turtle (*Lepidochelys kempii*)	Endangered	No
Leatherback Sea Turtle (*Dermochelys coriacea*)	Endangered	No
Loggerhead Sea Turtle (*Caretta caretta*)	Threatened	No
pallid sturgeon (*Scaphirhynchus albus*)	Endangered	No
gulf sturgeon (*Acipenser oxyrinchus*)	Threatened	No

It is important to note that according to the 2007 Gulf of Mexico Regional Biological Opinion (GRBO) revision, under Terms and Conditions 4.c and 6.c, observers and other sea turtle protection measures are not required at any time for hopper dredges working in the Mississippi River, Southwest Pass navigation channel. The GRBO only covers the Southwest Pass segment of the Mississippi River, Baton Rouge to the Gulf project from the Gulf of Mexico (bar channel) up to 1 mile inland of the gulf. It addresses types of dredge plants and their potential impacts to sea turtles (as well as required methods, equipment, etc. designed to prevent sea turtle takes) in this channel segment. The rest of the channel above this 1 mile inland reach is not covered by the GRBO because O&M activities are not considered to be a threat to sea turtles. CEMVN will continue to coordinate with the appropriate resource agencies for ESA compliance with each dredging contract awarded as is current practice.

Piping Plover: The piping plover, as well as its designated critical habitat, occurs along the Louisiana coast (habitat.fws.gov/crithab). Piping plovers winter in Louisiana and may be present eight to ten months of the year (LDWF 2011). They depart for the wintering grounds from mid-July through late October and remain until late March or April. Piping plovers forage on intertidal beaches, mudflats, sand flats, algal flats, and wash-over passes with no or very sparse vegetation. They roost in unvegetated or sparsely vegetated areas, which may have debris, detritus, or micro-topographic relief offering refuge from high winds and cold weather. They also forage and roost in wrack deposited on beaches. Piping plovers could occur along the shoreline and in the intertidal areas of the project vicinity during winter migration. Critical habitat unit LA–6 consists of 259 acres un-named sand (spoil) islands off South Pass of the Mississippi River near Port Eads in Plaquemines Parish, LA (Appendix A-16). This unit is part of the State-managed Pass a Loutre Wildlife Management Area. Maintenance activities associated with the proposed project may

cause piping plovers occurring near the project area to be temporarily displaced to nearby areas containing foraging and loafing habitat.

Red knot: The red knot was federally listed as a threatened species on December 11, 2014, as announced in the Federal Register Vol. 79, No. 238. The red knot is a medium-sized shorebird about 9 to 11 inches (23 to 28 centimeters) in length with a proportionately small head, small eyes, short neck, and short legs. The black bill tapers steadily from a relatively thick base to a relatively fine tip; bill length is not much longer than head length. Legs are typically dark gray to black, but sometimes greenish in juveniles or older birds in non-breeding plumage. Non-breeding plumage is dusky gray above and whitish below. The red knot breeds in the central Canadian arctic but is found in Louisiana during spring and fall migrations and the winter months (generally September through March).

Pallid Sturgeon: The pallid sturgeon is an endangered fish found in Louisiana, in both the Mississippi and Atchafalaya Rivers (with known concentrations in the vicinity of the Old River Control Structure Complex); it is possibly found in the Red River as well. The pallid sturgeon is adapted to large, free-flowing, turbid rivers with a diverse assemblage of physical characteristics that are in a constant state of change. Detailed habitat requirements of this fish are not known, but it is believed to spawn in Louisiana. Habitat loss through river channelization and dams has adversely affected this species throughout its range. Entrainment associated with dredging operations in the Mississippi and Atchafalaya Rivers and through diversion structures off the Mississippi Riverpose a risk for pallid sturgeon populations. Juvenile pallid sturgeon appear to be at risk for entrainment in hydraulic dredges, because of their benthic holding behavior and their relatively low burst swimming speed (Hoover et al. 2005). The density of pallid sturgeon in the lower Mississippi River Delta is thought to be low; however, sampling efforts in that area have not been extensive so population estimates in these areas are uncertain (USFWS 2010). Because pallid sturgeon are believed to be a strictly freshwater fish, they are probably absent from the Mississippi River Delta during low river flows when salt water from the Gulf of Mexico intrudes upriver along the bottom of the channel (salt water wedge). If project construction is planned during these events, impacts to pallid sturgeon due to dredging activities in the Mississippi River Delta are unlikely.

Gulf Sturgeon: The threatened Gulf sturgeon (*Acipenser oxyrhynchus desotoi*) is found in river systems from Louisiana to Florida, in nearshore bays and estuaries, and in the Gulf of Mexico. Gulf sturgeons are primitive, anadromous fish that annually migrate from the Gulf of Mexico into freshwater streams to spawn. Subadults and adults spend eight to nine months each year in rivers. Although Gulf sturgeon activity is not well documented, the species has been found in the upper reaches of the Pearl River and Lake Pontchartrain tributaries. The Gulf sturgeon is documented as occurring within parishes comprising the Mississippi Delta, Mississippi Sound, Breton Sound, Barataria, and Pontchartrain Basins (LDWF 2014a). Critical habitat has been designated along Louisiana river systems, nearshore bays and estuaries, and in the Gulf of Mexico (Figure 2-19; NOAA 2015). The areas impacted by project activities are not critical habitat for the Gulf sturgeon. However, it is possible that Gulf sturgeon may wander outside of areas where they are generally found to the north of the project area into the mud and sand-bottomed area where the navigation channel is located during cooler months when they are feeding in the estuaries. Even if they do occur in the area, Gulf sturgeon have the mobility necessary to avoid being adversely affected by dredging operations . Larval and small juvenile sturgeon, which are more susceptible to entrainment are not be expected in this area due the distance from spawning habitat.

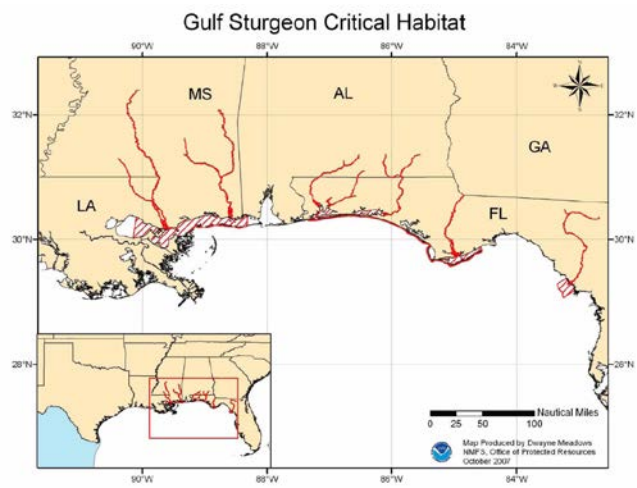


Figure 2-19 Gulf Sturgeon Critical Habitat

http://www.nmfs.noaa.gov/pr/pdfs/criticalhabitat/gulfsturgeon.pdf; accessed March 14, 2016).

Sturgeon entrainment or "takes" from dredging activities with observer programs are summarized in the USACE, Operations and Dredging Endangered Species System at http://dqm.usace.army.mil/odess/#/home. Since 1995, a total of 42 sturgeon takes (3 Gulf sturgeon, 11 shortnose sturgeon, 34 Atlantic sturgeon) have been recorded from the Atlantic and Gulf Coasts. Of these, 3 Atlantic and 2 shortnose sturgeon were released alive and the remainder were mortalities. Of the 34 observed Atlantic sturgeon mortalities, the majority were associated with hopper dredging (n=22) and mechanical clamshell dredging (n=3), operations. During this period a single Atlantic sturgeon was entrained by a hydraulic pipeline (i.e. cutterhead) dredge. Of the 11 shortnose sturgeon entrained, 5 each were taken by hopper and cutterhead dredge, while only 1 was entrained by a mechanical bucket dredge. All three Gulf sturgeon were entrained by hopper dredge, and all were reported from areas within the

boundaries of the Corps of Engineers, Mobile District, Alabama. Two other sturgeon takes (specific species not reported) were taken by hopper dredge.

A technical report prepared by the Corps of Engineers, Engineer Research and Development Center (ERDC/EL TR-14-12) contains the results of a study on tagged Atlantic sturgeon responses to cutterhead dredges. Tagged fish were actively tracked throughout a section of the James River during dredging operations, and their movements included passage both upstream and downstream in the vicinity of the dredge. Atlantic sturgeon behavior did not show either attraction or avoidance responses to any stimuli likely associated with the dredging operation (i.e., the physical presence of the dredge plant itself, noise generated during the dredging operation, or disturbance of sediment, either from increase turbidity or re-suspending potential food resources in the water column). This study and other reviewed reports and studies suggest that sturgeon encounters with cutterhead dredges are coincidental, and extremely rare unless the dredge is operating in areas where sturgeon are known to congregate. In areas where sturgeon are very uncommon to rare, cutterhead dredge encounters with sturgeon are highly unlikely.

The areas impacted by project activities are not critical habitat for the Gulf sturgeon. However, it is possible that Gulf sturgeon may wander outside of areas where they are generally found to the north of the project area into the mud and sand-bottomed area where the navigation channel is located during cooler months when they are feeding in the estuaries. Even if they do occur in the area, Gulf sturgeon have the mobility necessary to avoid being adversely affected by dredging operations. Larval and small juvenile sturgeon, which are more susceptible to entrainment are not be expected in this area due the distance from spawning habitat.

West Indian Manatee: Substantial food sources (submerged or floating aquatic vegetation) have not been observed in the river crossings during dredging operations and manatees are infrequent visitors to coastal Louisiana, and even more infrequent in the river (Appendix A-8). Because of the scarcity of food sources in the project area, and because there are extensive areas of relatively undisturbed wetlands and SAV's in other areas of Louisiana coastal zone (e.g. Lake Ponchartrain and Maurepas, Appendix A-8) , it is considered unlikely for the manatee to utilize the project area for food. If present, it would not be long-term, but rather it would be attributable to manatees migrating across the project area en route to the aformentioned productive areas.

Green and Loggerhead Sea Turtles: Two species of threatened sea turtles inhabit Gulf of Mexico waters along the Louisiana coast; these include the green (*Chelonia mydas*) and loggerhead (*Caretta caretta*) sea turtles. Although sea turtles are predominantly marine animals, they come ashore to nest on barrier islands and mainland beaches of parishes comprising the Mississippi Delta, Mississippi Sound, Breton Sound, Barataria, and Pontchartrain Basins (LDWF 2014a). Loggerhead Critical Habitat, Sargassum (brown macroalgae) habitat, exists in the southern (offshore) portion of the study area (see Figure 2-20**;** NOAA 2015). "Takes" from dredging activities with observer programs are summarized in the USACE, Operations and Dredging Endangered Species System at http://dqm.usace.army.mil/odess/#/home.

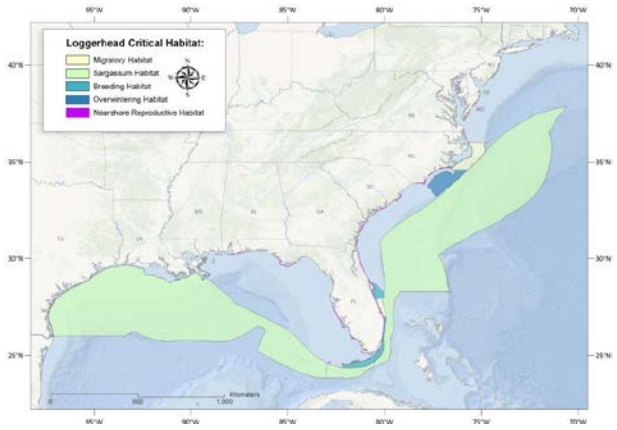


Figure 2-20 Loggerhead Critical Habitats including: migratory, sargassum, breeding, overwintering, and nearshore reproductive

http://www.nmfs.noaa.gov/pr/species/turtles/images/loggerhead_critical_habitat_map.jpg; accessed March 14, 2016).

Kemp's Ridley Sea Turtle: The most seriously endangered of the sea turtles, Kemp's Ridley turtles (*Lepidochelys kempii*) occur mainly in bays and coastal waters of the Atlantic Ocean and Gulf of Mexico (NMFS/USFWS 1992a). Nesting occurs on the northeastern coast of Mexico and occasionally on Texas Gulf Coast beaches from April to July. No Kemp's Ridley sea turtle nesting habitat occurs near the project site, and nesting has not been known to occur in the area. Along the Louisiana coast, turtles are generally found in shallow nearshore and inshore areas, and especially in salt marsh habitats, from May through October. "Takes" from dredging activities with observer programs are summarized in the USACE, Operations and Dredging Endangered Species System at http://dqm.usace.army.mil/odess/#/home.

Hawksbill Sea Turtle: The hawksbill (*Eretmochelys imbricate*) is a small sea turtle, generally spending most of its life in tropical waters such as the warmer portions of the Atlantic Ocean, Gulf of Mexico, and Caribbean Sea (NMFS/USFWS 1993). Hawksbills frequent rocky areas, coral reefs, shallow coastal areas, lagoons, narrow creeks, and passes. Nesting may occur on almost any undisturbed deep-sand beach in the tropics—in North America, the Caribbean coast of Mexico is a major nesting area. In the continental United States, nesting sites are restricted to Florida where nesting is sporadic at best (NMFS/USFWS, 1993). Due to the lack of suitable foraging and nesting habitats, there is a low probability of this species occurring within the project area. "Takes" from

dredging activities with observer programs are summarized in the USACE, Operations and Dredging Endangered Species System at http://dqm.usace.army.mil/odess/#/home.

Leatherback Sea Turtle: The leatherback sea turtle (*Dermochelys coriacea*) is the largest, deepest diving, and most migratory and wide ranging of all the sea turtles (NMFS/USFWS 1992). Leatherbacks are mainly pelagic, inhabiting the open ocean and seldom entering coastal waters except for nesting purposes. Nesting in the United States is mainly confined to the Florida coast, and no nesting has been reported from Louisiana (Gunter 1981). "Takes" from dredging activities with observer programs are summarized in the USACE, Operations and Dredging Endangered Species System at http://dqm.usace.army.mil/odess/#/home.

Since release of the draft GRR and SEIS in December of 2016, this Chapter has been revised to reflect additional plan formulation and analysis that occurred leading to a change from the Tentatively Selected Plan as identified in the draft report, to the Recommended Plan described herein. Sections 3.1 through 3.11 describe the plan formulation process used to identify the tentatively selected plan (TSP). Section 3.12 through 3.14 describes additional planning efforts that followed release of the draft report, which took into account comments received on the Draft Report as well as additional engineering and environmental investigations performed to achieve a feasibility level of design. These additional planning efforts allowed the team to modify and further refine features identified in the draft report, and identify a Recommended Plan which differed from the TSP.

3.0 PLAN FORMULATION

Plan formulation is the key to supporting the U.S. Army Corps of Engineers (USACE) Civil Works water resources development mission. It is a process requiring experience, analysis, intuition, and inspiration. To ensure sound decision-making, the process requires a systematic and repeatable approach. The 1983 Principles and Guidelines, published by the United States Water Resources Council, describes the study process for Federal water resource projects, and the systematic formulation of alternative plans that contribute to the Federal objective.

Plans or alternatives are composed of measures. Measures consist of features, which are structural elements that require construction or assembly, and/or activities that are nonstructural actions implemented to address planning objectives. Each feature and/or activity represents an implemental measure to address planning objectives at a specific geographic site.

This study considered measures to accomplish objectives pursuant to Net Economic Development (NED) and to maximize project benefits. All measures were evaluated and screened for capability to meet objectives and avoid constraints, for engineering, economic feasibility, and for benefits provided over the 50-year period of analysis from year 2025 to 2075. Those measures that warranted continued consideration and met the success thresholds were assembled into alternative plans. In the evaluation process, each alternative plan was required to meet study-specific minimum standards and qualifying criteria in order to merit further consideration.

3.1 Prior Studies

USACE has conducted numerous studies concerning deep-draft navigation on the Mississippi River below Baton Rouge, LA. The 1981 Feasibility Report and Chapter 1 documents details of some of the early studies.

The Federal project "Mississippi River Ship Channel, Gulf to Baton Rouge, Louisiana," sometimes referred to as the "Mississippi River Ship Channel, Baton Rouge, Louisiana to the Gulf of Mexico" has been authorized in parts dating back to the River and Harbor Acts of 1925. Subsequently, additional authorization was included in portions of the following Public Laws: the Rivers and Harbor Act of 1937; the Rivers and Harbor Act of 1945, and the Rivers and Harbor Act of 1962 (Refer to Chapter 1 for details on project authority).

Table 3-1 provides a list of studies and reports completed since the 1981 Feasibility Study and identifies their relevance to the MRSC study. The table is not intended to be a comprehensive list. Rather, it is intended to provide a list of relevant documents completed since the 1981 Feasibility study. That report provides information on prior studies and reports.

Table 3-1 Relevant prior reports and studies.

		Relevance to MRSC Study				
Comprehensive Planning Studies		Data Source	Consistency	Structural Measures	Non-Structural Measures	FWOP Conditions
1981	Final EIS and Feasibility Study *Deep-Draft Access to the Ports of New Orleans and Baton Rouge, Louisiana*	X	X	X	X	X
1983	Chief's Report, *Mississippi River Ship Channel, Gulf to Baton Rouge, Louisiana*	X	X	X	X	X
General Design Memoranda						
1983	General Design Memorandum No. 1 *Mississippi River Deep Draft*	X	X	X	X	X
1986	General Design Memorandum No. 1 Supplement No 1. *Mississippi River Ship Channel, Gulf to Baton Rouge, Louisiana* (Venice, La. To RM 181)	X	X	X	X	X
1986	General Design Memorandum No. 1 Supplement No 4. *Mississippi River Ship Channel, Gulf to Baton Rouge, Louisiana* (Training Works 45-ft channel)	X	X	X	X	X
1990	General Design Memorandum No. 1 Supplement No 6. *Mississippi River Ship Channel, Gulf to Baton Rouge, Louisiana, Saltwater Intrusion Mitigation*	X	X	X	X	X
1992	General Design Memorandum No. 1 Supplement No 2. *Mississippi River Ship Channel, Gulf to Baton Rouge, Louisiana, Phase II 45 Foot Channel (Mile 181 – 232.4)*	X	X	X	X	X
Deferred	General Design Memorandum No. 1 Supplement No 3. *Mississippi River Ship Channel, Gulf to Baton Rouge, Louisiana* (Training Works RM 181 to 232.4)					

Comprehensive Planning Studies		Relevance to MRSC Study: Data Source	Consistency	Structural Measures	Non-Structural Measures	FWOP Conditions
Deferred	General Design Memorandum No. 1 Supplement No 5. *Mississippi River Ship Channel, Gulf to Baton Rouge, Louisiana* (Widening of Jetty in Southwest Pass)					
April 1984	Mississippi River Baton Rouge to the Gulf of Mexico, LA South West Pass and the Bar Channel General Design Memorandum Supplement No. 2	X	X	X	X	X
May 1987	Mississippi River Baton Rouge to the Gulf of Mexico, LA South West Pass and the Bar Channel General Design Memorandum Supplement No. 3	X	X	X	X	X
March 1988	Mississippi River Baton Rouge to the Gulf of Mexico, LA South West Pass and the Bar Channel General Design Memorandum Supplement No. 5	X	X	X	X	X
Environmental Assessments[2]						
1987	Mississippi River Ship Channel Gulf to Baton Rouge, Louisiana Environmental Assessment EA 68 (Approach and berthing channels in the New Orleans Harbor, and river crossings Smoke Bend, Belmont, and Fairview)					
1990	Mississippi River Ship Channel, Gulf to Baton Rouge, Louisiana Channel Training, Miles 181.0- 232.4	X	X	X	X	X
1991	Mississippi River Ship Channel, Gulf to Baton Rouge, Louisiana Dredging at Sardine Point Crossing, East and West Baton Rouge Parishes, EA 124					
1991	Mississippi River Ship Channel Gulf to Baton Rouge, Louisiana, Saltwater Intrusion Mitigation, Plaquemines Parish, Louisiana	X	X	X	X	X

2. This is not a comprehensive list of all Environmental Assessments. It includes those that implemented specific projects features relevant to current project considerations used for plan formulation.

3.2 Planning Objectives

The planning goal of the study is to re-evaluate alternative channel depths between 45 ft and 50 ft (measured to the appropriate datum) and identify the depth for each reach of the Project that provides the greatest net benefits to the Nation. This study and analysis is used to determine whether it continues to be in the Federal interest to proceed with construction of the channel to a deeper depth within the existing Project authorization, as opposed to a recommendation and approval of the no action alternative (which consists of continuing to maintain the channel at the current constructed and maintained conditions). The goal of the general revaluation study of the MRSC is to determine whether it is in the Federal interest to improve deep draft navigation on the

MRSC by providing transportation cost savings, reducing safety concerns, and reducing maintenance inefficiencies. This will be accomplished by evaluating alternatives to construct and maintain deeper draft in the MRSC, up to 50ft depth.

The project objectives were developed based on the problems needs and opportunities presented in Chapter 1. The plan formulation was based on the following project objectives and constraints:

- **Objective 1**: Reduce transportation costs related to the limiting depths of the MRSC from the entrance channel in the Gulf of Mexico (RM 22 BHP) through the upriver limits of the Port of Baton Rouge (RM 233.8 AHP), beginning in base year 2025. This is measured in terms of transportation cost savings for current and future shipping fleets.

- **Objective 2**: Reduce safety concerns associated with the limiting channel width that result in transportation delays. This is measured in terms of reduced transportation delays.

- **Objective 3:** Maintain or improve operations and maintenance practices. This includes preserving, enhancing, and restoring ecological resources through the beneficial use of dredge material in the lower delta adjacent to the MRSC to the extent possible under the requirements of the Federal Standard; this is measured in terms of acres built from beneficial use of dredge material. This also include improving dredging intervals within MRSC crossings. This is measured based on the anticipated shoaling rates, deposition rates, annual dredging costs, and training dike construction costs.

3.3 Planning Constraints

Plan formulation is based on the objectives as defined, while considering the following constraints:

- **Constraint 1:** Avoid or minimize impacts on existing ecological resources in the lower delta.

- **Constraint 2:** Avoid or minimize impacts to existing channel training works in the lower Mississippi River Delta, particularly in South West Pass, and in the crossings Red Eye and Medora.

- **Constraint 3:** Avoid or minimize impacts to the flood risk reduction and hurricane storm damage risk reduction system adjacent to the MRSC.

- **Constraint 4:** As described in Chapter 1, at the request of the NFS, the alternatives considered were limited to a maximum depth of 50 ft (measured to the appropriate datum).

3.4 Management Measures

A management measure is a feature or activity that can be implemented at a specific geographic site to address one or more planning objectives. They are generally categorized as structural or nonstructural. Management measures considered for providing larger deep draft navigation access channels in the Mississippi River from the Gulf of Mexico to Baton Rouge, La were limited to the lower reaches of the Mississippi River from RM 22 BHP to RM 13.4 AHP and to 12 regularly maintained deep draft crossings located between RM 115 AHP to RM 232.2 AHP. The management measures provide deep draft access to the Port of Plaquemines, Port of New Orleans, Port of South Louisiana, and the Port of Baton Rouge.

Management measures were developed and evaluated in the 1981 Feasibility Report for alternative evaluation and selection of what became the authorized project. This GRR is limited to considering structural and nonstructural management measures that can be implemented within the current project authority.

3.4.1 Structural Management Measures

As discussed in Chapter 1 problems within the MRSC relate to transportation cost due to the need for vessels to light load. Light loading is a result of the channels current depth. The varying channel width from greater than 750ft to 500ft creates safety concerns, which result in transportation delays. Structural management measures, including, but not limited to, the widening and deepening of the channel were considered to allow for easier maneuvering of vessels and to reduce safety concerns. Also, as discussed in Chapter 1, there is the problem of high shoaling rates and sediment deposition in the channel which creates maintenance inefficiencies. Training works were considered as a structural measure to reduce maintenance inefficiencies.

3.4.1.1 Deepening the Channel

Ships with drafts greater than the current depth experience increased transportation cost due to the need to light load. Deepening of the channel would reduce the need for the current vessel fleet to light load in order to reach the ports along the MRSC. This results in transportation cost savings. This measure was carried forward with each of the alternatives developed for both the Initial and Final Array.

3.4.1.2 Widening the Channel

Widening of the channel would allow for larger vessels to safely pass each other. This measure would reduce safety concerns and thus cost increases that may occur due to delays in shipping traffic. This measure was carried forward for the consideration in the initial array of alternatives,

but was subsequently eliminated in development of the final array (refer to Section 3.7.1 for additional information).

3.4.1.3 Training Works

The implementation of training structures helps to stabilize the channel to provide reliable depths and widths for safe vessel passage. Currently, training works are authorized and in place in Southwest Pass and in two of the crossings, Red Eye and Medora. Training works have the potential to reduce the long-term Operation, Maintenance Repair, Rehabilitation, and Replacement (OMRR&R) cost. Because existing training works in the lower reach of the navigation channel already sufficiently address this concern, additional training works were not considered for the lower reach of the river from Venice to the Gulf, but were considered for the crossings within the Ports of South Louisiana and Baton Rouge. Due to the complexities of various types, quantities, and locations that could be considered, the evaluation of training works within the crossings was delayed until final analysis and feasibility level design of the Recommended Plan approved at the Alternative Decision Milestone (ADM). Deferring consideration of training works until after this point ensured the Recommended Plan is based on the most conservative analysis.

3.4.1.4 Additional Structural Measures

Certain structural management measures were not considered during this study since they already exist, constructed Project measures that are adequately functioning to meet Project demands and since none of these features would be impacted by the implementation of any of the alternatives considered by the GRR. Structural measures that fall within this category are as follows: general navigation features (GNF) such as realignment of the channel, turning basins, breakwaters and jetties, aids to navigation, berthing and mooring facilities.

The following additional considerations were taken into account during the evaluation and comparison of alternative plans.

3.4.1.5 Mitigation Features

The 1983 Chief's Report recommended, during periods of low flow in the river, installation of a submerged sill at RM 64.1 AHP, to mitigate the impacts of saltwater intrusion upriver. Comparison of alternatives considered the frequency of installing the sill based on the alternative depths. Consideration was given to both the long term OMRR&R cost, and the potential loss of sediment that could be used for other purposes.

In addition to the salt-water sill, the 1983 Chief's Report, as approved for implementation by supplemental general design documents, included the following principal components:

- measures to increase the capacity of the water treatment plant for Plaquemines Parish located on the West bank of the Mississippi River in Belle Chasse, La (RM 75.8 AHP);
- water transmission lines and booster pumps stations to connect this added capacity to the other water treatment plants on the west bank in West Pointe-a-la Hache and Boothville, and on the east bank included conversion of the existing community pond at Davant, La to a storage reservoir;
- construction of a siphon from the river to the reservoir required to replenish the reservoir with fresh water;
- construction of transmission lines and booster pumps to connect the reservoir to the water treatment plant on the east bank of the river at Pointe-a-la-Hache; and
- upgrades as necessary to provide for future increases in the demand for potable water.

Implementation of the project mitigation features on the west bank of the River included the following measures:

- the capacity of the Belle Chasse Water Plant was increased by approximately 50%;
- water lines were constructed to "connect" the Belle Chasse water system with Port Sulphur and Empire municipal water systems;
- two booster pumps were also constructed to help "push" water to the Port Sulphur and Empire water systems;

The intent was that when salinity levels at municipal water intakes become too high for these downriver west bank communities, the additional capacity at Belle Chasse maybe utilized. The connecting water lines and booster pumps helped to deliver fresh water to the communities down stream of Belle Chasse on the west bank of the river. To protect this intake at Belle Chasse, a saltwater sill is constructed at River Mile 64.1.

On the east bank of the river, a community pond at Davant was converted to a storage reservoir and a siphon from river to the reservoir was constructed to keep the reservoir supplied. A water line and booster pump was constructed to connect the reservoir at Davant to a water plant downriver at East Pointe-a-la-Hache. The reservoir at Davant is intended to provide freshwater to the eastbank of Plaquemines Parish if salinity levels get too high at East Point Ala Hache, but only if properly maintained by the non-Federal sponsor. However this reservoir is currently not in a condition to provide water during a low water high salinity event. As a result, in previous low water events USACE has provided raw water via barge to the East Point-a-la-Hache water treatment plant to enable Plaquemines Parish to provide potable water for the east bank of Plaquemines Parish located downstream.

3.4.2 Non-Structural Management Measures

The 1981 Feasibility report concluded that there were no nonstructural measures, which could conceivably improve deep-draft navigation conditions. Deep draft vessels already utilize tides, tug assistance, and light loading to maximize transportation of commodities through the MSRC from the Gulf of Mexico to the Port of Baton Rouge.

There is industry interest in projects involving transshipment hubs that use connector barges. However, there is not sufficient information within the navigation community as to the economic viability of connector vessels. Issues raised, such as, high labor costs, lack of specialized infrastructure for containerized barge transportation, increased delay times, operational staffing logistics, and other potential obstacles make some industry experts question the economic feasibility of these projects. Because of these many uncertainties, particularly in regards to reducing transportation costs caused by an insufficient channel depth, this alternative was not considered under non-structural management measures.

3.4.3 Additional Considerations for comparison of Alternatives

In addition to the management measures, alternatives were developed and compared based on the estimated initial construction cost, estimated increase in OMRR&R cost, transportation cost savings, and the beneficial use of dredge material.

3.4.3.1 Construction and OMRR&R Practices

Construction and OMRR&R measures for providing deep draft access were limited to existing dredging practices, as described in Section 3.5.2, including the current fleet of hopper, dustpan, and cutterhead dredges. Construction estimates for each alternative considered the dredge quantities, and the total construction cost (major NED cost). Long term OMRR&R for each alternative considered the estimated annual dredge quantities, and the incremental increase in OMRR&R annual cost. Incidental benefits were considered based on the acres of beneficial use from the initial construction dredge material that could be attained through placement of dredge materials within the Federal Standard, and the acres of beneficial use from long term OMRR&R of dredging that can be attained within the Federal Standard requirements.

3.4.3.2 Navigation Benefits

Channel improvement modifications result in reduced transportation cost by allowing more efficient use of vessels. The primary effect from channel deepening that can induce changes in vessel utilization is an increase in a vessel's loading capacity. Channel restrictions can limit a vessel's capacity by limiting its ability to load to its design draft. Deepening the channel can reduce this constraint. The vessel's capacity can increase towards its design capacity if

commodities are available to transit, vessel loading practices allow, and the weight of the commodity on the vessel will lower it deeper in the water. This increase in vessel capacity utilization can result in fewer trips being required to transport forecasted cargo. Historic traffic data shows that the ports of Plaquemines, New Orleans, South Louisiana, and Baton Rouge are already receiving vessels with drafts greater than 45 feet. Because a number of these vessels have excess capacity, a greater depth would allow them to load more cargo which, in turn, generates efficiencies in transportation cost savings. See sections 3.5 and 3.6 as well as Economics Appendix D for a more detailed explanation of existing navigation conditions/problems and expected benefits.

Project benefits were estimated by calculating the reduction in transportation cost for each project depth using the HarborSym Modeling Suite of Tools (HMST) which is a certified model developed by IWR. Detailed information on the HarborSym model and determination of transportation cost savings for each alternative can be found also in Economics Appendix D.

The results of the HarborSym model were used as the basis for the economic comparison of alternatives.

3.5 Existing Project Description

The MRSC extends from RM 233.8 AHP to RM 22 BHP (Figure 3-1). Among other things, Phase I deepened the MRSC to -45 ft MLG from Donaldsonville, LA, (RM 181 AHP) to the Gulf of Mexico. Phase II construction, deepened the MRSC to - 45 ft MLG between Donaldsonville, LA, (RM 181 AHP) to Baton Rouge, LA (RM 232.2 AHP), and included dredging of river crossings to an equivalent depth. The initial array of alternatives as defined below, considered deepening the MRSC based on the original Phase I and Phase II of construction, and identified RM 181 AHP as a a transition point for channel widths in each alternative. As the initial array of alternatives was further refined it was determined that the MRSC consists of three routinely dredged reaches to allow for navigation. These three reaches, as described in Chapter 1, were used to define the final array of alternatives.

3.5.1 Commerce, Fleet, and Vessel

3.5.1.1 Historical Commerce

The Port of Plaquemines, the Port of New Orleans, the Port of South LA, and the Port of Baton Rouge are all in the top 13 ranking of 2014 annual tonnage for U.S. ports. Based on WCSC data, these 4 ports handled a total of 464.2 million tons[1] of commerce in 2014, including 209.5 million

[1] All references to commodity shipments in "tons" refer to "short tons" of 2,000 pounds.

tons of foreign commerce and 254.7 million tons of domestic commerce. Except for slight bumps in 2008, 2009, and 2013, total tonnage has trended upward from 374.6 million tons in 2005 to 464.2 million tons in 2014 (Figure 3-5).

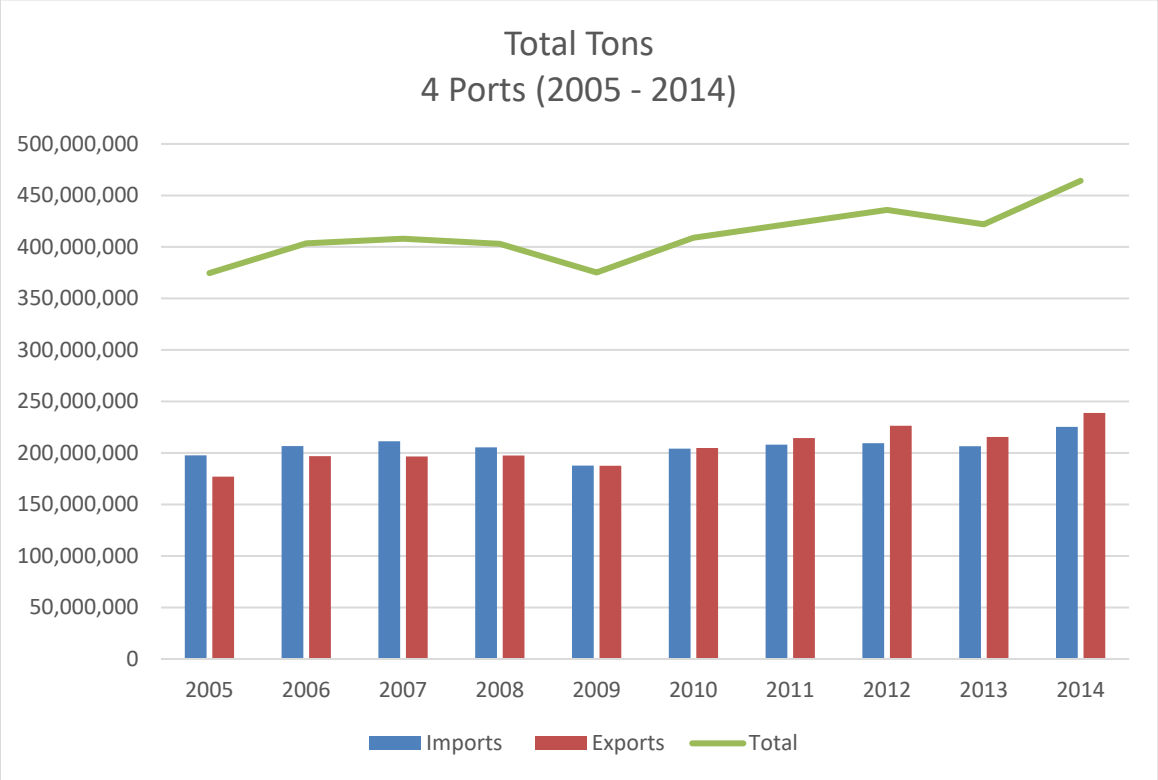


Figure-3-1 Total Tons 4 Ports

Source: WCSC

Food and farm products and petroleum and petroleum products dominate the commodity mix in terms of total tonnage passing through the 4 ports. A total of 1.38 billion tons of food and farm products moved through the ports from 2005 – 2014 followed by 1.37 billion tons of petroleum and petroleum products. The next highest commodity group is chemicals and related products at 455 million tons; manufactured equipment and machinery round out the bottom at 11 million tons. For the most part, commodities seem to be trending upward or holding steady except for coal which began to decrease rather sharply in 2012, likely due to the significant transformation from coal to natural gas and renewables for electricity generation in the US (Figure 3-6).

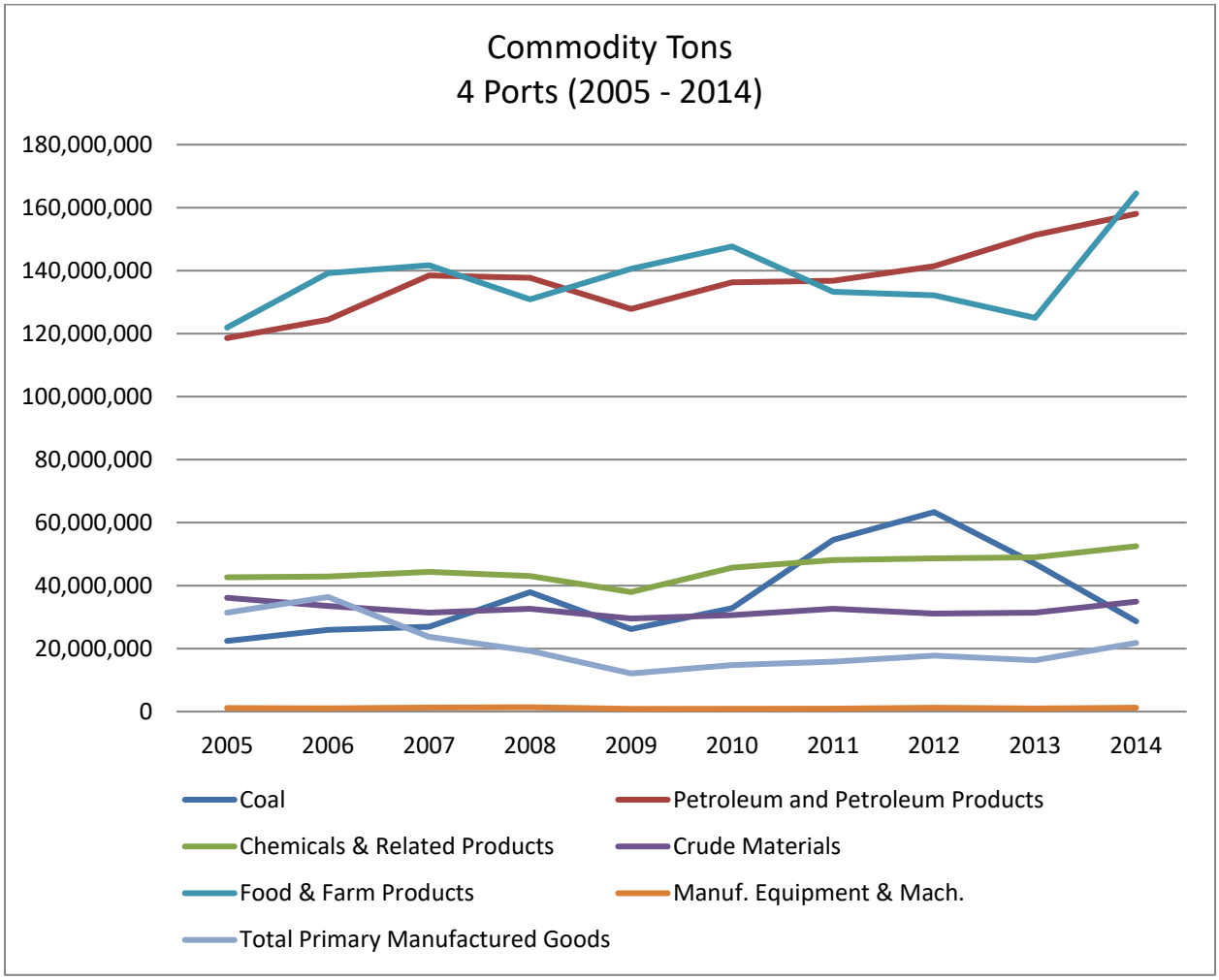


Figure 3-2 Commodity Tons 4 Ports
Source: WCSC

In terms of commodity distribution, food and farm products make up the highest percentage at 34%; petroleum and petroleum products are just slightly less at 33% (closely resembling the commodity percentages moved from Minneapolis, MN, to Mouth of Passes as shown in Table 1). The remaining commodity group breakouts are chemical and related products at 11%, coal at 9%, crude materials at 8%, primary manufactured goods at 5%, and manufactured equipment and machinery at <1% (Figure 3-7).

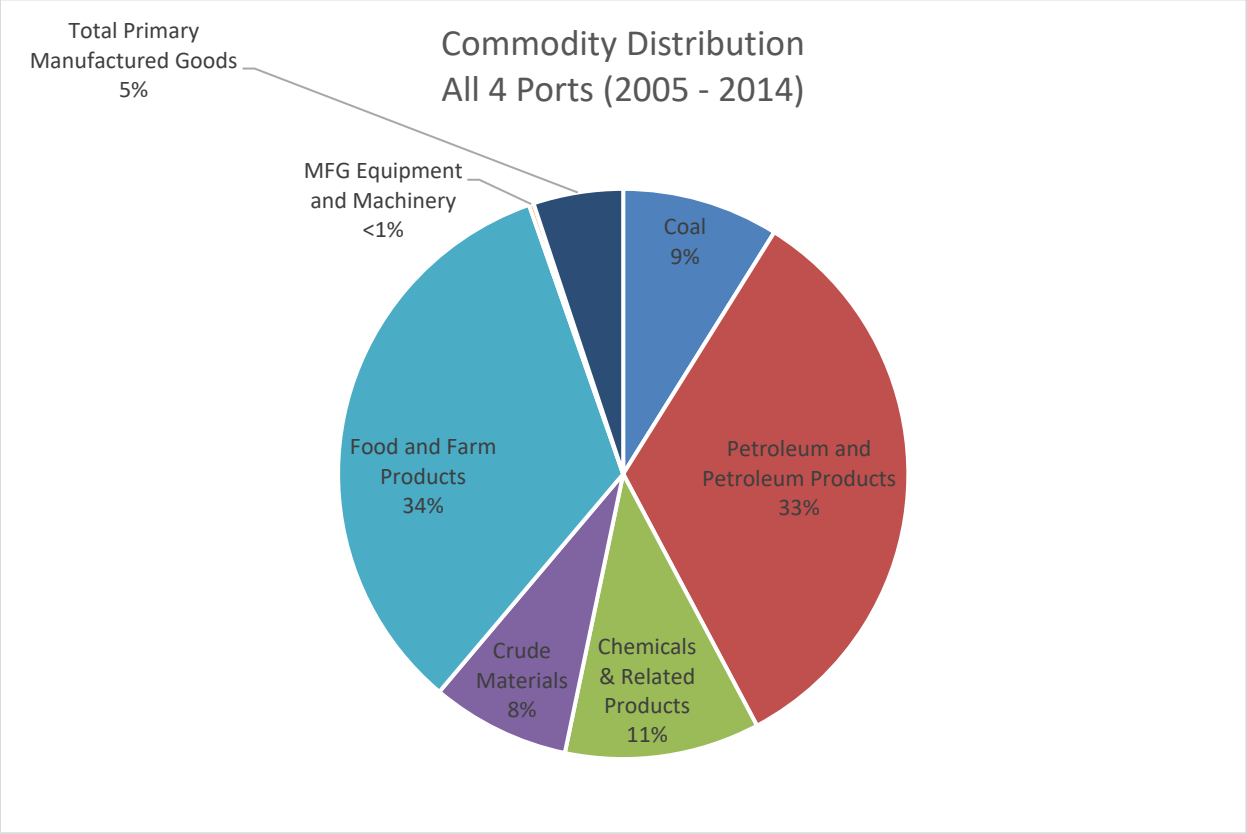


Figure 3-3 Commodity Distribution 4 Ports
Source: WCSC

Overall, foreign tonnage comprises about 46% of all tonnage passing through the 4 ports when taking an average of the years 2005 – 2014 (Figure 3-8). Fueled largely by the high volume of the Port of South LA, food and farm products and petroleum and petroleum products have consistently been the drivers of most foreign commodity movements for the 4 ports.

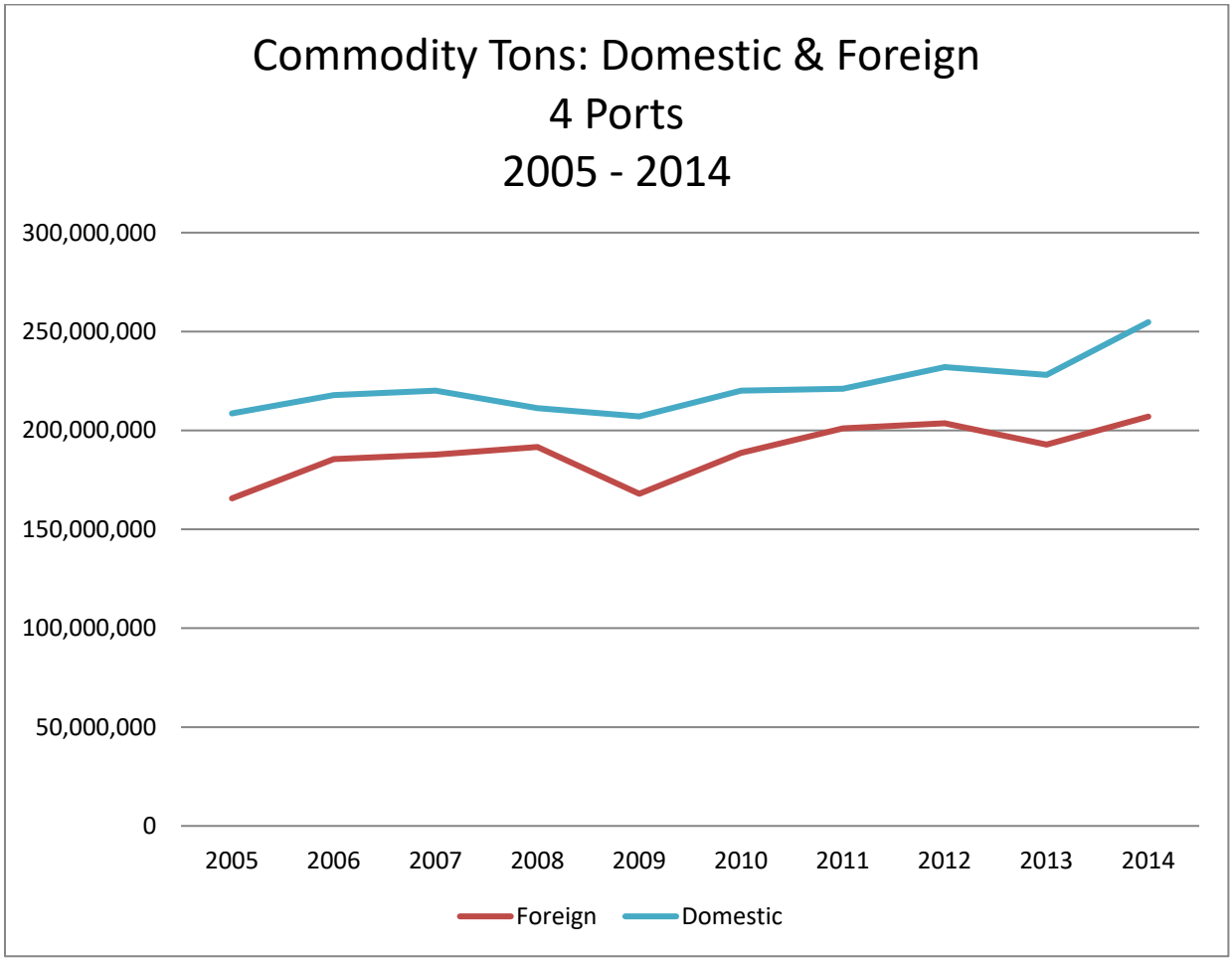


Figure3-4 Commodity Tons: Domestic & Foreign 4 Ports
Source: WCSC

Cargo information is used to provide the basis for commodity flows and projections. This study tried to identify (through both interviews with the ports and historic data) which commodities would benefit from a deepening of the channel. Table 3-2 identifies these commodities by port.

Table 3-2 Foreign Commodities Benefitting from a Deeper Channel

	Plaquemines		New Orleans		South LA		Baton Rouge	
	Exports	Imports	Exports	Imports	Exports	Imports	Exports	Imports
Coal	X				X		X	
Food Products	X		X	X	X		X	
Petroleum Products	X		X	X	X	X	X	X
Chemicals			X	X	X	X	X	X
Crude Materials			X			X		X
Primary MFG Goods				X		X		X

3.5.1.2 Fleet Characteristics

Data for fleet characteristics was obtained from the Waterborne Commerce Statistics Center, Crescent River Port Pilots' Association, and Associated Branch Pilots. A variety of different vessel types called on the Ports of the Mississippi River including tankers, containerships, bulk carriers, and general cargo vessels. Of the total number in 2014, 8% of transits were vessels with draft of 20 feet or less, 39% of transits drafted 21-29 feet, 45% of transits drafted 30-40 feet and 8% of vessel transits drafted 41-48 feet.

Figure 3-9 shows the distribution of vessel types calling the Lower Mississippi River Ship channel. The distribution of vessel transits by sailing draft for the period of 2010-2014 is presented in Figure 3-10. In 2014, there were a total of 381 vessel transits that drafted 45 feet or more, a 5% increase from 2010. The data suggests vessels fully utilize the existing channel depth on the Lower Mississippi River.

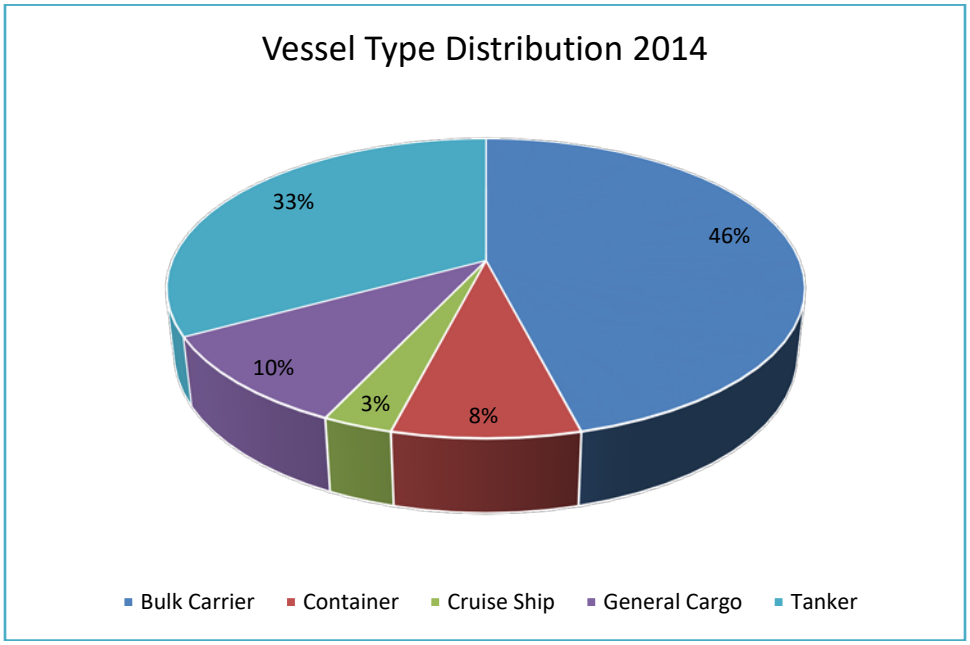


Figure 3-5 Vessel Type Distribution

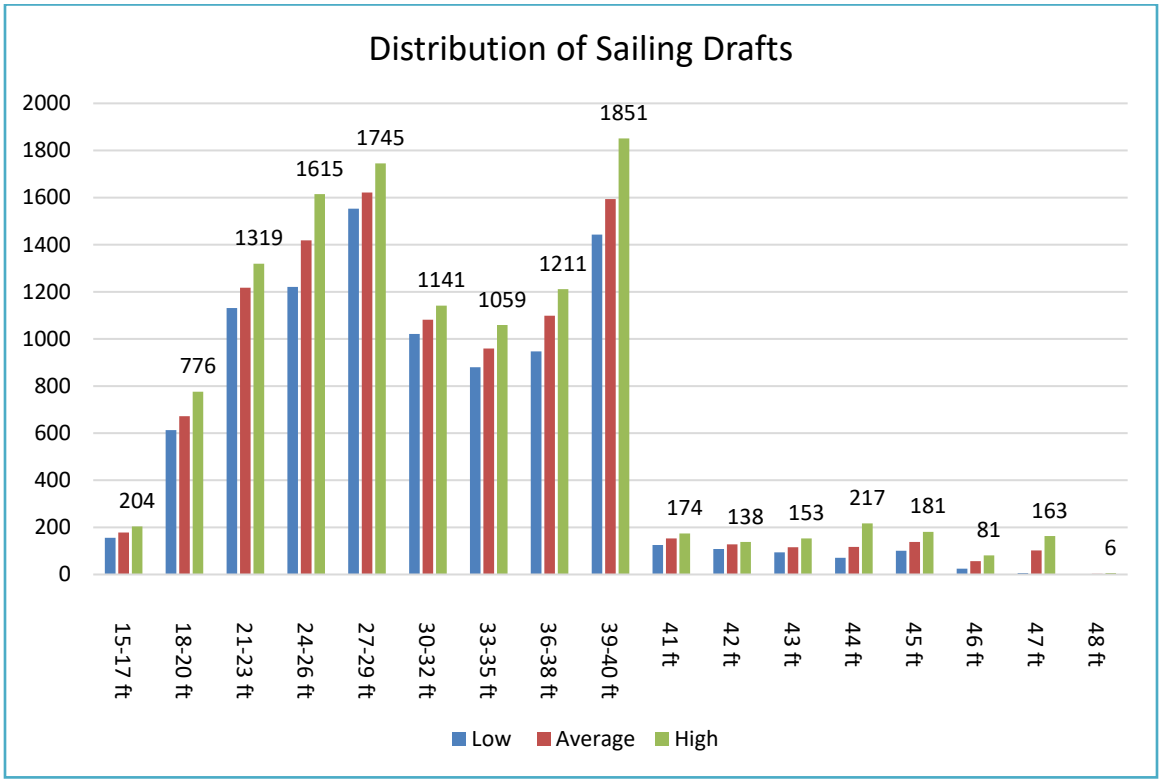


Figure 3-6 Distribution of Sailing Drafts

An analysis of the existing fleet data for vessels calling the Ports on the Lower Mississippi River revealed five typical vessel types: (1) containerships, (2) bulk carriers, (3) general cargo, (4) tankers, and (5) cruise ships. Based on the existing fleet, the vessel classes were further categorized into representative sub-classes based on vessel size as measured by deadweight tonnage (DWT). Table 3-3 shows the breakdown of the sub classes.

Table 3-3 Vessel Type Sub Classes

Vessel Type	Description	DWT	
		Min	Max
Bulk Carrier	Handysize	5,000	35,000
	Handymax	35,001	60,000
	Panamax	60,001	80,000
	Capesize	80,001	200,000
Products Tanker	Medium	34,000	60,000
	Panamax	60,001	80,000
	Aframax	80,001	120,000

Vessel Type	Description	DWT	
		Min	Max
	Suezmax	120,001	200,000
Chemical Tanker	Tanker	4,500	50,000
Containership	Subpanamax	8,000	42,000
	Panamax	42,001	60,000
	Post Panamax Generation 1	60,001	90,000
	Post Panamax Generation 2	90,001	110,000
General Cargo	General Cargo	3,000	55,000
LPG Tanker	LPG Tanker	2,000	45,000
Cruise	Cruise	6,000	12,000

3.5.1.3 Design Vessel

Because passing improvements and a widening of the channel are not considered in the final array of alternatives (only deepening is being considered), a design vessel was not defined. The current channel can accommodate both Capesize and Suezmax vessels with LOAs (length overall) of 950 feet and beams of 165 feet, and these are the largest vessels that are projected to call on the ports in future years even at channel depths of -50 feet. Deepening the channel is not expected to attract larger vessels; the current fleet would simply be able to better utilize their ships' capacities.

3.5.2 Dredging and Disposal

The following provides a summary of the dredging and disposal practices for reaches of the MRSC which are considered for deepening in this general reevaluation study. These reaches include: (1) the 12 deep draft crossings located within the Port of Baton Rouge and the Port of South Louisiana; and (2) the lower portion of the MRSC extending from RM 13.4 AHP to RM 22 BHP. As discussed in Chapter 1, although the portion from RM 233.8 to 232.4 AHP, the approach channel to the New Orleans Harbor, and South Pass are included under operation and maintenance of the MRSC, they are not considered under this GRR for deepening from their current depths.

3.5.2.1 Baton Rouge to New Orleans (RM 233.8 AHP to RM 115 AHP)

Between RM 233.8 AHP to RM 115 AHP the channel is authorized to depth of 55 ft and width of 500 ft. From RM 233.8 AHP to RM 232.4 AHP the channel is the channel is dredged to -40 ft LWRP and a width of 500 ft. Dredging quantities for this reach are included in the quantities for the crossing Baton Rouge Front. Between RM 232.4 AHP to RM 115 AHP dredging

involves maintaining a -45 ft LWRP by 500 ft channel at 12 deep-draft crossings located within the Ports of Baton Rouge and South Louisiana. Of these 12 crossings, nine (Smoke Bend, Philadelphia, Alhambra, Bayou Goula, Granada, Medora, Sardine Point, Red Eye, and Baton Rouge Front) are within the footprint of the Port of Baton Rouge. Three crossings (Fairview, Belmont, and Rich Bend) lie within the footprint of the Port of South Louisiana, which extends from RM 168.3 AHP to RM 115 AHP. Fairview and Rich Bend require maintenance dredging on less than an annual basis, the other 10 crossings are dredged at least annually. The areas in between the crossings are considered naturally deep and do not require maintenance dredging.

Dustpan dredges are primarily used at the crossings, but hopper dredges have also been used when additional dredging capacity is required. Dredged material is discharged unconfined at the surface or below the surface of the river in areas adjacent to or downriver from the crossings. River currents transport this dredged material downriver from each placement site. Maintenance dredging is performed annually with an average of approximately 22.4 million cubic yards of material being removed from within this reach over the period from 2007 through 2016.

The deep draft crossings are far removed from beneficial use opportunities, and it is not feasible to transport dredged material via pipeline from these sites. Beneficial use of dredged material from the crossings would require the use of multiple dredges, transport vessels, and other earth moving equipment operating in tandem to: (1) remove shoal material from the dredging area with a hopper or cutterhead dredge; (2) load the material onto barges with assistance from a spider barge, either by hopper pump-out or from a cutterhead dredge pipeline; (3) transport the barges with tugboats to a hydraulic unloader or Javeler dredge plants; (4) hydraulically pump material from the barges with one or more booster pumps thru a pipeline to the beneficial use site; and (5) manage dredged material placement at the beneficial use site.

The beneficial use of dredge material from the crossings was investigated under the current OMRR&R program. Two scenarios were evaluated for transporting 1 million cubic yards of dredged material from the furthest downriver crossing that is routinely dredged (Belmont) to the nearest available beneficial use site located at the LaBranche wetlands.

The first scenario involved the loading and barging of dredged material from Belmont crossing 26 miles downriver to a hydraulic unloader near the Bonnet Carre spillway for transport by pipeline across 7 to 12 miles the spillway grounds to a site in the LaBranche wetlands. This operation would involve a hopper dredge, spider barge, 25 hopper barges, 7 tugboats, a hydraulic unloader, 3 portable booster pumps, and 38,000 to 45,000 linear feet of pipeline. However, such an operation may be infeasible due to uncertainties about how the dredged material pipeline would cross railways, roads, and the Bonnet Carre structure and guide levees; possible conflicts with an unanticipated high-river event that requires opening of the spillway; and the availability of

equipment and pipeline. Assuming that these obstacles could be overcome, the estimated cost of this beneficial use of 1 million cubic yards of dredged material would approach $26 million.

The second scenario involved the loading and barging of dredged material 84 miles from Belmont crossing downriver and thru the IHNC Lock to Javeler dredge plants in Lake Pontchartrain for transport by pipeline to a site in the LaBranche wetlands. This operation would employ a hopper dredge, spider barge, 84 hopper barges, 21 tugboats, and 5 Javeler dredge plants. Pipeline lengths were not specified in the estimate, but assumed to be minimal due to the proximity of barge-accessible areas in Lake Pontchartrain to open water areas within the LaBranche wetlands. Similar to the first scenario, the estimated cost to beneficially use 1 million cubic yards of dredged material would be about $26 million.

Based on maintenance dredging records from 2011, the Federal Standard dredging and disposal plan for all deep draft crossings between New Orleans and Baton Rouge was implemented at an average cost of about $1.40 per cubic yard. Had one of the above scenarios been pursued to beneficially use 1 million cubic yards of dredged material from Belmont crossing, it is not unreasonable to assume that the incremental cost above the Federal Standard would have exceeded $24 million. Such a large expenditure of federal funds for nominal gains in both channel maintenance and wetland acreage is neither economically justifiable nor feasible. Based on this previous assessment, the beneficial use of dredge material from the crossings was not considered under the general reevaluation study.

3.5.2.2 New Orleans to the Gulf (RM 81.2 AHP to RM 22 BHP)

From RM 81.2 AHP to RM 13.4 AHP the MRSC is authorized to a depth of 55 ft and a width of 750 ft but is considered naturally deep and does not require construction or maintenance dredging to provide deep draft navigation access. From RM 13.4 AHP to RM 22BHP, the channel is maintained to a depth of -48.5 ft MLLW; the width varies by reach. From RM 13.4 AHP to RM 11 AHP the channel is survey annually but dredging is not required. The reach referred to as SWP, begins at RM 0 HoP and extends to the Gulf of Mexico ending at RM 22 BHP, including the Southwest Pass Bar Channel extending from RM 19.5 BHP to the end of the project reach in the Gulf of Mexico at RM 22 BHP.

Maintenance dredging in the lower portion of the river involves the use of both hopper dredges and cutterhead dredges. Hopper dredges provide the mobility required to move quickly between multiple locations as shoaling conditions change along the 32 miles of navigation channel that typically comprise this dredging reach. SWP hopper dredging efforts can be divided into two reaches: Mile 10.0 AHP to Mile 11.0 BHP and Mile 11.0 BHP to Mile 22.0 BHP. Shoal material removed by hopper dredges (working in the dredge-and-haul mode) from the Mile 10.0 AHP to Mile 11.0 BHP is placed unconfined at the hopper dredge disposal area (HDDA) located at the

Head of Passes. The HDDA is an open water disposal site situated at the heads of Pass a Loutre and SP. From 2007 through 2016, an average of approximately 6.9 million cubic yards per year of dredged material were placed in the HDDA by hopper dredges performing routine maintenance dredging of the channel.

Shoal material removed by hopper dredges from the Mile 11.0 BHP to Mile 22.0 BHP is either placed (via dredge-and-haul mode) unconfined at the Environmental Protection Agency-designated ocean dredged material disposal site (ODMDS) or discharged back into the channel by agitation dredging mode. The ODMDS is approximately 2,975 acres in size and is located adjacent to the right-descending bank of the SWP bar channel. It is a highly dispersive site with no accumulation of dredged material placed during annual maintenance dredging events. From 2007 to 2016, an average of approximately 4.4 million cubic yards per year of dredged material were placed in the SWP ODMDS during routine maintenance dredging events. Agitation dredging involves filling a hopper dredge to capacity and allowing it to overflow into the channel surface waters. Fine sediments released into surface waters are carried out of the channel and dispersed into the Gulf of Mexico by river currents.

The portions of the MRSC in between RM 13.4 AHP to RM 115 AHP, and in between the crossings, between RM 115 AHP to RM 232.4 AHP historically have depths in excess of 55 ft. In the present condition these reaches do not require dredging and maintenance to provide deep draft access. However, it is the intent that should existing conditions change in these reaches, the district would exercise its authority to conduct operation and maintenance action to maintain the 50 ft depth and the appropriate width as previously approved in prior reports. An environmental analysis and reassessment of the project may be required in that event.

3.6 Future Conditions

3.6.1 Commodity Forecasts

Under future without and future with project conditions, the same volume of cargo is assumed to move through the Port of Plaquemines, the Port of New Orleans, the Port of South LA, and the Port of Baton Rouge. However, a deepening project will allow shippers to load their vessels more efficiently or take advantage of larger vessels, resulting in fewer trips. This efficiency translates to transportation cost savings and is the main driver of NED benefits.

To minimize the impact of potential anomalies in trade volumes on long-term forecast, 5 years of data were employed to establish the baseline for the commodity forecast. Historic data from 2009 to 2013 (2013 was the latest year available from WCSC when the forecasts were developed) were

used to develop a baseline, allowing the forecast to capture both economic prosperity and downturn which occurred over that timeframe.

The difficulty in determining commodity forecasts for a study such as this lies in the 50-year period of analysis that is required by USACE regulations. Because long-term projections are uncertain at best and because there is risk in extending forecasts beyond their intended scope, the growth rates for this study are kept constant until year 2050 (25 years after the base year), after which no growth is assumed until the end of the study's scope in 2075. Annual growth rates from the base year are shown in Table 3-4 (See Economics Appendix for more information about forecasts).

Table 3-4 Growth Rate (annual)

	Baton Rouge		South LA		New Orleans		Plaquemines	
	Exports	Imports	Exports	Imports	Exports	Imports	Exports	Imports
Food & Farm[1]	0.5%	-	1.0%	-	1.1%	-0.4%	1.3%	-
Petroleum[2]	0.3%	0.4%	0.8%	0.4%	0.6%	0.3%	0.7%	-
Chemicals[2]	1.1%	0.9%	1.0%	1.4%	0.9%	1.4%[3]	-	-
Coal[2]	0.7%	-	0.7%	-	-	-	0.7%	-
Crude Materials[4]	-	2.5%	-	2.5%	0.0%	-	-	-
Primary MFG Goods[4]	-	5.0%	-	5.0%	-	5.0%	-	-

Note: Growth rates for the same commodity category can vary by port due to the varying compositional makeup of those commodities within each port. No growth rates are shown for Plaquemines Imports because these commodities were determined not to be significantly impacted by a deeper channel.

[1] Source is USDA Agricultural Projections to 2025 Feb 2016.

[2] Source is Annual Energy Outlook 2015 with Projections to 2040.

[3] Source is International Fertilizer Industry Association's (IFA) Fertilizer Outlook 2015-2019.

[4] Source is "A Container Trade Forecast for the Port of New Orleans 2015 - 2065" by R. K. Johns & Associates Inc., 2015 final report.

3.6.2 Vessel Fleet

Based upon 2014 data from WCSC for transits of vessels drafting greater than 45 feet, Plaquemines had a total of 44 transits, New Orleans 17 transits, South LA 137 transits, and Baton Rouge 8 transits. The vast majority of these transits with a draft greater than 45 feet are from bulk carriers transporting grain. Of the 206 transits in 2014 with a draft greater than 45 feet, 190 were from bulk carriers (92%). Oil tankers and chemical tankers followed at 6% and 1%, respectively. Numbers are similar when looking at data for years 2012 and 2013 (Table 3-5).

Table 3-5 Number of Vessels Drafting > 45'

Port	2015[1]	2014	2013	2012
Plaquemines				
Bulk Carrier	24	43	40	28
Oil Tanker	-	-	-	-
Chemical Tanker	-	1	1	-
General Cargo	-	-	-	2
New Orleans				
Bulk Carrier	4	12	26	12
Oil Tanker	3	5	11	6
Chemical Tanker	2	-	1	-
General Cargo	-	-	-	-
South LA				
Bulk Carrier	90	129	106	110
Oil Tanker	8	7	7	5
Chemical Tanker	1	1	1	-
General Cargo		-	1	-
Baton Rouge				
Bulk Carrier	4	6	6	6
Oil Tanker	-	1	-	2
Chemical Tanker	-	1	-	-
General Cargo	-	-	-	-
Total	136	206	200	171

1. Data recently made available

Source: WCSC

As the data indicates, vessels drafting greater than the authorized depth of the channel are already calling on the ports of Plaquemines, New Orleans, South LA, and Baton Rouge (probably due to a combination of high water events and over-dredging). The vast majority of these vessels are bulk carriers and, to a lesser extent, oil tankers. Data from WCSC showing excess capacity for these vessels as well as conversations with the ports also point to bulk carriers and oil tankers as vessels that will be able to utilize the deeper channel.

Vessels that could utilize extra depth are likely already calling on the 4 ports and are having to light-load to safely traverse the channel. With a greater depth, these vessels will be able to more fully utilize their capacity by loading more cargo which will, in effect, generate efficiencies in cost savings. Thus, a future fleet, mostly comprised of larger and deeper-drafting vessels, is not

expected; rather, ships' abilities to load closer to their capacities are anticipated to reduce light-loading inefficiencies. Approximately 0.5% of the vessels calling have design drafts 50 feet or greater.

3.6.3 OMRR&R Dredging and Disposal

The general reevaluation considered that current dredging and disposal practices as described under the existing project description would continue under future with or without project conditions.

The current dredging practices and recent OMRR&R (also referred to as O&M) data on dredging quantities and cost per cubic yard were used to develop estimated construction cost and the estimated increase in annual OMRR&R for each alternative.

3.6.4 OMRR&R of Other Features

Comparison of alternatives is based on the incremental change in OMRR&R between the current project and the proposed deepening. However, in order to properly maintain the current project there are other existing features that warrant O&M, which cannot be accommodated due to shortfalls in the annual O&M budget. The following is a list of O&M needs and projected "annual costs" that need to be captured in the overall project costs for OMRR&R. The breakdown of those annual costs/needs is as follows:

- O&M dredging of New Orleans Harbor - While dredging is not projected to increase from that currently performed for the existing project, the average annual costs required to maintain the NO harbor is estimated to be approx. $4.5 Million/ Year.
- O&M of the Hopper Dredge Disposal Area at HOP - Continued O&M will be required and is estimated to cost approx. $17 Million/ Year.
- O&M for the Saltwater Barrier Sill - Average annual cost is estimated to be approx. $1.2 Million/ Year.
- O&M of training works (i.e. foreshore and pile dike repairs, jetty repairs, and existing dikes in crossings) - Average annual cost is estimated to be approx. $15 Million/ Year.

TOTAL - $37.7 Million/ Year

These total costs are the same for the current project depth, as well as all proposed alternatives, and therefore do not affect the comparison and selection of a Recommended Plan.

3.7 Initial Array of Alternatives

The initial array of alternatives was developed prior to the implementation of the datum conversion based on the premise that the depth in the lower Mississippi from RM 13.4 AHP to RM 22 BHP was at -45 ft MLLW, (rather than the -48.5 ft MLLW, as was later determined). This depth was used to define the initial array. The initial array of alternatives considered varying channel depths and widths for the MRSC.

The alternatives defined in the initial array are referenced to MLLW from RM 22 BHP to 13.4 AHP, and to LWRP for the crossings, located between RM 115 AHP to 232.4 AHP.

As the initial array of alternatives was developed, a 600 foot channel width was considered for the Jetty and Bar Channel from river mile 17.5 BHP to the Gulf. And a width of 750 ft was considered from 17.5 BHP upriver to RM 181 AHP.

Initial Array Alternative 1:

-45 ft LWRP depth with a 500 ft channel width at the 12 maintained crossings,

45 ft depth (defined to the appropriate hydraulic datum, for each particular reach of the river) with a 750 ft channel width from mile 181 AHP to mile 17.5 BHP and,

-45 ft MLLW with a 600 ft channel width from mile 17.5 BHP to the Gulf of Mexico

Initial Array Alternative 2:

-48 ft LWRP depth with a 750 ft channel width at the 12 maintained crossings,

48 ft depth (defined to the appropriate hydraulic datum, for each particular reach of the river) with a 750 ft channel width from mile 181 AHP to mile 17.5 BHP and,

-48 ft MLLW depth with a 600 ft channel width from mile 17.5 BHP to the Gulf of Mexico

Initial Array Alternative 3:

-50 ft LWRP depth with a 750 ft channel width at the 12 maintained crossings,

50 ft depth (defined to the appropriate hydraulic datum, for each particular reach of the river) with a 750 ft channel width from mile 181 AHP to mile 17.5 BHP and,

-50 ft MLLW depth with a 600 ft channel width from mile 17.5 BHP to the Gulf of Mexico

3.7.1 Screening of the Initial Array

In evaluating the initial array of alternatives, several considerations were made to narrow the array.

Channel Widths: The initial array of alternatives considered varying channel widths from 500 ft to 750 ft. Based on discussions with CEMVN Operations Division and local stakeholders, it was determined that the existing channel width was adequate to safely pass the existing ship fleet, which includes Post-Panamax ships. Because vessels can safely pass at the existing width; and because widening the channel would result in additional cost and increased environmental impacts with no additional benefits, changes in the channel width were eliminated from the array of alternatives. Safety of the existing channel widths may be a concern with future shipping fleets if ship length and width increases.

As the need to widen the channel was eliminated, it was no longer necessary to define the alternatives with varying channel widths for the jetty and bar channel for RM 17.5 BHP to the Gulf at RM 22 BHP. For the final array, this reach was combined with Venice and Cubits Gap, and identified as extending from RM 13.4 AHP to RM 22 BHP. It should be noted that, although the reach known as Venice is typically dredged beginning from RM 11, this was extended up river to RM 13.4 to account for possible extension of the dredge reach in the event that the deposition of shoaled material migrates upriver.

Channel Depths: As discussed in Chapter 1, when implementing the April 2007 datum guidance, it was determined that the channel from RM 13.4 AHP to RM 22 BHP was maintained to -45 ft referenced to the MLG datum. Based on the datum conversion described in Chapter 1, and the Project Datum EDR included in Appendix H, it was determined that the channel has been maintained to -48.5 ft MLLW. The array of alternatives was, therefore, redefined based on the current depths and applicable datum in the lower Mississippi River.

3.7.2 Evaluation of the Existing Condition

The terms "existing conditions" and "future without project conditions (FWOP)" are used to conduct economic evaluations. Existing condition is defined as the condition that exists at the start of the study. As discussed above, for purposes of this report and the alternatives analysis herein, the existing condition in the lower Mississippi, from RM 13.4 AHP to 22 BHP is -48.5 ft MLLW.

Because the channel depth in this area was originally assumed to exist at -45 ft MLLW, the economic justification for the incremental difference between -45 ft MLLW and its current depth of -48.5 ft MLLW was assessed. The study looked at a scenario in which the lower Mississippi Channel would silt in overtime to -45 ft MLLW, and then determined the associated cost to reconstruct the channel from -45 ft MLLW to -48.5 ft MLLW. These benefits were estimated based on current vessel traffic data with an artificial -45 ft draft limit enforced. Since the channel is already at -48.5 ft MLLW, construction cost associated with going from -45 ft MLLW to -48.5 ft

MLLW is considered a sunk cost. First construction cost shown in table 3-2 was developed by using existing surveys of the channel, estimating construction quantities, and applying standard contract cost.

Average Annual Incremental OMRR&R to go from -45 ft MLLW to -48.5 ft , as shown in Table 3-2 was determined to be zero. The evaluation of alternatives to deepen the channel from RM 22 BHP to 13.4 AHP from the current -48.5 ft MLLW to -50 ft MLLW indicated there was no incremental difference in the annual OMRR&R requirements. Therefore, it was assumed there would also be no difference in the annual OMRR&R requirements between -48 ft MLLW and -50 ft MLLW. Table 3-6 shows the results.

Table 3-6 Economic Justification for Existing Condition

Does – SWP and Bar Channel	
Average Annual Benefits and Costs (2.875%)	
Channel Alternative	**From -45 ft MLLW to -48 ft MLLW**
First Cost of Construction	$84,939,642
Average Annual Cost	$3,364,985
Average Annual Incremental OMRR&R	None
Total Average Annual Benefits	$45,926,225
Benefit to Cost (B/C) Ratio	13.6:1

This provides a B/C ratio of 13.6:1. The incremental benefits would be lost if the channel was to return to -45 ft MLLW. The B/C ratio and average annual benefits show that even if no additional increment was constructed, there is justification for maintaining the channel at its current depth. Having established that, the remaining plan formulation evaluates alternatives based on the existing condition of -48.5 ft for RM 13.4 AHP to RM 22 BHP.

3.8 Final Array of Alternatives

The following is the final array of alternatives: Each alternative assumes that the current authorized widths of the channel would be maintained and that material dredged for construction from RM 13.4 AHP to RM 22 BHP and that the dredged material would be placed in designated beneficial use sites as uniformly as practicable to create intertidal coastal wetland habitat, to the extent permissible under Federal regulations regarding the Federal Standard.

- **Alternative 1 (No action/Future Without Project):** This alternative considers maintaining the channel in its current condition by maintaining a depth of -45 ft LWRP for

the 12 actively maintained crossings and a -48.5 ft MLLW in the lower Mississippi from RM 13.4 AHP to RM 22 BHP

Alternative 2 and 3 consider providing depths of -48.5 ft and -50 ft, respectively, from the Gulf of Mexico beginning at RM 22 BHP through Baton Rouge ending at RM 232.4 AHP. This would be accomplished by constructing and maintaining the channel as described below.

- **Alternative 2**: The alternative considers construction and maintenance to -48 ft LWRP for the 12 actively maintained crossings and -48.5 ft MLLW in Lower Mississippi River from RM 13.4 AHP to RM 22 BHP

- **Alternative 3**: The alternative considers construction and maintenance to -50 ft LWRP for the 12 actively maintained crossings and -50 ft MLLW in Lower Mississippi River from RM 13.4 AHP to RM 22 BHP

For the final array of alternatives, the navigation channel between RM 13.4 AHP to RM 115 AHP historically have a depth in excess of -55 ft and are considered naturally deep. For RM 115 AHP to RM 232.4 AHP, the portions of the river between the 12 actively maintained crossings are also considered naturally deep. Therefore, the alternatives only consider the reaches of the river where construction and subsequent operation and maintenance is required to provide deep draft access.

Analysis of the final array indicated opportunities to construct the channel with varying depths for the lower Mississippi (RM 22 BHP to RM 13.4 AHP) and the crossings, as long as the depth in the lower Mississippi was equal to or greater than that provided in the crossings. This scenario could possibly achieve greater benefits with lower cost. For instance, the lower Mississippi from RM 22 BHP to RM 13.4 AHP could be deepened to -50 ft MLLW while the crossings could remain at -45 ft LWRP or could be deepened to -48 ft LWRP. Deepening to RM 13.4 AHP, coupled with the naturally deep channel above RM 13.4 AHP, would effectively provide deep draft access for a depth at or in excess of -50 ft MLLW to the Port of Plaquemines and the Port of Orleans, but would limit the ability for the ships, which require this additional draft, to reach the ports above RM 115 AHP. The value of considering varying depths is it allows analysis of economic benefits provided by each port compared to the construction and operation and maintenance cost for each reach. Note, however, that this report is not conducting an analysis of implementing any construction action to sustain the naturally deep portions of the channel.

Within the Final Array, consideration was given to various permutations for depths in both the lower Mississippi from RM 13.4 AHP to RM 22 BHP and the crossings. Those additional permutations are listed below.

Alternative 3a and 3b consider providing depths of -50 ft MLLW from the Gulf of Mexico beginning at RM 22 BHP through the Port of New Orleans ending at RM 115 AHP, and providing depths of -45 and -48 ft LWRP respectively beginning at the Port of South Louisiana, RM 115 AHP to Baton Rouge ending at RM 232.4 AHP. This would be accomplished by constructing and maintaining the channel as described below.

Alternative 3a: This alternative considers construction and maintenance to -45 ft LWRP for the 12 actively maintained crossings and -50 ft MLLW in the Lower Mississippi River from RM 13.4 AHP to RM 22 BHP;

Alternative 3b: This alternative considers construction and maintenance to -48 ft LWRP for the 12 actively maintained crossings and -50 ft MLLW in the Lower Mississippi River from RM 13.4 AHP to RM 22 BHP.

3.9 Screening of Alternatives

Preliminary alternatives are formulated and refined by combining, adapting, and scaling management measures to best address the four criteria from the Principles and Guidelines:

- **Completeness.** Extent to which the alternative provides and accounts for all necessary investments or actions to ensure realization of the planning objectives. All alternatives included in the initial and final array account for all necessary investments and actions and are considered equally complete.

- **Effectiveness.** Extent to which the alternative contributes to achieving the planning objectives. All alternatives provide additional depth for vessels, which reduces the need for light loading, and provides transportation cost savings. Therefore, all alternatives are effective. However, alternatives that provide a 50 ft channel depth are more effective than the others, as they provide the greatest depth and transportation cost savings.

- **Efficiency.** Extent to which the plan is the most cost-effective means of addressing the specified problems and realizing the specified opportunities, consistent with protecting the nation's environment. All alternatives are cost effective. The cost effectiveness of each alternative varies based on the construction cost, operation and maintenance cost, and the economic analysis of average annual benefits.

- **Acceptability.** The extent to which the alternative plans are acceptable in terms of applicable laws, regulations and public policies. All alternatives are acceptable based on this definition.

Since all alternatives are considered complete, effective, and acceptable, alternatives were compared based on efficiency, comparison of alternatives and selection of the recommended plan is based on the alternative that is the most cost effective. First construction cost, annual operation and maintenance cost, and economic analysis to determine transportation cost savings were developed to consider the cost effectiveness of each alternative.

3.10 The Tentatively Selected Plan

3.10.1 Cost Estimates

Cost estimates were developed for both the first construction cost and the annual maintenance cost both within the crossings and in the lower Mississippi. First construction cost and O&M cost estimates were based on the current dredging and disposal practices, and cost of recent O&M contracts. assumed the continuation of current dredging practices. First construction cost and annual maintenance cost were not developed for the portions of the river that are naturally deep, and would not require construction or maintenance.

3.10.1.1 First Construction Cost

For both the crossings and the lower Mississippi, the construction and placement methods used in Phase I and Phase II of the project to deepen the portions of the MRSC to the current depths were used to develop the first construction cost for each alternative in the final array. Based on the construction duration required to construct the MRSC to the current depths, a duration of 3 to 5 years was used for first construction of all alternatives. First construction cost estimates were developed based on the estimated quantity of dredge material that would be removed under each alternative.

Based on the annual surveys taken for operation and maintenance, the reach in lower Mississippi River, is identified as extending from 13.4 AHP to 22 BHP, however construction dredging would only be required between approximate RM 6 AHP and approximate RM 22 BHP. Costs were based on the assumption that this work would be accomplished using two (2) hydraulic cutterhead dredge contracts covering the reach between Miles 6 AHP to 19.5 BHP, and one (1) hopper dredge contract covering the jetty and bar channel reach from Miles 19.5 BHP to 22 BHP. For the hydraulic cutter head dredging work, all dredge material would be utilized in a beneficial manner, within the limits of the Federal Standard, for either bank stabilization behind existing foreshore dikes along the channel or for marsh creation in the adjacent open waters. Construction of the jetty and bar channel reach from RM 19.5 BHP to 22 BHP would be performed via mobile hopper dredge(s) versus stationary cutter head dredges as this area is located within the Gulf entrance. For the hopper dredging work, all material would be dredged and hauled to the EPA approved Ocean

Dredge Material Disposal Site (ODMDS) adjacent to and west of the Gulf entrance channel between Approximate Miles 20.4 BHP and 23.1 BHP.

While there are numerous crossing locations between New Orleans and Baton Rouge, only 12 currently require maintenance dredging. These 12 deep draft crossings were evaluated as part of the deepening study based upon channel conditions that existed in the fall/winter of 2014. These 12 crossings include: Baton Rouge Front, Red Eye, Sardine Point, Medora, Granada, Bayou Goula, Alhambra, Philadelphia Point, Smoke Bend, Rich Bend, Belmont, and Fairview.

The crossings are currently maintained to -45 ft LWRP and would be deepened, if deepening was deemed justified, to either -48 ft or -50 ft below the LWRP based on the alternative recommended. Construction would be accomplished via contract and/or Government dustpan dredge(s) consistent with the method of construction already utilized to deepen and maintain the crossings. Material dredged from the crossings would be placed adjacent to the crossing and put back into the system for the material to be carried downstream and to fall out into deeper holes within the river.

First construction cost for the final array of alternatives are provided in Table 3-8 Economic Comparison of Final Array of Alternatives

The first construction cost for all alternatives also include estimates for relocation and real estate requirements which were identified at the time of the draft report. At the time of the draft report, relocations cost were estimated at $40M and Real Estate cost were estimated at $2.5M. These estimates have since been revised. Refer to Chapter 5, Appendix B, and Appendix C for additional information on the current real estate and relocation estimates.

3.10.1.2 Annual Operation and Maintenance Cost Based on 1D hydraulic Model

Comparison of alternatives for economic analysis is based on the incremental difference between current annual Operation and Maintenance (O&M) cost, and anticipated O&M cost for each alternative. The Engineer Research and Development Center (ERDC) was tasked with developing hydraulic models to determine the annual maintenance dredging quantities that could be anticipated within the 12 actively maintained crossings, as well as the lower Mississippi River reach between RM 13.4 AHP to RM 22 BHP under each of the alternatives. Comparison of alternatives to identify the TSP was based on the results of a 1D hydraulic model that looked at the increase of shoaling for the alternatives' depths identified for each reach.

CEMVN and ERDC both agreed that shoaling and maintenance dredging needs within the lower portion of the Mississippi River, from Venice, Louisiana (Mile 13.4 AHP) to the Gulf entrance channel (Mile 22 BHP), would remain essentially the same as currently exists in these locations. For this reason, the dredging needs for both the -48.5 ft and -50 ft MLLW alternative channel

depths in this reach were based on average annual quantities obtained from historical dredging performed within this reach of the MRSC. Because the annual dredge quantities in this reach would essentially remain the same as the current project, there is no cost difference in estimated annual O&M cost for this reach. In addition, there are no annual maintenance requirements for the reaches between RM 13.4 AHP to RM 115 AHP. Although New Orleans Harbor does require annual O&M, because it is excluded from the scope of this evaluation, there would be no change in the O&M cost.

The only locations within the project area that would have an increase in quantity of dredge material, and therefore an incremental increase in cost would be the 12 crossings that are currently maintained between RM 115 AHP to RM 232.4 AHP.

3.10.2 Comparison of Alternatives for selection of the TSP

Table 3-7 provides a comparison of each alternative considering the first construction cost, the incremental annual OMRR&R cost based on the results of the 1D hydraulic model, the total average annual cost, and the total average benefits used to calculate the net benefits. The average annual incremental O&M is the incremental increase in O&M cost for each alternative compared to the current annual expenditures. Alternative 3a includes deepening of the lower portion of the MRSC from RM 13.4 AHP to RM 22 BHP, there is no incremental increase in O&M for this alternative.

Table 3-7 Economic Comparison of Final Array of Alternatives

Channel Alternative	Alternative 2	Alternative 3	Alternative 3a	Alternative 3b
First Cost of Construction	$ 88,700,000	$ 183,100,000	$ 82,200,000	$ 170,900,000
Interest During Construction	$ 3,900,000	$ 8,000,000	$ 3,600,000	$ 7,500,000
Total Investment	$ 92,600,000	$ 191,100,000	$ 85,800,000	$ 178,400,000
Average Annual Const. Cost	$ 3,500,000	$ 7,300,000	$ 3,300,000	$ 6,800,000
Average Annual Increm. O&M	$ 100,000,000	$ 131,400,000	$0*	$ 100,000,000
Total Average Annual Cost	$ 103,500,000	$ 138,700,000	$ 3,300,000	$ 106,800,000
Total Average Annual Benefits	$ 106,600,000	$ 148,500,000	$ 10,600,000	$ 117,200,000
Net Excess Benefits	**$ 3,000,000**	**$ 9,800,000**	**$ 7,300,000**	**$ 10,400,000**
B/C Ratio	**1.03**	**1.07**	**3.25**	**1.10**

Alternative 1 (No Action): No NED benefits are associated with the No Action Alternative.

Alternative 2 (-48 ft LWRP for the Crossings and -48.5 ft MLLW for the Lower Mississippi): Alternative 2 has a positive B/C ratio and provides NED benefits; however, these are not as great as Alternatives 3, 3a, and 3b, all of which include deepening of the lower Mississippi from RM 13.4 AHP to RM 18 BHP to -50 ft. This indicates that there are NED benefits associated with deepening the lower Mississippi from its current -48.5 ft MLLW to -50 ft MLLW, which reduces transportation cost savings for ships to reach the Port of Plaquemines and the Port of New Orleans.

Alternative 3 (-50 ft LWRP for the Crossings and -50 ft MLLW for the Lower Mississippi): Alternative 3 has a positive B/C ratio and provides NED benefits greater than Alternative 2. While alternative 3 has very good NED benefits, and its B/C ratio is above 1, the B/C is not as great as alternatives 3a and 3b.

Alternative 3a (-45 ft LWRP for the Crossings and -50 ft MLLW for the Lower Mississippi): Alternative 3a has the highest B/C ratio and provides NED benefits greater than Alternative 2. However, the net excess benefits are not as great as Alternative 3 or 3b. Since this alternative only includes construction in the lower Mississippi from RM 13.4 AHP to RM 22 BHP, it shows there are benefits to be gained from deepening this reach to 50 ft. Since this alternative includes no construction or increase in O&M in the crossings, this indicates that cost for the crossings is significantly impacting the B/C ratio.

Alternative 3b (-48 ft LWRP for the Crossings and -50 ft MLLW for the Lower Mississippi): Alternative 3b has a positive B/C ratio and provides the greatest net net excess benefits. A comparison of Alternative 3b and Alternative 3a, which includes no deepening of the crossings, indicates that there is benefit to be gained by deepening the crossings to some amount, but the cost of construction and incremental O&M, significantly reduce the B/C ratio.

3.10.3 Optimization of Alternatives for selection of the TSP

Based on the comparison of Alternative 3b and 3a, it is discernible that there are benefits to be gained by deepening the crossings to reduce transportation cost for ships traveling to the Port of South Louisiana and the Port of Baton Rouge. However, the cost of construction and the annual incremental increase in OMRR&R is significantly influencing the B/C ratio.

With the understanding that there were opportunities to be gained from varying the depths in the crossings from those implemented in the lower Mississippi reach, a more detailed analysis of the reaches of the river and the various ports serviced by each crossing was conducted. There are three crossings actively maintained that are within the footprint of the Port of South Louisiana: Fairview; Belmont; and Rich Bend. There are nine actively maintained crossings that are within the footprint

of the Port of Baton Rouge: Smoke Bend; Philadelphia; Alhambra; Bayou Goula; Granada; Medora; Sardine; Red Eye; and Baton Rouge Front (refer to Figure 3-11).

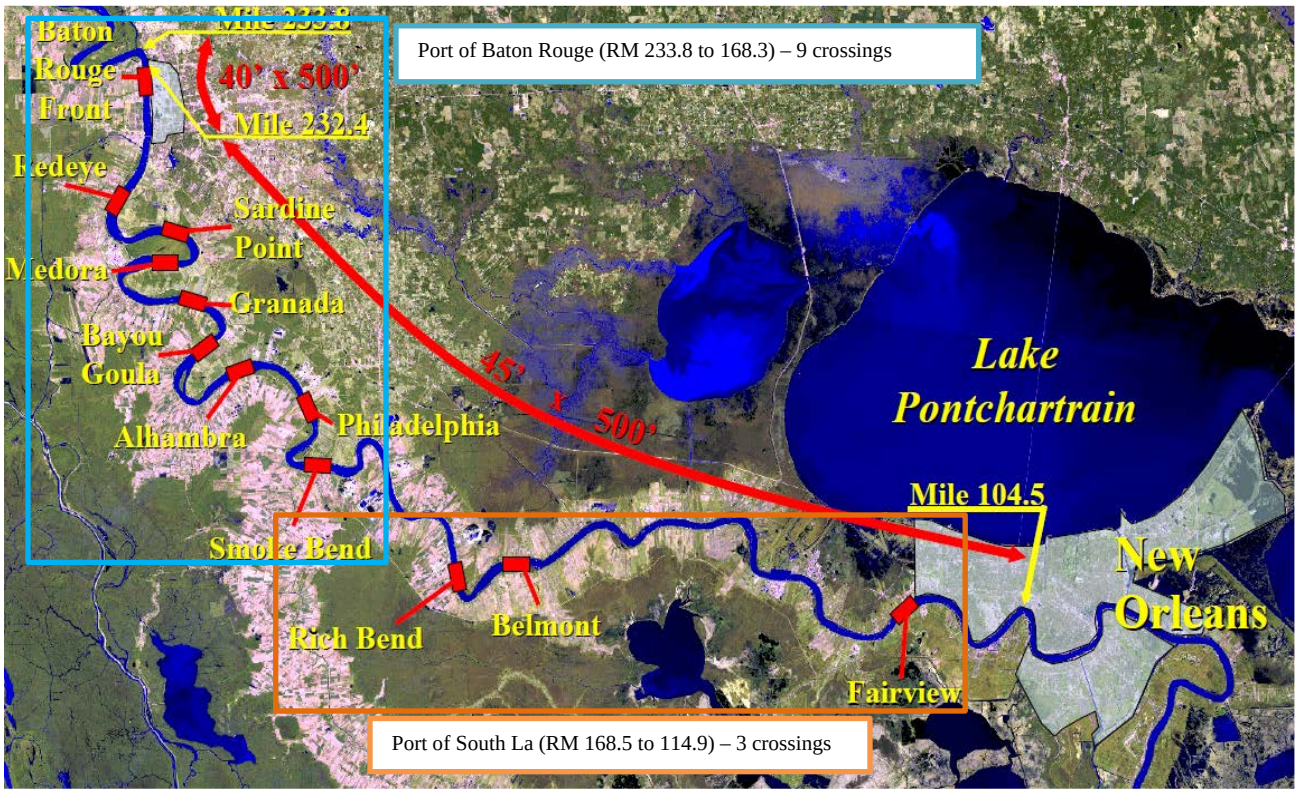


Figure 3-7 Crossing by Port

In order to optimize the final array, additional alternatives were developed that would allow for comparison of the NED benefit and B/C ratio for deepening the river through the Port of South Louisiana to -48 ft and -50 ft LWRP. This was compared to deepening through the Port of Baton Rouge to -48 ft and -50 ft LWRP. This would be accomplished by constructing and maintaining the channel as described below.

- **Alternative 2a**: The alternative considers construction and maintenance to -48 ft LWRP for the 3 crossings located within the footprint of the Port of South of Louisiana and -48 ft MLLW in the Lower Mississippi River from RM 13.4 AHP to RM 22 BHP. The 9 crossings located within the footprint of the Port of Baton Rouge would remain at 45 ft LWRP.

Alternative 3c and 3d considered providing depths of -50 ft from the Gulf of Mexico beginning at RM 22 BHP through the Port of New Orleans ending at RM 115 AHP, -48 ft and -50 ft respectively through the Port of South Louisiana from RM 115 AHP and ending at RM 168.3

AHP, and maintain the current -45 ft to Baton Rouge from RM 168.3 AHP to RM to RM 232.4 AHP. This would be accomplished by constructing and maintaining the channel as described below.

- **Alternative 3c**: The alternative considers construction and maintenance to -48 ft LWRP for the 3 crossings located within the footprint of the Port of South of Louisiana and -50 ft MLLW in the Lower Mississippi River from RM 13.4 AHP to RM 22 BHP. The 9 crossings located within the footprint of the Port of Baton Rouge would remain at -45 ft LWRP.

- **Alternative 3d**: The alternative considers construction and maintenance to -50 ft LWRP for the 3 crossings located within the footprint of the Port of South of Louisiana and -50 ft MLLW in the Lower Mississippi River from RM 13.4 AHP to RM 22 BHP. The 9 crossings located within the footprint of the Port of Baton Rouge would remain at -45 ft LWRP.

- **Alternative 3e**: The alternative considers construction and maintenance to -50 ft LWRP for the 3 crossings located within the footprint of the Port of South of Louisiana and -50 ft MLLW in the Lower Mississippi River from RM 13.4 AHP to RM 22 BHP. And construction and maintenance to -48 ft LWRP for the nine crossings located within the footprint of the Port of Baton Rouge.

The alternatives 2a, 3c, 3d, and 3e are all considered effective, complete, and acceptable alternatives. These alternatives were compared based on the overall cost effectiveness.

(Note the nomenclature for the alternatives is based on the depth of the lower Mississippi River reach from RM 13.4 AHP to RM 22 BHP, -48 ft MLLW for Alternative 2 and 2a, and -50 ft MLLW for alternative 3, and 3a through 3e).

Table 3-8 provides a comparison of the first construction cost, incremental O&M cost, Net Excess Benefits, and B/C ratio for each of the newly defined alternatives as well as Alternatives 2 and 3. Alternative 3a is not included in Table 3-8, as it did not provide greater net excess benefits when compared to alternative 3b, therefore this alternative was not carried forward in the evaluation. The estimates provided in the Table 3-8 are based on the abbreviated cost risk analysis which was performed for development and comparison of alternatives. The abbreviated risk analysis are included in the Engineering Appendix, Appendix C.

The optimization of the final array of alternatives identified that Alternative 3d yielded the greatest net excess benefits.

Table 3-8 Optimization of Alternatives

Channel Alternative	Alternative 2 -48 ft Full Channel	Alternative 2a -48 ft Through S. LA	Alternative 3 -50 ft Full Channel	Alternative 3d -50 ft Through S. LA
First Cost of Construction	$ 88,700,000	$ 5,600,000	$ 183,100,000	$ 89,000,000
Interest During Construction	$ 3,900,000	$ 200,000	$ 8,000,000	$ 3,900,000
Total Investment	$ 92,600,000	$ 5,800,000	$ 191,100,000	$ 92,900,000
Average Annual Const. Cost	$ 3,500,000	$ 200,000	$ 7,300,000	$ 3,500,000
Average Annual Increm. O&M	$ 100,000,000	$ 13,400,000	$ 131,400,000	$ 18,100,000
Total Average Annual Cost	$ 103,500,000	$ 13,700,000	$ 138,700,000	$ 21,700,000
Total Average Annual Benefits	$ 106,600,000	$ 83,800,000	$ 148,500,000	$ 117,200,000
Net Excess Benefits	**$ 3,000,000**	**$ 70,200,000**	**$ 9,800,000**	**$ 95,500,000**
B/C Ratio	**1.03**	**6.14**	**1.07**	**5.41**

Channel Alternative	Alternative 3b -50 ft SWP/48 ft Through BR	Alternative 3c -50 ft SWP/-48 ft Through S. LA	Alternative 3e -50 ft Through S. LA/ -48 ft Through BR
First Cost of Construction	$ 170,900,000	$ 87,800,000	$ 172,100,000
Interest During Construction	$ 7,500,000	$ 3,900,000	$ 7,600,000
Total Investment	$ 178,400,000	$ 91,600,000	$ 179,600,000
Average Annual Const. Cost	$ 6,800,000	$ 3,500,000	$ 6,800,000
Average Annual Increm. O&M	$ 100,000,000	$ 13,400,000	$ 104,700,000
Total Average Annual Cost	$ 106,800,000	$ 16,900,000	$ 111,500,000
Total Average Annual Benefits	$ 117,200,000	$ 94,400,000	$ 139,900,000
Net Excess Benefits	**$ 10,400,000**	**$ 77,500,000**	**$ 28,400,000**
B/C Ratio	**1.10**	**5.58**	**1.25**

3.10.4 Identifying the Tentatively Selected Plan

Based on the comparison of alternatives as shown in Table 3-8, the Tentatively Selected Plan (TSP) for the next phase of construction (that would be proposed for implementation in the Draft GRR and SEIS) was identified at the TSP Milestone as Alternative 3d. This alternative was to provide deep draft navigation to -50 ft MLLW from the Gulf beginning at RM 22 BHP through the Port of South Louisiana ending at RM 168.3 AHP, and providing deep draft navigation to -45 ft LWRP from RM 168.3 AHP through Baton Rouge ending at RM 232.4 AHP. This would be accomplished by constructing and maintaining the MRSC to -50 ft MLLW in the lower Mississippi from RM 13.4, AHP, to RM 22, below BHP, and by deepening the three crossings, Rich Bend, Belmont, and Fairview located within the Port of South Louisiana to -50 ft LWRP. The material dredged during construction of the RM 13.4 AHP to RM 19.5 BHP reach would be placed in locations designated for beneficial use of dredged material. . The material would be deposited as uniformly as practicable within the Federal Standard to create intertidal coastal wetland habitat within the limitations of the Federal regulations regarding the Federal Standard. The material dredged during construction of the RM 19.5 BHP to RM 22.0 BHP reach would be placed in the ODMDS. All other reaches of the river have depths that are naturally greater than -55 ft. In the present condition, these reaches do not require construction or operation and maintenance to provide deep draft access.

3.11 Summary of Accounts and Comparison of Alternatives

To facilitate the evaluation and display of effects of the alternative plans there are four Federal Accounts to consider:

(1) The national economic development (NED) account displays changes in the economic value of the national output of goods and services.

(2) The environmental quality account displays non-monetary effects on ecological, cultural, and aesthetic resources including the positive and adverse effects of ecosystem restoration plans.

(3) The regional economic development (RED) account displays changes in the distribution of regional economic activity (e.g., income and employment).

(4) The other social effects account displays plan effects on social aspects such as community impacts, health and safety, displacement, energy conservation and others.

The NED account is required. Other information that is required by law or that will have a material bearing on the decision-making process should be included in the other accounts, or in some other appropriate format used to organize information on effects. The Federal objective is to determine

the project alternative with maximum net economic benefits while protecting or minimizing impacts to the environment. The alternative plan that reasonably maximizes net economic benefits consistent with protecting the Nation's environment, the NED plan, shall be selected. Display of the NED and environmental quality accounts is required. Display of the regional economic development (RED) and other social effects accounts is discretionary.

There are real and tangible benefits to be gained in the region upriver from Baton Rouge by deepening the channel. RED (regional economic development) benefits come in the form of efficiencies that are separate from the transportation cost savings used by USACE to evaluate a project. Although RED may be used to further describe alternatives, and independent studies exist that point to real and tangible benefits to be gained, these are not considered in the NED decision process.

Consideration of the NED, RED, and other social effects is provided in the Economics Appendix D.

Environmental Quality impacts are described in Chapter 4 and no significant impacts were identified for any alternative. In fact, due to the anticipated incidental benefits from beneficial use of dredged material within the Federal standard, the NED plan is anticipated to have a net beneficial environmental impact. Therefore, the comparison and selection of alternatives is based on the NED plan. The NED plan is the alternative that provides the greatest net benefits to the Nation.

3.12 Release of the Draft Report

Alternatives 1 through 3, as described in the initial array, were reviewed and approved as the initial array of alternatives by the USACE vertical team (i.e., MVN, Division and HQ) with concurrence from the local sponsor at the designated Alternatives Milestone meeting on July 6, 2015. The three original alternatives (1, 2, 3) were carried forward for evaluation in the draft SEIS, while economics and cost/benefits analysis for all alternatives was developed concurrently. It was recognized that the original alternatives represented the maximum environmental impacts; all additional alternatives reduced the maximum impacts from the three original alternatives. For that reason, the other alternatives 2a, 3a, 3b, 3c, 3d, and 3e were developed, analyzed, and screened based on economic analysis only. The economic analysis screened alternatives 2a, 3a, 3b, 3c, and 3e from further consideration based on their respective net excess benefits. The draft SEIS was reinitiated to include alternative 3d, with the original alternatives, in the consideration for a selection of a TSP. The draft integrated GRR and SEIS was released for public review in December of 2016, and included Alternative 3d as the TSP. The draft SEIS included evaluation of alternatives 1, 2, 3 and 3d. The report was available for 30 days for public review and comments, with two public meetings held to provide additional opportunities for comments.

After release of the draft report, for the 30 day public review, the report also underwent concurrent Independent External Peer Review (IEPR) and Agency Technical Review (ATR). Significant comments from each of these reviews were considered, to determine if further plan formulation to confirm the TSP was warranted.

3.12.1 Consideration of significant Public, IEPR, and ATR Comments

During the public review period, comments were received from both industry and the NFS that indicated the need for further consideration to be given to deepening of the crossings located within the Port of Baton Rouge. Further comments from an IEPR comment indicated a risk in selecting the TSP based on the results of the 1D hydraulic model. In order to address these comments a 2D hydraulic model was performed by ERDC. Recognizing that the TSP was justified, the scope of the 2D model did not consider alternatives that provided depths less than -50 ft through the Port of South Louisiana. The 2D model was used to consider changes in sediment disposition as a result of deepening the channel, and how changes in sediment would impact annual O&M requirements. The following alternatives were included in the scope of the 2D modeled:

The Tentatively Selected Plan (Alternative 3d): Provides draft of 50 ft from the Gulf beginning at RM 22 BHP, and through the Port of South Louisiana ending at RM 168.3 AHP. This would be accomplished by dredging the lower portion of the river from RM 22 BHP to RM 13.4 AHP, and dredging the three routinely-maintained crossings located within the footprint of the Port of South of Louisiana from RM 115 AHP to RM 168.3 AHP to -50 ft LWRP. The nine routinely-maintained crossings located within the foot print of the Port of Baton Rouge, from RM 168.3 AHP to 232.4 AHP would continue to be maintained to the current -45 ft LWRP.

Alternative 3: Provides draft of -50 ft from the Gulf beginning at RM 22 BHP, and through the Port of Baton Rouge ending at RM 232.4 AHP. This would be accomplished by dredging the lower portion of the river from RM 22 BHP to RM 13.4 AHP to -50 ft MLLW, and dredging the three routinely-maintained crossings located within the footprint of the Port of South of Louisiana, from RM 115 AHP to RM 168.3 AHP and the nine routinely-maintained crossings located within the foot print of the Port of Baton Rouge, from RM 168.3 AHP to 232.4 AHP, to -50 ft LWRP.

Alternative 3e: Provides draft of 50 ft from the Gulf beginning at RM 22 BHP, and through the Port of South Louisiana ending at RM 168.3 AHP. This would be accomplished by dredging the lower portion of the river from RM 22 BHP to RM 13.4 AHP to -50 ft MLLW, and dredging the three routinely-maintained crossings located within the footprint of the Port of South of Louisiana from RM 115 AHP to RM 168.3 AHP to -50 ft LWRP. This alternative also proposes that the nine routinely-maintained crossings with the footprint of

the Port of Baton Rouge, from RM 168.3 AHP to RM 232.4 AHP, be constructed to a depth of -48 ft LWRP.

Both the 1D and 2D model show that maintenance dredging the lower portion of the river from RM 22 BHP to RM 13.4 AHP from its current depth of -48.5 ft MLLW to -50 ft MLLW, will result in little to no change in the average annual O&M cost. The draft report assumed that there was no increase in O&M cost for the lower portion of the river, the 2D model validates this assumption. Since the construction estimates have not changed and the O&M requirements from the lower portion of the river have not changed, the difference between the 1D and 2D model is in the dredging quantities and associated average annual O&M cost within the crossings.

The 2D model provided dredging indices applied as a multiplier to the observed historical average quantities from 1995 to 2015. Figure 3-12 shows the dredging indices by crossing.

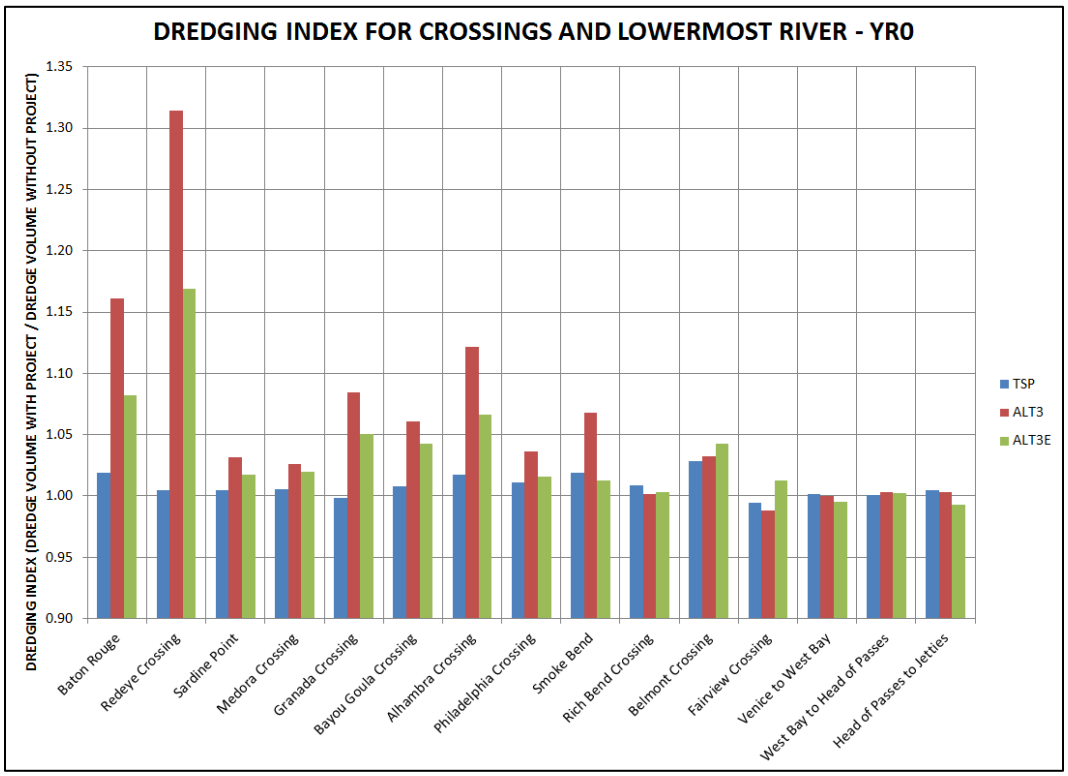


Figure 3-8 Dredging Indices for Each Crossing and the Lowermost River Reaches for the Yr0 Sea Level Analysis

These results demonstrate that the implementation of the TSP has very little impact on maintenance dredging. The largest relative impacts to maintenance dredging (as measured by the dredging index) for any of the scenarios are seen at Redeye Crossing and Baton Rouge Front. Specifically, the largest dredging indices are seen for Alternative 3, at these crossings. A detailed report of the 2D hydraulic model process and reports is included in Appendix J.

3.12.2 Conclusion of 2D model

Dredging indices for the crossings from the 2D model were applied to historical dredging quantities to determine how OMRR&R requirements would increase in future years for Alternatives 3, 3d, and 3e. This analysis provided significantly lower dredging quantities, and associated cost than the results that were obtained from the 1D model. Table 3-9 provides a comparison of historical dredging quantities compared to the estimate quantities based on the results of the 1D and 2D model. The table only provides a comparison for the crossings, as both models indicated little to no change in the dredging quantities for the lower portion of the river from Venice to the Gulf of Mexico.

Table 3-9 Comparison of Estimated Dredge Quantities for the crossings

1D Model Results		
Alternative	Estimated Dredge Quantity	Incremental Difference from current O&M
Historic Avg. Annual Dredge Quantity (1995 to 2016)	18 MCY	N/A
TSP (Alternative 3d)	18.9 MCY	3.2 MCY
Alternative 3	48.3 MCY	32.6 MCY
Alternative 3e	39.8 MCY	24.1 MCY
2D Model Results		
Alternative	Estimated Dredge Quantity	Incremental Difference from current O&M
Historic Avg. Annual Dredge Quantity (1999-2015)	15.9 MCY	N/A
TSP (Alternative 3d)	15.9 MCY	0 MCY
Alternative 3	17.9 MCY	2.0 MCY
Alternative 3e	17 MCY	1.1 MCY

In comparing the results of the 1D and 2D model, it is apparent that there are significant differences in the results. The differences are largely in the estimated dredging quantities for the 9 crossings located within the Port of Baton Rouge. ERDC performed an assessment to reconcile the difference between the model results. The conclusion of this assessment is included in Appendix J.

The results of the 2D model for the crossings were used to develop revised estimated annual OMRR&R cost for the three alternatives. For the lower portion of the river from Venice to the Gulf, the previously estimated annual O&M quantities and cost were used. Both the 1D and 2D model showed little to no change in the annual dredging requirements for this reach.

For the purpose of comparing alternatives, the construction costs shown in Table 3-9 were used for each alternative. Table 3-10shows the comparison of Net Excess Benefits and B/C ratio for each alternative based on the 1D model and 2D model. Highlighted in yellow is the alternative that provided the greatest Net Excess Benefits based on the maintenance dredging quantities from the 1D model. This was identified as the TSP in draft GRR and SEIS. Also highlighted in yellow is the alternative that provides the greatest Net Excess Benefits based on the results from the 2D model.

Table 3-10 Economic Comparison

1D Model Results				
Alternative	Total Average Annual Cost	Total Average Annual Benefits	Net Excess benefits	B/C Ratio
TSP (Alternative 3d)	$ 21.7 M	$ 117.2 M	$ 95.5 M	5.4
Alternative 3	$ 138.7 M	$ 148.5 M	$ 9.8 M	1.07
Alternative 3e	$ 111.5 M	$ 139.9 M	$ 28.4 M	1.3
2D Model Results				
TSP (Alternative 3d)	$ 3.7 M	$ 117.2 M	$ 113.5 M	31.7
Alternative 3	$ 12.6 M	$ 148.5 M	$ 135.9 M	11.8
Alternative 3e	$ 10.3 M	$ 139.9 M	$ 129.6 M	13.5

3.12.3 Change in the NED Plan

As identified in the draft report, based on the estimated dredging quantities from the 1D model, the alternative that provided the greatest net excess benefits, at the time of the TSP selection, was Alternative 3d, which recommended construction of a 50 ft navigation channel from the Gulf of Mexico through the Port of South Louisiana, while the navigation channel within the jurisdictional limits of the Port of Baton Rouge would remain at the presently constructed depth of a -45 ft. In the draft report, this alternative was identified as the NED Plan and TSP.

The estimated dredge quantities from the 2D model identify Alternative 3, rather than Alternative 3d, as the alternative having the greatest net excess benefits. Alternative 3d proposes the construction of a -50 ft deep navigation channel from the Gulf through the Port of Baton Rouge as the NED Plan. In May of 2017, USACE conducted an Agency Decision Milestone (ADM) meeting, during which MVN presented the results and comparison of the 1D and 2D models. The decision reached in the ADM meeting was to proceed with Alternative 3 as the Recommended Plan for further analysis and design through feasibility level design, and for the preparation of the final GRR and SEIS.

3.13 Feasibility Level Design

The draft report identified the need for feasibility level design of the TSP. The feasibility level design was intended to reduce the level of risk associated with the Recommended Plan when presented in the final report. Performance of feasibility level design necessary to complete the final GRR and SEIS included, but was not limited to, the evaluation of sea level rise, training works, salt-water intrusion and mitigation measures, geotechnical analysis and the further refinement of relocation and real estate needs. This evaluation is intended to confirm and further optimize the TSP or, alternatively, to identify that the assumptions used in the selection of the TSP were incorrect. For this study effort, it was identified that the conclusions reached in the selection of the TSP described in the draft GRR were incorrect and that Alternative 3 should be the Recommended Plan. With the approval to proceed with Alternative 3 as the recommended plan, Feasibility Level design was performed on this alternative.

3.13.1 Consideration of Climate change and Relative Sea Level Rise (RSLR)

3.13.1.1 Eustatic Sea Level Rise Effects on Dredging

Both the 1D and 2D hydraulic models considered the sensitivity of the dredging indices to SLR. For the 1D model for each proposed depth, simulations were conducted for no eustatic sea level rise and for the rates proposed by the National Research Council NRC 1 and NRC 3 curves. The study considered a eustatic sea level rise condition that does not take into account the influence of subsidence on apparent change in sea level rise (a subsidence sensitivity analysis was also completed). This was considered a worst case condition for sediment deposition in the channel as a result of channel deepening, and the influences of SLR. Use of the eustatic sea level rise condition identified the change in sediment that was introduced solely by sea level rise in the NRC 1 and 3 simulations.

For the 2D model, the sensitivity analysis for SLR was performed on Alternative 3d as it was the TSP at the time the modeling started. The model considered the sensitivity based on the low,

medium, and high SLR. Figure 3-13 shows the results of this sensitivity analysis for Alternative 3d.

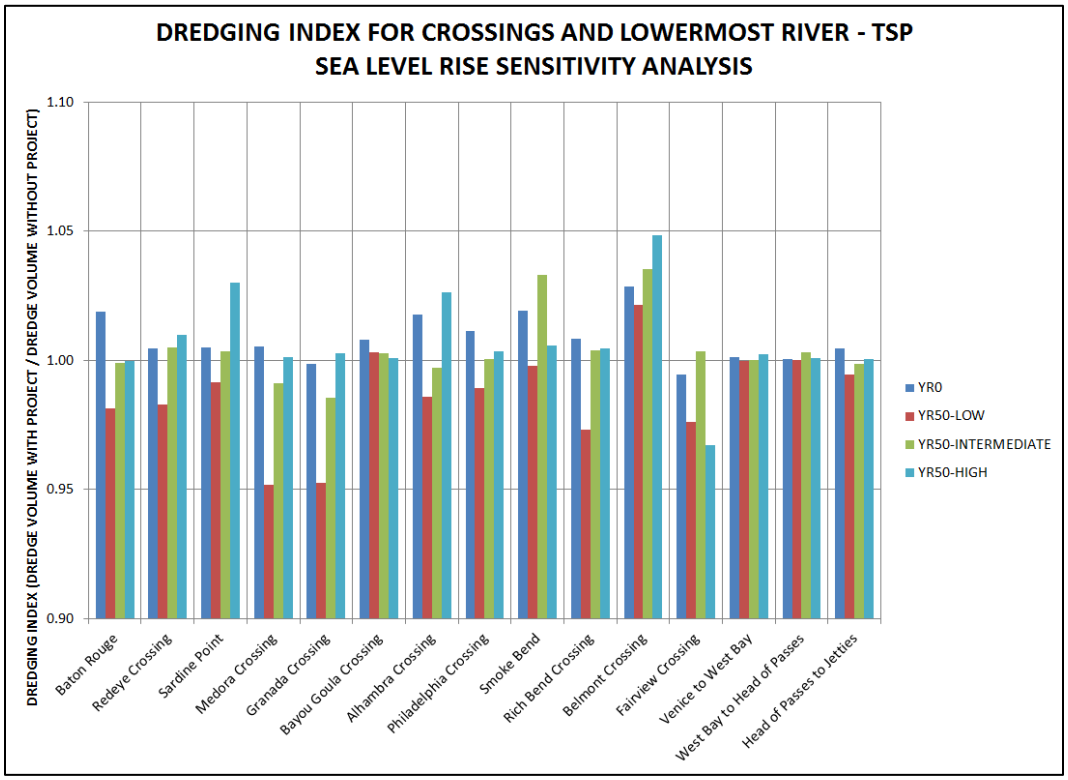


Figure 3-9 Sea-Level Rise Sensitivity Analysis

Both the 1D and 2D model show very little sensitivity to sea level rise for any of the future sea level changes. For the lower reach of the river from Venice to the Gulf (shown in the columns labeled Venice to West Bay, West Bay to Head of Passes, and Head of Passes to the Jetties), SLR for all three conditions had little to no impact on the dredging indices. For the crossings, the greatest difference observed is for the low SLR scenario, which shows a decrease in the dredging quantities for Alternative 3d. However, the magnitude of the influence of sea level on all of the results is small, and, therefore, it is not necessary to identify the true cause of this behavior in order to assess the sensitivity of the scenario analyses to sea level.

Because the eustatic sea level rise condition does not consider the effects of subsidence, a sensitivity analysis was conducted with the 2D model. Observations indicate that there is significant subsidence in the Lowermost Mississippi River, in some places as high a 20mm/year. The subsidence is known to vary spatially and (possibly) temporally, and there is significant uncertainty in the magnitude of the subsidence at any given location. To address the uncertainty of subsidence, a sensitivity analysis was run on the 3D model results. The sensitivity analysis indicated that for low and high SLR conditions, the dredging indices varied between 0.97 to 1.03,

indicating that the sediment disposition is relatively insensitive to the uncertainty in future sea level and/or subsidence.

The sensitivity analysis for SLR was performed on the Alternative 3d, however since the results indicate the magnitude of influence of SLR is small, it is believed the results would be similar for Alternative 3. The modeling shows that the alternatives are insensitive to the influence of relative sea level rise, and, therefore, this is likely not to influence plan selection. Therefore additional modeling was not performed for the Recommended Plan Alternative 3.

3.13.1.2 Evaluation of Salt Water Intrusion

Salt-water intrusion is a concern in the lower portion of the river during periods of low flow in the water. Salt water from the Gulf migrates upstream along the bottom of the river, below the less dense freshwater. As discussed in Chapter 2, this poses a problem for the municipal water intakes along the lower Mississippi River. In order to mitigate potential impacts of the salt water wedge, a sill is constructed at RM 64.1 AHP, to block the salt water wedge's migration upriver.

A Delft 3D model was used to simulate the impacts of implementing the Recommended Plan on salt water intrusion. The scope of the model considered how the Recommended Plan would impact the duration and frequency of salt water intrusion; whether the salt water intrusion would migrate further upriver; and the effectiveness of the barrier sill, for both the current project conditions and the Recommended Plan. The 3D model only considered the low SLR condition, as this condition has the greatest projected impacts on salinity.

The model showed the duration of the wedge was somewhat longer for the proposed -50 ft depth over the existing 48.5 ft depth. However for conditions modeled with the sill in place, the sill was effective at blocking saltwater intrusion for fresh water intakes located upstream, i.e. Plaquemines. The 50 ft project depth, with the sill in place, results in longer durations of elevated chloride levels at the freshwater in-take located downstream of the barrier sill in Boothville and Port Sulphur. However the mitigation measures implemented under the project included pipelines and reservoirs to supply freshwater to communities located downstream of the sill (Refer to Section 3.4.1.5 for additional information on the reservoir).

Scenarios in which the salt water intrusion was modeled without the sill in place showed that for both the current -48.5 ft and -50 ft depths, the toe of the wedge migrated no further upstream than RM 90 AHP. Scenarios in which the model considered the sill in place, indicated that the sill proved to be a sufficient impedance, preventing further upstream progression of the wedge even with the increased channel depth. The wedge did not progress past the barrier sill with -50 ft depth conditions. A detailed assessment of the 3D model and results is provided in Engineering Appendix C.

3.13.1.3 RSLR effect on other project features

The Mississippi River Southwest Pass channel training structures include pile dikes, foreshore stone protection and stone jetties. These features serve various functions such as erosion control, wake reduction (SW Pass), and increasing channel velocities to reduce shoaled sediments and dredging. The design elevation for the Southwest Pass jetties is 6 ft NAVD88, which does provide protection for future sea level rise increases when considering NRC future accelerated SLR.

Storms, subsidence, and continual tidal/wave action have deleterious effects on the training structures and it is unknown how each of these individually contribute to the damage overtime. For example if rock is missing or elevation is lost on the foreshore dikes or the jetties, it is not known if the damage is resulting from storms, wind, wakes, subsidence or a combination. There is no way to clearly identify damage that is resulting directly from subsidence or sea level rise. Annual O&M project funding is typically exhausted on dredging the deep draft navigation channel and in most years is not adequate to maintain channel dimensions. The majority of funding for repairs to channel training structures over the past 20 years has come from Supplemental packages based on emergency appropriations. To properly maintain the channel training structures, additional annual funding would be required. Table 3-11 provides information for funds expended from 2004-2017 to repair portions of the system based on the limited funds provided.

Table 3-11 Repair of Training Works, Funding Types and Comparison to Annual O&M Funding Needs

Year and Type of Repairs	Amount	Funding Type	Annual Funding required for all Training works
2004 Stone Repairs	$1.0M	Regular O&M funds	$15M
2005 Stone Repairs	$0.4M	Hurricane Supplemental funds	$15M
2007 Stone Repairs	$0.4M	Regular O&M funds	$15M
2009 Stone Repairs	$22.3M	American Recovery and Reinvestment Act funds	$15M
2009 Pile Dike Repairs	$36.3M	Hurricane Supplemental funds	$15M
2012 Stone Repairs	$16.5M	Disaster Relief Supplemental funds	$15M

Channel features such as channel training works, Hopper Dredge Disposal, and the jetties will require the same O&M costs to adapt to future sea level rise for the current project as well as for all alternatives considered. Based on need and capability an estimate of $37.7 Million/ Year is

required to maintain project features including the New Orleans, HDDA, and training works. The same cost would be required for all deepening alternatives considered as compared to the current project. Therefore this does not result in an incremental increase in OMRR&R requirements and does not impact the selection of the Recommended Plan.

3.13.1.4 Consideration of Project features and RSLR over a 100 yr period of analysis

A 100 year, FWOP, HEC-RAS 1D model run was completed for the lowermost Mississippi River under the Louisiana Coastal Area (LCA), Mississippi River Delta Management (MRDM) Study. The model extended to RM 18 BHP which included channel training works but not the Southwest Pass jetties. In the model, the bankline and training structures (foreshore dikes) were maintained (assuming that they would be adapted as part of O&M to respond to RSLR) to allow the model to run within a 1D framework. Future channel dredging was sustainable for sand volume remained the same but the location of dredging shifted upstream. The model indicated an increase in fine-grained sediment deposition as velocities increased with RSLR; However, finer sediments cannot be modeled with accuracy in a 1D hydrodynamic model because of the 3D effects of salinity on sediment transport in the lowermost river. The model results indicate that, for the current project depth, these features will continue to function as intended as long as they are maintained in response to RSLR.

3.13.2 Geotechnical Analysis

The recommendation to deepen the channel from its current depth to the proposed depth of -50 ft could have a negative impact on the existing channel conditions for both bank and levee stability. Under the current OMRR&R program, the current channel, for the locations routinely dredged, is analyzed regularly to determine levee and bank stability. For the lower portion of the river from the Venice to the Gulf, the existing Factor of Safety is great enough that there is little concern that deepening would have an impact on levee or bank stability.

For the crossings, eight of the twelve crossings have existing factors of safety that are at or near critical conditions. For the Mississippi River, critical conditions exist when the factor of safety of the levee into the channel is below 1.30, or when the bank safety factor is below 1.20. Table 3-12 provides a summary of the minimum safety factors within each river crossing:

Table 3-12 Reported safety factors based on 2016 surveys

River Crossing	Minimum Levee Safety Factor	Minimum Bank Safety Factor

Baton Rouge Front	1.32	1.13
Red Eye	1.46	1.19
Sardine Point	1.56	1.07
Medora	1.65	1.35
Granada	1.31	1.39
Bayou Goula	1.58	1.28
Alhambra	1.38	1.19
Philadelphia	1.43	1.15
Smoke Bend	1.41	1.28
Rich Bend	1.37	1.19
Belmont	1.56	0.93
Fairview	1.25	1.14

Of these crossings, geotechnical analyses indicate the need to further evaluate two crossings, Alhambra and Belmont, since the proposed dredging in these crossings falls outside of the permissible excavation limits for geotechnical investigation. The analyses indicated that deepening of the crossings would not negatively affect the existing factors of safety.

Further analysis of the crossings will be conducted during Engineering and Design for construction of the project. During this time, should the factors of safety change, additional measures including flattening of the existing slopes or placement of revetment or underwater rock stability berms in the channel may be required. This potential additional project cost was included in the cost risk analysis.

3.13.3 Evaluation of Training Works

Training works were considered as a structural management measure, to reduce the annual dredging requirements in the crossings. Due to the various combination in which training works could be implemented in the crossings, it was determined that this evaluation would be performed during feasibility level design. Based on the results of the 2D hydraulic modeling, deepening of the crossings from -45ft to -50ft LWRP, results in only a nominal increase in sediment disposition. It was determined that there was little opportunity to improve sediment disposition related to deepening of the crossings, and evaluation of training works was not carried forwarded.

3.13.4 Relocations

The relocations for the project may consist of relocating pipelines and submarine cables crossing the river at locations that require dredging to achieve the depth of -50 ft for the TSP. At the time of the draft report, the estimated cost for relocations was $40M. This was based on a preliminary assessment of utilities located within locations that would require construction to provide the -50 ft draft from Baton Rouge, beginning at RM 232.4 AHP and extending to the Gulf of Mexico,

ending at RM 22 BHP. This estimate included utilities located within the 12 crossings located within the Port of Baton Rouge, and the Port of South Louisiana. Once alternative 3d was identified as the TSP, the estimate was reduced to $11.6M based on utilities located within the three crossings located within the footprint of the Port of Baton Rouge. These estimate were carried forward, and included in the first construction cost for the purpose of comparing alternatives.

Since identification of the Recommended, Plan as Alternative 3, CEMVN Engineering Division Relocation Section, began contacting and coordinating with all utility owners located within the project foot print. Based on this coordination the estimated cost for relocations is $80.16M, including contingencies, this project cost was carried forward for the benefit to cost analysis of the recommended plan.

In accordance with memorandum from the Director of Real Estate dated January 10, 2013 SUBJECT: "Real Estate Policy Guidance Letter No. 31 – Real Estate Support to Civil Works Planning Paradigm (3x3x3)", and with similar guidance from the Office of the Chief Counsel (CECC-R) dated January 14, 2013, SUBJECT: CECC-R Bulletin 13-01, Preliminary Attorney's Opinion of Compensability, a compensability determination, in the form of a preliminary attorney's opinion of compensability, will be performed during feasibility level design only if the estimated relocation costs exceed 30% of the estimated total project cost. If the estimated total relocation costs do not exceed 30% of the estimated total project cost, the real estate assessment will address compensability, deferring the preparation of an attorney's opinion of compensability until the PED phase of project implementation. The total project construction cost for the Recommended Plan is estimated at $237.6M; therefore, the $80.16M is greater than 30% of the total project cost. Based on this a preliminary attorney's opinion on compensability is required, a summary of which is included in Appendix B.

3.13.5 Preliminary Assessment of Dredge Material Management Disposal Plan (DMMP)

In order to determine that the current OMRR&R methods for dredging and disposal of material for the MRSC is sufficient for both the current project and proposed deepening, a preliminary assessment of the current DMMP was required.

Modeling by ERDC for the lower Mississippi river from RM 13.4 AHP to RM 22 BHP, indicated that deepening the channel from -48.5 ft to a depth of -50 ft MLLW had little to no impact on the estimated dredging quantities. Therefore deepening the channel does not impact current dredging and disposal practices, and these practice may continue under both the current project and the proposed deepening.

In order to determine if deepening from -45ft to -50 ft LWRP would have an impact on dredging and disposal practices in the crossings, ERDC completed additional modeling and analysis. The

purpose of this additional work was to determine the degree to which the current practices of dredging the crossings, and placement of dredged material in the Mississippi River impacted dredging further downstream for both the current project and the proposed deepening. The modeling indicated that the current practices result in re-handling ~ 18% to 32% of material for the -45 ft channel. For the -50 ft channel, there is not a significant increase with, re-handling of material estimated at 21% to 36%. Results of that analysis are included in Appendix H.

The results of the analysis indicate that deepening the channel from the current -45 ft LWRP to -50 ft LWRP does not affect the current dredging and disposal practices for the crossings; therefore, the current dredging practices may continue under the proposed deepening to -50 ft. Appendix K includes the Preliminary Assessment for the Dredge Material Management Plan and the assessment documents that estimated dredging for both the current -45 ft project and the proposed -50 ft project. The dredge material management plan should be reassessed every 20 years to ensure the practices are still sufficient in future years.

3.13.6 Real Estate Requirements

The draft report identified the potential need for acquisition of additional land for disposal of dredge material in the lower portion of the river from Venice to the Gulf of Mexico. The estimated cost for potential acquisition was $2.5M. However both the 1D and 2D model show that deepening of the MRSC in this reach from the current depth of -48.5 ft to depth of -50 ft MLLW has little to no impact on the estimated annual dredge quantities. Based on the preliminary assessment of the DMMP, dredging and disposal methods would continue under the current practice, and there is no need for acquisition of additional land at this time.

3.14 Recommended Plan

Based on the review of significant comments from public, IEPR, and ATR, the results of further hydraulic modelling, and feasibility level design, the Recommended Plan is Alternative 3. The Recommended Plan provides deep draft navigation to a depth of 50 ft from the Gulf beginning at RM 22 BHP through the Port Baton Rouge ending at RM 232.4 AHP. This would be accomplished by constructing and maintaining the MRSC to -50 ft MLLW in the lower Mississippi from RM 13.4 AHP to RM 22 BHP, and by deepening the twelve regularly maintained crossings located within the Port of South Louisiana and the Port of Baton Rouge to -50 ft LWRP. The material dredged during construction of the RM 13.4 AHP to RM 19.5 BHP reach would be placed in locations designated for beneficial use of dredged material. The material would be deposited as uniformly as practicable within the Federal Standard to create intertidal coastal wetland habitat. The material dredged during construction of the RM 19.5 BHP to RM 22.0 BHP reach would be placed in the ODMDS.

All other reaches of the river have depths that are naturally greater than 55 ft. In the present condition, these reaches do not require construction or operation and maintenance to provide deep draft access to 50 ft. However, it is the intent of the GRR that should existing conditions change in these reaches, the district would exercise its authority to conduct operation and maintenance actions to maintain the authorized depth and width to the extent approved for construction and supported by an executed cost-sharing agreement with the non-Federal sponsor. The purpose of this integrated GRR and SEIS is to evaluate any significant changes in environmental baselines (e.g. coastal wetlands, human environment, etc.) that may have occurred since completion of the Feasibility Study and Environmental Impact Statement in 1985, and to ensure the project would still be compliant with all pertinent environmental regulations. If, in the future, the project requires dredging in areas outside of those evaluated in this SEIS, additional analysis could be required under NEPA and other environmental laws and regulations.

Since release of the draft GRR and SEIS in December of 2016, this Chapter has been revised to reflect additional plan formulation and analysis that occurred leading to a change from the Tentatively Selected Plan as identified in the Draft Report, to the Recommended Plan described in Chapter 3. The impacts of each alterntive, including the Recommended Plan, were disclosed in the Draft Report. Compilation of a Preliminary Assessment Dredge Material Management Plan determined that additional disposal areas in the lower portion of the river are not required, therefore references to new disposal sites have been removed. In addition, the CAA general conformity evaluation for non-attainment parishes has been been revised and a construction schedule developed.

4.0 ENVIRONMENTAL CONSEQUENCES FOR COMPARATIVE ANALYSIS

This chapter describes the significance of environmental impacts to each identified resource by examining the context and intensity of the direct, indirect, and cumulative environmental consequences of implementing 4 alternatives, including the no-action. For example, the significance criteria for air quality cumulative impacts would be an exceedance of a chronic or acute state air quality standard caused by the proposed project in conjunction with other listed projects. The discussion of resources in this chapter sequentially follows the discussion in Chapter 2.

As detailed in Chapter 3, after completion of the report, public comment, and consideration of all remaining data, final feasibility level designs will be developed for the Recommended Plan. In order to conduct a comparative analysis of the final alternative array, alternatives were “brought up” to a similar level of detail using assumptions derived from data collected during development of the Recommended Plan. Estimates developed from that analysis provide the basis for comparing potential impacts to significant resources from the alternatives in the Final Alternative Array to potential impacts from the No-Action Alternative.

The direct project-related impacts would occur within the navigation channel of the Mississippi River, in designated beneficial use placement areas adjacent to the river, South of Venice, LA. As such, for the purposes of environmental discussion and analysis, the scope of the potentially affected environment has been defined as the Mississippi River corridor between Baton Rouge and the Gulf of Mexico via Southwest Pass, and the surrounding coastal habitat in lower Plaquemines Parish, LA where dredged material would be used beneficially within the limits of the Federal Standard. Alternatives were compared by total NED cost and benefits; however, consideration of the following factors were also used for the evaluation and comparison of alternative plans in light of the important resources discussed in this Chapter.

- Constructing the sill and other saltwater mitigation measures for salt water intrusion impact
- Potential loss of sediment resources for other purposes
- Construction for each depth
- Dredge quantities
- Acres of beneficial use from initial construction (*incidental benefits)*
- Long term O&M for each depth
- Annual O&M dredge quantities
- Location of shoaling
- Acres of beneficial use from long term O&M dredged material placement within the Federal Standard (*incidental benefits)*
- Due to unpredictable river conditions and navigational needs, an assumption of uniform placement of dredge material was carried forward with the environmental analysis.

4.1 Description of Alternatives

The following alternatives represent the final array:

- **Alternative 1 (No action/Future Without Project):** Current project dimensions would be maintained at -45 ft LWRP for the 12 actively maintained crossings within the Ports of Baton Rouge and South Louisiana and at -48.5 ft MLLW in the lower Mississippi from RM 13.4 AHP to RM 22 BHP
- **Alternative 2**: Construction and maintenance to -48 ft LWRP for for the 12 actively maintained crossings within the Ports of Baton Rouge and South Louisiana and to -48.5 ft MLLW in Lower Mississippi River from RM 13.4 AHP to RM 22 BHP
- **Alternative 3**: Construction and maintenance to -50 ft LWRP for the 12 actively maintained crossings within the Ports of Baton Rouge and South Louisiana and -50 ft MLLW in Lower Mississippi River from RM 13.4 AHP to RM 22 BHP
- **Alternative 3d**: Construction and maintenance to -50 ft LWRP for the 3 crossings located within the footprint of the Port of South of Louisiana and to -50 ft MLLW in the Lower

Mississippi River from RM 13.4 AHP to RM 22 BHP. The 9 crossings located within the footprint of the Port of Baton Rouge would remain at -45 ft LWRP.

The direct, indirect and cumulative impacts of alternatives are evaluated in this chapter in order of the cubic yardage dredged over the 50-year period of analysis (i.e., Alternative 3 > Alternative 2, > 3d (Table 4-1). Alternatives 2 and 3d had comparable, and often times smaller resource impacts than those identified under Alternative 3. In order to minimize redundancy, the level of detail in the following discussion of impacts associated with Alternatives 2 and 3d is less than that detailed for Alternative 3. In order to prevent redundancy throughout the report, many of the impacts discussions for Alternatives 2 and 3d directly reference the impacts disclosed under Alternative 3.

This chapter presents an evaluation of alternatives in terms of the anticipated incremental impacts of each alternative beyond the no-action alternative / existing conditions (Table 4-1). Cumulative impacts of each alternative are discussed separately in Section 4.5 (Table 4-6). Impacts to important resources by alternative are discussed below in light of experiences with historical O&M practices and the final results of 3 hydraulic sedimentation models that have been completed for the study.

A one-dimensional (1D) sedimentation model based on the HEC-6T computer program was used to investigate long-term (multi-decade) system response to channel deepening alternatives (discussed in detail in Appendix C). System response was evaluated by comparison of plan condition (channel deepening) simulations to base condition (45 ft channel) simulations. The upstream shift in deposition projected by the 1D model is accompanied by a very slight reduction in deposition below Head of Passes. That reduction occurs because less sediment is transported into Southwest Pass; however, there is still an ample supply of fine sediment entering the Pass. The 1D model result does not rule out the possibility that increased salinity and sediment flocculation will yield a net increase in fine sediment deposition.

An Adaptive Hydraulics (AdH), two-dimensional (2D) sedimentation model was used to investigate the potential effects of channel deepening on maintenance of the channel crossings (upstream of Belle Chasse, LA) and shoaling and/or lateral bar growth (downstream of Belle Chase, LA). An existing 2D model developed for the Mississippi River Hydrodynamic and Delta Management Study was adapted to the requirements of this study. The results of this model indicated that O&M within the crossings would be substantially less than anticipated in the Draft GRR and SEIS. This model was a key driver in the selection of Alternative 3 as the Recommended Plan.

A three-dimensional (3D) model, Delft, was used to investigate the potential effects of channel deepening on the migration of the salt water wedge upriver from the Gulf of Mexico for the

Recommended Plan. The analysis considered three key components: (1) if deepening of the channel would cause the salt water wedge to migrate further upriver; (2) if deepening of the channel would impact the duration and frequency of the salt water migration; and (3) the effectiveness of the barrier sill in preventing the migration of the saltwater wedge upriver where it could impact fresh water intakes. The model looked at the location of the toe of the wedge without the sill in place.

It may be worth noting, that the large scale diversions that are currently being proposed upriver from Venice, LA, if constructed, would have much larger potential impacts on shoaling than sea level rise and channel deepening. Those diversions, if constructed and depending on size, could shift deposition to a location upstream of Venice, LA. In "wet" years, the combined effects of sediment diversions and increased upstream deposition could potentially reduce sediment loads passing Venice enough to reduce dredging downstream of Venice, LA. However, because future diversions are not part of the reasonably foreseeable future, impacts to future diversions associated with project alternatives are not evaluated.

4.1.1 No Action/Future Without-Project Conditions (Alternative 1)

Direct and Indirect Impacts: Under the No Action Alternative, current O&M dredging of the 12 river crossings to -45 ft LWRP and of the lower river to -48.5 ft MLLW would continue. There would be no direct impacts due to construction under the no-action alternative. Annual O&M dredging of the project area would continue at an average 38,650,000 cy per year and would establish approximately 528 acres of intermediate marsh in existing disposal areas annually. Existing conditions and trajectories of ecological change to aquatic resources would persist, as described in Section 2.4. The area would be subjected to increases in relative sea level rise which could increase saltwater intrusion and lead to increases in and the potential conversion of vast areas of adjacent marsh to open water. Much of the area, could be permanently inundated under both the intermediate and high RSLR scenarios. There could be a shift from fresh water dominant species to those species that can tolerate higher salinity.

The saltwater barrier sill would continue to be constructed at the same location, as necessary, during extended low water conditions (Appendix A-6). Although there may be a potential for the sediment source of the sill to be shared with outside parties, CEMVN Regulatory permits would be required, and those permits would require special conditions and limit use of the sediment source to allow the construction of the sill when necessary. Enforcement of the permit conditions are the responsibility of the Regulatory Branch of CEMVN.

Other than dredging amounts, many of these conditions will continue and many of these forces will continue to change the environment regardless of the implemented alternative.

4.1.2 Alternative 3 (Recommended Plan)

Alternative 3 would require construction (8,600,000 cubic yards) and maintenance (1,600,000 cubic yards annually) of twelve regularly maintained river crossings within the Ports of Baton Rouge and Souith Louisiana to -50 ft LWRP. It would also require the construction (21,500,000 cubic yards) of the lower river (RM 13.4 AHP – RM 22 BHP) to -50 ft MLLW, however, maintenance is not anticipated to increase in the lower river. The proposed deepening would occur within reaches that are currently maintained. Construction and O&M quantities under Alternative 3 for the crossings and the lower river are exhibited in Table 4-1. It should be noted that changes in advanced maintenance and allowable over depth (Appendix A-3) are not proposed under this alternative.

Alternative 3 would target open water environments to create coastal habitat via beneficial use to the extent allowed within the limits of the Federal Standard. Alternative 3 would not impact wetlands but for occasional unavoidable, minor, temporary impacts incedental and necessary for wetland creation on a much larger scale. As such, this project would not require compensatory mitigation (Section 4.6). Despite mitigation not being a requirement for the project, preliminary marsh model wetland value assessments (WVA) were performed to quantify the direct ecosystem effects of the project from beneficial use by both construction and O&M using the best available tool (Appendix A-7).

The WVA marsh model was used only as a general reference tool for this study, but was not used to develop compensatory mitigation features. Instead, the model is incorporated to complement the discussion of benefits achieved from the overall acres created. It should be noted that this model has not yet been certified by USACE, nor has it been formally approved for use for this project. However, the model has been approved for prior use on 34 coastal projects by the Deputy Chief, Planning and Policy Division by letter dated February 28, 2012. Because many reports have been submitted and approved using this model, the model is believed to be sufficiently accurate to complement the general discussion of acres of marsh created and benefits achieved therefrom.

Table 4-1 Incremental impacts (net change) of each alternative as measured in cy dredged. Alternative 1 (No Action) is included for comparison of other alternatives to current O&M dredging/existing conditions.

	Crossings Construction	Lower River Construction	Annual O&M Crossings	Annual O&M Lower River
Alt. 1	0	0	16,400,000	22,250,000
Alt. 2	5,467,000	0	950,000	0
Alt. 3	8,600,000	21,500,000	1,600,000	0
Alt 3d	616,500	21,500,000	0	0

Depending on need and availability, construction and maintenance activities would utilize dustpan and hopper dredges to maintain the crossings, and hopper and cutterhead dredges would be utilized in the lower river under Alternative 3. It is anticipated that construction and maintenance would occur across 12 regularly maintained crossings within the Ports of Baton Rouge and South Louisiana. Material dredged during construction and maintenance of crossings would continue to be placed immediately adjacent to the channel and downstream, (via agitation dredging from dustpan, direct deposit from hoppers), in areas greater than -50 ft LWRP. There are no feasible opportunities for beneficial use of the dredged material due to the location of the dredging areas (densely populated areas with no onshore disposal sites, Mississippi River mile 121 to 234 AHP), the rapid shoaling conditions in this segment of the project and the unacceptable time & costs under the limitations of the Federal Standard regulations to either perform hopper pump out or barging of material to beneficial use sites (100 to 234 miles from coastal LA).

Construction of the lower river would occur at various shoals from RM 13.4 AHP to RM 19.5 BHP with cutterhead dredges over 4 years and that all material would be used beneficially to the extent possible under the Federal Standard, and disposal in the HDDA would be unnecessary (Figure 2-9). It is anticipated that construction from RM 10 AHP to RM 19.5 BHP would result in 1462 acres of coastal habitat over the 4-year construction period. It is also anticipated that construction of the bar channel would occur at shoals from RM 19.5 BHP to RM 22 BHP with hopper dredges (because cutterhead dredges are too large) utilizing the Ocean Dredge Material Placement Site (ODMDS) over 4 years (Figure 2-9). This construction was approved by EPA on July 27, 2017 (Appendix A-13). One dimensional sedimentation modeling concluded that shoaling in the lower river would not be anticipated to increase as a result of deepening from 48.5 ft to 50 ft (Appendix C). As such, maintenance of the lower river would not be anticipated to increase. Alternative 3 is not anticipated to require additional maintenance dredging at a depth of 50 ft in the lower river; therefore an incremental benefit from beneficial use of dredged material, within the limits of the Federal Standard, during annual maintenance is not anticipated.

The area identified for available beneficial use placement (subject to the Federal Standard limiations) approximates 143,264 acres cleared previously under NEPA, (Figure 4-1).

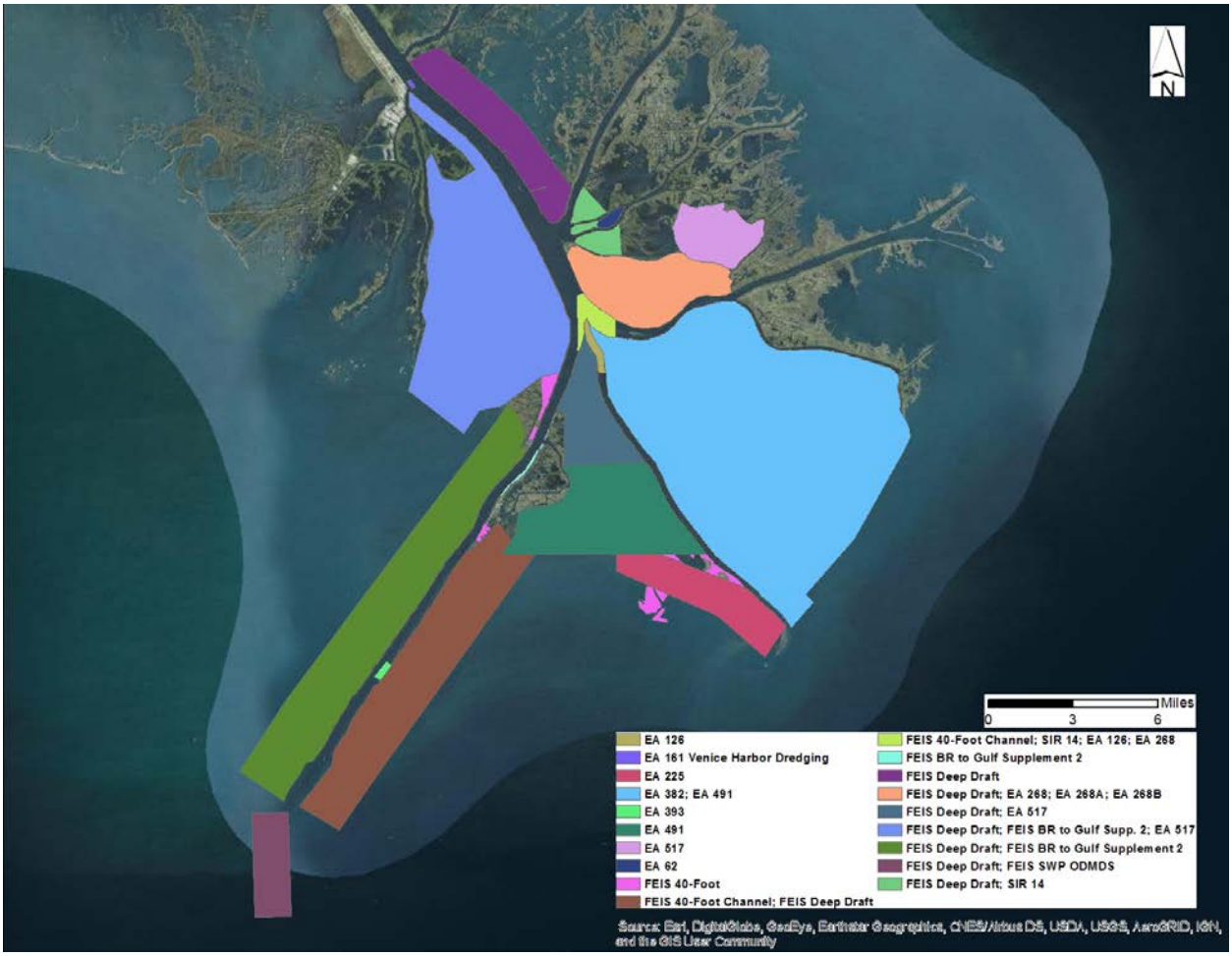


Figure 4-1 Available beneficial use placement areas and their associated NEPA docments.

4.1.3 Alternative 2

Alternative 2 would require construction (5,467,000 cubic yards) and maintenance (950,000 cubic yards annually) of twelve regularly maintained river crossings within the Ports of Baton Rouge and South Louisiana to -48 ft LWRP. Alternative 2 would not require construction or additional maintenance in the lower river.. Construction and O&M quantities under Alternative 2 for three crossings and the lower river are exhibited in Table 4-1. Constructing and maintaining the deep draft crossings from -45 ft LWRP to -48 ft LWRP would typically require the use of dustpan dredges; however, hopper dredges and cutterheads may occasionally be utilized in emergency situations. Material for both construction and maintenance would be placed immediately adjacent to the channel and/or downstream in areas greater than -50 ft LWRP. It should be noted that changes in advanced maintenance and allowable over depth (Appendix A-3) are not proposed under this alternative.

4.1.4 Alternative 3d

Alternative 3d would require construction (616,500 cubic yards) of the three southernmost regularly maintained river crossings (located within the Port of South Louisiana) to -50 ft LWRP; however, maintenance of the crossings is not anticipated to increase. Alternative 3d would also require construction (21,500,000 cubic yards) to deepen the lower river (below RM 13.4 AHP) to -50 ft MLLW; however, after construction, O&M is not anticipated to increase. Construction and O&M quantities under Alternative 3d for three crossings and the lower river are exhibited in Table 4-1. Alternative 3d only differs from the Recommended Plan (Alternative 3) in that it would deepen and maintain fewer crossings (i.e., a subset of 3 crossings vs. 12 crossings) to -50 ft LWRP. For Alternative 3d, activities in the lower river would not differ from those previously described under Alternative 3. Rather than deepening the 12 crossings, Alternative 3d would deepen a subset of those crossings, specifically Rich Bend crossing (Mile 160-155), Belmont crossing (Mile 156-151), and Fairview crossing (Mile 117-111). Deepening this subset of crossings would allow for deep draft access to the Port of South Louisiana but not to the Port of Baton Rouge.

4.2 Water Environment

4.2.1 Mississippi River

<u>No Action/Future Without-Project Conditions (Alternative 1)</u>

Direct and Indirect Impacts: O&M activities within the Mississippi River would continue, however, there would be no direct impacts under the no action alternative. Annual O&M dredging of the project area would continue at an average of 38,650,000 cy per year and would establish approximately 528 acres of intermediate marsh annually in existing disposal areas. Existing conditions and trajectories of ecological change to aquatic resources would persist, as described in section 2.4. The area would be subjected to increases in relative sea level rise which could increase saltwater intrusion and lead to increases in and the potential conversion of vast areas of adjacent marsh to open water. Much of the area, could be permanently inundated under both the intermediate and high RSLR scenarios. There could be a shift from fresh water dominant species to those species that can tolerate higher salinity.

The saltwater barrier sill would continue to be constructed at the same location, as necessary, during extended low water conditions (Appendix A-6). Although there may be a potential for the sediment source of the sill to be shared with outside parties, CEMVN Regulatory permits would be required, and those permits would require special conditions and limit use of the sediment source to allow the construction of the sill when necessary. Enforcement of the permit conditions are the responsibility of the Regulatory Branch of CEMVN.

Other than dredging amounts, many of these conditions and forces will continue to change the environment regardless of the alternative implemented.

Alternative 3

Direct and Indirect Impacts: Under Alternative 3, the project area would be constructed and maintained to a depth of 50 ft. The recent trend in shoaling between RM 13.4 AHP and RM 6 AHP in the vicinity of Venice, LA, is anticipated to increase due to additional channel deepening and eustatic sea level rise. Because MVN places material directly back into the downstream channel as it dredges the crossings within the Ports of Baton Rouge and South Louisiana, the sediment within the river system is not anticipated to decrease. As such, construction and maintenance of the crossings is not anticipated to have an impact on existing diversions as the sediment budget of the river would remain constant (Table 2-3, Figure 2-8). Because construction and maintenance of the lower river would remove sediment from the system, negative impacts (i.e., additional shoaling) in existing anchorage areas are not anticipated and dredging is not anticipated to increase.

Construction of crossings to 50 ft LWRP would require 8,600,000 cy over a 3-4 year period (Table 4-1). Once constructed, average annual maintenance of crossings would increase from existing practice by approximately 1,600,000 cy in these crossings. Dredged material would remain in the Mississippi River system and would be disposed of adjacent to the channel or in deeper portions of the river immediately downstream.

Construction would temporarily disrupt transportation, navigation, and commercial fishing in project areas. Increases in turbidity due to dredging activities would likely have a short duration before returning to pre-dredging conditions because sand and clay do not remain in suspension for extended periods due to large particle size. Any minor increase in turbidity would be localized within 1-2 miles of dredging depending upon the river stage; downstream turbidity would return to ambient conditions within 1-2 hours depending on river stage. Impacts to localized fisheries would be temporary and minimal because the river system is already a highly turbid system. Because MVN would dredge and place material back into the channel at the crossings, crossing construction and maintenance would not likely to affect sediment supply on existing downstream diversions.

Because of saltwater intrusion and relative sea level rise, based on study area loss rates from 1932-2010, the 1462 acres that would be created during construction of Alternative 3 would likely be reduced to 1082 acres after 50 years. However, it is anticipated that this alternative would not result in significant adverse direct or secondary impacts to this resource.

Alternative 2

Direct and Indirect Impacts: Under alternative 2, the 12 regularly maintained crossings would be constructed and maintained at -48 ft LWRP. The sediment load within the river would not be expected to change because, as CEMVN dredges each crossing, it would place material directly back into the downstream channel. As such, crossing construction and maintenance would not be likely to impact sediment supply for existing river diversions. Construction would temporarily disrupt transportation, navigation, and commercial fishing in project areas: however, these impacts would continue to be minor and temporary during the period of construction.

Construction of crossings to -48 ft LWRP would require dredging 5,467,000 cy over a 3 year period. Once constructed, average annual maintenance of crossings would increase from existing practice approximately 960,000 cy.

Marsh creation would not occur under Alternative 2 because maintenance activities would not increase in the lower river and construction would not occur; however, approximately 528 acres of coastal marsh habitat would continue to be established annually as part of the project under the no-action alternative. Because MVN dredges and places material back into the channel for the 12 crossings, crossing construction and maintenance would not likely have a cumulative impact on water levels, sediment transport, and existing diversions.

Disturbances due to dredging activities, such as increased turbidity and potential suspension of contaminants that may exist in the bed sediments, would likely have a short duration before returning to pre-dredging conditions. Impacts to localized fisheries would be temporary and minimal because the river system is a highly turbid system. It is anticipated that this alternative would not result in significant adverse direct or secondary impacts to this resource.

Alternative 3d

For Alternative 3d, activities in the lower river would not differ from those previously described under Alternative 3. Alternative 3d only differs from Alternative 3 in that it would deepen fewer crossings (i.e., a subset of crossings) to 50 ft (LWRP). A total of 616,500 cy would be dredged from water bottoms during construction and disposed of in deeper adjacent areas in the river. Once constructed, average annual maintenance within these 3 crossings would not increase in these 3 lower most crossings. (Table 4-1).

Disturbances due to dredging activities, such as increased turbidity and potential suspension of contaminants that may exist in the bed sediments, would likely have a short duration before returning to pre-dredging conditions. Impacts to localized fisheries would be temporary and minimal because the river system is a highly turbid system. It is anticipated that this alternative would not result in significant adverse direct or secondary impacts to this resource.

4.2.2 Mississippi River Delta

No Action/Future Without-Project Conditions (Alternative 1)

Direct and Indirect Impacts: O&M activities within the river would continue, however, there would be no direct impacts under the no-action alternative. The area would be subjected to increases in RSLR which could increase saltwater intrusion and lead to increases in, and the potential conversion of vast areas of adjacent marsh, to open water. Much of the area, could be permanently inundated under both the intermediate and high RSLR scenarios. There could be a shift from fresh water dominant species to those species that can tolerate higher salinity. O&M, including beneficial use within the Federal Standard, within the study area would continue as described above. The marshes of Plaquemines Parish are anticipated to continue to decline and convert to marsh and open water. However, CEMVN O&M would continue to use material beneficially for coastal habitat creation to the extent authorized under the Federal Standard. There would be no direct impacts under the no-action alternative.

The effects of human activities will continue to exacerbate land loss rates in the Plaquemines-Balize delta. Channel stabilization and levee maintenance along the Mississippi River will continue to restrict seasonal sediment-laden overbank flows that once nourished adjacent wetland areas. The Mississippi River levees to the north, and associated erosion control and channel stabilization measures extending to its mouth, will continue to limit the possibility of a naturally occurring crevasses or natural changes in the river's course. The river will continue to be maintained at its current navigational dimensions. As such, crossings would continue to require a combined annual average of approximately 16,400,000 cubic yards of dredging and have minimal effect on the delta since the material is contained within the system. Southwest Pass would continue to require approximately 19,900,000 cubic yards of dredging annually. Approximately 528 acres of coastal marsh habitat is expected to establish each year via beneficial use within the Federal Standard (Appendix A-8). Continued relative sea level rise could also impact the entire area resulting in vast areas of shallow open water as vertical accretion rates fail to keep pace with rising sea levels.

O&M dredging of the project area would continue at an average of 38,600,000 cy per year. Flow and water level trends described above are expected to continue. The gradual trend of shoaling upriver of Head of Passes between RM 6-13.4 is anticipated to continue. This is based on observations of the project indicating the migration of dredge requirements up river of this reach and proptionally fewer demands for dredging down river. Overall increase in dredging quantities in the lower river is not anticipated, Without the proposed project, the area would continue to be affected by the following:

- Federal and state water quality programs – may address land use practices in the Mississippi River basin and could impact the area water quality (Broussard 2008).

- Coastal processes – the marshes of Plaquemines Parish are anticipated to continue to decline and convert to marsh and open water, in turn affecting local water quality conditions. However, CEMVN O&M would continue to use material beneficially for coastal habitat creation to the extent possible under the Federal Standard as described previously.

- Climate change, relative sea-level rise and hurricane/tropical storm surge.

Other than dredging amounts, many of these conditions will continue and many of these forces will continue to change the environment regardless of the implemented alternative.

Alternative 3

Direct and Indirect Impacts: Deepening the 12 regularly maintained crossings upstream of New Orleans, LA, to 50 ft would not be expected to affect coastal land building/loss. Dredged material from the crossings would remain in the Mississippi River system and would be disposed of in deeper portions of the river immediately downstream; therefore, the sediment supply to the lower river is not anticipated to change.

According to wetland value assessment (WVA) models (Appendix A-7), approximately 576 AAHUs of intermediate marsh would be created as a result of the construction of 1462 acres of coastal wetland habitat under Alternative 3 from beneficial use placement within the limitations of the Federal Standard. Based on land loss, the WVA estimates approximately 1082 of the 1462 acres constructed would remain after 50 years (Appendix A-7).

According to results of the 3D model, deepening the channel to the recommended 50 ft resulted in the salt water wedge migrating no further upriver than under the current project conditions. The duration of the presence of the wedge was longer for the 50 ft project depth over the 48 ft project depth, but the barrier sill proved to be a sufficient impedance, preventing further upstream progression of the wedge even with the increased channel depth. With the barrier sill in place, freshwater intakes located downriver experienced longer durations of elevated chloride levels. As discussed in Chapter 3, recommendations from the 1983 Chief's report, and as approved for implementation in the subsequent general design documents, included measures to supply freshwater downstream of the barrier sill. However, some of these features, such as the reservoir at Davant, are currently not in a condition to provide water during a low water high salinity event. As a result, in previous low water events USACE has provided raw water via barge to the East

Point-a-la-Hache water treatment plant to enable Plaquemines Parish to provide potable water for the east bank of Plaquemines Parish located downstream.

Based on the 3D hydraulic modeling each alternative including the Recommended Plan would not impact to the current mitigation plan and measures, and for each alternative mitigation would continue as in previous years.

With implementation of the Recommended Plan there would be some minimal and insignificant impacts to wetland resources. Depending on the variable conditions of river shoaling and dredging need, and based also on the variable existing conditions of the surrounding environment at the time of dredging and beneficial use, the Federal Standard may determine that a small, undetermined amount of wetland habitat (typically < 1.0 acre) may be temporarily impacted by accessing the open water placement areas. However, these minor, incidental impacts would be temporary and would occur as an unavoidable impact of coastal habitat creation on a much larger scale. Depending on the amount of material dredged, a single dredging event could create between 60 and 600 acres of intermediate marsh. It is anticipated that, through the efforts taken to avoid and minimize impacts to wetlands and the benefits achieved from beneficial use of dredged material within the Federal Standard limitation, the marsh recreation that results from these dredged material management practices will more than functionally compensate for unavoidable remaining impacts. The proposed project would not result in overall adverse direct or secondary impacts to the aquatic environment and human environment in or near the project area. Due to the aforementioned habitat benefits achieved from beneficial use within the Federal Standard, the project is anticipated to have a net benefit in the delta area (Appendix A-7).

Alternative 2

Direct and Indirect Impacts: Coastal habitat would not be created under Alternative 2. Deepening the crossings to - 48 ft (LWRP) upstream of New Orleans, LA, is not anticipated to affect coastal land building/loss. Dredged material would remain in the Mississippi River system and would be disposed of in deeper portions of the river immediately downstream. Because the sediment would soon drop out of the water column, the sediment supply to the lower river would not be expected to change. Deepening the specified crossings would not be expected to influence the frequency and duration of saltwater wedge migration down river (Appendix C). Appropriate mitigation measures associated with the saltwater wedge (identified in Chapter 3 and highlighted above in the description of Alternative 3) would be taken to avoid such impacts, should they occur. It is anticipated that this alternative would not result in significant adverse direct or secondary impacts to this resource.

Alternative 3d

For Alternative 3d, activities in the lower river and delta area would not differ from those previously described under Alternative 3. Dredging operations in the crossings would not be expected to affect the delta and lower river area. It is anticipated that this alternative would not result in significant adverse direct or secondary impacts to this resource

4.2.3 Water Quality

No Action/Future without Project Conditions (Alternative 1)

Direct and Indirect Impacts: There would be no direct or indirect impacts from implementing the No-Action Alternative. With no action, study area water quality would likely continue current trends. For example, surface water quality has improved significantly with the implementation of the Clean Water Act and industrial and municipal discharge programs such as NPDES. These programs continue to advance with new or improved technologies to treat wastewater discharges. The causes of impairment listed in Table 2-5 will continue to degrade water quality until TMDL development and execution, and the suspected sources are addressed. In addition, contaminants of emerging concern such as pharmaceuticals and personal care products, microplastics, etc. continue to present uncertainty for surface water quality and potential concerns for human health and the environment.

Alternative 3

Direct and Indirect Impacts: The upper reach of the river from Baton Rouge to New Orleans has 12 crossings where channel depths are regularly maintained at a depth of 45 ft. Three drinking water intakes are in close proximity or just downstream of the crossing locations. Figure 4-3 shows the Donaldsonville intake at the Smoke Bend Crossing and Figure 4-4 shows two intakes for the St. James Water Districts #1 and #2 in relation to Belmont Crossing.

In order to better assess the potential impacts of deepening on water quality and biota within the river crossings, dredge slurry was collected directly from the discharge lines of dustpan dredges performing maintenance on 11 deep draft crossings during Fiscal Year 2016 in order to better assess the potential impacts of deepening on water quality within the river. The solid and liquid fractions of the slurry were analyzed individually for the presence of priority pollutants including metals, pesticides, polychlorinated biphenyls, and semi-volatile organic compounds. Metals were common to both fractions, and were detected at or below background levels in the Mississippi River. Chlordane pesticides and hydrocarbon exhaust products were detected infrequently in the solid samples, but at levels generally at or below 1 part per billion. All detected contaminants were

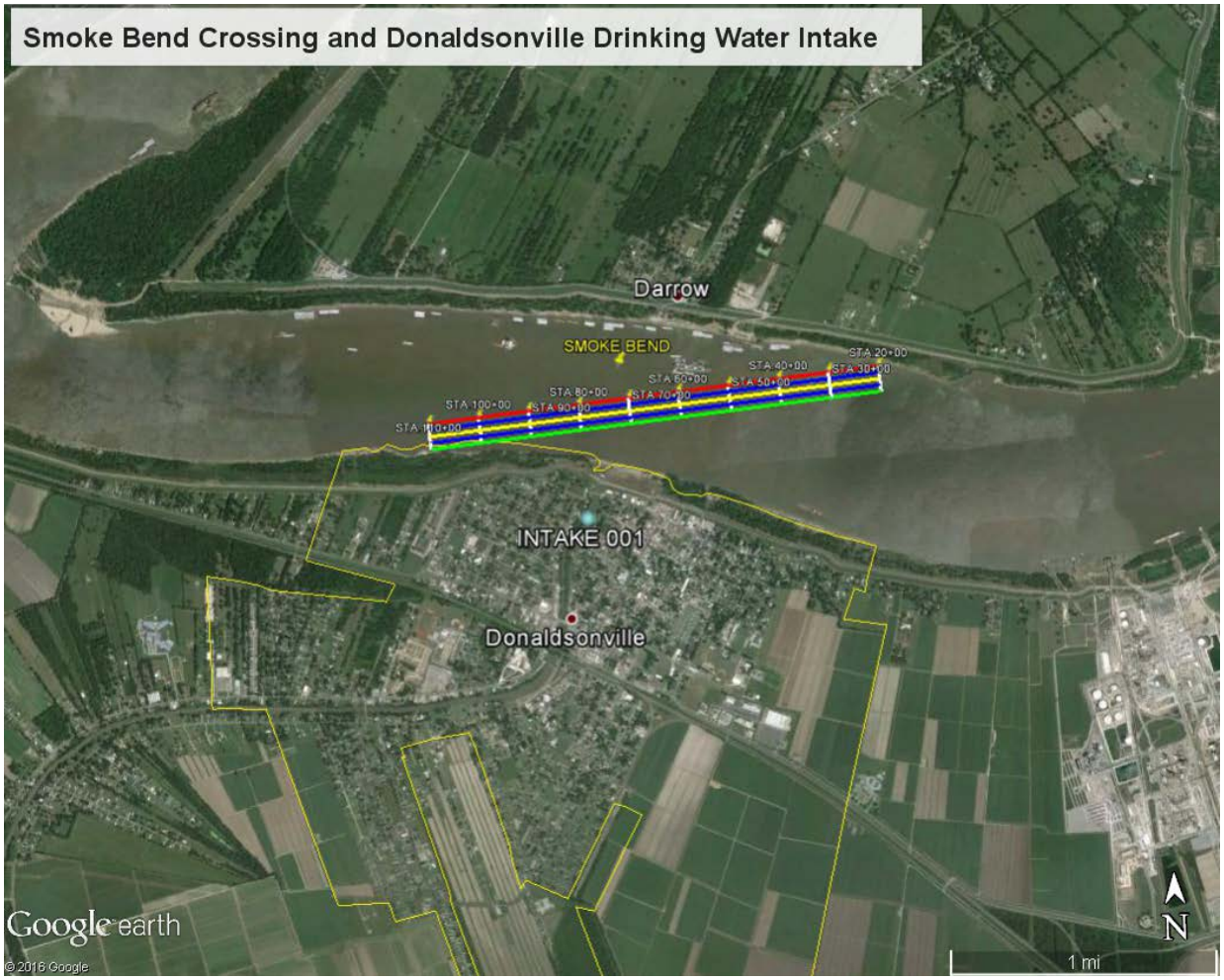


Figure 4-3 Smoke Bend Crossing and Donaldsonville Drinking Water Intake

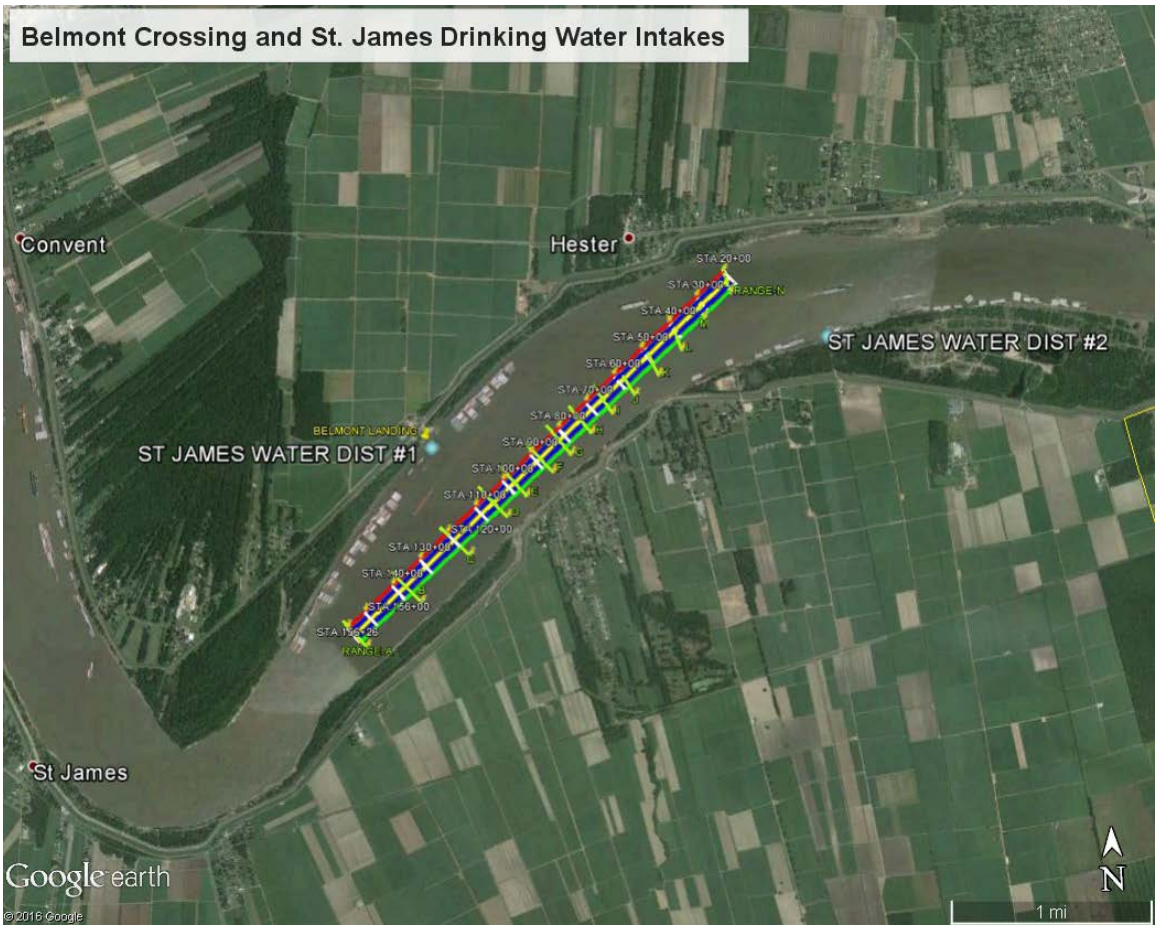


Figure 4-4 Belmont Crossing and St. James Water District #1 and #2 Intakes

below regulatory water quality criteria and ecological screening values, and dredging of the crossings is not expected to have a negative impact on human health or the environment. Based on the chemical analyses of the sediment contaminant samples, elutriate concentrations of contaminants are not above water quality criteria, and potential impacts to drinking water intakes are not anticipated (Appendix A-14) .

With implementation of the proposed action, there would be some disturbances to ambient water quality in the project area; however, direct and indirect impacts would be short-lived and highly localized. Based on current practices in the river and within beneficial placement areas changes in water column temperature, dissolved oxygen (hypoxia), and total suspended solids are expected to be temporary in duration, localized in nature, and minor in extent. Beneficial use-placement of dredge material in the open water placement area may cause temporary increases in turbidity and suspended solids concentrations, and a reduction in light penetration in the immediate vicinity; however, since the project area is a naturally turbid environment and resident biota are generally

adapted to, and very tolerant of, high suspended sediment concentrations, the effects would be negligible. A reduction in light penetration may indirectly affect phytoplankton (i.e., primary) productivity in the area as the amount of photosynthesis carried out by phytoplankton is reduced. Localized temporary pH changes, as well as a reduction in dissolved oxygen levels, may also occur during construction efforts. Water quality is expected to return to pre-construction conditions soon after the completion of placement activities associated with the proposed project.

The open water placement of dredged material for beneficial use, which is not expected to have any adverse effect on water quality of the receiving site, was evaluated as part of the Section 404(b)(1) Evaluation (Appendix A-10). To comply with Section 401 of the Clean Water Act, a Louisiana water quality certification was obtained on July 14, 2017. It is anticipated that this alternative would not result in significant adverse direct or secondary impacts to water quality. Additional information on this subject may be referenced in Appendix C.

Alternative 2

Direct and Indirect Impacts: Because Alternative 2 would deepen and maintain the river to 48 ft, direct and indirect impacts associated with Alternative 2 would be smaller in scope (i.e., at 3 crossings), and less in extent and duration than the minor impacts previously described under Alternative 3 for those areas. It is anticipated that this alternative would not result in significant adverse direct or secondary impacts to this resource. Additional information on this subject may be referenced in Appendix C.

Alternative 3d

Direct and Indirect Impacts: Because Alternative 3d would deepen and maintain the river to 50 feet up to the Port of South Louisiana, direct and indirect impacts associated with this alternative would be less in scope, but similar in extent and duration to the minor impacts previously described under Alternative 3. It is anticipated that this alternative would not result in significant adverse direct or secondary impacts to water quality. Additional information on this subject may be referenced in Appendix C.

4.2.4 Salinity

As previously discussed, impacts are discussed below in light of historical events of saltwater intrusion and the results of a 3D sedimentation model. The salt water wedge is present throughout the year in Southwest Pass and during low flow conditions may intrude upstream of Head of Passes. Fine sediments tend to flocculate when fresh water encounters saline water enhancing sediment deposition. Increased frequency and extent of salinity intrusion, due to channel deepening or relative sea level rise, could increase the contact area between fresh and saline water.

However, such increases are most likely during low flow periods when fine sediment concentrations are relatively low.

No Action/Future without Project Conditions (Alternative 1)

Direct and Indirect Impacts: O&M activities within the river would continue, however, there would be no direct impacts under the no-action alternative. Salinity gradient trends are expected to continue. Both with or without the proposed project, the area would still be affected by the following:

• Coastal processes – the marshes of Plaquemines Parish are anticipated to continue to decline and convert to higher saline marsh types and then to open water, in turn affecting local water quality conditions.

• Saltwater wedge migration-the saltwater wedge (Section 2.2.1) would continue to migrate upstream during low water conditions. The saltwater barrier sill would continue to be constructed as a mitigation measure for the project. Additional measures as implemented in previous lower water events may be required.

• Climate change, relative sea-level rise and hurricane/tropical storm surge- each of these processes would speed the process of saltwater intrusion in the area of the lower river.

Alternative 3

Direct and Indirect Impacts: The saltwater wedge is further expected to be influenced by eustatic sea level rise. Under alternative 3, over 50 years, the marshes of Plaquemines Parish are anticipated to continue to decline and convert to higher saline marsh types and then to open water, in turn affecting local water quality conditions. Climate change, relative sea-level rise, and hurricane/tropical storm surge would speed the process of saltwater intrusion in the area of the lower river.

It appears there would be little if any change in the frequency of construction of the sill for the Recommended Plan. According to results of the 3D model, deepening the channel to recommended 50 ft depth resulted in the salt water wedge migrating no further upriver than under the current project conditions. The duration of the presence of the wedge was longer for the 50 ft project over the 48 ft project condition, but the barrier sill proved to be a sufficient impedance preventing further upstream progression of the wedge even with the increased channel depth. With the barrier sill in place freshwater intakes located downriver experienced longer durations of elevated chloride levels. This alternative does not result in the need to change mitigation measures beyond what is

currently implemented during a low water event. Additional information on this subject may be found in Appendix C.

Alternative 2

Direct and Indirect Impacts: There would be no direct impacts to salinity under alternative 2. Current salinity gradient trends are expected to continue. The saltwater wedge is expected to be negatively influenced by eustatic sea level rise. Under alternative 2, over 50 years, the marshes of Plaquemines Parish are anticipated to continue to decline and convert to higher saline marsh types and then to open water, in turn affecting local water quality conditions. Climate change, sea-level rise, and hurricane/tropical storm surge would speed the process of saltwater intrusion in the area of the lower river. This alternative does not result in the need to change mitigation measures beyond what is currently implemented during a low water event. Additional information on this subject may be referenced in Appendix C.

Alternative 3d

Direct and Indirect Impacts section: Because Alternative 3d would deepen and maintain the river to 50 feet up to the Port of South Louisiana, direct and indirect impacts associated with this alternative would be less in scope, but similar in extent and duration to the minor impacts previously described under Alternative 3. This alternative does not result in the need to change mitigation measures beyond what is currently implemented during a low water event. Additional information on this subject may be referenced in Appendix C.

4.3 Human Environment

4.3.1 Population and Housing

No Action/Future without Project Conditions (Alternative 1)

Direct and Indirect Impacts: Population and housing would continue to grow as projected. Moody's Economy projected the populations to increase in all but three parishes: East Baton Rouge Parish, Iberville Parish, and West Baton Rouge Parish (Table 4-3).

Table 4-3 Population Projections for Select Louisiana Counties – 2015 to 2035

Parish	2015	2020	2025	2030	2035	Projected Percentage Change			
						2015 to 2020	2020 to 2025	2025 to 2030	2030 to 2035
Ascension Parish	120,261	133,212	145,076	155,967	166,192	10.8%	8.9%	7.5%	6.6%

East Baton Rouge Parish	430,202	428,749	423,971	416,921	409,210	-0.3%	-1.1%	-1.7%	-1.8%
Iberville Parish	30,860	30,736	30,554	30,430	30,368	-0.4%	-0.6%	-0.4%	-0.2%
Jefferson Parish	451,766	459,592	466,229	471,364	476,624	1.7%	1.4%	1.1%	1.1%
Orleans Parish	233,959	238,011	241,448	244,108	246,832	1.7%	1.4%	1.1%	1.1%
Plaquemines Parish	23,577	23,986	24,332	24,600	24,875	1.7%	1.4%	1.1%	1.1%
St. Bernard Parish	16,248	16,529	16,768	16,952	17,142	1.7%	1.4%	1.1%	1.1%
St. Charles Parish	55,257	56,214	57,026	57,654	58,297	1.7%	1.4%	1.1%	1.1%
St. James Parish	22,008	22,300	22,626	22,926	23,242	1.3%	1.5%	1.3%	1.4%
St. John the Baptist Parish	50,835	51,716	52,463	53,041	53,633	1.7%	1.4%	1.1%	1.1%
West Baton Rouge Parish	22,766	22,805	22,676	22,405	22,065	0.2%	-0.6%	-1.2%	-1.5%
Louisiana	4,423,850	4,495,380	4,556,410	4,604,250	4,650,210	1.6%	1.4%	1.0%	1.0%
United States	321,369,000	334,503,000	347,335,000	359,402,000	370,338,000	4.1%	3.8%	3.5%	3.0%

Alternative 3

Direct and Indirect Impacts: Deepening the river and crossings would have minimal impact on the population. Deepening the river has the potential to increase business activity at ports in the study area. An increase in business may have a positive impact on the rate of employment in the population and potentially increase population numbers in the regions where ports are located. It is anticipated that this alternative would not result in significant adverse direct or secondary impacts to this resource.

Alternative 2

Direct and Indirect Impacts: Implementing Alternative 2 would result in the same impacts described for Alternative 3.

Alternative 3d

Direct and Indirect Impacts: Implementing Alternative 3d would result in the same impacts described for Alternative 3.

4.3.2 Employment and Industrial Activity

No Action/Future without Project Conditions (Alternative 1)

Direct and Indirect Impacts: Industry and business would continue to grow or shrink depending on market forces. Inefficiencies due to shallow water depth along navigation channels would inhibit the ability of shipping-related business to grow and expand. All parishes, with the exception of St. James parish, are forecasted to see a rise in unemployment between 2015 and 2025 before seeing an increase in employment in all parishes by the year 2035 (Table 4-4).

Table 4-4 Projected Change in Unemployment for Select Louisiana Counties – 2015 to 2035 (Moody's Analytics Forecast Data - 2017)

	2015	2020	2025	2030	2035	Projected Change			
						2015 to 2020	2020 to 2025	2025 to 2030	2030 to 2035
Ascension Parish	3.4%	3.5%	3.7%	3.7%	3.5%	1.7%	5.9%	-0.7%	-3.9%
East Baton Rouge Parish	3.5%	3.6%	3.8%	3.7%	3.6%	1.7%	5.9%	-0.7%	-3.9%
Iberville Parish	5.0%	5.1%	5.4%	5.3%	5.1%	1.7%	5.9%	-0.7%	-3.9%
Jefferson Parish	3.7%	3.8%	4.1%	4.1%	4.0%	3.7%	6.9%	0.2%	-2.7%
Orleans Parish	5.2%	5.4%	5.8%	5.8%	5.7%	3.7%	6.9%	0.2%	-2.7%
Plaquemines Parish	4.0%	4.1%	4.4%	4.4%	4.3%	2.9%	7.1%	0.4%	-3.7%
St. Bernard Parish	4.8%	5.0%	5.3%	5.3%	5.2%	3.7%	6.9%	0.2%	-2.7%
St. Charles Parish	3.9%	4.0%	4.3%	4.3%	4.2%	3.7%	6.9%	0.2%	-2.7%
St. James Parish	5.5%	5.3%	5.1%	4.8%	4.5%	-5.1%	-2.7%	-5.8%	-6.0%
St. John the Baptist Parish	5.1%	5.3%	5.7%	5.7%	5.5%	3.7%	6.9%	0.2%	-2.7%
West Baton Rouge Parish	3.5%	3.6%	3.8%	3.8%	3.6%	1.7%	5.9%	-0.7%	-3.9%

Alternative 3

Direct and Indirect Impacts: Deepening the river from 45 to 50 ft would reduce the inefficiencies currently caused by insufficient depth. More efficient navigation would reduce the light loading, tidal/river stage delays, and frequency of operation and maintenance dredging intervals and allow for easier maneuvering..

A reduction in inefficiencies may encourage shipping-related businesses to expand, potentially increasing the employment rate in the study area.

Negative impacts on business and industrial activity during construction of the project mainly in the form of navigational delays due to movement of the dredges would be temporary and minimal.

It is anticipated that this alternative would not result in significant adverse direct or secondary impacts to this resource.

Alternative 2

Direct and Indirect Impacts: Implementing Alternative 2 would result in the same impacts described for Alternative 3.

Alternative 3d

Direct and Indirect Impacts: Implementing Alternative 3d would result in the same impacts described for Alternative 3.

4.3.3 Public Facilities and Services

No Action/Future without Project Conditions (Alternative 1)

Direct and Indirect Impacts: Increases in population could increase demand for public services such as police, school and public health services. Other public services and facilities, such as boat ramps and ferry services, may also see an increase in usage as a result of population growth.

Alternative 3

Direct and Indirect Impacts: River deepening would have a temporary and minor impact on public ferry services, public boat launches, utilities, and recreation near the deepening sites due to potential delays caused by movement of the dredges. It is anticipated that this alternative would not result in significant adverse direct or secondary impacts to this resource.

Alternative 2

Direct and Indirect Impacts: Implementing Alternative 2 would result in the same impacts described for Alternative 3.

Alternative 3d

Direct and Indirect Impacts: Implementing Alternative 3d would result in the same impacts described for Alternative 3.

4.3.4 Transportation

No Action/Future without Project Conditions (Alternative 1)

Direct and Indirect Impacts: The volume of goods transported by ship would remain similar to current levels, due to constraints imposed by water depth. Increased population numbers would put more demand on roadways, railways and public transportation.

Alternative 3

Direct and Indirect Impacts: Hydraulic cutterhead dredges and placement pipelines may cause minor and temporary interference of navigation by blocking sections of the channel, but are not expected to interfere significantly with shipping traffic. Dredging operations would be closely coordinated with representatives of the navigation industry and a Notice to Mariners would be posted by the USCG. Beneficial use-placement of dredged material in the shallow open water areas could cause minor disruptions to small vessels using these portions of the project area; however, the effects on navigation would be mainly temporary. Portions of the placement areas may become inaccessible to some watercraft as wetland vegetation eventually colonizes the area; however, the shallow nature of the area currently limits most vessel access. There would be impacts to the transportation of goods along the river in the study area. Deepening the river and crossings would eliminate the inefficiencies currently caused by insufficient river depth, resulting in fewer vessel trips on the river (because some vessels could carry more goods) and/or fewer train cars on the railways (due to decreased demand for rail transport) and/or fewer trucks transporting goods on the highways (also due to decreased demand). Transportation of goods on the river may be interrupted during dredging, but impacts would be temporary. Public ferry services near deepening sites may also be temporarily interrupted. It is anticipated that this alternative would not result in significant adverse direct or secondary impacts to this resource.

Alternative 2

Direct and Indirect Impacts: Dredging operations would be closely coordinated with representatives of the navigation industry and a Notice to Mariners would be posted by the USCG. Implementing Alternative 2 would result in the same impacts described for the Alternative 3.

Alternative 3d

Direct and Indirect Impacts: Implementing Alternative 3d would result in the same impacts described for Alternative 3.

4.3.5 Community and Regional Growth

No Action/Future without Project Conditions (Alternative 1)

Direct and Indirect Impacts: Communities would continue to grow and expand along with their populations. Community growth could fuel business development, as well as expand the physical community borders.

Alternative 3

Direct and Indirect Impacts: There would be no direct impacts on community and regional growth. Indirectly, some growth in population may occur due to increased businesses at the port facilities in the study areas. It is anticipated that this alternative would not result in significant adverse direct or secondary impacts to this resource.

Alternative 2

Direct and Indirect Impacts: Implementing Alternative 2 would result in the same impacts described for the Alternative 3.

Alternative 3d

Direct and Indirect Impacts: Implementing Alternative 3d would result in the same impacts described for the Alternative 3.

4.3.6 Cultural and Historic Resources

No Action/Future Without-Project Conditions (Alternative 1)

Direct and Indirect Impacts: There would be no direct impacts. Indirect impacts at Channel Crossings are unknown but could involve dredging by private shipping interests to allow deeper draft shipping to navigate the Mississippi River. At placement areas, indirect impacts of no-action would involve continued land loss due to subsidence and erosion. With the loss of land, resources that had been buried would be lost.

Alternative 3

Direct and Indirect Impacts: There are twelve regularly maintained crossings that would be deepened from 45 feet depth to 50 feet depth under this alternative. Both dredging depths include an additional 6 feet of advance maintenance, and 2 feet of allowed overdepth. The potential direct impact of the Recommended Plan is that any historic property located at the depth of new dredging

that may have remained intact by being buried could be destroyed by dredging. An indirect impact may be that if deeper channel crossings and the deepening of South West Pass lead to deeper draft shipping, the larger size of these watercraft may have unexpected effects via wave wash or other unpredicted physical factors that adversely affect cultural resources that are outside of the main shipping channel or are located along the banks of the river.

In 2016, the Tentatively Selected Plan (TSP) for dredging involved only 3 river crossings, the Rich Bend, Belmont, and Fairview crossings. A conclusion of No Historic Properties Affected for the proposed action to increase dredging depth at these 3 crossings, was sent to the Louisiana SHPO on November 23, 2016 and agreement with that conclusion was received on December 7, 2016. Coordination for the finding of No Historic Properties Affected for the deepening of all 12 existing, regularly maintained river crossings lying upriver of the Port of New Orleans was undertaken in a letter to the SHPO dated August 2, 2017, and CEMVN received agreement with its the conclusion of No Historic Properties Affected from SHPO on August 25, 2017.

In partial fulfillment of EO 13175 ("Consultation and Coordination With Indian Tribal Governments"), NEPA, Section 106 of the National Historic Preservation Act and 36 CFR Part 800, CEMVN offered the 11 federally recognized Tribes with a known interest in undertakings within CEMVN boundaries the opportunity to review and comment on the potential of the proposed action to significantly affect protected tribal resources, tribal rights, or Indian lands. An initial conclusion of "No Historic Properties Affected" for 3 river crossings (Fairview, Belmont, and Rich Bend) was sent to Tribes on December 19, 2016. (Appendix A, Annex 24.) Agreement to the conclusion of No Historic Properties Affected was received from the Seminole Nation of Oklahoma on January 25, 2017, the Choctaw Nation of Oklahoma and the Jena Band of Choctaw on January 24, 2017, and the Muscogee (Creek) Nation on February 6, 2017. (Appendix A, Annex 24.) In a letter dated August 26, 2017 (Appenidx A, Annex 24), CEMVN informed the 11 tribes that the proposed action had been expanded to include deepening of the 12 regularly maintained river crossings above New Orleans and of its conclusion of "No Historic Properties Affected" and invited comments. No new Tribal responses were received to the conclusion of "No Historic Properties Affected". If unexpected cultural resources are found during this project, work will be halted and the USACE archaeologist will be informed so that proper coordination may occur.

<u>Alternative 2</u>

Direct and Indirect Impacts: The direct and indirect impacts of this alternative would be the same as for the Recommended Plan. In regards to cultural resources and historic properties, there is no effective difference between deepening to 50 ft or only 48 ft.

<u>Alternative 3d</u>

Direct and Indirect Impacts: Implementing Alternative 3d would result in the same impacts described for the Alternative 3 within the three crossings.

4.3.7 Aesthetics and Visual Resources

No Action/Future without Project Conditions (Alternative 1)

Direct and Indirect Impacts: Under the no-action alternative, there would no direct impacts to visual resources within the study area. Visual resources would most likely evolve from existing conditions in a natural process due to subsidence and sea-level rise resulting in increased open water areas, or change as dictated by future land use patterns and O&M maintenance practices and policies.

Alternative 3

Direct and Indirect Impacts: Direct Impacts to visual resources would be minimal to negligible. The project area on the lower river is remote. The river crossings, and the Ports of Baton Rouge and South Louisiana are buffered by the Mississippi River levee and are generally not visible from major thoroughfares, major urban areas (except from tall buildings), single-family residences, and local businesses. Private, non-commercial user activity is low and primarily relegated to water traffic only. There may be some minimal direct impacts to areas where the project boundary spreads over the Delta National Wildlife Refuge and Pass A Loutre Preserve Wildlife Management Area. Indirect Impacts may occur due to operation of machinery and construction activities in the areas where dredging would take place, but these impacts would be minimal. Use of beneficial materials dredged from the channel within the Federal Standard may create an indirect impact, depending on where that material is used and if it results in marsh creation in areas visible to recreational users. Continued relative sea level rise could also impact the entire beneficial use area, resulting in vast areas of shallow open water as vertical accretion rates fail to keep pace with rising sea levels. It is anticipated that this alternative would not result in significant adverse direct or secondary impacts to this resource.

Alternative 2

Direct and Indirect Impacts: Implementing Alternative 2 would result in the same impacts described for Alternative 3.

Alternative 3d

Direct and Indirect Impacts: Implementing Alternative 3d would result in the same impacts described for the Alternative 3.

4.3.8 Noise

No Action/Future without Project Conditions (Alternative 1)

Direct and Indirect Impacts: There would be no direct impacts to noise under the no-action alternative. O&M activities within the river would continue; therefore, localized and temporary noise impacts would likely continue to occur at current levels and would affect animals and the relatively few people in the remote coastal wetland areas. Potential noise impacts concerns may be expected for those workers at oil and gas extraction sites and recreationists. Additional noise impacts associated with the villages, towns, and clusters of human habitations would continue at current levels. Institutional recognition of noise, such as provided by the regulations for Occupational Noise Exposure (29 CFR Part 1910.95) under the Occupational Safety and Health Act of 1970, as amended, would continue.

It is anticipated that, in some instances, noise impacts may be an important issue for their potential effects on wildlife, such as disruption of normal breeding patterns and abandonment of nesting colonies. However, tolerance of unnatural disturbance varies among wildlife. Therefore, these issues shall be addressed by coordinating with the USFWS to identify species of concern (e.g. bald eagles) and following feasible administrative and or engineering controls, determining and implementing appropriate buffer zones, and implementing construction "activity windows" (i.e., project construction initiation and completion dates to minimize disturbance to nesting birds) for the current O&M activities.

Terrestrial wildlife generally will not be impacted, as maintenance dredging activities will occur mainly over open water. There is the potential for noise or wave action generated by maintenance dredging activities to displace terrestrial wildlife in the area; however, this would be a temporary disturbance, with wildlife likely to return following the completion of placement activities. Migratory waterfowl and other avian species, if present, would likely be only temporarily displaced from the project area. Overall populations would not likely be adversely affected because these species would move to existing adjacent habitat areas during dredging activities.

Alternative 3

Direct and Indirect Impacts: Due to the remoteness of the lower river and delta area, noise impacts are not anticipated to affect communities in the lower river. Construction equipment is limited in the level of noise that can be emitted. Institutional recognition of noise, such as the regulations for Occupational Noise Exposure (29 CFR 1910.95) under the Occupational Safety and Health Act of 1970, as amended, would continue. This mandates that noise levels emitted from construction be below 90 dB for exposures of eight hours per day or more. Noise may cause some temporary and minor annoyance to residents adjacent to the crossings. However, the Occupational

Noise Exposure standards (29 CFR 1910.95) under the Occupational Safety and Health Act of 1970, as amended, would continue. Due to the nature of construction and O&M, the greatest noise impacts are anticipated to be associated with the extended maintenance periods of the crossings over 50 years. It is anticipated that, in some instances, noise impacts may be an important issue because of their potential effects on wildlife, such as disruption of normal breeding patterns and abandonment of nesting colonies. However, tolerance of unnatural disturbance varies among wildlife, and presence of wildlife varies on a seasonal-annual basis. Therefore, these issues shall be addressed prior to contract award by identifying the key species of concern (e.g. colonial nesting birds) and following feasible administrative and or engineering controls, determining and implementing appropriate buffer zones, and implementing construction "activity windows" (i.e., project construction initiation and completion dates to minimize disturbance to nesting birds).

Terrestrial wildlife may be directly impacted during the placement of beneficial use of dredged material; however, most wildlife would temporarily relocate to adjacent areas during construction. There is the potential for noise or wave action generated by construction activities to displace terrestrial wildlife in the area; however, this would be a temporary disturbance, with wildlife likely to return following the completion of placement activities. Migratory waterfowl and other avian species, if present, would likely be only temporarily displaced from the project area. Overall, populations would not likely be adversely affected because these species would move to existing adjacent habitat areas during construction activities.

Overall, noise impacts associated with construction and O&M would be minor in relation to the ambient noise that occurs in the busy industrial corridor. Localized and temporary noise impacts would likely continue to affect animals and the relatively few people in the remote areas. Potential noise impact concerns may be expected for workers at oil and gas extraction sites, recreationists, and construction activities. Additional noise impacts would be associated with the villages, towns, and clusters of human habitations. Institutional recognition of noise, such as provided by the regulations for Occupational Noise Exposure (29 CFR 1910.95) under the Occupational Safety and Health Act of 1970, as amended, would continue. It is anticipated that this alternative would not result in significant adverse direct or secondary impacts to this resource.

<u>Alternative 2</u>

Direct and Indirect Impacts: No noise impacts would occur downstream from Fairview crossing. No permanent noise impacts would occur as a result of Alternative 2 and all noise emissions would be relatively short-term, ending after construction. Due to the nature of construction and O&M, the greatest noise impacts are anticipated to be associated with the extended maintenance periods of Alternative 2 over 50 years. The temporary impacts from the maintenance period for Alternative

2 are similar to those previously described for Alternative 3 above, however, the noise caused by Alternative 2 is expected to be of shorter duration than Alternative 3. It is anticipated that this alternative would not result in significant adverse direct or secondary impacts to this resource.

Alternative 3d

Direct and Indirect Impacts: Because Alternative 3d would deepen and maintain the river to 50 feet up through the Port of South Louisiana, direct and indirect impacts associated with this alternative would be less in scope, but similar in extent and duration than the minor impacts previously described under Alternative 3.

4.3.9 Recreation Resources

No Action/Future without Project Conditions (Alternative 1)

Direct and Indirect Impacts: Without implementation of the proposed action, the conditions within the recreational environment would continue as they have in the past and would be dictated by the natural land use patterns and processes and current dredge material beneficial use practices. Direct impacts to recreation from dredging of the Mississippi River will be minimal and relate mostly to those impacts related to the dredge material placement in open water and marshes. During dredging of the river, bank fishing opportunities may diminish but this effect will be temporary. Without the increase in beneficial use of dredged material associated with the proposed action, indirect impacts would include the continued loss of wetlands/marshes and habitat diversity that affects recreational opportunities. Storm surge and saltwater could have a negative impact on freshwater forests and habitats and could reduce recreational resources (e.g., fishing, hunting, bird watching, and other). In general, further degradation of area marshes will continue regardless of the alternative implemented and associated negative impacts including lower quality fishery spawning, nursery, and foraging habitat would likely translate to a decline in recreational fishing, shrimping, and crabbing catch rates in the future. As existing freshwater wetland/marsh areas convert to saltwater marsh, then to open water, the recreational opportunities will change accordingly. For example, fresh water fishing opportunities may be expected to become saltwater opportunities. If the expected peak and then decline of fishery production occurs in these open waters, then the associated marine-fishery recreational opportunities will also decline. As populations of migratory birds and other animals dependent on marsh and swamp decrease, associated recreational opportunities, such as hunting and wildlife viewing, will decrease.

Alternative 3

Direct and Indirect Impacts: The dredging of the Mississippi River at the crossings would have minimal impacts on recreational use. Much of the recreation impacts associated with the

Recommended Plan, are related to the placement of dredge material. The material dredged at the crossing locations will be placed back into the water. Recreationists would be temporarily displaced during construction and placement of dredge material. Placement sites in the Delta NWR cross into designated waterfowl hunting areas, which would most likely be temporarily unavailable for use during dredge material placement. Fishing, hunting, and boating for users of the camps and campgrounds would also be affected during times of dredging and material placement.

As in years past, all work will be coordinated with land managers from each agency to determine desirable placement sites, specific target elevations of placement, and to ensure environmental compliance (Appendix A-17). .

Much of the receiving area that would be converted to land/marsh consists of mainly shallow open water. Less water would be available for boating and fishing; however, an increase in habitat value would be expected as the placement area would accept the dredge material in its highly turbid form and in time, become continuous, not-turbid, brackish marsh. The creation of marsh and associated coastal habitat would provide an increase in fish and wildlife habitat including nesting habitat for water fowl and nursery habitat for fish. Consumptive recreation use would likely increase as a result of an increase in quality and quantity of fish and wildlife habitat. Bird watching opportunities are also expected to increase because of improved habitat for neo-tropical migratory songbirds.

Alternative 2

Direct and Indirect Impacts: There would be fewer impacts to recreational resources with Alternative 2 than with Alternative 3. The duration of the impacts described previously under Alternative 3 would be less. Alternative 2 does not include deepening Southwest Pass from 48 ft to 50 ft, so there would be no additional dredge material placement in the marsh areas surrounding the Pass. Dredging of the crossings further north, up river, would have no impacts on recreational resources.

Alternative 3d

Direct and Indirect Impacts: Because Alternative 3d would deepen and maintain the river to 50 feet up to the Port of South Louisiana, direct and indirect impacts associated with this alternative would be less in scope, but similar in extent and duration than the minor impacts previously described under Alternative 3.

4.3.10 Air Quality

No Action/Future without Project Conditions (Alternative 1)

Direct and Indirect Impacts: Current O&M activities within the river would continue, however, there would be no direct impacts under the no-action alternative. Without implementation of the proposed project the status of attainment of air quality for East Baton Rouge, West Baton Rouge, Iberville, and Ascension Parishes and the other parishes in the project area would not change from current conditions, and there would be no direct, indirect, or cumulative impacts.

Alternative 3

Direct and Indirect Impacts: St. James, St. Charles, Jefferson and Plaquemines Parishes are currently in attainment of all NAAQS and are operating under attainment status. Proposed construction within attainment areas does not require a CAA general conformity evaluation.

Calculations previously performed on fairly large construction projects indicate that volatile organic compound (VOC) emissions from typical CEMVN construction projects are well below the 100-ton per year de minimis limit. Therefore, for construction within the attainment areas, it is expected that there would be no adverse impacts to air quality with the implementation of the proposed action. With the deepening of the lowest 3 crossings (Rich Bend, Fairmont, Belview) in St. James, St. Charles and Jefferson Parishes and the deepening of the lower river (between RM 13.4 AHP and 22 BHP) in Plaquemines Parish, the status of attainment for St. James, St. Charles, Jefferson and Plaquemines Parishes would not be altered from current conditions. Any minor impacts to air quality would be limited to the immediate vicinity of the dredge vessel and would dissipate quickly. There would be no lasting direct or indirect impacts resulting from the associated construction activities.

In the Baton Rouge 5-parish ozone maintenance area (Ascension, Iberville, East and West Baton Rouge, and Livingston Parishes), proposed construction activities to deepen the upper 9 crossings (Smoke Bend, Philadelphia, Bayou Goula, Granda, Medora, Sardine, Redeye and Baton Rouge Front) would be expected to produce a total of approximately 9 tons of VOC emissions and approximately 224 tons of NOx emissions during the construction period. If construction were continuous (meaning all crossings constructed within the same year), the total VOC emissions would be less than the de minimis level of 100 tons per year for ozone maintenance areas; however, the total NOx emissions would substantially exceed the de minimis level of 100 tons per year approved by the State Implementation Plan. Consequently, the proposed construction of the 9 uppermost crossings requires a phased construction schedule over several years to avoid exceeding the de minimis level for NOx in any given year.

The construction schedule was developed for the proposed Phase 3 deepening to 50 feet of the 9 crossings within the Port of Baton Rouge to ensure that construction remains within NAAQS compliance for the 5-parish non-attainment area around Baton Rouge. In order for deeper draft vessels to access Port facilities along the deeper channel once constructed, it is anticipate that the deepening construction would proceed in geographical sequence from the most southern crossing of the 9 (Smoke Bend) to the most northern (Baton Rouge Front).

Because construction of each crossing would cause a different level of emissions depending on the amount of material that would be dredged at that crossing, and the vessel used, emission estimates were calculated for construction of each crossing. The estimates are based on the worst-emitting vessel within the current available dredging fleet. Thus, these estimates represent the "worst case" scenario for emissions levels. At the time of this report, the worst-emitting dredge within the current dredging fleet is the Hurley Dustpan Dredge. At the of construction if the dredge utled prodiced fewer eens another dredge from the current fleet is used for construction, and if that vessel maintains its present "lesser" level of emissions, then that vessel is anticipated to produce fewer emissions than the "worst case emissions" vessel utilized.

Table 4-2 provides a summary of the worst-case emission results for each crossing and the construction schedule. Detailed calculations to support this table are included in Appendix A-26.

Table 4-2 Summary of Emmisions and Construction Schedule

Parish	Crossings (from lowest to highest)	VOC tons	NOx tons	Construction Year
Ascension	Smoke Bend (lowest)	0.189	4.253	1
	Philadelphia	0.504	11.342	1
	Sub-Total	0.504	15.595	
Iberville	Alhambra	6.3	14.178	1
	Bayou Goula	0.189	4.253	1
	Granada	0.378	8.507	1
	Medora	1.449	32.609	1
	Sub-Total	1.827	59.547	
East and West Baton Rouge	Sardine Point	0.63	14.178	1 or 2
	Redeye	3.214	72.307	2
	Baton Rouge Front (highest)	2.773	62.382	3
	Sub-Total	6.617	148.867	
Total		8.948	224.009	

In order to not exceed the requirements for VOC and NOx, emissions cannot exceed 100 tons/yr each within the non-attainment area. Based on this limitation, all crossings within Ascension and Iberville Parishes and the crossing at Sardine Point could be constructed within the first year without exceeding the 100 ton limit. The crossings at Redeye and at Baton Rouge Front would each have to be constructed in separate years to not exceed emission requirements. Because Redeye is the furtherest south, it would be constructed prior to Baton Rouge Front. Construction at Sardine Point could occur in the same year as construction of the lowest six crossings or Sardine Point construction could occur the same year as construction of Redeye without exceeding the de minumus emission levels.

Therefore, the crossings at Fairview, Belmont, Rich Bend (which are in attainment areas) and the crossings at Smoke Bend, Philadelphia, Alhambra, Bayou Goula, Granada, and Medora would all be constructed in Year One. Sardine Point and Redeye would be constructed in Year Two, and Baton Rouge Front would be constructed in Year Three. Alternatively, Sardine Point could be constructed in Year One. In that event, the construction schedule for Redeye (Yr 2) and Baton Rouge Front (Yr 3) would remain unchanged.

Crossing construction is subject to the availability of funding. Should sufficient funding not be available in any given year, the number of crossings that would be constructed in that year would be fewer than in the proposed schedule. If inadequate funding prevents construction as proposed by this schedule, then a general conformity evaluation would be completed and a new schedule would be developed that would ensure that applicable de minimus emission levels would not be exceeded in non-attainment areas. In all events, compliance with the Clean Air Act and, for construction in non-attainment areas, the State Implementation Plan would be maintained.

Once contructed, the proposed action would create a deeper channel that would allow more ships to be fully loaded thereby resulting in fewer overall trips required to transport the same volume of cargo. Fewer trips by the cargo vessels would result in a lower volume of air emissions in the short- and long-term.

Alternative 2

Direct and Indirect Impacts: Ambient air quality in East Baton Rouge, West Baton Rouge, and Ascension Parishes would not noticeably change from current conditions, and the status of attainment for the parishes would not be altered. However, on-site construction activities could exceed the NOx emissions in 5-parish non-attainment area for ozone. If construction were continuous, NOx emissions would exceed the de minimis level of 100 tons per year of NOx emissions approved by the State Implementation Plan. As such, in order to avoid exceeding the de minimis level for NOx, construction of the crossings within the non-attainment area would take a

phased approach as described for Alterntive 3. It is anticipated that this alternative would not result in significant adverse direct or secondary impacts to this resource.

Alternative 3d

Direct and Indirect Impacts: Because Alternative 3d would deepen and maintain the river to 50 feet up through the Port of South Louisiana, direct and indirect impacts associated with this alternative would be less in scope, but similar in extent and duration to the minor impacts previously described under Alternative 3. Under Alternative 3d, construction would occur only in St. James, St. Charles, Jefferson and Plaquemines Parishes, which are currently in attainment of all NAAQS and are operating under attainment status. Calculations previously performed on fairly large construction projects indicate that volatile organic compound emissions from typical CEMVN construction projects would be well below the 100-ton per year de minimis limit; therefore, it is expected that there would be no adverse impacts to air quality with the implementation of the proposed action. The status of attainment for St. James, St. Charles, and Plaquemines Parish would not be altered from current conditions, and there would be no lasting direct or indirect impacts resulting from the associated construction activities. Similar to Alternative 1, Alternative 3d would maintain the existing 45 ft river depth in the Baton Rouge 5-parish ozone maintenance area, and, therefore, would not result in increased project emissions within the Baton Rouge area. It is anticipated that this alternative would not result in significant adverse direct or secondary impacts to this resource.

4.4 Natural Environment

4.4.1 Soils and Water bottoms

Future without Project Conditions (Alternative 1)

Without the proposed action, operation and maintenance of the 45 ft Mississippi River deep-draft navigation channel from Baton Rouge to the Gulf of Mexico would continue as it has in the past. Direct and indirect impacts to soils and water bottoms in the Mississippi River and the Mississippi River Delta would remain the same under current operation and maintenance dredging of the river and placement of dredged material. Dredging in the Mississippi River would continue at current levels, resulting in direct impacts to approximately 2,500 acres of water bottoms. The placement of dredged material into existing placement areas in the Mississippi River Delta would continue, resulting in direct impacts to approximately 38,000 acres of soils and 100,000 acres of shallow open water bottoms. Annual O&M dredging of the project area would continue at an average 35,318,498 cy per year and would establish approximately 528 acres of intermediate marsh annually.

Soil erosion and land loss in the Mississippi River Delta would continue into the future. Natural and man-made levees would continue to subside and organic soils would not be able to maintain their elevations due to subsidence, decreased plant productivity, changes in existing land cover, and wave erosion. Soils in the study area would continue to degrade and be converted to open shallow water bottoms. Deltaic formation processes would continue at the mouth of the Mississippi River. Many water bottoms in the study area are a result of degraded and collapsing marshes, and areas that were previously wetlands or upland ridges are now subsided below the water surface. In the future without project conditions, organic content in the soils would continue to increase in areas that were formerly coastal marsh and swamp, and these areas would continue to be converted to shallow water bottoms. Water bodies would grow larger increasing the acreage of water bottoms in the study placement areas. Wave erosion would accelerate causing further land loss, thus making coastal communities more vulnerable to tropical storms.

Many of these conditions and forces will continue regardless of the alternative implemented.

Alternative 3

Direct and Indirect Impacts: Alternative 3 would result in direct impacts to existing water bottoms in the navigation channel. Water bottom soils along the water bottom consist of a mixture of a wide variety of silts, sands and clays that were eroded upstream in the watershed and shoaled within the river. Dredging at all locations would be to a maximum width of 500-feet resulting in approximately 2,800-acres of direct impacts to water bottoms in the Mississippi River.

Dredged material from the lower Mississippi River would be placed in the Mississippi River Delta to create coastal habitat that includes emergent and high marsh, bird islands, and deltaic ridges to the extent possible under the limitations of the Federal Standard. The placement of the dredged material in the placement areas would result in direct impacts to 1462 acres of water bottoms. Hydric soils in the placement areas consist of Aquents, Balize silty clay loam, Larose mucky clay; and less frequently Carville, Cancienne, and Shriever silty clay. Indirect impacts from the placement of dredged material would include greater soil stability in the Delta as shallow open water bottoms are filled and vegetation density increases. The increase in land and soil stability would provide greater diversity in habitat for wildlife and improve storm surge protection for the Louisiana coast. The direct impacts to water bottoms in the long term would contribute to positive indirect impacts resulting in greater habitat diversity for wildlife, essential fish habitat, and recreational opportunities in the Mississippi River Delta.

Overall, the direct and indirect impacts to soils and water bottoms resulting from the placement of dredged material to create coastal habitat would be beneficial.

Alternative 2

Direct and Indirect Impacts: The direct and indirect impacts to soils and water bottoms under Alternative 2 would be essentially the same as Alternative 3 for construction of the crossings. Alternative 2 would increase operation and maintenance of the Mississippi River deep-draft navigation channel from the current 45 ft to 48 ft in depth, resulting in direct impacts to existing water bottoms in the navigation channel. Construction and maintenance dredging in the Mississippi River would occur at up to 12 crossings and from river mile 13.4 AHP to mile 22 BHP in Southwest Pass. Dredging at all locations would be to a maximum width of 500 –ft, resulting in approximately 2,800 acres of direct impacts to water bottoms in the Mississippi River. Soils and water bottom impacts would not be anticipated to occur in the lower river as that section of the river is already dredged to -48.5 ft. It is anticipated that this alternative would not result in significant adverse direct or secondary impacts to this resource.

Alternative 3d

Direct and Indirect Impacts: Because Alternative 3d would deepen and maintain the river to 50 feet up to the Port of South Louisiana, direct and indirect impacts associated with this alternative would be less in scope, but similar in extent and duration than the minor impacts previously described under Alternative 3. Water bottoms would only be affected within 3 crossings.

4.4.2 Vegetation Resources

No Action/Future without Project Conditions (Alternative 1)

Direct and Indirect Impacts: There would be no direct impacts to the project area except for the minor impacts from the placement of beneficial use of dredge material (to the extent possible within the limitations of the Federal Standard) in the lower river delta during ongoing O&M. It is estimated that annual O&M dredging of the project area would establish approximately 528 acres of intermediate marsh annually on average. Existing conditions and trajectories of ecological change to area vegetation would persist. Undeveloped vegetated lands, including wetlands, would continue to be lost to subsidence and erosion. Emergent and upland habitats and associated sub-canopy species would continue to be subjected to saltwater intrusion and subsidence. These areas would convert to marsh and eventually open water (USACE 2010a and 2010b).

Much of the lower study area could be permanently inundated under the intermediate and high RSLR scenarios further speeding conversion of existing habitats. The area would continue to be subjected to increases in RSLR which could increase the geographic extent of saltwater intrusion, potentially convert vast areas of existing forested wetlands and swamp habitats to marsh and

eventually open water. There could also be a shift from fresh water dominant species to species that can tolerate higher salinity.

Alternative 3 (a depth of 50 ft for the Crossings and a depth of 50 ft in Lower Mississippi River)

Direct and Indirect Impacts: Deepening the crossings to 50 ft (LWRP) would not be anticipated to have impacts on vegetation in the batture or the lower river area. With implementation of the proposed action there would be some minimal and insignificant impacts to wetland resources. A small, undetermined amount of wetland habitat would be temporarily impacted during the excavation of channels to provide equipment access to the placement areas. The resulting loss of wetland function would be temporary, as these areas would be backfilled to pre-project marsh elevations and eventually revegetated (naturally) and restored upon completion of Phase 3 of the project. Direct placement of dredged material on existing marsh would be avoided. Submerged aquatic vegetation (SAV) persists in shallower, protected areas of the placement area. It is estimated that less than 10 percent of the open water placement area contains SAVs. The area would be subjected to increases in RSLR, which could increase saltwater intrusion and lead to increases in and the potential conversion of remaining SAVs to open water. Much of the area, could be permanently inundated under both the intermediate and high RSLR scenarios. There could be a shift from fresh water dominant species to those species that can tolerate higher salinity.

Impacts to SAVs may occur, but with beneficial use of dredged material to the extent permissible under the requirements of the Federal Standard, impacts to fisheries habitat is anticipated to be beneficial. With implementation of alternative 3, there would be positive impacts to wetlands in the project area. Up to 1462 acres of new coastal habitat and elevated wetlands would potentially be created in existing shallow open water areas with the beneficial use of dredged material within the Federal Standard removed during maintenance dredging of the Mississippi River. Due to variability in placement and settling rates, a small percentage of scrub shrub habitat may establish in some higher portions of the placement during the first few years of settlement to the targeted elevation of 2 ft. Due to high rates of land loss in the area, approximately 1080 acres of coastal habitat would be expected to remain after 50 years.

Newly created or nourished wetlands would provide additional foraging, breeding, nesting, and nursery areas, as well as refugia for a multitude of estuarine-dependent and commercially important fish and shellfish, migratory waterfowl, wildlife, and several species of wading, diving, and shore birds, and help to offset the substantial wetlands loss currently taking place in this portion of the Mississippi Deltaic Plain. Thus, positive direct and indirect impacts to wetlands and wetland-related resources in the project area would be expected with implementation of the proposed action. It is anticipated that this alternative would not result in significant adverse direct or secondary impacts to this resource. Overall, there would be positive net benefits to wetland

resources in the project area, with the creation of emergent wetland habitat of higher value to fish and wildlife resources than the existing open water.

Currently, CEMVN places dredged material from routine maintenance events in the lower river on the Delta National Wildlife Refuge (NWR) within the same beneficial use placement areas as would be used under the Recommended Plan. USFWS reviewed the Draft Integrated General Reevaluation Report and Supplemental Environmental Impact Statement and commented on the proposed action in its Coordination Act Report (CAR). In that report, it supported the beneficial use of dredge material to restore coastal habitat and noted that CEMVN is currently beneficially disposing of material on the Delta NWR. It advised that special use permits would need to be obtained from the Refuge Manager for construction and maintenance activities (including placement of dredged material) on the Refuge. On April 12, 2018, USFWS advised, "Marsh restoration is considered a refuge management activity and does not require a compatibility determination (603 FW 2.10 A). Marsh restoration fulfills the goals and purpose of the Delta National Wildlife Refuge and the goals of the National Wildlife Refuge System mission. The U.S. Army Corps of Engineers is a cooperation agency and is considered a Service-authorize agent for this activity." (Appendix A, Annex 17.)

Alternative 2

Direct and Indirect Impacts: Deepening the crossings to 48 ft (LWRP) would not be expected to have impacts on vegetation in the batture or placement areas. This alternative would not result in any increase in beneficial use of dredged material in the placement areas and therefore no increase in vegetation in those areas would be expected.

Alternative 3d

Direct and Indirect Impacts: Because Alternative 3d would deepen and maintain the river to 50 feet up to the Port of South Louisiana, direct and indirect impacts associated with this alternative would be less in scope, but similar in extent and duration than the minor impacts previously described under Alternative 3.

4.4.3 Wildlife

CEMVN coordinates with USFWS and NMFS each fiscal year (FY) on Operations and Maintenance Dredging and Placement Plans (Plans) for federally-maintained navigation channels in the New Orleans District concerning the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.c. 661 et seq.), the Endangered Species Act (ESA) of 1973 (87 Stat. 884, as amended; 16 U.S.c.1531 et seq.), the Bald and Golden Eagle Protection Act (BGEPA) (54 Stat. 250, as amended, 16 U.S.c. 668a-d), and the Migratory Bird Treaty Act (MBTA) of 1918 (40 Stat.

755, as amended;16 U.S.C. 703 et seq.) in order to ensure full compliance with federal law (Appendix A-15). CEMVN also receives a Biological Opinion under the Endangered Species Act for each dredging contract awarded to ensure full compliance with the Act. On June 29 ,2017 the United States Fish and Wildlife Service (USFWS) provided a Final Coordination Act Report, to conclude coordination under the Fish and Wildlife Coordination Act (Appendix 8). The Service provided 12 Fish and Wildlife Conservation Recommendations in the Draft Coordination Act Report. MVN has reviewed the recommendations and the recommendations and responses were provided to the Service prior to the Final Coordination Act Report (Appendix A-8a).

No Action/Future without Project Conditions (Alternative 1)

Direct and Indirect Impacts: O&M activities within the river would continue, however, there would be no direct or indirect impacts under the no-action alternative. Existing conditions and trajectories of ecological change to wildlife in the area would persist. Continued human encroachment and development would result in loss of existing wildlife wetland habitats. The area would be subjected to increases in RSLR which could increase saltwater intrusion and exacerbate ongoing conversion of existing forested wetland and swamp habitats to marsh and open water (USACE 2010a, USACE 2010b). Migratory neotropic avian species currently utilize the area as stopover habitat. As forested wetlands and emergent wetland habitats are lost, there would be a corresponding reduction in overall species diversity and abundance. Most mammal, amphibian and reptile species would be required to relocate to more suitable swamp habitats. There could be an increase in the population and distribution of nutria due to the conversion of swamp into open water and marsh which are the preferred habitats by nutria. Most of these natural processes will continue regardless of the alternative implemented.

Alternative 3

Direct and Indirect Impacts: With implementation of the proposed action, minimal adverse direct and indirect impacts to wildlife would be anticipated. Terrestrial wildlife generally would not be impacted, as construction activities would occur mainly over open water. There is the potential for noise or wave action generated by construction activities to displace terrestrial wildlife in the area; however, this would be a temporary disturbance, with wildlife likely to return following the completion of placement activities. Migratory waterfowl and other avian species, if present, would likely be only temporarily displaced from the project area. Overall, populations would not likely be adversely affected because these species would move to existing adjacent habitat areas during construction activities. The placement of dredge material for beneficial use would reduce some shallow open water habitat by converting it to marsh and other coastal habitat, thereby reducing available foraging habitat for some avian species. Migratory neotropic avian species that currently

utilize the area as stopover habitat would benefit as forested wetlands and emergent wetland habitats are established.

Some positive indirect impacts to wildlife in the project area would be expected with the proposed action. Approximately 1,462.5 acres of productive coastal habitat, including marsh, elevated wetlands, scrub-shrub, and other shallow open water habitat would be created through the beneficial use of dredged material. According to wetland value assessment models (Appendix 7), 576 AAHUs of intermediate marsh would be established during construction of 1462 acres (and a net of 1082 acres) of coastal marsh habitat under alternative 3. Submerged and emergent vegetation, as well as scrub-shrub vegetation, potentially colonizing these areas would provide valuable and diverse habitat for nesting birds and terrestrial wildlife such as raccoon, nutria, and alligator. Thus, it is anticipated that wildlife in and near the project area would ultimately benefit from the proposed activities. The reduction in the amount of shallow open water is negligible compared to that remaining in the project area.

The bald eagle (*Haliaeetus leucocephalus*) was removed from the list of Threatened and Endangered species on August 8, 2007. However, the bald eagle continues to be protected under the Migratory Bird Treaty Act of 1918 and the Bald and Golden Eagle Protection Act. Active nests have not been located near project features, although it is very possible that eagles may nest near project features at any point in the future. If an eagle's nest is found, a no-work zone of 660 feet from the nest will be implemented and CEMVN will immediately notify the USFWS Lafayette Office.

The brown pelican (*Pelecanus occidentalis*), a year-round resident of coastal Louisiana that may occur in the project area, was removed from the Federal List of Endangered and Threatened Wildlife (i.e., "delisted") by USFWS on November 17, 2009. Despite its recent delisting, brown pelicans, and other colonial nesting wading birds and seabirds, remain protected under the Migratory Bird Treaty Act of 1918. Portions of the proposed project area may contain habitats commonly inhabited by colonial nesting wading birds and seabirds. To minimize disturbance to pelicans and other colonial nesting birds and seabirds potentially occurring in the project area, MVN would observe all practicable conservation recommendations provided by the USFWS, Lafayette, Louisiana Field Office.

Special operating conditions addressing pelicans and other colonial nesting wading birds and seabirds, that would be included in all contract awards include:

Colonial Nesting Birds

Colonial nesting wading birds (including, but not limited to, herons, egrets, and Ibis) and seabirds/water-birds (including, but not limited to terns, gulls, Black Skimmers, and Brown

Pelicans) are known to nest in the project area. The nesting birds and their nests must not be disturbed or destroyed. The nesting activity period extends from 15 February through 15 September. USACE coordinates plans and specs with USFWS for each dredging contract (multiple times annually) for compliance under the Endangered Species Act and Migratory Bird Treaty Act. Previous coordination efforts indicate that dredging activity during this period may be subject to additional requirements as stated below. Note that below designations (e.g. “Section X”) will be filled in with the appropriate alpha or numeric reference at the proper time.

“Implementation and Reporting:

a. In addition to the paragraph located in Section X, paragraph X entitled "Implementation and Reporting," the Contractor shall also submit the Bird Nesting Prevention Plan, see paragraph X entitled "Bird Nesting Prevention and Avoidance Measures."

b. The presence of nesting wading birds and/or seabirds/water-birds within the minimum distances from the work area, as specified in the paragraph entitled "No Work Distances," shall be immediately reported to CEMVN.

No-work distance restrictions are as follows:

Terns, gulls, and Black Skimmers - 650 feet;

Colonial nesting wading birds - 1000 feet; and,

Brown Pelicans - 2000 feet.

Coordination by the New Orleans District personnel with the U.S. Fish and Wildlife Service may result in a reduction or relaxing of these no-work distances depending on the species of birds found nesting at the work site and specific site conditions.

Bird Nesting Prevention and Avoidance Measures:

The Contractor shall prepare and submit to the Contracting Officer's Representative, for approval, a plan detailing the efforts that will be undertaken to prevent birds from nesting within the minimum distances, as specified in paragraph X entitled "No Work Distances," from any work activity. The plan shall be submitted in accordance with paragraph X entitled "Implementation and Reporting."

Nest prevention measures shall be intended to deter birds from nesting on the placement area(s) and access corridor(s) without physically harming birds during the nesting activity period, as specified in the paragraph entitled "General." Nest prevention measures may be used in combination and/or adjusted to be most effective. The use of any harassment

measures shall be in accordance with EM 385-1-1 (Safety and Health Requirements), dated September 15, 2008. At minimum, nest prevention measures shall include the following:

> Flagging/Streamers - Flagging and/or streamers at least 2 ft in length and which consist of reflective plastic/mylar type material shall be attached to the top of stakes at least 3 feet in height. The stakes shall be driven into the ground at approximately 20-foot intervals. Flagging and/or streamers shall be placed such that the flags/streamers move in a light wind.
>
> Vehicular/Pedestrian Traffic - At minimum, one terrain vehicle and/or one person shall travel throughout the entire placement area at least once per hour from dawn to dusk.

Upon the exercise of Option Item "Bird Nesting Prevention and Avoidance Measures," the Contractor shall begin work within 24 hours. Specific nest prevention measures used during the work shall be monitored for effectiveness and may require adjustment and/or modification. All equipment/supplies used for nest prevention shall be removed from the work site upon the completion of work and as directed by the Contracting Officer.

If bird nests are discovered at the work site, immediate notification shall be made in accordance the paragraph entitled "Reporting." The Contractor shall immediately mark the bird nests with flagging on stakes 3-feet above the ground surface and no closer than 3 feet from the nest. The Contractor shall immediately implement safe work distances from the nest(s) as specified in the paragraph entitled "No Work Distances," place flagging to create exclusion zone(s) around the nest(s), and advise all equipment operators of the bird nest(s) and exclusion zone(s).”

Alternative 2

Direct and Indirect Impacts: Direct and indirect impacts on wildlife caused by crossing construction and maintenance would be expected to be minor in extent and short term in duration. Wildlife (deer, birds, raccoons, rabbits, etc.) that occur in the batture may be temporally inconvenienced by nuisance noise caused by dredging, however, considering other ambient noises, impacts on wildlife would be relatively minor in extent and short term in duration. The special operating conditions identified for Alternative 3 would also be included in the contracts for Alternative 2. It is anticipated that this alternative would not result in significant adverse direct or secondary impacts to this resource.

Alternative 3d

Direct and Indirect Impacts: Because Alternative 3d would deepen and maintain the river to 50 feet up through the Port of South Louisiana, direct and indirect impacts associated with this alternative would be less in scope, but similar in extent and duration than the minor impacts previously described under Alternative 3. Ambient noise levels upstream from the Port of South Louisiana would not increase.

4.4.4 Aquatic and Fisheries Resources

No Action/Future without Project Conditions (Alternative 1)

Direct and Indirect Impacts: O&M activities within the river would continue, however, there would be no direct impacts under the no-action alternative. Annual O&M dredging of the project area would continue at an average 35,318,498 cy per year and would establish approximately 528 acres of intertidal marsh (EFH) annually. Other existing marsh in the area would continue to gradually transition from intertidal EFH to open water EFH. Existing conditions and trajectories of ecological change to aquatic and fisheries resources, as described in previous Sections, would persist. The area would be subjected to increases in RSLR which could increase saltwater intrusion and lead to increases in and the potential conversion of vast areas of forested wetlands and swamp habitats to marsh and open water. Much of the area, could be permanently inundated under both the intermediate and high RSLR scenarios. There could be a shift from fresh water dominant species to those species that can tolerate higher salinity.

Alternative 3

Direct and Indirect Impacts: With implementation of the proposed action, there would be some minimal direct and indirect effects to aquatic resources/fisheries in the form of altered open water bottom habitat. A maximum of approximately 1462 acres of shallow open water bottoms would be temporarily or permanently impacted by the beneficial use-placement of dredged material into the placement areas. Based on the estimate of 10 percent cover of SAVs in the beneficial use placement area, it is estimated that 146.3 acres of SAV habitat would be converted to intertidal marsh as a result of project construction.

It is anticipated that mobile fishery species would avoid areas of placement activities during the project period, thereby minimizing direct and indirect impacts to those species. Brown shrimp, white shrimp, and crabs may be directly impacted through the filling of shallow open water areas with dredged materials; however, these species could potentially indirectly benefit from the abundance of introduced detritus, and subsequent food resources, from these materials. Sessile or slow moving benthic organisms may be smothered in areas where dredged material is deposited

for marsh creation. Sediment particles that become suspended due to placement activities may impact filter-feeding benthic invertebrates by fouling feeding apparatus if the concentration of such particles is excessively high. Clams and oysters, in particular, may experience a reduction in pumping rates with increased turbidity (Loosanoff 1961). The project area is not considered prime oyster habitat. Oysters would not be directly impacted because, per LDWF regulation, dredging would not occur within 1/2 mile of existing oyster lease boundaries, currently of which there is only one lease in the study area. Currently, LDWF does not identify oyster seed grounds in the placement areas. http://gis.wlf.la.gov/oystermap/map.html. However, CEMVN has identified one oyster lease partially within the existing beneficial placement area along the Northwest perimiter of the Southwest Pass boundary. Beneficial placement of material cannot occur within 0.5 mile of this lease as required by LDWF, but based on its distant location from the channel, and based on the adjacent open water areas, this should not present a challenge for beneficial use in accordance with the Federal Standard.

With implementation of the proposed action, some positive indirect impacts to fisheries in the project area would be expected. Beneficially used dredge material (within the limits of the Federal Standard) would be expected to create up to 1462 acres of coastal wetland platform and other coastal habitat in the open water placement areas. According to wetland value assessment models (Appendix 7), 576 AAHUs of intermediate marsh would be created during construction of 1462 acres of coastal wetland habitat under alternative 3 (noting that due to erosion, approximately 1082 acres would remain after 50 years). The expansive emergent and elevated wetland vegetation expected to colonize this area would enhance primary and secondary productivity in the area and provide substantial fisheries benefits resulting from valuable foraging, breeding, and nursery habitat for finfish and shellfish, while helping to offset the considerable wetlands loss currently taking place in this portion of the Mississippi River Delta. Creation of new marsh would provide highly productive fisheries habitat, increase detrital food material, and likely contribute to overall increased fisheries productivity in the project area. Benefits to both commercial and recreational fisheries would be expected.

Water quality and benthic species would be expected to rebound once project construction is complete. The restoration of fresh marsh in areas that are currently open water would provide indirect benefits to fisheries in the future by providing nutrients to the system in the form of detritus thereby increasing the primary productivity in the wetland system.

With implementation of the proposed action, essential fish habitat (EFH) for brown shrimp, white shrimp, and red drum would be directly impacted in the project area during the beneficial use-placement of dredged material in the shallow open waters of the placement areas. This may cause some mortality of the larval form of identified species when present, although juvenile forms of the species would be able to relocate to adjacent EFH. Minor negative effects to EFH would occur

primarily via increased turbidity during the construction period. The temporary water quality impacts from borrow excavation/expansion and the placement of such material are not anticipated to be substantial enough to cause water quality impairment under the standards of Louisiana Administrative Code, Title 33, Part IX, Chapter 11. Impacts to cover and foraging for managed species are anticipated to be relatively minor as the 1,462 acres of constructed marsh habitat is relatively small in size compared to the abundance of open water EFH habitat in the basin.

Approximately 146 acres of open water/SAV habitat would be converted when approximately 1,462.5 acres of shallow open water and associated EFH habitat would be converted to coastal marsh habitat in the placement areas. Placement of sediment could adversely impact EFH if elevations of the dredged material exceed intertidal elevations. CEMVN will coordinate with NMFS regarding the placement of fill material in each beneficial use area beginning with each annual dredging conference hosted by CEMVN where specific design and beneficial use site placement is discussed with the resource agencies. Prior to construction, CEMVN will undertake appropriate engineering and design assessments to ensure sediment elevations, after compaction and dewatering, would be within tidal range. Should containment dikes be determined necessary for beneficial use, CEMVN will breach each dike within 3 years after construction.

Although the beneficial use placement areas contain shallow open water EFH, a conversion from shallow open water EFH to intertidal marsh EFH habitat is actually envronmentally preferred by several natural resource agencies and environmental organizations because shallow open water habitat is widely abundant in the area and coastal marsh habitat is increasingly scarce. This conversion of EFH types is acceptable, is environmentally beneficial, and would not warrant EFH mitigation. Once established, coastal marsh habitat would be subject to ongoing environmental stressers (subsidence sea level rise, erosion, hurricanes, etc.) and, unless renourishment occurs, would begin the gradual cycle of tranisitioning back to shallow open water habitat EFH in many areas. After 50 years, it is anticipated that approximately 380 acres of constructed marsh will have reverted back to shallow open water EFH.

These areas would be converted to generally more productive categories of EFH (e.g., estuarine emergent marsh, marsh edge, inner marsh, marsh/water interface). Additional, short term EFH impacts would include a temporary and localized increase in estuarine water column turbidity during the placement of dredged material in shallow open water areas; however, the project area is a naturally turbid environment and increased turbidity is not expected to significantly affect EFH needs within the project area. Thus, the proposed action would provide mainly positive indirect impacts to EFH in the project area, and any direct or temporary adverse impacts would be sufficiently offset by the net benefits from creating up to 1,462.5 acres of marsh, new shallow open water habitat, and associated EFH. Due to environmental stressors such as subsidence, erosion, hurricanes, etc., it is estimated that approximately 380 acres of constructed marsh will have

reverted back to shallow open water EFH after 50 years. A conversion of shallow open water EFH to intertidal marsh EFH would not warrant mitigation. It is anticipated that this alternative would not result in significant adverse direct or secondary impacts to this resource.

NMFS commented on the Draft Integrated General Reevaluation Report and Supplemental Environmental Impact Statement under the Magnuson-Stevens Fishery Conservation and Management Act (16 U.S.C. §§1801, *et seq*.) in January 2017. NMFS did not provide EFH conservation recommendations on the project, and coordination with NMFS on EFH concluded on July 7, 2017 (Appendix A-19).

To avoid impacts on dolphins and West Indian manatee that may occaisionally be found in the area, and to ensure compliance with the law, CEMVN commits that all construction staff will be educated about the laws, about measures to avoid harm or harassment to manatees and dolphins and about appropriate best management practices (e.g., conducting a search within the project area to avoid or minimize potential entrapment during construction, Appendix A-18). These best management practices will be included in and required by the construction contracts. (Appendices A-12, A-18.)

Alternative 2

Direct and Indirect Impacts: With implementation of the Alternative 2, there would be some minimal direct and indirect effects to aquatic resources/fisheries in the form of altered open water bottom habitat. Impacts to EFH would not be expected under alternative 2 because EFH does not occur within the river and there would be no impacts to coastal habitat in the vicinity of Southwest Pass. It is anticipated that mobile fishery species would avoid areas of placement activities during the project period, thereby minimizing direct and indirect impacts to those species. Sessile or slow moving benthic organisms may be smothered in areas where dredged material is removed. Sediment particles that become suspended due to placement activities may impact filter-feeding benthic invertebrates by fouling feeding apparatus if the concentration of such particles is excessively high. Since the project area is a naturally turbid environment and the majority of resident finfish and shellfish species are generally adapted to, and very tolerant of, high suspended sediment concentrations, the effects of turbidity and suspended solids on fisheries in the area would likely be negligible.

Alternative 3d

Alternative 3d would be similar in scope, extent and duration as the minor beneficial impacts previously described under Alternative 3. Water bottoms would only be affected within 3 crossings for this alternative. It is anticipated that this alternative would not result in significant adverse direct or secondary impacts to this resource.

4.4.5 Threatened, Endangered, and Other Protected Species

No Action/Future without Project Conditions (Alternative 1)

Direct and Indirect Impacts: Adverse impacts on threatened or endangered species, designated critical habitats, and other species of concern would not be likely. The species identified above would continue to occasionally enter the project area, and the potential for harassment or a take would remain during regular maintenance dredging operations. All takes would be documented and reported to the appropriate management agency. Routine dredging operations would continue to be coordinated with the USFWS and NMFS for compliance on at least an annual basis under the Endangered Species Act and the best management practices outlined above would continue to be followed.

Alternative 3

Direct and Indirect Impacts:

Sea Turtles

While the Kemp's ridley, loggerhead, hawksbill, leatherback and green sea turtle species may be present in the project area, such presence is limited. High levels of sediment in the water column and low prey availability probably preclude any high concentrations of sea turtles in the proposed dredging regions. Other reasons for low occurrence include depressed salinity levels due to inflow from the Mississippi River, lack of seagrasses and coral reefs, mud and fine sand water bottoms, shallow water depths, and an absence of nesting habitat.

In the event that they may occur in the dredging or placement areas, sea turtles have the mobility necessary (i.e. physiology, suitable habitat elsewhere) to avoid the project area during periods of hopper dredging. Hopper dredging activities in the Mississippi River Southwest Pass navigation channel are performed in full compliance with the Terms and Conditions contained in the November 19, 2003 National Marine Fisheries Service Gulf of Mexico hopper dredging regional biological opinion (GRBO) and subsequent revision dated January 9, 2007 (http://sero.nmfs.noaa.gov/protected_resources/section_7/freq_biop/documents/dredge_bo/f13817_revision_2_grbo.pdf) . The GRBO covers the Southwest Pass segment of the Mississippi River, Baton Rouge to the Gulf project from the Gulf of Mexico (bar channel) up to 1 mile inland of the gulf. The channel upstream of this 1 mile inland reach is not covered by the GRBO because NMFS doesn't consider the remainder of the channel and O&M activities to be a threat to sea turtles. Hydraulic cutterhead pipeline dredging operations have not been identified as a source of sea turtle mortality.

CEMVN has concluded that the proposed action would have no effect on the loggerhead, hawksbill, leatherback, green, or Kemp's ridley sea turtles.

West Indian Manatee

It is extremely unlikely that manatees would be found in the project area or the surrounding shallow open waters; however, if manatees are observed within 100 yards of the “active work zone” during dredging/placement activities, MVN would implement the appropriate special operating conditions (e.g., no operation of moving equipment within 50 feet of a manatee; all vessels should operate at no wake/idle speeds within 100 yards of work area; siltation barriers, if used, should be re-secured and monitored; report manatee sightings or collisions), as provided by the USFWS, Lafayette, Louisiana Field Office. The following special operating conditions for manatees would be included in any MVN plans and specifications developed prior to dredging and placement activities, as recommended by the USFWS, Lafayette, Louisiana Field Office:

The West Indian manatee may be present in the project vicinity. The Contractor shall instruct all personnel associated with the project of the potential presence of manatees in the area, and the need to avoid collisions with these animals. All construction personnel shall be advised that there are civil and criminal penalties for harming, harassing, or killing manatees. Manatees are protected under the Marine Mammal Protection Act of 1972, and the Endangered Species Act of 1973. The Contractor shall be held responsible for any manatee harmed, harassed, or killed as a result of construction activities not conducted in accordance with these Specifications:

> “Manatee Signs. Prior to commencement of construction, each vessel involved in construction activities shall display at the vessel control station or in a prominent location, visible to all employees operating the vessel, a temporary sign at least 8-1/2" x 11" reading, "CAUTION: MANATEE HABITAT/IDLE SPEED IS REQUIRED IN CONSTRUCTION AREA." In the absence of a vessel, a temporary 3' x 4' sign reading "CAUTION: MANATEE AREA" shall be posted adjacent to the issued construction permit. A second temporary sign measuring 8-1/2" x 11" reading "CAUTION: MANATEE HABITAT. EQUIPMENT MUST BE SHUTDOWN IMMEDIATELY IF A MANATEE COMES WITHIN 50 FEET OF OPERATION" shall be posted at the dredge operator control station and at a location prominently adjacent to the issued construction permit.
>
> The Contractor shall remove the signs upon completion of construction.
>
> a. Special Operating Conditions if Manatees are Present in the Project Area.
>
> (1) If a manatee(s) is sighted within 100 yards of the project area, all appropriate precautions shall be implemented by the Contractor to ensure protection of the manatee.

These precautions shall include the operation of all moving equipment no closer than 50 feet of a manatee. If a manatee is closer than 50 feet to moving equipment or the project area, the equipment shall be shut down and all construction activities shall cease to ensure protection of the manatee. Construction activities shall not resume until the manatee has departed and the 50-foot buffer has been reestablished.

(2) If a manatee(s) is sighted in the project area, all vessels associated with the project shall operate at "no wake/idle" speeds at all times, and vessels will follow routes of deep water whenever possible, until the manatee has departed the project area. Boats used to transport personnel shall be shallow-draft vessels, preferably of the light-displacement category, where navigational safety permits.

(3) If siltation barriers are used, they shall be made of material in which manatees cannot become entangled, are properly secured, and are regularly monitored to avoid manatee entrapment."

CEMVN has concluded that with implementation of the above conditions the proposed action may affect, but is not likely to adversely affect the West Indian Manatee.

Piping Plover and Rufa Red Knot

Piping plovers and the Red Knot could occur along the shoreline and in the intertidal and shallow waters of the project area during winter migration, however, neither are permanent residents of the area. During placement of dredged material into designated areas, they may be temporarily displaced to nearby areas for foraging and loafing due to nuisance noises from dredging/placement operations; however, beneficial placement would not place material within the 259 acres of existing critical habitat for piping plovers (LA-Unit 6), and the proposed placement would be beneficial due to the net increase of available habitat for each species.

CEMVN has concluded that the proposed action may affect, but is unlikely to adversely affect the Piping Plover or the Red Knot. CEMVN has also concluded that the proposed action may affect but would not be likely to adversely affect designated critical habitat for the Piping Plover.

Sturgeon

The Gulf sturgeon (a subspecies of Atlantic sturgeon) is not anticipated to be present within the project area and the proposed action would have no effect on that species. Pallid sturgeon are believed to be a strictly freshwater fish rarely found downstream of New Orleans, LA. Both sturgeon are probably absent from the Mississippi River delta during low river flows when salt water from the Gulf of Mexico intrudes upriver along the bottom of the channel (salt water wedge).

If project construction is planned during these events, impacts to pallid sturgeon due to dredging activities in the Mississippi River Delta are unlikely. Although their densities are very low and they have not been found below RM 80 (Appendix A-16), Pallid sturgeon, however, are potentially affected by crossing construction and maintenance within the twelve crossings. CEMVN concluded that the proposed action may affect, but is not likely to adversely affect pallid sturgeon. As environmental conditions are consistently variable, USACE will continue to consult with the Service for ESA compliance, (as well as compliance with the Bald and Golden Eagle Protection Act, the Marine Mammal Protection Act, and the Migratory Bird Treaty Act) for each dredging contract awarded for the project.

In the most recent Biological Opinion on the project from the USFWS (December 28, 2016), the Service provided the following recommendations for MVN to implement during 2017 annual maintenance dredging activities. Implementation of those recommendations should further reduce the unlikely chance of encountering sea turtles, pallid sturgeon, or other fish species while conducting dredging activities (Appendix A-15).

> "1. To the extent possible, schedule dredging activities in the project area during low flow periods, when salt water occurs on the channel bottom further upriver than during normal or high river flows.
>
> 2. The cutterhead should remain completely buried in the bottom material during dredging operations. If pumping water through the cutterhead is necessary to dislodge material or to clean the pumps or cutterhead, etc., the pumping rate should be reduced to the lowest rate possible until the cutterhead is at mid-depth, where the pumping rate can then be increased.
>
> 3. During dredging, the pumping rates should be reduced to the slowest speed feasible while the cutterhead is descending to the channel bottom."

In accordance with these recommendations, cutterhead dredges working in the Mississippi River utilize the following operational best management practices to avoid/minimize adverse impacts to sturgeons that may be in the area of dredging activity: 1) When lowering the ladder, the pumping rate should be reduced to the slowest speed feasible while the cutterhead is being lowered to the channel bottom; 2) The cutterhead remains completely buried in the channel bottom during dredging operations; and 3) If pumping water through the cutterhead is deemed necessary to dislodge material, or to clean the pumps, the pumping rate should be reduced to the lowest rate feasible while raising the ladder until the cutterhead is at least at mid-depth at which point the pumping rate can then be increased.

The dredging activities in the Mississippi River Southwest Pass navigation channel and bar channel would comply with the Terms and Conditions contained in the November 19, 2003

National Marine Fisheries Service Gulf of Mexico Regional Biological Opinion (GRBO) hopper dredging and subsequent revision dated January 9, 2007 (http://sero.nmfs.noaa.gov/protected_resources/section_7/freq_biop/documents/dredge_bo/f13817_revision_2_grbo.pdf). Coordination with the National Marine Fisheries Service regarding requirements of NMFS' GRBO concluded on March 24, 2017 (Appendix A-20).

CEMVN concluded that the Recommended Plan would have no effect on Gulf Sturgeon or on loggerhead, hawksbill, leatherback, green, or Kemp's ridley sea turtles. ESA consultion for those species was not required.

CEMVN submitted a Biological Assessment for endangered species consultation under the purview of USFWS on July 7, 2017 (Appendix A-22). The assessment concluded that there would be no effect on loggerhead, hawksbill, leatherback, green, or Kemp's ridley sea turtles. The assessment further concluded that the action may affect, but is not likely to adversely affect the West Indian Manatee, the piping plover and its designated critical habitat (unit LA-6), the rufa red knot, and pallid sturgeon. The USFWS concurred with CEMVN's determination of May Affect, But Not Likely to Adversely Affect on August 25, 2017 (Appendix A-22). CEMVN will continue to coordinate on the subject of ESA threatened and endangered species and maintenance of federal navigation channels via the annual Environmental Dredging Conference, as well as during the review of project plans and specifications prior to each contract award.

Alternative 2

Direct and Indirect Impacts: Impacts to Gulf sturgeon, sea turtles, piping plover, and the red knot would not be expected (no effect) with Alternative 2 due to the location of construction (upstream of New Orleans). Pallid sturgeon are uncommon in the crossings but could occur. CEMVN has determined that this alternative may affect, but would not be likely to adversely affect pallid sturgeon. USACE would continue to consult with the Service for ESA compliance with each dredging contract awarded.

Alternative 3d

Direct and Indirect Impacts: Because Alternative 3d would deepen and maintain the river to 50 feet through the Port of South Louisiana, direct and indirect impacts associated with this alternative would be less in scope, but similar in extent and duration, than the relatively minor impacts previously described under Alternative 3 within the work zones. Effect determinations for this alternative are the same as for Alternative 3. USACE would continue to coordinate for ESA compliance with each dredging contract awarded.

4.5 Cumulative Impacts

Past, Present, and Foreseeable Coastal Restoration Actions in Louisiana:

Although this is a federal navigation project, it does have a component of beneficial use of dredged material to create desirable coastal habitat to the extent possible within the limitations of the Federal Standard. The list below describes coastal ecosystem restoration efforts that cumulatively affect coastal wetland loss within the region. The EPA, reporting on the Nation, states the number of restoration projects grows yearly. Current Federal initiatives call for a wide range of restoration actions, including improving or restoring 25,000 miles of stream corridor; which contributes to the success of neo-tropical migratory species

(sources: http://www.nwd-mr.usace.army.mil/rcc/MRFTF/docs/USACE-NFPC%20Nonstructural%20Measures%20Definitions.pdf; and http://water.epa.gov/type/wetlands/restore/principles.cfm).

- Coastal Impact Assistance Program (CIAP) is authorized by the Outer Continental Shelf (OCS) Lands Act, as amended; 31 U.S.C. 6301-6305. The intent of the program is to disburse funding to eligible producing states and coastal political subdivisions for the purpose of conservation, protection, or restoration of coastal areas including wetlands; mitigation of damage to fish, wildlife, or natural resources; planning assistance and the administrative costs of complying with these objectives; implementation of a federally-approved marine, coastal, or comprehensive conservation management plan; and mitigation of the impact of outer Continental Shelf activities through funding of onshore infrastructure projects and public service needs. Louisiana's CIAP Program, administered by the Department of Interior, includes a total of 103 projects state-wide, with 11 state projects, 17 state/parish projects and 75 parish projects. Examples of CIAP projects are presented below.
    - East Grand Terre Island Barrier Island Restoration
    - Barataria Land Bridge Dedicated Dredging created more than 2,000 acres of marsh
    - Currently under construction is the Marcantel Beneficial Use to create 440 acres of marsh
    - PO-73-2 - Central Wetlands – EBSTP to A2
    - PO-148 - Living Shoreline
    - TE-63 - Falgout Canal Freshwater Enhancement
    - BA-0161 - Mississippi River Water Reintroduction into Bayou Lafourche

- CWPPRA Program – In 1990, Congress passed the Coastal Wetlands Planning, Protection and Restoration Act (CWPPRA) (Public Law 101-646, Title III). Although originally enacted with a sunset provision, CWPPRA has now been amended and is no longer subject to a statutory termination date. However, the majority of CWPPRA projects that have been approved for construction are approved subject to a finite period of being operated and maintained by the CWPPRA program. Those projects, unless approved and funded for an extended period of operation an maintenance by the CWPPRA program, will terminate upon the expiration of the term of project life that was determined to be in effect for that project at the time of its approval for construction. As of Dec 2017, 214 CWPPRA projects have been approved, 110 have been constructed, 16 are under construction, 23 are in the engineering & design phase, 5 are Program support projects & 60 have been deauthorized (46), inactivated (6) or transferred to another program (8). 154 are currently active\. (There are 153 active CWPPRA projects refer to the following website for a comprehensive list: https://lacoast.gov/new/Projects/List.aspx).

- CS-Louisiana Coastal Area (LCA), Ecosystem Restoration Study (USACE 2004) recommends 15 near-term measures aimed at addressing the critical restoration needs. The components recommended for authorization include five critical near-term ecosystem restoration measures, a demonstration program consisting of a series of demonstration projects, a beneficial use of dredged material (BUDMAT) program, and a science and technology program. The five critical near-term ecosystem restoration measures, demonstration projects, and BUDMAT projects are all subject to the approval of feasibility level of detail decision documents by the Secretary of the Army. To date, a total of 80 acres of wetlands were created by placing HDDA dredged material in shallow open water areas of West Bay under the LCA BUDMAT program in FY 2015. At least for some unidentified period of time, LCA BUDMAT will potentially utilize dredge material from this project beneficially beyond the Federal Standard. Presently the LCA BUDMAT authorization is limited to federal expenditure of $100,000,000. The 2017 State Master Plan indicates little opportunity in partnering on beneficial use south of Venice, LA. The January 31, 2005, Chief's Report approved the Near-Term Plan substantially in accordance with the 2004 LCA Study. Title VII of the Water Resources Development Act of 2007 (WRDA 2007) (Public Law 110-114) authorized an ecosystem restoration Program for the Louisiana Coastal Area substantially in accordance with the Near-Term Plan. Some of the LCA projects have not yet been authorized for construction, and some of those that have been authorized for construction no longer have a non-federal sponsor. The following projects are being constructed in partnership with the State, or other local interest. Some portion of these projects were constructed without an agreement or In-Kind MOU in place and are thus not eligible for credit as a LCA project. None of the construction efforts by the State have been determined officially to be integral to the Federal LCA project. That will not occur until the Integral Determination Report process is commenced. Except for BUDMAT, these are being

constructed independently by the state and those portions of the projects have the potential to be approved as integral to the LCA project.

- LCA projects that are completed or are currently under study or construction include:
  - LCA BUDMAT at Tiger Pass (TP) (TP 1 constructed, TP 2 still in planning stage)
  - LCA West Bay Marsh Creation Tier 1 project, which is part of the LCA's Beneficial Use of Dredged Material (BUDMAT) Program
  - LCA Barataria Basin Barrier Shoreline Caminada (Phase II)
  - LCA Barataria Basin Barrier Shoreline Shell Island (Phase II)
  - A portion of the LCA Terrebonne Basin Barrier Shoreline Whiskey Island
  - LCA Amite Diversion Canal modification

- USACE Navigation projects, Beneficial Use of Dredged Material Program (not classified as an Ecosystem Restoration Project)

1. The CEMVN maintains 11 major navigational channels in LA. (2800 miles of waterways) On average, about 74.4 million cubic yards (CY) of shoal material are removed from Federal navigation channels every year.

   a. of this annual total, about 18.7 million CY is removed from projects located too far from potential beneficial use placement sites to be economically feasible
      - the Mississippi River Deep Draft Crossings account for about 18 million CY of this total

   b. of this annual total, about 16.3 million CY consists of "fluff" material that is not usable/suitable for marsh restoration
      - the Atchafalaya River and Calcasieu River bar channels account for this "fluff" material

2. Thus, of the 74.4 million CY that the CEMVN dredges every year, only about 39.4 million CY are actually available for beneficial use placement.

3. On average, about 16.4 million CY of dredged material is beneficially used on an annual basis.

4. With the exception of the Gulf Intracoastal Waterway, all major Federal navigation channels where maintenance dredging is performed have had some portion of their dredged material used beneficially.

5. Shoal material removed by hopper dredges in Southwest Pass (about 13-14 million CY annually) is not currently used directly for beneficial uses. However, the hopper dredge placement area located at Head of Passes is occasionally dredged by cutterhead dredge and this material is beneficially used to create marsh and duck nesting habitat on the nearby Delta National Wildlife Refuge, the extent permissible under the limitations of the Federal Standard regulations.

6. Since 1976, some portion of sediments removed from Federal navigation channels in Louisiana have been used in accordance with the Federal Standard regulations in a manner that results in an ancillary benefit of the project to coastal habitat restoration.

a. Dredged material from Southwest Pass provided the sediment source for this initial dredged material placement effort in 1976.

7. To date (1976-2015), the CEMVN has used dredged material, within the limits of the Federal Standard regulations, to create/restore approximately 62 square miles (39,568 acres) of coastal habitat as described below in Louisiana. The majority of this beneficial use is funded by the O&M budget for the navigation project and is subject to the limitations of the Federal Standard regulations. Any beneficial use beyond the Federal Standard limitations has and will continue to require statutory authority and funding from other programs, such as CWPPRA, LCA BUDMAT, Coastal Impact Assistance Program (CIAP), Continuing Authorities Program - Section 204, or by Contributed Funds depending on availability.

a. Approximately 33,083 acres of wetland habitat.

b. Approximately 3,485 acres of bird nesting islands, beach/shoreline, and barrier island habitat.

c. Approximately 3,000 acres of scrub/shrub, maritime forest ridge, grassland habitat (Southwest Pass).

8. Channel-by-channel breakdown of beneficial acres created/restored by Federal navigation projects, to the extent allowed within the limits of the Federal Standard regulations are as follows:

a. Calcasieu River = 3,358 acres
b. Mermentau River = 242 acres
c. Freshwater Bayou = 344 acres

d. Atchafalaya River = 8,986
e. Houma Navigation Canal = 143 acres
f. Port Fourchon = 309 acres
g. Barataria Bay Waterway = 1,079 acres
h. Tiger Pass = 624 acres
i. Baptiste Collette = 1,828
j. South Pass = 1,971 acres
k. Southwest Pass = 18,013 acres
l. MRGO = 2,591
m. Berwick Bay Harbor = 59
n. Tangipahoa River = 21

- Restoration of injuries to natural resources damaged by the 2010 Deepwater Horizon oil spill is presently under the Natural Resource Damage Assessment (NRDA), a legal process under the Oil Pollution Act of 1990 (OPA) and the Louisiana Oil Spill Prevention and Response Act of 1991 (LOSPRA) whereby designated trustees represent the public to ensure that natural resources injured in an oil spill are restored (source: http://la-dwh.com/AboutNRDA.aspx; accessed November 25, 2015). Both federal and state NRDA regulations provide a step-by-step process for trustees to determine injuries, to assess damages, and to develop and implement restoration projects that compensate the public for injuries to natural resources impacted by an incident. In general, the NRDA process involves three steps: (1) pre-assessment; (2) restoration planning; and (3) restoration implementation. On July 11, 2011, Governor Bobby Jindal unveiled the "Louisiana Plan" which outlines 13 initial proposed early restoration projects (source: http://la-dwh.com/LouisianaPlanProjects.aspx). The projects are consistent with Louisiana's Coastal Master Plan and they support the goal of compensating the public for natural resource injuries resulting from the Deepwater Horizon Oil Spill.

- In February of 2015, the Deepwater Horizon Natural Resource Damage Assessment Trustees finalized the Deepwater Horizon Oil Spill Draft Programmatic Damage Assessment and Restoration Plan and Programmatic Environmental Impact Statement (PDARP/PEIS) for public review and comment (source: http://la-dwh.com/PDARP_PEIS/Draft_PDARP_PEIS.aspx). The Trustees identified Alternative A as their preferred alternative. Alternative A is an integrated restoration portfolio that emphasizes the broad ecosystem benefits that can be realized through coastal habitat restoration in combination with resource-specific restoration in the ecologically interconnected northern Gulf of Mexico ecosystem. The restoration dollars could be used for a variety of restoration approaches. For illustration purposes only, the money allocated to Louisiana could be sufficient to create 20,000 to 40,000 acres of coastal marsh in Louisiana along hundreds of miles of shoreline, supporting the diversity of fish, birds, and animals that depend on coastal

marsh. Although no NRDA sponsored projects have yet been constructed, it is reasonably foreseeable that the nearly Gulf-coast wide damages would be mitigated.

- The Resources and Ecosystems Sustainability, Tourist Opportunities, and Revived Economies of the Gulf Coast States Act (RESTORE Act) represents a portion of the Congressional response to the Deepwater Horizon oil spill. The Act dedicates 80 percent of all Clean Water Act administrative and civil penalties related to the Deepwater Horizon oil spill to the Gulf Coast Restoration Trust Fund (Trust Fund). RESTORE Act funds are allocated between five buckets: the Direct Component (35%), the Council-Selected Restoration Component (30%), the Spill Impact Component (30%), the Gulf Coast Ecosystem Restoration Science Program (2.5%); and Centers of Excellence Research Grants Program (2.5%). In early 2013, Transocean entered into a plea agreement to pay $1 billion to resolve federal Clean Water Act civil penalty claims, of which $800 million will be made available under the RESTORE Act to fund Gulf Coast recovery projects. The process of selecting projects for implementation under the RESTORE Act is anticipated to continue through the period of analysis, until the allocated funds are exhausted. Some projects have been selected and funded for implementation and will be discussed as a part of the reasonably foreseeable actions section below. In November of 2016, the Louisiana Coastal Protection and Restoration Authority (CPRA) has been awarded two grants totaling approximately $7.5 million from the Gulf Coast Ecosystem Restoration Council (RESTORE Council) for engineering and design of the Golden Triangle Marsh Creation ($3.2M) project and the Biloxi Marsh Living Shoreline ($4.3M) project under the Resources and Ecosystems Sustainability, Tourist Opportunities and Revived Economies of the Gulf Coast States Act of 2012 (RESTORE Act). These projects represent two out of seven total projects that were selected for funding by the RESTORE Council under its Initial Funded Priorities List that will directly benefit Louisiana. One additional grant in the amount of $7.3 million was funded by the RESTORE Council in September for the engineering and design of the West Grand Terre Beach Nourishment and Stabilization Project.

Past, Present and Foreseeable Actions Along the Project Corridor (Baton Rouge, LA to the Gulf of Mexico:

The impact of past, present, and reasonably foreseeable projects in the project area on the important resources documented in this SEIS are represented by Table 4-5. Ecosystem restoration type projects in the basin work to enhance and restore historic ecosystem processes within the basin. Although these projects may result in temporal impacts and tradeoffs within the important resources, their overall effects on the system from a human and natural environmental perspective would be wholly positive. The structural projects (e.g. levee systems), to a large degree, produce

socioeconomic benefits (primarily in the form of navigation or flood control) that are the impetus for their construction. Though impacts to the natural environment from construction of these projects have been avoided to the maximum extent practicable, remaining unavoidable impacts would require mitigation. Environmental Justice impacts have been avoided during design of these projects. However, the structural projects have resulted in impacts to the aesthetics and recreational opportunities within the system. Ecosystem restoration plans in the region that improve estuarine habitat also provide benefits to the commercial fishing industry.

The list is not exhaustive, but provides a representative sample of projects that cumulatively effect the river corridor and coastal wetland loss.

Table 4-5 Cumulative impacts of past present and reasonably foreseeable projects along the project corridor between Baton Rouge, LA and the Gulf of Mexico

Project Name	Project Type	Wetlands and Other Surface Waters	Wildlife	Threatened and Endangered Species	Fisheries, Aquatic Resources, and Water	Essential Fish Habitat	Cultural Resources	Recreational Resources	Aesthetic Resources	Air Quality	Noise	Socioeconomics
CIAP BA-43 (EB): EB-Long Distance Mississippi River Sediment Pipeline	Diversion	+	+/-	o	+/-	+/-	o	+/-	o	o	o	o
CWPPRA BA-39: Mississippi River Sediment Delivery System - Bayou Dupont	Diversion	+	+/-	o	+/-	+/-	o	+/-	o	o	o	o
State of Louisiana BA-03: Naomi Siphon Diversion	Diversion	+	+/-	o	+/-	+/-	o	+/-	o	o	o	o
Louisiana DOTD: Future I-49 Corridor	Structure	+/-	+/-	o	o	-	o	-	-	o	+	+
US Army Corps of Engineers: Davis Pond Freshwater Diversion Structure	Structure	+/-	+/-	o	o	o	o	-	-	o	o	o

Project Name	Project Type	Wetlands and Other Surface Waters	Wildlife	Threatened and Endangered Species	Fisheries, Aquatic Resources, and Water	Essential Fish Habitat	Cultural Resources	Recreational Resources	Aesthetic Resources	Air Quality	Noise	Socioeconomics
Algiers Lock Local Drainage Improvements	Structure	+/-	+/-	o	-	-	o	+/-	-	o	o	-
Small Diversion at Convent/Blind River	Diversion	+	+/-	o	+/-	+/-	o	+/-	o	o	o	o
Venice Ponds Marsh Creation and Crevasses	Structure	+	+/-	o	+/-	+/-	o	+/-	o	o	o	o
Empire Lock	Structure	+/-	+/-	o	-	-	o	+/-	-	o	o	-
WestBay Sediment Diversion	Diversion	+	+/-	o	+/-	+/-	o	+/-	o	o	o	o
GIWW Navigation System	Structure	+/-	+/-	o	+/-	+/-	+/-	+/-	o	o	o	+
Harvey Canal Lock	Structure	+/-	+/-	o	-	-	o	+/-	-	o	o	-
Greater New Orleans Hurricane & Storm Damage Risk Reduction System	Structure	+/-	+/-	o	o	o	o	-	-	o	o	+
Mississippi River Levees : MR&T Project	Structure	+/-	+/-	o	-	-	+/-	-	-	o	o	+
Mississippi River Navigation Operations and Maintenance	Structure	+/-	+/-	o	+/-	+/-	o	-	o	o	o	+
New Orleans to Venice (NOV) levee project, Incorporation of Non-federal Levees (NFL) into NOV	Structure	+/-	+/-	o	o	o	o	-	-	o	o	+
New Orleans to Venice (NOV) levee project, St. Jude to Venice	Structure	+/-	+/-	o	o	o	o	-	-	o	o	+

Project Name	Project Type	Wetlands and Other Surface Waters	Wildlife	Threatened and Endangered Species	Fisheries, Aquatic Resources, and Water	Essential Fish Habitat	Cultural Resources	Recreational Resources	Aesthetic Resources	Air Quality	Noise	Socioeconomics
Oakville to La Reussite Non-federal Levee	Structure	+/-	+/-	o	o	o	o	-	-	o	o	+
Bonnet Carré Spillway	Structure	+/-	+/-	o	o	o	o	-	-	o	o	+
Commercial and Industrial Developments (Expansion of chemical plants and port facilities)	Structure	+/-	+/-	o	o	o	o	-	-	o	o	+
LCA BUDMAT	Bene-ficial Use	+	+	+	+	+/-	o	+	+	-	-	+
Inner Harbor Navigational Lock Replacement	Structure	+/-	+/- o	+/-	o	o	- +/-	+/- -	-	oo	o	+/- - o
Caernarvon Freshwater Diversion	Diversion	+	+	+	+	+/-	o	+/-	+	-	-	+
LCA Amite Diversion	Diverson	+	+	+	+	+/-	o	+/-	+	-	-	+

Cumulative Impacts of the Alternatives

The total impacts of dredging of each alternative over the 50-year period of analysis are quantified in Table 4-6.

Table 4-6 Cumulative Impacts from dredging (No action + incremental impacts of each alternative over 50 years)

	Crossings Construction	Lower River Construction	Annual O&M Crossings	Annual O&M Lower River	Total Construction Dredging	Total Maintenance Dredging over 50 years	Total Dredged Construction + Maintenance over 50 years	Acres created
Alt. 1	0	0	16,400,000	22,250,000	0.00	1,932,500,000	1,932,500,000	26,400
Alt. 2	5,467,000	0	17,360,000	22,250,000	5,467,000	1,980,500,000	1,985,967,000	26,400
Alt. 3	8,600,000	21,500,000	18,000,000	22,250,000	30,100,000.00	2,012,500,000	2,042,600,000	27,862
Alt 3d	616,600	21,500,000	16,400,000	22,250,000	22,116,600.00	1,932,500,000	1,954,616,600	27,862

Alternative 3

The cumulative impacts of building and maintaining the river crossings over 50 years are not anticipated to be significant based on 1D and 2D model results. As the sediment would remain within the river system, cumulative impacts on natural resources are expected to be minimal due to the already turbid nature of the river. Increased saltwater intrusion events would not increase the frequency of sill activation. Increasing the depth of the river is not anticipated to necessitate construction of additional saltwater mitigation features in the lower river. The appropriate mitigation measures identified in Chapter 2 and above (4.2.2)would be taken to avoid such impacts should they occur.

By constructing and maintaining Alternative 3, approximately 2,042,600,000 cy of material would be dredged during the 50-year project life. Based on land loss between 1932 and 2010 (Couvillon 2012), the placement area is projected to continue to lose approximately 57 percent of existing land within the entire placement. Beneficial use of dredged material within the limits of the Federal Standard would establish approximately 365 acres annually during the 4 year construction of the lower river. An additional 528 acres of intermediate marsh is anticipated to be established annually as part of the project, but under the no-action alternative. The amount of material dredged during construction of the Southwest Pass from 48 ft to 50 ft would be less than the amount of material dredged during typical annual maintenance, and Southwest Pass would not require additional (i.e., incremental) maintenance dredging after construction according to the 1D model (Appendix C).

During construction, the beneficial use of dredged material, within the limits of the Federal Standard, into open water habitat would result in approximately 576 AAHUs of intermediate marsh (with a final target elevation of 2 feet or less that allows for intertidal flow, Appendix A-7). Due to high rates of land loss in the area, approximately 1,082 acres are expected to remain after 50 years. As such, it is anticipated that approximately 380 acres of constructed marsh will have reverted back to shallow open water EFH after 50 years. Approximately 23,200 acres (6161 AAHUs) of intermediate marsh habitat is anticipated to be constructed and remain via beneficial use over the 50-year period of analysis (as part of the no-action alternative, Appendix A-7).

Eustatic sea level rise and channel deepening/enlargement would continue to shift deposition (and therefore dredging) upstream towards Venice, LA, over time. However, 1D model results indicate an increase in` dredging in the lower river is not expected.

Overall, the cumulative impacts of the proposed action on the natural environment are expected to be positive, with long-term benefits to navigation, wetlands, EFH, fisheries, wildlife resources, and recreational resources in the project area. The conversion of EFH types from construction of the proposed project would not be expected to have a significant negative impact to the EFH in

the delta basin because open water is widely available and coastal marsh habitat is increasingly scarce. Impacts to cover and foraging for managed species are not anticipated to contribute significant increases in cumulative impacts to managed species as the placement areas are small in size compared to the available EFH habitat in the basin.

The project would be cumulatively beneficial in the form of additional cover, resting, nesting and foraging habitat for wildlife species. Water quality and benthic species would still be expected to rebound once project construction is complete. The restoration of fresh marsh in areas that are currently open water would provide indirect benefits to fisheries in the future by providing nutrients to the system in the form of detritus thereby increasing the primary productivity in the wetland system.

With a phased construction approach, cumulative impacts to the air quality would be relatively minor, and the status of attainment would not noticeably change from current conditions or those in the foreseeable future. Long-term, cumulative impacts are not anticipated as it relates to surface water quality. The cumulative noise impacts would principally be related to the potential short-term disruption of fish and wildlife species and similar impacts by other similar Federal, state, local, and private restoration activities as well as other human-induced noise disruptions to these organisms.

Short-term disturbances due to dredging activities such as increased turbidity and potential suspension of contaminants that may exist in the bed sediments would likely have a short duration before returning to pre-dredging conditions. Impacts to localized fisheries would be expected to be temporary and minimal because the river system is a highly turbid system.

The dredging elutriates previously described and anlalyzed will not pose short or long-term impacts to drinking water supplies (Appendix A-14). Because MVN dredges and places material back into the channel at the crossings, crossing construction and maintenance is not likely to have cumulative impacts on existing diversions.

Overall, the cumulative impacts of the proposed action in addition to other planned and ongoing federal and state civil works projects are expected to be positive, with long-term benefits to recreational opportunities anticipated in the project area. Much of the impacts on recreation, however minimal, would be temporary. Beneficial use projects, in general, tend to have positive long term impacts on recreational opportunities as they, over time, provide nesting habitat for water fowl and nursery habitat for fish.

It is anticipated that the beneficial use of dredged material would not result in negative cumulative impacts to soils or water bottoms in or near the project area. Cumulative impacts to soils and water bottoms would be offset by the creation of marsh, bird islands, deltaic ridges, and other aquatic

habitat types that would ultimately provide valuable coastal habitat and improve storm surge attenuation capacity in the Mississippi River Delta.

There are no foreseen cumulative impacts to visual resources in the study area. Cumulative impacts would be the incremental direct and indirect impacts of implementing the proposed action combined with the continued activities of growth and development in the area. Continued relative sea level rise could also impact the entire area resulting in vast areas of shallow open water as vertical accretion rates fail to keep pace with rising sea levels. Impacts to visual resources would continue throughout not only the project area but also coastal Louisiana and the Nation due to the loss of wetlands and conversion of existing habitats to open water habitats. However, wetland restoration efforts such as the CWPPRA, CIAP, and LCA Programs could restore partially the land, would convert existing view sheds of open water into marsh, wetland, swamp or a variety of landscape types that frame large bodies of open water and use the basic design elements of form, line, texture, color and repetition to create an aesthetically pleasing view shed.

The cumulative impacts of the project, when added to other past, present, and reasonably foreseeable ecosystem restoration, mitigation or other type projects in the basin would minimally and temporarily affect socio-economic resources. Due to the remote and generally unpopulated areas where the projects would be constructed and the temporary nature of the project construction activities, the proposed modifications would add very little and only temporary impacts to any other impacts resulting from past, present and reasonably foreseeable projects in the region and would not contribute significantly to cumulative impacts to socio-economic resources in the basin.

Wetland loss could threaten public facilities and utilities and increase maintenance costs. In areas with high projected population growth rates, the need for public services could increase. Temporary and permanent relocation of residents due to damage from weather events would have a negative impact on community cohesion. In addition, community cohesion would be adversely affected if residents and business chose to relocate to areas with lower risk.

Construction would temporarily disrupt transportation, navigation, and commercial fishing in project areas, however, these impacts would continue to be minor and temporary during the period of construction when compared to the previous design. Impacts to commercial/industrial properties, public facilities, and utilities are not anticipated as the projects are typically located in unpopulated areas.

It is anticipated that through the efforts taken to avoid wetlands impacts and the beneficial use of dredged material that functionally compensates unavoidable remaining impacts, the proposed project would not result in overall adverse cumulative impacts to the aquatic environment and human environment in or near the project area.

Alternative 2

The cumulative impacts of building and maintaining the river crossings to 48 ft over 50 years are not anticipated to be significant based on 1D modeling results. As the sediment would remain within the river system, cumulative impacts on natural resources are expected to be minimal due to the already turbid nature of the river.

By constructing and maintaining Alternative 2, approximately 1,985,967,000 cy of material would be dredged during the 50-year period of evaluation. No additional (i.e., incremental) marsh creation would occur under Alternative 2 because O&M would not increase, however, an additional 528 acres of intermediate marsh is anticipated to be established annually as part of the project under the no-action alternative. Cumulatively, approximately 23,200 acres (6161 AAHUs) of intermediate marsh habitat is anticipated to remain via beneficial use, within the limits of the Federal Standard, over the 50-year period of analysis (as part of the no-action alternative, Appendix A-7). Because CEMVN dredges and places material back into the channel, crossing construction and maintenance is not likely to have a cumulative impact on water levels, sediment transport, or existing diversions.

Short-term disturbances due to dredging activities such as increased turbidity and potential suspension of contaminants that may exist in the bed sediments would likely have a short duration before returning to pre-dredging conditions. Impacts to localized fisheries is expected to be temporary and minimal because the river system is a highly turbid system. The dredging elutriates previously evaluated in this analysis will not have short or long-term impacts to drinking water (Appendix A-14). Because MVN dredges and places material back into the channel at the crossings, crossing construction and maintenance is not likely to have add to cumulative impacts on diversions.

The cumulative impacts of the project, when added to other past, present, and reasonably foreseeable ecosystem restoration, mitigation or other type projects in the basin would minimally and temporarily affect socio-economic resources. Due to the remote and generally unpopulated areas where the projects would be constructed and the temporary nature of the project construction activities, the proposed modifications would add very little and only temporary impacts to any other impacts resulting from past, present and reasonably foreseeable projects in the region and would not contribute significantly to cumulative impacts to socio-economic resources in the basin. Wetland loss could threaten public facilities and increase maintenance costs. In areas with high projected population growth rates, the need for public services could increase. Temporary and permanent relocation of residents due to damage from weather events would have a negative impact on community cohesion. In addition, community cohesion would be adversely affected if residents and business chose to relocate to areas with lower risk. Economic activity related to

shipping would be held back by low water depth (-48 ft MLLW) along the river. Economic activity related to wetland resources would be adversely affected by the depletion of these resources along the coastline. Industry development would contribute to the degradation of wetlands. Businesses may relocate to areas with less risk of storm damage.

Eustatic sea level rise and a reduction in river flows due to upstream diversions would continue to shift deposition (and therefore dredging) upstream towards Venice, La over time. However, 1D model results indicate an increase in net dredging in the lower river is not expected.

The cumulative noise impacts would principally be related to the potential short-term disruption of fish and wildlife species as well as other human-induced noise disruptions to these organisms. With a phased construction approach, impacts to the air quality would be relatively minor, and the status of attainment would not noticeably change from current conditions or those in the foreseeable future. Long-term, cumulative impacts are not anticipated as it relates to surface water quality. Near-term disturbances due to dredging activities such as increased turbidity and potential suspension of contaminants that may exist in the bed sediments would likely have a short duration before returning to pre-dredging conditions.

Overall, the cumulative impacts of the Alternative 2 on recreation, in addition to other planned and ongoing federal and state civil works projects, are expected to be negligible. Cumulative impacts associated with potential utility relocations are not anticipated to be significant. It is anticipated that the beneficial use of dredged material within the Federal Standard would not result in negative cumulative impacts to soils or water bottoms in or near the project area.

There are no foreseen cumulative impacts to visual resources in the study area. Cumulative impacts would be the incremental direct and indirect impacts of implementing the proposed action combined with the continued activities of growth and development in the area. Continued relative sea level rise could also impact the entire area resulting in vast areas of shallow open water as vertical accretion rates fail to keep pace with rising sea levels. Impacts to visual resources would continue throughout not only the project area but also coastal Louisiana and the Nation due to the loss of wetlands and conversion of existing habitats to open water habitats. However, wetland restoration efforts such as the CWPPRA and CIAP Programs could restore partially the land, would convert existing view sheds of open water into marsh, wetland, swamp or a variety of landscape types that frame large bodies of open water and use the basic design elements of form, line, texture, color and repetition to create an aesthetically pleasing view shed.

There are no distinct cumulative impacts to cultural resources within the channel crossings, because any unidentified cultural resources that may exist at the increased depths of dredging would be adversely affected or destroyed at the first instance of dredging. Within the placement

areas, the migration of sediments from one location to another by natural processes, could cumulatively lead to erosion of any unidentified historic property by physical force of moving sediment, or could gradually bury any historic property.

Construction would temporarily disrupt transportation, navigation and commercial fishing in project areas, however, these impacts would continue to be minor and temporary during the period of construction when compared to the previous design. Impacts to commercial/industrial properties, public facilities, and utilities are not anticipated as the projects are typically located in unpopulated areas. It is anticipated that the proposed project would not result in overall adverse cumulative impact to the aquatic environment and human environment in or near the project area.

Alternative 3d

See Cumulative Impacts section for Alternative 3. The cumulative impacts from work in the lower river are the same as those impacts reported for Alternative 3. The construction of the 3 crossings would require 616,000 cy of dredging and the average annual O&M of those crossings would require 18,000,000 cy of dredging. Over a 50-year period, 1,954,616,600 cy of material would be dredged from the crossings and from the lower river under Alternative 3d. Significant impacts to important resources are not expected under Alternative 3d. Due to the nature of the beneficial use of dredged material, subject to the limit of the Federal Standard, the cumulative impacts of Alternative 3d are anticipated to have a net positive environmental impact.

No Action/Future without Project Conditions (Alternative 1)

Cumulative impacts resulting from the No-Action Alternative (i.e., current O&M practices) would be the result of all past, present, and reasonably foreseeable future actions in the study area. Cumulatively, 1,932,500,000 cubic yards of material over the course of 50 years would be dredged in the project area to maintain the river at its current state. As such, approximately 23,200 acres (6,161 AAHUs) of intermediate marsh habitat is anticipated to be constructed via beneficial use over the 50 year project life, within the limits of the Federal Standard, as part of the no-action alternative (Appendix A-7). Without the proposed action, study area water quality would still be affected by industrial activity along the corridor, by other coastal environmental projects, Federal and state water quality management programs, coastal deltaic processes, land development, flood protection, and climate:

- O&M of the River— In order to maintain the river at it's current navigational capacity, the project area would continue to require a combined annual average of approximately 38,650,00 cubic yards of dredging. Approximately 528 acres of coastal marsh habitat (at a final target elevation of 2ft) is expected to establish each year via beneficial use, within the limits of the Federal Standard. However, due to tropical storms, subsidence, erosion, and

sea level rise, approximately 57% of these areas are not expected to exist 50 years after construction of Phase 3 of the project. Ongoing O&M activities identified under the No-Action alternative would complement any future marsh creation projects, including those associated with the BP oil spill.

- Other coastal environmental projects—Existing diversions would continue to affect study area water quality, salinity, aquatic vegetation and phytoplankton community dynamics, and bioaccumulation rates. Long-term river water inflows from diversions may in some cases accelerate wetland loss (Swarzenski et al. 2005, Kearny et al. 2012). Other coastal projects affecting study area water quality include wetlands creation and nourishment, ridge rehabilitation, shoreline protection, oyster reef creation, and other types of hydrologic modification.

  - The authority under the Louisiana Coastal Authority (LCA) Beneficial Use of Dredged Material (BUDMAT) program allows for dredged material from major navigation channels in Louisiana to use dredged material beneficially (statewide) beyond the Federal Standard by providing additional funding beyond that of the Federal Standard. During 2015, a LCA BUDMAT project paid for the removal and placement of approximately 2.3 million cubic yards of HDDA dredged material in West Bay for coastal habitat development. There are additional planned LCA BUDMAT projects that may use material from the HDDA for beneficial use, one of which is currently being constructed in the vicinity of Tiger Pass, near Venice, Louisiana, which plans to use 1.65 MCY of dredged material from the HDDA for marsh creation. An additional project identified as Tiger Pass 2 is under consideration. At least for some unidentified period of time, LCA BUDMAT will potentially utilize dredge material from this project beneficially beyond the Federal Standard. Presently, the LCA BUDMAT authorization is limited to federal expenditure of $100,000,000. The 2017 State Master Plan indicates little opportunity in partnering with the State of Louisiana on beneficial use south of Venice, LA.

- Federal and state water quality management programs—State and federal water quality management programs are expected to improve study area water quality. There are currently no anticipated changes in nonpoint source pollution management and regulation that would significantly reduce Mississippi River nutrient and pesticide loads.

- Coastal deltaic processes—The study area would continue to be impacted by coastal deltaic processes associated with a transgressive delta. The continued subsidence and erosion of estuary wetlands would reduce their water quality benefits. Changes in barrier island morphology may lead to increased tidal prism volumes, which may provide some water

quality benefits in regions of the study area where salinities may increase, such as decreased harmful algal blooms and removal of inorganic and organic materials.

- Existing conditions are anticipated to change in Plaquemines Parish as trajectories of ecological change to aquatic resources would persist. The area would be subjected to increases in RSLR, which could increase saltwater intrusion and lead to increases in and the potential conversion of vast areas of adjacent marsh to open water. Much of the area could be permanently inundated under both the intermediate and high RSLR scenarios. There could be a shift from fresh water dominate species to those species that can tolerate higher salinity.

- Development— Population growth could increase traffic circulation, creating need for expanded roadways and bridges. Land use patterns in the Mississippi River and delta are expected to continue, along with industrial activities affecting the study area. In general, it appears that river water quality as impacted by basin agriculture will not change significantly (e.g., see Murphy et al. 2013, Thelin and Stone 2013). Recent (2008-2013) study area watershed land use data was evaluated using the Annual Kendall test to determine land use trends in the study area (USDA-NASS 2014). Results suggest decreasing shrubland area, increasing forest area, increasing or decreasing land use for several crops, and increasing high intensity development, all of which may affect water quality (e.g., see Demcheck et al. 2004, Southwick et al. 2002). Industrial activities, including accidental spills, would continue to affect study area water quality. Although unanticipated, environmental catastrophes such as the 2011 BP oil spill can have widespread impacts on study area water quality.

- Flood Risk Reduction—Diversion of Mississippi River water into Lake Pontchartrain during river floods would continue during flood events in order to keep the river discharge below the Bonne Carre Spillway from exceeding 1.25 million cfs past New Orleans, La.

- Climate—Increasing surface water temperatures could affect water quality by increasing primary productivity, rates of waterbourne disease, and frequency of harmful algal blooms, and decreasing dissolved oxygen levels (Milello et al. 2014). Increasing sea-level and severity of hurricanes could aid in accelerating wetland loss rates, as well as increases in the flooding of study area infrastructure, impacting water quality by removing habitat capable of ameliorating water quality and increasing the frequency of introduction of infrastructure floodwaters into study area estuaries. Increasing severity of droughts in the study area may impact water quality by facilitating stagnation of estuary waters during the warm summer months, leading to changes in phytoplankton community and decreases in pH and dissolved oxygen levels. Increasing severity of droughts may also foster dieback

of some marsh communities and saltwater intrusion of upper estuary swamps, with both temporary and permanent impacts to these wetlands communities, affecting water quality. More severe rainfall events in the study area and Mississippi River watersheds could affect water quality by altering the transport of runoff constituents, particularly nutrients. Changes in Mississippi River discharge in response to climate change could alter the timing and extent of the Gulf of Mexico dead zone.

- Without the proposed project, study area water quality would likely continue current trends. For example, surface water quality has improved significantly with the implementation of the Clean Water Act and industrial and municipal discharge programs such as NPDES. These programs continue to advance with new or improved technologies to treat wastewater discharges.

- The causes of impairment will continue to degrade water quality until TMDL development and execution, and the sources are addressed. In addition, contaminants of emerging concern such as pharmaceuticals and personal care products, microplastics, etc. continue to present uncertainty for surface water quality and potential concerns for human health and the environment.

- With no action, processes affecting known or unknown cultural resources will continue as they are. Dredging within the channel is a regular maintenance activity that will likely have no additional effect on any resources that may have been within its area of effect. Within placement areas, natural process will continue to erode and degrade remaining lands and will likely submerge any cultural resource that has not already been destroyed.

- The continued beneficial use of dredged material, within the limits of the Federal Standard, in existing placement areas in the Mississippi River Delta would not result in overall adverse direct, indirect, or cumulative impacts to soils or water bottoms in or near the project area. The direct, indirect, and cumulative impacts to soils and water bottoms would remain consistent with current impacts to those resources from existing operation and maintenance dredging in the Mississippi River from Baton Rouge to the Gulf of Mexico. Cumulatively, approximately 26,400 acres are of intermediate marsh habitat is anticipated to be constructed within the Federal Standard limitations, via beneficial use over the 50 year period of analysis via annual O&M actions. Overall, the cumulative impacts of the proposed action would be positive, with long-term benefits to navigation, recreation, coastal habitat, and other resources in the study area.

- The Resources and Ecosystems Sustainability, Tourist Opportunities, and Revived Economies of the Gulf Coast States Act (RESTORE Act) represents a portion of the

Congressional response to the Deepwater Horizon oil spill. The Act dedicates 80 percent of all Clean Water Act administrative and civil penalties related to the Deepwater Horizon oil spill to the Gulf Coast Restoration Trust Fund (Trust Fund). RESTORE Act funds are allocated between five buckets: the Direct Component (35%), the Council-Selected Restoration Component (30%), the Spill Impact Component (30%), the Gulf Coast Ecosystem Restoration Science Program (2.5%); and Centers of Excellence Research Grants Program (2.5%). In early 2013, Transocean entered into a plea agreement to pay $1 billion to resolve federal Clean Water Act civil penalty claims, of which $800 million will be made available under the RESTORE Act to fund Gulf Coast recovery projects. The process of selecting projects for implementation under the RESTORE Act is anticipated to continue through the period of analysis, until the allocated funds are exhausted. Some projects have been selected and funded for implementation and will be discussed as a part of the reasonably foreseeable actions section below. In November of 2016, the Louisiana Coastal Protection and Restoration Authority (CPRA) has been awarded two grants totaling approximately $7.5 million from the Gulf Coast Ecosystem Restoration Council (RESTORE Council) for engineering and design of the Golden Triangle Marsh Creation ($3.2M) project and the Biloxi Marsh Living Shoreline ($4.3M) project under the Resources and Ecosystems Sustainability, Tourist Opportunities and Revived Economies of the Gulf Coast States Act of 2012 (RESTORE Act). These projects represent two out of seven total projects that were selected for funding by the RESTORE Council under its Initial Funded Priorities List that will directly benefit Louisiana. One additional grant in the amount of $7.3 million was funded by the RESTORE Council in September for the engineering and design of the West Grand Terre Beach Nourishment and Stabilization Project.

- Economic activity related to shipping would be held back by low water depth along the river. Economic activity related to wetland resources would be adversely affected by the depletion of these resources along the coastline. Industry development would contribute to the degradation of wetlands. Businesses may relocate to areas with less risk of storm damage.

- There are no foreseen cumulative impacts to visual resources in the study area from the no-action alternative. Cumulative impacts would be the incremental direct and indirect impacts of not implementing the proposed action and the continued loss of wetland and habitats due to human development and conversion of existing forested wetlands and swamp habitats to marsh and open water.

4.6 Mitigation Requirements Associated With the Recommended Plan

There are no significant long-term adverse cumulative effects expected from construction. Construction related impacts to the water column are generally temporary and localized and include: increased turbidity and total suspended sediments, organic enrichment, chemical leaching, reduced dissolved oxygen, and elevated carbon dioxide levels. Following construction, these temporary and localized effects would return to pre-construction levels. Conversion of shallow open water EFH to intertidal marsh EFH would not require EFH mitigation. The results of the 3D model did not suggest a need to modify the mitigation plan for saltwater intrusion. However, mitigation for the saltwater wedge (as described in Section 2.2.1) would continue to be required as in years past.

The Recommended Plan (Alternative 3) would result in the discharge of fill material into waters of the U.S. Under authority delegated from the Secretary of the Army and in accordance with Section 404 of the Clean Water Act of 1977, the USACE regulates discharges of dredged or fill material into waters (e.g., wetlands) of the U.S. Although USACE does not process and issue permits for its own activities, the USACE authorizes its own discharges of dredged or fill material by applying all applicable substantive legal requirements, including public hearings and application of the section 404(b)(1) guidelines.

CEMVN provides dredging contractors with a limited number of mandatory access corridors/staging areas for Southwest Pass cutterhead disposal operations. This is done to limit impacts to existing wetlands as well as to existing flowlines that lie on the ground surface all along Southwest Pass. If necessary, these mandatory access corridors/staging areas are backfilled by dredging contractors to match pre-disposal work elevations following completion of disposal operations. When determined to be unavoidable, small, undetermined amount of wetland habitat (typically < 1 acre) may be temporarily impacted during pipeline placement and access to the open water placement areas. However, these minor, incidental impacts are unavoidable, would be temporary, and would result in coastal marsh platforms ranging from 60 acres to 600 acres.

It is anticipated that through the efforts taken to avoid wetlands impacts and the beneficial use of dredged material (within the limits of the Federal Standard) that functionally compensates for the minor, unavoidable impacts incidental to beneficial use, the proposed project would have a net beneficial environmental impact, and would not result in overall adverse direct, secondary, or cumulative impacts to the aquatic environment in or near the project area. During construction, the beneficial use of dredged material, subject to the limitations of the Federal Standard, into open water habitat will result in approximately 1462 acres of coastal wetland habitat (and a net of 1082 acres and 576 AAHUs). Due to high rates of land loss in the area, 1082 acres of created marsh would be expected to remain 50 years after construction of Phase 3 (Appendix A-7). The 30-day public comment period of the 404 Public Notice concluded on August 2, 2017 with no controversial or substantial comments received. Signature of the 404(b)(1) evaluation by the

District Commander occurred August 22, 2017 and finalized documentation of compliance with the Section 404(b)(1) guidelines for the proposed actions is addressed in this SEIS (Appendices A-9, A-10, A-11). Beneficial use will continue to be monitored under the O&M beneficial use monitoring program (BUMP), as highlighted in 2.2.1 and continue to be analyzed to identify ways to better use dredged material in the future.

5.0 THE RECOMMENDED PLAN

The Recommended Plan for the next phase of construction is Alternative 3. Alternative 3 proposes to provide deep draft navigation to 50 ft from the Gulf beginning at RM 22 BHP through the Port of Baton Rouge ending at RM 232.4 AHP. This would be accomplished by constructing and maintaining the MRSC to a depth of -50 ft MLLW in the lower Mississippi from RM 13.4 AHP to RM 22 BHP, and by deepening the twelve regularly maintained crossings located within the Port of South Louisiana and the Port of Baton Rouge to a depth of -50 ft LWRP.

All other reaches of the river have depths that are naturally greater than 55 ft. In the present condition, these reaches do not require construction or operation and maintenance to provide deep draft access. However, it is the intent of the GRR that should existing conditions change in these reaches, the district would exercise its authority to conduct operation and maintenance actions to maintain the authorized depth and width to the extent approved for construction and supported by an executed cost-sharing agreement with the non-Federal sponsor. The purpose of this integrated GRR and SEIS is to evaluate any significant changes in environmental baselines (e.g. coastal wetlands, human environment, etc.) that may have occurred since completion of the Feasibility Study and Environmental Impact Statement, and to ensure the project would still be compliant with all pertinent environmental regulations. If, in the future, the project requires dredging in areas outside of those evaluated in this SEIS, additional analysis could be required under NEPA and other environmental laws and regulations.

5.1.1 Construction of the Recommended Plan

The Recommended Plan would provide deep draft navigation to a depth of 50 ft from the Gulf beginning at RM 22 BHP through the Port of Baton Rouge, ending at RM 232.4 AHP. This would be accomplished by deepening the MRSC from the Gulf of Mexico, beginning at RM 22 BHP, and extending upriver to near Venice, ending at RM 13.4 AHP, from the current -48.5 ft MLLW to -50 ft MLLW. Although the reach extends to 13.4 AHP, construction and operation and maintenance dredging would only be required to RM 11 AHP. Construction of the channel in this reach to -50 ft MLLW would closely follow the existing channel alignment and is estimated to result in approximately 18 million cubic yards of dredge material that may be used for beneficial use, within the limits of the requirements of the Federal Standard, by disposing it in lands adjacent to the Mississippi River.

Cutterhead dredges would be utilized to perform construction of the Southwest Pass reach from RM 11 AHP to RM 19.5 BHP. All material removed by cutter dredges would be used beneficially under the Federal Standard disposal plan for his channel. It is anticipated that construction from RM 6 AHP reach to RM 19.5 BHP would result in the creation of approximately 1462 acres of marsh habitat. Should it become necessary to utilize hopper dredges for construction of some

portion of this reach, hopper dredges would utilize the open water hopper dredge disposal area located at the Head of Passes. Hopper dredges would be utilized to perform construction from RM 19.5 BHP to RM 22.0 BHP. All material removed by hopper dredges in this reach would be placed in the Southwest Pass ODMDS. The EPA-designated Southwest Pass ODMDS is approximately 2975 acres in size and is located west of and parallel to the Southwest Pass bar channel in the Gulf Mexico, beginning near RM 20.3 BHP. Expansion of the ODMDS will not be required as part of this project. Depending on the availability of funding, it is feasible that construction of the channel from RM 22 BHP to RM 6 AHP could occur within a one-year period in conjunction with the annual OMRR&R contracts.

In order to implement the Recommended Plan, construction to deepen the twelve regularly-maintained crossings located within the footprint of the Port of South Louisiana and the Port of Baton Rouge, between RM 115 AHP and RM 232.4 AHP , from the current depth of 45 ft LWRP to 50 ft LWRP is also required. While there are numerous crossing located in this reach, only 12 currently require regular maintenance dredging. It is anticipated that deepening the crossings would not result in the need to change the existing alignment. Construction would be accomplished via contract and/or Government dustpan dredge(s) consistent with the method of construction utilized for the previous construction-related deepening, as well as the methods utilized for the maintenance of the crossings. Material dredged from the 12 crossings would be placed adjacent to the crossing and put back into the system for the material to be carried downstream and to fallout into deeper holes within the river.

Construction in the crossings is estimated to occur over the course of 3 years, depending on the availability of funding. Due to the air quality control requirements, for the 9 crossings located within the Port of Baton Rouge, construction of the crossings would follow the sequence as discussed in Chapter 4.

5.1.2 Real Estate Requirements Associated with the Recommend Plan

A Real Estate Plan (REP) describing the real estate requirements and costs for the project can be found in Appendix B. This general reevaluation study has determined that construction of the selected alternative will not require the acquisition of additional dredged material placement or access areas.

A preliminary assessment of the dredge material management disposal plan (DMMP) was performed in accordance with the requirements of ER 1105-2-100 and is included in Appendix K. This preliminary assessment concluded that dredging and disposal practices as currently performed under OMRR&R are sufficient for both the current project and the Recommended Plan for at least the next 20 years. Therefore, acquisition of privately owned land for construction or subsequent operation and maintenance of the Recommended Plan is not required at this time.

5.2 Relocations with the Recommended Plan

The relocations for a general cargo navigation project consist of relocating pipelines and submarine cables crossing the river at locations that require dredging to implement the recommend plan. The 1985 Congressional authorization for this Project authorized the Corps (subject to having a non-Federal sponsor willing to execute a cost-sharing agreement for its obligations for the construction and OMRR&R of the project) to construct the main navigation channel to a depth of 55 ft. At the time of construction of Phase 1 and Phase 2, impacted utilities or facilities should have been relocated to a depth greater than 55 ft. Subsequent to enactment of the project authorization in the 1985 Supplemental Appropriations Act, permit applications for new utility or facilities crossings would have required utilities/facilities to be placed at a depth greater than 55 ft, to allow for the future construction of the authorized project. A detailed assessment of the reaches requiring deepening in accordance with the Recommended Plan identified a total of 27 pipelines, of which 14 require relocations to deeper depths. The estimated cost for relocations associated with the recommended plan is $80.16M including contingency. The Engineering Appendix C provides a detailed summary of the relocation requirements and a tabulation of the impacted utilities.

In accordance with memorandum from the Director of Real Estate dated January 10, 2013 SUBJECT: "Real Estate Policy Guidance Letter No. 31 – Real Estate Support to Civil Works Planning Paradigm (3x3x3)", and with similar guidance from the Office of the Chief Counsel (CECC-R) dated January 14, 2013, SUBJECT: CECC-R Bulletin 13-01, Preliminary Attorney's Opinion of Compensability, a compensability determination, in the form of a preliminary attorney's opinion of compensability, will be performed during feasibility level design only if the estimated relocation costs exceed 30% of the estimated total project cost. If the estimated total relocation costs do not exceed 30% of the estimated total project cost, the real estate assessment will address compensability, deferring the preparation of an attorney's opinion of compensability until the PED phase of project implementation. The total project construction cost for the Recommended Plan is estimated at $237.6M; therefore, the $80.1M is greater than 30% of the total project cost. Based on this a preliminary attorney's opinion on compensability was prepared and is summarized in the Real Estate Plan, which is contained in Appendix B.

5.3 OMRR&R Associated with the Recommended Plan

Information on the quantities and costs associated with OMRR&R for the Recommended Plan can be found in the Engineering Appendix C. Comparison of alternatives and selection of the Recommended Plan used the incremental difference in OMRR&R cost from the current practices to anticipated requirements once the plan is implemented.

Hydraulic model results from both the 1D and 2D models indicated that there was no increase in the annual dredge quantities for the lower portion of the Mississippi from Venice, RM 13.4 AHP,

to the Gulf Mexico at river mile 22 BHP. Additionally, although the lower Mississippi River includes training works such as foreshore rock, jetties, and pile dikes, which must be maintained, the requirement to maintain these does not differ between each of the alternatives. Therefore, the incremental difference in operation and maintenance of the Recommended Plan for implementation of Phase 3 of the Project occurs only from the increase in estimated annual dredge quantities in the above referenced crossings that lie within the footprint of the Port of South, Louisiana and the Port of Baton Rouge.

With the Recommended Plan, twelve crossings located within the footprint of the Port of South, Louisiana and the Port of Baton Rouge would be constructed to -50 ft LWRP, which is a deeper depth than the currently approved and constructed main navigation channel in that reach. Post-construction, these crossings would be subsequently maintained to - 50 ft LWRP. The maintenance of the twelve crossings is estimated to result in approximately 15.9 million cubic yards of dredge material annually. This is an increase of 58,400 cy annually over the current dredging quantities for the existing constructed and maintained -45 ft channel in this reach of the Project.

Table 5-1 provides the estimated annual dredge quantities for each of the crossings, and the Engineering Appendix (Appendix C) provides a detailed assessment of the modeling and assumptions used to determine the increase in annual dredge quantities. For all crossings, it is projected that O&M dredging would be accomplished via contract and Government operated dustpan dredges, with the material dredged from the crossings disposed of adjacent to the crossings and put back into the system for the material to be carried downstream and to fallout into deeper holes within the river.

It should be noted that although table 5-1 indicates 0 CY of annual dredge material for Fairview crossing, it is anticipated that this crossing will require dredging during construction to provide the 50 ft channel depth. It is not anticipated at this time that regular annual maintenance of the Fairview crossing will be required during the period of analysis; Historically, Fairview is dredged intermittently when surveys indicate an increase in shoaling. Dredging of Fairview is not required on an annual basis, and deepening to -48 ft or -50 ft LWRP is not anticipated to result in an increase in the average annual quantity as shown in Table 5-1.

Table 5-1 Increase in Annual Maintenance Dredge Quantities for the Recommended Plan

Crossing Name	1999 - 2015	2D Model Results	
	Historical Average Annual Quantities From Dredging – 45 ft LWRP (cy)	Average Annual Quantities for -50ft LWRP (cy)	Increase in average annual quantities (CY)
Baton Rouge Front	1,845,387	2,140,600	295,213
Red Eye	4,359,091	5,710,400	1,351,309
Sardine	1,181,210	1,216,600	35,390
Medora	1,051,192	1,082,700	31,508
Granada	1,125,646	1,215,700	90,054
Bayou Goula	950,932	1,008,000	57,068
Alhambra	2,481,629	2,779,400	297,771
Philadelphia	256,276	266,500	10,224
Smoke Bend	518,415	554,700	36,285
Rich Bend	15,041	15,000	-41
Belmont	1,949,741	2,008,200	58,459
Fairview	0	0	0

5.4 General Navigation Features (GNF) and Local Service Facilities

ER 1105-2-100 identifies GNF to include: channels, jetties or breakwaters, locks and dams, basins or water areas for vessel maneuvering, turning, passing, mooring or anchoring incidental to transit of the channels and locks; and dredged material disposal areas. Items such as these are already in place, under previous construction or operation and maintenance of the existing project, or are not authorized under the MRSC project authority. Additional GNF features or modifications to current GNF features, beyond the recommended deepening of the channel and disposal of the associated dredge material, are not required under the recommended plan. Under the MRSC authority anchorages and moorings were not authorized to be included the project.

ER-1105-2-100 identifies Local Service Facilities (LSF) as including: piers, wharves; and floats; berthing, mooring, port facilities; utility services; and access channels. Appendix D provides a list of existing LSF for each port in the project area. Changes to the LSF are not considered part of the recommended plan. Relocations are considered part of LERRDs and are not part of LSF.

5.5 Risk and Uncertainty

Risk and uncertainty are intrinsic in water resources planning and design. In the draft report the following items were identified as risk and uncertainty associated with selection of the TSP: Relative Sea Level Rise; Salt Water Intrusion; Hydraulic Modeling (to include 2D and 3D models); design of the crossings (to include geotechnical analysis and consideration of training works); and further investigation of real estate and relocation requirements. These risk items were further considered and evaluated during feasibility level design of the Recommended Plan and are addressed in Chapter 3.

Risk and uncertainty exists in the possibility of the fluctuation of the Federal interest rate or changes in vessel operating costs. These risks are discussed further in the Economics Appendix D. Risk and uncertainties also exist in the estimates of future dredging requirements as a result of the hydraulic models used during the study. These uncertainties and the sensitivity of the model results to these uncertainties are captured in the reports prepared by ERDC, which are included in Appendix I.

There are also study risks which were addressed using a Risk Register. The purpose of the register is to practice risk-based decision making throughout the study. The register was used to highlight areas of study risks and identify ways to address those risks, such as reducing the schedule, optimizing the study area, and identifying the optimum amount of modeling to make a risk-based decision.

5.5.1 Environmental Factors

There is uncertainty about how much relative sea level change would occur in the region. Relative Sea Level Rise captures the effects of both subsidence and sea level rise. An assessment of RSLR was included in plan formulation. The evaluation and results are discussed in Chapter 3, and documented in the ERDC reports included in Appendix I. RSLR could impact the estimated sediment disposition and associated annual operation and maintenance cost associated with the Recommended Plan.

There is inherent risk associated with the uncertainty in projections of future RSLR. The study considered this uncertainty in the hydraulic models, the results of which indicated that the sediment disposition was relatively insensitive to RSLR, indicating that this is low risk to the estimated dredging quantities for future OMRR&R cost associated with the Recommended Plan. \

5.5.2 Modeling Factors

The hydraulic Models used for this study, including the 1D model HEC-6T, 2D model AdH/SEDLIB, and 3D model Delft, appear to provide a specific response on the alternatives to

deepen the channel under the various alternatives; however each model is only a representation of a complex system. While the analysis is enhanced by the models, application of the models can introduce error and uncertainty.

The 1D and 2D model provided very different results in terms of the predictions of channel deepening's impacts to sedimentation in the crossings. The HEC-6T model predicts a much more significant impact to dredging requirements than does the AdH/SEDLIB model. The study chose to use the results of the 2D model to estimate future dredging requirements in the crossings. This was based on an assessment by ERDC which compared the approaches and results of each model, and concluded that the results of the Adh/SEDLIB model should be considered more reliable than the dredging indices associated with the HEC-6T model. However, the assessment concluded that there were some factors better represented in the HEC-6T model, that could have the potential to influence the volume of dredging required in the dredge cuts. The inherent difference between these two models, and the decision to use the 2D model results provides some level of risk and uncertainties in the dredging indices and associate dredging quantities and cost for the crossings. A white paper which addresses the difference between the 1D and 2D model is included in Appendix I.

Both the 1D and 2D model indicated little to no increased sediment disposition in the lower portion of the river due to deepening of the channel. However, neither model considers the disposition of fine sediment and flocculation (the tendency to stick to together) when in the presence of salinity. Observation of historical dredging indicates that a significant fraction of sediment in the lower portion of the river includes these fine sediments, where they may interact with the salt water wedge as it migrates upriver from the Gulf. The study chose to use the results of the 1D and 2D model, but this decision provides a level of uncertainty to the quantities and cost used to compare alternatives, due to the fact these models did not account for changes in the fine sediment.

These inherent risks and uncertainties from the model results in the estimated sediment disposition and dredging requirements were captured in the risk analysis for estimated OMRR&R cost for the Recommended Plan.

5.5.3 Engineering Factors

The recommendation to deepen the channel from its current depth to the proposed depth of 50 feet could have a negative impact on the existing channel conditions for both levee and bank stability. Within the river crossings, the areas of the channel that have revetted banks are evaluated annually to determine levee and bank stability issues. For the lower portion of the river from Venice to the Gulf, the existing factors of safety are great enough that there is little concern that deepening will have an impact on levee or bank stability. For the crossings, eight of the twelve crossings have existing factors of safety (FoS) that are at or near critical conditions. For detailed discussions on

the FoS refer to the Appendix C. Further analysis of the crossings will be conducted during Pre-construction Engineering and Design. During this time, should the factors of safety change, additional measures, including flattening of the existing slopes or placement of revetment or underwater rock stability berms in the channel, may be required. In order to account for the risk and uncertainty associated with the geotechnical analysis of crossings, additional costs were captured in the risk analysis for the first construction cost for deepening of the channel to 50 ft.

5.5.4 Economic Risk

The Principles & Guidelines and subsequent ER1105-2-100 recognize the inherent variability to water resources planning. Navigation projects in particular are fraught with uncertainty about future conditions. Therefore a sensitivity analysis in which key quantitative assumptions and computations are changed is required to assess their effect on the final outcome. Typically, high- and low-growth scenarios are generated by altering commodity forecasts and then evaluated to determine if a project is still justified.

Because the Recommended Plan has a B/C ratio well above 1.0, a high-growth scenario based on a commodity forecast higher than the one used in the above analysis is unnecessary—the B/C ratio would only increase. For the low-growth scenario, no commodity growth for the 50-year period of analysis. Under this scenario, the recommended plan still provided a high B/C ratio at 5.7 to 1, indicating that the project [provides benefits to the nation, even if forecast for commodity growth are less than anticipated (refer to Appendix D for detailed information on the sensitivity analysis

5.5.5 Cost and Schedule Risk

The Cost and Schedule Risk Analysis (CSRA) identifies issues that require the development of subsequent risk response and mitigation plans. In addition to items discussed above, through the CSRA the following factors were identified as key risks that could impact the estimated total project cost: limited competition for advertising and awarding a contract; changes in fuel prices; changes in production rates; availability of funding; adverse weather conditions; clay materials in the crossings, and rock/stability berms in the crossings. The key schedule risks include: availability of construction and/or OMRR&R funds; production rates; and estimates in construction quantities.

Risk related to quantity and material estimate types (clay material, rock/stability berms) maybe reduced during PED through additional surveys and analysis of the channel for the development of plans and specifications.

5.6 Mitigation Plan & Adaptive Management & Monitoring (AM&M)

Dredge placement of material associated with construction will be placed to the maximum extent practicable in lands and waters within the Federal navigational servitude, subject to the limitations of the Federal Standard. There will be impacts to shallow open water and water bottoms and a temporary level of reduction in ecological value of the existing condition. However, the end state of dredge material placement is a net increase of ecological benefits that far exceed those impacted by the placement (refer to WVA located in Appendix A-7). The total benefits of the emergent marsh provide net positive contributions to a large component of the ecosystem, and as described in Chapter 4, mitigation is not required.

The purpose of adaptive management is to insure performance of restoration plans in order to insure the benefits endure throughout the period of analysis and that the investment is secure. Since ecosystem restoration is not a purpose of the project there is no adaptive management for this component of the plan. Further, if the placed material subsides or erodes and loses the estimated ecological benefits, the end state would be to reestablish water bottoms returning the system to the pre-project condition.

5.6.1 Value Engineering

Value Engineering (VE) is a process used to study the functions a project is to accomplish. As a result, the VE team takes a critical look at how these functions are met, and it identifies alternative ways to achieve the equivalent function while increasing the value, and the benefit to cost ratio of the project. The project was studied using the USACE standard value engineering (VE) methodology. The VE study was conducted at the time that the TSP was identified as the implementation of Phase 3 of the Project to deepen to the Project's main navigation channel to a depth of 50 ft from the Gulf through the Port of South Louisiana, and maintain the 45 ft depth of the Project's main navigation channel through the Port of Baton Rouge. The VE study focused on ways to add value by reducing operation and maintenance costs, by providing beneficial use of dredge material within the crossings, and/or by deepening the channel to a depth of 50 ft through the Port of Baton Rouge. The VE Team identified **(14)** items that are believed to either improve project performance and/or cost-effectiveness.

1. Construct river training structures (soft dikes) in selected channel crossings to reduce maintenance dredging.
2. Expedite construction; open Port of South Louisiana to 50-ft draft in 2 years.
3. Re-evaluate the economics to include planned future development and economic value to other states and the nation.
4. Validate dredged material quantity and cost estimates for crossings.

5. Consider constructing project through the Port of Baton Rouge; prioritize future O&M dredging as appropriate.
6. Do extensive planning for pipeline and utility relocations to minimize potential impacts to project implementation.
7. Consider reversing dredging operations for channel crossings through the Port of Baton Rouge from upstream to downstream.
8. Look for opportunities to piggyback CPRA, and other State projects to use dredged material.
9. Stockpile dredged material for potential use by others or for environmental improvement.
10. Consider additional HDDA (Hopper Dredge Disposal Area) locations (PA DMMP determined no additional disposal areas were necessary, therefore there is no need for an additional HDDA).
11. Include re-construction or upgrade of existing training structures in the lower river system.
12. Update MVN total dredging demand projections; address possible market impact.
13. Consider public-private partnership ('P3') for dredge plant construction.
14. Consider VE recommendations from Dredging Programmatic and BUDMAT studies.

The VE process is iterative and will continue throughout the PED phase. The VE analysis and response is located in **Appendix G**.

5.6.2 Detailed Cost Estimates

Once the Recommended Plan was identified, a detailed cost estimate for construction and operation and maintenance over the 50 year period of analysis was computed using the Micro Computer Aided Cost Estimating System (MCACES). A cost risk analysis was performed on the Recommended Plan for construction and OMRR&R. The estimated construction cost for the Recommended Plan including the risk-based contingency is $237.6M. In addition to including the estimated contract cost for construction, this estimate also includes Relocations, Lands and Damages, Preconstruction Engineering and Design, and Construction Management, with relocations estimated at $80.1M.

The annually estimated O&M for the recommended plan is $227.4M.

5.6.3 Benefit Analysis Associated with the Recommended Plan

The Recommended Plan is the NED Plan. When compared to the other alternatives, it provides the greatest Net Excess Benefits to the nation. In order to compare alternatives and determine the Recommended Plan, parametric costs for construction and annual OMRR&R, along with contingency from an abbreviated cost risk analysis, were used. Upon identification of the Recommended Plan, an MCACES level cost estimate for construction and OMRR&R and detailed

cost and schedule risk analysis (CSRA) was completed for the future with project condition. An MCACES level cost estimate and CSRA were also developed for OMRR&R of the currently constructed and maintained Phases 1 and 2 of the Project. These estimates were used to determine the net annual benefits and benefit to cost ratio for the Recommended Plan and are included in Appendix I.

The B/C Ratio shown below differs from that shown in Chapter 3 for comparison of alternatives and selection of the Recommended Plan. Soon after the Recommended Plan was determined, the 2018 Federal discount rate changed slightly from 2.875% to 2.75%. Additionally, construction and O&M costs were updated with average annual costs increasing from $12.6 million to $17.7 million. Finally, new vessel operating costs (approved for fiscal year 2016) from the National Deep Draft Navigation Planning Center of Expertise were used in calculating transportation cost savings which dropped from $148.5 million to $127.5 million. Total average annual benefits minus total average annual costs equals the average annual net benefits of the project, which in this scenario comes to $109.8 million. These changes were applied to the Recommended Plan only to determine the Net Excess Benefits and B/C Ration. The B/C ratio for the Recommended Plan is, accordingly, 7.2 to 1.

Investment Cost		
First Cost of Construction	$	237,700,000
Interest During Construction	$	10,000,000
Total Investment Cost	$	247,700,000
Average Annual Cost	$	
Average Annual Construction Cost	$	9,200,000
Average Annual Incremental OMRR&R	$	8,500,000
Total Average Annual Cost	$	17,700,000
Benefits		
Average Annual Benefits	$	127,500,000
Net Annual Benefits	$	109,800,000
B/C Ratio (computed at 2.75%)		7.2

7 percent OMB rate: At this discount rate, the recommended plan average annual costs are $27.6 million and average annual benefits are $123.8 million. Average annual net benefits are $96.2 million, and the B/C ratio is 4.5 to 1.

5.7 Implementation Requirements

5.7.1 Preconstruction Engineering and Design

Cost for the Preconstruction Engineering and Design (PED) for construction of Phase 3 of the project will be shared between LaDOTD and USACE. All detailed design will be in accordance with USACE's regulations and standards. Work-in-Kind contributions by the NFS will be determined at the time a Design Agreement or Project Partnership Agreement, and Project Management Plan is developed for PED.

5.7.1 Construction and LERRD

Construction will be performed in accordance with USACE's regulations and standards. Lands, easements, right-of-ways, relocations, and dredged material placement areas (LERRD) are the responsibility of the NFS (Appendix B).

5.7.2 Cost Sharing

The LaDOTD is the non-Federal NFS for the feasibility study. The cost-share during the study phase is 50% Federal and 50% non-Federal. Pursuant to Section 1111 of WRDA 2016, the cost share for construction of the Recommended Plan as Phase 3 of the authorized Project will be 75% Federal and 25% non-Federal, including all general navigation features (GNF). As discussed in Chapter 3. the only GNF feature considered are the widening and deepening of the channel, and the associated disposal of the dredged material. The NFS must provide all project LERRD required for the construction and OMRR&R of Phase 3 of the project, and must provide and ensure the performance of all relocations, including the obligation to bear a share of the cost of any deep-draft relocations, as defined in Section 101 (a)(4)of WRDA 1986, as amended. The required post-construction deferred NFS cash contribution is equivalent to 10 percent of the total project cost of the GNF for Phase 3 of the Project, plus the applicable statutory rate of interest. The NFS payment of this 10 percent cash contribution is deferred until after completion of the project, or a separable element of the project and is payable over a period not to exceed 30 years. The deferred 10 percent NFS cash contribution is reduced by the value of the credit approved by USACE for the LERR provided by the NFS, including relocations and the cost of any deep draft relocations borne by the NFS. OMRR&R of the general navigation features of Phase 3 of the Project is a 100% Federal responsibility for any increment of the project having a depth of 50 ft or less. A full description of the non-Federal and Federal responsibilities after the feasibility phase of the project is contained in Chapter 8 of this report.

5.8 Cost Apportionment

The Louisiana Department of Transportation and Development (LaDOTD) is the NFS during the development of the GRR for the project. Under the terms of the above referenced Feasibility Cost Sharing Agreement, the cost-share during this phase is 50 percent Federal and 50 percent non-Federal. LaDOTD will continue to be the NFS through preliminary engineering and design (PED), construction, and Operation, Maintenance, Repair, Replacement, and Rehabilitation (OMRR&R). Per Section 1111 of WRDA 2016, **t**he Federal cost share for the PED and construction of Phase 3 is 75%, the non-Federal cost share is 25%, for GNF for channel depths greater than 20 ft (Phase 1 and Phase 2 constructed to the project to 45 ft), but not in excess of 50 ft. Per Section 2102(b) of WRRDA 201, the cost share for OMRR&R, deep draft navigation for a channel up to 50 ft is 100 percent Federal for GNF. Among other responsibilities, the NFS must provide all project LERRDs required for the construction and OMRR&R of the general navigation features of the project and submit any work-in-kind request to the Federal government for the PED of the project. Table 5-1 provides a breakdown of the estimated cost and cost share requirements for both Federal and non-Federal based on the recommended plan. Appendix I includes a summary of the MII level cost estimate, as well as a cost risk analysis for the recommended plan. The estimated annual OMRR&R cost is $227,423,000 annually for the 50 ft project depth. This estimate reflects the fully funded requirements for all OMRR&R associated with the project.

Table 5-2 Cost Sharing for construction

	Total ($M)	Federal Plan Federal Cost ($M)	Non-Federal Cost ($M)
General Navigation Features		**75%**	**25%**
PED	$12.64	$9.48	$3.16
Construction	$128.01	$96.01	$32.00
Construction Management	$16.86	$12.65	$4.22
Subtotal Construction of GNF	**$157.51**	**$118.13**	**$39.38**
Lands, Easements, Relocations and ROW (LERRD)		0%	100%
Relocations	$80.16	$0.00	$80.16
Lands, Easements, ROW, and Disposal	$0.00	$0.00	$0.00
Project Cost Apportionment	**$237.67**	**$118.13**	**$119.54**
Non-Federal Construction Costs (Local Service Facilities)	$0.00	$0.00	$0.00
Aids to Navigation	$0.00	$0.00	$0.00
10% of GNF (less LERRD)[1]	$0.00	$0.00	$0.00[2]
Total Project First Costs	$237.67	$118.13	$119.54

The NFS, LaDOTD, supports and recognizes the importance of the deep draft navigation project for the Mississippi River Ship Channel. In a letter dated 2 October 2017 the NFS provided the following:

"The Louisiana Department of Transportation and Development (LaDOTD), is pleased to offer its support of Construction Phase of this project for navigation, Mississippi River Ship Channel (MRSC), Gulf to Baton Rouge, Louisiana to deepen the Mississippi River from the Gulf to Baton Rouge to 50 feet, to the United States Army Corps of Engineers (USACE. The LaDOTD request that the USACE, New Orleans District, initiate efforts and understand that all work must be developed in accordance with the Implementation Guidance for WIIN 2016.

[1] In accordance with Planning Guidance Letter (PGL) 44 revisions dated 27 September 2017, the Corps shall credit towards the NFS additional 10 percent payment the costs borne by the NFS to perform or assure the performance of all utility relocations. This cost is estimated at least 50% of the $80.16M plus the value of NFS incidental cost.

[2] It is not anticipated that the NFS will be required to make a cash contribution towards the 10% of the GNF cost because it shares of the cost of relocations will exceed the 10 %.over time adjustment.
[(GNF*10%)-LERRD] = [$157.51*.1 = $15.75 - $40.08 (+incidental cost) = ($24.33)].
LERRD credit cannot exceed the 10% over time adjustment, since LERRD credit is greater, the 10% adjustment = $0. The NFS shall not be entitled to reimbursement for that portion of its relocations cost that exceed 10% of the cost of the GNF.

This letter, while not legally binding on the LaDOTS as an obligation of future funds, declares the state's full support for the effort and expresses the LaDOTD's willingness to serve as the non-federal sponsor for Construction Phase."

In addition the NFS provided the "SELF CERTIFICATION OF FINACIAL CAPABILITY FOR DECISION DOCUMENTS" dated 18 October 2017, stating their awareness of the financial obligations of the NFS for the MRSC Phase 3 Project; and that the NFS has the financial capability to satisfy the NFS obligations for the project.

5.9 USACE Environmental Operating Principles

The United States Army Corps of Engineers Environmental Operating Principles were developed to ensure that Corps of Engineers missions include totally integrated sustainable environmental practices. The Principles provided incorporate direction to ensure the workforce recognized the Corps of Engineers role in, and responsibility for, sustainable use, stewardship, and restoration of natural resources across the Nation and, through the international reach of its support missions. The Environmental Operating Principles relate to the human environment and apply to all aspects of business and operations. Re-committing to these principles and environmental stewardship will lead to more efficient and effective solutions, and will enable the Corps of Engineers to further leverage resources through collaboration. This is essential for successful integrated resources management, restoration of the environment and sustainable and energy efficient approaches to all Corps of Engineers mission areas. It is also an essential component of the Corps of Engineers' risk management approach in decision-making, allowing the organization to offset uncertainty by building flexibility into the management and construction of infrastructure. The re-energized Environmental Operating Principles are:

- Foster sustainability as a way of life throughout the organization.
- Proactively consider environmental consequences of all Corps activities and act accordingly.
- Create mutually supporting economic and environmentally sustainable solutions.
- Continue to meet our corporate responsibility and accountability under the law for activities undertaken by the Corps, which may impact human and natural environments.
- Consider the environment in employing a risk management and systems approach throughout the life cycles of projects and programs.
- Leverage scientific, economic, and social knowledge to understand the environmental context and effects of Corps actions in a collaborative manner.

- Employ an open, transparent process that respects views of individuals and groups interested in Corps activities.

The Recommended Plan has been developed using the Environmental Operating Principles to guide and improve the development, formulation, and evaluation of alternatives under this study effort. In coordination with the agencies and other stakeholders, USACE proactively considered the environmental consequences of the proposed deepening project. The project would be constructed in compliance with all applicable laws. A risk management assessment has been performed, which included environmental concerns. In addition, USACE coordinated with all stakeholders to gather scientific, economic, and social information. This coordination was conducted in a manner that encouraged all groups to express their views.

5.10 USACE Campaign Plan

The USACE mission is to deliver vital engineering solutions, in collaboration with our partners, to secure our Nation, energize our economy, and reduce risk from disaster. The USACE has set several goals to help achieve this mission. Completing this General Reevaluation Study and Supplemental Environmental Impact Statement works towards Goal 2a – Modernize the Civil Works project planning program and process, through implementable solutions for the Nation's water resource priorities based on transparent, risk-informed decision making. It also supports Goal 4b to enhance trust and understanding with customers, stakeholders, teammates, and the public, through strategic engagement, communication and cyber security.

6. ENVIRONMENTAL LAWS & COMPLIANCE

Federal projects must comply with environmental laws, regulations, policies, rules, and guidance. The project delivery team coordinated with Federal and state resource agencies during planning for both the navigation dredging and disposal areas associated with the project. Compliance is achieved upon review of this report by appropriate agencies and the public, and with the signing of a Record of Decision (ROD). A ROD will not be signed until full compliance is achieved with the following laws.

6.1 Bald and Golden Eagle Protection Act of 1940 (Bald Eagles)

The Bald and Golden Eagle Protection Act of 1940 protects two eagle species. Bald eagles occur or occasionally occur in the project area. According to USFWS maps depicting active and inactive nests, all active nests are beyond 1,500 feet from the proposed work. USFWS considers this sufficient distance not to be of concern. The USACE finds that implementation of the Recommended Plan would have no effect on eagles. USFWS concurred with this determination in a Not Likely to Adversely Affect Determination on August 25, 2017 (Appendix A-22). The Recommended Plan is compliant with the Act.

6.2 Clean Air Act of 1972, Amended 1990 (Air Quality)

The Clean Air Act of 1972 (CAA) sets goals and standards for the quality and purity of air. It requires the Environmental Protection Agency to set National Ambient Air Quality Standards (NAAQS) for pollutants considered harmful to public health and the environment. Within the study area, Orleans, Jefferson, St. James, St. Charles and Plaquemines Parishes are classified as being in attainment with all NAAQS. St. Bernard Parish is classified as non-attainment for Sulphur Dioxide (SO_2). The five-parish area of West Baton Rouge, East Baton Rouge, Iberville, Ascension and Livingston Parishes are classified as maintenance status for ozone (O_2). The area is not considered an ozone transport region.

Under the Recommended Plan, the work on the upper 9 crossings would occur within the Baton Rouge 5-parish non-attainment area. The work on the lower 3 crossings (in St. James, St. Charles and Jefferson Parishes) and in the lower river (in Plaquemines Parish) would occur in areas that are in attainment with the NAAQS. The work that would occur within attainment areas do not require a CAA general conformity evaluation. A general conformity evaluation was performed for the work that would occur in the 5-parish ozone maintenance area around Baton Rouge.

With implementation of the proposed action, in the Baton Rouge 5-parish maintenance area (West Baton Rouge, East Baton Rouge, Iberville, Ascension and Livingston) for ozone, on-site construction activities for the 9 crossings within that 5-parish area would be expected to produce

approximately 9.14 tons of volatile organic compounds (VOC) emissions and approximately 224.03 tons of nitrogen oxides (NOx) emissions over the course of the entire the construction period. (VOC and NOx are considered precusors for ozone.) Based on emissions calculations of scenarios using the "worst case" dredge plants over time (i.e., the worst-emitting dredge) (Appendix A-26), if construction were continuous (i.e., occurring at all 9 crossings within one year), the total VOC emissions would be less than the de minimis level of 100 tons per year; however, the total NOx emissions would substantially exceed the de minimis level of 100 tons per year of NOx emissions approved by the State Implementation Plan.

In order to avoid exceeding the de minimis level for NOx in any year, the construction of the 9 northern-most crossings requires a multi-year, phased approach to complete the project (previously identified in 4.3.10). By staggering construction of the 9 crossings over 3 years, NOx emissions in any particular year will not exceed the de minimus level of 100 tons. Because emissions will not exceed the 100 ton de minimus threshold for either VOC or NOx, a general conformity determination for construction of the upper 9 crossings is not required.

The Recommended Plan would not result in significant adverse direct or secondary impacts to this resource. By following the proposed construction sequence as discussed in Chapter 4, construction of the crossings will not exceed the de minimus emission levels within the 5 non-attainment parishes. The Recommended Plan is compliant with the CAA.

6.3 Clean Water Act of 1972 – Section 401 (Water Quality)

The Clean Water Act of 1972 (CWA) sets and maintains goals and standards for water quality and purity. Section 401 requires a Water Quality Certification from the Louisiana Department of Enviornmental Quality (DEQ) certifying that the proposed project does not violate Louisiana's established effluent limitations and water quality standards. On April 20, 2017, DEQ issued a Water Quality Certification (WQC 170309-01) for the deepening of the lower river to -50 ft. On July 14, 2017, DEQ amended that Water Quality Certification to include the deepening of the 12 crossings. (Appendix A-11) The Recommended Plan is compliant with the Act.

6.4 Clean Water Act of 1972 – Section 404(b)(1) (Wetlands)

The USACE administers regulations under Section 404 of the CWA, which establishes a program to regulate the discharge of dredged and fill material into waters of the U.S., including wetlands. In accordance with Section 404(b)(1) of the Act, the Corps specifies disposal sites for dredged material through the application of guidelines developed by the EPA in conjunction with the Corps. A draft 404(b)(1) evaluation and 30-day public notice was released on June 30, 2017 (Appendix A-9). No adverse comments were received. The 404(b)(1) evaluation was signed on August 22, 2017 (Appendix A-10). The Recommended Plan is compliant with the Act.

6.5 Coastal Zone Management Act of 1972 (Coastal Zone Development)

The Coastal Zone Management Act of 1972 is a partnership structure allowing states and the Federal Government to work together for the protection of U.S. coastal zones from environmentally harmful over-development. The Louisiana Department of Natural Resources concurred with the CEMVN Coastal Zone Consistency Determination on August 28, 2017 (Appendix A-21). The Recommended Plan is compliant with the Act.

6.6 Endangered Species Act of 1973 (Threatened & Endangered Species)

The Endangered Species Act (ESA) of 1973 is designed to protect and recover threatened and endangered (T&E) species of fish, wildlife, and plants. CEMVN coordinates with USFWS and NMFS each fiscal year (FY) on Operations and Maintenance Dredging and Disposal Plans (Plans) for federally-maintained navigation channels in the New Orleans District concerning the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.), the Endangered Species Act (ESA) of 1973 (87 Stat. 884, as amended; 16 U.S.C. 1531 et seq.), the Bald and Golden Eagle Protection Act (BGEPA) (54 Stat. 250, as amended, 16 U.S.C. 668a-d), and the Migratory Bird Treaty Act (MBTA) of 1918 (40 Stat. 755, as amended;16 U.S.C. 703 et seq.) in order to ensure full compliance with federal law. CEMVN also receives a Biological Opinion under the Endangered Species Act for each dredging contract awarded to ensure full compliance with the Act.

CEMVN submitted a Biological Assessment for endangered species consultation under the purview of USFWS on July 7, 2017 (Appendix A-22). In it, CEMVN determined that there would be no effect on loggerhead, hawksbill, leatherback, green, or Kemp's ridley sea turtles and that the Recommended Plan may affect, but is not likely to adversely affect the West Indian Manatee, the piping plover and its designated critical habitat (unit LA-6), the rufa red knot, and pallid sturgeon. USFWS concurred with the CEMVN's determinations of either no effect or not likely to adversely affect for each listed Threatened and Endangered Species and designated critical habitat under USFWS' jurisdiction in a Not Likely to Adversely Affect Determination on August 28, 2017 (Appendix A-22).

The proposed dredging activities in the Mississippi River Southwest Pass navigation channel and bar channel are subject to the Terms and Conditions contained in the November 19, 2003 National Marine Fisheries Service Gulf of Mexico hopper dredging Regional Biological Opinion (GRBO) and subsequent revision dated January 9, 2007 (Appendix A-20, http://sero.nmfs.noaa.gov/protected_resources/section_7/freq_biop/documents/dredge_bo/f13817_revision_2_grbo.pdf). Coordination with the National Marine Fisheries Service regarding requirements of NMFS' GRBO concluded on March 24, 2017 (Appendix A-20).

CEMVN determined that the Recommended Plan would have no effect on any species under the jurisdiction of the NMFS (Kemp's ridley sea turtle, loggerhead sea turtle, hawksbill sea turtle, leatherback sea turtle, green sea turtle, and Gulf sturgeon). ESA consultation with NMFS for those species is not required. The Recommended Plan is compliant with the Act.

6.7 Fish and Wildlife Coordination Act of 1934 (Fish & Wildlife)

The Fish and Wildlife Coordination Act of 1934 (FWCA) provides authority for USFWS involvement in evaluating impacts to fish and wildlife from proposed water resource development projects. It requires that fish and wildlife resources receive equal consideration to other project features. It requires Federal agencies that construct, license or permit water resource development projects to first consult with the USFWS, NMFS, and state resource agencies regarding the impacts on fish and wildlife resources and measures to mitigate these impacts. Section 2(b) requires the USFWS to produce a Coordination Act Report (FWCAR) that details existing fish and wildlife resources in a project area, potential impacts due to a proposed project, and recommendations for a project. On June 29, 2017, the United States Fish and Wildlife Service (USFWS) provided a final Coordination Act Report (CAR), as required by the Fish and Wildlife Coordination Act (Appendix 8). USFWS' CAR recommendations and CEMVN's responses are provided in Appendix A-8-A. The Recommended Plan is compliant with the Act.

6.8 Magnuson-Stevens Fishery Conservation and Management Act (Essential Fish Habitat)

The Fishery Conservation and Management Act of 1976 as amended by the Sustainable Fisheries Act and the Magnuson-Stevens Fishery Conservation and Management Reauthorization Act of 2006 govern marine fisheries management in the U.S. The CEMVN has determined that the Recommended Plan would impact EFH by converting shallow open water EFH to intertidal marsh EFH. Hence, there would be a conversion of EFH types, resulting in improved estuarine benefits from restoring previsously eroded marsh. NMFS provided comments on the draft report in January 2017, but did not provide EFH conservation recommendations. Those comments were addressed in the final report, as well as in a letter dated July 7, 2017 to NMFS (Appendix A-19).

These two efforts concluded coordination under the Magnuson-Stevens Fishery Conservation and Management Act of 1976 and the Maguson-Stevens Act Reauthorization of 2006, and the Recommended Plan is compliant with the Acts.

6.9 Marine Mammal Protection Act of 1972 (Marine Mammals)

The Marine Mammal Protection Act of 1972 protects whales, dolphins, sea lions, seals, manatees, and other species of marine mammals. CEMVN coordinates with USFWS and NMFS each fiscal year on Operations and Maintenance Dredging and Disposal Plans for federally-maintained

navigation channels in the New Orleans District to assure compliance with the Act. To avoid impacts on dolphins and West Indian manatee that may occaisionally be found in the area, and ensure compliance with the law, in Section 4.4.5 CEMVN commits that all construction staff will be educated about the laws, about measures to avoid harm or harassment to manatees and dolphins and about appropriate best management practices (e.g., conducting a search within the project area to avoid or minimize potential entrapment during construction, Appendix A-18). These best management practices will be included in detail in the construction contracts, which fully meet the compliance criteria of the Act. (Appendix A-12.)

6.10 Migratory Bird Treaty Act of 1918 & Migratory Bird Conservation Act of 1929 (Migratory Birds)

The Migratory Bird Treaty Act of 1918 and Migratory Bird Conservation Act of 1929 protect migratory birds and their habitat. Many important habitats in the area provide migratory bird shelter, nesting, feeding, and roosting habitat. USFWS recommendations and best management practices will be followed to avoid impacts to any protected birds (Appendix A-8). The Recommended Plan is compliant with the Act.

6.11 National Historic Preservation Act of 1966 (Cultural and Historic Resources)

In compliance with Section 106 of the National Historic Preservation Act of 1966 and 36 CFR Part 800, Federal agencies must take into account the effects of their actions on historic properties and afford the Advisory Council on Historic Preservation (ACHP) a reasonable opportunity to comment on such undertakings. Historic properties include any prehistoric or historic district, site, building, structure, or object that is included in, or eligible for inclusion in, the National Register of Historic Places. A Federal agency shall consult with any Indian tribe that attaches religious and cultural significance to such properties. Agencies shall afford the State Historic Preservation Officer (SHPO) and Indian tribes a reasonable opportunity to comment before decisions are made. Coordination for Section 106 of the entire currently proposed study area began with Initiation Letters to SHPO and federally-recognized Tribes, introducing the project goals, dated September 15, 2015. Coordination for deepening of the three river crossings in the Port of South Louisiana (Fairview, Belmont, and Rich Bend) was begun on November 23, 2016, and agreement to CEMVN's conclusion of No Historic Properties Affected for construction on those crossings was received from the SHPO on December 7, 2016. Tribal responses to that conclusion are outlined below in Section 6.11.1. Coordination for the finding of No Historic Properties Affected for the deepening of all 12 existing, regularly maintained river crossings lying upriver of the Port of New Orleans was undertaken in a letter to the SHPO dated August 2, 2017, and CEMVN received agreement with its the conclusion of No Historic Properties Affected from SHPO on August 25, 2017.

6.11.1 Tribal Consultation (Tribal Interests)

In partial fulfillment of EO 13175 ("Consultation and Coordination With Indian Tribal Governments"), NEPA, Section 106 of the National Historic Preservation Act and 36 CFR Part 800, CEMVN offered the 11 federally recognized Tribes with a known interest in undertakings within CEMVN boundaries the opportunity to review and comment on the potential of the proposed action to significantly affect protected tribal resources, tribal rights, or Indian lands. An initial conclusion of No Historic Properties Affected for the 3 river crossings located in the Port of South Louisiana (Fairview, Belmont, and Rich Bend) was sent to Tribes on December 19, 2016. (Appendix A-24.) CEMVN received agreement with its finding of No Historic Properties Affected for construction on those three crossings from the Seminole Nation of Oklahoma on January 25, 2017, the Choctaw Nation of Oklahoma and the Jena Band of Choctaw on January 24, 2017, and the Muscogee (Creek) Nation on February 6, 2017. (Appendix A-24.) In a letter dated August 26, 2017, CEMVN (Appenidx A-24) informed the 11 tribes that the proposed action had been expanded to include deepening of all 12 regularly maintained river crossings above New Orleans and of CEMVN's conclusion of No Historic Properties Affected for that construction and invited comments. No new Tribal responses were received.

6.12 Resource Conservation and Recovery Act of 1976, as amended by the Hazardous and Solid Waste Amendments of 1984

The discharge of dredged material into waters of the United States is regulated under the Clean Water Act (CWA). In the absence of a known Hazardous, Toxic, and Radioactive Waste (HTRW) concern, the proposed action would not qualify for an HTRW investigation.

Based upon a review of the National Priorities List (NPL) under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), environmental databases, and contaminant sampling data, the probability of encountering HTRW in connection with this project is low. No portion of the project area proposed for dredging and disposal is included in the NPL. The Recommended Plan does not qualify for further HTRW investigation (Section 2.3.12). The Recommended Plan is compliant with the Act.

6.13 Executive Order 11514, Protection and Enhancement of Environmental Quality

Executive Order (EO) 11514 directs Federal agencies to "initiate measures needed to direct their policies, plans, and programs so as to meet national environmental goals." The Recommended Plan complies with EO 11514 by coordinating with the appropriate resource agencies, by avoiding and miniminzing environmental impacts when practicable, and by having net beneficial impacts on coastal wetlands and EFH. The Recommended Plan is compliant with the Order.

6.14 Executive Order 11988, Floodplain Management

EO 11988 requires a Federal agency, when taking an action, to avoid short- and long-term adverse effects associated with the occupancy and the modification of a floodplain. The agency must avoid direct and indirect support of floodplain development whenever floodplain siting is involved. In addition, the agency must minimize potential harm to or in the floodplain and explain why the action is proposed. Additional floodplain management guidelines for EO 11988 were provided in 1978 by the Water Resources Council. The objectives of Executive Order 11988 (Floodplain Management) were considered; however, MVN has determined that floodplain impacts, if any, from the proposed action would be mainly positive (i.e., improving the adjacent flood plain and associated habitats, and thus, maintaining their natural and beneficial values). Additionally, there is no practicable alternative for project construction outside the 100-year floodplain. As such, the Recommended Plan is compliant with the order.

6.15 Executive Order 11990, Protection of Wetlands

EO 11990, Protection of Wetlands, directs Federal agencies to avoid, to the extent possible, long and short-term adverse impacts associated with the destruction or modification of wetlands, and to avoid direct or indirect support of new construction in wetlands wherever there is a practicable alternative. The objectives of the Executive Order were considered and MVN has determined that all practicable avoidance and minimization measures will be incorporated prior to, and during, benefical use placement. The beneficial use of dredged material in the disposal areas will result in net benefits to wetland habitat (increased AAHUs) (Appendix A-7) and permanent adverse impacts to wetlands would not occur. The Recommended Plan is compliant with the Order.

6.16 Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations

EO 12898 requires agencies to make achieving environmental justice (EJ) part of their missions by identifying and addressing disproportionately high and adverse human health or environmental effects of programs, policies and activities on minority and low-income populations. As described in Section 1 of Chapter 2, because the dredged material from the crossing deepenings will be disposed in the river, nearby residents will not be affected. Because of the undeveloped nature and lack of human inhabitants within the dredge material placement areas, human populations also will not be affected in those areas. Consequently, further Environmental Justice analysis is not warranted and the project is compliant with the Executive Order.

6.17 Executive Order 13112, Invasive Species

EO 13112 requires agencies to prevent the introduction of invasive species; provide for their control; and minimize their economic, ecological and human health impacts. The Recommended Plan is consistent with the EO to the extent practicable and permitted by law and subject to the availability of appropriations, and within Administration budgetary limits. Relevant programs and authorities to prevent invasive species introductions would be used during construction, if necessary. The USACE will not authorize, fund, or carry out actions likely to cause or promote the introduction or spread of invasive species unless it has determined and made public its determination that the benefits of such actions clearly outweigh the potential harm; and that all feasible and prudent measures to minimize risk of harm would be taken in conjunction with the actions. The deepening and maintenance of the crossings and the lower river to -50 feet is not anticipated to affect invasive species and the Recommended Plan is compliant with the Order.

6.18 Executive Order 13186, Responsibilities of Federal Agencies to Protect Migratory Birds

EO 13186 requires agencies to take actions to further implement the Migratory Bird Treaty Act. The Recommended Plan has been evaluated for effects on migratory birds, with emphasis on species of concern. Habitats in the project area provide migratory bird shelter, nesting, feeding and roosting habitat. The Recommended Plan is anticipated to have a net beneficial impact on migtratory birds by increasing the availability of coastal habitat within the Mississippi Flyway. Potential impacts to the Threatened piping plover and rufa red knot were coordinated with USFWS under Section 7 of the Endangered Species Act and concluded in a Not Likely to Adversely Affect Determination dated August 25, 2017 (Appendix A-22), as well as the Final Coordination Act Report (Appendix A-8). The Recommended Plan is compliant with the Order.

6.19 Land and Water Conservation Fund Act of 1965

The Land and Water Conservation Act of 1965 established a fund from which the certain lands may be acquired and developed by Federal agencies for recreational purposes and from which the Secretary of the Interior may provide financial assistance to the States for outdoor recreation planning, development and land acquisition. The USACE must coordinate with the Secretary of the Interior to insure that no property acquired or developed with assistance from this Act will be converted to other purposes other than outdoor recreation uses. This would not apply to the beneficial placement of dredge material from this project because benefical use will convert existing open water to coastal habitat (most of which was previously marsh); it will not affect recreational uses and will not convert recreational uses to other uses. The generation of new marsh will provide additional recreational opportunities. The Recommended Plan is compliant with the Act.

6.20 Marine Protection, Research and Sanctuaries Act of 1972

This Act, also known as the Ocean Dumping Act, aims to regulate intentional ocean disposal of materials, and to authorize any related research. While the MPRSA regulates the ocean dumping of waste and provides for a research program on ocean dumping, it also provides for the designation and regulation of marine sanctuaries. The Act regulates the ocean dumping of all material beyond the territorial limit (3 miles from shore) and prevents or strictly limits dumping material that would adversely affect human health, welfare, or amenities, or the marine environment, ecological systems, or economic potentialities.

In accordance with Section 102 (c) of the MPRSA, EPA is responsible for designation/de-designation of Ocean Dredged Material Disposal Sites (ODMDSs), for evaluating environmental effects of disposal of dredged material at these sites and for reviewing and concurring on dredged material suitability determinations. The USACE is responsible for evaluating dredged material suitability and issuing MPRSA Section 103 permits, regulating site use, and developing and implementing a disposal-monitoring program. In accordance with Section 103 of MPRSA, the USACE is the permitting authority for dredged material disposal, subject to EPA review and concurrence. Navigational projects constructed and maintained by the USACE are subject to the applicable substantive Federal environmental laws and regulations even though the USACE does not issue permits to authorize its own activities. Prior to disposal of dredged material at any designated ODMDS, both EPA and the USACE are charged with making independent evaluations of all proposed dredged material disposal actions (40 CFR 225). USACE completed an Ocean Dumping Evaluation on November 30, 2016, which was submitted to the EPA for its concurrence. This project was determined to be compliant with the Act and the use of the ODMDS was approved by EPA for maintenance on February 6, 2017, and for construction on July 27, 2017 (confirmation of concurrence for construction was provided on December 12, 2017) (Appendix A-13).

6.21 Coastal Barrier Resources Act of 1982

The Coastal Barrier Resources Act (CBRA, Public Law 97-348) of the United States was enacted October 18, 1982. The United States Congress passed this Act in order to address the many problems associated with coastal barrier development. CBRA designated various undeveloped coastal barriers, which were illustrated by a set of maps adopted by law, to be included in the John H. Chafee Coastal Barrier Resources System (CBRS). These designated areas were made ineligible for both direct and indirect federal expenditures and financial assistance, which are believed to encourage development of fragile, high-risk, and ecologically sensitive coastal barriers. Coastal barriers are landscape features that protect the mainland, lagoons, wetlands and salt marshes from the full force of wind, wave and tidal energy. “Undeveloped coastal barriers” are defined by the CBRA to include barrier islands, bars, spits, and tombolos, along with associated

aquatic habitats, such as adjacent estuaries and wetlands. Composed of sand and other loose sediments, these elongated, narrow landforms are dynamic ecosystems and are vulnerable to hurricane damage and shoreline recession. Coastal barriers also provide important habitat for a variety of wildlife, and are an important recreational resource. The Recommended Plan will not affect any designated CBRS coastal barrier. Futher, construction of improvements to and maintenance of existing Federal navigation channels such as the Mississippi River Ship Channel, including the disposal of dredged material, are exempted from the CBRA's prohibition on federal expenditures. See 16 U.S.C. §3505(a)(2). As such, the Recommended Plan is compliant with the Act.

6.22 National Environmental Policy Act

The National Environmental Policy Act (NEPA) was signed into law on January 1, 1970. NEPA requires federal agencies to assess the environmental effects of their proposed actions prior to making decisions. The range of actions covered by NEPA is broad and includes making decisions on permit applications, adopting federal land management actions, and decisions to construct highways and other publicly-owned infrastructure and facilities. Using the NEPA process, agencies evaluate the environmental and related social and economic effects of their proposed actions. Agencies also provide opportunities for public review and comment on those evaluations. As detailed in Chapter 7, CEMVN fully engaged the public in the decision-making process. The Draft Report was released for a 45-day public comment period and two public meetings were held during that period. As set forth above, CEMVN undertook extensive consultation and coordination with other resource agencies and stakeholders. The Final Integrated GRR and SEIS demonstrates that the agency identified and rigorously evaluated the reasonable alternatives, avoided and minimized adverse effects to the extent practicable, and took a hard look at anticipated environmental consequences. The final report will be filed with EPA and published for 30-day public and agency comment. Any comments received will be provided to the decision-maker for consideration. Upon signature of the Record of Decision by the USACE Director of Civil Works, the Recommended Plan will have full NEPA compliance.

7.0 PUBLIC INVOLVEMENT

The NEPA provides people, organizations, and governments an opportunity to review and comment on proposed major Federal actions. This occurs throughout the planning process beginning with scoping meetings and continues through comment periods on draft and final reports. Comments are accepted and considered throughout the planning process.

The Draft Integrated General Reevaluation Report and Supplement Enviornmental Imapct Statement for the Mississippi River Ship Channel was released in December 2016 and the public review was completed in January 2017. Public meetings were held in December of 2016 and Janaury of 2017. Concurrent to the public review the report also under went an Agency Technical Review, and subsequently an Indendent External Peer Review. As a result of technical comments received, from the ATR, IEPR, the NFS, and industry, the CEMVN performed additional analyses in 2017 which resulted in a change in the recommended plan from the alternative that was proposed at the NED and TSP in the draft report.

Engaging and receiving input from the public, interested parties, stakeholders, government agencies, and nongovernmental organizations regarding the content of the Integrated GRR and SEIS throughout the development of the document is critical to achieving the USACE objective of enhancing trust and understanding with customers, stakeholders, teammates, and the public through strategic engagement and communication. Public participation efforts began with the NEPA scoping process and continue through the conclusion of the public comment period on the Final Integrated Report and SEIS. In addition to traditional mailings, a web site and other social media tools were used in an effort to broadly distribute study report information.

7.1 Public Scoping Meetings

The 13 May 2015 Notice of Intent (Fed. Reg. Vol. 80, No. 92, pp 27296-27298) (Appendix J) identified the NEPA public scoping meeting dates, locations, times, and meeting formats. The first scoping meeting was held on 26 May 2015, at the Belle Chasse Branch Library, in Belle Chase, LA, and began at 6:00 p.m. with an Open House wherein the public was invited to visit a series of poster stations staffed by the project delivery team members and subject matter experts. The second scoping meeting was held at the New Orleans District, in New Orleans, LA, and began at 8:30 a.m. The third scoping meeting was held at the Louisiana State Police Training Academy, in Baton Rouge, LA, and began at 6:00 p.m.

On 18 May 2015, a scoping meeting public notice fact sheet was mailed to approximately 407 individual mailing addresses compiled from an internal CEMVN mailing database. These individual addresses included various Federal, State of Louisiana, and local agencies and officials,

parish and city government representatives, non-governmental organizations, individual stakeholders, and members of the public.

In addition to the individual letters, scoping meeting publications were run in three local newspapers on the following dates:

- 19 May and 26 May 2015 – Plaquemines Gazette
- 24 May 24 and 28 May 2015 – New Orleans Advocate
- 24 May 24 2015 – Baton Rouge Advocate

Details on public coordination, scoping meetings, pertinent comments, and resolution of comments can be found in Appendix G "Scoping Report." A summary of pertinent comments can be found on page 36 of the scoping report.

7.2 NEPA Cooperating Agencies

Cooperating agencies (as defined under 40 CFR 1501.6) for this study include the following:

- U.S. Department of the Interior–USFWS
- U.S. Department of Commerce–NOAA and NMFS
- U.S. Department of Agriculture–NRCS

7.3 Review of the Draft Report

Federal, state, and local government agencies; elected officials; stakeholders; citizens; businesses; libraries, and universities, and other interested persons who requested copies were provided with the initial draft report. Notices of Availability and Interested Parties letters were mailed to the CEMVN District stakeholder/NEPA mailing lists. The following table provides a list of stakeholders who received a copy of the Draft Integrated GRR and SEIS.

Table 7-1 Report Recipients

Louisiana Congressional Delegation		
Senator Bill Cassidy	1st District Congressman Steve Scalise	4th District John C. Fleming
Senator David Vitter	2nd District Congressman Cedric Richmond	5th District Ralph Abraham
	3rd District Congressman Charles Boustany	6th District Garret Graves
LaDOTD		
Dr. Shawn Wilson	Sharon Balfour	Phil Jones
Tommy Clark	Chris Collins	
Louisiana State Senators & Representatives		
Ascension Parish	**Iberville Parish**	**East Baton Rouge Parish**
Senator: Eddie Lambert, and Troy E. Brown;	Senator: Robert Marionneaux;	Senator: Dan Claitor, Yvonne Colomb, Regina Barrow, Dale M. Erdey, Rick Ward, III, Mack "Bodi" White;
Representative: Tony Bacala, John A. Berthelot, Edward J. Price, Clay Schexnayder	Represenatives: Elton Aubert, Karen St. Germain	Representative: Barbara W. Carpenter, Stephen F. Carter, Paula P. Davis, Rick Edmonds, Franklin J. Foil, Kenneth E. Havard, Valarie Hodges, Barry Ivey, Edward C. "Ted" James, II, Edmond Jordan, C. Denise Marcelle, Haynes Smith,
Jefferson Parish	**Orleans Parish**	**St. Charles Parish**
Senator: Troy Carter, Conrad Appel, Senator Daniel "Danny" Martiny, John A. Alario, Jr., Jean-Paul J. Morrell, Karen Carter Peterson, Gary Smith;	Senator: Karen Carter Peterson, Jean-Paul J. Morrell, Conrad Appel, Troy Carter, Wesley Bishop, Sharon Hewitt;	Senator: Gary Smith, Troy E. Brown;
Representative: Robert E. Billiot, Patrick Connick, Jerry Gisclair, Cameron Henry, Stephanie Hilferty, Christopher J. Leopold, Rodney Lyons, Joseph A. Marino, III, Julie Stokes, Kirk Talbot, Polly Thomas, Thomas P. Willmott	Representative: Neil C. Abramson, John H. Bagneris, Joseph Bouie, Jr., Gary M. Carter, Jr., Raymond E. Garofalo, Jr., Jimmy Harris, Stephanie Hilferty, Walt Leger, III, Christopher J. Leopold, Helena N. Moreno	Representative: Edward J. Price, Clay Schexnayder
St. James Parish	**Plaquemines Parish**	**St. Bernard Parish**
Senator: Eddie Lambert, Troy E. Brown;	Senator: Sharon Hewitt, Troy Carter, John A. Alario, Jr.;	Senator: Sharon Hewitt
Represenative: Edward J. Price, Clay Schexnayder	Representative: Raymond E. Garofalo, Jr., Christopher J. Leopold , Jean-Paul J. Morrell;	Represenatative: Raymond E. Garofalo, Jr.
St. John the Baptist Parish	**West Baton Rouge Parish**	
Senator: Gary Smith, Troy E. Brown;	Senator: Rick Ward, III, Troy E. Brown; Represenative: Major Thibaut	
Representative: Randal L. Gaines, Gregory A. Miller, Clay Schexnayder	Represenative: Major Thibaut	
Federal Agencies		
Advisory Council on Historic Preservation	**Department of Energy:** Office of Environmental Compliance	**Department of Transportation:** Division Administrator, Federal Highway Administration; Southwest Region, Federal Aviation Administration
Department of Agriculture*:* Natural Resources Conservation Service: Louisiana State Conservationist; District Conservationist	**Department of Homeland Security:** Federal Emergency Management Agency, Region VI	**Environmental Protection Agency:** Office of Federal Activities, EIS Filing Section: Region VI, Marine and Wetlands Section; Region VI - Office of Planning and Coordination

Department of the Army: Mississippi Valley Division	**Department of the Interior:** Office of Environmental Policy and Compliance; U.S. Fish and Wildlife Service: Lacombe Office; Lafayette Field Office	**Department of Commerce:** National Oceanic and Atmospheric Administration; Protected Species Division; Habitat Conservation Division; NEPA Coordinator, Office of Program, Planning & Integration
Waterways Council Inc.	**Eighth Coast Guard District**	**United Sates Department of the Navy**
State Agencies and Offices		
Office of the Governor of Louisiana	**Louisiana Department of Agriculture & Forestry:** Office of Forestry; Office of Agriculture & Environmental Science	**Louisiana Department of Public Works**
Louisiana Office of Lieutenant Governor	**Louisiana Department of Environmental Quality:** Office of the Secretary; Environmental Planning Division	**Louisiana Department of Transportation & Development**
Louisiana Secretary of State	**Louisiana Department of Health & Hospitals:** Office of Public Health, Center for Environmental Health	**Louisiana Department of Wildlife and Fisheries:** Office of the Secretary; Natural Heritage Program
Louisiana Attorney General's Office	**Louisiana Department of Natural Resources:** Interagency Affairs; Lafayette Field Office; Division of State Lands; Office of Conservation, Surface Mining Division; Consistency Coordinator, Coastal Resources Program	**Louisiana Division of Administration:** State Land Office; State Planning Office
Governor's Office for Coastal Activities	**Coastal Protection and Restoration Authority Board**	**Louisiana Office of Cultural Development:** State Historic Preservation Officer; Division of Outdoor Recreation
Coastal Protection and Restoration Authority		**Louisiana State Board of Commerce & Industry**
Native American Tribes		
Alabama Coushatta Tribe of Texas	Coushatta Tribe of Louisiana	Seminole Tribe of Florida
Caddo Nation of Oklahoma	Jena Band of Choctaw Indians	Seminole Nation of Oklahoma
Chitimacha Tribe of Louisiana Band	Mississippi Band of Choctaw Indians	Tunica-Biloxi Tribe of Louisiana
Choctaw Nation of Oklahoma	Muscogee (creek) Nation	
Media Outlets		
The New Orleans District, Public Affairs Office will provide a news release to several hundred news media outlets including contact information for requesting copy of the report, and where to provide comments on the report.		
Libraries & Universities		
Louisiana State University: Geographic Information Center; Office of Sea Grant Development; Department of Geography; Government Documents	**Parish Libraries:** Ascension, East Baton Rouge, Iberville, Jefferson, Orleans, Plaquemines St. Bernard, St. Charles, St. James Parish, St. John the Baptist, West Baton Rouge	Earl K. Long Library Tulane University
Navigation, Dredging and River Related		
Associated Federal Pilots	Entergy	New Orleans-Baton Rouge Steamship Pilot Association
Bean Corporation	Hydro consultants, Inc.	Plaquemines Port Harbor & Terminal
Big River Coalition	Louisiana Department of Transportation & Development	Port of Greater Baton Rouge
C&M Contractors, Inc.	Louisiana Maritime Association (LAMA)	Port of New Orleans
Capt. K.C. Siverd	Louisiana Maritime Association (LAMA)	Port of South Louisiana
Carr Oil Company, Inc.C	Lower Mississippi River Committee (LOMRC)	South Louisiana Environmental Council

Crescent River Port Pilots Association	Maritime Navigation Safety Association (MNSA)	Associated Branch Pilots (Bar Pilots)
Cresent River Port Pilots Association	Maritime Navigation Safety Association (MNSA)	South Louisiana Port Commission
Engineering Development Group, Inc.	New Orleans Board of Trade	Wally Landry, Crucial, Inc.
Ports		
Port of New Orleans	Port of South Louisiana	Greater Port of Greater Baton Rouge
Plaquemines Port, Harbor & Terminal		
Levee Districts /Authorities		
Orleans Levee Distirct	North Lafourche Basin Levee District	Pontchartrain Levee District
East Jefferson Levee District	West Jefferson Levee District	Lafitte Area Independent Levee Distirct
Southeast Louisiana Flood Protection Authority - West	Plaquimines Parish – West Bank Levee District	Lake Borgne Basin Levee District
Southeast Louisiana Flood Protection Authority - East	Plaquimines Parish – Buras District	Plaquimines Parish – Grand Prairie Levee District
Floodplain Management Agencies		
FEMA Region VI	LADOTD, Public Works and Water Resources Division;	
Ascension Parish Government	**East Baton Rouge Parish Government**	**Iberville Parish Government**
Parish President Parish Council	Parish President Parish Council	Parish President Parish Council
Jefferson Parish Government	**Orleans Parish Government**	**Plaquemines Parish Government**
Parish President Parish Council	Mayor City Council	Parish President Parish Council
St. Bernard Parish Government	**St. Charles Parish Government**	**St. James Parish Government**
Parish President Parish Council	Parish President Parish Council	Parish President Parish Council
St. John the Baptist Government	**West Baton Rouge Parish**	
Parish President Parish Council	Parish President Parish Council	

7.4 Comments Received on the Draft Integrated GRR and SEIS.

The Draft Intgrated GRR and SEIS was made available for public review and comment for 45 days from December 16, 2016 until January 31, 2017. Two NEPA public meetings were conducted during public review period:

- 14 December 2016 at the USACE New Orleans District Office, 7400 Leake Ave. New Orleans, LA 70118.

- 26 January 2017 at the USACE New Orleans District Office, 7400 Leake Ave. New Orleans, LA 70118.

Comments made during the meetings were memorialized either by a court reporter or on hand-written comment cards provided to attendees at the meetings. A cumulative total of 20 people attended the 2 public meetings, with a total of 6 individuals offering oral comments. CEMVN received written comments from 8 Federal, state, parish and local governments, and written comments from 4 members of the public.

Written and oral comments received on the Draft GRR and SEIS and CEMVN responses are included in Appendix J. Written and oral comments and were reviewed and were considered in the preparation of this Final GRR and SEIS. Comments received during the 30-day public review of the Final GRR and SEIS will be provided to the decision-maker for consideration before a Record of Decision is signed.

Overall, public comments received both in writing and during the public hearings were supportive of the project. One comment received from industry requested further consideration of an alternative to use connector vessels in lieu of deepening the channel; this suggestion was addressed further in Chapter 3. Significant comments from industry and the NFS requesting further review and consideration of the dredging requirements associated with deepening the crossings located within the Port of Baton Rouge, lead to further consideration of alternatives in the 2D hydraulic model, the results of which are discussed in Chapter 3, and led to the Recommended Plan, which differed from the TSP as presented in the draft report. All registered commenting meeting participants, as well as those providing written comments, will be provided a copy of this Final Report. In addition, the Final and Draft Report will be posted at: http://www.mvn.usace.army.mil/About/Mississippi-River-Ship-Channel/.

8.0 RECOMMENDATION

Information in this document was developed for feasibility analysis, with input from agencies and comments from the public, to help refine potential solutions to provide deep draft navigation along the Mississippi River from Baton Rouge to Gulf of Mexico. These sources of information will assist the USACE Commander in making an informed decision.

8.1 Recommended Plan

The Recommended Plan provides deep draft navigation to a depth of 50 ft from the Gulf beginning at RM 22 BHP through the Port Baton Rouge ending at RM 232.4 AHP. This would be accomplished by constructing and maintaining the MRSC to -50 ft MLLW in the lower Mississippi from RM 13.4 AHP to RM 22 BHP, and by deepening the twelve regularly maintained crossings located within the Port of South Louisiana and the Port of Baton Rouge to -50 ft LWRP. The material dredged during construction of the RM 13.4 AHP to RM 19.5 BHP reach would be placed in locations designated for beneficial use of dredged material. The material would be deposited as uniformly as practicable within the Federal Standard to create intertidal coastal wetland habitat. The material dredged during construction of the RM 19.5 BHP to RM 22.0 BHP reach would be placed in the ODMDS.

All other reaches of the river have depths that are naturally greater than 55 ft. In the present condition these reaches do not require construction or operation and maintenance to provide deep draft access. However, it is the intent of the GRR that should existing conditions change in these reaches, the district would exercise its authority to conduct operation and maintenance actions to maintain the authorized depth and width to the extent approved for construction and supported by an executed cost-sharing agreement with the non-Federal sponsor. The purpose of this integrated GRR and SEIS is to evaluate any significant changes in environmental baselines (e.g. coastal wetlands, human environment, etc.) that may have occurred since completion of the Feasibility Study and Environmental Impact Statement in 1985, and to ensure the project would still be compliant with all pertinent environmental regulations. If, in the future, the project requires dredging in areas outside of those evaluated in this SEIS, additional analysis could be required under NEPA and other environmental laws and regulations.

Should it become necessary to utilize hopper dredges for construction of some portion of the RM 6 AHP to RM 19.5 BHP reach, hopper dredges would utilize the open water disposal area located at the Head of Passes and the Southwest Pass ODMDS. The EPA- designated Southwest Pass ODMDS is approximately 2975 acres in size and is located west of and parallel to the Southwest Pass bar channel in the Gulf Mexico beginning near RM 20.3. Expansion of this ODMDS will not be required as part of this project.

8.2 Plan Implementation

The following describes the NFS financing and the division of plan responsibilities.

8.2.1 Federal and non-Federal Cost-Sharing

The Louisiana Department of Transpiration (LaDOTD) is the NFS during the development of the GRR for the project and the cost-share during this phase is 50 percent Federal and 50 percent non-Federal. LaDOTD will continue to be the NFS through preconstruction engineering and design (PED), construction, and Operation, Maintenance, Repair, Replacement, and Rehabilitation (OMRR&R). The cost share for the PED and construction of Phase III of the project will be 75 percent Federal and 25 percent non-Federal since the deepening of the channel, as described in the Recommended Plan is limited to depths that are in excess of 20 feet, but do not exceed 50 feet. Per WRRDA 2014 the cost share for OMRR&R, deep draft navigation for a channel up to 50 ft is 100 percent Federal. Among other responsibilities, the NFS must provide all project LERRDs required for the construction and OMRR&R of the general navigation features of the project and submit any work-in-kind request to the Federal government for the PED of the project. The estimated first construction to provide the 50 ft depth is an estimated cost of $237,670,000. The estimated annual OMRR&R cost is $227,423,000 annually for the 50 ft project depth. Appendix I includes a summary of the MII level cost estimate, as well as a cost risk anaylsis for the Recommended Plan.

8.2.2 Federal Responsibilities

The Federal government will be responsible for PED and construction of the general navigation features of the project in accordance with the applicable provisions of Public Law 99-662 (WRDA of 1986), as amended. The Government, subject to Congressional authorization and the availability of funds, and using those funds provided by the NFS, shall expeditiously construct the project, applying those procedures usually applied to Federal projects, pursuant to Federal laws, regulations, and policies. The Federal Government is responsible for 75% of the total cost of the construction of the general navigation features of Phase 3 of the project (because all of the considered alternatives for Phase 3 construction were at depths that are greater than 20 feet and less than or equal to 50 feet) and 100 percent of the cost of the OMRR&R of the general navigation features of Phase 3 of the project since all of the considered alternatives are less than or equal to a depth of 50 feet.

8.2.3 Non-Federal Responsibilities

Federal implementation of Phase 3 of the project is dependent upon the agreement of the non-Federal sponsor to comply with all applicable Federal laws, regulations, and policies and to provide the following items of local cooperation, including, but not limited to, the following:

a. Provide, during the periods of design and construction of Phase 3 of the project, funds necessary to make its total contribution for commercial navigation equal to 25 percent of the cost of design and construction of the general navigation features attributable to dredging to a depth in excess of the currently constructed and maintained project depth of 45 feet, but not in excess of -50 feet, based upon the datum applicable in each respective portion of the project for which Phase 3 design and construction is being implemented.

b. Provide all lands, easements, rights-of-way, and relocations, including those necessary for the borrowing of material and placement of dredged or excavated material, and perform or assure performance of all relocations, including utility relocations, as determined by the Federal government to be necessary for the construction or operation and maintenance of the general navigation features, all in compliance with applicable provisions of the Uniform Relocation and Assistance and Real Property Acquisition Policies Act of 1970, as amended (42 U.S.C. 4601-4655) and the regulations contained in 49 C.F.R. Part 24;

c. Pay with interest, over a period not to exceed 30 years following completion of the period of construction of the general navigation features, an additional amount equal to 10 percent of the total cost of construction of the National Economic Development Plan general navigation features less the amount of credit afforded by the Federal government for the value of the lands, easements, rights-of-way, and relocations, including utility relocations, provided by the non-Federal sponsor for the general navigation features. If the amount of credit afforded by the Federal government for the value of lands, easements, rights-of-way, and relocations, including utility relocations, provided by the non-Federal sponsor equals or exceeds 10 percent of the total cost of construction of the general navigation features, the non-Federal sponsor shall not be required to make any contribution under this paragraph, nor shall it be entitled to any refund for the value of lands, easements, rights-of-way, and relocations, including utility relocations, in excess of 10 percent of the total costs of construction of the general navigation features;

d. Prevent obstructions or encroachments on the project (including prescribing and enforcing regulations to prevent such obstructions or encroachments) such as any new developments on project lands, easements, and rights-of-way or the addition of facilities which might reduce the outputs produced by the project, hinder operation and maintenance of the project, or interfere with the project’s proper function;

e. Provide, operate, and maintain, at no cost to the Federal government, the local service facilities in a manner compatible with the project's authorized purposes and in accordance with applicable Federal and state laws and regulations and any specific directions prescribed by the Federal government;

f. Give the Federal government a right to enter, at reasonable times and in a reasonable manner, upon property that the State of Louisiana, the LaDOTD, as the named non-Federal sponsor, and/or other non-Federal governmental entities own or control for access to the project for the purpose of completing, inspecting, operating, maintaining, repairing, rehabilitating, or replacing the project.

g. Hold and save the United States free from all damages arising from the construction or operation and maintenance of the project, any betterments, and the local service facilities, except for damages due to the fault or negligence of the United States or its contractors;

h. Keep, and maintain books, records, documents, and other evidence pertaining to costs and expenses incurred pursuant to the project, for a minimum of 3 years after completion of the accounting for which such books, records, documents, and other evidence are required, to the extent and in such detail as will properly reflect total cost of the project, and in accordance with the standards for financial management systems set forth in the Uniform Administrative Requirements for Grants and Cooperative Agreements to State and local governments at 32 CFR, Section 33.20;

i. Perform, or ensure performance of, any investigations for hazardous substances that are determined necessary to identify the existence and extent of any hazardous substances regulated under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 42 USC 9601-9675, that may exist in, on, or under lands, easements, rights-of-way, relocations, and disposal areas that the Federal government determines to be necessary for the construction or operation and maintenance of the general navigation features. However, for lands, easements, or rights-of-way that the Federal government determines to be subject to the navigation servitude, only the Federal government shall perform such investigation unless the Federal government provides the non-Federal sponsor with prior specific written direction, in which case the non-Federal sponsor shall perform such investigations in accordance with such written direction;

j. Assume complete financial responsibility, as between the Federal government and the non-Federal sponsor, for all necessary cleanup and response costs of any hazardous substances regulated under CERCLA that are located in, on, or under lands, easements, rights-of-way, relocations, and disposal areas required for the construction or operation and maintenance of the project;

k Agree, as between the Federal government and the non-Federal sponsor, that the non-Federal sponsor shall be considered the operator of the local service facilities for the purpose of CERCLA liability, and, to the maximum extent practicable, perform its obligations related to the project in a manner that will not cause liability to arise under CERCLA;

l. Comply with Section 221 of Public Law 91-611, Flood Control Act of 1970, as amended, (42 U.S.C. 1962d-5b) and Section 101(e) of the WRDA 86, Public Law 99-662, as amended, (33 U.S.C. 2211(e)) which provide that the Secretary of the Army shall not commence the construction of any water resources project or separable element thereof, until the non-Federal sponsor has entered into a written agreement to furnish its required cooperation for the project or separable element;

m. Comply with the applicable provisions of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, Public Law 91-646, as amended, (42 U.S.C. 4601-4655) and the Uniform Regulations contained in 49 CFR Part 24, in acquiring lands, easements,

and rights-of-way necessary for construction, operation, and maintenance of the project including those necessary for relocations, the borrowing of material, or the disposal of dredged or excavated material; and inform all affected persons of applicable benefits, policies, and procedures in connection with said act;

n. Comply with all applicable Federal and state laws and regulations, including, but not limited to: Section 601 of the Civil Rights Act of 1964, Public Law 88-352 (42 U.S.C. 2000d), and Department of Defense Directive 5500.11 issued pursuant thereto; Army Regulation 600-7, entitled "Nondiscrimination on the Basis of Handicap in Programs and Activities Assisted or Conducted by the Department of the Army"; and all applicable Federal labor standards requirements including, but not limited to, 40 U.S.C. 3141-3148 and 40 U.S.C. 3701-3708 (revising, codifying and enacting without substantive change the provisions of the Davis-Bacon Act (formerly 40 U.S.C. 276a et seq.), the Contract Work Hours and Safety Standards Act (formerly 40 U.S.C. 327 et seq.), and the Copeland Anti-Kickback Act (formerly 40 U.S.C. 276c));

o. Not use funds from other Federal programs, including any non-federal contribution required as a matching share therefore, to meet any of the non-Federal sponsor's obligations for the project unless the Federal agency providing the funds verifies in writing that such funds are authorized to be used to carry out the project; and

p. Accomplish all removals determined necessary by the federal government other than those removals specifically assigned to the federal government.

The recommendations herein reflect the information available at the time and current Department of the Army policies governing the formulation of individual projects. They do not reflect programming and budgeting priorities inherent in the formulation of the national Civil Works construction program nor the perspective of higher review levels within the Executive Branch. Consequently the recommendations may be modified before they are transmitted to Congress as proposals for implementing funding. However, prior to the transmission to Congress, the state, Federal agencies and other parties will be advised of any modifications and afforded the opportunity to comment.

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Michael N. Clancy
Colonel, U.S. Army
District Engineer

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Date

9.0 LIST OF PREPARERS

Table 9-1 provides the names, offices, and roles of USACE personnel who assisted in preparation and review of this report.

Table 9-1 List of Preparers

Name	Office	Discipline/Role
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