

SECTION 8

Summary of Recommended Alternatives and Considerations for the 30 Percent Design Evaluation

The Phase 1 design evaluation screened a wide array of project alternatives, according to specific screening criteria, to result in a short list of five alternatives for further evaluation through the next phase of design (completion of the 30 Percent Design Report). The approach that has been taken in the preceding sections, culminating with the remaining alternatives following screening in Section 7, outlines the range of viable alternatives that achieve the project objectives. Project objectives include preserving and protecting deteriorating coastal wetlands in the Barataria and Terrebonne basins and ensuring an adequate supply of fresh water for residential, agricultural, and industrial needs now and into the future. This short listing of alternatives is described in Section 8.1.

Additional engineering evaluations are required during the 30 percent design to refine various components and costs of the alternatives. Additionally, environmental considerations and stakeholder coordination will be required to screen the current short list of alternatives down to a single, preferred alternative at the conclusion of the 30 percent design evaluation. Remaining evaluations and coordination efforts required prior to selecting a preferred alternative for final design are discussed in Section 8.2.

The costs that have been presented thus far are comparative costs. These costs do not represent the recommended program budget because they do not include the numerous common cost features among alternatives and are not based on any specific design (only order-of-magnitude allowances for many items). Section 8.3 provides some additional guidance in defining a range of costs for establishing program budgets.

Finally, a summary of recommendations for proceeding to the next phase of design is provided in Section 8.4.

8.1 Description of the Short List of Alternatives Recommended for 30 Percent Design Analysis

The alternatives remaining after the screening analysis documented in Section 7 are summarized in Table 8-1. Additional evaluations are required before a preferred alternative can be selected; however, these five alternatives will be the starting point for the 30 percent design.

TABLE 8-1
 Recommended Alternatives for Further Study in the 30 Percent Design
Mississippi River Reintroduction into Bayou Lafourche – Phase 1 Design Report

Alternative No.	Alignment Alternative	Donaldsonville		Dredge Template	Maximum Target Water Level	Project Cost (nearest \$ million)	Project Flow (cfs)	Cost per cfs (\$)
		Railroad Crossing						
15	BL	NM		2-0@RM29	MW	61	1,025	59,150
32	BL	M, NB		8-2@RM29	MLW	123	1,530	80,150
38	BL	M, NB		2-0@RM29	MLW	68	970	70,100
44	SB	NM		2-ALL	MLW	113	1,400	80,500
47	SB	NM		8-ALL	MLW	179	2,000	89,500

Notes:

BL = Bayou Lafourche
 M = Modified
 NB = New Bridge
 NM = Not Modified
 SB = Smoke Bend

The cost efficiency (cost per cfs) of the remaining alternatives is presented graphically on Figure 8-1. Figure 8-1 indicates a trend of reduced cost efficiency as the total project flow increases. Therefore, when the environmental benefits are evaluated, benefits for alternatives with flow capacities greater than 1,000 cfs should be large enough to justify this reduction in cost efficiency for higher flows.

8.1.1 Alternative 15

Alternative 15 uses the Bayou Lafourche alignment and delivers approximately 1,000 cfs of flow (1,025 cfs was modeled). The unique attribute of this alternative, relative to the other remaining alternatives that use Bayou Lafourche as the main channel alignment, is that the UPRR bridge is left unmodified. Additionally, because of the hydraulic constriction created by the UPRR bridge culverts, the water level upstream of this bridge exceeds the MLW target level profile. The water level upstream of the bridge is allowed to rise as high as the MW target level.

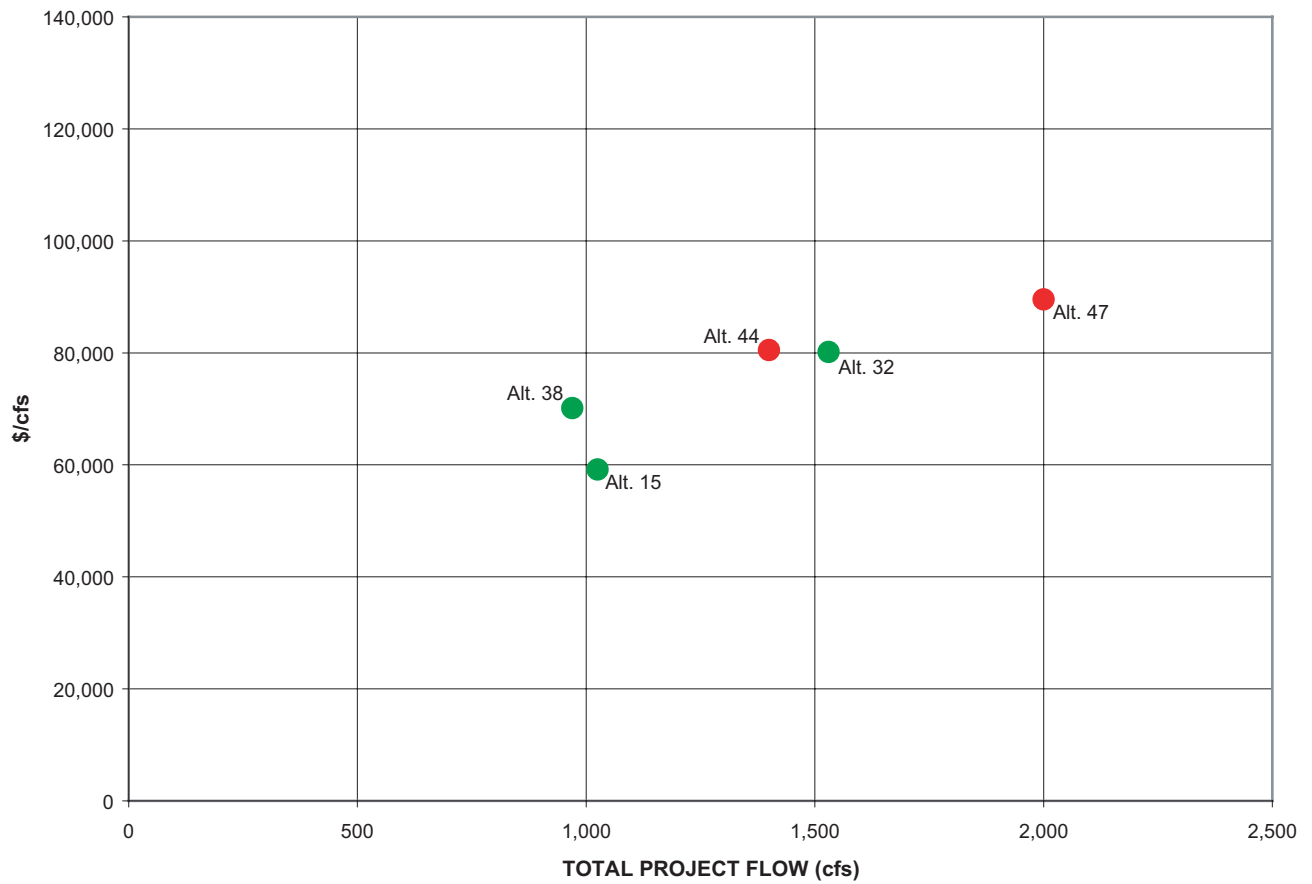
Below the UPRR bridge, this alternative does not exceed the MLW target profile. This alternative also does not exceed a 3-foot water level rise downstream of the Thibodaux weir (by definition of the screening criteria). Alternative 15 requires a relatively small amount of dredging (dredge template 2-0@RM29). The comparative cost for this alternative is \$61 million, as shown in Table 8-1.

As shown on Figure 8-1, Alternative 15 is the most cost efficient of all the remaining alternatives (approximately \$60,000/cfs). Land might need to be purchased along the bayou sides upstream of the UPRR bridge, but observations of property along this reach of the bayou indicate impacts are minimal at the water elevations required. This alternative might be favored for further consideration if the following are true:

- The incremental environmental benefits of alternatives with flows greater than 1,000 cfs are negligible.
- The removal of the existing UPRR bridge is cost prohibitive or otherwise undesirable.
- The funding is limited to a project of this cost range.

8.1.2 Alternative 32

Alternative 32 uses the Bayou Lafourche alignment and delivers approximately 1,500 cfs of flow (1,530 cfs was modeled). The unique attribute of this alternative, relative to the other remaining alternatives, is that Alternative 32 is the highest flow capacity alternative remaining that uses the Bayou Lafourche alignment. This alternative requires a new UPRR bridge. Alternative 32 does not exceed the MLW target profile at any point from Donaldsonville to Lockport. Similar to the other remaining alternatives, the water surface elevation is below a 3-foot water level rise downstream of the existing Thibodaux weir. This alternative requires a relatively large amount of dredging (dredge template 8-2@RM29). The comparative cost for this alternative would be \$123 million. Alternative 32 provides approximately 1,500 cfs for a moderate level of cost efficiency at approximately \$80,000/cfs.



LEGEND
 ● DONALDSONVILLE ALTERNATIVES
 ● SMOKE BEND ALTERNATIVES

FIGURE 8-1
COST-EFFICIENCY PLOT OF
FIVE REMANING ALTERNATIVES
 MISSISSIPPI RIVER REINTRODUCTION INTO BAYOU LAFOURCHE
 LOUISIANA DEPARTMENT OF NATURAL RESOURCES
 PHASE 1 DESIGN REPORT

This alternative might be favored for further consideration if the following are true:

- The incremental environmental benefits for flows greater than 1,000 cfs are appreciable.
- The removal of the existing UPRR bridge is not cost prohibitive or undesirable.
- Water level impacts in Donaldsonville at the MW target elevation are unacceptable.
- The Smoke Bend bypass channel is not cost competitive with the Bayou Lafourche alignment, or undesirable for other reasons (e.g., property acquisition).

8.1.3 Alternative 38

Alternative 38 uses the Bayou Lafourche alignment and delivers approximately 1,000 cfs of flow (970 cfs was modeled). This alternative would use the bayou alignment and provide a new bridge at the Donaldsonville UPRR crossing. This alternative does not exceed the MLW target profile at any point from Donaldsonville to Lockport. Additionally, the water surface elevation is below a 3-foot water level rise downstream of the existing Thibodaux weir. This alternative requires a relatively small amount of dredging (dredge template 2-0@RM29). The comparative cost for this alternative would be \$68 million. Alternative 38 provides approximately 1,000 cfs for a reasonable level of cost efficiency at approximately \$70,000/cfs.

This alternative might be favored for further consideration if the following are true:

- The incremental environmental benefits of alternatives with flows greater than 1,000 cfs are negligible.
- The removal of the existing UPRR bridge is not cost prohibitive.
- Water level impacts in Donaldsonville at the MW target elevation are unacceptable.
- Funding is limited to a project of this cost range.

The Phase 1 design considered either no replacement or full replacement of the UPRR bridge, where a full replacement would include a more open design that would significantly reduce the hydraulic restriction on the channel. However, at the 1,000-cfs flow rate, there is a possibility that more culverts could be bored into the existing embankment to allow the upstream water surface to be reduced. There are two unknowns at this time regarding this option that need to be answered during the next phase of design: (1) whether the embankment is stable enough to support installation of added culverts without creating risk to the railroad, and (2) the extent to which the upstream water line can be lowered (closer to the MLW target level) by installation of more culverts. There is a cost tradeoff between the investments in the UPRR crossing versus the cost of property impacted. At this point, the \$8 million bridge replacement far exceeds the property impact costs upstream, even with no improvements to the crossing, which favors Alternative 15. At flows greater than 1,000 cfs, only a full bridge replacement will suffice.

8.1.4 Alternative 44

Alternative 44 uses the Smoke Bend bypass channel alignment and delivers approximately 1,500 cfs of flow (1,400 cfs was modeled). Because the Smoke Bend bypass channel routes flows around Donaldsonville, the UPRR bridge would not require replacement. This

alternative does not exceed the MLW target profile at any point from Donaldsonville to Lockport (even with the backwater effect on Donaldsonville). Additionally, the water surface elevation is below a 3-foot water level rise downstream of the existing Thibodaux weir. This alternative requires a relatively moderate amount of dredging (dredge template 2-ALL). The comparative cost for this alternative would be \$113 million. Alternative 44 provides approximately 1,500 cfs for a moderate level of cost efficiency at approximately \$81,000/cfs.

This alternative might be favored for further consideration if the following are true:

- The incremental environmental benefits for flows greater than 1,000 cfs are appreciable.
- The removal of the existing UPRR bridge is cost prohibitive or otherwise undesirable.
- Water level impacts in Donaldsonville at the MW target elevation are unacceptable.
- Funding is limited to a project of this cost range.

8.1.5 Alternative 47

Alternative 47 uses the Smoke Bend bypass channel alignment and delivers approximately 2,000 cfs of flow. The unique attribute of this alternative is that it is the highest flow capacity alternative of the remaining alternatives. Because the Smoke Bend bypass channel routes flows around Donaldsonville, the UPRR bridge would not require replacement. This alternative does not exceed the MLW target profile at any point from Donaldsonville to Lockport. Additionally, the water surface elevation is below a 3-foot water level rise downstream of the existing Thibodaux weir. The comparative cost for this alternative would be \$179 million. Alternative 47 provides approximately 2,000 cfs for the least cost efficiency at approximately \$90,000/cfs.

This alternative might be favored for further consideration if the following are true:

- The incremental environmental benefits for flows greater than 1,500 cfs are appreciable.
- The removal of the existing UPRR bridge is cost prohibitive or otherwise undesirable.
- Funding is available for a project of this cost range.

8.2 Required Evaluations and Issue Coordination for 30 Percent Design

This section outlines the remaining technical, environmental, and policy issues to address and refine during the 30 percent design, so that a preferred alternative can be recommended and that the final design and construction of that alternative is implementable.

8.2.1 General Engineering Evaluations

During the 30 percent design evaluation, project components will continue to be developed so that alternative costs can be better refined for comparative purposes. To assist in this process, scale drawings will be prepared, allowing better refined estimates of quantities for cost estimating. However, before developing detailed drawings of specific project components described in the following paragraphs, various evaluations need to be conducted to refine the details.

Pump Station – A separate alternative analysis of the pump station needs to be conducted, evaluating the best options for intake, discharge, sedimentation control, pump types, and mechanical, electrical, and control systems. After the preferred pump station configuration is selected, the same configuration will be applied to the remaining alternatives. Only the capacity of the pump station will be varied to meet the requirements of the specific alternative.

Dredging – Dredging methods and materials handling require better definition to select probable construction methods and define costs. A range of alternatives is available for final use of dredged material, and the actual method might not be known until sometime beyond the 30 percent design. It is therefore important that the dredging evaluation develop a probable scenario that can be consistently included in the cost and benefits analyses of the remaining alternatives, so that comparisons can be made. Numerous environmental issues are associated with disposal or beneficial reuse of the dredged material.

Bridge Impacts and Upgrades – Two categories of bridge issues must be refined during the 30 percent effort. One is to verify the current cost estimate and preliminary layout of the bridge replacement with UPRR and confirm the requirements for design and construction of such a bridge. Additionally, the possibility of increasing flow through the UPRR crossing by adding culverts should be further investigated. The other area of refinement required regards the bridge stability issues for different dredging scenarios. It is possible that some of the timber pile bridges will require modifications to ensure their stability for the deeper dredging scenarios.

Utilities – Most of the utility crossings were identified in the Phase 1 design. After these utilities are located on the drawings, typical details for protecting or replacing the utilities will be developed, and costs can be more accurately estimated.

Bulkheading and Bank Stabilization – Criteria for bulkheading have been developed. These criteria depend on side slopes of the banks, of which complete and accurate information is not available. Refinement of the initial estimates might be possible using the available LIDAR-based contours. More detailed topography will be generated during final design to allow more accurate definition of the bulkheading required.

Drainage – Drainage impacts to local watersheds resulting from raised water levels will need to be defined and solutions developed for the final design effort. For the 30 percent phase, major drainage impacts will be assessed and contingencies included into the cost estimates for the refined alternatives. Additionally, the extent of the drainage investigation required for final design will be defined in the 30 percent effort.

System Control and Operations – The overall strategy for system water level and flow control during storm events and pollutant spills requires refinement to define the specific needs and requirements of the system.

8.2.2 Environmental Evaluations

Several activities focusing on environmental compliance and benefits will be ongoing concurrent with the general engineering evaluations.

NEPA Process – Assessing the environmental effects of project alternatives through the NEPA process is required by federal rule to fully consider environmental consequences and

integrate public input into the decisionmaking process. It is understood that EPA is responsible for performing the required NEPA analysis and preparing the necessary environmental documentation related to this project. The environmental benefits associated with the range of project flows will be weighed against environmental impacts through the NEPA analysis.

The NEPA requires federal agencies to integrate environmental values into their decision-making processes by considering the environmental impacts of their proposed actions and reasonable alternatives to those actions (<http://www.epa.gov/compliance/nepa>). The MRRBL project scope and schedule has proceeded in communication and coordination with EPA and their environmental process. This effort intends to proceed in unison with the NEPA compliance effort to select a preferred alternative for final design and construction.

Benefits Evaluation – Conditions of the CWPPRA motion for funding a Bayou Lafourche diversion project requires an updated estimate of costs and benefits of the remaining project alternatives to demonstrate accomplishment of wetlands conservation goals. The Phase 2 modeling effort will demonstrate the hydrodynamic affects of the Bayou Lafourche diversion alternatives. The model output will be used to verify wetlands benefits. This analysis will also be used as part of the final screening process to assess the sensitivity of benefits to overall flow within the range of flows being evaluated (1,000 to 2,000 cfs).

Beneficial Reuse of Dredged Material – A significant amount of dredged material will be removed from Bayou Lafourche during construction of the project. The project team will investigate the feasibility of beneficially reusing this material by several alternative means. The potential for using this material for marsh creation and/or nourishment will be reviewed. The ability to use this material in this manner might increase the quantifiable environmental benefits of the project. The ability to coordinate with USACE is important to verify the viability of this approach.

8.2.3 Property, Stakeholder, and Agency Coordination

Real Estate and Easements – Substantial coordination is required for securing easements and potentially purchasing property for project facilities or impact areas. The 30 percent evaluation will help to identify project construction access needs and facility property requirements and impact areas. However, much of the required level of detail to accurately define these needs will occur during the final design. Considering the scope of the real estate and easement acquisition efforts required prior to construction of the preferred alternative, it will be important for LDNR to initiate planning efforts to establish real estate management policy. A partial list of items requiring property issue coordination is as follows:

- Bayou-side property and structures impacted by raised water levels
- Construction easements, including access for channel improvements and stockpiling of dredged material
- Diversion facility property
- Bypass channel property (if selected)
- Property agreements for marsh creation from beneficial reuse of dredged material

Permitting – Numerous federal, state, and local agencies will be involved in the permitting processes for various aspects of environmental compliance and project construction. Specific permitting needs will be identified in the NEPA process concurrent with the 30 percent design effort. Early coordination among the state and the permitting agencies will help to ensure a reasonable schedule can be met for project construction.

Public Involvement – Public involvement will be part of the NEPA process, as required by law. Additional public involvement activities are planned by LDNR, and this design report may be used as an information tool to educate the public about the options considered.

Funding Approval Coordination – Coordination with CWPPRA will be required during the 30 percent design phase to review assumptions on the benefits analysis and proposed cost allocation. Proactive coordination with CWPPRA is recommended because they will make the final decision on whether the project moves forward to final design.

8.3 Development of Program Budgets from Comparative Cost Estimates

The costs that have been prepared for this analysis are comparative costs. These costs do not represent recommended cost levels for program budgeting, because they do not include the numerous common costs of features among alternatives.

Comparative costs were developed to simplify the analysis of the alternatives at the Phase 1 design stage. The comparative costs do not include common elements among alternatives (such as project contingencies). Likewise, the comparative costs do not include items that are inestimable at this stage of the design (e.g., detailed landside impacts resulting from increasing water levels associated with certain alternatives). Therefore, the costs that are represented for the alternatives in Sections 7 and 8 should not be used directly for establishing program budgets.

To establish a program budget from the comparative costs, additional discussion is required with the state to establish recommended contingency factors for construction and to establish allowances for additional engineering, legal, and administrative costs (engineering, legal, and administrative allowance). At this stage of project development, a construction contingency allowance of 30 percent is appropriate. Likewise, an additional engineering, legal, and administrative allowance of 25 to 35 percent is typical for program budget planning at this stage of project development.

As an example, an alternative with a comparative cost estimate of \$100 million at this stage of the project would represent an approximate construction cost of \$130 million (providing a 30 percent construction contingency allowance). An additional allowance of \$32 to \$40 million would be appropriate for engineering, legal, and administrative costs (this amount is reduced by work that is completed or already programmed elsewhere). Therefore, a \$100 million alternative at the comparative cost level would have a target program budget of approximately \$170 million.

Care must be exercised when using the comparative cost numbers in Sections 7 and 8 to establish program budgets. Because these estimates are Class 4 level (refer to Section 7.2 for a definition of this estimating level), they represent a range of potential costs for the

alternative. Factors such as financing objectives, sequencing, timing of project elements, and environmental mitigation requirements should be considered when establishing a program budget from comparative cost estimates.

8.4 Summary of Recommendations

Through the course of the Phase 1 design analysis, numerous issues have been addressed. A short list of five project alternatives, proposed after a rigorous and systematic evaluation and screening process, is recommended for the 30 percent design evaluation. These short-listed alternatives represent the perspectives of LDNR and the design team. The next phases of evaluation, the 30 percent and final design efforts, will require the integration of other ongoing activities, such as environmental analysis, public involvement, regulatory and funding agency coordination, and property and easement evaluations. A summary of additional recommendations for proceeding into the 30 percent design stage are presented in the following sections.

8.4.1 Integration of Design Activities with Environmental Documentation

As the design activities on the project proceed to the 30 percent stage, it is important to closely coordinate the design and environmental documentation work (NEPA). The scope of work for the design is predicated on this coordination. Through coordinating the design work with the environmental documentation activities, the appropriate degree of attention is provided to environmental considerations and tradeoffs for the selection of the recommended alternative for design (at the conclusion of the 30 percent design). Integrating public involvement into the design process also occurs through the NEPA process.

The EPA has selected a consultant for the NEPA process. This Phase 1 Design Report provides the initial project planning and alternative development information necessary to initiate environmental documentation activities. As components of the alternatives are refined more in the 30 percent design effort, regular coordination between the design team, the NEPA consultant, LDNR, and EPA will be necessary.

8.4.2 Coordination of Project Activities with Other Stakeholders

Numerous key activities were defined for the project going forward into 30 percent design. Many of these activities involve coordination of the various aspects of the project with other stakeholders. A partial list of these activities and stakeholders is as follows:

- Refine the availability and suitability of dredged material for use in agricultural operations and beneficial reuse applications (marsh creation or enhancement) near the bayou. The design team might need to coordinate with the representatives of the Louisiana State University Agricultural Extension Service for specific agricultural application requirements and the USACE to better ascertain the viability of marsh creation and enhancement opportunities.
- Refine the design criteria for crossing the levee along the Mississippi River with the USACE and the Mississippi River Commission. These discussions will explore the opportunity to incorporate other crossing techniques of the levee (as described in Section 4) as a means of reducing cost, while still maintaining levee integrity.

- Meet with representatives of the Louisiana Department of Transportation and the UPRR to refine crossing criteria for the project facilities.
- Gain concurrence on assumptions and parameters to be incorporated into the Wetlands Value Assessment with CWPPRA technical experts.
- Continue discussions with the LFWD regarding operation and maintenance requirements and design configuration of the diversion pump stations.
- Continue drainage impacts research along the bayou, and refine the information currently available through ongoing contacts with appropriate city and parish officials.