

**LOUISIANA COASTAL AREA (LCA)  
BARATARIA BASIN BARRIER SHORELINE (BBBS)  
RESTORATION PROJECT  
LAFOURCHE, JEFFERSON, AND PLAQUEMINES PARISHES, LOUISIANA  
REPORT SUMMARY FOR CIVIL WORKS REVIEW BOARD  
22 MAR 2012**

Feasibility Review Conference:	17 May 2011
Draft Report Guidance Memorandum:	01 Jun 2011
Division Engineer's Transmittal:	23 Jan 2012
Received at CECW-PC:	25 Jan 2012
CWRB Briefing:	22 Mar 2012
FEIS filed with EPA:	23 Mar 2012*
30-Day S&A Review start:	30 Mar 2012*
30-Day S&A Review end:	30 Apr 2012*

\*Subject to approval by the Civil Works Review Board

## STUDY INFORMATION

**Study Authority.** The Barataria Basin Barriers Shoreline (BBBS) study was conducted as part of the Louisiana Coastal Area (LCA) program under the authority of the Report of the Chief of Engineers date January 31, 2005, authorized by the Committees on Public Works of the Senate and U.S. House of Representatives dated April 19, 1967, and October 19, 1967, respectively.

Title VII of the Water Resources Development Act (WRDA) of 2007, P.L. 110 - 114, Section 7006(c)(1)(C) authorizes construction of the Barataria Basin Barrier Shoreline Restoration project in accordance with the restoration plan in the Report of the Chief of Engineers dated January 31, 2005, contingent upon completion of a construction report documenting any modifications to the Chief's Report, approval of the Secretary of the Army, and submission to the House Transportation and Infrastructure Committee and Senate Environmental and Public Works Committee.

Section 7006(c) (1) (C) states:

*Initial projects. – In General – the Secretary is authorized to carry out the following projects substantially in accordance with the restoration plan: C.  
Barataria Basin barrier shoreline restoration at a total cost of \$242,600,000.*

Section 7006(c) (3) and Section 7006(c) (4) states:

*Construction reports – Before the Secretary may begin construction of any project under this subsection, the Secretary shall submit a report documenting any modifications to the project, including cost changes, to the Committee on Transportation and Infrastructure of the House of Representatives and the Committee on Environmental and Public Works of the Senate.*

*Applicability of other provisions- Notwithstanding section 902 of the Water Resources Development Act of 1986 (33 U.S.C.2280), the cost of a project under*

*this subsection, including any modifications to the project, shall not exceed 150 percent of the cost of such project set forth in paragraph 1.*

**Study Sponsor.** The Louisiana Coastal Protection and Restoration Authority (LaCPRA), acting on behalf of the state of Louisiana, is the non-Federal sponsor for this study.

**Study Purpose and Scope.** The purpose of this study is to evaluate alternatives to restore the BBBS to ensure the geomorphic and hydrologic form and function of the barrier structures is maintained. Restoration of the shoreline and marsh platforms of the Caminada Headland and Shell Island would restore the natural hydrologic function of the barrier island system. The barrier islands influence the estuarine and freshwater wetland environments by regulating salinity gradients that are important to the continuation of estuarine and freshwater species. Restoration of these barrier shoreline landforms would also decrease shoreline erosion and protect the interior wetlands in the Barataria Basin by reducing the extent and intensity of tidal, wave, and storm processes behind the shorelines. In addition to their hydrogeomorphic functions, the barrier shorelines are critical habitat for diverse fish and wildlife species. The report is an integrated construction report and Environmental Impact Statement (EIS.) The scope of this report is the evaluation of the restoration of the Caminada Headland and Shell Island reaches within the Barataria Basin barrier shoreline.

**Project Location/Congressional District.** The Louisiana coastal barrier shoreline system in the Barataria Basin is located approximately 55 miles south of New Orleans and 45 miles northwest of the mouth of the Mississippi River. It forms a concave arch with respect to the Gulf of Mexico at the southern end of the Barataria Basin. The project is located in Lafourche, Jefferson, and Plaquemines Parishes.

Figure 1 (below) shows the Caminada Headland and Shell Island reaches to be restored and the sediment borrow sites.

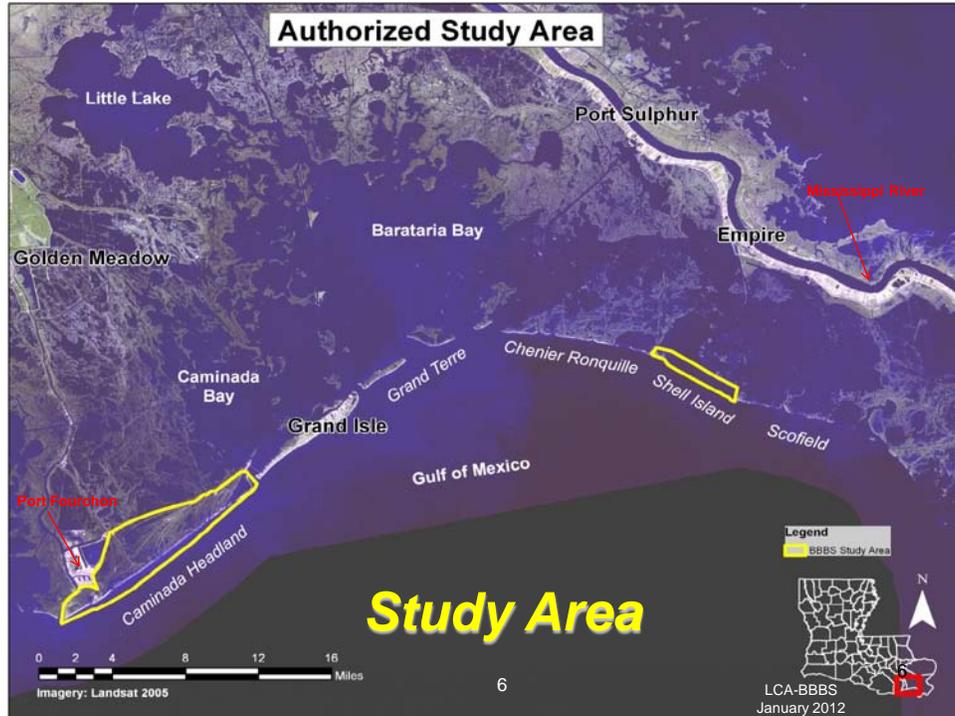
The Caminada Headland consists of:

- a sand dune, beach berm, barrier marshes, and
- chenier ridges interspersed with mangrove thickets, coastal dune shrub thickets, lagoons, and small bayous.

Shell Island once enclosed both Bastian Bay and Shell Island Bay, but has since disintegrated into several smaller islands and shoals. Shell Island consists primarily of:

- open water with little beach or saline marsh habitat, and
- few shrubs or mangroves.

The project is located in Louisiana Congressional District 3 represented by Congressman Jeff Landry.



**Figure 1 Project Location**

**Prior Reports and Existing Water Projects.** In 1990, passage of the Coastal Wetlands Planning, Protection and Restoration Act (CWPPRA) (PL-101-646, Title III) provided authorization and funding for the Louisiana Coastal Wetlands Conservation and Restoration Task Force to begin actions to curtail wetland losses. After extensive studies and construction of a number of coastal restoration projects under CWPPRA, it was apparent that a systematic approach involving large projects working in conjunction with these smaller projects would be necessary to deal with the continuing loss of the coastal wetlands effectively.

In 1998, the State of Louisiana and the five CWPPRA Federal agencies developed the “Coast 2050: Toward a Sustainable Coastal Louisiana” report (known as the Coast 2050 Plan). The underlying principles of the Coast 2050 Plan are to restore or mimic the natural processes that built and maintained coastal Louisiana.

The Coast 2050 Plan was the basis for a USACE reconnaissance report that demonstrated a Federal interest in restoration of coastal Louisiana wetlands. As a result of the reconnaissance report, the USACE and the State of Louisiana developed the LCA Report, (November 2004). A programmatic EIS (PEIS) was prepared as part of the LCA Report. The Record of Decision was signed on November 18, 2005. The LCA Report has multiple components that help to address the critical water resource problems and opportunities in coastal Louisiana.

The LCA Plan includes five near-term critical features that were recommended for specific authorization for implementation subject to approval of feasibility-level decision documents by the Secretary of the Army. The critical near-term projects address ecosystem losses that will result in rapidly increasing or irreversible impacts if existing trends continue unabated. The BBBS is one of the five near-term projects. Title VII of WRDA of 2007 authorizes construction for the near-term projects identified in the LCA report. During the development of the BBBS project, it was determined that the Caminada Headland and Shell Island reaches were not being addressed through other programs. Therefore, these two reaches of the project were identified as critical features.

Existing projects that impact the BBBS study area are:

- **Waterway from Empire to the Gulf of Mexico.** Completed in 1950, this project consists of a 9-foot-deep by 80-foot-wide channel from Doullut Canal, near Empire, southward to the Gulf of Mexico. The navigation channel and its associated jetties have altered sediment transport processes, resulting in accelerated erosion and shoreline retreat west of the jetties at Empire.
- **Bayou Lafourche, Louisiana Navigation Project.** The *Bayou Lafourche*, Louisiana, project was authorized by the Rivers and Harbors Act of 1935, which provided for a 6-foot deep by 60-foot wide navigational channel from Larose to the Gulf of Mexico with a jettied entrance at Belle Pass. The Rivers and Harbors Act of 1960, provided for a 12-foot deep by 125-foot wide navigational channel to the 12-foot contour in the Gulf of Mexico.
  - Construction of the *Port Fourchon*, Lafourche Parish, Louisiana project in southern Lafourche Parish, Louisiana, was authorized by Section 101(a)(16) of WRDA 1996, which provided for an inshore channel, with a depth of -24 feet Mean Low Gulf (MLG) over a bottom width of 300 feet, in Belle Pass and Bayou Lafourche extending from the Gulf of Mexico through the developed area of Port Fourchon (Mile 0.0 to Mile 3.4), and an entrance channel extending approximately 1.3 miles from the gulf shore to the -26 foot MLG contour with a depth of -26 feet MLG over a bottom width of 300 feet.
  - The current maintenance dredging is discussed in “Port Fourchon, Louisiana, Feasibility Report and Environmental Impact Statement”, August 1994. According to “Consistency Determination, FY09 Maintenance Dredging, Bayou Lafourche, Louisiana,” in FY 09, the USACE anticipates the removal of approximately 560,000 cubic yards of material from between Mile 0.5 and Mile – 1.8. The material removed would be deposited unconfined along the Gulf of Mexico shoreline adjacent to the jetties for beach nourishment purposes.
  - Additionally, in late 2008, the Greater Lafourche Port Commission dredged Pass Fourchon, placing approximately 400,000 cubic yards of material unconfined on the beach on Fourchon Island. On average, the channel dredging yields approximately 650,000 cubic yards of material every 1.5 to 2 years.
- **Offshore Breakwaters.** The Greater Lafourche Port Commission directed a cooperative effort that built a series of offshore breakwaters (off the southwestern segment of Caminada Headland) by sinking 12 old barges in 6 feet to 8 feet of water and filling them with stones. Sand accreted in the lee of the western barges; the others appear to have had no positive effect. There is an erosional shadow to the east of the barges where the shoreline has thinned and several over-wash fans can be seen, including some on the shoreline in front of Bay Champagne (LCA Report, 2004).

**Federal Interest.** The November 2004 Final LCA Report and subsequent 2005 Report of the Chief of Engineers identified the project as a critical, near-term ecosystem restoration project. Ecosystem restoration is one of the primary missions of the USACE Civil Works Program with the objective to contribute to NER.

The project area is declining and is currently disappearing. Over the last 100 years, the Caminada Headland has experienced an average shoreline erosion rate of 45 feet per year (USACE 2004). Shell Island has experienced an average erosion rate of 89 feet per year

between 1988 and 2004. The Caminada Headland is significant as critical habitat for the threatened piping plover. With the loss of the headland, only small, geographically dispersed areas will remain for the piping plover. The barrier shorelines are also valuable stopover habitats for migratory birds. The Louisiana coast is where the Central and Mississippi flyways meet.

The coast provides a place for neotropical migratory songbirds to rest and feed before or after crossing the Gulf of Mexico, and it is a winter home to 70 percent of the waterfowl that migrate across these flyways. Both Shell Island and the Caminada Headland are designated by the National Marine Fisheries Service (NMFS) as important transitional estuarine/marine habitats and valuable Essential Fish Habitats (EFH) for foraging, breeding, spawning, and cover for a variety of fish and shellfish.

There is public support for this project, with specific emphasis being placed on beginning construction as soon as possible. Several national and regional organizations have campaigned to save the Louisiana wetlands, and the BBBS project area is considered of great importance to these groups. Organizations such as the National Audubon Society, National Wildlife Federation, America's Wetlands Foundation, Coalition to Restore Coastal Louisiana, and Restore or Retreat consider saving the Louisiana wetlands a top priority.

## STUDY OBJECTIVES

**Problems and Opportunities.** The natural processes of subsidence, habitat switching, and erosion of wetlands, combined with widespread human alteration, have caused significant adverse impacts to the Louisiana coastal area, including increased rates of wetland loss and accelerated ecosystem degradation. Without action, Louisiana's healthy and productive coastal ecosystem is not sustainable. Construction of levees along the Mississippi River has cut the coastal ecosystem off from a primary source of sediment and nutrients, and hindered the wetlands' ability to maintain their elevation in the face of sea level change and subsidence. The shorelines are starved for sediment and are retreating. Infrastructure constructed for access into the wetlands has modified the hydrology of the coastal area, thus facilitating and accelerating saltwater intrusion and conversion of wetlands to open water. These alterations have impacted the natural sustainability and quality of the Louisiana coastal ecosystem. This loss of sustainability has manifested itself as accelerated land loss.

The problems in the BBBS project area are:

- Land loss due to erosion threatens the geomorphic structure and hydrologic function of barrier shoreline systems
- Loss of barrier island/headland ecosystem habitat
- Wetlands are impacted by increased salinity, tidal flux, wave action and storm impacts.
- Longshore sediment transport is significantly reduced, limiting the ecosystem's ability to be self-sustaining.

Opportunities for the BBBS project include:

- Barrier island restoration through placement of sand from offshore sources or the Mississippi River to help sustain geomorphic structures that protect the ecology of estuarine bays and marshes by reducing gulf influences.
- The use of sediment material from dedicated dredging to construct a marsh platform which can create a large amount of coastal habitat quickly.
- The beneficial use of dredged material from the Bayou Lafourche, Louisiana navigation project.

**Planning Objectives.** The BBBS is a unique ecosystem that helps to maintain the integrity of the gulf shoreline and protects the interior coast from further degradation. Aside from supporting coastal habitats, the coastal barrier chains in Louisiana are the first line of defense for protecting wetlands, inland bays, and mainland regions from direct effects of wind, waves, and storms. The barrier systems serve multiple hydrogeomorphic purposes such as:

- Reducing coastal flooding during periods of low level storm surge;
- Preventing direct ocean wave attack which accelerates rates of erosion and degradation of marshes and other wetlands; and
- Maintaining the gradient between saline and freshwater, thereby preserving estuarine systems.

Based on the function of these barrier islands and problems identified for the Caminada Headland and Shell Island during this study, the following planning objectives were developed to drive formulation and evaluation of alternative plans:

- Restore the barrier structures to ensure their ability to provide geomorphic and hydrologic form and function;
- Increase the acreage of shoreline, dune, and interior marsh habitat for essential fish and wildlife species, mimicking, as closely as possible, conditions which would occur in the area in the absence of human changes;
- Protect interior marsh and chenier ridge habitats for essential fish and wildlife species;
- Increase sediment input to supplement long-shore sediment transport processes along the gulf shoreline, increasing the ability of the restored area to continue to function and provide habitat with minimum continuing intervention; and
- Reduce land loss, preventing the dissolution of the Caminada Headland into separate barrier islands, and the disappearance of Shell Island.

**Planning Constraints.** Planning constraints relative to the study include:

- Natural resources limitations. The limited availability of natural resources such as suitable sand materials is a critical constraint. The sediment particle size used for construction should be similar to the native sand in the project area. The coarser sand required for beach and dune construction is located in a limited number of sites in the Gulf of Mexico and the Mississippi River. The presence of pipelines and cultural artifacts further decreases the available sand.
- Avoid adverse impacts to surrounding coastal areas and threatened and endangered species. Alternatives developed should not adversely impact the surrounding ecosystems. Additionally, these plans should not adversely impact threatened and endangered species such as the piping plover.
- Avoid impacts to infrastructure and cultural resources. On the Caminada Headland, pipeline canals, roads, and oil and gas infrastructure impact the development and evaluation of alternatives. Highway 3090 bisects the project area, and active pipeline canals run the length of most of the headland. Within the Ship Shoal borrow site, areas near pipelines and cultural resources may not be utilized. The project site is also near Port Fourchon, an important commercial site for the oil and gas industry, and includes

Fourchon Beach, a beach area visited by local residents. Relocations of the oil and gas infrastructure near Port Fourchon would have national impacts because Port Fourchon is linked to 50% of the refining capacity of the nation. Alternative plans must take into consideration impacts to commercial and recreational activities in the area.

## ALTERNATIVES

**Plan Formulation Rationale.** The BBBS study is an extension of previous planning and restoration efforts including the CWPPRA program, the *Coast 2050: Toward a Sustainable Coastal Louisiana* report, and the 2004 LCA Report. Alternative plan formulation was performed in a two stage process:

(1) the available ecosystem restoration measures were evaluated for capability to meet project objectives and avoid constraints; and

(2) alternative plans were formulated from the selected restoration measures. The plan formulation process included a number of detailed evaluations of potential scales and combinations of restoration measures, and an iterative refinement process for alternative development.

**Management Measures and Alternative Plans.** The management measures were evaluated to determine the contribution of each towards the achievement of the planning objectives, their compatibility with project constraints, their engineering feasibility, and the possibility of consequential damages to areas surrounding the project area. Measures that warranted continued consideration were incorporated into alternative plans. The development of alternative plans for the Caminada Headland focused on restoration of the shoreline and adjacent interior marshes that will help stabilize the restored shoreline. The development of alternatives for the Shell Island reach focused on reestablishing a barrier between a threatened estuarine ecosystem and the Gulf of Mexico by restoring the geomorphic structure and function of the barrier island.

The management measures were divided into two general categories: (1) shoreline restoration and protection, and (2) marsh restoration. Table 1 (below) lists the management measures evaluated.

The management measures carried forward in the analysis included sand shoreline restoration, restoration of interior marsh, dune and marsh vegetative plantings, and sand fencing. These management measures were combined to develop alternatives for the Caminada Headland and Shell Island. Ten preliminary alternatives were developed for the Caminada Headland and eight preliminary alternatives were developed for Shell Island. The analyses included variables such as the height and width of dunes, the placement of the beach profile, placement of marsh creation areas, renourishment cycles and sources of the renourishment, and for Shell Island one v. two island configurations. Engineering designs and preliminary costs were developed for each of these alternatives. The alternatives were evaluated based on their ability to meet project objectives and relative cost effectiveness while providing a variety and range of alternatives. The desired result was the most cost efficient alternatives for each reach that considered a broad range of restoration measures. The intermediate array included four alternatives for the Caminada Headland and four alternatives for Shell Island. The Wetland Valuation Assessment (WVA) benefit analysis was then completed on this intermediate array of alternatives.

**Table 1. Screening Results for Restoration Management Measures**

Management Measures	Warrants Further Evaluation	Eliminated	Discussion
<b>Shoreline Restoration and Protection Measures</b>			
Sand Shoreline Restoration	✓		Addresses the problem of lack of sediment and meets objectives by increasing acreage of shoreline and dunes, increasing sediment input/restores barrier structures/reduces land loss, and protecting interior marsh and chenier habitats
Rock Shoreline		X	Contributes to the problem by producing systemic disruption throughout barrier shoreline. Does not avoid adverse impacts to surrounding coastal areas.
Groins and Breakwaters		X	Contributes to the problem by producing systemic disruption throughout barrier shoreline. Does not avoid adverse impacts to surrounding coastal areas.
Modify Belle Pass Jetties		X	Does not meet objectives to restore barrier structures or increase sediment input.
Modify Empire Jetties		X	Contributes to the problem by producing systemic disruption throughout barrier shoreline. Does not avoid adverse impacts to surrounding coastal areas.
Sand Bypass System		X	Measure is ineffective due to natural resource limitations.
Feeder Shorelines		X	Measure is ineffective due to natural resource limitations.
Sand Fencing	✓		Meets objective by helping to restore barrier structures and retaining sediment.
Dune Fields		X	Does not meet objectives to increase acreage of marsh habitat or protect interior marsh and chenier habitats. Space limitations would require the building of dune fields on top of marsh habitats.
Dune Vegetative Plantings	✓		Meets objectives by helping to restore barrier structures and retaining sediment.
<b>Marsh Restoration Measures</b>			
Restore/Nourish Interior Marsh	✓		Meets objectives by restoring barrier structures, increasing acreage of marsh habitat, protecting interior marsh and chenier habitats, increasing sediment input, and reducing land loss.
Marsh Vegetative Plantings	✓		Meets objective by helping to restore barrier structures, protecting interior marsh and chenier habitats, and retaining sediment.
Plug or Fill Pipeline Canals		X	Does not avoid infrastructure. Does not meet objectives of restoring barrier structures, increasing acreage of marsh habitat, or increasing sediment input.
Terraces		X	Does not meet objectives of restoring barrier structures or increasing sediment input. Amount of open fetch in the bays is not a primary factor contributing to marsh erosion.
Chenier Ridge Restoration		X	Measure is recommended for further investigation under another study due to areas of uncertainty with measure

The following alternatives were further evaluated:

- Caminada Alternative 5: Shoreline and marsh creation with multiple renourishment cycles beneficially using materials from the Bayou Lafourche, Louisiana navigation project.
- Caminada Alternative 6: Shoreline and marsh creation with one renourishment cycle using material from Ship Shoal.
- Caminada Alternative 7: Shoreline and marsh creation with two renourishment cycles using material from Ship Shoal.
- Caminada Alternative 9: Shoreline and marsh creation with four renourishment cycles using material from Ship Shoal.
- Shell Island Alternative 1: Shoreline and marsh creation in a two island configuration with no renourishment.
- Shell Island Alternative 2: Shoreline and marsh creation in a two island configuration with four renourishment cycles.
- Shell Island Alternative 3: Shoreline and marsh creation in a one island configuration with no renourishment.
- Shell Island Alternative 5: Shoreline and marsh creation in a one island configuration with two renourishment cycles.

The eight alternatives in the intermediate array were evaluated individually and in combination. Cost-effectiveness and incremental cost analysis (CE/ICA) were performed by comparing the expected benefits of various restoration feature components over a series of target years during the period of analysis. The CE/ICA evaluated all possible combinations of the Caminada Headland alternatives and Shell Island alternatives, including the no action alternative. Figure 2 displays the intermediate array of alternatives and all possible combinations of those alternatives.

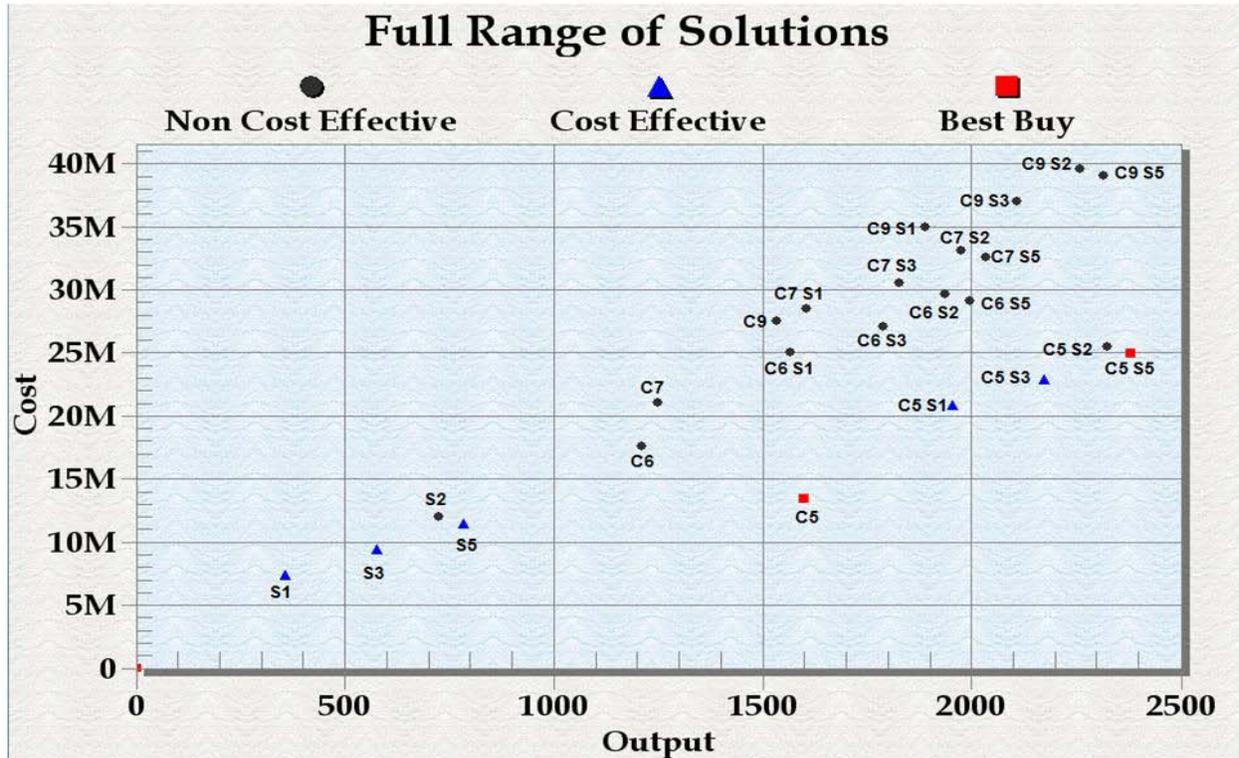


Figure 2 Analysis of Solutions

**Final Array of Alternatives.** The cost effectiveness and incremental cost analyses is an iterative process. For the incremental cost analysis, the cost effective alternative plans were sorted in order of increasing output. The plan with the lowest average annual cost per AAHU beyond the no action plan was identified and selected as the first “Best Buy” plan. The process continues, searching for the greatest increases in output for the least increases in cost. The best buy plans are those cost effective plans that are most efficient in production. The best buy plans provide the greatest increase in output for the least increase in cost. The alternatives were analyzed in all possible combinations. The most cost effective alternatives were selected for the final array. Tables 2 and 3 display the best buys which are cost effective and incrementally justified.

Table 2. Final Array Acreage

Alternative	Caminada Dune Acres	Caminada Marsh Acres	Shell Island Dune Acres	Shell Island Marsh Acres	Total Acres
C5	880	1186	N/A	N/A	2,066
C5/S5	880	1186	317	466	2,849

**Table 3. Final Array Borrow Requirements**

Alternative	Borrow Volume Caminada Dune (CY)	Borrow Volume Caminada Marsh (CY)	Borrow Volume Shell Island Dune (CY)	Borrow Volume Shell Island Marsh (CY)
C5	24,600,000	5,360,000	N/A	N/A
C5/S5	24,600,000	5,360,000	8,635,700	3,650,400

**Comparison of Alternatives.** The effects of the alternatives within the final array were evaluated against the No Action Alternative to determine their overall impact over the 50-year period of analysis. The alternatives were then compared to each other. The evaluation included the ability of the alternative to meet project objectives and avoid constraints, environmental impacts to significant resources, contributions to the Federal Objective, and the P&G four evaluation criteria of acceptability, completeness, efficiency, and effectiveness.

Risks and uncertainties related to the formulation, selection and implementation of the Recommended Plan have been considered in this study. Uncertainties in the analysis of the alternatives are associated with the precision of the information on ecosystem processes and the methods used to assess performance of alternatives. Physical processes associated with the evolution of coastal landforms are generally very complex. While the underlying principles controlling these processes are well understood, reliable simulation of such processes and their interactions (wind and wave processes, ocean currents, tides, sediment transport, storms) may require very large amounts of data. Where uncertainties are present regarding the particular values to use for certain processes or conditions in the study, generally, a mid-range value was selected. A value assignment may be selected that is not at or near the midpoint of a range of estimates where the value can be justified based on the best professional judgment of the project delivery team (PDT) members, or where there is a particular rationale for the value selected, such as the need for a conservative safety factor in selection of an estimate.

**Key assumptions.** The following assumptions are keys to the success of the project:

- Historical erosion rates were used as inputs to the engineering models. It is assumed that the erosion rate is constant and the construction of this project will not increase or decrease the rate of erosion.
- The net effects of local subsidence and sea level rise will not deviate significantly from the numbers estimated for this study.
- The amount of dredged material and timing of the maintenance dredging of the Bayou Lafourche Navigation project will follow historical patterns. It is assumed that the project will continue to be funded per its authorization.

**Recommended Plan.** The final array consisted of the *No Action Plan*, Caminada Headland Alternative 5 as a stand-alone alternative, and a combination of Caminada Headland Alternative 5 and Shell Island Alternative 5. Caminada Headland Alternative 5 would only restore one reach of the barrier shoreline. Without the restoration of both reaches, the systemic weakening of the Barataria barrier island system would continue. Near-term restoration of the Caminada Headland and Shell Island is essential to prevent the need for significantly more difficult and costly restoration efforts in the future, or the irretrievable loss of some islands. The Caminada Headland has experienced some of the highest rates of shoreline retreat on the Gulf coast. Shell

Island is one of the most fragmented areas of the Louisiana barrier shoreline. Shell Island is a critical element for defining the marine influences of the Gulf of Mexico and the fresher influences of the eastern Barataria estuary.

Due to continuing and extensive land loss, Shell Island is gradually converting to a series of interconnecting bays directly connected to the Gulf of Mexico. Additionally, the need for restoration of Shell Island is especially time sensitive. The critical geomorphic features still function as a skeletal framework upon which to build a viable barrier system if completed in the near term. Failure to restore Shell Island in the near term would result in the loss of this critical geomorphic skeletal framework, which may preclude any future attempts at restoring this barrier system.

Without the restoration of Shell Island, the 2004 LCA project goal of preventing the intrusion of the Gulf of Mexico into the interior bays and marshes in Plaquemines Parish would not be met. The restoration of the Barataria Basin barrier shoreline would not be complete should only one of the reaches be restored. These two reaches were deemed the most critical in the Barataria shoreline system because they would maintain the integrity of the gulf shoreline and protect the interior coast from further degradation. Therefore, Caminada Alternative 5 as a stand-alone alternative was not selected as the NER plan.

The Caminada Headland 5 and Shell Island 5 alternative fulfills the objectives of this study and the 2004 LCA report to establish dynamic salinity gradients that reflect natural cycles of freshwater availability and marine forcing and increasing sediment input from sources outside estuarine basins. Additionally, this plan satisfies the 2004 objective to maintain or establish natural landscape features and hydrologic processes that are critical to sustainable ecosystems structure and function.

The plan fulfills 3 of the 4 critical needs criteria listed in the 2004 report. It:

- prevents future land loss where predicted to occur,
- restores or preserves endangered critical geomorphic structures, and
- protects vital socioeconomic resources.

The plan meets the two (2) overall goals of the Barataria Basin Barrier Shoreline restoration project as defined in the 2004 LCA report.

- Caminada Headland: to maintain this headland, which would sustain significant and unique coastal habitats, help preserve endangered and threatened species, continue to transport sand to Grand Isle, and protect Port Fourchon and the only hurricane evacuation route available to the region.
- Shell Island: to prevent the intrusion of the Gulf of Mexico into interior bays and marshes, which threatens fisheries and the regional ecology. The project would also help restore natural sand transport along this reach of the coast, supporting the adjacent regional shorelines and various shoreline habitats.

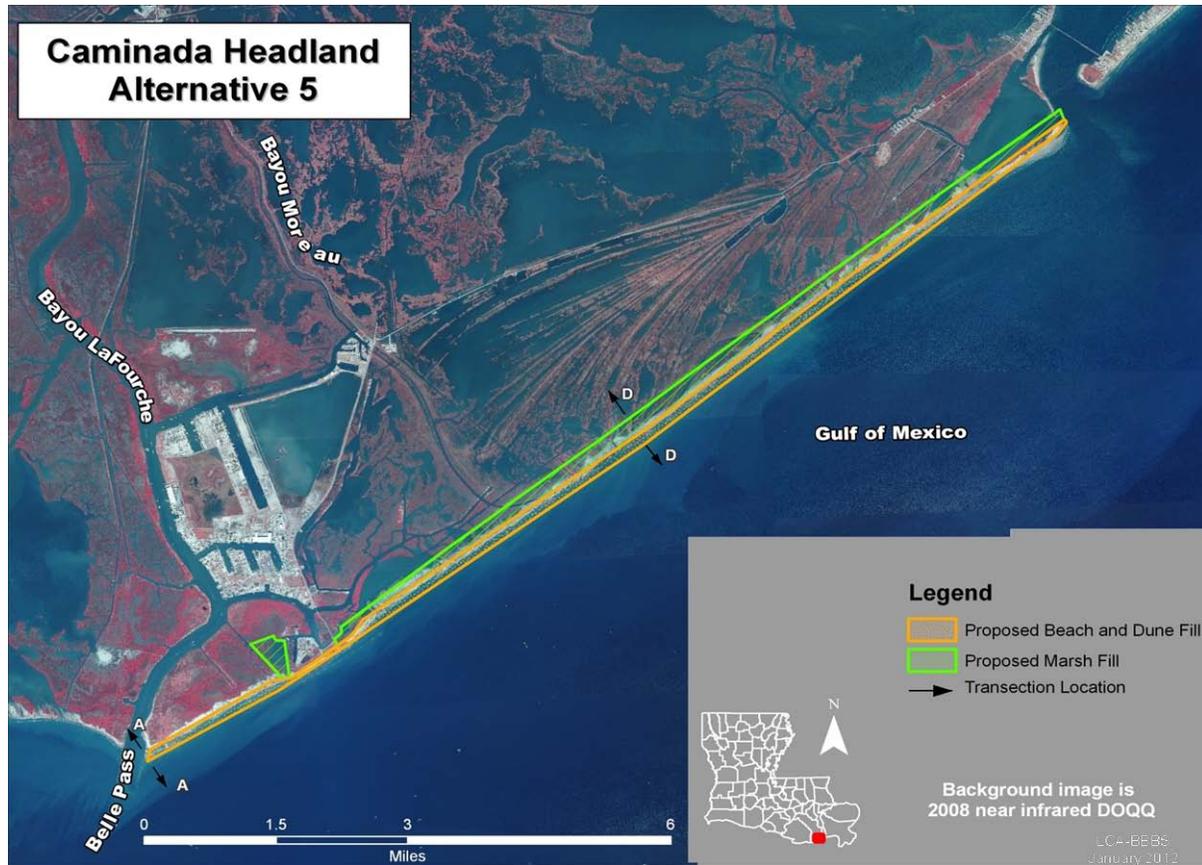
The Recommended Plan is a combination of Caminada Headland Alternative 5 and Shell Island Alternative 5. It is the national ecosystem restoration (NER) plan. The initial construction of the barrier shorelines will restore or create 2,849 acres of beach, dune, and marsh habitats. Approximately 1,816 acres of severely degraded habitat will be restored while 1,033 acres of habitat will be created. The project first cost is estimated to be \$428,000,000. The average annual cost of Operation, Maintenance, Repair, Replacement and Rehabilitation (OMRR&R) will be \$6,180,000. The estimated cost exceeds the authorization. Additional authorization from Congress would be required to construct the entire project.

### *Caminada Headland Features*

Caminada Headland Alternative 5 proposes a dune height of +7 feet NAVD88 with a dune width of 290 feet. Alternative 5 also proposes a landward beach and dune component to maximize acreage and longevity. The landward and seaward slopes would be set 20 feet horizontal to 1 foot vertical. The marsh fill is proposed on the landward side of the dune at an elevation of +2.0 feet NAVD88. Approximately 880 acres of beach/dune and 1,186 acres of marsh would be created or restored, resulting in a total of 2,066 acres. Fill quantities for the dune and marsh fills would be 5.1 million and 5.4 million cubic yards, respectively. Approximately 71,500 feet of sand fencing would be installed. Vegetative plantings would include a variety of native species. The recommended planting density is no greater than 8-foot centers.

The borrow area identified for the beach/dune restoration is Ship Shoal, a large submerged sand body in the Gulf of Mexico located offshore in south-central Louisiana. The sediment is to originate from South Pelto, Blocks 12 and 13, which is approximately 40 miles from the project site. The borrow site for the marsh restoration would be located approximately 1.5 miles south of the central portion of the Caminada Headland, and 4.7 miles southwest of Caminada Pass. The estimated cost of construction, including contingencies, supervision and administration, real estate, and pre-construction engineering and design (PED), is \$224,000,000. The estimated duration of construction is 936 days. It is estimated that the duration of plantings would be 750 days over a 3-year period.

The Recommended Plan includes renourishment of the Caminada Headland as part of the non-Federal sponsor's OMRR&R responsibilities. Renourishment will be implemented in conjunction with Corps operation and maintenance dredging of the Bayou Lafourche, Louisiana (Belle Pass) navigation project which yields on average approximately 650,000 cubic yards of material every 1.5 to 2 years. This material will be placed in the littoral drift south of Bayou Moreau where the long shore transport of material splits going east and west, allowing the long shore transport and wave action to move and place the sediment along the headland. Over each 10 year period, an estimated 3.9 million cubic yards of material will be returned to the headland. The non-Federal sponsor will pay the incremental cost of beneficially using this material over the federal standard. The estimated incremental cost of the renourishment is \$7.35 million per event. At year 50, an estimated 2,064 acres at intermediate RSLR or 2,122 acres at historic RSLR will remain, protecting the more fragile cheniere and marsh habitats within the Caminada Headland. Figure 3 displays the recommended plan for the Caminada Headland.



**Figure 3 Caminada Headland Recommended Plan**

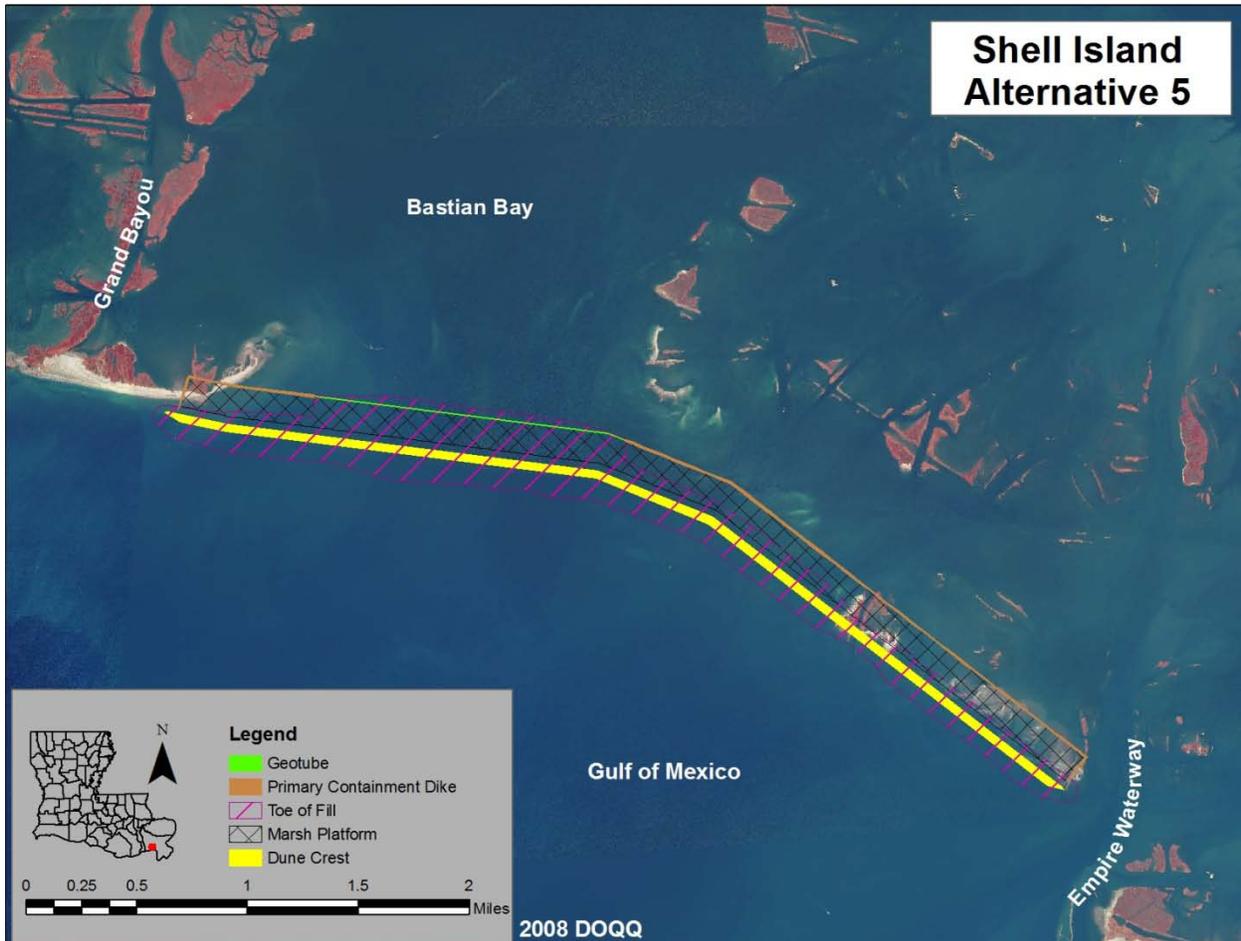
### *Shell Island Features*

Under alternative 5, the Shell Island reach would be restored as one island. This alternative would restore Shell Island to a form similar to its pre-Hurricane Bob (1979) condition. It is estimated that 5.6 million cubic yards of shoreline fill would be required to construct 317 acres of shoreline/dune area. The dunes will be built to a height of + 6 feet NAVD, and the marsh will be constructed to a height of + 2 feet NAVD. Approximately 2.1 million cubic yards of marsh fill would be required to construct 466 acres of marsh.

Shell Island would be re-nourished 20 years and 40 years after initial construction to the original construction template of 317 beach/dune acres. The marsh fill for alternative 5 would also be re-nourished to its original construction template at this time interval. Approximately 1.5 million cubic yards of beach fill would be required for re-nourishment cycles in years 20 and 40. In year 20, approximately 907,200 cubic yards of marsh fill would be required and in year 40, 604,700 cubic yards would be required for re-nourishment. The renourishment costs at year 20 and year 40 are estimated to be \$63.3 million and \$60.9 million, respectively, and would be a non-federal sponsor responsibility under its OMRR&R responsibilities. Under the intermediate RSLR scenario, the TY 50 acreage is estimated to be 855 acres; under the historic RSLR scenario, the TY 50 acreage is estimated to be 919 acres. Sand fencing and vegetative plantings would be similar to those described for the Caminada Headland alternative.

The borrow source for the dune/beach would be a large sand deposit near Nairn in the Mississippi River between mile markers 32 and 34, approximately 11 miles north of the project

area. The dredged material would be pumped from the Mississippi River via pipeline. The borrow source for the marsh restoration would be the Empire deposit, approximately 1.5 miles from the Empire Jetties. The estimated construction cost, including contingencies, supervision and administration, real estate, and PED is \$204,000,000. It is estimated that duration for construction would be 787 days. It is estimated that the duration for the plantings would be 360 days over a period of 3 years. Figure 4 displays the recommended plan for Shell Island.



**Figure 4 Shell Island Recommended Plan**

*Recommended Component of Construction*

Because the NER plan cannot be constructed within the maximum project cost as authorized by WRDA 2007, a subset of the NER, the Caminada Headland Alternative 5 increment, was selected as the recommended component of construction. The recommended component of construction represents an implementable and separable element of the NER plan, is cost effective and incrementally justified, and within the cost and scope of the current authorization.

**Systems/Watershed Context.** The LCA critical near-term features identified in the 2004 LCA report address the most critical ecological needs of the Louisiana coastal area in locations where delaying action would result in a loss of opportunity to achieve restoration. The main goal of the Barataria Basin Barrier Shoreline Restoration project, in both the 2004 report and this report, is to maintain the geomorphic and hydrologic form and function of the barrier structures. Near

term restoration of the Caminada Headland and Shell Island is essential to prevent the need for significantly more difficult and costly restoration efforts in the future, or irretrievable loss of these ecosystem habitats.

The critical geomorphic features still function as a framework upon which to build a viable barrier system if completed in the near term. As indicated in the 2004 LCA report, the design and operation of the BBBS feature would maintain the opportunity for, and support the development of large-scale, long range comprehensive coastal restoration. The project is synergistic with future restoration by maintaining or restoring the integrity of Louisiana's coastline, upon which all future restoration is dependent. BBBS will work in concert with other LCA features such as the Beneficial Use of Dredged Material (BUDMAT) program and Medium Diversion with dedicated dredging at Myrtle Grove, in addition to future projects developed under the Louisiana Coastal Comprehensive Plan and the LCA Mississippi River Hydrodynamic and Delta Management Study to improve the sustainability of the Barataria Basin.

The construction of diversions will help to restore some of the sediment that is now deposited off the continental shelf due to the channelization of the Mississippi River. This material will filter through the estuaries to the barrier islands bolstering their form and function as barrier structures. The barrier islands provide a geomorphic barrier, separating the Gulf of Mexico from the interior estuaries and helping to regulate salinity gradients important to the estuarine and freshwater wetland species. The diversions and marsh creation projects will help to restore the estuaries, while the barrier islands will protect the fragile inland marshes, decreasing land loss and habitat switching to more saline conditions. The project will protect interior marsh and cheniere ridges. The increased sediment input will supplement long shore sediment transport processes, increasing the ability of the restored area to continue to function and provide habitat. Without this project, the Caminada Headland will disintegrate into three separate islands, and Shell Island will completely disappear.

Modeling results have shown that barrier islands decreased wave energy landward of the island during tropical events. When the barrier islands were degraded in the models, the modeled wave heights increased, thus heightening the potential for overtopping levees and inundation of protected areas. Sustaining the geomorphic form of the barrier islands will provide storm surge attenuation for the interior wetlands and the surrounding coastal communities.

The Recommended Plan will prevent the fragmentation of the Caminada Headland and greatly ameliorate impacts on several important socio-economic sectors such as: Port Fourchon, the largest base for offshore oil and gas operations in coastal Louisiana and the largest coastal fishing port; major oil and gas infrastructure, such as regional transportation and storage facilities, the LOOP, and the Mars pipeline; and the regional hurricane evacuation route serving residents of southern Lafourche Parish, the community of Grand Isle and approximately 6,000 workers stationed at offshore facilities in the central Gulf of Mexico. By decreasing the rate of erosion and preventing the splintering of the headland, the investments in infrastructure located at Port Fourchon will be less vulnerable to storm surges. Oil and gas pipeline and Louisiana Highway 1 maintenance requirements will lessen compared to the future without project conditions.

USACE requested the following agencies to be cooperating agencies (as defined under 40 CFR 1501.6) for this study:

- Louisiana Department of Environmental Quality (LDEQ),
- The Louisiana Coastal Protection and Restoration Authority (LaCPRA),
- Louisiana Department of Wildlife and Fisheries (LDWF),
- Bureau of Ocean Energy Management, Regulation, and Enforcement (BOEMRE),
- National Marine Fisheries Service (NMFS),

- National Resource Conservation Service (NRCS),
- United States Environmental Protection Agency (USEPA),
- United States Fish and Wildlife Service (USFWS,) and the
- United States Geological Survey (USGS).

**Environmental Operating Principles.** The guiding principles as applied by the BBBS team are as follows:

- In accordance with the Environmental Operating Principles, the team's primary focus was to achieve environmental stability to provide a healthy, diverse and sustainable ecosystem. Louisiana's coast is at a critical juncture. Only a concerted effort will stem the degradation, and thus alternatives must include features which can be implemented in the near term and provide some immediate benefits to the ecosystem;
- Appreciation of the natural dynamism of coastal ecosystems must be integral to the planning and selection of preferred alternatives. Modeling analyses included tropical storms, wave effects, subsidence, and sea level rise to help predict the impacts of project features.;
- Features were included in the alternatives to allow for a balance between human use of these natural resources and the protection of the natural systems. The alternatives have been designed to restore the ecosystem, utilizing techniques that will allow the newly restored ecosystem to interact within its natural environment;
- Limited sediment availability adversely affects the project area. Because sediment mining can contribute to ecosystem degradation in the source area, the alternatives maximize the use of sediments external to the coastal ecosystem in the Gulf of Mexico and in the Mississippi River;
- Plans seek to achieve ecosystem sustainability and diversity while providing interchange and linkages among habitats. Care was taken to ensure the balance between dune and marsh habitats;
- Restoration techniques and results from previous coastal restoration projects have been incorporated into the analysis of the Caminada Headland and Shell Island reaches; and
- The development of the plan has included many diverse individuals and groups. This group included landowners, environmental organizations, Federal resource agencies, interested citizens and state and local government agencies.

### **Peer Review.**

**Agency Technical Review (ATR).** The ATR was managed by the Ecosystem Restoration Planning Center of Expertise (ECO-PCX) in the Mississippi Valley Division. The ATR was performed by a team composed of District staff of the Jacksonville District in the South Atlantic Division, and Walla Walla District in the Northwest Division. All comments have been addressed and closed and the report has been revised to reflect the comments. ATR certification was received on December 14, 2011.

**An Independent External Peer Review (IEPR).** IEPR was conducted for the project in accordance with procedures described in the Department of the Army, U.S. Army Corps of Engineers, Engineering Circular No. 1165-2-209, Civil Works Review Policy dated January 31, 2010. IEPR began on August 30, 2011. The IEPR panel identified 16 comments. All comments have been resolved and closed. The comments were addressed in the report. Battelle provided a

printout of final comments and responses on December 2, 2011. The panel concurred with all of the PDT's responses.

**EXPECTED PERFORMANCE**

**Project Costs.**

**Cost Summary  
 LCA Barataria Basin Barrier Shoreline Restoration Study  
 (October 2011 Price Levels)**

<u>Construction Item</u>	<u>Cost</u>
Lands and Damages	\$ 3,661,000
Elements	
Monitoring and Adaptive Management	\$ 1,299,000
Barrier Island and Marsh Restoration	<u>\$ 404,067,000</u>
Subtotal	\$ 409,027,000
Preconstruction Engineering and Design (PED)	\$ 6,800,000
Construction Management	<u>\$ 12,435,000</u>
Total First Cost	\$ 428,262,000

**Equivalent Annual Costs and Benefits.**

**Equivalent Annual Benefits and Costs /  
 Economic Cost and Benefits of Recommend Plan  
 LCA Barataria Basin Barrier Shoreline Restoration Study  
 (October 2011 Price Level, 50-Year Period of Analysis, 4.0 Percent Discount Rate)**

Investment Costs	
First Cost	\$ 428,262,000
Interest During Construction	<u>\$ 17,374,000</u>
Total	\$ 445,636,000
Annual Cost	
Interest and Amortization	\$ 20,761,000
OMRR&R	<u>\$ 6,183,000</u>
Subtotal	\$ 26,994,000
Annual Benefits	
Non-Monetary Ecosystem	1,719 AAHU

**Cost Sharing.**

**LCA Barataria Basin Barrier Shoreline Restoration Study – Cost Sharing  
 (October 2011 Price Level)**

<b>Recommend</b>			
<b>Item</b>	<b>Total</b>	<b>Federal</b>	<b>Non-Federal</b>
PED	\$6,800,000	\$4,420,000	\$2,380,000
Construction *	\$416,502,000	\$273,105,950	\$143,396,050
Lands, Easements, Rights of Way, Relocations, Disposals (LERRDs)	\$3,661,000	\$0	\$3,661,000
Monitoring & Adaptive Management	\$1,299,000	\$844,350	\$454,650
Total First Costs (rounded to nearest \$1000)	\$428,000,000	\$278,370,000	\$149,892,000
<b>Caminada Headline Increment</b>			
PED	\$3,604,000	\$2,342,600	\$1,261,400
Construction*	\$218,271,000	\$141,876,150	\$76,394,850
Lands, Easements, Rights of Way, Relocations, Disposals (LERRDs)	\$1,651,000	\$0	\$1,651,000
Monitoring & Adaptive Management	\$630,000	\$409,500	\$220,500
Total First Costs (rounded to nearest \$1000)	\$224,000,000	\$146,000,000	\$78,000,000

*\*Includes Construction Management cost*

**Project Implementation.** The LaCPRA, acting on behalf of the state of Louisiana, is the non-Federal sponsor. The cost share for the design and construction of the project is 65% Federal and 35% non-Federal. LaCPRA must provide all LERRD required for the project. OMRR&R of the project is a 100% LaCPRA responsibility. The cost of the renourishment events is included in the OMRR&R. A feasibility level monitoring and adaptive management plan has been developed for the project and is included in the construction cost.

**Operation, Maintenance, Repair, Rehabilitation, and Replacement (OMRR&R).** The Recommended Plan will include renourishment of the Caminada Headland which will be completed in conjunction with the Bayou Lafourche, Louisiana navigation project. Approximately 650,000 cubic yards of dredged material will be placed offshore in the littoral drift six times every 10 years. This renourishment is part of the non-Federal sponsor's OMRR&R requirements. The non-Federal sponsor will pay the incremental cost of beneficially using this material over the federal standard. The estimated incremental cost of the renourishment is \$7.35 million per event. Shell Island would be re-nourished 20 years and 40 years after initial construction to the original template of 317 beach/dune acres. The marsh fill would also be re-nourished to its original construction template at this time interval. The estimated cost of the renourishment at year 20 is \$63.3 million and \$60.9 million in year 40. OMRR&R would also include repair, replacement, and/or maintenance of sand fencing. The average annual cost of the OMRR&R will be \$6,180,000.

**Key Social and Environmental Factors.** The project areas are uninhabited so there are few direct social factors. The Caminada Headland is used by local residents for recreational purposes which will be improved by the construction of this project. The project will also provide additional protection for oil and gas infrastructure in the area and potentially protect that infrastructure from being exposed and vulnerable to damage in storms. The construction of these barrier shorelines will provide storm surge protection for the interior marshes and cheniere ridges within the basin, which will decrease erosion rates. During construction, habitats within the borrow areas and the construction sites will be temporarily impacted. The Caminada Headland is within the critical habitat of the piping plover. However, the proposed action is not likely to destroy or adversely impact the piping plover habitat due to available nearby habitat. An in-depth analysis of the environmental consequences is included in the report.

The project will restore and protect critical habitat for the endangered piping plover. The Caminada Headland is the largest expanse of piping plover habitat in southeast Louisiana. With the loss of the headland, only small, geographically dispersed areas will remain. The barrier shorelines are also valuable stopovers for migratory birds. The construction of Shell Island will result in additional habitat for the piping plover and migratory birds in an area that is greatly eroded. The Caminada Headland and Shell Island have been designated as important transitional estuarine/marine habitats and EFH. The recommended plan will prevent the loss of Shell Island and the break-up of the Caminada Headland, reducing land loss and ensuring the continuity of these valuable ecosystems.

**Stakeholder Perspectives and Differences.** The Draft Construction Report and Environmental Impact Statement were released to the public in June 2011 for a 45-day public review period. Two public meetings were held. Public comments were received and are incorporated in report. All public and agency comments are documented in Appendix E of the construction report.

**Environmental Compliance.** The NEPA documentation is an environmental impact statement. A draft Record of Decision has been developed and provide to HQUSACE.

**State and Agency Review.**

**Certification of Peer and Legal Review.** This project has undergone the following reviews and certifications:

Agency Technical Review	August 27, 2009
Agency Technical Review	January 31, 2011
Agency Technical Review	December 14, 2011
Independent External Peer Review	December 2, 2011
Cost Engineering Review	December 14, 2011
Legal Review	January 5, 2012

**Policy Compliance Review.**