7.0 CONCLUSIONS

The results of the landscape mapping and hydrologic simulations indicate that the barrier island restoration alternatives will have a measurable effect on several environmental conditions in the study area. The acreage of wetland preservation associated with the barrier shoreline alternatives are 8,137 hectares (31.4 mi2) for Alternative 1 and 3,584 hectares (13.8 mi2) for Alternative 2 in 100-years.

Tidal amplitude will not be significantly reduced in the bays or marshes of the study area due to the restoration Alternatives 1 and 2. Salinity simulations for both alternatives show that values in the bays of the study area will be reduced near the barrier islands, particularly near locations where tidal passes are closed or narrowed. The change in salinity is not enough to change the type of emergent habitat. The barrier alternatives show considerably larger effects on salinity if the Davis Pond diversion is included in the simulations. Both barrier alternatives reduce hurricane flooding in the study area. The reduction is highly variable in the study area and ranges from a few percent to up to 50% for Alternative 1 and from a few percent to up to 20% for Alternative 2.

Wave impacts at the marsh shoreline can be controlled by two means: 1) reducing the gaps between adjacent barrier islands, and 2) absorbing wave energy derived from locally-generated waves and/or longer period waves propagating through the tidal passes from the Gulf of Mexico. An optimal solution would be a combination of the above two, (i.e., Alternative 1). Numerical modeling indicates that Alternative 2 would successfully reduce overall wave energy levels in the back-barrier bay, especially in the vicinity and directly landward of the previous gaps, by restricting wave propagation through these gaps. However, Alternative 2 does not provide any mitigation regarding the erosional impact of wind-generated waves inside the bay on marsh shorelines. The data presented here indicate that Alternative 1, utilizing the nearshore wave energy absorbers, will protect the marsh shoreline more effectively in terms of dissipating between on average 80 and 100% of wave energy at the marsh-water interface around the bays. Although the numerical model predicts that Alternative 2 will reduce the potential for marsh shoreline erosion by significantly restricting wave energy, this solution does not offer any protection against wave generation in the bays driven by local winds.

Alternative 1 has the largest impact in reducing land loss. Including the creation of saline marsh on the barrier islands, Alternative 1 increases the area of saline marsh by 8,603 hectares (33.2 mi2) in 30-years and 13,127 hectares (50.7 mi2) in 100-years. An additional 1,287 hectares (5.0 mi2) and 1,439 hectares (5.6 mi2) of shore/flat habitat are increased for 30- and 100-years respectively.

Alternative 2 increases the area of saline marsh on the islands and along the bay shoreline by 2,953 hectares (11.4 mi2) in 30-years and 6,221 hectares (24.0 mi2) in 100-years. Shore/flat habitat is increased by 1,153 hectares (4.5 mi2) and 1,324 hectares (5.1 mi2) for 30- and 100-year respectively.

Alternatives 1 and 2 directly impact open water areas, such as inlets and nearshore environments by converting them to marsh and shore/flat habitat. The beach habitat created and maintained with Alternatives 1 and 2 provides nursery grounds for many species of fish. The saline marsh created and maintained on the islands provides habitat for various estuarine fish and macroinvertebrates. The beach and dune provide nesting grounds for various species of non-migratory and migratory birds. Alternative 1 has an added benefit directly attributable to the wave absorbers. The interior set of segmented breakwaters provides hard bottom habitat and shelter for invertebrates and vertebrates.

The saline marsh along the landward bay shoreline protected by Alternatives 1 and 2 increases the habitat available for resident fish species. Estuarine and marine migrants use the marsh during their first year of life. Various species of birds will also use the marsh.

Expected flood damages to residential, commercial, industry and public structures, as well as to roads, were estimated. These expected damages took into consideration the probability that such a storm would occur. Damage costs were then compared across project alternatives using only a Category 5 storm for analysis. Lesser storms would also yield economic implications for the different project alternatives. For this reason alone, the estimated cost savings from the project alternatives must be interpreted as minimum savings. Losses to the commercial fishing industry and losses in recreational enjoyment were estimated, and the benefits of project alternatives compared for these losses. Oil and gas related losses, insofar as they could be estimated, were also compared across alternatives.

Alternative 1 reduces the flood damage in the study area by $77.1 million for a 90.5W storm track and $136.4 million for a 91.5W storm track compared to no-action in 100-years. Linearly interpolating these reductions yields benefits of $23.1 and $40.9 million compared with no-action in 30-years. Present value of these benefits ranges from $2.1 to 16.9 million, with lower discount rates resulting in increases in cost savings.

Alternative 2 reduces the flood damage in the study area by $36.5 million for a 90.5W storm track and $74.8 million for a 91.5W storm track compared to no-action in 100-years. Thus, flood damage benefits of Alternative 2 compared to no-action in 30-years is $10.9 and $22.4. Present value of these benefits ranges from $1.0 to 9.2 million. Therefore, Alternative 1 provides approximately twice the savings as Alternative 2.

Non-storm losses to coastal Louisiana would stem from wetland losses, and associated recreational and commercial fishery losses. They would also stem from losses in the abilities of the barrier islands to protect oil and gas infrastructure. The present value of non-storm related cost savings or benefits from Alternative 1 compared to no-action range from $1.6 to $3.8 million over a 30-year period. The annualized values of these savings range from $145,000 to $188,000 per year. As in the case of storm damage protection, Alternative 2 provides approximately half the savings or benefits of Alternative 1. The present and annualized values of these savings and benefits increase using lower discount rates.

These economic benefits estimates will represent minimum benefits of the alternatives. Only one type of storm was considered. Considering a full range of storm types, along with their probabilities, would substantially increase benefits estimates of projects. There were no attempts to estimate migration costs if projects altered the need for populations to move. There was no reasonable way to predict what population responses to future hydrologic conditions would be. Recreational loss estimates may be a low if recreational demands in coastal Louisiana increase in the future. There were no estimates for the pain and suffering associated with increased storm vulnerability, or valuations of social losses in community and culture if populations were induced to migrate.

A summary of the benefits of the alternatives compared to no-action is shown in Table 7-1.

Table 7-1. Summary of Benefits of Alternatives 1 and 2 Compared to No-action

	Alternative 1	**Alternative 2**
Saline marsh preserved 30-years (100-years)	3,613 hectares (8,137 hectares)	316 hectares (3,584 hectares)
Habitat created	6,348 hectares	4,008 hectares
Annualized non-storm savings 30-Years (100-years)	$145,000-188,000 ($152,000-268,000)	$76,000-128,000 ($89,000-175,000)
Storm damage savings 30-years (100-years)	$23-41 million ($77-136 million)	$11-22 million ($36-75 million)

1 hectare = 2.47 acres
1 square mile = 259 hectares