LOUISIANA COASTAL PROTECTION AND RESTORATION TECHNICAL REPORT

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CULTURAL RESOURCES APPENDIX

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INTRODUCTION

Twenty four parishes across South Louisiana are subject to various levels of inundation by hurricane storm surges. These storm surges have the potential to damage or destroy numerous locally, regionally, and nationally important cultural assets. Cultural resources such as National Historic Landmarks, historic buildings and districts, archeological sites, shipwrecks, landscapes, and museums are particularly noteworthy with respect to the culture of communities in the area. In addition, the people that reside within South Louisiana derive from diverse cultural backgrounds and from numerous ethnic groups including Creole, Cajun, African American, French, Spanish, Native American, South American, Isleños, Filipino, Italian, Chinese, Vietnamese, among others. Communities of unique heritage can be found nestled within urban areas and on the rural landscape. Without hurricane risk reduction, these communities are at risk of dispersion and disintegration following inundation events. The damage to or loss of archeological sites, historic buildings, parks, and neighborhoods could lead to the loss of individual and community connection to place. Taken together, these outcomes could lead to a net loss of cultural diversity in South Louisiana.

In order to assess how different levels of risk reduction would help to preserve cultural resources, information is collected for a variety of cultural resources and compared to the structural and nonstructural plans. Environmental Systems Research Institute, Inc (ESRI) shapefiles are created for data that could be quantified easily and linked to a real world spatial location, including known archeological sites, National Register sites, and National Historic Landmarks. Given that not all cultural sites are recorded, the number of known cultural sites serves as a proxy measure of the actual number of sites that may be protected by the structural alternatives. The number of known sites protected by alternatives given the various cases is computed by analyzing the location of sites and their proximity to the levees, flood zones, overtopping, and coastal erosion zones. Effects on cultural resources from the nonstructural plans involve reviewing economic and ethnic makeup of communities in order to address concerns relating to Environmental Justice. For example, the high velocity flood zones (V-zones) identified for nonstructural measures (see the *Nonstructural Plan Component Appendix*) are reviewed in order to identify possible disproportionate impacts from the implementation of nonstructural plan on low-income, minority, and traditional communities.

Goals and Objectives

The LACPR effort recognizes the important role of cultural resources to people, communities, and the nation. For this exercise, information on known cultural resources enters into the Risk-Informed Decision Framework (RIDF) in order to aid the planning process and screening of alternatives. The primary goal of this appendix involves considering how the different structural and nonstructural alternatives of LACPR have the potential to reduce risk to cultural resources. The first objective seeks to characterize and compare the level of risk reduction to cultural sites offered by each alternative. This objective is accomplished by providing *cultural resource metrics* to the multi-criteria decision analysis (MCDA). These metrics are compiled from existing inventories of known sites and serve as proxy measure to characterize the level of risk reduction alternatives provide to cultural resources. The second objective is to preliminarily

identify low income, minority, and traditional communities that are at a high risk from disproportionate impacts of the nonstructural alternatives.

Consideration of the National Historic Preservation Act

Several laws and executive orders establish cultural sites as a significant resource and require the Federal Government to consider the effects of a Federal undertaking on cultural resources. The National Historic Preservation Act of 1966, as amended, requires Federal agencies to consider cultural resources during the planning and implementation of Federal undertakings. Additional laws such as the National Environmental Policy Act of 1969, as amended, the Archeological Resources Protection Act of 1979, the Native American Grave and Repatriation Act of 1990, and Executive Orders 11593, 13006, and 13287 provide guidance on treating and preserving historic sites. The LACPR effort, as directed by Congress, is a government undertaking that has no potential to cause effects on historic properties as per 36 CFR 800.3(a)(1), because no construction is authorized at this time. If the outcome of LACPR results in projects involving on the ground alterations, such as the construction of levees, restoration of wetlands, excavation of borrow, alterations to buildings, or other activities, USACE's responsibilities under Sections 106 of the National Historic Preservation Act will involve studies, surveys, and consultation to identify historic properties and traditional cultural properties as per §800.4.

Methodology Overview

The general methodology uses Geographic Information Systems (GIS) to identify sites that would be protected by the structural alternatives, and to identify communities, particularly traditional and ethnic communities, that would be impacted by the nonstructural alternatives. The two types of analysis required different methodological approaches.

In order to assess the impacts from the structural alternatives qualitative data on site location is collected and encoded into GIS shapefiles. Three units of analysis are identified (1) archeological sites, (2) historic properties, and (3) historic districts. While these units of analysis are not a comprehensive inventory of cultural resources in South Louisiana, for this exercise they serve to represent the kinds of cultural resources protected by the alternatives. The shapefiles of known archaeological sites, known historic properties, and known historic districts are then compared with shapefiles with data on levee placement, storm surge and levee overtopping, and coastal land loss projections in order to identify how an alternative protects known sites. The number of protected sites is calculated and this summary is input into the multi-criteria decision analysis (MCDA).

In order to assess the impacts from the nonstructural alternatives, the location of the nonstructural impacts is observed and traditional and ethnic qualities of the communities are identified.

Evaluation of Structural Alternatives

This section describes information on data collection, identification of impacts, and the process for calculating the metric information for input into the MCDA.

Units of Analysis

Cultural resources for MCDA comprise three units of analysis: (1) known archeological sites, (2) known historic properties, and (3) known historic districts. *Archeological sites* are locations with buried information, including, but not limited to, prehistoric campsites, plantations, shipwrecks, and military places. *Historic properties* include properties listed or determined eligible for listing on the National Register of Historic Places and National Historic Landmarks. *Historic Districts* are districts composed of a collection of sites, buildings, and structures. In general historic districts cover a geographic scale larger than an individual site. Taken together, these categories reflect cultural resources important at the local, regional, and national level.

Incorporation of cultural metrics in the MCDA

For the multi-criteria decision analysis (MCDA) archeological sites and historic properties factor into the "Environmental Quality Planning Account", and historic districts contribute to the "Other Social Effects Planning Account" (See main report and the *Risk-Informed Decision Framework Appendix*). Archeological sites and historic properties are considered within the Environmental Quality Planning Account because they are conventionally evaluated under guidelines for the National Environmental Policy Act of 1969, as amended, and the National Historic Preservation Act of 1966, as amended. The National Environmental Policy Act planning procedures and National Historic Preservation Act compliance process also require consideration of effects on historic districts. However, for this analysis, historic districts contribute to the Other Social Effects because many historic districts provide the structural backdrop for neighborhoods and communities. People living within residential historic districts reference the built environment and use it to identify themselves and their community. When these historic districts are destroyed, the community living within that district may be dissolved or destroyed. Many American cities experienced the unintended consequences, including community dissolution, from the loss of residential neighborhoods as a result of the Urban Renewal movement of the mid 20th Century (Longstreth, 2006). Likewise, the destruction of residential historic districts from natural causes has the potential to adversely affect communities. Therefore, the historic districts metric is a part of the Other Social Effects Planning Account because damage to these districts holds the real potential to significantly affect the social lives of individuals and entire communities.

Criteria for selecting metrics

The selection of cultural metrics was guided by criteria defined for the MCDA process. Please see section 3.1.3 of the *Risk-Informed Decision Framework Appendix* for a comprehensive presentation regarding all criteria for metric selection. Several selection criteria are extremely pertinent to the development of the cultural metrics. For example the metrics for the MCDA are to be cost-effective, verifiable, credible, and minimally redundant. Therefore existing inventories were referenced (see below) because they did not require intensive deployment of labor, thus they are cost effective. Also since LACPR attempts to characterize how alternatives would protect cultural resources; these existing inventories serve as proxy measures of all cultural resources, both known and unknown. The inventories were developed over many years of research and field investigations and provide verifiable data. These data also derive from credible agencies, such as the Louisiana Division of Archaeology and the National Park Service. Lastly, the metrics should be viewed holistically in order to minimize redundancy. For example,

a metric for "historic structures" was considered (see below). However, when the data were reviewed it was revealed that existing inventories of historic structures did not meet other criteria as stipulated by the RIDF. In addition many historic structures are captured by the historic district metric. One metric for structures and a second for historic districts would create redundancy.

Data Collection

A variety of sources, including an inventory of archeological sites maintained by the Louisiana Division of Archaeology, an inventory of historic buildings maintained by the Louisiana Division of Historic Preservation, and the National Register of Historic Places, provide information for the inventories of cultural resources. Table 1 below presents the data type and data source of each metric. While much of the information is publicly available, some information, such as the location of archeological sites is restricted to individuals with appropriate research qualifications, as defined by the state.

Table 1 - Summary of Cultural Site Data Types and Sources of Data

MCDA Planning Account	Metric	Type of Data	Source
Environmental Quality	Archeological Sites	Recorded Archeological Sites	Louisiana Department of Culture and Tourism, Division of Archaeology
Other Social Effects	Historic Districts	Known Historic Districts	Louisiana Department of Culture and Tourism, Division of Archaeology, Louisiana Department of Culture and Tourism, Division of Historic Preservation, and the City of New Orleans, Historic District Landmarks Commission, National Register of Historic Places.
Environmental Quality	Historic Properties	Determined National Register Properties	Department of Interior, National Park Service, National Register of Historic Places
Environmental Quality	Historic Properties	Designated National Historic Landmarks	Department of Interior, National Park Service, National Historic Landmarks

Assumptions

The fact that biases are inherent in the cultural sites' data set is worth reiterating. First, the sites included in the analysis are *known* sites, and the data set is not an inventory of *all* sites. Archeological sites, for example, tend to be recorded when a Federal undertaking has the potential for disturbing archeological sites. Other recorded archeological sites may have

prominent features, such as mounds, and are easily identified. In contrast, the data set likely under-represents deeply buried sites because they are not easily identified. In addition, the vast majority of archeological sites and historic buildings have not been evaluated to determine eligibility for inclusion on the National Register of Historic Places. Consequently the number of eligible National Register properties, is likely greater than the current inventory reflects. Therefore, the inventories of all units of analysis comprise known or recorded sites, and are not accurate inventory of all archeological sites, historic districts, National Register Properties, or National Historic Landmarks. In many ways, it is useful to think of these inventories as proxy measures of the actual number of cultural sites. As outlined above, cultural resource inventories and assessments will be undertaken prior to project construction in order to comply with the National Historic Preservation Act.

Archeological Sites

Archeological sites include the material remains of people and cultures from the historic and prehistoric past. Prehistoric sites include hunting and food processing camps, hamlets, villages, and mounds. Prehistoric and Native American groups of South Louisiana relied on hunting, fishing, and gathering plants. Archeological sites in this region tend to be located along natural waterways and in areas of relatively high elevation. Historic archeological sites include military sites, plantations, farmsteads, dwellings, commercial sites, and industrial sites. Historic archeological sites also tend to be located in areas of relatively high elevation, such as along natural levees, and on transportation routes. Shipwrecks form an additional category of historic sites and can be found throughout South Louisiana's waterways and off-shore.

Archeological sites provide important information about the past that is not available through other sources, such as historic records. Archeology is the main source of information from the prehistoric era, and of many societies that no longer exist. Information on proto-historic and historic period Native American groups survives through oral histories and ethnohistoric records. However, these sources tend not to extend far back into prehistory and the recorder's culture tends to bias ethnohistoric records. Historic archeological sites also offer information on segments of society, such as the lower classes, enslaved peoples, women, and children not included in historic writings or were not accurately depicted in writings. Archeology offers the opportunity to expand our knowledge of these components of society in order to depict how cultures were organized, explain why societies changed, and understand the region's, state's, and nation's heritage.

Archeological sites are preserved through an array of processes starting with the deposition of cultural material. Initially, a variety of factors influence site formation, such as the activities performed at a site, the number of people that occupied a site, the length of a stay, the kinds of materials used, and the rate of deposition. The presentation of two situations illustrates how these and other factors influence the creation and preservation of archeological sites. For example, if prehistoric hunters occupied a campsite for only few days, they may have built ephemeral shelters and left very little cultural material in a relatively small location. In addition, organic material tends to decay, which may result in little evidence of past human occupation surviving to the present day. In order to identify and collect information from the little surviving evidence, site identification requires an appropriate sampling strategy and recovery methodologies.

In contrast, when many people occupy one location for an extended length of time, they tend to possess a variety of objects made from a variety of materials. People living in one location for an extended length of time typically construct substantial structures, produce more trash, and may manage the trash by depositing it into trash heaps, middens, or pits. In this case, an archaeological site might be visible and easily identified from surface remains, in part due to structural remains and the concentration of cultural material. Careful excavation is still necessary in order to collect contextual information to address specific research questions. Archeologists take into consideration these types of behavioral and other natural processes when trying to identify the presence of archeological sites, ascertain past activities, and interpret what people did in the past.

Once a site is initially formed, additional factors, such as the rate of deposition, subsequent human activity, soil acidity, and climate influence site preservation. In South Louisiana, alluvium deposited from river floods and deltaic building episodes have deeply buried many sites. Many of the cultural resources located within the planning area were reported as having been disturbed in the initial site forms on file with the Louisiana Division of Archaeology. Some of these sites were impacted by construction activities conducted prior to the implementation of regulations governing the treatment of cultural resources. Unfortunately, destruction of cultural resource sites from man-made actions continues in Southl Louisiana. A discussion of processes that could impact cultural resources in South Louisiana is presented below.

The Louisiana Department of Culture and Tourism, the Division of Archaeology archives state archeological site files and archeological reports in the state offices in Baton Rouge, Louisiana. The Division of Archaeology maintains a web accessible GIS of recorded archeological sites and this database forms the primary source of information on known archeological sites for this analysis. The Division of Archaeology granted access to the database to the USACE. A direct copy of the GIS shapefile could not be obtained by the USACE; therefore, a shapefile was created by querying information available on the web-based GIS. The Division of Archaeology's web-based GIS displays site location and a table with pertinent associated data such as site name, occupation date or period, function, associated cultural material, and other related information. In addition, the Universal Transverse Mercator Northing and Easting coordinates (UTMs) are included in this table. The data on site location and site characteristics were extracted from the web-GIS and used to create an ESRI point shapefile for use in the LACPR analysis. The shapefile includes information on 2149 archeological sites and serves as the data set of known archeological sites in the GIS analysis.

This data set is not complete and it is a reflection of *recorded* archeological sites, and not the *actual* number of sites. Archeological sites are typically identified and recorded by archeologists prior to a ground disturbing civil works project. As a result, the inventory of sites tends to reflect areas of development. Consequently, site density may appear to be greater in developed areas, but in reality site density may be higher in undeveloped areas.

Historic Districts

For LACPR, an historic district is defined as a group of spatially-related properties sharing a common theme. Some historic districts have obtained National Register status (see below), but

most of the historic districts considered for LACPR have been defined by either state or local organizations. Generally, historic districts apply to a group of buildings or structures that are historically or architecturally significant. A group of associated archeological sites may also form an historic district. Sites, buildings, structures, and objects within historic districts are categorized as contributing and non-contributing properties. Contributing properties are any property, such as a structure or object, which adds to the historical integrity or architectural qualities that make an historic district significant. Contributing properties are integral parts of the historic context and character of an historic district. Although non-contributing elements are embedded within historic districts, the whole of an historic district is viewed as being greater than the sum of its parts. For this reason, the loss of individual elements has the potential to change the overall character of the historic district.

Louisiana Department of Culture and Tourism, Division of Historic Preservation, the Louisiana Department of Culture and Tourism, Division of Archaeology, and the City of New Orleans Historic District Landmarks Commission, and the National Register of Historic Places provide information on historic districts for this effort.

The Historic District Landmarks Commission is a regulatory agency for local historic districts in New Orleans. The Historic District Landmarks Commission has jurisdiction over nine local historic districts, 163 individual landmark buildings and 182 nominated landmark buildings in city neighborhoods. A goal of the Historic District Landmarks Commission is to adaptively reuse buildings in order to retain the architectural character of an area. Although there are numerous commercial corridors, the majority of buildings reviewed by the New Orleans Commission are residential in nature. In addition, the city maintains a Central Business District Historic Landmarks and the Vieux Carre Historic District. Historic Districts include Foubourg Marigny, Irish Channel, Algiers Point, Esplanade Ridge, Holy Cross, Bywater, Lower Garden District, Warehouse District, Lafayette Square, Picayune Place, St. Charles Avenue, Treme, and Canal Street.

The current inventory includes 69 historic districts; 56 listed on the National Register of Historic Places, and13 listed on the Historic District Landmarks Commission. Examples of historic districts include historic urban neighborhoods, commercial and government centers within Parish seats, plantations, and military sites. These historic districts are overwhelmingly significant due to their architectural styles. Others are significant due to their association with a person or event or their ability to yield information.

Given that the defined historic districts in this inventory overwhelmingly includes buildings, structures, and objects, the residual affects of flooding from levee overtopping has the potential to damage contributing elements of historic properties. This information is taken into consideration in determining the number of protected historic districts under the structural alternatives.

National Register Sites

The National Register of Historic Places is the Nation's official list of cultural resources worthy of preservation. Authorized under the National Historic Preservation Act of 1966, as amended, the National Register is part of a program to coordinate and support public and private efforts to

identify, evaluate, and protect our historic and archeological resources. Sites listed or eligible for listing on the National Register are referred to as “historic properties”. To be considered "historic," a property must be at least 50 years old (with certain exceptions), and possess integrity and significance. Integrity relates to a property’s location, design, setting, materials, workmanship, feeling, and association. If, for example, a structure was moved from the location where it achieved its significance, then the structure no longer possesses integrity of location. Therefore, such property would not meet the criteria necessary for inclusion on the National Register of Historic Places. A property’s significance may be related to a number of factors including:

- Its association with events that have made a noteworthy contribution to the broad patterns of our history
- Its relation to the lives of historically important people of our past
- It represents the distinctive characteristics of a type, period or method of construction
- It represents the work of a master
- It possesses high artistic value
- It represents a significant or distinguishable entity whose components may lack individual distinction
- It has yielded or may yield information important in history or prehistory

If an historic property is going to be adversely impacted by a Federal undertaking then the impacts must be mitigated.

An inventory of properties listed on the National Register of Historic Places is available through the National Park Service’s website (www.nps.gov/nr/). Similar to the state records, information on locations is typically not available on archeological sites, but it is available for historic structures and other properties. National Register properties also include 307 structures and 42 archeological sites within the planning area.

Historic Districts are also included in the National Register of Historic Places. Historic Districts are a special collection of historic places where individual elements may not meet the criteria to be included on the National Register; however, when many elements are considered the whole is considered to be greater than the sum of the parts. The fifty-six historic districts listed on the National Register of Historic Places are included in the *Historic District* unit of analysis (see above).

National Historic Landmarks

National Historic Landmarks are nationally significant historic places designated by the Secretary of the Interior because they possess exceptional value or quality in illustrating or interpreting the heritage of the United States. While there are many historic places across the nation, only a small number have meaning to all Americans. Today, fewer than 2,500 historic places bear this national distinction. National Historic Landmarks make tangible the American experience. Those landmarks are places where significant historical events occurred, where prominent Americans worked or lived, that represent those ideas that shaped the nation, that provide important information about our past, or that are outstanding examples of design or construction. National Historic Landmarks guide us in comprehending important trends and

patterns in American history. They form the common bonds that tie together the many groups that settled the country and provide anchors of stability in a fast-changing world, ensuring that the nation's heritage will be accessible to generations yet unborn. Within the planning area, 31 buildings and structures have achieved National Historic Landmark status.

Other cultural resources considered

Identification of cultural resources for use in the MCDA involved considering a number of other resources including historic structures, and museums and archives. However, given the quality of the data, biases in the data, or likelihood that another metric already incorporated the data, these resources did not meet the selection criteria outlined for the risk decision informed framework (see above and the *Risk-Informed Decision Framework Appendix*).

Historic Structures

Historic structures include houses, buildings, bridges, levees, docks and other manmade structural objects. Historic structures are structures over fifty years old and posses certain unique qualities of significance. The Louisiana Department of Culture and Tourism, Division of Historic Preservation maintains an inventory of historic structures. While a total of 11,296 historic structures have been recorded for LACPR planning area, many historic structures remain unrecorded. Taken as a whole, this inventory's inherent biases result in an unreliable database for use in the MCDA. In addition, the historic nature of many of these buildings is already captured in the historic districts metric. While historic structures are not included in the MCDA, they will be inventoried and assessed, as necessary, under National Historic Preservation Act at the project implementation phase.

Two main factors influence whether structures have been recorded and are listed on the state inventory. The first factor involves efforts of local historical societies and individual preservationists. The second factor relates to Federal agencies requirement to comply with the National Historic Preservation Act of 1966, as amended.

In some parishes, historical societies and individuals have undertaken inventories of local historic buildings. For example, a comprehensive inventory of historic structures within town centers and rural landscapes was undertaken for St. Tammany Parish. This effort resulted in 1,809 historic structures recorded within that parish. Similar studies have not been implemented for other parishes, such as Jefferson Davis, Cameron, and Calcasieu. While the density of historic structures is expected to be low in this western, rural part of the state, the lack of inventory efforts has resulted in the documentation of only a handful of structures.

In other parishes, the inventory of structures is a result of efforts related to Federal undertakings. For example, Orleans Parish contains 1278 recorded historic structures. Many of these structures were badly damaged or destroyed by levee failures following hurricane Katrina. The Federal Emergency Management Agency (FEMA) recorded historic buildings that were no longer habitable following the storm and prior to demolition. As a result, roughly 30 percent of all recorded structures within Orleans Parish currently listed on the Louisiana Division of Archaeology and Division of Historic Preservation on-line database are located within the Lower Ninth Ward, one of the hardest hit neighborhoods from the 2005 floods. The available online inventory does not reveal whether recorded historic structures are still standing, but the location

of the vast majority of recorded structures within Orleans Perish suggests that many of the recorded structures are no longer extant. Using the state historic structures inventory within the MCDA would therefore lead to counting some structures as protected, when in fact they do not exist. An effort to verify the status of recorded buildings would require large labor deployment, and would not be cost effective. Furthermore, given that historic structures tend to be included within historic districts the redundancy of including historic structures would not validate the need for the cost.

Museums form an additional metric that provide personal and community connection to place. Museum assets are included within the "residual damages" metric (see *Economics Appendix* and *Risk-Informed Decision Framework Appendix*).

In addition to the biases in the inventory of historic structures as a result of recording efforts, many historic buildings are already included as contributing elements within historic districts. Counting historic structures as individual elements when they are already included in counts of historic districts would lead to duplication within the MCDA. Therefore, the three units of analyses, archeological sites, historic districts, and historic properties are used to reference cultural resources for the MCDA.

Communities

In addition to archeological sites, historic buildings, and other historic properties, cultural resources also include traditional and ethnic communities. Executive Order 12898 instructs Federal agencies to consider the effects of Federal actions on minority and low income populations. Many of the traditional and ethnic communities tend to be either minority or low income populations. Numerous ethnicities live within South Louisiana and include Creole, Cajun, African-American, Native American, Isleños, Filipino, Italian, Yugoslavian, Chinese, and Vietnamese. Some of these groups depend on a subsistence economy from oystering and shrimping. In general, coastal wetland loss will adversely affect these groups causing displacement and disintegration.

Unlike the inventory of archaeological sites and National Register properties, inventories of traditional and ethnic communities do not exist. While, some information regarding ethnicity is available through census data, changes in population and in community composition following hurricanes Katrina and Rita is a dynamic and ongoing process. If the outcome of this LACPR effort results in the implementation of risk reduction measures, then effects of the proposed action on minority and low income communities would be considered. For the present LACPR effort communities that may be included in a voluntary nonstructural program and overarching effects of a non structural program on low income and ethnic communities are presented

Processes that could impact cultural resources

A variety of natural and human impacts affects cultural resources in the LACPR planning area. Some impacts have a greater effect on archeological sites and site preservation, while others have greater impacts on historic structures. Natural processes, such as subsidence, erosion, storm surges, and levee overtopping, have the potential to negatively impact cultural resources. Understanding the effects of these processes is crucial when comparing the LACPR alternatives.

Some alternatives include efforts to reduce some processes, such as coastal erosion, while others do not. Consequently, the ability to protect sites differs among the alternatives.

Land loss, due to processes such as coastal erosion or subsidence, forms a negative impact to all types of cultural assets. For example, eroding land also destroys the context of archeological deposits causing them to lose integrity and the ability to yield data. Erosion and subsidence of the soil underlying structures will negatively impact those structures by exposing them to the degrading effects of water or undermining the foundation. Therefore, if a site is located in an area that would be subject to land loss under any plan, then it is considered a negative impact. Land loss in the coastal zone is a particularly influential factor in the destruction of archeological sites within the LACPR planning area. Natural influences include subsidence, saltwater intrusion, and the frequency, magnitude, and duration of storms. Subsidence, compaction, and erosion accelerate the conversion of marsh to open water. Saltwater intrusion, coupled with subsidence, is resulting in the landward encroachment of the gulf. These processes are deleterious to archeological sites located in proximity to various lakes, bays, sounds, canals, and other water bodies.

Flooding either from storm surges or levee overtopping would generally be a negative impact to historic structures, but not necessarily to archeological sites. Flooding of historic structures may undermine the structural integrity of the building by deteriorating portions of the structure or completely destroying a structure. Secondary impacts, such as mold growth, that may damage structural, architectural, or decorative elements can undermine a structure's integrity. This loss of integrity may decrease a structure's ability to meet criteria for inclusion on the National Register of Historic Places. Alternatively, the replacement of structural and decorative elements may change the character of an historic district. If the flooding from storm surges alters the ecosystem from freshwater to saltwater marsh, then the storm surge has the potential to negatively impact archaeological sites. Saltwater intrusion kills freshwater vegetation exposing soils to increased erosion. When archaeological sites are located in these areas, sites are destroyed as the soil erodes.

Other factors influencing site preservation are related to the climate and topography of the area. The climate in this area is influenced by air masses, which result in severe storms during the summer months and sporadic, high energy disturbances during the winter months. When severe winds from high energy disturbances uproot trees growing on sites, the context is disturbed, hindering the research potential of the site. Rapid rainfall and flash flooding can cause erosion, leading to the destruction of archeological sites.

Wind damage associated with hurricanes is an additional negative impact to cultural assets. For example, wind can damage structural components of buildings, exposing building interiors and contents to wind and rain damage. Wind can also uproot trees, which can damage archeological sites. Given the difficulty in estimating wind damage and the need to take local features into consideration, wind damage is not considered in the analysis.

Human activities are significant contributing factors, influencing site preservation in the area. Natural levees and their adjacent waterways represent important features in the region. For example, distributary channels formed important routes of transportation during prehistoric,

historic, and modern times. The natural levees adjacent to the waterways provided suitable landforms for settlement, fortifications, and agricultural lands. Prehistoric settlements focused on these high ridges and natural levees and high ground was also preferred for historic settlements. Some of the first agricultural concessions in the area were granted along the Mississippi River and the major bayous of the planning area. Historically, settlement and development concentrated on suitable dry land adjacent to navigable watercourses. However, in the recent past, settlement has expanded to drained lowlands and natural backswamp areas. The flooding from Hurricanes Katrina and Rita in 2005 has heightened an awareness of the hazards associated with living in these drained lowlands, and future development has the potential to emphasize undeveloped high ground.

The construction of various flood and water control structures is another factor that has influenced site preservation in the coastal zone. Levees have been constructed to prevent flooding and to control the flow of water in some areas. Sites have been destroyed during the construction of levees and floodwalls. These water control projects also affect sediment transport and deposition in the area. Excavation and maintenance dredging of canals for the extraction of mineral resources and for navigation have accelerated erosion and disturbed archeological sites. Many archeological sites in the planning area have subsided and were exposed during dredging activities. The excavation of manmade canals divided some archeological sites. Subsequent erosion of the canal channels resulted in the loss of cultural deposits. Wakes from boats utilizing waterways forms an additional impact that negatively affects the preservation of archeological sites located along waterways.

The construction of new levees and expanding the footprints of existing levees also has the potential to damage cultural sites. Levees may be built upon archeological sites, or historic buildings may need to be moved or demolished in order to construct or expand levees. In addition, borrow material necessary for the levee improvement, expansion, and construction has the potential to impact and destroy both archeological sites and buildings present within borrow and stockpile areas. The National Historic Preservation Act requires that cultural resources be considered prior to a Federal undertaking that has the potential to cause effects on historic properties. The opportunity to consider effects to historic properties will occur prior to the implementation of any plan

Definitions

Consideration of the impacts to cultural resources leads to the designation of three types of site status: (1) protected sites (2) unprotected sites, (3) and unaffected sites. A *protected site* is a site that is protected under an alternative from storm surge, erosion, and flooding. An *unprotected site* is a site that could be damaged or destroyed under the given alternative. An *unaffected site* is a site that is neither protected nor damaged under a given alternative. The number of protected sites is the measure used for the three cultural metric inputs for the MCDA.

Assessing Future Conditions

The overall LACPR technical evaluation considers future conditions; however, it is difficult to project the future conditions of cultural sites. For example, when considering the future in 50 years, structures being built today could be included on the National Register of Historic Places.

However, as discussed above, historic properties must possess both integrity and significance. Both of these characteristics are difficult to predict fifty years into the future. Pre-fabricated homes constructed following Hurricane Katarina, referred to as Katrina cottages, could be eligible for the inclusion on the National Register of Historic Places. Precedence for this type of structure exists since pre-fabricated houses from the Sears and Roebuck Mail order catalog built between 1908 and 1940 have been determined eligible and are listed on the National Register. In addition, given the association of Katrina cottages to the Hurricane Katrina event and the rebuilding of New Orleans, it is possible that Katrina cottages will meet requirements of the NRHP in fifty years. Therefore, given the difficulty in trying to predict what may have merit in the future and inventorying such properties, analysis focuses on resources recorded now and did not attempt to quantify sites that could be considered cultural resources in the future.

GIS Analysis of Structural Alternatives—the process

The cultural metrics for the MCDA are calculated with the use of GIS. The process includes identifying protected sites by overlaying and querying several shapefiles. The base layer includes information on site location. For archeological sites, the location of the proposed levee alignments and future wetlands factor into the calculation of the number of protected sites. In contrast, shapefiles with data on flooding location and depth from storm surges factor into the calculation of protected historic districts and historic properties.

Archeological Sites

The number of protected known archaeological sites is calculated with the use of three GIS shapefiles. The first shapefile includes the location of known archeological sites; the second shapefile contains the levee alignments; and the third shapefile is the Coastal Louisiana Ecosystem Assessment and Restoration (CLEAR) model (Twilley and Barras, 2003; see *Coastal Restoration Plan Component Appendix*). The CLEAR model is an estimate of coastal land loss if no action is implemented. Three inputs are associated with each alternative and scenario, (1) the number of protected known sites, (2) the upper uncertainty limit, and (3) the lower uncertainty limit. Treating these figures as actual statistics is not appropriate; however, they loosely compare to a mean and associated error ranges. The first step in calculating the number of protected known archaeological sites involves identifying the sites protected by levees. The second step involves quantifying the number of protected sites when coastal lands are preserved and not transformed to open water. Calculating the upper and lower uncertainty limit varies for the baseline and alternatives (see below).

The number of protected archaeological sites for the baseline alternative is calculated by simply determining the number of sites protected by levees. The upper and lower uncertainty limits are calculated by adding and subtracting 12.5 percent to the number of protected known sites. This percentage is chosen because it is equivalent range attached to the number of protected known archaeological sites with coastal wetland features (see below).

The number of protected archaeological sites for the alternatives is calculated by adding the number of sites that are protected by levees and the sites that are protected by coastal wetland features. Determining the number of known archaeological sites protected by coastal wetland features utilizes the CLEAR Model. The CLEAR Model is a raster shapefile with grid blocks covering .0965 square miles (0.25 sq km). The attribute table associated with this shapefile

contains the estimated percentage of wetlands within each cell for future conditions in five year increments. The field "TOTWET50" is referenced to explore where land loss, as the result of erosion or subsidence, is expected in 50 years. Given that the model estimates the percentage of wetlands within the .0965 square mile cells, the precise location of water is not projected. The basic assumption for this analysis is that if archaeological sites are located within a cell that contains water, then the archaeological site could be destroyed. The process of land loss and increased wave action and erosion are processes that are likely to destroy sites. In order to capture a range of certainty of site loss for this analysis, the number of archeological sites is calculated twice. The lower uncertainty limit is calculated by examining cells that are estimated to be 75 percent wetland or more in 50 years with no action. Similarly, the upper uncertainty limit is calculated by examining cells that are estimated to be 50 percent or greater wetland. Once the number of sites that intersects these cell blocks is computed they are added to the number of sites protected. The mid-point for the MCDA is computed by taking the midpoint of the numbers calculated for the 50 percent and 75 percent wetlands results. While some present day land will still be lost and new land will be created in the process of coastal restoration, the use of the CLEAR model provides relative measure of how known archaeological sites could be protected.

To summarize, protected known archaeological sites for the baseline only includes sites protected by levees, and protected known archaeological sites for the alternatives with wetland restoration plans include sites protected by levees and sites that would otherwise be destroyed by wetland loss.

Example 1: Results of GIS Analysis for archaeological sites in Planning Unit 1

The results of GIS analysis and calculation of the archaeological sites metric for Planning Unit 1 are presented in Table 2. The planning units, the alternatives, and scenarios are defined in the main report. A total of 488 known archeological sites are located within Planning Unit 1. As outlined above, the number of protected archeological sites is calculated for several casess, including the baseline and the alternatives. Table 2 includes (1) the estimated number of protected known sites, (2) the upper uncertainty limit, and (3) the lower uncertainty limit. The result illustrates a major contrast in the performance of the baseline and the alternative in their ability to protect archaeological sites. The majority of this difference is the result of no net land loss which factors into the calculation of the alternatives. The inclusion of a levee on the north shore of Lake Pontchatrain forms a second feature of some alternatives (Plans 2, 4, 11, 22, 31, 33).

Table 2 - Summary of Archeological Sites Protected by the Structural Alternatives for Planning Unit 1 and for input into the MCDA.

Structural Alternatives	Estimated number of protected known sites	Upper Uncertainty limit	Lower Uncertainty limit
Baseline	91	102	80
LP-1a-100-1 (Plan 18)	231	261	201
LP-1b-400-1 (Plan 25)	233	263	203
LP-1a-100-3 (Plan 22)	271	301	241
HL-1a-100-3 (Plan 4)	271	301	241
LP-1a-100-2 (Plan 20)	231	261	201
HL-1a-100-2 (Plan 2)	273	303	243
LP-1b-1000-1 (Plan 31)	273	303	243
LP-1b-400-3 (Plan 29)	233	263	203
HL-1b-400-3 (Plan 11)	273	303	243
LP-1b-1000-2 (Plan 33)	273	303	243

Historic Properties and Historic Districts

Calculating the number of protected known historic districts and historic properties makes use of the same process and is accomplished with the use of three GIS shapefiles. The first shapefile includes the location of known historic districts or historic properties; the second shapefile contains data on the location and depth of flooding from storm surges and levee overtopping; and the third shapefile is the CLEAR model. The CLEAR model is used in a similar manner as in the calculation of protected known archaeological sites (see above). The shapefile on the location and depth of flooding is based on hydrologic data that models storm surges, relative sea level rise, and levee overtopping. Buildings and structures form the vast majority of historic districts and properties, and buildings and structures have a greater potential than archaeological sites to be damaged or destroyed by flooding.

In order to calculate the number of historic districts and historic properties protected by the alternatives, the shapefile with flood data is queried. Three flood depths serve to define the estimated protected sites, upper and lower uncertainty numbers. The basic assumption is that when historic districts flood, the damage to buildings, structures, and other contributing elements of historic districts will cause loss of integrity. A historic property or historic district is considered protected when it lies outside of four feet of flooding. For the upper uncertainty limit, the site must lie outside of two feet of flooding; and for the lower uncertainty limit sites lay outside of six feet of flooding. In addition, the results are calculated for low and high relative sea level rise.

Example 2: Results of GIS Analysis for historic properties and historic districts in Planning Unit 1

Table 3 presents the results of GIS analysis of the protected known historic properties and historic districts for the MCDA inputs for Planning Unit 1. The comparison of the baseline to all other alternatives reveals that more historic properties and historic districts would be protected if

coastal land loss features are incorporated. However, since most historic districts and properties are located in locations of naturally high elevation or areas that have been protected by levees, the results presented in Table 3 reveal that few sites would be damaged or destroyed by land loss.

Table 3 - Summary of Historic Properties and Historic Districts Protected by the Structural Alternatives for Planning Unit 1 and for input into the MCDA.

	Historic Properties N= 165			Historic Districts N- 54		
Structural Alternatives	Protected Historic Properties	Upper limit	Lower limit	Protected Districts	Upper limit	Lower limit
Baseline	126	130	122	46	50	41
LP-1a-100-1 (Plan 18)	133	140	127	50	51	43
LP-1b-400-1 (Plan 25)	137	142	131	50	51	48
LP-1a-100-3 (Plan 22)	133	143	127	50	51	43
HL-1a-100-3 (Plan 4)	133	137	126	50	51	43
LP-1A-100-2 (Plan 20)	133	143	127	50	51	43
HL-1A-100-2 (Plan 2)	143	152	131	50	51	43
LP-1b-1000-1 (Plan 31)	137	142	131	50	51	48
LP-1b-400-3 (Plan 29)	146	149	141	50	51	48
HL-1b-400-3 (Plan 11)	143	143	140	50	51	48
LP-1b-1000-2 (Plan 33)	159	159	156	50	52	48

Consideration of Nonstructural alternatives

In addition to the structural alternatives, the implementation of nonstructural alternatives has the potential to impact cultural resources. The *Nonstructural Plan Component Appendix* presents a full discussion of the nonstructural measures. To summarize, nonstructural measures seek to identify secondary flood risk reduction measures that will reduce the risk of property damage and make communities safer from future hurricanes. Nonstructural measures target specific areas that are at a high risk of flooding or critical facilities necessary for community health and safety, particularly during an emergency event. The buy-out and relocation of communities forms a potential undertaking that will have impacts on communities. Given that this undertaking may apply to low-income or minority populations Environmental Justice issues emerge. Measures to improve critical facilities may involve altering buildings or adding to existing buildings. Some of the targeted critical facilities may be eligible for or listed on the National Register of Historic Places and will need to be considered under the National Historic Preservation Act and National Environmental Policy Act. For the purposes of this technical report this initial assessment of the impacts to cultural resources from the implementation of the nonstructural alternatives aims to identify the types of resources that could be affected. In addition, the Programmatic Environmental Impact Statement presents a plan for developing a framework for identifying low-income and minority populations and for identifying, assessing, and mitigating cultural resources impacted by nonstructural alternatives.

Buy-outs and relocations

Voluntary buy-out and relocation are the two nonstructural measures that could influence the most qualitative cultural impacts and severe effects on communities. Cultural impacts are changes to the "norms, values and beliefs" that guide individuals and help them to locate themselves in society (Barrow, 1997: 226). Assessing cultural impacts prior to implementation of a nonstructural program will help planners identify how buy-out or relocation may alter people's norms, values, and beliefs when faced with new situations such as immigration, contact with new groups, changes in economic opportunities, and so on.

Possible communities Impacted by relocation or raising in place

Community cohesion could be adversely affected by proposed buyouts in many locations in South Louisiana. Some possibilities include cultural impacts to subsistence fishermen of Yugoslavian heritage in Plaquemines Parish, and Isleños communities of Yscloskey, Regio, St. Bernard, and Toca in St. Bernard Parish. Grand Bayou in Plaquemines Parish is another community that will likely need to be assessed under Environmental Justice consideration prior to the implementation of nonstructural measures. Grand Bayou is an intercultural community of about 125 individuals that is composed of Atakapa, Houma, and Cajun heritage. Although this community is geographically dispersed along the coastal waterways and bayous, the Grand Bayou residents are a close-knit community built on familial and community networks that date back more than 300 years. Many of the residents rely on aquatic extractive activities such as shrimping, oystering, and trapping. Coastal erosion has threatened the economic options for many of the residents. The Louisiana State University Interdepartmental Disaster Science and Management program has been working with Grand Bayou in order to help preserve this traditional community and learn about local knowledge regarding disaster response. Additional communities that may need to be evaluated in terms of Environmental Justice include several Cajun fishing communities such as Il Caminada, that live within the vicinity of Grand Isle, and Native American groups such as the Lacombe Choctaw.

Critical facilities

Nonstructural alternatives also include improving critical facilities in order to provide secondary flood risk reduction, especially during emergencies. Improvements may involve relocating critical facilities, raising structures in place, wet or dry flood proofing, re-facing exteriors with brick, increasing the number of doorways or windows, transforming a ground floor to a lobby, or moving generators from the ground floor to an elevated floor. Since the nonstructural alternatives are unlikely to provide risk reduction to cultural resources in a comparable method as the structural measures, the potential impacts of nonstructural alternatives are not quantified and not factored into the cultural metrics in the MCDA. For the most part, historic buildings and historic districts form the cultural resources that have the greatest potential to be impacted by these types of building modifications.

The potential actions listed above have the potential to change the character of a structure. Prior to implementing these actions, the effects of these actions on historic properties must be evaluated as per 36 CFR 800.3(a). The Programmatic Environmental Impact Statement addresses processes for identifying impacts to historic buildings and districts. While some of the measures may change the character of a building, modifications and additions can also be

developed in order to retain historic character. If a proposed action relating to improving a facility has the potential to cause effects to historic properties then mitigation measures will need to be employed. Depending on the effects, mitigation as specified in a Memorandum of Agreement of Programmatic Agreement, could involve documenting the structure with a Historic Architectural Building Survey and/or a Historic Architectural Engineering Record (HABS/HAER), using construction materials that meet both flood requirements and provide in-kind replacement, or other mitigation measures.

REVIEW

The cultural appendix presents ongoing analysis of cultural resources within the LACPR planning area. The location of cultural resources, such as archeological sites, historic districts, National Historic Register Properties, and National Historic Landmarks, are examined in proximity to structural alternatives in order to determine a number of known sites protected by each alternative. This information is then incorporated into the MCDA. In addition, the impact of nonstructural alternatives are explored in order to identify affects to traditional and ethnic communities within the LACPR planning area.

BIBLIOGRAPHY

Longstreth, Richard
2006. The Difficult Legacy of Urban Renewal. In *CRM: The Journal of Heritage Stewardship*. Volume 3(1).

Twilley, R.R. and J. Barras.
2003. Formulation of the CLEAR LCA Model, Chapter 2. In, R.R. Twilley (ed.), Coastal Louisiana Ecosystem Assessment and Restoration (CLEAR) Model of Louisiana Coastal Area (LCA) Comprehensive Ecosystem Restoration Plan. Volume I: Task 1-8. Final Report to Department of Natural Resources, Coastal Restoration Division, Baton Rouge, LA. Contract No. 2511-02-24. 319 pp

Barrow, Christopher .J.
1997. Environmental and Social Impact Assessment: An Introduction. London: Arnold.