Appendix P

WETLAND VALUE ASSESSMENT

MODIFICATIONS TO THE PROJECT

Since the completion of the Wetland Value Assessment analysis described in this appendix, Alternative B, which has been selected as the Recommended Plan, has been modified per the following.

Actions that have been removed from the project:

- CDF D/E marsh expansion has been eliminated
- CDF D/E upland expansion has been eliminated
- CDF 17/19 expansion into Calcasieu Lake has been eliminated

Actions that have been modified:

- CDFs 17 and 19 are expanded westward to the foreshore dike
- CDF 22 is expanded to the south
- CDF 22 is expanded westward to the foreshore dike

WETLAND VALUE ASSESSMENT
Results and Methodology

Calcasieu River and Pass, Louisiana Project
Dredged Material Management Plan/Supplemental Environmental Impact statement

1.0 INTRODUCTION

The Calcasieu River and Pass ("Calcasieu Ship Channel") spans 36 miles from Lake Charles, Louisiana, to the Gulf of Mexico and handles about 50 million tons of cargo through deep-draft and shallow-draft vessels and barges every year. Unfortunately, dredged material disposal capacity is inadequate for maintaining the channel to federally authorized dimensions. Therefore, under U.S. Army Corps of Engineers (USACE) guidance, an integrated DMMP/SEIS has been developed to identify and evaluate sites for the placement of material dredged from the ship channel.

The sites identified in the DMMP/SEIS include rehabilitated and/or expanded confined disposal facilities (CDFs) and beneficial use (BU) sites. BU sites are areas where dredged material would be used to restore coastal marsh that has been lost to open water due to erosion, subsidence, sea-level rise, and other factors. A CDF is an engineered structure for the containment of dredged material. Dredged material placed in CDFs is consolidated and de-watered to maximize capacity, resulting in the formation of upland habitat.

Wetland Value Assessments (WVAs) have been prepared for all BU and CDF sites in the DMMP/SEIS that are expected to create or impact wetlands in the project area. A WVA is a quantitative, habitat-based assessment developed to estimate anticipated environmental impacts and benefits to wetlands. The WVA is a modification of the Habitat Evaluation Procedure (HEP) developed by the U.S. Fish and Wildlife Service (USFWS). HEP is widely used by the USFWS and other federal and state agencies in evaluating the impact of development projects on fish and wildlife resources. A notable difference exists between the two methodologies, however, in that HEP generally uses a species-oriented approach, whereas the WVA uses a community or habitat-level approach.

The assessment found that a net benefit of 1,259.68 average annual habitat units (AAHUs) would result upon implementation of Plan B. Plan C would produce a net benefit of 2,035.08 AAHUs.

2.0 METHODOLOGY

The WVA methodology relies on the use of the Coastal Marsh Community Models, which were developed by the Coastal Wetlands Planning, Protection, and Restoration Act (CWPPRA) Environmental Work Group (EnvWG) to determine the suitability of marsh and open water habitats in the Louisiana coastal zone. The purpose of the WVA is to define an optimal combination of habitat conditions for all fish and wildlife species living in Louisiana coastal marsh ecosystems. Sections 2.1 – 2.4 below explain the methodology used to derive the Coastal Marsh Community Models. They are excerpts from the CWPPRA EnvWG Wetland Value Assessment Methodology for Coastal Marsh Community Models (Roy, 2007, pages 2 - 9). Please refer to that document for more information.

2.1. Variable Selection

Variables for the coastal marsh models were selected through a two-part procedure. The first involved a listing of environmental variables thought to be important in characterizing fish and wildlife habitat in coastal marsh ecosystems. The second part of the selection procedure involved reviewing variables used in species-specific habitat suitability index (HSI) models published by the USFWS. Review was limited to HSI models for those fish and wildlife species known to inhabit Louisiana coastal wetlands, and included models for 10 estuarine fish and shellfish, 4 freshwater fish, 12 birds, 3 reptiles and amphibians, and 3 mammals (Table 1). The number of models included from each species group was dictated by model availability.

Selected HSI models were then grouped according to the marsh type(s) used by each species. Because most species are not restricted to one marsh type, most models were included in more than one marsh type group. Within each wetland type group, variables from all models were then grouped according to similarity (e.g., water quality, vegetation, etc.). Each variable was evaluated based on 1) whether it met the variable selection criteria; 2) whether another, more easily measured/predicted variable in the same or a different similarity group functioned as a surrogate; and 3) whether it was deemed suitable for the WVA application (e.g., some freshwater fish model variables dealt with riverine or lacustrine environments). Variables that did not satisfy those conditions were eliminated from further consideration. The remaining variables, still in their similarity groups, were then further eliminated or refined by combining similar variables and/or culling those that were functionally duplicated by variables from other models (i.e., some variables were used frequently in different models in only slightly different format).

Table 1. HSI Models Consulted for Variables for Possible Use in the Coastal Marsh Models

Estuarine Fish and Shellfish	Birds	Mammals
pink shrimp	white-fronted goose	mink
white shrimp	clapper rail	muskrat
brown shrimp	great egret	swamp rabbit
spotted seatrout	northern pintail	
Gulf flounder	mottled duck	Freshwater Fish
southern flounder	American coot	channel catfish
Gulf menhaden	marsh wren	largemouth bass
juvenile spot	snow goose	red ear sunfish
juvenile Atlantic croaker	great blue heron	bluegill
red drum	laughing gull	
	red-winged blackbird	

Reptiles and Amphibians	roseate spoonbill
bullfrog	
slider turtle	
American alligator	

Source: Roy (2007) for the CWPPRA Environmental Work Group

Variables selected from the HSI models were then compared to those identified in the first part of the selection procedure to arrive at a final list of variables to describe wetland habitat quality. That list includes six variables for each marsh type:

1. Percent of the wetland covered by emergent vegetation,
2. Percent of the open water covered by aquatic vegetation,
3. Marsh edge and interspersion,
4. Percent of the open water area $\leq$ 1.5 feet deep,
5. Salinity, and
6. Aquatic organism access.

2.2 Suitability Index (SI) Graph Development

A variety of resources was utilized to construct each SI graph, including the HSI models from which the final list of variables was partially derived, consultation with other professionals and researchers outside the EnvWG, published and unpublished data and studies, and personal knowledge of EnvWG members. An important "non-biological" constraint on SI graph development was the need to insure that graph relationships were not counter to the purpose of the CWPPRA, that is, the long term creation, restoration, protection, or enhancement of coastal vegetated wetlands. That constraint was most operative in defining SI graphs for Variable V_1 (percent emergent marsh). The process of SI graph development was one of constant evolution, feedback, and refinement; the form of each SI graph was decided upon through consensus among EnvWG members.

The Suitability Index graphs were developed according to the following assumptions.

Variable V_1 - Percent of wetland area covered by emergent vegetation. Persistent emergent vegetation plays an important role in coastal wetlands by providing foraging, resting, and breeding habitat for a variety of fish and wildlife species; and by providing a source of detritus and energy for lower trophic organisms that form the basis of the food chain. An area with no emergent vegetation (i.e., shallow open water) is assumed to have minimal habitat suitability in terms of this variable, and is assigned an SI of 0.1.

Optimal vegetative coverage is assumed to occur at 100 percent (SI=1.0). That assumption is dictated primarily by the constraint of not having graph relationships conflict with the CWPPRA's purpose of long term creation, restoration, protection, or enhancement of vegetated wetlands. The EnvWG had originally developed a strictly biologically-based graph defining optimal habitat conditions at marsh cover values between 60 and 80 percent, and sub-optimal habitat conditions outside that range. However, application of that graph, in combination with the time analysis used in the evaluation process (i.e., 20-year project life), often reduced project benefits or generated a net loss of habitat quality through time with the project. Those situations arose primarily when: existing (baseline) emergent vegetation cover exceeded the optimum (> 80 percent); the project was predicted to maintain baseline cover values; and without the project the marsh was predicted to degrade, with a concurrent decline in percent emergent vegetation into the optimal range (60-80 percent). The time factor aggravated the situation when the without-project degradation was not rapid enough to reduce marsh cover values significantly below the optimal range, or below the baseline SI, within the 20-year evaluation period. In those cases, the analysis would show net negative benefits for the project, and positive benefits for letting the marsh degrade rather than maintaining the existing marsh. Coupling that situation with the presumption that marsh conditions are not static, and that Louisiana will continue to lose coastal emergent marsh; and taking into account the purpose of the CWPPRA, the EnvWG decided that, all other factors being equal, the models should favor projects that maximize emergent marsh creation, maintenance, and protection. Therefore, the EnvWG agreed to deviate from a strictly biologically-based habitat suitability index graph for V_1 and established optimal habitat conditions at 100 percent marsh cover.

Variable V_2 - Percent of open water area covered by aquatic vegetation. Fresh and intermediate marshes often support diverse communities of floating-leaved and submerged aquatic plants that provide important food and cover to a wide variety of fish and wildlife species. A fresh/intermediate open water area with no aquatics is assumed to have low suitability (SI=0.1). Optimal conditions (SI=1.0) are assumed to occur when 100 percent of the open water is dominated by aquatic vegetation. Habitat suitability may be assumed to decrease with aquatic plant coverage approaching 100 percent due to the potential for mats of aquatic vegetation to hinder fish and wildlife utilization; to adversely affect water quality by reducing photosynthesis by phytoplankton and other plant forms due to shading; and contribute to oxygen depletion spurred by warm-season decay of large quantities of aquatic vegetation. The EnvWG recognized, however, that those effects were highly dependent on the dominant aquatic plant species, their growth forms, and their arrangement in the water column; thus, it is possible to have 100 percent cover of a variety of floating and submerged aquatic plants without the above-mentioned problems due to differences in plant growth form and stratification of plants through the water column. Because predictions of which species may dominate at any time in the future would be tenuous, at best, the EnvWG decided to simplify the graph and define optimal conditions at 100 percent aquatic cover.

Brackish marshes also have the potential to support aquatic plants that serve as important sources of food and cover for several species of fish and wildlife. Although brackish marshes generally do not support the amounts and kinds of aquatic plants that occur in fresh/intermediate marshes, certain species, such as widgeon-grass, and coontail and milfoil in lower salinity brackish marshes, can occur abundantly under certain conditions. Those species, particularly widgeon-grass, provide important food and cover for many species of fish and wildlife. Therefore, the V_2 Suitability Index graph in the brackish marsh model is identical to that in the fresh/intermediate model.

Some low-salinity saline marshes may contain beds of widgeon-grass and open water areas behind some barrier islands may contain dense stands of seagrasses (e.g., *Halodule wrightii* and *Thalassia testudinum*). However, saline marshes typically do not contain an abundance of aquatic vegetation as often found in fresh/intermediate and brackish marshes. Open water areas in saline marshes typically contain sparse aquatic vegetation and are primarily important as nursery areas for marine organisms. Therefore, in order to reflect the importance of those open water areas to marine organisms, a saline marsh lacking aquatic vegetation is assigned a SI=0.3. It is assumed that optimal coverage of aquatic plants occurs at 100 percent.

Variable V_3 - Marsh edge and interspersion. This variable takes into account the relative juxtaposition of marsh and open water for a given marsh:open-water ratio, and is measured by comparing the project area to sample illustrations (Figures 1 - 4) depicting different degrees of interspersion. Interspersion is assumed to be especially important when considering the value of an area as foraging and nursery habitat for freshwater and estuarine fish and shellfish; the marsh/open water interface represents an ecotone where prey species often concentrate, and where post-larval and juvenile organisms can find cover. Isolated marsh ponds are often more productive in terms of aquatic vegetation than are larger ponds due to decreased turbidity, and, thus, may provide more suitable waterfowl habitat. However, interspersion can be indicative of marsh degradation, a factor taken into consideration in assigning suitability indices to the various interspersion classes.

A relatively high degree of interspersion in the form of stream courses and tidal channels (Interspersion Class 1) is assumed to be optimal (SI=1.0); streams and channels offer interspersion, yet are not indicative of active marsh deterioration. Areas exhibiting a high degree of marsh cover are also ranked as optimal, even though interspersion may be low, to avoid conflicts with the premises underlying the SI graph for variable V_1. Without such an allowance, areas of relatively healthy, solid marsh, or projects designed to create marsh, would be penalized with respect to interspersion. Numerous small marsh ponds (Interspersion Class 2) offer a high degree of interspersion, but are also usually indicative of the beginnings of marsh break-up and degradation, and are therefore assigned a more moderate SI of 0.6. Large ponds and other open water areas with little surrounding marsh (Interspersion Classes 3 and 4) offer lower interspersion values and usually indicate advanced stages of marsh loss, and are thus assigned SIs of 0.4 and 0.2, respectively. The lowest expression of interspersion, Class 5, is characterized by very small marsh islands (i.e., less then 5% emergent marsh) or areas made up entirely of open water. Class 5 is assumed to be least desirable and is assigned an SI=0.1.

Figure 1. Marsh edge and interspersion Class 1.
Source: Roy (2007) for the CWPPRA Environmental Work Group

Figure 2. Marsh edge and interspersion Class 2.
Source: Roy (2007) for the CWPPRA Environmental Work Group

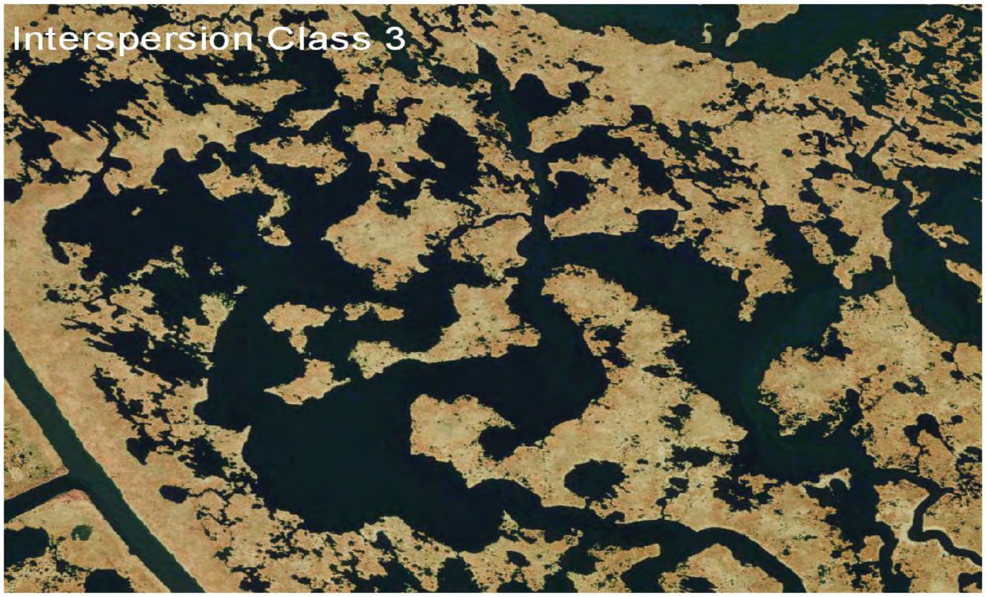


Figure 3. Marsh edge and interspersion Class 3.
Source: Roy (2007) for the CWPPRA Environmental Work Group

Figure 4. Marsh edge and interspersion Class 4.
Source: Roy (2007) for the CWPPRA Environmental Work Group

Variable V_4 - Percent of open water area ≤ 1.5 feet deep in relation to marsh surface. Shallow water areas are assumed to be more biologically productive than deeper water due to a general reduction in sunlight, oxygen, and temperature as water depth increases. Also, shallower water provides greater bottom accessibility for certain species of waterfowl, better foraging habitat for wading birds, and more favorable conditions for aquatic plant growth. Optimal open water conditions in a fresh/intermediate marsh are assumed to occur when 80 to 90 percent of the open water area is less than or equal to 1.5 feet deep. The value of deeper areas in providing drought refugia for fish, alligators and other marsh life is recognized by assigning an SI=0.6 (i.e., sub-optimal) if all of the open water is less than or equal to 1.5 feet deep.

Shallow water areas in brackish marsh habitat are also important. However, brackish marsh generally exhibits deeper open water areas than fresh marsh due to tidal scouring. Therefore, the SI graph is constructed so that lower percentages of shallow water receive higher SI values relative to fresh/intermediate marsh. Optimal open water conditions in a brackish marsh are assumed to occur when 70 to 80 percent of the open water area is less than or equal to 1.5 feet deep.

The SI graph for the saline marsh model is similar to that for brackish marsh, where optimal conditions are assumed to occur when 70 to 80 percent of the open water area is less than or equal to 1.5 feet deep. However, at 100 percent shallow water, the saline graph yields an SI= 0.5 rather than 0.6 as for the brackish model. That change reflects the increased abundance of tidal channels and generally deeper water conditions prevailing in a saline marsh due to increased tidal influences, and the importance of those tidal channels to estuarine organisms.

Variable V_5 - Salinity. It is assumed that periods of high salinity are most detrimental in a fresh/intermediate marsh when they occur during the growing season (defined as March through November, based on dates of first and last frost contained in Natural Resource Conservation Service soil surveys for coastal Louisiana). Therefore, mean salinity during the growing season (March-November) is used as the salinity parameter for the fresh/intermediate marsh model. Optimal conditions in fresh marsh are assumed to occur when mean salinity during the growing season is 0.5 parts per thousand (ppt) or less. Optimal conditions in intermediate marsh are assumed to occur when mean salinity during the growing season is 2.5 ppt or less.

For the brackish and saline marsh models, average annual salinity is used as the salinity parameter. The SI graph for brackish marsh is constructed to represent optimal conditions when salinities are between 0 ppt and 10 ppt. The EnvWG acknowledges that average annual salinities below 5 ppt will effectively define a marsh as fresh or intermediate, not brackish. However, the SI graph makes allowances for lower salinities to account for occasions when there is a trend of decreasing salinities through time toward a more intermediate condition. Implicit in keeping the graph at optimum for salinities less than 5 ppt is the assumption that lower salinities are not detrimental to a brackish marsh. However, average annual salinities greater than 10 ppt are assumed to be progressively more harmful to brackish marsh vegetation. Average annual salinities greater than 16 ppt are assumed to be representative of those found in a saline marsh, and thus are not considered in the brackish marsh model.

The SI graph for the saline marsh model is constructed to represent optimal salinity conditions at between 0 ppt and 21 ppt. The EnvWG acknowledges that average annual salinities below 10 ppt will effectively define a marsh as brackish, not saline. However, the suitability index graph makes allowances for lower salinities to account for occasions when there is a trend of decreasing salinities through time toward a more brackish condition. Implicit in keeping the graph at optimum for salinities less than 10 ppt is the assumption that lower salinities are not detrimental to a saline marsh. Average annual salinities greater than 21 ppt are assumed to be slightly stressful to saline marsh vegetation.

Variable V_6 - Aquatic organism access. Access by aquatic organisms, particularly estuarine-dependent fishes and shellfishes, is considered to be a critical component in assessing the quality of a given marsh system. Additionally, a marsh with a relatively high degree of access by default also exhibits a relatively high degree of hydrologic connectivity with adjacent systems, and therefore may be considered to contribute more to nutrient exchange than would a marsh exhibiting a lesser degree of access. The SI for V_6 is determined by calculating an "access value" based on the interaction between the percentage of the project area wetlands considered accessible by aquatic organisms during normal tidal fluctuations, and the type of man-made structures (if any) across identified points of ingress/egress (bayous, canals, etc.). Standardized procedures for calculating the Access Value have been established and are based on the structure ratings shown in Table XX. It should be noted that access ratings for man-made structures were determined by consensus among EnvWG members and that scientific research has not been conducted to determine the actual access value for each of those structures. Optimal conditions are assumed to exist when all of the study area is accessible and the access points are entirely open and unobstructed.

Table 2. Structure Types for Determining Aquatic Organism Access Values

Structure Type	Structure Rating
Open system	1.0
Rock weir set at 1ft below marsh level (BML), w/ boat bay	0.8
Rock weir with boat bay	0.6
Rock weir set at $\geq$ 1 ft BML	0.6
Slotted weir with boat bay	0.6
Open culverts	0.5
Weir with boat bay	0.5
Weir set at $\geq$ 1 ft BML	0.5
Slotted weir	0.4
Flap-gated culvert with slotted weir	0.35
Variable crest weir	0.3
Flap-gated variable crest weir	0.25
Flap-gated culvert	0.2
Rock weir	0.15
Fixed crest weir	0.1
Solid plug	0.0001

Source: Roy (2007) for the CWPPRA Environmental Work Group

A fresh marsh with no access is assigned an SI=0.3, reflecting the assumption that, while fresh marshes are important to some species of estuarine-dependent fishes and shellfish, such a marsh lacking access continues to provide benefits to a wide variety of other wildlife and fish species, and is not without habitat value. An intermediate marsh with no access is assigned an SI=0.2, reflecting that intermediate marshes are somewhat more important to estuarine-dependent organisms than fresh marshes. The general rationale and procedure behind the V_6 Suitability Index graph for the brackish marsh model is identical to that established for the fresh/intermediate model. However, brackish marshes are assumed to be more important as habitat for estuarine-dependent fish and shellfish than fresh/intermediate marshes. Therefore, a brackish marsh providing no access is assigned an SI of 0.1. The Suitability Index graph for aquatic organism access in the saline marsh model is the same as that in the brackish marsh model.

2.3 Habitat Suitability Index Formulas

In developing the HSI formulas, the EnvWG recognized that the primary focus of the CWPPRA is on vegetated wetlands, and that some marsh protection strategies could have adverse impacts to aquatic organism access. Therefore, the EnvWG made an *a priori* decision to emphasize variables V_1, V_2, and V_6 by grouping them together, when possible, and weighting them greater than the remaining variables. Weighting was facilitated by treating the grouped variables as a geometric mean. Variables V_3, V_4, and V_5 were grouped to isolate their influence relative to V_1, V_2, and V_6.

For all marsh models, V_1 receives the strongest weighting. The relative weights of V_1, V_2, and V_6 differ by marsh model to reflect differing levels of importance for those variables between the marsh types. For example, the amount of aquatic vegetation was deemed more important in a fresh/intermediate marsh than in a saline marsh, due to the relative contributions of aquatic vegetation between the two marsh types in terms of providing food and cover. Therefore, V_2 receives more weight in the fresh/intermediate HSI formula than in the saline HSI formula. Similarly, the degree of aquatic organism access was considered more important in a saline marsh than a fresh/intermediate marsh, and V_6 receives more weight in the saline HSI formula than in the fresh/intermediate formula. As with the Suitability Index graphs, the Habitat Suitability Index formulas were developed by consensus among the EnvWG members.

For several years, 1991 through 1996, the EnvWG utilized one HSI formula specific to each marsh type. However, it was noted that variables V_2 and V_4, which characterize open water areas only, often resulted in an "artificially inflated" HSI when those variable values were optimal (i.e., SI = 1.0) and open water comprised a very small portion of the project area. For example, Project Area A contains 90 percent marsh and 10 percent open water. Project Area B contains 10 percent marsh and 90 percent open water. Assume the open water in each project area is completely covered by submerged aquatic vegetation and is entirely less than 1.5 feet in depth. Under those conditions, the Suitability Index values for V_2 and V_4 would equal 1.0 for both project areas even though open water only accounts for 10 percent of Project Area A. The EnvWG has commonly referred to this as a "scaling" problem; the Suitability Index values for V_2 and V_4 are not "scaled" in respect to the proportion of the project area they characterize. This allows those variables to contribute disproportionately to the HSI in instances when open water constitutes a small portion of the project area.

The EnvWG acknowledged that the scaling problem presented a flaw in the WVA methodology resulting in unrealistic HSI values for certain project areas and eventually resulting in inflated wetland benefits for those projects. During 1996 and 1997, Dr. Gary Shaffer of Southeastern Louisiana University assisted the EnvWG in developing potential solutions to the scaling problem. After several unsuccessful attempts to develop a single HSI formula for each marsh type which scaled the Suitability Index values for V_2 and V_4 based on the ratio of marsh to open water, the EnvWG decided to develop a "split" model for each marsh type. The split model utilizes two HSI formulas for each marsh type; one HSI formula characterizes the emergent habitat within the project area and another HSI formula characterizes the open water habitat. The HSI formula for the emergent habitat contains only those variables important in assessing habitat quality for marsh (i.e., V_1, V_3, $V_{5,}$ and V_6). Likewise, the open water HSI formula contains only those variables important in characterizing the open water habitat (i.e., V_2, V_3, V_4, $V_{5,}$ and V_6). Individual HSI formulas were developed for marsh and open water habitats for each marsh type.

As with the development of a single HSI model for each marsh type, the split models follow the same conventions for weighting and grouping of variables as previously discussed.

2.4 Benefit Assessment

As previously discussed, the marsh models are split into marsh and open water components and an HSI is determined for both. Subsequently, net AAHUs are also determined for the marsh and open water habitats within the project area. Net AAHUs for the marsh and open water habitat components must be combined to determine total net benefits for the project.

The primary focus of the CWPPRA is on vegetated wetlands. Therefore, in order to place greater emphasis on wetland benefits to marsh, a weighted average of the net benefits (net AAHUs) for marsh and open water is calculated with the marsh AAHUs weighted proportionately higher than the open water AAHUs. The weighted formulas to determine net AAHUs for each marsh type are shown below:

Fresh Marsh: $$\frac{2.1(\text{Marsh AAHUs}) + \text{Open Water AAHUs}}{3.1}$$

Brackish Marsh: $$\frac{2.6(\text{Marsh AAHUs}) + \text{Open Water AAHUs}}{3.6}$$

Saline Marsh: $$\frac{3.5(\text{Marsh AAHUs}) + \text{Open Water AAHUs}}{4.5}$$

3.0 FEATURES AND ASSUMPTIONS OF THE CURRENT PROJECT

WVAs were prepared for each of the 20 dredged material placement sites identified in the DMMP/SEIS that would affect marsh and estuarine habitat (Attachment 1). An explanation of assumptions specific to each of the 20 placement sites accompanies each WVA. Salinity, water depth, and other characteristics specific to each site, such as nearby restoration projects that would impact aquatic organism access, are included in the assumption explanation for each site. The cubic yardage of dredged material allocated for each placement site (see Section 2 of the DMMP/SEIS) was used along with average water depth data to estimate the amount of marsh habitat that may be created as a result of the project. General features and assumptions that would apply to all of the 20 placement sites are explained below in Section 3.1.

3.1 Beneficial Use Sites

Most BU sites were, at the time of report preparation, privately owned. Four of the sites are located in the Sabine and Cameron Prairie National Wildlife Refuges (NWRs). Privately owned BU sites would be confined by dikes constructed to contain the dredged materials. An earthen containment dike would be constructed around an open-water area of a few hundred acres at a time to form a "cell." The cell would then be filled to capacity with dredged material, which would consolidate to form a substrate for the establishment of intertidal marsh. Additional cells would be constructed at the site for subsequent dredging cycles. A WVA was prepared for each cell to identify marsh and estuarine habitat improvements as a result of dredged material placement.

The dikes around the cells would be designed to slowly deteriorate and subside to the level of the adjacent marsh substrate, thereby promoting the tidal exchange of water. Earthen dikes may require mechanical degradation to the settled elevations of the disposal area if natural erosive processes do not degrade them sufficiently to meet fisheries and tidal access needs. Such breaches would be undertaken after consolidation of the dredged sediments and vegetative colonization of the exposed soil surface—approximately two to five years after pumping. For the purposes of the WVAs, it was assumed that dikes would be degraded 3 years after the last pumping event for the respective cell.

The WVAs assumed that dikes would not be constructed around the four BU sites in the NWRs. These include BU sites 5 and 18 (Sabine NWR) and BU sites 19 and 20 (Cameron Prairie NWR). Material would be allowed to flow unconfined to nourish existing marsh, create new marsh, and create shallow open water habitat.

The following features are applicable to both private and public BU sites:

- Dredge material slurry would be allowed to overflow existing emergent marsh vegetation within the project area, but would not be allowed to exceed a height of approximately one-foot above the existing marsh elevation. Tidal inlets and channels may be created during the pumping of dredge material and by natural tidal fluctuations.

- The target elevation of placed and consolidated fill at each BU site—both public and privately owned sites—would be determined through geotechnical analyses during the preparation of plans and specifications for the project. These analyses would consider long-term settlement of the dredged materials and placement area foundations, as well as elevation surveys of the nearby planned wetland habitat to determine the appropriate target range. These elevation targets would be coordinated with resource agencies prior to construction.

- Vegetation of marsh areas would rely on natural recruitment. However, marsh vegetation, such as *Spartina alterniflora*, may be planted by other agencies and organizations as desired. Aerial photography would be used to monitor changes in emergent marsh acreage on a yearly basis. If necessary, trenasses would be constructed to ensure tidal flow and organism ingress and egress throughout the project area. However, these WVAs do not take the possibility of trenass construction into account.

3.2 CDF Expansions

In addition to BU sites, the placement sites identified in the DMMP/SEIS include rehabilitated and/or expanded CDFs. The goal of CDF construction/expansion is to maximize the available site capacity by improving surface drainage, desiccation, shrinkage, and consolidation of dredged material within the site. This would be accomplished by installing spillboxes, weirs, and other dewatering structures and constructing an extensive network of shallow ditches that would lower the water table within the dredged material. Once evaporation and shrinkage reaches the point where the material has dried to the bottom of the trenches, a dragline and ditcher would deepen the trenches. This procedure would be repeated until the material has dried and become entirely crust. Vegetation would not be planted and vegetative establishment of the upland area would rely on natural recruitment.

In order to sustain future maintenance and operation of the ship channel, it may be necessary to expand some of the existing CDFs identified in the DMMP/SEIS in areas where additional lands or beneficial use placement options are not available. The initial assessment of the 20-year dredged material disposal capacity does not indicate that expansion of CDF sites would be necessary in the near future. However, if additional placement capacity is needed, the following CDFs would be expanded into adjacent marsh and/or estuarine habitat: CDFs 17/19 and D/E.

Dredged sediments pumped into the horizontally expanded areas of the CDFs would be confined by an earthen containment dike constructed one year prior to pumping. It is estimated that the containment features would be approximately 250’ wide to account for the possible inclusion of stability berms and a borrow canal. Actual footprints would be generated during geotechnical investigations. Once diked, the expanded areas would be filled to capacity with dredged material, which would consolidate to form an upland habitat. A WVA was prepared for each CDF expansion area to assess impacts to marsh and estuarine habitat.

4.0 RESULTS

The WVA models forecast the net marsh and estuarine habitat benefits of implementing Plans B and C starting the year project construction begins and ending 50 years after the start of the project. Tables 3 and 4 show a summary of the net benefits of Plans B and C.

Results show that in spite of habitat loss associated with CDF expansions into adjacent marsh and estuarine habitat, Plan B would cause a net increase of 1,259.68 AAHUs because of the beneficial use of dredged material planned for this alternative. A total capacity of 9,550 acres would be potentially usable for the beneficial use of dredged material during the 20-year life of the project. The WVAs estimated the acreage of marsh that may be created as a result of the project based on cubic yardage allocated for each site in the DMMP/SEIS along with water depth data. Using the WVA methodology, it is estimated that approximately 6,306 acres of marsh and estuarine habitat would be created as a result of the plan. If, in the future, more dredged material becomes available for beneficial use, it is assumed that more habitat acreage would be created within the boundaries of the BU sites identified in the DMMP/SEIS.

Because Plan C involves no CDF expansions and more beneficial use sites than Plan B, Plan C would create more habitat benefits than Plan B. Plan C would cause a net increase of 2,035.08 AAHUs and would create an estimated 10,030 acres of marsh and estuarine habitat. A total of 17,901 acres would be potentially useable for the beneficial use of dredged material over the life of the project.

Table 3. Acreage and AAHU Impacts of Plan B

Site	Acreage Available for Beneficial Use of Dredged Material	Marsh Created (acres)	Marsh Converted to Uplands (acres)	Open Water/Estuarine Habitat Converted to Uplands (acres)	Total AAHU
BU 5	3,083	3,000	0	0	500.37
BU 18	1,572	1,000	0	0	129.83
BU 19	1,026	300	0	0	70.36
BU 20	1,867	300	0	0	63.33
BU 49	639	600	0	0	167.61
BU 50	887	640	0	0	251.67
CDF D/E marsh expansion	476	466	0	0	121.98
CDF D/E upland expansion	0	0	7	286	-21.31
CDF 17/19 upland expansion	0	0	61	157	-24.16
Totals	**9,550**	**6,306**	**68**	**443**	**1,259.68**

Table 4. Acreage and AAHU Impacts of Plan C

Site	Acreage Available for Beneficial Use of Dredged Material	Marsh Created (acres)	Marsh Converted to Uplands (acres)	Open Water/Estuarine Habitat Converted to Uplands (acres)	Total AAHU
BU 4	1,279	476	0	0	165.17
BU 5	3,083	3,000	0	0	500.37
BU 6	990	564	0	0	104.45
BU 7	2,498	1,694	0	0	246.39
BU 18	1,572	1,000	0	0	129.83
BU 19	1,026	300	0	0	70.36

BU 20	1,867	300	0	0	63.33
BU 24	2,327	490	0	0	97.01
BU 48	1,475	708	0	0	162.75
BU 49	639	600	0	0	167.61
BU 50	887	640	0	0	251.67
BU 52	258	258	0	0	76.14
Totals	**17,901**	**10,030**	**0**	**0**	**2,035.08**

5.0 REFERENCES

Chabreck, R. and G. Linscombe. 1997. Vegetative type map of the Louisiana coastal marshes. Louisiana Department of Wildlife and Fisheries, Baton Rouge, Louisiana.

Louisiana Coastal Wetlands Conservation and Restoration Task Force and the Wetlands Conservation and Restoration Authority. 1998. Coast 2050: Toward a Sustainable Coastal Louisiana. Louisiana Department of Natural Resources. Baton Rouge, Louisiana.

Roy, K. 2007. Wetland Value Assessment Methodology – Coastal Chenier/Ridge Community Model. Coastal Wetlands Planning, Protection, and Restoration Act (CWPPRA), Lafayette, Louisiana.

Roy, K. 2007. Wetland Value Assessment Methodology – Coastal Marsh Community Models. Coastal Wetlands Planning, Protection, and Restoration Act (CWPPRA), Lafayette, Louisiana.

Beneficial Use Site 4

Beneficial Use (BU) Site 4 (Palermo Property--Brown Lake)

I. Project Location/Area

This Wetland Value Assessment (WVA) focuses on BU Site 4 (Figure 1), which is owned by the Palermo family near Brown Lake. This 1280-acre area is located about one mile west of the ship channel and one mile south of the GIWW.

II. Goals

Approximately 1.9 million cubic yards of material would be dredged from the Calcasieu Ship Channel (between miles 16 and 21) and placed in the area through two pumping cycles to create approximately 475 acres of intertidal, brackish marsh and estuarine habitat in BU site 4. The marsh and estuarine habitat created would achieve a ratio of 85% marsh to 15% shallow open water.

III. Project Features

Previously, the Corps created several dredge material containment cells in the project area. These cells can be identified in aerial photographs as three linear uniform disposal cell features. The proposed cells will be positioned adjacent to existing marsh in open water and will not incorporate the previously constructed disposal cells.

Dredged sediments pumped into BU 4 would be confined by dikes constructed to contain the dredged materials. Approximately 950,000 cyds would be pumped in each cycle, creating two 238-acre cells. To assess habitat benefits, a WVA was prepared for both of the two pumping cycles. For the purposes of this assessment, it is assumed that dikes would be degraded 3 years after the last pumping event for the respective cell.

IV. WVA Variables and Assumptions

The following is a description of assumptions for both of the two dredging cycles (cells). The same assumptions apply to both cycles, but target years (i.e., years that dikes would be constructed and dredged material pumped) would differ between the two.

Cycle 1

Variable 1 – Emergent Vegetation

FWOP: There is no marsh in the open water areas where the cells would be constructed.

FWP: To estimate the potential amount of marsh acres that could be created with the dredged material, the CWPPRA Sabine Refuge Marsh Creation (CS-28), Cycle 1 project was used as a reference site. That project created marsh by pumping material into an area confined by earthen dikes. It was found that approximately 4,000 cyds of dredge material created 1 acre of marsh.

A total of 950,000 cyds of dredged material will be pumped into the Cycle 1 238-acre cell.

→ 950,000 cyds / 4,000 cyds per acre = 238 acres

Based on USACE knowledge and experience of dredging operations, a maximum of 85% of this material will form into vegetated marsh, and the remaining 15% of the area would be shallow open water (also called mudflats). It would take several years for the dredged material to vegetate into marsh. Vegetation would not be planted, but would be allowed to form naturally. The following assumptions are used for marsh creation with natural recruitment:

Target Year (TY) 0: 0 acres of existing marsh
TY 9: 0 acres of existing marsh
TY 10 (dike and pump year): 10% of the dredged material would be marsh (.10*238ac=24ac of marsh)
TY 12 (2 years after pumping): 30% marsh (.3 * 238ac = 71ac of marsh)
TY 14 (4 years after pumping): 85% marsh (.85 * 238ac = 202ac. of marsh)

Marsh loss data was obtained from the Louisiana Coastal Area project report *Coast 2050: Toward a Sustainable Coastal Louisiana* (1998), Appendix F. The loss rate of -0.0045 is used for future-without-project (FWOP). Without the project, there would be no marsh restoration in this project area, so the loss rate would not apply. However, for the future-with-project (FWP) scenario, loss rates would apply after the material is pumped and the dike degraded. Marsh created in a confined area would likely differ in some aspects from naturally occurring marsh: it would be slightly higher in elevation than natural marsh, and its density would differ from natural marsh due to consolidation and type of material. Therefore, the loss rate that would be applied would differ as well; it would be reduced by 50% to account for these attributes. Therefore, for FWP, a loss rate of -0.0023 was applied starting the year that the dike would be degraded (TY 13). Please see the attached land loss spreadsheet to see how acreage lost after dike degradation was determined.

TY 13 (or 3 years after pumping): dike degraded and land loss rate of -0.0023 was applied.
TY 20: 84% marsh (199 acres)
TY 50: 78% marsh (186 acres)

<u>Variable 2 – Submerged Aquatic Vegetation (SAV)</u>

Currently, large open water areas of the site allow increased wave fetch. In the past, the area has experienced higher levels of salt water intrusion causing the marsh to transition from an intermediate marsh to a more brackish marsh. This area is not known to support SAVs.

FWOP
TY 0: 0%
TY 5: 0 %
TY 20: 0 %
TY 50: 0%

Without any hydrologic restoration to control salinity, the project area will continue to experience salinity spikes. The project area is not expected to support a significant amount of SAV habitat.

FWP:
TY 1: 0%
TY 10: 0%
TY 12: 0%
TY 14: 0%
TY 20: 0%
TY 50: 0%

Variable 3 – Interspersion

FWOP: The lowest expression of interspersion, Class 5, is characterized by open water and less than 5% of emergent marsh. Without marsh restoration efforts, 100% of the 238-acre project area in this cycle would fall into Class 5. Interspersion classifications are not expected to change within the 50-year time period for FWOP (i.e., marsh will not occur naturally).

FWP: Areas exhibiting a high degree of marsh cover are ranked as having a high degree of dispersion (Class 1 or Class 2). It is assumed that the confined area would achieve a Class 1 once the dredged material is pumped for this cycle. 100% of the project area would fall into Class 1 starting the first year it is pumped (TY 10) and throughout the remainder of the 20-year DMMP project life. By TY 50, the area falls to 78% marsh because of landloss rates. Therefore, in TY 50, the interspersion falls to a Class 2.

Table 1: FWP Interspersion Classification

Target Year	Class 1	%	Class 2	%	Class 5 (open water)	%
0 (FWOP)					200 ac	100
9					200 ac	100
10 (pump)	238 ac	100				
12	238 ac	100				
13 (dike degraded)	238 ac	100				
14	238 ac	100				
20	238 ac	100				
50			238 ac	100		

Variable 4 – Shallow Open Water Habitat (i.e., mudflats) (percent of open water </= 1.5 feet)

Shallow water areas are assumed to be more biologically productive than deeper water due to a general reduction in sunlight, oxygen, and temperature as water depth increases. Optimal conditions are expected to occur when 80 to 90 percent of the open water area is less than or equal to l.5 feet deep. A study by La Peyre et al. (2007) was conducted within the nearby

Sabine NWR which shows that a 3.28-foot (1 m) area waterward of the marsh edge has an average water depth less than 1.5 feet (NAVD 88). Subtidal, open water areas located 164.04 feet (50 m) from marsh edge have an average water depth of 1.7 feet (NAVD 88). Therefore, it was assumed that all water within 164 feet of existing emergent marsh is less than 1.5 feet deep.

FWOP:

Using ArcView, the perimeter of existing marsh was measured and multiplied by 164 feet. That value was converted into an acreage value. Based on this calculation, it was found that 10% (24 acres) of the 238 acres of open water in BU site 4, Cell 1, would be less than or equal to 1.5 ft.

FWOP (TY 0): 10% * 238ac of open water </= 1.5 ft =24acres

FWP:

TY 0 – shallow open water = 10% or same as FWOP
TY 9 –Shallow open water = 10% or same as FWOP
TY 10 – Pump year. 85 % of the 238-acres of material is expected to achieve marsh height. Any open water (15% of the area) would be shallow open water = 100%.
TY 12 – Two years after pumping. Shallow open water = 100%.
TY 13 – Dike degraded. Shallow open water = 100%
TY 14 – Four years after pumping. Shallow open water = 100%
TY 20 – Shallow open water = 80% As marsh is lost areas become shallow open water and water depths may gradually become deeper.
TY 50 – Shallow open water = 60%

<u>Variable 5 – Salinity</u>

Hydrographic data was downloaded by station number from the Louisiana Department of Natural Resources SONRIS site (accessed April 28, 2008, GEC). All data has been corrected for biofouling, instrument drift, and/or instrument malfunction.

Hourly water salinity records collected during 2003 – 2004 show that average annual salinity for the station located in the project area (CS09-04) is 7.99 parts per thousand (ppt).

The average annual salinity is expected to remain constant throughout the life of this project.

<u>Variable 6 – Fish Access</u>

FWOP: A water control structure, known as the Crab Gully Structure, is present just west of Highway 27. The project structure includes an open culvert, resulting in a current access value of 0.5. The access value is expected to remain the same throughout the life of the project.

TY 0: 0.5
TY 1: 0.5

TY 20: 0.5
TY 50: 0.5

FWP: The access value once the Brown Lake Hydrological Restoration Project is constructed is 0.5. During TY 9, the dike would be constructed, resulting in an access value of 0.0001. The access value is expected to remain at 0.0001 until the dike degrades in TY 13. The degree of access would then return to the original value of 0.5 and remain there throughout the life of the project.

TY 0: 0.5 (with water control structures)
TY 9: 0.5
TY 10: 0.0001 (dike and pumping year)
TY 13: 0.5 (dike degradation)
TY 20: 0.5 (end of project)
TY 50: 0.5

Cycle 2

The above assumptions, with the exception of Variable 4, were applied to Cycle 2 target years, which include the following. Variable 4 assumptions for Cell 2 are below.

FWOP:

TY 0, TY 1, TY 20, TY 50

FWP:

TY 0 – same as FWOP
TY 10 – same as FWOP
TY 11 – Dike and pump year. 10% credit given to marsh creation.
TY 13 – Two years after pumping. 30% credit given to marsh creation.
TY 14 – Dike degraded.
TY 15 – Four years after pumping. Marsh is fully vegetated (85% credit)
TY 20 – Landloss rates have reduced the amount of marsh from 85% of project area to 83%.
TY 50 – Landloss rates have reduced the amount of marsh from 85% of project area to 78%.

<u>Variable 4 – Shallow Open Water Habitat (i.e., mudflats) (percent of open water </= 1.5 feet)</u>

According to USDA's Natural Resources Conservation Service (NRCS) elevations, the water bottom is greater than 2' throughout most of the area in cell two. In the FWOP scenario, 3% of Cell 2 would be classified as </= 1.5'. Once the marsh is pumped, 100% of the water in Cell 2 would be shallow.

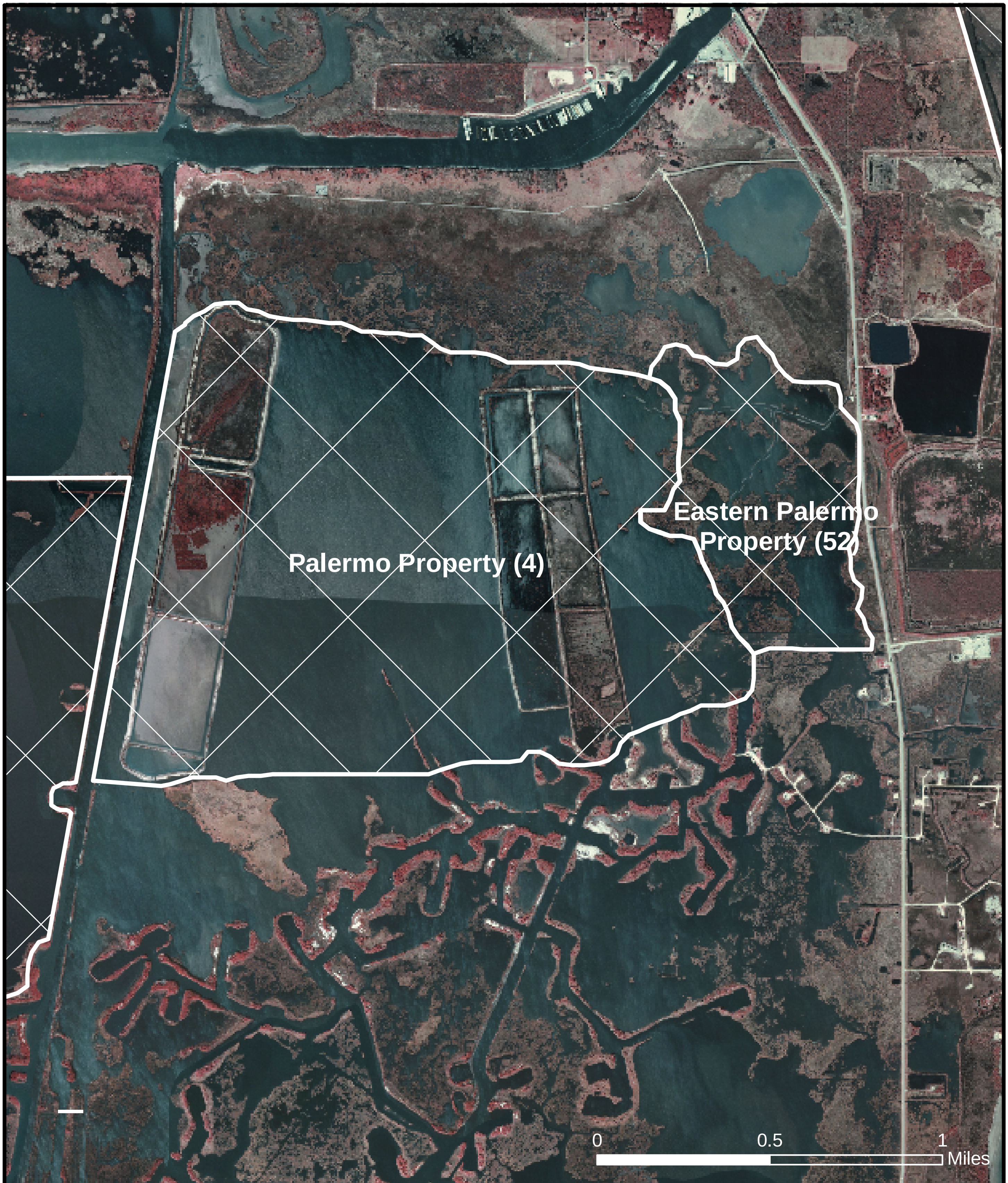
FWOP (TY 0): 3% * 238ac of open water </= 1.5 ft =7acres

FWP:

TY 0 – shallow open water = 3% or same as FWOP
TY 10 – shallow open water = 3% or same as FWOP
TY 11 – Pump year. 85 % of the 238-acres of material is expected to achieve marsh height. Any open water (15% of the area) would be shallow open water = 100%.
TY 13 – Two years after pumping. Shallow open water = 100%.
TY 14 – Dike degraded. Shallow open water = 100%
TY 15 – Four years after pumping. Shallow open water = 100%
TY 20 –Shallow open water = 80 %
TY 50 –Shallow open water = 60 %

V. References

La Peyre, Megan K., Bryan Gossman, and John A. Nyman. Assessing functional equivalency of nekton habitat in enhanced habitats: Comparison of terraced and unterraced marsh ponds. *Estuaries and Coasts.* Vol. 30, No. 3, p. 526–536. June 2007.



Beneficial Use Sites 4 and 52	
Calcasieu River and Pass, Louisiana	Figure: 1
Dredged Material Management Plan	Date: August 2007
	Scale:1:24,428
	Source: USGS/GEC/USACE
USGS DOQQ 2005 WESTLAKE SW 3009354	Map Author: Moore 27585101-765

WETLAND VALUE ASSESSMENT COMMUNITY MODEL
Brackish Marsh

Project: Cycle 2, BU Site 4, Calcasieu DMMP   Project Area: 238

Condition: Future Without Project

Variable		TY 0		TY 1		TY 20				
		Value	SI	Value	SI	Value	SI			
V1	% Emergent	0	0.10	0	0.10	0	0.10			
V2	% Aquatic	0	0.10	0	0.10	0	0.10			
V3	Interspersion	%		%		%				
	Class 1		0.10		0.10		0.10	0	0	0
	Class 2							0	0	0
	Class 3							0	0	0
	Class 4							0	0	0
	Class 5	100		100		100		0.1	0.1	0.1
V4	%OW <= 1.5ft	3	0.14	3	0.14	3	0.14			
V5	Salinity (ppt)	8	1.00	8	1.00	8	1.00			
V6	Access Value	0.50	0.55	0.50	0.55	0.50	0.55			
	Emergent Marsh HSI	**=**	**0.24**	**EM HSI =**	**0.24**	**EM HSI =**	**0.24**			
	Open Water HSI	**=**	**0.25**	**OW HSI =**	**0.25**	**OW HSI =**	**0.25**			

Project: Cycle 2, BU Site 4, Calcasieu DMMP

FWOP

Variable		TY 50								
		Value	SI	Value	SI	Value	SI			
V1	% Emergent	0	0.10							
V2	% Aquatic	0	0.10							
V3	Interspersion	%		%		%				
	Class 1		0.10					0	0	0
	Class 2							0	0	0
	Class 3							0	0	0
	Class 4							0	0	0
	Class 5	100						0.1	0	0
V4	%OW <= 1.5ft	3	0.14							
V5	Salinity (ppt)	8	1.00							
V6	Access Value	0.50	0.55							
		EM HSI =	0.24	EM HSI =		EM HSI =				
		OW HSI =	0.25	OW HSI =		OW HSI =				

Project: Cycle 2, BU Site 4, Calcasieu DMMP

Project Area: 238

Condition: Future With Project

Variable		TY 0		TY 10		TY 11 dike & Pump				
		Value	SI	Value	SI	Value	SI			
V1	% Emergent	0	0.10	0	0.10	10	0.19			
V2	% Aquatic	0	0.10	0	0.10	0	0.10			
V3	Interspersion	%		%		%				
	Class 1		0.10		0.10	100	1.00	0	0	1
	Class 2							0	0	0
	Class 3							0	0	0
	Class 4							0	0	0
	Class 5	100		100				0.1	0.1	0
V4	%OW <= 1.5ft	3	0.14	3	0.14	100	0.60			
V5	Salinity (ppt)	8	1.00	8	1.00	8	1.00			
V6	Access Value	0.50	0.55	0.50	0.55	0.00	0.10			
	Emergent Marsh HSI	**=**	**0.24**	**EM HSI =**	**0.24**	**EM HSI =**	**0.35**			
	Open Water HSI	**=**	**0.25**	**OW HSI =**	**0.25**	**OW HSI =**	**0.27**			

Project: Cycle 2, BU Site 4, Calcasieu DMMP

FWP

Variable		TY 13		TY 14 Dike degraded		TY 15				
		Value	SI	Value	SI	Value	SI			
V1	% Emergent	30	0.37	30	0.37	85	0.87			
V2	% Aquatic	0	0.10	0	0.10	0	0.10			
V3	Interspersion	%		%		%				
	Class 1	100	1.00	100	1.00	100	0.60	1	1	1
	Class 2							0	0	0
	Class 3							0	0	0
	Class 4							0	0	0
	Class 5							0	0	0
V4	%OW <= 1.5ft	100	0.60	100	0.60	100	0.60			
V5	Salinity (ppt)	8	1.00	8	1.00	8	1.00			
V6	Access Value	0.00	0.10	0.50	0.55	0.50	0.55			
		EM HSI =	**0.44**	**EM HSI =**	**0.54**	**EM HSI =**	**0.78**			
		OW HSI =	**0.27**	**OW HSI =**	**0.35**	**OW HSI =**	**0.32**			

Project: Cycle 2, BU Site 4, Calcasieu DMMP

FWP

Variable		TY 20		TY 50			
		Value	SI	Value	SI	Value	SI
V1	% Emergent	84	0.86	78	0.80		
V2	% Aquatic	0	0.10	0	0.10		
V3	Interspersion	%		%		%	
	Class 1	100	1.00		0.00		
	Class 2			100			
	Class 3						
	Class 4						
	Class 5						
V4	%OW <= 1.5ft	80	1.00	60	0.87		
V5	Salinity (ppt)	8	1.00	8	1.00		
V6	Access Value	0.50	0.55	0.50	0.55		
		EM HSI =	0.82	EM HSI =	0.68	EM HSI =	
		OW HSI =	0.38	OW HSI =	0.29	OW HSI =	

1	0	0
0	0.6	0
0	0	0
0	0	0
0	0	0

AAHU CALCULATION - MARSH

Future Without Project			Total	Cummulative
TY	Marsh Acres	x HSI	HUs	HUs
0	0	0.24	0.00	
1	0	0.24	0.00	0.00
20	0	0.24	0.00	0.00
50	0	0.24	0.00	0.00
			AAHUs =	0.00

Future With Project			Total	Cummulative
TY	Marsh Acres	x HSI	HUs	HUs
0	0	0.24	0.00	
10	0	0.24	0.00	0.00
11	24	0.35	8.39	3.75
13	71	0.44	30.89	37.94
14	71	0.54	38.17	34.53
15	202	0.78	158.33	92.87
20	199	0.82	163.85	569.48
50	186	0.68	127.02	4984.13
			AAHUs	114.45

NET CHANGE IN AAHUs DUE TO PROJECT	
A. Future With Project Emergent Marsh AAHUs =	114.45
B. Future Without Project Emergent Marsh AAHUs =	0.00
Net Change (FWP - FWOP) =	**114.45**

AAHU CALCULATION - OPEN WATER

Project: Cycle 2, BU Site 4, Calcasieu DMMP

Future Without Project			Total	Cummulative
TY	Water Acres	x HSI	HUs	HUs
0	238	0.25	58.44	
1	238	0.25	58.44	58.44
20	238	0.25	58.44	1110.43
50	238	0.25	58.44	1753.32
			AAHUs =	**58.44**

Future With Project			Total	Cummulative
TY	Water Acres	x HSI	HUs	HUs
0	238	0.25	58.44	
10	238	0.25	58.44	584.44
11	36	0.27	9.73	34.92
13	36	0.27	9.73	19.47
14	36	0.35	12.47	11.10
15	36	0.32	11.40	11.94
20	39	0.38	14.67	65.03
50	52	0.68	35.51	786.83
			AAHUs	**30.27**

NET CHANGE IN AAHUs DUE TO PROJECT	
A. Future With Project Open Water AAHUs =	30.27
B. Future Without Project Open Water AAHUs =	58.44
Net Change (FWP - FWOP) =	**-28.17**

TOTAL BENEFITS IN AAHUs DUE TO PROJECT	
A. Emergent Marsh Habitat Net AAHUs =	114.45
B. Open Water Habitat Net AAHUs =	-28.17
Net Benefits= (2.6xEMAAHUs+OWAAHUs)/3.6	**74.84**

WETLAND VALUE ASSESSMENT COMMUNITY MODEL
Brackish Marsh

Project: Cycle 1, BU Site 4, Calcasieu DMMP — Project Area: 238

Condition: Future Without Project

Variable		TY 0		TY 1		TY 20	
		Value	SI	Value	SI	Value	SI
V1	% Emergent	0	0.10	0	0.10	0	0.10
V2	% Aquatic	0	0.10	0	0.10	0	0.10
V3	Interspersion	%		%		%	
	Class 1		0.10		0.10		0.10
	Class 2						
	Class 3						
	Class 4						
	Class 5	100		100		100	
V4	%OW <= 1.5ft	10	0.23	10	0.23	10	0.23
V5	Salinity (ppt)	8	1.00	8	1.00	8	1.00
V6	Access Value	0.50	0.55	0.50	0.55	0.50	0.55
	Emergent Marsh HSI	**=**	**0.24**	**EM HSI =**	**0.24**	**EM HSI =**	**0.24**
	Open Water HSI	**=**	**0.25**	**OW HSI =**	**0.25**	**OW HSI =**	**0.25**

1/10/2009

Project: Cycle 1, BU Site 4, Calcasieu DMMP
FWOP

Variable		TY 50					
		Value	SI	Value	SI	Value	SI
V1	% Emergent	0	0.10				
V2	% Aquatic	0	0.10				
V3	Interspersion	%		%		%	
	Class 1		0.10				
	Class 2						
	Class 3						
	Class 4						
	Class 5	100					
V4	%OW <= 1.5ft	10	0.23				
V5	Salinity (ppt)	8	1.00				
V6	Access Value	0.50	0.55				
		EM HSI =	**0.24**	**EM HSI =**		**EM HSI =**	
		OW HSI =	**0.25**	**OW HSI =**		**OW HSI =**	

Project: Cycle 1, BU Site 4, Calcasieu DMMP

Project Area: 238

Condition: Future With Project

Variable		TY 0		TY 9		TY 10 Dike & Pump	
		Value	SI	Value	SI	Value	SI
V1	% Emergent	0	0.10	0	0.10	10	0.19
V2	% Aquatic	0	0.10	0	0.10	0	0.10
V3	Interspersion	%		%		%	
	Class 1		0.10		0.10	100	1.00
	Class 2						
	Class 3						
	Class 4						
	Class 5	100		100			
V4	%OW <= 1.5ft	10	0.23	10	0.23	100	0.60
V5	Salinity (ppt)	8	1.00	8	1.00	8	1.00
V6	Access Value	0.50	0.55	0.50	0.55	0.00	0.10
	Emergent Marsh HSI	=	0.24	EM HSI =	0.24	EM HSI =	0.35
	Open Water HSI	=	0.25	OW HSI =	0.25	OW HSI =	0.27

Project: Cycle 1, BU Site 4, Calcasieu DMMP

FWP

Variable		TY 12		TY 13 Dike degraded		TY 14	
		Value	SI	Value	SI	Value	SI
V1	% Emergent	30	0.37	30	0.37	85	0.87
V2	% Aquatic	0	0.10	0	0.10	0	0.10
V3	Interspersion	%		%		%	
	Class 1	100	1.00	100	1.00	100	0.60
	Class 2						
	Class 3						
	Class 4						
	Class 5						
V4	%OW <= 1.5ft	100	0.60	100	0.60	100	0.60
V5	Salinity (ppt)	8	1.00	8	1.00	8	1.00
V6	Access Value	0.00	0.10	0.50	0.55	0.50	0.55
		EM HSI =	**0.44**	**EM HSI =**	**0.54**	**EM HSI =**	**0.78**
		OW HSI =	**0.27**	**OW HSI =**	**0.35**	**OW HSI =**	**0.32**

Project: Cycle 1, BU Site 4, Calcasieu DMMP
FWP

Variable		TY 20		TY 50			
		Value	SI	Value	SI	Value	SI
V1	% Emergent	84	0.86	78	0.80		
V2	% Aquatic	0	0.10	0	0.10		
V3	Interspersion	%		%		%	
	Class 1	100	1.00		0.00		
	Class 2			100			
	Class 3						
	Class 4						
	Class 5						
V4	%OW <= 1.5ft	80	1.00	60	0.87		
V5	Salinity (ppt)	8	1.00	8	1.00		
V6	Access Value	0.50	0.55	0.50	0.55		
		EM HSI =	**0.82**	**EM HSI =**	**0.68**	**EM HSI =**	
		OW HSI =	**0.38**	**OW HSI =**	**0.29**	**OW HSI =**	

AAHU CALCULATION - MARSH

Future Without Project			Total	Cummulative
TY	Marsh Acres	x HSI	HUs	HUs
0	0	0.24	0.00	
1	0	0.24	0.00	0.00
20	0	0.24	0.00	0.00
50	0	0.24	0.00	0.00
			AAHUs =	**0.00**

Future With Project			Total	Cummulative
TY	Marsh Acres	x HSI	HUs	HUs
0	0	0.24	0.00	
9	0	0.24	0.00	0.00
10	24	0.35	8.39	3.75
12	71	0.44	30.89	37.94
13	71	0.54	38.17	34.53
14	202	0.78	158.33	92.87
20	199	0.82	163.85	664.39
50	186	0.68	127.02	5126.53
			AAHUs	**119.20**

NET CHANGE IN AAHUs DUE TO PROJECT	
A. Future With Project Emergent Marsh AAHUs =	119.20
B. Future Without Project Emergent Marsh AAHUs =	0.00
Net Change (FWP - FWOP) =	**119.20**

1/10/2009

AAHU CALCULATION - OPEN WATER

Project: Cycle 1, BU Site 4, Calcasieu DMMP

Future Without Project			Total	Cummulative
TY	Water Acres	x HSI	HUs	HUs
0	238	0.25	60.03	
1	238	0.25	60.03	60.03
20	238	0.25	60.03	1140.59
50	238	0.25	60.03	1800.93
			AAHUs =	**60.03**

Future With Project			Total	Cummulative
TY	Water Acres	x HSI	HUs	HUs
0	238	0.25	60.03	
9	238	0.25	60.03	540.28
10	36	0.27	9.73	35.49
12	36	0.27	9.73	19.47
13	36	0.35	12.47	11.10
14	36	0.32	11.40	11.94
20	39	0.38	14.67	78.03
50	52	0.68	35.51	809.31
			AAHUs	**75.28**

NET CHANGE IN AAHUs DUE TO PROJECT	
A. Future With Project Open Water AAHUs =	75.28
B. Future Without Project Open Water AAHUs =	60.03
Net Change (FWP - FWOP) =	**15.25**

1/10/2009

TOTAL BENEFITS IN AAHUs DUE TO PROJECT	
A. Emergent Marsh Habitat Net AAHUs =	119.20
B. Open Water Habitat Net AAHUs =	15.25
Net Benefits= (2.6xEMAAHUs+OWAAHUs)/3.6	**90.33**

Land Loss Spreadsheet

					Loss Rate Calculation				
Project:					**Beginning Year**	**Ending Year**	**Beginning Year Acreage**	**Ending Year Acreage**	**Loss Rate**
Total Acres		**TY0 Marsh Acres**		**TY0 Water Acres**	1974	1990	17,320	16,100	-0.004555
238		0		238			FWP Land Loss Reduction	0.50	

FWOP					FWP					
TY	Loss Rate	Marsh (acres)	% Marsh (V1)	Water (acres)	TY	Loss Rate	Marsh (acres)	% Marsh (V1)	Water (acres)	Net Acres of Marsh
0		0	0%	238	0		0	0%	238	0
1	-0.004555	**0**	**0%**	238	**1**	-0.002277	**0**	**0%**	238	0
2	-0.004555	0	0%	238	2	-0.002277	0	0%	238	0
3	-0.004555	0	0%	238	3	-0.002277	0	0%	238	0
4	-0.004555	0	0%	238	4	-0.002277	0	0%	238	0
5	-0.004555	0	0%	238	5	-0.002277	0	0%	238	0
6	-0.004555	0	0%	238	6	-0.002277	0	0%	238	0
7	-0.004555	0	0%	238	7	-0.002277	0	0%	238	0
8	-0.004555	0	0%	238	8	-0.002277	0	0%	238	0
9	-0.004555	0	0%	238	9	-0.002277	0	0%	238	0
10	-0.004555	0	0%	238	10	-0.002277	0	0%	238	0
11	-0.004555	0	0%	238	11	-0.002277	0	0%	238	0
12	-0.004555	0	0%	238	12	-0.002277	0	0%	238	0
13	-0.004555	0	0%	238	13	-0.002277	0	0%	238	0
14	-0.004555	0	0%	238	14	-0.002277	202	85%	36	202
15	-0.004555	0	0%	238	15	-0.002277	202	85%	36	202
16	-0.004555	0	0%	238	16	-0.002277	201	84%	37	201
17	-0.004555	0	0%	238	17	-0.002277	201	84%	37	201
18	-0.004555	0	0%	238	18	-0.002277	200	84%	38	200
19	-0.004555	0	0%	238	19	-0.002277	200	84%	38	200
20	-0.004555	**0**	**0%**	238	**20**	-0.002277	199	**84%**	39	**199**
21	-0.004555	0	0%	238	21	-0.002277	199	84%	39	199
22	-0.004555	0	0%	238	22	-0.002277	198	83%	40	198
23	-0.004555	0	0%	238	23	-0.002277	198	83%	40	198
24	-0.004555	0	0%	238	24	-0.002277	197	83%	41	197
25	-0.004555	0	0%	238	25	-0.002277	197	83%	41	197
26	-0.004555	0	0%	238	26	-0.002277	197	83%	41	197
27	-0.004555	0	0%	238	27	-0.002277	196	82%	42	196
28	-0.004555	0	0%	238	28	-0.002277	196	82%	42	196
29	-0.004555	0	0%	238	29	-0.002277	195	82%	43	195
30	-0.004555	0	0%	238	30	-0.002277	195	82%	43	195
31	-0.004555	0	0%	238	31	-0.002277	194	82%	44	194
32	-0.004555	0	0%	238	32	-0.002277	194	81%	44	194
33	-0.004555	0	0%	238	33	-0.002277	193	81%	45	193
34	-0.004555	0	0%	238	34	-0.002277	193	81%	45	193
35	-0.004555	0	0%	238	35	-0.002277	193	81%	45	193
36	-0.004555	0	0%	238	36	-0.002277	192	81%	46	192
37	-0.004555	0	0%	238	37	-0.002277	192	81%	46	192
38	-0.004555	0	0%	238	38	-0.002277	191	80%	47	191
39	-0.004555	0	0%	238	39	-0.002277	191	80%	47	191
40	-0.004555	0	0%	238	40	-0.002277	190	80%	48	190
41	-0.004555	0	0%	238	41	-0.002277	190	80%	48	190
42	-0.004555	0	0%	238	42	-0.002277	190	80%	48	190
43	-0.004555	0	0%	238	43	-0.002277	189	79%	49	189
44	-0.004555	0	0%	238	44	-0.002277	189	79%	49	189
45	-0.004555	0	0%	238	45	-0.002277	188	79%	50	188
46	-0.004555	0	0%	238	46	-0.002277	188	79%	50	188
47	-0.004555	0	0%	238	47	-0.002277	187	79%	51	187
48	-0.004555	0	0%	238	48	-0.002277	187	79%	51	187
49	-0.004555	0	0%	238	49	-0.002277	187	78%	51	187
50	-0.004555	0	0%	238	50	-0.002277	186	78%	52	186

Beneficial Use Site 5

Beneficial Use (BU) Site 5 (Sabine National Wildlife Refuge)

Project Location/Area

For this WVA, an approximately 3,000-acre open water area in Unit 1 of the Sabine NWR, Cameron Parish, Louisiana, was delineated.

Variable 1 – Emergent Vegetation

Approximately 8.9 million cubic yards of material would be pumped in four dredging cycles to create approximately 3,000 acres of intertidal, brackish marsh and shallow open water habitat in BU site 5. Approximately 2,000 acres of marsh habitat potentially could be created.

Dredged sediments pumped into BU site 5 would be unconfined and earthen dikes would not be constructed to contain the dredged materials. Material would be pumped adjacent to existing wetland vegetation to allow sediments to stack to an elevation conducive for emergent marsh vegetation. Dredged material slurry would be allowed to overflow existing emergent marsh vegetation within the project area, but would not be allowed to exceed a height of approximately one-foot above the existing marsh elevation. Subsequent dredging cycles would be pumped adjacent to existing marsh and/or the marsh platform created during the previous pumping event. Tidal inlets and channels are expected to be created during the pumping of dredge material and by natural tidal fluctuations.

Because unconfined dredge material placement is a relatively unpracticed technique for marsh creation, several assumptions have been made using known values from the following Coastal Planning, Protection and Restoration Act (CWPPRA) projects within the vicinity of the BU site:

CWPPRA (CS-23) Cycle 1

- East Area: 450,000 cyds pumped to + 4.4 MLG = 125 acres
- West Area: 235,000 cyds pumped to + 4.0 MLG = 78 acres
- 834, 416 cyds of material pumped to create ~ 203 acres of marsh and 93 acres of mudflat. (assume 4,000 cyds = 1 acre of marsh)
- Mudflat south of cycle: 150,000 cyds = 93 acres (assume 1,612 cyds = 1 ac of mudflat in this area)
- Maximum initial target elevation +4.5' MLG (+ 3.0 NAVD 88)
- Target elevations +2.0' MLG

CWPPRA Cycle 3

- ~ 1,000,000 cyds of material pumped to create ~ 230 acres of marsh and ~100 acres of mudflat
- Maximum initial elevation +4.5' MLG
- Target elevation +2.5' MLG
- 2-3' pre-project water depths

For 3 of the 4 cycles, 2,434,500 cyds of material will be pumped in each cycle, and 1,596,500 cyds will be pumped for the 4th and final cycle. Approximately 2,225 acres (8.9 mcyds/4,000 cyds = 2,225 acres) of marsh could be created, provided that the marsh creation area were confined with dikes and weirs. According to Corps engineers, where healthy marsh borders proposed unconfined marsh creation areas, material is likely to stack in a manner similar to confined BU marsh creation areas. Also, with beneficial use of dredge material projects, generally approximately 85% of marsh is created in confined marsh creation areas. It is assumed for this analysis that 75% of dredge material pumped adjacent to healthy marsh would create elevations conducive for marsh creation, and 25% would create shallow open water habitat (i.e., mudflats). Approximately 65 % of dredge material pumped in, and adjacent to, the interspersed marsh (i.e., northwestern corner) would create elevations conducive for marsh creation, and 30% would create shallow open water habitat (i.e., mudflats). The remaining 5% would nourish the existing marsh.

The following is a description of assumptions of marsh acres created for each dredging event:

<u>Cycle 1: 2,434,500 cyds (Pumped in TY 01)</u>

For cycle 1, material will be pumped into the northwestern corner of BU site 5 into an area with interspersed marsh (50% marsh/open water). Material is expected to stack up where existing marsh allows; however, depending on pipe placement and movement, material is likely to create an abundance of mudflat/shallow open water. Because of the interspersed marsh and open water, it is assumed that 65 % of dredged material would stack to create marsh. Sediments would overflow ~215 acres of existing marsh which is interspersed through out an approximately 465-acre area of cycle 1, but would not exceed 1 foot above marsh elevation. Because this method of beneficial use of dredge material for marsh creation is not the standard or typical method, conservative assumptions have been made to quantify benefits.

Calculation for amount (cyds) of dredge material that would nourish existing marsh:
215 ac x 43,560 sq feet = 9,365,400 sq. ft x 1'= 9,365,400 cft/27 = 346,867 cyds

Therefore, (2,434,500 cyds – 346,867 cyds =) **1,740,767 cyds** remains to create marsh in open water areas of the 465-acre area of Cycle 1.

- **65% of 1,740,767 cyds** = 1,131,499/4,000cyds = **283 acres of marsh**
  (or: 1,740,767 cyds/4,000 = 435 ac; 65% of 435 acres= 283 ac)
- **30% of 1,740,767 cyds** = 522,230 cyds/1,600 = **326 acres of mudflat**
- **05% of 1,740,767 cyds = 87,038 cyds "lost"** to the system
  (i.e., nourishment to surrounding marshes/loss of sediment to adjacent open water)

<u>Cycle 2 (TY 3) & 3 (TY 6): 2,434,500 cyds</u>
Cycle 2 materials would be pumped adjacent to cycle 1 or adjacent to "healthy" marsh along the southwestern corner of Sabine BU site 5. Cycle 3 materials would be pumped adjacent to cycle 2 or adjacent to "healthy" marsh along the southwestern corner of Sabine BU site 5.

- **80% of 2,434,500 cyds** = 1,947,600 cyds/4,000 = 487 acres of marsh
- **20% of 2,434,500 cyds** = 486,900 cyds/1,600 = 304 acres of mudflat

<u>Cycle 4 (TY 8): 1,596,500 cyds</u>

Cycle 4 materials would be pumped in the remaining open water areas and adjacent to previously pumped cycles.

- **80% of 1,596,500 cyds** = 1,277,200 cyds/4,000 =319 acres
- **20% of 1,596,500 cyds** = 319,300 cyds/1,600 = 200 acres
  *minimal amount of wetlands nourished in EC portion of the 3,000-acre project area.

Table 1: Summary of Habitat Created

Cycle	Marsh Acres	Shallow Open Water (V4)
1	283 * (215)	326
2	487	304
3	487	304
4	319	200
Total	**1,576 *(1791)**	**1134**
1,576+ 1134 + 215 (existing marsh NW corner) = 2,925 ac of habitat		

*346,867 cyds used to nourish 215 acres of existing marsh during cycle 1

The timeline for functional marsh credit is assumed as follows:

Marsh Creation	**Nourishment (no plantings)**
Construction Year - 10 % ……………………..	50%
Two Years After CY– 30 %..........................	100%
Four Years After CY – 100%	

Table 2: Timeline for Sabine BU site 5 Target Years.

TY	1	3	5	6	7	8	10	12
Cycle								
1	10%	30%	100					
2		10	30		100			
3				10		30	100	
4						10	30	100

Marsh loss data was obtained from the Louisiana Coastal Area project report *Coast 2050: Toward a Sustainable Coastal Louisiana* (1998), Appendix F. The 1974 to 1990 annual land loss rate for the Brown Lake area (-.45%) was used for FWOP. Material is not expected to stack and consolidate like confined material. Marsh loss rates for this area are intermediate, and sediments and nutrients will be added to the system through TY 8. Therefore, for the purpose of this WVA, loss rates were applied to FWP starting at TY 1, but were reduced by 25 % rather than the standard 50% reduction.

FWOP

8% (~ 250 acres of ~3,000 ac) defined project area is emergent marsh. This marsh is expected to continue to erode at a rate of -.45%/year. A portion of this is remnant interspersed marsh and “nourishment” credits were not applied in the WVA calculations. Approximately 215 acres of marsh in the northwestern corner is considered in the nourishment calculations.

FWP

Refer to Landloss Spreadsheet.

Variable 2 – Submerged Aquatic Vegetation (SAV)

Currently, large open water areas of the site allow increased wave fetch. Also, in the past the area has experienced higher levels of salt water intrusion causing the marsh to transition from an intermediate marsh to a more brackish marsh. No SAV has been observed in the area of Sabine BU site 5 during field inspections (Leonard 2008). Water control structures constructed under the CS-23 CWPPRA project were designed to reduce salinity spikes in the area. Also, marsh creation projects implemented and proposed in the area will help to reduce salinities and turbidity in adjacent marshes behind these projects, and would help to create suitable conditions for SAVs. Some SAVs are expected to colonize early on due to recent construction of CWPPRA marsh creation and marsh management projects and should gradually increase through time.

Wetland Value Assessments and monitoring reports conducted for the CWPPRA, PPL 8, Sabine Marsh Creation project were reviewed to determine the SAV potential.

FWOP
TY 0 – 0%
TY 5 – 5 %
TY 20 – 5 %
TY 20 – 5 %

FWP
TY 1 – 0%
TY 5 - 10%
TY 12 – 15 %
TY 20 – 20%
TY 50 – 20%

Variable 3 – Interspersion
Interspersion was determined by reviewing 2005 aerial photography and knowledge of the areas.

FWOP
TY 0 -20: 1,494 acres of 3,000 ac project area = Class 3 (NW & SW corners of PA) 50 %
1,506 acres of 3,000 ac project area = Class 5 (open water) 50 %
TY 50: 30 % = Class 4; 70% = Class 5

Table 3: FWP Interspersion Classification

Target Year	Cycles	Class 2 (%)	Class 3 (%)	Class 5 (%)
0 (FWOP)			50	50
1	1	28	22	50
3	2	34	20	46
5		34	20	46
6	3	30	50	20
7		30	50	20

8	4	20	80	
10		20	80	
12		20	80	
20		100		
50		100		

Variable 4 – Shallow Open Water Habitat (percent of open water < 1.5 feet)

A study by La Peyre et al. (2007) was conducted within the Sabine NWR which shows that a 3.28-foot (1 m) area waterward of the marsh edge has an average water depth less than 1.5 feet (NAVD 88). Subtidal, open water areas located 164.04 feet (50 m) from marsh edge have an average water depth of 1.7 feet (NAVD 88). To be conservative for WVA purposes, it was assumed that all water within 164 feet of existing emergent marsh is shallow open water habitat (i.e., less than or equal to 1.5 feet deep). Total acreage was determined for this shallow-water habitat buffer as a percentage of the total open water area.

FWOP
Using ArcView, the perimeter of existing marsh around the project area was measured and multiplied by 164 feet. Areas of open water interspersed with broken marsh within the project area (e.g., northwestern corner) were considered shallow open water habitats, and those acres were extrapolated using ArcView and known acreages of existing marsh. Moreover, open water acres associated with marsh coves located around the marsh edge/project boundary were measured. The shallow open water areas created in CWPPRA Cycles 1 and 3 were also added to the total acreage.

Summary of shallow open water:
20 ac - SW Corner
455 ac - NW Corner = 670-215
28 ac - Broken marsh in the east central portion of area
27 ac - Coves along central western (CW) boundary (18 ac + 19 ac)
42 ac - CWPPRA Cycle 1
93 ac - CWPPRA Cycle 3
665 ac Total / 3000 acres = 22%

FWOP (TY 0) = **22%** </= 1.5 ft (TY 0)

FWP
TY1 –
326 ac NW corner + 135 ac (CWPPRA cycles) + 20 + 28 + 27 = 536 ac mudflat
Open water = 3,000 -250 (215 + 35 = existing marsh ac) -283 Cycle 1 marsh ac = 2,467 acres
536/2,467 = **22%**

TY 3 –
326 +304 ac Cycle 2 + 135 ac + 18 ac (WC cove) + 28 ac (EC broken marsh) = 811ac mudflat
2,467-487 (Cycle 2 marsh created) = 1,980 ac open water
811/1,980 = **41%**

TY 6 –

326 + 304+304+ 93 (CWPPRA cycle 3) + 18 (WC cove) = 1,045 ac mudflat
1,980 -487 = 1,493 ac open water
1,045/1,493 = **70%**

TY 8 –
CWPPRA cycle 1, shallow open water covered during last pump cycle. Assumed 1,134 acres of mudflat are expected to be create through proposed project (i.e., 30 % Cycle 1, 20% Cycle 2-4).

1,134 ac mudflat
1,493 – 319 = 1,174 ac open water
1,134/ 1,174 = **97%**

97 % of shallow open water seems a little high. Optimal conditions range from 70- 80 % shallow open water. However, because new construction methods (i.e., unconfined) are proposed, optimal conditions are not assumed. Despite being a high percentage, the SI value for 97 % shallow open water (0.5) is used for the purpose of this WVA because it does not represent optimal conditions. By TY 20, 90 % shallow open water is assumed, and by TY 50 it is reduced to 75%.

Variable 5 – Salinity

Hydrographic data was downloaded by station number from the Louisiana Department of Natural Resources SONRIS site (accessed April 28, 2008, GEC). All data has been corrected for biofouling, instrument drift, and/or instrument malfunction.

Water salinity records show that average annual salinity for the station located in the project area is 6.03 parts per thousand (ppt).

Variable 6 – Fish Access

CWPPRA project CS-23 replaced water control structures on three major waterways within the study area. The project structures include deep bays, culverts, and flapgates, resulting in a current access value of 0.35. The access value is expected to remain the same throughout the life of the project. Moreover, because material would be pumped unconfined for FWP, dikes would not be necessary and fish access would remain the same value through the project life for FWP.

TY 0-50: 0.35 (with existing water control structures from CWPPRA project CS-23)

References

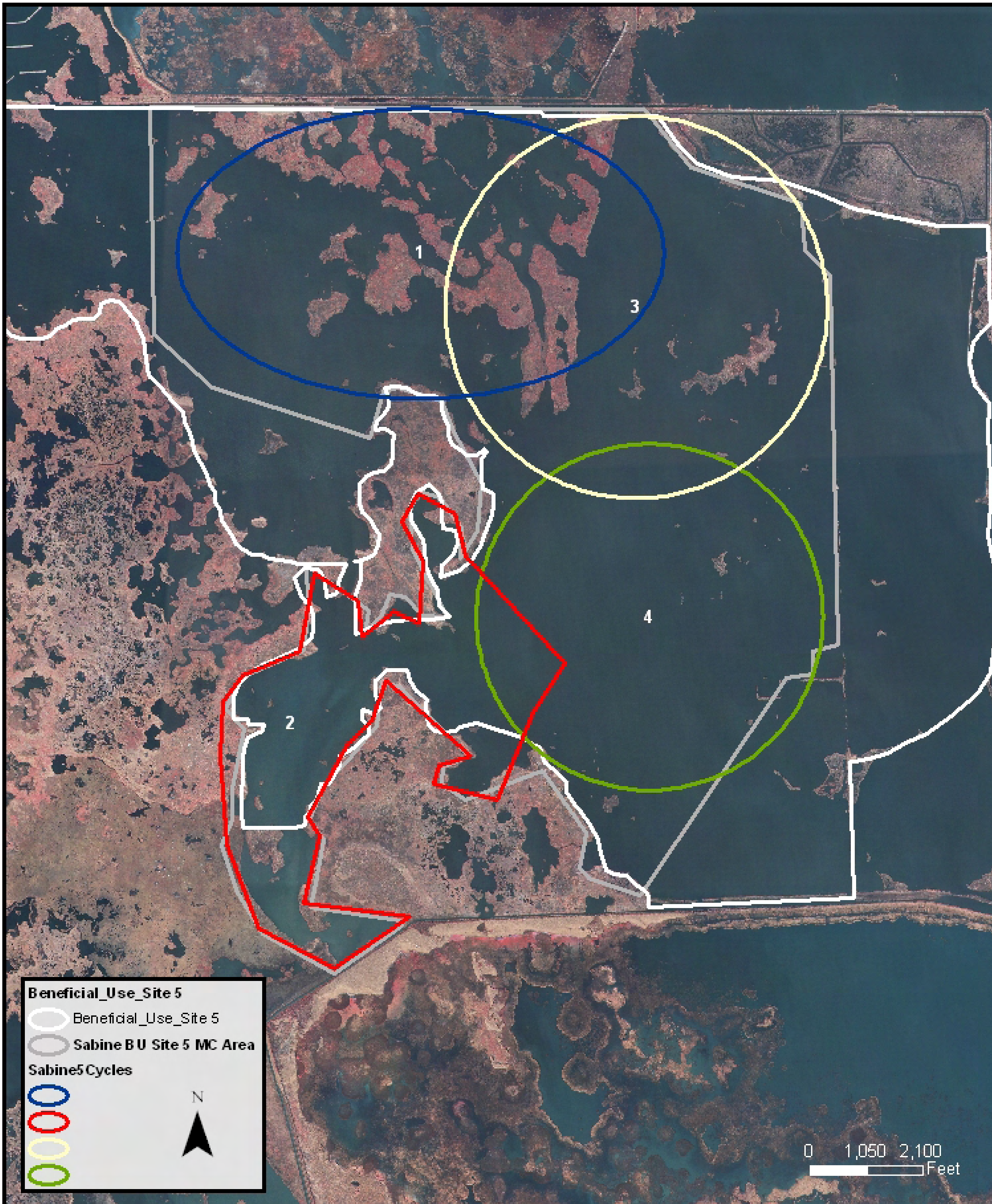
La Peyre, Megan K., Bryan Gossman, and John A. Nyman. Assessing functional equivalency of nekton habitat in enhanced habitats: Comparison of terraced and unterraced marsh ponds. *Estuaries and Coasts.* Vol. 30, No. 3, p. 526–536. June 2007.

Beneficial Use Site 5

Calcasieu River and Pass, Louisiana
Dredged Material Management Plan

USGS DOQQ 2005 WESTLAKE SW 3009354

Figure: 1
Date: August 2007
Scale:1:28,247
Source: USGS/GEC/USACE
Map Author: Moore 27585101-765



Beneficial Use Site 5

Calcasieu River and Pass, Louisiana
Dredge Material Management Plan

USGS DOQQ 2005

Date: August 2008
Scale: 1:28,428
Map Author: USFWS/ACT
Source: USGS/USFWS/USACE/GEC

WETLAND VALUE ASSESSMENT COMMUNITY MODEL
Brackish Marsh

Project: Sabine BU Site 5, Calcasieu DMMP   Project Area: 3,000

Condition: Future Without Project (FWOP)

Variable		TY 0		TY 1		TY 20				
		Value	SI	Value	SI	Value	SI			
V1	% Emergent	8	0.17	8	0.17	8	0.17			
V2	% Aquatic	0	0.10	0	0.10	5	0.15			
V3	Interspersion	%		%		%				
	Class 1		0.25		0.25		0.25	0	0	0
	Class 2							0	0	0
	Class 3	50		50		50		0.4	0.4	0.4
	Class 4							0	0	0
	Class 5	50		50		50		0.1	0.1	0.1
V4	%OW <= 1.5ft	22	0.38	22	0.38	22	0.38			
V5	Salinity (ppt)	6	1.00	6	1.00	6	1.00			
V6	Access Value	0.35	0.42	0.35	0.42	0.35	0.42			
	Emergent Marsh HSI =		0.30	EM HSI =	0.30	EM HSI =	0.30			
	Open Water HSI =		0.26	OW HSI =	0.26	OW HSI =	0.29			

Project: Sabine BU Site 5, Calcasieu DMMP
FWOP

Variable		50								
		Value	SI	Value	SI	Value	SI			
V1	% Emergent	6	0.15							
V2	% Aquatic	5	0.15							
V3	Interspersion	%		%		%				
	Class 1		0.13					0	0	0
	Class 2							0	0	0
	Class 3							0	0	0
	Class 4	30						0.2	0	0
	Class 5	70						0.1	0	0
V4	%OW <= 1.5ft	20	0.36							
V5	Salinity (ppt)	6	1.00							
V6	Access Value	0.35	0.42							
		EM HSI =	0.28	EM HSI =		EM HSI =				
		OW HSI =	0.28	OW HSI =		OW HSI =				

Project: Sabine BU Site 5, Calcasieu DMMP   Project Area: 3,000

Condition: Future With Project (FWP)

Variable		TY 0		TY 1		TY 3				
		Value	SI	Value	SI	Value	SI			
V1	% Emergent	8	0.17	6	0.15	13	0.22			
V2	% Aquatic	0	0.10	0	0.10	0	0.10			
V3	Interspersion	%		%		%				
	Class 1		0.25		0.31		0.33	0	0	0
	Class 2			28		34		0	0.6	0.6
	Class 3	50		22		20		0.4	0.4	0.4
	Class 4							0	0	0
	Class 5	50		50		46		0.1	0.1	0.1
V4	%OW <= 1.5ft	22	0.38	22	0.38	41	0.63			
V5	Salinity (ppt)	6	1.00	6	1.00	6	1.00			
V6	Access Value	0.35	0.42	0.35	0.42	0.35	0.42			
	Emergent Marsh HSI	**=**	**0.30**	**EM HSI =**	**0.30**	**EM HSI =**	**0.34**			
	Open Water HSI	**=**	**0.26**	**OW HSI =**	**0.26**	**OW HSI =**	**0.28**			

Project: Sabine BU Site 5, Calcasieu DMMP
FWP

Variable		5		6		7				
		Value	SI	Value	SI	Value	SI			
V1	% Emergent	22	0.30	23	0.31	34	0.41			
V2	% Aquatic	10	0.19	10	0.19	10	0.19			
V3	Interspersion	%		%		%				
	Class 1		0.33		0.40		0.40	0	0	0
	Class 2	34		30		30		0.6	0.6	0.6
	Class 3	20		50		50		0.4	0.4	0.4
	Class 4							0	0	0
	Class 5	46		20		20		0.1	0.1	0.1
V4	%OW <= 1.5ft	41	0.63	70	1.00	70	1.00			
V5	Salinity (ppt)	6	1.00	6	1.00	6	1.00			
V6	Access Value	0.35	0.42	0.35	0.42	0.35	0.42			
		EM HSI =	**0.40**	**EM HSI =**	**0.41**	**EM HSI =**	**0.47**			
		OW HSI =	**0.35**	**OW HSI =**	**0.38**	**OW HSI =**	**0.38**			

Project: Sabine BU Site 5, Calcasieu DMMP
FWP

Variable		8		10		12				
		Value	SI	Value	SI	Value	SI			
V1	% Emergent	38	0.44	51	0.56	58	0.62			
V2	% Aquatic	10	0.10	10	0.19	15	0.24			
V3	Interspersion	%		%		%				
	Class 1		0.44		0.44		0.44	0	0	0
	Class 2	20		20		20		0.6	0.6	0.6
	Class 3	80		80		80		0.4	0.4	0.4
	Class 4							0	0	0
	Class 5							0	0	0
V4	%OW <= 1.5ft	97	0.66	97	0.66	97	0.66			
V5	Salinity (ppt)	6	1.00	6	1.00	6	1.00			
V6	Access Value	0.35	0.42	0.35	0.42	0.35	0.42			
		EM HSI =	**0.50**	**EM HSI =**	**0.57**	**EM HSI =**	**0.60**			
		OW HSI =	**0.29**	**OW HSI =**	**0.36**	**OW HSI =**	**0.39**			

Project: Sabine BU Site 5, Calcasieu DMMP
FWP

Variable		20		50						
		Value	SI	Value	SI	Value	SI			
V1	% Emergent	56	0.60	51	0.56					
V2	% Aquatic	20	0.28	20	0.28					
V3	Interspersion	%		%		%				
	Class 1		0.40		0.40			0	0	0
	Class 2							0	0	0
	Class 3	100		100				0.4	0.4	0
	Class 4							0	0	0
	Class 5							0	0	0
V4	%OW <= 1.5ft	90	0.80	75	1.00					
V5	Salinity (ppt)	6	1.00	6	1.00					
V6	Access Value	0.35	0.42	0.35	0.42					
		EM HSI =	**0.59**	**EM HSI =**	**0.56**	**EM HSI =**				
		OW HSI =	**0.42**	**OW HSI =**	**0.43**	**OW HSI =**				

AAHU CALCULATION - MARSH

Project: Sabine BU Site 5, Calcasieu DMMP

TY	Marsh Acres	x HSI	HUs	HUs
0	250	0.30	75.82	
1	249	0.30	75.51	75.67
20	228	0.30	69.15	1374.28
50	171	0.28	47.22	1737.71
			AAHUs =	**63.75**

Future With Project			Total	Cummulative
TY	**Marsh Acres**	**x HSI**	**HUs**	**HUs**
0	250	0.30	75.82	
1	170	0.30	50.34	62.98
3	381	0.34	131.19	178.14
5	670	0.40	267.10	393.06
6	682	0.41	281.15	274.10
7	1014	0.47	480.45	377.39
8	1139	0.50	569.22	524.29
10	1530	0.57	867.54	1427.99
12	1739	0.60	1046.64	1911.76
20	1692	0.59	994.14	8162.23
50	1525	0.56	856.21	27733.46
			AAHUs	**820.91**

NET CHANGE IN AAHUs DUE TO PROJECT	
A. Future With Project Emergent Marsh AAHUs =	820.91
B. Future Without Project Emergent Marsh AAHUs =	63.75
Net Change (FWP - FWOP) =	**757.15**

AAHU CALCULATION - OPEN WATER

Project: Sabine BU Site 5, Calcasieu DMMP

Future Without Project			Total	Cummulative
TY	Water Acres	x HSI	HUs	HUs
0	2750	0.26	712.37	
1	2751	0.26	712.63	712.50
20	2772	0.29	813.67	14497.57
50	2829	0.28	797.53	24171.30
			AAHUs =	787.63

Future With Project			Total	Cummulative
TY	Water Acres	x HSI	HUs	HUs
0	2750	0.26	712.37	
1	2469	0.26	649.82	681.29
3	2471	0.28	699.47	1349.28
5	2475	0.35	861.15	1560.53
6	2511	0.38	956.03	908.39
7	2513	0.38	956.79	956.41
8	2038	0.29	598.45	770.72
10	1565	0.36	561.07	1169.75
12	1575	0.39	608.14	1169.12
20	1308	0.42	548.17	4636.97
50	1480	0.43	640.36	17816.24
			AAHUs	620.37

NET CHANGE IN AAHUs DUE TO PROJECT	
A. Future With Project Open Water AAHUs =	620.37
B. Future Without Project Open Water AAHUs =	787.63
Net Change (FWP - FWOP) =	-167.25

TOTAL BENEFITS IN AAHUs DUE TO PROJECT	
A. Emergent Marsh Habitat Net AAHUs =	757.15
B. Open Water Habitat Net AAHUs =	-167.25
Net Benefits= (2.6xEMAAHUs+OWAAHUs)/3.6	500.37

Land Loss Spreadsheet

Project: Sabine BU 5, Cycle 1					Loss Rate Calculation: Beginning Year	Ending Year	Beginning Year Acreage	Ending Year Acreage	Loss Rate
Total Acres		TY0 Marsh Acres		TY0 Water Acres	1974	1990	17,320	16,100	-0.0046
824		215		609	FWP Land Loss Reduction			0.25	

FWOP					FWP - Created Marsh			FWP - Nourished Marsh			FWP Totals				
					Created Marsh =	283		Nourished Marsh =	215						
TY	FWOP Loss Rate	Marsh (acres)	% Marsh (V1)	Water (acres)	FWP Loss Rate	Created Marsh Acreage	Adjusted Marsh Acreage (10% @ TY2; 30% @ TY4 and 100% @ TY6)	FWP Loss Rate	Nourished Marsh Acreage	Adjusted Marsh Acreage (50% @ TY1 and 100% @ TY3	Water (acres)	Marsh (acres)	% Marsh (V1)	Net Acres of Marsh	Total Acres Check
0		**215**	**26%**	**609**		0			0						
1	-0.0046	**214**	**26%**	**610**	-0.00345	282	**28**	-0.00345	214	**107**	328	**135**	**16%**	-79	824
2	-0.0046	213	26%	611	-0.00345	282	**28**	-0.00345	214	**107**	328	**135**	**16%**	-78	824
3	-0.0046	212	26%	612	-0.00345	281	84	-0.00345	213	**213**	330	**297**	**36%**	85	824
4	-0.0046	211	26%	613	-0.00345	280	84	-0.00345	212	**212**	332	**296**	**36%**	85	824
5	-0.0046	210	25%	614	-0.00345	279	279	-0.00345	211	**211**	334	**490**	**60%**	280	824
6	-0.0046	209	25%	615	-0.00345	278	278	-0.00345	211	211	335	489	59%	280	824
7	-0.0046	208	25%	616	-0.00345	277	277	-0.00345	210	210	337	487	59%	279	824
8	-0.0046	207	25%	617	-0.00345	276	276	-0.00345	209	209	339	485	59%	278	824
9	-0.0046	206	25%	618	-0.00345	275	275	-0.00345	208	208	340	484	59%	277	824
10	-0.0046	205	25%	619	-0.00345	274	274	-0.00345	208	208	342	482	58%	277	824
11	-0.0046	204	25%	620	-0.00345	273	273	-0.00345	207	207	344	480	58%	276	824
12	-0.0046	203	25%	621	-0.00345	272	272	-0.00345	206	206	345	479	58%	275	824
13	-0.0046	202	25%	622	-0.00345	272	272	-0.00345	206	206	347	477	58%	275	824
20	-0.0046	**196**	**24%**	**628**	-0.00345	265	**265**	-0.00345	201	**201**	358	**466**	**57%**	**270**	824
50	-0.0046	171	21%	653	-0.00345	239	239	-0.00345	181	181	404	420	51%	249	824

Sabine BU site 18 (Unit 1a)

Water Acre Calculations

Cycle1	Cycle 2	Cycle 3	Cycle 4	Marsh Ac	TY	Total Water acres
496					1	2750
496				496	2	2469
494	485			979	3	2471
492	484			976	4	2473
490	482			972	5	2475
489	480	485		969	6	2511
487	479	484		966	7	2513
485	477	482	318	962	8	2038
482	474	479	316	1,435	10	1565
479	471	475	314	1,425	12	1575
466	458	463	305	1,692	20	1308
420	413	412	275	1,520	50	1480

Marsh Acre Calculations %

Cycle1	Cycle 2	Cycle 3	Cycle 4	Total M %	TY	% marsh
135				170	1	6%
135				170	2	6%
297	49			381	3	13%
296	48			379	4	13%
490	145			670	5	22%
489	144	49		682	6	23%
487	479	48		1,014	7	34%
485	477	145	32	1,139	8	38%
482	474	479	95	1,530	10	51%
479	471	475	314	1,739	12	58%
466	458	463	305	1,692	20	56%
420	413	417	275	1,525	50	51%

Land Loss Spreadsheet

Project:	Sabine BU 5 Cycle 2				Loss Rate Calculation				
					Beginning Year	**Ending Year**	**Beginning Year Acreage**	**Ending Year Acreage**	**Loss Rate**
Total Acres		**TY0 Marsh Acres**		**TY0 Water Acres**	1974	1990	17,320	16,100	-0.0046
791		0		791	FWP Land Loss Reduction			0.25	

FWOP					FWP - Created Marsh			FWP - Nourished Marsh			FWP Totals				
					Created Marsh =		487	Nourished Marsh =		0					
TY	FWOP Loss Rate	Marsh (acres)	% Marsh (V1)	Water (acres)	FWP Loss Rate	Created Marsh Acreage	Adjusted Marsh Acreage (10% @ TY1; 30% @ TY3 and 100% @ TY5)	FWP Loss Rate	Nourished Marsh Acreage	Adjusted Marsh Acreage (50% @ TY1 and 100% @ TY3	Water (acres)	Marsh (acres)	% Marsh (V1)	Net Acres of Marsh	Total Acres Check
0		**0**	**0%**	**791**		0			0						
1	-0.00455	**0**	**0%**	**791**	-0.0034161	0	**0**	-0.00341607	0		791	**0**	**0%**	0	791
2	-0.00455	0	0%	791	-0.0034161	0		-0.00341607	0	**0**	791			0	791
3	-0.00455	0	0%	791	-0.0034161	485	**49**	-0.00341607	0	**0**	306	**49**	**6%**	49	791
4	-0.00455	0	0%	791	-0.0034161	484	48	-0.00341607	0	**0**	307	**48**	**6%**	48	791
5	-0.00455	0	0%	791	-0.0034161	482	**145**	-0.00341607	0	**0**	309	**145**	**18%**	145	791
6	-0.00455	0	0%	791	-0.0034161	480	144	-0.00341607	0	**0**	311	**144**	18%	144	791
7	-0.00455	0	0%	791	-0.0034161	479	479	-0.00341607	0	**0**	312	479	61%	479	791
8	-0.00455	0	0%	791	-0.0034161	477	477	-0.00341607	0	**0**	314	477	60%	477	791
9	-0.00455	0	0%	791	-0.0034161	475	475	-0.00341607	0	**0**	316	475	60%	475	791
10	-0.00455	0	0%	791	-0.0034161	474	474	-0.00341607	0	**0**	317	474	60%	474	791
11	-0.00455	0	0%	791	-0.0034161	472	472	-0.00341607	0	**0**	319	472	60%	472	791
12	-0.00455	0	0%	791	-0.0034161	471	471	-0.00341607	0	**0**	320	471	59%	471	791
13	-0.00455	0	0%	791	-0.0034161	469	469	-0.00341607	0	**0**	322	469	59%	469	791
20	-0.00455	**0**	**0%**	**791**	-0.0034161	458	**458**	-0.00341607	0	**0**	333	**458**	**58%**	**458**	791
50	-0.00455	0	0%	791	-0.0034161	413	413	-0.00341607	0	0	378	413	52%	413	791

Land Loss Spreadsheet

Project:	Sabine BU 5, Cycle 3				Loss Rate Calculation				
					Beginning Year	Ending Year	Beginning Year Acreage	Ending Year Acreage	Loss Rate
Total Acres		TY0 Marsh Acres		TY0 Water Acres	1974	1990	17,320	16,100	-0.0046
791		0		791	FWP Land Loss Reduction			0.25	

Cycle TY	FWOP					FWP - Created Marsh			FWP - Nourished Marsh			FWP Totals				
						Created Marsh =		487	Nourished Marsh =		0					
	TY	FWOP Loss Rate	Marsh (acres)	% Marsh (V1)	Water (acres)	FWP Loss Rate	Created Marsh Acreage	Adjusted Marsh Acreage (10% @ TY1; 30% @ TY3 and 100% @ TY5)	FWP Loss Rate	Nourished Marsh Acreage	Adjusted Marsh Acreage (50% @ TY1 and 100% @ TY3	Water (acres)	Marsh (acres)	% Marsh (V1)	Net Acres of Marsh	Total Acres Check
	0		0	0%	791		0			0						
6	6	-0.00455	0	0%	791	-0.0034161	485	49	-0.00341607	0	0	306	49	6%	49	791
7	7	-0.00455	0	0%	791	-0.0034161	484	48	-0.00341607	0		307	48	6%	48	791
8	8	-0.00455	0	0%	791	-0.0034161	482	145	-0.00341607	0	0	309	145	18%	145	791
9	9	-0.00455	0	0%	791	-0.0034161	480	144	-0.00341607	0		311	144	18%	144	791
10	10	-0.00455	0	0%	791	-0.0034161	479	479	-0.00341607	0	0	312	479	61%	479	791
11	11	-0.00455	0	0%	791	-0.0034161	477	477	-0.00341607	0	0	314	477	60%	477	791
12	12	-0.00455	0	0%	791	-0.0034161	475	475	-0.00341607	0	0	316	475	60%	475	791
13	13	-0.00455	0	0%	791	-0.0034161	474	474	-0.00341607	0	0	317	474	60%	474	791
14	14	-0.00455	0	0%	791	-0.0034161	472	472	-0.00341607	0	0	319	472	60%	472	791
15	15	-0.00455	0	0%	791	-0.0034161	471	471	-0.00341607	0	0	320	471	59%	471	791
16	16	-0.00455	0	0%	791	-0.0034161	469	469	-0.00341607	0	0	322	469	59%	469	791
17	17	-0.00455	0	0%	791	-0.0034161	467	467	-0.00341607	0	0	324	467	59%	467	791
18	18	-0.00455	0	0%	791	-0.0034161	466	466	-0.00341607	0	0	325	466	59%	466	791
19	19	-0.00455	0	0%	791	-0.0034161	464	464	-0.00341607	0	0	327	464	59%	464	791
20	20	-0.00455	0	0%	791	-0.0034161	463	463	-0.00341607	0	0	328	463	58%	463	791
21	21	-0.00455	0	0%	791	-0.0034161	461	461	-0.00341607	0	0	330	461	58%	461	791
22	22	-0.00455	0	0%	791	-0.0034161	459	459	-0.00341607	0	0	332	459	58%	459	791
23	23	-0.00455	0	0%	791	-0.0034161	458	458	-0.00341607	0	0	333	458	58%	458	791
24	24	-0.00455	0	0%	791	-0.0034161	456	456	-0.00341607	0	0	335	456	58%	456	791
25	25	-0.00455	0	0%	791	-0.0034161	455	455	-0.00341607	0	0	336	455	57%	455	791
26	26	-0.00455	0	0%	791	-0.0034161	453	453	-0.00341607	0	0	338	453	57%	453	791
27	27	-0.00455	0	0%	791	-0.0034161	452	452	-0.00341607	0	0	339	452	57%	452	791
28	28	-0.00455	0	0%	791	-0.0034161	450	450	-0.00341607	0	0	341	450	57%	450	791
29	29	-0.00455	0	0%	791	-0.0034161	449	449	-0.00341607	0	0	342	449	57%	449	791
30	30	-0.00455	0	0%	791	-0.0034161	447	447	-0.00341607	0	0	344	447	57%	447	791
31	31	-0.00455	0	0%	791	-0.0034161	446	446	-0.00341607	0	0	345	446	56%	446	791
32	32	-0.00455	0	0%	791	-0.0034161	444	444	-0.00341607	0	0	347	444	56%	444	791
33	33	-0.00455	0	0%	791	-0.0034161	443	443	-0.00341607	0	0	348	443	56%	443	791
34	34	-0.00455	0	0%	791	-0.0034161	441	441	-0.00341607	0	0	350	441	56%	441	791
35	35	-0.00455	0	0%	791	-0.0034161	439	439	-0.00341607	0	0	352	439	56%	439	791
36	36	-0.00455	0	0%	791	-0.0034161	438	438	-0.00341607	0	0	353	438	55%	438	791
37	37	-0.00455	0	0%	791	-0.0034161	436	436	-0.00341607	0	0	355	436	55%	436	791
38	38	-0.00455	0	0%	791	-0.0034161	435	435	-0.00341607	0	0	356	435	55%	435	791
39	39	-0.00455	0	0%	791	-0.0034161	434	434	-0.00341607	0	0	357	434	55%	434	791
40	40	-0.00455	0	0%	791	-0.0034161	432	432	-0.00341607	0	0	359	432	55%	432	791
41	41	-0.00455	0	0%	791	-0.0034161	431	431	-0.00341607	0	0	360	431	54%	431	791
42	42	-0.00455	0	0%	791	-0.0034161	429	429	-0.00341607	0	0	362	429	54%	429	791
43	43	-0.00455	0	0%	791	-0.0034161	428	428	-0.00341607	0	0	363	428	54%	428	791
44	44	-0.00455	0	0%	791	-0.0034161	426	426	-0.00341607	0	0	365	426	54%	426	791
45	45	-0.00455	0	0%	791	-0.0034161	425	425	-0.00341607	0	0	366	425	54%	425	791
46	46	-0.00455	0	0%	791	-0.0034161	423	423	-0.00341607	0	0	368	423	54%	423	791
47	47	-0.00455	0	0%	791	-0.0034161	422	422	-0.00341607	0	0	369	422	53%	422	791
48	48	-0.00455	0	0%	791	-0.0034161	420	420	-0.00341607	0	0	371	420	53%	420	791
49	49	-0.00455	0	0%	791	-0.0034161	419	419	-0.00341607	0	0	372	419	53%	419	791
50	50	-0.00455	0	0%	791	-0.0034161	417	417	-0.00341607	0	0	374	417	53%	417	791
51	51	-0.00455	0	0%	791	-0.0034161	416	416	-0.00341607	0	0	375	416	53%	416	791
52	52	-0.00455	0	0%	791	-0.0034161	415	415	-0.00341607	0	0	376	415	52%	415	791
53	53	-0.00455	0	0%	791	-0.0034161	413	413	-0.00341607	0	0	378	413	52%	413	791
54	54	-0.00455	0	0%	791	-0.0034161	412	412	-0.00341607	0	0	379	412	52%	412	791
55	55	-0.00455	0	0%	791	-0.0034161	410	410	-0.00341607	0	0	381	410	52%	410	791

Land Loss Spreadsheet

Project:	Sabine BU 5, Cycle 4				Loss Rate Calculation: Beginning Year	Ending Year	Beginning Year Acreage	Ending Year Acreage	Loss Rate
Total Acres		TY0 Marsh Acres		TY0 Water Acres	1974	1990	17,320	16,100	-0.0046
519		0		519	FWP Land Loss Reduction			0.25	

FWOP					FWP - Created Marsh			FWP - Nourished Marsh			FWP Totals				
					Created Marsh =		319	Nourished Marsh =		0					
TY	FWOP Loss Rate	Marsh (acres)	% Marsh (V1)	Water (acres)	FWP Loss Rate	Created Marsh Acreage	Adjusted Marsh Acreage (10% @ TY1; 30% @ TY3 and 100% @ TY5)	FWP Loss Rate	Nourished Marsh Acreage	Adjusted Marsh Acreage (50% @ TY1 and 100% @ TY3	Water (acres)	Marsh (acres)	% Marsh (V1)	Net Acres of Marsh	Total Acres Check
0		**0**	**0%**	**519**		0			0						
8	-0.00455	**0**	**0%**	**519**	-0.0034161	318	**32**	-0.00341607	0	**0**	201	**32**	**6%**	32	519
9	-0.00455	0	0%	519	-0.0034161	317	**32**	-0.00341607	0		202	**32**	**6%**	32	519
10	-0.00455	0	0%	519	-0.0034161	316	**95**	-0.00341607	0	**0**	203	**95**	**18%**	95	519
11	-0.00455	0	0%	519	-0.0034161	315	**94**	-0.00341607	0		204	**94**	**18%**	94	519
12	-0.00455	0	0%	519	-0.0034161	314	**314**	-0.00341607	0	**0**	205	**314**	**60%**	314	519
13	-0.00455	0	0%	519	-0.0034161	313	313	-0.00341607	0	0	206	313	60%	313	519
14	-0.00455	0	0%	519	-0.0034161	311	311	-0.00341607	0	0	208	311	60%	311	519
15	-0.00455	0	0%	519	-0.0034161	310	310	-0.00341607	0	0	209	310	60%	310	519
16	-0.00455	0	0%	519	-0.0034161	309	309	-0.00341607	0	0	210	309	60%	309	519
17	-0.00455	0	0%	519	-0.0034161	308	308	-0.00341607	0	0	211	308	59%	308	519
18	-0.00455	0	0%	519	-0.0034161	307	307	-0.00341607	0	0	212	307	59%	307	519
19	-0.00455	0	0%	519	-0.0034161	306	306	-0.00341607	0	0	213	306	59%	306	519
20	-0.00455	0	0%	519	-0.0034161	305	305	-0.00341607	0	0	214	305	59%	305	519
21	-0.00455	0	0%	519	-0.0034161	304	304	-0.00341607	0	0	215	304	59%	304	519
22	-0.00455	0	0%	519	-0.0034161	303	303	-0.00341607	0	0	216	303	58%	303	519
23	-0.00455	0	0%	519	-0.0034161	302	302	-0.00341607	0	0	217	302	58%	302	519
24	-0.00455	0	0%	519	-0.0034161	301	301	-0.00341607	0	0	218	301	58%	301	519
25	-0.00455	0	0%	519	-0.0034161	300	300	-0.00341607	0	0	219	300	58%	300	519
26	-0.00455	0	0%	519	-0.0034161	299	299	-0.00341607	0	0	220	299	58%	299	519
27	-0.00455	**0**	**0%**	**519**	-0.0034161	298	**298**	-0.00341607	0	**0**	221	**298**	**57%**	**298**	519
28	-0.00455	0	0%	519	-0.0034161	297	297	-0.00341607	0	0	222	297	57%	297	519
29	-0.00455	0	0%	519	-0.0034161	296	296	-0.00341607	0	0	223	296	57%	296	519
30	-0.00455	0	0%	519	-0.0034161	295	295	-0.00341607	0	0	224	295	57%	295	519
31	-0.00455	0	0%	519	-0.0034161	294	294	-0.00341607	0	0	225	294	57%	294	519
32	-0.00455	0	0%	519	-0.0034161	293	293	-0.00341607	0	0	226	293	56%	293	519
33	-0.00455	0	0%	519	-0.0034161	292	292	-0.00341607	0	0	227	292	56%	292	519
34	-0.00455	0	0%	519	-0.0034161	291	291	-0.00341607	0	0	228	291	56%	291	519
35	-0.00455	0	0%	519	-0.0034161	290	290	-0.00341607	0	0	229	290	56%	290	519
36	-0.00455	0	0%	519	-0.0034161	289	289	-0.00341607	0	0	230	289	56%	289	519
37	-0.00455	0	0%	519	-0.0034161	288	288	-0.00341607	0	0	231	288	55%	288	519
38	-0.00455	0	0%	519	-0.0034161	287	287	-0.00341607	0	0	232	287	55%	287	519
39	-0.00455	0	0%	519	-0.0034161	286	286	-0.00341607	0	0	233	286	55%	286	519
40	-0.00455	0	0%	519	-0.0034161	285	285	-0.00341607	0	0	234	285	55%	285	519
41	-0.00455	0	0%	519	-0.0034161	284	284	-0.00341607	0	0	235	284	55%	284	519
42	-0.00455	0	0%	519	-0.0034161	283	283	-0.00341607	0	0	236	283	55%	283	519
43	-0.00455	0	0%	519	-0.0034161	282	282	-0.00341607	0	0	237	282	54%	282	519
44	-0.00455	0	0%	519	-0.0034161	281	281	-0.00341607	0	0	238	281	54%	281	519
45	-0.00455	0	0%	519	-0.0034161	280	280	-0.00341607	0	0	239	280	54%	280	519
46	-0.00455	0	0%	519	-0.0034161	279	279	-0.00341607	0	0	240	279	54%	279	519
47	-0.00455	0	0%	519	-0.0034161	278	278	-0.00341607	0	0	241	278	54%	278	519
48	-0.00455	0	0%	519	-0.0034161	277	277	-0.00341607	0	0	242	277	53%	277	519
49	-0.00455	0	0%	519	-0.0034161	276	276	-0.00341607	0	0	243	276	53%	276	519
50	-0.00455	0	0%	519	-0.0034161	275	275	-0.00341607	0	0	244	275	53%	275	519
51	-0.00455	0	0%	519	-0.0034161	274	274	-0.00341607	0	0	245	274	53%	274	519

Beneficial Use Site 6

<u>Beneficial Use (BU) Site 6 (Bel Property)</u>

I. Project Location/Area

This wetland value assessment (WVA) focuses on BU Site 6 (Figure 1), also known as the Bel Property. This 990-acre area is located north of Unit 1 of the Sabine NWR in Cameron Parish, Louisiana.

II. Goal

The project goal is to create fish and wildlife habitat, including intertidal marsh, shallow mud flat and open water habitat within this 990-acre project area. Approximately 2.3 million cubic yards of material would be dredged from the Calcasieu Ship Channel (between miles 16 and 21) in two pumping cycles to create approximately 564 acres of intertidal, brackish marsh habitat in BU Site 6. Two 282-acre marsh creation cells would be designed and constructed to achieve a ratio of 85% marsh to 15% shallow open water.

III. Project Features

For the 2 cycles, a total of 2,258,700 cyds of material would be pumped, with 1,129,350 cyds in both cycles. Two 282-acre cells would be created to accommodate the two pumping cycles. To assess habitat benefits, a WVA was prepared for both of the two pumping cycles.

For the purposes of this assessment, it is assumed that dikes would be degraded 3 years after the last pumping event for the respective cell.

IV. WVA Variables and Assumptions

The following is a description of assumptions created for the two dredging cycles (cells). The same assumptions apply to both cycles, but target years (i.e., years that dikes would be constructed and dredged material pumped) would differ.

Cycle 1

<u>Variable 1 – Emergent Vegetation</u>

FWOP: There is 0% emergent marsh in the open water areas where the cells would be contructed.

FWP: A total of 1,129,350 cyds of dredged material will be pumped into this 282-acre cell. To estimate the potential amount of marsh acres that could be created with the dredged material, the CWPPRA Sabine Refuge Marsh Creation (CS-28), Cycle 1 project was used as a reference site. That project created marsh by pumping material into an area confined by earthen dikes. It was found that approximately 4,000 cyds of dredge material created 1 acre of marsh.

→ 1,129,350 cyds / 4,000 cyds per acre = 282 acres

Based on USACE knowledge and experience of dredging operations, a maximum of 85% of this material will form into vegetated marsh, and the remaining 15% of the area would be shallow open water (also called mudflats).

Target Year (TY) 0: ~ 0 acres of existing marsh (0%)
TY 9 – 0%
TY 10 (dike & pump year) –10% of the dredged material would be marsh (.10*282 ac=28.2 ac of marsh)
TY 11 (2 years after pumping) – 30% marsh (.3 * 282 ac = 84.6 ac of marsh)
TY 14 (4 years after pumping) – 85% marsh (.85 * 282 ac = 239.7 ac of marsh)

Marsh loss data was obtained from the Louisiana Coastal Area project report *Coast 2050: Toward a Sustainable Coastal Louisiana* (1998), Appendix F. The loss rate of -0.0045 is used for future-without-project (FWOP). Without the project, there would be no marsh restoration in this project area, so the loss rate would not apply. However, for the future-with-project (FWP) scenario, loss rates would apply after the material is pumped and the dike degraded. Marsh created in a confined area would likely differ in some aspects from naturally occurring marsh: it would be slightly higher in elevation than natural marsh, and its density would differ from natural marsh due to consolidation and type of material. Therefore, the loss rate that would be applied would differ as well; it would be reduced by 50% to account for these attributes. Therefore, for FWP, a loss rate of -0.0023 was applied starting the year that the dike would be degraded.

TY 13 (or 3 years after pumping): dike degraded and land loss rate of -0.0023 was applied.
TY 20: 84% marsh
TY 50: 78% marsh

<u>Variable 2 – Submerged Aquatic Vegetation (SAV)</u>

Currently, large open water areas of the site allow increased wave fetch. In the past, the area has experienced higher levels of salt water intrusion causing the marsh to transition from an intermediate marsh to a more brackish marsh. According to Billy Leonard, Oil and Gas Specialist / Wildlife Biologist with the Southwest Louisiana National Wildlife Refuge Complex, no SAV has been observed on the Sabine NWR, which is adjacent to proposed BU Site 6 and within the same marsh complex (Personal communication, April 2008). This marsh complex is influenced by the Rycade Canal water control structure (CS-02) to the north, as well as the Sabine Refuge Water Control Structures (CS-23). Once the BU site is constructed, salinity and turbidity will be reduced, and the area should support SAVs. Some SAVs are expected to colonize early on and should gradually increase over time.

FWOP
TY 0: 0%
TY 1: 0%
TY 20: 5%
TY 50: 7%

FWP:
TY 0: 0%

TY 12: 10%
TY 20: 15%
TY 50: 25%

<u>Variable 3 – Interspersion</u>

FWOP: The lowest expression of interspersion, Class 5, is characterized by open water and less than 5% of emergent marsh. Without marsh restoration efforts, 100% of the 847-acre cell in this cycle falls into Class 5. Interspersion classifications are not expected to change within the 50-year assessment period for FWOP (i.e., marsh will not occur naturally).

FWP: Areas exhibiting a high degree of marsh cover are ranked as having a high degree of dispersion (Class 1 or Class 2).   It is assumed that the confined area would achieve a Class 1 once the dredged material is pumped for this cycle because of the ratio of marsh to open water (85% marsh/15% open water).   100% of the 282-acre cell would fall into Class 1 starting the first year it is pumped (TY 1) and throughout the remainder of the 20-year DMMP project life. By TY 50, the area falls to Class 2 due to landloss rates.

Table 1: FWP Interspersion Classification

Target Year	Class 1	%	Class 2	%	Class 5	%
0					282 ac	100
9					282 ac	100
10 (dike & pump)	282 ac	100				
13 (dike degraded)	282 ac	100				
20	282 ac	100				
50			282 ac	100		

<u>Variable 4 – Shallow Open Water Habitat (i.e., mudflats) (percent of open water </= 1.5 feet)</u>

Shallow water areas are assumed to be more biologically productive than deeper water due to a general reduction in sunlight, oxygen, and temperature as water depth increases. Optimal conditions are expected to occur when 80 to 90 percent of the open water area is less than or equal to l.5 feet deep. According to DNR Sonris data, the average water depth in the project area is 2.4'. In the FWOP scenario, 10% of Cell 1 would be classified as </= 1.5'. Once the dredged material is pumped into the area, 100% of the water in the cell would be shallow.

FWOP:

(TY 0): 10% * 282 ac of open water </= 1.5 ft

FWP:

TY 0 (shallow open water) = 10% or same as FWOP
TY 9 = 10%
TY 10 (dike & pump year) = 100%.

TY 20 = 80 %
TY 50 = 60%

Variable 5 – Salinity

Hydrographic data was downloaded by station number from the Louisiana DNR SONRIS site (accessed July 30, 2008, GEC). All data has been corrected for biofouling, instrument drift, and/or instrument malfunction.

Monthly water salinity records collected during 2002 show that average annual salinity for the station located in the project area is 4.2 parts per thousand (ppt).

The salinity is expected to remain constant throughout the life of this project.

Variable 6 – Fish Access

Access by aquatic organisms is considered to be a critical component in assessing the quality of a given marsh system. The suitability index (SI) for this variable is determined by calculating an "access value" based on the percentage of the project area wetlands considered accessible by aquatic organisms during normal tidal fluctuations, and the type of man-made structures (if any) across identified points of ingress/egress (e.g., bayous, canals, etc.). A brackish marsh with no access is assigned an SI of .2. A solid plug is assigned an SI of .0001. A completely open system is assigned an SI of 1.0.

FWOP: Efforts to control salinity and water levels in this area have been conducted through the implementation of the Rycade Canal marsh management project (CS-02) and the Sabine Refuge Water Control Structures (CS-23). Therefore, the area is assigned an access value of 0.35.

TY 0: 0.35
TY 1: 0.35
TY 20: 0.35
TY 50: 0.35

FWP: The current access value, as noted previously, is 0.35. During target year TY 10, the dike would be constructed, resulting in an access value of 0.0001. The access value is expected to remain at 0.0001 until the dike degrades in TY 13. The degree of access would then return to the original value of 0.35 and remain there throughout the 50 year assessment period.

TY 0 0.35
TY 9 0.35
TY 10 (dike & pump year) 0.0001
TY 13 (dike degradation) 0.35
TY 20 0.35
TY 50 0.35

Cycle 2

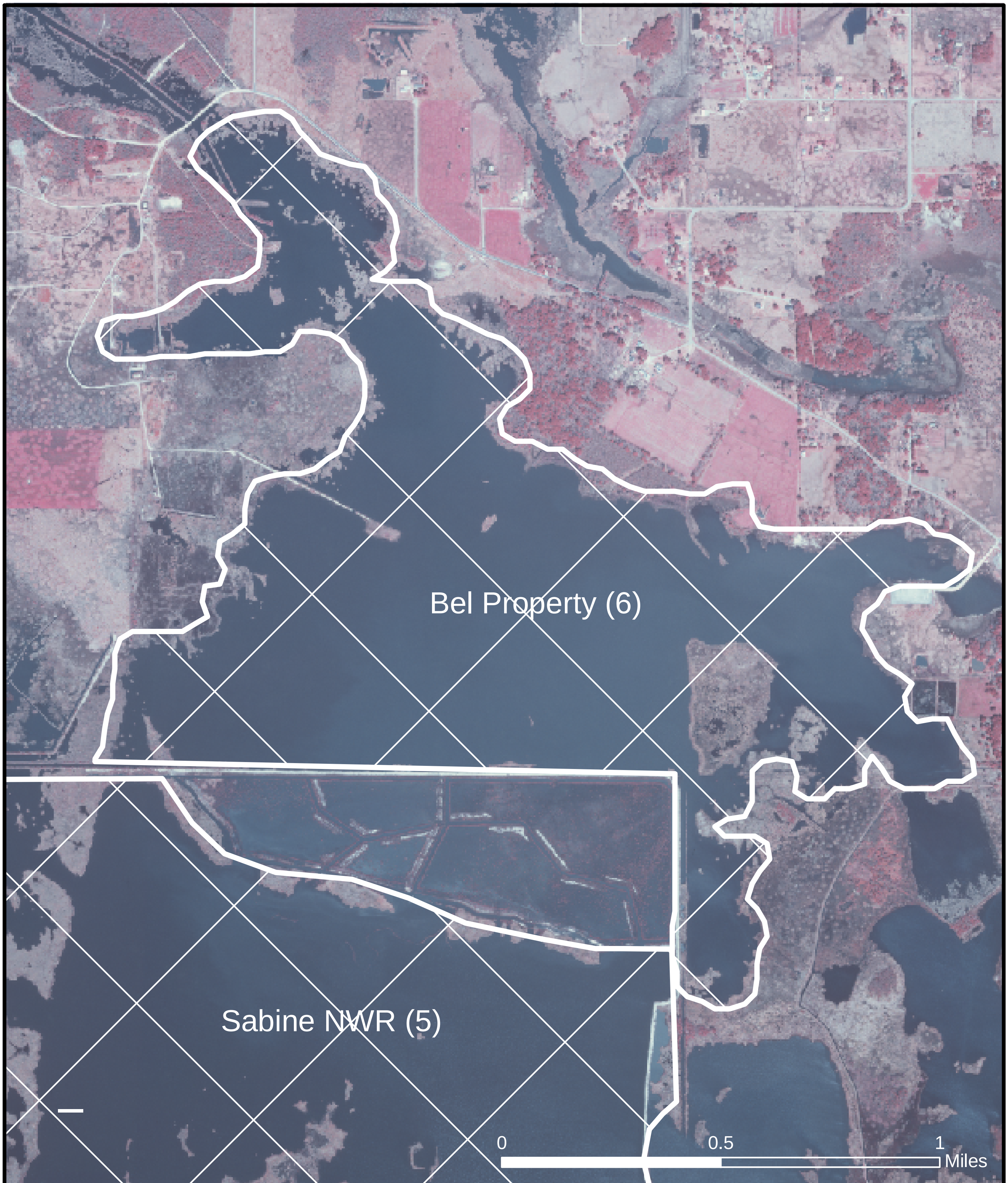
The above assumptions were applied to Cycle 2 Target Years, which include the following:

<u>FWOP:</u>

TY 0, TY 1, TY 20, TY 50

<u>FWP:</u>

TY 0: Same as FWOP
TY 11: Same as TY 0
TY 12: Dike construction and pump year. 10% credit given to marsh creation.
TY 14: Two years after pumping. 30% credit given to marsh creation.
TY 15: Dike degradation (3 years after pumping)
TY 16: Four years after pumping. 85% credit given to fully vegetated marsh
TY 20: Land loss rates have reduced the amount of marsh from 85% of project area to 84%
TY 50: Land loss rates have reduced the amount of marsh from 84% of project area to 79%



Beneficial Use Site 6

Calcasieu River and Pass, Louisiana
Dredged Material Management Plan

USGS DOQQ 2005 WESTLAKE SW 3009354

Figure: 1
Date: August 2007
Scale:1:19,259
Source: USGS/GEC/USACE
Map Author: Moore 27585101-765

WETLAND VALUE ASSESSMENT COMMUNITY MODEL
Brackish Marsh

Project: Cycle 1 BU Site 6, Calcasieu DMMP   Project Area: 282

Condition: Future Without Project

Variable		TY 0 Value	TY 0 SI	TY 1 Value	TY 1 SI	TY 20 Value	TY 20 SI			
V1	% Emergent	0	0.10	0	0.10	0	0.10			
V2	% Aquatic	0	0.10	0	0.10	5	0.15			
V3	Interspersion	%		%		%				
	Class 1		0.10		0.10		0.10	0	0	0
	Class 2							0	0	0
	Class 3							0	0	0
	Class 4							0	0	0
	Class 5	100		100		100		0.1	0.1	0.1
V4	%OW <= 1.5ft	10	0.23	10	0.23	10	0.23			
V5	Salinity (ppt)	4.2	1.00	4.2	1.00	4.2	1.00			
V6	Access Value	0.35	0.42	0.35	0.42	0.35	0.42			
	Emergent Marsh HSI	**=**	**0.23**	**EM HSI =**	**0.23**	**EM HSI =**	**0.23**			
	Open Water HSI	**=**	**0.24**	**OW HSI =**	**0.24**	**OW HSI =**	**0.27**			

Project: Cycle 1 BU Site 6, Calcasieu DMMP
FWOP

Variable		TY 50 Value	TY 50 SI	Value	SI	Value	SI			
V1	% Emergent	0	0.10							
V2	% Aquatic	7	0.16							
V3	Interspersion	%		%		%				
	Class 1		0.10					0	0	0
	Class 2							0	0	0
	Class 3							0	0	0
	Class 4							0	0	0
	Class 5	100						0.1	0	0
V4	%OW <= 1.5ft	10	0.23							
V5	Salinity (ppt)	4.2	1.00							
V6	Access Value	0.35	0.42							
		EM HSI =	**0.23**	**EM HSI =**		**EM HSI =**				
		OW HSI =	**0.28**	**OW HSI =**		**OW HSI =**				

WETLAND VALUE ASSESSMENT COMMUNITY MODEL
Brackish Marsh

Project: Cycle 1 BU Site 6, Calcasieu DMMP   Project Area: 282

Condition: Future With Project

Variable		TY 0 Value	TY 0 SI	TY 9 Value	TY 9 SI	TY 10 (dike & pump year) Value	TY 10 (dike & pump year) SI			
V1	% Emergent	0	0.10	0	0.10	10	0.19			
V2	% Aquatic	0	0.10	0	0.10	0	0.10			
V3	Interspersion	%		%		%				
	Class 1		0.10		0.10	100	1.00	0	0	1
	Class 2							0	0	0
	Class 3							0	0	0
	Class 4							0	0	0
	Class 5	100		100				0.1	0.1	0
V4	%OW <= 1.5ft	10	0.23	10	0.23	100	0.60			
V5	Salinity (ppt)	4.2	1.00	4.2	1.00	4.2	1.00			
V6	Access Value	0.35	0.42	0.35	0.42	0.00	0.10			
	Emergent Marsh HSI =		0.23	EM HSI =	0.23	EM HSI =	0.35			
	Open Water HSI =		0.24	OW HSI =	0.24	OW HSI =	0.27			

Project: Cycle 1 BU Site 6, Calcasieu DMMP
FWP

Variable		TY 12 Value	TY 12 SI	TY 13 (dike degraded) Value	TY 13 (dike degraded) SI	TY 14 Value	TY 14 SI			
V1	% Emergent	30	0.37	30	0.37	85	0.87			
V2	% Aquatic	10	0.19	10	0.19	10	0.19			
V3	Interspersion	%		%		%				
	Class 1	100	1.00	100	1.00	100	0.60	1	1	1
	Class 2							0	0	0
	Class 3							0	0	0
	Class 4							0	0	0
	Class 5							0	0	0
V4	%OW <= 1.5ft	100	0.60	100	0.60	100	0.60			
V5	Salinity (ppt)	4.2	1.00	4.2	1.00	4.2	1.00			
V6	Access Value	0.00	0.10	0.35	0.42	0.35	0.42			
		EM HSI =	0.44	EM HSI =	0.52	EM HSI =	0.75			
		OW HSI =	0.31	OW HSI =	0.39	OW HSI =	0.36			

Project: Cycle 1 BU Site 6, Calcasieu DMMP
FWP

Variable		TY 20 Value	TY 20 SI	TY 50 Value	TY 50 SI	Value	SI			
V1	% Emergent	84	0.86	78	0.80					
V2	% Aquatic	15	0.24	25	0.33					
V3	Interspersion	%		%		%				
	Class 1	100	1.00		0.00			1	0	0
	Class 2			100				0	0.6	0
	Class 3							0	0	0
	Class 4							0	0	0
	Class 5							0	0	0
V4	%OW <= 1.5ft	80	1.00	60	0.87					
V5	Salinity (ppt)	4.2	1.00	4.2	1.00					
V6	Access Value	0.35	0.42	0.35	0.42					
		EM HSI =	0.79	EM HSI =	0.65	EM HSI =				
		OW HSI =	0.45	OW HSI =	0.42	OW HSI =				

Future Without Project			Total	Cummulative
TY	Marsh Acres	x HSI	HUs	HUs
0	0	0.23	0.00	
1	0	0.23	0.00	0.00
20	0	0.23	0.00	0.00
50	0	0.23	0.00	0.00
			AAHUs =	**0.00**

Future With Project			Total	Cummulative
TY	Marsh Acres	x HSI	HUs	HUs
0	0	0.23	0.00	
9	0	0.23	0.00	0.00
10	28	0.35	9.79	4.34
12	85	0.44	36.98	45.15
13	85	0.52	44.01	40.49
14	240	0.75	178.96	105.59
20	236	0.79	185.39	1093.22
50	221	0.65	142.97	3350.66
			AAHUs	**92.79**

NET CHANGE IN AAHUs DUE TO PROJECT	
A. Future With Project Emergent Marsh AAHUs =	92.79
B. Future Without Project Emergent Marsh AAHUs =	0.00
Net Change (FWP - FWOP) =	**92.79**

AAHU CALCULATION - OPEN WATER

Project: Cycle 1 BU Site 6, Calcasieu DMMP

Future Without Project			Total	Cummulative
TY	Water Acres	x HSI	HUs	HUs
0	282	0.24	66.51	
1	282	0.24	66.51	66.51
20	282	0.27	76.19	1355.59
50	282	0.28	79.71	2338.43
			AAHUs =	**75.21**

Future With Project			Total	Cummulative
TY	Water Acres	x HSI	HUs	HUs
0	282	0.24	66.51	
9	282	0.24	66.51	598.57
10	254	0.27	68.68	67.76
12	197	0.31	60.47	129.84
13	197	0.39	77.73	69.10
14	42	0.36	15.33	45.76
20	46	0.45	20.78	107.97
50	61	0.42	25.46	728.21
			AAHUs	**34.94**

NET CHANGE IN AAHUs DUE TO PROJECT	
A. Future With Project Open Water AAHUs =	34.94
B. Future Without Project Open Water AAHUs =	75.21
Net Change (FWP - FWOP) =	**-40.27**

TOTAL BENEFITS IN AAHUs DUE TO PROJECT	
A. Emergent Marsh Habitat Net AAHUs =	92.79
B. Open Water Habitat Net AAHUs =	-40.27
Net Benefits= (2.6xEMAAHUs+OWAAHUs)/3.6	**55.83**

WETLAND VALUE ASSESSMENT COMMUNITY MODEL
Brackish Marsh

Project: Cycle 1 BU Site 6, Calcasieu DMMP   Project Area: 282

Condition: Future Without Project

Variable		TY 0 Value	TY 0 SI	TY 1 Value	TY 1 SI	TY 20 Value	TY 20 SI			
V1	% Emergent	0	0.10	0	0.10	0	0.10			
V2	% Aquatic	0	0.10	0	0.10	5	0.15			
V3	Interspersion	%		%		%				
	Class 1		0.10		0.10		0.10	0	0	0
	Class 2							0	0	0
	Class 3							0	0	0
	Class 4							0	0	0
	Class 5	100		100		100		0.1	0.1	0.1
V4	%OW <= 1.5ft	10	0.23	10	0.23	10	0.23			
V5	Salinity (ppt)	4.2	1.00	4.2	1.00	4.2	1.00			
V6	Access Value	0.35	0.42	0.35	0.42	0.35	0.42			
	Emergent Marsh HSI	**=**	**0.23**	**EM HSI =**	**0.23**	**EM HSI =**	**0.23**			
	Open Water HSI	**=**	**0.24**	**OW HSI =**	**0.24**	**OW HSI =**	**0.27**			

Project: Cycle 1 BU Site 6, Calcasieu DMMP

FWOP

Variable		TY 50 Value	TY 50 SI	Value	SI	Value	SI			
V1	% Emergent	0	0.10							
V2	% Aquatic	7	0.16							
V3	Interspersion	%		%		%				
	Class 1		0.10					0	0	0
	Class 2							0	0	0
	Class 3							0	0	0
	Class 4							0	0	0
	Class 5	100						0.1	0	0
V4	%OW <= 1.5ft	10	0.23							
			1.00							
V5	Salinity (ppt)	4.2								
V6	Access Value	0.35	0.42							
		EM HSI =	**0.23**	**EM HSI =**		**EM HSI =**				
		OW HSI =	**0.28**	**OW HSI =**		**OW HSI =**				

WETLAND VALUE ASSESSMENT COMMUNITY MODEL
Brackish Marsh

Project: Cycle 1 BU Site 6, Calcasieu DMMP   Project Area: 282

Condition: Future With Project

Variable		TY 0 Value	TY 0 SI	TY 11 Value	TY 11 SI	TY 12 (dike & pump year) Value	TY 12 (dike & pump year) SI			
V1	% Emergent	0	0.10	0	0.10	10	0.19			
V2	% Aquatic	0	0.10	0	0.10	0	0.10			
V3	Interspersion	%		%		%				
	Class 1		0.10		0.10	100	1.00	0	0	1
	Class 2							0	0	0
	Class 3							0	0	0
	Class 4							0	0	0
	Class 5	100		100				0.1	0.1	0
V4	%OW <= 1.5ft	10	0.23	10	0.23	100	0.60			
V5	Salinity (ppt)	4.2	1.00	4.2	1.00	4.2	1.00			
V6	Access Value	0.35	0.42	0.35	0.42	0.00	0.10			
	Emergent Marsh HSI	**=**	**0.23**	**EM HSI =**	**0.23**	**EM HSI =**	**0.35**			
	Open Water HSI	**=**	**0.24**	**OW HSI =**	**0.24**	**OW HSI =**	**0.27**			

Project: Cycle 1 BU Site 6, Calcasieu DMMP
FWP

Variable		TY 14 Value	TY 14 SI	TY 15 (dike degraded) Value	TY 15 (dike degraded) SI	TY 16 Value	TY 16 SI			
V1	% Emergent	30	0.37	30	0.37	85	0.87			
V2	% Aquatic	10	0.19	10	0.19	10	0.19			
V3	Interspersion	%		%		%				
	Class 1	100	1.00	100	1.00	100	0.60	1	1	1
	Class 2							0	0	0
	Class 3							0	0	0
	Class 4							0	0	0
	Class 5							0	0	0
V4	%OW <= 1.5ft	100	0.60	100	0.60	100	0.60			
V5	Salinity (ppt)	4.2	1.00	4.2	1.00	4.2	1.00			
V6	Access Value	0.00	0.10	0.35	0.42	0.35	0.42			
		EM HSI =	**0.44**	**EM HSI =**	**0.52**	**EM HSI =**	**0.75**			
		OW HSI =	**0.31**	**OW HSI =**	**0.39**	**OW HSI =**	**0.36**			

Project: Cycle 1 BU Site 6, Calcasieu DMMP
FWP

Variable		TY 20 Value	TY 20 SI	TY 50 Value	TY 50 SI	Value	SI			
V1	% Emergent	84	0.86	79	0.81					
V2	% Aquatic	15	0.24	25	0.33					
V3	Interspersion	%		%		%				
	Class 1	100	1.00		0.00			1	0	0
	Class 2			100				0	0.6	0
	Class 3							0	0	0
	Class 4							0	0	0
	Class 5							0	0	0
V4	%OW <= 1.5ft	80	1.00	60	0.87					
V5	Salinity (ppt)	4.2	1.00	4.2	1.00					
V6	Access Value	0.35	0.42	0.35	0.42					
		EM HSI =	**0.79**	**EM HSI =**	**0.65**	**EM HSI =**				
		OW HSI =	**0.45**	**OW HSI =**	**0.42**	**OW HSI =**				

Future Without Project			Total	Cummulative
TY	Marsh Acres	x HSI	HUs	HUs
0	0	0.23	0.00	
1	0	0.23	0.00	0.00
20	0	0.23	0.00	0.00
50	0	0.23	0.00	0.00
			AAHUs =	0.00

Future With Project			Total	Cummulative
TY	Marsh Acres	x HSI	HUs	HUs
0	0	0.23	0.00	
11	0	0.23	0.00	0.00
12	28	0.35	9.79	4.34
14	85	0.44	36.98	45.15
15	85	0.52	44.01	40.49
16	240	0.75	178.96	105.59
20	238	0.79	186.96	731.90
50	222	0.65	144.64	3194.37
			AAHUs	82.44

NET CHANGE IN AAHUs DUE TO PROJECT	
A. Future With Project Emergent Marsh AAHUs =	82.44
B. Future Without Project Emergent Marsh AAHUs =	0.00
Net Change (FWP - FWOP) =	**82.44**

AAHU CALCULATION - OPEN WATER

Project: Cycle 1 BU Site 6, Calcasieu DMMP

Future Without Project			Total	Cummulative
TY	Water Acres	x HSI	HUs	HUs
0	282	0.24	66.51	
1	282	0.24	66.51	66.51
20	282	0.27	76.19	1355.59
50	282	0.28	79.71	2338.43
			AAHUs =	75.21

Future With Project			Total	Cummulative
TY	Water Acres	x HSI	HUs	HUs
0	282	0.24	66.51	
11	282	0.24	66.51	731.58
12	254	0.27	68.68	67.76
14	197	0.31	60.47	129.84
15	197	0.39	77.73	69.10
16	42	0.36	15.33	45.76
20	44	0.45	19.87	70.29
50	60	0.42	25.04	680.96
			AAHUs	35.91

NET CHANGE IN AAHUs DUE TO PROJECT	
A. Future With Project Open Water AAHUs =	35.91
B. Future Without Project Open Water AAHUs =	75.21
Net Change (FWP - FWOP) =	**-39.30**

TOTAL BENEFITS IN AAHUs DUE TO PROJECT	
A. Emergent Marsh Habitat Net AAHUs =	82.44
B. Open Water Habitat Net AAHUs =	-39.30
Net Benefits= (2.6xEMAAHUs+OWAAHUs)/3.6	**48.62**

Land Loss Spreadsheet

					Loss Rate Calculation				
Project:	BU 6, Cycle 1				**Beginning Year**	**Ending Year**	**Beginning Year Acreage**	**Ending Year Acreage**	**Loss Rate**
Total Acres		**TY0 Marsh Acres**		**TY0 Water Acres**	1974	1990	17,320	16,100	-0.004555
282		0		236	FWP Land Loss Reduction			0.50	

FWOP					FWP					
TY	Loss Rate	Marsh (acres)	% Marsh (V1)	Water (acres)	TY	Loss Rate	Marsh (acres)	% Marsh (V1)	Water (acres)	Net Acres of Marsh
0		0	0%	282	0		0	0%	282	0
1	-0.004555	**0**	**0%**	282	**10**	0	**28**	**10%**	254	28
2	-0.004555	0	0%	282	11	0	28	10%	254	28
3	-0.004555	**0**	**0%**	282	**12**	0	**85**	**30%**	197	85
4	-0.004555	0	0%	282	13	-0.002277	85	30%	197	85
5	-0.004555	**0**	**0%**	282	**14**	-0.002277	**240**	**85%**	42	240
6	-0.004555	0	0%	282	15	-0.002277	239	85%	43	239
7	-0.004555	0	0%	282	16	-0.002277	239	85%	43	239
8	-0.004555	0	0%	282	17	-0.002277	238	84%	44	238
9	-0.004555	0	0%	282	18	-0.002277	238	84%	44	238
10	-0.004555	0	0%	282	19	-0.002277	237	84%	45	237
11	-0.004555	**0**	**0%**	282	**20**	-0.002277	236	**84%**	46	236
12	-0.004555	0	0%	282	21	-0.002277	236	84%	46	236
13	-0.004555	0	0%	282	22	-0.002277	235	83%	47	235
14	-0.004555	0	0%	282	23	-0.002277	235	83%	47	235
15	-0.004555	0	0%	282	24	-0.002277	234	83%	48	234
16	-0.004555	0	0%	282	25	-0.002277	234	83%	48	234
17	-0.004555	0	0%	282	26	-0.002277	233	83%	49	233
18	-0.004555	0	0%	282	27	-0.002277	233	83%	49	233
19	-0.004555	0	0%	282	28	-0.002277	232	82%	50	232
20	-0.004555	0	0%	282	29	-0.002277	232	82%	50	232
21	-0.004555	0	0%	282	30	-0.002277	231	82%	51	231
22	-0.004555	0	0%	282	31	-0.002277	231	82%	51	231
23	-0.004555	0	0%	282	32	-0.002277	230	82%	52	230
24	-0.004555	0	0%	282	33	-0.002277	230	81%	52	230
25	-0.004555	0	0%	282	34	-0.002277	229	81%	53	229
26	-0.004555	0	0%	282	35	-0.002277	228	81%	54	228
27	-0.004555	0	0%	282	36	-0.002277	228	81%	54	228
28	-0.004555	0	0%	282	37	-0.002277	227	81%	55	227
29	-0.004555	0	0%	282	38	-0.002277	227	80%	55	227
30	-0.004555	0	0%	282	39	-0.002277	226	80%	56	226
31	-0.004555	0	0%	282	40	-0.002277	226	80%	56	226
32	-0.004555	0	0%	282	41	-0.002277	225	80%	57	225
33	-0.004555	0	0%	282	42	-0.002277	225	80%	57	225
34	-0.004555	0	0%	282	43	-0.002277	224	80%	58	224
35	-0.004555	0	0%	282	44	-0.002277	224	79%	58	224
36	-0.004555	0	0%	282	45	-0.002277	223	79%	59	223
37	-0.004555	0	0%	282	46	-0.002277	223	79%	59	223
38	-0.004555	0	0%	282	47	-0.002277	222	79%	60	222
39	-0.004555	0	0%	282	48	-0.002277	222	79%	60	222
40	-0.004555	0	0%	282	49	-0.002277	221	78%	61	221
41	-0.004555	**0**	**0%**	282	**50**	-0.002277	221	**78%**	61	221
42	-0.004555	0	0%	282	51	-0.002277	220	78%	62	220
43	-0.004555	0	0%	282	52	-0.002277	220	78%	62	220
44	-0.004555	0	0%	282	53	-0.002277	219	78%	63	219
45	-0.004555	0	0%	282	54	-0.002277	219	78%	63	219
46	-0.004555	0	0%	282	55	-0.002277	218	77%	64	218
47	-0.004555	0	0%	282	56	-0.002277	218	77%	64	218
48	-0.004555	0	0%	282	57	-0.002277	217	77%	65	217
49	-0.004555	0	0%	282	58	-0.002277	217	77%	65	217
50	-0.004555	0	0%	282	59	-0.002277	216	77%	66	216

Land Loss Spreadsheet

					Loss Rate Calculation				
Project:	BU 6, Cycle 2				**Beginning Year**	**Ending Year**	**Beginning Year Acreage**	**Ending Year Acreage**	**Loss Rate**
Total Acres		**TY0 Marsh Acres**		**TY0 Water Acres**	1974	1990	17,320	16,100	-0.004555
282		0		236	FWP Land Loss Reduction			0.50	

FWOP					FWP					
TY	Loss Rate	Marsh (acres)	% Marsh (V1)	Water (acres)	TY	Loss Rate	Marsh (acres)	% Marsh (V1)	Water (acres)	Net Acres of Marsh
0		0	0%	282	0		0	0%	282	0
1	-0.004555	0	0%	282	12	0	28	10%	254	28
2	-0.004555	0	0%	282	13	0	28	10%	254	28
3	-0.004555	0	0%	282	14	0	85	30%	197	85
4	-0.004555	0	0%	282	15	-0.002277	85	30%	197	85
5	-0.004555	0	0%	282	16	-0.002277	240	85%	42	240
6	-0.004555	0	0%	282	17	-0.002277	239	85%	43	239
7	-0.004555	0	0%	282	18	-0.002277	239	85%	43	239
8	-0.004555	0	0%	282	19	-0.002277	238	84%	44	238
9	-0.004555	0	0%	282	20	-0.002277	238	84%	44	238
10	-0.004555	0	0%	282	21	-0.002277	237	84%	45	237
11	-0.004555	0	0%	282	22	-0.002277	236	84%	46	236
12	-0.004555	0	0%	282	23	-0.002277	236	84%	46	236
13	-0.004555	0	0%	282	24	-0.002277	235	83%	47	235
14	-0.004555	0	0%	282	25	-0.002277	235	83%	47	235
15	-0.004555	0	0%	282	26	-0.002277	234	83%	48	234
16	-0.004555	0	0%	282	27	-0.002277	234	83%	48	234
17	-0.004555	0	0%	282	28	-0.002277	233	83%	49	233
18	-0.004555	0	0%	282	29	-0.002277	233	83%	49	233
19	-0.004555	0	0%	282	30	-0.002277	232	82%	50	232
20	-0.004555	0	0%	282	31	-0.002277	232	82%	50	232
21	-0.004555	0	0%	282	32	-0.002277	231	82%	51	231
22	-0.004555	0	0%	282	33	-0.002277	231	82%	51	231
23	-0.004555	0	0%	282	34	-0.002277	230	82%	52	230
24	-0.004555	0	0%	282	35	-0.002277	230	81%	52	230
25	-0.004555	0	0%	282	36	-0.002277	229	81%	53	229
26	-0.004555	0	0%	282	37	-0.002277	228	81%	54	228
27	-0.004555	0	0%	282	38	-0.002277	228	81%	54	228
28	-0.004555	0	0%	282	39	-0.002277	227	81%	55	227
29	-0.004555	0	0%	282	40	-0.002277	227	80%	55	227
30	-0.004555	0	0%	282	41	-0.002277	226	80%	56	226
31	-0.004555	0	0%	282	42	-0.002277	226	80%	56	226
32	-0.004555	0	0%	282	43	-0.002277	225	80%	57	225
33	-0.004555	0	0%	282	44	-0.002277	225	80%	57	225
34	-0.004555	0	0%	282	45	-0.002277	224	80%	58	224
35	-0.004555	0	0%	282	46	-0.002277	224	79%	58	224
36	-0.004555	0	0%	282	47	-0.002277	223	79%	59	223
37	-0.004555	0	0%	282	48	-0.002277	223	79%	59	223
38	-0.004555	0	0%	282	49	-0.002277	222	79%	60	222
39	-0.004555	0	0%	282	50	-0.002277	222	79%	60	222
40	-0.004555	0	0%	282	51	-0.002277	221	78%	61	221
41	-0.004555	0	0%	282	52	-0.002277	221	78%	61	221
42	-0.004555	0	0%	282	53	-0.002277	220	78%	62	220
43	-0.004555	0	0%	282	54	-0.002277	220	78%	62	220
44	-0.004555	0	0%	282	55	-0.002277	219	78%	63	219
45	-0.004555	0	0%	282	56	-0.002277	219	78%	63	219
46	-0.004555	0	0%	282	57	-0.002277	218	77%	64	218
47	-0.004555	0	0%	282	58	-0.002277	218	77%	64	218
48	-0.004555	0	0%	282	59	-0.002277	217	77%	65	217
49	-0.004555	0	0%	282	60	-0.002277	217	77%	65	217
50	-0.004555	0	0%	282	61	-0.002277	216	77%	66	216

Beneficial Use Site 7

<u>Beneficial Use (BU) Site 7 (Bel Property</u>)

I. Project Location/Area

This wetland value assessment (WVA) focuses on BU Site 7 (Figure 1), which is owned by the Bel family. This 2498-acre area is located in Cameron Parish approximately six miles southwest of Hackberry, Louisiana.

II. Goals

The project goal is to create intertidal marsh and shallow open water habitat within this 2498-acre project area. There are 2267 acres of open water found in the project area. Approximately 6.7 million cubic yards of material would be dredged from the Calcasieu Ship Channel (between miles 16 and 21) in two pumping cycles to create approximately 1694 acres of intertidal, brackish marsh habitat in BU Site 7. The marsh and estuarine habitat created would achieve a ratio of 85% marsh to 15% shallow open water.

III. Project Features

For the two pumping cycles, a total of 6,776,000 cyds of material would be pumped, with 3,388,000 cyds in both cycles. Two 847-acre cells would be created to accommodate the two pumping cycles. To assess habitat benefits, a WVA was prepared for both of the two pumping cycles. It was assumed that containment dikes would be degraded three years after the last pumping cycle.

IV. WVA Variables and Assumptions

The following is a description of assumptions created for the two dredging cycles (cells). The same assumptions apply to both cycles, but target years (i.e., years that dikes would be constructed and dredged material pumped) would differ.

Cycle 1

<u>Variable 1 – Emergent Vegetation</u>

FWOP: There is 0% emergent marsh in the open water areas where the cells would be constructed.

FWP: To estimate the potential amount of marsh acres that could be created with the dredged material, the CWPPRA Sabine Refuge Marsh Creation (CS-28), Cycle 1 project was used as a reference site. That project created marsh by pumping material into an area confined by earthen dikes. It was found that approximately 4,000 cyds of dredge material created 1 acre of marsh.

A total of 3,388,000 cyds of dredged material will be pumped into this 847-acre cell.

- → 3,388,000 cyds / 4,000 cyds per acre = 847 acres

Based on USACE knowledge and experience of dredging operations, a maximum of 85% of this material will form into vegetated marsh, and the remaining 15% of the area would be shallow open water (also called mudflats).

Target Year (TY) 0: ~ 0 acres of existing marsh (0%)
TY 16 – 0%
TY 17(dike & pump year) –10% of the dredged material would be marsh (.10*847 ac = 84.7 ac of marsh)
TY 19 (2 years after pumping) – 30% marsh (.3 * 847 ac = 254.1 ac of marsh)
TY 21 (4 years after pumping) – 85% marsh (.85 * 847 ac = 719.95 ac of marsh)

Marsh loss data was obtained from the Louisiana Coastal Area project report *Coast 2050: Toward a Sustainable Coastal Louisiana* (1998), Appendix F. The loss rate of -0.0045 is used for future-without-project (FWOP). Without the project, there would be no marsh restoration in this project area, so the loss rate would not apply. However, for the future-with-project (FWP) scenario, loss rates would apply after the material is pumped and the dike degraded. Marsh created in a confined area would likely differ in some aspects from naturally occurring marsh: it would be slightly higher in elevation than natural marsh, and its density would differ from natural marsh due to consolidation and type of material. Therefore, the loss rate that would be applied would differ as well; it would be reduced by 50% to account for these attributes. Therefore, for FWP, a loss rate of -0.0023 was applied starting the year that the dike would be degraded.

TY 20 (or 3 years after pumping): dike degraded and land loss rate of -0.0023 was applied.
TY 50: 80% marsh

Variable 2 – Submerged Aquatic Vegetation (SAV)

Currently, large open water areas of the site allow increased wave fetch. In the past, the area has experienced higher levels of salt water intrusion causing the marsh to transition from an intermediate marsh to a more brackish marsh. According to Billy Leonard, Oil and Gas Specialist / Wildlife Biologist with the Southwest Louisiana National Wildlife Refuge Complex, no SAV has been observed in the area of BU Site 7 during field inspections and no significant populations are expected to occur in the future (Personal communication, April 2008).

FWOP
TY 0: 0%
TY 1: 0 %
TY 20: 2 %
TY 50: 2%

FWP:
TY 1: 0%
TY 5: 10%
TY 12: 15 %
TY 20: 20%
TY 50: 20%

Variable 3 – Interspersion

FWOP: The lowest expression of interspersion, Class 5, is characterized by open water and less than 5% of emergent marsh. Without marsh restoration efforts, 100% of the 2267-acre open water area falls into Class 5. Interspersion classifications are not expected to change within the 50-year assessment period for FWOP (i.e., marsh will not occur naturally).

FWP: Areas exhibiting a high degree of marsh cover are ranked as having a high degree of dispersion (Class 1 or Class 2). It is assumed that the confined area would achieve a Class 1 once the dredged material is pumped for this cycle because of the ratio of marsh to open water (85% marsh/15% open water). 100% of the project area would fall into Class 1 starting the first year it is pumped (TY 1) and throughout the remainder of the 20-year DMMP project life. By TY 50, the area falls to Class 2 due to landloss rates.

Table 1: FWP Interspersion Classification

Target Year	Class 1	%	Class 2	%	Class 5	%
0					847 ac	100
16					847 ac	100
17 (dike & pump)	847 ac	100				
20	847 ac	100				
50			847 ac	100		

Variable 4 – Shallow Open Water Habitat (i.e., mudflats) (percent of open water </= 1.5 feet)

Shallow water areas are assumed to be more biologically productive than deeper water due to a general reduction in sunlight, oxygen, and temperature as water depth increases. Optimal conditions are expected to occur when 80 to 90 percent of the open water area is less than or equal to l.5 feet deep. According to DNR Sonris data, the average water depth in the project area is 2.3’. In the FWOP scenario, 10% of Cell 1 would be classified as </= 1.5’. Once the dredged material is pumped into the area, 100% of the water in the cell would be shallow.

FWOP:

(TY 0): 10% * 847 ac of open water </= 1.5 ft

FWP:

TY 0 (shallow open water) = 10% or same as FWOP
TY 16 = 10%
TY 17 (dike & pump year) = 100%.
TY 20 = 80%
TY 50 = 60%

Variable 5 – Salinity

Hydrographic data was downloaded by station number from the Louisiana DNR SONRIS site (accessed July 30, 2008, GEC). All data has been corrected for biofouling, instrument drift, and/or instrument malfunction.

Monthly water salinity records collected during 2007-2008 show that average annual salinity for the Coastal Restoration Monitoring Station located near the project area is 7.3 parts per thousand (ppt).

The salinity is expected to remain constant throughout the life of this project.

<u>Variable 6 – Fish Access</u>

Access by aquatic organisms is considered to be a critical component in assessing the quality of a given marsh system. The suitability index (SI) for this variable is determined by calculating an "access value" based on the percentage of the project area wetlands considered accessible by aquatic organisms during normal tidal fluctuations, and the type of man-made structures (if any) across identified points of ingress/egress (e.g., bayous, canals, etc.). A brackish marsh with no access is assigned an SI of .2. A solid plug is assigned an SI of .0001. A completely open system is assigned an SI of 1.0.

FWOP: This area is considered an open system, and is therefore assigned an access value of 1.0.

TY 0: 1.0
TY 1: 1.0
TY 20: 1.0
TY 50: 1.0

FWP: The current access value, as noted previously, is 1.0. During target year TY 17, the dike would be constructed, resulting in an access value of 0.0001 and is expected to remain at 0.0001 until the dike degrades in TY 20. The degree of access would then return to the original value of 1.0 and remain there throughout the 50 year assessment period.

TY 0: 1.0
TY 16: 1.0
TY 17 (dike & pump year): 0.0001
TY 20 (dike degradation): 1.0
TY 50: 1.0

Cycle 2

The above assumptions were applied to Cycle 2 Target Years, which include the following:

<u>FWOP:</u>

TY 0, TY 1, TY 20, TY 50

<u>FWP:</u>

TY 0: Same as FWOP
TY 17: Same as TY 0
TY 18: Dike construction and pump year. 10% credit given to marsh creation.
TY 20: Two years after pumping. 30% credit given to marsh creation.
TY 21: Dike degradation (3 years after pumping)
TY 22: Four years after pumping. 85% credit given to fully vegetated marsh
TY 50: Land loss rates have reduced the amount of marsh from 85% of project area to 80%

Beneficial Use Site 7

Calcasieu River and Pass, Louisiana
Dredged Material Management Plan

USGS DOQQ 2005 WESTLAKE SW 3009354

Figure: 1
Date: January 2008
Scale:1:31,273
Source: USGS/GEC/USACE
Map Author: Laura 27585107

WETLAND VALUE ASSESSMENT COMMUNITY MODEL
Brackish Marsh

Project: Cycle 1, BU Site 7, Calcasieu DMMP   Project Area: 847

Condition: Future Without Project

Variable		TY 0 Value	TY 0 SI	TY 1 Value	TY 1 SI	TY 20 Value	TY 20 SI			
V1	% Emergent	0	0.10	0	0.10	0	0.10			
V2	% Aquatic	0	0.10	0	0.10	2	0.12			
V3	Interspersion	%		%		%				
	Class 1		0.10		0.10		0.10	0	0	0
	Class 2							0	0	0
	Class 3							0	0	0
	Class 4							0	0	0
	Class 5	100		100		100		0.1	0.1	0.1
V4	%OW <= 1.5ft	10	0.23	10	0.23	10	0.23			
V5	Salinity (ppt)	7.3	1.00	7.3	1.00	7.3	1.00			
V6	Access Value	1.00	1.00	1.00	1.00	1.00	1.00			
	Emergent Marsh HSI	**=**	**0.25**	**EM HSI =**	**0.25**	**EM HSI =**	**0.25**			
	Open Water HSI	**=**	**0.29**	**OW HSI =**	**0.29**	**OW HSI =**	**0.31**			

Project: Cycle 1, BU Site 7, Calcasieu DMMP
FWOP

Variable		TY 50 Value	TY 50 SI	Value	SI	Value	SI			
V1	% Emergent	0	0.10							
V2	% Aquatic	2	0.12							
V3	Interspersion	%		%		%				
	Class 1		0.10					0	0	0
	Class 2							0	0	0
	Class 3							0	0	0
	Class 4							0	0	0
	Class 5	100						0.1	0	0
V4	%OW <= 1.5ft	10	0.23							
V5	Salinity (ppt)	7.3	1.00							
V6	Access Value	1.00	1.00							
		EM HSI =	**0.25**	**EM HSI =**		**EM HSI =**				
		OW HSI =	**0.31**	**OW HSI =**		**OW HSI =**				

WETLAND VALUE ASSESSMENT COMMUNITY MODEL
Brackish Marsh

Project: Cycle 1, BU Site 7, Calcasieu DMMP   Project Area: 847

Condition: Future With Project

Variable		TY 0 Value	TY 0 SI	TY 16 Value	TY 16 SI	TY 17 (dike & pump year) Value	TY 17 (dike & pump year) SI			
V1	% Emergent	0	0.10	0	0.10	10	0.19			
V2	% Aquatic	0	0.10	0	0.10	0	0.10			
V3	Interspersion	%		%		%				
	Class 1		0.10		0.10	100	1.00	0	0	1
	Class 2							0	0	0
	Class 3							0	0	0
	Class 4							0	0	0
	Class 5	100		100				0.1	0.1	0
V4	%OW <= 1.5ft	10	0.23	10	0.23	100	0.60			
V5	Salinity (ppt)	7.3	1.00	7.3	1.00	7.3	1.00			
V6	Access Value	1.00	1.00	1.00	1.00	0.00	0.10			
	Emergent Marsh HSI =		**0.25**	**EM HSI =**	**0.25**	**EM HSI =**	**0.35**			
	Open Water HSI =		**0.29**	**OW HSI =**	**0.29**	**OW HSI =**	**0.27**			

Project: Cycle 1, BU Site 7, Calcasieu DMMP
FWP

Variable		TY 19 Value	TY 19 SI	TY 20 (dike degraded) Value	TY 20 (dike degraded) SI	TY 21 Value	TY 21 SI			
V1	% Emergent	30	0.37	30	0.37	85	0.87			
V2	% Aquatic	10	0.19	15	0.24	20	0.28			
V3	Interspersion	%		%		%				
	Class 1	100	1.00	100	1.00	100	0.60	1	1	1
	Class 2							0	0	0
	Class 3							0	0	0
	Class 4							0	0	0
	Class 5							0	0	0
V4	%OW <= 1.5ft	100	0.60	100	0.60	80	1.00			
V5	Salinity (ppt)	7.3	1.00	7.3	1.00	7.3	1.00			
V6	Access Value	0.00	0.10	1.00	1.00	1.00	1.00			
		EM HSI =	**0.44**	**EM HSI =**	**0.58**	**EM HSI =**	**0.87**			
		OW HSI =	**0.31**	**OW HSI =**	**0.52**	**OW HSI =**	**0.55**			

Project: Cycle 1, BU Site 7, Calcasieu DMMP
FWP

Variable		TY 50 Value	TY 50 SI	Value	SI	Value	SI			
V1	% Emergent	80	0.82							
V2	% Aquatic	20	0.28							
V3	Interspersion	%		%		%				
	Class 1		0.60					0	0	0
	Class 2	100						0.6	0	0
	Class 3							0	0	0
	Class 4							0	0	0
	Class 5							0	0	0
V4	%OW <= 1.5ft	60	0.87							
V5	Salinity (ppt)	7.3	1.00							
V6	Access Value	1.00	1.00							
		EM HSI =	**0.85**	**EM HSI =**		**EM HSI =**				
		OW HSI =	**0.55**	**OW HSI =**		**OW HSI =**				

Future Without Project			Total	Cummulative
TY	Marsh Acres	x HSI	HUs	HUs
0	0	0.25	0.00	
1	0	0.25	0.00	0.00
20	0	0.25	0.00	0.00
50	0	0.25	0.00	0.00
			AAHUs =	**0.00**

Future With Project			Total	Cummulative
TY	Marsh Acres	x HSI	HUs	HUs
0	0	0.25	0.00	
16	0	0.25	0.00	0.00
17	85	0.35	29.72	13.51
19	254	0.44	110.50	135.42
20	254	0.58	148.39	129.45
21	720	0.87	628.89	366.17
50	674	0.85	569.83	10224.72
			AAHUs	**217.39**

NET CHANGE IN AAHUs DUE TO PROJECT	
A. Future With Project Emergent Marsh AAHUs =	217.39
B. Future Without Project Emergent Marsh AAHUs =	0.00
Net Change (FWP - FWOP) =	**217.39**

AAHU CALCULATION - OPEN WATER

Project: Cycle 1, BU Site 7, Calcasieu DMMP

Future Without Project			Total	Cummulative
TY	Water Acres	x HSI	HUs	HUs
0	847	0.29	248.83	
1	847	0.29	248.83	248.83
20	847	0.31	266.11	4891.99
50	847	0.31	266.11	7983.36
			AAHUs =	**262.48**

Future With Project			Total	Cummulative
TY	Water Acres	x HSI	HUs	HUs
0	847	0.29	248.83	
16	847	0.29	248.83	3981.36
17	762	0.27	206.04	227.11
19	593	0.31	182.02	390.12
20	593	0.52	307.65	244.84
21	127	0.55	70.48	191.87
50	173	0.55	94.36	2392.34
			AAHUs	**148.55**

NET CHANGE IN AAHUs DUE TO PROJECT	
A. Future With Project Open Water AAHUs =	148.55
B. Future Without Project Open Water AAHUs =	262.48
Net Change (FWP - FWOP) =	**-113.93**

TOTAL BENEFITS IN AAHUs DUE TO PROJECT	
A. Emergent Marsh Habitat Net AAHUs =	217.39
B. Open Water Habitat Net AAHUs =	-113.93
Net Benefits= (2.6xEMAAHUs+OWAAHUs)/3.6	**125.35**

WETLAND VALUE ASSESSMENT COMMUNITY MODEL
Brackish Marsh

Project: Cycle 2, BU Site 7, Calcasieu DMMP   Project Area: 847

Condition: Future Without Project

Variable		TY 0 Value	TY 0 SI	TY 1 Value	TY 1 SI	TY 20 Value	TY 20 SI			
V1	% Emergent	0	0.10	0	0.10	0	0.10			
V2	% Aquatic	0	0.10	0	0.10	2	0.12			
V3	Interspersion	%		%		%				
	Class 1		0.10		0.10		0.10	0	0	0
	Class 2							0	0	0
	Class 3							0	0	0
	Class 4							0	0	0
	Class 5	100		100		100		0.1	0.1	0.1
V4	%OW <= 1.5ft	10	0.23	10	0.23	10	0.23			
V5	Salinity (ppt)	7.3	1.00	7.3	1.00	7.3	1.00			
V6	Access Value	1.00	1.00	1.00	1.00	1.00	1.00			
	Emergent Marsh HSI	**=**	**0.25**	**EM HSI =**	**0.25**	**EM HSI =**	**0.25**			
	Open Water HSI	**=**	**0.29**	**OW HSI =**	**0.29**	**OW HSI =**	**0.31**			

Project: Cycle 2, BU Site 7, Calcasieu DMMP
FWOP

Variable		TY 50 Value	TY 50 SI	Value	SI	Value	SI			
V1	% Emergent	0	0.10							
V2	% Aquatic	2	0.12							
V3	Interspersion	%		%		%				
	Class 1		0.10					0	0	0
	Class 2							0	0	0
	Class 3							0	0	0
	Class 4							0	0	0
	Class 5	100						0.1	0	0
V4	%OW <= 1.5ft	10	0.23							
			1.00							
V5	Salinity (ppt)	7.3								
V6	Access Value	1.00	1.00							
		EM HSI =	**0.25**	**EM HSI =**		**EM HSI =**				
		OW HSI =	**0.31**	**OW HSI =**		**OW HSI =**				

WETLAND VALUE ASSESSMENT COMMUNITY MODEL
Brackish Marsh

Project: Cycle 2, BU Site 7, Calcasieu DMMP — Project Area: 847

Condition: Future With Project

Variable		TY 0 Value	TY 0 SI	TY 17 Value	TY 17 SI	TY 18 (dike & pump year) Value	TY 18 (dike & pump year) SI			
V1	% Emergent	0	0.10	0	0.10	10	0.19			
V2	% Aquatic	0	0.10	0	0.10	0	0.10			
V3	Interspersion	%		%		%				
	Class 1		0.10		0.10	100	1.00	0	0	1
	Class 2							0	0	0
	Class 3							0	0	0
	Class 4							0	0	0
	Class 5	100		100				0.1	0.1	0
V4	%OW <= 1.5ft	10	0.23	10	0.23	100	0.60			
V5	Salinity (ppt)	7.3	1.00	7.3	1.00	7.3	1.00			
V6	Access Value	1.00	1.00	1.00	1.00	0.00	0.10			
	Emergent Marsh HSI	=	0.25	EM HSI =	0.25	EM HSI =	0.35			
	Open Water HSI	=	0.29	OW HSI =	0.29	OW HSI =	0.27			

Project: Cycle 2, BU Site 7, Calcasieu DMMP
FWP

Variable		TY 20 Value	TY 20 SI	TY 21 (dike degraded) Value	TY 21 (dike degraded) SI	TY 22 Value	TY 22 SI			
V1	% Emergent	30	0.37	30	0.37	85	0.87			
V2	% Aquatic	10	0.19	15	0.24	15	0.24			
V3	Interspersion	%		%		%				
	Class 1	100	1.00	100	1.00	100	0.60	1	1	1
	Class 2							0	0	0
	Class 3							0	0	0
	Class 4							0	0	0
	Class 5							0	0	0
V4	%OW <= 1.5ft	100	0.60	100	0.60	80	1.00			
V5	Salinity (ppt)	7.3	1.00	7.3	1.00	7.3	1.00			
V6	Access Value	0.00	0.10	1.00	1.00	1.00	1.00			
		EM HSI =	0.44	EM HSI =	0.58	EM HSI =	0.87			
		OW HSI =	0.31	OW HSI =	0.52	OW HSI =	0.52			

Project: Cycle 2, BU Site 7, Calcasieu DMMP
FWP

Variable		TY 50 Value	TY 50 SI	Value	SI	Value	SI			
V1	% Emergent	80	0.82							
V2	% Aquatic	20	0.28							
V3	Interspersion	%		%		%				
	Class 1		0.60					0	0	0
	Class 2	100						0.6	0	0
	Class 3							0	0	0
	Class 4							0	0	0
	Class 5							0	0	0
V4	%OW <= 1.5ft	60	0.87							
V5	Salinity (ppt)	7.3	1.00							
V6	Access Value	1.00	1.00							
		EM HSI =	0.85	EM HSI =		EM HSI =				
		OW HSI =	0.55	OW HSI =		OW HSI =				

Future Without Project			Total	Cummulative
TY	Marsh Acres	x HSI	HUs	HUs
0	0	0.25	0.00	
1	0	0.25	0.00	0.00
20	0	0.25	0.00	0.00
50	0	0.25	0.00	0.00
			AAHUs =	0.00

Future With Project			Total	Cummulative
TY	Marsh Acres	x HSI	HUs	HUs
0	0	0.25	0.00	
17	0	0.25	0.00	0.00
18	85	0.35	29.72	13.51
20	254	0.44	110.50	135.42
21	254	0.58	148.39	129.45
22	720	0.87	628.89	366.17
50	675	0.85	570.67	9894.89
			AAHUs	210.79

NET CHANGE IN AAHUs DUE TO PROJECT	
A. Future With Project Emergent Marsh AAHUs =	210.79
B. Future Without Project Emergent Marsh AAHUs =	0.00
Net Change (FWP - FWOP) =	**210.79**

AAHU CALCULATION - OPEN WATER

Project: Cycle 2, BU Site 7, Calcasieu DMMP

Future Without Project			Total	Cummulative
TY	Water Acres	x HSI	HUs	HUs
0	847	0.29	248.83	
1	847	0.29	248.83	248.83
20	847	0.31	266.11	4891.99
50	847	0.31	266.11	7983.36
			AAHUs =	262.48

Future With Project			Total	Cummulative
TY	Water Acres	x HSI	HUs	HUs
0	847	0.29	248.83	
17	847	0.29	248.83	4230.19
18	762	0.27	206.04	227.11
20	593	0.31	182.02	390.12
21	593	0.52	307.65	244.84
22	127	0.52	65.89	186.77
50	172	0.55	93.82	2230.28
			AAHUs	150.19

NET CHANGE IN AAHUs DUE TO PROJECT	
A. Future With Project Open Water AAHUs =	150.19
B. Future Without Project Open Water AAHUs =	262.48
Net Change (FWP - FWOP) =	**-112.30**

TOTAL BENEFITS IN AAHUs DUE TO PROJECT	
A. Emergent Marsh Habitat Net AAHUs =	210.79
B. Open Water Habitat Net AAHUs =	-112.30
Net Benefits= (2.6xEMAAHUs+OWAAHUs)/3.6	**121.04**

Land Loss Spreadsheet

					Loss Rate Calculation					
Project:	BU 7, Cycle 1				**Beginning Year**	**Ending Year**	**Beginning Year Acreage**	**Ending Year Acreage**	**Loss Rate**	
Total Acres		**TY0 Marsh Acres**		**TY0 Water Acres**	1974	1990	17,320	16,100	-0.004555	
847		0		847	FWP Land Loss Reduction			0.50		
FWOP					**FWP**					
TY	Loss Rate	Marsh (acres)	% Marsh (V1)	Water (acres)	TY	Loss Rate	Marsh (acres)	% Marsh (V1)	Water (acres)	Net Acres of Marsh
0		**0**	**0%**	**847**	0		0	0%	847	0
1	**-0.004555**	**0**	**0%**	**847**	**17**	**0**	**85**	**10%**	**762**	85
2	-0.004555	0	0%	847	18	0	85	10%	762	85
3	-0.004555	0	0%	847	**19**	**0**	**254**	**30%**	**593**	254
4	-0.004555	0	0%	847	20	-0.002277	254	30%	593	254
5	-0.004555	0	0%	847	**21**	**-0.002277**	**720**	**85%**	**127**	720
6	-0.004555	0	0%	847	22	-0.002277	718	85%	129	718
7	-0.004555	0	0%	847	23	-0.002277	717	85%	130	717
8	-0.004555	0	0%	847	24	-0.002277	715	84%	132	715
9	-0.004555	0	0%	847	25	-0.002277	713	84%	134	713
10	-0.004555	0	0%	847	26	-0.002277	712	84%	135	712
11	-0.004555	0	0%	847	27	-0.002277	710	84%	137	710
12	-0.004555	0	0%	847	28	-0.002277	709	84%	138	709
13	-0.004555	0	0%	847	29	-0.002277	707	83%	140	707
14	-0.004555	0	0%	847	30	-0.002277	705	83%	142	705
15	-0.004555	0	0%	847	31	-0.002277	704	83%	143	704
16	-0.004555	0	0%	847	32	-0.002277	702	83%	145	702
17	-0.004555	0	0%	847	33	-0.002277	701	83%	146	701
18	-0.004555	0	0%	847	34	-0.002277	699	83%	148	699
19	-0.004555	0	0%	847	35	-0.002277	697	82%	150	697
20	**-0.004555**	**0**	**0%**	**847**	36	-0.002277	696	82%	151	696
21	-0.004555	0	0%	847	37	-0.002277	694	82%	153	694
22	-0.004555	0	0%	847	38	-0.002277	693	82%	154	693
23	-0.004555	0	0%	847	39	-0.002277	691	82%	156	691
24	-0.004555	0	0%	847	40	-0.002277	689	81%	158	689
25	-0.004555	0	0%	847	41	-0.002277	688	81%	159	688
26	-0.004555	0	0%	847	42	-0.002277	686	81%	161	686
27	-0.004555	0	0%	847	43	-0.002277	685	81%	162	685
28	-0.004555	0	0%	847	44	-0.002277	683	81%	164	683
29	-0.004555	0	0%	847	45	-0.002277	682	80%	165	682
30	-0.004555	0	0%	847	46	-0.002277	680	80%	167	680
31	-0.004555	0	0%	847	47	-0.002277	679	80%	168	679
32	-0.004555	0	0%	847	48	-0.002277	677	80%	170	677
33	-0.004555	0	0%	847	49	-0.002277	675	80%	172	675
34	-0.004555	0	0%	847	**50**	**-0.002277**	**674**	**80%**	**173**	674
35	-0.004555	0	0%	847	51	-0.002277	672	79%	175	672
36	-0.004555	0	0%	847	52	-0.002277	671	79%	176	671
37	-0.004555	0	0%	847	53	-0.002277	669	79%	178	669
38	-0.004555	0	0%	847	54	-0.002277	668	79%	179	668
39	-0.004555	0	0%	847	55	-0.002277	666	79%	181	666
40	-0.004555	0	0%	847	56	-0.002277	665	78%	182	665
41	-0.004555	0	0%	847	57	-0.002277	663	78%	184	663
42	-0.004555	0	0%	847	58	-0.002277	662	78%	185	662
43	-0.004555	0	0%	847	59	-0.002277	660	78%	187	660
44	-0.004555	0	0%	847	60	-0.002277	659	78%	188	659
45	-0.004555	0	0%	847	61	-0.002277	657	78%	190	657
46	-0.004555	0	0%	847	62	-0.002277	656	77%	191	656
47	-0.004555	0	0%	847	63	-0.002277	654	77%	193	654
48	-0.004555	0	0%	847	64	-0.002277	653	77%	194	653
49	-0.004555	0	0%	847	65	-0.002277	651	77%	196	651
50	**-0.004555**	**0**	**0%**	**847**	66	-0.002277	650	77%	197	650

Land Loss Spreadsheet

					Loss Rate Calculation					
Project:	BU 7, Cycle 2				**Beginning Year**	**Ending Year**	**Beginning Year Acreage**	**Ending Year Acreage**	**Loss Rate**	
Total Acres		**TY0 Marsh Acres**		**TY0 Water Acres**	1974	1990	17,320	16,100	-0.004555	
847		0		847	FWP Land Loss Reduction			0.50		
FWOP					**FWP**					
TY	Loss Rate	Marsh (acres)	% Marsh (V1)	Water (acres)	TY	Loss Rate	Marsh (acres)	% Marsh (V1)	Water (acres)	Net Acres of Marsh
0		**0**	**0%**	**847**	0		0	0%	847	0
1	-0.004555	**0**	**0%**	847	**18**	0	**85**	**10%**	762	85
2	-0.004555	0	0%	847	19	0	85	10%	762	85
3	-0.004555	0	0%	847	**20**	0	**254**	**30%**	593	254
4	-0.004555	0	0%	847	21	-0.002277	254	30%	593	254
5	-0.004555	0	0%	847	**22**	-0.002277	**720**	**85%**	127	720
6	-0.004555	0	0%	847	23	-0.002277	718	85%	129	718
7	-0.004555	0	0%	847	24	-0.002277	717	85%	130	717
8	-0.004555	0	0%	847	25	-0.002277	715	84%	132	715
9	-0.004555	0	0%	847	26	-0.002277	713	84%	134	713
10	-0.004555	0	0%	847	27	-0.002277	712	84%	135	712
11	-0.004555	0	0%	847	28	-0.002277	710	84%	137	710
12	-0.004555	0	0%	847	29	-0.002277	709	84%	138	709
13	-0.004555	0	0%	847	30	-0.002277	707	83%	140	707
14	-0.004555	0	0%	847	31	-0.002277	705	83%	142	705
15	-0.004555	0	0%	847	32	-0.002277	704	83%	143	704
16	-0.004555	0	0%	847	33	-0.002277	702	83%	145	702
17	-0.004555	0	0%	847	34	-0.002277	701	83%	146	701
18	-0.004555	0	0%	847	35	-0.002277	699	83%	148	699
19	-0.004555	0	0%	847	36	-0.002277	697	82%	150	697
20	**-0.004555**	**0**	**0%**	**847**	37	-0.002277	696	82%	151	696
21	-0.004555	0	0%	847	38	-0.002277	694	82%	153	694
22	-0.004555	0	0%	847	39	-0.002277	693	82%	154	693
23	-0.004555	0	0%	847	40	-0.002277	691	82%	156	691
24	-0.004555	0	0%	847	41	-0.002277	689	81%	158	689
25	-0.004555	0	0%	847	42	-0.002277	688	81%	159	688
26	-0.004555	0	0%	847	43	-0.002277	686	81%	161	686
27	-0.004555	0	0%	847	44	-0.002277	685	81%	162	685
28	-0.004555	0	0%	847	45	-0.002277	683	81%	164	683
29	-0.004555	0	0%	847	46	-0.002277	682	80%	165	682
30	-0.004555	0	0%	847	47	-0.002277	680	80%	167	680
31	-0.004555	0	0%	847	48	-0.002277	679	80%	168	679
32	-0.004555	0	0%	847	49	-0.002277	677	80%	170	677
33	-0.004555	0	0%	847	**50**	**-0.002277**	**675**	**80%**	**172**	675
34	-0.004555	0	0%	847	51	-0.002277	674	80%	173	674
35	-0.004555	0	0%	847	52	-0.002277	672	79%	175	672
36	-0.004555	0	0%	847	53	-0.002277	671	79%	176	671
37	-0.004555	0	0%	847	54	-0.002277	669	79%	178	669
38	-0.004555	0	0%	847	55	-0.002277	668	79%	179	668
39	-0.004555	0	0%	847	56	-0.002277	666	79%	181	666
40	-0.004555	0	0%	847	57	-0.002277	665	78%	182	665
41	-0.004555	0	0%	847	58	-0.002277	663	78%	184	663
42	-0.004555	0	0%	847	59	-0.002277	662	78%	185	662
43	-0.004555	0	0%	847	60	-0.002277	660	78%	187	660
44	-0.004555	0	0%	847	61	-0.002277	659	78%	188	659
45	-0.004555	0	0%	847	62	-0.002277	657	78%	190	657
46	-0.004555	0	0%	847	63	-0.002277	656	77%	191	656
47	-0.004555	0	0%	847	64	-0.002277	654	77%	193	654
48	-0.004555	0	0%	847	65	-0.002277	653	77%	194	653
49	-0.004555	0	0%	847	66	-0.002277	651	77%	196	651
50	**-0.004555**	**0**	**0%**	**847**	67	-0.002277	650	77%	197	650

Beneficial Use Site 18

Calcasieu DMMP: Sabine Unit 1A, BU Site 18

Project Location/Area

For this WVA, an approximately 1,000-acre open water area in Unit 1a of the Sabine NWR, Cameron Parish, Louisiana, was delineated.

Variable 1 – Emergent Vegetation

Approximately 1,389,300 cubic yards of material would be pumped in six dredging cycles making approximately 8,335,800 cyds of material available to create approximately 600 acres of intertidal, brackish marsh and 400 acres of shallow open water habitat.

Dredged sediments pumped would be unconfined and earthen dikes would not be constructed to contain the dredged materials. This impounded area will be breached at some point to facilitate the movement of dredge material throughout the area. Material would be pumped adjacent to existing wetland vegetation to allow sediments to stack to an elevation conducive for emergent marsh vegetation. Dredged material slurry would be allowed to overflow existing emergent marsh vegetation within the project area, but would not be allowed to exceed a height of approximately one-foot above the existing marsh elevation. Material is expected to stack up where existing marsh allows; however, depending on pipe placement and movement, material is likely to create an abundance of mudflat/shallow open water. Subsequent dredging cycles would be pumped adjacent to existing marsh and/or the marsh platform created during the previous pumping event. Tidal inlets and channels are expected to be created during the pumping of dredge material and by natural tidal fluctuations.

Because unconfined dredge material placement is a relatively unpracticed technique for marsh creation, several assumptions have been made using known values from confined beneficial use marsh creation sites in the vicinity.

FWOP

TY 0: 0 acres/~ 1,000 ac project area (PA) = 0% emergent marsh (EM)

FWP

This area is relatively shallow which would require less material to achieve marsh elevations. Assuming that the average depth is approximately 1.5 feet and initial target elevations are +4.5 ft MLG, approximately 850 acres of marsh could be created (i.e., provided that the marsh creation area were confined with dikes and weirs). According to Corps, where healthy marsh borders proposed unconfined marsh creation areas, material is likely to stack in a manner similar to confined BU marsh creation areas. Also, with beneficial use of dredge material projects, generally approximately 85% of marsh is created in confined marsh creation areas. It is assumed for this analysis that 75% of dredge material pumped adjacent to healthy marsh would create elevations conducive for marsh creation, and 25% would create shallow open water habitat (i.e., mudflats). Material is expected to overflow the existing marsh; however, for this analysis nourishment was not considered because of the minimal amount of wetlands that exists within the open water area.

- One (1) acre of marsh would require 261,360 cubic feet of material:

4.5’MLG + 1.5’ water depths = 6’ x 43,560 sq ft = 261,360 cubic feet/27 = 9,680 cubic yards

- One (1) acre of mudflat would require 65,340 cubic feet of material:
  1.5’ X 43,560 sq. ft = 65,340 cubic ft/27 = 2,420 cubic yards

- Therefore,
  75% of 1,389,300 cyds = 1,041,975 cyds/ 9,680 cyds = **108 acres of marsh x 6 cycles = 648 acres of marsh total**

  25% of 1,389,300 cyds = 347,325 cyds/ 2,420 cyds = **144 acres of mudflat could be created per cycle;** however, portions of the previously pumped cycles would be affected. (A portion of the material would nourish previously created marsh habitat, but benefits for marsh nourishment were not considered in this calculation because of the unknowns.)

The timeline for functional marsh credit for marsh creation is assumed as follows:
Construction Year - 10 %
Two years after CY – 30 %
Four years after CY – 100%

Table 1 - Timeline for Sabine BU Site 18 pump events and functional credit.

TY	0-1	2	4	6	8	10	12	13	14	15	16	17	18	19	20	21	23
Cycle																	
1		10%	30%	100%													
2					10%	30%	100%										
3						10%	30%		100%								
4								10%		30%		100%					
5											10%		30%		100%		
6														10%		30%	100%

Marsh loss data was obtained from the Louisiana Coastal Area project report *Coast 2050: Toward a Sustainable Coastal Louisiana* (1999), Appendix F. The 1974 to 1990 annual land loss rate for the Brown Lake area (-.45%) was used for FWOP. Material is not expected to stack and consolidate like confined material. Marsh loss rates for this area are intermediate, and sediments and nutrients will be added to the system throughout the project life. Therefore, for the purpose of this WVA, loss rates were applied to FWP starting at TY 1, but were reduced by 25 %, rather than the standard 50% reduction.

*Refer to land loss spreadsheet for marsh acreages credited by target year.

Variable 2 – Submerged Aquatic Vegetation (SAV)

According to Billy Leonard, Oil and Gas Specialist / Wildlife Biologist with the Southwest Louisiana National Wildlife Refuge Complex, SAV has been observed within Sabine BU site 18 (Personal communication w/ Billy Leonard, August 13, 2008). Water control structures constructed under the CS-23 CWPPRA project were designed to reduce salinity spikes in the area, and the area of Unit 1A is semi-impounded allowing salinity levels to be further reduced.

Salinities are variable within the site which is influenced by rain events and some salinity coming in from a breach along the eastern boundary. The area of open water is located to the north of the breach.

FWOP
TY 0 – 20 %
TY 1 – 20 %
TY 20 – 20 %
TY 50 – 20 %

FWP
TY 0 – 20 %
TY 2 – 5 % (areas of lower salinity further to the west would be pumped first)
TY 10 – 15 % (those lower salinity areas previously pumped should have SAV recruitment)
TY 13 – 20 %
TY 23 – 25 % [marsh created in OW areas increase SAV potential (TY 23 = 5 years after last cycle)]
TY 50 – 35 %

Variable 3 – Interspersion
Interspersion was determined by reviewing 2004 DOQQ and knowledge of the area.

FWOP
TY 0 -50: 1,000 ac project area = Class 5 (open water)

Table 3: FWP Interspersion Classification

Target Year	Cycles	Class2 (%)	Class 3 (%)	Class 5 (%)
0-1 (FWOP)				100
2	1		17	83
8	2		33	67
10	3		50	50
13	4		66	34
16	5		83	17
19	6		100	
20			100	
50			100	

*No more than 620 acres/1,000 acre would be converted to marsh, which suggests a Class 3 interspersion.

Variable 4 – Shallow Open Water (SOW) Habitat (percent of open water < 1.5 feet)

Much of the area is relatively shallow (1-2 feet); however dredge sediments pumped into the area would help to further shallow up the area creating mudflat habitat (~ 0.5’ water depths).

FWOP
TY 1 – 70 %
TY 20 – 70 %
TY 50 – 70 %

FWP
TY 0 – 70 %
TY 2 – 65 % (shallow areas filled to marsh elevations removing that available SOW habitat)
TY 13 – 70 % (some deeper areas are filled in to create SOW and marsh during these cycles)
TY 16 – 75 % “”
TY 19 – 65 % (NWR personnel indicated that dikes would be breached once marsh habitat is restored)
TY 23 – 65 %
TY 50 – 65 %

Variable 5 – Salinity

Salinity was measured within Unit 1a on August 13, 2008. The southeastern corner of Unit 1a is approximately 7.7 ppt (Leonard 2008). The area is highly variable, but 7.7 ppt should be a good representation of the area (Leonard 2008). Areas closer to the breach along the eastern boundary would be around 10 ppt, and areas within the marsh further from the breach should be less, approximately 3.0 ppt. The open water area designated for placement of dredge material is north of the breach and is somewhat buffered with marsh vegetation from the breach. An average of 7.0 ppt was assumed.

Variable 6 – Fish Access
The CWPPRA, CS-23 project replaced water control structures on three major waterways within the study area. The project structures include deep bays, culverts, and flapgates, resulting in a current access value of 0.35. The site also has dikes all the way around with one 50-foot breach on the eastern boundary that can be controlled (variable crest weir = 0.3); however the structure is usually in the open position (Leonard 2008). Because this is the only access, the access value is reduced to a structure rating of 0.2.

Either after marsh creation/BU is complete or during the dredge pumping events, the Refuge intends to breach the dikes to facilitate movement of dredge material and to bring the marsh complex back into the system. The access value should increase to 0.35 at this point.

FWOP
TY 0 - 0.2 (with existing water control structures from the CWPPRA, CS -23 project and 1 breach in the project area dikes)
TY 50 - 0.2

FWP
TY 0 – 0.2
TY 20 – 0.35
TY 50 – 0.35

References

Louisiana Coastal Wetlands Conservation and Restoration Task Force and the Wetlands Conservation and Restoration Authority. 1999. Coast 2050: Toward a Sustainable Coastal

Louisiana, The Appendices. Appendix F— Region 4 Supplemental Information. Louisiana Department of Natural Resources. Baton Rouge, La.

Beneficial Use Site 18 and 49

Calcasieu River and Pass, Louisiana
Dredged Material Management Plan

USGS DOQQ 2005 WESTLAKE SW 3009354

Figure: 1
Date: August 2007
Scale:1:28,247
Source: USGS/GEC/USACE
Map Author: Moore 27585101-765

WETLAND VALUE ASSESSMENT COMMUNITY MODEL
Brackish Marsh

Project: Sabine BU Site 18, Calcasieu DMMP   Project Area: 1,000

Condition: Future Without Project (FWOP)

Variable		TY 0 Value	TY 0 SI	TY 1 Value	TY 1 SI	TY 20 Value	TY 20 SI			
V1	% Emergent	0	0.10	0	0.10	0	0.10			
V2	% Aquatic	20	0.28	20	0.28	20	0.28			
V3	Interspersion	%		%		%				
	Class 1		0.10		0.10		0.10	0	0	0
	Class 2							0	0	0
	Class 3							0	0	0
	Class 4							0	0	0
	Class 5	100		100		100		0.1	0.1	0.1
V4	%OW <= 1.5ft	70	1.00	70	1.00	70	1.00			
V5	Salinity (ppt)	7	1.00	7	1.00	7	1.00			
V6	Access Value	0.20	0.28	0.20	0.28	0.20	0.28			
	Emergent Marsh HSI	**=**	**0.22**	**EM HSI =**	**0.22**	**EM HSI =**	**0.22**			
	Open Water HSI	**=**	**0.37**	**OW HSI =**	**0.37**	**OW HSI =**	**0.37**			

Project: Sabine BU Site 18, Calcasieu DMMP
FWOP

Variable		TY 50 Value	TY 50 SI	Value	SI	Value	SI			
V1	% Emergent	0	0.10							
V2	% Aquatic	20	0.28							
V3	Interspersion	%		%		%				
	Class 1		0.10					0	0	0
	Class 2							0	0	0
	Class 3							0	0	0
	Class 4							0	0	0
	Class 5	100						0.1	0	0
V4	%OW <= 1.5ft	70	1.00							
V5	Salinity (ppt)	7	1.00							
V6	Access Value	0.20	0.28							
		EM HSI =	**0.22**	**EM HSI =**		**EM HSI =**				
		OW HSI =	**0.37**	**OW HSI =**		**OW HSI =**				

Project: Sabine BU Site 18, Calcasieu DMMP Project Area: 1,000
Condition: Future With Project (FWP)

Variable		TY 0 Value	TY 0 SI	TY 2 Value	TY 2 SI	TY 4 Value	TY 4 SI			
V1	% Emergent	0	0.10	1	0.11	3	0.13			
V2	% Aquatic	20	0.28	5	0.15	5	0.15			
V3	Interspersion	%		%		%				
	Class 1		0.10		0.15		0.15	0	0	0
	Class 2							0	0	0
	Class 3			17		17		0	0.4	0.4
	Class 4							0	0	0
	Class 5	100		83		83		0.1	0.1	0.1
V4	%OW <= 1.5ft	70	1.00	65	0.94	65	0.94			
V5	Salinity (ppt)	7	1.00	7	1.00	7	1.00			
V6	Access Value	0.20	0.28	0.20	0.28	0.20	0.28			
	Emergent Marsh HSI	**=**	**0.22**	**EM HSI =**	**0.23**	**EM HSI =**	**0.25**			
	Open Water HSI	**=**	**0.37**	**OW HSI =**	**0.30**	**OW HSI =**	**0.30**			

Project: Sabine BU Site 18, Calcasieu DMMP
FWP

Variable		6 Value	6 SI	8 Value	8 SI	10 Value	10 SI			
V1	% Emergent	11	0.20	12	0.21	15	0.24			
V2	% Aquatic	5	0.15	5	0.15	15	0.24			
V3	Interspersion	%		%		%				
	Class 1		0.15		0.20		0.25	0		
	Class 2							0	0	0
	Class 3	17		33		50		0.4	0	0
	Class 4							0	0.4	0.4
	Class 5	83		67		50		0.1	0	0
									0.1	0.1
V4	%OW <= 1.5ft	65	0.94	65	0.94	65	0.94			
V5	Salinity (ppt)	7	1.00	7	1.00	7	1.00			
V6	Access Value	0.20	0.28	0.20	0.28	0.20	0.28			
		EM HSI =	**0.30**	**EM HSI =**	**0.31**	**EM HSI =**	**0.33**			
		OW HSI =	**0.30**	**OW HSI =**	**0.30**	**OW HSI =**	**0.36**			

Project: Sabine BU Site 18, Calcasieu DMMP
FWP

Variable		Value (12)	SI	Value (13)	SI	Value (14)	SI			
V1	% Emergent	24	0.32	22	0.30	33	0.40			
V2	% Aquatic	15	0.24	20	0.28	20	0.28			
V3	Interspersion	%		%		%				
	Class 1		0.25		0.30		0.30	0	0	0
	Class 2							0	0	0
	Class 3	50		66		66		0.4	0.4	0.4
	Class 4							0	0	0
	Class 5	50		34		34		0.1	0.1	0.1
V4	%OW <= 1.5ft	70	1.00	70	1.00	70	1.00			
V5	Salinity (ppt)	7	1.00	7	1.00	7	1.00			
V6	Access Value	0.20	0.28	0.35	0.28	0.35	0.28			
		EM HSI =	**0.38**	**EM HSI =**	**0.37**	**EM HSI =**	**0.43**			
		OW HSI =	**0.36**	**OW HSI =**	**0.39**	**OW HSI =**	**0.39**			

Project: Sabine BU Site 18, Calcasieu DMMP
FWP

Variable		Value (15)	SI	Value (16)	SI	Value (17)	SI			
V1	% Emergent	35	0.42	35	0.42	43	0.49			
V2	% Aquatic	20	0.28	20	0.28	20	0.28			
V3	Interspersion	%		%		%				
	Class 1		0.30		0.35		0.35	0		
	Class 2							0		
	Class 3	66		83		83		0.4	0	0
	Class 4							0	0	0
	Class 5	34		17		17		0.1	0.4	0.4
									0	0
V4	%OW <= 1.5ft	70	1.00	75	1.00	75	1.00		0	0
V5	Salinity (ppt)	7	1.00	7	1.00	7	1.00			
V6	Access Value	0.35	0.42	0.20	0.28	0.20	0.28			
		EM HSI =	**0.47**	**EM HSI =**	**0.44**	**EM HSI =**	**0.48**			
		OW HSI =	**0.43**	**OW HSI =**	**0.39**	**OW HSI =**	**0.39**			

Project: Sabine BU Site 18, Calcasieu DMMP
FWP

Variable		18 Value	18 SI	19 Value	19 SI	20 Value	20 SI			
V1	% Emergent	45	0.51	46	0.51	53	0.58			
V2	% Aquatic	20	0.10	20	0.28	20	0.28			
V3	Interspersion	%		%		%				
	Class 1		0.35		0.40		0.40	0		
	Class 2							0	0	0
	Class 3	83		100		100		0.4	0	0
	Class 4							0	0.4	0.4
	Class 5	17						0.1	0	0
									0	0
V4	%OW <= 1.5ft	75	1.00	75	1.00	75	1.00			
V5	Salinity (ppt)	7	1.00	7	1.00	7	1.00			
V6	Access Value	0.20	0.28	0.20	0.28	0.35	0.42			
		EM HSI =	**0.49**	**EM HSI =**	**0.50**	**EM HSI =**	**0.57**			
		OW HSI =	**0.29**	**OW HSI =**	**0.40**	**OW HSI =**	**0.43**			

Project: Sabine BU Site 18, Calcasieu DMMP
FWP

Variable		21 Value	21 SI	23 Value	23 SI	50 Value	50 SI	
V1	% Emergent	55	0.60	62	0.66	57	0.61	
V2	% Aquatic	20	0.28	25	0.33	35	0.42	
V3	Interspersion	%		%		%		
	Class 1		0.40		0.40		0.40	0
	Class 2							0
	Class 3	100		100		100		0.4
	Class 4							0
	Class 5							0
V4	%OW <= 1.5ft	75	1.00	75	1.00	75	1.00	
V5	Salinity (ppt)	7	1.00	7	1.00	7	1.00	
V6	Access Value	0.35	0.42	0.35	0.42	0.35	0.42	
		EM HSI =	**0.58**	**EM HSI =**	**0.62**	**EM HSI =**	**0.59**	
		OW HSI =	**0.43**	**OW HSI =**	**0.46**	**OW HSI =**	**0.50**	

AAHU CALCULATION - MARSH

Project: Sabine BU Site 18, Calcasieu DMMP

Future Without Project			Total	Cummulative
TY	Marsh Acres	x HSI	HUs	HUs
0	0	0.22	0.00	
1	0	0.22	0.00	0.00
20	0	0.22	0.00	0.00
50	0	0.22	0.00	0.00
			AAHUs =	0.00

Future With Project			Total	Cummulative
TY	Marsh Acres	x HSI	HUs	HUs
0	0	0.22	0.00	
2	11	0.23	2.57	2.52
4	32	0.25	7.89	10.36
6	106	0.30	31.31	37.99
8	116	0.31	35.55	66.82
10	148	0.33	48.72	84.03
12	242	0.38	91.45	138.65
13	220	0.37	81.99	86.70
14	326	0.43	139.89	109.94
15	346	0.47	161.89	150.76
16	355	0.44	157.85	159.91
17	429	0.48	207.31	182.11
18	448	0.49	220.72	213.99
19	458	0.50	230.39	225.54
20	531	0.57	304.06	266.38
21	550	0.58	320.43	312.21
23	620	0.62	381.73	701.38
50	565	0.59	334.08	8298.77
			AAHUs	**220.96**

NET CHANGE IN AAHUs DUE TO PROJECT	
A. Future With Project Emergent Marsh AAHUs =	220.96
B. Future Without Project Emergent Marsh AAHUs =	0.00
Net Change (FWP - FWOP) =	**220.96**

AAHU CALCULATION - OPEN WATER

Project: Sabine BU Site 18, Calcasieu DMMP

Future Without Project			Total	Cummulative
TY	Water Acres	x HSI	HUs	HUs
0	1000	0.37	373.33	
1	1000	0.37	373.33	373.33
20	1000	0.37	373.33	7093.33
50	1000	0.37	373.33	11200.00
			AAHUs =	**373.33**

Future With Project			Total	Cummulative
TY	Water Acres	x HSI	HUs	HUs
0	1000	0.37	373.33	
2	892	0.30	268.78	639.52
4	893	0.30	269.08	537.86
6	894	0.30	269.38	538.46
8	787	0.30	239.94	509.45
10	681	0.36	243.77	485.59
12	683	0.36	247.73	491.50
13	576	0.39	223.49	236.06
14	578	0.39	224.26	223.88
15	579	0.43	246.85	235.55
16	473	0.39	185.31	215.47
17	475	0.39	186.09	185.70
18	477	0.29	139.00	162.58
19	371	0.40	146.75	144.72
20	373	0.43	161.85	154.29
21	375	0.43	162.71	162.28
23	380	0.46	173.48	336.15
50	435	0.50	217.74	8052.67
			AAHUs	**266.23**

NET CHANGE IN AAHUs DUE TO PROJECT	
A. Future With Project Open Water AAHUs =	266.23
B. Future Without Project Open Water AAHUs =	373.33
Net Change (FWP - FWOP) =	**-107.10**

TOTAL BENEFITS IN AAHUs DUE TO PROJECT	
A. Emergent Marsh Habitat Net AAHUs =	220.96
B. Open Water Habitat Net AAHUs =	-107.10
Net Benefits= (2.6xEMAAHUs+OWAAHUs)/3.6	**129.83**

Land Loss Spreadsheet

Project:	Sabine 18 (Unit 1A)				Beginning Year	Ending Year	Beginning Year Acreage	Ending Year Acreage	Loss Rate
					Loss Rate Calculation				
Total Acres		**TY0 Marsh Acres**		**TY0 Water Acres**	1974	1990	17,320	16,100	-0.0046
252		0		252	FWP Land Loss Reduction			0.25	

FWOP					**FWP - Created Marsh**			**FWP - Nourished Marsh**			**FWP Totals**				
					Created Marsh =	108		**Nourished Marsh =**	0						
TY	FWOP Loss Rate	Marsh (acres)	% Marsh (V1)	Water (acres)	FWP Loss Rate	Created Marsh Acreage	Adjusted Marsh Acreage (10% @ TY2; 30% @ TY4 and 100% @ TY6)	FWP Loss Rate	Nourished Marsh Acreage	Adjusted Marsh Acreage (50% @ TY1 and 100% @ TY3	Water (acres)	Marsh (acres)	% Marsh (V1)	Net Acres of Marsh	Total Acres Check
0		**0**	**0%**	**252**		0			0						
1	-0.0046	**0**	**0%**	**252**	-0.00345	0	**0**	-0.00345	0	**0**	252	**0**	**0%**	0	252
2	-0.0046	0	0%	252	-0.00345	108	11	-0.00345	0		144	**11**	**4%**	11	252
3	-0.0046	0	0%	252	-0.00345	107	11	-0.00345	0	**0**	145	**11**	**4%**	11	252
4	-0.0046	0	0%	252	-0.00345	107	32	-0.00345	0		145	**32**	**13%**	32	252
5	-0.0046	0	0%	252	-0.00345	107	32	-0.00345	0	**0**	145	**32**	**13%**	32	252
6	-0.0046	0	0%	252	-0.00345	106	106	-0.00345	0	0	146	106	42%	106	252
7	-0.0046	0	0%	252	-0.00345	106	106	-0.00345	0	0	146	106	42%	106	252
8	-0.0046	0	0%	252	-0.00345	105	105	-0.00345	0	0	147	105	42%	105	252
9	-0.0046	0	0%	252	-0.00345	105	105	-0.00345	0	0	147	105	42%	105	252
10	-0.0046	0	0%	252	-0.00345	105	105	-0.00345	0	0	147	105	42%	105	252
11	-0.0046	0	0%	252	-0.00345	104	104	-0.00345	0	0	148	104	41%	104	252
12	-0.0046	0	0%	252	-0.00345	104	104	-0.00345	0	0	148	104	41%	104	252
13	-0.0046	0	0%	252	-0.00345	104	104	-0.00345	0	0	148	104	41%	104	252
14	-0.0046	0	0%	252	-0.00345	103	103	-0.00345	0	0	149	103	41%	103	252
15	-0.0046	0	0%	252	-0.00345	103	103	-0.00345	0	0	149	103	41%	103	252
16	-0.0046	0	0%	252	-0.00345	103	103	-0.00345	0	0	149	103	41%	103	252
17	-0.0046	0	0%	252	-0.00345	102	102	-0.00345	0	0	150	102	41%	102	252
18	-0.0046	0	0%	252	-0.00345	102	102	-0.00345	0	0	150	102	40%	102	252
19	-0.0046	0	0%	252	-0.00345	101	101	-0.00345	0	0	151	101	40%	101	252
20	-0.0046	**0**	**0%**	**252**	-0.00345	101	**101**	-0.00345	0	**0**	151	**101**	**40%**	**101**	252
21	-0.0046	0	0%	252	-0.00345	101	101	-0.00345	0	0	151	101	40%	101	252
22	-0.0046	0	0%	252	-0.00345	100	100	-0.00345	0	0	152	100	40%	100	252
23	-0.0046	0	0%	252	-0.00345	100	100	-0.00345	0	0	152	100	40%	100	252
24	-0.0046	0	0%	252	-0.00345	100	100	-0.00345	0	0	152	100	40%	100	252
25	-0.0046	0	0%	252	-0.00345	99	99	-0.00345	0	0	153	99	39%	99	252
26	-0.0046	0	0%	252	-0.00345	99	99	-0.00345	0	0	153	99	39%	99	252
27	-0.0046	0	0%	252	-0.00345	99	99	-0.00345	0	0	153	99	39%	99	252
28	-0.0046	0	0%	252	-0.00345	98	98	-0.00345	0	0	154	98	39%	98	252
29	-0.0046	0	0%	252	-0.00345	98	98	-0.00345	0	0	154	98	39%	98	252
30	-0.0046	0	0%	252	-0.00345	98	98	-0.00345	0	0	154	98	39%	98	252
31	-0.0046	0	0%	252	-0.00345	97	97	-0.00345	0	0	155	97	39%	97	252
32	-0.0046	0	0%	252	-0.00345	97	97	-0.00345	0	0	155	97	39%	97	252
33	-0.0046	0	0%	252	-0.00345	97	97	-0.00345	0	0	155	97	38%	97	252
34	-0.0046	0	0%	252	-0.00345	96	96	-0.00345	0	0	156	96	38%	96	252
35	-0.0046	0	0%	252	-0.00345	96	96	-0.00345	0	0	156	96	38%	96	252
36	-0.0046	0	0%	252	-0.00345	96	96	-0.00345	0	0	156	96	38%	96	252
37	-0.0046	0	0%	252	-0.00345	95	95	-0.00345	0	0	157	95	38%	95	252
38	-0.0046	0	0%	252	-0.00345	95	95	-0.00345	0	0	157	95	38%	95	252
39	-0.0046	0	0%	252	-0.00345	95	95	-0.00345	0	0	157	95	38%	95	252
40	-0.0046	0	0%	252	-0.00345	94	94	-0.00345	0	0	158	94	37%	94	252
41	-0.0046	0	0%	252	-0.00345	94	94	-0.00345	0	0	158	94	37%	94	252
42	-0.0046	0	0%	252	-0.00345	94	94	-0.00345	0	0	158	94	37%	94	252
43	-0.0046	0	0%	252	-0.00345	93	93	-0.00345	0	0	159	93	37%	93	252
44	-0.0046	0	0%	252	-0.00345	93	93	-0.00345	0	0	159	93	37%	93	252
45	-0.0046	0	0%	252	-0.00345	93	93	-0.00345	0	0	159	93	37%	93	252
46	-0.0046	0	0%	252	-0.00345	92	92	-0.00345	0	0	160	92	37%	92	252
47	-0.0046	0	0%	252	-0.00345	92	92	-0.00345	0	0	160	92	37%	92	252
48	-0.0046	0	0%	252	-0.00345	92	92	-0.00345	0	0	160	92	36%	92	252
49	-0.0046	0	0%	252	-0.00345	91	91	-0.00345	0	0	161	91	36%	91	252
50	-0.0046	0	0%	252	-0.00345	91	91	-0.00345	0	0	161	91	36%	91	252

Sabine BU site 18 (Unit 1a)

Water Acre Calculations

Cycle1	Cycle 2	Cycle 3	Cycle 4	Cycle 5	Cycle 6	Total Marsh AC	TY	Water acres	% water
0							**1**	1000	100%
108						108	**2**	892	89%
107						107	**3**	893	89%
107						107	**4**	893	89%
107						107	**5**	893	89%
106						106	**6**	894	89%
106						106	**7**	894	89%
105	0					105	**8**	895	89%
105	108					213	**9**	787	79%
105	107	0				212	**10**	788	79%
104	107	108				319	**11**	681	68%
104	107	107				318	**12**	682	68%
104	106	107	0			317	**13**	683	68%
103	106	107	108			423	**14**	577	58%
103	105	106	107			422	**15**	578	58%
103	105	106	107	0		420	**16**	580	58%

102	105	105	107	108		526	**17**	474	47%
102	104	105	106	107		525	**18**	475	48%
101	104	105	106	107	0	523	**19**	477	48%
101	104	104	105	107	108	629	**20**	371	37%
101	103	104	105	106	107	626	**21**	374	37%
100	103	104	105	106	107	624	**22**	376	38%
100	103	103	104	105	107	622	**23**	378	38%
100	102	103	104	105	106	620	**24**	380	38%
99	102	103	104	105	106	618	**25**	382	38%
99	101	102	103	104	105	616	**26**	384	38%
99	101	102	103	104	105	614	**27**	386	39%
98	101	101	103	104	105	612	**28**	388	39%
98	100	101	102	103	104	609	**29**	391	39%
98	100	101	102	103	104	607	**30**	393	39%
97	100	100	101	103	104	605	**31**	395	39%
97	99	100	101	102	103	603	**32**	397	40%
97	99	100	101	102	103	601	**33**	399	40%
96	99	99	100	101	103	599	**34**	401	40%
96	98	99	100	101	102	597	**35**	403	40%
96	98	99	100	101	102	595	**36**	405	41%
95	98	98	99	100	101	593	**37**	407	41%
95	97	98	99	100	101	591	**38**	409	41%
95	97	98	99	100	101	589	**39**	411	41%
94	97	97	98	99	100	587	**40**	413	41%
94	96	97	98	99	100	585	**41**	415	42%
94	96	97	98	99	100	583	**42**	417	42%
93	96	96	97	98	99	581	**43**	419	42%
93	95	96	97	98	99	579	**44**	421	42%
93	95	96	97	98	99	577	**45**	423	42%
92	95	95	96	97	98	575	**46**	425	43%
92	94	95	96	97	98	573	**47**	427	43%
92	94	95	96	97	98	571	**48**	429	43%
91	94	94	95	96	97	569	**49**	431	43%
91	93	94	95	96	97	567	**50**	433	43%

Marsh Acre Calculations

Cycle1	Cycle 2	Cycle 3	Cycle 4	Cycle 5	Cycle 6	Total MC	TY	Water acres	% marsh
0							**1**	1000	0%
11						11	**2**	989	1%
11						11	**3**	989	1%
32						32	**4**	968	3%
32						32	**5**	968	3%
106						106	**6**	894	11%
106						106	**7**	894	11%
105	0					105	**8**	895	11%
105	11					116	**9**	884	12%
105	11	0				115	**10**	885	12%
104	32	11				147	**11**	853	15%
104	32	11				147	**12**	853	15%
104	106	32	0			242	**13**	758	24%
103	106	32	11			252	**14**	748	25%
103	105	106	11			325	**15**	675	33%
103	105	106	32	0		345	**16**	655	35%
102	105	105	32	11		355	**17**	645	36%
102	104	105	106	11		428	**18**	572	43%
101	104	105	106	32	0	448	**19**	552	45%
101	104	104	105	32	11	457	**20**	543	46%
101	103	104	105	106	11	530	**21**	470	53%
100	103	104	105	106	32	549	**22**	451	55%
100	103	103	104	105	32	548	**23**	452	55%
100	102	103	104	105	106	620	**24**	380	62%
99	102	103	104	105	106	618	**25**	382	62%
99	101	102	103	104	105	616	**26**	384	62%
99	101	102	103	104	105	614	**27**	386	61%
98	101	101	103	104	105	612	**28**	388	61%
98	100	101	102	103	104	609	**29**	391	61%
98	100	101	102	103	104	607	**30**	393	61%
97	100	100	101	103	104	605	**31**	395	61%
97	99	100	101	102	103	603	**32**	397	60%
97	99	100	101	102	103	601	**33**	399	60%
96	99	99	100	101	103	599	**34**	401	60%
96	98	99	100	101	102	597	**35**	403	60%
96	98	99	100	101	102	595	**36**	405	59%
95	98	98	99	100	101	593	**37**	407	59%
95	97	98	99	100	101	591	**38**	409	59%
95	97	98	99	100	101	589	**39**	411	59%
94	97	97	98	99	100	587	**40**	413	59%
94	96	97	98	99	100	585	**41**	415	58%
94	96	97	98	99	100	583	**42**	417	58%
93	96	96	97	98	99	581	**43**	419	58%
93	95	96	97	98	99	579	**44**	421	58%
93	95	96	97	98	99	577	**45**	423	58%
92	95	95	96	97	98	575	**46**	425	57%
92	94	95	96	97	98	573	**47**	427	57%
92	94	95	96	97	98	571	**48**	429	57%
91	94	94	95	96	97	569	**49**	431	57%
91	93	94	95	96	97	567	**50**	433	57%

Land Loss Spreadsheet

Project:	Sabine 18, Cycle 2				Beginning Year	Ending Year	Beginning Year Acreage	Ending Year Acreage	Loss Rate
Total Acres		TY0 Marsh Acres		TY0 Water Acres	1974	1990	17,320	16,100	-0.0046
252		0		252	FWP Land Loss Reduction			0.25	

Loss Rate Calculation (Beginning Year, Ending Year, Beginning Year Acreage, Ending Year Acreage, Loss Rate)

FWOP					FWP - Created Marsh			FWP - Nourished Marsh			FWP Totals				
					Created Marsh =		108	Nourished Marsh =		0					
TY	FWOP Loss Rate	Marsh (acres)	% Marsh (V1)	Water (acres)	FWP Loss Rate	Created Marsh Acreage	Adjusted Marsh Acreage (10% @ TY1; 30% @ TY3 and 100% @ TY5)	FWP Loss Rate	Nourished Marsh Acreage	Adjusted Marsh Acreage (50% @ TY1 and 100% @ TY3	Water (acres)	Marsh (acres)	% Marsh (V1)	Net Acres of Marsh	Total Acres Check
0		0	0%	252		0			0						
7	-0.00455	0	0%	252	-0.0034161	108	11	-0.00341607	0		144	11	4%		252
8	-0.00455	0	0%	252	-0.0034161	107		-0.00341607	0	0	145				252
9	-0.00455	0	0%	252	-0.0034161	107	32	-0.00341607	0	0	145	32	13%		252
10	-0.00455	0	0%	252	-0.0034161	107		-0.00341607	0	0	145				252
11	-0.00455	0	0%	252	-0.0034161	106	106	-0.00341607	0	0	146	106	42%	106	252
12	-0.00455	0	0%	252	-0.0034161	106	106	-0.00341607	0	0	146	106	42%	106	252
13	-0.00455	0	0%	252	-0.0034161	105	105	-0.00341607	0	0	147	105	42%	105	252
14	-0.00455	0	0%	252	-0.0034161	105	105	-0.00341607	0	0	147	105	42%	105	252
15	-0.00455	0	0%	252	-0.0034161	105	105	-0.00341607	0	0	147	105	42%	105	252
16	-0.00455	0	0%	252	-0.0034161	104	104	-0.00341607	0	0	148	104	41%	104	252
17	-0.00455	0	0%	252	-0.0034161	104	104	-0.00341607	0	0	148	104	41%	104	252
18	-0.00455	0	0%	252	-0.0034161	104	104	-0.00341607	0	0	148	104	41%	104	252
19	-0.00455	0	0%	252	-0.0034161	103	103	-0.00341607	0	0	149	103	41%	103	252
20	-0.00455	0	0%	252	-0.0034161	103	103	-0.00341607	0	0	149	103	41%	103	252
21	-0.00455	0	0%	252	-0.0034161	103	103	-0.00341607	0	0	149	103	41%	103	252
22	-0.00455	0	0%	252	-0.0034161	102	102	-0.00341607	0	0	150	102	41%	102	252
23	-0.00455	0	0%	252	-0.0034161	102	102	-0.00341607	0	0	150	102	40%	102	252
24	-0.00455	0	0%	252	-0.0034161	102	102	-0.00341607	0	0	150	102	40%	102	252
25	-0.00455	0	0%	252	-0.0034161	101	101	-0.00341607	0	0	151	101	40%	101	252
26	-0.00455	0	0%	252	-0.0034161	101	101	-0.00341607	0	0	151	101	40%	101	252
27	-0.00455	0	0%	252	-0.0034161	101	101	-0.00341607	0	0	151	101	40%	101	252
28	-0.00455	0	0%	252	-0.0034161	100	100	-0.00341607	0	0	152	100	40%	100	252
29	-0.00455	0	0%	252	-0.0034161	100	100	-0.00341607	0	0	152	100	40%	100	252
30	-0.00455	0	0%	252	-0.0034161	99	99	-0.00341607	0	0	153	99	39%	99	252
31	-0.00455	0	0%	252	-0.0034161	99	99	-0.00341607	0	0	153	99	39%	99	252
32	-0.00455	0	0%	252	-0.0034161	99	99	-0.00341607	0	0	153	99	39%	99	252
33	-0.00455	0	0%	252	-0.0034161	98	98	-0.00341607	0	0	154	98	39%	98	252
34	-0.00455	0	0%	252	-0.0034161	98	98	-0.00341607	0	0	154	98	39%	98	252
35	-0.00455	0	0%	252	-0.0034161	98	98	-0.00341607	0	0	154	98	39%	98	252
36	-0.00455	0	0%	252	-0.0034161	97	97	-0.00341607	0	0	155	97	39%	97	252
37	-0.00455	0	0%	252	-0.0034161	97	97	-0.00341607	0	0	155	97	39%	97	252
38	-0.00455	0	0%	252	-0.0034161	97	97	-0.00341607	0	0	155	97	38%	97	252
39	-0.00455	0	0%	252	-0.0034161	96	96	-0.00341607	0	0	156	96	38%	96	252
40	-0.00455	0	0%	252	-0.0034161	96	96	-0.00341607	0	0	156	96	38%	96	252
41	-0.00455	0	0%	252	-0.0034161	96	96	-0.00341607	0	0	156	96	38%	96	252
42	-0.00455	0	0%	252	-0.0034161	95	95	-0.00341607	0	0	157	95	38%	95	252
43	-0.00455	0	0%	252	-0.0034161	95	95	-0.00341607	0	0	157	95	38%	95	252
44	-0.00455	0	0%	252	-0.0034161	95	95	-0.00341607	0	0	157	95	38%	95	252
45	-0.00455	0	0%	252	-0.0034161	95	95	-0.00341607	0	0	157	95	38%	95	252
46	-0.00455	0	0%	252	-0.0034161	94	94	-0.00341607	0	0	158	94	37%	94	252
47	-0.00455	0	0%	252	-0.0034161	94	94	-0.00341607	0	0	158	94	37%	94	252
48	-0.00455	0	0%	252	-0.0034161	94	94	-0.00341607	0	0	158	94	37%	94	252
49	-0.00455	0	0%	252	-0.0034161	93	93	-0.00341607	0	0	159	93	37%	93	252
50	-0.00455	0	0%	252	-0.0034161	93	93	-0.00341607	0	0	159	93	37%	93	252

Land Loss Spreadsheet

Project:	Sabine 18, Cycle 3				Beginning Year	Ending Year	Beginning Year Acreage	Ending Year Acreage	Loss Rate
Total Acres		TY0 Marsh Acres		TY0 Water Acres	1974	1990	17,320	16,100	-0.0046
252		0		252	FWP Land Loss Reduction			0.25	

Loss Rate Calculation

	FWOP				FWP - Created Marsh			FWP - Nourished Marsh			FWP Totals				
					Created Marsh =		108	Nourished Marsh =		0					
TY	FWOP Loss Rate	Marsh (acres)	% Marsh (V1)	Water (acres)	FWP Loss Rate	Created Marsh Acreage	Adjusted Marsh Acreage (10% @ TY1; 30% @ TY3 and 100% @ TY5)	FWP Loss Rate	Nourished Marsh Acreage	Adjusted Marsh Acreage (50% @ TY1 and 100% @ TY3	Water (acres)	Marsh (acres)	% Marsh (V1)	Net Acres of Marsh	Total Acres Check
0		**0**	**0%**	**252**		0			0						
10	-0.00455	**0**	**0%**	**252**	-0.0034161	108	**11**	-0.00341607	0	**0**	144	**11**	**4%**		252
11	-0.00455	0	0%	252	-0.0034161	107		-0.00341607	0		145				252
12	-0.00455	0	0%	252	-0.0034161	107	**32**	-0.00341607	0	**0**	145	**32**	**13%**		252
13	-0.00455	0	0%	252	-0.0034161	107		-0.00341607	0		145				252
14	-0.00455	0	0%	252	-0.0034161	106	**106**	-0.00341607	0	**0**	146	**106**	**42%**	106	252
15	-0.00455	0	0%	252	-0.0034161	106	106	-0.00341607	0	0	146	106	42%	106	252
16	-0.00455	0	0%	252	-0.0034161	105	105	-0.00341607	0	0	147	105	42%	105	252
17	-0.00455	0	0%	252	-0.0034161	105	105	-0.00341607	0	0	147	105	42%	105	252
18	-0.00455	0	0%	252	-0.0034161	105	105	-0.00341607	0	0	147	105	42%	105	252
19	-0.00455	0	0%	252	-0.0034161	104	104	-0.00341607	0	0	148	104	41%	104	252
20	-0.00455	0	0%	252	-0.0034161	104	104	-0.00341607	0	0	148	104	41%	104	252
21	-0.00455	0	0%	252	-0.0034161	104	104	-0.00341607	0	0	148	104	41%	104	252
22	-0.00455	0	0%	252	-0.0034161	103	103	-0.00341607	0	0	149	103	41%	103	252
23	-0.00455	0	0%	252	-0.0034161	103	103	-0.00341607	0	0	149	103	41%	103	252
24	-0.00455	0	0%	252	-0.0034161	103	103	-0.00341607	0	0	149	103	41%	103	252
25	-0.00455	0	0%	252	-0.0034161	102	102	-0.00341607	0	0	150	102	41%	102	252
26	-0.00455	0	0%	252	-0.0034161	102	102	-0.00341607	0	0	150	102	40%	102	252
27	-0.00455	0	0%	252	-0.0034161	102	102	-0.00341607	0	0	150	102	40%	102	252
28	-0.00455	0	0%	252	-0.0034161	101	101	-0.00341607	0	0	151	101	40%	101	252
29	-0.00455	**0**	**0%**	**252**	-0.0034161	101	**101**	-0.00341607	0	**0**	151	**101**	**40%**	**101**	252
30	-0.00455	0	0%	252	-0.0034161	101	101	-0.00341607	0	0	151	101	40%	101	252
31	-0.00455	0	0%	252	-0.0034161	100	100	-0.00341607	0	0	152	100	40%	100	252
32	-0.00455	0	0%	252	-0.0034161	100	100	-0.00341607	0	0	152	100	40%	100	252
33	-0.00455	0	0%	252	-0.0034161	99	99	-0.00341607	0	0	153	99	39%	99	252
34	-0.00455	0	0%	252	-0.0034161	99	99	-0.00341607	0	0	153	99	39%	99	252
35	-0.00455	0	0%	252	-0.0034161	99	99	-0.00341607	0	0	153	99	39%	99	252
36	-0.00455	0	0%	252	-0.0034161	98	98	-0.00341607	0	0	154	98	39%	98	252
37	-0.00455	0	0%	252	-0.0034161	98	98	-0.00341607	0	0	154	98	39%	98	252
38	-0.00455	0	0%	252	-0.0034161	98	98	-0.00341607	0	0	154	98	39%	98	252
39	-0.00455	0	0%	252	-0.0034161	97	97	-0.00341607	0	0	155	97	39%	97	252
40	-0.00455	0	0%	252	-0.0034161	97	97	-0.00341607	0	0	155	97	39%	97	252
41	-0.00455	0	0%	252	-0.0034161	97	97	-0.00341607	0	0	155	97	38%	97	252
42	-0.00455	0	0%	252	-0.0034161	96	96	-0.00341607	0	0	156	96	38%	96	252
43	-0.00455	0	0%	252	-0.0034161	96	96	-0.00341607	0	0	156	96	38%	96	252
44	-0.00455	0	0%	252	-0.0034161	96	96	-0.00341607	0	0	156	96	38%	96	252
45	-0.00455	0	0%	252	-0.0034161	95	95	-0.00341607	0	0	157	95	38%	95	252
46	-0.00455	0	0%	252	-0.0034161	95	95	-0.00341607	0	0	157	95	38%	95	252
47	-0.00455	0	0%	252	-0.0034161	95	95	-0.00341607	0	0	157	95	38%	95	252
48	-0.00455	0	0%	252	-0.0034161	95	95	-0.00341607	0	0	157	95	38%	95	252
49	-0.00455	0	0%	252	-0.0034161	94	94	-0.00341607	0	0	158	94	37%	94	252
50	-0.00455	0	0%	252	-0.0034161	94	94	-0.00341607	0	0	158	94	37%	94	252

Land Loss Spreadsheet

Project: Sabine 18, Cycle 4

Total Acres	TY0 Marsh Acres	TY0 Water Acres
252	0	252

Loss Rate Calculation

Beginning Year	Ending Year	Beginning Year Acreage	Ending Year Acreage	Loss Rate
1974	1990	17,320	16,100	-0.0046

FWP Land Loss Reduction: 0.25

	FWOP				FWP - Created Marsh (Created Marsh = 108)			FWP - Nourished Marsh (Nourished Marsh = 0)			FWP Totals				
TY	FWOP Loss Rate	Marsh (acres)	% Marsh (V1)	Water (acres)	FWP Loss Rate	Created Marsh Acreage	Adjusted Marsh Acreage (10% @ TY1; 30% @ TY3 and 100% @ TY5)	FWP Loss Rate	Nourished Marsh Acreage	Adjusted Marsh Acreage (50% @ TY1 and 100% @ TY3	Water (acres)	Marsh (acres)	% Marsh (V1)	Net Acres of Marsh	Total Acres Check
0		**0**	**0%**	**252**		0			0						
13	-0.00455	**0**	**0%**	**252**	-0.0034161	108	**11**	-0.00341607	0	**0**	144	**11**	**4%**		252
14	-0.00455	0	0%	252	-0.0034161	107		-0.00341607	0		145				252
15	-0.00455	0	0%	252	-0.0034161	107	**32**	-0.00341607	0	**0**	145	**32**	**13%**		252
16	-0.00455	0	0%	252	-0.0034161	107		-0.00341607	0		145				252
17	-0.00455	0	0%	252	-0.0034161	106	**106**	-0.00341607	0	**0**	146	**106**	**42%**	106	252
18	-0.00455	0	0%	252	-0.0034161	106	106	-0.00341607	0	0	146	106	42%	106	252
19	-0.00455	0	0%	252	-0.0034161	105	105	-0.00341607	0	0	147	105	42%	105	252
20	-0.00455	0	0%	252	-0.0034161	105	105	-0.00341607	0	0	147	105	42%	105	252
21	-0.00455	0	0%	252	-0.0034161	105	105	-0.00341607	0	0	147	105	42%	105	252
22	-0.00455	0	0%	252	-0.0034161	104	104	-0.00341607	0	0	148	104	41%	104	252
23	-0.00455	0	0%	252	-0.0034161	104	104	-0.00341607	0	0	148	104	41%	104	252
24	-0.00455	0	0%	252	-0.0034161	104	104	-0.00341607	0	0	148	104	41%	104	252
25	-0.00455	0	0%	252	-0.0034161	103	103	-0.00341607	0	0	149	103	41%	103	252
26	-0.00455	0	0%	252	-0.0034161	103	103	-0.00341607	0	0	149	103	41%	103	252
27	-0.00455	0	0%	252	-0.0034161	103	103	-0.00341607	0	0	149	103	41%	103	252
28	-0.00455	0	0%	252	-0.0034161	102	102	-0.00341607	0	0	150	102	41%	102	252
29	-0.00455	0	0%	252	-0.0034161	102	102	-0.00341607	0	0	150	102	40%	102	252
30	-0.00455	0	0%	252	-0.0034161	102	102	-0.00341607	0	0	150	102	40%	102	252
31	-0.00455	0	0%	252	-0.0034161	101	101	-0.00341607	0	0	151	101	40%	101	252
32	-0.00455	**0**	**0%**	**252**	-0.0034161	101	**101**	-0.00341607	0	**0**	151	**101**	**40%**	**101**	252
33	-0.00455	0	0%	252	-0.0034161	101	101	-0.00341607	0	0	151	101	40%	101	252
34	-0.00455	0	0%	252	-0.0034161	100	100	-0.00341607	0	0	152	100	40%	100	252
35	-0.00455	0	0%	252	-0.0034161	100	100	-0.00341607	0	0	152	100	40%	100	252
36	-0.00455	0	0%	252	-0.0034161	99	99	-0.00341607	0	0	153	99	39%	99	252
37	-0.00455	0	0%	252	-0.0034161	99	99	-0.00341607	0	0	153	99	39%	99	252
38	-0.00455	0	0%	252	-0.0034161	99	99	-0.00341607	0	0	153	99	39%	99	252
39	-0.00455	0	0%	252	-0.0034161	98	98	-0.00341607	0	0	154	98	39%	98	252
40	-0.00455	0	0%	252	-0.0034161	98	98	-0.00341607	0	0	154	98	39%	98	252
41	-0.00455	0	0%	252	-0.0034161	98	98	-0.00341607	0	0	154	98	39%	98	252
42	-0.00455	0	0%	252	-0.0034161	97	97	-0.00341607	0	0	155	97	39%	97	252
43	-0.00455	0	0%	252	-0.0034161	97	97	-0.00341607	0	0	155	97	39%	97	252
44	-0.00455	0	0%	252	-0.0034161	97	97	-0.00341607	0	0	155	97	38%	97	252
45	-0.00455	0	0%	252	-0.0034161	96	96	-0.00341607	0	0	156	96	38%	96	252
46	-0.00455	0	0%	252	-0.0034161	96	96	-0.00341607	0	0	156	96	38%	96	252
47	-0.00455	0	0%	252	-0.0034161	96	96	-0.00341607	0	0	156	96	38%	96	252
48	-0.00455	0	0%	252	-0.0034161	95	95	-0.00341607	0	0	157	95	38%	95	252
49	-0.00455	0	0%	252	-0.0034161	95	95	-0.00341607	0	0	157	95	38%	95	252
50	-0.00455	0	0%	252	-0.0034161	95	95	-0.00341607	0	0	157	95	38%	95	252

Land Loss Spreadsheet

					Loss Rate Calculation				
Project:	Sabine 18, Cycle 5				**Beginning Year**	**Ending Year**	**Beginning Year Acreage**	**Ending Year Acreage**	**Loss Rate**
Total Acres		**TY0 Marsh Acres**		**TY0 Water Acres**	1974	1990	17,320	16,100	-0.0046
252		0		252	FWP Land Loss Reduction			0.25	

FWOP					FWP - Created Marsh			FWP - Nourished Marsh			FWP Totals				
					Created Marsh =		108	Nourished Marsh =		0					
TY	FWOP Loss Rate	Marsh (acres)	% Marsh (V1)	Water (acres)	FWP Loss Rate	Created Marsh Acreage	Adjusted Marsh Acreage (10% @ TY1; 30% @ TY3 and 100% @ TY5)	FWP Loss Rate	Nourished Marsh Acreage	Adjusted Marsh Acreage (50% @ TY1 and 100% @ TY3	Water (acres)	Marsh (acres)	% Marsh (V1)	Net Acres of Marsh	Total Acres Check
0		**0**	**0%**	**252**		0			0						
16	-0.00455	**0**	**0%**	**252**	-0.0034161	108	**11**	-0.00341607	0	**0**	144	**11**	**4%**		252
17	-0.00455	0	0%	252	-0.0034161	107		-0.00341607	0		145				252
18	-0.00455	0	0%	252	-0.0034161	107	**32**	-0.00341607	0	**0**	145	**32**	**13%**		252
19	-0.00455	0	0%	252	-0.0034161	107		-0.00341607	0		145				252
20	-0.00455	0	0%	252	-0.0034161	106	**106**	-0.00341607	0	**0**	146	**106**	**42%**	106	252
21	-0.00455	0	0%	252	-0.0034161	106	106	-0.00341607	0	0	146	106	42%	106	252
22	-0.00455	0	0%	252	-0.0034161	105	105	-0.00341607	0	0	147	105	42%	105	252
23	-0.00455	0	0%	252	-0.0034161	105	105	-0.00341607	0	0	147	105	42%	105	252
24	-0.00455	0	0%	252	-0.0034161	105	105	-0.00341607	0	0	147	105	42%	105	252
25	-0.00455	0	0%	252	-0.0034161	104	104	-0.00341607	0	0	148	104	41%	104	252
26	-0.00455	0	0%	252	-0.0034161	104	104	-0.00341607	0	0	148	104	41%	104	252
27	-0.00455	0	0%	252	-0.0034161	104	104	-0.00341607	0	0	148	104	41%	104	252
28	-0.00455	0	0%	252	-0.0034161	103	103	-0.00341607	0	0	149	103	41%	103	252
29	-0.00455	0	0%	252	-0.0034161	103	103	-0.00341607	0	0	149	103	41%	103	252
30	-0.00455	0	0%	252	-0.0034161	103	103	-0.00341607	0	0	149	103	41%	103	252
31	-0.00455	0	0%	252	-0.0034161	102	102	-0.00341607	0	0	150	102	41%	102	252
32	-0.00455	0	0%	252	-0.0034161	102	102	-0.00341607	0	0	150	102	40%	102	252
33	-0.00455	0	0%	252	-0.0034161	102	102	-0.00341607	0	0	150	102	40%	102	252
34	-0.00455	0	0%	252	-0.0034161	101	101	-0.00341607	0	0	151	101	40%	101	252
35	-0.00455	**0**	**0%**	**252**	-0.0034161	101	**101**	-0.00341607	0	**0**	151	**101**	**40%**	**101**	252
36	-0.00455	0	0%	252	-0.0034161	101	101	-0.00341607	0	0	151	101	40%	101	252
37	-0.00455	0	0%	252	-0.0034161	100	100	-0.00341607	0	0	152	100	40%	100	252
38	-0.00455	0	0%	252	-0.0034161	100	100	-0.00341607	0	0	152	100	40%	100	252
39	-0.00455	0	0%	252	-0.0034161	99	99	-0.00341607	0	0	153	99	39%	99	252
40	-0.00455	0	0%	252	-0.0034161	99	99	-0.00341607	0	0	153	99	39%	99	252
41	-0.00455	0	0%	252	-0.0034161	99	99	-0.00341607	0	0	153	99	39%	99	252
42	-0.00455	0	0%	252	-0.0034161	98	98	-0.00341607	0	0	154	98	39%	98	252
43	-0.00455	0	0%	252	-0.0034161	98	98	-0.00341607	0	0	154	98	39%	98	252
44	-0.00455	0	0%	252	-0.0034161	98	98	-0.00341607	0	0	154	98	39%	98	252
45	-0.00455	0	0%	252	-0.0034161	97	97	-0.00341607	0	0	155	97	39%	97	252
46	-0.00455	0	0%	252	-0.0034161	97	97	-0.00341607	0	0	155	97	39%	97	252
47	-0.00455	0	0%	252	-0.0034161	97	97	-0.00341607	0	0	155	97	38%	97	252
48	-0.00455	0	0%	252	-0.0034161	96	96	-0.00341607	0	0	156	96	38%	96	252
49	-0.00455	0	0%	252	-0.0034161	96	96	-0.00341607	0	0	156	96	38%	96	252
50	-0.00455	0	0%	252	-0.0034161	96	96	-0.00341607	0	0	156	96	38%	96	252

Land Loss Spreadsheet

Project:	Sabine 18, Cycle 6				Loss Rate Calculation				
					Beginning Year	Ending Year	Beginning Year Acreage	Ending Year Acreage	Loss Rate
Total Acres		TY0 Marsh Acres		TY0 Water Acres	1974	1990	17,320	16,100	-0.0046
252		0		252	FWP Land Loss Reduction			0.25	

FWOP					FWP - Created Marsh			FWP - Nourished Marsh			FWP Totals				
					Created Marsh =		108	Nourished Marsh =		0					
TY	FWOP Loss Rate	Marsh (acres)	% Marsh (V1)	Water (acres)	FWP Loss Rate	Created Marsh Acreage	Adjusted Marsh Acreage (10% @ TY1; 30% @ TY3 and 100% @ TY5)	FWP Loss Rate	Nourished Marsh Acreage	Adjusted Marsh Acreage (50% @ TY1 and 100% @ TY3	Water (acres)	Marsh (acres)	% Marsh (V1)	Net Acres of Marsh	Total Acres Check
0		**0**	**0%**	**252**		0			0						
19	-0.00455	**0**	**0%**	**252**	-0.0034161	108	**11**	-0.00341607	0	**0**	144	**11**	**4%**		252
20	-0.00455	0	0%	252	-0.0034161	107		-0.00341607	0		145				252
21	-0.00455	0	0%	252	-0.0034161	107	**32**	-0.00341607	0	**0**	145	**32**	**13%**		252
22	-0.00455	0	0%	252	-0.0034161	107		-0.00341607	0		145				252
23	-0.00455	0	0%	252	-0.0034161	106	**106**	-0.00341607	0	**0**	146	**106**	**42%**	106	252
24	-0.00455	0	0%	252	-0.0034161	106	106	-0.00341607	0	0	146	106	42%	106	252
25	-0.00455	0	0%	252	-0.0034161	105	105	-0.00341607	0	0	147	105	42%	105	252
26	-0.00455	0	0%	252	-0.0034161	105	105	-0.00341607	0	0	147	105	42%	105	252
27	-0.00455	0	0%	252	-0.0034161	105	105	-0.00341607	0	0	147	105	42%	105	252
28	-0.00455	0	0%	252	-0.0034161	104	104	-0.00341607	0	0	148	104	41%	104	252
29	-0.00455	0	0%	252	-0.0034161	104	104	-0.00341607	0	0	148	104	41%	104	252
30	-0.00455	0	0%	252	-0.0034161	104	104	-0.00341607	0	0	148	104	41%	104	252
31	-0.00455	0	0%	252	-0.0034161	103	103	-0.00341607	0	0	149	103	41%	103	252
32	-0.00455	0	0%	252	-0.0034161	103	103	-0.00341607	0	0	149	103	41%	103	252
33	-0.00455	0	0%	252	-0.0034161	103	103	-0.00341607	0	0	149	103	41%	103	252
34	-0.00455	0	0%	252	-0.0034161	102	102	-0.00341607	0	0	150	102	41%	102	252
35	-0.00455	0	0%	252	-0.0034161	102	102	-0.00341607	0	0	150	102	40%	102	252
36	-0.00455	0	0%	252	-0.0034161	102	102	-0.00341607	0	0	150	102	40%	102	252
37	-0.00455	0	0%	252	-0.0034161	101	101	-0.00341607	0	0	151	101	40%	101	252
38	-0.00455	**0**	**0%**	**252**	-0.0034161	101	**101**	-0.00341607	0	**0**	151	**101**	**40%**	**101**	252
39	-0.00455	0	0%	252	-0.0034161	101	101	-0.00341607	0	0	151	101	40%	101	252
40	-0.00455	0	0%	252	-0.0034161	100	100	-0.00341607	0	0	152	100	40%	100	252
41	-0.00455	0	0%	252	-0.0034161	100	100	-0.00341607	0	0	152	100	40%	100	252
42	-0.00455	0	0%	252	-0.0034161	99	99	-0.00341607	0	0	153	99	39%	99	252
43	-0.00455	0	0%	252	-0.0034161	99	99	-0.00341607	0	0	153	99	39%	99	252
44	-0.00455	0	0%	252	-0.0034161	99	99	-0.00341607	0	0	153	99	39%	99	252
45	-0.00455	0	0%	252	-0.0034161	98	98	-0.00341607	0	0	154	98	39%	98	252
46	-0.00455	0	0%	252	-0.0034161	98	98	-0.00341607	0	0	154	98	39%	98	252
47	-0.00455	0	0%	252	-0.0034161	98	98	-0.00341607	0	0	154	98	39%	98	252
48	-0.00455	0	0%	252	-0.0034161	97	97	-0.00341607	0	0	155	97	39%	97	252
49	-0.00455	0	0%	252	-0.0034161	97	97	-0.00341607	0	0	155	97	39%	97	252
50	-0.00455	0	0%	252	-0.0034161	97	97	-0.00341607	0	0	155	97	38%	97	252

Beneficial Use Site 19

<u>**Cameron Prairie NWR Beneficial Use (BU) Site 19**</u>

Project Location/Area: For this WVA, a 1,026-acre open water area in the southwestern portion of the Cameron-Creole Watershed in the Cameron Prairie National Wildlife Refuge, Cameron Parish, Louisiana, was delineated (Figure 1). A portion of the site (477 acres) is located on private land adjacent to the refuge.

Variable 1 – Emergent Vegetation

The Corps intends to pump approximately 1,628,100 cubic yards of dredge material into the Sabine BU site 19. The material would be allowed to flow unconfined to nourish existing marsh, create new marsh, and create shallow open water habitat. Material is expected to stack up where existing marsh allows; however, depending on pipe placement and movement, material is likely to create an abundance of mudflat/shallow open water. Assuming that the average depth is approximately 1.5 feet and initial target elevations are +4.5 ft MLG, approximately 168 acres of marsh could be created (i.e., provided that the marsh creation area were confined with dikes and weirs). According to Corps, where healthy marsh borders proposed unconfined marsh creation areas, material is likely to stack in a manner similar to confined BU marsh creation areas. Also, with beneficial use of dredge material projects, generally approximately 85% of marsh is created in confined marsh creation areas. It is assumed for this analysis that 75% of dredge material pumped adjacent to existing marsh would create elevations conducive for marsh creation, and 25% would create shallow open water habitat (i.e., mudflats). Material is expected to overflow the existing marsh; however, for this analysis nourishment was not considered because of the minimal amount of wetlands that exists within the open water area.

- One (1) acre of marsh would require 261,360 cubic feet of material:
  4.5'MLG + 1.5' water depths = 6' x 43,560 sq ft = 261,360 cubic feet/27 = 9,680 cubic yards
- One (1) acre of mudflat would require 65,340 cubic feet of material:
  1.5' X 43,560 sq. ft = 65,340 cubic ft/27 = 2,420 cubic yards

- Therefore,
  75% of 1,628,100 cyds = 1,221,075 cyds/ 9,680 cyds = **126 acres of marsh**

  25% of 1,628,100 cyds = 407,025 cyds/ 2,420 cyds = **168 acres of mudflat**

The timeline for functional marsh credit for marsh creation is assumed as follows:

Construction Year - 10 %
Two Years After CY – 30 %
Four Years After CY– 100%

Marsh loss and land change data was obtained from the USGS and the USACE during the evaluation of the Coastal Wetlands Planning, Protection and Restoration (CWPPRA), Priority Project List 17, East Cove Marsh Creation Project. Rates were derived from those data for the project boundary and extended boundary. The 1978-2006 annual rate (-0.41%/yr) was used in that analysis and will be used for this analysis. Material is not expected to stack and consolidate like confined material. Therefore, for the purpose of this WVA, loss rates were applied to FWP starting at TY 1, but were reduced by 25 % rather than the standard 50% reduction.

FWOP
TY 0: 15 acres/~ 300ac project area (PA) = 5 % emergent marsh (EM)

FWP
Refer to land loss spreadsheet for marsh acreages credited by target year.

V2 - Submerged Aquatic Vegetation (SAV)
No SAV was observed during the field inspections for the CWPPRA evaluation, but *Ruppia spp*. has been observed in the project area in concentrations as high as 80% cover by Cameron Prairie National Wildlife Refuge personnel (Jim Ashfield) prior to Hurricane Rita. With the repair of the Cameron-Creole Watershed project in the near future, those percentages are expected to return. For FWOP, through TY 50 all of the open water in area will be shallow, however, salinities will not be above the range for Widgeon Grass *(Ruppia maritima)* development. Widgeon grass has been observed in the area before Hurricane Rita in concentrations as high as 80% cover in project area open water areas.

FWOP
TY 0 – 60%
TY 20 – 80 %
TY 50 – 80 %

FWP
TY 0 60 %
TY 7 60 %
TY 8 0 % pump
TY 10 60 %
TY 12 60 %
TY 20 70 %
TY 50 80 %

Variable 3 – Interspersion
Interspersion Classes were determined using 2005 aerial photography and knowledge of the area.

FWOP
TY 0-20: 20/80 Class 4/Class5; TY 50: 100% Class 5

Table 1: FWP Interspersion Classification

Target Year	Cycles	Class3 (%)	Class 4 (%)	Class 5 (%)
0 (FWOP)			20	80
3			20	80
7			20	80
8	pump	100		
10		100		
12		100		
20		100		

50		100		

Variable 4 – Shallow Open Water Habitat (percent of open water < 1.5 feet)

GPS based water depths were taken during the May 19th, 2007, CWPPRA field trip. Combined water depth information from the NMFS and FWS for the two areas is shown on Table 4. Based on that information, BU site 19 contains an estimated 44% shallow water equal or less than 1.5 ft.

Table 2: Water Depth Information from May 19, 2007, Field Trip conducted by CWPPRA evaluation team.

Site	**Average Water Depths**	**Percentage of depths =< 1.5 ft**
East Site	1.6 ft	44%
West Site	1.44 ft	60%

FWOP
TY0 60%
TY3 60%
TY4 60%
TY20 60%
TY50 60%

FWP
TY 0 60 %
TY 7 60 %
TY 8 100 % (pump year)
TY 10 100 %
TY 12 90%
TY 20 85 %
TY 50 80 %

Variable 5 – Salinity

For the brackish and saline marsh models, average annual salinity is used as the salinity parameter. The SI graph for brackish marsh is constructed to represent optimal conditions when salinities are between 0 ppt and 10 ppt. Average annual salinities greater than 10 ppt are assumed to be progressively more harmful to brackish marsh vegetation. Average annual salinities greater than 16 ppt are assumed to be representative of those found in a saline marsh, and thus are not considered in the brackish marsh model. The SI graph for the saline marsh model is constructed to represent optimal salinity conditions at between 0 ppt and 21 ppt. The EnvWG acknowledges that average annual salinities below 10 ppt will effectively define a marsh as brackish, not saline.

Because the FWOP and FWP salinities are controlled by the operation of the Cameron-Creole Watershed project, FWOP and FWP salinities are expected to be the same over the project life. Salinities recorded during the May 19, 2007, field trip, from data collected by the NMFS and

FWS, indicated average salinities of 18.0 ppt. It is assumed that project area salinities would increase if the Cameron-Creole Watershed project were not maintained, but if so, FWOP salinities would not be different from FWP. The watershed project is expected be repaired and maintained in the near future, therefore average annual salinities would not be expected to increase above those recorded for the 1989 to 2003 period below (Table 3). Average annual salinities are slightly above optimal conditions for brackish marsh and there is a potential for greater project-area salinities to exist as a result of failed water control structures; therefore, the saline marsh model was used for this analysis.

Table 3: Average Cameron-Creole Watershed Salinities for No Name Bayou and Station EC 12 South of Lambert Bayou from 1989 to 2003.

AVERAGE SALINITIES (PPT) FOR NO NAME BAYOU AND EC 12 1989-2003			
	STATION		
YEAR	No Name	EC 12	
1989	11.96		
1990	10.58	8.77	
1991	8.07	5.01	
1992	8.79	5.48	
1993	8.92	6.47	
1994	9.83	6.83	
1995	10.3	6.91	
1996	11.97	8.3	
1997	9.76	5.92	
1998	10.1	6.32	
1999	16.51	11.06	
2000	22.06	17.66	
2001	8.62	5.58	
2002	8.49	6.25	
2003	13.61	9.15	
AVERAGE	**11.30**	**7.84**	

(Source: Glenn Harris, Cameron Prairie NWR 2007)

Variable 6 - Fish Access

All TY's: 0.4 (Cameron-Creole Watershed Project repaired, slotted fixed crest weir)

References

Harris, Glenn. 2003. Cameron-Creole Watershed average annual salinities from 1989 to 2003 at Stations No Name Bayou and EC 12. Cameron Prairie National Wildlife Refuge. Bell City, LA.

Beneficial Use Sites 19 and 20

Calcasieu River and Pass, Louisiana
Dredged Material Management Plan

USGS DOQQ 2005 WESTLAKE SW 3009354

Figure: 1
Date: August 2007
Scale:1:43,970
Source: USGS/GEC/USACE
Map Author: Moore 27585101-765

WETLAND VALUE ASSESSMENT COMMUNITY MODEL
Saline Marsh

Project: Calcasieu DMMP: Cameron Prairie BU 19 Project Area: 300

Condition: Future Without Project (FWOP)

Variable		TY 0		TY 1		TY 20				
		Value	SI	Value	SI	Value	SI			
V1	% Emergent	5	0.15	5	0.15	5	0.15			
V2	% Aquatic	60	0.72	60	0.72	80	0.86			
V3	Interspersion	%		%		%				
	Class 1		0.12		0.12		0.12	0	0	0
	Class 2							0	0	0
	Class 3							0	0	0
	Class 4	20		20		20		0.2	0.2	0.2
	Class 5	80		80		80		0.1	0.1	0.1
V4	%OW <= 1.5ft	60	0.87	60	0.87	60	0.87			
V5	Salinity (ppt)	11	1.00	11	1.00	11	1.00			
V6	Access Value	0.40	0.46	0.40	0.46	0.40	0.46			
	Emergent Marsh HSI	=	0.27	EM HSI =	0.27	EM HSI =	0.27			
	Open Water HSI	=	0.55	OW HSI =	0.55	OW HSI =	0.58			

Project: Calcasieu DMMP: Cameron Prairie BU 19
FWOP

Variable		TY 50								
		Value	SI	Value	SI	Value	SI			
V1	% Emergent	4	0.14							
V2	% Aquatic	80	0.86							
V3	Interspersion	%		%		%				
	Class 1		0.10					0	0	0
	Class 2							0	0	0
	Class 3							0	0	0
	Class 4							0	0	0
	Class 5	100						0.1	0	0
V4	%OW <= 1.5ft	60	0.87							
V5	Salinity (ppt)	11	1.00							
V6	Access Value	0.40	0.46							
		EM HSI =	0.27	EM HSI =		EM HSI =				
		OW HSI =	0.57	OW HSI =		OW HSI =				

Project: Calcasieu DMMP: Cameron Prairie BU 19 Project Area: 300

Condition: Future With Project (FWP)

Variable		TY 0 Value	TY 0 SI	TY 7 Value	TY 7 SI	TY 8 Value	TY 8 SI			
V1	% Emergent	5	0.15	5	0.15	7	0.16			
V2	% Aquatic	60	0.72	60	0.72	0	0.30			
V3	Interspersion	%		%		%				
	Class 1		0.12		0.12		0.40	0	0	0
	Class 2							0	0	0
	Class 3					100		0	0	0.4
	Class 4	20		20				0.2	0.2	0
	Class 5	80		80				0.1	0.1	0
V4	%OW <= 1.5ft	60	0.87	60	0.87	0	0.10			
V5	Salinity (ppt)	11	1.00	11	1.00	11	1.00			
V6	Access Value	0.40	0.46	0.40	0.46	0.40	0.46			
	Emergent Marsh HSI	=	0.27	EM HSI =	0.27	EM HSI =	0.32			
	Open Water HSI	=	0.55	OW HSI =	0.55	OW HSI =	0.43			

Project: Calcasieu DMMP: Cameron Prairie BU 19

FWP

Variable		TY 10 Value	TY 10 SI	TY 12 Value	TY 12 SI	TY 20 Value	TY 20 SI			
V1	% Emergent	17	0.25	46	0.51	45	0.51			
V2	% Aquatic	60	0.72	60	0.72	70	0.79			
V3	Interspersion	%		%		%				
	Class 1		0.40		0.40		0.40	0	0	0
	Class 2							0	0	0
	Class 3	100		100		100		0.4	0.4	0.4
	Class 4							0	0	0
	Class 5							0	0	0
V4	%OW <= 1.5ft	100	0.50	90	0.75	85	0.88			
V5	Salinity (ppt)	11	1.00	11	1.00	11	1.00			
V6	Access Value	0.40	0.46	0.40	0.46	0.40	0.46			
		EM HSI =	0.38	EM HSI =	0.54	EM HSI =	0.54			
		OW HSI =	0.55	OW HSI =	0.57	OW HSI =	0.59			

Project: Calcasieu DMMP: Cameron Prairie BU 19
FWP

Variable		50					
		Value	SI	Value	SI	Value	SI
V1	% Emergent	41	0.47				
V2	% Aquatic	80	0.86				
V3	Interspersion	%				%	
	Class 1		0.40				
	Class 2						
	Class 3	100					
	Class 4						
	Class 5						
V4	%OW <= 1.5ft	80	1.00				
V5	Salinity (ppt)	11	1.00				
V6	Access Value	0.40	0.46				
		EM HSI =	0.52	EM HSI =		EM HSI =	
		OW HSI =	0.61	OW HSI =		OW HSI =	

0	0	0
0	0	0
0.4	0	0
0	0	0
0	0	0

AAHU CALCULATION - EMERGENT MARSH

Project: Calcasieu DMMP: Cameron Prairie BU 19

Future Without Project			Total	Cummulative
TY	Marsh Acres	x HSI	HUs	HUs
0	15	0.27	4.12	
1	15	0.27	4.12	4.12
20	14	0.27	3.85	75.75
50	12	0.27	3.19	105.47
			AAHUs =	9.27

Future With Project			Total	Cummulative
TY	Marsh Acres	x HSI	HUs	HUs
0	15	0.27	4.12	
7	15	0.27	4.12	28.87
8	20	0.32	6.40	5.22
10	52	0.38	19.97	25.68
12	139	0.54	75.67	90.99
20	135	0.54	72.80	593.86
50	124	0.52	64.30	2055.43
			AAHUs	140.00

NET CHANGE IN AAHUs DUE TO PROJECT	
A. Future With Project Emergent Marsh AAHUs =	140.00
B. Future Without Project Emergent Marsh AAHUs =	9.27
Net Change (FWP - FWOP) =	130.74

1/12/2009

AAHU CALCULATION - OPEN WATER

Project: Calcasieu DMMP: Cameron Prairie BU 19

Future Without Project			Total	Cummulative
TY	Water Acres	x HSI	HUs	HUs
0	285	0.55	157.94	
1	285	0.55	157.94	157.94
20	286	0.58	164.55	3063.52
50	288	0.57	165.27	4947.28
			AAHUs =	408.44

Future With Project			Total	Cummulative
TY	Water Acres	x HSI	HUs	HUs
0	285	0.55	157.94	
7	285	0.55	157.94	1105.55
8	159	0.43	68.01	110.32
10	160	0.55	87.58	155.55
12	161	0.57	91.11	178.68
20	165	0.59	96.70	751.14
50	176	0.61	106.58	3048.23
			AAHUs	267.47

NET CHANGE IN AAHUs DUE TO PROJECT	
A. Future With Project Open Water AAHUs =	267.47
B. Future Without Project Open Water AAHUs =	408.44
Net Change (FWP - FWOP) =	**-140.96**

TOTAL BENEFITS IN AAHUs DUE TO PROJECT	
A. Emergent Marsh Habitat Net AAHUs =	130.74
B. Open Water Habitat Net AAHUs =	-140.96
Net Benefits= (3.5xEMAAHUs+OWAAHUs)/4.5	**70.36**

Land Loss Spreadsheet

Project: CP_BU19					Beginning Year	Ending Year	Beginning Year Acreage	Ending Year Acreage	Loss Rate
Total Acres		**TY0 Marsh Acres**		**TY0 Water Acres**					-0.0041
300		15		285	FWP Land Loss Reduction			0.25	

Loss Rate Calculation

FWOP					FWP - Created Marsh			FWP - Nourished Marsh			FWP Totals				
					Created Marsh =		126	Nourished Marsh =		15					
TY	FWOP Loss Rate	Marsh (acres)	% Marsh (V1)	Water (acres)	FWP Loss Rate	Created Marsh Acreage	Adjusted Marsh Acreage (10% @ TY1; 30% @ TY3 and 100% @ TY5)	FWP Loss Rate	Nourished Marsh Acreage	Adjusted Marsh Acreage (50% @ TY1 and 100% @ TY3	Water (acres)	Marsh (acres)	% Marsh (V1)	Net Acres of Marsh	Total Acres Check
0		**15**	**5%**	**285**		0			0						
1	-0.0041	**15**	**5%**	**285**	-0.003075	0	**0**	-0.0041	15	**15**	285	**15**	**5%**		300
2	-0.0041	15	5%	285	-0.003075	0	0	-0.0041	15	15	285				300
3	-0.0041	15	5%	285	-0.003075	0	**0**	-0.0041	15	**15**	285	**15**	**5%**		300
4	-0.0041	15	5%	285	-0.003075	0	0	-0.0041	15	**15**	285				300
5	-0.0041	15	5%	285	-0.003075	0	**0**	-0.0041	15	**15**	285	**15**	**5%**	0	300
6	-0.0041	15	5%	285	-0.003075	0	0	-0.0041	15	**15**	285	15	5%	0	300
7	-0.0041	15	5%	285	-0.003075	0	0	-0.0041	15	**15**	285	15	5%	0	300
8	-0.0041	15	5%	285	-0.003075	126	13	-0.003075	15	7	160	140	9%	126	300
9	-0.0041	14	5%	286	-0.003075	125	13	-0.003075	14	7	160	140	9%	125	300
10	-0.0041	14	5%	286	-0.003075	125	125	-0.003075	14	14	161	139	46%	125	300
11	-0.0041	14	5%	286	-0.003075	124	124	-0.003075	14	14	161	139	46%	125	300
12	-0.0041	14	5%	286	-0.003075	124	124	-0.003075	14	14	162	138	46%	124	300
13	-0.0041	14	5%	286	-0.003075	124	124	-0.003075	14	14	162	138	46%	124	300
14	-0.0041	14	5%	286	-0.003075	123	123	-0.003075	14	14	162	138	46%	123	300
15	-0.0041	14	5%	286	-0.003075	123	123	-0.003075	14	14	163	137	46%	123	300
16	-0.0041	14	5%	286	-0.003075	123	123	-0.003075	14	14	163	137	46%	123	300
17	-0.0041	14	5%	286	-0.003075	122	122	-0.003075	14	14	164	136	45%	122	300
18	-0.0041	14	5%	286	-0.003075	122	122	-0.003075	14	14	164	136	45%	122	300
19	-0.0041	14	5%	286	-0.003075	121	121	-0.003075	14	14	165	135	45%	122	300
20	-0.0041	**14**	**5%**	**286**	-0.003075	121	**121**	-0.003075	14	**14**	165	**135**	**45%**	**121**	300
21	-0.0041	14	5%	286	-0.003075	121	121	-0.003075	14	14	165	135	45%	121	300
22	-0.0041	14	5%	286	-0.003075	120	120	-0.003075	14	14	166	134	45%	121	300
23	-0.0041	14	5%	286	-0.003075	120	120	-0.003075	14	14	166	134	45%	120	300
24	-0.0041	14	5%	286	-0.003075	120	120	-0.003075	14	14	167	133	44%	120	300
25	-0.0041	14	5%	286	-0.003075	119	119	-0.003075	14	14	167	133	44%	119	300
26	-0.0041	13	4%	287	-0.003075	119	119	-0.003075	14	14	167	133	44%	119	300
27	-0.0041	13	4%	287	-0.003075	118	118	-0.003075	14	14	168	132	44%	119	300
28	-0.0041	13	4%	287	-0.003075	118	118	-0.003075	14	14	168	132	44%	118	300
29	-0.0041	13	4%	287	-0.003075	118	118	-0.003075	14	14	169	131	44%	118	300
30	-0.0041	13	4%	287	-0.003075	117	117	-0.003075	14	14	169	131	44%	118	300
31	-0.0041	13	4%	287	-0.003075	117	117	-0.003075	14	14	169	131	44%	117	300
32	-0.0041	13	4%	287	-0.003075	117	117	-0.003075	13	13	170	130	43%	117	300
33	-0.0041	13	4%	287	-0.003075	116	116	-0.003075	13	13	170	130	43%	117	300
34	-0.0041	13	4%	287	-0.003075	116	116	-0.003075	13	13	171	129	43%	116	300
35	-0.0041	13	4%	287	-0.003075	116	116	-0.003075	13	13	171	129	43%	116	300
36	-0.0041	13	4%	287	-0.003075	115	115	-0.003075	13	13	171	129	43%	116	300
37	-0.0041	13	4%	287	-0.003075	115	115	-0.003075	13	13	172	128	43%	115	300
38	-0.0041	13	4%	287	-0.003075	115	115	-0.003075	13	13	172	128	43%	115	300
39	-0.0041	13	4%	287	-0.003075	114	114	-0.003075	13	13	173	127	42%	115	300
40	-0.0041	13	4%	287	-0.003075	114	114	-0.003075	13	13	173	127	42%	114	300
41	-0.0041	13	4%	287	-0.003075	113	113	-0.003075	13	13	173	127	42%	114	300
42	-0.0041	13	4%	287	-0.003075	113	113	-0.003075	13	13	174	126	42%	114	300
43	-0.0041	13	4%	287	-0.003075	113	113	-0.003075	13	13	174	126	42%	113	300
44	-0.0041	13	4%	287	-0.003075	112	112	-0.003075	13	13	175	125	42%	113	300
45	-0.0041	12	4%	288	-0.003075	112	112	-0.003075	13	13	175	125	42%	113	300
46	-0.0041	12	4%	288	-0.003075	112	112	-0.003075	13	13	175	125	42%	112	300
47	-0.0041	12	4%	288	-0.003075	111	111	-0.003075	13	13	176	124	41%	112	300
48	-0.0041	12	4%	288	-0.003075	111	111	-0.003075	13	13	176	124	41%	112	300
49	-0.0041	12	4%	288	-0.003075	111	111	-0.003075	13	13	176	124	41%	111	300
50	-0.0041	12	4%	288	-0.003075	110	110	-0.003075	13	13	177	123	41%	111	300

Beneficial Use Site 20

Cameron Prairie NWR Beneficial Use (BU) Site 20

Project Location/Area: For this WVA, a 1,867-acre open water area in the southwestern portion of the Cameron-Creole Watershed in the Cameron Prairie National Wildlife Refuge, Cameron Parish, Louisiana, was delineated (Figure 1).

Variable 1 – Emergent Vegetation

The Corps intends to pump approximately 1,628,100 cubic yards of dredge material into the Sabine beneficial use site 20 which is located on the Cameron Prairie NWR. The material would be allowed to flow unconfined to nourish existing marsh, create new marsh, and create shallow open water habitat. Material is expected to stack up where existing marsh allows; however, depending on pipe placement and movement, material is likely to create an abundance of mudflat/shallow open water. Assuming that the average depth is approximately 1.5 feet and initial target elevations are +4.5 ft MLG approximately acres of marsh could be created (i.e., provided that the marsh creation area were confined with dikes and weirs). According to Corps, where healthy marsh borders proposed unconfined marsh creation areas, material is likely to stack in a manner similar to confined BU marsh creation areas. Also, with beneficial use of dredge material projects, generally approximately 85% of marsh is created in confined marsh creation areas. It is assumed for this analysis that 75% of dredge material pumped adjacent to existing marsh would create elevations conducive for marsh creation, and 25% would create shallow open water habitat (i.e., mudflats). Material is expected to overflow the existing marsh; however, for this analysis nourishment was not considered because of the minimal amount of wetlands that exists within the open water area (~ 48,400 cyds would nourish 30 acres).

- One (1) acre of marsh would require 261,360 cubic feet of material:
  4.5'MLG + 1.5' water depths = 6' x 43,560 sq ft = 261,360 cubic feet/27 = 9,680 cubic yards
- One (1) acre of mudflat would require 65,340 cubic feet of material:
  1.5' X 43,560 sq. ft = 65,340 cubic ft/27 = 2,420 cubic yards
- Therefore,
  75% of 1,628,100 cyds = 1,221,075 cyds/ 9,680 cyds = **126 acres of marsh**
  1579700=1184775/9680=122acres
  25% of 1,628,100 cyds = 407,025 cyds/ 2,420 cyds = **168 acres of mudflat**

The timeline for functional marsh credit for marsh creation is assumed as follows:

Construction Year - 10 %
Two Years After CY – 30 %
Four Years After CY – 100%

Marsh loss and land change data was obtained from the USGS and the USACE during the evaluation of the CWPPRA, PPL 17, East Cove Marsh Creation Project. Rates were derived from those data for the project boundary and extended boundary. The 1978-2006 annual rate (-0.41%/yr) was used in that analysis and will be used for this analysis. Material is not expected to stack and consolidate like confined material. Marsh loss rates for this area are intermediate, and sediments and nutrients will be added to the system throughout the project life. Therefore, for the purpose of this WVA, loss rates were applied to FWP starting at TY 1, but were reduced by 25 % rather than the standard 50% reduction.

FWOP
TY 0: 30 acres/~ 300ac project area (PA) = 10 % emergent marsh

FWP
Refer to land loss spreadsheet for marsh acreages credited by target year.

Variable 2 - Submerged Aquatic Vegetation (SAV)
No SAV was observed during the field inspections, but *Ruppia spp*. has been observed in the project area in concentrations as high as 80% cover by Cameron Prairie National Wildlife Refuge personnel (Jim Ashfield) prior to Hurricane Rita. With the repair of the Cameron-Creole Watershed project in the near future, those percentages are expected to return.

Assumption:
Though through TY50 all of the open water in area will be shallow, salinities will not be above the range for Widgeon Grass *(Ruppia maritima)* development. Widgeon grass has been observed in the area before Hurricane Rita in concentrations as high as 80% cover in project area open water areas.

FWOP
TY 0 – 60 %
TY 20 – 80 %
TY 50 – 80 %

FWP
TY 0 60%
TY 4 60 %
TY 5 0 % pump
TY 7 60 %
TY 9 70 %
TY 20 80 %
TY 50 80 %

Variable 3 – Interspersion
Interspersion Classes were determined using 2005 aerial photography and knowledge of the area.

FWOP

TY 0-20: 20 % Class 4, 80% Class 5; TY 50: 100% Class 5

Table 1: FWP Interspersion Classification

Target Year	Cycles	Class3 (%)	Class 4 (%)	Class 5 (%)
0 (FWOP)			20	80
4			20	80
5	pump	100		
7		100		
9		100		
20		100		
50		100		

Variable 4 - Shallow Open Water Habitat (percent open water <1.5 ft)

GPS based water depths were taken during the May 19th, 2007 field trip. Combined water depth information from the NMFS and FWS for the two areas is shown on Table 4. Based on that information, BU site 20 contains an estimated 60% shallow water equal or less than 1.5 ft.

Table 2: Water Depth Information from May 19, 2007 Field Trip conducted by CWPPRA evaluation team.

Site	Average Water Depths	Percentage of depths =< 1.5 ft
East Site	1.6 ft	44%
West Site	1.44 ft	60%

FWOP
TY0 60%
TY3 60%
TY4 60%
TY20 60%
TY50 60%

FWP
TY 0 60 %
TY 4 60 %
TY 5 100 % (pump)
TY 7 100 %
TY 9 90 %
TY 20 85 %
TY 50 80 %

Variable 5 - Salinity

Because the FWOP and FWP salinities are controlled by the operation of the Cameron-Creole Watershed project, FWOP and FWP salinities are expected to be the same over the 20-year project life. Salinities recorded during the May 19, 2007, field trip, from data collected by the NMFS and FWS, indicated average salinities of 12.8 ppt for the Eastern Site. It is assumed that project area salinities would increase if the Cameron-Creole Watershed project were not maintained, but if so, FWOP salinities would not be different from FWP. The watershed project is expected be repaired and maintained in the near future, therefore average annual salinities would not be expected to increase above those recorded for the 1989 to 2003 period below (Table 3).

Table 3: Average Cameron-Creole Watershed Salinities for No Name Bayou and Station EC 12 South of Lambert Bayou from 1989 to 2003.

AVERAGE SALINITIES (PPT) FOR NO NAME BAYOU AND EC 12 1989-2003		
	STATION	
YEAR	No Name	EC 12
1989	11.96	
1990	10.58	8.77
1991	8.07	5.01
1992	8.79	5.48
1993	8.92	6.47
1994	9.83	6.83
1995	10.3	6.91
1996	11.97	8.3
1997	9.76	5.92
1998	10.1	6.32
1999	16.51	11.06
2000	22.06	17.66
2001	8.62	5.58
2002	8.49	6.25
2003	13.61	9.15
AVERAGE	**11.30**	**7.84**

(Source: Glenn Harris, Cameron Prairie NWR 2007)

Variable 6 - Fish Access

All TY's: 0.4 (Cameron-Creole Watershed Project repaired, slotted fixed crest weir)

References

Harris, Glenn. 2003. Cameron-Creole Watershed average annual salinities from 1989 to 2003 at Stations No Name Bayou and EC 12. Cameron Prairie National Wildlife Refuge. Bell City, LA.

Beneficial Use Sites 19 and 20

Calcasieu River and Pass, Louisiana
Dredged Material Management Plan

USGS DOQQ 2005 WESTLAKE SW 3009354

Figure: 1
Date: August 2007
Scale:1:43,970
Source: USGS/GEC/USACE
Map Author: Moore 27585101-765

WETLAND VALUE ASSESSMENT COMMUNITY MODEL
Brackish Marsh

Project: Calcasieu DMMP: Cameron Prairie BU site 20　　　　Project Area: 300

Condition: Future Without Project (FWOP)

Variable		TY 0		TY 1		TY 20				
		Value	SI	Value	SI	Value	SI			
V1	% Emergent	10	0.19	10	0.19	10	0.19			
V2	% Aquatic	60	0.64	60	0.64	80	0.82			
V3	Interspersion	%		%		%				
	Class 1		0.12		0.12		0.12	0	0	0
	Class 2							0	0	0
	Class 3							0	0	0
	Class 4	20		20		20		0.2	0.2	0.2
	Class 5	80		80		80		0.1	0.1	0.1
V4	%OW <= 1.5ft	60	0.87	60	0.87	60	0.87			
V5	Salinity (ppt)	8	1.00	8	1.00	8	1.00			
V6	Access Value	0.40	0.46	0.40	0.46	0.40	0.46			
	Emergent Marsh HSI	=	0.31	EM HSI =	0.31	EM HSI =	0.31			
	Open Water HSI	=	0.58	OW HSI =	0.58	OW HSI =	0.65			

Project: Calcasieu DMMP: Cameron Prairie BU site 20
FWOP

Variable		TY 50								
		Value	SI	Value	SI	Value	SI			
V1	% Emergent	9	0.18							
V2	% Aquatic	80	0.82							
V3	Interspersion	%		%		%				
	Class 1		0.12					0	0	0
	Class 2							0	0	0
	Class 3							0	0	0
	Class 4	20						0.2	0	0
	Class 5	80						0.1	0	0
V4	%OW <= 1.5ft	60	0.87							
V5	Salinity (ppt)	8	1.00							
V6	Access Value	0.40	0.46							
		EM HSI =	0.30	EM HSI =		EM HSI =				
		OW HSI =	0.65	OW HSI =		OW HSI =				

Project: Calcasieu DMMP: Cameron Prairie BU site 20 Project Area: 300

Condition: Future With Project (FWP)

Variable		TY 0 Value	TY 0 SI	TY 4 Value	TY 4 SI	TY 5 Value	TY 5 SI			
V1	% Emergent	10	0.19	10	0.19	9	0.18			
V2	% Aquatic	60	0.64	60	0.64	0	0.10			
V3	Interspersion	%		%		%				
	Class 1		0.12		0.12		0.40	0	0	0
	Class 2							0	0	0
	Class 3					100		0	0	0.4
	Class 4	20		20				0.2	0.2	0
	Class 5	80		80				0.1	0.1	0
V4	%OW <= 1.5ft	60	0.87	60	0.87	0	0.10			
V5	Salinity (ppt)	8	1.00	8	1.00	8	1.00			
V6	Access Value	0.40	0.46	0.40	0.46	0.40	0.46			
	Emergent Marsh HSI	**=**	**0.31**	**EM HSI =**	**0.31**	**EM HSI =**	**0.33**			
	Open Water HSI	**=**	**0.58**	**OW HSI =**	**0.58**	**OW HSI =**	**0.25**			

Project: Calcasieu DMMP: Cameron Prairie BU site 20
FWP

Variable		7 Value	7 SI	9 Value	9 SI	20 Value	20 SI			
V1	% Emergent	22	0.30	51	0.56	49	0.54			
V2	% Aquatic	60	0.64	70	0.73	80	0.82			
V3	Interspersion	%		%		%				
	Class 1		0.40		0.40		0.40	0	0	0
	Class 2							0	0	0
	Class 3	100		100		100		0.4	0.4	0.4
	Class 4							0	0	0
	Class 5							0	0	0
V4	%OW <= 1.5ft	100	0.60	90	0.80	85	0.90			
V5	Salinity (ppt)	8	1.00	8	1.00	8	1.00			
V6	Access Value	0.40	0.46	0.40	0.46	0.40	0.46			
		EM HSI =	**0.41**	**EM HSI =**	**0.57**	**EM HSI =**	**0.56**			
		OW HSI =	**0.58**	**OW HSI =**	**0.63**	**OW HSI =**	**0.68**			

Project: Calcasieu DMMP: Cameron Prairie BU site 20

FWP

Variable		50 Value	SI	Value	SI	Value	SI
V1	% Emergent	45	0.51				
V2	% Aquatic	80	0.82				
V3	Interspersion Class 1 Class 2 Class 3 Class 4 Class 5	% 100	 0.40	%		%	
V4	%OW <= 1.5ft	80	1.00				
V5	Salinity (ppt)	8	1.00				
V6	Access Value	0.40	0.46				
		EM HSI =	0.54	EM HSI =		EM HSI =	
		OW HSI =	0.68	OW HSI =		OW HSI =	

0	0	0
0	0	0
0.4	0	0
0	0	0
0	0	0

AAHU CALCULATION - EMERGENT MARSH

Project: Calcasieu DMMP: Cameron Prairie BU site 20

Future Without Project			Total	Cummulative
TY	Marsh Acres	x HSI	HUs	HUs
0	30	0.31	9.17	
1	30	0.31	9.17	9.17
20	28	0.31	8.56	168.43
50	24	0.30	7.18	235.90
			AAHUs =	20.67

Future With Project			Total	Cummulative
TY	Marsh Acres	x HSI	HUs	HUs
0	30	0.31	9.17	
4	30	0.31	9.17	36.68
5	28	0.33	9.24	9.22
7	67	0.41	27.59	35.77
9	154	0.57	87.97	110.93
20	148	0.56	83.01	940.25
50	135	0.54	72.90	2337.21
			AAHUs	173.50

NET CHANGE IN AAHUs DUE TO PROJECT	
A. Future With Project Emergent Marsh AAHUs =	173.50
B. Future Without Project Emergent Marsh AAHUs =	20.67
Net Change (FWP - FWOP) =	**152.83**

AAHU CALCULATION - OPEN WATER

Project: Calcasieu DMMP: Cameron Prairie BU site 20

Future Without Project			Total	Cummulative
TY	Water Acres	x HSI	HUs	HUs
0	270	0.58	157.60	
1	270	0.58	157.60	157.60
20	272	0.65	177.79	3185.77
50	276	0.65	180.40	5372.91
			AAHUs =	**435.81**

Future With Project			Total	Cummulative
TY	Water Acres	x HSI	HUs	HUs
0	270	0.58	157.60	
4	270	0.58	157.60	630.40
5	144	0.25	36.62	90.19
7	145	0.58	84.73	121.24
9	146	0.63	92.71	177.42
20	152	0.68	102.83	1074.97
50	165	0.68	112.84	3234.53
			AAHUs	**266.44**

NET CHANGE IN AAHUs DUE TO PROJECT	
A. Future With Project Open Water AAHUs =	266.44
B. Future Without Project Open Water AAHUs =	435.81
Net Change (FWP - FWOP) =	**-169.38**

TOTAL BENEFITS IN AAHUs DUE TO PROJECT	
A. Emergent Marsh Habitat Net AAHUs =	152.83
B. Open Water Habitat Net AAHUs =	-169.38
Net Benefits= (2.6xEMAAHUs+OWAAHUs)/3.6	**63.33**

Land Loss Spreadsheet

Project: CP BU 20					Loss Rate Calculation: Beginning Year	Ending Year	Beginning Year Acreage	Ending Year Acreage	Loss Rate
Total Acres		**TY0 Marsh Acres**		**TY0 Water Acres**					-0.0041
300		30		270	FWP Land Loss Reduction			0.25	

FWOP					FWP - Created Marsh			FWP - Nourished Marsh			FWP Totals				
					Created Marsh =		126	**Nourished Marsh =**		30					
TY	FWOP Loss Rate	Marsh (acres)	% Marsh (V1)	Water (acres)	FWP Loss Rate	Created Marsh Acreage	Adjusted Marsh Acreage (10% @ TY1; 30% @ TY3 and 100% @ TY5)	FWP Loss Rate	Nourished Marsh Acreage	Adjusted Marsh Acreage (50% @ TY1 and 100% @ TY3	Water (acres)	Marsh (acres)	% Marsh (V1)	Net Acres of Marsh	Total Acres Check
0		**30**	**10%**	**270**		0			0						
1	-0.0041	**30**	**10%**	**270**	-0.003075	0	**0**	-0.0041	30	**30**	270	**30**	**10%**		300
2	-0.0041	30	10%	270	-0.003075	0		-0.0041	30	30	270				300
3	-0.0041	30	10%	270	-0.003075	0	**0**	-0.0041	30	**30**	270	**30**	**10%**		300
4	-0.0041	30	10%	270	-0.003075	0		-0.0041	30	30	270				300
5	-0.0041	29	10%	271	-0.003075	126	**13**	-0.003075	29	**15**	145	**27**	**9%**	-2	300
6	-0.0041	29	10%	271	-0.003075	125	**13**	-0.003075	29	**15**	145	155	14%	125	300
7	-0.0041	29	10%	271	-0.003075	125	37	-0.003075	29	29	146	154	22%	125	300
8	-0.0041	29	10%	271	-0.003075	124	37	-0.003075	29	29	146	154	22%	125	300
9	-0.0041	29	10%	271	-0.003075	124	124	-0.003075	29	29	147	153	51%	124	300
10	-0.0041	29	10%	271	-0.003075	124	124	-0.003075	29	29	147	153	51%	124	300
11	-0.0041	29	10%	271	-0.003075	123	123	-0.003075	29	29	148	152	51%	124	300
12	-0.0041	29	10%	271	-0.003075	123	123	-0.003075	29	29	148	152	51%	123	300
13	-0.0041	28	9%	272	-0.003075	123	123	-0.003075	29	29	149	151	50%	123	300
14	-0.0041	28	9%	272	-0.003075	122	122	-0.003075	29	29	149	151	50%	122	300
15	-0.0041	28	9%	272	-0.003075	122	122	-0.003075	29	29	150	150	50%	122	300
16	-0.0041	28	9%	272	-0.003075	121	121	-0.003075	28	28	150	150	50%	122	300
17	-0.0041	28	9%	272	-0.003075	121	121	-0.003075	28	28	151	149	50%	121	300
18	-0.0041	28	9%	272	-0.003075	121	121	-0.003075	28	28	151	149	50%	121	300
19	-0.0041	28	9%	272	-0.003075	120	120	-0.003075	28	28	152	148	49%	121	300
20	-0.0041	**28**	**9%**	**272**	-0.003075	120	**120**	-0.003075	28	**28**	152	**148**	**49%**	**120**	300
21	-0.0041	28	9%	272	-0.003075	120	120	-0.003075	28	28	152	148	49%	120	300
22	-0.0041	27	9%	273	-0.003075	119	119	-0.003075	28	28	153	147	49%	120	300
23	-0.0041	27	9%	273	-0.003075	119	119	-0.003075	28	28	153	147	49%	119	300
24	-0.0041	27	9%	273	-0.003075	118	118	-0.003075	28	28	154	146	49%	119	300
25	-0.0041	27	9%	273	-0.003075	118	118	-0.003075	28	28	154	146	49%	119	300
26	-0.0041	27	9%	273	-0.003075	118	118	-0.003075	28	28	155	145	48%	118	300
27	-0.0041	27	9%	273	-0.003075	117	117	-0.003075	27	27	155	145	48%	118	300
28	-0.0041	27	9%	273	-0.003075	117	117	-0.003075	27	27	156	144	48%	118	300
29	-0.0041	27	9%	273	-0.003075	117	117	-0.003075	27	27	156	144	48%	117	300
30	-0.0041	27	9%	273	-0.003075	116	116	-0.003075	27	27	156	144	48%	117	300
31	-0.0041	26	9%	274	-0.003075	116	116	-0.003075	27	27	157	143	48%	117	300
32	-0.0041	26	9%	274	-0.003075	116	116	-0.003075	27	27	157	143	48%	116	300
33	-0.0041	26	9%	274	-0.003075	115	115	-0.003075	27	27	158	142	47%	116	300
34	-0.0041	26	9%	274	-0.003075	115	115	-0.003075	27	27	158	142	47%	116	300
35	-0.0041	26	9%	274	-0.003075	115	115	-0.003075	27	27	159	141	47%	115	300
36	-0.0041	26	9%	274	-0.003075	114	114	-0.003075	27	27	159	141	47%	115	300
37	-0.0041	26	9%	274	-0.003075	114	114	-0.003075	27	27	160	140	47%	115	300
38	-0.0041	26	9%	274	-0.003075	113	113	-0.003075	27	27	160	140	47%	114	300
39	-0.0041	26	9%	274	-0.003075	113	113	-0.003075	26	26	160	140	47%	114	300
40	-0.0041	25	8%	275	-0.003075	113	113	-0.003075	26	26	161	139	46%	114	300
41	-0.0041	25	8%	275	-0.003075	112	112	-0.003075	26	26	161	139	46%	113	300
42	-0.0041	25	8%	275	-0.003075	112	112	-0.003075	26	26	162	138	46%	113	300
43	-0.0041	25	8%	275	-0.003075	112	112	-0.003075	26	26	162	138	46%	113	300
44	-0.0041	25	8%	275	-0.003075	111	111	-0.003075	26	26	163	137	46%	112	300
45	-0.0041	25	8%	275	-0.003075	111	111	-0.003075	26	26	163	137	46%	112	300
46	-0.0041	25	8%	275	-0.003075	111	111	-0.003075	26	26	163	137	46%	112	300
47	-0.0041	25	8%	275	-0.003075	110	110	-0.003075	26	26	164	136	45%	111	300
48	-0.0041	25	8%	275	-0.003075	110	110	-0.003075	26	26	164	136	45%	111	300
49	-0.0041	25	8%	275	-0.003075	110	110	-0.003075	26	26	165	135	45%	111	300
50	-0.0041	24	8%	276	-0.003075	109	109	-0.003075	26	26	165	135	45%	111	300

Beneficial Use Site 24

Beneficial Use (BU) Site 24 (Black Lake)

I. Project Location/Area: BU site 24 (Figure 1) is a 2327-acre area located west of the Calcasieu River and Pass and south of the Gulf Intracoastal Waterway (GIWW).

II. Goals: The project goal is to create approximately 490 acres of brackish marsh habitat in this 2327-acre area. Approximately 4.35 million cubic yards of material would be dredged from the Calcasieu Ship Channel (between miles 16 and 21) in two pumping cycles to create approximately 490 acres of intertidal, brackish marsh habitat in BU site 24. The marsh and estuarine habitat created would achieve a ratio of 85% marsh to 15% shallow open water.

III. Project Features

For the two pumping cycles, a total of 4,356,000 cyds of material will be pumped, with 2,178,000 cyds in both cycles. Two 245-acre cells would be created to accommodate the two pumping cycles. To assess habitat benefits, a WVA was prepared for both pumping cycles.

IV. WVA Variables and Assumptions

The following is a description of assumptions created for the two dredging cycles (cells). The same assumptions apply to both cycles, but target years (i.e., years that dikes would be constructed and dredged material pumped) would differ.

Cycle 1

Variable 1: Emergent Marsh

FWOP: There is 0% emergent marsh in the open water areas where the cells would be constructed.

FWP: A total of 2,178,000 cyds of dredged material will be pumped into this 245-acre cell.

To determine the potential amount of marsh acres that could be created with the dredged material, depth data collected by GBA, Inc. in 2007 was used. It was found that the open water area of this BU site is, on average, approximately 3-feet deep. Assuming that the cells would be filled initially to 2.5 feet above the water surface, 8,873 cyds would be required to create one acre of marsh. These numbers are estimates. Actual target elevations of placed and consolidated fill at the site would be determined through coordination with resource agencies and the development of geotechnical analyses during the preparation of plans and specifications for the project.

- → 3 + 2.5 = 5.5 ft. * 43,560 sq. ft = 239,580,260 cubic feet / 27 = 8,873 cyds per acre
- → 2,178,000 cyds / 8,873 cyds per acre = 245 acres

Based on USACE knowledge and experience of dredging operations, a maximum of 85% of this material will form into vegetated marsh, and the remaining 15% of the area would be shallow open water (also called mudflats). It would take several years for the dredged material to vegetate into marsh. Vegetation would not be planted, but would be allowed to form naturally. The following assumptions are used for marsh creation with natural recruitment:

Target Year (TY) 0: 0 acres of existing marsh
TY 12: 0 acres of marsh
TY 13: (dike and pump) –10% of the dredged material would be marsh (.10*245ac=25ac of marsh)
TY 15: (2 years after pumping) – 30% marsh (.3 * 245ac = 74ac of marsh)
TY 17: (4 years after pumping) – 85% marsh (.85 * 245ac = 208ac. of marsh)

Marsh loss data was obtained from the Louisiana Coastal Area project report *Coast 2050: Toward a Sustainable Coastal Louisiana* (1998), Appendix F. The loss rate of -0.0029 is used for future-without-project (FWOP). Without the project, there would be no marsh restoration in this project area, so the loss rate would not apply. However, for the future-with-project (FWP) scenario, loss rates would apply after the material is pumped and the dike degraded. Marsh created in a confined area would likely differ in some aspects from naturally occurring marsh: it would be slightly higher in elevation than natural marsh, and its density would differ from natural marsh due to consolidation and type of material. Therefore, the loss rate that would be applied would differ as well; it would be reduced by 50% to account for these attributes. Therefore, for FWP, a loss rate of -0.0015 was applied starting the year that the dike would be degraded (TY 16). Please see the attached land loss spreadsheet to see how acreage lost after dike degradation was determined.

TY 16 (3 years after pumping): dike degraded and land loss begins
TY 20: 85% marsh (208 acres of marsh)
TY 50: 81% (198 acres of marsh)

<u>Variable 2 – Submerged Aquatic Vegetation (SAV)</u>

Water control structures were implemented in 1985 as part of the Black Lake Marsh Management Area, at that time classified as an intermediate marsh. Management strategies were requested in 2001 (installation of 3 replacement structures, two of the 60-inch flapgated culverts were after-the-fact (0.2 structure rating)). The area was classified as shallow open water with extensive beds of widgeongrass and other SAVs. FWS recommended that two additional 60-inch variable crest weirs (0.25 Structure rating) be installed to properly manage water levels and salinity (5 ppt being the threshold).

FWOP
TY 0: 60 %
TY 1: 60 %
TY 20: 60 %
TY 50: 60 %

The area supports SAV in the FWOP scenario. Once marsh habitat is created, open water area SAV should increase.

FWP:
TY 0: 60%
TY 12: 60%
TY 13 (dike and pump): 20%
TY 15: 60%
TY 16: 80%
TY 17: 80%
TY 20: 80%
TY 50: 80%

<u>Variable 3 – Interspersion</u>

FWOP: The lowest expression of interspersion, Class 5, is characterized by open water and less than 5% of emergent marsh. Without marsh restoration efforts, 100% of the 245-acre project area in this cycle would fall into Class 5. Interspersion classifications are not expected to change within the 50-year assessment period for FWOP (i.e., marsh will not occur naturally).

FWP: Areas exhibiting a high degree of marsh cover are ranked as having a high degree of dispersion (Class 1 or Class 2). It is assumed that the confined area would achieve a Class 1 once the dredged material is pumped for this cycle because of the ratio of marsh to open water (85% marsh/15% open water). 100% of the project area would fall into Class 1 starting the first year it is pumped (TY 1) and throughout the remainder of the 20-year DMMP project life. By TY 50, the area falls to 80% marsh because of landloss rates. Therefore, in TY 50, the interspersion falls to a Class 2.

Table 1: FWP Interspersion Classification

Target Year	Class 1	%	Class 2	%	Class 5 (open water)	%
12					245 ac	100
13 (dike/pump)	245 ac	100				
15	245 ac	100				
16 (dike degraded)	245 ac	100				
17	245 ac	100				
20	245 ac	100				
50			245 ac	100		

<u>Variable 4 – Shallow Open Water Habitat (i.e., mudflats) (percent of open water </= 1.5 feet)</u>

Shallow water areas are assumed to be more biologically productive than deeper water due to a general reduction in sunlight, oxygen, and temperature as water depth increases. Optimal conditions are expected to occur when 80 to 90 percent of the open water area is less than or equal to l.5 feet deep. Based on limited water depth data of the area, water depth is expected to be greater than 2’ throughout most of the area. Therefore, it was assumed that in the FWOP scenario, only 10% of Cell 1 would be classified as </= 1.5’. Once the marsh is pumped, 100% of the water in Cell 1 would be shallow.

FWOP:
(TY 0): 80% * 160ac of open water </= 1.5 ft

FWP:
TY 0 – shallow open water = 80% or same as FWOP
TY 12 – Dike built. Shallow open water = 80%
TY 13 – Pump year. 85% of the 160-acres of material is expected to achieve marsh height. Any open water (15% of the area) would be shallow open water = 100%.
TY 15 – Two years after pumping. Shallow open water = 100%.
TY 16 – Dike degraded. Shallow open water = 100%
TY 17 – Four years after pumping. Marsh is fully vegetated. Shallow open water = 100% 90% as trenasses are formed, mechanically or naturally
TY 20 – Shallow open water = 80% As marsh is lost areas become shallow open water and water depths may gradually become deeper.
TY 50 – Shallow open water = 60%

<u>Variable 5 – Salinity</u>

Hourly water salinity records collected during 2007 show that average annual salinity for the CRMS station located in the project area is 8.1 parts per thousand (ppt). 2006 was considered an anomalous year, with average salinities of 13.1. For that reason, only 2007 data was used.

The salinity is expected to remain constant throughout the life of this project.

<u>Variable 6 – Fish Access</u>

Access by aquatic organisms is considered to be a critical component in assessing the quality of a given marsh system. The suitability index (SI) for this variable is determined by calculating an “access value” based on the percentage of the project area wetlands considered accessible by aquatic organisms during normal tidal fluctuations, and the type of man-made structures (if any) across identified points of ingress/egress (e.g., bayous, canals, etc.). A solid plug is assigned an SI of .0001. A completely open system is assigned an SI of 1.0.

Five water control structures were installed for the Black Lake Marsh Management Area, bringing the access value from 1.0 (an open system) to .22.

FWOP:

TY 0: .22
TY 1: .22
TY 20: .22
TY 50: .22

FWP: The current access value, as noted previously, is .22. During TY 13, the dike would be constructed, resulting in an access value of 0.0001. The access value is expected to remain at 0.0001 until the dike degrades in TY 16. The degree of access would then return to the original value of .22 and remain there throughout the 50 year assessment period.

TY 12 .22
TY 13 0.0001 (dike construction and pumping year)
TY 16 .22 (dike degradation)
TY 20 .22 (end of project)
TY 50 .22

Cycle 2

The above assumptions were applied to Cycle 2 target years, which include the following:

FWOP:

TY 0, TY 1, TY 20, TY 50

FWP:

TY 0: same as FWOP
TY 15 – same as FWOP
TY 16 – Dike and pump year. 10% credit given to marsh creation.
TY 18 – Two years after pumping. 30% credit given to marsh creation.
TY 19 – Three years after pumping. Dike degraded. Landloss begins.
TY 20 – Four years after pumping. Marsh is fully vegetated (85% credit)
TY 50 -- Landloss rates have reduced the amount of marsh from 85% of project area to 81%

Beneficial Use Sites 24 and 50

Calcasieu River and Pass, Louisiana
Dredged Material Management Plan

USGS DOQQ 2005 WESTLAKE SW 3009354

Figure: 1
Date: August 2007
Scale:1:31,273
Source: USGS/GEC/USACE
Map Author: Moore 27585101-765

WETLAND VALUE ASSESSMENT COMMUNITY MODEL
Brackish Marsh

Project: Cycle 1, BU Site 24, Calcasieu DMMP   Project Area: 245

Condition: Future Without Project

Variable		TY 0		TY 1		TY 20	
		Value	SI	Value	SI	Value	SI
V1	% Emergent	0	0.10	0	0.10	0	0.10
V2	% Aquatic	60	0.64	60	0.64	60	0.64
V3	Interspersion	%		%		%	
	Class 1		0.10		0.10		0.10
	Class 2						
	Class 3						
	Class 4						
	Class 5	100		100		100	
V4	%OW <= 1.5ft	10	0.23	10	0.23	10	0.23
V5	Salinity (ppt)	8.1	1.00	8.1	1.00	8.1	1.00
V6	Access Value	0.22	0.30	0.22	0.30	0.22	0.30
	Emergent Marsh HSI	**=**	**0.22**	**EM HSI =**	**0.22**	**EM HSI =**	**0.22**
	Open Water HSI	**=**	**0.47**	**OW HSI =**	**0.47**	**OW HSI =**	**0.47**

Project: Cycle 1, BU Site 24, Calcasieu DMMP

FWOP

Variable		TY 50					
		Value	SI	Value	SI	Value	SI
V1	% Emergent	0	0.10				
V2	% Aquatic	60	0.64				
V3	Interspersion	%		%		%	
	Class 1		0.10				
	Class 2						
	Class 3						
	Class 4						
	Class 5	100					
V4	%OW <= 1.5ft	10	0.23				
V5	Salinity (ppt)	8.1	1.00				
V6	Access Value	0.22	0.30				
		EM HSI =	0.22	EM HSI =		EM HSI =	
		OW HSI =	0.47	OW HSI =		OW HSI =	

1/12/2009

Project: Cycle 1, BU Site 24, Calcasieu DMMP　　Project Area: 245

Condition: Future With Project

Variable		TY 0		TY 12		TY 13 Dike & Pump	
		Value	SI	Value	SI	Value	SI
V1	% Emergent	0	0.10	0	0.10	10	0.19
V2	% Aquatic	60	0.64	60	0.64	20	0.28
V3	Interspersion	%		%		%	
	Class 1		0.10		0.10	100	1.00
	Class 2						
	Class 3						
	Class 4						
	Class 5	100		100			
V4	%OW <= 1.5ft	10	0.23	10	0.23	100	0.60
V5	Salinity (ppt)	8.1	1.00	8.1	1.00	8.1	1.00
V6	Access Value	0.22	0.30	0.22	0.30	0.00	0.10
	Emergent Marsh HSI	**=**	**0.22**	**EM HSI =**	**0.22**	**EM HSI =**	**0.35**
	Open Water HSI	**=**	**0.47**	**OW HSI =**	**0.47**	**OW HSI =**	**0.34**

Project: Cycle 1, BU Site 24, Calcasieu DMMP
FWP

Variable		TY 15		TY 16 Dike degraded		TY 17	
		Value	SI	Value	SI	Value	SI
V1	% Emergent	30	0.37	30	0.37	85	0.87
V2	% Aquatic	60	0.64	80	0.82	80	0.82
V3	Interspersion	%		%		%	
	Class 1	100	1.00	100	1.00	100	0.60
	Class 2						
	Class 3						
	Class 4						
	Class 5						
V4	%OW <= 1.5ft	100	0.60	100	0.60	100	0.60
V5	Salinity (ppt)	8.1	1.00	8.1	1.00	8.1	1.00
V6	Access Value	0.00	0.10	0.22	0.30	0.22	0.30
		EM HSI =	**0.44**	**EM HSI =**	**0.50**	**EM HSI =**	**0.70**
		OW HSI =	**0.43**	**OW HSI =**	**0.62**	**OW HSI =**	**0.59**

Project: Cycle 1, BU Site 24, Calcasieu DMMP

FWP

Variable		TY 20		TY 50			
		Value	SI	Value	SI	Value	SI
V1	% Emergent	85	0.87	81	0.83		
V2	% Aquatic	80	0.82	80	0.82		
V3	Interspersion	%		%		%	
	Class 1	100	1.00		0.00		
	Class 2			100			
	Class 3						
	Class 4						
	Class 5						
V4	%OW <= 1.5ft	80	1.00	60	0.87		
V5	Salinity (ppt)	8.1	1.00	8.1	1.00		
V6	Access Value	0.22	0.30	0.22	0.30		
		EM HSI =	0.75	EM HSI =	0.62	EM HSI =	
		OW HSI =	0.65	OW HSI =	0.56	OW HSI =	

AAHU CALCULATION - MARSH

Future Without Project			Total	Cummulative
TY	Marsh Acres	x HSI	HUs	HUs
0	0	0.22	0.00	
1	0	0.22	0.00	0.00
20	0	0.22	0.00	0.00
50	0	0.22	0.00	0.00
			AAHUs =	0.00

Future With Project			Total	Cummulative
TY	Marsh Acres	x HSI	HUs	HUs
0	0	0.22	0.00	
12	0	0.22	0.00	0.00
13	25	0.35	8.74	3.84
15	74	0.44	32.19	39.54
16	74	0.50	36.70	34.45
17	208	0.70	146.41	86.91
20	208	0.75	155.65	362.17
50	198	0.62	122.82	4437.61
			AAHUs	99.29

NET CHANGE IN AAHUs DUE TO PROJECT	
A. Future With Project Emergent Marsh AAHUs =	99.29
B. Future Without Project Emergent Marsh AAHUs =	0.00
Net Change (FWP - FWOP) =	**99.29**

1/12/2009

AAHU CALCULATION - OPEN WATER

Project: Cycle 1, BU Site 24, Calcasieu DMMP

Future Without Project			Total	Cummulative
TY	Water Acres	x HSI	HUs	HUs
0	245	0.47	113.94	
1	245	0.47	113.94	113.94
20	245	0.47	113.94	2164.87
50	245	0.47	113.94	3418.22
			AAHUs =	**113.94**

Future With Project			Total	Cummulative
TY	Water Acres	x HSI	HUs	HUs
0	245	0.47	113.94	
12	245	0.47	113.94	1367.29
13	37	0.34	12.46	58.76
15	37	0.43	15.89	28.36
16	37	0.62	22.87	19.38
17	37	0.59	21.77	22.32
20	37	0.65	23.96	68.60
50	47	0.62	29.15	838.50
			AAHUs	**48.06**

NET CHANGE IN AAHUs DUE TO PROJECT	
A. Future With Project Open Water AAHUs =	48.06
B. Future Without Project Open Water AAHUs =	113.94
Net Change (FWP - FWOP) =	**-65.88**

TOTAL BENEFITS IN AAHUs DUE TO PROJECT	
A. Emergent Marsh Habitat Net AAHUs =	99.29
B. Open Water Habitat Net AAHUs =	-65.88
Net Benefits= (2.6xEMAAHUs+OWAAHUs)/3.6	**53.41**

WETLAND VALUE ASSESSMENT COMMUNITY MODEL
Brackish Marsh

Project: Cycle 2, BU Site 24, Calcasieu DMMP   Project Area: 245

Condition: Future Without Project

Variable		TY 0		TY 1		TY 20				
		Value	SI	Value	SI	Value	SI			
V1	% Emergent	0	0.10	0	0.10	0	0.10			
V2	% Aquatic	60	0.64	60	0.64	60	0.64			
V3	Interspersion	%		%		%				
	Class 1		0.10		0.10		0.10	0	0	0
	Class 2							0	0	0
	Class 3							0	0	0
	Class 4							0	0	0
	Class 5	100		100		100		0.1	0.1	0.1
V4	%OW <= 1.5ft	10	0.23	10	0.23	10	0.23			
V5	Salinity (ppt)	8.1	1.00	8.1	1.00	8.1	1.00			
V6	Access Value	0.22	0.30	0.22	0.30	0.22	0.30			
	Emergent Marsh HSI	=	0.22	EM HSI =	0.22	EM HSI =	0.22			
	Open Water HSI	=	0.47	OW HSI =	0.47	OW HSI =	0.47			

Project: Cycle 2, BU Site 24, Calcasieu DMMP

FWOP

Variable		TY 50								
		Value	SI	Value	SI	Value	SI			
V1	% Emergent	0	0.10							
V2	% Aquatic	60	0.64							
V3	Interspersion	%		%		%				
	Class 1		0.10					0	0	0
	Class 2							0	0	0
	Class 3							0	0	0
	Class 4							0	0	0
	Class 5	100						0.1	0	0
V4	%OW <= 1.5ft	10	0.23							
V5	Salinity (ppt)	8.1	1.00							
V6	Access Value	0.22	0.30							
		EM HSI =	0.22	EM HSI =		EM HSI =				
		OW HSI =	0.47	OW HSI =		OW HSI =				

Project: Cycle 2, BU Site 24, Calcasieu DMMP Project Area: 245

Condition: Future With Project

Variable		TY 0 Value	TY 0 SI	TY 15 Value	TY 15 SI	TY 16 Dike and Pump Value	TY 16 Dike and Pump SI			
V1	% Emergent	0	0.10	0	0.10	10	0.19			
V2	% Aquatic	60	0.64	60	0.64	20	0.28			
V3	Interspersion	%		%		%				
	Class 1		0.10		0.10	100	1.00	0	0	1
	Class 2							0	0	0
	Class 3							0	0	0
	Class 4							0	0	0
	Class 5	100		100				0.1	0.1	0
V4	%OW <= 1.5ft	10	0.23	10	0.23	100	0.60			
V5	Salinity (ppt)	8.1	1.00	8.1	1.00	8.1	1.00			
V6	Access Value	0.22	0.30	0.22	0.30	0.00	0.10			
	Emergent Marsh HSI	**=**	**0.22**	**EM HSI =**	**0.22**	**EM HSI =**	**0.35**			
	Open Water HSI	**=**	**0.47**	**OW HSI =**	**0.47**	**OW HSI =**	**0.34**			

Project: Cycle 2, BU Site 24, Calcasieu DMMP

FWP

Variable		TY 18		TY 19 Dike Degraded		TY 20				
		Value	SI	Value	SI	Value	SI			
V1	% Emergent	30	0.37	30	0.37	85	0.87			
V2	% Aquatic	60	0.64	80	0.82	80	0.82			
V3	Interspersion	%		%		%				
	Class 1	100	1.00	100	1.00	100	0.60	1	1	1
	Class 2							0	0	0
	Class 3							0	0	0
	Class 4							0	0	0
	Class 5							0	0	0
V4	%OW <= 1.5ft	100	0.60	100	0.60	80	1.00			
V5	Salinity (ppt)	8.1	1.00	8.1	1.00	11.8	0.73			
V6	Access Value	0.00	0.10	0.22	0.30	0.22	0.30			
		EM HSI =	**0.44**	**EM HSI =**	**0.50**	**EM HSI =**	**0.67**			
		OW HSI =	**0.43**	**OW HSI =**	**0.62**	**OW HSI =**	**0.60**			

Project: Cycle 2, BU Site 24, Calcasieu DMMP

FWP

Variable		TY 50								
		Value	SI	Value	SI	Value	SI			
V1	% Emergent	81	0.83							
V2	% Aquatic	80	0.82							
V3	Interspersion	%		%		%				
	Class 1		0.60					0	0	0
	Class 2	100						0.6	0	0
	Class 3							0	0	0
	Class 4							0	0	0
	Class 5							0	0	0
V4	%OW <= 1.5ft	60	0.87							
V5	Salinity (ppt)	11.8	0.73							
V6	Access Value	0.22	0.30							
		EM HSI =	**0.66**	**EM HSI =**		**EM HSI =**				
		OW HSI =	**0.59**	**OW HSI =**		**OW HSI =**				

AAHU CALCULATION - MARSH

Future Without Project			Total	Cummulative
TY	Marsh Acres	x HSI	HUs	HUs
0	0	0.22	0.00	
1	0	0.22	0.00	0.00
20	0	0.22	0.00	0.00
50	0	0.22	0.00	0.00
			AAHUs =	0.00

Future With Project			Total	Cummulative
TY	Marsh Acres	x HSI	HUs	HUs
0	0	0.22	0.00	
15	0	0.22	0.00	0.00
16	25	0.35	8.74	3.84
18	74	0.44	32.19	39.54
19	74	0.50	36.70	34.45
20	208	0.67	140.17	84.46
50	198	0.66	130.08	4052.83
			AAHUs	84.30

NET CHANGE IN AAHUs DUE TO PROJECT	
A. Future With Project Emergent Marsh AAHUs =	84.30
B. Future Without Project Emergent Marsh AAHUs =	0.00
Net Change (FWP - FWOP) =	**84.30**

AAHU CALCULATION - OPEN WATEF

Project: Cycle 2, BU Site 24, Calcasieu DMMP

Future Without Project			Total	Cummulative
TY	Water Acres	x HSI	HUs	HUs
0	245	0.47	113.94	
1	245	0.47	113.94	113.94
20	245	0.47	113.94	2164.87
50	245	0.47	113.94	3418.22
			AAHUs =	113.94

Future With Project			Total	Cummulative
TY	Water Acres	x HSI	HUs	HUs
0	245	0.47	113.94	
15	245	0.47	113.94	1709.11
16	37	0.34	12.46	58.76
18	37	0.43	15.89	28.36
19	37	0.62	22.87	19.38
20	37	0.60	22.13	22.50
50	47	0.59	27.66	747.28
			AAHUs	51.71

NET CHANGE IN AAHUs DUE TO PROJECT	
A. Future With Project Open Water AAHUs =	51.71
B. Future Without Project Open Water AAHUs =	113.94
Net Change (FWP - FWOP) =	**-62.23**

TOTAL BENEFITS IN AAHUs DUE TO PROJECT	
A. Emergent Marsh Habitat Net AAHUs =	84.30
B. Open Water Habitat Net AAHUs =	-62.23
Net Benefits= (2.6xEMAAHUs+OWAAHUs)/3.6	**43.60**

Land Loss Spreadsheet

Project:					Beginning Year	Ending Year	Beginning Year Acreage	Ending Year Acreage	Loss Rate
					Loss Rate Calculation				
Total Acres		**TY0 Marsh Acres**		**TY0 Water Acres**	1974	1990	3,740	3,570	-0.002903
245		0		245	FWP Land Loss Reduction			0.50	

FWOP					FWP					
TY	Loss Rate	Marsh (acres)	% Marsh (V1)	Water (acres)	TY	Loss Rate	Marsh (acres)	% Marsh (V1)	Water (acres)	Net Acres of Marsh
0		0	0%	245	0		0	0%	245	0
1	-0.002903	**0**	**0%**	245	**1**	-0.001452	**0**	**0%**	245	0
2	-0.002903	0	0%	245	2	-0.001452	0	0%	245	0
3	-0.002903	0	0%	245	3	-0.001452	0	0%	245	0
4	-0.002903	0	0%	245	4	-0.001452	0	0%	245	0
5	-0.002903	0	0%	245	5	-0.001452	0	0%	245	0
6	-0.002903	0	0%	245	6	-0.001452	0	0%	245	0
7	-0.002903	0	0%	245	7	-0.001452	0	0%	245	0
8	-0.002903	0	0%	245	8	-0.001452	0	0%	245	0
9	-0.002903	0	0%	245	9	-0.001452	0	0%	245	0
10	-0.002903	0	0%	245	10	-0.001452	0	0%	245	0
11	-0.002903	0	0%	245	11	-0.001452	0	0%	245	0
12	-0.002903	0	0%	245	12	-0.001452	0	0%	245	0
13	-0.002903	0	0%	245	13	-0.001452	25	10%	221	25
14	-0.002903	0	0%	245	14	-0.001452	25	10%	220	25
15	-0.002903	0	0%	245	15	-0.001452	74	30%	172	74
16	-0.002903	0	0%	245	16	-0.001452	73	30%	172	73
17	-0.002903	0	0%	245	17	-0.001452	208	85%	37	208
18	-0.002903	0	0%	245	18	-0.001452	208	85%	37	208
19	-0.002903	0	0%	245	19	-0.001452	207	85%	38	207
20	-0.002903	**0**	**0%**	245	**20**	-0.001452	207	**85%**	38	**207**
21	-0.002903	0	0%	245	21	-0.001452	207	84%	38	207

22	-0.002903	0	0%	245	22	-0.001452	206	84%	39	206
23	-0.002903	0	0%	245	23	-0.001452	206	84%	39	206
24	-0.002903	0	0%	245	24	-0.001452	206	84%	39	206
25	-0.002903	0	0%	245	25	-0.001452	206	84%	39	206
26	-0.002903	0	0%	245	26	-0.001452	205	84%	40	205
27	-0.002903	0	0%	245	27	-0.001452	205	84%	40	205
28	-0.002903	0	0%	245	28	-0.001452	205	84%	40	205
29	-0.002903	0	0%	245	29	-0.001452	204	83%	41	204
30	-0.002903	0	0%	245	30	-0.001452	204	83%	41	204
31	-0.002903	0	0%	245	31	-0.001452	204	83%	41	204
32	-0.002903	0	0%	245	32	-0.001452	204	83%	41	204
33	-0.002903	0	0%	245	33	-0.001452	203	83%	42	203
34	-0.002903	0	0%	245	34	-0.001452	203	83%	42	203
35	-0.002903	0	0%	245	35	-0.001452	203	83%	42	203
36	-0.002903	0	0%	245	36	-0.001452	202	83%	43	202
37	-0.002903	0	0%	245	37	-0.001452	202	82%	43	202
38	-0.002903	0	0%	245	38	-0.001452	202	82%	43	202
39	-0.002903	0	0%	245	39	-0.001452	201	82%	44	201
40	-0.002903	0	0%	245	40	-0.001452	201	82%	44	201
41	-0.002903	0	0%	245	41	-0.001452	201	82%	44	201
42	-0.002903	0	0%	245	42	-0.001452	201	82%	44	201
43	-0.002903	0	0%	245	43	-0.001452	200	82%	45	200
44	-0.002903	0	0%	245	44	-0.001452	200	82%	45	200
45	-0.002903	0	0%	245	45	-0.001452	200	82%	45	200
46	-0.002903	0	0%	245	46	-0.001452	199	81%	46	199
47	-0.002903	0	0%	245	47	-0.001452	199	81%	46	199
48	-0.002903	0	0%	245	48	-0.001452	199	81%	46	199
49	-0.002903	0	0%	245	49	-0.001452	199	81%	46	199
50	-0.002903	0	0%	245	50	-0.001452	198	81%	47	198

Beneficial Use Site 48

Beneficial Use (BU) Site 48 (West Palermo Property)

I. Project Location/Area

This wetland value assessment (WVA) focuses on BU site 48 (Figure 1), also known as the West Palermo property. This 1475-acre area is located near Brown Lake, approximately one mile south of the GIWW and bordered by Highway 27 on the east.

II. Goals

The project goal is to create fish and wildlife habitat, including intertidal marsh and shallow open water habitat within the 1318-acre open water area of the BU site. Approximately 6.3 million cubic yards of material would be dredged from the Calcasieu Ship Channel (between miles 16 and 21) and placed in the area through three pumping cycles.

III. Project Features

For the three pumping cycles, a total of 6,292,000 cyds of material will be pumped, with 2,097,333 cyds in each cycle. Three 236-acre cells would be created to accommodate the three pumping cycles (6,292,000 cyds/3 = 2,097,333cyds/8873 cyds per acre = 236-acre cells created in each pumping cycle). To assess habitat benefits, a WVA was prepared for each of the three pumping cycles.

IV. WVA Variables and Assumptions

The following is a description of assumptions for the three dredging cycles (cells). The same assumptions apply to all cycles, but target years (i.e., years that dikes would be constructed and dredged material pumped) would differ between the three.

Cycle 1

Variable 1 – Emergent Vegetation

FWOP: There is 0% emergent marsh in the open water areas where the cells would be constructed.

FWP: A total of 2,097,333 cyds of dredged material will be pumped into this 236-acre cell. To determine the potential amount of marsh acres that could be created with the dredged material, depth data collected by GBA, Inc. in 2007 was used. It was found that the open water area of this BU site is, on average, approximately 3-feet deep. Assuming that the cells would be filled initially to 2.5 feet above the water surface, 8,873 cyds would be required to create one acre of marsh. These numbers are estimates. Actual target elevations of placed and consolidated fill at the site would be determined through coordination with resource agencies and the development of geotechnical analyses during the preparation of plans and specifications for the project. The analyses would consider long-term settlement of the dredged materials and placement area foundations, as well as elevation surveys of the nearby planned wetland habitat to determine the appropriate target range.

- → 3 + 2.5 = 5.5 ft. * 43,560 sq. ft = 239,580,260 cubic feet / 27 = 8,873 cyds per acre

- → 2,097,333cyds / 8,873 cyds per acre = 236 acres

Based on USACE knowledge and experience of dredging operations, a maximum of 85% of this material will form into vegetated marsh, and the remaining 15% of the area would be shallow open water (also called mudflats). It would take several years for the dredged material to vegetate into marsh. Vegetation would not be planted, but would be allowed to form naturally. The following assumptions are used for marsh creation with natural recruitment:

Target Year (TY) 0 – 0% emergent marsh
TY 1 – 0%
TY 2 (dike construction & pump year) – 10% of the dredged material would be marsh (.10 * 236 ac = 23.6 ac of marsh)
TY 4 (2 years after pumping) – 30% marsh (.3 * 236 ac = 70.8 ac of marsh)
TY 6 (4 years after pumping) – 85% marsh (.85 * 236 ac = 200.6 ac of marsh)

Marsh loss data was obtained from the Louisiana Coastal Area project report *Coast 2050: Toward a Sustainable Coastal Louisiana* (1998), Appendix F. The loss rate of -0.0045 is used for future-without-project (FWOP). Without the project, there would be no marsh restoration in this project area, so the loss rate would not apply. However, for the future-with-project (FWP) scenario, loss rates would apply after the material is pumped and the dike degraded. Marsh created in a confined area would likely differ in some aspects from naturally occurring marsh: it would be slightly higher in elevation than natural marsh, and its density would differ from natural marsh due to consolidation and type of material. Therefore, the loss rate that would be applied would differ as well; it would be reduced by 50% to account for these attributes. Therefore, for FWP, a loss rate of -0.0023 was applied starting the year that the dike would be degraded (TY 5).

TY 5 (or 3 years after pumping): dike degraded and land loss rate of -0.0023 was applied.
TY 20: 85 % marsh
TY 50: 85 % marsh

<u>Variable 2 – Submerged Aquatic Vegetation (SAV)</u>

In the past, this area has experienced higher levels of salt water intrusion causing the marsh to transition from an intermediate marsh to a more brackish marsh. Water control structures were designed and installed in the area to reduce salinity spikes in the area and help create suitable habitat for SAVs. However, these control structures are no longer operational. Without any hydrologic restoration to control salinity, the project area will continue to experience salinity spikes and is not expected to support a significant amount of SAV habitat. BU Site 48 is completely impounded and not influenced by salt water intrusion. Although there are no water structures to control water levels on the site, the area is expected to support a significant amount of SAV habitat because of the lower salinities levels.

FWOP:

TY 0: 60%
TY 5: 60%
TY 20: 60%
TY 50: 60%

FWP:

TY 1: 60%
TY 2: 0%
TY 5: 60%
TY 20: 80%
TY 50: 80%

Variable 3 – Interspersion

FWOP: The lowest expression of interspersion, Class 5, is characterized by open water and less than 5% of emergent marsh. Without marsh restoration efforts, 100% of the 236-acre cell would fall into Class 5. Interspersion classifications are not expected to change within the 50-year time period for FWOP (i.e., marsh will not occur naturally).

FWP: Areas exhibiting a high degree of marsh cover are ranked as having a high degree of dispersion (Class 1 or Class 2).   It is assumed that the confined area would achieve a Class 1 once the dredged material is pumped for this cycle because of the ratio of marsh to open water (85% marsh/15% open water).   100% of the 236-acre cell would fall into Class 1 starting the first year it is pumped (TY 1) and throughout the remainder of the 20-year DMMP project life. By TY 50, the area falls to 85% marsh because of landloss rates and interspersion falls to a Class 2.

Table 1: FWP Interspersion Classification

Target Year	Class 1	%	Class 2	%	Class 5	%
0 (FWOP)					236 ac	100
1					236 ac	100
2 (dike & pump)	236 ac	100				
5 (dike degraded)	236 ac	100				
20	236 ac	100				
50			236 ac	100		

Variable 4 – Shallow Open Water Habitat (i.e., mudflats) (percent of open water </= 1.5 feet)

Shallow water areas are assumed to be more biologically productive than deeper water due to a general reduction in sunlight, oxygen, and temperature as water depth increases. Optimal conditions are expected to occur when 80 to 90 percent of the open water area is less than or equal to l.5 feet deep. A study by La Peyre et al. (2007) was conducted within the nearby Sabine NWR which shows that a 3.28-foot (1 m) area waterward of the marsh edge has an average water depth less than 1.5 feet (NAVD 88). Subtidal, open water areas located 164.04 feet (50 m) from marsh edge have an average water depth of 1.7 feet (NAVD 88). Therefore, it was assumed that all water within 164 feet of existing emergent marsh is less than 1.5 feet deep.

FWOP:

Using ArcView, the perimeter of existing marsh was measured and multiplied by 164 feet. That value was converted into an acreage value. Based on this calculation, it was found that 28% (66 acres) of the 236 acres of open water in BU Site 48, Cell 1, would be less than or equal to 1.5 ft.

FWOP (TY 0): 28% * 236 ac of open water </= 1.5 ft

FWP:

TY 0 = 28% or same as FWOP
TY 2 (Pump year) = 100%
TY 20 = 80 %
TY 50 = 60 %

<u>Variable 5 – Salinity</u>

Hydrographic data was downloaded by station number from the Louisiana Department of Natural Resources SONRIS site (accessed July 30, GEC). All data has been corrected for biofouling, instrument drift, and/or instrument malfunction.

Hourly water salinity records collected during 2007 show that average annual salinity for the CRMS station located near the project area is 8.1 parts per thousand (ppt). The salinity is expected to remain constant throughout the life of this project.

<u>Variable 6 – Fish Access</u>

Access by aquatic organisms is considered to be a critical component in assessing the quality of a given marsh system. The access value is based on the percentage of the project area wetlands considered accessible by aquatic organisms during normal tidal fluctuations, and the type of man-made structures (if any) across identified points of ingress/egress (e.g., bayous, canals, etc.). A solid plug is assigned an SI of .0001 and a completely open system is assigned an SI of 1.0.

FWOP: This area is considered an impounded system, and is therefore assigned an access value of 0.0001.

TY 0: 0.0001
TY 1: 0.0001
TY 20: 0.0001
TY 50: 0.0001

FWP: The current access value, as noted previously, is 0.0001. During TY 2, the dike would be constructed, so the access value would remain 0.0001 throughout the 50-year assessment period.

TY 0	0.0001
TY 1	0.0001
TY 2 (dike & pump year)	0.0001
TY 5 (dike degradation)	0.0001
TY 20	0.0001
TY 50	0.0001

Cycles 2 and 3

The above assumptions were applied to Cycle 2 and 3 Target Years, which include the following:

FWOP (Cycles 2 and 3):

TY 0, TY 1, TY 20, TY 50

FWP (Cycle 2):

TY 0: Same as FWOP
TY 5: Same as TY 0
TY 6: Dike construction and pump year. 10% credit given to marsh creation.
TY 8: Two years after pumping. 30% credit given to marsh creation.
TY 9: Dike degradation (3 years after pumping)
TY 10: Four years after pumping. 85% credit given to fully vegetated marsh
TY 20: Landloss rates have reduced the amount of marsh from 85% of project area to 83%
TY 50: Landloss rates have reduced the amount of marsh from 83% of project area to 78%.

FWP (Cycle 3):

TY 0: Same as FWOP
TY 10: Same as TY 0
TY 11: Dike construction and pump year. 10% credit given to marsh creation.
TY 13: Two years after pumping. 30% credit given to marsh creation.
TY 14: Dike degradation (3 years after pumping)
TY 15: Four years after pumping. Marsh is fully vegetated (85% credit)
TY 20: Landloss rates have reduced the amount of marsh from 85% of project area to 83%.
TY 50: Landloss rates have reduced the amount of marsh from 83% of project area to 78%.

V. References

La Peyre, Megan K., Bryan Gossman, and John A. Nyman. Assessing functional equivalency of nekton habitat in enhanced habitats: Comparison of terraced and unterraced marsh ponds. *Estuaries and Coasts.* Vol. 30, No. 3, p. 526–536. June 2007.

Beneficial Use Site 48

Calcasieu River and Pass, Louisiana
Dredged Material Management Plan

USGS DOQQ 2005 WESTLAKE SW 3009354

Figure: 1
Date: January 2008
Scale:1:25,018
Source: USGS/GEC/USACE
Map Author: Laura 27585107

WETLAND VALUE ASSESSMENT COMMUNITY MODEL
Brackish Marsh

Project: Cycle 1, BU Site 48, Calcasieu DMMP　　Project Area: 236

Condition: Future Without Project

Variable		TY 0 Value	TY 0 SI	TY 1 Value	TY 1 SI	TY 20 Value	TY 20 SI			
V1	% Emergent	0	0.10	0	0.10	0	0.10			
V2	% Aquatic	60	0.64	60	0.64	60	0.64			
V3	Interspersion	%		%		%				
	Class 1		0.10		0.10		0.10	0	0	0
	Class 2							0	0	0
	Class 3							0	0	0
	Class 4							0	0	0
	Class 5	100		100		100		0.1	0.1	0.1
V4	%OW <= 1.5ft	28	0.46	28	0.46	28	0.46			
V5	Salinity (ppt)	8.1	1.00	8.1	1.00	8.1	1.00			
V6	Access Value	0.00	0.10	0.00	0.10	0.00	0.10			
	Emergent Marsh HSI	**=**	**0.20**	**EM HSI =**	**0.20**	**EM HSI =**	**0.20**			
	Open Water HSI	**=**	**0.35**	**OW HSI =**	**0.35**	**OW HSI =**	**0.35**			

Project: Cycle 1, BU Site 48, Calcasieu DMMP
FWOP

Variable		TY 50 Value	TY 50 SI	Value	SI	Value	SI			
V1	% Emergent	0	0.10							
V2	% Aquatic	60	0.64							
V3	Interspersion	%		%		%				
	Class 1		0.10					0	0	0
	Class 2							0	0	0
	Class 3							0	0	0
	Class 4							0	0	0
	Class 5	100						0.1	0	0
V4	%OW <= 1.5ft	28	0.46							
V5	Salinity (ppt)	8.1	1.00							
V6	Access Value	0.00	0.10							
		EM HSI =	**0.20**	**EM HSI =**		**EM HSI =**				
		OW HSI =	**0.35**	**OW HSI =**		**OW HSI =**				

WETLAND VALUE ASSESSMENT COMMUNITY MODEL
Brackish Marsh

Project: Cycle 1, BU Site 48, Calcasieu DMMP　　Project Area: 236

Condition: Future With Project

Variable		TY 0 Value	TY 0 SI	TY 1 Value	TY 1 SI	TY 2 (dike & pump year) Value	TY 2 SI			
V1	% Emergent	0	0.10	0	0.10	10	0.19			
V2	% Aquatic	60	0.64	60	0.64	0	0.10			
V3	Interspersion	%		%		%				
	Class 1		0.10		0.10	100	1.00	0	0	1
	Class 2							0	0	0
	Class 3							0	0	0
	Class 4							0	0	0
	Class 5	100		100				0.1	0.1	0
V4	%OW <= 1.5ft	28	0.46	28	0.46	100	0.60			
V5	Salinity (ppt)	8.1	1.00	8.1	1.00	8.1	1.00			
V6	Access Value	0.00	0.10	0.00	0.10	0.00	0.10			
	Emergent Marsh HSI =		**0.20**	**EM HSI =**	**0.20**	**EM HSI =**	**0.35**			
	Open Water HSI =		**0.35**	**OW HSI =**	**0.35**	**OW HSI =**	**0.27**			

Project: Cycle 1, BU Site 48, Calcasieu DMMP
FWP

Variable		TY 4 Value	TY 4 SI	TY 5 (dike degraded) Value	TY 5 SI	TY 6 Value	TY 6 SI			
V1	% Emergent	30	0.37	30	0.37	85	0.87			
V2	% Aquatic	20	0.28	60	0.64	60	0.64			
V3	Interspersion	%		%		%				
	Class 1	100	1.00	100	1.00	100	0.60	1	1	1
	Class 2							0	0	0
	Class 3							0	0	0
	Class 4							0	0	0
	Class 5							0	0	0
V4	%OW <= 1.5ft	100	0.60	100	0.60	100	0.60			
V5	Salinity (ppt)	8.1	1.00	8.1	1.00	8.1	1.00			
V6	Access Value	0.00	0.10	0.00	0.10	0.00	0.10			
		EM HSI =	**0.44**	**EM HSI =**	**0.44**	**EM HSI =**	**0.59**			
		OW HSI =	**0.34**	**OW HSI =**	**0.43**	**OW HSI =**	**0.40**			

Project: Cycle 1, BU Site 48, Calcasieu DMMP
FWP

Variable		TY 20 Value	TY 20 SI	TY 50 Value	TY 50 SI	Value	SI			
V1	% Emergent	85	0.87	85	0.87					
V2	% Aquatic	80	0.82	80	0.82					
V3	Interspersion	%		%		%				
	Class 1	100	1.00		0.00			1	0	0
	Class 2			100				0	0.6	0
	Class 3							0	0	0
	Class 4							0	0	0
	Class 5							0	0	0
V4	%OW <= 1.5ft	80	1.00	60	0.87					
V5	Salinity (ppt)	8.1	1.00	8.1	1.00					
V6	Access Value	0.00	0.10	0.00	0.10					
		EM HSI =	**0.63**	**EM HSI =**	**0.52**	**EM HSI =**				
		OW HSI =	**0.50**	**OW HSI =**	**0.41**	**OW HSI =**				

Future Without Project			Total	Cummulative
TY	Marsh Acres	x HSI	HUs	HUs
0	0	0.20	0.00	
1	0	0.20	0.00	0.00
20	0	0.20	0.00	0.00
50	0	0.20	0.00	0.00
			AAHUs =	0.00

Future With Project			Total	Cummulative
TY	Marsh Acres	x HSI	HUs	HUs
0	0	0.20	0.00	
1	0	0.20	0.00	0.00
2	24	0.35	8.39	3.60
4	71	0.44	30.89	37.94
5	71	0.44	30.89	30.89
6	201	0.59	117.94	71.13
20	201	0.63	126.88	1713.74
50	201	0.52	104.54	3471.29
			AAHUs	106.57

NET CHANGE IN AAHUs DUE TO PROJECT	
A. Future With Project Emergent Marsh AAHUs =	106.57
B. Future Without Project Emergent Marsh AAHUs =	0.00
Net Change (FWP - FWOP) =	106.57

AAHU CALCULATION - OPEN WATER

Project: Cycle 1, BU Site 48, Calcasieu DMMP

Future Without Project			Total	Cummulative
TY	Water Acres	x HSI	HUs	HUs
0	236	0.35	83.20	
1	236	0.35	83.20	83.20
20	236	0.35	83.20	1580.82
50	236	0.35	83.20	2496.02
			AAHUs =	83.20

Future With Project			Total	Cummulative
TY	Water Acres	x HSI	HUs	HUs
0	236	0.35	83.20	
1	236	0.35	83.20	83.20
2	212	0.27	57.32	69.93
4	165	0.34	55.58	113.94
5	165	0.43	70.88	63.23
6	35	0.40	14.00	41.80
20	35	0.50	17.40	219.80
50	35	0.41	14.48	626.44
			AAHUs	24.37

NET CHANGE IN AAHUs DUE TO PROJECT	
A. Future With Project Open Water AAHUs =	24.37
B. Future Without Project Open Water AAHUs =	83.20
Net Change (FWP - FWOP) =	-58.83

TOTAL BENEFITS IN AAHUs DUE TO PROJECT	
A. Emergent Marsh Habitat Net AAHUs =	106.57
B. Open Water Habitat Net AAHUs =	-58.83
Net Benefits= (2.6xEMAAHUs+OWAAHUs)/3.6	60.63

WETLAND VALUE ASSESSMENT COMMUNITY MODEL
Brackish Marsh

Project: Cycle 2, BU Site 48, Calcasieu DMMP   Project Area: 236

Condition: Future Without Project

Variable		TY 0 Value	TY 0 SI	TY 1 Value	TY 1 SI	TY 20 Value	TY 20 SI			
V1	% Emergent	0	0.10	0	0.10	0	0.10			
V2	% Aquatic	60	0.64	60	0.64	60	0.64			
V3	Interspersion	%		%		%				
	Class 1		0.10		0.10		0.10	0	0	0
	Class 2							0	0	0
	Class 3							0	0	0
	Class 4							0	0	0
	Class 5	100		100		100		0.1	0.1	0.1
V4	%OW <= 1.5ft	28	0.46	28	0.46	28	0.46			
V5	Salinity (ppt)	8.1	1.00	8.1	1.00	8.1	1.00			
V6	Access Value	0.00	0.10	0.00	0.10	0.00	0.10			
	Emergent Marsh HSI	**=**	**0.20**	**EM HSI =**	**0.20**	**EM HSI =**	**0.20**			
	Open Water HSI	**=**	**0.35**	**OW HSI =**	**0.35**	**OW HSI =**	**0.35**			

Project: Cycle 2, BU Site 48, Calcasieu DMMP
FWOP

Variable		TY 50 Value	TY 50 SI	Value	SI	Value	SI			
V1	% Emergent	0	0.10							
V2	% Aquatic	60	0.64							
V3	Interspersion	%		%		%				
	Class 1		0.10					0	0	0
	Class 2							0	0	0
	Class 3							0	0	0
	Class 4							0	0	0
	Class 5	100						0.1	0	0
V4	%OW <= 1.5ft	28	0.46							
V5	Salinity (ppt)	8.1	1.00							
V6	Access Value	0.00	0.10							
		EM HSI =	**0.20**	**EM HSI =**		**EM HSI =**				
		OW HSI =	**0.35**	**OW HSI =**		**OW HSI =**				

WETLAND VALUE ASSESSMENT COMMUNITY MODEL
Brackish Marsh

Project: Cycle 2, BU Site 48, Calcasieu DMMP Project Area: 236

Condition: Future With Project

Variable		TY 0 Value	TY 0 SI	TY 5 Value	TY 5 SI	TY 6 (dike & pump year) Value	TY 6 SI			
V1	% Emergent	0	0.10	0	0.10	10	0.19			
V2	% Aquatic	60	0.64	60	0.64	0	0.10			
V3	Interspersion	%		%		%				
	Class 1		0.10		0.10	100	1.00	0	0	1
	Class 2							0	0	0
	Class 3							0	0	0
	Class 4							0	0	0
	Class 5	100		100				0.1	0.1	0
V4	%OW <= 1.5ft	28	0.46	28	0.46	100	0.60			
V5	Salinity (ppt)	8.1	1.00	8.1	1.00	8.1	1.00			
V6	Access Value	0.00	0.10	0.00	0.10	0.00	0.10			
	Emergent Marsh HSI	**=**	**0.20**	**EM HSI =**	**0.20**	**EM HSI =**	**0.35**			
	Open Water HSI	**=**	**0.35**	**OW HSI =**	**0.35**	**OW HSI =**	**0.27**			

Project: Cycle 2, BU Site 48, Calcasieu DMMP
FWP

Variable		TY 8 Value	TY 8 SI	TY 9 (dike degraded) Value	TY 9 SI	TY 10 Value	TY 10 SI			
V1	% Emergent	30	0.37	30	0.37	85	0.87			
V2	% Aquatic	20	0.28	60	0.64	60	0.64			
V3	Interspersion	%		%		%				
	Class 1	100	1.00	100	1.00	100	0.60	1	1	1
	Class 2							0	0	0
	Class 3							0	0	0
	Class 4							0	0	0
	Class 5							0	0	0
V4	%OW <= 1.5ft	100	0.60	100	0.60	100	0.60			
V5	Salinity (ppt)	8.1	1.00	8.1	1.00	8.1	1.00			
V6	Access Value	0.00	0.10	0.00	0.10	0.00	0.10			
		EM HSI =	**0.44**	**EM HSI =**	**0.44**	**EM HSI =**	**0.59**			
		OW HSI =	**0.34**	**OW HSI =**	**0.43**	**OW HSI =**	**0.40**			

Project: Cycle 2, BU Site 48, Calcasieu DMMP
FWP

Variable		TY 20 Value	TY 20 SI	TY 50 Value	TY 50 SI	Value	SI			
V1	% Emergent	85	0.87	85	0.87					
V2	% Aquatic	80	0.82	80	0.82					
V3	Interspersion	%		%		%				
	Class 1	100	1.00		0.00			1	0	0
	Class 2			100				0	0.6	0
	Class 3							0	0	0
	Class 4							0	0	0
	Class 5							0	0	0
V4	%OW <= 1.5ft	80	1.00	60	0.87					
V5	Salinity (ppt)	8.1	1.00	8.1	1.00					
V6	Access Value	0.00	0.10	0.00	0.10					
		EM HSI =	**0.63**	**EM HSI =**	**0.52**	**EM HSI =**				
		OW HSI =	**0.50**	**OW HSI =**	**0.41**	**OW HSI =**				

Future Without Project			Total	Cummulative
TY	Marsh Acres	x HSI	HUs	HUs
0	0	0.20	0.00	
1	0	0.20	0.00	0.00
20	0	0.20	0.00	0.00
50	0	0.20	0.00	0.00
			AAHUs =	0.00

Future With Project			Total	Cummulative
TY	Marsh Acres	x HSI	HUs	HUs
0	0	0.20	0.00	
5	0	0.20	0.00	0.00
6	24	0.35	8.39	3.60
8	71	0.44	30.89	37.94
9	71	0.44	30.89	30.89
10	201	0.59	117.94	71.13
20	201	0.63	126.88	1224.10
50	201	0.52	104.54	3471.29
			AAHUs	96.78

NET CHANGE IN AAHUs DUE TO PROJECT	
A. Future With Project Emergent Marsh AAHUs =	96.78
B. Future Without Project Emergent Marsh AAHUs =	0.00
Net Change (FWP - FWOP) =	96.78

AAHU CALCULATION - OPEN WATER

Project: Cycle 2, BU Site 48, Calcasieu DMMP

Future Without Project			Total	Cummulative
TY	Water Acres	x HSI	HUs	HUs
0	236	0.35	83.20	
1	236	0.35	83.20	83.20
20	236	0.35	83.20	1580.82
50	236	0.35	83.20	2496.02
			AAHUs =	83.20

Future With Project			Total	Cummulative
TY	Water Acres	x HSI	HUs	HUs
0	236	0.35	83.20	
5	236	0.35	83.20	416.00
6	212	0.27	57.32	69.93
8	165	0.34	55.58	113.94
9	165	0.43	70.88	63.23
10	35	0.40	14.00	41.80
20	35	0.50	17.40	157.00
50	35	0.41	14.48	569.49
			AAHUs	28.63

NET CHANGE IN AAHUs DUE TO PROJECT	
A. Future With Project Open Water AAHUs =	28.63
B. Future Without Project Open Water AAHUs =	83.20
Net Change (FWP - FWOP) =	-54.57

TOTAL BENEFITS IN AAHUs DUE TO PROJECT	
A. Emergent Marsh Habitat Net AAHUs =	96.78
B. Open Water Habitat Net AAHUs =	-54.57
Net Benefits= (2.6xEMAAHUs+OWAAHUs)/3.6	54.74

WETLAND VALUE ASSESSMENT COMMUNITY MODEL
Brackish Marsh

Project: Cycle 3, BU Site 48, Calcasieu DMMP — Project Area: 236

Condition: Future Without Project

Variable		TY 0 Value	TY 0 SI	TY 1 Value	TY 1 SI	TY 20 Value	TY 20 SI			
V1	% Emergent	0	0.10	0	0.10	0	0.10			
V2	% Aquatic	60	0.64	60	0.64	60	0.64			
V3	Interspersion	%		%		%				
	Class 1		0.10		0.10		0.10	0	0	0
	Class 2							0	0	0
	Class 3							0	0	0
	Class 4							0	0	0
	Class 5	100		100		100		0.1	0.1	0.1
V4	%OW <= 1.5ft	28	0.46	28	0.46	28	0.46			
V5	Salinity (ppt)	8.1	1.00	8.1	1.00	8.1	1.00			
V6	Access Value	0.00	0.10	0.00	0.10	0.00	0.10			
	Emergent Marsh HSI	**=**	**0.20**	**EM HSI =**	**0.20**	**EM HSI =**	**0.20**			
	Open Water HSI	**=**	**0.35**	**OW HSI =**	**0.35**	**OW HSI =**	**0.35**			

Project: Cycle 3, BU Site 48, Calcasieu DMMP

FWOP

Variable		TY 50 Value	TY 50 SI	Value	SI	Value	SI			
V1	% Emergent	0	0.10							
V2	% Aquatic	60	0.64							
V3	Interspersion	%		%		%				
	Class 1		0.10					0	0	0
	Class 2							0	0	0
	Class 3							0	0	0
	Class 4							0	0	0
	Class 5	100						0.1	0	0
V4	%OW <= 1.5ft	28	0.46							
V5	Salinity (ppt)	8.1	1.00							
V6	Access Value	0.00	0.10							
		EM HSI =	**0.20**	**EM HSI =**		**EM HSI =**				
		OW HSI =	**0.35**	**OW HSI =**		**OW HSI =**				

WETLAND VALUE ASSESSMENT COMMUNITY MODEL
Brackish Marsh

Project: Cycle 3, BU Site 48, Calcasieu DMMP   Project Area: 236

Condition: Future With Project

Variable		TY 0		TY 10		TY 11 (dike & pump year)				
		Value	SI	Value	SI	Value	SI			
V1	% Emergent	0	0.10	0	0.10	10	0.19			
V2	% Aquatic	60	0.64	60	0.64	0	0.10			
V3	Interspersion	%		%		%				
	Class 1		0.10		0.10	100	1.00	0	0	1
	Class 2							0	0	0
	Class 3							0	0	0
	Class 4							0	0	0
	Class 5	100		100				0.1	0.1	0
V4	%OW <= 1.5ft	28	0.46	28	0.46	100	0.60			
V5	Salinity (ppt)	8.1	1.00	8.1	1.00	8.1	1.00			
V6	Access Value	0.00	0.10	0.00	0.10	0.00	0.10			
	Emergent Marsh HSI	=	0.20	EM HSI =	0.20	EM HSI =	0.35			
	Open Water HSI	=	0.35	OW HSI =	0.35	OW HSI =	0.27			

Project: Cycle 3, BU Site 48, Calcasieu DMMP
FWP

Variable		TY 13		TY 14 (dike degraded)		TY 15				
		Value	SI	Value	SI	Value	SI			
V1	% Emergent	30	0.37	30	0.37	85	0.87			
V2	% Aquatic	20	0.28	60	0.64	60	0.64			
V3	Interspersion	%		%		%				
	Class 1	100	1.00	100	1.00	100	0.60	1	1	1
	Class 2							0	0	0
	Class 3							0	0	0
	Class 4							0	0	0
	Class 5							0	0	0
V4	%OW <= 1.5ft	100	0.60	100	0.60	100	0.60			
V5	Salinity (ppt)	8.1	1.00	8.1	1.00	8.1	1.00			
V6	Access Value	0.00	0.10	0.00	0.10	0.00	0.10			
		EM HSI =	0.44	EM HSI =	0.44	EM HSI =	0.59			
		OW HSI =	0.34	OW HSI =	0.43	OW HSI =	0.40			

Project: Cycle 3, BU Site 48, Calcasieu DMMP
FWP

Variable		TY 20		TY 50						
		Value	SI	Value	SI	Value	SI			
V1	% Emergent	85	0.87	85	0.87					
V2	% Aquatic	80	0.82	80	0.82					
V3	Interspersion	%		%		%				
	Class 1	100	1.00		0.00			1	0	0
	Class 2			100				0	0.6	0
	Class 3							0	0	0
	Class 4							0	0	0
	Class 5							0	0	0
V4	%OW <= 1.5ft	80	1.00	60	0.87					
V5	Salinity (ppt)	8.1	1.00	8.1	1.00					
V6	Access Value	0.00	0.10	0.00	0.10					
		EM HSI =	0.63	EM HSI =	0.52	EM HSI =				
		OW HSI =	0.50	OW HSI =	0.41	OW HSI =				

Future Without Project			Total	Cummulative
TY	Marsh Acres	x HSI	HUs	HUs
0	0	0.20	0.00	
1	0	0.20	0.00	0.00
20	0	0.20	0.00	0.00
50	0	0.20	0.00	0.00
			AAHUs =	0.00

Future With Project			Total	Cummulative
TY	Marsh Acres	x HSI	HUs	HUs
0	0	0.20	0.00	
10	0	0.20	0.00	0.00
11	24	0.35	8.39	3.60
13	71	0.44	30.89	37.94
14	71	0.44	30.89	30.89
15	201	0.59	117.94	71.13
20	201	0.63	126.88	612.05
50	201	0.52	104.54	3471.29
			AAHUs	84.54

NET CHANGE IN AAHUs DUE TO PROJECT	
A. Future With Project Emergent Marsh AAHUs =	84.54
B. Future Without Project Emergent Marsh AAHUs =	0.00
Net Change (FWP - FWOP) =	**84.54**

AAHU CALCULATION - OPEN WATER

Project: Cycle 3, BU Site 48, Calcasieu DMMP

Future Without Project			Total	Cummulative
TY	Water Acres	x HSI	HUs	HUs
0	236	0.35	83.20	
1	236	0.35	83.20	83.20
20	236	0.35	83.20	1580.82
50	236	0.35	83.20	2496.02
			AAHUs =	83.20

Future With Project			Total	Cummulative
TY	Water Acres	x HSI	HUs	HUs
0	236	0.35	83.20	
10	236	0.35	83.20	832.01
11	212	0.27	57.32	69.93
13	165	0.34	55.58	113.94
14	165	0.43	70.88	63.23
15	35	0.40	14.00	41.80
20	35	0.50	17.40	78.50
50	35	0.41	14.48	498.31
			AAHUs	33.95

NET CHANGE IN AAHUs DUE TO PROJECT	
A. Future With Project Open Water AAHUs =	33.95
B. Future Without Project Open Water AAHUs =	83.20
Net Change (FWP - FWOP) =	**-49.25**

TOTAL BENEFITS IN AAHUs DUE TO PROJECT	
A. Emergent Marsh Habitat Net AAHUs =	84.54
B. Open Water Habitat Net AAHUs =	-49.25
Net Benefits= (2.6xEMAAHUs+OWAAHUs)/3.6	**47.38**

Land Loss Spreadsheet

					Loss Rate Calculation				
Project:	Cycle, BU 48				**Beginning Year**	**Ending Year**	**Beginning Year Acreage**	**Ending Year Acreage**	**Loss Rate**
Total Acres		**TY0 Marsh Acres**		**TY0 Water Acres**	1974	1990	17,320	16,100	-0.004555
236		0		236	FWP Land Loss Reduction			0.50	

FWOP					FWP					
TY	Loss Rate	Marsh (acres)	% Marsh (V1)	Water (acres)	TY	Loss Rate	Marsh (acres)	% Marsh (V1)	Water (acres)	Net Acres of Marsh
0		0	0%	236	0		0	0%	236	0
1	-0.004555	**0**	**0%**	236	**2**	0	**24**	**10%**	212	24
2	-0.004555	0	0%	236	3	0	24	10%	212	24
3	-0.004555	**0**	**0%**	236	**4**	0	**71**	**30%**	165	71
4	-0.004555	0	0%	236	5	-0.002277	71	30%	165	71
5	-0.004555	**0**	**0%**	236	**6**	-0.002277	**201**	**85%**	35	201
6	-0.004555	0	0%	236	7	-0.002277	200	85%	36	200
7	-0.004555	0	0%	236	8	-0.002277	200	85%	36	200
8	-0.004555	0	0%	236	9	-0.002277	199	84%	37	199
9	-0.004555	0	0%	236	10	-0.002277	199	84%	37	199
10	-0.004555	0	0%	236	11	-0.002277	198	84%	38	198
11	-0.004555	0	0%	236	12	-0.002277	198	84%	38	198
12	-0.004555	0	0%	236	13	-0.002277	197	84%	39	197
13	-0.004555	0	0%	236	14	-0.002277	197	83%	39	197
14	-0.004555	0	0%	236	15	-0.002277	197	83%	39	197
15	-0.004555	0	0%	236	16	-0.002277	196	83%	40	196
16	-0.004555	0	0%	236	17	-0.002277	196	83%	40	196
17	-0.004555	0	0%	236	18	-0.002277	195	83%	41	195
18	-0.004555	0	0%	236	19	-0.002277	195	83%	41	195
19	-0.004555	**0**	**0%**	236	**20**	-0.002277	194	**82%**	42	194
20	-0.004555	0	0%	236	21	-0.002277	194	82%	42	194
21	-0.004555	0	0%	236	22	-0.002277	193	82%	43	193
22	-0.004555	0	0%	236	23	-0.002277	193	82%	43	193
23	-0.004555	0	0%	236	24	-0.002277	193	82%	43	193
24	-0.004555	0	0%	236	25	-0.002277	192	81%	44	192
25	-0.004555	0	0%	236	26	-0.002277	192	81%	44	192
26	-0.004555	0	0%	236	27	-0.002277	191	81%	45	191
27	-0.004555	0	0%	236	28	-0.002277	191	81%	45	191
28	-0.004555	0	0%	236	29	-0.002277	190	81%	46	190
29	-0.004555	0	0%	236	30	-0.002277	190	80%	46	190
30	-0.004555	0	0%	236	31	-0.002277	189	80%	47	189
31	-0.004555	0	0%	236	32	-0.002277	189	80%	47	189
32	-0.004555	0	0%	236	33	-0.002277	189	80%	47	189
33	-0.004555	0	0%	236	34	-0.002277	188	80%	48	188
34	-0.004555	0	0%	236	35	-0.002277	188	80%	48	188
35	-0.004555	0	0%	236	36	-0.002277	187	79%	49	187
36	-0.004555	0	0%	236	37	-0.002277	187	79%	49	187
37	-0.004555	0	0%	236	38	-0.002277	186	79%	50	186
38	-0.004555	0	0%	236	39	-0.002277	186	79%	50	186
39	-0.004555	0	0%	236	40	-0.002277	186	79%	50	186
40	-0.004555	0	0%	236	41	-0.002277	185	78%	51	185
41	-0.004555	0	0%	236	42	-0.002277	185	78%	51	185
42	-0.004555	0	0%	236	43	-0.002277	184	78%	52	184
43	-0.004555	0	0%	236	44	-0.002277	184	78%	52	184
44	-0.004555	0	0%	236	45	-0.002277	184	78%	52	184
45	-0.004555	0	0%	236	46	-0.002277	183	78%	53	183
46	-0.004555	0	0%	236	47	-0.002277	183	77%	53	183
47	-0.004555	0	0%	236	48	-0.002277	182	77%	54	182
48	-0.004555	0	0%	236	49	-0.002277	182	77%	54	182
49	-0.004555	**0**	**0%**	236	**50**	-0.002277	181	**77%**	55	181
50	-0.004555	0	0%	236	51	-0.002277	181	77%	55	181

Land Loss Spreadsheet

					Loss Rate Calculation				
Project:	Cycle 2, BU 48				**Beginning Year**	**Ending Year**	**Beginning Year Acreage**	**Ending Year Acreage**	**Loss Rate**
Total Acres		**TY0 Marsh Acres**		**TY0 Water Acres**	1974	1990	17,320	16,100	-0.004555
236		0		236	FWP Land Loss Reduction			0.50	

FWOP					FWP					
TY	Loss Rate	Marsh (acres)	% Marsh (V1)	Water (acres)	TY	Loss Rate	Marsh (acres)	% Marsh (V1)	Water (acres)	Net Acres of Marsh
0		0	0%	236	0		0	0%	236	0
1	-0.004555	**0**	**0%**	236	**6**	0	**24**	**10%**	212	24
2	-0.004555	0	0%	236	7	0	24	10%	212	24
3	-0.004555	**0**	**0%**	236	**8**	0	**71**	**30%**	165	71
4	-0.004555	0	0%	236	9	-0.002277	71	30%	165	71
5	-0.004555	**0**	**0%**	236	**10**	-0.002277	**201**	**85%**	35	201
6	-0.004555	0	0%	236	11	-0.002277	200	85%	36	200
7	-0.004555	0	0%	236	12	-0.002277	200	85%	36	200
8	-0.004555	0	0%	236	13	-0.002277	199	84%	37	199
9	-0.004555	0	0%	236	14	-0.002277	199	84%	37	199
10	-0.004555	0	0%	236	15	-0.002277	198	84%	38	198
11	-0.004555	0	0%	236	16	-0.002277	198	84%	38	198
12	-0.004555	0	0%	236	17	-0.002277	197	84%	39	197
13	-0.004555	0	0%	236	18	-0.002277	197	83%	39	197
14	-0.004555	0	0%	236	19	-0.002277	197	83%	39	197
15	-0.004555	**0**	**0%**	236	**20**	-0.002277	196	**83%**	40	196
16	-0.004555	0	0%	236	21	-0.002277	196	83%	40	196
17	-0.004555	0	0%	236	22	-0.002277	195	83%	41	195
18	-0.004555	0	0%	236	23	-0.002277	195	83%	41	195
19	-0.004555	0	0%	236	24	-0.002277	194	82%	42	194
20	-0.004555	0	0%	236	25	-0.002277	194	82%	42	194
21	-0.004555	0	0%	236	26	-0.002277	193	82%	43	193
22	-0.004555	0	0%	236	27	-0.002277	193	82%	43	193
23	-0.004555	0	0%	236	28	-0.002277	193	82%	43	193
24	-0.004555	0	0%	236	29	-0.002277	192	81%	44	192
25	-0.004555	0	0%	236	30	-0.002277	192	81%	44	192
26	-0.004555	0	0%	236	31	-0.002277	191	81%	45	191
27	-0.004555	0	0%	236	32	-0.002277	191	81%	45	191
28	-0.004555	0	0%	236	33	-0.002277	190	81%	46	190
29	-0.004555	0	0%	236	34	-0.002277	190	80%	46	190
30	-0.004555	0	0%	236	35	-0.002277	189	80%	47	189
31	-0.004555	0	0%	236	36	-0.002277	189	80%	47	189
32	-0.004555	0	0%	236	37	-0.002277	189	80%	47	189
33	-0.004555	0	0%	236	38	-0.002277	188	80%	48	188
34	-0.004555	0	0%	236	39	-0.002277	188	80%	48	188
35	-0.004555	0	0%	236	40	-0.002277	187	79%	49	187
36	-0.004555	0	0%	236	41	-0.002277	187	79%	49	187
37	-0.004555	0	0%	236	42	-0.002277	186	79%	50	186
38	-0.004555	0	0%	236	43	-0.002277	186	79%	50	186
39	-0.004555	0	0%	236	44	-0.002277	186	79%	50	186
40	-0.004555	0	0%	236	45	-0.002277	185	78%	51	185
41	-0.004555	0	0%	236	46	-0.002277	185	78%	51	185
42	-0.004555	0	0%	236	47	-0.002277	184	78%	52	184
43	-0.004555	0	0%	236	48	-0.002277	184	78%	52	184
44	-0.004555	0	0%	236	49	-0.002277	184	78%	52	184
45	-0.004555	**0**	**0%**	236	**50**	-0.002277	183	**78%**	53	183
46	-0.004555	0	0%	236	51	-0.002277	183	77%	53	183
47	-0.004555	0	0%	236	52	-0.002277	182	77%	54	182
48	-0.004555	0	0%	236	53	-0.002277	182	77%	54	182
49	-0.004555	0	0%	236	54	-0.002277	181	77%	55	181
50	-0.004555	0	0%	236	55	-0.002277	181	77%	55	181

Land Loss Spreadsheet

					Loss Rate Calculation				
Project:	Cycle 3, BU 48				**Beginning Year**	**Ending Year**	**Beginning Year Acreage**	**Ending Year Acreage**	**Loss Rate**
Total Acres		**TY0 Marsh Acres**		**TY0 Water Acres**	1974	1990	17,320	16,100	-0.004555
236		0		236	FWP Land Loss Reduction			0.50	

FWOP					FWP					
TY	Loss Rate	Marsh (acres)	% Marsh (V1)	Water (acres)	TY	Loss Rate	Marsh (acres)	% Marsh (V1)	Water (acres)	Net Acres of Marsh
0		0	0%	236	0		0	0%	236	0
1	-0.004555	**0**	**0%**	236	**11**	0	**24**	**10%**	212	24
2	-0.004555	0	0%	236	12	0	24	10%	212	24
3	-0.004555	**0**	**0%**	236	**13**	0	**71**	**30%**	165	71
4	-0.004555	0	0%	236	14	-0.002277	71	30%	165	71
5	-0.004555	**0**	**0%**	236	**15**	-0.002277	**201**	**85%**	35	201
6	-0.004555	0	0%	236	16	-0.002277	201	85%	35	201
7	-0.004555	0	0%	236	17	-0.002277	201	85%	35	201
8	-0.004555	0	0%	236	18	-0.002277	201	85%	35	201
9	-0.004555	0	0%	236	19	-0.002277	201	85%	35	201
10	-0.004555	**0**	**0%**	236	**20**	-0.002277	**201**	**85%**	35	201
11	-0.004555	0	0%	236	21	-0.002277	200	85%	36	200
12	-0.004555	0	0%	236	22	-0.002277	200	85%	36	200
13	-0.004555	0	0%	236	23	-0.002277	199	84%	37	199
14	-0.004555	0	0%	236	24	-0.002277	199	84%	37	199
15	-0.004555	0	0%	236	25	-0.002277	198	84%	38	198
16	-0.004555	0	0%	236	26	-0.002277	198	84%	38	198
17	-0.004555	0	0%	236	27	-0.002277	197	84%	39	197
18	-0.004555	0	0%	236	28	-0.002277	197	83%	39	197
19	-0.004555	0	0%	236	29	-0.002277	197	83%	39	197
20	-0.004555	0	0%	236	30	-0.002277	196	83%	40	196
21	-0.004555	0	0%	236	31	-0.002277	196	83%	40	196
22	-0.004555	0	0%	236	32	-0.002277	195	83%	41	195
23	-0.004555	0	0%	236	33	-0.002277	195	83%	41	195
24	-0.004555	0	0%	236	34	-0.002277	194	82%	42	194
25	-0.004555	0	0%	236	35	-0.002277	194	82%	42	194
26	-0.004555	0	0%	236	36	-0.002277	193	82%	43	193
27	-0.004555	0	0%	236	37	-0.002277	193	82%	43	193
28	-0.004555	0	0%	236	38	-0.002277	193	82%	43	193
29	-0.004555	0	0%	236	39	-0.002277	192	81%	44	192
30	-0.004555	0	0%	236	40	-0.002277	192	81%	44	192
31	-0.004555	0	0%	236	41	-0.002277	191	81%	45	191
32	-0.004555	0	0%	236	42	-0.002277	191	81%	45	191
33	-0.004555	0	0%	236	43	-0.002277	190	81%	46	190
34	-0.004555	0	0%	236	44	-0.002277	190	80%	46	190
35	-0.004555	0	0%	236	45	-0.002277	189	80%	47	189
36	-0.004555	0	0%	236	46	-0.002277	189	80%	47	189
37	-0.004555	0	0%	236	47	-0.002277	189	80%	47	189
38	-0.004555	0	0%	236	48	-0.002277	188	80%	48	188
39	-0.004555	0	0%	236	49	-0.002277	188	80%	48	188
40	-0.004555	**0**	**0%**	236	**50**	-0.002277	187	**79%**	49	187
41	-0.004555	0	0%	236	51	-0.002277	187	79%	49	187
42	-0.004555	0	0%	236	52	-0.002277	186	79%	50	186
43	-0.004555	0	0%	236	53	-0.002277	186	79%	50	186
44	-0.004555	0	0%	236	54	-0.002277	186	79%	50	186
45	-0.004555	0	0%	236	55	-0.002277	185	78%	51	185
46	-0.004555	0	0%	236	56	-0.002277	185	78%	51	185
47	-0.004555	0	0%	236	57	-0.002277	184	78%	52	184
48	-0.004555	0	0%	236	58	-0.002277	184	78%	52	184
49	-0.004555	0	0%	236	59	-0.002277	184	78%	52	184
50	-0.004555	0	0%	236	60	-0.002277	183	78%	53	183

Beneficial Use Site 49

Beneficial Use (BU) Site 49 (Cameron Parish School Board)

I. Project Location/Area

This wetland value assessment (WVA) focuses on BU site 49 (Figure 1), called the Cameron Parish School Board. This 640-acre area lies east of the Sabine NWR on Section 16 property.

II. Goals

The project goal is to create 600 acres of intertidal marsh habitat in this 640-acre area. Approximately 2.4 million cubic yards of material would be dredged from the Calcasieu Ship Channel (between miles 9.5 and 12) in three dredging cycles to create three 200-acre marsh creation cells. The marsh and estuarine habitat created would achieve a ratio of 85% marsh to 15% shallow open water.

III. Project Features

For the 3 cycles, a total of 2,420,000 cyds of material will be pumped, with 806,667 cyds in each cycle. Three 200-acre cells would be created to accommodate each of the three pumping cycles. To assess habitat benefits, a WVA was prepared for each of the three pumping cycles.

IV. WVA Variables and Assumptions

The following is a description of assumptions created for each of the three dredging cycles (cells). The same assumptions apply to all three cycles, but target years (i.e., years that dikes would be constructed and dredged material pumped) would differ among the three.

Cycle 1

A total of 806,667 cyds (200 acres) of dredged material will be pumped into this 200-acre cell. To determine the potential amount of marsh acres that could be created with the dredged material, the CWPPRA, Sabine Refuge Marsh Creation (CS-28), Cycle 1 project was used as a reference site. That project created marsh by pumping material into an area confined by earthen dikes. It was found that approximately 4,000 cyds of dredge material created 1 acre of marsh.

→ 806,667cyds / 4,000 cyds per acre = 200 acres

Based on USACE knowledge and experience of dredging operations, a maximum of 85% of this material will form into vegetated marsh, and the remaining 15% of the area would be shallow open water (also called mudflats). It would take several years for the dredged material to vegetate into marsh. Vegetation would not be planted, but would be allowed to form naturally. The following assumptions are used for marsh creation with natural recruitment:

Target Year (TY) 0: ~ 0 acres of existing marsh
TY 4: ~ 0 acres of existing marsh
TY 5 (dike and pump year): 10% of the dredged material would be marsh (.10*200ac=20ac of marsh)
TY 7 (2 years after pumping): 30% marsh (.3 * 200ac = 60ac of marsh)
TY 9 (4 years after pumping): 85% marsh (.85 * 200ac = 170ac. of marsh)

Marsh loss data was obtained from the Louisiana Coastal Area project report *Coast 2050: Toward a Sustainable Coastal Louisiana* (1998), Appendix F. The loss rate of -0.0049 is used for future-without-project (FWOP). Without the project, there would be no marsh restoration in this project area, so the loss rate would not apply. However, for the future-with-project (FWP) scenario, loss rates would apply after the material is pumped and the dike degraded. Marsh created in a confined area would likely differ in some aspects from naturally occurring marsh: it would be slightly higher in elevation than natural marsh, and its density would differ from natural marsh due to consolidation and type of material. Therefore, the loss rate that would be applied would differ as well; it would be reduced by 50% to account for these attributes. Therefore, for FWP, a loss rate of -0.0025 was applied starting the year that the dike would be degraded (TY 8). Please see the attached land loss spreadsheet to see how acreage lost after dike degradation was determined.

TY 8 (or 3 years after pumping): dike degraded and landloss begins
TY 20: Because of land loss, marsh makes up 83% of area = 166 acres
TY 50: Land loss continues 77% = 154 acres

<u>Variable 2 – Submerged Aquatic Vegetation (SAV)</u>

Currently, large open water areas of the site allow increased wave fetch. In the past, the area has experienced higher levels of salt water intrusion causing the marsh to transition from an intermediate marsh to a more brackish marsh. According to Billy Leonard, Oil and Gas Specialist / Wildlife Biologist with the Southwest Louisiana National Wildlife Refuge Complex, no SAV has been observed in the area of the Sabine NWR during field inspections (Personal communication w/ GEC, April 2008). Water control structures constructed under the CS-23 CWPPRA project were designed to reduce salinity spikes in the area. Also, marsh creation projects implemented and proposed in the area will help to reduce salinities and turbidity in adjacent marshes behind these projects, and would help to create suitable conditions for SAVs. Some SAVs are expected to colonize early on due to recent construction of CWPPRA marsh creation and marsh management projects and should gradually increase through time. Based on prior experience with two CWPPRA projects (PPL 3 and PPL 8), the following assumptions were made regarding SAVs for the project area:

FWOP
TY 0 – 0%
TY 5 – 5 %
TY 20 – 5 %

FWP:
TY 1 – 0%

TY 4 – 0%
TY 5 (dike and pump year) - 10%
TY 7 – 15 % (Two years after pump year: turbidity reduced and wind/wave fetch reduced; SAVs colonize.)
TY 20 – 20%
TY 50 – 20%

<u>Variable 3 – Interspersion</u>

FWOP: The lowest expression of interspersion, Class 5, is characterized by open water and less than 5% of emergent marsh. Without marsh restoration efforts, 100% of the 200-acre project area in this cycle falls in Class 5. Interspersion classifications are not expected to change within the 20-year project life for FWOP (i.e., marsh will not occur naturally).

FWP: Areas exhibiting a high degree of marsh cover are ranked as having a high degree of dispersion (Class 1 or Class 2). It is assumed that the confined area would achieve a Class 2 once the dredged material is pumped for this cycle because of the ratio of marsh to open water (85% marsh/15% open water). 100% of the project area would fall into Class 2 starting the first year it is pumped (TY 5) and throughout the remainder of the 20-year DMMP project life. By TY 50, the area falls to 77% marsh because of landloss rates. Therefore, in TY 50, the interspersion falls to a Class 2.

Table 1: FWP Interspersion Classification: Cycle 2

Target Year	Class 1	%	Class 2	%	Class 5 (open water)	%
0 (FWOP)					200 ac	100
4					200 ac	100
5 dike, pump)	200 ac	100				
7	200 ac	100				
8	200 ac	100				
9	200 ac	100				
20	200 ac	100				
50			200 ac	100		

<u>Variable 4 – Shallow Open Water Habitat (i.e., mudflats) (percent of open water </= 1.5 feet)</u>

Shallow water areas are assumed to be more biologically productive than deeper water due to a general reduction in sunlight, oxygen, and temperature as water depth increases. Optimal conditions are expected to occur when 80 to 90 percent of the open water area is less than or equal to l.5 feet deep. A study by La Peyre et al. (2007) was conducted within the nearby Sabine NWR which shows that a 3.28-foot (1 m) area waterward of the marsh edge has an average water depth less than 1.5 feet (NAVD 88). Subtidal, open water areas located 164.04 feet (50 m) from marsh edge have an average water depth of 1.7 feet (NAVD 88). Therefore, it was assumed that all water within 164 feet of existing emergent marsh (which makes up approximately 40 acres in BU site 49) is less than 1.5 feet deep. Total acreage was determined for this shallow-water buffer as a percentage of the total open water area.

FWOP:

Using ArcView, the perimeter of existing marsh (40 acres in the area of BU site 49 outside of the cells) was measured and multiplied by 164 feet. That value was converted into an acreage value. Based on this calculation, it was found that 25% (150 acres) of the 600 acres of open water in BU site 49 would be less than or equal to 1.5 ft. This assumption regarding shallow open water was applied to the three cells for the FWOP scenario. Because 100% of the acreage (200 acres) in each cell is open water, 25% of the total area of each cell (50 acres) would be shallow open water. Once the cells are pumped with material, it is assumed that any open water would be shallow.

(TY 0): 25% * 200ac of open water </= 1.5 ft

FWP:

TY 0 – shallow open water = 25% or same as FWOP
TY 4 – shallow open water = 25% or same as FWOP
TY 5 – Dike and pump. Shallow open water = 100%.
TY 7 – Two years after pumping. Shallow open water = 100%.
TY 8 – Dike degraded. Shallow open water = 100%
TY 9 – Four years after pumping. Marsh is fully vegetated. Shallow open water = 100%
TY 20 – Shallow open water = 80% As marsh is lost areas become shallow open water and water depths may gradually become deeper.
TY 50 – Shallow open water = 60%

Variable 5 – Salinity

Hydrographic data was downloaded by station number from the Louisiana Department of Natural Resources SONRIS site (accessed April 28, 2008, GEC). All data has been corrected for biofouling, instrument drift, and/or instrument malfunction.

Hourly water salinity records collected during 2003 – 2004 show that average annual salinity for the station located in the project area is 9.1 parts per thousand (ppt).

The salinity is expected to remain constant throughout the life of this project.

Variable 6 – Fish Access

FWOP: CWPPRA project CS-23 was recently completed that replaced water control structures on three major waterways. BU site 49 would be under the same management. The project structures include deep bays, culverts, and flapgates, resulting in a current access value of 0.35. The access value is expected to remain the same throughout the life of the project.

TY 0 0.35 (with existing water control structures from CWPPRA project CS-23)

TY 1   0.35
TY 20 0.35
TY 50 0.35

FWP: The current access value, as noted previously, is 0.35. During target year TY 5, the dike would be constructed, resulting in an access value of 0.0001. The access value is expected to remain at 0.0001 until the dike degrades in TY 8. The degree of access would then return to the original value of 0.35 and remain there throughout the life of the project.

TY 0   0.35   (with existing water control structures from CWPPRA project CS-23)
TY 4   0.35
TY 5   0.0001 (dike and pump)
TY 8   0.35   (dike degradation)
TY 20 0.35
TY 50 0.35

Cycle 2

The above assumptions were applied to Cycle 2 target years, which include the following:

FWOP:

TY 0, TY 1, TY 20

FWP:

TY 0: same as FWOP
TY 7 – Same.
TY 8 – Dike and pump year. 10% credit given to marsh creation.
TY 10 – Two years after pumping. 30% credit given to marsh creation.
TY 11 – Dike degraded. Land loss begins.
TY 12 – Four years after pumping. Marsh is fully vegetated (85% credit)
TY 20 – Landloss rates have reduced the amount of marsh from 85% of project area to 83% = 166 acres
TY 50 - Landloss rates have reduced the amount of marsh from 85% of project area to 77% = 154 acres

Cycle 3

Cycle 1 assumptions (above) also apply to Cycle 3 target years:

FWOP:

TY 0, TY 1, TY 20

FWP:

TY 0: same as FWOP

TY 10 – Same.
TY 11 – Dike and pump year. 10% credit given to marsh creation.
TY 13 – Two years after pumping. 30% credit given to marsh creation.
TY 14 – Dike degraded.
TY 15 – Four years after pumping. Marsh is fully vegetated (85% credit)
TY 20 – Landloss rates have reduced the amount of marsh from 85% of project area to 84% = 168 acres
TY 50 - Landloss rates have reduced the amount of marsh from 85% of project area to 78% = 156 acres

Beneficial Use Site 18 and 49

Calcasieu River and Pass, Louisiana
Dredged Material Management Plan

USGS DOQQ 2005 WESTLAKE SW 3009354

Figure: 1
Date: August 2007
Scale:1:28,247
Source: USGS/GEC/USACE
Map Author: Moore 27585101-765

WETLAND VALUE ASSESSMENT COMMUNITY MODEL
Brackish Marsh

Project: Cycle 1, BU Site 49, Calcasieu DMMP   Project Area: 200

Condition: Future Without Project

Variable		TY 0		TY 1		TY 20	
		Value	SI	Value	SI	Value	SI
V1	% Emergent	0	0.10	0	0.10	0	0.10
V2	% Aquatic	0	0.10	5	0.15	5	0.15
V3	Interspersion	%		%		%	
	Class 1		0.10		0.10		0.10
	Class 2						
	Class 3						
	Class 4						
	Class 5	100		100		100	
V4	%OW <= 1.5ft	25	0.42	25	0.42	25	0.42
V5	Salinity (ppt)	9	1.00	9	1.00	9	1.00
V6	Access Value	0.35	0.42	0.35	0.42	0.35	0.42
	Emergent Marsh HSI	**=**	**0.23**	**EM HSI =**	**0.23**	**EM HSI =**	**0.23**
	Open Water HSI	**=**	**0.25**	**OW HSI =**	**0.28**	**OW HSI =**	**0.28**

1/12/2009

Project: Cycle 1, BU Site 49, Calcasieu DMMP

FWOP

		TY 50					
Variable		Value	SI	Value	SI	Value	SI
V1	% Emergent	0	0.10				
V2	% Aquatic	5	0.15				
V3	Interspersion	%		%		%	
	Class 1		0.10				
	Class 2						
	Class 3						
	Class 4						
	Class 5	100					
V4	%OW <= 1.5ft	25	0.42				
V5	Salinity (ppt)	9	1.00				
V6	Access Value	0.35	0.42				
		EM HSI =	0.23	EM HSI =		EM HSI =	
		OW HSI =	0.28	OW HSI =		OW HSI =	

Project: Cycle 1, BU Site 49, Calcasieu DMMP   Project Area: 200

Condition: Future With Project

Variable		TY 0		TY 4		TY 5 dike & pump	
		Value	SI	Value	SI	Value	SI
V1	% Emergent	0	0.10	0	0.10	10	0.19
V2	% Aquatic	0	0.10	0	0.10	10	0.19
V3	Interspersion	%		%		%	
	Class 1		0.10		0.10	100	1.00
	Class 2						
	Class 3						
	Class 4						
	Class 5	100		100			
V4	%OW <= 1.5ft	25	0.42	25	0.42	100	0.60
V5	Salinity (ppt)	9	1.00	9	1.00	9	1.00
V6	Access Value	0.35	0.42	0.35	0.42	0.00	0.10
	Emergent Marsh HSI	**=**	**0.23**	**EM HSI =**	**0.23**	**EM HSI =**	**0.35**
	Open Water HSI	**=**	**0.25**	**OW HSI =**	**0.25**	**OW HSI =**	**0.31**

Project: Cycle 1, BU Site 49, Calcasieu DMMP
FWP

Variable		TY 7		TY 8 dike degraded		TY 9	
		Value	SI	Value	SI	Value	SI
V1	% Emergent	30	0.37	30	0.37	85	0.87
V2	% Aquatic	15	0.24	15	0.24	15	0.24
V3	Interspersion	%		%		%	
	Class 1	100	1.00	100	1.00	100	0.60
	Class 2						
	Class 3						
	Class 4						
	Class 5						
V4	%OW <= 1.5ft	100	0.60	100	0.60	100	0.60
V5	Salinity (ppt)	9	1.00	9	1.00	9	1.00
V6	Access Value	0.00	0.10	0.35	0.42	0.35	0.42
		EM HSI =	**0.44**	**EM HSI =**	**0.52**	**EM HSI =**	**0.75**
		OW HSI =	**0.32**	**OW HSI =**	**0.42**	**OW HSI =**	**0.39**

Project: Cycle 1, BU Site 49, Calcasieu DMMP
FWP

Variable		TY 20		TY 50			
		Value	SI	Value	SI	Value	SI
V1	% Emergent	83	0.85	77	0.79		
V2	% Aquatic	20	0.28	20	0.28		
V3	Interspersion	%		%		%	
	Class 1	100	1.00		0.00		
	Class 2			100			
	Class 3						
	Class 4						
	Class 5						
V4	%OW <= 1.5ft	80	1.00	60	0.87		
V5	Salinity (ppt)	9	1.00	9	1.00		
V6	Access Value	0.35	0.42	0.35	0.42		
		EM HSI =	**0.78**	**EM HSI =**	**0.64**	**EM HSI =**	
		OW HSI =	**0.48**	**OW HSI =**	**0.39**	**OW HSI =**	

AAHU CALCULATION - MARSH

Future Without Project			Total	Cummulative
TY	Marsh Acres	x HSI	HUs	HUs
0	0	0.23	0.00	
1	0	0.23	0.00	0.00
20	0	0.23	0.00	0.00
50	0	0.23	0.00	0.00
			AAHUs =	**0.00**

Future With Project			Total	Cummulative
TY	Marsh Acres	x HSI	HUs	HUs
0	0	0.23	0.00	
4	0	0.23	0.00	0.00
5	20	0.35	6.99	3.10
7	60	0.44	26.10	31.96
8	60	0.52	31.06	28.58
9	170	0.75	126.76	74.73
20	166	0.78	129.65	908.44
50	154	0.64	98.91	3420.03
			AAHUs	**89.34**

NET CHANGE IN AAHUs DUE TO PROJECT	
A. Future With Project Emergent Marsh AAHUs =	89.34
B. Future Without Project Emergent Marsh AAHUs =	0.00
Net Change (FWP - FWOP) =	**89.34**

AAHU CALCULATION - OPEN WATER

Project: Cycle 1, BU Site 49, Calcasieu DMMP

Future Without Project			Total	Cummulative
TY	Water Acres	x HSI	HUs	HUs
0	200	0.25	50.03	
1	200	0.28	56.89	53.46
20	200	0.28	56.89	1080.92
50	200	0.28	56.89	1706.72
			AAHUs =	56.82

Future With Project			Total	Cummulative
TY	Water Acres	x HSI	HUs	HUs
0	200	0.25	50.03	
4	200	0.25	50.03	200.11
5	30	0.31	9.21	31.23
7	30	0.32	9.68	18.88
8	30	0.42	12.66	11.17
9	30	0.39	11.77	12.22
20	34	0.78	26.55	232.42
50	46	0.64	29.54	819.69
			AAHUs	66.29

NET CHANGE IN AAHUs DUE TO PROJECT	
A. Future With Project Open Water AAHUs =	66.29
B. Future Without Project Open Water AAHUs =	56.82
Net Change (FWP - FWOP) =	**9.46**

TOTAL BENEFITS IN AAHUs DUE TO PROJECT	
A. Emergent Marsh Habitat Net AAHUs =	89.34
B. Open Water Habitat Net AAHUs =	9.46
Net Benefits= (2.6xEMAAHUs+OWAAHUs)/3.6	**67.15**

WETLAND VALUE ASSESSMENT COMMUNITY MODEL
Brackish Marsh

Project: Cycle 2, BU Site 49, Calcasieu DMMP   Project Area: 200

Condition: Future Without Project

Variable		TY 0		TY 1		TY 20				
		Value	SI	Value	SI	Value	SI			
V1	% Emergent	0	0.10	0	0.10	0	0.10			
V2	% Aquatic	0	0.10	5	0.15	5	0.15			
V3	Interspersion	%		%		%				
	Class 1		0.10		0.10		0.10	0	0	0
	Class 2							0	0	0
	Class 3							0	0	0
	Class 4							0	0	0
	Class 5	100		100		100		0.1	0.1	0.1
V4	%OW <= 1.5ft	25	0.42	25	0.42	25	0.42			
V5	Salinity (ppt)	9	1.00	9	1.00	9	1.00			
V6	Access Value	0.35	0.42	0.35	0.42	0.35	0.42			
	Emergent Marsh HSI	**=**	**0.23**	**EM HSI =**	**0.23**	**EM HSI =**	**0.23**			
	Open Water HSI	**=**	**0.25**	**OW HSI =**	**0.28**	**OW HSI =**	**0.28**			

Project: Cycle 2, BU Site 49, Calcasieu DMMP
FWOP

Variable		TY 50								
		Value	SI	Value	SI	Value	SI			
V1	% Emergent	0	0.10							
V2	% Aquatic	5	0.15							
V3	Interspersion	%		%		%				
	Class 1		0.10					0	0	0
	Class 2							0	0	0
	Class 3							0	0	0
	Class 4							0	0	0
	Class 5	100						0.1	0	0
V4	%OW <= 1.5ft	25	0.42							
V5	Salinity (ppt)	9	1.00							
V6	Access Value	0.35	0.42							
		EM HSI =	0.23	EM HSI =		EM HSI =				
		OW HSI =	0.28	OW HSI =		OW HSI =				

Project: Cycle 2, BU Site 49, Calcasieu DMMP Project Area: 200

Condition: Future With Project

Variable		TY 0		TY 7		TY 8 dike & pump				
		Value	SI	Value	SI	Value	SI			
V1	% Emergent	0	0.10	0	0.10	10	0.19			
V2	% Aquatic	0	0.10	0	0.10	10	0.19			
V3	Interspersion	%		%		%				
	Class 1		0.10		0.10	100	1.00	0	0	1
	Class 2							0	0	0
	Class 3							0	0	0
	Class 4							0	0	0
	Class 5	100		100				0.1	0.1	0
V4	%OW <= 1.5ft	25	0.42	25	0.42	100	0.60			
V5	Salinity (ppt)	9	1.00	9	1.00	9	1.00			
V6	Access Value	0.35	0.42	0.35	0.42	0.00	0.10			
	Emergent Marsh HSI	**=**	**0.23**	**EM HSI =**	**0.23**	**EM HSI =**	**0.35**			
	Open Water HSI	**=**	**0.25**	**OW HSI =**	**0.25**	**OW HSI =**	**0.31**			

Project: Cycle 2, BU Site 49, Calcasieu DMMP

FWP

Variable		TY 10		TY 11 dike degraded		TY 12				
		Value	SI	Value	SI	Value	SI			
V1	% Emergent	30	0.37	30	0.37	85	0.87			
V2	% Aquatic	15	0.24	15	0.24	15	0.24			
V3	Interspersion	%		%		%				
	Class 1	100	1.00	100	1.00	100	0.60	1	1	1
	Class 2							0	0	0
	Class 3							0	0	0
	Class 4							0	0	0
	Class 5							0	0	0
V4	%OW <= 1.5ft	100	0.60	100	0.60	100	0.60			
V5	Salinity (ppt)	9	1.00	9	1.00	9	1.00			
V6	Access Value	0.00	0.10	0.35	0.42	0.35	0.42			
		EM HSI =	**0.44**	**EM HSI =**	**0.52**	**EM HSI =**	**0.75**			
		OW HSI =	**0.32**	**OW HSI =**	**0.42**	**OW HSI =**	**0.39**			

Project: Cycle 2, BU Site 49, Calcasieu DMMP
FWP

Variable		TY 20		TY 50						
		Value	SI	Value	SI	Value	SI			
V1	% Emergent	83	0.85	77	0.79					
V2	% Aquatic	20	0.28	20	0.28					
V3	Interspersion	%		%		%				
	Class 1	100	1.00		0.00			1	0	0
	Class 2			100				0	0.6	0
	Class 3							0	0	0
	Class 4							0	0	0
	Class 5							0	0	0
V4	%OW <= 1.5ft	100	0.60	100	0.60					
V5	Salinity (ppt)	9	1.00	9	1.00					
V6	Access Value	0.35	0.42	0.35	0.42					
		EM HSI =	0.78	EM HSI =	0.64	EM HSI =				
		OW HSI =	0.45	OW HSI =	0.37	OW HSI =				

AAHU CALCULATION - MARSH

Future Without Project			Total	Cummulative
TY	Marsh Acres	x HSI	HUs	HUs
0	0	0.23	0.00	
1	0	0.23	0.00	0.00
20	0	0.23	0.00	0.00
50	0	0.23	0.00	0.00
			AAHUs =	**0.00**

Future With Project			Total	Cummulative
TY	Marsh Acres	x HSI	HUs	HUs
0	0	0.23	0.00	
7	0	0.23	0.00	0.00
8	20	0.35	6.99	3.10
10	60	0.44	26.10	31.96
11	60	0.52	31.06	28.58
12	170	0.42	70.55	97.39
20	166	0.42	68.89	557.76
50	154	0.42	63.91	1992.00
			AAHUs	**54.22**

NET CHANGE IN AAHUs DUE TO PROJECT	
A. Future With Project Emergent Marsh AAHUs =	54.22
B. Future Without Project Emergent Marsh AAHUs =	0.00
Net Change (FWP - FWOP) =	**54.22**

AAHU CALCULATION - OPEN WATER

Project: Cycle 2, BU Site 49, Calcasieu DMMP

Future Without Project			Total	Cummulative
TY	**Water Acres**	**x HSI**	**HUs**	**HUs**
0	200	0.25	50.03	
1	200	0.28	56.89	53.46
20	200	0.28	56.89	1080.92
50	200	0.28	56.89	1706.72
			AAHUs =	**56.82**

Future With Project			Total	Cummulative
TY	**Water Acres**	**x HSI**	**HUs**	**HUs**
0	200	0.25	50.03	
7	200	0.25	50.03	350.18
8	30	0.31	9.21	31.23
10	30	0.32	9.68	18.88
11	30	0.42	12.66	11.17
12	30	0.39	11.77	12.22
20	34	0.78	26.55	174.32
50	46	0.64	29.54	759.72
			AAHUs	**27.15**

NET CHANGE IN AAHUs DUE TO PROJECT	
A. Future With Project Open Water AAHUs =	27.15
B. Future Without Project Open Water AAHUs =	56.82
Net Change (FWP - FWOP) =	**-29.67**

TOTAL BENEFITS IN AAHUs DUE TO PROJECT	
A. Emergent Marsh Habitat Net AAHUs =	54.22
B. Open Water Habitat Net AAHUs =	-29.67
Net Benefits= (2.6xEMAAHUs+OWAAHUs)/3.6	**30.91**

WETLAND VALUE ASSESSMENT COMMUNITY MODEL
Brackish Marsh

Project: Cycle 3, BU Site 49, Calcasieu DMMP   Project Area: 200

Condition: Future Without Project

Variable		TY 0 Value	TY 0 SI	TY 1 Value	TY 1 SI	TY 20 Value	TY 20 SI			
V1	% Emergent	0	0.10	0	0.10	0	0.10			
V2	% Aquatic	0	0.10	5	0.15	5	0.15			
V3	Interspersion	%		%		%				
	Class 1		0.10		0.10		0.10	0	0	0
	Class 2							0	0	0
	Class 3							0	0	0
	Class 4							0	0	0
	Class 5	100		100		100		0.1	0.1	0.1
V4	%OW <= 1.5ft	25	0.42	25	0.42	25	0.42			
V5	Salinity (ppt)	9	1.00	9	1.00	9	1.00			
V6	Access Value	0.35	0.42	0.35	0.42	0.35	0.42			
	Emergent Marsh HSI	=	0.23	EM HSI =	0.23	EM HSI =	0.23			
	Open Water HSI	=	0.25	OW HSI =	0.28	OW HSI =	0.28			

Project: Cycle 3, BU Site 49, Calcasieu DMMP

FWOP

Variable		TY 50								
		Value	SI	Value	SI	Value	SI			
V1	% Emergent	0	0.10							
V2	% Aquatic	5	0.15							
V3	Interspersion	%		%		%				
	Class 1		0.10					0	0	0
	Class 2							0	0	0
	Class 3							0	0	0
	Class 4							0	0	0
	Class 5	100						0.1	0	0
V4	%OW <= 1.5ft	25	0.42							
V5	Salinity (ppt)	9	1.00							
V6	Access Value	0.35	0.42							
		EM HSI =	0.23	EM HSI =		EM HSI =				
		OW HSI =	0.28	OW HSI =		OW HSI =				

Project: Cycle 3, BU Site 49, Calcasieu DMMP

Project Area: 200

Condition: Future With Project

Variable		TY 0		TY 10		TY 11 dike & pump				
		Value	SI	Value	SI	Value	SI			
V1	% Emergent	0	0.10	0	0.10	10	0.19			
V2	% Aquatic	0	0.10	0	0.10	10	0.19			
V3	Interspersion	%		%		%				
	Class 1		0.10		0.10	100	1.00	0	0	1
	Class 2							0	0	0
	Class 3							0	0	0
	Class 4							0	0	0
	Class 5	100		100				0.1	0.1	0
V4	%OW <= 1.5ft	25	0.42	25	0.42	100	0.60			
V5	Salinity (ppt)	9	1.00	9	1.00	9	1.00			
V6	Access Value	0.35	0.42	0.35	0.42	0.00	0.10			
	Emergent Marsh HSI	**=**	**0.23**	**EM HSI =**	**0.23**	**EM HSI =**	**0.35**			
	Open Water HSI	**=**	**0.25**	**OW HSI =**	**0.25**	**OW HSI =**	**0.31**			

Project: Cycle 3, BU Site 49, Calcasieu DMMP
FWP

Variable		TY 13 Value	TY 13 SI	TY 14 dike degraded Value	TY 14 dike degraded SI	TY 15 Value	TY 15 SI			
V1	% Emergent	30	0.37	30	0.37	85	0.87			
V2	% Aquatic	15	0.24	15	0.24	15	0.24			
V3	Interspersion	%		%		%				
	Class 1	100	1.00	100	1.00	100	0.60	1	1	1
	Class 2							0	0	0
	Class 3							0	0	0
	Class 4							0	0	0
	Class 5							0	0	0
V4	%OW <= 1.5ft	100	0.60	100	0.60	100	0.60			
V5	Salinity (ppt)	9	1.00	9	1.00	9	1.00			
V6	Access Value	0.00	0.10	0.35	0.42	0.35	0.42			
		EM HSI =	**0.44**	**EM HSI =**	**0.52**	**EM HSI =**	**0.75**			
		OW HSI =	**0.32**	**OW HSI =**	**0.42**	**OW HSI =**	**0.39**			

Project: Cycle 3, BU Site 49, Calcasieu DMMP

FWP

Variable		TY 20		TY 50						
		Value	SI	Value	SI	Value	SI			
V1	% Emergent	84	0.86	78	0.80					
V2	% Aquatic	20	0.28	20	0.28					
V3	Interspersion	%		%		%				
	Class 1	100	1.00		0.00			1	0	0
	Class 2			100				0	0.6	0
	Class 3							0	0	0
	Class 4							0	0	0
	Class 5							0	0	0
V4	%OW <= 1.5ft	100	0.60	100	0.60					
V5	Salinity (ppt)	9	1.00	9	1.00					
V6	Access Value	0.35	0.42	0.35	0.42					
		EM HSI =	0.79	EM HSI =	0.65	EM HSI =				
		OW HSI =	0.45	OW HSI =	0.37	OW HSI =				

AAHU CALCULATION - MARSH

Future Without Project			Total	Cummulative
TY	Marsh Acres	x HSI	HUs	HUs
0	0	0.23	0.00	
1	0	0.23	0.00	0.00
20	0	0.23	0.00	0.00
50	0	0.23	0.00	0.00
			AAHUs =	**0.00**

Future With Project			Total	Cummulative
TY	Marsh Acres	x HSI	HUs	HUs
0	0	0.23	0.00	
7	0	0.23	0.00	0.00
8	20	0.35	6.99	3.10
10	60	0.44	26.10	31.96
11	60	0.52	31.06	28.58
12	170	0.75	126.76	74.73
20	166	0.42	68.89	466.12
50	156	0.79	122.55	4740.44
			AAHUs	**106.90**

NET CHANGE IN AAHUs DUE TO PROJECT	
A. Future With Project Emergent Marsh AAHUs =	106.90
B. Future Without Project Emergent Marsh AAHUs =	0.00
Net Change (FWP - FWOP) =	**106.90**

AAHU CALCULATION - OPEN WATER

Project: Cycle 3, BU Site 49, Calcasieu DMMP

Future Without Project			Total	Cummulative
TY	Water Acres	x HSI	HUs	HUs
0	200	0.25	50.03	
1	200	0.28	56.89	53.46
20	200	0.28	56.89	1080.92
50	200	0.28	56.89	1706.72
			AAHUs =	**56.82**

Future With Project			Total	Cummulative
TY	Water Acres	x HSI	HUs	HUs
0	200	0.25	50.03	
7	200	0.25	50.03	350.18
8	180	0.31	55.25	52.83
10	140	0.32	45.15	100.61
11	30	0.42	12.66	30.73
12	30	0.39	11.77	12.22
20	34	0.79	26.71	174.99
50	44	0.65	28.46	741.94
			AAHUs	**29.27**

NET CHANGE IN AAHUs DUE TO PROJECT	
A. Future With Project Open Water AAHUs =	29.27
B. Future Without Project Open Water AAHUs =	56.82
Net Change (FWP - FWOP) =	**-27.55**

TOTAL BENEFITS IN AAHUs DUE TO PROJECT	
A. Emergent Marsh Habitat Net AAHUs =	106.90
B. Open Water Habitat Net AAHUs =	-27.55
Net Benefits= (2.6xEMAAHUs+OWAAHUs)/3.6	**69.55**

Land Loss Spreadsheet

					Loss Rate Calculation				
Project:					**Beginning Year**	**Ending Year**	**Beginning Year Acreage**	**Ending Year Acreage**	**Loss Rate**
Total Acres		**TY0 Marsh Acres**		**TY0 Water Acres**	1974	1990	20,665	19,095	-0.004926
200		0		200	FWP Land Loss Reduction			0.50	

FWOP					FWP					
TY	Loss Rate	Marsh (acres)	% Marsh (V1)	Water (acres)	TY	Loss Rate	Marsh (acres)	% Marsh (V1)	Water (acres)	Net Acres of Marsh
0		0	0%	200	0		0	0%	200	0
1	-0.004926	**0**	**0%**	200	**1**	-0.002463	**0**	**0%**	200	0
2	-0.004926	0	0%	200	2	-0.002463	0	0%	200	0
3	-0.004926	0	0%	200	3	-0.002463	0	0%	200	0
4	-0.004926	0	0%	200	4	-0.002463	0	0%	200	0
5	-0.004926	0	0%	200	5	-0.002463	0	0%	200	0
6	-0.004926	0	0%	200	6	-0.002463	0	0%	200	0
7	-0.004926	0	0%	200	7	-0.002463	0	0%	200	0
8	-0.004926	0	0%	200	8	-0.002463	0	0%	200	0
9	-0.004926	0	0%	200	9	-0.002463	0	0%	200	0
10	-0.004926	0	0%	200	10	-0.002463	0	0%	200	0
11	-0.004926	0	0%	200	11	-0.002463	0	0%	200	0
12	-0.004926	0	0%	200	12	-0.002463	0	0%	200	0
13	-0.004926	0	0%	200	13	-0.002463	0	0%	200	0
14	-0.004926	0	0%	200	14	-0.002463	0	0%	200	0
15	-0.004926	0	0%	200	15	-0.002463	170	85%	30	170
16	-0.004926	0	0%	200	16	-0.002463	170	85%	30	170
17	-0.004926	0	0%	200	17	-0.002463	169	85%	31	169
18	-0.004926	0	0%	200	18	-0.002463	169	84%	31	169
19	-0.004926	0	0%	200	19	-0.002463	168	84%	32	168
20	-0.004926	**0**	**0%**	200	**20**	-0.002463	168	**84%**	32	**168**
21	-0.004926	0	0%	200	21	-0.002463	168	84%	32	168
22	-0.004926	0	0%	200	22	-0.002463	167	84%	33	167
23	-0.004926	0	0%	200	23	-0.002463	167	83%	33	167
24	-0.004926	0	0%	200	24	-0.002463	166	83%	34	166
25	-0.004926	0	0%	200	25	-0.002463	166	83%	34	166
26	-0.004926	0	0%	200	26	-0.002463	165	83%	35	165
27	-0.004926	0	0%	200	27	-0.002463	165	83%	35	165
28	-0.004926	0	0%	200	28	-0.002463	165	82%	35	165
29	-0.004926	0	0%	200	29	-0.002463	164	82%	36	164
30	-0.004926	0	0%	200	30	-0.002463	164	82%	36	164
31	-0.004926	0	0%	200	31	-0.002463	163	82%	37	163
32	-0.004926	0	0%	200	32	-0.002463	163	82%	37	163
33	-0.004926	0	0%	200	33	-0.002463	163	81%	37	163
34	-0.004926	0	0%	200	34	-0.002463	162	81%	38	162
35	-0.004926	0	0%	200	35	-0.002463	162	81%	38	162
36	-0.004926	0	0%	200	36	-0.002463	161	81%	39	161
37	-0.004926	0	0%	200	37	-0.002463	161	81%	39	161
38	-0.004926	0	0%	200	38	-0.002463	161	80%	39	161
39	-0.004926	0	0%	200	39	-0.002463	160	80%	40	160
40	-0.004926	0	0%	200	40	-0.002463	160	80%	40	160
41	-0.004926	0	0%	200	41	-0.002463	159	80%	41	159
42	-0.004926	0	0%	200	42	-0.002463	159	80%	41	159
43	-0.004926	0	0%	200	43	-0.002463	159	79%	41	159
44	-0.004926	0	0%	200	44	-0.002463	158	79%	42	158
45	-0.004926	0	0%	200	45	-0.002463	158	79%	42	158
46	-0.004926	0	0%	200	46	-0.002463	157	79%	43	157
47	-0.004926	0	0%	200	47	-0.002463	157	79%	43	157
48	-0.004926	0	0%	200	48	-0.002463	157	78%	43	157
49	-0.004926	0	0%	200	49	-0.002463	156	78%	44	156
50	-0.004926	0	0%	200	50	-0.002463	156	78%	44	156

Beneficial Use Site 50

<u>Beneficial Use (BU) Site 50 (Marcantel)</u>

I. Project Location/Area

This wetland value assessment (WVA) focuses on BU site 50 (Figure 1), called West of Black Lake. This site is an 887-acre area located approximately 5.5 miles west of the Calcasieu River and Pass and one mile south of the Gulf Intracoastal Waterway (GIWW).

II. Goals

Approximately 7.2 million cubic yards of material would be dredged from the Calcasieu Ship Channel (between miles 16 and 21) in two pumping cycles to create approximately 640 acres of marsh habitat in this 887-acre open-water area. Two 320-acre marsh creation cells would be designed and constructed to achieve a ratio of 85% marsh to 15% shallow open water.

III. Project Features

A total of 7,219,750 cyds of material will be pumped, with 3,609,875 cyds in both cycles. Two 320-acre cells would be created to accommodate the two pumping cycles. To assess habitat benefits, a WVA was prepared for both pumping cycles.

IV. WVA Variables and Assumptions

The following is a description of assumptions created for the two dredging cycles (cells). The same assumptions apply to both cycles, but target years (i.e., years that dikes would be constructed and dredged material pumped) would differ.

Cycle 1

<u>Variable 1: Emergent Marsh</u>

FWOP: There is 0% emergent marsh in the open water areas where the cells would be constructed.

FWP: A total of 3,609,875 cyds of dredged material will be pumped into this 320-acre cell. To determine the potential amount of marsh acres that could be created with the dredged material, depth data collected by GBA, Inc. in 2007 was used. It was found that the open water area of this BU site is approximately 4-feet deep. Assuming that the cells would be filled initially to 3 feet above the water surface, 11,293 cyds would be required to create one acre of marsh. Based on these assumptions, 320 acres would be created by the first pumping cycle.

→ 4 + 3 = 7 ft. * (43,560 sq. ft) = 304,920 cubic feet / 27 = 11,293 cubic yards per acre
→ 3,609,875 cyds/11,293 cubic yards per acre = 320 acres

These numbers are estimates. Actual target elevations of placed and consolidated fill at the site would be determined through coordination with resource agencies and the development of geotechnical analyses during the preparation of plans and specifications for the project. The analyses would consider long-term settlement of the dredged materials and placement area foundations, as well as elevation surveys of the nearby planned wetland habitat to determine the appropriate target range.

Based on USACE knowledge and experience of dredging operations, a maximum of 85% of this material will form into vegetated marsh, and the remaining 15% of the area would be shallow open water (also called mudflats). It would take several years for the dredged material to vegetate into marsh. Vegetation would not be planted, but would be allowed to form naturally. The following assumptions are used for marsh creation with natural recruitment:

Target Year (TY) 0: ~ 0 acres of existing marsh
TY 1 (dike and pump) –10% of the dredged material would be marsh (.10*320ac=32ac of marsh)
TY 3 (2 years after pumping) – 30% marsh (.3 * 320ac = 96ac of marsh)
TY 5 (4 years after pumping) – 85% marsh (.85 * 320ac = 272ac. of marsh)

Marsh loss data was obtained from the Louisiana Coastal Area project report *Coast 2050: Toward a Sustainable Coastal Louisiana* (1998), Appendix F. The loss rate of -0.0029 is used for future-without-project (FWOP). Without the project, there would be no marsh restoration in this project area, so the loss rate would not apply. However, for the future-with-project (FWP) scenario, loss rates would apply after the material is pumped and the dike degraded. Marsh created in a confined area would likely differ in some aspects from naturally occurring marsh: it would be slightly higher in elevation than natural marsh, and its density would differ from natural marsh due to consolidation and type of material. Therefore, the loss rate that would be applied would differ as well; it would be reduced by 50% to account for these attributes. Therefore, for FWP, a loss rate of -0.0065 was applied starting the year that the dike would be degraded (TY 4). Please see the attached land loss spreadsheet to see how acreage lost after dike degradation was determined.

TY 4: (or 3 years after pumping) – dike degraded and landloss begins
TY 20: 78% marsh (250 acres of marsh)
TY 50: 64% (206 acres of marsh)

<u>Variable 2 – Submerged Aquatic Vegetation (SAV)</u>

Currently, large open water areas of the site allow increased wave fetch. In the past, the area has experienced higher levels of salt water intrusion causing the marsh to transition from an intermediate marsh to a more brackish marsh. This area is not known to support SAVs.

FWOP
TY 0: 0 %
TY 5: 0 %
TY 20: 0 %
TY 50: 0 %

Without any hydrologic restoration to control salinity, the project area will continue to experience salinity spikes. The project area is not expected to support a significant amount of SAV habitat.

FWP:
TY 0: 0%
TY 1: 0%
TY 3: 0%
TY 4: 0%
TY 5: 0%
TY 20: 5% or less
TY 50: 5% or less

<u>Variable 3 – Interspersion</u>

FWOP: The lowest expression of interspersion, Class 5, is characterized by open water and less than 5% of emergent marsh. Without marsh restoration efforts, 100% of the 212-acre project area in this cycle falls into Class 5. Interspersion classifications are not expected to change within the 50-year assessment period for FWOP (i.e., marsh will not occur naturally).

FWP: Areas exhibiting a high degree of marsh cover are ranked as having a high degree of dispersion (Class 1 or Class 2). It is assumed that the confined area would achieve a Class 1 once the dredged material is pumped for this cycle because of the ratio of marsh to open water (85% marsh/15% open water). 100% of the project area would fall into Class 1 starting the first year it is pumped (TY 1) and throughout the remainder of the 20-year DMMP project life. By TY 50, the area falls to 80% marsh because of landloss rates. Therefore, in TY 50, the interspersion falls to a Class 2.

Table 1: FWP Interspersion Classification

Target Year	Class 1	%	Class 2	%	Class 5 (open water)	%
0					320 ac	100
1 (dike&pump)	320 ac	100				
3	320 ac	100				
4 (dike degraded)	320 ac	100				
5	320 ac	100				
20	320 ac	100				
50			320 ac	100		

<u>Variable 4 – Shallow Open Water Habitat (i.e., mudflats) (percent of open water </= 1.5 feet)</u>

Shallow water areas are assumed to be more biologically productive than deeper water due to a general reduction in sunlight, oxygen, and temperature as water depth increases. Optimal conditions are expected to occur when 80 to 90 percent of the open water area is less than or equal to l.5 feet deep. According to DNR's Sonris data, water depth is greater than 2' throughout most of the area in cell two. In the FWOP scenario, 10% of Cell 1 would be classified as </= 1.5'. Once the marsh is pumped, 100% of the water in Cell 1 would be shallow.

FWOP:

(TY 0): 10% * 320ac of open water </= 1.5 ft

FWP:

TY 0 – shallow open water = 10% or same as FWOP
TY 1 – Pump year. 85 % of the 320-acres of material is expected to achieve marsh height. Any open water (15% of the area) would be shallow open water = 100%.
TY 3 – Two years after pumping. Shallow open water = 100%.
TY 4 – Dike degraded. Shallow open water = 100%
TY 5 – Four years after pumping. Marsh is fully vegetated. Shallow open water = 100%
TY 20 – Shallow open water = 80% As marsh is lost areas become shallow open water and water depths may gradually become deeper.
TY 50 – Shallow open water = 60%

<u>Variable 5 – Salinity</u>

Hydrographic data was downloaded by station number from the Louisiana DNR SONRIS site (accessed April 28, 2008, GEC). All data has been corrected for biofouling, instrument drift, and/or instrument malfunction.

Monthly water salinity records collected during 2003 – 2004 show that average annual salinity for the station located in the project area is 6.1 parts per thousand (ppt).

The salinity is expected to remain constant throughout the life of this project.

<u>Variable 6 – Fish Access</u>

Access by aquatic organisms is considered to be a critical component in assessing the quality of a given marsh system. The suitability index (SI) for this variable is determined by calculating an "access value" based on the percentage of the project area wetlands considered accessible by aquatic organisms during normal tidal flucturations, and the type of man-made structures (if any) across identified points of ingress/egress (e.g., bayous, canals, etc.). A brackish marsh with no access is assigned an SI of .2. A solid plug is assigned an SI of .0001. A completely open system is assigned an SI of 1.0.

FWOP: This area is considered an open system, and is therefore assigned an access value of 1.0.

TY 0: 1.0
TY 1: 1.0

TY 20: 1.0
TY 50: 1.0

FWP: The current access value, as noted previously, is 1.0. During target year TY 1, the dike would be constructed, resulting in an access value of 0.0001. The access value is expected to remain at 0.0001 until the dike degrades in TY 4. The degree of access would then return to the original value of 1.0 and remain there throughout the 50 year assessment period.

TY 0 1.0
TY 1 0.0001 (dike and pumping year)
TY 4 1.0 (dike degradation)
TY 20 1.0 (end of project)
TY 50 1.0

Cycle 2

The above assumptions were applied to Cycle 2 target years, which include the following:

FWOP:

TY 0, TY 1, TY 20, TY 50

FWP:

TY 0: same as FWOP
TY 2 – same as FWOP
TY 3 – Dike and pump year. 10% credit given to marsh creation.
TY 5 – Two years after pumping. 30% credit given to marsh creation.
TY 6 – Three years after pumping. Dike degraded.
TY 7 – Four years after pumping. Marsh is fully vegetated (85% credit)
TY 20 – Landloss rates have reduced the amount of marsh from 85% of project area to 78%
TY 50 – Landloss rates have reduced the amount of marsh from 85% of project area to 64%

Beneficial Use Sites 24 and 50

Calcasieu River and Pass, Louisiana
Dredged Material Management Plan

USGS DOQQ 2005 WESTLAKE SW 3009354

Figure: 1
Date: August 2007
Scale:1:31,273
Source: USGS/GEC/USACE
Map Author: Moore 27585101-765

WETLAND VALUE ASSESSMENT COMMUNITY MODEL
Brackish Marsh

Project: Cycle 1, BU Site 50, Calcasieu DMMP Project Area: 320

Condition: Future Without Project

Variable		TY 0		TY 1		TY 20	
		Value	SI	Value	SI	Value	SI
V1	% Emergent	0	0.10	0	0.10	0	0.10
V2	% Aquatic	0	0.10	0	0.10	0	0.10
V3	Interspersion	%		%		%	
	Class 1		0.10		0.10		0.10
	Class 2						
	Class 3						
	Class 4						
	Class 5	100		100		100	
V4	%OW <= 1.5ft	10	0.23	10	0.23	10	0.23
V5	Salinity (ppt)	6.1	1.00	6.1	1.00	6.1	1.00
V6	Access Value	1.00	1.00	1.00	1.00	1.00	1.00
	Emergent Marsh HSI	=	0.25	EM HSI =	0.25	EM HSI =	0.25
	Open Water HSI	=	0.29	OW HSI =	0.29	OW HSI =	0.29

1/12/2009

Project: Cycle 1, BU Site 50, Calcasieu DMMP
FWOP

		TY 50					
Variable		**Value**	**SI**	**Value**	**SI**	**Value**	**SI**
V1	% Emergent	0	0.10				
V2	% Aquatic	0	0.10				
V3	Interspersion	%		%		%	
	Class 1		0.10				
	Class 2						
	Class 3						
	Class 4						
	Class 5	100					
V4	%OW <= 1.5ft	10	0.23				
V5	Salinity (ppt)	6.1	1.00				
V6	Access Value	1.00	1.00				
		EM HSI =	**0.25**	**EM HSI =**		**EM HSI =**	
		OW HSI =	**0.29**	**OW HSI =**		**OW HSI =**	

Project: Cycle 1, BU Site 50, Calcasieu DMMP

Project Area: 320

Condition: Future With Project

Variable		TY 0		TY 1 dike and pump		TY 3	
		Value	SI	Value	SI	Value	SI
V1	% Emergent	0	0.10	10	0.19	30	0.37
V2	% Aquatic	0	0.10	0	0.10	0	0.10
V3	Interspersion	%		%		%	
	Class 1		0.10	100	1.00	100	1.00
	Class 2						
	Class 3						
	Class 4						
	Class 5	100					
V4	%OW <= 1.5ft	10	0.23	100	0.60	100	0.60
V5	Salinity (ppt)	6.1	1.00	6.1	1.00	6.1	1.00
V6	Access Value	1.00	1.00	0.00	0.10	0.00	0.10
	Emergent Marsh HSI	**=**	**0.25**	**EM HSI =**	**0.35**	**EM HSI =**	**0.44**
	Open Water HSI	**=**	**0.29**	**OW HSI =**	**0.27**	**OW HSI =**	**0.27**

1/12/2009

Project: Cycle 1, BU Site 50, Calcasieu DMMP
FWP

Variable		TY 4 Dike degraded		TY 5		TY 20	
		Value	SI	Value	SI	Value	SI
V1	% Emergent	30	0.37	85	0.87	78	0.80
V2	% Aquatic	0	0.10	0	0.10	5	0.15
V3	Interspersion	%		%		%	
	Class 1	100	1.00	100	1.00	100	0.60
	Class 2						
	Class 3						
	Class 4						
	Class 5						
V4	%OW <= 1.5ft	100	0.60	100	0.60	80	1.00
V5	Salinity (ppt)	6.1	1.00	6.1	1.00	6.1	1.00
V6	Access Value	1.00	1.00	1.00	1.00	1.00	1.00
		EM HSI =	**0.58**	**EM HSI =**	**0.92**	**EM HSI =**	**0.83**
		OW HSI =	**0.39**	**OW HSI =**	**0.39**	**OW HSI =**	**0.44**

Project: Cycle 1, BU Site 50, Calcasieu DMMP

FWP

Variable		TY 50					
		Value	SI	Value	SI	Value	SI
V1	% Emergent	64	0.68				
V2	% Aquatic	5	0.15				
V3	Interspersion	%		%		%	
	Class 1		0.60				
	Class 2	100					
	Class 3						
	Class 4						
	Class 5						
V4	%OW <= 1.5ft	60	0.87				
V5	Salinity (ppt)	6.1	1.00				
V6	Access Value	1.00	1.00				
		EM HSI =	**0.75**	**EM HSI =**		**EM HSI =**	
		OW HSI =	**0.43**	**OW HSI =**		**OW HSI =**	

AAHU CALCULATION - MARSH

Future Without Project			Total	Cummulative
TY	Marsh Acres	x HSI	HUs	HUs
0	0	0.25	0.00	
1	0	0.25	0.00	0.00
20	0	0.25	0.00	0.00
50	0	0.25	0.00	0.00
			AAHUs =	**0.00**

Future With Project			Total	Cummulative
TY	Marsh Acres	x HSI	HUs	HUs
0	0	0.25	0.00	
1	32	0.35	11.19	5.09
3	96	0.44	41.76	51.13
4	96	0.58	56.08	48.92
5	272	0.92	249.67	143.09
20	250	0.83	208.53	3431.92
50	206	0.75	155.18	5437.86
			AAHUs	**182.36**

NET CHANGE IN AAHUs DUE TO PROJECT	
A. Future With Project Emergent Marsh AAHUs =	182.36
B. Future Without Project Emergent Marsh AAHUs =	0.00
Net Change (FWP - FWOP) =	**182.36**

1/12/2009

AAHU CALCULATION - OPEN WATER

Project: Cycle 1, BU Site 50, Calcasieu DMMP

Future Without Project			Total	Cummulative
TY	Water Acres	x HSI	HUs	HUs
0	320	0.29	94.01	
1	320	0.29	94.01	94.01
20	320	0.29	94.01	1786.21
50	320	0.29	94.01	2820.32
			AAHUs =	**94.01**

Future With Project			Total	Cummulative
TY	Water Acres	x HSI	HUs	HUs
0	320	0.29	94.01	
1	288	0.27	77.87	85.81
3	224	0.27	60.57	138.44
4	224	0.39	86.90	73.74
5	48	0.39	18.62	52.76
20	70	0.44	30.57	366.28
50	114	0.43	48.71	1191.27
			AAHUs	**38.17**

NET CHANGE IN AAHUs DUE TO PROJECT	
A. Future With Project Open Water AAHUs =	38.17
B. Future Without Project Open Water AAHUs =	94.01
Net Change (FWP - FWOP) =	**-55.84**

TOTAL BENEFITS IN AAHUs DUE TO PROJECT	
A. Emergent Marsh Habitat Net AAHUs =	182.36
B. Open Water Habitat Net AAHUs =	-55.84
Net Benefits= (2.6xEMAAHUs+OWAAHUs)/3.6	**116.19**

WETLAND VALUE ASSESSMENT COMMUNITY MODEL
Brackish Marsh

Project: Cycle 2, BU Site 50, Calcasieu DMMP　　Project Area: 320

Condition: Future Without Project

Variable		TY 0		TY 1		TY 20				
		Value	SI	Value	SI	Value	SI			
V1	% Emergent	0	0.10	0	0.10	0	0.10			
V2	% Aquatic	0	0.10	0	0.10	0	0.10			
V3	Interspersion	%		%		%				
	Class 1		0.10		0.10		0.10	0	0	0
	Class 2							0	0	0
	Class 3							0	0	0
	Class 4							0	0	0
	Class 5	100		100		100		0.1	0.1	0.1
V4	%OW <= 1.5ft	10	0.23	10	0.23	10	0.23			
V5	Salinity (ppt)	6.1	1.00	6.1	1.00	6.1	1.00			
V6	Access Value	1.00	1.00	1.00	1.00	1.00	1.00			
	Emergent Marsh HSI	**=**	**0.25**	**EM HSI =**	**0.25**	**EM HSI =**	**0.25**			
	Open Water HSI	**=**	**0.29**	**OW HSI =**	**0.29**	**OW HSI =**	**0.29**			

Project: Cycle 2, BU Site 50, Calcasieu DMMP

FWOP

Variable		TY 50								
		Value	SI	Value	SI	Value	SI			
V1	% Emergent	0	0.10							
V2	% Aquatic	0	0.10							
V3	Interspersion	%		%		%				
	Class 1		0.10					0	0	0
	Class 2							0	0	0
	Class 3							0	0	0
	Class 4							0	0	0
	Class 5	100						0.1	0	0
V4	%OW <= 1.5ft	10	0.23							
V5	Salinity (ppt)	6.1	1.00							
V6	Access Value	1.00	1.00							
		EM HSI =	**0.25**	**EM HSI =**		**EM HSI =**				
		OW HSI =	**0.29**	**OW HSI =**		**OW HSI =**				

Project: Cycle 2, BU Site 50, Calcasieu DMMP   Project Area: 320

Condition: Future With Project

Variable		TY 0 Value	TY 0 SI	TY 2 Value	TY 2 SI	TY 3 Dike and pump Value	TY 3 Dike and pump SI			
V1	% Emergent	0	0.10	0	0.10	10	0.19			
V2	% Aquatic	0	0.10	0	0.10	0	0.10			
V3	Interspersion	%		%		%				
	Class 1		0.10		0.10	100	1.00	0	0	1
	Class 2							0	0	0
	Class 3							0	0	0
	Class 4							0	0	0
	Class 5	100		100				0.1	0.1	0
V4	%OW <= 1.5ft	10	0.23	10	0.23	100	0.60			
V5	Salinity (ppt)	6.1	1.00	6.1	1.00	6.1	1.00			
V6	Access Value	1.00	1.00	1.00	1.00	0.00	0.10			
	Emergent Marsh HSI	**=**	**0.25**	**EM HSI =**	**0.25**	**EM HSI =**	**0.35**			
	Open Water HSI	**=**	**0.29**	**OW HSI =**	**0.29**	**OW HSI =**	**0.27**			

Project: Cycle 2, BU Site 50, Calcasieu DMMP

FWP

Variable		TY 5 Value	TY 5 SI	TY 6 Dike degraded Value	TY 6 Dike degraded SI	TY 7 Value	TY 7 SI			
V1	% Emergent	30	0.37	30	0.37	85	0.87			
V2	% Aquatic	0	0.10	0	0.10	0	0.10			
V3	Interspersion	%		%		%				
	Class 1	100	1.00	100	1.00	100	0.60	1	1	1
	Class 2							0	0	0
	Class 3							0	0	0
	Class 4							0	0	0
	Class 5							0	0	0
V4	%OW <= 1.5ft	100	0.60	100	0.60	100	0.60			
V5	Salinity (ppt)	6.1	1.00	6.1	1.00	6.1	1.00			
V6	Access Value	0.00	0.10	1.00	1.00	1.00	1.00			
		EM HSI =	0.44	EM HSI =	0.58	EM HSI =	0.87			
		OW HSI =	0.27	OW HSI =	0.39	OW HSI =	0.36			

Project: Cycle 2, BU Site 50, Calcasieu DMMP

FWP

Variable		TY 20		TY 50						
		Value	SI	Value	SI	Value	SI			
V1	% Emergent	78	0.80	64	0.68					
V2	% Aquatic	5	0.15	5	0.15					
V3	Interspersion	%		%		%				
	Class 1	100	1.00		0.00			1	0	0
	Class 2			100				0	0.6	0
	Class 3							0	0	0
	Class 4							0	0	0
	Class 5							0	0	0
V4	%OW <= 1.5ft	80	1.00	60	0.87					
V5	Salinity (ppt)	6.1	1.00	6.1	1.00					
V6	Access Value	1.00	1.00	1.00	1.00					
		EM HSI =	0.88	EM HSI =	0.69	EM HSI =				
		OW HSI =	0.47	OW HSI =	0.38	OW HSI =				

AAHU CALCULATION - MARSH

Future Without Project			Total	Cummulative
TY	Marsh Acres	x HSI	HUs	HUs
0	0	0.25	0.00	
1	0	0.25	0.00	0.00
20	0	0.25	0.00	0.00
50	0	0.25	0.00	0.00
			AAHUs =	0.00

Future With Project			Total	Cummulative
TY	Marsh Acres	x HSI	HUs	HUs
0	0	0.25	0.00	
2	0	0.25	0.00	0.00
3	32	0.35	11.19	5.09
5	96	0.44	41.76	51.13
6	96	0.58	56.08	48.92
7	272	0.87	237.58	138.35
20	250	0.88	219.65	1824.34
50	206	0.69	141.44	8060.58
			AAHUs	202.57

NET CHANGE IN AAHUs DUE TO PROJECT	
A. Future With Project Emergent Marsh AAHUs =	202.57
B. Future Without Project Emergent Marsh AAHUs =	0.00
Net Change (FWP - FWOP) =	**202.57**

AAHU CALCULATION - OPEN WATER

Project: Cycle 2, BU Site 50, Calcasieu DMMP

Future Without Project			Total	Cummulative
TY	Water Acres	x HSI	HUs	HUs
0	320	0.29	94.01	
1	320	0.29	94.01	94.01
20	320	0.29	94.01	1786.21
50	320	0.29	94.01	2820.32
			AAHUs =	94.01

Future With Project			Total	Cummulative
TY	Water Acres	x HSI	HUs	HUs
0	320	0.29	94.01	
2	320	0.29	94.01	188.02
3	288	0.27	77.87	85.81
5	224	0.27	60.56	138.43
6	224	0.39	86.90	73.73
7	48	0.36	17.20	51.18
20	70	0.47	32.65	318.85
50	114	0.69	78.27	1897.41
			AAHUs	55.07

NET CHANGE IN AAHUs DUE TO PROJECT	
A. Future With Project Open Water AAHUs =	55.07
B. Future Without Project Open Water AAHUs =	94.01
Net Change (FWP - FWOP) =	-38.94

TOTAL BENEFITS IN AAHUs DUE TO PROJECT	
A. Emergent Marsh Habitat Net AAHUs =	202.57
B. Open Water Habitat Net AAHUs =	-38.94
Net Benefits= (2.6xEMAAHUs+OWAAHUs)/3.6	**135.48**

Land Loss Spreadsheet

					Loss Rate Calculation					
Project:					**Beginning Year**	**Ending Year**	**Beginning Year Acreage**	**Ending Year Acreage**	**Loss Rate**	
Total Acres		**TY0 Marsh Acres**		**TY0 Water Acres**	1974	1990	3,770	3,060	-0.012957	
320		0		320	FWP Land Loss Reduction			0.50		
FWOP					**FWP**					
TY	Loss Rate	Marsh (acres)	% Marsh (V1)	Water (acres)	TY	Loss Rate	Marsh (acres)	% Marsh (V1)	Water (acres)	Net Acres of Marsh
0		0	0%	320	0		0	0%	320	0
1	-0.012957	**0**	**0%**	320	**1**	-0.006478	**0**	**10%**	320	0
2	-0.012957	0	0%	320	2	-0.006478	0	10%	320	0
3	-0.012957	0	0%	320	3	-0.006478	0	30%	320	0
4	-0.012957	0	0%	320	4	-0.006478	0	30%	320	0
5	-0.012957	0	0%	320	5	-0.006478	272	85%	48	272
6	-0.012957	0	0%	320	6	-0.006478	270	84%	50	270
7	-0.012957	0	0%	320	7	-0.006478	272	85%	48	272
8	-0.012957	0	0%	320	8	-0.006478	270	84%	50	270
9	-0.012957	0	0%	320	9	-0.006478	268	84%	52	268
10	-0.012957	0	0%	320	10	-0.006478	267	83%	53	267
11	-0.012957	0	0%	320	11	-0.006478	265	83%	55	265
12	-0.012957	0	0%	320	12	-0.006478	263	82%	57	263
13	-0.012957	0	0%	320	13	-0.006478	262	82%	58	262
14	-0.012957	0	0%	320	14	-0.006478	260	81%	60	260
15	-0.012957	0	0%	320	15	-0.006478	258	81%	62	258
16	-0.012957	0	0%	320	16	-0.006478	257	80%	63	257
17	-0.012957	0	0%	320	17	-0.006478	255	80%	65	255
18	-0.012957	0	0%	320	18	-0.006478	253	79%	67	253
19	-0.012957	0	0%	320	19	-0.006478	252	79%	68	252
20	-0.012957	**0**	**0%**	320	**20**	-0.006478	250	**78%**	70	**250**
21	-0.012957	0	0%	320	21	-0.006478	248	78%	72	248

22	-0.012957	0	0%	320	22	-0.006478	247	77%	73	247
23	-0.012957	0	0%	320	23	-0.006478	245	77%	75	245
24	-0.012957	0	0%	320	24	-0.006478	244	76%	76	244
25	-0.012957	0	0%	320	25	-0.006478	242	76%	78	242
26	-0.012957	0	0%	320	26	-0.006478	240	75%	80	240
27	-0.012957	0	0%	320	27	-0.006478	239	75%	81	239
28	-0.012957	0	0%	320	28	-0.006478	237	74%	83	237
29	-0.012957	0	0%	320	29	-0.006478	236	74%	84	236
30	-0.012957	0	0%	320	30	-0.006478	234	73%	86	234
31	-0.012957	0	0%	320	31	-0.006478	233	73%	87	233
32	-0.012957	0	0%	320	32	-0.006478	231	72%	89	231
33	-0.012957	0	0%	320	33	-0.006478	230	72%	90	230
34	-0.012957	0	0%	320	34	-0.006478	228	71%	92	228
35	-0.012957	0	0%	320	35	-0.006478	227	71%	93	227
36	-0.012957	0	0%	320	36	-0.006478	225	70%	95	225
37	-0.012957	0	0%	320	37	-0.006478	224	70%	96	224
38	-0.012957	0	0%	320	38	-0.006478	222	69%	98	222
39	-0.012957	0	0%	320	39	-0.006478	221	69%	99	221
40	-0.012957	0	0%	320	40	-0.006478	219	69%	101	219
41	-0.012957	0	0%	320	41	-0.006478	218	68%	102	218
42	-0.012957	0	0%	320	42	-0.006478	217	68%	103	217
43	-0.012957	0	0%	320	43	-0.006478	215	67%	105	215
44	-0.012957	0	0%	320	44	-0.006478	214	67%	106	214
45	-0.012957	0	0%	320	45	-0.006478	212	66%	108	212
46	-0.012957	0	0%	320	46	-0.006478	211	66%	109	211
47	-0.012957	0	0%	320	47	-0.006478	210	66%	110	210
48	-0.012957	0	0%	320	48	-0.006478	208	65%	112	208
49	-0.012957	0	0%	320	49	-0.006478	207	65%	113	207
50	-0.012957	0	0%	320	50	-0.006478	206	64%	114	206

Land Loss Spreadsheet

					Loss Rate Calculation					
Project:					**Beginning Year**	**Ending Year**	**Beginning Year Acreage**	**Ending Year Acreage**	**Loss Rate**	
Total Acres		**TY0 Marsh Acres**		**TY0 Water Acres**	1974	1990	3,770	3,060	-0.012957	
320		0		320	FWP Land Loss Reduction			0.50		
FWOP					**FWP**					
TY	Loss Rate	Marsh (acres)	% Marsh (V1)	Water (acres)	TY	Loss Rate	Marsh (acres)	% Marsh (V1)	Water (acres)	Net Acres of Marsh
0		0	0%	320	0		0	0%	320	0
1	-0.012957	**0**	**0%**	320	**1**	-0.006478	**0**	**0%**	320	0
2	-0.012957	0	0%	320	2	-0.006478	32	10%	288	32
3	-0.012957	0	0%	320	3	-0.006478	32	10%	288	32
4	-0.012957	0	0%	320	4	-0.006478	32	10%	288	32
5	-0.012957	0	0%	320	5	-0.006478	96	30%	224	96
6	-0.012957	0	0%	320	6	-0.006478	96	30%	224	96
7	-0.012957	0	0%	320	7	-0.006478	272	85%	48	272
8	-0.012957	0	0%	320	8	-0.006478	270	84%	50	270
9	-0.012957	0	0%	320	9	-0.006478	268	84%	52	268
10	-0.012957	0	0%	320	10	-0.006478	267	83%	53	267
11	-0.012957	0	0%	320	11	-0.006478	265	83%	55	265
12	-0.012957	0	0%	320	12	-0.006478	263	82%	57	263
13	-0.012957	0	0%	320	13	-0.006478	262	82%	58	262
14	-0.012957	0	0%	320	14	-0.006478	260	81%	60	260
15	-0.012957	0	0%	320	15	-0.006478	258	81%	62	258
16	-0.012957	0	0%	320	16	-0.006478	257	80%	63	257
17	-0.012957	0	0%	320	17	-0.006478	255	80%	65	255
18	-0.012957	0	0%	320	18	-0.006478	253	79%	67	253
19	-0.012957	0	0%	320	19	-0.006478	252	79%	68	252
20	-0.012957	**0**	**0%**	320	**20**	-0.006478	250	**78%**	70	**250**
21	-0.012957	0	0%	320	21	-0.006478	248	78%	72	248
22	-0.012957	0	0%	320	22	-0.006478	247	77%	73	247

23	-0.012957	0	0%	320	23	-0.006478	245	77%	75	245
24	-0.012957	0	0%	320	24	-0.006478	244	76%	76	244
25	-0.012957	0	0%	320	25	-0.006478	242	76%	78	242
26	-0.012957	0	0%	320	26	-0.006478	240	75%	80	240
27	-0.012957	0	0%	320	27	-0.006478	239	75%	81	239
28	-0.012957	0	0%	320	28	-0.006478	237	74%	83	237
29	-0.012957	0	0%	320	29	-0.006478	236	74%	84	236
30	-0.012957	0	0%	320	30	-0.006478	234	73%	86	234
31	-0.012957	0	0%	320	31	-0.006478	233	73%	87	233
32	-0.012957	0	0%	320	32	-0.006478	231	72%	89	231
33	-0.012957	0	0%	320	33	-0.006478	230	72%	90	230
34	-0.012957	0	0%	320	34	-0.006478	228	71%	92	228
35	-0.012957	0	0%	320	35	-0.006478	227	71%	93	227
36	-0.012957	0	0%	320	36	-0.006478	225	70%	95	225
37	-0.012957	0	0%	320	37	-0.006478	224	70%	96	224
38	-0.012957	0	0%	320	38	-0.006478	222	69%	98	222
39	-0.012957	0	0%	320	39	-0.006478	221	69%	99	221
40	-0.012957	0	0%	320	40	-0.006478	219	69%	101	219
41	-0.012957	0	0%	320	41	-0.006478	218	68%	102	218
42	-0.012957	0	0%	320	42	-0.006478	217	68%	103	217
43	-0.012957	0	0%	320	43	-0.006478	215	67%	105	215
44	-0.012957	0	0%	320	44	-0.006478	214	67%	106	214
45	-0.012957	0	0%	320	45	-0.006478	212	66%	108	212
46	-0.012957	0	0%	320	46	-0.006478	211	66%	109	211
47	-0.012957	0	0%	320	47	-0.006478	210	66%	110	210
48	-0.012957	0	0%	320	48	-0.006478	208	65%	112	208
49	-0.012957	0	0%	320	49	-0.006478	207	65%	113	207
50	-0.012957	0	0%	320	50	-0.006478	206	64%	114	206

Beneficial Use Site 52

<u>Beneficial Use (BU) Site 52 (East Palermo)</u>

I. Project Location/Area

This wetland value assessment (WVA) focuses on BU Site 52, called the East Palermo property (Figure 1). This 258-acre area is located near Brown Lake, approximately one mile south of the GIWW and bordered by Highway 27 on the east.

II. Goals

Approximately 726,000 cubic yards of material would be dredged from the Calcasieu Ship Channel (between miles 16 and 21) in one dredging cycle to create a ratio of 85% marsh to 15% shallow open water in the 258-acre area. Approximately 157 acres of intertidal, brackish marsh would be created and 101 acres of existing marsh habitat would be nourished.

III. Project Features

The Brown Lake Hydrologic Restoration project, a CWPPRA project (CS- 09), is proposed for this area; however, final approval has not been accomplished and construction has not been initiated. Therefore, assumptions for future conditions did not consider the affects of this hydrologic restoration project.

Based on USACE knowledge and experience of dredging operations, created cells are approximately 200-300 acres in size. Because the total area of BU Site 52 is only 258 acres, an earthen dike will be constructed around the entire perimeter of the project area one year prior to pumping to confine dredged sediments.

IV. WVA Variables and Assumptions

The following is a description of assumptions created for BU Site 52:

<u>Variable 1 – Emergent Vegetation</u>

Currently, the project area consists of approximately 101 acres of emergent marsh and 157 acres of open water. To determine the percent of emergent marsh the following calculation was used:

> 101 + 157 = 258 total acres
> 101 acres of emergent marsh/258 total acres = .391
> .391 * 100 = 39.1 %
> ≈ 39 % emergent marsh

Marsh loss data was obtained from the Louisiana Coastal Area project report *Coast 2050: Toward a Sustainable Coastal Louisiana* (1998), Appendix F. The loss rate of -0.0045 is used for future-without-project (FWOP). However, for the future-with-project (FWP) scenario, loss rates would apply after the material is pumped and the dike degraded. Marsh created in a confined area would likely differ in some aspects from naturally occurring marsh: it would be slightly higher in elevation than natural marsh, and its density would differ from natural marsh due to consolidation and type of material. Therefore, the loss rate that would be applied would differ as well; it would be reduced by 50% to account for these attributes. Therefore, for FWP, a loss rate of -0.0023 was applied starting the year that the dike would be degraded (TY 12).

FWOP: 39% of the project area is emergent marsh. This marsh is expected to continue to erode at a rate of -0.0045 per year.

TY 0 – 39%
TY 1 – 39%
TY 20 – 36%
TY 50 – 31%

FWP:

To estimate the potential amount of marsh acres that could be created with the dredged material, the CWPPRA Sabine Refuge Marsh Creation (CS-28), Cycle 1 project was used as a reference site. That project created marsh by pumping material into an area confined by earthen dikes. It was found that approximately 4,000 cyds of dredge material created 1 acre of marsh.

The following timeline was used for functional marsh credit:

Marsh Creation	**Nourishment (no plantings)**
TY1 (pump year) – 10%	50%
2 years after pumping – 30%	100%
4 years after pumping – 85%	

TY 0 – 39%
TY 8 – 38%
TY 9 – 43%
TY 11 – 53%
TY 12 – 53%
TY 13 – 88%
TY 20 – 87%
TY 50 – 81%

See Land Loss Spreadsheet for marsh acreage credits by target year.

<u>Variable 2 – Submerged Aquatic Vegetation (SAV)</u>

In the past, this area has experienced higher levels of salt water intrusion causing the marsh to transition from an intermediate marsh to a more brackish marsh. The Crab Gully water control structure is located near BU Site 52 but is not operational. Without any hydrologic restoration to control salinity, the project area will continue to experience salinity spikes and is not expected to support a significant amount of SAV habitat.

FWOP
TY 0 – 0%
TY 1 – 0%
TY 20 – 0%
TY 50 – 0%

FWP:
TY 0 – 0%
TY 8 – 0%
TY 9 – 0%
TY 11 – 0%
TY 12 – 0%
TY 13 – 0%
TY 20 – 0%
TY 50 – 0%

<u>Variable 3 – Interspersion</u>

FWOP: Lower expressions of interspersion, Classes 3 – 5, are characterized by large areas of open water with little surrounding marsh. These interspersion values usually indicate advanced stages of marsh loss. Without marsh restoration efforts, 258-acre project area falls in Class 3. Interspersion classifications are not expected to change within the 50-year project life for FWOP (i.e., marsh will not occur naturally).

FWP: Areas exhibiting a high degree of marsh cover are ranked as having a high degree of dispersion (Class 1 or Class 2). It is assumed that the confined area would achieve a Class 1 once the dredged material is pumped for this cycle because of the ratio of marsh to open water (85% marsh/15% open water). 100% of the project area would fall into Class 1 starting the first year it is pumped (TY 9) and throughout the remainder of the 20-year DMMP project life. Based on landloss rates in the area, BU Site 52 may transition to a Class 3 by TY 50.

Table 1: FWP Interspersion Classification

Target Year	**Class 1**	**%**	**Class 2**	**%**	**Class 3**	**%**
0 (FWOP)					258 ac	100
8					258 ac	100
9 (dike & pump)	258 ac	100				
20	258 ac	100				
50			258	100		

<u>Variable 4 – Shallow Open Water Habitat (i.e., mudflats) (percent of open water </= 1.5 feet)</u>

Shallow water areas are assumed to be more biologically productive than deeper water due to a general reduction in sunlight, oxygen, and temperature as water depth increases. Optimal conditions are expected to occur when 80 to 90 percent of the open water area is less than or equal to l.5 feet deep.

FWOP:

According to aerial photography and hydrologic monitoring stations deployed in the area, BU Site 52 is a very shallow open water area. Therefore, it was assumed that 80% of the 157-acre open water area project area is shallow, or less than or equal to 1.5 feet.

FWOP (TY 0): 80% * 157 acres = 126 acres of open water </= 1.5 ft

FWP:

TY 0 – 80% or same as FWOP
TY 8 – 80%
TY 9 (dike & pump year) – 100%
TY 20 – 80%
TY 50 – 60%

<u>Variable 5 – Salinity</u>

Hydrographic data was downloaded by station number from the Louisiana Department of Natural Resources SONRIS site (accessed July 25, 2008, GEC). All data has been corrected for biofouling, instrument drift, and/or instrument malfunction.

Hourly water salinity records collected during 2003 – 2004 show that average annual salinity for the station located in the project area is 9.1 parts per thousand (ppt).

The salinity is expected to remain constant throughout the life of this project.

<u>Variable 6 – Fish Access</u>

FWOP: A water control structure, known as the Crab Gully Structure, is present just west of Highway 27. The project structure includes an open culvert, resulting in a current access value of 0.5. The access value is expected to remain the same throughout the life of the project.

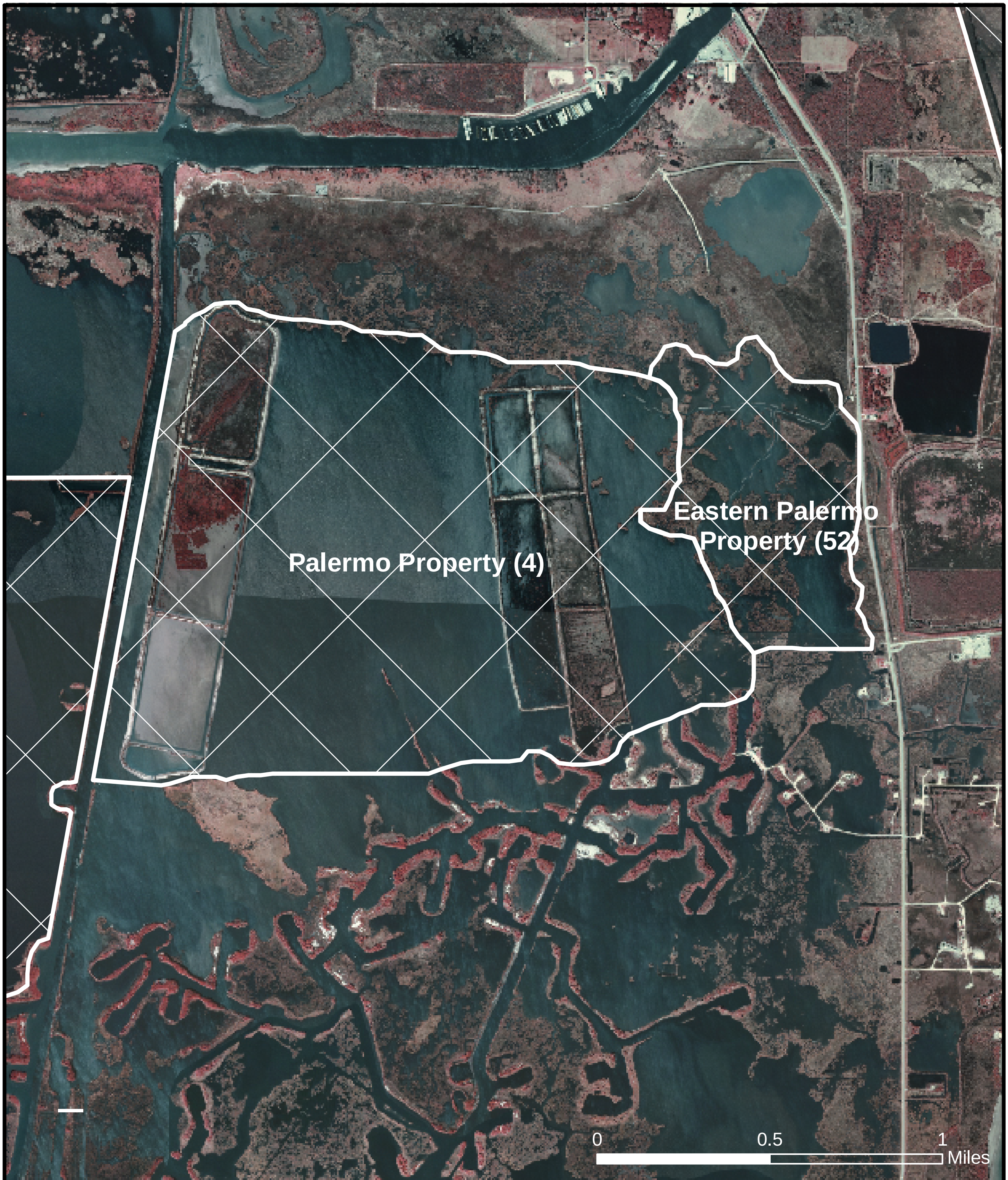
TY 0 – 0.5 (Crab Gully Structure is an open culvert)
TY 1 – 0.5
TY 20 – 0.5
TY 50 – 0.5

FWP: The current access value, as noted previously, is 0.5. During TY 9, the dike would be constructed, resulting in an access value of 0.0001. The access value is expected to remain at 0.0001 until the dike degrades in TY 13. The degree of access would then return to the original value of 0. 5 and remain there throughout the life of the project.

TY 0 – 0.5 (with existing water control structures)

TY 8 – 0.5
TY 9 – 0.0001 (dike & pump year)
TY 11 – 0.0001
TY 12 – 0.5 (dike degradation)

TY 13 – 0.5
TY 20 – 0.5
TY 50 – 0.5



Beneficial Use Sites 4 and 52

Calcasieu River and Pass, Louisiana
Dredged Material Management Plan

USGS DOQQ 2005 WESTLAKE SW 3009354

Figure: 1
Date: August 2007
Scale:1:24,428
Source: USGS/GEC/USACE
Map Author: Moore 27585101-765

WETLAND VALUE ASSESSMENT COMMUNITY MODEL
Brackish Marsh

Project: BU Site 52, Calcasieu DMMP Project Area: 258

Condition: Future Without Project

Variable		TY 0 Value	TY 0 SI	TY 1 Value	TY 1 SI	TY 20 Value	TY 20 SI			
V1	% Emergent	39	0.45	39	0.45	36	0.42			
V2	% Aquatic	0	0.10	0	0.10	0	0.10			
V3	Interspersion	%		%		%				
	Class 1		0.40		0.40		0.40	0	0	0
	Class 2							0	0	0
	Class 3	100		100		100		0.4	0.4	0.4
	Class 4							0	0	0
	Class 5							0	0	0
V4	%OW <= 1.5ft	80	1.00	80	1.00	80	1.00			
V5	Salinity (ppt)	9.1	1.00	9.1	1.00	9.1	1.00			
V6	Access Value	0.50	0.55	0.50	0.55	0.50	0.55			
	Emergent Marsh HSI	**=**	**0.52**	**EM HSI =**	**0.52**	**EM HSI =**	**0.51**			
	Open Water HSI	**=**	**0.33**	**OW HSI =**	**0.33**	**OW HSI =**	**0.33**			

Project: BU Site 52, Calcasieu DMMP
FWOP

Variable		TY 50 Value	TY 50 SI	Value	SI	Value	SI			
V1	% Emergent	31	0.38							
V2	% Aquatic	0	0.10							
V3	Interspersion	%		%		%				
	Class 1		0.40					0	0	0
	Class 2							0	0	0
	Class 3	100						0.4	0	0
	Class 4							0	0	0
	Class 5							0	0	0
V4	%OW <= 1.5ft	80	1.00							
V5	Salinity (ppt)	9.1	1.00							
V6	Access Value	0.50	0.55							
		EM HSI =	**0.37**	**EM HSI =**		**EM HSI =**				
		OW HSI =	**0.26**	**OW HSI =**		**OW HSI =**				

WETLAND VALUE ASSESSMENT COMMUNITY MODEL
Brackish Marsh

Project: BU Site 52, Calcasieu DMMP   Project Area: 258

Condition: Future With Project

Variable		TY 0		TY 8		TY 9 (dike & pump year)				
		Value	SI	Value	SI	Value	SI			
V1	% Emergent	39	0.45	38	0.44	43	0.49			
V2	% Aquatic	0	0.10	0	0.10	0	0.10			
V3	Interspersion	%		%		%				
	Class 1		0.40		0.40	100	1.00	0	0	1
	Class 2							0	0	0
	Class 3	100		100				0.4	0.4	0
	Class 4							0	0	0
	Class 5							0	0	0
V4	%OW <= 1.5ft	80	1.00	80	1.00	100	0.60			
V5	Salinity (ppt)	9.1	1.00	9.1	1.00	9.1	1.00			
V6	Access Value	0.50	0.55	0.50	0.55	0.00	0.10			
	Emergent Marsh HSI =		**0.52**	**EM HSI =**	**0.52**	**EM HSI =**	**0.49**			
	Open Water HSI =		**0.33**	**OW HSI =**	**0.33**	**OW HSI =**	**0.27**			

Project: BU Site 52, Calcasieu DMMP
FWP

Variable		TY 11		TY 12 (dike degraded)		TY 13				
		Value	SI	Value	SI	Value	SI			
V1	% Emergent	53	0.58	53	0.58	88	0.89			
V2	% Aquatic	0	0.10	0	0.10	0	0.10			
V3	Interspersion	%		%		%				
	Class 1	100	1.00	100	1.00	100	0.60	1	1	1
	Class 2							0	0	0
	Class 3							0	0	0
	Class 4							0	0	0
	Class 5							0	0	0
V4	%OW <= 1.5ft	100	0.60	100	0.60	100	0.60			
V5	Salinity (ppt)	9.1	1.00	9.1	1.00	9.1	1.00			
V6	Access Value	0.00	0.10	0.50	0.55	0.50	0.55			
		EM HSI =	**0.52**	**EM HSI =**	**0.67**	**EM HSI =**	**0.80**			
		OW HSI =	**0.27**	**OW HSI =**	**0.35**	**OW HSI =**	**0.32**			

Project: BU Site 52, Calcasieu DMMP
FWP

Variable		TY 20		TY 50						
		Value	SI	Value	SI	Value	SI			
V1	% Emergent	87	0.88	81	0.83					
V2	% Aquatic	0	0.10	0	0.10					
V3	Interspersion	%		%		%				
	Class 1	100	1.00		0.00			1	0	0
	Class 2			100				0	0.6	0
	Class 3							0	0	0
	Class 4							0	0	0
	Class 5							0	0	0
V4	%OW <= 1.5ft	80	1.00	60	0.87					
V5	Salinity (ppt)	9.1	1.00	9.1	1.00					
V6	Access Value	0.50	0.55	0.50	0.55					
		EM HSI =	**0.84**	**EM HSI =**	**0.70**	**EM HSI =**				
		OW HSI =	**0.38**	**OW HSI =**	**0.29**	**OW HSI =**				

Future Without Project			Total	Cummulative
TY	Marsh Acres	x HSI	HUs	HUs
0	101	0.52	52.80	
1	101	0.52	52.80	52.80
20	92	0.51	46.53	943.13
50	81	0.37	29.62	1134.51
			AAHUs =	42.61

Future With Project			Total	Cummulative
TY	Marsh Acres	x HSI	HUs	HUs
0	101	0.52	52.80	
8	97	0.52	50.16	411.81
9	230	0.49	111.58	81.58
11	229	0.52	119.49	231.08
12	229	0.67	152.53	136.01
13	228	0.80	182.01	167.29
20	228	0.84	191.05	1305.71
50	210	0.70	146.50	5685.43
			AAHUs	160.38

NET CHANGE IN AAHUs DUE TO PROJECT	
A. Future With Project Emergent Marsh AAHUs =	160.38
B. Future Without Project Emergent Marsh AAHUs =	42.61
Net Change (FWP - FWOP) =	**117.77**

AAHU CALCULATION - OPEN WATER

Project: BU Site 52, Calcasieu DMMP

Future Without Project			Total	Cummulative
TY	Water Acres	x HSI	HUs	HUs
0	157	0.33	52.06	
1	157	0.33	52.06	52.06
20	166	0.33	55.04	1017.49
50	177	0.26	45.58	1513.46
			AAHUs =	51.66

Future With Project			Total	Cummulative
TY	Water Acres	x HSI	HUs	HUs
0	157	0.33	52.06	
8	161	0.33	53.39	421.79
9	28	0.27	7.57	29.12
11	29	0.27	7.84	15.41
12	29	0.35	10.05	8.94
13	30	0.32	9.50	9.78
20	33	0.38	12.41	89.66
50	48	0.29	14.04	402.97
			AAHUs	19.55

NET CHANGE IN AAHUs DUE TO PROJECT	
A. Future With Project Open Water AAHUs =	19.55
B. Future Without Project Open Water AAHUs =	51.66
Net Change (FWP - FWOP) =	**-32.11**

TOTAL BENEFITS IN AAHUs DUE TO PROJECT	
A. Emergent Marsh Habitat Net AAHUs =	117.77
B. Open Water Habitat Net AAHUs =	-32.11
Net Benefits= (2.6xEMAAHUs+OWAAHUs)/3.6	**76.14**

Land Loss Spreadsheet

Project:	BU Site 52				Loss Rate Calculation: Beginning Year	Ending Year	Beginning Year Acreage	Ending Year Acreage	Loss Rate
Total Acres		TY0 Marsh Acres		TY0 Water Acres	1983	1980			-0.0045
258		101		157	FWP Land Loss Reduction			0.50	

	FWOP				FWP - Created Marsh			FWP - Nourished Marsh			FWP Totals					
					Created Marsh =	133		Nourished Marsh =	101							
TY	FWOP Loss Rate	Marsh (acres)	% Marsh (V1)	Water (acres)	FWP Loss Rate	Created Marsh Acreage	Adjusted Marsh Acreage (10% @ TY10; 30% @ TY12 and 100% @ TY14)	FWP Loss Rate	Nourished Marsh Acreage	Adjusted Marsh Acreage (50% @ TY1 and 100% @ TY3	Water (acres)	Marsh (acres)	% Marsh (V1)	Net Acres of Marsh	Total Acres Check	TY
0		101	39%	157		0			0							0
1	**-0.0045**	**101**	**39%**	**157**	**0**	**0**	**0**	**-0.0045**	**101**	**101**	**157**	**101**	**39%**		**258**	**1**
2	-0.0045	100	39%	158	0	0	0	-0.0045	100	100	158	100	39%		258	2
3	-0.0045	100	39%	158	0	0	0	-0.0045	100	100	158	100	39%		258	3
4	-0.0045	99	38%	159	0	0	0	-0.0045	99	99	159	99	38%		258	4
5	-0.0045	99	38%	159	0	0	0	-0.0045	99	99	159	99	38%	0	258	5
6	-0.0045	98	38%	160	0	0	0	-0.0045	98	98	160	98	38%	0	258	6
7	-0.0045	98	38%	160	0	0	0	-0.0045	98	98	160	98	38%	0	258	7
8	**-0.0045**	**97**	**38%**	**161**	**0**	**0**	**0**	**-0.0045**	**97**	**97**	**161**	**97**	**38%**	**0**	**258**	**8**
9	**-0.0045**	**97**	**38%**	**161**	**0**	**133**	**13**	**0.0000**	**97**	**48**	**28**	**230**	**43%**	**133**	**258**	**9**
10	-0.0045	97	37%	161	0	133	13	0	97	**48**	28	230	43%	133	258	10
11	**-0.0045**	**96**	**37%**	**162**	**0**	**133**	**40**	**0.0000**	**96**	**96**	**29**	**229**	**53%**	**133**	**258**	**11**
12	**-0.0045**	**96**	**37%**	**162**	**-0.00225**	**133**	**40**	**-0.0023**	**96**	**96**	**29**	**229**	**53%**	**133**	**258**	**12**
13	**-0.0045**	**95**	**37%**	**163**	**-0.00225**	**132**	**132**	**-0.0023**	**96**	**96**	**30**	**228**	**88%**	**133**	**258**	**13**
14	-0.0045	95	37%	163	-0.00225	132	132	-0.00225	95	95	30	228	88%	133	258	14
15	-0.0045	94	37%	164	-0.00225	132	132	-0.00225	95	95	31	227	88%	133	258	15
16	-0.0045	94	36%	164	-0.00225	132	132	-0.00225	95	95	31	227	88%	133	258	16
17	-0.0045	94	36%	164	-0.00225	131	131	-0.00225	95	95	32	226	88%	132	258	17
18	-0.0045	93	36%	165	-0.00225	131	131	-0.00225	95	95	32	226	87%	132	258	18
19	-0.0045	93	36%	165	-0.00225	131	131	-0.00225	94	94	33	225	87%	132	258	19
20	**-0.0045**	**92**	**36%**	**166**	**-0.00225**	**130**	**130**	**-0.0023**	**94**	**94**	**33**	**225**	**87%**	**132**	**258**	**20**
21	-0.0045	92	36%	166	-0.00225	130	130	-0.00225	94	94	34	224	87%	132	258	21
22	-0.0045	91	35%	167	-0.00225	130	130	-0.00225	94	94	34	224	87%	132	258	22
23	-0.0045	91	35%	167	-0.00225	129	129	-0.00225	94	94	35	223	86%	132	258	23
24	-0.0045	91	35%	167	-0.00225	129	129	-0.00225	93	93	36	222	86%	132	258	24
25	-0.0045	90	35%	168	-0.00225	129	129	-0.00225	93	93	36	222	86%	132	258	25
26	-0.0045	90	35%	168	-0.00225	129	129	-0.00225	93	93	37	221	86%	132	258	26
27	-0.0045	89	35%	169	-0.00225	128	128	-0.00225	93	93	37	221	86%	132	258	27
28	-0.0045	89	35%	169	-0.00225	128	128	-0.00225	93	93	37	221	85%	131	258	28
29	-0.0045	89	34%	169	-0.00225	128	128	-0.00225	92	92	38	220	85%	131	258	29
30	-0.0045	88	34%	170	-0.00225	127	127	-0.00225	92	92	38	220	85%	131	258	30
31	-0.0045	88	34%	170	-0.00225	127	127	-0.00225	92	92	39	219	85%	131	258	31
32	-0.0045	87	34%	171	-0.00225	127	127	-0.00225	92	92	39	219	85%	131	258	32
33	-0.0045	87	34%	171	-0.00225	127	127	-0.00225	91	91	40	218	85%	131	258	33
34	-0.0045	87	34%	171	-0.00225	126	126	-0.00225	91	91	40	218	84%	131	258	34
35	-0.0045	86	33%	172	-0.00225	126	126	-0.00225	91	91	41	217	84%	131	258	35
36	-0.0045	86	33%	172	-0.00225	126	126	-0.00225	91	91	41	217	84%	131	258	36
37	-0.0045	85	33%	173	-0.00225	125	125	-0.00225	91	91	42	216	84%	131	258	37
38	-0.0045	85	33%	173	-0.00225	125	125	-0.00225	90	90	42	216	84%	131	258	38
39	-0.0045	85	33%	173	-0.00225	125	125	-0.00225	90	90	43	215	83%	130	258	39
40	-0.0045	84	33%	174	-0.00225	125	125	-0.00225	90	90	43	215	83%	130	258	40
41	-0.0045	84	33%	174	-0.00225	124	124	-0.00225	90	90	44	214	83%	130	258	41
42	-0.0045	84	32%	174	-0.00225	124	124	-0.00225	90	90	44	214	83%	130	258	42
43	-0.0045	83	32%	175	-0.00225	124	124	-0.00225	89	89	45	213	83%	130	258	43
44	-0.0045	83	32%	175	-0.00225	123	123	-0.00225	89	89	45	213	82%	130	258	44
45	-0.0045	82	32%	176	-0.00225	123	123	-0.00225	89	89	46	212	82%	130	258	45
46	-0.0045	82	32%	176	-0.00225	123	123	-0.00225	89	89	46	212	82%	130	258	46
47	-0.0045	82	32%	176	-0.00225	123	123	-0.00225	89	89	47	211	82%	130	258	47
48	-0.0045	81	32%	177	-0.00225	122	122	-0.00225	88	88	47	211	82%	129	258	48
49	-0.0045	81	31%	177	-0.00225	122	122	-0.00225	88	88	48	210	82%	129	258	49
50	**-0.0045**	**81**	**31%**	**177**	**-0.00225**	**122**	**122**	**-0.0023**	**88**	**88**	**48**	**210**	**81%**	**129**	**258**	**50**

Beneficial Use in Calcasieu Lake Adjacent to CDF D/E

CDF D/E
Beneficial Use (BU) Expansion Area

I. Project Location/Area

This wetland value assessment (WVA) focuses on the BU expansion area adjacent to CDF D/E. CDF D/E is located adjacent to the eastern side of the Calcasieu Ship Channel between miles 12 to 16. The existing CDF would be expanded east into Calcasieu Lake, with an upland expansion area occupying approximately 293 acres. Adjacent to the upland expansion area, semi-confined intertidal marsh would be created in Calcasieu Lake. The marsh would extend from the edge of the upland expansion to the approximate 3-foot depth contour of Calcasieu Lake and would occupy approximately 466 acres. This area is currently open water.

II. Goals

Approximately 4.1 million cubic yards of material would be dredged from the Calcasieu Ship Channel (between miles 12 and 16) in four pumping cycles to create approximately 466 acres of brackish marsh and estuarine habitat adjacent to CDF D/E in Calcasieu Lake.

III. Project Features

A rock dike would be constructed to contain the dredged material until it has consolidated and wetland vegetation has become established. The rock dike would extend in height above the planned marsh level. During the pumping of dredged material, the material would be allowed to flow throughout the site, and the substrate for the establishment of marsh would form over four pumping cycles: project years 11, 13, 16, and 18. The dike would be opened after the dredged material has stabilized and vegetation has colonized to facilitate water exchange. The intervals and dimensions of the openings would be coordinated with resource agencies.

IV. WVA Variables and Assumptions

Variable 1: Emergent Marsh

FWOP: There is no marsh, only open water.

FWP: A total of 4,132,000 cyds of dredged material will be pumped into this 476-acre confined area. To determine the potential amount of marsh acres that could be created with the dredged material, an average water depth of the area was estimated based on field investigations conducted by GBA, Inc. It was estimated that the average water depth of this BU site is approximately 3-feet deep. Assuming that the cells would be filled initially to 2.5 feet above the water surface, 8,873 cyds would be required to create one acre of marsh. These numbers are estimates. Actual target elevations of placed and consolidated fill at the site would be determined through coordination with resource agencies and the development of geotechnical analyses during the preparation of plans and specifications for the project.

→ 3 + 2.5 = 5.5 ft. * 43,560 sq. ft = 239,580,260 cubic feet / 27 = 8,873 cyds per acre

→ 4,132,000 cyds / 8,873 cyds per acre = 466 acres

Each of the four pump cycles would create about 116.5 acres of marsh

→ 466 acres / 4 = 116.5 acres

Marsh creation assumptions: Based on USACE knowledge and experience of dredging operations, a maximum of 85% of this material will form into vegetated marsh, and the remaining 15% of the area would be shallow open water (also called mudflats). It would take several years for the dredged material to vegetate into marsh; it was assumed that the first year of pumping, the dredged material would create 10% marsh. Two years after pumping, the area would achieve 30% marsh, and four years after pumping, the area would achieve 85% marsh (see Table 1).

Landloss assumptions: It was assumed that three years after the last pump cycle, the dike would be degraded and landloss would begin. Land loss rates within the study area (northern Calcasieu Lake) have averaged 0.2 % per year during 1933 to 1955, 0.78 % per year from 1955 to 1978, 0.2 % per year during 1974 to 1983, and 0.14 % per year during 1983 to 1990 (Dunbar et al. 1992). For this project, the most recent rate--0.14% per year—was applied to the FWP scenario. Please see the attached land loss spreadsheet to see how acreage lost after dike gapping was determined.

Table 1 below shows the marsh creation and landloss acreages based on the above assumptions.

Table 1. Marsh Created by Target (Project) Year

Target (Project) Years	***Marsh Acres***	***Total Marsh Acres***	***% of Area***
TY 10 (same as FWOP)			
0 acres of marsh	0	0	0%
TY 11 (1st pump year; dike constructed):			
Pump 1: 117 x 10%=	12	12	3%
TY 13 (2nd pump year)			
Pump 1: 117 x 30%=	35		
Pump 2: 117 x 10%=	12		
		47	10%
TY 15			
Pump 1: 117 x 85%=	99		
Pump 2: 117 x 30%=	35		
Total		134	29%
TY 16 (3rd pump year)			
Pump 1: 117 x 85%=	99		
Pump 2: 117 x 30%=	35		

Pump 3: 117 x 10%=	12		
Total		146	31%
TY 17			
Pump 1: 117 x 85%=	99		
Pump 2: 117 x 85%=	99		
Pump 3: 117 x 10%=	12		
Total		210	45%
TY 18 (4th pump year)			
Pump 1: 117 x 85%=	99		
Pump 2: 117 x 85%=	99		
Pump 3: 117 x 30%=	35		
Pump 4: 117 x 10%=	12		
Total		245	53%
TY 20			
Pump 1: 117 x 85%=	99		
Pump 2: 117 x 85%=	99		
Pump 3: 117 x 85%=	99		
Pump 4: 117 x 30%=	35		
Total		332	71%
TY 21 (3 years after last pump year: dike degraded and landloss begins)			
Pump 1: 117 x 85%=	99		
Pump 2: 117 x 85%=	99		
Pump 3: 117 x 85%=	99		
Pump 4: 117 x 85%=	99		
Total		396	85%
TY 22			
Pump 1: 117 x 85%=	99		
Pump 2: 117 x 85%=	99		
Pump 3: 117 x 85%=	99		
Pump 4: 117 x 85%=	99		
Total		396	85%
TY 50			
Pump 1:	97		
Pump 2:	97		
Pump 3:	97		
Pump 4:	97	388	83%

Variable 2 – Submerged Aquatic Vegetation (SAV)

This area is not known to support SAVs.

FWOP
TY 0: 0 %
TY 1: 0 %
TY 20: 0 %
TY 50: 0 %

The project area is not expected to support a significant amount of SAV habitat.

FWP:
TY 0 - 18: 0%
TY 20: 0%
TY 50: 0%

<u>Variable 3 – Interspersion</u>

FWOP: The lowest expression of interspersion, Class 5, is characterized by open water and less than 5% of emergent marsh. Without marsh restoration efforts, 100% of the 476-acre project area would falls into Class 5. Interspersion classifications are not expected to change within the 50-year assessment period for FWOP (i.e., marsh will not occur naturally).

FWP: Areas exhibiting a high degree of marsh cover are ranked as having a high degree of dispersion (Class 1 or Class 2).   It is assumed that 100% of the *immediate area that is pumped* (25% of total project area) during each of the four pump years would fall into Class 1 for each of the four pump years and would remain a Class 1 throughout the remainder of the 20-year DMMP project life. By TY 50, the area falls to 83% marsh because of landloss rates. Therefore, in TY 50, the interspersion falls to a Class 2.

Table 2: Interspersion Classification

Target Year	***Interspersion Class***	
0	Class 5: 100%	
10	Class 5: 100%	
11 (pump)	Class 5: 75%	Class 1: 25%
13 (pump)	Class 5: 50%	Class 1: 50%
15	Class 5: 50%	Class 1: 50%
16 (pump)	Class 5: 25%	Class 1: 75%
17	Class 5: 25%	Class 1: 75%
18 (pump)	Class 1: 100%	
20	Class 1: 100%	
21	Class 1: 100%	
22	Class 1: 100%	
50	Class 2: 100%	

<u>Variable 4 – Shallow Open Water Habitat (i.e., mudflats) (percent of open water </= 1.5 feet)</u>

Shallow water areas are assumed to be more biologically productive than deeper water due to a general reduction in sunlight, oxygen, and temperature as water depth increases. Optimal conditions are expected to occur when 80 to 90 percent of the open water area is less than or equal to l.5 feet deep. The BU area of CDF D/E will be built adjacent to the CDF expansion area of CDF D/E more than 500 ft. from the current shoreline. Its lake-side boundary will extend to the existing 3-foot depth contour. It was assumed that most of the BU expansion area in the FWOP scenario would be 2- to 3-feet deep.

In the FWP scenario, it is assumed that water surrounding the areas receiving dredged material would become shallow. Because there are four pump years, it was assumed that shallow open water would increase in 25% increments. In other words, an additional 25% of the total water area would become shallow during each pump year.

FWOP:

(TY 0): 0% * 476ac of open water </= 1.5 ft

FWP:

TY 0 – shallow open water = 0% or same as FWOP
TY 10 – shallow open water = 0% or same as FWOP
TY 11 – Pump year. Shallow open water = 25%
TY 13 – Pump year.. Shallow open water = 50%
TY 15 – Shallow open water = 50%
TY 16 – Pump year. Shallow open water = 75%
TY 17 – Pump year. Shallow open water = 75%
TY 18 – Pump year. Shallow open water = 100%
TY 20 – Pump year. Shallow open water = 100%
TY 21 – Dike degraded. Shallow open water = 80% as trenasses are formed, naturally or mechanically.
TY 22 – Shallow open water = 80%
TY 50 – Shallow open water = 60% As marsh is lost areas become shallow open water and water depths may gradually become deeper.

<u>Variable 5 – Salinity</u>

As part of an oyster resources field investigation conducted by E and E Group, LLC in August of 2007, salinity levels in the lake near the CDF were recorded in the area of CDF D/E using an YSI Model 30 S-C-T Meter. The average salinity was approximately 8.0 ppt.

The salinity is expected to remain constant throughout the life of this project.

<u>Variable 6 – Fish Access</u>

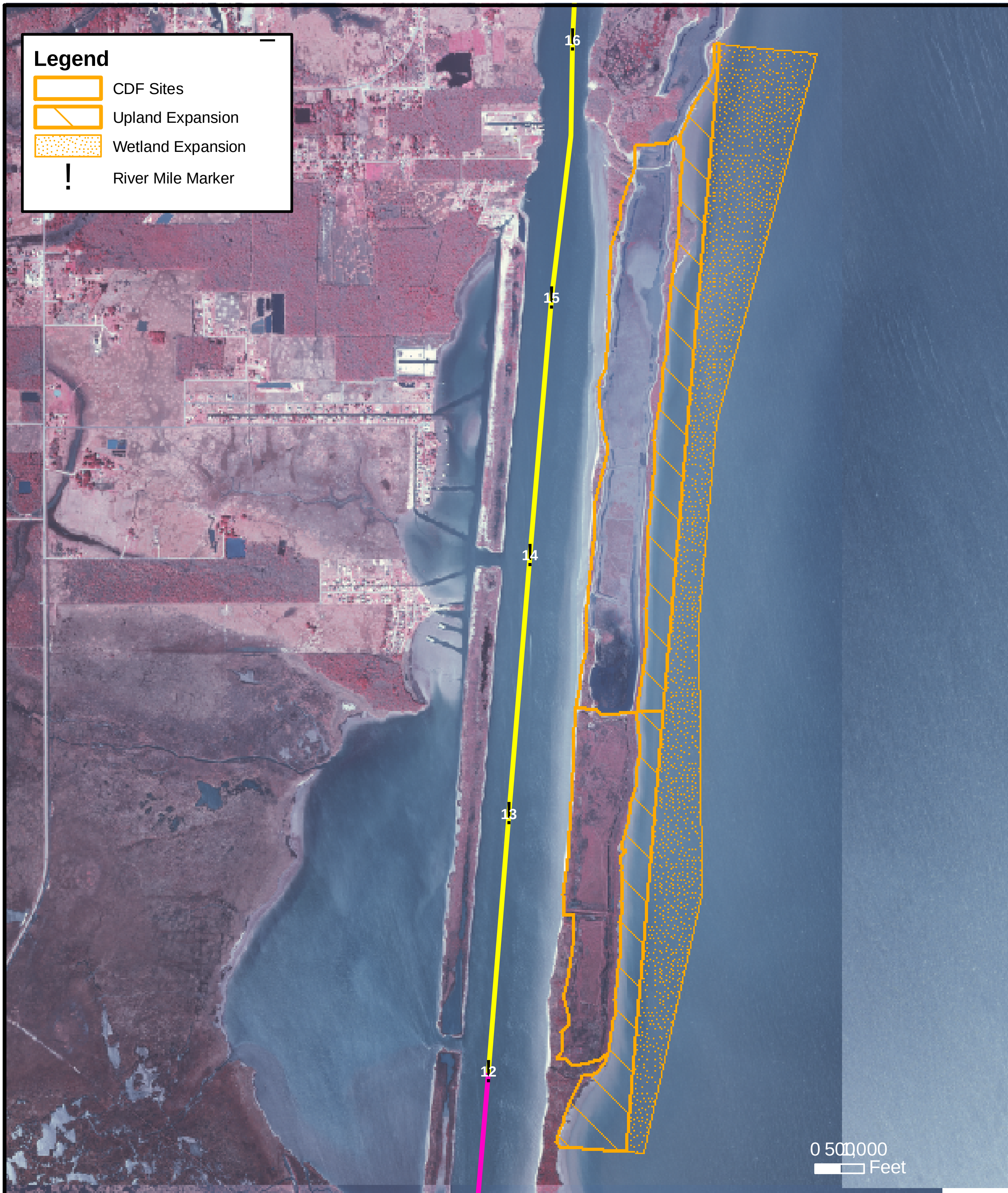
Access by aquatic organisms is considered to be a critical component in assessing the quality of a given marsh system. The suitability index (SI) for this variable is determined by calculating an “access value” based on the percentage of the project area wetlands considered accessible by aquatic organisms during normal tidal flucturations, and the type of man-made structures (if any) across identified points of ingress/egress (e.g., bayous, canals, etc.). A brackish marsh with no access is assigned an SI of .2. A solid plug is assigned an SI of .0001. A completely open system is assigned an SI of 1.0.

FWOP: This area is considered an open system, and is therefore assigned an access value of 1.0.

TY 0: 1.0
TY 1: 1.0
TY 20: 1.0
TY 50: 1.0

FWP: The current access value, as noted previously, is 1.0. During TY 11, the rock dike would be constructed, with a vertical height extending at least 1 foot above the water level, resulting in an access value of 0.0001. The access value is expected to remain at 0.0001 until the dike is gapped in TY 21. The intervals and dimensions of the openings would be coordinated with the resource agencies. The degree of access would increase to a .6 value and would remain there throughout the 50 year assessment period.

TY 0 1.0
TY 10 1.0
TY 11 Rock dike constructed. .0001
TY 12 - 20: .0001
TY 21 Dike is gapped. .6
TY 22 - 50: .6



CDF D/E

Calcasieu River and Pass, Louisiana
Dredged Material Management Plan

USGS DOQQ 2005 WESTLAKE SW 3009354

Figure: 1
Date: August 2007
Scale:1:32,930
Source: USGS/GEC/USACE
Map Author: Moore 27585101-765

Target Year Determination:

2 years after pumping: 30% marsh, 4 years after pumping: 85% marsh

Target Years			**% of area**
TY 10 (Rock dike constructed):			
0 acres of marsh	0	0	0%
TY 11 (1st pump year):			
Pump 1: 117 x .10=	12	12	3%
TY 13 (2nd pump year)			
Pump 1: 117 x .30=	35		
Pump 2: 117 x .10=	12		
		47	10%
TY 15			
Pump 1: 117 x .85=	99		
Pump 2: 117 x .30=	35		
		134	29%
TY 16 (3rd pump year)			
Pump 1: 117 x .85=	99		
Pump 2: 117 x .30=	35		
Pump 3: 117 x .10=	12		
		146	31%
TY 17			
Pump 1: 117 x .85=	99		
Pump 2: 117 x .85=	99		
Pump 3: 117 x .10=	12		
		210	45%
TY 18 (4th pump year)			
Pump 1: 117 x .85=	99		
Pump 2: 117 x .85=	99		
Pump 3: 117 x .30=	35		
Pump 4: 117 x .10=	12		
		245	53%
TY 20			
Pump 1: 117 x .85=	99		
Pump 2: 117 x .85=	99		
Pump 3: 117 x .85=	99		
Pump 4: 117 x .30=	35		
		332	71%
TY 21 (3 years after last pump year: dike degraded and landloss begins)			
Pump 1: 117 x .85=	99		
Pump 2: 117 x .85=	99		
Pump 3: 117 x .85=	99		
Pump 4: 117 x .85=	99		
TY 22		396	85%
Pump 1: 117 x .85=	99		
Pump 2: 117 x .85=	99		
Pump 3: 117 x .85=	99		

Pump 4: 117 x .85=	99		
		396	85%
TY 50			
Pump 1:	97		
Pump 2:	97		
Pump 3:	97		
Pump 4:	97		
		388	83%

WETLAND VALUE ASSESSMENT COMMUNITY MODEL
Brackish Marsh

Project: CDF D/E Beneficial Use Expanded Area, Calcasieu DMMP   Project Area: 466

Condition: Future Without Project

Variable		TY 0		TY 1		TY 20	
		Value	SI	Value	SI	Value	SI
V1	% Emergent	0	0.10	0	0.10	0	0.10
V2	% Aquatic	0	0.10	0	0.10	0	0.10
V3	Interspersion	%		%		%	
	Class 1		0.10		0.10		0.10
	Class 2						
	Class 3						
	Class 4						
	Class 5	100		100		100	
V4	%OW <= 1.5ft	0	0.10	0	0.10	0	0.10
V5	Salinity (ppt)	8	1.00	8	1.00	8	1.00
V6	Access Value	1.00	1.00	1.00	1.00	1.00	1.00
	Emergent Marsh HSI	=	0.25	EM HSI =	0.25	EM HSI =	0.25
	Open Water HSI	=	0.28	OW HSI =	0.28	OW HSI =	0.28

Project: CDF D/E Beneficial Use Expanded Area, Calcasieu DMMP
FWOP

Variable		TY 50					
		Value	SI	Value	SI	Value	SI
V1	% Emergent	0	0.10				
V2	% Aquatic	0	0.10				
V3	Interspersion	%		%		%	
	Class 1		0.10				
	Class 2						
	Class 3						
	Class 4						
	Class 5	100					
V4	%OW <= 1.5ft	0	0.10				
V5	Salinity (ppt)	8	1.00				
V6	Access Value	1.00	1.00				
		EM HSI =	0.25	EM HSI =		EM HSI =	
		OW HSI =	0.28	OW HSI =		OW HSI =	

Project: CDF D/E Beneficial Use Expanded Area, Calcasieu DMMP Project Area: 466

Condition: Future With Project

Variable		TY 0		TY 10		TY 11 Dike, 1st Pump	
		Value	SI	Value	SI	Value	SI
V1	% Emergent	0	0.10	0	0.10	3	0.13
V2	% Aquatic	0	0.10	0	0.10	0	0.10
V3	Interspersion	%		%		%	
	Class 1		0.10		0.10	25	0.33
	Class 2						
	Class 3						
	Class 4						
	Class 5	100		100		75	
V4	%OW <= 1.5ft	0	0.10	0	0.10	25	0.42
V5	Salinity (ppt)	8	1.00	8	1.00	8	1.00
V6	Access Value	1.00	1.00	1.00	1.00	0.00	0.10
	Emergent Marsh HSI	**=**	**0.25**	**EM HSI =**	**0.25**	**EM HSI =**	**0.24**
	Open Water HSI	**=**	**0.28**	**OW HSI =**	**0.28**	**OW HSI =**	**0.21**

Project: CDF D/E Beneficial Use Expanded Area, Calcasieu DMMP

FWP

Variable		TY 13 Second Pump		TY 15		TY 16 Third Pump	
		Value	SI	Value	SI	Value	SI
V1	% Emergent	10	0.19	29	0.36	31	0.38
V2	% Aquatic	0	0.10	0	0.10	0	0.10
V3	Interspersion	%		%		%	
	Class 1	50	0.55	50	0.55	75	0.60
	Class 2						
	Class 3						
	Class 4						
	Class 5	50		50		25	
V4	%OW <= 1.5ft	50	0.74	50	0.74	75	1.00
V5	Salinity (ppt)	8	1.00	8	1.00	8	1.00
V6	Access Value	0.00	0.10	0.00	0.10	0.00	0.10
		EM HSI =	**0.30**	**EM HSI =**	**0.38**	**EM HSI =**	**0.39**
		OW HSI =	**0.25**	**OW HSI =**	**0.25**	**OW HSI =**	**0.27**

Project: CDF D/E Beneficial Use Expanded Area, Calcasieu DMMP
FWP

Variable		TY 17		TY 18 Fourth Pump		TY 20	
		Value	SI	Value	SI	Value	SI
V1	% Emergent	45	0.51	53	0.58	71	0.74
V2	% Aquatic	0	0.10	0	0.10	0	0.10
V3	Interspersion	%		%		%	
	Class 1	75	0.78	100	1.00	100	1.00
	Class 2						
	Class 3						
	Class 4						
	Class 5	25					
V4	%OW <= 1.5ft	75	1.00	100	0.60	100	0.60
V5	Salinity (ppt)	8	1.00	8	1.00	8	1.00
V6	Access Value	0.00	0.10	0.00	0.10	0.00	0.10
		EM HSI =	0.47	EM HSI =	0.52	EM HSI =	0.58
		OW HSI =	0.28	OW HSI =	0.27	OW HSI =	0.27

1/11/2009

Project: CDF D/E Beneficial Use Expanded Area, Calcasieu DMMP
FWP

Variable		TY 21		TY 22		TY 50	
		Value	SI	Value	SI	Value	SI
V1	% Emergent	85	0.87	85	0.87	83	0.85
V2	% Aquatic	0	0.10	0	0.10	0	0.10
V3	Interspersion Class 1 Class 2 Class 3 Class 4 Class 5	% 100	0.00	% 100	0.00	% 100	0.00
V4	%OW <= 1.5ft	80	1.00	80	1.00	60	0.87
V5	Salinity (ppt)	8	1.00	8	1.00	8	1.00
V6	Access Value	0.60	0.64	0.60	0.64	0.60	0.64
		EM HSI =	0.74	EM HSI =	0.74	EM HSI =	0.73
		OW HSI =	0.31	OW HSI =	0.31	OW HSI =	0.30

AAHU CALCULATION - MARSH

Future Without Project			Total	Cummulative
TY	Marsh Acres	x HSI	HUs	HUs
0	0	0.25	0.00	
1	0	0.25	0.00	0.00
20	0	0.25	0.00	0.00
50	0	0.25	0.00	0.00
			AAHUs =	**0.00**

Future With Project			Total	Cummulative
TY	Marsh Acres	x HSI	HUs	HUs
0	0	0.25	0.00	
10	0	0.25	0.00	0.00
11	12	0.24	2.89	1.47
13	47	0.30	14.09	16.29
15	134	0.38	51.06	62.79
16	146	0.39	57.61	54.31
17	210	0.47	98.19	77.12
18	245	0.52	127.83	112.70
20	332	0.58	194.08	320.09
21	396	0.74	292.53	1022.16
22	396	0.74	292.53	292.53
50	388	0.73	282.71	8052.95
			AAHUs	**200.25**

NET CHANGE IN AAHUs DUE TO PROJECT	
A. Future With Project Emergent Marsh AAHUs =	200.25
B. Future Without Project Emergent Marsh AAHUs =	0.00
Net Change (FWP - FWOP) =	**200.25**

1/11/2009

AAHU CALCULATION - OPEN WATER

Project: CDF D/E Beneficial Use Expanded Area, Calcasieu DMMP

Future Without Project			Total	Cummulative
TY	Water Acres	x HSI	HUs	HUs
0	466	0.28	132.46	
1	466	0.28	132.46	132.46
20	466	0.28	132.46	2516.82
50	466	0.28	132.46	3973.92
			AAHUs =	**132.46**

Future With Project			Total	Cummulative
TY	Water Acres	x HSI	HUs	HUs
0	466	0.28	132.46	
10	466	0.28	132.46	1324.64
11	367	0.21	76.03	102.97
13	250	0.25	62.03	139.63
15	250	0.25	62.03	124.06
16	134	0.27	36.23	49.57
17	134	0.28	37.96	37.09
18	134	0.27	36.25	37.11
20	70	0.27	18.90	55.15
21	70	0.31	21.78	20.34
22	70	0.31	21.78	21.78
50	78	0.30	23.56	635.12
			AAHUs	**50.95**

Don't use landloss spreads
It's not right. Calculate it o

NET CHANGE IN AAHUs DUE TO PROJECT	
A. Future With Project Open Water AAHUs =	50.95
B. Future Without Project Open Water AAHUs =	132.46
Net Change (FWP - FWOP) =	**-81.51**

1/11/2009

TOTAL BENEFITS IN AAHUs DUE TO PROJECT	
A. Emergent Marsh Habitat Net AAHUs =	200.25
B. Open Water Habitat Net AAHUs =	-81.51
Net Benefits= (2.6xEMAAHUs+OWAAHUs)/3.6	**121.98**

Land Loss Spreadsheet - CDF D/E

					Loss Rate Calculation				
Project:	CDF				**Beginning Year**	**Ending Year**	**Beginning Year Acreage**	**Ending Year Acreage**	**Loss Rate**
Total Acres		**TY0 Marsh Acres**		**TY0 Water Acres**	1983	1990			-0.0014
117		0		117	FWP Land Loss Reduction			0.50	

FWOP					**FWP**					
TY	Loss Rate	Marsh (acres)	% Marsh (V1)	Water (acres)	TY	Loss Rate	Marsh (acres)	% Marsh (V1)	Water (acres)	Net Acres of Marsh
0		0	0%	117	0		0	0%	117	0
1	-0.0014	**0**	**0%**	117	**1**	-0.0007	**0**	**0%**	117	0
2	-0.0014	0	0%	117	2	-0.0007	0	0%	117	0
3	-0.0014	0	0%	117	3	-0.0007	0	0%	117	0
4	-0.0014	0	0%	117	4	-0.0007	0	0%	117	0
5	-0.0014	0	0%	117	5	-0.0007	0	0%	117	0
6	-0.0014	0	0%	117	6	-0.0007	0	0%	117	0
7	-0.0014	0	0%	117	7	-0.0007	0	0%	117	0
8	-0.0014	0	0%	117	8	-0.0007	0	0%	117	0
9	-0.0014	0	0%	117	9	-0.0007	0	0%	117	0
10	-0.0014	0	0%	117	10	-0.0007	0	0%	117	0
11	-0.0014	0	0%	117	11	-0.0007	0	0%	117	0
12	-0.0014	0	0%	117	12	-0.0007	0	0%	117	0
13	-0.0014	0	0%	117	13	-0.0007	0	0%	117	0
14	-0.0014	0	0%	117	14	-0.0007	0	0%	117	0
15	-0.0014	0	0%	117	15	-0.0007	0	0%	117	0
16	-0.0014	0	0%	117	16	-0.0007	0	0%	117	0
17	-0.0014	0	0%	117	17	-0.0007	0	0%	117	0
18	-0.0014	0	0%	117	18	-0.0007	0	0%	117	0
19	-0.0014	0	0%	117	19	-0.0007	0	0%	117	0
20	-0.0014	**0**	**0%**	117	**20**	-0.0007	**0**	**0%**	117	**0**
21	-0.0014	0	0%	117	21	-0.0007	99	85%	18	99
22	-0.0014	0	0%	117	22	-0.0007	99	85%	18	99
23	-0.0014	0	0%	117	23	-0.0007	99	85%	18	99
24	-0.0014	0	0%	117	24	-0.0007	99	85%	18	99
25	-0.0014	0	0%	117	25	-0.0007	99	85%	18	99
26	-0.0014	0	0%	117	26	-0.0007	99	85%	18	99
27	-0.0014	0	0%	117	27	-0.0007	99	85%	18	99
28	-0.0014	0	0%	117	28	-0.0007	99	85%	18	99
29	-0.0014	0	0%	117	29	-0.0007	98	85%	18	98
30	-0.0014	0	0%	117	30	-0.0007	98	84%	18	98
31	-0.0014	0	0%	117	31	-0.0007	98	84%	18	98
32	-0.0014	0	0%	117	32	-0.0007	98	84%	18	98
33	-0.0014	0	0%	117	33	-0.0007	98	84%	18	98
34	-0.0014	0	0%	117	34	-0.0007	98	84%	18	98
35	-0.0014	0	0%	117	35	-0.0007	98	84%	18	98
36	-0.0014	0	0%	117	36	-0.0007	98	84%	19	98
37	-0.0014	0	0%	117	37	-0.0007	98	84%	19	98
38	-0.0014	0	0%	117	38	-0.0007	98	84%	19	98
39	-0.0014	0	0%	117	39	-0.0007	98	84%	19	98
40	-0.0014	0	0%	117	40	-0.0007	98	84%	19	98
41	-0.0014	0	0%	117	41	-0.0007	98	84%	19	98
42	-0.0014	0	0%	117	42	-0.0007	98	84%	19	98
43	-0.0014	0	0%	117	43	-0.0007	97	84%	19	97
44	-0.0014	0	0%	117	44	-0.0007	97	84%	19	97
45	-0.0014	0	0%	117	45	-0.0007	97	84%	19	97
46	-0.0014	0	0%	117	46	-0.0007	97	84%	19	97
47	-0.0014	0	0%	117	47	-0.0007	97	83%	19	97
48	-0.0014	0	0%	117	48	-0.0007	97	83%	19	97
49	-0.0014	0	0%	117	49	-0.0007	97	83%	19	97
50	-0.0014	0	0%	117	50	-0.0007	97	83%	19	97

Confined Disposal Facility
Site 17/19

Confined Disposal Facility (CDF) 17/19
Expansion Area

I. Project Location/Area

CDFs 17 and 19 are located adjacent to the eastern side of the Calcasieu Ship Channel between miles 18 to 20. The existing CDFs would be incorporated into a single CDF and expanded east into Calcasieu Lake and west along the channel to straighten out the eroded shoreline. The expanded area would occupy approximately 218 acres. The expanded area is mostly water but includes approximately 61 acres of marsh.

II. Goals

This WVA will assess the impacts of filling in the 218-acre expansion area with dredged material. Approximately 1.9 million cubic yards of material would be dredged and placed in the approximately 218-acre expanded area of CDF 17/19, thereby converting the area to an upland habitat.

III. Project Features

The possible expansion of this CDF site would occur toward the end of the 20-year DMMP if needed. It was assumed that this area would be diked in TY 17 and pumped in TY 18. The containment dike would be approximately 250-feet wide and would be built along the perimeter of the expansion area. The actual width of the dike would be determined during the plans and specifications phase of the project.

IV. WVA Variables and Assumptions

The following is a description of assumptions for CDF 17/19:

Variable 1 – Emergent Vegetation

FWOP:

Currently, the assessment area consists of approximately 61 acres of emergent marsh. The rest of the expanded area (157 acres) is open water in Calcasieu Lake.

Land loss rates within the study area (northern Calcasieu Lake) have averaged 0.2 % per year during 1933 to 1955, 0.78 % per year from 1955 to 1978, 0.2 % per year during 1974 to 1983, and 0.14 % per year during 1983 to 1990 (Dunbar et al. 1992). For this project, the most recent rate--0.14% per year—was applied to the FWOP scenario.

TY 0 – 28%
TY 1 – 28%
TY 20 – 27%

TY 50 – 26%

FWP:

ArcGIS was used to find out impacts of the containment features around the perimeter of the proposed expansion area. Approximately 28 acres of marsh would be impacted by the containment features during the dike construction year (TY 17), leaving 33 acres of existing marsh that year (15% of the area). After the containment features are built, the area would be pumped with dredged material and there would be no marsh.

TY 0 – 28%
TY 16 – 28%
TY 17 – (dike construction) – 15%
TY 18 – (pump year) – 0%
TY 20 – 0%
TY 50 – 0%

<u>Variable 2 – Submerged Aquatic Vegetation (SAV)</u>

No SAVs have been observed or are expected to occur within the area.

FWOP:
TY 0 – 0%
TY 5 – 0 %
TY 20 – 0 %
TY 50 – 0 %

FWP:
TY 1 – 0%
TY 16 – 0%
TY 17 – (dike construction) – 0%
TY 18 – (pump year) – 0%
TY 20 – 0%
TY 50 – 0%

<u>Variable 3 – Interspersion</u>

FWOP: Areas exhibiting a high degree of marsh cover and interspersion are assumed to be optimal (Class 1 and Class 2). It is assumed that the marsh that currently exists in the expansion area of CDF 17/19 is a Class 2 because of the numerous small marsh ponds that are common to the area. However, these ponds may also be indicative of the beginning stages of marsh degradation. Because land loss rates are relatively low within the Calcasieu Lake area (0.14%), this area should maintain a Class 2 interspersion throughout the life of the project and beyond. The open water area makes up 72% of the total impact area and is classified as a Class 5.

FWP: The year that the area is diked, the marsh makes up 15% of the area and is classified as a Class 2 interspersion. Once pumped, the existing marsh habitat would be filled in with dredged material and undergo an active crust management program, whereby the evaporation of moisture and consolidation of material would be maximized to increase the available site capacity. The dredged material would become entirely crust. Therefore, this area would receive 0 credit for marsh interspersion starting the year it is pumped (TY 18).

Table 1: FWP Interspersion Classification

Target Year	Class 2	%	Class 5	%
0 (FWOP)	61 ac	28	157 ac	72
16 (FWOP)	61 ac	28		
17 (dike)	61 ac	15	157 ac	85
18 (pump)	0 ac	0	0 ac	0
20	0 ac	0	0 ac	0

<u>Variable 4 – Shallow Open Water Habitat (i.e., mudflats) (percent of open water </= 1.5 feet)</u>

Shallow water areas are assumed to be more biologically productive than deeper water due to a general reduction in sunlight, oxygen, and temperature as water depth increases. Optimal conditions are expected to occur when 80 to 90 percent of the open water area is less than or equal to l.5 feet deep.

FWOP:

Based on spot water depth data obtained from E and E Group, LLC in August of 2007 for the DMMP Oyster Assessment, it was assumed that approximately 70% of the open water area of the expansion site is shallow.

FWOP: 70% of open water </= 1.5 ft

FWP:

The existing marsh habitat would be filled in with dredged material and undergo an active crust management program, whereby the evaporation of moisture and consolidation of material would be maximized to increase the available site capacity. Therefore, starting the year that the material is pumped into the existing marsh, the site would receive 0 credit for providing shallow open water habitat.

TY 0 – shallow open water = 70% or same as FWOP
TY 16 -- shallow open water = 70% or same as FWOP
TY 17 – dike construction = 70% or same as FWOP
TY 18 – pump year = 0%
TY 20 – project end = 0%
TY 50 – 0%

Variable 5 – Salinity

As part of an oyster resources field investigation conducted by E and E Group, LLC in August of 2007, salinity levels in the lake near the CDF were recorded in the area of CDF 17/19 using an YSI Model 30 S-C-T Meter. The average salinity was approximately 8.4 ppt.

FWOP: The salinity is expected to remain constant throughout the life of this project.

FWP: The expanded CDF would be managed by providing drainage for precipitation and water released by excess pore water pressure. Therefore, this variable would not be applicable.

Variable 6 – Fish Access

FWOP: Optimal aquatic organism access is assumed to exist when the area is accessible and the access points are entirely open and unobstructed. CDF 17/19 has a high degree of access and hydrologic connectivity with adjacent systems. Therefore, this open system is assumed to have an access value of 1.0. The access value is expected to remain the same throughout the life of the project.

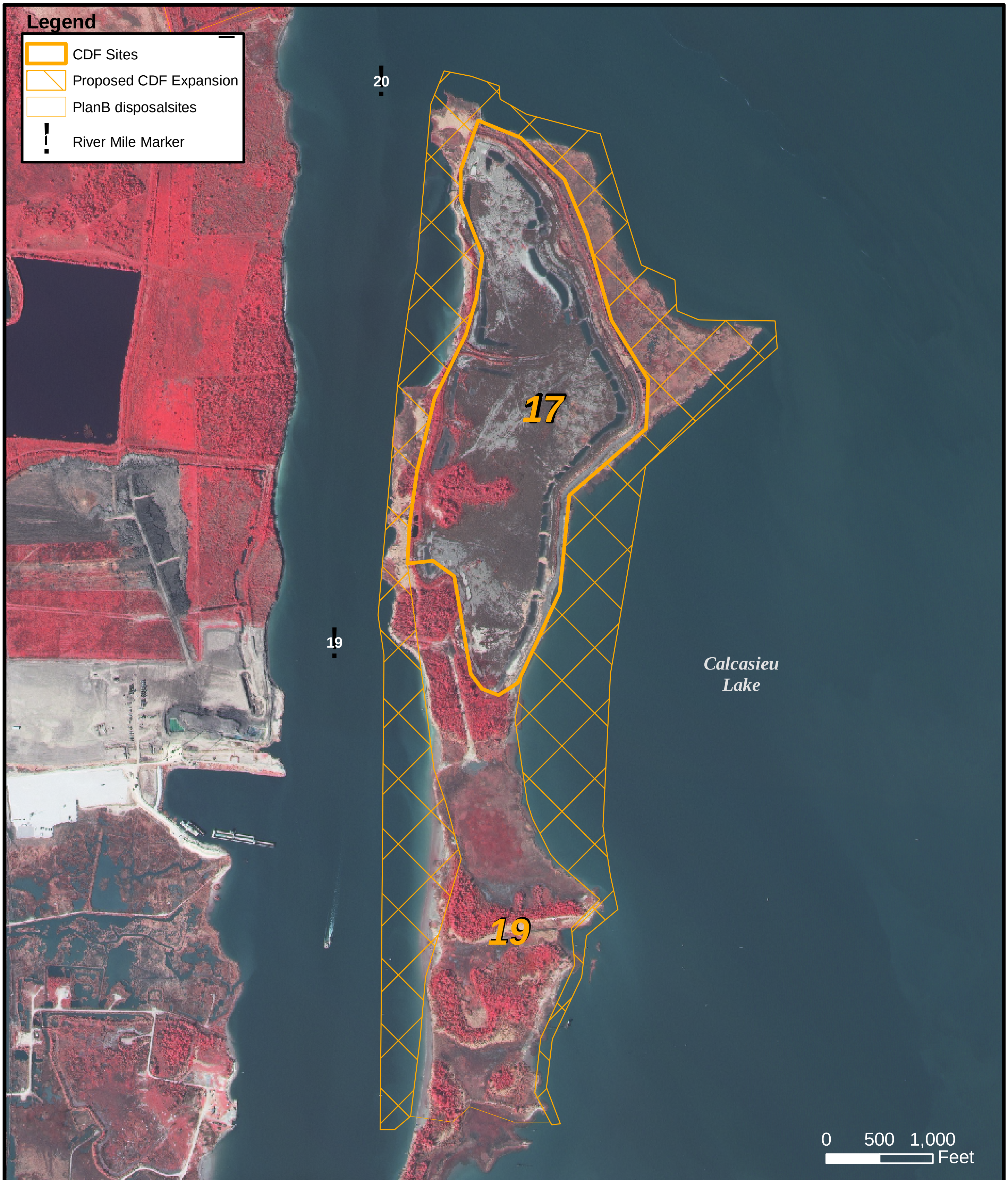
TY 0 1.0
TY 1 1.0
TY 20 1.0
TY 50 1.0

FWP: The current access value of CDF 17/19 is 1.0. During TY 15, a rock dike would be constructed along both the channel side and lake side of this CDF in order to straighten the shorelines and facilitate site management. the dike would be constructed, resulting in an access value of 0.0001. The access value is expected to go to 0.0001 the year the dike is constructed and remain there throughout the life of the project and beyond.

TY 0 1.0
TY 16 1.0
TY 17 (dike construction): .0001
TY 18 (pumping year): N/A
TY 20 (end of project): N/A
TY 50 N/A

V. References

Dunbar, J. B., L. D. Britsch, and E. B Kemp III. 1992. Land Loss Rates; Report 3, Louisiana Coastal Plain. Technical Report No. GL-90-2, U.S. Army Engineer District, New Orleans. 28 pp. plus Appendices.



CDFs 17 AND 19
PROPOSED EXPANSION AREA FOR PLAN B

Calcasieu River and Pass, Louisiana
Dredged Material Management Plan

USGS DOQQ 2005 MOSS LAKE SW 3009362

GEC

Figure: 1
Date: January 2009
Scale:1:15,000
Source: USGS/GEC/USACE
Map Author: Moore 27585101-765

WETLAND VALUE ASSESSMENT COMMUNITY MODEL
Brackish Marsh

Project: Upland expansion, CDF 17/19 — Project Area: 218

Condition: Future Without Project

Variable		TY 0 Value	TY 0 SI	TY 1 Value	TY 1 SI	TY 20 Value	TY 20 SI			
V1	% Emergent	28	0.35	28	0.35	27	0.34			
V2	% Aquatic	0	0.10	0	0.10	0	0.10			
V3	Interspersion	%		%		%				
	Class 1		0.24		0.24		0.24	0	0	0
	Class 2	28		28		28		0.6	0.6	0.6
	Class 3							0	0	0
	Class 4							0	0	0
	Class 5	72		72		72		0.1	0.1	0.1
V4	%OW <= 1.5ft	70	1.00	70	1.00	70	1.00			
V5	Salinity (ppt)	8.4	1.00	8.4	1.00	8.4	1.00			
V6	Access Value	1.00	1.00	1.00	1.00	1.00	1.00			
	Emergent Marsh HSI	**=**	**0.49**	**EM HSI =**	**0.49**	**EM HSI =**	**0.48**			
	Open Water HSI	**=**	**0.36**	**OW HSI =**	**0.36**	**OW HSI =**	**0.36**			

Project: Upland expansion, CDF 17/19

FWOP

Variable		TY 50								
		Value	SI	Value	SI	Value	SI			
V1	% Emergent	26	0.33							
V2	% Aquatic	0	0.10							
V3	Interspersion	%		%		%				
	Class 1		0.24					0	0	0
	Class 2	28						0.6	0	0
	Class 3							0	0	0
	Class 4							0	0	0
	Class 5	72						0.1	0	0
V4	%OW <= 1.5ft	70	1.00							
V5	Salinity (ppt)	8.4	1.00							
V6	Access Value	1.00	1.00							
		EM HSI =	0.47	EM HSI =		EM HSI =				
		OW HSI =	0.36	OW HSI =		OW HSI =				

Project: Upland expansion, CDF 17/19 Project Area: 218

Condition: Future With Project

Variable		TY 0		TY 16		TY 17 Dike built				
		Value	SI	Value	SI	Value	SI			
V1	% Emergent	28	0.35	28	0.35	15	0.00			
V2	% Aquatic	0	0.10	0	0.10	0	0.00			
V3	Interspersion	%		%		%				
	Class 1		0.24		0.24		0.00	0	0	0
	Class 2	28		28		15		0.6	0.6	0.6
	Class 3							0	0	0
	Class 4							0	0	0
	Class 5	72		72		85		0.1	0.1	0.1
V4	%OW <= 1.5ft	70	1.00	70	1.00	70	0.00			
V5	Salinity (ppt)	8.4	1.00	8.4	1.00	8.4	0.00			
V6	Access Value	1.00	1.00	1.00	1.00	0.00	0.00			
	Emergent Marsh HSI	**=**	**0.49**	**EM HSI =**	**0.49**	**EM HSI =**	**0.00**			
	Open Water HSI	**=**	**0.36**	**OW HSI =**	**0.36**	**OW HSI =**	**0.00**			

Project: Upland expansion, CDF 17/19

FWP

Variable		TY 18 Value	TY 18 SI	TY 20 Value	TY 20 SI	TY 50 Value	TY 50 SI			
V1	% Emergent	0	0.00	0	0.00	0	0.00			
V2	% Aquatic	0	0.00	0	0.00	0	0.00			
V3	Interspersion	%		%		%				
	Class 1		0.00		0.00		0.00	0	0	0
	Class 2	0		0		0		0	0	0
	Class 3							0	0	0
	Class 4							0	0	0
	Class 5							0	0	0
V4	%OW <= 1.5ft	0	0.00	0	0.00	0	0.00			
V5	Salinity (ppt)	0	0.00	0	0.00	0	0.00			
V6	Access Value	0.00	0.00	0.00	0.00	0.00	0.00			
		EM HSI =	**0.00**	**EM HSI =**	**0.00**	**EM HSI =**	**0.00**			
		OW HSI =	**0.00**	**OW HSI =**	**0.00**	**OW HSI =**	**0.00**			

AAHU CALCULATION - MARSH

Future Without Project			Total	Cummulative
TY	Marsh Acres	x HSI	HUs	HUs
0	61	0.49	29.66	
1	61	0.49	29.66	29.66
20	59	0.48	28.28	550.31
50	57	0.47	26.92	827.96
			AAHUs =	**28.16**

Future With Project			Total	Cummulative
TY	Marsh Acres	x HSI	HUs	HUs
0	61	0.49	29.66	
16	60	0.49	29.17	470.59
17	33	0.00	0.00	12.40
18	0	0.00	0.00	0.00
20	0	0.00	0.00	0.00
50	0	0.00	0.00	0.00
			AAHUs	**9.66**

NET CHANGE IN AAHUs DUE TO PROJECT	
A. Future With Project Emergent Marsh AAHUs =	9.66
B. Future Without Project Emergent Marsh AAHUs =	28.16
Net Change (FWP - FWOP) =	**-18.50**

AAHU CALCULATION - OPEN WATER

Project: Upland expansion, CDF 17/19

Future Without Project			Total	Cummulative
TY	Water Acres	x HSI	HUs	HUs
0	157	0.36	56.72	
1	157	0.36	56.72	56.72
20	159	0.36	57.45	1084.61
50	161	0.36	58.17	1734.22
			AAHUs =	57.51

Future With Project			Total	Cummulative
TY	Water Acres	x HSI	HUs	HUs
0	157	0.36	56.72	
16	158	0.36	57.08	910.46
17	45	0.00	0.00	21.74
18	0	0.00	0.00	0.00
20	0	0.00	0.00	0.00
50	0	0.00	0.00	0.00
			AAHUs	18.64

NET CHANGE IN AAHUs DUE TO PROJECT	
A. Future With Project Open Water AAHUs =	18.64
B. Future Without Project Open Water AAHUs =	57.51
Net Change (FWP - FWOP) =	**-38.87**

TOTAL BENEFITS IN AAHUs DUE TO PROJECT	
A. Emergent Marsh Habitat Net AAHUs =	-18.50
B. Open Water Habitat Net AAHUs =	-38.87
Net Benefits= (2.6xEMAAHUs+OWAAHUs)/3.6	**-24.16**

Land Loss Spreadsheet - CDF 17/19

					Loss Rate Calculation				
Project:					**Beginning Year**	**Ending Year**	**Beginning Year Acreage**	**Ending Year Acreage**	**Loss Rate**
Total Acres		**TY0 Marsh Acres**		**TY0 Water Acres**	1983	1990			-0.0014
218		61		157	FWP Land Loss Reduction				

FWOP					FWP					
TY	Loss Rate	Marsh (acres)	% Marsh (V1)	Water (acres)	TY	Loss Rate	Marsh (acres)	% Marsh (V1)	Water (acres)	Net Acres of Marsh
0		61	28%	157	0		61	28%	157	0
1	-0.0014	**61**	**28%**	157	**1**	-0.0014	**61**	**28%**	157	0
2	-0.0014	61	28%	157	2	-0.0014	61	28%	157	0
3	-0.0014	61	28%	157	3	-0.0014	61	28%	157	0
4	-0.0014	61	28%	157	4	-0.0014	61	28%	157	0
5	-0.0014	61	28%	157	5	-0.0014	61	28%	157	0
6	-0.0014	60	28%	158	6	-0.0014	60	28%	158	0
7	-0.0014	60	28%	158	7	-0.0014	60	28%	158	0
8	-0.0014	60	28%	158	8	-0.0014	60	28%	158	0
9	-0.0014	60	28%	158	9	-0.0014	60	28%	158	0
10	-0.0014	60	28%	158	10	-0.0014	60	28%	158	0
11	-0.0014	60	28%	158	11	-0.0014	60	28%	158	0
12	-0.0014	60	28%	158	12	-0.0014	60	28%	158	0
13	-0.0014	60	27%	158	13	-0.0014	60	27%	158	0
14	-0.0014	60	27%	158	14	-0.0014	60	27%	158	0
15	-0.0014	60	27%	158	15	-0.0014	60	27%	158	0
16	-0.0014	60	27%	158	16	-0.0014	60	27%	158	0
17	-0.0014	60	27%	158	17	-0.0014	33	15%	45	-27
18	-0.0014	59	27%	159	18	-0.0014	0	0%	0	-59
19	-0.0014	59	27%	159	19	-0.0014	0	0%	0	-59
20	-0.0014	**59**	**27%**	159	**20**	-0.0014	0	**0%**	0	**-59**
21	-0.0014	59	27%	159	21	-0.0014	0	0%	0	-59
22	-0.0014	59	27%	159	22	-0.0014	0	0%	0	-59
23	-0.0014	59	27%	159	23	-0.0014	0	0%	0	-59
24	-0.0014	59	27%	159	24	-0.0014	0	0%	0	-59
25	-0.0014	59	27%	159	25	-0.0014	0	0%	0	-59
26	-0.0014	59	27%	159	26	-0.0014	0	0%	0	-59
27	-0.0014	59	27%	159	27	-0.0014	0	0%	0	-59
28	-0.0014	59	27%	159	28	-0.0014	0	0%	0	-59
29	-0.0014	59	27%	159	29	-0.0014	0	0%	0	-59
30	-0.0014	58	27%	160	30	-0.0014	0	0%	0	-58
31	-0.0014	58	27%	160	31	-0.0014	0	0%	0	-58
32	-0.0014	58	27%	160	32	-0.0014	0	0%	0	-58
33	-0.0014	58	27%	160	33	-0.0014	0	0%	0	-58
34	-0.0014	58	27%	160	34	-0.0014	0	0%	0	-58
35	-0.0014	58	27%	160	35	-0.0014	0	0%	0	-58
36	-0.0014	58	27%	160	36	-0.0014	0	0%	0	-58
37	-0.0014	58	27%	160	37	-0.0014	0	0%	0	-58
38	-0.0014	58	27%	160	38	-0.0014	0	0%	0	-58
39	-0.0014	58	26%	160	39	-0.0014	0	0%	0	-58
40	-0.0014	58	26%	160	40	-0.0014	0	0%	0	-58
41	-0.0014	58	26%	160	41	-0.0014	0	0%	0	-58
42	-0.0014	58	26%	160	42	-0.0014	0	0%	0	-58
43	-0.0014	57	26%	161	43	-0.0014	0	0%	0	-57
44	-0.0014	57	26%	161	44	-0.0014	0	0%	0	-57
45	-0.0014	57	26%	161	45	-0.0014	0	0%	0	-57
46	-0.0014	57	26%	161	46	-0.0014	0	0%	0	-57
47	-0.0014	57	26%	161	47	-0.0014	0	0%	0	-57
48	-0.0014	57	26%	161	48	-0.0014	0	0%	0	-57
49	-0.0014	57	26%	161	49	-0.0014	0	0%	0	-57
50	-0.0014	57	26%	161	50	-0.0014	0	0%	0	-57

Ignore water acres.

Confined Disposal Facility D/E Upland Expansion

<u>Confined Disposal Facility (CDF) D/E: Upland Expansion</u>

I. Project Location/Area

CDF D/E is located adjacent to the eastern side of the Calcasieu Ship Channel between miles 12 to 16. The existing CDF would be expanded east into Calcasieu Lake, with the upland expansion area occupying approximately 293 acres. This area is currently mostly water but includes 7 acres of marsh.

II. Goals

Approximately 8.2 million cubic yards of material would be dredged from the Calcasieu Ship Channel (between miles 12 and 16) and placed in the approximately 293-acre expanded area of CDF D/E, thereby converting the area to an upland habitat.

III. Project Features

A rock containment dike would be constructed around the proposed expanded area. Once diked, the area would be filled to capacity with dredged material, which would consolidate to form an upland habitat. The possible expansion of this CDF site would occur toward the end of the 20-year DMMP if needed. It was assumed that this area would be diked in TY 17 and pumped in TY 18.

IV. WVA Variables and Assumptions

The following is a description of assumptions for CDF D/E:

<u>Variable 1 – Emergent Vegetation</u>

FWOP:

Currently, the assessment area consists of approximately 7 acres of emergent marsh (2% of the area). The rest of the expanded area is open water in Calcasieu Lake.

Land loss rates within the study area (northern Calcasieu Lake) have averaged 0.2 % per year during 1933 to 1955, 0.78 % per year from 1955 to 1978, 0.2 % per year during 1974 to 1983, and 0.14 % per year during 1983 to 1990 (Dunbar et al. 1992). For this project, the most recent rate--0.14% per year—was applied to the FWOP scenario and had no effect on the marsh.

TY 0 – 2%
TY 1 – 2%
TY 20 – 2%
TY 50 – 2%

FWP:

The rock dike constructed in surrounding waters to contain the dredged material would not impact the existing marsh area.

TY 0 – 2%
TY 16 – 2%
TY 17 – (dike construction) – 2%
TY 18 – (pump year) – 0%
TY 20 – 0%
TY 50 – 0%

<u>Variable 2 – Submerged Aquatic Vegetation (SAV)</u>

No SAVs have been observed or are expected to occur within the area.

FWOP:
TY 0 – 0%
TY 5 – 0 %
TY 20 – 0 %
TY 50 – 0 %

FWP:
TY 1 – 0%
TY 16 – 0%
TY 17 – (dike construction) – 0%
TY 18 – (pump year) – 0%
TY 20 – 0%
TY 50 – 0%

<u>Variable 3 – Interspersion</u>

FWOP: Areas exhibiting a high degree of marsh cover and interspersion are assumed to be optimal (Class 1 and Class 2). It is assumed that the marsh that currently exists in the expansion area of CDF D/E is a Class 2 because of the numerous small marsh ponds that are common to the area. However, these ponds may also be indicative of the beginning stages of marsh degradation. Because land loss rates are relatively low within the Calcasieu Lake area (0.14%), this area should maintain a Class 2 interspersion throughout the life of the project and beyond. The open water area makes up 98% of the total impact area and is classified as a Class 5.

FWP: Once pumped, the existing marsh habitat would be filled in with dredged material and undergo an active crust management program, whereby the evaporation of moisture and consolidation of material would be maximized to increase the available site capacity. The dredged material would become entirely crust. Therefore, this area would receive 0 credit for marsh interspersion starting the year it is pumped (TY 18).

Table 1: FWP Interspersion Classification

Target Year	Class 2	%	Class 5	%
0 (FWOP)	7 ac	2	291 ac	98
16 (FWOP)	7 ac	2	291 ac	98
17 (dike)	7 ac	2	291 ac	98
18 (pump)	0 ac	0	0 ac	0
20	0 ac	0	0 ac	0

Variable 4 – Shallow Open Water Habitat (i.e., mudflats) (percent of open water </= 1.5 feet)

Shallow water areas are assumed to be more biologically productive than deeper water due to a general reduction in sunlight, oxygen, and temperature as water depth increases. Optimal conditions are expected to occur when 80 to 90 percent of the open water area is less than or equal to l.5 feet deep.

FWOP:

The 293-acre expansion area includes mostly water. Based on spot water depth data obtained from E and E Group, LLC in August of 2007, it was assumed that approximately 80% of the open water area of the expansion site is shallow.

80% of open water </= 1.5 ft

FWP:

The existing marsh habitat would be filled in with dredged material and undergo an active crust management program, whereby the evaporation of moisture and consolidation of material would be maximized to increase the available site capacity. Therefore, starting the year that the material is pumped into the existing marsh, the site would receive 0 credit for providing shallow open water habitat.

TY 0 – shallow open water = 80% or same as FWOP
TY 16 – shallow open water = 80% or same as FWO
TY 17 – dike construction = 80% or same as FWOP
TY 18 – 0%
TY 20 – 0%
TY 50 – 0%

Variable 5 – Salinity

As part of an oyster resources field investigation conducted by E and E Group, LLC in August of 2007, salinity levels in the lake near the CDF were recorded in the area of CDF D/E using an YSI Model 30 S-C-T Meter. The average salinity was approximately 8.0 ppt.

FWOP: The salinity is expected to remain constant throughout the life of this project.

FWP: The expanded CDF would be managed by providing drainage for precipitation and water released by excess pore water pressure. Therefore, this variable would not be applicable.

Variable 6 – Fish Access

FWOP: Optimal aquatic organism access is assumed to exist when the area is accessible and the access points are entirely open and unobstructed. CDF D/E has a high degree of access and hydrologic connectivity with adjacent systems. Therefore, this open system is assumed to have an access value of 1.0. The access value is expected to remain the same throughout the life of the project.

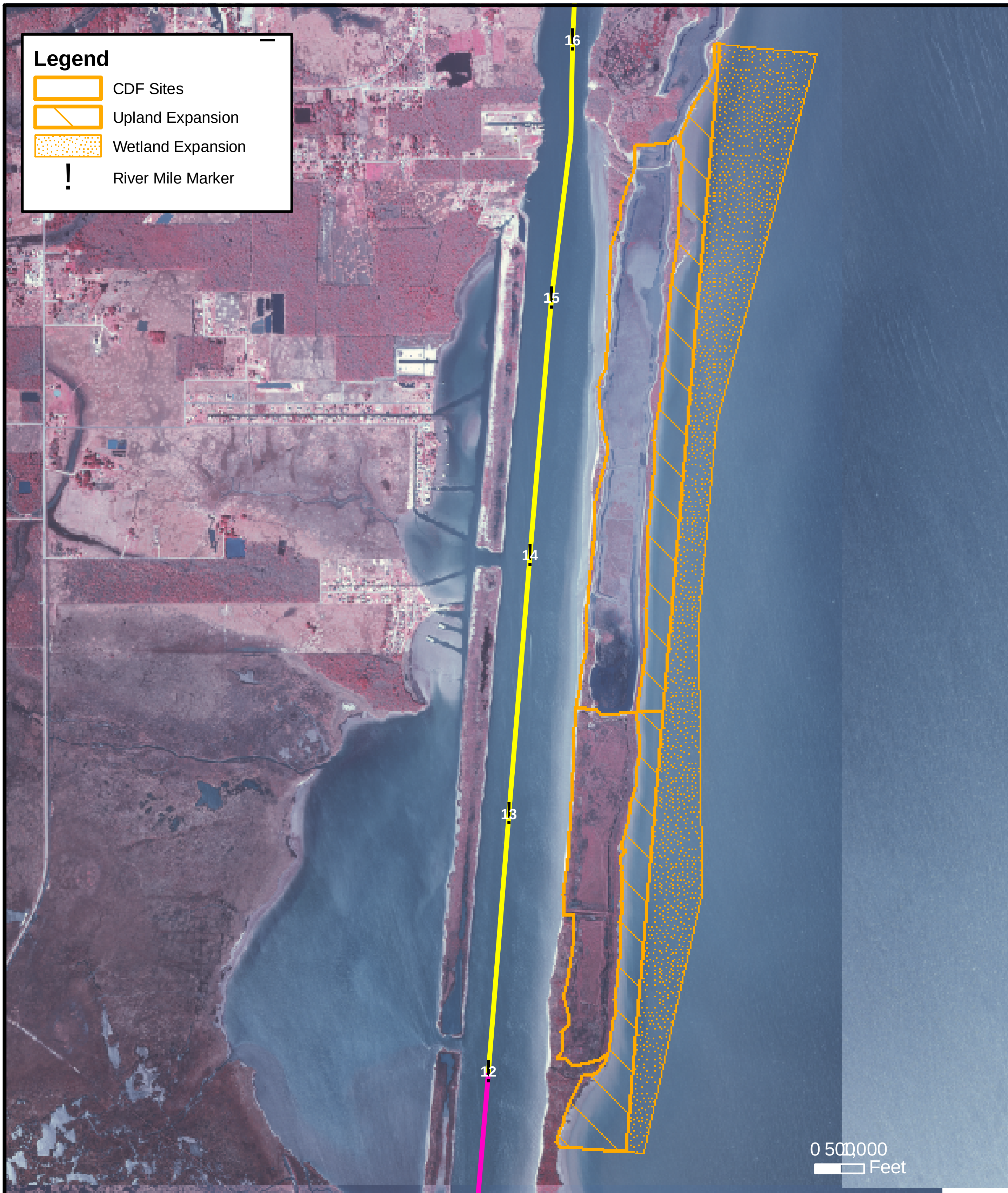
TY 0: 1.0
TY 1: 1.0
TY 20: 1.0
TY 50: 1.0

FWP: The current access value of CDF D/E is 1.0. During TY 17, the dike would be constructed, resulting in an access value of 0.0001. The access value is expected to remain at 0.0001 throughout the life of the project and beyond.

TY 0 1.0
TY 16 1.0
TY 17 (dike construction): .0001
TY 18 (pumping year): .0001
TY 20 (end of project): .0001
TY 50: .0001

V. References

Dunbar, J. B., L. D. Britsch, and E. B Kemp III. 1992. Land Loss Rates; Report 3, Louisiana Coastal Plain. Technical Report No. GL-90-2, U.S. Army Engineer District, New Orleans. 28 pp. plus Appendices.



CDF D/E

Calcasieu River and Pass, Louisiana
Dredged Material Management Plan

USGS DOQQ 2005 WESTLAKE SW 3009354

Figure: 1
Date: August 2007
Scale:1:32,930
Source: USGS/GEC/USACE
Map Author: Moore 27585101-765

WETLAND VALUE ASSESSMENT COMMUNITY MODEL
Brackish Marsh

Project: Upland expansion, CDF D/E   Project Area: 293

Condition: Future Without Project

Variable		TY 0		TY 1		TY 20	
		Value	SI	Value	SI	Value	SI
V1	% Emergent	2	0.12	2	0.12	2	0.12
V2	% Aquatic	0	0.10	0	0.10	0	0.10
V3	Interspersion	%		%		%	
	Class 1		0.11		0.11		0.11
	Class 2	2		2		2	
	Class 3						
	Class 4						
	Class 5	98		98		98	
V4	%OW <= 1.5ft	80	1.00	80	1.00	80	1.00
V5	Salinity (ppt)	8	1.00	8	1.00	8	1.00
V6	Access Value	1.00	1.00	1.00	1.00	1.00	1.00
	Emergent Marsh HSI =		**0.27**	**EM HSI =**	**0.27**	**EM HSI =**	**0.27**
	Open Water HSI =		**0.35**	**OW HSI =**	**0.35**	**OW HSI =**	**0.35**

0	0	0
0.6	0.6	0.6
0	0	0
0	0	0
0.1	0.1	0.1

Project: Upland expansion, CDF D/E
FWOP

Variable		TY 50					
		Value	SI	Value	SI	Value	SI
V1	% Emergent	2	0.12				

V2	% Aquatic	0	0.10							
V3	Interspersion	%		%		%				
	Class 1		0.11					0	0	0
	Class 2	2						0.6	0	0
	Class 3							0	0	0
	Class 4							0	0	0
	Class 5	98						0.1	0	0
V4	%OW <= 1.5ft	80	1.00							
V5	Salinity (ppt)	8	1.00							
V6	Access Value	1.00	1.00							
		EM HSI =	0.27	EM HSI =		EM HSI =				
		OW HSI =	0.35	OW HSI =		OW HSI =				

WETLAND VALUE ASSESSMENT COMMUNITY MODEL
Brackish Marsh

Project: Upland expansion, CDF D/E   Project Area: 293

Condition: Future With Project

Variable		TY 0		TY 16		TY 17 Dike built				
		Value	SI	Value	SI	Value	SI			
V1	% Emergent	2	0.12	2	0.12	2	0.12			
V2	% Aquatic	0	0.10	0	0.10	0	0.10			
V3	Interspersion	%		%		%				
	Class 1		0.11		0.11		0.11	0	0	0
	Class 2	2		2		2		0.6	0.6	0.6
	Class 3							0	0	0
	Class 4							0	0	0

	Class 5	98		98		98		0.1	0.1	0.1
V4	%OW <= 1.5ft	80	1.00	80	1.00	80	1.00			
V5	Salinity (ppt)	8	1.00	8	1.00	8	1.00			
V6	Access Value	1.00	1.00	0.00	0.10	0.00	0.10			
	Emergent Marsh HSI =		0.27	EM HSI =	0.21	EM HSI =	0.21			
	Open Water HSI =		0.35	OW HSI =	0.23	OW HSI =	0.23			

Project: Upland expansion, CDF D/E

FWP

Variable		TY 18 Pump YR		TY 20		50				
		Value	SI	Value	SI	Value	SI			
V1	% Emergent	0	0.00	0	0.00	0	0.00			
V2	% Aquatic	0	0.00	0	0.00	0	0.00			
V3	Interspersion	%		%		%				
	Class 1	0	0.00	0	0.00	0	0.00	0	0	0
	Class 2							0	0	0
	Class 3							0	0	0
	Class 4							0	0	0
	Class 5							0	0	0
V4	%OW <= 1.5ft	0	0.00	0	0.00	0	0.00			
V5	Salinity (ppt)	0	0.00	0	0.00	0	0.00			
V6	Access Value	0.00	0.00	0.00	0.00	0.00	0.00			
		EM HSI =	0.00	EM HSI =	0.00	EM HSI =	0.00			
		OW HSI =	0.00	OW HSI =	0.00	OW HSI =	0.00			

Future Without Project			Total	Cummulative
TY	Marsh Acres	x HSI	HUs	HUs

0	7	0.27	1.92	
1	7	0.27	1.92	1.92
20	7	0.27	1.92	36.39
50	7	0.27	1.92	57.46
			AAHUs =	1.92

Future With Project			Total	Cummulative
TY	Marsh Acres	x HSI	HUs	HUs
0	7	0.27	1.92	
16	7	0.21	1.48	27.18
17	7	0.21	1.48	1.48
18	0	0.00	0.00	0.49
20	0	0.00	0.00	0.00
50	0	0.00	0.00	0.00
			AAHUs	0.58

NET CHANGE IN AAHUs DUE TO PROJECT	
A. Future With Project Emergent Marsh AAHUs =	0.58
B. Future Without Project Emergent Marsh AAHUs =	1.92
Net Change (FWP - FWOP) =	-1.33

AAHU CALCULATION - OPEN WATER

Project: Upland expansion, CDF D/E

Future Without Project			Total	Cummulative
TY	Water Acres	x HSI	HUs	HUs

0	286	0.35	100.58	
1	286	0.35	100.58	100.58
20	286	0.35	100.58	1910.95
50	286	0.35	100.58	3017.29
			AAHUs =	**100.58**

Future With Project			Total	Cummulative
TY	**Water Acres**	**x HSI**	**HUs**	**HUs**
0	286	0.35	100.58	
16	286	0.23	66.95	1340.18
17	98	0.00	0.00	26.14
18	0	0.00	0.00	0.00
20	0	0.00	0.00	0.00
50	0	0.00	0.00	0.00
			AAHUs	**27.33**

NET CHANGE IN AAHUs DUE TO PROJECT	
A. Future With Project Open Water AAHUs =	27.33
B. Future Without Project Open Water AAHUs =	100.58
Net Change (FWP - FWOP) =	**-73.25**

TOTAL BENEFITS IN AAHUs DUE TO PROJECT	
A. Emergent Marsh Habitat Net AAHUs =	-1.33
B. Open Water Habitat Net AAHUs =	-73.25

Net Benefits= (2.6xEMAAHUs+OWAAHUs)/3.6	**-21.31**

Land Loss Spreadsheet - CDF D/E

					Loss Rate Calculation					
Project:	Upland Expansion D/E				**Beginning Year**	**Ending Year**	**Beginning Year Acreage**	**Ending Year Acreage**	**Loss Rate**	
Total Acres		**TY0 Marsh Acres**		**TY0 Water Acres**	1983	1990			-0.0014	
293		7		286	FWP Land Loss Reduction					
FWOP					**FWP**					
TY	Loss Rate	Marsh (acres)	% Marsh (V1)	Water (acres)	TY	Loss Rate	Marsh (acres)	% Marsh (V1)	Water (acres)	Net Acres of Marsh
0		7	2%	286	0		7	2%	286	0
1	-0.0014	**7**	**2%**	286	**1**	-0.0014	**7**	**2%**	286	0
2	-0.0014	7	2%	286	2	-0.0014	7	2%	286	0
3	-0.0014	7	2%	286	3	-0.0014	7	2%	286	0
4	-0.0014	7	2%	286	4	-0.0014	7	2%	286	0
5	-0.0014	7	2%	286	5	-0.0014	7	2%	286	0
6	-0.0014	7	2%	286	6	-0.0014	7	2%	286	0
7	-0.0014	7	2%	286	7	-0.0014	7	2%	286	0
8	-0.0014	7	2%	286	8	-0.0014	7	2%	286	0
9	-0.0014	7	2%	286	9	-0.0014	7	2%	286	0
10	-0.0014	7	2%	286	10	-0.0014	7	2%	286	0
11	-0.0014	7	2%	286	11	-0.0014	7	2%	286	0
12	-0.0014	7	2%	286	12	-0.0014	7	2%	286	0
13	-0.0014	7	2%	286	13	-0.0014	7	2%	286	0
14	-0.0014	7	2%	286	14	-0.0014	7	2%	286	0
15	-0.0014	7	2%	286	15	-0.0014	7	2%	286	0
16	-0.0014	7	2%	286	16	-0.0014	7	2%	286	0
17	-0.0014	7	2%	286	17	-0.0014	7	2%	98	0
18	-0.0014	7	2%	286	18	-0.0014	0	0%	0	-7
19	-0.0014	7	2%	286	19	-0.0014	0	0%	0	-7
20	-0.0014	**7**	**2%**	286	**20**	-0.0014	**0**	**0%**	0	**-7**
21	-0.0014	7	2%	286	21	-0.0014	0	0%	0	-7
22	-0.0014	7	2%	286	22	-0.0014	0	0%	0	-7
23	-0.0014	7	2%	286	23	-0.0014	0	0%	0	-7
24	-0.0014	7	2%	286	24	-0.0014	0	0%	0	-7
25	-0.0014	7	2%	286	25	-0.0014	0	0%	0	-7
26	-0.0014	7	2%	286	26	-0.0014	0	0%	0	-7
27	-0.0014	7	2%	286	27	-0.0014	0	0%	0	-7
28	-0.0014	7	2%	286	28	-0.0014	0	0%	0	-7
29	-0.0014	7	2%	286	29	-0.0014	0	0%	0	-7
30	-0.0014	7	2%	286	30	-0.0014	0	0%	0	-7
31	-0.0014	7	2%	286	31	-0.0014	0	0%	0	-7
32	-0.0014	7	2%	286	32	-0.0014	0	0%	0	-7
33	-0.0014	7	2%	286	33	-0.0014	0	0%	0	-7
34	-0.0014	7	2%	286	34	-0.0014	0	0%	0	-7
35	-0.0014	7	2%	286	35	-0.0014	0	0%	0	-7
36	-0.0014	7	2%	286	36	-0.0014	0	0%	0	-7
37	-0.0014	7	2%	286	37	-0.0014	0	0%	0	-7
38	-0.0014	7	2%	286	38	-0.0014	0	0%	0	-7
39	-0.0014	7	2%	286	39	-0.0014	0	0%	0	-7
40	-0.0014	7	2%	286	40	-0.0014	0	0%	0	-7
41	-0.0014	7	2%	286	41	-0.0014	0	0%	0	-7
42	-0.0014	7	2%	286	42	-0.0014	0	0%	0	-7
43	-0.0014	7	2%	286	43	-0.0014	0	0%	0	-7
44	-0.0014	7	2%	286	44	-0.0014	0	0%	0	-7
45	-0.0014	7	2%	286	45	-0.0014	0	0%	0	-7
46	-0.0014	7	2%	286	46	-0.0014	0	0%	0	-7
47	-0.0014	7	2%	286	47	-0.0014	0	0%	0	-7
48	-0.0014	7	2%	286	48	-0.0014	0	0%	0	-7
49	-0.0014	7	2%	286	49	-0.0014	0	0%	0	-7
50	-0.0014	7	2%	286	50	-0.0014	0	0%	0	-7