



State of Louisiana

**Coastal Protection and Restoration
Authority of Louisiana**

2019 Monitoring Plan

for

Cole's Bayou Marsh Restoration (TV-0063)

State Project Number TV-0063
Priority Project List #21

August 2019
Vermilion Parish

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**MONITORING PLAN
for
COLE’S BAYOU MARSH RESTORATION PROJECT TV-0063**

The Coastal Protection and Restoration Authority (CPRA) and the National Oceanic and Atmospheric Administration / National Marine Fisheries Service (NMFS) agree to carry out the terms of this Operation, Maintenance, Monitoring and Rehabilitation Plan (hereinafter referred to as the “Plan”) of the accepted, completed project features.

The project features covered by this plan are inclusive of and are identified as the Cole’s Bayou Marsh Restoration Project (TV-0063). This plan outlines the provisions to monitor the project using standardized data collection techniques and to analyze that data to determine whether the project is achieving the anticipated benefits.

Construction of TV-0063 was authorized by Section 303(a) of Title III Public Law 101-646, the Coastal Wetlands Planning and Restoration Act (CWPPRA) enacted on November 29, 1990 as amended. This project was approved on the 21 Priority Project List.

The construction components associated with this project are located in Vermilion Parish between Little Vermilion Bay and Freshwater Bayou Canal and on state water bottoms of nearby Little Vermilion Bay.

PROJECT DESCRIPTION, PURPOSE, LOCATION, AND GOALS

Description:

The Cole’s Bayou Marsh Restoration Project is 3,840 acres in the Teche Vermilion Basin. There will be approximately 365 acres of created marsh and 53 acres of nourished marsh in recently-formed shallow open water areas. In addition, the project will encourage additional freshwater nutrient and sediment inflow from Freshwater Bayou through the installation of a series of culverts throughout the project area. The proposed location of the project is east of Intracoastal City and Freshwater Bayou Canal, west of Little Vermilion Bay and just south of the Gulf Intracoastal Waterway (GIWW) (Figure 1).



Purpose:

Within the project area, wetlands are undergoing loss rates of -16.13 acres per year based on USGS data from 1983 to 2011 within the extended project boundary. Wetland loss processes in this area include subsidence/sediment deficit, interior ponding and pond enlargement, and storm impacts resulting in rapid episodic losses. In addition, significant interior marsh loss has resulted from salt water intrusion and hydrologic changes associated with increasing tidal influence. As hydrology in this area has been modified, habitats have shifted to more of a floatant marsh type, resulting in increased susceptibility to tidal energy and storm damages. Habitat shifts and hydrologic stress reduce marsh productivity, a critical component of vertical accretion in wetlands.

The purpose of the project is to create sustainable emergent marsh through the use of dredged sediments from a borrow site in nearby Little Vermilion Bay and to improve the project area hydrology by reestablishing the historic freshwater and sediment patterns into the interior wetlands through the installation of a series of one-way culverts. Although Little Vermilion Bay is not considered an “external” source of material, significant sediment inflows into this area may result in some borrow area infilling. Half of the marsh creation areas will be planted with brackish marsh vegetation to accelerate the development and maintenance of vegetative cover and diversity throughout the project life. In order to create a functional brackish marsh (10% - 65% inundated) that is comparable to healthy marsh within the project area and surrounding marshes, 1.3ft NAVD88 has been identified as the final target marsh elevation.

The water control structures in the northern part of the project area will be operated to allow the ingress of water and fisheries organisms into the semi-impounded project area but avoid backflow of water and potential loss of interior marsh sediment (i.e., north to south flow only). The southern structures are envisioned to allow water to drain out of the marsh.

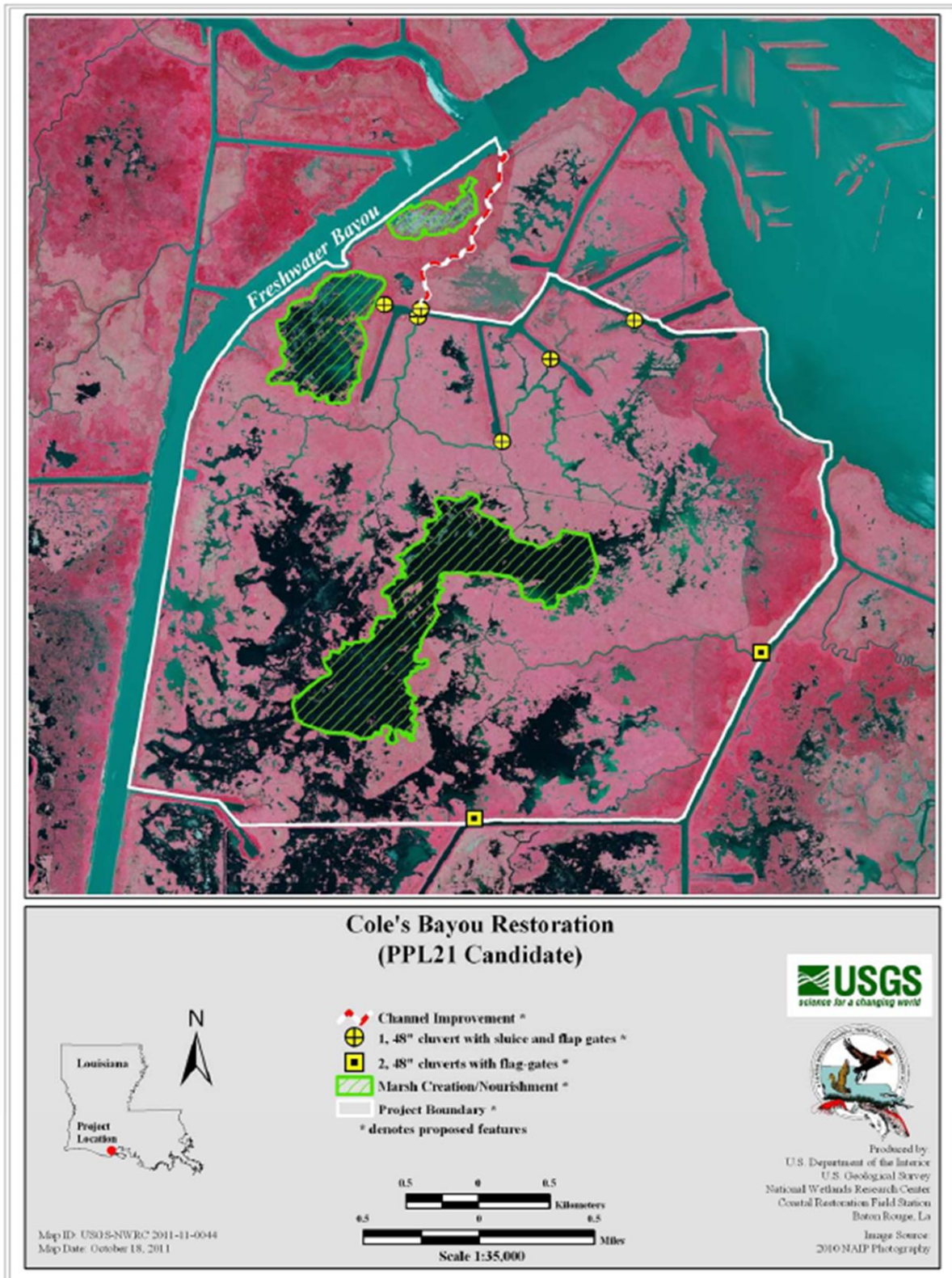


Figure 1. Cole's Bayou Marsh Restoration (TV-0063) project area and features.

Goals:

The specific project goals are:

1. Create 365 acres of brackish marsh in recently formed shallow open water.
2. Nourish 53 acres of existing brackish marsh.
3. Increase freshwater and sediment inflow into interior wetlands by improving project area hydrology.

Features:

Approximately 3.2 million cubic yards of dredging material is available from a borrow site located nearby in Little Vermilion Bay (Figure 2). The dredged material will be placed into three marsh creation cells east of Freshwater Bayou and west of Little Vermilion Bay, to create approximately 365 acres and nourish approximately 53 acres of brackish marsh. The borrow site was chosen to avoid and minimize impacts to inshore infrastructure and sensitive aquatic habitats. Retention levees will be gapped and/or degraded to support estuarine fisheries access and to achieve a functional marsh. The project also proposes to restore the hydrology in the project area by installing 8 water control structures in the northern boundary, 4 water control structures in the southern boundary and dredging a conveyance channel around the largest marsh creation cell. The water control structures will be fitted with a check valve that allows water to only flow south through the water control structure. The project would result in approximately 398 net acres of brackish marsh over the 20-year project life.

ITEMS REQUIRING MONITORING

The Coastwide Reference Monitoring System (CRMS) - Wetlands is a network of 392 monitoring sites distributed throughout the coastal zone of Louisiana. Hydrographic, vertical accretion, elevation change, vegetation, soils, and aerial photography data are collected at each CRMS site. Although no CRMS monitoring stations are located in the TV-63 project area, there are several CRMS stations located nearby which can be used as references to determine project effectiveness.

The following monitoring strategies will provide the information necessary to evaluate the specific goals of restoring/creating approximately 365 acres and nourishing approximately 53 acres of emergent marsh while increasing freshwater and sediment inflow into the project area.

- A. **Water Level** - Water level (ft) readings will be recorded hourly at two project specific locations within the project area and multiple CRMS sites within the vicinity of the project area. Water level readings will be used to determine the frequency, depth, and duration of flooding in the project area relative to the marsh elevation determined by the

fill area surveys. Water level will be monitored post construction in Y5 and Y18 concurrent with fill area surveys.

- B. **Emergent Vegetation** - To document the condition of the natural as well as the planted emergent vegetation in the project area over the life of the project, vegetation will be monitored at 20 sampling stations using a modified Braun Blanquet sampling method as outlined in (Folse et al. 2012). Stations will be established uniformly across the created and natural marsh and the location of the stations will be such that they coincide with at least some of the elevation transects or settlement plates within the containment areas. Twenty stations with replicate plots will be established within the dredged areas and natural marsh (10 stations within each). Percent cover, dominant plant heights, and species composition will be documented in 2m x 2m sampling plots marked with a corner pole to allow for revisiting the sites over time. Vegetation data from the relevant CRMS sites within the area will be used as reference stations to compare species composition over time. Vegetation will be monitored post construction in Y1, Y3, Y5, Y7, Y10 and Y18.
- C. **Aerial Photography** - In order to evaluate land/water ratios in the fill areas, land/water data will be obtained from digital imagery with 1-meter resolution. The photography will be georectified using standard operating procedures described in Steyer et al. (1995, revised 2000), and land/water ratios will be determined. Aerial photography will be captured using the nearest CRMS coastwide flights to Y0 (preconstruction) and postconstruction when coastwide imagery becomes available near Y5, Y14, and at a later date if deemed necessary.
- D. **Dissolved Oxygen / Hypoxia Monitoring** - To identify potentially hypoxic conditions within the dredge areas, synoptic surveys will record dissolved oxygen (DO), depth, salinity and temperature in the Vermilion Bay borrow areas monthly from July through September (Figure 2). Measurements will be taken in the deepest portion of the borrow area, approximately 2 ft. off of the bottom, and in a reference location approximately 0.25 to 0.50 miles outside of the borrow area. The location of the reference area will be based on results of the geophysical investigation (CB&I; BAMB 2013). Site visits will be conducted once per month for data collection. During each synoptic event vertical profiles will be taken for depth, temperature, salinity and dissolved oxygen (DO) at each site. Vertical profile data will be collected at one foot intervals in waters shallower than 20 feet. Dissolved oxygen monitoring will be conducted at Y1 and Y2 and Y3 if deemed necessary due to sedimentation fill within the borrow area.
- E. **Soil Properties** - Project specific soil cores will be collected using a Swensen corer (10 cm deep) at 40 sites (two at every vegetation station) at Y1, Y3, Y5, Y10, Y18, and at a later date if deemed necessary. Analysis of soil properties will include but not necessarily be limited to bulk density, moisture, and percent organic matter.

- F. Supplemental data from the surrounding CRMS sites will also be available and can be used to assess trends and changes in the watershed. Those data include hourly salinity, annual vegetation, rates of elevation change, vertical accretion, and shallow subsidence as well as soil composition and aerial photography analysis. Supplemental data will be used in OM&M Reports as needed.

MONITORING BUDGET

The cost associated with the Monitoring of the features outlined above in this plan for the 20 year project life is \$400,681 agreed upon by CPRA and NOAA.

RESPONSIBILITIES – MONITORING

A: CPRA will:

1. Conduct joint site inspections with NMFS after major storm events if determined to be necessary by CPRA and/or NMFS. CPRA will submit to NMFS, a report detailing the condition of the project features.
2. Provide a total contribution equal to the amount outlined in the Memoranda of Agreement for the 20 year life of the project.
3. Coordinate and oversee all monitoring data collection.
4. Ensure that all data goes through quality control procedures.
5. Analyze the data and report on the status of the project.
6. The federal and state representatives appointed above shall meet as necessary to review the reports and discuss the project status.

B. NMFS will:

1. Conduct joint site inspections with CPRA after major storm events if determined to be necessary by CPRA or NMFS.
2. Provide a total contribution equal to the amount outlined in the Memoranda of Agreement for the 20 year life of the project.
3. Review reports submitted by CPRA and provide comments.

NOTES

A.	Implementation	Start Construction:	April 2018
		End Construction:	August 2019
B.	Monitoring	Initiated:	September 2020
C.	NOAA Project Manager	Patrick Williams	225-380-0058
D.	CPRA Project Manager	Brad Miller	225-342-4122
E.	CPRA Project Engineers	Amanda M. Taylor	225-342-9419
		Shannon M. Haynes	225-342-9424
F.	CPRA Monitoring Manager	Mark Mouledous	337-482-0661
G.	CPRA Operations Manager	Mel Guidry	337-482-0682
H.	Landowners	E. A. McIlhenny	337-433-0156
		Exxon Corporation	337-893-0268

REFERENCES

- Barras, J.A., 2006, Land area change in coastal Louisiana after the 2005 hurricanes—A series of three maps: U.S. Geological Survey Open-File Report 2006–1274. (Also available at <http://pubs.usgs.gov/of/2006/1274/>.)
- CB&I. 2013. Louisiana Borrow Area Management and Monitoring; Shaw Environmental and Infrastructure, Baton Rouge, LA. 29 pp.
- Coastal Protection and Restoration Authority of Louisiana. 2012. *Louisiana's Comprehensive Master Plan for a Sustainable Coast*. Coastal Protection and Restoration Authority of Louisiana. Baton Rouge, LA.
- Couvillion, B.R.; Barras, J.A.; Steyer, G.D.; Sleavin, William; Fischer, Michelle; Beck, Holly; Trahan, Nadine; Griffin, Brad; and Heckman, David, 2011, *Land area change in coastal Louisiana from 1932 to 2010: U.S. Geological Survey Scientific Investigations Map 3164*, scale 1:265,000, 12 p. pamphlet
- Folse, T. M., J. L. West, M. K. Hymel, J. P. Troutman, L. A. Sharp, D. Weifenbach, T. McGinnis, and L. B. Rodrigue. 2008 (revised 2012). A Standard Operating Procedures Manual for the Coastwide Reference Monitoring System-*Wetlands*: Methods for Site Establishment, Data Collection, and Quality Assurance/Quality Control. Louisiana Coastal Protection and Restoration Authority, Office of Coastal Protection and Restoration. Baton Rouge, LA. 191 pp.
- Louisiana Coastal Wetlands Conservation and Restoration Task Force and the Wetlands Conservation and Restoration Authority. 1998. *Coast 2050: Toward a Sustainable Coastal Louisiana, The Appendices. Appendix D – Region 2 Supplemental Information*. Louisiana Department of Natural Resources. Baton Rouge, Louisiana. 170 pp.
- Nyman, J. A. and R. H. Chabreck 1996. Some effects of 30 years of weir management on coastal marsh aquatic vegetation and implications to waterfowl management. *Gulf of Mexico Science* 14:16-25.
- Steyer, G.D., R.C. Raynie, D.L. Steller, D. Fuller, and E. Swenson. 1995 (revised 2000). Quality management plan for the Coastal Wetlands Planning, Protection, and Restoration Act monitoring program. Open-file series no. 95-01 (Revised June 2000). Baton Rouge: Louisiana Department of Natural Resources, Coastal Restoration Division. 97 pp.
- Taylor, A. and Haynes, S., 2015. *Cole's Bayou Marsh Restoration Project (TV-63) – 30% Design Report*. Coastal Protection and Restoration Authority of Louisiana. Baton Rouge, LA. 42P.

Appendix I
Figures
and
Project Monitoring Budget

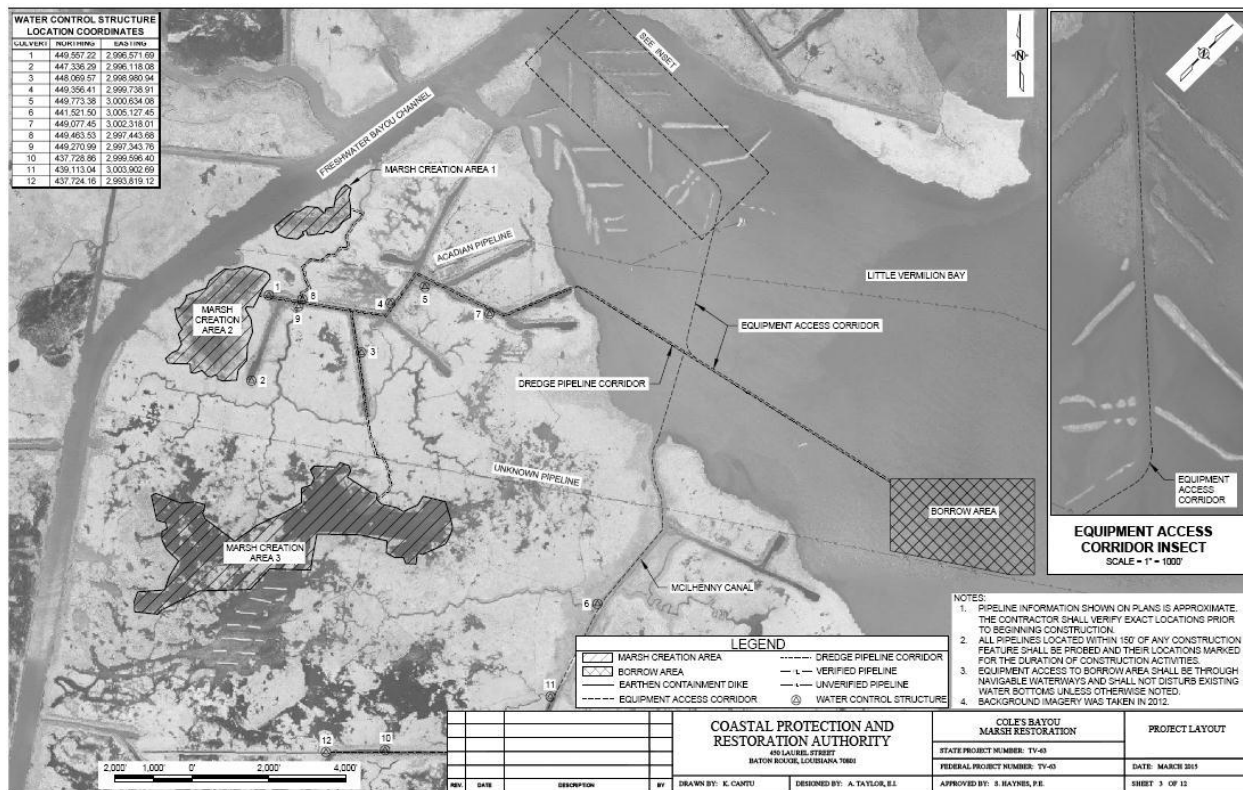


Figure 2. Cole's Bayou Marsh Restoration Project (TV-0063) project borrow area location and three separate dredge placement locations (from Taylor and Haynes 2015).

Cole's Bayou Marsh Restoration
Operation & Maintenance and Monitoring

Project Priority List 21 (ver.070711)

O&M Cost Considerations:

Annual Costs

	Federal	State	TOTAL
Annual Inspections	\$3,100	\$3,100	\$6,200
Annual Cost for Operations	\$0	\$0	\$0
Preventive Maintenance	\$0	\$0	\$0

Specific Intermittent Costs

Construction Items	Quantity	Unit Cost	Year 0	Year 1	Year 2	Year 3	Year 5	Year 7	Year 10	Year 14	Year 18
Contractor Mobilization/Demobilization											
Contractor Mobilization/Demobilization											
Gapping Containment Dikes (CY)											
25% replacement 48" AL CMP culvert inlet structures with sluice and flap combo											
25% replacement double 48" AL CMP culvert outlet structures with flap gates											
			\$0		\$0						
Subtotal			\$0	\$0	\$0	\$0	\$0		\$0	\$0	\$0
Subtotal w/ 25% contingency			\$0	\$0	\$0	\$0	\$0		\$0	\$0	\$0

State Costs

Engineering Monitoring	0	\$0.00	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Aerial Photography	1	\$24,682.00	\$24,682	\$0	\$0	\$0	\$36,191	\$0	\$0	\$50,508	\$0
Data Sonde (stage and salinity)	2	\$10,500.00	\$0	\$0	\$0	\$0	\$21,000	\$0	\$0	\$0	\$21,000
Vegetative Analysis	1	\$6,300.00	\$0	\$6,300	\$0	\$6,300	\$6,300	\$6,300	\$6,300	\$6,300	\$6,300
Soil Organic Matter	1	\$2,500.00	\$0	\$2,500	\$0	\$2,500	\$2,500	\$0	\$2,500	\$0	\$2,500
DO monitoring (inshore)	1	\$11,000.00	\$0	\$11,000	\$11,000	\$11,000	\$0	\$0	\$0	\$0	\$0
Data analysis/report	1	\$36,000.00	\$0	\$0	\$0	\$36,000	\$36,000	\$10,000	\$10,000	\$36,000	\$36,000
			\$24,682	\$19,800	\$11,000	\$55,800	\$101,991	\$16,300	\$18,800	\$86,508	\$65,800

Engineering and Design Cost

Administrative Cost			\$4,510	\$2,280	\$7,876	\$600	\$4,470	\$4,075	\$4,075	\$5,205	
Eng Survey	2 days	@ \$3,606 per day									
Inspection	4 days	@ \$1,635 per day									
Subtotal			\$4,510	\$2,280	\$7,876	\$600	\$4,470	\$4,075	\$4,075	\$5,205	

Federal Costs

Administrative Cost			\$4,510	\$2,280	\$7,876	\$600	\$4,470	\$4,075	\$4,075	\$5,205	
Subtotal			\$4,510	\$2,280	\$7,876	\$600	\$4,470	\$4,075	\$4,075	\$5,205	
Total			\$33,702	\$24,360	\$234,262	\$57,000	\$110,931	\$26,950	\$94,658	\$76,210	

Annual Project Costs:

Corps Administration	\$1,225	annually,	plus	\$1,020	in year 20
Monitoring *	\$0				<i>(Dependent upon type of project)</i>
<small>* Monitoring is now done through CRMS and is a line item in overall planning budget and not included in individual projects.</small>					

Construction Schedule:

Planning & Design Start	April-12	
Planning & Design End	December-14	<i>(Minimum of one year to complete this phase)</i>
Const. Start	August-15	<i>(Requires 4 months for contracting and advertising)</i>
Const. End	October-16	
	Check Sums	
	State	\$7,610
	Federal	\$7,610
		\$15,220
		\$5,380
		\$10,976
		\$3,700
		\$7,570
		\$10,976
		\$3,700
		\$7,570
		\$21,952
		\$7,400
		\$15,140

