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Alternative Formulation Briefing:	03 DEC 2007
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Draft Report Guidance Memorandum:	26 FEB 2010
Division Engineer Transmittal:	29 JUL 2011

REPORT SUMMARY
Central and Southern Florida Project
Comprehensive Everglades Restoration Plan
Biscayne Bay Coastal Wetlands Project, Phase I

Study Authority: The Comprehensive Everglades Restoration Plan (CERP) was approved in Section 601 of the Water Resources Development Act (WRDA) 2000, which states, in part:

Section 601, Water Resources Development Act of 2000

PUBLIC LAW 106–541—DEC. 11, 2000

(b) COMPREHENSIVE EVERGLADES RESTORATION PLAN.—

(1) APPROVAL

(A) IN GENERAL. —Except as modified by this section, the Plan is approved as a framework for modifications and operational changes to the Central and Southern Florida Project that are needed to restore, preserve, and protect the South Florida ecosystem while providing for other water-related needs of the region, including water supply and flood protection. The Plan shall be implemented to ensure the protection of water quality in, the reduction of the loss of fresh water from, and the improvement of the environment of the South Florida ecosystem and to achieve and maintain the benefits to the natural system and human environment described in the Plan, and required pursuant to this section, for as long as the project is authorized.

The South Biscayne Bay Coastal Wetlands Enhancement Project was an element of CERP, and the authority for the preparation of the Biscayne Bay Coastal Wetlands (BBCW) project is contained in Section 601(d) WRDA 2000 which states:

(d) AUTHORIZATION OF FUTURE PROJECTS-

(1) IN GENERAL- Except for a project authorized by subsection (b) or (c), any project included in the Plan shall require a specific authorization by Congress.

(2) SUBMISSION OF REPORT- Before seeking congressional authorization for a project under paragraph (1), the Secretary shall submit to Congress--

(A) a description of the project; and

(B) a project implementation report for the project prepared in accordance with subsections (f) and (h).

Section 601(h)(4) of WRDA 2000 further requires that a Project Implementation Report (PIR) document the following:

(4) PROJECT-SPECIFIC ASSURANCES-

(A) PROJECT IMPLEMENTATION REPORTS-

(i) IN GENERAL- The Secretary and the non-Federal sponsor shall develop project implementation reports in accordance with section 10.3.1 of the Plan.

(ii) COORDINATION- In developing a project implementation report, the Secretary and the non-Federal sponsor shall coordinate with appropriate Federal, State, tribal, and local governments.

(iii) REQUIREMENTS- A project implementation report shall--

(I) be consistent with the Plan and the programmatic regulations promulgated under paragraph (3);

(II) describe how each of the requirements stated in paragraph (3)(B) is satisfied;

(III) comply with the National Environmental Policy Act of 1969 (42 U.S.C. 4321 et seq.);

(IV) identify the appropriate quantity, timing, and distribution of water dedicated and managed for the natural system;

(V) identify the amount of water to be reserved or allocated for the natural system necessary to implement, under State law, subclauses (IV) and (VI);

(VI) comply with applicable water quality standards and applicable water quality permitting requirements under subsection (b)(2)(A)(ii);

(VII) be based on the best available science; and

(VIII) include an analysis concerning the cost-effectiveness and engineering feasibility of the project.

The BBCW project meets all the requirements listed above.

The BBCW project's primary purpose is to contribute to the restoration of Biscayne Bay and adjacent coastal wetlands as part of a comprehensive plan for restoring the south Florida Everglades ecosystem. The project purpose is to redistribute freshwater - currently being discharged through man-made canals directly to the Bay - to coastal wetlands adjoining Biscayne Bay. This will provide a more natural and historic overland flow, restoring healthier salinity patterns in the Bay. This project will help restore saltwater wetlands and the nearshore bay through the re-establishment of optimal salinity concentrations for fish and shellfish habitat. Although the BBCW project was authorized by Section 601(d) of the WRDA 2000 as noted above, the original scope of the proposed project has been altered in order to address restoration goals in the study area. The project was split into two separate but related project phases. The phase referenced in this Summary Report (Phase I) will rehydrate coastal wetlands and reduce harmful point source freshwater discharge to Biscayne Bay. The BBCW project is integral to the health of the south Florida ecosystem. Due to the changes in scope, a subsequent second PIR (Phase II) is recommended to study the remaining features for authorization under the CERP authority in WRDA 2000, Section 601.

Study Sponsor: The South Florida Water Management District (SFWMD) is the non-Federal Sponsor for the implementation of this project as part of the CERP. The SFWMD has been actively involved throughout the BBCW project development process. As part of the State's commitment to Everglades Restoration (announced in October 2004 by the Governor of the State of Florida), the State and the SFWMD have committed over \$1.5 billion in additional funds via "certificates of participation" to accelerate design and construction activities on certain CERP projects. This state commitment is known as the State Expedited Construction Program. The BBCW project is one of the projects included in the State Expedited Construction Program. To ensure appropriate and timely coordination of Federal activities necessary to support the State Expedited Construction Program, the Administration - through the Department of the Army and the Department of Interior - has committed to align resources and workloads to produce PIRs consistent with the State of Florida's construction schedules. Construction on the proposed Deering Estate project began in May 2010; construction on the L-31E Flow Way culverts was completed on April 2010.

Study Need: Today nearly all aspects of south Florida's flora and fauna have been affected by development, altered hydrology, nutrient input and spread of non-native species that have resulted directly or indirectly from a century of water management.

Significant areas within the project study boundary are characterized by a low-productivity dwarf mangrove forest, known as the "white zone" - due to its appearance on aerial photos - which are caused by salt deposits on the soil surface. Recent studies in this area indicate that the landward boundary of the white zone has moved inland by an average of one and a half kilometers (0.9 miles) since 1940, and the zone is expanding in areas cut off from freshwater sources by canals or roads. The low productivity of the white zone is primarily a result of wide seasonal fluctuations in salinity and the absence of freshwater input from upstream sources, among other factors.

The distribution, life cycles, community structures, and population densities of the fauna of south Florida are intricately linked to regional hydrology. The current status of fish and wildlife has been strongly influenced by the cumulative effects of drainage activities in the early 20th Century, the Central and Southern Florida (C&SF) project, and the ensuing agricultural and urban development made possible by those activities. Reduction in the spatial extent of Everglades wetlands by half has resulted in a proportional reduction in habitat of aquatic organisms, and changes in the hydrology of the remaining wetlands east of the protective levees has further reduced their populations. Estuarine fishes and shellfishes have precipitously declined in abundance within the project area due to loss of estuarine habitat along the bay's southwestern shore. Abrupt salinity fluctuations due to direct canal discharges have negatively affected fish populations.

The study area for the BBCW project is composed of a variety of privately-owned, local, state, and Federal lands. Privately-owned natural lands in south Florida have become scarce due to development and most currently remaining are likely to be developed in the near future. Fish and wildlife habitat within the study area will be adversely impacted by future residential, commercial and/or industrial development. The ecosystem within this area is extremely unique and fragile. The disruptive freshwater drainage caused by canals has already created hypersalinity in Biscayne Bay, as shallow marshes are overdrained through canals, and then

seepage is reduced abruptly after the end of rainy episodes. Further development and creation of impervious surfaces will lead to increased runoff velocity and more frequent and higher freshwater discharges. Increased development within this area will lead to increased habitat fragmentation, decreasing the area of wildlife corridors that are imperative for larger animals to traverse these areas.

The spatial extent of the natural areas within the study area has the potential to decrease considerably in the absence of project restoration. Much of this area is not currently in public ownership or in public land acquisition plans and will likely be developed for both urban and agricultural uses.

This project aims to restore the overland sheetflow in up to an 11,000-acre area and to improve the ecology of Biscayne Bay, including its freshwater and saltwater wetlands, nearshore bay habitat, marine nursery habitat, and the oyster reef community.

Study Purpose and Scope: A major emphasis of the CERP is to remedy many of the hydrologic aspects of the flood control project that in hindsight have had deleterious effects on the wetland vegetative communities and fish and wildlife resources.

In accordance with WRDA 2000 and the Programmatic Regulations for the CERP (Section 385.26), a PIR must be completed prior to implementing any component of CERP.

The BBCW project PIR contains the initial design necessary to prepare plans and specifications for construction. As previously stated, the BBCW project's primary purpose is to redirect freshwater - currently discharged through man-made canals directly to the Bay - to coastal wetlands adjacent to the bay in order to restore a more natural water flow pattern to Biscayne Bay. The BBCW project PIR bridges the gap between the conceptual level of detail contained in the April 1999 *Final Integrated Feasibility Report and Programmatic Environmental Impact Statement* and the detailed design necessary to prepare plans and specifications required to proceed to construction. The decision to implement the project via two PIRs was made to address changing conditions, technical uncertainties, concerns and issues which have arisen since the Restudy analysis of the BBCW. This decision was based on recommended Adaptive Management approaches to the project, as well as sponsor preference.

The first PIR (BBCW, Phase I) will contain the analysis to support implementation of the first stage of restoration for the project area. Several factors were considered in determining features for the first PIR, most prominent of which included consideration of lands that are currently in public ownership, offering earlier realization of stand-alone benefits not dependent on other CERP projects, and the SFWMD's early implementation plans through the State Expedited Construction program. The first PIR includes a restoration plan that will provide low risk, substantial ecological gains; provide opportunities to address project uncertainties; and refine knowledge through the testing of first PIR project elements, facilitating the optimization of features in the next PIR.

The second PIR (Phase II) will be a more comprehensive study that is intended to provide a complete solution to addressing the broader needs of the entire basin and allow time for the

acquisition of lands needed to achieve restoration benefits. The second PIR will include additional analysis and make use of knowledge gained through implementation of adaptive management actions, including those described in the Adaptive Management Plan (Annex E-Part IV). As described in the Adaptive Management plan, adaptive management actions shall be implemented based on project performance, and may include: adjustments to project-level and system operations, oyster restoration measures, filling drainage and mosquito ditches, and vegetation management through fire or vegetation removal to ensure benefits are realized. In addition, information from monitoring of Phase I actions will contribute to a better understanding of overland flow in achieving nearshore bay, saltwater (tidal) wetland, and freshwater wetland hydrological targets and corresponding improvement of ecological targets. This last piece of information will feed into a better understanding of the remaining restoration problems to be addressed by BBCW Phase II and the best alternative plan (which areas/how much), design, and operations to achieve them, as well as how much additional water will be needed to be sent from other parts of the system via system operations to achieve CERP restoration goals in this part of the system.

The BBCW project, Phase I PIR is fully compatible and consistent with CERP, and contains documentation of the planning process and all relevant assumptions and rationale for project decision making. All planning analyses, including economic, environmental, water quality, flood protection, real estate, and plan formulation, that were conducted during the planning phase are documented and included in this PIR. This project, if constructed, will incorporate multiple primary structural components focused on improving environmental conditions in the BBCW. The main structural components will consist of seven pump stations, approximately ten culverts reconnecting wetlands, three miles of spreader canals, and plugging 2,500 feet of mosquito control ditches.

Project Location/Congressional District: Biscayne Bay is a shallow saline tropical bay/coastal lagoon located along the southeastern coast of Florida. It is bordered to the west by the mainland of Florida, which includes the densely populated areas of Miami-Dade County. The project is located in southeast Miami-Dade County, south of Miami and east of Florida City and Homestead. The study area is bounded to the south and east by south-central Biscayne Bay, Biscayne National Park (BNP), and the Atlantic Coastal Ridge. Agricultural and suburban development bound the project to the north and west. Looking from the west to the east, the natural areas of the proposed project site are identified as Biscayne Bay which is bordered by a series of barrier islands and the northern Florida Keys. Biscayne Bay is connected to the Atlantic Ocean by a series of channels and cuts, some natural and some manmade, and it contains a number of islands, the majority of which are manmade as well. The Selected Plan includes features in three of the four sub-components set forth in the Yellow Book or Restudy: Deering Estate/Shoal Point; Cutler Wetlands; and L-31 East Flow Way (the fourth sub-component is Barnes Sound/Model Lands). The project footprint requires approximately 3,761 acres of land. Of the total acreage required, 1,412.32 acres would be required in fee and 148.90 acres would require perpetual easement interest. Additionally, 1,262.56 acres would be provided through the execution of Supplemental Agreements between the SFWMD and the State of Florida and local Miami-Dade County government entities. 937.32 acres are currently owned by the United States National Park Service for the Biscayne National Park (BNP) which will provide a Memorandum of Agreement to the SFWMD for the use of these lands. The proposed

project is located in Florida Congressional District number 18. The project location is shown in Figure 1.

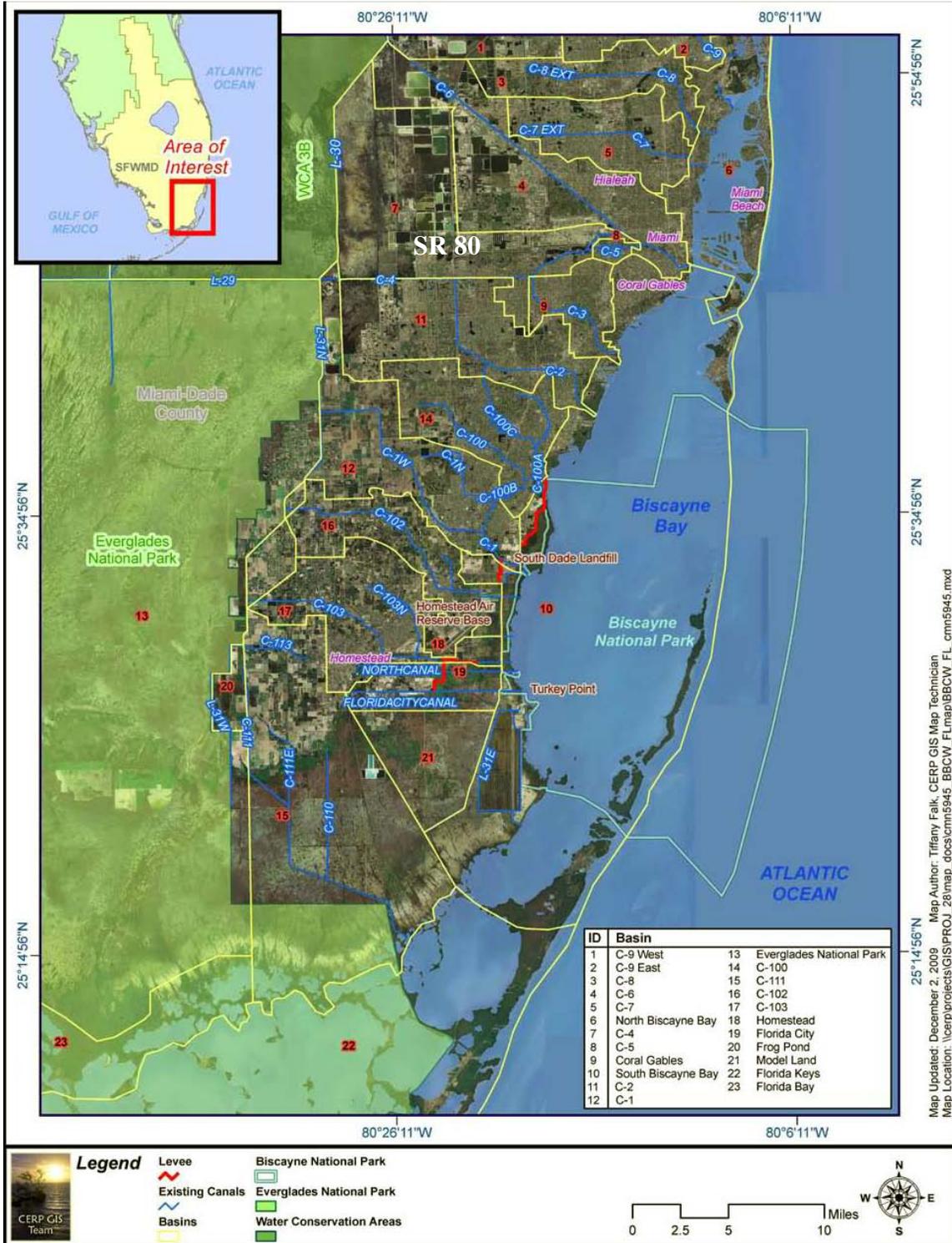


FIGURE 1: Project Area Map

Prior Reports and Existing Water Projects: Prior planning efforts and reports related to the proposed BBCW project include: the 1948 Central and South Florida project, the 1962 Flood Control Act, the C-111 Project (1994 C-111 General Re-Evaluation Report), and the C&SF Project Comprehensive Review Study (a.k.a. *Restudy*, USACE and SFWMD, 1999). Restoration in the project area was investigated in the early 1980s in Miami-Dade County's Biscayne Bay Management Plan (Metropolitan Dade County Board of County Commissioners 1986). The SFWMD's Biscayne Bay Surface Water Improvement and Management Plan (1995) further considered restoration opportunities, resulting in a conceptual restoration plan for the area included in the CERP Study.

Other CERP projects in the vicinity of the BBCW project area include the C-111 Spreader Canal CERP Project, the vast majority of which is being expedited (i.e. constructed in advance of a Record of Decision) by the Non-Federal Sponsor, and the Wastewater Reuse Technology CERP Pilot project, which is intended to resolve decision critical uncertainties related to discharging reclaimed water into the BBCW. Non-CERP restoration efforts near the BBCW project include Miami Dade's constructed Stormwater Detention and Treatment Area Project (SDTA) which is a pilot project constructed within the BBCW study area to evaluate a method for modifying the timing and delivery of canal discharges to Biscayne Bay, and the South Florida Regional Planning Council's South Dade Watershed Plan, which is intended to formulate an integrated land use and water management strategy for all of the lands that comprise the major drainage basins in southeastern Miami-Dade County.

Federal Interest: The BBCW project, as presented in this PIR, is one of two projects aimed at achieving restoration goals in the proposed project area. The proposed project would encompass a greater extent of restoration than envisioned under the original WRDA 2000 authorization, and provides a more comprehensive proposal for environmental restoration in the project area. With the passage of WRDA 2000, the CERP - a national priority - was approved as a "framework for modifications and operational changes to the C&SF project that are needed to restore, preserve, and protect the south Florida ecosystem while providing for other water-related needs of the region, including water supply and flood protection". The BBCW project, as part of CERP, will provide substantial environmental restoration in the study area, contributing immense improvements to the hydrology and habitat of Biscayne Bay and Biscayne National Park. The Everglades has been designated an International Biosphere Reserve (1976) and a World Heritage Site (1979) by the United Nations Educational, Scientific, and Cultural Organization (UNESCO) and a Wetland of International Importance (1987) in accordance with the Ramsar Convention. Wetlands adjacent to Biscayne Bay and the bay itself are of both local and National significance (note BNP, mangroves, seagrass, etc.)

STUDY OBJECTIVES

Problems and Opportunities: The ecological problems in the project study area have been well documented, and are mainly due to the conversion of natural land to agriculture and urban development and the disruption of the natural hydrologic regime. Salinity/ water control structures, berms, and levees have created an abrupt difference between saline and freshwater habitats. The historically very low and moderately saline habitats are almost entirely non-existent. Redirected freshwater flows through canals to Biscayne Bay produce point source

discharges which create low salinity within the limited area of discharged plume, and subsequently induce abnormally high salinity (>40 practical salinity units [psu]) in adjacent nearshore areas. Rapid canal drainage combined with a lower water table has reduced the functional habitat value of the remaining freshwater wetlands. Hydroperiods that were once as long as an entire year have been reduced to weeks or days allowing remaining freshwater wetlands to be invaded by non-native vegetation. These low functional wetlands are now targets for conversion to other types of land uses (agriculture, rock mining, and urbanization) losing their ecological values. These ecological problems will be exacerbated in the future if left unchecked and will continue to result in:

- A decline in estuarine species diversity and number due to hyper-salinity and extreme salinity fluctuations in Biscayne Bay.
- A continued reduction and elimination of freshwater/saltwater ecotones (transitional areas where fresh and saltwater meet and mix), that are important to estuarine species.
- A continued alteration and degradation of freshwater and saltwater wetlands.
- Freshwater being discharged directly to Biscayne Bay and not available for distribution through coastal wetlands.
- A decrease in natural water storage due to loss of wetlands.

As a result of project implementation, there are opportunities to:

- Reduce point source discharges and redistribute freshwater flows to Biscayne Bay.
- Improve storage of freshwater to augment dry season flows to Biscayne Bay.
- Restore water levels in freshwater wetlands.
- Preserve and restore the spatial extent of natural coastal glades habitat within the study area.
- Increase tourism, recreation and economic value.

Planning Objectives: Project-specific objectives were developed by integrating the project problem statements with the overall CERP ecologic goals, which include: improving habitat function and quality, and improving native plant and animal abundance and diversity.

Project objectives are:

- Reestablish productive fish & invertebrate nursery habitat along the shoreline.
- Redistribute freshwater flow to minimize point source discharges to improve freshwater and estuarine habitat.
- Restore and improve quantity, quality, timing, distribution of freshwater to the bay, including Biscayne National Park.
- Preserve and restore spatial extent of natural coastal glades habitat.
- Reestablish connectivity between Biscayne coastal wetlands, C-111 Basin, Model Lands, and adjacent basins.
- Restore nearshore and saltwater wetland salinity regimes.

In addition to the objectives, project constraints were developed to ensure that the proposed project would not reduce levels of service for flood protection, impact federally-listed Endangered Species, and cause unintended consequences that would impede further opportunities for restoration in the area. The project delivery team also took into consideration resource and legal and policy constraints in developing objectives and constraints for this project. The following constraints affecting plan formulation were identified by the project team:

Universal constraints:

- Complying with all Federal, state and local laws, regulations and policies.
- Maintain existing levels of flood protection to agricultural and urban lands (Savings Clause [Section 601 (h)(5)(B) of WRDA 2000]).
- Maintain levels of service for existing legal users (Savings Clause [Section 601 (h)(5)(A) of WRDA 2000]).
- Minimizing impacts to cultural, historical and archaeological resources.
- Minimizing adverse socioeconomic impacts on the local and regional economies.
- Avoiding, minimizing, or providing compensatory mitigation for any impacts to pre-existing compensatory mitigation sites within the project area under Section 404 of the Clean Water Act

Study Specific constraints:

- Do not increase salinity intrusion into the freshwater Biscayne Aquifer within the study area.
- Do not adversely affect the habitats of threatened or endangered species in the study area, such as the American Crocodile or the West Indian Manatee.
- Do not use water that violates State water quality standards for discharge into the wetlands being rehydrated/ restored in the project.

ALTERNATIVES

Plan Formulation Rationale: The plan formulation efforts used in the Restudy served as the foundation for the starting point in developing management measures and the subsequent Initial Array of Alternatives. In reviewing the Restudy Plan for BBCW, a conceptual restoration plan for the area was included as two elements of the authorized and approved CERP or “Yellow Book” (YB) selected alternative (Alternative D13R):

- (1) BBCW (designated as Other Project Element (OPE)) and
- (2) Biscayne Bay Coastal Canals (component FFF of CERP).

This conceptual plan includes pump stations, spreader swales, stormwater treatment areas (STAs), flow-ways, levees, culverts and backfilling canals located in southeast Miami-Dade County and covers 13,600 acres from the Deering Estate area at C-100C, south to the FPL Turkey Point power plant, generally along L-31E (See **Figure 2**). Using this as the basis for development of alternatives, the Initial Array of Alternatives, including the "No Action" alternative, were developed, then modeled and screened, leading to the formation of a Final Array of Alternatives.

The Final Array was then evaluated using a Cost Effectiveness/Incremental Cost Analysis that was based on average annual habitat unit values compared to costs. Further evaluation of the Final Array was conducted by comparing alternative consistency with objectives and constraints, the four Principles and Guidelines accounts, and effects on the environment. After evaluation and comparison, a Recommended Plan was selected as the proposed project.

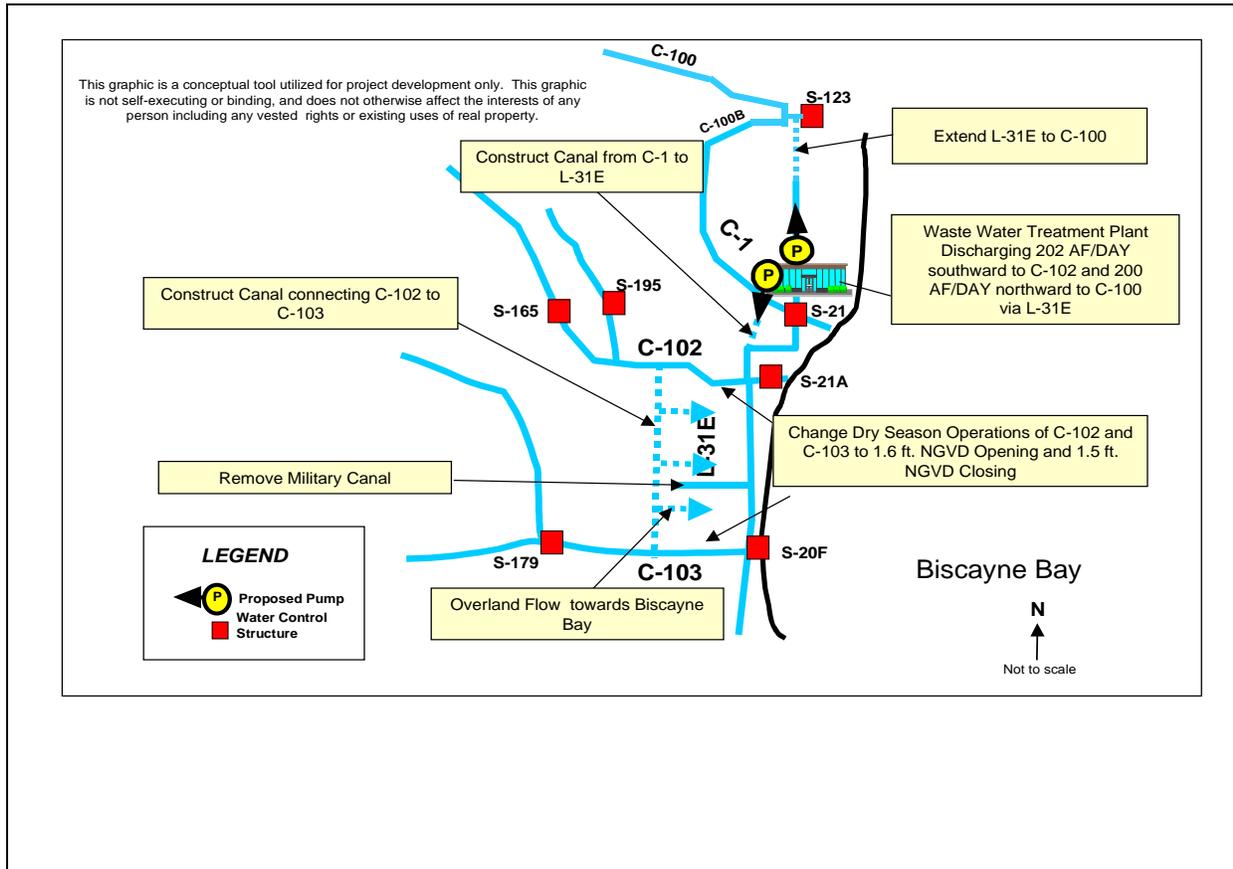


FIGURE 2: Alternative D13R (Yellow Book) – South Biscayne Bay and Coastal Wetlands enhancement component

(Source: Restudy Appendix A4–Description of Alternative D-13R (Page A4-47))

Evaluations of the final array of alternatives were conducted on a System-Formulation basis in the context of the rest of CERP. In coordination with USACE Headquarters, it was agreed that a separate Next-Added Increment (NAI) evaluation would not be performed for this proposed project as the NAI would be equal to the System-Formulation evaluation due to the project location at the terminus of the Everglades system and lack of interaction with other CERP components.

Management Measures and Alternative Plans: Management measures included both structural and non-structural elements. Management measures and subsequent alternative plans for this project were consistent with those that were produced during prior planning efforts. To assemble a suite of management measures for the BBCW project, the Yellow Book Alternative

was used as a starting point for developing project measures and the initial array of alternatives. Verification for the need of each measure was conducted and additional features or activities were added as necessary. The following is a list of the management measures considered and/or used in the development alternatives:

- Spreader Canals – Spreader canals would redistribute over a wider area water that is currently being discharged directly into Biscayne Bay as point source discharges. Increased overland flow to freshwater and saltwater wetlands would increase spatial extent of wetland habitats, restore existing wetland habitats, improve water quality and restore historic salinity levels in the Bay.
- Stormwater Treatment Areas (STAs) – These areas would be utilized for storing and treating water before it is discharged to freshwater wetlands and Biscayne Bay. Due to the extremely porous substrate in this area of Florida, the STAs would likely be constructed above-ground with a liner. The primary benefit of these types of impoundments would be improved water quality, with some measure of water supply and habitat value.
- Reservoirs – Reservoirs were considered and added as a measure that would provide needed water for restoration during periods of low flows (i.e., the dry season). The reservoirs would be filled during peak storm events and would be utilized for wetland rehydration during low flow periods in the major canals. Reservoirs constructed above-ground would need to be lined in order to retain water in the porous South Florida geology.
- Pump Stations – Pump stations would be required to divert flow from major conveyance canals into reservoirs, STAs, and spreaders. They would also aid the control of water when needed for restoration purposes during low flow events and also maintain authorized flood damage reduction levels for urban or agricultural areas.
- Removal of existing levees – The major levee that obstructs overland flow is the L-31E Levee.
- Culverts – Culverts provide gravity water flow underneath levees or roadways where the distribution of additional water is proposed. Culverts would be necessary in order to render some of the existing obstacles to flow (levees) as transparent as possible.
- Construction of new levees – New levees may need to be constructed in order to provide for flood damage reductions where wetland restoration is proposed in close proximity to any municipalities. Levees may be used in combination with other measures to achieve project objectives.
- Flow-ways – The creation of new flow-ways provide a means to convey water from major conveyance canals to spreader features or directly to wetlands.
- Stormwater Treatment Plant – This measure could be used to add water into the project area, by routing water from urban areas through the plant for treatment.
- Desalination Plant – This measure could be used to add water into the project area, by converting saltwater from the Bay into freshwater for use in other part of the project area.
- Removal of minor drainage and structural features – This would include the plugging or backfilling of ditches and removal of minor roads that are negatively affecting the movement of water.
- Operations – This measure is non-structural in nature. The existing study area is complex in terms of C&SF water management features. Efficient operations of such a complex

system would reduce infrastructure needs (i.e., more pumps, culverts, canals) and therefore reduce the cost of alternative plans.

Since this project used Alternative YB as the origin for development of all other alternatives (by feature, cost and intended benefits), it is discussed in detail below to understand the nature of feature development in component areas. All other alternatives are discussed in comparative terms to reduce redundancy.

Deering Estate Flow-way (YB Alternative): Involves pumping water from the SW 160th Street ditch (a tributary to C-100C) through property adjacent to the Deering Estate and ultimately into Cutler Drain, which runs through the Deering Estate. The design involves adding a pump station at the end of SW 160th Street Canal, filling in mosquito ditches in coastal mangroves, and constructing weirs to delay water passage in old Cutler Drain.

Cutler Wetlands (YB Alternative): This involves routing water south from C-100A to the Cutler Wetlands area via a shallow distribution swale to C-100B, pumping water from C-100B to a spreader swale, and pumping water from C-100A south into a spreader swale to allow sheet flow to Biscayne Bay. For water quality, flows are routed through an STA. Construction includes a spreader swale from C-100A south to C-100B with a levee west of the spreader swale, and a pump along the north end of the spreader swale at C-100A; a pump adjacent to the STA and C- 100B; and a levee seepage canal along the northern and southern end of the STA.

L-31E Flow-way (YB Alternative): This includes a flow redistribution system west of L-31E and existing wetlands restoration in the area between L-31E and the western boundary of the redistribution system. A distribution swale with a western levee will be constructed along this boundary. The wetland area west of L-31E should be used for short-term, shallow impounding of water to maintain wetlands and help drive freshwater flow to the nearshore bay out of the east bank of L-31E. For water quality purposes, flows are routed through STAs. Construction involves installation of culverts and risers under L-31E; construction of a spreader swale east of L-31E; backfilling Military Canal; a plug in C-100B; a new a canal west of the landfill to intersect with the L-31E borrow canal; and filling in mosquito ditches. A seepage collection ditch may be required on the western side of the STA(s), as well as pumps to the STA.

Model Lands/Barnes Sound (YB Alternative): Operation of this component involves pumping available water from the Florida City Canal to a shallow east-west spreader canal with flows routed through an STA. Design involves construction of a pump at the Florida City Canal; a new canal south from Florida City Canal to a shallow spreader swale along the edge of the saltwater wetlands with an STA and seepage management facility.

In addition to the “No-Action” alternative, a total of seventeen alternatives were developed for the Initial Array. Each alternative was then modeled and compared for performance. Upon review of the initial array of alternatives, it was concluded that some alternatives were extremely similar and some features should be combined, therefore eliminating some alternatives. The rationale for the combination of certain alternatives was that the features and operations of these alternatives were too similar in cost and expected benefits such that there would be no discernible differences when comparing plans. Further consideration led to the decision to

eliminate some alternatives based on anticipated significant construction or operating costs, environmental impacts, or expected benefits. **Table 1** provides a summary of the initial array of alternatives, including main differences between the YB alternative and the alternative being crafted and/or a major feature that is distinctive. In addition, **Table 1** also provides a list of those alternatives that were eliminated as well as the reason for their elimination.

TABLE 1: Initial Array of Alternatives

INITIAL ARRAY OF ALTERNATIVES			
Alternative	Description	Carried Forward	Reason for Elimination
A	Future Without Project Condition	Yes	
YB	Yellow Book (Restudy) alternative; includes extensive use of STAs, some canal and ditch backfilling, pumps, and connector canals from C-102 to C-103, and from C-1 to the L-31E borrow canal. Uses culverts and risers under L-31E Levee to remove obstacle to flow.	Yes	
C	Similar to YB, but uses some gravity flow instead of pumps. Removes the L-31E Levee to remove obstacle to flow and backfills all major drainage canals to recreate historic sloughs.	No	Similarity to Alternative E; net features carried over to E
D	Identical to C but adds minor features including road removal and more ditch backfilling.	No	Similarity to Alternative E; net features carried over to E
E	Deviates from YB and C by adding reservoirs to provide water to the project areas during the dry season; unlike C does not remove L-31E Levee.	Yes, with net features from C & D	
F	Largely resembles YB but attempts to improve the ecological lift by adding reservoirs and reducing STA sizes.	No	Benefits are similar to YB but at a higher cost; also similar to J& L; net features added to J
G	Minimizes construction for a less expensive approach: for examples, smaller pumps and spreader canals, less STA acreage, and greater reliance on water management operational changes to achieve objectives.	No	Similarity to M; net features added to M
H	Resembles G but in lieu of STAs, uses polishing ponds and lateral ditches to provide water treatment.	No	Similarities to M; net features added to M
I	Resembles YB but extends the C-102/103 connector canal northward and proposes a desalinization plant for water supply.	No	High operational costs and environmental degradation due to desalinization plant byproducts
J	Maximizes redirection of flow to natural flowways; includes a	Yes, with net features from	

	combination of reservoirs and STAs to capture flows from canals; does not attempt to recreate historic sloughs.	F & L	
K	Resembles YB but uses package treatment plants in lieu of STAs to significantly reduce land acquisition costs.	No	High operational costs and environmental degradation due to water treatment plant byproducts
L	Resembles YB but uses a combination of reservoirs and STAs instead of STAs alone to cleanse and store water; improves water availability and reduces cost in comparison to YB.	No	Similarity to F & J; net features added to J
M	Strives to meet project objectives with the smallest footprint and smallest number of constructed features possible.	Yes, with net features from G & H	
N	A “no holds barred” approach with limited concern with costs; provides for construction features wherever needed seeking maximum ecological lift.	No	Projected cost more than twice the inflated YB cost

As a result of the initial screening, Alternatives A, YB, E, J, and M were carried forward. Three more alternatives, Alternatives P, Q and S were then developed to ensure that a full array of project measures was considered. The addition of the three plans resulted in the following secondary array of alternative plans (see **Table 2**). The secondary array of alternatives were then screened, eliminating Alternative P because it produced results similar to the less expensive Alternative E. Alternative S was also eliminated because it would reduce the ability to control water levels west of the L-31E levee and therefore not meet the flood protection constraint. As a result, the remaining alternatives included No Action Alternative, YB, E, J, M and Q.

TABLE 2: Secondary Array of Alternatives

SECONDARY ARRAY OF ALTERNATIVES			
Alternative	Description	Carried Forward	Reason for Elimination
A	Future Without Project Condition	Yes	
YB	Yellow Book (Restudy) alternative; includes extensive use of STAs, some canal and ditch backfilling, pumps, and connector canals from C-102 to C-103, and from C-1 to the L-31E borrow canal. Uses culverts and risers under L-31E Levee to remove obstacle to flow.	Yes	
E	Deviates from YB and C by adding reservoirs to provide water to the project areas during the dry season; unlike C does not remove L-31E Levee.	Yes, with net features from C & D	
J	Maximizes redirection of flow to natural flowways; includes a combination of reservoirs and STAs to capture flows from canals; does not attempt to recreate historic sloughs.	Yes, with net features from F & L	
M	Strives to meet project objectives with the smallest footprint and smallest number of constructed features possible.	Yes, with net features from G & H	
P	Another “no holds barred” alternative; this alternative is designed to achieve target salinity levels in the Bay.	No	Benefits similar to E but at a higher cost
Q	Designed to align with possible location of C-111 spreader canal; seeks passive water flow versus pumps; does not include reservoirs; attempts to avoid costly real estate.	Yes, maintained to refine construction costs	Above allowable inflated YB cost limit
S	Non-structural alternative that uses operational changes to hold water higher in existing canals; benefits achieved by increasing groundwater flow to the Bay.	No	Would cause groundwater to rise within communities west of project area; would likely cause flooding at Homestead Air Force Base, impacting Homeland Security

Cost is an important factor in plan selection and was therefore used to screen the intermediate plans. The total initial cost (including construction and real estate) reported in the Yellow Book

for the BBCW project was \$299,583,000 at Fiscal Year 1999 price levels. Increased by 20 percent over the 1999 cost and escalated to Fiscal Year 2007 price levels, the cost is estimated to be \$461,983,000. Alternatives YB, E, J, and Q were above escalated cost. Alternatives YB, E and J were therefore eliminated from further consideration though YB was carried through to the final array as a point of comparison to the Restudy. While Alternative Q exceeded the inflated YB cost limit it was carried forward because the team felt that the construction costs could be further refined. Alternative O was introduced after this screening as a compromise between Alternative M and Alternative Q.

Alternative O: A combination of Alternatives M and Q that includes the use of flow-ways, spreader canals, culverts, piping, weirs, canal plugs, mosquito ditch plugs (102 total) and pumps to achieve the overall project goals of restoring and enhancing wetlands and nearshore bay habitat by minimizing point source discharges and improving the quantity, quality, timing, and distribution of water to freshwater and tidal wetlands and to the bay.

Final Array of Alternatives: After further evaluation to determine the extent to which the alternative plans would be able to meet project objectives, five alternatives remained after intermediate plans were screened. They are: the No Action Alternative (Future without Plan), Alternative YB (Restudy plan), Alternative M, Alternative O, and Alternative Q. A sixth alternative, Alternative O Phase 1, was added to explore opportunities to implement the project in stages. The decision to implement the project via two PIRs was based on technical uncertainties and sponsor preference. The second PIR would contain additional analysis and information gained through adaptive management actions to support implementation of the rest of the conceptual plan.

The next step was to evaluate the final array of alternatives using ecological output measured in habitat units (HUs) and alternative costs. The cost effectiveness analysis began with a comparison of the costs and outputs of alternative plans to identify the least cost plan for every level of output considered. Alternative plans were compared to identify those that would produce greater levels of output at the same cost, or at a lesser cost, as other alternative plans. Alternative plans identified through this comparison were the cost effective alternative plans. The following three criteria were used in the cost effectiveness screening analysis:

1. The same output level could be produced by another plan at less cost;
2. A larger output level could be produced at the same cost; or
3. A larger output level could be produced at less cost.

Sometimes it is difficult to summarize the results of CE/ICA when the analyses are performed separately on HUs for distinct species or communities. This was the case for the BBCW features and alternatives, in which certain features or alternatives provide greater benefits to the freshwater wetlands in the watershed, while other alternatives provide greater benefits for the nearshore habitats. Separate ecological zones were all considered to be of equal importance. It was also believed that a combined HU score summing all three zones, while not appropriately representing the significance of each ecological zone, would provide a valuable cumulative impact analysis for determining the plan which best meets the needs of the watershed. The results of the CE/ICA on each ecological zone were examined both independently and combined,

and plan selection was based upon utilizing an aggregate of these results. In summary, the CE/ICA analysis was performed using the following four metrics to represent various ecosystem outputs of the BBCW alternatives:

1. Combined HU Score
2. Freshwater Ecological Zone
3. Saltwater Ecological Zone
4. Nearshore Ecological Zone

The CE/ICA analysis was conducted for each of the BBCW alternative plans. The analyses compared the alternative plans’ average annual costs against the appropriate average annual HU estimates. The average annual outputs were calculated as the difference between with-plan and without-plan conditions over the period of analysis (through year 2050). A summary of the average annual lift calculations and average annual costs used in the CE/ICA analysis are provided in **Table 3**.

TABLE 3: Costs and Outputs Used in CE/ICA

Alternative	Annual Cost	Freshwater HU's	Saltwater HU's	Nearshore HU's	Combined HU's
Alternative O	\$35,480,000	3,439	5,704	3,974	13,116
Alternative M	\$26,340,000	173	5,760	2,250	8,183
Alternative Q	\$54,400,000	5,415	3,967	3,595	12,976
Alternative YB	\$60,030,000	4,532	2,902	2,667	10,101
Alternative O, Phase 1	\$9,070,000	444	5,905	3,106	9,456

Notes: Values for alternatives are differences between “Without” plan and “With” plan on an average annual basis. Values assume system benefits (ecosystem outputs that would accrue to the BBCW study area if rest of CERP were constructed).

The total cost of CERP is not included in this CE/ICA analysis. The cost of the balance of the CERP features, those not included in the BBCW alternatives, is the same for all the BBCW alternatives. Including it in this analysis does not bring any additional insight or differentiation between alternatives. For this analysis, the difference between the alternatives can be shown through a display of the outputs and costs of each BBCW alternative without the cost of the “other CERP” features.

Cost Effectiveness Analysis – Total System-Wide Combined Outputs (**Table 4**) show that Alternatives O and Alternative O Phase I are cost effective in the overall production of habitat units. Alternatives YB and Q show a much higher average annual cost than that of Alternative O, while providing less total benefits, rendering them non cost-effective. Alternative O produces 3500 more habitat units than does Alternative O Phase I. Alternative O Phase I produces habitat units at the lowest average cost per unit of output at \$959 per habitat unit, which is about one third of the cost per habitat unit of Alternative O.

**TABLE 4: Results of
Cost Effectiveness / Incremental Cost Analysis**

Name	Annual Cost	Combined	Cost Per HU	Cost Effective
No Action Plan	0	0		Best Buy
Alternative O P-1	\$9,070,000	9,455	\$959	Best Buy
Alternative M	\$26,340,000	8,183	\$3,219	No
Alternative O	\$35,480,000	13,117	\$2,705	Best Buy
Alternative Q	\$54,400,000	12,977	\$4,192	No
Alternative YB	\$60,030,000	10,101	\$5,943	No

Based on the CE/ICA analysis, Alternative O Phase I is the only plan that is cost effective for the combined ecological zones and all of the ecological zones separately while examining the system-wide impacts of the BBCW alternatives implementation. Alternative O Phase I is also the most efficient at producing nearshore, saltwater and combined wetland habitat units. None of the other alternatives are cost effective in all three ecological zones, and only Alternative O is a best buy plan in the production of combined eco-zone output. Alternative Q is the most efficient plan at producing habitat for the freshwater zone. Alternatives M and YB are not cost effective for any of the ecological zones. Alternative O Phase I will provide substantial ecological restoration benefits. Alternative O is not considered a cost effective plan in saltwater restoration since it produces approximately the same saltwater habitat units as Alternative M, but at a much higher cost. It should be noted that the cost increase between Alternative O Phase I and Alternative O is attributed to substantially greater freshwater wetland improvements.

As a result of the cost effectiveness/incremental cost analysis, Alternative O Phase I was identified as the National Ecosystem Restoration plan. It is the plan that reasonably maximizes the production efficiency for each of the ecological zones, in that it contains the lowest average cost per unit of output, is cost effective for all ecological zones, and is a logical first step towards achieving restoration of the BBCW study area. This alternative provides a substantial improvement in the much needed restoration of the Biscayne Bay nearshore and saltwater wetlands. It is recognized that Alternative O would provide a more comprehensive watershed restoration plan than Alternative O Phase I (due to the large increases in freshwater benefits), and therefore has been identified as the environmentally preferred plan and as the Conceptual Watershed Alternative. Alternative O Phase I is a compatible subset of Alternative O and as such, the remaining components of Alternative O could be further studied and constructed in the future, with no conflicts to the current Alternative O Phase I configuration.

Comparison of Alternatives: The results of the ecological evaluation and Cost-Effectiveness/Incremental Cost Analyses of the No Action plan and YB, M, O and Q alternatives resulted in identifying Alternative O as the best plan that reasonably maximizes ecosystem restoration benefits when compared to costs and is consistent with the Federal objective (i.e. National Ecosystem Restoration or NER plan). While typically the NER plan would also be identified as the TSP, instead Alternative O was identified as a conceptual or watershed plan for the entire study area to be implemented under two PIRs – Phase I and Phase II.

Alternative O Phase I was created by determining which Alternative O features were the most suitable and beneficial additions to the restoration of Biscayne Bay. The team identified 12 potential features based on the following three criteria:

- Provides significant additional benefits;
- Provides critical information for development of a second PIR to complete construction of the TSP and to adaptively manage the project, consistent with the National Research Council's Incremental Adaptive Restoration recommendation for CERP;
- Most economical.

This list of 12 features was refined by considering cost, acres benefited, adaptive management benefits and uncertainties, Savings Clause compliance, and schedule impacts. Alternative O Phase 1 is summarized in **Table 5**.

TABLE 5: Summary of Measures–Alternative O Phase 1

Management Measure	Sub Component			
	Deering Estate	Cutler Wetlands	L-31E Flow/ North Canal Flow Way	Barnes Sound Wetlands
Reservoirs (ac.)	N/A	N/A	N/A	N/A
Detention Areas (ac-ft)	N/A	N/A	N/A	N/A
Pumps (cfs)	(1) S 700-100 cfs	(1)S-701-400cfs	(1) S -703 – 50 cfs (1) S-705 – 100 cfs (1) S-709 – 40 cfs (1) S-710 – 40 cfs (1) S-711 – 40 cfs	N/A
Levees (ft)	N/A	N/A	N/A	N/A
Canals (cfs)	(1) C-100A Extension–100 cfs	(1) C-701 Open Channel–400cfs	N/A	N/A
Spreader canals (ft)	N/A	(1) C-702–19,700 ft	(1) C-711–2,400 ft	N/A
Backfilling	N/A	Plug mosquito ditches	N/A	N/A
Culverts / Structures	(1) Culvert–63in. (1) Weir S-D1	(2) Box Culvert – 6 ft, for flow way & road crossings	(4)Culvert: S-23 –36in (3) Culvert: S-706–36in (1) Culvert: S-708 –36in (2) Culvert: S-712 –36in (1) Inverted Siphon S-707 – two @ 63in	N/A
Unique measures	Grade south ½ of Powers property	N/A	N/A	N/A

Key: ac acre ft/cyd feet per cubic yard
ac-ft acre-feet in inches
cfs cubic feet per second N/A not applicable
ft foot/feet

Key Assumptions: The basic assumption is that the system does not create any water (except rainfall runoff), and therefore must rely on the water it receives from upstream sources. This fresh water can then be redistributed from the watershed away from the existing canal discharges and into the coastal wetlands adjoining Biscayne Bay to provide a more natural and historic overland flow through existing coastal wetlands. System and project benefits were determined with a project-specific tool referred to as the Criterion Based Ecological Evaluation Matrix (CBEEM) to quantify the ecological output of alternatives. CBEEM is a Microsoft (MS) Excel spreadsheet tool that utilizes hydrologic modeling results, management measure size and

operation, and available hydrologic data to derive a HU score that represents the ecological lift achieved by each alternative. This method evaluated benefits within each of the three major ecological zones present within the project area (nearshore bay, saltwater wetlands, freshwater wetlands). The project was not specifically formulated for recreation, but a recreation plan was added to the Tentatively Selected Plan.

Recommended Plan: The Recommended Plan encompasses a footprint of approximately 3,761 acres and includes features in three of the project's four sub-components (hydrologically distinct regions of the study area): Deering Estate, Cutler Wetlands, and L-31 East Flow Way (see descriptions below for each component and **Figure 3 & Table 6** for project features). There are no features in the fourth sub-component, Barnes Sound/Model Land Basin. Of the total acreage required, 1,412.32 acres would be required in fee and 148.90 acres would require perpetual easement interest. Additionally, 1,262.56 acres would be provided through the execution of Supplemental Agreements between the SFWMD and the State of Florida and local Miami-Dade County government entities. 937.32 acres are currently owned by the United States National Park Service for the Biscayne National Park (BNP) which will provide a Memorandum of Agreement to the SFWMD for the use of these lands.

Deering Estate: This region is in the north part of the project area and includes an approximately 500-foot extension of the C-100A Spur Canal through the Power's Addition Parcel (Power's Parcel), construction of a freshwater wetland on the Power's Parcel and delivery of fresh water to the Cutler Creek and ultimately to coastal wetlands along Biscayne Bay.

Cutler Wetlands: Features in this region, which is in the central portion of the project area, include a pump station, a conveyance canal, a spreader canal, culverts and mosquito control ditch plugs. The pump station, located on C-1, will deliver water to a 6,900-foot lined conveyance canal that will run under SW 97th Avenue, SW 87th Avenue (L-31E Levee), and across the L-31E Borrow Canal via concrete box culverts and deliver water to the spreader canal located in the saltwater wetlands. This spreader canal is divided into four segments.

L-31 East Flow Way: Features in this region, which is in the southern portion of the project area, will isolate the L-31E Borrow Canal from the major discharge canals (C-102, Military Canal and C-103) and allow freshwater flow through the L-31E Levee to the saltwater wetlands. Gated culverts and inverted siphon structures will isolate the L-31E Borrow Canal from these canals, allowing L-31E Borrow Canal to maintain higher water levels. Two pump stations and a series of culverts will move fresh water directly to the saltwater wetlands east of L-31E. Two more pump stations and a spreader canal will deliver water to the freshwater wetlands south of C-103.



FIGURE 3: The Recommended Plan

TABLE 6: Summary of Alternative O Phase 1 Structures

Structure Number	Structure Type	Design Capacity (cfs)	Location	Tech Specs & Notes
DEERING ESTATE				
S-700	Pump Station	100	East of C-100A Spur Canal, Power's Addition Parcel	Delivers water from C-100A Spur Canal to historic flow way on Deering Estate, Culvert from pump station under Old Cutler road, including outlet spreader structure
C-100A	Canal Extension	100	Extension of Existing C-100A Spur Canal Power's Addition Parcel	Delivers water to historic flow way on Deering Estate
CUTLER WETLANDS				
S-701	Pump Station	400	On C-1 Canal	Delivers water from C-1 to C-701 and eventually to C-702 (Spreader Canal)
C-701	Lined Canal	400	Lennar Property	Delivers water from S-701 Pump Station to the Cutler Spreader Canal (C-702)
C-702	Spreader Canal	400	Cutler Wetlands	Delivers water to the saltwater wetlands via overland sheetflow
L-31 EAST FLOW WAY				
S-703	Pump Station	50	On L-31 E Canal, just north of C-102	Delivers water to the saltwater wetlands, utilizes an outlet spreader structure
S-705	Pump Station	100	On L-31 E Canal, just south of C-102 intersection	Delivers water from C-102 to southern reach of L-31 E Borrow Canal
S-706A, B, C	Culvert	Varies	L-31E Levee	Delivers water from L-31 E Canal to saltwater wetlands to the east
S-708	Culvert	Varies	L-31 E Levee	Delivers water from L-31 E Canal to saltwater wetlands to the east
S-23 A, B,	Culvert	Varies	L-31 E	Delivers water from L-31

C, D			Levee	E Canal to saltwater wetlands to the east
S-707	Inverted Siphon	Varies	Intersection of L-31 E Canal and Military Canal	Will connect L-31 E Canal on the north and south sides of Military Canal while isolating flows from Military Canal
S-709	Pump Station	40	On L-31 E Canal, just north of C-103 intersection	Delivers water from C-103 north to L-31 E Canal
S-710	Pump Station	40	Approximately 0.7 miles west of L-31 E Canal on south bank of C-103	Delivers water from C-103 to the freshwater wetland (between C-103 and North Canal, west of L-31 E Canal) via a spreader structure
S-711	Pump Station	40	Approximately 1.4 miles west of L-31 E Canal on south bank of C-103	Delivers water from C-103 to the freshwater wetland (between C-103 and North Canal, west of L-31 E Canal) via a spreader canal (C-711)
C-711E	Spreader Canal	40	Approximately 1.4 miles west of L-31 E Canal, between C-103 and North Canal	Delivers water from S-711 Pump Station to the freshwater wetland via overland sheet flow
C-711W	Seepage Collection Ditch	Varies	Approximately 1.4 miles west of L-31 E Canal, between C-103 and North Canal	Collects seepage from C-711E spreader canal and delivers it back to C-103
S-712A&B	Culvert	Varies	L-31 E Levee	Delivers water from L-31E Canal to

				saltwater wetlands to the east
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Systems/Watershed Context: The Recommended Plan was formulated to maximize system-wide benefits and is consistent with the goals and objectives of the CERP. The evaluation of project effects demonstrates that the proposed project will benefit the Everglades ecosystem, including Biscayne National Park, Biscayne Bay, and its associated estuaries. Conceptually, this project encompasses the lower area of the Everglades ecosystem, namely the south easement segment for the greater Everglades flow-way.

The non-Federal sponsor, SFWMD, is a cooperating agency under the National Environmental Policy Act (NEPA). Several additional agencies were requested to be cooperating agencies because of their special expertise in the subject area. An official letter inviting the US Environmental Protection Agency (EPA), US Fish and Wildlife Service (FWS), National Park Service (NPS), Florida Fish and Wildlife Conservation Commission (FWC), Florida Department of Environmental Protection (FDEP), US Geological Survey (USGS), Miami-Dade Department of Environmental Resources Management (DERM), and National Oceanographic and Atmospheric Administration / National Marine Fisheries Service (NOAA Fisheries Service) to be cooperating agencies (as defined by NEPA) was sent in June 2007. Two responses have been received; the EPA conditionally accepted the invitation to be a cooperating agency and the FWS declined the invitation. The other state and Federal agencies that were formally invited have not responded. The selection of these agencies to be invited as cooperating agencies did not exclude any other agencies from full participation in the project.

Environmental Operating Principles: The proposed project is consistent with the USACE “Environmental Operating Principles” particularly with respect to the south Florida ecosystem-wide approach for plan formulation, evaluation, and selection. It is a holistic consideration of water resources needs and solutions to water resources problems in the study area. In addition to the project-specific monitoring plan that was developed for the BBCW project Phase I, an adaptive assessment and management program has already been implemented as part of the CERP to ensure that authorized projects are achieving the intended purposes. Project implementation, including plan formulation, involved collaborative interactions with the multiple agencies represented on the Project Delivery Team (PDT). Study area stakeholder groups and members of the general public were provided multiple opportunities to receive information on the project and also to provide comments and recommendations via a scoping meetings, public meeting, internet postings, teleconferences, and interagency PDT meetings.

USACE Campaign Plan: The Jacksonville District has integrated the USACE Campaign Plan into its mission for successful South Florida Everglades Ecosystem Restoration (SFEER) execution, and has identified key tasks to fulfill Goal Number 2 of the Plan, "Engineering Sustainable Water Resources." Examples of the accomplishment of this goal include successful and concurrent Public and Headquarters review of the Draft PIR as well as integral coordination with South Atlantic Division that has been instrumental in resolving policy compliance concerns in a timely fashion.

Agency Technical Review/Independent External Peer Review: An external Agency Technical Review (ATR) was performed by a multi-disciplinary team consisting of technical staff from the USACE Wilmington, Savannah, Walla Walla and Mobile Districts. ATR team membership and the scope of ATR work were coordinated with the USACE National Ecosystem Restoration Planning Center of Expertise. Significant ATR comments raised focused on hydrologic modeling and environmental benefits quantification, project real estate requirements, and the development of project cost estimates. In general, the ATR Team found that the information presented in the report describing the plan formulation and evaluation supported the selection of the recommended plan. All concerns resulting from ATR of the Final PIR have been resolved.

Independent External Peer Review (IEPR) of the BBCW Project Phase I was managed by Battelle Memorial Institute, a non-profit science and technology organization with experience in establishing and administering peer review panels for the USACE. The IEPR Panel consisted of six individuals selected by Battelle with technical expertise in Civil Works Planning, Estuarine Ecology, Economics, Hydrogeology and Hydraulics, and Design and Construction Cost Engineering. The Final Report from the IEPR Panel was issued December 1, 2009 and included 19 final comments. The two comments of high significance in the Final Report included the discussion that the future conditions, with regard to sea level rise and water availability are not comprehensive and need to be expanded to provide a more quantitative analysis and graphical explanation.

The USACE received concurrence from the IEPR Panel on all 19 comment responses and all necessary changes were made to the PIR. Overall, the Panel found the USACE had done a good job with a complex project and had presented a very in-depth and data rich report. The panel agreed with the use of competing hydrologic and hydraulic models and thought the USACE had made a good effort to scrutinize the models.

EXPECTED PROJECT PERFORMANCE

Project Costs: Table 7 includes a breakdown of the cost of the Biscayne Bay Coastal Wetlands Phase I project, including construction, lands and damages, pre-construction engineering and design costs, recreation and interest during construction. Cost is rounded to the nearest \$1,000 and is at FY11 price levels.

**TABLE 7: Project Costs for The Recommended Plan
(FY11 Price Level)**

Ecosystem Restoration Cost Elements	TOTALS*
<u>Construction</u>	
Deering Estate Flowway	
06 Fish and Wildlife Facilities	\$1,205,000
13 Pumping Plant	\$4,064,000
Cutler Wetlands	
06 Fish and Wildlife Facilities	\$1,479,000
09 Channels and Canals	\$12,280,000
13 Pumping Plant	\$12,662,000
L-31E Wetlands	
06 Fish and Wildlife Facilities	\$1,479,000
09 Channels and Canals	\$2,516,000
13 Pumping Plant	\$16,596,000
15 Floodway Control-Diversion Structure	\$6,272,000
Sub-Total Construction Cost	\$58,555,000
<u>Non-Construction</u>	
01 Lands and Damages	\$80,985,000
30 Planning, Engineering, and Design*	\$32,950,000
31 Construction Management	\$16,212,000
Sub-Total Non-Construction Cost	\$130,147,000
TOTAL INITIAL COST	\$188,702,000
Recreation Cost Elements	
14 Recreation Facilities	\$2,316,000
TOTAL INITIAL COST	\$191,018,000

* Initial costs rounded to the nearest \$1,000.

*PED includes sunk costs of \$22,995,000

The costs shown above are updated, detailed costs that are not equivalent to the preliminary, planning-level cost estimates utilized for the alternative comparison in Section 6 and the Economic Appendix. Costs for the Project Monitoring Plan were not included in the total project costs in accordance with current cost estimating practices.

Equivalent Annual Costs and Benefits: The following table lists the costs and benefits of the recommended plan.

TABLE 8: Economic Costs and Benefits of Recommended Plan

Item	Restoration		Recreation		Total Costs	
	Allocated Costs	Benefits	Allocated Costs	Benefits	Allocated Costs	Benefits
Investment Cost (\$)						
First Cost	\$182,702,000		\$2,316,000		\$191,018,000	
Interest During Construction ⁱ	\$16,650,000		\$134,000		\$16,790,000	
Total (4.125%)	\$205,350,000		\$2,450,000		\$207,808,000	
Total (7%)	\$217,600,000		\$2,550,000		\$220,150,000	
Annual Cost (\$)						
Interest and Amortization ⁱⁱ	\$10,570,000		\$127,000		\$10,695,000	
OMRR&R ⁱⁱⁱ	\$1,873,000		\$25,000		\$1,898,000	
Monitoring					\$ 193,000	
Subtotal (4.125%)	\$12,636,000		\$150,000		\$12,786,000	
Subtotal (7.0%)	\$18,388,000		\$216,000		\$18,604,000	
Annual Benefits						
Non-monetary						
Ecological Function^{iv} (Avg. Annual Habitat Unit)		9,276				
Monetary						
(Recreation\$) ^v				\$210,000		
Net Annual Recreation Benefits				\$58,000		
Recreation Benefit-Cost Ratio				1.4 to 1		
Recreation Benefit-Cost Ratio (at 7%) ^{vi}				1 to 1		

ⁱ Project based on 3 year construction schedule.

ⁱⁱ Based on October 2010 price levels, 4.125 percent rate of interest, and a 40-year period of analysis.

ⁱⁱⁱ Operation, Maintenance, Repair, Replacement, and Rehabilitation.

^{iv} Ecological function – term used to measure the net average annual habitat units.

^v Recreation benefits reflect 2010 unit day values from EGM, 10-02

^{vi} Per Executive Order 12893

Cost Sharing: The total first cost of the project, including the value of LERRDs and preconstruction engineering and design costs will typically be shared 50/50 by the Federal government and the non-Federal sponsor. However, the non-Federal sponsor has expressed its intention to construct all or part of the ecosystem restoration features in the recommended plan under its state expedited program. As such, the non-Federal sponsor would be contributing a share of costs for this project that is greater than 50 percent, and would carry over excess credits to another authorized CERP project to balance the 50-50 cost share across all projects in the CERP in accordance with Section 601 of WRDA-2000. A Pre-Partnership Agreement was executed on 13 August 2009 with the non-Federal sponsor that covers planned construction work.

TABLE 9: Cost Share Table for the Biscayne Bay Coastal Wetlands Phase I Project - Recommended Plan^{vii}

Item	Federal Cost	Non-Federal Cost	Total
Ecosystem Restoration (ER)			
PED ^{viii}	\$ 28,056,500	\$ 4,551,500	\$ 32,608,000
Construction Management	\$ 7,855,500	\$ 7,855,500	\$ 15,711,000
LER&R	\$ -	\$ 78,822,000	\$ 78,822,000
Ecosystem Restoration ^{ix}	\$ 55,317,000	\$ -	\$ 55,317,000
ER Subtotal	\$ 91,229,000	\$ 91,229,000	\$ 182,458,000
Recreation (ER)	\$1,132,000	\$1,132,000	\$2,264,000
Total Project Cost	\$ 92,361,000	\$ 92,361,000	\$ 184,722,000
Total Project Level Monitoring Costs	\$ 958,500	\$ 958,500	\$ 1,917,000
OMRR&R (non-recreation)	\$ 840,000	\$ 840,000	\$ 1,680,000
OMRR&R (vegetation management) ^x	\$ 96,500	\$ 96,500	\$ 193,000
OMRR&R (recreation)		\$ 25,000	\$ 25,000
Annual OMRR&R	\$ 936,500	\$ 961,500	\$ 1,898,000

^{vii} FY '11 Price Level. Note: Total costs shown are consistent with costs shown throughout the report. Due to rounding, numbers may not appear to be totaled correctly.

^{viii} PED estimates for non-recreation components are derived directly from the MCACES. PED includes development of the PIR and sunk costs of \$22,948,000.

^{ix} The ecosystem restoration construction cost and PED cost are not detailed as being shared equally due to the non-Federal Sponsor's land costs. The Federal shares were changed to bring the total project cost to a 50/50 share basis.

^x OMRR&R for vegetation management annual costs are greater during the first 5 years (\$218,000). After the first 5 years of OMRR&R for vegetation management the costs of continued vegetation management decreases (\$190,000).

Rules that determine how project responsibilities are shared are established in federal law and related implementing policies. Section 601 of WRDA 2000 provides in-kind cost sharing credit to the non-Federal sponsor for design and construction, and for the treatment of credit between projects to maintain a 50/50 cost share. The Master Agreement, Article II.5, requires the

cumulative non-Federal credited expenditures and projected contributions to the overall program construction costs to always be equal to 50 percent or greater for the non-Federal Sponsor. For any one CERP project, no credit to the non-Federal Sponsor is allowable if their cost share exceeds 50 percent. However, credit is allowable under the CERP program as a whole after final accounting of the CERP program is complete. The total project first cost is estimated at \$184,722,000.

Project Implementation: The SFWMD is the non-Federal sponsor for this project. The SFWMD is interested in expediting this initially authorized project and has advanced completion of the detailed design activities for the Deering Estate and the L-31E Flow Way, including plans and specifications, in accordance with the current schedule for the State's Expedited Construction program. The Sponsor has initiated construction of the Deering Estate project in May 2010 with completion anticipated by May 2011. Construction on the L-31E Flow Way elements in the State Expedited Construction program were completed in April 2010. The SFWMD is currently funding the design and construction features in advance of Secretary of the Army's approval and Congressional authorization and appropriation of funds in anticipation of receiving credit for work performed toward their cost share on a subsequent CERP project. All detailed design and construction will be coordinated with the USACE. A Pre-Partnership Credit Agreement was executed on 13 August 2009 with the non-Federal Sponsor that covers planned construction work. Crediting for work performed by the SFWMD will be subject to project authorization and adherence to USACE design standards and regulations. LERRDs will be the responsibility of the SFWMD.

The PIR contains a recommendation that the non-Federal sponsor receive credit for planning, engineering, design and construction performed by it, or under contract by it, towards the implementation of the BBCW Project Phase I before execution of the project cooperation agreement if the Secretary of the Army determines that the work performed was for a reasonable cost, necessary and integral to the project, and was implemented to appropriate design and construction standards.

The USACE is proceeding with two separate and independent but related actions: the planning evaluation of the Federal project and the regulatory evaluation of the SFWMD's application for a Section 404 (Clean Water Act) permit for the proposed project, both of which are described in this Final PIR/EIS. The State's Expedited Construction Program project is consistent with the plan recommend in this document. The purposes of the Federal recommended plan identified in this Final PIR and the State Expedited Construction Program project are consistent. As such, the Final PIR/EIS served as the basis for the Regulatory Division's NEPA evaluation of the SFWMD's proposed State's Expedited Program project. A separate Record of Decision will be signed on the Recommended Plan described in the PIR.

Operation, Maintenance, Repair, Rehabilitation, and Replacement (OMRR&R): Annual operations and maintenance (O&M) costs were estimated for the construction features of the Recommended Plan. The O&M costs were determined by extrapolation from operational costs histories supplied by the SFWMD using industry standard cost data and data from past and projected cost trends. O&M activities include such items as nuisance and exotic vegetation control, monitoring of restoration success performance measures, mowing, erosion control, pump

maintenance, levee road maintenance, and building maintenance. The annual Operation, Maintenance, Repair, Replacement, and Rehabilitation (OMRR&R) costs are estimated to be \$1,898,000 (rounded to the nearest \$1,000) annually. Recreation OMRR&R costs have been estimated at approximately \$25,000 annually. The non-Federal sponsor is responsible for 100 percent of the OMRR&R recreation costs. Annual OMRR&R costs include costs for vegetation management, as described in **Table 9** above.

Key Social and Economic Factors: The design of the selected plan minimizes potential impacts to existing wetlands and unique landscape features in the project area, and any permanent loss of habitat function would be offset by the environmental gains provided by the ecosystem restoration features of the Recommended Plan. Regional Economic Development benefits will occur as the result of expenditures of construction dollars in the local economy, providing for employment, output, and employee compensation. There will be no adverse impacts on minorities or disadvantaged populations as a result of the proposed project.

Stakeholder Perspectives and Differences: Stakeholders such as non-governmental organizations and the public were given the opportunity to attend and provide their views at a scoping meeting, numerous project delivery team (PDT) meetings, and a public meeting. Stakeholders and interested parties have also been provided the opportunity to voice their comments, concerns, and issues during the Public Comment period for the Draft PIR. All of the public comment received from the advertisement of the proposed project was both positive and supportive of the restoration efforts and Recommended Plan. Additionally, the non-Federal has proactively acquired nearly all necessary lands for construction of the proposed project, and in turn the project would be implemented more than three years ahead of the previous schedule.

Status of Residual Agricultural Chemical Guidance Compliance:

The ASA(CW) recently signed a policy providing special guidance for CERP projects to address residual agricultural chemicals. Attached is the guidance, Memorandum for Deputy Commanding General for Civil and Emergency Operations, Subject: Comprehensive Everglades Restoration Plan (CERP) – Residual Agricultural Chemicals, dated September 14, 2011. This guidance would permit the soils containing residual agricultural chemicals to possibly be utilized in project features and would permit the USACE to handle the materials under specified conditions. As detailed in the guidance, the cost of actions addressing residual agricultural chemicals is not include in the total project cost for the project and should never result in increasing the project costs, as the non-Federal sponsor is expected to take all actions that are necessary to respond to the presence of residual agricultural chemicals prior to construction of the federal project and the costs for the work would remain a 100% non-Federal responsibility. However, a reduction in the total cost of the project for both the non-Federal sponsor and Federal Government may result due to the efficiencies created by permitting soil to remain on site and to be used by one contractor for the combined construction of project features and the response action.

The guidance requires that the non-Federal Sponsor request in writing to conduct the response action and the inclusion of a “Residual Agricultural Chemicals” section in a PIR and, if necessary, a corresponding appendix. To date, no such written request has been made by

SFWMD for the Biscayne Bay Coastal Wetlands Project. However, a draft request is in preparation and it is expected that a letter will be available by the CWRB briefing.

The PIR must be revised to incorporate the new policy, as well as additional policy concerns that have been raised and addressed. The incorporation of the new guidance will remain unresolved at the time of the CWRB. However, draft revisions are being circulated for review and concurrence. Completion of the PIR is subject to non-Federal sponsor concurrence with the revisions and HQUSACE policy review.