

FINAL

August 2002

CENTRAL AND SOUTHERN FLORIDA PROJECT

**COMPREHENSIVE EVERGLADES
RESTORATION PLAN**



**COMPREHENSIVE EVERGLADES
RESTORATION PLAN**

PROJECT MANAGEMENT PLAN

BISCAYNE BAY COASTAL WETLANDS



**U.S. Army Corps of Engineers
Jacksonville District**



**South Florida
Water Management District**

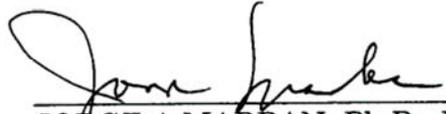
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1.2 List of Acronyms

AE	Architect-Engineer (Contractor)
AFB	Alternatives Formulation Briefing
AHPA	Archeological and Historic Preservation Act
BA	Biological Assessment
BBRRCT	Biscayne Bay Regional Restoration Coordination Team
BCOE	Biddability, Constructibility, Operability, and Environmental
BNP	Biscayne National Park
BO	Biological Opinion
BBCW	Biscayne Bay Coastal Wetlands
C&SF	Central and Southern Florida
CAAD	Computer Aided Architectural Design
CAR	Coordination Act Report
CARL	Conservation and Recreation Lands
CEQ	Council on Environmental Quality
CERP	Comprehensive Everglades Restoration Plan
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CGM	CERP Guidance Memorandum
CWA	Clean Water Act
CZMA	Coastal Zone Management Act
DAR	Design Analysis Report
D-CAR	Draft Coordination Act Report
DCT	Design Coordination Team
D-EIS	Draft Environmental Impact Statement

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Section 1

DERM	Miami-Dade County Department of Environmental Resource Management
DHI	Danish Hydraulic Institute
EA	Environmental Assessment
E&D	Engineering and Design
EBAM	Ecological Benefits Assessment Method
EDR	Engineering Design Report
EEL	Environmentally Endangered Lands
EFH	Essential Fish Habitat
EIS	Environmental Impact Statement
ESA	Endangered Species Act
EMB	Everglades Mitigation Bank
FDEP	Florida Department of Environmental Protection
F-EIS	Final Environmental Impact Statement
FFWCC	Florida Fish and Wildlife Conservation Commission
FONSI	Finding of No Significant Impact
FPPA	Farmlands Protection Policy Act
FPL	Florida Power and Light Company
FWCA	Fish and Wildlife Coordination Act
FWCAR	Fish and Wildlife Coordination Act Report
GIS	Geographic Information System
HAFB	Homestead Air Force Base
HEC	Hydrologic Engineering Center
H&H	Hydrology and Hydraulics
HQ	Headquarters (USACE)
HTRW	Hazardous, Toxic, and Radioactive Waste
IFAS	Institute of Food and Agricultural Services
IPR	In-Progress Review
ITR	Independent Technical Review
LERRD	Lands, Easements, Rights-of-way, Relocations, and Disposal
LECWSP	Lower East Coast Water Supply Plan
L31E	Levee 31 East
MBTA	Migratory Bird Treaty Act
MCACES	Micro Computer Aided Cost Engineering System
MFL	Minimum Flows and Levels
MPMP	Master Program Management Plan (CERP)
MSFCMA	Magnuson-Stevens Fishery Conservation and Management Act
NEPA	National Environmental Policy Act
NGVD	National Geodetic Vertical Datum
NMFS	National Marine Fisheries Service
NGP	Noticed General Permit
NHPA	National Historic Preservation Act

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Section 1

NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollution Discharge Elimination System
NPS	National Park Service
OA	Organic Act
O&M	Operations and Maintenance
P&S	Plans and Specifications (SFWMD)
PAL	Planning Aid Letter
PAR	Planning Aid Report
PCA	Project Cooperation Agreement
PDT	Project Delivery Team
PED	Pre-construction, Engineering, and Design
PIM	Project Implementation Monitoring
PIR	Project Implementation Report
PLRG	Pollutant Load Reduction Goal
PM	Project Manager
PMP	Project Management Plan
PRB	Project Review Board
PWPRG	Public Workshop Project Review Group
QCM	Quality Control Manager
QCP	Quality Control Plan
QC/QA	Quality Control and Quality Assurance
RD	Remedial Design
RE	Real Estate
RECOVER	Restoration, Coordination, and Verification
REP	Real Estate Plan
Restudy	C&SF Comprehensive Review Study Final Integrated Feasibility Report and Programmatic Environmental Impact Statement (April 1999 Final Feasibility Report)
RFP	Request for Proposal
RPC	(South Florida) Regional Planning Council
SAD	South Atlantic Division (USACE)
SAP	Sampling and Analysis Plan
SCORP	State Comprehensive Outdoor Recreation Plan
SCP	Spreader Canal Project
SEIS	Supplemental Environmental Impact Statement
SFWMD	South Florida Water Management District
SFWMM	South Florida Water Management Model
SFWQPP	South Florida Water Quality Protection Plan
SOR	Save Our Rivers
SOW	Scope Of Work
STA	Stormwater Treatment Area
STDA	Stormwater Treatment and Distribution Area
SWIM	Surface Water Improvement and Management
TRC	Technical Review Conference

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Section 1

USACE	United States Army Corps of Engineers
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Services
USGS	United States Geological Survey
VEC	Valued Ecosystem Component
WBS	Work Breakdown Structure
WCA	Water Conservation Area
WQ	Water Quality
WQC	Water Quality Certification
WRDA	Water Resources Development Act
WRPRG	Water Resources Project Review Group
WW	Waste Water

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Section 1

1.3 List of Project Management Plan Preparers

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Section 1

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2 Project Information

The first version of the Project Management Plan (PMP) will include detailed information regarding the Project Implementation Report (PIR) phase of work and less information will be included regarding subsequent phases. Except where noted in Section 2.3, the initial PMP will identify costs and schedule of subsequent phases as shown in the Master Program Management Plan (MPMP).

The official name for this project as authorized in Section 601(b) of the Water Resource Development Act of 2000 is the Biscayne Bay Coastal Wetlands (BBCW). The project includes but is not limited to planning, engineering, design, plans and specifications (P&S), real estate acquisition, project cooperation agreement (PCA), construction, operation, and monitoring.

2.1 Background

A major goal stated in the Comprehensive Everglades Restoration Plan (CERP) is to improve freshwater deliveries to Biscayne Bay. The purpose of the BBCW project is to achieve that goal in part by restoring coastal wetlands and tributaries in some areas of southern Miami-Dade County, by rehydrating and reconnecting freshwater wetlands to marine wetlands along the bay.

Biscayne Bay is a component of the South Florida ecosystem, nationally and internationally unique, and an important natural and economic resource. It is also a resource in peril, having been severely impacted by human activities for more than 100 years. The Central and Southern Florida (C&SF) Project Comprehensive Review Study Final Integrated Feasibility Report and Programmatic Environmental Impact Statement (April 1999 Final Feasibility Report) (Restudy) recommended the CERP for the restoration, protection and preservation of the water resources of C&SF.

The primary goal of the CERP is to restore, preserve and protect the South Florida ecosystem through improved water management while providing for other water related needs of the region such as flood protection and water supply. The CERP contains more than 60 major components that involve creation of some 217,000 acres of reservoirs and wetland-based water treatment areas. These components will vastly increase water storage and supply for the natural system, and human needs, while maintaining current C&SF Project purposes. The C&SF Project was constructed by the U.S. Army Corps of Engineers (USACE) with the SFWMD as local sponsor to provide flood protection and water supply to developed areas of South Florida. CERP

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will restore more natural patterns of water, including sheet flow and levels, and improve Water Quality (WQ) in the South Florida ecosystem. Native flora and fauna, including threatened and endangered species are expected to benefit as a result of restored hydrologic conditions.

A large portion of southern Biscayne Bay lies within the boundary of Biscayne National Park (BNP), where the shorelines are mostly undeveloped, and land uses within the project area include open land, rock mining, agriculture, environmental protected lands, and telecommunication towers. A map identifying the preliminary project study area is shown in Figure 1, Appendix B. Water flow to the estuary of southern Biscayne Bay was disrupted by the creation and operation of parts of the C&SF Project about 35 years ago. The total impact of the changes is not fully understood, but important habitats necessary for a healthy estuary, have been degraded or eliminated. Habitats most affected include wetlands and nearshore fish communities. In some cases, threatened or endangered species such as the American crocodile are directly dependent on the affected habitats.

Prior to development and drainage of the watershed, water flowed from the Everglades through subterranean strata and surface features like sloughs through a coastal ridge, into Biscayne Bay. Groundwater upwelled into the bay and numerous creeks and rivers conveyed surface runoff. Groundwater elevations were lowered by several feet beginning in the 1920s to provide flood protection capacity in the watershed considerably diminishing groundwater flow into Biscayne Bay. Stormwater runoff was diverted from wetlands and sloughs into canals that presently discharge at a few points along the shoreline increasing the intensity of freshwater discharge and partitioning it from coastal wetlands. Levee 31 East (L31E) was constructed about 30 years ago near the coast of southern Biscayne Bay to control saltwater intrusion into the Biscayne Aquifer. The drainage system is currently operated to provide flooding protection for urban and agricultural land uses, and maintain adequate fresh water supply for groundwater withdrawals by private and public wells.

The issues and opportunities for restoration in southern Miami-Dade County have been discussed for many years. This project began to take form under the Biscayne Bay Surface Water Improvement and Management (SWIM) Plan administered by the SFWMD, but certain issues and solutions were proposed in the early 1980s, and investigated under Miami-Dade County's Biscayne Bay Management Plan. The SFWMD has been operating a pilot project (L-31E Culvert and Weir Project) in the study area and conducting research for several years. Much of the land in the project area remains open, so the idea of restoring and using wetlands near the coast has been an attractive idea to slow runoff and redistribute flow away from the canal

outfalls into a more natural estuarine system. The major benefit of restoring more natural drainage would be to restore estuarine conditions in many areas, but other benefits may include improved water quality and enhanced water supply protection.

The CERP includes a brief, conceptual description of the BBCW project (p. 9-24). It was identified as an “Other Project Element”, meaning that the effect of the proposed project could not be modeled with the South Florida Water Management Model (SFWMM). The SFWMM is designed for detecting broad, regional changes in hydrology. The hydrologic impact of the BBCW project is near the threshold of resolution of the SFWMM, and near the boundary of the model, therefore increasing uncertainty of results from this particular modeling tool.

2.2 Authority/Authorization

The authority for this project is contained within the Water Resources Development Act (WRDA) 2000. The “Design Agreement between the Department of the Army and the SFWMD for the Design of Elements of the Comprehensive Plan for the Everglades and South Florida Ecosystem Restoration Project” contains additional guidance.

WRDA of 2000 provides guidance and authority for implementing CERP. Section 601, of the Act states:

(b) CERP -

(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 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 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.

Section 601(b)(2) Specific Authorizations, states:

(A) IN GENERAL. The secretary shall carry out the projects included in the plan in accordance with subparagraphs (B), (C), (D), and (E).

Additional authorization will be required prior to construction.

Section 601 (d) Authorization of Future Projects, states:

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

2.3 Related Projects

There are many projects that will be affected by the BBCW effort. There are many projects underway that will add to the body of knowledge required to complete the project. There are also many groups and initiatives that will play a role during the execution of the project. A map of the general location of these related projects is shown in Appendix B, Figure 2. These projects are being performed outside of the BBCW project.

2.3.1 USACE/SFWMD Projects

2.3.1.1 CERP C-111 Spreader Canal Project

The C-111 Spreader Canal Project would enhance the C-111 Project design for the C-111 Spreader Canal with the construction of a storm water treatment area, the enlarging of pump station S-332E and the extension of the canal under U.S. Highway 1 and Card Sound Road into the Model Lands. The purpose of this project is to improve deliveries and enhance the connectivity and sheet flow in the Model Lands and Southern Glades areas, reduce wet season flows in C-111, and decrease potential flood risk in the lower south Miami-Dade County area.

The BBCW project and the C-111 Spreader Canal Project will both address restoration objectives in the Model Land basin. Therefore, development of performance measures will require inter-project coordination. In addition, review of project footprints and real estate requirements will be needed.

This project is in the PIR phase and is scheduled to start construction in the year 2009.

2.3.1.2 Florida Bay/Florida Keys Feasibility Study

The Florida Bay & Florida Keys Feasibility Study will comprehensively examine the Florida Bay and Florida Keys marine environments, and the actions and land uses upstream, to determine the modifications that are needed to successfully restore water quality and ecological conditions of the Bay. The study may also include analyses of alternatives for restoration of the marine environment surrounding the Florida Keys, for positive impacts on Florida Bay. For example, additional tidal creek restoration projects (beyond those authorized in the Florida Keys Tidal Restoration Project) may be considered.

The southern extent of Biscayne Bay is located adjacent to the northern extent of Florida Bay. The distinction is in name only. Both are part of the embayment of water between barrier islands/keys and the mainland at the southern tip of Florida. It is uncertain if there will be any connection between these two projects but water circulation at, and about, the geographic location of the name change may be affected by the BBCW project. For this reason, co-located or adjacent area restoration targets should be compatible between the two projects.

2.3.1.3 C-102/C-103 Wetland Restoration

The C-102/C-103 project under continuous authority Section 1135 (Project modifications for improvement of the environment, WRDA 1986) 'is a joint project between the SFWMD and the USACE. The project cost is estimated at \$2.5 Million dollars with a cost share of 25%, 75% respectively. The project will mitigate environmental impacts resulting from the construction of the flood control canal system in South Miami-Dade County. The conceptual project will remove the fill (approximately 72,000 cubic yards) from the berms on both sides of the Mowry (C-103) and Princeton (C-102) canals at a specified distance east of the salinity structures. Nuisance vegetation will be removed and the area replanted with suitable native species such as mangroves. Spoil islands at the mouths of the canals within Biscayne Bay will either be removed or cleared of exotic vegetation and replanted with native plants. Public use of the area will be addressed through interpretive signage and possible foot paths and parking facilities. The fill to be removed will likely be used to back fill other canals or borrow pits in the area where possible and beneficial. The resulting project will affect the BBCW project beneficially by greater distribution of the canal discharges through the coastal mangroves, restoring over 18 acres of tidal wetlands, removing extensive areas of exotic vegetation, and enhancing the public use and bay access in the area.

The Preliminary Restoration Report has been approved and funded. The Environmental Restoration Report should be completed in March 2003. All interested parties will be invited to attend the planning meetings. Construction could begin in March 2004.

The C-102/103 Project Team will provide preliminary drafts of key report sections to the BBCW project Team for review and comment. Sections to be reviewed will include, but not necessarily be limited to: Study Plan Objectives, Existing Conditions, Future Without Project, Alternatives to be considered, Performance measures to be employed, and Preliminary Selected Plan.

2.3.2 USACE/Miami-Dade County Projects

2.3.2.1 CERP South Miami-Dade County Wastewater Reuse

This feature includes a plant expansion to produce advanced treatment of wastewater from the existing Miami-Dade County South District Wastewater Treatment Plant located north of the C-1 Canal. The initial design of this feature assumed that the plant would have a capacity of approximately 130 million gallons per day. More detailed analyses will be required to determine the quality and quantity of water needed to meet the ecological goals and objectives of Biscayne Bay. Additionally, due to the water quality issues associated with discharging reclaimed water into BNP, an Outstanding Florida Water, such as potential failures of the treatment system and the limited ability to control contaminant inputs to the sanitary sewer system serving the treatment facility, other potential sources of water to provide required freshwater flows to southern and central Biscayne Bay should be investigated before pursuing the reuse facility as a source. An initial pilot project is underway to identify potential technologies and assess potential environmental impacts. The pilot project is scheduled to be completed in 2013. If the full-scale project is authorized it could be constructed between 2016 and 2020. It is possible that the BBCW project will be constructed prior to water being available through wastewater reuse. Modeling will be performed to evaluate the effects of the unavailability of wastewater reuse.

The BBCW project will develop water quality and quantity requirements and advise the Reuse PDT, when formed. RECOVER will investigate alternative sources of water for the BBCW project.

2.3.2.2 Biscayne Bay Feasibility Study

The USACE and Miami-Dade County are the sponsors of the Biscayne Bay Feasibility Study, which examines the effects of canal and groundwater

discharges on Biscayne Bay. For the past several years, the first phase of the project focused on the development of a hydrodynamic model to simulate water circulation and salinity patterns. The USACE model, developed by the Waterways Experiment Station, will be used to assess several water flow scenarios. The sponsors are currently contemplating the development of a water quality assessment tool to simulate the transport of contaminants (i.e. nutrients, metals) in Biscayne Bay. The water quality model, in combination with the hydrodynamic model, will provide the capability of assessing effects from proposed water management modifications being investigated in various local and regional planning activities (Central & South Florida Project Review Study, Lower East Coast Water Supply Plan (LECWSP), South Biscayne Bay Watershed Management Plan). These tools are also an essential element in developing freshwater flow and water quality performance measures for the Bay. The current Feasibility Cost Share Agreement has been amended to allow initial water quality data collection and identification of possible assessment tools. This phase of work is scheduled to be completed by 2004. A completed Water Quality Assessment tool is not anticipated until 2005/2006.

Resource management agencies will benefit from the feasibility study due to an increased understanding of impacts upon Biscayne Bay associated with regional water management modifications considered in the CERP. Because of the timing of the feasibility study, it is not expected that the water quality tool will be available to evaluate the alternatives proposed for the BBCW project. However, the water quality tool may be used to better address long-term effects using post construction information. The available hydrodynamic model can be used for the BBCW to look at changes in circulation and salinity in the Bay. Modification to the model will be required for near shore investigations; a three dimensional feature may be required.

2.3.3 SFWMD/Miami-Dade County Projects

2.3.3.1 Biscayne Bay Water Quality Monitoring

The Miami-Dade County Department of Environmental Resources Management (DERM) has been collecting water quality data in Biscayne Bay, the Miami River and its canal tributaries since 1979. This program is jointly funded by Miami-Dade County and the State of Florida through the SFWMD. The SFWMD also coordinates a regional network of coastal estuary monitoring stations conducted by Florida International University (FIU).

The DERM water quality monitoring program includes a network of over 100 sampling sites in the Bay and throughout the watershed. Water samples are

collected and analyzed for bacteria, nutrients, metals, organic compounds, water clarity, and physical characteristics. Periodically, sediment chemistry and toxicity are also evaluated. Complementary work by FIU focuses on surface water parameters related to nutrient dynamics and water column productivity, and includes 25 stations in Biscayne Bay. The extensive database provides a foundation for assessing effects of proposed water management modifications being investigated in various local and regional activities (CERP, LECWSP, South Biscayne Bay Watershed Management Plan). The water quality data are also critical for developing freshwater flow, water quality targets, and pollutant loading criteria for Biscayne Bay. Monitoring has provided information necessary to identify and eliminate sources of contamination to Biscayne Bay Aquatic Preserve and BNP.

These data are expected to contribute toward the establishment of baseline conditions, salinity and water quality performance measures, and evaluate the effectiveness of restoration projects undertaken in connection with the BBCW project.

2.3.4 SFWMD Projects

In the last two years the SFWMD received specific appropriations from the State of Florida Legislature, in the amounts of \$2.5 million in FY02 and \$ 3.5 million in FY03 for projects related to Biscayne Bay restoration. The prioritization of which projects will be implemented with these appropriations is determined by the Biscayne Bay Regional Restoration Coordination Team. Some of those projects are listed below.

2.3.4.1 L-31E Culvert and Weir Construction

This multiple-year project by the SFWMD tested the release of freshwater into coastal wetlands lying east of L31E in southern Biscayne Bay to examine hydrologic, water quality and vegetation effects resulting from redistributing freshwater from canals into tidal wetlands. Freshwater flow through the coastal wetlands of southern Biscayne Bay was eliminated by construction of L31E in 1968, and other elements of the Central and South Florida Flood Control Project. Work for this pilot project has proceeded since 1994. Culverts were installed and became operable in August 1997. A report will be produced in 2002 that will summarize the results of all the monitoring conducted since the inception of the project.

A second task of the project is to gather information on the location and character of the creek systems that once conveyed water in southern Biscayne Bay. Remnant creek systems have been mapped. An interim report that includes information about a specific creek is due in 2002.

Information from this project will assist in describing past, existing and future conditions of the creek channels in this area and provide early information on the performance of restoration measures employed. All will be taken into account in the BBCW project.

2.3.4.2 Deering Glade Rehydration

Miami-Dade County Parks Department, in cooperation with the SFWMD, hired a consultant to study the feasibility of rehydrating the Deering Glade. This project relates directly to the BBCW CERP sub-component 1, the Deering Estate Flowway. The feasibility report was completed in November, 2001 and will be available electronically on the CERP website. While significantly more baseline data such as topography, geotechnical investigation, location of cultural and historical resources, and performance measures are needed before the project moves forward, the report proposes different alternatives for the rehydration of the slough. The most comprehensive alternative includes a small pump, the extension of the spur canal onto the Powers property, the creation of five acres of wetland habitat on the property, jack and bore under Old Cutler Road, and the construction of a weir at the end of the spur canal to control gravity flow. Another weir would be constructed on the Deering property to maintain a freshwater head that would help to rehydrate the freshwater wetlands and encourage groundwater flow to the bay. This report includes a collection of background information, a preliminary water budget and suggests what data are needed for further study. Review of the feasibility report will assist in planning the BBCW project. Some features of the Deering Estate Flowway sub-component might be performed under the Deering Estate Rehydration Project (Phase1) proposed by the Miami-Dade Parks and Recreation Department.

2.3.4.3 Flow Monitoring with Horizontal Doppler Systems at Coastal Spillways

Currently, the calculation of discharges at coastal spillways in the SFWMD are based on equations developed by the USACE using reduced-scale models of inland spillways (September 1963). These equations do not account for the tidal effect typically observed at coastal sites and therefore are a rather crude approximation for estimating flows at coastal spillways when the effect of the tide is as important as that of gravity. In extreme scenarios, the equations for estimating flows currently in use, result in negative discharge estimates at coastal spillways while the discharge is actually positive. This project is aimed at improving the accuracy of flow estimates at coastal sites in the SFWMD. As part of this work, the SFWMD will install horizontal doppler systems upstream of coastal spillways S20F, S21, S21A, and S22. Horizontal doppler systems are acoustic doppler-based index-velocity meters that allow

for continuous monitoring of the flow through a given canal cross section. These data will be used for developing equations for tidal flow computations that accurately account for the factors governing the flow at coastal spillways. The new equations will help reduce the flow computation inaccuracies typical of coastal spillways, especially during times of flood discharges when the gates are fully out of the water. These systems will also play a key role in the monitoring efforts of freshwater discharges into Biscayne Bay. Three of the above mentioned structures are located in the expected BBCW project area (S20F, S21, S21A). The data collected with these systems may support part of the data needs of the BBCW project. The information collected could be used to improve boundary conditions of the Biscayne Bay hydrodynamic model and provide a better estimate of salinity and flow responses. It is expected that data will be available starting in October, 2002.

2.3.4.4 Historical Changes of Salinity, Water Quality and Vegetation Patterns

Current restoration goals for Biscayne Bay are aimed at restoring more natural flow of freshwater into Biscayne Bay, and natural vegetation, but benchmarks must first be established to understand the environmental conditions prior to significant human alteration. This project is designed to examine the natural patterns of temporal change in salinity, water quality, vegetation, and benthic fauna in Biscayne Bay over the last 100-300 years and to examine the causes of change.

The objectives of this two-year project are to examine historical changes in the Biscayne Bay ecosystem in broad context at selected sites on a decadal to centennial scale, and to correlate these changes with natural events and anthropogenic alterations in the South Florida region. Specific emphasis will be placed on historical changes to 1) amount, timing, and sources of freshwater influx and the resulting effects on salinity and water quality; 2) shoreline and sub-aquatic vegetation; and 3) the relationship between sea-level change, onshore vegetation, and salinity. In addition, a detailed examination of historical seasonal salinity patterns will be derived from biochemical analyses of molluscs, ostracodes, foraminifera and corals. Results from coral analyses can be used to compare marine and estuarine trends, examine linkages between the two systems, and provide precise chronological control. Compiled results derived from this project can provide benchmarks for performance criteria related to restoring freshwater flow, and to understand the consequences of altered flow. These data may also be used to forecast potential problems as upstream changes in water delivery are made during restoration.

The project is expected to be completed in 2003, but is subject to future funding. The lead organization is the U.S. Geological Survey under contract with the SFWMD.

2.3.4.5 Coastal and Nearshore Community Baseline Study to Develop Biological Performance Measures Project

Loss and degradation of coastal wetlands and nearshore estuarine habitat is a long-term threat to ecological function and productivity of Biscayne Bay. The ecology is dependent upon the quantity, quality, timing, and distribution of freshwater inflow. Scientifically based performance measures based on biological communities are needed to quantify change, and benchmarks are needed to indicate whether restoration is succeeding.

The overall objective of this three-year project is to characterize and document segments of baseline fish community conditions in the coastal and nearshore area of southern Biscayne Bay for use as comparative data to detect trends that may result from changes to freshwater inputs. It is expected that the 2003 work will include development of performance measures and restoration targets for the coastal wetlands and near-shore waters of Western Biscayne Bay, and design of a long-term monitoring plan for these performance measures. To develop performance measures, this project is focusing on collecting scientific data on the benthic animal communities of the coastal wetlands and adjacent nearshore areas (small forage fish, juvenile game fish, and invertebrates such as pink shrimp, blue crab), to determine their relationships with freshwater inflows to Biscayne Bay.

The project is expected to be completed in 2004, but is subject to future funding. The lead organization is the National Marine Fisheries Service (NMFS) under contract with the SFWMD. The BBCW PDT team will need to coordinate development of performance measure with this effort as well as development of the scope of work (SOW) for the epibenthic survey.

2.3.4.6 Minimum Flows and Levels, Technical Criteria Development

Pursuant to Section 373.042(1), Florida Statute (F.S.), the water management districts developed a priority list and schedule for the establishment of minimum flows and levels (MFLs) for surface waters and aquifers within their jurisdiction. This list, included in the SFWMD's *District Water Management Plan* (SFWMD, 2000), requires that MFLs for Biscayne Bay be established by 2004.

The minimum flow for a water body is the limit at which further water withdrawals would cause significant harm to the water resources or ecology of that area. For establishing the MFLs, significant harm is defined as the temporary loss of water resource functions that result from a change in surface or ground water hydrology, that takes more than two years to Recover, but which is considered less severe than serious harm. The water resource functions that are protected under Chapter 373, F.S., include flood control, water quality, water supply and storage, fish and wildlife, navigation and recreation.

For the purposes of determining significant harm to the water resources and/or ecology of Biscayne Bay, the SFWMD will utilize a resource-based strategy similar to the Valued Ecosystem Component (VEC) approach developed by the U.S. Environmental Protection Agency as part of its National Estuary Program (USEPA 1987). The VEC approach is based on the concept that estuary management goals can best be achieved by providing suitable environmental conditions for selected key species or key groups of species that inhabit the estuary. Based on components of baseline information and data, the SFWMD will identify a key water resource(s) (i.e. species and/or habitats) to be protected against significant harm, which maintain a direct relationship with surface water flows and salinity.

Based on the above, the District will compile and analyze existing information and data, and new information and data that is forthcoming through a number of the projects identified within this Section, to identify key technical flow/salinity/VEC relationships and develop numerical MFL criteria for Biscayne Bay. In addition, critical information and data will be obtained and/or evaluated for reservations of water for the Bay and restoration requirements for the critical estuarine ecosystems.

2.3.4.7 Biscayne Bay Water Quality Data Analysis

The water quality monitoring data collected by DERM over the last 20 years will be comprehensively analyzed for use in characterizing Biscayne Bay, identifying problem areas and understanding trends in water quality.

2.3.4.8 Biscayne Bay Habitat Restoration Planning/Design

A specific coastal and/or marine area of Biscayne Bay will be identified for ecosystem restoration. This project will include the initial planning and design of this specific restoration project.

2.3.4.9 Biscayne Bay Environmental Education and Outreach

This project will provide for a coordinator to initiate and oversee a multi-faceted Biscayne Bay-wide conservation volunteer program. The volunteers would provide: 1) a presence on the Bay for the protection of the Bay's natural resources; 2) additional opportunities to educate the local community about the Bay; and 3) opportunities for the public to become more involved in and with the Bay.

2.3.4.10 Biscayne Bay Economic Survey

This project will evaluate the economic activities of Biscayne Bay and the associated impacts from the users of the Bay, to develop a comprehensive baseline of economic data. Specifically, a methodology for estimating the economic impacts of various management scenarios, such as additional restrictions on use of Biscayne Bay, improved access to the Bay, Bay water quality improvements, etc. will be developed.

2.3.4.11 Detection, Mapping and Characterization, of Groundwater Discharges to Biscayne Bay

This project will determine the past and present roles of artesian springs in supplying freshwater, and/or introducing contaminants to Biscayne Bay, and will attempt to detect and characterize springs that are presently discharging to the Bay. This data and information will contribute to addressing the current issues associated with improving the quantity, quality, timing and distribution of freshwater inflows to Biscayne Bay.

2.3.5 Miami-Dade Projects

2.3.5.1 South Dade Watershed Plan

The southern watershed in Miami-Dade County includes the majority of the remaining undeveloped lands, and thus presents the best opportunities for improving hydrology. The purpose of the South Dade Watershed Plan is 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: the C-2, C-100, C-1, C-102, C-103, North Canal, and Florida City Basins. The entire footprint of BBCW project is located in the Watershed Plan area. The South Dade Watershed serves two national parks, as well as urban and agricultural areas. The Plan will direct the comprehensive management of land uses as well as the quality, quantity, timing and distribution of surface and ground water.

Plan objectives, as outlined in Land Use Policy 3E of Miami-Dade County's Comprehensive Development Master Plan, are to 1) identify and protect lands essential for preserving the environmental, economic, and community values of BNP; 2) identify and establish mechanisms for protecting constitutional private property rights of affected land owners; 3) support a viable, balanced economy, including agriculture, recreation, tourism, and urban development; and 4) assure compatible land uses and zoning decisions consistent with long-term objectives for a sustainable South Dade. The Plan will have two time horizons: a short-term component extending through the year 2015, and a long-term component extending through the year 2050. This extended time horizon presents an opportunity for common objectives of the Watershed Plan and the BBCW project to be accomplished concurrently.

The Plan will be based on a comprehensive study that analyzes surface and ground water uses and corresponding land uses, including water uses for sustaining and restoring the environment, sustaining economically viable agriculture, providing flood protection, supplying and protecting drinking water, and other water uses pertinent to probable land uses. Study results will provide valuable information that could be utilized to meet project goals of the BBCW project, depending on when the results are available. For example, the study will address existing and needed numeric standards for the quality, quantity, timing and distribution of waters into and of BNP, property rights of landowners as they relate to Watershed Plan objectives, and existing and needed studies of freshwater and groundwater supply. Of special note, the study must also devise methods for integrating the Watershed Plan into the CERP. The study and plan will be prepared by a team of consultants to be hired through a Request for Proposal (RFP) process being managed by the (South Florida) Regional Planning Council (RPC). The RPC anticipates issuing an RFP by April 2002. Estimated timeframes for completion of the study and plan are early 2003 and late 2003, respectively.

2.3.5.2 Miami-Dade County Agriculture and Rural Area Study

Agriculture currently provides a 140-square mile buffer between urban land uses and two national parks in South Miami-Dade County. Future urban expansion to accommodate population growth in the County and economic pressures are impacting the agricultural industry's viability in South Dade. It is the intention of this study to develop and maintain economically sustainable, environmentally sensitive agriculture in South Miami-Dade County. Specific project goals are to: 1) determine whether regulatory agencies should adjust existing and establish new policies to retain agriculture as a viable economic land use in south Miami-Dade County; 2) determine the extent of this area in which such policies should be implemented; 3) determine any additional land uses, development standards,

and/or retention programs that should be authorized to maintain or promote recommended agricultural and rural development; and develop a plan to accomplish the foregoing purposes, including implementation programs and actions.

The BBCW project footprint includes lands that are currently being farmed and/or are designated as agriculture on Miami-Dade County's Future Land Use Plan Map. Results of the Agriculture and Rural Area Study will provide information on the future viability of agriculture and alternative land uses in these areas. The study is scheduled for completion in late 2002.

2.3.5.3 South Dade Stormwater Treatment and Distribution Area Pilot Project

In the late 1980's, Miami-Dade County acquired approximately 680 acres of degraded wetlands east of Homestead Air Reserve Base in order to explore methods for hydrologic and biological restoration and enhancement. The parcel is bisected by Military Canal and is bounded on the east by the L-31E levee canal. Miami-Dade County has completed preliminary engineering and hydrologic assessments and will construct a small-scale demonstration project on approximately 80 acres north of Military Canal to reroute canal water and promote sheet flow through the wetland. The pilot project includes a pump system to provide water to the wetland, construction of small distribution canals or flowways, elimination of existing drainage ditches and exotic vegetation, and monitoring.

The intent of the project is to provide improvements in water quality and timing of freshwater discharges to BNP and provide important information on the function of filtering wetland systems required to scale up restoration to a more regional scale. The project site is entirely within the footprint of the BBCW project. It will help develop technical water quality, flood protection, and biological criteria needed to determine how much wetland area is required to treat or detain canal discharge.

Construction is expected to start Jan 2003 and be completed in June 2004. Operation and monitoring is anticipated to begin in August 2004 and last for two years.

2.3.5.4 Stormwater Management Master Plan – South Dade Basins

Development in South Miami-Dade County has heightened concerns about the impact of drainage and stormwater runoff on the quality and quantity of water discharged into BNP via the canals in South Miami-Dade County. To address this concern, the Miami-Dade County Board of County Commissioners amended the Comprehensive Development Master Plan

requiring the development and implementation of an integrated land use and water management plan for South Miami-Dade County. The primary objective of the planning effort is to "improve the quality, quantity and periodicity of freshwater discharges to, and to prevent degradation of, Biscayne National Park."

Phase I of the subject plan, which has been completed, consisted of collecting and mapping information and infrastructure data and performing sub-basin delineations for the C-1, C-102 (including Goulds Drainage Area), C-103, North Canal, and Florida City Basins.

Phase II, which is approximately 60% complete as of February, 2002, will use the deliverables from Phase I to develop a model and predict the effects of existing and future land uses on the quantity and quality of surface water discharges to Biscayne Bay. This will be achieved by calculating pollutant loading into receiving water bodies, analyzing the quantity distribution and timing of freshwater discharges to Biscayne Bay, and identifying pollutant loading reduction levels, canal conveyance capacities, and stormwater management strategies. The project will allow evaluation of the effects of varying land uses that will help to establish the basis for comprehensive land use strategies.

2.3.5.5 Miami-Dade County Emergency Management Local Mitigation Strategy

The Local Mitigation Strategy is an entity consisting of local, state, federal and municipal representatives, private business, and universities. This group identifies and prioritizes mitigation activities that reduce risk to the residents of the community. Any local mitigation plan streamlines the federal grant funds application process post-disaster, and serves as a blueprint for communities to follow to provide residents better protection from future disasters. All federal grants for mitigation activities must have LMS approval. Presently a flood mitigation project in the C-4 basin is being implemented. Funding for this project will come from federal grants created as a result of the No-Name Storm being declared a disaster. State and local matches totaling 25% of the total cost will be required. The project is considered a flood mitigation project, and as such has the approval of the Local Mitigation Strategy.

Most of the lands in the project area are vulnerable to natural and technological hazards and would be a poor place for urban development. The area is extremely low-lying and is vulnerable to storm surge and high winds from hurricanes (even with the presence of the L-31E levee). In addition, it is a natural wetlands area and any possible future development here would be subject to flooding, a major problem in other low-lying areas. Also, the close

proximity to wild lands makes the area vulnerable to wild land fires. Finally, any potential future development would be in close proximity to the Turkey Point Nuclear Plant and in its critical exposure zone, an evacuation problem for the Emergency Management community.

It is anticipated that the BBCW project Team will coordinate with the MTS Coordinator, providing Project briefings during the PIR preparation.

2.3.6 Other Related Efforts/Teams/Committees

2.3.6.1 Miami Dade County Environmentally Endangered Lands (EEL) Acquisition

Two EEL projects, the Biscayne Coastal Wetlands and Friends of the Everglades acquisition projects lie within the conceptual boundary of the CERP Biscayne Coastal Wetlands project components (Figure 2a, Appendix B). Both of these projects are part of the SFWMD's Save Our Rivers (SOR) plan for acquisition. These projects are part of a willing sellers program and are therefore subject to an owner's willingness to sell. This makes it difficult to assess when the lands will be available and the impact to the BBCW project.

2.3.6.1.1 Biscayne Coastal Wetlands Acquisition Project

The Biscayne Wetlands Acquisition Project consists of three non-contiguous tracts that buffer BNP and are located in southeast Miami-Dade County between Homestead Bayfront Park and SW 196 Street. The parcels consist of high quality coastal mangroves and disturbed wetlands. Tract A, or Biscayne Wetlands is approximately 445 acres in size and consists of relatively high quality coastal mangrove habitat. Tract B or Black Point Wetlands is approximately 271 acres. Approximately 79 acres have been acquired in Tract B and 396 acres are under contract. Tract C or Cutler Wetlands is approximately 1,260 acres in size. Approximately 68 acres are already under County ownership.

All three of these sites provide an important buffer to BNP and are important for hydrologic restoration in the area. Under an approved Memorandum of Understanding, Miami-Dade County and SFWMD are jointly funding the acquisition. Florida Communities Trust has approved a 50% matching grant for the purchase of Tract A that will be acquired by the County. The District, with funds from a legislative appropriation to the Water Management Fund will acquire Tracts B & C. There are 1829 acres of wetlands remaining to be acquired within this project area.

2.3.6.1.2 Friends-of-the-Everglades Acquisition Project

The Friends-of-the-Everglades Acquisition Area is located directly south of the EEL BCW Tract C. This project contains a total of 3,649 acres, approximately 3,000 of which lie in the CERP conceptual BBCW boundary. The project contains freshwater wetlands and mangrove forests that will be critical in the hydrologic restoration and protection of southern Miami-Dade County. Both the Miami-Dade County EEL Program and the SFWMD SOR Plan designate the project for acquisition. However, there is not a joint acquisition agreement between these agencies at this time and no land has been acquired.

The easternmost four sections of the project area were designated in the Southwest Biscayne Bay Advance Identification Study as "Generally Unsuitable for Disposal of Fill" which is the designation generally reserved for the highest quality wetlands, or as "Site by Site Evaluation Required" indicating these lands act as an effective buffer for adjacent high quality wetlands.

2.3.6.2 Florida Power & Light Company

2.3.6.2.1 Florida Power & Light Company Operations

Florida Power & Light Company (FPL) Turkey Point Nuclear Power Plant is located about nine miles east of Homestead. The area has 12,800 acres, including 6,800 acres for cooling canals and about 30 acres for plant facilities. The remaining area is dominated by mangrove swamps maintained in the natural state to serve as a wildlife preserve. FPL monitors vegetation and wildlife at the site, including endangered American crocodile, 63 species of birds and 21 species of fish. The plant has been in operation since 1972 and has generated more than 179 billion kilowatt-hours. Boy Scout and Girl Scout camps created by FPL offer access to hiking trails, natural creeks and Biscayne Bay.

A cooling water system consists of 36 canals each five miles long , 200 feet wide and four feet deep. Total canal length is 168 miles covering 6,800 acres. Water takes about two days to travel a complete loop. FPL in conjunction with the Florida Department of Health, Bureau of Radiation, monitors radiation in the vicinity of the plant. Air samples are taken monthly and quarterly at six sites. Site locations range from plant property out to 12 miles.

The BBCW PDT will coordinate with the FPL to ensure that the proposed alternatives for the BBCW restoration project do not impact the FPL facilities and operations in the project area.

2.3.6.2.2 FPL Everglades Mitigation Bank (EMB) Site

Previously known as the South Dade Mitigation Bank, the EMB is a 13,249 acre site located approximately five miles south of Florida City, just southwest of Turkey Point Power Generation Facility and east of U.S. Highway One. Access to the site is available from U.S. Highway One, Card Sound Road and from the L-31 Levee via Palm Drive. The EMB consists of two major phases.

Phase I contains 4,223 acres located between U.S. Highway One and Card Sound Road. Phase I was permitted to operate as a mitigation bank in 1996. Phase II contains 9,026 acres located east of Card Sound Road extending to Card Sound then north along the L-31 Canal. A Mitigation Bank Conceptual Approval Permit was issued in 1996 for both Phases. Construction activities for Phase I were completed in 1997. An application for Phase II of this bank is currently under review by Florida Department of Environmental Protection (FDEP). The purpose of this mitigation bank permit application is to obtain construction permit authorization for the balance of the EMB lands (Phase II). Mitigation banks are regional areas designed to improve wetlands and ecological functions within the design area. They are intended to offset wetland impacts associated with projects permitted by regulatory agencies. The EMB site is within the BBCW project area. The BBCW selected plan must integrate the existing FPL facilities (including the EMB) with the proposed project features for the BBCW area.

2.3.6.3 Biscayne Bay Science Program Management Committee

The Working Group, a subcommittee of the South Florida Ecosystem Restoration Task Force, directed the Florida Bay Program Management Committee to expand its responsibilities to include connected marine ecosystems in adjoining waters, including Biscayne Bay, in 1998. The Florida Bay Program Management Committee was appointed by the South Florida Ecosystem Restoration Working Group in 1994 to identify scientific information needs, and implement and coordinate scientific programs supporting resource management and ecosystem restoration actions affecting Florida Bay. The Program Management Committee produced a strategic science plan for Biscayne Bay. The purpose of the plan is to increase the probability of successfully restoring and preserving Biscayne Bay by identifying critical information gaps, and to increase efficiency by coordinating the funding of priority research and monitoring activities. The

current plan (2002) includes 30 recommended activities. Historically the Program Management Committee has provided Peer review and expert assistance for science issues, which may be needed by this project.

2.3.6.4 Biscayne Bay Regional Restoration Coordination Team

The Biscayne Bay Regional Restoration Coordination Team (BBRRCT) was created in 2001, as part of the Working Group of the South Florida Ecosystem Restoration Task Force. The Team will integrate and coordinate restoration, enhancement, and preservation projects, plans and activities, and will work toward maintaining a functioning ecosystem while promoting a sustainable region. The purpose of the team is to provide a forum for public involvement, outreach and interagency coordination and communication; to identify priority issues for action and to create teams to address those issues as needed; to make recommendations on key issues to the Working Group; to identify goals and performance measures related to key issues and to assess the achievement of goals; to identify funding requirements; and to review elements of the CERP that affect Biscayne Bay.

The Team has representatives from 23 entities, including public agencies, not-for-profits, and private organizations. The Team serves in an advisory role, and will not supplement agency authority or have any regulatory authority. Appropriate coordination with this team will be required throughout the BBCW project. Attendance at meetings will be considered as a method to interact and solicit input from stakeholders.

2.3.6.5 Biscayne Bay Website

The BBRRCT has established a Biscayne Bay website to post relevant information concerning Biscayne Bay. This website address is <http://www.DiscoverBiscayneBay.org>. This website is intended to keep the public informed about scientific reports, meetings, and progress of work related to the restoration of the Bay. It can serve as an additional source of information related to this project. The web site is expected to be operational in the June of 2002.

2.3.6.6 Governor's Commission for a Sustainable South Florida

The Governor's Commission for a Sustainable South Florida was established to make recommendations for achieving a healthy South Florida ecosystem that can coexist with and mutually support a sustainable economy and quality communities. Most of the Commission's recommendations were used in the development of the Restudy/CERP plan. A number of valuable reports

and documentation are available on the following website:
<http://fcn.state.fl.us/everglades/gcssf/gcssf-reports.html>.

2.3.6.7 United States Geological Survey (USGS) Completed and Ongoing Studies in Biscayne Bay

2.3.6.7.1 Quantifying Freshwater Discharge for Coastal Hydraulic Structures

As part of the South Florida Ecosystem Program, the USGS, in cooperation with the SFWMD, completed a study in 1996 to determine discharge ratings for 16 coastal hydraulic control structures in eastern Miami-Dade County, Florida. Results of the study are described in the USGS publication FS-123-96. Discharge data was needed to quantify water that could be made available for water supply and ecosystem restoration and to calibrate regional hydrologic models.

The total volume of freshwater flow through all coastal hydraulic control structures to Biscayne Bay is of great interest to water managers. This volume not only influences the freshwater available for human consumption, but it also affects the ecology of the bay which receives the freshwater. The volume of flow through the coastal hydraulic control structures constitutes the majority of the freshwater flow into Biscayne Bay because other structures farther north discharge into the Intracoastal Waterway. Only 12 of the 16 coastal hydraulic control structures have the necessary remote telemetry to compute continuous discharges; the other four (G-58, S-25, G-93, and S-197) are considered minor or, in the case of S-197, discharge significantly to the south of the area of interest. Cumulative flow volumes were determined for each of these 12 coastal hydraulic control structures in 1994 based on the theoretical and computed ratings. This information may be useful in describing existing conditions and predicting future conditions for the BBCW project.

2.3.6.7.2 Determination of Nutrient Loads to East Coast Canals

The USGS, as part of its South Florida Place-Based Studies Program, completed a project in 1997 to document and define the concentration, distribution, and transport of nutrients to the Bay from the coastal canal network. Water samples were collected from east coast canals in 1996-97 (primarily during the wet season) to determine concentrations of major organic and inorganic nitrogen and phosphorus species. Study results indicate that within the Biscayne Bay watershed, median concentrations of some nitrogen and phosphorus species were highest in selected land-use categories: (1) nitrite plus nitrate in the agricultural land-use category; (2) ammonia, total phosphorus, and orthophosphate in the urban land-use

category; and (3) total organic nitrogen in the wetlands category. Results of the study are described in the USGS publication WRI report 99-4094. This information may be useful in describing existing conditions and predicting future conditions for the BBCW project.

2.3.6.7.3 Water Quality Trends at Two Discharge Stations

An analysis of water quality trends was made at two U.S. Geological Survey daily discharge stations in southern Florida (1966-1994). The ESTREND computer program was the principal tool used for the determination of water quality trends at the Miami Canal station west of Biscayne Bay in Miami and the Tamiami Canal station along U.S. Highway 41 in the Big Cypress National Preserve in Collier County. Variability in water quality, caused by both seasonality and streamflow, was compensated for by applying the nonparametric Seasonal Kendall trend test to unadjusted concentrations or flow-adjusted concentrations (residuals) determined from linear regression analysis.

Concentrations of selected major inorganic constituents and physical characteristics; pH and dissolved oxygen; suspended sediment; nitrogen, phosphorus, and carbon species; trace metals; and bacteriological and biological characteristics were determined at the Miami and Tamiami Canal stations. Median and maximum concentrations of selected constituents were compared to the Florida Class III freshwater standards for recreation, propagation, and maintenance of a healthy, well-balanced population of fish and wildlife. The median concentrations of the water-quality constituents and characteristics generally were higher at the Miami Canal station than at the Tamiami Canal station. The maximum value for specific conductance at the Miami Canal station exceeded the State standard. The median and maximum concentrations for unionized ammonia at the Miami and Tamiami Canal stations exceeded the State standard, whereas median dissolved-oxygen concentrations at both stations were below the State standard. Results of the study are described in the USGS publication WRI report 00-4099). This information may be useful in describing existing conditions and predicting future conditions for the BBCW project.

2.3.6.7.4 Simulation of Groundwater Discharge to Biscayne Bay, Southeastern Florida

As part of the Place-Based Studies Program, the U.S. Geological Survey initiated a project in 1996, in cooperation with the USACE, to quantify the rates and patterns of submarine groundwater discharge to Biscayne Bay. Project objectives were achieved through field investigations at three sites (Coconut Grove, Deering Estate, and Mowry Canal) along the coastline of

Biscayne Bay and through the development and calibration of variable-density, ground-water flow models. Two-dimensional, vertical cross-sectional models were developed for steady-state conditions for the Coconut Grove and Deering Estate transects to quantify local-scale ground-water discharge patterns to Biscayne Bay. A larger regional-scale model was developed in three dimensions to simulate submarine ground-water discharge to the entire bay. The SEAWAT code, which is a combined version of MODFLOW and MT3D, was used to simulate the complex variable-density flow patterns.

Results of the study are described in the USGS publication WRI report 00-4251. This information may be useful in describing existing conditions and predicting future conditions for the BBCW project.

2.3.6.7.5 Remote Sensing for Coral Reef in the Biscayne National Park

In 2001 the USGS (Coastal Marine Science Center at St. Petersburg, Florida) in cooperation with BNP, National Aeronautic and Space Administration, National Oceanic and Atmospheric Administration (NOAA), and University of Florida, began an investigation of various airborne, shipborne, and spaceborne remotely sensed data sets for their use to extract information about coral reef environments. The capabilities of various types of remotely sensed image data to map both morphology and cover types in Biscayne Bay are being investigated. The applicability of remotely sensed image data for detecting and mapping the location of live and dead reef areas, density of coral cover, and possibly the major types of coral present are being researched. Remotely sensed image data and algorithms to detect and map areas affected by sediment runoff and deposition of mud are also being studied.

Major project objectives are: 1) Evaluate remote sensing methods and data to identify the most efficient approaches to various systematic coral reef mapping and monitoring applications, and develop robust remote sensing procedures to create meter-scale or finer thematic maps of coral reef ecosystems in support of mapping and process studies. 2) Investigate the capabilities and limitations of Landsat-7 and Ikonos satellite images for reef mapping, as well as higher resolution data collected using airborne and shipborne surveys. Develop protocols for the use of aerial photography, airborne bathymetric Lidar, hyperspectral surveys, Ikonos and Landsat-7 satellite images, and shipborne acoustic data in the mapping of reefs, their structures, composition, vulnerability, and neighborhood at regional scale.

The resulting high resolution mapping methods will be used to generate thematic maps identifying biogeochemical measurements in Biscayne Bay. These maps will provide fine detail on coral community structure, and should

aid in the areal extrapolation of site measurements of photosynthesis, respiration, and calcification. Besides the very-high resolution aerial image maps the database includes airborne SHOALS Lidar bathymetry with 15 cm vertical resolution out to 130 feet water depth for 40 miles; similar data have been collected on south Oahu. Photos with a scale of 1:10K and 1:5K were recently collected at BNP and scanned using an 800 dpi spot size in Flagstaff. The scanned photos will be used to generate one-foot resolution digital image maps. This information may be useful in describing existing conditions and predicting future conditions for the BBCW project.

2.3.6.8 Studies for Two Federally Listed Endangered Species, USFWS

Two federally and state-listed species that have been documented in the area of the BBCW project are the American crocodile (*Crododylus acutus*) and West Indian manatee (*Trichechus manatus*). A number of studies and databases that may be relevant to this project are available. Currently, three crocodile monitoring studies are being conducted. The University of Florida is under contract with the USFWS through 2003 to conduct crocodile population surveys from Biscayne Bay south to Florida Bay. Parameters being measured include nesting effort and success, vegetation-substrate-salinity regimes near nests, growth and survival, population structure, relative abundance, and habitat relations. Quarterly reports are provided to USFWS. The Florida Fish and Wildlife Conservation Commission (FFWCC) in conjunction with the USFWS has conducted crocodile population dynamics studies in Crocodile Lake National Wildlife Refuge for the past 25 years. Current monitoring in the refuge primarily focuses on nesting and hatchling success, with salinity measurements being taken in and around nest sites. A third monitoring project is conducted at Florida Power and Light's Turkey Point Nuclear Power Plant. Nesting sites are closely monitored and hatchlings are relocated from high-salinity nesting areas to brackish environments that are critical for juvenile survival.

Several databases are available for tracking manatees in the project area. The FFWCC maintains a mortality database that includes cause of death, whether from motorboat, floodgate, and other human-related, natural, or undetermined causes. The FFWCC also maintains a stranding and rescue database that is searchable by county. The FFWCC has proposed a Manatee Distribution Study that is awaiting approval from the USACE. The study will involve aerial and radio tracking surveys and include all conveyance canals that may provide accessibility/risk to manatees. The Florida Marine Research Institute maintains a database that includes aerial surveys, USGS radio telemetry data, and mortality information. These data will be made available via a series of CD-ROMs in June, 2002. Now Miami-Dade County has current aerial and public sighting data available.

2.3.6.9 Programs and Projects Sponsored or Funded by Biscayne National Park

2.3.6.9.1 Biscayne National Park Coastal Wetlands Project

Dr.'s Evelyn Gaiser, Michael Ross, and John Meeder from Florida International University have evaluated the impacts of a pilot project diverting surface water from L-31E canal to a test plot. They have examined paleo-ecological data and pretreatment conditions and compared changes in soils, pore water chemistry, plant community dynamics and a number of physiological adaptations in mangroves as they relate to hydroperiod, groundwater flow, tidal flux and the water budget. The difference in periphyton composition and production between dwarf and fringing mangrove communities is being defined. The distribution of the dominant molluscan and crustacean fauna has been examined in relation to water inputs and salinity patterns. Sea grass distributions within the near shore area were also examined. This looks at the effects of using the L-31E canal as a spreader canal to restore sheet flow to marl prairies and coastal mangroves and the ability of the marsh and mangrove system to assimilate the fresh water and any loading of nutrients and pollutants before reaching Biscayne Bay. This is part of the SFWMD project described in Section 3.2.1.3. This information can be used by the BBCW PDT to help identify alternatives and assess impacts.

2.3.6.9.2 Biscayne National Park Salinity Data Analysis

J. Luo and J. Serafy, University of Miami, Rosentiel School of Marine and Atmospheric Sciences and NOAA, NMFS are conducting studies to edit and analyze water quality data collected by personnel from BNP. The edited data will be subjected to time series analysis and multiple regression modeling to derive the relations between salinity, canal flow, wind stress and other factors. This is the longest existing continuous recording salinity record for the Bay. Bay sites in this study were initiated by the Park in conjunction with Miami-Dade County DERM, SFWMD and the USACE as a component of the Biscayne Bay Feasibility Study as baseline data to calibrate a hydrodynamic model of the Bay. Only two years of data were used in this calibration. This larger data analysis will concentrate on creating a mathematical relationship to water management changes to be used until models for use in scenario review are ready. Results of this study should help in predicting the effects of changing quantities, sources and timing of freshwater inflow to Biscayne Bay. This work is currently funded by the National Park Service (NPS), Comprehensive Ecosystems Studies Initiative program.

2.3.6.9.3 Biscayne National Park Phytoplankton Survey

L. Brand, University of Miami, Rosentiel School of Marine and Atmospheric Sciences, is conducting studies on the distribution and composition of phytoplankton in BNP with transects along the shoreline and projecting off shore from canal mouths. Pigment analysis is being used to estimate biomass of prokaryotic (blue green) and eukaryotic algae. Plankton abundance is being compared to data on salinity and nutrients to assess the effects of the sources quantities and timing of freshwater inputs to Biscayne Bay. This study is initiated to examine the lower trophic level responses to changing water conditions. Phytoplankton is the bases of many marine and estuarine food chains. It responds rapidly to changing conditions and is being examined to create a performance measure to evaluate water flow changes to the Bay. This work builds on work that was done by this investigator in the 1980s and is currently funded by the NPS, Comprehensive Ecosystems Studies Initiative program.

2.3.6.9.4 Biscayne National Park Mangrove Fish Community Survey

J. Luo and J Serafy, University of Miami, Rosentiel School of Marine and Atmospheric Sciences, and NOAA, NMFS are conducting studies on fishes of the mangroves on both the eastern and western sides of Biscayne Bay. This work is to examine a number of areas to determine if differences in species richness and abundance are related to salinity envelopes and the quality of mangrove communities. The fish studies are intended to produce background data on fish populations to measure changes that occur with alterations of the quantity, timing and quality of water entering Biscayne Bay. This work has been ongoing since 1998 and is currently funded by the NPS, Comprehensive Ecosystems Studies Initiative program. This work looks at the nursery and juvenile habitat of the Bay and is being applied to develop performance measures and water flow needs for the Bay.

2.3.6.9.5 Bait Shrimp Fisheries Study

J. Serafy, J. Ault and others from the University of Miami have examined the relationship of canal discharge and unstable salinity conditions on fish assemblages collected in roller frame trawl surveys. Mean species richness was found to be greater in more stable salinity regimes. Abundance comparisons varied among species but total abundance was greatest in more euryhaline areas. Freshwater challenge experiments revealed the most common inshore fishes are tolerant to rapid changing salinity. Results of the fish study provide background data for judging the effects of changes in water delivery.

2.3.6.9.6 Biscayne National Park Fisheries and Habitat Survey

J. Ault, J. Serafy and others from the University of Miami have examined the effects of commercial fisheries on key habitats within BNP. The bait shrimp roller frame trawl fishery was intensively sampled and other commercial, bait and recreational fisheries were surveyed to estimate effort and catches. The fishery studies are useful background data to evaluate changes that may result from changes in water delivery.

2.3.6.9.7 Biscayne National Park Fisheries Management Plan

BNP, in cooperation with the Florida Fish & Wildlife Conservation Commission, is beginning to develop a fisheries management plan and associated environmental impact statement (EIS) for the Park. The planning process includes summarizing and synthesizing existing fishery data, identifying gaps in knowledge, gathering public input on issues that concern or interest fishermen and other resource users and then formulating alternative plans to optimize fisheries resources and protect critical habitats. Finally a preferred alternative will be chosen and a management plan and impact statement prepared. Background data on catch per unit of effort; size frequencies, etc can be used to evaluate changes to populations and size structure of sport and commercial fishery organisms with changes in water delivery and salinity in Biscayne Bay.

2.3.6.9.8 Biscayne National Park Water Quantity Needs

The NPS has hired Dr. Martin Roessler to synthesize literature and ongoing research studies pertaining to historical, current and future inputs of freshwater to Biscayne Bay and the impacts of freshwater on the ecology of the coastal wetland, bay and offshore communities and key indicator organisms. Gaps in research are to be identified. Criteria for measuring the impacts of alternate water supply scenarios on wetland and aquatic systems within BNP are to be identified and performance measures to evaluate changes developed. The synthesis and recommendations will be shared with the USACE / SFWMD CERP teams.

2.3.6.9.9 Biscayne National Park General Management Plan

Currently BNP is in the process of revising its General Management Plan. This is a multi-year planning process that revises the vision of the resources of the Park and how they will be utilized, protected or conserved. There is extensive public scoping of this plan and the large amount of public input is synthesized to generate alternatives for Park management. This process is expected to be completed by the end of 2003.

2.3.6.10 Homestead Air Force Base Related Projects

2.3.6.10.1 Homestead Air Force Base Operations

Homestead Air Force (HAFB) is located in southern Dade County approximately seven miles northeast of the City of Homestead. The base is surrounded by residential areas, farmland and plant nurseries and contains a runway, taxiway, aircraft parking aprons, and prior to Hurricane Andrew, landside support activities, military, residential, recreational and administrative facilities. The site had been fully operational for over 50 years prior to Hurricane Andrew. The site today consists primarily of the runway, taxiway, aircraft parking aprons and the Air Reserve Base facilities. Large portions of the base were destroyed by Hurricane Andrew and subsequently cleared, although the main infrastructure (runways, roads and drainage system) are still in place.

The existing stormwater management system for the base consists of approximately 24 miles of drainage canals, ditches and swales. Runoff from the site sheet flows over land to swales and ditches which in turn flow into the perimeter canal. The discharge from the site is regulated by a pump system that consists of three 100,000 gpm pumps with an on elevation of 4.1' National Geodetic Vertical Datum (NGVD) and an off elevation of 2.5' NGVD. This operating schedule was developed during the original permit issuance, June 13, 1985, to provide for water quality treatment within the perimeter canal and lake system prior to discharge into Military Canal. Ultimate discharge is into Biscayne Bay via Military Canal.

Future plans for redevelopment of the base consist of both military and civilian (Dade County) uses. As the primary water management system will serve both the civilian and military areas of the base, the Air Force and Dade County will be required to enter into an agreement in which the responsibilities for operation and maintenance of the surface water management system are clearly delineated.

As the former HAFB redevelops, stormwater management plans will become increasingly important. The HAFB stormwater management plan must address water quality, water supply, wetland protection and disposition, and flood control, especially relating to the use of Military Canal and the management of runoff from the airport. Specifically, the HAFB plan must minimize the risk of flood damage to the airport, runway, and apron areas, and avoid adverse impacts to Biscayne Bay posed by quality, frequency and amount of stormwater runoff discharged from the HAFB property.

The BBCW PDT will need to coordinate with the HAFB to ensure that the proposed alternatives for the BBCW restoration project do not impact the HAFB operations. It is expected that the HAFB will be able to provide water flow and quality data for Military Canal that can be used in the determination of the need for STAs.

In the event that the BBCW selected plan recommends filling Military Canal, alternate stormwater management facilities will need to be provided to ensure uninterrupted operation of HAFB. In addition, the alternative plans will need to be evaluated based on the potential to increase bird populations in the aircraft flight path.

2.3.6.10.2 Military Canal Remedial Action Project

This Design Analysis Report (DAR) is being prepared to present the remedial design (RD) Military Canal near HAFB. The RD for Military Canal includes remedial activities within Military Canal. The Boundary Canal that surrounds HAFB collects surface water runoff and flows by gravity to a reservoir located at the headwaters of Military Canal. The reservoir then discharges into the canal and ultimately discharges into BNP. A portion of the Homestead Air Force Base Boundary Canal system, specifically the reservoir, has been incorporated into the remedial action to support the restoration of Military Canal. The purpose of the RD is to minimize future exposure by human and ecological receptors to potentially contaminated sediment located in Military Canal and to prevent potentially contaminated sediment from migrating to BNP. A Montgomery Watson report, entitled "OU11 Design Analysis Report, Technical Specifications and Technical Drawings" (July, 2002), outlines the criteria, parameters, computations, and design rationale for implementing the selected remedial alternative for the site. The 90% Design Document is scheduled to be completed by Summer 2002 and will be provided to the BBCW PDT.

The four major components of this remedial design as described below:

2.3.6.10.2.1 Liners to Encapsulate Sediments

A sediment encapsulation liner will be installed along approximately 11,400 feet of the Military Canal. In addition, the sediment encapsulation liner will be installed in the scour area of the Stormwater Reservoir. The liner in the reservoir will extend from the pump house west to the outside of the sediment control structure and from the south bank of the reservoir to the north bank. The liner is comprised of manufactured filter fabric that is filled with fine aggregate concrete. The fine aggregate concrete sets, hardens, and creates a durable concrete erosion control and sediment encapsulation

system. Prior to placing the filter fabric and filling it with concrete, a geotextile liner will be installed in order to minimize sediment disturbance.

2.3.6.10.2.2 Sediment Encapsulation

A sediment control structure, composed of steel sheet piling, will be installed within the reservoir to minimize resuspension and transport of sediment during pumping operations. The reservoir discharges either through an open spill gate or is transferred through the pump station. Presently the pump station is configured with three 100,000 gallon per minute (gpm) discharge pumps. Discharge via pumping is controlled manually and usually occurs during or in advance of significant storm events. The operating ranges of the pumps typically do not exceed 160,000 gpm during any given pumping event.

The sediment control structure will be installed to a maximum height elevation of 1.0 foot NGVD, which is below the average reservoir water elevation of 1.5 feet NGVD. The structure will act as a submerged weir and will allow more suspended solids to settle prior to entering into the pump intake structures. The sediment control structure will also prevent the pumps from collecting sediments and transporting them along the bottom of the reservoir into the canal. The control structure will be approximately 200 feet long. The control structure will be constructed without disturbing the existing topography of the reservoir.

2.3.6.10.2.3 Boundary Canal Redirection

A diversion baffle, composed of steel sheet pile, is to be constructed in the reservoir to redirect the northeast arm of the Boundary Canal. This will enhance the settling capacity (by providing a longer sediment settling time) of the existing wet detention system, by redirecting the flow further away from the pump intakes. This diversion baffle will be installed along the southern side of the canal to direct the flow to the western side of the reservoir. The wall will be installed starting from the eastern entrance point of the northeast arm of the Boundary Canal and proceed in a western direction for 285 feet. The wall will be constructed using steel W sheet piling and will extend above the water surface to an elevation of 4.0 feet NGVD. The wall will be constructed without leveling, dredging, and/or grading the existing topography of the reservoir.

2.3.6.10.2.4 Discharge Line Abandonment

Pathways exist from the former Sewage Treatment Plant to the reservoir/Military Canal System. These pathways consist of manholes and culverts that were never properly abandoned. As part of the RD, these potential conduits will be abandoned.

In addition to the major components of the RD, the remedial action will include the following specific tasks:

- Preparation of DAR, Quality Assurance Project Plan, Site-Specific Safety and Health Plan, and Contractor Quality Control Plan, as required.
- Performing health and safety monitoring during construction activities of the workers.
- Constructing a debris staging area to stockpile debris removed from the canal.
- Removing debris from the entire Military Canal prior to encapsulation, as necessary. Debris will be disposed at a disposal facility.
- Installing a non-woven geotextile over the contaminated sediment in the Military Canal. This will be used as an underlayment for the concrete-filled fabric liner that will be placed on top of the geotextile.
- Installation of a concrete filled fabric liner in the scour area between the pump intakes and the sediment control structure.
- Installing temporary silt curtains in Military Canal during construction activities to minimize down stream transport of resuspended sediment.
- Monitoring turbidity during the construction activities at the down gradient end of the canal, prior to discharge to the BNP.
- Integrating other remedial activities into Miami-Dade County's Department of Environmental Resource Management (DERM) Wetland Pilot Project. In order to address impacts to the waters of the United States resulting from CERCLA releases from HAFB, the USAF proposed to support the DERM pilot wetland project on the following tasks:

EXHIBIT 16

Section 2

- a. Purchase and installation of two 80 cubic feet per second (cfs) submersible electric axial flow pumps with control panel. These pumps can also be used as part of the larger DERM wetland project.
- b. Provide necessary power utilities to the site for operation of the pump system.
- c. Construct and install pump well housing.
- d. Install intake box with manatee exclusion grate/trash rack.
- e. Install two intake culverts.
- f. Install two discharge culverts with stabilized headwall.
- g. Construct a fill pad for pump station.
- h. Construct culverts connecting the Pilot Project with the L31 canal.

Short-term impacts during remedial design construction will be mitigated by using engineering controls, personal protective equipment, and performing construction activities during the dry season.