CENTRAL AND SOUTHERN FLORIDA PROJECT

FINAL REVISED GENERAL REEVALUATION REPORT/SECOND SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT (RGRR/SEIS) FOR THE TAMIAMI TRAIL MODIFICATIONS

MODIFIED WATER DELIVERIES TO EVERGLADES NATIONAL PARK

U.S. ARMY CORPS OF ENGINEERS
JACKSONVILLE DISTRICT
SOUTH ATLANTIC DIVISION

NOVEMBER 2005

CENTRAL AND SOUTHERN FLORIDA PROJECT
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The 1989 Everglades National Park (ENP) Protection and Expansion Act authorized improvements in the delivery of water from Water Conservation Area 3B (WCA 3B) to the ENP expansion area in Northeast Shark River Slough (NESS) immediately south of Tamiami Trail (U.S. Highway 41). Such improvements were documented in a General Design Memorandum and Final Environmental Impact Statement on Modified Water Deliveries to ENP, issued in 1992. At that time, it was believed that the culverts under Tamiami Trail were sufficient to pass the increased volume of water from the L-29 Canal on the north side of Tamiami Trail into ENP to the south without collateral effects. Later, it was determined that higher water in the canal could damage the highway subgrade. In addition, under extreme conditions, low spots along the highway could be overtopped. The 2003 General Reevaluation Report /Supplemental Environmental Impact Statement (GRR/SEIS) analyzed eight alternative plans to protect the highway and selected a 3,000-foot bridge as the Recommended Plan. The Corps subsequently withdrew the 2003 GRR/SEIS because new modeling predicted higher water levels that would damage the roadway, increased costs of construction materials required reevaluating the project, and these higher costs required reanalyzing tradeoffs of benefits and costs.

Alternative plans evaluated in the RGRR/SEIS include the 3,000-foot bridge, four-mile bridges located centrally and at the eastern end of the project corridor, a three-mile bridge, a two-mile bridge, a two-bridge option with two- and one-mile-long bridges, a two-bridge option with bridges 1.3 and 0.7 miles long, three 3,000-foot bridges, and a 10.7-mile bridge extending the entire length of the corridor. The Recommended Plan calls for a bridge up to two miles long located at the western end of the project corridor, a bridge up to one mile long at the eastern end, and raising the profile of the unbridged portions of Tamiami Trail with an asphalt overlay. A longer bridge alternative could not be recommended because its cost would greatly exceed the project budget. Adverse impacts include the loss of parking area by roadside businesses, and effects on cultural resources. The project would provide sufficient conveyance to enable the restoration of approximately 109,000 acres of wetlands of NESS within ENP by subsequent water management projects.

All information provided in the 1992 Final EIS and the 2003 GRR/SEIS is incorporated herein by reference.

SEND YOUR COMMENTS TO THE DISTRICT ENGINEER BY: January 9, 2006.

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EXECUTIVE SUMMARY

CENTRAL AND SOUTHERN FLORIDA PROJECT

FINAL REVISED GENERAL REEVALUATION REPORT SECOND SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT (RGRR/SEIS) TAMIAMI TRAIL MODIFICATIONS

MODIFIED WATER DELIVERIES TO EVERGLADES NATIONAL PARK, FLORIDA

EXECUTIVE SUMMARY

Background. The Everglades National Park Protection and Expansion Act, December 1989, authorized the Secretary of the Army to undertake certain actions to improve water deliveries to the Everglades National Park (ENP) and to take steps to restore natural hydrologic conditions to the extent practicable. The General Design Memorandum (GDM) called for in the Act was completed in June 1992. Under the provisions of this GDM and Environmental Impact Statement (EIS) for Modified Water Deliveries (MWD) to ENP, water would be transferred from Water Conservation Area (WCA)-3B to the L-29 Canal (Tamiami Canal) and through the existing culvert system south under U.S. Highway 41 (the Tamiami Trail) into Northeast Shark River Slough. When the GDM was completed in 1992, it was believed that existing culverts under the roadway would be adequate to convey the flow of water. Subsequent hydrological analyses, however, revealed that the higher stage in the L-29 Canal required for the culverts to convey the increased flow could adversely affect the structure of Tamiami Trail and overtop low areas along the highway under certain storm conditions.

Alternative means for water conveyance were evaluated through the preparation of a General Reevaluation Report and Supplemental Environmental Impact Statement (GRR/SEIS), the final version of which was coordinated with the public in December 2003. The Recommended Plan consisted of a 3,000-foot bridge, elevation of the remaining unbridged roadway, and a proposed real estate agreement to pay compensation for a flowage easement along the unbridged portion of Tamiami Trail. Concerns regarding probable damage to Tamiami Trail were raised prior to, during, and subsequent to the public and agency review of the final report, and the Final GRR/SEIS was withdrawn without a signed Record of Decision. This current report serves to incorporate and evaluate all features necessary for project implementation.

It was determined that water in the L-29 Canal would most likely be at a higher design stage than had previously been estimated, and a reevaluation of the alternative actions under the conditions of higher water stages should be made. The increase in design high water stage raises the cost to mitigate impacts to the road. Therefore, the tradeoffs of benefits and costs needed to be reanalyzed. Prior to completion of the 2003 GRR/SEIS, there had been coordination discussions between the USACE and the FDOT regarding the potential use of a temporary asphalt overlay in addition to a maintenance agreement with escrow funds to be utilized until such time that the roadway could be reconstructed to its ultimate condition under the Comprehensive Everglades Restoration Program (CERP). The 2003 GRR/SEIS proposed the 3,000-foot bridge, the

longest bridge that was affordable under the DOI budget at the time, and one-time compensation to FDOT for construction of a substitute facility for the impacted Tamiami Trail. However, FDOT could not assume responsibility for completing a NEPA analysis and the permitting associated with the reconstruction of the remaining roadway within the necessary timeframe. FDOT required that reconstruction of the unbridged portions of roadway would need to be complete prior to implementation of the MWD project and associated occurrence of higher water elevations in the L-29 canal, in order to ensure the integrity and safe public use of the highway. Additionally, safety concerns on Tamiami Trail would potentially require a more costly method to mitigate for the effects of the higher design stage. Finally, a reevaluation is warranted because marked increases in the costs of construction materials affects the benefit/cost analysis.

Purpose. The purpose of this project is to identify a means to enable the conveyance of the authorized flow of water from WCA-3B and the L-29 Canal north of the Tamiami Trail to Northeast Shark River Slough (NESS) and ENP south of the Tamiami Trail, as provided by the1992 GDM/FEIS.

Alternatives. Alternatives evaluated were the construction of:

Alternative 9. 3,000-foot-long bridge.
Alternative 10. Four-mile-long bridge in the central region of the project area.
Alternative 11. Four-mile-long bridge at the eastern end of the project area.
Alternative 12. Three-mile-long bridge.
Alternative 13. Two-mile-long bridge.
Alternative 14. Two-mile-long bridge at the western region of the project area and a one-mile-long bridge at the eastern end.
Alternative 15. 1.3-mile-long bridge at the western region of the project area and a 0.7-mile-long bridge at the eastern end.
Alternative 16. Three 3,000-foot-long bridges.
Alternative 17. 10.7-mile-long elevated roadway within existing right-of-way.

Each alternative would involve removal of the roadway within the footprint of the bridges and the reconstruction with an asphalt overlay of the unbridged portion of the road to raise the road profile.

Major Findings and Conclusions. All alternatives except the No-Action plan would convey increased flows associated with the MWD project without having water either damage or overtop the highway. Potential impacts of the various alternatives included incorporation of wetlands into the highway right-of-way, minor expansion of the right-of-way toward endangered wood stork rookeries, increased traffic noise at the bridge locations, incorporation of airboat tour operators' property into the right-of-way, and potential impacts to airboat tour businesses and potential reduction in visitations to Miccosukee Tribal businesses and ENP during construction.

Recommended Plan. The Recommended Plan is Alternative 14, Raised Profile with Two-Mile Bridge West and One-Mile Bridge East.

The Two-Mile Bridge West and One-Mile Bridge East alternative consists of providing hydraulic openings through the Tamiami Trail by removing portions of the existing highway and embankment. Bridges would be constructed over the openings to replace the removed sections of road and maintain motor vehicle traffic across the openings.

The eastern bridge would be located approximately one mile west of S-334 and extend to the west for up to one mile. The western bridge would be up to two miles long and extend from the vicinity of the Blue Shanty Canal to approximately one-half mile east of the Osceola Camp. The bridges would include two 12-foot-wide travel lanes, two 10-foot-wide shoulders, and safety barriers. The lower limit of the bridge superstructure would be based on vertical clearance requirements for exposure and maintenance considerations. This elevation would be 14.75 feet NGVD, based on a six-foot clearance between the lowest portion of the bridge and an 8.75-foot control water elevation in the Tamiami Canal. The bridges would include a pollution abatement system to collect and treat runoff. Access would be provided from the bridge to Everglades Safari and the Jefferson Pilot communications site.

The existing Tamiami Trail roadway embankment would be removed from the areas where the bridges would be located. The remaining highway embankment would be reconstructed with an asphalt overlay to raise the crown elevation to 12.3 feet, the minimum required based on the canal DHW of 9.7 feet and the roadway cross section geometry. The preferred alignment of the roadway to the south would require expansion of the right-of-way to the south due to the necessity to avoid impacting the L-29 Canal. In meeting current FDOT standards for roadway geometry, the higher profile of the roadway would result in a wider roadbed than currently exists. The width of the expansion would vary based on the amount of elevation needed for a particular portion of road and the amount of bridge offset to the south, with preliminary estimates ranging from 0 to 48 feet. Expansion of the right-of-way is controversial and will be minimized to the maximum extent practicable.

The construction cost is estimated to be $125,106,000, and the total annualized cost is estimated to be $9,061,911.

The bridges would provide sufficient openings (hydraulic conveyance capacity) in combination with the conveyance capacity provided by the remaining culverts to convey authorized flows under the MWD project, while not exceeding maximum allowable stage elevations in the L-29 Canal. The raised profile of the unbridged portions of Tamiami Trail would be constructed to accommodate a maximum stage, or Design High Water (DHW) of 9.7 feet NGVD for a 24-hour, 20-year event. The 40 existing culverts (grouped into 14 sets) under the highway not located within the footprint of the bridges would be retained to assist in promoting an even distribution of flow from the L-29 Canal to ENP. The three miles of bridge length provides a considerable improvement in the hydraulic conveyance capacity between the L-29 Canal and Northeast Shark Slough, and between WCA-3B and Northeast Shark Slough if potential subsequent projects are implemented, such as CSOP and decompartmentalization in the Comprehensive Everglades Restoration Plan. The Recommended Plan reduces the head required to convey the 100-year flow of 4,764 cfs to Northeast Shark Slough from approximately 1.3 feet to 0.2 feet (85 percent reduction). The Recommended Plan also reduces the head required to convey the one-year flow of 1,021 cfs to Northeast Shark Slough from approximately 0.5 feet to 0.1 feet (80 percent reduction). Reducing the head required to convey the flows arising from rainfall events ranging in average return periods from 100 to one year is important because these head differences result in higher stages in WCA-3B; the water level in WCA-3B must be higher than the L-29 Canal to allow flow from WCA-3B. Without the conveyance improvements provided by the Recommended Plan, the water level in WCA-3B would be prohibitively high, resulting in a damaging combination of depth and duration for tree islands for the magnitude of flow through

WCA-3B desired by ENP.

The location of the bridges in the project area would be anticipated to establish a more natural flow pattern in Northeast Shark Slough and thereby assist in reestablishing the ridge and slough habitat that existed in this location prior to the construction of the Tamiami Trail. The bridge locations and lengths of the Recommended Plan would result in a flow distribution of approximately 66 percent west of the Tigertail Camp and 34 percent east of the Tigertail Camp, which is similar to the distribution that would be provided by a full-length bridge. It is important to provide increased flow east of the Tigertail Camp to provide restoration of the eastern portion of the land acquired by the Everglades Expansion Act.

The bridges openings would provide substantial (three miles out of a total of 10.7 miles) connectivity between ENP and the L-29 Canal. Improving ecological connectivity by the direct opening provided by the bridge openings would be expected to enhance aquatic biological communities south of the existing Tamiami Trail, exceeding those demonstrated by water deliveries through S-333 and the existing culverts demonstrated in the MWD ENP testing program. There would be a net gain of approximately 6.4 acres of vegetated wetlands from road and bridge construction and removal of the existing highway embankment from the hydraulic openings of the bridges.

To provide protection for the endangered wood stork, U.S. Fish and Wildlife Service (FWS) has established primary and secondary zones that place certain restrictions on activities within the zones. 2,295 linear feet of US 41 are located in the primary zone of the Tamiami West wood stork colony, and 2,122 linear feet are within the secondary zone. 3,123 linear feet of highway are located in the secondary zone of the Tamiami East wood stork colony. Although restrictions would require phasing of construction, no significant impacts to threatened or endangered species are expected. No restrictions would be placed on construction within the 449 feet of the alignment that traverses the Frog City wading bird colony in WCA-3B.

With the necessity of placing the centerline of the bridge approximately 47 feet to the south of the centerline of the existing road, the Everglades Safari Park operation would lose much of its parking area. Elevating the roadway profile by about two feet would be expected to have little or no impact on Coopertown Airboats and Restaurant or Gator Park.

Construction would involve modifying the Tamiami Trail, which has been identified as a historic cultural resource. Aesthetics would be enhanced by the removal of exotic vegetation on the southern side of the Tamiami Trail, which would be necessary for the modifications and reconstruction under this action alternative.

Noise modeling indicates that the project, although predicted to exceed FDOT approach criteria, appears to have no impact when compared to future without project conditions.

There would be temporary impacts to fishing from the Tamiami Trail right-of-way during construction. Access to public boat ramps would not be affected under this alternative. Public avoidance of construction activities may also temporarily reduce the number of customers for the airboat tour businesses and the Miccosukee commercial enterprises to the west of the project, as well as visitors to the Shark Valley Park entrance.

ENP operations would likely be temporarily affected by construction. ENP law enforcement staff and research personnel launch airboats from Frog City.

Areas of Controversy/Unresolved Issues. Several issues are controversial or unresolved.

The selection of the Two-Mile Bridge West and One-Mile Bridge East alternative rather than the 10.7-Mile Bridge as the Recommended Plan is controversial. Individuals with resource and regulatory agencies, environmental advocacy organizations, and the public have expressed a strong preference for providing an elevated highway that would provide additional environmental benefits. A longer bridge alternative could not be recommended because its cost would greatly exceed the project budget. The cost of the 10.7-Mile Bridge exceeds the budget by approximately a factor of two.

Whether or not wildlife enhancement features (barriers, underpasses, and bridges) would be incorporated into the project is unresolved. These are considered "enhancements" that are not authorized as part of this project. Wildlife features could be included if a separate funding source is identified.

Recreational interests have requested bridging at a height that would allow the passage of airboats. These features are not required to meet the project purpose of water deliveries to ENP and are not authorized for this project. Currently, there is no airboat passage between the north and south side of Tamiami Trail in this area. Airboat crossings could be included if a separate funding source is identified. Consistent with the 1989 Everglades National Park Protection and Expansion Act, ENP is evaluating airboat usage in this area as part of its on-going effort to prepare a new General Management Plan. Any consideration of additional airboat access points into ENP would be most appropriately addressed in the context of that plan.

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RGRR/SEIS FOR THE TAMIAMI TRAIL

SECTION 1.0
INTRODUCTION

In December 1989, the Secretary of the Army was authorized by the Everglades National Park Protection and Expansion Act to take actions to improve water deliveries to the Everglades National Park (ENP) and to restore natural hydrologic conditions. Steps to improve and restore hydrologic conditions were developed through a General Design Memorandum (GDM) for Modified Water Deliveries ("Mod Waters" or "MWD") to ENP that was completed in June 1992. The GDM outlined how water would be transferred from Water Conservation Area (WCA) 3B to the L-29 Canal and through the existing culverts south under U.S. Highway 41 (Tamiami Trail) into Northeast Shark River Slough (NESS). Upon completion of the GDM, it was believed that the existing culverts under the Tamiami Trail would be adequate to convey the flow of water anticipated for MWD. However, subsequent hydrologic analyses revealed that the hydraulic head in the L-29 Canal that would be required for the culverts to convey the increased flows could cause premature deterioration of the road and possibly overtop low areas of the road under certain conditions. Therefore, it became necessary to identify and evaluate modifications to the highway to allow unimpeded conveyance of water from WCA-3B and the L-29 Canal north of the Tamiami Trail to NESS and ENP south of the Tamiami Trail.

Alternative means for water conveyance were evaluated through the preparation of a General Reevaluation Report and Supplemental Environmental Impact Statement (GRR/SEIS), the final version of which was coordinated with the public in December 2003. Prior to completion of the 2003 GRR/SEIS there had been coordination discussions between the USACE and the FDOT regarding the potential use of a temporary asphalt overlay in addition to a maintenance agreement with escrow funds to be utilized until such time that the roadway could be reconstructed to its ultimate condition under Decompartmentalization. However the 2003 GRR/SEIS proposed Alternative 7a which included a 3,000-foot bridge [conveyance easement] and one-time compensation to FDOT for construction of a substitute facility for the impacted Tamiami Trail. FDOT could not assume responsibility for completing National Environmental Policy Act (NEPA) analysis and permitting associated with the reconstruction of the remaining roadway. Reconstruction of the unbridged portions of roadway would need to be complete prior to implementation of the MWD project and associated occurrence of higher water elevations in the L-29 Canal, in order to insure the integrity and safe public use of the highway. Because of concerns regarding probable damage to the Tamiami Trail raised prior to, during and subsequent to public and agency reviews of the final report, the Final GRR/SEIS was withdrawn without a signed Record of Decision.

Most importantly, it was determined that water in the L-29 Canal would be at a higher design stage than had previously been calculated, and a reevaluation of the alternative actions under the conditions of higher water stages should be made. The increase in design high water stage raises the cost to mitigate impacts to the road. Therefore, the tradeoffs of benefits and costs should be reanalyzed. Finally, a reevaluation is warranted because of marked increases in the costs of construction materials.

This document is a Revised General Reevaluation Report into which a Second Supplemental Environmental Impact Statement has been integrated (RGRR/SEIS). It revises the previous GRR/SEIS to update the alternative analysis and serves to

incorporate and evaluate all features necessary for project implementation. This RGRR/SEIS may serve as a vehicle for a Post Authorization Change (PAC) Report.

The USACE is responsible for all aspects of this project including designing, building, permitting and effectuating this project.

1.1 STUDY AUTHORITY

The Everglades National Park Protection and Expansion Act (PL 101-229, Section 104, 16 U.S.C. Part 410r-5 *et seq*.), December 1989 (Appendix A) authorized the Secretary of the Army to construct certain modifications to the Central and Southern Florida Project, improve water deliveries to ENP, and, to the extent practicable, restore the natural hydrological conditions within the park. This Act provides the underlying authority for this project. Section 101 of the Act states:

> *Sec. 101(a)(1). The Everglades National Park is a nationally and internationally significant resource and the park has been adversely affected and continues to be adversely affected by external factors which have altered the ecosystem including the natural hydrologic conditions within the park… Wildlife resources and their associated habitats have been adversely impacted by the alteration of natural hydrologic conditions within the park, which has contributed to an overall decline in fishery resources and a 90 percent population loss of wading birds.*

The Act also directed the U.S. Army Corps of Engineers (USACE) to address restoration of water deliveries and natural hydrological conditions. The Act states:

> *Sec 104(a)(1). Upon completion of a final report by the Chief of the Army Corps of Engineers, the Secretary of the Army, in consultation with the Secretary, is authorized and directed to construct modifications to the Central and Southern Florida Project to improve water deliveries into the park and shall, to the extent practicable, take steps to restore the natural hydrological conditions within the park.*
>
> *Sec 104(a)(2). Such modifications shall be based upon the findings of the Secretary's experimental program authorized in Section 1302 of the 1984 Supplemental Appropriations Act (97 Stat. 1292) and generally as set forth in a General Design Memorandum to be prepared by the Jacksonville District entitled* Modified Water Deliveries to Everglades National Park*. The Draft of such Memorandum and the Final Memorandum, as prepared by the Jacksonville District, shall be submitted as promptly as practicable to the Committee on Energy and Natural Resources and the Committee on Environment and Public Works of the United States Senate and the Committee on Interior and Insular Affairs and the Committee on Public*

Works and Transportation of the United States House of Representatives.

Sec 104(a)(3). Construction of project modifications authorized in this subsection and flood protection systems authorized in subsections (c) and (d) are justified by the environmental benefits to be derived by the Everglades ecosystem in general and by the park in particular and shall not require further economic justification.

The 1992 General Design Memorandum and its associated Final Environmental Impact Statement (GDM/FEIS) called for in the Act was completed in June 1992. The 1992 GDM/FEIS is the authorizing document for structural modifications and additions to deliver water for ecosystem restoration in ENP. The 1992 GDM/FEIS states:

The future-without project condition will lead to the further deterioration of unique and outstanding ecological resources of the Everglades that are recognized and valued throughout the world. Therefore, based on the direction provided in ENP Protection and Expansion Act of 1989, the goal is to restore natural hydrologic conditions in the Park to the extent practicable. Meeting this goal will lead to improvements in the abundance, diversity and ecological integrity of native plants and animals in the Park.

1.2 PROJECT PARTNERS

The South Florida Water Management District (SFWMD) is the local, Non-Federal Sponsor for this C&SF project except the roadway elements. The Florida Department of Transportation will be responsible for roadway operation, maintenance, repair, replacement and rehabilitation (OMRRR). Other participating agencies include the U.S. Department of Interior (Fish and Wildlife Service [FWS] and National Park Service [NPS], Everglades National Park [ENP]), the Florida Fish and Wildlife Conservation Commission (FWC), the Florida Department of Transportation (FDOT), the Miami-Dade County Department of Environmental Resource Management (DERM), and the Florida Department of Environmental Protection (FDEP). ENP, although not a formal "Cooperating Agency," provided full cooperation in this effort.

1.3 PURPOSE AND SCOPE OF STUDY

1.3.1 Purpose and Need for Action

Under the current authorized and approved plan described in the 1992 GDM/FEIS, water would be passed from WCA-3B through two water control structures, S-355A and S-355B, to the L-29 Canal, and from the L-29 Canal through the existing culvert system under the Tamiami Trail into NESS within ENP. When the 1992 GDM/FEIS was completed, it was believed that existing culverts under the roadway would be adequate to convey the flow of water without any collateral impacts. Subsequent hydrological analyses, however, revealed that the head height in the L-29 Canal required for the

culverts to convey the increased water would most likely adversely affect the structure of the Tamiami Trail and even overtop the highway under certain conditions.

The purpose of this project is to identify a means to enable the conveyance of the authorized flow of water from WCA-3B and the L-29 Canal north of the Tamiami Trail to NESS and ENP south of the Tamiami Trail, as provided by the1992 GDM/FEIS, and to provide for appropriate measures so that increased water associated with the MWD Project will not adversely affect the structural integrity of Tamiami Trail.

1.3.2 Study Area/Project Area

As mentioned in Section 1.0, this project to modify the Tamiami Trail is a component of the larger MWD program described in the 1992 GDM/FEIS. The study area for the MWD program is located in Broward and Miami-Dade Counties, Florida. It includes ENP, East Everglades, WCA-3A, and WCA-3B. It is bounded on the west by the Big Cypress National Preserve, on the north by the Everglades Agricultural Area and WCA-2, and on the east by Levee 30 (L-30), L-31N, and L-31W.

The study area for this project, shown in Figure 1, is located in the west-central portion of Miami-Dade County. The areas subject to direct impacts from the project flank both sides of U.S. Highway 41, commonly called the Tamiami (Tampa to Miami) Trail. The Tamiami Trail, the L-29 Canal, and the L-29 Levee on the north side of the canal form the southern boundary of WCA-3B. The south side of the Tamiami Trail is bounded primarily by ENP, but six private properties are also located on the south side of the highway.

The limits of the project begin at S-334, slightly more than one mile west of the intersection of Krome Avenue (State Road 997) and the Tamiami Trail, and extend westward along the highway approximately 10.7 miles to Water Control Structure S-333. The L-29 Canal, also known as the Tamiami Canal, runs along the north side of the Tamiami Trail through this area. The project limits are bounded at each end by water control structures across the canal, S-333 on the west and S-334 on the east. Bridges on these structures provide access to boat ramps and recreation sites on the north side of the canal. The two unimproved roads located on the north side of the L-29 Canal, one along the canal bank and one about 100 feet from the canal bank on top of the levee, parallel the canal. These roads are surfaced with crushed limerock. The roads provide vehicle access for the members of the Miccosukee Indian Tribe living in the Tigertail Camp, for four boat launch ramps, and for recreational fishermen who fish from the L-29 Levee. Figure 2 shows the project area in relation to other MWD and other federal projects.

1.4 NATIONAL ENVIRONMENTAL POLICY ACT REQUIREMENTS

The 1992 GDM/FEIS selected a recommended plan (the Full Structural Plan) for improving hydrologic conditions in ENP, for constructing structures to facilitate the natural flow of water, and for planning the operational design of a system to achieve maximum ecosystem restoration. The 2003 GRR/SEIS provided the first supplement to the 1992 GDM/FEIS. This Revised General Reevaluation Report and Second Supplemental Environmental Impact Statement (RGRR/SEIS) for the Tamiami Trail component of the MWD Project is a second supplement to the 1992 GDM/FEIS. The

SEIS is a self-supporting document that is included as part of the RGRR; it complies with the requirements of NEPA, as provided in 40 CFR Part 1500-1508. Compliance of each alternative with all relevant Federal laws, regulations, and Executive Orders is discussed in Appendix B.

1.5 HISTORY OF THE AREA

Historically, the Everglades was a shallow wetland conveying water from Lake Okeechobee to the southern coast of Florida. Although modifications to the flow of water were begun in the 1880s, most of the flow alterations were associated with the development of the C&SF Flood Control Project, which was originally authorized by Congress in 1948. With the construction of WCA-3A and WCA-3B and the extension of Levee 67 (L-67 ext.), flows to ENP became subject to water supply deficits during the dry season and excesses during the wet season, resulting in a decline in ecological quality.

The Flood Control Act of 1968 provided for modifications to the C&SF Project through the implementation of the Everglades National Park-South Dade Conveyance System (ENP-SDCS). The intent was to improve the supply and distribution of water to ENP and to provide for increased agricultural and urban water needs of Miami-Dade County.

Congress passed Public Law (PL) 91-282 in June 1970 to establish a minimum water delivery schedule to protect ENP resources.

The Experimental Program of Water Deliveries to ENP (Section 1302 of the Supplemental Appropriations Act of 1984; PL 98-181) authorized modifications to improve the schedule of minimum water deliveries established in PL 91-282. This program allowed for a two-year Experimental Program for Water Deliveries to ENP for the purposes of developing an improved regulation/delivery schedule. In response to PL 98-181, the USACE completed the General Plan for Implementation of an Improved Water Delivery Schedule to Everglades National Park, Florida, which was approved by the Secretary of the Army in February 1985. This plan recommended: (1) the preparation of a General Design Memorandum (GDM) and an Environmental Impact Statement (EIS) addressing modifications to improve water deliveries to ENP and (2) extension of the two-year time limit specified in PL 98-181 based on a written agreement between USACE, ENP, and SFWMD. The Experimental Program of Water Deliveries was subsequently extended to January 1, 1989, and January 1, 1992, under PL 99-190 and PL 100-676, respectively.

Section 107 of PL 102-104 authorized continuation of the experimental programs until the completion of modifications to the C&SF Project, authorized by Section 104 of PL 101-229 (Everglades National Park Protection and Expansion Act of 1989). PL 101-229 was the basic authorization for the 1992 GDM/FEIS.

Section 528 of the Water Resources Development Act (WRDA) enacted October 1996 (PL 102-580) was entitled *Everglades and South Florida Ecosystem Restoration.* It authorized a number of ecosystem restoration studies, formerly referred to as "the Restudy," and now collectively known as the Comprehensive Everglades Restoration Plan (CERP). The USACE submitted a report to Congress on July 1, 1999, containing the CERP blueprint, which would further increase the flow of water entering NESS. The plan was approved as part of WRDA 2000, which included a requirement that the MWD

project must be constructed before certain CERP components can be funded for construction. Section 601(b)(2)(D)(iv) stated:

> *No appropriation shall be made to construct the Water Conservation Area 3 Decompartmentalization and Sheetflow Enhancement Project (including component AA, Additional S-345 Structures; component QQ Phase 1, Raise and Bridge East Portion of Tamiami Trail and Fill Miami Canal within WCA 3; component QQ Phase 2, WCA 3 Decompartmentalization and Sheetflow Enhancement; and component SS, North New River Improvements) or the Central Lakebelt Storage Project (including components S and EEE, Central Lake Belt Storage Area) until the completion of the project to improve water deliveries to Everglades National Park authorized by section 104 of the Everglades National Park Protection and Expansion Act of 1989 (16 U.S.C. 410r-8).*

1.6 PRIOR STUDIES/REPORTS/RELATED PROJECTS

Several previous and future studies are relevant to the current study.

1.6.1 General Design Memorandum and Environmental Impact Statement, Modified Water Deliveries to Everglades National Park, June 1992

The document described the evolution of alternative plans considered for improving water deliveries to ENP. It also described the relationships between hydrologic and ecological conditions in the Everglades, historic conditions, the existing baseline conditions, and the expected future conditions of the Everglades without improved water deliveries.

There were four components of the 1992 GDM/FEIS:

1. Conveyance of water between WCA-3A and WCA-3B (Conveyance and Seepage).

2. Conveyance of water south across the Tamiami Trail to the NESS portion of ENP (Tamiami Trail Modifications).

3. Flood Mitigation of the 8.5 Square Mile Area (SMA) residential development along the eastern side of NESS (8.5 Square Mile Area).

4. An overall operational plan for the water control structures incorporated in the above (CSOP and MWD for C-111).

The 1992 GDM/FEIS also provided an explanation of the chronology that was followed during alternative plan formulation and evaluation. Alternative plans were evaluated and screened out or selected for further analysis. Basic alternative plans were developed to meet the objectives of location, timing, and volume of water to be delivered to ENP. The 1992 GDM/FEIS recommended several features, which included raising an approximately 1,500-foot section of the Tamiami Trail adjacent to structure S-334. Since

approval of the 1992 GDM/FEIS, several developments have necessitated readdressing the original recommendation for the Tamiami Trail. The 1992 GDM/FEIS is incorporated by reference into this RGRR/SEIS.

1.6.2 Integrated General Reevaluation Report and Environmental Impact Statement, Canal 111 (C-111), South Miami-Dade County, Florida, May 1994

This report, which integrated a feasibility report level of documentation with an EIS, proposed to provide an assessment of the authorized C&SF Flood Control Project within the C-111 basin. This would ensure that measures recommended for implementation were feasible and consistent with the protection of the natural values associated within ENP and maintenance of flood control within the C-111 basin east of Levee L-31N and C-111. The recommended plan included both structural and non-structural components, as well as modifications to existing work within the C-111 basin. It was expected to help restore the ecology of ENP in addition to maintaining flood protection within the C-111 basin east of L-31N and C-111.

1.6.3 U.S. Fish and Wildlife Service Final Biological Opinion for the U.S. Army Corps of Engineers, Modified Water Deliveries to Everglades National Park, Experimental Water Deliveries Program, Canal 111 Project, February 19, 1999

This biological opinion, predicated on consultation by the Corps, ENP, SFWMD, FWS, and FWC, encompassed three interrelated Everglades restoration projects: the MWD project, the C-111 projects, and the Experimental Program. This report chronicled data on the biology and ecology of threatened and endangered species, previous biological opinions prepared for similar actions in the action area, the Technical Agency Draft of Volume I of the Multi-Species Recovery Plan for the Threatened and Endangered Species of South Florida, and other published and unpublished sources of information.

This biological opinion documented modifications from the existing rules of operations for the southern portion of the C&SF project needed to reduce adverse impacts to the endangered Cape Sable seaside sparrow. This report discussed a reasonable and prudent alternative (RPA) that can achieve the objectives of the opinion and ancillary terms and conditions needed for compliance. Specifically, the RPA demanded that, in order to meet the requirements of the Endangered Species Act:

> *(1) By March11, 1999, a minimum amount of sparrow habitat be protected from unusually high or low water levels;*
>
> *(2) By May 1, 1999, a fire management plan be initiated;*
>
> *(3) Between March 1, 2000, and 2003, incrementally increase protections from unusually high or low water levels; and*
>
> *(4) Annual reports must be submitted detailing progress implementing the RPA. Other reasonable and prudent measures and recommendations were discussed.*

1.6.4 General Reevaluation Report and Final Supplemental Environmental Impact Statement, 8.5 Square Mile Area, July 2000, Record of Decision Signed 6 December 2000

This document evaluated an array of alternatives and recommended a partial buy-out alternative for providing flood mitigation to the 8.5 Square Mile Area (8.5 SMA), a residential area bounded on the west by ENP and separated from urban lands to the east by the L-31N flood protection levee and borrow canal. The report chronicled project authorization and needs and considered all significant aspects of the project, including hydrologic modeling simulations, social impact assessments, policy analysis, real estate information, engineering design and cost analysis, environmental impact assessment, economics, and review of public concerns. The recommended plan included perimeter and interior levees, a seepage canal, and acquisition of properties that could not be provided with flood mitigation that would meet applicable water quality standards and permitting requirements.

1.6.5 General Reevaluation Report and Final Supplemental Environmental Impact Statement, Tamiami Trail Modifications, December 2003.

This study evaluated eight alternative plans to increase the overall cross-sectional area of openings under the highway for passage of water from the Tamiami Canal south to ENP in order to minimize the backup effect and limit the maximum rise in water level in the canal under the MWD peak design flow. The alternatives include adding additional culverts under the highway, constructing one or more bridges within or outside the existing highway right-of-way, or elevating the highway for the full 10.7-mile section within the project area. Additionally, each alternative included an option to provide treatment of storm water runoff from reconstructed portions of the highway. The recommended plan was a 3,000-foot bridge without water quality treatment features, with its western terminus sited between the Blue Shanty Canal at Everglades Safari Park and the Airboat Association of Florida facility.

This peak design flow is the total capacity of all of the structures discharging water into the L-29 Borrow Canal (L-29BC). The structures under the 2001 GRR discharging water into the L-29BC are: spillways S-333 (1,150 cfs), S-355A (1,000 cfs), S-355B (1,000 cfs), and S-356 (950 cfs). A frequency analysis was performed of predicted flows from the South Florida Water Management Model (SFWMM or 2x2) based on the combined discharges of the above mentioned structures under the operational criteria for the 1992 Authorized Plan for MWD. This analysis took the peak discharge from the simulated period of record from 1965 to 1995 and, using the Corps of Engineers program Flood Frequency Analysis (FFA), predicted the 100-year event. Currently the Combined Structural and Operational Plan is considering adding additional structures to the L-29 Levee to move more water out of WCA-3B and create a more evenly distribution of flow out the southern end of WCA-3B.

1.6.6 Interim Structural and Operational Plan (ISOP) for the Hydrologic Compliance with the Cape Sable Seaside Sparrow Biological Opinion for the Year 2000, 8 December 1999.

This report detailed actions consistent with the requirements of the RPA (reasonable and prudent alternative) of the BO (biological opinion) for the year 2000 for each of the listed sparrow subpopulations. The actions presented herein are directly linked to hydrologic

conditions as affected by the operation of the C&SF Project. This plan includes the actions contained herein as may be modified by further modeling and/or testing and monitoring through coordination with the FWS and others as deemed appropriate. The plan for deviations from current operations will continue to play a key role in meeting the goals and objectives of the BO. The current and future deviations are discussed later in this report.

1.6.7 Final Environmental Impact Statement, Interim Operational Plan (IOP) for Protection of the Cape Sable Seaside Sparrow, May 2002.

The Final Environmental Impact Statement (FEIS) presented a final recommended plan, Alternative 7R that improves upon the preliminarily recommended plan, Alternative 7, in the Supplemental Draft EIS issued in October 2001. An improvement was made to Alternative 7 to create favorable hydroperiods in sparrow habitat in ENP while providing flood protection capability for developed lands east of the L-31N Canal. Alternative 7R includes operation of previously authorized structural features described in the 1992 Modified Water Deliveries to Everglades National Park report and the 1994 and 2001 C-111 reports that will maintain flood protection capability, while continuing to provide sufficient protection for the Cape Sable Seaside Sparrow and its habitat to prevent jeopardizing its continued existence. The increased capability over Alternative 7 is obtained by adding an additional pump station (S-332C) and seepage reservoirs along the L-31N Canal to supplement the capacity of the existing pump station, S-332B, top lower canal and groundwater levels in advance of significant storms. Construction of the previously authorized pump station S-356 in the Tamiami Canal is also included so that it can be used to return Northeast Shark River Slough the seepage from the northern reach of the L-31N Canal, thereby lowering canal stages in advance of storms. These pump stations are being built as interim structures to enable their completion, along with associated seepage reservoirs, by June 2002 for use in protecting sparrow habitat during the upcoming wet season. Alternative 7R incorporates the system operations of Alternative 7, including a second seepage reservoir for Pump Station S-332B and the removal of the southern four miles of Levee 67 Extension and canal. This FEIS describes and evaluates Alternative 7R in comparison with the alternatives previously addressed in the Supplemental DEIS.

1.6.8 Environmental Impact Statement, Combined Structural and Operational Plan (CSOP), 2006

The Combined Structural and Operational Plan (CSOP) under development is an integrated structural and operational plan for two modifications of the C&SF project – referred to as the Modified MWD project and the C-111 canal (C-111) project. Both the MWD and C-111 projects are integral parts of the C&SF project. The existing C-111 canal and adjacent canals are the result of a number of changes from the initially conceived plan for the southern area of the C&SF project. The intent of CSOP is to be consistent with the purposes of the MWD and C-111 projects modifications as defined by the authorizing legislation and further refined by subsequent general design memoranda, general reevaluation reports and supplements to these documents. Specifically, the purpose of CSOP is to define the operational plan for these C&SF project modifications which was not included in previous design documents in a consistent manner to enhance water deliveries to ENP while maintaining the other authorized purposes of both projects.

1.6.9 Everglades National Park Temporary Airboat Concession Contracts Environmental Assessment, circa 2006

The NPS is considering whether to issue temporary concession contracts to three airboat tour companies operating within the East Everglades Expansion Area of Everglades National Park. In accordance with the NEPA, the NPS will prepare an Environmental Assessment (EA) to analyze the environmental effects of authorizing airboat tours in the Park over a three-year period. When Congress passed the Everglades National Park Protection and Expansion Act in 1989, ENP was enlarged to include 109,506 acres of the East Everglades, including a portion of Northeast Shark River Slough, a waterway that is critical for the hydrologic restoration and protection of Park resources. Once the Park acquired these private and state lands, airboat use in the East Everglades addition would be prohibited, except for private airboat owners and commercial operators who were using the area as of January 1, 1989. Section 103(d) of the Act authorized the NPS to enter into concession contracts with commercial airboat tour operators in the addition area.

The NPS has determined that Coopertown Airboat Tours, Gator Park Airboat Tours and Everglades Safari Park are eligible for concession contracts under the provisions of the Act. All three companies are located on small tracts of private land within the Park along Tamiami Trail and conduct airboat tours on NPS owned lands. The operators estimate that they collectively take more than 300,000 passengers into the Park annually and that business has grown over the past five years.

With over 99 percent of the expansion lands now in federal ownership, commercial airboat tours are occurring on Park lands without the commercial service authorizations required by NPS law and regulations.

The purpose of the proposed action is to authorize Coopertown Airboat Tours, Gator Park Airboat Tours, and Everglades Safari Park to continue to conduct airboat tours within the East Everglades addition of Everglades National Park for a three-year period.

The contracts are needed to allow these companies to conduct airboat tours, consistent with NPS laws, regulations and policies, until completion and implementation of the Park's General Management Plan (GMP) and Environmental Impact Statement (EIS), currently under development. The Record of Decision for the Final GMP/EIS will include a determination on whether or to what extent commercial airboat concessions will be authorized and implemented over the 15 to 20 year life of the GMP. The NPS intends to defer acquiring the operators' land and buildings until completion of the GMP. The issuance of temporary airboat concession contracts is not intended to pre-determine the outcome of decisions to be reached in the GMP process.

1.6.10 Everglades National Park General Management Plan and Environmental Impact Statement, circa 2009

The General Management Plan for Everglades National Park will provide a broad conceptual framework to guide decisions for long-range park management, resource protection, appropriate types and levels of visitor activities, and appropriate facility development. The management plan will articulate the park's mission, purpose, and significance, and define the resource conditions and visitor experiences that should be achieved and maintained over time. The plan will consider ENP both as a unit of the

national park system and in a broader ecosystem context that includes the surrounding South Florida region.

SECTION 2.0
EXISTING CONDITIONS/AFFECTED ENVIRONMENT

2.1 INTRODUCTION

The Council on Environmental Quality Regulations requires a description of the affected environment (40 CFR 1502.15):

> *The environmental impact statement shall succinctly describe the environment of the area(s) to be affected or created by the alternatives under consideration.*

The affected environment section of this report describes the conditions as they existed in mid-2005 when this report was prepared. It is to these conditions that the alternative actions are applied to determine environmental impacts.

2.2 GEOLOGY AND SOILS

Florida's geology has been shaped by a succession of major sea level fluctuations. The state is composed primarily of limestone with stratigraphic thicknesses of 2,000 feet in the north and more than 5,000 feet in the south. In the geologic past, inundation by warm tropical and subtropical seas with depths less than 100 meters created favorable conditions for depositions by corals and other organisms that formed the characteristic limestones of Florida. Later sea level reductions caused widespread dissolving of limestones, creating large caverns, sinkholes, springs, and other porous features of karst formations that affect surface expression and aquifer characteristics.

The Lower East Coast on the Atlantic Coastal Ridge is primarily underlain by thin sand and limestones that are highly permeable and moderately to moderately well drained. The soil of the Tamiami Trail project area is mainly of the Lauderhill-Dania-Pahokee Association, which consists of nearly level, poorly drained soils containing organic material eight to more than 51 inches deep over limestone bedrock. These soils extend west from the Atlantic Coastal Ridge into the Everglades. Typically, the soils are black to dark brown muck underlain by soft porous limestone. These soils are characterized by high subsidence, ponding, excess humus, and low strength.

2.3 SURFACE WATERS

Major characteristics of South Florida hydrology are local rainfall, evapo-transpiration, canals and water control structures, flat topography, and the highly permeable Biscayne Aquifer. Water introduced from either direct rainfall or canals is rapidly removed by evapotranspiration, seepage into the aquifer, or canal and overland surface drainage to the Atlantic Ocean, Florida Bay, or the Gulf of Mexico.

In the last 50 years, the construction of the C&SF Project has created many problems by converting nearly half of the original Everglades ecosystem to agricultural and urban uses. The hydrology of the remaining Everglades has become altered by the operation of the C&SF Project. The average annual flows and surface water stages have been reduced, and regional groundwater has been lowered. Annual hydroperiods have been

increased or decreased depending on location. Long and short hydroperiod wetlands have been relocated geographically. The frequency, duration, and magnitude of interannual wet and dry cycles have been changed, and salinity levels in estuaries have been altered. The construction and operation of the C&SF Project provided a network of canals and levees that have accelerated the spread of contaminants, sediments, and exotic species.

The water storage capacity has been reduced within the remaining natural system, and an unnatural mosaic of impounded, fragmented, and both over-inundated and over-drained marshes has been created throughout the system. More water now flows through canals to the east and less to ENP and Florida Bay than occurred historically. The altered timing of wet and dry cycles has resulted in water conditions that do not correspond to life cycles of native species. Generally, the Everglades receives too much water during wet periods and too little during droughts. In wet periods, water is impounded in the WCAs and then discharged to Everglades or coastal canals. During dry periods, water can flow through the canals to coastal areas and bypass the wetlands.

Current hydrologic conditions are a result of implementation of the experimental program begun in 1989. Pump Station S-9 discharges urban runoff from the western C-11 basin in Broward County into the north end of WCA-3A. These waters eventually pass through WCA-3B to the L-29 Canal through structures 12 a, b, c, and d, and then under the Tamiami Trail into ENP.

The 2003 GRR/SEIS discussed the need for conveying under Tamiami Trail a peak design flow of 4,000 cubic feet per second (cfs) to NESS. The peak design flow is the total capacity of all the structures discharging water into the L-29 Canal: spillways S-333 (1,150 cfs), S-355A (1,000 cfs), S-355B (1,000 cfs), and S-356 (950 cfs). A frequency analysis was performed of predicted flows from the South Florida Water Management Model (SFWMM pr 2x2) based on the combined discharges of these structures under the operational criteria for the 1992 Authorized Plan for MWD. This analysis took the peak discharge from the simulated period of record from 1965 to 1995 and using the USACE program, Flood Frequency Analysis, predicted this would have a return frequency of a one in 100 year event. Currently, the Combined Structural and Operational Plan is considering adding additional structures to the L-29 Levee to move more water with a more even distribution of flow.

2.3.1 Water Management

SFWMD works cooperatively with other agencies to develop scientifically sound approaches for managing the distribution and timing of water to the remaining natural systems. The studies are focused on: (1) water supply needs of lakes and wetlands in terms of water levels, duration, timing, and distribution of water deliveries; (2) minimum water levels and the time duration that these levels need to be maintained to protect groundwater systems from overuse or from saltwater intrusions; and (3) minimum flows and levels for rivers and estuaries needed to maintain streamflow characteristics and biological communities. Florida law requires the designation of areas where water resources are critical or anticipated to become critical over the next 20 years as Water Resource Caution Areas. Much of South Florida, including the Everglades, has been designated as a Water Resource Caution Area.

Surface waters in the state of Florida are classified as Class III for recreation, propagation and maintenance of a healthy, well-balanced population of fish and wildlife. Additionally, a water body may be designated as an Outstanding Florida Water (OFW), which FDEP defines as a water worthy of special protection because of its natural attributes. WCA-3B is designated as Class III while ENP is designated in F.A.C. 62-302.700(9)(a) as an OFW.

2.3.2 Water Supply

Levees and canals divide the former Everglades into areas designated for development and areas for fish and wildlife benefits, natural system preservation, and water storage. The natural areas consist of the three WCAs and ENP.

The primary purposes for the WCAs and their appurtenant levees, canals, structures, and pump stations include flood control, water conservation, prevention of saltwater intrusion, recreation, preservation of fish and wildlife, and water supply for ENP. WCAs include about 1,400 miles of canals and levees, 181 major water control structures, over 2,000 minor control structures, and 18 major pumping stations. The WCAs are completely contained by levees, except for about seven miles on the western side of WCA-3A, which has a tieback levee. Levees on the eastern side of the Everglades also protect from inundation the agricultural and industrial areas that otherwise would be short hydroperiod wetlands. The main canals are West Palm Beach Canal, Miami Canal, Bolles and Cross Canals, North New River Canal, South New River Canal, Hillsboro Canal, and Tamiami Canal.

The WCAs provide detention for excess water from the agricultural area and parts of the east coast region and for flood discharge from Lake Okeechobee to the sea. The eastern levees prevent floodwaters from inundating the east coast urban areas; provide a water supply for east coast areas and ENP; improve the water supply for east coast communities by recharging underground freshwater reservoirs; reduce seepage; ameliorate saltwater intrusion in coastal wellfields; and benefit fish and wildlife in the Everglades. The maintenance of water levels in the WCAs essentially represents the seasonal and monthly limits of storage. The levels vary from high stages in the late fall and winter to low stages at the beginning of the wet season. This permits the storage of runoff during the wet season for use during the dry season and serves to maintain and preserve the vegetative regimen essential to fish and wildlife and the prevention of wind tides. Reservoir storage is commonly divided into the inactive zone, the water supply (conservation) zone, and the flood control zone. The distribution of water among the flood control and water supply zones varies seasonally. The schedules for WCA-1, WCA-2A, and WCA-3A include a minimum water level below which water releases are not permitted unless water is supplied from another source. When water levels fall below the minimum levels, transfers from Lake Okeechobee or the WCAs are made to meet water supply demands.

2.3.3 Flooding

Many of the developed areas in southeastern Florida that were formerly part of the Everglades depend on the C&SF system for flood protection. The regional canal systems provide flood protection to developed areas in eastern Dade, Broward, and Palm Beach counties. Local stormwater management systems collect and route stormwater to the regional canals, then discharge to the ocean via estuaries. SFWMD

with other local government and agencies encourages integration among land use, watershed management, and stormwater master plans. Under flood conditions, the focus of stormwater management becomes rapid and efficient removal of floodwaters regardless of impacts on water supply and natural systems.

The WCAs provide a detention reservoir for excess water from the agricultural area and parts of the Lower East Coast region and for flood discharge from Lake Okeechobee. Currently, stages in the L-29 Canal are artificially controlled to provide a target elevation of 7.5 feet or below. The design stage upstream of the L-29 Canal and downstream of Tamiami Trail is nine feet. Prior to the construction of the C&SF project features, flow in the Everglades was uncontrolled, and stages varied greatly and at times overtopped Tamiami Trail.

The Flood Control Act of 1965 authorized a plan to provide seasonal flood protection in Southwest Miami-Dade County. The plan consisted of levees, canals, water control structures, and pumping stations capable of removing 15 inches of runoff per month in addition to seepage into the area following a 10-year flood. The project was officially deauthorized after Congress expanded ENP to include most of the area that would have been protected.

2.4 WATER QUALITY

2.4.1 Surface Water

General. The water quality in the Everglades has been greatly influenced by development-related activities. Extensive drainage networks allowed the development of large land tracts for urban and agricultural development. Nonpoint (e.g., agricultural runoff) and point (e.g., wastewater discharges) sources of contamination now influence surface waters in many areas. Parameters of concern include:

- Metals – mercury, copper, cadmium, lead, zinc, arsenic.
- Pesticides – DDT and derivatives, atrazine, simazine, ametryn, endosulfan compounds, ethion, bromacil, 2,4-D, aldecarb, and fenamiphos.
- Nutrients – phosphorus, nitrite/nitrate, and ammonia/un-ionized ammonia.
- Biological – fecal coliforms and pathogens, and chlorophyll-a.
- Physical parameters – pH, dissolved oxygen, conductivity, turbidity, oil and grease, temperature, and salinity.
- Other constituents – polycyclic aromatic hydrocarbons (PAHs), dioxins and furans, sulfate, chloride, tributyltin (TBT), polychlorinated biphenyls (PCBs), and volatile organic compounds (VOCs).

The primary concerns in the Everglades are nutrients, dissolved oxygen (DO), mercury, biochemical oxygen demand (BOD), and coliforms. Marsh and canal waters typically have low DO levels relative to the standards in Class I and III Florida State Administrative Code. FDEP is in the process of revising the DO criterion to reflect that these conditions may exist due to natural conditions and do not necessarily require abatement. Nutrient levels at the marsh perimeter are elevated, probably from the breakdown of organic debris as well as agricultural drainage. Key water quality parameters monitored include DO, conductivity, and nutrients. Table 1 shows the results of water sampling in 2004 and 2005 in association with the SFWMD Tamiami

Bridge Culverts Project, which monitors water passing under the Tamiami Trail into ENP at 11 sites.

Table 1. Water Quality at Tamiami Trail Culverts

Approximate Location	Years	DO (mg/l)	Sp Cond (µS/cm)	pH	Tot PO_4 (mg/l)	K (mg/l)	Mg (mg/l)	SO_4 (mg/l)
S-333	2004	3.48	581.22	7.24	0.011	5.30	16.20	30.50
	2005	4.72	661.46	7.48	0.014	--	--	--
FDOT 30[1]	2004	3.46	480.12	7.15	0.015	1.10	5.10	1.70
	2005	5.02	667.04	7.43	0.016	--	--	--
FDOT 36[1]	2004	3.69	430.50	7.20	0.011	2.10	7.60	5.40
	2005	4.93	580.00	7.34	0.016	--	--	--
FDOT 40[1]	2004	4.53	583.25	7.36	0.013	3.00	9.00	9.20
	2005	4.84	663.40	7.47	0.014	--	--	--
FDOT 50[1]	2004	4.54	552.01	7.36	0.012	2.90	9.50	12.00
	2005	4.85	677.83	7.49	0.014	--	--	--
FDOT 52[1]	2004	4.85	532.83	7.34	0.011	2.90	9.60	12.30
	2005	5.16	645.44	7.52	0.013	--	--	--
FDOT 54[1]	2004	3.99	561.68	7.30	0.011	3.00	9.70	12.50
	2005	5.47	644.20	7.54	0.012	--	--	--
FDOT 56[1]	2004	4.64	574.85	7.34	0.010	3.00	9.80	12.40
	2005	5.02	689.00	7.60	0.014	--	--	--
FDOT 58[1]	2004	4.76	566.07	7.39	0.011	3.10	10.10	13.30
	2005	5.27	572.34	7.57	0.014	--	--	--
FDOT 60[1]	2004	4.81	567.29	7.44	0.012	3.30	10.60	14.60
	2005	5.35	557.54	7.56	0.013	--	--	--
FDOT 62[1]	2004	4.96	598.90	7.55	0.013	3.50	11.10	15.80
	2005	5.41	555.50	7.52	0.014	--	--	--
Criteria for Surface Water Quality[2]	--	Not less than 5	Not greater than 50% above background or 1275, whichever is greater	6-8.5	N/A	N/A	N/A	N/A

Notes: [1] Locations correspond to FDOT Culvert Stations in Figure 3.
Values represent averages collected throughout 2004 and through July 2005.
[2] F.A.C. 62-302.530 Criteria for Class III, Predominantly Fresh Waters in Florida

Source: SFWMD.

The most recent water quality study along Tamiami Trail was conducted by the U.S. Geological Survey (USGS) National Water-Quality Assessment Program in 1996-1997 and reported in 1999. The report concluded that the quality of water along the Trail is variable due to natural and human influences. Specific conductance and concentrations of chloride, sulfate, and dissolved organic carbon tended to be relatively low in the undeveloped part of Tamiami Trail from the Turner River (mile 30.4) to about S-12-C

(mile 66.6) and relatively high at the more developed west and east ends. Relatively high concentrations occurred to the east of S-12-C due to the inflow of mineralized water from the northern Everglades through a network of canals. Twelve pesticides or pesticide degradation products were detected along the Tamiami Trail, with highest concentrations at Tomato Road in the west and S-12-D in the east where agricultural influences were greatest. Total phosphorus tended to decrease from west to east.

Seasonal variations in water quality complicate the spatial variations. Concentrations of many dissolved constituents increase during the dry season because of such processes as movement of seawater to the west, evapotranspiration, groundwater inflow, or the higher population of wildlife around the Tamiami Trail.

ENP, located south of the Project Area, is an OFW. In general, an OFW has narrative criteria for not allowing degradation/worsening of water quality conditions relative to the better of (1) to a fixed point in time, which for ENP is 1978-79, or (2) the conditions that existed in the year prior to application to FDEP for a Water Quality Certification (WQC).

Highway Runoff. Highway use results in the introduction of metals, fuels, lubricants, combustion products, and toxic chemicals as potential environmental contaminants. Table 2 summarizes several of the major constituents in runoff from highway use and their primary sources.

Table 2. Highway Runoff Constituents and Their Primary Sources

Constituents	Primary Sources
Lead	Leaded gasoline (exhaust), tire wear, lubrication, bearing wear
Zinc	Tire wear, motor oil
Iron	Rust, vehicle/engine wear
Copper	Metal plating, bearing/bushing wear, engine wear, brake wear
Cadmium	Tire wear, metal plating
Chromium	Metal plating, engine wear, brake wear
Nickel	Exhaust, lubricants, plating, brake wear
Organic compounds	Vehicle exhaust, fuel leaks, lubricants

Source: USEPA (1993).

The concentration of pollutants in runoff is dependent on a number of factors, including the amount of traffic to which the road is subjected. Table 3 illustrates the differences in concentration of pollutants in highway runoff relative to vehicle usage.

Runoff from the Tamiami Trail. Because there are no known studies of the quality or quantity of runoff from the Tamiami Trail in the project area, the quality of the runoff and the effects to the Everglades ecosystem must be inferred. The average daily traffic (ADT) volume along the Tamiami Trail, approximately 5,200 vehicles per day (vpd), is quite low. Applying the findings of Driscoll *et al.* (1990), runoff from the Tamiami Trail would have relatively low concentrations of contaminants. Bingham *et al*., (2002) suggested that runoff from the Tamiami Trail would have “little effect on the quality of the water and the surrounding aquatic habitat in the Tamiami Canal.”

Table 3. Pollutant Concentrations in Highway Runoff

Pollutant	Event Mean Concentration for Highways with Fewer than 30,000 Vehicles/Day* (mg/l)	Event Mean Concentration for Highways with More than 30,000 Vehicles/Day* (mg/l)
Total Suspended Solids	41	142
Volatile Suspended Solids	12	39
Total Organic Carbon	8	25
Chemical Oxygen Demand	49	114
Nitrite and Nitrate	0.46	0.76
Total Kjeldahl Nitrogen	0.87	1.83
Phosphate Phosphorus	0.16	0.40
Copper	0.022	0.054
Lead	0.080	0.400
Zinc	0.080	0.329

* Event mean concentrations are for the 50 percent median site.
Source: Driscoll *et al*. (1990).

USGS water quality data have been collected from various locations along the Tamiami Canal since the 1940s. Among the data were concentrations of cadmium, chromium, copper, iron, lead, nickel, and zinc, all of which are constituents of highway runoff. For most of the metals information, the database contained only the total fraction of the metals. Current *Florida Criteria for Surface Water Quality, Class lll, Recreation, Propagation and Maintenance of a Healthy, Well-Balanced Population of Fish and Wildlife, Predominately Fresh Waters (Section 62-302.530, F.A.C.)* requires metals to be expressed as the total recoverable fraction, which is a more restrictive criterion. Lead, which has largely been eliminated from highway runoff since the USEPA 25-year phase-out of leaded gasoline concluded in 1995, frequently exceeded water quality standards during the 1970s. A comparison of the historical data to the State Criteria showed that with the exception of lead, metals concentrations in the Tamiami Canal generally complied with water quality standards, with a rate of exceedance of approximately five percent. Similar results were found by Sullivan *et al.* (1996).

There are local sources of these metals in addition to highway runoff, such as airboat franchises and residential areas along the Tamiami Trail, and the potential exists for transport of metals from other locations by the network of canals.

It therefore appears that based on existing data and projections, runoff from the Tamiami Trail may have little measurable adverse effect on water quality and biological communities in the L-29 Canal. However, to reduce any potential for degradation in ENP, which is an OFW requiring special consideration, the State of Florida requires that treatment of bridge storm runoff must be included as a component of the proposed project.

2.4.2 Groundwater

South Florida contains three major aquifer systems. The surficial aquifer system is comprised of rocks and sediments from the land surface to the top of the confining bedrock. The locally productive water bearing units of the surficial aquifer include the Biscayne Aquifer, the undifferentiated surficial aquifer, the coastal aquifer of Palm Beach and Martin counties, and the shallow aquifer of southwest Florida. Practically all municipal and irrigation water is obtained from the surficial aquifer system. The Biscayne aquifer has been classified as a Sole Source Aquifer under the Federal Safe Drinking Water Act based on the aquifer's susceptibility to contamination and the fact that it is a principal source of drinking water. Well fields in this aquifer can generally yield in excess of 2,000 gallons per minute. Because the Biscayne Aquifer is highly permeable and is at or near the land surface in many locations, it is readily susceptible to groundwater contamination. Well fields in the aquifer can be recharged rapidly and effectively from WCAs and the coastal canal system.

The intermediate aquifer system consists of beds of sand, sandy limestone, limestone, and dolostone that dip and thicken to the south and southwest. In much of South Florida, the intermediate aquifer represents a confining unit that separates the surficial aquifer system from the Floridian aquifer system.

The Floridian aquifer system is divided by a middle confining unit into the Upper and Lower Floridian aquifers. From Jupiter to south Miami, the Upper Floridian Aquifer is being considered for storage of potable water in an aquifer storage and recovery program. In the Lower Floridian Aquifer, there are zones of cavernous limestones and dolostones that contain saline water and are used primarily for injection of treated sewage and industrial wastes. Where the aquifer contains fresh water, it is a water supply source.

2.5 HAZARDOUS, TOXIC AND RADIOACTIVE WASTE

A preliminary assessment for hazardous, toxic, and radioactive waste (HTRW) in the project corridor was conducted in accordance with Corps regulation ER 1165-2-132. The field survey and database search were conducted in accordance with the provisions of ASTM Standard E 1527-00, Standard Procedure for Environmental Site Assessments: Phase I Environmental Site Assessment Process. No evidence of HTRW was found to exist within the project area. During project construction, further HTRW awareness should be practiced.

The HTRW database review indicated that no contamination exists along Tamiami Trail within the project area. Evidence of a leaking underground storage tank (UST) was found on the western boundary of the project area. However, the UST was upgraded in 1999 and associated contaminants remediated. It does not appear to pose a risk to the project area.

2.6 ENVIRONMENTAL RESOURCES

The historic Everglades was a broad, shallow wetland with water flowing very slowly over 3,900 square miles from Lake Okeechobee to the mangrove zone at the southern tip of Florida. The sheetflow that naturally occurred over this region was influenced by rainfall and a relatively low surface relief. Sheetflow provided the necessary conditions

for the development of the Everglades ecosystem. Figure 3 illustrates locations of important natural features of the project area.

2.6.1 Everglades National Park (ENP)

ENP was authorized by congress on May 10, 1934 and dedicated by Harry S. Truman on December 6, 1947. The enabling legislation provided the fundamental purpose of the park as being:

> *permanently reserved as a wilderness, and no development of the project or plan for the entertainment of visitors shall be undertaken which will interfere with the preservation intact of the unique flora and fauna and the essential primitive natural conditions now prevailing in this area.*

The original 460,000 acres in 1947 was expanded to 1.4 million acres by 1958. Recognized by the U.S. Congress as a nationally and internationally significant resource, the Everglades National Park Protection and Expansion Act of 1989 (PL 101-229) authorized the acquisition of additional land to benefit the natural resources of ENP. Section 101(b) states that the purpose of the Act is to:

> *...increase the level of protection of the outstanding natural values of Everglades National Park and to enhance and restore the ecological values, natural hydrologic conditions, and public enjoyment of such area...*

Because the ENP possesses "outstanding universal values," it was designated by the United Nations Educational, Scientific, and Cultural Organization as an International Biosphere Reserve in 1976 and subsequently as a World Heritage Site in 1979. The site includes historic Everglades that have been limited in manmade influences and, for the most part, avoids agricultural land. In 1987, the Ramsar Convention designated ENP as a Wetland of International Importance.

ENP provides habitat for approximately 25 terrestrial and two aquatic species of mammals. The bird life of ENP is especially rich, with over 300 species identified. The FWS has identified 16 species of animals listed as threatened or endangered under the Endangered Species Act in the project area. South Florida's location makes it a migratory crossroads for West Indian and Central and South American birds, and numerous North American species are residents. A majority of this continent's species of wading birds, shorebirds, and waterfowl are found within ENP at different times of the year. One of the key reasons for the establishment of ENP was to protect the nesting areas and feeding grounds of wading birds such as herons, egrets, ibises, wood storks, and spoonbills.

The reptiles and amphibians of the region include two species of crocodilians, three or four species of salamanders, six species of lizards, 10 species of land and freshwater turtles, five species of sea turtles, 12 species of frogs, and 23 species of snakes. The waters of the Everglades and ENP support a large variety of fish in both freshwater and estuarine habitats. Fish provide a major part of the diet for most of the other vertebrate animal inhabitants.

The historic wetlands communities of the southern Everglades included sawgrass marshes, sloughs (with aquatic plants), marsh (marl) prairies, tree islands with bay forests, and cypress forests. Upland communities include Miami rockland pine forests and hammock forests, both in the pinelands and as tree islands surrounded by wetland vegetation. A gradient of water conditions and associated hydroperiods exist among these communities. Most of the historic wetland communities remain, although changes in the species composition, structure, and spatial distribution of some communities have resulted from human influences.

2.6.2 Shark River Slough East and West Basins

Historically, Shark River Slough was a 30-mile-wide expanse of relatively shallow water moving downstream through the low-gradient wetland landscape. The pattern of water flow was regionally uniform across a broad expanse and lacked any central drainage channel or dendritic drainage pattern. The slough collected flows from the eastern portion of the Everglades, including the western side of the Atlantic coastal ridge, and moved that water to the southwest through the mangrove estuaries of the southwestern coast into the Gulf of Mexico.

Marl prairies, fire-maintained marshes that are intermittently flooded, flank both sides of Shark River Slough. A unique feature of the marl prairies is the high species richness of the plant communities. Sawgrass (*Cladium jamaicense)* and muhly grass (*Muhlenbergia capillaris* var. *filipes*) dominate, although more than 100 species of mostly herbaceous plants have been reported. Higher elevation tropical hammock and pine forests occur as islands within the prairie landscape. These tree islands support plants of West Indian origin that are unique to South Florida and contain the highest number of rare plant species in South Florida.

Historically, the ridge and slough landscape was an extensive landscape, encompassing WCA-3B and Shark River Slough. Within the ridge and slough landscape is a complex mosaic of marsh assemblages with distinct tree islands. The marsh contains large stands of sawgrass that are interrupted by more open communities with a mixture of smaller aquatic plants and periphyton. These habitats are frequently elongated and oriented parallel to the direction of water flow, suggesting a strong functional connection between hydrology and vegetation. Tree islands of various types form a third element of the ridge and slough landscape, rising slightly above the elevation of the sawgrass ridges. The orientation of the larger tree islands has the same parallel alignment to the direction of flow.

Although seemingly small, the two-to-three-foot difference in elevation between ridge surface and slough bottom was highly significant in the pre-drainage Everglades. During the typical annual rise and fall of wet and dry season water levels, this elevation difference allowed sloughs to remain water-filled throughout the year, while adjacent ridges would be exposed a few months of the year. In the pre-drainage system, native species were adapted to the multiple habitats provided by the tree islands, ridges, and sloughs. Aquatic organisms depended on the sloughs as extensive areas that would remain inundated throughout all but exceptionally dry years

2.6.3 Water Conservation Area 3B

WCA-3B, located to the north of the L-29 Levee for the entire length of the project, is managed by FWC as the Francis S. Taylor Wildlife Management Area. WCA-3B is dominated by a generally unimpacted wetland sawgrass community and has historically been used to assist in the management of water levels and flow quantities. The area provides nesting and foraging habitat for many terrestrial and aquatic species. Tree islands found throughout the area are used by a wide variety of wildlife.

2.6.4 Biological Resources

WCA-3B and ENP are mostly natural areas with long and short hydroperiod wetlands with an abundance of interspersed willowheads, bayheads, and hardwood hammocks. Sawgrass (*Cladium jamaicense*) communities dominate the long hydroperiod wetlands, whereas muhly grass (*Muhlenbergia capillaris*) and black sedge (*Schoenus nigricans*) dominate the short hydroperiod wetlands mostly influenced by Northeast Shark River Slough and local rainfall. Four herbaceous wetland cover types are found in the Everglades: (1) sloughs with deep, permanent water levels; (2) sawgrass marshes with semi-permanent water levels and long hydroperiods; (3) wet peat prairies; and (4) wet marl prairies with shorter hydroperiods.

Plant communities present along the Tamiami Trail in the project area include:

- Swamp forest bayheads (*Magnolia virginiana, Annona glabra, Chrysobalanus icaco, Persea borbonia, Ilex cassine, Metopium toxiferum*, among others);
- Maidencane/spike-rush, a mix of shallow open water, *Eleocharis* spp. *and Panicum hemitomon*, which can include sparse association of low-stature *Cladium jamaicense, Typha* spp., *Sagittaria lancifolia, Pontederia lanceolata, Nymphaea*. spp., etc., typical of SFWMD impounded conservation areas;
- Graminoid (grasses, sedges, and rushes);
- Non-graminoid emergent marsh (*Pontederia lanceolata, Sagittaria* spp., *Nymphaea odorata, Typha* spp., with *Ludwigia repens* and *Utricularia* spp. as possible submergents);
- Saw grass (*Cladium jamaicense*);
- Cat-tail (*Typha* spp.);
- Scrub hardwood, which includes species such as *M. toxiferum, P. borbonia, Myrica cerifera, I. cassine, M. virginiana, Myrsine floridana, Conocarpus erectus, Chrysobalanus icaco*, often with a moderate-to-heavy component of mixed grasses; and
- Willow shrublands *(Salix caroliniana*).

Other classifications along the Tamiami Trail include Brazilian pepper/shrubland mix, open water, spoil areas, areas influenced by human activities, major roads, and canals.

Several small areas of filled wetlands in private ownership are present along the south side of the Tamiami Trail.

Partitioning of the Everglades by levees, canals, and roads has created barriers to the free movement of organisms, particularly aquatic species and those with limited mobility. The Tamiami Trail, the L-29 Canal, and the L-29 Levee are impediments to the free movement of organisms between ENP and WCA-3B. For aquatic organisms, the L-29 Levee and its associated water control structures obstruct movement between the L-29 Canal and WCA-3B. Aquatic connectivity between the L-29 Canal and ENP is currently limited to the series of small culverts under the Tamiami Trail. The L-29 Canal is a potential obstruction that must be crossed by terrestrial animals by swimming, and traffic mortality on the Tamiami Trail reduces the free movement of animals.

2.6.5 Protected Species

Federally listed species known or potentially encountered in the project area, and which were given consideration by FWS coordination in accordance with Section 7 of the Endangered Species Act, include the Cape Sable seaside sparrow *(Ammodramus maritimus mirabili*s), eastern indigo snake *(Drymarchon corais couperi*), Florida panther (*Puma [= Felis] concolor coryi*), snail kite *(Rostrhamus sociabili*s), West Indian manatee (*Trichechus manatus*), and wood stork *(Mycteria americana*).

- **Cape Sable Seaside Sparrow (*Ammodramus maritimus mirabilis*).** The Cape Sable seaside sparrow was listed as endangered in 1967. The principal reasons for its decline and the greatest threats to its continued survival are vegetation changes, fire, development, and hydrologic alteration. Nesting may begin as early as late February and may persist into early August. The amount of summer nesting, which essentially means the number of third broods attempted, may depend on the characteristics of individual rainy seasons. Nesting activity decreases abruptly when the marsh becomes flooded. The Cape Sable seaside sparrow remains widely distributed over a large area of South Florida and continues to occupy much of its historically known range in Collier, Dade, and Monroe counties. It inhabits brushless, subtropical marshes (prairies) of interior southern Florida.

- **Eastern Indigo Snake (*Drymarchon corais couperi).*** The indigo snake was listed as threatened in 1979 because of a loss of habitat associated with farming, construction, forestry, and other land use conversions, as well as over-collecting for the pet trade. In South Florida, the snake can be found in a variety of habitats, including wet prairies and mangrove swamps. Farther north, it can be found in pine-hardwood forest, mixed hardwood forest, creek bottoms, agricultural fields, and sandy habitats of the Florida scrub communities, typically in association with gopher tortoises.

- **Florida Panther (*Puma [= Felis] concolor coryi*).** The Florida panther was listed as endangered in 1967. Activities beginning as early as the 1800s influenced the status of the panther, with the first bounty passed in Florida in 1832. Following bounty hunting, agricultural land clearing and lumbering reduced its habitat drastically into the 1950s. Significant habitat reduction continues today. Other factors affecting the population's decline include contaminants, prey availability, human-related disturbance and mortality, disease, and genetic erosion. The only known reproducing panther population is located in the Big Cypress Swamp/Everglades physiographic

region of South Florida. Panthers prefer native, upland forests, especially hardwood hammocks and pine flatwoods, to wetlands and disturbed habitats.

- **Snail Kite (*Rostrhamus sociabilis plumbeus*).** Snail kites, listed as endangered in 1967, require long hydroperiod wetlands that remain inundated throughout the year. This preference is associated with the apple snail (*Pomacea paludosa*), its primary food source, which requires nearly continuous flooding of wetlands for greater than one year. Suitable habitats for the kite include freshwater marsh and shallow vegetated lake margins where apple snails can be found. Critical habitat for the snail kite was designated in 1977 and includes WCA-1, 2, and 3A, and portions of ENP, as well as Lake Okeechobee shorelines and portions of the St. Johns marsh. Preferred nesting habitat includes small trees and shrubs such as willow, bald cypress, pond cypress, sweet bay, dahoon holly, southern bayberry, and elderberry. During dry periods when suitable shrubs and trees experience dry conditions, herbaceous species such as sawgrass, cattail, bulrush, and common reed are used for nest sites. The breeding season can vary from year to year depending on rainfall and water levels. Ninety-eight percent of nesting attempts occur from December through July, with 89 percent initiated between January and June.

- **West Indian Manatee (*Trichechus manatus*).** The West Indian manatee was first listed in 1967. This endangered species lives in freshwater, brackish, and marine habitats and eats submerged, emergent, and floating vegetation. During the hot summer months, the mammal's habitat can range as far north as Rhode Island and as far west as Texas. During winter months, the population concentrates in peninsular Florida, depending on warm water flows from natural springs and power plant outfalls. The most significant threat facing manatees in Florida is death or injury from boat strikes.

- **Wood Stork (*Mycteria americana*).** The wood stork was listed as endangered in 1984 due to loss of foraging habitat and colony nesting failures. Preferring freshwater wetlands for nesting, roosting, and foraging, wood storks can be found throughout central and southern Florida. Nests are typically constructed in tree stands within swamps or stands surrounded by large areas of open water. Because of their tactile feeding methods, storks feed most effectively in shallow water settings where prey items are concentrated. During winter and spring dry seasons when water levels recede, prey items are often further concentrated, providing foraging areas with abundant food supplies. Drainage in South Florida may be responsible for delaying stork early nesting from November to February or March. Nesting delays are believed to contribute to nest failures and colony abandonment because of the dispersal of prey items associated with the onset of the wet season (May-June).

Stands of pond apple are located on the southern side of most of the sets of culverts along the length of the Tamiami Trail in the project area. ENP hydrologists suggest that these stands result from elevated levels of nutrients present in the water passing under the culverts, although there are other potential causes, including the placement of dredged material. Wood stork rookeries occur at two of these stands: the Tamiami Trail

East Rookery and the Tamiami Trail West Rookery. The larger Tamiami Trail West Rookery contained approximately 1,500 nests during the 1999 breeding season. The rookery boundary is located approximately 300 feet south of the highway.

Wading bird rookeries occur within two miles of the highway within the project corridor. In addition to the wood stork, FWC has identified six birds as species of special concern that may nest or otherwise be found in the vicinity of Tamiami Trail between S-334 and the L-67 Canal: tricolored heron, snowy egret, little blue heron, limpkin, roseate spoonbill, and white ibis. These migratory birds are protected under the provisions of the Migratory Bird Treaty Act. As such, they are protected species under the jurisdiction of FWS. Nesting activities in these rookeries usually last until the rains have dispersed prey, leading to the cessation of nesting. FWS and FWC identified the Frog City wading bird colony, which hosts tricolored herons and great egrets, as potentially requiring protective measures during construction. The Frog City rookery is located in WCA-3B close to the L-29 Levee approximately one-quarter mile west of the Tigertail Camp.

The American alligator (*Alligator mississippiensis),* a species of special concern, and the Everglades mink (*Mustela vison evergladensis*), listed as threatened by the State of Florida, are also found along the Tamiami Trail corridor.

2.7 CLIMATE

The subtropical climate of South Florida, with distinct wet and dry seasons, high rates of evapotranspiration, and climatic extremes of floods, droughts, and hurricanes, sustains the Everglades while creating water supply and flood control issues in the agricultural and urban areas. Temperatures are moderated by the Atlantic Ocean and Gulf Stream, but the moderating effects quickly diminish inland. The average temperature is 68° Fahrenheit (F) in winter and 82° F in summer. Seasonal rainfall patterns in South Florida resemble the wet and dry season patterns of the humid tropics more than the winter and summer patterns of temperate latitudes. Of the 53 inches of rain that South Florida receives annually on average, 75 percent falls during the wet season months of May through October. During the wet season, thunderstorms generated by easterly tradewinds and land-sea convection patterns occur almost daily. The prevailing wind is from the east-southeast. Wet season rainfall peaks during May-June and September-October. Tropical storms and hurricanes also provide major contributions to wet season rainfall with a high level of annual variability and low level of predictability. During the dry season, rainfall is governed by large-scale winter weather fronts that pass through the region approximately weekly. High evapotranspiration rates in South Florida roughly equal annual precipitation. Recorded annual rainfall in South Florida has varied from 37 to 106 inches, and annual extremes in rainfall result in floods and droughts. Multi-year high and low rainfall periods often alternate on a time scale approximately on the order of decades.

2.8 AIR QUALITY

In accordance with the 1990 Clean Air Act Amendments (CAA), the USEPA designated the Southeast Florida Airshed, consisting of Miami-Dade, Broward, and Palm Beach counties, as a nonattainment area for ozone and its precursors. On April 27, 1995, the airshed was redesignated as an ozone attainment/maintenance area. Miami-Dade County is an attainment area for carbon monoxide. Nitrogen dioxide, sulfur dioxide, and total suspended particulates are present in concentrations that are better than national

standards. USEPA has not determined a designation for airborne lead in southeastern Florida. ENP is a Class I Airshed.

2.9 RECREATION

ENP receives in excess of a million visitors each year. Recreational opportunities include biking, boating, fishing, hiking, camping, and wildlife viewing. Approximately six miles west of the project area, the Shark Valley Information Center offers a fifteen mile tram road (not open to private motorized vehicles) that extends into the marsh, offering one of the best opportunities for viewing wildlife. A two hour narrated tram ride provides an overview of the freshwater Everglades, and bicycles are available to rent. An observation tower is located halfway around the tram road.

The Airboat Association of Florida is a recreational association with facilities on the south side of the Tamiami Trail about three miles east of the western end of the project area. Facilities include a caretaker's residence, meeting room, workshop arenas for working on airboats, a cookhouse, several mobile RV sites including covered picnic areas, and a pistol shooting range. Three commercial airboat tour operators are also located on the south side of Tamiami Trail and receive several hundred thousand visitors a year. These ecotourism businesses offer guided tours into ENP.

The Francis S. Taylor Wildlife Management Area, which includes WCA-3B, is managed by FWC. This area is managed for both consumptive (hunting, frogging, fishing) and non-consumptive (wildlife viewing, camping, boating, airboating, etc.) recreational use and environmental purposes. WCA-3B is accessed by crossing the L-29 Canal at either the S-333 or S-334 water control structures and launching at the boat and airboat ramps.

The shoulder between the L-29 Canal and the L-29 Levee is used for passage along the canal, picnicking, or launching boats into the L-29 Canal. A road atop the L-29 Levee allows panoramic views to the north into WCA-3B.

Primary access to boat ramps on the north side of the L-29 Canal is at S-333 and S-334. Roads across these structures lead to several boat ramps and to bank fishing on the north bank of the L-29 Canal. S-334 provides access to a boat ramp (Boat Ramp 153) three miles to the east that allows boat launching into the L-29 Canal. A picnic area is associated with the boat ramp. Control structure S-333 provides access across the L-29 Canal to one airboat ramp and two boat ramps. There is one boat ramp each on Canals 67-A and 67-C, which are heavily used by boat fishermen. The airboat ramps provide access for deer and waterfowl hunters, as well as for recreational airboaters. Approximately 10.5 miles of the north bank of the L-29 Canal are available for bank fishing.

Bank fishing is also popular from the shoulders of the Tamiami Trail. Fishermen frequent the 10.7 miles of the south bank of the L-29 Canal (north shoulder of the highway) and points along the south shoulder of the highway where water is discharged through culverts. FWC personnel conducted angler counts along the Tamiami Trail from December 1998 to May 1999. The mean number of anglers per mile for weekdays and weekend days, respectively, was 0.95 and 2.28. Ninety-four percent were bank anglers (personal communication, FWC, September 28, 2000). These numbers translate into an estimated 10 fishermen per weekday and 23 per weekend day, totaling approximately 5,000 man-days of fishing per year within the 10.7-mile study area.

Personal observation revealed 25 bank fishermen and two boats with two fishermen in the project study segment at approximately 10:00 a.m. on a Saturday in September 2000. Almost all the bank fishermen were fishing on either side of the highway right-of-way, with only a few on the north bank of the L-29 Canal.

It should be noted that at least some of the fishing is subsistence, not recreational. There is reportedly recreational fishing for oscars, which apparently "put up a good fight." Recreational anglers have been observed fishing for bass by boat in the canal during the short period of time when dry conditions drive the bass out of the marshes (Dr. Joel Trexler/FIU, pers comm).

2.10 CULTURAL RESOURCES

Studies for historic and archaeological resources were conducted to identify and assess National Register of Historic Places (NHRP) eligibility of historic properties within the project area, to survey potential archaeological sites, to conduct archival research, and to assess the potential of each historic resource as a Traditional Cultural Property as defined by National Register Bulletin No. 38, *Guidelines for Evaluating and Documenting Traditional Cultural Properties*. This work was conducted to comply with Section 106 of the National Historic Preservation Act (NHPA) of 1966, as amended, and the Archaeological and Historic Preservation Act of 1974 (Appendix C).

Background research was conducted at the Florida Master Site File, the Florida Collection of the Florida State Library. Additional literature was examined at the University of Florida libraries, the Miami-Date Public Library, and the Historical Museum of Southern Florida.

The archaeological survey consisted of visual examinations and limited shovel testing along the right-of-way of the Tamiami Trail. Formal and informal ethnographic interviews were conducted with anglers, business owners, and members of the Airboat Association of Florida. An architectural historian assessed historic properties within the project area for NRHP eligibility.

The cultural resources investigation identified five historic properties within the project corridor:

- **Tamiami Trail**, Site Number 8DA6765. The highway is considered a historic engineering and construction feat under conditions that were unprecedented in highway construction. It provided the first route across the southern peninsula and offered an opportunity for the general public to observe the Everglades from automobiles.

- **Tamiami Canal**, Site Number 8DA6766. The canal is tied to the historic and engineering significance of the highway, and neither would exist without the other.

- **Coopertown Airboat Rides and Restaurant**, Site Number 8DA6767. Coopertown has historic significance as a former Seminole camp and as a work camp during construction of the Tamiami Trail. It is the oldest continuously operating airboat tour business, it is representative of the heritage of tourism in Florida (Janus Research, 2001).

- **Airboat Association of Florida,** Site Number 8DA6768. The Airboat Association of Florida has used the site for recreational airboating since 1952 and is the principal proponent for the sport in this section of the Everglades.

- **Gator Park,** Site Number 8DA10088. The facility consists of a ca. 1950 concrete block building, an outbuilding, a campground, a wildlife show area, and an airboat docking facility. The building appears to have been originally a gas station, and it has been altered from its original appearance.

Janus Research (2001) recommended that the Tamiami Trail, the Tamiami Canal, and Coopertown Airboat Rides and Restaurant be considered potentially eligible for NRHP listing. The Airboat Association of Florida Site was recommended for consideration as ineligible for listing. The State Historic Preservation Officer (SHPO) by letter of September 21, 2001, concurred with these recommendations. Subsequent to the 2001 findings and recommendations, members of the public have expressed the opinion that the Airboat Association of Florida site has historic value. Although individuals conducting the most recent investigation were denied access to the site to reevaluate previous findings, secondary information suggests that the site may be eligible for NRHP listing (Appendix C). Until a more definitive evaluation can be made by examining the buildings and reviewing documents stored by the association, the Airboat Association of Florida site has received a preliminary recommendation as potentially eligible for the NHRP. It is also recommended that the site be managed as if it were an eligible property.

Gator Park is considered not eligible for NRHP listing because the building has been altered, and the facility does not have a long history as a tourist attraction.

2.11 AESTHETICS

The views along the project segment of the Tamiami Trail are interesting, but somewhat limited and constrained. On the north side of the highway are the L-29 Canal and the L-29 Levee, which extend along the entire 10.7 miles of the project segment. The view of the north side of the canal and levee is broken up by several water control structures and the Tigertail Camp. A panoramic view of the sawgrass and occasional hammocks or tree islands is largely blocked by the height of the levee. On the south side, the view is often blocked by tall vegetation along the roadside. Occasional breaks allow some distance views. The Osceola Camp and the grove of trees at the Airboat Association site provide some points of interest.

2.12 NOISE ENVIRONMENT

The 2003 GRR/SEIS evaluated existing conditions, future without project conditions, and the alternatives under consideration at that time, three of which are very similar to the four alternatives currently under consideration. Table 4 presents project area traffic data from the report.

Table 4. Project Area Traffic Data

Year	ADT (vpd)	Design Hour (vph)	Flow (vph)	Level of Service (LOS)	Average Speed (mph)
2000	5,375	800	860	D	50
2020	8,852	1,316	1,400	D	50

Source: USACE (2003).

Traffic noise impacts were evaluated using maximum peak hour traffic at LOS "D" because they provide higher noise levels than maximum peak hour traffic at LOS "C." Because the geometry of all current alternatives is identical with respect to Highway Capacity Manual (HCM) operational analysis, projected flow, LOS, and average speeds are identical for a given year and month for all alternatives.

Sensitive receivers selected and evaluated for the 2003 report included the Flight 592 Memorial, Osceola Camp, Safari Park, Gator Park, Tigertail Camp, Coopertown Airboats, and the Airboat Association of Florida. Three sound levels were determined for each activity: (1) noise abatement criteria (NAC); (2) existing noise levels; and (3) predicted noise levels.

Ambient noise levels were recorded for 16.5 hours at the Osceola Camp and at the Tigertail Camp to determine background and peak hour noise levels. Measurements indicated average background A-weighted hourly equivalents (LAeq1h) of 65.8 dBA at the Osceola Camp and 58.4 dBA at the Tigertail Camp. Peak hour levels were 68.0 dBA at the Osceola Camp and 61.0 dBA at the Tigertail Camp.

Peak hour existing conditions from the 2003 report are presented in Table 5. Significantly, the evaluation indicated that the northwest portion of the Osceola Camp exceeded Florida Department of Transportation (FDOT) approach criterion of 66 dBA at peak hour existing conditions.

Table 5. Existing Peak Hour Noise Levels

Site	Receiver[1]				
	1	2	3	4	5
Flight 592 Memorial	59.9	--	--	--	--
Osceola Camp	68.3	62.0	57.5	62.2	62.6
Safari Park	69.6	69.9	--	--	--
Gator Park	69.6	62.7	--	--	--
Tigertail Camp	60.5	60.8	--	--	--
Coopertown Airboats	69.6	69.9	62.7	--	--

Notes: [1] Hypothetical points for sites for existing peak-hour modeling.

Source: USACE (2003).

2.13 EXISTING ROADWAY

The original Tamiami Trail was most likely constructed in the late 1920s and early 1930s primarily by digging the canal by steam shovel and placing the spoil ahead to create the roadbed. In the mid-1940s, about 38 bridges were added at various locations on the Tamiami Trail, 19 of which were within the project area. In the early 1950s, the bridges were removed and replaced with the culverts that are currently in place (Figure 4). In 1968, the shoulders were widened and the pavement was overlaid. In 1970, a guardrail was added on the north side. At some time in the 1980s or 1990s, another guardrail was added on the south side of the road. Finally, in 1993, the shoulders were widened, and the mainline pavement was resurfaced.

FDOT requires that culverts be designed for a projected maintenance-free time or a Design Service Life (DSL) appropriate for the culvert function and highway type. Recently, the FDOT Culvert Service Life Estimator Program was used with soil parameters to determine DSLs for four locations. The results indicated that the existing reinforced concrete pipe culverts under US 41, which have been in operation for approximately 50 years, should continue to provide service for an additional 50 years.

The road is currently in need of maintenance. The asphalt surface of the road has surface environmental stress cracks and subsurface fatigue cracks. On the Pavement Condition Rating, by which road surfaces are rated on a scale of 1 to 10, the Tamiami Trail would receive an FDOT rating of 6. Whenever a road is rated at 6 or below, repair actions are typically required. Because of pavement deterioration in terms of cracking, rutting, and ride, FDOT determined that the portion of the Tamiami Trail within the project area is in need of rehabilitation.

2.14 TRIBAL LANDS

The Miccosukee Indian Tribe has lived in what is now ENP for generations and has traditional, aboriginal, and statutory rights to live in the Everglades.

Two Miccosukee Tribe family group settlements are located within the project area: the Tigertail Camp and the Osceola Camp. The Tigertail Camp, located north of Tamiami Trail between the L-29 Canal and the L-29 Levee, is home to approximately 15-20 persons, as indicated by the 2003 report. Vehicle access is by means of unimproved roads adjacent to and on top of the L-29 Levee that intersect the Tamiami Trail at canal crossings at each end of the project area. A pedestrian bridge crossing the canal connects a small parking area along the northern side of the highway to the Tigertail Camp. The living facilities of the Tigertail Camp were recently elevated above the flow levels anticipated for MWD.

According to the 2003 report, the Osceola Camp is home to 10-15 people. It is located on the south side of the Tamiami Trail approximately one-half mile east of the western end of the project area. Access is by vehicle directly from the highway. Structures in the Osceola Camp have not yet been raised above the MWD Project higher water elevations, but this work must be completed before the 8.5 SMA construction is complete and the water levels increase.

2.15 ECONOMICS/SOCIOECONOMICS

The project study area is west of the "limits to urbanization" boundary established by the Miami-Dade Planning Department. Coupled with the protected natural areas north and south of the corridor, this effectively means that no additional development will be allowed along the corridor within the project limits. However, new ENP operations/visitor areas are possible in light of the ongoing ENP General Management Planning process consistent with the Everglades National Park Protection and Expansion Act of 1989.

The Miami-Dade County region is a major metropolitan area with a population in excess of two million. The region supports a diverse economy with an emphasis on tourism, wholesale and retail trade, manufacturing, and shipping/transport. Miami-Dade County, which encompasses more than 2,000 square miles, is located along the southeastern portion of the Florida peninsula. It is bounded by Biscayne Bay and the Atlantic Ocean to the east, ENP to the west, the Florida Keys to the south, and Broward County to the north. One-third of the Miami-Dade County area is within the boundary of ENP.

According to the 2000 census, the population of the county is approximately 70 percent white and slightly more than 20 percent black. Approximately 57 percent of Miami-Dade residents identify themselves as Hispanic. In 2000 it was estimated that 18 percent of the county's residents were in poverty, with almost 25 percent of that number being children under the age of 18. Over one million persons were employed. Local, state, and Federal government employment accounted for approximately 143,000 jobholders.

Three tourist-oriented businesses located on the south side of Tamiami Trail in the study area offer airboat trips, souvenirs, and restaurant facilities: Coopertown Airboat Rides and Restaurant, Everglades Safari Park, and Gator Park, Inc. The particular attraction of the businesses is ecotourism. Their guided airboat tours into ENP include explanations about the nature of the Everglades as an ecological area and information on some of the plants and animals. According to the owners/managers of the businesses, approximately 90 percent of all visitors inquire about airboat tours (Personal communication, business owners/managers, multiple dates, 2000).

The three businesses have approximately 15 permanent residents among them. One also has recreational vehicle sites, many of which are occupied for extended periods by "semi-permanent" residents. The businesses also employ approximately 30 full time and 20 part time workers.

2.16 FLIGHT 592 MEMORIAL

The Valu Jet Flight 592 Memorial is located at the western end of the project area on the northern side of the L-29 Levee, about 250 feet from Tamiami Trail. Access to the memorial is via the S-333 canal crossing. The site consists of a parking area and a sculpture/memorial consisting of 110 concrete pillars that symbolize each of the lives lost in the DC-9 crash on May 11, 1996. The pillars are arranged in a triangular pattern that points to the actual crash site eight miles away in the Everglades.

SECTION 3.0
FUTURE WITHOUT PROJECT CONDITION

3.1 INTRODUCTION

The future without project condition represents the condition of the study area as it would be expected to develop if no improvements were made to the Tamiami Trail. Under no-action, implementation of the other MWD project elements (raising the Tigertail and Osceola Camps, building mitigation features for the 8.5 square mile area; improving the conveyance of water across the L-67 levees inside WCA 3, and improving the Taylor Slough bridges) would go forward. Operations of the MWD project would be as determined in the Combined Structural and Operational Plan Study (CSOP).

The purpose of the MWD Project is to deliver greater volumes of water into the L-29 Canal for the restoration, to the extent practicable, of original hydrologic conditions in NESS. This greater volume will create higher water levels in the Everglades. Given the higher water level, the configuration of the existing culverts (invert, size and location) and the head-loss through the culverts needed to pass the greater volume of water, water levels in the L-29 Canal will be even higher. These higher water levels can lead to increased road damage or overtopping and require mitigation or compensation to the road's owner, FDOT. Under the without-project condition, Phase I and Phase II WCA-3 CERP Decompartmentalization would reevaluate conveyance requirements across Tamiami Trail and might require a greater conveyance capacity than that proposed in the 1992 GDM/EIS.

For the greater Everglades ecosystem, a lack of improvements to eastern Tamiami Trail would probably mean that flows would reach the south side of the Trail more slowly, flows would be concentrated at a few points rather than arriving over a broad front, and system connectivity might be impaired.

3.2 FUTURE WATER DELIVERIES

The MWD project will modify the existing C&SF Project to provide a more natural flow regime to ENP. North of the L-29 Canal, the MWD project calls for connecting WCA-3A to WCA-3B through a series of structures or breaches in the L-67A and L-67C levees. The current approved project calls for gated control structures in these levees; however, there is a proposal to use "passive" weirs instead. This proposal is known as the "Conveyance and Seepage" study. These gated structures have not yet been constructed. The MWD project calls for passing a volume of water through WCA-3B, but not significantly changing the water levels. (The volume introduced into WCA-3B will equal the volume released.) In addition, the L-67 Extension will be degraded upon completion of the project.

In addition to the current water control structures (S-333 and S-334), the MWD project includes the construction of S-355A&B in the L-29 Levee and pumping station S-356 at the eastern end of the project area. The S-355A&B water control structures will pass water from WCA-3B into ENP. The S-356 pumping station, already built under the Interim Operating Plan (USACE, 2002), will return seepage water collected in the L-31N Canal back to the L-29 Canal. As part of the Conveyance and Seepage study,

additional weirs in the L-29 Levee are proposed. Once the MWD project features are complete and land acquired, constraints to reaching the L-29 Canal stages will be lifted.

Water levels south of Tamiami Trail will not be managed. Water levels are associated with flow through the Tamiami Trail culverts, rainfall, seepage, and evapotranspiration. However, because of the enhanced ability to provide water into the L-29 Canal and the lifting of the constraints, canal water levels could become much higher. Greater flows and higher water levels led to the study of modifications to Tamiami Trail.

The Control Water Elevation for this project was computed as the average of the annual peak high water stages over a 35-year simulated period of record using the Natural System Model. The Control Water Elevation was determined to be 8.75 feet. Based on a percentage exceedance curve of all the data, this stage would be exceeded only 12.5 percent of the time during the period of record. The remaining 87.5 percent of the time the stage would be lower than this elevation. The CWE is not an operational stage but a stage utilized during bridge design to determine a bridge deck elevation that would enable inspections of the underside of the new bridge.

Without the construction of modifications to Tamiami Trail, the future without project condition may involve constraints on water management operations in the project area. The potential area of concern is overtopping and saturation of the subgrade of the highway during high water events. This could affect public safety and adversely impact residents and businesses in the area.

3.2.1 Natural System Model

The Natural System Model (NSM) was created in 1989 based on established procedures of the South Florida Water Management Model (SFWMM). NSM utilizes recent climatic data (1965-1990) to simulate the hydrologic response of the pre-drainage Everglades. The model does not actually simulate the hydrologic response of the natural system prior to human influence because climatic data for that period are not available. However, NSM makes possible a comparison between the response of the natural system and that of the managed system under identical climatic inputs from recent data.

The climatic inputs of NSM are nearly identical to those of SFWMM, mimicking the hydrology of South Florida, which is dependent mainly on rainfall and is heavily influenced by the processes of evapotranspiration, overland flow, and strong links between surface and groundwater hydrology. The input data include such elements as vegetation, land surface elevation, aquifer properties, river location, rainfall, potential evapotranspiration, and inflow of water at the model boundary.

NSM is the best available tool for estimating hydropattern targets during the restoration process. For this study the NSM was only used for the determination of the Roadway Design High Water Elevation (DHW), see Engineering Appendix Annex A Hydrology and Hydraulics section 9. The water surface elevations (associated with bridge/roadway design criteria), that are developed through analysis with the NSM, would define the upper limit of elevations derived through simulation. Use of these upper-bound elevations for structural design would ensure that the bridge/roadway not be subject to failure from hydraulic forces directly related to water depth/water surface elevation. This method will maximize consistency with future CERP projects as well as the ongoing CSOP study.

3.3 INTERIM FLOW TARGETS AND THE INTERIM OPERATIONAL PLAN

Prior to 1989, in addition to rainfall, ENP received its inflow through the S-12 structures (S12A, B, C, and D). These structures are located west of L-67 Extension and deliver water to ENP from WCA-3A. In 1983, Congress authorized the Experimental Water Delivery program because of adverse environmental impacts to ENP resulting from high rainfall and water management practices in South Florida. In an attempt to remedy the location, timing and volume of water deliveries to ENP, the legislation authorized a series of seven tests using different water delivery schemes from the C&SF project to ENP. A series of tests have been used – most involve a "rainfall-based" delivery formula that specifies the amount of water to be delivered to ENP in weekly volumes through the S-12s (west of the L-67 extension) and S-333 (east of the L-67 extension). However, because of management constraints, S-333 usually could not deliver its required volume. Generally, the volume of flow that could not be delivered at S-333 was shifted back to the S-12s.

As part of the FWS 1999 Biological Opinion on the project, RPAs were developed to "preclude jeopardy" to the Cape Sable seaside sparrow. These RPAs included a number of land and water management actions, which have subsequently been implemented. One set of options required early, staged closure of the S-12 structures to avoid surface flooding in the sparrow's Subpopulation A nesting area and a redistribution of flows to the culverts located east of the L-67 Levee. By March 2002, 60 percent of all regulatory water releases crossing Tamiami Trail were required to occur east of the L-67 Extension.

The South Dade Conveyance System, of which the structures and canals along eastern Tamiami Trail are components, is currently operated under the Interim Operational Plan (IOP), as described in the May 2002 IOP FEIS, Table 2.10.

3.4 EFFECTS OF FUTURE FLOWS ON ROADWAY

The road is currently in need of maintenance. The asphalt surface of the road has surface environmental stress cracks and subsurface fatigue cracks.

Current maintenance actions include such items as repairing damaged guardrails, small pavement patching, mowing, and litter removal. Periodic maintenance items would include resurfacing or complete guardrail replacement. FDOT District 6, which is responsible for these tasks along this section of Tamiami Trail, has been maintaining this portion of Tamiami Trail in accordance with their policies and procedures. This maintenance plan is based on the current water elevation of 7.5 feet, which is 0.3 feet below the limestone base. The top of the road (crown) is at elevation 9.8 feet at the low points of the highway and 10.1 feet at the high points. According to FDOT, the water elevation must be at a minimum of two feet below the base of the road for the limestone base to maintain its integrity.

When MWD is implemented, the design high water (DHW) elevation will be raised from 7.5 feet to 9.7 feet. Once water reaches an elevation of 9.7 feet, it would be five inches into the asphalt of the shoulder, which is at elevation 9.23 feet, and the limestone base would be impacted. Support for the asphalt pavement would weaken, existing cracks would widen, and additional cracks would develop. Deterioration of the pavement would accelerate, particularly at the low areas. The asphalt pavement would deflect

more than normal under traffic, at which point structural fatigue cracking would occur; and shortly thereafter, potholes would develop.

This extensive fatigue marks the end of the pavement life, at which point the asphalt is rendered as little more than a granular base. To repair this damage, it would be necessary either to remove the asphalt and build a new six-inch asphalt pavement surface (but as long as the water levels will be high, the same failure will occur again rapidly), or level out the damaged areas and place a new six-inch surface on top and begin raising the pavement elevation. More frequent construction and repairs would result in more frequent traffic congestion, which could impact residents, tourism, and businesses along the road and in the area.

From a frequency standpoint, each time the water is at approximate average elevation 8.5 or higher, the described problems would occur. Large localized areas of failure could occur in many cases at approximately 8.0 feet. When the water elevation is 7.5 feet or lower, conditions would be no worse than at present, because the water is currently at elevation 7.5 feet. Between elevation 7.6 and 8.0 feet, there is a 50 percent chance of failure occurring.

Water would begin overtopping the highway at an event frequency of between 200 and 500 years. Overtopping would cause erosion of the embankment and washouts of the shoulders and edges of the pavement. After a flow test was conducted by the USACE in the spring of 2000, it was determined that these types of damages did occur in localized areas. Overtopping would close the road to traffic, which would severely impact tourism, residents, and businesses along the road.

SECTION 4.0
PROBLEMS AND OPPORTUNITIES

4.1 CENTRAL AND SOUTHERN FLORIDA FLOOD CONTROL PROJECT EFFECTS ON NATURAL HYDROLOGY

In the last 50 years, the construction of the C&SF Project has created many problems by converting nearly half of the original Everglades ecosystem to agricultural and urban uses. The hydrology of the remaining Everglades has become altered by the operation of the C&SF Project. More water now flows through canals to the east and less through NESS to ENP and Florida Bay than occurred historically. Generally, the Everglades receives too much water during wet periods and too little during droughts. Changes in hydrology have also altered Everglades topography due to drainage, soil oxidation, subsidence, erosion-deposition, and burning.

The project is an element of the restoration effort that, to the extent practicable, seeks to restore more natural flows to the Everglades. The modification of the Tamiami Trail offers the opportunity for water to be conveyed with fewer obstructions to NESS and ENP.

4.2 CENTRAL AND SOUTHERN FLORIDA FLOOD CONTROL PROJECT EFFECTS ON ECOLOGICAL QUALITY

Biological community structure has become affected by the loss of pre-C&SF hydroperiods and a general reduction in water levels and flows in the Everglades. Construction and implementation will disrupt biological communities that have adapted to the existing conditions of the project area. However, implementation of any of the action alternatives will provide the opportunity for long-term improvements in the biological community structure not only in the project area but also in many thousands of acres in ENP. Increased conveyance through Tamiami Trail will provide greater hydrologic connectivity and more natural hydroperiods.

4.3 FLOOD DAMAGE TO ROAD

The potential adverse impacts to the roadway that could result from higher water stages in the L-29 Canal include the following:

1. Overtopped roadways could pose a greater potential for automobile accidents or temporary road closures.

2. With higher water, the limerock base layer of the subgrade would become saturated and soften. The reduction in strength of the base layer would accelerate cracking of the road and pothole formation, which would, in turn, create a greater potential for accidents.

3. Reduced integrity of the roadway would result in increased repair and maintenance costs.

4.4 CERP COMPATIBILITY

A goal of CERP is to reduce compartmentalization of the Everglades and promote ecological connectivity. Ecological connectivity can be achieved through connections, corridors, or other means that provide organisms the ability to overcome the isolation of populations. A recommended project feature of CERP is restoration of ecological connectivity between WCA-3B and ENP through the removal of the L-29 Levee and partial filling of the Tamiami Canal.

The project offers the opportunity to implement a feature compatible with CERP de-compartmentalization by reducing the barrier effects of the highway and promoting an increased opportunity for movement between the L-29 Canal and ENP.

SECTION 5.0
FORMULATION OF ALTERNATIVE PLANS

5.1 INTRODUCTION

The planning process consists of a series of steps that identifies or responds to problems and opportunities associated with the Federal objective in the selection of a recommended plan. The process involves an orderly and systematic approach to making determinations and decisions at each step so that the public can be fully aware of the basic assumptions employed, the data and information analyzed, the areas of risk and uncertainty, the reasons and rationales used, and the significant implications of each alternative plan. Steps in this process are:

- The identification of problems, opportunities, and constraints associated with the Federal objective;
- The inventory, forecast, and analysis of resource conditions within the planning area relevant to the identified problems and opportunities;
- The formulation of alternative plans through the establishment of goals and objectives, and the identification of planning requirements;
- The evaluation of the effects of the alternative plans;
- The comparison of alternative plans; and
- The selection of a recommended plan based on the comparison.

The final recommended plan must be consistent with the original MWD project purpose "to take steps to restore natural hydrologic conditions to the extent practicable in the Everglades National Park." Consistency is defined as the ability of the plan to pass the peak flows expected under MWD in a natural spatial configuration.

In achieving the objectives of the planning process, each of the alternatives was evaluated according to planning goals, objectives, and performance measures as discussed in Section 5.2, and additional considerations as described in Section 5.3. The alternatives and the criteria were developed from meetings, discussions, and coordination with representatives of affected or interested agencies, organizations, and the public.

5.2 PLANNING GOALS, OBJECTIVES, AND PERFORMANCE MEASURES

Given the problems and opportunities of the existing condition and those forecasted for the future without project condition, the goal of this project is:

> To provide modification features to Tamiami Trail needed to convey increased flows created by the Modified Water Deliveries Project provisions in the General Design Memorandum prepared under authorization of the Everglades National

Park Protection and Expansion Act of 1989 to design actions to improve water deliveries to ENP.

For each of the alternatives proposed for implementation, identifications were made of objectives that any such solution should attain and constraints that any such solution should avoid. Performance measures provide quantitative or qualitative indicators of how well (or poorly) an alternative meets a specific objective or avoids a specific constraint.

5.2.1 Restoration and Enhancement of Ecological Function through Restoration of Hydrology to ENP

Engineers, hydrologists, and biologists from six agencies (SFWMD, ENP, FWS, FWC, FDEP, and USACE) participated in two Tamiami Trail Modification Benefits Workshops held 23-26 May 2005 and 6-7 July 2005 in Jacksonville, Florida. The report resulting from the July workshop, *MWD Tamiami Trail Modification Benefits Analysis Procedures, August 2005,* is appended (Appendix E). Information in this section is derived from the report.

The goal of the benefits analysis was to identify the hydrologic and ecological conditions that would occur with alternative lengths and locations of conveyance (equal to bridge length) of water under Tamiami Trail. These conditions would be evaluated and compared to identify quantitative benefits for each alternative.

Among other sources used in the analysis, the May 2005 *Draft Tamiami Trail Alternative Optimization Report* prepared by ENP (appended to the FWCAR, Appendix F) contained the greatest amount of information and detailed analysis potentially applicable to the comparison of TTM alternatives. The interagency team used the report's findings as a baseline and focused on ways to make comparisons among alternatives.

5.2.2 Planning Objectives

The interagency team considered the restoration and/or enhancement of four ecological and hydrological characteristics of the project. These have been selected as Planning Objectives for this project:

1. Restore Water Deliveries to Everglades National Park;
2. Restore Ridge and Slough Processes;
3. Restore Vegetative Communities; and
4. Restore Fish and Wildlife Resources.

The degree to which each alternative meets the planning objectives is evaluated by the performance measures.

5.2.3 Screening of Performance Measures

The team considered the 33 performance measures displayed in the ENP report. Of these, 11 performance measures were removed because differences among alternatives resulted from different upstream operations of structures rather than bridge lengths. Five performance measures were removed because they depended on removing the L-29 Canal, a potential CERP action, rather than bridge length. Five performance

measures were removed for other reasons. Two performance measures were revised: the reconnection of deep sloughs, which is important for dry years, and connectivity of ENP to flows in the L-29 Canal. One new performance measure was developed for east-west distribution of flows. The remaining 13 performance measures reflect differences among alternative bridge lengths and are not dependent on removing the L-29 Levee or on different upstream operations. The 13 performance measures address the four Planning Objectives: hydrology, ridge and slough processes, vegetation, and wildlife.

1. Planning Objective: Restore Water Deliveries to Everglades National Park.

   - PM 1.A. Average annual flow volumes. This is a measure of the ability of alternatives to pass MWD flows. The flow considered for this performance measure is 683,000 acre-feet per year. Average annual flow volumes are computed from the South Florida Water Management Model (also referred to as the 2x2 Model). This value refers to the average annual amount of water in acre-feet passed across Transect 18, which is located just south of Tamiami Trail between L-67Ext (west side) and L-31 (east side) and is used as a measure for the delivery of water to North East Shark River Slough (NESS). The 683,000 average annual acre-feet per year delivered to NESS came from the Combined Structural and Operational Plan (CSOP) modeling efforts. This value represents alternative 2 (West Bookend Run), which is the most aggressive environmental plan that the CSOP team looked at. This plan incorporated increased discharge capacity at S-333 (from 1350 to 2000 cfs), structures S-355 A and B (As-Built), pump station S-356 (As-Built), and 3 additional – 1,000 feet long passive weirs through the L-29 levee (total length of 3,000 feet). All of the plans for the Tamiami Trail Modifications were compared against this desired flow amount and the ability of the bridge to convey this amount of water without impact to the roadway or increased stages upstream in Water Conservation Area 3B (WCA-3B). Appendix D Engineering, Annex A - Hydrology & Hydraulics, Table 3, shows the different volumes of water from many different operational scenarios (NSM, D13R, CERP0, and CSOP alternatives 1 through 5) for a comparison.

   - PM 1.B. Area with high flow velocity (>0.1 feet per second) discharges within one mile of structures in the Tamiami Trail. Higher velocities adversely affect vegetation colonization and increase scouring. This performance measure identifies alternatives that would produce the least amount of impacted area.

   - PM 1.C. Distribution of flows from L-29 Canal into NESS. This performance measure describes the connection between the L-29 Canal and NESS as a percent of total project length.

   - PM1.D. Distribution of flows, east to west. This performance measure gauges how well bridge lengths and locations, in combination with the

remaining culverts, match the more natural distribution as represented by a 10.7-mile bridge.

2. Planning Objective: Restore Ridge and Slough Processes.

- PM 2.A. Reverse filling in of sloughs. This performance measure is related to the alignment of a bridge with degraded sloughs south of the Tamiami Trail, thereby maximizing the potential for its reestablishment. This is a semi-quantitative measure with a scale of 0-7.

- PM 2.B. Difference between average velocity in marsh and average velocity at road. This performance measure is a ratio that describes how closely the water velocities near the road match the velocity in the marsh at a distance of approximately 6,000 feet downstream from the road. Lower velocities at the road would provide higher ratios. The target is a ratio of 1.0.

- PM 2.C. Flows from L-29 Canal into deep sloughs of NESS. The benefits of different bridge lengths were assessed considering each bridge location. The increased connection provided by a bridge aligned with deeper portions of NESS facilitates increased flows where it would have occurred without the highway being present. This performance measure is the percentage of "marsh capacity" of each alternative compared to the marsh capacity of a 10.7-mile bridge.

3. Planning Objective: Restore Vegetative Communities.

- PM 3.A. Shift to open water, spikerush marsh and slough communities in NESS. This performance measure evaluates the potential for alternatives to restore the historic ridge and slough landscape. The alternatives were scored semi-quantitatively on a scale of 0-7.

- PM 3.B. Risk of ridge and tree island peat burning in NESS. This performance measure is dependent on hydroperiod and the ability of the alternative to deliver enough water to maintain sufficient hydration of peat soils to minimize fire risk. This is a semi-quantitative evaluation with a scale of 0-7.

- PM 3.C. Invasion of exotic woody plant species. This performance measure depends on maintaining sufficient water in sloughs to prevent the establishment of exotic species. Bridge length is also considered; more highway embankment removed in association with longer bridge lengths would reduce the substrate available for exotic species. Alternatives were evaluated semi-quantitatively on a scale of 0-7.

4. Planning Objective: Restore Fish and Wildlife Resources.

- PM 4.A. Total abundance of fishes in ENP marshes. The lateral connection of sloughs through overflow from deeper sloughs improves fish access to micro-topographic relief refugia during dry-downs and increased hydroperiod within adjacent sloughs. Longer bridge length increases the pathways for fish dispersion and movement by improving and extending escape routes to the L-29 Canal during the dry season. Alternatives were scored on a semi-quantitative scale of 0-7.

- PM 4.B. Conditions for wading bird foraging and nesting. This performance measure is based on the potential for restoring hydropatterns in NESS to increase abundance and availability of forage fish that wading birds depend on for nesting success. In addition, bridges immediately adjacent to rookeries were less beneficial than locations that provide a buffer distance. This is a semi-quantitative measure with a scale of 0-7.

- PM. 4.C. Reduction in wildlife mortality. Bridges would reduce the possibility for animals to enter travel lanes, and longer bridges would provide greater reductions in mortality. This performance measure is based on FWS mortality data for the Tamiami Trail. Bridges would reduce mortality by an average of 261 deaths per mile per year.

5.3 ADDITIONAL CONSIDERATIONS

5.3.1 State and Federal Programs

Certain limitations exist that must be considered in evaluating, designing, and implementing the proposed project. Programmatic limitations that involve maintaining consistency with Federal and State programs and actions include:

- **FHWA and FDOT Requirements.** This project involves the modification U.S. Highway 41. The completed project must provide the public with a facility that meets the highway standards required by the Federal Highway Administration and the FDOT.

- **Florida Coastal Zone Management Program**. This project is located within the designated Coastal Zone of the State of Florida. Therefore, it is necessary for the project to comply with the requirements of the Florida Coastal Zone Management Program (Appendix G). Part of that program involves the receipt of an official determination by FDEP that the project is consistent with the Florida Water Quality Criteria.

- **Flood Control.** This project must not adversely affect the ability of any channels or structures to provide currently authorized flood control measures to the public.

- **Other MWD Components.** This project is a component of the overall MWD Program. Therefore, the project must maintain full consistency with the other MWD component projects. In December 2004, ENP and the Jacksonville District of the USACE submitted the most recent Capital Asset Plan for the MWD project. The Plan advises Congress that the estimated overall cost for the MWD project is $398.42 million. This figure includes funding for Tamiami Trail Modifications, as well as the other MWD project components: 8.5 Square Mile Area, Conveyance and Seepage Control Features, and Project Implementation Support. The Tamiami Trail component included $109.76 million for construction. Although the $398.42 million for the overall MWD project is certainly considered a cost constraint, the funding for individual MWD components may be reprogrammed within the Plan by consent of the two agencies. Although an important consideration, the $109.76 million is not necessarily a cost constraint as long as any increase in that cost can be reasonably offset by savings in other MWD components.

5.3.2 Use of the Tamiami Trail for Hurricane Evacuation

In 1999 the Governor's Hurricane Evacuation Task Force identified seven limited access routes with a potential "need to reverse" to enhance regional evacuations (FDOT web site). U.S. 41 (Tamiami Trail) is not one of the designated routes; the closest designated east-west, coast-to-coast hurricane evacuation route (with a need to reverse lane) is Interstate Highway 75 (Alligator Alley), which is located approximately 20 miles to the north. However, because of its location as the southernmost east-west artery across the state, Tamiami Trail provides coast-to-coast access between Miami and Naples and would undoubtedly be used for hurricane evacuation, if necessary, but traffic would be maintained in both directions.

The use of Tamiami Trail for hurricane evacuation requires that the highway's traffic flow not be impeded during the hurricane season. This may influence construction phasing and/or means to maintain traffic flows during construction.

5.3.3 Protected Species

According to the 2003 FWCAR, a total of six Federally listed species (five endangered, one threatened) exist in the project vicinity.

Two wood stork rookeries exist near the project area. The FWS, using the *Habitat Management Guidelines for the Wood Stork in the Southeast Region* (Guidelines) (Ogden 1990) and Tamiami West Colony photography from the 1999 nesting season, identified primary and secondary restriction zones for the Tamiami West Colony and the Tamiami East Colony (see Figure 3). Based on photo interpretation, it was apparent that wood storks nested as close as 300 feet south of Tamiami Trail during the 2000 nesting season, when an estimated 1,300 storks nested at this site. The primary and secondary restriction zones present constraints with respect to construction noise and alternative alignment location, as well as a potential constraint to the timing of construction.

The Primary Zone is the most critical area and must be managed according to the Guidelines to insure the colony survives. Human activities inside the Primary Zone during the wood stork nesting season, in particular, should be conducted according to the Guidelines. For the Tamiami East and West rookeries, the primary zone extends

only 1,000 feet on all sides due to the visual barrier the pond apple forest creates between the rookery and Tamiami Trail, and the fact that storks appear to have become somewhat acclimated to highway traffic noise.

The Secondary Zone extends outward from the Primary Zone 1,000 feet. Restrictions in this zone are needed to minimize disturbances that might impact the Primary Zone and to protect essential areas outside the Primary Zone. The Secondary Zone may be used by wood storks for collecting nesting material and for roosting, loafing, and feeding (especially important for newly fledged young).

Approximately 2,295 linear feet of the existing Tamiami Trail are located within the Primary Zone for the Tamiami West Colony, and 2,122 linear feet are located within the Secondary Zone for the western rookery. The only restricted area for the Tamiami East Colony is 3,123 linear feet in the Secondary Zone.

1. **Primary Zone:**

   Tamiami West Colony: From February (or onset of nesting activity) through the onset of the rainy season (or when the young have fledged), highway construction (e.g., heavy human/equipment activity, pile driving, blasting) should not be permitted in the reach of the highway affected by that alternative.

   Tamiami East Colony: The Primary Zone of the Tamiami East Colony does not overlap any of the alternative alignments for the Tamiami Trail Project. Thus, no wood stork Primary Zone restrictions apply to highway construction activities in the vicinity of this colony, unless otherwise determined to be necessary by a qualified onsite observer(s).

2. **Secondary Zone:** No unauthorized human activity (on foot, airboat, or off-road vehicle) should occur at any time of the year within the reach of highway affected by that alternative on the south side of the highway and particularly during the nesting season.

3. **Length of Restrictions:** These restrictions shall remain in effect during the construction phase of the Tamiami Trail Project.

4. **Qualified Observer:** Subject to the approval of the FWS and FWC, a qualified observer(s) shall be stationed onsite during the construction phase of the Tamiami Trail Project. The observer shall monitor wood stork activity and shall notify FWS, FWC, and the USACE if wood stork behavior is modified such that roosting, nest building, breeding, nesting, and/or fledging of young is disrupted or otherwise interfered with.

5. **Modification of Restrictions:** If new information becomes available concerning the Tamiami West Wood stork colony, the USACE, FWS and FWC should immediately contact each other to determine what modifications, if any, are warranted.

The project must not preclude compliance with the RPAs of the February 19, 1999, FWS Final Biological Opinion on the Cape Sable seaside sparrow. These RPAs included a

number of land and water management actions, which have subsequently been implemented. The South Dade Conveyance System, of which the structures and canals along eastern Tamiami Trail are a part, is currently operated under the IOP, as described in the May 2002 IOP FEIS.

Based on the most recent snail kite nesting data, the closest snail kite nest to the Tamiami Trail is located in WCA-3B over one mile north of the project. Therefore, FWS did not recommend that any specific precautions be implemented regarding further protection of the snail kite.

Radio-telemetry data for the Florida panther indicates that, between 1991 and 2000, no panthers ranged near Tamiami Trail. In 2001, a two-year old male (Florida panther #85) born in ENP came as close as one-half mile south of the highway. Because habitat disruption would be contained to the immediate vicinity of the highway, because the habitat is of degraded quality due to proximity to the road and the infestation of exotic species, and because construction activities would have no greater impact on the species than that of regular vehicular traffic on Tamiami Trail, FWS did not recommend the implementation of any special features.

The likelihood of the West Indian manatee occurring in the project vicinity is negligible. For over the last 20 years, FWC has reported a single record of a manatee in the L-29 Canal. During drought conditions, the manatee migrated through gates at Lake Okeechobee, various other structures and canals to eventually make its way into L-29 Canal where it died of cold-related stress during a cold weather event. The USACE has agreed to provide for manatee protection procedures in its construction contracts.

In the 2003 FWCAR, FWS recommended *Standard Construction Protection Measures for the Eastern Indigo Snake* in order to minimize or avoid any potential adverse impact to the species. The measures include development and implementation of an education plan for construction personnel, directions for relocation of the eastern indigo snake, and development and submittal of a monitoring report.

Because all action alternatives are located south of the L-29 Levee/Canal, FWS and FWC did not recommend that any Buffer Zone restrictions be applied to the Frog City Wading Bird Colony. The rookery is protected from highway construction noise by the approximately 20-foot high L-29 Levee, and the wading birds nesting at this colony have acclimated to continuous highway traffic and noise.

5.3.4 Hydraulics and Hydrology

Because the L-29 Canal is a conveyor and equalizer for water flows prior to passage into ENP, alternatives that would interfere with the ability of the canal to provide conveyance and equalization of flows should be avoided. This would include any significant reduction in its width or the placement of structures that would affect its capacity. The L-29 Canal is regulated under Section 10 of the Rivers and Harbors Act.

5.3.5 Section 4(f) Considerations

Section 4(f) of the Department of Transportation Act of 1966, which protects certain public lands and all historic sites, technically was repealed in 1983 when it was codified, without substantive change, as 49 U.S.C. 303. This regulation declares a national policy

of preservation of public park and recreation lands, wildlife and waterfowl refuges and historic sites and prohibits the U. S. Department of Transportation (DOT) from approving any program that uses such publicly owned lands of local significance unless: (1) there is no feasible and prudent alternative, and (2) such use includes all possible planning to minimize harm. Section 4(f) applies to all historic sites and to publicly owned public parks, recreation areas, and wildlife and waterfowl refuges of local significance. When a project "uses" 4(f) lands, a 4(f) evaluation is required. Potential 4(f) lands that could be affected by Tamiami Trail modifications include ENP, WCA-3B (Taylor Wildlife Management Area) and US 41. A Section 4(f) evaluation requires consideration of alternatives in light of the purpose and need for the project.

Projects requiring DOT approval or using DOT funds may trigger the applicability of 4(f). However, this is not a DOT project. This project is funded through the Department of Interior, and it does not involve approval by DOT. Therefore, this project is not subject to 4(f) regulations, and a 4(f) evaluation is not required. However, although the project is not subject to Section 4(f), it is the intent of the USACE to minimize any adverse effects on ENP or WCA-3B.

5.3.6 Transfer of Everglades National Park Property to the State of Florida

Expansion of the existing roadway onto ENP property or construction of a new roadway on ENP property presents constraints. At this time, granting of a perpetual easement to FDOT for construction, operation, and maintenance of the roadway in ENP, as part of the Tamiami Trail component of the MWD Project, is contemplated. At a later date, it may be advantageous for Park management efficiencies to seek a legislative boundary revision that would allow for divesting of all lands north of the highway's new southern right-of-way line. The northern boundary of the Park would then be coincident with the southern right-of-way boundary of the newly aligned US 41, as is presently the case.

Alternative actions that incorporate ENP property into the roadway should be avoided if possible. If it is not possible to avoid incorporating ENP property into the roadway, the amount of property should be minimized to the extent practicable.

5.3.7 Compatibility with Future CERP Actions

Modifications to Tamiami Trail should be compatible with the anticipated CERP features. Implementation of CERP may result in higher flows and higher stages of water than would be provided by MWD. Alternatives should maximize integration and connections of compartments and management areas through CERP decompartmentalization actions. Alternatives should enhance implementation of potential future CERP actions that may include removal of the L-29 Levee, filling of the L-29 Canal, or the removal or degradation of other structures that may be deemed to be impediments to hydrological or ecological connectivity or the restoration of sheetflow. Although alternatives should minimize any retrofit required for implementation of CERP objectives, the MWD project does not preclude any future modification, retrofit, or removal of any structure or facility associated with the modification of Tamiami Trail if such action is necessary to promote the hydrologic restoration of ENP and the South Florida ecosystem.

5.4 ALTERNATIVES

In the evolution of this project, four sets of alternative plans were developed and evaluated to modify the Tamiami Trail to accommodate the passage of MWD flows from the L-29 Canal to ENP. Initial plans for roadway protection were considered and rejected; 13 preliminary alternative plans were subsequently developed by an interdisciplinary team; eight alternatives were evaluated in the 2003 GRR/SEIS; and nine alternatives are considered in this RGRR/SEIS.

5.4.1 Initial Plans to Protect Tamiami Trail

In the early plan formulation process, armoring of Tamiami Trail with geotextile fabric and riprap was considered as a possible means of protecting the road once the increased flows were established. Major drawbacks included excessive costs, continued saturation of the highway subgrade, continued problems with highway surface deterioration, and continued susceptibility of the road to overtopping.

Installation of sheet pile walls was also considered. Major drawbacks of sheet piling included a high cost and an inability to provide sheetflow to the ENP. These two plans were not developed further.

5.4.2 Preliminary Array of Alternatives

In the late 1990s, a multidisciplinary team with expertise in hydraulics/hydrology, geotechnical engineering, planning procedures, and project management/project implementation developed a list of measures and alternatives with assistance from agency representatives and public scoping workshops. The information was used as an initial step in the planning process and as a basis for additional refinement of alternatives. Several measures, including new alignment of road, new alignment of single lanes of road, bridges, culverts, raise low sections of road, pipes under road, and clearing vegetation, were considered individually and in combinations to establish the alternatives. The 13 preliminary alternatives and their dispositions were:

- **No-Action.** The roadway would not be modified. Although this alternative would not meet the requirements or objectives of the project, it was retained for further evaluation to satisfy the requirements of NEPA.

- **New Tamiami Trail Alignment North of Existing Road.** Relocation of the roadway to the north of the L-29 Canal on the northern side of the L-29 Levee. The subgrade of the relocated roadway would be constructed at a higher elevation. *This alternative was retained for further evaluation in the 2003 GRR/SEIS.*

- **New Tamiami Trail Alignment South of Existing Road**. The roadway would be relocated south of the existing roadway with the subgrade constructed at a higher elevation. *This alternative was retained for further evaluation in the 2003 GRR/SEIS.*

- **Raising Low Portions of Tamiami Trail**. Increased volumes of water predicted under MWD/CERP/NSM lead to increased stages in the L-29 Canal

and the 9.7-foot design high water criterion for the road. This would require raising the road. The small total width of opening provided by the existing culverts also generates/requires additional head for the water to pass. This is in addition to the MWD/CERP/NSM stage predictions. Therefore, there would be a continued potential for subgrade inundation, and this alternative was not retained for further evaluation.

- **Incorporation of Bridge Spans on Current Tamiami Trail Alignment.** Bridges would be constructed along the existing roadway. *This alternative was retained for further evaluation in the 2003 GRR/SEIS.*

- **Placement of Underground Distribution Pipe South of Tamiami Trail**. This alternative was not retained for further evaluation because the discharge would not be distributed evenly to NESS. There was increased potential for disturbance to ENP lands during construction, encroachment on ENP land because of limited right-of-way, subgrade inundation, impacts to wood stork rookeries, and loss of wetland habitat.

- **Placement of Additional Culverts in Tamiami Trail.** This preliminary alternative was initially eliminated from further evaluation. *After further analysis, however, this alternative was retained for further evaluation the 2003 GRR/SEIS.*

- **Raising Entire 10.7-Mile Length of Tamiami Trail.** The highway would be elevated along the entire length of the project area. *This alternative was retained for further consideration in the 2003 GRR/SEIS.*

- **Clearing of Exotic Vegetation South of Tamiami Trail**. Vegetation to the south of existing culverts should be removed to improve water flow. In an August 13, 1999, letter from FDOT to the USACE, it was stated:

  > *"A visual inspection of each culvert on both sides of the roadway revealed that all of the culverts were between 50% and 100% full of water. No culverts were observed with obstructions from substantial sediment, debris, or vegetation build-up inside of, or immediately adjacent to, the pipe openings. A southern flow of water was observed at each location with rates varying from slow to rapid. Based on the consultant's observations, it appears that at present, the primary determining factor for flow rate through the culverts is the water level."*

  Because a build-up in vegetation or other debris was found not to be the primary determinant for flow rates through the culverts, the USACE concluded that additional conveyance capacity would be necessary to accommodate MWD flows.

  Further, ENP preferred not to allow removal of vegetation or land disturbance because temporary impacts to the ENP ecosystem could result from mobilization of machinery for vegetation removal and from possible water-borne transport of exotic seed sources.

This alternative was not retained for further evaluation.

- **Move Westbound Lane of Tamiami Trail to L-29 Levee.** The roadway would be reconstructed on top of the L-29 Levee. This alternative was not retained for further evaluation because of high cost, impacts to businesses south of the road, the fact that L-29 Levee is not designed for use as a roadway, incompatibility with the CERP alternative of removing the L-29 Levee, complications of placing a roadway on S-355 Structures, and impacts to the Tigertail Camp.

- **Combination of Bridge Spans and Raising Portions of Tamiami Trail.** Bridges would be constructed along the existing roadway, and portions of the roadway with the greatest likelihood for flooding would be raised. *This alternative was retained for further evaluation in the 2003 GRR/SEIS.*

- **Combination of Bridge Spans and Clearing of Exotic Vegetation South of Tamiami Trail.** This alternative entailed the removal of vegetation with a potential to interfere with water flow through culverts. This alternative was not retained for further consideration because of FDOT findings that vegetation does not impede flow, complications with rerouting of traffic around construction zones, and ENP preferences not to allow removal of vegetation or land disturbances.

- **Combination of Bridge Spans, Raising Portions of Tamiami Trail, Placement of Additional Culverts, and Clearing of Exotic Vegetation**. This alternative is similar to previous alternatives, except that it includes the installation of additional culverts under the road. It was not retained for further evaluation because of FDOT findings that vegetation does not impede flow, complications with rerouting of traffic around construction zones, and ENP preferences not to allow removal of vegetation or land disturbances.

5.4.3 2003 GRR/SEIS Alternative Actions

The Preliminary Array of Alternatives was screened by a multi-disciplinary study team of the USACE personnel. Six of the preliminary alternatives were retained for further evaluation in the 2003 GRR/SEIS in addition to the no-action alternative:

1. New Roadway to the North
2. New Roadway to the South
3. New Bridge Spans on Current Alignment
4. Additional Culverts
5. 10.7-Mile Bridge
6. New Bridge Spans and Raising Road Profile

Two additional alternatives were identified through public and interagency input:

1. Existing Alignment with Raised Profile, Four-Mile Bridge
2. Existing Alignment with Raised Profile, 3,000-Foot Bridge

The 1999 Central and Southern Florida Project, Comprehensive Review Study (also known as the "CERP Yellow Book") discussed the concept of providing 10 bridges across the Tamiami Trail as a way to decompartmenalize WCA-3B and NESS. This conceptual plan included ten 100-foot-long bridges that would be evenly spaced along the alignment as a means to distribute the flow evenly. The cost for these bridges, which are conceptual costs with little or no engineering design performed, was estimated to be $11.1 million. Initial estimates for a four-bridge plan, which were based on some engineering analysis, show that the cost would be approximately $14.4 million. In addition to the bridge construction costs, other factors that were evaluated by the planning design team included roadway costs, spatial distribution of the flow, and maintenance of traffic (MOT) during construction. The roadway costs and the spatial distribution of flow were very similar for both the four-bridge and 10-bridge plans, while the MOT for the 10-bridge plan was more complicated and, ultimately, more expensive. Based on this evaluation, the planning design team for the 2003 GRR/SEIS decided not to develop the 10-bridge plan. The four-bridge plan was subsequently incorporated into the 2003 GRR/SEIS.

Of the eight alternatives evaluated in the 2003 GRR/SEIS, seven were considered with and without the treatment of highway runoff ("water quality treatment"). The 10.7-mile bridge alternative was also evaluated with and without removal of the highway embankment. The fates of the alternatives, as evaluated in the Plan Formulation section of the 2003 GRR/SEIS, are summarized below:

- **No-Action.** The roadway would not be modified. Although this alternative would not meet the requirements or objectives of the project, it was retained for further evaluation to satisfy the requirements of NEPA.

- **Existing Alignment and Profile with Four New Bridges.** Not selected as the Recommended Plan because no provisions would be made for higher water levels, which would cause degradation of the structure of the highway. In addition, higher water levels could result in overtopping, adversely affecting public safety and interfering with hurricane evacuation.

- **Existing Roadway Alignment with Raised Profile and Four New Bridges without Water Quality Treatment.** Not selected as the Recommended Plan. When compared to the Recommended Plan, this alternative had less capacity to add features to provide sheetflow, less capability for avoiding impacts to businesses, less ecological connectivity, greater wetland losses, and a lower environmental performance score. This alternative was not determined to be a Cost Effective Alternative.

- **Existing Roadway Alignment with Raised Profile and Four New Bridges with Water Quality Treatment.** Not selected as the Recommended Plan because treatment of highway runoff was not required by FDEP plus the same disadvantages as the alternative "Existing Roadway Alignment with Raised Profile and Four New Bridges without Water Quality Treatment."

- **New Roadway to the North with Eight New Bridges without Water Quality Treatment.** Not selected as the Recommended Plan because of adverse impacts to the Tigertail Camp (including effects on access and privacy, exceedance of noise criteria, increased safety risks, and possible

environmental justice issues), adverse ecological impacts in WCA-3B (greater loss of wetland habitat units and acreage than most other alternatives), and adverse impacts on the Frog City wading bird colony. In addition, a new roadway embankment would be incompatible with CERP decompartmentalization.

- **New Roadway to the North with Eight New Bridges with Water Quality Treatment.** Not selected as the Recommended Plan because treatment of highway runoff was not required by FDEP plus the same disadvantages as the alternative "New Roadway to the North with Eight New Bridges without Water Quality Treatment."

- **New Roadway to the South with Four New Bridges without Water Quality Treatment.** Not selected as the Recommended Plan because of adverse impacts to the Osceola Camp (including effects on access and privacy, exceedance of noise criteria, loss of facilities and structures, increased safety risks, and possible environmental justice issues), losses in facilities by all businesses, encroachment into ENP and protection zones of endangered wood stork colonies, and greater losses in wetland acreage and functional units than other alternatives. In addition, a new roadway embankment would be incompatible with CERP decompartmentalization.

- **Build New Roadway to the South with Four New Bridges with Water Quality Treatment.** Not selected as the Recommended Plan because treatment of highway runoff was not required by FDEP.

- **10.7-Mile Elevated Roadway within Existing Right-of- Way without Water Quality Treatment.** Not selected as the Recommended Plan because costs exceeded funding identified in the DOI Capital Asset Plan. In addition, degradation of the highway embankment, which would be provided in another alternative, would provide better hydraulic and ecological connectivity.

- **10.7-Mile Elevated Roadway within Existing Right-of- Way, without Water Quality Treatment, with Degradation of the Existing Highway Embankment.** Not selected as the Recommended Plan because costs exceeded funding identified in the DOI Capital Asset Plan. However, elements of this plan were retained for further evaluation in the 2005 RGRR/SEIS.

- **10.7-Mile Elevated Roadway within Existing Right-of-Way with Water Quality Treatment.** Not selected as the Recommended Plan because costs exceeded funding identified in the DOI Capital Asset Plan. In addition, the treatment of highway runoff was not required. However, elements of this plan were retained for further evaluation in the 2005 RGRR/SEIS.

- **Existing Alignment with Raised Profile, Four-Mile Bridge without Water Quality Treatment.** Not selected as the Recommended Plan because costs exceeded funding identified in the DOI Capital Asset Plan. However,

elements of the Four-Mile Bridge plan were retained for further evaluation in the 2005 RGRR/SEIS.

- **Existing Alignment with Raised Profile, Four-Mile Bridge with Water Quality Treatment.** Not selected as the Recommended Plan because treatment of highway runoff was not required by FEDP. However, elements of this plan were retained for further evaluation in the 2005 RGRR/SEIS.

- **Existing Alignment with Raised Profile and 3,000-Foot Bridge without Water Quality Treatment.** Selected as the Recommended Plan in the GRR/SEIS. The 3,000-Foot Bridge was retained for further evaluation in the 2005 RGRR/SEIS.

- **Existing Alignment with Raised Profile and 3,000-Foot Bridge with Water Quality Treatment.** Not selected as the Recommended Plan because treatment of highway runoff was not required by FEDP. However, elements of the 3,000-Foot Bridge plan were retained for further evaluation in the 2005 RGRR/SEIS.

- **Existing Alignment with Raised Profile and Additional Culverts without Water Quality Treatment.** Not selected as the Recommended Plan. When compared to the "Existing Alignment with Raised Profile and 3,000-foot bridge without water quality" Plan, this alternative had less capacity to add features to provide sheetflow, less capability for avoiding impacts to businesses, and less ecological connectivity. This alternative had a similar environmental performance score to the Recommended Plan but at approximately double the costs.

- **Existing Alignment with Raised Profile and Additional Culverts with Water Quality Treatment.** Not selected as the Recommended Plan because of incompatibility with future CERP actions and treatment of highway runoff was not required by FDEP.

5.4.4 Final Array of Alternatives

The previous analyses and comparisons produced the following conclusions:

- There was a need to raise the profile of the road;
- Using the existing ROW and alignment is preferable to moving the road to a new location north or south of the existing highway;
- Culverts are more costly and provide limited benefit when compared to bridges; thus, bridges are preferable to culverts;
- Dry linear retention facilities for stormwater are not appropriate for this location because impacts to wetlands were deemed to exceed benefits to water quality.

Alternatives that did not comply with these findings were not carried forward to the final analysis. All subsequent alternatives incorporated these conclusions. Thus, the following alternatives are those considered and evaluated in this 2005 RGRR/SEIS.

Future without Project Condition (No-Action Alternative). The construction of bridges or other appurtenances to facilitate the passage of water from the L-29 Canal under the Tamiami Trail to NESS would not take place. The road would remain in its existing configuration. MWD flows would be conveyed from the L-29 Canal to ENP by the existing culvert system under the Tamiami Trail. Although this alternative fails to meet the planning goals, objectives, and requirements, its evaluation is required by Section 1502.14 of the Council on Environmental Quality regulations implementing NEPA.

Action Alternatives. Nine action alternatives were selected for detailed engineering evaluation and comparative analysis. All include bridge construction and reconstruction of the remaining highway, with differences being in the bridge lengths and locations.

The bridge typical section would satisfy current FDOT standards and be uniform throughout its entire length. The bridge would include two 12-foot-wide travel lanes, two 10-foot-wide shoulders, and safety barriers.

The lower limit of the bridge superstructure would be based on vertical clearance requirements for exposure and maintenance considerations. This elevation is expected to be 14.75 feet NGVD 1929, based on an 8.75-foot Control Water Elevation plus six feet (Appendix D). The Control Water Elevation for this project is defined as the average high water elevation based on the Natural System Model output for stages along Tamiami Trail. This stage was computed by taking each high water stage for each year in the period of record (35 years) from the NSM and then computing an average elevation of all of the highs. This stage would be 8.75 feet. Based on a percent exceedance curve of all of the data this stage would only be exceeded 12.5 percent of the time during the period of record. Or in other words 87.5 percent of the time the stage would be lower than this elevation.

The USACE is coordinating with FDEP in developing a pollution abatement system to collect and treat runoff from the bridges.

The existing Tamiami Trail roadway embankment would be removed from the area where the bridge would be constructed.

The remaining highway embankment would be reconstructed to raise the crown elevation to 12.3 feet, the minimum required based on the design high water of 9.7 feet and the roadway cross section geometry. To meet current FDOT standards for roadway geometry, the higher profile of the roadway would result in a wider roadbed than currently exists. Therefore, expansion of the highway footprint southward would be necessary to avoid impacting the L-29 Canal. The width of the expansion would vary based on the amount of raising a particular portion of road would need, with preliminary estimates ranging from 0 to 48 feet.

Bridge(s) would be offset from the existing highway centerline by approximately 50 feet to the south to enable the safe passage of vehicles along the highway during construction.

Access facilities, such as ramps to the bridge or elevated roadway, would be provided for existing business, facilities, and residential communities.

The maintenance of traffic and construction sequence for the bridge and roadway would be based on the best balance of traffic safety, environmental impacts, and construction cost and duration.

Staging areas for construction equipment and materials may be located at business sites along the corridor. Staging and other functions may also require use of the existing shoulder for temporary periods. Additional staging areas may be necessary near the eastern end of the corridor.

This project would generate a large quantity of material excavated from the road bed that could be disposed or recycled for use in other area projects. One disposal site, Rocky Glades, which is owned by SFWMD, is approximately 15 to 20 miles from the construction site. Selected quantities of soils and organic peat may be evaluated for placement in the nearby Broward Water Preserve Area. Asphaltic material could be used in other road beds. Excavated fill could be used for backfilling the levee for the L-67 Extension project, where up to 50,000 cubic yards of material could be needed. Storing and recycling material could reduce hauling and disposal costs, as well as provide cost savings on other projects where this type of material is needed. Additionally, FDOT may consider some of the excavated material to be "salvageable materials" that could be used by FDOT for other purposes.

Total construction cost, as used in this report, includes labor and materials for completing the structure(s), as well as preconstruction engineering and design and supervision/administration. Total investment is the total construction cost plus, real estate costs, and interest during construction. The annualized cost is based on the costs expected to be incurred over a 50-year period of analysis. Detailed descriptions and costs of the final array of alternatives presented in this section are excerpted from the engineering analyses of Appendix D. and the investment costs and annualization calculations of Section 5.7.1 and Appendix E

Alternative 9. 3,000-Foot Bridge. Alternative 9 is similar to Alternative 7 of the 2003 GRR/SEIS, but with a higher roadway centerline elevation and a roadway cross section that meets current FDOT standards.

Alternative 9 would involve creating an approximately 3,000-foot-wide hydraulic opening through Tamiami Trail by removing a 3,000-foot length of the highway and embankment (Figure 5). A bridge would be constructed over the opening to replace the removed section of road and maintain motor vehicle traffic across the opening. The bridge would be located between the Blue Shanty Canal and the Airboat Association of Florida site.

The construction cost for the 3,000-Foot Bridge is estimated to be $68,300,000. The total investment is estimated to be $85,779,764. The annualized cost for the 50-year period of analysis is estimated to be $4,755,734.

Alternative 10. Four-Mile Bridge (Central). While a four-mile bridge was considered in the 2003 GRR/SEIS, Alternative 10 sites the bridge in a different location.

Alternative 10 would involve creating a conveyance opening through Tamiami Trail by removing up to four miles of the existing highway and embankment. A bridge would be constructed over the opening to replace the removed section of road and maintain motor vehicle traffic across the opening. The bridge would start approximately one mile east of

the Osceola Camp and proceed east approximately four miles, ending west of (before) the Tigertail Camp (Figure 6).

Access would be provided to the Jefferson Pilot site, Everglades Safari Park, the SFWMD S-12 telemetry site, and the Airboat Association of Florida.

The construction cost for the Four-Mile Bridge (Central) is estimated to be $141,400,000. The total investment is estimated to be $175,685,557. The annualized cost for the 50-year period of analysis is estimated to be $9,448,248.

Alternative 11. Four-Mile Bridge (East). Similar to Alternative 10, Four-Mile Bridge (Central), Alternative 11 sites a bridge of up to four miles long, but in the eastern portion of the project area.

Alternative 11 (Figure 7) would remove up to four miles of the existing highway and embankment. A bridge would be constructed over the opening to replace the removed section of road and maintain motor vehicle traffic across the opening. The bridge would start approximately 200-300 feet west of S-334 and proceed west approximately four miles, ending between Coopertown and the Tigertail Camp.

Access roadways would be provided for Coopertown Airboats and the Radio One site.

The construction cost for the Four-Mile Bridge (East) is estimated to be $139,200,000. The total investment is estimated to be $172,979,773. The annualized cost for the 50-year period of analysis is estimated to be $9,297,162.

Alternative 12. Three-Mile Bridge. Alternative 12 sites a bridge of up to three miles in length in the western portion of the project area.

Alternative 12 (Figure 8) would create a conveyance opening through Tamiami Trail by removing up to three miles of the existing highway and embankment. A bridge would be constructed over the opening to replace the removed section of road and maintain motor vehicle traffic. The bridge would begin approximately 1,500 feet west of the Airboat Association of Florida and proceed west approximately three miles, ending approximately one-half mile east of (before) the Osceola Camp.

An access roadway would be provided for the Jefferson Pilot communications site, Everglades Safari Park, and the SFWMD S-12 telemetry site.

The total construction cost for the Three-Mile Bridge is estimated to be $119,500,000. The total investment is estimated to be $148,750,716. The annualized cost for the 50-year period of analysis is estimated to be $8,007,594.

Alternative 13. Two-Mile Bridge. Alternative 13 sites a bridge with a length of up to two miles in the western portion of the project area.

Alternative 13 (Figure 9) would create a conveyance opening through Tamiami Trail by removing up to two miles of the existing highway and embankment. A bridge would be constructed over the opening to replace the removed section of road and maintain motor vehicle traffic. The bridge would start approximately 1,300 feet west of the S-12

Telemetry Tower and proceed west approximately two miles, ending approximately one-half mile east of (before) the Osceola Camp.

Access roadways would be provided for Everglades Safari Park and the Jefferson Pilot communications site.

The total construction cost for the Two-Mile Bridge is estimated to be $99,300,000. The total investment is estimated to be $123,906,707. The annualized cost for the 50-year period of analysis is estimated to be $6,747,967.

Alternative 14. Two-Mile Bridge West and One-Mile Bridge East. As with Alternative 13, Alternative 14 sites a bridge of up to two miles long in the western portion of the project area; however, Alternative 14 also sites a bridge of up to one mile long in the eastern portion of the project area.

Alternative 14 (Figure 10) would create two conveyance openings through Tamiami Trail by removing up to three miles (cumulative) of the existing highway and embankment. One bridge would be constructed over each opening to replace the removed section of road and maintain motor vehicle traffic. The opening and bridge for the eastern bridge would start approximately one mile west of S-334 and proceed west approximately one mile, ending approximately 3,000 feet east of (before) Radio One. As with Alternative 13, the western bridge would start approximately 1,200 feet west of the S-12 Telemetry Tower and proceed west approximately two miles, ending approximately 2,640 feet east of (before) the Osceola Camp.

Access roadways from the western bridge would be provided for Everglades Safari Park and the Jefferson Pilot communications site; no access roadways are necessary for the eastern bridge.

The total construction cost for this alternative is estimated to be $127,900,000. The total investment is estimated to be $159,081,888. The annualized cost for the 50-year period of analysis is estimated to be $8,584,467.

Alternative 15. 1.3-Mile Bridge West and 0.7-Mile Bridge East. Alternative 15 sites a bridge with a length of up to 0.7 mile in the eastern portion of the project area and a bridge of up to 1.3 miles long in the western potion of the project area. The bridges are sited in similar locations to the bridges in Alternative 14.

Alternative 15 (Figure 11) would create two conveyance openings through Tamiami Trail by removing up to two miles (cumulative) of the existing highway and embankment. One bridge would be constructed over each opening to replace the removed section of road and maintain motor vehicle traffic across the opening. The opening for the eastern bridge would start approximately one mile west of S-334 and proceed west approximately 0.7 mile, ending approximately 4,500 feet east of (before) Radio One. The opening for the western bridge would begin approximately 1,300 feet west of Everglades Safari and proceed west approximately 1.3 miles, ending approximately 4,500 feet east of (before) the Osceola Camp.

An access roadway from the western bridge would be provided for the Jefferson Pilot communications site; no access roadways are necessary for the eastern bridge.

The total construction cost for this alternative is estimated to be $104,100,000. The total investment is estimated to be $129,810,234. The annualized cost for the 50-year period of analysis is estimated to be $7,077,608.

Alternative 16. Three 3,000-Foot Bridges. Alternative 16 sites three bridges, each with a length of up to 3,000 feet, in the eastern, central, and western portions of the project area.

Alternative 16 (Figure 12) would create three conveyance openings through Tamiami Trail by removing up to 9,000 feet (cumulative) of the existing highway and embankment. One bridge would be constructed over each opening to replace the removed section of road and maintain motor vehicle traffic across the opening. The opening for the eastern bridge would start approximately one mile west of S-334 and proceed west approximately 3,000 feet, ending approximately 6,000 feet east of (before) Radio One. The opening for the central bridge would start approximately 1,300 feet west of S-355A and proceed west approximately 3,000 feet, ending immediately east of (before) the Airboat Association of Florida. The opening and bridge for the western bridge would start approximately 2,000 feet west of the Jefferson Pilot Communication Site and proceed west approximately 3,000 feet, ending approximately 4,500 feet east of (before) the Osceola Camp.

No access roadways are necessary for any of the bridges.

The total construction cost for this alternative is estimated to be $101,800,000. The total investment is estimated to be $126,981,461. The annualized cost for the 50-year period of analysis is estimated to be $6,947,863.

Alternative 17. 10.7-Mile Bridge. Similar to Alternative 5 in the 2003 report, Alternative 17 would involve creating an approximately 10.7-mile-wide hydraulic opening through Tamiami Trail by removing a 10.7-mile length of the highway and embankment (Figure 13). A bridge would be constructed over the opening to replace the removed section of road and maintain motor vehicle traffic across the opening. The opening and bridge would start approximately 200-300 feet east of S-333 and proceed east approximately 10.7 miles, ending approximately 200-300 feet west of S-334.

Access facilities, such as ramps to the bridge or elevated roadways, would be provided for existing business and residential communities.

The total construction cost for the 10.7-Mile Bridge is estimated to be $278,000,000. The total investment is estimated to be $343,690,089. The annualized cost for the 50-year period of analysis is estimated to be $18,189,615.

Table 6 follows the development of alternative plans from those presented in the Preliminary Array of Alternatives through the 2003 GRR/SEIS to those evaluated in this 2005 RGRR/SEIS.

Table 6. Progression in the Development of Alternatives for Tamiami Trail Modifications

Preliminary Array of Alternatives (Section 5.4.2)	
Alternative	**Disposition**
New Alignment North of Road	Retained in 2003 GRR/SEIS
New Alignment South of Road	Retained in 2003 GRR/SEIS
Raise Low Portions of Road	Rejected: Continued highway degradation
New Bridge Spans on Current Alignment	Retained in 2003 GRR/SEIS
Underground Distribution Pipes	Rejected: Uneven distribution of water
Additional Culverts	Retained in 2003 GRR/SEIS
10.7-Mile Bridge	Retained in 2003 GRR/SEIS
Clearing of Exotic Vegetation	Rejected: Would not enable MWD flows
Combination-Bridge Spans and Raising Low Portions of Road	Retained in 2003 GRR/SEIS
Combination-Bridge Spans and Clearing Exotic Vegetation	Rejected: Vegetation clearing would not enable MWD flows
Combination-Bridge Spans, Raising Low Portions, Additional Culverts, Clearing Exotic Vegetation	Rejected: Vegetation clearing would not enable MWD flows

2003 GRR/SEIS (Section 5.4.3)	
Alternative	**Disposition**
Existing Alignment & Profile, Four New Bridges	Rejected: Higher waster levels would damage highway
Existing Alignment, Raised Profile, Four New Bridges	Rejected: Fewer benefits and more detriments than Recommended Plan
New Roadway to North; Eight New Bridges	Rejected: Adverse socioeconomic & environmental impacts
New Roadway to South; Four New Bridges	Rejected: Adverse socioeconomic & environmental impacts
10.7-Mile Elevated Roadway	Retained: RGRR/SEIS Alt 12
Existing Alignment; Raised Profile; 3000-Foot Bridge	Retained: RGRR/SEIS Alt 9
Existing Alignment; Raised Profile; Four-Mile Bridge	Retained: RGRR/SEIS Alts 10 & 11
Existing Alignment; Raised Profile; Additional Culverts	Rejected: Fewer benefits & higher cost than 3,000-Foot Bridge

2005 RGRR/SEIS	
Alternative	**Disposition**
Alt 9. 3-000-Foot Bridge	Considered, but not selected
Alt 10. Four-Mile West-Central Bridge	Considered, but not selected
Alt 11. Four-Mile Bridge East	Considered, but not selected
Alt 13. 2-Mile Bridge	Considered, but not selected
Alt 14. 2-Mile West & 1-Mile East Bridges	Recommended Plan
Alt 15. 1,3-Mile West & 0.7-Mile East Bridges	Considered, but not selected
Alt 16. Three 3,000-Foot Bridges	Considered, but not selected
Alt 17. 10.7-Mile Bridge	Considered, but not selected

Sources: USACE and G.E.C., Inc.

5.5 ENHANCEMENTS/BETTERMENTS

Items that are in addition to the project features are considered "enhancements" or "betterments."

5.5.1 Wildlife Crossing Options

Wildlife crossings would enhance ecological connectivity among animal populations and reduce mortality to wildlife crossing the highway. The FHWA has provided policy and guidance on addressing the issue of wildlife mortality (*FHWA Final Guidance, Transportation Enhancement Activities, 23 U.S.C. and TEA-21*). This program is not limited to threatened and endangered species, but includes any wildlife mortality directly caused by vehicles. States are charged to recognize and develop a statement of purpose and need for such projects. The criteria used to determine a need for a wildlife crossing or control project in a specific location are determined based on migration patterns, habitat use and distribution, and crossing characteristics of the wildlife through data collection on safety of motorists, habitat fragmentation, and wildlife mortality.

In the 2003 FWCAR, features recommended to reduce wildlife mortality along U.S. 41 included the construction of wildlife barriers to reduce wildlife mortality on the highway and/or the incorporation of wildlife crossings for improving connectivity across the highway and the L-29 Canal. While reducing wildlife mortality is part of the performance evaluation for the alternatives, wildlife crossings are not part of the project purpose and cannot be features of the Recommended Plan; however, features that would improve wildlife survival could be added as enhancements to the project and funded separately.

5.5.2 Airboat Crossing Options

Three businesses on the south side of Tamiami Trail offer short excursions into ENP, and airboat drivers act as tour guides, providing information about the Everglades. Members of the Airboat Association of Florida engage in recreational airboating. No airboat passages are present between the north and south sides of Tamiami Trail in the project area. Airboating interests have requested that the project include bridging at a height that would allow commercial and recreational airboaters to access both sides of the Tamiami Trail. An airboat passage feature is not part of the project purpose and was therefore not evaluated. Airboat crossings could be added as betterments to the project and funded separately.

5.6 ENVIRONMENTAL EFFECTS OF ALTERNATIVES

5.6.1 Geology and Soils

Although various alternatives involve the movement of soils, driving of piles, or making shallow excavations into the limestone bedrock, none of the alternatives is anticipated to affect either the geological conditions or the soils along the Tamiami Trail. No prime or unique farmlands occur in the project impact area.

5.6.2 Water Management

No-Action Alternative. Under the no-action alternative, occasional constraints on water management operations may be necessary. Because overtopping of the highway during

high water events may potentially affect public safety, it may occasionally be necessary to restrict water levels in the L-29 Canal to prevent flooding of the highway. Such restrictions would not meet the purpose of the MWD project.

Action Alternatives. One of the objectives of a bridge opening is to minimize the head differential between the L-29 Canal and the downstream marsh. Under the MWD project, water would be delivered to the L-29 Canal from WCA-3A, WCA-3B, and the L-31N Canal through five separate structures. The L-29 Canal receives this water and acts as a stage equalizer upstream of the highway embankment. The stage in the L-29 Canal under the MWD project is dictated by water flowing through the bridge openings. The shorter the bridge, the larger is the stage differential because a similar flow must pass through a smaller opening. Figure 14 shows that as the bridge length gets shorter, this stage difference gets larger. This analysis is based on a RMA-2 analysis that kept all parameters (flows, stages, n-values, etc.) constant between runs except the size and location of the bridge. See Appendix D for additional information.

The breach in the existing embankment associated with Alternative 9, which would provide 3,000 linear feet of hydraulic connectivity, is the smallest of the alternatives evaluated. Alternatives 10 and 11 would provide up to four miles of hydraulic passage. Alternatives 12 and 14 would provide three miles of hydraulic passage, and alternatives 13 and 15 would provide two miles. The three bridges of Alternative 16 would provide 9,000 feet. Alternative 17 would permit the entire removal of the highway embankment, providing for approximately 10.7 miles of hydraulic passage. The existing culvert system, which extends along the length of the Tamiami Trail in the project area, currently provides a general equalization of flows to ENP. Although all the bridges would be capable of conveying the required amount of water, the existing culvert system would remain in place

The L-29 Canal and its ability to provide conveyance and equalization of flows into ENP would not be adversely affected by any of the action alternatives. No structures would be placed in the canal, and none of the action alternatives call for a decrease in channel dimensions.

Alternative 17, 10.7-Mile Bridge, offers the greatest potential to reduce high flow velocity discharges associated with structures in the Tamiami Trail and to minimize the difference between the average velocity at the road and that in the marsh. Alternative 9, 3,000-Foot Bridge, would provide the least potential, whereas the remaining alternatives would enable reductions in high flow velocities and reduce differences of average velocities in general proportion to their lengths.

There is an expectation to preserve, protect, and restore the entire area of NESS acquired through the ENP Expansion and Protection Act. The single bridge alternatives, except for Alternative 17, 10.7-Mile Bridge, do not provide flows to both the eastern and western halves of the project area. The multiple bridge alternatives would provide more balanced flows.

Depth and duration of water levels in WCA-3B are dependent on stage differentials, with larger bridge openings reducing the potential for prolonged inundation and alternation of plant communities in WCA-3B.

5.6.3 Water Quality

The project involves modification to an existing roadway (Tamiami Trail) and the associated surface water management system. Stormwater or surface water management is regulated by the State of Florida under part IV of Chapter 373 of the Florida Statutes. The State's stormwater regulations require that runoff from impervious surface areas be discharged through retention areas, detention devices, filtering and cleaning devices, or subject to some other type of Best Management Practices, prior to discharge from the site.

For the proposed project, the FDEP has determined that stormwater treatment is required to provide a level of treatment commensurate with what is provided by the existing conditions. The proposed bridge(s) would increase the total impervious surface area (within the bridge footprint), but would have no practicable means of providing grassed shoulders or traditional swales for treatment of stormwater. The area directly adjacent to the existing roadway has some limited water quality treatment described below, and that limited treatment would be lost within the bridge footprint. Therefore, implementation of Best Management Practices (BMPs) to collect and trap sediments and floatables (oil and grease) from polluted stormwater runoff (treatment of first flush) from the proposed bridge(s), regardless of length, is necessary prior to discharge. That portion of the improved roadway which does not add additional impervious surface areas will only be required to provide grassed shoulders similar to the existing design (Figure 15). The overall project design (bridge section(s) and the road improvements) will slightly reduce the impervious surface area versus existing conditions.

The following factors were considered in determining the level of treatment required for the bridge and improved road way sections.

- The runoff from the road and bridge will flow into ENP, an Outstanding Florida Water (OFW).

- Only minimal treatment is provided by the existing roadway design. Under existing conditions, stormwater runoff from the road flows from the paved areas and over a grassed sideslope before entering the L-29 Canal. There are no formal swales or stormwater detention areas. Discharge to the park is facilitated by culverts underneath the Tamiami Trail which direct surface waters within the L-29 Canal southward to ENP. Some incidental treatment of the stormwater runoff takes place due to the grassed sideslope and in the canal prior to discharging southward into the Park via the overflow culverts.

- The road is located between L-29 Borrow Canal, a Class III Surface Water on the North side, and ENP, an OFW, on the South side. The location and proximity of environmentally sensitive lands make the use of standard treatment systems such as swales and detention ponds both cost-prohibitive (due to the haul distance) and unfeasible (due to location). The December 2003 GRR/SEIS for Tamiami Trail considered implementing traditional treatment areas as part of the proposed project, but these stormwater treatment areas were not included in the Recommended Plan because wetland impacts and costs far exceeded the water quality benefits.

- The raised road will provide slightly better treatment than the existing road. Specifically, the new road will have a grassed section between the roadway pavement and the asphalt strip underlying the guardrail. The asphalt strip will retain some water in the grassed strip providing limited treatment by infiltration and prevent the growth of vegetation.

- The raised roadway will involve less impervious pavement than the existing design. The rebuilt roadway shoulders will be constructed to FDOT standard, which is a 10-foot shoulder on either side of the road. For the 10-feet shoulders on the rebuilt roadway, five feet will be paved and five feet will be unpaved. The current project roadway (10.7 miles between the S-333 and the S-334) has eight foot and 10-foot paved shoulders, south and north of the Trail, respectively.

- Any of the bridge options will have a fully paved 10-foot shoulder on either side of the traffic lanes for the bridge shoulders. The current impervious surface on the shoulders for the existing project roadway is approximately 1.017 million square feet (56496 x (8' + 10") or approximately 23.34 acres. A 10.7 mile raised/bridged road way would have approximately 25.94 acres for the shoulders impervious surface. That would be a net increase of approx 2.6 acres above the existing roadways impervious surface for the shoulders (an additional two foot of shoulder for 10.7 miles). There would be a complete loss of the limited water quality treatment beneath the bridge due to the loss of the grassed/vegetated side slopes.

- The existing road and the raised road and bridge(s) will have the same number of travel lanes. However, the use of Tamiami Trail (vehicle trips) is expected to increase with time, which may cause increased pollutant loading.

- Bridge safety is the paramount responsibility and cannot be compromised; therefore a positive discharge such as scuppers in the bridge deck or bridge sidewalls or both is desirable over more complex systems which could require frequent maintenance.

- Cost associated with water quality features, if excessive, could result in a meaningfully shorter bridge thereby diminishing the benefits to ENP and increasing the impacts to WCA-3B due to the higher stages in WCA-3B associated with shorter bridge lengths.

Maximizing stormwater treatment while minimizing wetland impact can best be achieved by implementing BMPs such as providing for means for collecting or trapping sediments and floatables (oil and grease) prior to discharge. There are a number of BMP sediment removal technologies on the market that target removal of sediments and gross pollutants from stormwater runoff. CSR Stormceptor® is an inline stormwater separator, considered in this evaluation that removes sediments and hydrocarbons from stormwater runoff. The Stormceptor® consists of two chambers; a bypass chamber and a treatment chamber. Normal flow is directed to the treatment chamber via a weir/orifice flow control structure, where it is treated and then discharged through an outlet pipe based upon the head difference between the inlet weir and the outlet pipe. Oil and other pollutants with specific gravity less than water will rise to the surface of the treatment chamber while heavier particulate will settle to the bottom of the treatment unit.

Absorbent pads can be easily incorporated into some of these treatment systems to collect oil and grease. The Stormceptor® unit however, does not require absorbent pads to collect oil and grease. During high flow the runoff will bypass the treatment unit. A Stormceptor® System can remove approximately 80 percent of the total suspended solids, and 95 percent of the oil and grease from the treatment volume. There are also other sediment trap types of stormwater systems on the market that provide similar performance.

A preliminary surface water management system design was developed for the four - mile bridge section to provide a planning level cost estimate. That system had a cost of approximately $15 million. The high cost of the surface water management system was associated mainly with the stormwater collection system as well as structural bridge and foundation modifications necessary to accommodate the collection system and not the actual cost of the Stormceptor® treatment units. The preliminary design efforts helped facilitate getting the stormwater design requirements better identified, so that we can have a final design that would be cost effective and acceptable to all parties (FDOT, FDEP, USACE and ENP).

The initial design ensured that the first flush was treated and not overloaded (significant bypass) except by events exceeding 2.8 inches of rainfall per hour on the bridge conveyed to the Stormceptor® treatment units that were spaced 0.5 miles apart. A very large and heavy (particularly when water filled) piping collection system was required to accommodate the conveyance requirements during a significant rainfall. Significant and costly structural and foundation changes were required to provide sloping of the bride and structural support to accommodate the Stormceptor® conveyance system (piping system's size and weight).

The estimated surface water management system cost is as follows: approximately nine million for the piping collection system and Stormceptor treatment units and an additional approximate six million for structural and foundation modifications necessary to accommodate the piping collection system. This design exercise determined this particular design approach to be cost prohibitive, as it would have greatly diminished the funding available to build a larger bridge span.

Further optimization of the Stormceptor® system design will be developed in the detailed design phase. As part of optimization and design, USACE will evaluate the concept of increasing the number of treatment units, minimizing or eliminating the piping collection system and eliminating/reducing any structural/foundation upgrades to the bridge sections, and possibly providing for additional overflow discharge during storm events. This concept would be consistent with the requirements providing treatment to the maximum extent practical within all the project constraints (cost, real estate, design constraints etc), while still ensuring traffic safety by clearing water from the travel lanes. More details on this concept are listed below.

Based on consideration of these facts, the USACE is investigating treatment system consisting of the following. It should be realized that other options will be considered as well, and no final design has been chosen at this point in time. Any design will be fully coordinated with the FDOT and the FDEP to ensure compliance with the requirements of those agencies.

- Crown to Edge of Bridge slope of 2 percent (minimum cross section allowed by FDOT).
- Slope towards water quality inlets 0.2 percent with the inlets places on center-to-center distances of 600 feet. This result in the water quality inlets being located 0.9 feet below the highest, edge of bridge, deck elevations located in the mid points (300 feet from the inlets). The use of 0.2 percent instead of 0.3 percent longitudinal slope is expected to provide sufficient bridge deck drainage. If 0.3 percent is used, crest and sag vertical curves are required. At the crest, the curve will include largely flat lengths that result in slower drainage than the case of 0.2 percent grade without vertical curves.
- It is proposed that scuttles located in the side walls of the bridge inch be above the deck to provide a positive outfall independent of the water quality inlet.
- It is proposed that placement of scupper be one foot from the edge of the driving lane to provide a positive outfall independent of the water quality inlet.
- It is proposed that the water quality inlet would discharge down through a pipe into a sediment trap system. The sediment trap would be located directly under the water quality inlet. The flow from the south side of the road would be routed to sediment trap system either on the ground or hung from the bridge.

This conceptual design eliminates the need for an expensive change in bridge section and underdeck piping. Other designs may be considered, but on-site treatment of bridge runoff (such as the concept described above) is the preferred approach. The WQ treatment design for bridge runoff will be completed during the preconstruction engineering and design (PED) phase that will follow the authorization and funding of the Tamiami Trail Project.

This design approach is only a concept being discussed, and no final design has been decided on at this point in time. Coordination with FDEP will occur during PED to ensure that the final stormwater system design is consistent with FDEP requirements. The final design will meet the mandatory requirements of the FDOT and SFMWD for safety/ accepted practices and water quality treatment requirements.

5.6.4 Hazardous, Toxic and Radioactive Waste

Contaminants could be disturbed or released by increasing the water level and hydroperiod or by removing unnatural structures from the landscape. Experience has shown that the highly permeable ground substrate in the project area results in rapid flushing and dilution of residual contaminants.

A preliminary assessment indicated that no HTRW or other harmful substances are known to have impacted the project area. Contractual documents for construction of the project will include a requirement that the contractor be watchful for potential contaminants. If contaminants are found during project construction, a safety zone would be established around the contaminated site, and the site must be remediated before construction could resume.

5.6.5 Environmental Resources

5.6.5.1 Everglades National Park

No-Action Alternative. Under the No-Action Alternative, the existing Tamiami Trail configuration, although capable of passing the required flows, is subject to saturation of the road base, thereby weakening the roadway, and to overtopping. During periods of high water, desired flows to ENP could potentially be reduced to prevent flooding of the highway and protect public safety.

Action Alternatives. All alternatives would promote the hydrologic restoration of ENP by providing additional passage of MWD flows and enhancing the hydroperiod. All action alternatives meet the DHW performance requirements.

5.6.5.2 Shark River Slough (SRS) East and West Basins

No-Action Alternative. Under the No-Action Alternative, impacts to the SRS would be similar to those described above for ENP.

Action Alternatives. All alternatives would convey the desired MWD flows to SRS. Important especially during dry years, the restoration of hydrology in SRS would reduce the risk of ridge and tree island peat burning. Alternative 17, 10.7-Mile Bridge, would distribute the flows over 55,366 feet into NESS and is the standard to which the remaining alternatives are compared for hydrologic and ecological restoration. Alternatives with longer bridges provide better hydrologic distributions of flows, whereas alternatives that are located in the central to western portion of the study area generally provide greater potential for the restoration of ridge and slough habitats.

5.6.5.3 Water Conservation Area 3B

No-Action Alternative. Under the No-Action Alternative, there would be no alteration to the existing conditions of WCA-3B.

Action Alternatives. Under the MWD project, water would be delivered to the L-29 Canal from WCA-3B through five separate structures. The L-29 Canal would receive this water and act as a stage equalizer upstream of the highway embankment. The stage in the L-29 Canal under the MWD project would be dictated by water flowing through the bridge openings. The shorter the bridge, the larger the stage differential because a similar flow must pass through a smaller opening.

This impact would be carried over to WCA-3B and result in higher stages and longer durations in WCA-3B than NSM predicts. Larger bridge openings would provide a less impeded flow and reduce the potential for prolonged inundation and the subsequent alteration of plant communities in WCA-3B.

5.6.5.4 Biological Communities

No-Action Alternative. Under the No-Action Alternative, biological communities near the project are expected to be generally unaffected. A potential effect would occur if increased head height in the L-29 Canal resulting from increased flows were to overtop the road. Under these conditions, flows may be reduced to lower head height in the

canal, thereby limiting restoration of more natural hydrologic conditions to ENP. Flow restrictions would create barriers to the free movement of organisms, particularly those with limited mobility, such as aquatic organisms (fishes, invertebrates, etc.), and ecological connectivity between the L-29 Canal and ENP would remain limited.

Action Alternatives.

Ecological Connectivity. All action alternatives would increase ecological connectivity. Hydraulic openings range from the 3,000 feet provided by Alternative 9 to over 50,000 feet provided by Alternative 17, 10.7-Mile Bridge.

Most of the Combined Structural and Operational Plan for Modified Water Deliveries Project and C-111 Canal Project (CSOP) alternatives, propose construction of three new weirs in the L-29 levee. Two weirs would be placed in the western half of the Tamiami Trail project area, and one weir would be placed in the eastern half. These weirs were proposed independently of the development of the alternatives developed for modifying the Tamiami Trail. It would be more effective and increase ecological connectivity between WCA-3B and NESS if the bridge openings in Tamiami Trail closely aligned with the openings in the L-29 canal.

Providing an eastern bridge would provide better ecological connectivity with south-eastern WCA-3B when the proposed eastern conveyance through the L-29 Levee is constructed and additional connectivity as CERP (Decompartmentalization) removes of the L-29 Levee (or increase the conveyance and connectivity by the installation of additional conveyance). Specifically, Alternative 17, 10.7-Mile Bridge and the two-bridge alternatives would provide both eastern and western ecological connectivity from WCA-3B to NESS when or if the L-29 Levee is degraded. The only connections between the L-29 Canal and ENP provided by provided by single-bridge alternatives would be restricted to the locations of their hydraulic openings (either eastern or western sites) and the system of culverts.

Animals. Through the restoration of hydrology and minimization of exotic species invasion, Alternative 17 demonstrates the largest capacity to restore fish communities. The success of the remaining alternatives was directly related to the sizes of the bridge spans.

Evaluation of the ability for alternatives to enhance of wading bird foraging and nesting was based on the potential for restoring hydropatterns in NESRS to increase abundance and availability of forage fish on which wading birds depend for nesting success. Natural hydropatterns increase fish abundance and availability to wading birds during the crucial nesting period. Bridge alternatives on the east side of NESRS have reduced potential benefits for foraging wading birds because of limited microtopography leaving forage fish stranded over a shortened time period. Water delivered to western side is more beneficial to birds because water flows to the east side will dry out quicker due to degraded (shallower) sloughs and greater seepage. Deeper sloughs are preferred over shallower sloughs; during the dry season the deeper sloughs are more likely to have continuous flows, and during the wet season have overland flows. Bridges immediately adjacent to existing bird rookeries are less beneficial than bridge locations that include a buffer distance.

Bridges that ranked highest with respect to animal communities were Alternative 17, 10.7-Mile Bridge, Alternative 10, Four-Mile Bridge (Central); Alternative 11, Four-Mile Bridge (East); Alternative 12, Three-Mile Bridge; and Alternative 14, Two-Mile Bridge West and One-Mile Bridge East.

There are no specific provisions to reduce wildlife mortality, although the bridge spans of the various alternatives would provide some reduction in mortality of wildlife crossing the Tamiami Trail. Alternative 17, 10.7-Mile Bridge, would elevate traffic for the extent of the project area and virtually eliminate wildlife mortality along this length of Tamiami Trail. Alternative 9, 3,000-Foot Bridge, provides the lowest potential to reduce wildlife mortality along the project corridor. In a 2004 wildlife mortality survey, USFWS determined that the highest percent of mortality in the project area (47 percent of deaths) was found at Transect 3 where the eastern bridge would be placed for Alternatives 11 and 14.

5.6.5.5 Wetlands

No-Action Alternative. Under the No-Action Alternative, wetlands would not be adversely affected through modifications to Tamiami Trail. However, wetland communities in WCA-3A and WCA-3B, as well as ENP, would further degrade due to reduced flow from WCA to ENP. Additionally, the No-Action Alternative precludes the removal of existing highway embankment or exotic vegetation that diminishes the quality of the wetland habitat.

Action Alternatives.

Direct Effects of Project. The crown elevation of the roadway would be raised to 12.3 feet NGVD, requiring additional width of the embankment on the southern edge of the road to stabilize side slopes. In meeting current FDOT standards for roadway geometry, the higher profile of the roadway will result in a wider roadbed than currently exists. The action alternatives would require expansion of the highway footprint southward due to necessary avoidance of the L-29 Canal. The width of the expansion is estimated to vary from 0 to 48 feet, depending on the height of the road and the amount of elevation a particular portion of the road needs.

Wetland losses would also result from constructing the bridge approaches, which would transition from the roadway approximately 47 feet to the south over a distance of approximately 1700 feet. In addition, shading by the bridge is anticipated to convert wetland habitat to open-water habitat.

Removal of the existing embankment under the bridges associated with each alternative offers the opportunity to restore wetland habitat that had previously been impacted by fill. Table 7 summarizes the anticipated impacts to wetlands. All action alternatives would promote the hydrological restoration of over 60,000 acres of Everglades wetlands within ENP.

Ridge and Slough Landscape. The ridge and slough landscape of NESS originally consisted of a system of dense sawgrass ridges interspersed with adjacent and relatively open sloughs. These parallel ridges and sloughs existed in an organized pattern, oriented parallel to the flow direction. Although the mechanisms of ridge and slough landscape degradation are not fully understood, it is likely that barriers to flow, including levees and canals, contributed to the loss of the ridges and sloughs. Over the

past 40 years of hydrologic isolation from the ecosystem to the north, the landscape has largely become a drier, more topographically uniform community of mixed sawgrass. The remnant sloughs on the eastern side of the project area are more degraded and therefore would be more difficult to restore. There is also a greater number of remnant sloughs on the western side, and there is historic information that pre-development flows through them were proportionately greater than would be indicated by their combined cross-section.

Table 7. Impacts to Wetlands

Alternatives	Wetland Gain (Loss) (ac)		Wetland (Loss) from Raising Road Elevation[1] (ac)	Wetland (Loss) from Constructing Approaches (ac)	Net Wetland Gain (Loss) from Project (ac)
	Area Under Bridge	Area of Roadway Removed			
Alt 9. 3,000-Foot Bridge	(3.2)	5.2	(16.0)	(4.9)	(18.9)
Alt 10. 4-Mile Bridge (Central)	(22.8)	36.4	(10.6)	(4.9)	(1.9)
Alt 11. 4-Mile Bridge (East)	(22.8)	36.4	(10.6)	(4.9)	(1.9)
Alt 12. 3-Mile Bridge	(17.1)	27.3	(12.1)	(4.9)	(6.9)
Alt 13. 2-Mile Bridge	(11.4)	18.2	(13.7)	(4.9)	(11.8)
Alt 14. 2-Mile Bridge & 1-mile Bridge	(17.1)	27.3	(12.1)	(9.8)	(11.8)
Alt 15. 1.3-Mile Bridge & 0.7-Mile Bridge	(11.4)	18.2	(13.7)	(9.8)	(16.7)
Alt 16. Three 3,000-Foot Bridges	(9.7)	15.5	(14.2)	(14.7)	(23.1)
Alt 17. 10.7-Mile Bridge	(57.1)	90.9	0.0	(4.9)	28.9

Note: [1]Based on the typical section provided in the Engineering Appendix.

Sources: USACE and G.E.C., Inc.

Alternatives that are focused on flowing water through the west side are generally considered more desirable. Direct flooding of sloughs immediately downstream of a bridge is considered most beneficial because lateral flooding of adjacent sloughs will become truncated as seasonal flows diminish and interspersed ridges isolate southward flows.

Alternative 17, 10.7-Mile Bridge, offers the greatest potential for restoration of sloughs because it directly floods all the remnant sloughs. Alternative 9, 3,000-Foot Bridge, is minimally better than culverts, in that it would flood only one slough. Of the remaining alternatives, Alternative 10, Four-Mile Bridge (Central); Alternative 12, Three-Mile Bridge; and Alternative 14, Two-Mile Bridge West and One-Mile Bridge East, ranked highest.

Exotic Vegetation. Exotic vegetation present along the south side of Tamiami Trail has diminished the quality of wetland habitat in the project area. The dominant exotic species of vegetation, Brazilian pepper (*Schinus terebenthifolius*), which exists in a 10-30-foot-wide corridor along the highway. The construction of modifications to Tamiami Trail presents the opportunity to remove existing exotic vegetation, thereby improving the quality of wetlands in the project area.

All action alternatives present the opportunity to reduce opportunities for exotic woody plant species by maintaining enough inundation to prevent seed germination and by removing the highway embankment in the location where bridges would be built. Alternative 10, Four-Mile Bridge (Central), and Alternative 17, 10.7-Mile Bridge, would provide the highest potential to shift to open water, spikerush marsh and slough communities in ENP through enhancing flows from L-29 Canal to ENP and reversing the filling in of deep sloughs. Alternative 10, Four-Mile Bridge (Central) is projected to restore two sloughs while Alternative 11, Four-Mile Bridge (East) will restore one slough. Alternative 12 would restore two sloughs. Alternative 14, Two-Mile Bridge (West) and One-Mile Bridge (East), would restore three sloughs.

5.6.5.6 Protected Species

No-Action Alternative. Protected species near the project area and ENP are expected to be generally unaffected under the without project conditions.

Action Alternatives*.* The FWCAR references six threatened or endangered species in the project area: Cape Sable seaside sparrow (CSSS), eastern indigo snake, Florida panther, snail kite, West Indian manatee, and wood stork. FWS and FWC also identified the Frog City wading bird colony as potentially requiring protective measures during construction.

The CSSS, a Federally-listed endangered species, is currently being protected under the Interim Operational Plan as described in the May 2002 IOP FEIS. As part of the FWS 1999 Biological Opinion on the project, RPAs were developed to “preclude jeopardy” to the CSSS. By March 2002, 60 percent of all regulatory water releases crossing Tamiami Trail were required to occur east of the L-67 Extension. However, when water levels in eastern ENP as measured at G-3273 exceed 6.8 feet, discharges to ENP east of the L-67 Extension are not permitted. When the 6.8-foot stage is reached, all regulatory and stormwater releases occur in the west basin through the S-12 structures. The action alternatives will be capable of passing sufficient flow through their respective hydraulic openings that would satisfy the RPAs of the 1999 Biological Opinion for the CSSS.

The FWCAR requested the implementation of *Standard Protection Measures for the Eastern Indigo Snake* during construction. With the implementation of these standards, none of the action alternatives is likely to adversely affect the eastern indigo snake.

The FWCAR mentions the Florida panther near the project area. A two-year old, male Florida panther was discovered through radio-telemetry data to have ranged as close to one-half mile south of Tamiami Trail in 2001. The USFWS has determined that formal consultation under Section 7 of the Endangered Species Act will be necessary to assess the effects of habitat loss on the Florida panther. Under the recent panther consultation protocols, any loss of habitat greater than five acres in the primary habitat zone must undergo formal consultation.

Based on the most recent snail kite nesting data, the closest snail kite nest to the Tamiami Trail is located in WCA-3B, over one mile north of the project. Therefore, FWS does not recommend any specific precautions be implemented regarding further protection of the snail kite. Implementation of the project is not likely to adversely affect the snail kite.

It is highly unlikely that the West Indian manatee occurs in the project area. Because no work will be performed in the L-29 Canal, no adverse effects on the manatee are anticipated. The USACE has agreed to provide for manatee protection procedures in its construction contracts.

Two wood stork rookeries are located just to the south of the Tamiami Trail within the project area. All action alternatives would involve either bridge or highway construction within the wood stork rookery protection zones designated by FWS. Because reconstruction of the highway would require additional area to the south to accommodate slopes associated with increasing the height of the road, bridge construction would involve an expansion of the right-of-way approximately 50 feet to the south. Only Alternative 11, Four-Mile Bridge (East) and Alternative 17, 10.7-Mile Bridge, would involve bridge construction within the wood stork protection zones. However, with the implementation of the restrictions discussed in Section 5.3.3, *Protected Species*, disturbances that might impact the colonies would be minimized.

The Frog City rookery, which supports nesting by tricolored herons and great egrets, is located in WCA-3B close to the L-29 Levee approximately one-quarter mile west of the Tigertail Camp. Because all action alternatives are located south of the L-29 Levee/Canal, FWS and FWC did not recommend that any Buffer Zone restrictions be applied to the Frog City colony. The colony is protected from construction noise by the approximately 20-foot-high L-29 Levee, and the wading birds nesting at this colony have acclimated to continuous highway traffic and noise. Therefore, no adverse impacts to the rookery are anticipated.

Because construction activities would be restricted to the immediate vicinity of the highway, no adverse effects on the American alligator, the Everglades mink, or any wading birds are expected under any action alternative.

5.6.6 Habitat Units

Habitat units derived from the performance measures were selected as the best single metric available that integrated information for assessing the quality and quantity of improved hydrologic and ecologic function within the study area. It should be noted that the habitat units calculated in this analysis do not represent the totality of the Everglades ecosystem. There are other aspects of the ecosystem addressed in this report that describe other features not captured in the habitat unit analysis.

Engineers, hydrologists, and biologists from six agencies (SFWMD, ENP, FWS, FWC, FDEP, and USACE) participated in two Tamiami Trail Modification Benefits Workshops, the report of which is located in Appendix E. The goal of the benefits analysis was to identify hydrologic and ecological conditions that would occur with alternative lengths and locations of conveyance (equal to bridge length and location) of water under Tamiami Trail. These conditions would be evaluated and compared to identify quantitative benefits for each alternative.

The team developed and screened potential performance measures; thirteen performance measures in four groups were selected for evaluation:

1. Restore Water Deliveries to ENP
    A. Average Annual Flow Volumes
    B. Proportion of Area with Low Flow Velocity (<0.1 foot per second) Discharges within One Mile of Tamiami Trail
    C. Connectivity of L-29 Canal and NESS as Percent of Total Project Length
    D. Distribution of Flows, East to West
2. Restore Ridge and Slough Processes
    A. Reverse Filling in of Sloughs
    B. Difference between Average Velocity in Marsh and Average Velocity at Road
    C. Flows from L-29 Canal into Deep Sloughs of NESS
3. Restore Vegetative Communities
    A. Shift to Open Water, Spikerush Marsh and Slough Communities in NESS
    B. Risk of Ridge and Tree Island Peat Burning in NESS
    C. Invasion of Exotic Woody Plant Species
4. Restore Fish and Wildlife Communities
    A. Total Abundance of Fishes in ENP Marshes
    B. Conditions of Wading Bird Foraging and Nesting
    C. Reduction in Wildlife Mortality

The team then performed the following sequence of steps: apply the same flows to all alternatives, estimate values, assign numerical scoring to qualitative raw values, estimate rates of change, and estimate acreage in NESS where changes would occur. A subteam then worked with the scores, rates of change, and area to: normalize the scores, factor in the rate of change, multiply by area to produce habitat units, calculate the habitat unit benefit for each alternative as the difference between the with-alternative condition and future-without-project condition, and calculate the average annual habitat unit benefit for a 50-year period of analysis.

Performance measure values and scores represent the ultimate, or end-point, of changes due to the alternatives. Different metrics used in the analysis necessitated a normalization of the different performance measures into a 0-1 index. The normalization method used was “percent of maximum,” in which the maximum output in each category was assigned a “1” and the output values for the alternatives for that same resource category were scaled as a percent of the maximum.

It is recognized that the restoration of the entire area would not occur immediately after the completion of construction. It was estimated that in the first year, 30 percent of the end-point would be achieved. Most of this represents the hydrological changes such as depth, velocity, and hydroperiod. Herbaceous vegetation may take this long to fully respond to the hydrological changes. Fish and wildlife populations would require a few seasons to respond to the changed hydrology and vegetation. The without-project condition is proposed to remain the same throughout the period of analysis, the same as existing conditions. The period of analysis is 50 years, from 2010 to 2060.

Changes produced by each alternative were assessed over the same acreage of NESS, even though not all of the individual performance measures would necessarily affect the same acreage. The area selected for analysis and comparison of habitat units was defined by L-67 Extension on the west, Tamiami Trail on the north, and L-31N and the 8.5 Square Mile Area (SMA) on the east. The southern limit, although indeterminate, was defined as an east-west line connecting the end of the L-67 Extension to 8.5 SMA. The total area is 63,195 acres.

Habitat units were calculated by multiplying the indices by the acreages that were impacted by the performance measures.

Habitat benefits calculated for each alternative and expressed in average annual habitat units are provided in Table 8. The *MWD Tamiami Trail Modification Benefits Analysis Procedures* report (Appendix E) provides greater detail on the development of performance measures and the procedures used for calculating habitat units.

Table 8. Average Annual Habitat Unit Benefits

Alternative	Average Annual Benefits (AAHU)
No-Action	0
Alt 9. 3,000-Foot Bridge	12,453
Alt 10. 4-Mile Bridge (Central)	32,674
Alt 11. 4-Mile Bridge (East)	28,549
Alt 12. 3-Mile Bridge	27,973
Alt 13. 2-Mile Bridge	22,422
Alt 14. 2-Mile Bridge and 1-Mile Bridge	28,371
Alt 15. 1.3-Mile Bridge and 0.7-Mile Bridge	22,185
Alt 16. Three 3,000-Foot Bridges	22,246
Alt 17. 10.7-Mile Bridge	51,763

Source: USACE.

While habitat benefits were found generally to be associated with bridge length, the location of a bridge was also important. Those alternatives with bridges located more toward the central or western part of the project area tended to provide greater benefits.

5.6.7 Climate

No effect on climate would result with or without implementation of the project.

5.6.8 Air Quality

No-Action Alternative. The 2003 GRR/SEIS concluded that carbon monoxide (CO) would increase during the period from baseline, existing conditions through the design year from 4.8 parts per million (ppm) to 5.0 ppm at the Osceola Camp (a 4.2 percent increase) and from 4.0 ppm to 4.8 ppm (a 20 percent increase) at the Tigertail Camp. The increased concentrations are due solely to the projected increases in traffic volume. At neither location do the projected increases exceed the National Ambient Air Quality Standard (NAAQS) eight-hour standard of 9.0 ppm.

Action Alternatives. The proposed alternatives do not increase traffic volume in the project area; however, some require the relocation of traffic closer to residential areas. As such, the proposed alternatives were evaluated with respect to transportation conformity and CO hot spots.

Transportation conformity evaluated the alternatives under consideration at that time. The evaluations addressed the existing profile and alignment for 2000 and all alternatives, including the no-action alternative, for 2006 and 2020.

CO analyses were conducted for all alternatives at the project implementation date (2006), the design year (2020), and for comparison with existing conditions. Traffic data for the evaluations, presented in tables 9, 10, and 11, were based on conditions estimated for January and July.

Table 9. Existing Traffic

Alternative	Month	ADT	Design Hour	Flow	LOS	Avg. Speed
Existing Conditions	January	5,375	800	860	D	50
	July	5,375	500	549	C	52

Notes: ADT (vpd), Design Hour and Flow (vph), LOS (Level of Service), Speed (mph).

Source: USACE, 2003.

Table 10. 2006 Traffic

Alternative	Month	ADT	Design Hour	Flow	LOS	Avg. Speed
Future w/o Project	January	6,420	955	1,030	D	50
	July	6,420	596	648	C	52
Alternatives 9-17	January	6,420	955	1,030	D	50
	July	6,420	596	648	C	52

Notes: ADT (vpd), Design Hour and Flow (vph), LOS (Level of Service), Speed (mph).

Source: USACE, 2003.

Table 11. 2020 Traffic

Alternative	Month	ADT	Design Hour	Flow	LOS	Avg. Speed
Future w/o Project	January	8,852	1,316	1,400	D	50
	July	8,852	822	884	D	50
Alternatives 9-17	January	8,852	1,316	1,400	D	50
	July	8,852	822	884	D	50

Notes: ADT (vpd), Design Hour and Flow (vph), LOS (Level of Service), Speed (mph).

Source: USACE, 2003.

In accordance with the Highway Capacity Manual, and to analyze potential air quality impacts in a conservative manner with respect to carbon monoxide emissions, project ADTs were adjusted by a factor of 160 percent to account for heavier tourist season traffic. A peak hour to daily traffic ratio of 9.29 percent was used for the evaluation, and final adjustments were made to arrive at the flows for the peak 15-minute total for both directions of flow (service flow) along the length of the project. July (non-tourist season) traffic calculations were similar to those made for January. The only difference was that volumes were not increased by the 160 percent Sunday/holiday factor.

Level of Service (LOS) evaluations were conducted to determine the likely average vehicle speed along the length of the project. Based on current roadway geometry and traffic as well as roadway geometry for the nine alternatives and traffic volumes, LOS calculations were made using directional distribution and lane width factors of one. Heavy vehicle factors were chosen based on 11.47 percent heavy trucks. For conservative evaluations, and to account for tourist season traffic, it was assumed that recreational vehicles and buses each comprised seven percent of overall traffic flows.

With flow rate and average speed estimates for each alternative and analysis year, a preliminary screening of CO concentrations was conducted for sensitive receptors along the project; and CO, VOC, and nitrogen oxide (NO_x) emission factors were computed. Table 12 presents the results of the CO screening analysis with respect to potential

concentrations near the Tigertail and Osceola camps. The analysis is based on January temperatures and rural conditions.

Table 12. CO Screening Results

Year/ Alternative	Background		Tigertail Camp		Osceola Camp	
	1-hr.	8-hr.	1-hr.	8-hr.	1-hr.	8-hr.
2000 / Existing	1.7	1.0	6.7	4.0	8.1	4.8
2006 / W/O Project	1.7	1.0	6.3	4.8	8.0	4.8
2006 / 9 – 16	1.7	1.0	6.3	4.8	8.0	4.8
2006 / 17	1.7	1.0	5.9	3.5	8.1	4.8
2020 / W/O Project	1.7	1.0	8.1	4.8	8.4	5.0
2020 / 9 – 16	1.7	1.0	8.1	4.8	8.4	5.0
2020 / 17	1.7	1.0	8.1	4.8	8.9	5.3

Notes: All concentrations ppm. Concentrations at sensitive receptors include background concentrations.

Source: USACE, 2003.

Table 13 presents emission factor calculations for CO, VOC, and NO_x emissions. CO emission factors are based on January weather and traffic conditions. VOC and NO_x emission factors are based on July weather and traffic.

Table 13. Emission Factors

Year	Emission Factors		
	CO	VOC	NO_x
2000	9.656	1.479	2.819
2006	7.897	1.260	2.504
2020	8.024	1.150	2.251

Notes: Values represent weighted average, in grams per mile (gpm).

Source: USACE, 2003.

Table 14 presents flow rate hourly emissions, the emission factors from Table 13 above multiplied by the project flow rate volumes.

Table 14. Hourly Emissions

Year	Total Emission		
	CO	VOC	NO_x
2000	8.30	0.81	1.55
2006	8.13	0.82	1.62
2020	11.23	1.02	2.00

Notes: Values represent weighted average, in kilograms per mile per hour (Kg/mph).

Source: USACE, 2003.

The data indicate that the only increases in CO concentrations, compared to future without project conditions, would occur at the Osceola Camp with the construction of Alternative No. 17. However, the increase does not exceed NAAQS standards. CO, VOC, and NO_x emissions increase 35 percent, 26 percent, and 29 percent, respectively, from 2000 to 2020, regardless of the alternative. The projected increases are caused solely by projected increases in traffic.

Implementation of the alternatives would have little impact on baseline air quality in the project area. Construction associated with the alternatives was not addressed in the 2003 GRR/SEIS. Although construction would cause minor short-term air quality impacts in the form of dust from earthwork and other construction activity, such impacts would be minimized by adherence to state and local regulations. FDEP does not require air emission permits for mobile sources such as construction equipment; therefore it is unlikely that air emission permits will be required for the project.

5.6.9 Recreation

No-Action Alternative. If the project is not implemented, there would be no effects on recreation in the area. Recreational boating, airboating, fishing, and wildlife observation are expected to continue as currently practiced.

Action Alternatives. None of the action alternatives would affect access to boat ramps via S-333 and S-334. No effect on bank fishing access to the north bank of the L-29 Canal is anticipated. The use of shoulders as a parking area for access to fishing areas at culvert crossings and the south bank of the L-29 Canal would be temporarily affected during reconstruction of the highway. A method of “rolling construction” would be employed, and recreational restrictions due to construction would be localized. Therefore, bank fishing from the Tamiami Trail would be restricted only at those locations of the roadway where construction is taking place. Bank fishing from the south bank of the L-29 Canal could resume after the completion of roadway reconstruction. The highway embankment would be removed where bridges are constructed, therefore bank fishing from the highway embankment would be eliminated at these locations.

Under all alternatives except Alternative 17, 10.7-Mile Bridge, there appears to be adequate area along the unbridged portion of the roadway to which fishermen could relocate.

Under Alternative 17, 10.7-Mile Bridge, bank fishing would be restricted at locations where construction is taking place during the 36-month construction phase. On completion of construction, approximately one mile of existing roadbed would remain accessible on the east and 0.5 mile on the west. Degradation of the roadbed would eliminate bank fishing from the Tamiami Trail along virtually the entire existing roadway.

There would be no project impacts on boat fishing.

Access to the Airboat Association of Florida and the airboat tour businesses would be maintained under all alternatives.

5.6.10 Cultural Resources

No-Action Alternative. Because no construction would be conducted under the without project condition, there would be no alteration of cultural resources identified in the project area.

Action Alternatives. The cultural resource assessment survey (Appendix C) resulted in the identification of four historic resources:

- Coopertown Airboat Rides and Restaurant (8DA6767);
- Airboat Association of Florida (8DA6768);
- Tamiami Trail (8DA6765); and
- Tamiami Canal (8DA6766).

Bridges and highway construction associated with all alternatives would involve major reconstruction of the Tamiami Trail, and each would expand the right-of-way on the south side of the existing highway. The Tamiami Canal (L-29 Canal) would be maintained in its existing condition. Table 15 summarizes the impacts of the project on cultural resources.

It has been determined that the project will have an adverse effect on the Tamiami Trail, which is eligible for nomination to the NHRP. Consultation for the Memorandum of Agreement to mitigate the adverse effects is currently underway with SHPO and other interested parties. Ongoing mitigation measures would include the placement of historic markers at various areas of significance along the Tamiami Trail. The markers would include photographs, maps, and narratives. Adequate provisions would be made for pulloff and parking for any historic markers.

Should construction activities uncover any unanticipated archaeological finds, activity in the immediate area of the find will be stopped and the USACE notified. Construction will not continue until the site finds are evaluated by a professional archaeologist and the USACE provides a notice to proceed.

In the event that human remains are found during construction or maintenance activities, the provisions of *Chapter 872, Florida Statute (872.05)* will apply to the extent there exists a waiver of Federal sovereignty. *Chapter 872, Florida Statute* states:

> *When human remains are encountered, all activity that might disturb the remains shall cease and may not resume until authorized by the District Medical Examiner (if the remains are less than 75 years old) or the State Archaeologist (if the remains are more than 75 years).*

If Native American remains are encountered, provisions of the Native American Graves Protection and Repatriation Act (NAGPRA) may apply.

Table 15. Summary of Effects of Alternatives on Cultural Resources

Alternative	Coopertown Airboat Rides & Restaurant	Airboat Association of Florida	Tamiami Trail	Tamiami Canal
Alt 9. 3,000-Foot Bridge	No Impact	No Impact	Major Reconstruction, Embankment Partially Removed	No Impact
Alt 10. 4-Mile Bridge (Central)	No Impact	Approximately 50-foot encroachment into property	Major Reconstruction, Embankment Partially Removed	No Impact
Alt 11. 4-Mile Bridge (East)	Approximately 50-foot encroachment into property	No Impact	Major Reconstruction, Embankment Partially Removed	No Impact
Alt 12. 3-Mile Bridge	No Impact	No Impact	Major Reconstruction, Embankment Partially Removed	No Impact
Alt 13. 2-Mile Bridge	No Impact	No Impact	Major Reconstruction, Embankment Partially Removed	No Impact
Alt 14. 2-Mile Bridge & 1-Mile Bridge	No Impact	No Impact	Major Reconstruction, Embankment Partially Removed	No Impact
Alt 15. 1.3-Mile Bridge and 0.7-Mile Bridge	No Impact	No Impact	Major Reconstruction, Embankment Partially Removed	No Impact
Alt 16. Three 3,000-Foot Bridges	No Impact	No Impact	Major Reconstruction, Embankment Partially Removed	No Impact
Alt 17. 10.7-Mile Bridge	Approximately 50-foot encroachment into property	Approximately 50-foot encroachment into property	Major Reconstruction, Embankment Completely Removed	No Impact

Source: G.E.C., Inc.

5.6.11 Aesthetics

No-Action Alternative. If the project is not implemented, the existing aesthetic quality of the area would continue.

Action Alternatives. The removal of exotic vegetation on the southern side of the Tamiami Trail would be necessary for the modifications and reconstruction associated with all alternatives. Bridges may enhance the aesthetic quality of the area by offering a view of the expanse of the Everglades within the project corridor.

5.6.12 Noise Environment

The 2003 GRR/SEIS evaluated peak hour noise levels for the following sensitive receptors. Receptors were selected for modeling based on site characteristics including topography, number of buildings, building arrangement, recreation or other outdoor use areas, building location with respect to the highway, and site features such as fences and walls. The number of receivers selected is the minimum necessary to establish noise contours at a site based on the site's characteristics.

Flight 592 Memorial. This is a special use area (cemeteries, memorials, etc.) treated as a Category B activity. The 2003 GRR/SEIS concluded that none of the alternatives would result in adverse noise impacts to the site and that no noise abatement measures would be required (Table 16).

Table 16. Predicted Peak Hour Noise Levels – Flight 592 Memorial

Receiver	Existing	No Action	Alt. 9	Alt. 10	Alt. 11	Alt. 12	Alt. 13	Alt. 14	Alt. 15	Alt. 16	Alt. 17
1	59.9	62.0	62.2	62.2	62.2	63.4	62.0	62.0	62.0	62.0	63.4

Notes: All values LA eq1h (2020), except existing (2000).
Noise levels containing "+" and "<" were not actually modeled, but were derived qualitatively based on comparisons of modeled noise levels.

Source: USACE, 2003.

Osceola Camp. Modeling indicates that alternatives 9 through 17, although predicted to exceed FDOT approach criteria, appear to have little or no impact when compared to future without project conditions. Alternative 17, 10.7-Mile Bridge, is predicted to exceed FDOT approach criteria and cause adverse impacts beyond those of the future without project alternative (Table 17).

Airboat Association of Florida, Safari Park, Gator Park, and Coopertown Airboats. Alternatives 10, 16, and 17 are predicted to result in noise levels that exceed approach criteria and future without project noise levels at the Airboat Association of Florida (Table 18). Alternatives 10, 12, 13, 14, and 17 are predicted to result in noise levels that exceed approach criteria and future without project noise levels at Safari Park. Alternative 17 is predicted to result in noise levels that exceed approach criteria and future without project noise levels at Gator Park (Table 19). Alternative 11, Four-Mile

Bridge (East), and Alternative 17, 10.7-Mile Bridge, are predicted to result in noise levels that exceed approach criteria and future without project noise levels at Coopertown Airboats (Table 18).

Table 17. Predicted Peak Hour Noise Levels – Osceola Camp

Receiver	Existing	No Action	Alt. 9	Alt. 10	Alt. 11	Alt. 12	Alt. 13	Alt. 14	Alt. 15	Alt. 16	Alt. 17
1	**68.3**	**70.5**	**70.4**	**70.4**	**70.4**	**70.5**	**70.5**	**70.5**	**70.5**	**70.5**	**73.4+**
2	62.0	64.2	64.2	64.2	64.2	64.2	64.2	64.2	64.2	64.2	**66.0+**
3	57.5	59.6	61.8	61.8	61.8	59.6	59.6	59.6	59.6	59.6	63.2+
4	62.2	64.3	65.3	65.3	65.3	64.3	64.3	64.3	64.3	64.3	**67.0+**
5	62.6	64.7	64.7	64.7	64.7	64.7	64.7	64.7	64.7	64.7	**67.7+**

Notes: All values LA eq1h (2020), except existing (2000). Noise levels meeting or exceeding noise abatement criteria in **bold**.
Noise levels containing "+" and "<" were not actually modeled, but were derived qualitatively based on comparisons of modeled noise levels.

Source: USACE, 2003.

Table 18. Predicted Peak Hour Noise Levels – Airboat Association of Florida, Safari Park and Coopertown Airboats

Receiver	Existing	No Action	Alt. 9	Alt. 10	Alt. 11	Alt. 12	Alt. 13	Alt. 14	Alt. 15	Alt. 16	Alt. 17
1	69.6	**71.7**	**71.7**	**75.3+**	**71.6**	**71.7**	**71.7**	**71.7**	**71.7**	**<75.3**	**75.3+**
2	69.9	**72.0**	**72.0**	**74.4+**	**72.0**	**74.4+**	**74.4+**	**74.4+**	**72.0**	**72.0**	**74.4+**
3	62.7	64.8	64.8	64.8	68.5+	64.8	64.8	64.8	64.8	64.8	68.5+

Notes: All values LA eq1h (2020), except existing (2000). Noise levels meeting or exceeding noise abatement criteria in **bold**.
Noise levels containing "+" and "<" were not actually modeled, but were derived qualitatively based on comparisons of modeled noise levels.

Source: USACE, 2003.

Table 19. Predicted Peak Hour Noise Levels – Gator Park

Receiver	Existing	No Action	Alt. 9	Alt. 10	Alt. 11	Alt. 12	Alt. 13	Alt. 14	Alt. 15	Alt. 16	Alt. 17
1	69.6	**71.7**	**71.7**	**71.7**	**71.7**	**71.7**	**71.7**	**71.7**	**71.7**	**71.7**	**74.9**
2	62.7	64.9	64.9	64.9	64.9	64.9	64.9	64.9	64.9	64.9	67.3

Note: Noise levels containing "+" and "<" were not actually modeled, but were derived qualitatively based on comparisons of modeled noise levels.

Source: USACE, 2003. All values LA eq1h (2020), except existing (2000). Noise levels meeting or exceeding noise abatement criteria in **bold**.

Tigertail Camp. Modeling indicates that none of the alternatives would exceed FDOT approach criteria (Table 20).

Table 20. Predicted Peak Hour Noise Levels – Tigertail Camp

Receiver	Existing	No Action	Alt. 9	Alt. 10	Alt. 11	Alt. 12	Alt. 13	Alt. 14	Alt. 15	Alt. 16	Alt. 17
1	60.5	62.6	63.2	63.2	63.2	62.6	62.6	62.6	62.6	62.6	<62.1
2	60.8	62.9	63.4	63.4	63.4	62.9	62.9	62.9	62.9	62.9	<62.3

Notes: All values LA eq1h (2020), except existing (2000).
Noise levels containing "+" and "<" were not actually modeled, but were derived qualitatively based on comparisons of modeled noise levels.

Source: USACE, 2003.

The 2003 GRR/SEIS conducted a preliminary evaluation of noise abatement barriers for residential properties at the Osceola Camp where estimated noise levels (1) met or exceeded FDOT noise abatement criteria as a result of an alternative, and (2) are estimated to be noticeably higher (greater than or equal to three dBA) than future without project noise levels. Noise abatement barriers were not evaluated for the commercial properties along the project. A unit barrier construction cost of $25.00 per square foot and a design insertion loss of 10 dBA were utilized for the evaluation.

Roadside barriers were analyzed at the Osceola Camp for alternatives 9 through 17, and modeling concluded that a wall ranging in height from 8-20 feet over a length of approximately 1,450 feet would be required. The preliminary cost for the barrier system was estimated to be $425,000 (2000 dollars), or $30,360 per residence for up to 14 residential structures that would benefit from the barrier. Modeling for Alternative 17 concluded that a wall ranging in height from 8-16 feet over a length of approximately 1,250 feet would be required. The preliminary cost was estimated at $455,000, or approximately $32,500 per residence.

The FDOT unit cost threshold, $30,000 per benefited residence, was exceeded by all alternatives for which a barrier was indicated. In accordance with FDOT criteria, costs in excess of $30,000 per benefited residence are deemed not reasonable, and a noise barrier would not normally be constructed.

Construction and vibration noise generated during project construction would cause temporary impacts through increased noise levels near the receptors. Noise emissions from construction equipment range generally from 70 dBA for pumps and portable equipment to approximately 95 dBA for tractors, graders, and other heavy equipment. Avoidance and/or mitigation options will be developed during the project development and design phases and specified in construction plans in accordance with FDOT's *Standard Specifications for Road and Bridge Construction*.

5.6.13 Transportation

No-Action Alternative. When the MWD project is completed, water elevation in the L-29 Canal will increase. The roadway base would be subjected to increased saturation and would likely require more frequent maintenance. Any occurrence of overtopping could close the road or reduce traffic to one lane, thereby impacting motorists who use the roadway. Overtopping would require the deployment of traffic control devices to warn motorists and slow traffic. The implications could be severe if overtopping interferes with the passage of emergency vehicles or during hurricane evacuation.

Action Alternatives. Implementation of action alternatives would neither increase nor decrease traffic on the Tamiami Trail. Reconstruction of the roadway would eliminate undulations and cracks in the highway surface and improve the drivability of the road.

During the construction phase of the project, traffic would be maintained as it exists today, with one lane of travel in each direction. The overlay of the existing roadway would be accomplished using a moving operation. Traffic will be shifted north, utilizing the north shoulder, once temporary pavement and barrier wall on the outside edge are constructed for the entire length of the project.

Access to businesses, residential area, and other sites along the highway would be maintained under all action alternatives. With the elimination of the highway embankment where bridges are located, it would be necessary to provide access to sites by ramps or elevated side roads that would connect with the main bridge.

Highway reconstruction may temporarily impede access to the pedestrian bridge from the Tamiami Trail across the L-29 Canal to the Tigertail Camp. The use of shoulders for temporary lanes would limit roadside parking and may require individuals to access the Tigertail Camp by other means. Access to the Tigertail Camp by the unimproved road along the L-29 Levee would remain available under all alternatives. Under Alternative 17, 10.7-Mile Bridge, a bridge would replace boat access to the Tigertail Camp across the canal.

Although the Tamiami Trail is not designated as an official hurricane evacuation route, improvements to the roadway will enhance its use in South Florida as an east-west route during hurricane evacuations.

5.6.14 Tribal Lands

No tribal lands would be affected. All alternatives provide access to both the Tigertail Camp and the Osceola Camp. The 1992 GDM/EIS discussed the need to raise both the Tigertail and Osceola camps to reduce the potential for flooding from improved water deliveries to ENP. Raising the Tigertail Camp has been accomplished, and coordination with the Osceola Camp is underway to complete its raising prior to implementation of this component of MWD.

5.6.15 Economics/Socioeconomics

Economy. The proposed project should stimulate economic activity in the region through short-term construction activities. Effective planning requires analysis of the

expected economic impacts of the project on the regional economy. Such analysis must include systematically tracing and estimating interindustry relationships that affect regional economic conditions. One methodology available for tracing such activity is an I-O model, which is an economic model that describes the interindustry relations within an economy.

IMPLAN is a regional impact model that enables the evaluation of the economic impact of specific activities such as construction of public works projects. IMPLAN was used in this analysis to estimate the economic impacts of the proposed project as measured by expected increases in business activity, personal income, and employment.

The basic data sources for the current edition of IMPLAN are the 1997 Benchmark Input-Output Accounts of the United States (developed by the U.S. Department of Commerce, Bureau of Economic Analysis [BEA]), and 2002 county income and employment data (published by BEA and the Bureau of Labor Statistics [BLS]).

The model measures the effects of three types of impacts: direct, indirect, and induced. Direct impacts consist of employment and purchases of goods and services in the region resulting from the activity being evaluated. This includes the initial round of spending and employment generated by business activity that is directly dependent on the proposed project.

Indirect (interindustry) impacts consist of goods and services purchased by the firms that supply inputs consumed in the direct activity. Indirect impacts include the multiplier effects associated with supplying and servicing the firms that have experienced an increase in sales as a result of construction activities.

Induced impacts (benefits) include the economic activity (business sales, employment, and personal income) generated by household purchases made by persons employed by the firms that are directly or indirectly impacted by the construction activities.

IMPLAN uses a 509-sector I-O model to illustrate the indirect and induced economic interactions of a region. The model generates multipliers, which summarize the magnitude of the indirect and induced effects generated by a given direct change (increase in sales), to estimate changes in output, income, and employment.

The IMPLAN model for Miami-Dade County indicates that each million dollars in construction expenditures results in an expected increase of $2.179 million in business sales, $0.969 million in personal income, and 22 jobs within the local economy. Table 21 summarizes the expected impacts of construction activities on the local economy for each alternative considered.

Businesses. Three businesses are on the south side of the Tamiami Trail in the project corridor: Coopertown Airboat Rides and Restaurant, Gator Park, Inc., and Everglades Safari Park. During construction of the highway, when provisions are made to maintain the flow of traffic, there may be infrequent motoring delays because of slower speeds or occasional stops. Because some motorists may wish to avoid construction areas, the number of visitors to businesses during the period of construction may be reduced. A similar reduction in visitors could be experienced by the Miccosukee Indian Village, Airboats, Restaurant, and Gas Station, which is located to the west of the project area.

The centerline of a new bridge would be offset by approximately 47 feet to the south of the existing highway centerline. The businesses, all of which are located on the south side of the highway, would lose much of their parking area from the expanded right-of-way associated with a new bridge.

Table 21. Expected Economic Impact of Construction Activities Associated With Each Alternative

Alternative	Construction Cost	Expected Increase in[1]		
		Business Sales	Earnings	Employment (Jobs)
Alt 9. 3,000-Foot Bridge	$68,300,000	$148,867,000	$65,612,000	1,503
Alt 10. 4-Mile (Central)	$141,400,000	$308,196,000	$135,836,000	3,111
Alt 11. 4-Mile (East)	$139,200,000	$303,401,000	$133,723,000	3,062
Alt 12. 3-Mile Bridge	$119,500,000	$260,462,000	$114,798,000	2,629
Alt 13. 2-Mile Bridge	$99,300,000	$216,434,000	$95,393,000	2,185
Alt 14. 2-Mile Bridge and 1-Mile Bridge	$127,900,000	$278,771,000	$122,867,000	2,814
Alt 15. 1.3-Mile Bridge & 0.7-Mile Bridge	$104,100,000	$226,897,000	$100,004,000	2,290
Alt 16. Three 3,000-Foot Bridges	$101,800,000	$221,883,000	$97,794,000	2,240
Alt 17. 10.7-Mile Bridge	$278,000,000	$605,929,000	$267,061,000	6,116

Notes: [1] Figures are measures of indirect and induced results of proposed project as defined in Section 5.6.14; business sales and earnings given in US dollars and employment given in number of jobs created.

Sources: USACE and G.E.C., Inc. (2005).

Businesses may lose some of their parking area as a result of the wider footprint associated with raising the road height, but any effect, if present, is likely to be minor. Effects of alternatives on businesses are summarized in Table 22.

Six properties south of the Tamiami Trail have been authorized for ENP acquisition by the Everglades National Park Protection and Expansion Act of 1989. The assumption is that ENP will acquire all six of these properties while noting that disposition of the FPL property is a matter of ongoing interagency discussions. The businesses currently owned by Coopertown Airboats, Gator Park, and Everglades Safari Park are located on these properties. ENP has not yet determined if any or all of the businesses will be allowed to remain open as ENP concessions. If any business is allowed to remain open as a concession, or if that decision has not been made by the time of construction, it would be necessary to construct a ramp to access the site if a bridge passed in front.

Airboat Association of Florida. The Airboat Association of Florida is a non-profit conservation and outdoor recreation organization. The Airboat Association site is located approximately 3.5 miles from the western end of the project corridor. All alternatives include provisions for maintaining access to the site. During construction, the flow of traffic on the Tamiami Trail would be maintained; however, motorists accessing the site may experience temporary delays because of traffic control measures.

Table 22. Effects of Alternatives on Businesses

Alternative	Effects on Businesses		
	Coopertown Airboats	Gator Park	Everglades Safari
Alt 9. 3,000-Foot Bridge	Possible Slight Reduction in Parking	Possible Slight Reduction in Parking	Possible Slight Reduction in Parking
Alt 10. 4-Mile (Central)	Possible Slight Reduction in Parking	Possible Slight Reduction in Parking	50-Foot Reduction in Parking
Alt 11. 4-Mile (East)	50-Foot Reduction in Parking	Possible Slight Reduction in Parking	Possible Slight Reduction in Parking
Alt 12. 3-Mile Bridge	Possible Slight Reduction in Parking	Possible Slight Reduction in Parking	50-Foot Reduction in Parking
Alt 13. 2-Mile Bridge	Possible Slight Reduction in Parking	Possible Slight Reduction in Parking	50-Foot Reduction in Parking
Alt 14. 2-Mile Bridge and 1-Mile Bridge	Possible Slight Reduction in Parking	Possible Slight Reduction in Parking	50-Foot Reduction in Parking
Alt 15. 1.3-Mile Bridge and 0.7-Mile Bridge	Possible Slight Reduction in Parking	Possible Slight Reduction in Parking	Possible Slight Reduction in Parking
Alt 16. Three 3,000-Foot Bridges	Possible Slight Reduction in Parking	Possible Slight Reduction in Parking	Possible Slight Reduction in Parking
Alt 17. 10.7-Mile Bridge	50-Foot Reduction in Parking	50-Foot Reduction in Parking	50-Foot Reduction in Parking

Sources: PBS&J and G.E.C., Inc. (2005).

Osceola and Tigertail Camps. Under all alternatives, access to the Osceola Camp would be provided during construction and following completion of the project. Short-term traffic disruptions and noise would be created by construction.

All alternatives would include provisions for access to the Tigertail Camp. However, Alternative 17, under which a 10.7-mile bridge would be constructed, would replace the pedestrian bridge accessing the Tigertail Camp with a vehicular bridge.

The Miccosukee Tribe has expressed a preference not to have a bridge adjacent to either the Osceola or Tigertail camps. The only alternative that would locate a bridge adjacent to their residences would be Alternative 17, 10.7-Mile Bridge.

5.6.16 Flight 592 Memorial

No impacts on the Flight 592 Memorial are expected. Access to the site would be provided under all action alternatives.

5.6.17 Real Estate

No-Action Alternative. Under the No-Action Alternative, no impacts to real estate would occur.

Action Alternatives. All alternatives, with the exception of no action alternative, require additional lands to construct the project. Department of Interior, Florida Department of Transportation and private landowners own or hold an interest in lands required for the project. In addition to the lands required for construction, it is necessary to purchase an interest in the Airboat Association tract due to increased water levels.

Acreages required for the alternatives range from 22 acres (Alternative 9) to 60 acres (Alternative 17). The estimated real estate costs used to evaluate each alternative is the same ($1,511,000) and only includes an estimate to purchase the Airboat Association and administrative costs. All lands located south of the existing road were authorized in the Everglades Expansion Act (except the Airboat Association tract). DOI will purchase the required interest in these lands.

All lands outside the existing Tamiami Trail right of way required for the construction, operation and maintenance of the Tamiami Trail modification are being purchased by DOI and USACE. Interests in lands required for the operation and maintenance of the roadway and bridge(s) will be conveyed to FDOT when construction is complete. (Refer to Appendix H for details.)

5.6.18 Environmental Justice and Impacts on Children

An environmental justice analysis, which is intended to “analyze and address the distributional effects of environmental impacts on certain populations,” is included to address the requirements of Executive Order (EO) 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*. The purpose of the EO is to prevent the impacts of an action from falling disproportionately on minority or low-income communities. A determination that disproportionate impacts are evident can be subjective and a matter of legal interpretation. Disproportionate impacts occur when, in order to minimize or avoid impacts to another community or environmental resource, the impacts are instead focused on the minority or low-income community.

The Miami-Dade County region, a major metropolitan area with a population in excess of two million people and encompassing more than 2,000 square miles, is located along the southeastern portion of the Florida peninsula. The population of the county is approximately 70 percent white and slightly more than 20 percent black. Approximately

57 percent of Miami-Dade residents identify themselves as Hispanic. In 2000 it was estimated that 18 percent of the county's residents were in poverty, with almost 25 percent of that number being children under the age of 18. Over one million persons were employed. Local, state, and Federal government employment accounted for approximately 143,000 jobholders.
Under all alternative actions, some short-term traffic disruptions and construction noise would likely be created for residents of the Tigertail and Osceola camps. However, no long-term adverse impacts to the affected communities are expected. Likewise, no disproportionate impacts are expected.

Impacts on Children. An investigation of environmental health risks and children is included to comply with the intent of EO 13045, *Protection of Children from Environmental Health Risks and Safety Risks*. Data used to characterize the population within the affected area were obtained from local resources through interviews.

None of the alternatives significantly changes the location of the highway; therefore, none is expected to increase either the environmental health or safety risks to children in either Tigertail or Osceola camps. Modeling indicates that all action alternatives, although predicted to exceed FDOT noise approach criteria, appear to have no impact on the Osceola Camp when compared to future without project conditions.

5.6.19 Summary of Environmental Effects

5.6.19.1 No Impact by Alternatives

None of the alternatives would affect any of the following resources or considerations:

- Geology and Soils
- Climate
- Air Quality
- HTRW
- Flight 592 Memorial
- Environmental Justice
- Impacts on Children
- Tribal Lands

The Corps has determined that there would not likely be any adverse effects on the following protected species under any alternative action provided that certain conditions apply. Protected species are anticipated to be unaffected if, during construction, standard measures for the protection of indigo snakes and manatees are implemented, and if the FWS recommendations for protecting wood storks are instituted. The Florida panther may be adversely affected and will require formal consultation with the FWS, but is not likely to be jeopardized by any of the alternatives.

The State of Florida has expressed concerns regarding effects of stormwater runoff from the highway and its effects on water quality. With the incorporation of a pollution abatement system into bridge design, concerns have been lessened, and adverse effects on water quality are not expected under any alternative.

5.6.19.2 Equal Impact Among Alternatives

Several environmental resources and conditions would be affected by the project, but the effects among the alternatives would not differ.

- Transportation. Although construction activities could cause traffic delays, the highway would remain open. Access would be maintained to all businesses, communication sites, the Airboat Association of Florida, and the Osceola and Tigertail camps.
- Real Estate. All alternatives require additional lands. All lands south of the existing road were authorized by the Everglades Expansion act for purchase by DOI (except the Airboat Association of Florida). It would be necessary to purchase an interest in the Airboat Association tract for required construction, operations, and maintenance, as well as for increased water levels.
- Exotic Vegetation. All alternatives would involve removal of the exotic vegetation (primarily Brazilian pepper) along the highway corridor.
- Aesthetics. With the removal of exotic vegetation, expanses of the Everglades would be more visible to the south. Bridges may provide opportunities for scenic vistas.

5.6.19.3 Impacts Associated with Bridge Length

The total combined span of bridges without regard to bridge location in the project corridor determines effects on several features and resources—the greater the combined span or the hydraulic passage beneath the bridge(s), the greater the effects.

- The difference in water elevation between the water in the L-29 Canal and the marsh to the immediate south of the project, Alternative 17, 10.7-Mile Bridge, would provide the least stage differentials while Alternative 9, 3,000-Foot Bridge, would offer the greatest differences. Other alternatives would be ranked according to their total bridge lengths.
- Stage differences, in turn, would affect the velocity of flow from the L-29 Canal to ENP; greater stage differentials would promote higher flow velocities, thereby promoting erosion. The flow velocities associated with the 10.7-Mile Bridge would be the lowest of the alternatives considered, while flows associated with the 3,000-Foot Bridge would be the highest.
- Depth and duration of water levels in WCA-3B are also dependent on stage differentials, with larger bridge openings reducing the potential for prolonged inundation and alternation of plant communities in WCA-3B.

Bridge lengths also affect aspects of the biology of the area. Bridges offer less opportunity for wildlife to encounter vehicles; therefore, wildlife mortality would be reduced in direct proportion to bridge length. The 10.7-Mile Bridge would offer the most benefits, while the 3,000-Foot Bridge would present the least; the remaining alternatives would be ranked according to their bridge lengths.

Because the highway embankment would be removed beneath the bridge(s), bank fishing from the Tamiami Trail (the south bank of the L-29 Canal) would be reduced by longer bridges. The 10.7-Mile Bridge would eliminate this type of fishing entirely, while the 3,000-Foot Bridge would reduce the area for fishing by only approximately five percent.

5.6.19.4 Impacts Associated with Bridge Location

The remaining environmental effects of alternatives considered in this report were associated at least partly by the locations of bridges.

In considering fixed features such a businesses, etc., the presence of adverse impacts was fully dependent on bridge location. Alternative 10, Four-Mile Bridge Central, and Alternative 11, Four-Mile Bridge East would encroach approximately 50 feet into the property of the Airboat Association of Florida and Coopertown Airboats and Restaurant, respectively, while Alternative 17, 10.7-Mile Bridge would affect both. Both sites were considered to be historic resources. Tamiami Trail, the remaining cultural resource affected by the project, would be modified by all alternatives.

Businesses would be similarly affected by bridge location. A 50-foot encroachment would eliminate a major portion of the parking areas at the airboat tour companies. Coopertown Airboats would be affected by bridges associated with Alternative 11, Four-Mile Bridge (East) and Alternative 17, 10.7-Mile Bridge. Gator Park would be affected only by Alternative 17. Everglades Safari Park would lose parking in association with five alternatives: Alternative 10, Four-Mile Bridge Central); Alternative 12, Three-Mile Bridge; Alternative 13, Two-Mile Bridge; Alternative 14, Two-Mile Bridge West and One-Mile Bridge East; and Alternative 17, 10.7-Mile Bridge.

Noise levels modeled for residential areas were dependent not only on the bridge location, but also on the distance of the residential area from a bridge. The Tigertail Camp was determined to be sufficiently far from the highway/bridge that noise criteria would not be exceeded. However, construction of Alternative 17, 10.7-Mile Bridge, the only alternative with a bridge located in proximity to the Osceola Camp, would result in noise levels that exceed noise criteria and are higher than the future without project condition.

Economic effects of the project, as determined through the IMPLAN model, are determined by project construction cost. The greatest number of jobs, business sales, and earnings would be associated with Alternative 17, 10.7-Mile Bridge, which would be the costliest; Alternative 9, 3,000-Foot Bridge, the least costly, would provide the least.

Wetland loss and gain determinations were determined by number and length of bridges, amount of road reconstruction, road/bridge transitions, and amount of embankment to be removed. The 10.7-Mile Bridge was determined to have a net gain in wetland acreage, while Alternative 16, three 3,000-Foot Bridges, would result in the greatest net loss of wetland area.

While total bridge length was the determining factor for several ecological parameters, bridge location was a major influence on others. The balance of flows across the project area, which simulates a sheetflow condition, was best achieved by Alternative 17, 10.7-Mile Bridge, and the multiple-bridge options. The gain in habitat units from the project was influenced by a combination of the bridge length and location. While the 10.7-Mile Bridge provided the greatest number of habitat units, the two four-mile bridges and Alternative 14, Two-Mile Bridge (West) and One-Mile Bridge (East), were more effective than the remaining alternatives.

A combination of bridge length and location was important in the east-west distribution of flows. In recognizing that an opening extending the full length of the project corridor would provide the optimum distribution of flows, alternatives were compared to this hypothetical opening to judge the effectiveness in distributing flows east to west. Alternative 17, 10.7-Mile Bridge approximated the full-opening condition. The four-mile bridges ranked lowest, while the remaining alternatives were judged to provide intermediate flow distributions. In comparison to the full-opening condition, Alternative 17 would supply flows most conductive to the reestablishment of sloughs in NESS. Comparing the other alternatives to a full opening, the four-mile bridges, the three-mile bridge, and the two-mile bridge (west)/one-mile bridge (east) ranked highest, while the remaining alternatives were less effective.

Table 23 presents a comparison of environmental effects that differed among alternatives and a general ranking of alternatives based on the degree of adverse or beneficial impacts.

5.6.19.5 Impacts Associated with Both Bridge Length and Location

Ecological connectivity between the L-29 Canal and ENP is dependent not only on the size of the hydraulic openings beneath bridges, but also by bridge location.

As part of the Combined Structural and Operational Plan for Modified Water Deliveries Project and C-111 Canal Project (CSOP), three new weirs would be placed in the L-29 levee: two in the western half of the project area and weir in the eastern half. Locating Tamiami Trail bridge openings in proximity to the openings in the L-29 Levee would increase ecological connectivity between WCA-3B and NESS.

An eastern bridge would provide better ecological connectivity with southeastern WCA-3B when the proposed eastern opening in the L-29 Levee is constructed. Additional connectivity would be realized when CERP Decompartmentalization either removes the L-29 Levee or provided for an additional means for flow conveyance. Alternative 17, 10.7-Mile Bridge and the two-bridge alternatives would provide both eastern and western ecological connectivity from WCA-3B to NESS. Ecological connections between the L-29 Canal and ENP provided by single-bridge alternatives would be restricted to the locations of their hydraulic openings (either eastern or western sites) and the system of culverts.

5.7 EVALUATION OF ALTERNATIVES

Several considerations were made in the evaluation of project alternatives. First, each alternative must achieve the project goal. Each alternative is evaluated through performance measures to determine how well the project objectives are met. A comparison is made of the future with a given alternative to the future without condition, or No-Action Alternative.

Cost is another important evaluation criterion. Average annual costs were developed for each of the alternatives and for the No-Action Alternative. Average annual costs for the No-Action Alternative reflect higher routine and periodic maintenance costs caused by damage to the roadway from higher water levels associated with MWD. Based on the 2003 GRR/SEIS, total average annual costs under the No-Action Alternative would be $3.3 million.

Finally, all USACE water resources project alternatives must be evaluated with respect to: (1) acceptability; (2) completeness; (3) effectiveness; and (4) efficiency. Ecosystem restoration project alternatives are also evaluated on the basis of cost-effectiveness and incremental cost analysis. Ecosystem restoration benefits are evaluated on their significance. Other evaluation criteria important in the present study are environmental and socioeconomic effects, wetland impacts, air quality and noise impacts, and recreation.

5.7.1 Cost Estimates

Data for initial construction/implementation, land acquisition, monitoring, and periodically recurring costs for operation, maintenance, repair, replacement, and rehabilitation, have been developed through engineering design and cost estimation and real estate appraisal efforts. Details of that data development are explained and discussed elsewhere in this report. The main issues requiring economic evaluation attention include equivalent time basis calculations, price levels, and timing of project spending.

Costs represent the difference between conditions without any plan (the “base condition” or “without-project condition”) and with a plan or alternative. For purposes of this report and analysis, NED (National Economic Development Costs, as defined by Federal and USACE policy) costs are expressed in 2005 price levels, and are based generally on costs estimated to be incurred over a 50-year period of analysis. Costs of a plan represent the value of goods and services required to implement and operate/maintain the plan. Table 24 displays the costs associated with the alternatives.

The engineering firm, PBS&J, Inc., designed and provided cost estimates for a four-mile bridge with a full pollution abatement system using Stormceptor® technology. The cost of a Stormceptor® system has been prorated for the other bridge lengths and included in the construction cost of each alternative.

The timing of a plan’s costs is important. Construction and initial implementation costs cannot be added to periodically recurring costs for project operation, maintenance, and monitoring. Additionally, construction costs incurred in a given year of the project cannot be added to construction costs incurred in other years if meaningful and direct comparisons of the costs of the different components are to be made. A common practice of equating sums of money across time with their equivalent at an earlier single point in time is the process known as discounting. Through this process, which involves the use of an interest rate (or discount rate) officially prescribed by Federal policy for use in water resource planning analysis (currently set at 5.125 percent per year), the cost time streams for the alternative plans were converted into equivalent values.

Engineering Regulation (ER) 1105-2-100 requires that interest during construction (IDC) be computed to represent the opportunity cost of capital incurred during the construction period. Interest was computed for construction and PED costs from the middle of the month in which the expenditures were incurred until the first of the month following the estimated construction completion date.

5.7.2 Cost Effectiveness and Incremental Cost Analysis

Cost Effectiveness and Incremental Cost Analysis (CE/ICA) reveals information about financial investments given the dollar costs and non-dollar outputs (benefits) of alternative investment choices. The analyses are conducted in a series of steps that progressively identify alternatives that meet specified criteria and screen out those that do not. ER 1105-2-100 requires cost effectiveness and incremental cost analyses to support recommendations for ecosystem restoration.

Cost effectiveness analysis begins with a comparison of the costs and outputs of alternative plans to identify the least-cost plan for each level of output considered. The resulting least-cost alternative plans are then compared to identify those that would produce greater levels of output at the same cost, or at a lesser cost, than other alternative plans. Alternative plans identified through this comparison are the “cost effective alternative plans.” The cost effective alternative plans are then compared to identify the most economically efficient alternative plans that would produce the greatest benefit-to-cost comparison.

The plans that offer the greatest increases in output for the least increases in cost (the plans that have the lowest incremental costs per unit of output for successively larger levels of output) are those that are most efficient in production and are defined as the "best buy" plans. Using this definition, the largest of the cost-effective plans is identified as a best buy plan by default, regardless of the magnitude of the incremental cost.

Finally, the additional costs for the additional amounts of output (incremental cost) produced by the Best Buy alternative plans are calculated. The results of all the calculations and comparisons of costs and outputs provide a basis for addressing the decision question of whether the additional outputs are worth the costs incurred to achieve them.

For the Tamiami Trail project, the analysis compares the average annual costs of alternative plans (assuming a three-year construction period) against the appropriate average annual habitat unit estimates. Details of the analysis are presented in Appendix E. Just as the output of each alternative was calculated by subtracting the without-plan value from the with-plan value (“with-and-without analysis”) for every year of the period of analysis (2010-2060) to estimate the average annual change in habitat units (shown in Table 8), so too were average annual equivalent costs calculated for each of the alternatives. The average annual equivalent costs and benefits used for the CE/ICA are displayed in Table 25. Costs include all construction, lands, easements, relocations, rights-of-way, disposal areas, interest, and operation and maintenance expenditures and monitoring over the same period of analysis for which average annual habitat units were calculated (2010-2060).

All the environmental outputs were calculated on an average annual basis to account for the fact that several years may be required for full attainment of the functional capacities to be realized. Figure 16 provides a graphical representation of the cost effective plans, and Figure 17 depicts the Best Buy plans.

Table 25 presents the results of the cost effectiveness analysis. Table 26 summarizes the results of the incremental cost analysis.

Table 26. Results of Incremental Cost Analysis: Best Buy Plans Arrayed by Increasing Output

Alternative	Average Annual Cost	Output (HU)	Average Cost Per Output	Incremental Average Annual Cost	Incremental Output (HU)	Incremental Cost Per Output
Without Plan	$0	0	N/A	N/A	N/A	N/A
Alt 12. 3-Mile Bridge	$8,007,594	27,973	$286	$8,007,594	27,973	$286
Alt 10. 4-Mile Bridge (Central)	$9,448,247	32,674	$289	$1,440,653	4,701	$306
Alt 17. 10.7-Mile Bridge	$18,189,614	51,763	$351	$8,741,367	19,089	$457

Source: USACE.

5.7.3 Environmental Considerations

Through the establishment and evaluation of planning objectives and performance measures, alternatives were compared, and benefits of each alternative were determined (Appendix E). Table 27 presents a comparison of the hydrologic and ecological benefits of each alternative.

By providing for the removal of the roadway embankment, Alternative 17, 10.7-Mile Bridge, facilitates maximum sheetflow from the L-29 Canal into NESS. This alternative also allows for increased ecological connectivity to be established between WCA-3B and ENP. It is generally recognized as the plan that maximizes environmental outputs. In the FWCAR (Appendix F) Alternative 17 as the "Environmentally Preferred Alternative, Performs Best for Environmental Objectives without Regard to Fiscal Constraints."

Alternative 10, Four-Mile Bridge (Central), and Alternative 11, Four-Mile Bridge (East), were developed by the planning team as alternative means to meet the MWD objectives, increase sheetflow, and promote ecological connectivity. The FWCAR designated the four-mile bridge (central) alternative as an "Environmentally Acceptable Alternative." The NPS Alternative Optimization Report (appended to FWCAR, Appendix F) recommended the central location for the Four-Mile Bridge because this location contained the greatest flow in the ridge and slough habitats that existed prior to construction of the Tamiami Trail.

Alternative 9, 3,000-Foot Bridge, was selected as the Recommended Plan in the 2003 GRR/SEIS. It provided the greatest ecological benefits of the alternatives evaluated while constrained by fiscal limitations in effect at the time. With a relaxation in fiscal constraints and an opportunity to construct a longer bridge that provides improved sheetflow and ecological connectivity, the 3,000-Foot bridge does not offer the benefits of the other alternatives evaluated.

5.7.4 Evaluation of Objectives in Northeast Shark River Slough

Objective 1: Restore Water Deliveries to ENP. All alternatives provided improvement over existing conditions and the No-Action Alternative. All were equally capable of conveying the average annual NSM flows to ENP. The 10.7-Mile Bridge would provide reduced velocities to the greatest proportion of the area, the best connectivity between the L-29 Canal and ENP, and the best distribution of flows from east to west. The 3,000-Foot Bridge would offer the least reduction in flow velocity, the least connectivity, and the most restrictive flow distribution. Alternative 14, Two-Mile Bridge West and One-Mile Bridge East, ranked high in meeting this objective, as did the two four-mile bridge alternatives.

Objective 2: Restore Ridge and Slough Processes. The 10.7-Mile Bridge scored highest for reversing the filling in of sloughs, minimizing the difference between average velocities at the road and the marsh, and enhancing flows from the L-29 Canal into deep sloughs of NESS. The 3,000-Foot Bridge scored the lowest for each performance measure. The two Four-Mile bridges scored equally for reversing the filling in of sloughs and minimizing the differences between flow velocities at the road and the marsh. Alternative 10, the Four-Mile Bridge (Central), Alternative 11, Four-Mile Bridge (East), and Alternative 14, Two-Mile Bridge West and One-Mile Bridge East, ranked higher in meeting this objective than the other alternatives.

Objective 3: Restore Vegetative Communities. The 10.7-Mile Bridge scored highest for shifting communities to open water, spikerush marsh, and slough communities; reducing the risk of ridge and tree island burning; and reducing the invasion of exotic species. The 3,000-Foot Bridge scored the lowest for these performance measures. The Four-Mile Bridge (Central), the Four-Mile Bridge (East), the Three-Mile Bridge, and the Two-Mile Bridge West and One-Mile Bridge East ranked above the remaining alternatives for meeting this objective.

Objective 4: Fish and Wildlife Resources. The 10.7-Mile Bridge received the highest score for improving the total abundance of fishes in ENP marshes, improving conditions for wading bird foraging and nesting, and reducing wildlife mortality. The Four-Mile bridges, the Three-Mile Bridge, and Two-Mile Bridge West and One-Mile Bridge East scored higher for meeting this objective than the remaining alternatives.

5.7.5 Evaluation of Constraints

Fiscal Constraints. The level of funding budgeted for constructing the Tamiami Trail modifications under MWD is as identified in the DOI Capital Asset Plan. Reference on current funding levels can be made to the April 2005 version of the Capital Asset Plan (OMB Circular A-11 Exhibit 300(b), Modified Water Deliveries).

The cost of constructing Alternative 17, 10.7-Mile Bridge, is more than double the budget requested in the DOI Capital Asset Plan. Construction of either alternatives 10, 11, 12, or 14 would also be greater than the amount budgeted. Construction of alternatives 9, 13, 15, and 16 would be within the funding cap; but, as discussed above, there are additional reasons for excluding these as practical alternatives. The Everglades Expansion and Protection Act states that the MWD Project features are "justified by the environmental benefits to be derived by the Everglades ecosystem in general and by the park in particular and shall not require further economic justification . . ." However, the Federal Government also recognizes that limited funds are available for the project.

Other Constraints

- **FHWA and FDOT Requirements.** The completed project will provide a facility that meets the highway standards required by the Federal Highway Administration and the FDOT. FDOT approval on design, plans and specifications must be obtained before proceeding to construction.
-
- **Florida Coastal Zone Management Program**. This project is located within the designated Coastal Zone of the State of Florida. A Coastal Zone Management Plan Consistency Report is included (Appendix G).

- **Water Quality Certification**. Appendix I provides FDEP with a report demonstrating that the project is consistent with the Florida Water Quality Criteria.

- **Flood Control.** This project will not adversely affect the ability of any channels or structures to provide currently authorized flood control measures to the public.

- **Hurricane Evacuation**. This project will not prevent the use of the highway for use by the public for hurricane evacuation.

- **Hydraulics and Hydrology**. This project will not reduce the width of the L-29 Canal or reduce its capacity. No structures will be placed within the canal.

- **Section 4(f) Considerations**. Projects requiring DOT approval or using DOT funds may trigger the applicability of a 4(f) evaluation. This project is not subject to 4(f) regulations, and a 4(f) evaluation is not required. However, although the project is not subject to Section 4(f), it is the intent of the USACE to minimize any adverse effects on 4(f) properties.

5.7.6 Planning Criteria

Corps of Engineers policy (ER 1105-2-100) requires the use of four screening criteria in the screening and evaluation of alternative plans. The criteria are acceptability, completeness, effectiveness, and efficiency. These four criteria are defined in the following paragraphs.

Acceptability is the workability and viability of the alternative plan with respect to acceptance by Sate and local entities and the public and compatibility with existing laws, regulations, and public policies. One aspect of acceptability is whether the alternative is feasible or doable with regard to technical, environmental, economic, social, or similar reasons.

Completeness is the extent to which an alternative plan includes and accounts for all necessary investments or other actions to ensure the realization of the planned effects.

Effectiveness is the extent to which an alternative plan contributes to the attainment of the planning objectives (alleviates problems and achieves opportunities). The most effective alternatives make significant contributions to all of the planning objectives. Less effective alternatives make smaller contributions to one or more of the objectives. Effectiveness is a matter of degree rather than all or nothing.

Efficiency is the extent to which an alternative plan is the most cost-effective means of alleviating problems and realizing opportunities, consistent with protecting the Nation's environment. It is a measure of allocation of resources. Cost-effectiveness is one common measure of efficiency. Both monetary and non-monetary costs are considered. Opportunity costs are also considered.

Table 28 presents the results of assessing each alternative by the planning criteria.

Table 28. Relationship of Alternatives to Planning Criteria

Alternatives	Acceptability	Completeness	Effectiveness	Efficiency
No Action	N/A	Not Complete	Not effective. Does not address objectives or provide ecosystem benefits.	N/A
Alt. 9. 3,000-Mile Bridge	Least environmental acceptability	Complete	Least effective alternative. 12,453 AAHUs	Least efficient alternative. $394/Habitat Unit
Alt 10. 4-Mile Central	Not Acceptable. Exceeds Cost CAP	Complete	Effective. 32,674 AAHUs	$311/Habitat Unit
Alt 11. 4-Mile East	Not Acceptable. Exceeds Cost CAP	Complete	Effective 28,549 AAHUs	$350/Habitat Unit
Alt 12. 3-Mile	Acceptable	Complete	Effective. 27,973 AAHUs	Most efficient alternative. $307/Habitat Unit
Alt 13. 2-Mile	Less environmentally acceptable	Complete	Less effective. 22,422 AAHUs	$318/Habitat Unit

Alternatives	Acceptability	Completeness	Effectiveness	Efficiency
Alt 14. 2-Mile & 1-Mile Bridge	Acceptable	Complete	Effective. 28,371 AAHUs	$324/Habitat Unit
Alt 15. 1.3 & 0.7-Mile Bridge	Acceptable	Complete	Less effective. 22,422 AAHUs	$337/Habitat Unit
Alt 16. Three 3,000-Foot Bridges	Less environmentally acceptable	Complete	Less effective alternative. 22,246 AAHUs	$329/Habitat Unit
Alt 17. 10.7-Mile Bridge	Not Acceptable. Exceeds Cost CAP	Complete	Most effective alternative. 51,763 AAHUs	$385/Habitat Unit

Source: USACE.

5.7.7 System of Accounts

Table 29 provides a summary of the evaluation analysis (Section 5.7) in a comparative format. It incorporates environmental impacts of Section 5.6, costs from Section 5.7.1, and habitat benefits from Appendix E.

5.7.8 CERP Compatibility

WRDA 2000 § 601(b)(2)(C) authorized raising and bridging of Tamiami Trail as an "Initial Project" of the Comprehensive Everglades Restoration Plan. It is necessary, therefore, to ensure that the Tamiami Trail Modifications project be compatible with CERP. It is a goal of CERP to increase flow through WCA-3B into ENP. Openings in the Tamiami Trail are necessary to pass the water south into NESS. The physical connection of WCA-3B to NESS would also require removal of the L-29 Levee, which is not a feature of MWD but is a feature being considered under CERP Decompartmentalization analyses.

The ENP Protection and Expansion Act authorized acquisition of the entire NESS. There is an expectation to preserve, protect, and restore the entire area acquired.

The CERP plan for Tamiami Trail included 10 sets of bridges distributed along the entire 10.7-mile-long segment to provide an even distribution of flows. The NSM predicts flows across the entire project area, with a greater proportion of the flows in the western half but a significant flow also in the eastern half. The single bridge alternatives, except the 10.7-mile skyway, do not enable the necessary distribution of flows. Constructing a bridge at one side or the other would potentially reduce the benefits to WCA-3B and ENP. Alternative 11, Four-Mile Bridge (East), would not provide for western flows. Alternative 10, Four-Mile Bridge (Central); Alternative 12, Three-Mile Bridge; and Alternative 13, Two-Mile Bridge, do not provide water and flows to the eastern half of NESS.

Alternative 14, Two-Mile Bridge West and One-Mile Bridge East; Alternative 15, 1.3-Mile Bridge West and 0.7-Mike Bridge East; and Alternative 16, Three 3,000-Foot Bridges, provide for flows at each half of the project area. Of these three, Alternative 14 would provide the most linear feet of hydraulic connectivity and the highest percent distribution of flows from the L-29 Canal to NESS

The engineering design of the bridge and reconstruction of the highway accounts for NSM-predicted flows. Because flows associated with MWD and CERP are expected to be less than those predicted by NSM, the project will be compatible with CERP.

Subsection 601(b)(2)(D) of WRDA 2000 required the Secretary of Army to review and approve a project implementation report prepared under that § 601(f) and (h), and to submit that report to the Committee on Transportation and Infrastructure of the House of Representatives and the Committee on Environment and Public Works of the Senate. Prior to any appropriations being made, subsection 601(b)(2)(D)(iv) also required completion of the project to improve water deliveries to Everglades National Park authorized by Section 104 of the Everglades National Park Protection and Expansion Act of 1989, and approval of the project implementation report by those Committees.

The report is prepared under the authority of the Everglades National Park Protection and Expansion Act of 1989 to complete the project to improve water deliveries authorized in that Act. It is not intended to be the project implementation report to implement the Initial Project in the Comprehensive Everglades Restoration Plan discussed in § 601 of the Water Resources Development Act of 2000, nor is it intended to prejudge the results of that project implementation report. That project implementation report (Water Conservation Area 3 Decompartmentalization Phase 1) will be prepared at a later date.

It is recognized that:

1. Only limited funding is provided by the Modified Water Deliveries Project for modifications to the Tamiami Trail;

2. Full restoration of natural flows to Northeast Shark River Slough (NESS) and Everglades National Park may only be accomplished through implementation of MWD Project features coupled with the restoration features of the CERP, once the seepage control features for the projected high water levels in NESS are fully mitigated;

3. Additional funding and restoration capability is authorized by CERP Decompartmentalization (Phase 1) for Tamiami Trail, subject to the constraints of WRDA 2000, and future adjustments may occur to Tamiami Trail using CERP authority and that additional features may augment the MWD project features by increasing the ecological connectivity between the Water Conservation Areas and the ENP, thereby restoring a more natural sheetflow regime to ENP.

4. Current funding levels identified for Tamiami Trail in CERP are limited.

5. Per the CERP Restudy, 9.1.7.2 “The purpose of these features {Water Conservation Area 3 Decompartmentalization and Sheetflow

Enhancement (AA, QQ and SS)} is to reestablish the ecological and hydrological connection between Water Conservation Areas 3A, and 3B, and the Everglades National Park, and Big Cypress National Preserve." 10.6.2.3 "This project is included {Water Conservation Area 3 Decompartmentalization and Sheetflow Phase-1} in the initial authorization for two reasons; (1) to provide immediate opportunities for enhanced sheetflow within Water Conservation Area 3 and between Water Conservation Area 3 and Everglades National Park and (2) to integrate with ongoing modifications that are being made in the detailed design and construction of the Modified Water Deliveries to Everglades National Park project. . . The Project Implementation Report will address the scope and method to be used for Miami Canal backfilling, conveyance improvements to the North New River Canal and, the bridging of Tamiami Trail, and L-29 modifications that are necessary to enable unrestricted flow from Water Conservation Area 3 into Everglades National Park. . These project modifications will be coordinated with the existing Modified Water Deliveries to Everglades National Park Project . . . The benefits to the project from this feature are that restoring sheetflow will reduce the unnatural discontinuities in the landscape."

6. This report is not intended to be the project implementation report (PIR) to implement the Initial Project in the CERP WRDA or prejudge the results of the PIR;

7. Final CERP features for Tamiami Trail have not yet been identified the proposed modifications will be analyzed in a public forum consistent with NEPA;

8. Without prejudging the results of the PIR required by WRDA 2000, the intent of this RGRR/SEIS is to maximize the compatibility and avoid retrofitting costs of MWD project features with future CERP features;

9. The intent of this RGRR/SIES is to have a clear design for MWD onto which a CERP design can follow;

10. Completion of the MWD project is a prerequisite to actions under CERP, and a delay in completion of MWD would delay implementation of CERP;

11. The CERP Decompartmentalization planning effort is under revision as a result of the CERP Programmatic Regulations and recommendations from the Master Implementation Sequencing Plan Team. CERP Decompartmentalization had previously been separated into two phases. In order to optimize the project for system benefits in accordance with the Programmatic Regulations, the planning effort is under revision to incorporate the Phase II components as well as other pieces of the North New River project.

Planning efforts underway for the CERP WCA-3 Decompartmentalization project for Tamiami Trail are scheduled to be completed prior to construction of modifications to Tamiami Trail under MWD. All aspects of the Tamiami Trail Modifications project are fully compatible with CERP.

5.7.9 Risk and Uncertainty

An analysis of risks and uncertainties associated with ecosystem restoration projects is required by ER 1105-2-100. In addition, risk and uncertainty are to be considered in the context of the six-step Corps planning process. General procedures are provided by IWR Report 92-R-1, *Guidelines for Risk and Uncertainty Analysis in Water Resources Planning.*

Risk is considered to apply to those situations where there is a likelihood or chance of unwanted or adverse consequences. Uncertainty is considered to be inherent in virtually all projects and applies to situations where there is statistical variability, subjective judgment, inherent randomness, disagreement, etc. (IWR 2000).

The intent of this project is to enable the conveyance under Tamiami Trail of increased water flows created by the MWD project as a step in the restoration of natural hydrologic conditions in ENP to the extent practicable. The various alternatives were developed to allow increased flows in configurations that would provide the greatest ecological benefits while preventing damage to the highway and while constrained by costs.

Efforts have been made to lower the risk of highway deterioration as higher water levels are introduced. The road design is for NSM stages, which are not expected to be exceeded by MWD or CERP stages. Geotechnical surveys were conducted to identify subsurface conditions, preliminary design was done through contracting with experienced highway engineers, and standard construction methods are planned. FDOT has reviewed and will continue to be involved in the design of the proposed project. The USACE will need a permit from FDOT for work within the FDOT right-of-way and will need full FDOT approval of design, plans, and specifications prior to beginning construction.

There is risk regarding the adequacy of flow distribution to ENP for the restoration of hydrologic conditions that would be most ecologically beneficial. This risk has been minimized by extensive coordination among hydrologists, ecologists, engineers, and environmental scientists from SFWMD, ENP, FWS, FWC, FDEP, and USACE.

Types and sources of uncertainty in this project include, but are not necessarily limited to the use of hydrologic and ecological models for determining effects of alternative actions. There is inherent uncertainty in all models that results from assumptions, approximations, statistical variation, variability, and inherent randomness. The hydrologic analysis used the CSOP West Bookend Alternative for flows within all the different bridge configurations. This was performed so that all alternatives could be compared under the same hydrologic regime and so that the effect of the bridge opening alone could be quantified.

Corps of Engineers hydrologic models are generally considered to be state-of-the-art. It is concluded that uncertainties associated with the models are low and unlikely to affect the project. Uncertainty in biological modeling is reduced through the use of experienced personnel.

A number of privately-owned parcels are located along the Tamiami Trail within northern NESS. DOI has authority to purchase all these parcels except the Airboat Association of

Florida property. Construction of the Tamiami Trail modifications requires that real estate interests, fee, or flowage interests are obtained. Without these interests, because of higher water levels, it may not be possible for the MWD project to be operated. There is a relatively high degree of risk associated with this issue.

It was found by IWR (2000) that 57 percent of ecosystem restoration projects surveyed experienced significant cost overruns or underruns. IWR noted that the differences between actual and estimated costs were associated with large, integrated restoration projects. Issues pertaining to uncertainty in ecosystem restoration costs included incomplete surveys, insufficient detailed planning, general project experience, construction window constraints, difficulty with land acquisition, escalating costs of materials, and weather conditions. While several of these items are beyond the scope of this planning document, it is felt that with the level of detail of the studies associated with this stage of the project, the costs are as representative as is practicable. More detailed and more accurate cost estimates will be determined following the preparation of plans and specifications.

Uncertainty exists with regard to the cost estimate for the pollution abatement system. The costs for this system were determined by prorating for each alternative the approximately $15,000,000 estimated cost for a four-mile bridge. The cost of this item is thought to be high, and it is expected that the cost will be reduced when more detailed engineering in undertaken.

5.8 SELECTION OF THE RECOMMENDED PLAN

Alternative 14, Two-Mile Bridge West and One-Mile Bridge East is the Recommended Plan.

A summary of costs, ecosystem changes, and social changes allows placement of the alternatives into three broad groups.

Group 1: Alternative 10 (4-mile central), Alternative 11 (4-mile east) and Alternative 17 (10.7-mile) scored the highest ecosystem benefits as measured by habitat units in Everglades National Park and produced the least adverse stage impacts in WCA-3B. These alternatives though have the greatest adverse impacts to cultural resources and businesses along the highway. They have the highest estimated costs.

Group 2: Alternatives 9 (3,000 feet), 13 (2-mile west), 15 (1.3-mile west and 0.7-mile east), and 16 (three 3,000 feet) scored the lowest ecosystem benefits as measured by habitat units in Everglades National Park and produced the greatest adverse stage impacts in WCA-3B. However, these alternatives did result in the least adverse impacts to cultural resources and businesses along the highway. They have the lowest estimated costs.

Group 3: Alternatives 12 (3-mile) and 14 (2-mile west and 1-mile east) have intermediate quantity ecosystem benefits as measured by habitat units in Everglades National Park and intermediate stage impacts in WCA-3B. They have the intermediate adverse impacts to cultural

resources and businesses along the highway. They have intermediate estimated costs.

While many non-government organizations and individuals prefer an alternative with maximum ecosystem benefits in ENP, the very high cost and large impacts prevent Alternatives 10, 11 or 17 from becoming the recommended plan.

Alternative 10, Four-Mile Bridge (Central), Alternative 11, Four-Mile Bridge (East), and Alternative 17, 10.7-Mile Bridge, are unacceptable because of high cost. The construction cost estimates for these three alternatives are so much higher than the amount budgeted for Tamiami Trail that these alternatives can not be implemented. A third party(s) would have to be identified to contribute over $150 million to implement Alternative 17. No such funding source has been identified. If a state or federal agency intended to contribute the needed funds to construct one of these costly alternatives, the process of budgeting and obtaining funds could very likely add an additional three years to the scheduled start of construction.

Additionally, 10, Four-Mile Bridge (Central), Alternative 11, Four-Mile Bridge (East), and particularly Alternative 17, 10.7-Mile Bridge, would adversely affect more of the historic businesses (Coopertown, Gator Park, Airboat Association, Everglades Safari) than the alternatives with shorter bridges. These resources are fairly evenly spaced along the highway. Shorter bridges can be placed to avoid most of these features, whereas the longer bridges cannot be located to avoid them. Alternative 17 would also place the bridge adjacent to the Tigertail Camp and the Osceola Camp of the Miccosukee Tribe of Indians. The Tribe has previously expressed opposition to this condition.

Alternative 9, 3,000-Foot Bridge, Alternative 13, Two-Mile Bridge, Alternative 15, 1.3-Mile Bridge West and 0.7-Mile Bridge East, and Alternative 16, Three 3000-Foot Bridges, are not recommended because of low ecosystem benefits, cost effectiveness concerns, and potential adverse impacts to WCA-3B. Alternatives 15 and 16 are not cost effective relative to Alternative 13, which costs less and provides more habitat units in ENP. While the cost estimates for Alternative 9 and Alternative 13 are under the DOI budget, Alternative 9 provides the lowest benefits (habitat units) of the alternatives analyzed and Alternative 13 is in the lower half of the HU produced. DOI/ENP and other agencies recognize that larger alternatives can be obtained while staying within range of the funding limits and they do not want to settle for the small alternatives.

The analysis of stage impacts in the L-29 borrow canal and WCA-3B demonstrated that stage increases to the north of the proposed Tamiami Trail bridges are proportional to the total length of the bridges (Appendix D, H&H Annex, Section 15.C.) For the shorter bridge alternatives and MWD flows, the stage in the canal would be higher than in the downstream marsh in ENP, from 0.12 to 0.28 feet for a one-year event and from 0.32 to 0.54 feet for the 100-year event. These effects are most pronounced for the shortest alternative, Alternative 9, 3,000-Foot Bridge. There would be an additional (but not calculated) stage differential between WCA-3B and the canal as water is passed through the structures in the L-29 levee. This would create higher stages and longer durations for WCA-3B, which has a direct impact on the sustainability of tree islands, and may also continue adverse effects on nesting success of snail kites in WCA-3A, where adversely long high water stages are believed to have led to a progressive loss of snail kite nesting habitat. Tree islands are a highly valued resource in WCA-3B and elsewhere. Current wet season water stages and durations in WCA-3A are considered too high and too

long. Tree islands in much of the South Florida ecosystem are disappearing at a rapid rate. High water levels are one of the main factors stressing tree islands, and alternatives that would induce high stages or keep water levels high for a longer duration are to be avoided.

The two remaining alternatives, Alternative 12, Three-Mile Bridge, and Alternative 14, Two-Mile Bridge West and One-Mile Bridge East, are attractive alternatives that were considered for recommendation. Both alternatives avoid most of the adverse effects on cultural resource, businesses, and Tribal communities, and the high costs of alternatives 10, 11, and 17. These two alternatives avoid the negatives of the limited ecosystem benefits in ENP, cost effectiveness concerns, and stage impacts in WCA-3B associated with Alternatives 9, 13, 15, and 16.

Habitat Units and Performance Measures. Average annual habitat units within ENP provided by alternatives 12 and 14 are similar, with Alternative 14 (28,371) providing more than Alternative 12 (27,973). Average annual costs for Alternative 14 ($9,180,431) are also higher than Alternative 12 ($8,579,230). According to the Cost Effectiveness Analysis, both plans are cost effective means to obtain habitat units. The Incremental Cost Analysis shows that Alternative 12 is the smallest best buy plan while Alternative 14 is not a best buy plan. Best buy plans are plans with lowest unit cost per increment of benefit. Alternative 10, a larger plan than Alternative 14 and too expensive to implement, is the second best buy plan. However, CE/ICA is not the only factor considered during selection of a plan. Additional details and factors for these two alternatives are considered below.

Alternatives 14 and 12 have the same values for the vegetation and wildlife performance measures, but they have different values for the hydrologic and ridge and slough performance measures. Alternative 14 has higher values for the east-west distribution of flows, for hydration of deep sloughs, and for connectivity. These performance measures are sensitive to the distribution or location of the bridges across the project area, and they apply to the entire 63,195 acre area that would receive benefits. Alternative 12 has higher values for acres with velocity greater than 0.1 feet per second and for the difference in velocity at the bridge and the marsh. These velocity measures are sensitive to the length of bridge rather than distribution, and the velocity measures apply only to a relatively few acres in the project area.

Consistency with CERP. Alternative 14, with a bridge in each half of the project area, would better match the intent of the CERP plan for Tamiami Trail than Alternative 12, with a bridge in only the western half of the project area. The CERP plan (Comprehensive Review Study, April 1999, in volume 3 Plan Formulation - Appendix A page A4-33 describes the recommended plan for Tamiami Trail, in addition Volume 4 Appendix C page C-A-38 MCACES describes the cost estimate for this component) for this section of Tamiami Trail called for ten 100-foot bridges, a total of 1,000 feet of opening. Subsequent analysis, including the analysis discussed in the present Report's Engineering Appendix, appears to indicate that a total opening of only 1,000 feet, in the aggregate, would be insufficient to reduce velocity changes and stage elevation effects discussed herein. The proposed 100-foot bridges would be spaced equally along the 10.7 miles between S-333 and S-334 (project area). This distribution suggests an expectation that water would be distributed across the project area evenly rather than only at one end. Both alternatives would raise the remaining road sufficiently high that any foreseeable CERP water stages and flows would not damage the road foundation or

overtop the road; but in fact the two bridges of the preferred Alternative (Alt 14) would not only provide conveyance for anticipated CERP flows; they go beyond the "Review Study" recommended plan in the sense that they provide much greater conveyance centered on the two known deeper sloughs along the 10.7-mile stretch of eastern Trail.

Connectivity. Most of the Combined Structural and Operational Plan for Modified Water Deliveries Project and C-111 Canal Project (CSOP) alternatives, including Alternatives 2, 4, and 5, propose construction of three new weirs in the L-29 levee. Two weirs would be placed in the western half of the TTM project area, and one weir would be placed in the eastern half. These weirs were proposed independently of the development of the alternatives developed for modifying the Tamiami Trail. It would be more effective and increase ecological connectivity between WCA-3B and NESS if the bridge openings in Tamiami Trail closely aligned with the openings in the L-29 canal. Alternative 14 with a bridge in the west and east is a much better fit than Alternative 12, which provides a bridge only in the west.

Providing an eastern bridge provides better ecological connectivity with southeastern WCA-3B when the proposed eastern conveyance through the L-29 Levee is constructed and additional connectivity as CERP (Decompartmentalization) removes of the L-29 Levee (or increase the conveyance and connectivity by the installation of additional conveyance). Specifically, two bridges will provide both eastern and western ecological connectivity from WCA-3B to NESS when or if the L-29 Levee is degraded. The only connections between the L-29 Canal and ENP provided by Alternative 12 along the seven miles from eastern end of the three-mile-long bridge to the L-31N Canal would be through culverts. With the two bridges provided by Alternative 14, the longest distance to a bridge opening would be less than three miles.

Stage in WCA-3B. Alternative 14 provides a minor reduction in the stages in southeastern WCA-3B relative to Alternative 12 by increasing the discharges from southeastern WCA-3B and by shortening the distance from the proposed eastern L-29 Weir to a bridge opening.

Deeper Sloughs. According to available topography, deeper sloughs of NESS occur at both the eastern and western portions of the project corridor, not just in the western half. Without barriers, the preferential flow would be through these deeper sloughs. Connection provided by bridges aligned with the deeper sloughs facilitates increased flow where it would occur preferentially. During dry conditions, these sloughs would maintain water for the longest time, have a more natural recession rate, and function as refuges for fish and wildlife. The two bridges of Alternative 14 are more effective than the single bridge of Alternative 12 in maintaining hydration of the deep sloughs on the eastern half of the area. During wet conditions, the preferential flows in the deeper sloughs would be more likely to have sufficient velocity to redevelop and maintain open water vegetation.

Flows in the NSM. According to the Natural System Model output, the flows through NESS originated east of the L-30 levee and canal and flowed southwesterly toward the eastern half of the project area. There were significant flows in the eastern half of the project area. Alternative 14, with its eastern one-mile bridge, would better enable the return of flows to this area than Alternative 12, which has no bridge in the area but only the existing culverts that would remain.

Flows with the C&SF Project. Alternative 14 matches better than Alternative 12 the hydraulic data and predictions that take into account the existing levees, canals, and structures of the area. Historical data for flows under Tamiami Trail in the 1940s, after construction of some of the flood protection and drainage features that are now included in the C&SF project cut off the easternmost section of the Everglades, suggest that more water flowed in the western half of the project area than in the eastern half. However, a substantial amount, one-third of the total flow, went in the eastern half. Model output for the 10.7-mile alternative under existing conditions also suggests that two-thirds of the flows are through culverts are in the western half of the project area, while one-third of the flows are through culverts in the eastern half. The two-to-one split of the bridge length in Alternative 14 matches these flows better than Alternative 12. Locating one-third of the bridge length east of Tigertail Camp provides a flow to the eastern area similar to what would be provided by a full length bridge.

Social Impacts. Alternative 14 would produce fewer adverse social impacts than Alternative 12. It is not possible to avoid impacts to businesses, towers, the Airboat Association, and the Miccosukee Camps with a three-mile-long bridge. The developed sites are closer together than three miles, particularly in the western half of the project area. With a three-mile-long bridge, at least two, and for most locations three developed sites would have a bridge constructed in front. With a two-mile-long bridge, there is the potential to avoid placing a bridge in front of one or two developed sites. A one-mile bridge in the eastern half of the project area can be located to avoid all developed sites.

Authority. Since Congress authorized the protection and expansion of the Everglades National Park in 1989 and ordered a project to restore the hydrology of the area to the extent practicable, the Federal government has purchased almost all of the approximately 107,000 acres of land authorized. This Tamiami Trail Modifications study is one part of the Modified Water Deliveries project. It could be concluded that because these lands were specifically identified for acquisition, they are important enough that they all should merit having their hydrology restored rather than only some of the lands. Alternative 14, with its two bridges, would better send water to both halves of the Everglades Expansion area than would Alternative 12. Alternative 14 would not abandon or orphan a large portion by not providing flow. Alternative 14 would provide needed flow to the eastern portion of NESS both to prevent additional impacts and provide restoration to the portions of ENP along L-31N Canal.

Agency Support. A number of key agencies support the selection of Alternative 14, including the DOI, SFWMD, FDEP, and FWC. These agencies submitted letters supporting Alternative 14 after their review of the Draft RGRR/SEIS. The alternative recommended in the Draft Report is the same as recommended in this Final Report – Alternative 14, Two-Mile Bridge West and One-Mile Bridge East.

Summary. Table 29a provides a summary display of the comparison of Alternatives 12 and 14 for the criteria discussed in the text of Section 5.8. Alternative 14 has twelve "✓" while Alternative 12 has only four "✓".

Table 29a. Comparison of Alternatives 12 and 14

Criteria	Alternative 12 3-Mile Bridge	Alternative 14 2- Mile Bridge West and 1-Mile Bridge East
Habitat units produced		✓
Cost Effective (yes/no)	✓	✓
Best Buy (yes/no)	✓	
Consistency with CERP		✓
Connectivity – CSOP Weirs		✓
Connectivity – Eastern WCA-3B		✓
Connectivity – Western WCA-3B	✓	✓
Stage in WCA-3B	✓	✓
Hydrate the two deeper sloughs		✓
Flow locations of NSM		✓
Flow locations with C&SF – 1/3 east		✓
Potential to avoid Everglades Safari		✓
Authority – hydrate the lands purchased		✓

Note: A "✓" indicates that the alternative produces higher or preferred value for the criterion or that the alternative meets the condition for a yes/no criterion.

SECTION 6.0
RECOMMENDED PLAN

ALTERNATIVE 14: EXISTING ALIGNMENT - RAISED PROFILE WITH TWO-MILE BRIDGE WEST AND ONE-MILE BRIDGE EAST

6.1 DESCRIPTION

The Recommended Plan would create two conveyance openings through Tamiami Trail by removing up to three miles (cumulative) of the existing highway, embankment, and associated culverts.

One bridge would be constructed over each opening to replace the removed section of road and maintain motor vehicle traffic. The opening and bridge for the eastern bridge would start approximately one mile west of S-334 and proceed west approximately one mile, ending approximately 3,000 feet east of (before) Radio One. The western bridge would start approximately 1,200 feet west of the S-12 Telemetry Tower and proceed west approximately two miles, ending approximately 2,640 feet east of (before) the Osceola Camp (Figure 18).

The western two-mile bridge of the Recommended Plan would result in the removal of the S-5, S-7, and S-9 culvert sets (a total of nine culverts). The proposed eastern one-mile bridge span would result in the removal of the S-16 and S-17 culvert sets (six culverts). Construction of the bridges and bridge approaches would reduce the number of culverts sets from 19 (55 individual culverts) to 14 (40 individual culverts). The remaining culverts will require lengthening to extend beyond the widened roadway.

The bridges would provide two 12-foot-wide travel lanes with 10-foot shoulders and outside barriers.

As part of the Recommended Plan, the unbridged roadway would be reconstructed to provide a raised profile. The reconstructed roadway would consist of two 12-foot-wide travel lanes and a ten-foot-wide shoulder on each side of the roadway. Five feet of this shoulder would be paved.

Guardrails would be located at the outside edges of these shoulders. The profile would be raised significantly for transitioning to the bridges and would be established per applicable drift, maintenance, and navigation bridge clearances, while minimizing humps in the profile.

Detailed descriptions of the Recommended Plan with accompanying drawings, costs, and schedules are located in Appendix D.

6.2 ACCESS TO EXISTING FACILITIES/SITES

The Flight 592 Memorial, located north of the L-29 Canal near the western limits of the project, would not be impacted with this alternative. Access to the S-333, S-334, and S-336 structures, the Osceola Camp, the Tigertail Camp, the Airboat Association of

Florida, businesses, and other existing sites and facilities located along the roadway portion of the project would be retained. Access to Everglades Safari Park and the Jefferson Pilot communications site will be further evaluated during the Planning, Engineering, and Design (PED) phase of the project.

6.3 DRAINAGE/TREATMENT OF STORMWATER RUNOFF

The grassed side slopes directly adjacent to the existing roadway provide some limited treatment of highway runoff as described in Section 5.6.3 of this report. The reconstructed roadway will replace grassed side slopes lost as a result of construction.

The proposed bridges would increase the total impervious surface area (within the bridge footprint), but would have no practicable means of providing grassed shoulders or traditional swales for treatment of stormwater. Therefore, it would be necessary to provide a means to collect and trap contaminants from stormwater runoff (treatment of first flush) from the proposed bridges prior to discharge. There are a number of BMP sediment removal technologies on the market that would target removal of sediments and gross pollutants from stormwater runoff while minimizing wetland impacts. The USACE, in coordination with FDEP and FDOT, is considering incorporating into bridge design the CSR Stormceptor®, an inline stormwater separator that removes sediments and hydrocarbons from stormwater runoff. The Stormceptor® consists of two chambers; a bypass chamber and a treatment chamber. The new bridge decks would include drains that connect to a drainage collection and distribution system that would subsequently connect to Stormceptor® units. A description of the collection and treatment system is located in Section 5.6.3.

The estimated cost of the pollution abatement system, which is included in the total construction cost, is based on prorating a cost estimate for a four-mile bridge. It is anticipated that the cost, which is likely excessive, will be reduced when more detailed engineering designs are prepared.

Roadway and bridge specifications will continue to be coordinated with FDEP and FDOT as they are developed.

6.4 UTILITIES

The placement of utilities within the highway right-of-way is through permits issued to utility companies by FDOT. Utilities within the corridor that would be affected by the new construction include buried telephone facilities beyond the guardrails north and south of the roadway, fiber optic cables, and a 23 kilovolt overhead electric line about 100 feet south of the guardrail. All utilities within the typical section would require relocation. The Corps will work with FDOT to address these relocations during PED.

6.5 MAINTENANCE OF TRAFFIC DURING CONSTRUCTION

Existing traffic flow would be maintained with one lane of travel in each direction. The overlay of the existing roadway would be accomplished using a moving operation. For the proposed bridges, the existing traffic would be shifted to the northern shoulder to provide the necessary area for construction.

6.6 REAL ESTATE

The Federal Government and FDOT will enter into an agreement known as a Relocation Agreement. The compensation to FDOT for the real estate rights needed for the construction, operation, and maintenance of the Tamiami Trail project will be the construction of the two bridges and relocation and raising the existing road. The appropriate organizations at the Federal and State levels will develop and approve an agreement containing the details and method of implementation. The agreement will be finalized during development of the construction Plans and Specification (P&S) for the final approved plan.

It is the intention of the Federal Government not to expend any more funds than necessary to construct alternate facilities for the Tamiami Trail that a future project under CERP may impact.

FDOT has communicated with, and has been assured by the USACE that the USACE will design, obtain environmental permits for and construct the improvements needed to both the bridged and unbridged portions of the Tamiami Trail as a result of anticipated impacts to the highway due to increased water elevations caused by operation of the MWD project.

Real estate requirements and issues are discussed in the Real Estate Appendix (Appendix H) and will be further developed during the Planning, Engineering and Design (PED) phase of the Project. A supplement to the Real Estate Appendix will be produced during PED.

6.6.1 Lands and Easements

The footprint of the Recommended Plan falls generally within the maintenance right-of-way of the existing roadway, and ownership is claimed by FDOT. This ownership claim is partially overlapped on the northern side of the roadway by SFWMD's right-of-way claim along the L-29 Canal. Such an overlap is fairly common when a roadway parallels a canal, and in the past has been resolved through the exchange of quit claims between agencies to establish a contiguous right-of-way boundary shared by the two agencies. In some areas, SFWMD holds only flowage easements and fee title is held by approximately two dozen private landowners. Most of the private holdings involve large tracts, but a few are as small as two acres.

Additional lands required for the project footprint are located south of the Tamiami Trail. With the exception of the Airboat Association of Florida, acquisition of these lands was authorized by the Everglades National Park Expansion and Protection Act of 1989, PL 101-229. During PED, the USACE and DOI will determine whether and what type interests to acquire in the remaining privately owned properties located within the boundaries of the Everglades National Park Expansion Area. Acquisition of the remaining private lands within the Everglades National Park Expansion Area will be performed either by USACE and DOI. This will be determined during PED and documented in the supplement to the Real Estate Appendix. If DOI acquires the remaining private lands, prior to construction, DOI will certify to the USACE the right to construct on lands located within the project footprint. Once construction is complete, DOI or the USACE will convey a perpetual road easement or an equivalent easement to FDOT for lands within the right-of-way. If USACE acquires the remaining private lands, all lands not required for the road right-of-way will be transferred by USACE to DOI to

become a part of the Park. The USACE will acquire the necessary interests in the Airboat Association of Florida parcel required for the Project, which will be determined during PED, and will convey the necessary interests to FDOT for operation and maintenance of the road. For purposes of this report, associated real estate costs have assumed the worst case scenario, which would be the acquisition of the fee simple title to the remaining private lands within the Everglades National Park Expansion Area. During PED, the necessary interests in these lands will be determined. DOI is in the process of preparing a Long Term General Management Plan to address these remaining lands, however, it will not be completed prior to initiation of construction of this Project. Therefore, the interest necessary for construction, operation and maintenance of this Project will have to be acquired in advance of completion of the Long Term General Management Plan.

6.6.2 Construction Relocations

Relocation under Public Law 91-646 may arise with the parcel of land owned by the Airboat Association of Florida. A caretaker currently lives on the property with his family. As such, there is a possibility that the caretaker and his family may have to be relocated as “tenants” under P.L. 91-646, if the first floor elevation is not sufficiently elevated above the anticipated flowage easement requirements.

Relocation impacts under Public Law 91-646 to the remaining private lands within the boundaries of the Everglades National Park Expansion Area, including the Everglades Safari Park, will be addressed during PED.

6.6.3 Public Highways and Bridges

There are no additional non-project-related relocations of public highways or bridges affected by the alternatives under consideration.

6.7 OPERATIONS AND MAINTENANCE

The Non-Federal Sponsor (SFWMD) will be responsible for maintenance of the conveyance area and the culverts as part of the project cost sharing agreement. Maintenance of the conveyance will also require maintaining the L-29 Canal from S-333 to S-334 free of aquatic weeds to prevent a reduction in conveyance capacity.

FDOT will be responsible for maintaining the pollution abatement system, bridges, and roadway.

Features identified as public highway relocation and flowage easement compensation are two bridges and the raising of the roadway. The USACE will assume all responsibility for completing appropriate NEPA analysis and processes, acquiring all necessary environmental permits, designing and constructing the proposed bridge structures and remaining roadway with raised profile. O&M for the bridges and the roadway is not the responsibility of the Non-Federal Sponsor because the compensation to FDOT is the provision of the substitute facility. Responsibilities of the Non-Federal Sponsor include cost-sharing, records maintenance, and assisting in managing the project in a manner consistent with applicable Federal and State laws and regulations, including the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), 42 USC 9601-9675.

The necessary evaluation and analysis of the Recommended Plan occurred under Section 404 of the Clean Water Act by which the USACE can authorize the issuance of a permit to FDOT for the maintenance of the substitute facility constructed by the USACE and transferred to FDOT.

6.8 CONSTRUCTION AND LIFE CYCLE COSTS

Appendix J provides the MCACES Gold cost estimate for constructing the Recommended Plan. Table 30 summarizes those costs. Construction costs include the estimate for a full water treatment system as described in Section 5.6.3. Agencies are coordinating to develop a less costly system. Table 31 presents revised values for all costs.

6.9 COST SHARING

A Project Cooperation Agreement (PCA) or a PCA amendment will be required between the USACE and the South Florida Water Management District, the non-Federal sponsor. The PCA is a legally binding document between the Federal Government and the local sponsor identifying the sponsor's duties and obligations for this project. However, in accordance with current Federal policy, the PCA cannot be executed until construction funds for the project have been appropriated.

Table 30. Refined Construction Cost Estimate for the Recommended Plan. MCACES print date 11 August 2005, effective date 10 August 2005

Roadway	$48,680,000
Bridge (1-mile)	$20,504,000
Bridge (2-mile)	$41,034,000
Drainage System (1-mile)	$2,323,126
Drainage System (2-mile)	$4,646,708
Utilities Relocation Coordination	$50,000
Disposal Fees (1-mile)	$137,000
Disposal Fees (2-mile)	$274,000
Disposal Old Road Bed (1-mile)	$2,486,000
Disposal Old Road Bed (2-mile)	$4,971,000
Total	$125,106,000

Source: USACE.

Table 31. Revised Values for All Costs

Real Estate Cost (DOI)	$13,864,000*A
Construction Cost (From Table 30)	$125,106,000
PED & EDC (6%)	$7,506,360
S/A (8%)	$10,008,480
Total Construction	$142,620,840
Real Estate	$1,511,000*B
Initial cost	$144,131,840
Interest	
IDC Construction	$11,247,206
IDC Real Estate	$266,497
Total Investment	$155,645,543
Average annual costs	
Interest and Amortization	$8,690,947
Operation and Maintenance	$18,602
Total Annualized Cost	$8,709,549

Note: Period of Analysis is 50 years; discount rate of 5.125%
Source: USACE.
*A. Real Estate Costs of $13,864,000 is the current estimate for acquisition of lands or interests in the remaining lands within the Everglades National Park Expansion Area to be completed by USACE or DOI. It assumes the worst case scenario of the acquisition of fee simple title to all these lands. These lands were authorized for acquisition by DOI, therefore these costs are not included in the costs associated with the Tamiami Trail Project. These funds will be provided by DOI. More details will be developed during PED.
*B. Real Estate cost of $1,511,000 is the current estimate for acquisition of lands or interests in the Airboat Association of Florida, which includes acquisition costs and associated administrative costs. More details will be developed during PED to determine the interest required over this land.

Section 104(a)(3) of the Everglades National Park Protection and Expansion Act, PL 101-229, authorized construction of the project based on "the environmental benefits to be derived by the Everglades ecosystem in general and by the park in particular." Construction cost would be 100% Federal. Operation, Maintenance, Repair, Replacement and Rehabilitation (OMRRR) costs shall be not more than 75 percent Federal. These costs are consistent with staff agreements previously reached between the Office of Management and Budget and the Assistant Secretary of the Army (Civil Works).

Acquisition of lands for ENP expansion shall be in accordance with the Everglades National Park Protection and Expansion Act, PL 101-229, and cost-shared between the Department of the Interior and the State of Florida.

Table 32 provides a breakdown of the Federal and Non-Federal cost sharing for elements of the project.

Table 32. Federal/Non-Federal Cost Sharing

Initial Cost	Total	Federal	Non-Federal
Construction/PED/S&A	$142,620,840	$142,620,840	$0
Real Estate*(a)	$1,511,000	$1,511,000	$0
Total Project Costs	$144,131,840	$144,131,840	$0
Real Estate Costs (DOI) *(b)	$13,864,000	$13,864,000	$0
OMRRR			
Conveyance features	$18,602	$13,951	$4,651

*(a). Real Estate cost of $1,511,000 is the current estimate for acquisition of lands or interests in the Airboat Association of Florida, which includes acquisition costs and associated administrative costs. More details will be developed during PED to determine the interest required over this land.
*(b). Real Estate Costs of $13,864,000 is the current estimate for acquisition of lands or interests in the remaining lands within the Everglades National Park Expansion Area to be completed by USACE or DOI. It assumes the worst case scenario of the acquisition of fee simple title to all these lands. These lands were authorized for acquisition by DOI, therefore these costs are not included in the costs associated with the Tamiami Trail Project. These funds will be provided by DOI. More details will be developed during PED.
The specific requirements of local cooperation will be prescribed by the MWD PCA and will comply with the following general guidelines:

> *Maintain and operate the works after completion in accordance with regulations prescribed by the Secretary of the Army, except for the water control structures and outlets in Water Conservation Area No. 3, which will be maintained and operated by the Corps of Engineers.*

6.10 PROJECT IMPLEMENTATION

The Final RGRR/SEIS for Tamiami Trail will be provided to the staff of the Non-Federal Sponsor, SFWMD, and a Notice of Availability will be published in the Federal Register. The following steps will take place prior to full implementation of the selected plan:

- To comply with the NEPA process, the formal public comment period for the Final RGRR/SEIS will be 30 days. Availability will be noticed in the Federal Register, and the comment period will begin upon the date of FR publication. Additionally, the documents will be posted on the Jacksonville District, USACE Environmental website during the comment period.

- After the close of the comment period for the Final RGRR/SEIS, approximately 30 days will be required to compile responses to comments and prepare the draft

Record of Decision. The Non-Federal Sponsor will present the Final GRR/SEIS to the SFWMD Governing Board. The Governing Board is expected to issue a letter indicating support if they accept the project.

- The Record of Decision (ROD) package, consisting of the FGRR and FEIS, comments, responses, District recommendations, and draft ROD, will be transmitted to the USACE regional and Headquarters offices for approval. As a matter of routine, the USACE will notify interested parties (generally, commenters on the FEIS) when the ROD is signed, and include a photocopy of the ROD in the letter of notification.

- Once the ROD is signed, a Project Cooperation Agreement Amendment will require approximately 120-180 days for execution with the Non-Federal Sponsor, SFWMD.

If the Recommended Plan is approved, design and construction would be completed approximately four years following the signing of the ROD. The duration of construction of the Recommended Plan is approximately 36 months.

6.11. RESTRICTIONS ON FUTURE ACTIONS

It is neither the objective nor the intent of the selection of the Recommended Plan to restrict or inhibit any future actions in the project area. Although the Recommended Plan should minimize any retrofit required for implementation of CERP objectives, the Recommended Plan does not preclude any future modification, retrofit, or removal of any structure or facility associated with the modification of Tamiami Trail if such action is necessary to promote the hydrologic restoration of ENP and the South Florida ecosystem.

SECTION 7.0
ENVIRONMENTAL EFFECTS OF THE RECOMMENDED PLAN

7.1 INTRODUCTION

The Recommended Plan, Alternative 14, Two-Mile Bridge West and One-Mile Bridge East, consists of modifications to approximately seven miles of the roadway by increasing the existing profile to allow for MWD flows and of constructing two bridges to facilitate conveyance of the flows from the L-29 Canal on the north side of Tamiami Trail to NESS on the south side of Tamiami Trail. Temporary impacts resulting from construction would consist of noise and some slowing of traffic on the existing road during construction periods.

7.2 GEOLOGY AND SOILS

Various alternatives involve the movement of soils, driving of piles, or making shallow excavations into the limestone bedrock. Although limestone excavation increases the bedrock's surface area-to-volume ratio and the leaching effects of groundwater, none of the action alternatives will involve operations on a large enough scale to affect either the geological conditions or the soils along the Tamiami Trail. No prime or unique farmlands occur in the project area.

7.3 WATER MANAGEMENT

The MWD program would enable the restoration of more natural water flows from and to ENP. The Recommended Plan involves the removal of a portion of the existing Tamiami Trail embankment to facilitate that flow without causing deterioration of the roadway. The retention of the existing culvert system would promote an even distribution of flows across the project area. The net effects of the project would be beneficial.

7.4 WATER QUALITY

Except for temporary adverse impacts associated with construction, the Recommended Plan, which would include a pollution abatement system for bridge stormwater runoff, would have no direct effect on the surface water quality of the L-29 Canal or ENP. Removal of fill and pavement on the section of roadway to be replaced by the bridge could lead to temporary and localized increases in turbidity during fill removal. All appropriate highway safety and sediment-control measures would be incorporated into construction plans and specifications to avoid or minimize these effects.

The Recommended Plan would have no direct effect on groundwater.

There is an existing WQC/permit for portions of the MWD project. The USACE would seek modifications to the existing permit for the road/bridge and the conveyance channel. Applications for modifications will be submitted when an appropriate level of detail exists regarding project design and environmental impacts.

7.5 HAZARDOUS, TOXIC AND RADIOACTIVE WASTE

The preliminary assessment indicated that no HTRW or other harmful substances are known to have impacted the project area. However, if contaminants are found during property procurement or project construction, the site would be remediated before construction re-commenced in that location.

7.6 ENVIRONMENTAL RESOURCES

7.6.1 Everglades National Park

The Recommended Plan would promote the hydrologic restoration of ENP by providing the passage of MWD design high water in the L-29 Canal. The effects of the project would be of a beneficial nature.

7.6.2 Shark River Slough East and West Basins

The Recommended Plan would enable the conveyance of MWD design flows to NESS. Project implementation would reduce the risk of ridge and tree island peat burning through the restoration of hydrology. Flows would be distributed through a two-mile hydraulic opening and a one-mile hydraulic opening, with the remaining culverts under Tamiami Trail assisting in promoting an even distribution of flows from the L-29 Canal to ENP.

7.6.3 Water Conservation Area 3B

The Recommended Plan would be constructed across the L-29 Levee and the L-29 Canal from WCA-3B. The project would reduce prolonged inundation in WCA-3B.

7.6.4 Biological Communities

The project would have beneficial impacts on biological communities.

Ecological connectivity between the L-29 Canal and ENP would be enhanced by construction of the two bridges. Additionally, the Recommended Plan provides an opportunity for integrating the bridges into a corridor-wide raised facility or as a part of a multi-bridge system to minimize retrofit when implementing aspects of CERP. Although there are no specific provisions made to reduce wildlife mortality, the bridge spans are anticipated to provide some reduction in mortality of wildlife crossing the Tamiami Trail, particularly at the eastern bridge where the 2003 FWS wildlife mortality survey revealed the highest incidence of mortality along the project.

7.6.5 Wetlands

The Recommended Plan would provide an overall benefit to wetlands in the project area.

As discussed in Section 5.6.5.5, the Recommended Plan would involve a permanent loss of approximately 21.9 acres of wetlands, which would be incorporated into highway right-of-way. An additional 17.1 acres would be lost under the bridges due to shading, for a total wetland loss of approximately 39 acres. However, with the removal of highway

embankment, approximately 27.3 acres of wetlands would be restored. The net loss would be approximately 11.8 acres. These determinations were calculated based on preliminary engineering drawings for the project, with the assumption that all properties south of the highway were wetlands. The purpose of the calculations was to compare alternative actions.

To determine the effects of the Recommended Plant on wetlands more accurately, Geographic Information Systems (GIS) technology was used to compare the construction footprint of the Recommended Plan to the Florida Land Use, Cover, and Forms, Classification System (FLUCCS) database. Results showed that new construction would fill or otherwise affect the following land uses:

Water	0.3 acres
Mixed Wetland Hardwoods-Mixed Shrubs	7.8 acres
Freshwater Marshes	10.3 acres
Freshwater Marshes-Sawgrass	2.5 acres
Spoil Areas	0.1 acres
Roads and Highways	19.3 acres

Differences in total area affected (40.3 acres from the GIS determination vs. 39 acres from the calculations based on engineering drawings) approximate each other and are due to the different methodologies used.

The FLUCCS analysis indicates that in addition to 0.3 acres of open water being affected by the project, the Recommended Plan would result in a loss of 20.6 acres of wetlands due to either fill or shading by bridges. With the restoration of 27.3 acres of wetlands from removal of the highway embankment, there would be a net gain in 6.4 acres of wetlands from construction of the Recommended Plan.

The additional bridge conveyance and water distribution associated with this project would enable the restoration of approximately 109,000 acres of wetlands of NESS within ENP.

In addition to the restoration of wetlands through the removal of embankment, implementation of the Recommended Plan would improve wetland habitat in ENP through the restoration of deep sloughs in NESS and the promotion of distribution of sheetflow.

Construction of the Recommended Plan would enable the removal of a 10-to-30-foot-wide, 10-mile long strip of exotic vegetation from the south side of the roadway. By restoring water deliveries to ENP and ridge and slough processes, the invasion of exotic woody vegetation would be further minimized.

7.6.6 Threatened or Endangered Species

The Recommended Plan has been evaluated for its impacts to threatened and endangered species as well as to the Frog City wading bird colony on the north side of the L-29 Levee. Consultation with the USFWS under provisions of the Endangered Species Act is on going. The Corps' Biological Assessment (Appendix K) provides an assessment of potential effects of the Recommended Plan on listed species, which the USFWS agrees could occur in the project area.

The USFWS has determined that formal consultation under Section 7 of the Endangered Species Act will be necessary to assess the effects of habitat loss on the Florida panther. Under the recent panther consultation protocols, any loss of habitat greater than five acres in the primary habitat zone must undergo formal consultation.

The USFWS has informally agreed with the Corps' determination that none of the remaining species is likely to be adversely affected by the Recommended Plan as described in the Biological Assessment. A Biological Opinion will be issued by USFWS prior to signing of the ROD.

7.7 CLIMATE

No effect on climate would result from implementation of the Recommended Plan.

7.8 AIR QUALITY

The Recommended Plan is predicted to have little impact on baseline, future without project air quality in the project area. Although construction associated with the project was not addressed in the 2003 GRR/SEIS, and although there would likely be minor, short-term air quality impacts in the form of dust from earthwork and other construction activity, such impacts would be minimized by adherence to state and local regulations and to FDOT's *Standard Specifications for Road and Bridge Construction*.

7.9 RECREATION

Impacts to recreation would be minor.

Access to boat ramps via S-333 and S-334 would not be affected. No effect on bank fishing access to the north bank of the L-29 Canal is anticipated.

Bank angling losses at the bridge locations on the south side of the canal would be more than compensated for by the north side of the canal, which would not be impacted by the project and would provide a safer location away from traffic. However, access to the north side of the canal via the unpaved road is not as convenient as via the paved highway. On the south side of the highway, only culvert fishing is possible because there is no other open water. These locations will be decreased where bridges replace culverts. However, indications are that the existing 19 culvert sites are not nearly saturated with anglers.

Although the use of shoulders for temporary lanes would preclude parking on roadsides in the construction area, a method of "rolling construction" would be employed, and impacts from construction would be localized. Bank fishing from the Tamiami Trail would not be available at construction sites during the 36-month construction period. After the completion of construction, bank fishing from the roadway in the L-29 Canal at culvert outfalls could resume fully. Because the roadway embankment would be removed from bridge locations, there would be a net loss of bank fishing opportunity.

7.10 CULTURAL RESOURCES

A cultural resource assessment survey resulted in the identification of four historic resources:

- Coopertown Airboat Rides and Restaurant;
- Airboat Association of Florida Site;
- Tamiami Trail; and
- Tamiami Canal.

The Recommended Plan would result in bridging portions of the Tamiami Trail, removing of the existing highway embankment where the bridges are built, and reconstruction of the remaining highway. However, both the highway and its alignment have received modifications and relocations throughout its history. There would be no adverse impacts on the Coopertown Airboat Rides and Restaurant, the Airboat Association of Florida site, or the Tamiami Canal (L-29 Canal). Results of the cultural resources survey were coordinated with the SHPO in the 2003 document. Copies of the correspondence are included in Appendix C.

Construction of the proposed project would comply with the provisions of *Chapter 872, Florida* Statute (872*.05)* and NAGPRA.

7.11 AESTHETICS

The removal of exotic vegetation on the south side of the Tamiami Trail would be necessary for construction to take place. Therefore, the project would enhance the aesthetic quality of the area by offering a view of the expanse of the Everglades throughout the length of the project corridor.

7.12 NOISE ENVIRONMENT

The Recommended Plan is predicted to have little or no impact on the baseline, future without project, noise environment at the two sensitive receptor sites comprised of permanent residences: the Osceola and Tigertail camps. The Recommended Plan is also predicted to have no impact on the Flight 592 Memorial. Construction and vibration noise generated during project construction would cause temporary impacts through increased noise levels near the receptors. Avoidance and/or mitigation options will be developed during the project development and design phases and specified in construction plans in accordance with FDOT's *Standard Specifications for Road and Bridge Construction*.

7.13 TRANSPORTATION

Implementation of the Recommended Plan would not increase or decrease traffic on the Tamiami Trail. Reconstruction of the roadway would eliminate undulations and cracks in the highway surface and improve the drivability and safety of the road.

The highway would remain available for evacuation during hurricane season, and improvements made through implementation of Alternative 14 would improve safe travel of motorists during evacuation scenarios in the future.

Access across the L-29 Canal to the Tigertail Camp by the pedestrian bridge would remain. However, when highway construction takes place at the parking area associated with the bridge, it may temporarily interfere with the use of the bridge. If the

highway shoulder is used for temporary lanes, roadside parking would be restricted, and access to the bridge may be limited. Access to the Tigertail Camp by the road along the L-29 Levee would remain.

Although a Section 4(f) evaluation is not required, Alternative 14, Two-Mile Bridge West and One-Mile Bridge East, would comply with the intent of Section 4(f) and would not adversely impact 4(f) properties. Implementation of the Recommended Plan would improve publicly owned parks in the project area through providing MWD flows to ENP.

7.14 TRIBAL LANDS

There would be no direct impacts on tribal lands. Access would be provided to both the Tigertail Camp and the Osceola Camp.

7.15 ECONOMICS/SOCIOECONOMICS

No significant impacts on socioeconomic conditions are anticipated.

The effects by the Recommended Plan on other segments of the local economy were evaluated using IMPLAN, a regional impact model (Section 5.6.14). Using U.S. Department of Commerce and Bureau of Labor Statistics information, this model measure the effects of three types of impacts: direct, indirect, and induced. The IMPLAN model for Miami-Dade County indicates that each million dollars in construction expenditures results in an expected increase of $2.179 million in business sales, $0.969 million in personal income, and 22 jobs within the local economy.

Access would be provided to Jefferson Pilot and Everglades Safari during construction and after project completion, if needed. During construction of Alternative 14, while provisions are made to maintain the flow of traffic, there may be infrequent motoring delays because of slower speeds or occasional stops. Because some drivers may wish to avoid construction areas, the number of visitors to businesses during the period of construction may be reduced. Minor parking losses at Coopertown Airboats and Restaurant and at Gator Park will result from widening of the road base to facilitate raising of the highway. Under the proposed design of the project Everglades Safari Park would experience a significant loss in parking area; during more detailed preconstruction engineering design, attempts will be made to minimize impacts to Everglades Safari Park.

The Osceola Camp is likely to be exposed to short-term construction noise, dust, inconvenience, and possible traffic delays during the 36-month period of construction. Because of its distance from the highway, the Tigertail Camp is less likely to be affected by construction noise, but bridge access to the camp may be temporarily affected at times during construction. No other effects on the Osceola or Tigertail camps are likely to occur.

7.16 FLIGHT 592 MEMORIAL

No impacts on the Flight 592 Memorial are expected.

7.17 ENVIRONMENTAL JUSTICE AND IMPACTS ON CHILDREN

Because no adverse environmental effects are associated with the Recommended Plan, no disproportionate adverse environmental effects on minority or low-income communities would occur. The Environmental Justice Executive Order also assures opportunities for minority or low-income residents to be informed about, and comment on, Federal actions.

Because the Recommended Plan does not change the location of the highway, this project is not expected to affect the environmental health or increase safety risks to children in either the Tigertail or Osceola camps over existing conditions. Modeling indicates that the Recommended Plan, although predicted to exceed FDOT noise approach criteria, appears to have no impact on the Osceola Camp when compared to future without project conditions.

7.18 CUMULATIVE IMPACTS

Cumulative impacts are defined in 40 CFR 1508.7 as those impacts that result from:

> *...the incremental impacts of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or nonfederal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.*

This project is one component of the MWD project, which would restore to the extent practicable a portion of the Everglades ecosystem. This effort is also tied into the Central and Southern Florida Flood Control Project Comprehensive Restudy, now referred to as the Comprehensive Everglades Restoration Project (CERP). Table 33 lists several other past, current, and projected efforts that cumulatively affect the Southeastern Florida/Southern Everglades regional environment.

This project would restore natural hydrology to a portion of the Everglades ecosystem to the extent practicable. This effort is also tied to the Central and Southern Florida Flood Control Project Comprehensive Restudy, now referred to as CERP.

Collectively, all the above actions are needed to achieve the greatest possible hydrologic restoration of the southern Everglades. Virtually all the above actions were incorporated into the CERP analysis, which was designed to consider the entire South Florida ecosystem. In doing so, the hydrologic conditions of the area were modeled on a broad scale. In the hydrologic modeling analysis, a set of performance measures was applied to ecological targets to determine the restoration benefits of the hydrologic improvements. The CERP analysis also included some fundamental assumptions about the future status of the MWD project and other on-going projects within the ecosystem prior to completing the CERP modeling. It was assumed that the MWD project was in place as designed and providing the expected flows to NESS. No adverse environmental impacts were identified.

Table 33. Projects with Cumulative Effects on Southeastern Florida/ Southern Everglades Regional Environment

Project	Responsible Agency
Past Actions	
Modified Water Deliveries to Everglades National Park – Raising Tigertail Camp	USACE
Experimental Program of Water Deliveries to Everglades National Park – Test Iterations 1-5 (Shark River Slough)	USACE
Experimental Program of Water Deliveries to Everglades National Park – Test Iteration 6 (Taylor Slough)	USACE
Experimental Program of Water Deliveries to Everglades National Park – Test Iteration 7 (modified Taylor Slough)	USACE
Interim Structural and Operational Plan (ISOP) for the Hydrologic Compliance with the Cape Sable Seaside Sparrow Biological Opinion	USACE
Interim Operational Plan (IOP) for Protection of the Cape Sable Seaside Sparrow,	USACE
Current Actions	
Experimental Program of Water Deliveries – Emergency Deviation from Test Iteration 7, Interim Structural and Operational Plan	USACE
Modified Water Deliveries to Everglades National Park – Conveyance between WCA-3A and WCA-3B (Conveyance and Seepage Control Project)	USACE
Modified Water Deliveries to Everglades National Park – 8.5 Square Mile Area	USACE
South Dade (C-111) Project	USACE
Additional Lands – 8.5 Square Mile Area (Willing Seller Land Acquisition Program)	FDEP
East Coast Buffer/Water Preserve Areas Project	SFWMD
Lower East Coast Regional Water Supply Interim Plan	SFWMD
Future Actions	
Comprehensive Everglades Restoration Plan	USACE/ SFWMD
Experimental Program of Water Deliveries – Emergency Deviation from Test Iteration 7 – Interim Operational Plan	USACE
Combined Structural and Operational Plan (CSOP)	USACE
Everglades National Park General Management Plan	ENP
Lower East Coast Regional Water Supply Plan – South Florida Ecosystem Restoration Plan	SFWMD

Source: U.S. Army Corps of Engineers.

WRDA 2000 provided the approval of CERP as a framework and guide for modifications to the C&SF Project needed to restore the South Florida ecosystem and to provide for the other water-related needs of the region. WRDA 2000 also authorized the construction of four pilot projects (two pilot projects already authorized in WRDA 99) and ten initial projects needed to provide, in the short term, system-wide water quality and flow distribution benefits as well as an adaptive assessment and monitoring program. In addition, WRDA 2000 provided authorization for a Programmatic Authority to implement small restoration projects (less than $25 million).

Implementation of this project as a predecessor of the larger CERP action would result in a sustainable South Florida through the restoration of the ecosystem, ensuring reliable water supplies and providing flood protection. Therefore, the Recommended Plan for Tamiami Trail Modification is expected to contribute to a net beneficial cumulative impact.

7.19 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

The No-Action Alternative would involve no irreversible or irretrievable commitments of resources. Action alternatives, including the Recommended Plan, would require irreversible and irretrievable commitments. The expenditure of funding, energy, labor, and materials would be required for all action alternatives.

The project would not cause the permanent removal or consumption of any renewable resources.

Project implementation would commit lands and resources for channel enlargement, excavated material disposal areas, and other project features.

7.20 UNAVOIDABLE ADVERSE ENVIRONMENTAL EFFECTS

All alternatives evaluated have unavoidable adverse direct and indirect environmental effects that are discussed in this document and its appendices.

7.20.1 RELATIONSHIP BETWEEN SHORT-TERM USES OF THE ENVIRONMENT AND MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

Long-term benefits and short-term adverse environmental impacts represent tradeoffs between the local short-term use and the long-term stability and productivity of the environment. Long-term enhancements in productivity result from improved hydrologic conditions and enhanced biological community structure in the Everglades.

Short-term uses associated with all alternatives, including the Recommended Plan, include construction resources, dollars, and labor expended during road construction. They also include the short-term construction-related impacts to traffic flow, businesses, and residents, as discussed in this document.

The Recommended Plan would involve a net gain of approximately 6.4 acres of wetlands. The long-term beneficial effects to the Everglades resulting from the

implementation of this project and the remaining MWD actions would greatly outweigh any unavoidable adverse impacts.

The No-Action Alternative would be detrimental to the long-term environment. Increased water stages in the L-29 Canal would increase the rate of highway deterioration and affect public safety. Restrictions on water discharges to ENP to protect the highway could restrict the implementation of MWD and other projects intended to restore the hydrologic and biological functions of the Everglades.

7.21 SECONDARY IMPACTS

Secondary impacts involve those linked to the project but which occur subsequent to construction. This project is a component of the MWD project, which is intended to facilitate hydrologic restoration of the Everglades by providing additional water to NESS. For hydrologic restoration to be achieved without significant deterioration of the Tamiami Trail, this project must be implemented. The intent of the project, therefore, is to facilitate beneficial secondary impacts, which would consist of improvements to the Everglades ecosystem.

7.22 COMPATIBILITY WITH FEDERAL, STATE, AND LOCAL OBJECTIVES

This project has been coordinated with agencies of Federal, state, and local governments. Agency representatives have participated in workshops, meetings, and other project-related activities, and have provided reviews of this document. There is no known incompatibility with the objectives of Federal, state, or local entities.

7.23 CONFLICTS AND CONTROVERSY

Some opposition to the project may occur from the residents of the Miccosukee Tribe, local businessmen, and recreational fishermen over potential loss of privacy, possible impacts on businesses, and the loss of some recreational access. Some environmental organizations may argue that this project offers insufficient benefits to the Everglades ecosystem.

Numerous individuals and organizations have stated a preference for the 10.7-Mile Bridge alternative.

Expansion of the highway right-of-way to the south is controversial among environmental advocacy organizations and members of the general public.

Airboat operators have expressed a desire for bridging at a height that would allow for the passage of airboats. Such a feature may be considered later as a betterment, if recommended and funded by DOI, or an airboat passage feature may be considered with a later project.

7.24 UNCERTAIN, UNIQUE, OR UNKNOWN RISKS

The direct site-specific impacts of the Recommended Plan can be predicted with a high degree of certainty; therefore, uncertainty is minimized. However, predictions of cumulative and secondary impacts are, to a degree, inherently uncertain. This project is based on the best available scientific and engineering information, and although no

significant adverse impacts are expected, a low probability of risk is always present. The project design is not unique; thus, it should not create unique risks.

7.25 PRECEDENT AND PRINCIPLE FOR FUTURE ACTIONS

This project would not establish a precedent for future actions with significant effects or represent a decision in principle for future considerations.

7.26 ENVIRONMENTAL COMMITMENTS

The Tamiami Trail project is an integral part of the MWD project for hydrologic restoration in ENP. Portions of the MWD project have been implemented, but the benefits from the MWD project cannot be fully realized until the Tamiami Trail project has been completed.

The Recommended Plan will be further evaluated, refined, and optimized during subsequent project development phases. The following items list commitments to ensure that the Tamiami Trail project is developed in a manner consistent with the goals of maximizing the hydrologic restoration of NESS and associated ENP wetlands while avoiding, minimizing, and/or mitigating adverse effects:

(a) Implementation of the Recommended Plan shall not adversely harm the restoration levels of ENP's hydrology greater than that simulated by hydrologic modeling as described in the appendices to this document.

(b) To the maximum extent practicable, operate, maintain, repair, replace, and rehabilitate the Recommended Plan in a manner that will not cause liability to arise under CERCLA.

(c) SFWMD shall be the operator of the conveyance features of the MWD project for purposes of CERCLA liability.

(d) Should any CERCLA-regulated substances be found during construction on the State of Florida lands, the Corps shall take whatever immediate actions are necessary to stabilize the situation and comply with all CERCLA reporting requirements. The Corps assumes no liability for any pre-existing toxic or hazardous substances found on State lands or placed/discharged by the roadway traffic during the construction activity. The Corps contractor is however responsible for any actions/remediation necessary for spilling toxic/hazardous substances or fuel directly caused by their construction activities.

(e) Construction of the raised road portion shall be staged, and a qualified ornithologist stationed during construction, to assure that construction does not disrupt wading bird colonies located in proximity to the construction zone, as recommended in the FWCAR.

7.27 COMPLIANCE WITH ENVIRONMENTAL REQUIREMENTS

Coordination and evaluation of required compliance with specific Federal acts, executive orders, and other policies for the various alternatives was achieved, in part, through the

coordination of this document with appropriate agencies and the public. This compliance was established in conjunction with the 1992 GDM/EIS and the 2003 GRR/SEIS. Appendix B documents compliance with all applicable Federal statutes, executive orders, and policies; Table 34 summarizes the level of compliance with those statutes, orders, and policies.

Table 34. Compliance with Environmental Laws, Regulations and Executive Orders, Tamiami Trail RGRR, Recommended Alternative

Law, Regulation or Policy	Status C, PC, NC	Comments	Full Compliance Expected
Clean Air Act	C	Sec. 309: Draft RGRR/SEIS was coordinated with public and agencies between Aug. 26 and Oct. 11 2005. EPA rated the document "LO" for Lack of Objections." Sec. 176: No permanent sources of air emissions are part of the recommended plan.	Compliant at present. Final compliance would be achieved after coordination of Final RGRR
Clean Water Act	PC	404(b)(1) Evaluation was included in Draft RGRR/SEIS; WQC will be required (State permit); NPDES non point source permit will be required (State delegation); Project will comply fully with state criteria.	Full compliance upon issuance of the WQC and NPDES permits by the state.
National Environmental Policy Act of 1969	PC	Draft RGRR/SEIS was coordinated between 26 August and 11 October, 2005. EPA rated the document "LO."	Full compliance upon coordination of the final RGRR/SEIS, public outreach activities completed and signing of the ROD.
Fish and Wildlife Coordination Act of 1958	C	DCAR received 10 Aug 2005 and a FCAR received 20 Oct 2005. FWS and DOI are active team participants and have provided info on fish and wildlife elements on project.	
Endangered Species Act of 1973	PC	FWS has informally concurred with Corps 26 Aug 05 determinations of "not likely to adversely affect" for all listed species except the Florida Panther. Consultation on loss of panther habitat along S. margin of TT is ongoing, with Service's full cooperation in preparation of an amended Biological Opinion.	A FWS determination of effects on the panther is expected in Jan 06 before ROD is signed.
Magnuson-Stevens Fishery Mgt Act	NA	Inland project that provides no change in water flows would not affect Essential Fish Habitat in palustrine, estuarine, and marine areas; NMFS will accept FSEIS as the EFH assessment.	

Law, Regulation or Policy	Status C, PC, NC	Comments	Full Compliance Expected
Fishery Conservation and Management Act	PC	The project has been coordinated with NMFS	Full compliance after review of the final RGRR/SEIS by NMFS.
Coastal Zone Management Act o f 1972	PC	Based on a review of the Draft RGRR/SEIS and comments provided by state reviewing agencies, the State has determined that, at this stage, the project is consistent with the Florida Coastal Zone Management Program.	Additional consistency review by the State will occur during coordination of the final RGRR/SEIS. Full compliance will occur with issuance of the WQC by the State.
Coastal Barrier Resources Act and Coastal Barrier Improvement Act	NA	There are no designated coastal barrier resources in the project area that would be affected by this project. These Acts do not apply.	
Marine Mammal Protection Act	PC	West Indian Manatee not likely to be adversely affected.	Full compliance after review of the final RGRR/SEIS by USFWS.
Marine Protection, Research and Sanctuaries Act	NA	The term “dumping” as defined in the Act (3[33 U.S.C. 1402](f)) does not apply to this project. Therefore the MPRSA does not apply.	
Estuary Protection Act of 1968	NA	It is not anticipated that estuaries would be adversely affected by this project.	
Anadromous Fish Conservation Act	NA	Anadromous fish species would not be affected. The project has been coordinated with NMFS.	
Migratory Bird Treaty Act and Migratory Bird Conservation Act	C	No migratory birds would be affected by project activities.	
Wild and Scenic River Act of 1968	C	No designated Wild and Scenic river reaches would be affected by project related activities.	
Federal Water Project Recreation Act	C	The principles of this Act (PL 89-72) have been fulfilled by complying with the recreation cost sharing criteria as outlined in Section 2 (a), paragraph (2).	
Submerged Lands Act of 1953	NA	The project would not occur on submerged lands of the State of Florida. This Act does not apply.	

Law, Regulation or Policy	Status C, PC, NC	Comments	Full Compliance Expected
Rivers and Harbors Act of 1899	C	The proposed work would not obstruct navigable waters of the United States.	
National Historic Preservation Act of 1966 and the Archeology and Historic Preservation Act	PC	SHPO coordination has been initiated; historic properties have been identified; SHPO will enter into a Memorandum of Agreement to document historic structures and Tamiami Trail and Canal itself	Full compliance by completion of final RGRRR/SEIS.
RECRA, CERCLA, Toxic Substances Control Act of 1976	C	No sites have been identified. The initial survey indicates that problems are unlikely.	
Farmland Protection Policy Act of 1981	C	Project site is surrounded by public and Tribal lands. No farmlands on the project.	
E.O. 11988 Floodplain Management	NA	Project site is surrounded by public lands. No further development can occur in the floodplain.	
E.O. 11990 Protection of Wetlands	C	(Wetlands protection) The areas proposed for Tamiami Trail bridging and widening are a mosaic of wetlands with small tree island uplands. A net gain of 6.4 acres of wetlands is expected, and a net functional "lift" of 28,371 HU is expected.	
E.O. 12898 Environmental Justice	C	This E.O. requires consideration of, and avoidance of disproportionately adverse effects on minority and low-income populations. The Miccosukee tribal populations of Osceola and Tiger Tail camps will be avoided and raised to avoid adverse high water impacts. Tiger Tail Camp has already been raised. Osceola Camp is scheduled for raising in 2006. .Subsistence fishing will not be adversely affected.	
E.O. 13089 Coral Reef Protection	NA	This project will not adversely impact coral reefs or coral reef resources.	
E.O. 13112 Invasive Species	C	Project is not expected to lead to propagation of invasive species.	

Note: C: Complies fully; PC: partial compliance due to plan development; NC: non-compliant; NA: not applicable.
Source: USACE

SECTION 8.0
RECOMMENDATIONS

I recommend that the Modified Water Deliveries to Everglades National Park Project, Central and Southern Florida Project be modified to allow for improved water deliveries to Everglades National Park by modification, construction and implementation of the following items to Tamiami Trail in accordance with the Everglades National Park Protection and Expansion Act (PL101-229, Section 104, 16 U.S.C. Part 410r-5 *et seq.),* December 1989.

The Recommended Plan includes features to convey the additional flows from L-29 Canal, north of the Tamiami Trail, south to the ENP. The Recommended Plan consists of the following components, which are further described in Section 6, The Recommended Plan.

(1) Construction of a two-mile bridge and a one-mile bridge and acquisition of channel easements from the Florida Department of Transportation where NESS passes under Tamiami Trail. The two bridges will include pollution abatement systems.

(2) Reconstruction to raise the profile of the unbridged portion of Tamiami Trail together with all resulting modifications to ensure structural integrity of the highway under anticipated higher stages in the L-29 Canal resulting from implementation of the Modified Water Deliveries to Everglades National Park project and acquisition of a flowage easement from the Florida Department of Transportation along the unbridged portion of Tamiami Trail.

(3) Removal of the existing highway fill adjacent to the bridge.

(4) Acquisition of the necessary real estate interests required for the Project from the Airboat Association of Florida.

(5) Maintenance of the remaining culverts along the Tamiami Trail between S-333 and S-334.

(6) Maintenance of water flow under the bridged portions of the Tamiami Trail between S-333 and S-334.

The total estimated project cost of the Recommended Plan is $144,131,840.

The above recommendations are made with the provision that prior to project implementation, SFWMD, the Non-Federal Sponsor, shall enter into a binding agreement, most likely in the form of a PCA or PCA amendment between the Department of the Army and SFWMD for Modification of the Central and Southern Florida Project, Modified Water Deliveries to Everglades National Park Project, which provides for the following regarding the conveyance features for the project:

a. Operate, maintain, repair, replace, and rehabilitate the project, or functional portion of the project, including mitigation, in a manner compatible with the project's authorized purposes and in accordance with applicable Federal and State laws and regulations and any specific directions prescribed by the Federal Government;

b. Provide 25 percent of the cost of operating, maintaining, repairing, replacing, and rehabilitating the Project Modification;

c. Do not use Federal funds to meet the Non-Federal Sponsor's share of project operation, maintenance, repair, replacement and rehabilitation costs unless the Federal granting agency verifies in writing that the expenditure of such funds is authorized;

d. Give the Federal Government a right to enter, at reasonable times and in a reasonable manner, upon property that the Non-Federal Sponsor, now or hereafter, owns or controls for access to the project for the purpose of inspecting, operating, maintaining, repairing, replacing, rehabilitating, or completing the project. No completion, operation, maintenance, repair, replacement, or rehabilitation by the Federal Government shall relieve the Non-Federal Sponsor of responsibility to meet the Non-Federal Sponsor's obligations, or to preclude the Federal Government from pursuing any other remedy at law or equity to ensure faithful performance;

e. Hold and save the United States free from all damages arising from the construction, operation, maintenance, repair, replacement, and rehabilitation of the project and any project-related betterments, except for damages due to the fault or negligence of the United States or its contractors;

f. Perform, or cause to be performed, any investigations for hazardous substances that are determined necessary to identify the existence and extent of any hazardous substances regulated under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), Public Law 96-510, as amended (42 U.S.C. 9601-9675), that may exist in, on, or under lands, easements, or rights-of-way that the Federal Government determines to be required for the initial construction, periodic nourishment, operation, and maintenance of the project. However, for lands that the Federal Government determines to be subject to the navigation servitude, only the Federal Government shall perform such investigations unless the Federal Government provides the Non-Federal Sponsor with prior specific written direction, in which case the Non-Federal Sponsor shall perform such investigations in accordance with such written direction;

g. Assume, as between the Federal Government and the Non-Federal Sponsor, complete financial responsibility for all necessary cleanup and response costs of any CERCLA regulated materials located in, on, or under lands, easements, or rights-of-way that the Federal Government determines to be necessary for the initial construction, periodic nourishment, operation, or maintenance of the project;

h. Agree that, as between the Federal Government and the Non-Federal Sponsor, the Non-Federal Sponsor shall be considered the operator of the project for the purpose of CERCLA liability, and to the maximum extent practicable, operate, maintain, and repair the project in a manner that will not cause liability to arise under CERCLA;

i. Prevent obstructions of or encroachments on the project (including prescribing and enforcing regulations to prevent such obstruction or encroachments) which might reduce the level of protection it affords, hinder operation and maintenance, or interfere with its proper function, such as any new developments on project lands or the addition of facilities which would degrade the benefits of the project;

j. Not less than once each year, inform affected interests of the extent of protection afforded by the project;

k. Keep and maintain books, records, documents, and other evidence pertaining to costs and expenses incurred pursuant to the project, for a minimum of three years after completion of the accounting for which such books, records, documents, and other evidence is required, to the extent and in such detail as will properly reflect total costs of construction of the project, and in accordance with the standards for financial management systems set forth in the Uniform Administrative Requirements for Grants and Cooperative Agreements to State and Local Governments at 32 Code of Federal Regulations (CFR) Section 33.20;

l. Comply with Section 221 of Public Law 91-611, Flood Control Act of 1970, as amended (42 U.S.C. 1962d-5), and Section 103 of the Water Resources Development Act of 1986, Public Law 99-662, as amended (33 U.S.C. 2213), which provides that the Secretary of the Army shall not commence the construction of any water resources project or separable element thereof, until the Non-Federal Sponsor has entered into a written agreement to furnish its required cooperation for the project or separable element;

m. Comply with all applicable Federal and State laws and regulations, including, but not limited to, Section 601 of the Civil Rights Act of 1964, Public Law 88-352 (42 U.S.C. 2000d), and Department of Defense Directive 5500.11 issued pursuant thereto, as well as Army Regulation 600-7, entitled "Nondiscrimination on the Basis of Handicap in Programs and Activities Assisted or Conducted by the Department of the Army," and all applicable Federal labor standards and requirements, including but not limited to 40 U.S.C. 3141- 3148 and 40 U.S.C. 3701 - 3708 (revising, codifying and enacting without substantial change the provisions of the Davis-Bacon Act (formerly 40 U.S.C. 276a *et seq.),* the Contract Work Hours and Safety Standards Act(formerly 40 U.S.C. 327 *et seq.)* and the Copeland Anti-Kickback Act (formerly 40 U.S.C. 276c *et seq.)* ;

n. Comply with Section 402 of the Water Resources Development Act of 1986, as amended (33 U.S.C. 70lb-12), which requires a Non-Federal

interest to participate in and comply with applicable Federal floodplain management and flood insurance programs, prepare a flood plain management plan within one year after the date of signing a Project Cooperation Agreement, and implement the plan not later than one year after completion of construction of the project; and,

o. Comply with all applicable provisions of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, Public Law 91-646, as amended (42 U.S.C. 4601-4655), and the Uniform Regulations contained in 49 CFR Part 24, in acquiring lands, easements, and rights-of-way, necessary for the initial construction, periodic nourishment, operation, and maintenance of the project, including those necessary for relocations, borrow materials, and dredged or excavated material disposal, and inform all affected persons of applicable benefits, policies, and procedures in connection with said Act.

The recommendations contained herein reflect the information available at this time and Departmental policies governing formulation of individual projects. They do not reflect program and budgeting priorities inherent in the formulation of a national Civil Works construction program nor the perspective of higher review levels within the Executive Branch. Consequently, the recommendations may be modified before they are transmitted to the Office of Management and Budget (OMB) as proposals for implementation funding. However, prior to transmittal to the OMB, any sponsor, the State, interested Federal agencies, and other parties will be advised of any modifications and will be afforded an opportunity to comment further.

Robert M. Carpenter
Colonel, U.S. Army
District Engineer

SECTION 9.0
PUBLIC INVOLVEMENT, REVIEW AND CONSULTATION

9.1 PUBLIC INVOLVEMENT

In compliance with USACE policies and NEPA, input on projects is solicited from the public and other government agencies. The public was invited to comment during the scoping process and during public meetings, and comments were solicited for this document.

9.2 NOTICE OF INTENT

A Notice of Intent to prepare a Draft Second Supplemental Impact Statement for the Tamiami Trail feature of the MWD project was published in the Federal Register, Volume 70, Number 111, Page 33884, June 10, 2005.

9.3 SCOPING

Scoping is the phase in the NEPA process whereby the initial scope of issues to be analyzed in the EIS is determined. This phase occurs as early in the process as possible and is an open process intended to obtain the views of the public and other interested agencies regarding the scope of the study. Scoping was carried out as part of developing the previous GRR/SEIS in 2000.

Potentially interested individuals, agencies, and organizations were invited to attend and participate in a scoping meeting held at the Miami-Dade County Extension Office, 18710 SW 288th Street, Homestead, Florida, on June 8, 2000, at 8:30 p.m. The format of the meeting was to receive comments and concerns from the public on the issues and alternatives to be addressed.

On June 9, 2000, at the same location, a technical workshop was held to provide an interactive forum to discuss technical aspects of the project.

The topics discussed during the scoping process were of major importance in determining the pertinent issues to be analyzed in depth. To complete the scoping process, the Corps allowed the record to remain open until June 21, 2000, for receipt of written statements. During the Scoping Meeting, the following issues and concerns were expressed:

- **Impacts to the Tigertail Camp.** A representative of the Miccosukee Tribe expressed concerns about the possibility of flooding or the relocation of the Tigertail Camp.

- **Impacts on Structures 355A and 355B.**

- **Impacts on Businesses along the Roadway.** Existing businesses along the south side of the roadway may be adversely impacted by the project. A representative of the Miccosukee Tribe expressed concerns about the businesses along the roadway. A Tamiami Trail businessman expressed

concern that constructing a new roadway would adversely impact businesses along the existing roadway.

- **Impacts to Wetlands.**

- **Construction Impacts to Traffic Flow.** A representative of the Miccosukee Tribe expressed concerns that the high volume of traffic on the roadway would result in major disruptions with the implementation of traffic controls and detours. He expressed particular concern about the effects of traffic congestion on the Tigertail and Osceola camps.

- **Impacts to Hurricane Evacuation.** The Tamiami Trail is not an official evacuation route for the lower east coast of Florida, but it is a parallel road that might be expected to carry evacuation traffic in the case of congestion.

- **Effects of the Project on Loss of Private Land.** A private citizen expressed concern over the condemnation of private land for the purpose of environmental protection. His concern was that the land actually might later be used for commercial purposes. A recreational fisherman expressed concern that the National Park would get additional property and that access to that property by the public would be denied.

- **Impacts on the Osceola Camp.** A representative of the Miccosukee Tribe expressed concern that the project would adversely affect the Osceola Camp.

- **Impacts of Changes in Area Hydrology.** Concern was expressed by a representative of the Miccosukee Tribe about the levels of water in the L-29 Canal, specifically, what the water level would be under the new modeling scenario. There was also a question on the need for additional culvert capacity to transmit that water to the south. There was concern expressed by an individual that the filling of canals, which he understood would take place, could adversely impact flood control programs in South Florida. A representative of the Florida Biodiversity Project expressed a desire for a full hydrological analysis of the raising of the roadway. A businessman stated that the existing culverts are obstructed on the southern side and that removal of the obstructions may enable an adequate flow.

- **Impacts on Recreation.** A recreational fisherman expressed concern about the implementation of the project, as well as other MWD projects, on recreational fishing in the canals of the area. One of his concerns was that canals would be filled. Points taken included the canals being the only nearby freshwater fishery, the canals serving as a refuge for fishes during droughts, and the economic importance of freshwater fishing in the vicinity.

- **Impacts on Wildlife.** A representative of the Florida Biodiversity Project requested that historical records be compiled on road kills along 1-75 and

US 41. A recreational fisherman expressed concerns that the effects of the project would include a loss of fisheries habitat.

- **Impacts on the Homestead Agricultural Community.** An individual expressed concerns that the elevation of water in the Northeast Shark River Slough would raise ground water levels in the South Dade agricultural areas and adversely impact farming operations.

- **Environmental Impact Assessment.** A representative of the Florida Biodiversity Project requested: that FWS and the NPS be designated as cooperating agencies in the preparation of the EIS; that the analysis of all alternatives include direct, indirect, and cumulative impacts; that there should be full coordination with relevant agencies as required by NEPA and the Endangered Species Act; and that a scoping document regarding the scoping alternatives be released to the public. A representative of the Miccosukee Tribe expressed concern that the MWD project had been divided into three separate ElSs, thereby possibly masking the combined impacts of the projects. The individual expressed an opinion that because there have been delays in implementing the MWD projects and restorations of the central Everglades, tribal lands have not been protected. Therefore, the delays have constituted a denial of justice to the Miccosukee Tribe.

9.4. NOTICE OF AVAILABILITY

A Notice of Availability of the Draft RGRR/SEIS was published in the Federal Register on August 26, 2005 (Volume 70, Number 165) [Notices] [Page 50346-50347].

9.5 PUBLIC AGENCY MEETINGS

The Jacksonville District hosted a workshop for agencies, organizations, and individuals interested in the MWD project on July 9, 2000. Attendees and relevant comments included:

- **Coopertown Airboats** stated its understanding of possible benefits gained by an elevated highway but expressed concern over how residents and businesses would access properties currently located along the Tamiami Trail.

- **Everglades National Park** expressed concern over wetland loss caused by Tamiami Trail and called for practices that would provide for a rapid and efficient exchange of technical information among interested agencies.

- **Florida Department of Environmental Protection** stated concerns related to water quality issues in general, and stormwater issues in particular, that might arise during implementation of the project.

- **Florida Department of Transportation** asked to review the Draft EIS before it is officially promulgated and stated its desire to participate in all aspects of the EIS and technical design.

- **Miccosukee Tribe** representatives stated that the Tamiami Trail serves as an ecological barrier and expressed a desire for focused attention on a possible wildlife corridor. Concerns were expressed regarding delays and detour associated with implementation of the project. Representatives also expressed concerns as to how the MWD-recommended flows would be achieved before the required studies are completed.

Subsequent interagency meetings were held on October 2 and 3, and December 4 and 5, 2000.

9.6 PUBLIC WORKSHOPS

A public workshop for the proposed project was conducted on February 6, 2001. The purpose of the workshop was to discuss input to the performance measures used to select the alternatives.

A second public workshop was held in Miami on September 15, 2005. The purpose of this workshop was to solicit comments from the public on the Draft RGRR/SEIS. A transcript of this workshop is available upon request. Major topics included:

- Support for the 10.7-Mile Bridge
- Support for a two-bridge option
- Provisions for airboat passage beneath bridge(s)
- Enabling MWD flows by cleaning culverts
- Concerns about the effect of the project on businesses
- The amount of time for MWD program implementation
- Concern about loss of recreation access due to long bridge
- Concern about high water in WCA-3.

9.7 PUBLIC SUPPORT FOR A 10.7-MILE BRIDGE

Numerous letters have been received by the Corps expressing full support for the construction of a bridge spanning the entire project area. In addition, all environmental agencies and interests, including DOI, expressed opinions that construction of the 10.7-Mile Bridge would be the most beneficial alternative.

Implementation of the 10.7-Mile Bridge is not possible at this time because of fiscal constraints of the project. The cost of a raised causeway greatly exceeds the current budget available for Tamiami Trail Modification under MWD, as identified in the DOI Capital Asset Plan.

The 10.7-Mile Bridge alternative may have significance with respect to the eventual ecological restoration to be achieved through the CERP project. This bridge would provide the upper range of environmental benefits.

9.8 COMMENTS AND RESPONSES ON DRAFT AND FINAL DOCUMENTS

The draft document was made available to agency personnel and the public for review and comment. Following the release of the draft document, the public was invited to

provide comments at a public workshop. All comments were reviewed and evaluated. The Final RGRR/SEIS incorporates a response to each comment and, where appropriate, a revision of the text of the document. A comment/response matrix may be found in Appendix L.

A Notice of Availability of the Final RGRR/SEIS will be noticed in the Federal Register, and a public comment period will begin upon the date of Federal Register publication. The formal public-comment period will be 30 days. The Final RGRR/SEIS will be posted on the Jacksonville District, USACE Environmental website during the comment period. After the close of the comment period, responses will be compiled for all comments.

SECTION 10.0
LIST OF STUDY TEAM MEMBERS AND REPORT PREPARERS

Persons who were responsible for contributing to this EIS are listed in Table 34.

Table 35. Tamiami Trail RGRR/SEIS List of Preparers

Name	Discipline/ Expertise	Organization	Role in Document Preparation
Brad Foster	Ecologist	USACE	Plan Formulation, Planning Technical Lead
Jon Moulding	Biologist	USACE	NEPA and Environmental Technical Lead
Bill Gallagher	Water Resources Planner	USACE	Planning
Jim Riley	Environmental Engineer	USACE	Water Quality
David Pugh	Archaeologist	USACE	Cultural Resources
Kevin Wittmann	Economist	USACE	Economics
Mike Wolz	Civil Engineer	USACE	Design, Engineering Technical Lead
James McRae	Civil Engineer	USACE	Design
Trent Ferguson	Civil Engineer	USACE	Hydrology
Scott Burch	Civil Engineer	USACE	Cost Estimates
Jerrell Pennington	Civil Engineer	USACE	Cost Estimates
Cindy Turner	Real Estate	USACE	Real Estate
John Pax	Attorney	USACE	Legal
Michael Loden	Environmental Scientist	G.E.C., Inc	EIS/Report Preparation, Supervision, Review
Cade E. Carter	Civil Engineer	G.E.C., Inc	EIS/Report Preparation; Engineering
Jeff Robinson	Civil Engineer	G.E.C., Inc	EIS/Report Preparation; Noise and Air Quality
Stephanie Murray	Biologist	G.E.C., Inc	EIS/Report Preparation; Biology
Joseph Wyble	Geologist	G.E.C., Inc	EIS/Report Preparation and Review
Daniel Maher	Economist	G.E.C. Inc	EIS/Report Preparation; Socioeconomics

SECTION 11.0
GLOSSARY OF TERMS AND ACRONYMS AND ABBREVIATIONS, CONVERSION TABLE

11.1 GLOSSARY

Ameliorate - to improve.

Appurtenant - auxiliary, accessory.

Biodiversity - abundance and variety of living organisms within an area.

Capillary Action - water being elevated into the pores of soils above the free water table.

Coliforms - aerobic bacteria found in the colon.

Contiguous - adjacent.

Conveyance Capacity - the rate, generally measured in cubic feet per second (cfs), at which water can be transported by a canal, aqueduct or ditch.

Culvert - A concrete, metal or plastic passage that transports water under a road or embankment.

Dissolved Oxygen (DO) - the concentration of oxygen dissolved in water.

Dry Season - the months associated with a lower incident of rainfall, hydrologically, for South Florida, October – April.

Endangered Species - a species identified and defined in the Federal Register in accordance with the Endangered Species Act of 1976.

Environmental Justice - a term used to describe any disproportionately high and adverse affects of Federal agency activities and programs on minority and low income populations within a project area.

Evapotranspiration - the total water loss from the soil.

Fauna - animal life.

Flora - plant life.

Flow Rate - the number of items per unit of time.

Flowage Easements - easements acquired for the right to manipulate water levels in a certain area.

Habitat Fragmentation - the splitting of natural ecosystems into smaller, isolated units.

Hammock - localized, thick stands of trees that can grow on natural rises of only a few inches in the land.

Hydraulic Head – Water-level or pressure expressed as water column height above an arbitrary datum (e.g., culvert centerline).

Hydroperiod - the length of time an area is inundated with water.

Lithologic Units - areas of rock formations.

Lithology - the scientific study of rocks.

Marl - soils comprised of clays, carbonates and shell remains.

Milling - removal of an asphalt layer on a road surface by means of mechanical cutters.

National Ambient Air Quality Standards - standard air pollutant levels set forth by the Environmental Protection Agency (EPA) under the Clean Air Act.

Nonattainment - describes an area where air pollution levels persistently exceed the National Ambient Air Quality Standards (NAAQS).

Oolitic - composed of calcium carbonate.

Overtopping - when flood waters rise above the top of a structure.

PAHs - Polynuclear aromatic hydrocarbons are often byproducts of petroleum processing or combustion. Some of these water insoluble compounds are highly carcinogenic at relatively low levels.

Peat - soil rich in humus or organic material which is highly porous.

Physiographic - describes the features and phenomena of nature.

Porosity - the amount of pore space.

Prairie - land predominantly covered by grasses.
Prime and Unique Farmlands - land that has the best combination of physical and chemical characteristics for producing crops and/or specific high-value food (Farmland Protection Policy Act of 1991).

Recharge - the processes of water filling the voids in an aquifer.

Sequences - layers of deposit beneath the soil surface.

Sensitive Receptors - specific areas within a project area that can be directly affected by project activities such as noise levels and air contaminants.

Spatially Variable - not the same in all areas.

Specific Conductance - a measure of the electrical conductivity of dissolved ions in the water.

Spillway - an overflow structure of a dam.

Spoil Area - an area where dredged or excavated soil or rock material is deposited.

Threatened Species - a species identified and defined in the Federal Register in accordance with the Endangered Species Act of 1976.

Transmissivity - a measure of the amount of radiation propagated through a given medium.

Vinyl Chloride - a flammable gaseous carcinogenic compound used in making vinyl resins.

Volatile Organic Compounds (VOCs) - any compound of carbon that participates in atmospheric photochemical reactions such as benzene, toluene, and vinyl chloride.

Warm Starts - the ignition of an engine after the engine has been run for a given amount of time.

Watershed - the area drained by a river or river system.

Wet Season - Hydrologically, for South Florida, the months associated with a higher incident of rainfall, May – September.

11.2 ACRONYMS AND ABBREVIATIONS

AAHU - Average Annual Habitat Unit
ADT - Average Daily Traffic
AFDM - ash-free dry mass
BEA - Bureau of Economic Analysis
BLS - Bureau of Labor Statistics
BOD - Biochemical Oxygen Demand
C&SF - Central and Southern Florida
CAA - Clean Air Act
CAAA - Clean Air Act Amendments
CAR - Coordination Act Report
CE/ICA - Cost Effectiveness and Incremental Cost Analysis
CERCLA - Comprehensive Environmental Response, Compensation and Liability Act
CERP - Comprehensive Everglades Restoration Plan
CO - Carbon Monoxide
cpu - Color Photometric Units
CSOP - Combined Structural and Operational Plan
CWA - Clean Water Act
DERM - Department of Environmental Resources Management
DO - Dissolved Oxygen

DOC - Dissolved Organic Carbon
DOI - Department of Interior
DSL - Design Service Life
EDC – Engineering During Construction
EIS - Environmental Impact Statement
EMO - Environmental Management Office
ENP - Everglades National Park
EO - Executive Order
ER - Engineering Regulation
FAG - Florida Administrative Code
FAC - Florida Archaeological Council
FDEP - Florida Department of Environmental Protection
FDHR - Florida Division of Historical Resources
FDOT - Florida Department of Transportation
FFWCC - Florida Fish and Wildlife Conservation Commission
FHWA - Federal Highway Administration
ft - Feet
FWC - Florida Fish and Wildlife Commission
FWCAR - Fish and Wildlife Coordination Act Report
FWS - U.S. Fish and Wildlife Service
GDM - General Design Memorandum
g/sm/d - Grams Per Square Meter Per Day
gpm - Grams Per Mile
GRR - General Reevaluation Report
HCM - Highway Capacity Manual
HTRW - Hazardous, Toxic, and Radiological Waste
IDC - Interest During Construction
IOP - Interim Operational Plan
L-67 ext - Extension of Levee 67
LOS - Level of Service
MOT - Maintenance of Traffic
MPO - Metropolitan Planning Organization
MWD - Modified Water Deliveries
NAAQS - National Ambient Air Quality Standards
NAPLs - Non-aqueous Phase Liquids
NEPA - National Environmental Policy Act
NESS - Northeast Shark River Slough
mg - Milligrams
mph - Miles Per Hour
NH3 - Ammonia Nitrogen
NHPA - National Historic Preservation Act
NO_3 NO_2 - Nitrate-Nitrite
NO_x - Oxides of Nitrogen
NPL - National Priority List
NPS - National Park Service
NRHP - National Registry of Historic Places
NSM - Natural System Model
NVGD - National Vertical Geodetic Datum
OFW - Outstanding Florida Water
OMRRR - Operation, Maintenance, Repair, Replacement, and Rehabilitation
OP - Ortho-phosphorus

PAHs - Polycyclic Aromatic Hydrocarbons
PCBs - Polychlorinated Biphenyls
PD&E Manual - Project Development and Environment Manual
PED - Pre-construction Engineering and Design
PIR - Project Implementation Report
PM - Performance Measure
PMP - Project Management Plan
ppm - Parts Per Million
RCRA - Resource Conservation and Recovery Act
ROPA - Register of Professional Archaeologists
RPA - Reasonable and Prudent Alternatives
S/A – Supervision and Administration
S-12s - Structure 12s
SCDS - South Dade Conveyance System
SETS - Supplemental Environmental Impact Statement
SFWMD - South Florida Water Management District
SFWMM - South Florida Water Management Model
SHPO - State Historic Preservation Office
SRS - Shark River Slough
SWIM - Surface Water Improvement Management
TBT - Tributyltin
TCE - Trichloroethylene
TDS - Total Dissolved Solids
TKN - Total Kjeldahl Nitrogen
TMDLs - Total Maximum Daily Loads
TP - Total Phosphorus
TSS - Total Suspended Solids
TTM - Tamiami Trail Modifications
USACE - U.S. Army Corps of Engineers
USEPA - U.S. Environmental Protection Agency
USGS - U.S. Geological Survey
UST - Underground Storage Tank
VOC - Volatile Organic Carbon
VOCs - Volatile Organic Compounds
vpd - Vehicles Per Day
vph - Vehicles Per Hour
WCA 3A - Water Conservation Area 3A
WCA-3B - Water Conservation Area 3B
WQC - Water Quality Certification

11.3 CONVERSION TABLE

To Convert From	To	Multiply By
AREA		
Acres	square feet square meters hectares	43560 4046.9 0.40469
Hectares	acres square feet square meters	2.4710 107639 10000
Square centimeters	square inches	0.1550
Square feet	acres square meters	0.00002295 0.092903
Square kilometers	acres square miles	247.1059 0.38610
Square meters	acres square feet	0.00024710 10.7639
Square miles	acres square kilometers	640 2.59
Square yards	acres square meters	0.00020661 0.8361
FLOW RATE VOLUME		
Cubic feet per minute	kilograms per minute	0.4536
Cubic meters per hour	cubic centimeters per second cubic meters per second cubic meters per hour liters per second gallons (US) per second pounds of water per minute (at 68°F)	471.9 0.0004719 1.699 0.4719 0.2247 62.32
Cubic meters per second	cubic meters per second cubic meters per minute cubic meters per hour gallons (US) per minute gallons (imp) per hour liters	0.028317 1.699 101.9 448.8 646315 28.32
Gallons (US) per minute	cubic meters per minute cubic meters per second gallons (US) per minute liters per second	0.016667 0.00027778 4.4033 0.27778
Liters per minute	cubic meters per hour gallons (US) per minute	3600 15850
Liters per second	cubic meters per second cubic meters per minute cubic meters per hour cubic feet per second cubic feet per hour liters per second	0.000063090 0.0037854 0.2771 0.002228 8.021 0.06309

To Convert From	To	Multiply By
Standard cubic feet per minute	cubic meters per second cubic meters per minute cubic meters per hour liters per minute gallons (US) per minute gallons (imp) per minute	0.001 0.06 3.600 60 15.85 13.20
LENGTH		
Feet	inches	12
Inches	feet meters yards	0.0833 0.0254 0.02778
Kilometers	centimeters inches meters yards	100000 39370 1000 1093.61
Meters	centimeters feet millimeters yards	100 3.28 1000 1.0936
Millimeters	feet inches yards	0.00328 0.03937 0.001094
Statute miles	Inches feet meters yards	63360 5280 1609.344 1760
Yards	Feet inches meters st. miles	3 36 0.9144 0.0005682
MASS/WEIGHT		
Grams	milligrams centigrams decagrams hectagrams kilograms pounds ounces	1000 100 0.1 0.01 0.001 0.0022 0.03527
Kilograms	grams ounces (avoir) pounds	1000 35.27 2.2046
Metric tons (tonnes)	ounces (avoir) pounds (avoir)	0.035274 0.0022046
Ounces (avoir)	pounds tons (short)	0.0625 0.00003125

To Convert From	To	Multiply By
Pounds (avoir)	kilograms ounces tons	0.4536 16 0.0005
Metric tons	ounces grams kilograms pounds-avoir	32000 907.185 907.1847 2000
VOLUME		
Barrels (oil)	cubic feet gallons (US liquid) cubic meters liter quart (US liquid)	5.615 42 0.159 158.99 168
Cubic centimeters	gallons (US liquid)	0.0002642
Cubic feet	cubic yard gallons (US liquid) cubic meters	0.037 7.48 0.02832
Cubic inches	cubic feet cubic yards gallons (US liquid) liters	0.0005787 0.0000214 0.004329 0.01639
Cubic meters	cubic centimeters cubic inches cubic yards gallons (US) liters	1,000,000 61,023.74 1.308 264.172 1,000
Cubic yards	cubic centimeters cubic feet cubic meters gallons (US liquid) liters	764554.86 27 0.7646 201.974 764.55
Gallons (US liquid)	cubic inches liters pint (US liquid) ounce (US liquid) quart (US liquid)	231 3.7854 8 128 4
Liters	cubic centimeters cubic meters cubic feet cubic yards gallons (US liquid)	1000 0.001 0.03531 0.001308 0.2642
Milligrams per liter	parts per thousand parts per million parts per billion	0.001 1.0 1000

SECTION 12.0
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