United States
Environmental Protection
Agency

Region 4
61 Forsyth Street
Atlanta, Georgia

EPA 904/9-01-001
June 2001

Environmental Impact Statement

Draft

Tampa Bay Regional Reservoir Project
Hillsborough County, Florida

Draft
Environmental Impact Statement
for the
Tampa Bay Regional Reservoir Project

Prepared by
U. S. Environmental Protection Agency Region 4

Tampa Bay Water proposes to build and operate an 1100-acre reservoir facility in Hillsborough County southeast of Tampa, Florida. Untreated raw surface water would be diverted from the Hillsborough River, the Tampa Bypass Canal, and the Alafia River and stored in the regional reservoir. This water would be used during dry periods when no surface water could be diverted. The purpose of the project is to increase the reliability of Tampa Bay Water's regional water supply system.

This draft environmental impact statement was prepared in June, 2001, in cooperation with the U. S. Army Corps of Engineers. Technical assistance was provided by Burns & McDonnell who served as the third party contractor to EPA with financial resources being provided by the applicant Tampa Bay Water.

Comments or inquiries should be directed to
John Hamilton
Office of Environmental Assessment
EPA Region 4
61 Forsyth Street
Atlanta Georgia 30303
(404) 562-9617
Fax (404) 562-9598
E-Mail: hamilton.john@EPA.gov

Approved By:

A. Stanley Meiburg
Acting Regional Administrator

June 8, 2001
Date

TAMPA BAY REGIONAL RESERVOIR PROJECT
DRAFT ENVIRONMENTAL IMPACT STATEMENT

Lead Agency:
U.S. Environmental Protection Agency, Region IV

Cooperating Agency:
U.S. Army Corps of Engineers, Jacksonville District, Tampa Regulatory Office

Applicant:
Tampa Bay Water

(X) Draft ( ) Final

Type of Action: Administrative (X) Legislative ( )

ABSTRACT The Draft Environmental Impact Statement (DEIS) discloses the environmental impacts from Tampa Bay Water's plan to construct and operate the Tampa Bay Regional Reservoir. The proposed reservoir and associated pipeline would be located in Hillsborough County, southeast of Tampa, Florida. Three alternatives were selected for in-depth evaluation in the DEIS: an 1,100-acre reservoir, an 1,100-acre reservoir with Aquifer Storage and Recovery (ASR) system, and the No Federal Action alternative. The two action alternatives would store untreated raw surface water diverted during high flow conditions from the Hillsborough River, the Tampa Bypass Canal, and the Alafia River in the regional reservoir. With the second action alternative, surface water would be treated to current drinking water standards and injected into an underground receiving aquifer. This water would be stored for use during dry periods when little or no surface water could be diverted. Construction of either alternative would impact wetlands, upland vegetation, and fish and wildlife habitat. Approximately 182 acres of wetlands within the reservoir footprint and 6 acres along the pipeline route would be impacted. The magnitude of the effects on the Alafia and Hillsborough rivers, Tampa Bypass Canal, and Tampa Bay from operating either of the action alternatives appears to be within the normal range of variation currently found in the natural systems.

If the No Federal Action alternative were selected, federal funding in the amount of $12,615,000 would not be provided for the 1,100-acre reservoir. Were Tampa Bay Water unable to obtain non-federal funds and not to build the reservoir, no additional surface water withdrawals as a result of the reservoir from the Alafia River, the Hillsborough River, or the Tampa Bypass Canal would be made. If no additional withdrawals occur, no additional impacts from this project to these rivers or the Tampa Bay estuary would result. Without the proposed storage reservoir, with or without the ASR system, Tampa Bay Water would not be able to offset reduced groundwater withdrawals as stipulated in their Consolidated Water Use Permit with the Southwest Florida Water Management District (SWFWMD). If groundwater pumping exceeded the permitted quantities specified in the Consolidated Water Use Permit, Tampa Bay Water could potentially lose up to $183 million of funding committed by SWFWMD through the Northern Tampa Bay Groundwater Withdrawal Reduction Agreement (Partnership Agreement).

Comments are solicited on all aspects of the DEIS and will be considered in preparation of the Final EIS and Record of Decision. Comments should be sent to Mr. John Hamilton at U.S. Environmental Protection, Office of Environmental Assessment, 61 Forsyth St., Atlanta, GA 30303 by August 13, 2001.

SUMMARY

INTRODUCTION

Tampa Bay Water, formerly the West Coast Regional Water Supply Authority, proposes construction of a reservoir and associated pipeline in Hillsborough County, Florida to store and transport untreated raw surface water diverted during high flow conditions from the Hillsborough River, the Tampa Bypass Canal, and the Alafia River. This stored water is for use during dry periods when little or no surface water can be diverted.

The Tampa Bay Regional Reservoir was authorized for grant funding in the amount of $12,615,000 by the U.S. Environmental Protection Agency (EPA) under the State Tribal Assistance Grant Program. This funding action would partially provide the means to design and construct the Tampa Bay Regional Reservoir and reservoir transmission main. EPA, as the lead federal agency, must consider all environmental effects of the construction and operation of the Tampa Bay Regional Reservoir, and must conduct a National Environmental Policy Act (NEPA) analysis of project impacts on the existing environment. Pursuant to 40 C.F.R. 1501.4 (c) and in accordance with Section 102(2)(C) of NEPA, EPA has identified the need to prepare an environmental impact statement (EIS) for the Tampa Bay Regional Reservoir Project. The U.S. Army Corps of Engineers (COE), Jacksonville District is a Cooperating Agency (40 C.F.R. 1501.5) as jurisdictional wetlands are present on the proposed sites that would require permitting under Section 404 of the Clean Water Act.

This Draft Environmental Impact Statement (DEIS) was prepared in accordance with Council of Environmental Quality (CEQ) regulations 40 CFR Parts 1500 through 1508 implementing NEPA and provides a complete and objective analysis of environmental effects of the proposed project and its reasonable alternatives.

PROJECT PURPOSE AND NEED

The purpose of the Tampa Bay Regional Reservoir Project is to improve the reliability and dependability of Tampa Bay Water's regional surface water supply system. The reservoir would store untreated raw surface water diverted during high flow conditions from the Hillsborough River, the Tampa Bypass Canal, and the Alafia River. This stored water would be used during dry periods when little or no surface water could be diverted. The first 66 million gallons per day (mgd) of raw water withdrawn from one or more of the three surface water sources would be treated at the new Tampa Bay Regional Water Treatment Plant and then distributed through Tampa Bay Water's regional water supply system.

Diverted amounts of raw water exceeding 66 mgd would be pumped into the reservoir and stored for later use. During the dry season when little or no water could be diverted from the surface water sources, up to 66 mgd would be withdrawn from the reservoir, treated at the Tampa Bay Regional Water Treatment Plant and distributed to wholesale customers, that would then distribute it to retail customers.

The Tampa Bay Regional Reservoir Project would effectively increase the yield of the regional surface water system. Rapid population growth and

economic development has resulted in an increase in projected future water demand. In addition, Tampa Bay Water has also entered into various agreements, which require reductions in groundwater use and maintaining water demand at or below 94 percent of the total permitted water supply capacity. Based on increased water demand and reduction of the existing groundwater supply, Tampa Bay Water proposes to develop new water supply sources to meet the additional required water supply.

ALTERNATIVES

A total of twelve alternatives were initially evaluated in the DEIS - No Federal Action and eleven action alternatives - to determine if they were capable of improving the reliability and dependability of Tampa Bay Water's integrated water supply system. Each alternative was presented with regard to physical features, water supply, cost, and source of water. Alternatives were evaluated using a tiered screening process that was based upon engineering feasibility, environmental fatal flaws, and the ability to meet the regional demand for drinking water. All eleven action alternatives were initially screened to identify any extraordinary or unproven technical engineering actions that would be required to implement the alternatives. The identification of such constraints eliminated an alternative from further consideration. Of the eleven alternatives originally considered, three were eliminated due to engineering constraints. These three alternatives were (1) capturing freshwater springs, (2) using lakes found in abandoned phosphate pits, and (3) using aboveground storage tanks. The remaining eight alternatives under consideration were evaluated on their ability to meet the water demand and requirements set forth for the region. The eight alternatives under consideration must be capable of providing at least 58 mgd of water by the year 2007. Of the eight alternatives remaining, six were eliminated. The six alternatives eliminated were: (1) potable water reuse; (2) reclaimed water; (3) seawater desalination; (4) brackish groundwater; (5) water conservation; and (6) an Aquifer Storage and Recovery (ASR) system. Only two alternatives were capable of providing the necessary water supply to meet the regional demands by 2007. These two alternatives were an 1,100 acre reservoir and (2) an 1,100-acre reservoir with an ASR system.

Tampa Bay Regional Reservoir Project. Tampa Bay Water's Board of Directors considered multiple options for the potential regional reservoir location. Preliminary screening was conducted to minimize impacts to residential areas and natural features such as wetlands, bottom hardwood and riparian communities. A total of fifteen potential sites were reviewed and evaluated considering such criteria as natural features, land use, land values, relocations, construction costs, and potential contamination by hazardous materials. Seven of the fifteen alternative sites were retained in the screening process and were subjected to more extensive geotechnical and environmental analysis. These seven alternatives were presented to the public through a public involvement program. The screening process and cost analysis led to the selection of the preferred site for the Tampa Bay Regional Reservoir. The proposed reservoir and associated facilities would occupy approximately

1,100 acres. The actual water surface area of the reservoir would be about 900 acres when full and would have a storage volume of approximately 48,000 acre-feet (15 billion gallons). It would be located in southeastern Hillsborough County, south of County Road 640, north of County Road 672, and west of County Road 39. Portions of the site have been mined for phosphate, but are currently being used as improved pasture.

Reservoir embankments would be 30 to 65 feet high and constructed from onsite soils materials. To control erosion, the interior face of the embankments would be covered with soil cement.

Approximately 7.5 miles of 84-inch water transmission pipeline would connect the proposed reservoir to Tampa Bay Water's regional water system via the South Central Hillsborough Intertie. The new pipeline route would generally follow existing roadways and linear utility corridors. The route would begin approximately 400 feet north of the intersection of Fishhawk Drive, Bell Shoals Road and Boyette Road. It would then travel south and east, parallel to Boyette Road where it would cross rural land to the Tampa Bay Regional Reservoir site. The real property rights required for construction and operation of the pipeline would include a temporary easement of 50 feet for construction and a 50-foot permanent easement for construction, operation and maintenance activities. In areas near homes and other potentially sensitive locations, the easement would be reduced where possible to avoid or minimize impacts.
Detailed design, site permitting and construction of the reservoir are estimated to cost approximately $111.9 million while annual operation and maintenance costs are estimated at $964,000. Treated water from Tampa Bay Water's Enhanced Surface Water System is estimated to cost $1.27 per 1,000 gallons.

Tampa Bay Regional Reservoir and ASR System. An ASR system has been considered a possible enhancement to the Tampa Bay Regional Reservoir to improve the reliability of the overall surface water system. Two alternatives were evaluated that included the Tampa Bay Regional Reservoir and an ASR system. The first alternative evaluated included the proposed reservoir of 1,100 acres and an 18-mgd ASR system. The second alternative included a smaller reservoir of 800 acres and a 30-mgd ASR system.

The concept of the ASR system can be thought of as an underground reservoir. The ASR system would work together with the surface reservoir to increase the total storage capacity of the system. An advantage of subsurface storage is that it is not subject to evaporative losses and it does not require the acquisition of large parcels of land. Favorable hydrology and the ability to blend the recovered ASR water with water stored in the surface reservoir means that a large percent of the water put into storage could be recovered for use.

Up to this time, ASR has most commonly been used in Florida for the storage of fully treated potable water. However, new applications of this technology using water that has limited pretreatment are being developed. ASR is most easily permitted if the injected water meets all primary and secondary

drinking water standards. There is a regulatory exemption process currently in place that addresses the injection of water that exceeds one or more secondary drinking water parameters. Currently, exemptions of primary drinking water standards are very difficult to obtain. At this time there are new rules and procedures being considered that may allow an exemption for specific primary drinking water standards. Assuming sufficient water is available for storage, an ASR system capacity would likely be limited by regulatory criteria and maximum drawdown allowed during the recovery period within a prescribed distance from the wells. Prior to final design of an ASR system, a pilot study would need to be conducted to clearly define the ASR storage interval, the type of pretreatment, and specific details regarding the wellfield design and operation. The pilot study, permitting, and construction of the ASR wellfield under current regulatory criteria is estimated to take about ten years.

Engineering studies conducted by Tampa Bay Water of the proposed Tampa Bay Regional Reservoir indicated that an ASR system having a capacity to store and recover water at a rate of approximately 18 mgd could greatly improve the reliability of the overall water storage and supply system. The ASR system could be located at the regional reservoir site, along the regional reservoir pipeline route, or at a more distant location. An ASR system built adjacent to the regional reservoir site could potentially be the most cost efficient; no additional acquisition of property would be required. It is also thought that pretreatment could be more easily accomplished using stored reservoir water since the large volume of surface water stored could serve to buffer and dilute any unforeseen water quality parameters.

An ASR wellfield located more distant from the regional reservoir could offer certain advantages if regulatory issues and/or public opinion do not favor siting ASR wells adjacent to the reservoir.

The estimated costs of building an ASR system were based on constructing the ASR system near the regional reservoir site. Individual well capacities used in this analysis were estimated to be approximately 2 mgd. A system of 9 wells was used yielding a total ASR system capacity of 18 mgd with one 2-mgd backup well. The estimated cost of the entire wellfield was approximately $10.7 million. The total estimated cost of the regional reservoir and the ASR system was about $121 million.

The preliminary investigation for the second alternative conducted by Tampa Bay Water, on a smaller 800-acre reservoir, showed that an ASR system having a capacity to store and recover water at a rate of approximately 30-mgd would be required. The design and location of the ASR system would be similar to that in the first alternative.

For the second alternative a system of 15 wells was used, yielding 30 mgd with two 2-mgd backup wells. The estimated cost of the ASR system was approximately $18 million. The total estimated cost of the regional reservoir and the ASR system was about $128 million.

No Federal Action. The No Federal Action alternative is also included in the

DEIS. As stated in Chapter 2, the Tampa Bay Regional Reservoir Project is Tampa Bay Waters' preferred alternative. To compare viable alternatives in this DEIS, it was necessary to consider that No Federal Action equated to no reservoir. However, absent $12,615,000 in federal funds, nothing in this DEIS would prevent Tampa Bay Water from building the 1,100-acre reservoir and connecting transmission pipeline.

If the Tampa Bay Regional Reservoir were not built, Tampa Bay Water has demonstrated that it would not meet the tri-county area potable water demands under the commitments and obligations of the Interlocal and Partnership agreements nor would it meet the cumulative water supply needs predicted to occur by the year 2007. A 25-mgd deficit in water need would result.

Tampa Bay Water and SWFWMD have agreed to a Consolidated Water Use Permit that reduces Tampa Bay Water's current groundwater withdrawals of 158 mgd to 120 mgd by December 2002, and to 90 mgd by December 2007. Exceeding permitted withdrawal quantities in the Consolidated Water Use Permit could result in loss of funding committed by SWFWMD to Tampa Bay Water through the Partnership Agreement. In addition, groundwater pumpage above permitted levels would continue, resulting in an increase in environmental impacts to wetlands and lakes.

ENVIRONMENTAL CONSEQUENCES

Construction and operation of the action alternatives presented above would, to varying degrees, impact similar natural resources.

The proposed action alternatives would not affect the permitted freshwater withdrawal schedules from the Alafia and Hillsborough rivers and the Tampa Bypass Canal. The alternatives would increase the dependable yield of Tampa Bay Water's total surface water system by providing for the additional storage of surface water diverted during periods of higher flow for use during drier periods.

Implementation of either of the two action alternatives could decrease freshwater inflow into Tampa Bay by up to 115 mgd during high flow conditions (on a maximum daily basis). These proposed freshwater withdrawals have raised concerns about potential effects on Tampa Bay and its tributaries. The potential impacts of freshwater withdrawals on salinity and circulation on Tampa Bay ecosystem have been evaluated.

Modeling results have indicated freshwater withdrawals from the Alafia and Hillsborough rivers and the Tampa Bypass Canal would influence salinity and flushing time in Tampa Bay. The largest expected changes are predicted to occur in northwestern Hillsborough Bay, south of the interbay peninsula, and in portions of the main ship channel. However, because these changes are so small, there is no reason to believe that salinity and flushing time of the bay would be significantly adversely affected by the proposed freshwater withdrawals.

Implementation of the proposed projects to meet established 2007 water demands would divert up to 129 mgd (on a maximum daily basis) of freshwater

flows from the Hillsborough River and Tampa Bypass Canal. Withdrawals for the Hillsborough River would begin, based on a permit issued by SWFWMD, when flows in the river below the City of Tampa's Hillsborough River reservoir reach 65 mgd. Withdrawals from the Tampa Bay Bypass Canal would begin, based on the SWFWMD permit, when flows in the canal exceed 7 mgd.

Studies evaluating the potential impacts of freshwater withdrawals from the Hillsborough River and Tampa Bypass Canal indicate that some alterations to the flow and salinity regime could be expected. The saltwater wedge in the Hillsborough River would likely also fluctuate, moving up and down stream within its normal range. The magnitudes of these effects appear to be within the normal range of variation currently found in the natural system.

Withdrawals from the Alafia River would begin only when flow in the river reaches or exceeds 80 mgd, a threshold determined by SWFWMD and included in Tampa Bay Water's permit. Once this threshold is reached, withdrawals are permitted up to 10 percent of the flow, with a maximum withdrawal of 51.7 mgd. Hydrologic modeling studies prepared for the permitted freshwater withdrawals, described in Chapter 4, include analyses of the predicted impacts on both the Alafia River and Tampa Bay at the mouth of the Alafia River. Projected impacts resulting from freshwater withdrawals, including fluctuations of the saltwater wedge in the Alafia River, were estimated to be within the range of existing variation.

Under the Partnership Agreement between Tampa Bay Water, SWFWMD, and member governments, the proposed Tampa Bay Regional Reservoir Project and the associated freshwater withdrawals from the Alafia and Hillsborough rivers and Tampa Bypass Canal would allow Tampa Bay Water's member governments to reduce withdrawals from existing groundwater wellfields. The Partnership Agreement describes the required reduction in groundwater withdrawals from the 11 regional wellfields by the year 2002 and 2007.

By reducing reliance on groundwater, the action alternatives described in this DEIS would assist in maintaining groundwater levels and would enhance the biological health of related wetlands, lakes, and streams. Improved biological health of these resources would in turn benefit the fish and wildlife that inhabit these resources.

Construction activities associated with the proposed alternatives would not be expected to have any long-term impacts on local or regional ambient air quality. Any long-term increases in fugitive dust or engine emissions for operation of equipment would be temporary and minimal. Construction activities in the immediate reservoir pipeline areas would also have a temporary effect on local ambient air quality. The proposed Tampa Bay Regional Reservoir Project would not significantly impact the existing air quality in the project area.

Construction and operation of the proposed Tampa Bay Regional Reservoir Project would not impact vegetation and wetlands associated with the Alafia and Hillsborough rivers or the Tampa Bypass Canal.

The Tampa Bay Regional Reservoir Environmental Resource Permit and the U.S. Army Corps of Engineers Dredge and Fill Permit Applications addressed direct and indirect impacts of wetlands in the proposed project area. Direct impacts are those such as dredge and fill activities resulting from reservoir and pipeline construction. Indirect impacts are those that could result in potential changes in local water table elevations resulting from reservoir seepage.

The reservoir site selection process for the proposed Tampa Bay Regional Reservoir Project avoided and minimized direct and indirect impacts to wetlands to the maximum extent practical. The total amount of wetlands impacted by the project would be 188.3 acres. This includes 182.3 acres of wetlands within the reservoir footprint and 6 acres along the pipeline route. Impacts to wetlands along the pipeline would be temporary and would not require mitigation. Impacts to wetlands within the reservoir footprint would be permanent and would require mitigation.

Federal threatened and endangered and state sensitive species have been identified within the proposed project area. The species potentially occurring include the American alligator, eastern indigo snake, wood stork, Florida sandhill crane, southeastern American kestrel, Florida scrub jay, and bald eagle. With exception of the Florida sandhill crane, the project would not be expected to adversely affect any of the above mentioned species.

A cultural resource survey of the Tampa Bay Regional Reservoir Project area was made. Six previously unrecorded historic structures and four previously unrecorded prehistoric or archaeological sites were located. The six previously unrecorded historic structures are not eligible for listing on the National Register of Historic Places (NRHP). One of the prehistoric sites required a Phase II cultural resources survey, but nothing of significance was found. All four prehistoric sites were not considered to be eligible for NRHP listing.

The reservoir area is primarily undeveloped woodlands, wetlands, and grasslands used primarily for cattle grazing. Some agricultural crops are grown on the northwest portion of the site. The southern one-third of the site was previously mined for phosphate ore and has since been reclaimed.

Construction of the water transmission pipeline could result in minor temporary impacts such as disruption of traffic flow and congestion, and increased noise and dust levels. Construction impacts from the transmission pipeline would be temporary and would occur for no more than a few days in any one location.

Unavoidable adverse impacts. The construction and operation of an action alternative would have unavoidable adverse impacts that could not be completely mitigated. Construction and operation of the two action alternatives would result in the following unavoidable adverse impacts.

- Construction would result in a temporary decrease in air quality in the immediate project area.
- Noise in the immediate project area would be temporarily increased during construction.

- Terrestrial insects, reptiles, and mammals would be displaced to other areas, or lost, as the dam is constructed and the reservoir is filled.
- Land used for the reservoir would be lost to cattle grazing and other agricultural production.
- Unvegetated land exposed during the late summer through early spring would be vulnerable to erosion.
- Loss of wetlands.

Irreversible and Irretrievable Commitments of Resources. Construction of the project facilities would be the major aspect of the proposed action that would involve an irreversible commitment of resources. Construction of the regional reservoir would use construction materials such as soil for the embankment, concrete, and financial resources. The project would also commit freshwater flows from the Alafia and Hillsborough rivers and the Tampa Bypass Canal to fill and maintain the reservoir pool. If withdrawal of the existing freshwater inflow was found to have unacceptable adverse impacts on Tampa Bay, the flows would be restored. However, reduction or elimination of this regional water supply storage would cause considerable hardship to the regional water supply system; resources would have been committed to the development and treatment of the water from the reservoir to supplement the regional water supply system.

Relationship between short-term uses of the environment and the maintenance and enhancement of long-term productivity. The short-term and long-term tradeoff inherent in the project is a positive one (i.e. it favors the long-term). In the short-term, use of resources to construct the project facilities would be required. These facilities would then yield long-term benefits of supplementing and increasing drought-resistant water supply allowing for the natural recharge of groundwater in the wellfield area and satisfying some of the increased water demands associated with population growth in the three-county area.

Conflicts with Land Use Plans, Policies, or Controls. The proposed project would not conflict with any existing land use plans, policies, or controls. The construction of the reservoir and pipeline would be consistent with zoning currently designated for the site.

Summary of Cumulative Impacts. Tampa Bay Water has developed a Master Water Plan for meeting the potable water needs of the Tampa Bay region for the 15-year period 1995 through 2010. The Master Water Plan incorporates plans for obtaining freshwater from numerous sources or storing freshwater, which include the:

- Alafia and Hillsborough rivers
- Tampa Bypass Canal
- Tampa Bay Regional Reservoir
- Brandon Urban Dispersed Wells and Cone Ranch projects

Studies have been conducted to predict potential impacts from individual projects of the Master Water Plan, and the cumulative impact that would result from implementing a number of the projects simultaneously. The assessments of potential impacts to Tampa Bay tributaries focused on changes to freshwater inflow rates and water quality that would result from the

proposed surface water withdrawals. Potential impacts to the Hillsborough River and Tampa Bypass Canal system and the Alafia River were evaluated. Stream flow characteristics and water quality of the rivers were examined. Resources of interest include fish, benthos, and submerged and emergent aquatic vegetation that could potentially be impacted by changes in flow patterns or salinity regimes resulting from withdrawals. The extent and magnitude of impacts were then assessed to identify any potential threats to living resources.

Different methods were used to estimate potential cumulative impacts so that the result of the diverse analysis could be compared. Obtaining similar results using different methods of analysis provides an increased level of confidence in the findings.

The conclusions of the modeling efforts conducted by both Hillsborough County and Tampa Bay Water were similar and considered the other projects in the Master Water Plan. The conclusions concerning the possible individual and cumulative impacts are summarized below.

Alafia River

- Low and high flows are preserved under the withdrawal schedule. There is little change to salinity regimes under low and high flow conditions.
- The saltwater interface may vary by a maximum of approximately 0.25-mile under moderate flow conditions. This could result in the conversion of a small area of freshwater marsh to saltwater marsh. The location of the saltwater interface is predicted to change much less under high flow and low flow conditions.
- Maximum salinity increase is predicted to be less than 2 ppt, which is within the observed long-term variability of the system.

Hillsborough River/Tampa Bypass Canal

- Withdrawals from the Hillsborough River begin when flows below the City of Tampa's reservoir reach 5.6 times the minimum flow of 10 cfs.
- Significant impacts are unlikely to living resources of concern within the Hillsborough River and Tampa Bypass Canal system. The greatest withdrawals would be during the wet summer months when maintaining habitat for the biological resources would not be as critical. The predicted impacts to freshwater inflow and salinity patterns during summer months are not expected to be significant.

Tampa Bay

- SWFWMD modeling efforts suggest salinity increases of no more that 1.5 ppt in Hillsborough Bay due to freshwater withdrawals.
- Investigations show no evidence of significant impacts to the tributaries and living resources resulting from individual projects. In addition, the cumulative impact analysis did not identify any fatal flaws.
- SWFWMD's Tampa Bay model suggested salinity increases due to enhanced surface water system (ESWS) withdrawals (and Brandon Urban Dispersed Wells and Cone Ranch) would be within the range of long-term variability.
- Results of the coastal mass balance model suggested a maximum

monthly impact to salinity from ESWS withdrawals (and a desalination facility, Brandon Urban Dispersed Wells, and Cone Ranch) within the range of long-term variability (Coastal Environmental/PBS&J 1998).

- The mass balance model suggested that the annual cycle of salinity within bay segments re-establishes and stabilizes at slightly higher levels than current levels after 3 to 4 years of operation of the Master Water Plan projects.

Potential impacts to the Alafia and Hillsborough rivers, the Tampa Bypass Canal, and Tampa Bay from withdrawal of freshwater for storage in the proposed reservoir are considered to be modest and within the range of normal variability. This salinity fluctuation is expected to be well within the normal range of variability and is also within the relatively wide range of salinity tolerances of identified living resources of interest found in oligohaline zones.

Impacts from Past and Present Actions. Past and present human activity have substantially affected the land cover at and in the vicinity of the proposed action alternatives. The southern portion of the proposed reservoir area contains reclaimed phosphate mines and is currently being used for agricultural purposes. The northern portion of the site is unmined agricultural land. Overgrazing has changed the plant species composition of existing rangelands and the physical structure of these habitats by the selective removal of the more palatable species or life stages of plants. The lack of restrictions on cattle movement has also resulted in the degradation of riparian and wetland communities. The effect of these actions have reduced the quality of habitat for native fauna and increased erosion. Initially, the construction of one of the proposed actions or alternative would continue the trend in the destruction or degradation of native terrestrial habitats.

Through the environmental assessment process, gopher tortoise burrows were located in the upland area in the northwest corner of the reservoir site. To minimize impacts to the tortoises, the reservoir configuration was further revised to avoid the upland area in the northwest portion of the site. Mitigation measures would offset the losses through the enhancement of existing habitat or the creation of replacement habitat.

The original reservoir layout was rectangular in shape and was moved to avoid potential environmental impacts associated with Doe Branch Creek and property owned by Hillsborough County. The current shape of the reservoir reflects these changes.

SWFWMD Governing Board in August 2000 voted to acquire the property necessary for the proposed reservoir using a State fund called the Florida Forever Fund. There are three property owners for the reservoir site, with parcels totaling 5,200 acres. SWFWMD has acquired one of the three parcels of land and is in the process of acquiring the remaining two parcels. The area of 5,200 acres will include the 1,100 acres required for the proposed reservoir, and the property necessary for all of three mitigation sites. The entire 5,200 acres would remain in public ownership and property not directly related to the proposed reservoir footprint and

mitigation areas will be permanently preserved. The 5,200-acre acquisition is also important because it links the habitat corridors of the mainstream of the Alafia River to Fish Hawk creek, and to the South Prong of the Alafia. This purchase will keep the land adjacent to the proposed reservoir from being encroached upon by suburban development.

Significance of Cumulative Impacts. The mitigation proposed for the loss of vegetation communities caused by construction of the proposed action or the alternative would complement the natural habitat of the area. The proposed mitigation plan provides information to compensate for unavoidable wetland impacts associated with the proposed reservoir project. The amount of mitigation is based on wetland impacts as determined by the U.S. Army Corps of Engineers, Florida Department of Environmental Protection, and Hillsborough County Environmental Protection Commission. Mitigation would be conducted at three sites adjacent to the reservoir. These mitigation projects are expected to provide an ecological benefit to the region.

MITIGATION

The development and implementation of a comprehensive HBMP is a condition of the SWFWMD water use permit for the freshwater diversions from the Alafia and Hillsborough rivers and Tampa Bypass Canal. The goal of the HBMP is to measure the change in water quality, vegetation, and animal populations that would occur in the project area, where surface water withdrawals would occur, as a result of the project and to determine an appropriate course of action in response to such changes. This program would ensure that the salinity distribution in the tidal portions and estuaries of the Alafia and Hillsborough rivers would not be significantly altered as a result of the freshwater withdrawals, and that recreation or commercial use or aesthetic qualities of these resources would not be adversely impacted.

The project would comply with local, state, and federal emission limits and operating parameter requirements for air emission sources during construction. Dust and noise control measures would be implemented during construction of the proposed projects. Minimizing the area excavated, wetting of excavated areas and timely seeding of or sodding of exposed areas would minimize dust levels and erosion potentials. Noise abatement procedures would include selective timing of construction activities that could impact nearby sensitive receptors.

Impacts to jurisdictional wetlands on project sites would be mitigated in accordance with Section 404 of the Clean Water Act and all other State of Florida and local wetland regulations. Wetland mitigation was discussed in Section 4 and the Mitigation Plan in Appendix B.

CONCLUSIONS

Based on the analysis of the two action alternatives and the No Federal Action alternative presented in the preceding sections and discussions in Chapter 4, the alternative preferred by EPA is the 1,100-acre Tampa Bay Regional Reservoir Project. To briefly summarize, the 1,100-acre Tampa Bay Regional Reservoir Project would not affect the permitted freshwater withdrawal schedules from the Alafia

and Hillsborough rivers and the Tampa Bypass Canal. The water supply project would increase the dependable yield of the total surface water system by providing for the additional storage of surface water diverted during periods of higher flow for use during drier periods. The first 66-mgd of surface water withdrawn from the three combined water supply sources would be treated at the new regional water treatment plant before being distributed to customers via Tampa Bay Water's regional water system. Any surface water withdrawals in excess of 66 mgd would be pumped into the 1,100-acre regional reservoir for storage. When surface water flows decrease and are below permitted withdrawal levels, stored water would be withdrawn from the reservoir and treated at the regional water treatment facility for distribution.

The 1,100-acre Tampa Bay Regional Reservoir alternative is also the project preferred for implementation by Tampa Bay Water. The regional reservoir would provide a quality source of water that could effectively provide Tampa Bay Water and their member governments a viable water source to supplement the integrated surface water supply system. Development of an ASR system could improve the overall reliability of Tampa Bay Waters' preferred 1,100-acre water supply reservoir. A stand alone ASR alternative was originally included in the initial array of alternatives; this alternative was eliminated because it did not provide the required supply in the time frame desired. In addition, the policy and technical issues pursuant to ASR have not been technically addressed in this DEIS to the extent required by the National Environmental Policy Act. EPA makes no recommendation as to the desirability or feasibility of the inclusion of ASR in the Tampa Bay Regional Reservoir Project.

Summary of Conclusions.

- The Tampa Bay Regional Reservoir Project would improve the reliability and dependability of Tampa Bay Water's regional surface water supply system.
- Construction of Tampa Bay Water's preferred alternative, Tampa Bay regional reservoir, would impact 188.3 acres of wetlands. This includes 182.3 acres of wetlands within the reservoir footprint and 6 acres along the pipeline route.
- By reducing reliance on groundwater, the preferred alternative would assist in maintaining water levels and enhance the biological health of related wetlands, lakes, and streams. Improved biological health of these resources would in turn benefit the fish and wildlife that inhabit these resources.
- The magnitude of the salinity changes in the Alafia and Hillsborough rivers, Tampa Bypass Canal, and Tampa Bay from operating the reservoir are expected within the normal range of variation currently found in the natural system.
- Most adverse impacts would be avoided or minimized and mitigated where avoidance would not be practical.
- SWFWMD has agreed to acquire the property for the regional reservoir and additional land located immediately adjacent to the reservoir footprint totaling approximately 5,200 acres.

AREAS OF CONTROVERSY

The most prominent controversy concerning the Tampa Bay Regional Reservoir Project identified in the public scoping process concerned the operation of the reservoir and associated impacts on the Alafia and Hillsborough rivers, Tampa Bypass Canal and Tampa Bay.

Citizens and representatives of Hillsborough County expressed additional concerns pertaining to the construction and operation of the reservoir. These included the safety of the reservoir and impacts associated with embankment failure.

ISSUES BEING RESOLVED

Issues being resolved include preparation of inundation maps for the regional reservoir and monitoring water seeping from the regional reservoir. These issues are described below.

- Tampa Bay Water has prepared inundation maps and an Emergency Action Plan has also been drafted.
- By June 2001, Tampa Bay Water will have a formal plan to monitor and assess potential impacts to the areas surrounding the reservoir. Tampa Bay Water coordinated with regulatory agencies during the planning and development of the monitoring plan.
- Areas of concern regarding seepage from the reservoir include such resources as gopher tortoise habitat located outside of the northeast corner of the reservoir embankment. Tampa Bay Water has initiated the collection of baseline date, which will be used for including these areas in the monitoring plan.

TABLE OF CONTENTS

SUMMARY S-1

TABLE OF CONTENTS TC-1

LIST OF TABLES TC-9

LIST OF FIGURES TC-10

CHAPTER 1 INTRODUCTION AND BACKGROUND

1.1 INTRODUCTION 1-1

1.2 PURPOSE OF THIS DOCUMENT 1-2

1.3 PROJECT PURPOSE 1-2

1.4 PROJECT NEED 1-4

1.5 CURRENT WATER SUPPLY SYSTEM 1-4
1.5.1 Water Supply Sources 1-4
1.5.2 Treatment Facilities 1-4
1.5.3 Transmission Facilities 1-5
1.5.4 Operation of the System 1-5

1.6 DEMAND AND POPULATION PROJECTIONS 1-5
1.6.1 Demand Forecast Method 1-5
1.6.2 Population Projections 1-7

1.7 WATER CONSERVATION MEASURES 1-7
1.7.1 Hillsborough County Water Conservation Plan 1-9
1.7.2 Pasco County Water Conservation Plan 1-9
1.7.3 Pinellas County Water Conservation Plan 1-10
1.7.4 City of St. Petersburg Water Conservation Plan 1-11
1.7.5 City of Tampa Water Conservation Plan 1-11
1.7.6 City of New Port Richey Water Conservation Plan 1-12

1.8 WATER USE PERMITS AND PRINCIPLE AGREEMENTS 1-13
1.8.1 Water Permits 1-13
1.8.2 Principle Agreements 1-13

1.9 NEW PROJECTS 1-14

1.10 TAMPA BAY REGIONAL RESERVOIR PROJECT 1-16

1.11 SUMMARY OF PROJECT NEED 1-16

1.12 ADMINISTRATIVE AND ENVIRONMENTAL REQUIREMENTS 1-16
1.12.1 U.S. Environmental Protection Agency, Region 4 1-17
1.12.2 Tampa Bay Water 1-17
1.12.3 U.S. Army Corps of Engineers 1-17
1.12.4 Florida Department of Environmental Protection 1-17
1.12.5 Southwest Florida Water Management District 1-20
1.12.6 Environmental Protection Commission of Hillsborough County 1-20

1.13 EIS PREPARATION 1-20

1.14 ORGANIZATION OF THE DOCUMENT 1-21

CHAPTER 2 ALTERNATIVES, INCLUDING THE PROPOSED ACTION

2.1 INTRODUCTION 2-1

2.2 ACTION ALTERNATIVES 2-3
2.2.1 Tampa Bay Regional Reservoir Project 2-3
2.2.2 Other Action Alternatives 2-12

2.3 NO FEDERAL ACTION ALTERNATIVE 2-22

2.4 EVALUATION OF ACTION ALTERNATIVES 2-22

2.5 ALTERNATIVES CARRIED FORWARD 2-25

CHAPTER 3 AFFECTED ENVIRONMENT

3.1 INTRODUCTION 3-1

3.2 GENERAL SETTING 3-1

3.3 SOILS AND GEOLOGY 3-4
3.3.1 Soils 3-4
3.3.2 Geology 3-5

3.4 AIR QUALITY 3-9

3.5 NOISE 3-9

3.6 WATER RESOURCES 3-10
3.6.1 Groundwater 3-10
3.6.2 Surface Water Quantity 3-11
3.6.2.1 Alafia River 3-11
3.6.2.2 Hillsborough River 3-12
3.6.2.3 Tampa Bypass Canal 3-16
3.6.2.4 Tampa Bay 3-16
3.6.3 Surface Water Quality 3-18
3.6.3.1 Tampa Bay Regional Reservoir Project 3-19
3.6.3.2 Alafia River 3-19
3.6.3.3 Hillsborough River 3-20
3.6.3.4 Tampa Bypass Canal 3-21
3.6.3.5 Tampa Bay 3-22

3.7 MINIMUM FLOWS AND LEVELS 3-23
3.7.1 Alafia River 3-25
3.7.2 Hillsborough River 3-25
3.7.3 Tampa Bypass Canal 3-26

3.8 UPLAND VEGETATION 3-26
3.8.1 Tampa Bay Regional Reservoir Project 3-27
3.8.2 Alafia River, Hillsborough River, Tampa Bypass Canal and Tampa Bay 3-27

3.9 WETLANDS 3-28
3.9.1 Tampa Bay Regional Reservoir Project 3-29
3.9.2 Alafia River 3-30
3.9.3 Hillsborough River and Tampa Bypass Canal 3-31
3.9.4 Tampa Bay 3-31

3.10 WILDLIFE 3-31
3.10.1 Tampa Bay Regional Reservoir Project 3-31
3.10.2 Alafia River 3-34
3.10.3 Hillsborough River and Tampa Bypass Canal 3-34
3.10.4 Tampa Bay 3-35

3.11 FISH 3-37
3.11.1 Tampa Bay Regional Reservoir Project 3-37
3.11.2 Alafia River 3-37
3.11.3 Hillsborough River 3-38
3.11.4 Tampa Bay 3-39

3.12 THREATENED AND ENDANGERED SPECIES 3-39
3.12.1 Federally Threatened and Endangered Species 3-39
3.12.2 State Listed Species of Special Concern 3-48

3.13 SOCIOECONOMIC CONDITIONS 3-55
3.13.1 Socioeconomic Portfolio for the Region of Influence 3-55
3.13.2 Seasonal Residents 3-58
3.13.3 Public Services 3-58
3.13.4 Environmental Justice 3-59

3.14 VISUAL AND AESTHETIC CHARACTERISTICS 3-61

3.15 CULTURAL RESOURCES 3-61

3.16 RECREATION 3-66

3.17 RISK ANALYSIS AND IMPACT TO THE HUMAN COMMUNITY 3-67

CHAPTER FOUR ENVIRONMENTAL CONSEQUENCES

4.1 INTRODUCTION 4-1

4.2 GENERAL SETTING 4-2
4.2.1 Action Alternatives 4-2
4.2.2 No Federal Action 4-2
4.2.3 Mitigation 4-2

4.3 HYDROLOGY 4-3
4.3.1 Surficial and Subsurface Soil Conditions 4-3
4.3.2 Surface Drainage 4-3
4.3.3 Mining and Reclamation History 4-3
4.3.4 Action Alternatives 4-4
4.3.5 No Federal Action 4-4
4.3.6 Mitigation 4-4

4.4 GEOLOGICAL, HYDROGEOLOGICAL, AND GEOPHYSICAL INVESTIGATION 4-4
4.4.1 Action Alternatives 4-6
4.4.2 No Federal Action 4-7
4.4.3 Mitigation 4-7

4.5 GEOTECHNICAL EXPLORATION 4-8
4.5.1 Action Alternatives 4-9
4.5.2 No Federal Action Alternative 4-10
4.5.3 Mitigation 4-10

4.6 AIR QUALITY 4-10
4.6.1 Action Alternatives 4-11
4.6.2 No Federal Action 4-11
4.6.3 Mitigation 4-11

4.7 NOISE QUALITY 4-12
4.7.1 Action Alternatives 4-12
4.7.2 No Federal Action 4-12
4.7.3 Mitigation 4-12

4.8 WATER RESOURCES 4-12
4.8.1 Groundwater Quantity 4-12
4.8.1.1 Tampa Bay Regional Reservoir Project 4-13
4.8.1.2 Tampa Bay Regional Reservoir and ASR System 4-14
4.8.1.3 No Federal Action 4-15
4.8.1.4 Mitigation 4-15
4.8.2 Groundwater Quality 4-16
4.8.2.1 Tampa Bay Regional Reservoir Project 4-16
4.8.2.2 Tampa Bay Regional Reservoir and ASR System 4-16
4.8.2.3 No Federal Action 4-17
4.8.2.4 Mitigation 4-17
4.8.3 Surface Water Quantity 4-18
4.8.3.1 Tampa Bay Regional Reservoir Project 4-19
4.8.3.2 Tampa Bay Regional Reservoir and ASR System 4-21
4.8.3.3 No Federal Action 4-21
4.8.3.4 Mitigation 4-21
4.8.4 Surface Water Quality 4-22
4.8.4.1 Tampa Bay Regional Reservoir Project 4-22
4.8.4.2 Tampa Bay Regional Reservoir and ASR System 4-29
4.8.4.3 No Federal Action 4-29
4.8.4.4 Mitigation 4-29

4.9 MINIMUM FLOWS AND LEVELS 4-29
4.9.1 Action Alternatives 4-30
4.9.2 No Federal Action 4-32
4.9.3 Mitigation 4-32

4.10 UPLAND VEGETATION 4-32
4.10.1 Action Alternatives 4-32
4.10.2 No Federal Action 4-33
4.10.3 Mitigation 4-33

4.11 WETLANDS 4-33
4.11.1 Tampa Bay Regional Reservoir Project 4-34
4.11.2 Tampa Bay Regional Reservoir and ASR System 4-36

4.11.3 No Federal Action 4-36
4.11.4 Mitigation 4-36

4.12 WILDLIFE 4-36
4.12.1 Action Alternatives 4-37
4.12.2 No Federal Action 4-40
4.12.3 Mitigation 4-40

4.13 FISHERIES 4-40
4.13.1 Tampa Bay Regional Reservoir Project 4-41
4.13.2 Tampa Bay Regional Reservoir and ASR System 4-42
4.13.3 No Federal Action 4-42
4.13.4 Mitigation 4-42

4.14 THREATENED AND ENDANGERED SPECIES 4-42
4.14.1 Federally Threatened and Endangered Species 4-43
4.14.1.1 Action Alternatives 4-43
4.14.1.2 No Federal Action 4-45
4.14.1.3 Mitigation 4-45
4.14.2 State Listed Species of Special Concern 4-45
4.14.2.1 Action Alternatives 4-45
4.14.2.2 No Federal Action 4-48
4.14.2.3 Mitigation 4-48

4.15 SOCIOECONOMIC CONDITIONS 4-49
4.15.1 Population 4-49
4.15.1.1 Action Alternatives 4-49
4.15.1.2 No Federal Action 4-49
4.15.2 Housing 4-51
4.15.2.1 Action Alternatives 4-51
4.15.2.2 No Federal Action 4-51
4.15.3 Land Use 4-51
4.15.3.1 Action Alternatives 4-51
4.15.3.2 No Federal Action 4-51
4.15.4 Employment and Income 4-51
4.15.4.1 Action Alternatives 4-51
4.15.4.2 No Federal Action 4-51
4.15.5 Community Services and Facilities 4-53
4.15.5.1 Action Alternatives 4-53
4.15.5.2 No Federal Action 4-53
4.15.6 Public Finance 4-53
4.15.6.1 Action Alternatives 4-53
4.15.6.2 No Federal Action 4-53
4.15.7 Environmental Justice 4-53
4.15.8 Mitigation 4-53

4.16 VISUAL AND AESTHETIC CHARACTERISTICS 4-54
4.16.1 Action Alternatives 4-54
4.16.2 No Federal Action 4-54
4.16.3 Mitigation 4-54

4.17 CULTURAL RESOURCES 4-55
4.17.1 Action Alternatives 4-55
4.17.2 No Federal Action 4-56
4.17.3 Mitigation 4-56

4.18 RECREATION 4-56
4.18.1 Action Alternatives 4-56
4.18.2 No Federal Action 4-57
4.18.3 Mitigation 4-57

4.19 RISK ANALYSIS AND IMPACT TO THE HUMAN COMMUNITY 4-57
4.19.1 Action Alternatives 4-58
4.19.2 No Federal Action 4-58
4.19.3 Mitigation 4-58

4.20 UNAVOIDABLE ADVERSE IMPACTS 4-59

4.21 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES 4-59

4.22 RELATIONSHIP BETWEEN SHORT-TERM USES OF THE ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG TERM PRODUCTIVITY 4-59

4.23 CONFLICTS WITH LAND USE PLANS, POLICIES, OR CONTROLS 4-60

4.24 CUMULATIVE IMPACTS 4-60
4.24.1 Summary of Incremental Impacts 4-60
4.24.2 Impacts from Past and Present Actions 4-61
4.24.3 Significance of Cumulative Impacts 4-63

4.25 CONCLUSION 4-63

CHAPTER 5 COORDINATION AND PUBLIC INVOLVEMENT

5.1 INTRODUCTION 5-1

5.2 PUBLIC INVOLVEMENT 5-1
5.2.1 Public Meetings 5-1
5.2.2 Public Scoping Meeting 5-1
5.2.3 Draft EIS 5-2
5.2.4 Final EIS 5-2

5.3 AGENCY COORDINATION 5-2
5.3.1 Public Notice and Other Communications 5-2
5.3.2 Other Agency Consultations 5-3

5.4 DEIS PREPARATION TEAM 5-3
5.4.1 Federal Lead Agency 5-3
5.4.2 Applicant 5-3
5.4.3 Third-Party Contractor 5-3
5.4.4 Other Contributors 5-4

CHAPTER 6 LITERATURE CITED 6-1

APPENDIX A BIOLOGICAL ASSESSMENT A-1

APPENDIX B MITIGATION SUMMARY B-1

APPENDIX C ALAFIA RIVER AND HILLSBOROUGH RIVER/TAMPA BYPASS CANAL WITHDRAWAL PERMITS C-1

APPENDIX D CORRESPONDENCE D-1

APPENDIX E WILDLIFE SPECIES LIST E-1

LIST OF TABLES

1-1 Tampa Bay Regional Demographic Projections 1-7
1-2 Alafia River Permit Total Withdrawal Quantities Authorized Under This Permit 1-15
1-3 Tampa Bypass Canal Permit Total Withdrawal Quantities Authorized Under This Permit 1-15
1-4 Hillsborough River Permit Total Withdrawal Quantities Authorized Under This Permit 1-15
1-5 Maximum Withdrawal Hillsborough River and Tampa Bay Bypass Canal 1-15
1-6 Tampa Bay Regional Reservoir EIS and Pipeline Permits 1-19
2-1 Alternatives Evaluated 2-2
2-2 Summary Matrix of the Reservoir Siting Results 2-4
2-3 Reclaimed Water Alternatives 2-15
2-4 Aquifer Storage and Recovery Wellfield Alternatives 2-19
2-5 Estimated Capital Cost Range for the Proposed ASR System 2-21
3-1 Hillsborough County Maximum Permissible Sound Levels 3-10
3-2 Federally, Threatened, or Endangered Species 3-41
3-3 Florida Threatened, Endangered, and Special Concern Species 3-49
3-4 Population Information for the Authority's Member Counties 3-56
4-1 Summary of Wetland Impacts for the Tampa Bay Regional Reservoir 4-34
4-2 Summary of Wetland Impacts for the Associated Facilities 4-37
5-1 EIS Preparers at U.S. Environmental Protection Agency, Region IV 5-5
5-2 EIS Preparers at Tampa Bay Water 5-5
5-3 EIS Preparers at Burns & McDonnell 5-6
5-4 EIS Preparers at Florida Environmental, Inc 5-7
5-5 EIS Preparers at Environmental Permitting and Design, Inc 5-7

LIST OF FIGURES

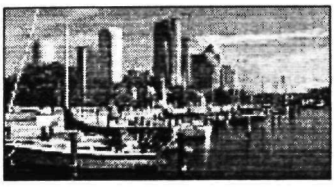
1-1 Tampa Bay Water Service Boundary 1-3
1-2 EPACT Adjusted Annual Average Demand Projections (mgd) by Water Year 1-6
1-3 Enhanced Surface Water System with and without the proposed Regional Reservoir 1-18
2-1 Project Location Map 2-9
2-2 Reservoir Cross Section 2-11
2-3 Pipeline Route 2-13
3-1 General Setting 3-2
3-2 Hydrologic Soil Groups 3-6
3-3 Geologic Cross Section 3-8
3-4 Alafia River Drainage Area 3-13
3-5 Hillsborough and Tampa Bypass Canal Map 3-14
3-6 Tampa Bay 3-17
3-7 WQI Annual Average 3-24
3-8 Wildlife Habitat 3-32
3-9 Economic Breakdown of ROI 3-57
3-10 Environmental Justice 3-61
4-1 Reservoir Wetland Impacts 4-35
4-2 Pipeline Wetland Impacts 4-38
4-3 Proposed Mitigation Sites 4-50
4-4 Adjacent Lands 4-52

CHAPTER 1

INTRODUCTION AND BACKGROUND

1.1 INTRODUCTION

Tampa Bay Water, formerly The West Coast Regional Water Supply Authority, was established on October 25, 1974. In August 1998, the Authority became Tampa Bay Water, which is responsible for supplying wholesale water to its six member governments of Hillsborough, Pasco, and Pinellas counties and the Cities of New Port Richey, St. Petersburg, and Tampa (Figure 1-1).



Tampa Bay Water is the largest wholesale water supplier in the State of Florida. Its member governments serve the needs of approximately 2 million people. Tampa Bay Water provides an average of 176 million gallons of drinking water each day (mgd). Currently, this water comes in the form of groundwater from the Floridan aquifer. Since the Floridan aquifer is hydraulically connected to surface waters in some areas, environmental resources have been impacted in these specific areas. In fact, the potential impacts of groundwater pumping have been a matter of substantial concern among the member governments, the Southwest Florida Water Management District (SWFWMD), the Florida Legislature and the public over the course of several years.

In answer to these concerns, Tampa Bay Water and SWFWMD have negotiated a Consolidated Water Use Permit, which regulates withdrawals from the 11 wellfields currently operated by Tampa Bay Water.

The Consolidated Water Use Permit currently limits withdrawals from 11 of the 12 wellfields, currently operated by Tampa Bay Water, to 158 mgd (based on a 36-month running average). The total permitted capacity of the 11 wellfields will be reduced to 121 mgd in December 2002 and to 90 mgd in December 2007. To meet the terms of the Consolidated Water Use Permit and the demands of the growing population, Tampa Bay Water has identified the need to develop 53 mgd of new water supply sources by 2002 and an additional 58 mgd by 2007.

To meet these demands, Tampa Bay Water initiated a study that resulted in the Master Water Plan Alternative System Configurations (Report) (Black & Veatch 1998). The Report evaluated potential water supply alternatives and facilities using water demand projections, existing water supply sources and facility capacities. The outcome was the identification of potential water supply sources and facilities to meet the needs of the Tampa Bay area through the year 2010.

A number of combinations of projects presented in the Report could potentially meet the future demands of the Tampa Bay Area. However, based on a viable implementation schedule, only four of the new systems could potentially meet the December 2002 and 2007 groundwater reduction requirements. Each of the four systems identified in the Report would provide both integration of

the water supply system and rotational service. A water conservation program is also included in all of the systems, which proposes a reduction of average annual demand by 10 mgd in 2000 and 17 mgd in 2005.

Each of the four systems described contained one set of core projects that would meet the 2002 need and a second set of core project(s) to meet the need in 2007. The projects that were capable of providing the need for 2002 are as follows:

- Tampa Bypass Canal Water Supply project
- Alafia River project
- Brandon Urban Dispersed Wells project
- Seawater Desalination project
- Cypress Bridge II project

Regardless of which new sources were constructed initially to meet the established 2002 need, Tampa Bay Water determined that one of the following projects would also need to be included in the system to meet the projected needs of the Tampa Bay area by December 31, 2007.

- Tampa Bay Regional Reservoir project
- Seawater Desalination Expansion
- Hillsborough Bay Resource Exchange

To make the system functional, the new Tampa Bay Regional Water Treatment Plant (WTP) and the South Central Hillsborough Intertie would also need to be constructed. Each one of these projects represents a piece of the puzzle that together will form an integrated water supply for the Tampa Bay region. The piece of the puzzle that is the subject of this Environmental Impact Statement (EIS) is the **Tampa Bay Regional Reservoir Project.**

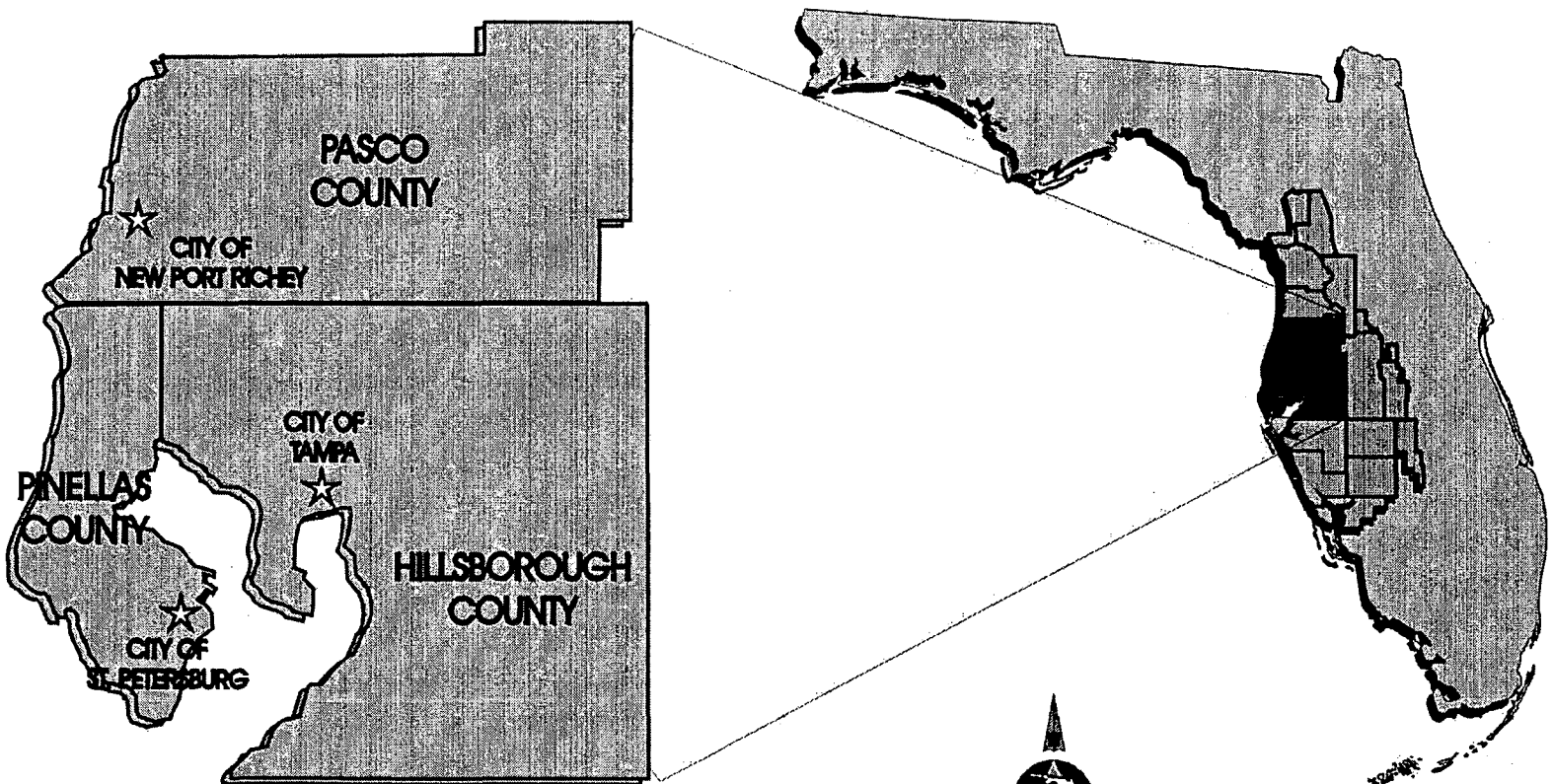
1.2 PURPOSE OF THIS DOCUMENT

The Tampa Bay Regional Reservoir was authorized for grant funding by the U.S. Environmental Protection Agency (EPA) under the State Tribal Assistance Grant Program. This action, if funded, would partially provide the means to acquire the real property and to design and construct the Tampa Bay Regional Reservoir and reservoir transmission main. EPA, as the lead federal agency, must consider all environmental effects of the construction and operation of the Tampa Bay Regional Reservoir, and must conduct a National Environmental Policy Act (NEPA) analysis of project impacts on the existing environment. Pursuant to 40 C.F.R. 1501.4 (c) and in accordance with Section 102(2)(C) of NEPA, EPA has identified the need to prepare an EIS for the **Tampa Bay Regional Reservoir Project.**

1.3 PROJECT PURPOSE

Tampa Bay Water wishes to build the Tampa Bay Regional Reservoir to improve the reliability and dependability of the regional surface water supply system. The reservoir would store untreated raw surface water diverted during high flow conditions from the Hillsborough River, the Tampa Bypass Canal, and the Alafia River. This stored water would be used during dry periods when little or no surface water can be diverted. The first 66 mgd of raw water withdrawn from one or more of the three surface water sources would be treated at the new Tampa Bay Regional WTP and then pumped into

Figure 1-1. Tampa Bay Water Service Boundary



Source: Tampa Bay Water, 1998

Tampa Bay Water's regional water distribution system.

As envisioned, diverted amounts of raw water exceeding 66 mgd would be pumped into the reservoir and stored for later use. During the dry season when lilttle or no water could be diverted from the surface water sources, up to 66 mgd would be withdrawn from the reservoir, treated at the Tampa Bay Regional WTP and distributed to retail customers.

1.4 PROJECT NEED

Tampa Bay Water believes that the proposed Tampa Bay Regional Reservoir is needed to increase the yield of the regional surface water system. Rapid population growth and economic development has resulted in an increase in projected future water demand (See Section 1.6). In addition, Tampa Bay Water has also entered into various agreements, which require reductions in groundwater use and maintaining water demand at or below 94 percent of the permitted capacity. Based on increased water demand and reduction of the existing supply, Tampa Bay Water wishes to develop new water supply sources to meet the additional required water supply capacity presented in the following schedule (Black & Veatch 1998).

Year		Additional Capacity Required (mgd)
December	2002	53
"	2007	58
Total		**111**

1.5 CURRENT WATER SUPPLY SYSTEM

Tampa Bay Water's existing water supply system (the System) includes 12 wellfields, two water treatment plants, several booster pumping stations, transmission mains, and interconnections with member government systems (Tampa Bay Water 1999b).

1.5.1 Water Supply Sources. Tampa Bay Water currently obtains water from 12 wellfields located in Pasco, Pinellas, and Hillsborough counties and from a pipeline interconnect within the City of Tampa's water distribution system. The 12 wellfields are:

1. Cosme-Odessa Wellfield
2. Cross Bar Ranch Wellfield
3. Cypress Bridge Wellfield
4. Cypress Creek Wellfield
5. Eldridge-Wilde Wellfield
6. Morris Bridge Wellfield
7. Northwest Hillsborough Wellfield
8. North Pasco Wellfield
9. Section 21 Wellfield
10. South Pasco Wellfield
11. Starkey Wellfield South-Central
12. South Central Hillsbrough Regional Wellfield

Additional sources of water include surface water from the Tampa Bay Bypass Canal. One portion of a Master Water Plan project, well #7 of the Brandon Urban Dispersed wells project, has been in operation since January 2001 to meet demand requirements.

1.5.2 Treatment Facilities. Water in the System is treated at two water treatment facilities, the Cypress Creek WTP located in Pasco County and the Lake Bridge WTP in Hillsborough County. All other water is treated by facilities owned and operated by the individual member governments.

1.5.3 Transmission Facilities. The existing water transmission system includes eleven major transmission mains and five booster-pumping stations. Tampa Bay Water's major transmission mains are (Tampa Bay Water 2000b):

- Cypress Creek Transmission Main
- Cypress Bridge Transmission Main
- Cross Bar Ranch Transmission Main
- Morris Bridge Transmission Main
- North Pasco Wellfield Phase-I Transmission Main
- NW Hillsborough Transmission Main
- South Central Hillsborough Regional Wellfield Transmission Main
- Sheldon Road Transmission Main
- Starkey Wellfield Transmission Main
- Tampa Bypass Canal Transmission Main
- South Pasco Transmission Main

Tampa Bay Water owns and operates four booster pumping stations and one surface water pumping station. These include:

- U.S. 41 Booster Pump Station
- West Pasco Booster Pump Station
- Morris Bridge Booster Pump Station
- Tampa/Hillsborough Interconnect Booster Pump Station
- Tampa Bypass Canal Intake and Pump Station

1.5.4 Operation of the System. Tampa Bay Water, through its member governments, supplies potable water to approximately 85 percent of persons residing in Hillsborough, Pinellas, and Pasco counties. Member governments service areas include incorporated and unincorporated portions of the three county areas. This interconnected system allows Tampa Bay Water great flexibility in pumping between most of its wellfields. The South Central Hillsborough Regional Wellfield, the Starkey Wellfield, and the North Pasco wellfields are isolated from the remainder of the system and are operated to match the demands of their corresponding water service area.

1.6 DEMAND AND POPULATION PROJECTIONS

Tampa Bay Water has completed several studies and developed comprehensive planning documents that include water demand projections and demand management options, and examine existing water supply sources and facility capacities to address the future needs of its six member governments. This section presents the demand and population projections used by Tampa Bay Water to determine future systems requirements and implementation plans (Tampa Bay Water 1999b).

1.6.1 Demand Forecast Method. The demand forecast for the region was estimated using the AQUATrak Demand Forecast Factor (DEF) program (Ayres Associates in 1998). The objectives of the program were to forecast each member government's average annual water usage by major urban sectors and to estimate seasonal components of water use. The average annual water demand for each member government, for a given base year, was separated into the following major urban water use sectors:

- Single Family
- Multi-Family
- Commercial
- Industrial
- Public/Institutional
- Wholesale
- Other

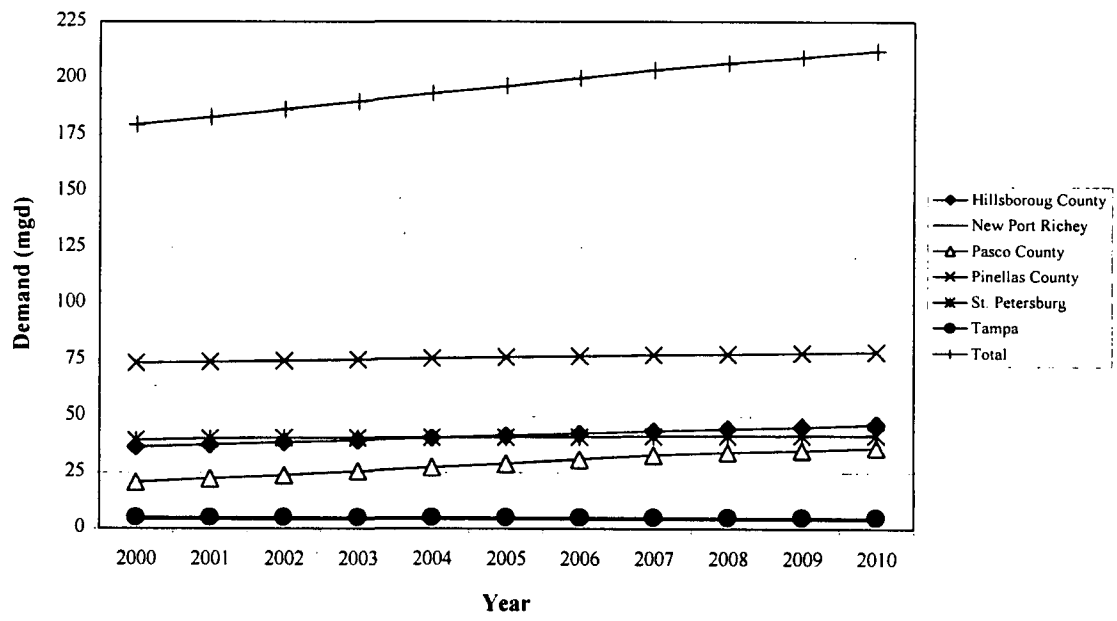
Total demand was determined using data obtained from member governments utility billing records and from water production records supplied by Tampa Bay Water. Member governments total water demand, less what is self supplied by the City of Tampa from the Hillsborough River, represented total withdrawals from all of their permitted sources as well as imported water supplies (Figure 1-2).

The year 1995 was selected as the base year for the AQUATrak program because it represented the most recent year of normal rainfall and temperature. Socioeconomic data provided by each of the member governments, as well as a combination of utility billing data and census data, were used to estimate the various socioeconomic variables needed to project demand coefficients. Other data utilized included member governments comprehensive plans, SWFWMD data, U.S. Census Bureau data, and Traffic Analysis data used for regional transportation plans.

The Water Conservation Programs implemented by each member government, as well as the U.S. Energy Policy Act (EPACT) legislation (Tampa Bay Water 1999b), were considered when estimating each of the demand coefficients. The adjusted coefficients termed the EPACT-adjusted demand projections.

EPACT-adjusted demand projections presented in Table 1-1 for each member government were derived in 1999 from the AQUATrak program (utilizing the 1995 water year as the base year) except

Figure 1-2. EPACT Adjusted Annual Average Demand Projections (mgd) by Water Year



for Pasco County and the City of Tampa. Pasco County demands are from the Pasco County 1999 Annual Report. The City of Tampa's demand projections are estimated from the water supply contract that states the City will buy five mgd of treated water annually. The total demand given represents the projected water demand that Tampa Bay Water will need to supply during the next 10-year period (See Figure 1-2).

1.6.2 Population Projections.

Regional demographic data provided to Tampa Bay Water by each member government was input directly in the AQUATrak program. The AQUATrak program was used to compile this information to produce regional demographic projections as shown in Table 1-1 (Ayres Associates 1998).

Tampa Bay Water is required to meet forecasted water demands, while reducing withdrawals from existing wellfields. The increase in water demand together with the groundwater withdrawal reduction requirements makes the development of new water supplies by Tampa Bay Water and implementation of conservation measures important.

1.7 WATER CONSERVATION MEASURES

One factor that can affect water demand is water conservation. Even with the existing water conservation programs in place, new water supplies must be developed to meet the region's growing water needs. To address the future needs of its member governments, Tampa Bay Water developed a Resource

Table 1-1. Tampa Bay Regional Demographic Projections [1]

Category	Year		
	2000	2005	2010
Single population	989,617	1,017,515	1,043,256
Multi-family population	412,447	420,148	427,377
Comm/Indus. Employees	888,130	958,669	1,029,209
No. single-family homes	450,509	476,449	502,808
No. multi-family units	286,938	298,517	310,233
No. multi-family accounts [2]	15,670	16,279	116,897
Total no. dwelling units	737,448	774,966	813,041
No. comm./indus. accounts	44,144	47,880	51,616

(1) Source: EPACT Regional Demographic Projections developed from AQUATrak demand forecast factor program, Tampa Bay Water, 3/1/99.

(2) Based on 55 MF units/account for Hillsborough County, 11 MF units/account for the City of New Port Richey, 2.5 MF units/account for Pasco County, 16 MF units/account for Pinellas County, 13 multi-family units/account for the City of St. Petersburg, and 53 MF units/account for the City of Tampa.

Development Plan (RDP) in 1994 (Law Environmental Inc 1994). This RDP is based on water demand projections and includes an examination of existing water supply and facility capacities. Based on the RDP, Tampa Bay Water developed a Master Water Plan in 1995, which included demand management and water conservation.

Water demand reductions through water conservation of 10 mgd by 2000, 17 mgd by 2005 and 42 mgd by 2030 were established as goals for the Master Water Plan based on projections in the Water Demand Summary. The Regional Water Supply Demand Management Plan (DMP) was developed in 1997 to provide Tampa Bay Water and its member governments a means to coordinate the on-going water conservation efforts with SWFWMD from a regional perspective. That same year, the Demand Management Implementation Plan (DMIP) was developed and identified the Best Management Practices (BMPs) that could be used by the member governments to reduce water demand consistent with or exceeding the Master Water Plan Goals. During this process, AQUATrak application software was also developed to facilitate strategic planning of BMPs.

In 1998, the Northern Tampa Bay New Water Supply and Groundwater Reduction Agreement (the Partnership Agreement) was finalized. Tampa Bay Water, the member governments and the SWFWMD agreed to cooperate in the development of new water supplies and in reducing pumpage from specific existing wellfields, using financial assistance from the SWFWMD. The Partnership Agreement requires that Tampa Bay Water provide an annual report on the status of conservation and demand management projects. The SWFWMD, intends to collectively continue to fund $9 million per year for water conservation and reclaimed water projects that effectively reduce potable water usage. Due to the current 1999-2000 drought, water conservation has become more urgent. In response, the Basin Boards of the SWFWMD have committed another $90 million through 2007 to promote water conservation and water reuse.

In 1998, the Partnership Conservation Guidelines (PCG) was developed to determine how SWFWMD cooperative funding could be used to implement conservation programs in a timely and cost-effective manner. This was in accordance with the water conservation and reuse goals of the Partnership Agreement. The Tampa Bay Board of Directors also approved of the development of a Regional Five-year Conservation Plan. Since this time, the six member governments have developed and adopted individual water conservation plans.

To date, member governments have reported annual water savings as follows: 2.07 mgd for fiscal year 1996, 3.80 mgd for 1997, 5.15 mgd for 1998 and 6.83 mgd for 1999.

The compilation of member governments 5-year conservation plans indicate anticipated savings of 9.5 mgd for 2000, 13.1 mgd for 2001, 17.6 mgd for 2002, 22.0 mgd for 2003 and 26.3 mgd by 2004. This is achievable if programs proposed are implemented and they save water as identified by members (Tampa Bay Water 1999a).

These conservation plans include regulatory, economic, educational and operational measures. An overview of each member governments water conservation plan is presented here.

1.7.1 Hillsborough County Water Conservation Plan. Hillsborough County, Florida was established in 1834, encompassing about 1,051 square miles. It is the sixth largest county in the State of Florida and has the twelfth largest school district in the United States. In 1990, the County's population was 834,054 and is expected to increase to 1,085,500 by the year 2010.

Hillsborough County provides water service to the unincorporated areas of Hillsborough County that are outside the service areas of the Cities of Tampa, Temple Terrace, and Plant City. These unincorporated areas also include 11 franchise utility companies, which serve approximately 8,000 franchise customers.

To date, Hillsborough County has had annual water savings for the following fiscal years: 0.874 mgd for 1996, 0.813 mgd for 1997, 0.399 mgd for 1998 and 0.695 mgd for 1999. The County had cumulative savings of 2.806 mgd during these years.

The continued water conservation efforts in Hillsborough County have been effective in reducing water use from 146 gallons per capita per day (gpcd) in 1989 to 110.7 gpcd in 1995. Some of Hillsborough County's conservation efforts are list below.

The plan for the next five years calls for a water savings of: 0.614 mgd for the fiscal year 2000, 0.785 mgd for 2001, 0.711 mgd for 2002, 0.661 mgd for 2003 and 0.527 mgd for 2004. (Tampa Bay Water 1999a).

Hillsborough County Continuing Conservation Efforts

- Retrofit Kits
- Irrigation Evaluations
- Meter Replacements
- Billing Frequency
- Demonstration Projects
- Billing Inserts
- 4-H Summer Water Camp
- Leak Detection
- Community Events
- Conservation Committee
- Speakers Bureau
- Other Awareness Efforts

1.7.2 Pasco County Water Conservation Plan. Pasco County, Florida was established in 1887. With an estimated 1997 population of 315,785, Pasco County is projected to have 381,000 residents by the year 2010. The County is primarily a retirement and tourist area, but construction, retail trade, service industries, agriculture and manufacturing are all important to the community's financial strength.

The Pasco County Water System services residents throughout the unincorporated areas of the County. The County has owned and operated its own combined water and sewer system since 1979. It serves at peak times of the year (December-March) in excess of 51,000 water customers and 45,000 wastewater customers. The ultimate authority for the water system is the Pasco County Board of County Commissioners.

The Pasco County Conservation Plan includes a community newsletter, public education pamphlets, and public speaking, a Conservation Education Center at Starkey Wilderness Park, and a Nature Coast Envirothon.

To date, Pasco County has had annual water savings for the following fiscal years: 0.328 mgd for 1996, 0.269 mgd for 1997, 0.194 mgd for 1998 and 0.335 mgd for 1999. The cumulative water savings for Pasco County is 1.072 mgd from 1996-1999 (Tampa Bay Water 1999b).

The plan during the next five years calls for water savings of 0.402 mgd each fiscal year from 2000-2004. (Tampa Bay Water 1999c).

1.7.3 Pinellas County Water Conservation Plan. Pinellas County was established in 1911 as a Charter County under the Constitution and Laws of the State of Florida. It is located at the midpoint on the West Coast of Florida. The county contains a total area of 439 square miles, of which approximately 280 square miles are land and the balance is water. Pinellas County is the most densely populated in Florida, with 3,211 persons per square mile. The 1998 population was estimated to be 899,066.

Pinellas County's water system was created by a special act of Florida Legislature in 1935 to provide water service to the beach communities. Construction of the Pinellas County's system started in 1936 under a loan and grant provided by the Works Progress Administration. The system was in operation in 1937, serving less than 200 customers and has expanded due to population growth. The system currently serves 105,960 retail customers, 93.5 percent of which are residential (Tampa Bay Water 1999a).Pinellas County's water conservation program has steadily decreased per capita water consumption. In fact, the decrease in per capita use places Pinellas County among the lowest in per capita water use in the Tampa Area. In 1988-89, the average daily usage for Pinellas County was 77 mgd. In 1992-93, average daily usage had decreased to 70 mgd. Some of Pinellas County's water conservation efforts are listed below.

Pinellas County Water Conservation Efforts.

- Land Acquisition
- Water Quality – Pinellas County has one of the most advanced water quality laboratories in Florida.
- Water Restriction Enforcement
- Lawn Watering Program
- Inter-governmental Conservation Coordinating Committee
- Florida Yards and Neighborhoods
- Speaker's Bureau

To date, Pinellas County has established annual fiscal year water savings as follows: 0.429 mgd for 1996, 0.128 mgd for 1997, 0.137 mgd for 1998 and 0.134 mgd for 1999. The cumulative water savings for Pinellas County is 0.87 mgd for these years.

The plan during the next five years calls for fiscal year water savings of: 0.260 mgd for the year 2000, 1.218 mgd for

2001, 1.732 mgd for 2002, .607 mgd for 2003 and 0.463 mgd for 2004.

1.7.4 City of St. Petersburg Water Conservation Plan.
St. Petersburg was incorporated in 1893 as a town and as a city in 1903. The City encompasses 60 square miles, containing about 37,730 acres of land. The total population remained stable from 1980-1990 with less than a one percent increase. The total population is projected to be 248,721 in 2000, 259,355 in 2010, and 272,629 in 2020.

St. Petersburg purchases raw water from Tampa Bay Water (Tampa Bay Water 1999a) and utilizes a public utility system which includes the treatment, transmission, and distribution of potable water; collection, transmission, treatment, and disposal of wastewater; storage, pumping, transmission, and distribution of reclaimed water; and the collection, transmission and treatment of stormwater within the City and adjacent areas.

St. Petersburg is recognized worldwide for its Reclaimed Water System. The use of reclaimed water has stabilized potable water use. In 1986, per capita use was about 141 gallons per day. In 1994, usage dropped 13 percent to 120 gallons per capita per day. With an extensive conservation plan in place, the City of St. Petersburg would like to reduce potable water consumption to 100 gallons per capita per day by the year 2001.

St. Petersburg's water conservation education and public awareness program contains elementary school outreach programs, an annual water conservation coloring contest, a green thumb festival and other expos, fairs and festivals, education materials, outreach programs and a conservation character named "Driplet" who spreads the message about conserving limited water resources.

These efforts have resulted in fiscal year water savings as follows: 0.215 mgd for 1996, 0.401 mgd for 1997, 0.152 mgd for 1998 and 0.133 mgd for 1999. The cumulative saving for these years amounts to 0.90 mgd.

In the next five fiscal years, St. Petersburg is predicted to save: 0.213 mgd for 2000, 0.290 mgd for 2001, 0.410 mgd for 2002, 0.410 mgd for 2003 0.412 mgd for 2004 (Tampa Bay Water 1999a).

1.7.5 City of Tampa Water Conservation Plan. The City of Tampa, located in Hillsborough County, is the third most populous municipality in Florida. The population growth is shown in the table below.

Year	Population
1980	271,577
1990	280,108
1995	285,153
2000	289,800

Tampa's water system is run by the Tampa Water Department and provides service both within and outside the city limits. About 88 percent of Tampa's customers are residential, with the remainder being commercial and industrial. The Water Department receives raw water from the Hillsborough River Reservoir and the Morris Bridge wellfield. During the 1998 fiscal year, the Water Department

pumped an average of 69.8 mgd of treated water into the transmission and distribution system. The maximum month pumpage was 84.5 mgd during June 1998. The maximum day pumpage was 98.7 mgd. The maximum day-to-average-day ratio was 1.41(Tampa Bay Water 1999b).

The City of Tampa's water conservation plan is designed to reduce demands on water resources and increase the efficiency of water use. These efforts have resulted in fiscal year water savings as follows: 0.221 mgd for 1996, 0.111 mgd for 1997, 0.189 mgd for 1998 and 0.328 mgd for 1999. The cumulative saving for these years is 0.85 mgd. The projected water savings for the upcoming fiscal years are 0.561 mgd for 2000, 0.551 mgd for 2001, 1.167 mgd for 2002, 2.167 mgd for 2003 and 2.567 mgd for 2004 (Tampa Bay Water 1999a). A sample of implemented programs to date include:

City of Tampa Bay's Water Conservation Efforts

- Rate Structure
- Tampa City Code Provisions
- Plumbing Retrofit Program
- Toilet Rebate Program
- Sensible Sprinkling Program
- Waterless Urinal
- Unaccounted for Water Educational Initiatives

1.7.6 City of New Port Richey Water Conservation Plan. The City of New Port Richey was incorporated as a municipality in 1924. Located in Pasco County, the city covers 4.5 square miles with a 1998 population of 14,693 people. The water system is operated together with the wastewater system as the "Utility System" and is administered by the City's Department of Public Works, with assistance from the City Manager and the City's Finance Department. This system has been in operation since the 1920's when it was originally constructed. The City receives about 90 percent of its raw water from Tampa Bay Water. The remainder of the City's water requirements is met through withdrawals from six different City owned wells located within the City's corporate limits. The City provides water service to about 15,434 customers located within and outside its corporate limits. Some of New Port Richey's water conservation practices are listed below.

City of New Port Richey's Water Conservation Efforts

- Reuse water
- Water reuse study
- Installation of water aquamiser on a local sprinkler system
- Water conservation kits
- Informative pamphlets
- Water Restriction Ordinance
- Public Presentations
- Wash water reuse system
- Toll-free water conservation hot- line
- Other programs

These efforts have resulted in fiscal year water use savings as follows: 0.000 mgd for 1996, 0.010 mgd for 1997, 0.310 mgd for 1998 and 0.010 mgd for 1999. The cumulative saving is 0.330 mgd for these years. The water savings projections for the upcoming fiscal years

are 0.540 mgd for 2000, 0.750 mgd for 2001, 0.760 mgd for 2002, 0.770 mgd for 2003 and 0.780 mgd for 2004 (Tampa Bay Water 1999a).

1.8 WATER USE PERMITS AND PRINCIPLE AGREEMENTS

Water use permits and principle agreements regulate the current and future water supply of Tampa Bay Water. These water use permits and principle agreements along with an increasing water demand, are driving the development of new water supply sources in the region.

1.8.1 Water Permits. Tampa Bay Water and SWFWMD have negotiated a Consolidated Water Use Permit, which regulates withdrawals from 11 of the 12 wellfields currently supplying water to Tampa Bay Water. The Consolidated Permit currently limits withdrawals from the 11 wellfields to 158 mgd (based on a 36-month running average). The total permitted capacity of the 11 wellfields will be reduced to 121 mgd in December 2002 and to 90 mgd in December 2007 (based on a 12-month average). The annual average withdrawals of the 11 wellfields are shown in the table that follows.

Wellfields	Annual Average Withdrawal (mgd)
1. Cosme-Odessa	10
2. Cross Bar Ranch	21
3. Cypress Bridge	8
4. Cypress Creek	26
5. Eldridge Wilde	28
6. Morris Bridge	12
7. Northwest Hillsborough	9
8. North Pasco	5
9. Section 21	10
10. South Pasco	14
11. Starkey	15
Total	**158**

The South Central Hillsborough Regional Wellfield continues to be regulated under a separate water use permit of 24.1-mgd annual average.

Water use permits have also been issued by SWFWMD for surface water withdrawals from the Alafia River, Hillsborough River, and the Tampa Bypass Canal. The purpose of these permits is to provide additional new water for Tampa Bay Water's Regional Water Supply System (HDR 1998a).

Peak monthly withdrawals for the Alafia River are presented in Table 1-2. The peak monthly withdrawals for the Hillsborough River and Tampa Bypass Canal are presented in Tables 1-3 and 1-4 respectively. Since water from these two sources is drawn from the same intake, the withdrawal for these two sources are presented in Table 1-5 (Tampa Bay Water 2000c).

1.8.2 Principle Agreements. The Interlocal Agreement requires Tampa Bay Water, as of December 31, 2002, to maintain production at or below 94 percent of permitted capacity. The failure for Tampa Bay Water to maintain this reserve capacity is defined under the Amended and Restated Interlocal Agreement as "Production Failure." Should Tampa Bay Water fail to maintain the buffer, the member governments are entitled under the Amended and Restated Interlocal Agreement to pursue their own supplies, thereby eliminating Tampa Bay Water (State of Florida 1998b).

The Partnership Agreement was entered into between Tampa Bay Water and its six member governments and SWFWMD in April 1998. This agreement, which is officially, referred to as the "Northern Tampa Bay New Water Supply and Ground Water Withdrawal Reduction Agreement" states:

- Tampa Bay Water shall have one or more projects, in operation and providing an annual average quantity of at least 38-mgd of new water supplies by December 31, 2002.
- By December 31, 2007, Tampa Bay Water shall have at least an additional 47-mgd of water permitted, in operation and supplying the member governments.
- A reduction in groundwater pumping from the 11 existing wellfields to an annual average of 121 mgd must be achieved by December 31, 2002. As of December 31, 2007, groundwater withdrawals must be further reduced to an annual average not to exceed 90 mgd.
- The agreement ends the existing litigation between Tampa Bay Water and the SWFWMD.
- Commitment of funding ($183 million) by SWFWMD will be made to assist Tampa Bay Water in developing new water supply projects.

Under these water use permits and agreements, Tampa Bay Water has the obligation to supply member governments with potable water. Tampa Bay Water must satisfy the water supply requirements of its member governments and the requirements of the water use permits and agreements by developing new water supply sources.

1.9 NEW PROJECTS

Tampa Bay Water and SWFWMD negotiated a new Consolidated Water Use Permit for the existing wellfields. As previously stated, the new water use permit reduces the combined permitted capacity of these wellfields to 90 mgd by December 21, 2007.

- To comply with these new regulatory restrictions while satisfying the water supply demands of its member governments, Tampa Bay Water has initiated analyses and permitting efforts for a number of new projects to meet the 2002 and 2007 demands.

Various potential water supply configurations were reviewed by Tampa Bay Water (Section 1-1) and several of the projects included in the water supply system for design and implementation were considered. These projects are capable of providing between 97 and 107 mgd of new supply for the region and are in one of the following three developmental stages:

Stage A: This stage includes feasibility studies, preliminary design and water use permitting. In Stage A, water supply projects in this phase of development include:

- Cypress Bridge II
- Brackish Water Desalination
- Cone Ranch & Dispersed Wells
- Seawater Desalination II

Stage B: The projects included in this phase are in final design, engineering, property acquisition and bidding stages.

Table 1-2. Alafia River Permit
Total Withdrawal Quantities Authorized Under This Permit

Alafia River Flow at Intake	Withdrawal Rate
< 80 MGD	0 MGD
80 MGD to 520 MGD	8 MGD to 52 MGD (10% of flow)
> 520 MGD	52 MGD Maximum

Table 1-3. Tampa Bypass Canal Permit
Total Withdrawal Quantities Authorized Under This Permit

Tampa Bypass Canal Flow at Structure 160	Withdrawal Rate
< 7 MGD	0 MGD
7 to 81 MGD	80% of total flow above 7 MGD
> 81 MGD	65 MGD Maximum

Table 1-4. Hillsborough River Permit
Total Withdrawal Quantities Authorized Under This Permit

Hillsborough River Discharge at Tampa Dam	Withdrawal Rate
< 65 MGD	0 MGD
65 to 97 MGD	10% of total flow
97 to 139 MGD	10% of total flow increasing proportionally to 30%
139 to 647 MGD	30% of total flow
> 647 MGD	194 MGD (maximum)

Table 1-5. Maximum Withdrawal
Hillsborough River and Tampa Bay Bypass Canal

Hillsborough River	194 MGD
Tampa Bypass Canal	65 MGD
Total	**259 MGD**

Projects in this Stage B phase of development include:

- **Tampa Bay Regional Reservoir Project**
- Seawater Desalination Project
- Loop 72 Phase A (Property Acquisition only)
- Brandon/South Central Connection

Stage C: These projects have all the necessary permits for construction and operation and are in various stages of construction.

- Alafia River Project
- Tampa Bypass Canal Water Supply Project (including Hillsborough River High Water)
- Tampa Bay Regional Water Treatment Plant
- South Central Hillsborough Intertie
- North Central Hillsborough Intertie
- Brandon Urban Dispersed Wells Project

1.10 TAMPA BAY REGIONAL RESERVOIR PROJECT

The proposed Tampa Bay Regional Reservoir is an off-stream reservoir. This means that the reservoir does not impound any existing stream, and that water stored in the reservoir would have to be delivered to and from the reservoir via a pipeline. About 1,900 acres would be needed to contain the 1,100-acre reservoir, associated roads, storm water collection system, water treatment areas and buffer. The reservoir's anticipated storage capacity would be approximately 15 billion gallons (48,000 acre-feet). The Tampa Bay Regional Reservoir Project also would include about 8 miles of 84-inch transmission main to tie the reservoir into the South Central Hillsborough Intertie near the Alafia River diversion facility (HDR Engineering Inc. 1998b).

To illustrate the role of the reservoir, the following graph depicts the variation in available water resources with and without the reservoir (HDR Engineering Inc. 1999). The graph is based on a 20-year study of historical flow records (Figure 1-3) and demonstrates inconsistencies and fluctuations in available water.

1.11 SUMMARY OF PROJECT NEED

Tampa Bay Water currently supplies its member governments with water from 12 well fields. Water use permits and agreements between Tampa Bay Water, SWFWMD, and its member governments limit the withdrawal of water from the 11 Northern Tampa Bay wellfields to 158 mgd, with reductions in withdrawals to 121 and 90 mgd required in 2002 and 2007, respectively. Tampa Bay Water believes that it must develop new water supply capacity to meet the projected requirements of the region. Tampa Bay Regional Reservoir is designed to improve the reliability and capacity of the water supply system. The reservoir, if constructed, would be completed by 2004 and will likely take one year to fill and would be fully operational by 2005. It is estimated that the reservoir increases the sustainable yield from surface water diversions from approximately 25-mgd to 50-60 mgd annually.

1.12 ADMINISTRATIVE AND ENVIRONMENTAL REQUIREMENTS

The Tampa Bay Regional Reservoir Project is subject to a number of regulatory requirements, which involves

several regulatory agencies. Each of the involved agencies and their interest in the Regional Reservoir project is presented in Table 1-6.

1.12.1 U.S. Environmental Protection Agency, Region 4. EPA is the lead federal agency responsible for the scope and content of the DEIS. They are responsible for assuring the DEIS complies with the requirements of NEPA and EPA regulations. EPA will make sure those reasonable alternatives and pertinent environmental issues and impacts are addressed in the DEIS.

1.12.2 Tampa Bay Water. Tampa Bay Water, formerly the West Coast Regional Water Supply Authority, was established on October 25, 1974. In August 1998, the Authority became Tampa Bay Water, which is responsible for supplying wholesale water to its six member governments of Hillsborough, Pasco, and Pinellas counties and the Cities of New Port Richey, St. Petersburg, and Tampa. As such, Tampa Bay Water is the largest wholesale water supplier in the state of Florida. Its member governments supply the needs of approximately 2 million people and Tampa Bay Water provides an average of 176 mgd of drinking water to them. Tampa Bay Water is regulated by the Safe Drinking Water Act and receives its water use permits through the SWFWMD.

Tampa Bay Water, by Florida mandate, is responsible for developing, recovering, storing, and supplying water for its member governments in such a fashion to reduce environmental impacts (State of Florida 1998a). To accomplish this directive, Tampa Bay Water is permitted to transport and use ground or surface water, across county boundaries, or outside the watershed from which it is taken if it is publicly and environmentally acceptable (State of Florida 1999).

Tampa Bay Water is proposing the construction of the Tampa Bay Regional Reservoir and pipeline.

1.12.3 U.S. Army Corps of Engineers. The U.S. Army Corps of Engineers (Corps) has primary authority for the Clean Water Act, Section 404 program. The Clean Water Act, Section 404 program, regulates the discharge of dredge and fill material into "Waters of the United States" and establishes a permit program to ensure compliance with the Act. Rivers, streams, estuaries, territorial seas, and most ponds, lakes, and wetlands are considered "Waters of the United States" and are protected by the Clean Water Act. Construction of the Tampa Bay Regional Reservoir and pipeline through waters of the United States are potential activities that would require a Corps permit.

In addition, the Corps must ensure that the permit complies with the Endangered Species Act, the Marine Mammal Protection Act, and other federal environmental laws.

1.12.4 Florida Department of Environmental Protection. The Florida Department of Environmental Protection (FDEP) is in charge of protecting, conserving, and managing Florida's environmental and natural resources. The FDEP has offices throughout the state from which environmental permits are generally issued. The FDEP has the authority to issue the Environmental Resource

Figure 1-3. Enhanced Surface Water System with and without the proposed Regional Reservoir.

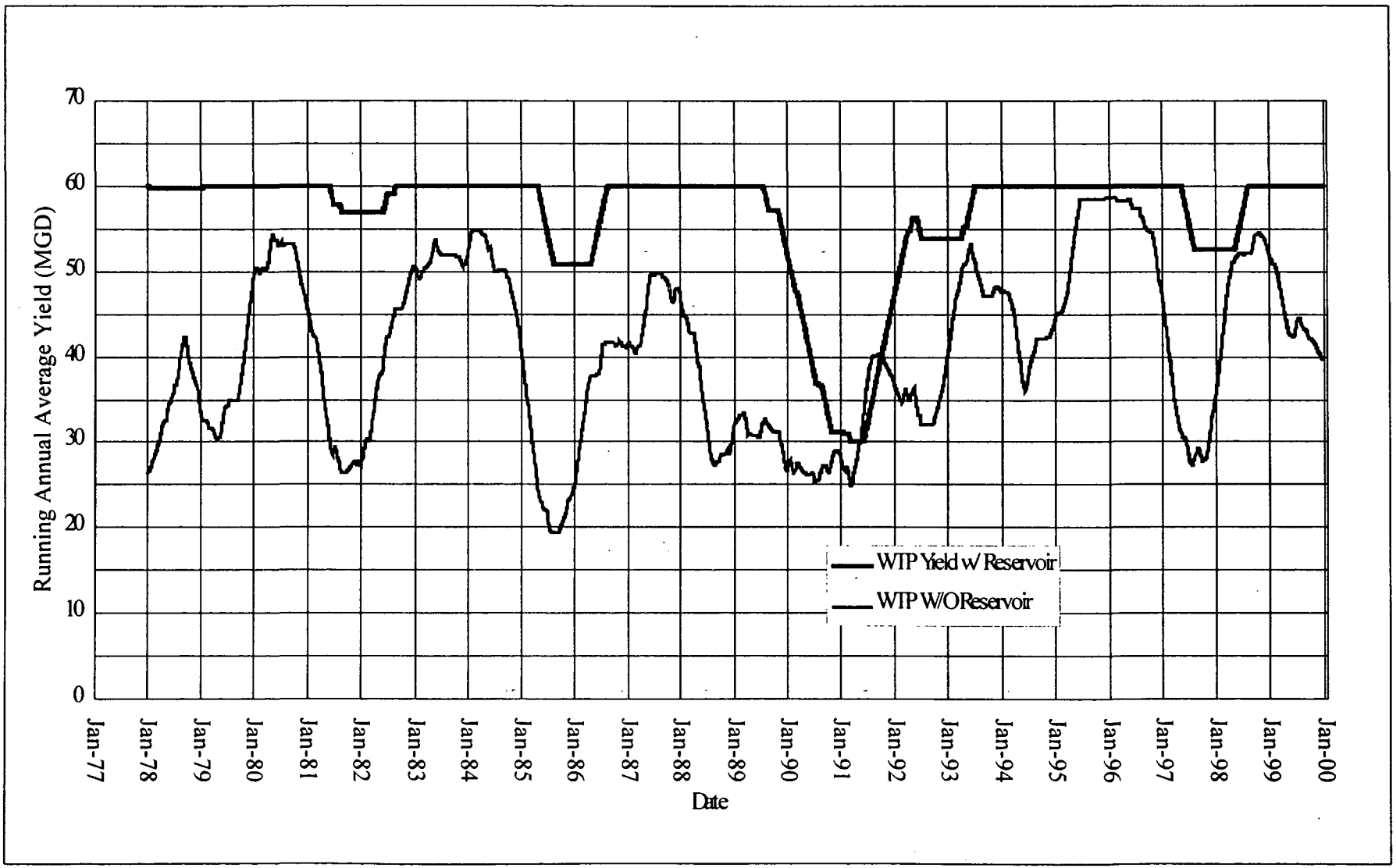


Table 1-6. Tampa Bay Regional Reservoir EIS and Pipeline Permits

Requirement in Conventional Permitting	U.S. Army Corps of Engineers	U.S. Environmental Protection Agency	Florida Department of Environmental Protection	Florida Departme nt of Health	Southwest Florida Water Managemen t District	Hillsborough County	Hillsborough County Environmental Protection Commission
Dredge and Fill Permit (individual)	I	R				R	R
Dredge and Fill Permit (nationwide)	I	R					
Environmental Resource Permit (individual)			I		R	R	R
Public Drinking Water Construction Permit – Raw Water Supply				I			
Public Drinking Water Conservation Permit – Intake and Transmission Main				I			
Notice of Intent to Use Storm Water General Permit		I					
HCPGMD Site Development Review						I	
Natural Resource Permit						I	
Right of Way Permit						I	
EPC Wetlands Permit						R	I
Disbursement of Grant Funds – NEPA Review	S	I	S	S	S	S	S

I=Issues Permit/Disburses Grant Funds R=Reviews S=Provides Supporting Expertise
HCPGMD=Hillsborough Co. Planning & Growth Mngt. Dept.

Permit (ERP) that would be required prior to the construction of the reservoir.

1.12.5 Southwest Florida Water Management District. The SWFWMD is a water management district responsible for a broad range of water management activities. These activities include:

- management of water related environmental resources
- promotion of conservation, development, and proper utilization of surface and groundwater
- provide water storage for beneficial purposes
- prevent damage from floods, soil erosion, and excessive drainage
- manage stormwater and protect water quality
- protect wetlands, fish and wildlife and other natural resources
- promote recreational development

SWFWMD administers a variety of water-related permits and regulatory programs. In addition to its regulatory functions, the SWFWMD operates more than 75 man-made water management structures, including the Tampa Bypass Canal.

SWFWMD is responsible for regulating withdrawals of water through the issuance of water use permits that specify average, peak, or maximum allowed withdrawals from the given supply source.

The Tampa Bay Regional Reservoir will not require a water use permit from SWFWMD. SWFWMD will review the ERP application.

1.12.6 Environmental Protection Commission of Hillsborough County. The Environmental Protection Commission of Hillsborough County (EPC) is responsible for issuing county construction permits for impacts to wetlands, for the construction of air emissions sources, and for providing review support in other areas.

1.13 EIS PREPARATION

EPA is the lead agency in the preparation of this DEIS and has primary responsibility for preparing the DEIS.

Public and agency input into this DEIS was received through a public scoping meeting and from agency reviews of drafts of the preliminary DEIS.

EPA held a public scoping meeting for the reservoir project at the Riverside High School on June 8, 2000. Scoping is a process to obtain views from the public and other agencies regarding the issues to be addressed in the EIS. The issues and concerns raised at the public scoping meeting included the following:

- Concerns with effects of interbasin transfer of waters.
- Desire to address short and long-term impacts on the aquatic ecosystem from any incremental withdrawals of water attributable to the reservoir.
- Desire to have a peer review of the SWFWMD Permits issued to Tampa Bay Water for withdrawals from the Alafia and Hillsborough Rivers and the Tampa Bay Bypass Canal.
- Encourage a risk and impact analysis of the human community to include an emergency action plan, impacts of recreation, and ground and surface water contamination.

- Concerns for impacts to threatened and endangered species.
- Concerns for the effect of salinity changes on aquatic organisms, sport, and commercial fisheries.
- Effects on wetlands from construction of the reservoir and pipeline and indirect impacts to surrounding wetlands from altered drainage flow.
- Effects on ecosystems associated with the rivers and bays in the area.
- Concerns for water quality in the reservoir, particularly production of blue-green algae and contamination via treatment methods.
- Desire for the scope of work to include all possible projects in the region.

- Concerns with evaporation in the reservoir.
- Effects of the State of Florida designation of the reservoir as a high hazard structure.
- Concerns with seepage of water from the reservoir and flow changes in the watershed.
- Effects on recreational use of the Regional Reservoir and the Alafia and Hillsborough rivers.

1.14 ORGANIZATION OF THE DOCUMENT

This DEIS contains six chapters and two supporting appendices. Chapter 1 is a statement of the purpose of and need for action; identifies the location of the proposed action; and describes the organization of the DEIS. Chapter 2 provides alternatives selection criteria and alternatives considered; describes the proposed action; describes the no-action alternative; details other action alternatives; summarizes the environmental impacts; identifies the preferred alternative; and lists mitigation. Chapter 3 is a general description of the biophysical resources that the proposed action and alternatives could potentially affect. Chapter 4 is an analysis of the environmental consequences of the proposed action and alternatives. Chapter 5 discusses the public involvement, agency coordination, issues identified during the scoping process, lists the preparers and other contributors to the document. Chapter 6 is a list of source documents relevant to the preparation of this DEIS. Appendix A is the biological assessment and Appendix B is the mitigation plan for the proposed project. The Alafia River and Hillsborough River/Tampa Bypass Canal withdrawal permits are included as appendix C. Appendix D contains correspondence for the DEIS while Appendix E is a wildlife and vegetation species list.

CHAPTER 2

ALTERNATIVES, INCLUDING THE PROPOSED ACTION

2.1 INTRODUCTION

This chapter identifies eleven action alternatives that are capable of improving the reliability and dependability of Tampa Bay Water's integrated water supply system, as described in Chapter 1, Purpose and Need. Each alternative is discussed with regard to physical features, water supply, cost, and source of water. This chapter also includes a discussion of the No Federal Action alternative. Alternatives were evaluated using a tiered screening criteria based upon engineering feasibility, environmental fatal flaws, and their ability to meet the regional demands for drinking water. Feasible alternatives are identified and carried forward in Chapters 3 and 4 for detailed description and analysis.

As described in Chapter 1, groundwater withdrawals from the wellfields utilized by Tampa Bay Water's member governments have indirectly impacted water levels in lakes and wetlands in the area. In order to reduce impacts resulting from groundwater withdrawals and to meet growing demands of its member governments, Tampa Bay Water has determined it must develop at least 111 mgd of new water supply by December 31, 2007. Alternative water sources such as seawater desalination and surface water storage are being considered, as well as new small-scale fresh and brackish groundwater withdrawal projects.

To meet Tampa Bay Water's projected water supply demands described in Chapter 1, Tampa Bay Water initiated a water supply planning process in 1993. In 1994, Tampa Bay Water (then the West Coast Regional Water Supply Authority), its Members, the SWFWMD, and other local governmental agency representatives developed the Resource Development Plan (RDP). The RDP established a schedule, based on existing and projected conditions, to ensure the development of future water sources through 2030 and provided specific recommendations for developing new water supplies. Tampa Bay Water's Board of Directors approved one of the RDP's recommended plans in December 1995 as the Master Water Plan.

Under the Master Water Planning Process, water supply options were studied, analyzed and compared. Tampa Bay Water's Board of Directors then selected projects for implementation that were technically feasible and environmentally and economically sound. In November 1998, the Board selected a combination of Master Water Plan projects for development to meet regional demand through 2010 (Black and Veatch 1998).

A number of project configurations presented in the Master Water Plan – Alternative Configurations were identified that could have potentially met the future demands of the region. However, based on a viable implementation schedule, Tampa Bay Water believes that only four of the new systems could potentially meet the

December 2002 and 2007 groundwater withdrawal limitations imposed by the partnership agreement with SWFWMD. Each of the four systems unified the water supply system and allowed for rotational service. A water conservation program was also included in all of the systems, which proposed a reduction of average annual demand by 10 mgd in 2000 and 17 mgd in 2005.

Each of the four new systems presented in the Master Water Plan – Alternative Configurations report contained a set of core projects that Tampa Bay Water believed would meet the requirements of year 2007 wellfield withdrawal cutbacks. These core projects as well as reasonable alternatives that were suggested during the regional reservoir public scoping meetings are evaluated in this chapter.

The action alternatives considered include water storage, water supply, and demand management alternatives. The first category, water storage, includes alternatives that have a water storage component capable of providing water to the regional water system during periods when surface water flows are inadequate to meet the water demands of the region. The second category, water supply, involves alternatives that could provide surface water to the region without the use of a water storage component. Demand management, the third category, focuses on reducing water demand through conservation measures in order to serve additional customers with existing supplies. Also included in the list of alternatives is "No Federal Action".

Because Tampa Bay Water has proposed to apply federal grant funds toward the reservoir project, the NEPA process - including this DEIS - requires evaluation of environmental impacts, proposed mitigation of unavoidable impacts, and feasible alternatives to the reservoir itself. At the conclusion of the NEPA process, EPA may release grant funds without conditions, release funds with conditions, or withhold funds exercising the No Federal Action alternative (40 CFR Part 6.203 (1)(2)). Were EPA to select No Federal Action, Tampa Bay Water may elect to not build the reservoir, or to build the reservoir using non-federal funds.

For purposes of comparing alternatives in this DEIS, it was necessary to consider that No Federal Action equated to no reservoir; however, absent federal funds, nothing in this DEIS would prevent Tampa Bay Water from building the reservoir and pipeline. The action and no-action alternatives are presented in Table 2-1.

Table 2-1. Alternatives Evaluated

Action Alternatives

- Tampa Bay Regional Reservoir
- Freshwater from Springs in the Gulf
- Lakes in Abandoned Phosphate Pits
- Above-Ground Water Storage Tanks
- Reclaimed Water for Potable Reuse
- Reclaimed Water
- Seawater Desalination
- Brackish Water Desalination
- Water Conservation
- Aquifer Storage and Recovery System (ASR)
- Tampa Bay Regional Reservoir and ASR

No-Action Alternative

- No Federal Action

2.2 ACTION ALTERNATIVES

Action alternatives include any actions that could be undertaken by Tampa Bay Water to supplement or create additional regional water resources. These include the proposed Tampa Bay Regional Reservoir Project and other storage/supply alternatives.

2.2.1 Tampa Bay Regional Reservoir Project. Multiple options for the potential reservoir site were considered by Tampa Bay Water. Preliminary screening eliminated reservoir locations that were near residential areas and natural features such as wetlands, bottom hardwood and riparian communities. Fifteen potential sites were reviewed and evaluated considering criteria such as natural features, land use, land values, relocations, construction costs, and potential contamination by hazardous materials. Table 2-2 provides a matrix of the reservoir siting screening results (HDR 1998). Seven alternative sites underwent more extensive geotechnical and environmental analysis and were included in a public involvement program. The screening process and related cost analysis led to the selection of the preferred site for the Tampa Bay Regional Reservoir. To effectively operate the proposed reservoir, the following facilities would be required:

- Connection with the South Central Hillsborough Intertie
- Intake and pump stations situated on the Alafia River and Tampa Bypass Canal
- The Tampa Bay Regional Surface Water Treatment Plant
- The North Central Hillsborough Intertie

The proposed Tampa Bay Regional Reservoir would be an off-stream aboveground reservoir that would store water withdrawn from the Tampa Bypass Canal, the Hillsborough River, and the Alafia River during periods of high flow. The purpose of the reservoir would be to increase the sustainable yield of the system by storing untreated surface water for use during low flow periods when little or no water could be withdrawn directly from the above mentioned sources. The proposed reservoir would not affect the permitted withdrawal schedules from the surface water sources, but would increase the dependable yield of the system from approximately 25 mgd to 50-60 mgd annually (HDR 1999a).

During periods when the allowable withdrawals from the surface water sources exceed the capacity of the water treatment facilities, excess water would be directed to and stored in the proposed Tampa Bay Regional Reservoir. Any surface water withdrawal amounts that exceed 66 mgd would be delivered to the reservoir for storage. When stream flows decrease and surface water withdrawals are limited, water would be delivered from the reservoir to the water treatment facility, treated and distributed to meet water demands (HDR 2000).

The proposed reservoir and associated facilities would cover approximately 1,100 acres (900 acres of surface area when full), with a storage volume of approximately 48,000 acre-feet (15 billion gallons). The proposed location is in southeastern Hillsborough County, south of County Road 640, north of County Road 672, and west of State Road 39 (Figure 2-1). Portions of the site have been mined for phosphate, but

Table 2-2. Summary matrix of the reservoir siting results.

Source: HDR Engineering, Inc., June 1998. Alafia River Project, Reservoir site screening report selection of sites for comprehensive evaluation.

SITE	SIZE (acres)	WETLAND MITIGATION (acres)	NUMBER OF PARCELS	NUMBER OF STRUCTURES	DISTANCE TO ALAFIA WITHDRAWAL LOCATION (miles)	RESERVOIR & PIPELINE COSTS	COMMENTS
1	600	0	5	**2 total** (1 house, 1 mobile home)	9.1	$85,821,000	No wetland mitigation anticipated because site was previously mined. (Based on conversation with Florida Department of Environmental Protection (FDEP)).[a]
	900	60	14	**2 total** (1 house, 1 mobile home)	9.1	$100,824,000	Portions of Turkey Creek will need to be rerouted. No wetland mitigation anticipated because site was previously mined (Based on conversation with FDEP).[a]
	1200	75	19	**3 total** (1 house, 2 mobile homes)	9.1	$113,900,000	Portions of Turkey Creek will need to be rerouted. No wetland mitigation anticipated because site was previously mined (Based on conversation with FDEP).[a]
2	600	0	13	**5 total** (2 houses, 1 mobile home, 1 warehouse, 1 comm.)	13.5	$107,124,000	No wetland mitigation anticipated because site was previously mined. (Based on conversation with FDEP).
	900	0	16	**12 total** (5 houses, 3 mobile homes, 1 warehouse, 1 comm., 3 access. struc.)	13.5	$122,704,000	Based on the aerial photograph it appears an industrial facility may need to be relocated. No wetland mitigation anticipated because site was previously mined. (Based on conversation with FDEP).

Table 2-2 cont. Summary matrix of the reservoir siting results.

SITE	SIZE (acres)	WETLAND MITIGATION (acres)	NUMBER OF PARCELS	NUMBER OF STRUCTURES	DISTANCE TO ALAFIA WITHDRAWAL LOCATION (miles)	RESERVOIR & PIPELINE COSTS	COMMENTS
2 (cont.)	1200	0	20	**17 total** (5 houses, 4 mobile homes, 1 warehouse, 2 comm., 5 access struc.)	13.5	$139,129,200	Based on the aerial photograph it appears an industrial facility may need to be relocated. No wetland mitigation anticipated because site was previously mined. (Based on conversation with FDEP).
3	3600	47	45	**35 total** (13 houses, 8 mobile homes, 2 warehouses, 12 access. struc.)	7.0	$91,574,000	Wetland mitigation required at $50,000/ac.
4	600	89	41	**39 total** (16 houses, 14 mobile homes, 9 access. struc.)	8.3	$113,449,000	Wetland mitigation required at $50,000/ac.
5	600	77	9	**8 total** (3 mobile homes, 5 access. struc.)	7.3	$100,006,000	Wetland mitigation required at $50,000/ac.
	900	105	13	**8 total** (3 mobile homes, 5 access. struc.)	7.3	126,006,000	Wetland mitigation required at $50,000/ac.
6	600	83	5	**2 total** (1 mobile home, 1 access. struc.)	6.6	$91,209,000	Wetland mitigation required at $50,000/ac.
	900	88	8	**2 total** (1 mobile home, 1 access. struc.)	6.6	$108,413,000	Wetland mitigation required at $50,000/ac.

Table 2-2 cont. Summary matrix of the reservoir siting results.

SITE	SIZE (acres)	WETLAND MITIGATION (acres)	NUMBER OF PARCELS	NUMBER OF STRUCTURES	DISTANCE TO ALAFIA WITHDRAWAL LOCATION (miles)	RESERVOIR & PIPELINE COSTS	COMMENTS
6 cont.	1200	99	9	**5 total** (1 mobile home, 3 access. struc., 1 bldg.)	6.6	$125,418,000	Wetland mitigation required at $50,000/ac.
7	600	117	7	**4 total** (3 houses, 1 mobile home)	10.8	$104,180,000	Wetland mitigation required at $50,000/ac.
	900	150	9	**4 total** (3 houses, 1 mobile home)	10.8	$121,660,000	Wetland mitigation required at $50,000/ac.
8	600	0	9	0	12.8	$100,087,000	No wetland mitigation anticipated because site was previously mined. (Based on conversation with FDEP).[b]
	900	0	10	0	12.8	$129,119,000	No wetland mitigation anticipated because site was previously mined. (Based on conversation with FDEP).[b]
8A	600	0	6	**3 total** (1 gov't bldg, 1 mobile home, 1 storage)	13.0	$102,061,000	No wetland mitigation anticipated because site was previously mined. (Based on conversation with FDEP).
	900	0	9	**3 total** (1 gov't bldg, 1 mobile home, 1 storage)	13.0	$114,271,000	No wetland mitigation anticipated because site was previously mined. (Based on conversation with FDEP).
9	600	0	5	0	16.0	$113,441,000	Former K10 site offered by IMC. All wetlands removed during mining process.[c]

Table 2-2 cont. Summary matrix of the reservoir siting results.

Site	SIZE (acres)	WETLAND MITIGATION (acres)	NUMBER OF PARCELS	NUMBER OF STRUCTURES	DISTANCE TO ALAFIA WITHDRAWAL LOCATION (miles)	RESERVOIR & PIPELINE COSTS	COMMENTS
9 cont.	900	0	8	0	16.00	$122,244,000	Former K10 site offered by IMC. All wetlands removed during mining process.[c]
	1200	0	8	0	16.0	$131,211,000	Former K10 site offered by IMC. All wetlands removed during mining process.[c]
10	600	78	4	0	12.5	$107,307,000	Wetland mitigation required at $50,000/ac.
	900	87	4	0	12.5	$123,214,000	Wetland mitigation required at $50,000/ac.
	1200	118	6	0	12.5	$140,956,000	Wetland mitigation required at $50,000/ac.
11	600	59	14	**19 total** (5 houses, 9 mobile homes, 4 access. struc., 1 warehouse)	11.0	$104,580,000	Wetland mitigation required at $50,000/ac.
	900	187	30	**35 total** (8 houses, 18 mobile homes, 8 access. struc., 1 warehouse)	11.0	$128,999,000	Wetland mitigation required at $50,000/ac.
12	600	4	2	0	18.4	$122,942,000	Wetland mitigation required at $50,000/ac.
	900	4	5	**8 total** (4 houses, 4 access struc.)	18.4	$133,827,000	Wetland mitigation required at $50,000/ac.
13A	600	0	2	0	22.7	$137,367,000	Wetlands removed during mitigation process. Land values based on quote to Authority from IMC. Reservoir will require closing of Taylor Road.

Table 2-2 cont. Summary matrix of the reservoir siting results.

Site	SIZE (acres)	WETLAND MITIGATION (acres)	NUMBER OF PARCELS	NUMBER OF STRUCTURES	DISTANCE TO ALAFIA WITHDRAWAL LOCATION (miles)	RESERVOIR & PIPELINE COSTS	COMMENTS
13A cont.	900	0	7	0	22.7	$151,225,000	Wetlands removed during mitigation process. Land values based on quote to Authority from IMC. Reservoir will require closing of Taylor Road.
	1200	0	9	0	22.7	$168,859,600	Wetlands removed during mitigation process. Land values based on quote to Authority from IMC. Reservoir will require closing of Taylor Road.
13B	1800	0	10	0	22.0	$182,483,000	Wetlands removed during mitigation process. Land values based on quote to Authority from IMC. Reservoir will require closing of Taylor Road.
14	600	55	2	0	21.6	$140,118,000	Wetland mitigation required at $50,000/ac.
	900	70	4	0	21.6	$151,103,000	Wetland mitigation required at $50,000/ac.
	1200	200	4	0	21.6	$175,071,000	Wetland mitigation required at $50,000/ac.
15	600	263	20	**16 total** (5 houses, 4 mobile homes, 6 access. struc., 1 office)	10.3	$130,416,000	Wetland mitigation required at $50,000/ac.

[a] The Hillsborough County Environmental Protection Commission later indicted that the majority of the surface area at the site would be claimed by that agency as wetlands and would require mitigation. This area represented over 800 acres of mitigation, causing the selection of this site to be cost prohibitive.

[b]. Through continued evaluation of the site, and communication with regulatory agencies, jurisdictional wetland impacts are expected to occur with construction of the facility, which will require mitigation.

c. In 1997, IMC removed its offer for the use of this site, indicating that it would be a necessary component of ongoing phosphate mining activities. Even so, this was evaluated in the reservoir site selection process because of Tampa Bay Water's eminent domain authority.

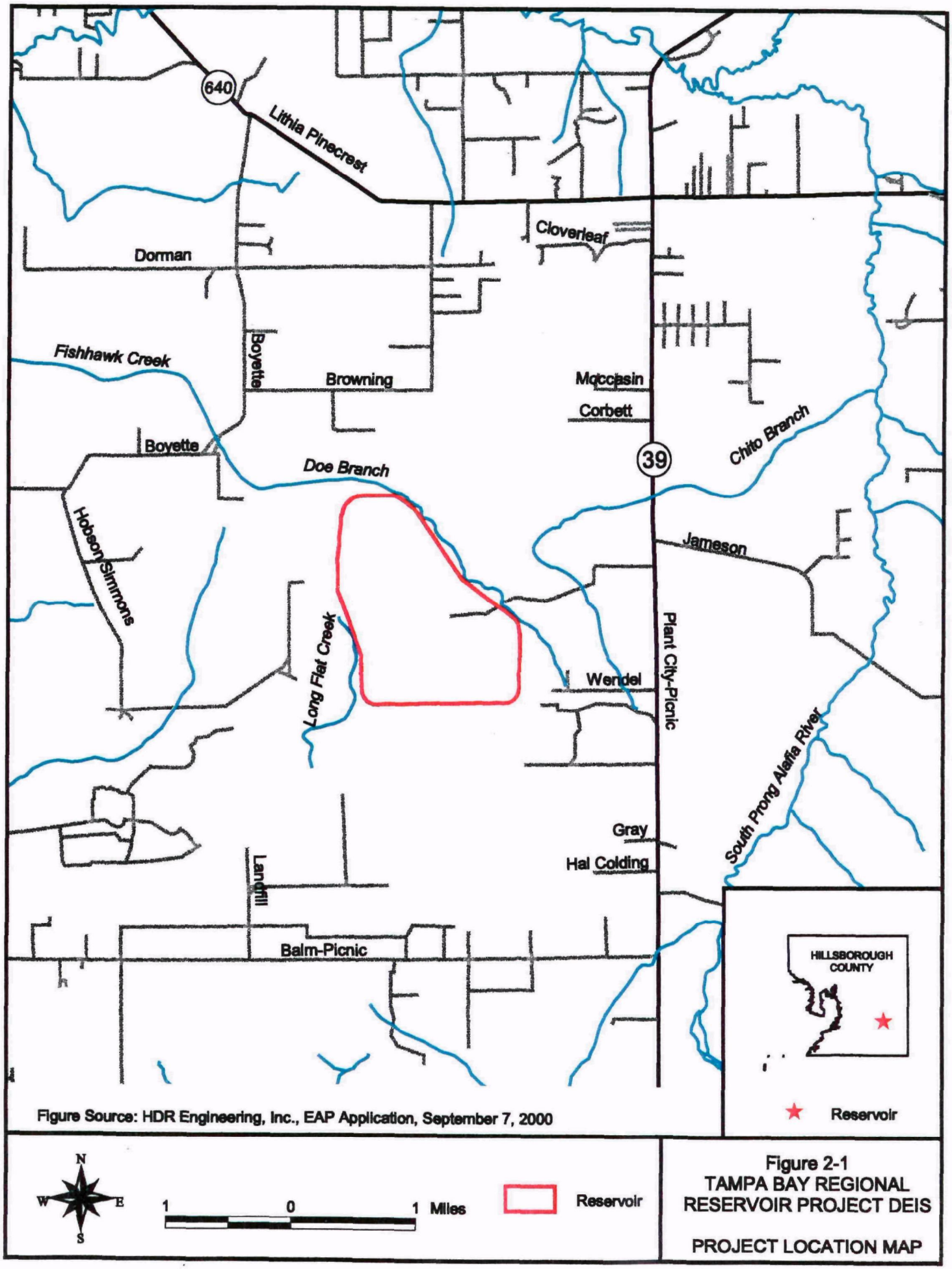


Figure 2-1
TAMPA BAY REGIONAL
RESERVOIR PROJECT DEIS

PROJECT LOCATION MAP

are currently being used as improved pasture.

The reservoir embankments would be 30 to 65 feet high and constructed primarily from onsite soils. The reservoir embankment is the most perceptible structural feature of the reservoir. The design features described below are the essential features that would control seepage, minimize erosion, provide for operation and maintenance, and ensure long-term stability of the structure.

The embankment cross-section and resulting earthwork quantity and cost depend on the strength and compressibility of the foundation soils, the strength of the compacted embankment soils, and the embankment height Figure 2-2. The embankment would be constructed using on-site soils that meet the proposed design goals, and result in 3:1 side slopes on the interior and exterior sides of the embankment. Given the varying topography of the site, the embankment height would vary to maintain a constant crest elevation.

An investigation of wave runup potential and maximum precipitation indicated that 8.5 feet of freeboard from the operating water surface elevation would be necessary to prevent overtopping. A 20-foot wide access road would provide access along the crest of the embankment to allow for inspection and maintenance along the entire reservoir perimeter.

A blanket drain is also included in the reservoir design. The blanket drain is a horizontal drainage zone that would be located at the downstream toe of the embankment. This drainage zone would control groundwater seepage through the embankment and collect embankment and shallow foundation seepage.

The potential range of reservoir drawdown suggests that the entire interior face of the embankment may be exposed to wave action and subsequent erosion. A soil-cement barrier along the interior face of the embankment would serve as the primary erosion control mechanism.

Reservoir seepage depends on the water head, thickness and permeability of the subsurface strata, and hydrogeologic factors. The typical mining and reclamation techniques suggest that reservoir areas used at the candidate sites are geologically variable and potentially susceptible to significant loss of the reservoir water. To minimize the loss of the water and prevent adverse seepage impacts, a slurry wall is recommended. It is anticipated that the slurry wall would penetrate the upper portion of the confining layer by at least five feet. The thickness of the slurry wall would be approximately three feet thick.

Approximately 7.5 miles of 84-inch pipeline would connect the proposed reservoir to Tampa Bay Water's regional water system at the South Central Hillsborough Intertie. The new pipeline route would generally follow existing roadways and linear utility corridors. The route would begin approximately 400 feet north of the intersection of Fishhawk Drive, Bell Shoals Road and Boyette Road. It would then run south and east, parallel to Boyette Road where it would cross rural land to the Tampa Bay Regional Reservoir site (HDR 1999a). The real property rights required for construction and operation of the pipeline would include a

EMBANKMENT CROSS-SECTION

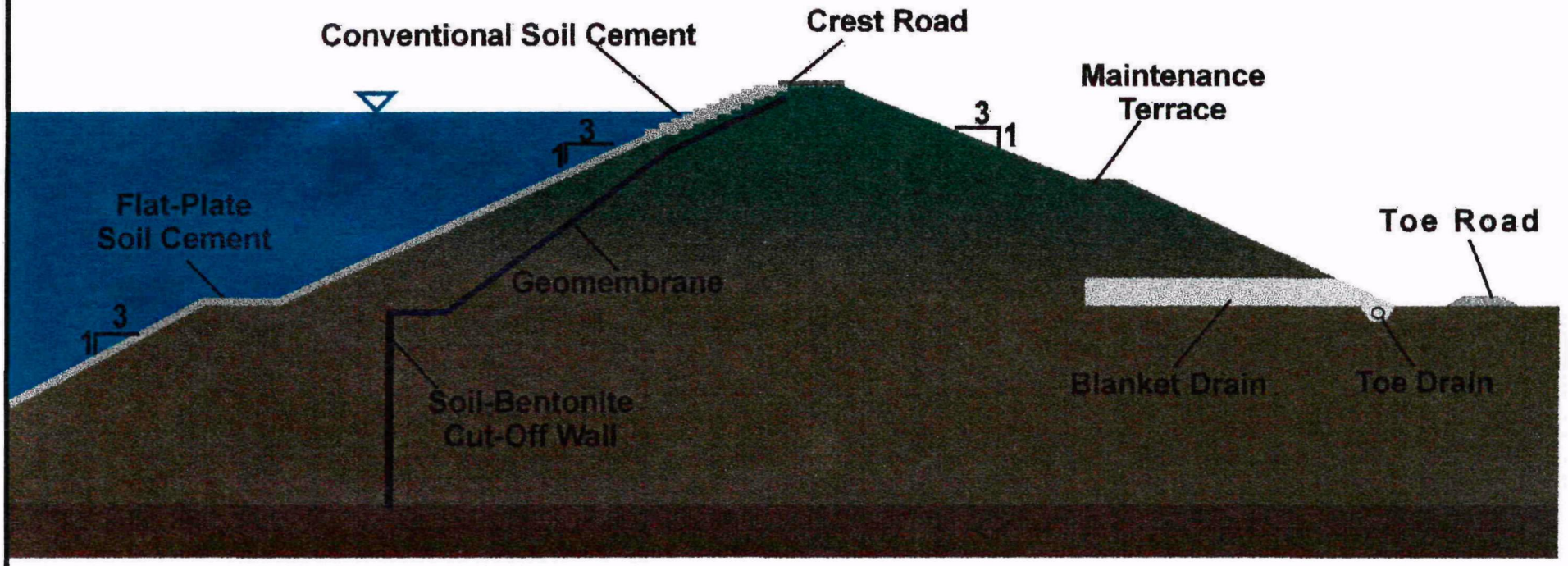


Figure Source: HDR Engineering, Inc., EAP Application, September 7, 2000

Figure 2-2
TAMPA BAY REGIONAL
RESERVOIR PROJECT DEIS

EMBANKMENT CROSS-SECTION

temporary easement of 50 feet during construction and a 50-foot permanent easement for construction, operation and maintenance. In areas near homes and other potentially sensitive locations, the easement would be reduced where possible to avoid or minimize impacts (HDR 2000). The approximate alignment of the proposed pipeline route is shown in Figure 2-3.

The proposed regional reservoir project site consists of the footprint of the embankment and reservoir, the associated facilities and pipeline, and all of the mitigation sites that would be used to offset wetland impacts associated with the project. Associated facilities would include an intake tower and the pipeline to connect the reservoir to Tampa Bay Water's regional water system. The proposed reservoir surface area is approximately 930 acres. When combined with the associated facilities, approximately 1,100 acres would be affected by the construction of the proposed reservoir. Impacts from the proposed associated pipeline would be minimal and short-term, as the majority of the pipeline would occur within easement parallel to existing roadways.

Tampa Bay Water has determined that design, site permitting and construction of the reservoir are expected to cost approximately $111.9 million while annual operation and maintenance cost are estimated at $964,000. The cost per 1,000 gallons of treated water from the entire Enhance Surface Water System is estimated to be $1.27.

2.2.2 Other Action Alternatives

Capturing freshwater from springs in the Gulf of Mexico. Under this alternative, freshwater would be piped from springs located in the Gulf of Mexico to onshore water treatment facilities and distributed for use as potable water. The alternative would require an extensive transmission system to transport freshwater from the springs to the existing treatment and distribution system, making this alternative infeasible.

Using Lakes in Abandoned Phosphate Pits. This alternative involves the treatment and use of water from lakes formed in inactive phosphate mines in the region. The extensive pumping and transmission system that would be required to transport water from each mine to existing treatment facilities for distribution and delivery is not reasonable and practical due to engineering feasibility and construction cost. In order to pump a reasonable amount of water such a distance would require the construction of additional water treatment facilities and distribution systems.

Using Aboveground Storage Tanks. In order to provide a continuous supply of water during low flow conditions, multiple storage tanks would have to be developed. The use of aboveground storage tanks would not have the means to continually provide the necessary supply of water to support the region.

Potable Water Reuse. The use of highly treated wastewater treatment plant effluent as a potable water supply is increasing throughout the United States, especially as water resources become more restricted and water supplies more extended. Facilities exist throughout the United States that utilize reclaimed water as a potable drinking

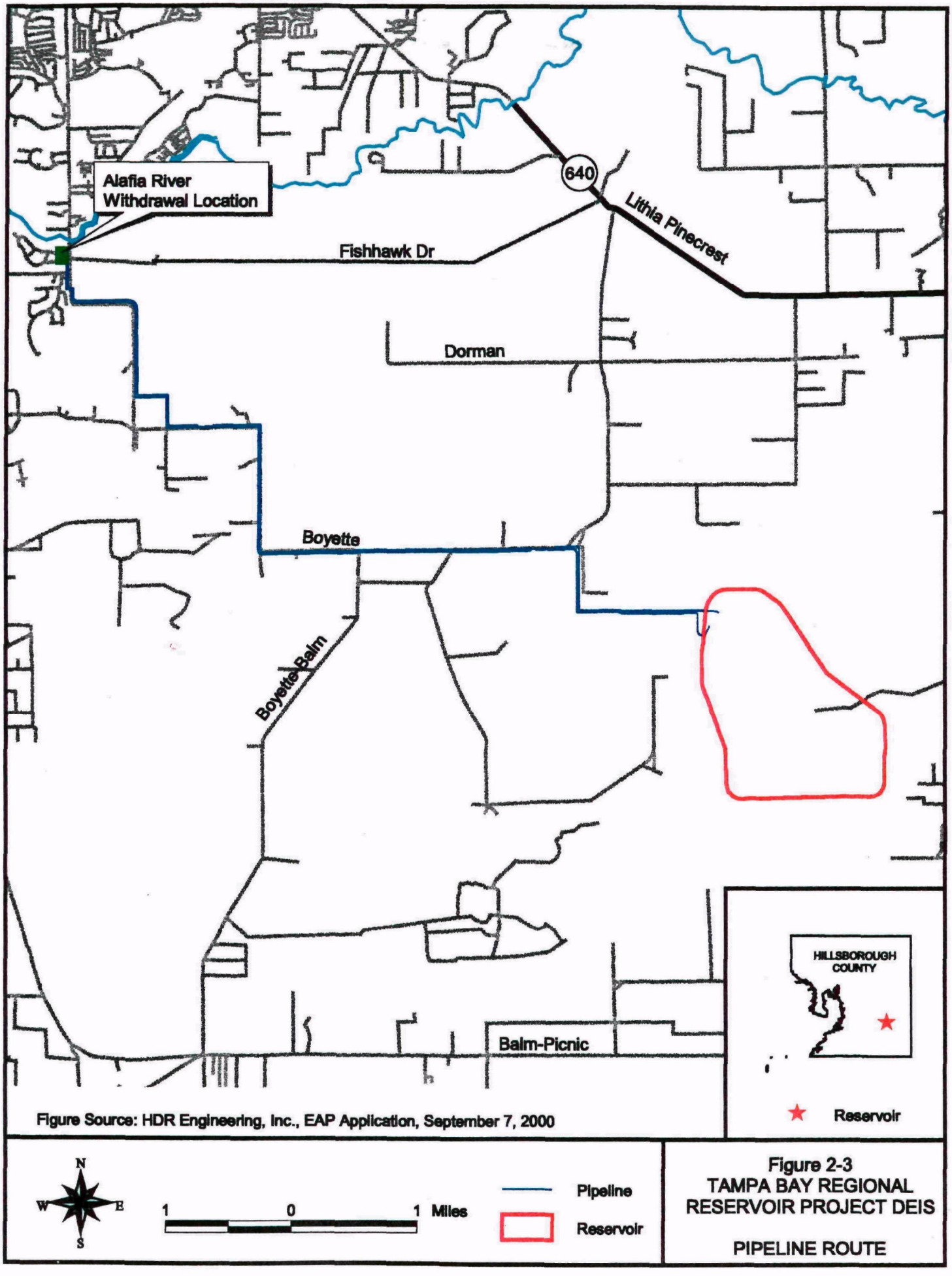


Figure 2-3
TAMPA BAY REGIONAL
RESERVOIR PROJECT DEIS

PIPELINE ROUTE

water supply. The City of Tampa (City), in its Tampa Water Resource Recovery Project (TWRRP) Feasibility Study, concluded that treated water effluent was indeed a feasible water supply and there were no adverse health risks associated with this type of water reuse (Law Environmental, Inc., 1994). In this alternative, the City proposed to treat effluent waters from the Howard F. Curran Advanced Wastewater Treatment Plant, to supplement the City's existing potable water supply.

One proposed option was for the City to divert water from the existing water treatment facilities for treatment and distribution from a new treatment facility. Treated water would be pumped to the Tampa Bypass Canal, where it would mix with the existing water supply, and stay in the canal for a specified residence time prior to being withdrawn, treated again, and distributed for use as a potable supply by the City. The costs associated with this alternative include treatment of the effluent to interim standards, transmission to a new treatment facility and interconnect system, and a new water treatment facility. A significant amount of investigation was conducted on this project. A final EIS was prepared. Public opinion regarding this alternative was not favorable. Concern was expressed over health risks that could be associated with the reuse of treated water as a potable water supply. In March 1999, the Tampa Bay Water Board of Directors removed the project from further consideration.

Resue of Reclaimed Water. Reclaimed water is defined by the FDEP as water that is beneficially reused after being treated to at least the secondary wastewater treatment standards by a domestic wastewater treatment plant (WWTP). The use of reclaimed water to irrigate crops, golf courses, and parks, decreases the reliance of theses facilities on potable water supplies and reduces the quantity of effluent discharged from WWTP.

The SWFWMD has solicited input from utilities, local governments, and public interest groups to develop possible reclaimed water options. As a result, SWFWMD developed a list of 180 potential reclaimed water options, which were then narrowed to 25. Of these, 25 potential options, nine were located in Tampa Bay Water's three county region of Hillsborough, Pasco, and Pinellas counties. The nine reclaimed water options are described in Table 2-3. Reclaimed water implementation is not considered to be a viable alternative to the reservoir project.

Seawater Desalination. Seawater desalination involves the use of membrane filtration technology to produce freshwater from seawater. The regions first seawater desalination plant will be built at the Big Bend Power Station in southern Hillsborough County and will produce 25 mgd of drinking water. The facility is scheduled to come on line by the end of 2002.

Tampa Bay Water is investigating the possibility of a second desalination facility to help meet the area's water needs for 2008. This project is known as Seawater Desalination II.

Table 2-3. Reclaimed Water Alternatives

Options	County	Water Offset (MGD)	Capital Cost (millions)	Cost/1000 gallons	Cost/mgd (millions)
Largo/Clearwater Pasco Interconnnect/Dehydration ASR	Pasco	3	$4.31	$0.54	$2.3
Pinellas County-St. Peterburg Storage/Interconnect	Pinellas	10	$11.05	$0.28	$1.1
Horizontal Well Reclaimed System Augmentation	Hillsborough	1.2	$16.67	$3.31	$13.8
Tampa/C. Hillsborough Interconnect	Hillsborough	18	$13.09	$0.24	$0.7
Downstream Augmentation of Hillsborough River	Hillsborough	10	$20.27	$0.51	$2.0
Downstream Augmentation of Alafia River	Hillsborough	7	$11.69	$0.40	$1.6
S. Hillsborough ASR Wells/Recharge/Saltwater Intrusion Barrier	Hillsborough	20	$14.01	$0.17	$0.7
US 41 Industrial Corridor Transmission	Hillsborough	10	$7.79	$0.18	$0.78
Pinellas County Efficiency Study	Pinellas	17	$0.1	N/A	N/A

Another option beyond the Seawater Desalination II alternative would be to expand Tampa Bay Water's currently planned desalination plant at Tampa Electric Company's Big Bend Power Station located on Tampa Bay in southern Hillsborough County. Currently, the private developer of the seawater desalination project is in the process of obtaining permits to facilitate constructing a 25-mgd desalination plant at this site.

As designed, the desalination plant is expandable to 35 mgd. The headworks and transmission mains are designed for the 35-mgd capacity. The plant's process equipment would have to be modified in order to treat the additional quantity.

Expansion of the Big Bend Site would require a modification of the FDEP Wastewater Facility Permit in order to accommodate the additional concentrate discharge. If the discharge for the 25-mgd facility does not violate discharge permit conditions and environmental monitoring programs show no indications of adverse impacts, a modification for an increased discharge quantity may be obtained after some

additional analysis. This option could produce up to 10 mgd of potable water for the region. The capital cost of this expansion is estimated to be $27.9 million. The cost per mgd is $2,793.00 while the cost per 1,000 gallons is $2.69. Serious consideration of this project for implementation would be contingent upon successful permitting, construction, and operation of the first seawater desalination facility.

Brackish Water Desalination. A study was conducted in 1999 to determine the feasibility of developing a brackish groundwater supply within the Tampa Bay Water service area (Missimer International 2000). Pinellas County was identified as the only feasible area for brackish groundwater withdrawals given a review of currently planned or proposed brackish groundwater desalination options and an assessment of brackish groundwater resources in the region.

Two potential brackish wellfields and associated reverse osmosis (RO) plant sites were considered for development in Pinellas County. Each site consisted of a brackish groundwater wellfield, an RO treatment plant, associated water piping for transmission of water from the wellfield to the treatment plant, and the discharge of the waste concentrate.

The first site is located in Pinellas County within the City of Clearwater, and has now evolved into what is called the Clearwater wells project. This project will use the City's existing municipal supply wellfield, which currently produces approximately 3.0 mgd. The City makes up the rest of its 15-mgd demand by purchasing water from Pinellas County, a member government of Tampa Bay Water. The project proposes to increase production from the wellfield from 3.0 mgd to 5.0-mgd (Phase I) by December 2001. This will represent a direct decrease in demand from Tampa Bay Water's Regional System. The second phase of this project involves the installation of an RO membrane treatment plant that would treat a portion of the water within an area of the City that receives no water from Pinellas County. The RO plant, scheduled to be on-line by December 2002, would allow the City to manage deteriorating water quality in an area of the City, which doesn't have the benefit of dilution with outside sources. The capital cost of the project is estimated at $8.2 million, and the cost per 1,000 gallons is estimated at $1.68. Tampa Bay Water's involvement in the project occurred during the project definition and feasibility stage. The City of Clearwater will complete final design and construction activities, and will continue to own and operate its municipal wellfield. This way the City and Tampa Bay Water both benefit, while the original goals of the project are met.

The second brackish water site is also located in Pinellas County, specifically in Pinellas Park. The project would include a 3-4 acre Reverse Osmosis plant site and installation of 13 to 15 dispersed brackish water production wells. The dispersed wells collectively would produce on average 6.5 mgd of brackish groundwater from the Upper Floridian Aquifer. This 6.5-mgd of brackish water withdrawn would result in 5 mgd of potable treated water and 1.5 mgd of byproduct. The total capital and unit costs for this project are approximately $24 million for capital

costs and $1.90/1000 gallons. Tampa Bay Water is currently pursuing implementation of this project in the 2008 time frame.

Water Conservation. The Tampa Bay region member governments are responsible for implementing programs that quantifiably reduce water demand. Tampa Bay Water supports local government conservation programs by funding programs quantifying water conservation potential and cost, providing region-wide educational and marketing programming, and various research and development based programs.

Demand Management is considered an important component in the Master Water Plan. The Plan included an aggressive demand management-conservation component with goals to reduce overall demand by 10 mgd in 2000 and an additional 7-mgd by 2005.

A Regional Water Supply Demand Management Plan (DMP) was developed in June 1997, which explored the opportunities for reducing the future demand by improving the efficiencies in existing and future water use in the region. The DMP provided Tampa Bay and its member governments a means to coordinate the on-going conservation efforts with SWFWMD from a regional perspective.

Future Conservation Measures

- Education and public awareness programs
- Programs to reduce outside and inside water use
- Implementation of a water rate structure
- Improved utility operations

Subsequently, additional efforts were initiated to formulate a Demand Management Implementation Board Plan (DMIP) to identify specific Best Management Practices (BMP's) that could be used by member governments to reduce water demand consistent with or exceeding the Master Water Plan goals. Examples of conservation BMP's include: low flow toilet rebates, plumbing retrofit kit giveaway programs, irrigation system and landscape rebates, and 13 other potential BMP's. During this process, application software (AQUATrak) was also developed to facilitate strategic planning for implementation of selected BMP's.

The Partnership Agreement requires Tampa Bay Water and its member governments to continue to plan, coordinate, develop, construct, and implement conservation and reclaimed water projects in accordance with the responsibilities assigned to them in the Interlocal Agreement. Additionally, the Partnership Agreement required Tampa Bay Water to provide an annual report on the status of conservation and demand management projects. According to this agreement, the District, in conjunction with the appropriate Basin Boards, intends to collectively continue to fund, to the extent authorized by law, approximately $9 million dollars per year for conservation and reclaimed water projects that effectively reduce potable water use. This collective funding is expected to be continued for

ten years (through 2008) and is expected to provide funds for such purposes to Tampa Bay Water, its member governments, and other local governments in Hillsborough, Pasco, and Pinellas counties on a 50/50 cost sharing basis.

To determine how Member Governments plan on meeting the conservation and reuse goals of the Partnership Agreement, a compilation of their plans is annually completed. Members used the AQUATrak program, application software developed to assist in determining cost-effectiveness of conservation programming, to generate water savings estimates or their own savings per program, wherever possible.

According to member governments' actual and projected 5-year water conservation plans, the region will save approximately 11.3 mgd by the end of fiscal year 2000 and 26.0 mgd by the end of fiscal year 2005. The projections assume that default savings contained in the AQUATrak demand management program, or the members identified savings rates are achieved for all best management practices. The default savings values that were developed in the AQUATrak program are based on national, regional, and local conservation program data (where available). Potable water savings resulting from reclaimed water use, account for 16.6 mgd to the 26.0 mgd that would be saved by the end of fiscal year 2005. Savings originally identified in the Master Water Plan and the 5-year water conservation plan does not include implementation of the National Energy Policy Act. Between implementation of the Act in 1994 and 2000, approximately 5.25-mgd savings occurred due to its implementation (in addition to active conservation implementation in the region).

Education programs have been developed successfully by many members. Education programs are generally targeted toward specific age groups and/or sectors of the population. Many education programs are offered on an annual basis and are designed to educate the public on the need to conserve water and a means to modify future water use habits. In-school education programs have developed curriculum materials and are approved for use by the public school system. Generally, these programs offer specific curricula, a mechanism to measure knowledge increase, and change in water use habits.

Public awareness programs also provide education to the public but are generally not quantifiable in nature. They reach a broad population base and are developed to keep issues in front of the public. No predefined curriculum materials are generally developed and mechanisms to measure their effectiveness are much more broad and non-quantifiable than education programs. The member governments believe that these programs are very successful at promoting conservation and specific best management practices that may be implemented by the public.

Aquifer Storage and Recovery. Aquifer storage and recovery (ASR) is the process where potable water is injected into an aquifer, stored, and withdrawn. An ASR system is comprised of wells, pipelines, and pumps that allow the water to be injected and withdrawn as needed. A hypothetical system would store treated

water withdrawn from the Tampa Bypass Canal, the Hillsborough River, and the Alafia River during periods of higher flow. The purpose of an ASR system would be to increase the sustainable yield of the water supply system by storing water for use during low flow periods when surface water withdrawals are restricted.

Federal and state regulations in Florida currently require that water injected into a storage aquifer meet potable water quality standards to prevent contamination of the aquifer, groundwater, and potable or domestic wells.

If an ASR project were being considered as a replacement for the reservoir project, Regional Surface Water Treatment Plant (RSWTP) would have to be tripled in size to handle the peak flow. Partial treatment of water would require construction of a centrally located water treatment plant.

To replace the storage capacity of the reservoir, the required injection or storage capacity was determined as follows:

- Maximum total surface water withdrawal capacity - 181 mgd
- Less surface water treatment plant capacity - 66 mgd
- Required wellfield capacity for injection - 115 mgd

Two alternatives have been developed to meet the reservoir replacement criteria (Table 2-4). One of the ASR wellfield options proposes a wellfield system with a withdrawal capacity of 30-mgd and 68 mgd of injection capacity. This alternative would have two additional wellfields with 15 mgd of additional withdrawal capacity and 30 mgd of injection capacity. The second alternative includes the development of six wellfields. Each sized for approximately 10 mgd of withdrawal capacity and 20 mgd of injection capacity. For either of the full or partial treatment alternatives, additional transmission pipelines would be required to transport water to and from the ASR wellfields. An 84-inch diameter pipeline would be sufficient to transport 121 mgd.

Placement of the ASR wellfields is dependent upon both hydrogeologic factors and impacts to the environment and other existing users. The permeability and thickness of the confining layers above the proposed water storage zones are critical factors for preventing water level drawdown from well pumping and natural depletion in the shallow aquifer system during the dry season. Preliminary studies have shown that areas south of the Alafia River have geologic characteristics that limit this type of drawdown. The degree of mineralization in the groundwater that is native to the storage zone is also

Table 2-4. ASR Wellfield Alternatives

Components	Alternative 1		Alternative 2
Number of Wellfields	1	2	6
Withdrawal Capacity	30 mgd/wellfield	15 mgd/wellfield	10 mgd/wellfield
Injection Capacity	60 mgd/wellfield	30 mgd/ wellfield	20 mgd/wellfield

important since the mixing of injected water with existing groundwater could effect water quality. Preliminary studies showed that the most favorable areas for the ASR wellfields were at least two miles east of I-75. Additional investigations using more specific ASR wellfield siting criteria are needed to more specifically identify wellfield locations.

Capital cost estimates were prepared for both alternatives. The cost estimates include wellfield development, treatment, transmission, and other associated facility costs (Table 2-5).

Tampa Bay Regional Reservoir and ASR System. ASR has been considered a possible enhancement to the Tampa Bay Regional Reservoir to improve the reliability of the overall surface water system. Two alternatives were intially evaluated that included a regional reservoir and an ASR system. The first reservoir and ASR alternative evaluated included a proposed 1,100-acre regional reservoir and an 18-mgd ASR system. The second reservoir and ASR alternative was a smaller 800 acre regional reservoir and a 30-mgd ASR system.

The concept of the ASR system can be thought of as an underground reservoir. The ASR system would work together with the surface reservoir to increase the total storage capacity of the system. An advantage of subsurface storage is that it is not subject to evaporative losses and it does not require the acquisition of large parcels of land. Favorable hydrology and the ability to blend the recovered ASR water with water stored in the surface reservoir means that a large percent of the water put into storage could be recovered for use. The Tampa Bay Regional Reservoir is an important component of the aquifer storage system because it can be used to store high flows so that injection capacity can be minimized.

Up to this time, ASR has most commonly been used in Florida for the storage of fully treated potable water. However, new applications of this technology using water that has limited pretreatment are being developed. ASR is most easily permitted if the injected water meets all primary and secondary drinking water standards. There is a regulatory exemption process currently in place that addresses the injection of water that exceeds one or more secondary drinking water parameters. Currently, exemptions of primary drinking water standards are very difficult to obtain. At this time there are new rules and procedures being considered by the State of Florida that might allow an exemption for specific primary drinking water standards. Assuming sufficient water is available for storage, an ASR system capacity would likely be limited by regulatory criteria and maximum drawdown allowed during the recovery period within a prescribed distance from the wells. Prior to final design of an ASR system, a pilot study would need to be conducted to clearly define the ASR storage interval, the type of pretreatment, and specific details regarding the wellfield design and operation. The pilot study, permitting, and construction of the ASR wellfield under current regulatory criteria is estimated to take about ten years. A preliminary investigation conducted by Tampa Bay Water of the proposed Tampa Bay Regional Reservoir

Table 2-5. Estimated capital cost range for the proposed ASR system.

Description	Estimated Cost
Full Treatment Option:	
Wellfield	$43,500,000
Treatment	$111,894,000
Transport	$61,594,500
Other associated costs	$86,795,400
Total	**$303,783,900**
Partial Treatment Option:	
Wellfield	$23,550,000
Treatment	$94,215,000
Transport	$58,845,000
Other associated costs	$70,644,000
Total	**$247,254,000**

indicated that an ASR system having a capacity to store and recover water at a rate of approximately 18 mgd could greatly improve the reliability of the overall water storage and supply system. The ASR system could be located at the regional reservoir site, along the regional reservoir pipeline route, or at a more distant location. An ASR system built adjacent to the regional reservoir site could potentially be the most cost efficient; no additional acquisition of property would be required. It is also thought that pretreatment could be more easily accomplished using stored reservoir water since the large volume of surface water stored could serve to buffer and dilute any unforeseen water quality parameters.

An ASR wellfield located more distant from the regional reservoir could offer certain advantages if regulatory issues and/or public opinion do not favor siting ASR wells adjacent to the reservoir.

The estimated costs of building an ASR system were based on constructing the ASR system near the regional reservoir site. Individual well capacities used in this analysis were estimated to be approximately 2 mgd. A system of nine wells was used yielding a total ASR system capacity of 18 mgd with one 2-mgd backup well. The estimated cost of the entire wellfield was approximately $10.7 million. The total estimated cost of the regional reservoir and the ASR system was about $121 million.

The preliminary investigation for the second alternative conducted by Tampa Bay Water, of a smaller 800-acre Tampa Bay Regional Reservoir, showed that an ASR system having a capacity to store and recover water at a rate of approximately 30-mgd would be required. The design and location of the ASR system would be similar to that in the first alternative.

For the second alternative, a system of 15 wells was used, yielding 30 mgd with two 2-mgd backup wells. The estimated cost of the ASR system was approximately $18 million. The total

estimated cost of the regional reservoir and the ASR system was about $128 million.

2.3 NO FEDERAL ACTION ALTERNATIVE

For the purposes of comparing alternatives in this EIS, it was necessary to consider that the No Federal Action equated to no reservoir; however, absent federal funds, nothing in this DEIS would prevent Tampa Bay Water from building the reservoir and pipeline. If the Tampa Bay Regional Reservoir were not built, Tampa Bay Water believes it would not meet the needs of the tri-county area under the commitments and obligations of the Interlocal and Partnership Agreements. The No Federal Action alternative would not provide the 111-mgd cumulative water supply needs by 2007; a short-fall of approximately 25-mgd would occur. If pumping levels exceeded the permitted quantities specified in the Consolidated Water Use Permit, Tampa Bay Water could potentially lose up to $183 million of funding committed by SWFWMD through the Partnership Agreement. The No Federal Action alternative is the least cost effective of all the alternatives presented.

Groundwater withdrawal above permitted levels would continue to adversely impact wetlands and lakes. If conditions of the consolidated permit are followed, the No Federal Action alternative would ultimately result in a water deficit for the tri-county area.

2.4 EVALUATION OF ACTION ALTERNATIVES

An evaluation of 11 action alternatives was conducted to determine which were considered to be reasonable and practicable. Each alternative was assessed, using three criteria - engineering feasibility, environmental impacts, and the ability to meet established regional water demands. A detailed comparison of the alternatives that successfully met all three criteria was then made in the DEIS.

All 11 alternatives were initially evaluated to identify any extraordinary or unproven technical engineering actions that would be required to implement the alternatives. Identification of such activities or constraints was sufficient to eliminate an alternative from further consideration. Of the 11 alternatives originally considered, three were eliminated due to engineering constraints. These alternatives were capturing freshwater springs, using lakes found in abandoned phosphate pits, and using aboveground storage tanks.

- The proposed alternative to **capture underground freshwater from springs** percolating into the Gulf of Mexico has been suggested as a possible source for potable water. Recovery of usable amounts of water from these sources is problematic. Undersea springs would have to be located and somehow capped. The amount and quality of water resources from underground springs is unknown, and it is also unknown if the springs flow year-round. Water would have to be piped along the seabed to a central treatment and distribution center. A network of pipes situated in or on the seabed would be subject to damage by storms, dredging activities, anchors from commercial vessels and pleasure craft, and commercial

fishing. Technology to capture undersea springs for a public water supply is currently not available. This alternative is not feasible from an engineering standpoint and was removed from consideration.

- The second alternative to be eliminated was one that proposed to **use lakes found in abandoned phosphate pits.** Abandoned phosphate mines are unacceptable as water storage facilities. The abandoned mines are unlined, and the mine sidewalls are sufficiently porous making them essentially reservoirs for standing groundwater. Building perimeter berms on the mine shoulders would be structurally unsound. Phosphate mines generally cannot be lined or retrofitted for water storage facilities because the geotechnical requirements of soil and substrate are critical and are unlikely to exist in abandoned mines. Attempts to store water above existing groundwater levels would result in hydrostatic pressure driving water into the ground. Conversely, drawing down water from the abandoned mines would be essentially the same as pumping from the aquifer. SWFWMD has limited the capacity of groundwater withdrawals from the existing 11 wellfields to 121-mgd by December 2002 and to 90-mgd by December of 2007. By drawing down water from an abandoned mine, in reality one would be pumping groundwater, and SWFWMD's mandate to reducing the regions dependence on groundwater would not be met. Most of the abandoned mines are located in Polk, Hardee, and Manatee counties, all considerable distance from the major population areas within Tampa Bay Water's service area. In order to pump sufficient amounts of water these distances, additional water treatment facilities requiring extensive pumping and transmission systems would need to be built. This alternative was problematic and was removed from consideration.
- The third alternative to be removed from further consideration due to engineering feasibility was **using aboveground storage tanks**. A public water supply for a large metropolitan area such as Tampa/St. Petersburg must have water supply system large enough to provide a continuous supply of water, and a network of storage tanks would not be a reliable source. In order to provide a continuous supply of water during low flow conditions, multiple storage tanks would have to be developed. The use of aboveground storage tanks would not have the means to continually provide the necessary supply of water to support the region. Because siting, construction, and maintenance of hundreds of aboveground tanks would not be feasible, this alternative was removed from consideration.

The remaining eight alternatives were investigated to determine their impacts on the environment. Significant impacts could include increasing the likelihood of saltwater intrusion, negatively impacting habitat for threatened or endangered species, or negatively impacting special or protected habitat types. The probability of expensive mitigation related to each alternative was also considered, as such requirements could increase the cost of water. The eight alternatives did not demonstrate

any major fatal environmental flaws and therefore none were eliminated.

The eight alternatives were then evaluated on their ability to meet the water demand and requirements set forth for the region. As stated above, the alternatives considered must be capable of providing at least 58 mgd of water by the year 2007. Of the eight remaining alternatives, seven were eliminated. The seven alternatives eliminated were: potable water reuse, reclaimed water, seawater desalination, brackish groundwater, water conservation, an ASR system, and a 800 surface acre Tampa Bay Regional Reservoir and 30 mgd ASR wellfield.

- The first alternative to be removed from further consideration was using **reclaimed water for potable use**. Reclaimed water for potable use was examined by EPA and Tampa Bay Water with the proposed Tampa Bay Water Resource Recovery Project. Lack of public support, health concerns, and concerns about costs caused the project to be discontinued in 1999 and it was dropped from further consideration in this study.
- The second alternative to be eliminated was one that proposed to use **reclaimed water** to meet the regional demand. Most of the options included in this alternative are being implemented, and offsets that could be expected have already been considered in demand projections. The use of reclaimed water would not supply the capacity needed for the region and therefore was eliminated from further consideration.
- The third alternative to be removed from consideration was the use of **seawater desalination.** Seawater desalination alternatives would not meet the demands of the region given the time constraints on Tampa Bay Water, and public concern was also expressed about the potential impacts of brine disposal from the plant. For schedule reasons this alternative was eliminated from further consideration.
- The major constraints of the fourth alternative, using **brackish groundwater,** are the disposal of the reverse osmosis byproduct (concentrate) and the impacts on existing groundwater supplies. Inadequate supply capacity, potential environmental concerns, and costs associated with brackish groundwater caused it to be eliminated from further consideration.
- The fifth alternative to be eliminated was one that proposed to solely reduce demand by using **water conservation** practices. Water conservation will reduce the amount of water used, although the cumulative reduction is not large enough to meet projected water demands. Decreases due to conservation are considered already in the region's demand projections. For this reason, water conservation is not carried forward as a stand-alone alternative. However, water conservation programs are a critical component and they are a part of each alternative carried forward in this DEIS.
- Developing an **ASR system** as a stand alone alternative was the sixth alternative eliminated. The ASR system would not meet the region's

water needs in time because of the estimated 10-years required to test and build an ASR system. The projected costs of this alternative further preclude it as a stand-alone alternative. However, ASR could be used to supplement the supply by increasing the yield of the surface water system, and will be considered in a combination alternative.

- The seventh alternative to be eliminated was using a combination of an **800 surface acre Tampa Bay Regional Reservoir and 30 mgd ASR wellfield** to meet the regional need. This alternative would not meet the required schedule to meet project needs nor would it supply enough water for the region. For these reasons this alternative is not carried forward as a standalone alternative.

None of the alternatives eliminated from further consideration would allow Tampa Bay Water's member governments to meet the established water needs of the region as defined in the Interlocal and Partnership Agreements. Tampa Bay Water's member governments would be required to continue to pump the existing groundwater facilities above permitted limits.

2.5 ALTERNATIVES CARRIED FORWARD

Eleven action alternatives were originally identified for inclusion in the alternative screening process. The ability of these eleven alternatives to satisfy the established project purpose and need was evaluated. Only two of the eleven original action alternatives are capable of providing the needed water supply to meet the identified regional demands by 2007. The two action alternatives selected for further consideration in the DEIS are:

- **1,100 Acre Tampa Bay Regional Reservoir Project.** The proposed reservoir and associated facilities would cover approximately 1,100 acres (900 acres of surface area when full), with a storage volume of approximately 48,000 acre-feet (15 billion gallons). This alternative is Tampa Bay Water's preferred project and is located in southeastern Hillsborough County, south of County Road 640, north of County Road 672, and west of State Road 39 (See Figure 2-1).

  Approximately 7.5 miles of 84-inch pipeline would connect the proposed reservoir to Tampa Bay Water's regional water system at the South Central Hillsborough Intertie. The new pipeline route would generally follow existing roadways and linear utility corridors. See Section 2.2.1 for a detailed description of this alternative.

- **1,100 Acre Tampa Bay Regional Reservoir and 18-mgd ASR System.** The second action alternative would include the same 1,100-acre reservoir found in the first alternative above but would also include an 18-mgd ASR system. The proposed reservoir would cover approximately 900 acres of surface area when full and would have a storage volume of approximately 48,000 acre-feet (15 billion gallons). As before, the proposed location is in southeastern Hillsborough County, south of County Road 640, north of

County Road 672, and west of State Road 39 (See Figure 2-1).

In addition, approximately 7.5 miles of 84-inch pipeline would connect the proposed reservoir to Tampa Bay Water's regional water system at the South Central Hillsborough Intertie. The new pipeline route would generally follow existing roadways and linear utility corridors.

The proposed 18-mgd ASR system would be constructed near the 1,100-acre regional reservoir site. Individual well capacities used in this analysis were estimated to be approximately 2 mgd. A system of nine ASR wells was used, yielding a total ASR system capacity of 18 mgd with one 2-mgd backup well.

The estimated cost of the entire ASR wellfield was approximately $10.7 million. The total estimated cost of the 1,100-acre regional reservoir and the 18-mgd ASR system was about $121 million. See Section 2.4 for a detailed description of this alternative.

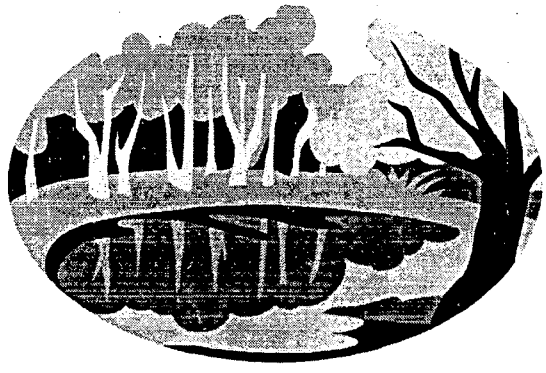
No Federal Action. The No Federal Action alternative, as defined in Section 2.1, is also carried forward in the DEIS to serve as a baseline for comparing the two action alternatives.

CHAPTER 3

AFFECTED ENVIRONMENT

3.1 INTRODUCTION

A wide array of action and no-action alternatives were evaluated both to meet the need being satisfied by Tampa Bay Water's Regional Reservoir Project and improving the reliability and dependability of Tampa Bay Water's integrated water supply system. A multi-step screening process identified two feasible alternatives capable of obtaining these goals and one "no action" alternative. Chapter 3, Affected Environment, describes the natural resources, such as vegetation and wildlife, and the human resources, such as socioeconomic and cultural resources, which could be impacted by the three alternatives remaining under consideration.

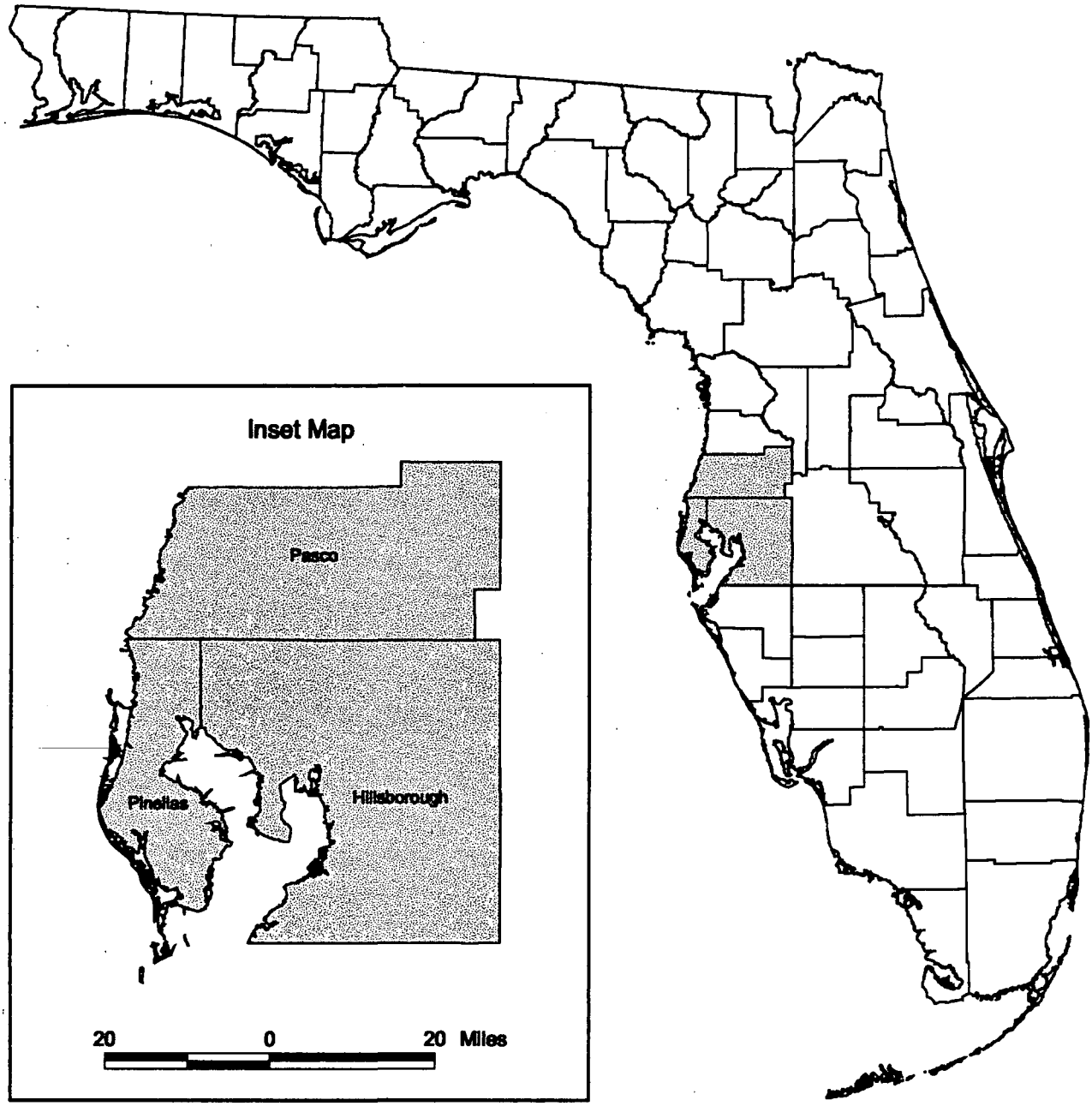


3.2 GENERAL SETTING

The project area for the proposed alternatives, as described in Chapter 2, is in the west-central portion of Florida, in Hillsborough, Pasco, and Pinellas counties. Because each of the feasible alternatives are in the same general area, Chapter 3 will focus on the potential reservoir area, the immediate area surrounding it, and the proposed alignment for the associated pipeline. This area, plus land areas from which water could be withdrawn or could be impacted, the Alafia and Hillsborough rivers, the Tampa Bypass Canal, and Tampa Bay, will be included in the project area (Figure 3-1).

In general, the Florida landscape is dominated by flatwoods, which are associated with low, flat topography and poorly drained, sandy soils. Individual stands of flatwoods may occupy thousands of acres, forming a matrix of communities that include isolated hammocks, marshes, wet prairies, and scrub. Major streams in the project area are often lined with forested vegetation. Land use in the project area consists primarily of undeveloped woodlands, wetlands, and grasslands that are utilized for cattle grazing and agriculture. Major cities in the three-county area include Tampa in Hillsborough County, St. Petersburg in Pinellas County and New Port Richey in Pasco County. Smaller cities and towns, and rural areas are interspersed throughout the project area.

Tampa Bay, located on the state's west-central coast, is Florida's largest open water estuary. It is a Y-shaped bay with an area of approximately 398 square miles (mi^2) that receives runoff from a watershed encompassing an area of 2,275 mi^2. The watershed is composed of five major river systems and smaller sub-basins of coastal streams that form a drainage area that contains all or portions of Pasco, Pinellas, Hillsborough, Polk, Manatee, and Sarasota counties. The rivers that flow into Tampa Bay are the Hillsborough, Alafia, Little Manatee and Manatee, and the Tampa Bypass Canal.



70 0 70 Miles

Figure 3-1
TAMPA BAY REGIONAL RESERVOIR PROJECT DEIS

GENERAL SETTING

The three water supply sources for the proposed Tampa Bay Regional Reservoir Project are the Alafia River, the Hillsborough River, and the Tampa Bypass Canal. These three sources originate to the east of Tampa Bay, flow southwest or west as their floodplains become progressively broader and are tidally affected near Tampa Bay.

The Alafia River watershed is located in Hillsborough and Polk counties, originating in west-central Polk County. The river flows approximately 24 miles westward where it enters southeast Hillsborough Bay and Tampa Bay. Unlike most Florida streams, the tributaries to the Alafia River are somewhat narrow, swift-flowing streams with deep-cut banks and relatively few large swamps (U.S Department of the Interior 1990). The Alafia River watershed contains about 420 mi^2.

Headwaters of the Hillsborough River watershed are located in the southwestern portion of the Green Swamp in Pasco County. From this point, the river flows southwest approximately 54 miles to upper Hillsborough Bay, through Pasco, Polk, and Hillsborough counties. The Hillsborough River is impounded by a dam in Tampa that forms the Hillsborough River Reservoir, the primary drinking water supply for the city of Tampa. The Hillsborough River watershed covers an area of about 650 mi^2.

The Tampa Bypass Canal is the channeled extension of Six-Mile Creek that intersects the Hillsborough River at Trout Creek and at the City of Tampa's water supply reservoir. Vertical lift gates and slide gates at five water control structures located at narrow points along the waterway regulate flow in the canal.

Each of the two viable alternatives considered in this Draft Environmental Impact Statement (DEIS) are physically located in the same geographic area. Because both alternatives involve construction of a reservoir, pipeline, and/or aquifer storage and recovery (ASR) system, the general location in which construction would occur will be collectively called the project construction area. This construction area is located in southeast Hillsborough County, approximately 16 miles east of Tampa Bay and 8 miles south of the Alafia River. Land use in the area is primarily agricultural but also includes mined lands, pastureland, and residential properties.

Climate. The climate of the project area is characterized as subtropical. This is a mild climate, resulting from low topography, proximity to the Gulf of Mexico and the Atlantic Ocean, and relatively low latitude (Florida Department of Envionmental Regulation (FDER) 1995). The mean annual temperature is 72.2 degrees Fahrenheit (^{o}F), which is modified by winds from the Gulf of Mexico as they sweep across the Florida peninsula. Summers are warm and humid, often with daily afternoon thundershowers. Summer temperatures peak during June, July, and August, when they average 90 ^{o}F. Winters are short and mild with bright sunny days and little rainfall. Windy cold spells seldom occur and are short-lived. The coldest month is January, which has an average temperature of 60.8 ^{o}F. Although freezes can occur

once or twice a month during the winter season, they are usually not damaging. Snowfall is negligible (Natural Resource Conservation Service (NRCS) 1989).

Annual average precipitation is about 50 inches. Approximately 60 percent of the rainfall occurs from June through September and falls from heavy thunderstorms. The wettest year on record occurred in 1959 when 76.57 inches of rainfall was recorded. The driest year (28.89 inches) occurred in 1956. In August through November, disturbances varying in force from hurricanes to thunderstorms move northward from the tropics bringing damaging winds and heavy rains. Thunderstorms accompanied by moderately high winds can occur throughout the year (NRCS 1989).

3.3 SOILS AND GEOLOGY

The soils and geology define the hydrology, topography, and ecology of a region. Soil composition and the underlying parent materials combine to provide conditions that support the different natural habitat types of the surrounding landscape.

3.3.1 Soils. Soils are described and classified based on a number of measurable differences, characterized by the nature of the parent rock, weathering processes, the transport mechanisms involved, biology, and stage of decomposition. In central and south Florida, the soils are geologically young and reflect changes in sediment types. Sands and organics dominate the soils in west-central Florida. These soils are a product of the damp, semitropical climate, flat topography, and the relatively short geological time the parent materials have been exposed to soil developmental conditions (FDER 1995).

The project area is located within a broad, flat regional feature known as the Polk Upland, that occupies a large portion of west-central Florida. A thin sequence of Pleistocene sands and a thick sequence of siliciclastic (sand, silt, and clay) and carbonate sediments underlay the upland.

Dominant soils in the watershed of the Hillsborough River, Alafia River, and Tampa Bypass Canal contain an accumulation of organic matter and precipitated aluminum and iron oxides. Well-leached sands overlie the organic layer and are moderately to strongly acidic resulting in low vegetation productivity. However, the acidic nature of the soils makes them well-suited for pine flatwoods. Seasonal ponding is often associated with these soils because they are typically found in areas with little or no slope and are often underlain with a well-developed hardpan that blocks downward movement of water.

The soils in the project construction area consist mostly of nearly level, poorly to very poorly drained soils that have sandy or loamy subsoil or are sandy throughout. Dominant soil types include the Myakka, Basinger, and Holopaw series. These soil types are typically associated with swamps and depressions. Typically these soils are not suited to most cultivated or citrus crops or pasture but support natural vegetation of cypress with an understory of bluestem, maidencane, Jamaica sawgrass, and cutgrass (NRCS 1989). The reservoir site is currently in pasture, and row crops are located adjacent to the site.

Phosphorous strip mining has impacted portions of the proposed construction area, but these areas have since been reclaimed. It is assumed that soil characteristics of these areas are now similar to the surrounding landscape with the exception of thin layers of very soft elastic silt or highly plastic clay that underlie the surface. These silt and clay layers appear to be clay tailings from the earlier phosphate mining process (HDR 1998).

Hydrologic Soil Groups. Hydrologic soil groups are those soils grouped according to their runoff producing characteristics (HDR 2000) (Figure 3-2). Group A soils generally consist of deep, well-drained sands or gravels with a high rate of water transmission, usually greater than 0.30 inches per hour. At the other end of the range, Group D soils have a high runoff potential and very low infiltration rates. Group D soils consist chiefly of clay soils with high swelling potential, soils with a permanent high water table, soils with a claypan (hardpan) or clay layer at or near the surface and shallow soils over nearly impervious materials. These soils have a low rate of transmission (0.0 to 0.05 inches per hour). Groups B and C range between Groups A and D (HDR 2000).

Hydrologic soil group classifications are an indication of the infiltration capacity of the soils and groundwater table elevations. Soil types of the reservoir site were delineated using the NRCS soil survey. The soil groups were found to be fairly homogenous and consist primarily of the B and D hydrologic soils groups. Typically these types of soils contain a semi-impermeable layer or hardpan several feet below the surface.

Some soils are listed in more than one hydrologic soil group. Soils such as those with B and D groups are also in the hydrologic soil group D in their natural (pre-developed) condition because of the high water table conditions that create drainage impedance. If these soils can be effectively drained and properly maintained, they may be reclassified in a different hydrologic soil group (HDR 2000).

3.3.2 Geology. The Peninsular Arch and Ocala Uplift formations characterize the majority of the geology in the project area. The productive storage zones in the project area are the lower Suwannee, and Avon Park formations. These storage zones are located in the upper Floridan aquifer system. The upper Floridan aquifer is a highly variable hydrologic system consisting of carbonate rocks separated by less permeable sediments that act as semi-confining layers. The top of the Floridan aquifer deepens moving south across the project area. As a consequence, areas with a higher degree of confinement are found in the southern portion of the site. Figure 3-3 provides a simplified representation of a north-south cross section showing aquifer formation contacts and potential water storage intervals.

The Suwannee storage zone is the uppermost productive layer present in the Floridian aquifer on a regional basis. Granular limestone is the predominant component and is primarily found in the upper part of the Suwannee production

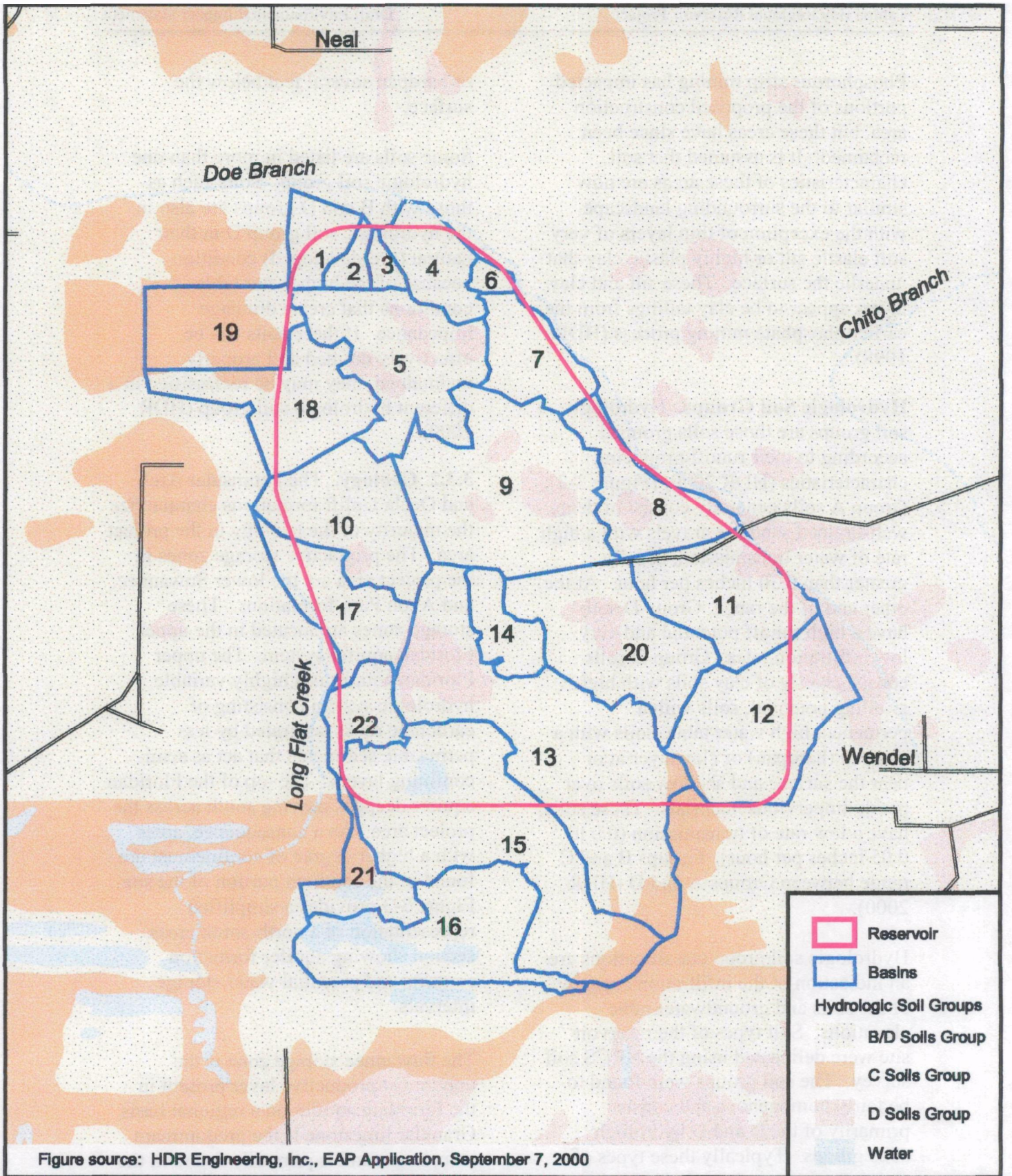


Figure source: HDR Engineering, Inc., EAP Application, September 7, 2000

Figure 3-2
TAMPA BAY REGIONAL RESERVOIR
DEIS PROJECT

HYDROLOGIC SOIL GROUPS

zone. This zone typically ranges from 100 to 150 feet thick and is approximately 150 feet below sea level (bsl) in the northern portion of the aquifer and about 400 feet bsl in the southern portion. The confining layer of this zone is clayey limestone in the lower part of the Suwannee Limestone formation or chalky limestone in the underlying Ocala Limestone formation.

The underlying Avon Park storage zone is a highly permeable, fractured rock system that is the source for water supply wells in Hillsborough County. The storage zone occurs in the upper part of the Avon Park formation in fractured dolostone or in the basal layers of the Ocala Limestone. This zone typically ranges from approximately 600 feet bsl in the northern portion of the study area to 750 feet bsl in the south and is between 100 and 150 feet thick, with some areas ranging up to 300 feet (HDR 2000).

A layer of sedimentary rocks underlies the Alafia River, Hillsborough River and Tampa Bypass Canal, and Tampa Bay. The Alafia River flows through the Southwestern Flatwoods physiographic district, primarily in the Bone Valley Uplands. These uplands are a poorly drained plateau underlain by deeply weathered sand and clayey sand. The Hillsborough River flows through the Ocala Uplift physiographic district, principally in the Hillsborough Valley. Sluggish surface drainage and many karst features characterize the valley. The Tampa Bypass Canal is also located in the Ocala Uplift District in the Hillsborough Valley (FDER 1995).

Sinkhole Potential. The reservoir would be located in an area where historic sinkhole activity is rare. The level of geotechnical and geological investigations at the reservoir took into account the existence of paleosinkholes, a few of which have been documented at the site, and reported modern sinkholes, which have not been reported at, or near, the site. Reports of modern sinkholes placed the nearest sinkhole at least a mile or two from the proposed reservoir site. These sinkholes are located in the Brandon karst terrain to the north and west of the site.

Strip mining has impacted the southern portion of the proposed reservoir site; the northern portion is undisturbed land. The topography of the land to the north of the mined areas is gently sloping with elevation contours that are somewhat elongated and parallel, with abundant surface drainage features. The general topographic features of the proposed site and surrounding area indicate low sinkhole potential characteristics (HDR 1999).

Photolineament and Geophysical Investigations. This photolineament or karst analysis consisted of a study of aerial photography to reveal indicators of fracturing in the underlying limestone and dolostone at the site. These indicators can include features such as alignments of three or more circular depressions, elongation of depressions in the land surface, alignments and/or elongation of wetlands and lakes, linear stream segments, linear soil tones, or linear vegetation patterns.

In addition to the preliminary literature review and preliminary test wells, a photolineament analysis and geophysical investigation were also conducted to assist in locating test-drilling locations

COPYRIGHT © 2001 BURNS AND McDONNELL ENGINEERING COMPANY, INC.

NORTH A

A' SOUTH

ROMP DV-1

ROMP 61

W-9039

W-9040

ROMP 49

ROMP 123

ROMP 39

UNDIF. SAND & CLAY

PEACE RIVER FORMATION

ARCADIA FORMATION, UNDIF.

TAMPA MEMBER

SUWANNEE LIMESTONE

SUWANNEE PRODUCTION ZONE

OCALA LIMESTONE

AVON PARK HIGHLY PERMEABLE ZONE

AVON PARK FORMATION

MIDDLE CONFINING UNIT

BASE OF UPPER FLORIDAN AQUIFER

T.D. = 1695 FT.

DEPTH (IN FEET N.G.V.D.)

+100
0
100
200
300
400
500
600
700
800
900
1000
1100
1200
1300
1400
1500
1600
1700

LEGEND

– MAJOR PRODUCTION ZONE

FIGURE SOURCE: WATER RESOURCE SOLUTIONS
DATE: 7/8/00

0 2.5
HORIZONTAL SCALE (MILES)

Figure 3-3

TAMPA BAY REGIONAL RESERVOIR PROJECT DEIS GEOLOGIC CROSS SECTION

K:\VCO\ACAD\ESANDP\FIG_3-3.dwg 02-12-2001 15:01 CJW

of potential sinkhole sites at the reservoir (HDR 2000).

Aerial photographs from 1939, 1948, 1957, and 1988 were also evaluated. Once it was determined that photolinear features were present on the site, a geophysical analysis was conducted using ground penetrating radar, seismic refraction, and seismic reflection to evaluate subsurface stratigraphy and structure at the reservoir site. The results of the geophysical analysis were used to identify borehole locations that were used to further refine the site.

3.4 AIR QUALITY

The State of Florida has adopted the U.S. National Ambient Air Quality Standards (NAAQS) except for sulfur dioxide (SO_2). Florida's SO_2 standard is slightly more stringent than the national standard. In 1997, the U.S. Environmental Protection Agency (EPA) changed the ozone standard from a one-hour standard to an eight-hour standard. EPA is currently redesignating the status of ozone areas.

All three counties (Hillsborough, Pasco and Pinellas) in the general study area are in attainment or are unclassified for all criteria pollutants, and meet the new eight-hour standard (FDEQ 2000).

Currently Hillsborough and Pinellas counties are air quality maintenance areas for ozone. Designated areas of Hillsborough County are air quality maintenance areas for particulate matter (total suspended particulate) and lead. Air quality maintenance areas, due to past nonattainment status, are required to implement strategies to maintain attainment with the standards for the specified air pollutant established ambient air quality standards. A discussion with the Florida Department of Environmental Quality (FDEQ) indicated that Hillsborough and Pinellas counties might be redesignated to nonattainment areas for ozone under the new eight hour standard (FDEP 2000).

The State of Florida currently has air quality monitors for particulate matter, sulfur dioxide, ozone and lead in the study area. The air quality in the three-county area currently meets all ambient air quality standards. Local municipalities, agricultural and mining industries are not expected to emit high levels of any pollutant that would exceed established air quality standards.

3.5 NOISE

The potential construction area is located in a sparsely populated rural area. Existing sources of noise include vehicles on roads and highways, farm equipment and a nearby pistol shooting range located to the south of the proposed reservoir. A residential area is located less than half a mile to the east from the potential regional reservoir area. Existing ambient noise data are not available for the potential construction area. The FDEP does not regulate noise levels from industrial or public works facilities. Hillsborough County regulates noise generated by non-exempted sources. Sound level limits have been established in Chapter 1-10.03 of the Rules of the Environmental Protection Commission of Hillsborough County (HCEPC 2000). Table 3-1 shows the regulated sound level limits grouped by receiving land use.

Table 3-1. Hillsborough County Maximum Permissible Sound Levels

RECEIVING LAND USE CATEGORY	TIME	SOUND LEVEL LIMIT (dBA)
Residential, Public Space	7:00 a.m. – 10:00 p.m.	60
	10:00 p.m. – 7:00 a.m.	55
Commercial	7:00 a.m. – 10:00 p.m.	65
	10:00 p.m. – 7:00 a.m.	60
Industrial	All Times	75

3.6 WATER RESOURCES

The major water resources of the project area include both surface and groundwater sources. The major components of these resources are discussed in the following sections.

3.6.1 Groundwater. The hydrogeology of south-central Hillsborough County, including the proposed regional reservoir area, consists of a surficial aquifer, a intermediate aquifer, and the underlying Floridan aquifer. The geologic units that make up the aquifers consist of permeable strata (strata with pores or openings that permits water to pass through) separated by layers of dense, low permeability rock. These dense layers, which act to hold water in the aquifers, are called confining layers and generally consist of relatively impermeable clay and clay marl.

The hydrology of the proposed reservoir area was defined during geotechnical and aquifer performance testing (HDR 2000). The surfical aquifer in the project area is about 25 to 50 feet thick and generally consists of unconsolidated to poorly consolidated fine sand to silty and clayey sand. The intermediate aquifer is composed of the Miocene-aged Hawthorne Group, which includes the Peace River and the Arcadia (Tampa member) formations. In terms of water availability, the Tampa member formation is generally the most productive portion of the intermediate aquifer. The Floridan aquifer includes the Suwannee Limestone, the Ocala Limestone, and the Avon Park formation.

In a literature review to determine the general groundwater conditions at the proposed reservoir site, the NRCS soil survey for Hillsborough County described the fluctuation of the seasonal high water table as ranging from the surface to approximately 10 inches below the surface (HDR 1999). Soil borings for geotechnical exploration indicated groundwater levels approximately five feet below the surface during the dry season (HDR 2000). Based on the soil survey results, geotechnical exploration and evaluation of drainage features, the wet season water table was estimated to be approximately one foot below ground surface over the majority of the reservoir site. Drainage features within and along the periphery of the site, which serve to lower the groundwater table, were also

considered in estimating the wet season water table. These features include the upland cut ditches along the northern portion of the site as well as numerous connections draining the existing wetlands and the phosphate mined area.

Groundwater levels for the surficial aquifer in the general area were found to be about 70 to 80 feet above mean sea level (msl) and the groundwater elevation in the intermediate aquifer about 40 to 50 feet msl. The groundwater elevation data indicates a downward vertical gradient between the surficial and the intermediate aquifer, increasing the potential for recharge to the intermediate aquifer. The groundwater elevation in the upper Floridan aquifer in the vicinity of the reservoir is about 30 feet msl.

In addition to the literature review, ten preliminary soil borings were obtained (HDR 2000). These soil borings ranged in depth from 45 to 50 feet below sea-level, and indicated a somewhat uniform lithology consisting of loose to medium dense sands underlain by very dense, calcareous sandy silt. The dense silt would impede the vertical flow of water from the shallow sands to the deeper limestone, resulting in a lower potential for limestone dissolution and sinkhole development.

Groundwater quality data for aquifers beneath the reservoir site, specifically for total dissolved solids (TDS), chloride, and hardness were also reviewed. Data from the SWFWMD and Florida Geologic Society indicated that, in the intermediate aquifer, TDS ranged from about 250 parts per million (ppm) to 500 ppm, and chloride was less than 25 ppm. There was no data available for hardness. In the Floridan aquifer, TDS also ranged from 250 ppm to 500 ppm but chloride was approximately 20 ppm. In this case, hardness ranged from about 120 to 180 ppm.

3.6.2 Surface Water Quantity. The proposed regional reservoir and pipeline are located in the Alafia River basin. The major surface water components in the overall study area include the Alafia and Hillsborough rivers, Tampa Bypass Canal, and Tampa Bay. These surface water components are described in the following sections.

3.6.2.1 Alafia River. The Alafia River drains approximately 420 square miles (mi^2) of Hillsborough and western Polk counties (Figure 3-4). The North and the South Prong tributaries form the headwaters of the river and converge in eastern Hillsborough County to form the Alafia River. The river meanders generally westward and empties into the southeastern portion of Hillsborough Bay.

As described in Section 3.2, the tributary streams contributing to the Alafia River are rather narrow, swift-flowing streams with deep-cut banks and comparatively few large swamps. Only Alafia Creek,

tributary to the South Prong, is an exception, draining a large wetland slough named Hooker's Prairie. The lower Alafia River drops sharply in elevation near Bell Shoals Road, and then meanders in a narrow, deeply incised channel downstream to U.S. 301. From U.S. 301 to U.S. 41, the river widens with little change in depth (Giovanelli 1981).

The mouth of the Alafia River has been extensively modified by dredge and fill activities. A deep-water channel was dredged from the main ship channel in Tampa Bay, through uplands north of the river mouth to the river upstream of the mouth. This channel provided shipping access to a fertilizer-processing plant. The original river mouth was partially filled with the excavated material effectively changing its location. Over the years, sediment from an upstream spoil area has accumulated in the historic river mouth, reducing it to a small tidal creek with little or no connection to the current river (Stoker *et al.* 1996).

The lower watershed, from Turkey Creek to Hillsborough Bay, is dominated by agricultural and urban land uses. South of the river, the four tributaries (Bell, Fishhawk, Little Fishhawk, and Rice creeks) drain a predominately agricultural area. The area to the north of the river, drained by Buckhorn Creek, is much more urban, especially around the cities of Brandon, Valrico, and Dover (USDI 1990).

Lithia Springs is a second magnitude spring, with an average flow between 10 and 100 cubic feet per second (cfs). The spring flows into the Alafia River about 13.8 river miles upstream of U.S. Highway 41 or about 2 miles upstream of Bell Shoals road. Buckhorn Spring, a smaller spring, flows into the river about 6.6 miles upstream of U.S. Highway 41 or about three miles downstream of Bell Shoals road. Several other small springs and seeps contribute flow to the Alafia River. Discharges from the springs average 49 cfs, ranging from 7 to 84 cfs. (USGS 1983 in USDI 1990). During the wet season, the spring contributes less than 10 percent of the total flow in the lower Alafia River, but as much as 27 percent in the dry season (USDI 1990).

3.6.2.2 Hillsborough River. The Hillsborough River flows southwest 54 miles from its source in southeastern Pasco County to Hillsborough Bay (Figure 3-5). The headwaters of the river are near the western edge of the Green Swamp in Pasco and Polk counties. From this point the river flows southwesterly through Hillsborough County through the cities of Temple Terrace and Tampa to Hillsborough Bay. Principal surface drainage tributaries to the river include the New River, and Blackwater, Flint, Stout, and Cypress creeks. The Hillsborough River also receives an average of 57 cfs of groundwater discharge from Crystal Spring, located near the Hillsborough-Pasco County line (SWFWMD 1992).

The dam for the City of Tampa's drinking water source reservoir is located 10 miles upstream from the mouth of the Hillsborough river. Discharge at the dam depends on reservoir inflows, water supply withdrawals, and losses due to evaporation and seepage. Freshwater discharge from the reservoir displaces

K:\KCO\ACAD\ESANDP\Fig_3-4.dwg 02-12-2001 11:01 CJW

COPYRIGHT ©2001 BY BURNS AND McDONNELL ENGINEERING COMPANY, INC.

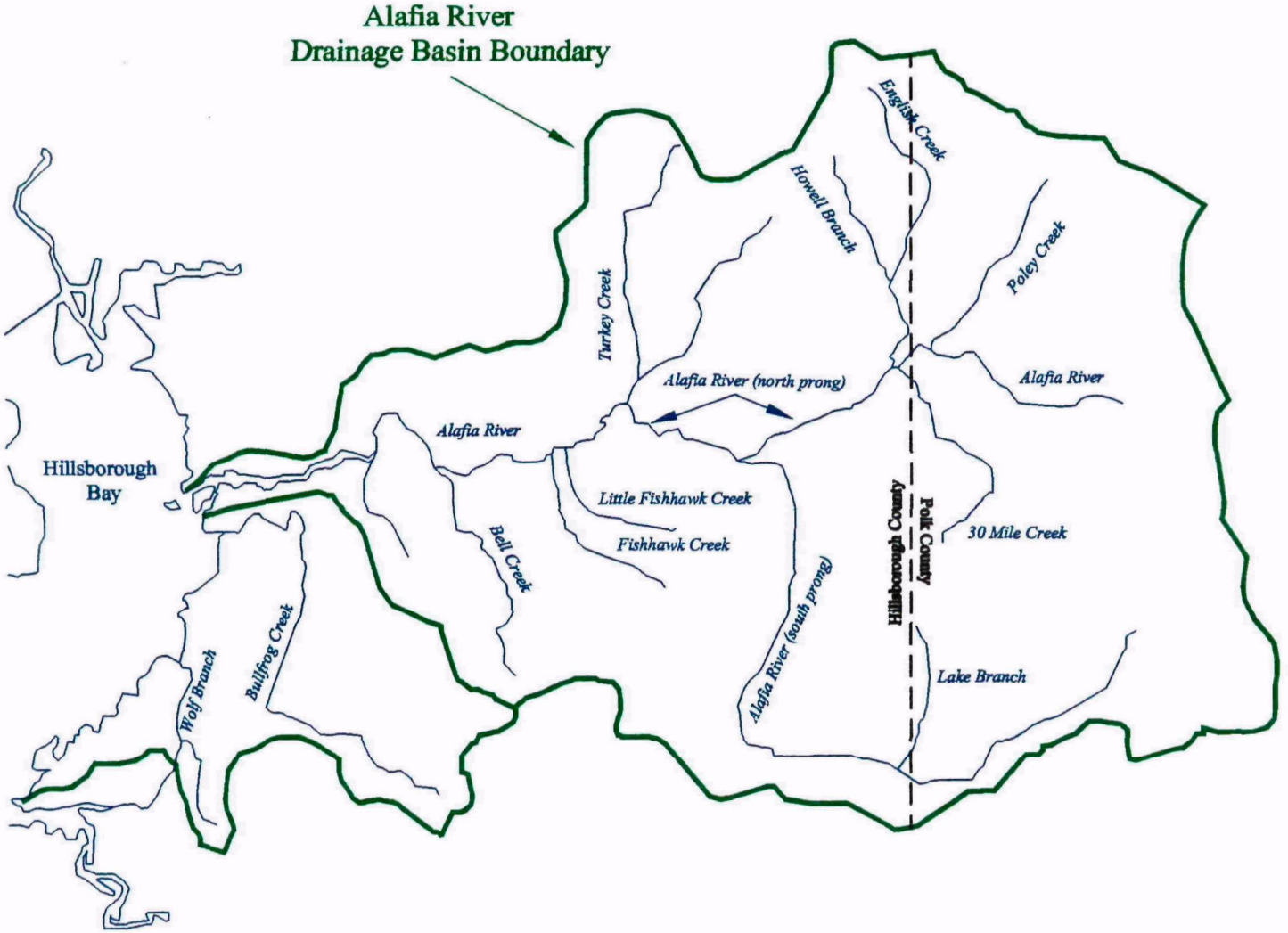
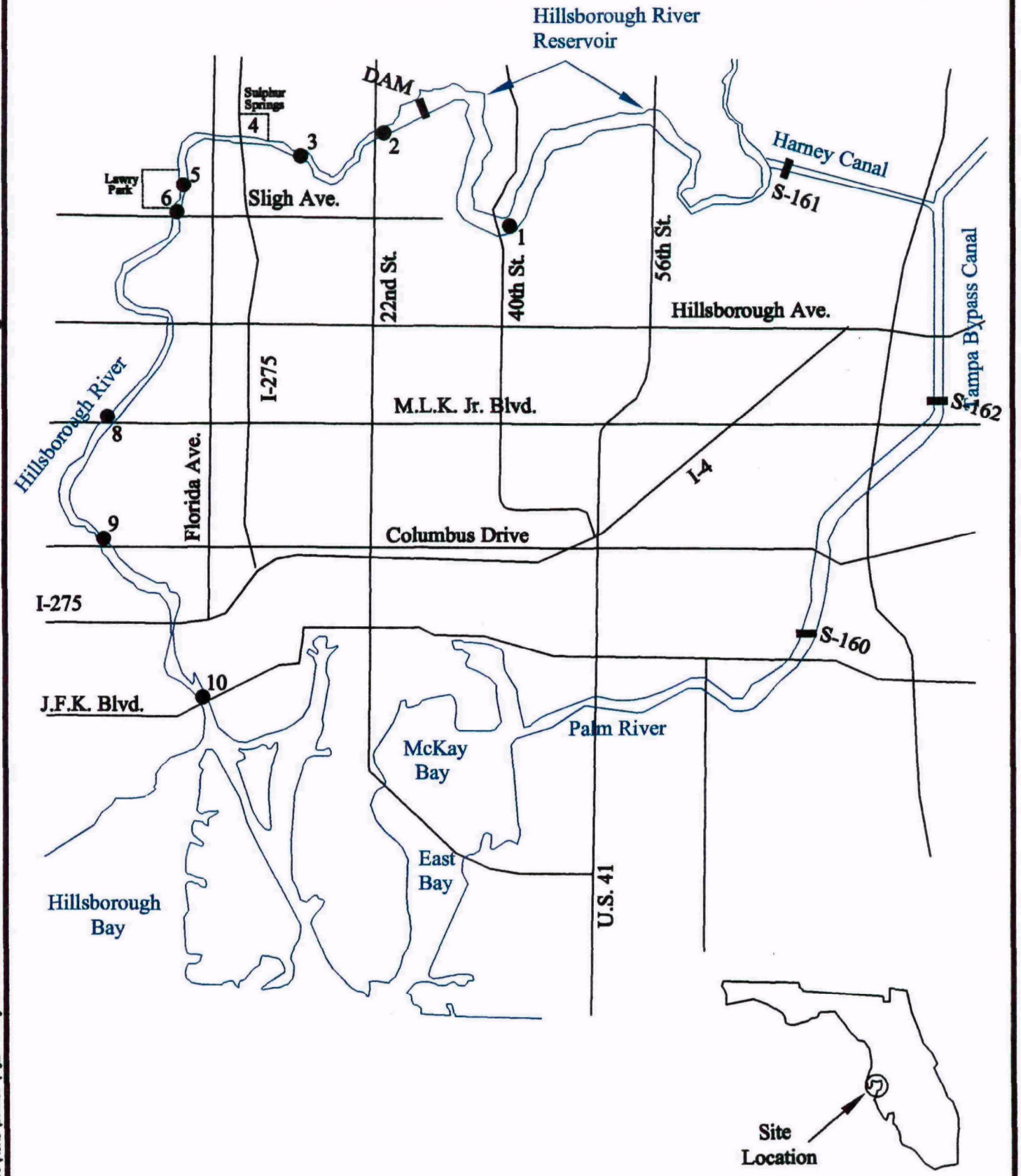


Figure 3–4
TAMPA BAY REGIONAL RESERVOIR PROJECT DEIS
ALAFIA RIVER DRAINAGE BASIN MAP

COPYRIGHT © 2001 BY BURNS AND McDONNELL ENGINEERING COMPANY, INC.



K:\YCO1\ACAD\ES\NDP\Fig_3-5.dwg 02-12-2001 14:52 CJW

LEGEND

● Sampling Stations

N

NOT TO SCALE

Figure 3-5

TAMPA BAY REGIONAL RESERVOIR PROJECT DEIS HILLSBOROUGH RIVER AND TAMPA BYPASS CANAL

saline water downstream of the dam. The annual mean discharge at the dam, as recorded by U.S. Geological Survey (USGS) from 1939 to 1996 is 463 cfs. The median discharge for this time period was 152 cfs; annual mean discharges ranged from less than 100 cfs to nearly 1,700 cfs. The maximum daily discharge of 13,500 cfs was recorded in March 1960 (SWFWMD 1999a). The USGS data represent the best available information on the reservoir although the hydrologic records are described as poor, with potential error greater than 15 percent (Stoker *et al.* 1996).

Surface salinity downstream of the dam is inversely proportional to the amount of discharge (Water and Air Research, Inc and SDI Environmental Services (WAR and SDI) 1995). Discharges of 100 cfs to 250 cfs displace the saline water wedge downstream of Station 2 or 3 (Figure 3-5). Discharges of 250 cfs to 1,000 cfs displace the saline water wedge further downstream from Stations 5 to 8, and discharges greater than 1,000 cfs displace the wedge even further, downstream of Station 9. The extent to which saltwater is displaced is determined partially by the tide stage at the time of measurement. As would be expected freshwater occurs at one or two stations further downstream at low tide than at high tide.

The Hillsborough River downstream of the dam is a highly modified system that has been subjected to considerable shoreline hardening, the filling of wetlands, sediment deposition, and water quality determined due to stormwater runoff. These alterations to the lower Hillsborough River have been so extensive that hydrologic functions associated with floodplain and estuarine wetlands have been essentially lost (SWFWMD 1999a).

The lower Hillsborough River extends approximately 10 miles downstream of the City of Tampa's dam. The watershed of this portion of the river is 11,400 acres and is highly urbanized. Residential and commercial land uses comprise 93 percent of the river's watershed below the dam. Storm sewers drain nearly all of this land, for 114 major stormwater outfalls enter the river below the dam. For over a century, there has been extensive filling of fresh and saltwater wetlands associated with the lower river so that very few of these wetlands remain. The shoreline of the lower river has been highly modified and approximately 76 percent of the shoreline is either bulkhead, riprap, or fill. Natural shorelines comprise only 24 percent of the lower river shoreline and most are found near the dam. There are no natural shorelines downstream of the I-275 bridge. This portion of the river is tidal and brackish except during freshwater releases from the reservoir (SWFWMD 1999a).

The lower river also receives inflow from Sulphur Springs (located approximately one mile downstream of the dam), other natural springs along its course, urban stormwater, and tidal flow from Hillsborough Bay. Spring flow at Sulphur Springs is regulated by a control structure at the spring boil and by a structure near the river. The long-term average discharge for Sulphur Springs is 40 cfs; however a declining trend was reported in 1996 (Stoker *et al* 1996). Average spring flows in recent years (through 1995) have been about 31 cfs. Flow in the lower river ranges from 71 cfs to 2,295 cfs, averaging 614 cfs

mainly due to reservoir releases (WAR and SDI 1995).

The Tampa Bypass Canal also affects drainage in the lower Hillsborough River basin (Stoker et al 1996). Prior to construction of the bypass canal, the basin drained about 690 mi^2. Because of pumpage from the bypass canal to the Hillsborough River, the effective drainage basin area sometimes increases. Operation of the control structures that divert water from the Hillsborough River to the bypass canal during floods also temporarily alters the effective drainage area.

3.6.2.3 Tampa Bypass Canal. The Tampa Bypass Canal was constructed between 1966 and 1982 for flood control in the Hillsborough River basin. The canal system, which was largely excavated in the channel of the former Six Mile Creek and Palm River, is connected to the Hillsborough River basin by a series of water control structures used to divert flood waters away from the Hillsborough River (Figure 3-5). The purpose of the Tampa Bypass Canal was to divert Hillsborough River floodwater to McKay Bay, bypassing the cities of Temple Terrace and Tampa. Since 1985, the Tampa Bypass Canal has also been used to augment water supplies in the Hillsborough River reservoir during the dry season.

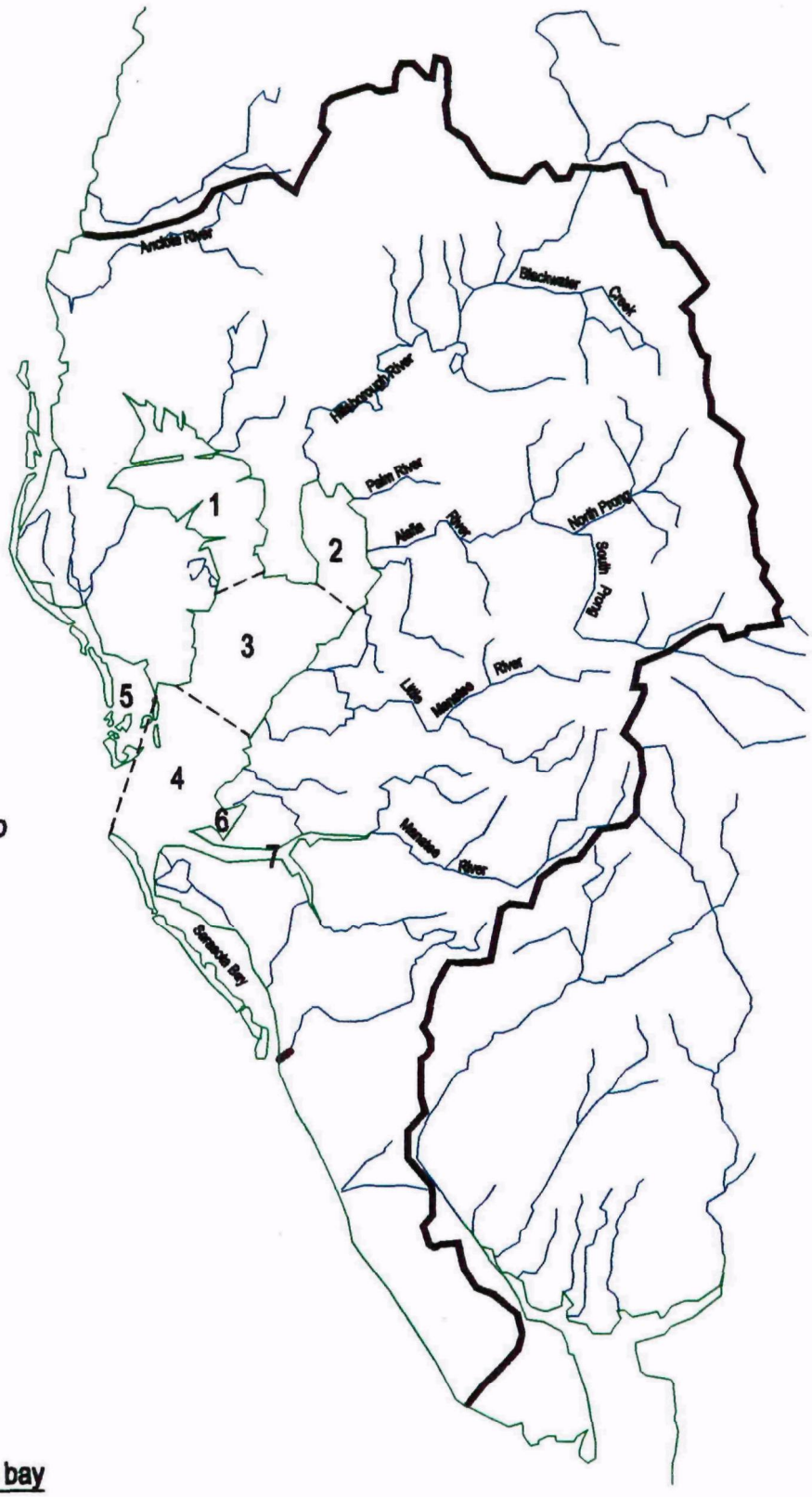
The Tampa Bypass Canal extends about 14 miles from Cow House Creek in the Lower Hillsborough Flood Detention Area to McKay Bay at the mouth of the Palm River. Hydrologic conditions in the canal are affected by surface and groundwater inflows, direct precipitation, evapotranspiration, and direct surface water withdrawals (SWFWMD 1999b).

The canal is subdivided into three principal reaches or pools - the upper, middle and lower pool. The pools are separated by flood control structures that consist of multiple vertical lift gates seated on the crest of an ogee weir. An array of overflow weirs is located at the top of each lift gate to control the upstream pool stage during low and moderate flows. The Tampa Bypass Canal bottom width and elevations range from 400 feet at elevation –21.0 feet msl near McKay Bay to 200 feet at elevation 16.0 feet msl at Cow House Creek (SWFWMD 1999b).

Large base flows in the canal have become a source of water supply for the City of Tampa. Sometimes, during the dry season, water can be pumped from the Tampa Bypass Canal to the Hillsborough River to augment flow in the river. Besides carrying flow from the Lower Hillsborough Flood Detention Area (LHFDA) and the City of Tampa reservoir, the Tampa Bypass Canal is the drainage for approximately 33 mi^2. Land use in the area is generally semi-rural and residential (SWFWMD 1999b).

3.6.2.4 Tampa Bay. Florida's largest open water estuary, Tampa Bay is located on the state's west-central coast. It has a total area of approximately 398 mi^2 and is generally Y-shaped (Figure 3-6). The bay extends approximately 35 miles inland from the Gulf of Mexico and is five to 10 miles wide along most of its length. It is crossed by four major causeways and has 42 nautical miles of dredged channels with designed mean low water depths of 20 to 43 feet.

COPYRIGHT © 2001 BY BURNS AND McDONNELL ENGINEERING COMPANY, INC.



Gulf of Mexico

Subdivisions of Tampa bay

1 - Old Tampa Bay
2 - Hillsborough Bay
3 - Middle Tampa Bay
4 - Lower Tampa Bay
5 - Boca Ciega Bay
6 - Terra Ceia Bay
7 - Manatee River

N

NOT TO SCALE

Figure 3-6

TAMPA BAY REGIONAL RESERVOIR PROJECT EIS SUBDIVISIONS OF TAMPA BAY

K:\WOO\ACAD\ESANDP\Fig_3-6.dwg 02-16-2001 09:32 NJC

The major shipping channel extends from the mouth of the bay to the upper reaches of the Middle Tampa Bay segment where it splits north into the Old Tampa Bay segment and to the northeast into the Hillsborough Bay segment. The average depth of the bay is approximately 13 feet with a maximum natural depth of 89 feet in a small area at the mouth of the bay in Egmont Channel (Pribble 1999).

Tampa Bay receives runoff from a tributary watershed of approximately 2,275 mi^2, encompassing all or portions of Pasco, Pinellas, Hillsborough, Polk, Manatee, and Sarasota counties. The watershed is composed of major river systems and smaller sub-basins of coastal streams. In addition, about five percent of the watershed is internally drained and discharges surface flow to the bay only under extreme high flow or flood conditions (Zarbock *et al.* 1995).

Tampa Bay is divided into seven segments that include Old Tampa Bay, Hillsborough Bay, Middle Tampa Bay, Lower Tampa Bay, Manatee River, Boca Ciega Bay and Terra Ceia Bay (Figure 3-6). Tidal action causes seawater and freshwater to be exchanged between the segments and with the Gulf of Mexico. Lower Tampa Bay tidally exchanges about 6.5 percent of its total volume each day, while Middle Tampa Bay and Old Tampa Bay both exchange about 4.6 percent of their total volume.

Hillsborough Bay has the least tidal exchange of any of the major segments, with approximately 1.4 percent of its total volume exchanged daily (Pribble 1999; Goodwin 1987 in Zarbock *et. al.* 1995).

Freshwater inflow to Tampa Bay total about 525 billion gallons on an annual basis with the four major rivers contributing about 70 to 85 percent. The Hillsborough and Alafia rivers, two of the four major rivers, contribute approximately 44 percent of the total inflow to Tampa Bay through the Hillsborough Bay segment (Pribble 1999).

Tampa Bay is generally vertically well mixed. Freshwater inflows result in horizontal salinity gradients important in the circulation and flushing of the bay, especially along the eastern shore. Northern portions of the bay are generally more influenced by the surrounding watershed and its freshwater inflow. Salinity is higher in areas that interact strongly with the Gulf of Mexico and lower in regions affected by freshwater inflow and regions farthest from the Gulf. Surface salinity's are generally 1 to 2 parts per thousand (ppt) less than those near the bottom. Variability occurs between years of 6 to 10 ppt at the surface and 5 to 6 ppt near the bottom (Zarbock 1995; Pribble 1999).

3.6.3 Surface Water Quality. Surface waters within the Tampa Bay watershed continue to be threatened by excessive nutrient loading. Population pressures present the biggest challenge to nutrient management. The vast amount of developed land in the Tampa Bay region, with associated increases in impervious surfaces and reduction of terrestrial vegetation has fundamentally redirected nutrient assimilation to aquatic systems (Hillsborough County 1997).

3.6.3.1 Tampa Bay Regional Reservoir Project. A preliminary characterization of the expected reservoir water quality based on an assessment of inflows, reservoir storage, and outflows was prepared. The quality of the water diverted from the Alafia and Hillsborough rivers and the Tampa Bypass Canal depends on season, flow regime, and other climatic factors. Withdrawals from any or all of these sources may be diverted to the reservoir during moderate and high flow periods. Chlorophyll-*a* and blue-green algae levels are predicted to be higher than found in many natural lakes and rivers (Coastal Environmental and PBS&J 1998).

To predict reservoir water quality and trophic status, nutrient loading, transparency, hydrology, and eutrophication was modeled. Normal pool, high pool, and low pool scenarios were investigated. The reservoir was assumed to be well-mixed and global variables of annual precipitation, evaporation, and atmospheric loading of total nitrogen and total phosphorus were used. The modeling results indicated that nitrogen is the limiting nutrient and that the water quality in the reservoir is expected to have high concentrations of phosphorus and chlorophyll *a*. Predictive response modeling generally showed that the reservoir should have water with a quality comparative to other reservoirs and lakes in the area (HDR 1999). As a result, the in-lake water quality treatment should be similar to other facilities in the area. Treatment with chemicals, such as copper sulfate, or other means to control primary productivity in the reservoir will likely be required. Although contaminant levels are not expected to be excessive in reservoir water, periodic testing to monitor the potential buildup of metals, pesticides or other contaminants in reservoir sediments should be maintained (Coastal Environmental and PBS&J 1998).

3.6.3.2 Alafia River. Water quality conditions in the Alafia River were at their worst during the 1950's and 1960's; however, improved water quality has resulted due to the implementation of pollution abatement practices applied in the 1970's and 1980's. Even so, concentrations of several constituents such as phosphorus and nitrogen, fluoride, dissolved solids, sulfate and coliform bacteria remain high (FDER 1988 from SWFWMD 1992; Jones & Upchurch 1993).

Water quality has consistently been adversely affected in the North Prong due to the high density of phosphate mines and chemical processing plants. Water quality has typically been best in the South Prong tributary, and is of intermediate quality in the main stem downstream of the confluence of the two tributaries (SWFWMD 1992). The only domestic point sources of pollution are the city of Mulberry on the North Prong and Cargill, Inc. near the mouth of the river (USDI 1990).

Buckhorn and Lithia Springs historically discharge nitrate-rich water into the Alafia River. The total amount of nitrate contributed annually is approximately 22 percent of the total nitrogen the Alafia River contributes to Tampa Bay (Jones & Upchurch, 1993).

In the Alafia River main stem, water quality is better than in the North Prong, but is still degraded and shows the

influence of phosphate mining and agricultural land use in the upper watershed (HCEPC 1984 in USDI 1990). Phosphorus, total nitrogen, nitrate and coliform levels are high in the middle and upper reaches and decrease downstream toward Tampa Bay. Ammonia and organic nitrogen show the opposite pattern moving toward the bay. This increase in ammonia and organic nitrogen is most likely a result of the Cargill point-source discharge near U.S. 41 (USDI 1990).

While certain chemical and biological parameters have improved near Hillsborough Bay, water quality is still degraded as evident in the area's algal blooms and fish kills (FDEP 1982 in USDI 1990). These problems are influenced by tidal changes, the saltwater-to-freshwater interface, the industrial point source near U.S. 41, and the inflow of relatively poor quality water from the basin (Giovanelli 1981; FDEP 1982, HCEPC 1982, 1984 in USDI 1990).

The Alafia River is tidal upstream to about Bell Shoals Road. An oscillating saline wedge (saltwater interface) results in degraded conditions similar to those described for the Hillsborough River below the City of Tampa's dam. Under conditions of high flow and high tide, salinities may range from less than 1 ppt on the surface to more than 20 ppt near the bottom. Dissolved oxygen levels near the mouth are vertically stratified (top to bottom) because of the saltwater interface and the high algal productivity at the surface (USDI 1990).

The importance of maintaining streamflows in the Alafia River and Hillsborough Bay was crucial for proper environmental balance even though the need for drinking water was increasing at a rapid rate (Giovanelli 1981). Salinity is critical to the distribution and maintenance of many estuarine organisms and modifications to riverine systems may cause changes in salinity distributions. Saltwater intrusion and changes in salinity distribution of the Alafia River, Bullfrog Creek, and Hillsborough Bay was recognized as a possible result of reduced freshwater inflow.

The Alafia River has the greatest concentration of total phosphorus and delivers more phosphorus to Tampa Bay than any of the other rivers (Lewis and Estevez 1988). Data on discharges from permitted point sources showed that waste discharges to the Alafia River render it the greatest source of phosphorus and fluoride to Tampa Bay.

3.6.3.3 Hillsborough River. Water quality in the Hillsborough River basin is affected by residential, agricultural, and industrial land uses. Phosphate mining has not been a major land use. The quality of the water entering the tidal portion of the Hillsborough River at the City of Tampa's dam is most likely affected by storage in the upstream reservoir (Stoker *et al.* 1996). The effects of storage on water quality typically include a reduction in suspended sediments and a decrease in the constituents associated with the suspended sediments.

Water flowing from Sulphur Springs contains sodium-chloride. The primary source of water to the spring is probably the deep zones of the Upper Floridan aquifer. An interconnection of the spring with nearby sinkholes that are

used as stormwater detention areas sometimes results in stormwater runoff mixing with spring flows (Stewart and Mills 1984 in Stoker *et al.* 1996).

It was found that the water quality characteristics of the Hillsborough River differed from Sulphur Springs. Concentrations of total and dissolved phosphorus, orthophosphorus, ammonia nitrogen, and organic carbon are less in Sulphur Springs than in the Hillsborough River. Concentrations of nitrate, nitrite, and silica were greater in the spring than in the river.

Water quality characteristics at the mouth of the Hillsborough River are affected by water quality characteristics of Hillsborough Bay (Stoker *et al* 1996). Suspended solids, specific conductance, ammonia nitrogen, phosphorus, and chloride were greater at the mouth of the bay than further upstream in the nontidal portion of the Hillsborough River or at Sulphur Springs. Concentrations of total nitrate plus nitrite, total organic carbon, and dissolved silica at the mouth of the river are inversely related to specific conductance which indicates that concentrations of these constituents are higher in the Hillsborough River than in Hillsborough Bay. Phosphorus is not related to specific conductance at the mouth of the Hillsborough River.

Although it is highly modified, the lower Hillsborough River contains valuable freshwater and estuarine communities. Salinity and dissolved oxygen (DO) are critical water quality variables affecting the abundance and distributions of organisms in the lower Hillsborough River. Studies by SWFWMD (1999a) indicate that the salinity regime of the lower Hillsborough River is very responsive to freshwater inflow.

Results from the current hydrobiological monitoring program show that mean surface salinities in the lower Hillsborough River ranged from 3.9 ppt one-half mile below the dam to 15.7 ppt at the mouth. Salinity in the lower river was highly variable. Releases from the City of Tampa's reservoir resulted in a freshwater zone below the dam. Surface DO values generally increased progressively downstream. Low surface DO concentrations were found at Stations 3 and 5 during periods of no discharge from the dam (Figure 3-5). Surface DO concentrations at Stations 2, 3, 5 and 6 were positively correlated with discharge from the dam. Depletion of DO with depth was common in the lower river and there were frequent occurrences of low oxygen in bottom waters. At stations nearest the dam, DO bottom concentrations were closely related to the rate of freshwater inflows (WAR and SDI 1995).

3.6.3.4 Tampa Bypass Canal. Water quality monitoring results show that mean values for DO, conductivity, and pH were generally high in the Tampa Bypass Canal (WAR and SDI 1995). As with many physical parameters, surface means for biological oxygen demand (BOD), ammonia, total Kjeldahl nitrogen (TKN), turbidity, and chlorophyll-a were high in the Tampa Bypass Canal. Conditions with no oxygen frequently exist in bottom waters downstream of the Tampa Bypass Canal control Structure 160 during the summer and fall during warm water conditions (Figure 3-5).

The Tampa Bypass Canal below Structure 160 has high salinity values. Bottom salinities just below Structure-160 averaged 24.6 ppt with a minimum value of 20.0 ppt. Surface salinity's at this station averaged 19.6 ppt with a minimum of 12.5 ppt.

3.6.3.5 Tampa Bay. Tampa Bay water quality is important to both the ecology and economy of the study area. Water quality influences the types of plants and animals that can live and reproduce in the bay, their abundance, and where and when they can be found. Many commercial and recreational fishes are dependent on the quality of the bay's water for survival, which can impact the local economy.

Long term and recent water quality data were examined to assess conditions in Tampa Bay. Physical parameters and water clarity parameters, DO concentration and nutrient concentrations (total phosphorus and total nitrogen), and phytoplankton biomass as estimated by chlorophyll-*a* were reviewed as water quality indicators of Tampa Bay (Squires and Cardinale 1999). Since 1974, water quality in Tampa Bay has increased near the Gulf of Mexico verse inner areas of the Bay. Hillsborough Bay typically has the poorest water quality since it receives the highest nutrient loads and has the greatest amount of upstream industrial activity relative to the other Tampa Bay segments.

The low water quality conditions occurred in the bay between 1974 and 1997, during the late 1970's and early 1980's. Improvements in water quality are mostly attributed to decreased point source loadings from wastewater treatment plants, and in particular, the conversion of the City of Tampa's Hookers Point wastewater treatment plant from primary to advanced treatment. A sharp decrease in total phosphorus concentrations from 1978 to 1982 represents the general slow-down in upstream mining and fertilizer production activity. Recent trends in nutrient concentrations and water clarity indicate that the large improvements in the water quality of Tampa Bay realized in the early 1980's have been maintained through the 1990's.

The Hillsborough County Environmental Protection Commission (HCEPC) has conducted estuarine sampling in Tampa Bay since 1972. A countywide surface water quality surveillance network has been designed and implemented to determine whether the level of water pollution is increasing or decreasing throughout the county and Tampa Bay. The most recent summary of the water quality monitoring program covers the years from 1995 to 1997, and includes data from 52 bay stations and 40 tributary stations (Hillsborough County, 1997).

The HCEPC developed a water quality index (WQI) that can be used to compare water quality in Tampa Bay from year to year. The index is an aggregate value of several parameters including DO, chlorophyll *a*, total coliform, BOD, total phosphorus, TKN, and effective light penetration. For each parameter, a "bad-to-good" scale has been devised. The final WQI is in the range of 1-100 points with 100 points representing the highest water quality possible.

Bay segments exhibit similar water quality patterns indicating that year to year WQI values are sensitive to regional environmental factors such as rainfall (Figure 3-7). The greatest range and variability occur in Hillsborough Bay while lower Tampa Bay has been the most consistent. Although Hillsborough Bay has the poorest water quality of other major bay segments, it consistently improved through 1993, declined in 1994 and 1995, and returned to former levels consistent with the values derived in the early 1990's. WQI values for old Tampa Bay and middle Tampa Bay segments are similar, with middle Tampa Bay's WQIs about five points higher than old Tampa Bay. Old Tampa Bay and lower Tampa Bay have each registered an approximate ten-point increase and middle Tampa Bay has registered a fifteen-point increase during the period of record. Lower Tampa Bay has been in the good to excellent category throughout the period of record (Hillsborough County 1997).

Nutrient loading has been a water quality issue in Tampa Bay. High nutrient loads have resulted in algae growth and degradation of water quality. Industrial runoff, urban stormwater and high nutrient inflows from the Alafia River have contributed to nutrient loading in the Bay.

The relationship between freshwater inflow and salinity is a characteristic of the Tampa Bay ecosystem (Lewis and Estevez 1988). Sixty years of marine research (up to1988) have shown that low-salinity estuarine water, combined with the physical protection and energy sources supplied by marine plants, constitutes the nursery habitat for most of the commercially and recreationally important fish and shellfish species in the Gulf of Mexico. It was noted that flows for all the tributaries to Tampa Bay need to be established based on biological studies as well as the water quality of these systems, with particular emphasis placed on salinity patterns in tidal areas.

The mixing of the Gulf of Mexico water with freshwater inflows, whether directly as precipitation or as runoff via the rivers and streams, produces a salinity gradient in Tampa Bay. The gradient is both vertically and horizontally distributed and changes seasonally with variation in rainfall. The salinity gradient is used by a variety of aquatic life from microscopic plankton to large adult fish. Variation in salinity can trigger breeding behavior or migration of some fishes. Juveniles of a species will often occupy a habitat that is very different from the habitat and salinity utilized by the adults of the species. Man-made structures and activities, such as dams and freshwater withdrawal, can mask or alter the natural salinity cycles (Hillsborough County 1997).

3.7 MINIMUM FLOWS AND LEVELS

In 1996, amendments by the Florida Legislature to Section 373.042 Florida Statutes required SWFWMD to adopt minimum flows and levels in Hillsborough, Pasco, and Pinellas counties for priority waters that are experiencing or may be expected to experience adverse impacts. (SWFWMD 1999a).

Section 373.043 Florida Statues defines the minimum flow for a surface watercourse as "*the limit at which further withdrawals would be*

K:\KCO\ACAD\ESANDP\Fig_3-7.dwg 02-12-2001 11:09 CJW

COPYRIGHT © 2001 BY BURNS AND McDONNELL ENGINEERING COMPANY, INC.

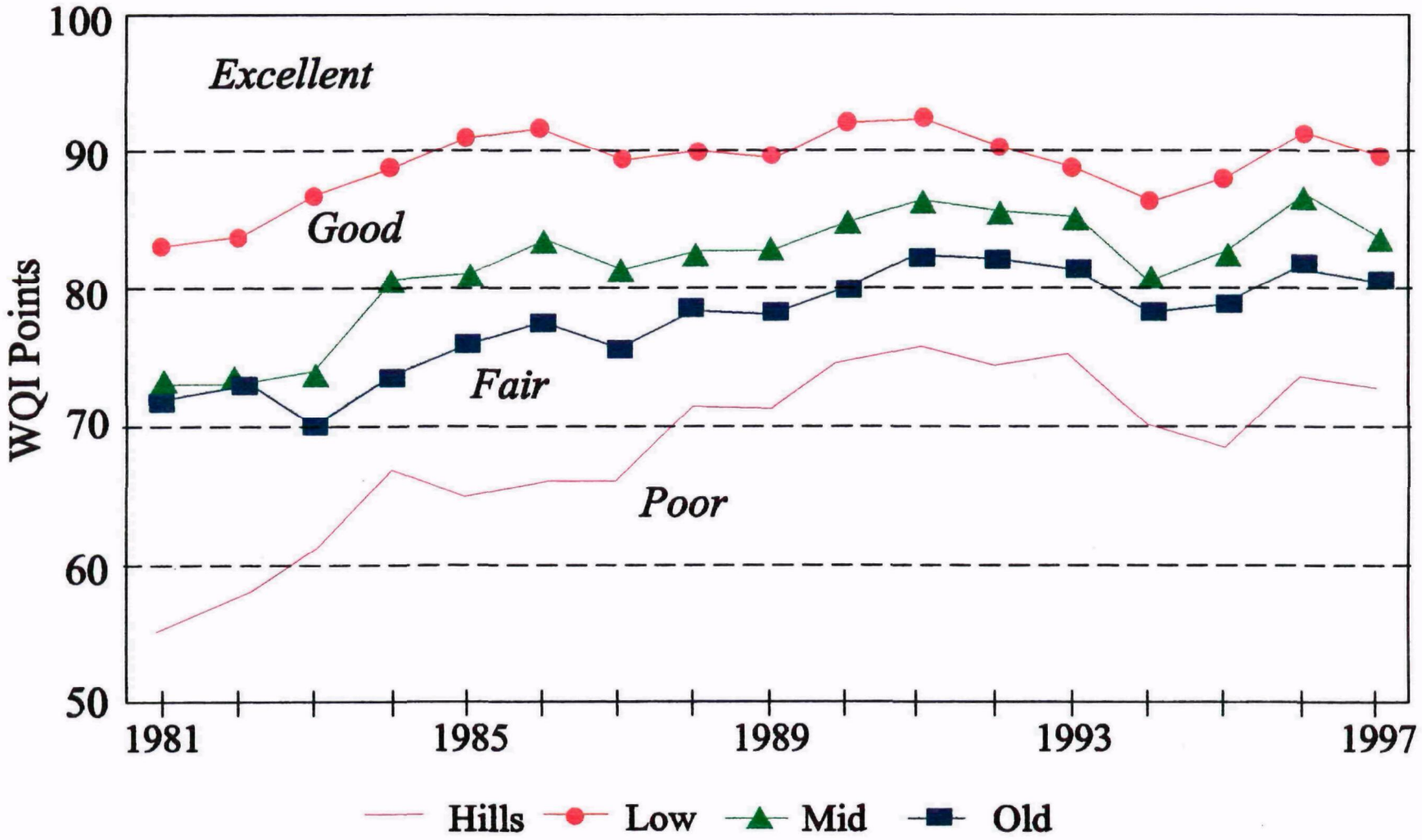


Figure 3-7
TAMPA BAY REGIONAL
RESERVOIR PROJECT EIS
WATER QUALITY INDEX (WQI)
ANNUAL AVERAGES
BY BAY SEGMENT 1981-1997

significantly harmful to water resources or ecology of the area". In addition, the definition of the minimum level of an aquifer or surface water body is "*the level of groundwater in an aquifer and the level of surface water at which further withdrawals would be significantly harmful to the water resources of the area*" (SWFWMD 1999a).

The following paragraphs describe the existing status of efforts to establish minimum flows and levels for the Alafia and Hillsborough rivers and Tampa Bypass Canal.

3.7.1 Alafia River. The process of developing minimum flows and levels for the Alafia River is being conducted. A minimum flow will be adopted for the River with the objective of maintaining the quality of the river. Minimum flows and levels will likely be established by the end of 2001.

3.7.2 Hillsborough River. The process to develop minimum flows and levels for the Hillsborough River by SWFWMD was conducted as an open public process. Interested parties were invited to participate in developing scientific methods for determining the limit at which significant harm would occur to the resource. The Tampa Bay National Estuary Program facilitated a technical advisory group representing various interests. The advisory group was commissioned to make recommendations to SWFWMD staff for identifying and evaluating water resources and ecological criteria necessary to establish minimum flows and levels. At the completion of this process, SWFWMD finalized the methodologies and minimum levels and flows for the Hillsborough River and obtained approval for implementation by the SWFWMD Governing Board on February 23, 1999.

A minimum flow of 10 cfs has been adopted for the lower Hillsborough River with the objective of maintaining an oligohaline and/or freshwater zone from the City of Tampa's dam downstream to the point where Sulfur Springs discharges to the river. After approval of its proposed rule to establish a minimum flow for the lower Hillsborough River, SWFWMD received petitions requesting an independent scientific peer review from the HCEPC, Tampa Bay Water and the City of Tampa. As a result, a scientific review panel made of members with experience in marine science, oceanography, civil engineering, and fisheries ecology was established. The review panel issued a final report for the lower Hillsborough River on October 28, 1999. The peer review panel recommended the use of the 10-cfs minimum flow but only as an experiment under an adaptive management approach. The panel also recommended that detailed monitoring and assessment of biological systems be conducted concurrently.

Because the existing database for the river during low flows is limited, SWFWMD and the City of Tampa agreed to conduct a study to re-evaluate the minimum flow for the lower Hillsborough River once the ruling was implemented. The study is to be completed by December 31, 2005 unless the city and SWFWMD agree to an extension. If the study demonstrates the need for revisions to the minimum flow, SWFWMD shall revise the minimum flow ruling (SWFWMD 1999a).

3.7.3 Tampa Bypass Canal. In 1998, SWFWMD proposed a minimum flow of zero discharge for the Tampa Bypass Canal. An independent peer review panel of recognized experts was established to review scientific and technical data and methodologies used in the development of the proposed minimum flow. The proposed flow of zero discharge was found deficient by the Northern Tampa Bay Minimum Flows and Levels Scientific Peer Review Panel in 1999, resulting in a renewed look at minimum flows for the Tampa Bypass Canal. The panel recommended that additional data be collected to improve resolution, especially in the critical zero flow range, and a mechanistic model be developed to evaluate and predict the effects of various minimum flow strategies on the Palm River/McKay Bay system. A final ruling on the minimum flows and levels for the Tampa Bypass Canal is expected by July of 2001.

3.8 UPLAND VEGETATION

In the Alafia River basin, and more specifically the Fishhawk Creek sub-basin, the primary ecosystem type is mesic flatwoods or pine flatwoods, interspersed with isolated hammocks, marshes, wet prairies and scrub. These flatwoods are typified by low, relatively flat, moderately to poorly drained, acidic, sandy soils with overlying organic hardpan with open canopy pine forests, which support frequent fires. This combination of sandy soils and frequent fires has led to a vegetation community that is adapted to xeric (i.e., dry) and frequently burned conditions (Myers and Dwell 1991).

Prior to settlement, the flatwoods' vegetation was dominated by an overstory of longleaf pine, slash pine, and pond pine. The understory shrub layer included saw palmetto, gallberry, fetterbush, staggerbush, dwarf huckleberry, wax myrtle, dwarf live oak, and tarflower. Typically, the herbaceous layer only existed where there was a relatively open canopy. Grasses were the primary herbaceous ground cover with wiregrass as the dominant cover (Myers and Dwell 1991).

Despite being the most widespread biological community in Florida, very few undisturbed flatwoods still exist because of the influx of humans and their activities. Flatwoods have historically been used for lumber, livestock grazing and other forms of agriculture. Houses, fences and other structures associated with settlement have drastically reduced the number of naturally occurring fires, which help maintain these communities.

Currently, the vast majority of upland habitats in the project area are mixed coniferous/hardwood forests. The coniferous components of this community are dominated by slash pine, longleaf pine and, to a lesser degree, sand pine. Representative hardwood components include a variety of oak species including live oak, sand live oak, water oak, laurel oak, and turkey oak. Other hardwood species include sweetgum, and various hickories. Some areas in the western extent of the project area are classified as upland hardwood forests, with representative species similar to those hardwoods listed above without the coniferous component.

Shrub and brushland, rangeland, and pine flatwoods comprise the second most dominant cover types found in the project vicinity. Pine flatwoods are low-

lying communities, which support pine as the dominant overstory species. Common pines include slash pine and longleaf pine. Common ground cover and understory species include saw palmetto, wax myrtle, gallberry, wiregrass, and a large variety of herbs and brush. Brushland and rangeland support similar understory and groundcover species to the pine flatwoods, but lack any pine overstory. Rangeland includes a mixture of these native plants with grasslands and is frequently used to graze cattle.

Cropland and pasture are located throughout the study area. Common crops include tomatoes, strawberries, and a variety of melons. Pasture is often "improved" through the planting of bahia grass.

3.8.1 Tampa Bay Regional Reservoir Project. Upland habitats within the proposed reservoir footprint are dominated by improved pasture and are actively used for cattle grazing and sod production. The southern third of the site consists of phosphate mined land, which was subsequently reclaimed. The native soils have been removed in this area and natural upland communities do not exist.

Located just outside of the northwest corner of the reservoir footprint is an area of scrubby flatwoods. This community is dotted with xeric oaks, scattered long leaf pine and turkey oak, suggesting a sandhill community. Due to an abundance of wiregrass and palmetto and lesser amounts of the pine and turkey oak, however, this community is characterized as a scrubby flatwood. Hillsborough County has designated this area as significant upland habitat.

Pipeline and Access Roads. The proposed pipeline corridor from the Alafia River generally follows Boyette Road. The dominant upland communities along the corridor include mixed coniferous hardwood forest and improved pasture with minor areas of pine forest and pine flatwoods. The mixed coniferous and hardwood forests are dominated by xeric and mesic hammock composed largely of laurel oak, live oak, and sand live oak, with scattered slash and long-leaf pine.

3.8.2 Alafia River, Hillsborough River, Tampa Bypass Canal and Tampa Bay. Land use in the Alafia River and Hillsborough watersheds, which includes the Tampa Bypass Canal, is primarily agriculture (improved pasture, citrus, fishponds), rangeland (unimproved pasture), wetlands and barren land. Barren land, a byproduct of phosphate mining and processing, dominates the landscape drained by the North and South Prongs, major tributaries in the Alafia River watershed (USDI 1990).

Upland forest communities included coniferous forest, pine flatwoods, hardwoods, and mixed conifer/hardwoods. Mixed conifer/hardwood areas represent most of the upland forest communities. These upland forests are distributed throughout the study area, and are often associated with drainage features or make up large blocks of land surrounded by residential land uses.

At the mouth of the Alafia River, there is a berm derived from dredging. This

basin resulting from the berm has become vegetated by upland woody species such as live oak, laurel oak, water oak, red maple, sweet gum, pignut hickory, cabbage palm, and occasional southern magnolia. Where conifers are mixed, slash pine and southern red cedar are the dominant trees (HDR 1998).

3.9 WETLANDS

Wetlands are important natural communities protected by the Clean Water Act and provide the following important functions:

- contain vegetation that filters sediment and impurities from surface runoff to improve water quality
- increase flood water retention and erosion control
- provide recreational opportunities like bird watching, canoeing, and fishing
- provide important habitat for many rare and endangered plants and animals
- are important fish spawning and nursery areas, as well as nesting, resting, and feeding areas for waterfowl and mammals

Section 404 of the Clean Water Act regulates discharges of fill or dredged material, unless exempted, into "waters of the United States," which include jurisdictional wetlands and other aquatic habitats. Jurisdictional wetlands are defined for regulatory purposes in the Clean Water Act, and the EPA uses this definition and the U.S. Army Corps of Engineers (Corps) to administer the Section 404 permit program:

Wetlands are those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions (Environmental Laboratory, 1987). Wetlands generally include swamps, bogs, and similar areas (40 CFR 230.3 and 33 CFR 328.3).

This definition recognizes and emphasizes the fact that wetlands possess three essential characteristics: hydric soils, prevalence of hydrophytic vegetation, and wetland hydrology. These three characteristics are the mandatory technical criteria required for wetland determination. Areas must meet all three of these criteria before being designated as jurisdictional wetlands.

Wetlands are frequently located between open water and upland systems. They are inundated or saturated for prolonged periods during the growing season. The majority of the project area consists of upland, or non-wetland, communities. Because of the existing topography, soils, and climate, only a few wetlands are present in the project area.

Wetlands may be classified within three broad categories based upon dominant vegetation species. Forested wetlands are characterized by woody vegetation that is 6.0 meters tall or taller (Cowardin et al. 1979). Forested wetlands within the project support a wide variety of species.

Scrub/shrub wetlands are dominated by woody vegetation less than 6.0 meters tall. Dominant species include true shrubs, young trees, and trees or shrubs that are small or stunted because of environmental conditions. Scrub/shrub wetlands may represent a successional stage leading to forested wetland, or they

may be stable communities. Typical species in the project area include willows and wax myrtle.

Emergent wetlands are characterized by erect, rooted, herbaceous plants adapted to wet soil conditions. These wetlands appear as fringe wetlands or develop along and/or within drainage ditches. These areas are typically dominated by soft rush within the project area.

Based on mapping compiled by SWFWMD, the vast majority of wetland resources in the study area include river/lake swamp and freshwater marsh. River/lake swamp is largely associated with the riverine systems of Long Flat Creek, Doe Branch, Chito Branch, and Fishhawk Creek. These hardwood forests support a wide variety of species including oaks, black gum, cypress, American elm, hickory, red bay and sweet bay. Canopies are typically dense while shrub layers vary from dense thickets to relatively open conditions. Isolated basins formed over paleo-karst features typically represent freshwater marsh wetlands. Many of these systems are surrounded by improved pasture and have undergone some degree of drainage resulting from the construction of shallow agricultural swales. Common species include maidencane, pickerelweed, smartweed, and soft rush.

Cypress domes and isolated cypress swamps are concentrated west of the proposed reservoir site and are uncommon in the immediate study area.

3.9.1 Tampa Bay Regional Reservoir Project. Wetland communities found within the footprint of the proposed reservoir can be segregated into five major types: (1) basin marsh, (2) cypress swamp, (3) open water, (4) scrub shrub/mixed forest swamp, and (5) drainage ways. The drainage ways are dominated by soft rush and are classified as herbaceous wetlands.

Most basin marshes have undergone some degree of hydrologic alteration as a result of the excavation of shallow ditches and cattle ponds through or within the wetland. These features reduce surface water elevations and hydroperiods. Vegetation in deeper zones of these marshes typically consists of maidencane, pickerelweed, soft rush, and a variety of less dominant herbs. Landward zones of these systems are flooded less frequently and support red carpetgrass, large-flowered false pimpernel, and coinwort.

Cypress swamp is represented by only one system, located in the northeastern section of the proposed reservoir site. This small, two lobed strand is dominated by bald cypress, with a subcanopy supporting dahoon holly, laurel oak and cabbage palm. The northern lobe supports an interior marsh with seasonal to semi-permanent water. This is a high quality system, although the surrounding land use of improved pasture has removed or significantly altered any historic wet prairie fringe. Open water in the reservoir footprint is found in two situations; the first as lakes within the reclaimed mine land to the south and, second, as excavated cattle ponds within isolated basin marshes. Drainage in the form of shallow swales is found in the reclaimed mine land as well as in pasturelands. In reclaimed areas, these drainage ditches are most always vegetated by soft rush and smartweed. Ditches within pasture are vegetated by a mixture of soft rush, and big carpetgrass.

Scrub shrub/mixed forest swamp areas are dominated by primrose willow, Carolina willow, red maple, and wax myrtle. These systems, left after mine reclamation activities were completed, are generally linear and parallel with steep transition zones to the adjacent upland.

Pipeline and Access Roads. Wetlands along the proposed pipeline route are limited to bottomland hardwood forest associated with Long Flat Creek, and small areas of wet pasture. Within Long Flat Creek, dominant species include cypress, sweet gum, red maple, laurel oak, Carolina ash, black gum, and cabbage palm. However, the remaining pipeline length will follow the rights-of-way of the existing Boyette road.

3.9.2 Alafia River. The Alafia River has both a palustrine and an estuarine component, and both of these components support different wetland habitat types.

The predominant palustrine wetland community is classified as river/lake swamp. Forested wetlands are nearly all associated with drainage features, especially the Alafia River, Bell Creek, and Buckhorn Creek. Representative tree species include red maple, popash, American elm, hackberry, cypress, water locust, black gum, sweetgum, Carolina willow, laurel oak, and slash pine (HDR 1998).

Hydroperiods for these wetlands are variable and dictated by overland flooding of river and creek systems, rainfall, springs, and groundwater seepage. Rainfall, springs, and seepage are the primary sources of surface water for the majority of wetlands in the study area. Due to the deep entrenchment of much of the Alafia River channel in non-tidal and tidal/freshwater areas, overland flooding of contiguous and nearby wetlands occurs infrequently.

Estuarine areas contain seawater that has been significantly diluted with freshwater inflow from land. Because these areas are a freshwater-saltwater interface, water concentrations can vary depending on tides, amount of rainfall and other conditions that affect the quantity of freshwater runoff into riverine systems. Typically, the estuarine system is considered to extend upstream to where salinity of the water measures less than 0.5 parts per thousand (ppt).

The most abundant estuarine wetland communities are saltwater marsh and mangrove swamps. Black needle rush and saltmarsh cordgrass dominate the saltwater marsh communities. The saltwater marsh communities are common in protected backwater areas and along the Alafia River. These communities function as nursery grounds for a variety of finfish and are some of the most important and productive zones of the Alafia River estuary. There are also areas of mangrove swamp in the study area. Black mangrove and red mangrove are the dominant tree species (HDR 1998).

As salinity in the river decreases moving upstream, saltmarsh communities are replaced by species that favor freshwater such as cattail and leather fern. Since seawalls and residential development throughout the lower reaches of the Alafia River system have replaced much of the natural shorelines, these species

are uncommon and occur sporadically on narrow shorelines and mud flats.

3.9.3 Hillsborough River and Tampa Bypass Canal. Both the lower Hillsborough River and the Tampa Bypass Canal (below Structure S-160) are highly modified systems. Most of the wetlands associated with the shoreline of the lower Hillsborough River have been filled and sections of the shoreline have been hardened by seawalls, rip-rap or other material. Bulkheads, or walls, are the most prevalent shoreline types along the Hillsborough River (WAR and SDI, 1995) with little shoreline with natural cover. The morphology of the original stream that was excavated to create the Tampa Bypass Canal has been drastically changed. Because of this, very little natural shoreline exists.

3.9.4 Tampa Bay. Tampa Bay, classified as a subtropical estuary, has a rich mosaic of fish and wildlife habitats. The bay consists of open water and vegetated intertidal zones. Approximately ninety-three percent of Tampa Bay is open water and seven percent is vegetated intertidal area with mixtures of mangrove and tidal marsh vegetation (Lewis and Estevez 1988).

The three broad classes of emergent saltwater wetlands that are generally recognized are:

- mangrove forests
- tidal marshes
- salt barren/high marshes

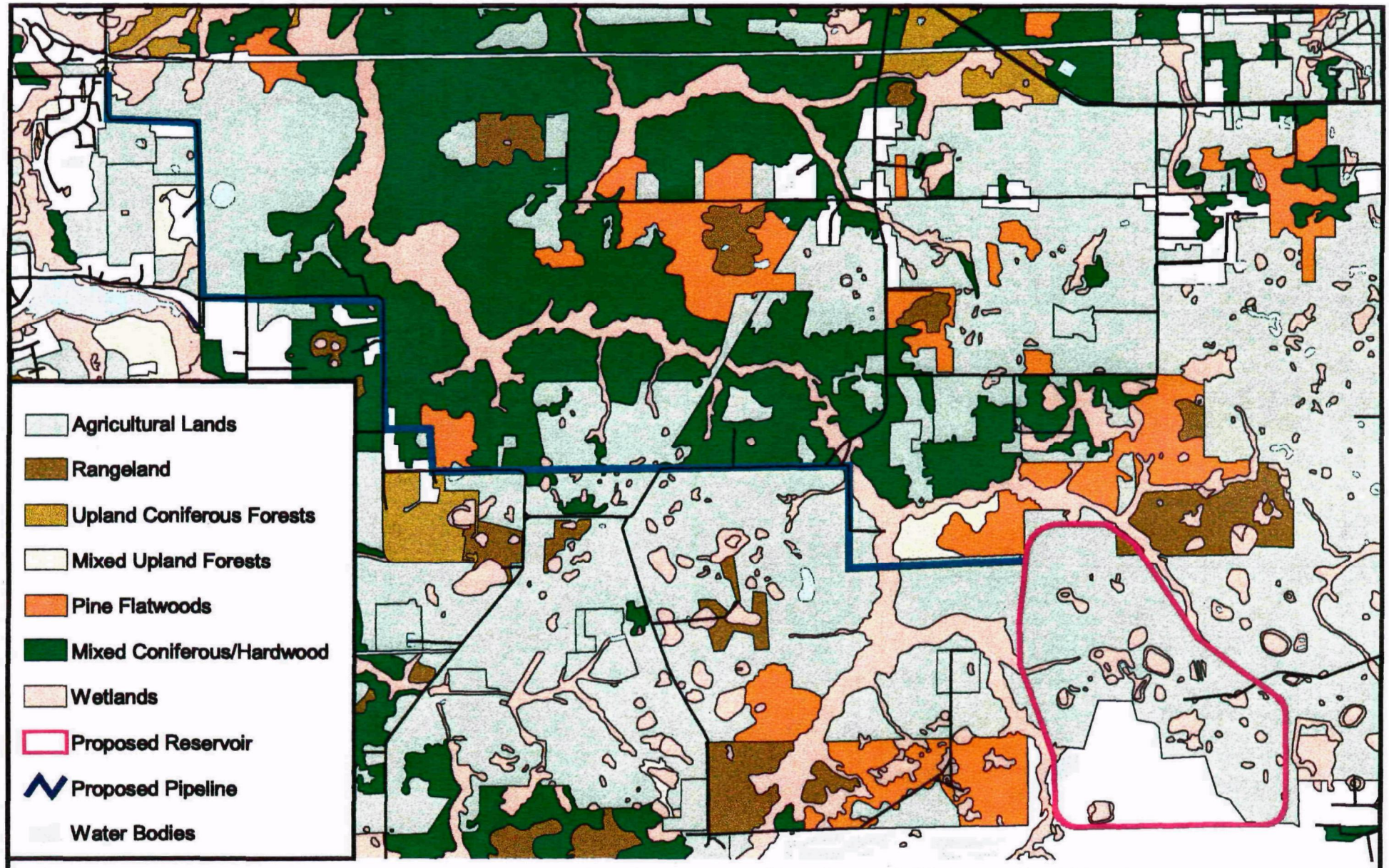
Mangrove Forests and Tidal Marshes. The saltwater wetlands include the mangrove forests and tidal marshes. They occur primarily along a natural intertidal shelf, which rims the bay and, to a lesser extent, along filled intertidal areas created by urban development. The saltwater wetlands are typically a mosaic of mangrove forests composed of red mangrove, black mangrove, and white mangrove interspersed with species of the tidal marshes such as smooth cordgrass and black needle rush. Other plant species commonly found in these wetland areas include leather fern and the brackish water cattail. Exotic plants such as Brazilian pepper have invaded many of the native communities throughout the bay (Janicki 1995).

Salt Barren/High Marsh. The salt barren/high marsh habitat, or saltern, is created when saltwater from the bay enters sand flats, termed salt barrens, on extremely high tides. The water collects and pools in these areas and is subsequently evaporated by the sun and wind. The residual salt content within the sediments of these salt flats often exceeds 100 ppt. These areas provide habitat for a unique community of salt tolerant plants that typically include sea purslane, glasswort, saltwort, sea oxeye daisy, and sea lavender (Janicki 1995).

3.10 WILDLIFE

The general project area contains a variety of wildlife habitat types used by a diverse group of species (Figure 3-8). A discussion of the various habitats present and the common species found in the vicinity of the proposed Tampa Bay Regional Reservoir, Alafia River, Hillsborough River, Tampa Bypass Canal, and Tampa Bay are presented.

3.10.1 Tampa Bay Regional Reservoir Project. Extensive field reviews of existing habitats within the reservoir site and related infrastructure alignments



Source: Southwest Florida Water Management District Land Use Land Cover 1990

Figure Source: HDR Engineering, Inc., EAP Application, September 7, 2000

N
W E
S

4000 0 4000 Feet

Figure 3-8
TAMPA BAY REGIONAL RESERVOIR PROJECT DEIS

WILDLIFE HABITAT

have been completed (HDR 2000). Suitability of habitats for the support of wildlife, including listed species, as well as documentation of wildlife utilization, has been ongoing since 1998. The following is a summary of expected and observed onsite conditions.

Wildlife species expected to occur in the vicinity of the Tampa Bay Regional Reservoir and pipeline are numerous and varied due to the mosaic of upland and wetland communities found in the region. Small mammals that can be expected include raccoon, armadillo, opossum, eastern cottontail, gray squirrel, pocket gopher, cotton mouse, cotton rat, round-tailed muskrat, gray fox, skunk, and bobcat. Large mammals include wild pig and white-tailed deer. Reptiles utilizing the upland habitats at the reservoir site include the skinks, green anole, Cuban brown anole, six-lined racerunner, and Southern fence lizard. Upland snakes that can be expected at the reservoir site include the black racer, the Eastern diamondback, dusky pygmy rattlesnake, Eastern indigo, garter snake, Southern ringneck snake, yellow rat snake, Florida kingsnake, and peninsula ribbon snake. A wide variety of birds can be expected to use the upland habitats of the reservoir site including year-round upland and wetland residents as well as winter migrants. Some of the more upland residents include the killdeer, red-shouldered hawk, red-bellied wood pecker, downy woodpecker, blue jay, American crow, mourning dove, ground dove, burrowing owl, turkey vulture, black vulture, cattle egret, grey catbird, mockingbird, cardinal, eastern meadowlark, boat-tailed grackle, common grackle, brown-headed cowbird and common bobwhite.

Winter migrants might include the red-winged blackbird, robin, American kestrel, common nighthawk, belted kingfisher, northern flicker, Eastern phoebe, great-crested flycatcher, Eastern kingbird, tree swallow, barn swallow, purple martin, Carolina wren, brown thrasher, and palm warbler.

Many species of wading or water birds use the shallow wetlands for feeding and some for nesting. In the proposed reservoir area, these include the heron and egret guild and contain such birds as the great egret, great blue heron, snowy egret, little blue heron, tri-colored heron, green-backed heron, white ibis, glossy ibis, wood stork. Other wetland bird species expected in the herbaceous wetlands include the least bittern, limpkin, black rail, Florida mottled duck, black-crowned night-heron and yellow-crowned night-heron, and sandhill crane.

Representative upland-bird species common in and around freshwater herbaceous wetlands found in the proposed reservoir area include such species as the red-shouldered hawk, Coopers' hawk, red-winged blackbird, sora rail, tree swallow, barn swallow, common yellowthroat, boat-tailed grackle, and cardinal.

Some of the amphibians common to the freshwater herbaceous wetlands in the area are the greater siren, dwarf siren, two-toed amphiuma, southern cricket frog, little grass frog, Florida chorus frog, pig frog, southern leopard frog, bullfrog and green tree frog.
Many of the reptiles common in freshwater herbaceous wetlands of the area include the water snakes such as the cottonmouth moccasin, Florida watersnake and Eastern mud snake.

Upland snakes that utilize wetlands for food include the eastern diamondback, dusky pygmy rattlesnake, eastern indigo, garter snake, Southern ringneck snake, yellow rat snake, Florida kingsnake, and peninsula ribbon snake. Alligators are commonly found within wetlands, especially those with a deeper core area, and play a key role in maintaining some wetlands throughout the dry season.

Turtles that tend to be found in wetlands, referred to here as the aquatic-turtle guild, include such species as the Florida softshell turtle, Florida chicken turtle, Florida red-bellied turtle and the stinkpot.

The Florida box turtle is an upland species more adapted for terrestrial life that can often be found in or around shallower wetlands. The gopher tortoise, also an upland species, has been observed in and around the proposed regional reservoir.

3.10.2 Alafia River. The diverse habitat around the Alafia River provides cover and forage for a variety of wildlife species. Small mammals occurring along the river include the hispid cotton rat, rice rats, feral house rats, least shrew, cotton mice, and black rats. Other species encountered along the river include deer, gray squirrel, fox squirrel, cottontail rabbit, marsh rabbit, wild hog, raccoon, gray fox, red fox, and bobcat (Dames & Moore 1975).

Marine mammals occurring in the vicinity of the lower Alafia River system include the bottlenose dolphin and the West Indian manatee. Dolphins can be found throughout Tampa Bay with the northern mouth of the bay being most heavily used (HDR 1998). Based on data collected by the Florida Marine Research Institute (FMRI) from 1987 through 1989, the Alafia River system provides habitat for bottlenose dolphins in Tampa Bay but does not appear to be a critical resource (Weigle *et al.* 1991). The West Indian (Florida) manatee can be found throughout Tampa Bay, with the highest numbers occurring in the winter season from December through February and the lowest numbers in the summer, between June and October.

A wide variety of bird species frequent the diverse habitats present around the Alafia River. Birds reported in the Alafia River basin include little blue heron, cattle egret, great egret, bobwhite, killdeer, and willet. Other common bird species include common flicker, blue jay, carolina wren, tufted titmouse, brown thrasher, starling, cardinal, and red-winged blackbird.

Benthic macroinvetebrates in the Alafia River include those invertebrate animals that spend a portion or all of their life cycle within or on the bottom sediments. These groups are comprised of both the primary consumers (herbivores) and secondary consumers (carnivores) and play an important role in the ecology of aquatic systems. Benthic macroinvetebrates provide a source of food for a variety of higher animals including other invertebrates, fish, birds, and mammals (Coastal Environmental and PBS&J 1998a; HDR 1998). During the fall, mollusks were most common while in the winter and spring amphipods were dominant. Large invertebrates collected included blue crabs, horseshoe crabs, spider crabs, fiddler crabs, stone crabs and barnacles.

3.10.3 Hillsborough River and Tampa Bypass Canal. Similar to the Alafia

River, the diverse habitat around the Hillsborough River and Tampa Bypass Canal provides cover and forage for a variety of wildlife species. However, due to the developed nature of the area and its heavy recreational use, those species occurring are more tolerant of human disturbance and development. Housing and commercial developments and human disturbance throughout the area impact the overall amount of habitat present, generally limiting the population size of any particular species. Additionally, competition within and between species for the limited resources of cover and forage likely contributes to the limited species diversity and populations occurring in the area.

Small mammals occurring along the river and canal include the hispid cotton rat, rice rats, feral house rats, least shrew, cotton mice, and black rats. Other species encountered along the river include deer, gray squirrel, fox squirrel, cottontail rabbit, marsh rabbit, wild hog, raccoon, gray fox, red fox, and bobcat.

A wide variety of bird species frequent the diverse habitats present around the Hillsborough River and Tampa Bypass Canal. Birds reported include little blue heron, cattle egret, great egret, bobwhite, killdeer, and willet. Other common bird species include common flicker, blue jay, carolina wren, tufted titmouse, brown thrasher, starling, cardinal, and red-winged blackbird.

The estuarine areas are host to over 70 species of overwintering waterbirds. Birds known to frequent these shallow ponds and mud flats include wood stork, bald eagle, least tern, sharp-shinned hawk, snowy plover, roseate spoonbill, white ibis, glossy ibis, little blue heron, tricolored heron, snowy egrets, great egret, and great blue heron. Migrants include an array of waterfowl and shorebirds that forage in the mud and ponds. Black-necked stilts, mottled ducks, Wilson's plovers, and green-backed herons nest within these spoil areas (HDR 1994).

Benthic macroinvertebrates occurring in the Hillsborough River and the Tampa Bypass Canal were reviewed. The most abundant organisms were polychaetes and amphipods. Pelecypods occasionally were dominant in the lower Hillsborough River and in McKay Bay (WAR and SDI 1995).

3.10.4 Tampa Bay. Tampa Bay, classified as a subtropical estuary, has a rich mosaic of fish and wildlife habitats. Each of the seven named subunits of the bay consists of open water and vegetated intertidal zones. Approximately ninety-three percent of Tampa Bay is open water and seven percent is vegetated intertidal area with mixtures of mangrove and tidal marsh vegetation (Lewis and Estevez 1988).

A list of mangrove animals in South Florida has been compiled (Odum *et al* 1982). Included in this list were 220 species of fish, 24 species of reptiles and amphibians, 18 species of mammals and 181 species of birds (divided into wading birds, probing shore birds, floating and diving water birds, aerially searching birds, birds of prey and arboreal birds). A variety of these wildlife species uses the habitats found in Tampa Bay.

A variety of mammals use the habitat around Tampa Bay including the cotton

mouse, the hispid cotton rat, the round-tailed muskrat, the house mouse, the least shrew, and the short-tailed shrew. The small mammal fauna of the bay are predominately aboreal and terrestrial species adapted to periodic flooding. Opossum, marsh rabbits, cotton rats and rice rats are common in mangrove habitat. White-tailed deer also utilize mangrove habitat as well as many other upland habitats. A number of medium-sized and large carnivores, including, gray fox, bobcat, striped skunk, raccoon, mink, and river otter, utilize south Florida mangroves. The striped skunk, raccoon and bobcat are common in mangroves, but several of the rarer species seem to be highly dependent on mangrove habitat.

The Florida manatee and bottlenose dolphin can be found in Tampa Bay during every month of the year. Other species of dolphins and an occasional whale are sometimes observed in nearby Gulf of Mexico waters. They occasionally strand on Gulf beaches but are not commonly found within the bay.

Both the American alligator and the American crocodile are occasionally found in mangrove swamps of the bay. The alligator is widespread throughout the southeastern United States and is only incidentally found in low salinity sections of mangrove habitat. The American crocodile is rare, usually found in the mangrove-dominated areas of the upper and lower Florida Keys, although recorded as far north as Tampa Bay. Species of toads associated with mangrove habitat includes the squirrel treefrog, urban treefrog, the giant marine toad and possibly in the more freshwater communities, the narrow-mouthed toad, the eastern spadefoot toad, the frog, the green tree frog, and the southern leopard frog.

There are four species of sea turtles that inhabit the Tampa Bay estuary, including the loggerhead sea turtle, green sea turtle, Kemp's ridley sea turtle, and occasionally the hawksbill sea turtle (Meylan *et al.* 1999). Under the Endangered Species Act of 1973 (ESA) as amended, the loggerhead sea turtle is listed as Threatened, and the other species above are listed as endangered. Historically, sea turtles were abundant in Tampa Bay (Wik 1960), but recent studies suggest that sea turtles are now less numerous (Lewis and Estevez 1988). This population decline follows a worldwide trend as sea turtles have suffered habitat loss, overharvesting, and other human-related stresses (pollution, monofilament entanglement, propeller wounds, fishhooks, etc.) during the past century.

The nesting season for sea turtles in the Tampa Bay area is from May to October. Tampa Bay beaches have been monitored for nesting activities since 1982, and nearly all nests laid have been loggerhead sea turtle nests. There have been occasional nests by other species, including a green sea turtle nest identified at Ft. Desoto in 1994 and a Kemp's ridley nest on Madeira Beach in 1989 (Meylan *et al.* 1994). Nesting activities occur almost exclusively on the Gulf facing beaches in the Tampa Bay area. Nesting inside the Bay appears to be rare. The most productive nesting beach in the Tampa Bay area is Egmont Key, with an average of 35 nests per year.

The Tampa Bay benthic community is made up of the organisms living on and

within the bottom sediments and is an important indicator of changes in the quality of the surrounding waters and sediments. An on-going, bay-wide benthic monitoring program was initiated in 1993 for Tampa Bay. Several abiotic (station depth, temperature, salinity, dissolved oxygen, and percent silt clay) and biotic (richness or number of species, abundance, diversity, evenness, and dominance) parameters are examined to help describe conditions of the benthic community. In addition, a Benthic Index has been developed to assess the health of Tampa Bay. The benthic community is primarily composed of bivalves, polychaetes and amphipods.

The Tampa Bay system is home to about 28 species of colonial water birds and allies' totaling about 44,000 breeding pairs plus their young for a total of nearly 200,000 birds (Paul 1999). While the breeding population is about 45,000 pairs annually at 20 or more sites, up to half the total occurs in Hillsborough Bay (including the mouth of the Alafia river) alone. Two species, white ibis and laughing gull account for half to two-thirds of all individuals. Most rare or coastal species have stable or increasing populations, while many of those that forage commonly or primarily in freshwater wetlands are decreasing (Paul 1999).

3.11 FISH

The general project area contains a variety of fish habitat types that are available and used by a diverse group of species. A discussion of the various habitats present and the common species found in the vicinity of the proposed Tampa Bay Regional Reservoir, Alafia River, Hillsborough River, Tampa Bypass Canal, and Tampa Bay are presented.

3.11.1 Tampa Bay Regional Reservoir Project. Most of the fishes that could potentially be found in the freshwater marsh wetlands of the proposed reservoir area are small, minnow-sized species such as the live bearing mosquitofish, least killifish, sailfin molly, sheepshead minnow, flagfish, golden topminnow, Seminole killifish and bluefin killifish. Small sunfishes such as the pigmy sunfish and smaller individuals of larger species such as the warmouth and redear sunfish can also be found in these marshes.

The size and abundance of individual fish species varies seasonally. Small fishes especially mosquito fish and killifish (along with the invertebrates) increase rapidly following re-flooding of a previously dry marsh. As water levels rise and stabilize, larger fish survive and become dominant. These include such species, which inhabit the deeper marshes and ponds such as the Florida gar, bullhead catfish and bowfin.

The wildlife and fish species lists included in Appendix F are by no means all-inclusive, but they are representative of the major groups of fauna that are found at the proposed reservoir area. These lists exemplify the great diversity and abundance of wildlife and fish in the general area of the proposed regional reservoir and pipeline.

3.11.2 Alafia River. Fish data from several sources including Florida Marine Research Institute (FMRI), Tampa Bay National Estuary Program (TBNEP), SWFWMD, and the Fisheries-Independent Monitoring Program (FIMP) was reviewed to determine the

composition of the estuarine fish populations of the Alafia River (HDR 1998). Fish populations in the Alafia River were sampled in 1973 and 1974 (Dames and Moore 1975 and HDR 1998).

A study conducted by the Florida Game and Freshwater Fish Commission reported fish data for the river from four years of collection. Two sampling stations were located close to the proposed diversion location on the Alafia River at Bell Shoals Road, one at Lithia Pinecrest Road and the other at SR 39. At the Lithia Pinecrest Road station, the predominant species found were coastal shiners, mosquitofish, and spotted sunfish. The shiner was found to frequent deeper zones of the river and the mosquitofish were most abundant in slow moving, shallow, backwater areas. During sampling, fishermen were observed with catches of largemouth bass, bullheads, and striped mullet.

At the SR 39 station, mosquitofish and spotted sunfish were again the predominant species found. Other species included coastal shiner, redfin pickerel, and pirate perch. Downstream near the mouth of the Alafia River, species present included sand seatrout, hardhead catfish, spotted sea trout, bull shark, silverside, juvenile black drum, striped mullet, and sheepshead minnow. Within the upper reaches of the estuary, striped mojarra, spotfin mojarra, and bay anchovy were found.

3.11.3 Hillsborough River. As observed in the Alafia River, the Hillsborough River provides habitat for a wide variety of freshwater, estuarine, and marine fish species. The shallow fish species found in the river were composed of both resident and migratory species. Resident species often reproduce in the rivers, so juveniles as well as adults were found to be present. Migratory species enter the lower reaches of the river mainly as juveniles or as young-of-the-year, and inhabit these nursery areas prior to moving to the bay.

Residents were numerically dominant, comprising about 92 percent of the total population. Three of the four most abundant residents were schooling species; the bay anchovy and two species of silversides. The fourth most abundant species was the yellowfin menhaden. Other prominent residents were species of killifish along with the tidewater mojarra, the hogchoker, and the clown goby. All were spawned in Tampa Bay or in the Gulf of Mexico (Peebles and Flannery 1992 in WAR and SDI 1995).

The freshwater resident fish community is an important component of the Hillsborough River. Important freshwater gamefish such as largemouth bass, redear sunfish and bluegill sunfish are commonly found in the area. The transient fish community is especially important because most of the species represent the juveniles of important sport or commercial fish species.

The dominant transient was the schooling yellowfin menhaden. While other prominent immigrants were the black drum, spot, red drum, sand sea trout, southern kingfish, striped mullet, pinfish, and the striped mojarra. Other marine sport and commercial fishes using the Hillsborough River, Palm River and McKay Bay as nursery areas

included common snook, spotted seatrout, bonefish, ladyfish, and sheepshead.

Sixteen commercially important species of major importance to Gulf of Mexico fisheries have been identified in McKay Bay. These species are silver mullet, stripped mullet, spot, spotted seatrout, red drum, sheepshead, Gulf killifish, longnose killifish, rainwater killifish, sailfin molly, bay anchovy, tarpon, snook, Gulf toadfish, tidewater silverside, and mojarra (HDR 1994).

3.11.4 Tampa Bay. Tampa Bay provides important habitat for both adult and juvenile resident and migratory fish species. The seagrass beds and backwater areas in the bay provide important nurseries for the larva and juvenile stages of these species (Lewis and Estevez 1988). Most species spawn during the spring and early summer in either the nearby Gulf or in higher salinity areas of Tampa Bay. During and following these spawning periods, the larval and juvenile fish typically migrate into either seagrass beds or shallow, protected, low-salinity nursery areas of the bay to feed and mature (Comp 1985; Lewis *et al.* 1985b).

Fish sampling programs have used various approaches to study the fishes in Tampa Bay. Early studies focused on species numbers and species dominance (Springer and McErlean 1961; Moe and Martin 1965; Comp 1985). Comp (1985) listed 125 common fish species in Tampa Bay; only ten represented the majority of species sampled. This ten species included the tidewater silverside, bay anchovy, scaled sardine, striped mullet, pinfish, longnose killifish, spot, silver perch, silver jenny, and code goby. The scientists conducting these studies emphasized that the sampling gear used was biased towards smaller, less mobile species. Other species such as sharks and rays may have been abundant, but were rarely sampled (Lewis and Estevez 1988).

The dominant fish families of the benthic habitat include drums, porgys, grunts mojarras, snappers, and mullet. Other families with sizeable contributions to the benthic fauna include pipefishes, flounder, sole, searobins, and toadfishes. Numerically abundant fishes of the mid and upper waters include anchovies, herrings, and needlefishes.

More estuarine species, such as mullet and spot, were also common along with anchovy, needlefish and gobies. This is in agreement with a variety of authors cited by Montague and Wiegert (1991). These smaller species provide forage for the less common but more recreationally valuable predatory fish and wading birds that can utilize these areas. Tarpon, snook, drum, croakers, sea trout, kingfish, sharks and rays can be found in salt-marsh creeks and ditches, along with a variety of herons and egrets near the edges of the tidal creeks.

3.12 THREATENED AND ENDANGERED SPECIES

The Endangered Species Act of 1973 (ESA) affords federal protection to those species and their habitats determined to meet the criteria for listing as either federally threatened or endangered. The ESA defines a federally threatened species as "any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range." A

federally endangered species is defined by the ESA as "any species, which is in danger of extinction throughout all, or a significant portion of its range." Candidate species are those for which a sufficient amount of information has been gathered to support a listing as threatened or endangered, but listing at the present time is precluded at this time (50 CFR 17).

3.12.1 Federally Threatened and Endangered Species. The FWS has identified five endangered and six threatened species as potentially occurring in the project area (Table 3-2). Brief descriptions of each species are presented below. More detailed descriptions are included in (Appendix A) the Biological Assessment.

Florida Scrub Jay

Extensive field reviews of existing habitats within the proposed reservoir site and related infrastructure alignments have been completed by HDR biologists. Documentation of suitable wildlife habitat, including habitat required for listed species, and wildlife utilization has been ongoing at the reservoir site since 1998. Biologist's conducting wetland and wildlife assessments spent a total of 44 full or partial days on the reservoir site. The pipeline route was driven each of these days to and from the site.

Wood stork. Wood storks feed in a variety of aquatic habitats ranging from freshwater marshes and streams to intertidal zones of estuaries, consuming fish, amphibians, and reptiles. Wood storks normally nest in large rookeries and feed in flocks. This species prefers to nest in large cypress trees or in mangrove swamps and may travel up to 80 miles to marshland and shallow open water areas to forage, especially during the breeding season. Wood stork nesting is highly dependent on water levels and food availability. Almost any shallow wetland depression where fish tend to become concentrated, either through local reproduction by fishes or as a consequence of area drying, may be good feeding habitat. These sites include drying marshes, shallow roadside or agricultural ditches, narrow tidal creeks and pools, and depressions in cypress heads or swamp sloughs (Ogden 1996).

For nesting to be successful in South Florida, colonies must begin forming between November and January. Storks begin moving into the vicinity of the rookery several weeks before nesting begins. Nesting colonies may be abandoned due to human disturbance and lack of available food.

Wood storks have been observed foraging in marsh wetlands located within the proposed reservoir site (HDR 2000). No rookeries or nests have been observed on site and no sign of

Table 3-2. Federally Threatened or Endangered Species

Common Name	Scientific Name	Status
Birds		
Wood stork*	*Mycteria americana*	Endangered
Florida scrub jay	*Amphelocoma coerulescens coerulescens*	Threatened
Bald eagle*	*Haliaeetus leucocephalus*	Threatened
Red-cockaded woodpecker	*Picoides borealis*	Endangered
Reptiles		
Hawksbill sea turtle	*Eretmochelys imbricata*	Endangered
Green sea turtle	*Chelonia mydas*	Endangered
Kemp's Ridley sea turtle	*Lepidochelys kempii*	Endangered
Leatherback sea turtle	*Dermochelys coriacea*	Endangered
Loggerhead sea turtle	*Caretta caretta*	Threatened
American alligator*	*Alligator mississippiensis*	Threatened
Eastern indigo snake*	*Drymarchon corais couperi*	Threatened
Fish		
Gulf sturgeon	*Acipenser oxyrhynchus desotoi*	Threatened
Mammals		
Florida manatee	*Trichechus manatus*	Endangered
Plants		
Beautiful PawPaw	*Deeringothamnus pulchellus*	Endangered
Florida Bonamia	*Bonamia grandiflora*	Threatened
Small's Jointweed	*Polygonella myriophylla*	Endangered
Pygmy Fringe Tree	*Chionanthus pygmaeus*	Endangered
Florida Golden Aster	*Chrysopsis floridana*	Endangered

*Observed at the proposed reservoir site

rookeries, such as old nests or accumulation of guano, have been observed in forested and shrub wetlands on the reservoir site. No nesting was observed during the first four months (January through April) of the 1999, 2000, and 2001 breeding seasons.

Florida Scrub Jay. The Florida scrub jay is strongly associated with several Florida scrub communities and adjacent non-scrub habitats of certain types. Florida scrub jays are most abundant in open, oak dominated scrub communities of the interior and Atlantic coastal sand ridges (Fitzpatrick *et al.* 1991).

An area of potential scrub jay habitat was identified at the reservoir site. This area of scrubby flatwoods, used for cattle grazing, is bounded by row crops to the south, active pasture to the east, and hardwood-dominated wetlands associated with Doe Branch and Long Flat Creek to the north and west respectively. The eastern two-thirds of

the area has a rather dense saw palmetto and wiregrass cover, while the remainder is a more hardwood-dominated turkey oak community. Surveys were conducted following the Florida Wildlife Conservation Commission's Nongame Wildlife Program Technical Report No. 8 to determine and document the presence or absence of scrub jays within the survey area (HDR 2000). No scrub jays were found during the survey period.

Bald Eagle. Bald eagles have been protected in the United States for many years. Florida has the largest population of nesting bald eagles in the Southeastern United States. Although populations are recovering due to the decline of the insecticide DDT, habitat alteration continues to be a problem. The bald-eagle breeding season in Florida officially begins in mid-October with nest repair activities. Most of the young are fledged by mid-May, the official end of the nesting season in South Florida. While some eagles are year-round residents in Florida, many migrate to northern territories for the summer, often returning to the same Florida nest site for the winter breeding season.

Bald eagles may be seen feeding in coastal and inland areas (Paul 1999). Because eagles rely on a diet predominately of fish, nesting in South Florida usually occurs in slash-pine trees, near permanent water bodies. Eagles occasionally use less desirable nesting trees when suitable slash pines are not available.

Bald eagles are known to occur in the vicinity of the project. No nests have been observed or recorded within the reservoir site or within the pipeline corridor, although one individual was observed in flight over the reservoir site (HDR 2000).

Red-cockaded Woodpecker. The red-cockaded woodpecker has been listed as a federal endangered species since 1970. Documented population declines are presumed to be due to reductions in available nesting habitat.

Primary nesting and roosting habitat for red-cockaded woodpeckers consists of pine stands, or pine-dominated pine/hardwood stands, with a low or sparse understory and ample old-growth pines. Nest and roost cavities are almost always located in old age living pines that are at least 60 years old. In southwest Florida, the hydric slash pine flatwoods provide the preferred critical nesting and foraging habitat for red-cockaded woodpeckers.

Red-cockaded woodpeckers are non-migratory, territorial, and live in cooperative breeding social groups. They forage primarily on arthropods and sometimes consume vegetative matter. Red-cockaded woodpeckers are not listed by the FNAI as occurring in Hillsborough, Pasco, or Pinnellas counties.

Hawksbill Sea Turtle. Under the ESA, the hawksbill sea turtle is listed as an endangered species. Known for their beautiful shells, which are used to make tortoise shell jewelry, hawksbill sea turtles have suffered population declines during the past century due to overharvesting.

Hawksbill sea turtles have life histories that are similar to other sea turtle species

(Musick and Limpus 1996). Hatchling hawksbills live in the open ocean, in the shelter of weedline habitats of oceanic currents (Carr *et al.* 1966). Little is known about the hawksbill diet during the hatchling life history phase. Hawksbills in the Atlantic are thought to become juveniles at an age of 1 to 3 years (Musick and Limpus 1996). Juvenile hawksbills are typically found in shallower more developed habitats where their diets consist primarily of sponges (Meylan 1984). Common foraging habitats of the adult hawksbills include coral reefs and rock outcroppings, and less commonly seagrass pastures in mangrove-fringed bays (Bjorndal and Bolten 1988).

Tampa Bay beaches have been monitored for nesting sea turtles since 1982, and nearly all nests laid have been loggerhead sea turtle nests. The Florida Marine Research Institute (FMRI) and the Sea Turtle Stranding and Salvage Network (STSSN) document injured or dead turtles that strand on Florida beaches. Data indicate that the hawksbill sea turtle is the least common sea turtle species in Tampa Bay (Meylan *et al.*1999). All hawksbills have been found in the outer Bay area. Size-classes of hawksbill sea turtles found stranded in Tampa Bay indicate that the population consists primarily of juveniles.

Green Sea Turtle. Green sea turtles have highly migratory life histories that are similar to other sea turtle species (Musick and Limpus1996). It is believed that hatchling green turtles live in weedline habtiats of oceanic currents, where they primarily feed on plant and animal material (Bjorndal 1985). Green turtles leave open water habitats and enter benthic foraging areas at a size of 20 to 25 cm carapace length in the western Atlantic (Bjorndal and Bolten 1988). As adults, green sea turtles shift to a diet primarily consisting of seagrasses and algae (Mortimer, 1982). Green sea turtle are most commonly observed foraging over seagrass beds (Bjorndal and Bolten, 1988).

Stranding data collected by FMRI and STSSN indicate that the green sea turtle is the third most commonly found sea turtle species in Tampa Bay. Size-classes of green sea turtles found stranded in Tampa Bay indicate that the population consists primarily of juveniles and sub-adults (Meylan *et al.* 1999).

Kemp's Ridley Sea Turtle. Kemp's ridley sea turtles also begin their lives as migratory animals, living in the open water of the sea as hatchlings and not reappearing in the shoreline zone until they are about 2 years old or about 20 cm carapace length (Zug *et al.* 1997; Ogren 1989). Once Kemp's ridley sea turtles become juveniles they move into the shallow benthic feeding habitats along the continental shelf and feed primarily on crabs (Burke *et al.* 1993). These juveniles can be found in shallow waters along the east coast of North America and in the Gulf of Mexico. As adults they return to the western Gulf of Mexico where they nest almost exclusively on one beach area (Rancho Nuevo) in Tampaulipas, Mexico.

Stranding data collected by FMRI and the STSSN indicate that the Kemp's ridley sea turtle is the second most common sea turtle species in Tampa Bay (Meylan *et al.* 1999). Size-classes of Kemp's ridley sea turtles found stranded

in Tampa Bay show that juveniles and sub-adults comprise the population.

Loggerhead Sea Turtle. Loggerhead sea turtles have highly migratory life histories that are similar to other sea turtle species (Musick and Limpus1996). During their first few years of life, loggerheads live in the open ocean, often in association with sargassum (Carr 1987). Loggerhead turtles leave the open water habitats and enter shallow water foraging areas at a size of 40 to 50 cm carapace length in the western Atlantic (Carr 1986). Loggerheads are more opportunistic feeders than other sea turtle species, foraging on a wide variety of invertebrates (Bjorndal, 1996).

American Alligator

Stranding data collected by FMRI and STSSN suggest that the loggerhead sea turtle is the most common sea turtle with the widest distribution in Tampa Bay (Meylan *et al.* 1999). Size-classes of loggerhead sea turtles found stranded in Tampa Bay indicate that adults make up the majority of the population.

Leatherback Sea Turtle. The endangered Leatherback sea turtle is the largest of all marine turtles, with adults weighing between 650 pounds and 1,300 pounds. Leatherbacks nest regularly, but not abundantly, in Florida (Moler, 1992). Most Nesting records are for the Atlantic Coast in the mid-peninsular area of Florida. Harris et al. (1984) reported a minimum of 18 and maximum of 45 Florida nests between 1979 and 1983. On the Gulf Coast, there is only a single record of hatchlings.

This species is endangered because of morality resulting from shrimp trawls, entanglement in lobster lines, and ingestion of plastic refuse in the ocean. The future of the leatherback rests primarily in the hands of other nations. Human predation on turtles and their eggs on many of the tropical nesting grounds is excessive.

American Alligator. The American alligator is commonly found in the great river swamps, lakes, bayous, marshes, and other bodies of water in Florida. American alligators were once considered an endangered species by the FWC, but due to a remarkable comeback in many areas, they have been downgraded to a species of special concern. This species is protected by the USFWS due to its similarity of appearance to the endangered American crocodile. The American alligator generally grows from six to 16 feet in length, and can grow to 19 feet. The growth rate of the alligator is dependent on climate and food availability. Their diets include nearly any animal including fish, crabs, turtles, mammals, birds, other alligators, and even dead animals. Both male and female alligators dig open depressions in marshes and wetlands called 'gator holes', which vary in width from several

yards to the size of a small lake. These gator holes are significant to the freshwater ecology of Florida because they provide a dry season refuge for aquatic life as well as the many birds, mammals, and reptiles that concentrate in these holes in search of food and water (Conant and Collins 1991). American alligators occur in creeks, streams, and other wetlands throughout Hillsborough County. They have been observed on the reservoir site in two open water bodies on the western portion of the reservoir site.

Eastern Indigo Snake. In southern Florida, the eastern indigo snake may be found in a variety of habitats including freshwater marshes, coastal prairies, mangrove forests and other upland habitats. Indigo snakes potentially utilize several habitat types found within the project area including flatwoods, hardwood forest, marsh edges, and freshwater swamp. Eastern indigos frequent gopher tortoise burrows, which are used as dens and for egg laying. A scrubby flatwoods community located outside of the northwest corner of the reservoir supports a large gopher tortoise population, and it is likely that the eastern indigo is also present in this area. This snake is listed as threatened by both federal and state wildlife agencies. Losses of habitat and over-collection for the pet trade have contributed to the species decline.

Individual Indigo snakes were observed on the reservoir site on two occasions (HDR 2000). One sighting was within the northern hardwood forest associated with Doe Branch. The second sighting was within an oak shrouded fence line in the west-central portion of the proposed reservoir site.

Gulf Sturgeon. The gulf sturgeon is a threatened sub-species of the Atlantic sturgeon, and once inhabited the Hillsborough River and Tampa Bay (FMRI 2000; FWS 2000). Subadult and adult Gulf sturgeon migrate upstream to spawn in rivers draining to the Gulf of Mexico from early spring through the end of May. In late September to early October, adults migrate downstream to estuarine habitats until they are at least two years old. Gulf sturgeons are long-lived and grow large, living up to 28 years and growing up to 8 feet and 200 pounds.

Manatee

The first sturgeon fishery in Florida was established in 1886 in Tampa Bay, but only lasted a few years. Construction of the Hillsborough Dam in 1888 is thought to have contributed to the sturgeon's decline, since dams prevent sturgeon from migrating upstream to spawn (Wooley and Crateau 1985; FMRI 2000). Currently, the Florida Marine Research Institute is leading a cooperative effort to release a limited number of Gulf sturgeons into parts of the Hillsborough River.

Florida Manatee. The Florida manatee is protected by both federal and state wildlife agencies and listed as endangered (FGFFC 1997). They inhabit freshwater, brackish, and marine

habitats and move freely between salinity extremes. Water depths of at least one to two meters are preferred and flats and shallows are avoided unless adjacent to deeper water. Along the coast, manatees tend to travel in water three to five meters deep. If the water is deep enough and the currents are not too strong, manatees will travel great distances up coastal rivers (Florida Power and Light 1982).

Florida manatee can be found in Tampa Bay during every month of the year. From 1991 to 1998, manatees were counted statewide by numerous biologists from ten state, federal, county, and private agencies. The highest number of manatees counted in Tampa Bay was 164 during January 1997. This number represented 7.4 percent of the state total at that time (Ackerman *et al.* 1999).
In a preliminary review of current manatee sighting data, Florida Marine Research Institute staff verify that Florida manatee also frequent both the Lower Hillsborough River and the Palm River (FMRI 2000). Since 1978, idle-speed zones have been established in the Alafia River to avoid boat and propeller-related injuries and deaths to manatees (HDR 1998).

Because of their lack of tolerance to water less than 68°F, manatees aggregate at the warm water discharges of power plants and springs during cold fronts (Ackerman *et al.* 1999). Cargill Fertilizer company was once considered the major wintering area for manatees in Tampa Bay, but since the 1986 reduction of warm-water effluent it is considered a minor wintering site.

Beautiful PawPaw. Destruction of habitat for residential, commercial, recreational, and agricultural purposes is the leading cause of declining populations. The beautiful pawpaw, a low shrub with a stout taproot and yellow-green berries, is listed as endangered by FWS. Typically, this plant grows in poorly drained, slash pine-saw palmetto flatwoods with sandy soils.

Beautiful pawpaw is a disturbance-dependant plant that resprouts readily from the roots following the removal of the top by fire or mowing. Flowers occur on new growth and are white with a pleasant scent. A lack of disturbance leads to the eventual death of the plant.

Florida Bonamia. The Florida bonamia was formerly widespread in central Florida. Conversion of Florida's scrub habitat to residential housing or agricultural areas has dramatically reduced the amount of habitat available for this plant.

Florida bonamia is the only morning glory vine with large, blue flowers that is found in Florida scrub vegetation. It is a perennial plant with sturdy stems and leathery oval leaves found only in scrub areas of central and South Florida. Primarily, this morning glory is found in sand pine scrub vegetation with evergreen scrub oaks and sand pine (commonly referred to as Florida scrub), but can occasionally be found in clear-cut areas in the Ocala National Forest.

Florida bonamia grows for three or more years and flowers from spring to summer. It has a mixed mating system, can self-pollinate, and it can produce seeds without fertilization. However,

pollinators are essential to ensure substantial seed production.

Small's Jointweed. Small's jointweed is also known as sandlace. Loss of habitat to residential and agricultural development is the most serious threat to the upland scrub community in which Small's jointweed is found. At least two thirds of the pine scrub vegetation in south central Florida has been cleared.

Small's jointweed is a sprawling shrub with many branches that zigzag along the ground forming dense mats. Lower parts of creeping branches have reddish-brown bark that cracks and separates in interlacing strips. The leaves are 0.1 to 0.3 inches in length and are needle-like and fleshy. Small white, pink, or yellow petal-like sepals are present when the plant flowers.
This plant is restricted to the pure white andy ridges in the scrub of the southern Florida Lakes Region, where 40 to 50 percent of the scrub community is open, bare sand.

Pygmy Fringe Tree. The pygmy fringe tree is listed as endangered by the FWS, primarily because of habitat loss due to residential development and to citrus groves. Although locally abundant, development of a few more large citrus groves within its range could severely impact the pygmy fringe tree.

The pygmy fringe tree grows as a shrub that may be less than 1 meter tall, but may grow as tall as 2 to 4 meters. This small scrub tree blooms in March, with four white fused petals in shown panicles. The pygmy fringe tree bears fruits that are purple drupes 2 to 2.5 cm long.

The pygmy fringe tree is endemic to Florida, occurring in Lake, Osceola, and Hillsborough Counties and at sites along the Lake Wales Ridge in Highlands and Polk Counties. This species is found primarily in scrub habitats along the coasts and sand ridges of central Florida.

Florida Golden Aster.
Residential and commercial development poses the greatest threat to the Florida golden aster. Added threats include mowing, dumping, excessive grazing, and off-road vehicle damage. Additionally, this species' restricted distribution has contributed to its decline and endangered status.

A member of the Asteraceae family, the Florida golden aster is a perennial herb showing yellow flowers in mature specimens. Young plants of this species forms rosettes with leaves covered in dense, white, short-wooly hairs. As the plant matures, upright stems grow from the rosettes to a height of 0.3 to 0.4 meters, with obovate-elliptic, hairy leaves. Flower heads are clustered and flat-topped, with yellow rays and central discs. The species is short-lived and reproduces by seeds, which are dispersed by wind.

The Florida golden aster primarily occurs in scrub habitats where there is well-drained fine sand. It grows best in open, sunny areas.

The distribution of the Florida golden aster includes Hillsborough and Hardee Counties, and in recent years has been collected in Manatee County. Historically, populations occurred on St. Petersburg Beach and Bradenton Beach, but have since been destroyed.

3.12.2 State Listed Species of Special Concern. In addition to the U.S. Fish and Wildlife Service listing of protected species, the Florida Fish and Wildlife Conservation Commission (FWC, formerly the FGFWFC) is responsible for listing protected species in the state of Florida. The FWC maintains state lists of endangered, threatened, and species of special concern. The listing status is related to population abundance in Florida. Federally listed endangered and threatened species are most often listed by the state as well, but the species of special concern category is strictly a state listing. Data bases maintained by the Florida Natural Areas Inventory (FNAI) and the FWC were consulted for the identification and locations of threatened, endangered, and species of special concern known to occur in the project area (HDR 2000). Pedestrian and vehicle surveys were completed on numerous occasions during 1998 and 1999 to document species use of the proposed reservoir site. Table 3-3 lists the state species of special concern most likely to occur within the project area and their listing status.

Florida Sandhill Crane. The sandhill crane prefers open pine flatwoods or prairies located near wet prairies and seasonal ponds. Sandhill cranes are often seen in improved pastures and open woodlands feeding on a variety of plants and invertebrates.
Four nesting pairs of Florida sandhill cranes were documented on the proposed reservoir site during the 1999-nesting season (April 13, 1999) (HDR 2000). Only one pair of offspring was observed during the nesting season (April 14, 1999). Their absence may be due to extreme dry conditions in the region and a general absence of standing water within marsh wetlands, which are preferred by the crane.

Sandhill Cranes

During non-nesting months, no more than two pair of adult cranes were observed foraging on the proposed reservoir site at any one time. During the 2000 nesting season, no nests or nesting adults were observed at the 1999 nest sites. One adult crane was observed sitting on a nest on January 8, 2000.

Least Tern. This smallest North American tern is a familiar resident in Florida from March through September. Their breeding range extends throughout Florida, both inland and on the coast. Historically, least terns nested on coastal beaches, dunes, and islands. Today, most nesting occurs from April through August on man-made habitats including dredged-material islands, construction sites, phosphate mines, and gravel rooftops (Kale and Maehr 1990). Nesting behavior can be either colonial or solitary.

Typically, 100 to 150 pairs of least tern are censused annually in the Tampa Bay area, but colonies move frequently. Most least terns in the Tampa Bay area now

Table 3-3. Florida Threatened, Endangered, and Special Concern Species

Common Name	Scientific Name	Status
Birds		
Florida sandhill cranes	*Grus canadensis pratensis*	Threatened
Least tern	*Sterna antillarum*	Threatened
Bald eagle	*Haliaeetus leucocephalis*	Threatened
Southeastern snowy plover	*Charadirus alexandrinus*	Threatened
Peregrine falcon	*Falco peregrinus*	Endangered
Wood stork	*Myceteria americana*	Endangered
Southeastern American kestrel	*Falco sparverius parulus*	Endangered
Snowy egret*	*Egretta thula*	SSC
White ibis*	*Eudocimus albus*	SSC
Roseate spoonbill	*Ajaia ajaia*	SSC
Burrowing owl*	*Speotyto cunicularia*	SSC
Tri-colored heron	*Egretta tricolor*	SSC
Little blue heron*	*Egretta caerulea*	SSC
Brown pelican	*Pelicanus occidentlis*	SSC
American oystercatcher	*Haematopus palliatus*	SSC
Black skimmer	*Rynchops nigra*	SSC
Reddish Egret	*Haematopus palliatus*	SSC
Reptiles		
Gopher tortoise*	*Gopherus polythemus*	SSC
Mammals		
Florida mouse	*Podomys floridanus*	SSC
Shermans fox squirrel*	*Sciurus niger shermani*	SSC
Florida gopher frog	*Rana capito aeospus*	SSC
Fish		
Common snook	*Centropomis undecimalis*	SSC

SSC: Species of Special Concern
*Observed at the proposed reservoir site

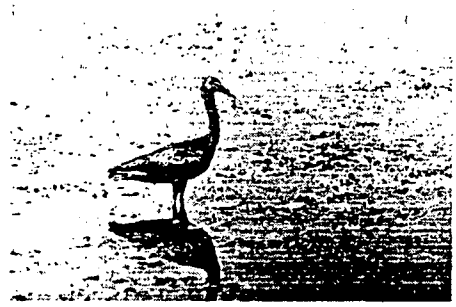
nest on gravel rooftops where they can be difficult to locate. Nesting colonies have been lost to development, chronic human disturbance, and occasionally to raccoon predation (Paul 1999).

Southeastern Snowy Plover. The southeastern snowy plover inhabits barrier beaches, particularly near passes and intertidal sand flats. They feed on marine worms and small crustaceans, by quickly running back and forth in the wash zone and probing their bills in the sand. This species nests in shallow depressions on salt flats or the open beach. Populations of the plover are declining due to nesting habitat loss and nest destruction on beaches. Several individuals exist in the Tampa Bay

region and are thought to be on the brink of local extinction (Paul 1999).

Peregrine Falcon. Peregrine falcons are large and powerfully built birds of prey with long, pointed wings typical of falcons. They are currently listed as endangered by the state of Florida (Meyer and Smallwood 1996). The peregrine falcon was delisted from the federal list on August 25, 1999 and is now in a five year monitoring program.

Peregrines are the largest falcon found in Florida, which is an important wintering area, especially for the Arctic subspecies. Migrant falcons can be seen in Florida after the first cold front and some remain all winter. Peregrines take a wide variety of bird prey, specializing on wetland species. Peregrine falcons are often observed along Florida's coasts including the Tampa Bay area, feeding on migrant shorebirds, but inland lakes and marshes also attract falcons (Kale and Maehr 1990).



White Ibis

Peregrines have been observed throughout Florida during the winter, but are encountered most often near the coasts. The destruction of habitat poses the greatest threat to the Peregrine falcon in Florida. Coastal wetlands, particularly important to the species, suffer the highest rates of development and urbanization (Rodgers, *et al.*1996).

Southeastern American Kestrel. The American kestrel is America's most numerous and smallest falcon. The southeastern American kestrel, a subspecies of the American kestrel, is a permanent, non-migrating resident in Florida. The population decline of the southeastern American kestrel appears to be due to loss of suitable nest sites and foraging habitat.

American kestrels are secondary cavity nesters often utilizing abandoned woodpecker nest cavities. They can also be found nesting in abandoned or occupied buildings that provide cover from predators and readily nest in man-made boxes within a variety of habitat types (Stys 1993).

In Florida, the southeastern American kestrel prefers open habitats including pastures, open longleaf pine-turkey oak sandhill communities, grasslands, and open sites within suburban and residential areas. The habitat must have open areas of short vegetation with scattered perch sites, an adequate prey base, and have suitable nest sites in close proximity to foraging areas.

The majority of prey items of the southeastern American kestrel are insects, small rodents, reptiles, and occasionally birds. Various prey capture techniques are employed by the kestrels, including perch hunting, flight hunting and hover hunting.

Pasture is the primary kestrel habitat on the proposed reservoir site. American kestrels were frequently observed within the proposed reservoir site and pipeline routes during the fall and winter months (HDR 2000). The first arrivals during the 1999 fall season were documented on October 22nd. No kestrels were

observed during the five-month period of April through August indicating that kestrels observed on the reservoir site during fall and winter months were migratory individuals and not the listed Florida subspecies.

Snowy Egret. Snowy egrets are common in Florida and are found mostly in fresh and saltwater marshes. Snowy egrets are very active foragers employing techniques such as walking, running, and hopping and use their feet to stir and probe the sediment in shallow water while searching for food. They eat shrimp, fish, crabs, amphibians, small snakes, worms, crayfish and insects (Kale and Maehr 1990). The snowy egret nests either singly, or in large or small colonies with other heron species located in shrub-covered wetlands or islands in lakes and coastal lagoons. Snowy egrets have been documented foraging in wetlands at the proposed site reservoir (HDR 2000) and about 800 to 1,000 pairs are censused annually in the Tampa Bay area. The population appears stable but has declined significantly since the early 1980s in the Tampa Bay area, and probably statewide (Paul, 1999).

White Ibis. White ibis occur along coastal and coastal-plain habitats from North Carolina through Texas, the West Indies, Central America and northern South America. In peninsular Florida, they normally occur in wetlands such as marshes, marsh prairies and mangrove swamps. White ibis feed in shallow fresh or salt water either alone or in flocks, probing the substrate with their bill. Forage includes crayfish, mudcrabs, frogs, and aquatic insects.

There are about 6,000 to 11,000 pairs of white ibis nesting in the Tampa Bay area. Annual numbers strongly reflect local wetland conditions. Although white ibis are Florida's most numerous wading birds, this species is believed to have declined by about two-thirds since the 1940s due to loss of wetlands and wet pastures. Despite these losses, the population at the mouth of the Alafia River remains one of the largest in the state (Paul 1999). White ibis have been observed foraging or resting on the proposed reservoir site (HDR 2000).

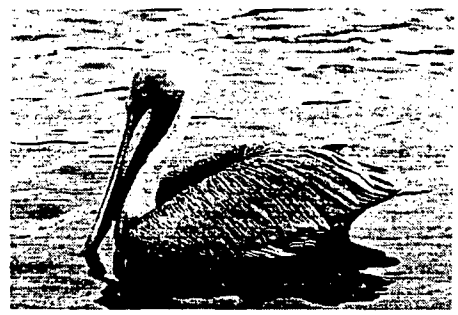
Roseate Spoonbill. Although the roseate spoonbill range has expanded, impacts to wetlands continue to threaten their feeding habitats. They are most often found in the mangrove and tidal marsh habitat. Forage includes small fish, crustaceans, mollusks, and aquatic insects. They feed by wading through shallow water, moving their partially open bills back in forth until finding prey (Paul 1999).

The roseate spoonbill was probably extirpated from the Tampa Bay area by 1900. The species was subjected to severe hunting pressures as their wings were used as ladies' fans. They were rediscovered nesting in the bay in 1975 and have shown a strong recovery during the 1990s. There are approximately 110 to 150 pairs in the Tampa Bay area, which represents about 15 percent of the state population.

Burrowing Owl. Burrowing owls live in open, treeless areas and roost and nest underground, typically in sandy soil. Burrows extend 4 to 8 feet underground with nests located at the end of the burrow. The burrowing owl spends most of its time on the ground near the

mouth of the burrow or perched on a nearby post. It is a small, mostly diurnal owl that averages nine inches in height and forages primarily on insects, lizards, frogs, snakes and rodents. Populations have decreased because of the loss of habitat.

One pair of burrowing owls has been observed on the proposed reservoir site but no quantitative surveys have been completed (HDR 2000). Extensive time on site provided some assurance that this is the only pair.



Brown Pelican

Tricolored Heron. Tricolored heron habitat includes fresh and saltwater marshes, shores, mudflats, and tidal creeks. They normally feed by wading in water and stalking prey that includes fish, amphibians, and insects. This species nests in large colonies, often with other heron species.

This medium-sized heron is still abundant through much of peninsular Florida (Kale and Maehr 1990). No tricolored herons were observed at the proposed reservoir site (HDR 2000), however, there are an estimated 500 to 700 breeding pairs censused annually in the Tampa Bay area. This population appears stable, but like other herons in Florida, tricolored heron numbers have declined significantly due to wetland habitat loss. (Paul 1999).

Little-Blue Heron. This medium-sized heron is widely distributed in Florida and utilizes a variety of nesting and feeding habitats. Although many nesting colonies occur on saltwater sites, little blue herons seem to prefer freshwater habitats for feeding. They can also be found foraging in mudflats, tidal shallows, salt marshes and southern wooded swamps. They feed while wading slowly through shallow water, searching for small fish, frogs, and invertebrates. The general downward population trend of this species is due to wetland habitat losses and possible competition with cattle egrets for nest sites (Kale and Maehr1990).

Nesting populations of the little blue heron in the Tampa Bay area appear to be stable at around 300 pairs. They nest and forage primarily in freshwater habitats and are vulnerable to continuing alteration of wetlands (Paul 1999). Little blue heron have been observed utilizing wetlands at the proposed reservoir site for resting and foraging (HDR 2000).

Brown Pelican. Brown pelicans prefer coastal habitats and nest colonial with up to several hundred birds in a rookery and usually on coastal mangrove islands. Loss of nesting habitat on coastal beaches threatens existing populations. This species breeds, roosts and feeds in flocks, often flying in line formations both high in the air and just above the water surface.

The brown pelican is perhaps Florida's most distinctive and widely recognized bird. They dive for fish from 20- to 30-feet heights, and can be seen flying to and from feeding grounds in loose V-formations. There have been 1,600 to

2,000 breeding pairs of brown pelicans censused in Florida since 1994. About 20 percent of the state breeding population occurs in the Tampa Bay area (Paul, 1999).

American Oystercatcher. The American oystercatcher is one of Florida's most unmistakable shorebirds. Strictly a coastal species, American oystercatcher populations have been declining for many years.

American oystercatchers nest on open beaches above the high-tide mark. Population numbers appear to have stabilized on some undisturbed Gulf coast beaches and islands, and on dredged material islands and shell bars along the Atlantic Intracoastal Waterway (Kale and Maehr 1990). American oystercatcher habitat includes mangroves, beaches, and tidal marshes (Paul, 1999). This species feeds primarily on oysters, but also a variety of other mollusks, crustaceans, and other invertebrates. The American oystercatcher population is stable and increasing. A minimum of 125 pairs or approximately 40 percent of the state population occurs in the Tampa Bay area.

Black Skimmer. Black skimmers are found along the entire Florida coast, nesting in large colonies, often with other tern species (Kale and Maehr 1990). Black skimmer habitat includes beaches and estuaries. Unique among birds, this species feeds by flying quickly over the water, skimming the water surface for fish with its elongated lower mandible, and snatching their fish or shrimp prey with a quick downward snap. Several birds can be seen feeding together in this manner.

There are about 600 to 700 pairs of black skimmers in the Tampa Bay area. Including another 300 pairs at colonies near Clearwater, 50 to 70 percent of the state population nests in the region (Paul, 1999).

Reddish Egret. The reddish egret is Florida's least common heron. Primarily a Gulf coast species, reddish egrets nest from Florida Bay north to Tampa Bay. The rate of recovery following protection from past plume hunting has been much slower than for other species (Kale and Maehr 1990). Reddish egrets are strictly a coastal species, often associated with mangroves. They are colonial nesters preferring coastal red mangrove islands. Their habitats include shorelines, tidal flats, and shallow pools. The reddish egret is a very active heron, using a variety of feeding techniques. Forage includes fish, frogs, and crustaceans.

Hunted for their nuptial plumes, the reddish egret was extirpated from Tampa Bay by 1900. They were found nesting again in 1974 and since that time, their numbers have increased to 60 to 75 pairs. This represents 15 percent to 20 percent of the state population (Paul 1999).

Gopher Tortoise. The gopher tortoise requires habitat that has well-drained sandy soils, abundant herbaceous ground cover for food, and a generally open canopy and sparse shrub cover, allowing sunlight to reach the ground floor. Gopher tortoises dig burrows that average approximately 15 feet in length and 6 to 7 feet in depth. Burrows provide protection from temperature extremes, desiccation, and predators and are essential to the survival of tortoises

throughout much of Florida (Cox *et al.* 1987).

Gopher tortoises burrows also serve as refuges for a variety of other animals including 39 invertebrate and 42 vertebrate species. Protected species that are linked with gopher tortoise burrows are the Eastern indigo snake, Florida mouse, gopher frog, and Florida pine snake.

One area of suitable gopher tortoise habitat, located outside of the north-west corner of the proposed reservoir site, was surveyed to quantify population densities. A total of 54 active and 16 inactive burrows were identified, giving an approximate density of 1.6 tortoises per acre (HDR 2000).

Gopher Tortoise

Florida Mouse. Similar to the gopher tortoise, the Florida mouse is dependent on xeric upland communities such as sand pine scrub, coastal scrub, scrubby flatwoods and longleaf pine-turkey oak sandhill. The mouse prefers deep, well-drained sandy soils, open tree cover, and sparse, patchy ground cover. This species is closely associated with gopher tortoise burrows, in high pine habitats with an open overstory of longleaf pine. In more scrubby habitats, the mouse is not as dependent on the use of burrows. Suitable habitat exists adjacent to the northwest corner of the proposed reservoir footprint (HDR 2000) and it is likely that the Florida mouse utilizes the gopher tortoise burrows on site.

Sherman Fox Squirrel. Fox squirrels feed mostly on pine seeds in the summer and on acorns during other times of the year. Breeding occurs in late winter and mid summer. Fox squirrels have two to four offspring per litter, and usually have one litter per year; however, under proper conditions they may have two litters. Sherman fox squirrel habitat on the proposed reservoir site includes oak-dominated fence lines, sparse oak woodland near Long Flat Creek, oak hammock, and cypress swamp The squirrels have been observed on the proposed reservoir site at several locations over the past two years. Although fox squirrels are widespread in Florida, they are listed as threatened (state list) and their distribution is patchy due to habitat loss.

Gopher Frog. The gopher frog is closely linked to the gopher tortoise, often using the tortoise burrow as a refuge. The gopher frog is generally nocturnal but occasionally emerges to sit near the mouth of its burrow on dark, damp days. Its diet consists mainly of invertebrates, frogs, and toads.

Most documented occurrences for the gopher frog have been within native, xeric uplands, particularly longleaf pine and turkey oak community associations. Unlike the gopher tortoise, the gopher frog appears to be absent from most coastal islands and dunes.

Surveys for the frog have not been conducted on the reservoir site, although suitable habitats exist (HDR 2000). The gopher frogs' preferred breeding habitat includes seasonally flooded, grassy ponds and cypress domes that lack fish populations.

Common Snook. Common snook have a wide tolerance to different salinity levels and are found in warm estuaries and adjacent rivers, and in nearshore waters of the tropical and sub-tropical western Atlantic. On Florida's West Coast, snook travel into estuarine and nearshore waters from April through September to spawn (FMRI 2000). Eggs and larval snook are found in estuarine passes and river mouths. Juveniles settle in warm, brackish, shallow riparian habitats including unvegetated bottoms and submerged mangrove prop-roots (Muller 2000). As they grow, snook move into seagrass meadows, mangrove fringes, and deeper estuarine waters.

Because of their complex life histories, long life span, and sensitivity to low water temperatures, snook can easily become overfished (Taylor 2000). This susceptibility to exploitation led the State of Florida to designate the common snook as a "species of special concern". Snook have been regulated in Florida since 1947, when snook haul seines were made illegal in Lee County. The latest regulations, established in 1999, limit anglers to no more than two snook per day, between 24 and 36 inches (maximum total length). Snook possession is illegal from December 15 to January 31 and in June and July.

Snook are well documented inhabitants of Tampa Bay, usually located among the mangroves, tidal marshes and non-vegetated subtidal areas of lower salinities (Comp 1985; Janicki *et al.* 1995) Snook are reported as utilizing Tampa Bay as a nursery habitat (Lewis and Estevez 1988) and are capable of moving far inland in the canals and rivers (HDR 1994; USDI 1990).

3.13 SOCIOECONOMIC CONDITIONS

The social and economic conditions of the region served by Tampa Bay Water as well as the need to reduce groundwater pumping are the factors ultimately responsible for the increase in demand for additional water supplies. The region of influence (ROI) that will be the focus of the socioeconomic study includes Tampa Bay Water's three-county service area made up of Hillsborough, Pasco, and Pinellas counties.

In the State of Florida, consideration must be made for the seasonal residents that may or may not be included in census figures. These seasonal residents are often referred to as "snowbirds" and are not reflected in the census figures for the state. A more detailed description of these seasonal residents and their effect on the population and regional economy will be presented at the end of this section.

Many factors combine to make up the socioeconomic character of a region. These factors vary from population growth rate to unemployment rate. The following sections present the existing socioeconomic makeup of the ROI followed by forecasts for the region.

3.13.1 Socioeconomic Portfolio for the Region of Influence. The socioeconomic portfolio of the ROI is distinctly different depending on which

of the three counties is being analyzed. The diversity of this ROI is similar to the composition of the State of Florida, which is composed of retirement, tourist, and farm counties.

Population. The counties of Hillsborough, Pasco, and Pinellas have experienced steady growth over the past 10 years. The population change from 1990-1999 in these counties averaged 11.2 percent which is 5.6 percent lower that the state average of 16.8 percent and 1.6 percent higher than the United States average of 9.6 percent. Pasco County experienced the most growth with a 17.6 percent increase in population and Pinellas County experienced the least amount of growth, averaging only 3.2 percent during the 10-year period. The estimated 1999 population for the ROI is 2,149,687. Table 3-4 summarizes the population of the region (US Census Bureau 1995).

In future years, population growth in the ROI is projected to be the lowest experienced since 1930. Even with the first of the baby boomers retirement in 2010, regional growth is not expected to reach previous highs due to the combination of out-migration of the same age group and the low birthrate (West 1999). The anticipated annual population growth from 1995-2010 for the ROI is protected as follows: Hillsborough County, 1.4 percent; Pasco County, 1.7 percent; and Pinellas County, 1.1 percent.

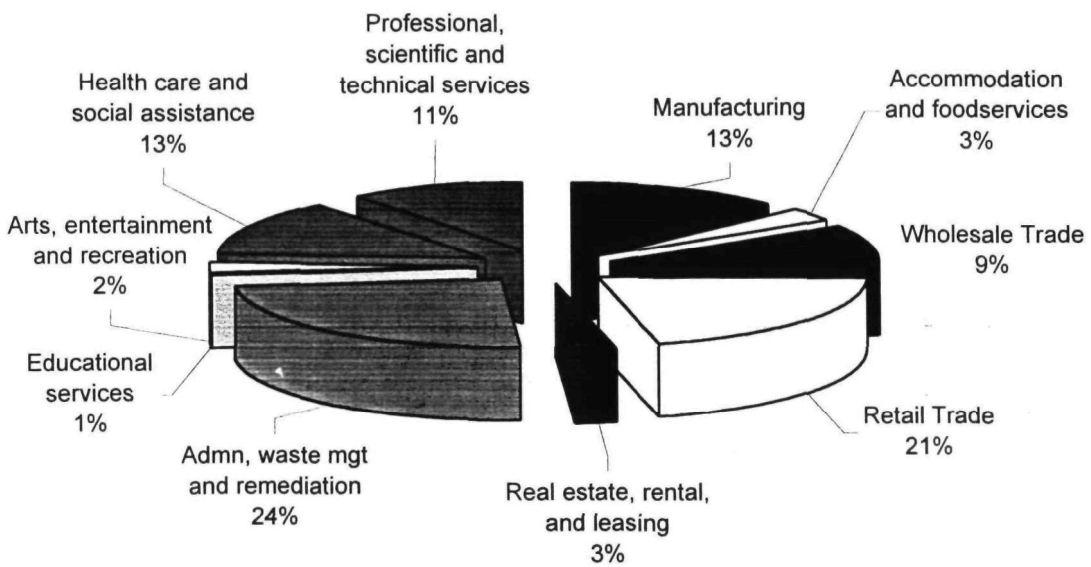
Housing. In 1990, the number of single-family homes in the ROI was 547,794 with a home ownership rate averaging 71.06 percent compared to the state ownership rate of 67.2 percent and the United States rate of 64.2 percent. The number of persons per household averaged 2.31 in the three-county area compared to the state average of 2.46 and the United States average of 2.63. The higher percentage of home ownership and lower percentage of persons per household can possibly be attributed to the fact that 28.1 percent of the population in the three-county area is 65 years old and older compared to the state level of 18.3 percent and the United States level of 12.7 percent (US Census Bureau 1995).

The number of building permits issued in 1999 for the ROI was 21,726. The highest number of permits issued was 14,665 in Hillsborough County and the lowest number was 3,237 in Pinellas County. In Florida, work began on more than 148,000 housing units in 1999. This was the biggest surge in home development in the past decade. This surge was centered in the construction of

Table 3-4. Population information for the Authority's member counties (US Census Bureau).

	Hillsborough County	Pasco County	Pinellas County
1999 estimated population	940,484	330,704	878,499
Percent change in population 1990-1999	12.8 percent	17.6 percent	3.2 percent

Figure 3-9. Economic Breakdown of ROI



A slower population growth is forecasted to lead to a smaller number of housing starts. The Bureau of Economic Business Research (BEBR) has forecasted 1.9 million housing starts from 1996-2010, down from the 1981-1995 number of 2.1 million. The forecast of long-term housing starts is derived from the existing housing start, vacancy rates, changes in the stock of mobile homes and the replacement of aged housing. Mobile homes are taken into consideration due to their prevalence throughout the state. Prior to Hurricane Andrew in 1992, the number of new housing starts has mirrored the number of mobile homes sold. Since 1992, the number of new mobile homes sold has been smaller than in previous years, but it is anticipated that the number of mobile homes will again increase within the next decade. The number of forecasted housing starts between 2001 and 2010 in the ROI is as follows: Hillsborough County – 81,200;

categories. In Pasco County, retail trade is the largest employer followed by health care and social assistance, accommodation, and food services (US Census Bureau 1995). Figure 3-9 illustrates the employment breakdown of the ROI as a whole.

Job growth rates for the State of Florida are expected to decline through the next decade. The BEBR has evaluated this forecasted decline and believes that it is due to the state having reached a full employment status. Forecasted growth will be due to the accumulation of employees and productivity increases. For each of the counties in the ROI, job growth rates have declined from the 1980-1995 forecast (West 1999). The job growth rate in a county typically mirrors its population growth rate. People are transient and move where the work is often commuting between counties and economic shocks. The forecast population growth rate for the

ROI from 1995-2010 has Pasco County with the highest forecasted annual job growth rate of 1.7 percent, followed by Hillsborough County at 1.4 percent, and Pinellas County at 0.5 percent.

It is anticipated that the declining job growth rate will also balance the personal income growth rate, which has been higher than the national average for the past few decades. Pasco and Hillsborough counties will experience income growth rates lower than what was experienced from 1980-1995, while Pinellas County is expected to experience a higher income growth rate. Pasco County again leads the ROI with an anticipated income growth rate of 4.0 percent followed by Hillsborough County at 3.3 percent and Pinellas County at 2.8 percent. The average income in 2010 in the counties is projected to be as follows: Hillsborough - $67,341, Pasco - $54,884, and Pinellas - $74,683. Pinellas County is the only county above the state's forecasted average of $69,766.

3.13.2 Seasonal Residents. In Section 3.7, mention was made of the seasonal residents. These temporary residents re-locate to the area during the winter months. Because official ties are often to other locations in other states, their population numbers do not show up in the State of Florida demographics. Not only are the populations not included on the Florida Census, they also do not show up as tourists at the state and national level due to the long length of their stay in the state. Approximately 857,500 seasonal residents reside in the state during the months from October to April. Of the individuals, 41.2 percent reside within the ROI and have an average stay of 5.9 months (Galvez 1997).

Telephone surveys of the seasonal residents have revealed the following statistics:

- 92.8 percent are white
- 66.7 percent are married
- 63.7 percent are college educated
- 61.0 percent do not participate in the labor force
- 66.4 percent are age 55 or older
- 32.3 percent are over the age of 70
- 71.0 percent are retired
- average income of snowbirds is 19 percent higher than the residents of Florida

For those snowbirds that are employed in the three-county area, most fill low paying laborer and clerical positions as well as positions that result from the presence of their fellow seasonal residents. The spending habits of these individuals differ from the full-time Florida residents. For example, seasonal residents often purchase very expensive homes that are expensively furnished. While the region benefits greatly from the seasonal residents, their lack of inclusion in the state demographics can present problems when planning for services such as ambulances, fire stations, and hospitals. At this point in time, the best method to estimate seasonal residents is through telephone interviews.

3.13.3 Public Services. Public services in the three-county area are categorized into transportation, law enforcement, healthcare, and education. The following sections provide brief descriptions of these services for the ROI.

Transportation. The ROI is served primarily by Interstates 75, 275 and 4 and U.S. Highway 301. The Tampa International Airport is the major airport serving the region. Smaller airports are also found in each of the counties and larger municipalities. The Seminole Gulf Railroad is the major rail carrier in the region for freight and Amtrak is the major passenger carrier. The Greyhound Bus Line is the major bus carrier.

Law Enforcement. Each county houses its own sheriff and associated staff. The crime rate in each of the counties is lower than the state average. The larger municipalities in the region maintain police departments which serve the area within the designated city limits.

Healthcare. Hillsborough County is home to three major hospitals, Pasco County has four large hospitals, and Pinellas County has five major hospitals.

Education. The three-county area is served by 228 elementary schools, 71 middle schools, and 44 high schools.

3.13.4 Environmental Justice. The purpose of an environmental justice analysis is to guarantee the fair environmental protection and treatment of all races, incomes, and cultures with respect to the development, implementation, and enforcement of environmental laws, regulations and policies. This analysis ensures that no person or groups of people experience a disproportionate share of the negative environmental impacts of a project. Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations" requires each Federal agency to identify and address such potential impacts of its programs, policies, and activities.

In accordance with EPA's guidelines, the following four questions must be addressed during an environmental justice analysis:

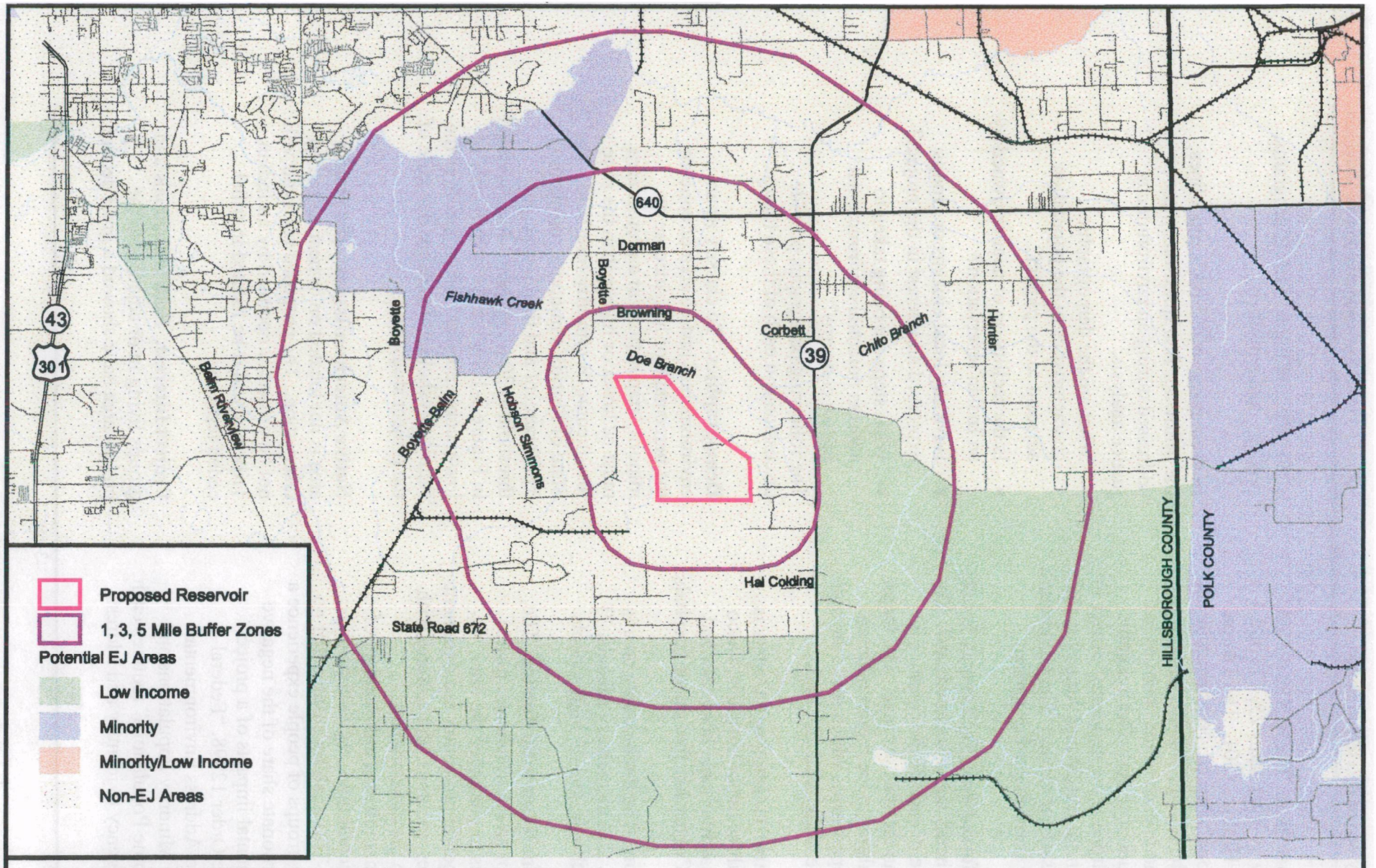
- What are the demographic characteristics of the population adjacent to the project?
- Is the facility on or near or owned by an Indian reservation?
- Have any local citizens or groups expressed an interest in the project?
- What steps are being taken to address potential environmental justice concerns?

The following paragraphs provide discussions on each of these topics.

Demographics. To classify as an environmental justice area of concern, the percentage of low-income or minority populations in a project area must be lower or higher than the state's low-income or minority threshold. The State of Florida's minority threshold is 31.99 percent and the low-income threshold is 30.01 percent. As illustrated in Figure 3-10, there are no minority or low-income populations greater than the state's threshold limit within one mile of the project study area.

Native American Issues. The project area is not located on or near an Indian reservation. The proposed reservoir will not be owned or operated by an Indian Tribe nor will it be located in tribal ceded territory.

Project Interest. Both individuals and groups living in or adjacent to the project area have showed a great deal of



Source: 1990 U.S. Census Population and Housing Sumary Tape File 3 (STF3) data.
Aggregated to Block group Level ~600-2000 People.

Figure Source: EPA Region 4, Environmental Accountability Division

Figure 3-10
TAMPA BAY REGIONAL RESERVOIR PROJECT DEIS

POTENTIAL ENVIRONMENTAL JUSTICE AREAS

Relative State Minority Threshold: 31.99%
Relative State Low Income Threshold (15K): 30.01%

interest in the Regional Reservoir Project. Most of the concerns raised during the preparation of the DEIS and the NEPA process relate to the construction and operation of the reservoir. These concerns have all been taken into account and are addressed in the appropriate sections of the DEIS.

3.14 VISUAL AND AESTHETIC CHARACTERISTICS

The primary determinants of visual character are topography, vegetation, and land use. Unique combinations of vegetation, topography, and manmade features create the aesthetic quality of the area.

Located in west-central Florida along the Gulf coast, the landscape of Hillsborough County is primarily composed of large, nearly level plains called flatwoods. The flatwoods rise gradually from the coast to more than 100 feet msl in the eastern part of the county. Along the coast, elevations range from sea level to approximately 144 feet.

The land use in the proposed reservoir area is primarily agricultural land, being used for row and citrus crops, livestock grazing, and improved pasture. Portions of the site were once part of a phosphorous mine that have since been reclaimed. Small ponds, one small manmade lake, and several small to medium sized streams are also present. Overall the land in the project area is flat, however the few high areas that are present do provide a long range panorama of the landscape. Physical features of the area, such as wetlands, ponds and wooded areas, are generally considered to be visually pleasing.

The proposed pipeline route is primarily located in disturbed right-of-ways along existing roadways such as Boyette Road. The land use along the alignment includes improved pasture, upland forest, and agricultural cropland. Very few wetlands are present along the proposed route and those that are in the area have been considered. Several rural residences are traversed and the entrance to one Girl Scout camp property is crossed. No major streams or rivers are crossed. Electrical transmission and distribution lines and communication towers are also present along the route.

3.15 CULTURAL RESOURCES

The cultural resources of a given area are often described from a prehistoric and historic context. The discussions that follow present the cultural perspectives of the Regional Reservoir Project using these separations.

Prehistoric Background. The project area is located in the Central Peninsular Gulf Coast archaeological region, which extends from just north of Tampa Bay southward to the northern portion of Charlotte Harbor (Milanich and Fairbanks 1980; Milanich 1994). Within this zone, archaeologists have defined the Paleo-Indian, Archaic, Transitional, Woodlands, and Mississippian stages on the basis of unique sets of material culture traits such as characteristic stone tool forms and ceramics as well as subsistence, settlement, and burial patterns.

The Paleo-Indian stage identifies the earliest evidence of human culture in Florida, dating from about 12,000 BC to 7500 BC. During this time period, Florida was in a cooler and drier climate. Sea level was approximately 130-165

feet below today's modern levels. A xerophytic environment was typical with scrub oaks, pine, open grassy prairies, and savannas the most common vegetation types. Inland water sources were in shorter supply, and this lack of water led to the so-called Oasis hypothesis, a supposition that localized watering holes determined the patterning of Paleoindian presence in prehistoric Florida.

In Hillsborough County, the evidence for Paleo-Indian occupation is abundant. Lanceolate-shaped projectile points are often found in dredged spoils from beneath Tampa Bay, indicating that Paleoindian sites might now lie submerged by higher sea levels that have been present since the late Pleistocene (Austin 2000). The Harney Flats site, excavated in 1980, is a regional example of a large terrestrial Paleoindian habitation site. Tools such as scrapers, adzes, and spokeshaves have been found at this site along the Hillsborough River drainage. Sites such as these have yielded information about both the manufacturing processes of this period as well as the stylistic transitional from Paleo-Indian to Archaic points.

The Late Paleo-Indian periods indicated a trend toward a wetter climate. With the probable expansion of water sources, the Paleoindian hunters expanded their strategies to include greater portions of the state. This transition resulted in the loss of large lanceolate points such as the Suwannee and Simpson points, and the incorporation of smaller points including the Tallahassee, Santa Fe, and Beaver Lake types. Important sites for Late Paleo-Indian presence are found in lithic scatters from Boca Ciega Bay near St. Petersburg, and Deerstand site in the Hillsborough River drainage. Following the end of the Ice Ages, the Pliestocene megafauna gradually died out, forcing the use of smaller game and other food sources by the aboriginal peoples of Florida. This climatic change is reflected in the cultural aspects of the Archaic period (Almy *et al* 1998).

Milanich (Milanich and Fairbanks 1980; Milanich 1994) has divided the Archaic time period into three periods: Early, Middle, and Late Archaic. Early Archaic cultures appear to overlap with the Paleoindian period cultures, but are documented as attaining unique identity in Florida approximately 6500 to 5000 BC. The archaeological record is usually interpreted as indicating an expansion of the tools from Paleoindian sources. Specialized stone tools developed as well as tools to perform multiple tasks. Many well preserved bone artifacts and wooden tools have been recovered from the sites of Little Salt Springs in Sarasota County and Windover Pond in Brevard County. The Early Archaic populations are known to have established camps near water sources, especially small seasonal campsites.

These Early Archaic cultures are assumed to have adapted from the nomadic lifestyle of the Paleo-Indian period to a more settled coastal and riverine-associated with the Middle Archaic period. This period lasted from approximately 5000 to 1000 BC. A shift from a dispersed settlement pattern to a system of base camps has been hypothesized (Bullen *et al* 1959). Artifacts associated with this period include broad-bladed, stemmed projectile points such as the Newnan, Marion, and Putnam types.

The major sites contributing to knowledge about the Middle Archaic period are the Deerstand and Wetherington Island Sites in Hillsborough County, four lithic scatter sites on the CF Industries property in Hardee County, and the Republic Groves Site southeast of Zolfo Springs in Hardee County, along with the previously mentioned Little Salt Springs site in Sarasota County. Quarry sites, such as the Wetherington Island Site in northeast Hillsborough County represent quarry sites where chert was mined and roughly shaped before being taken to other locations for tool making (Chance 1981). The Republic Grove Site (Wharton et al. 1981), and the Little Salt Springs Site (Clausen et al. 1979) include human interments, artifacts and tools. These sites contain representations of wetland burials, which have preserved human tissues in peat remarkably well. These sites have the potential to provide extraordinary information about native peoples in Florida.

During the Late Archaic, approximately 3000 to 1200 BC, prehistoric human settlements adapted to specific environmental zones. This period marked the arrival of essentially modern climatic conditions. An increased use of coastal resources is found in archaeological records for shell midden sites, such as the one adjacent to Sarasota Bay (Bullen and Bullen 1976). The increasing reliance on coastal resources has resulted in the presence of many Late Archaic middens across the Florida coast. Many of these sites may have been already destroyed due to the practice of utilizing shell middens to provide road materials for towns like Bradenton and Tampa. The remaining identified sites are located in Tampa Bay and Hillsborough County such as the Culbreath, Apollo Beach sites, and the Canton Street site in St. Petersburg. Other regional examples include the Palmer Site in Sarasota County, and Useppa Island Archaic site in the mouth of Charlotte Harbor (Almy and Hutchinson 1998).

The Late Archaic Period also marks the appearance of ceramic shards of pottery. For this reason, the period is sometimes called the Ceramic Period, or the Orange Period in Peninsular Florida. The early pottery was fiber-tempered ware, dating back to approximately 2000-1650 BC. More recent pottery was decorated with geometric designs and punctuation. These features now serve as the method used to distinguish earlier and later sites within the 2000-1000 BC period.

The later cultures of Florida all incorporated ceramics in their lifestyle, which has become an important tool today as chronological markers of specific periods. The Transitional stage bridged the time between the Archaic and the Woodland stages, and was associated with limited horticulture. Although still referred to in the literature, the Transitional period is no longer considered a distinct viable period as new and better data from all parts of the state are collected and recorded. Evidence points to regional interaction with other cultures such as the Poverty Point complex of the lower Mississippi valley. The Canton Street site in St. Petersburg, for example, shows evidence of the gradual introduction of pottery manufacturing methods typical of the Transitional period.

The Woodlands stage is known throughout the central peninsular Gulf Coast regions as the Manasota culture period (ca. 500 BC to AD 300). These sites were characterized as economy sites based on fishing, hunting, and shellfish gathering (Almy *et al* 1979). Ceramics were limited to sand-tempered undecorated pottery and little use of stone tools have been found. Shell tools and bone tools were increasingly preferred. Most of these sites are identified by the presence of coastal shell middens, usually linear deposits parallel to the shoreline, sometimes forming undulating swales or possessing shell ramps (Milanich 1994). Burial mound customs, artifacts of trade and economy, and settlement patterns suggest a complex social and religious organization from this period. Some use of horticulture in the larger settlements may be indicative of larger populations and a more sedentary lifestyle.

Tampa Bay may have provided an ideal setting for the Manasota cultures due to its vast resources describing the setting:

A large inlet that offers numerous estuaries and in the past extensive marsh and mangrove stands...a giant food basket of fish and shellfish that could support relatively large pre-Columbian populations...[where they] could take advantage not only of marine resources but of the resources of the wooded locals and the inland rivers and wetlands.

Regional sites have been identified from the Late Manasota/Early Wheeden Island cultural stages at Stanley Mound in Manatee County and Sarasota County Mound (Bullen 1971). These sites have been valuable in providing information about tools, burial customs, and other subsistence patterns for the region.

The final prehistoric Mississippian cultural stage is known as the Safety Harbor period, named after the type-site in Tampa Bay, Pinellas County. Spanish contact is known from several sites of this stage. Recovered artifacts provide evidence this culture continued to occupy its traditional region into colonial times. Large towns with temple mounds, plazas, middens and burial mounds characterized this period. Most major sites were located along the shore, often over the top of Manasota sites. Evidence also exists for the use of maize (Almy *et al* 1981).

The Timucuan Indians are recognized as the primary constituents of the Safety Harbor period. Large populations were located at Safety Harbor, Miximo Point, Narvaes Midden, and Tierra Verde, all in Pinellas County. Inland sites include Parrish Mounds in Manatee County, the Davis Mound in Hardee County, and the Arcadia Site and Keen Mound in Desoto County. A burial site located on the Myakka River, outside of the project area for the alternatives remaining under consideration, may have a Safety Harbor Component.

Historic Background. With the Spanish Crown's explorations into Florida came disease and repeated conflict. Panfilo de Narvaez landed south of Tampa Bay in 1528, traveling inland and then north to the Apalachee Bay region (Milanich and Hudson 1993). Hernando de Soto also landed on the west coast of Florida, in Tampa Bay near the mouth of the Little Manatee River. DeSoto and some of his men left the Tampa Bay camp and headed northeast,

crossing what is now known as the Alafia River (River of Mocoso). Archaeological sites associated with the DeSoto expedition have been located in Hillsborough County, however these sites are outside of the project alternatives remaining under consideration. After the first half of the 18th century, native Indian populations had been largely wiped out. Florida's historic period began with the occupation of Spain from 1565 to 1763. No permanent settlements were established in the project region.

The State of Florida was ceded to England in 1763, until the Treaty of Paris returned Florida to Spain. Loose associations between portions of the Creek Nation and other Indian groups from Alabama, Georgia and South Carolina were pushed into Florida by American colonization prior to the settlement of Florida. The emigrated groups became known as the Seminole Indians, and at times formed confederations against the American advance. Seminole Indians began moving into the Tampa Bay area in the early 18th century.

Bloody conflict marked the contact between the fledgling Americans and the Seminoles. By 1818, these skirmishes had developed into the First Seminole War. The Seminoles relinquished their claims to the peninsula of Florida with the Treaty of Moultrie Creek in 1823 and were relocated to areas near Ocala and north of Charlotte Harbor. After this war, Florida officially became a United States Territory in 1821. A second Seminole Indian revolt occurred in 1835 and became known as with the Second Seminole War. This conflict lasted until 1842 when the federal government withdrew its troops from Florida. With military installations Fort Chokonikla, Fort Hartsuff, and Fort Green in Manatee County to protect residents from continued minor skirmishes, the Seminoles were pushed further to the south into the Everglades and Big Cypress Swamp. Fighting erupted once again with the Third Seminole War, also known as the Billy Bowlegs War. Ending in 1856, the Seminole warriors were persuaded to move west.
In 1845, Florida was admitted to the Union with Tallahassee as the state capital. Manatee County was created in 1855 from portions of Hillsborough and Dade counties. Cattle ranching was one of the first economic activities undertaken in Manatee County. By the late 1850's, cattle were a significant portion of southwest Florida's economy. Tampa and Punta Rassa, south of Fort Meyers became major shipping ports for cattle. During this period in Florida's history, cattle barons and "crackers" became participants in society. Don Vicente Martinez Ybor moved his cigar factory from Key West to the outskirts of Tampa in 1886. The historic district today is still a commerce district, catering to nighttime revelry and entertainment.

Florida seceded from the Union in 1861 as a prelude to the Civil War. Florida became a major supplier of beef to the Confederate Army during this time. Development of the State was slow until the end of the Civil War allowed the railroad to arrive in the 1880's. Phosphate was discovered in the late 1880's while surveying the Peace River. Florida's phosphate industry went through three periods of development, bringing corresponding increases in population. Agriculture became an

important part of Florida's economy and is today second only to tourism as an economic anchor.

The stories of several historic communities including Boyette to the west, Lithia to the north, and Picnic to the south of the proposed regional reservoir have been summarized. Along the western end of the pipeline corridor are Riverview and the historic community of Bell Shoals. Boyette was originally known as Fish Hawk, later renamed for Thomas Boyette in 1902. Lithia's first white settlers came to the area before the Civil War. Occupied also around this time was the settlement of Hurrah, later renamed to Picnic. Dating back to the 1840's Peru was one of Hillsborough County's earliest settlements; the town was situated on the south side of the Alafia River near the intersection of U.S. 301 and Balm-Riverview Road. However, Riverview eclipsed, and eventually consumed Peru during the 20th century. With the discovery of phosphate in the region, people flooded into Riverview. Later, Riverview developed into a haven from urban Tampa where people grew citrus and raised cattle.

3.16 RECREATION

Hillsborough, Pasco, and Pinellas counties contain many significant natural resources that are developed and used to satisfy the public's recreation demands. In the project area, the Alafia River, Hillsborough River, Tampa Bypass Canal, and Tampa Bay provide a variety of recreational opportunities. These activities include fishing, canoeing and boating, youth sports, walking and jogging trails, bicycling, and others. Recreational opportunities of almost every type are available on lands administered by various federal and state agencies in the project area.

In considering the opportunities for recreational and educational use of the Tampa Bay Regional Reservoir and surrounding area, Tampa Bay Water consulted with residents, recreation users, recreation experts, and environmental experts to determine the best recreation opportunities while preserving the existing conditions of the area. A conceptual recreation plan for the regional reservoir and surrounding lands were developed (Wade-Trim 2000). Three different recreation plans were developed that reflect a variety of recreational opportunities for the area. These plans are described as follows:

- Level 1 – focuses on water-related recreational uses such as canoeing and fishing as well as trail systems. The Level One plan has primarily passive recreation uses.
- Level 2 – has extensive boating and fishing opportunities plus primitive camping, horseback riding and an equestrian center. A golf course is also featured.
- Level 3 – has the most complete offering of recreational opportunities, featuring all of the uses proposed in the previous two plans, plus an expanded equestrian center, a sporting clays and paintball complex, an expanded environmental education center, a sports complex and recreational vehicle camping.

In August 2000, Tampa Bay Water presented the conceptual recreation plan through a mailer to 1,400 people living in the area and asked for their input. The mailing list included property owners near the regional reservoir, people who

have expressed an interest in the project, as well as a number of recreational and environmental groups. A short survey was included in the mailing that addressed which recreation uses were favored, what level of development they felt was appropriate, what concerns they had about the conceptual recreation plan, and what might be done to mitigate those concerns.

A total of 115 questionnaires (8 percent response rate) were returned from the 1,400 persons contacted. Results of the survey indicated most respondents were interested in canoeing, hiking and biking trails, interpretive nature trails, fishing, an environmental education center and primitive camping. Overall, the respondents seemed to prefer a less intensive type of recreational development and more passive activities. The plan preferred by the respondents (about 42 percent) was the Level 1 plan, although 38 percent indicated preference for the Level 2 plan.

At this point, there is no definite commitment to incorporate recreational uses at the Tampa Bay Regional Reservoir. Further development of a recreational plan would include identification of potential funding sources and facilities management alternatives for the uses favored by the public in the survey. Any recreational activities would be compatible with the reservoir's primary purpose and consistent with the needs to protect water quality, manage water levels, and maintain security. However, the reservoir would be suitable for recreation in the context of a large man-made lake, and at least some of the surrounding property that would be in public ownership could be used for land-based activities.

3.17 RISK ANALYSIS AND IMPACT TO THE HUMAN COMMUNITY

Throughout the siting and design of the Tampa Bay Regional Reservoir, safety has been and will continue to be a primary consideration. The consideration of safety and risk began with the initial site selection process and continued through the geotechnical site characterization. Several layers of analysis were included in the geotechnical investigation, each of which built on the previous layer and further refined the study. These layers included a historical site analysis, a geophysical investigation using ground penetrating radar, seismic reflection and refraction, and a geotechnical analysis.

A detailed stability analysis was conducted on an embankment with the proposed dimensions of the Tampa Bay Regional Reservoir. While the embankment was found to be stable on its own and met all applicable standards, other design features were incorporated to further increase the factor of safety of the embankment. These features include a geomembrane liner on the interior face of the embankment to reduce seepage, soil cement on the interior embankment facing to reduce potential erosion of the embankment, and a drain system on the exterior of the embankment to collect seepage. The resulting factors of safety under all conditions referenced in the design standards are greater than required (HDR 2000).

During design, the potential impact of large storm events and the wind and rain associated with those storms were also

evaluated. The design of the reservoir includes 8.5 feet of freeboard, which is the difference between the maximum operating water surface elevation and the embankment crest elevation. This freeboard will allow for maximum rainfall of 40 inches (3.3 feet) and 5.2 feet of wave run-up and storm surge. The 5.2 feet of freeboard for wave run-up and storm surge accounts for sustained winds of 110 miles per hour.

Even though safety has been considered in all aspects of reservoir design from project planning to operation, an emergency action plan (EAP) has been prepared. The EAP was prepared using the guidelines established by the Federal Emergency Management Agency (FEMA) (HDR 2000).

The EAP is a formal document that identifies potential emergency conditions at the Tampa Bay Regional Reservoir and specifies preplanned actions to be followed to avoid or minimize impacts. The EAP specifies actions that will be taken to moderate or alleviate the problems and contains procedures and information to assist personnel in issuing early warning and notification messages to responsible emergency management authorities of any emergency situations.

Emergency Detection and Evaluation. The EAP provides a discussion of the procedures for the timely and reliable detection, evaluation, and classification of an existing or potential emergency condition. It also establishes procedures for determining the classification of an emergency condition, based on the severity or urgency of the situation. Based on FEMA guidelines, four emergency conditions have been identified.

- Embankment Advisory Condition. A situation where an unusual problem or situation has occurred, but failure of the embankment is not imminent.
- Embankment Warning Condition. A situation where any developing or occurring event or circumstance could potentially adversely affect the integrity of the embankment, but is considered controllable.
- Embankment Emergency Condition. A situation where rapid deterioration is occurring or available freeboard has been reduced to the point where sufficient freeboard does not exist to contain the anticipated rainfall and wave run-up from an approaching hurricane.
- Embankment Breach Condition. Defined as the dislocation or failure of any structure that allows for an expanding, uncontrollable discharge of water through the embankment indicating a breach is occurring.

Emergency Notification. In the event of an emergency at the regional reservoir, Tampa Bay Water would be responsible for notifying both the Hillsborough County Emergency Management Department (HCEMD) and the State Dam Safety Officer at the Bureau of Mine Reclamation for the FDEP. Once an emergency condition is identified, the HCEMD is contacted. This allows the HCEMD to coordinate with both their Emergency Dispatch Operations and Emergency Management Office.

General Responsibilities under the Emergency Action Plan. The EAP also

establishes the responsibilities of Tampa Bay Water, as the facility owner, and the local and state emergency management agencies, as the entities with the statutory obligation for warning and evacuating the public within the potentially affected areas (HDR 2000). These specific responsibilities by agency are:

Tampa Bay Water

- Identification of the Emergency Condition
- Notification of the Hillsborough County Emergency Management Department and the FDEP State Dam Safety Officer
- Implementation and direction of emergency repairs
- Update the emergency status to the appropriate Hillsborough County Agency and the State Dam Safety Officer
- Provisions for security measures at the facility
- Evacuation of the Tampa Bay Regional Reservoir site itself in the event of an emergency condition
- Provision of technical assistance to local and state emergency management agencies, when necessary
- Reporting termination of emergency situation on-site at the facility

Hillsborough County Emergency Management Department

- Coordinate with both the Emergency Dispatch Operations and the Emergency Management Office. Coordinating the County's response at the County's Emergency Operations Center.
- Responsible for orchestrating response and recovery actions in the aftermath of a disaster.
- Dispatch center for 911 calls requesting police, fire, or medical assistance and dispatching the appropriate rescue units.

Florida Department of Community Affairs, Division of Emergency Management

- Control and coordination of with Public Law in accordance with all emergency action.
- Provide assistance to Hillsborough County when it is requested and is beyond Hillsborough County capabilities.
- If necessary, notification of other appropriate state agencies.
- Review and testing of the emergency notification process.
- Request of Federal Aid if applicable.

Florida Department of Environmental Protection, Bureau of Mine Reclamation, State Dam Safety Officer

- Provide technical assistance to Tampa Bay Water.
- Assist in the evaluation and assessment of potential emergency conditions.
- Implement their authority to direct Tampa Bay Water to take any necessary, reasonable safety measures.

Termination and Recovery of an Emergency. For an emergency situation to be terminated there has to be an agreement between Tampa Bay Water and Hillsborough County as to when it is appropriate to terminate the emergency condition. Upon inspection of the facility, it is Tampa Bay Water's responsibility to make the decision when the facility is safe and the emergency condition can be terminated. It is then

Hillsborough County's responsibility to terminate off-site evacuation and emergency response activities. Upon termination of the emergency, a news release would be issued by Tampa Bay Water to the local media for broadcast to the general public. At this time, the County would begin evaluating the overall emergency response and prepare a report documenting the emergency procedures. The purpose of the report is to help identify any deficiencies in the Emergency Action Plan that could include procedure, manpower, materials, or equipment used during the emergency.

Once the emergency is terminated, recovery actions are taken to demobilize and return to the pre-emergency conditions of the facility. Tampa Bay Water is responsible for securing the site, taking necessary actions of restoring the basic facility service, and assessing the damage. As with the termination phase, off-site recovery actions are the responsibility of Hillsborough County.

Preparedness. The EAP describes preparedness actions to be taken by Tampa Bay Water prior to and following the onset of an emergency. This includes the installation of equipment or the establishment of procedures to:

- Prevent emergency conditions from developing and warning of the onset of an emergency condition.
- Facilitate the operation of the facility in an emergency condition.
- Minimize the extent of damage resulting from any emergency situation.

The preparedness section of the EAP describes the procedures such as surveillance, instrumentation, and inspection schedules. An extensive surveillance program has been designed for the Tampa Bay Regional Reservoir, which include instrumentation and alarms for detecting water levels and instrumentation for evaluating embankment performance. An inspection program has been developed for the Tampa Bay Regional Reservoir and includes various types of inspections. These include an annual third-party and weekly inspections, and informal observations by project personnel as they operate the reservoir. Inundation maps will also be used to assist in notification and evacuation of the public in the event of an emergency at the Tampa Bay Regional Reservoir.

CHAPTER 4

ENVIRONMENTAL CONSEQUENCES

4.1 INTRODUCTION

Chapter 4, Environmental Consequences, discusses the adverse and positive impacts associated with development of the two action alternatives carried forward in the Tampa Bay Regional Reservoir Project DEIS and how the significant adverse impacts resulting from implementation of either of the two action alternatives would be mitigated. The two action alternatives considered are:

- 1,100-Acre Tampa Bay Regional Reservoir Project
- 1,100-Acre Tampa Bay Regional Reservoir Project and an 18-mgd ASR System

These two water storage/supply alternatives along with the No Federal Action alternative (see Chapter 2) are compared in the following sections. The impacts addressed include those to both the existing natural resources and the existing human environment. The descriptions of mitigation measures contained in these discussions are intended as brief summaries. A summary of the proposed mitigation plan has been developed and is included as Appendix B.

According to Tampa Bay Water, the addition of an 18-mgd ASR system as a component with the 1,100-acre regional reservoir would enhance the overall surface water supply system by increasing its reliability. However, the time interval required to develop an operational ASR system is about 10 years. Therefore, the inclusion of an ASR component with the 1,100-acre reservoir does not satisfy the need to develop an operational water supply by the year 2007. All of the technical aspects of the development and operation of an ASR system have not been addressed in this DEIS. As a result, Tampa Bay Water may want to further evaluate the effects of adding an ASR system to the existing 1,100-acre reservoir at some point in the future.

As stated in Chapter 2, the Tampa Bay Regional Reservoir Project is Tampa Bay Waters' preferred alternative. To compare viable alternatives in this DEIS, it was necessary to consider that No Federal Action equated to no reservoir. However, absent $12,615,000 in federal funds, nothing in this DEIS would prevent Tampa Bay Water from building the 1,100-acre reservoir and connecting transmission pipeline.

If the Tampa Bay Regional Reservoir were not built, Tampa Bay Water has demonstrated that it would not meet the tri-county area potable water demands under the commitments and obligations of the Interlocal and Partnership agreements nor would it meet the cumulative water supply needs predicted to occur by the year 2007. A 25-mgd deficit in water need would result.

Tampa Bay Water and SWFWMD have agreed to a Consolidated Water Use Permit that reduces Tampa Bay Water's current groundwater withdrawals of 158 mgd to 120 mgd by December 2002, and to 90 mgd by December 2007. Exceeding permitted withdrawal quantities in the Consolidated Water Use

Permit could result in loss of funding committed by SWFWMD to Tampa Bay Water through the Partnership Agreement. In addition, groundwater pumpage above permitted levels would continue, resulting in an increase in environmental impacts to wetlands and lakes.

The natural resources evaluated in this chapter include land, water, air, vegetation communities, wildlife, and threatened and endangered species. The human resources examined are population, land use and ownership, employment, economics, recreation, cultural resources, and aesthetics. The methodology for determining impacts to these resources and the criteria for evaluating the significance of these impacts are described. The impacts are further categorized and, for potentially significant impacts, mitigation measures are proposed.

4.2 GENERAL SETTING

The general setting of an area is a function of its geographic location, topography, climate, and land cover. Locations can not be changed by human activity, although the selection of alternatives in different locations could result in different types and levels of impact to the general setting. Climate can only be changed by human activity on a massive scale. Topography could be altered or modified by human activities conducted on a local scale. However, extensive measures would normally be required to significantly change the overall topography of an area.

Methodologies and Significance Criteria. Site visits and best professional judgement was used to gauge the effects the alternatives would have on location, topography, climate, and land cover. Impacts to the general setting of the project area would be significant if they resulted in a dramatic change in the overall character of the area.

4.2.1 Action Alternatives. Both of the action alternatives would alter a specific portion of the existing project area through the construction and operation and maintenance of the embankment, transmission main, and reservoir. Changes to the general setting of the local area would be limited to the lands temporarily disturbed or permanently modified by construction or operation and maintenance. No changes in climatic conditions would result.

Changes in the local topography would result from the construction of the reservoir embankments, which are proposed to be 65 feet at the highest point. All borrow material required to construct the embankments would come from the reservoir interior. No significant changes in area topography, other than the embankments, would result.

4.2.2 No Federal Action. The No Federal Action alternative would not change the climate, topography, or land cover of the local area since no construction or operation and maintenance activities would occur. Land use changes currently on-going with local area development would continue unabated. With the exception of land development, the No Federal Action would not significantly impact the general setting of the area.

4.2.3 Mitigation. Planned mitigation areas located outside of the embankment

and reservoir area would be shaped and vegetated after construction to mitigate for wetland impacts that are expected due to the construction of the project.

4.3 HYDROLOGY

Methodology and Significance Criteria. The following local and regional hydrogeology information of the site and surrounding area was reviewed.

- Hydrology of the Floridan Aquifer System in West-Central Florida, 1985;
- Ground-Water Resource Availability Inventory: Hillsborough County, Florida, 1988;
- The Geology of Florida, 1997;
- U.S. Geological Survey (USGS) 7.5 minute series topographic map, Lithia, Florida Quadrangle, 1955, and 1972;
- U.S. Geological Survey (USGS) 7.5 minute series topographic map, Lithia, Florida Quadrangle, 1955, and 1987;
- USDA Soil Surveys of Hillsborough County, Florida, 1958 and 1989.

4.3.1 Surficial and Subsurface Soil Conditions. The 1989 U.S. Department of Agriculture (USDA) Soil Conservation Service (SCS) soil survey for Hillsborough County, Florida defines nine dominant soil types characteristic of the proposed reservoir property and the immediate vicinity. Sandy soil types dominate the northern portion of the site and the southern half is dominated by soils typical of those found in reclaimed strip mine areas. Prior to mining, several discontinuous, low, wet areas were located within the southern portion of the site. Some of these depressional areas were mapped by the 1958 USDA soil survey as containing organic bearing soils.

4.3.2 Surface Drainage. Based on nearby drainage basin features and ground surface elevations, the apparent surficial groundwater flow direction and unchanneled surface-water runoff direction is to the northwest on an regional basis. The regional reservoir site is bounded by Doe Branch to the northeast and Long Flat Creek to the west. These creeks drain to the northwest into Chapman Hammock and Cabbage Hammock, respectively. These areas eventually drain into Fishhawk Creek and the Alafia River.

4.3.3 Mining and Reclamation History. The approximate southern one-third of the proposed site was previously disturbed and mined for phosphate ore. The mining was done using surface excavating equipment that first removed the overburden materials, then the phosphate bearing ore or "matrix". Agrico Chemical Company (Agrico) did the mining from the 1940s through the 1960s. The area was known as the Boyette Mine. After mining, the disturbed land areas were incorporated into a series of waste clay disposal ponds that were active in the 1950s and 1960s. Reclamation activities began in the mid-1970s and were generally finished by the late 1980s.

The year that clearing and mining by Agrico commenced is not exactly known; however, historical aerial photographs and records indicate that it was about 1945. Mining activities at the Boyette Mine continued until about 1966. Agrico sold some of the mined land in the late 1960s and early 1970s. The mined area that is included in the

reservoir footprint was sold to Amos Adams in 1969 and later to Dr. J. C. Pruitt. After areas were mined, they were re-shaped to act as disposal or settling areas for waste phosphatic clays. Reclamation of these areas was done as part of the State's Nonmandatory or "Old Lands" Reclamation Rules, administered by the State of Florida Department of Environmental Protection (FDEP), Bureau of Mine Reclamation, (FAC Rule 62C-17). This reclamation work was done for Dr. J. C. Pruitt in the early to mid-1980s.

The sand tailings from the mining operation appear to have been deposited in areas south of the proposed reservoir area. The sand tailing area, south of the reservoir project area is one-quarter circular in shape and extended to an elevation of about +150 feet NGVD, which is its current maximum elevation.

4.3.4 Action Alternatives. Construction and operation of either alternative would not significantly impact the hydrology of the proposed site. The site would still be drained by Doe Branch to the northeast and Long Flat Creek to the west. These creeks drain to the northwest into Chapman Hammock and Cabbage Hammock, respectively.

4.3.5 No Federal Action. The No Federal Action alternative does not include development of either alternative and therefore would not alter the existing hydrology.

4.3.6 Mitigation. No mitigation is proposed for this portion of the project. Potential impacts to the hydrology of the proposed reservoir would be modest.

4.4 GEOLOGICAL, HYDROGEOLOGICAL, AND GEOPHYSICAL INVESTIGATION

This section describes the geology and hydrogeology of the site, including an analysis of the potential for sinkhole development. Construction of the proposed reservoir requires characterization of the materials upon which it would be built. It is important to understand the potential for leakage from the reservoir and for development of sinkholes, which are common features in parts of west central Florida. It is also important to delineate the availability and distribution of geologic materials that may be useful in construction of the reservoir or that may interfere with its construction or function.

Methodology and Significance Criteria. Geological investigations were undertaken to develop information on the surface and subsurface geologic materials for the proposed reservoir site characterization. Geologic investigations necessary to support detailed geologic design of the alternatives included a photolineament analysis, ground penetrating radar, seismic reflection and refraction, drillings, test pits, pedestrian surveys, and the review of existing data. Impacts on geology would be significant if natural geologic processes such as uplift, faulting, landslides, or weathering were changed. Conversely, local geology would significantly impact the project if expensive and time consuming engineering solutions were required for embankment or wellfield construction. Such investigations required:

- Review of past studies by others in the same location or in geologically similar locales. Observation of

landforms and materials exposed at the ground surface or in shallow trenches.
- Review of aerial photographs of the site.
- Measurement of the geophysical properties of the sediments and rocks in the subsurface.
- Drilling of boreholes to recover sediment and rock samples for analysis.
- Construction of cross-sections and maps of the subsurface as enabled by the program of drilling and sampling.
- A geophysical investigation was used to "screen" large areas of the reservoir site for discrete structures and to assist in identification of locations for test drilling. Geophysicist accomplished this by observing the physical responses of the subsurface to such diverse probing tools as seismic and radar waves.

The geophysical program was developed to work with the geological investigation to develop a model of the subsurface geology of the site to:

- Locate areas within the site that are potential hazards to the success of the planned impoundment.
- Provide information about the characteristics of subsurface materials that would affect the engineering design of the project.
- Guide the drilling program to locations appropriate for verification and delineation of subsurface features.

In order to conduct a photolinear analysis at the reservoir site, aerial photographs taken in 1939, 1948, 1957, and 1998 were reviewed. The 1939 and 1948 images allowed identification of photolinear features in the land that was subsequently mined.

Once it was determined that photolinear features are present on the site, they were identified in the field and staked as potential borehole locations. Geophysical exploration in the vicinity of these sites was used to refine the borehole locations for drilling. Geophysical investigation concentrated on areas where photolinear features intersected each other, especially where these features had been assigned high levels of confidence, and where photolinears intersected the proposed embankment centerline. Additional geophysical exploration sites were selected near circular depressions and wetlands that might represent past sinkhole activity.

A complementary suite of geophysical methods was utilized to evaluate subsurface stratigraphy and structure at the Tampa Bay Regional Reservoir site. This combination included ground penetrating radar, seismic refraction, and seismic reflection (Table 4-1).

Upon completion of the geophysical investigations, the photolinear features were reviewed. Some of the photolinears exhibited no geophysical anomalies while others indicated the presence of geophysical anomalies. Where necessary, preliminary borehole locations were moved to the center of the geophysical anomaly. Typically, the locations of the final boreholes were less than 100 feet from the original locations. A geologist developed the SPT and lithologic information collected from the boreholes with oversight by principal geologists and engineers. Lithologic

designations were reviewed and a geologic interpretation of the stratigraphy and karst at the site was prepared. Geologic formations were identified based on rock characteristics. However, the upper 100 to 150 feet of sediment at the site includes well-defined sequences of siliciclastic (sand, silt, and clay) and carbonate (limestone and dolostone) sediments within a single formation. These sequences were given informal designations in order to correlate between boreholes and identify anomalous sections where karst activities maybe present.

4.4.1 Action Alternatives. The findings of the geological, geophysical, and hydrological investigations are summarized below.

- The Tampa Bay Regional Reservoir site is located on a physiographic province characterized by well developed stream systems and minimal karst or sinkhole activity.
- The geology of the site includes a sand mantle that averages 18 feet in thickness.
- Underlying the sand mantle is a thick section of siliciclastic and carbonate strata of the Hawthorn Group.
- The uppermost unit of the Hawthorn Group is the siliciclastic and phosphatic Bone Valley Member of the Peace River Formation. The Bone Valley averages 12 feet in thickness at the site. No other Peace River Formation sediments have been documented at the site.
- The Bone Valley was mined for phosphate in the southwestern third of the site.
- Beneath the Bone Valley Member lies the Arcadia Formation, which consists of siliciclastic and phosphatic sediments, limestone, and dolostone.
- The shallow strata were subdivided into five informal stratigraphic units as follows: Unit A, the surficial marine terrace sands; B, Bone Valley Member siliciclastic sediments; C, a weathered limestone at the top of the Arcadia Formation; D, a siliciclastic unit that lies below Unit C; and E, a dolostone unit that lies approximately below Unit D.
- The top of the Bone Valley Member (Unit B) and portions of the Unit C limestone were affected by weathering and soil formation prior to deposition of Unit A. This weathering zone, the leached zone, includes some loose material.
- At the reservoir site, the surficial aquifer generally consists of unconsolidated to poorly consolidated fine sand to silty and clayey sand of informal stratigraphic Unit A. However, due to the complex interbedding of strata, variable lithology, and infilling of erosional features, the surficial aquifer is likely to be in hydraulic connection with stratigraphic Units B, C, and D in some areas of the site.
- The intermediate aquifer system penetrated at the reservoir site consists of Hawthorn Group sediments of informal stratigraphic Units B, C, D, and E. The full thickness of the intermediate aquifer and confining beds was not penetrated at the reservoir site.
- The most consistent permeable zone encountered at the site is a weathered, nodular cherty dolostone where drilling mud losses have occurred. This unit is typically encountered within informal stratigraphic Unit E, and is defined,

for the purposes of this study, as the "permeable zone of Unit E".

- The definition of an upper confining unit of similar lithology at the reservoir is difficult due to the complex nature of the Hawthorn Group. Ground-water elevation data from on-site piezometer nests indicate a substantial head difference ("head loss interval") between the 75-foot depth interval and the permeable zone of Unit E at the reservoir site. This head difference indicates that confinement likely exists between the two intervals.
- Geophysical surveying identified anomalous areas across the site that maybe related to subsurface karst activity. The observed anomalies included columns of disturbed soil and broad depressions within the shallow soil horizons and locations along seismic lines where the cemented layer is depressed.
- Locations having the coincidental occurrence of GPR, refraction, and reflection anomalies were prioritized for investigation by drilling for verification and positive subsurface analysis.
- Karst-related features were detected at the site. These include a small number of collapse-type paleosinkholes (no modern sinkholes were detected) and solution-type sinkholes.
- The ancient collapse-type features found in Areas C (ERM-16A) and D (ERM-42A) were of concern because of their proximity to the embankment. The embankment centerline was subsequently adjusted to the east to avoid the feature at ERM-42A. The features in areas C and D appear to be ancient, inactive features due to the undisturbed character of the uppermost sand unit.
- The solution sinkhole-type features are restricted to broad depressions in Areas A, B, and, to some degree E (Figure 3.5-7). Areas A and B have sag features (wetlands, sag ponds) and the land surface in Area E is characterized by a small embayment in the floodplain to the north.
- The only concern relative to the solution sinkholes is potential enhanced leakage from the reservoir. Structural failure of these features is improbable.
- Columns of disturbed soil are present in many parts of the site. These reflect downward movement of soil, but do not appear to be associated with voids or well-developed ground-water circulation systems.
- Sinkhole risk at the reservoir is considered to be low relative to other areas in Hillsborough County.

The geology of the project area was found to be suitable for the construction of the alternatives. Some additional areas would be disturbed for construction of roads, pipelines, and other associated facilities. These impacts would be relatively superficial and would not affect natural geologic processes or local area geology. Overall, no significant impacts to the areas' geology would result.

4.4.2 No Federal Action. The No Federal Action alternative would not disturb the area geology and therefore no significant impacts would occur.

4.4.3 Mitigation. Detailed geologic investigations required to prepare the final design plans were performed. These investigations establish design

criteria that insure sound and safe construction and operation of the water storage reservoir and associated alternatives. No mitigation is proposed for the geological impacts from construction phase impacts of either of the two action alternatives or the No Federal Action alternative.

4.5 GEOTECHNICAL EXPLORATION

The objective of the geotechnical exploration program was to evaluate the following general conditions at the proposed regional reservoir site:

- Characterization of the soil and rock material beneath the proposed reservoir embankments.
- Evaluation of geologic features identified by the project geologists and geophysicists.
- Characterizations of potential borrow material in the interior of the reservoir for embankment construction.
- Delineation of phosphatic waste clay deposits in the mined area of the site.
- Piezometric elevations at various depths, locations, and time around the site were evaluated to provide a better understanding of the local hydrogeology.
- Measurement of the in-situ borehole hydraulic conductivity and aquifer well pumping characteristics; this information will be used to model the reservoir leakage characteristics, as discussed in Section 3; the test results and evaluation of the data will be presented in a supplemental report.

Methodology and Significance Criteria. To accomplish these objectives, the following types of explorations were utilized:

- Rotary-wash borings (land and over water)
- Cone penetrometer test soundings with pore pressure measurements
- Flat-plate dilatometer test soundings
- Rotary-auger borings
- Test trenches
- Soil probing and shallow hand auger borings
- Borehole hydraulic conductivity testing
- Piezometers and pumping wells.

The entire field exploration program was performed between January 28, and December 14, 1999. A substantial quantity of drilling, soil sampling, soil and rock coring, in-situ testing, and trenching was performed at the reservoir site. This includes approximately 5,300 feet of coring, over 13,300 feet of rotary-wash borings, and approximately 3,200 feet of CPTU soundings.

Quantitative laboratory testing was performed on representative samples of the soils encountered in the field exploration. The laboratory-testing program for this investigation included tests for moisture content, percent fines, grain size, organic loss on ignition, Atterberg limits, specific gravity, standard Proctor, maximum/minimum density, hydraulic conductivity, and unit weight. Additionally, strength and compressibility tests were performed. Tests were performed on soil and rock samples collected between January 28, and November 10, 1999. All tests were performed in accordance with the applicable American Society for Testing and Materials (ASTM) test methods.

4.5.1 Action Alternatives. The original reservoir layout for the site encompassed Hillsborough County's land north of the landfill and one private landowner to the north. This layout was rectangular in shape and would have required the rerouting of a large portion of Doe Branch Creek. Based on information from the SWFWMD, the proposed reservoir was reconfigured to minimize the impact to Doe Branch. The current reservoir configuration would not impact the existing creek system.

The initial reservoir configuration also maximized the use of the southern portion of the site, which is owned by the Hillsborough County (County) Solid Waste Management Department and Parks and Recreation Department. Based on initial discussions, both of these departments and the County's Real Estate Departments issued letters outlining their concerns or issues with the initial reservoir configuration.

The Solid Waste Management Department stated that they had plans for the area as a source of cover material, buffer and potential leachate disposal. In addition, the Florida Department of Environmental Protection has a requirement that any Class I water body be at least 3,000 feet from a landfill cell. The Parks and Recreation Department's concerns centered upon the man-made lake in the southern portion of the site. This lake is currently the only lake with potential vehicle access on their property. Prior to the initiation of the detailed geotechnical investigation, the reservoir was moved approximately 3,000 feet to the north in response to input from the County's Solid Waste Management Department.

During the geotechnical investigation conducted on the County's property, it was determined that construction of the embankment on this property would require removal of more waste clays from the mining process than would be required if the embankment was moved north, approximately 800 feet, off of the County's property. As a result, constructing the embankment on the County's property would increase construction costs. Based on this issue and the previous alignment, the southern alignment of the embankment was moved north off the County's property.

Approximately 260 acres of the reservoir footprint (or slightly less than 25 percent) has been affected by the mining process. The land reclamation process has disturbed most of the prior observable evidence of the previous mining activity. The remainder of the site is considered to be "unmined" based on available historic information. This conclusion is also supported by the data obtained from the subsurface investigation program. The unmined area typically consists of 30 to 40 feet of predominantly sandy soil overlying limestone and dolostone rock layers ("rock"), interlayered with sandy layers to the depth explored.
The overburden soils above the top of rock are predominantly cohesionless soils. The percentage of different soil types was found to be a function of depth for the embankment borings. The variation in soil types with depth shows a similar pattern for the majority of the segments with fines content typically increasing with depth. The fines content ranged from 4 to 97 percent with a median value of 24 percent for all soils tested to a depth of 30 feet. However, for soils to a depth of 15 feet (potential

borrow material), the fines content ranged from 4 to 72 percent with a median value of 15 percent.

Of importance to embankment design is the strength, compressibility, and hydraulic conductivity characteristics of the overburden soils because this may influence the design of the embankment. The overburden soils generally appear to be acceptable for use as structural fill within the embankment and foundations of the reservoir ancillary structures. Overburden soils containing substantial amounts of vegetation or other deleterious materials would not be acceptable as structural fill.

4.5.2 No Federal Action Alternative. The No Federal Action alternative would have no impact on the geotechnical aspects in the project area.

4.5.3 Mitigation. Soil loss caused by construction or operation and maintenance would be minimized by implementation of erosion and sedimentation control plans. Silt fences, silt traps, sedimentation basins, reshaping, reseeding, and soil cement on the reservoir embankments would be used to control erosion caused by construction and operation and maintenance. Restricting human activity to specific access points and vehicular traffic to prepared roadways and parking areas would reduce or eliminate impacts from construction activities. Implementing these mitigation measures would avoid significant soil disturbance and loss.

4.6 AIR QUALITY

All three counties (Hillsborough, Pasco and Pinellas) in the general study area are in attainment or are unclassified for all criteria pollutants and meet established ambient air quality standards. It is possible that Hillsborough and Pinellas counties will be redesignated from attainment or unclassified to nonattainment areas for ozone under the new eight-hour standard. This would occur if these counties exceed the national standard for ozone.

Methodology and Significance Criteria. The State of Florida has adopted the U.S. National Ambient Air Quality Standards (NAAQS) except for sulfur dioxide (SO_2). Florida's SO_2 standard is slightly more stringent than the national standard. In 1997, the Environmental Protection Agency (EPA) changed the ozone standard from a one-hour standard to an eight-hour standard. The EPA is currently redesignating the status of ozone areas.

Currently, Hillsborough and Pinellas counties are air quality maintenance areas for ozone. Some areas in Hillsborough County are designated as air quality maintenance areas for particulate matter (total suspended particulate) and lead. Air quality maintenance areas are defined as areas that, due to past nonattainment status, are required to implement strategies to maintain attainment with the standards for the specified air pollutant.

The State of Florida currently has air quality monitors for particulate matter, sulfur dioxide, ozone and lead in the study area. The air quality in the three-county area currently meets all ambient air quality standards. Local municipalities and agricultural and mining industries are not expected to emit high levels of any pollutant that

would exceed established air quality standards.

4.6.1 Action Alternatives. The proposed site for the two action alternatives is not in an air quality maintenance area for particulate matter or lead, but is included in the maintenance area for ozone.

Particulate matter, in the form of total suspended particulate (TSP) and particulate matter less than 10 microns in size (PM10) would be generated in the construction process. Ozone may be generated from the photochemical reaction of exhaust gases carbon monoxide (CO), nitrogen oxides (NOx), and volatile organic compounds (VOC) in the atmosphere from mobile sources used during construction.

Fugitive particulate matter emissions would be generated by various construction activities such as earthmoving, excavation, and grading operations. CO, NOx, and VOC emissions would also be generated from the exhaust of the construction vehicles. There may be some temporary adverse affects on the air quality from construction activities, but these activities would not be expected to have any long-term impacts on the local ambient air quality in the three-county area.

Construction emissions can be distinguished as either onsite or offsite. Onsite emissions generated during construction principally would consist of exhaust emissions (e.g., NOx, SOx, CO, VOC, and PM10) from mobile diesel and gasoline-powered construction equipment and portable auxiliary equipment, and fugitive dust (e.g., PM10) from disturbed soil. Offsite emissions during the construction phase would consist of exhaust emissions from worker commute trips and material transport trips to and from the construction site. Onsite construction activities are typically divided into three distinct phases: (1) demolition and land clearing, (2) site preparation, and (3) general construction. This project could, with no control measures, be expected to have a significant short-term impact on the regional air quality due to construction activities. Long-term, non-construction related air quality impacts from this project would be insignificant because normal maintenance activity at the reservoir, once it is constructed, would have minimal impact on air quality.

4.6.2 No Federal Action. No construction or operational activities would be associated with this alternative. Therefore, the No Federal Action alternative would not have any impact on ambient air quality in the project area.

4.6.3 Mitigation. The emissions from construction activities are primarily from demolition, excavation, off-road mobile source equipment, and on-road motor vehicles (construction worker trips). The mitigation measures listed below are intended to minimize the emissions associated with construction activities.

Construction related mitigation measures include:

- Water active portions of construction site daily.
- Apply non-toxic soil stabilizers to graded areas that will be inactive for 10 days or more.

- Improved fueling management techniques to reduce evaporation emissions.
- Fuel -tank storage berms to contain/absorb accidental spills and protecting wet areas.
- Impervious matting around fueling zones.
- Off-site oil change/maintenance of construction equipment.

No other feasible measures have been identified to reduce emissions from construction or operation and maintenance activities.

4.7 NOISE QUALITY

Construction and operation activities associated with the alternatives could raise noise levels in the surrounding area. Noise sources during construction would include heavy construction equipment and increased vehicular traffic to and from the construction site. Following project construction, any potential noise would be from operation and maintenance activities with the embankments, intake facilities, pump stations or pipeline. Sensitive noise receptors could include residences, livestock and wildlife.

Methodologies and Significance Criteria. Most individuals would notice noise levels that increase by an increment of 10 dBA or more. For the purposes of this analysis, the impact would be considered significant if permanent residences were to experience an increase of 10 dBA or more above ambient noise levels. Noise impacts would be considered significant if increases in ambient noise levels would result in significant redistribution or disturbance to wildlife.

4.7.1 Action Alternatives. There are no permanent residences within approximately 650 feet of the proposed project site. After construction, higher noise levels in the vicinity of the dam would be caused by traffic from periodic dam and reservoir operation and maintenance and possible recreational use. Activities associated with the day to day operations of the reservoir would be virtually noiseless.

The reservoir may be used for recreational activities such as fishing, boating and hiking in the future. These activities generate minimal noise and would have no significant impacts on local residences or wildlife.

4.7.2 No Federal Action. No construction or operational activities would be associated with the No Federal Action alternative. No noise impacts to either human or wildlife populations in the project area would occur.

4.7.3 Mitigation. Construction activities near residences would be restricted to daytime hours. No mitigation is proposed for the No Federal Action alternative.

4.8 WATER RESOURCES

The project area includes both groundwater and surface water resources. The impacts to these resources from the alternatives carried forward are discussed in the following sections.

4.8.1 Groundwater Quantity. The hydrogeologic units underlying the reservoir site consist of the surficial, intermediate, and upper Floridan aquifer systems (LAW 1999). The character of the geologic units at the surface and in

the subsurface of the study area influence potential impacts to the water table and groundwater in that area.

Methodologies and Significance Criteria. A detailed hydrogeologic evaluation was performed to evaluate the character of the potential reservoir site, the pipeline, and the ASR system facilities. Objectives of the hydrogeologic evaluation were:

- To identify permeable units and determine the level of confinement between these units in the site subsurface
- To estimate existing vertical seepage through the shallow confining units in the site subsurface
- To determine the effects of the reservoir on the surrounding near-surface environment

Using data generated during the geotechnical site characterization and data collected during site-specific aquifer performance tests (APTs), a seepage evaluation was performed for the proposed reservoir to determine horizontal and vertical hydraulic properties of the aquifer systems and the confining strata in the site subsurface. Potential water losses and the effects of these losses from a completed and filled reservoir were predicted by these tests. Flow modeling was performed using the site-specific data to predict the potential range of losses from the reservoir.

Flow modeling of the reservoir was performed to predict water losses from the reservoir at maximum pool level, and to estimate the distribution of the surficial seepage, particularly to the shallow water table and surrounding streams. Flow modeling of the reservoir was performed using the finite computer program SEEP/W (Geo-Slope version 4.2.2) for the simulation. To simulate observed conditions, the SEEP/W model was calibrated to site-specific groundwater elevation data from monthly piezometer monitoring at the reservoir site. The model does not account for precipitation or evapotranspiration effects, which normally add or remove water from a system. Only horizontal and vertical water seepage losses were modeled for the proposed reservoir (HDR 2000).

A preliminary ASR feasibility study identified permitting, hydrogeologic, groundwater quality, and siting concerns. Criteria for the development of a successful ASR system include water availability, cost effectiveness, suitable storage capacity in a receiving aquifer, limited nearby competing groundwater users, and minimization of impacts during pumping.

Regional hydrogeologic trends were evaluated through cross sections developed from lithologic descriptions from core and drill cuttings, available aquifer test results, and well-control points (HDR 2000a).

4.8.1.1 Tampa Bay Regional Reservoir Project. Significant water exchange from vertical migration of water from the reservoir into underlying aquifers is not expected. Although the potential exists for downward vertical movement of groundwater to lower aquifers, the presence of low permeability confining intervals would retard the vertical movement of water between the aquifer units. The difference in water pressure gradients between the reservoir and the underlying

aquifer indicates that a significant low permeability layer (uppermost intermediate confining unit) is present. A lowermost intermediate confining unit, which is deeper than the depths investigated at the reservoir site, has been identified below the permeable zone(s) of the intermediate aquifer system (Ryder 1985; SWFWMD 1993). These low permeability-confining intervals retard the vertical movement of water between the aquifer units.

Presently, land surface covered by the proposed reservoir and associated facilities - approximately 1,100 acres - contributes an estimated 10 inches of rainfall per year or 0.75 to 1 mgd to the underlying aquifer as a result of direct infiltration. A similar amount of runoff occurs from the site to the Alafia River.

Flow modeling studies indicated that seepage loss into the shallow water table and adjacent streams would occur. Seepage from the reservoir would be dependent on the water level within the reservoir. With a full reservoir, the estimated maximum water loss through seepage would be 3.7 mgd for typical site conditions. The resulting long-term average seepage, based on historical data, is estimated at 2.5 mgd. This assumes an operational phase with varying water levels based on historical stream flow records. Based on this historical analysis, the reservoir is expected to be full approximately 15 percent of the time.

Pre-reservoir runoff and infiltration rates at the site average 1.5 to 2 mgd. Therefore, seepage from the reservoir at maximum pool level could potentially add 0.5 to 1 mgd more water to the groundwater and surface water system at the site.

Impacts from horizontal seepage would include a rise in the water table within 400 feet of the embankment toe. The flow model shows that some of the horizontal flow from the reservoir would discharge to the water table outside of the embankment boundary. This calculated discharge, which would represent upward flow to the surficial aquifer, is highest (45 percent of the total upward movement) within approximately 100 feet from the embankment toe under typical site conditions. Within 100 to 200 feet from the embankment toe, the discharge to the water table dissipates to approximately 20 percent of the upward flux. At distances of 200 to 400 feet from the embankment toe, the upward movement decreases rapidly, and would not be distinguishable from normal surficial aquifer water levels at distances greater than 400 feet (HDR 2000).

4.8.1.2 Tampa Bay Regional Reservoir and ASR System. The impacts associated with construction and operation of the reservoir component of this alternative are the same as in Section 4.8.1.1 above. In addition to the reservoir, this alternative would provide additional underground storage capacity and would enhance the reliability of the proposed surface reservoir as a regional water storage facility. The majority of existing permitted groundwater users within the study area currently tap the upper and intermittent parts of the Floridan aquifer. The proposed storage zones for the ASR systems have sufficient confinement to potentially preclude any impacts to the surficial or intermediate aquifer systems. Injection

and pumpage within the proposed storage zones may affect existing users (mostly agricultural users) that tap the upper Floridan aquifer for a water supply by producing variations in the level and pressure within the aquifer system.

Two potential ASR storage zones have been identified in the upper Floridan aquifer in the study area. The uppermost potential storage interval occurs in the lower part of the Suwannee Limestone and is composed of granular limestone with matrix-type porosity. The lowermost potential storage interval occurs in the upper part of the Avon Park Formation, a laterally persistent highly permeable zone in fractured dolostone. Confining units above the upper Floridan aquifer retard the vertical movement of any injected water in the storage intervals between the intermediate and surficial aquifers. The top of the upper Floridan aquifer deepens to the south across the study area, producing a higher degree of confinement (see Figure 3-3).

An ASR system by itself does not produce a net loss of water from the aquifer system; an ASR accounting system would be developed that would report how much water is recharged to the aquifer system and how much water is removed. Composed of intensely fractured rock, the Avon Park highly permeable zone has transmissivities from two to ten times greater than the Suwannee production zone. Injection and recovery rates per well are estimated to be 2.5 mgd or more in this zone.

4.8.1.3 No Federal Action. The No Federal Action alternative would result in the reservoir and/or ASR system not being constructed; therefore, it is assumed that no impact to the proposed reservoir site or the surrounding area would occur.

4.8.1.4 Mitigation. The embankment design contains several measures to minimize seepage from the reservoir (HDR 1999). First, the installation of a flexible geomembrane liner on the inner embankment slope would reduce water seapage and lower the surface of the saturated zone within the embankment. The geomembrane liner would connect to a second minimizing measure, a very low permeability soil-bentonite cut-off wall that would be designed to extend into the underlying confining layer at least 5 feet. The cut-off wall also reduces water losses from the reservoir and lowers the surface of the saturated zone in the embankment. A third measure would be a horizontal blanket and toe drain that would be designed to control the water table outside of the reservoir embankment by collecting and routing seepage to discrete discharge points.

The majority of potential upward movement resulting from seepage is predicted to occur within the first 200 feet outside of the reservoir embankment. Within the first 100 feet of this interval, the embankment design includes drainage facilities (stormwater ponds, a perimeter roadway, and drainage swales) to intercept water that reaches the surface. Streams that occur around the majority of the perimeter of the embankment in the second 100-foot interval will intercept and convey any upward water that reaches the stream bottoms.

To prevent environmental and ecological impacts due to the predicted rise in the

water table from seepage, a monitoring and management program would be implemented. This program, consisting of a network of piezometers along the perimeter of the reservoir and near adjacent streams, biological transects, stream flows, and annual infrared aerial photography would allow assessing biological health and hydroperiod conditions prior to, during, and after filling the reservoir so that adverse ecological impacts can be avoided. A management program would be implemented in any areas where seepage adversely impacted the surrounding landscape. A means of management of seepage impacts is the use of extraction well that would control surficial aquifer groundwater levels, a proven method that can be applied to specific areas.

4.8.2 Groundwater Quality. Water seeping from the proposed reservoir or injected through the ASR system could affect the water quality of the adjacent aquifers. Water to be stored for the regional reservoir would be diverted from the Alafia River, Hillsborough River, and Tampa Bypass Canal. The quality of water diverted from these three sources is dependent on the season of the year, flow regime, and other existing climatic factors.

Methodologies and Significance Criteria. Groundwater quality data were reviewed for the aquifers located beneath the reservoir site, specifically for total dissolved solids (TDS), chlorides, and hardness (HDR 2000). Data from SWFWMD and Florida Geologic Society indicated that, in the intermediate aquifer, TDS ranges from about 250 parts per million (ppm) to 500 ppm, and chloride is less than 25 ppm. There are no data available for hardness. In the underlying Floridan aquifer, TDS also ranged from 250 ppm to 500 ppm but chloride is approximately 20 ppm. In this case, hardness ranges from about 120 to 180 ppm. The Florida Department of Environmental Protection (FDEP) permits injection of treated water using ASR facilities into aquifer zones containing native water with less than 10,000 ppm TDS.

4.8.2.1 Tampa Bay Regional Reservoir Project. Quality of water seeping from the reservoir into the surrounding water table would be dependent on the quality of the water stored in the reservoir. High organic, nutrient, or bacteriological concentrations in water in the reservoir could impact ambient water quality of nearby streams and local groundwater in the surficial aquifer. A reservoir seepage evaluation concluded that significant water exchange from vertical migration of water into underlying aquifers would not occur. This is due to the intermediate confining aquifer layer that is located between the bottom of the reservoir and the underlying aquifer.

4.8.2.2 Tampa Bay Regional Reservoir and ASR System. This alternative would provide additional underground storage and would enhance the reliability of the proposed surface reservoir as a regional water storage facility. Chloride ion and TDS concentrations of the inflow water typically meet State drinking water standards. The proposed ASR storage zones in the upper Floridan aquifer have sufficient confinement to preclude any water quality impacts to the surficial or intermediate aquifer systems.

Groundwater quality in the targeted Suwannee and Avon Park aquifer storage zones is generally high in the study area. State regulations do not permit the injection of lower quality water into a zone containing higher quality water. Three groundwater constituents - alkalinity, hardness, and hydrogen sulfide - that are not regulated under State drinking water standards have been identified to have somewhat elevated levels in the upper Floridan aquifer in the study area (HDR 2000a). Significant mixing of native groundwater with treated injected water could result in the required retreatment of recovered water to reduce concentrations of these constituents to acceptable levels prior to distribution.

4.8.2.3 No Federal Action. The No Federal Action alternative would result in continued adverse environmental impacts to wetlands and lakes from groundwater pumpage from existing wellfields. Groundwater withdrawals above permitted levels to meet tri-county water supply needs could result in degradation of the water quality in the producing aquifers.

4.8.2.4 Mitigation. Embankment design includes several measures to minimize impacts due to seepage from the reservoir. A flexible geomembrane liner on the inner slope and a soil-bentonite cut-off wall will be included in embankment construction.

Quality of the water stored in the reservoir could directly affect the quality of any seepage to the surficial aquifer and surrounding drainage features. Best management practices (BMPs) proposed for use to control water quality in the reservoir include (HDR 1999):

- In-lake treatment for algae control, such as copper sulfate, potassium permanganate, powdered activated charcoal, destratification or aeration, and biomanipulation
- Source treatment for nutrient control, such as pretreatment of source water; and
- Watershed BMPs to improve source water quality.

Although contaminant levels are not expected to be excessive, periodic testing to monitor potential buildup of metals, pesticides, or other contaminants in the reservoir sediments would also be conducted. In the event of build-up of herbicides from reservoir operations, alternative methods of algae control would be evaluated and Tampa Bay Water would monitor the condition of the sediments.

Two alternatives for surface water pretreatment prior to ASR injection have been proposed to meet permitting requirements. Full treatment prior to injection would include disinfection and addition of chloramines. Quality of the injected water would be equivalent to potable water sent to a distribution system. Water recovered from ASR systems typically requires disinfection prior to distribution. The second treatment alternative, partial treatment prior to injection, would reduce the coliform bacteria to acceptable levels through disinfection by ultraviolet light. This pretreatment method would only satisfy the microbiological standards required for injection. With this treatment alternative, water withdrawn from the ASR systems would require full treatment at the water treatment plant prior to distribution.

New legislation allowing a limited aquifer exemption from primary drinking water standards for coliform bacteria was considered by the Florida Legislature this year. This exemption would have modified pretreatment requirements for ASR injection water to remove the requirements to reduce coliform levels; however, the proposed legislation did not pass in this years legislation session.

Selection of an appropriate ASR storage zone could reduce the need for retreatment of recovered water. The highly permeable zone of the Avon Park aquifer is highly fractured and can sustain high injection and recovery rates with little change in aquifer pressure. However, this fractured characteristic also promotes rapid flushing of the aquifer and significant mixing of the native groundwater and the injected ASR water could be expected. The Avon Park zone would be the best choice when using partially-treated injection water, since mixing with the native water would not be a concern and the water would be treated after recovery. The Suwannee aquifer production zone is typically characterized by matrix-type porosity and is not fractured. The Suwannee zone would be more effective for a potable water ASR system, where no retreatment of recovered ASR water would be required.

4.8.3 Surface Water Quantity.

Because of the ecological importance of maintaining sufficient freshwater inflow into Tampa Bay, it is important to document the stream flow from Tampa Bay's tributaries that would be affected by the proposed surface water withdrawals. Surface water runoff, spring inflow, and tidal currents influence flows in the tributaries. Discharges in tidal rivers are highly variable and are characterized by frequent reversals in flow and changes in flow magnitude due to upstream and downstream movements of water with tidal currents (PBS&J, 1998).

Methodologies and Significance Criteria. Numerous studies have illustrated the importance of freshwater inflows to the biological structure and productivity of an ecosystem (Lewis and Estevez 1988; Sklar and Browder 1998; Estevez 2000; Estevez 2000a; USEPA 1999). Estuaries function as transition zones between the freshwater of a river and the saline environment of the sea and, by definition, receive freshwater inflows. Freshwater inflow in estuaries:

- Provide a food supply by stimulating both photosynthesis and microbial decomposition.
- Deposit sediments that stabilize coastal wetlands against erosion, subsidence, and sea level rise.
- Drive estuarine circulation and establish salinity gradients.
- Create a range of salinities under which plants and animals thrive.

The ability of an estuary to function properly and to sustain populations of animals and plants depends on the quantity, quality, timing, and location of freshwater inflows.

Peak monthly withdrawal quantities for the Alafia River, Hillsborough River, and the Tampa Bypass Canal would be based on the practical conveyances of combined flow through an 84-inch diameter pipeline to the proposed reservoir. The maximum withdrawals would be determined by the existing

SWFWMD water permits and by the physical constraints tied to the size of the pumping systems and conveyance infrastructure. Water velocity and impingement impacts at the intake structures have also been taken into consideration and evaluated. Surface water intakes are under construction. Their size and design have already been determined. In the case of the Tampa Bypass Canal intake, it is designed with a smaller maximum capacity than permitted by the SWFWMD.

4.8.3.1 Tampa Bay Regional Reservoir Project Alafia River. To assist in the determination of freshwater withdrawal impacts, the location of the saltwater interface for pre-withdrawal and post-withdrawal scenarios under average tide conditions was analyzed for inclusion in the Alafia River Water Use Permit application. The minimum flow in the Alafia River prior to withdrawal was established from a percentile analysis of daily historical flows measured from January 1, 1977 to December 31, 1996. The minimum flow selected corresponded to the 80th percentile flow or 124-cubic feet per second (cfs) (80-mgd). This means that a flow of 124 cfs or greater occurred for 80 percent of an average year, based on historical data. Therefore, the lowest 20 percent of flows would not be affected by the freshwater withdrawals. This analysis was conducted because low flow periods are often the most crucial for oligohaline habitat maintenance, and that this lower limit for withdrawals appears sufficiently prudent to avoid impacts.

When flow is 80 mgd (124 cfs) or greater in the Alafia River, 10 percent of the total river flow would be withdrawn. The maximum rate of withdrawal is 51.7 mgd (80 cfs), regardless of river flow, which corresponds to the 7th percentile. Therefore, the withdrawal would occur at the maximum proposed rate for 7 percent of an average year. No additional withdrawals in excess of 51.7 mgd (80 cfs) would occur when flows exceeded 517 mgd (800 cfs) thereby maintaining the beneficial flushing impacts found with high river flows.

Frequency analysis of historic stream flows was compared to the proposed withdrawal schedule. The comparison showed that the proposed withdrawals would not lower the low flows, and would lower the mid-frequency flows by 7 to 10 percent and high flows by 5 percent or less. Regression analyses of stream flow and salinity showed that salinity near the mouth of the Alafia River would increase by less than 2 ppt during moderate flows; virtually no change in salinity regime would occur at lowest and highest frequency flows.

High flows can greatly benefit oligohaline and estuarine waterbodies by flushing the system. The freshwater withdrawal schedule permitted by SWFWMD for the Alafia River would substantially preserve high flows in the Alafia River, and continue the benefits afforded by a wide range of flows.

Hillsborough River. The Hillsborough River is the largest river discharging into Tampa Bay. The mean annual flow of the river at the City of Tampa Hillsborough River reservoir (USGS gage 02304500 near Tampa) is 463 cfs for the period 1939-1996. Flows in the lower Hillsborough River are regulated by the operation of the dam. The permitted withdrawal schedule for the

Hillsborough River is based on the quantity of water flowing over the dam at the City of Tampa reservoir. The water use permit contains a requirement for a low flow over the dam of 65-mgd (100-cfs), below which no water can be withdrawn. The withdrawal would actually occur at a pump station located on the Tampa Bypass Canal. This is possible because the river and the canal are connected by another canal called the Harney Cut. During flows of 65 to 97 mgd (150 cfs), 10 percent of the total flow could be withdrawn, and during flows from 97 to 139 mgd (215 cfs), 10 percent of the total flow can be withdrawn, increasing proportionally from 10 percent up to 30 percent. From flows of 139 to 647 mgd (1000 cfs), 30 percent of the total flow could be withdrawn with a cap on the maximum withdrawal at 194 mgd (300 cfs) no matter how high flows become.

In the past, no flow was allowed to pass downstream through the dam during many months to preserve the City of Tampa's drinking water supply. However, to protect and enhance the living resources in the lower river, a minimum flow rate of 10-cfs (6.5-mgd) has been provisionally adopted.

Tampa Bypass Canal. Water from the Hillsborough River can be diverted to the Tampa Bypass Canal through a flood-control structure just north of the City of Tampa, and through the Harney Canal at the City of Tampa's reservoir. Flow in the canal is controlled by a series of structures that retain water in the canal during low flow periods and are opened during high flows.
For the Tampa Bypass Canal, the permitted withdrawal schedule limits the low flow withdrawal to 7 mgd (11 cfs), below which no water can be withdrawn. During flows from 7 to 81 mgd (125 cfs), 80 percent of the total flow above 7 mgd could be withdrawn. A maximum of 65 mgd (100 cfs) could be withdrawn when flows are greater than 81 mgd.

Statistical models were used to predict salinity in the Tampa Bypass Canal as a function of flow releases from Structure 160, the most downstream control structure. A minimum flow past Structure 160 of zero mgd has been provisionally adopted by SWFWMD. Historical median flow at S-160 is approximately 40 mgd.

Tampa Bay. Potential impacts to Tampa Bay salinity regimes resulting from Tampa Bay Water's Master Water Plan projects were assessed using a mass balance approach and a constructed box model. The bay was divided into 13 segments and water and salinity inputs and outputs to the segments were evaluated using the mass balance model. Some of the scenarios included the Tampa Bypass Canal water supply project alone, the Alafia River project alone, and the combined enhanced surface water project (ESWS), with and without each of the proposed desalination options.

Results of the mass balance model suggest that the annual cycle of salinity within bay segments would re-establish and stabilize at slightly higher than current levels after 3 to 4 years of operation of the Master Water Plan projects. Even with desalination, the model indicated that after a minor initial increase in salinity over the first 2 to 3 years, equilibrium would be reached. In effect, fluctuations of salinity conditions in the bay would be overcome by the

flushing action of the wet season flows (Coastal Environmental/PBS&J 1998).

4.8.3.2 Tampa Bay Regional Reservoir and ASR System. The addition of an ASR system to the storage capacity of the proposed reservoir would increase impacts due to increased freshwater withdrawals to the Alafia or Hillsborough rivers, Tampa Bypass Canal, or to the Tampa Bay estuary beyond those withdrawals incurred by the reservoir alone. Limits on freshwater withdrawals from each of the rivers and the canal are regulated and permitted by SWFWMD. The same minimum and maximum flows, which limit low flow and maximum high flow withdrawals, would remain in effect whether or not the ASR system is constructed.

Any future changes to the withdrawal permits would require additional evaluations of minimum flows and levels program administered by SWFWMD.

4.8.3.3 No Federal Action. If the No Federal Action alternative were selected, it is assumed that no additional surface water withdrawals from the Alafia River, the Hillsborough River, or the Tampa Bypass Canal would be made. If no additional withdrawals occurred, no impacts from this project to these rivers or the Tampa Bay estuary would result.

Tampa Bay Water and SWFWMD have agreed to a Consolidated Water Use Permit that reduces Tampa Bay Water's current groundwater withdrawals of 158 mgd to 120 mgd by December 2002, and to 90 mgd by December 2007. Without the proposed storage reservoir with or without the ASR system, Tampa Bay Water would not be able to:

- Rely on increased surface water withdrawals to offset reduced groundwater withdrawals as stipulated in their Consolidated Water Use Permit with SWFWMD.
- Store surface water withdrawn in excess of 66 mgd during the wet season for use during the dry season when no withdrawals can be made.

Tampa Bay Water would be in violation of their Consolidated Water Use permit unless alternative surface water storage was found.

4.8.3.4 Mitigation. A condition of the Alafia River, Hillsborough River, and Tampa Bypass Canal water use permits is the establishment of an extensive HBMP. The HBMP is an adaptive-management monitoring program that includes elements of water quality, benthic invertebrates, fish, plankton, bird census, vegetation analyses, flow, and rainfall (Dr. Ralph Montgomery, personal communication).

Developed using a consensus-based approach, the HBMP incorporates programmatic criteria designed to ensure that the permitted withdrawals meet the conditions of the SWFWMD water use permits. The goal of the HBMP is to determine if conditions in the Alafia and Hillsborough rivers, and the Tampa Bypass Canal deviate from their normal rate and range of fluctuation. The focus of the HBMP is to monitor the extent that water quality, vegetation, and animal populations are adversely impacted or salinity distributions in tidal streams and estuaries are significantly altered. The HBMP also will monitor

changes in recreational use or aesthetic qualities. Monitoring began, as part of the HBMP, in April 2000.

4.8.4 Surface Water Quality. While it is important to meet the increasing need for potable water, it is equally as important that the water quality in the Alafia River, Hillsborough River, and the Tampa Bypass Canal and the proper balance of freshwater to the Tampa Bay estuary be maintained.

Methodologies and Significance Criteria. As noted by Zarbock *et al.* (1995), "Water is one of Florida's most plentiful, and most utilized, natural resources . . . As the volume of water diverted for consumptive use increases, the potential for altering natural systems that depend on it also increases." In an estuary, the most important hydrobiological parameter is salinity (Copeland 1966) and one of the most conspicuous water quality characteristics of an estuary is fluctuation in salinity. This fluctuation, in turn, is influenced by fluctuations in freshwater inflow as well as the quality if those inflows.

Numerous studies have demonstrated the importance of freshwater inflows to the biological structure and productivity of estuarine ecosystems. Sklar and Browder (1998) concluded that freshwater inflow is one of the most influential landscape processes affecting biotic community structure and function in estuaries. Watersheds determine surface and groundwater flows to estuaries and their flows have a source, timing, and velocity that can be significantly affected by human alterations in the landscape. As a result, landscape alterations influence productivity, structure, and behavior of coastal plant and animal populations.

The general consensus from these studies is that the changes in flows resulting from the proposed freshwater withdrawals will affect salinity downstream of the intake structures. Some shifts in flow and salinity regimes can be expected to occur due to the withdrawals. Salinity increases due to withdrawals for Tampa Bay Water's Regional Reservoir Project, a component of the Enhanced Surface Water System, are modest and are expected to be within the range of normal variability.

4.8.4.1 Tampa Bay Regional Reservoir Project. Potential impacts to the downstream reaches of the Alafia and Hillsborough rivers, the Tampa Bypass Canal, and consequently in Tampa Bay resulting from freshwater withdrawals for reservoir storage are discussed below.

Alafia River. The Alafia River is a coastal stream discharging through Hillsborough Bay, into Tampa Bay. Reduction of streamflow would result in the upstream movement of saltwater and increased salinity in Hillsborough Bay (Giovanelli 1980). The proposed withdrawals were predicted to shift the location of the saltwater interface location in the Alafia River from a few hundredths of a mile during high and low flows to almost one-quarter mile during moderate frequency flows (Coastal Environmental/PBS&J 1998).

These studies showed that salinity levels are sensitive to fluctuations in freshwater inflow. Model results indicated that the freshwater inflow from the Alafia River had the greatest effect on areas closest to

the mouth of the river during periods of above average flow. Large volumes of freshwater inflow reduce the conductivity in areas adjacent to the river, whereas areas located towards the center of Hillsborough Bay and Tampa Bay experience little change. For below average streamflow conditions, the effect of variations in freshwater inflow on salinity is small (Giovanelli 1980).

Additional analyses were conducted to examine the magnitude of change in salinity at the mouth of the Alafia River caused by changes to stream flow. Salinity in Hillsborough Bay near the mouth of the Alafia River is highly influenced by river flow. Less than 2 ppt change in salinity is expected during moderate flows from the proposed withdrawals at the mouth of the river and that this increase is well within the natural variation of the system. Neither low flows nor high flows would be substantially affected because of the withdrawal limits imposed by the SWFWMD water use permits. There is virtually no change expected in salinity regime at the lowest and highest frequency concentrations.

In the Alafia River Water Use Permit application, salinity changes from freshwater withdrawals of the Alafia River were predicted. Analysis of salinity data from each of 18 segments of the river was conducted from the mouth to the Bell Shoals Road intake structure to develop the relationship between the salinity concentration and flow. The model assumed that, as freshwater was withdrawn at Bell Shoals, a volume of downstream water would move farther upstream to take its place. The quantity of water that moved in each segment was dependent on the percent of the total volume of water in the segment that was removed by the withdrawal. The model was limited to predicting salinity concentrations for flows between 124 cfs and 400 cfs and for moderate to high tide conditions.

Results from the model showed that the changes in salinity due to the proposed withdrawals were less than 1.0 ppt in all segments of the river.

It was concluded that, predicted salinity changes in river segment A (river mouth) are zero ppt. This is due primarily to the over-riding influence of tidal waters from Tampa Bay on the mouth of the river. It is anticipated that the proposed withdrawal schedule, both withdrawal flow and period, should have minimal impact on the saltwater/freshwater interface, downstream water levels, and both freshwater and estuarine ecosystems" (HDR 1998).

In summary, analysis of salinity intrusion indicated the following:

- Because low and high flows are preserved under the withdrawal schedule and there is little change to salinity regimes under low and high flow conditions.
- The location of the saltwater interface may vary by a maximum of 0.24 mile during moderate flows. The saltwater interface was predicted to not change, or change only by a few hundredths of a mile for both low and high frequency flows.
- Maximum salinity increase in the zone is predicted to be 3 ppt, which is within the observed long-term variability of the system.

Hillsborough River. The Hillsborough River is the largest freshwater tributary to the Tampa Bay estuary and has been impounded and flows have been regulated since the late 1800s. In the lower portion of the river, salinity regimes and dissolved oxygen characteristics are affected by the amount of freshwater that is released from the City of Tampa's reservoir and freshwater inflows from Sulphur Springs.

During a three-year study from 1991 to 1993, discharge rates from the reservoir and downstream displacement of salinity were investigated (WAR/SDI 1995). This study indicated that surface salinity downstream of the dam are inversely proportional to the amount of discharge from the reservoir. That is, salinity decreases when discharge increases. Discharges of 100 cfs to 250 cfs displace the saline water wedge downstream of Station 2 or 3 (see Figure 3-5). Discharges of 250 cfs to 1,000 cfs displace the saline water wedge farther downstream from Station 5 to Station 8, and discharges greater than 1,000 cfs displace the wedge even farther, downstream of Station 9. The downstream extent to which saltwater is displaced is determined partially by the tide stage at the time of measurement. Freshwater is present at one or two stations farther downstream at low tide than at high tide.

Coastal Environmental (1993) compared the frequency of flows at the Hillsborough River dam using historical conditions with and without the proposed withdrawals. This study showed that low flows and high flows, while both important to maintaining oligohaline habitats, would be protected through a proposed withdrawal schedule of 56 cfs minimum flow (proposed at that time) for the Hillsborough River.

A two-dimensional hydrodynamic model of the lower Hillsborough River was also developed to examine the response of salinity in the lower reaches of the River to inflows of freshwater (SWFWMD 1999a). The model simulated the effects of different minimum flow scenarios on salinity distributions in the river. Forty-five scenarios were run, including different combinations of discharges from the reservoir and flows from Sulphur Springs that could be diverted to the base of the dam. The model was also used to examine the effects of a minimum flow of 10 cfs on salinity distribution during naturally occurring patterns of rainfall, reservoir discharges, and stormwater runoff.

The model results illustrated that a release of 10 cfs from the reservoir would reduce salinity to between 1 and 2 ppt on the river bottom at the base of the dam. The volumes of low salinity waters rapidly increased with larger discharges from the reservoir. The results are similar to the other studies and indicate that the salinity regime of the lower Hillsborough River is very sensitive to freshwater inflows. Model results also showed that dramatic changes in the salinity regime of the lower river could occur at relatively low minimum flows (10 to 30 cfs).
In conclusion, the results of the analysis indicated, under the proposed withdrawal schedule, the 5 to 11 ppt salinity (oligohaline) portion of the Hillsborough River is predicted to vary in area by 33 percent and in volume by 15 percent over existing conditions. The salinity fluctuation is also within the

normal range of variability and is also within the relatively wide range of salinity tolerances of the identified fauna and biota. The HBMP would be used to monitor the impacts of withdrawals on the biological resources of the Hillsborough River.

Tampa Bypass Canal. The Tampa Bypass Canal was constructed to divert floodwaters from the urbanized portions of the Hillsborough River to the nearby Palm River. The Palm River then discharges to McKay Bay, which, like the Hillsborough River, is a tributary to Hillsborough Bay. Structure 160 is the downstream most structure on the Tampa Bypass Canal that regulates the quantity of freshwater that enters the downstream estuarine portion of the canal. When warranted, water is also pumped from the Tampa Bypass Canal to augment the City of Tampa's water supply reservoir located just upstream of Station 2.

An analysis was conducted to investigate the relationships between freshwater discharge and water quality conditions downstream of Structure 160 (Coastal Environmental 1997). This analysis showed that between 1985 and 1993, there was no flow over Structure S-160 on the Tampa Bypass Canal for approximately 5 percent of the time, and flows over the structure were 200 cfs or less over 90 percent of the time. The analysis also showed that flows are important to maintaining the estuary habitats and would not be impacted by the permitted withdrawals from the proposed reservoir project.
Another assessment of potential impacts from the implementation of proposed withdrawals from the Tampa Bypass Canal on McKay Bay, which also receives freshwater from the Tampa Bypass Canal system, was conducted (PBS&J 1998). Although the study showed that flushing rates in McKay Bay are determined in part by freshwater flows, tidal exchange makes up a much larger component of the bay's total flushing capacity. The residence time in the McKay Bay would increase slightly due to the proposed freshwater withdrawals, from 1.08 days to 1.10 days. Under the proposed withdrawals for the Tampa Bypass Canal, predicted changes in salinities throughout most of the year are approximately 1.0 to 1.5 ppt. The greatest changes in salinities, of 3 to 4 ppt in the Palm River below Structure 160, would occur only one or two months during the wet season. The resultant salinities in McKay Bay would be 22 to 24 ppt, or 1 to 2 ppt greater than currently existing salinities.

Statistical analyse predicting salinity as a function of flow indicated that surface salinity values would remain over 20 ppt over the length of the Palm River, even if the flows at Structure 160 were maintained at their post-construction median value of 73 cfs. Increasing flows from zero to 20 cfs would reduce salinity by about 2 ppt to produce values of 23 to 28 ppt between the surface and two meters depth at the station nearest Structure 160. It is unlikely that salinity changes of this magnitude for short periods of time would change the basic ecological characteristics of the Palm River or McKay Bay. Overall, the salinity distributions and ecological characteristics under no-flow conditions would be similar (SWFWMD 1999b). Other important water quality characteristics in the Palm River showed either no relationship or a weak response to freshwater inflows. There is very

little relationship between dissolved oxygen concentrations and freshwater inflows in the Palm River/McKay Bay system. Bottom water throughout the length of the Palm River exhibited problems with low oxygen regardless of the rate of freshwater inflow.

It is not expected that zero flows at Structure S-160 will continue for long periods of time even though a zero minimum flow requirement was proposed by SWFWMD for the minimum flow for the Tampa Bypass Canal. Construction of the Tampa Bypass Canal breached the top of the upper Floridan aquifer, which increased the baseflow and total discharge at Structure 160 by approximately 1.5 to 2 times.

In summary, the study conducted on the Tampa Bypass Canal found that significant impacts to living resources of concern within the Hillsborough River and Tampa Bypass Canal system are unlikely. The heaviest withdrawals would be during the wet summer months when maintaining oligohaline habitat for the biological resources is not as critical. The predicted impacts to freshwater inflow and salinity patterns during summer months are not expected to be significant.

Tampa Bay. Sources of freshwater inflow to Tampa Bay include streamflow and overland flow, point source discharges, direct rainfall, and groundwater. To evaluate potential water quality effects due to the project, studies were conducted that compared existing condition inflows to historical inflows and correlated salinity concentrations at selected sampling sites within Tampa Bay.

One investigation studied the potential effect to the salinity characteristics in Tampa Bay that could result from alterations to freshwater inflows (Zarbock *et al.* 1995). The study evaluated flow relationships in the open water segments of Tampa Bay, including Hillsborough Bay, for the years 1985 through 1991. A hydrologic model was also developed to predict surface flows over the entire Tampa Bay watershed. Methods focused on the use of available flow data from the watershed. The relationships derived in this investigation provide evidence that the month-to-month variation in freshwater inflow measurably affects mean monthly salinity concentrations in Tampa Bay. The degree of significance of these relationships appears to be a function of volume of the receiving water by segment, internal circulation within the bay segment, and the degree of interaction with other bay segments and the Gulf of Mexico.

Based on these analyses, these areas have always been subject to wide variation in salinity due to the proximity of major sources of freshwater, and organisms that live or breed in this type of environment are physiologically adapted to fluctuating salinity regimes.

In addition, a 'fatal flaw' analysis of potential impacts from Tampa Bay Water's individual Master Water Plan projects, as well as potential cumulative impacts from implementing a number of the projects simultaneously, was conducted (Coastal Environmental/PBS&J 1998). Fatal flaws are impacts of enough magnitude or severity that might jeopardize a project's ability to obtain permits.

The assessment of potential impacts to Tampa Bay focused on potential changes to freshwater inflow rates resulting from the proposed surface water withdrawals. A variety of statistical methods was used to evaluate cumulative impacts and to provide an increased level of confidence in the findings. Methods used include regression analyses or the functional relationship between two variables, a previously developed mechanistic model (SWFWMD's Tampa Bay Model), and a box model for a water and salinity mass balance.

SWFWMD's Tampa Bay Model was used to predict changes to the salinity distributions in the Tampa Bay estuary in response to a variety of freshwater withdrawal scenarios. The model used monthly salinity data from Hillsborough County's Environmental Protection Commissions sampling sites in Tampa Bay and monthly freshwater inflows for the water years 1985 through 1994. Sources of freshwater inputs to the bay included stormwater runoff, point source discharges, direct rainfall, and groundwater infiltration. The ESWS components included withdrawals from the Alafia River and the Hillsborough River and Tampa Bypass Canal system according to the proposed withdrawal schedules. The model simulated the progressive implementation of several of Tampa Bay Water's proposed Master Water Plan projects.

The model suggested that implementing the ESWS projects alone might increase salinity in the lower Hillsborough Bay by approximately 0.4 ppt in May and by 0.5 ppt in September. In the upper Hillsborough Bay, salinity predictions from the model showed increases in salinity due to implementation of the ESWS projects of 0.3 ppt in May and 0.7 ppt in September.

The cumulative modeled impacts of desalination and freshwater withdrawals associated with the proposed reservoir project were assessed to determine if impacts to Tampa Bay and its estuary would occur. Potential cumulative impacts to Tampa Bay salinity regimes were assessed using a mass balance approach and a constructed box model. The mass balance accounted for water and salt movement between segments of the bay to predict changes in salinity. Tampa Bay was divided into 13 segments and loading and predicted water quality data were prepared at the segment scale. The model was structured so that the desalination process could be simulated and was run for a 10-year period. The predicted changes reflect an average condition over an entire segment, and may not accurately represent small-scale changes within a segment.

The mass balance study suggested that by implementing the ESWS, the Alafia River and the Hillsborough River and Tampa Bypass Canal withdrawals alone would increase salinity in lower Hillsborough Bay in May by 0.5 ppt (1.6 percent) and by approximately 0.6 ppt (2.8 percent) in September. The range of salinity in lower Hillsborough Bay typically varied from 3 ppt to 6 ppt in any given month. Long-term variability is greater than the predicted segment-averaged change in salinity of about 1.5 ppt resulting from the withdrawals.

The mass balance approach for upper Hillsborough Bay suggested that implementation of the ESWS projects would increase salinity in the bay by 0.5

ppt (1.8 percent) in May and 0.8 ppt (3.8 percent) in September. Like lower Hillsborough Bay, the range of salinity in upper Hillsborough Bay also typically varied from over 3 ppt to 6 ppt in any month. Long-term variability is greater than the predicted segment-averaged change in salinity of about 1.5 ppt resulting from the withdrawals.

Mass balance modeling also indicated that, after an initial increase in salinity over the first 2 to 3 years, an equilibrium condition would be reached. An annual cycle developed, but no trend over time was evident. The evaluation of potential cumulative impacts to Tampa Bay was completed at a relatively broad spatial scale; small-scale impacts were not defined (Coastal Environmental/ PBS&J 1998). A three-dimensional, time-dependent hydrodynamic model of Tampa Bay was developed and used to evaluate smaller scale impacts that could result from surface water withdrawals from the Alafia River, and the Hillsborough River and Tampa Bypass Canal system.

At a bay-segment scale, results of the three-dimensional model for salinity were very similar to those of the Tampa Bay box model (Janicki *et al.* 1995); both models predicted salinity changes in the range of 1.0 ppt or less on an annual basis.

In Hillsborough Bay, the cumulative impacts of the three surface water withdrawals on surface water salinity were typically 1.0 ppt or less. Worst-case changes in surface water salinity are predicted to occur in July and August. In the lower Hillsborough River, the predicted salinity changes for these months are between 2 and 2.5 ppt. In McKay Bay, the predicted salinity changes range between 2 and 3 ppt; and in the Tampa Bypass Canal below Structure S-160, the predicted salinity change is 3 to 4 ppt (PBS&J 1998a).

The predicted annual change in surface salinity in the majority of Hillsborough Bay is 1.0 ppt or less. Some apparent influence of freshwater withdrawals from the Alafia River is predicted to occur on surface salinities at the mouth of the river. However, the affected area is small and the predicted surface salinity change due to freshwater withdrawals is typically less than 0.75 ppt throughout the year.

In summary the water quality studies conducted on Tampa Bay indicated:

- The investigation of impacts to tributaries that may result from individual projects has not yielded evidence of significant impacts to living resources. In addition, the cumulative impact analysis did not identify any fatal flaws.
- Regression analysis indicated salinity increase of no more than 1.5 ppt in Hillsborough Bay due to ESWS freshwater withdrawals.
- SWFWMD mechanistic Tampa Bay model suggests salinity increase due to ESWS withdrawals (and Brandon Urban Dispersed Wells and Cone Ranch) are within the range of long-term variability for that portion of the bay.
- The mass balance model indicated a maximum monthly impact to salinity from ESWS withdrawals (and a desalination facility, Brandon Urban Dispersed Wells, and Cone Ranch) within the range of long-term variability of that portion for the bay.

- The mass balance model predicted that the annual cycle of salinity within bay segments re-establishes and stabilizes at slightly higher levels than current levels after 3 to 4 years of operation of the Master Water Plan projects.

4.8.4.2 Tampa Bay Regional Reservoir and ASR System. The addition of an ASR system to the storage capacity at the proposed reservoir is not expected to increase impacts to the Alafia River, the Hillsborough River and Tampa Bypass Canal system, or in the Tampa Bay estuary, beyond those caused by the reservoir alone. The limits on withdrawal from each of the rivers are regulated by SWFWMD. The same minimum and maximum flows, which limit low flow withdrawal and maximum high flow withdrawal, would remain in effect for the withdrawal permits whether the ASR system is included or not.

Any changes to the withdrawal permits would come from additional analysis either through the minimum flows and levels programs administered by SWFWMD or from additional data and analysis obtained from the HBMP that is a condition of the SWFWMD permit.

4.8.4.3 No Federal Action
If the No Federal Action alternative were chosen it would be assumed that there would be no storage for additional surface water withdrawals from the Alafia River or the Hillsborough River and the Tampa Bypass Canal system. If there were no additional withdrawals, there would be no impacts from this project to these rivers or the Tampa Bay estuary.

4.8.4.4 Mitigation. No mitigation is proposed for this portion of the project. Potential impacts to the Alafia River, the Hillsborough River and the Tampa Bypass Canal, and in Tampa Bay from withdrawal of surface waters for storage in the proposed reservoir would be modest and within the range of normal variability. The salinity fluctuation is also within the normal range of variability and is also within the relatively wide range of salinity tolerances of the identified fauna and biota.

A condition of the Alafia River, Hillsborough River and Tampa Bypass Canal water use permits issued by SWFWMD is the establishment of an extensive HBMP to be conducted by Tampa Bay Water. This adaptive management monitoring program, started in 2000, includes elements of water quality, benthic invertebrates, fish, plankton, bird census, vegetation analyses, flows and rainfall (Ralph Montgomery 2001).

4.9 MINIMUM FLOWS AND LEVELS

In 1996, the Florida Legislature directed the SWFWMD to establish minimum flows for surface-water courses and minimum levels for aquifers and surface waters, pursuant to Section 373.042 of the Florida Statutes.

Methodology and Significance Criteria. The purpose for establishing minimum flows and levels is to identify a limit at which further groundwater withdrawals would be "significantly harmful" to the water resources or ecology of the area. The SWFWMD Governing Board interprets the phrase "further withdrawals" to mean continued

withdrawals that would cause water levels or flows to drop below the established minimum flows or levels (SWFWMD 1999).

Currently, minimum flows and levels have not been set for the Alafia River. Modeling over a 10-year period using the proposed withdrawals, flow diversions, and desalination options showed initial increases in monthly salinities of around 1 ppt over the first three years of the simulations, with annual wet season flushing resetting the system each year so that no continued buildup of salinity occurs.

The minimum flow designation for the Alafia River is scheduled to be set by the end of 2001 by SWFWMD. The withdrawals from the Alafia River by Tampa Bay Water are not scheduled to begin until the end of 2002. There is a specific condition in the Alafia River permit, which requires the withdrawal table to be modified if the table is inconsistent with the minimum flow. Minimum flows and levels for the lower Hillsborough River have been set by SWFWMD at 10 cfs. The determination of the minimum flow was based on the loss of historical hydrologic functions, the existing changes and alterations along the river and its watershed, and the dependence of viable ecological communities downstream of the dam on flows from the Hillsborough River and Sulphur Springs (SWFWMD 1999a).

To help determine minimum flows, statistical models and a two-dimensional hydrodynamic model of the lower Hillsborough River were used to evaluate salinity distributions. Statistical analyses were used to predict dissolved oxygen concentrations and the probability of low oxygen conditions in the lower river under various minimum flow releases.

The Tampa Bypass Canal has been the subject of numerous monitoring studies and additional studies focusing in re-analysis of existing data. Data have been collected and analyzed within the past five years either for or by the City of Tampa, Tampa Bay Water, Hillsborough County Environmental Protection Commission, the USGS, SWFWMD, the Department of Community Affairs and the Tampa Bay National Estuary Program. These data and studies were analyzed by the SWFWMD to develop a minimum flow rule in 1998. The proposed zero minimum flow discharge was found deficient by the Northern Tampa Bay Scientific Peer Review Panel in 1999, resulting in this renewed look at minimum flows for the Tampa Bypass Canal.

4.9.1 Action Alternatives.

Alafia River. Although minimum flows and levels have not been set for the Alafia River, the potential impacts of the various projects to tributaries of the Tampa Bay estuary result in salinity changes that remain within the range of natural system variation. The largest predicted effects on freshwater flow occur in the middle range of flow frequencies, leaving the low and high flow rates relatively or entirely unimpacted. Low and high flows are preserved under the withdrawal schedule and little change to salinity regimes under low and high flow conditions occurs.

Hillsborough River. During the Lower Hillsborough River minimum flows study and associated workshops, a minimum flow of 10 cfs as a lower limit for river discharges at the dam was provisionally adopted by SWFWMD, with exceptions for extreme drought conditions. Two key points in determining the minimum flow, agreed to by the technical advisory group convened to assist SWFWMD in establishing minimum flows, were that salinity and dissolved oxygen are critical water quality variables affecting the abundance and distribution of organisms in the lower Hillsborough River.

The determination of minimum flows evaluated how freshwater flows affect the distribution of salinity and dissolved oxygen concentrations in the lower river. Results indicate that salinity is very responsive to freshwater inflows and that relatively small minimum flows could dramatically reduce salinity values. Flows as small as 10 to 20 cfs below the dam could markedly reduce the maximum salinity values at downstream water quality stations. Other data indicated that the continued releases of water below the dam would improve dissolved oxygen concentrations in the lower river, depending on the magnitude of the freshwater release.

Tampa Bypass Canal. To determine minimum flows for the Tampa Bypass Canal, SWFWMD examined flow releases that must be maintained during dry periods to sustain the downstream estuary. A principal factor contributing to the evaluation was the highly altered status of the canal and Palm River. Excavation of the Palm River to form the Tampa Bypass Canal dramatically altered the salinity regime of this system and its relationship to freshwater inflows. Bottom waters in the Palm River have poor flushing characteristics and are relatively isolated from the effects of freshwater inflows.

Predictions of salinity as a function of flow indicate that surface salinity values will remain over 20 ppt over the length of the Palm River, even if the flows at Structure 160 are maintained at their post-construction median value of 73 cfs. Increasing flows from zero to 20 cfs reduces salinity by about 2 ppt to produce values of 23 to 28 ppt between the surface and two meters depth at the water quality station nearest Structure 160. Overall, the salinity distributions and ecological characteristics under no-flow conditions are relatively similar. It is unlikely that salinity changes of this magnitude for short periods of time will change the basic ecological characteristics of the Palm River or McKay Bay.

From a hydrologic perspective, it is not expected that zero flows at Structure 160 will remain for long periods of time even if a zero minimum flow has been established; construction of the canal breached the top of the Upper Floridan aquifer and groundwater inflow increases baseflow and total discharge at Structure 160 (SWFWMD 1999b).

Tampa Bay. Most studies on minimum flows and levels of tributaries entering Tampa Bay have focused on the maintenance of flow regimes to sustain the estuary. In response to a variety of freshwater withdrawal scenarios, several models and analyses have been conducted to predict changes to the salinity distributions in the Tampa Bay estuary. These models include

SWFWMD's Tampa Bay Model and Mass Balance Model (Zarbock *et al.* 1995) and a fatal flaw analysis (Coastal Environmental/PBS&J 1998). Since the tributary minimum flows are based on the minimum requirements of living resources for that water body, the potential impacts of the proposed withdrawals, diversions, and desalination options are not expected to adversely affect these living resources.

The salinity fluctuations found in the above studies are well within the normal range of variability of any month's salinity in Tampa Bay. They are also within the relatively wide range of salinity tolerances of identified living resources of interest. The mass balance model suggested that the annual cycle of salinity within bay segments re-establishes and stabilizes at slightly higher levels than current levels after 3-4 years of operation of the proposed withdrawals.

4.9.2 No Federal Action. The construction and operation of the alternatives would not significantly affect the minimum flows and levels of the above mentioned sources.

4.9.3 Mitigation. A condition of the Alafia River, Hillsborough River and Tampa Bypass Canal water use permits issued by SWFWMD is the establishment of an extensive HBMP to be conducted by Tampa Bay Water. This adaptive management monitoring program, started in 2000, includes elements of water quality, benthic invertebrates, fish, plankton, bird census, vegetation analyses, flows and rainfall (Ralph Montgomery 2001).

Since minimum flows are legislatively defined, the potential impacts of the proposed withdrawals, diversions, and desalination options within the estuary should remain similar to those of an unimpacted system.

4.10 UPLAND VEGETATION

All upland habitats within the footprint of the proposed reservoir site will be converted to open water, embankments, and operations facilities. Upland habitats within the proposed reservoir footprint are dominated by improved pasture and are actively used for cattle grazing and sod production.

Methodology and Significance Criteria. A site visit verified the different upland types found within the project area. Existing vegetation would be permanently lost or altered because of construction of the action alternatives and associated components. The significance of the impacts of the proposed water storage alternatives on vegetation communities was determined by evaluating the overall quality of the habitat, regional abundance, importance to wildlife, and permanence of the impact. Significant impacts would occur if the vegetation loss was permanent, of high value to wildlife, and relatively scarce in the surrounding area.

4.10.1 Action Alternatives. The proposed reservoir site is comprised of improved pasture, some scrub-shrub/mixed forest and a variety of wetland and open water types. The primary upland habitats that are found within the proposed reservoir footprint are improved pasture that is actively used for cattle grazing and sod production. The total number of acres that will be impacted by the footprint of the reservoir is approximately 1,100

acres. Of these 1,100 acres, a little more than 1,000 acres are uplands. All impacts within the reservoir footprint are permanent.

The associated facilities that are required for the operation of the reservoir include a pipeline from Tampa Bay Water's regional system and a service road. The proposed pipeline corridor, from 400 feet north of the intersection of Fishhawk Drive, Bell Shoals Road, and Boyette Road, generally follows existing road rights-of-way, and most impacts to these uplands will be temporary. The construction and continued maintenance of an access road to the reservoir would permanently impact approximately 15 acres of upland vegetation. Water withdrawn from the Alafia River, Hillsborough River and Tampa Bypass Canal and the continued maintenance of the reservoir would not be expected to impact any upland communities along these three drainage's or adjacent to McKay Bay (Tampa Bay).

Permanent and temporary impacts to vegetation would result from implementation of an ASR system. Existing vegetation would be permanently lost or altered at the sites of new wells, basins, and access roads. Construction of pipelines would temporarily and permanently disturb additional areas of existing vegetation. The vegetation at the ASR sites would be converted to buildings and settling ponds. The upland vegetation community is one of the dominant land covers in the Hillsborough county and permanent loss of vegetation from an ASR system would not significantly impact area upland vegetation.

Most of the areas that would be disturbed by the action alternatives contain vegetation communities, which have already been greatly altered by human activity for agriculture or urban and suburban development.

4.10.2 No Federal Action. No impacts to upland vegetation would occur with the No Federal Action alternative since no construction or operation and maintenance activities would be assumed.

4.10.3 Mitigation. The alignment of the reservoir footprint was adjusted during the final design stage to minimize the impacts to upland areas in the northwest corner of the proposed reservoir site. This is an area known to be habitat for gopher tortoises.

4.11 WETLANDS

Wetlands that would be impacted in the study area include forested, herbaceous, scrub-shrub and open water wetlands. These impacts have been broken down into those occurring because of the reservoir and those occurring because of the associated infrastructure (e.g., access roads, pipelines, etc.).

Wetland communities on site include five major types: 1) basin marsh, 2) cypress swamp, 3) open water, 4) scrub shrub/mixed forest swamp, and 5) drainage ways classified as herbaceous wetlands. Most basin marshes have undergone some degree of hydrologic alteration, such as excavation of shallow ditches and cattle ponds through or within the wetlands. There is one cypress swamp located in the northeastern portion of the proposed reservoir site. Lakes within reclaimed mine land and excavated cattle ponds

within isolated basin marshes represent open water. Drainage ways are found throughout, and the scrub shrub/mixed forest areas are associated only with reclaimed mine lands in the southern third of the proposed site.

Wetlands along the pipeline route are limited to bottomland hardwood forest and small areas of wet pasture. The disturbances to wildlife caused by construction of the transmission and effluent pipelines would be primarily temporary. Some woodland habitat would be lost for the maintenance of the pipeline.

Methodologies and Significance Criteria. Wetland limits were delineated in the field with the aid of infrared photography and recorded on 1"-200' rectified aerials with one foot contour intervals and assigned a letter and number designation. The wetlands were classified using both the Florida Land Use, Cover and Forms classification system (FLUCFCS) and the National Wetland Inventory (NWI) wetland classification system.

4.11.1 Tampa Bay Regional Reservoir Project. Herbaceous wetlands account for 60 percent (109.58 ac) of the total impacted wetlands on the reservoir. Reclaimed lands, which are located in the southwest portion of the project, contain 19 percent (34.68 ac) of the total impacted wetlands. Reclaimed lands are those lands that have been restored following phosphate mining. The communities that are found in this region are forested, scrub-shrub, and herbaceous wetlands and open water features. Impacts to forested communities comprise 9 percent (16.63 ac) of the total impacts and open water features account for 12 percent (21.39 ac). Impacts within the reservoir footprint are permanent and would require mitigation. The amount of wetland impacts as determined by the U.S. Army Corps of Engineers, Florida Department of Environmental Protection, and Hillsborough County Environmental Protection Commission within the reservoir footprint are presented in Table 4-1. Figure 4-1 shows where individual wetland impacts would occur within the reservoir footprint.

Table 4-1. Summary of Wetland Impacts for the Tampa Bay Regional Reservoir

	Forested	Herbaceous	Reclaimed Lands (Forested and Herbaceous)	Open Water	*Total Acreage Impacts
FDEP/EPC Acreage Impacts	14.32	94.88	34.56	21.39	**165.15**
ACOE Acreage Impacts	16.63	109.58	34.68	21.39	**182.28**

*all impacts within the reservoir are permanent

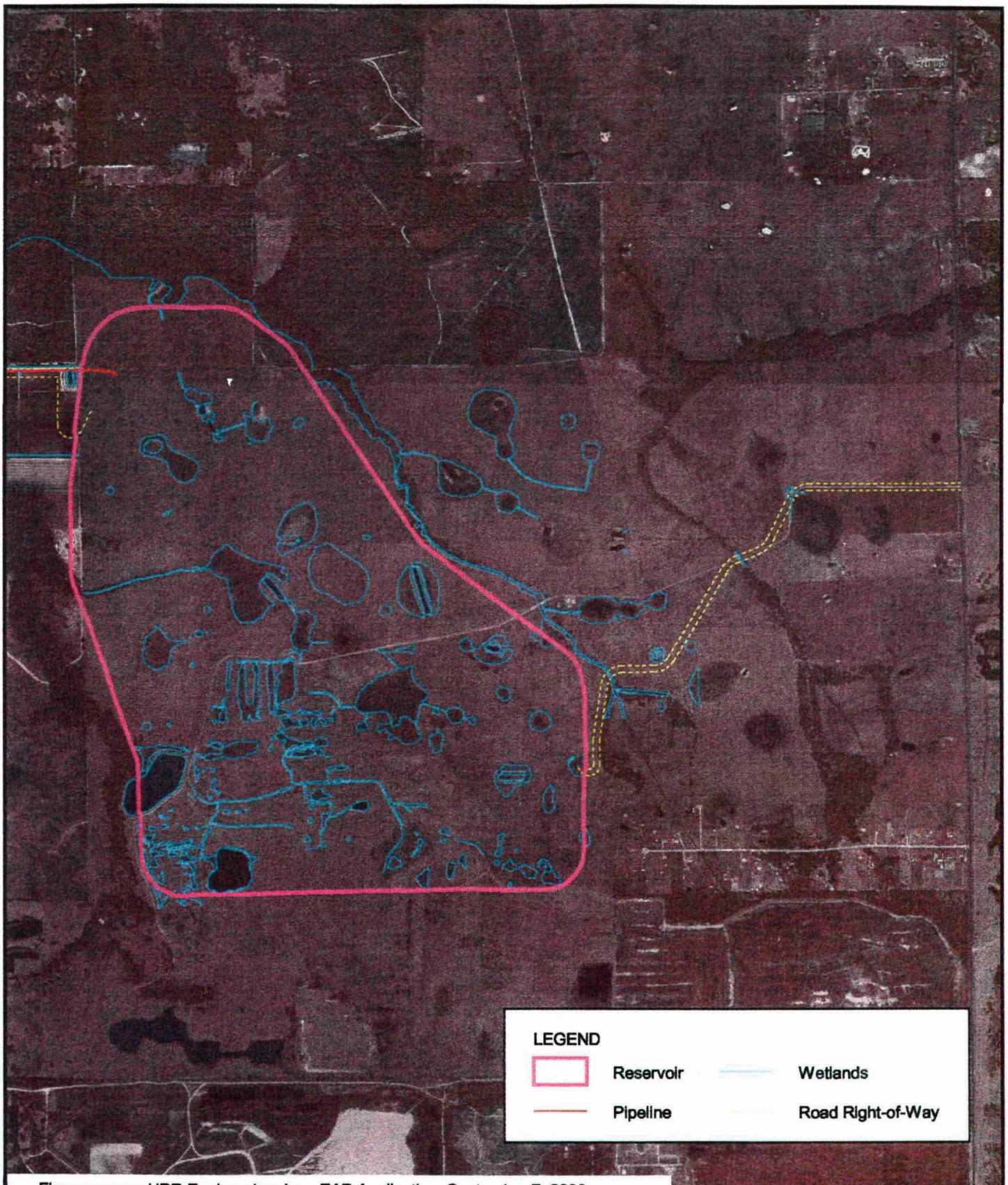


Figure source: HDR Engineering, Inc., EAP Application, September 7, 2000

N
W
E
S

2000 0 2000 Feet

Figure 4-1
TAMPA BAY REGIONAL RESERVOIR PROJECT DEIS

RESERVOIR WETLAND IMPACTS

For pipeline and access roads associated with the reservoir, a total of 10,131 cubic yards of fill will be placed in wetlands and 861 cubic yards will be dredged.

The pipeline route includes numerous creek crossings. Most of these are minor and would involve open-cut construction across creeks that may or may not have water in them at the time of construction. These creeks include jurisdictional wetlands and waters of the United States. Actual crossing construction (open cut or trenchless) would depend on environmental resource permit negotiations. Turbidity control and erosion control would be in place during construction. Grades should be returned to pre-construction conditions. Herbaceous impacts account for 8 percent (0.46 ac) of the total impacted wetlands along the pipeline route. Impacts to forested communities comprise 72 percent (4.33 ac) of the total impacts and open water features account for 20 percent (1.23 ac). Impacts along the pipeline are temporary and are not anticipated to require off-site mitigation. Impacts to individual wetlands are included in Table 4-2; a graphic illustration of impacted wetlands is presented in Figure 4-2.

Both palustrine and estuarine wetlands occur along the Alafia River. The principal palustrine wetland community along the river is river/lake swamp with a few forested wetlands while, the estuarine wetland communities are primarily saltwater marsh and mangrove swamps.

The Hillsborough River and Tampa Bypass Canal are both highly modified systems. As a result, very little natural shoreline and few wetlands exist. In Tampa Bay, emergent saltwater wetlands occur and include mangrove forest, tidal marshes and salt barren/high marshes. However, because of commercial and residential development, the extent of these natural communities is limited. Potential impacts to these communities found in and around Tampa Bay and its tributaries would result if salinity levels change dramatically. Therefore, the operational impacts of this project would not be expected to affect these natural systems.

4.11.2 Tampa Bay Regional Reservoir and ASR System. The wetland impacts associated with construction and operation of proposed reservoir for this alternative are the same as those described above, with some additional potential impacts associated with the ASR system.

The construction of transmission pipelines and access roads may cross wetlands located in the area of the ASR system. These wetlands, however, would be impacted only temporarily. For transmission pipelines, wetlands were considered lost within the permanent easement and temporarily disturbed within an additional construction easement. Pipelines within the well fields were considered to temporarily disturb wetlands within a 50-foot wide construction zone. Crossing wetlands by access roads would be avoided. In the event that access roads could not avoid wetlands, the impact would be permanent. The access road width would be approximately 20 ft. Based on spot observations, wetlands were assumed to exist along the banks of all streams that would be crossed by pipelines.

Table 4-2 Summary of Wetland Impacts for the Associated Facilities

	Forested	Herbaceous	Open Water	*Total Acreage Impacts
FDEP/EPC Acreage Impacts	4.33	0.46	1.23	**6.02**
ACOE Acreage Impacts	4.33	0.46	1.23	**6.02**

*Includes both temporary and permanent impacts.

Wetlands and aquatic beds are afforded an extra measure of protection under the Clean Water Act. Any unavoidable loss to these special aquatic sites would be a significant impact.

4.11.3 No Federal Action. The No Federal Action alternative would not have any impacts on the wetlands in the project area because it would be assumed that neither of the proposed alternatives would be built. However, impacts to wetlands resulting from the withdrawals from existing wellfields would continue to significantly impact wetlands in Tampa Bay Water's service area.

4.11.4 Mitigation. The mitigation plan provides base information to compensate for unavoidable wetland impacts associated with the proposed reservoir project. The amount of mitigation is based on wetland impacts as determined by the U.S. Army Corps of Engineers (Corps), Florida Department of Environmental Protection (FDEP), and Hillsborough County Environmental Protection Commission. The mitigation projects are expected to provide an ecological benefit to the region. The mitigation summary is included as Appendix B.

4.12 WILDLIFE

In this discussion, wildlife is considered to be the more common species of mammals, birds, reptiles, amphibians, and fish that occur in the project area. Information was obtained from on-site observations during the permitting process as well as scientific literature research. Construction of any of the water supply alternatives would impact wildlife directly through mortality of individuals during reservoir construction and indirectly through habitat loss.

Methodologies and Significance Criteria. Extensive field reviews and surveys of the proposed reservoir site have been conducted since 1998 for suitable wetland and wildlife habitats, including those for federal and state listed threatened and endangered species. Potential impacts on terrestrial wildlife were evaluated based on the quantity, quality, and scarcity of the habitats disturbed by or lost to construction. Impacts would be significant if high quality, relatively rare wildlife habitat is lost or significantly impacted.

4.12.1 Action Alternatives. Wildlife species expected to occur in the vicinity of the proposed project area are numerous and varied due to the mosaic

Figure source: HDR Engineering, Inc., EAP Application, September 7, 2000

N
W E
S

2000 0 2000 Feet

LEGEND

Reservoir

Pipeline

Wetlands

Road Right-of-Way

Figure 4-2
TAMPA BAY REGIONAL RESERVOIR
PROJECT DEIS

PIPELINE WETLAND IMPACTS

of upland and wetland communities found in the region.

Wildlife observed on the reservoir site, or highly likely to utilize the site, include small and large mammals, reptiles, amphibians, and a wide variety of birds. Small mammals that may occur on the project site such as raccoon, armadillo, opossum, and eastern cottontail, will be displaced to surrounding habitats by construction of the reservoir. Large mammals such as wild pig, and white-tailed deer, and reptiles such as the anole, six-lined racerunner, and various snakes, are mobile species and will likewise be displaced to surrounding habitats. Impacts to these species are expected to be minor but habitat loss would be permanent in nature.

A wide variety of upland and wetland dependent bird species, both permanent residents and winter migrants, potentially utilize the proposed reservoir site. Habitat for these species will be lost within the footprint of the reservoir. These species will be displaced by the construction of the reservoir but many, especially upland species, will likely utilize the uplands immediately surrounding the reservoir. Wetland-dependent species will be displaced to wetlands in the surrounding areas. Impacts to these species are also expected to be minor but habitat would be lost due to construction.

Alafia River, Hillsborough River, and Tampa Bypass Canal. The diverse habitat around the Alafia River provides cover and forage for a variety of wildlife species. Species occurring in and along the river include small and large mammals, marine mammals, birds (including wading birds), and benthic macroinvertebrates.

It is unlikely that significant impacts to the Alafia River would result from the proposed surface-water withdrawals. Many resource managers agree that in most systems the largest potential for impacts occurs when low flows are disrupted. For the proposed project, the largest predicted effects on freshwater flows would occur in the middle range of flow frequencies, leaving the low and high flow rates relatively or entirely unimpacted. Therefore it is highly unlikely that operation of either of the proposed alternatives would impact wildlife associated with Alafia River. Similar to the Alafia River, the diverse habitats around the Hillsborough River and Tampa Bypass Canal provide cover and forage for a variety of wildlife species. However, these habitats have been greatly impacted by human development, resulting in limited species diversity and population sizes. Developments and human disturbance limit the overall amount of habitat present, and competition is high for limited resources. It is unlikely that significant impacts to the wildlife associated with the Hillsborough River/Tampa Bypass Canal system would result from the operation of any of the water supply alternatives.

Tampa Bay. Tampa Bay is a subtropical estuary with a rich mosaic of fish and wildlife habitats. These habitats include seagrass beds, salterns, and vegetated intertidal areas with mixtures of mangrove and tidal marsh vegetation. A variety of wildlife species use the habitats found in Tampa Bay, including small and large mammals, marine mammals, birds (including wading

birds), reptiles, amphibians, and benthic macroinvertebrates.

Potential impacts of the proposed withdrawals should not adversely affect the estuary as a nursery and habitat for living resources. The required minimum and maximum flow levels as specified by the existing water use permits would be addressed through operating schedules, design considerations, and other resource management activities. The potential impacts of the various projects to tributaries of the Tampa Bay estuary result in salinity changes that remain within the range of natural system variation. It is unlikely that significant impacts to wildlife habitat in and around Tampa Bay would result from operation of the action alternatives. The largest predicted effects on freshwater flows would occur in the middle range of flow frequencies, leaving the low and high flow rates relatively or entirely unimpacted.

ASR wells are by definition constructed below ground level, usually with minimal surface impacts. Additional impacts to wildlife from the addition of the ASR wells to the reservoir site would be essentially temporary in nature and related to construction. Human presence and noise associated with drilling activities would be expected to cause wildlife to avoid the area. After construction, human presence will be limited and would not be expected to cause increased impacts over current conditions.

4.12.2 No Federal Action. The No Federal Action alternative would not require any construction activities and would not change existing wildlife habitats in the project area. Overall, the No Federal Action alternative would have no impacts, positive or negative, on local wildlife.

4.12.3 Mitigation. Three mitigation sites are proposed in the vicinity of the Tampa Bay Regional Reservoir Project to compensate for unavoidable wetland impacts associated with the project. The three sites are:

- East Pruitt/Carlton-Smith Site
- West Pruitt Site
- North Carlton-Smith Site

Based on anticipated mitigation requirements, all three sites would need to be developed to meet the mitigation needs for the proposed reservoir project. The mitigation sites would be developed near the Tampa Bay Regional Reservoir Project. In addition 5,200 acres immediately adjacent to the proposed reservoir is being purchased by the SWFWMD and will be preserved as a natural area.

4.13 FISHERIES

The general project area contains a variety of available fish habitat types, used by a diverse group of species. A discussion of the various habitats present and the common species found in the vicinity of the proposed Tampa Bay Regional Reservoir, Alafia River, Hillsborough River, Tampa Bypass Canal, and Tampa Bay are presented in Chapter 3. In this section, possible impacts to fish species found in these areas as a result of freshwater withdrawals are discussed.

Methodologies and Significance Criteria. Potential impacts to the Alafia River, the Hillsborough River, Tampa Bypass Canal, and the Tampa Bay estuary would include changes to

downstream habitats and the associated fish species due to surface water withdrawals for storage in the proposed reservoir and ASR wells. Salinity plays the most important role as a limiting factor for most species in estuaries, where organism distribution can be established in relation to the isohalines (Cognetti and Maltagliati 2000). Therefore, salinity is used here as the primary indicator for potential impacts to wildlife. Impacts to terrestrial and aquatic wildlife and fishes were based on changes in the salinity gradients of the rivers and estuaries, as well as the habitats affected by these changes.

Fish data from several studies and sources were reviewed to determine species present that would potentially be affected by the proposed withdrawals (Dames and Moore 1975, HDR 1998). As expected, in the upstream reaches of the Alafia River, species preferring lower salinity to freshwater habitats were found, and downstream near the mouth, species preferring higher salinity habitats were found.

4.13.1 Tampa Bay Regional Reservoir Project. Fish species expected to occur in the vicinity of the proposed project area are limited to the open water habitat found on site. Most of the fish would occur in the freshwater marsh wetlands of the proposed reservoir area. Fish that inhabit these areas are typically small, minnow-sized species and smaller individuals of larger species. The size and abundance of individual fish species varies seasonally. Numbers of small fishes increase rapidly following re-flooding of previously dry marshes. As water levels rise and stabilize, larger fish survive and become dominant, including species that inhabit the deeper marshes and ponds. Impacts to species found on the site are expected to be minor but open water habitat associated with wetlands on the interior would be lost due to construction of the reservoir. Species assemblages typical for this habitat are presented in Chapter 3.

Construction of the proposed reservoir would increase open water habitat and provide a significant freshwater fishery. This would provide a positive benefit for the fisheries on site.

Alafia River, Hillsborough River, and Tampa Bypass Canal. Like the tidal portion of the Little Manatee River, the Alafia River and Hillsborough River are used heavily year-round as nursery habitat by an economically important assemblage of estuarine-dependent fishes, with larval species richness highest during spring and summer.

Based on the salinity tolerances of species present, it is predicted that the maximum increase of 2 ppt within the oligohaline reaches of the Alafia and Hillsborough rivers is not expected to cause undue stress to these fisheries. Fish species with identified salinity preferences are reported to tolerate salinity concentration ranges greater than the maximum predicted increase within oligohaline reaches of the river. In addition, fish are mobile and can move to coincide with the most favorable water-quality conditions during short-term perturbations.

Tampa Bay. Tampa Bay provides important habitat for both adult and juvenile resident and migratory fish species. The seagrass beds and backwater areas in the bay provide important nurseries for the larvae and

juvenile stages of these species (Lewis and Estevez 1988). Most species spawn during the spring and early summer in either the nearby Gulf or in higher salinity areas of Tampa Bay. During and following these spawning periods, the larval and juvenile fish typically migrate into either seagrass beds or shallow, protected, low-salinity nursery areas of the bay to feed and mature (Comp 1985; Lewis *et al.* 1985).

Like juvenile snook and spotted seatrout, juvenile striped mullet and red drum are euryhaline. Juvenile striped mullet prefer low-salinity riverine tidal creeks and creek mouths with unvegetated muddy or mud and sand bottoms, and may avoid linear mangrove habitats and marsh shorelines. Epiphytic and benthic microalgae and macrophyte detritus of these habitats provide the food source. Juvenile red drum occur in waters of 0-50 ppt salinity, but migrate to 0.5–8 ppt salinities and prefer tidal tributaries and backwater areas with muddy bottoms, low-energy shorelines or coves; and some shoreline emergent vegetation (Killam *et al.* 1992).

Both salinity and habitat characteristics affect distribution of the species described above, so that changes in the salinity regime with respect to fixed habitat features may change the availability of suitable habitat. This is also true with respect to seagrasses, marshes, and riparian vegetation that are both living resources and relatively fixed biotic components of fish habitat. Inspection of these predicted salinities and preferences for the vegetation, benthos, and fishes examined indicates that the predicted salinities resulting from application of the proposed withdrawal schedule are well within the range of salinities tolerated by the organisms.

4.13.2 Tampa Bay Regional Reservoir and ASR System. Additional impacts to fisheries from the addition of the ASR system to the reservoir site will be essentially temporary in nature and related to construction. After construction, human presence will be limited and is not expected to cause increased impacts over current conditions.

4.13.3 No Federal Action. If the No Federal Action alternative were chosen, the proposed reservoir and associated facilities associated pipeline, and the ASR system would not be built. There would be no impacts to fisheries from this alternative.

4.13.4 Mitigation. Tampa Bay Water has corresponded with FDEP and EPC and it appears that the agencies would require open water mitigation for the proposed reservoir. Therefore an additional 14 acres of open water would have to be created within the three mitigation areas. These open water areas would provide mitigation for impacted fisheries in the proposed project area.

Intake velocities at maximum withdrawal rates for the Tampa Bypass Canal and the Alafia River Pump Station. Intakes are less than 0.5 ft/sec to minimize entrainment and impingement.

4.14 THREATENED AND ENDANGERED SPECIES

Eleven endangered and seven threatened species have been identified as potentially occurring in the project area

(Table 3-5). Brief descriptions of each species are presented in Chapter 3. More detailed descriptions are included in the Biological Assessment (Appendix A).

Methodologies and Significance Criteria. Field reviews and surveys of the proposed reservoir site have been conducted since 1998 for suitable wetland and wildlife habitats, including those for listed species (HDR 2000).

Impacts of the proposed project on wildlife would include temporary disturbance during construction and loss of habitat. Impacts on terrestrial wildlife were evaluated based on the quantity, quality, and scarcity of the habitats disturbed by or lost to construction. Impacts would be significant if high quality, relatively rare wildlife habitat is lost or significantly impacted. Impacts from construction of the proposed pipeline to habitat potentially supporting protected species will be temporary in nature.

4.14.1 Federally Threatened and Endangered Species.

4.14.1.1 Action Alternatives. Prior to construction, supplemental surveys are anticipated to confirm the presence or absence of listed species within zones of direct impact, and appropriate permits or authorizations will be requested. Typically these authorizations include avoidance of construction during the breeding seasons of certain species, *e.g.* burrowing owl, fox squirrel, and sandhill crane.

Wood Stork. Surveys conducted in 1999 and 2000 indicated that impacts to the foraging habitat of the wood stork would occur as a result of the project construction and operation, however, impacts to nesting areas or rookeries would not occur. It is concluded that the proposed project is not likely to adversely affect the wood stork.

Scrub Jays. Surveys were conducted following the guidelines in the FWC Nongame Wildlife Program Technical Report No. 8 prepared to determine the presence of scrub jays within the survey area and, if present, to document the population (Fitzpatrick *et al.* 1991). Although an area of potential scrub jay habitat was identified at the reservoir site, no scrub jays were observed. The footprint of the proposed reservoir was redesigned to avoid this habitat; therefore, the proposed project is not likely to adversely affect the Florida scrub jay.

Bald Eagles. Bald eagles are known to occur in the vicinity of the project site; however, only one individual was observed in flight over the reservoir site. Because no nests have been observed or recorded on the reservoir site or within the pipeline corridor, the project is not anticipated to adversely affect the bald eagle.

Red-Cockaded Woodpecker. Impacts as a result of the proposed project are not expected to adversely affect the red-cockaded wookpecker. The Florida Natural Areas Inventory (FNAI) does not list the red-cockaded woodpecker as occurring in Hillsborough, Pasco, or Pinnellas counties. This species was not found during surveys of the regional reservoir site and pipeline corridor and therefore construction and operation of the project would not likely impact the species.

American Alligators. American alligators occur in creeks, streams, and other wetlands throughout Hillsborough County. They have been observed on the western portion of the reservoir site in two open-water bodies. Although some loss of suitable habitat would occur as a result of the project, the proposed project is not likely to adversely affect the American alligator population.

Indigo Snakes. Individual indigo snakes were observed on the reservoir site on two occasions. One sighting was within the northern hardwood forest associated with Doe Branch. The second sighting was within an oak-shrouded fence line in the west-central portion of the proposed reservoir site.

Potential impacts to the indigo snake are associated with habitat loss, specifically wetland hardwood forest. However, due to the expanse of similar habitats in the project vicinity, the proposed project is not likely to adversely affect the eastern indigo snake.

Sea Turtles. Decreases in freshwater inflow into Tampa Bay are not expected to adversely affect sea turtle populations. Sea turtles are highly migratory and will travel great distances to forage (Musick and Limpus 1996) and are also capable of moving into preferred salinity habitats. In addition, all sea turtle species have salt glands that mechanically reduce water and salt flux, and physiological mechanisms that work to actively extrude gained salt, obtain free water, and regulate the internal ionic balance (Lutz 1996). Because nesting activities occur almost exclusively on the Gulf-facing beaches in the Tampa Bay area, potential salinity changes within the bay should have no effect on sea turtle nesting.

Gulf Sturgeon. The Gulf sturgeon is threatened sub-species of the Atlantic sturgeon, and once inhabited the Hillsborough River and Tampa Bay. Sub-adult and adult Gulf sturgeon migrate upstream to spawn in rivers draining to the Gulf of Mexico from early spring through the end of May (USFWS 2000). In late September to early October, adults migrate downstream to estuarine habitats until they are at least two years old. Currently, the Florida Marine Research Institute is leading a cooperative effort to release a limited number of Gulf sturgeon into parts of the Hillsborough River (FMRI 2000). Due to the sturgeon's mobility, the proposed project is not likely to adversely impact the Gulf sturgeon.

Florida Manatee. The Florida manatee is protected by both federal and state wildlife agencies and listed as endangered (FGFFC 1997). They inhabit freshwater, brackish, and marine habitats and move freely between salinity extremes. If the water is deep enough and the currents are not too strong, manatees will travel great distances up coastal rivers (Florida Power and Light 1982). Because manatees move freely between salinity extremes, and the adjacent tributaries provide a source of freshwater, proposed freshwater withdrawals would have no adverse impacts on this species (Coastal Environmental/PBS&J 1998).

Threatened and Endangered Plants. Impacts as a result of the proposed project are not expected to adversely affect endangered and threatened plant

species. Florida bonamia, pygmy fringe tree and Florida golden aster are documented to occur in Hillsborough County, but have not been found on the proposed project site. Beautiful pawpaw and Small's jointweed are not documented by the FNAI or FWS to occur in Hillsborough County, and are therefore not likely to be impacted by the proposed project.

4.14.1.2 No Federal Action. The No Federal Action alternative would not impact federal threatened and endangered species.

4.14.1.3 Mitigation. The Proposed Mitigation Plan provides base information to compensate for unavoidable wetland impacts associated with the proposed reservoir project. The amount of mitigation is based on wetland impacts as determined by the United States Army Corps of Engineers, FDEP, and Hillsborough County Environmental Protection Commission. In addition to the proposed mitigation sites, SWFWMD is purchasing 5,200 acres adjacent to the proposed reservoir that would remain set aside as a natural area.

The basin-marsh mitigation could provide habitat suitable for sandhill cranes, a protected species observed in the area, and other wetland dependent species of the proposed reservoir site. Most likely, some type of mitigation for loss of habitat will be required by permitting agencies for sandhill cranes and other wetland-dependent species. The mitigation project would most likely provide benefits to future corridors. As a result of this site's proximity to the Pruitt Site, where several protected species of wildlife have been observed, it is reasonable to assume that herons, egrets, and Florida sandhill cranes use this site. Recent field observations on the proposed mitigation parcel indicate that eastern indigo snakes, alligators, and a bald eagle use this site. The mitigation scenario proposed for the site is expected to benefit these species.

4.14.2 State Listed Species of Special Concern. The Florida Fish and Wildlife Conservation Commission (FWC, formerly the FGFWFC) is responsible for listing protected species in the State of Florida. Impacts to State Listed Species of Special Concern are regulated by the FWC, and impacts may require permits and/or mitigation.

4.14.2.1 Action Alternatives.

Sandhill Cranes. During the 1999 nesting season, four nesting pairs of Florida sandhill cranes and one pair of offspring were documented on the proposed reservoir site. During non-nesting months, no more than two pair of adult cranes were observed foraging on the proposed reservoir site at any one time. During the 2000 nesting season, no nests or nesting adults were observed at the 1999 nest sites, although one adult was observed sitting on a nest at a previously undocumented site on January 8, 2000. Mitigation for impacts to wetlands, including suitable nesting habitat, will replace crane nesting habitat. Construction related impacts to active nest sites would not be permitted.

The proposed mitigation plan for wetland impacts associated with the reservoir construction include basin-marsh restoration/creation, which could provide suitable habitat for sandhill cranes.

Southeastern American Kestrel. In Florida, the southeastern American kestrel prefers open habitats including pastures, open longleaf pine-turkey oak-sandhill communities, grasslands, and open sites within suburban and residential areas. Pasture is the primary kestrel habitat on the proposed reservoir site. American kestrels were frequently observed within the proposed reservoir site and pipeline routes during the fall and winter months. The first arrivals during the 1999 fall season were documented on October 22nd. No kestrels were observed during the five-month period of April through August indicating that kestrels observed on the reservoir site during fall and winter months were migratory individuals and not the listed Florida subspecies.

Because of their diverse habitat preferences, it is concluded that the proposed reservoir site does not currently support resident Southeastern American kestrels, and therefore the project would not likely adversely affect this species.

Wading Birds. Wading birds found in the vicinity of Tampa Bay include the snowy egret, white ibis, tricolored heron, little blue heron, reddish egret, and roseate spoonbill. Some loss of wading bird foraging habitat would occur as a result of the project; however, since no colonies or sign of colonial activities were observed during the 1998, 1999, or 2000 nesting season, impacts to nesting areas or rookeries would not occur. Therefore the proposed project would not likely adversely affect these wading bird species. Over 14 acres of open water systems would be developed to mitigate for impacts that could occur in the reservoir footprint and would provide habitat for wading birds.

Burrowing Owls. One pair of burrowing owls has been observed on the proposed reservoir site but no quantitative surveys have been completed. If construction of the reservoir impacts any nesting burrowing owls, the necessary permits would be applied for and mitigation will be proposed.

Gopher Tortoise. Gopher tortoise habitat is located outside of the northwest corner of the proposed reservoir site and was surveyed to quantify population densities. A total of 54 active and 16 inactive burrows were identified, giving an approximate density of 1.6 tortoises per acre. This area would be avoided and direct impacts are not expected.

Surveys have been completed within suitable habitat along the pipeline route; two active burrows were identified. Impacts to suitable habitat along the pipeline route would be temporary. Additional surveys prior to construction would be completed to confirm the presence or absence of tortoises.

Potential secondary impacts related to seepage could occur to the population located in the northwest corner of the reservoir site. Seepage could potentially result in an increase in water-table elevations and therefore flooding of gopher tortoise burrows.

As part of the ecological and HBMP, surficial aquifer wells would be installed in this area to track changes in the surficial aquifer (*i.e.* water table) under baseline conditions (pre-construction),

during construction, and during operation. The extent of seepage and related changes in the water table, if any, would appear gradually during the initial filling of the reservoir. Should surficial aquifer levels deviate from an expected annual flux compared to baseline conditions, management strategies would be implemented. These strategies would primarily include the establishment of well points and pumpage of this seepage water out and back into the reservoir or other suitable off-site location.

Florida Mouse. Suitable habitat also exists for the Florida Mouse adjacent to the northwest corner of the proposed reservoir footprint and it is likely that the Florida mouse uses the gopher tortoise burrows on-site. This area would be avoided during construction and operation of the alternatives and associated facilities. The project is not likely to adversely affect the Florida mouse.

Sherman Fox Squirrel. Sherman fox squirrel habitat on the proposed reservoir site includes oak-dominated fence lines, sparse oak woodland near Long Flat Creek, oak hammock, and cypress swamp. The squirrels have been observed on the proposed project site at several locations over the past two years. Although fox squirrels are widespread in Florida, they are listed as threatened (State list) and their distribution is patchy due to habitat loss.

If nests were identified within the site footprint, an equivalent acreage of habitat would be placed into preservation. The acreage to be preserved would be calculated by measuring the impacted habitat plus a 100-foot buffer. Preservation of hardwood riverine corridors (*e.g.* Doe Branch and Long Flat Creek) would adequately mitigate for impacts to habitat used by this species.

Gopher Frog. The gopher frog is closely linked to the gopher tortoise, often using the tortoise burrow as a refuge. Surveys for the frog have not been conducted on the project site, although suitable habitat exists. A cypress swamp with interior marsh is located approximately one-quarter mile southeast from the xeric community noted for the gopher tortoise. This cypress swamp is within the proposed reservoir footprint and would be lost. If the gopher frog occupies the xeric oak community, the project could adversely affect breeding opportunities for those individuals.

Estuarine Birds. Estuarine birds listed as species of special concern in the Tampa Bay area include the least tern, southeastern snowy plover, brown pelican, American oystercatcher, and black skimmer. These birds live and forage in a variety of saline habitats, including coastal beaches, dunes, intertidal sand flats, and estuaries. The potential salinity changes from the proposed withdrawals would not be expected to adversely impact food sources of marine birds.
These birds have physiological adaptations that enable them to tolerate high salinities. Many estuarine birds have paired nasal salt glands, located above the orbit of each eye, that secrete a salty fluid through a duct connected with the nasal cavity (Schmidt-Nielson 1991). These salt glands are usually inactive until the bird is under osmotic stress (eating salty food or drinking

seawater), and can effectively eliminate the internal salt load in a matter of hours (Schmidt-Nielson 1991). With these physiological adaptations, it is unlikely that the proposed withdrawals would adversely affect coastal bird populations.

Peregrines. Peregrines have been observed throughout Florida during the winter, but are encountered most often near the coasts. The destruction of habitat poses the greatest threat to the Peregrine falcon in Florida. Coastal wetlands, particularly important to the species, suffer from the highest rates of development and urbanization (Rodgers *et al.*1996). It is unlikely that the proposed withdrawals would adversely impact these birds.

Brown Pelican. The brown pelican is perhaps Florida's most distinctive and widely recognized bird. They dive for fish from 20- to 30-foot heights, and can be seen flying to and from feeding grounds in loose V-formations. There have been 1,600 to 2,000 breeding pairs of brown pelicans counted in Florida since 1994. About 20 percent of the state breeding population occurs in the Tampa Bay area (Paul, 1999). It is unlikely that that proposed withdrawals would adversely affect brown pelican populations.

Snook. Common snook are well-documented inhabitants of Tampa Bay, usually located among the mangroves, tidal marshes, and non-vegetated subtidal areas of lower salinities (Comp 1985; Janicki *et al.* 1995). Adult snook generally inhabit brackish water areas where salinities range from 0 to 36 ppt.

Studies suggest that salinity may not be a major factor influencing larval and juvenile snook distribution in the estuary; however, water temperature, water depth, currents and structural habitat components appear to be critical factors in the selection of snook spawning and nursery habitat. Extremely low water temperatures can be lethal to snook. Snook abundance is probably limited by the availability of critical habitat in the Tampa Bay estuary. Typical habitats of larval, juvenile and adult snook include mangroves, backwaters, tidal tributaries, and areas that provide access to deep water channels (Versar 1992).

Given the large range in salinities in which snook are found in Tampa Bay, this difference in metabolic cost may not be critical to survival of this species. Therefore the possible maximum salinity changes from the proposed freshwater withdrawals would not be expected to adversely impact juvenile or adult snook in Tampa Bay and its associated tributaries.

4.14.2.2 No Federal Action. If the No Federal Action alternative were chosen, it would be assumed that there would be no construction of the proposed reservoir, pipeline, or ASR well field and no additional surface-water withdrawals from the Alafia River, the Hillsborough River, or the Tampa Bypass Canal. If there are no additional withdrawals, there would be no impacts from this project to the proposed reservoir site, the tributary rivers, or the Tampa Bay estuary.

4.14.2.3 Mitigation. Three mitigation sites are proposed in the vicinity of the Tampa Bay Regional Reservoir Project to compensate for unavoidable wetland

impacts associated with the project (Figure 4-3). The three sites are:

- East Pruitt/Carlton-Smith Site (approximately 367 acres)
- West Pruitt Site (approximately 850 acres)
- North Carlton-Smith Site (design phase)

Based on anticipated mitigation requirements, all three sites would need to be developed to meet the mitigation needs for the proposed reservoir project. The mitigation sites would be developed near the Tampa Bay Regional Reservoir Project (Figure 4-4).

4.15 SOCIOECONOMIC CONDITIONS

The construction and operation of the project alternatives would have both positive and negative impacts from a social and economic perspective. The construction phase would take approximately two years to complete and would create some short-term employment in the area. New long-term employment would consist primarily of personnel for operations and maintenance of the water supply and treatment components. The construction of the reservoir would remove grazing and agricultural land out of production. The 5,200 acres purchased by SWFWMD would be taken off of the tax role as SWFWMD and Tampa Bay Water are both state agencies and are tax exempt.

Existing social and economic conditions and trends within the project region were documented and impacts caused by the project were evaluated. Based on existing conditions and trends, project impacts would be significant only if changes in the social and economic environment of the area would exceed the ability of the area to absorb the change and result in hardships for a segment of the population, the economy, or public services.

4.15.1 Population.

4.15.1.1 Action Alternatives. During the construction phase, the primary effect on population would be a temporary increase from the influx of the construction work force. Construction is anticipated to take two years for either of the action alternatives. The peak maintenance and operation work force expected at any single site would be approximately two people. It is anticipated that the project work force would likely be composed of both local and non-local personnel. Non-local workers would be distributed throughout the area, with some residing locally in the Riverview area and others commuting from the City of Tampa and surrounding communities. Even if all of the workers came from outside of the study area, the short-term increase in population would not cause impacts large enough to be analyzed due to the existing large population base.

The primary long-term effect of the two action alternatives would be the facilitation of the current forecasted trend in area population growth, which would not be a significant impact.

4.15.1.2 No Federal Action. The No Federal Action alternative would not require any construction or result in any change in the availability for water for public consumption. Consequently, this alternative would not impact the regional population.

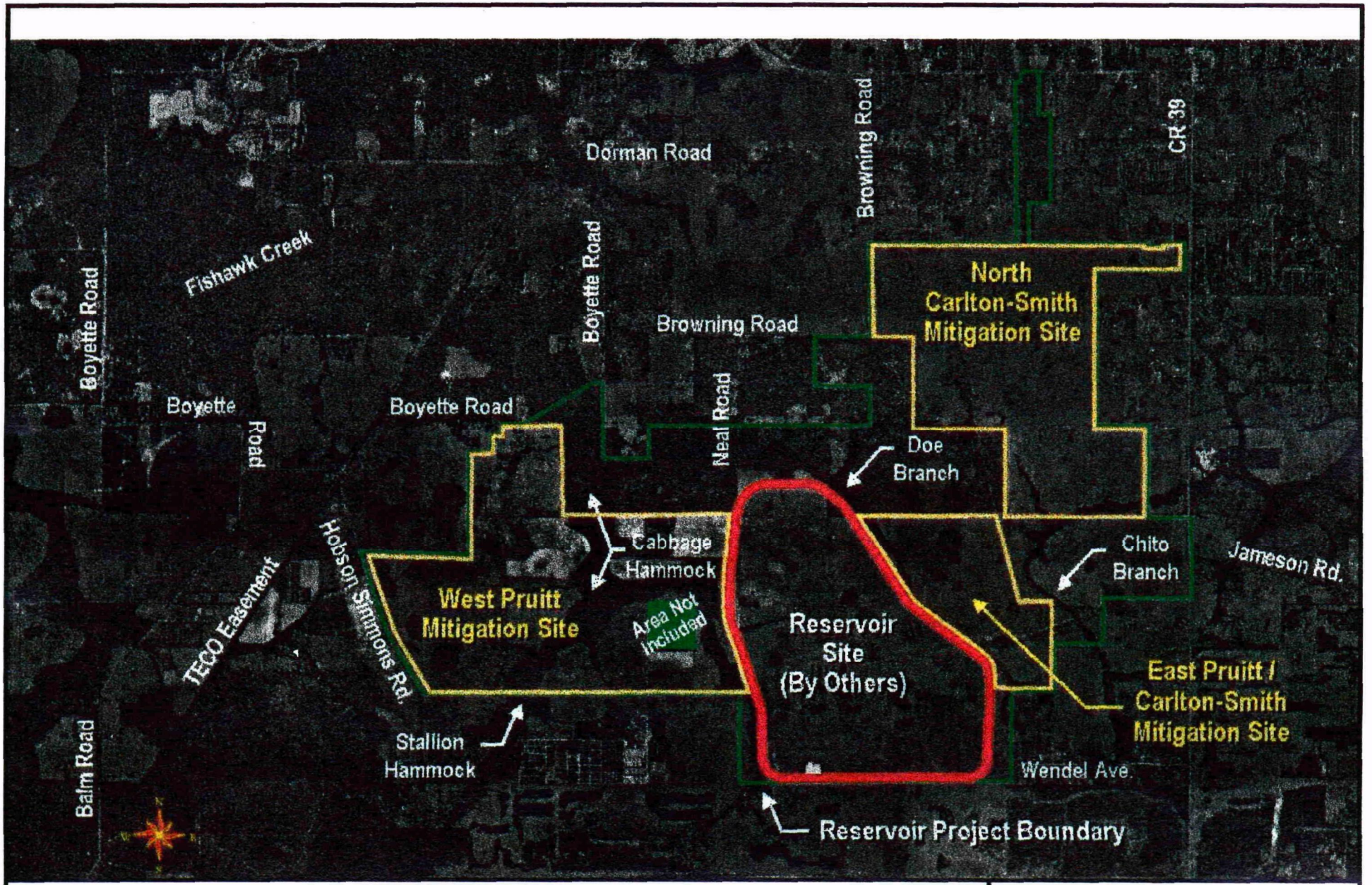


Figure 4-3
TAMPA BAY REGIONAL RESERVOIR PROJECT DEIS

PROPOSED MITIGATION SITES

4.15.2 Housing.

4.15.2.1 Action Alternatives. No increases in housing demands are expected from the temporary and permanent work forces needed for the project because most of the labor would come from local sources. No residences are found within the proposed reservoir site; therefore, no significant impacts on existing housing are anticipated.

4.15.2.2 No Federal Action. Under the No Federal Action alternative, no significant impacts on existing housing would occur.

4.15.3 Land Use.

4.15.3.1 Action Alternatives. The development of a reservoir would alter the current land use of the project area and other lands immediately adjacent to the reservoir. The total land requirements of the reservoir are approximately 1,100 acres. This land is currently used as rangeland with some pasture. The loss of this land as rangeland is imminent with or without the reservoir since it is located in an area experiencing developmental pressure. If the proposed reservoir were developed approximately 5,200 acres including the reservoir footprint would be purchased by SWFWMD. This property would be set aside as a natural area to not be developed in the future. No significant impacts to land use would result from the action alternatives.

4.15.3.2 No Federal Action. The No Federal Action alternative would not lead to any changes in existing land use, nor would it provide any benefits to the public.

4.15.4 Employment and Income.

4.15.4.1 Action Alternatives. The construction and operation of a new water supply would provide both temporary and long-term employment within the study area. Most of the new employment would be in the construction sector of the economy. Demands for construction materials could also stimulate job growth in the manufacturing sector; however, this growth would not necessarily be local because some construction materials would likely be imported from outside the project area (e.g., structural steel, water treatment plant equipment, pipe). The purchase of materials, fuel, food, and services by construction workers would contribute to local employment and income, particularly in the rural community of Riverview. Overall, the project construction would tend to reduce local unemployment.

Limited gains in permanent employment would occur directly as a result of constructing a new water treatment facility. The work force needed to operate the new water supply would be small relative to the size of the construction work force and the available work force in the Tampa area. Indirectly, the additional water provided by the plant would facilitate the continued expansion of the area economy. This expansion would result in increasing employment and income in most sectors of the local economy.

4.15.4.2 No Federal Action. No employment benefits would result from the implementation of the No Federal Action alternative. Current practices and trends would be expected to continue. No significant impacts to employment would result.

Figure Source: HDR Engineering, Inc., EAP Application, May 15, 2001

★ Reservoir

N
W E
S

1 0 1
Miles

LEGEND

- Proposed Greenway
- Original "4,800 Acre" Primary Study Area
- Current SWFWMD "5,200 Acre"
- Pipeline
- Wetlands
- Railroads
- Reservoir Site
- Acquired ELAPP Site Area
- Approved ELAPP Site Area
- Other Preservation Lands
- Other Recreational Public Owned Lands
- Other Hillsborough County Lands
- Wetlands

Figure 4-4
TAMPA BAY REGIONAL RESERVOIR PROJECT DEIS

ADJACENT LANDS

4.15.5 Community Services and Facilities.

4.15.5.1 Action Alternatives. The addition of 80 to 120 temporary workers to the project area would impose minimal, if any, increases in demand on local services facilities. Construction and recreation activities could lead to accidents that would require emergency medical services. Adequate hospital facilities are present within the region to accommodate any additional injuries caused by construction or the slight, temporary increase in population.

Some additional police patrol of the water supply alternative facilities could be required. The existing police force for Hillsborough County should be able to accommodate the additional patrols and police services associated with project construction and operation. Few workers would be likely to enroll children in the local schools because of the seasonal timing of the construction. Excess classroom facilities are present, therefore, small increases in enrollment would not cause overcrowding in schools. Should workers and their families relocate to the area during construction, area schools and churches should be adequate to accommodate them.

The construction and operation of a reservoir would result in an increase in traffic on the roads that lead to the individual alternative sites. Because both workers and recreation users would come from different communities in the area, the traffic would be spread over the local and state roads in Hillsborough County. The project would require Tampa Bay Water to receive a traffic permit from the Hillsborough County's Planning and Growth Management Department.

As discussed earlier, population increases would be nominal and distributed throughout the region. Therefore, a negligible increase would occur in the demand for drinking water and wastewater treatment facilities.

4.15.5.2 No Federal Action. The No Federal Action alternative would not result in any increased demands on public services or facilities, nor would it provide any additional water for public consumption. No significant impacts to public services and facilities would occur.

4.15.6 Public Finance.

4.15.6.1 Action Alternatives. The land, which has been set aside for both of the reservoir alternatives, would be owned by the SWFWMD. This land would be taxed in the same manner regardless of whether or not either of the alternatives is constructed; therefore, no public finance impacts are anticipated.

4.15.6.2 No Federal Action. The No Federal Action alternative would not result in an increase or decrease to public finances; therefore, no impact is anticipated.

4.15.7 Environmental Justice. After completing the environmental justice review in Chapter 3, it has been determined that there are no potential environmental justice areas that would warrant further investigation.

4.15.8 Mitigation. No adverse or significant impacts to any of the above socioeconomic parameters would result from construction of a water supply

alternative. Therefore, no mitigation is proposed.

4.16 VISUAL AND AESTHETIC CHARACTERISTICS

The main elements of visual character are landscape character, visual variety, and deviation from landscape character. Impact to visual character is a function of how the project changes these aspects of the landscape.

Methodologies and Significance Criteria. Landscape character is the overall visual impression resulting from the visual features created by the area topography, vegetation, and land use. Visual variety concerns the different features within the landscape. Visual variety is considered appealing, whereas visual continuity is considered monotonous. Impacts on the landscape generally result when human alterations to the topography, vegetation, or land use contrast with the natural character of an area. In general, strong contrast with these components results in visual disharmony, while changes that conform to the existing visual components are less noticeable.

Significant visual impacts would result if the action projects would create visual disharmony. Visual impacts would be significant if large numbers of people would view the visual disharmony created, alter current points of recognized scenic value, or alter state or federally designated scenic areas.

4.16.1 Action Alternatives. The construction of a new embankment and reservoir and an ASR system would impact all components of landscape character by adding an earthen embankment and well heads to the landscape and removing some vegetation. The embankment for each of the alternatives would create visual contrast in the existing landscape. The embankment would be covered with natural vegetation creating less of a contrast to the natural character of the area. The land use of the reservoir and the immediate vicinity of each ASR well would change.

No areas designated as scenic by state or federal agencies are located in the immediate project area, therefore, none would be impacted by this project.

Impacts to the visual character of the area would result from this project. Overall, the only significant impact to the visual character of the area would be the addition of a water body to an agricultural landscape. However, these impacts would generally be considered positive because of the introduction of variety into the landscape. Overall, no significant adverse impacts to the visual character or the area would result from the project.

4.16.2 No Federal Action. This alternative would not change landscape and visual character or create large deviations from surrounding landscape character. Therefore, the no-action alternative would have no effect on the aesthetics of the area.

4.16.3 Mitigation. Visual impacts caused by the action alternatives would be mitigated by adding berms and vegetation to screen the structures from view, breaking up the strong rectangular and geometric visual elements, and return a natural aspect to the landscape. Trees would be planted along the southeast portion of the reservoir

embankment to create a natural barrier and visual relief from Wendell Avenue. Painting the associated structures earthtone colors would mitigate the visual impact of the well structures. Lighting would be kept to the minimum necessary to provide adequate safety and security.

4.17 CULTURAL RESOURCES

The proposed action alternatives possess the potential to impact cultural resources in several ways. Archaeological evidence remains one of the primary links to Florida's prehistory in the absence of oral traditions and written records. Possible damage associated with construction of transmission mains, excavation of the reservoir, placement of intake, storage facilities, ASR wells and pipelines, reservoir filling, or erosion could alter or destroy sites and prevent the recovery of culturally significant or historically valuable information. The presence of water storage structures and associated facilities has the potential to alter the character of historic sites.

Methodologies and Significance Criteria. Existing cultural resource information was reviewed for the broad study area and for the specific locations of the project sites involved in the Tampa Bay Regional Reservoir EIS analysis. This effort determined the number, type, location, and significance of previously recorded historical and archaeological sites in relation to National Register of Historic Places [NRHP] significance. Sites were evaluated for their potential for listing on the NRHP. The criteria used to determine the inclusion of a site on the NRHP is in accordance with the Department of the Interiors regulations 36 CFR 60.4.

The quality of significance in American history, architecture, archaeology, engineering, and culture is present in district, sites, buildings, structures, and objects that possess integrity of location, design, setting, and materials. Workmanship feeling, and association, and that (a) are associated with events that have made a significant contribution to the broad patterns of our history; or (b) that are associated with the lives of persons significant in our past; or (c) that embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant distinguishable entity whose components may lack individual distinction; or (d) that have yielded or may be likely to yield information important in history or prehistory.

This review examined existing data and literature such as cultural assessment reports, site descriptions and resource evaluations contained in the Florida Site File (FSF) system and the NRHP. Additionally, personnel at Florida State Historic Preservation offices (SHPO) were consulted. Identified sites considered potentially eligible for listing on the NRHP were investigated to determine proximity to construction activities. Impacts to cultural resources would be considered adverse if the project would damage or destroy any site identified as eligible for the NRHP.

4.17.1 Action Alternatives. Resource review identified archaeological sites that have been documented within a one-mile radius of the potential project sites. Impacts to cultural resources would include damage from exposure, erosion or construction to artifacts of cultural

significance. Most of the prehistoric archaeological sites can be characterized as low to moderate density lithic or artifact scatters. The historic structures documented have a lack of significant historical association or architectural distinction. In addition, these structures exhibit non-historic modifications that would most likely limit the importance of the buildings in regards to their potential for listing on the NRHP.

The construction and operation of either of the action alternatives would potentially alter several sites not considered eligible for listing on the NRHP. These sites have been determined to be ineligible based on their limited potential for research and lack of significant historical association (Austin 2000). The Alafia River site (8HI6762) was discovered at the site of the proposed intake pump station at Bell Shoals Road. This site is a moderate-density lithic scatter that is not considered eligible for listing on the NRHP. The Long Flat Creek site (8HI6817) is located within the footprint of the proposed reservoir. The research potential of the Long Flat Creek site appears to be limited. According to Austin (2000) the assemblage is sparse and unexceptional, and no temporally diagnostic materials were encountered. The Pruett site (8HI6818) also located in the reservoir footprint is an additional small lithic scatter site of limited research potential. Historical resources along the proposed pipeline route could potentially suffer adverse impacts during construction. These structures are not considered eligible for listing on the NRHP.

A Phase II archaeological test was conducted on the Hutto Lake (8HI6820) site located within the pipeline corridor. The site has produced information that contributes to a better understanding of regional prehistory, however it does not appear to meet the eligibility criteria for listing on the National Register of Historic Places. Therefore, no further archaeological work is recommended for the site.

4.17.2 No Federal Action. The No Federal Action alternative would not impact cultural resources in the area.

4.17.3 Mitigation. Avoidance of the site has been recommended. If avoidance is not feasible, then Phase II test excavations have been recommended to gather data sufficient to either 1) make a final determination of NRHP eligibility, or 2) mitigate project impact. This study also determined that no secondary visual impact as a result of construction of an earthen dam would occur to any historic structures due to their distance from the reservoir and either intervening natural foliage or a proposed tree planting that would provide a visual buffer.

4.18 RECREATION

Although recreation is not a primary purpose of these water supply alternatives, the creation of a reservoir could provide additional recreation opportunities to the area. Currently, recreation plans have been proposed but not finalized for the reservoir and surrounding project area.

4.18.1 Action Alternatives. A new reservoir would provide additional flat-water recreational opportunities for local area residents in the Tampa area. The local economy would benefit because

less money would leave the area for the other regional recreation areas.

The new water supply would both eliminate and provide opportunities for land-oriented recreation. Private land, currently not accessible to the public, would be purchased as part of the project as a buffer around the reservoir and for mitigation areas. This land would likely be open to public access. The land acquired around the project area would be purchased by SWFWMD and made available to the public. If the project area is made available for recreation, the project would have a positive impact on recreation of the local area.

4.18.2 No Federal Action. No recreation facilities would be created as a result of the No Federal Action alternative.

4.18.3 Mitigation. No mitigation is proposed for recreation.

4.19 RISK ANALYSIS AND IMPACT TO THE HUMAN COMMUNITY

Safety has been a primary factor throughout the design and, as a result, failure of the reservoir embankment is not anticipated. Nevertheless, this does not preclude the necessity of a thorough Emergency Action Plan (EAP) and preparation of inundation maps for the water supply alternatives.

Methodology and Significance Criteria. The EAP has been developed for the Tampa Bay Regional Reservoir following the guidelines provided by the Federal Emergency Management Agency (FEMA). The EAP is a formal document that identifies potential emergency conditions at the Tampa Bay Regional Reservoir and specifies preplanned actions that would be carried out by Tampa Bay Water, Hillsborough County's Emergency Management Agency, and local emergency management organizations such as the county sheriff.

Inundation maps would be used to assist in notification and evacuation of the public in the event of an emergency at the Tampa Bay Regional Reservoir. Inundation maps would be prepared using the United States National Weather Services FLDWAV model.

It is important that the inundation maps represent the best available information and not lead to confusion by re-issuance of several versions. Therefore, it was determined in the pre-application meetings with the FDEP that a workgroup session(s) needs to be held to discuss the model parameters that would be required for the FLDWAV modeling efforts prior to the preparation of the maps. After these sessions, Tampa Bay Water would submit the parameters to the FDEP's State Dam Safety Officer for review. Upon agency approval of reservoir footprint and maximum water surface elevation, the inundation maps would be prepared.

It is important to note that there are currently no state regulations or rules that require the preparation of an EAP or inundation maps, nor state guidelines describing how to prepare them. FDEP representatives have explained that they would require the inundation maps during the permit review process, but that they would request them as part of the "request for additional information" stage of the process. In this way, direction can be given by FDEP on the

methodology, data and assumptions to be used to create the inundation maps.

4.19.1 Action Alternatives. Both of the water supply alternatives would include an off-stream reservoir that is enclosed by earthen embankments. The reservoir does not have a drainage area contributing runoff to the water impoundment. It is filled by pumping inflows from the Alafia and Hillsborough rivers and Tampa Bypass Canal or by direct rainfall. A reservoir of this type is difficult to analyze for failure because there is no clear location where a breach may occur. If a breach were to occur, the breach would gradually become larger and larger with flow rates through the breach varying according to the size of the opening.

Ultimately, discharge from a breach would reach the tidal system of Old Hillsborough Bay via the Alafia River. Historically, dam failures occurring on a typical "fair weather" day have caused the most damage. This is simply because a dam failure is not expected and the population is less prepared for evacuation. This scenario would be simulated with a mean annual flow in the Alafia River.

The boundary conditions would be developed in coordination with the State of Florida Dam Safety Officer.

Breach of the dam embankment of either water supply alternative could imperil communities in the inundation area identified from the modeling efforts described above. Warning systems and development of the EAP have been established to mitigate the effects of an embankment breach.

4.19.2 No Federal Action. Under the No Federal Action alternative, an embankment and subsequent reservoir would not be developed. No impact to the human community due to dam failure would occur.

4.19.3 Mitigation. The EAP is a formal document that identifies potential emergency conditions at the Tampa Bay Regional Reservoir and specifies preplanned actions to be followed to avoid or minimize impacts. The EAP specifies actions that would be taken to assist personnel in issuing early warning and notification messages to responsible emergency management authorities of any emergency situation.

Continuing education and training of Tampa Bay Water staff involved with the Tampa Bay Regional Reservoir would be an important element of both the normal operation and maintenance of the reservoir and the EAP. Tampa Bay Water as owner of the Tampa Bay Regional Reservoir, would be responsible for training of all personnel involved in the EAP. Training of personnel involved in the implementation of the EAP would be conducted to make sure that personnel would be familiar with all elements of the plan and their responsibilities and duties under the EAP.

Tampa Bay Water would review and update the EAP annually. If, during the annual review, no updates to the EAP are identified, a statement indicating that a review was completed and no changes were identified would be provided to each recipient of the EAP. A complete reprint of the EAP would be completed every three years. In addition, the EAP would be updated after each change

involving individuals identified by name in the plan or changes to their telephone numbers.

4.20 UNAVOIDABLE ADVERSE IMPACTS

The construction and operation of an action alternative would have unavoidable adverse impacts (through not necessarily significant) that could not be completely mitigated. Construction and operation of any of the alternatives would result in the following unavoidable adverse impacts.

- Construction would result in temporary decrease in air quality in the immediate project area.
- Noise in the immediate project area would be temporarily increased during construction.
- Terrestrial insects, reptiles, and mammals would be displaced to other areas, or lost, as the embankment is constructed.
- Pastureland would be lost for cattle grazing and other agricultural production.
- Unvegetated land exposed during the late summer through early spring would be vulnerable to erosion.
- Loss of approximately 188.3 acres of COE jurisdictional wetlands.

4.21 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

Any of the proposed alternatives would permanently change the natural land contours of the affected area. Clearing, cuts, fills, and borrow extraction would result in modifications to the landscape. Some soils would be lost during construction because of erosion. Revenues generated from grazing leases and grazing rights, sod farming, and other agricultural practices on lands and easements purchased for the project would be lost.

Construction and operation would result in the permanent commitment to the project of local soils for borrow material and concrete.

Energy expended on the project would not be available for other uses. Petroleum-based products, including gasoline, diesel fuel, lubricants, and antifreeze, would be consumed during construction. Operation and maintenance of the project facilities would also require the commitment of lesser amounts of energy. The project would result in a commitment of manpower. Considerable efforts and funds have already been expended on planning and design of the project.

Existing terrestrial habitat would be converted to an aquatic ecosystem. The clearing of vegetation and imposition of project features would cause a readjustment of the wildlife in the immediate project area.

4.22 RELATIONSHIP BETWEEN SHORT-TERM USES OF THE ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG TERM PRODUCTIVITY

The short-term/long-term tradeoff inherent in the project is a positive one (i.e. it favors the long-term). In the short-term, use of resources to construct the project facilities would be required. These facilities would then yield long-term benefits of supplementing and increasing drought-proof water supply allowing for the natural recharge of groundwater in the wellfield area and satisfying some of the increased water

demands associated with population growth in the three-county area.

4.23 CONFLICTS WITH LAND USE PLANS, POLICIES, OR CONTROLS

The proposed project would not conflict with any land use plans, policies, or controls. The construction of the 1,100-acre reservoir and transmission pipeline is consistent with zoning designated for the site.

4.24 CUMULATIVE IMPACTS

Cumulative impacts result when the effects of an action are added to or interact with other effects in a particular place within a particular time. Cumulative impacts are those effects on resources from the proposed action or alternative added to the effects on those same resources from the past, present, and reasonably foreseeable action of others. Thus the cumulative impacts of an action can be viewed as the total effects on a resource, ecosystem, or human community of that action in combination with all other activities affecting that resource.

4.24.1 Summary of Incremental Impacts. Tampa Bay Water has developed a Master Water Plan for meeting the potable water needs of the Tampa Bay region for the 15 year period 1995 through 2010. The Master Water Plan incorporates plans for obtaining freshwater from numerous sources or storing freshwater, which include the:

- Alafia and Hillsborough rivers
- Tampa Bypass Canal
- Tampa Bay Regional Reservoir
- Brandon Urban Dispersed Wells and Cone Ranch projects

Studies have been conducted to predict potential impacts from individual projects of the Master Water Plan, and the cumulative impact that would result from implementing a number of the projects simultaneously. The assessments of potential impacts to Tampa Bay tributaries focused on changes to freshwater inflow rates and water quality that would result from the proposed surface water withdrawals. Potential impacts to the Hillsborough River and Tampa Bypass Canal system and the Alafia River were evaluated. Stream flow characteristics and water quality of the rivers were examined. Resources of interest include fish, benthos, and submerged and emergent aquatic vegetation that could potentially be impacted by changes in flow patterns or salinity regimes resulting from withdrawals. The extent and magnitude of impacts were then assessed to identify any potential threats to living resources.

Different methods were used to estimate potential cumulative impacts so that the result of the diverse analysis could be compared. Obtaining similar results using different methods of analysis provides an increased level of confidence in the findings.

The conclusions of the modeling efforts conducted by both Hillsborough County and Tampa Bay Water were similar and considered the other elements of the Master Water Plan. The conclusions concerning the possible individual and cumulative impacts are summarized below.

Alafia River

- Low and high flows are preserved under the withdrawal schedule. There is little change to salinity

regimes under low and high flow conditions.

- The saltwater interface may vary by a maximum of approximately 0.25-mile under moderate flow conditions. This could result in the conversion of a small area of freshwater marsh to saltwater marsh. The location of the saltwater interface is predicted to change much less under high flow and low flow conditions.
- Maximum salinity increase is predicted to be less than 2 ppt, which is within the observed long-term variability of the system.

Hillsborough River/Tampa Bypass Canal

- Withdrawals from the Hillsborough River begin when flows below the City of Tampa's reservoir reach 5.6 times the minimum flow of 10 cfs.
- Significant impacts are unlikely to living resources of concern within the Hillsborough River and Tampa Bypass Canal system. The greatest withdrawals would be during the wet summer months when maintaining habitat for the biological resources would not be as critical. The predicted impacts to freshwater inflow and salinity patterns during summer months are not expected to be significant.

Tampa Bay

- SWFWMD modeling efforts suggest salinity increases of no more that 1.5 ppt in Hillsborough Bay due to freshwater withdrawals.
- Investigations show no evidence of significant impacts to the tributaries and living resources resulting from individual projects. In addition, the cumulative impact analysis did not identify any fatal flaws.
- SWFWMD's Tampa Bay model suggested salinity increases due to ESWS withdrawals (and Brandon Urban Dispersed Wells and Cone Ranch) would be within the range of long-term variability.
- Results of the coastal mass balance model suggested a maximum monthly impact to salinity from ESWS withdrawals (a desalination facility, Brandon Urban Dispersed Wells, and Cone Ranch) within the range of long-term variability (Coastal Environmental/PBS&J 1998).
- The mass balance model suggested that the annual cycle of salinity within bay segments re-establishes and stabilizes at slightly higher levels than current levels after 3 to 4 years of operation of the Master Water Plan projects.

Potential impacts to the Alafia and Hillsborough rivers, the Tampa Bypass Canal, and Tampa Bay from withdrawal of freshwater for storage in the proposed reservoir are considered to be modest and within the range of normal variability. This salinity fluctuation is expected to be well within the normal range of variability and is also within the relatively wide range of salinity tolerances of identified living resources of interest found in oligohaline zones.

4.24.2 Impacts from Past and Present Actions. Past and present human activity have substantially affected the land cover at and in the vicinity of the proposed action alternatives. The southern portion of the proposed reservoir area contains reclaimed phosphate mines and is currently being

used for agricultural purposes. The northern portion of the site is unmined agricultural land. Overgrazing has changed the plant species composition of existing rangelands and the physical structure of these habitats by the selective removal of the more palatable species or life stages of plants. The lack of restrictions on cattle movement has also resulted in the degradation of riparian and wetland communities. The effect of these actions have reduced the quality of habitat for native fauna and increased erosion. Initially, the construction of one of the proposed actions or alternative would continue the trend in the destruction or degradation of native terrestrial habitats.

Through the environmental assessment process, gopher tortoise burrows were located in the upland area in the northwest corner of the reservoir site. To minimize impacts to the tortoises, the reservoir configuration was further revised to avoid the upland area in the northwest portion of the site. Mitigation measures would offset the losses through the enhancement of existing habitat or the creation of replacement habitat. The original reservoir layout for the site encompassed Hillsborough County's land north of the landfill and one private landowner to the north. This layout was rectangular in shape and would have required the rerouting of a large portion of Doe Branch Creek. Based on information from the SWFWMD, the proposed reservoir was reconfigured to minimize the impact to Doe Branch. The current reservoir configuration would not impact the existing creek system.

The initial reservoir configuration also maximized the use of the southern portion of the site, which is owned by the Hillsborough County (County) Solid Waste Management Department and Parks and Recreation Department. Based on initial discussions, both of these departments and the County's Real Estate Departments issued letters outlining their concerns or issues with the initial reservoir configuration. The Solid Waste Management Department stated that they had plans for the area as a source of cover material, buffer and potential leachate disposal. In addition, the Florida Department of Environmental Protection has a requirement that any Class I water body be at least 3,000 feet from a landfill cell. The Parks and Recreation Department's concerns centered upon the man-made lake in the southern portion of the site. This lake is currently the only lake with potential vehicle access on their property. Prior to the initiation of the detailed geotechnical investigation, the reservoir was moved approximately 3,000 feet to the north in response to input from the County's Solid Waste Management Department.

During the geotechnical investigation conducted on the County's property, it was determined that construction of the embankment on this property would require removal of more waste clays from the mining process than would be required if the embankment was moved north, approximately 800 feet, off of the County's property. As a result, constructing the embankment on the County's property would increase construction costs. Based on this issue and the previous alignment, the southern alignment of the embankment was moved north off the County's property.

SWFWMD Governing Board in August 2000 voted to acquire the property necessary for the proposed reservoir using a State fund called the Florida Forever Fund. There are three property owners for the reservoir site, with parcels totaling 5,200 acres. SWFWMD has acquired one of the three parcels of land and is in the process of acquiring the remaining two parcels. The area of 5,200 acres will include the 1,100 acres required for the proposed reservoir, and the property necessary for all of three mitigation sites. The entire 5,200 acres would remain in public ownership and property not directly related to the proposed reservoir footprint and mitigation areas will be permanently preserved. The 5,200-acre acquisition is also important because it links the habitat corridors of the mainstream of the Alafia River to Fish Hawk creek, and to the South Prong of the Alafia. This purchase will keep the land adjacent to the proposed reservoir from being encroached upon by suburban development.

4.24.3 Significance of Cumulative Impacts. The mitigation proposed for the loss of vegetation communities caused by construction of the proposed action or the alternative would complement the natural habitat of the area. The proposed mitigation plan provides information to compensate for unavoidable wetland impacts associated with the proposed reservoir project. The amount of mitigation is based on wetland impacts as determined by the U.S. Army Corps of Engineers, Florida Department of Environmental Protection, and Hillsborough County Environmental Protection Commission. Mitigation would be conducted at three sites adjacent to the reservoir. These mitigation projects are expected to provide an ecological benefit to the region.

A condition of the Alafia River and Tampa Bypass Canal Water Supply Water Use Permits is the establishment of an extensive HBMP to be conducted by Tampa Bay Water. Because of the similar schedule for development and the close proximity and the integrated nature of these two water supply projects, SWFWMD agreed that a single unified HBMP could be jointly developed to address permit requirements for both projects simultaneously.

The goal of the HBMP is to generate information at an appropriate scale and solution to determine if the permitted water supply projects are in compliance with SWFWMD's rules and permit conditions. In addition, the goal of the HBMP is to ensure that, following the implementation of the permitted surface withdrawals, flows in the potentially affected water bodies do not deviate from the normal rate and range of fluctuation to the extent that: water quality, vegetation, and animal populations are adversely impacted in streams and estuaries; or salinity distributions in tidal streams and estuaries are significantly altered as a result of withdrawals; or recreational use or aesthetic qualities of the resource are adversely impacted. This adaptive management-monitoring program was started in 2000 and includes elements of water quality, benthic invertebrates, fish, plankton, bird census, vegetation analyses, flows, and rainfall.

4.25 CONCLUSION

Based on the analysis of the two action alternatives and the No Federal Action

alternative presented in the preceding sections and discussions in Chapter 4, the alternative preferred by EPA is the 1,100-acre Tampa Bay Regional Reservoir Project. To briefly summarize, the 1,100-acre Tampa Bay Regional Reservoir Project would not affect the permitted freshwater withdrawal schedules from the Alafia and Hillsborough rivers and the Tampa Bypass Canal. The water supply project would increase the dependable yield of the total surface water system by providing for the additional storage of surface water diverted during periods of higher flow for use during drier periods. The first 66-mgd of surface water withdrawn from the three combined water supply sources would be treated at the new regional water treatment plant before being distributed to customers via Tampa Bay Water's regional water system. Any surface water withdrawals in excess of 66 mgd would be pumped into the 1,100-acre regional reservoir for storage. When surface water flows decrease and are below permitted withdrawal levels, stored water would be withdrawn from the reservoir and treated at the regional water treatment facility for distribution.

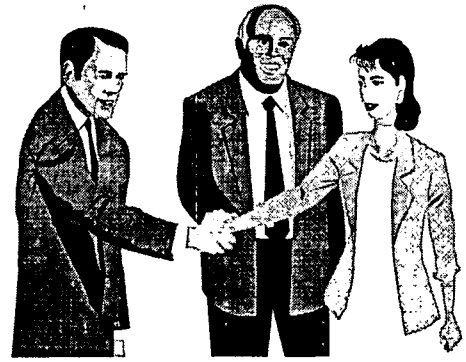
The 1,100-acre Tampa Bay Regional Reservoir alternative is also the project preferred for implementation by Tampa Bay Water. The regional reservoir would provide a quality source of water that could effectively provide Tampa Bay Water and their member governments a viable water source to supplement the integrated surface water supply system. Development of an ASR system could improve the overall reliability of Tampa Bay Waters' preferred 1,100-acre water supply reservoir. A stand-alone ASR alternative was originally included in the initial array of alternatives; this alternative was eliminated because it did not provide the required supply in the time frame desired. In addition, the policy and technical issues pursuant to ASR have not been technically addressed in this DEIS to the extent required by the National Environmental Policy Act. EPA makes no recommendation as to the desirability or feasibility of the inclusion of ASR in the Tampa Bay Regional Reservoir Project.

CHAPTER 5

COORDINATION AND PUBLIC INVOLVEMENT

5.1 INTRODUCTION

The National Environmental Policy Act (NEPA) requires federal agencies to follow a process of environmental analysis, consultation, disclosure, and public involvement when taking actions such as construction, funding, or permitting of projects. The process is intended to identify the significant impacts to the human environment and provide an opportunity for interested individuals, organizations, and government agencies to participate in the analysis. The process is also to inform the public of the proposed action and its effects. For actions with a high potential for significant adverse environmental impact, the centerpiece of NEPA analysis is the Environmental Impact Statement (EIS). The U.S. Environmental Protection Agency (EPA) is the federal agency responsible for issuing the funding and serves as the agency responsible for conducting the NEPA process of the Tampa Bay Regional Reservoir Project. On April 10, 2000, EPA published a Notice of Intent in the Federal Register to prepare an EIS for the Tampa Bay Regional Reservoir.



5.2 PUBLIC INVOLVEMENT

The initial mechanism for public participation in NEPA is the scoping process. The purpose of scoping is to identify significant environmental issues that require study, sort out insignificant issues, and thereby focus the scope of the EIS. High priority was given to public involvement from the early stages of this project. A thorough program was prepared to provide information and to receive input from the public in the vicinity where the proposed action would be carried out. The public involvement plan included public meetings, informational handouts, publication of public meeting notices, and media releases and briefings. In addition, public comment was solicited on the Draft EIS (DEIS).

5.2.1 Public Meetings Tampa Bay Water conducted many public meetings and briefings in order to gain public input on the reservoir siting process. In addition, Hillsborough County conducted a public meeting prior to the Tampa Bay Water's Board selection of the proposed reservoir site. These meetings and briefings were held prior to the initiation of the DEIS and are listed below.

Public Meetings and Briefings:

- July 20, 1998
- July 23, 1998
- September 1, 1998
- September 29, 1998
- October 7, 1998
- October 14, 1998

5.2.2 Public Scoping Meeting. A DEIS public scoping meeting was held in the auditorium of the Riverview High School in Riverview, Florida, on June 8, 2000. A radio announcement was

broadcast on June 7, 2001 on stations WRBQ and WQYX announcing the DEIS public scoping meeting. The formal meeting was attended by approximately 125 people and opened with a presentation given by the EPA and the third party contractor, Burns & McDonnell. Upon conclusion of the presentation, the meeting was opened for public comment. The meeting proceeded with presentations and comments from the public. The major comments received for consideration and inclusion in the DEIS were impacts of withdrawals from the Hillsborough and Alafia rivers and Tampa Bypass Canal, impacts to Tampa Bay, and impacts from construction of the reservoir. At the end of the meeting, EPA outlined the schedule for the EIS and invited the public to submit comments postmarked by June 22, 2000.

5.2.3 Draft EIS. Comments received from the public and government agencies as a result of the scoping meeting were used to tailor the content of the DEIS so that issues specific to this project were addressed. Examples of issues raised by the public and government agencies were viable alternatives to the proposed action, withdrawals attributable to the reservoir operation, and risk analysis and impact to the human community.

5.2.4 Final EIS Comments on the DEIS received from the public and the cooperating agencies will be addressed in the Final EIS (FEIS). Once the FEIS has been prepared, a Notice of Availability will be published and the FEIS will be distributed. After 30 days, a Record of Decision reporting the final decision of the EPA will be prepared and issued.

5.3 AGENCY COORDINATION

5.3.1 Public Notice and Other Communications. EPA and Hillsborough County Environmental Protection Commission staff participated in two meetings held on February 17th and 22nd, 2000. The purpose of the open televised meetings was to discuss the EIS process and other related environmental issues.

On March 17, 2000, EPA published the legal notice announcing their intention to prepare an EIS for the regional reservoir project. The announcement was published in the Sun Herald from March 17th to March 25th, 2000.
On May 8, 2000, EPA published a public notice announcing their intention to prepare an EIS on the regional reservoir project. The notice was published in The Tampa Tribune on May 8th and 9th, 2000 and in The Free Press on the following dates:

- May 6, 2000
- May 13, 2000
- May 20, 2000
- May 27, 2000

The public notice was also published in the U. S. Federal Register on May 8, 2000.

On January 11, 2001, Hillsborough County held an additional meeting in their offices in Tampa, Florida. Parties in attendance included EPA and members representing Hillsborough County. The purpose of the meeting was to discuss the status of the DEIS. This included a discussion about the alternatives considered, cumulative impact analysis, impacts to public health

and safety and property, reservoir water quality, wetlands, and mitigation plans.

5.3.2 Other Agency Consultations. On October 2, 2000, an agency letter requesting input on the project was mailed to the State of Florida Clearinghouse and various federal agencies including:

- Hillsborough County
- Hillsborough County Environmental Protection Commission
- Pasco County
- Pinellas County
- City of Tampa
- City of St. Petersburg
- City of New Port Richey
- National Resource Conservation Service
- U. S. Geological Survey
- U. S. Army Corps of Engineers
- National Marine Fisheries Service
- U. S. Fish and Wildlife Service

The purpose of this letter was to request input pertaining to the project. A copy of the letter is included as Appendix E.

The U.S. Fish and Wildlife Service and the National Marine Fisheries Service were consulted, as required by Section 7 of the Endangered Species Act. The agencies were asked for a list of potential species occurring in the project area and for their concurrence on the impacts to federally listed threatened or endangered species and their recommendations for mitigation. A copy of this letter is also included as Appendix E.

5.4 DEIS PREPARATION TEAM

An interdisciplinary team of qualified federal and state government personnel and consultants were responsible for the preparation of the Tampa Regional Reservoir Project DEIS.

5.4.1 Federal Lead Agency. The EPA, Region IV was the lead federal agency for this project and the U.S. Army Corps of Engineers is a Cooperating Agency. As the lead federal agency, EPA must consider all environmental effects of the construction and operation of the Tampa Bay Regional Reservoir Project, and must conduct a NEPA analysis of project impacts on the existing environment. The Tampa Bay Regional Reservoir Project was authorized for grant funding by the EPA under the State Tribal Assistance Grant Program. This funding action will partially provide the means to acquire the real property and to design and construct the Tampa Bay Regional Reservoir Project including the connecting reservoir transmission main. EPA staff who contributed to the DEIS are identified in Table 5-1.

5.4.2 Applicant. Tampa Bay Water is the sponsor of the Tampa Bay Regional Reservoir Project. Projects receiving federal funds for actions that may impact the environment will trigger the preparation of the EIS. The staff at Tampa Bay Water who contributed to the DEIS are listed in Table 5-2.

5.4.3 Third-Party Contractor. Burns & McDonnnell Engineering Company, Inc., Kansas City, Missouri, was the third-party consultant, which had primary responsibility for preparation of the DEIS. The contributors, their roles and expertise are listed in Table 5-3.

Additional expertise was provided in the areas of archaeology, hydrology, biology, and wetlands to Burns & McDonnell by specific subconsultants.

These subconsultants and their credentials are listed in Table 5-4 and Table 5-5.

5.4.4 Other Contributors.

Many other individuals or sources contributed information to the DEIS as personal communication through telephone or written contact:

- Sid Flannery – SWFWMD, water quality
- Stephen Grabe – Hillsborough County Environmental Protection Commission (HCEPC), Benthics & water quality
- Marty Kelly – SWFWMD, Minimum Flows and Levels
- Anthony D' Aquila – HCEPC, water resources
- Richard Boler – HCEPC, Director of water quality monitoring
- Sam Stone – Peace River/Manasota Regional Water Supply Authority, ASR system operations
- Tom Logan – Florida Fish and Wildlife Conservation Commission (FWC), State wildlife listing procedures
- Andy Squires – Pinellas County, water quality.
- Mark Thompson – National Marine Fisheries Service, managed fish species
- Beth Wright – Florida Marine Research Institute, manatees
- Jim Beever – FWC, protected species, red-cockaded woodpeckers
- Ric Jensen – Texas Water Resources Institute, estuaries
- David Tomasko – SWFWMD, seagrasses
- Dawn Creamer - Florida Master Site File, Division of Historical Resources
- Robin Jackson - State Historic Preservation Offices, Division Of Historical Resources
- Dr. Ralph Montgomery - Post Buckley Jernigan & Shuh
- FMRI - http://www.fmri.usf.edu/fish/
- NMFS - http://www.galveston.gov
- USFWS - http://www.endangered.fws.gov

Table 5-1. DEIS Preparers at U.S. Environmental Protection Agency, Region IV

Name	Education and Discipline	Years Experience and Expertise	EIS Role
Heinz Mueller	BS, Engineering MS, Urban Planning	25, EIS Preparation	NEPA Policy
John Hamilton	BS, Zoology MS, Parasitology	36, EIS Preparation Public Health	Project Officer
Serdar Ertep	BS, Engineering MS, Geography	7, Geographic Information Systems (GIS)	GIS Specialist

Table 5-2. EIS Preparers at Tampa Bay Water

Name	Education and Discipline	Years Experience and Expertise	EIS Role
Amanda Rice	BS, Civil Engineering MS, Civil Engineering	8, Water Resource & Supply Development	Project Manager
Ken Herd, P.E.	BS, Civil Engineering MS, Civil Engineering	17, Water Supply Development	Program Manager
David Bracciano	BS, Water Resource Development MPA, Public Administration	18, Alternative Supplies, Demand Management	Conservation & Water Demand Specialist

Table 5-3. EIS Preparers at Burns & McDonnell

Name	Education and Discipline	Years Experience and Expertise	EIS Role
Fred Pinkney	PhD Plant Ecology and Statistics, MS Range Ecology, BS Range Science	30, environmental impact analysis and water resources studies, NEPA compliance	Project Manager
Justin Meyer	MA Ecology and Evolutionary Biology, BS Biology	3, environmental impact analysis and water resources studies, NEPA compliance	Assistant Project Manager
Angela Bulger	MA Environmental Biology, BS Biology and Systematics and Ecology	1.5, years in environmental impact analysis and NEPA compliance	Biologist
Andrew Grammer	MA Botany, BS Biology (Ecology)	3, wetland ecology, habitat assessments and threatened and endangered species surveys	Wetland Specialist
Mark Wolff	BS, Biological Systems Engineering	3, noise modeling, water resource studies	Noise Specialist
Richonia Freeman	BS Chemical Engineering	6, air quality reporting, Clean Air Act compliance and permitting	Air Specialist
Nancy Trobisch	M.A. Education, B.S. Business Communications	15, writing, editing, publishing, teaching	Technical Editor
Dennis Lessig	MS Zoology, BS Education	30, water pollution control, environmental regulatory analysis	Quality Assurance
Rod Fraser	MA Geography, BS Criminal Justice	6, mapping and analysis of linear features and Corps projects	GIS Specialist

Table 5.4. EIS Preparers at Florida Environmental,Inc

Name	Education and Discpline	Years Experience and Expertise	EIS Role
Sunny Diver	MS Ecology/Zoology	22, water and wildlife	Project Manager
Charles Kocur	MS Oceanography	22,estuarine biology	Quality Control and Technical Review
Erin Redfearn	MS Biology	4, wildlife resources	Literature research and technical writing
Karen Burnett	MS Geology	26, geology and environmental sciences	Technical writing

Table 5.5. EIS Preparers at Environmental Permitting and Design, Inc.

Name	Education and Discipline	Years Experience and Expertise	EIS Role
Donna Clarke	Master of Science, I.M., Georgia Institute of Technology B.E., Mathematics, University of Miami	10, years in Environmental Projects Management	Project Manager
Jesse Hardin	New College of University of South Florida	2, years in Environmental Science	Cultural Resources

CHAPTER 6

LITERATURE CITED

Ackerman, B.B., T.D. Pitchford, B.L. Weigle, J.E. Reynolds, III, R.S. Wells, and M.A. Baran. 1999. Marine Mammals, in: *Baywide Environmental Monitoring Report, 1993-1998, Tampa Bay, Florida.* J.R. Pribble, A.J. Janicki, and H. Greening (eds.). Technical Publication 07-99. St. Petersburg, FL.

Almy, Marion and L Hutchinson-Neff. 1998. *Cultural Resource Assessment Survey Peace River/Manasota Regional Water Supply Authority Regional Transmission System Expansion Sarasto and DeSoto Counties, Florida.* Archeological Consultants, Inc. for PBS&J.

Austin, Robert J and G Mohlman. 2000. *A Cultural Resource Assessment Survey of the Proposed Tampa Bay Water Regional Reservoir and Pipeline, Hillsborough County, Florida.* Southeastern Archeological Research, Inc. for Tampa Bay Water.

Ayres Associates. 1998. *AQUATrak Demand Management Program, Users Guide,* prepared for Tampa Bay Water. Clearwater, Florida.

Black and Veatch. 1998. *Master Water Plan, Alternative System Configurations, Final Report.* Clearwater, Florida.

Bjorndal, K.A. 1985. *Nutritional ecology of sea turtles.* Copeia. 736, 1985.

Bjorndal, K. A. 1996. *Foraging ecology and nutrition of sea turtles*, in: Biology of Sea Turtles. Lutz, P.L. and J.A. Musick, eds. CRC Press, Boca Raton, FL.

Bjorndal, K. A. and A.B. Bolten. 1988. *Growth rates of immature green turtles, Chelonia mydas, on feeding grounds in the southern Bahamas.* Copeia. 555, 1988.

Bullen, Ripley and EM Dolan. 1959. *The Johnson Lake Site, Marion County, Florida.* Florida Anthropologist, 12:77-94.

Bullen, Ripley. 1971. *The Sarasota County Mound, Englewood, Florida.* Florida Anthropologist, 24:1-30.

Burke, V.J., Morreale, S.J., and A.G.J. Rhodin. 1993. *Lepidochelys kempi (Kemp's ridley sea turtle) and Caretta caretta (loggerhead sea turtle) diet.* Herpetol. Rev. 24, 31.

Carr, A. 1986. *Rips, FADS, and little loggerheads.* Bioscience, 36, 92-100.

Carr, A. 1987. *New perspectives on the pelagic stage of sea turtle development.* Conserv. Biol. 1, 103.

Carr, A., Heath, H., and Ogren, L. 1966. *The ecology and migrations of sea turtles: the hawksbill turtle in the Caribbean Sea.* Am. Mus. Novit. 2248, 1.

Chance, Marsha A. 1981. *Investigations at Wetherington Island: An Archaic Lithic Procurement Site in Hillsborough County.* Florida Anthropologist 34:109-119.

Clausen, Carl J., A.D. Cohen, C. Emiliani, J.A. Holman, and J.J. Stipp. 1979. *Little Salt Springs, Florida: A Unique Underwater Site.* Science 203:609-614.

Coastal Environmental. 1997. *An Analysis of the Effects of Freshwater Inflows on Salinity Distributions, Dissolved Oxygen Concentrations, and Habitat Characteristics of the Hillsborough River and Palm River/Tampa Bypass Canal.* Tampa Bay National Estuary Program Technical Publication #08-97.

Coastal Environmental and PBS&J, Inc. 1998. *Cumulative Impact Analysis for Master Water Plan Projects.* Prepared for West Coast Regional Water Supply Authority. Coastal Environmental/PBS&J, Inc., St. Petersburg, FL.

Cognetti, G. and F. Malagliatti. 2000. *Biodiversity and adaptive mechanisms in brackish water fauna.* Marine Pollution Bulletin. 40, 1, 7-14.

Comp, G.S. 1985. *A Survey of the Distribution and Migration of the Fishes in Tampa Bay.* Pages 393 – 425 in S.F. Treat, J.L. Simon, R.R. Lewis III, and R.L. Whitman, Jr. eds. Proceedings, Tampa Bay Area scientific information symposium (May 1982). Burgess Publishing Co., Inc., Minneapolis, MN.

Conant, R. and J.T. Collins. 1991. *A Field Guide to Reptiles and Amphibians Eastern/Central North America.* Third Edition. Houghton Mifflin Company, Boston, New York.

Copeland, B.J. 1966. *Effects of Decreased River Flow on Estuarine Ecology.* Journal WPCF, Vol 38, No. 11, p. 1831-1839.

Cowardin, L.M, V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of Wetlands and Deepwater Habitats of the United States. U.S. Fish and Wildlife Publication FWS/OBS-79/31. Washington, DC.

Cox, J., D. Inkley and R. Kautz. 1987. *Ecology and habitat protection needs of gopher tortoise (Gopherus polyphemus) populations found on lands slated for large-scale development in Florida.* Nongame Wildlife Technical Report No. 4. Office of Environmental Services. Florida Game and Freshwater Fish Commission. 620 Meridian Street, Tallahassee, FL.

Dames and Moore. 1975. *Hydrobiological Assessment of the Alafia and Little Manatee Rivers*. From HDR, 1998. Prepared for the Southwest Florida Water Management District. 631 pp.

Environmental Laboratory. 1987. Corps of Engineers Wetlands Delineation Manual. Technical Report Y-87-1. US Army Corps Waterways Experiment Station, Vicksburg, Mississippi.

Estevez, E.D. 2000. *A Review and Application of Literature Concerning Freshwater Flow Management in Riverine Estuaries.* Center for Coastal and Tropical Ecology. Mote Marine Laboratory, Sarasota, FL. Submitted to the South Florida Water Management District. West Palm Beach, FL.

Estevez, E.D. 2000a. *Matching Salinity Metrics to Estuarine Seagrasses for Freshwater Inflow Management.* Seagrasses – Monitoring, Ecology, Physiology, and Management. Ch. 22, CRC Marine Science Series. (ed.) M.J. Kennish, Ph.D., CRC Press LLC.

FDEQ 2000. Personal Communication, Tami Egen, Florida Department of EnvironmentalProtection, Air Resource Management.

FDER 1995. State of Florida Department of Environmental Regulation, An Ecological Characterization of the Tampa Bay Watershed. Tallahassee, Florida.

Fitzpatrick, J.W., G.E. Woolfenden, and M.T. Kopeny. 1991. *Ecology and development-related habitat requirements of the Florida scrub jay (Aphelocoma coerulescens coerulescens).* Nongame Wildlife Program Technical Report No. 8. Office of Environmental Services. Florida Game and Freshwater Fish Commission. 620 Meridian Street, Tallahassee, FL.

Florida Game and Fresh Water Fish Commission. 1997. *Florida's Endangered Species and Species of Special Concern*, Official Lists. Tallahassee, FL.

Florida Power and Light Company. 1982. *The West Indian Manatee in Florida.* FPL Corporate Communications, Miami, FL.

FMRI. 2000. http://www.fmri.usf.edu/fish/

FNAI 1997. *County Distribution and Habitats of Rare and Endangered Species in Florida.* Florida Natural Areas Inventory, Suite 200-C, 1018 Thomasville Road, Tallahassee, FL.

FWS 2001. U.S. Fish and Wildlife Service Division of Endangered Species: Species Accounts.

Galvez, Janet. The Florida Elusive Snowbird. October 1997

Giovannelli, R.F. 1981. *Relation between Freshwater Flow and Salinity Distributions in the Alafia River, Bullfrog Creek, and Hillsborough Bay, Florida.* U.S.G.S Investigations Report 80-102. U.S.G.S. Water Resources Division, Tallahassee, FL.

Goodwin, C.R. 1987. *Tidal flow, Circulation, and Flushing Changes Caused by Dredge and Fill in Tampa Bay, Florida.* U.S. Geological Survey Water Supply Paper 2282. Tampa, Florida. 88 pp.

HCEPC. 1997. *Trace Metal Status of Tampa Bay Sediments.* Environmental Protection Commission of Hillsborough County. 1900, 9th Avenue, Tampa FL.

HCEPC 1982 from USDI 1990. *An Ecological Characterization of the Tampa Bay Watershed.* Biological Report 90(20). Fish and Wildlife Service and Minerals Management Service.

HCEPC 1984 from USDI 1990. *An Ecological Characterization of the Tampa Bay Watershed.* Biological Report 90(20). Fish and Wildlife Service and Minerals Management Service.

HCEPC 2000. *Rules of the Environmental Protection Commission of Hillsborough County.* Hillsborough County Environmental Protection Commission. Tampa, FL.

HDR 1994. *Environmental Assessment of the Palm River, Tampa Hillsborough County, Florida.* HDR Engineering, Inc. Tampa, Florida. Prepared for the Palm River Management Committee.

HDR 1998a. *Water Use Permit Application. Attachment 1a.* Prepared by HDR Engineering, Inc., for the West Coast Regional Water Supply Authority.

HDR 1998b. *Water Use Permit Application.* Tampa Florida.

HDR 1999a. *Tampa Bay Regional Reservoir Project.* Clearwater, Florida.

HDR 1999b. *Tamp Bay Regional Reservoir Project. Draft Basis of Design Report.* Prepared for Tampa Bay Water, Clearwater, FL in association with Greeley and Hansen, Law Engineering, Inc. Consensus Builders, Inc.

HDR 2000a. *Tampa Bay Regional Reservoir Joint Application for Environmental Resource Permit.* Submitted to the Southwest Florida Water Management District, 2379 Broad Street, Brooksville, Florida 34609.

HDR 2000b. *Regional Reservoir Transmission Main, Basis of Design Report.* Tampa, Florida.

HDR 2000c. *Potable Water ASR Report (draft)*. Tampa, Florida Environmental Inc. Prepared for Tampa Bay Water, Clearwater, FL.

Hillsborough County. 1997. *Surface Water Quality 1995-1997*. Environmental Protection Commission of Hillsborough County, Tampa, FL.

Janicki, A.J., D.L. Wade, D.E. Robison. 1995. *Habitat Protection and Restoration Targets for Tampa Bay*. Tampa Bay National Estuary Program Technical Publication #07-93.

Jones, G.W. and S.B. Upchurch. 1993. *Origin of Nutrients in Ground Water Discharging from Lithia and Buckhorn Springs*. Ambient Ground-Water Quality Monitoring Program, Southwest Florida Water Management District.

Kale, H.W., II and D.S. Maehr. 1990. Florida's Birds – A Handbook and Reference. Pineapple Press. Sarasota, FL.

Killam, K.A. R.J. Hochberg and E.C, Rzemien. 1992. *Synthesis of Basic Life Histories of Tampa Bay Species*. Versar, Inc. Columbia, Md. Prepared for Tampa Bay National Estuary Program. St. Petersburg, FL.

Law Environmental, Inc. 1999. *Tampa Bay Regional Reservoir Geotechnical Site Characterization Report, Volumes I and II*. Tampa, Florida.

Law Environmental, Inc. 1994. *Water Resource Development Plan*. Clearwater, Florida.

Lewis III, R.R. and E.D. Estevez. 1988. *The Ecology of Tampa Bay, Florida: An Estuarine Profile*. U.S. Department of the Interior, Fish and Wildlife Service, National Wetlands Research Center, Washington, D.C. 20204. Biological Report 85(7.18).

Lewis, R.R., III, R.G. Gilmore, Jr., D.W. Crewz, and W.E. Odum. 1985. *Mangrove habitat and fishery resources of Florida*. In: Florida aquatic habitat and fishery resources. Florida Chapter of the American Fisheries Society.

Luer, George and MA Almy. 1981. *Temple Mound of the Tampa Bay Area*. Florida Anthropologist, 34:127-155.

Lutz, P.L. 1996. Salt, water, and pH balance in the sea turtle, in: Biology of Sea Turtles. Lutz, P.L. and J.A. Musick, eds. CRC Press, Boca Raton, FL.

Meyer, J.D. and J.A. Smallwood. 1996. *Peregrine Falcon Falco peregrinus*, in: Rare and Endangered Biota of Florida Volume V, J.A. Rodgers, Jr. H.W. Kale and H.T. Smith eds. 1996. University Press of Florida, Gainesville, Tallahassee, FL.

Meylan, A.B. 1984. *Feeding ecology of the Hawksbill Turtle (Eretmochelys imbricata): Spongivory as a Feeding Niche in the Coral Reef Community,* Dissertation. University of Florida, Gainesville, FL.

Meylan, A.B., P. Castanada, C. Coogan, T. Lozon, and J. Fletemeyer. 1994. *Lepidochelys* kempii (Kemp's *ridley sea turtle) reproduction. Herpetological Review* 21(1): 19-20.

Meylan, A., A. Redlow, A. Mosier, K. Moody, and A. Foley. 1999. *Occurrence and Distribution of Sea Turtles in Tampa Bay, Florida.* In: *Baywide* Environmental Monitoring Report, 1993-1998, Tampa Bay, Florida. J.R. Pribble, A.J. Janicki, and H. Greening (eds.). Technical Publication 07-99. St. Petersburg, FL.

Milanich, Jerald and C Fairbanks. 1980. Florida Archaeology. Academic Press, New York.

Milanich, Jerald. 1994. Archaeology of Precolumbian Florida. University Press of Florida, Gainesville.

Moe, M.A., Jr. and G.T. Martin. 1965. *Fishes Taken in Monthly Trawl Samples Offshore of Pinellas County, Florida, with New Additions to the Fish Fauna of the Tampa Bay Area.* Tulane Stud. Zool. 12(4): 129-151.

Mortimer, J.A. 1982. *Feeding ecology of sea turtles*, in: Biology and Conservation of Sea Turtles. Bjorndal, K.A., ed. Smithsonian Institution Press, Washington, D.C.

Montague, C.L., and R.G. Wiegert. 1991. *Salt Marshes.* In: Ecosystems of Florida, R.L. Myers and J.J. Ewel, eds. 1991. Univ. Cent. Fla. Press, Orlando, Fl.

Muller, R. G. and M. D. Murphy. 2000. *The 2000 stock assessment update of common snook, Centropomus Undecimalis.* Fish and Wildlife Conservation Commission, Forida Marine Research Institute. 48pp.

Musick, J.A. and C.J. Limpus. 1996. *Habitat utilization and migration in juvenile sea turtles*, in: Biology of Sea Turtles. Lutz, P.L. and J.A. Musick, eds. CRC Press, Boca Raton, FL.

Myers, R.L., and J.J. Ewel, eds. 1991. *Ecosystems of Florida.* Eds. Univ. Cent. Fla. Press, Orlando, Fl.

NMFS. 2001. Endangered Species: Leatherback Sea Turtles.

Odum, W.E., C.C. McIvor, and T.J. Smith, III. 1982. *The Ecology of the Mangroves of South Florida: A Community Profile.* Bur. Land Mgmt. U.S. Dept. Int. FWS/OBS-81/24.

Ogden, J.C. 1996. *Wood Stork Mycteria americana,* in: Rare and Endangered Biota of Florida Volume V, J.A. Rodgers, Jr. H.W. Kale and H.T. Smith eds. 1996. University Press of Florida, Gainesville, Tallahassee, FL.

Ogren, L.H. 1989. *Distribution of juvenile and subadult Kemp's ridley turtles: Preliminary results from the 1984–1987 surveys*, in: Proc. 1st Int. Symp. Kemp's Ridley Sea Turtle Biology, Conservation and Management, Caillouet, C.W., Jr. and Landry, A.M., Jr., eds. Sea Grant College Program, Galveston, TX, 116.

NRCS (Natural Resource Conservation Service) 1989. *Soil Survey of Hillsborough County, Florida.* National Cooperative Soil Survey. USDA, Soil Conservation Service.

Paul, R. 1999. *Bird Populations*, in: Baywide Environmental Monitoring Report, 1993-1998, Tampa Bay, Florida. J.R. Pribble, A.J. Janicki, and H. Greening (eds.). Technical Publication 07-99. St. Petersburg, FL.

PBS&J, 1998a. *Assessment of the Effects of Reductions in Freshwater Inflow on the Biological Communities of the Lower Alafia River.* Prepared for Tampa Bay Water. PBS&J, Inc., 2535 Landmark Drive, Suite 221, Clearwater, FL.

PBS&J. 1998. *Assessment of the Potential Impacts of the Tampa Bay Water Surface Water Projects on Tampa Bay.* Prepared for Tampa Bay Water. PBS&J, Inc., 2535 Landmark Drive, Suite 221, Clearwater, FL.

Peebles, E.B. and M.S. Flannery. 1992. *Fish Nursery Use of the Little Manatee River Estuary (Florida): Relationships with Freshwater Discharge.* Final report submitted to the Southwest Florida Water Management District, Brooksville, Florida. 91pp.

Pribble, J.R. 1999. *Bay Characteristics.* In: Baywide Environmental Monitoring Report, 1993-1998, Tampa Bay, Florida. J.R. Pribble, A.J. Janicki, and H. Greening (eds.). Technical Publication 07-99. St. Petersburg, FL.

Ryder, Paul D. 1985. *Hydrogeology of the Floridan Aquifer System in West-Central Florida.* U. S. Geological Survey Professional Paper 1403-F.

Schmidt-Nielson. 1991. Animal Physiology: Adaptation and Environment. Fourth Edition. Cambridge University Press.

Sklar F.H. and J.A. Browder. 1998. *Coastal Environmental Impacts brought About by Alterations to Freshwater Flow in the Gulf of Mexico.* Environ. Mgt. Vol 22, No. 4, pp. 547-562.

Springer, V.G. and A.J. McErlean. 1961. *Notes on and Additions to the Fish Fauna of the Tampa Bay area. Copeia* 4:480-482.

Squires, A.P. and T. Cardinale. 1999. *Water Quality.* In: Baywide Environmental Monitoring Report, 1993-1998, Tampa Bay, Florida. J.R. Pribble, A.J. Janicki, and H. Greening (eds.). Technical Publication 07-99. St. Petersburg, FL.

State of Florida. 1998a. *Florida Statue 373.223.* Tallahassee, Florida.

State of Florida, Department of Environmental Protection. 1998b. *Amended and Restated Interlocal Agreement.* Tallahassee, Florida.

State of Florida. 1999. *Florida Statue 373.1962.* Tallahassee, Florida.

Stewart, J.W. and L.R. Mills. 1984. *Hydrogeology of the Sulphur Springs area, Tampa Florida.* U.S. Geological Survey Water-Resources Investigations report 83-4085.

Stoker, Y.E., V.A. Levesque and W.M. Woodham. 1996. *The Effect of Discharge and Water Quality of the Alafia River, Hillsborough River, and the Tampa Bypass Canal on Nutrient Loading to Hillsborough Bay, Florida.* USGS Water-Resources Investigations Report 95-4107, Tallahassee, FL.

Stys, B. 1993. *Ecology and Habitat Protection needs of the Southeastern American kestrel (Falco sparverius paulus) on large-scale development sites in Florida.* Nongame Wildlife Technical Report No.13. Office of Environmental Services. Florida Game and Freshwater Fish Commission. 620 Meridian Street, Tallahassee, FL.

SWFWMD 1992. *Water Supply Needs and Sources 1990-2020.* Southwest Florida Water Management District, January 1992. 2379 Broad Street, Brooksville, FL 34609-6899.

SWFWMD 1993. *Computer Model of Groundwater Flow in the Eastern Tampa Bay Water Use Caution Area.* Brooksville, FL.

SWFWMD. 1999a. *An Analysis of Hydrologic and Ecological Factors Related to the Establishment of Minimum Flows for the Hillsborough River.* Southwest Florida Water Management District, Peer Review Final Draft. June 15, 1999.

SWFWMD. 1999b. *An Analysis of Hydrologic and Ecological Factors Related to the Establishment of Minimum Flows for the Tampa Bypass Canal at Structure 160.* Southwest Florida Water Management District, 2379 Broad Street, Brooksville, Florida 34609.

Tampa Bay Water. 1999a. *Compilation of member governments' Five-Year Conservation Plan, Annual Report.* Clearwater, Florida.

Tampa Bay Water. 1999b. *A Regional Water Supply Authority Utility Revenue Bonds Series 1999.* Clearwater, Florida.

Tampa Bay Water. 1999c. *Partnership Conservation Guidelines, First Annual Update*. Clearwater, Florida.

Tampa Bay Water. 2000a. *New Water Plan Quarterly Report.* Clearwater, Florida.

Tampa Bay Water. 2000b. *Tampa Bay Water, Special District Public Facilities Report.* Clearwater, Florida.

Tampa Bay Water. 2000c. *New Water Plan, Second Annual Report*, prepared for the Southwest Florida Water Management District. Clearwater, Florida.

Taylor, R. G. 2000. *Management of Common Snook in Florida.* Fish and Wildlife Conservation Commission, Florida Marine Research Institute, 100 Eighth Avenue Southeast, St. Petersburg, Florida. 10pp.

Tihansky, A.B. 1999. *Sinkholes, West-Central Florida.* In: Land Subsidence in the United States. Galloway, Devin, Jones, Ingebritsen (eds). USGS Circular 1182, pp 121-140.

U.S. Census Bureau 1995. *State and County Facts.* United States Census Bureau.

USEPA 1999. *The Ecological Condition of Estuaries in the Gulf of Mexico.* EPA 620-R-98-004.

URS Greiner Woodward Clyde. 2000. Master Water Plan Wetlands Mitigation Project. Final Addendum to the Master Water Plan Off-Site Wetlands Mitigation Site Selection Feasibility Study. Prepared for Tampa Bay Water, Clearwater, FL

USDI (United States Department of the Interior). 1990. *An Ecological Characterization of the Tampa Bay Watershed.* Biological Report 90(20). Fish and Wildlife Service and Minerals Management Service.

USFWS (United States Fish and Wildlife Service). 2000. http://www.endangered.fws.gov

WAR/SDI. 1995. *Second Interpretive Report, Tampa Bypass Canal and Hillsborough River Hydro-biological Monitoring Report. Volume I of III.* Water and Air Research, Inc. 6821 Archer Road, Gainesville, FL, 32608 and SDI Environmental Services, Inc. 13911 N. Dale Mabry, Suite 201, Tampa FL 33618. Prepared for West Coast Regional Water Supply Authority, Clearwater, Florida and City of Tampa, Tampa, FL.

Weigle, B.L., J.E. Reynolds, III, B.B. Ackerman, I.E. Beeler, and P.L. Boland. 1991. *Distribution and Abundance of Bottlenose Dolphins (Tursiops truncatus) in Tampa Bay.* In: Proceedings, Tampa Bay Area Scientific Information Symposium 2, February 27-March 1, 1991. Treat, S.F. and P.A. Clark (Eds.). Pp. 277-288. Tampa, FL.

West, Carol T., Lenze, D. G. Florida Long Term Economic Forecast 2000 – Volume 2 – State and Counties September 2000.

West, Carol T., Lenze, D. G. The Florida Short Term Outlook October 1999.

Wharton, Barry, G Ballo, and M Hope. 1981. *The Republic Groves Site, Hardee County, Florida.* Florida Anthropologist 34:59-80.

Wik, R.M. 1960. *Captain Nathaniel Wyche Hunter and the Florida Indian Campaigns,* 1837-1841. Florida Historical Quarterly 39 (1): 62-75.

Wooley, C. M. and E. J. Crateau. 1985. *Movement, microhabitat, exploitation and management of the Gulf of Mexico Sturgeon, Appalachicola River, Florida.* North American Journal of Fisheries Management 16:590-605.

Zarbock, H. A.Janicki, D. Wate, D Heimbuch and H. Wilson. 1995. *Current and Historical Freshwater Inflows to Tampa Bay, Florida.* Prepared for Tampa Bay National Estuary Program, St. Petersburg, Florida. Coastal Environmental, Inc. St. Petersburg, Florida.

Zug, G.R., Kalb, H., and Luzan, S.L. 1997. *Age and growth in wild Kemp's ridley sea turtles (Lepidochelys kempi) from skeletochronological data.* Biological Conservation. 80, 3, 261-268.

APPENDICES

LIST OF APPENDICES

APPENDIX A - BIOLOGICAL ASSESSMENT

APPENDIX B - MITIGATION SUMMARY

APPENDIX C - ALAFIA RIVER AND HILLSBOROUGH RIVER/TAMPA BYPASS CANAL WITHDRAWAL PERMITS

APPENDIX D - CORRESPONDENCE

APPENDIX E - WILDLIFE AND VEGETATION SPECIES LIST

APPENDIX A - BIOLOGICAL ASSESSMENT

BIOLOGICAL ASSESSMENT

for

TAMPA BAY WATER'S
TAMPA BAY REGIONAL RESERVOIR PROJECT

Submitted to the

U.S. Environmental Protection Agency
Office of Environmental Assessment

by

BURNS & MCDONNELL ENGINEERING COMPANY, INC.

June 2001

25489

Burns & McDonnell
SINCE 1898

TABLE OF CONTENTS

PART 1 INTRODUCTION 1
1.1 OVERVIEW 1
1.2 PURPOSE OF THE BIOLOGICAL ASSESSMENT 1
1.3 PROJECT PURPOSE 1
1.4 PROJECT NEED 2
1.5 PROPOSED FACILITY 2
1.6 PROJECT HISTORY 3
PART 2 THE PROPOSED PROJECT 7
2.1 ALTERNATIVES 7
2.2 DESCRIPTION OF THE PREFERRED ALTERNATIVE 8
2.3 RELEVANT ECOLOGICAL IMPACTS 9
2.3.1 Tampa Bay Regional Reservoir Project Area 9
2.3.2 Alafia River 10
2.3.3 Hillsborough River and Tampa Bypass Canal 10
2.3.4 Tampa Bay 10
2.3.5 Groundwater 11
PART 3 POTENTIALLY IMPACTED SPECIES 13
3.1 WOOD STORK 13
3.1.1 General Life History 13
3.1.2 Project Area 16
3.2 FLORIDA SCRUB JAY 16
3.2.1 General Life History 16
3.2.2 Project Area 18
3.3 BALD EAGLE 19
3.3.1 General Life History 19
3.3.2 Project Area 21
3.4 RED-COCKADED WOODPECKER 21
3.4.1 General Life History 21
3.4.2 Project Area 22
3.5 PEREGRINE FALCON 22
3.5.1 General Life History 22
3.5.2 Project Area 23
3.6 HAWKSBILL SEA TURTLE 23
3.6.1 General Life History 23
3.6.2 Project Area 24
3.7 GREEN SEA TURTLE 24
3.7.1 General Life History 24
3.7.2 Project Area 25
3.8 KEMP'S RIDLEY SEA TURTLE 25
3.8.1 General Life History 25
3.8.2 Project Area 26
3.9 LOGGERHEAD SEA TURTLE 26
3.9.1 General Life History 26
3.9.2 Project Area 27

3.10 LEATHERBACK SEA TURTLE 27
3.10.1 General Life History 27
3.10.2 Project Area 28
3.11 AMERICAN ALLIGATOR 28
3.11.1 General Life History 28
3.11.2 Project Area 29
3.12 EASTERN INDIGO SNAKE 29
3.12.1 General Life History 29
3.12.2 Project Area 30
3.13 GULF STURGEON 30
3.13.1 General Life History 30
3.13.2 Project Area 31
3.14 FLORIDA MANATEE 31
3.14.1 General Life History 31
3.14.2 Project Area 32
3.15 BEAUTIFUL PAWPAW 32
3.15.1 General Life History 32
3.15.2 Project Area 32
3.16 FLORIDA BONAMIA 33
3.16.1 General Life History 33
3.16.2 Project Area 33
3.17 SMALL'S JOINTWEED 33
3.17.1 General Life History 33
3.17.2 Project Area 33
3.18 PYGMY FRINGE TREE 33
3.18.1 General Life History 34
3.18.2 Project Area 34
3.19 FLORIDA GOLDEN ASTER 34
3.19.1 General Life History 34
3.19.2 Project Area 34
PART 4 POTENTIAL IMPACTS OF THE PREFERRED ALTERNATIVE 35
4.1 WOOD STORK 35
4.2 FLORIDA SCRUB JAY 35
4.3 BALD EAGLE 35
4.4 RED-COCKADED WOODPECKER 35
4.5 PEREGRINE FALCON 36
4.6 ENDANGERED AND THREATENED SEA TURTLES 36
4.7 AMERICAN ALLIGATOR 36
4.8 EASTERN INDIGO SNAKE 36
4.9 GULF STURGEON 36
4.10 FLORIDA MANATEE 36
4.11 THREATENED AND ENDANGERED PLANTS 37
PART 5 CONCLUSIONS 38
5.1 MITIGATION MEASURES 39
LITERATURE CITED LC-1

PART 1
INTRODUCTION

1.1 OVERVIEW

This biological assessment was prepared as part of the environmental studies for the Tampa Bay Regional Reservoir Project. The assessment, under Section 7 of the Endangered Species Act of 1973, (Public Law 930205), and subsequent amendments, addresses the potential impacts of the project on species that are federally listed as threatened and endangered. The species discussed in this assessment were identified by the U.S. Fish and Wildlife Service (FWS) because of their documented or potential occurrence in the vicinity of the proposed reservoir, or because they were observed on the project site by wildlife biologists. The discussion for each species includes its status, life history, and the potential impact of the Tampa Bay Regional Reservoir Project on each.

1.2 PURPOSE OF THE BIOLOGICAL ASSESSMENT

The Tampa Bay Regional Reservoir Project was authorized for grant funding by the U.S. Environmental Protection Agency (EPA) under the State Tribal Assistance Grant Program. This funding action will partially provide the means to acquire the real property and to design and construct the Tampa Bay regional reservoir and transmission main. EPA, as the lead federal agency, must consider all environmental effects of the construction and operation of the Tampa Bay Regional Reservoir Project, and must conduct a National Environmental Policy Act (NEPA) analysis of project impacts on the existing environment. Pursuant to 40 C.F.R. 1501.4(c) and in accordance with Section 102(2)(c) of NEPA, EPA has identified the need to prepare an Environmental Impact Statement (EIS) for the Tampa Bay Regional Reservoir Project. This biological assessment is submitted to the FWS as part of the determination of potential impacts of the Tampa Bay Regional Reservoir Project on threatened and endangered species. In response, the FWS will prepare a biological opinion stating whether the proposed action would adversely affect or jeopardize the continued existence or have no impact on the threatened and endangered species identified for the Tampa Bay Regional Reservoir Project area.

1.3 PROJECT PURPOSE

The purpose of the Tampa Bay Regional Reservoir Project would be to improve the reliability and dependability of Tampa Bay Water's regional surface water supply system. The reservoir would store untreated raw surface water diverted during high flow conditions from the Hillsborough River, the Tampa Bypass Canal, and the Alafia River. This stored water would be used during dry periods when little or no surface water could be diverted. The first 66 million gallons per day (mgd) of raw water withdrawn from one or more of the three surface water sources would be treated at the new Tampa Bay Regional Water Treatment Plant (WTP) and then distributed through Tampa Bay Water's regional water distribution system.

Diverted amounts of raw water exceeding 66 mgd would be pumped into the reservoir and stored for later use. During the dry season when little or no water could be diverted from the surface water sources, up to 66 mgd would be withdrawn from the reservoir, treated at the Tampa Bay Regional WTP and distributed to retail customers.

1.4 PROJECT NEED

The Tampa Bay Regional Reservoir project is needed to increase the yield and improve the reliability of the regional surface water system. Rapid population growth and economic development has resulted in an increase in projected future water demand.

Tampa Bay Water currently supplies its member governments with water from 12 groundwater wellfields. Water use permits and agreements between Tampa Bay Water, Southwest Florida Water Management District (SWFWMD), and its member governments limit the withdrawal of water from the 11 Northern Tampa Bay wellfields to 158 mgd, with reductions in withdrawals to 121 and 90 mgd required in 2002 and 2007 respectively. Based on increased water demand and reduction of the existing supply, Tampa Bay Water needs to develop new water supply sources to meet the additional required water supply capacity presented in the following schedule (Black and Veatch 1998).

Year	Additional Water Supply Required (mgd)
December 2002	53
December 2007	58
Total	**111**

The reservoir would be constructed by 2004 and would likely take one year to fill. It is anticipated to be fully operational by 2005. It is estimated that the additional storage capacity in the reservoir would increase the sustainable annual yield from surface water diversions from approximately 25-mgd to 50-60 mgd.

1.5 PROPOSED FACILITY

The proposed Tampa Bay regional reservoir is an off-stream, above-ground reservoir that would store water withdrawn from the Hillsborough River, the Tampa Bypass Canal, and the Alafia River during periods of high flow. The reservoir would increase the sustainable yield of Tampa Bay Water's system by storing untreated surface water for use during low flow periods when little or no direct flow water could be withdrawn from these sources. Water would be transmitted to the WTP during dry periods for treatment and distribution via Tampa Bay Water's regional water supply system.

The regional reservoir project site consists of the footprint of the embankment and reservoir, the associated facilities and transmission pipeline, and all of the mitigation sites that would be used to offset impacts associated with the project. Associated facilities include an intake tower and potential water quality pump station. The transmission pipeline would connect the reservoir to Tampa Bay Water's new WTP and regional water system.

The proposed reservoir and associated facilities would cover approximately 1,100 acres (900 acres of surface area when full), with a storage volume of approximately 48,000 acre-feet (15 billion gallons) (HDR 2000b). It would be located in southeastern Hillsborough County, south of County Road 640, north of County Road 672, and west of State Road 39 (Figure 1-1). Portions of the site have been mined for phosphate,

but are currently being used as improved pasture.

Reservoir embankments would be 30 to 65 feet high and constructed primarily from onsite soils. To control erosion, the interior face of the embankments would be covered with a soil and cement mixture.

Approximately 7.5 miles of 84-inch pipeline would connect the proposed reservoir to Tampa Bay Water's regional water system at the South Central Hillsborough Intertie. The new pipeline route would generally follow existing roadways and linear utility corridors. The route would begin approximately 400 feet north of the intersection of Fishhawk Drive, Bell Shoals Road and Boyette Road. It would then run south and east, parallel to Boyette Road where it crosses rural land to the Tampa Bay regional reservoir site (HDRa 1999).

The real property rights required for construction and operation of the pipeline include a temporary easement of 50 feet during construction and a 50-foot permanent easement for construction, operation and maintenance activities. In areas near homes and other potentially sensitive locations, the easement would be reduced where possible to avoid or minimize impacts (HDR 2000). The approximate alignment of the proposed pipeline route is shown in Figure 1-2.

1.6 PROJECT HISTORY

Tampa Bay Water, formerly the West Coast Regional Water Supply Authority, was established on October 25, 1974. In August 1998, the Authority became Tampa Bay Water, which is responsible for supplying wholesale water to its six member governments of Hillsborough, Pasco, and Pinellas Counties and the Cities of New Port Richey, St. Petersburg, and Tampa.

Tampa Bay Water is the largest wholesale water supplier in the state of Florida. Its member governments serve the needs of approximately 2 million people. By Florida mandate, Tampa Bay Water is responsible for developing, recovering, storing, and supplying water for its member governments in such a way as to reduce environmental impacts. Tampa Bay Water is permitted to transport and use ground or surface water, across county boundaries within the 3 county area, if publicly and environmentally acceptable.

Tampa Bay Water provides an average of 176 million gallons of drinking water each day. Currently, this water is groundwater from the Floridan aquifer. Environmental resources have been impacted in some areas where the Floridan aquifer is indirectly connected to surface waters. The potential impacts of groundwater pumping have been a matter of substantial concern among the member governments, SWFWMD, the Florida Legislature and the public for several years. To answer these concerns, Tampa Bay Water and SWFWMD have negotiated a Consolidated Water Use Permit, which regulates withdrawals from the 11 wellfields currently operated by Tampa Bay Water.

The Consolidated Water Use Permit currently limits withdrawals from the 11 of the 12 wellfields to 158 mgd (based on a 36-month running average). The total permitted capacity of the 11 wellfields will be reduced to 121 mgd in December 2002 and to 90 mgd in December 2007. To meet the terms of

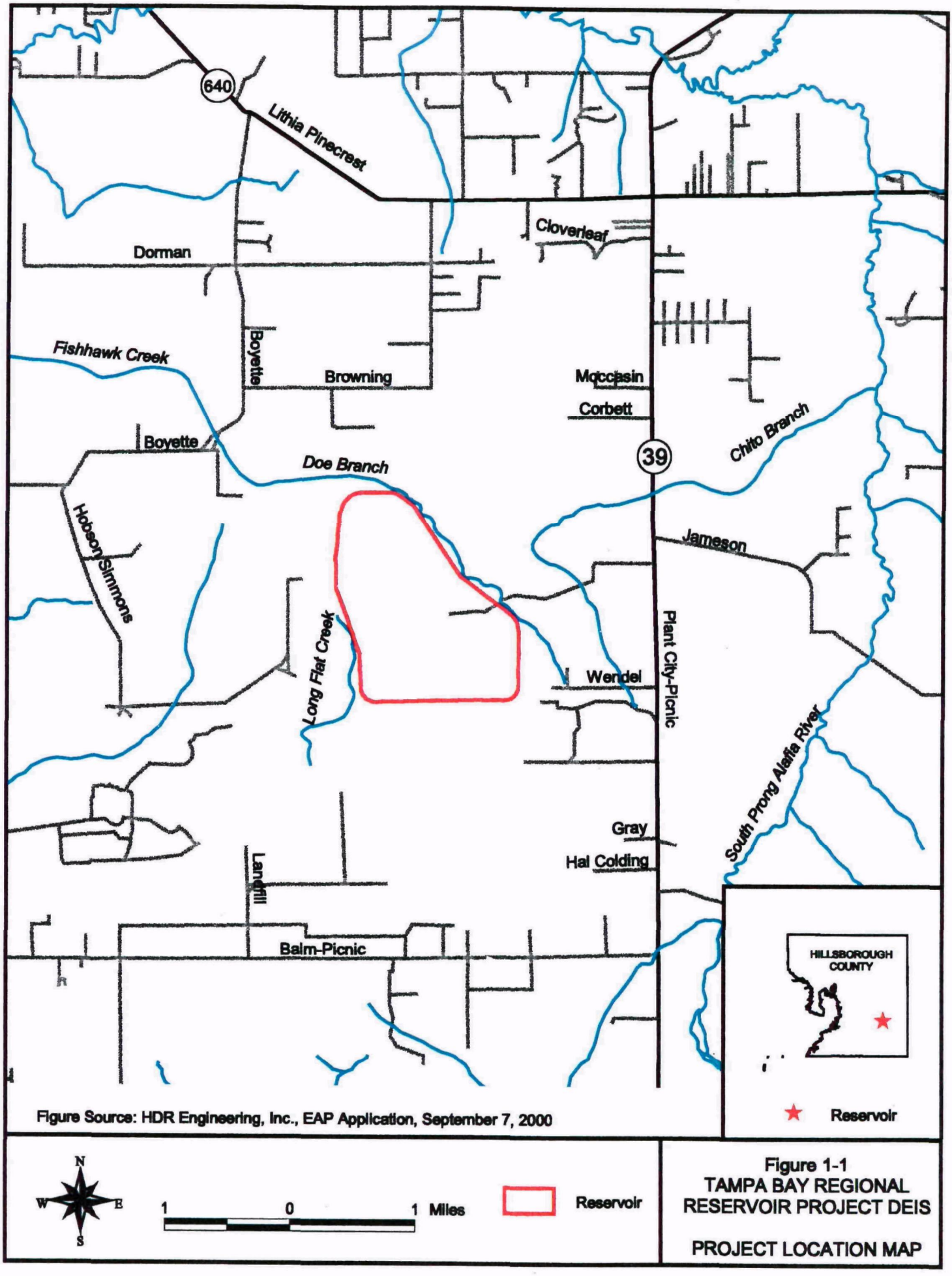


Figure 1-1
TAMPA BAY REGIONAL
RESERVOIR PROJECT DEIS

PROJECT LOCATION MAP

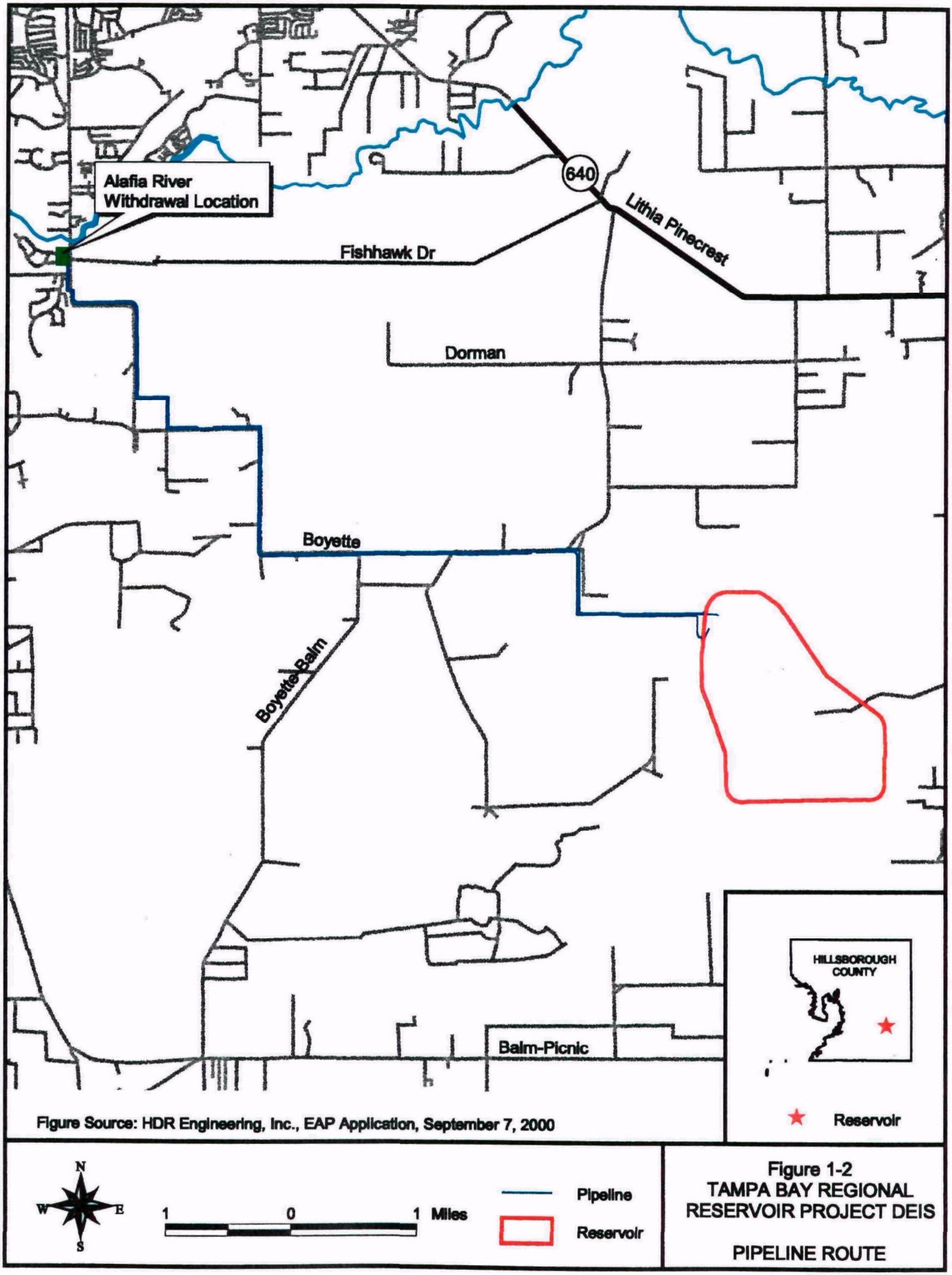


Figure 1-2
TAMPA BAY REGIONAL
RESERVOIR PROJECT DEIS

PIPELINE ROUTE

the Consolidated Water Use Permit and demands of the growing population, Tampa Bay Water has identified the need to develop 53 mgd of new water supply sources by 2002 and an additional 58 mgd by 2007.

To meet these demands, Tampa Bay Water initiated a study that resulted in the Master Water Plan Alternative System Configurations (Report) (Black & Veatch, 1998). The Report evaluated potential water supply alternatives and facilities using water demand projections, existing water supply sources, and facility capacities. The outcome was the identification of potential water supply sources and facilities to meet the needs of the Tampa Bay area through the year 2010.

A number of combinations of projects presented in the Report could potentially meet the future demands of the Tampa Bay Area. However, based on a viable implementation schedule, only four of the new systems could potentially meet the December 2002 and 2007 groundwater reductions (Black & Veatch 1998). Each of the four systems would provide both integration of the water supply system and rotational service. A water conservation program is also included in all the systems, which proposes reduction of average annual demand by 10 mgd in 2000 and 17 mgd in 2005 (Black & Veatch 1998).

Each of these systems contained a set of core projects what would meet the 2002 need and a second set of core projects to meet the need in 2007. The projects capable of providing the need for 2002 include:

- Tampa Bypass Canal Water Supply Project
- Alafia River Project
- Brandon Urban Dispersed Wells Project
- Seawater Desalination Project
- Cypress Bridge II Project

Regardless of which new sources were initially constructed to meet the established 2002 need, one of the following projects would also need to be included in the system to meet the projected needs of the Tampa Bay area by December 31, 2007. These include:

- Tampa Bay Regional Reservoir Project;
- Seawater Desalination Expansion (from initial of 20 or 35 mgd to 50 mgd);
- Hillsborough Bay Resource Exchange Project.

To make the system functional, the new Tampa Bay Regional WTP and the South Central Hillsborough Intertie would also need to be constructed. Each of these projects represents a piece of the puzzle that together will form an integrated water supply for the Tampa Bay region. The piece of the puzzle that is the subject of this EIS is the Tampa Bay Regional Reservoir Project.

PART 2 THE PROPOSED PROJECT

2.1 ALTERNATIVES

Twelve alternatives capable of improving the reliability and dependability of Tampa Bay Water's integrated water supply system have been identified. Alternatives evaluated in the EIS were grouped into two categories: action and no action alternatives. Alternatives were subjected to a tiered screening criteria based on engineering feasibility, environmental fatal flaws, and their ability to meet regional demands. Feasible alternatives were identified and carried forward for detailed description and analysis.

The action alternatives considered include water storage, water supply, and demand management alternatives.

- Water storage includes alternatives that have a water storage component capable of providing water to the regional water system during periods when surface water flows are inadequate to meet the water demands of the region.
- Water supply involves alternatives that could provide drinking water to the region without the use of a water storage component.
- Demand management, focuses on reducing water demand through conservation measures to serve additional customers with existing supplies.

Action alternatives include any actions that could be undertaken by Tampa Bay Water to supplement or create additional water resources. These include the proposed Tampa Bay Regional Reservoir Project and other storage/supply alternatives.

Table 2.1. List of Alternatives Evaluated

Action Alternatives

- Tampa Bay Regional Reservoir
- Freshwater from Springs in the Gulf
- Lakes in Abandoned Phosphate Pits
- Above-Ground Water Storage Tanks
- Reclaimed Water for Potable Reuse
- Reclaimed Water
- Seawater Desalination
- Brackish Water Desalination
- Water Conservation
- Aquifer Storage and Recovery (ASR) System
- Tampa Bay Regional Reservoir and ASR System

No Action Alternative

- No Federal Action

Also included in the list of alternatives is the No Federal Action. The action and no-action alternatives are presented in the Table 2.1.

Based on the alternative analysis, **the recommended alternative is the Tampa Bay Regional Reservoir Project.** The EPA believes the proposed reservoir can provide a quality source of water that can effectively provide Tampa Bay Water's member governments'

water to supplement the integrated surface water system.

The proposed reservoir will not affect the permitted withdrawal schedules from the surface water sources. It will simply increase the dependable yield of the surface water system by providing storage of water during periods of sufficient flow in the surface water system for use during dry periods.

2.2 DESCRIPTION OF THE PREFERRED ALTERNATIVE

The addition of an off-stream reservoir would improve the reliability and dependability of the regional water system. Tampa Bay Water's Board of Directors has considered several options for the potential reservoir site. A preliminary screening process was used to eliminate reservoir alternatives because of land use issues, natural features such as wetlands, bottomland hardwood and riparian communities, and proximity to residential areas. Preliminary screening resulted in the identification of 15 potential reservoir sites to be reviewed in detail. The review process included a range of criteria, including natural features, land use, land values, relocations, construction costs, and potential contamination by hazardous materials. Seven alternatives underwent more extensive geotechnical and environmental analyses and were included in a public involvement program. The screening process and related cost analysis led to the selection of the preferred off-stream reservoir site, the proposed Tampa Bay regional reservoir. Implementation of the proposed site would involve the following facilities:

- The South Central Hillsborough Intertie.
- The Alafia River and Tampa Bypass Canal Intakes and Pump Stations.
- The Tampa Bay Regional Water Treatment Plant.

The proposed Tampa Bay regional reservoir is an off-stream above ground reservoir that would store water withdrawn from the Tampa Bypass Canal, the Hillsborough River, and the Alafia River during periods of high flow. The purpose of the reservoir would be to increase the sustainable yield of the system by storing untreated surface water for use during low flow periods when direct flow water cannot be withdrawn from the above mentioned sources. The reservoir would not affect the permitted withdrawal schedules from the surface water sources, but would increase the dependable yield of the system from approximately 25 mgd to 50-60 mgd (HDR 1999).

During periods when the allowable withdrawals from the surface water sources exceed the capacity of the water treatment facilities, water would be stored in the proposed Tampa Bay regional reservoir. Any surface water withdrawal amounts that exceed 66 mgd would be pumped to the reservoir for storage, prior to treatment. When stream flows decrease and direct flow surface water withdrawals are limited, water would be pumped from the reservoir to the treatment facility and distributed to meet water demands (HDR 2000b).

2.3 RELEVANT ECOLOGICAL IMPACTS

2.3.1 Tampa Bay Regional Reservoir Project Area

The Tampa Bay Regional Reservoir Environmental Resource Permit and U.S. Army Corps of Engineers Dredge and Fill Permit Application prepared in August of 2000 assessed direct and indirect impacts to wetlands in the proposed project areas (HDR 2000b). Direct impacts are defined as dredge and fill activities resulting from reservoir and pipeline construction. Indirect impacts are related to potential changes in local water table elevations resulting from reservoir seepage.

The reservoir site selection process for the proposed Tampa Bay Regional Reservoir Project used criteria to avoid and minimize direct and indirect impacts to wetlands. It was estimated that the total amount of wetlands impacted by the project is 189.9 acres. This includes 182.3 acres of wetlands within the reservoir footprint and 7.6 acres along the pipeline route. Impacts along the pipeline are temporary and are not anticipated to require off-site mitigation. Impacts within the reservoir footprint are permanent and will require mitigation.

Based on mitigation credits anticipated from the project site, the Recommended Mitigation Plan, proposed by Tampa Bay Water, is anticipated to provide approximately 521 acres of wetland mitigation using a combination of enhancement, restoration, and creation. All of the proposed mitigation sites and scenarios are subject to additional coordination and approvals by permitting agencies, development of final impact acres and mitigation requirements, and additional engineering studies. The recommended Mitigation Plan is proposed to meet the anticipated mitigation requirements of the reservoir project.

Extensive field reviews and surveys of the proposed reservoir site have been conducted since 1998 for suitable wetland and wildlife habitats, including those for federal and state listed threatened and endangered species. Potential impacts on terrestrial wildlife were evaluated based on the quantity, quality, and scarcity of the habitats disturbed by or lost to construction. Impacts would be significant if high quality, relatively rare wildlife habitat is lost or significantly impacted.

Wildlife species expected to occur in the vicinity of the proposed project area are numerous and varied due to the mosaic of upland and wetland communities found in the region. Wildlife observed on the reservoir site, or highly likely to utilize the site, include small and large mammals, reptiles, amphibians, and a wide variety of birds. Small mammals that may occur on the project site such as raccoon, armadillo, opossum, and eastern cottontail, would be displaced to surrounding habitats by construction of the reservoir. Large mammals such as wild pig, and white-tailed deer, and reptiles such as the anole, six-lined racerunner, and various snakes, are mobile species and would likewise be displaced to surrounding habitats. Impacts to these species are expected to be minor but habitat loss would be permanent in nature.

A wide variety of upland and wetland dependent bird species, both permanent residents and winter migrants, potentially utilize the proposed reservoir

site. Habitat for these species would be lost within the footprint of the reservoir. These species would be displaced by the construction of the reservoir but many, especially upland species, would likely utilize the uplands immediately surrounding the reservoir. Wetland-dependent species would be displaced to wetlands in the surrounding areas. Impacts to these species are also expected to be minor but habitat would be lost due to construction.

2.3.2 Alafia River

The diverse habitat around the Alafia River provides cover and forage for a variety of wildlife species. Species occurring in and along the river include small and large mammals, marine mammals, birds (including wading birds), and benthic macroinvertebrates.

It is unlikely that significant impacts to the Alafia River would result from the proposed surface-water withdrawals. Many resource managers agree that in most systems the largest potential for impacts occurs when low flows are disrupted. For the proposed project, the largest predicted effects on freshwater flows would occur in the middle range of flow frequencies, leaving the low and high flow rates relatively or entirely unimpacted. Therefore it is highly unlikely that operation of the proposed alternative would impact wildlife associated with Alafia River.

2.3.3 Hillsborough River and Tampa Bypass Canal

Implementation of the proposed projects would divert up to 129 mgd (on a maximum daily basis) of freshwater flows from the Hillsborough River and Tampa Bypass Canal. Withdrawals for the Hillsborough River would begin when flows in the river below the City of Tampa's Hillsborough River Reservoir reach 65 mgd, which has been permitted by the SWFWMD. Withdrawals from the Tampa Bay Bypass Canal would begin when flows in the river reach 7 mgd, which has been permitted by the SWFWMD.

Similar to the Alafia River, the diverse habitats around the Hillsborough River and Tampa Bypass Canal provide cover and forage for a variety of wildlife species. However, these habitats have been greatly impacted by human development, resulting in limited species diversity and population sizes. Developments and human disturbance limit the overall amount of habitat present, and competition is high for limited resources. It is unlikely that significant impacts to the wildlife associated with the Hillsborough River and Tampa Bypass Canal systems would result from the operation of any of the water supply alternatives.

Studies evaluating the potential impacts of the Hillsborough River and Tampa Bypass Canal indicate that although some alterations to the flow and salinity regime could be expected due to withdrawals, the magnitude of the effects appear to be within the normal range of variation for the natural system.

2.3.4 Tampa Bay

Tampa Bay is a subtropical estuary with a rich mosaic of fish and wildlife habitats. These habitats include seagrass beds, salterns, and vegetated intertidal areas with mixtures of mangrove and tidal marsh vegetation. A variety of wildlife species use the habitats found in Tampa Bay, including small and large mammals, marine mammals, birds (including wading birds), reptiles,

amphibians, and benthic macroinvertebrates.

Implementation of the proposed projects would eliminate up to 181 mgd (on a maximum daily basis) of freshwater inflow into Tampa Bay. The proposed withdrawals raise concerns about the potential effects on Tampa Bay and its tributaries. The potential impacts of freshwater withdrawals on salinity and circulation and the potential impacts of any changes in salinity and/or circulation on the Tampa Bay ecosystem have been evaluated.

Potential impacts of the proposed withdrawals would not adversely affect the estuary as a nursery and habitat for living resources (Coastal Environmental/PBS&J 1998). The required minimum and maximum flow levels must be addressed through operating schedules, design considerations, and other resource management activities.

The prediction of possible local-scale changes in salinity and circulation resulting from the withdrawals was made utilizing a three-dimensional hydrodynamic model (PBS&J 1998). The objectives of this model were to estimate the modifications to spatial and temporal patterns of salinity and residual tidal circulation within Tampa Bay that could result from surface water withdrawals from the Alafia River and Hillsborough Rivers and the Tampa Bypass Canal. The model used spatial scales sufficient to determine changes to portions of the estuary.

The modeling indicates freshwater withdrawals from the Alafia and Hillsborough Rivers and the Tampa Bypass Canal appear to influence salinity and flushing time in Tampa Bay. The potential impacts of the various projects to tributaries of the Tampa Bay estuary result in salinity changes that remain within the range of natural system variation. It is unlikely that significant impacts to wildlife habitat in and around Tampa Bay would result from operation of the action Tampa Bay Regional Reservoir Project. The largest predicted effects on freshwater flows would occur in the middle range of permitted flow frequencies, leaving the low and high flow rates relatively or entirely unimpacted (Coastal Environmental/PBS&J 1998).

2.3.5 Groundwater

By legal actions under the Partnership Agreement between Tampa Bay Water, SWFWMD, and member governments, the proposed projects would allow Tampa Bay Water's member governments to reduce withdrawals from regional wellfields. The Partnership Agreement outlines the required reduction in groundwater withdrawals from the 11 of the 12 regional wellfields by the year 2002 and 2007.

By contributing to a reduced reliance on groundwater, the proposed projects would enhance the water levels and biological health of related wetlands, lakes, and streams. The improved biological health of these resources would in turn benefit the fish and wildlife that depend on them for habitat.

At the reservoir site, significant water exchange from vertical migration of water into underlying aquifers is not expected. Although the hydraulic potential exists for downward vertical movement of groundwater to lower aquifers, the presence of low

permeability confining intervals would retard the vertical movement of water between the aquifer units (HDR 2000b).

Flow modeling results indicate water loss from seepage would occur into the shallow water table and surrounding streams. Seepage from the reservoir at maximum pool level could potentially add 0.5 to 1 mgd of water to the groundwater/surface water system of the site. Horizontal flow discharge to the water table outside of the embankment boundary is predicted to be as high as 45 percent of the total upward flux within 100 feet of the embankment toe. Impacts from horizontal seepage would include a rise in the water table within 400 feet of the embankment toe (HDR 2000b).

Adding ASR to the reservoir site would provide additional underground storage and would enhance the reliability of the proposed surface reservoir as a regional water supply. The majority of existing permitted groundwater users within the study area tap the intermediate aquifer and the uppermost part of the Floridan aquifer. The proposed storage zones for ASR have sufficient confinement from the intermediate aquifer to preclude any impacts to the surficial or intermediate aquifer systems. Injection and pumpage within the proposed storage zones may affect existing users (mostly agricultural users) that tap the Upper Floridan aquifer for a water supply by producing variations in the level and pressure within the aquifer system (HDR 2000a).

PART 3
POTENTIALLY IMPACTED SPECIES

The Endangered Species Act of 1973 (ESA) affords protection to those species and their habitats that are listed as federally threatened or endangered. A federally endangered species is "any species which is in danger of extinction throughout all or a significant portion of its range". A federally threatened species is "any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range".

For the Tampa Bay Regional Reservoir Project, the FWS identified five endangered and six threatened species that could be impacted by the project (Table 3-1).

3.1 WOOD STORK

The endangered wood stork (*Mycteria americana*) is one of two species of storks that breed in North America. These inhabitants of marshes, cypress swamps, and mangrove swamps reach the northern limit of its breeding range in the southeastern United States where it shares breeding colonies with great egrets, snowy egrets, white ibis, and other species. The unique feeding method of the wood stork requires specialized habitat requirements. These habitats on which wood storks depend have been disrupted by changes in the distribution, timing, and quantity of water flows in south Florida. The population declines that accompanied this disruption led to its listing as an endangered species and continue to threaten their recovery in the United States (FWS 1999).

In south Florida, breeding colonies of wood stork occur in Broward, Charlotte, Collier, Miami-Dade, Hardee, Indian River, Lee, Monroe, Osceola, Palm Beach, Polk, St. Lucie, and Sarasota counties. At one time or another, wood storks have nested in every county in south Florida (FWS 1999).

The current population of adult birds is difficult to estimate, because not all adult birds nest every year. Presently, the wood stork population is believed to number 11,000 adults. Recent United States breeding is restricted to Florida, Georgia, and South Carolina (FWS 1999).

3.1.1 General Life History

The wood stork is one of 17 species of true storks (Ciconiidae) in the world. The wood stork is one of three stork species found in the Western Hemisphere and is the only one that breeds north of Mexico. The wood stork has no described subspecies, races, or distinctive subpopulations (FWS 1999).

The wood stork is a large, long-legged wading bird, with a body length from head to tail of 35 to 45 inches and a wingspread of 60 to 65 inches. The plumage is white, except for iridescent black primary and secondary wing feathers and a short black tail. Storks soar with necks and legs extended. On adults, the rough scaly skin of the head and neck is unfeathered and dark gray in color, the legs are dark, and the feet are flesh-colored. The bill is black colored (Ogden 1996).

During the courtship and early nesting season, adults have pale salmon coloring under the wings, fluffy, white undertail covets that are longer than the tail, and toes that brighten to a vivid pink.

Table 3-1

ENDANGERED, THREATENED, CANDIDATE OR PROPOSED SPECIES

Common Name	Scientific Name	Federal Status
Wood Stork	*Myceteria americana*	Endangered
Florida Scrub Jay	*Amphelocoma coerulescens*	Threatened
Bald Eagle	*Haliaeetus leucocephalus*	Threatened
Red-cockaded Woodpecker	*Picoides borealis*	Endangered
Peregrine Falcon	*Falco peregrinus*	Delisted
Hawksbill Sea Turtle	*Eretmochelys imbricata*	Endangered
Green Sea Turtle	*Chelonia mydas*	Endangered
Kemp's Ridley Sea Turtle	*Lepidochelys kempii*	Endangered
Loggerhead Sea Turtle	*Caretta caretta*	Threatened
Leatherback Sea Turtle	*Dermochelys coriacea*	Endangered
American Alligator	*Alligator mississippiensis*	Threatened
Eastern Indigo Snake	*Drymarchon corais couperi*	Threatened
Gulf Sturgeon	*Acipenser oxyrhynchus desotoi*	Threatened
Florida Manatee	*Trichechus manatus*	Endangered
Beautiful PawPaw	*Deeringothamnus pulchellus*	Endangered
Florida Bonamia	*Bonamia grandiflora*	Threatened
Small's Jointweed	*Polygonella myriophylla*	Endangered
Pygmy Fringe Tree	*Chionanthus pygmaeus*	Endangered
Florida Golden Aster	*Chrysopsis floridana*	Endangered

Immature storks, up to about three years old, differ from adults in having a yellow or straw-colored bill and varying amounts of dusky feathering on the head and neck. In the field, wood storks are distinctive among North American wading birds through their long, heavy bills, black primary and secondary feathers, and black tails (Ogden 1996).

Nesting, roosting, and foraging activities are primarily associated with freshwater and estuarine habitats. Wood storks typically construct their nests in medium to tall trees that occur in stands located either in swamps or on islands surrounded by relatively broad expanses of open water (Ogden 1996). Historically, wood storks in south Florida established breeding colonies primarily in large stands of bald cypress (*Taxodium distichum*) and red mangrove (*Rhizophora mangle*) although other species of trees have been used (FWS 1999).

During the non-breeding season or while foraging, wood storks occur in a wide variety of wetland habitats. Typical foraging sites include freshwater marshes and stock ponds, shallow, seasonally flooded roadside or agricultural ditches, narrow tidal creeks or shallow tidal pools, managed impoundments, and depressions in cypress heads and swamp sloughs. Loss or degradation of wetlands in central and south Florida is one of the principal threats to the wood stork.

Wood storks use a specialized type of feeding called tactolocation. A foraging

wood stork wades through the water with its beak immersed and partially open. When it touches a prey item, the wood stork will snap its mandibles shut, raise its head, and swallow what has been caught. The wood storks will regularly stir the water with their feet, a behavior that appears to startle hiding prey. This feeding method allows storks to feed at night and use water that is turbid or densely vegetated. However, the prey must be concentrated in relatively high densities for wood storks to forage effectively (FWS 1999). The natural hydrologic regime in south Florida involves seasonal flooding of extensive areas followed by drying events that confine water to ponds and sloughs. Fish populations reach high numbers during the wet season, but become concentrated into smaller areas as drying occurs. Wood storks are able to exploit high concentrations of fish in drying pools and sloughs. Storks forage in a wide variety of shallow wetlands, where prey reach high enough densities and water is shallow and open enough for the birds to be successful. Good feeding conditions usually occur in relatively calm water, where depths are between 5 and 10 inches, and where the water column is uncluttered by dense patches of aquatic vegetation (FWS 1999).

Wood Stork

The wood stork is a highly colonial species, usually nesting in large rookeries and feeding in flocks. They tend to use the same colony sites over many years, as long as the sites remain undisturbed and sufficient feeding habitat remains in the surrounding wetlands. Traditional wetland nesting sites may be abandoned by storks once local or regional drainage schemes remove surface water from beneath the colony trees. Maintaining adequate water levels to protect nests from predation is a critical factor affecting production of a colony. As a result of drainage changes, or predation, many storks have shifted colony sites from natural to managed or impounded wetlands (FWS 1999).

Wood storks are seasonally monogamous, probably forming a new pair bond every season. Their nests are flat platforms, constructed out of sticks with a lining of finer material, up to 3 feet in diameter. Adult storks maintain them throughout the breeding season maintain them.

Nesting periods vary geographically. In Florida, wood storks lay eggs as early as October and as late as June. In general, earlier nesting occurs in the southern portion of the state. Colonies that start after January in south Florida risk having

young in the nests when the May-June summer rains flood marshes and disperse fish.

Wood storks usually lay a single clutch of two to five eggs per breeding season depending on environmental conditions. Incubation takes approximately 28 days and begins after the first one or two eggs are laid. Fledging takes about nine weeks and the young stay at the nest for an additional three to four weeks to be fed by the parents.

3.1.2 Project Area

Wood storks can be observed throughout south Florida foraging or loafing in and around shallow wetlands and ditches. Wood storks have been observed foraging in marsh wetlands located within the proposed reservoir site (HDR 2000b). No rookeries or nesting habitat exist on site except for one small cypress wetland, which is suitable, but does not support nesting woodstork.

3.2 FLORIDA SCRUB JAY

The Florida scrub jay (*Aphelocoma coerulescens*) is a relict species of fire-dominated oak scrub habitat that occurs on well-drained sandy soils in peninsular Florida. Scrub jays are extremely habitat specific, sedentary, and territorial. Florida scrub jays form family groups and fledglings remain with their parents in their natal territory as helpers (FWS 1999).

The Florida scrub jay is listed as a threatened species in Florida because of loss, fragmentation, and degradation of scrub habitats throughout the state. This is primarily due to urbanization, agriculture, and fire suppression. According to FWS, the population has declined by an estimated 25 to 50 percent in the last 10 to 12 years. At one time, the Gulf coast of Florida supported a contiguous major core population of scrub jays. Today this population is divided into two subregions because of the extensive amount of habitat fragmentation and loss that has occurred in Pinellas, Hillsborough, Pasco, and Hernando counties (FWS 1999).

The Florida scrub jay has disappeared from several counties and is reduced to scattered, small and rapidly declining populations in many more. The decreasing trend of the Florida scrub jay population is correlated with loss of scrub habitat. Today, only relict patches of xeric oak scrub remain (Fitzpatrick *et al.* 1994).

3.2.1 General Life History

The Florida scrub jay is a disjoint member of a species complex otherwise restricted to western North America. Following its isolation, probably in late Pliocene or early Pleistocene times, the Florida population diverged extensively from its western counterparts. Now, important differences exist in plumage, morphology, vocalizations, display, and social behavior. The Florida scrub jay is genetically distinct and represents the only bird species restricted to Florida (Woolfenden 1996).

The Florida scrub jay is about 10 inches long, and similar to its close relative, the blue jay. The predominant colors of both species are blue and white, but the two differ in color pattern. Scrub jays have no crest and lack the white tips, black barring, and bridle of the blue jay. Scrub jays have a pale blue head, nape, wings, and tail and, are a pale gray on he back and belly. A white eyebrow blends with a frosted white forehead. Throat and upper breast are faintly striped and bordered by pale blue, forming a distinct bib. Both sexes of Florida scrub jays are

nearly identical in plumage with males slightly larger than females. Juvenile plumage is smoky gray on the head and back, entirely lacking the blue crown and nape of adults. An incomplete molt during summer makes juveniles nearly indistinguishable from adults (Woolfenden 1996).

Scrub Jay

Florida scrub jay habitat requirements are very specie specific. Optimal scrub jay habitat consists of scrub or scrubby flatwoods with a 50 to 75 percent cover of scrub oak, 1 to 3 meters in height; scattered patches of bare sand covering 10 to 30 percent of the area; and no more than a 20 percent canopy cover by trees (Fitzpatrick *et al.* 1991). Scrub oak habitat on the west coast of Florida is often different in appearance from oak scrub habitat on the east coast. Normally, it is sub-optimal habitat and instead of the open expanses of scrub oaks and rosemary interspersed with large patches of sandy open areas, it is usually more overgrown and vegetated, with little open sand due to leaf litter and palmetto growth. This is largely due to fire suppression in the suburban developed areas.

Long-term breeding populations of scrub jays exist only where there are scrub oaks in sufficient quantity to provide an ample acorn supply, cover from predators, and sufficient nest sites. Protected scrub habitats will most effectively sustain overall scrub jay populations if located within a matrix of surrounding habitats that can be utilized and traversed by scrub jays. Elimination of scrub habitat through human activities has occurred throughout Florida scrub jay native range. Conversion of scrub habitat to citrus groves and dwellings proceeded throughout the 20th century with rapid acceleration in the 1950s and 1960s. Continued loss of habitat to rural residential development, mobile-home parks, industrial construction, shopping malls, golf courses, and other recreational uses closely tracked the rapid growth of the human population in Florida through the 1970s and 1980s. Conversion of scrub to citrus groves eliminated scrub and jays from hundreds of xeric-soil patches as early as the 1920s. Major killing freezes caused rapid southward expansion of the citrus industry in the 1970s and 1980s, especially in the interior peninsula. Scrub habitat vacated by citrus growers is not restored to its natural condition and rarely reverts to habitat suitable for Florida scrub jays (Woolfenden 1996).

Fire suppression by humans has caused many of the remaining patches of scrub to become tall and dense with a canopy of oaks and pines and a thick leaf litter. Under these conditions, death rates for breeding adults exceed recruitment and

the scrub jays die out. Entire local populations of Florida scrub jays have disappeared as a result, despite the persistence of native xeric vegetation (Woolfenden 1996).

Florida scrub jays forage on or near the ground in open areas and along edges of natural or man-made openings. Insects make up a large portion of their animal diet throughout most of the year although a variety of vertebrate prey items are consumed. Acorns are the most important plant food. The acorns are cached beneath the surface of bare sand during the fall and retrieved and consumed in winter and early spring.

The Florida scrub jay is a non-migratory, family-oriented species with a well-defined territory. Believed to be monogamous, the breeding pair stays within the territory year after year. Juveniles remain in their natal territory for up to five years before dispersal to (generally) within two territories of their natal territory and less than five miles. Prior to dispersal, prebreeders, primarily yearlings, living in their natal territory assist the breeders, usually their parents, with daily activities.

The nests are usually built in scrub oaks at a height of 1 to 2 meters although other trees are used, especially in suburban areas or areas of sub-optimal habitat. Nesting normally occurs from the beginning of March through the end of June although some areas differ slightly. Clutch size ranges from one to five eggs, typically three to four, and only the female incubates and broods eggs and nestlings. Average production of young is two fledglings per year, per pair. In optimal habitat, survival of scrub jay fledglings to yearling class is about 35 percent.

Florida scrub jays live most of their lives as members of a group and conduct most daily activity in close proximity to their group members. Almost no Florida scrub jays breed before the age of two years. Older prebreeders that fail to acquire breeding space almost always return to their natal area, where they help the resident breeders defend the territory and rear offspring. A well-developed sentinel system exists, in which one member of the group sits on an exposed perch above the shrubbery watering for predators or territory intruders.

3.2.2 Project Area

One area of suitable habitat was identified on the project site that would potentially support scrub jays. An area of scrubby flatwoods is located just outside of the northwest corner of the proposed reservoir site. The eastern two-thirds of the site has dense saw palmetto (*Serenoa repens*) and wiregrass (*Aristida* spp.) cover, while the remainder is a more hardwoods-dominated turkey-oak community.

Florida scrub jay surveys were conducted in the scrubby flatwoods habitat to determine their presence within the project area and to document the population if jays were found. Survey methods employed followed Florida Game and Freshwater Fish Commission Nongame Wildlife Program Technical Report No. 8 (Fitzpatrick *et al.* 1991). Playback stations were located approximately 300 to 500 feet apart and placed such that all Type II and Type III scrub habitat was sampled. Morning surveys were conducted on April 10, 11, 13, 14, and 15, 1999 beginning one hour after sunrise and

concluding between 10:30 and 11:00 am. A pre-recorded tape of scrub jay distress calls, obtained from the Archbold Biological Station, was played at full volume for one minute each in four directions. Weather conditions were relatively cool (between 75^0 and 80^0 F), calm, and free of precipitation.

3.3 BALD EAGLE

The bald eagle (*Haliaeetus leucocephalus*) was formerly distributed in suitable habitat across the North American continent from western Alaska to the Maritime Provinces of Canada south to the Florida Keys, the Gulf Coast, and Baja California. Presently, over 90 percent of the nesting eagles are found in disjunct populations in Florida, the Chesapeake Bay area, the Great Lakes, Maine, and the Pacific Northwest (Curnutt 1996).

The bald eagle was originally found throughout Florida in great numbers, probably in excess of 1,000 nesting pairs. By the early 1970s, habitat loss and a declining population led to the extirpation of bald eagles from most of Florida. At the top of the food chain, this raptor was adversely affected by the bioaccumulation of pesticides, particularly dichlorodiphenyltrichloroethane (DDT). These pesticides interfered with calcium metabolism, which resulted in eggshell thinning. The banning of DDT in 1972 halted a 30-year decline of bald eagle reproduction in Florida. Bald eagles are now considered common in Florida and are known to breed throughout the state. Population estimates, based on the 1993 Florida statewide survey, were 1,775 to 2,450 individuals and 667 breeding pairs (Curnutt 1996).

Interactions between eagles and humans are the single most important factors affecting eagles. Anthropogenic effects have been responsible for degradation of nesting, foraging, and wintering habitat throughout the species' range. Current threats to the bald eagle include habitat fragmentation and loss, collisions with cars and powerlines, and shooting. (FWS 1999).

3.3.1 General Life History

The bald eagle is in the Order Falconiformes, Family Accipitridae. The bald eagle is the sole representative of the genus *Haliaeetus* ("sea eagle") regularly found in the western hemisphere. The division of *H. leucocephalus* into two species, the southern and northern bald eagle, is based primarily on size. Bald eagles from opposite ends of their 2,750-mile range (north to south) are distinctly different with the northern bald eagle slightly larger than the southern. There is a gradient of larger to smaller birds from north to south and the overlap of breeding and migration ranges make it difficult to define geographic limits of subspecies (Curnutt 1996).

The bald eagle is the largest raptor that breeds in Florida. The female is 35 to 37 inches in length, slightly larger than the male. Wingspan varies from 79 to 90 inches. The male bald eagle has a body length from 30 to 34 inches and a wingspan that ranges from 72 to 85 inches.

The white head and tail, chocolate-brown wings and body, and yellow eyes, bill, and feet readily identify adults. First-year juveniles are nearly uniform dark brown with variable white speckling under the wings and on the underside of the tail. Each year

thereafter, molting brings about a highly variable array of dark and white patterns. The head and tail become increasingly white with age until full adult plumage is reached in the 4th or 5th year. During this same period, the legs, bill, and eyes change gradually from black to yellow (FWS 1999).

Bald eagles are considered a water-dependent species typically found near estuaries, large lakes, reservoirs, major rivers, and some seacoast habitats. Distribution is influenced by the availability of suitable nest and perch sites near large open water bodies, typically with a high proportion of water-to-land edge (FWS 1999). Throughout their range, bald eagles demonstrate a remarkable ability to tolerate disturbances to their habitat. Their adaptability to a variety of habitat conditions makes generalizations about habitat requirements and nesting behavior difficult. Though variable, eagles have basic habitat requirements that must be met to successfully reproduce and survive during the winter or non-nesting season (FWS 1999).

Nesting habitat includes the nest tree, perch and roost sites, and adjacent high use areas; it usually does not include foraging areas. The nest, perches, roost sites and use areas around the nest comprise the nesting territory. The size and shape of a defended nesting territory varies greatly depending on the terrain, vegetation, food availability, and eagle density in the area. Generally, bald eagle nesting habitat is adjacent to or near large bodies of water that are used for foraging. Nest sites must also provide good visibility and a clear flight path to the nest (FWS 1999).

Most eagles select nest trees that are larger and taller than surrounding trees. Nests are usually positioned below the treetop of live conifers, although other tree species have been used. A typical nest is about 5 feet in diameter and is often used year after year. Over the years, some nests become as large as nine feet in diameter, and weigh up to several tons. When a nest tree falls or strong winds blow a nest down, the established pair of eagles usually rebuild at or near the site within a few weeks, particularly if it happens near the breeding season (Curnutt 1996).

In south Florida, bald eagles breed and nest during the winter months. Contrary to changes in habitat use exhibited by northern bald eagles, eagles in the south do not substantially alter habitat throughout the year. Some adults may remain in and defend their nesting territory outside of the nesting season, use or defend portions of their territory, or disperse and congregate at food sources such as landfills. Of those adults that do not maintain territories throughout the year, most are not thought to leave the state (FWS 1999).

Bald eagles are monogamous. Annual courtship behavior serves to re-establish pair bonds. Early in the nesting season, mated pairs of bald eagles will perform spectacular aerial displays that include pursuit flights and high soaring, talon-locking, and cartweeling. In establishing territories, eagles may also fly around the perimeter of their nesting areas to advertise their presence (Curnutt 1996).

In the southeast United States, nesting activities generally begin in early September, with egg laying occurring as early as late October and peaking in the

latter part of December. Depending on latitude, incubation may be initiated as early as October to as late as March. Clutches usually consist of one or two eggs, but occasionally three or four are laid. Incubation takes approximately 35 days and fledging occurs within 10 to 12 weeks of hatching. Parental care may extend four to six weeks after fledging even though young eagles are fully developed and may not remain at the nest after fledging (FWS 1999).

Juveniles fledged in Florida are highly migratory, with more than one-third of the recoveries made 1000 miles or more north of Florida during the non-nesting season (FWS 1999). Juvenile Florida eagles tend to move rapidly to northern summering grounds from South Carolina to Prince Edward Island, Canada. Most radio-collared juveniles return each year but a small proportion remains away for two to three years. It is not known whether all birds fledged in Florida ultimately breed in Florida.

The bald eagle is an opportunistic feeder. Its diet varies tremendously depending on the time of year and habitat, and foraging behavior is highly diverse. In the southeastern United States, the bulk of the diet is fish; however turtles, birds, and waterfowl are also taken. Bald eagles typically hunt from perch sites or by soaring over foraging areas. Most foraging occurs early in the morning with another, less intense feeding period usually in the late afternoon.

3.3.2 Project Area

Bald eagles are known to occur in the vicinity of the project site; however, only one individual was observed in flight over the proposed reservoir site. Florida Natural Areas Inventory (FNAI) records indicates bald eagle nests are located greater than 1 mile south of the proposed reservoir and to the north near Alderman Ford Park at the Alafia River. No nests have been observed or recorded on the reservoir site or within the pipeline corridor (HDR 2000a).

3.4 RED-COCKADED WOODPECKER

The historic range of the red-cockaded woodpecker encompassed the southeastern United States from eastern Texas and Oklahoma to New Jersey and, at one time, it probably occurred in all 67 Florida counties, with the exception of the Florida Keys in Monroe County (FWS 1999).

3.4.1 General Life History

The red-cockaded woodpecker belongs to the Picidae family and was first described by Vieillot in 1807. Adults are approximately 18 to 20 cm in length and have a wingspan of 35 to 38 cm. Males are slightly larger than females. The red-cockaded woodpecker has large, conspicuous cheek patches, a black cap and neck, and black and white barred back and wings. Males have a few red feathers slightly above and behind each eye, however the red spot is rarely visible in the field (FWS 1999).

Primary nesting and roosting habitat for red-cockaded woodpeckers consists of pine stands, or pine-dominated pine/hardwood stands, with a low or sparse understory and ample old-growth pines. The low or sparse understory allows unimpeded access to cavities. Nest and roost cavities are almost always located in old age living pines that are at least 60 years old. In southwest Florida, the hydric slash pine flatwoods provide the preferred critical nesting and foraging habitat for red-cockaded

woodpeckers. This community does not have the dense midstory of xeric and mesic flatwoods in southwest Florida (FWS 1999).

Red-cockaded woodpeckers are non-migratory, territorial, and live in cooperative breeding social groups. Such groups are typically comprised of a breeding pair and up to three "helpers," which are usually males. Nesting occurs from late April through early June and the nest cavity is usually the roost cavity of the male. Nest cavities are usually excavated on the west to southwest side of a mature pine tree and generally located 10 to 13 m above the ground. Clutch size is normally two to four eggs and incubation lasts 10 to 11 days. Both parents incubate eggs and young fledge at 26 to 29 days of age. Red-cockaded woodpeckers are long-lived birds, reaching as many as 15 years old 9FWS 1999).

Red-cockaded woodpeckers forage primarily on arthropods, taken by chipping away the outer layer of tree bark and gleaning what they find underneath. Vegetative matter, such as pine mast and fruits, is sometimes consumed.

3.4.2 Project Area

The Florida Natural Areas Inventory (FNAI) does not list the red-cockaded woodpecker as occurring in Hillsborough, Pasco, or Pinnellas counties. This species nor suitable habitat was not found during surveys of the regional reservoir site and pipeline corridor.

3.5 PEREGRINE FALCON

Historically, the peregrine falcon had a range as extensive as any other bird and bred in nearly every state. However, in the early 1950's it became apparent that peregrine falcon numbers were declining (FWS 2000). Pesticides, in particular DDT and its metabolites, were causing eggshell thinning which resulted in widespread nesting failure. The species was listed as endangered in 1970 (35 FR 16047) and in 1972 DDT was banned in the Untied States (FWS 2000). Through research, conservation, management, and protection, the specie population within the lower 48 states is increasing. The peregrine falcon was delisted from the federal list on August 25, 1999 and is now in a five year monitoring program.

3.5.1 General Life History

The peregrine falcon is between 15 and 21 inches in length with a wingspan of 38 to 45 inches, or approximately the size of a crow. This species is identified by a strong facial pattern characterized as wide, black sideburns. Adult birds are blue-gray and barred above and pinkish and spotted below. Juveniles are brown and heavily streaked (FWS 2000). Peregrine falcons can live up to 17 years in the wild. Females and males are dimorphic in size. Females weigh 21 to 53 ounces, while males weigh 16 to 30 ounces. It has been suggested that peregrines do not reach sexual maturity until 2 years of age (FWS 2000).

The peregrine falcon is the fastest bird on record, with cruising speeds of 40 to 55 miles per hour and diving speeds of 99 to 273 miles per hour (FWS 2000). These flying abilities allow the bird to hunt over a relatively large area. It is not uncommon for a peregrine to travel as much as 17 miles from its' nest to hunting areas. Peregrines feed almost exclusively on birds, which they capture while in flight. Peregrines strike their prey while diving, often killing it upon contact. Geographic areas with an

abundance of birds are common hunting grounds. During winter, areas, which concentrate waterfowl, provide important foraging areas.

Even with the falcon's remarkable flying ability, nests are usually situated near waterways where abundant prey occurs. Some peregrine falcons, however, have adapted to urban landscapes. They have substituted high-rise buildings for cliffs and ledges and feed on pigeons.

Nesting occurs in spring; generally a pair of falcons is present on the nest by March. Three to four eggs are laid in April. The incubation period lasts about 33 days. Both the female and male incubate the eggs, although the female spends the majority of time on the nest. Young fledge in mid-summer (FWS 2000).

Little is known about post-breeding movements. Some peregrine falcons have been known to over-winter in the vicinity of their nests, particularly during mild winters. Others leave the area and do not return to the nesting area. It is not known if this is because of mortality or other factors (FWS 2000).

3.5.2 Project Area

The FNAI lists the peregrine falcon as having potential to occur in Hillsborough, Pasco, and Pinnellas counties. This species has not been observed on reservoir project site and pipeline corridor.

3.6 HAWKSBILL SEA TURTLE

Hawksbill sea turtles (*Eretmochelys imbricata*) are highly desired for their beautiful shells that are used to make tortoise shell jewelry. The demand for hawksbill shells has led to population declines during the past century due to overharvesting. This exploitation is the primary contributor to the species listing status of endangered.

3.6.1 General Life History

Hawksbill sea turtles belong to the family Chelonidae, one of the two marine turtle families. These sea turtles possess a dorsal bony shell called a carapace, which is covered by large hard epidermal plates or scutes. The turtles also have a ventral shell (plastron), although it is reduced compared to other turtle families. Shell shape is compressed and tapering at each end, an adaptation for their highly aquatic life. Body shape and forelimbs are also streamlined and compacted, providing hydrodynamic flippers for swimming. Their heads and necks are largely nonretractable, adding to their basic hydrodynamic body shape (Zug 1993).

The hawksbill is a small- to medium-sized sea turtle, and adult females in the Caribbean range from 24.6 to 37.0 inches straight carapace length and weighs approximately 100 pounds. The carapace is patterned with radiating streaks of yellow, reddish brown, brown, and black. The large scutes on the hawksbill's carapace overlap (except in the very young and old), lending to the species name (imbricata). The head is relatively small with a narrow snout and smooth cutting edges on the jaws, suggesting a hawk's bill. The hawksbill has two pairs of scales between the eyes and nostrils; this is a difference from the green turtle, which only has one pair of scales.

Hawksbill sea turtles have life histories that are similar to other sea turtle species (Musick and Limpus 1996). Hatchling hawksbills live in the open ocean, in the shelter of weedline habitats of ocean

currents (Carr *et al.* 1966). Little is known about the hawksbill diet during the hatchling life history phase. Hawksbills in the Atlantic ocean are thought to become juveniles at an age of one to three years (Musick and Limpus 1996). Juvenile hawksbills are typically found in shallower habitats where their diet includes primarily sponges (Meylan 1984). Adult hawksbills inhabit tropical seas preferring coral reefs and rocky ledges where they forage primarily on sponges. Common foraging habitats of the adult hawksbills include coral reefs and rock outcroppings, and less commonly seagrass pastures in mangrove-fringed bays (Bjorndal and Bolten 1988).

Like other sea turtle species, hawksbill turtles reproduce in shallow waters adjacent to nesting beaches (Ehrhart 1982). After mating, females move to nesting beaches, come ashore, and lay their clutches of eggs in the sand in two-week intervals over the summer nesting season. Nest incubation lasts approximately 60 days. Although sea turtles may not necessarily return to their beach of birth, genetic studies have demonstrated that breeding sea turtles return to the region of their birth. When the nesting season is over, adult females return to their foraging areas where they begin to prepare for the next reproductive period, a few to several years in the future. As adults, hawksbill turtles are less migratory than other sea turtle species, nesting primarily on tropical islands surrounded by the preferred coral reef foraging areas.

Tampa Bay beaches have been monitored for nesting sea turtles since 1982, and nearly all nests laid have been loggerhead sea turtle nests. The Florida Marine Research Institute (FMRI) and the Sea Turtle Stranding and Salvage Network (STSSN) document injured or dead turtles stranded on Florida beaches.

3.6.2 Project Area

Data indicate that the hawksbill sea turtle is the least common sea turtle species in Tampa Bay (Meylan *et al.* 1999). All hawksbills observed have been found in the outer bay area. Size-classes of hawksbill sea turtles found stranded in Tampa Bay indicate that the population consists primarily of juveniles.

3.7 GREEN SEA TURTLE

The green sea turtle (*Chelonia mydas*) is distributed worldwide, with its important nesting and feeding grounds located in the tropics. In many countries this species has long been harvested for its meat and eggs. The green sea turtle is currently listed as endangered under the authority of the Endangered Species Act.

3.7.1 General Life History

Like the Hawksbill sea turtle, green sea turtles belong to the family Chelonidae, one of the two marine turtle families. These sea turtles are the hard-shelled marine turtles (Zug 1993). Hatchling green turtles are solid black to dark gray dorsally with a white margin around the posterior margin of the carapace and along the edge of their flippers. The ventral shell or plastron is creamy white. The juvenile carapace is brownish green, with light and dark streaks radiating within each plate or scute. Although a faint juvenile pattern may be seen in some adults, the carapace is primarily olive with numerous black spots. A single pair of elongate scales between the eyes, a strongly serrate jaw, and a single claw on each front flipper distinguishes this large sea turtle from

the other species. Mature females measure 35 to 46 inches in straight carapace length and weigh 220-390 pounds.

Green sea turtles have highly migratory life histories that are similar to other sea turtle species (Musick and Limpus 1996). It is believed that hatchling green turtles live in weedline habitats of ocean currents, where they feed primarily on plant and animal material (Bjorndal 1985). Green turtles leave open water habitats and enter benthic foraging areas at a size of 8 to 10 inches carapace length in the western Atlantic Ocean (Bjorndal and Bolten 1988). As adults, green sea turtles shift to a diet primarily consisting of seagrasses and algae (Mortimer 1982). Green sea turtles are most commonly observed foraging over seagrass beds (Bjorndal and Bolten 1988).

Like other sea turtle species, green turtles reproduce in shallow waters adjacent to nesting beaches (Ehrhart 1982). After mating, females move to nesting beaches, come ashore, and lay their clutches of eggs in the sand in two-week intervals over the summer nesting season. Nest incubation lasts approximately 60 days. Although sea turtles may not necessarily return to their beach of birth, genetic studies have demonstrated that breeding sea turtles return to the region of their birth. Green turtles show a strong tendency toward nest site fidelity, and have been documented returning to the same tenth-mile area of beach many times within one nesting season. When the nesting season is over, adult female green turtles return to their foraging areas and begin to prepare for the next reproductive period, a few to several years in the future.

3.7.2 Project Area

Available data indicate that the green sea turtle is the third most commonly found sea turtle species in Tampa Bay. Size classes of green sea turtles found stranded in Tampa Bay indicate that the population consists primarily of juveniles and sub-adults (Meylan *et al.* 1999).

3.8 KEMP'S RIDLEY SEA TURTLE

The Kemp's ridley sea turtle is less widely distributed than other sea turtle species, occurring primarily in the continental shelf waters of the Gulf of Mexico. Before the implementation of turtle excluder devices (TEDs) on shrimp nets, this species suffered great loss from incidental catch, and led to their designated endangered status under the Endangered Species Act.

3.8.1 General Life History

Kemp's ridley sea turtles (*Lepidochelys kempii*) also belong to the family Chelonidae. As one of the two marine turtle families, these sea turtles are hard-shelled marine turtles (Zug 1993). The Kemp's ridley sea turtle is a small species with an extremely broad shell or carapace that may resemble a heart shape. The small orbit located high on the head above the deep upper jaw creates a parrot-like appearance. Mature females average about 25 inches in carapace length and range in weight from 70 to 110 pounds. Dorsal coloration of the adult is grey to olive green with a yellowish ventral shell. Hatchlings are completely dark, with the ventral shell becoming lighter and changing whitish after several months. There is a transition from the juvenile

coloration to the adult when carapace length reaches 11 inches.

Kemp's ridley sea turtles also begin their lives as migratory animals, living in the open water of the sea as hatchlings and not reappearing in the shoreline zone until they are about two years old or have a 8-inches carapace length (Zug *et al.* 1997; Ogren 1989). Once Kemp's ridley sea turtles become juveniles, they move into the shallow benthic feeding habitats along the continental shelf and feed primarily on crabs (Burke *et al* 1993). These juveniles can be found in shallow waters along the east coast of North America and in the Gulf of Mexico.

Like other sea turtle species, Kemp's ridley turtles reproduce in shallow waters adjacent to nesting beaches (Ehrhart 1982). After mating, females come ashore, and lay their clutches of eggs in the sand in two-week intervals over the summer nesting season. Nest incubation lasts approximately 60 days. Although sea turtles may not necessarily return to their beach of birth, genetic studies have demonstrated that breeding sea turtles return to the region of their birth. As adults, Kemp's ridleys return to the western Gulf of Mexico where they nest almost exclusively on one beach area (Rancho Nuevo) in Tampaulipas, Mexico. When the nesting season is over, adult females return to their foraging areas and begin to prepare for the next reproductive period, a few to several years in the future.

While most marine turtle species are widely distributed, the Kemp's ridley sea turtle nesting is restricted to a narrow band of beaches in the western Gulf of Mexico. This site was and is the only known nesting area for this species, although there have been few isolated cases of nesting in Florida.

3.8.2 Project Area

Available data indicates that the Kemp's ridley sea turtle is the second most common sea turtle species in Tampa Bay. (Meylan *et al.* 1999). Size-classes of Kemp's ridley sea turtles found stranded in Tampa Bay show that juveniles and sub-adults comprise the population.

3.9 LOGGERHEAD SEA TURTLE

The loggerhead sea turtle (*Caretta caretta*) is rarely hunted for its meat. Although the eggs are harvested in some parts of the world, direct take for human consumption has not been a major factor in its decline. The wide range of this species brings it into contact with many human activities including incidental capture in shrimp trawls and injury by contact with boat propellers, dredges, and fishermen; all have contributed to this species decline and its listing as a threatened species.

3.9.1 General Life History

Loggerhead sea turtles belong to one of the two marine turtle families, which includes all hard-shelled marine turtles (Zug 1993). The loggerhead sea turtle is a medium to large sea turtle. Their limbs are modified as flippers, the shell is streamlined and elongated, and their heads are large with powerful jaws adapted for crushing mollusks. In Florida, adult loggerheads have shell lengths that range from 2.3 to 4.1 feet; individuals weigh from 155 to 400 pounds. Adult loggerheads typically have reddish brown shells that are often covered with barnacles, and cream-colored ventral shells or plastrons. Hatchlings are brown to reddish-brown dorsally and from buff to gray-black

ventrally. The loggerhead can be distinguished from other sea turtles because of their large heads, reddish brown color, and presence of barnacles on their shells.

Loggerhead sea turtles have highly migratory life histories that are similar to other sea turtle species (Musick and Limpus 1996). During their first few years of life, loggerheads live in the open ocean, often in association with sargassum vegetative communities (Carr 1987). Loggerhead turtles leave the open water habitats and enter shallow water foraging areas in the western Atlantic when shell lenghts reach 15 to 20 inches (Carr 1986). Loggerheads are more opportunistic feeders than other sea turtle species, foraging on a wide variety of invertebrates (Bjorndal 1996).

Like other sea turtle species, loggerhead turtles reproduce in shallow waters adjacent to nesting beaches (Ehrhart 1982). After mating, females move to nesting beaches, come ashore, and lay their clutches of eggs in the sand in two-week intervals over the summer nesting season. Nest incubation lasts approximately 60 days. Although sea turtles may not necessarily return to their beach of birth, genetic studies have demonstrated that breeding sea turtles return to the region of their birth. Loggerheads show a strong tendency toward nest site fidelity. When the nesting season is over, adult females return to their foraging areas and begin to prepare for the next reproductive period, a few to several years in the future. Loggerheads are the most temperate chelonids, and mostly nest on subtropical and temperate beaches.

3.9.2 Project Area

Available data suggest that the loggerhead sea turtle is the most common sea turtle with the widest distribution in Tampa Bay (Meylan *et al.* 1999). Size classes of loggerhead sea turtles found stranded in Tampa Bay indicate that adults make up the majority of the population.

3.10 LEATHERBACK SEA TURTLE

The leatherback sea turtle (*Dermochelys coriacea*) has suffered from habitat destruction, incidental bycatch in commercial fisheries, and egg and meat harvesting, thus leading to the present endangered status.

3.10.1 General Life History

The leatherback sea turtle represents a separate family, Dermochelyidae, and is morphologically distinct from the Cheloniid sea turtle species. Instead of a shell made of horny scutes, the leatherback turtle has extremely reduced carapace bones covered with a thick, leathery skin, hence earning the common name "leatherback". Leatherback sea turtles are the largest sea turtles in the world, averaging 118 to 178 cm in length and 650 to 1500 pounds in weight. Hatchling leatherbacks are dorsally black and ventrally white, and are covered with tiny scales. Adult leatherbacks have similar coloration, although their ventral surface is darker and they lack scales. Splotches of white may also appear on the head, neck and flippers, especially in juveniles and hatchlings. In both adults and hatchlings the upper jaw has two tooth-like projections at the premaxillary-maxillary sutures (NMFS 2001).

Of all sea turtle species, the least is known about the life history of the leatherback turtle. Leatherbacks are believed to be the most pelagic of all sea turtles, which makes the species the most difficult to study. Like other species, hatchling leatherbacks move immediately to the water and swim actively offshore. Hatchling leatherbacks virtually disappear after moving offshore, and are not seen again until the juvenile stage (110 to 120 cm curved carapace length), when they recruit to temperate continental shelf waters to feed on concentrations of jellyfish (Musick and Limpus 1996). As adults, leatherbacks are pelagic and often follow aggregations of jellyfish up and down the U.S. East Coast. Leatherbacks feed throughout the water column, and are adept deep divers (Bjorndal 1996). Although primarily tropical, the leatherback travels farther north than other sea turtles, reaching Nova Scotia and Newfoundland. Adult leatherbacks are uniquely endothermic, capable of maintaining a deep body temperature far above that of the surrounding water, apparently through muscular activity and fatty insulation.

Age at sexual maturity of the leatherback is unknown. Like other sea turtle species, female leatherbacks come ashore and lay their eggs on tropical beaches. Eggs of the leatherback are larger (approximately baseball sized) than those of Cheloniid species. In the Atlantic and Caribbean, nesting occurs from February to July, with the largest nesting populations found in the U.S. Virgin Islands, Puerto Rico, and the east coast of Florida (NMFS 2001). Nesting along the West Coast of Florida is extremely rare.

3.10.2 Project Area

Distribution of the leatherback turtle extends from Cape Sable, Nova Scotia, south to Puerto Rico and the U.S. Virgin Islands (NMFS 2001). Sightings of leatherbacks in the Gulf of Mexico and Tampa Bay are rare.

3.11 AMERICAN ALLIGATOR

The American alligator (*Alligator mississippiensis*) is commonly found in the great river swamps, lakes, bayous, marshes, and other bodies of water in Florida. American alligators were once considered an endangered species by the FWS, but due to a remarkable comeback in many areas, they have been downgraded to a species of special concern. This species continues to be protected by FWS due to its similarity of appearance to the endangered American crocodile.

3.11.1 General Life History

American alligators are largely tropical American crocodilians, in the family Alligatoridae. American alligators are easily distinguished from all other crocodilians in that they have mandibular teeth that fit inside the upper jaw; that means that no teeth are visible when their mouths are closed. Crocodilians are the only cold-blooded

reptiles with a fully developed secondary palate and a four-chambered heart. Thick skin and scales armor the back and bottom of their bodies. Although they are aquatic, their limbs are well developed, making them capable of running at high speeds on land (Zug 1993).

The American alligator generally grows to a length of 6 to 16 feet, and can grow up to 19 feet. This large reptile has a broad snout, a short neck, a heavy body, and a laterally compressed tail. Adults are blackish or dark gray, and faint yellowish crossbands are sometimes evident. The young are black with conspicuous yellow crossbands. Crocodilians produce eggs that hatch outside the body. Mating usually occurs shortly prior to egg-laying and, unlike turtles, they do not appear to have long-term sperm storage. Alligators build nests that form large mounds made of vegetation and soil. The rotting plant material of the nest mound help to incubate the eggs. Females guard nests and assist their young in hatching and nest emergence (Zug 1993).

The growth rate of the alligator is dependent on climate and food availability. Their diets include nearly any animal including fish, crabs, turtles, mammals, birds, other alligators, and even dead animals. Both male and female alligators dig open depressions in marshes and wetlands called 'gator holes', which vary in width from several yards to the size of a small lake. These gator holes are significant to the freshwater ecology of Florida because they provide a dry season refuge for aquatic life as well as the many birds, mammals, and reptiles that concentrate in these holes in search of food and water (Conant and Collins 1991).

3.11.2 Project Area

American alligators occur in creeks, streams, and other wetlands throughout Hillsborough County. This species has been observed on the western portion of the reservoir site in two open-water bodies.

3.12 EASTERN INDIGO SNAKE

The Eastern indigo snake (*Drymarchon corais couperi*) was formerly collected heavily for the pet trade. Although some illegal collecting continues, the listing of the eastern indigo snake as federally threatened has largely curtailed the commercial collecting of this species. The most serious and far-reaching threat to the survival of this species is habitat loss or degradation. Historically, indigo snakes took refuge from temperature extremes in gopher tortoise burrows; however, gopher tortoises and their burrows are also becoming more rare due to habitat encroachment.

3.12.1 General Life History

The eastern indigo snake has a maximum-recorded length of 8.6 feet. They are iridescent black in color, but the throat is typically red, coral, or white. Both the color of the throat and the extent of this coloration are extremely variable. In some individuals, especially in south Florida, bright red covers the face and throat and may extend several inches onto the belly. In much of north Florida, indigo snakes show only a light pinkish-bluish color on the throat. The scales of the indigo snake are smooth, although adult males typically show a partial ridge on the front of the middorsal scales (Moler 1992).

The only snake commonly confused with the Eastern indigo snake is the black racer (*Coluber constrictor*). The black racer is a smaller snake in Florida, usually less than 4 feet long; it is dull black in coloration, with white (brown in some areas) on the throat and lower scales around the mouth.

In southern Florida, the Eastern indigo snake may be found in a variety of habitats including freshwater marshes, coastal prairies, mangrove forests, and other upland habitats. Eastern indigos frequent gopher tortoise burrows, which are used as dens and for egg laying. This species feeds on virtually any vertebrate small enough for it to overpower. Prey includes fish, frogs, toads, lizards, snakes, small turtles, birds, and small mammals. Indigo snakes are not constrictors and its prey is usually swallowed alive (Moler 1992).

Indigo Snakes are completely diurnal. They actively search prey, especially favoring the edges of wetlands, where frogs and snakes abound. During the warmer months, they range widely, individuals utilizing activity areas of 125-250 acres or more. Males are territorial, at least during the breeding season, and confrontations sometimes lead to combat or cannibalism (Moler 1992).

3.12.2 Project Area

Indigo snakes potentially use several habitat types found within the project area including flatwoods, hardwood forest, marsh edges, and freshwater swamp. Individual indigo snakes were observed on the reservoir site on two occasions (HDR 2000b). One sighting was within the northern hardwood forest associated with Doe Branch. The second sighting was within an oak-shrouded fence line in the west-central portion of the proposed reservoir site (HDR 2000b).

A scrubby flatwoods community located outside of the northwest corner of the reservoir supports a large gopher tortoise population; it is likely that the eastern indigo is also present in this area. This snake is also listed as threatened the State of Florida.

3.13 GULF STURGEON

The Gulf sturgeon is a threatened sub-species of the Atlantic sturgeon, and was once common in the Hillsborough River and Tampa Bay (FMRI 2000; FWS 2000). The first sturgeon fishery in Florida was established in 1886 in Tampa Bay, but only lasted a few years. Construction of the Hillsborough Dam in 1888 is thought to have contributed to the sturgeon's decline, preventing the sturgeon from migrating upstream to spawn (FMRI 2000).

3.13.1 General Life History

Gulf sturgeons are in the family Acipenseridae. The Gulf Sturgeon is a large fish with a long extended snout. Gulf Sturgeon can live up to 70 years. It takes 8 to 12 years for females and 7 to 10 years for males to reach sexual maturity. Their habitat is the Gulf of Mexico and the fresh water rivers draining into the Gulf. The Sturgeon spends most of their lives in fresh water. They only reproduce in fresh water, but their feeding habits only allow them to eat in saltwater. They are a threatened species due mainly to loss of habitat and poor water quality. In areas where fresh water rivers have been dammed the sturgeon have been prevented from traveling upstream to spawn. Over fishing of the species has also caused a decline in number of fish.

Sub-adult and adult sturgeon along the west coast of Florida migrate upstream to spawn in rivers draining to the Gulf of Mexico from early spring through the end of May (FWS 2000). In late September to early October, adults migrate downstream to estuarine habitats until they are at least two years old. Gulf sturgeon are long-lived and grow large, living at least 28 years, growing up to 8 feet in length and weighing up to 200 pounds (FWS 2000).

The life history traits of sturgeons make them unique and susceptible to overexploitation by humans. They are exceptionally long-lived. As is often the case with long-lived vertebrates, sexual maturity is attained slowly. In Atlantic sturgeon, both sexes mature after 5 to 30 years, the older ages characterizing individuals at higher latitudes. After maturation, females may only spawn every three to five years, and even longer intervals may characterize other sturgeon species.

Manatee

Fertility is relatively high in the gulf sturgeon; ovaries may account for 25 percent of the body mass of a female. Sturgeon eggs are the most valuable kind of caviar, making an individual female worth several thousand dollars. Sturgeons are also commercially important as a smoked product. Natural predators beyond the juvenile stage are rare; parasitic lampreys are one of the few organisms capable of attacking an adult sturgeon (Helfman *et al.* 1997).

3.13.2 Project Area

Although Gulf sturgeons have been extirpated from Tampa Bay since 1889, the Hillsborough River still retains some sturgeon habitat (FMRI 2000). The FMRI is currently leading a cooperative effort to release a limited number of Gulf sturgeons into parts of the Hillsborough River (FMRI 2000).

3.14 FLORIDA MANATEE

Exploitation of the Florida manatee (*Trichechus manatus*) during the 17th, 18th, and 19th centuries is thought to have reduced their number from several thousand to their current population level. The principal threats to manatees in Florida result from boat propellers, vandalism, poaching, and habitat destruction. The Florida manatee is protected by both federal and state wildlife agencies and listed as endangered (FGFWFC 1997).

3.14.1 General Life History

The Florida manatee belongs to the animal order Sirenia. Manatees are commonly referred to as "seacows" because of their characteristic behavior of grazing on aquatic vegetation.

Manatees inhabit freshwater, brackish, and marine habitats and move freely between salinity extremes. Water depths of at least 3 to 6 feet are preferred and flats and shallows are avoided unless adjacent to deeper water. Along the coast, manatees tend to travel in water

10 to 15 feet deep. If the water is deep enough and the currents are not too strong, manatees will travel great distances up coastal rivers (Florida Power and Light 1982). The manatee diet is strictly herbivorous, consisting of algae and seagrasses.

Because of their lack of tolerance to water less than 68°F, manatees aggregate at the warm water discharges of power plants and springs during cold fronts (Ackerman *et al.* 1999). Cargill Fertilizer Company was once considered the major wintering area for manatees in Tampa Bay, but since the 1986 reduction of warm-water effluent, it is considered a minor wintering site.

Manatees are essentially solitary animals with a weak social structure. Cohesive associations are formed only when males pursue an estrous female. Gestation is believed to last 385 to 400 days and twins are rare. Calves are born and nursed in the water. The family unit consists of mother and offspring. The reproductive rate is probably one calf per adult female every 2 to 2 ½ years. There is no well-defined breeding season. Estimated age at reproductive maturity is four to six years. Longevity is unknown, although captives have lived over 25 years.

3.14.2 Project Area

Florida manatees can be found in Tampa Bay during every month of the year. From 1991 to 1998, manatees were counted statewide by numerous biologists from ten state, federal, county, and private agencies. The highest number of manatees counted in Tampa Bay was 164 during January 1997. This number represented 7.4 percent of the state total at that time (Ackerman *et al.* 1999).

In a preliminary review of current manatee sighting data, FMRI staff verified that Florida manatee also frequent both the lower Hillsborough River and the Palm River (FMRI 2000). Since 1978, idle-speed zones have been established in the Alafia River to avoid boat and propeller-related injuries and deaths to manatees (HDR 1998).

3.15 BEAUTIFUL PAWPAW

Habitat destruction for residential, commercial, recreational, and agricultural purposes is the leading cause of Beautiful pawpaw (*Deeringothamnus pulchellus*) declining populations (FWS 2001).

3.15.1 General Life History

The beautiful pawpaw, a low shrub with a stout taproot and yellow-green berries, is listed as endangered by FWS. Typically, this plant grows in poorly drained, slash pine-saw palmetto flatwoods with sandy soils. In Pine Island, beautiful pawpaw can be found on road edges that are regularly mowed with little soil disturbance.

Beautiful pawpaw is a disturbance-dependant plant that resprouts readily from the roots following the removal of the top by fire or mowing. Flowers occur on new growth and are white with a pleasant scent. A lack of disturbance leads to the eventual death of the plant. Currently, the taking, transport, and sale of beautiful pawpaw is regulated by Florida law (FWS 2000).

3.15.2 Project Area

Beautiful pawpaw is found in northern Lee, southern Charlotte and Orange Counties. The FNAI and FWS do not document beautiful pawpaw to occur in Hillsborough County (FNAI 2001; FWS 2001).

3.16 FLORIDA BONAMIA

The Florida bonamia (*Bonamia grandiflora*) was formerly widespread in central Florida. Conversion of Florida's scrub habitat to residential housing and agricultural areas has dramatically reduced the amount of habitat available for this plant, leading to its present threatened status.

3.16.1 General Life History

Florida bonamia is the only morning glory vine with large, blue flowers that is found in Florida scrub vegetation. It is a perennial plant with sturdy stems and leathery oval leaves found only in scrub areas of central and South Florida. Primarily, this morning glory is found in sand pine scrub vegetation with evergreen scrub oaks and sand pine (commonly referred to as Florida scrub), but can occasionally be found in clear-cut areas in the Ocala National Forest.

Florida bonamia grows for three or more years and flowers from spring to summer. It has a mixed mating system, can self-pollinate, and it can produce seeds without fertilization. However, pollinators are essential to ensure substantial seed production.

3.16.2 Project Area

Most of the known Florida bonamia populations occur in Marion County within the Ocala National Forest. The FNAI documents the presence of Florida bonamia in Hillsborough County, although biologists have not found this species on the project site.

3.17 SMALL'S JOINTWEED

Small's jointweed (*Polygonella myriophylla*), also known as sandlace, is listed as endangered by the FWS. Loss of habitat to residential and agricultural development is the most serious threat to the upland scrub community in which Small's jointweed is found. At least two thirds of the original pine scrub vegetation in south central Florida has been cleared.

3.17.1 General Life History

Small's jointweed is a sprawling shrub with many branches that zigzag along the ground forming dense mats. Lower parts of creeping branches have reddish-brown bark that cracks and separates in interlacing strips. The leaves are 0.1 to 0.3 inches in length and are needle-like and fleshy. Small white, pink, or yellow petal-like sepals are present when the plant flowers.

This plant is restricted to the pure white sandy ridges in the scrub of the southern Florida Lakes Region, where 40 to 50 percent of the scrub community is open, bare sand. The shrub's range is in Highlands, Polk, Osceola, and Orange counties, Florida.

3.17.2 Project Area

Small's jointweed is found in central Florida, and the FNAI and FWS do not document small's jointweed occuring in Hillsborough County (FNAI 2001; FWS 2001). Surveys conducted on the reservoir site and along the pipeline corridor did not indicate the presence of this species.

3.18 PYGMY FRINGE TREE

The pygmy fringe tree (*Chionanthus pygmaeus*) is listed as endangered by the FWS, primarily because of habitat loss due to residential development and to citrus groves. Although locally abundant, development of a few more large citrus groves within its range could severely impact the pygmy fringe tree.

3.18.1 General Life History

The pygmy fringe tree grows as a shrub that may be less than 1 meter tall, but may grow as tall as 2 to 4 meters. This small scrub tree blooms in March, with four white fused petals in shown panicles. The pygmy fringe tree bears fruits that are purple drupes 2 to 2.5 cm long.

The pygmy fringe tree is endemic to Florida, occurring in Lake, Osceola, and Hillsborough Counties and at sites along the Lake Wales Ridge in Highlands and Polk Counties. This species is found primarily in scrub habitats along the coasts and sand ridges of central Florida.

3.18.2 Project Area

The FNAI documents the presence of the pygmy fringe tree in Hillsborough County, although the species has not been documented on the project site.

3.19 FLORIDA GOLDEN ASTER

Residential and commercial development poses the greatest threat to the Florida golden aster (*Chrysopsis floridana*). Added threats include mowing, dumping, excessive grazing, and off-road vehicle damage. Additionally, this species' restricted distribution has contributed to its decline and endangered status.

3.19.1 General Life History

A member of the Asteraceae family, the Florida golden aster is a perennial herb showing yellow flowers in mature specimens. Young plants of this species forms rosettes with leaves covered in dense, white, short-wooly hairs. As the plant matures, upright stems grow from the rosettes to a height of 0.3 to 0.4 meters, with obovate-elliptic, hairy leaves. Flower heads are clustered and flat-topped, with yellow rays and central discs. The species is short-lived and reproduces by seeds, which are dispersed by wind.

The Florida golden aster primarily occurs in scrub habitats where there is well-drained fine sand. It grows best in open, sunny areas.

The distribution of the Florida golden aster includes Hillsborough and Hardee Counties, and in recent years has been collected in Manatee County. Historically, populations occurred on St. Petersburg Beach and Bradenton Beach, but have since been destroyed.

3.19.2 Project Area

The FNAI and FWS document Florida golden aster populations occurring in Pinellas and Hillsborough Counties, although biologists have not found this species on the proposed reservoir site.

PART 4 POTENTIAL IMPACTS OF THE PREFERRED ALTERNATIVE

Development of the Tampa Bay Regional Reservoir Project could impact the existing environment in the project area in several ways. Construction of the reservoir would impact numerous wetland and upland habitats, and the associated wildlife species. Construction of the water transmission pipeline, access roads, and ancillary facilities would result in temporary disturbances to wildlife and habitats. Freshwater withdrawals would only minimally affect salinities within Tampa Bay and its tributaries, with a predicted shift in the Alafia River isohaline migrating only 0.24 mile upstream. This part of the report addresses the extent to which the federally threatened or endangered species would be impacted by these changes.

4.1 WOOD STORK

Wood storks have been observed foraging in marsh wetlands located within the proposed reservoir site. No rookeries or nests have been observed on site and no sign of rookeries were observed during the first four months of 1999 and 2000. Surveys in 1999 and 2000 indicate that impacts to the foraging habitat of the wood stork would occur as a result of the project construction and operation; however, impacts to nesting areas or rookeries would not occur. It is therefore concluded that the proposed project is not likely to adversely affect the wood stork.

4.2 FLORIDA SCRUB JAY

Surveys were conducted following FWC Nongame Wildlife Program Technical Report No. 8 guidelines (Fitzpatrick *et al.* 1991). The purpose of the surveys was to determine the presence of scrub jays within the Tampa Bay Regional Reservoir Project area and, if present, to document the population. Although an area of potential scrub jay habitat was identified at the reservoir site, no scrub jays were observed. The survey did not identify any scrub jay habitat within the transmission pipeline corridor. The footprint of the proposed reservoir was redesigned to avoid this habitat; therefore, the proposed project is not likely to adversely affect the Florida scrub jay.

4.3 BALD EAGLE

Bald eagles are known to occur in the vicinity of the project site; however, only one individual was observed in flight over the reservoir site. Because no nests have been observed or recorded on the reservoir site or within the pipeline corridor, the project is not anticipated to adversely affect the bald eagle. Creation of the proposed reservoir would likely provide additional foraging habitat for Bald eagles.

4.4 RED-COCKADED WOODPECKER

Impacts as a result of the proposed project are not expected to adversely affect the red-cockaded wookpecker. The Florida Natural Areas Inventory (FNAI) does not list the red-cockaded woodpecker as occurring in Hillsborough, Pasco, or Pinnellas counties. This species was not found during surveys of the regional reservoir site and pipeline corridor and therefore construction and operation of the project would not likely impact the species.

4.5 PEREGRINE FALCON

Impacts as a result of the proposed project are not expected to adversely affect the peregrine falcon. The FNAI lists the peregrine falcon as having potential to occur in Hillsborough, Pasco, and Pinnellas counties. This species has not been observed on reservoir project site or pipeline corridor and the project would not likely impact the species.

4.6 ENDANGERED AND THREATENED SEA TURTLES

Decreases in freshwater inflow into Tampa Bay are not expected to adversely affect sea turtle populations. Sea turtles are highly migratory, travel great distances to forage and are capable of moving into preferred salinity habitats. In addition, all sea turtle species have salt glands that mechanically reduce water and salt flux, and physiological mechanisms that work to actively extrude gained salt, obtain free water, and regulate the internal ionic balance. Because nesting activities occur almost exclusively on the beaches facing the Gulf of Mexico outside of Tampa Bay proper, potential small salinity changes within the bay should have no effect on sea turtle nesting.

4.7 AMERICAN ALLIGATOR

American alligators occur in creeks, streams, and other wetlands throughout Hillsborough County. They have been observed on the western portion of the reservoir site in two open-water bodies, but they have not been observed within the transmission pipeline corridor. Although some loss of suitable habitat would occur as a result of the project, the proposed project is not likely to adversely affect the American alligator due to a recent increase in population and the abundance of habitat in the project area.

4.8 EASTERN INDIGO SNAKE

Individual indigo snakes were observed on the reservoir site on two occasions. One sighting was within the northern hardwood forest associated with Doe Branch. The second sighting was within an oak-shrouded fence line in the west-central portion of the proposed reservoir site.

Potential impacts to the indigo snake are associated with habitat loss, specifically wetland hardwood forest. However, due to the large expanse of similar habitats in the project vicinity, the proposed project is not likely to adversely affect the eastern indigo snake.

4.9 GULF STURGEON

The Gulf sturgeon is threatened sub-species of the Atlantic sturgeon, and once inhabited the Hillsborough River and Tampa Bay. Sub-adult and adult Gulf sturgeon migrate upstream to spawn in rivers draining to the Gulf of Mexico from early spring through the end of May. In late September to early October, adults migrate downstream to estuarine habitats until they are at least two years old. Currently, the FMRI is leading a cooperative effort to release a limited number of Gulf sturgeons into parts of the Hillsborough River. Due to the sturgeon's mobility, the proposed project is not likely to adversely impact the Gulf sturgeon.

4.10 FLORIDA MANATEE

The Florida manatee is protected by both federal and state wildlife agencies and is listed as endangered. They inhabit freshwater, brackish, and marine habitats and move freely between salinity extremes. If the water is deep enough

and the currents are not too strong, manatees will travel great distances up coastal rivers. Because manatees move freely between salinity extremes, proposed freshwater withdrawals would have no adverse impacts on this species.

4.11 THREATENED AND ENDANGERED PLANTS

Impacts as a result of the proposed project are not expected to adversely affect endangered and threatened plant species. Florida bonamia, pygmy fringe tree and Florida golden aster are documented to occur in Hillsborough County, but have not been found on the proposed project site. Beautiful pawpaw and Small's jointweed are not documented by the FNAI or FWS to occur in Hillsborough County, and are therefore not likely to be impacted by the proposed project.

PART 5
CONCLUSIONS

The preferred alternative for the proposed Tampa Bay Regional Reservoir Project is designed to provide a consistent, drought-resistant source of water that will meet the region's water needs through 2010. The project involves construction of a 1,100-acre reservoir, transmission pipeline, and associated infrastructure.

The four endangered and one threatened sea turtle species found in Tampa Bay will not be affected by the proposed project. Sea turtles are highly mobile and would travel great distances to preferred reproductive and foraging habitats. All four species have adaptations to handle a wide range of salinities. In addition, sea turtle nesting typically occurs on the beaches facing the Gulf of Mexico, outside of Tampa Bay proper, which is an area not affected by the proposed project.

The wood stork, American alligator, and eastern indigo snake have all been documented on the reservoir site and will experience some habitat loss; however, the proposed project is not likely to adversely affect these species. No wood stork rookeries or nests have been observed in the project area. Although the American alligator and eastern indigo snake will lose suitable habitat due to reservoir construction, other suitable habitat occurs in the areas around the reservoir site. It is therefore concluded that the proposed project is not likely to adversely affect these species.

Construction of the Tampa Bay Regional Reservoir Project will impact habitats and wildlife on the reservoir site, and freshwater withdrawals for the reservoir may minimally increase salinities in the Alafia River, Hillsborough River, Tampa Bypass Canal, and Tampa Bay.

Freshwater withdrawals are predicted to shift the Alafia River isohaline only 0.24 mile upstream. Five endangered and six threatened species have been identified in the project area. A list of potential impacts to these species is listed in Table 5-1.

Neither the Florida scrub jay, red-cockaded woodpecker, bald eagle, or peregrine falcon would be affected by the proposed project. Both the Florida scrub jay or red-cockaded woodpecker habitat is not found on the project area or in potentially impacted areas, and no bald eagle or peregrine falcon nests were found on the reservoir site or along the pipeline corridor. Since these species are not found utilizing potentially impacted areas, the proposed project is not likely to adversely affect these species.

The proposed project will not affect the gulf sturgeon and Florida manatee, both highly mobile species. Both species are documented in Tampa Bay and associated tributaries, and move freely between salinity extremes; therefore the minimal changes in salinity are not expected to adversely affect these species.

The four endangered and one threatened plant species present would not be affected by the proposed project. Impacts as a result of the proposed project are not expected to adversely

Table 5-1
SUMMARY OF ENDANGERED AND THREATENED SPECIES

Common Name	Potential Impacts	Potential Impact Effects
Wood Stork	Loss of habitat	May affect, not likely to adversely affect
Florida Scrub Jay	None, habitat not lost	No effect
Bald Eagle	No nests present	Not likely to adversely effect
Red-cockaded Woodpecker	None, habitat not lost	No effect
Peregrine Falcon	None, habitat not lost	No effect
Hawksbill Sea Turtle	None, highly mobile	No effect
Green Sea Turtle	None, highly mobile	No effect
Kemp's ridley Sea Turtle	None, highly mobile	No effect
Loggerhead Sea Turtle	None, highly mobile	No effect
Leatherback Sea Turtle	None, highly mobile	No effect
American Alligator	Loss of habitat	May affect, not likely to adversely affect
Eastern Indigo Snake	Loss of habitat	May affect, not likely to adversely affect
Gulf Sturgeon	None, highly mobile	No effect
Florida Manatee	None, highly mobile	No effect
Beautiful PawPaw	None, habitat not lost	No effect
Florida Bonamia	None, habitat not lost	No effect
Small's Jointweed	None, habitat not lost	No effect
Pygmy Fringe Tree	None, habitat not lost	No effect
Florida Golden Aster	None, habitat not lost	No effect

affect the endangered and threatened plant species.

5.1 MITIGATION MEASURES

Three mitigation sites are proposed in the vicinity of the Tampa Bay Regional Reservoir Project to compensate for unavoidable wetland impacts associated with the project (Figure 5-1). The three sites are:

- East Pruitt/Carlton-Smith Site
- West Pruitt Site
- North Carlton-Smith Site

Based on anticipated mitigation requirements, all three sites would need to be developed to meet the mitigation needs for the proposed reservoir project. The mitigation sites would be developed near the Tampa Bay Regional Reservoir Project. In addition, the acquisition and preservation of other sites are still being considered as potential mitigation opportunities in the event that the proposed overall plan does not meet permitting requirements.

East Pruitt/Carlton-Smith Mitigation Site. The East Pruitt/Carlton-Smith Site lies approximately 5.5 miles southeast of the Alafia River in Hillsborough County and is adjacent to the proposed reservoir site. The mitigation site encompasses approximately 367 acres and is located between the proposed Tampa Bay Regional Reservoir and County Road (C.R.) 39 in southeastern Hillsborough County. The site is currently used for cattle and horse grazing with some sod farming areas.

A large association of herbaceous and forested wetland creation and enhancement is proposed over the central portion of the mitigation site. A smaller second area of wetland creation lies adjacent to the south. In addition grading is proposed within the southern extent of Doe Branch Creek to reestablish natural creek grades lost through historic channeling. The onsite and surrounding drainage basins for each mitigation area have been surveyed, quantified, and modeled in order to delineate existing drainage basins and surface water flow direction.

Hillsborough County has mapped a small area of the East Pruitt/Carlton-Smith Site, at the northern extent of Doe Branch creek, with the Significant Wildlife Habitat designation. The mapped Significant Wildlife Habitat areas on the site would be enhanced by the proposed wetland mitigation and enhancement plans. In part, this would occur by the proposed planting of a natural upland tree buffer around wetland mitigation sites up to 300 feet wide. This mitigation concept would provide ecological benefits to the property by increasing natural habitat cover and diversity, particularly along wetland ecotones. In addition, the mitigation areas could provide a linkage to nearby preservation and recreation lands owned by Hillsborough County and SWFWMD.

The final conceptual mitigation plans propose a total of approximately 216 acres of habitat improvements. This includes approximately 102 acres of wetland mitigation and enhancement and 114 acres of surrounding upland buffer restoration. Correspondence with Florida Department of Environmental Protection (FDEP) and Hillsborough County Environmental Protection Commission (EPC), it appears highly unlikely that either agency would award open water mitigation credit for the proposed reservoir. Therefore an additional 14 acres of open water would have to be created within the three mitigation areas.

The East Pruitt/Carlton-Smith Site would be expected to provide the anticipated required mitigation for the following agencies: FDEP, approximately 31 percent; EPC, approximately 35 percent; and U.S Army Corps of Engineers (COE), approximately 57 percent.

West Pruitt Mitigation Site. The West Pruitt Site lies approximately five miles southeast of the Alafia River in Hillsborough County and is adjacent to the west side of the proposed reservoir site. The site encompasses approximately 850 acres and is located south of Boyette Road and east of Hobson-Simmons Road in southeastern Hillsborough County. The site is currently used for cattle grazing and other agricultural activities such as row crops. Stallion and Cabbage Hammock

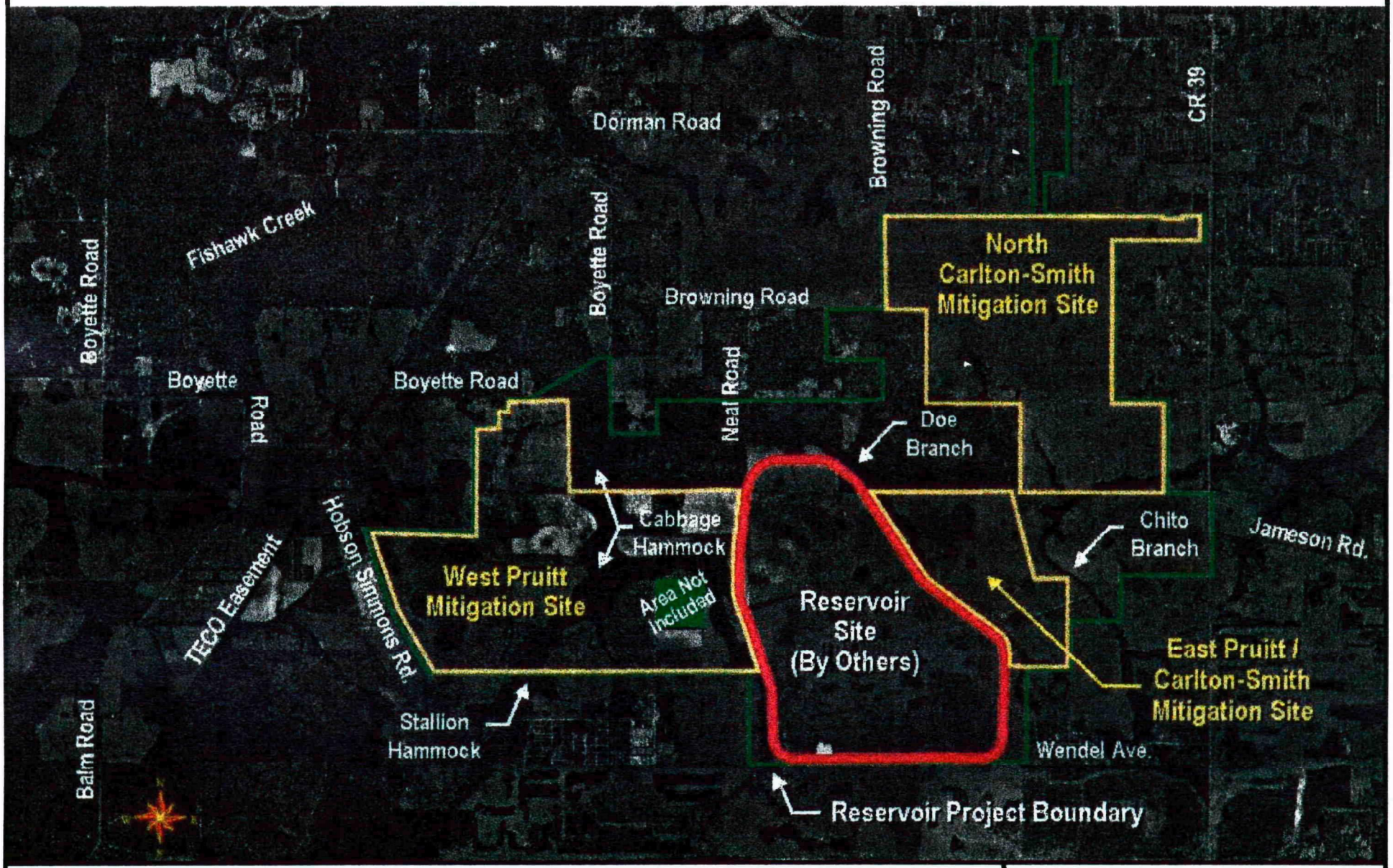


Figure 5-1
TAMPA BAY REGIONAL RESERVOIR PROJECT DEIS

PROPOSED MITIGATION SITES

(with the Long Flat Creek tributary) traverses the central portion of the West Pruitt property where they converge and drain northward to Coleman Hammock and then to Fishawk Creek, which is a tributary to the Alafia River.

Four mitigation areas are situated within the western half of the West Pruitt property. Constructing additional areas of inundation and planting with herbaceous species would expand two separate existing marsh systems. Two other areas of mixed hardwood and cypress wetlands would be constructed, one as a flow-through system and the other located adjacent to a forested floodplain. These areas would also be planted with tree species. In addition, eight cypress wetlands would be enhanced by hydrological improvements.

Like the East Pruitt/Carlton-Smith Mitigation Site, the West Pruitt Mitigation Site was previously mapped by Hillsborough County and designated as Significant Wildlife Habitat. This designation covers the majority of the southern, eastern, and northern site and completely overlaps the Stream Swamps that drain northward through the property. This mitigation site would also be enhanced with proposed plantings of natural upland trees providing ecological benefits to the property.

The conceptual mitigation plan for this site totals approximately 295 acres of habitat improvements. This includes approximately 59 acres of wetland mitigation and 83 acres of wetland enhancement and 153 acres of surrounding upland buffer restoration. The West Pruitt site is expected to provide approximately 29 percent of the FDEP, 35 percent of the EPC, and 62 percent of the COE requirements for the overall Tampa Bay Regional Reservoir Project's wetland impacts.

North Carlton-Smith Site

The North Carlton-Smith Site is located northeast of the boundary of the reservoir project, approximately 3 miles south of the Alafia River. The site encompasses approximately 1,000 acres and is located east of Browning Road, west of County Road 39, and one mile south of Lithia Pinecrest Road (County Road 640). The southern limit of the site is traversed by Chito Branch, which drains to the east. Northern drainages on the property lead to Doe Branch, in the southwest. Currently, the land is used for cattle grazing and is owned by Carlton-Smith.

Approximately 199 acres of habitat improvements are proposed for this mitigation site. This includes approximately 119 acres of wetland mitigation and 80 acres of wetland enhancement. Eight systems are included in the mitigation plan for this site. The plans include creation of herbaceous wetland, wet prairies, and mixed hardwood wetlands, enhancement of mixed hardwoods, herbaceous, and open water wetlands, and creation of a natural upland buffer around wetland areas.

LITERATURE CITED

Ackerman, B.B., T.D. Pitchford, B.L. Weigle, J.E. Reynolds, III, R.S. Wells, and M.A. Baran. 1999. Marine mammals, in: *Baywide Environmental Monitoring Report, 1993-1998, Tampa Bay, Florida.* J.R. Pribble, A.J. Janicki, and H. Greening, eds. Technical Publication 07-99. St. Petersburg, FL.

Bjorndal, K.A. 1985. Nutritional ecology of sea turtles. *Copeia.* 736, 1985.

Bjorndal, K. A. 1996. Foraging ecology and nutrition of sea turtles, in: *Biology of Sea Turtles.* Lutz, P.L. and J.A. Musick, eds. CRC Press, Boca Raton, FL.

Bjorndal, K. A. and A.B. Bolten. 1988. Growth rates of immature green turtles, *Chelonia mydas*, on feeding grounds in the southern Bahamas. *Copeia.* 555, 1988.

Black and Veatch. November 1998. *Master Water Plan, Alternative System Configurations, Final Report.* Clearwater, Florida.

Burke, V.J., Morreale, S.J., and A.G.J. Rhodin. 1993. *Lepidochelys kempi* (Kemp's ridley sea turtle) and *Caretta caretta* (loggerhead sea turtle) diet. *Herpetol. Rev.* 24, 31.

Carr, A. 1986. Rips, FADS, and little loggerheads. *Bioscience*, 36, 92-100.

Carr, A. 1987. New perspectives on the pelagic stage of sea turtle development. *Conserv. Biol.* 1, 103.

Carr, A., Heath, H., and Ogren, L. 1966. The ecology and migrations of sea turtles: the hawksbill turtle in the Caribbean Sea. *Am. Mus. Novit.* 2248, 1.

Coastal Environmental and PBS&J, Inc. 1998. *Cumulative Impact Analysis for Master Water Plan Projects.* Prepared for West Coast Regional Water Supply Authority. Coastal Environmental/PBS&J, Inc., St. Petersburg, FL.

Conant, R. and J.T. Collins. 1991. *Reptiles and Amphibians, Eastern and Central North America.* Third edition. Houghton Mifflin Company. Boston New York.

Curnutt, J.L. 1996. Threatened Southern Bald Eagle, in: *Rare and Endangered Biota of Florida.* J.A. Rodgers, Jr., H.W. Kale II, and H.T. Smith, eds. University Press of Florida, Gainesville, FL.

Ehrhart, L.M. 1982. A review of sea turtle reproduction, in: *Biology and Conservation of Sea Turtles.* Bjorndal, K.A., ed. Smithsonian Institution Press, Washington, D.C.

Fitzpatrick, J.W., G. E. Woolfenden, M.T. Kopeny. 1991. *Ecology and Development-Related Requirements of the Florida Scrub Jay (Aphelocoma Coerulescens coerulescens)*. Office of Environmental Services. Florida Game and Fresh Water Fish Commission, Tallahassee, FL.

Fitzpatrick, J.W., B. Pranty, and B. Stith. 1994. Florida scrub jay Statewide Map 1992-1993. Archbold Biological Station, Lake Placid, Florida.

Florida Game and Fresh Water Fish Commission (FGFWFC). 1997. *Florida's Endangered Species and Species of Special Concern*, Official Lists. Tallahassee, FL.

Florida Power and Light Company. 1982. *The West Indian Manatee in Florida*. FPL Corporate Communications, Miami, FL.

FMRI. 2000. http://www.fmri.usf.edu/fish/

FWS 1999. U.S. Fish and Wildlife Service. South Florida Multi-Species Recovery Plan. Atlanta, Georgia. 2172 pp.

FWS 2000. U. S. Fish and Wildlife Service. http://www.endangered.fws.gov

FWS 2001. U.S. Fish and Wildlife Service Division of Endangered Species: Species Accounts.

HDR Engineering, Inc. 1998. *Water Use Permit Application. Attachment 1a.* Prepared by HDR Engineering, Inc., for the West Coast Regional Water Supply Authority.

HDR Engineering, Inc. 1999. *Tampa Bay Regional Reservoir Project*. Clearwater, Florida.

HDR Engineering, Inc. 2000a. *Regional Reservoir Transmission Main, Basis of Design Report*. Tampa, Florida.

HDR Engineering Inc., 2000b. *Tampa Bay Regional Reservoir Joint Application for Environmental Resource Permit*. Submitted to the Southwest Florida Water Management District, 2379 Broad Street, Brooksville, Florida 34609.

Helfman, G.S., Collette, B.B. and Facey, D.E. 1997. *The Diversity of Fishes*. Blackwell Science, Inc. Malden, Massachusetts.

Meylan, A.B. 1984. Feeding ecology of the hawksbill turtle (*Eretmochelys imbricata*): Spongivory as a feeding niche in the coral reef community, dissertation, University of Florida, Gainesville.

Meylan, A., A. Redlow, A. Mosier, K. Moody, and A. Foley. 1999. Occurrence and distribution of sea turtles in Tampa Bay, Florida, in: *Baywide Environmental Monitoring Report, 1993-1998, Tampa Bay, Florida.* J.R. Pribble, A.J. Janicki, and H. Greening, eds. Technical Publication 07-99. St. Petersburg, FL.

Miller, T. 1987. Knotting: A previously undescribed feeding behavior in muraenid eels. *Copeia*1987:1055–1057.

Moler, P. E. 1992. Eastern indigo snake, in: *Rare and Endangered Biota of Florida: Volume III. Amphibians and Reptiles.* Paul E. Moler, ed. University Press of Florida, Gainesville, Florida.

Mortimer, J.A. 1982. Feeding ecology of sea turtles, in: *Biology and Conservation of Sea Turtles*, Bjorndal, K.A., ed. Smithsonian Press, Washington, D.C. p. 103.

Musick, J.A. and C.J. Limpus. 1996. Habitat utilization and migration in juvenile sea turtles, in: *Biology of Sea Turtles.* Lutz, P.L. and J.A. Musick, eds. CRC Press, Boca Raton, FL.

NMFS. 2001. Endangered Species: Leatherback Sea Turtles. www.nmfs.noaa.gov/prot_res/turtles/leatherback.html

Ogden, J.C. 1996. Endangered Wood Stork, In: *Rare and Endangered Biota of Florida.* J.A. Rodgers, Jr., H.W. Kale II, and H.T. Smith, eds. University Press of Florida, Gainesville, FL.

Ogren, L.H. 1989. Distribution of juvenile and subadult Kemp's ridley turtles: Preliminary results from the 1984–1987 surveys, in: *Proc. 1st Int. Symp. Kemp's Ridley Sea Turtle Biology, Conservation and Management*, Caillouet, C.W., Jr. and Landry, A.M., Jr., eds. Sea Grant College Program, Galveston, TX, 116. PBS&J. 1998. *Assessment of the Potential Impacts of the Tampa Bay Water Surface Water Projects on Tampa Bay.* Prepared for Tampa Bay Water. PBS&J, Inc., 2535 Landmark Drive, Suite 221, Clearwater, FL.

PBS&J. 1998. *Assessment of the Potential Impacts of the Tampa Bay Water Surface Water Projects on Tampa Bay.* Prepared for Tampa Bay Water. PBS&J, Inc., 2535 Landmark Drive, Suite 221, Clearwater, FL.

Woolfenden, G.E. 1996. Threatened Florida Scrub Jay, In: *Rare and Endangered Biota of Florida.* J.A. Rodgers, Jr., H.W. Kale II, and H.T. Smith, eds. University Press of Florida, Gainesville, FL.

APPENDIX B - MITIGATION SUMMARY

TAMPA BAY REGIONAL RESERVOIR, CONCEPTUAL MITIGATION PLAN SUMMARY

INTRODUCTION

Tampa Bay Water's Regional Reservoir Project (Reservoir Project) proposes to construct a 1,100-acre reservoir to meet future water supply needs. Construction of the reservoir would have permanent impacts to wetlands that currently exist within the proposed reservoir footprint, pipeline, and access roads. The following summarizes the proposed mitigation plan for those impacts, as presented by Tampa Bay Water in the *Master Water Plan Mitigation Project Basis of Design Report (BODR)* (URS Corporation Southern, 2001a,b,c).

Three mitigation sites were presented to the U.S. Army Corps of Engineers (COE), the Florida Department of Environmental Protection (FDEP), the Hillsborough County Environmental Protection Commission (EPC), and other agencies as potential mitigation areas. The sites were:

- East Pruitt/Carlton-Smith Site
- West Pruitt Site
- North Carlton-Smith Site

The three sites were chosen for their proximity to the proposed reservoir location, the availability of appropriate habitat, and the presence of Significant Wildlife Habitat as designated by Hillsborough County Planning and Growth Management Department. Coordination with lead permitting agencies includes the COE for federal permits, the FDEP for the Environmental Resource Permit (ERP) application, and the Environmental Protection Commission of Hillsborough County (EPC) for county approval.

PURPOSE AND NEED

The proposed wetland mitigation areas serve as compensation for unavoidable permanent herbaceous and forested wetland impacts associated with the proposed Reservoir Project. According to the ERP application (HDR, 2000), approximately 169 acres have been designated as impacted wetlands based on FDEP and EPC wetland jurisdiction, and 185 acres based on COE wetland jurisdiction. These wetlands are predominantly herbaceous with a small forested wetland component. Using the Wetland Rapid Assessment Procedure (WRAP), Tampa Bay Water estimated the COE jurisdictional wetlands impacted by the Reservoir Project to have a functional unit value (FUV) of 111.12. These wetlands will be mitigated for on the three proposed sites, East Pruitt/Carlton-Smith Site, West Pruitt Site, and North Carlton-Smith Site by creating new wetlands, restoring impacted wetlands, and enhancing existing wetlands on the properties.

SITE SELECTION PROCESS

Candidate mitigation sites in the Alafia River basin underwent an extensive review and were narrowed down to the sites presented for agency comment. The three proposed mitigation properties are within the reservoir project boundary (Figure 1) and are within the Alafia River basin. The sites were chosen because they can provide wetland mitigation adjacent to the reservoir project, thereby compensating for impacts to wetland-dependent fish and wildlife resources in proximity to the wetland impact area. In addition, the sites contain large areas designated by Hillsborough County as Significant Wildlife Habitat that can benefit from the proposed wetland mitigation (URS Corporation Southern, 2001a).

The Southwest Florida Water Management District (SWFWMD) will acquire the properties associated with the three mitigation areas as part of an acquisition totaling approximately 5,200 acres. The SWFWMD has eminent domain authority for this acquisition.

SITE LOCATIONS

All three proposed mitigation sites are within or adjacent to the reservoir project boundary (Figure 1) and within the Alafia River basin in Hillsborough County. The Alafia River is between 5 and 6 miles northwest of the mitigation sites.

East Pruitt/Carlton-Smith Site

The East Pruitt/Carlton-Smith site encompasses approximately 367 acres, between the proposed Tampa Bay Regional Reservoir and County Road 39. The western boundary of the site is comprised of the proposed reservoir and Doe Branch creek, which is the major site drainage. Chito Branch forms the eastern boundary of the mitigation site (Figure 1). Currently, the land is used for cattle and horse grazing with some sod farming areas. The site is located on lands currently owned by Pruitt and Carlton-Smith.

West Pruitt Site

The West Pruitt Site encompasses approximately 850 acres and is located to the west side of the proposed reservoir site, South of Boyette Road and east of Hobson-Simmons Road. Stallion Hammock and Cabbage Hammock traverse the central portion of the property (Figure 1). Row crops, cattle grazing, and other agricultural activities are the current land use at the site.

North Carlton-Smith Site

The North Carlton-Smith Site is located northeast of the boundary of the Reservoir Project, approximately 3 miles south of the Alafia River. The site encompasses approximately 1,000 acres and is located east of Browning Road, west of County Road 39, and one mile south of Lithia Pinecrest Road (County Road 640). The southern limit of the site is traversed by the Chito Branch, which drains to the east. Northern drainages on the property lead to Doe Branch, in the southwest. Currently, the land is used for cattle grazing.

EXISTING CONDITIONS

The following describes the current environmental conditions on the three properties proposed as mitigation sites. More detailed descriptions s can be found in the *Master Water Plan Mitigation Project BODRs* (URS Corporation Southern, 2001a,b,c).

Landscape Setting

The mitigation project sites are located in a remote rural area of Hillsborough County where there is little to no residential and commercial development. The majority of vegetation on the properties has historically been cleared for agricultural activities. Uplands across the sites are fairly flat with a primary cover of bahia grass (*Paspalum notatum*), scattered longleaf pine (*Pinus palustris*), and saw palmetto (*Serenoa repens*). Wetlands located on the properties contain water high in tannin concentration with low to moderate turbidity. The presence of cattle and agricultural activities could lead to high aquatic nutrient and bacteria concentrations on the site.

East Pruitt/Carlton-Smith Site

The primary land use on this mitigation project site is as cattle and horse grazing on cropland, pastureland, and improved pasture. In the east portion of the site live oak (*Quercus virginiana*) communities are associated with Chito Branch. Approximately 50 residences are located on Wendel Avenue to the Southeast of the site. Wetland vegetative communities are interspersed across the site and include stream swamp, freshwater marshes, emergent aquatic vegetation, dog fennel, low marsh grasses, and wet prairies. These communities are generally in poor ecological condition with ditches for flood control that have altered historic drainage patterns and caused soil erosion.

West Pruitt Site

This mitigation project site contains agricultural land as well as some natural communities in the northwestern and northeastern portions. Management of the property currently serves as cattle grazing on cropland and pastureland and as row crops. Wetland vegetative communities are interspersed across the site. These communities include stream swamps, cypress, mixed forested wetland, and freshwater marsh. The wetland systems are in average ecological condition with drainage patterns altered from historic condition using ditches for flood control. Erosion is present near these ditches and along the lower elevations of fields adjacent to wetland systems.

North Carlton-Smith Site

Land on this site is primarily used for cattle grazing or as pastureland. The majority of upland and wetland vegetative communities have been cleared and excavated for agricultural activities, except in some stream and lake swamps and where live oak occurs along Chito Branch and smaller tributaries. Wetland vegetation is scattered across the site and includes communities such as stream swamps, freshwater marsh, wet prairies, and emergent aquatic vegetation. These wetland systems are in moderate, to often poor, ecological condition. Numerous small ditches, cattle watering holes, and spoil piles have altered historic drainage patterns.

Soils

According to the Soil Survey of Hillsborough County (1989), the dominant soil classifications in the mitigation sites are Myakka fine sand, Basinger-Holopaw-Samsula soils, depressional, Malabar fine sand, Smyrna fine sand, and St. Johns fine sand. In uplands, the high water table depth varies between 0 and –1.0 foot between June and November. During prolonged dry periods, water can recede to a depth of 40 inches and even during normal hydric conditions permeability is rapid in the surface and subsurface layers. Hydric soils underlay the wetlands on the sites and are classified as Basinger-Holopaw-Samsula soils, depressional, Malabar fine sand, and St. Johns fine sand. Hand auger borings in wetland areas indicate fairly acidic soils with an organic content ranging from 3.6 to 8.5 percent.

Hydrology

Extensive hydrologic and hydraulic modeling was performed for the project area to analyze and evaluate the existing drainage conditions. This included identifying seasonal high water elevations (SHW) and drainage areas, where possible.

East Pruitt/Carlton-Smith Site

A lack of trees or shrubs within the basin-marshes at this site prevented definitive establishment of SHW. Consequently, SHW was set at the wetlands overflow contour elevation (URS Corporation Southern, 2001a). The majority of the drainage area at the site drains to Doe Branch. Basin-Marshes rely on rainfall and groundwater for base-flow conditions because there are no contributing creeks, rivers, or inflows to them. Man-made ditches provide outflow from one wetland to another and to Doe Branch, which also receives inflow from the south. Currently, approximately 1,176 acres drain from Wendel Avenue, Carlton-Smith and Cytec Brewster areas to Doe Branch. Approximately 272 acres of this drainage area enter wetland systems on the property (URS Corporation Southern, 2001a).

West Pruitt Site

Hydrologic and hydraulic modeling was performed on a drainage area of approximately 521 acres. Approximately 104 acres drain to the west and discharge off-site. The remaining 417 acres drain to the east and discharge into Stallion Hammock. Cypress swamps on the site are dependent on rainfall and groundwater for base-flow conditions because no contributing inflows into these swamps are present. Existing outflows are man-made ditches between wetlands and to Stallion Hammock.

Existing SHW for the cypress swamps and open water cattle ponds were determined in August 2000. Most wetlands on the site receive overflow from adjacent wetlands. Approximately 77 acres currently drain directly to three wetlands on the property that are sites for proposed mitigation (URS Corporation Southern, 2001b).

North Carlton-Smith Site

Extensive modeling was performed on the 976-acre drainage area on the mitigation site. The models included all wetland systems, northern inflows and southern discharges. Approximately 730 acres drain to the southwest and discharge into Fishawk Creek. The remaining 247 acres drain to the southeast and discharge to Chito Branch. Small swamps on the site are dependent on rainfall and groundwater for base-flow conditions because of the lack of contributing creeks, rivers, or other inflows. Natural tributaries and man-made ditches provide outflows to Fishawk Creek and Chito Branch.

Existing SHW for the swamps, marshes, and open water ponds on the site were determined during the winter drought period from January to April, 2001. The wetland sites have been distributed into six groups based on proximity to drainages. Interconnecting ditches, pipes, and drainage systems provide overflow to the wetlands.

Vegetation

The mitigation sites are primarily used for agricultural purposes such as livestock grazing and crop production. As a result, bahia grass, crab grass (*Digitaria* sp.), slash pine (*Pinus elliottii*), and longleaf pine are vegetative covers common to all three sites.

East Pruitt/Carlton-Smith Site

Upland vegetation on this mitigation site is dominated by improved pastures containing species such as bahia grass and crab grass as well as longleaf pine and slash pine that do not form a solid canopy. Small sod farms are present in other field areas but are not widespread. Throughout the site, upland habitat diversity is low because of historical land-clearing and current land management practices.

West Pruitt Site

Cropland and pastureland dominates the vegetation at the West Pruitt mitigation site. Species such as bahia grass and crabgrass comprise the majority of the ground cover and longleaf pine and slash pine are scattered across the site. Row crops and remnant furrows that have been invaded by weedy pioneering species are present in other areas of the site. Cogongrass (*Imperata cylindrica*), a detrimental invasive species, is present in a few areas. Remnant pine flatwoods and pine-mesic oak are present on the northern portion of the property. These areas will complement the proposed mitigation plan (URS Corporation Southern, 2001b).

North Carlton-Smith Site

Upland vegetative communities on the North Carlton-Smith Site are dominated by ground cover species such as bahia grass, crabgrass, dog fennel, and other species common to pastureland habitat. Open field areas contain pioneering species that are subjected to intense grazing and active management practices that limit their growth. Pine flatwoods extend from the north portion of the property. Although this forested area

is not widespread, it will complement the proposed mitigation plan by serving as a wildlife corridor. The entire property supports few natural upland habitats.

Wetlands

Existing wetland vegetation on the three sites proposed for mitigation are typical of systems in west-central Florida. Jurisdictional wetlands were delineated according to Florida Administrative Code 62-340 for the Florida Department of Environmental Protection and Chapter 1-11 for the Environmental Protection Commission of Hillsborough County. To establish federal wetlands jurisdictional limits, the COE's *Wetland Delineation Manual*, 1987, was used. Jurisdictional wetlands were identified, marked, land-surveyed, plotted, and reviewed by qualified biologists (URS Corporation Southern, 2001a,b,c). Formal approval from all permitting agencies is being pursued.

East Pruitt/Carlton-Smith Site

Naturally occurring wetlands on this site include stream swamps, freshwater marshes, and wet prairies. Doe Branch contains stream swamp on the site but it has been channellized and partially cleared. Live oaks on spoil mounds, scattered cabbage palm (*Sabal palmetto*), and other mesic oak species are present along the creek. Small fill roads crossing Doe Branch and Chito Branch cross the site and provide a moderately continuous corridor through the property that will complement the overall mitigation and enhancement design (URS Corporation Southern, 2001a).

Excavated ponds on the property support pickerelweed and floatingheart (*Nymphoides* sp.) as well as nuisance species such as primrose willow (*Ludwigia peruviana*), cattails (*Typha* sp.), water hyacinth (*Eichhornia crassipes*), dog fennel (*Eupatorium capillifolium*), and duckweed (*Lemna* sp.). No phosphate mining has occurred at this site but cattle watering ponds represent small-scale disturbances to wetlands and associated soils. These areas would be re-contoured to simulate more natural conditions (URS Corporation Southern, 2001a).

West Pruitt Site

Existing wetland types on this mitigation site are swamps, cypress, mixed forested wetland habitat, and freshwater marsh. The floodplain areas of Stallion Hammock, Long Flat Creek, Cabbage Hammock, Chapman Hammock, and Coleman Hammock provide a mosaic of stream swamps and mixed wetland hardwoods on the site. These swamps provide a refuge of habitats and a continuous corridor through the property that would complement the proposed mitigation and enhancement plan.

Cypress domes present on the site vary in condition from good with evidence of seedling recruitment, presence of hardwood transition species, established shrub and groundcover species, and adequate levels of inundation, to systems with ditch disruption that have altered flood storage elevations and inundation periods. Cattle grazing and numerous field ditches have resulted in flow, soil, and vegetation disruption in approximately half of these systems. Upland species have recruited into some of the wetlands and lower than average rainfall in the past few years has aggravated wetland conditions.

Freshwater marshes contain species typical of this wetland type but fringes adjacent to agricultural fields contain nuisance species such as primrose willow. Open water and wetland species, including excavated ponds, also support nuisance species, including pickerelweed, cattails, torpedo grass (*Panicum repens*), and duckweed. No phosphate mining has occurred on this mitigation site. Cattle watering ponds in some marshes would be reconfigured and re-contoured to more natural conditions.

North Carlton-Smith Site

Existing wetland vegetation on this site are typical of those that occur in stream and lake swamps, freshwater marshes, wet prairies, and emergent aquatic vegetation systems in west-central Florida. Floodplain areas and tributaries to Chito Branch and Doe Branch are crossed by fill roads, with and without culverts. Wetlands created by these access roads are not extensive and do not contain natural ecotones because of frequent cattle disturbance and proximity to adjacent pasturelands.

Several freshwater marshes on the site have been previously recontoured to create open water areas with narrow littoral zones and adjacent wet prairies. These areas contain species typical of that habitat type in the region. Wetland forest fringes and marshes adjacent to agricultural fields contain nuisance species, primarily primrose willow and torpedo grass. No phosphate mining has occurred on this mitigation site. Several cattle watering ponds occur across the property and have been excavated in many of the marshes, creating a moderate- to small-scale disturbance to wetlands and associated soils on the property.

Significant Wildlife Habitat

Hillsborough County has designated land in the proposed mitigation properties as Significant Wildlife Habitat. The proposed wetland mitigation and enhancement plans would improve the wildlife habitat through planting natural upland tree buffers around wetland mitigation sites. The buffers would increase natural habitat cover and diversity in the area and link sites to nearby preservation and recreation lands.

East Pruitt/Carlton-Smith Site

A small area, at the northern extent of Doe Branch, was mapped by Hillsborough County as Significant Wildlife Habitat. Approximately two miles west of the mitigation site, larger areas along Stallion Hammock and Cabbage Hammock (on the West Pruitt Site) are also designated as Significant Wildlife Habitat.

West Pruitt Site

Land designated as Significant Wildlife Habitat covers the majority of the southern, eastern, and northern portions of the site and overlaps the Stream Swamps in the north end of the property. The southern and central property areas, however, are now cleared agricultural lands and do not support natural upland vegetative communities. Few isolated natural pine forests still occur in the northern and northeastern portions of the site.

North Carlton-Smith Site

Designated Significant Wildlife Habitat occurs along Chito Branch at the southern boundary of the site and overlaps the Stream Swamps that drain to the east. Another area overlaps the band of Pine Flatwoods on the site's northern portion. Very few natural upland habitats occur on the site.

Protected Species

The Florida Fish and Wildlife Conservation Commission and the U.S. Fish and Wildlife Service were contacted to determine lists of potentially occurring species, and the Florida Natural Areas Inventory databases of known protected species sightings were reviewed. Surveys were conducted for protected species and their habitat on the proposed mitigation properties. Seven species were identified onsite, including American alligator (*Alligator mississippiensis*), wood stork (*Mycteria americana*), great blue heron (*Ardea herodias*), sandhill crane (*Grus canadensis*), bald eagle (*Haliaeetus leucocephalus*), eastern indigo snake (*Drymarchon corias couperi*), and Sherman's fox squirrel (*Sciurus niger shermani*). Sandhill crane nesting was observed and documented in basin-marshes on the East Pruitt/Carlton-Smith Site during Spring 2000 and 2001. Coordination with state, federal, and local agencies will ensure no adverse impacts will occur to protected species as a result of the mitigation process. Should it be necessary to prepare a protected species mitigation plan, the ERP application will be amended following coordination with permitting agencies.

PROPOSED MITIGATION

Several mitigation design parameters were evaluated during the development of the Conceptual Mitigation Design. The design was developed to improve site conditions and to fit into natural site features while benefiting the regional ecosystem. The parameters include:

- enhancement of the general landscape setting,
- use of onsite wetlands and topography,
- incorporation of existing soil and use of impacted-wetland topsoil for inoculation of mitigation sites,
- control of nuisance and exotic vegetative species,
- maintenance or establishment of appropriate hydrology,
- diversification or maintenance of wetland plant species,
- establishment of a marsh system for wildlife forage opportunities,
- transplantation of cypress trees from impacted wetlands,
- simplification of construction techniques to minimize earthwork, and
- implementation of erosion control for wetland and water quality protection.

Wetland enhancement at the sites will be accomplished by improving the hydroperiod, controlling exotic and nuisance species using herbicide application and/or manual removal, and excavation and re-grading of wetland areas. Restoration areas will be

replanted with desirable wetland species. The enhancement and creation of basin marshes will include: removal of exotic and nuisance species, grade modifications to increase wetland size, ditch modification to increase hydroperiods and inundation levels, removal of spoil mounds in wetlands to create waterfowl roosting habitat, increasing open-water areas, planting native herbaceous wetland species, and planting upland buffers.

The FDEP will determine the total wetland mitigation credit for each of the wetland mitigation sites, based on ERP guidelines. Hillsborough County EPC will determine mitigation credit based on a 1:1 creation to impact ratio for all wetland habitat types. WRAP scores will be calculated for impacted and mitigated wetland acreage, and Functional Unit Values will be developed according to COE guidelines. An additional 15 acres of open water will also be developed within the sites to mitigate for open water impacts.

East Pruitt/Carlton-Smith Site

Approximately 216 acres of habitat improvements are proposed on this mitigation site. This includes approximately 102 acres of wetland mitigation and enhancement and 114 acres of surrounding upland buffer restoration. Specifically, the mitigation plan for this site proposes mitigation in four systems; enhancement of two large marsh systems, improvement to a small cattle pond, and creation of forested floodplain along Doe Branch. The enhancement of Doe Branch will include: removal of collapsed culverts, grading and planting of the east side of the channel to provide riparian wetland habitat. All of the proposed mitigation wetlands include planting approximately 300-foot wide upland buffers to increase habitat diversity.

West Pruitt Site

The Conceptual Mitigation Plan for this site proposes a total of approximately 295 acres of habitat improvements. Approximately 59 acres of wetland mitigation, 83 acres of wetland enhancement, and 153 acres of surrounding upland buffer restoration are included in the plan. Mitigation is proposed in four systems at this site. Two are large marsh systems, one is a mixed hardwood and cypress slough, and one is a mixed hardwood floodplain along Stallion Hammock. Currently, 15 acres of open water creation are planned for development from existing agricultural uplands on the northeastern portion of this site, adjacent to the reservoir.

North Carlton-Smith Site

Approximately 199 acres of habitat improvements are proposed for this mitigation site. This includes approximately 119 acres of wetland creation and 80 acres of wetland enhancement. Eight systems are included in the mitigation plan for this site. The plans include creation of herbaceous wetland, wet prairies, and mixed hardwood wetlands, enhancement of mixed hardwoods, herbaceous, and open water wetlands, and creation of a natural upland buffer around wetland areas.

Landscape Setting

The proposed mitigation plans will benefit the area surrounding the proposed reservoir by increasing habitat diversity and creating and enhancing critical habitat such as wetlands. These improvements will provide additional habitat for local fauna and create corridors linking adjacent natural areas.

East Pruitt/Carlton-Smith Site

The proposed mitigation plan will improve habitat at the East Pruitt/Carlton-Smith Site in a number of ways. Forested wetlands, upland buffers, and riparian habitat will be created or enhanced, improving the low habitat diversity on the site and in surrounding areas. Forest, shrub, and marsh areas will provide foraging habitat and cover for local avian, mammalian, and herpetofaunal species. Deeper portions of the expanded marsh systems will provide increased habitat for fish and other aquatic organisms and littoral areas will provide foraging and nesting habitat for wading birds. The buffer systems around wetland systems and along Doe Branch will improve the biological function of these wetlands and provide additional habitat diversity.

West Pruitt Site

Proposed mitigation on the West Pruitt Site will add large herbaceous wetlands over areas previously managed as row-crop fields. Forested wetland creation along streams will diversify habitat at the site. This combination of wetland and upland mitigation will provide foraging and cover habitat for local fauna and will increase habitat diversity. Enhancement of marsh systems will provide habitat for aquatic organisms and increase feeding and nesting habitat for wading birds. Upland tree buffers will improve the biological function of the wetland systems they surround.

North Carlton-Smith Site

This site contains disturbed wetland systems and altered natural upland systems that will be restored and enhanced by the proposed mitigation plan. Habitat will be diversified and foraging and nesting habitat will be made available for avian, mammalian, herpetofaunal, and aquatic species. Buffer zones around wetland systems will improve the ecotone and biological function of the wetlands. Recovery of the natural landscape will eventually benefit the site and the regional environment.

Soils

Soils on the proposed mitigation sites are dominated by those common to Hillsborough County. Myakka fine sand dominates the upland soil type and wetland soils are predominantly Basinger-Holopaw-Samsula soils, depressional, and Malabar fine sand. Appropriate topsoil and subsoil from the proposed reservoir site will be used for construction and grading on the mitigation properties. The use of imported topsoil and wetland muck from impacted wetlands on the reservoir site for construction of mitigation wetlands will ensure survival of planted and recruited vegetation and provide benefits such as wetland stabilization.

Hydrology

Extensive hydrologic and hydraulic modeling was performed to the project area to determine peak stages in the proposed wetland systems for storm events and to predict impacts from the proposed reservoir. The modeling was performed according to Natural Resouce Conservation Service methods.

East Pruitt/Carlton-Smith Site

Effects of the proposed reservoir are important to this mitigation site because horizontal seepage to the proposed wetland sites could affect their success. Modeling indicates that seepage from the proposed reservoir is estimated to be very small and would primarily occur within 100 feet of the intercept to Doe Branch. Horizontal seepage from the proposed reservoir, therefore, is not expected to impact the proposed wetland mitigation sites. Within the proposed reservoir, drainage to Doe Branch will be reduced, which will reduce flows to wetland systems within the mitigation site. To offset the reduction, grading of certain areas will increase the drainage area to other wetland systems. Overall, the analysis determined that the altered hydrologic system will provide adequate water quantities for proposed wetland expansions (URS Corporation Southern, 2001e).

West Pruitt Site

The proposed mitigation at this site would increase the drainage areas to three wetlands and reduce the drainage areas to four adjacent wetlands. Results of the hydrologic and hydraulic modeling for the proposed conditions indicate that the increase storage provided by expanded wetlands would lower peak stages in these wetlands. Overall, the altered hydrologic conditions can support the three proposed expanded wetland systems (URS Corporation Southern, 2001d).

North Carlton-Smith Site

Following proposed mitigation, drainage areas would be increased in all but four wetland sites. Reduced drainage at these wetlands would not have negative impacts because models indicate that proposed wetland mitigation can be supported. Removal of existing pipes, and the blocking of ditches would help compensate this loss by allowing wetlands to hold more water for longer time-periods. Existing conditions and modeling suggest that hydrologic conditions are adequate to support planned wetland mitigation planting and inundation areas.

Vegetation

Species composition for the proposed wetland mitigation sites was selected based on desirable vegetation currently present at the sites and from species documented from the Reservoir Project area. Other species were chosen based on their establishment success in past projects. The use of these plants should increase the mitigation success while complementing existing habitat types. Additionally, attempts may be made to transplant mature pond cypress trees from the forested wetlands impacted by the proposed reservoir. Transplantation would occur during optimal conditions to achieve the highest degree of

success. The feasibility of this type of transplantation will be assessed and evaluated further during the final permitting and design phase.

Upland areas that will be re-contoured or left undisturbed to provide a 300-foot-wide buffer around mitigation wetlands will be planted with trees, shrubs, and native ground cover. These plantings should stabilize soils, improve wetland functions, and increase habitat diversity. Because of the large size of this project, plant materials would be utilized from a variety of sources, including those that are nursery grown or field collected. Contract growing may also be used.

Management Plan

Wetland mitigation areas in all three mitigation sites are expected to have a three- to five-year permit-required wetland mitigation monitoring and maintenance plan. Monitoring plans will be designed to provide assessments of wetland condition and recommendations for maintenance, replanting, and corrective actions as necessary to meet permit conditions. The SWFWMD is anticipating obtaining ownership of the land proposed for mitigation by July 2001. Typically, their management practices include prescribed burning, control of exotic species, habitat restoration, timber management, wildlife management, and resource monitoring. These will be integrated with permit conditions to assure that best management practices will be employed for the success of the mitigation sites.

Construction Techniques

Similar construction techniques will be used on all three-mitigation properties. Earthmoving activities to stockpile topsoil excavate and transport soil, and dump, spread, and grade topsoil will require specialized equipment. Issues of concern will include transport of exotic or nuisance species, reestablishment of subsoil confining layers, and segregation of undesirable soils. Final design and permitting will take these issues into consideration. Planting of vegetation will occur only after grading has been approved by the project engineer and environmental scientist and accepted by the planting contractor.

Construction Schedule

A generalized construction schedule has been proposed and will be further developed as the project advances. The schedule includes the following:

- Coordination with Reservoir Contractor throughout the Bid and Construction phases
- Demolition of existing structures
- Earthwork and site preparation
- Exotic and nuisance species control
- Planting

Construction of all mitigation sites has been scheduled to run concurrently with the sequence of reservoir construction, from December 2001 through January 2004.

Earthwork associated with the mitigation construction should be performed during the dry season and completed prior to the onset of the following wet season. Aquatic plant introduction should occur during the wet season to ensure establishment, and tree transplantation should be implemented during the winter and early spring dormancy period. The construction schedule should also take into account breeding and migration seasons for threatened or endangered species that may utilize the existing habitat. These activities should be coordinated with the U.S. Fish and Wildlife Service and the Florida Fish and Wildlife Conservation Commission.

Construction Erosion Control

Erosion control during the construction process will be in accordance with the Florida Department of Transportation standard specifications and detail drawings. Other appropriate measures will be taken, including preparation of an National Pollutant Discharge Elimination System (NPDES) Stormwater Pollution Prevention Plan, filing a Notice of Intent with the EPA's General Clearinghouse, and inclusion of primary pollution control measures. These pollution control measures will include staked hay bales and silt fences and a monitoring and inspection program.

CONCLUSIONS AND RECOMMENDATIONS

The proposed mitigation plan for the Tampa Bay Regional Reservoir Project is part of a comprehensive assessment of biological and physical parameters, anticipated regulatory agency requirements, and use of current hydrologic and hydraulic modeling techniques. The plan incorporates existing biological conditions, takes into account the type of habitat lost, and attempts to provide a variety of onsite and regional ecological improvements to the existing natural habitats. Based on anticipated mitigation requirements, the three sites together are expected to meet mitigation needs as well as enhance and diversify existing habitat in the surrounding area.

LITERATURE CITED

HDR Engineering, Inc. 2000a. Tampa Bay Regional Reservoir Joint Application for Environmental Resource Permit. Submitted to the Southwest Florida Water Management District, 2379 Broad Street, Brooksville, Florida 34609.

URS Corporation Southern. 2001a. Master Water Plan Mitigation Project, Basis of Design Report for Conceptual Mitigation Design, Proposed Wetland Mitigation Project, West Pruitt Site. Draft prepared for Tampa Bay Water, March 30, 2001.

URS Corporation Southern. 2001b. Master Water Plan Mitigation Project, Basis of Design Report for Conceptual Mitigation Design, Proposed Wetland Mitigation Project, East Pruitt/Carlton-Smith Site. Draft prepared for Tampa Bay Water, April 30, 2001.

URS Corporation Southern. 2001c. Master Water Plan Mitigation Project, Basis of Design Report for Conceptual Mitigation Design, Proposed Wetland Mitigation Project, North Carlton-Smith Site. Draft prepared for Tampa Bay Water, June, 2001.

URS Corporation Southern. 2001d. Master Water Plan Mitigation Project, Hydrologic and Hydraulic Evaluation for Conceptual Mitigation Design, Final Report, Proposed Wetland Mitigation Project, West Pruitt Site. Draft prepared for Tampa Bay Water, March 30, 2001.

URS Corporation Southern. 2001e. Master Water Plan Mitigation Project, Hydrologic and Hydraulic Evaluation for Conceptual Mitigation Design, Final Report, Proposed Wetland Mitigation Project, East Pruitt/Carlton-Smith Site. Draft prepared for Tampa Bay Water, April 20, 2001.

APPENDIX C - ALAFIA RIVER AND HILLSBOROUGH RIVER/TAMPA BYPASS CANAL WITHDRAWAL PERMITS

Southwest Florida
Water Management District

2379 Broad Street, Brooksville, Florida 34609-6899
(352) 796-7211 or 1-800-423-1476 (FL only)
SUNCOM 628-4150 TDD only 1-800-231-6103 (FL only)
World Wide Web: http://www.swfwmd.state.fl.us

An Equal Opportunity Employer

Tampa Service Office
7601 Highway 301 North
Tampa, Florida 33637-6759
(813) 985-7481 or
1-800-836-0797 (FL only)
SUNCOM 578-2070

Bartow Service Office
170 Century Boulevard
Bartow, Florida 33830-7700
(941) 534-1448 or
1-800-492-7862 (FL only)
SUNCOM 572-6200

Venice Service Office
115 Corporation Way
Venice, Florida 34292-3524
(941) 486-1212 or
1-800-320-3503 (FL only)
SUNCOM 526-6900

Lecanto Service Office
3600 West Sovereign Path
Suite 226
Lecanto, Florida 34461-8070
(352) 527-8131
SUNCOM 667-3271

Ronald C. Johnson
Chair, Lake Wales
Brenda Menendez
Vice Chair, Tampa
Sally Thompson
Secretary, Tampa
Ronnie E. Duncan
Treasurer, Safety Harbor
Monroe "Al" Coogler
Lecanto
Joe L. Davis, Jr.
Wauchula
Rebecca M. Eger
Sarasota
John P. Harllee, IV
Bradenton
Watson L. Haynes, II
St. Petersburg
John K. Renke, III
New Port Richey
Pamela Stinnette-Taylor
Tampa

E. D. "Sonny" Vergara
Executive Director
Gene A. Heath
Assistant Executive Director
Edward B. Helvenston
General Counsel

July 27, 1999

Tampa Bay Water
2535 Landmark Drive, Suite 211
Clearwater, FL 33761

RECEIVED
AUG 30 1999
TAMPA BAY WATER

Subject: Final Agency Action Transmittal Letter
Individual Water Use Permit No(s). 2011794.00

Dear Sir or Madam:

Your Water Use Permit(s) was/were approved by the District Governing Board subject to all terms and conditions set forth in the approved Permit(s).

You or any person whose substantial interests are affected by the District's action regarding your application may request an administrative hearing in accordance with Sections 120.569 and 120.57, F.S., and Chapter 28-106, F.A.C., of the Uniform Rules of Procedure. A request for hearing must (1) explain how each petitioner's substantial interests will be affected by the District's action, or proposed action; (2) state all material facts disputed by the petitioner or state that there are no disputed facts; and (3) otherwise comply with Chapter 28-106.301, F.A.C.. A request for hearing must be filed with and received by the Agency Clerk of the District at the District's Brooksville address within 21 days of receipt of this notice. Receipt is deemed to be the fifth day after the date on which this notice is deposited in the United States mail. Failure to file a request for hearing within this time period shall constitute a waiver of any right such person may have to request a hearing under Sections 120.569 and 120.57, F.S.

Mediation pursuant to Section 120.573, F.S. to settle an administrative dispute regarding the District's action in this matter is not available prior to the filing of a request for hearing.

Please be advised that the Governing Board has formulated a water shortage plan as referenced in Condition 4 of the Standard Water Use Permit Conditions (Exhibit A), and will implement such a plan during periods of water shortage. You will be notified during a declared water shortage of any change in the conditions of your Permit(s) or any suspension of your Permit(s), or of any restriction on your use of water for the duration of any declared water shortage.

The ID tag(s) for your withdrawal(s) shall be installed by a District representative. This representative will attempt to contact you within 30 days to discuss placement of your tags. If you have any questions or concerns regarding your tags, please contact Debbie Summerall at extension 2023 in the Tampa Regulation Department. If you have any questions or concerns regarding your permit or any other information, please contact this office at extension 4343.

Sincerely,

Adeline Wood

Adeline Wood, Supervisor
Records and Data Department

AW:kat

Enclosures: 1. Approved Permit
2. Rule 40D-1.521, F.A.C.

cc: C. Edwin Copeland, Jr.

Doc No. 010315
File Div/Proj No. 46004
File Sec. permit
File:
cc: Gates
Ford
KDS

WUPINAPR.FAA
R.3-23-92

Protecting Your Water Resources

SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT
INDIVIDUAL
WATER USE PERMIT NO. 2011794.00

EXPIRATION DATE: December 31, 2010 PERMIT ISSUE DATE: July 27, 1999

THE PERMITTEE IS RESPONSIBLE FOR APPLYING FOR A RENEWAL OF THIS PERMIT PRIOR TO THE EXPIRATION DATE IN ACCORDANCE WITH DISTRICT RULES, WHETHER OR NOT THE PERMITTEE RECEIVES PRIOR NOTIFICATION BY MAIL. CONTINUED USE OF WATER AFTER THE EXPIRATION DATE IS A VIOLATION OF DISTRICT RULES, EXCEPT AS OTHERWISE PROVIDED BY APPLICABLE LAW. VIOLATION OF THE CONDITIONS OF THIS PERMIT CONSTITUTES A VIOLATION OF APPLICABLE LAW.

This permit, issued under the provision of Chapter 373, Florida Statutes and Florida Administrative Code 40D-2, authorizes the Permittee to withdraw the quantities outlined herein, and requires various activities to be performed by the Permittee as outlined by the Special Conditions. This permit, subject to all terms and conditions, meets all District permitting criteria.

PROJECT NAME: Alafia River Project

GRANTED TO: Tampa Bay Water, A Regional Water Supply Authority
2535 Landmark Drive, Suite 211
Clearwater, FL 33761

The above named party is considered the Permittee in this document and is solely responsible for performance of the terms and conditions of this permit.

ABSTRACT: It is the Governing Board's intent that the Permittee reduce withdrawals from its existing Central System, comprised of 11 wellfields located in Pasco, Hillsborough and Pinellas Counties; and that reasonable present and future demand be satisfied solely from environmentally sustainable sources of supply. To this end, the District, Tampa Bay Water and its Member Governments, consisting of Pasco, Hillsborough, and Pinellas Counties, City of St. Petersburg, City of Tampa, and City of New Port Richey, entered into the Northern Tampa Bay New Water Supply and Ground Water Withdrawal Reduction Agreement (Agreement) approved May 14, 1998. In general, the agreement consolidates the individual wellfield permits into one permit for the Central System, and outlines a specific time frame, plan of actions and requirements to achieve the withdrawal reductions from the system. Most critical to achieving the Central System reductions is obtaining new environmentally sustainable sources of water supplies to allow for replacement of restricted quantities. Tampa Bay Water prepared a New Water Plan which outlines environmentally sustainable sources of water supplies for replacement of restricted quantities. The District's Governing Board approved the New Water Plan on August 25, 1998. The New Water Plan specifies a number of proposed projects to meet the following objectives; having one or more projects permitted, constructed, in operation and providing at least 38 mgd of new supply to the Central System by December 31, 2002; by December 31, 2007 having the remaining projects permitted, constructed, in operation and providing an additional 47 mgd, for a total of at least 85 mgd of new water supply for regional distribution to the Tampa Bay Water Member Governments. The District will be providing co-funding for eligible projects in accordance with the New Water Sources Funding Agreement between the District and Tampa Bay Water. This Application represents one of the new water supply source projects of the New Water Plan which is eligible for co-funding.

The water use authorized by this permit is for the purpose of providing additional new water supply quantities for Tampa Bay Water's Interconnected Regional Water Supply System. The allocation of the water use quantities for replacement and rotation purposes is pursuant to the Agreement.

This is a new application for a surface water withdrawal from the Alafia River to be used for public supply in Tampa Bay Water's service area located within the Northern Tampa Bay, the Eastern Tampa Bay and the Southern Water Use Caution Areas (WUCAs). This application includes one surface water withdrawal intake structure located on the south side of the Alafia River, at the intersection of Bell Shoals Road and the river. Tampa Bay Water's interconnected regional water supply system service area includes the communities of Pasco, Hillsborough, and Pinellas Counties, City of St. Petersburg, City of Tampa, and City of New Port Richey. An Environmental Resource Permit (ERP) is required for the implementation of this Water Use Permit. The Permittee has submitted a complete ERP application (# 4918392.00) to the District for this project.

Special Conditions are included to address pertinent concerns. Special Conditions include a withdrawal schedule linked to river flow, comprehensive review/consistency with adopted minimum flows, metering and reporting of pumpage, hydrologic monitoring (water levels, water quality, rainfall, evaporation, streamflow), ecological monitoring and mitigation through an approved Hydro-Biological Monitoring Program (HBMP), complaint investigation and mitigation, WUCA conditions, and submittal of a Surface Water Diversion Annual Report. With the proposed permit conditions applied, the application meets all Chapter 40D-2.301 rule criteria.

WITHDRAWAL QUANTITIES TABLE

TOTAL QUANTITIES AUTHORIZED UNDER THIS PERMIT (in MGD)	
Withdrawal Rate	**Alafia River Flow at Bell Shoals Road**
0 MGD	< 80 MGD
8 MGD to 51.7 MGD (10% of flow)	80 MGD to 517 MGD
51.7 MGD Maximum	> 517 MGD

Actual quantities are based on percentage withdrawals identified in the **PUMPING SCHEDULE AND AVAILABLE QUANTITIES** Special Condition of this permit. The Maximum Daily withdrawal is limited by system pumping capacity. Refer to Exhibit "A" for historical analysis of flows in the Alafia River as an example of the application of the withdrawal quantities table set forth above.

PROPERTY LOCATION: South Central Hillsborough County, two and half miles south of Bloomingdale Avenue at the intersection of Bell Shoals Road and the Alafia River.

TYPE OF APPLICATION: New

WATER USE CAUTION AREA: Eastern Tampa Bay / Southern

APPLICATION FILED: June 18, 1998

ACRES: 0.00 Owned (To be acquired)
629,536.00 Serviced
(Owned)+629,536.00 Owned and Serviced

APPLICATION AMENDED: N/A

WATER USE: Regional Public Supply System

SERVICE AREA NAME: Tampa Bay Water's Interconnected Regional Water Supply System

USE TYPE:
Residential Single Family
Residential Multi-Family
Commercial/Industrial Non Process
Unaccounted Use
Lawn and Landscape
Fire Fighting/Testing

TOTAL PUBLIC SUPPLY: 1,770,101 Gross = 137 gpd/person

DISTRICT/ PERMITTEE I.D. NO.	SEC. / TWN. / RNG.	LOCATION LAT/LONG	EQUIVALENT DIAMETER (INCHES)
1 / ALF-1	24/30/20	275125.35/821608.13	120

PERMIT SPECIAL CONDITIONS

All conditions referring to approval by the Regulation Department Director, Resource Regulation, shall refer to the Director, Tampa Regulation Department, Resource Regulation.

1. APPROVALS
   All conditions referring to approval by the Regulation Department Director, shall refer to the Director, Tampa Regulation Department.

2. WITHDRAWAL LIMITATIONS

Withdrawals from the Alafia River will be limited to the periods of time when flows in the river, as estimated at Bell Shoals Road using the calculation identified in the **ALAFIA RIVER REGIONAL PUMPING FACILITIES OPERATIONS AND REGULATORY LEVELS** Special Condition of this permit, are greater than 124 cubic feet per second (cfs). Surface water withdrawals may occur at a rate of 10 percent of the total river flow at Bell Shoals Road between 124 to 800 cfs, up to a maximum withdrawal rate of 80 cfs. Based on historical Alafia River flow data from 1977 through 1996 presented in Exhibit "A", surface water quantities available under the withdrawal schedule would yield 7.21 MGD to 28.95 MGD on an Annual Average basis. Since daily withdrawals will be regulated by the withdrawal schedule, as described above, no Annual Average withdrawal quantity is assigned to this permit in order to allow maximum flexibility to meet demands.

3. PUMPING SCHEDULE AND AVAILABLE QUANTITIES

The amount of water diverted from the Alafia River for water supply purposes shall not exceed the quantities listed in Table 1 below.

TABLE 1 WITHDRAWALS FROM THE ALAFIA RIVER

Maximum Withdrawal Rate - MGD / CFS	Alafia River Flow at Bell Shoals Road in Millions of Gallons Per Day (MGD) / Cubic Feet Per Second (CFS)
0 (no Withdrawal)	0 to 80 / 0 to 124
10% of total flow	80 to 517 / 124 to 800
51.7 / 80 cfs	Above 517 / 800

4. SUBMISSION OF DATA AND REPORTS

A. DATA REPORTS

The Permittee shall provide the District with 1 copy of the data reports required by these Special Conditions. All reports of data shall be submitted to the District on or before the 15th day of the month following data collection and shall be addressed to:

Permit Data Section, Records & Data Department
Southwest Florida Water Management District
2379 Broad Street
Brooksville, Florida 34609-6899

B. OTHER REPORTS

For other reports or plans, unless otherwise indicated, the Permittee shall provide to the District 1 original, 1 unbound copy, and 1 copy in acceptable digital format (see paragraph 4.C., below). Unless otherwise specified, all reports required to be submitted by the Permittee to the District pursuant to one or more conditions of this permit shall be submitted as part of the Annual Report required by this permit.

C. FORMAT

All data and reports shall be submitted in writing, and, when feasible and, if prepared, in digital format and medium compatible with the format and medium then utilized by or agreed to by the District.

5. LEGAL CONTROL OF PROPERTY

This permit is issued contingent upon the Permittee's power to acquire the property rights for properties on which pumps or other withdrawal facilities will be located, as described in the application, through eminent domain; specifically, the properties associated with District ID No. 1, Permittee ID No. ALF-1, (Alafia River withdrawal intake) and the proposed regional pumping facility near the Alafia River. If the property needed for this project is not so conveyed, or if the ownership or other legal control is divided, this permit shall immediately terminate unless the terms of the permit are modified or the permit is transferred pursuant to District rules. In no case shall issuance of this permit convey any property rights to the Permittee.

6. OPERATIONS PLAN

The Optimized Regional Operations Plan (Operations Plan) shall be modified when new water supply capacity is added to Tampa Bay Water's Interconnected Regional Water Supply System. The Permittee shall submit a modification to the Operations Plan which incorporates the Alafia River Project and describes how Tampa Bay Water shall operate its water supply system in a manner to minimize environmental stresses to the 11 Central System Wellfield area. The Permittee shall comply with the Operations Plan and all modifications thereof, as approved by the District.

7. USE OF WITHDRAWAL QUANTITIES

Surface water withdrawal quantities from the Alafia River Project shall be used for the purpose of providing replacement capacity and rotational capacity to the following Tampa Bay Water Central System wellfields as required by the Agreement:

1. Cosme-Odessa Wellfield
2. Cross Bar Ranch Wellfield
3. Cypress Bridge Wellfield
4. Cypress Creek Wellfield
5. Eldridge-Wilde Wellfield
6. Morris Bridge Wellfield
7. Northwest Hillsborough Regional Wellfield
8. North Pasco Wellfield
9. Section 21 Wellfield
10. South Pasco Wellfield
11. Starkey Wellfield

Wellfield replacement and rotational capacity is authorized for the Alafia River facility to reduce flow from the Tampa Bay Water Central System, to optimize withdrawals at wellfields and to relieve environmental stresses. Withdrawal quantities delivered by the Alafia River regional pumping facilities shall be used for existing system demand and documented growth. The identification of wellfields receiving rotation capacity will be determined by Tampa Bay Water's Optimized Regional Operations Plan.

8. MONITORING OF ENVIRONMENTAL CONDITIONS

A. HYDROBIOLOGICAL MONITORING

The Permittee shall develop and implement a Hydrobiological Monitoring Program (HBMP) for the Alafia River. The scope and design of the HBMP shall be based on discussions with District staff and Permittee which shall occur within 60 days of permit issuance and submittal of a draft HBMP within 120 days of permit issuance. The District may solicit outside technical review for design of the HBMP. The final HBMP plan must be approved by the District prior to implementation. The initial date of implementation will be specified in the final approved HBMP plan.

The HBMP shall address the following objectives:

1. Establish baseline conditions prior to permitted use for streamflow rates, salinity distributions, and selected water quality and biological variables within the Alafia River and its estuary.
2. Monitor withdrawals from the Alafia River at the withdrawal point and evaluate streamflow data for the river at all applicable locations.
3. Evaluate the ecological relationships of the Alafia River and its estuary to freshwater flows.
4. Monitor selected water quality and biological variables in order to determine if the ecological characteristics of the river and its estuary related to freshwater flow change over time.
5. Determine the relative effect of permitted withdrawals from the Alafia River on any ecologic changes that may occur in the river and its estuary.
6. Determine if these withdrawals cause or significantly contribute to any unacceptable environmental impacts that the river and its estuary exhibit as a result of changes in freshwater flows.
7. Coordinate with appropriate agencies which have or are currently collecting data which can be incorporated into the HBMP to avoid duplication of effort and to facilitate the most efficient use of resources.

HBMP reports will be submitted to the District according to the time frame established in the final approved HBMP plan. The periodic cycle for these reports will include yearly Data reports and periodic Interpretive reports that will be submitted according to a specific schedule which will be established in the final approved HBMP plan.

On an annual basis, the Permittee shall submit a Data report of all raw data collected during the past year. The Data reports will be submitted in tabular form with text limited to an explanation of variable names and a description of any problems encountered or important observations made during the monitoring year. This information shall be included in the Annual Report for this permit.

At the end of selected years specified in the final approved HBMP plan, the Permittee will submit Interpretive reports that will include comprehensive analyses of all data collected to date that specifically address the objectives of the HBMP. Qualitative and quantitative analyses shall be presented in the Interpretive reports to evaluate the interactions of hydrologic conditions and withdrawals on streamflow, inundation of the river channel and its floodplain, nutrient loading, salinity distributions in the estuary, and the response of related water quality and biological variables. The Interpretive reports will also include an appendix that provides all raw data collected during the previous year, thus fulfilling the requirement for the Annual Report for that year. Upon

completion of each cycle of the HBMP, a draft HBMP Interpretive report shall be submitted to the District as part of the overall Annual report. The District shall review and provide written comments within 45 days of the submittal of each draft HBMP Interpretive report. Final Interpretive reports shall be submitted by the Permittee within 90 days of receipt of District comments.

The District will review the results of these reports to determine if the withdrawals have or are expected to result in unacceptable environmental impacts to the natural resources of the Alafia River and its estuary as addressed in Part 4 of the District's Basis of Review for Water Use Permit Applications. If unacceptable environmental impacts have or are expected to occur due to the withdrawals, then the District shall require a revision to the withdrawal schedule.

B. **AERIAL PHOTOGRAPHY**

The Permittee shall conduct aerial photographic reconnaissance of all water supply facilities encompassed within this permit, all environmental monitoring station locations, and surrounding areas as approved by the District. The reconnaissance areas must be submitted in writing within 120 days of permit issuance for approval by the District. The approved photographic reconnaissance shall occur on a semi-annual basis (April-May and October-November) unless another schedule is identified as part of the final approved HBMP plan. Photography shall be color infrared at 1"=2000'± scale with 60% forward overlap and 30% side overlap. Original or first generation positive transparencies of the flight photography and an analysis of the flight's photography shall be included in the Annual Report submitted to the District by July 1 of each year. This photography shall be used to detect landscape changes over an extended period of time and when the HBMP monitoring detects potential changes at monitoring sites.

9. **WUCA CONSERVATION REPORTING**

As part of the Annual Report required by this permit, the Permittee shall submit the following information relative to each Demand Planning Area or Member Government serviced by this permit:

A. **PER-CAPITA USE**

1. The population served;
3. Significant deducted uses, the associated quantity, and conservation measures applied to these uses;
3. Total withdrawals;
4. Treatment losses;
5. Environmental mitigation quantities;
6. Sources and quantities of incoming and outgoing transfers of water and wholesale purchases and sales of water, with quantities determined at the supplier's departure point;
7. Documentation of reuse and desalination credits, if taken.
8. The gross per-capita use rate, and, at the Permittee's option, an adjusted (compliance) per-capita use rate, as specified in the Basis of Review for Water Use Permit Applications, that reflects adjustments for significant users, treatment losses, environmental mitigation, and incentives for reuse and the use of desalination sources.

B. WATER CONSERVING RATE STRUCTURE

A copy of the official rate-structure document for each Member Government serviced by this Permit in effect at the time the Annual Report is compiled.

C. WATER AUDIT PROGRAM

Documentation of the results of the ongoing water audits for each Member as well as Tampa Bay Water's distribution system serviced by this permit.

D. RESIDENTIAL WATER USE

The total number of connections and total water use for:

1. Residential customers for each of the following categories:
   a) single family dwelling units served;
   b) multi-family dwelling units served and the number of equivalent residential units represented; and
   c) mobile homes served.

   (Where separate indoor and outdoor meters exist, residential water use quantities shall include both the indoor and outdoor water uses associated with the dwelling units, including irrigation water.)
2. Commercial customers
3. Industrial customers
4. Public/Institutional customers
5. Wholesale customers, including the name and quantity sold to each individual customer
6. Other customers

E. RECLAIMED WATER USE

1. The quantity of total reclaimed water provided by the Member Governments serviced by this permit for reuse on both a total annual average daily and monthly basis;
2. For all individual customer reuse connections with line sizes of 4-inches or greater, a listing of:
   a) account name and address;
   b) location of connection(s) by latitude - longitude;
   c) line size;
   d) meter (yes or no); and
   e) metered quantities, if metered.
3. The annual average daily quantities, monthly quantities, locations, and methods of disposal for effluent that is not reused.
4. A map or plan depicting the area of reuse service; including areas projected to be added within the next year, if possible.

10. WATER QUANTITY AND HYDROLOGIC MONITORING CONDITIONS

A. FLOW METERING

1. INSTALLATION, MAINTENANCE AND OPERATION OF FLOW METERS

Upon construction of the Project pumping facilities, flow measuring devices shall be installed at the following locations:

District ID Nos./ Permittee ID Nos.	Location
1 / ALF-1	Alafia River Regional Pumping Station intake structure pipeline from the River near Bell Shoals Road
2 / ALF-2	Influent Meter into the Regional Water Treatment Plant

Flow measuring devices shall be non-resettable, totalizing flow meters or other flow measuring devices as approved in writing by the Regulation Department Director. Such devices shall have and maintain an accuracy within five percent of the actual flow as installed. Total flow and meter readings from the listed intake and effluent lines shall be recorded on a daily basis and reported to the Permit Data Section, Records and Data Department (using District forms) on or before the fifteenth (15th) day of the following month. Monthly flow data shall be submitted on the District-supplied scanning card provided to the Permittee for that purpose, or other District-approved electronic form of data submittal, to the Permit Data Section, Records and Data Department, on or before the 15th day of the following month. If a metered withdrawal is not utilized during a given month, a report shall be submitted to the Permit Data Section, Records and Data Department, indicating zero gallons.

a) **SCADA-EQUIPPED FACILITIES**

For flow monitoring points equipped with SCADA (Supervisory Control and Data Acquisition), the Permittee shall maintain the following for each flow monitoring point: one venturi-type flow meter or other approved flow meter, one non-resettable totalizing recording device at each monitoring point, one remote transmitter unit that transfers the recorded flow data by telemetry to the remote SCADA master station. The SCADA master station flow data shall be recorded on a daily basis for each flow monitoring point and for the combined facility pumpage. For all SCADA-equipped monitoring points, the non-resettable totalizing recording device at each monitoring point shall be recorded on an annual basis, and reported in the Annual Report with a comparison to the SCADA-retrieved cumulative flow for each monitoring point. If and when any the facility becomes equipped with SCADA, the provisions of this paragraph shall apply.

b) **TOTAL FACILITY PUMPAGE**

Flow data recorded at the Alafia River intake structure pipeline shall represent the total surface water source pumpage for the Alafia River Project.

2. METER CALIBRATION, TESTING AND MAINTENANCE PROGRAM
The Permittee shall undertake regular and routine testing, calibration and preventive/corrective maintenance for all flow meters to ensure that they have and maintain an accuracy within 5 percent of actual flow as installed. The Permittee shall describe the standard operating procedures for the Meter Calibration, Testing and Maintenance Program in a report submitted for District approval by January 1, 2000. The report shall include a description of methods to be used for estimation of flow from a withdrawal point during a meter malfunction. Changes to the program shall be subject to District approval.

3. NOTIFICATION AND CORRECTION OF METERING DISCREPANCIES
Within 3 working days of identification of a meter that is not providing an accuracy within 5 percent of actual flow as installed, the Permittee shall inform the District in writing of the facts regarding the problem. Until the problem is corrected, flows through the metered point shall be estimated, using methods identified in the Meter Calibration, Testing and Maintenance program. The Permittee shall correct the problem within 15 days following identification of the problem, or discontinue use of the withdrawal point until the problem is corrected, unless an extension is confirmed in writing from the Regulation Department Director.

4. ANNUAL REPORT REGARDING FLOW METERS
The Annual Report shall summarize activities conducted under the Meter Calibration, Testing and Maintenance Program to maintain accuracy of withdrawal metering. For SCADA equipped monitoring points, the non-resettable totalizing recording device at each monitoring point shall be recorded on an annual basis, and reported in the Annual Report with a comparison to the SCADA-retrieved cumulative flow for each monitoring point.

5. DESTINATION OF WATER
The Permittee shall provide a monthly summary report of the total quantity of water delivered to each Member Government. This amount will be estimated based upon the percentage of total water delivered to each Member from the Tampa Bay Water Interconnected Regional Water Supply System. The Permittee shall also provide a summary in the Annual Report showing the volume of water withdrawn during the annual reporting period from the Alafia River intake, the water delivered from the Alafia River to a reservoir (if constructed), and the water delivered from the Alafia River to the Regional Water Treatment plant for distribution to the Interconnected Regional Water Supply System.

B. RAINFALL AND EVAPORATION MONITORING
The Permittee shall monitor the rain gauges and evaporation pan at the sites and at the frequencies listed below. The sites listed are currently monitored in accordance with the South Central Hillsborough Regional Wellfield (SCHRWF) Water Use Permit (WUP No. 204352). The Permittee may utilize data obtained for the SCHRWF to satisfy the permit monitoring requirements for this condition. However, should monitoring at the sites listed cease to be required under the SCHRWF WUP, the Permittee shall be required to monitor the listed sites for this permit, or establish new, District approved sites to replace the lost sites.

The sites listed shall continue to be monitored and reported in accordance with the SCHRWF permit. Data from these sites shall not be reported for this permit as long as the data is submitted in support of the SCHRWF permit. For the purpose of this permit, data obtained from the listed sites during the annual reporting period shall be summarized in the Annual Report required by this permit. Any proposed changes to the recording frequency and locations shall be approved by the Regulation Department Director, and shall be summarized in the annual report as described in the Annual Reporting Special Condition.

District ID No.	Permittee ID No.	Latitude/ Longitude	Frequency
NA[1]	SC1RG	275151/821212	Continuous
NA	SC4RG	275151/820842	Continuous
NA	SC1EVAP[2]	271551/821213	Continuous
NA	SCHM2RG	275614/820954	Continuous
NA	SC17RG	275204/820458	Continuous

[1] District ID Nos. are not applicable; sites are currently permitted under SCHRWF.
[2] Permittee ID No. SC1EVAP is an evaporation station; all others in this table are rainfall.

C. STAGE, STREAMFLOW AND SPRING DISCHARGE MONITORING

1. EXISTING MONITORING

The Permittee shall monitor the average daily stage and estimated average daily flow for the Alafia River, and the average daily stage and spring discharge for Lithia Springs at the sites and frequencies listed below. The sites listed are currently monitored in accordance with the South Central Hillsborough Regional Wellfield (SCHRWF) Water Use Permit (WUP No. 204352). The Permittee may utilize data obtained for the SCHRWF to satisfy the permit monitoring requirements for this condition. However, should monitoring at the sites listed cease to be required under the SCHRWF WUP, the Permittee shall be required to monitor the listed sites for this permit, or establish new, District approved sites to replace the lost sites.

The sites listed shall continue to be monitored and reported in accordance with the SCHRWF permit. Data from these sites shall not be reported for this permit as long as the data is submitted in support of the SCHRWF permit. For the purpose of this permit, data obtained from the listed sites during the annual reporting period shall be summarized in the Annual Report required by this permit. Any proposed changes to the recording frequency and locations shall be approved by the Regulation Department Director, and shall be summarized in the annual report as described in the Annual Reporting Special Condition.

District ID No.	Permittee ID No.	Water Body	Latitude/ Longitude	Frequency
NA[1]	AR-L[2]	Alafia	275209/821225	Continuous
NA	NPRONG[3]	Alafia	275307/820614	Continuous
NA	SPRONG[4]	Alafia	274733/820652	Continuous
NA	LS	Lithia Sp.	275150/821349	Weekly

[1] District ID Nos. are not applicable; sites are currently permitted under SCHRWF.
[2] AR-L =Alafia River at Lithia Pinecrest
[3] NPRONG = North Prong of the Alafia River at County Road 676
[4] SPRONG = South Prong of the Alafia River at Jamerson Road

2. **ADDITIONAL MONITORING**
By December 31, 1999, the Permittee shall install a stage recorder as identified below. Stream stage shall be recorded at the frequency identified below, and reported to the Permit Data Section, Records & Data Department (using District forms) on or before the fifteenth day of the following month. Stream stage shall be reported as average daily values. The frequency of stage recording may be modified by the Regulation Department Director, as necessary to ensure the protection of the resource. The stage recorder shall be surveyed and referenced to the NAVD, and a copy of the survey including location and latitude and longitude shall be submitted with the first stage data report to the District.

District ID No.	Permittee ID No.	Water Body	Latitude/ Longitude	Frequency
100	AR-BS[1]	Alafia	275128.75/821613.84	Continuous

[1] AR-BS = Alafia River near Bell Shoals Road

11. **ALAFIA RIVER REGIONAL PUMPING FACILITIES OPERATIONS AND REGULATORY LEVELS**
The regional pumping facility for the Alafia River as part of this permit includes a single surface water withdrawal intake structure on the Alafia River near Bell Shoals Road bridge. Withdrawals at the Alafia River regional pumping facility shall be subject to the following constrains:

A. The flow at Bell Shoals Road will be determined by the following formula:

Alafia River Flow at the Lithia Gauge (cfs) x ((335 sq. mi. + 39.2 sq. mi.) / 335 mi.) + Flow from Lithia Springs (cfs) = Alafia River Flow at Bell Shoals Road

B. No withdrawals will be made from the regional withdrawal intake on the Alafia River when estimated flow at Bell Shoals Road is less than 124 cfs.

C. The volume of withdrawal shall not exceed 10 percent of the previous day's estimated average daily flow rate of the Alafia River at Bell Shoals Road.

D. The amount of the peak withdrawal will not exceed 80 cfs.

12. **INVESTIGATION OF COMPLAINTS**
The Permittee shall investigate complaints related to withdrawals. This condition shall be an ongoing effort for the duration of this permit. All complainants will make an application to the Permittee and must receive an investigation report, including any action to be taken within a reasonable time by the Permittee. The Permittee shall file a report of the complaint, the findings of facts, and any mitigation

action taken or to be taken by the Permittee, to the Regulation Department Director for review and approval within 90 days of the receipt of any complaint. The report shall include:

A. The name and address of each complainant;
B. The date and nature of the complaint;
C. A summary of the Permittee's investigation;
D. A summary of the Permittee's determination, including details of any mitigation activities; and
E. Cost of mitigation activity for each complaint.

Full mitigation shall not exceed 180 days from complaint receipt, unless additional time is granted by the District. A summary of the investigations of complaint and mitigation activities, related to the Alafia River Project operations for the annual reporting periods shall be provided, and reported in the Annual Report.

13. **BASIN PLAN**

The Permittee will develop and implement a Watershed Protection Program and Action Plan for the Alafia River watershed. The overall goal of this program will be to protect and improve the water quality in the river, especially the water quality upstream of the proposed withdrawal point. The Permittee will use its best efforts to foster the development of a citizen and userbased Stewardship Group for the river, and will assist such a group in its efforts to protect the quantity and quality of water in the Alafia River. The Permittee will review the published literature on watershed protection efforts and will develop an initial comprehensive listing of possible actions to be considered for the Alafia. The Permittee will then determine the feasibility of each of these possible actions with respect to the Alafia River in cooperation with the District, Hillsborough County, and citizens / organizations / businesses along or within the watershed. Actions to be considered include but are not limited to: (a) fee simple acquisition of lands adjacent to the river and its tributaries; (b) purchasing development rights of lands adjacent to the river/tributaries; (c) education/partnership programs with agricultural businesses and homeowner-associations on the use of Best Management Practices for fertilizers and pesticides; (d) identification of major non-point source and point source discharges and estimation of pollutant loadings from each; (e) citizen-based monitoring and stewardship actions to protect and improve water quantity and quality. The Permittee will provide a yearly status report to the District on the progress toward the development and implementation of the Watershed Protection Program and Action Plan. Yearly status reports should include descriptions of the extent to which the goals identified have been achieved. The Permittee will implement water quality sampling necessary to adequately document the improvements to water quality resulting from the implementation of the Action Plan.

14. **ANNUAL REPORT**

A. **GENERAL INFORMATION AND DATA**

The Permittee shall provide a comprehensive and concise annual report ("Annual Report") to the District which describes the operation of the Alafia River Regional Pumping Facility covered under this permit. Information collected through the following conditions of this permit shall be included in this Annual Report:

The Operations Plan
WUCA Conservation Reporting
Water Distribution Data
Meter Calibration, Testing and Maintenance Program

Data sources shall be referenced in the Annual Report, but no raw data shall be included in the report. Only essential text, graphs, and tables should be included in the report. Six copies of the Annual Report shall be submitted to the Permits Data Section by July 1 of each year. The Annual Report shall cover the preceding water year period from October 1 to September 30.

Operations Plan implementation, water quantity and water distribution information collected for this permit shall be summarized for the annual reporting period. A population estimate for the annual reporting period, which includes only those served by the municipal system within the defined service areas, shall be provided and referenced. The quantities of water delivered to and used within the service area of each member government of Tampa Bay Water over the annual reporting period shall be used with the population estimate to determine a per capita use rate for the period. Any changes to the service area boundaries shall be described in the text and plotted on a map.

B. **ALAFIA RIVER SURFACE WATER WITHDRAWAL ANNUAL REPORT**

The Permittee shall provide a concise individual annual report ("Surface Water Withdrawal Annual Report") to the District which provides a compilation of data collected during the course of the year as part of the final approved HBMP plan. The Surface Water Withdrawal Annual Report shall concisely summarize the elements listed below, and any other elements within this permit which require annual environmental reporting, with emphasis on the interactions between these elements, where appropriate. Six copies of each Surface Water Withdrawal Annual Report shall be submitted to the Permits Data Section by July 1 of each year. The Annual Reports shall cover the preceding water year from October 1 to September 30.

1. **HYDROLOGIC AND ENVIRONMENTAL CONDITIONS**

Data collected as a part of the **MONITORING OF ENVIRONMENTAL CONDITION - HYDROBIOLOGICAL MONITORING** Special Conditions shall be summarized and analyzed by the Permittee to document any effects of surface water withdrawals on the Alafia River and its estuary. Each annual report will contain a HBMP data report of all raw data collected during the past year. A brief summary of any recommended changes to the monitoring requirements shall also be included. More comprehensive analyses for the HBMP shall be included in the HBMP Interpretive reports which shall be submitted for each periodic cycle as defined in the final approved HBMP plan.

The Permittee shall provide a comprehensive and concise individual annual report ("Surface Water Withdrawal Annual Report") to the District which provides an assessment of the water resources and environmental systems associated with the Alafia River covered under this permit. An assessment of the water resources and environmental systems in the area of the Alafia River is required for all sections listed below as defined in the approved HBMP. The Surface Water Withdrawal Annual Report shall concisely summarize the elements listed below, and any other elements within this permit which require annual environmental reporting, with emphasis on the

interactions between these elements, where appropriate. Six copies of each Surface Water Withdrawal Annual Report shall be submitted to the Permits Data Section by July 1 of each year. The Annual Reports shall cover the preceding water year from October 1 to September 30.

2. INVESTIGATION OF COMPLAINTS
A summary of the investigations of all complaints concerning adverse impacts to existing legal users, land uses and environmental features, as well as all of the Permittee's efforts to mitigate such adverse impacts, shall be provided for each reporting period. This summary shall include:

a) Number and type of complaint(s);
b) Number and type of mitigation activity(ies); and
c) Number and type of complaint(s) which did not require mitigation activity.

3. OTHER
All reports specified to be included in the Surface Water Withdrawal Annual Reports by conditions of this permit shall be so included.

15. TIME EXTENSIONS
Unless specified otherwise, time extensions to condition deadlines may be granted upon written request to the District, provided that the request is made prior to the deadline, the Permittee has demonstrated a good faith effort in meeting the deadline set forth in the condition, and a reasonable modified deadline is proposed by the Permittee.

16. MODIFICATION OR REVOCATION OF PERMIT BY DISTRICT
Nothing in this permit is intended, nor shall anything herein be construed, to replace, limit or impair the District's right to modify or revoke this permit in accordance with applicable law.

17. OTHER LIMITATIONS AND REQUIREMENTS
The remedies for violation of this permit are cumulative. Thus, the pursuit of one remedy shall not preclude the pursuit of other remedies provided by this permit or by applicable law. The pursuit of any remedy provided in this permit or by applicable law shall not constitute a forfeiture or waiver of any other remedy. The waiver of one violation shall not be deemed a waiver of any other violation. Forbearance to enforce one or more of the remedies provided by this permit or by applicable law on an event of violation shall not be deemed or construed to constitute a waiver of the right to any remedy for that violation.

18. MINIMUM FLOWS FOR ALAFIA RIVER
The District anticipates establishment of minimum flows for the Alafia River during the term of this permit. If during the course of consideration of minimum flows for the Alafia River, it is determined that additional hydrologic, biologic, or chemical data is needed in order to assess minimum flows, the District and the Permittee shall work collaboratively to achieve a mutually acceptable data collection program. Should a mutually acceptable program not be accomplished, the District may require modification of this permit.

Once minimum flows are adopted, this water use permit may be subject to additional comprehensive review by the District during the term of this permit. The decision as to the need for further modification or review of the permit shall be made by the District after adoption of minimum flows for the Alafia River system. All withdrawals from the Alafia River shall be consistent with the adopted minimum flow. Any requests to increase the yield of this project through modification of the withdrawal schedule shall be through formal application to the District.

STANDARD CONDITIONS:

1. The Permittee shall comply with the Standard Conditions attached hereto, incorporated herein by reference as Exhibit "B" and made a part hereof.

Authorized Signature
SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT

EXHIBIT A

Alafia River Withdrawal Schedule Applied to 1977 through 1996 Flows

YEARLY SUMMARY		
DATE	ANNUAL AVERAGE FLOW (MGD)	ANNUAL AVERAGE WITHDRAWAL (MGD)
1977	116	9.99
1978	201	17.71
1979	417	28.95
1980	212	20.87
1981	134	10.26
1982	241	21.16
1983	342	28.34
1984	198	17.99
1985	117	8.24
1986	158	13.66
1987	264	23.05
1988	285	20.08
1989	139	12.25
1990	99	7.21
1991	201	14.16
1992	134	9.84
1993	206	18.11
1994	293	23.05
1995	304	25.54
1996	226	19.69
AVERAGE	214	17.51

40D-2
Exhibit "B"

WATER USE PERMIT CONDITIONS

STANDARD CONDITIONS

1. If any of the statements in the application and in the supporting data are found to be untrue and inaccurate, or if the Permittee fails to comply with all of the provisions of Chapter 373, F.S., Chapter 40D, or the conditions set forth herein, the Governing Board shall revoke this permit in accordance with Rule 40D-2.341, following notice and hearing.

2. This permit is issued based on information provided by the Permittee demonstrating that the use of water is reasonable and beneficial, consistent with the public interest, and will not interfere with any existing legal use of water. If, during the term of the permit, it is determined by the District that the use is not reasonable and beneficial, in the public interest, or does impact an existing legal use of water, the Governing Board shall modify this permit or shall revoke this permit following notice and hearing.

3. The Permittee shall not deviate from any of the terms or conditions of this permit without written approval by the District.

4. In the event the District declares that a Water Shortage exists pursuant to Chapter 40D-21, the District shall alter, modify, or declare inactive all or parts of this permit as necessary to address the water shortage.

5. The District shall collect water samples from any withdrawal point listed in the permit or shall require the Permittee to submit water samples when the District determines there is a potential for adverse impacts to water quality.

6. The Permittee shall provide access to an authorized District representative to enter the property at any reasonable time to inspect the facility and make environmental or hydrologic assessments. The Permittee shall either accompany District staff onto the property or make provision for access onto the property.

7. Issuance of this permit does not exempt the Permittee from any other District permitting requirements.

8. The Permittee shall cease or reduce surface water withdrawal as directed by the District if water levels in lakes fall below applicable minimum water level established in Chapter 40D-8 or rates of flow in streams fall below the minimum levels established in Chapter 40D-8.

9. The Permittee shall cease or reduce withdrawal as directed by the District if water levels in aquifers fall below the minimum levels established by the Governing Board.

10. The Permittee shall practice water conservation to increase the efficiency of transport, application, and use, as well as to decrease waste and to minimize runoff from the property. At such time as the Governing Board adopts specific conservation requirements for the Permittee's water use classification, this permit shall be subject to those requirements upon notice and after a reasonable period for compliance.

11. The District may establish special regulations for Water Use Caution Areas. At such time as the Governing Board adopts such provisions, this permit shall be subject to them upon notice and after a reasonable period for compliance.

12. The Permittee shall mitigate, to the satisfaction of the District, any adverse impact to existing legal uses caused by withdrawals. When adverse impacts occur or are imminent, the District shall require the Permittee to mitigate the impacts. Adverse impacts include:
    a. A reduction in water levels which impairs the ability of a well to produce water;
    b. Significant reduction in levels or flows in water bodies such as lakes, impoundments, wetlands, springs, streams or other watercourses; or
    c. Significant inducement of natural or manmade contaminants into a water supply or into a usable portion of any aquifer or water body.

13. The Permittee shall mitigate to the satisfaction of the District any adverse impact to environmental features or offsite land uses as a result of withdrawals. When adverse impacts occur or are imminent, the District shall require the Permittee to mitigate the impacts. Adverse impacts include the following:
    a. Significant reduction in levels or flows in water bodies such as lakes, impoundments, wetlands, springs, streams, or other watercourses;
    b. Sinkholes or subsidence caused by reduction in water levels;
    c. Damage to crops and other vegetation causing financial harm to the owner; and
    d. Damage to the habitat of endangered or threatened species.

14. When necessary to analyze impacts to the water resource or existing users, the District shall require the Permittee to install flow metering or other measuring devices to record withdrawal quantities and submit the data to the District.

15. A District identification tag shall be prominently displayed at each withdrawal point by permanently affixing the tag to the withdrawal facility.

16. The Permittee shall notify the District within 30 days of the sale or conveyance of permitted water withdrawal facilities or the land on which the facilities are located.

17. All permits issued pursuant to these Rules are contingent upon continued ownership or legal control of all property on which pumps, wells, Withdrawals or other water withdrawal facilities are located.

RECEIVED

00581

Doc No #

File Div/Proj No
46081

File Sec.
Permit

File:

cc: Gates
Conn

SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT
INDIVIDUAL WATER USE PERMIT NO. 2011796.00
FOR
TAMPA BAY WATER, A REGIONAL WATER SUPPLY AUTHORITY
TAMPA BYPASS CANAL WATER SUPPLY PROJECT
(INCLUDING HILLSBOROUGH RIVER WATER SOURCE)

EXPIRATION DATE: December 31, 2010 **PERMIT ISSUE DATE:** March 30, 1999

THE PERMITTEE IS RESPONSIBLE FOR APPLYING FOR A RENEWAL OF THIS PERMIT PRIOR TO THE EXPIRATION DATE IN ACCORDANCE WITH DISTRICT RULES, WHETHER OR NOT THE PERMITTEE RECEIVES PRIOR NOTIFICATION BY MAIL. CONTINUED USE OF WATER AFTER THE EXPIRATION DATE IS A VIOLATION OF DISTRICT RULES, EXCEPT AS OTHERWISE PROVIDED BY APPLICABLE LAW. VIOLATION OF THE CONDITIONS OF THIS PERMIT CONSTITUTES A VIOLATION OF APPLICABLE LAW.

This permit, issued under the provision of Chapter 373, Florida Statutes and Florida Administrative Code 40D-2, authorizes the Permittee to withdraw the quantities outlined herein, and requires various activities to be performed by the Permittee as outlined by the Special Conditions. This permit, subject to all terms and conditions, meets all District permitting criteria.

GRANTED TO: Tampa Bay Water, A Regional Water Supply Authority
2535 Landmark Drive, Suite 211
Clearwater, FL 34621

The above named party is considered the Permittee in this document and is solely responsible for performance of the terms and conditions of this permit.

ABSTRACT: This Permit was initially scheduled for consideration by the District's Governing Board on December 15, 1998. However, a petition was received on December 4, 1998, from Mr. John R. Mohme in objection to the District's Proposed Agency Action dated November 13, 1998. On February 17, 1999, the Petitioner signed a Joint Stipulation to Dismissal of the petition, which releases the proposed permit for Governing Board action.

It is the Governing Board's intent that the Permittee reduce withdrawals from its existing Central System, comprised of 11 wellfields located in Pasco, Hillsborough and Pinellas Counties; and that reasonable present and future demand be satisfied solely from environmentally sustainable sources of supply. To this end, the District, Tampa Bay Water and its Member Governments, consisting of Pasco, Hillsborough, and Pinellas counties, City of St. Petersburg, City of Tampa, and City of New Port Richey, entered into the Northern Tampa Bay New Water Supply and Ground Water Withdrawal Reduction Agreement (Partnership Agreement) approved May 14, 1998. In general, the agreement consolidates the individual wellfield permits into one permit for the Central System, and outlines a specific timeframe, plan of actions and requirements to achieve the withdrawal reductions from the system. Most critical to achieving the Central System reductions is obtaining new environmentally sustainable sources of water supplies to allow for replacement of restricted quantities. Tampa Bay Water prepared a New Water Plan which outlines environmentally sustainable sources of water supplies for replacement of restricted quantities. The District's Governing Board approved the New Water Plan on August 25, 1998. The New Water Plan specifies a number of proposed projects to meet the following objectives; having one or more projects permitted, constructed, in operation and providing at least 38 mgd of new supply to the Central System by December 31, 2002; By December 31, 2007 having the remaining projects permitted, constructed, in operation and providing an

additional 47 mgd, for a total of at least 85 mgd of new water supply for regional distribution to the Tampa Bay Water Member Governments. The District will be providing co-funding for eligible projects in accordance with the New Water Sources Funding Agreement between the District and Tampa Bay Water. This Application represents one of the new water supply source projects of the New Water Plan which is eligible for co-funding. The water use authorized by this permit is for the purpose of providing additional new water supply quantities for Tampa Bay Water's Central System. The allocation of the water use quantities for replacement and rotation purposes is pursuant to the Partnership Agreement.

This is a new application for surface water withdrawals from the TBC to be used for public supply in Tampa Bay Water's Interconnected Regional Water Supply System service area located within the Northern Tampa Bay, the Eastern Tampa Bay and the Southern Water Use Caution Areas (WUCAs). This application includes two surface water withdrawal intake structures on the TBC, one located on the north side of the TBC Structure S-162, withdrawing water from the TBC's Middle Pool, and one on the south side of S-162, withdrawing water from the TBC's Lower Pool. In addition, surface water will be diverted from the Hillsborough River through the Harney Canal Structure 161 to be combined with water in the TBC for withdrawal at the two surface water withdrawal intake structures near S-162. Both surface water withdrawals and diversions are located within the Northern Tampa Bay WUCA. Tampa Bay Water's Interconnected Regional Water Supply System service area includes the communities of Pasco, Hillsborough, and Pinellas Counties, City of St. Petersburg, City of Tampa, and City of New Port Richey. An Environmental Resource Permit (ERP) is required for the implementation of this Water Use Permit. The Permittee has submitted a complete ERP application (29-0144697-3-001) to the Florida Department of Environmental Protection for this project.

Special Conditions are included to address pertinent concerns. Special Conditions include operational management levels, metering and reporting of pumpage, hydrologic monitoring (water levels, water quality, rainfall, evaporation, streamflow), ecologic monitoring and mitigation through an approved Hydrobiological Monitoring Program (HBMP), complaint investigation and mitigation, WUCA conditions, and submittal of a Surface Water Diversion Annual Report. With the proposed permit conditions applied, the application meets all Chapter 40D-2.301 rule criteria.

WITHDRAWAL QUANTITIES TABLES

TOTAL QUANTITIES AUTHORIZED UNDER THIS PERMIT (in MGD)	
Diversion Rate	**Hillsborough River Discharge Rate at Tampa Dam**
0 MGD	**< 65 MGD**
6.5 MGD to 9.7 MGD (10% of flow)	**65 MGD to 97 MGD**
9.7 MGD to 42 MGD (10% to 30% of flow - see Exhibit "A")	**97 MGD to 139 MGD**
42 MGD to 194 MGD (30% of flow)	**139 MGD to 647 MGD**
194 MGD Maximum	**> 647 MGD**

TOTAL QUANTITIES AUTHORIZED UNDER THIS PERMIT (in MGD)	
Withdrawal Rate	**Tampa Bypass Canal Discharge Rate at S-160**
0 MGD	**< 7 MGD**
0 MGD to 65 MGD (80% of total flow , Flow at S-160 cannot be less than 7 MGD)	**7 MGD to 81 MGD**
65 MGD Maximum	**> 81 MGD**

Actual quantities are based on percentage withdrawals identified in the **PUMPING SCHEDULE AND AVAILABLE QUANTITIES** Special Condition of this permit. The Maximum Daily withdrawal is limited by system pumping capacity. Refer to Exhibit "B" for historical analysis of flows in the Tampa Bypass Canal and the Hillsborough River as an example of the application of the withdrawal quantities table set forth above.

PROPERTY LOCATION: Central Hillsborough County. Paired withdrawal sites located on a small tract of land on the east side of the Tampa Bypass Canal, adjacent to Structure S-162, 1 mile south of I-4 / TBC overpass.

TYPE OF APPLICATION: New

WATER USE CAUTION AREA: Northern Tampa Bay

APPLICATION FILED: June 18, 1998

ACRES: 0.00 Owned (To be acquired within 2 years)
629,536.00 Serviced
(Owned) + 629,536.00 Owned and Serviced

APPLICATION AMENDED: N/A

WATER USE: Regional Public Supply

SERVICE AREA NAME: Tampa Bay Water's Interconnected Regional Water Supply System

USE TYPE:

Residential Single Family
Residential Multi-Family
Commercial/Industrial Non Process
Unaccounted Use
Lawn and Landscape
Fire Fighting/Testing

Gross Per Capita Use: 137 gpcd

DISTRICT/ PERMITTEE I.D. NO.	SEC./ TWN./ RNG.	LOCATION LAT/LONG	EQUIVALENT DIAMETER (INCHES)
1 / TBC-1	06/29/20	275858.83/ 822105.26	96
2 / TBC-2	01/29/19	275854.63/ 822111.51	96

PERMIT SPECIAL CONDITIONS

All conditions referring to approval by the Regulation Department Director, Resource Regulation, shall refer to the Director, Tampa Regulation Department, Resource Regulation.

1. APPROVALS

   All conditions referring to approval by the Regulation Department Director, shall refer to the Director, Tampa Regulation Department.

2. INDIVIDUAL WITHDRAWAL QUANTITIES

   The water use quantities listed above for the TBC Regional Pumping Station intake pipelines from the TBC Middle Pool and Lower Pool near S-162 provide for flexibility in pumping schedules and are not intended to dictate the distribution of pumpage from each of the permitted sources. The Permittee may make adjustments in pumpage distribution as necessary so long as adverse impacts to water resources, environmental systems, and existing legal users do not result and other conditions of this permit are satisfied. In all cases, the total withdrawal quantities are limited to the withdrawal schedule set forth above.

3. WITHDRAWAL LIMITATIONS

Withdrawals from the Tampa Bypass Canal will be limited to the periods of time when flows through the TBC and the Hillsborough River, as measured at S-160 and the Tampa Dam, in accordance with the **TAMPA BYPASS CANAL REGIONAL PUMPING FACILITIES OPERATIONS AND REGULATORY LEVELS** Special Condition of this permit, are greater than 7 MGD and 65 MGD, respectfully. Operation of the pumping facilities associated with this project shall not interfere with the Hillsborough River reservoir augmentation requirements as specified in the Amended and Restated Interlocal Agreement (June 10, 1998), Section 3.08 (D)(1), which states that Tampa Bay Water's Harney Pumping Station on the TBC shall augment the Hillsborough River Reservoir within the permitted quantity range as specified in Water Use Permit No. 206675.03 when the draft from Tampa's Hillsborough River Water Treatment Plant exceeds the flow in the Hillsborough River as measured at the Morris Bridge Hillsborough River Flow gauge and the Hillsborough River Reservoir stage is below 22.5 feet MSL as measured at the Hillsborough River Reservoir dam.

4. PUMPING SCHEDULE AND AVAILABLE QUANTITIES

The pumping facilities associated with this permit will be located at the TBC, near Structure 162. Water available from the Hillsborough River Water Source will be diverted through Structure 161 (S-161) into the TBC and combined with quantities available from the TBC Source for withdrawal at Tampa Bay Water's Regional Pumping Facilities. The amount of water diverted from the Hillsborough River through S-161 into the TBC specifically for water supply purposes shall not exceed the quantities listed in Table A-1. Quantities available for regional withdrawal from the Tampa Bypass Canal Source, independent of water diverted into the Canal from the Hillsborough River Water Source shall not exceed the quantities listed in Table B-1.

A. HILLSBOROUGH RIVER WATER SOURCE: The average daily discharge at the Hillsborough River Dam, as measured on the previous day, will be the standard utilized to calculate the quantity of water available for diversion from the Hillsborough River to the TBC for regional use. The diversion of water from the Hillsborough River through S-161 into the TBC for water supply purposes, and the withdrawal of those diverted quantities for regional use will be based on the schedule in Table A-1 below.

B. TAMPA BYPASS CANAL WATER SOURCE: The average daily discharge at Control Structure 160 (S-160) on the TBC Lower Pool, as measured on the previous day, will be the standard utilized to calculate the quantity of water available for withdrawal from the TBC Source for distribution to the regional system. The withdrawal rate will be based on the schedule in Table B-1 below.

C. MAXIMUM COMBINED WITHDRAWALS: The maximum combined withdrawal rate from the Tampa Bay Water Regional Pumping Facilities on the TBC shall not exceed 258 MGD or 400 CFS.

TABLE A-1 DIVERSIONS FROM HILLSBOROUGH RIVER

Maximum Diversion Rate - MGD / CFS	**Hillsborough River Discharge Measured at Tampa Dam in Millions of Gallons Per Day (MGD) / Cubic feet per Second (CFS)**
0 (no Diversion)	0 to 65 / 0 to 100
10% of total flow	65 to 97 / 100 to 150
10% to 30% - sliding scale	97 to 141 / 150 to 215
30% of total flow	141 to 647 / 215 to 1001
194 / 300	Above 647 / 1001

TABLE B-1 WITHDRAWALS FROM THE TBC

Maximum Withdrawal Rate - MGD / CFS	**TBC Discharge Measured at Structure 160 in Millions of Gallons Per Day (MGD) / Cubic feet per Second (CFS))**
0 (no Withdrawal)	0 to 7 / 0 to 11
80% of total flow and flow at S-160 cannot be less than 7 MGD	7 to 81 / 11 to 125
65 / 100 cfs	Above 81 / 125

5. TAMPA BYPASS CANAL REGIONAL PUMPING FACILITIES OPERATIONS AND REGULATORY LEVELS

Regional pumping facilities proposed as part of this permit include water intake structures on both the Middle Pool and Lower Pool of the TBC in the immediate vicinity of Structure 162. These intake structures will enable water to be withdrawn from the Middle and Lower Pool of the TBC by a common pumping station located adjacent to S-162. Unless superseded by the provisions in the Coordination Plan Special Condition of this permit, withdrawals at the Tampa Bay Water Regional Pumping Facilities on the TBC shall be subject to the following constraints in addition to the limitations imposed in the Pumping Schedule and Available Quantities Special Condition.

A. 1. Withdrawals from the regional intake on the TBC Middle Pool will be limited to the following:

a) Quantities being diverted in accordance with Table A-1 from the Hillsborough River or,

b) Quantities available from the Tampa Water Resource Recovery Project or,

c) The TBC Middle Pool is at or above 14 feet NGVD and discharge at S-160 is greater than or equal to 100 cfs or the District is maintaining the elevation in the Middle Pool lower than 14 feet NGVD.

2. Withdrawals from the regional intake on the TBC Lower Pool will be limited to the following:

a) Quantities being diverted in accordance with Tables A-1 and B-1 from the Hillsborough River and/or TBC Lower Pool or,

b) The TBC discharge at S-160 is greater than or equal to 11 cfs.

B) The following structural constraints shall apply to regional withdrawals from the Middle Pool as limited by 5A1.a), 5A1.b), and 5A.1.c) above:

1. No withdrawals will be made when the surface water elevation in the TBC Middle Pool and Harney Canal, as read on the gauges at S-161 and S-162, is at or below twelve and a half (12.5) feet NGVD, or

2. The difference in the surface water elevations between the Harney Canal, as read on the east gauge at S-161, and the Hillsborough River, as read on the west gauge at S-161, is 9.5 feet or greater.

C) The following structural constraints shall apply to regional withdrawals from the Lower Pool as limited by 5A2.a), and 5A2.b) above:

1. No withdrawals shall be made when the difference in the surface water elevations between the TBC Middle Pool, as read on the gauge at S-162 upstream, and the TBC lower pool, as read on the gage at S-162 downstream, is 6.5 feet or greater.

6. SUBMISSION OF DATA AND REPORTS

A. DATA REPORTS

The Permittee shall provide the District with 1 copy of the data reports required by these Special Conditions. All reports of data shall be submitted to the District on or before the 15th day of the month following data collection and shall be addressed to:

Permit Data Section, Records & Data Department
Southwest Florida Water Management District
2379 Broad Street
Brooksville, Florida 34609-6899

B. OTHER REPORTS

For other reports or plans, unless otherwise indicated, the Permittee shall provide to the District 1 original, 1 unbound copy, and 1 copy in acceptable digital format (see paragraph 3.C., below). Unless otherwise specified, all reports required to be submitted by the Permittee to the District

pursuant to one or more conditions of this permit shall be submitted as part of the Annual Report required by this permit.

C. FORMAT

All data and reports shall be submitted in writing, and, when feasible and, if prepared, in digital format and medium compatible with the format and medium then utilized by or agreed to by the District.

7. LEGAL CONTROL OF PROPERTY

This permit is issued contingent upon the Permittee's power to acquire the property rights for properties on which pumps or other withdrawal facilities will be located, as described in the application, through eminent domain. Specifically, the properties associated with District ID No. 1 and No. 2, and Permittee ID No. TBC-1 and No. TBC-2, (Tampa Bypass Canal withdrawal intakes) and the proposed regional pumping facility near the Tampa Bypass Canal. If only a part of such lands is so conveyed, or if the ownership or other legal control is divided, this permit shall immediately terminate unless the terms of the permit are modified or the permit is transferred pursuant to District rules. In no case shall issuance of this permit convey any property rights to the Permittee.

8. OPERATIONS PLAN

The Optimized Regional Operations Plan (Operations Plan) shall be modified when new water supply capacity is added to Tampa Bay Water's Regional Interconnected Water Supply System. The Permittee shall submit a modification to the Operations Plan which incorporates the TBC Water Supply Project and describes how Tampa Bay Water shall operate its water supply system in a manner to avoid and minimize environmental stresses to the 11 Central System Wellfield area. The Permittee shall comply with the Operations Plan and all modifications thereof, as approved by the District.

9. USE OF WITHDRAWAL QUANTITIES

Surface water withdrawal quantities from the TBC Water Supply Project shall be used for the purpose of providing replacement capacity and rotational capacity to the following Tampa Bay Water Central System wellfields as required by the Agreement:

1. Cosme-Odessa Wellfield
2. Cross Bar Ranch Wellfield
3. Cypress Bridge Wellfield
4. Cypress Creek Wellfield
5. Eldridge-Wilde Wellfield
6. Morris Bridge Wellfield
7. Northwest Hillsborough Regional Wellfield
8. North Pasco Wellfield
9. Section 21 Wellfield
10. South Pasco Wellfield
11. Starkey Wellfield

Wellfield replacement and rotational capacity is authorized for the Tampa Bay Water Central System to optimize withdrawals at wellfields and to relieve environmental stresses. Withdrawal quantities delivered by the TBC Regional Pump Facilities shall be used for existing system demand and documented growth. The identification of wellfields receiving rotation capacity will be determined by the approved Tampa Bay Water Optimized Regional Operations Plan.

10. MONITORING OF ENVIRONMENTAL CONDITIONS

A. HYDROBIOLOGICAL MONITORING

The Permittee shall develop and implement a Hydrobiological Monitoring Program (HBMP) for the Hillsborough River/Tampa Bypass Canal. The scope and design of the HBMP shall be based on discussions with District staff and the Permittee which shall occur within 60 days of permit issuance and submittal of a draft HBMP within 120 days of permit issuance. The District may solicit outside technical review for design of the HBMP. The final HBMP plan must be approved by the District prior to implementation. The initial date of implementation will be specified in the approved HBMP plan.

The HBMP shall address the following objectives:

1. Establish baseline conditions prior to permitted use for streamflow rates, salinity distributions, and selected water quality and biologic variables within the lower Hillsborough River below Tampa Dam, TBC, Palm River, and McKay Bay.

2. Monitor diversions from the Hillsborough River and withdrawals from the TBC at the withdrawal points and evaluate streamflow data for the lower Hillsborough River at Sulphur Springs, and the TBC at structures 160 and 162.

3. Evaluate the ecological relationships of the lower Hillsborough River below Tampa Dam, TBC, Palm River, and McKay Bay to freshwater flows.

4. Monitor selected water quality and biologic variables in order to determine if the ecological characteristics of the lower Hillsborough River below Tampa Dam, TBC, Palm River, and McKay Bay related to freshwater flow change over time.

5. Determine the relative effect of permitted diversions and withdrawals on any ecologic changes that may occur in the lower Hillsborough River below Tampa Dam, TBC, Palm River, and McKay Bay.

6. Determine if these withdrawals cause or significantly contribute to any unacceptable environmental impacts that the lower Hillsborough River below Tampa Dam, TBC, Palm River, and McKay Bay exhibit as a result of changes in freshwater flows. The HBMP shall identify criteria that will be used to determine unacceptable environmental impacts to the resources.

7. Coordinate with appropriate agencies which have or are currently collecting data which can be incorporated into the HBMP to avoid duplication of effort and to facilitate the most efficient use of resources.

HBMP reports will be submitted to the District according to the time frame established in the final approved HBMP plan. The periodic cycle for these reports will include yearly Data reports and periodic Interpretive reports that will be submitted according to a specific schedule which will be established in the final approved HBMP plan.

On an annual basis, the Permittee shall submit a Data report of all raw data collected during the past year. The Data reports will be submitted in tabular form with text limited to an explanation of variable names and a description of any problems encountered or important observations made during the monitoring year. This information shall be included in the Annual Report for this permit.

At the end of selected years specified in the final approved HBMP plan, the Permittee will submit Interpretive reports that will include comprehensive analyses of all data collected to date that specifically address the objectives of the HBMP. Qualitative and quantitative analyses shall be presented in the interpretive reports to evaluate the interactions of hydrologic conditions and withdrawals on streamflow, nutrient loading, salinity distributions, and the response of related water quality and biological variables in the lower Hillsborough River below Tampa Dam, TBC, Palm River, and McKay Bay. The Interpretive reports will also include an appendix that provides all raw data collected during the previous year, thus fulfilling the requirement of the Annual for that year. Upon completion of each cycle of the HBMP, a draft HBMP Interpretive report shall be submitted to the District as part of the overall Annual report. The District shall review and provide written comments within 45 days of the submittal of each draft HBMP Interpretive report. Final interpretive reports shall be submitted by the Permittee within 90 days of receipt of District comments.

The District will review these results of these reports to determine if the diversions or withdrawals have or are expected to result in unacceptable environmental impacts to the natural resources of the lower Hillsborough River below Tampa Dam, TBC, Palm River, and McKay Bay as addressed in Part 4 of the District's Basis of Review for Water Use Permit Applications. If unacceptable environmental impacts have or are expected to occur due to the withdrawals, then the District shall require a revision to the diversion and/or withdrawal schedule.

B. AERIAL PHOTOGRAPHY

The Permittee shall conduct aerial photographic reconnaissance of all water supply facilities encompassed within this permit, all environmental monitoring station locations, and surrounding areas as approved by the District. The reconnaissance areas must be submitted in writing within 120 days of permit issuance for approval by the District. The approved photographic reconnaissance shall occur on a semi-annual basis (April-May and October-November). Photography shall be color infrared at 1"=2000'+ scale with 60% forward overlap and 30% side overlap and flown in a north-south flight path whenever possible. Original or first generation positive transparencies of the flight photography and an analysis of the flight's photography shall be included in the Annual Report submitted to the District by July 1 of each year. This photography shall be used to detect landscape changes over an extended period of time and in instances where the HBMP monitoring detects potential changes to monitoring sites.

11. WUCA CONSERVATION REPORTING

As part of the Annual Report required by this permit, the Permittee shall submit the following information relative to each Demand Planning Area or Member Government serviced by this permit:

A. PER-CAPITA USE

1. The population served;
2. Significant deducted uses, the associated quantity, and conservation measures applied to these uses;
3. Total withdrawals;
4. Treatment losses;
5. Environmental mitigation quantities;
6. Sources and quantities of incoming and outgoing transfers of water and wholesale purchases and sales of water, with quantities determined at the supplier's departure point;
7. Documentation of reuse and desalination credits, if taken.
8. The gross per-capita use rate, and, at the Permittee's option, an adjusted (compliance) per-capita use rate, as specified in the Basis of Review for Water Use Permit Applications, that reflects adjustments for significant users, treatment losses, environmental mitigation, and incentives for reuse and the use of desalination sources.

B. WATER CONSERVING RATE STRUCTURE

A copy of the official rate-structure document for each Member Government serviced by this Permit in effect at the time the Annual Report is compiled.

C. WATER AUDIT PROGRAM

Documentation of the results of the ongoing water audits for each Member as well as the Authority's water distribution system serviced by this permit.

D. RESIDENTIAL WATER USE

The total number of connections and total water use for:

1. Residential customers for each of the following categories:
   a) single family dwelling units served;
   b) multi-family dwelling units served and the number of equivalent residential units represented; and
   c) mobile homes served.

   (Where separate indoor and outdoor meters exist, residential water use quantities shall include both the indoor and outdoor water uses associated with the dwelling units, including irrigation water.)
2. Commercial customers
3. Industrial customers
4. Public/Institutional customers
5. Wholesale customers, including the name and quantity sold to each individual customer
6. Other customers

E. RECLAIMED WATER USE

1. The quantity of total reclaimed water provided by the Member Governments serviced by this permit for reuse on both a total annual average daily and monthly basis;
2. For all individual customer reuse connections with line sizes of 4-inches or greater, a listing of:
   a) account name and address;
   b) location of connection(s) by latitude - longitude;
   c) line size;
   d) meter (yes or no); and
   e) metered quantities, if metered.
3. The annual average daily quantities, monthly quantities, locations, and methods of disposal for effluent that is not reused.
4. A map or plan depicting the area of reuse service including and areas projected to be added within the next year, if possible.

12. WATER QUANTITY AND HYDROLOGIC MONITORING CONDITIONS

The tables contained in the following Special Conditions of this permit contain specific details of the monitoring requirements. Changes and adjustments to the monitoring requirements may be made as necessary to provide for continued or more effective monitoring of hydrologic conditions associated with the withdrawals. Monitoring requirement changes shall be made after consultation with the Permittee, and shall be confirmed by written approval from the Regulation Department Director. Nothing in this permit shall be construed to limit the authority of obligation of the District to require changes or additions to monitoring requirements as necessary to ensure the protection of the resource.

A. FLOW METERING

1. INSTALLATION, MAINTENANCE AND OPERATION OF FLOW METERS

Upon construction of the Project pumping facilities, flow measuring devices shall be installed at the following locations:

District ID No. 1, Permittee ID No. TBC-1-TBC Regional Pumping Station intake pipeline from the TBC Middle Pool near S-162

District ID No. 3, Permittee ID No. TBC-3-TBC Pumping Station Effluent Line

NOTE: District ID No. 2, Permittee ID No. TBC-2, is defined as the TBC Regional Pumping Station intake pipeline from the TBC Lower Pool near S-162. This intake pipeline will not be metered directly. However, surface water withdrawal quantities diverted through this intake pipeline will be calculated by taking the difference between quantities recorded at District ID No. 3 and District ID No. 1 on a daily basis.

Flow measuring devices shall be non-resettable, totalizing flow meters or other flow measuring devices as approved in writing by the Director of the Tampa Regulation Department. Such devices shall have and maintain an accuracy within five percent of the actual flow as installed. Total flow and meter readings from the listed intake and effluent lines shall be recorded on a daily basis and reported to the Permit Data Section, Records and Data Department (using District forms) on or

before the fifteenth (15th) day of the following month. Monthly flow data shall be submitted on the District-supplied scanning card provided to the Permittee for that purpose, or other District-approved electronic form of data submittal, to the Permit Data Section, Records and Data Department, on or before the 15th day of the following month. If a metered withdrawal is not utilized during a given month, a report shall be submitted to the Permit Data Section, Records and Data Department, indicating zero gallons.

a) SCADA-EQUIPPED FACILITIES

For flow monitoring points equipped with SCADA (Supervisory Control and Data Acquisition) the Permittee shall maintain the following for each flow monitoring point: one venturi-type flow meter or other flow metering device, one non-resettable totalizing recording device at each monitoring point, one remote transmitter unit that transfers the recorded flow data by telemetry to the remote SCADA master station. The SCADA master station flow data shall be recorded on a daily basis for each flow monitoring point and for the combined facility pumpage. For all SCADA-equipped monitoring points, the non-resettable totalizing recording device at each monitoring point shall be recorded on an annual basis, and reported in the Annual Report with a comparison to the SCADA-retrieved cumulative flow for each monitoring point. If and when any the facility becomes equipped with SCADA, the provisions of this paragraph shall apply.

b) TOTAL FACILITY PUMPAGE

Flow data recorded at the TBC Pumping Station Effluent Line shall represent the total surface water source pumpage for the TBC Water Supply Project.

2. METER CALIBRATION, TESTING AND MAINTENANCE PROGRAM

The Permittee shall undertake regular and routine testing, calibration and preventive/corrective maintenance for all flow meters to ensure that they have and maintain an accuracy within 5 percent of actual flow as installed. The Permittee shall describe the standard operating procedures for the Meter Calibration, Testing and Maintenance Program in a report submitted for District approval by January 1, 2000. The report shall include a description of methods to be used for estimation of flow from a withdrawal point during a meter malfunction. Changes to the program shall be subject to District approval.

3. NOTIFICATION AND CORRECTION OF METERING DISCREPANCIES

Within 3 working days of identification of a meter that is not providing an accuracy within 5 percent of actual flow as installed, the Permittee shall inform the District in writing of the facts regarding the problem. Until the problem is corrected, flows through the metered point shall be estimated, using methods identified in the Meter Calibration, Testing and Maintenance program. The Permittee shall correct the problem within 15 days following identification of the problem, or discontinue use of the withdrawal point until the problem is corrected, unless an extension is confirmed in writing from the Director of the Tampa Regulation Department.

4. ANNUAL REPORT REGARDING FLOW METERS

The Annual Report shall summarize activities conducted under the Meter Calibration, Testing and Maintenance Program to maintain accuracy of withdrawal metering. For SCADA equipped monitoring points, the non-resettable totalizing recording device at each monitoring point shall be recorded on an annual basis, and reported in the Annual Report with a comparison to the SCADA-

retrieved cumulative flow for each monitoring point. The Permittee shall present the results of a daily comparison of withdrawals from the intake structures on both sides of Structure S-162 to the cumulative flow recorded at the TBC Pumping Station Effluent Line for the annual reporting period. The Annual Report shall also present the total amounts of water delivered to member governments and other points of use.

5. DESTINATION OF WATER

The Permittee shall provide a monthly summary report of the total quantity of water delivered to each Member Government. This amount will be estimated based upon the percentage of total water delivered to each Member from the Tampa Bay Water Interconnected Regional Water Supply System. The Permittee shall also provide a summary in the Annual Report showing the volume of water withdrawn during the annual reporting period from the TBC intake structures, the water delivered from the TBC to a reservoir (if constructed), and the water delivered from the TBC to the Regional Water Treatment plant for distribution to the Interconnected Regional Water Supply System.

B. RAINFALL AND EVAPORATION MONITORING

1. RAINFALL GAUGES

The District currently maintains rainfall gauges at TBC Structures S-160, S-161 and S-162 as listed below. Data obtained from these monitoring points shall be made available to Tampa Bay Water. For purposes of this permit, data obtained from the listed site during the annual reporting period shall be summarized in the Annual Report required by this permit. Should the District discontinue monitoring at the listed sites, Tampa Bay Water will be required to establish replacement sites for those where District monitoring will be terminated. Any proposed changes to the recording frequency and locations shall be approved by the Regulation Department Director, and shall be summarized in the annual report as described in Annual Reporting Special Condition.

District I.D. No.	Site Name	Latitude/ Longitude	Frequency
206	Structure 160	275722.07/822214.31	Continuous
54	Structure 162	275901.06/822106.31	Continuous
55	Structure 161	280106.06/822214.31	Continuous

2. EVAPORATION PAN

Within 60 days of permit issuance, the Permittee shall establish and maintain a continuous-recording evaporation pan(s) as identified below. Total daily evaporation shall be recorded and submitted to the District, in a form acceptable to the District, by the 15th day of the following month. The period of record for these data shall begin and end on the last day of each month.

District I.D. No.	Permittee I.D. No.	Latitude/ Longitude	Frequency
208	S-162EV	To Be Determined	Continuous

C. STAGE ELEVATION MEASUREMENTS

The District's Resource Data Department will collect continuous stage elevations from the TBC at the locations designated below, and provide the data to the Permittee for use in meeting regulatory compliance levels in the TBC. Stage elevation data shall be provided on a continuous basis using the District's SCADA system.

Continuous Stage Measurements

Location ID	SWFWMD SCADA ID
S-159 (upstream)	47
S-160 (upstream)	48
S-161 (east)	49
S-161 (west)	49
S-162 (upstream)	50
S-162 (downstream)	50

NOTE: Stage elevation data for the Tampa Dam is recorded by the City of Tampa.

D. DISCHARGE MEASUREMENTS

The Permittee will calculate average daily discharge measurements for flow at the structures and frequencies designated below, and submit the data to the Permit Data Section, Records and Data Department, in a form acceptable to the District, on or before the 15th day of the following month. Flow measurements may not be required to be calculated during flood control discharge events declared by the District's Operations Department.

Average Daily Flow Measurements

District ID No.	Permittee ID No.	Latitude/ Longitude	Frequency
400	S-159F	to be determined	Avg. Daily
401	S-160F	to be determined	Avg. Daily
402	S-161F	to be determined	Avg. Daily
403	S-162F	to be determined	Avg. Daily

13. COORDINATION PLAN

By December 31, 1999, the Permittee, in coordination with the District's Operations Department, Land Management Department, Resource Regulation Department, and the City of Tampa shall provide a coordination plan which identifies the multiple functions (flood control, Hillsborough Reservoir augmentation, regional water supply) and activities (regional pumping station construction, telemetry improvements, etc.) authorized for the TBC. The first and foremost priority of the TBC shall continue to be for the purposes of flood management. The Coordination Plan shall include but will not necessarily be limited to the following issues:

A. Works of the District Permitting;
B. District Land Use and Protection License Agreement;
C. USCOE Permitting;
D. A plan and time line for construction of regional pumping facilities on the TBC;
E. A detailed communications plan including telemetry to enable operation of the TBC for water supply purposes without interfering in flood control operations of the Canal and the Hillsborough Reservoir dam or interfering with City of Tampa water supply operations;
F. A list and conceptual design for control structure automation/improvements necessary to facilitate conveyance of water through the TBC to the Tampa Bay Water Regional Pumping Facilities;
G. Water supply operations schedule and protocol to enable diversion of appropriate flows and withdrawal of available quantities;
H. SWFWMD application of herbicides in the TBC
I. Consistency with established Minimum Flows on the Hillsborough River and TBC

Prior to activation of the TBC pumping facilities, and following District approval of the Coordination Plan, the Permittee, in coordination with the District's Operations Department, shall develop a Coordination Plan Agreement which provides for the operation and maintenance of the permanent pumping facilities, discharge structure improvements, and telemetry on the TBC. The TBC Coordination Plan Agreement shall be included as an integral part of a Comprehensive Management Plan for the Hillsborough River, the TBC, Sulfur Springs and the Morris Bridge Wellfield in accordance with the Amended and Restated Interlocal Agreement (July 10, 1998), Section 3.08 (G).

14. INVESTIGATION OF COMPLAINTS

The Permittee shall investigate complaints related to withdrawals. This condition shall be an ongoing effort for the duration of this permit. All complainants will make an application to the Permittee and must receive an investigation report, including any action to be taken within a reasonable time by the Permittee. The Permittee shall file a report of the complaint, the findings of facts, and any mitigation action taken or to be taken by the Permittee, to the Director of the Tampa Regulation Department for review and approval within 90 days of the receipt of any complaint. The report shall include:

A. The name and address of each complainant;
B. The date and nature of the complaint;
C. A summary of the Permittee's investigation;
D. A summary of the Permittee's determination, including details of any mitigation activities; and
E. Cost of mitigation activity for each complaint.

Full mitigation shall not exceed 180 days from complaint receipt, unless additional time is granted by the District. A summary of the investigations of complaint and mitigation activities, related to the TBC Water Supply Project operations for the annual reporting periods shall be provided, and reported in the Annual Report.

15. CAPPING WELLS NOT IN USE

Within 60 days of permit issuance, any wells constructed during the Tampa Bypass Canal Linear Wellfield hydrogeologic testing program (1997), that are not proposed for continued monitoring shall

be capped in a watertight manner. These wells shall, within two (2) years after permit issuance be plugged and abandoned in accordance with Chapter 62-532.500(4) F.S. and Chapter 40D-3.531(2).

16. ANNUAL REPORT

A. GENERAL INFORMATION AND DATA

The Permittee shall provide a comprehensive and concise annual report ("Annual Report") to the District which describes the operation of the TBC Regional Pumping Facility covered under this permit. Information collected through the following conditions of this permit shall be included in this Annual Report:

The Operations Plan
Conservation Reporting
Water Distribution Data
Meter Calibration, Testing and Maintenance Program
Investigation of Complaints

Data sources shall be referenced in the Annual Report, but no raw data shall be included in the report. Only essential text, graphs, and tables should be included in the report. Six copies of the Annual Report shall be submitted to the Permits Data Section by July 1 of each year. The Annual Report shall cover the preceding water year period from October 1 to September 30.

Operations Plan implementation, water quantity and water distribution information collected for this permit shall be summarized for the annual reporting period. A population estimate for the annual reporting period, which includes only those served by the municipal system within the defined service areas, shall be provided and referenced. The quantities of water delivered to and used within the service area of each member government of Tampa Bay Water over the annual reporting period shall be used with the population estimate to determine a per capita use rate for the period. Any changes to the service area boundaries shall be described in the text and plotted on a map.

B. TBC WATER SUPPLY PROJECT ANNUAL REPORTS

The Permittee shall provide a concise individual annual report ("Surface Water Diversion and Withdrawal Annual Report") to the District which provides a compilation of data collected during the course of the year as part of the final approved HBMP plan. The Surface Water Diversion and Withdrawal Annual Report shall concisely summarize the elements listed below, and any other elements within this permit which require annual environmental reporting, with emphasis on the interactions between these elements, where appropriate. Six copies of each Surface Water Diversion and Withdrawal Annual Report shall be submitted to the Permits Data Section by July 1 of each year. The Wellfield Annual Reports shall cover the preceding water year from October 1 to September 30.

1. HYDROLOGIC AND ENVIRONMENTAL CONDITIONS

a) Data collected as a part of **MONITORING OF ENVIRONMENTAL CONDITION - HYDROLOGICAL MONITORING** Special Conditions shall be summarized and analyzed by the Permittee to document any effects of surface water diversions and withdrawals on the

lower Hillsborough River below Tampa Dam, TBC, Palm River, and McKay Bay and the cumulative effects to the Tampa Bay estuary. Each annual report will contain a HBMP data report of all raw data collected during the past year. A brief summary of any recommended changes to the monitoring requirements shall be included. More comprehensive analyses for the HBMP shall be included in the HBMP Interpretive reports which shall be submitted for each periodic cycle as defined in the final approved HBMP plan.

b) The Annual Report shall include an update of the status of plans to use additional surface water or ground-water storage facilities to increase water supplies available from the enhanced surface water system, which includes the Hillsborough River, Tampa Bypass Canal, and Alafia River surface water sources. This update shall describe the size, location infrastructure and permitting status of any water storage facilities that are being considered for use. The effects of these storage facilities for improving water supply yields from the enhanced surface water system shall be discussed. Should additional water storage facilities become available that could alleviate or prevent unacceptable environmental impacts, then alternative withdrawal schedules will be evaluated.

2. INVESTIGATION OF COMPLAINTS

A summary of the investigations of all complaints concerning adverse impacts to existing legal users, land uses and environmental features, as well as all of the Permittee's efforts to mitigate such adverse impacts, shall be provided for each reporting period. This summary shall include:

a) Number and type of complaint(s);
b) Number and type of mitigation activity(ies); and
c) Number and type of complaint(s) which did not require mitigation activity.

3. OTHER

All reports specified to be included in the Wellfield Annual Reports by conditions of this permit shall be so included.

17. TIME EXTENSIONS

Unless specified otherwise, time extensions to condition deadlines may be granted upon written request to the District, provided that the request is made prior to the deadline, the Permittee has demonstrated a good faith effort in meeting the deadline set forth in the condition, and a reasonable modified deadline is proposed by the Permittee. However, the extensions provided for in this shall not apply to the **Pumpage Schedule and Available Quantities** Specific Condition of this permit.

18. MODIFICATION OR REVOCATION OF PERMIT BY DISTRICT

Nothing in this permit is intended, nor shall anything herein be construed, to replace, limit or impair the District's right to modify or revoke this permit in accordance with applicable law.

19. OTHER LIMITATIONS AND REQUIREMENTS

A. Should the Permittee's ownership of the lands and facilities encompassed within this permit change such that the Permittee takes ownership of the surface water intake points, pumping facilities, and transmission lines only, with the remainder of the associated lands reverting to ownership by Member Governments, impacts to such lands shall not be considered "offsite land-use impacts" within the meaning of Rule 40D-2.301(1)(h) and Section 4.7 of the Basis of Review for Water Use Permitting.

B. The remedies for violation of this permit are cumulative. Thus, the pursuit of one remedy shall not preclude the pursuit of other remedies provided by this permit or by applicable law. The pursuit of any remedy provided in this permit or by applicable law shall not constitute a forfeiture or waiver of any other remedy. The waiver of one violation shall not be deemed a waiver of any other violation. Forbearance to enforce one or more of the remedies provided by this permit or by applicable law on an event of violation shall not be deemed or construed to constitute a waiver of the right to any remedy for that violation.

20. MINIMUM FLOWS FOR HILLSBOROUGH RIVER AND TAMPA BYPASS CANAL

The District anticipates establishment of minimum flows for the Hillsborough River and TBC during the term of this permit. If during the course of consideration of minimum flows for the Hillsborough River and TBC it is determined that additional hydrologic, biologic, or chemical data is needed in order to assess minimum flows, the District and the Permittee shall work collaboratively to achieve a mutually acceptable data collection program. Should a mutually acceptable program not be accomplished, the District may require modification of this permit.

Once minimum flows are established, this water use permit may be subject to additional comprehensive review by the District during the term of this permit. The decision as to the need for further modification or review of the permit shall be made by the District after adoption of minimum flows for the Hillsborough River and Tampa Bypass Canal systems.

STANDARD CONDITIONS:

1. The Permittee shall comply with the Standard Conditions attached hereto, incorporated herein by reference as Exhibit "C" and made a part hereof.

BG Jarvis

Authorized Signature
SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT

EXHIBIT A

HILLSBOROUGH RIVER FLOW DIVERSIONS FOR 10%-30% OF FLOW

Flow Over Dam Before Diversions (MGD/CFS)	Diversions (MGD/CFS)	Percent Diversions	Flow Over Dam Before Diversions (MGD/CFS)	Diversions (MGD/CFS)	Percent Diversions
97/150	9.7/15.0	10.00	119/184	22.0/34.0	18.48
98/151	9.8/15.1	10.00	120/185	22.6/35.0	18.92
98/152	9.8/15.2	10.00	120/186	23.3/36.0	19.35
99/153	9.9/15.3	10.00	121/187	23.9/37.0	19.79
100/154	10.0/15.4	10.00	121/188	24.6/38.0	20.21
100/155	10.0/15.5	10.00	122/189	25.2/39.0	20.63
101/156	10.1/15.6	10.00	123/190	25.8/40.0	21.05
101/157	10.1/15.7	10.00	123/191	26.5/41.0	21.47
102/158	10.2/15.8	10.00	124/192	27.1/42.0	21.88
103/159	10.3/15.9	10.00	125/193	27.8/43.0	22.28
103/160	10.3/16.0	10.00	125/194	28.4/44.0	22.68
104/161	10.4/16.1	10.00	126/195	29.1/45.0	23.08
105/162	10.5/16.2	10.00	127/196	29.7/46.0	23.47
105/163	10.5/16.3	10.00	127/197	30.4/47.0	23.86
106/164	10.6/16.4	10.00	128/198	31.0/48.0	24.24
107/165	10.7/16.5	10.00	128/199	31.7/49.0	24.62
107/166	10.7/16/6	10.00	129/200	32.3/50.0	25.00
108/167	11.0/17.0	10.18	130/201	33.0/51.0	25.37
108/168	11.6/18.0	10.71	130/202	33.6/52.0	25.74
109/169	12.3/19.0	11.24	131/203	34.2/53.0	26.11
110/170	12.9/20.0	11.76	132/204	34.9/54.0	26.47
110/171	13.6/21.0	12.28	132/205	35.5/55.0	26.83
111/172	14.2/22.0	12.79	133/206	36.2/56.0	27.18
112/173	14.9/23.0	13.29	134/207	36.8/57.0	27.54
112/174	15.5/24.0	13.79	134/208	37.5/68.0	27.88
113/175	16.2/25.0	14.29	135/209	38.1/59.0	28.23
114/176	16.8/26.0	14.77	136/210	38.8/60.0	28.57
114/177	17.4/27.0	15.25	136/211	39.4/61.0	28.91
115/178	18.1/28.0	15.73	137/212	40.1/62.0	29.25
116/179	18.7/29.0	16.20	138/213	40.7/63.0	29.58
116/180	19.4/30.0	16.67	138/214	41.4/64.0	29.91
117/181	20.0/31.0	17.13	139/215	41.7/64.5	30.00
118/182	20.7/32.0	17.58			
118/183	21.3/33.0	18.03			

EXHIBIT B

HILLSBOROUGH RIVER FLOWS/DIVERSIONS

DATE	ANNUAL AVERAGE FLOW OVER DAM (MGD)	ANNUAL AVERAGE DIVERSION (MGD)
1975	176	41.5
1976	108	25.9
1977	28	5.7
1978	167	39.3
1979	370	55.4
1980	55	11.9
1981	74	20.8
1982	259	57.6
1983	368	74.1
1984	150	40.8
1985	139	27.0
1986	148	38.3
1987	191	32.6
1988	212	37.5
1989	31	7.0
1990	11	0.8
1991	118	27.5
1992	63	17.0
1993	51	12.8
1994	173	35.3
1995	210	45.2
AVERAGE	148	31.0

EXHIBIT B Cont.

TAMPA BYPASS CANAL FLOWS/WITHDRAWALS

DATE	ANNUAL AVERAGE FLOW OVER S-160 (MGD)	ANNUAL AVERAGE WITHDRAWAL (MGD)
1975	29	21.07
1976	21	14.40
1977	24	16.5
1978	26	18.32
1979	256	35.88
1980	42	30.52
1981	28	19.61
1982	115	40.74
1983	205	43.22
1984	56	30.78
1985	123	20.15
1986	44	31.96
1987	103	29.66
1988	163	13.38
1989	23	15.40
1990	33	24.22
1991	51	33.15
1992	87	39.37
1993	63	43.68
1994	75	40.52
1995	91	56.68
AVERAGE	79	29.49

WATER USE PERMIT CONDITIONS

STANDARD CONDITIONS

1. If any of the statements in the application and in the supporting data are found to be untrue and inaccurate, or if the Permittee fails to comply with all of the provisions of Chapter 373, F.S., Chapter 40D, or the conditions set forth herein, the Governing Board shall revoke this permit in accordance with Rule 40D-2.341, following notice and hearing.

2. This permit is issued based on information provided by the Permittee demonstrating that the use of water is reasonable and beneficial, consistent with the public interest, and will not interfere with any existing legal use of water. If, during the term of the permit, it is determined by the District that the use is not reasonable and beneficial, in the public interest, or does impact an existing legal use of water, the Governing Board shall modify this permit or shall revoke this permit following notice and hearing.

3. The Permittee shall not deviate from any of the terms or conditions of this permit without written approval by the District.

4. In the event the District declares that a Water Shortage exists pursuant to Chapter 40D-21, the District shall alter, modify, or declare inactive all or parts of this permit as necessary to address the water shortage.

5. The District shall collect water samples from any withdrawal point listed in the permit or shall require the Permittee to submit water samples when the District determines there is a potential for adverse impacts to water quality.

6. The Permittee shall provide access to an authorized District representative to enter the property at any reasonable time to inspect the facility and make environmental or hydrologic assessments. The Permittee shall either accompany District staff onto the property or make provision for access onto the property.

7. Issuance of this permit does not exempt the Permittee from any other District permitting requirements.

8. The Permittee shall cease or reduce surface water withdrawal as directed by the District if water levels in lakes fall below applicable minimum water level established in Chapter 40D-8 or rates of flow in streams fall below the minimum levels established in Chapter 40D-8.

9. The Permittee shall cease or reduce withdrawal as directed by the District if water levels in aquifers fall below the minimum levels established by the Governing Board.

10. The Permittee shall practice water conservation to increase the efficiency of transport, application, and use, as well as to decrease waste and to minimize runoff from the property. At such time as the Governing Board adopts specific conservation requirements for the Permittee's water use classification, this permit shall be subject to those requirements upon notice and after a reasonable period for compliance.

11. The District may establish special regulations for Water Use Caution Areas. At such time as the Governing Board adopts such provisions, this permit shall be subject to them upon notice and after a reasonable period for compliance.

12. The Permittee shall mitigate, to the satisfaction of the District, any adverse impact to existing legal uses caused by withdrawals. When adverse impacts occur or are imminent, the District shall require the Permittee to mitigate the impacts. Adverse impacts include:
    a. A reduction in water levels which impairs the ability of a well to produce water;
    b. Significant reduction in levels or flows in water bodies such as lakes, impoundments, wetlands, springs, streams or other watercourses; or
    c. Significant inducement of natural or manmade contaminants into a water supply or into a usable portion of any aquifer or water body.

13. The Permittee shall mitigate to the satisfaction of the District any adverse impact to environmental features or offsite land uses as a result of withdrawals. When adverse impacts occur or are imminent, the District shall require the Permittee to mitigate the impacts. Adverse impacts include the following:
    a. Significant reduction in levels or flows in water bodies such as lakes, impoundments, wetlands, springs, streams, or other watercourses;
    b. Sinkholes or subsidence caused by reduction in water levels;
    c. Damage to crops and other vegetation causing financial harm to the owner; and
    d. Damage to the habitat of endangered or threatened species.

14. When necessary to analyze impacts to the water resource or existing users, the District shall require the Permittee to install flow metering or other measuring devices to record withdrawal quantities and submit the data to the District.

15. A District identification tag shall be prominently displayed at each withdrawal point by permanently affixing the tag to the withdrawal facility.

16. The Permittee shall notify the District within 30 days of the sale or conveyance of permitted water withdrawal facilities or the land on which the facilities are located.

17. All permits issued pursuant to these Rules are contingent upon continued ownership or legal control of all property on which pumps, wells, diversions or other water withdrawal facilities are located.

APPENDIX D - CORRESPONDENCE

Water Resource
ASSOCIATES

May 21, 2001

Mr. John Hamilton
US Environmental Protection Agency
Region IV
61 Forsyth St., SW
Atlanta, GA 30303

Re: Tampa Bay Regional Reservoir (TBRR) EIS

Dear John:

This is a follow-up to our conversation whether the inclusion of information generated by Hillsborough County, in support of the evaluation of the TBRR, would be included in the Environmental Impact Statement (EIS) for the proposed reservoir. Based on our discussion, it was decided rather than including documents or parts of documents, that you would prefer to reference and briefly describe this data in the EIS.

To accomplish this, I have included references and a description of three items that we are requesting be included in the EIS. This information is provided to you both in hard copy and electronically for your use.

ENVIRONMENTAL IMPACT ASSESSMENT FOR THE PROPOSED TAMPA BAY, FLORIDA WATER WITHDRAWAL PROJECTS

A study was conducted by Hillsborough County to determine if environmental effects from withdrawals of freshwater water from the Hillsborough River, the Alafia River and the Tampa Bypass Canal/Palm River would occur with respect to marine life in Tampa Bay. These impacts could be caused by changes in the temperature and salinity distributions that may result from these withdrawals. The entire Bay was considered with a special focus on the above named rivers and on McKay and Hillsborough Bays because of their proximity to the proposed withdrawal sites.

14502 NORTH DALE MABRY HWY. SUITE 226 TAMPA, FLORIDA 33618
PHONE: 813-265-3130 FAX: 813-265-6610
www.wraconsultants.com

A well-tested and extensively used three-dimensional hydrodynamic circulation model was developed to encompass all of Tampa Bay including the rivers and tributaries delivering freshwater into the bay. The study period of calendar years' 1998 and 1999 was chosen from a 40-year record of freshwater inflows into the bay because they represented extreme conditions, relatively wet and dry years. Water withdrawal scenarios from the Hillsborough River, the Alafia River and the Tampa Bypass Canal/Palm River were constructed based on specifications in the Enhanced Surface Water System permitted withdrawal schedule.

An analysis of the changes in the bay, as a result of the withdrawals, indicates that only the region where any detectible change can be found is in the area of the withdrawals themselves.

No changes were apparent anywhere in the vicinity of the proposed desalination facility and no changes in temperature were found anywhere in the entire river/bay system.

Changes in salinity due to the withdrawals will be confined to the Hillsborough River, the Alafia River, and the Tampa Bypass Canal/Palm River and the McKay Bay portion of the bay. The model results show salinity increases when compared to background of 1.5-psu, 20% of the time in the Hillsborough River. There is a 1 to 2-psu increase of salinity in the surface waters of the Tampa Bypass Canal. The Alafia River shows minor increases in salinity in the range of 0.5 to 1-psu with infrequent bursts of 2 to 3-psu upstream. The organisms now present in the river will tolerate the salinity changes that will result from river withdrawal and no significant changes will occur to the ecology of the river as a result of withdrawal.

The Palm River is largely a degraded habitat and proposed river withdrawals are not expected to lead to further significant degradation of the biota. Although the flow patterns of the Alafia River have been altered less than the other two river-estuarine systems, the habitat, especially the benthic habitat, cannot be defined as "healthy". The slight increases that will occur in salinity when withdrawal is permitted will easily be tolerated by the oligohaline and low mesohaline species occurring presently.

"Seawater Desalination Brine Disposal Investigation"; Alan F. Blumberg, Ph. D and Norman Blake, Ph. D; Hillsborough County, Florida; Draft May 2001

HILLSBOROUGH INDEPENDENT MONITORING PROGRAM (HIMP)

In mid-1999, the Board of County Commissioners authorized EPC to develop an independent monitoring program with the objective of establishing sufficient pre-operational and post-operational observations to determine any environmental change in the rivers and near shore ecological communities of the Tampa Bay estuary, particular to the areas of study, which are contiguous to Hillsborough County.

The Hillsborough Independent Monitoring Program (HIMP) has three components: water quality monitoring, benthic invertebrate and sediments monitoring, and vegetative analysis. Areas of monitoring include the lower Hillsborough River, the Alafia River, the Palm River and McKay Bay, the Hillsborough Bay, and the area adjacent to the location of the proposed desalination facility at Big Bend, referred to generally as the Apollo Beach embayment. The Little Manatee River is monitored as a control site.

Water quality monitoring is conducted for the typical criteria (conductivity, dissolved oxygen, temperature, chlorophyll, etc.) Sampling is conducted throughout the rivers and bays named. Generally, three types of sampling are done. Synoptic surveys involve traversing the sampled water body by boat and deploying electronic monitors (Hydrolab Surveyor) to take water column measurements at multiple locations. Continuous moveable monitoring involves deploying multi-probe electronic monitors (Hydrolab Datasondes) throughout the sampled water body. These instruments are programmed to collect data at fifteen-minute intervals over a 72-hour continuous period before they are retrieved. Finally, limited numbers of continuous fixed electronic monitors (Campbell Model AMJ 99) are set on pilings to continuously record salinity and dissolved oxygen at top and bottom of the water column every fifteen minutes. This data is stored and periodically recovered by boat.

The benthic invertebrate and sediment monitoring is designed to provide a statistically defensible method for characterizing the status of the benthic community and compiling data on sediments analyzed for trace metals, polycyclic aromatic hydrocarbons, organochlorine pesticides, and polychlorinated biphenyls. The study design is the stratified-random probability based approach developed for EMAP. The desired criterion was that the study design could detect at least a 20% change in mean species richness 80% of the time at a $p = 0.05$ (confidence level = 95%).

The vegetative component of the HIMP is focused principally on the Alafia River, and is meant to provide ground-truthed inventories and evaluations of vegetative transects along the shoreline of the river. The objective is to characterize key locations of transitions between salt tolerant and freshwater dependent vegetation, so as to note significant change in composition and location over time.

The water quality and benthic monitoring components of the HIMP have completed early two years of monitoring to date, and numerous data reports have been published (and are available) at the agency. This year will mark the first vegetative analysis conducted by the HIMP.

TAMPA BAY REGIONAL RESERVOIR FLOOD INUNDATION MAPPING

In October 2000, the Hillsborough County Commission retained the firm of Applied Technology and Management (ATM), to produce inundation mapping for the Tampa Bay Regional Reservoir (TBRR). Although this mapping was to be produced by Tampa Bay Water (TBW), there was a disagreement between the County and TBW on when the appropriate time was to develop this mapping. Hillsborough County believed that it was appropriate to have this information as part of the upfront permitting process to determine public health and safety issues. TBW disagreed and said they would provide the mapping before the reservoir was charged or filled from captured surface water.

Meetings with the Florida Department of Environmental Protection (FDEP) Dam Safety Officer and the Hillsborough County Emergency Operations Director were held to determine the appropriate dam break scenarios and other parameters to consider for the inundation maps. Based on these meetings the following scenarios were developed:

1. A northwest breech in the Fishhawk Creek watershed and a breech in the southeast berm adjacent to Wendel Avenue.
2. The breech considered a failure at the toe of the berm and not an overtopping scenario;
3. Downstream conditions considered three separate antecedent conditions: the probable maximum precipitation, the 100-year flood event and the fair weather condition; and
4. The dam break considered that the dam was full at the time of failure.

Model runs were calibrated and depicted graphically using 1-foot contour mapping. The final product depicts the different breech scenarios and timing of the flood wave as it is generated and moves down gradient. The modeling is currently being used to draft the amendment to the County's Emergency Operations Action Plan and is also being used by County planners in reviewing zoning and development of regional impact requests.

This information generated and the programs developed are extremely important to Hillsborough County as the host government for this major water supply project. We request that the consultants developing the EIS will review this information and that it will be referenced in the document.

If you need any clarification of the information sent or need any additional information, don't hesitate to contact me.

Sincerely,

Peter G. Hubbell
Principal

Cc: Gary Kuhl, HCWRT
Mario Cabana, HCWRT
Ed Helvenston, HCWRT
Rick Garrity, HCEPC
Darrell Howton, HCEPC
Rick Tchsantz, HCEPC
Tony D'Aquila, HCEPC

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 4
ATLANTA FEDERAL CENTER
61 FORSYTH STREET
ATLANTA, GEORGIA 30303-8960

JAN 19 2001

Dr. Joseph Powers, Acting Regional Administrator
National Marine Fisheries Service, Southeast Region
9721 Executive Center Drive, North
St Petersburg, Florida 33702

Subj: Early Coordination with the National Marine Fisheries Service on Threatened and Endangered Species on the Proposed Tampa Bay Water Reservoir and Pipeline Request for Listed Species of Concern in Project Area

Dear Dr. Powers:

In accordance with Section 7 (a) (2) of the Endangered Species Act (ESA), the Environmental Protection Agency (EPA) will be requesting consultation with the National Marine Fisheries Service regarding potential impacts on threatened and endangered (T&E) species at a site in Hillsborough County, Florida. The purpose of this letter is to advise you of the proposed project and to allow for early coordination between National Marine Fisheries Service and EPA.

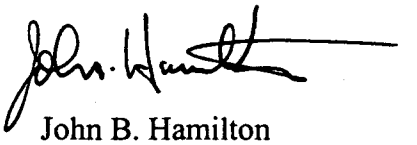
EPA is providing partial funding in the amount of $12.6 million to assist Tampa Bay Water to construct a 1200-acre reservoir and pipeline situated in Hillsborough County south of the Alafia River. A summary of preliminary information concerning the project is attached and provides a general project overview. The Alafia River intake structure component of the project is not included in the EIS.

EPA will determine if these actions are likely to jeopardize the continued existence of any listed species or result in the destruction or adverse modification of critical habitats. A biological assessment is being prepared and should be available, along with a draft EIS, by approximately mid-2001.

EPA wishes to determine early in the preparation of the EIS if National Marine Fisheries Service has any special concerns for any T & E species found in the project area. Eleven T & E species potentially found in the project area have been identified thus far by the Authority, and we will consult internet sites and other sources for information. EPA requests that National Marine Fisheries Service alert us if there are new or proposed listings of species that should be included in our biological opinion.

Thank you for your assistance in this matter. Please feel free to call me at 404.562.9617 if more information is needed.

Sincerely,



John B. Hamilton
Project Officer

Enclosure

cc:

Fred C. Pinkney, Ph.D.
Burns & McDonnell
9400 Ward Parkway
Kansas City, MO 64114

Amanda Rice, EIT
Environmental Engineer
Tampa Bay Water
2535 Landmark Drive, Suite 211
Clearwater, FL 33761-3930

ATTACHMENT

BACKGROUND - Tampa Bay Water is proposing to construct and operate an above-ground water storage facility to be known as the Tampa Bay Regional Reservoir. The reservoir will store untreated raw surface water diverted during high flow conditions from the Hillsborough River, the Tampa Bypass Canal, and the Alafia River. This stored water is for use during dry periods when no surface water can be diverted. The first 60 mgd of raw water withdrawn from one or more of the three surface sources will be treated at the new Tampa Bay Water Regional wastewater treatment plant and then pumped into Tampa Bay Water's regional distribution system. About 1,900 acres are need to contain the 1,200-acre reservoir, associated roads, stormwater collection system, and buffer zones. The reservoir will have capacity of approximately 15 billion gallons, will be constructed by year 2004, and will likely take one year to fill. It is estimated that the reservoir will increase sustainable yield from surface water diversions approximately 25-mgd to 50-60 mgd annually.

BIOLOGICAL ASSESSMENT - EPA and its contractor Burns and McDonnell will prepare a biological assessment to satisfy the requirements of Section 7 of the Endangered Species Act. The biological assessment will utilize information developed by the local water authorities on streamflow depletions to assess the effects of federally listed species, specifically the magnitude, timing, frequency and duration of estimated water depletions on a monthly basis throughout the river reach area under various operating scenarios. The biological assessment shall address the following:

- description of the status, known occurrences, and habitat and life requirements of the species
- potential impacts of the federally threatened or endangered species which are expected to occur in the project area
- potential for the project to impact critical habitat for the continued existence of each species
- provide an analysis indicating reasons for impacts

The threatened and endangered species that could be included in the biological assessment are:

- eastern indigo snake
- sand skink
- Florida grasshopper sparrow
- Florida scrub jay
- crested caracara
- bald eagle
- wood stork
- Highlands scrub hypercium
- Small's jointweed
- hairy jointweed
- paper-like nailwort

The biological assessment will provide one of the following conclusions:

- the proposed project is unlikely to adversely affect any federally-listed species or candidate species
- the proposed project may adversely affect one or more federally-listed species or candidate species

Master Water Plan

The Plan includes a progressive conservation program with the goal of reducing per capita use by 10 mgd in 2000 and 17 mgd in 2005.

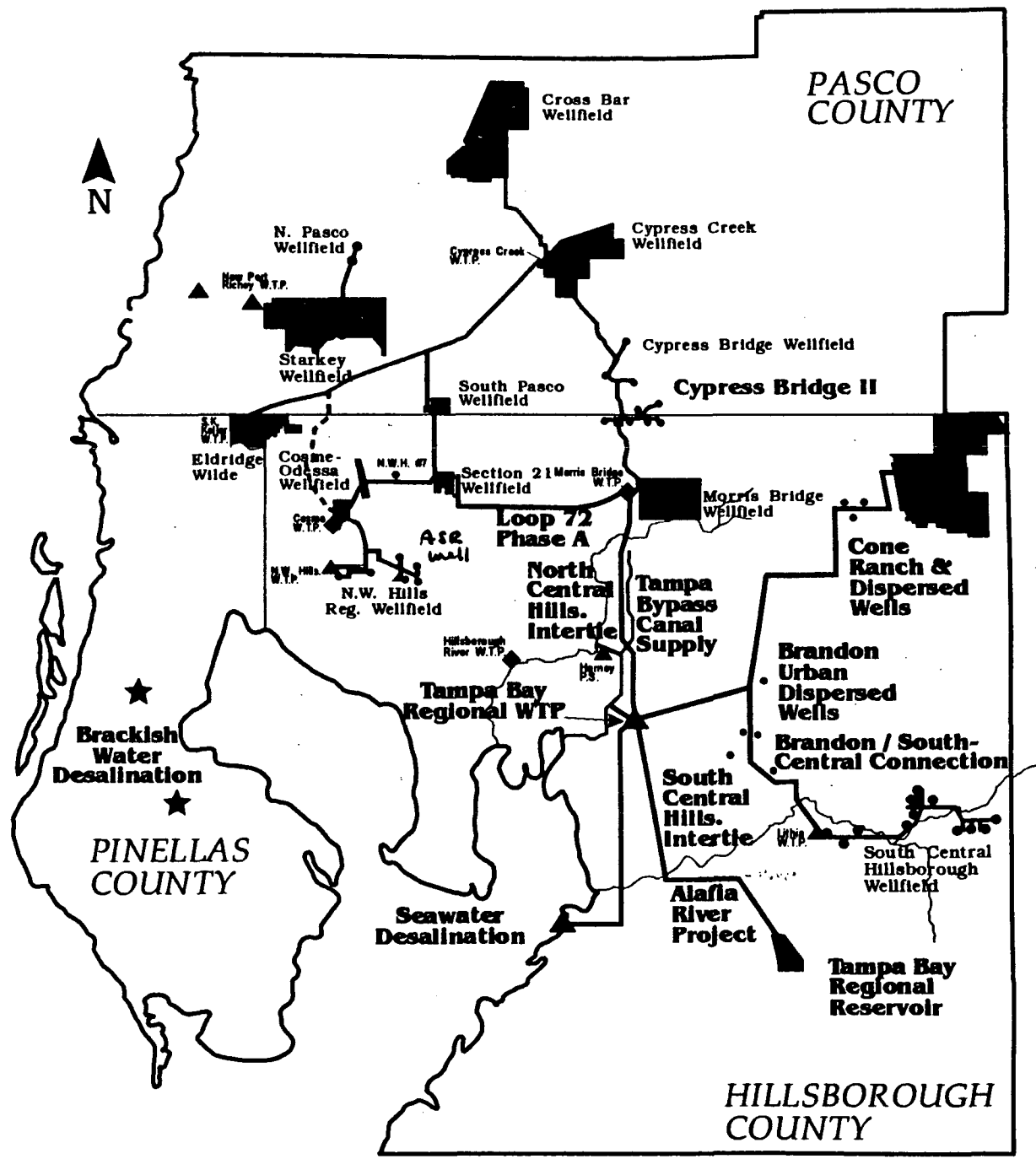
Board-Approved Projects
Projected Capacities - MGD

Stage B Projects (Final Design, Prop Acquisition)	
Brandon Urban Dispersed Wells	6
North Central Intertie	
Seawater Desalination	25
Enhanced Surface Water System (including Tampa Bypass Canal/Hillsborough River High Water, Alafia River, South Central Intertie, Tampa Bay Regional Reservoir, Regional Water Treatment Plant)	60
Brandon/ South-Central Connection	
Loop 72 Phase A	
Stage A Projects (Feasibility, Prelim Design)	
Cone Ranch & Dispersed Wells	12*
Brackish Water Desalination	4-10*
Cypress Bridge II	4(max)
Developmental Alternatives (Concept, Discussion)	
Seawater Desalination II	

* Estimate of capacity. Permit applications will be based on optimized capacity within the limits of sound environmental practice.

LEGEND

- Existing Facilities
- New Water Supplies
- New Pipelines / Interties
- New Water Treatment Plant
- Potential Brackish Water Desalination Site



TAMPA BAY WATER
Supplying Water To The Region

SDP99-11_29_99.CDR/DMK
11/29/1999

Filed

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE

Southeast Regional Office
9721 Executive Center Drive North
St. Petersburg, FL 33702
(727) 570-5312, FAX 570-5517
http://caldera.sero.nmfs.gov

FEB 2 2001

F/SER3:EGH:mdh

Mr. John B. Hamilton
Project Officer
United States Environmental Protection Agency
61 Forsyth Street
Atlanta, GA 30303-8960

We received and reviewed your letter dated January 19, 2001, concerning the proposed Tampa Bay Water Reservoir and Pipeline, and request for a list of species of concern in the project area. You have requested early coordination pursuant to section 7 consultation requirements of the Endangered Species Act of 1973. We have assigned log number I/SER/2001/00068 to this consultation. Please refer to this number in future correspondence on this project.

Enclosed is a list of Federally listed species under the jurisdiction of the National Marine Fisheries Service for the state of Florida (West Coast).

If you have any questions, please contact Jennifer Lee, fishery biologist, at the number listed above, or by email at jennifer.lee@noaa.gov.

Sincerely,

Katherine R. Wang
Acting Assistant Regional Administrator
for Protected Resources

Enclosure

cc: F/PR3
o:\section7\informal\Hamilton.wpd

File: 1514-22.k.1

-Endangered and Threatened Species and Critical Habitats under the Jurisdiction of the National Marine Fisheries Service

Florida - Gulf Coast

Listed Species	Scientific Name	Status	Date Listed
Marine Mammals			
blue whale	*Balaenoptera musculus*	Endangered	12/02/70
finback whale	*Balaenoptera physalus*	Endangered	12/02/70
humpback whale	*Megaptera novaeangliae*	Endangered	12/02/70
sei whale	*Balaenoptera borealis*	Endangered	12/02/70
sperm whale	*Physeter macrocephalus*	Endangered	12/02/70
Turtles			
green sea turtle	*Chelonia mydas*	Endangered[1]	07/28/78
hawksbill sea turtle	*Eretmochelys imbricata*	Endangered	06/02/70
Kemp's ridley sea turtle	*Lepidochelys kempi*	Endangered	12/02/70
leatherback sea turtle	*Dermochelys coriacea*	Endangered	06/02/70
loggerhead sea turtle	*Caretta caretta*	Threatened	07/28/78
Fish			
gulf sturgeon	*Acipenser oxyrhynichus desotoi*	Threatened	07/28/78

Species Proposed for Listing

None

Designated Critical Habitat

None

Proposed Critical Habitat

None

Candidate Species[2]	Scientific Name
Fish	
dusky shark	*Carcharhinus obscurus*
sand tiger shark	*Odontaspis taurus*
night shark	*Carcharinus signatus*
saltmarsh topminnow	*Fundulus jenkensi*
Alabama shad	*Alosa alabamae*
mangrove rivulus	*Rivulus marmoratus*
Key silverside	*Menidia conchorum*
speckled hind	*Epinephelus drummondhayi*
jewfish	*Epinephelus itajara*
Warsaw grouper	*Epinephelus nigritus*
Nassau grouper	*Epinephelus striatus*

2. Candidate species are not protected under the Endangered Species Act, but concerns about their status indicate that they may warrant listing in the future. Federal agencies and the public are encouraged to consider these species during project planning so that future listings may be avoided.

---

[1] Green turtles are listed as threatened, except for breeding populations of green turtles in Florida and on the Pacific Coast of Mexico, which are listed as endangered.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 4
ATLANTA FEDERAL CENTER
100 ALABAMA STREET, S.W.
ATLANTA, GEORGIA 30303-3104

JAN 17 2001

Jay Slack, Field Supervisor
US Fish & Wildlife Service
Box 2676
Vero Beach, Florida 32961-2676

Subj: Early Coordination with the US Fish & Wildlife Service on Threatened and Endangered Species on the Proposed Tampa Bay Water Reservoir and Pipeline Request for Listed Species of Concern in Project Area

Dear Mr. Slack:

In accordance with Section 7 (a) (2) of the Endangered Species Act (ESA), the Environmental Protection Agency (EPA) will be requesting consultation with the U.S. Fish and Wildlife Service (FWS) regarding potential impacts on threatened and endangered (T&E) species at a site in Hillsborough County, Florida. The purpose of this letter is to advise you of the proposed project and to allow for early coordination between FWS and EPA.

EPA is providing partial funding in the amount of $12.6 million to assist Tampa Bay Water to construct a 1200-acre reservoir and pipeline situated in Hillsborough County south of the Alafia River. A summary of preliminary information concerning the project is attached and provides a general project overview. The Alafia River intake structure component of the project is not included in the EIS.

EPA will determine if these actions are likely to jeopardize the continued existence of any listed species or result in the destruction or adverse modification of critical habitats. A biological assessment is being prepared and should be available, along with a draft EIS, by approximately mid-2001.

EPA wishes to determine early in the preparation of the EIS if FWS has any special concerns for any T & E species found in the project area. Eleven T & E species potentially found in the project area have been identified thus far by the Authority, and we will consult internet sites and other sources for information. EPA requests that FWS alert us if there are new or proposed listings of species that should be included in our biological opinion.

Thank you for your assistance in this matter. Please feel free to call me at 404.562.9617 if more information is needed.

Sincerely,

John B. Hamilton
Project Officer

Enclosure

cc: USFWS
Cynthia Dohner, Chief
Division of Endangered Species
1875 Century Blvd, Suite 200
Atlanta, GA 30345

Fred C. Pinkney, Ph.D.
Burns & McDonnell
9400 Ward Parkway
Kansas City, MO 64114

Amanda Rice, EIT
Environmental Engineer
Tampa Bay Water
2535 Landmark Drive, Suite 211
Clearwater, FL 33761-3930

ATTACHMENT

BACKGROUND - Tampa Bay Water is proposing to construct and operate an above-ground water storage facility to be known as the Tampa Bay Regional Reservoir. The reservoir will store untreated raw surface water diverted during high flow conditions from the Hillsborough River, the Tampa Bypass Canal, and the Alafia River. This stored water is for use during dry periods when no surface water can be diverted. The first 60 mgd of raw water withdrawn from one or more of the three surface sources will be treated at the new Tampa Bay Water Regional wastewater treatment plant and then pumped into Tampa Bay Water's regional distribution system. About 1,900 acres are need to contain the 1,200-acre reservoir, associated roads, stormwater collection system, and buffer zones. The reservoir will have capacity of approximately 15 billion gallons, will be constructed by year 2004, and will likely take one year to fill. It is estimated that the reservoir will increase sustainable yield from surface water diversions approximately 25-mgd to 50-60 mgd annually.

BIOLOGICAL ASSESSMENT - EPA and its contractor Burns and McDonnell will prepare a biological assessment to satisfy the requirements of Section 7 of the Endangered Species Act. The biological assessment will utilize information developed by the local water authorities on streamflow depletions to assess the effects of federally listed species, specifically the magnitude, timing, frequency and duration of estimated water depletions on a monthly basis throughout the river reach area under various operating scenarios. The biological assessment shall address the following:

- description of the status, known occurrences, and habitat and life requirements of the species
- potential impacts of the federally threatened or endangered species which are expected to occur in the project area
- potential for the project to impact critical habitat for the continued existence of each species
- provide an analysis indicating reasons for impacts

The threatened and endangered species that could be included in the biological assessment are:

- eastern indigo snake
- sand skink
- Florida grasshopper sparrow
- Florida scrub jay
- crested caracara
- bald eagle
- wood stork
- Highlands scrub hypercium
- Small's jointweed
- hairy jointweed
- paper-like nailwort

The biological assessment will provide one of the following conclusions:

- the proposed project is unlikely to adversely affect any federally-listed species or candidate species
- the proposed project may adversely affect one or more federally-listed species or candidate species

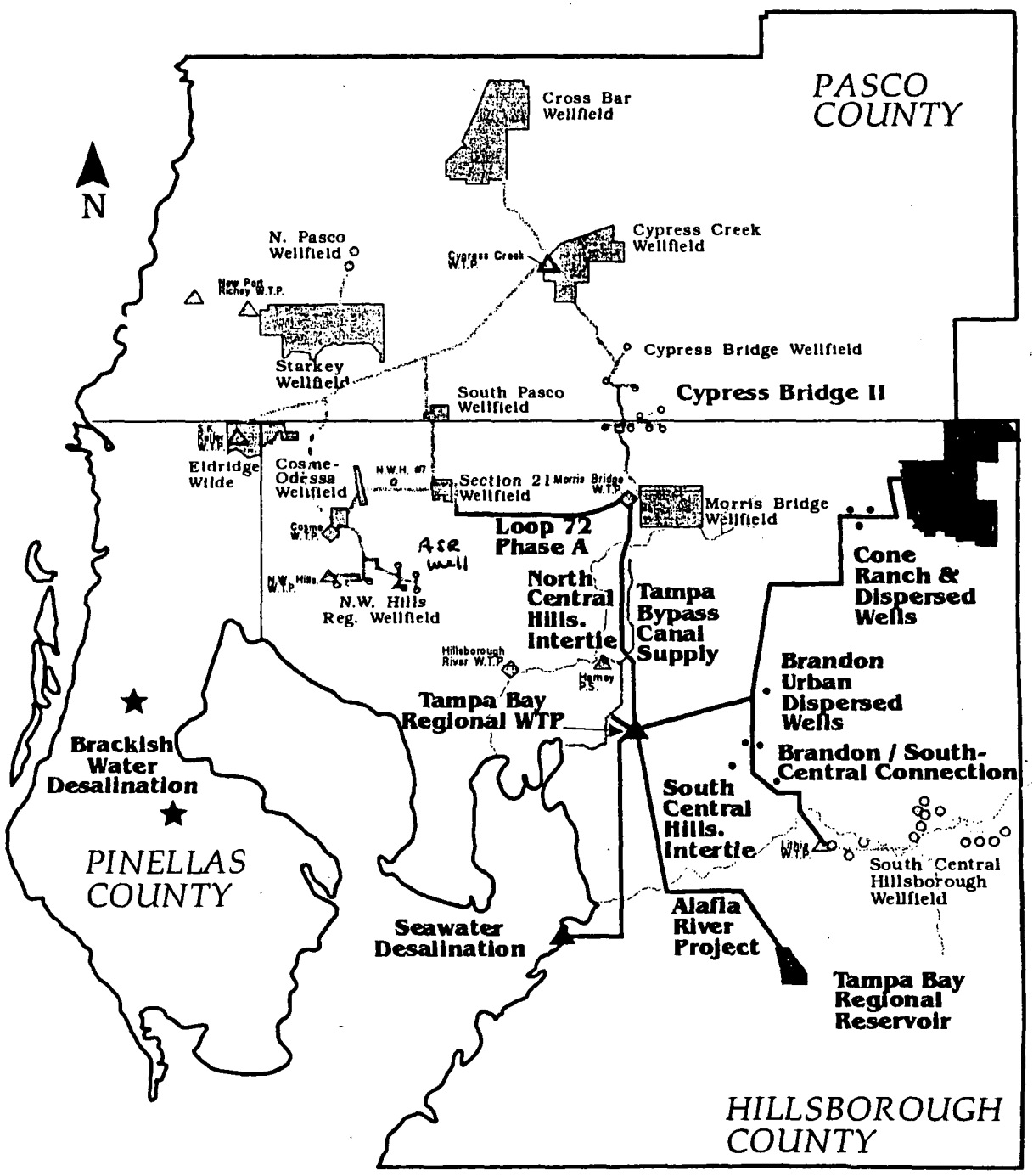
Master Water Plan

The Plan includes a progressive conservation program with the goal of reducing per capita use by 10 mgd in 2000 and 17 mgd in 2005.

Board-Approved Projects
Projected Capacities - MGD

Stage B Projects (Final Design, Prop Acquisition)	
Brandon Urban Dispersed Wells	6
North Central Intertie	
Seawater Desalination	25
Enhanced Surface Water System (including Tampa Bypass Canal/Hillsborough River High Water, Alafia River, South Central Intertie, Tampa Bay Regional Reservoir, Regional Water Treatment Plant)	60
Brandon/ South-Central Connection	
Loop 72 Phase A	
Stage A Projects (Feasibility, Prelim Design)	
Cone Ranch & Dispersed Wells	12*
Brackish Water Desalination	4-10*
Cypress Bridge II	4(max)
Developmental Alternatives (Concept, Discussion)	
Seawater Desalination II	

* Estimate of capacity. Permit applications will be based on optimized capacity within the limits of sound environmental practice.



LEGEND

- Existing Facilities
- New Water Supplies
- New Pipelines / Interties
- New Water Treatment Plant
- Potential Brackish Water Desalination Site

TAMPA BAY WATER
Supplying Water To The Region

SDP98-11_20_99.CDR/DMK
11/20/1999

September 29, 2000

Name
Address

Tampa Bay Regional Reservoir Project Environmental Impact Statement
Request for Resource Information and Issue Identification
TAMPAEIS 00-180-4

Dear:

Burns & McDonnell has been retained by Tampa Bay Water as a third-party consultant to assist the U.S. Environmental Protection Agency (EPA) in preparation of an Environmental Impact Statement (EIS) for the Tampa Bay Regional Reservoir Project. The purpose of this letter is to request your agency to provide input on the project. We also request that you identify any natural resource data that would be available for the proposed project area that could be used in the preparation of the EIS.

The purpose of this EIS is to evaluate the proposed Tampa Bay Regional Reservoir Project, which is designed to improve the reliability and dependability of the regional surface water system and help meet the 2005 water needs of Tampa Bay Water and its member governments. Tampa Bay Water is charged with providing potable water to its six member governments - Hillsborough, Pasco, and Pinellas counties, and the cities of St. Petersburg, New Port Richey, and Tampa. To meet the terms of ground water reduction agreements, Tampa Bay Water needs to develop 53-mgd of new water supply by 2002 and an additional 58-mgd of supply by 2007.

The Tampa Bay Regional Reservoir Project is an off-stream reservoir designed to improve the reliability and capacity of the surface water supply system. The reservoir would store untreated surface water diverted during high flow conditions from the Hillsborough River, the Tampa Bypass Canal, and the Alafia River (see Figure 1). This water is stored in the reservoir for use during dry periods when surface water is not available. The reservoir will be constructed by January 2004, will likely take one year to fill, and is anticipated to be operational by January 2005. The reservoir is designed to increase the yield of the surface water supply system by approximately 25-mgd during average-year conditions. At this time, other alternatives to the regional reservoir being considered include aquifer storage and recovery (ASR) systems.

Please provide any information you deem pertinent on the Tampa Bay Regional Reservoir Project. Examples of the information provided could include water rights and

water quality issues, protected species information, institutional concerns, locations of sensitive environmental resources, or any other issues that you feel should be addressed in the EIS.

We have enclosed the distribution list of the recipients of this letter for your review. Please inform us of other agencies of offices/departments that you feel should be contacted.

Thank you for your assistance with providing this information. Please submit any information by October 30, 2000. If you have any questions or require additional information, please contact Fred Pinkney at (816) 822-3304 or myself at (816) 822-3481.

Sincerely,

Justin Meyer
Assistant Project Manager

Enclosure

CC. John Hamilton, U.S. Environmental Protection Agency
Amanda Rice, Tampa Bay Water
Files

APPENDIX E - WILDLIFE AND VEGETATION SPECIES LIST

Tampa Bay Regional Reservoir Project EIS
Fish and Wildlife Species

Common Name	Scientific Name
Mammals	
Raccoon	*Procyon lotor*
Armadillo	*Dasypus novemcinctus*
Opossum	*Didelphis marsupialis*
Eastern cottontail	*Sylvilagus floridanus*
Gray squirrel	*Sciurus* carolinensis
Pocket gopher	*Geomys pinetis*
Cotton rat	*Sigmodon hispidus*
Round-tailed muskrat	*Neofiber alleni*
Cotton mouse	*Peromyscus gossypinus*
Gray fox	*Urocyon cinereoargenteus*
Skunk	*Spilogale putorius*
Bobcat	*Lynx rufus*
Wild pig	*Sus scrofa*
White-tailed deer	*Odocoileus virginianus*
Bottlenose dolphin	*Tursiops truncatus*
West Indian manatee	*Trichechus manatus*
Reptile	
Skinks	*Eumeces*
Green anole	*Anolis carolinensis*
Cuban brown anole	*Anolis sagrei*
Six-lined racerunner	*Cnemidophorus sexlineatus sexlineatus*
Southern fence lizard	*Sceloporus undulatus undulatus*
Black racer	*Coluber constrictor riapus*
Eastern diamondback	*Crotalus adamanteus*
Dusky pygmy rattlesnake	*Sistrurus miliarius barbouri*
Eastern indigo	*Drymarchon corais couperi*
Garter snake	*Thamnophis sirtalis sirtalis*
Southern ringneck snake	*Diadophis punctatus punctatus*
Yellow rat snake	*Elaphe obsoleta quadrivitta*
Florida kingsnake	*Lampropeltis getula floridana*
Cottonmouth moccasin	*Agkistrodon piscivorus*
Florida watersnake	*Neroida fasciata pictiventris*
Eastern mud snake	*Farancia abacura*
Alligators	*Alligator mississippiensis*
Florida softshell turtle	*Apalone ferox*
Florida chicken turtle	*Deirochelys reticularia chysea*
Florida red-bellied turtle	*Pseudemys nelsoni*
Stinkpot	*Sternotherus odoratus*

Florida box turtle	*Terrapene carolina bauri*
Loggerhead sea turtle	*Caretta caretta*
Green sea turtle	*Chelonia mydas*
Hawksbill sea turtle	*Eretmochelys imbricata*
Kemp's ridley sea turtle	*Lepidochelys kempi*
Peninsula ribbon snake	*Thamnophis sauritus sakenii*
Birds	
Red-winged blackbird	*Agelaius phoeniceus*
Robin	*Turdus migratorius*
American kestrel	*Falco sparverius*
Common nighthawk	*Chordeiles minor*
Belted kingfisher	*Ceryle alcyon,*
Northern flicker	*Colaptes auratus*
Eastern phoebe	*Sayornis phoebe*
Great-crested flycatcher	*Myiarchus crinitus*
Eastern kingbird	*Tyrannus tyrannus*
Barn swallow	*Hirundo rustica*
Tree swallow	*Tachycineta bicolor*
Purple martin	*Progne subis*
Carolina wren	*Thryothorus ludovicianus*
Great egret	*Casmeroides albus*
Great blue heron	*Ardea herodias*
Snowy egret	*Egretta thula*
Brown thrasher	*Toxostoma rufum*
Palm warbler	*Dendroica palmarum*
Little blue heron	*Egretta caerulea*
Tri-colored heron	*Egretta tricolor*
Green-backed heron	*Butorides striatus*
White ibis	*Eudocimus albus*
Glossy ibis	*Plegadis falcinellus*
Wood stork	*Mycteria americana*
Yellow-crowned night-heron	*Nyctanassa violacea*
Least bittern	*Ixobrychus exilis*
Impkin	*Aramus guarauna*
Black rail	*Laterallus jamaicensis*
Florida mottled duck	*Anas fulvigula*
Sandhill crane	*Grus canadensis.*
Coopers' hawk	*Accipiter cooperii*
Sora rail	*Porzana carolina*
Common yellowthroat	*Geothlypis trichas*
Amphibians	
Greater siren	*Siren lacertina*
Dwarf siren	*Pseudobranchus striatus*
Two-toed amphiuma	*Amphiuma means*
Southern cricket frog	*Acris gryllus dorsalis*

Florida chorus frog	*Pseudacris nigrita verrucosa*
Pig frog	*Rana grylio*
Southern leopard frog	*Rana utricularia*
Bullfrog	*Rana catesbeiana*
Green tree frog	*Hyla cineria*
Squirrel tree frog	*Hyla squirella*
Giant toad	*Bufo marinus*
Narrow-mouthed toad	*Gastrophryne carolinensis*
Eastern spadefoot toad	*Scaphiopus holbrooki*
Urban tree frog	*Hyla septentrionalis*
Fish	
Mosquitofish	*Gambusia affinis*
Least killifish	*Heterandria formosa*
Sheepshead minnow	*Cyprinodon variegatus*
Sailfin molly	*Poecilia latipinna*
Flagfish	*Jordanella floridae*
Golden topminnow	*Fundulus chrysotus*
Sminole killifish	*F.seminolis*
Bluefin killifish	*Lucania goodei*
Pigmy sunfish	*Elassoma spp.*
Warmouth	*Lepomis gulosus*
Redear sunfish	*L. microlophus*
Florida gar	*Lepisosteus platyrhincus*
Bullhead catfish	*Ictalurus natalis*
Bowfin	*Amia calva*
Coastal shiners	*Notropis pertersoni*
Spotted sunfish	*Lepomis punctatus*
Largemouth bass	*Micropterus salmoides floridanum*
Bullheads	*Ictalurus spp*
Redfin pickerels	*Esox americanus americanus*
Pirate perch	*Aphredoderus sayanus*
Sand seatrout	*Cynoscion arenarius*
Hardhead catfish	*Arius felis*
Spotted sea trout	*Cynoscion nebulosus*
Bull sharks	*Carcharhinus leucas*
Black drum	*Pogonias cromis*
Striped mullet	*Mugil cephalis*
Bay anchovy	*Anchoa mitchilli*
Yellowfin menhaden	*Brevoortia smithi*
Tidewater mojarra	*Eucinostormus harengulus*
Hogchoker	*Trinectes maculatus*
Largemouth bass	*Micropterus salmoides*
Redear sunfish	*Lepomis microlophus*
Bluegill sunfish	*L. macrochirus*
Black drum	*Pogonias cromis*

Spot	*Leiostomus xanthurus*
Silversides	*Menidia beryllina*
Red drum	*Sciaenops ocellatus*
Sand sea trout	*Cyoscion aranarius*
Southern kingfish	*Menticirrhus americanus*
Clown goby	*Microgobius gulosus*
Pinfish	*Lagodon rhomboides*
Striped mojarra	*Diapterus plumieri*
Common snook	*Centropomus undecimalis*
Spotted seatrout	*Cynoscion nebulosus*
Bonefish	*Albula vulpes*
Ladyfish	*Elops saurus,*
Gulf killifish	*Fundulus grandis*
Longnose killifish	*F. similis*
Rainwater killifish	*Lucania parva*
Scaled sardine	*Harengula jaguana*
Pinfish	*Lagodon rhomboides*
Longnose killifish	*Fundulus similis*
Silver perch	*Bairdiella chrysoura*
Silver jenny	*Eucinostomus gula*
Code goby	*Gobiosoma robustum*
Porgys	*Sparidae*
Grunts	*Pomadasyidae*
Mojarras	*Gerreidae*
Snapper	*Lutjanidae*
Pipefishes	*Sygnathidae*
Flounder	*Bothidae*
Sole	*Soleidae*
Needlefishes	*Belonidae*

Tampa Bay Regional Reservoir Project Plant Species	
Common Name	**Scientific Name**
Slash Pine	*Pinus elliottii*
Sand pine	*Pinus clausa*
Live oak	*Quercus virginiana*
Sand live oak	*Quercus geminata*
Water oak	*Quercus nigra*
Laurel oak	*Quercus laurifolia*
Turkey oak	*Quercus laevis*
Sweetgum	*Liquidambar styraciflua*
Hickories	*Carya* spp.
Cabbage palm	*Sabal palmetto*
Southern magnolia	*Magnolia grandiflora*
Southern red cedar	*Juniperus silicicola*
Saw palmetto	*Serenoa repens*
Red maple	*Acer rubrum*
Wax myrtle	*Myrica cerifera*
Gallberry	*Ilex glabra*
Bahia grass	*Paspalum notatum*
Wiregrass	*Aristida stricta*
Cypress	*Taxodium distichum*
American elm	*Ulmus americana*
Red bay	*Persea borbonia*
Sweet bay	*Magnolia virginiana*
Maidencane	*Panicum hemitomon*
Pickerelweed	*Pontederia cordata*
Smartweed	*Polygonum hydropiperoides*
Soft rush	*Juncus effusus*
Red carpetgrass	*Axonopus spp.*
Large-flowered false pimpernel	*Lindernia grandiflora*
Coinwort	*Centella asiatica*
Dahoon holly	*Ilex cassine*
Big carpetgrass	*Axonopus furcatus*
Willow	*Ludwigia peruviana*
Carolina willow	*Salix caroliniana*
Red maple	*Acer rubrum*
Carolina ash	*Fraxinus caroliniana*
American elm	*Ulmus americana*
Hackberry	*Celtis laviengata*
Cypress	*Taxodium distichum*
Water locust	*Gleditsia aquatica*

Black gum	*Nyssa sylvatica*
Sweetgum	*Liquidambar styraciflua*
Black needle rush	*Juncus reomerianus*
Saltmarsh cordgrass	*Spartina alterniflora*
Black mangrove	*Avicennia germinans*
Red mangrove	*Rhizophora mangle*
Leather fern	*Acrostichum danaeifolium*
Cattail	*Typha latifolia*
Carolina willow	*Salix caroliniana*