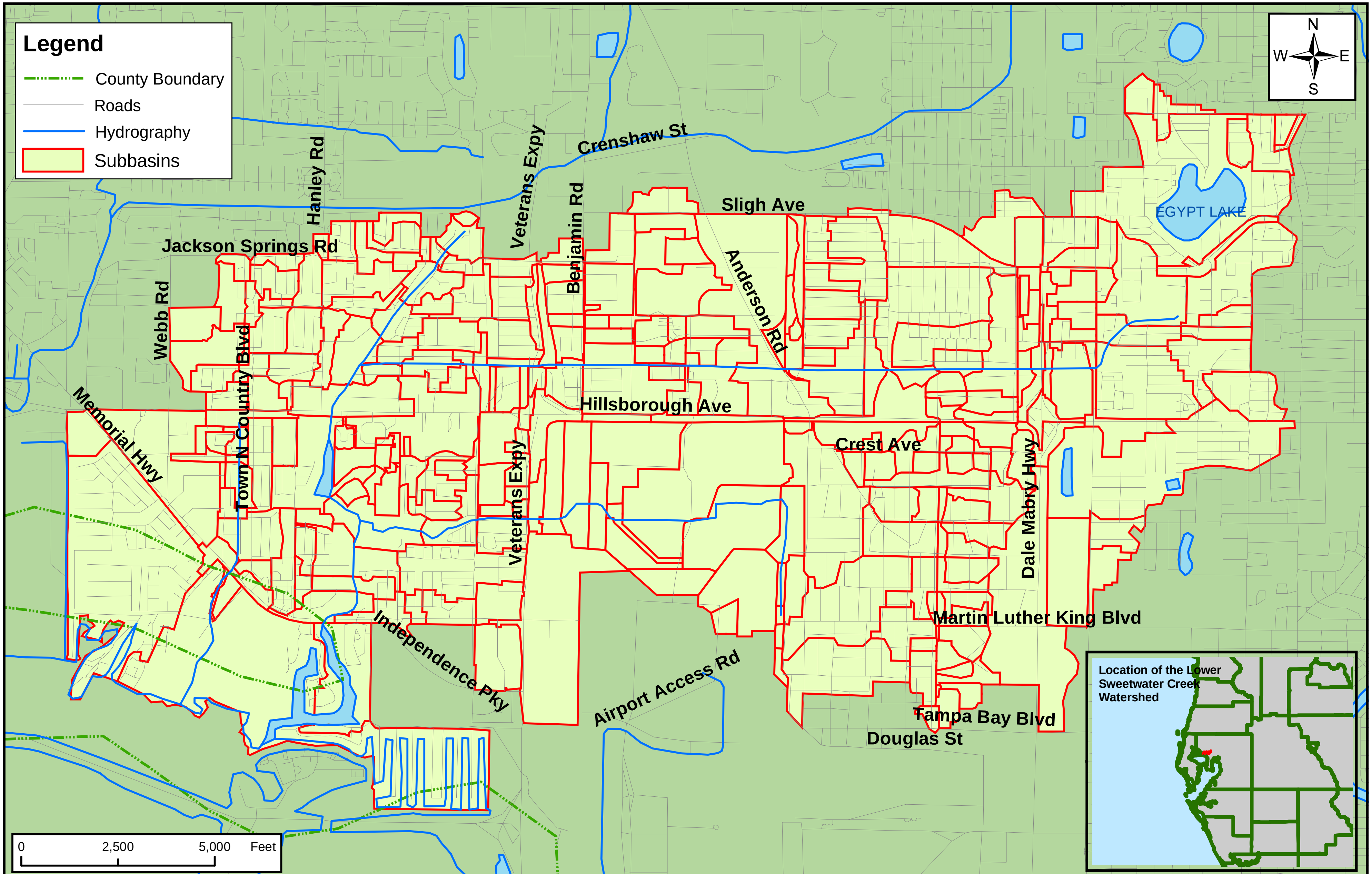
CHAPTER 7: EXISTING WATER QUALITY CONDITIONS

7.1 Overview

The Lower Sweetwater Creek (LSC) watershed is located roughly between Armenia Avenue on the east, Hillsborough Avenue and Memorial Highway on the south, Kirby Street and Sligh Avenue to the north, and Webb Road on the west (Figure 7-1) in Hillsborough County. It heads in the Egypt Lake area and runs 6.5 miles to its outfall in Old Tampa Bay. Channel H exits the Egypt Lake area, intersects Channel G (Sweetwater Creek), and then proceeds southwesterly to Old Tampa Bay. North of Hillsborough Avenue, Lower Sweetwater Creek is joined by the Henry Street Canal from the east that intersects the Creek north of Comanche Avenue. South of Hillsborough Avenue, an unnamed canal from the east intersects the Creek in the Holly Park area. From this point, the Creek travels 3,400 feet south to pass under Memorial Highway, then to Old Tampa Bay. The LSC represents the lower remnant of the Sweetwater Creek system that heads in the vicinity of the intersection of US 41 and Debuel Road in northern Hillsborough County.

Prior to the permanent settlement of Hillsborough County in the first half of the 19^{th} century, approximately 90% of the land in the Lower Sweetwater Creek watershed was occupied by soils that supported two land cover types: pine flatwoods (FLUCFCS 411) and longleaf pine-xeric oak (FLUCFCS 412). The remainder of the land in the watershed was occupied by cypress swamps (FLUCFCS 621), stream and lake swamp (FLUCFCS 615), wetland forested mixed (FLUCFCS 630), freshwater marshes and wet prairies (FLUCFCS 641 and 643), saltwater marshes (FLUCFCS 642), tidal flats/submerged shallow platform (FLUCFCS 651), and mangrove swamps (FLUCFCS 612). The large areas of stream and lake swamp, cypress swamp, and saltwater marshes adjacent to the channel in the lower reaches of Lower Sweetwater Creek were significant contiguous wetlands in the watershed. By 1910, Hillsborough was the most populous county in the state, and considerable development of roads and railroads had occurred. By 1916, in the Lower Sweetwater Creek watershed, major roadways (Old Memorial Highway, Anderson Road, Sligh Avenue, Armenia Avenue, Dale Mabry Highway, Habana, Kelly Road, and Gunn Highway) were hard surface facilities, and numerous secondary roads were in place. Over several hundred homes and buildings had been constructed, and the Tampa and Gulf Coast Railroad had at least two lines through the watershed. At least two small communities and villages (Lake View, Rocky Point) had grown up west of Tampa around roadway intersections and rail lines. By 1938, agriculture had become well established on the uplands (longleaf pine-xeric oak, pine flatwoods) throughout the watershed. Cattle, row crops, and citrus were the dominant commodities. By 1950, agriculture accounted for 27.9% of the lands in the watershed, while uplands were reduced to 38.8% of the watershed. By 2004, the percent coverage of the watershed by native uplands was further reduced to 3.1%.



Lower Sweetwater Creek Watershed

Figure 7-1

AYRES ASSOCIATES

The rapid development of agriculture followed by urbanization over the previous 150 years has resulted in both major physical alterations and a documented decline in the water quality of surface water features in the watershed. Surface water and groundwater quality, together with water quantity, is the single most important environmental support factor in sustaining the well-being of human populations, promoting economic growth, and maintaining viable aquatic ecosystems in Florida, including the Lower Sweetwater Creek watershed.

This chapter describes historical and existing trends in water quality for the streams, lakes, and groundwater within the Lower Sweetwater Creek watershed for the purposes of identifying significant problem areas/issues and potential sources of contamination. Detailed analyses of water quality conditions are addressed later in this chapter.

Surface Water Resources - The surface water systems in the 11.7 square mile Lower Sweetwater Creek watershed include streams, canals, ponds, lakes, and open water estuarine systems.

Streams – In the Lower Sweetwater Creek watershed, there are two named streams: Sweetwater Creek and the Henry Street Canal. In addition, two unnamed channels that intersect Lower Sweetwater Creek north of Memorial Highway are also part of the stream system. The channel of Sweetwater Creek has been greatly modified by diversion, straightening, and deepening, a process that began after 1916 and was well along by 1938. Two (waterbody identification) WBIDs comprise the Lower Sweetwater Creek channel, WBID 1570A in the estuarine reaches and WBID 1570 in the freshwater reaches.

Lakes - In the Lower Sweetwater Creek watershed, there is only one named lake, Egypt Lake, which occupies 67 acres. Egypt Lake, once developed on the north and northeast shores for citrus production, now is an urban lake with dense residential, commercial, and institutional development around it. The Southwest Florida Water Management District (SWFWMD) has adopted guidance levels for the lake. By 1938, at least four canals were constructed from the south shore of the lake, the largest of which allowed the lake to drain southward to a large system composed of open water and forested wetland. The areal coverage of lake in the watershed has not changed significantly between 1950 and 1999. Florida Department of Environmental Protection (FDEP) considers Egypt Lake as the head of the Lower Sweetwater Creek system, and two WBIDs have been assigned to the area: WBID 1570Y designating Egypt Lake and WBID 1570Z designating the Egypt Lake surrounding area (FDEP, 2004).

Reservoirs - Reservoirs are artificial impoundments of water constructed in association with agricultural and residential development in the watershed; residential reservoirs are managed to provide aesthetic or stormwater management functions.

Estuary - The Sweetwater Creek watershed as a whole contributes flow to Rocky Creek via Channel G and to Old Tampa Bay north of the Courtney Campbell Causeway. The Lower Sweetwater Creek watershed contributes flow directly to Old Tampa Bay. The estuary of the Creek has been altered significantly by dredging and filling to accommodate residential and commercial development between 1950 and 1982.

The freshwater and estuarine water bodies are not a major watershed component in terms of areal coverage, however, these water resources are of critical importance, and the maintenance of satisfactory water quality conditions as well as the conservation and restoration of these resources are the subjects of a number of ongoing planning activities and action projects for this area including:

- Florida Department of Environmental Protection (FDEP) Impaired Waters and Total Maximum Daily Load (TMDL) Program
- Hillsborough County's Comprehensive Plan (Stormwater Management, Conservation and Aquifer Recharge, and Coastal Management Elements);
- Southwest Florida Water Management District's Tampa Bay/Anclote River Comprehensive Watershed Management Plans (CWM);
- Southwest Florida Water Management District's Minimum Flows and Levels (MFL) Program;
- Southwest Florida Water Management District's Surface Water Improvement and Management (SWIM) Program for Tampa Bay;
- Southwest Florida Water Management District's Northern Tampa Bay Phase II Program; and
- Tampa Bay Estuary Program's Comprehensive Conservation Management Plan.

Both federal (Clean Water Act [CWA]) and state (Chapter 62-302, Chapter 62-303, Chapter 62-304 Florida Administrative Code [F.A.C.]) initiatives have been developed to protect, restore, and maintain surface waters. During the 1997 session, the Florida Legislature amended the Water Resources Act (Chapter 373.036, Florida Statute) and clarified responsible agencies' roles relating to water supply planning.

The primary goals of these initiatives have been to provide mechanisms for water supply assessment and to maintain water quality conditions that protect both human health and fish and wildlife populations. A classification system has been developed by the FDEP that designates a surface water body based upon the water body's designated use (Table 7-1).

Table 7-1 Surface Water Classifications developed under Chapter 62-302, F.A.C.

SURFACE WATER CLASSIFICATION	DESIGNATED USE	CRITERIA
CLASS 1	Potable Water Supplies	Very stringent
CLASS 2	Shellfish Propagation or Harvesting	Stringent
CLASS 3	Recreation, Propagation and Maintenance of a Healthy, Well-Balanced Population of Fish and Wildlife	Moderately stringent
CLASS 4	Agricultural Water Supplies	Less stringent
CLASS 5	Navigation, Utility and Industrial Use	Less stringent

Each classification specifies minimum water quality criteria that must be met by surface waters falling in that classification. These criteria are consistent with minimum federal standards set by the U.S. Environmental Protection Agency (US EPA) (Appendix 7-1)[1]. Waters in the Lower Sweetwater Creek watershed are classified as Class III (62-302 F.A.C., amended 09JAN06).

Discharges to surface waters are regulated by the FDEP, Southwest Florida Water Management District (SWFWMD), Hillsborough County Environmental Protection Commission (HCEPC), and/or the US EPA, depending on the type and magnitude of a particular discharge. Comprehensive stormwater regulation is also required under Section 402(p) of the CWA, and cities/municipalities with populations greater than 100,000 are required to develop and implement stormwater plans under Phase I of the National Pollutant Discharge Elimination System (NPDES) stormwater regulations. Phase II of the NPDES program, which was implemented in 2004, required smaller communities to obtain a permit and develop a program for water quality improvement.

Groundwater Resources – The groundwater resources in the watershed have been developed for potable supply, irrigation, and limited industrial use. The groundwater system is composed of water contained in two aquifer units - the surficial and Floridan aquifers. The surficial aquifer is composed variously of clastic deposits of medium to fine-grained materials including quartz sand, silty sand, kaolinitic clay, gravel, shell, and limestone. The surficial aquifer supplies comparatively small volumes of water for domestic use and lawn watering. Composed of limestone and dolomite beds ranging in thickness from 1,000 – 1,200 feet, the Floridan Aquifer is the chief source of groundwater production, and the Upper Floridan is the aquifer zone used commonly in the watershed for larger scale supply purposes.

No springs are reported in the watershed; however, the occurrence of such features is to be expected and there is a spring historically reported on the western boundary of the watershed. At least five sinkholes (#1430, 1447, 1503, 1505, and 1569) have been reported in the watershed by the Florida Sinkhole Research Institute.

[1] Appendix 7-1 – FDEP Surface water classification chart

Groundwater in the Lower Sweetwater Creek watershed is of critical importance for potable water supply and for the maintenance of salinity patterns in Upper Old Tampa Bay and the lower reaches of Sweetwater Creek. The conservation and protection of these resources are important components of a number of ongoing planning activities and action projects for this area including:

- Hillsborough County's Comprehensive Plan (Stormwater Management, Conservation and Aquifer Recharge, and Coastal Management Elements)
- Southwest Florida Water Management District's Tampa Bay/Anclote River Comprehensive Watershed Management Plans (CWM)
- Southwest Florida Water Management District's Northern Tampa Bay Phase II Program

Both federal (Clean Water Act [CWA]) and state (Chapter 62-302, Florida Administrative Code [F.A.C.]) initiatives have been developed to protect, restore, and maintain groundwaters. During the 1997 session, the Florida Legislature amended the Water Resources Act (Chapter 373.036, Florida Statute) and clarified responsible agencies' roles relating to water supply planning. The primary goals of these initiatives have been to provide water supply assessment and water quality conditions that protect human health. A classification system has been developed by the FDEP that designates groundwater based upon its designated use (Table 7-2).

Table 7-2 Groundwater Classifications Developed under Chapter 62-520, F.A.C.

GROUNDWATER CLASSIFICATION	DESIGNATED USE	CRITERIA
CLASS F-1	potable water use in single source aquifer, having TSS < 3,000 mg/L and reclassified as such by the ERC	Very stringent
CLASS G-I	potable water use in single source aquifer, having TSS < 3,000 mg/L	Stringent
CLASS G-II	potable water use in single source aquifer, having TSS < 10,000 mg/L unless otherwise classified by the ERC	Moderately stringent
CLASS G-III	Non-potable water use; groundwater in unconfined aquifers with TSS >10,000 mg/L, or with TSS of 3,000 – 10,000 mg/L and having no future use as potable supply or designated as exempt aquifer	Less stringent
CLASS G-IV	Non-potable water use; groundwater in confined aquifer with TSS > 10,000 mg/L	Less stringent

The following section provides a brief discussion of the Federal and Florida rules and regulations in regard to water quality protection.

7.1.1 Regulatory Background

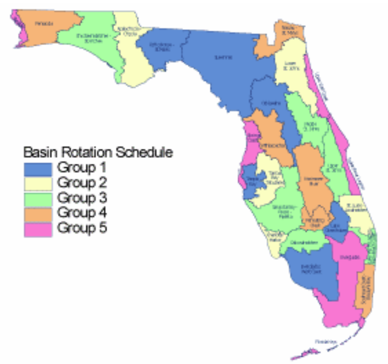
The Total Maximum Daily Load (TMDL) requirements were originally promulgated as a part of the Federal Water Pollution Control Act of 1972 and were later expanded by the Clean Water Act (CWA) of 1977 and the Water Quality Act (WQA) of 1987. The law requires states to define state-specific water quality standards for various designated uses and to identify water bodies that do not meet established water quality standards (Subsection 303(d)). Water bodies that do not meet such water quality standards as a result of human-induced conditions are to be considered impaired. An updated list of impaired water bodies must be presented by the state to the Environmental Protection Agency (EPA) every two years and must designate which of the listed impaired water bodies will require implementation of the TMDL process. State of Florida issued a full 303(d) planning list in 2002 and has been producing basin-specific 303(d) impaired waters lists recently in accordance with the Florida Watershed Restoration Act (FWRA, Chapter 403.067, Florida Statute).

In Florida, the TMDL process is multi-phased and includes identification, verification, and listing of impaired waters, followed by the development and implementation of constituent specific TMDL (e.g., DO, TN, etc.). As a first step, FDEP develops a planning list of impaired waters based on existing data. FDEP then prepares a verified list following the collection of additional corroborating water quality, biological, or other data. The verified list is then adopted by the FDEP Secretary as the basin specific 303(d) list to be sent to EPA in compliance with the CWA. Once a water body is placed on the verified list of impaired waters, the next phase of the TMDL process is to develop a TMDL, including the initial allocation of allowable loads. The next step in the TMDL process is the development of the Basin Management Action Plan (BMAP), or the TMDL implementation plan, in which detailed allocations of allowable loadings for point and non-point sources (NPS) for a specific water quality constituent is done and load reduction strategies are evaluated. Florida's TMDL development and implementation process includes the following phases:

Phase 1: Data Compilation and Assessment
Phase 2: Collection and Assessment of Additional Data
Phase 3: Determination of Total Maximum Daily Load
Phase 4: Development of Allocation and Basin Management Action Plan (BMAP)
Phase 5: Implementation of the TMDL and BMAP

The process for the determination of impaired waters is described in the Impaired Water Rule, 62-303 FAC. In Phase 3, the TMDL is estimated, generally with the use of mathematical models associated with water quantity and quality data and watershed information. Details of the applicable models and input requirements are discussed in the FDEP, TMDL Protocol version 6.0 (2006). This section is adopted from the FDEP, TMDL protocol for completeness.

Once the TMDL is established in Phase 3, the allowable loads are allocated in Phase 4 to both the point and non-point sources for each specific water quality constituent. Point sources would include domestic and industrial wastewater and National Pollutant Discharge Elimination System (NPDES), industrial and municipal separate storm sewer systems (MS4s), and stormwater discharges. Non-point sources would include septic tanks, agricultural, silvicultural, atmospheric, and natural flora and fauna discharges, as well as legacy sediment effects. One or more implementation plans are then developed to define how each source will be controlled to achieve the allocated load. For contributing pollutant sources under NPDES permits, the allocation will be achieved through permit-specified effluent limitations and load reductions. For other sources, such as agricultural areas that are not regulated by NPDES permits, load allocations will be achieved through non-regulatory programs based on the implementation of Best Management Practices (BMPs) associated with each crop type. Lastly, in Phase 5 of the TMDL process, the implementation of the BMAPs are initiated. FDEP uses the concept of watershed approach to implement the TMDL program that is briefly described here.



To implement the watershed approach for all water bodies in Florida, FDEP has divided each of the six FDEP Districts into five geographically based groups of watersheds. A map of the groups is shown in the inset and a table that lists the groups by basin and district is provided below (Table 7.2a). As illustrated in Table 7.2b, the five phases of the State's TMDL program for each group are completed in annual cycles, starting with Group 1.

FDEP Basin Rotation Schedule (Source: FDEP, 2007)

For each TMDL completed under the phased watershed management approach outlined above, a technical analysis of the assimilative capacity of the subject water segment in question may be conducted. The assimilative capacity is the total amount of a pollutant that can be discharged into a water segment without causing use impairment. Thus, the assimilative capacity, as a result, is numerically equivalent to that segment's TMDL with a Margin of Safety (MOS). To determine the assimilative capacity, the fate of the total loading to a water segment may be compared to water quality criteria and other environmental targets to test for use impairment. Such comparisons are usually done using water quality data and hydraulic-hydrologic-water quality modeling tools.

Table 7-2a Watersheds Listed by Group and FDEP District

YEAR*	00 01	01 02	02 03	03 04	04 05	05 06	06 07	07 08	08 09	09 10
Group 1	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5
Group 2		Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 1	Phase 2	Phase 3	Phase 4
Group 3			Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 1	Phase 2	Phase 3
Group 4				Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 1	Phase 2
Group 5					Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 1
	1st Five-Year Cycle – High Priority Waters					**2nd Five-Year Cycle – Medium Priority Waters**				

Table 7-2b Schedule of Phases for Each Group

DEP District	Group 1 Basins	Group 2 Basins	Group 3 Basins	Group 4 Basins	Group 5 Basins
NW	Ochlockonee-St. Marks	Apalachicola-Chipola	Choctawhatchee-St. Andrews Bay	Pensacola Bay	Perdido Bay
NE	Suwannee	Lower St. Johns		Nassau-St. Marys	Upper East Coast
Central	Ocklawaha	Middle St. Johns	Upper St. Johns	Kissimmee	Indian River Lagoon
SW	**Tampa Bay**	**Tampa Bay Tributaries**	Sarasota Bay-Peace-Myakka	Withlacoochee	Springs Coast
S	Everglades West Coast	Charlotte Harbor	Caloosahatchee	Fisheating Creek	Florida Keys
SE	Lake Okeechobee	St. Lucie-Loxahatchee	Lake Worth Lagoon-Palm Beach Coast	Southeast Coast - Biscayne Bay	Everglades

7.1.2 Existing Literature

Numerous reports and data sources, including those listed below, were reviewed to determine existing water quality conditions, historical trends, water quality models, areas of concern, relevant issues, and ongoing management activities in the Lower Sweetwater Creek watershed:

- FDEP 2002 Update to Florida's List of Impaired Waters, as amended on March 11, 2003
- FDEP 2004 305(b) Report
- Hillsborough County Environmental Protection Commission (HCEPC) Annual Water Quality Reports
- Hillsborough County Comprehensive Plan
- Hillsborough County Watershed Atlas
- Hillsborough River Greenways Task Force Ecosystem Protection Plan
- SWFWMD's Tampa Bay/Anclote Comprehensive Watershed Management (CWM) Plan
- SWFWMD's Save Our Rivers Five Year Work Plan
- SWFWMD's Tampa Bay Surface Water Improvement and Management (SWIM) Plan for Tampa Bay
- SWFWMD's Groundwater Quality of the Southwest Florida Water Management District, Central Region
- Tampa Bay Estuary Program (TBEP) Comprehensive Conservation Management Plan (CCMP) and related technical reports
- United States Environmental Protection Agency Total Maximum Daily Load Reports
- University of Florida LAKEWATCH Annual Data Summary for 2004

Water quality data were obtained from Florida LAKEWATCH and Hillsborough County Watershed Atlas for all parameters and all stations lying within the Lower Sweetwater Creek watershed boundary. The majority of data obtained from the Hillsborough County Watershed Atlas originated from the United States Geological Survey (USGS), SWFWMD, or HCEPC.

7.1.3 Water Quality Contaminants

Despite relatively stringent regulatory criteria (e.g., Chapter 62-302, F.A.C.), contaminants are found in streams and lakes which sometimes exceed allowable regulatory limits. Surface waters in the watershed are the receiving water bodies for untreated and partially treated stormwater runoff from lands that are developed (86%) for commercial, residential, and industrial purposes. Runoff contains complex mixtures of nutrients (i.e., nitrogen and phosphorus compounds), toxic organic substances (pesticides, herbicides, industrial chemicals, oils and greases), metals, solids (trash, litter), and particulates from eroded soils. All of the agricultural development and much of the urban/suburban development within the watershed preceded regulations implemented in the 1970s and 1980s to protect water quality. While regulations have been implemented for 20 – 30 years and there are stormwater treatment projects underway within the watershed, contaminants occur in the surface waters of the Lower Sweetwater Creek. These are described below:

- **Nutrients**, compounds of nitrogen and phosphorus, are derived from several sources, including:

    - fertilizers applied to landscapes around homes, golf courses, parks, residential complexes, and commercial facilities
    - animal excrement from pets, feral animal, and wildlife
    - wastewater treatment facilities, including septic tanks
    - atmospheric deposition in rainfall that contains combustion products from incinerators and electric generating plants

    Such compounds can cause an overabundance of nuisance aquatic weeds and blooms of algae and blue-green bacteria (aka, blue-green algae) in surface waters. In addition to unsightly appearance and taste/odor problems, the most injurious result of excessive algal and bacterial growth is the depression of dissolved oxygen in affected waters. Low dissolved oxygen (<5.0 mg/liter of water) contributes directly to fish kills, stress to all aquatic organisms, and a decline in fishery quality. In addition, some blue-green bacteria produce toxins that are harmful to humans and other animals.

    The Class III water bodies criterion for DO, as established by Subsection 62-302.530(31), F.A.C., states that DO shall not on average be less than 5.0 mg/L in a 24-hour period, and shall not be less than 4 mg/L at any time, and that normal daily and seasonal fluctuations above these levels shall be maintained. In Florida waters due to warm temperatures (subtropical climate), nitrogen and phosphorus are most often the limiting nutrients, and nitrogen is typically the limiting nutrient in most Florida estuaries.

There is a general understanding in the scientific community that nitrogen is the principal cause of nutrient over-enrichment in urban water courses and coastal systems. Determining the limiting nutrient in a water body can be accomplished by calculating the ratio of nitrogen to phosphorus. When the ratios of total nitrogen (TN) to total phosphorus (TP) in a water body is less than 10 then it is classified as nitrogen limited. If nitrogen is the limiting nutrient, reductions in TN loadings would be expected to result in decreases in algal growth, and are measured as decreases in chlorophyll *a* levels. Reductions in TN loading are also expected to result in additional benefits for other water quality parameters of concern, including DO and biochemical oxygen demand (BOD). Reductions in nitrogen will result in lower algal biomass levels in the water column; lower algal biomass levels will result in smaller diurnal fluctuations in DO, fewer algal-based total suspended solids, and reduced BOD. The expectation that reductions in nitrogen loading will provide improvements in other water quality parameters is supported by a statistical evaluation of water quality data through a simple linear regression of chlorophyll *a* versus BOD**.**

Processes that consume oxygen from the water column, such as the microbial breakdown of organic material and sediment oxygen demand (SOD), are fairly constant over the short term. Algal populations, however, can increase rapidly, and the production of oxygen as a result of photosynthesis during daylight hours and the respiration or consumption of water from the water column at night can result in large diurnal fluctuations of DO in the water column. Portions of increased algal biomass will also become part of the organic material that will be broken down by microbes or settle to the bottom. Therefore, management of nutrients in the watershed to maintain the assimilative capacity of receiving waters will improve the water quality by preventing algal growth and maintaining required DO levels for the aquatic life.

- **Total suspended solids (TSS)** may cause high biological or chemical oxygen demand that also can reduce the availability of oxygen in the water for aquatic life. Metals and injurious organic compounds that are toxic in high concentrations are often bound to TSS and can be found in the sediments of receiving waters as a result of having been washed into a lake or stream in stormwater runoff. Excessive TSS concentrations also reduce water clarity and affect aquatic plant communities and may interfere with the feeding efficiency of filter-feeding aquatic insects and shellfish. High TSS in a lake or stream also increase the tendency of the water to heat during the day, further reducing the water's ability to hold oxygen.

- **Metals**, including mercury, lead, and copper, can reach levels that are toxic to many fish, amphibians, and aquatic insects. In some cases, metals such as mercury may accumulate in fish, posing a threat to human health if contaminated fish are consumed regularly.

- **Toxicants**, organic contaminants, and pesticides (which include insecticides, herbicides, and fungicides) can be found in residential, commercial, industrial, and agricultural areas, which can potentially be transported to surface waters via stormwater runoff. Though often undetectable in the water column, some compounds (e.g., pesticides) and their derivatives may accumulate in sediments in concentrations that are harmful to aquatic life.

- **Pathogens**, which may include bacteria, viruses, and protozoa, can cause a number of human diseases including respiratory and gastrointestinal ailments, skin rashes, and eye and ear infections. Transport of pathogens can occur via stormwater runoff or groundwater (from inadequately constructed septic tank systems) to surface waters. Illnesses may occur if pathogens are ingested either through accidental contact by recreational users of lakes and streams or through ingestion of inadequately treated drinking water. Pathogenic organisms are not routinely monitored by most water sampling agencies, except for potable water supplies. Indicators of pathogen contamination include total and fecal coliform bacteria that are tested by some agencies (e.g., health departments) at public bathing beaches and in ambient water quality monitoring programs. Efforts are currently underway by the US EPA to adopt standards for two new indicators, *E. coli* and the enterococcal group.

- **Litter, trash**, and other discarded solid objects originate from humans around shopping and commercial areas, industrial sites, landfills, automobiles, and overflowing trash cans. Litter poses a health and safety risk to humans and aquatic animals and impairs the aesthetic and economic values of neighborhoods, streams, and lakes.

7.1.4 Pollution Sources and Transport

Excess nutrients, pathogens, and toxic contaminants can follow several different pathways to the streams, lakes, and groundwater in the Lower Sweetwater Creek watershed including:

1. untreated stormwater runoff from urban, residential, commercial, and agricultural land uses;
2. contaminated sediments which may be re-suspended during high flow or wind events in streams and lakes/bays, respectively;
3. atmospheric deposition (primarily nitrogen oxides and certain heavy metals like mercury which can be transported to the creeks and lakes in rainfall and dryfall);
4. failing septic tanks, which may contribute significantly to nitrogen and pathogen loading, although only 24% of homes in the County remain on on-site septic systems at this point;
5. animal waste from pets, feral dogs and cats, and wildlife; and
6. untreated domestic wastewater which may occur as accidental discharges during heavy rainfall events from wastewater treatment and transport facilities.

Of these, the primary sources of nutrients in surface water are believed to be the first three items above listed with the bulk (98%) of the nutrient load being generated from urban lands and highways in the watershed (FDEP, 2004). The loads of nitrogen and phosphorus have been estimated for 2003, a year when rainfall was a normal 52 inches, at 28.8 tons and 4.3 tons, respectively. Because other contaminants are known to be associated with stormwater runoff from urban lands and roadway surfaces, it can be expected that stormwater runoff is also the primary source of metal, oils and greases, and other toxic substances in the watershed.

In addition to items 1-6 above, groundwater in the watershed can also be contaminated from saltwater intrusion from lateral movement from Old Tampa Bay and from vertical, although the latter is probably not significant. Using the DRASTIC methodology, the vulnerability to contamination of the Floridan Aquifer in the watershed has been estimated at 145 in the coastal reaches of the LSC and 149 in the upper reaches of the LSC on a relative scale ranging from <79 to >200. The DRASTIC index was computed using data from the following factors: the depth to water in the aquifer, net recharge (0 inches/year in the watershed), aquifer and soil media, topography, the impact of the vadose zone, and hydraulic conductivity. Using the same methodology, the vulnerability of the surficial aquifer was estimated as 147-200 (Kelley, 1988).

7.1.5 Superfund/Landfills/Point Sources

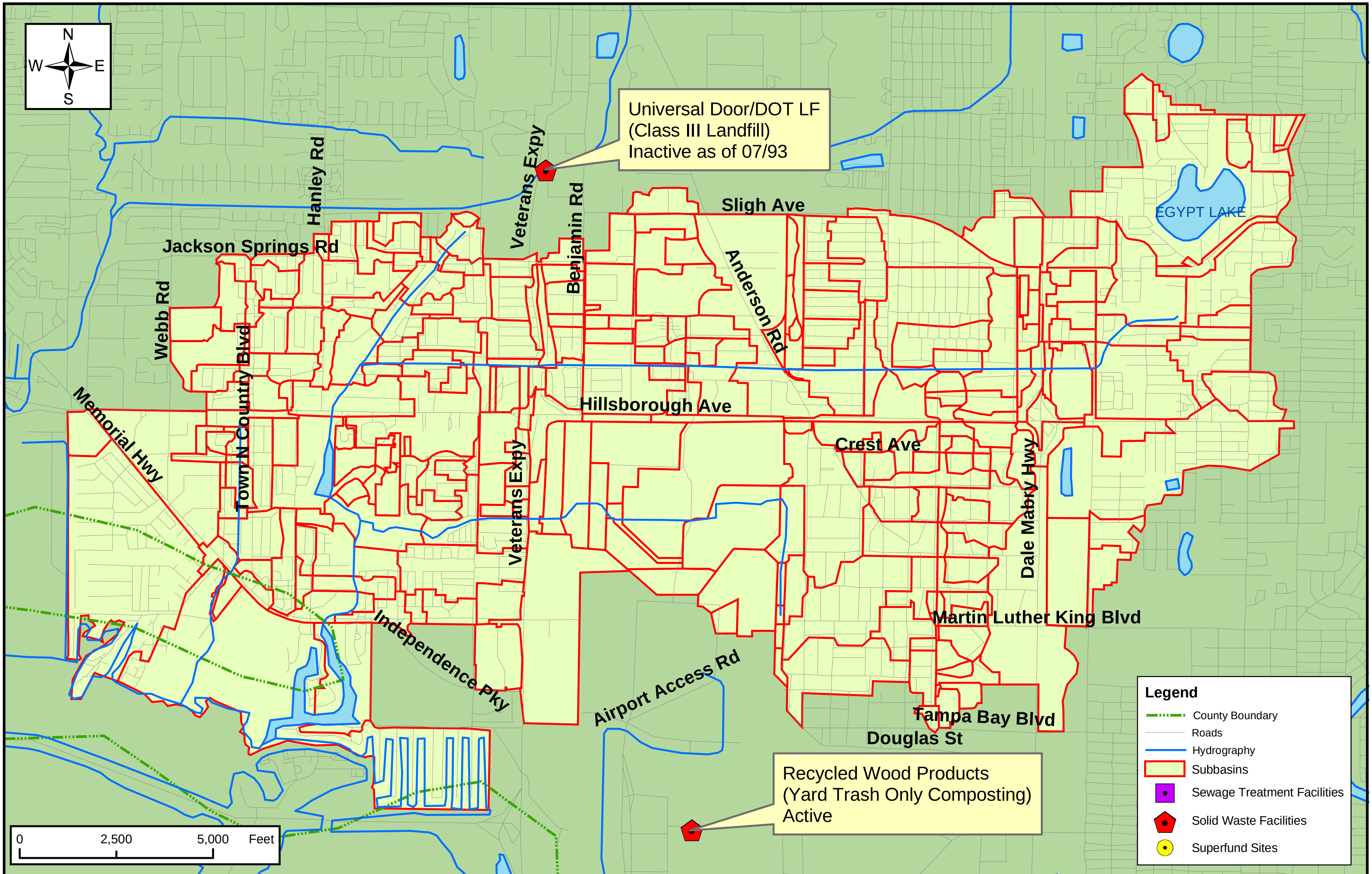
Superfund sites – A survey of US EPA's National Priority List indicated that there are no active superfund sites located in the Lower Sweetwater Creek watershed.

Landfills and other waste facilities – There are no active solid waste facilities in the watershed (FDEP, 2006).

Point sources – There are no permitted active domestic sewage treatment facilities in the watershed. There are four permitted industrial waste sites in the watershed. There are seven hazardous materials sites listed in the Florida Geographic Data Library (FGDL) as located in the watershed. There are at least 25 permitted surface water management systems in the watershed (FDEP, 2006). Figure 7-2 shows all Superfund Sites, Solid Waste Facilities, and Sewage Treatment Facilities.

7.1.6 Other Issues

Contaminated sediments - Although we have no specific data on sediments in the Lower Sweetwater Creek watershed to indicate specific issues, it is helpful to indicate that recent studies in the Tampa Bay area have identified the presence of contaminated sediments in several areas of the Bay (Long et al., 1991 and 1994; Long and Greening, 1999, Grabbe and Barron, 2002). Of the areas sampled, Old Tampa Bay, the receiving water body for Lower Sweetwater Creek, had consistently lower levels of polychlorinated biphenyls (PCBs), organochlorine pesticides, and polycyclic aromatic hydrocarbons (PAHs) than other segments of the Tampa Bay system.



Location of the Superfund Sites, Solid Waste Facilities, and Sewage Treatment Facilities in the Lower Sweetwater Creek Watershed

Figure 7-2

AYRES ASSOCIATES

While PCBs and PAHs were detected in sediment in the estuaries of Rocky Creek and Channel A, concentrations exceeded national standards for sediment quality in less than 30% of the sample tested. Few, if any, samples have been taken within the Lower Sweetwater Creek watershed to evaluate sediment quality, but since contaminated sediments have been detected within the Bay, it is recommended that all contributing areas be sampled for potential contaminated sediment flux to the Bay. A number of management activities have been proposed to reduce contaminant loading to Hillsborough Bay, including source reductions and stormwater treatment. Such activities may be needed for all sources of inflow to the Bay. A sediment sampling plan may be needed to determine whether a sediment TMDL is warranted for this watershed.

Mercury in fish - Old Tampa Bay north of Courtney Campbell Causeway (WBID 1558I) is impaired for mercury in fish tissue, and a Total Maximum Daily Load (TMDL) for that parameter is scheduled for development in 2011.

7.1.7 Total Maximum Daily Loads (TMDLs)

Section 303(d) of the Clean Water Act includes a requirement for states to identify, list, and prioritize waters for which water quality standards are not being protected by technology-based effluent limitations. Based on the priorities reported, each state must develop TMDLs for those waters that do not meet applicable water quality standards. The TMDL process quantifies and allocates the amount of a pollutant that can be assimilated by a waterbody. The process also identifies the source(s) of the pollutant and recommends appropriate regulatory actions to achieve compliance with water quality standards.

A TMDL can be expressed as the sum of all point sources (waste load allocations or WLAs), non-point sources (load allocations or LAs), and an appropriate margin of safety (MOS), as shown below:

$$TMDL = \Sigma\ WLAs + \Sigma\ LAs + MOS$$

The calculation must also account for seasonal variation in water quality. Nationally, the issues that are implicated in the most impaired waterbodies/segments include: sediments, nutrients, pathogens, low dissolved oxygen, and metals.

In the TMDL process, watersheds are evaluated using the following phased approach:

- Phase 1 - Initial Basin Assessment
- Phase 2 - Coordinated Monitoring
- Phase 3 - Data Analysis and TMDL Development
- Phase 4 - Basin Management Plan Development
- Phase 5 - Begin Implementation of Basin Management Plan
- Linkage to TMDL Implementation

Figure 7-3 displays the location of watersheds scheduled for TMDL development as of 2002 in the US EPA 303(d) report for Florida and their WBIDs. The Lower Sweetwater Creek watershed is divided into the following WBIDs relating to TMDLs: marine segment (WBID 1570A) and the freshwater segment (WBID 1570). WBID 1570 is not listed on FDEP or by US EPA. Waters in segment 1570A were identified as impaired for dissolved oxygen (DO), nutrients, fecal coliform, and total coliform bacteria (U.S. EPA only).

Table 7-3 shows the TMDL development schedule for US EPA and FDEP. Refer to Appendix 7-2 for a complete list of waterbodies and their corresponding TMDL schedule.

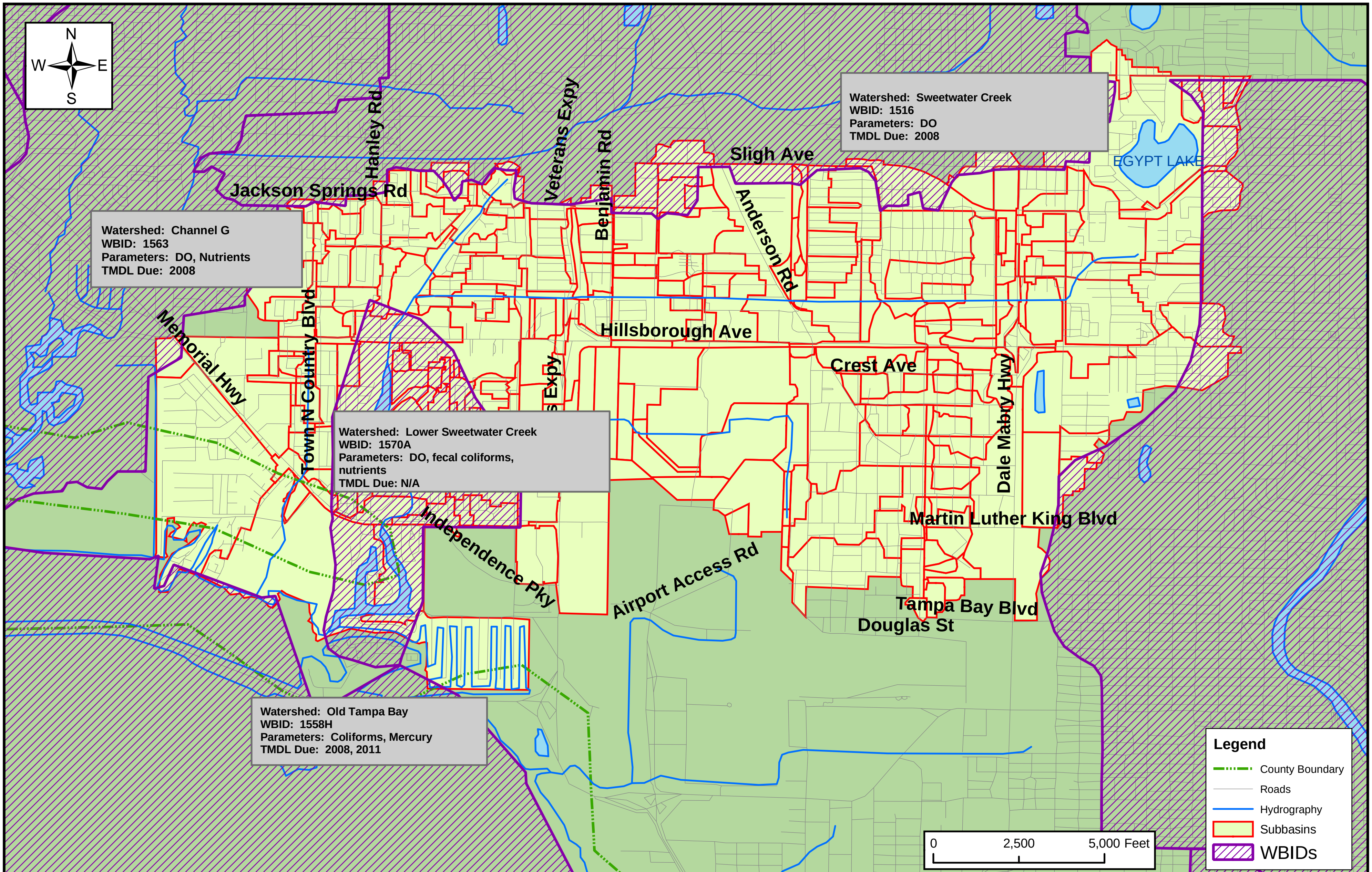
Table 7-3 List of 303(d) Waterbodies and their Schedules in the Lower Sweetwater Creek Watershed

		FDEP		US EPA	
Name	**WBID**	**Parameters**	**Schedule**	**Proposed TMDL**	**Approved TMDL**
Lower Sweetwater Creek *estuarine/marine*	1570A	DO, Coliforms (fecal coliform), Nutrients (Chlorophyll), Nutrients	2003	DO, Fecal Coliform, Nutrients, Total Coliform	None
Lower Sweetwater Creek *freshwater*	1570	None	N/A	None	None

1-FDEP parameters and schedule based on FDEP Verified List of Impaired Waters for the Group 1 Basins (including amended order – March 2003) G1CompositeVerifiedList_2-7-05.xls

2-US EPA TMDLs based on information downloaded on Nov 2007 APPROVED/DISAPPROVED by EPA on JUN-11-2003, Section 303(d) List Fact Sheet for Watershed TAMPA BAY.

FDEP issued its final reports for Lower Sweetwater Creek TMDLs for coliforms and nutrients in September 2004. The FDEP has been evaluating various areas of the state based on a “rotating watershed” approach (Livingston, 2000). FDEP’s assessment study for the Tampa Bay area, which includes Lower Sweetwater Creek, was issued in February 2004.



Location of WBIDs as they pertain to the Lower Sweetwater Creek Watershed

Figure 7-3

AYRES ASSOCIATES

7.2 Water Quality Conditions in Lower Sweetwater Creek Watershed

7.2.1 Overall Data Assessment Methodology

Station Selection - Locations of all surface water and ground water quality sampling stations evaluated in this chapter are shown in Figure 7-4. Data were available over the period 1968 through mid-2005 for the database as a whole; however, the most extensive database existed for Egypt Lake and Sweetwater Creek at Memorial Highway (HCEPC #104). Only these two stations had at least 20 data points per parameter; these stations are the “representative” stations discussed in next section of this report and are listed in Table 7-4. Data are available for the Henry Street Canal, but the data is composed of only six sampling episodes over the period 8/93 – 9/97, and there were not 20 samples per parameter in the data set. Nevertheless, a discussion of water quality conditions in the Canal is provided in this report because the data set includes some of the only information on metals for the Lower Sweetwater Creek watershed. See Appendix 7-4 for a summary of sampling stations containing water quality data for Lower Sweetwater Creek watershed and a corresponding number of sampling events per station.

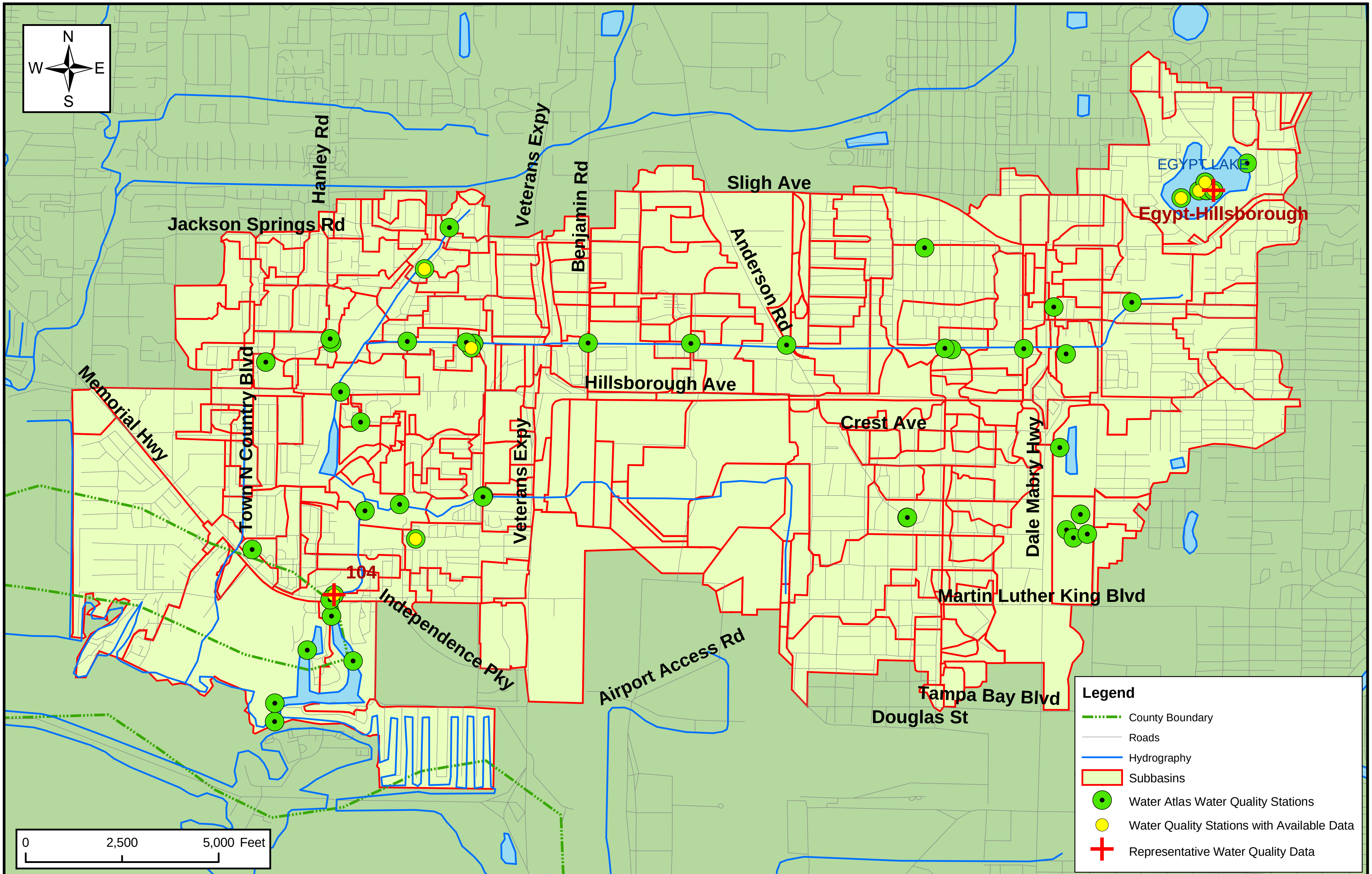
Table 7-4 Water Quality Sampling Stations in the Lower Sweetwater Creek Watershed containing at least 20 data points per parameter and number of samples/parameter

Station ID	Number of samples/parameter								
	DO	BOD5	pH	TN	TKN	TP	Chl a	Fecal Coli	Total Coli
HCEPC #104	181	184	180	170	184	183	181	181	144
Egypt Lake				117		111	80		

Data are discussed in three different time frames:

1. Annual averages for the period of record in order to determine overall trends;
2. Monthly averages for the last 10 -15 years up to 2004 to determine if the second half of the data record exhibits different trends than those shown by the entire data; and
3. Recent data from 2005 to examine trends, if any, shown by the newest data.

The discussion focuses on five parameters due to their significance in assessing the conditions of a water body and because they are used in the calculations of some important quality indices.



Location of Surface Water Quality Sampling Stations in the Lower Sweetwater Creek Watershed

Figure 7-4

AYRES ASSOCIATES

The parameters are: dissolved oxygen (DO), biochemical oxygen demand (BOD), nutrients (total nitrogen and total phosphorous, designated by TN and TP, respectively), and chlorophyll a (chl a). With the exception noted above for the Henry Street Canal, very little data are available for metals or toxic organic materials in any of the data sets from HCEPC, FDEP, SWFWMD, USGS, LAKEWATCH, or Stream WaterWatch that were examined for this report.

It is important to note that the data sets used for this evaluation were the most current available at the time at the start of the project. More recent sample data is available, but not included in this analysis.

7.2.2 Water Quality Conditions and Trends

Lakes

Egypt Lake, previously described in Section 7.1, was sampled annually by HCEPC from 1968 to 1994 and by LAKEWATCH from 1993 to the present time. SWFWMD also sampled the lake over the periods 7/1994 – 3/1998 and 7/2000 – 2/2001. This discussion is based chiefly on the HCEPC and LAKEWATCH data sets.

In order to evaluate and compare lake water quality throughout Florida, the FDEP makes use of a Trophic State Index (TSI). Initially developed by Carlson (1977), the TSI is a number generated by inserting values for three water quality indicators (total phosphorus concentration, chlorophyll a concentration, and Secchi depth) into an equation modified from the original to include total nitrogen concentrations and exclude the Secchi depth measurement. Today, the TSI is interpreted as follows: a TSI between 0 and 59 is *good*, while a value between 60 and 69 is *fair,* and 70 to 100 is *poor.* Egypt Lake's current TSI is 42.5 based on LAKEWATCH data, placing the lake in the *good* category. The historical average for TSI based on LAKEWATCH data for 1992 – 2005 is 49.7; this value also places the lake in the *good* category.

Chlorophyll a (Figures 7-5a and 7-5b)
Monthly average data for chlorophyll a (chl a) are available for Egypt Lake from 8/1993-3/2004 (Figure 7-5a). These data also represent the Period of Record data from LAKEWATCH expressed as annual averages (Figure 7-5b), and both average data sets are discussed here. Over that period, 42 samples were taken, and chl a remained at or below 20 µg/L 76% of the time; exceptions noted included late summer of 1996. Linear trend analysis of the monthly average data and the period of record data indicated a slight decline (improving condition) in chl a concentrations.

The information for Egypt Lake, one sampling episode in March 2004, is already included in the monthly average graph shown in Figure 7-5a. At that time, chl a concentration was reported as 16.5 µg/L.

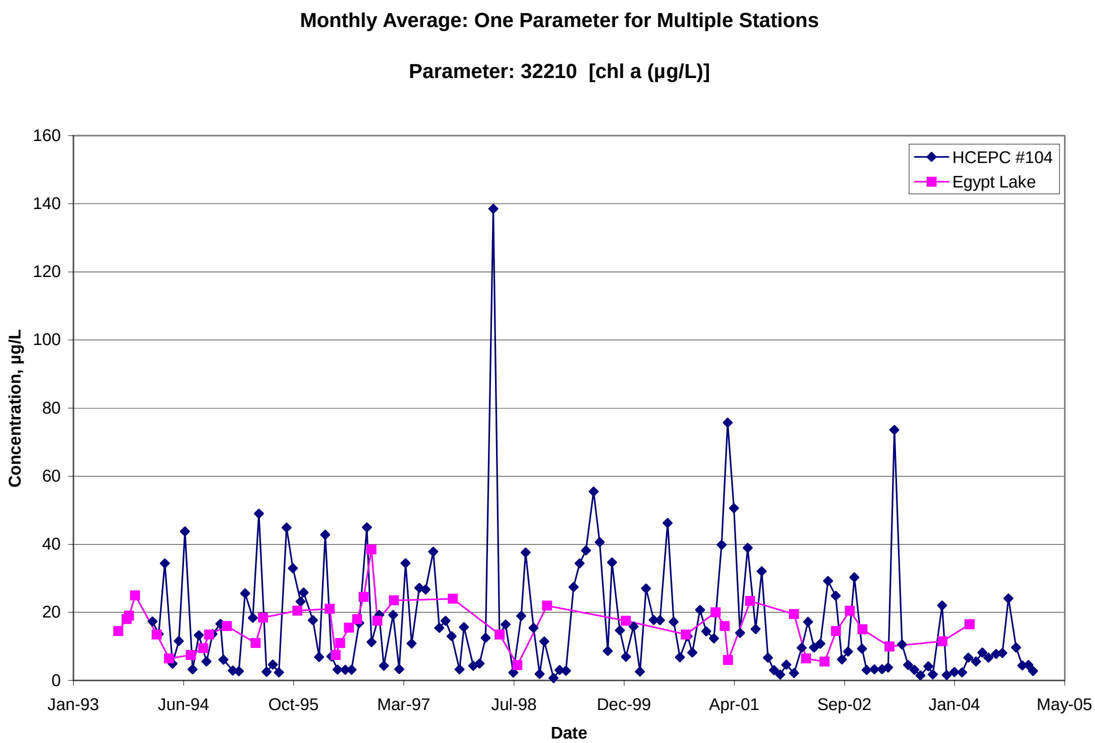


Figure 7-5a Monthly Averages for chl a at Egypt Lake and Sweetwater Creek at Memorial Highway (HCEPC #104), 8/93 – 3/04

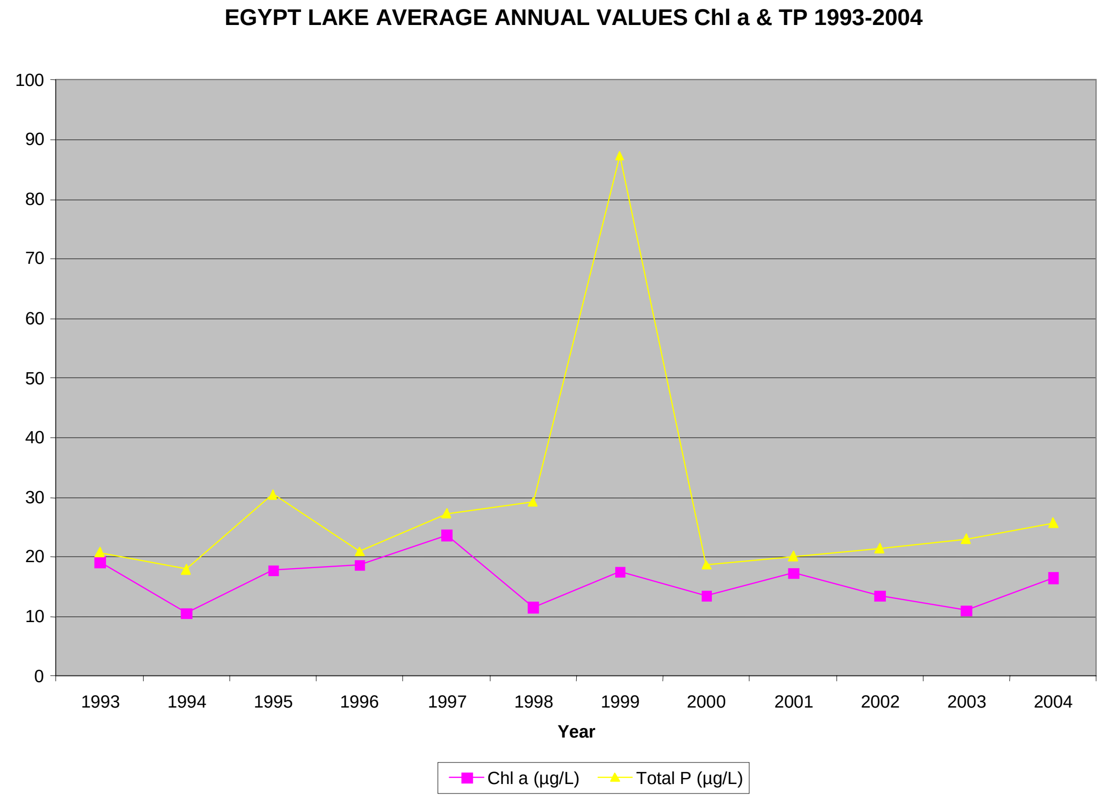


Figure 7-5b Period of Record Annual Averages for chl a at Egypt Lake and Sweetwater Creek at Memorial Highway (HCEPC #104), 8/93 – 3/04

Total Nitrogen (TN) (Figures 7-5c and 7-5d)
Monthly average data for total nitrogen (TN) are available for Egypt Lake from 1989-2005 (Figure 7-5c). These data also represent the Period of Record data from LAKEWATCH expressed as annual averages (Figure 7-5d), and both average data sets are discussed here. All of the 44 samples taken were within a range of 0.5 – 1.0 mg/L TN, although a slight trend toward increasing TN concentrations was revealed in a linear trend analysis of both monthly average and annual average data.

The most recent information for Egypt Lake, one sampling episode in March 2004, is already included in the monthly average graph shown in Figure 7-5c. At that time, the TN concentration was reported as 805 µg/L.

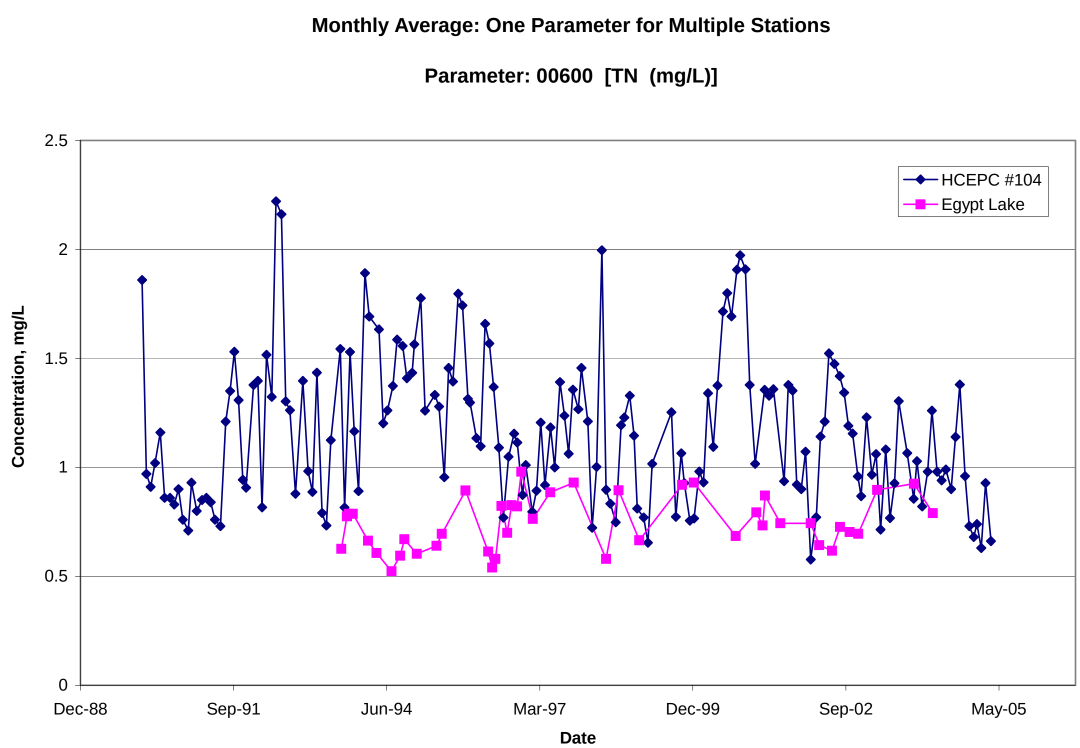


Figure 7-5c Monthly Average Values for TN at Egypt Lake and Sweetwater Creek at Memorial Highway (HCEPC #104), 1989-2005

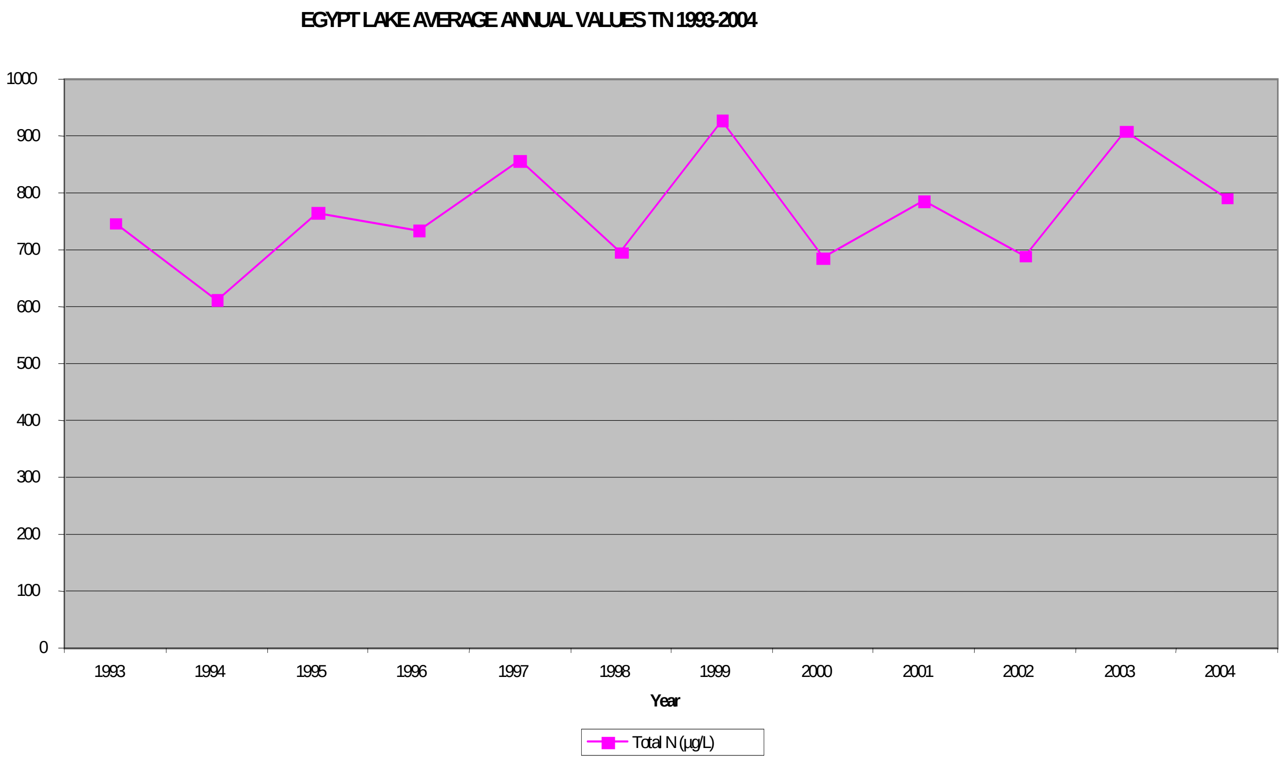


Figure 7-5d Period of Record Annual Average Values for TN at Egypt Lake and Sweetwater Creek at Memorial Highway (HCEPC #104), 8/93 – 3/04

Total Phosphorous (TP) (Figures 7-5e and 7-5f)

Monthly average data for total phosphorous (TP) are available for Egypt Lake from 1989-2005 (Figure 7-5e). These data also represent the Period of Record data from LAKEWATCH expressed as annual averages (Figure 7-5f). Both monthly and annual averages are discussed here. All 44 samples taken, all were less than 0.02 mg/L TP, and no increasing or decreasing trend was noted.

The most recent information for Egypt Lake, one sampling episode in March 2004, is already included in the monthly average graph shown in Figure 7-5e. At that time, the TP concentration was reported as 26.5 µg/L.

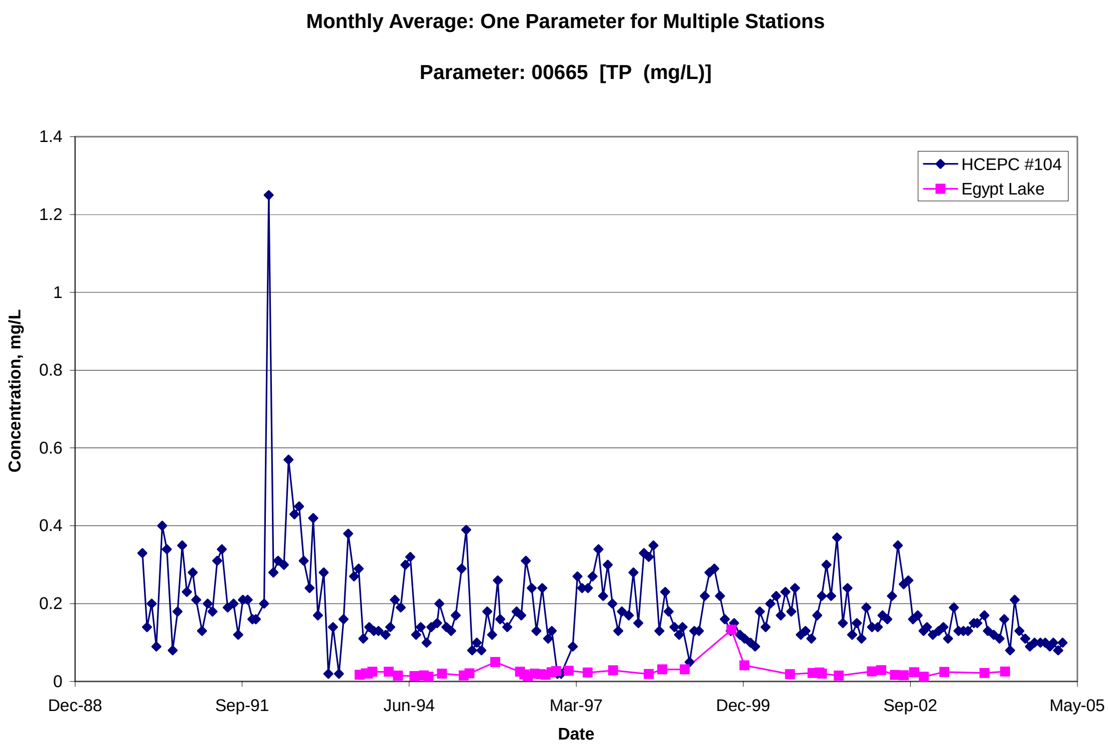


Figure 7-5e Monthly Average Values for TP for Egypt Lake and Sweetwater Creek at Memorial Highway (HCEPC #104)

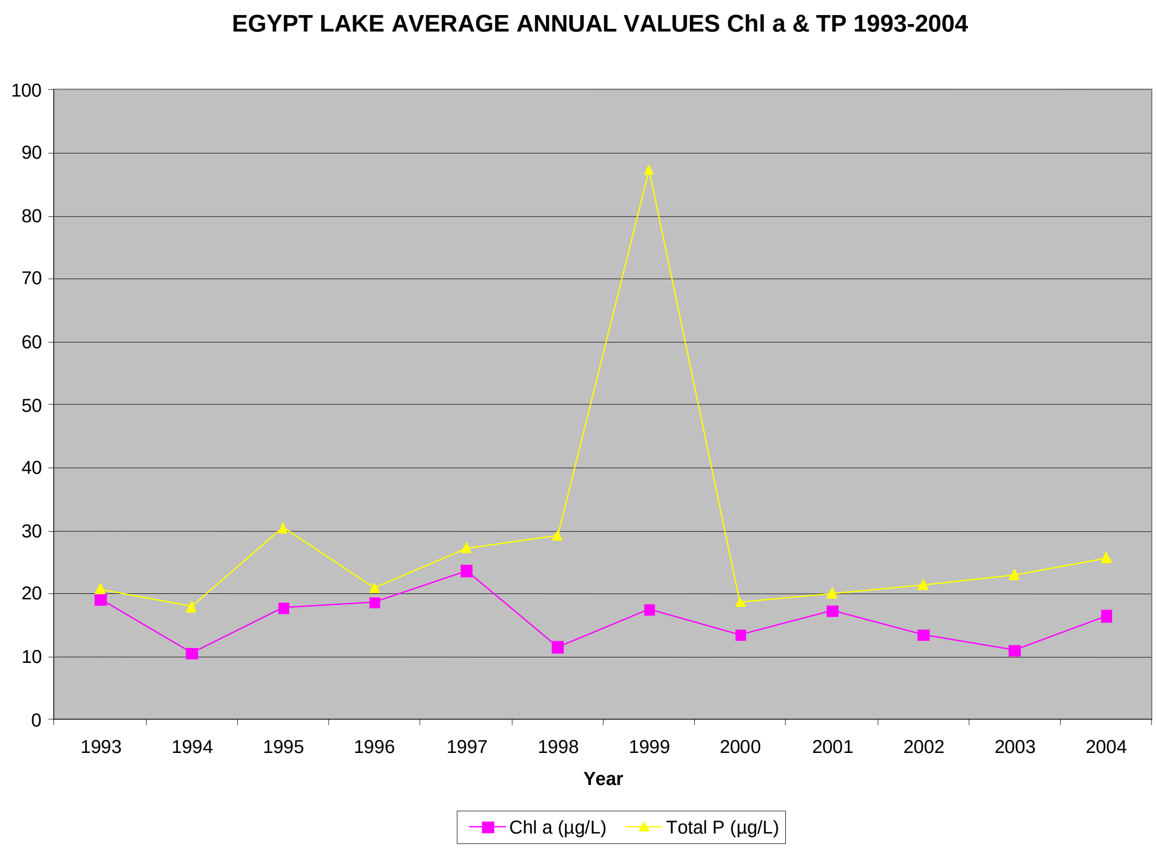


Figure 7-5f Period of Record Annual Averages for TP at Egypt Lake (LAKEWATCH), 8/93 – 3/04

Streams

Sweetwater Creek - The stream sampling station having sufficient data for analysis was Sweetwater Creek at Memorial Highway (HCEPC #104), within the Lower Sweetwater Creek watershed, which is located 0.8 mile from the Creek's outfall to Old Tampa Bay. At this point, the Creek is tidal and salinities span a range typical of brackish to marine waters, with a definite gradient from water surface to streambed. This station has been sampled by various agencies/entities over the period 1974 to the present time. The most complete data set is available from HCEPC whose record began in 1974 and continues to the present. This discussion is based chiefly on the HCEPC data set and that of the STREAMWATCH program. Summary statistics of all data extracted from the Hillsborough County Watershed Atlas for the watershed can be found at the end of this chapter (Appendix 7-3).

The Florida Water Quality Index (WQI) developed by Hand et al. (1992) is used to assess and compare water quality within watersheds. Table 7-5 provides the WQIs for this reach of Sweetwater Creek. The WQI is interpreted as follows: between 0 and 45 is *good*, while a value between 45 and 60 is *fair,* and >60 is *poor.* Table 7-5 shows that the seasonal average WQI for the reach of Sweetwater Creek represented by HCEPC #104 is highest during the wet season (Jul-Sep) and lowest during the drier times of the year (Apr-Jun and Jan-Mar), indicating that water quality declines in the lower reach of the Creek during periods of high stormwater runoff. All of the WQIs from 2002 through 2005 were in the *fair* to *poor* range; none were in the *good* range (0-45).

Table 7-5 Average Seasonal Water Quality Indices (WQIs) for Sweetwater Creek at Memorial Highway (HCEPC #104), 2002 – 2005

Season	2002	2003	2004	2005	Seasonal Average
Apr - Jun	70	67	52	66	62
Jan - Mar	54	64	60	57	68
Jul - Sep	62	77	70	71	72
Oct - Dec	60	65	56	50	70

<u>Dissolved Oxygen and Biochemical Oxygen Demand (Figures 7-6a, b, and c)</u>
Monthly average data for dissolved oxygen (DO) and biochemical oxygen demand (BOD) are available for Sweetwater Creek at Memorial Highway from 1989-2005 (Figure 7-6a). Of the approximately 182 samples for DO, 78% were lower than the 5.0 mg/L FDEP criterion. A linear trend analysis indicated a slight pattern of DO decline over the sample period. Of the 185 samples for BOD, 94% were lower than 5.0 mg/L, and there was a trend toward lower (improved) BOD conditions at the sampling station.

Period of record data (1974 – 2005) for dissolved oxygen (DO) and BOD are shown in the form of annual averages (Figure 7-6b). A visual inspection of the data indicates that BOD averaged between 5.75 and 1.4 over the 32-year period. A linear trend analysis indicates an overall improving trend (lower BOD concentrations) occurred in the 1980s but was reversed in 1993. After that peak, another improving trend appears to have been underway since 2002 and continues to the present. The data for DO indicate that oxygen concentrations have failed to meet FDEP quality criteria on an annual average basis. The lowest averages were recorded in 2000 and 2001, while the highest average was recorded in 1998. A linear trend analysis indicates a slight, statistically insignificant, decline in DO over the period of record.

Recent data (Jan-Mar 2005) for DO and BOD indicate that BOD ranged between 1.0 mg/L and 3.0 mg/L. DO declined below FDEP water quality criteria (5.0 mg/L), ranging between 3.75 mg/L to 5.75 mg/L over that period (Figure 7-6c).

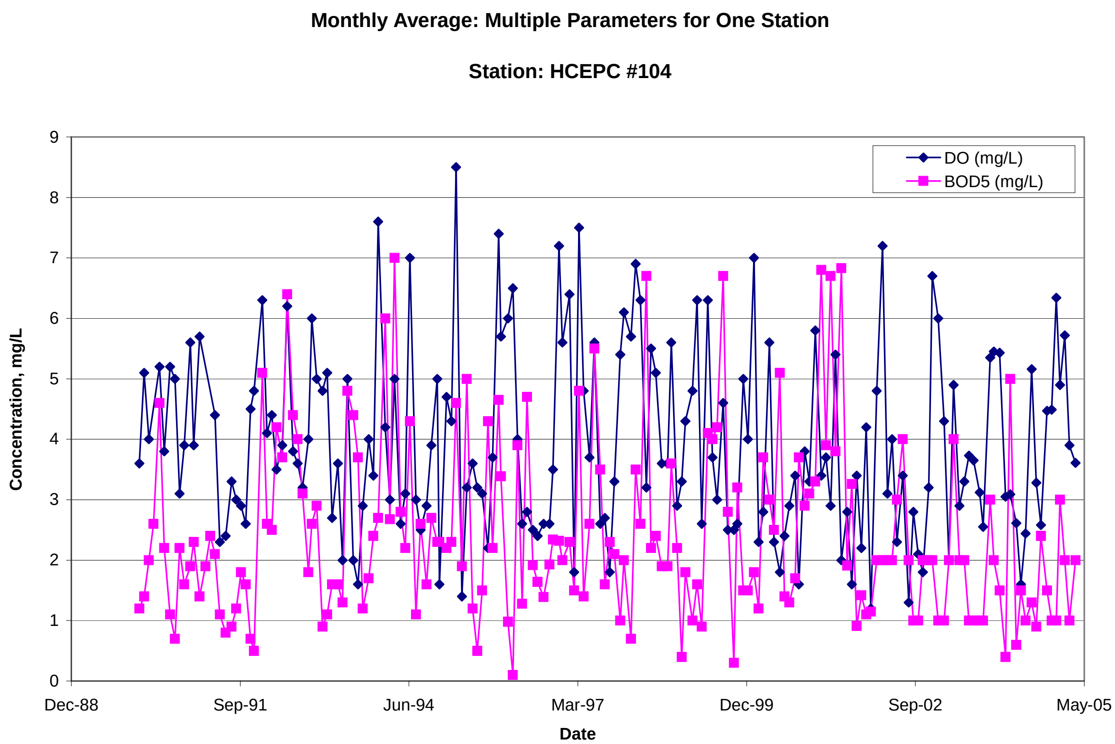


Figure 7-6a Monthly Average Values for BOD and DO for Sweetwater Creek at Memorial Highway, (HCEPC #104)

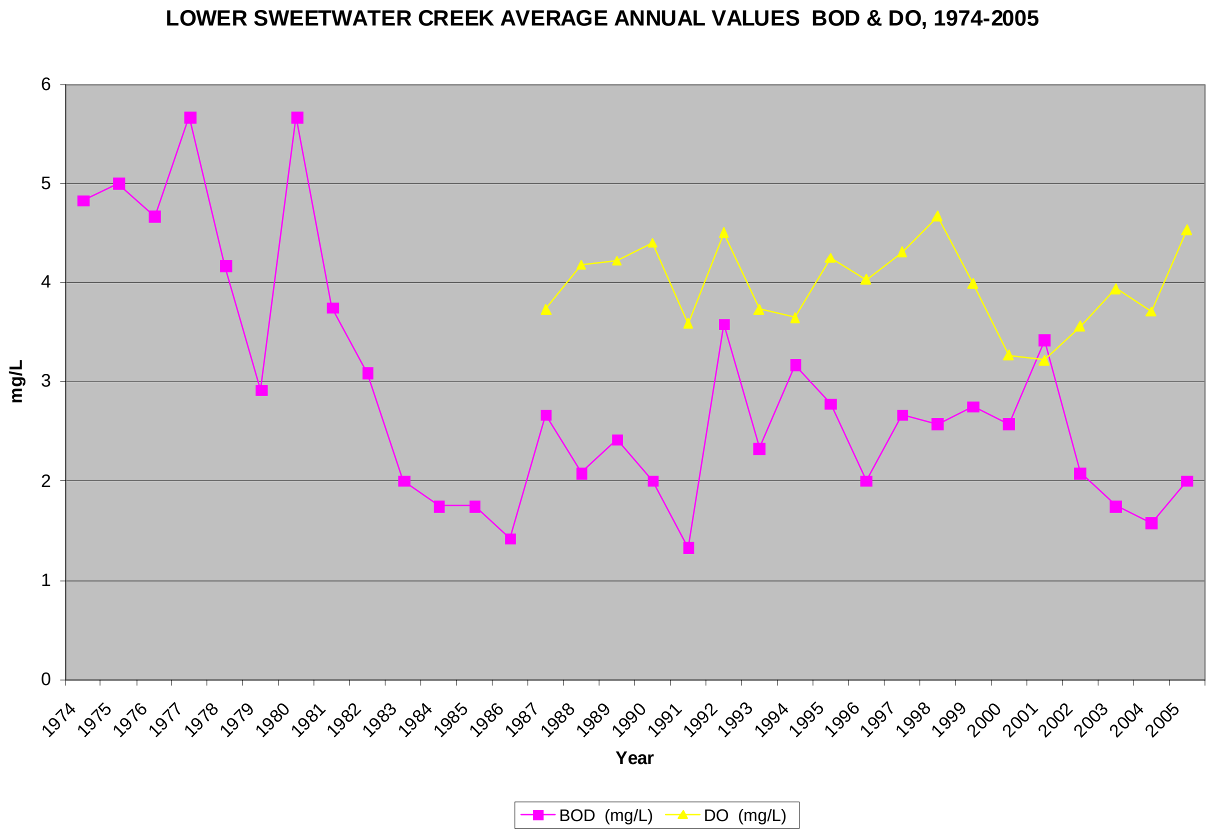


Figure 7-6b Period of Record Annual Average Values for BOD and DO for Lower Sweetwater Creek at Memorial Highway, (HCEPC #104)

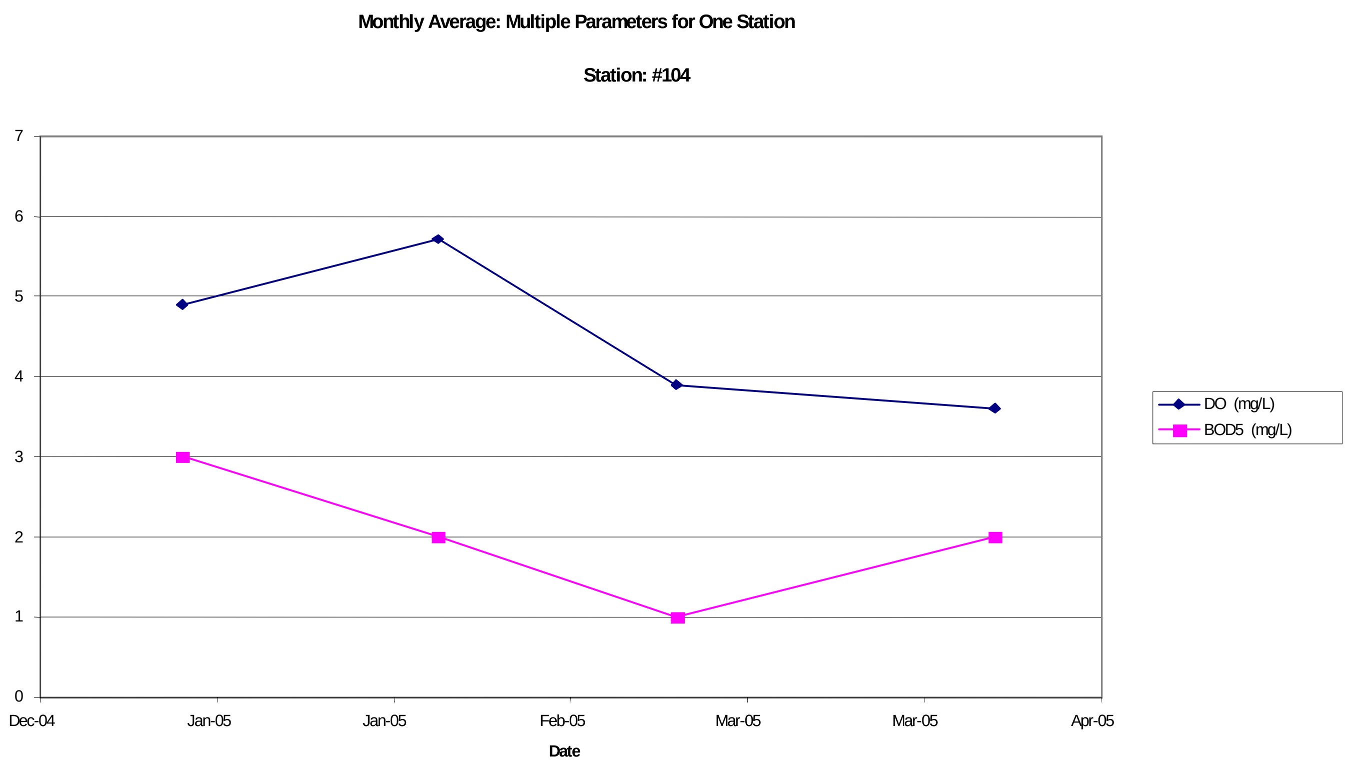


Figure 7-6c Recent Values for BOD and DO for Sweetwater Creek at Memorial Highway, (HCEPC #104)

Chlorophyll a (Figures 7-7a and 7-7b)

Monthly average data for chlorophyll a (chl a) are available for Sweetwater Creek at Memorial Highway from 1993-2005 (Figure 7-7a). Of the approximately 133 samples for chl a over that period, 26% were higher than 20 µg/L; one sample in spring of 1998 spiked to a high of 140 µg/L. More samples exceeded 20 µg/L in the five-year period 1995-1999 (17 samples) than in the period 2000-2005 (12 samples). A linear trend analysis indicated a slight, statistically insignificant, declining pattern in chl a concentrations.

Period of record data are presented as annual averages for 1974-2004 (Figure 7-7b). During that period, chl a concentrations ranged from 60 mg/L to 4.0 mg/L (1986). Since 1987, peaks in chl a have been lower and the range of concentrations has been less. A linear trend analysis indicated a decline in chl a concentrations over the period of record which was more pronounced over the time period 1974-1986 and less pronounced from 1986-2005.

Recent data for this station (Table 7-6) indicated a decreasing trend in chl a concentrations, ranging from 4.6 µg/L in December 2004 to a low of 0.9 µg/L in April 2005.

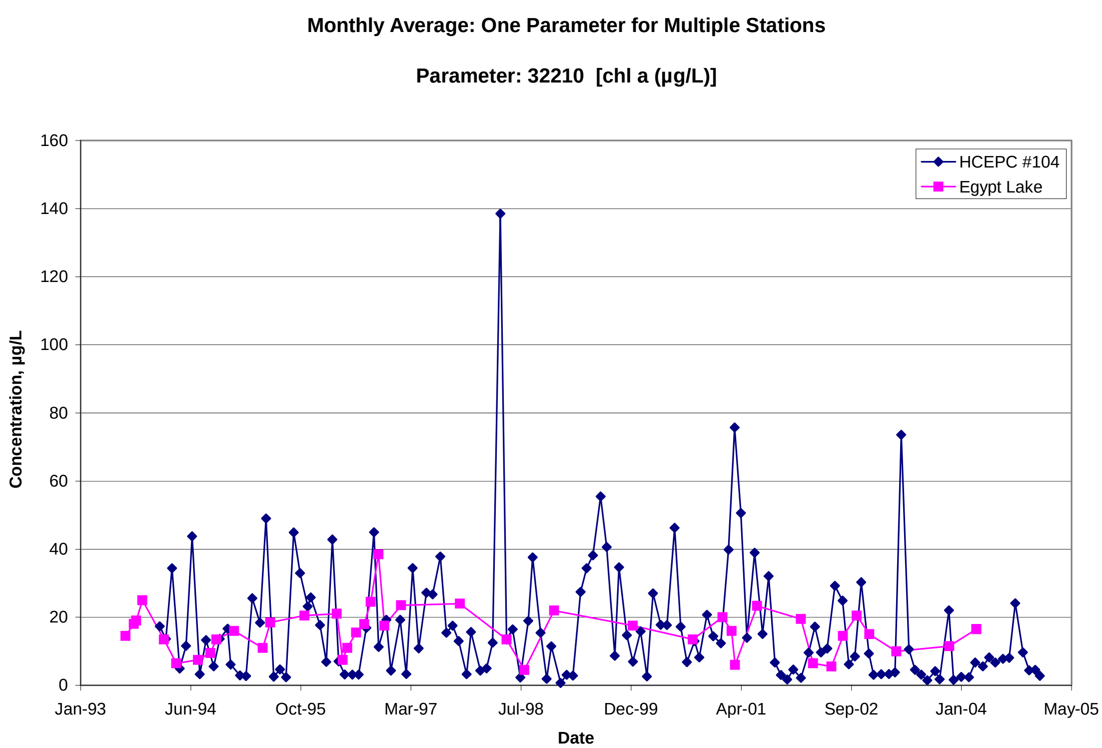


Figure 7-7a Monthly Average Data for chl a for Sweetwater Creek at Memorial Highway (HCEPC #104) and Egypt Lake

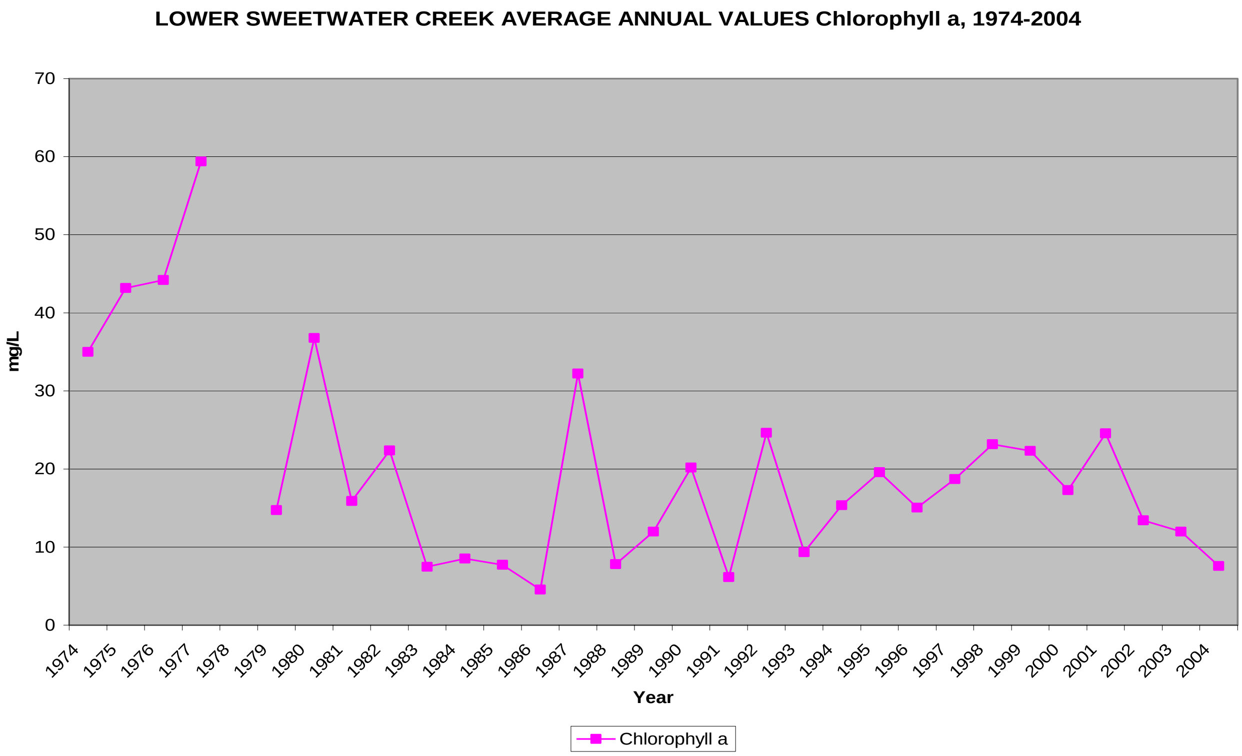


Figure 7-7b Period of Record Annual Average Values for chl a at Memorial Highway (HCEPC #104)

Table 7-6 Recent Data for chl a for Sweetwater Creek at Memorial Highway (HCEPC #104)

DATE	chl a (µg/L)
12/2004	4.6
01/2005	2.8
02/2005	1.3
03/2005	0.9
04/2005	0.9

Nutrients: Total Nitrogen and Total Phosphorous (Figures 7-8a and b and Table 7-7)
Monthly average data for total nitrogen (TN) are available for Sweetwater Creek at Memorial Highway from 1990 - 2005 (Figure 7-8a). Over that 16-year period, the concentrations of TN in 38% of the samples were less than 1.0 mg/L, while 38% of the samples reported TN concentrations in the range 1.0 – 1.5 mg/L. TN concentrations in 15% of the samples exceeded 1.5 mg/L.

Approximately the same number of samples exceeded 1.5 mg/L in the five-year period 1995 – 1999 as in the period 2000 - 2005. A slight decreasing trend in TN was noted in a linear trend analysis. Period of record data for TN were available for 1981 - 2004 (Figure 7-8b). TN concentrations in the 24 samples reported were below 1.5 mg/L except for three samples, most notably in 1987 when a peak >2.0 mg/L occurred. A linear trend analysis indicated an overall decreasing trend in TN. Recent data for TN (Table 7-7) ranged from 740 µg/L to 630 µg/L; however, only three samples were available.

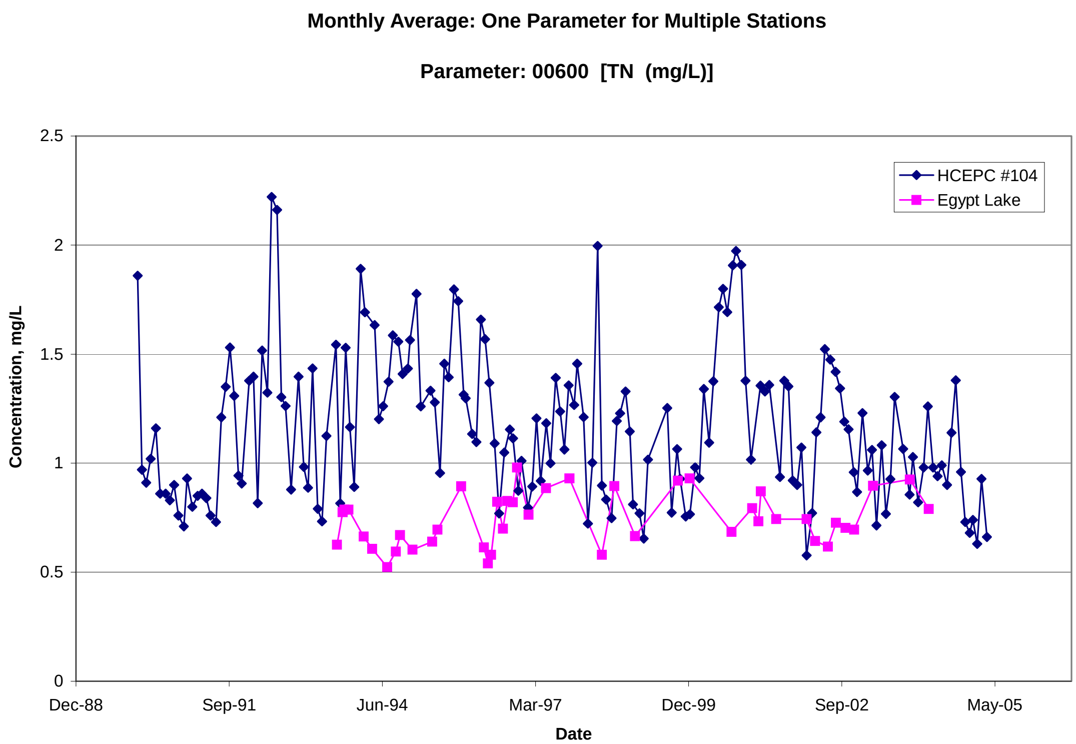


Figure 7-8a Monthly Average Data for TN for Sweetwater Creek and Egypt Lake

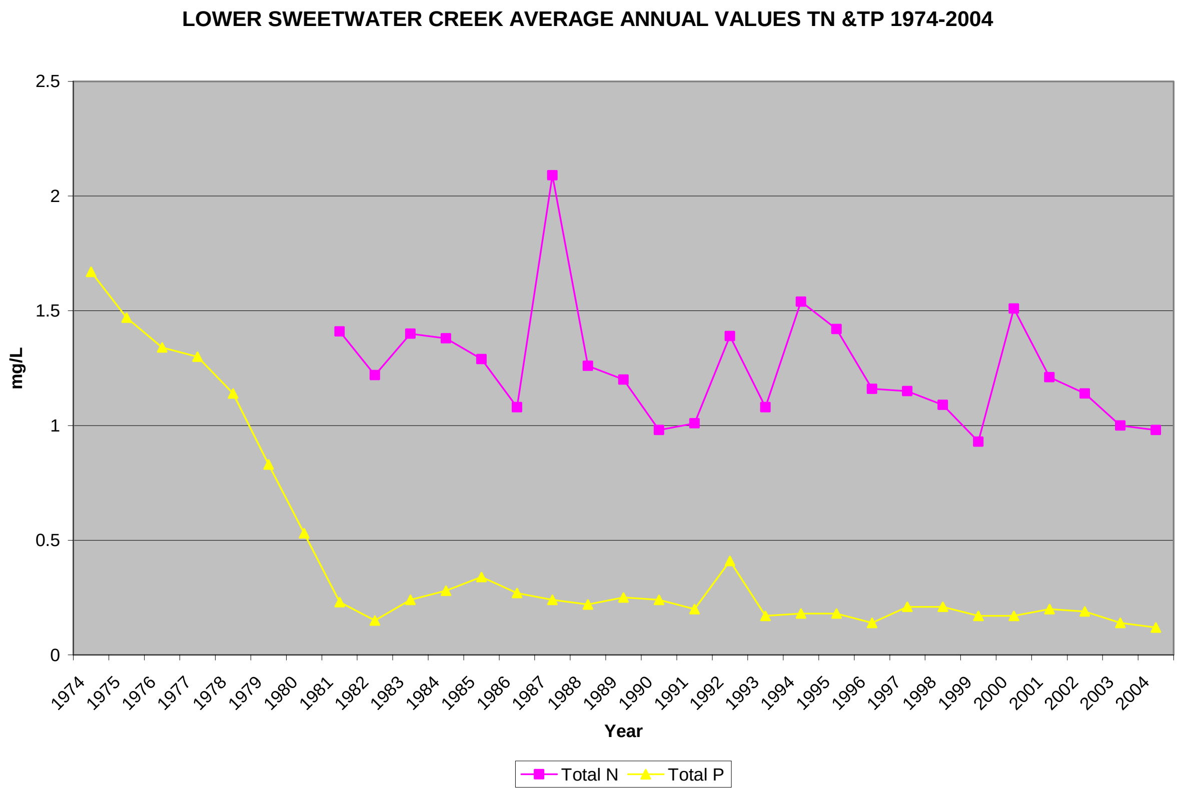


Figure 7-8b Period of Record Annual Average Values for TN and TP at Lower Sweetwater Creek at Memorial Highway (HCEPC #104)

Table 7-7 Recent Data for TN at Memorial Highway (HCEPC #104)

DATE	TN (µg/L)
12/2004	680
01/2005	740
02/2005	630

Total Phosphorous (TP) (Figures 7-9a and b and Table 7-8)
Monthly average data for total phosphorous (TP) are available for Sweetwater Creek at Memorial Highway from 1990 – 2005 (Figure 7-9a). Over that 16-year period, 60% of the samples reported TP concentrations less than 0.2 mg/L, while 37% of the samples reported TP concentrations in the range 0.2-0.4 mg/L. Five samples (3%) had concentrations exceeding 0.4 mg/L, all of them in late 1991 and early 1992. An improvement in TP concentrations in the Creek may be occurring as the five-year period 2000-2005 saw a reduction in the number of samples having TP concentrations exceeding 0.2 mg/L as compared to the previous five-year period (13 samples *versus* 20 samples). This trend was confirmed in a linear trend analysis done for this report.

Period of record data for TP are available from 1974 to 2004 (Figure 7-9b). Data show a decrease in TP concentrations from a high of >1.5 mg/L in 1974 to 0.5 mg/L in 1980. A further decrease in TP has occurred to the present except for a peak to 0.4 mg/L in 1992.

Recent data for TP (Table 7-8) ranged from 90 – 100 µg/L over the period 12/2004 – 03/2005 when four samples were taken. These values are consistent with the monthly and period of record data sets, although no clear trend is evident from such a small sample size.

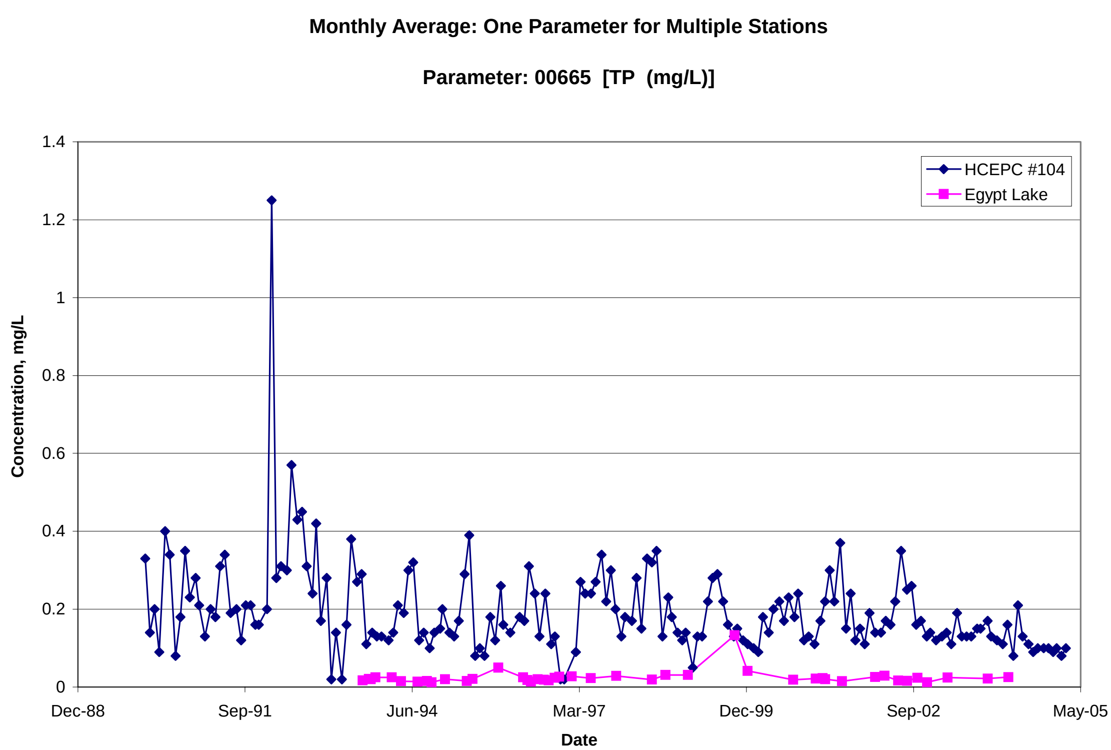


Figure 7-9a Monthly Average Values for TP for Sweetwater Creek (HCEPC #104) and Egypt Lake

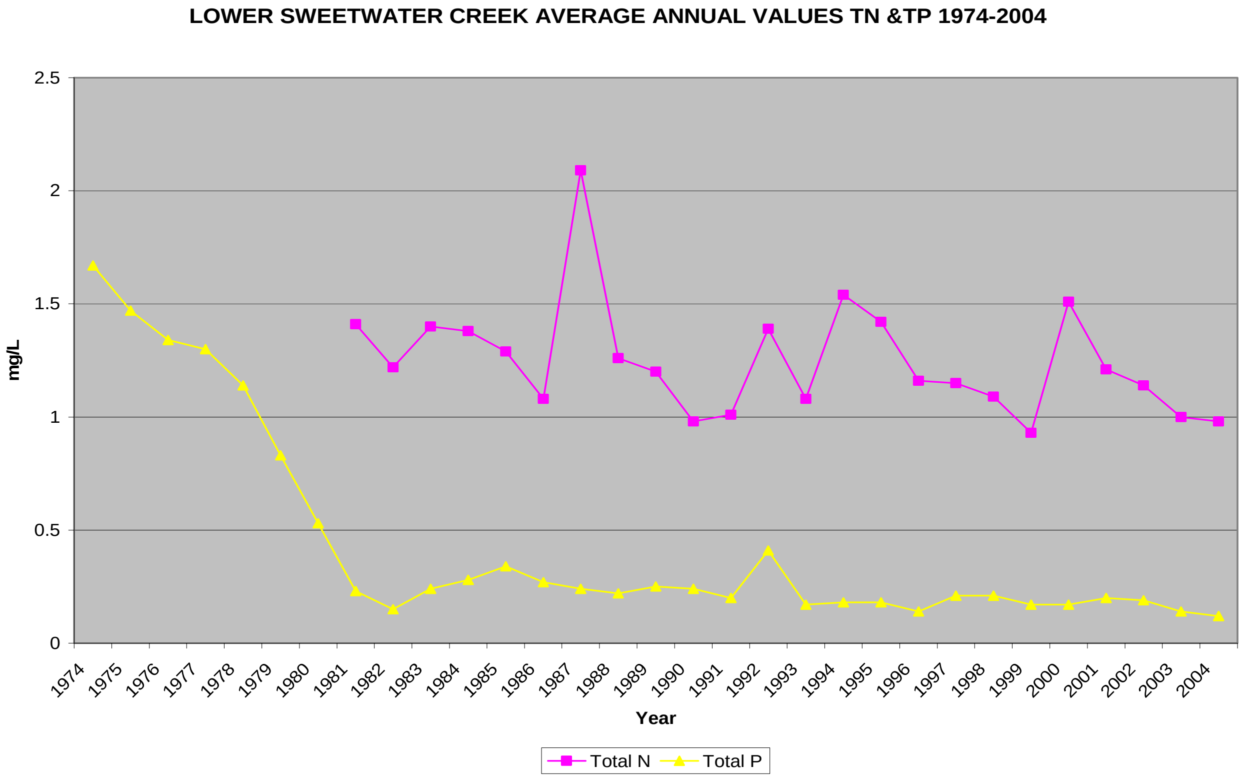


Figure 7-9b Period of Record expressed as Annual Averages for TP and TN for Lower Sweetwater Creek at Memorial Highway (HCEPC #104)

Table 7-8 Recent Data for TP at HCEPC #104

DATE	TP (µg/L)
12/2004	90
01/2005	100
02/2005	80
03/2005	100

Bacterial Quality: Total and fecal coliform (Figures 7-10a and b)

Monthly average data for total coliform are available for Sweetwater Creek at Memorial Highway from 1990 - 2001 and for fecal coliform from 1990 - 2005 (Figure 7-10a). Generally, bacterial counts are high in the reach of Sweetwater Creek represented by HCEPC Station #104 at Memorial Highway. Spikes in coliform counts exceeding 5,000 colonies/100 ml occurred frequently over the 12-year period reported in Figure 7-10a, and 12 spikes exceeding 15,000 colonies/100 ml occurred during that period. Two spikes exceeding 20,000 colonies/100 ml occurred in 2000 and 2001.

Fecal coliform counts spiked over 5,000 colonies/100 ml nine times over the 15-year period reported in Figure 7-10a. Spikes in total and fecal coliform counts did not coincide 100% of the time; however, some elevation in fecal coliform counts over previous samples was observed approximately 60% of the time when total coliform counts spiked over 15,000 colonies/100 ml. Higher bacterial counts generally occur during periods of high-volume stormwater runoff, at which time spikes in both total and fecal coliform counts would be expected. As total and fecal coliform spikes were not always coincident, other factors besides stormwater runoff may be contributing to bacterial water quality in the watershed. Linear trend analyses indicated an increasing trend for total coliform and a straight-line trend for fecal coliform.

Period of record annual average data for total coliform are available for 1974-2001 when 141 samples were analyzed (Figure 7-10b). Following a peak in 1976 at 180,000 colonies/100 ml, a decline below 20,000 colonies/100 ml occurred that continued through the remainder of the period of record.

Recent data for total coliform were not available. Two samples were available for fecal coliform, one in 12/2004 and in 01/2005. For those samples, 900 colonies/100 ml and 300 colonies/100 ml were reported, insufficient to indicate a trend.

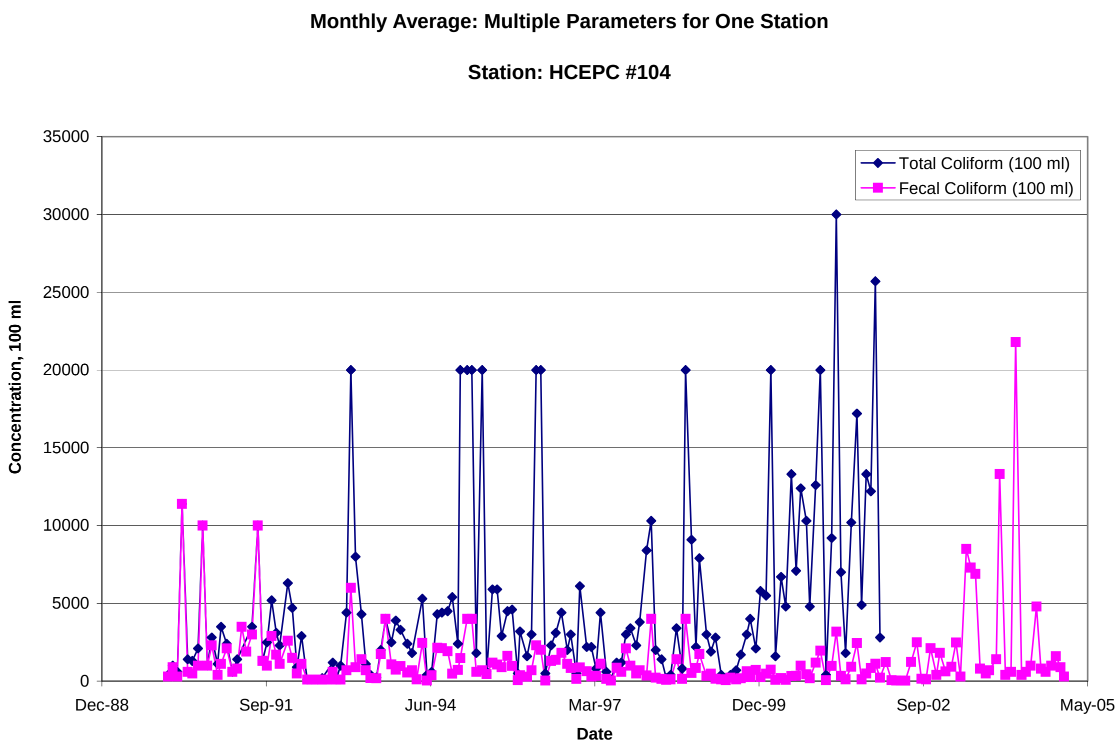


Figure 7-10a Monthly Averages for Total Coliform (1990-2001) and Fecal Coliform (1990-2005) at Sweetwater Creek (HCEPC #104)

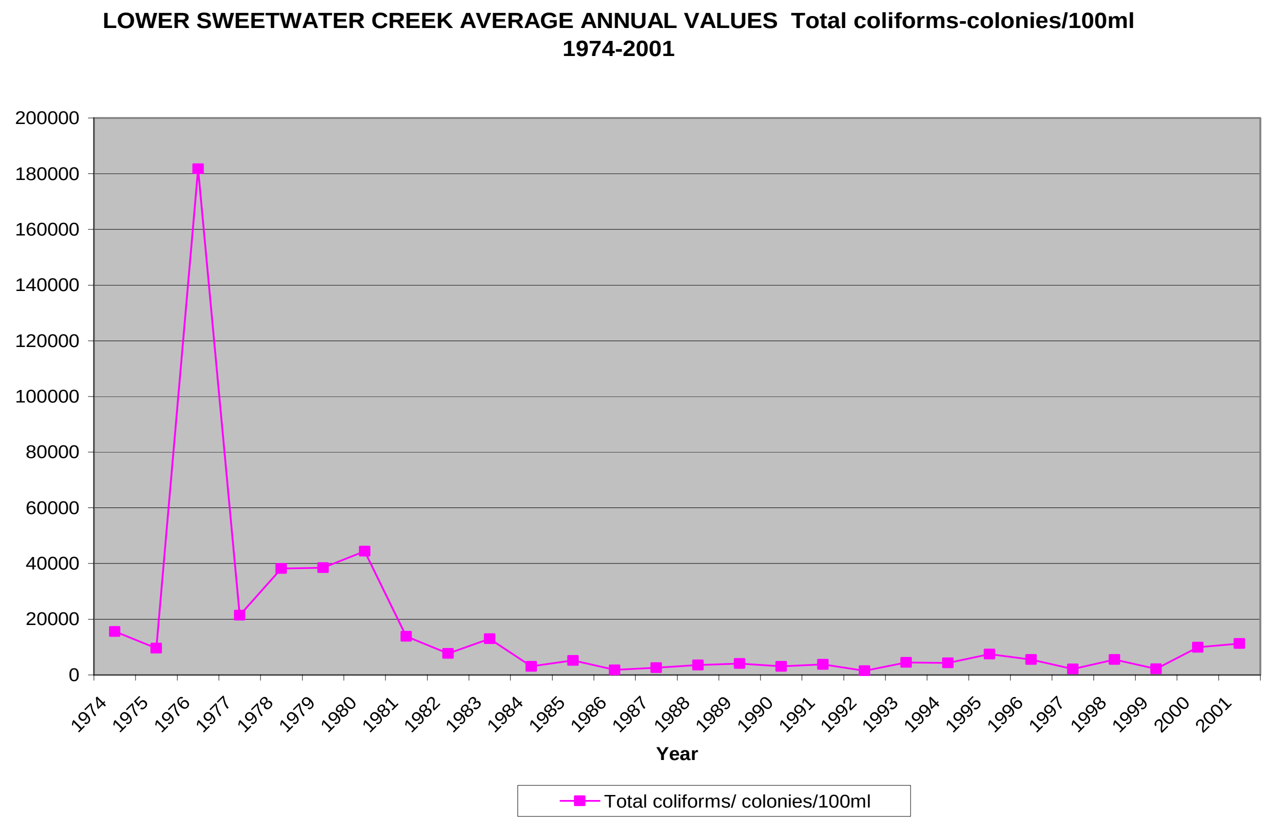


Figure 7-10b Period of Record Data Annual Averages for Total Coliform at Lower Sweetwater Creek (HCEPC #104)

Henry Street Canal

Data were collected during six sampling events over the period 1993-1997 (Table 7-9). From this information, the Henry Street Canal can be described as a freshwater stream that met FDEP water quality criteria in most cases with the exceptions of the following: mercury and DO on 9/28/94. Data are not sufficient to determine trends.

Table 7-9 Data for Metals, TP, DO, and Conductivity at Henry Street Canal 1993 – 1997 (USGS)

DATE	Aluminum*	Arsenic*	Cadmium*	Chromium*	Copper*	Lead*	Mercury*	Nickel*	Zinc*
8/27/1993	300	1	1	5	4	4	0.1	1	10
8/31/1993		1	1	5	3	1	0.1	1	4
DATE	**TP***	**DO****	**cond*****						
8/27/1993	110	6.2	221						
8/31/1993	120	6.8	176						
8/29/1994	130	6.9	257						
9/13/1994	100	5.9	305						
9/28/1994	140	5.2	264						
9/28/1997	180	4.6	225						
9/29/1997	100		262						

* µg/L

** DO concentration in mg/L

*** Cond is conductivity in umho/cm^2 @ 25C

Groundwater

The RULES of the ENVIRONMENTAL PROTECTION COMMISSION of HILLSBOROUGH COUNTY (CHAPTER 1-5 – WATER QUALITY STANDARDS, Amended 11/10/04) have adopted the groundwater quality standards, groundwater classifications, and criteria established or adopted in Sections 62-520.400, 62-520.410, 62-520.420, 62-520.430, and 62-520.440, F.A.C., as amended on 12/9/1996.

The Lower Sweetwater Creek watershed is located within the Tampa Bay/Anclote River (TB/A) watershed. The useable aquifer system within this area consists of the Surficial Aquifer System (SAS) and Upper Floridan Aquifer (UFA). Groundwater within this area (from the UFA) provides a dependable potable water supply and is available through much of the TB/A watershed. For residential and industrial uses, groundwater (mostly from the Floridan Aquifer) is withdrawn. The Water Management District has recognized groundwater as a limited resource, therefore, intending to reduce stress on groundwater by assisting large water users in developing alternative resources (e.g., sea water desalination). Groundwater in the Lower Sweetwater

Creek watershed interacts with surface water in wetlands, streams and canals, Egypt Lake and artificial ponds, and the Sweetwater Creek estuary. Ongoing management activities for the region's water supplies are discussed in more detail in Chapter 9.

To protect groundwater resources, in 1983, the Florida Legislature passed the Water Quality Assurance Act, which required FDEP to "Establish a ground-water quality monitoring network designed to detect or predict contamination of the state's water resources" (403.063 F.S.). In agreement and cooperation with the SWFWMD, the Ambient Ground-Water Quality Monitoring Program (AGWQMP) was implemented to satisfy the statutory requirements. The FDEP has also implemented a sophisticated ground water protection program based on groundwater classifications, water quality standards, and monitoring regulations. The state also administers the federally-delegated Underground Injection Control (UIC) Program, which protects the quality of underground sources of drinking water, and prevents degradation of other aquifers adjacent to injection zones. The FDEP exercises regulatory authority over groundwater quality under Chapter 62-520, F.A.C., which is augmented by monitoring and permitting activities (for withdrawals) through each of the state's water management districts. In Florida, groundwater standards are equivalent to drinking water standards.

In addition to the regulatory activities described above, the FDEP has developed specific rules under 62-521.200, F.A.C. for wellhead protection to protect potable water wells from contamination, and subsequent replacement or restoration due to contamination. This statewide wellhead protection program includes criteria for delineating wellhead protection areas, and FDEP imposed permitting and monitoring requirements within these wellhead protection areas. Hillsborough County has also developed a Wellhead Protection Program similar to the FDEP program.

The quality of groundwater is directly related to the quality of the recharge water, porous media, and the resident time for groundwater in the media. Stormwater runoff, pesticide application to land, surface and underground chemical spills, and saltwater intrusion also impact the quality of groundwater, locally or regionally. Water quality within the Northern Tampa Bay area is generally good in the aquifers above the middle confining unit of the Floridan Aquifer system (SWFWMD, 1996). The groundwater quality is typically a calcium bicarbonate water of relatively low total dissolved solids (TDS). Groundwater near the coastal areas is generally higher in TDS.

Very little water quality data were available for groundwater in the watershed, and the data are insufficient to make definite conclusions regarding the current quality status of the aquifers. Generalized data are available for the upper Floridan in the watershed (Kelley, 1988) for the following parameters: total dissolved solids, total hardness, chloride, and sulfate (Table 7-10a). In addition, isolated data are available for a well penetrating the surficial aquifer, Regional Observation Monitoring (Well) Program (ROMP) TR 12-1- shallow, located just east of George Road approximately 4,000 feet from the Memorial Highway Bridge, for 1991 and 1993 (Table 7-10b).

Table 7-10a Generalized Data for Water in the Upper Floridan Aquifer in the Lower Sweetwater Creek Watershed (Kelley, 1988)

Parameter	Concentration (mg/L)
Total dissolved solids	300 > 500
Total hardness	200 > 250
Chloride (Cl^-)	250
Sulfate (SO_4^-)	50

Table 7-10b Data for ROMP TR 12-1, Shallow (SWFWMD, 1991; SWFWMD, 1996)

Parameter	Concentration (mg/L)	
	1991	1993
Total organic carbon	14.8	
Nitrate (as N)	0.041	0.34
Phosphorous (as P)	0.17	0.09
Barium (Ba)	0.053	
Copper (Cu)	0.047	
Lead (Pb)	0.061	
Zinc (Zn)	0.11	
Selenium (Se)	0.003	

7.3 Overall Trends and Summary

7.3.1 Overall Water Quality Issues/Areas of Concern

The primary water quality issues/areas of concern for water resources in the Lower Sweetwater Creek watershed are related to both the highly urbanized nature of the landscape, the potential for future growth, and the alterations made in the stream channel and estuarine system. The overriding area of concern is untreated stormwater runoff from areas developed prior to the implementation of effective surface water management regulation. This condition is widespread throughout the watershed and has resulted in negative impacts to the Lower Sweetwater Creek and coastal Old Tampa Bay where both water quality and habitat have been impaired. Several chemical/physical parameters are of concern in water bodies that receive untreated stormwater, particularly dissolved oxygen, nitrogen, and phosphorous. Other parameters that have been problematic in the past include: total dissolved solids, turbidity, toxic metals, and toxic organic substances (e.g., insecticides, herbicides, fungicides).

As urbanization and commercial development in the watershed continue, other adverse impacts to both water quality and habitat may occur or increase in areas already experiencing problems, including:

- Increased impervious surface area (construction of roads, buildings, etc.);
- Continued diversion of surface runoff and natural flow from their historic path and away from receiving water bodies;
- Increased potential for sinkhole development due to the excess drawdown at wellfields;
- Excessive impact on groundwater quality through introduction of pollutants via sinkholes;
- Increases in peak flows which can cause stream bank erosion, sedimentation, and increased pollutant loading;
- Increases in surface water pollution from stormwater runoff.

Based on the County's future land use plan for the area, these activities are anticipated to occur at various locations in the watershed and are anticipated to cause similar negative trends in water quality. Development of both non-structural and structural best management practices (BMPs) will be necessary to reduce pollutant loading to the tributaries in these subwatersheds in order to comply with TMDL requirements. The Lower Sweetwater Creek marine segment were identified as impaired for dissolved oxygen, nutrients, and fecal coliform by FDEP. The freshwater segment of the Creek is currently not listed by FDEP or US EPA for TMDLs.

Estimates of pollutant loading are developed in Chapter 10 of this report, followed by an evaluation of water quality treatment level of service for this watershed (Chapter 11). A list of recommended management activities along with specific, strategically-located alternatives to alleviate water quality problems and pollutant loading will be developed in subsequent chapters of this report.

The available groundwater quality information from the Lower Sweetwater Creek watershed is not sufficient to draw statistically significant conclusions. Based on available information, it can be concluded that problems exist in localized areas with some metals and some toxic organic substances, including pesticides. Further monitoring on a regular basis is a clear need.

7.4 Bibliography

The attached bibliography includes a list of references used for this study and additional references that could be cited by readers.

Ayres Associates, 1995, An Estimate of Nutrient Loadings from Wastewater Residuals Management and Onsite Wastewater Treatment Systems in the Tampa Bay Watershed. Ayres Associates, Tampa, Florida.

Canfield, D.E., Jr. 1981, Chemical and Trophic State Characteristics of Florida Lakes. Institute of Food and Agricultural Sciences, University of Florida, Gainesville.

Canfield, D.E., Jr. and M.V. Hoyer, 1988a. Regional geology and the chemical and trophic state characteristics of Florida lakes. Lake and Reservoir Management, 4: 21-31.

Canfield, D.E., Jr. and M.V. Hoyer, 1992. Aquatic macrophytes and their relation to the limnology of Florida lakes. Final report. Bureau of Aquatic Plant Management, Florida Department of Natural Resources, Tallahassee, Florida.

Canfield, D.E., Jr., K.A. Langland, S.B. Linda, and W.T. Haller, 1985. Relations between water transparency and maximum depth of macrophyte colonization in lakes. J. Aquat. Plant Manage. 23: 25-28.

Carlson, R.E. 1977, A trophic state index for lakes, Limnology and Oceanography 22: 361-369.

Chapter 62-302 F.S. Surface Water Quality Standards.

Chapter 62-520 F.S. Ground Water Classes, Standards, and Exemptions.

Dixon, L.K., 1994. Literature compilation and data synthesis for atmospheric deposition to the Tampa Bay watershed. Mote Marine Laboratory Technical Report #370. Tampa Bay National Estuarine Program, St. Petersburg, Florida.

Doolittle, J., G. Schellentrager, and S. Ploetz, 1989. Soil Survey of Hillsborough County, Florida. U.S. Department of Agriculture, Soil Conservation Service.

Florida Department of Environmental Protection, 1996. Development of the stream condition index (SCI) for Florida. Technical Report of the Stormwater and Nonpoint Source Management Section. Tallahassee, Florida.

Florida Department of Environmental Protection. March 11, 2003. Amendments to FDEP 2002 Update to Florida's 303(d) List of Impaired Waters submitted to USEPA October 01, 2002. FDEP. Tallahassee, FL.

Florida Department of Environmental Protection. 2004 305(b) report and 303(d) List. FDEP. Tallahassee, FL.

Florida Department of Environmental Protection. September 15, 2004. TMDL Report – Total Coliform and Fecal Coliform TMDL for Lower Sweetwater Creek (WBID 1570A). FDEP. Tallahassee, FL.

Florida Department of Environmental Protection. September 15, 2004. TMDL Report – Nutrients TMDL for Lower Sweetwater Creek (WBID 1570A). FDEP. Tallahassee, FL.

Florida Department of Environmental Protection. January 13, 2006. Wastewater Facility Regulation Database (WAFR). FDEP. Tallahassee, FL.

Frazer, T. K., 1999. Nutrient assimilation capacity of five Gulf coast rivers. Annual project summary, Southwest Florida Water Management District, Tampa, Florida.

Gallovay, David, Jones, D.R., and Ingebritsen, S.E., United States Geological Survey, 1999. Sinkholes, West-Central Florida, A Link Between Surface Water and Ground Water, Excerpt From Circular 1182.

Goetz, C.L., R.C. Reichenbaugh, and J.K. Ogle, 1978. Water Supply Potential of the Lower Hillsborough River, Florida, 1976. WRI Report 78-29, U.S. Geological Survey.

Gold, M., M. Bartlett, J. Dorsey, and C. McGee, 1990. An assessment of inputs of fecal indicator organisms and human enteric viruses from two Santa Monica storm drains: Technical Report. Santa Monica Bay Restoration Project.

Grabe, S.A., and J. Barron. 2002. Status of Tampa Bay Sediments: Polycyclic aromatic hydrocarbons, organochlorine pesticides, and polychlorinated biphenyls – 1993, 1995-99. Hillsborough Environmental Protection Commission. Tampa, FL.

Haile, R. W., J. Alamillo, K. Barrett, R. Cressey, J. Dermond, C. Ervin, A. Glasser, N. Harawa, P. Harmon, J. Harper, C. McGee, R. C. Millikan, M. Nides, and J. S. Witte, 1996. An epidemiological study of possible adverse health effects of swimming in Santa Monica Bay. Final Report. Santa Monica Bay Restoration Project. 211 pp.

Hand, J., M. Paulic, 1992. 1992 Florida Water Quality Assessment, 305(b) Technical Appendix. Florida Department of Environmental Regulation, Tallahassee.

Hand, J., J. Col, and E. Grimison, 1994. Central Florida District Water Quality Assessment 305(b) Technical Appendix. Bureau of Surface Water Management, Florida Department of Environmental Protection, Tallahassee.

Hillsborough County City-County Planning Commission, 1985. Understanding the Hillsborough -- Searching for Answers on River Resource Management. Hillsborough County City-County Planning Commission, Tampa, Florida.

Hillsborough County Environmental Protection Commission, 1998. Surface Water Quality 1995-1997, Hillsborough County, Florida. Hillsborough County Environmental Protection Commission, Tampa, Florida.

Hillsborough River Greenways Task Force, 1995. An Ecosystem Plan for the Upper Hillsborough River: Issue Analyses, Action Plans, and Recommendations. The Florida Greenways Program of 1000 Friends of Florida and the Conservation Fund, Florida.

Huber, W.C., P.L. Brezonik, J.P. Heany, R.E. Dickinson, S.D. Preston, D.S. Dwornik, and M.A. DeMaio. 1983. A classification of Florida lakes. University of Florida Water Resources Research Center. Publication No. 72. Gainesville, Florida.

Institute for Food and Agricultural Sciences. 2005. Florida LAKEWATCH Annual Data Summary, 2004. University of Florida. Gainesville, FL.

Jones, G.W., E.C. DeHaven, L. Clark, J.T. Rauch, and C.G. Guillen. 1990. Groundwater Quality of the Southwest Florida Water Management District: Central Region. Southwest Florida Water Management District, Brooksville, FL.

Kelley, G.M. 1988. Groundwater Resource Availability Inventory: Hillsborough County, Florida. Southwest Florida Water Management District. Brooksville, FL.

Kurz, R. C. 1998. A comparison of rapid sand filtration, alum treatment, and wet detention for the removal of bacteria, viruses, and a protozoan surrogate from stormwater. Technical Report. Southwest Florida Water Management District. Brooksville, FL.

Livingston, E.H. 2000. Florida's Rotating Basin Approach: Towards Better Integration, Coordination, and Cooperation. Technical Presentation. Bureau of Watershed Management, Florida Department of Environmental Protection, Tallahassee, Florida.

Long, E. R., D. M. MacDonald, and C. Cairncross. 1991. Status and trends in toxicants and the potential for their biological effects in Tampa Bay, Florida. NOAA Technical Memorandum NOS ORCA 58. National Oceanic and Atmospheric Administration. Silver Spring, MD.

Long, E. R., D. A. Wolfe, R.S. Carr, K. J. Scott, G. B. Thursby, H. L. Windom, R. Lee, F. D. Calder, G. M. Sloane, and T. Seal. 1994. Magnitude and extent of sediment toxicity in Tampa Bay, Florida. NOAA Technical Memorandum NOS ORCA 78. National Oceanic and Atmospheric Administration. Silver Spring, MD.

Long, E. R. and H. S. Greening. 1999. Chemical Contamination in Tampa Bay: Extent, toxicity, potential sources and possible sediment quality management plans. NOAA Special Report. Silver Spring, MD.

Metcalf and Eddy, Inc. 1983a. Water Quality Assessment of the Lower Hillsborough River. Report submitted to the City of Tampa, Florida, by Metcalf and Eddy, Inc., Boston, Massachusetts.

Metcalf and Eddy, Inc. 1983b. Tampa Nationwide Urban Runoff Program - Phase II Final Report. Report submitted to the City of Tampa by Metcalf and Eddy, Inc., Boston, Massachusetts.

Mote Marine Laboratory. 1984. Biological and Chemical Studies on the Impact of Stormwater Runoff upon the Biological Community of the Hillsborough River, Tampa, Florida. Report submitted to the City of Tampa Department of Public Works by Mote Marine Laboratory, Sarasota, Florida.

Paulic, M., and J. Hand. 1994. Florida Water Quality Assessment 1994 305(b) Report. Bureau of Surface Water Management, Florida Department of Environmental Protection, Tallahassee.

Pollman, C. Export of atmospherically derived nitrogen in the Tampa Bay watershed *in* Treat, S. F. 2003. Tampa BASIS 4. Tampa Bay Estuary Program. Tampa, Fl. pp. 127 – 135.

Poor, N., S. Campbell, and H. Kay. Source attribution for the atmospheric deposition of polycyclic aromatic hydrocarbons (PAHs) to Tampa Bay *in* Treat, S. F. 2003. Tampa BASIS 4. Tampa Bay Estuary Program. Tampa, Fl. pp. 136 – 144.

Rose, J.B. “Tampa Water Resource Recovery Pilot Project Microbiological Evaluation.” in Tampa Water Resource Recovery Project Pilot Studies. Final Report to the City of Tampa. Tampa: CH2M Hill. 1993.

Rosenau, J.C., G.L. Faulkner, C.W. Hendry, Jr., and R.W. Hull. 1977. Springs of Florida. Bulletin No. 31 (Revised). Bureau of Geology, Department of Natural Resources, Tallahassee.

Southwest Florida Water Management District. 1991. Groundwater quality in the Southwest Florida Water Management District. Southwest Florida Water Management District, Ambient Groundwater Quality Monitoring Program. Brooksville, FL.

Southwest Florida Water Management District. 1992. Tampa Bay Surface Water Improvement and Management Plan. Southwest Florida Water Management District, SWIM Department, Tampa.

Southwest Florida Water Management District. 1995. Surface Water Improvement and Management (SWIM) Plan for Lake Thonotosassa. Southwest Florida Water Management District, SWIM Department, Tampa.

Southwest Florida Water Management District. 1996. Northern Tampa Bay Water Resources Assessment Project, Volume I: Surface water/ Groundwater Interrelationship, SWFWMD, Resource Evaluation Section, Brooksville, Florida.

Southwest Florida Water Management District. 1996. Northern Tampa Bay Water Resources Assessment Project, Volume II: Saline water intrusion and water quality. SWFWMD, Resource Evaluation Section, Brooksville, Florida.

Southwest Florida Water Management District. 1999. Contribution of total nitrogen loading to the Hillsborough River Reservoir from Crystal Springs. Technical Report. Ambient Groundwater Monitoring Program, Tampa, Florida.

Southwest Florida Water Management District. 2000. Origin of nitrate in groundwater discharging from Crystal Springs. Technical Report. Water Quality Monitoring Program, Tampa, Florida.

Southwest Florida Water Management District. 2000. Tampa Bay/Anclote Comprehensive Watershed Management Plan -Draft. Brooksville, Florida.

Subsurface Evaluations, Inc. 1992. Dataset containing a point coverage of sinkhole locations for the State of Florida. Subsurface Evaluations, Inc. 3206 Swann Ave, Tampa FL 33609. As included in the Florida Geographic Data Library, 431 Architecture Building, PO Box 115706,

Swancar, A. and C. B. Hutchinson. 1992. Chemical and Isotopic Composition and Potential for Contamination of Water in the Upper Floridan Aquifer, West-Central Florida, 1986-89, U.S. Geological Survey Open-File Report 92-47.

Tampa Bay National Estuary Program. 1996. Charting the Course for Tampa Bay -- Comprehensive Conservation and Management Plan. Tampa Bay National Estuary Program, St. Petersburg.

Tampa Bay Estuary Program. 1996. Toxic Contamination Sources Assessment: Task 1 – Risk Assessment for Chemicals of Potential Concern and Methods for Identification of Specific Sources. Technical Report #09-96 of the Tampa Bay National Estuary Program. Prepared by Parsons Engineering Science (R. McConnell, R. DeMott, and J. Schulten).

Tampa Bay Estuary Program. 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. Technical Report #08-97 of the Tampa Bay National Estuary Program. Prepared by Coastal Environmental/Post, Buckley, Schuh and Jernigan, Inc.

Tampa Bay Estuary Program. 1998. Interpretation of Bulk Atmospheric Deposition and Stormwater Quality Data in the Tampa Bay Region. Technical Report #04-98 of the Tampa Bay Estuary Program. Prepared by Mote Marine Laboratory and Camp Dresser and McKee, Inc. for the Tampa Bay Regional Planning Council and the Tampa Bay Estuary Program (L.K. Dixon, M.G. Heyl, and S. Murray).

Tampa Bay Estuary Program. 1999. Impacts of Atmospheric Deposition on Stormwater Quality. Technical Report #03-99 of the Tampa Bay Estuary Program. Prepared by BCI Engineers & Scientists, Inc. and PBS&J for the Tampa Bay Estuary Program (M.P.Timpe and R.T. Pribble).

Tampa Bay Estuary Program. 1999. Atmospheric Deposition Contributions to Nitrogen and Phosphorus Loadings in Tampa Bay: Intensive Wet and Dry Deposition Data Collection and Analysis August 1996-July 1998. Technical Report #05-99 of the Tampa Bay Estuary Program. Prepared by Janicki Environmental (R.J. Pribble and A.J. Janicki).

USEPA. 2004. Draft Total Maximum Daily Load (TMDL) for Nutrients and Dissolved Oxygen in Rocky Creek, Tampa Bay Basin. USEPA Region IV. Atlanta, GA

United States Department of Agriculture. 1916. Field Operations of the Bureau of Soils, 18th Annual Report, Soil Survey of Hillsborough County, Florida. Soil Conservation Service. pp.749 – 786.

United States Department of Agriculture. 1958. Soil Survey of Hillsborough County, Florida. Soil Conservation Service. Washington, DC.

United States Department of Agriculture. 1989. Soil Survey of Hillsborough County, Florida. Soil Conservation Service. Washington, DC.

Watershed Management

Surface Water Quality Classifications

The Clean Water Act requires that the surface waters of each state be classified according to designated uses. Florida has five classes with associated designated uses, which are arranged in order of degree of protection required:

Class I - Potable Water Supplies
Fourteen general areas throughout the state including: impoundments and associated tributaries, certain lakes, rivers, or portions of rivers, used as a drinking water supply.

Class II - Shellfish Propagation or Harvesting
Generally coastal waters where shellfish harvesting occurs.

Class III - Recreation, Propagation and Maintenance of a Healthy, Well-Balanced Population of Fish and Wildlife
The surface waters of the state are Class III unless described in rule 62-302.400 F.A.C.

Class IV - Agricultural Water Supplies
Generally located in agriculture areas around Lake Okeechobee.

Class V - Navigation, Utility and Industrial Use.
Currently, there are not any designated Class V bodies of water. The Fenholloway River was reclassified as Class III in 1998

For a more detailed description of classes and specific waterbody designations, see 62-302.400.

Criteria for Surface Water Quality Classifications

To protect present and future most beneficial uses of the waters, water quality criteria have been established for each classification. While some criteria are intended to protect aquatic life, others are designed to protect human health. The criteria are located in rules 62-302.500 and 62-302.530 F.A.C. Water quality standards also include narrative criteria for pollutants and other conditions not specifically listed.

Anti-degradation Policy

The anti-degradation policy (found in 62-302.300 and 62-4.242 F.A.C.) allows for protection of water quality above the minimum required for a classification.

For more information please contact: Eric Shaw at (850) 245-8429 or Janet Klemm at (850) 245-8427.

Water Quality Standards and Special Projects Program
Florida Department of Environmental Protection
2600 Blair Stone Road - M.S. 3560
Tallahassee, FL 32399
850-245-8417
Contact Us

VERIFIED LIST OF IMPAIRED WATERS FOR THE GROUP 1 BASINS (INCLUDING AMENDED ORDER - MARCH 2003)

BASIN	WBID[1]	WATER SEGMENT NAME	PARAMETERS IDENTIFIED USING THE IMPAIRED WATERS RULE	CONCENTRATIONS CAUSING IMPAIRMENT[2]	PRIORITY FOR TMDL DEVELOPMENT[3]	PROJECTED YEAR FOR TMDL DEVELOPMENT	COMMENTS
TAMPA BAY	1473W	LAKE JUANITA	NUTRIENTS (HISTORIC TSI)	MEDIAN TN = 0.60 MG/L; MEDIAN TP = 0.01 MG/L	MEDIUM	2008	NITROGEN AND PHOSPHORUS ARE LIMITING NUTRIENTS.
TAMPA BAY	1473X	MOUND LAKE	NUTRIENTS (HISTORIC TSI)	MEDIAN TN = 0.45 MG/L; MEDIAN TP = 0.01 MG/L	MEDIUM	2008	NITROGEN AND PHOSPHORUS ARE LIMITING NUTRIENTS.
TAMPA BAY	1473Y	CALM LAKE	NUTRIENTS (HISTORIC TSI)	MEDIAN TN = 0.33 MG/L; MEDIAN TP = 0.01 MG/L	MEDIUM	2008	NITROGEN AND PHOSPHORUS ARE LIMITING NUTRIENTS.
TAMPA BAY	1474V	CRESCENT	NUTRIENTS (TSI)	MEDIAN TN = 0.65 MG/L; MEDIAN TP = 0.02 MG/L	MEDIUM	2008	NITROGEN AND PHOSPHORUS ARE LIMITING NUTRIENTS.
TAMPA BAY	1474W	DEAD LADY LAKE	NUTRIENTS (TSI)	MEDIAN TN = 0.88 MG/L; MEDIAN TP = 0.03 MG/L	MEDIUM	2008	NITROGEN AND PHOSPHORUS ARE LIMITING NUTRIENTS.
TAMPA BAY	1478H	LAKE REINHEIMER - OPEN	NUTRIENTS (TSI)	MEDIAN TN = 1.03 MG/L; MEDIAN TP = 0.02 MG/L	MEDIUM	2008	NITROGEN AND PHOSPHORUS ARE LIMITING NUTRIENTS.
TAMPA BAY	1486	LAKE TARPON	DISSOLVED OXYGEN	< 5.0 MG/L	MEDIUM	2008	LINKED TO NUTRIENTS.
TAMPA BAY	1486	LAKE TARPON	NUTRIENTS (TSI)	MEDIAN TN = 1.13 MG/L; MEDIAN TP = 0.03 MG/L	MEDIUM	2008	NITROGEN AND PHOSPHORUS ARE LIMITING NUTRIENTS. NUTRIENTS BEING ADDRESSED BY SWFWMD THROUGH PLRGS.
TAMPA BAY	1486A	LAKE TARPON	DISSOLVED OXYGEN	< 5.0 MG/L	MEDIUM	2008	THIS WBID WAS PREVIOUSLY INCLUDED ON THE VERIFIED LIST AS WBID 1486, BUT SHOULD HAVE BEEN LISTED AS 1486A. LINKED TO NUTRIENTS.
TAMPA BAY	1493	BUCK LAKE	NUTRIENTS (TSI)	MEDIAN TN = 1.18 MG/L; MEDIAN TP = 0.14 MG/L	MEDIUM	2008	NITROGEN AND PHOSPHORUS ARE LIMITING NUTRIENTS.
TAMPA BAY	1494B	BRANT LAKE	NUTRIENTS (TSI)	MEDIAN TN = 1.03 MG/L; MEDIAN TP = 0.04 MG/L	MEDIUM	2008	NITROGEN AND PHOSPHORUS ARE LIMITING NUTRIENTS.
TAMPA BAY	1496	SUNSET LAKE	NUTRIENTS (TSI)	MEDIAN TN = 0.72 MG/L; MEDIAN TP = 0.02 MG/L	MEDIUM	2008	NITROGEN AND PHOSPHORUS ARE LIMITING NUTRIENTS.
TAMPA BAY	1502A	LAKE ESTES	NUTRIENTS (TSI)	MEDIAN TN = 0.82 MG/L; MEDIAN TP = 0.03 MG/L	MEDIUM	2008	NITROGEN AND PHOSPHORUS ARE LIMITING NUTRIENTS.
TAMPA BAY	1502C	CHAPMAN LAKE	NUTRIENTS (TSI)	MEDIAN TN = 1.07 MG/L; MEDIAN TP = 0.04 MG/L	MEDIUM	2008	NITROGEN AND PHOSPHORUS ARE LIMITING NUTRIENTS.
TAMPA BAY	1507A	ROCKY CREEK	NUTRIENTS (CHL A)	TN = 1.35 MG/L	HIGH	2003	AS NOTED IN THE DEPARTMENT'S OCTOBER 1 SUBMITTAL TO EPA, THIS WATER SHOULD HAVE BEEN INCLUDED IN THE ORIGINAL ORDER ADOPTED BY THE SECRETARY BUT WAS INADVERTENTLY LEFT OFF THE LIST. NITROGEN IS THE LIMITING NUTRIENT.
TAMPA BAY	1507A	ROCKY CREEK	DISSOLVED OXYGEN	< 4.0 MG/L, AND LESS THAN 5.0 MG/L AS DAILY AVERAGE	HIGH	2003	LINKED TO NUTRIENTS AND BOD. FLOW DISRUPTED BY CONTROL STRUCTURES. ALGAL BLOOMS OBSERVED.
TAMPA BAY	1507A	ROCKY CREEK	NUTRIENTS (HISTORIC CHLOROPHYLL)	MEDIAN TN = 1.35 MG/L	MEDIUM	2008	NITROGEN IS LIMITING NUTRIENT. FLOW DISRUPTED BY CONTROL STRUCTURES. ALGAL BLOOMS OBSERVED.
TAMPA BAY	1513	DOUBLE BRANCH	COLIFORMS (TOTAL COLIFORM)	> 2400 PER ML	LOW	2008	
TAMPA BAY	1513	DOUBLE BRANCH	DISSOLVED OXYGEN	< 4.0 MG/L, AND LESS THAN 5.0 MG/L AS DAILY AVERAGE	LOW	2008	LINKED TO NUTRIENTS.
TAMPA BAY	1516	SWEETWATER CREEK – UPPER	NUTRIENTS (CHL A)	TN = 0.67 MG/L	MEDIUM	2008	AS NOTED IN THE DEPARTMENT'S OCTOBER 1 SUBMITTAL TO EPA, THIS WATER SHOULD HAVE BEEN INCLUDED IN THE ORIGINAL ORDER ADOPTED BY THE SECRETARY BUT WAS INADVERTENTLY LEFT OFF THE LIST. NITROGEN IS THE LIMITING NUTRIENT.
TAMPA BAY	1516	SWEETWATER CREEK - UPPER	COLIFORMS (TOTAL COLIFORM)	> 2400 PER ML	LOW	2008	
TAMPA BAY	1516	SWEETWATER CREEK - UPPER	DISSOLVED OXYGEN	< 5.0 MG/L	LOW	2008	LINKED TO NUTRIENTS.
TAMPA BAY	1516	SWEETWATER CREEK - UPPER	NUTRIENTS (HISTORIC CHLOROPHYLL)	MEDIAN TN = 0.67 MG/L	MEDIUM	2008	NITROGEN IS LIMITING NUTRIENT.
TAMPA BAY	1516A	LAKE CARROLL	NUTRIENTS (TSI)	MEDIAN TN = 0.44 MG/L; MEDIAN TP = 0.01 MG/L	MEDIUM	2008	NITROGEN AND PHOSPHORUS ARE LIMITING NUTRIENTS.
TAMPA BAY	1516B	LAKE MADELENE	NUTRIENTS (TSI)	MEDIAN TN = 0.67 MG/L; MEDIAN TP = 0.01 MG/L	MEDIUM	2008	NITROGEN AND PHOSPHORUS ARE LIMITING NUTRIENTS.
TAMPA BAY	1516E	LAKE ELLEN - OPEN WATER	NUTRIENTS (TSI)	MEDIAN TN = 0.72 MG/L; MEDIAN TP = 0.02 MG/L	MEDIUM	2008	NITROGEN AND PHOSPHORUS ARE LIMITING NUTRIENTS.

BASIN	WBID[1]	WATER SEGMENT NAME	PARAMETERS IDENTIFIED USING THE IMPAIRED WATERS RULE	CONCENTRATIONS CAUSING IMPAIRMENT[2]	PRIORITY FOR TMDL DEVELOPMENT[3]	PROJECTED YEAR FOR TMDL DEVELOPMENT	COMMENTS
TAMPA BAY	1530	MOCCASIN CREEK	NUTRIENTS (CHLOROPHYLL)	MEDIAN TN = 0.94 MG/L	LOW	2008	NITROGEN IS LIMITING NUTRIENT.
TAMPA BAY	1536C	TAMPA BYPASS CANAL	COLIFORMS (TOTAL)	> 2400 PER 100 ML	MEDIUM	2008	AS NOTED IN THE DEPARTMENT'S OCTOBER 1 SUBMITTAL TO EPA, THIS WATER SHOULD HAVE BEEN INCLUDED IN THE ORIGINAL ORDER ADOPTED BY THE SECRETARY BUT WAS INADVERTENTLY LEFT OFF THE LIST. 13 EXCEEDANCES/72 SAMPLES.
TAMPA BAY	1536C	TAMPA BYPASS CANAL	NUTRIENTS (CHL A)	TN = 0.89 MG/L	MEDIUM	2008	AS NOTED IN THE DEPARTMENT'S OCTOBER 1 SUBMITTAL TO EPA, THIS WATER SHOULD HAVE BEEN INCLUDED IN THE ORIGINAL ORDER ADOPTED BY THE SECRETARY BUT WAS INADVERTENTLY LEFT OFF THE LIST. NITROGEN IS LIMITING NUTRIENT.
TAMPA BAY	1536C	TAMPA BYPASS CANAL	DISSOLVED OXYGEN	< 5.0 MG/L	LOW	2008	LINKED TO NUTRIENTS AND BOD. FLOW DISRUPTED BY CONTROL STRUCTURES. ALGAL BLOOMS OBSERVED.
TAMPA BAY	1536E	PALM RIVER	NUTRIENTS (CHL A)	TN = 1.02 MG/L	MEDIUM	2008	AS NOTED IN THE DEPARTMENT'S OCTOBER 1 SUBMITTAL TO EPA, THIS WATER SHOULD HAVE BEEN INCLUDED IN THE ORIGINAL ORDER ADOPTED BY THE SECRETARY BUT WAS INADVERTENTLY LEFT OFF THE LIST. NITROGEN IS LIMITING NUTRIENT.
TAMPA BAY	1536E	PALM RIVER	DISSOLVED OXYGEN	< 4.0 MG/L, AND LESS THAN 5.0 MG/L AS DAILY AVERAGE	LOW	2008	LINKED TO NUTRIENTS AND BOD. FLOW DISRUPTED BY CONTROL STRUCTURES. ALGAL BLOOMS OBSERVED.
TAMPA BAY	1536E	PALM RIVER	NUTRIENTS (HISTORIC CHLOROPHYLL)	MEDIAN TN = 1.0 MG/L	MEDIUM	2008	NITROGEN IS LIMITING NUTRIENT. FLOW DISRUPTED BY CONTROL STRUCTURES. ALGAL BLOOMS OBSERVED.
TAMPA BAY	1536F	SIXMILE CREEK	NUTRIENTS (CHL A)	TN = 0.74 MG/L	MEDIUM	2008	THIS WATER SHOULD HAVE BEEN INCLUDED IN THE ORIGINAL ORDER ADOPTED BY THE SECRETARY BUT WAS INADVERTENTLY LEFT OFF THE LIST. NITROGEN IS LIMITING NUTRIENT. IN THE DEPARTMENT'S OCTOBER 1 SUBMITTAL TO EPA, THIS SEGMENT WAS INCORRECTLY REFERRED TO AS WBID 1536B.
TAMPA BAY	1536F	SIXMILE CREEK	DISSOLVED OXYGEN	< 5.0 MG/L	MEDIUM	2008	THIS WATER IS BEING ADDED BECAUSE DATA FOR THIS WATER WERE INCORRECTLY ATTRIBUTED TO WBID 1536B IN THE ORIGINAL ORDER ADOPTED BY THE SECRETARY. LINKED TO NUTRIENTS AND BOD. FLOW DISRUPTED BY CONTROL STRUCTURES. ALGAL BLOOMS OBSERVED.
TAMPA BAY	1558A	TAMPA BAY LOWER	MERCURY-FISH	LESS THAN CURRENT CRITERION (0.025 UG/L)	LOW	2011	AGE OF DATA VERIFIED TO BE WITHIN LAST 7.5 YEARS. NUMERIC CRITERION IS INADEQUATE BECAUSE MERCURY IS ACCUMULATING IN THE FOOD CHAIN SUCH THAT FISH TISSUE MERCURY LEVELS EXCEED RECOMMENDED LEVELS FOR CONSUMPTION.
TAMPA BAY	1558A	TAMPA BAY LOWER	COLIFORMS - SHELLFISH	EXCEEDS SEAS THRESHOLDS	MEDIUM	2008	LISTED DUE TO DOWNGRADE IN SHELLFISH HARVESTING CLASSIFICATION.
TAMPA BAY	1558B	TAMPA BAY MID	COLIFORMS - SHELLFISH	EXCEEDS SEAS THRESHOLDS	MEDIUM	2008	LISTED DUE TO DOWNGRADE IN SHELLFISH HARVESTING CLASSIFICATION.
TAMPA BAY	1558B	TAMPA BAY MID	MERCURY-FISH	LESS THAN CURRENT CRITERION (0.025 UG/L)	LOW	2011	AGE OF DATA VERIFIED TO BE WITHIN LAST 7.5 YEARS. NUMERIC CRITERION IS INADEQUATE BECAUSE MERCURY IS ACCUMULATING IN THE FOOD CHAIN SUCH THAT FISH TISSUE MERCURY LEVELS EXCEED RECOMMENDED LEVELS FOR CONSUMPTION.
TAMPA BAY	1558C	TAMPA BAY UPPER	MERCURY-FISH	LESS THAN CURRENT CRITERION (0.025 UG/L)	LOW	2011	AGE OF DATA VERIFIED TO BE WITHIN LAST 7.5 YEARS. NUMERIC CRITERION IS INADEQUATE BECAUSE MERCURY IS ACCUMULATING IN THE FOOD CHAIN SUCH THAT FISH TISSUE MERCURY LEVELS EXCEED RECOMMENDED LEVELS FOR CONSUMPTION.
TAMPA BAY	1558D	HILLSBOROUGH BAY LOWER	MERCURY-FISH	LESS THAN CURRENT CRITERION (0.025 UG/L)	LOW	2011	AGE OF DATA VERIFIED TO BE WITHIN LAST 7.5 YEARS. NUMERIC CRITERION IS INADEQUATE BECAUSE MERCURY IS ACCUMULATING IN THE FOOD CHAIN SUCH THAT FISH TISSUE MERCURY LEVELS EXCEED RECOMMENDED LEVELS FOR CONSUMPTION.
TAMPA BAY	1558E	HILLSBOROUGH BAY UPPER	MERCURY-FISH	LESS THAN CURRENT CRITERION (0.025 UG/L)	HIGH	2011	AGE OF DATA VERIFIED TO BE WITHIN LAST 7.5 YEARS. NUMERIC CRITERION IS INADEQUATE BECAUSE MERCURY IS ACCUMULATING IN THE FOOD CHAIN SUCH THAT FISH TISSUE MERCURY LEVELS EXCEED RECOMMENDED LEVELS FOR CONSUMPTION.
TAMPA BAY	1558F	OLD TAMPA BAY LOWER	COLIFORMS - SHELLFISH	EXCEEDS SEAS THRESHOLDS	MEDIUM	2008	LISTED DUE TO DOWNGRADE IN SHELLFISH HARVESTING CLASSIFICATION.

BASIN	WBID[1]	WATER SEGMENT NAME	PARAMETERS IDENTIFIED USING THE IMPAIRED WATERS RULE	CONCENTRATIONS CAUSING IMPAIRMENT[2]	PRIORITY FOR TMDL DEVELOPMENT[3]	PROJECTED YEAR FOR TMDL DEVELOPMENT	COMMENTS
TAMPA BAY	1558F	OLD TAMPA BAY LOWER	MERCURY-FISH	LESS THAN CURRENT CRITERION (0.025 UG/L)	LOW	2011	AGE OF DATA VERIFIED TO BE WITHIN LAST 7.5 YEARS. NUMERIC CRITERION IS INADEQUATE BECAUSE MERCURY IS ACCUMULATING IN THE FOOD CHAIN SUCH THAT FISH TISSUE MERCURY LEVELS EXCEED RECOMMENDED LEVELS FOR CONSUMPTION.
TAMPA BAY	1558G	OLD TAMPA BAY	COLIFORMS - SHELLFISH	EXCEEDS SEAS THRESHOLDS	MEDIUM	2008	LISTED DUE TO DOWNGRADE IN SHELLFISH HARVESTING CLASSIFICATION.
TAMPA BAY	1558G	OLD TAMPA BAY	MERCURY-FISH	LESS THAN CURRENT CRITERION (0.025 UG/L)	LOW	2011	AGE OF DATA VERIFIED TO BE WITHIN LAST 7.5 YEARS. NUMERIC CRITERION IS INADEQUATE BECAUSE MERCURY IS ACCUMULATING IN THE FOOD CHAIN SUCH THAT FISH TISSUE MERCURY LEVELS EXCEED RECOMMENDED LEVELS FOR CONSUMPTION.
TAMPA BAY	1558H	OLD TAMPA BAY	COLIFORMS - SHELLFISH	EXCEEDS SEAS THRESHOLDS	MEDIUM	2008	LISTED DUE TO DOWNGRADE IN SHELLFISH HARVESTING CLASSIFICATION.
TAMPA BAY	1558H	OLD TAMPA BAY	MERCURY-FISH	LESS THAN CURRENT CRITERION (0.025 UG/L)	LOW	2011	AGE OF DATA VERIFIED TO BE WITHIN LAST 7.5 YEARS. NUMERIC CRITERION IS INADEQUATE BECAUSE MERCURY IS ACCUMULATING IN THE FOOD CHAIN SUCH THAT FISH TISSUE MERCURY LEVELS EXCEED RECOMMENDED LEVELS FOR CONSUMPTION.
TAMPA BAY	1558I	OLD TAMPA BAY	COLIFORMS - SHELLFISH	EXCEEDS SEAS THRESHOLDS	MEDIUM	2008	LISTED DUE TO DOWNGRADE IN SHELLFISH HARVESTING CLASSIFICATION.
TAMPA BAY	1558I	OLD TAMPA BAY	MERCURY-FISH	LESS THAN CURRENT CRITERION (0.025 UG/L)	LOW	2011	AGE OF DATA VERIFIED TO BE WITHIN LAST 7.5 YEARS. NUMERIC CRITERION IS INADEQUATE BECAUSE MERCURY IS ACCUMULATING IN THE FOOD CHAIN SUCH THAT FISH TISSUE MERCURY LEVELS EXCEED RECOMMENDED LEVELS FOR CONSUMPTION.
TAMPA BAY	1563	CHANNEL G	NUTRIENTS (CHL A)	TN = 1.13 MG/L	MEDIUM	2008	AS NOTED IN THE DEPARTMENT'S OCTOBER 1 SUBMITTAL TO EPA, THIS WATER SHOULD HAVE BEEN INCLUDED IN THE ORIGINAL ORDER ADOPTED BY THE SECRETARY BUT WAS INADVERTENTLY LEFT OFF THE LIST. NITROGEN IS LIMITING NUTRIENT.
TAMPA BAY	1563	CHANNEL G	DISSOLVED OXYGEN	< 4.0 MG/L, AND LESS THAN 5.0 MG/L AS DAILY AVERAGE	LOW	2008	LINKED TO NUTRIENTS.
TAMPA BAY	1569	BISHOP CREEK	COLIFORMS (FECAL COLIFORM)	> 800 PER 100 ML	LOW	2008	
TAMPA BAY	1569	BISHOP CREEK	COLIFORMS (TOTAL COLIFORM)	> 2400 PER ML	LOW	2008	
TAMPA BAY	1570A	SWEETWATER CREEK TIDAL - LOWER	DISSOLVED OXYGEN	< 4.0 MG/L, AND LESS THAN 5.0 MG/L AS DAILY AVERAGE	HIGH	2003	FOR THE 1998 303(D) ANALYSIS THE STATION DATA WERE INCORRECTLY ASSIGNED TO WBID 1601. LOW DO LINKED TO NUTRIENTS.
TAMPA BAY	1570A	SWEETWATER CREEK TIDAL - LOWER	COLIFORMS (FECAL COLIFORM)	> 800 PER 100 ML	HIGH	2003	FOR THE 1998 303(D) ANALYSIS THE STATION DATA WERE INCORRECTLY ASSIGNED TO WBID 1601.
TAMPA BAY	1570A	SWEETWATER CREEK TIDAL - LOWER	COLIFORMS (TOTAL COLIFORM)	> 2400 PER ML	HIGH	2003	FOR THE 1998 303(D) ANALYSIS THE STATION DATA WERE INCORRECTLY ASSIGNED TO WBID 1601.
TAMPA BAY	1570A	SWEETWATER CREEK TIDAL - LOWER	NUTRIENTS (CHLOROPHYLL)	MEDIAN TN = 1.21 MG/L	HIGH	2003	NITROGEN IS LIMITING NUTRIENT. FOR THE 1998 303(D) ANALYSIS THE STATION DATA WERE INCORRECTLY ASSIGNED TO WBID 1601.
TAMPA BAY	1570A	SWEETWATER CREEK TIDAL - LOWER	NUTRIENTS (HISTORIC CHLOROPHYLL)	MEDIAN TN = 1.21 MG/L	HIGH	2003	NITROGEN IS LIMITING NUTRIENT. FOR THE 1998 303(D) ANALYSIS THE STATION DATA WERE INCORRECTLY ASSIGNED TO WBID 1601.
TAMPA BAY	1574	ALLIGATOR CREEK	NUTRIENTS (CHL A)	TN = 1.03 MG/L TP = 0.14 MG/L	MEDIUM	2008	AS NOTED IN THE DEPARTMENT'S OCTOBER 1 SUBMITTAL TO EPA, THIS WATER SHOULD HAVE BEEN INCLUDED IN THE ORIGINAL ORDER ADOPTED BY THE SECRETARY BUT WAS INADVERTENTLY LEFT OFF THE LIST. NITROGEN AND PHOSPHORUS ARE LIMITING NUTRIENTS.
TAMPA BAY	1574A	ALLIGATOR LAKE	NUTRIENTS (HIST. CHL A)	TN = 0.67 MG/L TP = 0.14 MG/L	MEDIUM	2008	AS NOTED IN THE DEPARTMENT'S OCTOBER 1 SUBMITTAL TO EPA, THIS WATER SHOULD HAVE BEEN INCLUDED IN THE ORIGINAL ORDER ADOPTED BY THE SECRETARY BUT WAS INADVERTENTLY LEFT OFF THE LIST. NITROGEN AND PHOSPHORUS ARE LIMITING NUTRIENTS.
TAMPA BAY	1574A	ALLIGATOR LAKE	DISSOLVED OXYGEN	< 4.0 MG/L, AND LESS THAN 5.0 MG/L AS DAILY AVERAGE	LOW	2008	LINKED TO NUTRIENTS.

BASIN	WBID[1]	WATER SEGMENT NAME	PARAMETERS IDENTIFIED USING THE IMPAIRED WATERS RULE	CONCENTRATIONS CAUSING IMPAIRMENT[2]	PRIORITY FOR TMDL DEVELOPMENT[3]	PROJECTED YEAR FOR TMDL DEVELOPMENT	COMMENTS
TAMPA BAY	1574A	ALLIGATOR LAKE	NUTRIENTS (CHLOROPHYLL)	MEDIAN TN = 0.67 MG/L; MEDIAN TP = 0.14 MG/L	LOW	2008	NITROGEN AND PHOSPHORUS ARE LIMITING NUTRIENTS.
TAMPA BAY	1575	MULLET CREEK	COLIFORMS (FECAL COLIFORM)	> 800 PER 100 ML	LOW	2008	
TAMPA BAY	1575	MULLET CREEK	COLIFORMS (TOTAL COLIFORM)	> 2400 PER ML	LOW	2008	
TAMPA BAY	1584B	MCKAY BAY	DISSOLVED OXYGEN	< 5.0 MG/L	HIGH	2003	LINKED TO NUTRIENTS.
TAMPA BAY	1584B	MCKAY BAY	NUTRIENTS (CHLOROPHYLL)	MEDIAN TN = 0.80 MG/L	HIGH	2003	NITROGEN IS LIMITING NUTRIENT.
TAMPA BAY	1584B	MCKAY BAY	NUTRIENTS (HISTORIC CHLOROPHYLL)	MEDIAN TN = 0.80 MG/L	HIGH	2003	NITROGEN IS LIMITING NUTRIENT.
TAMPA BAY	1584B	MCKAY BAY	MERCURY-FISH	LESS THAN CURRENT CRITERION (0.025 UG/L)	HIGH	2011	AGE OF DATA VERIFIED TO BE WITHIN LAST 7.5 YEARS. NUMERIC CRITERION IS INADEQUATE BECAUSE MERCURY IS ACCUMULATING IN THE FOOD CHAIN SUCH THAT FISH TISSUE MERCURY LEVELS EXCEED RECOMMENDED LEVELS FOR CONSUMPTION.
TAMPA BAY	1603C	BECKETT LAKE - OPEN WATER	NUTRIENTS (TSI)	MEDIAN TN = 0.87 MG/L; MEDIAN TP = 0.06 MG/L	MEDIUM	2008	NITROGEN AND PHOSPHORUS ARE LIMITING NUTRIENTS.
TAMPA BAY	1604	ALLEN CREEK	NUTRIENTS (CHLOROPHYLL)	MEDIAN TN = 1.05 MG/L			NITROGEN IS LIMITING NUTRIENT.
TAMPA BAY	1605	DELANEY CREEK	COLIFORMS (FECAL COLIFORM)	> 800 PER 100 ML	HIGH	2003	
TAMPA BAY	1605	DELANEY CREEK	COLIFORMS (TOTAL COLIFORM)	> 2400 PER ML	HIGH	2003	
TAMPA BAY	1605	DELANEY CREEK	DISSOLVED OXYGEN	< 5.0 MG/L	HIGH	2003	LINKED TO NUTRIENTS.
TAMPA BAY	1605	DELANEY CREEK	LEAD	> E(1.273[LNH]-4.705)	HIGH	2003	
TAMPA BAY	1605D	DELANEY CREEK TIDAL	LEAD	> 5.6 UG/L	MEDIUM	2008	
TAMPA BAY	1605D	DELANEY CREEK TIDAL	COLIFORMS (FECAL COLIFORM)	> 800 PER 100 ML	MEDIUM	2008	
TAMPA BAY	1605D	DELANEY CREEK TIDAL	COLIFORMS (TOTAL COLIFORM)	> 2400 PER ML	MEDIUM	2008	
TAMPA BAY	1605D	DELANEY CREEK TIDAL	DISSOLVED OXYGEN	< 4.0 MG/L, AND LESS THAN 5.0 MG/L AS DAILY AVERAGE	MEDIUM	2008	LINKED TO NUTRIENTS.
TAMPA BAY	1605D	DELANEY CREEK TIDAL	NUTRIENTS (CHLOROPHYLL)	MEDIAN TN = 2.33 MG/L	MEDIUM	2008	NITROGEN IS LIMITING NUTRIENT.
TAMPA BAY	1624	DIRECT RUNOFF TO BAY	COLIFORMS (FECAL COLIFORM)	> 800 PER 100 ML	HIGH	2003	
TAMPA BAY	1624	DIRECT RUNOFF TO BAY	COLIFORMS (TOTAL COLIFORM)	> 2400 PER ML	HIGH	2003	
TAMPA BAY	1624	DIRECT RUNOFF TO BAY	DISSOLVED OXYGEN	< 4.0 MG/L, AND LESS THAN 5.0 MG/L AS DAILY AVERAGE	HIGH	2003	LINKED TO NUTRIENTS.
TAMPA BAY	1625	CROSS CANAL (NORTH)	NUTRIENTS (CHL A)	TN = 1.06 MG/L	MEDIUM	2008	AS NOTED IN THE DEPARTMENT'S OCTOBER 1 SUBMITTAL TO EPA, THIS WATER SHOULD HAVE BEEN INCLUDED IN THE ORIGINAL ORDER ADOPTED BY THE SECRETARY BUT WAS INADVERTENTLY LEFT OFF THE LIST. NITROGEN IS LIMITING NUTRIENT.
TAMPA BAY	1625	CROSS CANAL (NORTH)	COLIFORMS (FECAL COLIFORM)	> 800 PER 100 ML	LOW	2008	
TAMPA BAY	1625	CROSS CANAL (NORTH)	DISSOLVED OXYGEN	< 4.0 MG/L, AND LESS THAN 5.0 MG/L AS DAILY AVERAGE	LOW	2008	LINKED TO NUTRIENTS.
TAMPA BAY	1627	LONG BRANCH	COLIFORMS (FECAL COLIFORM)	> 800 PER 100 ML	HIGH	2003	
TAMPA BAY	1627	LONG BRANCH	COLIFORMS (TOTAL COLIFORM)	> 2400 PER ML	HIGH	2003	
TAMPA BAY	1627	LONG BRANCH	DISSOLVED OXYGEN	< 5.0 MG/L	HIGH	2003	LINKED TO NUTRIENTS AND BOD.

BASIN	WBID[1]	WATER SEGMENT NAME	PARAMETERS IDENTIFIED USING THE IMPAIRED WATERS RULE	CONCENTRATIONS CAUSING IMPAIRMENT[2]	PRIORITY FOR TMDL DEVELOPMENT[3]	PROJECTED YEAR FOR TMDL DEVELOPMENT	COMMENTS
TAMPA BAY	1637	BLACK POINT CHANNEL	DISSOLVED OXYGEN	< 4.0 MG/L, AND LESS THAN 5.0 MG/L AS DAILY AVERAGE	LOW	2008	THIS SEGMENT WAS LISTED ON THE 1998 303(D) LIST; HOWEVER, IT WAS NOT ASSESSED IN THE 1996 305(B) REPORT. LINKED TO NUTRIENTS.
TAMPA BAY	1666	BULLFROG CREEK	COLIFORMS (FECAL COLIFORM)	> 800 PER 100 ML	MEDIUM	2008	
TAMPA BAY	1666	BULLFROG CREEK	COLIFORMS (TOTAL COLIFORM)	> 2400 PER ML	MEDIUM	2008	
TAMPA BAY	1666A	BULLFROG CREEK	NUTRIENTS (CHL A)	TN = 1.28 MG/L	MEDIUM	2008	AS NOTED IN THE DEPARTMENT'S OCTOBER 1 SUBMITTAL TO EPA, THIS WATER SHOULD HAVE BEEN INCLUDED IN THE ORIGINAL ORDER ADOPTED BY THE SECRETARY BUT WAS INADVERTENTLY LEFT OFF THE LIST. NITROGEN IS LIMITING NUTRIENT.
TAMPA BAY	1666A	BULLFROG CREEK	COLIFORMS (TOTAL COLIFORM)	> 2400 PER ML	LOW	2008	
TAMPA BAY	1666A	BULLFROG CREEK	DISSOLVED OXYGEN	< 4.0 MG/L, AND LESS THAN 5.0 MG/L AS DAILY AVERAGE	LOW	2008	LINKED TO NUTRIENTS.
TAMPA BAY	1683	SMACKS BAYOU	NUTRIENTS (CHL A)	TN = 0.76 MG/L	MEDIUM	2008	AS NOTED IN THE DEPARTMENT'S OCTOBER 1 SUBMITTAL TO EPA, THIS WATER SHOULD HAVE BEEN INCLUDED IN THE ORIGINAL ORDER ADOPTED BY THE SECRETARY BUT WAS INADVERTENTLY LEFT OFF THE LIST. NITROGEN IS LIMITING NUTRIENT.
TAMPA BAY	1683	SMACKS BAYOU	COLIFORMS (FECAL COLIFORM)	> 800 PER 100 ML	LOW	2008	
TAMPA BAY	1700	COFFEEPOT BAYOU	NUTRIENTS (CHL A)	TN = 1.00 MG/L	MEDIUM	2008	AS NOTED IN THE DEPARTMENT'S OCTOBER 1 SUBMITTAL TO EPA, THIS WATER SHOULD HAVE BEEN INCLUDED IN THE ORIGINAL ORDER ADOPTED BY THE SECRETARY BUT WAS INADVERTENTLY LEFT OFF THE LIST. NITRGEN IS LIMITING NUTRIENT.
TAMPA BAY	1700	COFFEEPOT BAYOU	COLIFORMS (FECAL COLIFORM)	> 800 PER 100 ML	LOW	2008	
TAMPA BAY	1709D	LITTLE BAYOU - BASIN Q	COLIFORMS (FECAL COLIFORM)	> 800 PER 100 ML	MEDIUM	2008	
TAMPA BAY	1709D	LITTLE BAYOU - BASIN Q	DISSOLVED OXYGEN	< 4.0 MG/L, AND LESS THAN 5.0 MG/L AS DAILY AVERAGE	MEDIUM	2008	LINKED TO NUTRIENTS.
TAMPA BAY	1709D	LITTLE BAYOU - BASIN Q	NUTRIENTS (CHLOROPHYLL)	MEDIAN TN = 1.11 MG/L	MEDIUM	2008	NITROGEN IS LIMITING NUTRIENT.
TAMPA BAY	1778	COCKROACH BAY	MERCURY-FISH	LESS THAN CURRENT CRITERION (0.025 UG/L)	LOW	2011	HAS CONTAMINATED SEDIMENTS - ONGOING RESTORATION EFFORT. AGE OF DATA VERIFIED TO BE WITHIN LAST 7.5 YEARS. NUMERIC CRITERION IS INADEQUATE BECAUSE MERCURY IS ACCUMULATING IN THE FOOD CHAIN SUCH THAT FISH TISSUE MERCURY LEVELS EXCEED RECOMMENDED LEVELS FOR CONSUMPTION.
TAMPA BAY	1778	COCKROACH BAY	NUTRIENTS (CHL A)	TN = 1.16 MG/L	MEDIUM	2008	AS NOTED IN THE DEPARTMENT'S OCTOBER 1 SUBMITTAL TO EPA, THIS WATER SHOULD HAVE BEEN INCLUDED IN THE ORIGINAL ORDER ADOPTED BY THE SECRETARY BUT WAS INADVERTENTLY LEFT OFF THE LIST. NITROGEN IS LIMITING NUTRIENT.
TAMPA BAY	1778	COCKROACH BAY	DISSOLVED OXYGEN	< 4.0 MG/L, AND LESS THAN 5.0 MG/L AS DAILY AVERAGE	LOW	2008	LINKED TO NUTRIENTS AND BOD.
TAMPA BAY	1778	COCKROACH BAY	COLIFORMS - SHELLFISH	EXCEEDS SEAS THRESHOLDS			LISTED DUE TO DOWNGRADE IN SHELLFISH HARVESTING CLASSIFICATION.
TAMPA BAY	1797B	BISHOPS HARBOR	MERCURY-FISH	LESS THAN CURRENT CRITERION (0.025 UG/L)	LOW	2011	AGE OF DATA VERIFIED TO BE WITHIN LAST 7.5 YEARS. NUMERIC CRITERION IS INADEQUATE BECAUSE MERCURY IS ACCUMULATING IN THE FOOD CHAIN SUCH THAT FISH TISSUE MERCURY LEVELS EXCEED RECOMMENDED LEVELS FOR CONSUMPTION.
TAMPA BAY	1797B	BISHOPS HARBOR	COLIFORMS - SHELLFISH	EXCEEDS SEAS THRESHOLDS			LISTED DUE TO DOWNGRADE IN SHELLFISH HARVESTING CLASSIFICATION.
TAMPA BAY	8999	FLORIDA GULF COAST	MERCURY-FISH	LESS THAN CURRENT CRITERION (0.025 UG/L)	LOW	2011	CONFIRMED RECENT DATA FOR COASTAL FISH ADVISORY FOR MACKEREL. INCLUDES NEARSHORE AREAS IN 8049.

1 WBID = **W**ater**B**ody **ID**entification Number

2 FOR NUTRIENTS, THESE ARE MEDIAN CONCENTRATIONS CALCULATED FROM DATA GENERATED FROM 1995 THROUGH JUNE, 2002. THE SPECIFIC CONCENTRATION OF NUTRIENTS CAUSING THE IMPAIRMENT IS UNKNOWN.

3 PRIORITIES WERE RETAINED FROM THE 1998 303(D) LIST (I.E., HIGH OR LOW), BUT HIGH, MEDIUM AND LOW ARE USED FOR NEWLY LISTED WATERS IDENTIFIED UNDER THE IWR.

Appendix 7-3. Available Water Quality Data for Lower Sweetwater Creek Watershed

WBODYID	WATERBODYNAME	STATIONID	DATASOURCE	SAMPLE_DATE	TSI	BOD5_MGL	CHLA_UGL	CU_UGL	DO_MGL	FCOLI_100ML	NH3_UGL	PB_UGL	PH	TCOLI_100ML	TN_UGL	TP_UGL	TSS_MGL	ZN_UGL
5211	EGYPT LAKE	5211	HCEPC_WQ_REPORTS	12/29/1994	41.46518623		11.84				10				381.6	10		
5211	EGYPT LAKE	5211	HCEPC_WQ_REPORTS	11/3/1993						307.5				412.5				
5211	EGYPT LAKE	5211	HCEPC_WQ_REPORTS	6/5/1992								30	7.65					9
5211	EGYPT LAKE	5211	HCEPC_WQ_REPORTS	1/30/1992	47.75184823	1.81	7.6			130	20			130	625	100		
5211	EGYPT LAKE	5211	HCEPC_WQ_REPORTS	8/12/1991						1000				1000				
5211	EGYPT LAKE	Egypt-Hillsborough	LAKEWATCH_SUPP	9/29/1993	53.26265882		18.06666666						7.55		775	21		
5211	EGYPT LAKE	Egypt-Hillsborough	LAKEWATCH_V	3/22/2004	54.97747371		16.5								790	25.66666666		
5211	EGYPT LAKE	Egypt-Hillsborough	LAKEWATCH_V	11/20/2003	50.37904343		11.5								925	21.66666666		
5211	EGYPT LAKE	Egypt-Hillsborough	LAKEWATCH_V	3/24/2003	50.74240907		10								896.6666667	24.33333333		
5211	EGYPT LAKE	Egypt-Hillsborough	LAKEWATCH_V	11/21/2002	45.80155945		15								695	12.5		
5211	EGYPT LAKE	Egypt-Hillsborough	LAKEWATCH_V	9/25/2002	52.51794798		20.5								703.3333333	23.66666666		
5211	EGYPT LAKE	Egypt-Hillsborough	LAKEWATCH_V	7/25/2002	48.4704172		14.5								726.6666667	16		
5211	EGYPT LAKE	Egypt-Hillsborough	LAKEWATCH_V	6/2/2002	41.85383876		5.5								616.6666667	16.5		
5211	EGYPT LAKE	Egypt-Hillsborough	LAKEWATCH_V	3/11/2002	44.75149447		6.5								643.3333333	29		
5211	EGYPT LAKE	Egypt-Hillsborough	LAKEWATCH_V	1/15/2002	52.86891007		19.5								743.3333333	26		
5211	EGYPT LAKE	Egypt-Hillsborough	LAKEWATCH_V	6/30/2001	51.13414964		23.33333333								743.3333333	15		
5211	EGYPT LAKE	Egypt-Hillsborough	LAKEWATCH_V	3/22/2001	45.04168183		6								870	20.5		
5211	EGYPT LAKE	Egypt-Hillsborough	LAKEWATCH_V	3/6/2001	53.46147055		16								733.3333333	23		
5211	EGYPT LAKE	Egypt-Hillsborough	LAKEWATCH_V	1/24/2001	54.54357332		20								793.3333333	22		
5211	EGYPT LAKE	Egypt-Hillsborough	LAKEWATCH_V	9/11/2000	49.77489068		13.5								685	18.66666666		
5211	EGYPT LAKE	Egypt-Hillsborough	LAKEWATCH_V	12/13/1999	55.37309585		17.5								930	41.5		
5211	EGYPT LAKE	Egypt-Hillsborough	LAKEWATCH_V	9/27/1999											920	133		
5211	EGYPT LAKE	Egypt-Hillsborough	LAKEWATCH_V	12/21/1998	54.00410339		22								665	31		
5211	EGYPT LAKE	Egypt-Hillsborough	LAKEWATCH_V	8/8/1998	44.09801963		4.5								895	31.33333333		
5211	EGYPT LAKE	Egypt-Hillsborough	LAKEWATCH_V	5/19/1998	49.98374569		13.5								580	19		
5211	EGYPT LAKE	Egypt-Hillsborough	LAKEWATCH_V	10/19/1997	58.8416474		24								930	28.33333333		
5211	EGYPT LAKE	Egypt-Hillsborough	LAKEWATCH_V	5/19/1997											885	23		
5211	EGYPT LAKE	Egypt-Hillsborough	LAKEWATCH_V	1/25/1997	54.63266538		23.5								763.3333333	27.66666666		
5211	EGYPT LAKE	Egypt-Hillsborough	LAKEWATCH_V	11/11/1996	55.85213562		17.5								980	26.66666666		
5211	EGYPT LAKE	Egypt-Hillsborough	LAKEWATCH_V	10/14/1996	60.12073688		38.5								820	23.66666666		
5211	EGYPT LAKE	Egypt-Hillsborough	LAKEWATCH_V	9/9/1996	52.96236391		24.5								826.6666667	17		
5211	EGYPT LAKE	Egypt-Hillsborough	LAKEWATCH_V	8/11/1996	51.7403713		18								700	18.5		
5211	EGYPT LAKE	Egypt-Hillsborough	LAKEWATCH_V	7/5/1996	51.87506183		15.5								823.3333333	20.5		
5211	EGYPT LAKE	Egypt-Hillsborough	LAKEWATCH_V	5/26/1996	44.90572245		11								580	14		
5211	EGYPT LAKE	Egypt-Hillsborough	LAKEWATCH_V	5/5/1996	42.78273253		7.5								540	18.33333333		
5211	EGYPT LAKE	Egypt-Hillsborough	LAKEWATCH_V	4/8/1996	52.26854289		21								613.3333333	25		
5211	EGYPT LAKE	Egypt-Hillsborough	LAKEWATCH_V	11/13/1995	57.17962846		20.5								893.3333333	50		
5211	EGYPT LAKE	Egypt-Hillsborough	LAKEWATCH_V	6/11/1995	53.43331404		18.5								695	21		
5211	EGYPT LAKE	Egypt-Hillsborough	LAKEWATCH_V	5/8/1995	46.10675825		11								640	15.5		
5211	EGYPT LAKE	Egypt-Hillsborough	LAKEWATCH_V	12/29/1994	49.26849218		16								603.3333333	20.33333333		
5211	EGYPT LAKE	Egypt-Hillsborough	LAKEWATCH_V	10/9/1994	44.88457209		13.5								670	12.33333333		
5211	EGYPT LAKE	Egypt-Hillsborough	LAKEWATCH_V	9/12/1994	45.05121323		9.5								595	15.5		
5211	EGYPT LAKE	Egypt-Hillsborough	LAKEWATCH_V	7/17/1994	42.14817824		7.5								523.3333333	14		
5211	EGYPT LAKE	Egypt-Hillsborough	LAKEWATCH_V	4/10/1994	41.93196805		6.5								606.6666667	15		
5211	EGYPT LAKE	Egypt-Hillsborough	LAKEWATCH_V	2/13/1994	49.47527395		13.5								663.3333333	25		
5211	EGYPT LAKE	Egypt-Hillsborough	LAKEWATCH_V	11/7/1993	57.65864067		25								786.6666667	25		
5211	EGYPT LAKE	Egypt-Hillsborough	LAKEWATCH_V	10/10/1993	53.24464724		19								786.6666667	20.33333333		
5211	EGYPT LAKE	Egypt-Hillsborough	LAKEWATCH_V	9/29/1993	53.23604142		18								775	21		
5211	EGYPT LAKE	Egypt-Hillsborough	LAKEWATCH_V	8/23/1993	49.18578774		14.5								626.6666667	17		
5211	EGYPT LAKE	STA-128	LEGACY_SWFWMD_WQ	2/7/2001			14.15		9	44				470		24	3.5	
5211	EGYPT LAKE	STA-128	LEGACY_SWFWMD_WQ	7/27/2000			8.9		6.96							19	3.4	
5211	EGYPT LAKE	Egypt Lake	SWFWMD_KenRomie_WQ	3/5/1998	42.70333655		8.18						7.4		350	25		
5211	EGYPT LAKE	Egypt Lake	SWFWMD_KenRomie_WQ	8/7/1997	54.12470421		31.8						8.1		730	16		
5211	EGYPT LAKE	Egypt Lake	SWFWMD_KenRomie_WQ	1/23/1995	43.06867236		6.2						7.9		1760	17		
5211	EGYPT LAKE	Egypt Lake	SWFWMD_KenRomie_WQ	7/28/1994	47.76947425		4.9						7.6		840	105		
5211	EGYPT LAKE	02306652	USGS_NWIS	1/19/2000														
5211	EGYPT LAKE	02306652	USGS_NWIS	7/8/1999														
40	HENRY STREET CANAL	02306654	USGS_NWIS	9/29/1997							320				1350	100		
40	HENRY STREET CANAL	02306654	USGS_NWIS	9/28/1997					4.65		220		6.85		1460	180		
40	HENRY STREET CANAL	02306654	USGS_NWIS	9/28/1994					5.2		220		7.6		1170	140		
40	HENRY STREET CANAL	02306654	USGS_NWIS	9/13/1994					5.9		300		6.85		1330	100		
40	HENRY STREET CANAL	02306654	USGS_NWIS	8/29/1994					6.9		190		6.75		1130	130		
40	HENRY STREET CANAL	02306654	USGS_NWIS	8/31/1993				3	6.8		50	1	7.4		1020	120		4
40	HENRY STREET CANAL	02306654	USGS_NWIS	8/27/1993				4	6.2		50	4	7.45		1030	110		10
69	SWEETWATER CREEK	104	HCEPC_WQ	4/6/2005		2			3.61				7.2		662			
69	SWEETWATER CREEK	142	HCEPC_WQ	4/6/2005		1									606			
69	SWEETWATER CREEK	162	HCEPC_WQ	4/6/2005		2	12		6.23				7.4		576			
69	SWEETWATER CREEK	162	HCEPC_WQ	3/1/2005		1	12.9		3.94				7.2		965			

69	SWEETWATER CREEK	142	HCEPC_WQ	3/1/2005		1				400					1017			
69	SWEETWATER CREEK	104	HCEPC_WQ	3/1/2005		1			3.9		210		7.3		928	100		
69	SWEETWATER CREEK	104	HCEPC_WQ	2/2/2005		2			5.72				7.7		630	80		
69	SWEETWATER CREEK	162	HCEPC_WQ	2/2/2005		1			4.14				7.4		810			
69	SWEETWATER CREEK	142	HCEPC_WQ	2/2/2005	49.81906284	1	10.6								650	40		
69	SWEETWATER CREEK	142	HCEPC_WQ	1/4/2005	36.78208763	0	1.2			60	60				900	50		
69	SWEETWATER CREEK	162	HCEPC_WQ	1/4/2005	40.66150909	1	1.9		2.35	100	90		7.2		1010	50		
69	SWEETWATER CREEK	104	HCEPC_WQ	1/4/2005	42.37783266	3	2.8		4.9	300	50		7.5		740	100		
69	SWEETWATER CREEK	104	HCEPC_WQ	12/14/2004	45.04331448	1	4.6		6.34	900	30		7.7		680	90		
69	SWEETWATER CREEK	142	HCEPC_WQ	12/14/2004		1				20	70				1090	60		
69	SWEETWATER CREEK	142	HCEPC_WQ	11/16/2004		1				100	70				1080	40		
69	SWEETWATER CREEK	104	HCEPC_WQ	11/16/2004	45.48588469	1	4.4		4.49	1600	70		7.5		730	100		
69	SWEETWATER CREEK	104	HCEPC_WQ	10/19/2004	54.12158967	1.5	9.7		4.47	1000	130		7.3		960	100		
69	SWEETWATER CREEK	142	HCEPC_WQ	10/19/2004	50.6201715	1.4	7.1			140	90				1110	50		
69	SWEETWATER CREEK	142	HCEPC_WQ	9/14/2004		1.3				400	150				850	60		
69	SWEETWATER CREEK	104	HCEPC_WQ	9/14/2004	63.72027994	2.4	24.1		2.58	600	190		7.1		1380	100		
69	SWEETWATER CREEK	104	HCEPC_WQ	8/17/2004	54.43412611	0.9	8.1		3.28	800	130		7.2		1140	90		
69	SWEETWATER CREEK	142	HCEPC_WQ	8/17/2004	49.54155387	0.6	2.6			100	60				1540	50		
69	SWEETWATER CREEK	142	HCEPC_WQ	7/20/2004	58.99868135	1.6	21.8		4.34	2200	50		6.6		860	70		
69	SWEETWATER CREEK	104	HCEPC_WQ	7/20/2004	51.85825972	1.3	7.8		5.16	4800	80		6.9		900	110		
69	SWEETWATER CREEK	104	HCEPC_WQ	6/15/2004	51.78821888	1	6.7		2.44	1000	140		7.3		990	130		
69	SWEETWATER CREEK	142	HCEPC_WQ	6/15/2004		2.5				400	40				2400	620		
69	SWEETWATER CREEK	142	HCEPC_WQ	5/18/2004		3.8				100	80				1540	170		
69	SWEETWATER CREEK	104	HCEPC_WQ	5/18/2004	52.68574888	1.5	8.2		1.6	600	220		7.4		940	210		
69	SWEETWATER CREEK	104	HCEPC_WQ	4/20/2004	50.48033995	0.6	5.6		2.61	400	180		7.3		980	80		
69	SWEETWATER CREEK	142	HCEPC_WQ	4/20/2004	36.84030053	0.5	2			120	50				640	20		
69	SWEETWATER CREEK	142	HCEPC_WQ	3/16/2004		0.8				700	30				830	50		
69	SWEETWATER CREEK	104	HCEPC_WQ	3/16/2004	54.38047833	5	6.7		3.09	21800	240		7.2		1260	160		
69	SWEETWATER CREEK	104	HCEPC_WQ	2/17/2004	44.28729269	0.4	2.4		3.05	600	210		7.2		980	110		
69	SWEETWATER CREEK	142	HCEPC_WQ	2/17/2004		0.9				80	40				800	60		
69	SWEETWATER CREEK	142	HCEPC_WQ	1/13/2004	42.40263106	0.8	2.7			80	70				760	90		
69	SWEETWATER CREEK	104	HCEPC_WQ	1/13/2004	42.66525657	1.5	2.5		5.43	400	150		7.6		820	120		
69	SWEETWATER CREEK	104	HCEPC_WQ	12/9/2003	41.79136761	2	1.58		5.45	13300	300		7.4		1028	130		
69	SWEETWATER CREEK	142	HCEPC_WQ	12/9/2003		1				200	70				919	110		
69	SWEETWATER CREEK	142	HCEPC_WQ	11/18/2003		1				80	70				855	110		
69	SWEETWATER CREEK	104	HCEPC_WQ	11/18/2003	58.8016438	3	22.05		5.35	1400	50		7.6		856	170		
69	SWEETWATER CREEK	104	HCEPC_WQ	10/7/2003	42.94824786	1	1.76		2.55	700	170		7.2		1065	150		
69	SWEETWATER CREEK	142	HCEPC_WQ	10/7/2003	41.82635537	0	1.7			140	50				982	120		
69	SWEETWATER CREEK	142	HCEPC_WQ	9/16/2003		0				80						100		
69	SWEETWATER CREEK	104	HCEPC_WQ	9/16/2003		1	4.15		3.12	500			7.2			150		
69	SWEETWATER CREEK	104	HCEPC_WQ	8/12/2003	44.57064872	1	1.48		3.65	800	210		7.1		1304	130		
69	SWEETWATER CREEK	142	HCEPC_WQ	8/12/2003	56.69326966	2	14.87		3.31	220	70		6.5		916	120		
69	SWEETWATER CREEK	142	HCEPC_WQ	7/15/2003	58.16906364	1	19.78			220	50				868	120		
69	SWEETWATER CREEK	104	HCEPC_WQ	7/15/2003	45.64758883	1	3.15		3.73	6900	100		7.4		927	130		
69	SWEETWATER CREEK	104	HCEPC_WQ	6/17/2003	46.33737072	2	4.6		3.3	7300	60		7.3		767	130		
69	SWEETWATER CREEK	142	HCEPC_WQ	6/17/2003		2				1340	20				703	120		
69	SWEETWATER CREEK	142	HCEPC_WQ	5/20/2003		1				460	50				739	130		
69	SWEETWATER CREEK	104	HCEPC_WQ	5/20/2003	56.01914128	2	10.56		2.9	8500	160		7.4		1082	190		
69	SWEETWATER CREEK	104	HCEPC_WQ	4/15/2003	65.54150155	4	73.56		4.9	300	20		7.5		715	110		
69	SWEETWATER CREEK	142	HCEPC_WQ	4/15/2003	36.55952871	1	1.55			100	20				640	100		
69	SWEETWATER CREEK	142	HCEPC_WQ	3/18/2003	45.98432527	1	3.9			380	20				829	90		
69	SWEETWATER CREEK	104	HCEPC_WQ	3/18/2003	48.44954832	2	3.8		2	2480	200		7.2		1061	140		
69	SWEETWATER CREEK	104	HCEPC_WQ	2/18/2003	46.53376924	1	3.35		4.3	920	120		7.3		966	130		
69	SWEETWATER CREEK	142	HCEPC_WQ	2/18/2003		1				280	20				906	110		
69	SWEETWATER CREEK	142	HCEPC_WQ	1/14/2003	32.8799046	1	0.45			140	80				981	90		
69	SWEETWATER CREEK	104	HCEPC_WQ	1/14/2003	49.57287272	1	3.25		6	620	150		7.4		1230	120		
69	SWEETWATER CREEK	104	HCEPC_WQ	12/10/2002	44.82552529	2	3.1		6.7	1820	80		7.4		868	140		
69	SWEETWATER CREEK	142	HCEPC_WQ	12/10/2002		2			7.1	1720	60		7.3		810	120		
69	SWEETWATER CREEK	142	HCEPC_WQ	11/19/2002		0				170	20				952	110		
69	SWEETWATER CREEK	104	HCEPC_WQ	11/19/2002	53.80718439	2	9.3		3.2	400	130		7.3		959	130		
69	SWEETWATER CREEK	104	HCEPC_WQ	10/15/2002	64.31027292	2	30.3		1.8	2120	90		7.4		1155	170		
69	SWEETWATER CREEK	142	HCEPC_WQ	10/15/2002	61.75585444	0	32			90	120				878	130		
69	SWEETWATER CREEK	142	HCEPC_WQ	9/17/2002		0				90	30				703	170		
69	SWEETWATER CREEK	104	HCEPC_WQ	9/17/2002	55.48840681	1	8.5		2.1	120	140		7.3		1191	160		
69	SWEETWATER CREEK	104	HCEPC_WQ	8/20/2002	54.50779393	1	6.2		2.8	160	100		7.2		1343	260		
69	SWEETWATER CREEK	142	HCEPC_WQ	8/20/2002	48.4199474	1	6.6			100	20				731	120		
69	SWEETWATER CREEK	142	HCEPC_WQ	7/23/2002	50.4009842	1	8.2			40	30				760	150		
69	SWEETWATER CREEK	104	HCEPC_WQ	7/23/2002	65.10979401	2	24.9		1.3	2500	170		7.3		1419	250		
69	SWEETWATER CREEK	104	HCEPC_WQ	6/18/2002	66.67281689	4	29.2		3.4	1240	60		7.3		1475	350		
69	SWEETWATER CREEK	142	HCEPC_WQ	6/18/2002		2				2000	20				468	150		
69	SWEETWATER CREEK	142	HCEPC_WQ	5/14/2002		4				50	490				1341	180		
69	SWEETWATER CREEK	104	HCEPC_WQ	5/14/2002	59.85577028	3	10.8		2.3	20	50		7.3		1523	220		

69	SWEETWATER CREEK	104	HCEPC_WQ	4/16/2002	56.60936363	2	9.7		4	40	40		7.3		1210	160		
69	SWEETWATER CREEK	142	HCEPC_WQ	4/16/2002	33.78529047	1	1.6			30	20				484	120		
69	SWEETWATER CREEK	142	HCEPC_WQ	3/19/2002		1				170	30				554	120		
69	SWEETWATER CREEK	104	HCEPC_WQ	3/19/2002	60.10226919	2	17.2		3.1	40	20		7.3		1141	170		
69	SWEETWATER CREEK	104	HCEPC_WQ	2/19/2002	51.69036928	2	9.6		7.2	60	70		7.6		771	140		
69	SWEETWATER CREEK	142	HCEPC_WQ	2/19/2002		1				550	30				566	100		
69	SWEETWATER CREEK	142	HCEPC_WQ	1/15/2002	38.31056319	1	2.4			570	120				562	120		
69	SWEETWATER CREEK	104	HCEPC_WQ	1/15/2002	37.96719103	2	2.2		4.8	1220	170		7.3		577	140		
69	SWEETWATER CREEK	104	HCEPC_WQ	12/11/2001	49.96575822	1.15	4.619043		1.2	220	290		6.9	2800	1072	190		
69	SWEETWATER CREEK	142	HCEPC_WQ	12/11/2001		0.57				180	90			5300	575	140		
69	SWEETWATER CREEK	142	HCEPC_WQ	11/13/2001		1.25				40				4500	634			
69	SWEETWATER CREEK	104	HCEPC_WQ	11/13/2001	40.917202	1.1	1.70665		4.2	1120	180		7.3	25700	900	110		
69	SWEETWATER CREEK	104	HCEPC_WQ	10/16/2001	45.32421412	1.42	3.040991		2.2	840	200		7.2	12200	921	150		
69	SWEETWATER CREEK	142	HCEPC_WQ	10/16/2001		1.82	0.857992			60	80			3500	581			
69	SWEETWATER CREEK	142	HCEPC_WQ	9/18/2001		1.73				100				7000	788	80		
69	SWEETWATER CREEK	104	HCEPC_WQ	9/18/2001	55.23512651	0.91	6.686307		3.4	500	180		7.2	13300	1352	120		
69	SWEETWATER CREEK	104	HCEPC_WQ	8/21/2001	66.61182897	3.26	32.048676		1.6	120			7.4	4900	1378	240		
69	SWEETWATER CREEK	142	HCEPC_WQ	8/21/2001		1.02	1.8865			120				6600	679			
69	SWEETWATER CREEK	142	HCEPC_WQ	7/24/2001		1.32	22.277568			460				11700	872			
69	SWEETWATER CREEK	104	HCEPC_WQ	7/24/2001	57.02691822	1.91	15.081075		2.8	2440	120		7.2	17200	936	150		
69	SWEETWATER CREEK	104	HCEPC_WQ	6/19/2001		6.83	38.94391385		2	920			7.6	10200		370		
69	SWEETWATER CREEK	142	HCEPC_WQ	6/19/2001		2.77				20				7800	913	140		
69	SWEETWATER CREEK	142	HCEPC_WQ	5/15/2001		2.8				80	180			8200	851	90		
69	SWEETWATER CREEK	104	HCEPC_WQ	5/15/2001	60.47264961	3.8	13.94777778		5.4	120			7.6	1800	1359	220		
69	SWEETWATER CREEK	104	HCEPC_WQ	4/17/2001	69.50950471	6.7	50.59056		2.9	340	60		7.4	7000	1329	300		
69	SWEETWATER CREEK	142	HCEPC_WQ	4/17/2001	39.84932967	1.9	2.636072			40	80			6900	609	90		
69	SWEETWATER CREEK	142	HCEPC_WQ	3/20/2001		2.3				1720	130			18300	970	120		
69	SWEETWATER CREEK	104	HCEPC_WQ	3/20/2001	72.62975323	3.9	75.724832		3.7	3180	130		7.4	30000	1356	220		
69	SWEETWATER CREEK	104	HCEPC_WQ	2/20/2001		6.8	39.86811636		3.4	980	10		7.3	9200		170		
69	SWEETWATER CREEK	142	HCEPC_WQ	2/20/2001		2.3				40	340			3700	1004	50		
69	SWEETWATER CREEK	142	HCEPC_WQ	1/16/2001		1.1	1.95016			100	290			200	731			
69	SWEETWATER CREEK	104	HCEPC_WQ	1/16/2001	56.48606034	3.3	12.377544		5.8	60	50		7.6	400	1016	110		
69	SWEETWATER CREEK	104	HCEPC_WQ	12/12/2000	61.2468624	3.1	14.443365		3.3	1960	160		7.2	20000	1378	130		
69	SWEETWATER CREEK	142	HCEPC_WQ	12/12/2000		2.4				420	310			13900	907	60		
69	SWEETWATER CREEK	142	HCEPC_WQ	11/14/2000		1.5				40	210			11900	607	100		
69	SWEETWATER CREEK	104	HCEPC_WQ	11/14/2000	65.09254549	2.9	20.73792		3.8	1200	40		7.4	12600	1909	120		
69	SWEETWATER CREEK	104	HCEPC_WQ	10/10/2000	60.6369893	3.7	8.178912		1.6	180	90		7.3	4800	1973	240		
69	SWEETWATER CREEK	142	HCEPC_WQ	10/10/2000	37.54146455	1	1.388045			60	80			8300	849	50		
69	SWEETWATER CREEK	142	HCEPC_WQ	9/19/2000		1.7				720	40			10400	1016	70		
69	SWEETWATER CREEK	104	HCEPC_WQ	9/19/2000	63.61385117	1.7	13.006477		3.4	440	180		7.2	10300	1907	180		
69	SWEETWATER CREEK	104	HCEPC_WQ	8/15/2000	57.67252365	1.3	6.80959125		2.9	1000	250		7.2	12400	1693	230		
69	SWEETWATER CREEK	142	HCEPC_WQ	8/15/2000	59.43499247	1.4	17.558164			220	40			8900	1135	80		
69	SWEETWATER CREEK	142	HCEPC_WQ	7/18/2000	55.37515622	1.7	10.927392			320	80			10300	996	120		
69	SWEETWATER CREEK	104	HCEPC_WQ	7/18/2000	65.08017145	1.4	17.22048		2.4	340	230		7.2	7100	1799	170		
69	SWEETWATER CREEK	104	HCEPC_WQ	6/20/2000	71.6037722	5.1	46.24494		1.8	320			7.3	13300	1715	220		
69	SWEETWATER CREEK	142	HCEPC_WQ	6/20/2000		1.8				220				9800	738	110		
69	SWEETWATER CREEK	142	HCEPC_WQ	5/16/2000		4.3				180	480			9300	2534	480		
69	SWEETWATER CREEK	104	HCEPC_WQ	5/16/2000	62.30358346	2.5	17.67484125		2.3	80	150		7.1	4800	1375	200		
69	SWEETWATER CREEK	104	HCEPC_WQ	4/18/2000	59.87471031	3	17.7449825		5.6	200			7.5	6700	1094	140		
69	SWEETWATER CREEK	142	HCEPC_WQ	4/18/2000	65.63098611	3.3	26.53972			640	420			10700	1379	130		
69	SWEETWATER CREEK	142	HCEPC_WQ	3/14/2000		2.7				80	220			3800	894	70		
69	SWEETWATER CREEK	104	HCEPC_WQ	3/14/2000	65.08309011	3.7	27.02275		2.8	80	70		7.3	1600	1340	180		
69	SWEETWATER CREEK	104	HCEPC_WQ	2/15/2000	45.27024491	1.2	2.60736		2.3	740	220		7.2	20000	931	90		
69	SWEETWATER CREEK	142	HCEPC_WQ	2/15/2000		1.6				60	90			1400	562			
69	SWEETWATER CREEK	142	HCEPC_WQ	1/18/2000		0.8	23.81707			20	40			2800	639			
69	SWEETWATER CREEK	104	HCEPC_WQ	1/18/2000	57.90298203	1.8	15.879264		7	480	40		7.7	5500	981	100		
69	SWEETWATER CREEK	104	HCEPC_WQ	12/14/1999	49.26533778	1.5	6.921732		4	260	120		7.4	5800	766	110		
69	SWEETWATER CREEK	142	HCEPC_WQ	12/14/1999		1.3				140	120			600	592	100		
69	SWEETWATER CREEK	142	HCEPC_WQ	11/16/1999		0.9				20	70			200	626	90		
69	SWEETWATER CREEK	104	HCEPC_WQ	11/16/1999	54.55965686	1.5	14.754992		5	720	70		7.3	2100	755	120		
69	SWEETWATER CREEK	104	HCEPC_WQ	10/12/1999	62.9356143	3.2	34.705824		2.6	260	50		7.2	4000	928	150		
69	SWEETWATER CREEK	142	HCEPC_WQ	10/12/1999	40.82878964	0.7	2.063586			60	50			1200	786	100		
69	SWEETWATER CREEK	142	HCEPC_WQ	9/22/1999		0.5				180	50			1800	899	80		
69	SWEETWATER CREEK	104	HCEPC_WQ	9/22/1999	54.42191013	0.3	8.67357		2.5	640	170		7.2	3000	1064	130		
69	SWEETWATER CREEK	104	HCEPC_WQ	8/17/1999	62.10888342	2.8	40.64644714		2.5	180			6.9	1700	773	160		
69	SWEETWATER CREEK	142	HCEPC_WQ	8/17/1999		1.3	8.028852			380	90			3000		100		
69	SWEETWATER CREEK	142	HCEPC_WQ	7/20/1999	49.43582802	0.9	7.790258			140	60			200	719	180		
69	SWEETWATER CREEK	104	HCEPC_WQ	7/20/1999	69.54202584	6.7	55.48957867		4.6	120			7.4	700	1253	220		
69	SWEETWATER CREEK	104	HCEPC_WQ	6/15/1999		4.2	38.16659		3	220	90		7.4	400		290		
69	SWEETWATER CREEK	142	HCEPC_WQ	6/15/1999		1.5				180	140			300	677	110		
69	SWEETWATER CREEK	142	HCEPC_WQ	5/18/1999		1.6				80	180			300		80		
69	SWEETWATER CREEK	104	HCEPC_WQ	5/18/1999		4	34.40478462		3.7	60	70		7.5	200		280		

69	SWEETWATER CREEK	104	HCEPC_WQ	4/20/1999		4.1	27.42822429		6.3	120			7.9	400		220		
69	SWEETWATER CREEK	142	HCEPC_WQ	4/20/1999	45.56858336	0.7	5.762806			40	140			100	614	90		
69	SWEETWATER CREEK	142	HCEPC_WQ	3/16/1999		1				220	50			1100	462	50		
69	SWEETWATER CREEK	104	HCEPC_WQ	3/16/1999	45.87386512	0.9	2.83479		2.6	160	290		7.2	2800	1016	130		
69	SWEETWATER CREEK	104	HCEPC_WQ	2/16/1999	41.74467555	1.6	3.08364		6.3	480			7.6	1900	654	130		
69	SWEETWATER CREEK	142	HCEPC_WQ	2/16/1999		0.5				240	80			800	475	70		
69	SWEETWATER CREEK	142	HCEPC_WQ	1/19/1999		1.1				380	100		7	700	703	102		
69	SWEETWATER CREEK	104	HCEPC_WQ	1/19/1999	32.15771141	1	0.702788		4.8	340			7.4	3000	770	50		
69	SWEETWATER CREEK	104	HCEPC_WQ	12/8/1998	53.49594348	1.8	11.439		4.3	1740	90		7.4	7900	811	140		
69	SWEETWATER CREEK	142	HCEPC_WQ	12/8/1998		1.2				60	140			500	720	40		
69	SWEETWATER CREEK	142	HCEPC_WQ	11/17/1998		1				340	80			1200	795	50		
69	SWEETWATER CREEK	104	HCEPC_WQ	11/17/1998	44.22024601	0.4	1.88485		3.3	840	170		7.3	2200	1145	120		
69	SWEETWATER CREEK	104	HCEPC_WQ	10/20/1998	60.97095268	2.2	15.453801		2.9	520	120		7.1	9100	1329	140		
69	SWEETWATER CREEK	142	HCEPC_WQ	10/20/1998	39.68998036	0.6	2.248866			120				1500	801	40		
69	SWEETWATER CREEK	142	HCEPC_WQ	9/15/1998		0.8				80	10			2000	560	50		
69	SWEETWATER CREEK	104	HCEPC_WQ	9/15/1998	66.5333176	3.6	37.607076		5.6	4000	73		7.7	20000	1229	180		
69	SWEETWATER CREEK	104	HCEPC_WQ	8/25/1998	61.27553571	1.9	18.941005		3.6	140	130		7.2	800	1193	230		
69	SWEETWATER CREEK	142	HCEPC_WQ	8/25/1998		0.5				20				2700	625	70		
69	SWEETWATER CREEK	142	HCEPC_WQ	7/21/1998	51.8482721	1.5	10.06035			100	60			300	722	60		
69	SWEETWATER CREEK	104	HCEPC_WQ	7/21/1998	41.12101901	1.9	2.314074		3.6	1400	170		7.3	3400	748	130		
69	SWEETWATER CREEK	104	HCEPC_WQ	6/16/1998	56.41014415	2.4	16.47462		5.1	120	50		7.7	400	833	350		
69	SWEETWATER CREEK	142	HCEPC_WQ	6/16/1998		2.3				160	110			500	742	180		
69	SWEETWATER CREEK	142	HCEPC_WQ	5/19/1998		2				140	90			700	755	100		
69	SWEETWATER CREEK	104	HCEPC_WQ	5/19/1998	55.77557731	2.2	13.506624		5.5	80			7.1	200	897	320		
69	SWEETWATER CREEK	104	HCEPC_WQ	4/21/1998	81.13226648	6.7	138.493285		3.2	140			7.3	1400	1996	330		
69	SWEETWATER CREEK	142	HCEPC_WQ	4/21/1998	49.06035624	1.5	7.394416			100	110			400	719	90		
69	SWEETWATER CREEK	142	HCEPC_WQ	3/17/1998		1.8				320	160			900	838	80		
69	SWEETWATER CREEK	104	HCEPC_WQ	3/17/1998	56.41919335	2.6	12.5198		6.3	220	90		7.1	2000	1002	150		
69	SWEETWATER CREEK	104	HCEPC_WQ	2/17/1998	46.32436481	3.5	5.015054		6.9	4000	60		7.1	10300	723	280		
69	SWEETWATER CREEK	142	HCEPC_WQ	2/17/1998		2.1			7.8	880	60		6.9	5600	846	140		
69	SWEETWATER CREEK	142	HCEPC_WQ	1/20/1998		0.8	6.495916			20	90			800	878			
69	SWEETWATER CREEK	104	HCEPC_WQ	1/20/1998	50.80338375	0.7	4.325408		5.7	360	260		7.2	8400	1211	170		
69	SWEETWATER CREEK	104	HCEPC_WQ	12/9/1997	62.05042803	2	15.666528		6.1	700	280		7.2	3800	1456	180		
69	SWEETWATER CREEK	142	HCEPC_WQ	12/9/1997		1.8				140	50			800	763			
69	SWEETWATER CREEK	142	HCEPC_WQ	11/18/1997		1.4				200	50			1600	908	120		
69	SWEETWATER CREEK	104	HCEPC_WQ	11/18/1997	49.25237334	1	3.259584		5.4	500	290		6.9	2300	1267	130		
69	SWEETWATER CREEK	104	HCEPC_WQ	10/14/1997	59.96229309	2.1	13.021946		3.3	1000	190		7.1	3400	1357	200		
69	SWEETWATER CREEK	142	HCEPC_WQ	10/14/1997	44.71776411	0.9	4.455198			120	60			400	674	130		
69	SWEETWATER CREEK	142	HCEPC_WQ	9/16/1997		1.5				20	80			100	620	200		
69	SWEETWATER CREEK	104	HCEPC_WQ	9/16/1997	59.47142049	2.3	17.51408		1.8	2100	110		7.2	3000	1063	300		
69	SWEETWATER CREEK	104	HCEPC_WQ	8/19/1997	60.20246179	1.6	15.459445		2.7	600	170		7.2	1200	1237	220		
69	SWEETWATER CREEK	142	HCEPC_WQ	8/19/1997		0.6				20				600	579	110		
69	SWEETWATER CREEK	142	HCEPC_WQ	7/22/1997	38.61716663	1.1	2.189166			60	10			100	615	120		
69	SWEETWATER CREEK	104	HCEPC_WQ	7/22/1997	67.90693166	3.5	37.830394		2.6	860	90		7.2	1200	1391	340		
69	SWEETWATER CREEK	104	HCEPC_WQ	6/17/1997	61.84235722	5.5	26.70912		5.6	40	10		7.7	100	999	270		
69	SWEETWATER CREEK	142	HCEPC_WQ	6/17/1997		1.1				120	60			300	814	170		
69	SWEETWATER CREEK	142	HCEPC_WQ	5/20/1997		0.6				120	70			1000	585	70		
69	SWEETWATER CREEK	104	HCEPC_WQ	5/20/1997	63.79214711	2.6	27.205668		3.7	140			7.2	600	1183	240		
69	SWEETWATER CREEK	104	HCEPC_WQ	4/15/1997	54.46657242	1.4	10.861244		4.8	1120	90		7.6	4400	919	240		
69	SWEETWATER CREEK	142	HCEPC_WQ	4/15/1997		0.4				800				2600	486	100		
69	SWEETWATER CREEK	142	HCEPC_WQ	3/18/1997		1.4				120	40			300	630	110		
69	SWEETWATER CREEK	104	HCEPC_WQ	3/18/1997	65.68404993	4.8	34.421484		7.5	340	50		7.7	800	1205	270		
69	SWEETWATER CREEK	104	HCEPC_WQ	2/18/1997	45.63048891	1.5	3.322815		1.8	300	260		7.3	2200	893	90		
69	SWEETWATER CREEK	142	HCEPC_WQ	2/18/1997		2				120	130			400	637	10		
69	SWEETWATER CREEK	142	HCEPC_WQ	1/21/1997	30.41218029	1.9	2.550639			260				500	634	10		
69	SWEETWATER CREEK	104	HCEPC_WQ	1/21/1997		2.3	19.254162		6.4	640			7.6	2200	796			
69	SWEETWATER CREEK	104	HCEPC_WQ	12/10/1996	42.37274416	2	4.312605		5.6	880	180		7.3	6100	1011	20		
69	SWEETWATER CREEK	142	HCEPC_WQ	12/10/1996		1.9				320	10			2300	636	20		
69	SWEETWATER CREEK	142	HCEPC_WQ	11/19/1996		0.59				380	60			800	541	20		
69	SWEETWATER CREEK	104	HCEPC_WQ	11/19/1996	53.13801506	2.32	19.234752		7.2	140	10		8	500	873	20		
69	SWEETWATER CREEK	104	HCEPC_WQ	10/15/1996	56.80308517	2.34	11.273353		3.5	840			7.2	3000	1114	130		
69	SWEETWATER CREEK	142	HCEPC_WQ	10/15/1996		1.13	2.227085			80				700	576			
69	SWEETWATER CREEK	142	HCEPC_WQ	9/24/1996		1.4				80	10			1300	634	50		
69	SWEETWATER CREEK	104	HCEPC_WQ	9/24/1996	67.76980492	1.93	44.97245946		2.6	1100	160		7.1	2000	1154	110		
69	SWEETWATER CREEK	104	HCEPC_WQ	8/20/1996	59.05350923	1.39	16.856808		2.6	1820	150		7.4	4400	1049	240		
69	SWEETWATER CREEK	142	HCEPC_WQ	8/20/1996		0.37				160	60			900	407	80		
69	SWEETWATER CREEK	142	HCEPC_WQ	7/16/1996	41.42130329	0.9	2.888665			100	50			700	663	130		
69	SWEETWATER CREEK	104	HCEPC_WQ	7/16/1996	43.65668285	1.64	3.157722		2.4	1360	150		7.1	3100	769	130		
69	SWEETWATER CREEK	104	HCEPC_WQ	6/18/1996	47.41771894	1.92	3.162724		2.5	1300	290		7.4	2300	1090	240		
69	SWEETWATER CREEK	142	HCEPC_WQ	6/18/1996		1.95				640				1600	780	100		
69	SWEETWATER CREEK	142	HCEPC_WQ	5/14/1996		0.1				60	40			400	633	50		
69	SWEETWATER CREEK	104	HCEPC_WQ	5/14/1996	50.00146251	4.7	3.222132		2.8	40			7.2	500	1369	310		

69	SWEETWATER CREEK	104	HCEPC_WQ	4/16/1996	57.10397243	1.28	7.056003		2.6	2020	170		7.2	20000	1568	170		
69	SWEETWATER CREEK	142	HCEPC_WQ	4/16/1996	36.74850467	0.43	2.605122			100				600	460	80		
69	SWEETWATER CREEK	142	HCEPC_WQ	3/19/1996		2.65				220	10			900	517	80		
69	SWEETWATER CREEK	104	HCEPC_WQ	3/19/1996	70.68462932	3.9	42.80937556		4	2300	80		7.3	20000	1658	180		
69	SWEETWATER CREEK	104	HCEPC_WQ	2/20/1996		0.1	6.884544		6.5	700	160		7.4	3000	1097			
69	SWEETWATER CREEK	142	HCEPC_WQ	2/20/1996		0.6				40				200	566	10		
69	SWEETWATER CREEK	142	HCEPC_WQ	1/23/1996		0.86	4.925679			80				900	672			
69	SWEETWATER CREEK	104	HCEPC_WQ	1/23/1996	60.23132391	0.98	17.672697		6	280	60		7.3	1600	1134	140		
69	SWEETWATER CREEK	104	HCEPC_WQ	12/12/1995	64.41483673	3.39	25.856435		5.7	380	150		7.3	3200	1297	160		
69	SWEETWATER CREEK	142	HCEPC_WQ	12/12/1995		2.2				60	50			300	687	10		
69	SWEETWATER CREEK	142	HCEPC_WQ	11/28/1995		1.6				80				1000	728	10		
69	SWEETWATER CREEK	104	HCEPC_WQ	11/28/1995	63.76467091	4.65	23.169056		7.4	60	10		7.6	500	1314	260		
69	SWEETWATER CREEK	104	HCEPC_WQ	10/24/1995	67.97356819	2.2	32.938726		3.7	980	170		7	4600	1743	120		
69	SWEETWATER CREEK	142	HCEPC_WQ	10/24/1995	35.3083154	1	5.034744			20				180	699	10		
69	SWEETWATER CREEK	142	HCEPC_WQ	9/26/1995		1.6				160				1500	681			
69	SWEETWATER CREEK	104	HCEPC_WQ	9/26/1995	71.89599832	4.3	44.916672		2.2	1620	60		6.9	4500	1797	180		
69	SWEETWATER CREEK	104	HCEPC_WQ	8/22/1995	46.06110185	1.5	2.3791		3.1	900	230		7	2900	1394	80		
69	SWEETWATER CREEK	142	HCEPC_WQ	8/22/1995		0.9				40	10			800	523			
69	SWEETWATER CREEK	142	HCEPC_WQ	7/25/1995	41.98130648	1.2	3.253605			460				2100	603	50		
69	SWEETWATER CREEK	104	HCEPC_WQ	7/25/1995	52.22822526	0.5	4.707875		3.2	1060	290		7	5900	1456	100		
69	SWEETWATER CREEK	104	HCEPC_WQ	6/27/1995	44.63744872	1.2	2.532026		3.6	1200	160		7	5900	955	80		
69	SWEETWATER CREEK	142	HCEPC_WQ	6/27/1995		1.4				100	10			1200	552			
69	SWEETWATER CREEK	142	HCEPC_WQ	5/23/1995		1.4				320	140			2100	628	50		
69	SWEETWATER CREEK	104	HCEPC_WQ	5/23/1995	68.86441531	5	48.98043509		3.2	460	10		7.5	600	1279	390		
69	SWEETWATER CREEK	104	HCEPC_WQ	4/25/1995	62.26037652	1.9	18.401919		1.4	700	140		7.2	20000	1333	290		
69	SWEETWATER CREEK	142	HCEPC_WQ	4/25/1995		1.3	4.63232			100				700	764			
69	SWEETWATER CREEK	142	HCEPC_WQ	3/21/1995		1.6				140	10			200	519			
69	SWEETWATER CREEK	104	HCEPC_WQ	3/21/1995		4.6	25.58358		8.5	600	10		7.7	1800		170		
69	SWEETWATER CREEK	104	HCEPC_WQ	2/21/1995	47.99679089	2.3	2.7607		4.3	4000	230		7.2	20000	1260	130		
69	SWEETWATER CREEK	142	HCEPC_WQ	2/21/1995		0.8				260	10			500	599	50		
69	SWEETWATER CREEK	142	HCEPC_WQ	1/24/1995		0.8	3.88569			160	10			600	579			
69	SWEETWATER CREEK	104	HCEPC_WQ	1/24/1995	51.29583066	2.2	2.903295		4.7	4000	320		7.2	20000	1776	140		
69	SWEETWATER CREEK	104	HCEPC_WQ	12/13/1994	56.02791731	2.3	6.093885		1.6	1480	330		7	20000	1565	200		
69	SWEETWATER CREEK	142	HCEPC_WQ	12/13/1994		1.5				480	10			2500	563	40		
69	SWEETWATER CREEK	142	HCEPC_WQ	11/29/1994		0.5				180	50			700	480	50		
69	SWEETWATER CREEK	104	HCEPC_WQ	11/29/1994	62.32747265	2.3	16.655415		5	720	50		7	2400	1434	150		
69	SWEETWATER CREEK	104	HCEPC_WQ	10/25/1994	61.31302539	2.7	13.68456		3.9	480			7.2	5400	1409	140		
69	SWEETWATER CREEK	142	HCEPC_WQ	10/25/1994	41.96754019	1.2	3.323575			280				800	583	50		
69	SWEETWATER CREEK	142	HCEPC_WQ	9/27/1994		0.4				260	10			2000	636	50		
69	SWEETWATER CREEK	104	HCEPC_WQ	9/27/1994	53.82434652	1.6	5.61146		2.9	1920	70		7.2	4500	1557	100		
69	SWEETWATER CREEK	104	HCEPC_WQ	8/23/1994	61.68619513	2.6	13.286415		2.5	2120	110		7.1	4400	1586	140		
69	SWEETWATER CREEK	142	HCEPC_WQ	8/23/1994		0.9	3.309705			40				100		90		
69	SWEETWATER CREEK	142	HCEPC_WQ	7/26/1994		0.9	4.675235			300	20			800		50		
69	SWEETWATER CREEK	104	HCEPC_WQ	7/26/1994	50.12979936	1.1	3.25565		3	2140			7	4300	1373	120		
69	SWEETWATER CREEK	104	HCEPC_WQ	6/21/1994	67.90226212	4.3	43.77		7	380	20		7.9	600	1261	320		
69	SWEETWATER CREEK	142	HCEPC_WQ	6/21/1994		1.4				440	20			700		210		
69	SWEETWATER CREEK	142	HCEPC_WQ	5/24/1994		1.1				240	90			1900	389	60		
69	SWEETWATER CREEK	104	HCEPC_WQ	5/24/1994	57.83219372	2.2	11.61		3.1	40	20		7.4	400	1202	300		
69	SWEETWATER CREEK	104	HCEPC_WQ	4/26/1994	54.99729994	2.8	4.956225		2.6	2460	120		7.3	5300	1633	190		
69	SWEETWATER CREEK	142	HCEPC_WQ	4/26/1994	43.43107428	1.6	8.367825			140				400	392	110		
69	SWEETWATER CREEK	142	HCEPC_WQ	3/22/1994		1.2				180				300	614			
69	SWEETWATER CREEK	104	HCEPC_WQ	3/22/1994		7	34.38		5	120	20		7.6			210		
69	SWEETWATER CREEK	104	HCEPC_WQ	2/22/1994	62.21136429	2.68	13.67		3	700			7.3	1800	1692	140		
69	SWEETWATER CREEK	142	HCEPC_WQ	2/22/1994		0.66				40	80			300	415	50		
69	SWEETWATER CREEK	142	HCEPC_WQ	1/25/1994	29.56802277	1.8	1.0269			40				200	440	100		
69	SWEETWATER CREEK	104	HCEPC_WQ	1/25/1994	63.75753667	6	17.34075		4.2	560	20		7.3	2400	1891	120		
69	SWEETWATER CREEK	104	HCEPC_WQ	12/14/1993		2.7			7.6	960	20		7.4	3300	891	130		
69	SWEETWATER CREEK	142	HCEPC_WQ	12/14/1993		2				140				200	499	20		
69	SWEETWATER CREEK	142	HCEPC_WQ	11/16/1993		1.9				180	100			500	578	20		
69	SWEETWATER CREEK	104	HCEPC_WQ	11/16/1993		2.4			3.4	740			7.1	3900	1166	130		
69	SWEETWATER CREEK	104	HCEPC_WQ	10/19/1993		1.7			4	1080			7.1	2500	1529	140		
69	SWEETWATER CREEK	142	HCEPC_WQ	10/19/1993		0.5				80				300	724			
69	SWEETWATER CREEK	142	HCEPC_WQ	9/14/1993		0				40				700	484			
69	SWEETWATER CREEK	104	HCEPC_WQ	9/14/1993		1.2			2.9	4000			7.1	4000	816	110		
69	SWEETWATER CREEK	104	HCEPC_WQ	8/17/1993		3.7			1.6	1740	220		7	2000	1543	290		
69	SWEETWATER CREEK	142	HCEPC_WQ	8/17/1993		1.9				320				2300	656	90		
69	SWEETWATER CREEK	142	HCEPC_WQ	7/20/1993		1.7				240	20			440				
69	SWEETWATER CREEK	104	HCEPC_WQ	7/20/1993		4.4			2	180	20		7.2	240		270		
69	SWEETWATER CREEK	104	HCEPC_WQ	6/15/1993		4.8			5	200			7.3	400	1125	380		
69	SWEETWATER CREEK	142	HCEPC_WQ	6/15/1993		2.6				100				700	779			
69	SWEETWATER CREEK	142	HCEPC_WQ	5/18/1993		1.8				300				1400	580			
69	SWEETWATER CREEK	104	HCEPC_WQ	5/18/1993		1.3			2	700	20		7.1	1100	733	160		

69	SWEETWATER CREEK	104	HCEPC_WQ	4/20/1993		1.6			3.6	1400			7	4300	791	20		
69	SWEETWATER CREEK	142	HCEPC_WQ	4/20/1993		1.2				100	20			900	368	20		
69	SWEETWATER CREEK	142	HCEPC_WQ	3/16/1993		1.1				200	20			200	323	110		
69	SWEETWATER CREEK	104	HCEPC_WQ	3/16/1993		1.6			2.7	900	250		6.9	8000	1435	140		
69	SWEETWATER CREEK	104	HCEPC_WQ	2/16/1993		1.1			5.1	6000	20		7.2	20000	887	20		
69	SWEETWATER CREEK	142	HCEPC_WQ	2/16/1993		0.6				200	20			600	415	20		
69	SWEETWATER CREEK	142	HCEPC_WQ	1/19/1993		0.2				100				900	369	20		
69	SWEETWATER CREEK	104	HCEPC_WQ	1/19/1993		0.9			4.8	700	310		7.1	4400	983	280		
69	SWEETWATER CREEK	104	HCEPC_WQ	12/15/1992		2.9			5	100			7.6	1000	1397	170		
69	SWEETWATER CREEK	142	HCEPC_WQ	12/15/1992		0.5				100				1400	292	20		
69	SWEETWATER CREEK	142	HCEPC_WQ	11/17/1992		0.6				100	310			400	383	110		
69	SWEETWATER CREEK	104	HCEPC_WQ	11/17/1992		2.6			6	100			7.4	100		420		
69	SWEETWATER CREEK	104	HCEPC_WQ	10/27/1992		1.8			4	600	20		7.1	1200	879	240		
69	SWEETWATER CREEK	142	HCEPC_WQ	10/27/1992		0.9				200	20			600	526			
69	SWEETWATER CREEK	142	HCEPC_WQ	9/22/1992		1.1				100	20			600	629			
69	SWEETWATER CREEK	104	HCEPC_WQ	9/22/1992		3.1			3.2	100	20		7.2		1262	310		
69	SWEETWATER CREEK	104	HCEPC_WQ	8/25/1992		4			3.6	100			7.5	200	1303	450		
69	SWEETWATER CREEK	142	HCEPC_WQ	8/25/1992		0.5				200	20			1000	1277			
69	SWEETWATER CREEK	142	HCEPC_WQ	7/28/1992		1.6				500	20			500	565	110		
69	SWEETWATER CREEK	104	HCEPC_WQ	7/28/1992		4.4			3.8	100	20		7.4	100	2161	430		
69	SWEETWATER CREEK	104	HCEPC_WQ	6/23/1992		6.4			6.2	100	20		7.8	100	2221	570		
69	SWEETWATER CREEK	142	HCEPC_WQ	6/23/1992		1.7					20			700		240		
69	SWEETWATER CREEK	142	HCEPC_WQ	5/26/1992		2.6				200				700	1436	150		
69	SWEETWATER CREEK	104	HCEPC_WQ	5/26/1992		3.7			3.9	100			7.4	100	1323	300		
69	SWEETWATER CREEK	104	HCEPC_WQ	4/21/1992		4.2			3.5	1100			7.3	2900	1516	310		
69	SWEETWATER CREEK	142	HCEPC_WQ	4/21/1992		1.8				3100				3100	472	110		
69	SWEETWATER CREEK	142	HCEPC_WQ	3/24/1992		2				300	20			600	496	120		
69	SWEETWATER CREEK	104	HCEPC_WQ	3/24/1992		2.5			4.4	500	20		7.3	900	817	280		
69	SWEETWATER CREEK	104	HCEPC_WQ	2/25/1992		2.6			4.1	1500	20			4700	1397	1250		
69	SWEETWATER CREEK	142	HCEPC_WQ	2/25/1992		1.8				500				2700	2863	1350		
69	SWEETWATER CREEK	142	HCEPC_WQ	1/28/1992		2.6				200					877	410		
69	SWEETWATER CREEK	104	HCEPC_WQ	1/28/1992		5.1			6.3	2600	100		7.2	6300	1378	200		
69	SWEETWATER CREEK	104	HCEPC_WQ	12/10/1991		0.5			4.8	1100	70		7.3	2300	907	160		
69	SWEETWATER CREEK	142	HCEPC_WQ	12/10/1991		1				700	90			1600	1066	1110		
69	SWEETWATER CREEK	142	HCEPC_WQ	11/19/1991		1				300				2100	1117	980		
69	SWEETWATER CREEK	104	HCEPC_WQ	11/19/1991		0.7			4.5	1700	90		7.3	3100	943	160		
69	SWEETWATER CREEK	104	HCEPC_WQ	10/22/1991		1.6			2.6	2900	70		7.2	5200	1308	210		
69	SWEETWATER CREEK	142	HCEPC_WQ	10/22/1991		1.6				800	70			2900	1110	760		
69	SWEETWATER CREEK	142	HCEPC_WQ	9/24/1991		1.6				1400	110			2700	1060	520		
69	SWEETWATER CREEK	104	HCEPC_WQ	9/24/1991		1.8			2.9	1000	140		7.2	2500	1530	210		
69	SWEETWATER CREEK	104	HCEPC_WQ	8/27/1991		1.2			3	1300	150		7	1300	1350	120		
69	SWEETWATER CREEK	142	HCEPC_WQ	8/27/1991		1.3				1100				2200	840	90		
69	SWEETWATER CREEK	142	HCEPC_WQ	7/30/1991		0.9				1600	80			1800	770	320		
69	SWEETWATER CREEK	104	HCEPC_WQ	7/30/1991		0.9			3.3	10000	160		7	10000	1210	200		
69	SWEETWATER CREEK	104	HCEPC_WQ	6/25/1991		0.8			2.4	3000	140		7	3500	730	190		
69	SWEETWATER CREEK	142	HCEPC_WQ	6/25/1991		1.4				500	80			900	790	170		
69	SWEETWATER CREEK	142	HCEPC_WQ	5/21/1991		1.9				4900	70				800	400		
69	SWEETWATER CREEK	104	HCEPC_WQ	5/21/1991		1.1			2.3	1900	170		7.1		760	340		
69	SWEETWATER CREEK	104	HCEPC_WQ	4/23/1991		2.1			4.4	3500	80		7.3		840	310		
69	SWEETWATER CREEK	142	HCEPC_WQ	4/23/1991		3				3000	80				790	990		
69	SWEETWATER CREEK	142	HCEPC_WQ	3/26/1991		3.2				800				900	670	590		
69	SWEETWATER CREEK	104	HCEPC_WQ	3/26/1991		2.4				800	110			1400	860	180		
69	SWEETWATER CREEK	104	HCEPC_WQ	2/25/1991		1.9				600	230			600	850	200		
69	SWEETWATER CREEK	104	HCEPC_WQ	1/22/1991		1.4			5.7	2100	180		7.3	2400	800	130		
69	SWEETWATER CREEK	142	HCEPC_WQ	1/22/1991		1.3				700					530	1360		
69	SWEETWATER CREEK	142	HCEPC_WQ	12/18/1990		0.8				200	80			800	820	1460		
69	SWEETWATER CREEK	104	HCEPC_WQ	12/18/1990		2.3			3.9	1100			6.8	3500	930	210		
69	SWEETWATER CREEK	104	HCEPC_WQ	11/27/1990		1.9			5.6	400	170		7.4	1100	710	280		
69	SWEETWATER CREEK	142	HCEPC_WQ	11/27/1990		1.2				200	90			700	560	1580		
69	SWEETWATER CREEK	142	HCEPC_WQ	10/23/1990		2.1				900	110			900	690	850		
69	SWEETWATER CREEK	104	HCEPC_WQ	10/23/1990		1.6			3.9	2300	100		7.1	2800	760	230		
69	SWEETWATER CREEK	104	HCEPC_WQ	9/25/1990		2.2			3.1	1000	180		7.2	1000	900	350		
69	SWEETWATER CREEK	142	HCEPC_WQ	9/25/1990		2.6				300	340			600	720	1120		
69	SWEETWATER CREEK	142	HCEPC_WQ	8/28/1990						400				400	750	420		
69	SWEETWATER CREEK	104	HCEPC_WQ	8/28/1990		0.7			5	10000	120		7.2	10000	830	180		
69	SWEETWATER CREEK	104	HCEPC_WQ	7/31/1990		1.1			5.2	1000	190		7.6	2100	860	80		
69	SWEETWATER CREEK	142	HCEPC_WQ	7/31/1990		1.7				200				700	460	400		
69	SWEETWATER CREEK	142	HCEPC_WQ	6/26/1990		2.8				1100	80			4200	470	1260		
69	SWEETWATER CREEK	104	HCEPC_WQ	6/26/1990		2.2			3.8	500			7.3	1300	860	340		
69	SWEETWATER CREEK	104	HCEPC_WQ	5/29/1990		4.6			5.2	600			7.5	1400	1160	400		
69	SWEETWATER CREEK	142	HCEPC_WQ	5/29/1990		3.2				1000	170			3000	750	1900		
69	SWEETWATER CREEK	142	HCEPC_WQ	4/24/1990		2.6				800	100			1600	960	1780		

69	SWEETWATER CREEK	104	HCEPC_WQ	4/24/1990		2.6				11400	70			11400	1020	90		
69	SWEETWATER CREEK	104	HCEPC_WQ	3/27/1990		2			4	300			7.2	600	910	200		
69	SWEETWATER CREEK	142	HCEPC_WQ	3/27/1990		1.1				500	90			600	620	1280		
69	SWEETWATER CREEK	142	HCEPC_WQ	2/27/1990		0.9				200	70			300	1110	340		
69	SWEETWATER CREEK	104	HCEPC_WQ	2/27/1990		1.4			5.1	900	260		7	1000	970	140		
69	SWEETWATER CREEK	104	HCEPC_WQ	1/30/1990		1.2			3.6	300	590		7.1	400	1860	330		
69	SWEETWATER CREEK	142	HCEPC_WQ	1/30/1990		1.1				100				200	980	900		
69	SWEETWATER CREEK	69	HCEPC_WQ_REPORTS	8/23/1993						3000								
69	SWEETWATER CREEK	69	HCEPC_WQ_REPORTS	4/16/1992						42200				92500				
69	SWEETWATER CREEK	24030149	STORET_21FLTPA	4/10/2001					4.71	75			7.15	900			2	
69	SWEETWATER CREEK	24040112	STORET_21FLTPA	4/10/2001					3.91	1300			7.1	2600			6	
69	SWEETWATER CREEK	24040112	STORET_21FLTPA	3/10/1998					6.97				6.6					
69	SWEETWATER CREEK	332	STREAMWATER_WATCH_WQ	2/27/2005					5.7				7.6					
69	SWEETWATER CREEK	332	STREAMWATER_WATCH_WQ	1/30/2005					5.6				7.5					
69	SWEETWATER CREEK	332	STREAMWATER_WATCH_WQ	4/30/2004					7				7.5					
69	SWEETWATER CREEK	332	STREAMWATER_WATCH_WQ	3/31/2004					6.5				7.4					
69	SWEETWATER CREEK	332	STREAMWATER_WATCH_WQ	3/1/2004					7.5				6.7					
69	SWEETWATER CREEK	321	STREAMWATER_WATCH_WQ	2/16/2004					5.4				7.5					
69	SWEETWATER CREEK	332	STREAMWATER_WATCH_WQ	1/30/2004					8				7					
69	SWEETWATER CREEK	332	STREAMWATER_WATCH_WQ	12/31/2003					7.5				6.8					
69	SWEETWATER CREEK	332	STREAMWATER_WATCH_WQ	11/3/2003					4.2				6.5					
69	SWEETWATER CREEK	321	STREAMWATER_WATCH_WQ	10/28/2003					4.1				7		733.3333333	163		
69	SWEETWATER CREEK	321	STREAMWATER_WATCH_WQ	8/24/2000					3.5				7					
69	SWEETWATER CREEK	321	STREAMWATER_WATCH_WQ	7/11/2000					5.15				7.15		1203.333333	243		
69	SWEETWATER CREEK	321	STREAMWATER_WATCH_WQ	6/19/2000					1.9				7.1					
69	SWEETWATER CREEK	321	STREAMWATER_WATCH_WQ	6/14/2000					12.9				8.45		963.3333333	211.6666667		
69	SWEETWATER CREEK	321	STREAMWATER_WATCH_WQ	5/30/2000					2.9				8					
69	SWEETWATER CREEK	321	STREAMWATER_WATCH_WQ	4/13/2000					7.8				8					
69	SWEETWATER CREEK	321	STREAMWATER_WATCH_WQ	3/24/2000					5.75				7.8		770	136.3333333		
69	SWEETWATER CREEK	321	STREAMWATER_WATCH_WQ	3/14/2000					6.3				7.5					
69	SWEETWATER CREEK	321	STREAMWATER_WATCH_WQ	2/2/2000					8.85				7.5					
69	SWEETWATER CREEK	321	STREAMWATER_WATCH_WQ	11/17/1999					5.1				4.6					
69	SWEETWATER CREEK	324	STREAMWATER_WATCH_WQ	5/1/1999					1				6.8					
69	SWEETWATER CREEK	324	STREAMWATER_WATCH_WQ	3/31/1999					1.6				6.3					
69	SWEETWATER CREEK	324	STREAMWATER_WATCH_WQ	2/26/1999					4.4				6.8					
69	SWEETWATER CREEK	324	STREAMWATER_WATCH_WQ	1/31/1999					4.4				6.8					
69	SWEETWATER CREEK	324	STREAMWATER_WATCH_WQ	12/31/1998					4.4				6.7					
69	SWEETWATER CREEK	02306647	USGS_NWIS	9/28/1997					5.06		80		6.95		990	100		
69	SWEETWATER CREEK	02306647	USGS_NWIS	6/22/1994					4.6		170		7.1		836	90		
69	SWEETWATER CREEK	02306647	USGS_NWIS	5/5/1994					4.1		60		7.05		754	110		
69	SWEETWATER CREEK	02306500	USGS_NWIS	9/3/1991		1.7			5.1		60		7.05		1050	210		
69	SWEETWATER CREEK	02306500	USGS_NWIS	8/6/1991		1.8			5.2		60		6.95		930	200		
69	SWEETWATER CREEK	02306500	USGS_NWIS	5/29/1991		1.2			3.4	170	110		7.25	25000	1250	680		
69	SWEETWATER CREEK	02306500	USGS_NWIS	5/9/1991		1.7			1.6		320		7.25		2900	2900		
69	SWEETWATER CREEK	02306500	USGS_NWIS	4/3/1991					5.6		40		7.25		1670	2400		
69	SWEETWATER CREEK	02306500	USGS_NWIS	8/28/1990		1.5			1.6		170		7.05		1660	670		
69	SWEETWATER CREEK	02306500	USGS_NWIS	6/26/1990		2.4			2.2		200		7.2		3100	1900		
69	SWEETWATER CREEK	02306500	USGS_NWIS	4/4/1990		8.4			4.5		2800		7		6200	3000		
69	SWEETWATER CREEK	02306500	USGS_NWIS	2/20/1990					3.5		2100		7		4400	2000		

Appendix 7-4. Water Quality Sampling Stations and Number of Data Collection Events per Station per Parameter for Lower Sweetwater Creek Watershed

Count of Count		
STATIONID	PARAMETER	Total
02306500	BOD5_mgl	9
	Ca_mgl	9
	Cl_mgl	9
	Color_pcu	9
	Cond_umhocm	17
	DO_MGL	9
	Fcoli_100ml	1
	Flow_cfs	9
	K_mgl	9
	Level_ft	9
	Na_mgl	9
	NH3_ugl	9
	Nox_ugl	9
	PH	17
	SO4_mgl	9
	Tcoli_100ml	1
	TDS_mgl	9
	TempA_F	3
	TempW_F	9
	TKN_ugl	9
	TOC_mgl	9
	TP_ugl	9
02306500 Total		192
02306647	Ca_mgl	2
	Cl_mgl	2
	Cond_umhocm	9
	DO_MGL	7
	Flow_cfs	3
	K_mgl	2
	Level_ft	3
	Mn_ugl	2
	Na_mgl	2
	NH3_ugl	3
	Nox_ugl	3
	OP_mgl	2
	PH	8
	SO4_mgl	2
	TDS_mgl	2
	TempW_F	5
	TKN_ugl	4
	TP_ugl	3
02306647 Total		64
02306652	Cond_umhocm	2
	TempW_F	2
02306652 Total		4
02306654	Al_ugl	1
	As_ugl	2
	Ca_mgl	5
	Cd_ugl	2

02306654	Cl_mgl	5						
	Color_pcu	5						
	Cond_umhocm	12						
	Cr_ugl	2						
	Cu_ugl	2						
	DO_MGL	7						
	Fe_ugl	2						
	Flow_cfs	6						
	Hg_ugl	2						
	K_mgl	5						
	Level_ft	7						
	Na_mgl	5						
	NH3_ugl	7						
	Ni_ugl	2						
	Nox_ugl	7						
	Pb_ugl	2						
	PH	12						
	SO4_mgl	5						
	TDS_mgl	5						
	TempW_F	7						
	TKN_ugl	7						
	TP_ugl	7						
	Zn_ugl	2						
02306654 Total		133						
104	BOD5_mgl	184						
	Chla_ugl	181						
	Chlb_ugl	161						
	Chlc_ugl	182						
	Color_pcu	181						
	Cond_umhocm	180						
	DepthBottom_ft	184						
	DO_MGL	181						
	Ecoccus_100ml	38						
	F_mgl	183						
	Fcoli_100ml	181						
	Fstrep_100ml	144						
	NH3_ugl	181						
	Norg_ugl	170						
	Nox_ugl	182						
	OP_mgl	170						
	PH	180						
	Secchi_ft	184						
	Tcoli_100ml	144						
	TempA_F	183						
	TempW_F	180						
	TKN_ugl	184						
	TN_ugl	170						
	TP_ugl	183						
	Turb_ntu	183						
104 Total		4274						
142	BOD5_mgl	182						
	Chla_ugl	75						
	Chlb_ugl	84						
	Chlc_ugl	84						
	Cl_mgl	4						

142	Color_pcu	180							
	Cond_umhocm	4							
	DepthBottom_ft	183							
	DO_MGL	4							
	Ecoccus_100ml	39							
	F_mgl	182							
	Fcoli_100ml	181							
	Fstrep_100ml	32							
	NH3_ugl	179							
	Norg_ugl	169							
	Nox_ugl	182							
	OP_mgl	169							
	PH	5							
	Secchi_ft	182							
	Tcoli_100ml	143							
	TempA_F	181							
	TempW_F	4							
	TKN_ugl	183							
	TN_ugl	169							
	TP_ugl	181							
	Turb_ntu	182							
142 Total		3163							
162	BOD5_mgl	4							
	Chla_ugl	3							
	Chlb_ugl	1							
	Chlc_ugl	3							
	Cl_mgl	4							
	Color_pcu	4							
	Cond_umhocm	4							
	DepthBottom_ft	4							
	DO_MGL	4							
	Ecoccus_100ml	1							
	F_mgl	4							
	Fcoli_100ml	1							
	NH3_ugl	1							
	Norg_ugl	2							
	Nox_ugl	4							
	OP_mgl	1							
	PH	4							
	Secchi_ft	4							
	SO4_mgl	4							
	TempA_F	4							
	TempW_F	4							
	TKN_ugl	4							
	TN_ugl	2							
	TP_ugl	1							
	Turb_ntu	4							
162 Total		76							
24030149	Alkalinity_mglCaCO3	1							
	Color_pcu	1							
	Cond_umhocm	1							
	DO_MGL	1							
	Fcoli_100ml	1							
	PH	1							
	Secchi_ft	1							

24030149	Tcoli_100ml	1						
	TempW_F	1						
	TSS_MGL	1						
	Turb_ntu	1						
24030149 Total		11						
24040112	Alkalinity_mglCaCO3	1						
	Color_pcu	1						
	Cond_umhocm	2						
	DO_MGL	2						
	Fcoli_100ml	1						
	PH	2						
	Secchi_ft	2						
	Tcoli_100ml	1						
	TempW_F	2						
	TSS_MGL	1						
	Turb_ntu	1						
24040112 Total		16						
321	DO_MGL	12						
	PH	12						
	TempA_F	12						
	TempW_F	12						
	TN_ugl	12						
	TP_ugl	12						
	Turb_ntu	5						
321 Total		77						
324	DO_MGL	5						
	PH	5						
	TempA_F	4						
	TempW_F	4						
324 Total		18						
332	DO_MGL	8						
	PH	8						
	TempA_F	2						
	TempW_F	8						
332 Total		26						
5211	BOD5_mgl	1						
	Cd_ugl	1						
	Chla_ugl	6						
	Chlb_ugl	5						
	Chlc_ugl	5						
	Cl_mgl	1						
	Color_pcu	1						
	Cond_umhocm	1						
	Cr_ugl	1						
	Ecoli_100ml	4						
	Fcoli_100ml	6						
	Fstrep_100ml	1						
	NH3_ugl	2						
	Nox_ugl	3						
	OP_mgl	1						
	Pb_ugl	1						
	PH	1						
	Tcoli_100ml	6						
	TKN_ugl	5						
	TN_ugl	6						

5211	TP_ugl	3						
	Turb_ntu	2						
	Zn_ugl	1						
5211 Total		64						
69	Fcoli_100ml	4						
	Fstrep_100ml	1						
	Tcoli_100ml	3						
69 Total		8						
Egypt Lake	Chla_ugl	4						
	PH	4						
	Secchi_ft	4						
	TN_ugl	4						
	TP_ugl	4						
Egypt Lake Total		20						
Egypt-Hillsborough	Alkalinity_mglCaCO3	2						
	Chla_ugl	80						
	Cl_mgl	2						
	Color_pcu	2						
	Cond_umhocm	2						
	PH	2						
	Secchi_ft	48						
	SO4_mgl	2						
	TN_ugl	117						
	TP_ugl	111						
Egypt-Hillsborough Total		368						
STA-128	Chla_ugl	2						
	Cond_umhocm	2						
	DO_MGL	2						
	Fcoli_100ml	1						
	NO2_UGL	2						
	Secchi_ft	2						
	Tcoli_100ml	1						
	TP_ugl	2						
	TSS_MGL	2						
	Turb_ntu	2						
STA-128 Total		18						
(blank)	(blank)							
(blank) Total								
Grand Total		8532						

CHAPTER 62-302 SURFACE WATER QUALITY STANDARDS

62-302.200 Definitions.

(1) "Acute Toxicity" shall mean the presence of one or more substances or characteristics or components of substances in amounts which:

(a) Are greater than one-third (1/3) of the amount lethal to 50% of the test organisms in 96 hours (96 hr LC_{50}) where the 96 hr LC_{50} is the lowest value which has been determined for a species significant to the indigenous aquatic community; or

(b) May reasonably be expected, based upon evaluation by generally accepted scientific methods, to produce effects equal to those of the concentration of the substance specified in paragraph (a) above.

(2) "Annual Average Flow" is the long-term harmonic mean flow of the receiving water, or an equivalent flow based on generally accepted scientific procedures in waters for which such a mean cannot be calculated. For waters for which flow records have been kept for at least the last three years, "long-term" shall mean the period of record. For all other waters, "long-term" shall mean three years (unless the Department finds the data from that period not representative of present flow conditions, based on evidence of land use or other changes affecting the flow) or the period of records sufficient to show a variation of flow of at least three orders of magnitude, whichever period is less. For nontidal portions of rivers and streams, the harmonic mean (Q_{hm}) shall be calculated as

$$Q_{hm} = \frac{n}{\frac{1}{Q_1} + \frac{1}{Q_2} + \frac{1}{Q_3} + \frac{1}{Q_4} + \ldots + \frac{1}{Q_n}}$$

in which each Q is an individual flow record and n is the total number of records. In lakes and reservoirs, the annual average flow shall be based on the hydraulic residence time, which shall be calculated according to generally accepted scientific procedures, using the harmonic mean flows for the inflow sources. In tidal estuaries and coastal systems or tidal portions of rivers and streams, the annual average flow shall be determined using methods described in EPA publication no. 600/6-85/002b pages 142-227, incorporated by reference in paragraph 62-4.246(9)(k), F.A.C., or by other generally accepted scientific procedures, using the harmonic mean flow for any freshwater inflow. If there are insufficient data to determine the harmonic mean then the harmonic mean shall be estimated by methods as set forth in the EPA publication *Technical Support Document for Water Quality-Based Toxics Control* (March 1991), incorporated by reference in paragraph 62-4.246(9)(d), F.A.C., or other generally accepted scientific procedures. In situations with seasonably variable effluent discharge rates, hold-and-release treatment systems, and effluent-dominated sites, annual average flow shall mean modeling techniques that calculate long-term average daily concentrations from long-term individual daily flows and concentrations in accordance with generally accepted scientific procedures.

(3) "Background" shall mean the condition of waters in the absence of the activity or discharge under consideration, based on the best scientific information available to the Department.

(4) "Chronic Toxicity" shall mean the presence of one or more substances or characteristics or components of substances in amounts which:

(a) Are greater than one-twentieth (1/20) of the amount lethal to 50% of the test organisms in 96 hrs (96 hr LC_{50} where the 96 hr LC_{50} is the lowest value which has been determined for a species significant to the indigenous aquatic community; or

(b) May reasonably be expected, based upon evaluation by generally accepted scientific methods, to produce effects equal to those of the concentration of the substance specified in paragraph (a) above.

(5) "Commission" shall mean the Environmental Regulation Commission.

(6) "Compensation Point for Photosynthetic Activity" shall mean the depth at which one percent of the light intensity at the surface remains unabsorbed. The light intensities at the surface and subsurface shall be measured simultaneously by irradiance meters such as the Kahlsico Underwater Irradiameter, Model No. 268 WA 310 or other devices having a comparable spectral response.

(7) “Department” shall mean the Department of Environmental Protection.

(8) “Designated Use” shall mean the present and future most beneficial use of a body of water as designated by the Environmental Regulation Commission by means of the Classification system contained in this Chapter.

(9) “Dissolved Metal” shall mean the metal fraction that passes through a 0.45 micron filter.

(10) “Effluent Limitation” shall mean any restriction established by the Department on quantities, rates or concentrations of chemical, physical, biological or other constituents which are discharged from sources into waters of the State.

(11) “Exceptional Ecological Significance” shall mean that a water body is a part of an ecosystem of unusual value. The exceptional significance may be in unusual species, productivity, diversity, ecological relationships, ambient water quality, scientific or educational interest, or in other aspects of the ecosystem’s setting or processes.

(12) “Exceptional Recreational Significance” shall mean unusual value as a resource for outdoor recreation activities. Outdoor recreation activities include, but are not limited to, fishing, boating, canoeing, water skiing, swimming, scuba diving, or nature observation. The exceptional significance may be in the intensity of present recreational usage, in an unusual quality of recreational experience, or in the potential for unusual future recreational use or experience.

(13) “Existing Uses” shall mean any actual beneficial use of the water body on or after November 28, 1975.

(14) “Man-induced conditions which cannot be controlled or abated” shall mean conditions that have been influenced by human activities, and

(a) Would remain after removal of all point sources,

(b) Would remain after imposition of best management practices for non-point sources, and

(c) Cannot be restored or abated by physical alteration of the water body, or there is no reasonable relationship between the economic, social and environmental costs and the benefits of restoration or physical alteration.

(15) “Natural Background” shall mean the condition of waters in the absence of man-induced alterations based on the best scientific information available to the Department. The establishment of natural background for an altered waterbody may be based upon a similar unaltered waterbody or on historical pre-alteration data.

(16) “Nuisance Species” shall mean species of flora or fauna whose noxious characteristics or presence in sufficient number, biomass, or areal extent may reasonably be expected to prevent, or unreasonably interfere with, a designated use of those waters.

(17) “Nursery Area of Indigenous Aquatic Life” shall mean any bed of the following aquatic plants, either in monoculture or mixed: *Halodule wrightii*, *Halophila* spp., *Potamogeton* spp. (pondweed), *Ruppia maritima* (widgeon-grass), *Sagittaria* spp. (arrowhead), *Syringodium filiforme* (manatee-grass), *Thalassia testudinum* (turtle grass), or *Vallisneria* spp. (eel-grass), or any area used by the early-life stages, larvae and post-larvae, of aquatic life during the period of rapid growth and development into the juvenile states.

(18) “Outstanding Florida Waters” shall mean waters designated by the Environmental Regulation Commission as worthy of special protection because of their natural attributes.

(19) “Outstanding National Resources Waters” shall mean waters designated by the Environmental Regulation Commission that are of such exceptional recreational or ecological significance that water quality should be maintained and protected under all circumstances, other than temporary lowering and the lowering allowed under Section 316 of the Federal Clean Water Act.

(20) “Pollution” shall mean the presence in the outdoor atmosphere or waters of the state of any substances, contaminants, noise, or man-made or man-induced alteration of the chemical, physical, biological or radiological integrity of air or water in quantities or levels which are or may be potentially harmful or injurious to human health or welfare, animal or plant life, or property, including outdoor recreation.

(21) “Predominantly Fresh Waters” shall mean surface waters in which the chloride concentration at the surface is less than 1,500 milligrams per liter.

(22) “Predominantly Marine Waters” shall mean surface waters in which the chloride concentration at the surface is greater than or equal to 1,500 milligrams per liter.

(23) “Propagation” shall mean reproduction sufficient to maintain the species’ role in its respective ecological community.

(24) “Secretary” shall mean the Secretary of the Department of Environmental Protection.

(25) “Shannon-Weaver Diversity Index” shall mean: negative summation (from i = 1 to s) of $(n_i/N) \log_2 (n_i/N)$ where s is the number of species in a sample, N is the total number of individuals in a sample, and ni is the total number of individuals in species i.

(26) “Special Waters” shall mean water bodies designated in accordance with Rule 62-302.700, F.A.C., by the Environmental Regulation Commission for inclusion in the Special Waters Category of Outstanding Florida Waters, as contained in Rule 62-302.700, F.A.C. A Special Water may include all or part of any water body.

(27) “Surface Water” means water upon the surface of the earth, whether contained in bounds created naturally or artificially or diffused. Water from natural springs shall be classified as surface water when it exits from the spring onto the earth’s surface.

(28) “Total Recoverable Metal” shall mean the concentration of metal in an unfiltered sample following treatment with hot dilute mineral acid.

(29) “Water quality criteria” shall mean elements of State water quality standards, expressed as constituent concentrations, levels, or narrative statements, representing a quality of water that supports the present and future most beneficial uses.

(30) “Water quality standards” shall mean standards composed of designated present and future most beneficial uses (classification of waters), the numerical and narrative criteria applied to the specific water uses or classification, the Florida antidegradation policy, and the moderating provisions contained in this rule and in Chapter 62-4, F.A.C., adopted pursuant to Chapter 403, F.S.

(31) “Waters” shall be as defined in Section 403.031(13), Florida Statutes.

(32) “Zone of Mixing” or “Mixing Zone” shall mean a volume of surface water containing the point or area of discharge and within which an opportunity for the mixture of wastes with receiving surface waters has been afforded.

Specific Authority 403.061, 403.062, 403.087, 403.504, 403.704, 403.804, 403.805 FS. Law Implemented 403.021, 403.031, 403.061, 403.085, 403.086, 403.087, 403.088, 403.502, 403.802 FS. History–New 5-29-90, Amended 2-13-92, Formerly 17-302.200, Amended 1-23-95, 5-15-02.

62-302.300 Findings, Intent, and Antidegradation Policy for Surface Water Quality.

(1) Article II, Section 7 of the Florida Constitution requires abatement of water pollution and conservation and protection of Florida’s natural resources and scenic beauty.

(2) Congress, in Section 101(a)(2) of the Federal Water Pollution Control Act, as amended, declares that achievement by July 1, 1983, of water quality sufficient for the protection and propogation of fish, shellfish, and wildlife, as well as for recreation in and on the water, is an interim goal to be sought whenever attainable. Congress further states in Section 101(a)(3), that it is the national policy that the discharge of toxic pollutants in toxic amounts be prohibited.

(3) The present and future most beneficial uses of all waters of the State have been designated by the Department by means of the classification system set forth in this Chapter pursuant to Section 403.061(10), F.S. Water quality standards are established by the Department to protect these designated uses.

(4) Because activities outside the State sometimes cause pollution of Florida’s waters, the Department will make every reasonable effort to have such pollution abated.

(5) Water quality standards apply equally to and shall be uniformly enforced in both the public and private sector.

(6) Public interest shall not be construed to mean only those activities conducted solely to provide facilities or benefits to the general public. Private activities conducted for private purposes may also be in the public interest.

(7) The Commission, recognizing the complexity of water quality management and the necessity to temper regulatory actions with the technological progress and the social and economic well-being of people, urges, however, that there be no compromise where discharges of pollutants constitute a valid hazard to human health.

(8) The Commission requests that the Secretary seek and use the best environmental information available when making decisions on the effects of chronically and acutely toxic substances and carcinogenic, mutagenic, and teratogenic substances. Additionally, the Secretary is requested to seek and encourage innovative research and developments in waste treatment alternatives that might better preserve environmental quality or at the same time reduce the energy and dollar costs of operation.

(9) The criteria set forth in this Chapter are minimum levels which are necessary to protect the designated uses of a water body. It is the intent of this Commission that permit applicants should not be penalized due to a low detection limit associated with any specific criteria.

(10)(a) The Department’s rules that were adopted on March 1, 1979, regarding water quality standards are designed to protect the public health or welfare and to enhance the quality of waters of the State. They have been established taking into consideration the use and value of waters of the State for public water supplies, propogation of fish and wildlife, recreational purposes, and agricultural, industrial, and other purposes, and also taking into consideration their use and value for navigation.

(b) Under the approach taken in the formulation of the rules adopted in this proceeding:

1. The Department’s rules that were adopted on March 1, 1979, regarding water quality standards are based upon the best scientific knowledge related to the protection of the various designated uses of waters of the State; and

2. The mixing zone, zone of discharge, site specific alternative criteria, exemption, and equitable allocation provisions are designed to provide an opportunity for the future consideration of factors relating to localized situations which could not adequately be addressed in this proceeding, including economic and social consequences, attainability, irretrievable conditions, natural background, and detectability.

(c) This is an even-handed and balanced approach to attainment of water quality objectives. The Commission has specifically recognized that the social, economic and environmental costs may, under certain special circumstances, outweigh the social, economic and environmental benefits if the numerical criteria are enforced statewide. It is for that reason that the Commission has provided for mixing zones, zones of discharge, site specific alternative criteria, exemptions and other provisions in Chapters 62-302, 62-4, and 62-6, F.A.C. Furthermore, the continued availability of the moderating provisions is a vital factor providing a basis for the Commission’s determination that water quality standards applicable to water classes in the rule are attainable taking into consideration environmental, technological, social, economic and institutional factors. The companion provisions of Chapters 62-4 and 62-6, F.A.C., approved simultaneously with these Water Quality Standards are incorporated herein by reference as a substantive part of the State’s comprehensive program for the control, abatement and prevention of water pollution.

(d) Without the moderating provisions described in subparagraph (b)2. above, the Commission would not have adopted the revisions described in (b)1. above nor determined that they are attainable as generally applicable water quality standards.

(11) Section 403.021, Florida Statutes, declares that the public policy of the State is to conserve the waters of the State to protect, maintain, and improve the quality thereof for public water supplies, for the propagation of wildlife, fish and other aquatic life, and for domestic, agricultural, industrial, recreational, and other beneficial uses. It also prohibits the discharge of wastes into Florida waters without treatment necessary to protect those beneficial uses of the waters.

(12) The Department shall assure that there shall be achieved the highest statutory and regulatory requirements for all new and existing point sources, and all cost-effective and reasonable best management practices for nonpoint source control. For the purposes of this rule, highest statutory and regulatory requirements for new and existing point sources are those which can be achieved through imposition of effluent limits required under Sections 301(b) and 306 of the Federal Clean Water Act (as amended in 1987) and Chapter 403, F.S. For the purposes of this rule, cost-effective and reasonable best management practices for nonpoint source control are those nonpoint source controls authorized under Chapters 373 and 403, F.S., and Department rules.

(13) The Department finds that excessive nutrients (total nitrogen and total phosphorus) constitute one of the most severe water quality problems facing the State. It shall be the Department's policy to limit the introduction of man-induced nutrients into waters of the State. Particular consideration shall be given to the protection from further nutrient enrichment of waters which are presently high in nutrient concentrations or sensitive to further nutrient concentrations and sensitive to further nutrient loadings. Also, particular consideration shall be given to the protection from nutrient enrichment of those waters presently containing very low nutrient concentrations: less than 0.3 milligrams per liter total nitrogen or less than 0.04 milligrams per liter total phosphorus.

(14) Existing uses and the level of water quality necessary to protect the existing uses shall be fully maintained and protected. Such uses may be different or more extensive than the designated use.

(15) Pollution which causes or contributes to new violations of water quality standards or to continuation of existing violations is harmful to the waters of this State and shall not be allowed. Waters having water quality below the criteria established for them shall be protected and enhanced. However, the Department shall not strive to abate natural conditions.

(16) If the Department finds that a new or existing discharge will reduce the quality of the receiving waters below the classification established for them or violate any Department rule or standard, it shall refuse to permit the discharge.

(17) If the Department finds that a proposed new discharge or expansion of an existing discharge will not reduce the quality of the receiving waters below the classification established for them, it shall permit the discharge if such degradation is necessary or desirable under federal standards and under circumstances which are clearly in the public interest, and if all other Department requirements are met. Projects permitted under Part IV of Chapter 373, F.S., shall be considered in compliance with this subsection if those projects comply with the requirements of subsection 373.414(1), F.S.; also projects permitted under the grandfather provisions of Sections 373.414(11) through (16), F.S., or permitted under Section 373.4145, F.S., shall be considered in compliance with this subsection if those projects comply with the requirements of subsection 62-312.080(2), F.A.C.

(18)(a) Except as provided in subparagraphs (b) and (c) of this paragraph, an applicant for either a general or generic permit or renewal of an existing permit for which no expansion of the discharge is proposed is not required to show that any degradation from the discharge is necessary or desirable under federal standards and under circumstances which are clearly in the public interest.

(b) If the Department determines that the applicant has caused degradation of water quality over and above that allowed through previous permits issued to the applicant, then the applicant shall demonstrate that this lowering of water quality is necessary or desirable under federal standards and under circumstances which are clearly in the public interest. These circumstances are limited to cases where it has been demonstrated that degradation of water quality is occurring due to the discharge.

(c) If the new or expanded discharge was initially permitted by the Department on or after October 4, 1989, and the Department determines that an antidegradation analysis was not conducted, then the applicant seeking renewal of the existing permit shall demonstrate that degradation from the discharge is necessary or desirable under federal standards and under circumstances which are clearly in the public interest.

Specific Authority 403.061, 403.062, 403.087, 403.088, 403.504, 403.704, 403.804, 403.805 FS. Law Implemented 373.414, 403.021, 403.061, 403.085, 403.086, 403.087, 403.088, 403.101, 403.141, 403.161, 403.182, 403.502, 403.702, 403.708, 403.802 FS. History–Formerly 17-3.041, Amended 1-28-90, Formerly 17-3.042, 17-302.300, Amended 12-19-94, 1-23-95, 12-26-96, 5-15-02.

62-302.400 Classification of Surface Waters, Usage, Reclassification, Classified Waters.

(1) All surface waters of the State have been classified according to designated uses as follows:

CLASS I	Potable Water Supplies
CLASS II	Shellfish Propagation or Harvesting
CLASS III	Recreation, Propagation and Maintenance of a Healthy, Well-Balanced Population of Fish and Wildlife
CLASS IV	Agricultural Water Supplies
CLASS V	Navigation, Utility and Industrial Use

(2) Classification of a water body according to a particular designated use or uses does not preclude use of the water for other purposes.

(3) The specific water quality criteria corresponding to each surface water classification are listed in Rules 62-302.500 and 62-302.530, F.A.C.

(4) Water quality classifications are arranged in order of the degree of protection required, with Class I water having generally the most stringent water quality criteria and Class V the least. However, Class I, II, and III surface waters share water quality criteria established to protect recreation and the propagation and maintenance of a healthy, well-balanced population of fish and wildlife.

(5) Criteria applicable to a classification are designed to maintain the minimum conditions necessary to assure the suitability of water for the designated use of the classification. In addition, applicable criteria are generally adequate to maintain minimum conditions required for the designated uses of less stringently regulated classifications. Therefore, unless clearly inconsistent with the criteria applicable, the designated uses of less stringently regulated classifications shall be deemed to be included within the designated uses of more stringently regulated classifications.

(6) Any person regulated by the Department or having a substantial interest in this chapter may seek reclassification of waters of the State by filing a petition with the Secretary in the form required by Rule 62-103.040, F.A.C.

(7) A petition for reclassification shall reference and be accompanied by the information necessary to support the affirmative finding required in this section to support the proposed reclassification.

(8) All reclassifications of waters of the State shall be adopted, after public notice and public hearing, only upon an affirmative finding by the Environmental Regulation Commission that:

(a) The proposed reclassification will establish the present and future most beneficial use of the waters; and

(b) Such a reclassification is clearly in the public interest.

(9) Reclassification of waters of the State which establishes more stringent criteria than presently established by this chapter shall be adopted, only upon additional affirmative finding by the Environmental Regulation Commission that the proposed designated use is attainable, upon consideration of environmental, technological, social, economic, and institutional factors.

(10) The surface waters of the State of Florida are classified as Class III – Recreation, Propagation and Maintenance of a Healthy, Well-Balanced Population of Fish and Wildlife, except for certain waters which are described in this subsection 62-302.400(12), F.A.C. A water body may be designated as an Outstanding Florida Water or an Outstanding National Resource Water in addition to being classified as Class I, Class II, or Class III. A water body may also have special standards applied to it. Outstanding Florida Waters and Outstanding National Resource Waters are listed in Rule 62-302.700, F.A.C.

(11) Unless otherwise specified, the following shall apply:

(a) The landward extent of a classification shall coincide with the landward extent of waters of the state, as defined in Rule 62-301.400, F.A.C.

(b) Water quality classifications shall be interpreted to include associated water bodies such as tidal creeks, coves, bays and bayous.

(12) Exceptions to Class III:

(a) All secondary and tertiary canals wholly within agricultural areas are classified as Class IV and are not individually listed as exceptions to Class III. "Secondary and tertiary canals" shall mean any wholly artificial canal or ditch which is behind a control structure and which is part of a water control system that is connected to the works (set forth in Section 373.086, F.S.) of a water management district created under Section 373.069, F.S., and that is permitted by such water management district pursuant to Section 373.103, 373.413, or 373.416, F.S. Agricultural areas shall generally include lands actively used solely for the production of food and fiber which are zoned for agricultural use where county zoning is in effect. Agricultural areas exclude lands which are platted and subdivided or in a transition phase to residential use;

(b) The following listed water bodies are classified as Class I, Class II, or Class V:

1. Alachua County – none.

2. Baker County – none.

3. Bay County

Class I

Bayou George and Creek – Impoundment to source.
Bear Creek – Impoundment to source.
Big Cedar Creek – Impoundment to source.
Deer Point Impoundment – Dam to source.
Econfina Creek – Upstream of Deer Point Impoundment.

Class II

East Bay and Tributaries – East of U.S. Highway 98 to, but excluding Wetappo Creek.
North Bay and Tributaries – North of U.S. Highway 98 to Deer Point Dam excluding Alligator Bayou and Fanning Bayous north of an east-west line through Channel Marker 3.
West Bay and Tributaries – West of North Bay (line from West Bay Point on the north to Shell Point on the South) except West Bay Creek (northwest of Channel Marker 27C off Goose Point), Crooked Creek (north of a line from Crooked Creek Point to Doyle Point), and Burnt Mill Creek (north of a line from Graze Point to Cedar Point).

4. Bradford County – none.

5. Brevard County

Class I

St. Johns River and Tributaries – Lake Washington Dam south through and including Sawgrass Lake, Lake Hellen Blazes, to Indian River County Line.

Class II Goat Creek.

Indian River – South from a line due east of Barnes Blvd. (SR 502) to South Section Line of Section 29, T26S, R37E, Palm Shores.

Indian River – From a line from Cape Malabar northeastward through Intracoastal Waterway marker 16, to shore, then southward to S. Brevard County Line.

Indian River – N. Brevard County Line south to Florida East Coast Railroad Crossing (vicinity of Jay Jay).

Kid Creek.

Mosquito Lagoon – North Brevard County Line south to Beach Road.

Trout Creek.

Indian River – The east side of the Intracoastal Waterway from SR 405 northward, to a line from the southern point of land at the mouth of Brock Creek to Intracoastal Waterway Channel Marker 33.

Indian River – From SR 405 south to SR 528.

6. Broward County – none.

7. Calhoun County

Class I

Bear Creek.

Econfina Creek.

8. Charlotte County

Class I

Alligator Creek – North and South Prongs from headwaters to the water control structure downstream of SR 765-A.

Port Charlotte Canal System – Surface waters lying upstream of, or directly connected to, Fordham Waterway upstream of Conway Boulevard.

Prairie Creek – DeSoto County Line and headwaters to Shell Creek.

Shell Creek – Headwaters to Hendrickson Dam (east of Myrtle Slough, in Section 20, T40S, R24E).

Class II

Lemon Bay, Placida Harbor, and Tributaries – N. Charlotte County Line south to Gasparilla Sound and bounded on the east by SR 775.

Charlotte Harbor, Myakka River, and Gasparilla South – Waters except Peace River upstream from the northeastern point of Myakka Cutoff to the boat ramp in Ponce de Leon Park in south Punta Gorda, Catfish Creek north of N. Lat. 26º50'56", and Whidden Creek north of N. Lat. 26º 51'15".

9. Citrus County

Class II Coastal Waters – From the southern side of the Cross Florida Barge Canal southward to the Hernando County line, with the exception of Crystal River (from the southern shore at the mouth of Cedar Creek to Shell Point to the westernmost tip of Fort Island), Salt River (portion generally east and southward along the eastern edge of the islands bordering the Salt River and Dixie Bay to St. Martins River), and St. Martins River from its mouth to Greenleaf Bay.

10. Clay County – none.

11. Collier County

Class II

Cocohatchee River.

Connecting Waterways – From Wiggins Pass south to Outer Doctors Bay.

Dollar Bay.

Inner and Outer Clam Bay.

Inner and Outer Doctors Bay.

Little Hickory Bay.

Tidal Bays and Passes – Naples Bay and south and easterly through Rookery Bay and the Ten Thousand Islands to the Monroe County Line.

Wiggins Pass.

12. Columbia County – none.

13. Dade County – none.

14. DeSoto County

Class I

Horse Creek – From the northern border of Section 14, T38S, R23E, southward to Peace River.

Prairie Creek – Headwaters to Charlotte County Line.

15. Dixie County

Class II

Coastal Waters – From an east-west line through Stuart Point southward to the County line, excluding the mouth of the Suwannee River and its passes.

16. Duval County

Class II

Ft. George River and Simpson Creeks – Ft. George Inlet north to Nassau Sound.
Intracoastal Waterway and Tributaries – Confluence of Nassau and Amelia Rivers south to Flashing Marker 73 thence eastward along Ft. George River to Ft. George Inlet and includes Garden Creek.
Nassau River and Creek – From the mouth of Nassau Sound, (a line connecting the northeasternmost point of Little Talbot Island to the southeasternmost tip of Amelia Island westerly to a north-south line through Seymore Point.
Pumpkinhill Creek.

17. Escambia County

Class II

Escambia Bay – Louisville and Nashville Railroad Trestle south to Pensacola Bay (Line from Emanuel Point east northeasterly to Garcon Point).
Pensacola Bay – East of a line connecting Emanuel Point on the north to the south end of the Pensacola Bay Bridge (U.S. Highway 98).
Santa Rosa Sound – East of a line connecting Gulf Breeze approach to Pensacola Beach (Bascule Bridge), and Sharp Point with exception of the Navarre Beach area from a north-south line through Channel Marker 106 to Navarre Bridge.

18. Flagler County

Class II

Matanzas River (Intracoastal Waterway) – N. Flagler County Line south to an east-west line through Fl. Marker 109.
Pellicer Creek.

19. Franklin County

Class II

Alligator Harbor – East from a line from Peninsula Point north to St. James Island to mean high water.
Apalachicola Bay – with exception of an area encompassed within a 2-mile radius from Apalachicola entrance of John Gorrie Memorial Bridge.
East Bay and Tributaries – with the exception of area encompassed within 2-mile radius from Apalachicola entrance of John Gorrie Memorial Bridge.
Gulf of Mexico – North of a line from Peninsula Point on Alligator Point to the southeastern tip of Dog Island and bounded on the east by Alligator Harbor and west by St. George Sound.
Ochlockonee Bay – From the confluence of Sopchoppy and Ochlockonee Rivers eastward to a line through the two flashing beacons marking the end of the main channel and south channel, to the shoreline south of Bald Point north to the county line.
St. George Sound – Gulf of Mexico westerly to Apalachicola Bay.
St. Vincent Sound – Apalachicola Bay to Indian Pass.

20. Gadsden County

Class I

Holman Branch – SR 270-A to source.
Mosquito Creek – U.S. Highway 90 north to Florida State Line.
Quincy Creek – SR 65 to source.

21. Gilchrist County – none.

22. Glades County

Class I

Lake Okeechobee.

23. Gulf County

Class II

Indian Lagoon – West of Indian Pass and St. Vincent Sound.
St. Joseph Bay – South of a line from St. Joseph Point due east, excluding an area that is both within an arc 2.9 miles from the center of the mouth of Gulf County Canal and east of a line from St. Joseph Point to the northwest corner of section 13, T8S, R11W.

24. Hamilton County – none.

25. Hardee County – none.

26. Hendry County

Class I

Lake Okeechobee.

27. Hernando County – none.

28. Highlands County – none.

29. Hillsborough County

Class I

Cow House Creek – Hillsborough River to source.
Hillsborough River – City of Tampa Water Treatment Plant Dam to Flint Creek.

Class II

Old Tampa Bay – Waters within Hillsborough County between SR 60 (Courtney Campbell Parkway), and Interstate 275 (Howard Frankland Bridge), to the line of mean high water.

Old Tampa Bay and Mobbly Bay – Beginning at the intersection of the north shore of SR 60 (Courtney Campbell Parkway) and Longitude 82º35'45" west, thence due north to the line of mean high water, thence westward along the line of mean high water, (except Rocky and Double Branch Creeks which are included only to SR 580), and up Channel A to a line connecting the lines of mean high water on the outer sides of the canal banks, to the county line, thence southerly along the county line to SR 60, thence along the north shore of SR 60 to the point of beginning.

Tampa Bay – Beginning at Gadsden Point, thence along a line connecting Gadsden Point and the intersection of Gadsden Point Cut and Cut "A" to a point one-half nautical mile inside said intersection, thence westward along a line one-half nautical mile inside and parallel to Gadsden Point Cut, Cut "G", Cut "J", Cut "J2", and Cut "K", to the line of mean high water, thence along the line of mean high water to the point of beginning.

Tampa Bay – Beginning at the intersection of the Hillsborough County Line and the line of mean high water, thence to the rear range marker of Cut "D", thence northerly along the line of Cut "D" range to a point one-half nautical mile inside the southern boundary of Cut "C", thence along a line one-half mile inside and parallel to Cut "C", Cut "D", and Cut "E" to a point with Latitude 27º45'40" north and Longitude 82º30'40" west, thence to a point Latitude 27º47' north and Longitude 82º27' west, thence on a true bearing of 140º to the line of mean high water, thence along the line of mean high water southward to the western tip of Mangrove Point, thence to the northwestern tip of Tropical Island, thence eastward along the line of mean high water to the eastern tip of Goat Island, thence due south to the line of mean high water, thence generally southward along the line of mean high water to the point of beginning.

Tampa Bay – Hillsborough County portion west of the Sunshine Skyway (excluding Tampa Harbor Channel) up to the line of mean high water.

30. Holmes County – none.

31. Indian River County

Class I

St. Johns River and Tributaries – Brevard County Line south through and including Blue Cypress Lake to SR 60.

Class II Indian River – Indian River County Line south to SR 510 east of the Intracoastal Waterway channel centerline.

Indian River – SR 510 south to an east-west line from the north side of the North Relief Canal.

Indian River – From an east-west line through the northernmost point of Round Island south to county line and east of Intracoastal Waterway centerline.

32. Jackson County

Class I

Econfina Creek – Bay County to source.

33. Jefferson County

Class II

Coastal Waters – Within the county, excluding the mouth of Aucilla River.

34. Lafayette County – none.

35. Lake County – none.

36. Lee County

Class I

Caloosahatchee River – E. Lee County Line to South Florida Water Management District Structure 79.

Class II

Charlotte Harbor.

Matanzas Pass, Hurricane Bay, and Hell Peckish (Peckney) Bay – From San Carlos Bay to a line from Estero Island through the southernmost tip of the unnamed island south of Julies Island, northeastward to the southernmost point of land in section 27, T46S, R24E.

Matlacha Pass – Charlotte Harbor to San Carlos Bay.

Pine Island Sound – Charlotte Harbor to San Carlos Bay.

San Carlos Bay – From a line from point Ybel to Bodwitch Point northward to a line from the eastern point at the mouth of Punta Blanca Creek, southeast through the southern point of Big Shell Island to the mainland and westward to Pine Island Sound.

37. Leon County – none.

38. Levy County

Class II

Coastal Waters and Tidal Creeks – Within the county excluding:

a. The mouth of the Suwannee River, and its passes;

b. Alligator Pass to a line connecting the seawardmost points of the islands connecting Alligator Pass with the Gulf;

c. Cedar Key area – from SR 24 bridge at the northernmost point of Rye Key, southwestward to the northernmost point of Gomez Key, then southward to the westernmost point of Seahorse Key, then along the southern shoreline of Seahorse Key to its easternmost point, then northeastward to the southernmost point of Atsena Otie Key, then northward along the eastern shoreline of Atsena Otie Key to its northeasternmost point, then northward to the southernmost point of Dog Island, northwestward to the westernmost point of Scale Key, northwestward to the boundary marker piling, then northward to the point of beginning;

d. The mouth of the Withlacoochee River.

39. Liberty County – none.

40. Madison County – none.

41. Manatee County

Class I

Manatee River – From Rye Bridge Road to the sources thereof, including but not limited to the following tributaries: the East Fork of the Manatee River, the North Fork of the Manatee River, Boggy Creek, Gilley Creek, Poley Branch, Corbit Branch, Little Deep Branch, Fisher Branch, Ft. Crawford Creek, Webb Branch, Clearwater Branch, Craig Branch, and Guthrey Branch.

Lake Evers (Ward Lake) and Braden River – City of Bradenton Water Treatment Dam to SR 675, excluding upland cut irrigation or drainage ditches and including the following tributaries:

Tributary	Upstream Limit(s)
a. Rattlesnake Slough	Lockwood Ridge Road in Section 28, Township 35 South, Range 18 East.
b. Cedar Creek	
West Branch	Whitfield Avenue in Section 27, Township 35 South, Range 18 East.
Central Branch	Country Club Way in Section 34, Township 35 South, Range 18 East.
East Branch	To a point where an east-west line lying 1200 feet south of the section line between Sections 23 and 26 (Township 35 South, Range 18 East) crosses the tributary.
c. Cooper Creek	
West Branch (Foley Branch)	South Boundary of Section 1, Township 36 South, Range 18 East.
East Branch	East Boundary of Section 31, Township 35 South, Range 19 East.
d. Nonsense Creek	To a point where an east-west line lying 800 feet North of the section line between Sections 14 and 23 (Township 35 South, Range 18 East) crosses the creek.
e. Hickory Hamock	To a point where an east-west line lying 1000 feet South of the section line between Sections 17 and 20 (Township 35 South, Range 19 East) crosses the creek.
f. Wolf Slough	East Boundary of Section 16, Township 35 South, Range 19 East.
g. Unnamed Tributary 1	To a point where an east-west line lying 2300 feet south of the section line between Sections 21 and 28 (Township 35 South, Range 19 East) crosses the tributary.
h. Unnamed Tributary 2	East Boundary of Section 14, Township 35 South, Range 19 East.
i. Unnamed Tributary 3	West Boundary of Section 25, Township 35 South, Range 19 East.
j. Unnamed Tributary 4	To a point where a north-south line lying 200 feet East of the section line between Sections 23 and 24 (Township 35 South, Range 19 East) crosses the tributary.

Class II

Gulf and Coastal Waters of Tampa Bay – (Including, but not limited to Terra Ceia Bay, Perico Bayou, Palma Sola Bay, and Sarasota Bay), excluding waters northward of a line from the southern shore of the mouth of Little Redfish Creek northwesterly through the red marker (approximately one nautical mile away) to the county line; Manatee River upstream of a line from Emerson Pt. to Mead Pt.

Gulf Waters – North of 27º31' N. Lat.

42. Marion County – none.
43. Martin County

Class I

Lake Okeechobee.

Class II

Great Pocket – St. Lucie River to Peck's Lake.
Indian River – N. Martin County Line south to the mouth of St. Lucie Inlet, east of the Intracoastal Waterway Channel centerline.
Loxahatchee River – West of the Florida East Coast Railroad Bridge including Southwest, Northwest, and North Forks.

44. Monroe County

Class II

Monroe County Coastline – From Collier and Dade County Lines southward to and including that part of Florida Bay within Everglades National Park.

45. Nassau County

Class II

Alligator Creek.
Nassau River and Creek – From the mouth of Nassau Sound (a line connecting the northeasternmost point of Little Talbot Island to the southeasternmost point of Amelia Island) westerly to Seymore Point.
South Amelia River – Nassau River north to a line from the northern shore of the mouth of Alligator Creek to the northernmost shore of Harrison Creek.
Waters between South Amelia River and Alligator Creek.

46. Okaloosa County

Class II

Choctahatchee Bay and Tributaries – From a line from White Point southwesterly through Fl. Light Marker 2 of the Intracoastal Waterway, eastward to the county line, including East Pass.
Rocky Bayou – Choctahatchee Bay (from a line extending due east from Shirk Point) to Rocky Creek.
Santa Rosa Sound – From a north-south line through Manatee Point west to the Santa Rose County Line.

47. Okeechobee County

Class I

Lake Okeechobee.

48. Orange County – none.
49. Osceola County – none.
50. Palm Beach County

Class I

Canal C-18 (freshwater portion).
City of West Palm Beach Water Catchment Area.
Clear Lake, Lake Mangonia, and the waterway connecting them.
Lake Okeechobee.
M-Canal – L-8 to Lake Mangonia.

Class II

Canal C-18 – Salinity barrier to Loxahatchee River.
Loxahatchee River – Upstream of Florida East Coast railroad bridge including Southwest, Northwest, and North Forks.

51. Pasco County – none.
52. Pinellas County

Class II

Old Tampa Bay, Mobbly Bay and Tampa Bay – South and westward to Sunshine Skyway (SR 55), except Safety Harbor north of an east-west line through Phillipi Point.
Tampa Bay and Gulf waters – West of Sunshine Skyway (SR 55), excluding waters north of SR 682 and waters that are both west of Pinellas Bayway and north of an east-west line through the southernmost point of Pine Key.

53. Polk County – none.
54. Putnam County – none.
55. St. Johns County

Class II

Guano River and Tributaries – From Guano Lake Dam south to Tolomato River.
Matanzas River, Intracoastal Waterway and Tributaries, excluding Treasure Beach Canal System – From Intracoastal Waterway Marker number 29, south to Flagler County Line.
Pellicer Creek.
Salt Run – Waters south of an east-west line connecting Lighthouse Park boat ramp with Conch Island.
Tolomato River (North River) and Tributaries – From a line connecting Spanish Landing to Booth Landing, south to an east-west line through Intracoastal Waterway Marker number 55.

56. St. Lucie County

Class II

Indian River – From Middle Point south to S. St. Lucie County Line, east of Intracoastal Waterway Channel centerline.
Indian River – N. St. Lucie County Line south to an east-west line through the southern point of Fishhouse Cove.

57. Santa Rosa County

Class II

Blackwater Bay – From a line connecting Robinson's Point to Broad River south to East Bay (line due west from Escribano Point).
East Bay and Tributaries – Blackwater Bay (line due west from Escribano Point) southerly to Pensacola Bay (line from Garcon Point on the north to Redfish Point on the south).
Escambia Bay – Louisville and Nashville Railroad Trestle south to Pensacola Bay (Line from Emanuel Point east northeasterly to Garcon Point).
Pensacola Bay – East of a line connecting Emanuel Point on the north to the south end of the Pensacola Bay Bridge (U.S. Highway 98).
Santa Rosa Sound – From a line connecting Gulf Breeze approach to Pensacola Beach, (Bascule Bridge), and Sharp Point, east to Santa Rosa/Okaloosa County line with exception of the Navarre Beach area from a north-south line through Channel Marker 106 eastward to Navarre Beach Toll Road.

58. Sarasota County

Class I

Big Slough Canal – South to U.S. 41.
Cooper Creek (Foley Branch) upstream to the South boundary of Section 1, Township 36 South, Range 18 East.
Myakka River – From the Manatee County line southwesterly through Upper and Lower Myakka Lakes to Manhattan Farms (north line of Section 6 T39S, R20E).

Class II

Lemon Bay – From a line eastward from the northern shore of the mouth of Forked Creek south to Charlotte County Line.
Myakka River – From the western line of section 35, T39S, R20E south to Charlotte County Line.
Sarasota Bay – West of the Intracoastal Waterway Channel centerline.

59. Seminole County – none.
60. Sumter County – none.
61. Suwannee County – none.
62. Taylor County

Class V

Fenholloway River. Repealed effective December 31, 1997.

63. Union County – none.
64. Volusia County

Class II

Indian River North, Indian River Lagoon, and Mosquito Lagoon from an east-west line through Intracoastal Waterway Channel Marker 57 south to S. Volusia County Line.
Indian River – North of County Line.

65. Wakulla County

Class II

Coastal Waters and Tributaries – From Jefferson County Line westward with the exception of Spring Creek and the portion of King Bay (Dickerson Bay) west and north of a line from the westernmost tip of Porter Island south to Hungry Point, and Walker Creek north of a line from Live Oak Point southwest across the Creek to the closest tip of Shell Point.

66. Walton County

Class II

Choctawhatchee Bay and Tributaries – Except waters north of a line from Alaqua Point to Wheeler Point.

67. Washington County

Class I

Econfina Creek.

Specific Authority 403.061, 403.062, 403.087, 403.088, 403.504, 403.704, 403.804 FS. Law Implemented 403.021, 403.061, 403.087, 403.088, 403.141, 403.161, 403.182, 403.502, 403.504, 403.702, 403.708 FS. History–Formerly 28-5.06, 17-3.06, Amended and Renumbered 3-1-79, Amended 1-1-83, 2-1-83, Formerly 17-3.081, Amended 4-25-93, Formerly 17-302.400, Amended 12-26-96, 8-24-00.

62-302.500 Surface Waters: Minimum Criteria, General Criteria.

(1) Minimum Criteria. All surface waters of the State shall at all places and at all times be free from:

(a) Domestic, industrial, agricultural, or other man-induced non-thermal components of discharges which, alone or in combination with other substances or in combination with other components of discharges (whether thermal or non-thermal):

1. Settle to form putrescent deposits or otherwise create a nuisance; or

2. Float as debris, scum, oil, or other matter in such amounts as to form nuisances; or

3. Produce color, odor, taste, turbidity, or other conditions in such degree as to create a nuisance; or

4. Are acutely toxic; or

5. Are present in concentrations which are carcinogenic, mutagenic, or teratogenic to human beings or to significant, locally occurring, wildlife or aquatic species, unless specific standards are established for such components in subsection 62-302.500(2) or Rule 62-302.530, F.A.C.; or

6. Pose a serious danger to the public health, safety, or welfare.

(b) Thermal components of discharges which, alone, or in combination with other discharges or components of discharges (whether thermal or non-thermal):

1. Produce conditions so as to create a nuisance; or

2. Do not comply with applicable provisions of subsection 62-302.500(3), F.A.C.

(c) Silver in concentrations above 2.3 micrograms/liter in predominently marine waters.

(2) General Criteria.

(a) The criteria of surface water quality provided in subsection 62-302.500(2) and Rule 62-302.530, F.A.C., shall apply to all surface waters outside zones of mixing except:

1. Where inconsistent with the limitations of Section 403.061(7), F.S.; or

2. Where relief from such criteria has been granted pursuant to other applicable rules of the Department.

(b) The Department may establish a Technical Advisory Committee on request or on its own initiative, to review and advise the Department about the sufficiency and validity of data or methodologies and the need for revision of numerical surface water quality criteria established in this rule chapter. The committee shall be appointed by the Secretary and consist of professionals knowledgeable about the specific criteria to be reviewed. The committee shall be chaired by a representative of the Department and shall meet at the call of the chair. Any findings, conclusions, or recommendations of the commmittee shall be conveyed to the Secretary and to the chair of the Commission but shall not bind the Department.

(c) Effluent limits may be established for pollutants for which analytical detection limits are higher than the established water quality criteria based upon computation of concentrations in the receiving waters. Effluent limits will be established on site-specific conditions in the context of a Department permit. Monitoring reports and permit applications shall specify the detection limits and indicate non-detectable results in such cases. Unless otherwise specified, such non-detectable results shall be accepted as demonstrating compliance for that pollutant as long as specified effluent limits are met.

(d) Criteria for metals in Rule 62-302.530 and paragraph 62-302.500(1)(c), F.A.C., are measured as total recoverable metal. However, cadmium, chromium, copper, lead, nickel, silver, and zinc may be applied as dissolved metals when, as part of a permit application, a dissolved metals translator has been established according to the procedures described in the document, “Guidance for Establishing a Metals Translator”, Florida Department of Environmental Protection, December 17, 2001.

(e) A violation of any surface water quality criterion as set forth in this chaper constitutes pollution. For certain pollutants, numeric criteria have been established to protect human health from an unacceptable risk of additional cancer caused by the consumption of water or aquatic organisms. These numeric criteria are based on annual average flow conditions. However, this allowable annual average does not relieve any activity from complying with subsection 62-302.500(1), Rule 62-302.530, F.A.C., or any other provision of water quality standards.

(f) Notwithstanding the specific numerical criteria applicable to individual classes of water, dissolved oxygen levels that are attributable to natural background conditions or man-induced conditions which cannot be controlled or abated may be established as alternative dissolved oxygen criteria for a water body or portion of a water body. Alternative dissolved oxygen criteria may be established by the Secretary or a Director of District Management in conjunction with the issuance of a permit or other Department action only after public notice and opportunity for public hearing. The determination of alternative criteria shall be based on consideration of the factors described in subparagraphs 62-302.800(1)(a)1.-4., F.A.C. Alternative criteria shall not result in a lowering of dissolved oxygen levels in the water body, water body segment or any adjacent waters, and shall not violate the minimum criteria specified in subsection 62-302.500(1), F.A.C. Daily and seasonal fluctuations in dissolved oxygen levels shall be maintained.

Specific Authority 403.061, 403.062, 403.087, 403.504, 403.704, 403.804 FS. Law Implemented 403.021, 403.061, 403.087, 403.088, 403.141, 403.161, 403.182, 403.502, 403.702, 403.708 FS. History–Formerly 28-5.02, 17-3.02, Amended 10-28-78, Amended and Renumbered 3-1-79, Amended 1-1-83, 10-4-89, Formerly 17-3.051, Amended 4-25-93, Formerly 17-302.500, Amended 1-15-96, 12-26-96, 5-15-02.

62-302.520 Thermal Surface Water Criteria.

All discharges or proposed discharges of heated water into receiving bodies of water (RBW) which are controlled by the State shall be subjected to a thorough study to assess the consequences of the discharge upon the environment. The State shall be divided into two general climatological zones: Peninsular Florida, which varies from tropical in nature to temperate but is modified by the peninsular configuration and is the area south of latitude 30º N (excluding Gulf and Franklin Counties): and Northern Florida which is temperate and continental and is the area above latitude 30º N plus the portions of Gulf and Franklin Counties which lie below 30º N.

(1) Heated water discharges existing on July 1, 1972:

(a) Shall not increase the temperature of the RBW so as to cause substantial damage or harm to the aquatic life or vegetation therein or interfere with beneficial uses assigned to the RBW,

(b) Shall be monitored by the discharger to ensure compliance with this rule, and

(c) If the Department, pursuant to notice and opportunity for hearing, finds by a preponderance of the evidence that a discharge has caused substantial damage, it may require conversion of such discharge to offstream cooling or approved alternate methods. In making determinations regarding such conversions, the Department may consider:

1. The nature and extent of the existing damage;

2. The projected lifetime of the existing discharge;

3. Any adverse economic and environmental (including non-water quality) impacts which would result from such conversion; and

4. Such other factors as may be appropriate.

(2) Heated water sources proposed for future discharges into RBW controlled by the State shall not increase the water temperature by more than the monthly temperature limits prescribed for the particular type and location of the RBW. New sources shall include all expansions, modifications, alterations, replacements, or repairs which result in an increased output of ten percent (10%) or more of the level of energy production which existed on the date this rule became effective. Water temperatures shall be measured by procedures approved by the Florida Department of Environmental Protection (DEP). In all cases where a temperature rise above ambient is allowed and a maximum RBW temperature is also prescribed, the lower of the two limitations shall be the control temperature.

(3) Definitions.

(a) Ambient (natural) temperature of a RBW shall mean the existing temperature of the receiving water at a location which is unaffected by man-made thermal discharges and a location which is also of a depth and exposure to winds and currents which typify the most environmentally stable portions of the RBW.

(b) Coastal waters shall be all waters in the State which are not classified as fresh waters or as open waters.

(c) A cooling pond is a body of water enclosed by natural or constructed restraints which has been approved by the Florida DEP for purposes of controlling heat dissipation from thermal discharges.

(d) An existing heat source is any thermal discharge (a) which is presently taking place, or (b) which is under construction or for which a construction or operation permit has been issued prior to the effective date of this rule.

(e) Fresh waters shall be all waters of the State which are contained in lakes and ponds, or are in flowing streams above the zone in which tidal actions influence the salinity of the water and where the concentration of chloride ions is normally less than 1500 milligrams per liter.

(f) Open water shall be all waters in the State extending seaward from the most seaward 18-foot depth contour line (three-fathom bottom depth contour) which is offshore from any island; exposed or submerged bar or reef; or mouth of any embayment or estuary which is narrowed by headlands. Contour lines shall be determined from Coast and Geodetic Survey Charts.

(g) The point of discharge (POD) for a heated water discharge shall be primarily that point at which the effluent physically leaves its carrying conduit (open or closed), and discharges into the waters of the state, or, in the event it is not practicable to measure temperature at the end of the discharge conduit, a specific point designated by the Florida DEP for that particular thermal discharge.

(h) Heated water discharges are the effluents from commercial or industrial activities or processes in which water is used for the purpose of transporting waste heat, and which constitute heat sources of one million British Thermal Units per hour (1,000,000 BTU/HR.), or greater.

(i) Blowdown shall mean the minimum discharge of recirculating cooling water for the purpose of discharging materials contained in the water, the further buildup of which could cause concentrations in amounts exceeding limits established by best engineering practice.

(j) Recirculating cooling water shall mean water which is used for the purpose of removing waste heat and then passed through a cooling system for the purpose of removing such heat from the water and then, except for blowdown, is used again to remove waste heat.

(4) Monthly and Maximum Temperature Limits.

(a) Fresh Waters – Heated water with a temperature at the POD more than 5º F higher than the ambient (natural) temperature of any stream shall not be discharged into such stream. At all times under all conditions of stream flow the discharge temperature shall be controlled so that at least two-thirds (2/3) of the width of the stream's surface remains at ambient (natural) temperature. Further, no more than one-fourth (1/4) of the cross-section of the stream at a traverse perpendicular to the flow shall be heated by the discharge. Heated water with a temperature at the POD more than 3º F higher than the ambient (natural) temperature of any lake or reservoir shall not be discharged into such lake or reservoir. Further, no heated water with a temperature above 90º F shall be discharged into any fresh waters in Northern Florida regardless of the ambient temperature of the RBW. In Peninsular Florida, heated waters above 92º F shall not be discharged into fresh waters.

(b) Coastal Waters – Heated water with a temperature at the POD more than 2º F higher than the ambient (natural) temperature of the RBW shall not be discharged into coastal waters in any zone during the months of June, July, August, and September. During the remainder of the year, heated water with a temperature at the POD more than 4º F higher than the ambient (natural) temperature of the RBW shall not be discharged into coastal waters in any zone. In addition, during June, July, August, and September, no heated water with a temperature above 92º F shall be discharged into coastal waters. Further, no heated water with a temperature above 90º F shall be discharged into coastal waters during the period October thru May.

(c) Open Waters – Heated water with a temperature at the POD up to 17º F above ambient (natural) temperature of the RBW may be discharged from an open or closed conduit into open waters under the following restraints: The surface temperature of the RBW shall not be raised to more than 97º F and the POD must be sufficient distance offshore to ensure that the adjacent coastal waters are not heated beyond the temperatures permitted in such waters.

(d) Cooling Ponds – The temperature for heated water discharged from a cooling pond shall be measured at the POD from the pond, and the temperature limitation shall be that specified for the RBW.

(5) General.

(a) Daily and seasonal temperature variations that were normal to the RBW before the addition of heat from other than natural causes shall be maintained.

(b) Recapitulation of temperature limitations prescribed above:

			COASTAL		
ZONE	STREAMS	LAKES	SUMMER	REMAINDER	OPEN
NORTH.	90º F Max.	90º F Max.	92º F Max.	90º F Max.	97º F Max.
	AM + 5º F	AM + 3º F	AM + 2º F	AM + 4º F	AM + 17º F
PENIN.	92º F Max.	92º F Max.	92º F Max.	90º F Max.	97º F Max.
	AM + 5º F	AM + 3º F	AM + 2º F	AM + 4º F	AM + 17º F

(6) Upon application on a case-by-case basis, the Department may establish a zone of mixing beyond the POD to afford a reasonable opportunity for dilution and mixture of heated water discharges with the RBW, in the following manner:

(a) Zones of mixing for thermal discharges from non-recirculated cooling water systems and process water systems of new sources shall be allowed if supported by a demonstration, as provided in Section 316(a), Public Law 92-500 and regulations promulgated thereunder, including 40 C.F.R. Part 122, by an applicant that the proposed mixing zone will assure the protection and propagation of a balanced, indigenous population of shellfish, fish and wildlife in and on the body of water into which the discharge is to be made and such demonstration has not been rebutted. It is the intent of the Commission that to the extent practicable, proceedings under this provision should be conducted jointly with proceedings before the federal government under Section 316(a), Public Law 92-500.

(b) Zones of mixing for blowdown discharges from recirculated cooling water systems, and for discharges from non-recirculated cooling water systems of existing sources, shall be established on the basis of the physical and biological characteristics of the RBW.

(c) When a zone of mixing is established pursuant to this subsection 62-302.520(6), F.A.C., any otherwise applicable temperature limitations contained in Rule 62-302.520, F.A.C., shall be met at its boundary; however, the Department may also establish maximum numerical temperature limits to be measured at the POD and to be used in lieu of the general temperature limits in Rule 62-302.520, F.A.C., to determine compliance by the discharge with the established mixing zone and the temperature limits in Rule 62-302.520, F.A.C.

Specific Authority 403.061, 403.062, 403.087, 403.504, 403.704, 403.804 FS. Law Implemented 403.021, 403.061, 403.087, 403.088, 403.141, 403.161, 403.182, 403.502, 403.702, 403.708 FS. History–Formerly 28-5.02, 17-3.02, Amended 10-28-70, Amended and Renumbered 3-1-79, Formerly 17-3.05, 17-3.050, 17-302.520.

62-302.530 Table: Surface Water Quality Criteria.

The following table contains both numeric and narrative surface water quality criteria to be applied except within zones of mixing. The left-hand column of the Table is a list of constituents for which a surface water criterion exists. The headings for the water quality classifications are found at the top of the Table. Applicable criteria lie within the Table. The individual criteria should be read in conjunction with other provisions in water quality standards, including Rule 62-302.500, F.A.C. The criteria contained in Rule 62-302.500, F.A.C., also apply to all waters unless alternative or more stringent criteria are specified in Rule 62-302.530, F.A.C. Unless otherwise stated, all criteria express the maximum not to be exceeded at any time. In some cases, there are separate or additional limits, which apply independently of the maximum not to be exceeded at any time. For example, annual average (denoted as “annual avg.” in the Table) means the maximum concentration at average annual flow conditions (see subsection 62-302.200(2), F.A.C.).

62-302.530, Criteria for Surface Water Quality Classifications

Parameter	Units	Class I: Potable Water Supply	Class II: Shellfish Propagation or Harvesting	Class III: Recreation, Propagation and Maintenance of a Healthy, Well-Balanced Population of Fish and Wildlife		Class IV: Agricultural Water Supplies	Class V: Navigation, Utility, and Industrial Use
				Predominantly Fresh Waters	Predominantly Marine Waters		
(1) Alkalinity	Milligrams/L as $CaCO_3$	Shall not be depressed below 20		Shall not be depressed below 20		≤ 600	
(2) Aluminum	Milligrams/L		≤ 1.5		≤ 1.5		
(3) Ammonia (un-ionized)	Milligrams/L as NH_3	≤ 0.02		≤ 0.02			
(4) Antimony	Micrograms/L	≤ 14.0	≤ 4,300	≤ 4,300	≤ 4,300		
(5) (a) Arsenic (total)	Micrograms/L	≤ 50	≤ 50	≤ 50	≤ 50	≤ 50	≤ 50
(5) (b) Arsenic (trivalent)	Micrograms/L measured as total recoverable Arsenic		≤ 36		≤ 36		

Notes: (1) "ln H" means the natural logarithm of total hardness expressed as milligrams/L of $CaCO_3$. For metals criteria involving equations with hardness, the hardness shall be set at 25 mg/L if actual hardness is < 25 mg/L and set at 400 mg/L if actual hardness is > 400 mg/L. (2) This criterion is protective of human health not of aquatic life. (3) For application of dissolved metals criteria see 62-302.500(2)(d), F.A.C.

Parameter	Units	Class I	Class II	Class III: Fresh	Class III: Marine	Class IV	Class V
(6) Bacteriological Quality (Fecal Coliform Bacteria)	Number per 100 ml (Most Probable Number (MPN) or Membrane Filter (MF))	MPN or MF counts shall not exceed a monthly average of 200, nor exceed 400 in 10% of the samples, nor exceed 800 on any one day. Monthly averages shall be expressed as geometric means based on a minimum of 5 samples taken over a 30 day period.	MPN shall not exceed a median value of 14 with not more than 10% of the samples exceeding 43, nor exceed 800 on any one day.	MPN or MF counts shall not exceed a monthly average of 200, nor exceed 400 in 10% of the samples, nor exceed 800 on any one day. Monthly averages shall be expressed as geometric means based on a minimum of 10 samples taken over a 30 day period.	MPN or MF counts shall not exceed a monthly average of 200, nor exceed 400 in 10% of the samples, nor exceed 800 on any one day. Monthly averages shall be expressed as geometric means based on a minimum of 10 samples taken over a 30 day period.		
(7) Bacteriological Quality (Total Coliform Bacteria)	Number per 100 ml (Most Probable Number (MPN) or Membrane Filter (MF))	≤ 1,000 as a monthly avg., nor exceed 1,000 in more than 20% of samples examined during any month, nor exceed 2,400 at any time, using either MPN or MF counts.	Median MPN shall not exceed 70, and not more than 10% of the samples shall exceed an MPN of 230.	≤ 1,000 as a monthly average; nor exceed 1,000 in more than 20% of the samples examined during any month; ≤ 2,400 at any time. Monthly averages shall be expressed as geometric means based on a minimum of 10 samples taken over a 30 day period, using either the MPN or MF counts.	≤ 1,000 as a monthly average; nor exceed 1,000 in more than 20% of the samples examined during any month; ≤ 2,400 at any time. Monthly averages shall be expressed as geometric means based on a minimum of 10 samples taken over a 30 day period, using either the MPN or MF counts.		
(8) Barium	Milligrams/L	≤ 1					
(9) Benzene	Micrograms/L	≤ 1.18	≤ 71.28 annual avg.	≤ 71.28 annual avg.	≤ 71.28 annual avg.		

Notes: (1) "ln H" means the natural logarithm of total hardness expressed as milligrams/L of $CaCO_3$. For metals criteria involving equations with hardness, the hardness shall be set at 25 mg/L if actual hardness is < 25 mg/L and set at 400 mg/L if actual hardness is > 400 mg/L. (2) This criterion is protective of human health not of aquatic life. (3) For application of dissolved metals criteria see 62-302.500(2)(d), F.A.C.

Parameter	Units	Class I	Class II	Class III: Fresh	Class III: Marine	Class IV	Class V
(10) Beryllium	Micrograms/L	≤ 0.0077 annual avg.	≤ 0.13 annual avg.	≤ 0.13 annual avg.	≤ 0.13 annual avg.	≤ 100 in waters with a hardness in mg/L of $CaCO_3$ of less than 250 and shall not exceed 500 in harder waters	
(11) Biological Integrity	Per cent reduction of Shannon-Weaver Diversity Index	The Index for benthic macroinvertebrates shall not be reduced to less than 75% of background levels as measured using organisms retained by a U. S. Standard No. 30 sieve and collected and composited from a minimum of three Hester-Dendy type artificial substrate samplers of 0.10 to 0.15 m^2 area each, incubated for a period of four weeks.	The Index for benthic macroinvertebrates shall not be reduced to less than 75% of established background levels as measured using organisms retained by a U. S. Standard No. 30 sieve and collected and composited from a minimum of three natural substrate samples, taken with Ponar type samplers with minimum sampling area of 225 cm^2.	The Index for benthic macroinvertebrates shall not be reduced to less than 75% of established background levels as measured using organisms retained by a U. S. Standard No. 30 sieve and collected and composited from a minimum of three Hester-Dendy type artificial substrate samplers of 0.10 to 0.15 m^2 area each, incubated for a period of four weeks.	The Index for benthic macroinvertebrates shall not be reduced to less than 75% of established background levels as measured using organisms retained by a U. S. Standard No. 30 sieve and collected and composited from a minimum of three natural substrate samples, taken with Ponar type samplers with minimum sampling area of 225 cm^2.		
(12) BOD (Biochemical Oxygen Demand)		Shall not be increased to exceed values which would cause dissolved oxygen to be depressed below the limit established for each class and, in no case, shall it be great enough to produce nuisance conditions.					
(13) Boron	Milligrams/L					≤ 0.75	
(14) Bromates	Milligrams/L		≤ 100		≤ 100		
(15) Bromine (free molecular)	Milligrams/L		≤ 0.1		≤ 0.1		
(16) Cadmium	Micrograms/L See Notes (1) and (3).	Cd ≤ $e^{(0.7852[\ln H]-3.49)}$	≤ 9.3	Cd ≤ $e^{(0.7852[\ln H]-3.49)}$	≤ 9.3		

Notes: (1) "ln H" means the natural logarithm of total hardness expressed as milligrams/L of $CaCO_3$. For metals criteria involving equations with hardness, the hardness shall be set at 25 mg/L if actual hardness is < 25 mg/L and set at 400 mg/L if actual hardness is > 400 mg/L. (2) This criterion is protective of human health not of aquatic life. (3) For application of dissolved metals criteria see 62-302.500(2)(d), F.A.C.

Parameter	Units	Class I	Class II	Class III: Fresh	Class III: Marine	Class IV	Class V
(17) Carbon tetra-chloride	Micrograms/L	≤ 0.25 annual avg.; 3.0 max	≤ 4.42 annual avg.	≤ 4.42 annual avg.	≤ 4.42 annual avg.		
(18) Chlorides	Milligrams/L	≤ 250	Not increased more than 10% above normal background. Normal daily and seasonal fluctuations shall be maintained.		Not increased more than 10% above normal background. Normal daily and seasonal fluctuations shall be maintained.		In predominantly marine waters, not increased more than 10% above normal background. Normal daily and seasonal fluctuations shall be maintained.
(19) Chlorine (total residual)	Milligrams/L	≤ 0.01	≤ 0.01	≤ 0.01	≤ 0.01		
(20) (a) Chromium (trivalent)	Micrograms/L measured as total recoverable Chromium See Notes (1) and (3).	Cr (III) ≤ $e^{(0.819[\ln H]+0.6848)}$		Cr (III) ≤ $e^{(0.819[\ln H]+0.6848)}$		Cr (III) ≤ $e^{(0.819[\ln H]+0.6848)}$	In predominantly fresh waters, ≤ $e^{(0.819[\ln H]+0.6848)}$
(20) (b) Chromium (hexavalent)	Micrograms/L See Note (3).	≤ 11	≤ 50	≤ 11	≤ 50	≤ 11	In predominantly fresh waters, ≤ 11. In predominantly marine waters, ≤ 50
(21) Chronic Toxicity (see definition in Section 62-302.200(3), F.A.C. and also see below, "Substances in concentrations which...")							

Notes: (1) "ln H" means the natural logarithm of total hardness expressed as milligrams/L of $CaCO_3$. For metals criteria involving equations with hardness, the hardness shall be set at 25 mg/L if actual hardness is < 25 mg/L and set at 400 mg/L if actual hardness is > 400 mg/L. (2) This criterion is protective of human health not of aquatic life. (3) For application of dissolved metals criteria see 62-302.500(2)(d), F.A.C.

Parameter	Units	Class I	Class II	Class III: Fresh	Class III: Marine	Class IV	Class V
(22) Color, etc. (see also Minimum Criteria, Odor, Phenols, etc.)	Color, odor, and taste producing substances and other deleterious substances, including other chemical compounds attributable to domestic wastes, industrial wastes, and other wastes					Only such amounts as will not render the waters unsuitable for agricultural irrigation, livestock watering, industrial cooling, industrial process water supply purposes, or fish survival.	
(23) Conductance, Specific	Micromhos/cm	Shall not be increased more than 50% above background or to 1275, whichever is greater		Shall not be increased more than 50% above background or to 1275, whichever is greater		Shall not be increased more than 50% above background or to 1275, whichever is greater	Shall not exceed 4,000
(24) Copper	Micrograms/L See Notes (1) and (3).	$Cu \leq e^{(0.8545[\ln H]-1.702)}$	≤ 3.7	$Cu \leq e^{(0.8545[\ln H]-1.702)}$	≤ 3.7	≤ 500	≤ 500
(25) Cyanide	Micrograms/L	≤ 5.2	≤ 1.0	≤ 5.2	≤ 1.0	≤ 5.0	≤ 5.0
(26) Definitions (see Section 62-302.200, F.A.C.)							
(27) Detergents	Milligrams/L	≤ 0.5	≤ 0.5	≤ 0.5	≤ 0.5	≤ 0.5	≤ 0.5
(28) 1,1-Dichloroethylene (1,1-dichloroethene)	Micrograms/L	≤ 0.057 annual avg.; ≤ 7.0 max	≤ 3.2 annual avg.	≤ 3.2 annual avg.	≤ 3.2 annual avg.		
(29) Dichloromethane (methylene chloride)	Micrograms/L	≤ 4.65 annual avg.	≤ 1,580 annual avg.	≤ 1,580 annual avg.	≤ 1,580 annual avg.		
(30) 2,4-Dinitrotoluene	Micrograms/L	≤ 0.11 annual avg.	≤ 9.1 annual avg.	≤ 9.1 annual avg.	≤ 9.1 annual avg.		

Notes: (1) "ln H" means the natural logarithm of total hardness expressed as milligrams/L of $CaCO_3$. For metals criteria involving equations with hardness, the hardness shall be set at 25 mg/L if actual hardness is < 25 mg/L and set at 400 mg/L if actual hardness is > 400 mg/L. (2) This criterion is protective of human health not of aquatic life. (3) For application of dissolved metals criteria see 62-302.500(2)(d), F.A.C.

Parameter	Units	Class I	Class II	Class III: Fresh	Class III: Marine	Class IV	Class V
(31) Dissolved Oxygen	Milligrams/L	Shall not be less than 5.0. Normal daily and seasonal fluctuations above this level shall be maintained.	Shall not average less than 5.0 in a 24-hour period and shall never be less than 4.0. Normal daily and seasonal fluctuations above these levels shall be maintained.	Shall not be less than 5.0. Normal daily and seasonal fluctuations above these levels shall be maintained.	Shall not average less than 5.0 in a 24-hour period and shall never be less than 4.0. Normal daily and seasonal fluctuations above these levels shall be maintained.	Shall not average less than 4.0 in a 24-hour period and shall never be less than 3.0.	Shall not be less than 0.3, fifty percent of the time on an annual basis for flows greater than or equal to 250 cubic feet per second and shall never be less than 0.1. Normal daily and seasonal fluctuations above these levels shall be maintained.
(32) Dissolved Solids	Milligrams/L	≤ 500 as a monthly avg.; ≤ 1,000 max.					
(33) Fluorides	Milligrams/L	≤ 1.5	≤ 1.5	≤ 10.0	≤ 5.0	≤ 10.0	≤ 10.0
(34) "Free Froms" (see Minimum Criteria in Section 62-302.500, F.A.C.)							
(35) "General Criteria" (see Section 62-302.510, F.A.C. and individual criteria)							

Notes: (1) "ln H" means the natural logarithm of total hardness expressed as milligrams/L of $CaCO_3$. For metals criteria involving equations with hardness, the hardness shall be set at 25 mg/L if actual hardness is < 25 mg/L and set at 400 mg/L if actual hardness is > 400 mg/L. (2) This criterion is protective of human health not of aquatic life. (3) For application of dissolved metals criteria see 62-302.500(2)(d), F.A.C.

Parameter	Units	Class I	Class II	Class III: Fresh	Class III: Marine	Class IV	Class V
(36) (a) Halomethanes (Total trihalomethanes) (total of bromoform, chlorodibromomethane, dichlorobromomethane, and chloroform). Individual halomethanes shall not exceed (b)1. to (b)5. below.	Micrograms/L	≤ 100					
(36) (b) 1. Halomethanes (individual): Bromoform	Micrograms/L	≤ 4.3 annual avg.	≤ 360 annual avg.	≤ 360 annual avg.	≤ 360 annual avg.		
(36) (b) 2. Halomethanes (individual): Chlorodibromomethane	Micrograms/L	≤ 0.41 annual avg.	≤ 34 annual avg.	≤ 34 annual avg.	≤ 34 annual avg.		
(36) (b) 3. Halomethanes (individual): Chloroform	Micrograms/L	≤ 5.67 annual avg.	≤ 470.8 annual avg.	≤ 470.8 annual avg.	≤ 470.8 annual avg.		
(36) (b) 4. Halomethanes (individual): Chloromethane (methyl chloride)	Micrograms/L	≤ 5.67 annual avg.	≤ 470.8 annual avg.	≤ 470.8 annual avg.	≤ 470.8 annual avg.		
(36) (b) 5. Halomethanes (individual): Dichlorobromomethane	Micrograms/L	≤ 0.27 annual avg.	≤ 22 annual avg.	≤ 22 annual avg.	≤ 22 annual avg.		
(37) Hexachlorobutadiene	Micrograms/L	≤ 0.45 annual avg.	≤ 49.7 annual avg.	≤ 49.7 annual avg.	≤ 49.7 annual avg.		

Notes: (1) "ln H" means the natural logarithm of total hardness expressed as milligrams/L of $CaCO_3$. For metals criteria involving equations with hardness, the hardness shall be set at 25 mg/L if actual hardness is < 25 mg/L and set at 400 mg/L if actual hardness is > 400 mg/L. (2) This criterion is protective of human health not of aquatic life. (3) For application of dissolved metals criteria see 62-302.500(2)(d), F.A.C.

Parameter	Units	Class I	Class II	Class III: Fresh	Class III: Marine	Class IV	Class V
(38) Imbalance (see Nutrients)							
(39) Iron	Milligrams/L	≤ 0.3	≤ 0.3	≤ 1.0	≤ 0.3	≤ 1.0	
(40) Lead	Micrograms/L See Notes (1) and (3).	Pb ≤ $e^{(1.273[\ln H]-4.705)}$	≤ 8.5	Pb ≤ $e^{(1.273[\ln H]-4.705)}$	≤ 8.5	≤ 50	≤ 50
(41) Manganese	Milligrams/L		≤ 0.1				
(42) Mercury	Micrograms/L	≤ 0.012	≤ 0.025	≤ 0.012	≤ 0.025	≤ 0.2	≤ 0.2
(43) Minimum Criteria (see Section 62-302.500, F.A.C.)							
(44) Mixing Zones (See Section 62-4.244, F.A.C.)							
(45) Nickel	Micrograms/L See Notes (1) and (3).	Ni ≤ $e^{(0.846[\ln H]+0.0584)}$	≤ 8.3	Ni ≤ $e^{(0.846[\ln H]+0.0584)}$	≤ 8.3	≤ 100	
(46) Nitrate	Milligrams/L as N	≤ 10 or that concentration that exceeds the nutrient criteria					
(47) Nuisance Species		Substances in concentrations which result in the dominance of nuisance species: none shall be present.					
(48) (a) Nutrients		The discharge of nutrients shall continue to be limited as needed to prevent violations of other standards contained in this chapter. Man-induced nutrient enrichment (total nitrogen or total phosphorus) shall be considered degradation in relation to the provisions of Sections 62-302.300, 62-302.700, and 62-4.242, F.A.C.					
(48) (b) Nutrients		In no case shall nutrient concentrations of a body of water be altered so as to cause an imbalance in natural populations of aquatic flora or fauna. [Note: For Class III waters in the Everglades Protection Area, this criterion has been numerically interpreted for phosphorus in Section 62-302.540, F.A.C.]					

Notes: (1) "ln H" means the natural logarithm of total hardness expressed as milligrams/L of $CaCO_3$. For metals criteria involving equations with hardness, the hardness shall be set at 25 mg/L if actual hardness is < 25 mg/L and set at 400 mg/L if actual hardness is > 400 mg/L. (2) This criterion is protective of human health not of aquatic life. (3) For application of dissolved metals criteria see 62-302.500(2)(d), F.A.C.

Parameter	Units	Class I	Class II	Class III: Fresh	Class III: Marine	Class IV	Class V
(49) Odor (also see Color, Minimum Criteria, Phenolic Compounds, etc.)	Threshold odor number		Shall not exceed 24 at 60 degrees C as a daily average.				Odor producing substances only in such amounts as will not unreasonably interfere with use of the water for the designated purpose of this classification.
(50) (a) Oils and Greases	Milligrams/L	Dissolved or emulsified oils and greases shall not exceed 5.0	Dissolved or emulsified oils and greases shall not exceed 5.0	Dissolved or emulsified oils and greases shall not exceed 5.0	Dissolved or emulsified oils and greases shall not exceed 5.0	Dissolved or emulsified oils and greases shall not exceed 5.0	Dissolved or emulsified oils and greases shall not exceed 10.0
(50) (b) Oils and Greases		No undissolved oil, or visible oil defined as iridescence, shall be present so as to cause taste or odor, or otherwise interfere with the beneficial use of waters.					
(51) **Pesticides and Herbicides**							
(51) (a) 2,4,5-TP	Micrograms/L	≤ 10					
(51) (b) 2-4-D	Micrograms/L	≤ 100					
(51) (c) Aldrin	Micrograms/L	≤ .00013 annual avg.; 3.0 max	≤ .00014 annual avg.; 1.3 max	≤ .00014 annual avg.; 3.0 max	≤ .00014 annual avg.; 1.3 max		
(51) (d) Beta-hexachlorocyclohexane (b-BHC)	Micrograms/L	≤ 0.014 annual avg.	≤ 0.046 annual avg.	≤ 0.046 annual avg.	≤ 0.046 annual avg.		
(51) (e) Chlordane	Micrograms/L	≤ 0.00058 annual avg.; 0.0043 max	≤ 0.00059 annual avg.; 0.004 max	≤ 0.00059 annual avg.; 0.0043 max	≤ 0.00059 annual avg.; 0.004 max		
(51) (f) DDT	Micrograms/L	≤ 0.00059 annual avg.; 0.001 max	≤ 0.00059 annual avg.; 0.001 max	≤ 0.00059 annual avg.; 0.001 max	≤ 0.00059 annual avg.; 0.001 max		
(51) (g) Demeton	Micrograms/L	≤ 0.1	≤ 0.1	≤ 0.1	≤ 0.1		

Notes: (1) "ln H" means the natural logarithm of total hardness expressed as milligrams/L of $CaCO_3$. For metals criteria involving equations with hardness, the hardness shall be set at 25 mg/L if actual hardness is < 25 mg/L and set at 400 mg/L if actual hardness is > 400 mg/L. (2) This criterion is protective of human health not of aquatic life. (3) For application of dissolved metals criteria see 62-302.500(2)(d), F.A.C.

Parameter	Units	Class I	Class II	Class III: Fresh	Class III: Marine	Class IV	Class V
(51) (h) Dieldrin	Micrograms/L	≤ 0.00014 annual avg.; 0.0019 max	≤ 0.00014 annual avg.; 0.0019 max	≤ 0.00014 annual avg.; 0.0019 max	≤ 0.00014 annual avg.; 0.0019 max		
(51) (i) Endosulfan	Micrograms/L	≤ 0.056	≤ 0.0087	≤ 0.056	≤ 0.0087		
(51) (j) Endrin	Micrograms/L	≤ 0.0023	≤ 0.0023	≤ 0.0023	≤ 0.0023		
(51) (k) Guthion	Micrograms/L	≤ 0.01	≤ 0.01	≤ 0.01	≤ 0.01		
(51) (l) Heptachlor	Micrograms/L	≤ 0.00021 annual avg.; 0.0038 max	≤ 0.00021 annual avg.; 0.0036 max	≤ 0.00021 annual avg.; 0.0038 max	≤ 0.00021 annual avg.; 0.0036 max		
(51) (m) Lindane (g-benzene hexachloride)	Micrograms/L	≤ 0.019 annual avg.; 0.08 max	≤ 0.063 annual avg.; 0.16 max	≤ 0.063 annual avg.; 0.08 max	≤ 0.063 annual avg.; 0.16 max		
(51) (n) Malathion	Micrograms/L	≤ 0.1	≤ 0.1	≤ 0.1	≤ 0.1		
(51) (o) Methoxychlor	Micrograms/L	≤ 0.03	≤ 0.03	≤ 0.03	≤ 0.03		
(51) (p) Mirex	Micrograms/L	≤ 0.001	≤ 0.001	≤ 0.001	≤ 0.001		
(51) (q) Parathion	Micrograms/L	≤ 0.04	≤ 0.04	≤ 0.04	≤ 0.04		
(51) (r) Toxaphene	Micrograms/L	≤ 0.0002	≤ 0.0002	≤ 0.0002	≤ 0.0002		
(52) (a) pH (Class I and Class IV Waters)	Standard Units	Shall not vary more than one unit above or below natural background provided that the pH is not lowered to less than 6 units or raised above 8.5 units. If natural background is less than 6 units, the pH shall not vary below natural background or vary more than one unit above natural background. If natural background is higher than 8.5 units, the pH shall not vary above natural background or vary more than one unit below background.					
(52) (b) pH (Class II Waters)	Standard Units	Shall not vary more than one unit above or below natural background of coastal waters as defined in Section 62-302.520(3)(b), F.A.C., or more than two-tenths unit above or below natural background of open waters as defined in Section 62-302.520(3)(f), F.A.C., provided that the pH is not lowered to less than 6.5 units or raised above 8.5 units. If natural background is less than 6.5 units, the pH shall not vary below natural background or vary more than one unit above natural background for coastal waters or more than two-tenths unit above natural background for open waters. If natural background is higher than 8.5 units, the pH shall not vary above natural background or vary more than one unit below natural background of coastal waters or more than two-tenths unit below natural background of open waters.					

Notes: (1) "ln H" means the natural logarithm of total hardness expressed as milligrams/L of $CaCO_3$. For metals criteria involving equations with hardness, the hardness shall be set at 25 mg/L if actual hardness is < 25 mg/L and set at 400 mg/L if actual hardness is > 400 mg/L. (2) This criterion is protective of human health not of aquatic life. (3) For application of dissolved metals criteria see 62-302.500(2)(d), F.A.C.

Parameter	Units	Class I	Class II	Class III: Fresh	Class III: Marine	Class IV	Class V
(52) (c) pH (Class III Waters)	Standard Units	Shall not vary more than one unit above or below natural background of predominantly fresh waters and coastal waters as defined in Section 62-302.520(3)(b), F.A.C. or more than two-tenths unit above or below natural background of open waters as defined in Section 62-302.520(3)(f), F.A.C., provided that the pH is not lowered to less than 6 units in predominantly fresh waters, or less than 6.5 units in predominantly marine waters, or raised above 8.5 units. If natural background is less than 6 units, in predominantly fresh waters or 6.5 units in predominantly marine waters, the pH shall not vary below natural background or vary more than one unit above natural background of predominantly fresh waters and coastal waters, or more than two-tenths unit above natural background of open waters. If natural background is higher than 8.5 units, the pH shall not vary above natural background or vary more than one unit below natural background of predominantly fresh waters and coastal waters, or more than two-tenths unit below natural background of open waters.					
(52) (d) pH (Class V Waters)	Standard Units	Not lower than 5.0 nor greater than 9.5 except certain swamp waters which may be as low as 4.5.					
(53)(a) Phenolic Compounds: Total		Phenolic compounds other than those produced by the natural decay of plant material, listed or unlisted, shall not taint the flesh of edible fish or shellfish or produce objectionable taste or odor in a drinking water supply.					
(53) (b) Phenolic Compounds: Total	Micrograms/L	1. The total of all chlorinated phenols, and chlorinated cresols, except as set forth in (c) 1. to (c) 4. below, shall not exceed 1.0 unless higher values are shown not to be chronically toxic. Such higher values shall be approved in writing by the Secretary. 2. The compounds listed in (c) 1. to (c) 6. below shall not exceed the limits specified for each compound.					1. The total of the following Phenolic compounds shall not exceed 50: a) Chlorinated phenols; b) Chlorinated cresols; and c) 2,4-dinitrophenol.
(53) (c) 1. Phenolic Compound: 2-chlorophenol	Micrograms/L	≤ 120	< 400 See Note (2).	< 400 See Note (2).	< 400 See Note (2).	< 400 See Note (2).	
(53) (c) 2. Phenolic Compound: 2,4-dichlorophenol	Micrograms/L	< 93 See Note (2).	< 790 See Note (2).	< 790 See Note (2).	< 790 See Note (2).	< 790 See Note (2).	
(53) (c) 3. Phenolic Compound: Pentachlorophenol	Micrograms/L	≤ 30 max; ≤ 0.28 annual avg; $\leq e^{(1.005[pH]-5.29)}$	≤ 7.9	≤ 30 max; ≤ 8.2 annual avg; $\leq e^{(1.005[pH]-5.29)}$	≤ 7.9	≤ 30	
(53) (c) 4. Phenolic Compound: 2,4,6-trichlorophenol	Micrograms/L	≤ 2.1 annual avg.	≤ 6.5 annual avg.	≤ 6.5 annual avg.	≤ 6.5 annual avg.	≤ 6.5 annual avg.	

Notes: (1) "In H" means the natural logarithm of total hardness expressed as milligrams/L of $CaCO_3$. For metals criteria involving equations with hardness, the hardness shall be set at 25 mg/L if actual hardness is < 25 mg/L and set at 400 mg/L if actual hardness is > 400 mg/L. (2) This criterion is protective of human health not of aquatic life. (3) For application of dissolved metals criteria see 62-302.500(2)(d), F.A.C.

Parameter	Units	Class I	Class II	Class III: Fresh	Class III: Marine	Class IV	Class V
(53) (c) 5. Phenolic Compound: 2,4-dinitrophenol	Milligrams/L	≤ 0.0697 See Note (2).	≤ 14.26 See Note (2).	≤ 14.26 See Note (2).	≤ 14.26 See Note (2).	≤ 14.26 See Note (2).	
(53) (c) 6. Phenolic Compound: Phenol	Milligrams/L	≤ 0.3	≤ 0.3	≤ 0.3	≤ 0.3	≤ 0.3	≤ 0.3
(54) Phosphorus (Elemental)	Micrograms/L		≤ 0.1		≤ 0.1		
(55) Phthalate Esters	Micrograms/L	≤ 3.0		≤ 3.0			
(56) Polychlorinated Biphenyls (PCBs)	Micrograms/L	≤ 0.000044 annual avg.; 0.014 max	≤ 0.000045 annual avg.; 0.03 max	≤ 0.000045 annual avg.; 0.014 max	≤ 0.000045 annual avg.; 0.03 max		
(57) (a) Polycyclic Aromatic Hydrocarbons (PAHs). Total of: Acenaphthylene; Benzo(a)anthracene; Benzo(a)pyrene; Benzo(b)fluoranthene; Benzo(ghi)perylene; Benzo(k)fluoranthene; Chrysene; Dibenzo-(a,h)anthracene; Indeno(1,2,3-cd)pyrene; and Phenanthrene	Micrograms/L	≤ 0.0028 annual avg.	≤ 0.031 annual avg.	≤ 0.031 annual avg.	≤ 0.031 annual avg.		
(57) (b) 1 (Individual PAHs): Acenaphthene	Milligrams/L	< 1.2 See Note (2).	< 2.7 See Note (2).	< 2.7 See Note (2).	< 2.7 See Note (2).		
(57) (b) 2. (Individual PAHs): Anthracene	Milligrams/L	< 9.6 See Note (2).	< 110 See Note (2).	< 110 See Note (2).	< 110 See Note (2).		
(57) (b) 3. (Individual PAHs): Fluoranthene	Milligrams/L	< 0.3 See Note (2).	< 0.370 See Note (2).	< 0.370 See Note (2).	< 0.370 See Note (2).		

Notes: (1) "In H" means the natural logarithm of total hardness expressed as milligrams/L of $CaCO_3$. For metals criteria involving equations with hardness, the hardness shall be set at 25 mg/L if actual hardness is < 25 mg/L and set at 400 mg/L if actual hardness is > 400 mg/L. (2) This criterion is protective of human health not of aquatic life. (3) For application of dissolved metals criteria see 62-302.500(2)(d), F.A.C.

Parameter	Units	Class I	Class II	Class III: Fresh	Class III: Marine	Class IV	Class V
(57) (b) 4. (Individual PAHs): Fluorene	Milligrams/L	< 1.3 See Note (2).	< 14 See Note (2).	< 14 See Note (2).	< 14 See Note (2).		
(57) (b) 5. (Individual PAHs): Pyrene	Milligrams/L	< 0.96 See Note (2).	< 11 See Note (2).	< 11 See Note (2).	< 11 See Note (2).		
(58) (a) Radioactive substances (Combined radium 226 and 228)	Picocuries/L	≤ 5	≤ 5	≤ 5	≤ 5	≤ 5	≤ 5
(58) (b) Radioactive substances (Gross alpha particle activity including radium 226, but excluding radon and uranium)	Picocuries/L	≤ 15	≤ 15	≤ 15	≤ 15	≤ 15	≤ 15
(59) Selenium	Micrograms/L	≤ 5.0	≤ 71	≤ 5.0	≤ 71		
(60) Silver	Micrograms/L See Note (3).	≤ 0.07	See Minimum criteria in Section 62-302.500(3)	≤ 0.07	See Minimum criteria in Section 62-302.500(3)		
(61) Specific Conductance (see Conductance, Specific, above)							
(62) Substances in concentrations which injure, are chronically toxic to, or produce adverse physiological or behavioral response in humans, plants, or animals		None shall be present.					

Notes: (1) "ln H" means the natural logarithm of total hardness expressed as milligrams/L of $CaCO_3$. For metals criteria involving equations with hardness, the hardness shall be set at 25 mg/L if actual hardness is < 25 mg/L and set at 400 mg/L if actual hardness is > 400 mg/L. (2) This criterion is protective of human health not of aquatic life. (3) For application of dissolved metals criteria see 62-302.500(2)(d), F.A.C.

Parameter	Units	Class I	Class II	Class III: Fresh	Class III: Marine	Class IV	Class V
(63) 1,1,2,2-Tetra-chloroethane	Micrograms/L	≤ 0.17 annual avg.	≤ 10.8 annual avg.	≤ 10.8 annual avg.	≤ 10.8 annual avg.		
(64) Tetrachloroethyl-ene (1,1,2,2-tetrachlo-roethene)	Micrograms/L	≤ 0.8 annual avg., ≤ 3.0 max	≤ 8.85 annual avg.	≤ 8.85 annual avg.	≤ 8.85 annual avg.		
(65) Thallium	Micrograms/L	< 1.7	< 6.3	< 6.3	< 6.3		
(66) Thermal Criteria (See Section 62-302.520)							
(67) Total Dissolved Gases	Percent of the saturation value for gases at the existing atmospheric and hydrostatic pressures	≤ 110% of saturation value	≤ 110% of saturation value	≤ 110% of saturation value	≤ 110% of saturation value		
(68) Transparency	Depth of the com-pensation point for photosynthetic activity	Shall not be reduced by more than 10% as compared to the natural background value.	Shall not be reduced by more than 10% as compared to the natural background value.	Shall not be reduced by more than 10% as compared to the natural background value.	Shall not be reduced by more than 10% as compared to the natural background value.		
(69) Trichloroethylene (trichloroethene)	Micrograms/L	≤ 2.7 annual avg., ≤ 3.0 max	≤ 80.7 annual avg.	≤ 80.7 annual avg.	≤ 80.7 annual avg.		
(70) Turbidity	Nephelometric Turbidity Units (NTU)	≤ 29 above natural background conditions	≤ 29 above natural background conditions	≤ 29 above natural background conditions	≤ 29 above natural background conditions	≤ 29 above natural background conditions	≤ 29 above natural background conditions
(71) Zinc	Micrograms/L See Notes (1) and (3).	Zn ≤ $e^{(0.8473[\ln H]+0.884)}$	≤ 86	Zn ≤ $e^{(0.8473[\ln H]+0.884)}$	≤ 86	≤ 1,000	≤ 1,000

Notes: (1) "ln H" means the natural logarithm of total hardness expressed as milligrams/L of $CaCO_3$. For metals criteria involving equations with hardness, the hardness shall be set at 25 mg/L if actual hardness is < 25 mg/L and set at 400 mg/L if actual hardness is > 400 mg/L. (2) This criterion is protective of human health not of aquatic life. (3) For application of dissolved metals criteria see 62-302.500(2)(d), F.A.C.

Specific Authority 403.061, 403.062, 403.087, 403.504, 403.704, 403.804 FS. Law Implemented 403.021, 403.061, 403.087, 403.088, 403.141, 403.161, 403.182, 403.502, 403.702, 403.708 FS. History–New 1-28-90, Formerly 17-3.065, Amended 2-13-92, 6-17-92, Formerly 17-302.540, 17-302.550, 17-302.560, 17-302.570, 17-302.580, Amended 4-25-93, Formerly 17-302.530, Amended 1-23-95, 1-15-96, 5-15-02, 7-19-04.

62-302.540 Water Quality Standards for Phosphorus Within the Everglades Protection Area.

(1) Purpose and Scope.

(a) The purpose of this rule is to implement the requirements of the Everglades Forever Act by utilizing the powers and duties granted the Department under the Act and other applicable provisions of Chapters 373 and 403, F.S., to establish water quality standards for phosphorus, including a numeric phosphorus criterion, within the EPA.

(b) The water quality standards adopted by this rule include all of the following elements:

1. A numerical interpretation of the Class III narrative nutrient criterion for phosphorus;

2. Establishment of moderating provisions for permits authorizing discharges into the EPA in compliance with water quality standards, including the numeric phosphorus criterion; and

3. A method for determining achievement of the numeric phosphorus criterion, which takes into consideration spatial and temporal variability, natural background conditions and confidence in laboratory results.

(2) Findings.

(a) The Legislature, in adopting the Everglades Forever Act, recognized that the EPA must be restored both in terms of water quantity and water quality.

(b) Best Management Practices (BMPs) have reduced phosphorus loads from the Everglades Agricultural Area to the EPA by more than twice the amount required by existing rules. Stormwater Treatment Areas (STAs) have reduced phosphorus concentrations to less than the goal of 50 ppb established in the Everglades Forever Act.

(c) While a significant percentage of the EPA currently meets the numeric phosphorus criterion, further efforts are required to achieve the criterion in the remaining impacted areas of the EPA.

(d) Even as water quality continues to improve, restoration will be a long-term process because of historic phosphorus accumulations found in sediments within impacted areas. This phosphorus can diffuse back into the water column, a phenomenon the Department recognizes as reflux.

(e) The Basin-Specific Feasibility Studies completed by the District considered environmental factors, implementation cost, scheduling, and technical factors in evaluating measures to reduce phosphorus levels entering the EPA. These studies and other information provided to the Commission show that:

1. At this time, chemical treatment technology is not cost-effective for treating discharges entering the EPA and poses the potential for adverse environmental effects.

2. Optimization of the existing STAs, in combination with BMPs, is currently the most cost-effective and environmentally preferable means to achieve further phosphorus reductions to the EPA, and to restore impacted areas. The effectiveness of such measures should be determined and maximized prior to requiring additional measures. Optimization shall take into consideration viable vegetative technologies, including Periphyton-based STAs that are found to be cost-effective and environmentally acceptable.

(f) The District and the Department recognize that STA and BMP optimization requires a sustained commitment to construct, implement, stabilize and measure phosphorus reduction benefits.

(g) The Comprehensive Everglades Restoration Plan (CERP) contains projects that will affect the flows and phosphorus levels entering the EPA. Achievement of water quality standards for water quality projects required under the Everglades Forever Act can be most effectively and efficiently attained when integrated with CERP projects.

(h) The Long-Term Plan constitutes a comprehensive program to optimize the STAs and BMPs to achieve further phosphorus reductions and thereby accomplish implementation of Best Available Phosphorus Reduction Technology (BAPRT).

(i) It is the intent of the Commission that implementation of this rule will fulfill commitments made by the State of Florida to restore and maintain water quality in the EPA, while, at the same time, fulfill the States obligations under the Settlement Agreement to achieve the long-term phosphorus concentration levels and discharge limits established in that Agreement for the Loxahatchee National Wildlife Refuge (Refuge) and the Everglades National Park (Park).

(j) Establishment of the numeric phosphorus criterion, based upon analyses conducted primarily in freshwater open water slough systems, assumed that preservation of the balance of the native flora and fauna in these open water slough systems would protect other communities of native vegetation in the EPA. Further research should be conducted in other habitat types to further evaluate the natural variability in those habitat types.

(k) The Commission has received substantial testimony regarding mercury and its impact on the EPA. The Commission encourages all interested parties to continue research efforts on the effects of mercury.

(l) The Commission finds that this rule must incorporate a flexible approach towards the application of the numeric phosphorus criterion for phosphorus in order to guide the implementation of phosphorus reductions in the Everglades Protection Area. Chapter 403, F.S., the Everglades Forever Act and U.S. Environmental Protection Agency regulations set forth at 40 CFR Part 131 include general policies that authorize such flexibility under appropriate circumstances, including those described in paragraphs (c) through (h) and (k) above. The Commission has exercised this authority by including in this rule both a numeric interpretation of the phosphorus criterion and the various other standard setting provisions of this rule, including the permitting and moderating provisions.

(3) Definitions.

(a) "Best Available Phosphorus Reduction Technology" (BAPRT) shall be as defined by Section 373.4592(2)(a), F.S. BMPs shall maintain and, where practicable, improve upon the performance of urban and agricultural source controls in reducing overall phosphorus levels. Agricultural BMPs within the Everglades Agricultural Area and the C-139 Basin shall be in accordance with Chapters 40E-61 and 40E-63, F.A.C. STA phosphorus reductions shall be improved through implementation of optimization measures as defined by Section 373.4592(2)(l), F.S. BAPRT may include measures intended to reduce phosphorus levels in discharges from a single basin or sub-basin, or a program designed to address discharges from multiple basins.

(b) "Long-Term Plan" shall be as defined by Section 373.4592(2)(j), F.S.

(c) The "Everglades Protection Area" or "EPA" shall mean Water Conservation Areas 1 (Refuge), 2A, 2B, 3A and 3B, and the Everglades National Park.

(d) "Impacted Areas" shall mean areas of the EPA where total phosphorus concentrations in the upper 10 centimeters of the soils are greater than 500 mg/kg.

(e) "District" shall mean the South Florida Water Management District.

(f) "Optimization" shall be as defined by Section 373.4592(2)(l), F.S.

(g) "Settlement Agreement" shall mean the Settlement Agreement entered in Case No. 88-1886-Civ-Hoeveler, United States District Court for the Southern District of Florida, as modified by the Omnibus Order entered in the case on April 27, 2001.

(h) "Technology-based Effluent Limitation" or "TBEL" shall be as defined in Section 373.4592(2)(p), F.S.

(i) "Unimpacted Areas" shall mean those areas which are not "Impacted Areas".

(4) Phosphorus Criterion.

(a) The numeric phosphorus criterion for Class III waters in the EPA shall be a long-term geometric mean of 10 ppb, but shall not be lower than the natural conditions of the EPA, and shall take into account spatial and temporal variability. Achievement of the criterion shall be determined by the methods in this subsection. Exceedences of the provisions of this subsection shall not be considered deviations from the criterion if they are attributable to the full range of natural spatial and temporal variability, statistical variability inherent in sampling and testing procedures or higher natural background conditions.

(b) Water Bodies. Achievement of the phosphorus criterion for waters in the EPA shall be determined separately in impacted and unimpacted areas in each of the following water bodies: Water Conservation Areas 1, 2 and 3, and the Everglades National Park.

(c) Achievement of Criterion in Everglades National Park. Achievement of the phosphorus criterion in the Park shall be based on the methods as set forth in Appendix A of the Settlement Agreement unless the Settlement Agreement is rescinded or terminated. If the Settlement Agreement is no longer in force, achievement of the criterion shall be determined based on the method provided for the remaining EPA. For the Park, the Department shall review data from inflows into the Park at locations established pursuant to Appendix A of the Settlement Agreement and shall determine that compliance is achieved if the Department concludes that phosphorus concentration limits for inflows into the Park do not result in a violation of the limits established in Appendix A.

(d) Achievement of the Criterion in WCA-1, WCA-2 and WCA-3.

1. Achievement of the criterion in unimpacted areas in each WCA shall be determined based upon data from stations that are evenly distributed and located in freshwater open water sloughs similar to the areas from which data were obtained to derive the phosphorus criterion. Achievement of the criterion shall be determined based on data collected monthly from the network of monitoring stations in the unimpacted area. The water body will have achieved the criterion if the five year geometric mean averaged across all stations is less than or equal to 10 ppb. In order to provide protection against imbalances of aquatic flora or fauna, the following provisions must also be met:

a. The annual geometric mean averaged across all stations is less than or equal to 10 ppb for three of five years;

b. The annual geometric mean averaged across all stations is less than or equal to 11 ppb; and

c. The annual geometric mean at all individual stations is less than or equal to 15 ppb. Individual station analyses are representative of only that station.

2. Achievement of the criterion shall be determined based on data collected monthly from the network of monitoring stations in the impacted area. Impacted Areas of the water body will have achieved the criterion if the five year geometric mean averaged across all stations is less than or equal to 10 ppb. In order to provide protection against imbalances of aquatic flora or fauna, the following provisions must also be met:

a. The annual geometric mean averaged across all stations is less than or equal to 10 ppb for three of five years;

b. The annual geometric mean averaged across all stations is less than or equal to 11 ppb; and

c. The annual geometric mean at all individual stations is less than or equal to 15 ppb. Individual station analyses are representative of only that station.

If these limits are not met, no action shall be required, provided that the net improvement or hydropattern restoration provisions of subsection (6) below are met. Notwithstanding the definition of Impacted Area in subsection (3), individual stations in the network shall be deemed to be unimpacted for purposes of this rule if the five-year geometric mean is less than or equal to 10 ppb and the annual geometric mean is less than or equal to 15 ppb.

(e) Adjustment of Achievement Methods. The Department shall complete a technical review of the achievement methods set forth in this subsection at a minimum of five year intervals and will report to the ERC on changes as needed. Data will be collected as necessary at stations that are evenly distributed and representative of major natural habitat types to further define the natural spatial and temporal variability and natural background of phosphorus concentrations in the EPA. As a part of the review, the Department may propose amendments to the achievement method provisions of this rule to include:

1. A hydrologic variability algorithm in a manner similar to the Settlement Agreement; and

2. Implementing adjustment factors that take into account water body specific variability, including the effect of habitat types. The hydrologic variability evaluation shall be based on data from at least one climatic drought cycle and data reflecting the average interior stage of the water body on the dates of sample collection.

(f) Data Screening. Data from each monitoring station shall be evaluated prior to being used for the purposes of determining achievement of the criterion. Data shall be excluded from calculations for the purpose of determining achievement of the criterion if such data:

1. Do not comply with the requirements of Chapter 62-160, F.A.C.; or

2. Are excluded through the screening protocol set forth in the *Data Quality Screening Protocol*; or

3. Were collected from sites affected by extreme events such as fire, flood, drought or hurricanes, until normal conditions are restored; or

4. Were affected by localized activities caused by temporary human or natural disturbances such as airboat traffic, authorized (permitted or exempt) restoration activities, alligator holes, or bird rookeries.

5. Were sampled in years where hydrologic conditions (e.g., rainfall amount, water levels and water deliveries) were outside the range that occurred during the period (calendar years 1978 – 2001) used to set the phosphorus criterion.

(5) Long-Term Compliance Permit Requirements for Phosphorus Discharges into the EPA.

(a) In addition to meeting all other applicable permitting criteria, an applicant must provide reasonable assurance that the discharge will comply with state water quality standards as set forth in this section.

(b) Discharges into the EPA shall be deemed in compliance with state water quality standards upon a demonstration that:

1. Phosphorus levels in the discharges will be at or below the phosphorus criterion set forth in this rule; or

2. Discharges will not cause or contribute to exceedences of the phosphorus criterion in the receiving waters, the determination of which will take into account the phosphorus in the water column that is due to reflux; or

3. Discharges will comply with moderating provisions as provided in this rule.

(c) Discharges into the Park must not result in a violation of the concentration limits established for the Park in Appendix A of the Settlement Agreement as determined through the methodology set forth in subsection (4).

(d) Discharge limits for permits allowing discharges into the EPA shall be based upon TBELs established through BAPRT and shall not require water quality based effluent limitations through 2016. Such TBELs shall be applied as effluent limitations as defined in subsection 62-302.200(10), F.A.C.

(6) Moderating Provisions. The following moderating provisions are established for discharges into or within the EPA as a part of state water quality standards applicable to the phosphorus criterion set forth in this rule:

(a) Net Improvement in Impacted Areas.

1. Until December 31, 2016, discharges into or within the EPA shall be permitted using net improvement as a moderating provision upon a demonstration by the applicant that:

a. The permittee will implement, or cause to be implemented, BAPRT, as defined by Section 373.4592(2)(a), F.S., and further provided in this section, which shall include a continued research and monitoring program designed to reduce outflow concentrations of phosphorus; and

b. The discharge is into or within an impacted area.

2. BAPRT shall use an adaptive management approach based on the best available information and data to develop and implement incremental phosphorus reduction measures with the goal of achieving the phosphorus criterion. BAPRT shall also include projects and strategies to accelerate restoration of natural conditions with regard to populations of native flora or fauna.

3. For purposes of this rule, the Long-Term Plan shall constitute BAPRT. The planning goal of the Long-Term Plan is to achieve compliance with the criterion set forth in subsection (4) of this rule. Implementation of BAPRT will result in net improvement in impacted areas of the EPA. The Initial Phase of the Long-Term Plan shall be implemented through 2016. Revisions to the Long-Term Plan shall be incorporated through an adaptive management approach including a Process Development and Engineering component to identify and implement incremental optimization measures for further phosphorus reductions.

4. The Department and the District shall propose amendments to the Long-Term Plan as science and environmental conditions warrant. The Department shall approve all amendments to the Long-Term Plan.

5. As part of the review of permit applications, the Department shall review proposed changes to the Long-Term Plan identified through the Process Development and Engineering component of the Long-Term Plan to evaluate changes necessary to comply with this rule, including the numeric phosphorus criterion. Those changes which the department deems necessary to comply with this rule, including the numeric phosphorus criterion, shall be included as conditions of the respective permit or permits for the structures associated with the particular basin or basins involved. Until December 31, 2016, such permits shall include technology-based effluent limitations consistent with the Long-Term Plan.

(b) Hydropattern Restoration. Discharges into or within unimpacted areas of the EPA shall be permitted for hydropattern restoration purposes upon a demonstration by the applicant that:

1. The discharge will be able to achieve compliance with the requirements of sub-subparagraph (6)(a)1.a. above;

2. The environmental benefits of establishing the discharge clearly outweigh the potential adverse impacts that may result in the event that phosphorus levels in the discharge exceed the criterion; and

3. The discharge complies with antidegradation requirements.

(c) Existing Moderating Provisions. Nothing in this rule shall eliminate the availability of moderating provisions that may otherwise exist as a matter of law, rule or regulation.

(7) Document Incorporated by Reference. The following document is referenced elsewhere in this section and is hereby incorporated by reference:

Data Quality Screening Protocol, dated 7-15-04.

(8) Contingencies. In the event any provision of this rule is challenged in any proceeding, the Commission shall immediately be notified. In the event any provision of this rule:

(a) Is determined to be invalid under applicable laws; or

(b) Is disapproved by the U.S. Environmental Protection Agency under the Clean Water Act, the Department shall bring the matter back before the Commission at the earliest practicable date for reconsideration.

Specific Authority 373.043, 373.4592, 403.061 FS. Law Implemented 373.016, 373.026, 373.4592, 403.021(11), 403.061, 403.201 FS. History–New 7-15-04, Amended 5-25-05.

62-302.700 Special Protection, Outstanding Florida Waters, Outstanding National Resource Waters.

(1) It shall be the Department policy to afford the highest protection to Outstanding Florida Waters and Outstanding National Resource Waters. No degradation of water quality, other than that allowed in subsections 62-4.242(2) and (3), F.A.C., is to be permitted in Outstanding Florida Waters and Outstanding National Resource Waters, respectively, notwithstanding any other Department rules that allow water quality lowering.

(2) A complete listing of Outstanding Florida Waters and Outstanding National Resource Waters is provided in subsections (9) and (10). Outstanding Florida Waters generally include the following surface waters (unless named as Outstanding National Resource Waters):

(a) Waters in National Parks, Preserves, Memorials, Wildlife Refuges and Wilderness Areas;

(b) Waters in the State Park System and Wilderness Areas;

(c) Waters within areas acquired through donation, trade, or purchased under the Environmentally Endangered Lands Bond Program, Conservation and Recreation Lands Program, Land Acquisition Trust Fund Program, and Save Our Coast Program;

(d) Rivers designated under the Florida Scenic and Wild Rivers Program, federal Wild and Scenic Rivers Act of 1968 as amended, and Myakka River Wild and Scenic Designation and Preservation Act;

(e) Waters within National Seashores, National Marine Sanctuaries, National Estuarine Research Reserves, and certain National Monuments;

(f) Waters in Aquatic Preserves created under the provisions of Chapter 258, F.S.;

(g) Waters within the Big Cypress National Preserve;

(h) Special Waters as listed in paragraph 62-302.700(9)(i), F.A.C.; and

(i) Certain Waters within the Boundaries of the National Forests.

(3) Each water body demonstrated to be of exceptional recreational or ecological significance may be designated as a Special Water.

(4) The following procedure shall be used in designating an Outstanding National Resource Water as well as any Special Water:

(a) Rulemaking procedures pursuant to Chapter 120, F.S., and Chapter 62-102, F.A.C., shall be followed;

(b) At least one fact-finding workshop shall be held in the affected area;

(c) All local county or municipal governments and state legislators whose districts or jurisdictions include all or part of the water shall be notified at least 60 days prior to the workshop in writing by the Secretary;

(d) A prominent public notice shall be placed in a newspaper of general circulation in the area of the proposed water at least 60 days prior to the workshop; and

(e) An economic impact analysis, consistent with Chapter 120, F.S., shall be prepared which provides a general analysis of the impact on growth and development including such factors as impacts on planned or potential industrial, agricultural, or other development or expansion.

(5) The Commission may designate a water of the State as a Special Water after making a finding that the waters are of exceptional recreational or ecological significance and a finding that the environmental, social, and economic benefits of the designation outweigh the environmental, social, and economic costs.

(6) The Commission may designate a water as an Outstanding National Resource Water after making all of the following findings:

(a) That the waters are of such exceptional recreational or ecological significance that water quality should and can be maintained and protected under all circumstances other than temporary degradation and the lowering allowed by Section 316 of the Federal Clean Water Act; and

(b) That the level of protection afforded by the designation as Outstanding National Resource Waters is clearly necessary to preserve the exceptional ecological or recreational significance of the waters; and

(c) That the environmental, social, and economic benefits of the designation outweigh the environmental, social, and economic costs.

(7) The policy of this section shall be implemented through the permitting process pursuant to Rule 62-4.242, F.A.C.

(8) For each Outstanding Florida Water listed under subsection 62-302.700(9), F.A.C., the last day of the baseline year for defining the existing ambient water quality (paragraph 62-4.242(2)(c), F.A.C.) is March 1, 1979, unless otherwise indicated. Where applicable, Outstanding Florida Water boundary expansions are indicated by date(s) following "as mod." under subsection 62-302.700(9), F.A.C. For each Outstanding Florida Water boundary which expanded subsequent to the original date of designation, the baseline year for the entire Outstanding Florida Water, including the expansion, remains March 1, 1979, unless otherwise indicated.

(9) Outstanding Florida Waters:

(a) Waters within National Parks and National Memorials.

National Park or National Memorial	County
1. Biscayne National Park (as mod. 5-14-86, 8-8-94)	Dade
2. Dry Tortugas National Park (10-4-90)	Monroe
3. Everglades National Park (as mod. 8-8-94)	Monroe/Dade/ Collier
4. Fort Caroline National Memorial (8-8-94)	Duval

(b) Waters within National Wildlife Refuges.

Wildlife Refuge	County
1. Archie Carr (8-8-94)	Indian River/Brevard
2. Caloosahatchee	Lee
3. Cedar Keys (as mod. 5-14-86, 4-19-88)	Levy
4. Chassahowitzka (as mod. 5-14-86, 4-19-88)	Citrus/Hernando
5. Chinsegut	Hernando
6. Crocodile Lake (12-1-82; as mod. 5-14-86, 4-19-88, 8-8-94)	Monroe
7. Crystal River (5-14-86; as mod. 10-4-90)	Citrus
8. Egmont Key	Hillsborough
9. Florida Panther (10-4-90; as mod. 8-8-94)	Collier
10. Great White Heron (as mod. 5-14-86, 4-19-88)	Monroe
11. Hobe Sound (as mod. 5-14-86, 4-19-88, 8-8-94)	Martin

12. Island Bay	Charlotte
13. J. N. “Ding” Darling (as mod. 5-14-86, 4-19-88, 8-8-94)	Lee
14. Key West	Monroe
15. Lake Woodruff (as mod. 8-8-94)	Volusia/Lake
16. Lower Suwannee (12-1-82; as mod. 8-8-94)	Dixie/Levy
17. Loxahatchee	Palm Beach
18. Matlacha Pass (as mod. 8-8-94)	Lee
19. Merritt Island	Volusia/Brevard
20. National Key Deer (as mod. 5-14-86, 4-19-88, 10-4-90, 8-8-94)	Monroe
21. Okefenokee (Florida Portion)	Baker
22. Passage Key	Manatee
23. Pelican Island (as mod. 8-8-94)	Indian River
24. Pine Island (as mod. 8-8-94)	Lee
25. Pinellas	Pinellas
26. St. Johns (including Bee Line Unit) (as mod. 5-14-86, 4-19-88)	Brevard
27. St. Marks (as mod. 10-4-90, 8-8-94)	Jefferson/Wakulla/ Taylor
28. St. Vincent (including Pig Island Unit)	Franklin/Gulf

(c) Waters within State Parks, State Wildlife Parks, and State Recreation Areas.

State Park or State <u>Recreation Area</u>	<u>County</u>
1. Amelia Island State Recreation Area (5-14-86)	Nassau
2. Anastasia State Recreation Area (as mod. 4-19-88)	St. Johns
3. Avalon State Recreation Area (4-19-88; as mod. 8-8-94)	St. Lucie
4. Bahia Honda State Park (as mod. 5-14-86)	Monroe
5. Bear Creek State Recreation Area (12-1-82)	Gadsden
6. Big Lagoon State Recreation Area (12-1-82; as mod. 5-14-86, 8-8-94)	Escambia
7. Big Talbot Island State Park (5-14-86; as mod. 4-19-88, 8-8-94)	Duval

8. Bill Baggs Cape Florida State Recreation Area	Dade
9. Blackwater River State Park	Santa Rosa
10. Blue Springs State Park	Volusia
11. Bulow Creek State Park (5-14-86; as mod. 4-19-88)	Flagler/Volusia
12. Caladesi Island State Park	Pinellas
13. Cayo Costa State Park (12-1-82; as mod. 5-14-86, 4-19-88, 10-4-90, 8-8-94)	Lee
14. Collier-Seminole State Park	Collier
15. Dead Lakes State Recreation Area	Gulf
16. De Leon Springs State Recreation Area (5-14-86; as mod. 10-4-90)	Volusia
17. Delnor-Wiggins Pass State Recreation Area (12-1-82)	Collier
18. Don Pedro Island State Recreation Area (5-14-86; as mod. 4-19-88)	Charlotte
19. Dr. Julian G. Bruce St. George Island State Park (12-1-82)	Franklin
20. Edward Ball Wakulla Springs State Park (4-19-88)	Wakulla
21. Falling Waters State Recreation Area	Washington
22. Faver-Dykes State Park	St. Johns
23. Florida Caverns State Park (as mod. 8-8-94)	Jackson
24. Fort Clinch State Park (as mod. 4-19-88, 8-8-94)	Nassau
25. Fort Cooper State Park (12-1-82)	Citrus
26. Fort Pierce Inlet State Recreation Area (12-1-82; as mod. 5-14-86)	St. Lucie
27. Fred Gannon Rocky Bayou State Recreation Area	Okaloosa
28. Gamble Rogers Memorial State Recreation Area at	Flagler

Flagler Beach	
29. Gasparilla Island State Recreation Area (5-14-86; as mod. 4-19-88, 10-4-90)	Lee
30. Grayton Beach State Recreation Area (as mod. 4-19-88)	Walton
31. Guana River State Park (5-14-86; as mod. 4-19-88)	St. Johns
32. Henderson Beach State Recreation Area (5-14-86)	Okaloosa
33. Highlands Hammock State Park (as mod. 8-8-94)	Highlands/Hardee
34. Hillsborough River State Park	Hillsborough
35. Homosassa Springs State Wildlife Park (10-4-90)	Citrus
36. Honeymoon Island State Recreation Area (12-1-82; as mod. 5-14-86)	Pinellas
37. Hontoon Island State Park	Volusia/Lake
38. Hugh Taylor Birch State Recreation Area	Broward
39. Ichetucknee Springs State Park	Columbia/ Suwannee
40. John D. McArthur Beach State Park (12-1-82)	Palm Beach
41. John Pennekamp Coral Reef State Park (as mod. 5-14-86, 4-19-88)	Monroe
42. John U. Lloyd Beach State Recreation Area	Broward
43. Jonathan Dickinson State Park	Martin
44. Lake Arbuckle State Park (5-14-86)	Polk
45. Lake Griffin State Recreation Area	Lake
46. Lake Kissimmee State Park	Polk
47. Lake Louisa State Park (12-1-82)	Lake
48. Lake Manatee State Recreation Area (12-1-82)	Manatee
49. Lake Rousseau State Recreation Area (12-1-82)	Citrus/Levy/Marion
50. Lake Talquin State	Leon

Recreation Area (12-1-82; as mod. 5-14-86)	
51. Little Manatee River State Recreation Area (12-1-82)	Hillsborough
52. Little Talbot Island State Park	Duval
53. Long Key State Recreation Area	Monroe
54. Lovers Key State Recreation Area (5-14-86)	Lee
55. Manatee Springs State Park (as mod. 10-4-90)	Levy
56. Mike Roess Gold Head Branch State Park (as mod. 5-14-86, 4-19-88, 8-8-94)	Clay
57. Myakka River State Park	Manatee/Sarasota
58. North Peninsula State Recreation Area (5-14-86; as mod. 4-19-88, 10-4-90)	Volusia
59. Ochlockonee River State Park	Wakulla
60. O'Leno State Park (as mod. 5-14-86)	Alachua/Columbia
61. Oleta River State Recreation Area (12-1-82)	Dade
62. Oscar Scherer State Park (as mod. 8-8-94)	Sarasota
63. Peacock Springs State Recreation Area (4-19-88)	Suwannee
64. Perdido Key State Recreation Area (12-1-82)	Escambia
65. Ponce de Leon Springs State Recreation Area	Holmes/Walton
66. Port Charlotte Beach State Recreation Area (12-1-82)	Charlotte
67. St. Andrews State Recreation Area (as mod. 5-14-86, 4-19-88)	Bay
68. Sebastian Inlet State Recreation Area	Indian River/Brevard
69. Silver River State Park (4-19-88; as mod. 10-4-90, 8-8-94)	Marion
70. Suwannee River State Park (as mod. 10-4-90)	Hamilton/Madison/ Suwannee

71. Three Rivers State Recreation Area	Jackson
72. T. H. Stone Memorial St. Joseph Peninsula State Park	Gulf
73. Tomoka State Park	Volusia
74. Torreya State Park	Liberty
75. Wekiwa Springs State Park (as mod. 4-19-88)	Orange/Seminole

(d) Waters within State Ornamental Gardens, State Botanical Sites, State Historic Sites, and State Geological Sites.

State Ornamental Gardens, State Botanical Site, State Historic Site, or State Geological Site	County
1. Alfred B. Maclay State Gardens	Leon
2. Devils Millhopper State Geological Site (10-4-90)	Alachua
3. Eden State Gardens	Walton
4. Fort Zachary Taylor State Historic Site (10-4-90)	Monroe
5. Indian Key State Historic Site (10-4-90)	Monroe
6. Key Largo Hammock State Botanical Site (5-14-86)	Monroe
7. Koreshan State Historic Site (10-4-90)	Lee
8. Lignumvitae Key State Botanical Site (5-14-86)	Monroe
9. Marjorie Kinnan Rawlings State Historic Site (10-4-90)	Alachua
10. Natural Bridge Battlefield State Historic Site (10-4-90)	Leon
11. Paynes Creek State Historic Site (10-4-90)	Hardee
12. Ravine State Gardens	Putnam
13. San Marcos de Apalachee State Historic Site (10-4-90)	Wakulla
14. Washington Oaks State Gardens (as mod. 5-14-86)	Flagler
15. Windley Key Fossil Reef State Geological Site (10-4-90)	Monroe

(e) Waters within State Preserves, State Underwater Archaeological Preserves, and State Reserves.

State Preserve or State Reserve	County
1. Anclote Key State Preserve (12-1-82)	Pasco/Pinellas
2. Cape St. George State	Franklin

Reserve (12-1-82)	
3. Cedar Key Scrub State Reserve (12-1-82; as mod. 4-19-88)	Levy
4. Charlotte Harbor State Reserve (as mod. 4-19-88)	Charlotte
5. Crystal River State Reserve (5-14-86; as mod. 4-19-88)	Citrus
6. Fakahatchee Strand State Preserve (12-1-82; as mod. 5-14-86, 4-19-88, 10-4-90, 8-8-94)	Collier
7. Haw Creek State Preserve (12-1-82)	Flagler/Putnam/ Volusia
8. Lower Wekiva River State Reserve (12-1-82)	Lake/Seminole
9. Nassau Valley State Reserve (12-1-82)	Duval/Nassau
10. Paynes Prairie State Preserve (as mod. 10-4-90, 8-8-94)	Alachua
11. Prairie-Lakes State Preserve	Osceola
12. River Rise State Preserve (12-1-82; as mod. 8-8-94)	Alachua/Columbia
13. Rock Springs Run State Reserve (5-14-86; as mod. 4-19-88)	Orange
14. San Felasco Hammock State Preserve (12-1-82; as mod. 5-14-86, 4-19-88)	Alachua
15. San Pedro State Underwater Archaeological Preserve (10-4-90)	Monroe
16. Savannas State Reserve (12-1-82; as mod. 5-14-86, 10-4-90, 8-8-94)	Martin/St. Lucie
17. St. Lucie Inlet State Preserve (12-1-82)	Martin
18. Waccasassa Bay State Preserve (12-1-82; as mod. 4-19-88)	Levy
19. Weedon Island State Preserve (12-1-82)	Pinellas
20. William Beardell Tosohatchee State Reserve (12-1-82)	Orange

(f) Waters within Areas Acquired through Donation, Trade, or Purchased Under the Environmentally Endangered Lands Bond Program, Conservation and Recreation Lands Program, Land Acquisition Trust Fund Program, and Save Our Coast Program.

Program Area	County
1. Andrews Tract (5-14-86; as mod.	Levy

4-19-88, 8-8-94)	
2. Apalachicola Bay (8-8-94)	Franklin
3. Barefoot Beach (12-1-82)	Collier
4. Beker Tracts (10-4-90)	Manatee
5. Big Bend Coastal Tract (4-19-88; as mod. 10-4-90)	Dixie/Taylor
6. Big Shoals (4-19-88)	Hamilton
7. B.M.K. Ranch (8-8-94)	Lake/Orange
8. Bower Tract (5-14-86; as mod. 4-19-88)	Hillsborough
9. Caravelle Ranch (8-8-94)	Putnam
10. Carlton Half-Moon Ranch (8-8-94)	Sumter
11. Catfish Creek (8-8-94)	Polk
12. Chassahowitzka Swamp (5-14-86; as mod. 4-19-88, 8-8-94)	Hernando/Citrus
13. Coupon Bight (10-4-90; as mod. 8-8-94)	Monroe
14. Crystal River (10-4-90)	Citrus
15. Curry Hammock (8-8-94)	Monroe
16. Deering Hammock/Estate (5-14-86; as mod. 4-19-88, 8-8-94)	Dade
17. East Everglades (5-14-86)	Dade
18. Econfina River (8-8-94)	Taylor
19. Emerson Point (8-8-94)	Manatee
20. Escambia Bay Bluffs (5-14-86)	Escambia
21. Estero Bay (8-8-94)	Lee
22. Florida First Magnitude Springs (8-8-94)	Levy
23. Ft. George Island (10-4-90)	Duval
24. Ft. Mose (8-8-94)	St. Johns
25. Ft. San Luis (5-14-86; as mod. 8-8-94)	Leon
26. Gateway (5-14-86)	Pinellas
27. Gills Tract (8-8-94)	Pasco
28. Green Turtle Beach (4-19-88)	St. Lucie
29. Guana River (5-14-86; as mod.	St. Johns

4-19-88)	
30. Homosassa Reserve/Walker Tract (8-8-94)	Citrus
31. Indian River North Beach (5-14-86)	Indian River
32. ITT/Hammock (5-14-86)	Dade
33. Josslyn Island (10-4-90)	Lee
34. Levy County Forest/Sandhills (8-8-94)	Levy
35. Letchworth Mounds (8-8-94)	Jefferson
36. Lower Econlockhatchee (8-8-94)	Seminole
37. Martin County Tracts (5-14-86)	Martin
38. Mashes Sands (5-14-86)	Wakulla
39. Miami Rockridge Pinelands (8-8-94)	Dade
40. Milton to Whiting Field (8-8-94)	Santa Rosa
41. North Beach (5-14-86)	Broward
42. North Key Largo Hammock (5-14-86; as mod. 4-19-88, 10-4-90, 8-8-94)	Monroe
43. Placid Lakes (8-8-94)	Highlands
44. Point Washington (8-8-94)	Walton
45. Port Bougainville (10-4-90)	Monroe
46. Rainbow River/Springs (8-8-94)	Marion
47. Rookery Bay (10-4-90; as mod. 8-8-94)	Collier
48. Rotenberger (as mod. 4-19-88, 8-8-94)	Palm Beach
49. Saddle Blanket Lakes Scrub (8-8-94)	Polk
50. Save Our Everglades (10-4-90; as mod. 8-8-94)	Collier
51. Sea Branch (8-8-94)	Martin
52. Seminole Springs/Woods (8-8-94)	Lake
53. Snake Warrior Island (Oaks of Miramar) (8-8-94)	Broward
54. Spring Hammock (4-19-88; as mod. 10-4-90)	Seminole
55. Spruce Creek (4-19-88; as mod.	Volusia

8-8-94)	
56. St. Martins River (8-8-94)	Citrus
57. Stark Tract (10-4-90)	Volusia
58. Stoney-Lane (10-4-90)	Citrus
59. Surfside Additions (5-14-86)	St. Lucie
60. Three Lakes/Prairie Lakes (as mod. 8-8-94)	Osceola
61. Topsail Hill (8-8-94)	Walton
62. Upper Black Creek (8-8-94)	Clay
63. Volusia Water Recharge Area	Volusia
64. Wacissa/Aucilla Rivers (10-4-90)	Jefferson/Taylor
65. Wekiva River Buffers (8-8-94)	Seminole
66. Westlake (5-14-86; as mod. 4-19-88)	Broward
67. Wetstone/Berkovitz (8-8-94)	Pasco
68. Withlacoochee Tracts (12-1-82)	Sumter

(g) Waters within National Seashores.

National Seashores	County
1. Canaveral	Brevard/Volusia
2. Gulf Islands	Escambia/Santa Rosa

(h) Waters within State Aquatic Preserves.

Aquatic Preserves	County
1. Alligator Harbor	Franklin
2. Apalachicola Bay	Franklin
3. Banana River (as mod. 8-8-94)	Brevard
4. Big Bend Seagrasses	Wakulla/Taylor/ Jefferson/Dixie/ Levy

except for the following areas:

a. Keaton Beach, Taylor County – Begin at 29º 49' 50" N. Lat., 83º 35' 24" W. Long.; then west to 29º 49' 45", 83º 35' 50"; then south to 29º 49' 04", 83º 35' 48"; then east to 29º 49' 04", 83º 35' 24"; then north to the point of beginning.

b. Steinhatchee, Taylor County – Begin at 29º 40' 35", 83º 22' 10"; then west to 29º 40' 35", 83º 23' 10"; then north to 29º 41', 83º 23' 10"; then west to 29º 41', 83º 24' 10"; then south to the Taylor County-Dixie County boundary; then eastward along the boundary to 29º 39' 55", 83º 22' 10"; then north to the point of beginning.

c. Suwannee, Dixie County – Begin at 29º 20' 30", 83º 08' 10"; then west to 29º 20' 30", 83º 08' 25"; then south to 29º 20' 05", 83º 08' 25"; then southwesterly along SR 349 to 29º 19' 51", 83º 08' 35"; then west to 29º 19' 51", 83º 08' 45"; then southwesterly to 29º 19' 40", 83º 09' 12"; then south to 29º 19' 30", 83º 09' 12"; then northeasterly to 29º 19' 39", 83º 08' 53"; then southeasterly to 29º 19' 25", 83º 08' 41"; then southwesterly to 29º 19' 20", 83º 08' 49"; then southeasterly to 29º 19' 14", 83º 08' 41"; then northeasterly along the bank of the Suwannee River to and along the bank of Demory Creek to 29º 19' 45", 83º 08' 10"; then north to the point of beginning.

d. Cedar Key unincorporated airport area, Levy County – Begin at 29º 08' 26", 83º 03' 17"; then south to 29º 07' 34", 83º 03' 17", then northeasterly to 29º 07' 48", 83º 02' 33"; beginning northerly and tracing the corporate limit of Cedar Key to the point of beginning.

e. Cedar Key unincorporated causeway area, Levy County – That portion of Section 20 lying within 1000 feet of the centerline of SR 24 and lying north of a line 500 feet northeast of and parallel to the northern corporate limit of Cedar Key.

f. Cedar Key channel, Levy County – Begin at 29º 08' 58", 83º 01' 17"; then west to 29º 08' 58", 83º 01' 24"; then south to 29º 08' 05", 83º 01' 26"; then northeasterly to 29º 08' 08", 83º 01' 17"; then northerly to the point of beginning.

g. Keaton Beach navigation channel, Taylor County – Begin at 29º 49' 02", 83º 35' 30"; then west to 29º 49' 02", 83º 37' 58"; then south to 29º 48' 45", 83º 37' 58"; then east to 29º 48' 45", 83º 35' 30"; then north to the point of beginning.

h. Keaton Beach local channels, Taylor County – Begin at 29º 49' 01", 83º 35' 38"; then southeast to 29º 48' 55", 83º 35' 15"; then northeast to 29º 48' 59", 83º 35' 13"; then northwest to 29º 49' 06", 83º 35' 36"; then southwest to the point of beginning. (10-29-86)

5. Biscayne Bay (Cape Florida)	Dade/Monroe
6. Biscayne Bay (Card Sound) (12-1-82)	Dade/Monroe
7. Boca Ciega Bay	Pinellas
8. Cape Haze	Charlotte/Lee
9. Cape Romano-Ten Thousand Islands	Collier
10. Cockroach Bay	Hillsborough
11. Coupon Bight	Monroe
12. Estero Bay (as mod. 4-19-88)	Lee
13. Fort Clinch State Park	Nassau
14. Fort Pickens State Park	Santa Rosa/Escambia
15. Gasparilla Sound-Charlotte Harbor (as mod. 10-4-90)	Charlotte/Lee
16. Guana River Marsh (8-8-94)	St. Johns
17. Indian River Malabar to Vero Beach	Brevard/Indian River
18. Indian River Malabar to Vero Beach (additions), except those Indian River portions of Sebastian Creek and Turkey Creek upstream of U.S. Highway 1 (1-26-88)	Brevard/Indian River
19. Indian River Vero Beach to Ft. Pierce (as mod. 10-4-90)	Indian River/St. Lucie
20. Jensen Beach to Jupiter Inlet (as mod. 10-4-90)	Martin/Palm Beach/St. Lucie
21. Lake Jackson	Leon
22. Lemon Bay (4-19-88; as mod. 10-4-90)	Charlotte/Sarasota
23. Lignumvitae Key	Monroe
24. Loxahatchee River-Lake Worth Creek (as mod. 8-8-94)	Martin/Palm Beach
25. Matlacha Pass	Lee
26. Mosquito Lagoon	Volusia/Brevard
27. Nassau River-St. Johns River Marshes	Nassau/Duval
28. North Fork, St. Lucie	St. Lucie/Martin
29. Oklawaha River (10-4-90)	Marion
30. Pellicer Creek	St. Johns/Flagler
31. Pine Island Sound	Lee
32. Pinellas County	Pinellas

33. Rainbow Springs (4-19-88)	Marion
34. Rocky Bayou State Park	Okaloosa
35. Rookery Bay (12-1-82; as mod. 11-24-87, 7-11-91)	Collier
36. St. Andrews State Park	Bay
37. St. Joseph Bay	Gulf
38. St. Martins Marsh (as mod. 8-8-94)	Citrus
39. Terra Ceia (5-22-86)	Manatee
40. Tomoka Marsh	Volusia/Flagler
41. Wekiva River (12-1-82)	Lake/Orange/ Seminole
42. Wekiva River Addition, except that portion of the St. Johns River between Interstate Highway 4 and the Wekiva River confluence (12-28-88)	Lake/Seminole/ Volusia
43. Yellow River Marsh	Santa Rosa

(i) Special Waters.

1. Apalachicola River except for the following areas:

a. From a point 50 feet north of the northern boundary of the Jackson County Port Authority Slip, and including the slip itself, downstream to a point about four-tenths of a mile downstream, and specifically identified by navigation mile 103 on the 1982 U.S. Geological Survey Quadrangle Map of Sneads, Florida; and

b. From 850 feet downstream of the U.S. Army Corps of Engineers Blountstown Navigation Gage in Calhoun County, north to a point approximately 2,700 feet upstream of the Gage, and specifically identified by the line passing through 30º 25' 45" N. Lat. and 85º 1' 35" W. Long.; and 30º 25' 38" N. Lat. and 85º 1' 20" W. Long. (12-11-84).

2. Aucilla River.

3. Blackwater River.

4. Butler Chain of Lakes – consisting of Lake Butler, Lake Down, Wauseon Bay, Lake Louise, Lake Palmer (also known as Lake Isleworth), Lake Chase, Lake Tibet, Lake Sheen, Pocket Lake, Fish Lake, and the waterways which connect these lakes (3-1-84), and Lake Blanche and its connecting waterway (2-18-87).

5. Chassahowitzka River System including: Potter, Salt, Baird, Johnson, Crawford, Ryle, and Stevenson Creeks, and other tributaries to the Chassahowitzka River; but excluding artificial waterbodies, defined as any waterbody created by dredging, or excavation, or by the filling in of its boundaries, including canals as defined in subsection 62-312.020(3), F.A.C. (1-5-93).

6. Chipola River.

7. Choctawhatchee River.

8. Clermont Chain of Lakes – consisting of Lake Louisa (also known as Lake Louise), Lake Susan, Lake Crescent, Lake Minnehaha, Lake Winona, Lake Palatlakaha, Lake Hiawatha, Lake Minneola, Lake Wilson, Lake Cook, Cherry Lake, Lake Hunt, Lake Stewart, Lake Lucy, Lake Emma, and the waterways that interconnect Clermont Chain of Lakes (5-28-86).

9. Crooked Lake in Polk County including the area known as Little Crooked Lake and the connecting waterway between these waterbodies; less however, artificial waterbodies, defined as any waterbody created by dredging, or excavation, or by the filling in of its boundaries, including canals as defined in subsection 62-312.020(3), F.A.C. (4-9-87).

10. Crystal River, including Kings Bay (2-1-83).

11. Econlockhatchee River System – consisting of the Econlockhatchee River and the following tributaries:

a. Little Econlockhatchee River upstream to Michaels Dam in Jay Blanchard Park; and

b. Mills Creek upstream to Mills Lake; and

c. Southerly branch of Mills Creek upstream to Fort Christmas Road in Section 2, Township 22 South, Range 32 East; and

d. Silcox Branch (branch of Mills Creek) upstream to Lake Pickett; and

e. Long Branch upstream to the eastern section line of Section 34, Township 22 South, Range 32 East; and

f. Hart Branch upstream to the Old Railroad Grade in Section 18, Township 23 South, Range 32 East; and

g. Cowpen Branch upstream to the southernmost bifurcation of the creek in Section 20, Township 23 South, Range 32 East; and

h. Green Branch upstream to the western section line of Section 29, Township 23 South, Range 32 East; and

i. Turkey Creek upstream to Weewahootee Road in Section 5, Township 24 South, Range 32 East, and to the west section lines of Section 5, Township 24 South, Range 32 East, and Section 32, Township 23 South, Range 32 East; and

j. Little Creek upstream to the eastern section line of Section 22, Township 24 South, Range 32 East; and

k. Fourmile Creek upstream to the southern line of the NE 1{2} of Section 28, Township 24 South, Range 32 East; and

l. Econlockhatchee River Swamp upstream to State Road 532;

m. But excluding all other tributaries and artificial water bodies, defined as any water body created by dredging, or excavation, or by the filling in of its boundaries, including canals as defined in subsection 62-312.020(3), F.A.C. (6-18-92).

12. Estero Bay Tributaries including: Hendry Creek to State Road 865, Big Bayou, Mullock Creek to U.S. 41 (State Road 45); Mud Creek; Estero River (north and south branches) to I-75 Halfway Creek to State Road 41; Spring Creek to Business Route 41 (State Road 887, old State Road 41), and the unnamed south branch of Spring Creek in Sections 20 and 29; Imperial River to the eastern line of Section 31, Range 26 East, Township 47 South, Oak Creek, and Leitner Creek; except for Tenmile Canal and any artificial water bodies, defined as any water body created by dredging, or excavation, or by the filling in of its boundaries, including canals as defined in subsection 62-312.020(3), F.A.C. (10-4-90).

13. Florida Keys, including channels as defined in subsection 62-312.020(4), F.A.C., and described as follows: Commence at the northeasterly most point of Palo Alto Key and run due north to a point at the center of the channel of Broad Creek as the point of beginning, thence due east to the eastern boundary of the jurisdictional waters of the State of Florida, thence meander southerly along said eastern boundary to a point due south of the westernmost point of the island of Key West; thence westerly, northerly and easterly along the arc of a curve three leagues distant from the westernmost point of the island of Key West to a point due north of the island of Key West; thence northeasterly three leagues distant from the most northerly land of the Florida Keys to the intersection with the boundary of the Everglades National Park; thence southeasterly, northeasterly and northwesterly along the boundary of the Everglades National Park to the intersection with the Dade County-Monroe County line; thence northeasterly and easterly along the Dade County-Monroe County line to the point of beginning; less however, three areas:

a. Key West Sewage Outfall, being a circle 150 feet in radius from the point of discharge located at approximately 24º 32' 13" N. Latitude and 81º 48' 55" W. Longitude; and

b. Stock Island Power Plant Mixing Zone; being a circle 150 feet in radius from the end of the power plant discharge canal; and

c. Artificial waterbodies, defined as any waterbody created by dredging, or excavation, or by the filling in of its boundaries, including canals as defined in subsection 62-312.020(3), F.A.C. (5-8-85).

14. Hillsborough River from Fletcher Avenue (State Road 582A) in Hillsborough County upstream to the Withlacoochee River Overflow in Pasco County, and the following tributaries:

a. Crystal Springs; and

b. Blackwater Creek westward of the Hillsborough – Polk County line; and

c. Cypress Creek, Thirteenmile Run eastward of Livingston Avenue, and Big Cypress Swamp upstream to and including the Cypress Creek Wellfield, as delineated in the maps entitled “Cypress Creek OFW Boundary Maps,” incorporated herein by reference; and

d. Trout Creek upstream to Bruce B. Downs Boulevard (State Road 581);

e. But excluding all other tributaries as well as the proposed transportation corridor, which crosses Cypress Creek in Section 21, Township 27 South, Range 19 East, as identified in the Adopted 2010 Long Range Transportation Plan of the Metropolitan Planning Organization, dated May 26, 1993.

f. A copy of the maps referenced in subparagraph c. above may be obtained from the Department of Environmental Protection, Bureau of Surface Water Management, 2600 Blair Stone Road, Tallahassee, Florida 32399-2400 (4-12-95).

15. Homosassa River System including: Halls River, Turtle, Otter, Battle, and Price Creeks, and other tributaries to the Homosassa River; but excluding artificial waterbodies, defined as any waterbody created by dredging, or excavation, or by the filling in of its boundaries, including canals as defined in subsection 62-312.020(3), F.A.C. (1-5-93).

16. Kingsley Lake and Black Creek (North Fork) downstream to the northern line of Section 23, Township 5 South, Range 23 East, including all tributaries along this segment of Black Creek (11-8-90).

17. Lake Disston – Specifically including Lake Disston plus contiguous wetlands within the following areas: Township 14 South, Range 29 East, Sections 21, 20, 19, 18, 17, 16, 9, 8 and 7 in Flagler County; and Township 14 South, Range 28 East, Sections 13 and 24 in Volusia County except:

a. Artificial water bodies defined as any water body created by dredging, or excavation, or by the filling in of its boundaries, including canals as defined in subsection 62-312.020(3), F.A.C.; and

b. Any natural water bodies connected by artificial water bodies to the above-described system.

18. Lake Powell, Phillips Inlet, and all tributaries to Lake Powell as bounded by the following described line: Begin at the Northwest corner of Section 26, Township 2 South, Range 18 West; thence East to the Northwest corner of Section 29, Township 2 South, Range 17 West; thence South to the Northwest corner of the SW 1/4 of Section 29, Township 2 South, Range 17 West; thence East to the West line of Section 27, Township 2 South, Range 17 West, thence South to the mean high water line of the Gulf of Mexico; thence meander Northwest along the mean high water line to the West line of Section 35, Township 2 South, Range 18 West; thence North to the point of beginning (8-18-91).

19. Lemon Bay estuarine system – from Boca Grande Causeway northward to approximately two thousand feet northwest of the mouth of Alligator Creek, specifically identified as the East line of Section 31, Township 39 South, Range 19 East, including Placida Harbor, Gasparilla Pass, Kettle Harbor, Bocilla Lagoon, Bocilla Pass, Knight Pass, Stump Pass, Lemon Bay, Buck Creek upstream to County Road 775, Oyster Creek upstream to County Road 775, Ainger (Rock) Creek upstream to County Road 775, and Godfrey (Godfried, Gottfried) Creek upstream to County Road 775; but excluding:

a. Alligator Creek, Forked Creek, Lemon Creek, and all other tributaries; and

b. Artificial waterbodies, defined as any waterbody created by dredging, or excavation, or by the filling in of its boundaries, including canals as defined in subsection 62-312.020(3), F.A.C. (4-29-86).

20. Little Manatee River – from its mouth to the western crossing of the river by S.R. 674, including Hayes, Mill and Bolster Bayous, but excluding South Fork, Ruskin Inlet and all other tributaries (10-1-82).

21. Lochloosa Lake (including Little Lochloosa Lake, Lochloosa Lake Right Arm, and Lochloosa Creek upstream to County Road 20A) (12-15-87).

22. Myakka River between State Road 771 (El Jobean Bridge) and the Charlotte-Sarasota County line, except for artificial waterbodies, defined as any waterbody created by dredging, or excavation, or by the filling in of its boundaries, including canals as defined in subsection 62-312.020(3), F.A.C. (4-19-88).

23. Ochlockonee River.

24. Oklawaha River between the eastern line of Section 36, Township 15 South, Range 23 East, and Eureka Lock and Dam, including Turkey Creek, Strouds Creek, Dead River (the water body so named near Gores Landing), Cedar Creek, and Fish Creek, but excluding Marshall Swamp, the Dead River (the water body so named exiting Marshall Swamp), and all other tributaries (12-20-89).

25. Orange Lake up to the U.S. Highway 301 bridge, the River Styx up to Camps Canal, and Cross Creek (4-9-87).

26. Perdido River.

27. Rainbow River, including Indian Creek, but excluding all other tributaries (1-17-85).

28. Santa Fe River System – consisting of the Santa Fe River, Lake Santa Fe, Little Lake Santa Fe, Santa Fe Swamp, Olustee Creek, and the Ichetucknee River below S.R. 27, but excluding all other tributaries (8-16-84).

29. Sarasota Bay estuarine system – generally extending from Venice north to the Hillsborough-Manatee County line and specifically described as follows: Commence at the northern tip of Anna Maria Island and follow a line running to the southern tip of Egmont Key until intersecting the boundary between Hillsborough and Manatee Counties; thence run easterly and northeasterly along the county boundary until intersecting the Intracoastal Waterway; thence proceed southerly until intersecting a line between the southern tip of Mullet Key and the western tip of Snead Island; thence proceed southeasterly along said line to the western tip of Snead Island; thence to De Soto Point; and thence westerly and southerly including all of the Sarasota Bay estuarine system southward to the northernmost U.S. Highway Business Route 41 bridge over the Intracoastal Waterway in Venice, including Anna Maria Sound, Passage Key Inlet, Perico Bayou, Palma Sola Bay, Longboat Pass, Sarasota Bay, New Pass, Big Sarasota Pass, Roberts Bay, Little Sarasota Bay, Dryman Bay, Blackburn Bay, Lyons Bay, Venice Inlet, Dona Bay upstream to the U.S. Highway 41 bridge, and Roberts Bay upstream to the U.S. Highway 41 bridge; less however, the following areas:

a. All tributaries, including Palma Sola Creek, Bowlees Creek, Whitaker Bayou, Hudson Bayou, Phillippi Creek, Catfish Creek, North Creek, South Creek, Shakett Creek, Curry Creek; and

b. A circle 1500 feet in radius from the mouth of Whitaker Bayou; and

c. A circle 1500 feet in radius from the mouth of Phillippi Creek; and

d. Artificial waterbodies, defined as any waterbody created by dredging, or excavation, or by the filling in of its boundaries, including canals as defined in subsection 62-312.020(3), F.A.C. (4-29-86).

e. The designation shall not affect the consideration by the Department of an application for Site Specific Alternative Criteria for the discharge of the City of Bradenton's Municipal Sewage Treatment Plant being built under Department of Environmental Protection Construction Permit No. DC41-81224. The application will be processed under the regulations of the Department existing on February 18, 1986.

30. St. Marks River – except that part between Rattlesnake Branch and the confluence of the St. Marks and Wakulla Rivers.

31. Shoal River.

32. Silver River (Marion County) (4-9-87).

33. Spruce Creek upstream to State Road 40A, and the following tributaries:

a. Unnamed tributary upstream to the Southern section line of Section 4, Township 17 South, Range 33 East; and

b. Unnamed tributary upstream to the Northern section line of Section 20, Township 16 South, Range 33 East; and

c. Unnamed tributary upstream to the Northern section line of Section 23, Township 16 South, Range 32 East (right fork), and to the Western line of the NE 1/4 of Section 27, Township 16 South, Range 32 East; and

d. Unnamed tributary upstream to the Western section line Section 35, Township 16 South, Range 32 East; and

e. Strickland Bay; and Turnbull Bay and Turnbull Creek upstream to the Northwestern section line of Section 43, Township 17 South, Range 33 East; and

f. Murray Creek upstream to the Town of Ponce Inlet municipal limits; and

g. Waters east from U.S. Highway 1 following the northerly and southerly municipal limits of the Town of Ponce Inlet to its intersection with the western boundary of the Intracoastal Waterway and including Rose Bay upstream to Nova Road (State Road 5A);

h. But excluding all other tributaries (7-11-91).

34. Suwannee River.

35. Tomoka River upstream to Interstate Highway 4; and the following tributaries:

a. Priest Branch upstream to the Western and Southern section lines of Section 6, Township 15 South, Range 32 East; and

b. Little Tomoka River and its tributaries as bounded by the following described line: Begin at the Southwestern point of confluence between the Tomoka River and the Little Tomoka River; thence meander upstream along the Little Tomoka River to the Western section line of Section 25, Township 14 South, Range 31 East; thence South to the Southwest corner of Section 25, Township 14 South, Range 31 East; thence West to the Southwest corner of Section 28, Township 14 South, Range 31 East; thence North to the Northwest corner of Section 28, Township 14 South, Range 31 East; thence East to the West section line of Section 25, Township 14 South, Range 31 East; thence South to the Northern shore of the Little Tomoka River; thence meander easterly to the confluence with the Tomoka River; thence South to the point of beginning; and

c. Groover Branch upstream to the Northern section line of Section 24, Township 14 South, Range 31 East; and

d. Misner's Branch upstream to the Northern section line of Section 29, Township 14 South, Range 32 East; and

e. Thompson Creek and Strickland Creek upstream to the Northern section line of Section 40, Township 14 South, Range 32 East;

f. But excluding all other tributaries (7-11-91).

36. Wacissa River.

37. Wakulla River.

38. Weekiwachee Riverine and Spring System – consisting of the Weekiwachee Springs and River, Mud Springs and River, Jenkins Creek, Salt Spring and Creek, the Weekiwachee Swamp, and all tributaries and contiguous wetlands within the following sections: Township 23 South, Range 17 East, Sections 2-9; Township 22 South, Range 17 East, Sections 20, 21, and 27-35, together with that portion of Section 19 that is southerly of CR 550 (Cortez Blvd.); Township 22 South, Range 16 East, Sections 25 and 36; including any and all waters, and wetlands contiguous to the tributaries located southerly of the north line of Section 25, Township 22 South, Range 16 East and westerly projection thereof and easterly of the west line of Section 36, Township 22 South, Range 16 East and northerly projection thereof, and easterly of a line through latitude 28º 32' 52" North, longitude 82º 39' 23" West, and through latitude 28º 31' 47" North, longitude 82º 39' 52" West (North American Datum of 1983). This OFW excludes artificial waters defined as any water body created by dredging, or excavation, or by the filling in of its boundaries, including canals as defined in subsection 62-312.020(3), F.A.C. (12-11-03).

39. Wekiva River System – consisting of the Wekiva River, Rock Springs Run and its tributary Sulphur Spring, the Little Wekiva River south to its confluence with the southernmost run of Sanlando Springs, Black Water Creek and Swamp (up to Lake Dorr), Lake Norris, Seminole Springs and Creek, Seminole Swamp, Sulphur Spring and Run, and Messant Spring and Creek, but excluding all other tributaries (12-28-88).

40. Wiggins Pass Estuarine Area and the Cocohatchee River System – the estuarine and marine waters from the Lee/Collier County line southward through and including Water Turkey Bay to 50 feet north of S.R. 846 (Bluebill Ave.) 1995 right-of-way; the Cocohatchee River downstream from 50 feet west of U.S. 41 1995 right-of-way; and Wiggins Pass; but excluding maintenance dredging as authorized by Section 403.813(2)(f), F.S., in the following areas:

a. Wiggins Pass from the Gulf of Mexico eastward for 200 linear feet (as measured from the southwestern point of Little Hickory Island);

b. The channel (South Channel, Vanderbilt Channel), that connects Wiggins Pass with Vanderbilt Lagoon through Water Turkey Bay; and

c. East Channel (for purposes of this designation described as the East Channel from its confluence with South Channel to Vanderbilt Drive, including all waters surrounding the spoil islands known as Conklin Point and Island Marina).

41. Withlacoochee Riverine and Lake System, including:

a. The Withlacoochee River downstream of State Road 33 in Lake County to eastern section line of Section 33, Township 16 South, Range 18 East; and

b. The lower Withlacoochee River, from the Gulf of Mexico to the Cross Florida Barge Canal By-Pass Spillway, but not including that portion of the river between Lake Rousseau and the Cross Florida Barge Canal; and

c. The Little Withlacoochee River; and

d. Jumper Creek downstream of State Road 35, including Jumper Creek Swamp; and

e. Gum Springs, Gum Slough (Dead River), and Gum Swamp; and

f. Lake Panasoffkee, Outlet River, Little Jones Creek, Big Jones Creek, and Rutland Creek; and

g. Shady (Brook, Panasoffkee) Creek downstream of State Road 468, including Warm Spring Hammock; and

h. Lake Tsala Apopka; and

i. But excluding all other tributaries and artificial waterbodies, defined as any waterbody created by dredging, or excavation, or by the filling in of its boundaries, including canals as defined in subsection 62-312.020(3), F.A.C. (4-10-89); and

(j) Waters within Rivers Designated Under the Florida Scenic and Wild Rivers Program, Federal Wild and Scenic Rivers Act of 1968 as amended, and Myakka River Wild and Scenic Designation and Preservation Act

River Segment	County
1. Loxahatchee National Wild and Scenic River Segment (5-14-86)	Martin/Palm Beach
2. Myakka Florida Wild and Scenic River Segment (5-14-86)	Sarasota
3. Wekiva Florida Scenic and Wild River Segment (12-1-82)	Lake/Seminole

(k) Waters within National Preserves

National Preserve	County
1. Big Cypress National Preserve (as mod. 5-14-86, 4-19-88, 8-8-94)	Collier/Dade/ Monroe
2. Timucuan Ecological and Historic Preserve (8-8-94)	Duval

(l) Waters within National Marine Sanctuaries

Marine Sanctuary	County
1. Key Largo	Monroe
2. Looe Key (12-1-82)	Monroe

(m) Waters within National Estuarine Research Reserves

National Estuarine Research Reserve	County
1. Apalachicola (12-1-82; as mod. 5-14-86, 4-19-88)	Franklin/Gulf
2. Rookery Bay (as mod. 5-14-86, 4-19-88)	Collier

(n) Certain Waters within the Boundaries of the National Forests

National Forest	County
1. Apalachicola	Wakulla/Leon/ Franklin
a. Sopchoppy River (9-1-82)	
b. Big Dismal Sink (9-1-82)	
2. Ocala	Putnam/Marion/ Lake
a. Alexander Springs (9-1-82)	
b. Alexander Springs Creek (9-1-82)	
c. Juniper Springs (9-1-82)	
d. Juniper Creek (9-1-82)	
e. Salt Springs (9-1-82)	
f. Salt Springs Run (9-1-82)	
g. Lake Dorr (9-1-82)	
h. Lake Kerr (9-1-82)	
i. Little Lake Kerr (9-1-82)	
3. Osceola	Baker/Columbia
a. Deep Creek (9-1-82)	
b. Robinson Creek (9-1-82)	
c. Middle Prong – St. Marys River (9-1-82)	
d. Ocean Pond (9-1-82)	
e. Falling Creek (9-1-82)	

(10) Outstanding National Resource Waters:

(a) The Commission designates the following waters as Outstanding National Resource Waters:

1. Biscayne National Park, as described in the document entitled “Outstanding National Resource Waters Boundary Description and Map for Biscayne National Park”, dated June 15, 1989, herein adopted by reference.

2. Everglades National Park, as described in the document entitled “Outstanding National Resource Waters Boundary Description and Map for Everglades National Park”, dated June 15, 1989, herein adopted by reference.

(b) It is the intent of the Commission that water bodies designated as Outstanding National Resource Waters shall be protected and maintained to the extent required by the federal Environmental Protection Agency. Therefore, the designations set forth in paragraph 62-302.700(10)(a), F.A.C., shall not be effective until the Florida Legislature enacts legislation specifically authorizing protection and maintenance of Outstanding National Resource Waters to the extent required by the federal Environmental Protection Agency pursuant to 40 C.F.R. 131.12.

(c) It is also the intent of the Commission to utilize the Surface Water Improvement and Management Act planning process, as outlined in Section 373.451, F.S., and Chapter 62-43, F.A.C., to establish the numerical standards for water quality parameters appropriate for Everglades and Biscayne National Parks’ status as outstanding National Resource Waters.

(d) The baseline for defining the existing ambient water quality (paragraph 62-4.242(2)(c), F.A.C.) in Outstanding National Resource Waters is a five year period from March 1, 1976 to March 1, 1981, unless otherwise indicated.

Specific Authority 403.061, 403.087, 403.088, 403.804, 403.805 FS. Law Implemented 403.021, 403.061, 403.062, 403.087, 403.088, 403.101, 403.141, 403.182, 403.502, 403.702, 403.708, 403.918 FS. History–New 3-1-79, Amended 8-10-80, 8-24-82, 9-30-82, 11-30-82, 2-1-83, 6-1-83, 3-1-84, 8-16-84, 12-11-84, 1-17-85, 5-8-85, 4-29-86, 5-14-86, 5-22-86, 5-28-86, 10-29-86, 2-18-87, 4-9-87, 11-24-87, 12-15-87, 1-26-88, 4-19-88, 12-28-88, 4-10-89, 9-13-89, 10-4-89, 12-20-89, 1-28-90, Formerly 17-3.041, Amended 10-4-90, 11-8-90, 7-11-91, 8-18-91, 12-11-91, 6-18-92, 1-5-93, 8-8-94, Formerly 17-302.700, Amended 1-23-95, 4-3-95, 4-12-95, 7-16-96, 4-4-01, 12-11-03.

62-302.800 Site Specific Alternative Criteria.

(1) A water body, or portion thereof, may not meet a particular ambient water quality criterion specified for its classification, due to natural background conditions or man-induced conditions which cannot be controlled or abated. In such circumstances, and upon petition by an affected person or upon the initiation by the Department, the Secretary may establish a site specific alternative water quality criterion when an affirmative demonstration is made that an alternative criterion is more appropriate for a specified portion of waters of the state. Public notice and an opportunity for public hearing shall be provided prior to issuing any order establishing alternative criteria.

(a) The affirmative demonstration required by this section shall mean a documented showing that the proposed alternative criteria would exist due to natural background conditions or man-induced conditions which cannot be controlled or abated. Such demonstration shall be based upon relevant factors which include:

1. A description of the physical nature of the specified water body and the water pollution sources affecting the criterion to be altered.

2. A description of the historical and existing water quality of the parameter of concern including, spatial, seasonal, and diurnal variations, and other parameters or conditions which may affect it. Conditions in similar water bodies may be used for comparison.

3. A description of the historical and existing biology, including variations, which may be affected by the parameter of concern. Conditions in similar water bodies may be used for comparison.

4. A discussion of any impacts of the proposed alternative criteria on the designated use of the waters and adjoining waters.

(b) The Secretary shall specify, by order, the site specific criteria for the parameters which the Secretary determines to have been demonstrated by the preponderance of competent substantial evidence to be more appropriate.

(2) In accordance with the procedures set forth below, affected persons may petition the Department to adopt an alternative water quality criterion for a specific water body, or portion thereof, on the basis of site-specific reasons other than those set forth above in subsection 62-302.800(1), F.A.C. The Department shall process any such petition as follows:

(a) No later than 60 days after receipt of a petition, the Department shall review the petition and notify the petitioner of whether the petition is sufficiently complete to enable the Department to evaluate the proposed site-specific alternative criterion under subparagraph (c) below. If the petition is not sufficiently complete, the Department shall request the submittal of additional information. The Department shall review any additional information within 60 days of receipt from the applicant and may then request only that information reasonably needed to clarify or answer new questions directly related to the additional information, unless the Department shows good cause for not having requested the information previously.

(b) Petitions deemed complete by the Department shall be processed under subparagraph (c). For any petition not deemed complete, if the petitioner believes that additional information requested by the Department under subparagraph (a) is not necessary to the Department’s evaluation, the Department, at the petitioner’s request, shall proceed to process the petition under subparagraph (c) below.

(c) The Department shall initiate rulemaking for the Commission to consider approval of the proposed alternative criterion as a rule if the petitioner meets all the requirements of this subparagraph and its subparts. The petitioner must demonstrate that the proposed criterion would fully maintain and protect human health, existing uses, and the level of water quality necessary to protect human health and existing and designated beneficial uses. If the petition fails to meet any of these requirements (including the required demonstration), the Department shall issue an order denying the petition. In deciding whether to initiate rulemaking or deny the petition, the Department shall evaluate the petition and other relevant information according to the following criteria and procedures:

1. The petition shall include all the information required under subparagraphs (1)(a)1.-4. above.

2. In making the demonstration required by this subparagraph (c), the petition shall include an assessment of aquatic toxicity, except on a showing that no such assessment is relevant to the particular criterion. The assessment of aquatic toxicity shall show that physical and chemical conditions at the site alter the toxicity or bioavailability of the compound in question and shall meet the requirements and follow the Indicator Species procedure set forth in *Water Quality Standards Handbook* (December 1983), a publication of the United States Environmental Protection Agency, incorporated here by reference.

3. The demonstration shall also include a risk assessment that determines the human exposure and health risk associated with the proposed alternative criterion, except on a showing that no such assessment is relevant to the particular criterion. The risk assessment shall include all factors and follow all procedures required by generally accepted scientific principles for such an assessment, such as analysis of existing water and sediment quality, potential transformation pathways, the chemical form of the compound in question, indigenous species, bioaccumulation and bioconcentration rates, and existing and potential rates of human consumption of fish, shellfish, and water. If the results of the assessments of health risks and aquatic toxicity differ, the more stringent result shall govern.

4. The demonstration shall include information indicating that one or more assumptions used in the risk assessment on which the existing criterion is based are inappropriate at the site in question and that the proposed assumptions are more appropriate or that physical or chemical characteristics of the site alter the toxicity or bioavailability of the compound. Such a variance of assumptions, however, shall not be a ground for a proposed alternative criterion unless the assumptions characterize a factor specific to the site, such as bioaccumulation rates, rather than a generic factor, such as the cancer potency and reference dose of the compound. Man-induced pollution that can be controlled or abated shall not be deemed a ground for a proposed alternative criterion.

5. The petition shall include all information required for the Department to complete its economic impact statement for the proposed criterion.

6. For any alternative criterion more stringent than the existing criterion, the petition shall include an analysis of the attainability of the alternative criterion.

7. No later than 180 days after receipt of a complete petition or after a petitioner requests processing of a petition not found to be complete, the Department shall notify the petitioner of its decision on the petition. The Department shall publish in the Florida Administrative Weekly either a notice of rulemaking for the proposed alternative criterion or a notice of the denial of the petition, as appropriate, within 30 days after notifying the petitioner of the decision. A denial of the petition shall become final within 14 days unless timely challenged under Section 120.57, F.S.

(d) The provisions of this subsection do not apply to criteria contained in Rule 62-302.500, F.A.C., or criteria that apply to:

1. Bacteriological Quality.
2. Biological Integrity.
3. B.O.D.
4. Chlorides.
5. Color.
6. Detergents.
7. Dissolved Oxygen.
8. Dissolved Solids.
9. Nutrients.
10. Odor.
11. Oils and Greases.
12. Radioactive Substances.
13. Specific Conductance.
14. Substances in concentrations that injure, are chronically toxic to, or produce adverse physiological or behavioral response in humans, animals, or plants.
15. Substances in concentrations that result in the dominance of nuisance species.
16. Total Dissolved Gases.
17. Transparency.
18. Turbidity.
19. Any criterion or maximum concentration based on or set forth in paragraph 62-4.244(3)(b), F.A.C.

(e) Despite any failure of the Department to meet a deadline set forth in this subsection (4), the grant of an alternative criterion shall not become effective unless approved as a rule by the Commission.

(f) Nothing in this rule shall alter the rights afforded to affected persons by Chapter 120, F.S.

(3) The Department shall modify permits of existing sources affected in a manner consistent with the Secretary's Order.

(4) Additional relief from criteria established by this Chapter may be provided through exemption pursuant to Rule 62-4.243, F.A.C., or variances as provided for by Rule 62-103.100, F.A.C.

Specific Authority 403.061, 403.062, 403.087, 403.504, 403.704, 403.804, 403.805 FS. Law Implemented 403.021, 403.061, 403.087, 403.088, 403.141, 403.161, 403.201, 403.502 FS. History–Formerly 17-3.05(4), Amended 3-1-79, 10-2-80, 2-1-83, Formerly 17-3.031, Amended 6-17-92, Formerly 17-302.800, Amended 5-15-02.

CHAPTER 8: EXISTING NATURAL SYSTEMS CONDITIONS

8.1 Overview

The Lower Sweetwater Creek watershed area encompasses 7,518 acres in Hillsborough County. The watershed contains plant communities, both terrestrial and aquatic, that provide a variety of important environmental functions, including habitats for listed species and other wildlife, stability for stream banks and lake shores, improvement of water and air quality, and moderation of water and air temperatures. However, plant communities have undergone several periods of significant alteration since the 1830's as land use in the watershed changed from original conditions to agriculture to the current suburban/urban uses. Land use shifts have left the watershed with substantially less acreage in native plant communities, impaired water quality in streams, degradation of all plant communities by non-native invasive plants, and highly disturbed stream banks and lake shores. Most populations of native wildlife have been reduced and/or eliminated.

One of the objectives of this watershed management plan is to identify opportunities to restore and protect natural systems in the Lower Sweetwater Creek watershed which are important in preventing excessive runoff volumes and pollutant loads, restoring and/or maintaining terrestrial and aquatic biodiversity, protecting stream channel stability, and reducing stream bank erosion. The first step toward this goal is to describe the historical and existing natural systems in the Lower Sweetwater Creek watershed and to identify specific key factors that prove useful in assessing watershed ecosystem quality. The evaluation of the key factors is done by means of a prioritization matrix which ranks the subwatersheds with respect to environmental quality. A discussion of the overall trends in environmental quality is provided early in the chapter, followed by more discussion of the significant issues for habitats and wildlife within the Lower Sweetwater Creek watershed.

8.2 Data Sources/Literature Review

Several sources of information were reviewed for this report, and a list appears in the Bibliography in Section 8.9. Further, Geographic Information System (GIS) databases were utilized from the following organizations:

- Florida Department of Environmental Protection (FDEP)
- Florida Department of Transportation (FDOT)
- Florida Fish and Wildlife Conservation Commission (FFWCC)
- Hillsborough County Stream Water Watch Program

- Florida Natural Areas Inventory (FNAI)
- Hillsborough County Environmental Protection Commission (EPC)
- Hillsborough County Environmental Lands Acquisition and Protection Program (ELAPP)
- Hillsborough County Planning Commission
- Hillsborough River Greenways Task Force (HRGTF)
- Southwest Florida Water Management District (SWFWMD)
- Natural Resources Conservation Service (NRCS)
- U.S. Fish and Wildlife Service (USFWS)
- University of Florida, Geoplan Center, Florida Geographic Data Library (FGDL)
- University of Florida Lakewatch Program
- University of South Florida, Florida Center for Community Development and Design

8.3 Overall Trends and Summary

There are numerous ecological factors and relationships that define the condition of a natural system, and therefore the "level of service" that can be provided by that system. To evaluate and score the watershed, a series of parameters were considered which represented important ecological functions, extent of human development/impacts, and the presence/absence of important wildlife species. The data that were used to develop quantitative parameter scores were processed and generated from a library of information and staff experience, in addition to existing GIS data provided by the SWFWMD and Hillsborough County. Most of these data are presented in subsequent subsections of this chapter. The parameters used in this LOS determination are described as follows:

- Historical and existing land use – expressed as a percent, this factor describes the change in land uses in the watershed area over the period from the 1950 to 2004;
- Loss of natural lands
  - habitat fragmentation – describes the impact to the watershed area of the splitting up and isolation of wildlife habitat;
  - riparian buffers – describes the losses of forested systems in stream floodplains and their significance to ecosystem quality in the watershed area;
- Hydrologic alterations – describes the impact to environmental quality and function resulting from physical alterations to streams and lakes such as channelization, diversion, filling, and encroachment;
- Exotic flora and fauna – describes the impact to native plant and animals in the watershed area of the invasion and establishment of exotic species;
- Strategic habitat conservation areas – describes the identification by FFWCC of areas that are particularly important to preserve in terms of wildlife conservation; and
- Land held in public ownership – describes the land acreage currently acquired by public resource conservation agencies that provides important natural environmental functions in the watershed area.

Using the data described in the following sections of this chapter, a natural systems evaluation matrix was developed to provide a comparative tool for measuring the quality and quantity of existing natural habitats within the watershed. This tool can be used to evaluate the overall condition of the watershed so that future efforts to protect or restore natural systems can be prioritized and implemented effectively either as stand-alone projects or in conjunction with flood and/or water quality improvement activities. An overall score was calculated based on the sum of scores for each habitat parameter (Table 8-1). Using a scoring technique similar to the water quality level of service evaluation, the overall natural system evaluation matrix score was based on the ratio of the total watershed score divided by the maximum possible score. The watershed was then given a grade based on the following ratios: *1.0 to 0.8 = A, 0.79 to 0.6 = B, 0.59 to 0.4 = C, 0.39 to 0.20 = D, <0.2 = F*.

Based on criteria relating to conservation lands, intactness of riparian buffers, contiguity of natural habitats, amount of natural habitat remaining, and the identification of Strategic Habitat Conservation Areas, the Lower Sweetwater Creek watershed received a grade of "F." No watersheds in the Northwest Hillsborough County area scored an "A" or a "B," indicating the overall degraded nature of natural systems in the region.

Table 8-1 Natural Systems Evaluation Matrix - Lower Sweetwater Creek Watershed

HABITAT PARAMETER	SCORE
Habitat fragmentation	0
Riparian buffer rating	1
Natural habitat remaining	0
Strategic Habitat Conservation Areas	0
Public ownership for conservation/restoration purposes	0
Overall score	F

The status of the natural systems in the Lower Sweetwater Creek watershed as a whole is described in this report section. Detailed descriptions of the conditions and an assessment of the natural systems are included in the following sections.

8.4 Historical and Existing Habitats

This section discusses, in broad terms, the historical (pre-1900) natural systems conditions based on information derived from the General Land Office Survey Notes. This description is presented as background for detailed discussion of the land use patterns and natural systems areal coverages existing in the 1950's and 2004. Information on the 1950's and 2004 land uses were obtained from SWFWMD. The following tables have collapsed the Level III Florida Land Use Cover and Forms Classification System (FLUCFCS) (2004) land use codes to Level I to enhance comparisons among the pre-1900, 1950's, and 2004 time periods. The figures illustrating land uses retain the Level III coding. The narratives following the tables provide details of the Level III land use cover types included in the Level I listings in the tables.

Historical (pre-1900) land uses and cover types – Prior to the permanent settlement of Hillsborough County in the first half of the 19th century, approximately 90% of the land in the Lower Sweetwater Creek watershed contained soils that supported two land cover types: pine flatwoods (FLUCFCS 411) and longleaf pine-xeric oak (FLUCFCS 412). The remainder of the land in the watershed was occupied by cypress swamps (FLUCFCS 621), stream and lake swamp (FLUCFCS 615), wetland forested mixed (FLUCFCS 630), freshwater marshes and wet prairies (FLUCFCS 641 and 643), saltwater marshes (FLUCFCS 642), tidal flats/submerged shallow platform (FLUCFCS 651), and mangrove swamps (FLUCFCS 612). Large areas of stream and lake swamp, cypress swamp, and saltwater marshes adjacent to the channel in the lower reaches of Lower Sweetwater Creek were significant contiguous wetlands in the watershed. By 1910, Hillsborough was the most populous county in the state, and considerable development of roads and railroads had occurred. By 1916, in the Lower Sweetwater Creek watershed, major roadways (Old Memorial Highway, Anderson Road, Sligh Avenue, Armenia Avenue, Dale Mabry Highway, Habana, Kelly Road, and Gunn Highway) were hard surface facilities, and numerous secondary roads were in place. Several hundred homes and buildings had been constructed, and the Tampa and Gulf Coast Railroad had at least two lines through the watershed. At least two small communities and villages (Lake View, Rocky Point) had grown up west of Tampa around roadway intersections and rail lines. By 1938, agriculture had become well established on the uplands (longleaf pine-xeric oak, pine flatwoods) throughout the watershed. Cattle, row crops, and citrus were the dominant commodities. By 1950, agriculture accounted for 27.9% of the lands in the watershed, while uplands were reduced to 38.8% of the watershed. By 2004, the percent coverage of the watershed by native uplands was further reduced to 3.1%.

Land uses and cover types from the 1950's - Table 8-2 provides a list and the acreages of land uses and cover types existing in 1950; each land use is compared to the total watershed area. Figure 8-1 illustrates the 1950 land uses and cover types in the Lower Sweetwater Creek watershed.

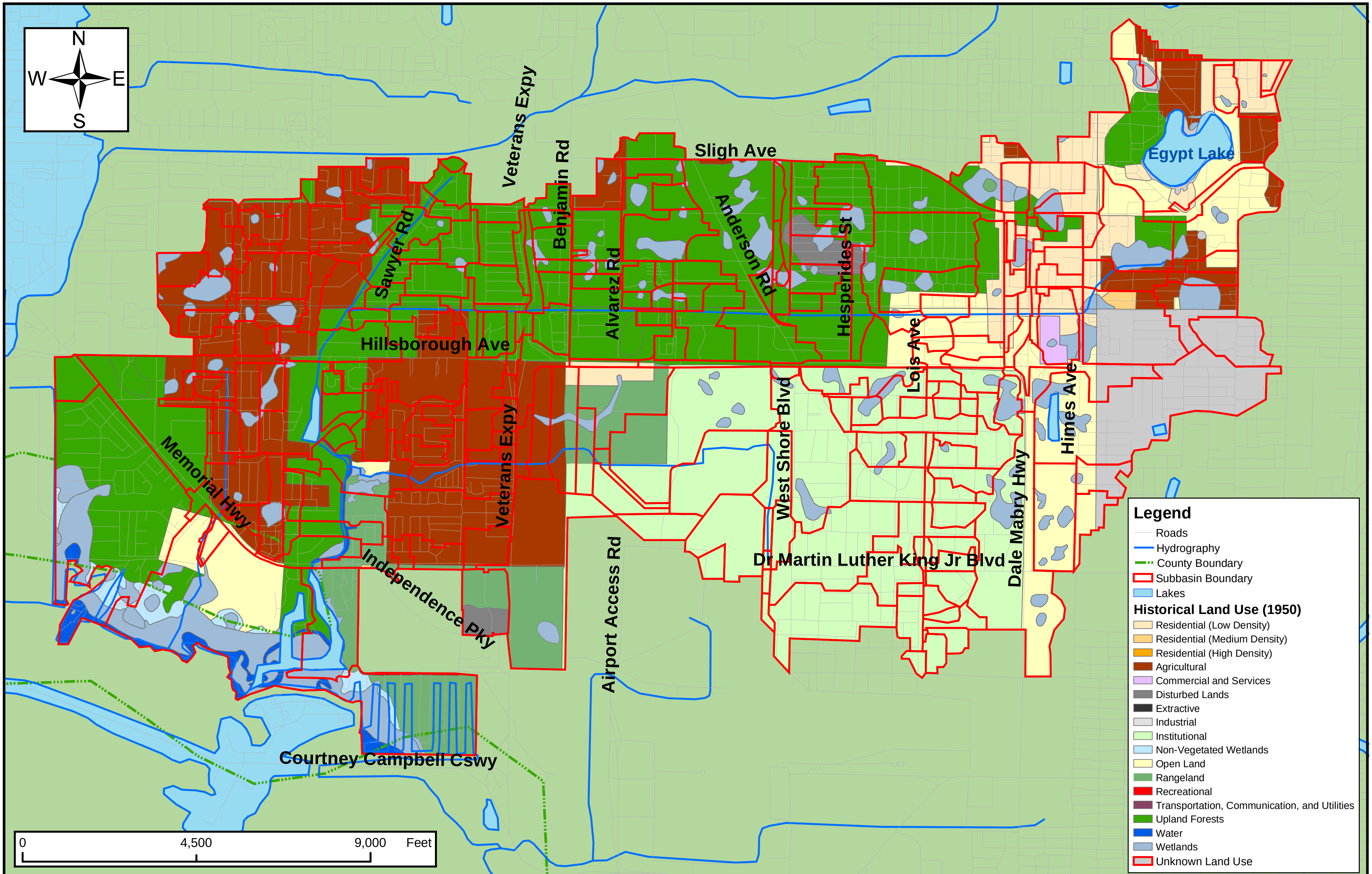
Table 8-2 Land Use in the Lower Sweetwater Creek Watershed, 1950

Land Use	Total Area (acres)	% of Watershed
Uplands	2539	34
Herbaceous wetlands	223	3
Forested wetlands	364	5
Agriculture	2093	28
Lakes	75	0.9
Low/Medium Density Residential	381	5
Commercial, Utilities, Transportation, Institutional	1511	20
Unknown land use	332	4
Total	7,518	99.9%

2004 land uses and cover types - Table 8-3 provides a list and the acreages of land uses and cover types existing in 2004; each land use is compared to the total watershed area. Figure 8-2 illustrates the 2004 land uses and cover types in the Lower Sweetwater Creek watershed.

Table 8-3 Land Use within the Lower Sweetwater Creek Watershed, 2004

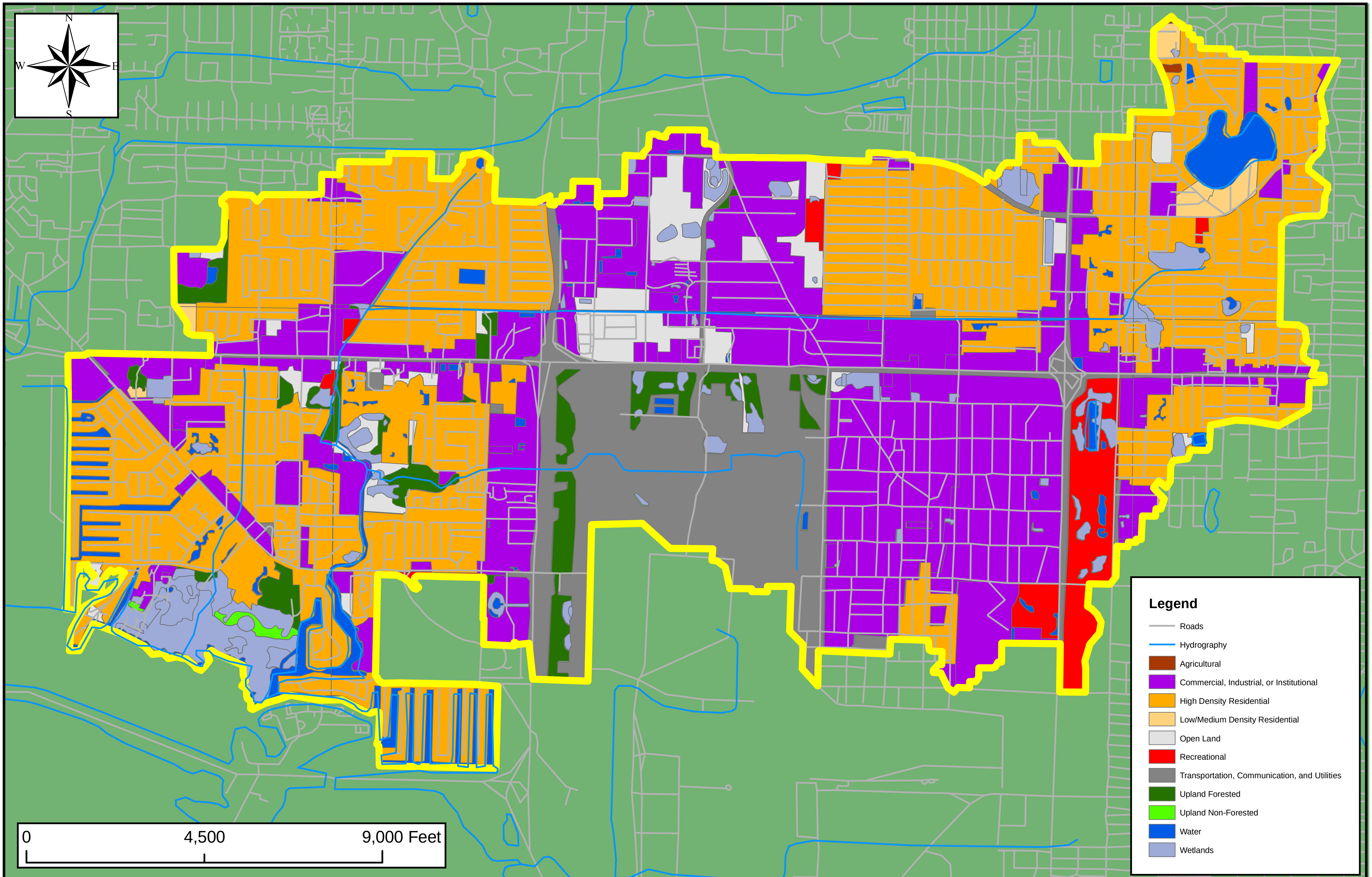
Land Use	Total Area (acres)	% of Watershed
Uplands	249	3
Wetlands	374	5
Agricultural	3.3	0.04
Water	275	3.4
Open Land / Recreational	512	7
Low/Medium Density Residential	58	0.72
High Density Residential	3125	40
Commercial, Utilities, Transportation, Institutional	3396	43
Total	7,991	100%



Historical Land Use in the Lower Sweetwater Creek Watershed (1950)

Figure 8-1

AYRES ASSOCIATES



Land Use in the Lower Sweetwater Creek Watershed (2004)

Figure 8-2

AYRES ASSOCIATES

8.4.1 Upland Natural Systems

The following upland habitat descriptions are based on the information contained in Harper (1921), Carlisle et al. (1978), Florida Department of Transportation's FLUCFCS Manual (1999), and the Soil Surveys of Hillsborough County from 1916, 1958, and 1989. In the plant community descriptions below, only the species that are most characteristic of the plant community in the Lower Sweetwater Creek watershed are mentioned as being present; however, the natural plant communities that still remain in the watershed are highly diverse and contain many more species than are mentioned in this report. For ease of reading, only common names of plants are used in the report narrative, but Section 8.10 provides a list of all scientific names of plants and animals included in the report.

Pine flatwoods (411)

The most common upland plant community in the state and in the Lower Sweetwater Creek watershed is the pine flatwoods community which is associated with Malabar fine sands and Immokalee fine sands. The primary canopy species common to pine flatwoods is slash pine with some longleaf pine, while the shrubby understory is dominated by saw palmetto with some gallberry, staggerbush, blueberry, and tarflower. Herbaceous ground cover is sparse and includes wiregrass, several species of bluestem, and goldenrod. This community occurs on flat, moderately to poorly drained terrain composed of acid sands overlying an organic/clayey hardpan. Even on better drained terrain, flatwoods can experience periods of inundation when rainfall amounts are in the normal to above normal range. On less well drained terrain, a wet phase of pine flatwoods occurs in which obligate to facultative-wet plant species can be found regularly. These species include trees: sweetbay, gordonia, red maple; shrubs: wax myrtle, gallberry, fetterbush; and herbs: spikerush, redroot, bog buttons, pink sundews, and yellow-eyed grass. Pine flatwoods is a fire-maintained community that will transition to a hardwood-dominated community with very dense canopy dominated by live oak, laurel oak, and pignut hickory if fire is excluded. In the Lower Sweetwater Creek watershed, pine flatwoods have been used for pasture, row crops, and (with drainage) some citrus. More recently, some residential and commercial development has replaced agriculture, and the percent of the watershed occupied by pine flatwoods decreased from 29% in 1950 to 0.3% in 2004.

Longleaf pine-xeric oak (412)

The longleaf pine - xeric oak plant community, also known as sandhill, is associated with Norfolk fine sands in the Lower Sweetwater Creek watershed. Natural canopy vegetation is dominated by longleaf pine, and characteristically has a mid-canopy of bluejack oak, turkey oak, sand live oak. The understory contains a medium to low density shrub community consisting of shiny blueberry, Darrow's blueberry, gopher apple, Adam's needle, and beautyberry. Herbs compose the ground cover and include: wiregrass, sky-blue lupine, drumheads, Carolina elephant's foot, dwarf pawpaw, and eastern milk pea. This community also is a fire-maintained community that will transition to a hardwood-dominated community with few to no pines and a very dense canopy dominated by sand live oak, turkey oak, bluejack oak if fire is excluded. This plant community occupied a large percentage of the watershed in the pre-development period, but was largely replaced by citrus by 1950. Longleaf pine-xeric oak has not become re-established in the watershed since 1950, and it remains absent from the 2004 land use mapping.

Hardwood conifer mixed forest (434)
In a hardwood-conifer mixed forest, neither upland conifers nor hardwoods attain more than 66% dominance in the canopy. By definition, these areas typically occur on well-drained but non-droughty soils and are often the result of fire suppression in pine flatwoods. Mixed forests are often successional to upland hardwood forests. This community has the same species as the longleaf pine-xeric community (FLUCFCS 412) except that neither the pines nor the oaks dominate. The percent coverage of this community increased from 0.4 to 2.6% between 1950 and 2004, likely as a result of natural successional activity.

Shrub and brushland (320)
Shrub and brushland occurs on the same soils as pine flatwoods and longleaf pine-xeric oak communities. However, it is dominated by herbs and shrubs; few to no trees are present. Typical species include saw palmetto, gallberry, wax myrtle, species of bluestem, other woody scrub plant species, and various short herbs and grasses as shown in the picture here. It often develops following the clearing of pines for timber or on long-fallow cropland. This community occupied 4.4% of the watershed in 1950 and 1% by 2004. The decrease in areal coverage of this community is likely related to the conversion of these lands to residential or commercial uses.

8.4.2 Wetland/Aquatic Natural Systems

The following wetland habitat descriptions are based on the information contained in Carlisle et al. (1978), Florida Department of Transportation's FLUCFCS Manual (1999), the Soil Surveys of Hillsborough County from 1916, 1958, and 1989, and the USDA aerial photos of 1938. For information on lakes and Lower Sweetwater Creek - Brushy Creek, SWFWMD's Directory of Lakes (SWFWMD, 2005) and the USF Hillsborough Watershed Atlas (http://www.hillsborough.wateratlas.usf.edu) were consulted. In the plant community descriptions below, only the species that are most characteristic of the plant community in the Lower Sweetwater Creek watershed are mentioned as being present; however, the natural plant communities that still remain in the watershed are highly diverse and contain many more species than are mentioned in this report. For ease of reading, only common names of plants are used in the report narrative, but Section 8.10 provides a list of all scientific names of plants and animals included in the report.

Cypress swamp (621)
Cypress swamp, another major plant community in the watershed in early 1900s, occupied only 1.1% of the Lower Sweetwater Creek watershed by 1950; and by 2004, this plant community occupied only 0.03% of the watershed, so it was virtually wiped out in recent years.

Stream and Lake swamp (615)
This category covered about 0.1% of the land in the 1950s in the Lower Sweetwater Creek watershed; but the stream and lake swamp community currently (2004) covers 0.2% of the watershed. From information included in the 1916 Soil Survey, it appears that this community was somewhat more common than indicated by the areal coverage of 1950. The community is also referred to as bottomland hardwood forests and is associated with the stream channel of the Creek. Canopy tree species include red maple, water oak, sweetgum, swamp black gum, pond cypress, and some tall Carolina willows. The subcanopy and understory in this community are typically of open aspect except in forests where the hydroperiod (depth and duration of inundation) has been reduced, which has allowed a tangle of shrub species to become established on the forest floor invade and close to the understory. In such cases, shrubs such as fetterbush and buttonbush make the forest virtually impenetrable.

Mangrove swamps (612)
The areal coverage of this habitat has remained at about 1% of the watershed over the period 1950-2004. The information contained in the 1938 USCA aerial mapping indicates that mangroves were common in the estuary of the Creek at that time; therefore, it can be assumed that they were present in the pre-development period also. This land cover type is especially important in that it provides cover and foraging habitat for invertebrates and fish, roosting and nesting habitat for birds, and shoreline protection. Effort should be made to restore this habitat where feasible.

Wetland Forested Mixed (630)
Wetland forested mixed is a wetland forest where neither hardwoods nor conifers achieve a 66% dominance of the crown canopy composition. In 1950, this group covered 2.6% of the land in this watershed; by 2004 the coverage was reduced to 1.6% of the watershed area. Species common to this community are those described in the Stream and Lake Swamp community (FLUCFCS 615).

Freshwater marsh (641)

The areal coverage of freshwater marsh in the Lower Sweetwater Creek watershed decreased over the period 1950 – 2004. In 1950, this land cover type represented 1.4% of the watershed, while it occupied 0.4% of the watershed in 2004. This habitat is typically characterized by large basins with peat substrates, seasonal to year-round inundation, and infrequent fire. Freshwater marshes usually occur as open expanses of grasses, sedges, rushes, and other herbaceous species cover the soils that are usually saturated and/or covered with surface water for two or more months during the year (Brown et al., 1990). Freshwater marsh is highly diverse and marshes may differ significantly from one another even though located in geographic proximity. In the Lower Sweetwater Creek watershed, typical species include: sawgrass, cattail, arrowhead, maidencane, buttonbush, cordgrass, soft rush, and fire flag. The species composition of freshwater marsh habitat often occurs in zones and is dependent upon soil type, hydroperiod, water depth, and successional stage (Wolfe and Drew, 1990).

Saltwater marsh (642)

Formerly occupying less than 1% of the watershed, saltwater marsh decreased in areal coverage by 0.6% by 2004. This land cover type is particularly valuable as habitat for invertebrates and juvenile fish and as a protective barrier from storm surges. In the Lower Sweetwater Creek watershed, saltwater marshes exist in the creek's estuary where by far the most common plant species is black needle rush; some cordgrass is also present. Significant habitat for juvenile fish and invertebrates of commercial importance is provided by saltwater marsh which, in the Lower Sweetwater Creek estuary, has been eliminated and/or impacted by transportation facilities, urban development, and untreated stormwater runoff. Where feasible, restoration of this habitat should be considered.

Wet prairies (643)

Formerly (1950) occupying 0.5% of the land in the Lower Sweetwater Creek watershed, the wet prairie community in 2004 covers 0.3% of the watershed. Wet prairies are usually open, mixed grass-sedge associations, which occur in areas of periodic flooding and are distinguished from marshes as having shorter herbaceous species and longer, drier hydroperiods (Wolfe and Drew, 1990). Like freshwater marshes, wet prairies support a diversity of species, and each system may be different from a neighboring system. Important species in the Lower Sweetwater Creek watershed wet prairie systems include: spike rushes, beak rushes, St. John's wort, yellow-eyed grass, whitetop sedge, pink sundew, early whitetop fleabane, and meadow beauty.

Emergent aquatic vegetation (644)
Not recognized in 1950, emergent aquatic vegetation in the Lower Sweetwater Creek watershed covered only 0.1% in 2004. Typically, this habitat is associated with the deepwater portions of freshwater marshes and includes species such as water lettuce, spatterdock, water hyacinth, duckweed, and water lilies.

Tidal flats/submerged shallow platform (651)
This habitat type occupies the lower reaches of Lower Sweetwater Creek. It represents a challenging, but biologically productive area that is important as habitat for animals that are critical links in the estuarine food webs. Vegetation occurring here is very sparse, and the area may consist solely of mud into which animals burrow. The areal coverage of this habitat has decreased from 0.2% in 1950 to 0% in 2004. Common in the estuary of Lower Sweetwater Creek in pre-development times, this habitat has been replaced by urban development. Where feasible, this habitat should be restored.

Streams and waterways (510)
While Lower Sweetwater Creek is a major landscape feature and the only linear waterway in the watershed, it is not identified in the 1950 land use mapping. The 2004 mapping recognized this community as occupying 0.2% of the watershed. The channel of the Creek has been greatly modified by diversion, straightening, and deepening so that it is a more recognizable feature on satellite imagery at this point. The plant community supported on the Creek banks in its upper reaches is included under the Stream and Lake Swamp community description (FLUCFCS 615) and the Wetland Forested Mixed community description (FLUCFCS 630); in the lower reaches, the land cover types include tidal flats/submerged shallow platform (FLUCFCS 651), and Saltwater marshes (FLUCFCS 642). The Creek habitat is highly degraded from trash disposal, exotic plant invasion, and untreated stormwater runoff.

Lakes (520)/Reservoirs (530)
Lakes are defined by FLUCFCS as inland water bodies excluding reservoirs. In the Lower Sweetwater Creek watershed, there is only one named lake, Egypt Lake, which occupies 67 acres. Egypt Lake, once developed on the north and northeast shores for citrus production, is now an urban lake with residential, commercial, and institutional development around it. The areal coverage of the lake in the watershed has not changed much between 1950 and 2004, and remains at approximately 0.8%.

Reservoirs are artificial impoundments of water. Not recognized in the land use mapping of 1950, this community type occupies (2004) 0.8% of the watershed. These water features have been constructed in association with agricultural and residential development in the watershed; residential reservoirs are managed to provide aesthetic or stormwater management functions.

8.4.3 Urban Altered Land Use

The following land use descriptions are based on the 2004 land use map of the Lower Sweetwater Creek watershed, the corresponding descriptions FLUCFCS, and staff knowledge of the area.

Residential [Low (110), Medium (120), High (130)] Density
Residential land uses occupied less than 1% in 1916 and approximately 5% of the watershed in 1950. By 2004, they accounted for almost 40% of the watershed, reflecting much more rapid growth in the last half of the 20th century. Of the 3,004 acres in residential land uses in 2004, 0.4% are in low density uses (< 2 units/acre), 0.4% are occupied by medium density uses (2-5 units/acre). The majority 39% of residential land uses is represented by high density use (>5 units/acre).

Commercial and Services (140)
Commercial areas and services is a land use that is predominantly associated with the distribution of products and services. This category is composed of a large number of individual types of commercial land use, which often occur in complex combinations. This category often includes a main building and the integral areas that support the main structure. Coverage of commercial facilities increased to 14% of the watershed in 2004. Land uses present in the watershed that fall into the Commercial areas and Services category include: service stations and convenience stores, retail facilities, restaurants, manufacturing facilities, and industrial facilities. Because significant commercial development occurred in the watershed prior to the implementation of stormwater management regulations, impervious surfaces associated with commercial facilities generates considerable untreated stormwater runoff that enters Sweetwater Creek.

Institutional (170)
In the Lower Sweetwater Creek watershed, Institutional land uses include schools, hospitals, churches, and small office facilities. By 1950, this category occupied 19% of the watershed. This figure decreased dramatically by 2004 to 5% as some school properties transitioned to residential and commercial uses.

Recreational (180)
Recreational land uses were absent in the1950 land use mapping but were reported as occupying 2.6% of the watershed in 2004 which represents community recreational facilities, historic sites, and area parks, including Egypt Lake Park, Burke Street Park, and NW Little League Park.

Open land (190)

Open Land includes undeveloped land within urban areas and inactive land with street patterns but without structures. Open land normally does not have any structures or any indication of intended use. Urban inactive land is often in a transitional state and will eventually be developed into one of the typical urban land uses. Occupying 7.8% of the watershed in 1950, this category covered 3.7% in 2004.

Cropland and Pastureland (210)

Formerly occupying 18.3% of the watershed in 1950, this land use category was absent in 2004 as agricultural lands transitioned to urban land uses.

Tree Crops (220)

In the Lower Sweetwater Creek watershed, this category includes citrus groves which were established by 1938. By 1950, only 1.7% of the watershed was used for tree crops, and by 2004, virtually no land was in tree crop cultivation as lands were converted from citrus to residential and commercial uses.

Transportation (810)

In the Lower Sweetwater Creek watershed, railroads and paved roadways have occupied the watershed since the late 1890's and early 1900's. By 1950, this land cover type occupied 0.1% of the watershed, and by 2004, it covered over 12% of the watershed as early facilities were expanded and new facilities were constructed.

Communications (820)

In the Lower Sweetwater Creek watershed, this category includes microwave towers, although it is not included on the 1950 or the 2004 mapping.

Utilities (830)

In the Lower Sweetwater Creek watershed, this category includes: water treatment facilities and electrical transmission facilities. It is absent on the 1950 or the 2004 mapping. Utilities have existed in the watershed since the before 1920's.

8.4.4 Natural Systems Trends

This section identifies the historical and remaining upland, wetland, and aquatic natural systems in the Lower Sweetwater Creek watershed and summarizes the relative loss of natural habitat between 1950 and 2004 land cover. Existing land use classifications other than natural systems, such as reservoirs and developed and altered lands, were not included in the habitat loss analysis. Historical and existing land use types were consolidated into general habitats of uplands and wetlands for the purpose of estimating percent habitat loss. An exact analysis of "type for type" habitat loss is not possible due to differences in the classification of vegetation communities, as well as inaccuracies inherent in the historical land use data.

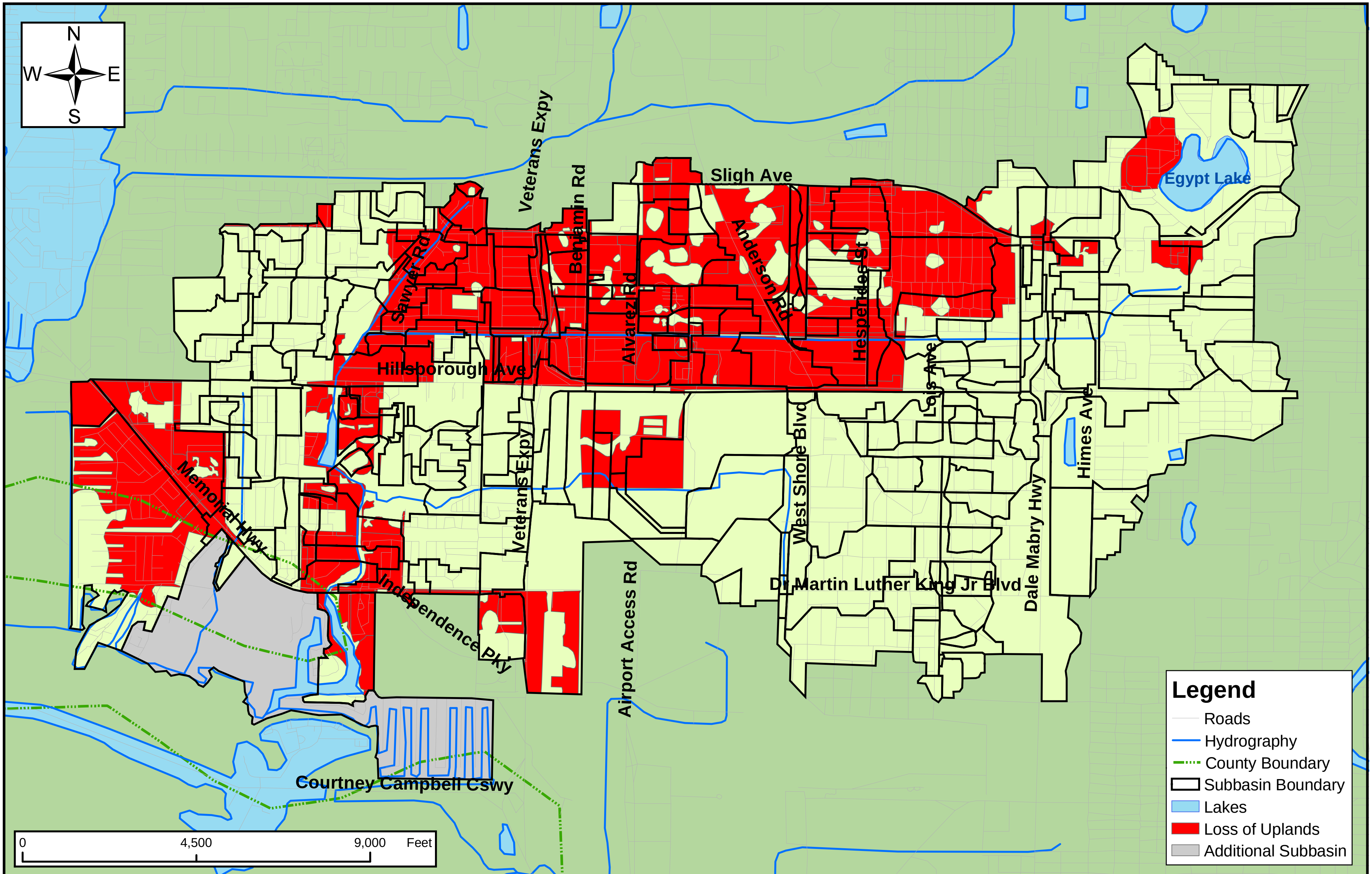
Table 8-4 demonstrates the historical and existing upland and wetland acreage, the relative habitat loss of each is based on the total available area of the natural systems.

Historical and Existing Land Cover Changes

The areal coverage of native uplands in the Lower Sweetwater Creek watershed in 1950 is estimated at 2,539 acres, and dropped to 248 acres by 2004 (Table 8-4). The net loss from the pre-development period to 1950 was 62% (4,227 acres), while the net loss from 1950 to 2004 amounted to 90% (2,291 acres), indicating that the conversion of native uplands to agricultural/residential/commercial land uses accelerated between 1950 and 2004. Native uplands were converted to agricultural land uses and urban land uses and supporting infrastructure beginning in the mid- to late 1890's. The most attractive areas for citrus production were lands occupied by the longleaf pine-xeric oak community, while pine flatwoods were the primary upland community displaced for pasture cultivation and cattle production. Residential development and transportation facilities also are preferentially located on lands supporting these two plant communities. Remaining upland communities have been degraded by land use practices on adjacent agricultural and urban lands and/or by encroachment on the margins of uplands. At present, most uplands are remnants of a once larger habitat.

The areal coverage of wetlands in 1950 was estimated at 662 acres, and the coverage by wetlands in 2004 is approximately 374 acres. The net loss from the pre-development period to 1950 was 22% (162 acres), while the net loss of native wetlands from 1950 to 2004 was 43% (288 acres), indicating that the conversion of native wetlands to agricultural, residential, and commercial land uses accelerated between 1950 and 2004. However, existing wetlands have been degraded by physical disturbances associated with past agricultural practices, the construction of transportation facilities, and residential and commercial development. Wetlands located within citrus groves generally were ditched to enhance drainage for rows of trees adjacent to the wetland. In the case of wetlands located in pastures, pasture grass is planted and cattle graze up to and through the wetland itself. Consequently, wetlands have no protective buffer zones; they are invaded by pasture grass species and other non-wetland plants; and they are the receiving waters for stormwater and irrigation runoff containing pesticides and fertilizers. Many wetlands are remnants of once larger habitats. Between 1950 and 2004, the wetlands that remained in the watershed were degraded further or eliminated to accommodate continued urban development.

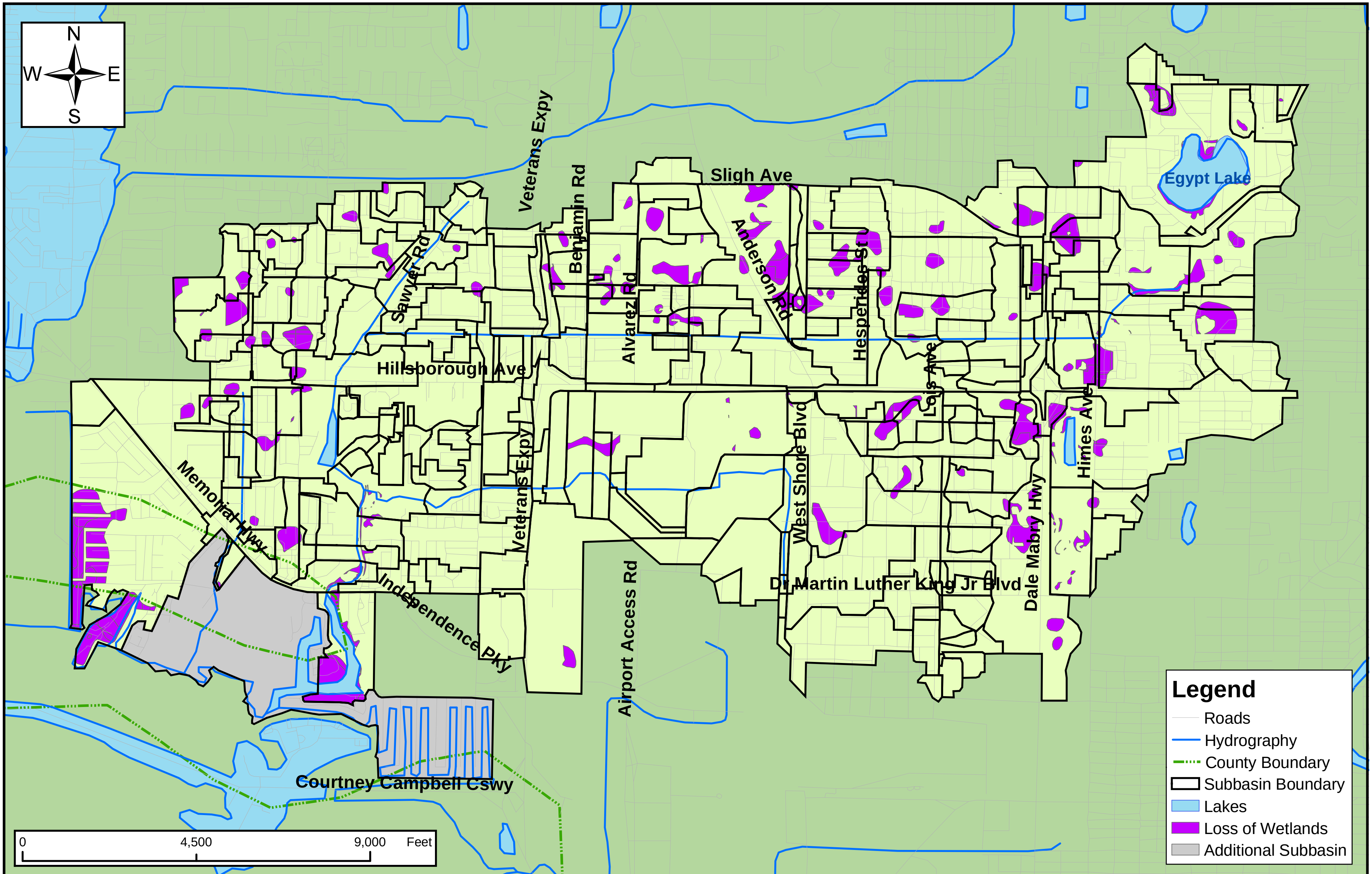
Figures 8-3 and 8-4 show the loss of native uplands and wetlands in the watershed.



Loss of Uplands in the Lower Sweetwater Creek Watershed

Figure 8-3

AYRES ASSOCIATES



Loss of Wetlands in the Lower Sweetwater Creek Watershed

Figure 8-4

AYRES ASSOCIATES

Table 8-4 Change of Uplands and Wetlands in the LSWC Watershed

	Acres in 1950	Acres in 2004	Acre Reduction	% Reduction
Uplands	2,539	248	2,291	90.23%
Wetlands	662	374	288	43.5%

8.4.5 Prioritization of Restorable Habitat Types

Currently, based on the ecological value and rarity within the watershed, upland habitats, particularly Longleaf pine-Xeric oak (FLUCFCS 412) are identified as a priority habitat for re-establishment.

Wetlands habitats, particularly Stream and Lake Swamp (FLUCFCS 615), Mangrove Swamp (FLUCFCS 612), and Saltwater Marsh (FLUCFCS 642) were identified as high priority for restoration due to their hydrological and ecological value. The remaining natural habitats in the watershed will be considered during the development of alternatives (restoration, conservation, stormwater treatment, flood detention) in later chapters of this plan.

8.5 Natural Systems Issues and Areas of Concern

8.5.1 Habitat Loss, Degradation, and Fragmentation

As described above, the Lower Sweetwater Creek watershed was once composed of a variety of upland and wetland habitats. Within the last century, many large tracts have been converted from natural land features to agricultural uses, predominantly in the northeastern and southern portions of the watershed.

Based on existing SWFWMD land use data, approximately 88% of the watershed has been altered by human activities, first by agricultural activity, and later by urban development. Lands in a near-natural condition (uplands, wetlands) comprise an estimated 11% of the watershed, although most native habitats are disturbed and degraded to some degree by agricultural practices, urban development, or water production activities in the watershed.

Habitat Fragmentation

Habitat fragmentation is defined as the break-up of a continuous landscape containing large patches into smaller, numerous, less connected patches. To measure habitat fragmentation within the watershed, ArcView was used to join contiguous natural habitat polygons from SWFWMD's 2004 land use layer. The polygons with FLUCFCS code of 3000, 4000, 5000, 6000, and 7000 (natural systems designations) were dissolved to form contiguous polygons throughout each watershed. The areas of these contiguous polygons were then calculated and compared to the overall area of a given watershed. If one or more contiguous polygons represented a significant proportion of a watershed (i.e., greater than 75%), the watershed was categorized as having relatively little fragmentation. Alternately, if a watershed was comprised of several small contiguous natural systems polygons and few large contiguous polygons, then the area was categorized as being highly fragmented. Large numbers of small polygons represent a high level of fragmentation, while small numbers of large polygons represent a low level of fragmentation (Table 8-5).

The watershed has a total of 141 contiguous natural areas, none of which represent more than 25% of the watershed (Figure 8-5). Therefore, the degree of habitat fragmentation in the watershed can be described as high and a score of 0 assigned (Table 8-5).

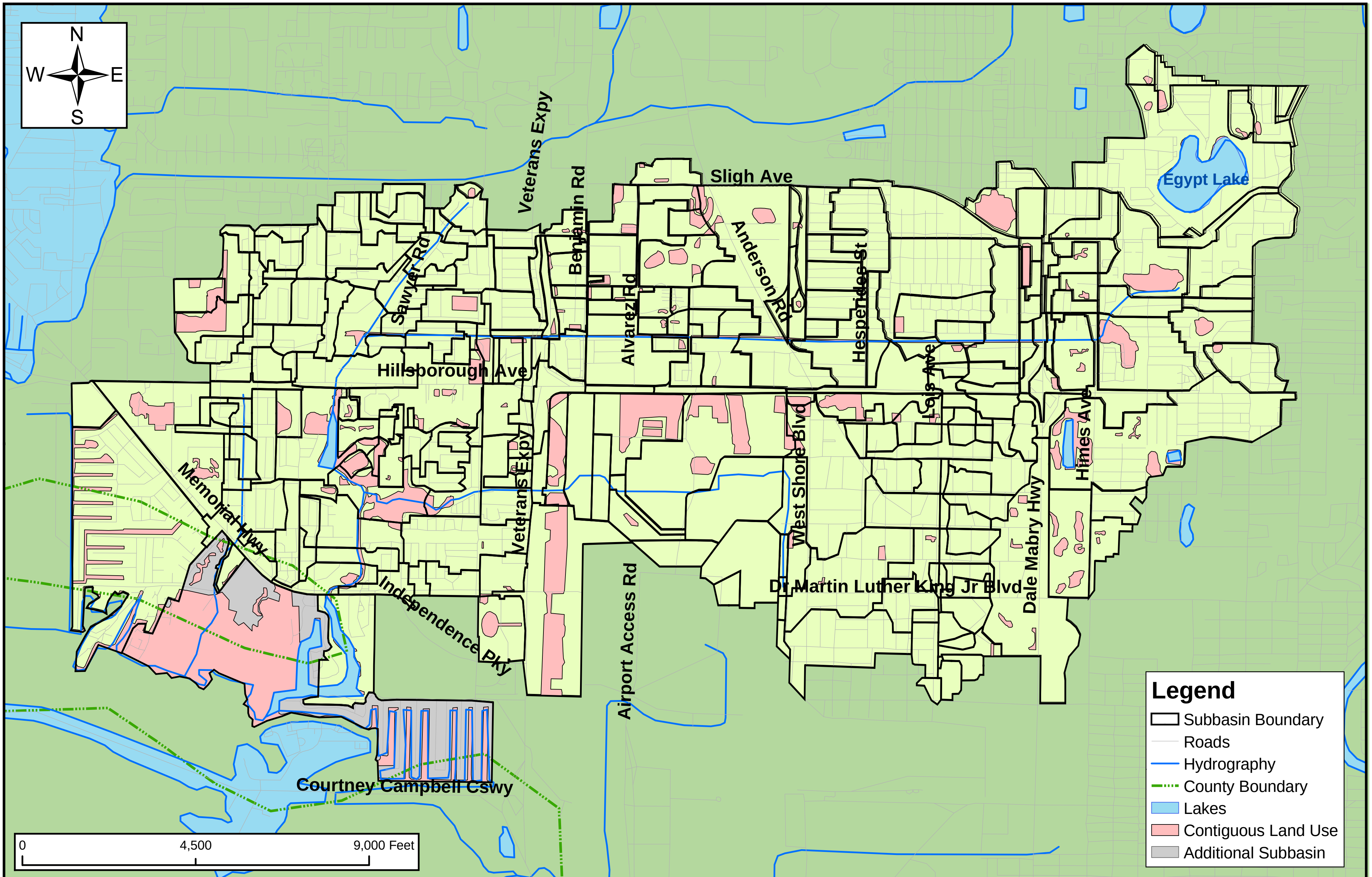
Table 8-5 Distribution of Contiguous Natural Systems Polygons within the Lower Sweetwater Creek Watershed

	Contiguous Natural Polygons			
Score = 0	<25 %	=>25% but <50%	=>50% but <75%	=>75%
Degree of fragmentation	High	Moderate	Low	Very Low
Number of polygons	141	0	0	0

8.5.2 Wildlife Corridors

Wildlife corridors are naturally existing or restored native linear landscape features connecting two or more larger tracts of habitat functioning as a dispersal route for native flora and fauna, and for the occurrence of the natural ecological processes such as fire (Harris, 1991). With the continuing need for land development to support an increasing human population, wildlife habitats were cleared and destroyed.

In the Lower Sweetwater Creek watershed where urbanization, agriculture, and deforestation have fragmented natural habitats, there is a need to reserve natural pathways for the movement and migration for wildlife to prevent inbreeding or overexploitation of prey.



Extent of Contiguous Land Use in the Lower Sweetwater Creek Watershed

Figure 8-5

AYRES ASSOCIATES

The Hillsborough County Comprehensive Plan defines wildlife corridors as “contiguous stands of Significant Wildlife Habitat which facilitate the natural migratory patterns, as well as other habitat requirements (e.g., breeding, feeding) of wildlife.” The need for and use of wildlife corridors became apparent as early as the 1930s (Edmisten, 1963) and corridors have been used widely ever since for the benefit of game species (McElfres et al., 1980) as well as non-game animals (Maher, 1990).

Regulatory Component

Wildlife corridors are one of the many avenues that support the Biodiversity Treaty proposed by the United Nations and signed by then President Clinton, but not ratified by the United States Congress. In 1992, the United Nations published the Global Diversity Assessment for the purpose of implementing the Global Biodiversity Treaty and Agenda 21. Section 10.4.2.1.2 of the Global Biodiversity Assessment sets forth the criteria for protected areas stating that, “Representative areas of all major ecosystems in a region need be reserved, blocks should be as large as possible, buffer zones should be established around core areas, and corridors should connect these areas.” These core areas and buffer zones would then be connected by wildlife corridors, in accordance with the Wildlands Project. The goal is to allow animals to travel from one core habitat to another through wildlife corridors without anthropogenic obstruction or interference. The remaining areas will be utilized for human habitats conforming to the principles of sustainable development as supported by Executive Order 94-54 that created the Governor’s Commission for a Sustainable Florida and Section 163.3244 F.S. (Sustainable Community Demonstration Project). Establishment of wildlife corridors is consistent with the Hillsborough County Comprehensive Plan (CARE Policy 14.2) and the Hillsborough County Land Development Code.

Wildlife Corridors in the Lower Sweetwater Creek Watershed

As discussed in the previous section, significant habitat fragmentation has occurred throughout the watershed. The protection of wildlife corridors and major routes between two or more core and/or remnant areas of wildlife habitat is critical for the long-term survival of a wide range of plant and animal species. Public lands, which often supply wildlife refuge and corridors, exist as only 1.2% of the watershed; therefore, there is very little land that can serve as a wildlife corridor/refuge. Restoration efforts will be necessary to provide wildlife corridors in the watershed in the future. The identification of degraded areas that have the potential to serve as effective wildlife corridors should be done where feasible. Approximately 11% of the watershed remains undeveloped, although undeveloped uplands and wetlands have been disturbed and encroached upon, diminishing their ecological value.

Conservation Development

Conservation development is a concept proposed for urban watersheds that focuses on residential development designs that utilize conservation strategies such as inter-connected networks of permanent open space. The method allows residential developments that maximize open space conservation without reducing overall building density. The same method has little potential in this watershed as much of the land has been developed for well over 50 years.

Retrofit of existing development is infeasible at this point. This concept could be applied to commercial and industrial re-development, should it occur. The Conservation Development concept is consistent with Hillsborough County Natural Resources Regulation, serving as an avenue to identify areas that may serve as wildlife corridors and/or areas that should be protected and preserved as core habitats or environmentally sensitive lands.

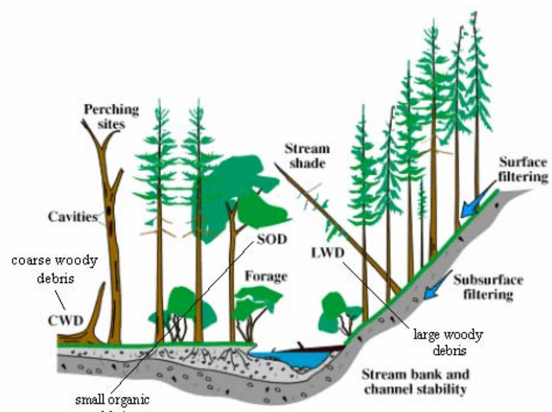
Criteria for significant wildlife habitat minimum widths and sizes are contained in Appendix B of the Hillsborough County Natural Resources Regulation. Existing studies have established a definitive link between habitat area size and species diversity (Miller and Schaeffer, 1998). The Hillsborough County Natural Resources Regulation sets a 75-acre minimum based on wildlife research review that concluded that species diversity rapidly declines below 60 acres, while another study determined 50 to 74 acres as the optimum minimum habitat. Although wildlife corridors do not have to follow these criteria for size and width, reserving 75 acres or more of significant wildlife habitat should be taken into consideration as core habitat or as the basis for a wildlife corridor.

Although wildlife corridors can help conserve habitat dependent species affected by encroaching urbanization, it is important to consider that the total amount of available habitat is the critical factor and that no amount of corridors connecting isolated habitat areas will replace extensive loss of habitat. Wildlife corridors allow for the linkage and preservation of isolated wildlife habitats in the competition for space with humans.

8.5.3 Identification of Existing Riparian Buffer Areas

Measures of ecosystem health can play an important role in the linkage between land use practices, ecological integrity, and water quality. The loss of natural riparian vegetation due to agriculture and development impair the functional role of riparian buffers, strongly influencing the diversity and productivity of both the aquatic and terrestrial biota, and the physical stability of the streambank and channel. A critical component of the riverine ecosystem, riparian buffers function ecologically to:

- regulate sediment storage and transport, stream flow characteristics;
- maintain bank and channel stability by provision of solid root mass and ground cover, regulate stream temperature;
- regulate instream biological production by determining the inputs of small organic debris (SOD);
- buffer streams from fine sediments;
- provide wildlife habitat features, including coarse woody debris (CWD), large woody debris (LWD), and nest and perch sites; and
- provide summer and winter forage for terrestrial fauna.



Source: Province of BC Watershed Restoration Program; BC Ministry of Environment, Lands and Parks

Factors such as the width of riparian (streamside vegetation) zones and the abundance and diversity of plant and macro-invertebrate communities can serve as biological indicators of environmental stress and water quality. Table 8-6 summarizes a rating system that was used in this plan to evaluate existing environmental conditions within the Lower Sweetwater Creek watershed. This rating scheme was used to assess the existing riparian habitats within each of the subwatersheds within the Lower Sweetwater Creek watershed. Unfortunately, detailed macro-invertebrate or water quality data were not available for the watershed, and the analyses were restricted to the vegetation component of this rating system (riparian buffer widths and percent of riparian buffer as developed land use).

A number of agencies throughout the U.S. have developed stream buffer protection ordinances (e.g., Baltimore County, Rhode Island Coastal Resources Management Council, City of Napa – California, Portland Metro). More detailed buffer zone analyses have been performed in Florida, specifically in the Wekiva River basin and the east central Florida region (Brown et al., 1987; Brown and Schaefer, 1990). The purpose of the Florida studies were to develop methodologies for determining buffer zone widths for regionally significant wetland systems that could then be used for the purposes of establishing minimum criteria for future land use planning. The buffer zone widths developed by Brown et al. (1987) are similar to those used in this riparian buffer rating system described above with minimum buffer widths ranging from 24m to 98m (Table 8-7).

Table 8-6 Rating of Stream Water Quality and Health based on existing vegetation and development activities within a watershed ***(modified from Office of the Commissioner for the Environment, Victoria, Australia, 1988)***

Rating	Vegetation
Excellent	Streamside vegetation intact for minimum 100m width from the bank, with continuous cover essentially unmodified and with few exotic plants. Watershed vegetation is substantially uncleared. Less than 10% of watershed developed.
Good	Existing streamside vegetation communities intact, with cover essentially unmodified for, at a minimum, 30m width for over 80% of each stream segment. Infrequent exotics. Largely undisturbed by roadways. Limited permanent clearing of watershed vegetation.
Fair	Existing streamside vegetation communities predominantly intact and exotics infrequent. Riparian zone intact for 30m width, at minimum, for over 60% of watershed.
Poor	Existing streamside vegetation largely fragmented and exotics frequent. Riparian zone of 30m width intact for less than 60% of watershed, and frequently disturbed by roadways/development. Watershed largely cleared of native vegetation.
Degraded	Little remnant streamside vegetation. Surviving patches fragmented. Exotics frequent. Riparian zone of 30m width intact for less then 25% of watershed, and frequently disturbed by roadways & development. Watershed substantially cleared of native vegetation.

Table 8-7 Recommended Buffer Widths (in meters) for protection of water quality and quantity and wetland-dependent wildlife habitat (from Brown and Schaefer, 1987)

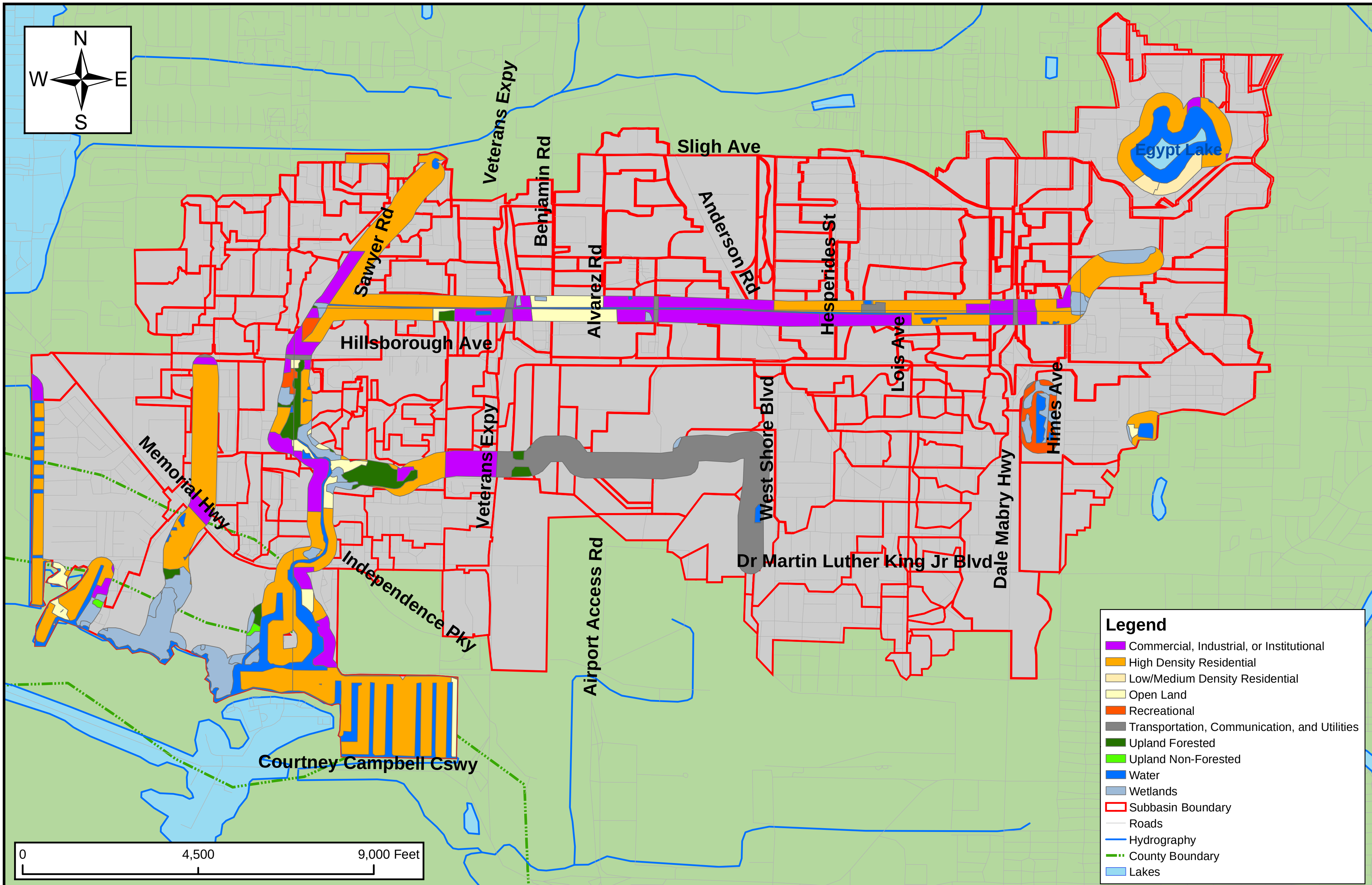
	Protect Water Quantity *Minimize Groundwater Drawdown*		Protect Water Quality *Control Sedimentation*		Protect Wildlife Habitat	
Landscape Association (Habitat Type)	Min.	Max.	Min.	Max.	Min.	Max.
Flatwoods/isolated wetlands	30	168	23	114	98	168
Flatwoods/flowing-water wetlands	30	168	23	114	98	168
Flatwoods/hammocks/hardwood swamps	15	76	23	114	N/A	168
Sandhills/wetlands	6	76	23	114	98	223
Flatwoods/salt marshes	30	168	23	114	98	N/A
Coastal hammocks/salt marshes	30	168	23	114	98	N/A
AVERAGE	***24***	***137***	***23***	***114***	***98***	***182***

To calculate riparian zone widths and percentages of riparian zones that have been converted to development in the Lower Sweetwater Creek watershed area, the ArcView buffer extension was used. First, 30m and 100m buffer zones were created around the stream network coverage that was created during the hydrologic analysis. From this coverage, the 2004 land use data were clipped for each of the buffer zones and evaluated to determine percent of natural land cover within each clipped area to develop a rating score. These scores were then converted to numerical values and used in the natural systems evaluation matrix.

Within the 100 m buffer encompassing 1,448 acres, 75% (1,092 acres) of the land has been developed for agricultural, commercial, or residential purposes, leaving 24% of the buffer area in native habitats (Figure 8-6). Within the 30 m buffer (541 acres), 66% (358 acres) of the land has been developed for agricultural, commercial, or residential purposes, leaving 33% of the buffer area in native habitats (Figure 8-7). It should be noted that much of the remaining native habitats have undergone disturbance and encroachment, reducing their ecological value. Based on the riparian zone analyses, rating scores were developed for the Lower Sweetwater Creek watershed (Table 8-8). The score for the watershed was a 1, giving the watershed a "poor" rating.

Table 8-8 Riparian Buffer Measures within the Lower Sweetwater Creek Watershed

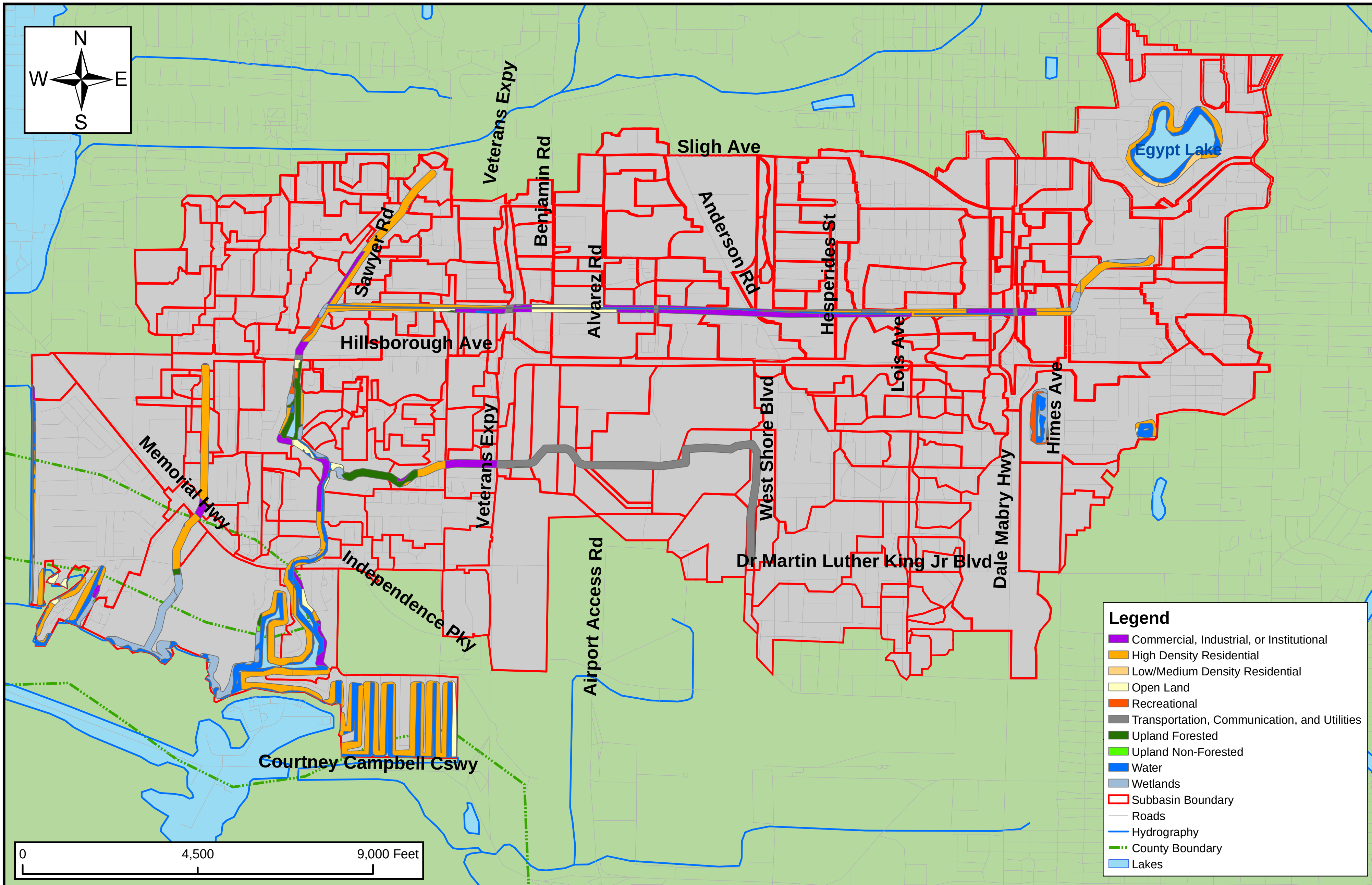
		Excellent	Good	Fair	Poor	Degraded
Score	*Vegetation Intact within 100m buffer?*	*<10% watershed developed*	*30m buffer intact for >80% of stream*	*30m buffer intact for >60% of stream*	*30m buffer intact for <60% of stream*	*30m buffer intact for <25% of stream*
Poor (1)	no	no			33%	



Land Use Within 100-meter Riparian Buffer in the Lower Sweetwater Creek Watershed

Figure 8-6

AYRES ASSOCIATES



Land Use Within 30-meter Riparian Buffer in the Lower Sweetwater Creek Watershed

Figure 8-7

AYRES ASSOCIATES

8.5.4 Biological Indicators of Ecosystem Health

The ability to evaluate the "health" of an ecosystem can be extremely complex due to the variability of chemical, physical, geomorphological, and meteorological processes that occur over time and space and also the diversity of habitat types that may be present within a watershed. The current ongoing program to evaluate the measures of ecosystem health—is the FDEP's Biological Reconnaissance (BioRecon) program.

The FDEP's bioassessment program involves field sampling of aquatic biological communities to characterize community structure (i.e. diversity, pollution tolerance). The BioRecon program includes measurements of water quality indicators such as dissolved oxygen, evaluating habitat conditions, and determining the health of aquatic insect communities. Many common insects spend their juvenile life within aquatic systems including dragonflies, mayflies, beetles, black flies, and mosquitoes. These organisms show the effects of physical habitat alterations, point and nonpoint source contaminants, and cumulative pollutants over their life cycle. To determine if a community has been negatively impacted by human activities, data are compared to reference communities (believed to be natural or relatively unimpacted by humans).

The BioRecon program has not collected macro-invertebrate data in the Lower Sweetwater Creek watershed. The BioRecon procedure is a screening tool that evaluates three metrics including: the total number of macro-invertebrate taxa; number of Ephemeroptera (mayflies), Plecoptera (stoneflies), and Trichoptera (caddisflies) or EPT; and a Florida Index which represents taxa intolerant of stream perturbations. The sampling methodology involves three sweeps of a dip net for a given stream sampling location and the identification of all organisms within the net. Scores for three categories are tabulated based on this data and if two of three exceed threshold values the stream is rated as "healthy," if less than two meet the thresholds then the stream is rated as "suspected impaired" or "impaired. While useful for the Hillsborough River Watershed Plan, the BioRecon data cannot give an assessment of watershed health in Lower Sweetwater Creek watershed.

8.5.5 Strategic Habitat Conservation Areas

In 1994, the FWC published *Closing the Gaps in Florida's Wildlife Habitat Conservation System*, which identifies habitats that must be conserved and managed to ensure the survival of key components of Florida's biological diversity. The primary objectives of the report are to:

- Identify habitat areas that are essential to the survival of rare and declining species not adequately protected by the current system of conservation areas
- Identify areas that are important to several globally endangered species of plants, animals, and plant communities
- Identify regional areas of high biological diversity to assist in local land use planning

The FWC utilized land cover and vegetation data, public land boundaries, and documented occurrences of species and communities to identify Strategic Habitat Conservation Areas (SHCA). Hillsborough County was identified as containing SHCA critical to the wood stork, white ibis, great egret, little blue heron, short-tailed hawk, and Florida sandhill crane. As previously discussed, the protection and preservation of the remaining natural areas of the watershed are important components of this watershed management plan. These natural lands are critical to the maintenance of local and regional wildlife and the protection of water resources. Approximately 11% (898 acres) of the watershed remains undeveloped.

Strategic Conservation Habitat Areas within the Lower Sweetwater Creek Watershed
A total of 33 acres (0.4% of the watershed) of Strategic Habitat Conservation Area (SHCA) were identified in the Lower Sweetwater Creek watershed, giving the watershed a score of 0 for this assessment category (Figure 8-8).

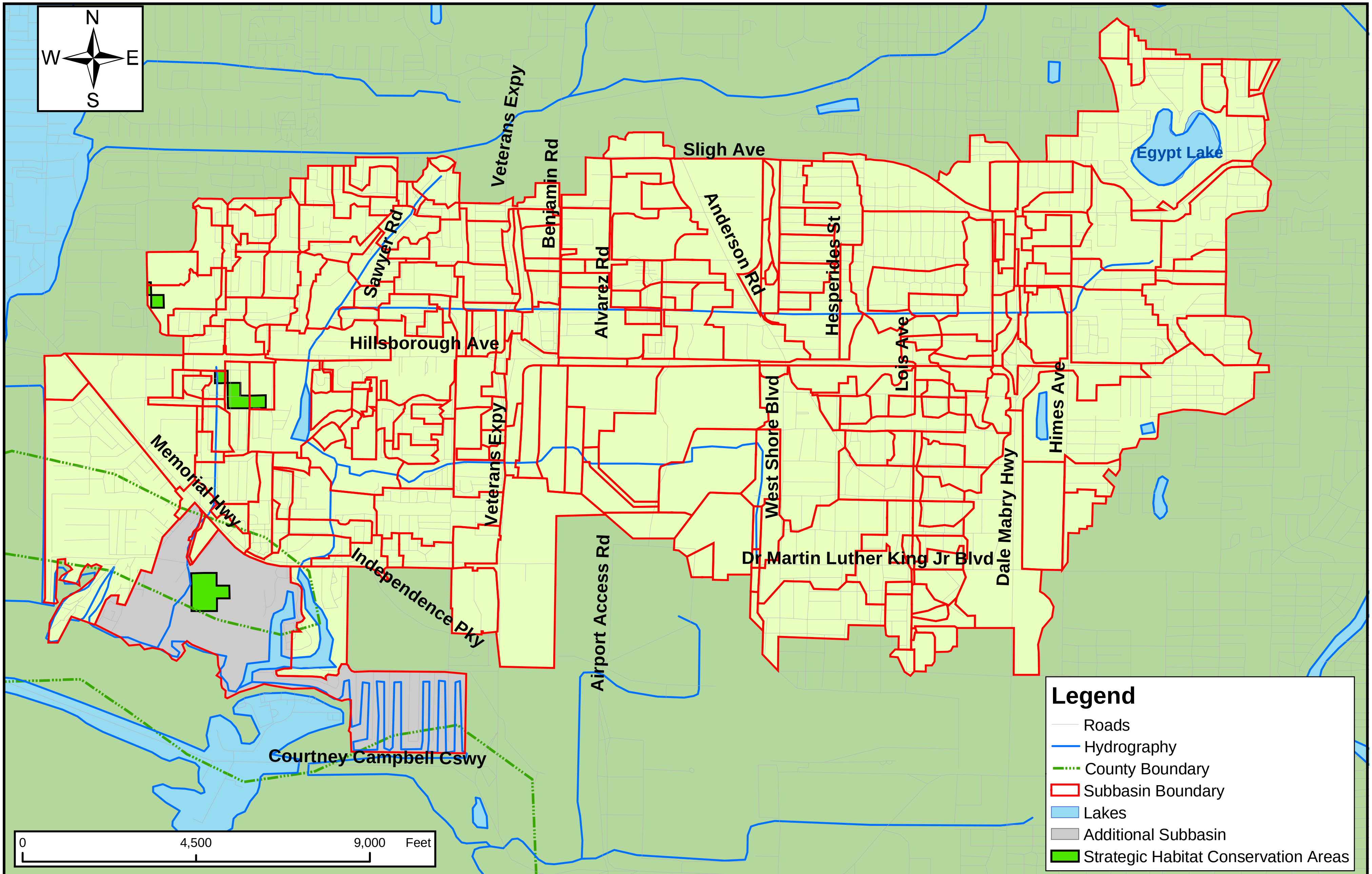
8.5.6 Hydrologic Alterations

Hydrologic alterations can be defined as any action that would change or affect the water cycle. The Lower Sweetwater Creek watershed and its diverse array of natural systems are affected by hydrological alterations that would upset the watershed's delicate ecological balance.

Development for the purposes of residential, commercial, industrial, institutional, recreational, extractive, and agricultural land use has increased impervious surface area and/or resulted in the channelization and rerouting of surface water flows which has adversely affected the watershed's hydrological cycle. Development of groundwater supplies in the watershed has affected lake elevations and in-lake wildlife habitat. These hydrological alterations can have results such as:

1. Accelerated successional changes of natural systems in both upland and wetland systems;
2. Changes in the sizes of faunal populations (some species are favored and increase in numbers, while others are stressed and decline in numbers and/or viability);
3. Reduced biodiversity; and
4. Changes in water quality.

Natural plant communities, particularly uplands, have been replaced by agricultural, commercial, or residential development, leaving parcels of smaller size and ecological value. While wetlands have decreased somewhat in areal coverage, the habitat quality of existing systems can be presumed to be less than original conditions due to several factors, including: exotic species invasion, excessive disturbance of wetland margins, elimination of protective upland buffers; trash disposal; rim ditching; and reduced hydroperiod. The elimination and disturbance of natural habitats has resulted in a decline in the number of wild animal species (lowered biodiversity) present in the watershed.



Strategic Habitat Conservation Areas

Figure 8-8

AYRES ASSOCIATES

Channel Alterations
All natural channels in the watershed have been dredged, straightened, and/or filled to serve as water conveyances for stormwater, resulting in loss or reduction in ecological value.

Channelization has also resulted in degraded water quality in streams allowing exotic species like water hyacinth to compete with native species. Increased stormwater runoff and removal of bank vegetation in these ditch systems have resulted in sedimentation and eutrophication, altering the aquatic species that utilize the system. Non-native and/or nuisance aquatic species more tolerant of anoxic or poor water quality conditions dominate these waterways which decreases biological diversity.

8.5.7 Protected Species

Many native fauna and flora are protected from activities that harm or interfere with them or their habitat by federal, state, and local regulations. Fauna and flora are federally protected by the USFWS under Title 50 Code of Federal Regulations (CFR) 17 and 23. Federally protected species are categorized as threatened or endangered. State protection of fauna is administered by the FWC under F.A.C., Rules 39-27.003, 39-27.004, and 39-27.005. The Florida Department of Agriculture and Consumer Services administers Chapter 5B-40, F.A.C. State protected floral species are categorized as commercially exploited, threatened, or endangered. Management strategies still needed to be developed to protect these species, including coordination efforts with Florida Natural Areas Inventory (FNAI), FWC, and USFWS. Hillsborough County EPC indirectly protects these species by protecting wetland habitats essential to the survival of these species. In addition, the County's upland habitat ordinance provides protection of essential habitats.

The presence of wildlife or plant species is often considered indicative of the presence and health of natural systems. Many animal species, both protected and unprotected, have been observed in the Lower Sweetwater Creek watershed in recent years. A literature search was conducted to determine the floral and faunal composition of the watershed. This search included the review of recent surveys conducted within the watershed by Hillsborough County and ELAPP staff, standard Florida literature references such as the *Rare and Endangered Biota of Florida*, the *Florida Atlas of Breeding Sites for Herons and their Allies*, the FNAI, the FFWCC, and the USFWS. Protected species that have been observed and/or may utilize the watershed are listed in Table 8-9. The table also includes information on their preferred habitat. A species is noted as occurring within the watershed if evidence of their presence was observed through animal tracks, scat, burrows, nests, dens, scratchings, vocalizations, or animal sightings by county or state staff. The Lower Sweetwater Creek watershed has limited capacity to support protected wildlife, and 8 species are expected to occur there.

Fish
No protected fish species are expected to utilize habitats in the Lower Sweetwater Creek watershed.

Reptiles and Amphibians

Protected reptiles and amphibians that may occur in the Lower Sweetwater Creek watershed are the American alligator, eastern indigo snake, and gopher tortoise (Table 8-9).

The **American alligator** is a resident of river swamps, lakes, marshes, bayous, and other bodies of water and is prevalent within the watershed. The required habitat of the short-tailed snake is longleaf pine-turkey oak associations and adjacent upland hammocks or sand pine scrub. The Florida gopher frog *(Rana capito)* prefers a xeric upland habitat, but are often found in commensal association with the gopher tortoise (*Gopherus polyphemus*). Florida gopher frogs breed in habitats that are seasonally flooded, grassy ponds, and cypress heads that lack fish populations.

The **gopher tortoise** prefers dry well-drained soils. Many xeric habitats may be used including sand pine scrub, live oak, or turkey oak communities. The gopher tortoise excavates a long burrow and occupies it semi-permanently.

The **eastern indigo snake** is restricted to the southeastern United States and inhabits a wide variety of habitats from mangrove swamps to xeric pinelands and scrub. It often lives in association with the gopher tortoise where the tortoise burrows provide shelter from desiccating heat and cold winter temperatures. During warmer months, the indigo snake ranges widely, utilizing a territory of 125-250 acres. Wetland edges are preferred foraging areas, where eastern indigo snakes feed on small birds, mammals, fish, and frogs.

Avifauna

Protected birds that occur in the watershed include little blue heron, snowy egret, tricolored heron, and white ibis. All species require relatively shallow water habitats for foraging, although the white ibis also forage in pastures and lawns. All species nest in freshwater habitats including cypress, wetland hardwoods, or shrub swamps are also important nesting habitats. Degradation of both nesting and foraging habitats has contributed to population declines in these species.

Mammals

Listed species of mammals that may occur in the watershed are Sherman's fox squirrel which typically inhabits areas of fire-maintained longleaf pine-turkey oak sandhills and flatwoods (Humphrey, 1992). The fox squirrel was identified by Cox et al. (1994) as an indicator of remaining natural communities including sandhill, mixed pine-hardwood, dry prairie, and open pine flatwoods.

Table 8-9 Protected Animal Species that Potentially Occur in the Lower Sweetwater Creek Watershed

Species Common Name	FFWCC	USFWS	Observed
AMPHIBIANS REPTILES			
American alligator	SSC	T(S/A)	X
Eastern indigo snake	T	T	X
Gopher tortoise	SSC	-	X
BIRDS			
Little blue heron	SSC	-	X
Snowy egret	SSC	-	X
Tricolored heron	SSC	-	X
White ibis	SSC	-	X
MAMMALS			
Sherman's fox squirrel	SSC	-	X

FFWCC-Florida Wildlife Conservation Commission
USFWS-United States Fish and Wildlife Service

E = Endangered T= Threatened SSC = Species of Special Concern
C = Commercially Exploited T(S/A) = Threatened due to similarity of appearance

Flora

Over 300 species of plants are expected to occur in the Lower Sweetwater Creek watershed. The watershed's habitat, geographical location, and climate suggest that 10 species that are listed as endangered, threatened, or commercially exploited by the US Department of Agriculture potentially occur there (Table 8-10). Both uplands and wetlands support protected species, but with the elimination of much of the native upland habitat, many of the protected species that may still be present in the watershed are species that prefer wetland habitats, for example orchids and ferns.

Table 8-10 Protected Plant Species Expected to Occur in the Lower Sweetwater Creek Watershed

Floral Species scientific name	Common name	FDA listing
Habenaria floribunda	Orchid	Threatened
Ilex ambigua	Carolina holly	Threatened
Ilex cassine	dahoon	Commercially exploited
Osmunda cinnamomea	Cinnamon fern	Commercially exploited
Osmunda regalis	Royal fern	Commercially exploited
Spiranthes vernalis	Spring ladies' tresses	Threatened
Thelypteris palustris	Marsh fern	Threatened
Tillandsia fasciculata	Cardinal airplant	Commercially exploited
Tillandsia simulata	Southern needleleaf	Threatened
Tillandsia utriculata	Giant airplant	Commercially exploited

8.5.8 Exotic Species

Florida is particularly prone to biological invasions due to the widespread disturbance of native habitats as well as its semi-tropical climate, great expanse of waterways, and "island-like habitat" (bounded on three sides by water and the fourth by frost). This section discusses exotic plants and animals that have been observed or have the potential of invading the Lower Sweetwater Creek watershed.

8.5.8.1 Exotic Plants

An exotic plant is a non-indigenous species, or one introduced to this state either purposefully or accidentally. A naturalized exotic is a non-native plant that has reproduced on its own either sexually or asexually.

Approximately 1.7 million acres of Florida's remaining natural areas have been invaded by exotic plant species. These exotic plant invasions degrade and diminish Florida's natural areas. Invasive, non-indigenous plants are non-native plants that have invaded Florida's forests and wetlands. They replace native plant species and often form exotic monocultures. In many cases, these stands of exotic plants are not useful to the state's wildlife, which have evolved to depend on native plants for food and shelter. Native animals are rarely able to adapt to new exotic plants. Animals that depend on native plants will move away or even become extinct if exotic plants replace too many of our native plants. Some of the effects of invasive plant species include:

- Decrease in biological diversity of native ecosystems
- Poisoning of some wildlife and livestock species
- Reduction of aquatic habitat for native fish and wildlife species, including listed species
- Decrease in the ecological value of important habitats for native fish and wildlife
- Clogging of lakes and waterways and other wetlands, impeding wildlife movements

Exotic Plant Species Control Programs

The FDEP’s Bureau of Invasive Plant Management is the lead agency in Florida responsible for coordinating and funding two statewide programs to control invasive aquatic and upland plants on public conservation lands and waterways. Florida’s aquatic plant management program, established in the early 1900s, is one of the oldest invasive species removal programs. With the addition of the Upland Invasive Plant Management Program under Florida Statute 369.252, the state addresses the need for a statewide coordinated approach to the upland exotic and invasive plant problem. Additionally, Hillsborough County’s Land Development Code requires the removal of exotic species for newly developed areas. The Exotic Pest Plant Council (EPPC) has played a major role in identifying exotic species that pose a threat to natural flora. The EPPC was established in 1984 for the purpose of focusing attention on:

1. impacts to biodiversity from exotic pest plants;
2. impacts of exotic plants to the integrity of native plant community composition and function;

3. habitat loss due to exotic plant infestations;
4. impacts of exotic plants to endangered species primarily due to habitat loss and alteration (e.g., Cape Sable Seaside Sparrow);
5. the need to prevent habitat loss and alteration by comprehensive management for exotic plants;
6. the socioeconomic impacts of exotic pest plants (e.g., increased wildfire intensity and frequency in *Melaleuca*);
7. changes in the seriousness of exotic pest plants and to indicate which are the worst problems; and
8. informing and educating resource managers about which species deserve to be monitored, and to help managers set priorities for management.

The Council's Florida chapter, the Florida Exotic Pest Plant Council (FEPPC), compiles a list of Florida's most invasive exotic plant species every few years, grouping them according to degree of invasiveness. The most recent compilation can be found at the end of this chapter. The FEPPC has also developed a database map for the Noxious and Exotic Weed Task Team of Category I species throughout the state. A review of this database resulted in the list of FEPPC Category I species occurrence within Hillsborough County, which are described individually below.

This list is based on the definitions of invasive exotic species made by the FEPPC Committee:

- Category I are exotic pest plants that invade and disrupt Florida's native plant communities
- Category II are exotic pest plants that have the potential to invade and disrupt native plant communities as indicated by (1) aggressive weediness; (2) a tendency to disrupt natural successional processes; (3) a similar geographic origin and ecology as Category I species; (4) a tendency to form large vegetative colonies; and/or (5) sporadic, but persistent, occurrence in natural communities
- (N) indicates a species listed as noxious on the United States Department of Agriculture and the Florida Department of Agriculture and Consumer Services lists
- (P) indicates a species listed as prohibited by the Florida Department of Environmental Protection under Rule 62C-52, F.A.C.

Exotic Plants in the Lower Sweetwater Creek Watershed

The Lower Sweetwater Creek watershed has been susceptible to exotic species invasion as a result of the physical disruption of habitats for development purposes, agricultural and industrial operations, and the escape of exotic species from residential landscapes. Information contained in several reports (see Bibliography) and on site visual inspection of the watershed revealed the presence of a total of 18 exotic species in the watershed including: air potato, alligator weed, Australian pine, Brazilian pepper, castor bean, chinaberry tree, Chinese tallow tree, cogon grass, hydrilla, paper mulberry, parrot's feather, punk tree, skunk vine, water hyacinth, and wild taro. Below is a brief description of the exotic species observed within the Lower Sweetwater

Creek watershed. The vegetative descriptions are from the University of Florida's Northeast Region Data Center. The photographs are reprinted from the University of Florida, Institute of Food and Agricultural Sciences Aquatic, Center for Aquatic and Invasive Plants, online Aquatic, Wetland and Invasive Plant Information Retrieval System (APIRS).

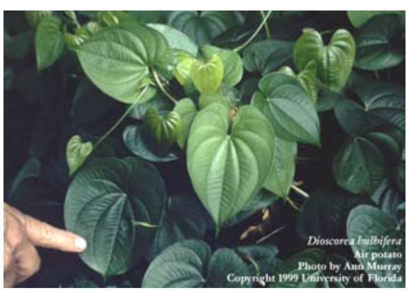
Alligator Weed

Alligator weed is an immersed plant that is usually found in water, but can grow in a variety of habitats, including dry land. It may form sprawling mats over the water or along shorelines. Alligator weed stems are long, branched, and hollow. Leaves are opposite, simple, elliptic, and have smooth margins. Flowers grow on stalks and are whitish and papery, and bloom during the warm months.

Australian Pine

Several species of Australian pine were introduced into Florida prior to 1920 (Morton, 1980). The three species of Australian pine in Florida are *Casuarina equisetifolia*, *C. glauca*, and *C. cunninghamiana*. Hybridization of these species is extensive and complicates identification (Schardt and Schmitz, 1990). The tree is an emersed hardwood, native to Australia and Malaysia, and occurs along rocky coasts, dunes, sand bars, and islands.

The Australian pine was primarily planted to form windbreaks along coastal areas. The trees can reach 35-m heights and grow at a rate of 1.0 to 1.5 m a year. In southern and central Florida, Australian pines typically produce dense stands and form thick carpets of needles on the ground prohibiting the growth of native vegetation. In dune communities, Australian pine's dense shade and leaf-litter retard the growth of native coastal vegetation (Schardt and Schmitz, 1990). Dense mono-specific stands of Australian pine crowd out native vegetation in coastal areas and affect habitat for several listed and non-listed species. It is prevalent on the margins of the saltmarsh in the Lower Sweetwater Creek estuary.

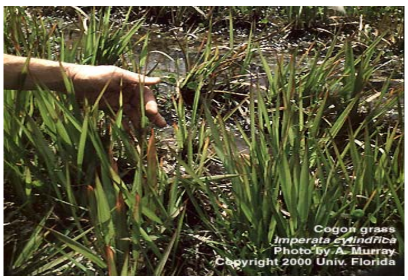


Air Potato

It is believed that air potato was introduced to Florida as an ornamental and food plant around 1905. It was already recognized as a pest plant throughout the state by the 1970s. It is a non-native, invasive vine covered with large handsome leaves. It can quickly grow 60-70 feet in length, which is long enough to overtop (and shade-out) tall trees. A member of the yam family (*Dioscoreaceae*), air potato produces large numbers of aerial tubers, (potato-like growths attached to the stems) that grow into new plants and is a particular problem in the margins of the Stream and Lake Swamp (FLUCFCS 615) land cover type.

Water Hyacinth

The water hyacinth is a floating plant that grows in all types of freshwaters. It has inflated petioles and forms large floating mats that can completely cover lakes, ponds, and streams. It is a prolific tropical weed now naturalized in waterways throughout the state and the frost-free coastal areas of the Southeast (Bell and Taylor, 1982). Water hyacinths vary in size from a few inches to over three feet tall. It has showy lavender flowers. The leaves are rounded and leathery, attached to a spongy and sometimes inflated stalk, and the roots are dark and feathery. It occurs in backwater areas of Lower Sweetwater Creek and in some artificial ponds.



Cogon Grass

Cogon grass is a non-native grass with extensive rhizomes, spreading stems from 3-10 feet. It is one of the most aggressive weeds of dry lands in Florida, but can occur in areas that become briefly flooded. It can cover large areas. Native to the warmer regions of the Old World, it was brought to the U.S. as experimental forage. It has spread, partially through its use as a packing material. It is commonly seen along roadsides, ditches, swales, and abandoned land. Difficult to eradicate due to its hardy rhizomes, the plant quickly out competes most native grasses. It is most prevalent along roadsides and abandoned land in the watershed.

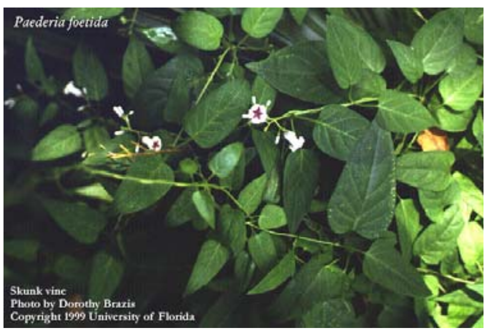
Punk Trees (Melaleuca)

Melaleuca trees, also known as punk trees or paperbark tea trees, are native to Australia, New Guinea, and New Caledonia. Melaleuca is characterized in Florida by a rapid growth rate, efficient reproduction, and the ability to invade a wide variety of habitats (Meskimen, 1962). This exotic tree grows along roadsides, on ditchbanks. Once established, trees form dense stands that are nearly impenetrable (Center and Dray, 1986).

More than 4,000 trees per hectare are not uncommon in melaleuca forests. Melaleuca is a pest, especially in the Everglades and surrounding areas, where the trees grow into immense forests virtually eliminating all other vegetation. Although small mammals seem to use these forests, species diversity in wet prairie-marsh ecosystems with dense monocultures of melaleuca decreases by 60-80% (Austin, 1978; Woodall, 1978; Mazzotti et al., 1981). Schortemeyer et al. (1981) reported that only 10% of the bird species in melaleuca stands actually fed there and only 1.5% of their activity involves nesting in these trees. Melaleuca can replace native pond cypress. Punk tree are seen as small clumps distributed in the lower reaches of the watershed in residential areas and on the margins of the salt marsh in the Lower Sweetwater Creek estuary.

Chinaberry Tree

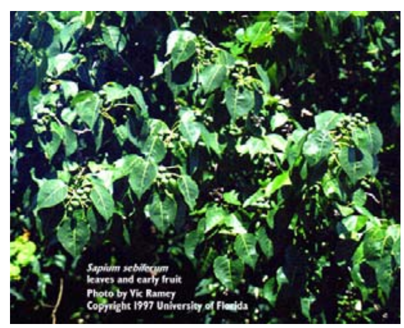
Chinaberry is a naturalized, fast-growing tree in the southeastern U.S. It is invading the forests, fence lines, and disturbed areas of Florida and elsewhere, including Hawaii. Belonging to the mahogany family of plants, chinaberry is native to Asia. Striking and colorful, chinaberry was widely introduced as an ornamental shade tree because of its large compound leaves, distinctive clusters of lilac-colored flowers, and round yellow fruits. Chinaberry seeds are spread by fruit-eating birds. Chinaberry outgrows, shades-out, and displaces native vegetation. The bark, leaves, and seeds are poisonous to farm and domestic animals. Chinaberry is a landscape element on residential properties in the watershed.



Skunk Vine

Skunk vine, a woody vine from Asia, actually does smell more-or-less skunk-like. The aggressive, competitive plant may grow high into the trees in a variety of habitats, from mesic hammocks to xeric sand hill communities. It appears to prefer sunny floodplains and bottomlands, and can even grow under water. Reportedly introduced in 1897 as a "potential fiber crop", skunk vine now occurs throughout the southeastern U.S. Herbarium records indicate that skunk vine grows in at least 17 counties of central and north central Florida. Its stems root freely. This species is prevalent on the edges of the channel.

Chinese Tallow



Like melaleuca, the Chinese tallow is a tree that grows and spreads rapidly, is difficult to kill, and tends to take over large areas by out-competing native plants. Chinese tallow is spreading rampantly in large natural areas, including Paynes Prairie State Preserve near Gainesville, state-owned protected lands along the St. Johns River. It is a landscape element on residential property and has escaped into all but the xeric plant communities.

Brazilian Pepper

Brazilian pepper is one of the most aggressive of the invasive non-indigenous plants in Florida. It is invading aquatic and terrestrial habitats, greatly reducing the quality of native biotic communities in the state. Brazilian pepper is from South America, and was probably introduced as an ornamental in the mid 1800s. Since it is not cold hardy, the tree occurs mostly in southern Florida. Brazilian pepper is indigenous to the coast of tropical Brazil, Paraguay, and Argentina (Ewel, 1986). It was present in Florida in the early

1840's (Barkley, 1944) and was re-introduced into Florida in 1898 (Morton, 1978). This plant was once sold as a landscape ornamental because it produced dense masses of scarlet berries. The species is established on ditch banks.

Wild Taro

The wild taro is an emergent plant, imported from the Pacific Islands. It occurs in and out of water. The leaves can grow to two feet long and are medium to large in size, arrowhead-shaped with heart-shaped bases. They are dark, velvety green, and water repellant. Wild taro leaves are peltate: the leaf stem attaches more-or-less to the middle of the underside of the leaf. Leaf stems grow to four feet tall, and flowers occur in small fingerlike spikes. It is established in backwater areas of the Lower Sweetwater Creek Channel.

Hydrilla, a submerged aquatic plant, grows rooted in the bottom substrate of quiet reaches of the Creek and other freshwater habitats. It escaped from the aquarium trade and is well established in the Creek.

8.5.8.2 Exotic Fauna

An exotic animal is a non-indigenous species introduced to an area either purposefully or accidentally. Exotic, non-indigenous, invasive species compete with native species for space, food, and ecological niche. Activities to prevent and control invasive animal species that severely impact the lands and waters of the United States have become a priority for watershed management. The term invasive species is defined by the Presidential Executive Order 13112. Known as "exotic-invasive" or "alien-invasive" species, these invasive plants and animals cause vast ecological and economic damage, and sometimes, human health impacts in areas that they infest. These species have gained a foothold on public and private lands throughout the nation and in other parts of the world, and range across almost every ecosystem of the country including those found within the Lower Sweetwater Creek watershed. Common methods of introduction include release of pets, escape from pet dealers, or intentional introduction for pest control.

USGS, FDEP, UF-IFAS, and Hillsborough County information on non-indigenous species were reviewed to compile a list of exotic species that have been observed or reported in the watershed. Some of the exotic animal species found in the watershed include: Nine-banded armadillo, Cuban tree frog, Greenhouse frog, and Brown anole. These four species arrived in Florida by natural migration (nine-banded armadillo) and by accidental introduction (Cuban tree frog, Greenhouse frog, and Brown anole). Armadillos disturb soils in all habitats, particularly Stream and Lake Swamp, Cypress, and other wetlands during the dry season. The Cuban tree frog is a voracious predator and will attack and devour anything smaller than itself, including native frogs, fish, and invertebrates. The greenhouse frog may be replacing native frogs, particularly in south Florida, while the brown anole competes to some degree with the native Carolina anole (chameleon).

8.6 Conservation and Preservation Programs

Conservation and preservation programs are critical instruments in the protection of natural communities. These programs promote and protect biological diversity which is supported by international treaties, federal regulations, state legislation, local comprehensive management plans, and local ordinances which are discussed in detail in Section 8.7.

Local governments in Florida may use two instruments of preservation: conservation easement as supported by 704 F.S. and 193 F.S. and land acquisition. These Florida Statutes support the following methods of preservation:

- Full fee acquisition
- Less than full fee acquisition
- 193 F.S. easement
- Transfer of development rights
- Purchase of development rights

8.6.1 Land Acquisition Conservation and Preservation Programs

There are several land acquisition conservation and preservation programs in Florida available to local governments that have jurisdiction over the Lower Sweetwater Creek watershed. While the opportunity to acquire lands for conservation purposes is extremely limited in this watershed, these programs are briefly described in the following sections.

Conservation and Recreation Lands Program
The Conservation and Recreational Lands (CARL) program was established in 1979 by the Florida Legislature which expanded the 1972 Environmentally Endangered Lands Program to include resource conservation measures for other types of lands. It is one of Florida's environmental land acquisition programs for the protection and conservation of unique natural areas, endangered species, unusual geologic features, wetlands, and significant archaeological and historical areas. Mineral-extraction severance taxes and documentary stamp fees funded the CARL program until the recent creation of the Preservation 2000 (P2000) program. The CARL program receives approximately $105 million annually from the sale of bonds. Future funding from the sale of bonds is dependent on legislative action, but the Florida Forever program is scheduled to continue until 2010.

The Land Acquisition and Restoration Council (ARC) was established by Section 259.035 (1) F.S., and selects and ranks projects on the CARL acquisition list each year. Nine members of ARC represent the following state agencies: Department of Community Affairs, DEP, Division of Forestry of the Department of Agriculture and Consumer Affairs, FWC, Division of Historical Resources of the Department of State, and four appointees of the Governor with backgrounds from scientific disciplines related to land, water, or environmental science.

The FDEP Bureau of Land Acquisition reviews all CARL and P2000 acquisitions and handles land exchanges, negotiates, and acquires lands for the department and other state agencies. Lands acquired under the CARL program are maintained as parks, recreation areas, wildlife management areas, wilderness areas, forests, and greenways.

Florida Forever Program

Established in 1999 by the Florida Legislature, the Florida Forever Program is the principal land acquisition program for Florida. It provides for up to $3 billion statewide over a 10-year period to protect and improve environmental lands, water resources, and urban green space. The allocation to SWFWMD equates to approximately 25% of total funds expected to be provided under the program.

Hillsborough County Environmental Lands Acquisition and Protection Program (HCELAPP)

The HCELAPP was established by Hillsborough County in 1987 for the purpose of acquiring, preserving, and protecting endangered and environmentally sensitive lands, beaches, parks, and recreational lands. Although resource protection is the primary purpose of acquiring sensitive lands in the county, public use that is compatible with the preservation and protection of such lands has been allowed on select parcels. The program is administered through the county's Parks and Recreation Department and is overseen by an advisory committee composed of both local citizens and public agency staff. Parcels deemed environmentally sensitive are evaluated and ranked on a site-by-site basis through an annual nomination process.

HCELAPP's land acquisition efforts for acquiring environmentally sensitive lands are often in cooperation with FDEP's CARL Program, SWFWMD, the Florida Forever Program, and The Nature Conservancy. HCELAPP has acquired approximately 97 acres in the Lower Sweetwater Creek watershed and the Pam Callahan Nature Preserve that includes estuarine and marine habitats.

Nature Conservancy

The Nature Conservancy (TNC) is a non-profit international organization whose goals are to conserve biological diversity through habitat conservation. TNC works with the Natural Heritage Inventory scientists and other researchers to set conservation priorities and acquire lands for conservation management.

TNC utilizes acquisition, land exchanges, conservation easements, retained life estates, and other arrangements to work with property owners to protect natural habitats. They also provide landowners with technical assistance on identifying and managing natural resources including rare species and unusual natural communities.

Trust for Public Lands

The Trust for Public Land (TPL) is a national non-profit land conservation organization that was created to protect land for public use and enjoyment. The principal goal of TPL is to acquire lands suitable for open space and parks, and convey them to public agencies for ownership and management. TPL also provides training and technical assistance to private landowners, local land trusts, and government agencies to enhance their land conservation goals.

Wetland Reserve Program

The Wetland Reserve Program (WRP) is administered through the USDA Natural Resources Conservation Service (NRCS). The WRP is a voluntary program offering landowners the opportunity to protect, restore, and enhance wetlands on their property. The NRCS provides technical and financial support for conservation easements and wetland restoration in an effort to achieve the greatest wetland functions and values, along with optimum wildlife habitat.

8.6.2 Public Lands in the Lower Sweetwater Creek Watershed

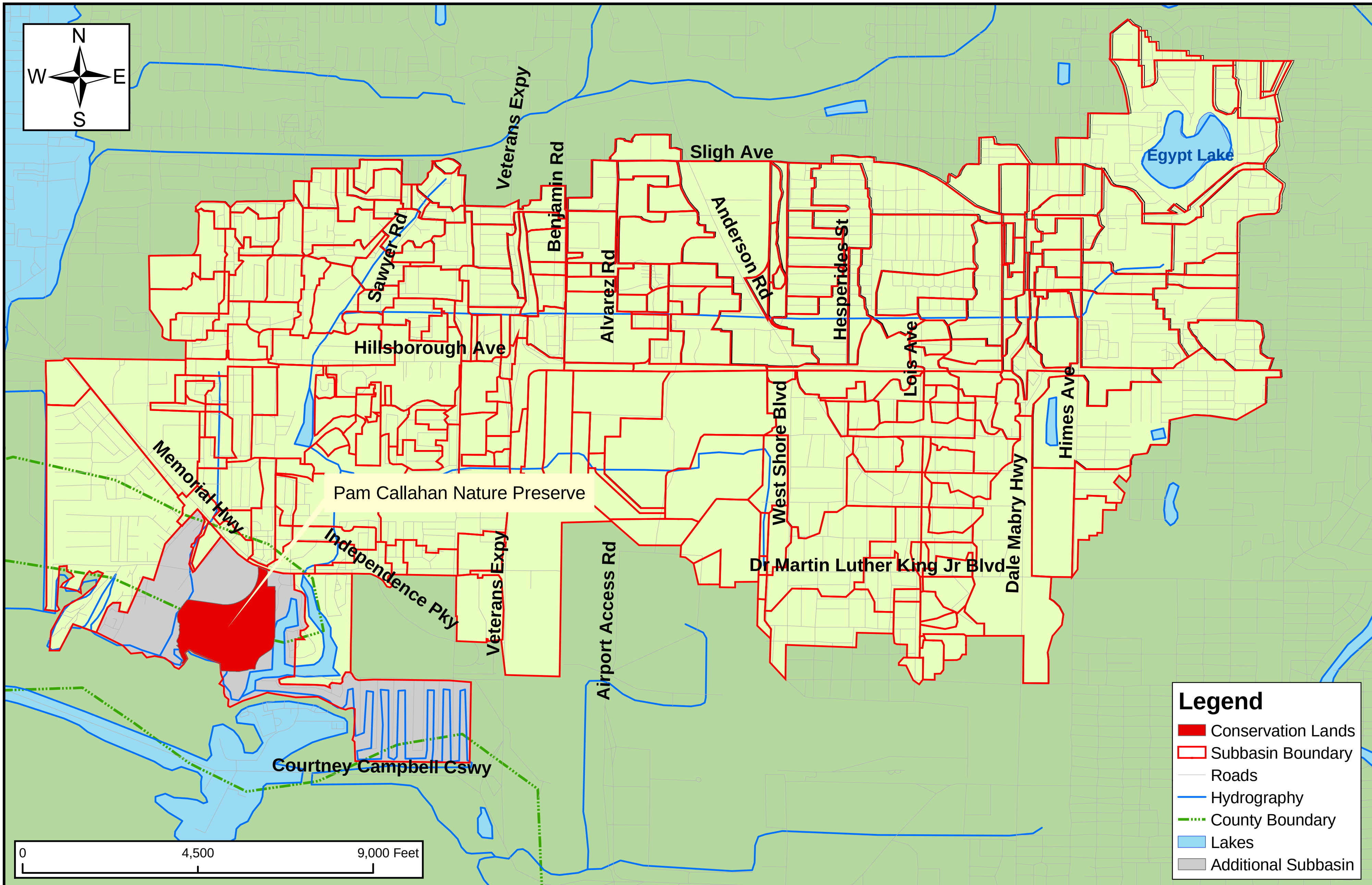
A review of existing public lands within the watershed was conducted utilizing GIS metadata for conservation lands in Florida compiled by the Florida Greenways Planning Team, Department of Landscape Architecture of the University of Florida based on:

- SWFWMD GIS acquired and proposed land data
- CARL, Conservation Lands 2004, and FNAI Managed areas GIS data (FGDL)
- Hillsborough County ELAPP GIS data
- Atlas of Outstanding Florida Waters

Hillsborough County Parks information provided by the Hillsborough Planning Commission was also reviewed and utilized for this report. An analysis of the GIS data layers was performed to approximate proposed and acquired land area. Almost 97 acres have been acquired for conservation purposes (Table 8-11). Figure 8-9 shows the 2004 conservation areas identified by SWFWMD.

Table 8-11 Acreages of Lands for Conservation Purposes within the Lower Sweetwater Creek Watershed

Parcel Name	Acres
Pam Callahan Nature Preserve	97
Total	97



Conservation Lands in the Lower Sweetwater Creek Watershed

Figure 8-9

AYRES ASSOCIATES

8.6.3 Greenways and Trails

Subsection 260.012(1) (2) F.S. (The Florida Greenways and Trails Act) defines “greenways” as linear open space established along either a natural corridor such as a riverfront, stream valley, or ridgeline, or over land along a railroad right-of-way converted to recreational use, a canal, a scenic road or other route; any natural or landscaped course for pedestrian of bicycle passage; an open space connector linking parks, nature reserves, cultural features, or historic sites with each other and populated areas; or a local strip or linear park designated as parkway or greenbelt. The same statute defines “trails” as a linear corridor and any adjacent support parcel on land or water providing public access for recreation or authorized alternative modes of transportation.

Greenways can be hard surfaced pathways that permit different recreational uses such as walking, jogging, skating, and biking, or they can be natural corridors with a simple path along a stream or riverbank. Many greenways connect destination points such as parks, libraries, schools, and shopping areas. A utility or drainage ROW, or an abandoned railroad corridor can be converted to a pedestrian bike or walkway. Conservation areas protecting a community’s natural resources such as rivers, streams, wetlands, wildlife, and floodways are often included in greenways. Greenways benefit the community in many ways by providing opportunities for recreation and alternative transportation, improving environmental protection, providing places for environmental education, and stimulating economic development.

In the Lower Sweetwater Creek watershed, there are no existing trails. Several trails and bikeways are proposed by Hillsborough County.

Funding sources for the development of greenways and trails are available from:

1. **Recreational Trails Program** - The Recreational Trails Program (RCT) is a federally competitive grant program that provides, renovates, or maintains recreational trails. The Intermodal Surface Transportation Efficiency Act ISTEA) of 1991 included the National Recreational Trails Fund Act (NRTFA) and established the National Recreational Trails Funding Program (NRTFP). The National Highway System Designation Act (NHS Act) of 1995 amended and revived the NRTFA. The Transportation Equity Act for the 21st Century (TEA-21) amended the previous legislation and provided six years of funding. In Florida, the RCT is administered by the FDEP in coordination with the U.S. Department of Transportation, Federal Highway Administration.

2. **Florida Recreation Development and Assistance Program** - The Florida Recreation and Development Assistance Program is a competitive program that provides grants for acquisition and development of land for public outdoor recreation use.

3. **FDOT Transportation Enhancement Program** - The Florida Department of Transportation (FDOT) Transportation Enhancement Program provides funds for

transportation-related activities designed to strengthen the cultural, aesthetic, and environmental aspects of Florida's intermodal transportation system. The program provides for implementation of a variety of projects including bike and pedestrian facilities. Projects are selected by local metropolitan planning organizations and the FDOT district offices.

4. **Florida Scenic Highways Program** - The Florida Scenic Highways Program is administered by the FDOT. This program works with local governments to identify and protect scenic roadways throughout the state. Designated corridors, including associated greenway and trail projects, may be eligible for increased funding opportunities.

8.6.4 Natural Systems Restoration

The Lower Sweetwater Creek watershed reflects a variety of land uses that have resulted in both conversion of natural lands to urban, suburban, commercial, and agricultural development and degradation of remaining native habitats. Increased future land development will continue to produce adverse impacts to natural systems. Consequences of development have included: reduction in biological diversity, overall habitat quality, abundance, and distribution, as well as habitat fragmentation, species isolation, impairment of water quality, and loss of wildlife corridors.

In order to alleviate the negative impacts of development, it is necessary to protect and restore natural systems within the watershed through land acquisition, conservation methods, public environmental education, exotic plant species removal, replacement of native habitats where they have been eliminated and/or degraded. High quality natural areas are a priority to both the human population and animal populations within the watershed, and the implementation of a meaningful restoration/protection plan will produce substantial ecological and aesthetic benefits.

Restoration - There are several candidate areas for restoration. Chief among these areas are the locations at which Lower Sweetwater Creek has been crossed by major roadways, electrical transmission facilities, and the railroad grades. At all of these locations, the Creek have been subject to factors that have degraded stream habitat, discouraged wildlife establishment, allowed the invasion of exotic plant species, resulted in trash accumulation in the channel, and negatively affected water quality. Priority restoration measures at these areas include:

1. Diversion and treatment of untreated stormwater runoff;
2. Exotic species removal;
3. Reshaping channel banks to eliminate erosion and undercutting;
4. Trash removal; and
5. Re-establishing desirable native plant species consistent with the original habitat and compatible with the needs of each transportation facility.

Other candidate areas for restoration include:

1. Roadway rights-of-way where exotic species have become established – Following the removal of exotic species, desirable native species should be planted, and a maintenance program should be implemented to ensure restoration success. Appropriate signage at each restoration site should be erected for public education purposes;
2. Enhancement of habitat on Channel G, where feasible, to promote fisheries and safe public access for fishing and birding; and
3. Restoration of native habitats in areas formerly occupied by salt marsh, mangroves, and salt flats in the estuarine area of the watershed, and restoration of former pine flatwoods and longleaf pine-xeric oak habitats in the upper reaches of the watershed, particularly in the vicinity of Egypt Lake where feasible.

8.7 Regulations Protecting Natural Systems

As part of the development of the Lower Sweetwater Creek watershed management plan, existing regulatory mechanisms that protect natural communities within the watershed and throughout the County were researched and reviewed. Regulations are an important component in the protection, maintenance, preservation, and conservation of natural lands.

HCEPC Wetland Rule
The Hillsborough County Environmental Protection Commission's (HCEPC) Chapter 1-11 (Wetlands) Rule provides standards for the identification, protection, maintenance, and utilization of wetlands in Hillsborough County.

Hillsborough County
Wetlands, uplands, and environmentally sensitive areas are protected by the County Land Development Code (Ordinance No. 00-21, PART 4.01.00) requirements including set backs, buffer zones, and other mechanisms. The Natural Resources regulations protect habitats that are scarce within the county and supports the Endangered Species Act, enforcing protection of listed species and their habitats.

Environmental Resource Permit
The Environmental Resource Permit (ERP) process is administered by the SWFMWD and the FDEP under Part IV of Chapter 373, Florida Statutes (F.S.) and Chapters 40D-4, 40, 45, and 400, Florida Administrative Code (F.A.C.). This permit provides protection for surface water bodies, wetland ecosystems, partially through coordination with the Florida Fish and Wildlife Conservation Commission, NMFS, USFWS, and the USACOE.

Federal Regulation
Federal protection for wetlands is provided under the Section 404 Dredge and Fill Permit administered by the USACOE and the National Pollutant Discharge Elimination System Permit (NPDES) administered by the EPA.

Tampa Bay Comprehensive Conservation Management Plan
The Tampa Bay Estuary Program has developed a Comprehensive Conservation Management Plan that promotes improved land and water management throughout the Tampa Bay watershed, including the protection and restoration of declining natural communities that serve as indicators of the health of Tampa Bay.

Hillsborough County Comprehensive Plan
County comprehensive plans are mandated by Chapter 163 F.S., as amended by the Local Government Comprehensive Planning and Land Development Regulation Act. This act requires the development of a comprehensive plan by each local government within Florida. Chapter 163 F.S. is further defined by Rule 9J-5, F.A.C., which establishes minimum criteria for each element of the comprehensive plan. The Hillsborough Comprehensive Plan has the following elements:

1. Coastal management;
2. Conservation and aquifer recharge;
3. Future land use;
4. Transportation;
5. Housing;
6. Recreation and open space;
7. Economically disadvantaged groups;
8. Potable water;
9. Sanitary sewage;
10. Storm water;
11. Solid waste; and
12. Capital improvement projects.

Elements that directly affect natural communities within the Lower Sweetwater Creek watershed are coastal management, recreation and open space, potable water, conservation and aquifer recharge, and capital improvement projects.

8.8 Public Education

Public education is one of the most important components of a watershed management plan. Public outreach programs and projects can promote the participation and involvement of local residents, which contributes to the acceptance, approval, and successful implementation of this watershed management plan. The following is a summary of current public education and outreach programs throughout the state that apply to natural systems-related concerns in the Lower Sweetwater Creek watershed. More specific information pertaining to these programs can be found by contacting the responsible agency by phone or through their web site.

Hillsborough County implements several programs applicable county-wide, including the Lower Sweetwater Creek watershed:

1. **Officer Snook Program** - The Officer Snook Program teaches children about water pollution and its effect on our rivers, ponds, lakes, and streams. Officer Snook provides a fun and educational coloring book for each student, as well as curriculum guides and activity books for teachers who want to continue pollution prevention education in their classrooms.

2. **Stormwater Ecologist** – This program is designed to give students and teachers the power to make responsible decisions about stormwater pollution prevention and to demonstrate how our actions all play a role in the health of the world around us. Stormwater Ecologist not only talks about making a difference, we'll actually help you make one with our hands-on and community projects. This program incorporates aspects of science, politics, and economics, making it appropriate for a wide range of classes.

3. **Hillsborough County's Adopt-A-Pond** - The Adopt-A-Pond program is a public-private partnership helping neighborhoods improve their water quality, wildlife habitat value, and aesthetic value of stormwater ponds. The program is dedicated to improve pond environments. The program offers free education on stormwater runoff, storm drain marking kits, free native wetland plants, technical advice on pond management, and the opportunity to participate in a network of other members of the program. In the watershed, one pond is included in the Program, Sunrise Villas of Tampa Bay (#94-119) in Section 32, Township 28, and Range 18.

4. **Hillsborough County Stream Waterwatch** - The Stream Waterwatch program is a cooperative effort between Hillsborough County, Hillsborough County Community College, FWC, and the SWFWMD. The goal of this program is to ensure clean and healthy streams. Volunteers are trained to collect water quality samples, to take field measurements of physical parameters, and to collect, sort, and identify macro-

invertebrates. Volunteers collect monthly stream samples and measurements. They also participate in stream clean-ups, restoration projects, and related activities.

5. **Hillsborough County Lake Management Program** - The Lake Management Program (LaMP) is a cooperative program involving Hillsborough County, University of Florida LAKEWATCH, and the University of Florida. Volunteers take monthly samples and learn about aquatic plants, water quality, and the wildlife that utilize their lakes. Citizens learn what they can do in their households and yards to improve the health of their lakes.

6. **Nature' s Classroom at the Wilderness Park** - The Nature's Classroom is located within the Wilderness Park, an award winning outdoor educational facility for sixth graders in Hillsborough County. Nearly 10,000 students and faculty have experienced the Hillsborough River first hand by viewing animals and plants in their natural habitats. The SWFWMD's Hillsborough River Basin Board for flood control and water quality protection originally purchased the Wilderness Park.

University of Florida/Hillsborough County Cooperative Extension Service

The Cooperative Extension Service (CES) is an educational service of the University of Florida and Hillsborough County that provides research-based information to the public through workshops, publications, and mass media. The CES offers assistance on creating and maintaining a Florida yard, composting, creating wildlife habitat, xeriscaping, water conservation with micro-irrigation, butterfly gardening, and landscaping for beginners. Several programs are implemented in Hillsborough County:

1. **Master Gardener Program** - The CES offers the Master Gardener Program that provides gardeners with training and the opportunity to improve their horticultural knowledge and skills. Through organized volunteer activities, gardeners then share their experience with the public. Master gardeners help to educate the community by helping gardeners solve their plant problems, promoting environmental responsibility through water conservation and pest control, beautifying Hillsborough County by teaching about appropriate plants for its climate, and working with school and community gardens.

2. **Backyard Wildlife Habitat Program** - The CES offers the Backyard Wildlife Habitat Program, which promotes the use of native plants. The program teaches that the right selection of native plants can provide a natural food source year-round that many native plants are attracted to. When used correctly the plants will require less water, fertilizer, and pesticides.

3. **Florida Yards and Neighborhoods Program** - The CES offers the Florida Yards and Neighborhoods Program (FYNP). The FYNP is a partnership of concerned citizens, members of the landscape industry, the University of Florida's Cooperative Extension Service, the National Estuary Program, Florida Sea Grant College Program, and numerous environmental agencies. The program was developed to address serious

problems of pollution and disappearing habitats by enlisting homeowners to help save our waterways. The program provides special education and outreach activities in the community by assisting residents to reduce pollution and enhance their environment by improving home and landscape management.

SWFWMD Environmental Education Programs
SWFWMD implements several programs throughout its 16-county service area that includes Hillsborough County:

1. Xeriscape - The xeriscape program promotes water conservation through creative landscaping. Landscapes that conserve water will save the homeowner money on water, energy, and maintenance bills, and will help preserve valuable fresh water resources and provide wildlife habitat. The program guides homeowners through a seven-step process including 1) design, 2) plant selection, 3) improving the soil, 4) wise utilization of turf, 5) efficient irrigation, 6) using mulch, and 7) maintenance.

2. SWFWMD In-School Education Programs - The In-School Education Program helps achieve the SWFWMD's goal of preserving and protecting water resources and related ecosystems through educational materials for teachers and students from Kindergarten through grade 12.

3. SWFWMD Mini-grants is a program that offers teachers funding to do classroom projects on water quality, water supply, water conservation, or watersheds. Applications are available through the SWFWMD at http://www.swfwmd.state.fl.us/infoed/educators/minigrants/hillsboroughmg.pdf.

4. SWFWMD Teacher workshops provide teachers information on water resources, as well as hands-on activities and strategies for the best instructional methods on water issues.

5. Project WET is an inter-disciplinary water education program for teachers and other educators working with young people in Kindergarten through grade 12. The program can be integrated into existing curricula of a school, museum, or community organization. The goal of the project is to facilitate and promote appreciation, awareness, knowledge, and stewardship of water resources though the development of classroom-ready teaching aids. The Project WET Curriculum and Activity Guide is a collection of over 90 innovative, interdisciplinary activities that are hands-on, easy to use, and fun. Designed with a commitment to state and national education standards, Project WET activities cover diverse topics and disciplines. The Project WET Curriculum and Activity Guide activities promote critical thinking and problem-solving skills. These activities help provide young people with the knowledge and experience they will need to make informed decisions regarding water resource management.

6. The *Envirothon* is a problem-solving, natural resource education program for high school students. Student team to solve problems and conduct hands-on investigations about forestry, soils, aquatics, wildlife, and current environmental issues. SWFWMD sponsors an annual *Envirothon* in Hillsborough County inviting local high schools to compete against each other in solving problems in various disciplines.

7. Florida Waters Project Teacher's Guides is a set of activities and background information designed to encourage students to investigate and explore the water systems in their communities, to learn more about water issues and land resources in their communities, and to take an active role in the protection and preservation of our precious water resources.

8. SWFWMD Water Matters is a set of multi-disciplinary activities and background information designed to help students learn about the process of water management and how they can be involved with the process. Water Matters is available to the public.

9. My Water Activity Book is full of fun activities to help students from kindergarten through 2nd grade learn about water resources by coloring and completing mazes, word games, dot-to-dot, and puzzles. This book is available to teachers and students.

10. SWFWMD Splash! Water Education Packet is a colorful, multidisciplinary middle school packet containing fact and activity sheets on wetlands, the hydrologic cycle, desalination, water use, water conservation, community planning, and water management. The packet is free to educators.

11. Water Drops Newsletter is a water resource newsletter available to teachers from grades 3 through 5. Newsletter issues come with a teacher's guide on water conservation, water management, and the water cycle. The newsletter was designed to assist teachers in discussing water related issues with their students.

12. The Watershed Education Resources Box is a collection of puppets, poetry, fiction, and non-fiction materials available to teachers to help students understand watersheds and the importance of watersheds.

13. The Watershed Excursion Tabloid includes information about watersheds found throughout the SWFWMD, explains to students why watersheds are important to Florida's ecosystems, and how we can all work to keep our watersheds clean and healthy.

14. The Water Education Week Publications were created and distributed in conjunction with the Newspaper In-Education Program. This 16-page newspaper tabloid with teacher's guide focuses on a particular water topic each year. Materials are designed for

grades 4-7. The booklets on water quality, habitats, water management and use, technology, and sustainability are available as class sets and are free to educators.

15. The Water from the Ground Up is a full curriculum available to teachers that includes text, a teacher's guide, an activity book, and basic District hydrologic information for students in grades 3-5. The curriculum includes topics on surface water and groundwater sources in west central Florida, water quality, water use, floods, droughts, and water conservation.

16. The Water Watchers is a video and teacher's guide available to kindergarten through grade 3 teachers that includes classic children's songs with water resource lyrics. It also features simple experiments to illustrate such concepts as the hydrologic cycle, water pollution, saltwater intrusion, etc.

17. Who Gets the Water? is an interdisciplinary curriculum available to middle school teachers that provides a basic understanding of the environmental and economic concepts necessary to make good decisions in the face of limited resources.

Florida Department of Education, Office of Environmental Education, Environmental Program

The Florida Department of Education has divided Florida into several Environmental Education Regional Service Areas. The Lower Sweetwater Creek watershed is within Regional Service IV that covers Charlotte, De Soto, Glades, Hardee, Hendry, Hernando, Highlands, Hillsborough, Lee, Manatee, Pasco, Pinellas, Polk, and Sarasota counties. Each regional service area has several environmental projects, including the promotion of "Teaching Naturally." This is an interdisciplinary guide using activities to make education real for students by using the environment as an integral concept across subject areas for all grade levels. The mission of Regional Service Projects (RSP) is to assist their region's pre-K through 12 schools, colleges, and universities in improving teaching and learning through environmental education. The RSP IV functions include:

- Conducting assessments of educational needs of teachers and students that environmental education can meet;
- Soliciting and brokering resources to match the needs of teachers, preservice educators, and students that environmental education can meet;
- Publishing and distributing Regional Resource Guides that cover a broad spectrum of regional, state, and national resources for educator use;
- Developing and supporting a cadre of skilled facilitators, most of whom are classroom teachers, to deliver workshops;
- Developing materials and workshops that link environmental education with Sunshine State Standards;
- Collaborating with Area Centers for Educational Enhancement to improve teaching and enhance student performance;

- Assisting post-secondary educators in integrating environmental education concepts and methods in their teaching; and
- Materials developed by the program of the Office of Environmental Education are distributed at no cost to the public.

Florida Fish and Wildlife Conservation Commission implements several programs state-side, including Hillsborough County and the Lower Sweetwater Creek watershed:

1. **Project WILD** is a supplementary, interdisciplinary instructional program for teachers of kindergarten through high school age students. It is a way for teachers to incorporate concepts related to people, wildlife, and a healthy environment into major school subjects and skill areas. WILD activities are organized around a conceptual framework that addresses awareness and appreciation of wildlife, human values and wildlife, wildlife and ecological systems, wildlife conservation, cultural and social interaction with wildlife, wildlife issues and trends, and responsible human actions. Project WILD is one of the most widely used conservation and environmental education programs among educators. It is based on the premise that young people and educators have a vital interest in learning about our natural world. The program emphasizes on wildlife because of its intrinsic and ecological values, as well as its importance as a basis for teaching how ecosystems function. Project WILD addresses the need for human beings to develop as responsible citizens of our planet.

2. **FWC Schoolyard Wildlife Project** is an environmental education program that teaches teachers, parents, and students how to turn school grounds into an effective outdoors classroom. The Schoolyard Wildlife Project's resources help incorporate Florida's natural history into school curricula to teach environmental awareness, problem-solving, basic biology, and ecological principles. Two types of hands-on, interactive, one-day workshops are offered: *Schoolyard Activities & Ecology* and *Schoolyard Ecosystems*. A combination weekend workshop is offered twice a year. The *Schoolyard Activities & Ecology* workshop provides teachers with high quality, Florida-specific natural history and ecology lessons, and natural science explorations. This four- to six-hour workshop targets educators in grades K-6. The *Schoolyard Ecosystems* workshop teaches educators about local ecosystems and how to involve their students in the creation, restoration, or enhancement of native wildlife habitats on school grounds. This six-hour workshop targets educators in grades K-12. The Schoolyard Wildlife Activity Guide and Schoolyard Ecosystems book can be received only by attending the workshop.

Florida Wildlife Federation Backyard Wildlife Habitat Program - The Florida Wildlife Federation, together with the National Wildlife Federation, offers all Florida residents an opportunity to take part in the Backyard Wildlife Habitat Program.

The program's goal is to promote and expand gardening for wildlife in Florida. This program promotes the use of native plants, wildlife habitat creation, water conservation, and the use of fewer fertilizers and pesticides to result in less water pollution. As a result, the homeowner trades time-consuming lawn care for hours spent watching birds, butterflies, and small mammals.

Tampa Audubon Society Audubon Resource Center

The Tampa Audubon Society is a non-profit organization dedicated to preserving Florida's resources and unique habitats. It is one of 45 chapters in Florida that assist members and other community leaders in taking on the challenges of local environmental conservation, education, and advocacy. The Tampa Audubon Society offers conservation education and outreach programs to students, providing solid, science-based curricula and site-based programs in subjects as far reaching as aquifer function and wetland conservation. Outdoor and experience-based conservation education is the heart of Audubon's work in the Tampa Bay area. By giving children, families, and adults the opportunity to experience Florida's natural resources and identify wildlife and habitat types, the Audubon helps to create and nurture a culture of conservation.

Within the Tampa Bay area, factors such as the elimination of wetlands development, decreased water quality, and an increase in population make it essential for residents to understand the Tampa Bay ecosystem so that growth and development can proceed in harmony with nature. Being intimately involved with these issues, the Audubon Society has developed a unique partnership with the Hillsborough County Parks and Recreation Department. Through this partnership, an Audubon Resource Center (ARC) was established in April 1998 at Lettuce Lake Park. The purpose of the ARC is to help foster a "culture of conservation" and an environmental ethic in the Tampa Bay region that will encourage community involvement as part of the Audubon mission. The Hillsborough River borders the 240-acre urban park and visited by 650,000 people each year, including school classes, clubs, inner-city youth, minorities, and families.

The ARC at the Lettuce Lake Park is designed to enhance Audubon's education and community involvement goals and helps citizens develop an appreciation, awareness, and understanding of the natural world and the interplay of forces that affect living things. The ARC is a multi-faceted hub for conservation and utilizes guided tours, educational brochures and materials, and hands-on activities like nest box building and habitat enhancement to reach its goals. The Center includes a natural history exhibit, nature store, and resource center full of books and informational materials. The exhibit shows wildlife of Tampa Bay and the Hillsborough River in their natural setting, giving students, young and old, closer look at the interrelationship of the ecosystem.

8.9 Bibliography

Australian Commissioner for the Environment. 1988. Rating of stream water quality and health based on existing vegetation and development activities within a watershed. AOCE. Victoria.

Brown, M.T., J. Schaefer, K. H. Brandt, S. J. Doherty, C.D. Dove, J.P. Dudley, D. A. Eifler, L. D. Harris, R. F. Noss, and R. W. Wolfe. 1987. An evaluation of the applicability of upland buffers for the wetlands of the Wekiva Basin, Center for Wetlands, University of Florida, Gainesville, Florida.

Brown, M.T., J. M. Schaefer, and K. H. Brandt. 1990. Buffer zones for water, wetlands, and wildlife in east central Florida, Center for Wetlands, University of Florida, Gainesville, Florida.

Carlisle, V.W., R.E. Caldwell, F. Sodek, III, L.C. Hammond, F.G. Calhoun, M.A. Granger, and H.L Breland. 1978. Characterization data for selected Florida Soils. Univ. of Florida IFAS, Gainesville, Florida.

Cox, J., R. Kautz, M. MacLaughlin, and T. Gilbert. 1994. Closing the Gap in Florida's Wildlife Habitat Conservation System, Florida Fish and Wildlife Conservation Commission (formerly Florida Game and Fresh Water Fish Commission). Tallahassee, FL.

Cowell, BC. 1973. Aquatic insect survey of the Upper Tampa Bay Watershed Project and the Sweetwater Creek Watershed Project. Report prepared for SWFWMD, Brookeville, FL.

Edmisten, JA. 1963. The Ecology of Florida Pine Flatwoods. University of Florida Graduate School, Gainesville, Florida.

Florida Department of Agricultural and Consumer Services. 1938 – 39. Aerial photos of Hillsborough County.

Florida Department of Transportation. 1999. Florida land use, cover and forms classification system, Florida Department of Transportation State Topographic Bureau Thematic Mapping Section.

Florida Fish and Wildlife Conservation Commission (formerly Florida Game and Fresh Water Fish Commission). 1992. Final report: Aquatic and Terrestrial Wildlife Survey in the Lake Tarpon Watershed, FFWCC. Tallahassee, Florida.

Florida Fish and Wildlife Conservation Commission (formerly Florida Game and Fresh Water Fish Commission). Jan, 2004. Florida's Endangered Species, Threatened Species and Species of Special Concern, Official Lists, FFWCC. Tallahassee, Florida.

Florida Land Boundary Information system. 2003. General Land Office Township plats and survey notes. http://labins.data.org\.

Florida Natural Areas Inventory, 1997. Matrix of habitats and distribution by county of rare/endangered species of Florida.

Florida Natural Areas Inventory, 1990. The natural communities of Florida, FDEP, Tallahassee. Florida.

Harper, R.M. 1921. Thirteenth Annual Report: The Geography of Central Florida. Florida State Geological Survey, Tallahassee, Florida.

Harris, L D. 1991. The need, rationale and implementation of wildlife dispersal corridors. Issue IV in a series of papers for the S.W.I.M. Model Ordinance Project. Surface Water Improvement and Management Program of the Southwest Florida Water Management District, Brooksville, Florida.

Maher, D. 1990. The Florida panther and private lands, Conservation Biology. 4:1-4.

McElfresh, R., J. Inglis, and B. Brown. 1980. Gray squirrel usage of hardwood ravines within pine plantations. Proceedings of the Louisiana State University Forestry Symposium.

Myers, R. L. and J. J. Ewel (eds.). 1990. Ecosystems of Florida.,University of Central Florida Press.

Miller, S. H, and J. H. Schaefer, 1998. Hardwood hammock fragments: relationships between human population growth and wildlife species richness. Fla. Game and Fresh Water Fish Comm. Final Report. Tallahassee. 90pp + vi.

National Resources Conservation Service (formerly, Soil Conservation Service). 1915, 1958, and 1989. Soil Survey of Hillsborough County, Florida.

Soil Conservation Society of America. 1987. Twenty-six Ecological Communities of Florida. SCSOA. Gainesville, FL.

Southwest Florida Water Management District Ecologic Evaluation Section. 2004. Minimum and Guidance Levels for Crescent Lake in Hillsborough County, FL. SWFWMD. Brooksville, FL.

Southwest Florida Water Management District Ecologic Evaluation Section. 2005. Directory of Lakes. SWFWMD. Brooksville, FL.

Southwest Florida Water Management District Land Resources Department. Dec, 2004. Florida Forever Work Plan Annual Update - 2005. SWFWMD. Brooksville, FL.

United States Code of Federal Regulations, Title 50, Parts 17.11 and 17.12. October 1, 1997. Endangered and Threatened Wildlife and Plants.

United States Department of Agriculture. 1916. Field operations of the Bureau of Soils. 18th Annual Report – Soil Survey of Hillsborough County. USDA. Washington, DC.

United States Department of Agriculture. 1958. Soil Survey of Hillsborough County. USDA. Washington, DC.

United States Department of Agriculture. 1983. Soil Survey of Hillsborough County. USDA. Washington, DC.

University of South Florida. Florida Center for Community Design + Research. 2005. Hillsborough Water Atlas. http://map.wateratlas.usf.edu/website/hills\.

Wolfe, S. H., and R.D. Drew, eds. 1990. An ecological characterization of the Tampa Bay watershed. U.S. Fish and Wildlife Service Biological Report 90(20).

8.10 List of Common and Scientific Names for Plants and Animals Mentioned in Report

Trees

Australian pine, Casuarina equisetifolia
Bald cypress, Taxodium distichum
Bluejack oak, Quercus incana
black gum, Nyssa sylvatica var sylvatica
Brazilian pepper, Schinus terebinthifolius
Carolina holly, Ilex ambigua
Carolina willow, Salix caroliniana
castor bean, Ricinus communis
chinaberry tree, Melia azedarach
Chinese tallow tree, Sapium sebiferum
dahoon, Ilex cassine
laurel oak, Quercus laurifolia
lobllolly bay, Gordonia lasianthus
loblolly pine, Pinus taeda
longleaf pine, Pinus palustris
Pond cypress, Taxodium ascendens
punk tree, Melaleuca quinquenervia
red maple, Acer rubrum
sand live oak, Quercus geminata
slash pine, Pinus elliottii
southern red maple, Acer rubrum
swamp bay, Persea palustris
sweetbay, Magnolia virginiana
Turkey oak, Quercus laevis

Shrubs

Beautyberry, Callicarpa Americana
Buttonbush, Cephalanthus occidentalis
Darrow's blueberry, Vaccinium darrowii
Fetterbush, Lyonia lucida
Gallberry, Ilex glabra
Gopher apple, Licania michauxii
saw palmetto, Serenoa repens
shiny blueberry, Vaccinium myrsinites
staggerbush, Lyonia ferruginea
tarflower, Bejaria racemosa

titi, Cyrilla racemosa
Virginia willow, Itea virginiana
Wax myrtle (southern bayberry), Myrica cerifera

Herbs
air potato, Dioscorea bulbifera
alligator flag (fire flag), Thalia geniculata,
Alligator weed, Alternanthera philoxeroides
Arrowhead, Sagittaria lancifolia
ball moss, Tillandsia recurvata
Beak rush, Rhyncospora sp.
bladderwort, Utricularia purpurea
bladderwort, Utricularia inflata
bog buttons, Lachnocaulon anceps
bushy bluestem, Andropogon glomeratus
Cardinal airplant, Tillandsia fasciculata
Carolina elephant's foot, Elephantous carolinianus
Cattail, Typha, latifolia
Cattail, Typha domingensis
Cinnamon fern, Osmunda cinnamomea
cogon grass, Imperata cylindrical/I. brasiliensis
drumheads, Polygala cruciata
duckweed, Spirodela punctata
dwarf pawpaw, Asimina pygmaea
eastern milk pea, Glactia regularis
false nettle, Boehmeria cylindrica
fire flag (alligator flag), Thalia geniculata
giant airplant, Tillandsia utriculata
goldenrod, Solidago fistulosa
maidencane, Panicum hemitomon
marsh fern, Thelypteris palustris
early whitetop fleabane, Erigeron vernus
meadow beauty, Rhexia sp.
netted chain fern, Woodwardia areolata
parrot's feather, Myriophyllum heterophyllum
Pink sundew, Drosera capillaris
redroot, Lachnanthes caroliana
royal fern, Osmunda regalis
sand cordgrass, Spartina bakeri
sawgrass, Cladium jamaicensis
skunk vine, Paederia foetida
southern needleleaf, Tillandsia simulate
Southern shield fern, Thelypteris kunthii

Soft rush, Juncus effuses
Spanish moss, Tillandsia usneoides
Spatterdock, Nuphar luteum
spike rush, Eleocharis sp.
Spring ladies' tresses, Spiranthes vernalis
St John's wort, Hypericum fasciculatum
toothed mid-sorus fern, Blechnum serrulatum
tropical soda apple, Solanum viarum
Virginia chain fern, Woodwardia virginica
Water hoarhound, Lycopus rubellus
water hyacinth, Eichhornia crassipes
Water lettuce, Pistia stratoides
water spangles, Salvinia minima
whitetop sedge, Rhynchospora colorata
white water lily, Nyphaea odorata
wild taro, Colocasia esculenta
wiregrass, Aristida beyrichiana
yellow-eyed grass, Xyris sp.

ANIMAL SPECIES

Reptiles
American alligator, Alligator mississippiensis
eastern indigo snake, Drymarchon corais couperi
gopher tortoise, Gopherus polyphemus

Birds
Little blue heron, Egretta caerulea
Snowy egret, Egretta thula
Tricolored heron, Egretta tricolor
White ibis, Eudocimus albus
Wood stork, Mycteria americana

Mammals
Sherman's fox squirrel, Sciurus niger shermani

CHAPTER 9: WATER SUPPLY

9.1 Overview

The combination of increased water demand with the highly karstic nature of the watershed's geology has resulted in the development of a number of critical issues relating to water supply, including:

- lowered average water levels and increased fluctuations in lakes and wetlands
- declines in average elevations of the potentiometric surface and the water table
- increased annual fluctuations in the elevations of the potentiometric surface and the water table
- reduced streamflows in the Lower Sweetwater Creek
- saltwater contamination of coastal groundwater sources due to saline intrusion and upconing in coastal areas
- reduced reliability of private water supply wells
- increased sinkhole occurrence
- contamination of groundwater resources by septic tanks and stormwater runoff

As a result of these issues, increased emphasis has been placed on the development of alternative water supply sources, water reuse, off-line reservoirs, surface water withdrawals, aquifer storage and recovery, and water conservation programs in the region. In 2002, an estimated 36% of the County's water demand was supplied by surface waters, a figure that is 3% higher than in 1993. This entire amount was derived from the Hillsborough River Reservoir system which provides the majority of the City of Tampa's water supply. The reservoir system includes the Hillsborough River, Sulphur Springs, and the Tampa Bypass Canal. Groundwater resources occur throughout the County; however, higher quality groundwater is typically found with increasing distances from the coast.

Sinkhole formation occurs throughout the county with most occurrences reported in northern and western Hillsborough County. Northwest Hillsborough county is considered to be an area of "very numerous" sinkhole formation, particularly the cover – collapse category of sinkholes that occur abruptly. The Florida Department of Environmental Protection (FDEP) Sinkhole Database (2006) lists a total of 84 sinkholes that have been reported in the Northwest Hillsborough area, many of which occurred in the vicinity of the Cosme, Section 21, and Eldridge – Wilde Wellfields that are operated by Tampa Bay Water (TBW). For example, within 1 month of increasing the pumping rate at Section 21 wellfield, 64 new sinkholes formed within a 1-mile radius of the wellfield. Most of the sinkholes were formed in the vicinity of well 21-10, which was pumping at nearly twice the rate of the other wells. Neighboring areas also noticed dramatic declines in lake levels and dewatering of wetland areas. At this point it is recognized that sinkholes can occur as a result of natural geologic phenomena and by the influence of human activities including groundwater pumping, well construction, building construction, etc. The Lower Sweetwater Creek watershed is located in an area of “highest hazard” for sinkhole formation.

The entire Northwest Hillsborough Watershed area lies within the Northern Tampa Bay Water Use Caution Area (NTBWUCA), an area that includes Pinellas County, western and central Hillsborough County, and western and southern Pasco County. This designation was created in 1989 by the Southwest Florida Water Management District (SWFWMD) in response to the impacts observed in connection with groundwater withdrawals and the anticipated future increases in water demand in the area. Through this designation, the District developed a resource assessment and recovery strategy to be implemented through a combination of regulatory measures, conservation and supply projects, and voluntary compliance. The components of the assessment and recovery strategy are enunciated in Rule 40D-8, Florida Administrative Code (F.A.C.) and included:

- “All water use permittees within the Area are addressed by this Rule 40D-80.073, F.A.C. However, Tampa Bay Water’s facilities account for the majority of water withdrawals within the Area. For this reason, these facilities are the primary focus of the portion of the recovery strategy encompassed by this Rule 40D-80.073, F.A.C. Other users are addressed in 40D-80.073(5), F.A.C.”

- “Recovery to Wetland and Lake Minimum Levels for wetlands and lakes described in and established in 40D-8 is the objective of this Rule 40D-80.073, F.A.C.”

- “…the Floridan Aquifer Recovery Management Levels set forth in Table 80-1 below shall be used as long-term guidelines for allocating withdrawals within the Operations Plan, submitted to the District by TBW pursuant to the Agreement, and shall be reevaluated in 2010.”

- Based on that analysis and evaluation, on or before December 31, 2010, the District will initiate rulemaking to revise the MFLs…as necessary; adopt rules to implement the existing or the New MFLs…; and incorporate a second phase to this Recovery Strategy.

The Interim Recovery monitoring effort focuses on addressing other (non –Tampa Bay Water) water use, supplemental hydration of lakes and wetlands, and new applications for water use. The portion of the District's recovery strategy embodied within this Rule is the first regulatory phase of a long-term approach toward eventual attainment of the Minimum Flows and Levels (MFL) Program goals.

All users, including public water supply utilities, are required to incorporate conservation measures as a means of reversing detrimental environmental trends such as lake level declines and adverse wetland impacts. A number of planning efforts have been developed to protect and enhance water supplies in the Northwest Hillsborough watersheds. These include:

Hillsborough County Comprehensive Plan (Conservation and Aquifer Recharge Element) – The purpose of the Conservation and Aquifer Recharge Element of the County's Comprehensive Plan is to provide a plan and policy direction for the preservation, conservation, and management of the natural resources of Hillsborough County. The plan provides guidelines for future governmental programs and decisions related to the protection and enhancement of the County's natural environment, as well as the public health, safety and welfare. The objective of the Conservation and Aquifer Recharge Element is to ensure that the air, land, water and living resources of Hillsborough County remain an asset, rather than become a liability, to the quality of life of all existing and future inhabitants.

Hillsborough County Water Resources Team Goals – The mission of the Hillsborough County Water Resource Team is to address water supply and natural resource protection issues, as they relate to projects proposed or operated in Hillsborough County by Tampa Bay Water. Specifically, the Water Resource Team is to:

- Pro-actively coordinate with Tampa Bay Water to develop new and innovative water supply projects that are sensitive to the protection of natural resources
- Protect the County's environmental resources from adverse impacts that may result from water supply development projects undertaken by Tampa Bay Water
- Evaluate the water supply projects proposed by Tampa Bay Water for public health, ecological sustainability and cost effectiveness, in order to influence Tampa Bay Water to improve the projects in those areas where deficiencies exist
- Evaluate the operation of Tampa Bay Water's existing water supply projects and recommend actions to protect the County's environmental resources from adverse impacts
- Evaluate related proposed plans, rules and other initiatives undertaken by the Southwest Florida Water Management District and the Florida Department of Environmental Protection with the aim of protecting the County's environmental resources and safeguarding the quality of life for citizens of Hillsborough County
- Recommend action to the Board of County Commissioners and the Hillsborough County Environmental Protection Commission that will safeguard the rights of the County, its citizenry and the Environmental Protection Commission

Southwest Florida Water Management District Water Management Plan (DWMP) - The 2005 District Water Management Plan (Plan) was accepted by the Governing Board in July 2005 and represented the second five-year update of the District's "comprehensive plan." The Plan serves as a guide to the District in carrying out all its water resource management responsibilities, including those for Water Supply, Flood Protection, Water Quality and Natural Systems, and also reflects the District's Management Services support activities. It plays a significant role in ensuring coordination and consistency of District planning and management, as well as helping to link the District's activities with the planning and management activities of local governments and other agencies.

Southwest Florida Water Management District Northern Tampa Bay Water Resources Assessment Project (NTBWRAP) and Northern Tampa Bay Phase II Program (NTB II) - The Northern Tampa Bay Water Use Caution Area was designated in 1989, and it precipitated the expansion and development of projects to collect data and assess water resource conditions. In 1996, the District published the final report of a multi-year study which assessed the regional water resources of the Northern Tampa Bay area. This study, known as the Northern Tampa Bay Water Resources Assessment Project, was an effort to better understand the current state of the water resources of the area, as well as to provide the foundation for future, more detailed, hydrogeologic and biologic studies.

Since that time, the District has entered into a Partnership Agreement with Tampa Bay Water and its member governments to reduce groundwater withdrawals in the area from 158 mgd to 90 mgd by 2007. Additionally, the District has established a Minimum Flows and Levels Rule (40D-8), which includes minimum levels for cypress wetlands, lakes, and aquifers.

As a follow-up to previous hydrologic and biologic analyses performed in the Northern Tampa Bay area, the Southwest Florida Water Management District has launched a new program known as the Northern Tampa Bay Phase II program (NTB II). NTB II consists of a series of technical projects in Northern Tampa Bay to support the ongoing development of minimum flows and levels, water resources recovery, water use permitting, and environmental resource permitting.

Southwest Florida Water Management District's Northwest Hillsborough Basin Board – The basin board has approved a total of $6,831,519 for water supply-related projects for FY2006, many of which directly affect the region of northwest Hillsborough covered in this report.

Tampa Bay Water's Master Water Plan - Originally approved in 1995 and revised several times since then, this plan is currently aimed at providing a total capacity of 111 million gallons per day (mgd) of water supply by 2008 and reducing demand through conservation. The Master Water Plan is the blueprint to meet long-term drinking water needs for the people of the Tampa Bay region. This strategic plan studies, analyzes and compares water supply options. The options proven to be technically feasible, environmentally sound and economical are selected and implemented by Tampa Bay Water's Board of Directors Figure (9-1A and 9-1B).

The first configuration of the Master Water Plan project is nearing completion, with many of the projects having been implemented in the 2002 – 2005 timeframe. This group of water supply projects will meet regional water demands through 2012. Currently, Tampa Bay Water is working on a second configuration of projects to meet future demand in 2012 and beyond.

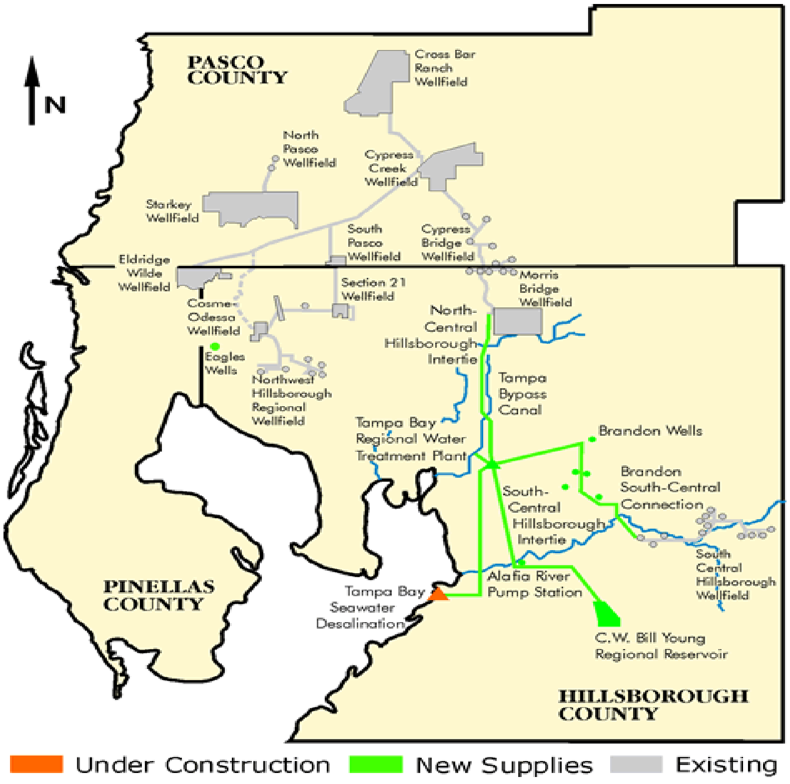


Figure 9-1A Tampa Bay Water Existing Facilities
(Source: Tampa Bay Water, 2006)

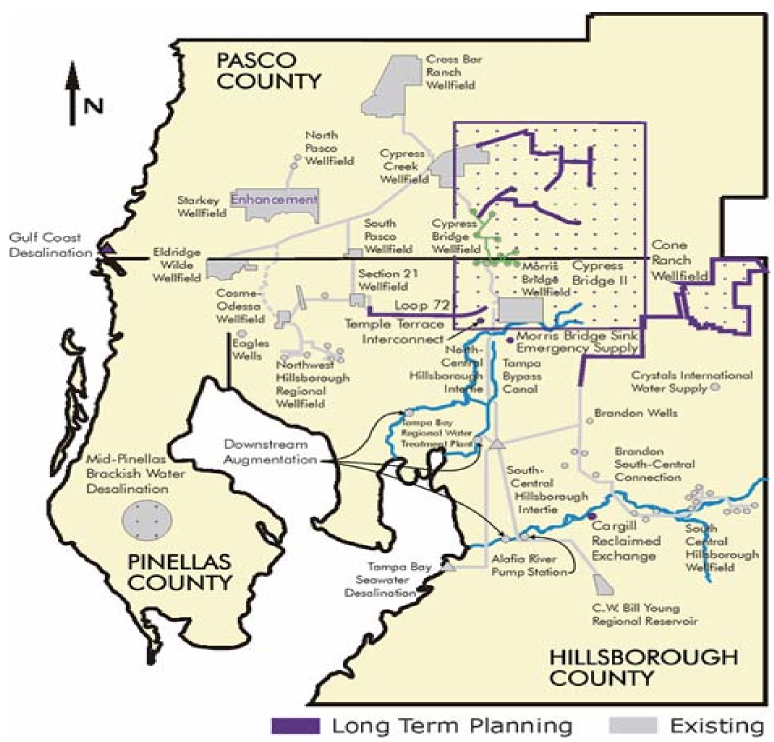


Figure 9-1B Tampa Bay Water Future Infrastructure
(Source: Tampa Bay Water, 2006)

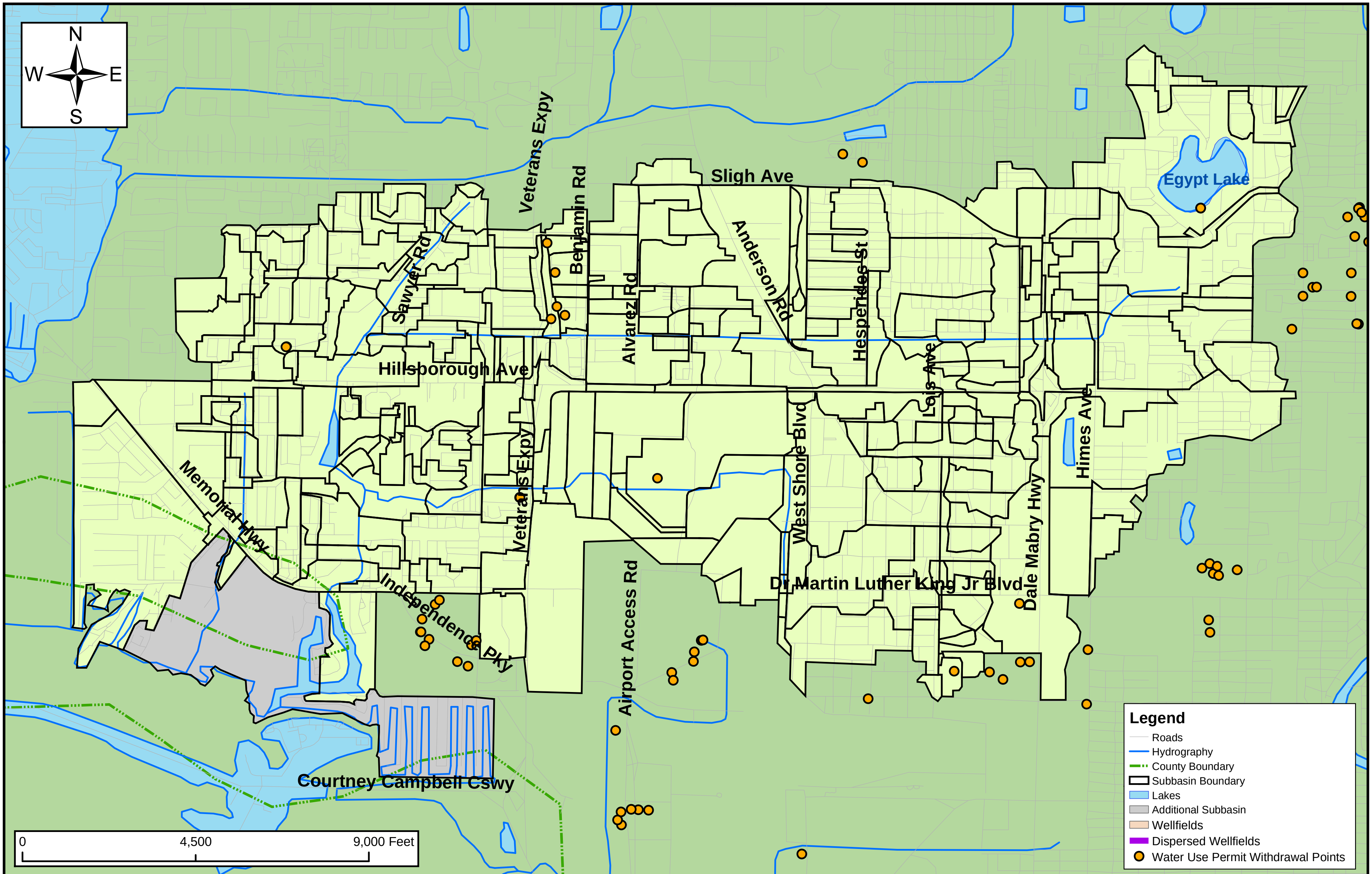
9.2 Groundwater Use

Hydrogeologic Setting - The project area constitutes a hydrogeologic transition zone between the northern and southern regions of the SWFWMD's 16-county service area. The surficial aquifer is composed of unconsolidated deposits of fine-grained sand, silt, and clayey sands having an average thickness of 30 feet. The elevation of the water table ranges from 5 feet NGVD to approximately 50 feet NGVD in the northern portion of Northwest Hillsborough County. In the Lower Sweetwater Creek watershed, the water table ranges from 10 – 30 feet NGVD. Groundwater derived from this aquifer is used most often for lawn irrigation and livestock watering as the aquifer produces yields that typically range around 20 gallons per minute. While of no significance for direct use for potable supply, the surficial aquifer is important in the northeastern portion of the project area as a source of recharge for the Upper Floridan Aquifer via vertical leakage across the semi-confining unit, a vertical zone composed of clays of a thickness ranging from 6 to 45 feet that is discontinuous across the project area.

The Lower Sweetwater Creek watershed, however, is a discharge, rather than a recharge, area. The Upper Floridan Aquifer, composed of a continuous series of carbonate units, ranges from 1000 feet to 1100 feet thick in the project area; in the Lower Sweetwater Creek watershed, the thickness of the Upper Floridan is approximately 1100 feet. The Upper Floridan is very close to the land surface in some areas. In the Lower Sweetwater Creek watershed, the limerock of the Upper Floridan comes to within 10 feet of the land surface. While the Upper Floridan is close to land surface in the area, the fact that the Lower Sweetwater Creek watershed is a discharge area reduces the potential for contamination of the Upper Floridan in the range of low to moderate.

Although numerous potable supply wells are located in the Lower Sweetwater Creek watershed, there are no major municipal supply facilities located there (Figure 9-2).

In the Hillsborough County portion of the NTBWUCA, the estimated withdrawal of groundwater amounted to 92.6 million gallons per day (mgd) in 2002, while the permitted groundwater quantities totaled 116.2 mgd. Over the period 1993 – 2002, actual withdrawals from the four public supply facilities that are located in the Northwest Hillsborough area (Cosme-Odessa, Eldridge-Wilde, Northwest Hillsborough, and Section 21) have ranged from a low of 51.4 mgd in 1993 to a high of 59.3 mgd in 2000 (Figure 9-3). However, the groundwater withdrawal reduced after 2000 (Figure 9-3). Groundwater withdrawals over that period have shown a very slight increasing trend, although the increase is not statistically significant. For comparison, in all of Hillsborough County, a total of 174.8 mgd was utilized for potable supply (47.5%), agriculture (38.9%), industrial and commercial uses (6.3%), recreational and aesthetic uses (5.9%), and mining/dewatering (1.3%).



Wellfield and Well Locations in the Lower Sweetwater Creek Watershed

Figure 9-2

AYRES ASSOCIATES

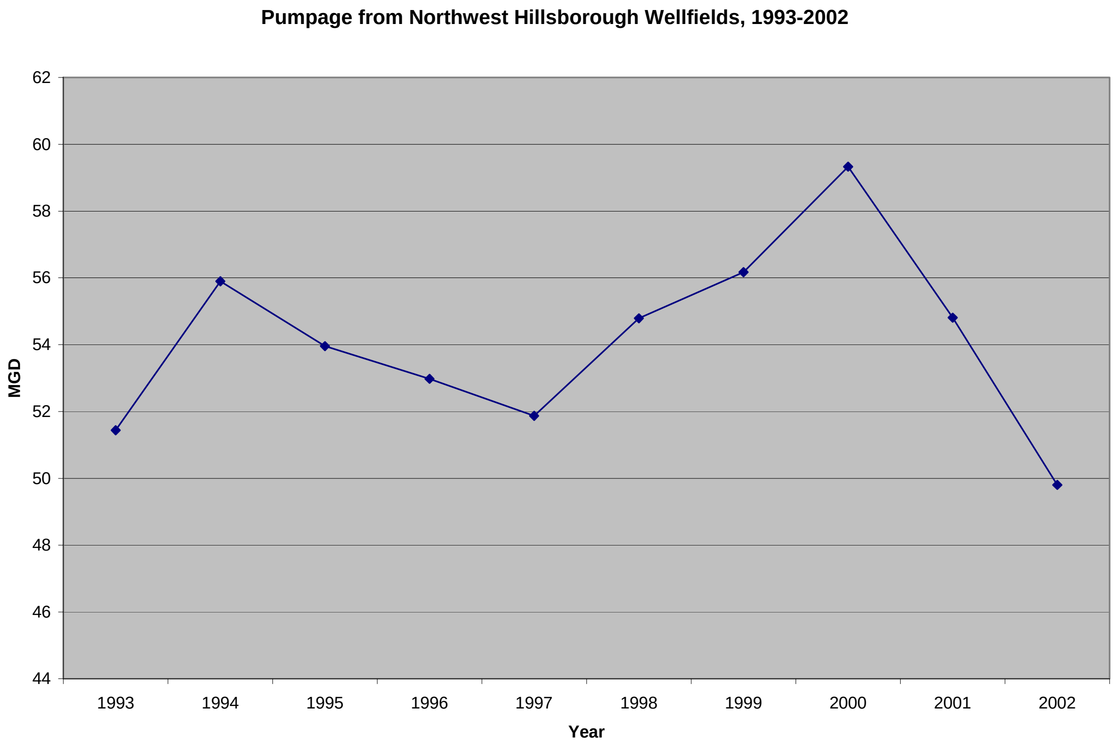


Figure 9-3 Groundwater Withdrawals-Northwest Hillsborough Public Supply Facilities *(Source: SWFWMD, Estimated Water Use, 2002)*

Currently, the average production limit for the public supply facilities in the Northwest Hillsborough area totals 57.5 mgd (Table 9-1)

Table 9-1 Average Production Limits (mgd) for the Public Supply Facilities in the Northwest Hillsborough Area

WATER SUPPLY FACILITY	AVERAGE PRODUCTION LIMIT (MGD)	DESTINATION OF WATER PUMPED
Eldridge – Wilde wellfield	26.5	SK Keller pumping station
Northwest Regional wellfield	10	Cosme treatment plant and NW Hillsborough treatment facility
Cosme-Odessa	11	Cosme treatment plant
Section 21	10	Lake Park treatment plant
TOTAL	57.5	

Total per capita water use for the period, 1993 – 2002, ranged from a low of 105 gallons per capita per day (gpcd) in 1998 to a high of 154 gpcd in 1995 for both surface and groundwater sources (Figure 9-4). Per capita water use showed a slight decreasing trend over that period, but it was not statistically significant. In 2003, Hillsborough County utilized approximately 70% of its reuse capacity. On a per capita basis, the actual rate of reuse amounted to 30.54 gpcd, while the reuse capacity equaled 43.4 gpcd.

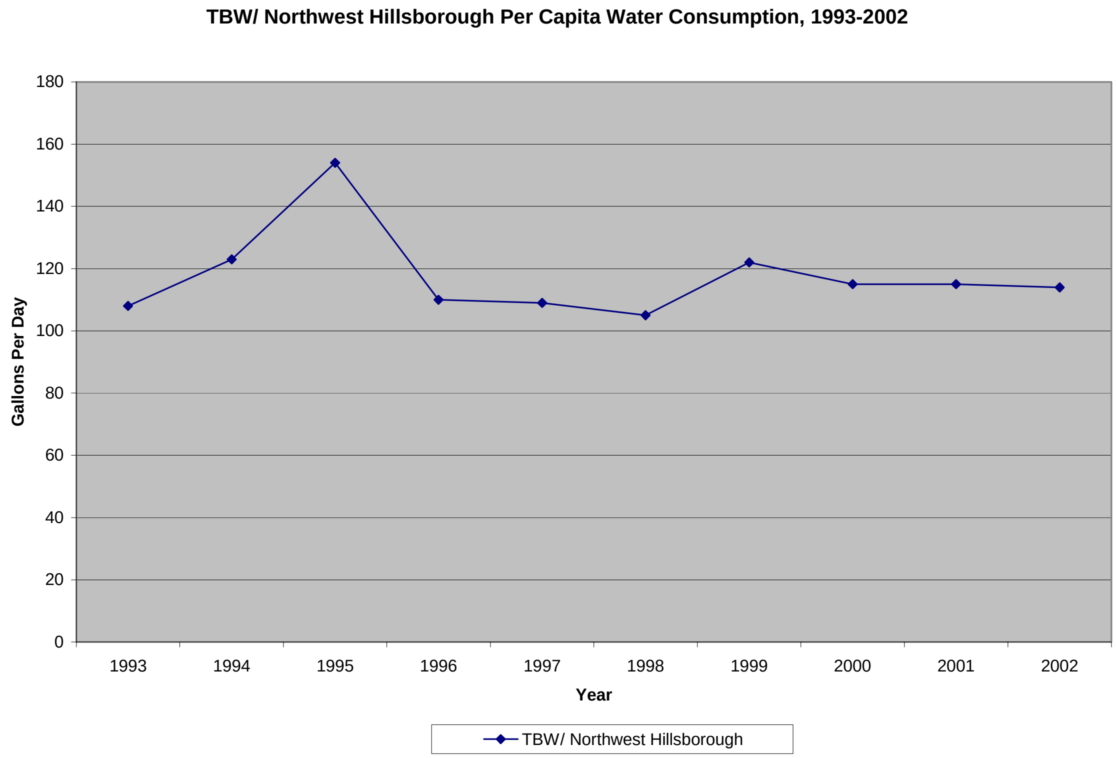


Figure 9-4 Per Capita Water Use in the NTBWUCA
(Source: SWFWMD, Estimated Water Use, 2002)

Figure 9-5 shows the cumulative rainfall (inches) and the "variance from normal" (NOAA) for the period between May 2005 through April 2006 for Tampa International Airport (TIA), while Table 9-2 lists other rainfall stations that are located within the NTBWUCA and operated by SWFWMD. The TIA station reports an above-normal rainfall condition equaling 2.7 inches at that location.

However, due to the nature of rainfall over a large geographic area, the rainfall surplus for the area as a whole as represented by the nine rainfall stations listed in Table 9-2, the rainfall amounts to 0.7 inches over the April 2005 – March 2006 time period. In addition, the average rainfall amount for March 2006 in the Northwest Hillsborough area was 0.13 inches, which represents a departure from the normal March rainfall amount totaling -3.24 inches. Since January, 2006, the departure from normal for the time period January – March was 1.49 inches.

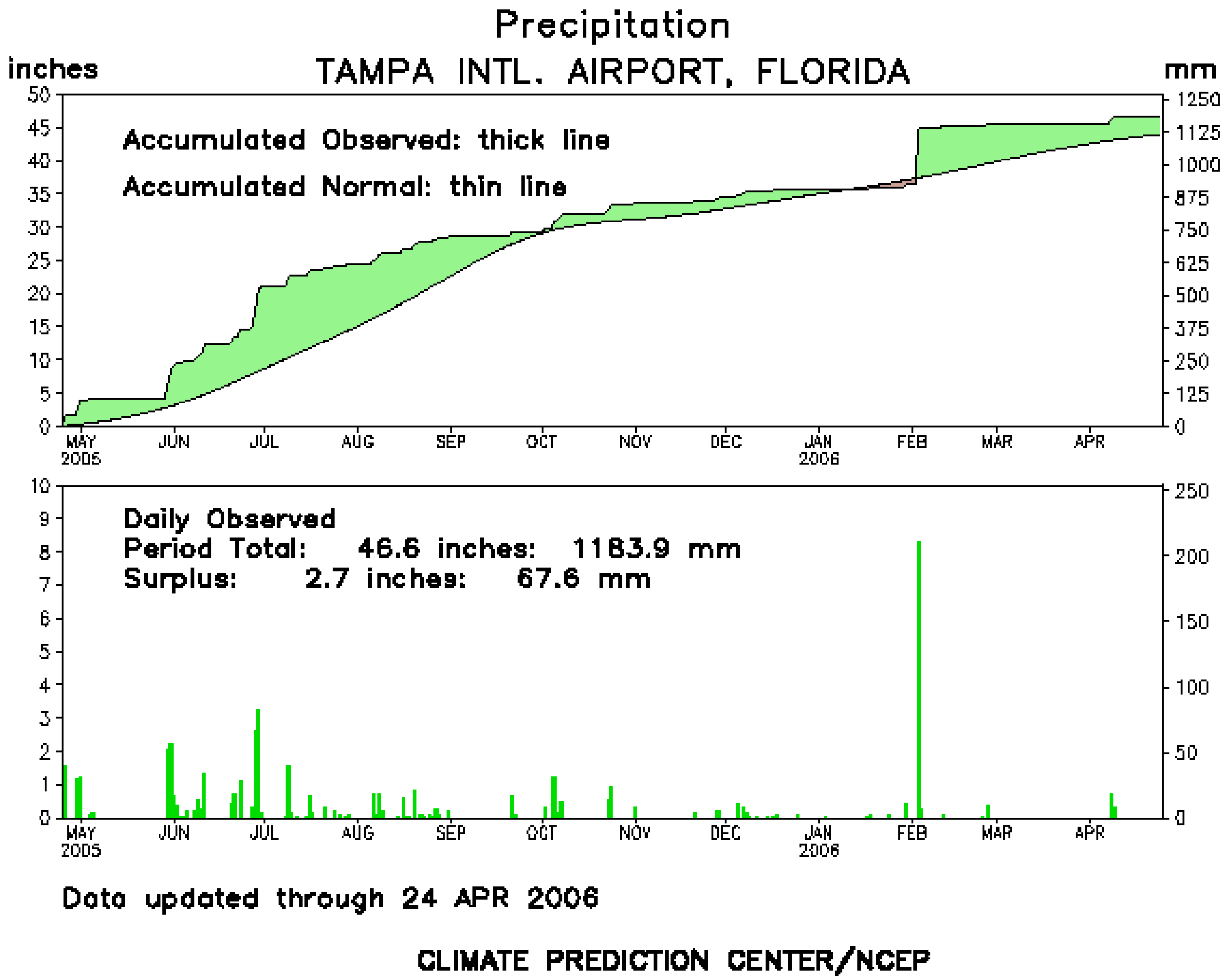


Figure 9-5 Rainfall and Departure from Normal for the Tampa International Airport ***(Source: SWFWMD, Estimated Water Use, 2002)***

Table 9-2 Rainfall Stations in the Northwest Hillsborough Area ***(Source: SWFWMD)***

TYPE	SITE	SITE NAME	LATITUDE	LONGITUDE
RNF	313	E-101 (ROMP TR 13-3)	280355.05	823818.34
RNF	390	CRESCENT LAKE	280918.04	823552.34
RNF	394	ISLAND FORD	280909.04	823614.34
RNF	395	BAY LAKE	280410.05	822958.33
RNF	440	LAKE COMO ET	281056.03	822811.33
RNF	503	LAKE HANNA	280830.02	822648.92
RNF	538	ELDRIDGE-WILDE 2N	281011.04	823905.34
RNF	561	ST PETE 42	281036.03	823056.33
RNF	582	ST PETE JACKSON 26 A RAIN	280733.04	823057.33

Groundwater levels in the Northwest Hillsborough area as represented by three monitoring wells, (EWWF 11 FLDN, EWWF 2S DEEP, and COSME 3 FLDN) indicate that groundwater elevations for March 2006 are declining from those observed in April 2006, but they have not reached the historical low for March (Table 9-3).

Table 9-3 Comparison of Groundwater Elevations (NGVD)
in the Northwest Hillsborough Area (Source: SWFWMD, Hydrologic Conditions Report – March 2006)

WELL	WATER LEVEL MARCH 2006	CHANGE FROM PRIOR MONTH	MARCH HISTORICAL LOW LEVEL	LOW LEVEL FOR PERIOD OF RECORD
COSME 3 FLDN	21.47	-5.45	20.77	10.94
EWWF 11 FLDN	14.32	-2.57	7.33	0.31
EWWF 2S DEEP	16.45	-2.29	6.62	-1.16

The Northern Tampa Bay Phase II (NTB II) project was initiated by SWFWMD as an outgrowth of the 1989 declaration of the NTBWUCA and the Northern Tampa Bay Water Resource Assessment Project (WRAP) which was completed in 1996. This study will continue through 2010 and will include assessments of the biological and hydrological conditions in Northern Tampa Bay to support the development of minimum flows and levels, water resource recovery, water use permitting, and environmental resource permitting. NTB II consists of a series of technical projects in Northern Tampa Bay to support the ongoing development of minimum flows and levels, water resources recovery, water use permitting, and environmental resource permitting.

The goal of the NTB II project is to enhance the data collection effort, implement projects for the assessment of water supply needs, and to develop a water resources recovery strategy. As of 2005, 30 nested groundwater monitoring sites have been installed and 50 new wetland monitoring sites have been established, many of them in the Northwest Hillsborough area. These projects include detailed assessments of water resources and involve intensive data collection and monitoring to characterize hydrologic conditions and determine the effects of water withdrawals (SWFWMD, 2000).

9.3 Surface Water Use

The majority of the Northwest Hillsborough area relies on groundwater for its water supply, but the Sweetwater Creek and Lower Sweetwater Creek Watersheds together with a portion of the Rocky/Brushy Creek Watershed are within the service area of the City of Tampa for which the primary water source is Hillsborough River Reservoir. In 2002, the NTBWUCA was supplied with 54.998 mg for public supply from wellfields in the area; in that same year, a total of 85.477 mg was provided from surface water sources.

Lakes and Streams - In the Lower Sweetwater Creek watershed, there are two named streams: Sweetwater Creek and the Henry Street Canal. In addition, two unnamed channels that intersect Lower Sweetwater Creek north of Memorial Highway are also part of the stream system. The channel of Sweetwater Creek has been greatly modified by diversion, straightening, and deepening. In the Lower Sweetwater Creek watershed, there is only one named lake, Egypt Lake, which occupies 67 acres. The SWFWMD has adopted guidance levels for the lake. FDEP considers Egypt Lake as the head of the Lower Sweetwater Creek system.

Reservoirs - Reservoirs are artificial impoundments of water constructed in association with agricultural and residential development in the watershed; residential reservoirs are managed to provide aesthetic or stormwater management functions. In the Lower Sweetwater Creek watershed, there is one named surface water management facility that participates in the County's Adopt-A-Pond program (Sunrise Villas of Tampa) and numerous, unnamed such ponds; all are associated with residential properties. While not natural lakes, these surface water bodies contribute to the watershed's water resources in recharge, water quality, and flood abatement.

Estuary - The Lower Sweetwater Creek watershed contributes flow directly to Old Tampa Bay. The lower reaches of the Creek has been altered significantly by dredging and filling to accommodate residential and commercial development between 1950 and 1982.

9.4 Water Supply Issues / Areas of Concern

With the recent occurrence of widespread drought within the region, many concerns have been raised as to how the future water supply needs will be met.

In recent years, several projects have been proposed and initiated to meet the future water needs of the region. However, it remains to be seen whether these new projects will provide sufficient water without causing significant adverse impacts on the environment. Several studies have documented the decline in water levels of wetlands, lakes as well as groundwater (SWFWMD, 1996).

The demand for water will continue to increase as population grows and both groundwater and surface water supply needs increase. Furthermore, with increasing development in the region, there will be less permeable land available for the rainfall to replenish the groundwater.

9.4.1 Aquifer Recharge

Approximately half of the Northwest Hillsborough area occupies lands where recharge to the Floridan Aquifer occurs at a rate varying from 1.0 inch to 10 inches per year. The remainder of the Northwest Hillsborough area, including the Lower Sweetwater Creek watershed, is a discharge area that discharges from the Floridan aquifer at an estimated rate of 1 to 5 inches per year (SWFWMD, 1996). Figure 9-6 presents the recharge and discharge rates in the Northwest Hillsborough area.

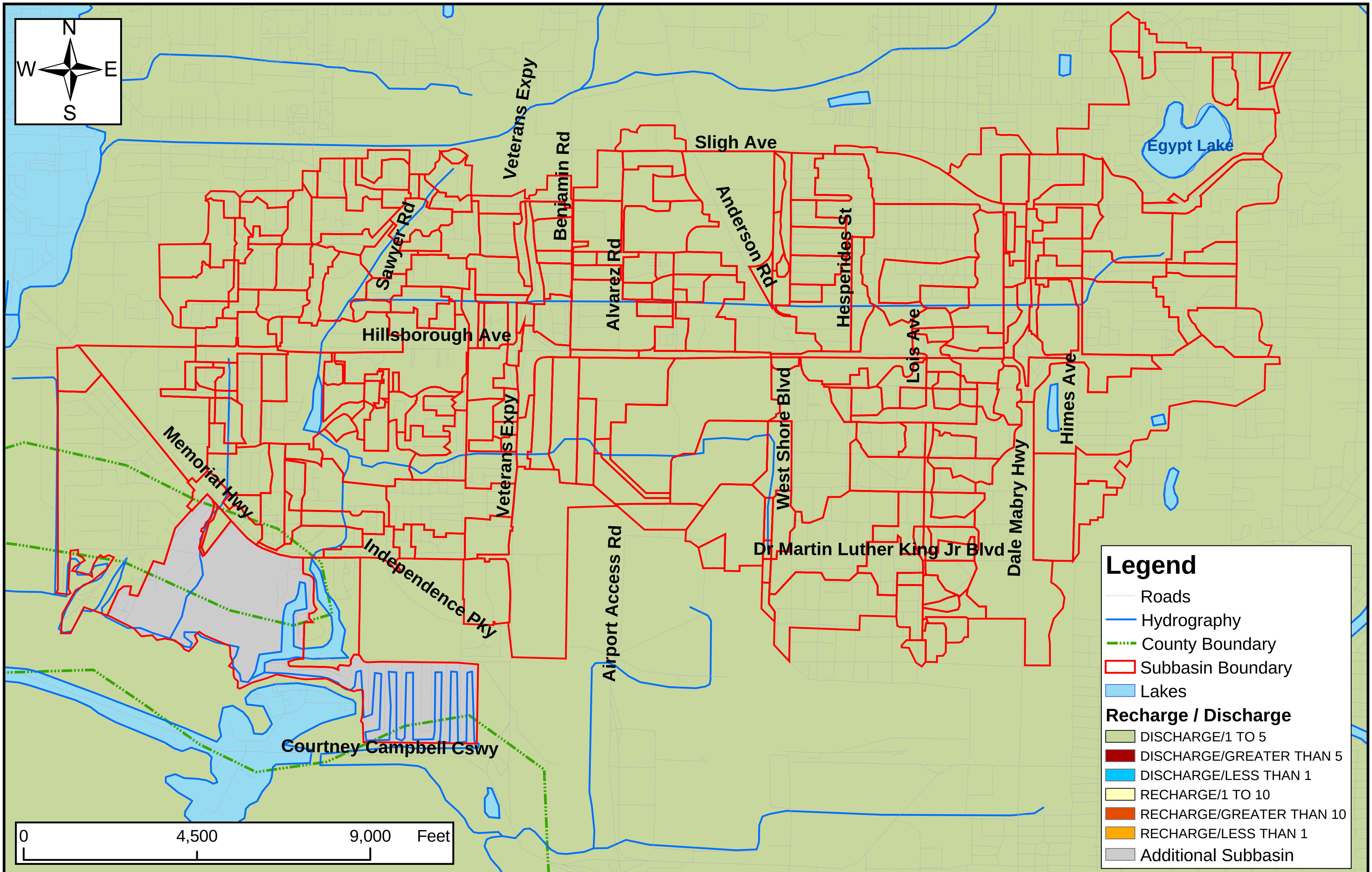
Protection of recharge areas in the watershed is critical to the preservation of the regional groundwater sources and meeting regional water supply demands.

Several management and regulatory strategies have been undertaken in recent years to enhance aquifer recharge in the Northwest Hillsborough area, which include the following:

- Optimization and expansion of existing aquifer storage and recovery systems
- Delineation of recharge/discharge relationship
- Identification of sites for wetlands, lake, and aquifer rehydration
- Identification of opportunities to re-engineer stormwater management systems to enhance groundwater recharge and improve water quality in waterbodies used for drinking water
- Identification of opportunities to use reclaimed water for rehydration
- Improvement of wellhead protection ordinances to include recharge areas and landuse ordinances
- Modification of Environmental Resource Permit (ERP) regulations to enhance aquifer recharge
- Modification of local, state, and District regulations to maintain and enhance groundwater recharge

9.4.2 Impacts Due to Water Withdrawals

The literature describing the effects of groundwater withdrawal on wetland hydroperiods and lake stages dates back to 1971. Since that time, the nature of the impacts to wetlands has been documented in wetlands both in and around major wellfields (Rochow, 1998). Generally, symptoms of wetland health decline (e.g., replacement of aquatic plant species by upland species, tree-fall, soil subsidence, loss of wetland-dependent wildlife) have occurred in the vicinity of large-scale groundwater withdrawals (e.g., Section 21, Cosme, Northwest Regional, and Eldridge – Wilde Wellfields). As a Water Use Permit (WUP) condition, permit holders have been required to monitor water levels and ecological indicators of wetland viability, and annual reports have been prepared describing wetland hydro-biological conditions since the mid-1970s.



Generalized recharge or discharge rate of the Floridian Aquifer System (in/yr)

Figure 9-6

AYRES ASSOCIATES

The link has been made between groundwater withdrawals and reduced hydroperiod in area wetlands. Under the NTB II project, the SWFWMD has established many more wetland monitoring sites, and recovery strategy has been developed.

The recovery strategy involves:

- District and Tampa Bay Water (TBW) water level monitoring
- District and TBW biologic monitoring (WAPs)
- TBW annual assessment of wellfields (annual reports)
- District Minimum Flows and Levels (MFL) monitoring
- Environmental Monitoring Plan (EMP) referrals to the Operations Plan

During the first several years of pumpage from the three wellfields in the project area, wetlands within the wellfield's zone of influence exhibited signs of wetland health decline including the replacement of wetland vegetation with upland species. These ecological changes were attributed to sustained groundwater production as well as below normal rainfall conditions. From about 1986 to 1993, overall annual pumpage rates for the wellfields were reduced by nearly 40% compared to the original production period. Recent pumpage data from the area's three wellfields, however, indicates that the production in the wellfields has increased but not significantly.

Several management strategies have been proposed and/or undertaken to minimize the impacts due to water withdrawals, which include the following:

- Development of operation and management plans to minimize environmental impacts for all permitted water users; TBW's Optimized Regional Operations Plan (OROP)
- Implementation of projects associated with the NTBWUCA
- Investigation for alternative sources of water
- Development and implementation of aggressive water conservation and water reuse programs
- Continuation of cooperative funding to encourage development of alternative water sources
- Continuation of regulatory requirements/incentives for alternative water sources

9.4.3 Minimum Flows and Levels (MFLs)

Chapter 373.042 (2) F.S., requires the SWFWMD to adopt minimum flows and levels on streams, lakes and aquifer water levels throughout the District. By statute, the District must prioritize the adoption of minimum levels in areas of Hillsborough, Pinellas, and Pasco counties which are experiencing or are expected to experience adverse impacts because of groundwater withdrawals. In response to this charge, the District has proposed minimum levels in lakes, wetlands, and aquifers in priority areas including the Northwest Hillsborough area.

Establishment of minimum flows and levels (MFLs) constitutes defining the minimum flow regime and water levels necessary to prevent significant environmental impacts to lakes, wetlands, streams, and aquifers. The Hillsborough County Comprehensive Plan (Coastal Management

Element) requires cooperation between the County and the SWFWMD to ensure that the minimum freshwater flows needed to support natural, optimal diversity and productivity in estuarine areas are scientifically determined and maintained. To date in the Northwest Hillsborough area, levels have been set by the District on 15 wetlands, seven wells, and 15 lakes. Lakes having Minimum Levels adopted by SWFWMD's Governing Board include: Alice, Calm, Church, Crescent, Echo, Garden, Horse, Jackson, Juanita, Little Moon, Mound, Rainbow, Sunset, and Taylor.

In addition, Lakes Raleigh and Rogers are scheduled for MFL development in 2006, and Brooker Creek is scheduled in the 2011 – 2018 timeframe.

The key management strategies of the MFL program include:

- Prioritization of areas where determination of minimum flows and levels are needed
- Development of scientific justification for establishing minimum flows and levels
- Development of action plan and permitting strategies to work toward achieving the minimum flows and levels where existing levels are below the minimum levels

Water supply issues are being addressed by SWFWMD, TBW, the City of Tampa, and Hillsborough County in order to balance the protection of water resources with sustainable development. New sources of potable water are being developed by Tampa Bay Water member governments, and projects implemented through these efforts will address improvements to water supplies in concert with water quality, flooding, and natural systems restoration.

9.4 Bibliography

The attached bibliography includes a list of references used for this study and additional references that could be cited by readers.

Florida Department of Environmental Protection. 2006. Sinkhole Database. Florida Bureau of Geology. Tallahassee, Florida.

Northwest Hillsborough Basin Board. October 7, 2006. Planning Workshop. SWFWMD. Brooksville, Florida.

Rochow, T. F. 1998. The effects of water table level changes on freshwater marsh and cypress wetlands in the northern Tampa Bay region. Environmental Section Technical Report 1998-1. Southwest Florida Water Management District. Brooksville, Florida.

Southwest Florida Water Management District. September 7, 2005. Recovery Analysis for Northern Tampa Bay. SWFWMD. Brooksville, Florida.

Southwest Florida Water Management District. 2002. Estimated Water Use in the Southwest Florida Water Management District. SWFWMD. Brooksville, Florida.

Southwest Florida Water Management District. 2000. Preliminary Plan for Expansion of the Regional Network of Floridan and Surficial Aquifer Monitor Wells for Northern Tampa Bay.

Southwest Florida Water Management District. 1999. Hillsborough River Comprehensive Watershed Management Plan. Final Draft. Brooksville, Florida.

Southwest Florida Water Management District. 1996. Northern Tampa Bay Water Resource Assessment Project, Volume 1, Surface Water/Groundwater Interrelationships. SWFWMD. Brooksville, Florida.

Southwest Florida Water Management District. 1996. Northern Tampa Bay Water Resource Assessment Project, Volume 2, Saline Water Intrusion and Water Quality. SWFWMD. Brooksville, Florida.

Southwest Florida Water Management District. 1996. Northern Tampa Bay Water Resource Assessment Project, Appendices A – F. SWFWMD. Brooksville, Florida.

Southwest Florida Water Management District. 1988. Groundwater Resource Availability Inventory: Hillsborough County, Florida. Brooksville, Florida.

Tampa Bay Water. 2006. New Water Plan: Prepared for the Southwest Florida Water Management District. Quarterly Report.

Tihansky, A.B., 1999, Sinkholes, West-Central Florida, in Galloway, D., Jones, D.R., and Ingebritsen, S.E., eds., Land Subsidence in the United States: USGS Circular 1182, p. 121-140.

Univ. of South Florida. 2006. Hillsborough Water Atlas. http://www.hillsboroughwateratlas.usf.edu. USF. Tampa, Florida.

Water Reuse Work Group. June, 2003 rev. 05MAY2006. Water Reuse for Florida. FDEP. Tallahassee, Florida.

CHAPTER 10: POLLUTANT LOADING AND REMOVAL MODEL

10.1 Overview

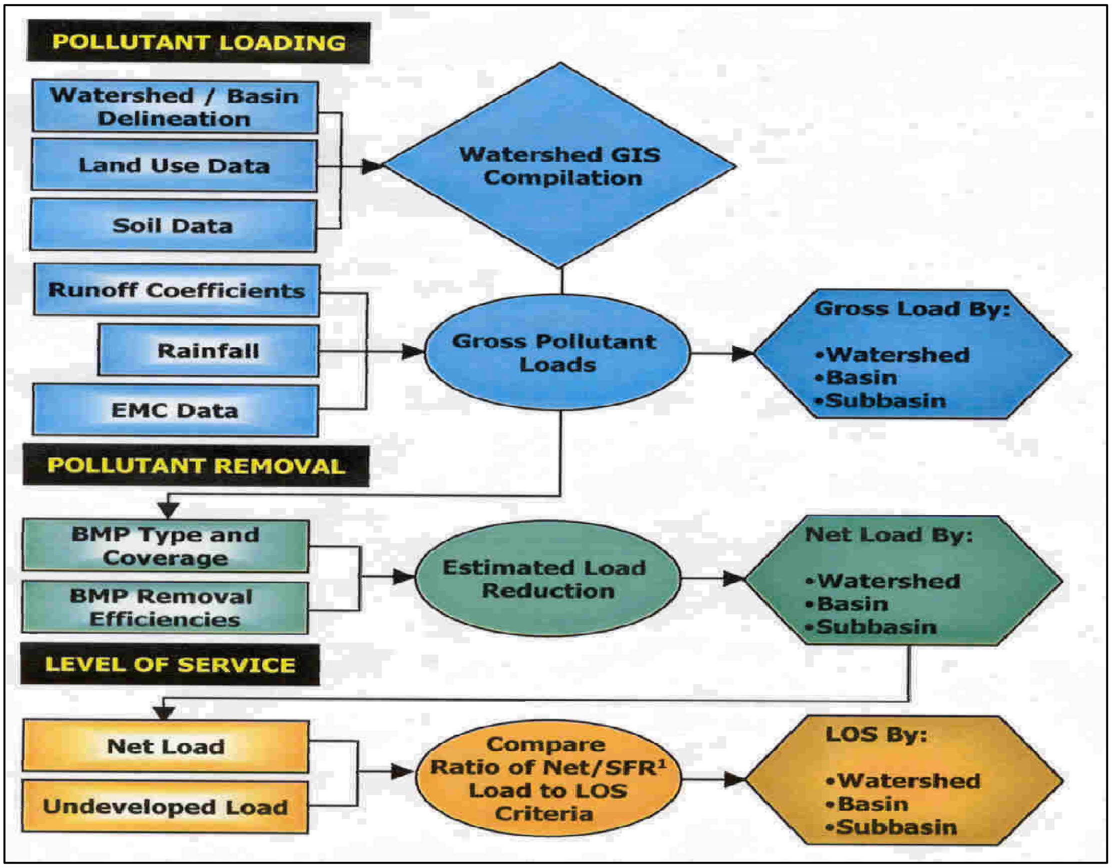
Potential water quality impacts resulting from stormwater runoff in the Lower Sweetwater Creek watershed were evaluated using the Pollutant Loading and Removal Model previously developed by Parsons Engineering Science, Inc. in conjunction with the Hillsborough County Public Works/Stormwater Management Section. The model was developed to:

- Estimate the potential water quality impacts resulting from the most current (2004) land use mapping and soils conditions
- Evaluate the reduction in potential loading due to the existing best management practices (BMP) within the watershed
- Evaluate future water quality conditions based on potential improvements or alternatives within a given watershed

This chapter discusses the process used to delineate the areas treated by existing Best Management Practices (BMPs) and an estimate of their overall effectiveness in reducing pollutant loading within the watershed using the above-mentioned model. The gross pollutant loading within the watershed was estimated based on the 2004 land use and soils characteristics. Gross pollutant loading was estimated by assuming no treatment of stormwater runoff, and is indicative of the potential of various land uses to yield contaminants into the environment. From this gross loading, the reduction in loading due to the existing BMPs was subtracted to approximate the net pollutant loading within the watershed. Analyses were conducted at both watershed and subbasin levels.

10.2 Pollutant Loading and Removal Model

The Pollutant Loading and Removal Model has three main components: calculation of gross pollutant loads, estimation of net loads based on existing treatment, and evaluation of the treatment level-of-service based on individual hydrologic units (Figure 10-1). For the purposes of these analyses, the hydrologic units of interest are the subwatershed and subbasin. In the model, land use and hydrologic soil characteristics were used to determine runoff characteristics. A gross pollutant load for each subbasin was calculated as the product of the runoff volume and the stormwater event mean concentrations (EMC) for each pollutant and land use of interest. Six EMC values were measured during previous stormwater characterization studies performed by Hillsborough County, and later submitted as part of the County's National Pollutant Discharge Elimination System (NPDES) permit.



Note:
1. Ratio of net load (treated) to untreated single family residential (SFR)
2. Level of Service Criteria:
A) Net Load 20% or less of SFR
B) Net Load 20-40% of SFR
C) Net Load 40-70% of SFR
D) Net Load 70-100% of SFR
E) Net Load > 100% of SFR

Figure 10-1 Hillsborough County Pollutant Loading and Removal Model
(Source: Parsons Engineering Science, Inc.)

Net pollutant loads were estimated at the subbasin level based on the treatment provided by existing BMPs and the land use for which the BMP was implemented. The treatment level-of-service for each subbasin, described in greater detail in the following chapter, is based on comparing the net pollutant loads to a benchmark condition. This benchmark is represented by the extent of loading that would occur if the subbasins were designated as low/medium density residential land use with no stormwater treatment.

The 12 different parameters (pollutants) that are evaluated in the model are listed in Figure 10-2.

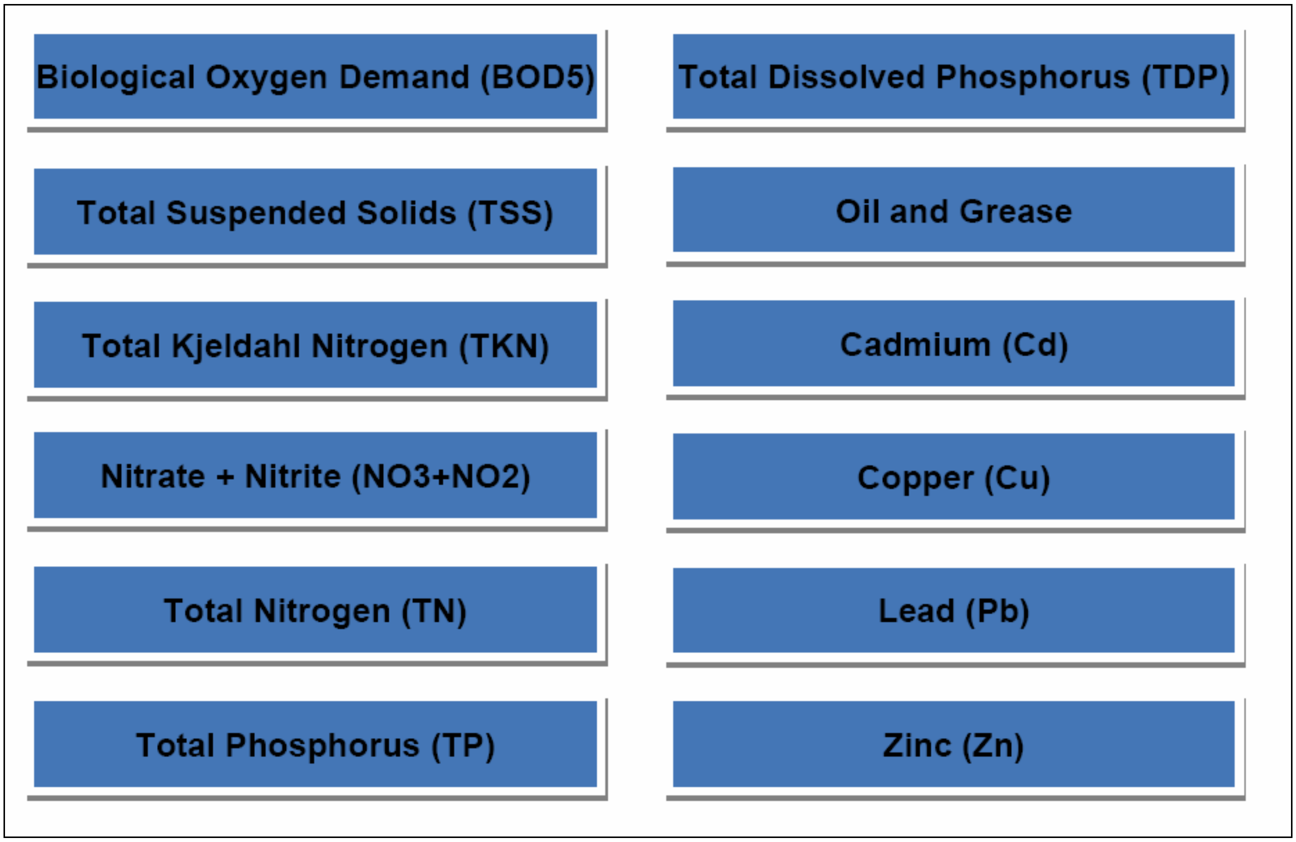


Figure 10-2 Pollutants Evaluated in the Pollutant Loading and Removal Model

10.2.1 Land Use

The percentage of impervious land surface area is typically determined by land use composition (e.g., transportation = roads = high proportion of impervious area). The degree of imperviousness can then be used to estimate the volume of runoff expected from various subbasins within a watershed. The 2004 land use coverage provided by the Southwest Florida Water Management District (SWFWMD) was used in this modeling effort to determine land use types in each subbasin.

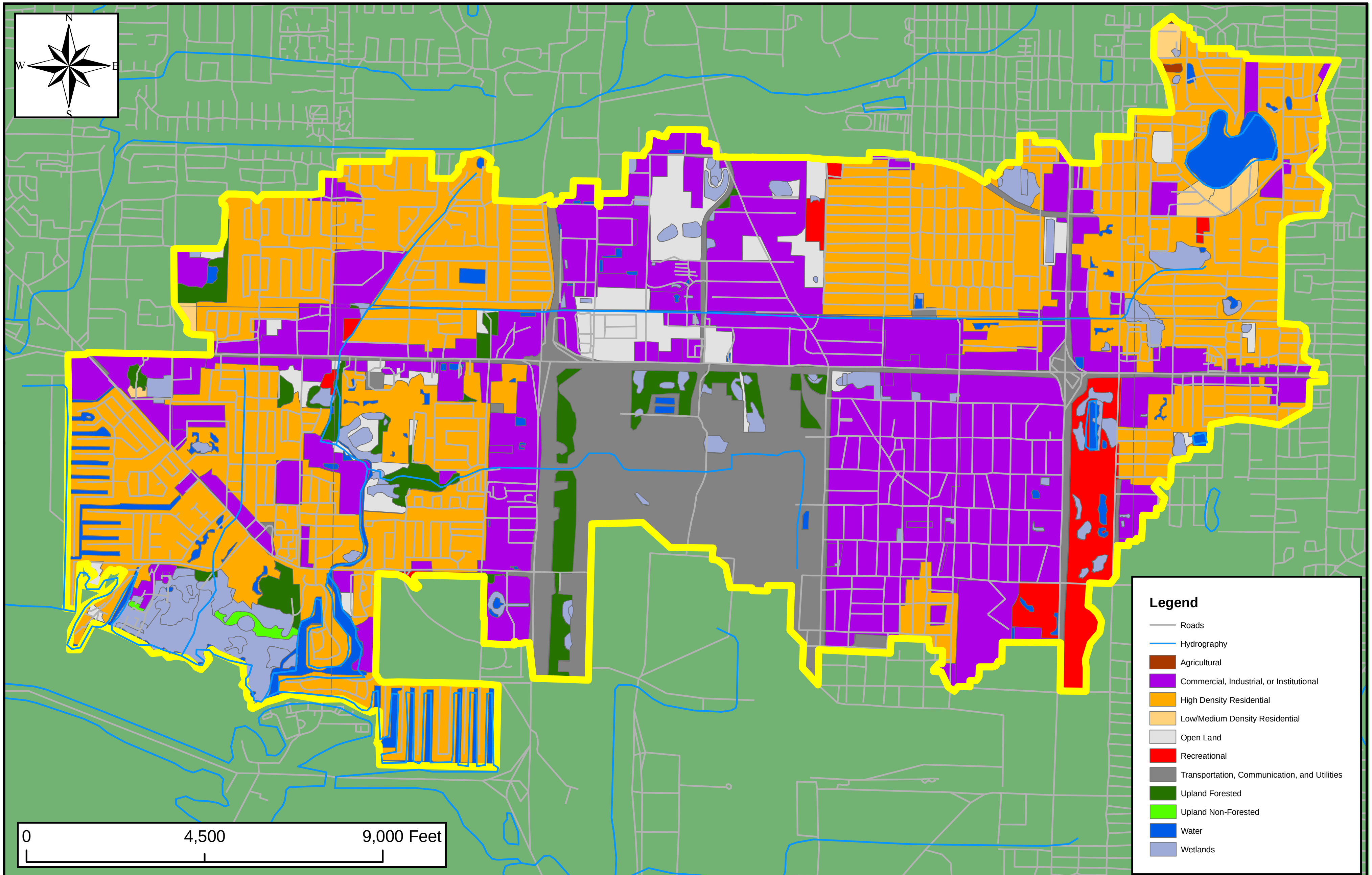
The land use categories evaluated for the pollutant loading model include:

- Low/medium density residential
- High density residential
- Light industrial
- Agricultural
- Commercial
- Institutional
- Highway/Utility
- Recreational
- Open land, and
- Extractive (mining)/disturbed

Figure 10-3 illustrates the distribution of the land use categories within the Lower Sweetwater Creek watershed. Acreages and percentages of land uses based on these general categories for the watershed are summarized in Table 10-1.

Table 10-1 Lower Sweetwater Creek Watershed 2004 Land Use Distribution

Land Use	Total Square Miles	Acreage	Percentage
Agricultural	13,412	3	0.0%
Commercial, Industrial, or Institutional	9,686,777	2,394	30.0%
High Density Residential	12,646,790	3,125	39.1%
Low/Medium Density Residential	232,959	58	0.7%
Open Land	1,210,573	299	3.7%
Recreational	861,011	213	2.7%
Transportation, Communication, and Utilities	4,053,687	1,002	12.5%
Upland Forested	957,549	237	3.0%
Upland Non-Forested	47,465	12	0.1%
Water	1,114,764	276	3.4%
Wetlands	1,514,027	374	4.7%
TOTAL	**32,339,013**	**7,991**	**100.0%**



Land Use Distribution in the Lower Sweetwater Creek Watershed (2004)

Figure 10-3

AYRES ASSOCIATES

10.2.2 Soil Characteristics

Soil type is another important component of runoff calculations since different soils have varying capacities for infiltration. In addition, the distribution of soils can vary significantly throughout a watershed. Hydrologic soil groups are typically used to classify soils based on runoff potential. Soils are grouped into four hydrologic soil groups (A through D), which reflect varying levels of infiltration rates and soil moisture capacities. Descriptions of these soil groups are as follows:

- **Group A** (low runoff potential): Soils with high infiltration rates even when thoroughly wetted and which have a high rate of water transmission. The soils under this group have a typical maximum infiltration rate of 10 in/hr when dry and 0.5 in/hr when saturated.

- **Group B** (moderately low runoff potential): Soils that have moderate infiltration rates when thoroughly wetted and a moderate rate of water transmission. The soils under this group have a typical maximum infiltration rate of 8 in/hr when dry and 0.4 in/hr when saturated.

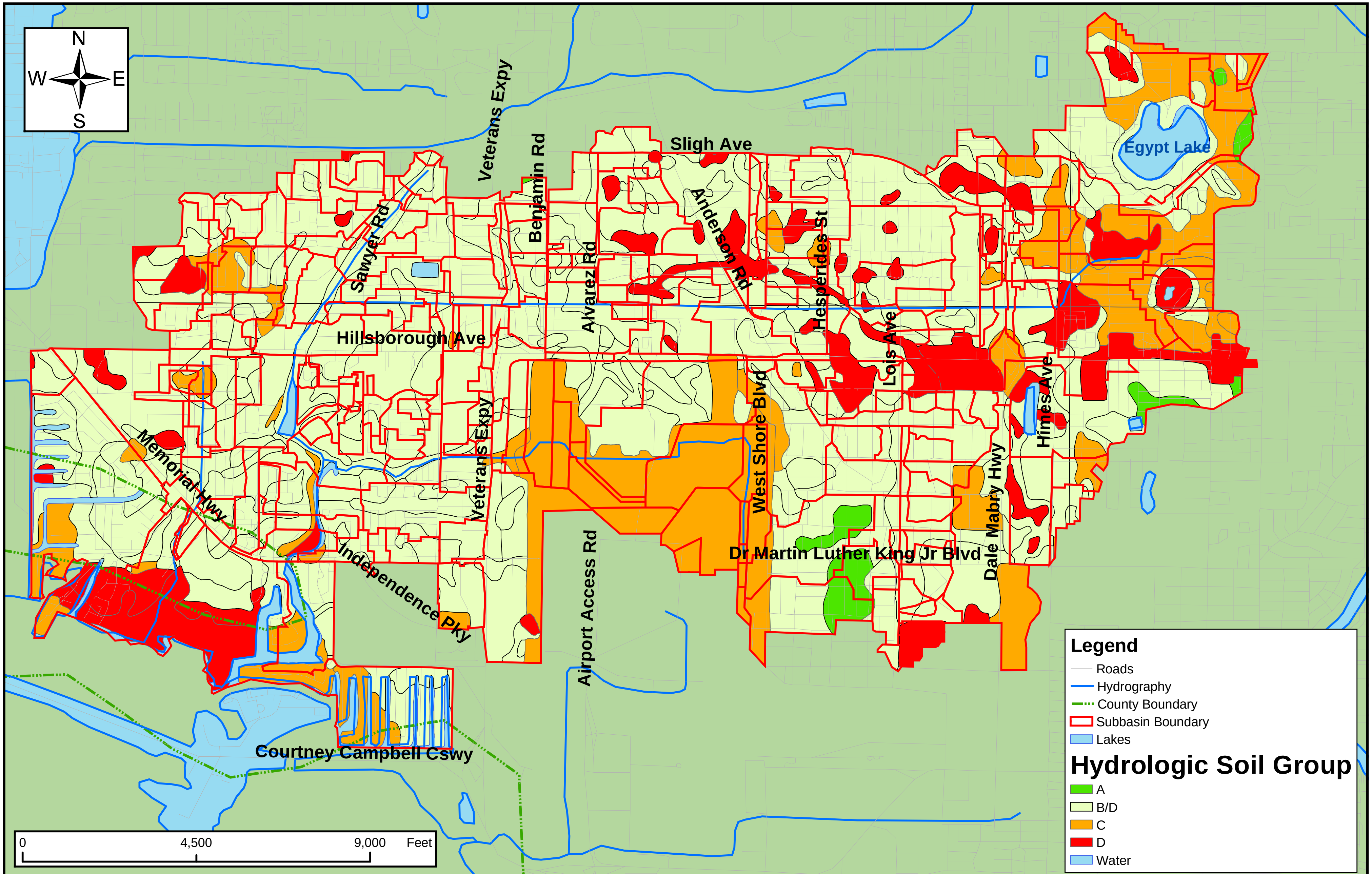
- **Group C** (moderately high runoff potential): Soils that have a slow infiltration rate when thoroughly wetted and a slow rate of water transmission. The soils under this group have a typical maximum infiltration rate of 5 in/hr when dry and 0.25 in/hr when saturated.

- **Group D** (high runoff potential): Soils having very slow infiltration rates when thoroughly wetted and a very slow rate of water transmission. The soils under this group have a typical infiltration rate of 3 in/hr when dry and 0.10 in/hr when saturated.

Some wet soils that can be adequately drained may have dual hydrologic soil group classifications (e.g., B/D). The first designation is based on the drained condition, and the second letter designation is based on the undrained or natural condition. Figure 10-4 illustrates the distribution of the soil hydrologic groups within the Lower Sweetwater Creek watershed. Table 10-2 presents a summary of the percent coverages of each of the hydrologic groups in the watershed.

Table 10-2 Lower Sweetwater Creek Watershed Soil Hydrologic Group Distribution

Soil Hydrologic Group	Acreage	Percentage
A	102	1.27%
B/D	5,555	69.50%
C	1,409	17.63%
D	723	9.05%
Water	203	2.54%
Total	**7,993**	**100.00%**



Hydrologic Soil Group Distribution in the Lower Sweetwater Creek Watershed

Figure 10-4

AYRES ASSOCIATES

Runoff volume calculations were based on the application of runoff coefficients by soil and land use type. Most of the coefficients, listed by land use, can be found in the Florida Department of Transportation (FDOT) Drainage Manual. Runoff coefficients used in this analysis are summarized in Table 10-3.

10.2.3 Basin Delineation

During the hydraulic analyses described earlier, the Lower Sweetwater Creek watershed was divided into 277 subbasins representing approximately 7,993 acres (Figure 10-5). The model described was run at the subbasin level (to provide a fine level of detail) by comparing hydrologic, hydraulic, and runoff water quality characteristics of the watershed. The subbasins range in size from approximately 0.6 acres to more than 475 acres with an average size of about 29 acres.

It should be noted that the largest subbasin, number 400004, measuring almost 475 acres in area was not added to the overall boundary of the Lower Sweetwater Creek watershed until after the results of the Hillsborough County NPS Pollutant Loading and Removal Model were obtained. Therefore, pollutant loading and water quality level-of-service values for this subbasin were not calculated, and subbasin 400004 is grayed out on all of the associated figures.

10.2.4 Event Mean Concentrations (EMC)

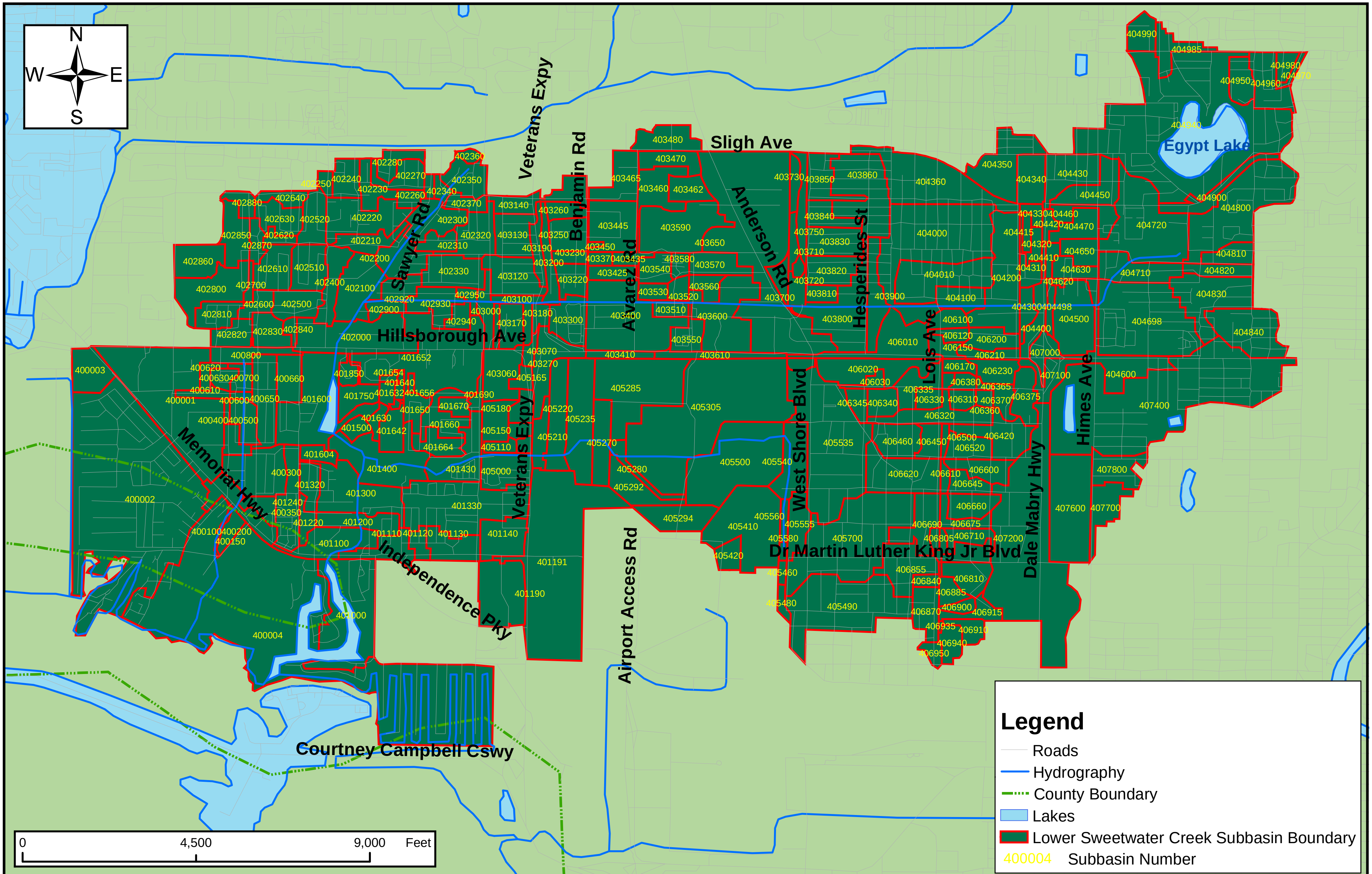
Pollutant loading analyses were based on the same group of parameters required for NPDES permitting of stormwater discharges for Hillsborough County, as listed in Table 10-4. The annual load of a specific constituent generated from each subbasin during cumulative annual rainfall events were calculated as the product of the annual runoff volume times the corresponding event mean concentration (EMC). The EMC is the mean concentration of a chemical parameter expected in the stormwater runoff discharged from a particular land use category during a typical (average) storm event. The calculated constituent mass represents the pollutant load.

For watershed analyses in Hillsborough County, the EMC values reported in the County's NPDES permit applications for stormwater discharges and supporting documents were used where available. For land use categories or parameters not reported by Hillsborough County, EMC data from other studies in Florida were used.

EMC values were available for many land uses for numerous pollutants including five-day biological oxygen demand (BOD5), total suspended solids (TSS), total kjeldahl nitrogen (TKN), nitrite plus nitrate (NO2+NO3), total nitrogen (TN), total and dissolved phosphorous (TP and TDP), oil and grease, cadmium (Cd), copper (Cu), lead (Pb), and zinc (Zn). Normalized EMC data (EMC values multiplied by runoff coefficients) for total nitrogen, total phosphorus, and total suspended solids are also shown graphically in Figures 10-6 through 10-8. Given land segments of equal area, the charts can be used to identify those land uses and associated soil types which contribute significant loads for these parameters.

Table 10-3 Runoff Coefficients by Land Use Category and Soil Type

FLUCCS Code	Land Use	Hydrologic Group			
		A	B/D	C	D
1100	Low/Medium Density Residential	0.267	0.322	0.379	0.43
1200	Low/Medium Density Residential	0.267	0.322	0.379	0.43
1300	High Density Residential	0.5	0.566	0.634	0.7
1400	Commercial	0.45	0.549	0.651	0.75
1410	Commercial	0.45	0.549	0.651	0.75
1420	Commercial	0.45	0.549	0.651	0.75
1430	Commercial	0.45	0.549	0.651	0.75
1440	Commercial	0.45	0.549	0.651	0.75
1450	Commercial	0.45	0.549	0.651	0.75
1460	Light Industrial	0.5	0.599	0.701	0.8
1500	Light Industrial	0.5	0.599	0.701	0.8
1600	Extractive (Mining)/Disturbed	0.05	0.05	0.05	0.05
1700	Institutional	0.45	0.549	0.651	0.75
1800	Recreational	0.1	0.166	0.234	0.3
1900	Open Land	0.1	0.166	0.234	0.3
2000	Agricultural	0.15	0.233	0.318	0.4
2100	Agricultural	0.15	0.233	0.318	0.4
2140	Agricultural	0.15	0.233	0.318	0.4
2200	Agricultural	0.15	0.233	0.318	0.4
2300	Agricultural	0.15	0.233	0.318	0.4
2400	Agricultural	0.15	0.233	0.318	0.4
2500	Agricultural	0.15	0.233	0.318	0.4
2550	Agricultural	0.15	0.233	0.318	0.4
2600	Agricultural	0.15	0.233	0.318	0.4
3100	Open Land	0.1	0.166	0.234	0.3
3200	Open Land	0.1	0.166	0.234	0.3
3300	Open Land	0.1	0.166	0.234	0.3
4000	Upland Forest	0.05	0.05	0.05	0.05
4100	Upland Forest	0.05	0.05	0.05	0.05
4110	Upland Forest	0.05	0.05	0.05	0.05
4120	Upland Forest	0.05	0.05	0.05	0.05
4200	Upland Forest	0.05	0.05	0.05	0.05
4340	Upland Forest	0.05	0.05	0.05	0.05
4400	Upland Forest	0.05	0.05	0.05	0.05
5000	Water	1	1	1	1
5100	Water	1	1	1	1
5200	Water	1	1	1	1
5300	Water	1	1	1	1
5400	Water	1	1	1	1
6000	Wetland Non-Forested	0.2	0.2	0.2	0.2
6100	Wetland Forest	0.1	0.1	0.1	0.1
6110	Wetland Forest	0.1	0.1	0.1	0.1
6120	Wetland Forest	0.1	0.1	0.1	0.1
6150	Wetland Forest	0.1	0.1	0.1	0.1
6200	Wetland Forest	0.1	0.1	0.1	0.1
6210	Wetland Forest	0.1	0.1	0.1	0.1
6300	Wetland Forest	0.1	0.1	0.1	0.1
6400	Wetland Non-Forested	0.1	0.1	0.1	0.1
6410	Wetland Non-Forested	0.1	0.1	0.1	0.1
6420	Wetland Non-Forested	0.1	0.1	0.1	0.1
6430	Wetland Non-Forested	0.1	0.1	0.1	0.1
6440	Wetland Non-Forested	0.1	0.1	0.1	0.1
6500	Wetland Non-Forested	0.1	0.1	0.1	0.1
6510	Wetland Non-Forested	0.1	0.1	0.1	0.1
6520	Wetland Non-Forested	0.1	0.1	0.1	0.1
6530	Wetland Non-Forested	0.1	0.1	0.1	0.1
7100	Wetland Non-Forested	0.1	0.1	0.1	0.1
7400	Extractive (Mining)/Disturbed	0.05	0.05	0.05	0.05
8000	Highway/Utility	0.5	0.599	0.701	0.8
8100	Highway/Utility	0.5	0.599	0.701	0.8
8200	Highway/Utility	0.5	0.599	0.701	0.8
8300	Highway/Utility	0.5	0.599	0.701	0.8



Subbasin Divisions in the Lower Sweetwater Creek Watershed

Figure 10-5

AYRES ASSOCIATES

Table 10-4 Event mean concentration (EMC) values by land use in Hillsborough County

	NPDES Conventional WQ (mg/l)								NPDES Metals (mg/l)			
Land Use	**BOD_5**	**TSS**	**TKN**	**NO_3 $+NO_2$**	**TN**	**TP**	**TDP**	**Oil and Grease**	**Cd**	**Cu**	**Pb**	**Zn**
Low/Medium Density Residential	1.00	19.00	1.082	0.281	1.363	0.401	0.282	1.080	0.001	0.013	0.008	0.022
High Density Residential	2.60	29.00	1.368	0.679	2.047	1.337	0.552	1.073	0.001	0.047	0.006	0.058
Light Industrial	2.87	18.20	2.088	0.187	2.275	0.332	0.187	3.663	0.001	0.024	0.006	0.096
Agricultural	18.30	12.70	2.167	0.803	2.970	2.349	1.223	0.500	0.013	0.041	0.003	0.017
Commercial	2.67	22.92	1.645	0.387	2.032	0.279	0.157	0.650	0.001	0.018	0.004	0.026
Institutional	2.67	22.92	1.645	0.387	2.032	0.279	0.157	0.650	0.001	0.018	0.004	0.026
Highway/Utility	24.00	261.00	2.990	1.140	4.130	0.120	0.300	0.400	0.040	0.103	0.960	0.410
Recreational	3.80	11.10	2.090	0.508	2.598	0.050	0.130	0.900	0.007	0.041	0.006	0.004
Open Land	3.80	11.10	2.090	0.508	2.598	0.050	0.130	0.900	0.001	0.001	0.001	0.006
Extractive (Mining)/Disturbed	28.94	13.20	3.500	0.030	3.530	0.194	0.134	0.900	0.001	0.001	0.001	0.006
Upland Forest	0	0	0	0	0	0	0	0	0	0	0	0
Wetland Forest	0	0	0	0	0	0	0	0	0	0	0	0
Wetland Non-Forested	0	0	0	0	0	0	0	0	0	0	0	0
Water	0	0	0	0	0	0	0	0	0	0	0	0

Note:

1. FLUCCS code (FDOT 1985) ending in "0" indicates Level 1 (includes all subcategories).
2. Stormwater characterization stations for NPDES permit (Hills. Co., 1993); "NA" - not analyzed.

NPDES parameters: BOD5, COD, TSS, TDS, TKN, NO3+NO2, TP, DP, O&G; cadmium, copper, lead, zinc.

All EMC values without footnotes were obtained from samples collected for the Hills. Co. NPDES Permit Application (1994).

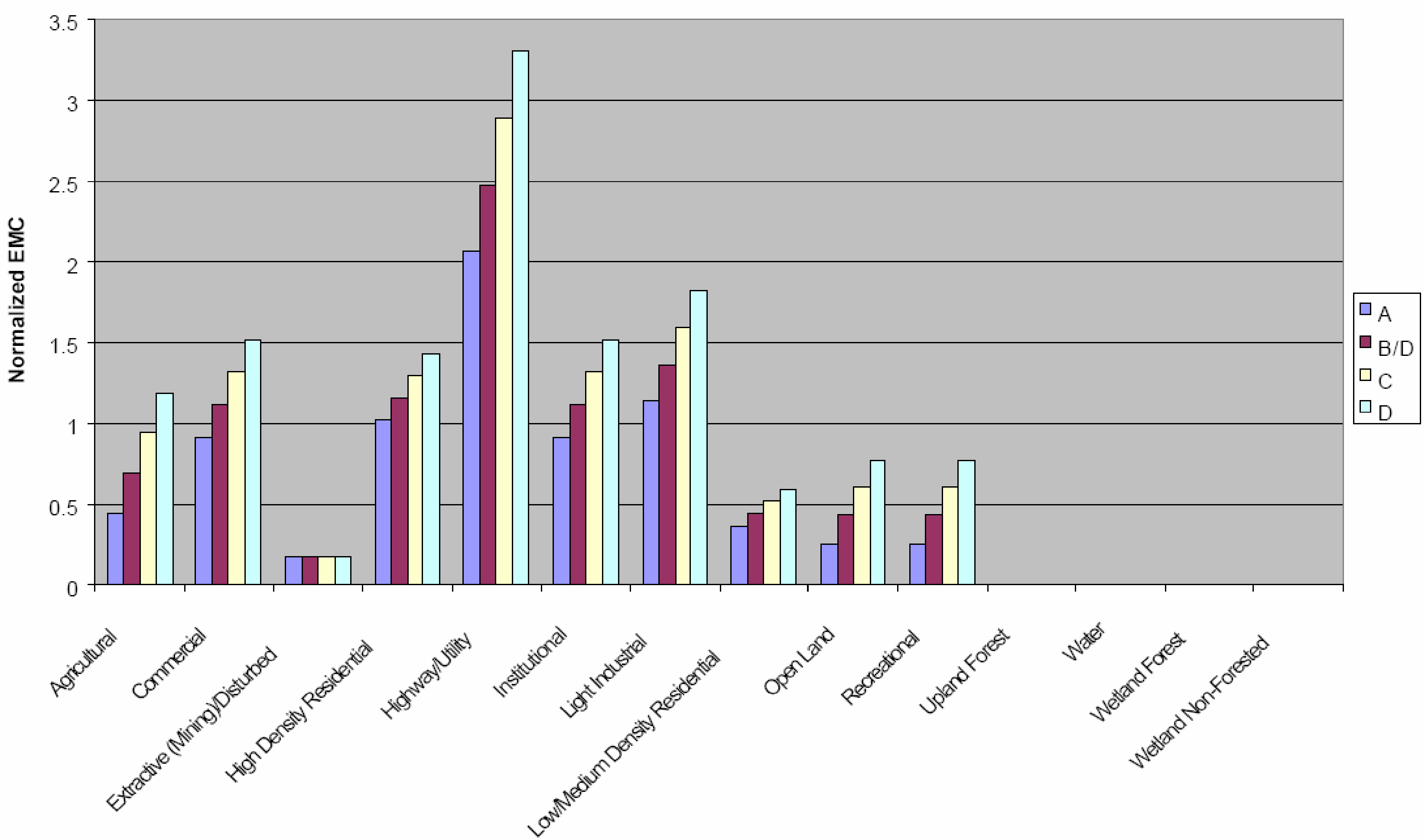
For parameters not detected in all samples, EMCs were calculated using one-half the reporting limit for nondetects.

"BDL" - indicates below detection limits for all Hills. Co. samples collected for a particular land use.

For pollutants not reported by Hills. Co. (1994), additional sources were used as noted:

a. Average values used by Hillsborough Co. (1994) (from Smith and Lord (1990), provided in Wanielista and Yousef (1993).
b. Literature value reported as EMC in Hillsborough Co. 1994.
c. Calculated value from Sarasota County stormwater samples.
d. Orange County, 1993.
e. Surrogate based on 1/2 DL for values reported as BDL.
f. EMCs for open land use were assumed to be less than or equal EMCs for recreational land use.
g. Total nitrogen (TN) estimated as the sum of NH_3 + organic-N (TKN) and oxidized-N (NO_2+NO_3).

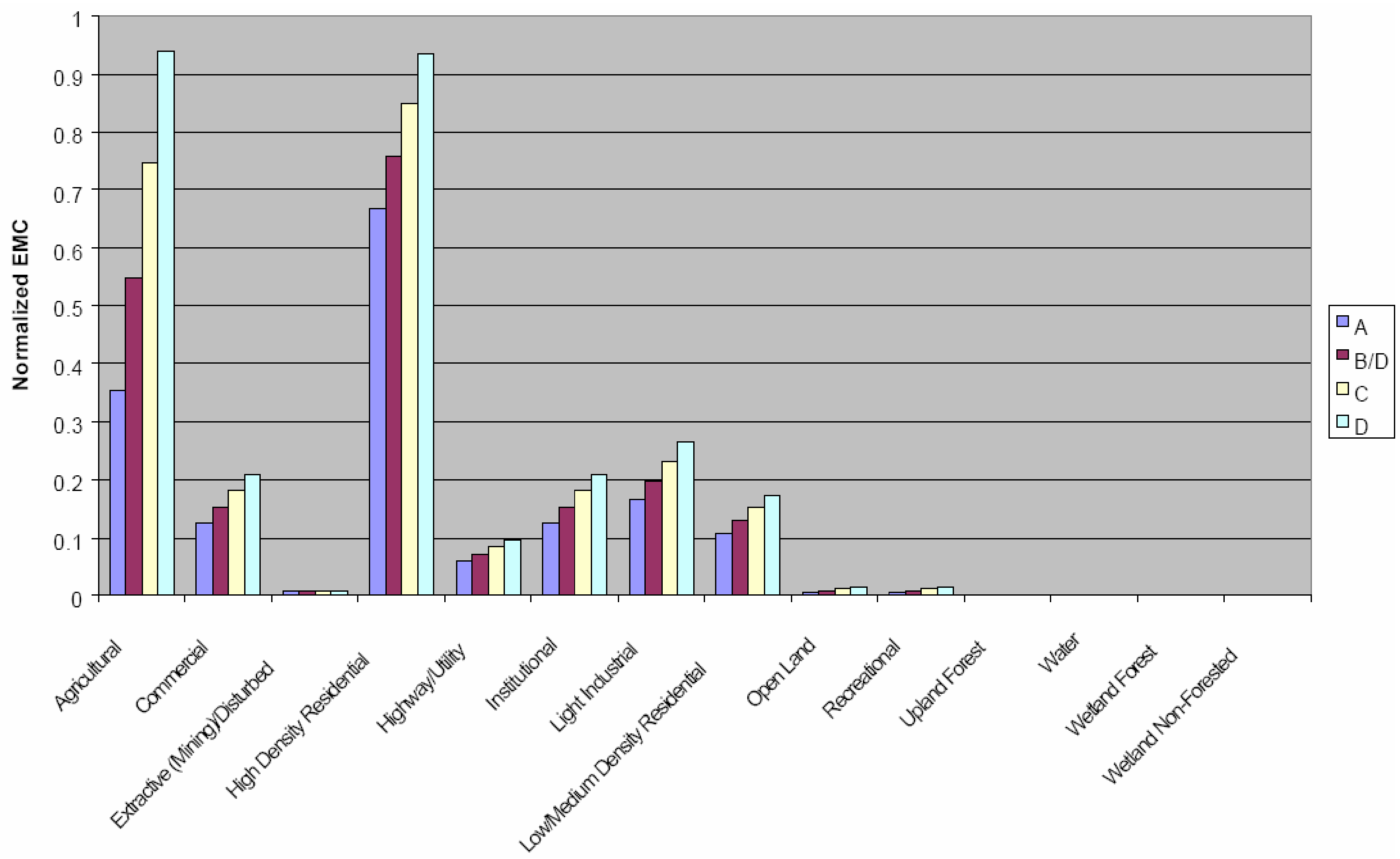
EMCs reported as representative of agricultural land use were used for all subcategories of agricultural land use (e.g., pastures, crops, and groves).



Total Nitrogen Loading Potential by Land Use and Hydrologic Group

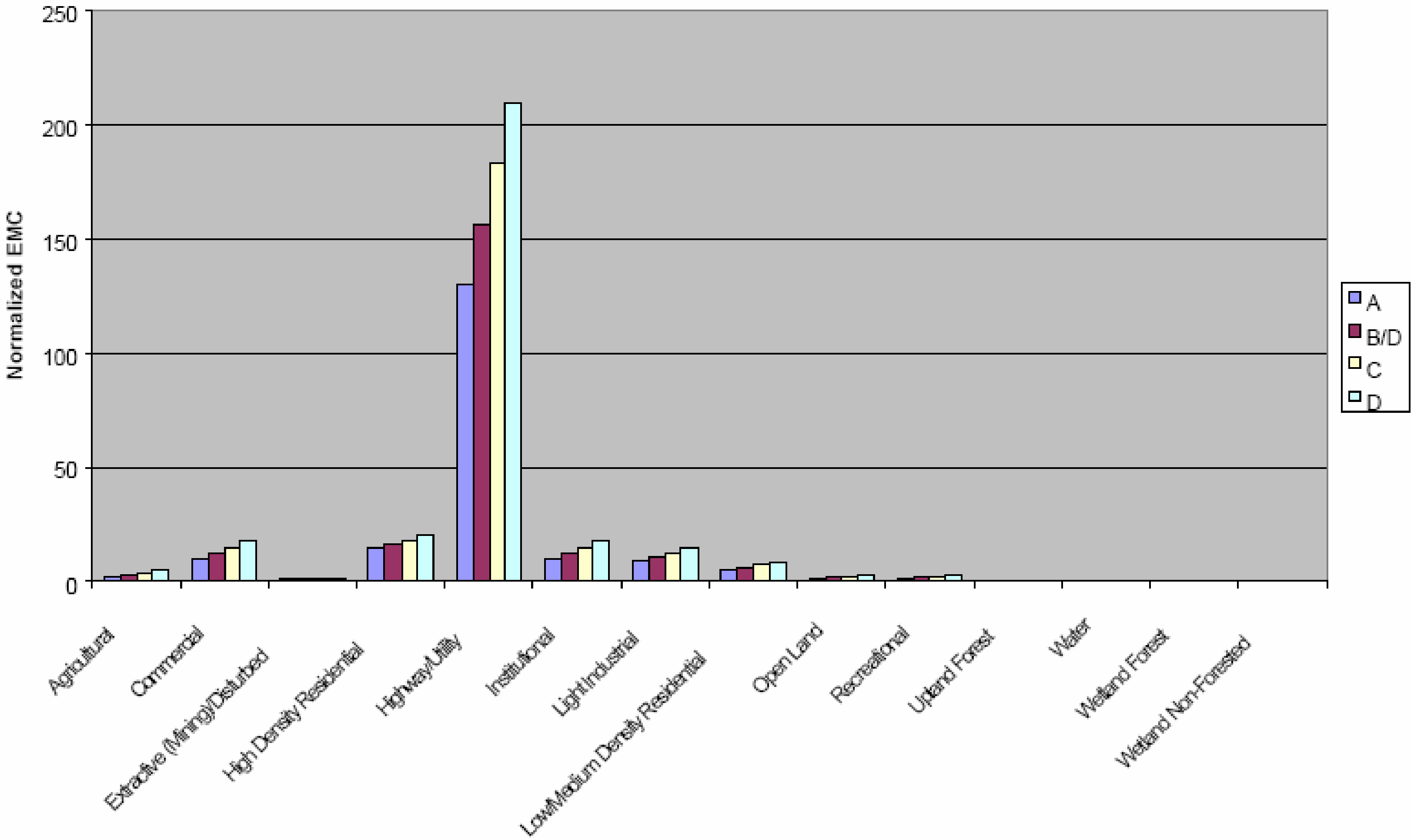
Figure 10-6

AYRES ASSOCIATES



Total Phosphorus Loading Potential by Land Use and Hydrologic Group

Figure 10-7



	Total Suspended Solids Loading Potential by Land Use and Hydrologic Group	**Figure 10-8**	AYRES ASSOCIATES

For example, highway/utilities are clearly shown to have the greatest impact on TSS loading. Likewise, agriculture and high density residential will be expected to contribute the majority of the TP loading when compared with the other land use categories with similar area and soil characteristics.

Literature reviews performed by Parsons Engineering Science, Inc. for the Northwest Hillsborough and Pemberton/Baker Creek watershed reports in 1999 included comparisons of pollutant values in Hillsborough County to other Florida and national studies. Summaries of these comparisons are provided in the following paragraphs:

- "BOD5 data found in Hillsborough County samples tend to be lower, or similar, than those found in other areas in Florida, except for agriculture. The agriculture EMC for BOD5 is approximately five times larger than other values reported in Florida. In general, Hillsborough County agricultural land use EMCs for a number of parameters, tend to be much higher than those reported elsewhere in Florida. For most parameters, these elevated EMCs increase estimated load calculations significantly where agricultural land use is found."
- "Nitrogen from residential land uses tends to be higher in Florida and Hillsborough County than nationally due to the increased application of lawn fertilizer by homeowners and golf course managers. Slightly higher TKN and TP values for multi-family sites may reflect more intensive landscape maintenance for these land uses. Commercial land uses also have nitrogen values that are higher than national averages. This may reflect primarily atmospheric deposition, as studies in Florida have shown that commercial sites produce elevated nitrogen loads even if little green area is present. Phosphorous runoff tends to be lower in Florida than the U.S. average, although data from Hillsborough County studies differs somewhat. Phosphorous runoff from residential and commercial land uses are higher than Florida average, while runoff from industrial land uses are similar to Florida and national averages. As with nitrogen, elevated loads from multi-family land uses could reflect more intensive landscape maintenance. The Hillsborough County data indicate that total nitrogen and total phosphorus EMCs for the agricultural land use are 74 and 586 percent higher, respectively, than that for low/medium family residential uses. The total nitrogen EMC is similar to that found for other locations in Florida. However, the EMC for total phosphorus is six times as high as the average EMC found for various agricultural sites in Florida. This situation makes agriculture one of the main contributors of nutrient loadings."
- "TSS data for Hillsborough County are comparable to other Florida locations and lower than U.S. averages. TSS results from soil erosion, with construction sites a major contributor along with agricultural practices. Additional primary sources of TSS include vehicle emissions and atmospheric deposition."
- "Lead data for Hillsborough County are lower than other locations in Florida and across the U.S. Relatively low lead concentrations may reflect fate and transport characteristics of the particular systems sampled and/or decreased emissions due to the use of unleaded gasoline. Copper data for Hillsborough County are higher than other locations in Florida, but similar to the nationwide average. Relatively high values were observed for residential

land uses. Transportation-related activities, particularly releases from brake linings, have been identified as primary sources for copper. Copper is also a common element in algaecides and fungicides, and many fertilizers contain copper. Zinc data are much lower for Hillsborough County and Florida in general than the rest of the U.S. Sources of zinc include industrial processes, transportation-related activities, atmospheric deposition and fertilizers. Relatively low zinc concentrations may reflect fate and transport characteristics of the particular systems sampled and/or the presence of fewer industrial processing facilities in Hillsborough County than other parts of the U.S."

10.2.5 Existing Stormwater Treatment

The type and coverage of BMPs providing stormwater treatment were also determined to estimate net pollutant loads from each subbasin. BMP coverage data was developed for each aggregate land use within each subbasin based on existing Environmental Resource Permit (ERP) data (Figure 10-9) provided by the SWFWMD and photo-interpretation of digital orthophotography. BMPs used to reduce loads generated by various land uses included wet ponds, percolation ponds (dry retention basins), grassed swales, infiltration trenches, on-line retention, off-line retention/detention, wet detention with natural wetlands, and infiltration/exfiltration. Table 10-5 provides the estimated removal efficiencies of a BMP for a given pollutant.

Table 10-5 Estimated Pollutant Removal Efficiencies for Typical Stormwater BMPs

BMP Type	BOD_5	TSS	TKN	NO_3+NO_2	TN	TP	TDP	Oil & Grease	Cd	Cu	Pb	Zn
Wet-detention	60% 1	85% 1	30% 1	80% 1	30% 1	65% 1	80% 3	35% 2	75% 2	65% 1	75% 1	85% 1
Percolation	80% 1	80% 1	80% 1	80% 1	80% 1	80% 1	80% 3	80% 3	80% 3	80% 1	80% 1	80% 1
Infiltration Trench		75% 4				60% 4					65% 4	65% 4
Grass Swale		60% 4	10% 4	15% 4	10% 4	20% 4					70% 4	60% 4
On-Line Retention (1)	40% 1	85% 1	15% 1	95% 1	40% 1	50% 1	10% 1			25% 1	50% 1	70% 1
Off-line Retention/Detention (Dual Ponds) (1)	80% 1	90% 1			60% 1	85% 1				65% 1	75% 1	85% 1
Wet Detention with Natural Wetlands	60% 1	80% 1	30% 1	80% 1	30% 1	65% 1	80% 1	35% 1	75% 1	65% 1	75% 1	85% 1
Infiltration/Exfiltration	90% 1	90% 1			70% 1	70% 1					70% 1	60% 1

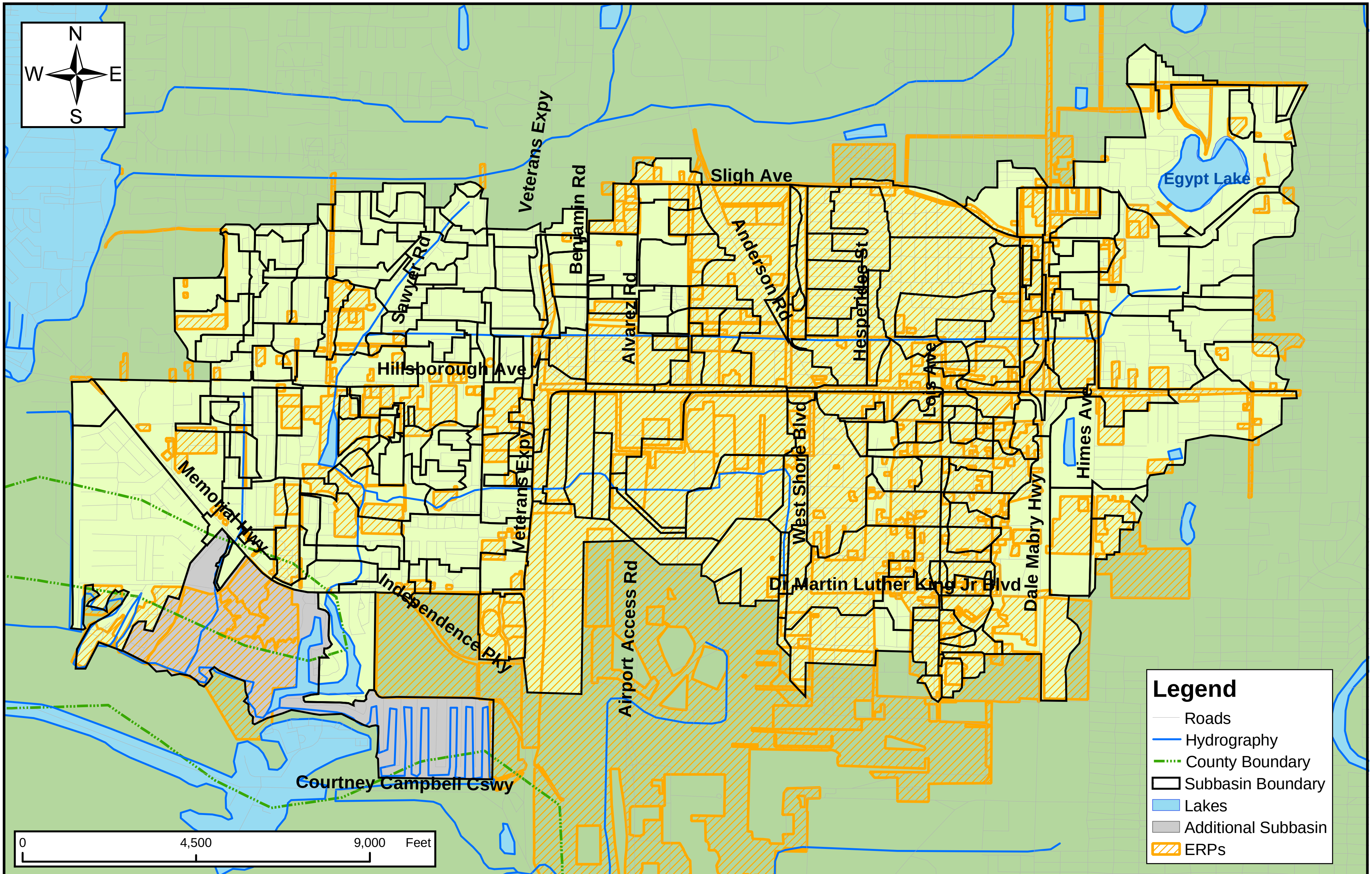
Source:

[1]Harper, H.H. 1999. Pollutant removal efficiencies for typical stormwater management systems in Florida. Florida Water Resources Journal.

[2]Kadlec, R.H. and R.L. Knight, 1996. "Treatment Wetlands." CTC Press, Inc. Boca Raton, Florida.

[3]USEPA, 1993. "Guidance specifying management measures for sources of nonpoint pollution in coastal waters." U.S. Environmental Protection Agency, Office of Water, Washington, D.C.

[4]Parsons Engineering Science, Inc. Unpublished Data.



Location of ERPs in the Lower Sweetwater Creek Watershed

Figure 10-9

AYRES ASSOCIATES

For each land use within a subbasin, a percent coverage of the area treated by a particular BMP was estimated and delineated as a polygon within a BMP coverage file created in ESRI® ArcMap™. Efforts were made to use regularly published electronic data, and to digitize the resulting treatment areas so that they could be revised as new data to become available in the future. The following GIS data layers were used to create the necessary BMP inputs for the pollutant loading model.

1. Land use (2004) from SWFWMD;
2. Soils (1990) from the United States Department of Agriculture/Natural Resource Conservation Service (formerly USDA/SCS) Soil Survey Maps;
3. Subbasin boundaries as described in Section 10.2.3;
4. Digital orthophotos obtained from SWFWMD (2004); and
5. ERP data from SWFWMD (2002).

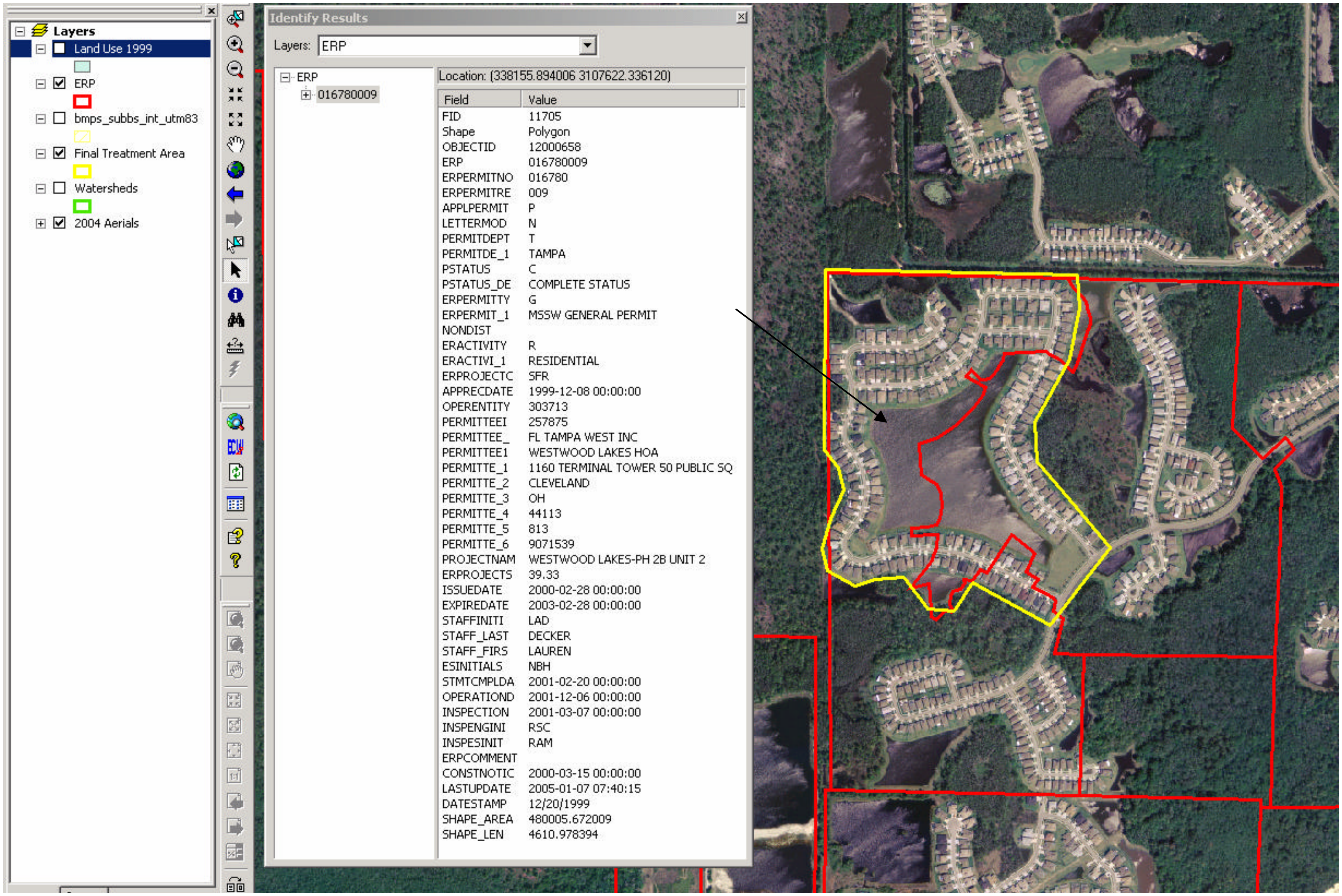
The percent of treated area within a subbasin for a particular land use was estimated by utilizing all of the available resources to pinpoint treatment ponds, treatment ditches and other recognized treatment practices. For this model, only those treatment areas that were man-made were considered. Although natural wetlands and depressions may offer some level of treatment, they were not considered. Treatment areas were first located by overlaying ERP data and 2004 orthophotography using ESRI® ArcMap™ software. Figure 10-10 illustrates a typical BMP identified using the digital orthophotographs and ERP data.

To aid in the identification of treatment areas, the orthophotos were verified against the land use coverage. Subsequently, all three data layers were viewed together (ERP, orthophotos and land use layers) to determine treatment area boundaries and confirm the type of treatment used (Figure 10-11). Once the 313 treatment areas were outlined in GIS, they were digitized in ESRI® ArcMap™ (Figure 10-12).

There are several advantages of digitizing the treatment areas, including the following:

1. Modeling results are reproducible;
2. Treatment polygons may be geographically overlaid on other GIS coverages (e.g., soils, land-use, potentiometric surface, etc.);
3. Digitized information can be used in future analyses including characterizing the effects of land use changes; and
4. Treatment polygons can be added or deleted to reflect changes in the level of treatment. For example, when a property is developed or new regulations come into effect, the treatment characteristics of the area may significantly change.

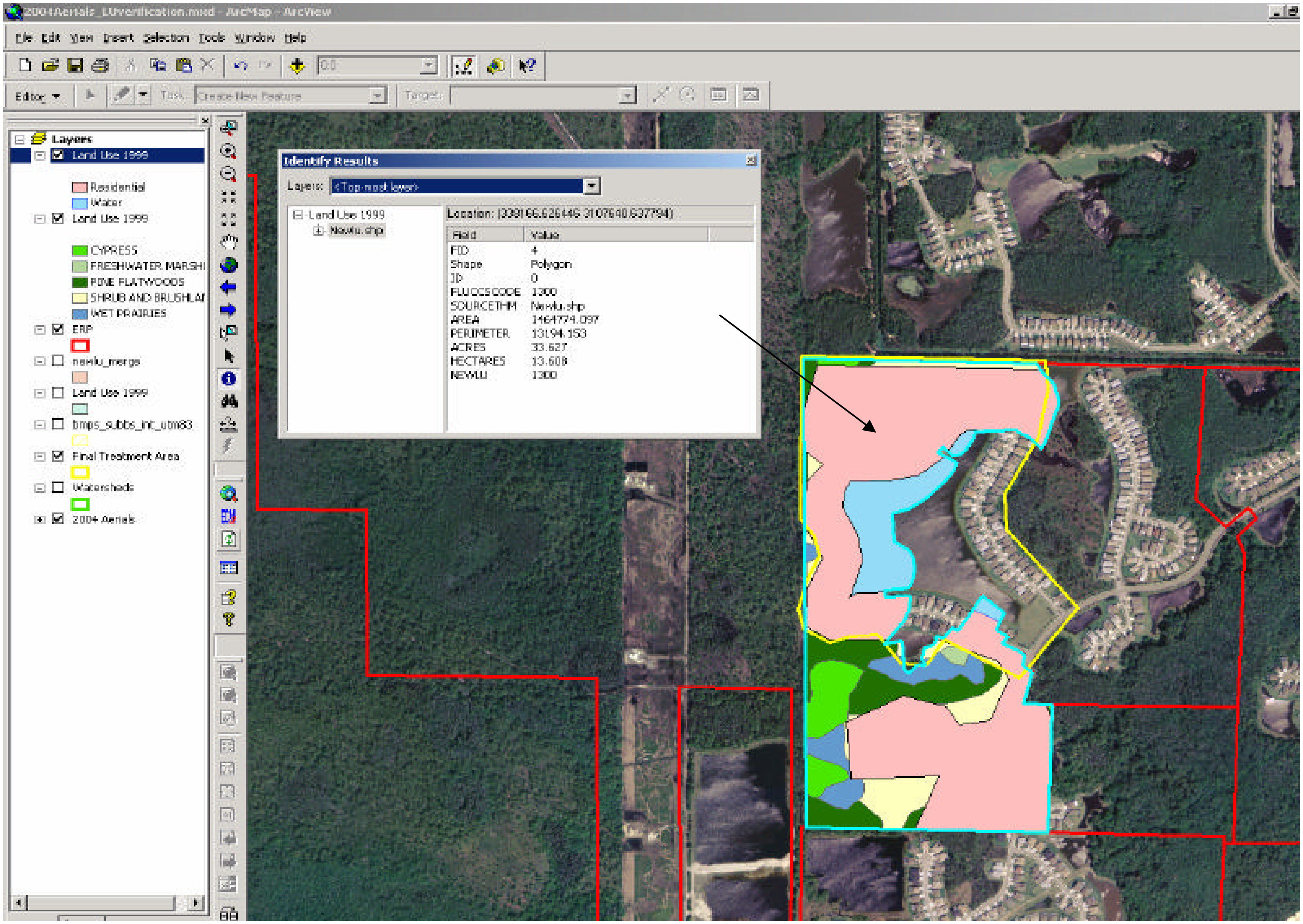
After the treatment areas were identified, a final GIS layer was developed through a series of intersections and unions of layers containing the treatment areas, soils, land use and subbasin boundaries. As a result, each polygon in the final layer had specific soil, land use and treatment characteristics.



Identification of BMPs Using Digital Orthography and ERP Data

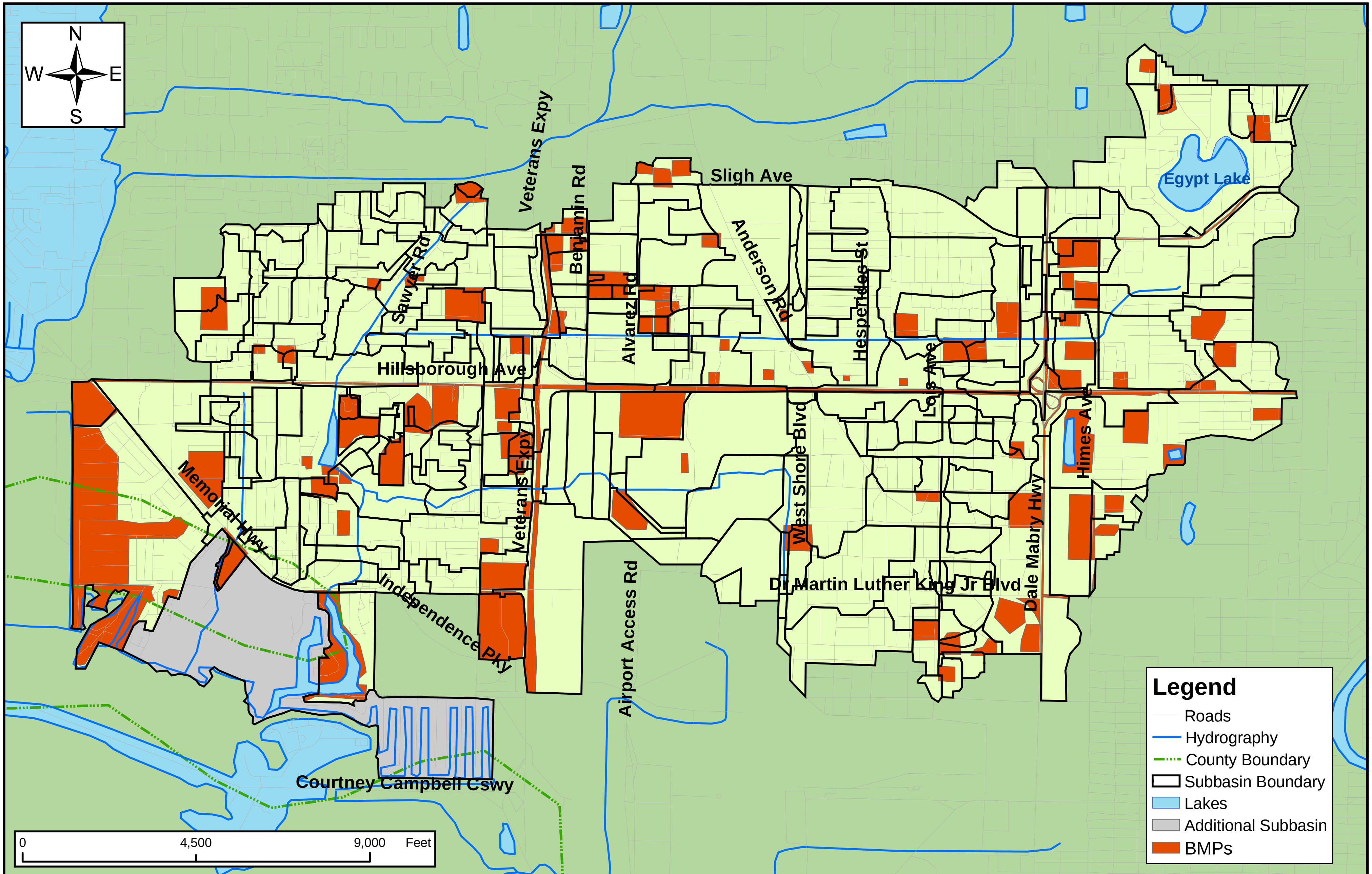
Figure 10-10

AYRES ASSOCIATES



Identification of Treatment Areas

Figure 10-11



Location of BMPs in the Lower Sweetwater Creek Watershed

Figure 10-12

AYRES ASSOCIATES

In order to ascertain the percentage of coverage of each BMP for each type of land use and soil within a subbasin, the information provided by the final GIS layer was incorporated into a database. The database was then used to query for areas of unique combinations of subbasin, land use and hydrologic soil group. This database was also used to obtain information regarding the percentage of area being treated by a particular BMP for each type of land use within a subbasin. The pollutant loading model provided by the County requires that land uses be grouped in specific classifications and input data files (Excel® files) to be in structured formats. To accomplish this, a series of Excel® macro programs were created to aggregate land use, assign appropriate hydrologic classifications, and appropriately format the model input files. Spreadsheet calculations were also performed to verify query results, and to ensure that the land use and hydrologic classifications match those of the model and appropriate soils information.

BMPs identified in the Lower Sweetwater Creek watershed were either retention ponds or grass swales. Distinct concentrations of ERP locations were observed in the central portion of the watershed, east of the Veterans Expressway and west of the Dale Mabry Highway. A number of BMPs identified throughout the watershed was relatively small (only 313); no obvious spatial pattern was observed in the distribution of the BMPs. A number of wet detention ponds were located along Veterans Expressway and Dale Mabry Highway. Another large BMP located to the west of the watershed was a part of the Bay Crest Park subdivision.

It is important to note that the pollutant loads generated from this modeling effort are based on the 2004 aerial photography and 2004 land use information. Recently proposed and constructed developments and BMPs that are not accounted for in the 2004 land use or present on the 2004 aerial photography were not included in this analysis. Since all of the coverages used for the model are in digital format, this information can be updated relatively easily as new land use data and aerial photography becomes available.

10.3 Pollutant Loads

The EPA Simple Method (USEPA, 1992) was used in the pollutant loading model to calculate loads. According to the Simple Method, non-point source pollutant loads are calculated using the following formula:

$$L_l = (0.227)(P)(CF)(Rv_l)(C_l)(A_l)$$

where:

L_l = annual pollutant load per basin (lb/yr)

P = annual average precipitation (in/yr)

Rv_l = weighted average runoff coefficient based on impervious area

C_l = event mean concentration of pollutant (mg/L)

A_l = catchment area contributing to outfall (acres)

CF = correction factor for storms that do not produce runoff (assumed CF=0.9, 10 percent of storms do not produce runoff)

The runoff characteristics discussed above were used with EMC values for specific land uses to calculate gross pollutant loads. All EMCs, runoff coefficients, and BMP efficiency values were incorporated into lookup tables provided with the model. Data generated in GIS by the union of subbasin area, hydrologic soils groups, and land use were then used to estimate average annual runoff. This runoff value was calculated as the product of the annual rainfall amount times the corresponding weighted runoff coefficient for a given subbasin. A correction factor of 0.9 was used to account for the numerous small rainfall events (possibly less than 0.1 inch) that occur throughout the year but do not result in any runoff as a result of abstraction. The contribution from each subbasin in terms of stormwater runoff volume was then calculated by multiplying the runoff coefficient times the average annual rainfall value for the Tampa Bay area (52.4 inches x correction factor or 0.9 = 47.16 inches).

10.3.1 Gross Pollutant Loads

Estimates of gross pollutant loads were calculated for each subbasin within the entire watershed using the 2004 land use and hydrologic soils information. These calculations were performed assuming no existing stormwater treatment within any of the subwatersheds throughout the project area.

10.3.2 Annual Net Pollutant Loads

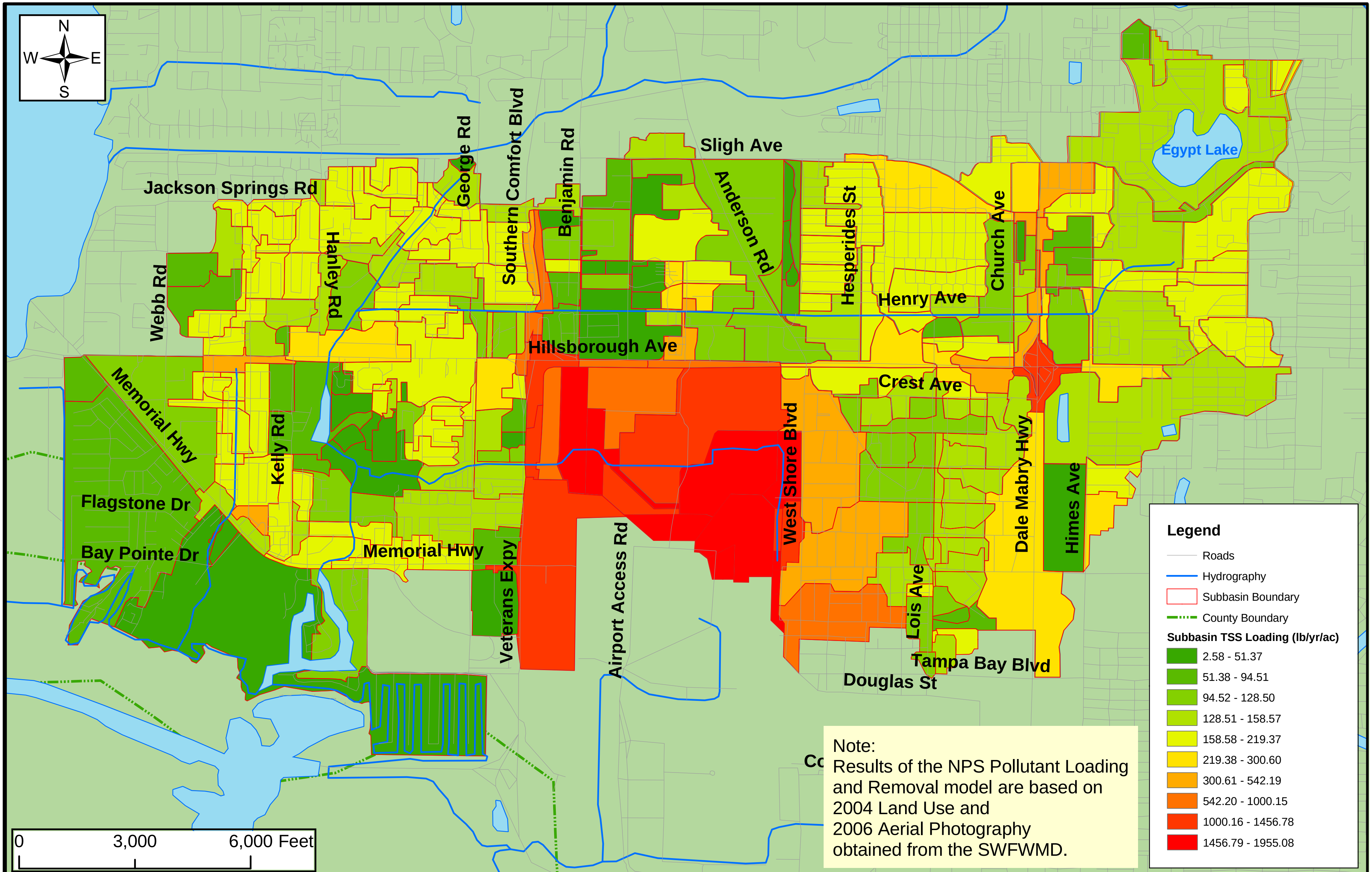
Estimates of annual net pollutant loads were subsequently calculated for each subbasin and the Lower Sweetwater Creek watershed using the 2004 land use and hydrologic soils information and the stormwater treatment BMP coverage file. These calculations typically resulted in lower pollutant loading values for those subbasins that received one or more of the eight types of stormwater treatment. Net pollutant loads are summarized for the watershed level in Table 10-6. Net pollutant loads at the subbasin level are provided in Table 10-1 in the Appendix for Chapter 10.

Table 10-6 Net Pollutant Loads for the Watershed Level for Lower Sweetwater Creek Watershed (lb/yr)

BOD5	TSS	TKN	NO3 +NO2	TN	TP	TDP	Oil and Grease	Cd	Cu	Pb	Zn
269,494	2,572,021	75,781	23,764	99,192	28,260	15,011	49,211	346	1,927	6,862	4,540

To further analyze net pollutant loading spatially, loading data was incorporated into GIS and color coded to show areas of high pollutant loading potential on an annual basis. A select number of parameters were chosen based on existing concerns within the Lower Sweetwater Creek watershed. Those parameters included total suspended solids (TSS – which can limit penetration of light, causing problems for submerged aquatic vegetation), total nitrogen (TN – which can result in eutrophic conditions), and total phosphorus (TP – which can result in eutrophic conditions).

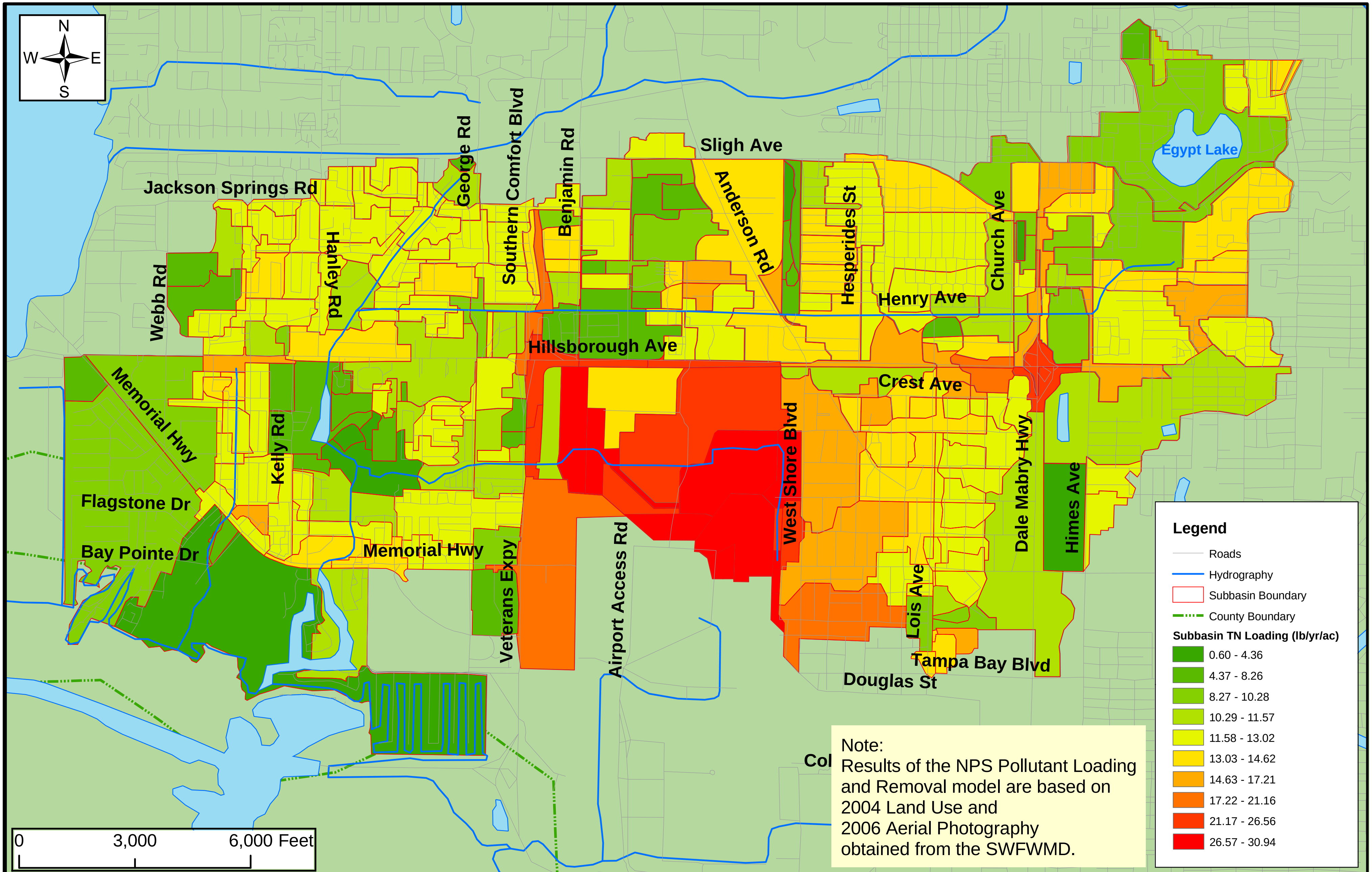
Figures 10-13 through 10-15 illustrate the subbasins TSS, TN, and TP annual loading per acre.



Subbasin Loads for TSS (lb/yr/acre) in the Lower Sweetwater Creek Watershed

Figure 10-13

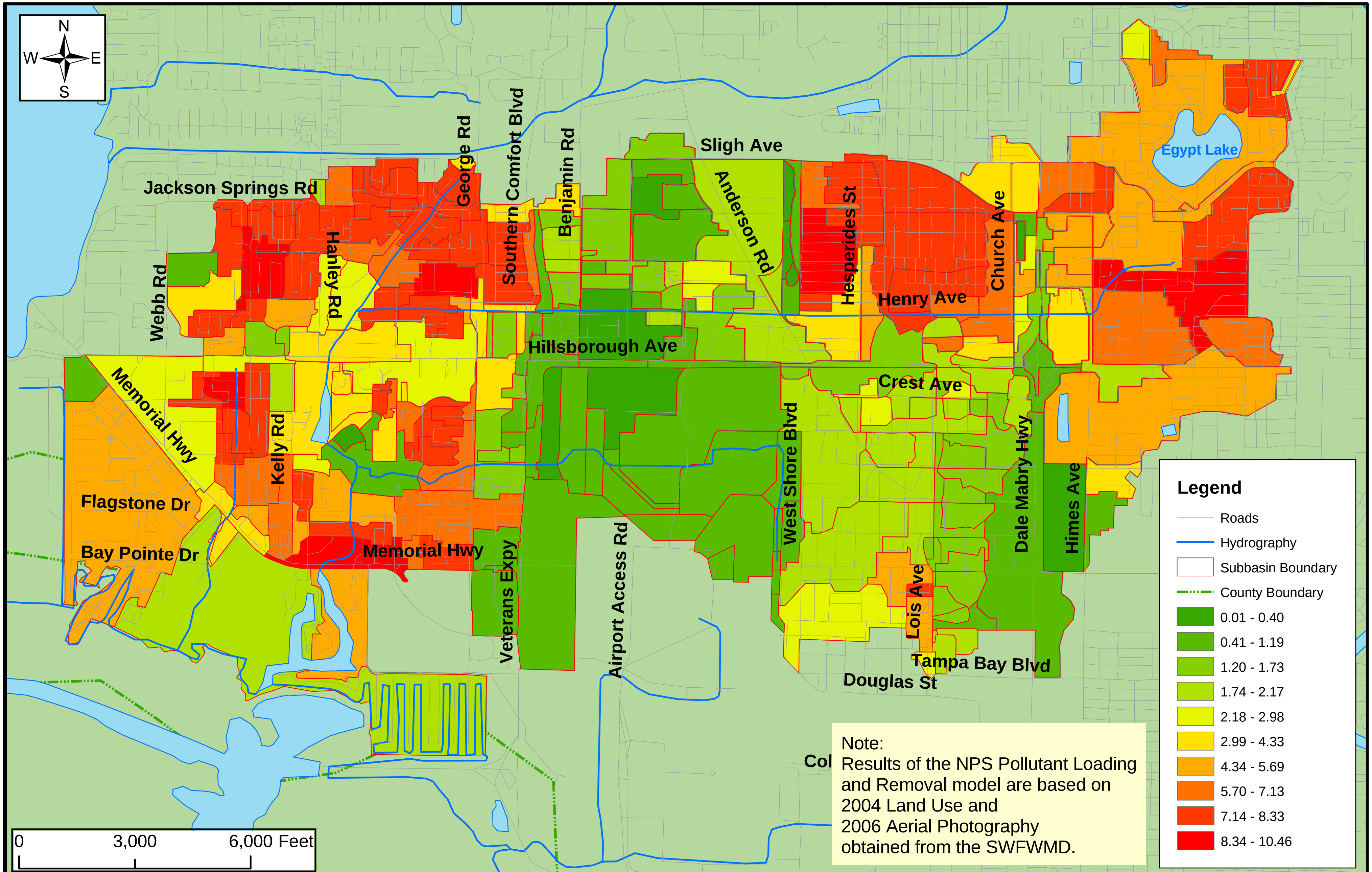
AYRES ASSOCIATES



Subbasin Loads for TN (lb/yr/acre) in the Lower Sweetwater Creek Watershed

Figure 10-14

AYRES ASSOCIATES



Subbasin Loads for TP (lb/yr/acre) in the Lower Sweetwater Creek Watershed

Figure 10-15

AYRES ASSOCIATES

Total Suspended Solids

Total suspended solids loading values were greatest in subbasins that contained high density residential and highway/utility land uses (Figure 10-13). Lower Sweetwater Creek watershed is characterized by highly developed areas. It contains a number of densely populated neighborhoods, large commercial and industrial polygons, the Tampa International Airport, and a number of major highways. These land uses are characterized by large impervious surface area (such as roads, buildings, parking lots, etc.), which have relatively high runoff coefficients and pollutant loads. It appears that the areas exhibiting the greatest TSS loads are clustered around highway/utility land use polygons and subbasins incorporating the Tampa International Airport. Figure 10-7 previously illustrated that the highway/utility land use category exhibits the highest degree of loading for TSS out of all other land use types. Over 13 percent of the Lower Sweetwater Creek watershed land use coverage is comprised of the highway/utility land use category. This nearly one thousand acres is responsible for over 70 percent of the TSS loading into the waterbodies of the Lower Sweetwater Creek watershed. The watershed also contains a little less than three thousand acres of the high density residential land use, which represents over 39 percent of the total area of the Lower Sweetwater creek watershed, yet is responsible for over 18 percent of the entire TSS load for the watershed.

The high percentage of coverage for highway/utility and high density residential land uses within the watershed (over 40%) and their high EMC values make these areas a significant contributor of TSS pollution. Table 10-7 compares the TSS loading for different types of land uses in the Lower Sweetwater Creek watershed.

Table 10-7 TSS Contribution from Various Land Uses within the Lower Sweetwater Creek Watershed

Land Use	Acreage	TSS Loading (lb/yr)	Percent of Land Use Cover	Percent of TSS Loading
Agricultural	10	339	0.13%	0.01%
Commercial	1,176	142,131	15.64%	5.53%
High Density Residential	2,948	475,704	39.21%	18.50%
Highway/Utility	999	1,804,091	13.28%	70.14%
Institutional	353	44,019	4.69%	1.71%
Light Industrial	796	91,890	10.59%	3.57%
Low/Medium Density Residential	67	4,145	0.89%	0.16%
Open Land	308	5,844	4.10%	0.23%
Recreational	197	3,858	2.62%	0.15%
Upland Forest	237	0	3.15%	0.00%
Water	226	0	3.01%	0.00%
Wetland Forest	140	0	1.86%	0.00%
Wetland Non-Forested	62	0	0.82%	0.00%
Grand Total	**7,518**	**2,572,021**	**100.00%**	**100.00%**

Lowest loading values were found in subbasins having less development. A few subbasins located throughout the Lower Sweetwater Creek watershed contain small areas of such land uses as wetlands, upland forest, and open space. Those subbasins show the lowest TSS loads in the watershed. A plot of total TSS loads at the subbasin level (Figure 10-13) provides a more detailed spatial representation of real loading rates.

Total Nitrogen

Total nitrogen loading values were greatest in the south central portion of the Lower Sweetwater Creek watershed (Figure 10-14). The land uses represent a mixture of mostly highway/utility and small areas of upland forested and wetlands. As depicted in Figure 10-5, the land uses that contribute significant TN loading include highway/utility, light industrial, commercial, institutional, agricultural, and high-density residential. Residential, representing about 40% of the abovementioned subbasins, contributes approximately 36%, while highway/utility land use adds additional 31% of the TN loads. Table 10-8 illustrates the percentages of land uses and the respective contribution of TN loading into the subbasins.

Lowest loading values were found within subbasins containing small areas of undeveloped land use, such as upland forests, wetlands, and open space. A plot of total nitrogen loads at the subbasin level (Figure 10-14) provides a more detailed spatial representation of areal loading rates. The TN loading values are great throughout the entire Lower Sweetwater Creek watershed, with highest values occurring in subbasins characterized by highway/utility and high density residential land uses.

Table 10-8 TN Contribution from Various Land Uses within the Lower Sweetwater Creek Watershed

Land Use	Acreage	TN Loading (lb/yr)	Percent of Land Use Cover	Percent of TN Loading
Agricultural	10	79	0.13%	0.08%
Commercial	1,176	13,799	15.64%	13.91%
High Density Residential	2,948	35,796	39.21%	36.09%
Highway/Utility	999	30,882	13.28%	31.13%
Institutional	353	4,173	4.69%	4.21%
Light Industrial	796	11,642	10.59%	11.74%
Low/Medium Density Residential	67	311	0.89%	0.31%
Open Land	308	1,474	4.10%	1.49%
Recreational	197	1,036	2.62%	1.04%
Upland Forest	237	0	3.15%	0.00%
Water	226	0	3.01%	0.00%
Wetland Forest	140	0	1.86%	0.00%
Wetland Non-Forested	62	0	0.82%	0.00%
Grand Total	**7,518**	**99,192**	**100.00%**	**100.00%**

Total Phosphorus

In contrast to TN, for total phosphorus, greatest loading values were calculated for the western and northeastern parts of the Lower Sweetwater Creek watershed (Figure 10-15). Residential areas are the major contributors of total phosphorus in these subbasins, accounting for over 80% of the total loading.

Table 10-9 compares the contributions of the land uses to total phosphorus loading within these subwatersheds. Lower loading values were found in subbasins containing land uses other than residential, including subbasins to the central and southeastern parts of the Lower Sweetwater Creek watershed. The plot of total phosphorus loads at the subbasin level (Figure 10-15) provides a more detailed spatial representation of areal loading rates.

Table 10-9 TP Contribution from Various Land Uses within the Lower Sweetwater Creek watershed

Land Use	Acreage	TP Loading (lb/yr)	Percent of Land Use Cover	Percent of TP Loading
Agricultural	10	63	0.13%	0.22%
Commercial	1,176	1,858	15.64%	6.58%
High Density Residential	2,948	23,059	39.21%	81.59%
Highway/Utility	999	883	13.28%	3.13%
Institutional	353	565	4.69%	2.00%
Light Industrial	796	1,694	10.59%	5.99%
Low/Medium Density Residential	67	91	0.89%	0.32%
Open Land	308	28	4.10%	0.10%
Recreational	197	19	2.62%	0.07%
Upland Forest	237	0	3.15%	0.00%
Water	226	0	3.01%	0.00%
Wetland Forest	140	0	1.86%	0.00%
Wetland Non-Forested	62	0	0.82%	0.00%
Grand Total	**7,518**	**28,260**	**100.00%**	**100.00%**

10.4 Assessment of Pollutant Loading Model

For the purposes of this study, no statistical correlation between the existing water quality information and pollutant loading results predicted by the model was conducted. Although, during other studies (Hillsborough River Watershed Management Plan, Ayres Associates Inc, 2002) the same Hillsborough County NPS Pollutant Loading and Removal model was used to generate pollutant loading information. That information was later compared to the existing water quality conditions in the Hillsborough River watershed. Upon such comparison, a conclusion was made that the model appears to estimate loads with reasonable accuracy for isolated drainage areas where there are no extraneous factors that affect flow (e.g., dams, surface water withdrawals, etc.).

Pollutant loads generated by the model used in the Hillsborough River Watershed study were also compared to modeling results for the Upper Hillsborough River Diagnostic Watershed Assessment project (Limno-Tech, Inc, 1997). The methodology used to estimate areal loads in the Limno-Tech study involved the use of EPA's Stormwater Management Model (SWMM) output to develop estimates of pollutant loads at the subbasin level for total phosphorus, total nitrogen, and total suspended solids. These values were divided by each subbasin's area to estimate unit area load values. Due to the differences in methodology and subbasin or subwatershed delineations, only general comparisons was made between the model output of the Hillsborough River Watershed study and the Limno-Tech assessment.

Generally, the two models were in agreement in that the greatest total phosphorus and nitrogen loads occur in the developed areas near Tampa (Hillsborough River below S-155), Plant City, and western Polk County (Itchepackesassa Creek subwatershed), although the model used in the Hillsborough River Watershed study identified additional areas where elevated loads are expected to occur. Actual areal loading rates for most parameters were approximately ten times lower in the Limno-Tech study which was based on time-variable hydrodynamic calculations using actual flows for the year 1987. Changes in land use and differences in rainfall between 1987 and 1995 may partially account for the significant difference in loading values between the two studies. During this study, the NPS modeling procedure was nearly identical to the procedure used during the Hillsborough River Watershed project, therefore, the statement about the model accuracy is assumed to remain true for this study as well.

10.5 Bibliography

The attached bibliography includes a list of references used for this study and additional references that could be cited by readers.

Ayres Associates Inc. 2002. Hillsborough River Watershed Management Plan. Final Report. Hillsborough County, Florida.

Harper, H.H. 1999. Pollutant removal efficiencies for typical stormwater management systems in Florida. Florida Water Resources Journal.

Kadlec, R.H. and R.L. Knight, 1996. "Treatment Wetlands." CTC Press, Inc. Boca Raton, Florida.

Limno-Tech, Inc. 1997. Upper Hillsborough River Diagnostic Watershed Assessment. Final Report. Southwest Florida Water Management District, Tampa, Florida.

Parsons Engineering Science, Inc. Unpublished Data.

US EPA, 1993. "Guidance specifying management measures for sources of nonpoint pollution in coastal waters." U.S. Environmental Protection Agency, Office of Water, Washington, D.C.

Appendix 10-1. Net Pollutant Loads at the Subbasin Level for Lower Sweetwater Creek Watershed

Subbasin ID	Basin ID	Area (acres)	Volume (acre-feet)	Runoff coefficient	BOD5	TSS	TKN	NO3 +NO2	TN	TP	TDP	Oil and Grease	Cd	Cu	Pb	Zn
400001	LSW	137.105	278.0666	0.516063	2243.415	17371.34	1110.855	265.0932	1378.517	330.7139	192.2896	551.1958	1.648958	19.1429	14.89591	24.79027
400002	LSW	335.69	805.5111	0.610577	3689.306	30011.66	2232.751	646.0482	2896.538	1737.262	895.5867	1851.596	1.738342	70.5077	7.860924	66.4724
400003	LSW	23.601	51.80692	0.558554	376.3061	2098.071	207.4769	10.38957	191.6011	19.63481	20.96301	89.66726	0.40794	2.457188	6.278572	3.603772
400100	LSW	2.644	5.881261	0.566	24.94638	69.56202	18.59465	0.542904	19.64048	10.69016	7.944462	17.15863	0.015991	0.563692	0.047974	0.278248
400150	LSW	8.704	20.3298	0.594322	76.7639	214.0532	57.21863	1.670599	60.43681	32.8953	24.44635	52.79978	0.049208	1.734569	0.147623	0.856213
400200	LSW	24.364	53.21212	0.555737	373.7226	3456.593	220.0515	67.12212	287.4329	95.87111	45.22313	118.6652	0.146932	4.147401	0.722716	5.232463
400300	LSW	39.833	88.13325	0.562995	625.7023	6693.764	339.2298	150.5373	489.7726	276.569	115.9514	239.6547	0.239636	10.04215	1.35467	12.54918
400350	LSW	10.021	22.3749	0.568143	424.5049	4551.561	107.3938	42.74709	150.1409	50.75323	24.67191	50.73857	0.544371	3.121547	12.16369	7.416709
400400	LSW	9.272	20.6987	0.568038	145.1582	1604.387	76.76041	37.48839	114.2842	74.49438	31.00456	60.38866	0.05628	2.631947	0.334305	3.218565
400500	LSW	15.593	34.68476	0.566	245.2023	2734.949	129.0141	64.03552	193.0496	126.0906	52.05833	101.1931	0.094309	4.432503	0.565851	5.469897
400600	LSW	2.676	6.178793	0.587523	43.68069	487.2077	22.98276	11.40738	34.39014	22.46196	9.273747	18.02669	0.0168	0.789612	0.100802	0.974415
400605	LSW	2.197	4.870461	0.564089	34.29823	369.7151	18.47176	8.424584	26.90338	16.02321	6.725367	13.59668	0.013243	0.577042	0.075889	0.711917
400610	LSW	7.112	15.78331	0.564695	111.7988	1225.049	59.59518	28.20408	87.79927	53.98868	22.42394	44.69305	0.042915	1.922521	0.251085	2.384978
400620	LSW	5.957	13.24041	0.565563	93.67359	1037.709	49.53692	24.14144	73.67836	47.03467	19.46237	38.18979	0.036001	1.661413	0.213929	2.054308
400630	LSW	7.267	17.38051	0.608576	122.8707	1370.481	64.6489	32.08816	96.73706	63.1839	26.0864	50.7078	0.047258	2.221125	0.283548	2.740962
400650	LSW	31.763	70.54645	0.565147	499.0113	5512.255	264.4438	127.8917	392.3356	248.0451	102.7365	202.4039	0.191721	8.779854	1.134663	10.86529
400660	LSW	18.172	16.87695	0.236319	111.6557	1006.626	63.12241	22.06748	85.18988	31.61994	14.18699	35.90016	0.040666	1.23664	0.190758	1.610087
400700	LSW	8.506	20.7787	0.621585	146.894	1638.433	77.28886	38.36194	115.6508	75.53743	31.18673	60.62203	0.056498	2.655392	0.338986	3.276867
400800	LSW	15.91	35.31379	0.564783	760.77	6060.429	179.6969	59.74834	240.1483	47.47163	27.70872	66.37612	1.021397	4.399172	14.82652	9.298081
401000	LSW	87.914	232.2397	0.67218	941.6141	6926.09	603.2032	133.3638	732.8645	325.4332	180.4244	419.4312	0.446707	14.5861	1.785466	13.45842
401100	LSW	31.358	72.694	0.589872	449.7647	4883.222	240.8639	112.6727	353.4635	220.5058	92.48316	183.6372	0.174973	7.879627	1.01476	9.630912
401110	LSW	21.026	43.59211	0.527544	303.7695	3171.452	162.2417	74.34709	236.5771	137.6613	57.73682	118.3319	0.145257	5.103435	0.669485	6.087673
401120	LSW	8.164	17.01778	0.530405	122.5333	1243.217	67.68445	27.45639	95.1401	46.76528	19.97013	43.99593	0.053009	1.787267	0.251809	2.203664
401130	LSW	22.191	45.5842	0.522691	326.7523	3443.065	174.914	80.2981	255.0057	150.2175	62.90947	128.266	0.148785	5.516082	0.722598	6.6395
401140	LSW	26.676	58.16202	0.554787	338.307	1757.545	230.6344	20.57881	229.5349	27.58334	22.91391	100.0088	0.2505	2.413852	2.185626	2.617231
401190	LSW	46.141	112.0199	0.617754	553.3926	2278.451	348.4007	11.10824	313.4913	32.76236	35.10673	153.86	0.598455	3.86931	7.118983	4.308093
401191	LSW	178.505	351.1517	0.500555	21981.85	215111.9	2707.337	1014.087	3727.994	107.1549	276.1458	370.9055	36.75639	94.49759	779.7741	338.4143
401200	LSW	21.421	49.75089	0.590974	328.8462	3667.9	173.0237	85.87946	258.9032	169.1029	69.81659	135.7123	0.126479	5.944528	0.758876	7.335801
401220	LSW	8.045	17.65182	0.558304	126.2522	1261.863	71.57635	26.35026	97.92661	41.56526	18.05414	42.46164	0.047996	1.625507	0.245242	2.089362
401240	LSW	30.588	67.4186	0.560836	480.3463	4984.399	265.8696	108.5536	374.4233	187.4222	79.65889	173.6386	0.183313	7.00778	0.990865	8.860702
401300	LSW	50.833	101.686	0.509006	676.5443	6251.233	388.3458	139.9525	522.332	243.4623	107.813	248.3927	0.266134	9.251593	1.286825	11.29737
401320	LSW	13.244	29.43337	0.565494	208.2361	2306.803	110.1212	53.66539	163.7866	104.5546	43.26352	84.89439	0.08003	3.693221	0.475557	4.566616
401330	LSW	83.295	183.5271	0.560646	1284.788	13195.8	713.7957	288.6437	997.8796	513.7912	219.0165	474.4767	0.509537	19.17629	2.957774	24.00948
401400	LSW	54.966	55.69075	0.257808	278.1702	2034.805	166.022	44.51236	208.0418	51.50212	26.44274	83.59322	0.102329	2.232716	0.380835	2.897657
401430	LSW	32.477	62.83537	0.492307	438.8996	4793.885	234.5008	110.0263	344.5272	209.4891	87.11046	174.4406	0.168417	7.478273	0.980853	9.286386
401500	LSW	7.372	3.340995	0.115318	11.53312	33.68885	6.343215	1.541796	7.885011	0.151752	0.394554	2.731528	0.003035	0.003035	0.003035	0.01821
401600	LSW	75.879	107.9388	0.361962	704.4217	6498.704	403.8814	143.2516	542.5952	237.0723	105.3589	249.0383	0.312684	9.38458	1.341682	11.30271
401604	LSW	8.446	20.39128	0.614329	85.04535	506.0736	60.31492	9.030748	65.65318	21.39891	12.61345	35.27973	0.043476	1.066412	0.142529	0.957777
401630	LSW	5.75	3.559849	0.157533	21.01102	146.1331	11.71382	3.893969	15.64948	6.310808	3.146118	7.725197	0.007565	0.235705	0.030079	0.267075
401632	LSW	5.417	12.04947	0.566	85.12016	948.6267	44.80701	22.20684	67.01575	43.76331	18.08169	35.15443	0.032763	1.539137	0.196395	1.89778
401640	LSW	4.803	9.244696	0.489765	63.01314	655.2853	34.0379	15.29976	49.38299	30.92607	13.32561	26.56683	0.024898	1.113523	0.139502	1.31938
401642	LSW	15.407	34.57065	0.570948	144.4829	469.7055	105.7333	5.17535	113.6386	62.14134	44.85384	96.68991	0.090158	3.2042	0.279093	1.689919
401650	LSW	11.25	17.86853	0.404151	129.0577	1201.521	70.87009	29.05921	99.03209	53.74463	23.3017	50.73471	0.048585	1.89835	0.245965	2.337884

Appendix 10-1. Net Pollutant Loads at the Subbasin Level for Lower Sweetwater Creek Watershed

Subbasin ID	Basin ID	Area (acres)	Volume (acre-feet)	Runoff coefficient	BOD5	TSS	TKN	NO3 +NO2	TN	TP	TDP	Oil and Grease	Cd	Cu	Pb	Zn
401652	LSW	98.682	162.1356	0.418069	2180.628	20509.76	676.4909	231.6615	896.3168	304.4774	151.7775	353.456	2.544517	16.93094	47.11794	33.82733
401654	LSW	2.056	4.384732	0.54266	30.86847	344.3022	16.24157	8.06142	24.30299	15.87352	6.553614	12.73918	0.011872	0.558007	0.071235	0.688604
401656	LSW	1.756	1.299109	0.188247	7.647411	6.941765	6.048799	0.0861	5.302944	0.156822	0.42782	3.029478	0.003532	0.010054	0.002664	0.009859
401660	LSW	21.662	46.42893	0.545378	327.2649	3612.049	173.0583	84.55868	257.3096	166.5568	68.9836	135.0696	0.126107	5.858391	0.748035	7.223113
401664	LSW	15.517	34.5157	0.566	244.0072	2721.618	128.3853	63.72341	192.1087	125.476	51.8046	100.6999	0.093849	4.410899	0.563093	5.443237
401670	LSW	8.073	17.95742	0.566	126.9491	1415.971	66.79478	33.15326	99.94804	65.28116	26.95228	52.39094	0.048827	2.29485	0.29296	2.831942
401690	LSW	5.315	11.70275	0.560263	84.83037	872.9107	46.57976	18.52961	65.10937	31.21266	13.34733	29.60081	0.034316	1.185366	0.230712	1.522424
401750	LSW	15.997	36.51269	0.580782	132.5798	443.5661	96.93372	5.034408	104.3322	57.17421	41.0057	88.38516	0.082596	2.937432	0.257373	1.56999
401850	LSW	6.717	15.81065	0.598938	60.53238	199.963	44.4625	1.981187	47.50975	24.07981	17.80038	39.14358	0.037357	1.276512	0.113902	0.664523
402000	LSW	59.804	130.6392	0.555841	1951.997	16725.49	614.5829	197.3644	813.1395	192.0194	100.3098	259.5948	2.205535	13.07381	32.92377	25.2419
402100	LSW	38.084	70.09109	0.468304	483.126	4379.939	289.7598	80.8999	370.3686	89.79484	43.22494	134.2948	0.182582	4.277848	0.801231	5.829488
402200	LSW	24.913	55.01786	0.561934	376.8881	3801.526	211.3621	83.34128	294.4051	155.4747	68.13118	145.7277	0.149595	5.860889	0.789401	7.052068
402210	LSW	16.332	36.00882	0.561018	246.0299	2477.703	139.2994	54.68003	192.036	99.83186	42.80141	93.17951	0.097909	3.730581	0.511706	4.591342
402220	LSW	40.144	90.87254	0.575996	642.4204	7165.338	338.0162	167.7651	505.7813	330.3331	136.3836	265.114	0.247084	11.61244	1.482471	14.33032
402230	LSW	14.504	32.26241	0.566	228.0776	2543.942	120.0039	59.56334	179.5672	117.2845	48.42263	94.12587	0.087722	4.122941	0.526333	5.087885
402240	LSW	16.014	35.31376	0.561115	251.4983	2620.267	138.8321	57.31352	196.1456	99.81381	42.33838	91.60827	0.096019	3.716459	0.522118	4.691673
402250	LSW	5.057	10.92479	0.549703	79.18052	688.376	48.51416	11.86484	60.379	9.624999	5.162948	19.84278	0.029705	0.557123	0.121347	0.798553
402260	LSW	7.017	15.60847	0.566	110.3434	1230.753	58.0576	28.8166	86.8742	56.74196	23.42675	45.53787	0.04244	1.994669	0.254639	2.461506
402270	LSW	17.777	39.5428	0.566	279.546	3118.013	147.0842	73.00452	220.0887	143.7512	59.34977	115.3665	0.107518	5.053332	0.645106	6.236026
402280	LSW	12.601	28.85726	0.582717	204.0051	2275.441	107.338	53.2767	160.6147	104.9057	43.31184	84.19132	0.078463	3.687784	0.470781	4.550882
402285	LSW	3.635	8.085621	0.566	57.16092	637.5642	30.07544	14.9278	45.00324	29.39391	12.1357	23.58987	0.021985	1.033294	0.13191	1.275128
402300	LSW	26.167	58.20535	0.566	411.1891	4582.69	216.4444	107.2792	323.7323	211.4087	87.34493	169.8146	0.158262	7.435006	0.94873	9.167813
402310	LSW	10.241	22.77988	0.566	156.9885	1700.171	83.93284	39.54286	123.5983	80.20731	33.97519	66.46049	0.061939	2.865342	0.359943	3.434246
402320	LSW	26.912	59.86251	0.566	413.5231	4491.005	220.7574	104.52	325.5699	211.4028	89.33424	174.6494	0.162767	7.540791	0.948704	9.062921
402330	LSW	28.788	73.6588	0.651059	289.4393	2193.015	179.4229	45.95981	227.8778	138.2313	74.5884	153.5008	0.143058	5.791498	0.620335	5.076261
402340	LSW	5.122	11.39327	0.566	80.54422	898.3779	42.37865	21.03443	63.41309	41.41832	17.10016	33.23998	0.030979	1.455992	0.185871	1.796756
402350	LSW	21.268	47.38403	0.566908	309.1656	3138.792	170.7958	71.85481	243.3931	155.5825	69.45619	137.6216	0.128347	5.748337	0.698814	6.47843
402360	LSW	3.86	10.11946	0.667079	27.9373	77.9021	20.82404	0.607995	21.99525	11.97185	8.896957	19.21585	0.017909	0.631276	0.053726	0.311608
402370	LSW	9.263	20.60209	0.565936	145.6596	1623.259	76.68884	37.97594	114.6648	74.67818	30.84057	60.01994	0.056018	2.626766	0.335694	3.242343
402400	LSW	21.209	46.90483	0.562736	338.7223	3065.076	203.3036	56.19941	259.503	60.37753	29.28021	92.81127	0.127535	2.923226	0.557013	4.013815
402500	LSW	20.15	45.11504	0.56971	312.7006	2987.529	181.7794	62.38969	242.1741	100.5375	44.51761	107.2592	0.122669	3.984139	0.595617	5.010252
402510	LSW	24.518	55.62475	0.577285	393.2366	4386.1	206.9029	102.6952	309.5982	202.2143	83.48715	162.2857	0.151245	7.108507	0.907469	8.772201
402520	LSW	20.12	44.62445	0.564355	316.2529	3449.206	169.1499	79.05109	248.201	150.1401	62.4651	125.3607	0.121335	5.365785	0.705165	6.666202
402600	LSW	10.358	23.11538	0.567849	161.551	1774.051	85.66118	41.43192	127.1519	82.63442	34.54705	67.42215	0.062851	2.927119	0.370911	3.563075
402610	LSW	24.096	58.85527	0.62151	416.0746	4640.832	218.9193	108.6595	327.5787	213.9584	88.33584	171.7108	0.160029	7.521349	0.960172	9.281664
402620	LSW	5.326	12.45796	0.595187	88.07096	982.3299	46.33887	23.00007	69.33894	45.2888	18.69814	36.34621	0.033873	1.592052	0.203241	1.96466
402630	LSW	20.528	45.66207	0.566	322.8059	3600.527	169.8456	84.302	254.1476	165.9967	68.53418	133.2195	0.124156	5.835337	0.744937	7.201055
402640	LSW	9.979	22.17003	0.56531	156.8927	1733.685	83.12222	40.23687	123.3591	78.08166	32.33649	63.67625	0.060281	2.763106	0.356933	3.419067
402700	LSW	3.723	8.877045	0.606712	62.75586	699.9692	33.01923	16.38893	49.40817	32.27099	13.32355	25.89886	0.024137	1.134433	0.144821	1.399938
402800	LSW	37.851	55.65865	0.374165	308.1058	3477.728	176.3404	76.89389	253.0933	147.0431	64.06996	138.083	0.131911	5.252018	0.800775	6.529128
402810	LSW	16.492	36.46013	0.562539	256.4873	2865.958	135.435	66.94757	202.3826	131.6237	54.44258	106.3089	0.099136	4.627398	0.596083	5.715804
402820	LSW	14.82	32.53981	0.558694	309.4661	3128.416	138.9385	48.95665	187.8952	67.69372	30.67072	74.0392	0.22777	3.068751	3.850756	4.968043
402830	LSW	17.054	31.08813	0.463848	275.2837	2375.826	138.3234	34.09202	171.4492	32.27061	18.65069	62.36781	0.190622	1.915479	2.931923	3.233818

Appendix 10-1. Net Pollutant Loads at the Subbasin Level for Lower Sweetwater Creek Watershed

Subbasin ID	Basin ID	Area (acres)	Volume (acre-feet)	Runoff coefficient	BOD5	TSS	TKN	NO3 +NO2	TN	TP	TDP	Oil and Grease	Cd	Cu	Pb	Zn
402840	LSW	4.408	9.511158	0.549034	55.52112	343.5566	39.35429	5.235491	42.0064	5.395739	3.858498	16.80487	0.02661	0.397243	0.095759	0.434414
402850	LSW	23.217	47.05802	0.515745	329.9199	3656.133	173.674	85.78287	259.4586	168.246	69.55537	135.6869	0.126574	5.91449	0.755602	7.300815
402860	LSW	24.128	48.49516	0.511428	239.5767	1857.793	149.5731	33.38023	180.9949	26.29283	15.32968	62.21429	0.091423	1.559932	0.335765	2.152988
402870	LSW	8.824	20.5173	0.591646	145.0461	1617.822	76.31658	37.87935	114.1959	74.58718	30.79441	59.85942	0.055787	2.621988	0.334722	3.235644
402880	LSW	8.656	19.25423	0.566	136.1169	1518.227	71.61843	35.54745	107.1659	69.9955	28.89867	56.1744	0.052353	2.460575	0.314116	3.036454
402900	LSW	8.722	19.40104	0.566	137.1548	1529.803	72.16451	35.8185	107.983	70.5292	29.11901	56.60272	0.052752	2.479336	0.316511	3.059606
402920	LSW	12.852	29.26657	0.57944	195.841	2184.381	103.0425	51.14464	154.1872	100.7075	41.57856	80.82209	0.075323	3.540203	0.451941	4.368761
402930	LSW	22.411	51.45386	0.584204	337.6347	3765.926	177.6478	88.17461	265.8224	173.6222	71.68245	139.3393	0.12986	6.103397	0.779157	7.531851
402940	LSW	8.525	18.37743	0.548527	129.488	1426.753	68.18141	33.54478	101.7262	65.51943	27.11195	53.06415	0.049544	2.302801	0.294464	2.844426
402950	LSW	5.308	9.446392	0.452838	64.78503	658.2339	34.27582	15.92083	50.19691	29.4022	12.36556	25.36718	0.023973	1.032125	0.13354	1.283263
403000	LSW	13.1	21.82286	0.423885	146.3171	1380.123	84.57694	28.13172	112.7508	41.05457	18.58694	47.05162	0.055535	1.682651	0.265301	2.16067
403060	LSW	28.377	63.72374	0.571403	1019.68	8458.98	275.151	71.0038	346.3462	103.2475	66.52848	145.0238	1.358922	7.712612	23.29947	14.12134
403070	LSW	5.431	12.46061	0.583804	594.4008	5193.468	84.75553	30.03472	115.2339	7.172206	9.319729	16.7797	0.955514	2.659805	17.50035	8.086815
403100	LSW	11.733	25.65446	0.556367	161.876	1717.583	81.92704	34.24016	115.9983	69.07923	31.16769	64.93948	0.099278	2.611569	1.256505	3.323983
403110	LSW	4.065	9.462112	0.592291	68.23545	626.7574	40.62827	11.74209	52.37036	13.64734	6.454538	19.30949	0.025728	0.630617	0.11514	0.854782
403120	LSW	30.424	67.73666	0.56652	539.5836	5685.902	255.4844	123.1636	378.8871	239.3327	100.6338	195.5589	0.30375	8.772791	2.940259	11.17688
403130	LSW	24.747	55.04673	0.566	389.1503	4340.523	204.7529	101.6281	306.381	200.1131	82.61961	160.5993	0.149673	7.03464	0.898039	8.681045
403140	LSW	26.618	59.57827	0.569534	461.3057	3919.259	229.2497	65.73987	287.272	102.0985	48.58612	124.0641	0.34189	4.739787	3.960259	6.556202
403170	LSW	16.36	37.40373	0.581754	226.7245	2260.008	127.1723	50.48688	178.0886	104.7143	47.18498	96.81025	0.093719	3.936222	0.496094	4.477313
403180	LSW	6.511	13.13887	0.513473	584.6505	4962.148	83.013	30.22525	113.7608	10.38583	11.10377	21.55453	0.950369	2.701357	16.43546	7.760858
403190	LSW	11.77	26.41491	0.571058	433.8444	4640.663	116.7514	53.95854	170.7541	81.95571	36.73629	69.29463	0.522155	4.022297	10.92712	8.040029
403200	LSW	14.892	36.12278	0.617214	1612.853	11259.87	215.9788	70.29156	285.527	11.50686	23.08865	39.94222	2.673139	7.098346	37.77962	17.78114
403220	LSW	15.038	34.06908	0.576471	205.1439	1629.927	131.4649	27.12249	156.1462	21.02753	12.62816	53.16283	0.081703	1.372284	0.301533	1.859439
403230	LSW	6.87	14.28658	0.52915	135.7212	1247.264	65.32513	15.92357	81.16581	10.43159	6.260904	24.62762	0.099651	0.805859	1.652319	1.577051
403250	LSW	19.16	42.34561	0.562368	316.9177	2546.159	178.4621	36.39181	210.9981	27.47413	17.22805	70.5743	0.206135	2.024284	2.368601	3.168526
403260	LSW	10.024	21.90181	0.555964	108.6117	468.6163	84.46721	6.143227	81.83607	9.975491	8.411105	37.62015	0.061911	0.826444	0.192088	0.69854
403270	LSW	29.23	65.99169	0.574471	4180.485	37020.84	512.3386	190.6478	705.9765	20.79631	52.90113	73.12322	6.953835	17.95928	130.8002	58.12316
403300	LSW	24.214	35.14155	0.369285	263.6739	1800.525	157.4488	37.18672	194.5069	20.17812	13.55754	63.85116	0.090069	1.223145	0.295302	1.871288
403370	LSW	4.974	11.70836	0.59896	41.54443	89.1878	36.28099	0.502083	31.63511	3.619666	3.666372	16.86583	0.025947	0.34056	0.051895	0.198498
403400	LSW	80.845	107.4672	0.338244	890.1974	4613.095	574.2268	81.8963	655.669	65.96437	46.50009	739.5654	0.309933	4.606768	1.918658	18.20252
403410	LSW	8.118	19.17682	0.601084	1211.17	8233.547	144.8052	52.36116	198.9525	5.818299	15.40689	26.20237	2.010842	5.211406	27.16529	13.03714
403425	LSW	10.928	22.90655	0.533367	161.5399	1353.824	99.61472	23.20733	122.6638	16.46189	9.432476	39.52576	0.06036	1.033551	0.236343	1.502183
403435	LSW	7.621	17.65337	0.589418	76.81457	437.79	55.24551	6.905644	58.2387	7.182843	5.367831	23.81591	0.03631	0.534978	0.103223	0.557152
403445	LSW	37.175	77.16131	0.528149	495.6596	3766.497	318.3366	64.20972	375.6377	48.74187	30.23368	129.632	0.197098	3.196655	0.700528	4.285999
403450	LSW	1.914	4.129589	0.549	21.54754	103.7341	16.52537	1.446797	16.40795	2.032895	1.639083	7.298484	0.011228	0.162004	0.029145	0.145593
403460	LSW	24.789	25.0461	0.257092	237.4547	921.3409	141.924	27.45324	169.3773	9.779372	10.12581	121.7122	0.068101	0.586218	0.169285	2.39927
403462	LSW	14.986	37.13576	0.630542	255.2775	2128.502	112.8071	14.63363	127.3921	15.85749	10.21491	170.8307	0.250086	1.619542	5.041035	6.432422
403465	LSW	24.526	45.36673	0.470672	332.2692	2265.986	233.1484	27.92834	261.0767	37.40675	21.22099	344.1982	0.117823	2.616192	0.6039	9.227854
403470	LSW	16.987	39.73564	0.595211	191.3605	1118.505	136.1364	13.63489	149.0935	19.6616	11.83126	221.194	0.065521	1.410612	0.326771	5.615895
403480	LSW	22.745	46.7025	0.52247	289.2408	1347.221	233.4651	14.04499	226.7377	29.51057	20.94373	414.667	0.119612	2.39706	0.489831	7.5936
403510	LSW	7.731	16.73243	0.55072	150.3245	1066.796	94.26746	9.352542	103.62	14.61807	8.476149	160.3191	0.085386	1.15514	1.241684	4.618472
403520	LSW	7.371	18.7432	0.64703	192.9744	1788.949	81.46843	19.06147	99.52495	12.02506	7.864222	30.06531	0.178286	1.09648	3.384896	2.410929
403530	LSW	7.566	17.19798	0.578387	70.07007	208.9489	58.85864	2.054812	53.35671	6.263378	5.916506	26.97084	0.041494	0.559501	0.089798	0.378208

Appendix 10-1. Net Pollutant Loads at the Subbasin Level for Lower Sweetwater Creek Watershed

Subbasin ID	Basin ID	Area (acres)	Volume (acre-feet)	Runoff coefficient	BOD5	TSS	TKN	NO3 +NO2	TN	TP	TDP	Oil and Grease	Cd	Cu	Pb	Zn
403540	LSW	14.209	31.74164	0.568425	154.5368	763.6337	117.7341	10.78216	117.6762	14.63292	11.66553	51.84822	0.079766	1.156875	0.209791	1.058766
403550	LSW	18.608	36.16189	0.494492	744.8078	7372.891	184.5013	48.65178	232.9909	18.88765	17.10878	101.2464	1.003804	3.466119	22.83352	12.18784
403560	LSW	10.785	29.22931	0.689614	332.7227	2711.095	162.1144	19.33786	181.4522	23.81311	14.69687	257.6282	0.290729	2.242576	5.687504	8.959254
403570	LSW	18.677	47.23381	0.643507	501.655	3866.119	273.8408	30.02213	303.8629	41.29928	24.72696	449.8481	0.373997	3.579376	6.716386	14.30494
403580	LSW	6.717	15.12219	0.572858	165.4142	1543.618	65.48482	15.12427	79.50997	9.294397	6.341455	23.84954	0.166018	0.920722	3.279934	2.131528
403590	LSW	53.738	69.38359	0.328536	1104.258	8976.06	389.3202	74.20798	454.6318	33.51287	32.60255	398.7288	1.216446	4.900695	26.05138	18.6431
403600	LSW	50.943	109.2102	0.545489	844.6344	5185.052	594.6167	56.42506	645.688	88.34866	52.51323	1000.239	0.332547	6.526478	2.600546	25.6531
403610	LSW	13.804	33.37729	0.615253	1842.959	10368.21	237.7667	78.52337	319.6167	12.30653	25.309	79.2415	3.011744	8.057386	31.40973	17.0775
403650	LSW	200.589	451.7867	0.573104	3670.254	24311.18	2398.554	242.0853	2630.048	358.5048	212.8345	4000.179	1.823216	27.5777	22.51824	109.1988
403700	LSW	8.768	23.16578	0.672286	166.7086	968.1706	126.9225	9.754403	132.1374	18.91605	11.46703	228.5474	0.062411	1.432347	0.313372	5.261559
403710	LSW	7.059	5.301405	0.191098	54.71994	160.4273	30.12646	7.303423	37.42988	0.737606	1.877313	13.1385	0.014415	0.015791	0.014684	0.091873
403720	LSW	3.03	3.120868	0.262084	30.80823	89.99246	16.94453	4.118574	21.0631	0.405371	1.053966	7.296686	0.008107	0.008107	0.008107	0.048645
403730	LSW	8.221	5.363216	0.166	55.41424	161.8679	30.47783	7.408009	37.88584	0.729135	1.89575	13.12443	0.014583	0.014583	0.014583	0.087496
403750	LSW	23.739	31.89435	0.341868	270.1957	1299.093	175.0692	25.90639	200.9756	18.83679	13.8563	218.9334	0.083815	1.27835	0.317528	5.177158
403800	LSW	53.362	130.0743	0.62025	935.4886	7319.924	622.5787	117.971	738.733	217.5246	101.5134	918.1006	0.338789	10.441	1.880501	27.07517
403810	LSW	8.489	18.91454	0.566952	134.1388	1474.505	71.48398	34.14875	105.6327	67.18456	27.81643	59.24494	0.051429	2.381095	0.30779	3.042474
403820	LSW	22.586	53.96187	0.607932	382.3073	4237.538	201.6359	99.16492	300.8009	194.7426	80.49678	159.3007	0.146723	6.854771	0.87737	8.51169
403830	LSW	24.736	61.76109	0.635321	437.2889	4859.94	230.132	113.9285	344.0605	223.8015	92.46093	180.0917	0.16793	7.866943	1.004779	9.71081
403840	LSW	15.15	37.29173	0.626336	264.5086	2927.439	139.2384	68.72366	207.9621	134.6278	55.66292	108.6726	0.101397	4.732061	0.60473	5.843046
403850	LSW	21.355	40.55913	0.483277	297.6932	3034.631	157.4602	73.31875	230.779	135.6888	57.0201	116.7512	0.157334	5.076676	0.655221	5.905588
403860	LSW	59.045	132.4187	0.570655	936.726	10388.27	494.9668	241.9227	736.8894	472.1438	195.2967	382.6377	0.360049	16.66462	2.142824	20.59895
403900	LSW	23.629	57.18062	0.615759	391.3084	3932.61	221.1675	82.7015	303.869	133.2084	57.60375	136.0226	0.148797	5.165071	0.769759	6.671884
404000	LSW	115.657	262.4834	0.577481	1959.754	21002.87	982.584	460.7928	1442.92	876.5905	366.1329	726.6013	1.019939	31.89829	9.960676	40.79178
404010	LSW	48.254	107.6591	0.567708	917.7887	8021.399	411.0489	172.6855	582.5416	352.825	154.544	300.8646	0.906795	13.85675	9.166607	16.94634
404100	LSW	16.633	38.43963	0.588052	235.769	2471.431	128.2162	57.01053	185.6037	119.3358	51.92745	102.3198	0.095467	4.338	0.536296	5.041531
404200	LSW	60.122	134.9602	0.571189	821.509	7703.068	473.4665	172.5235	645.8741	395.228	185.1297	376.9398	0.358892	15.1412	1.805569	16.14546
404300	LSW	9.603	21.3849	0.566641	142.6379	1249.995	86.98033	22.4468	109.1729	23.55766	11.96501	39.27238	0.054716	1.196013	0.229979	1.606808
404310	LSW	8.756	20.53876	0.596865	144.988	1388.152	84.06784	27.99071	112.1263	42.27049	19.15214	47.55372	0.055845	1.736079	0.270036	2.200419
404320	LSW	8.392	14.02381	0.425214	111.4188	821.9319	64.12387	18.63486	82.75873	18.58628	9.490608	31.08794	0.038091	0.795334	0.143762	1.100978
404330	LSW	5.583	6.849754	0.312187	199.8909	1969.64	41.28423	13.27983	54.56406	4.123476	4.222626	12.21158	0.282777	0.841229	6.543842	3.001549
404340	LSW	21.353	50.79528	0.605302	516.8971	5222.472	220.4896	75.93406	296.4236	99.41525	45.8577	112.7557	0.416857	4.756948	7.503517	8.174767
404350	LSW	42.442	65.32071	0.391618	853.967	9310.345	254.5617	114.9861	369.551	178.1027	79.0776	153.4391	0.957653	8.359247	20.41758	16.12851
404360	LSW	73.332	164.9204	0.572253	1866.171	20375.86	674.7902	310.0972	984.6847	526.7742	227.0113	446.0296	1.722732	21.98496	33.79795	36.48234
404400	LSW	15.179	36.30218	0.608551	820.7726	5460.635	187.743	54.11325	242.9791	23.2555	19.31417	56.4379	1.12716	3.976274	12.64202	7.874745
404410	LSW	2.14	4.90732	0.583496	178.9409	1798.25	30.7881	10.10786	40.93488	2.634822	3.05525	6.996905	0.27537	0.807714	6.017418	2.755288
404415	LSW	5.274	2.254177	0.108757	4.518701	13.19936	2.485285	0.604079	3.089364	0.059457	0.154587	1.070219	0.001189	0.001189	0.001189	0.007135
404420	LSW	11.085	23.73211	0.544764	726.5298	5978.781	137.2105	43.56374	181.168	17.08751	15.26091	37.36029	1.077776	3.43311	17.92624	9.085117
404430	LSW	30.661	75.38642	0.625625	1170.623	11256.71	341.5252	135.263	477.2327	178.9844	83.71724	176.4832	1.360165	9.65217	24.1362	18.58941
404450	LSW	26.076	62.64147	0.611263	535.026	5484.599	244.5331	111.0026	355.7082	200.0399	84.76279	171.0431	0.336416	7.631925	3.846705	10.1947
404460	LSW	14.768	36.00864	0.62043	332.1851	2684.89	142.796	43.01441	181.3088	81.09578	39.63882	88.16666	0.337077	3.787607	4.514806	5.062707
404470	LSW	17.669	43.10943	0.620823	199.742	1223.057	132.4192	23.31434	156.9492	88.22442	52.50647	112.0443	0.106989	3.984167	0.406853	3.035265
404498	LSW	6.326	14.54167	0.584915	274.307	1913.779	73.96889	20.21961	94.45509	9.600872	7.336979	23.7189	0.348655	1.368474	3.983307	2.677802
404500	LSW	42.762	98.98812	0.589023	556.134	4220.804	356.9636	79.76608	430.4928	159.7215	86.77589	219.2311	0.25292	7.32694	0.998629	7.359129

Appendix 10-1. Net Pollutant Loads at the Subbasin Level for Lower Sweetwater Creek Watershed

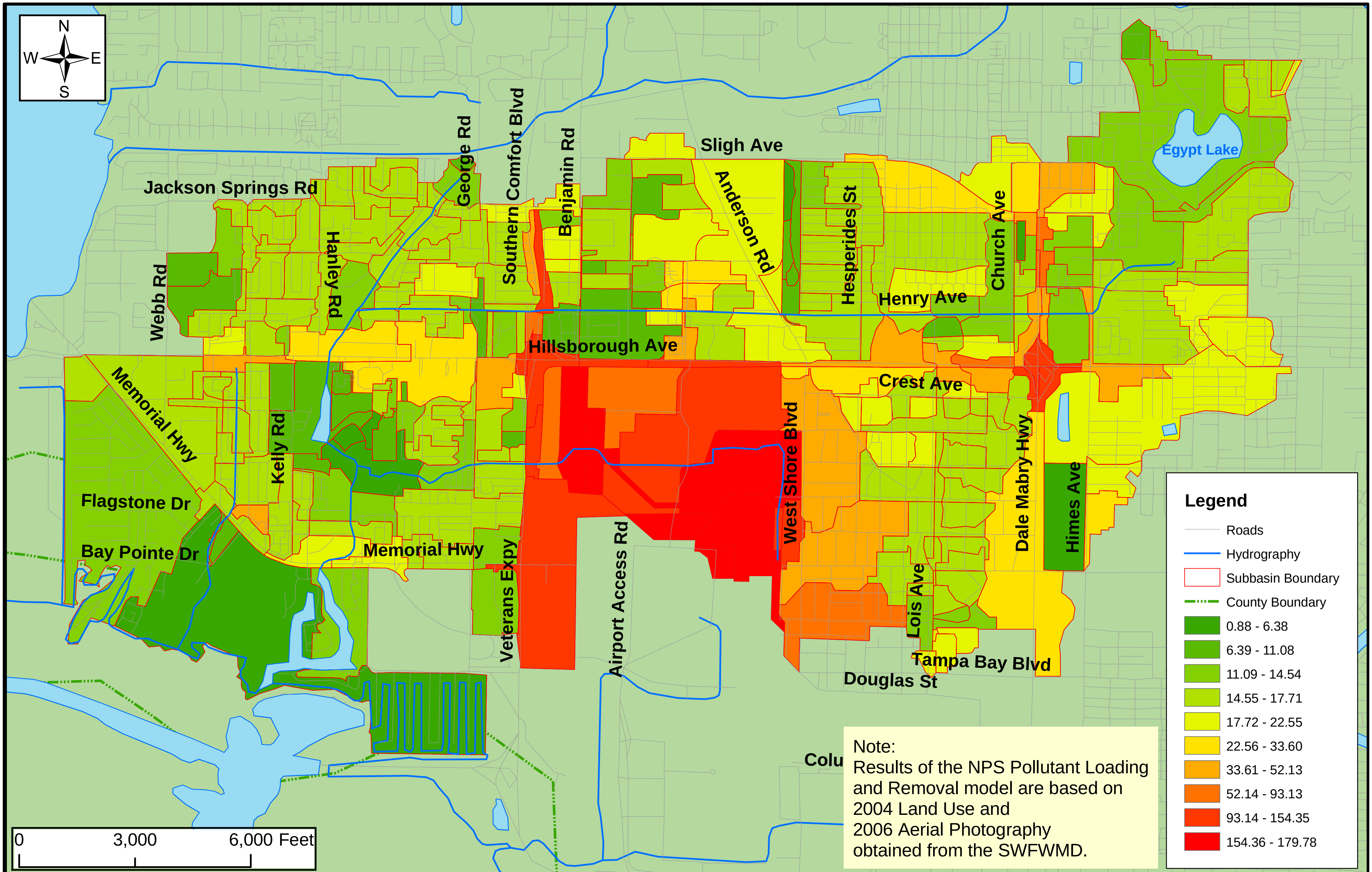
Subbasin ID	Basin ID	Area (acres)	Volume (acre-feet)	Runoff coefficient	BOD5	TSS	TKN	NO3 +NO2	TN	TP	TDP	Oil and Grease	Cd	Cu	Pb	Zn
404600	LSW	33.635	82.74294	0.625961	1326.204	8625.105	399.0333	109.2815	509.4751	73.71469	47.87904	146.1267	1.570652	7.415392	14.31657	12.08908
404620	LSW	1.896	4.122888	0.553313	24.72541	176.2989	16.52639	3.103423	18.98895	4.874315	2.784846	8.517214	0.01121	0.252	0.039969	0.267372
404630	LSW	11.997	26.85545	0.569596	169.771	1449.073	102.5233	28.77406	131.9385	57.17268	29.26463	67.76106	0.073021	2.447754	0.32526	2.57247
404650	LSW	14.227	36.9215	0.660349	170.265	1156.757	109.0403	23.22157	134.0509	79.94994	45.56876	94.68219	0.088241	3.478908	0.358788	2.808416
404698	LSW	101.547	226.7146	0.568094	1576.291	15903.27	866.1877	340.0971	1206.435	603.013	263.0937	573.4938	0.662373	22.9502	4.558453	28.58048
404710	LSW	28.998	71.75214	0.629614	505.1517	5608.074	266.477	131.1694	397.7098	259.495	107.5815	209.3375	0.195096	9.145802	1.164525	11.23369
404720	LSW	80.859	153.512	0.483083	1032.073	10779.87	558.6256	249.3052	808.1324	456.4641	193.2376	403.3104	0.433483	16.67574	2.243637	20.33593
404800	LSW	84.991	204.5019	0.612254	1448.116	15912.14	770.3728	367.3257	1137.698	706.3701	293.0999	581.8184	0.556045	25.10072	3.266209	31.11212
404810	LSW	13.971	34.77568	0.633367	245.8451	2742.118	129.3523	64.20338	193.5557	126.4211	52.1948	101.4584	0.094556	4.444122	0.567335	5.484236
404820	LSW	13.293	33.23974	0.636271	234.1828	2595.407	123.7042	60.58514	184.3154	119.3853	49.50852	96.61826	0.09038	4.213062	0.538093	5.180773
404830	LSW	48.39	117.2305	0.616443	723.0488	7226.121	402.4498	164.76	569.2211	362.6168	163.8575	325.579	0.303662	13.5032	1.628926	14.99662
404840	LSW	43.99	104.4582	0.604221	861.4688	8735.18	405.4088	161.3989	566.0756	303.3585	136.0455	283.2084	0.567601	11.99594	8.460525	16.21511
404900	LSW	19.392	37.76093	0.495482	245.0723	2442.658	140.1849	57.08042	197.6486	99.18992	45.01124	103.589	0.122787	3.807518	0.556491	4.3196
404940	LSW	286.873	713.2968	0.632686	3332.347	35078.06	1785.035	797.2488	2582.977	1511.662	648.5135	1346.541	1.389264	53.66873	7.631345	66.45459
404950	LSW	16.157	39.81238	0.626996	251.5203	2663.413	136.0599	61.62174	198.0238	127.8846	55.20169	108.4709	0.101091	4.623428	0.573902	5.421497
404960	LSW	26.75	65.3682	0.621799	399.5458	3962.184	223.5257	89.55061	314.1737	194.5799	88.2773	177.3009	0.167479	7.293851	0.888827	8.112391
404970	LSW	3.897	9.915217	0.64741	71.55997	651.7088	42.80422	12.06148	54.8657	13.42077	6.435045	19.88228	0.02696	0.636276	0.11899	0.86868
404980	LSW	7.684	18.34142	0.607369	130.3362	1386.523	70.942	30.99607	101.9381	56.2923	23.65149	49.35929	0.049871	2.054365	0.279593	2.573496
404985	LSW	16.867	44.97753	0.678524	235.4376	2346.215	131.21	53.47707	185.3613	118.1953	53.53258	106.3615	0.099128	4.406915	0.530439	4.878803
404990	LSW	14.884	21.35055	0.365003	113.6331	915.1698	65.38556	16.36806	80.67875	32.90772	20.87033	60.17292	0.091306	1.068455	0.373059	1.286674
405000	LSW	45.01	97.96208	0.553804	721.5303	5921.306	429.8615	92.24418	515.9029	72.1353	42.99009	173.3031	0.368632	4.808307	3.214028	7.078824
405110	LSW	5.904	12.73829	0.549	90.41219	756.9413	56.51032	12.71062	68.84675	9.400256	5.408192	22.51319	0.034636	0.597873	0.134771	0.849545
405130	LSW	3.725	8.049776	0.549876	56.36097	464.22	35.53201	7.765805	42.91755	5.83924	3.406247	14.22688	0.021888	0.374646	0.083717	0.523919
405150	LSW	5.543	12.7056	0.583254	57.67559	277.834	44.22602	3.876151	43.9186	5.441848	4.386493	19.53126	0.030048	0.433588	0.078019	0.389832
405165	LSW	6.414	13.89627	0.551286	131.1891	1147.462	62.6548	13.18958	74.37334	9.309455	6.142467	24.19293	0.10818	0.786801	1.861715	1.52398
405180	LSW	10.328	24.36974	0.600402	148.8044	856.2876	82.28697	6.907436	81.00639	8.955413	8.226076	34.54142	0.16028	0.975098	2.212275	1.389649
405210	LSW	13.297	31.10769	0.59528	1956.436	18168.02	242.2006	89.99171	333.1957	10.06795	24.86653	34.46827	3.259848	8.42269	64.93467	28.54536
405220	LSW	32.064	35.71592	0.283434	2078.572	22604.47	258.9554	98.73216	357.6876	10.39286	25.98215	34.64286	3.464286	8.920537	83.14287	35.50893
405235	LSW	49.8	152.7158	0.780301	9963.9	108357.4	1241.336	473.2853	1714.621	49.8195	124.5488	166.065	16.6065	42.76174	398.556	170.2166
405270	LSW	23.267	73.15145	0.8	4773.607	51912.98	594.7119	226.7463	821.4582	23.86804	59.67009	79.56012	7.956012	20.48673	190.9443	81.54912
405280	LSW	10.035	31.55004	0.8	1926.065	19321.47	250.2945	82.81588	331.4437	9.464349	25.32062	34.31408	3.431408	8.479721	75.71479	31.20236
405285	LSW	75.817	127.6862	0.428534	6172.544	59772.99	815.7962	253.94	1062.192	30.11141	82.7916	112.8932	11.28932	27.45781	240.8913	97.74672
405292	LSW	22.912	68.73963	0.763399	3552.228	27585.82	512.8411	109.7696	611.2792	16.63269	52.86618	74.24973	7.424973	16.69785	133.0615	49.11733
405294	LSW	26.305	82.70292	0.8	5396.903	58691.32	672.3641	256.3529	928.717	26.98451	67.46128	89.94838	8.994838	23.16171	215.8761	92.19709
405305	LSW	186.745	398.345	0.542772	25133.23	271211.3	3148.759	1185.371	4332.364	125.5783	315.8729	424.7183	42.11125	108.0372	1002.403	426.9329
405410	LSW	71.764	225.626	0.8	14723.56	160118.7	1834.311	699.3692	2533.68	73.61781	184.0445	245.3927	24.53927	63.18862	588.9425	251.5275
405420	LSW	10.386	32.65358	0.8	2130.858	23173.09	265.4694	101.2158	366.6852	10.65429	26.63573	35.51431	3.551431	9.144934	85.23434	36.40216
405460	LSW	2.935	9.22764	0.8	602.1634	6548.527	75.01953	28.60276	103.6223	3.010817	7.527043	10.03606	1.003606	2.584285	24.08654	10.28696
405480	LSW	4.423	13.90591	0.8	907.4511	9868.53	113.0533	43.10393	156.1572	4.537255	11.34314	15.12418	1.512418	3.894478	36.29804	15.50229
405490	LSW	91.586	221.9746	0.616711	5489.2	55036.06	1375.116	314.2353	1689.372	226.41	156.3877	1461.76	7.570938	30.06207	173.8715	111.5694
405500	LSW	90.998	286.0547	0.79988	18666.76	203001	2325.567	886.671	3212.238	93.33379	233.3345	311.1126	31.11126	80.1115	746.6703	318.8904
405535	LSW	124.438	291.546	0.596158	5998.267	54315.88	1802.832	308.2701	2109.617	242.133	176.3919	2289.621	7.727608	32.61878	166.0205	126.7066
405540	LSW	30.369	95.48014	0.8	6155.722	66026.19	772.7384	287.4999	1059.297	30.68489	77.64943	103.845	10.3845	26.53897	245.4791	104.1996

Appendix 10-1. Net Pollutant Loads at the Subbasin Level for Lower Sweetwater Creek Watershed

Subbasin ID	Basin ID	Area (acres)	Volume (acre-feet)	Runoff coefficient	BOD5	TSS	TKN	NO3 +NO2	TN	TP	TDP	Oil and Grease	Cd	Cu	Pb	Zn
405555	LSW	18.924	59.49706	0.8	3274.315	28166.56	455.2865	115.8033	563.455	15.61125	46.63132	64.70949	6.470949	15.03118	124.89	48.14294
405560	LSW	5.307	16.68521	0.8	961.347	8895.119	129.6933	37.33852	165.4318	4.647396	13.21188	18.14697	1.814697	4.33093	37.17917	14.78979
405580	LSW	2.316	7.281504	0.8	475.1654	5167.424	59.19769	22.57036	81.76805	2.375827	5.939568	7.919424	0.791942	2.039252	19.00662	8.117409
405700	LSW	111.526	256.2208	0.584582	4761.138	43361.36	1546.42	262.5741	1808.843	216.3064	150.458	1984.566	5.704993	26.48829	124.039	102.697
406010	LSW	39.979	96.94489	0.617022	1794.361	10165.09	491.4476	126.8849	620.0403	63.9236	48.97516	200.145	2.266582	9.0609	16.22388	14.90778
406020	LSW	40.777	73.11535	0.456248	1136.048	8102.147	380.2995	74.16779	455.4214	50.56666	35.85492	375.5947	1.314389	6.226373	17.4091	17.80719
406030	LSW	5.75	14.35732	0.63535	110.3776	700.3773	80.28172	7.206854	87.48857	12.76633	7.190662	140.6816	0.038464	0.922679	0.211447	3.687584
406100	LSW	10.38	22.66429	0.555587	119.6849	641.8012	85.49168	9.434977	92.14594	24.90646	17.72143	50.34576	0.061625	1.445202	0.189943	1.101379
406120	LSW	6.937	16.08884	0.590147	114.1199	1153.264	64.17108	24.54218	88.73518	40.95034	17.73548	40.11374	0.043746	1.571852	0.228112	1.984543
406150	LSW	8.635	23.12736	0.681508	311.2445	1996.094	110.2842	28.43318	139.1022	16.98073	11.08702	39.46316	0.325211	1.694418	2.186407	2.561924
406170	LSW	6.952	19.14898	0.700879	304.9802	2075.877	94.26572	24.95127	119.5702	13.14019	9.287524	31.89725	0.355636	1.576681	3.48527	2.796133
406180	LSW	2.751	5.998669	0.554845	43.52458	373.7552	26.83078	6.312166	33.14295	4.550631	2.560749	10.60183	0.016311	0.285434	0.065242	0.415918
406200	LSW	16.25	42.0297	0.658128	299.8235	2778.593	177.3554	53.25829	230.6932	68.82998	32.22712	89.72909	0.11428	3.047474	0.522569	3.998305
406210	LSW	9.59	28.71867	0.761997	627.9719	4022.141	150.2305	42.35554	193.478	18.28305	15.07246	45.83875	0.84523	3.04833	8.601945	5.705124
406230	LSW	15.389	45.82793	0.757752	767.6118	5073.838	227.3762	60.70156	289.0379	31.11801	22.48008	75.89536	0.920089	3.924564	8.678869	6.87653
406310	LSW	7.784	17.99522	0.58825	130.568	1121.217	80.48881	18.93567	99.42448	13.65129	7.681911	31.80409	0.048929	0.856264	0.195717	1.247699
406320	LSW	28.475	64.18897	0.573593	482.7843	3600.467	324.5839	50.62249	375.2063	53.17827	29.93955	368.361	0.174531	3.604229	0.825032	10.41522
406330	LSW	8.115	19.0404	0.597028	148.2052	951.0878	107.2667	10.05668	117.3234	17.08855	9.624903	183.9818	0.051771	1.230307	0.281926	4.837691
406335	LSW	19.02	43.75663	0.585384	327.5051	2516.868	212.4976	36.75055	249.2584	34.96534	19.75145	208.2679	0.12815	2.359641	0.682707	6.144563
406340	LSW	12.954	35.24289	0.692269	275.021	1744.036	200.085	17.91949	218.0045	31.81428	17.91949	351.0112	0.095826	2.299828	0.527044	9.19931
406345	LSW	8.817	20.81587	0.600733	162.4385	1030.098	118.1783	10.58397	128.7622	18.79079	10.58397	207.3213	0.056599	1.358371	0.311293	5.433483
406360	LSW	4.424	9.559308	0.549818	69.35954	595.6057	42.75677	10.05889	52.81566	7.251756	4.080737	16.89477	0.025992	0.454859	0.103968	0.662795
406365	LSW	2.192	6.184445	0.717906	44.87251	385.3302	27.66171	6.50765	34.16936	4.691561	2.640054	10.93016	0.016816	0.294274	0.067263	0.428799
406370	LSW	9.466	21.51514	0.578343	182.7112	1338.332	98.15288	20.98223	118.2116	15.47894	9.446556	39.68629	0.154358	1.164537	1.408216	1.710735
406375	LSW	19.165	47.59617	0.631932	814.0064	7012.386	247.3464	57.30489	302.9699	31.55911	24.02638	103.4515	1.157141	4.314831	21.04101	11.16678
406380	LSW	5.954	17.51624	0.748582	127.0927	1091.373	78.34643	18.43165	96.77809	13.28794	7.477441	30.95756	0.047627	0.833473	0.190508	1.214489
406420	LSW	30.913	66.91842	0.550823	502.77	4078.326	301.5452	67.45405	366.3986	49.61889	28.83486	133.5711	0.258839	3.300797	1.65793	4.835565
406450	LSW	11.673	27.42345	0.597788	212.3753	1347.506	154.6037	14.07582	168.208	24.48081	13.8728	268.1291	0.074565	1.772017	0.404523	6.965587
406460	LSW	23.567	55.47837	0.599	432.9304	2745.412	314.9682	28.20836	343.1765	50.08115	28.20836	552.5519	0.150847	3.620324	0.829658	14.4813
406500	LSW	3.508	7.568756	0.549	54.91667	471.5816	33.85345	7.964306	41.81775	5.741709	3.230998	13.37674	0.02058	0.360143	0.082318	0.52478
406520	LSW	16.321	35.2137	0.549	255.5003	2194.037	157.5034	37.054	194.5574	26.71335	15.03224	62.2354	0.095747	1.675569	0.382987	2.441543
406600	LSW	17.844	42.72896	0.609309	306.9127	2605.424	190.3973	43.88873	233.7068	32.00723	18.19457	75.51761	0.116181	2.020394	0.458885	2.910504
406610	LSW	4.159	8.973334	0.549	65.10787	559.0957	40.13583	9.442289	49.57812	6.807231	3.830593	15.85914	0.024399	0.426977	0.097595	0.622166
406620	LSW	42.82	100.2615	0.595792	753.5498	4692.532	555.0921	50.23977	595.9841	85.95133	50.07814	950.0265	0.272613	6.304154	1.413869	23.53605
406645	LSW	12.259	26.44965	0.549	191.9109	1647.981	118.3037	27.83194	146.1356	20.06488	11.29099	46.74614	0.071917	1.25855	0.287669	1.833887
406660	LSW	17.43	38.5591	0.562907	279.7735	2402.477	172.4667	40.57424	213.041	29.25119	16.46035	68.14794	0.104843	1.834752	0.419372	2.673496
406675	LSW	11.283	24.34386	0.549	176.6319	1516.777	108.885	25.6161	134.5011	18.46742	10.39206	43.02445	0.066191	1.158351	0.264766	1.687882
406680	LSW	3.081	6.647473	0.549	48.23211	414.1798	29.73274	6.994877	36.72762	5.042818	2.837715	11.7485	0.018075	0.316306	0.072298	0.460903
406690	LSW	26.417	58.79077	0.566282	446.929	3127.602	310.6402	39.55561	350.1958	50.2468	28.29444	435.4889	0.159162	3.501636	0.801948	11.82775
406710	LSW	12.644	27.28032	0.549	197.938	1699.737	122.0191	28.70601	150.7251	20.69503	11.64559	48.21423	0.074176	1.298075	0.296703	1.891481
406800	LSW	3.925	8.468462	0.549	61.44468	527.639	37.87764	8.911032	46.78868	6.424233	3.61507	14.96685	0.023026	0.402954	0.092104	0.587161
406805	LSW	12.326	26.59421	0.549	192.9598	1656.988	118.9503	27.98405	146.9343	20.17455	11.3527	47.00163	0.07231	1.265428	0.289241	1.84391
406810	LSW	19.126	41.26568	0.549	299.4117	2571.114	184.5727	43.42227	227.995	31.30443	17.61575	72.93146	0.112202	1.963539	0.448809	2.861157

Appendix 10-1. Net Pollutant Loads at the Subbasin Level for Lower Sweetwater Creek Watershed

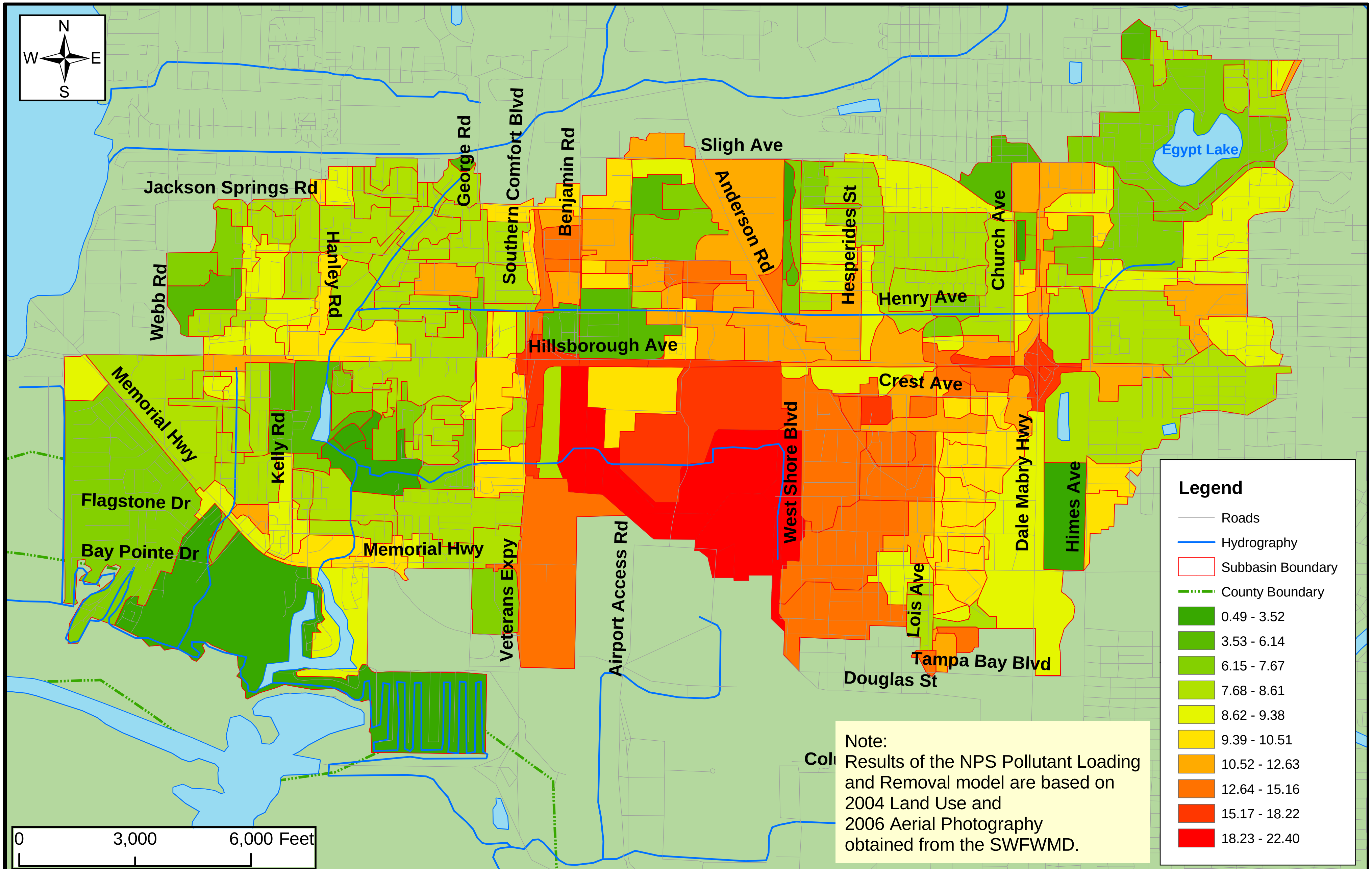
Subbasin ID	Basin ID	Area (acres)	Volume (acre-feet)	Runoff coefficient	BOD5	TSS	TKN	NO3 +NO2	TN	TP	TDP	Oil and Grease	Cd	Cu	Pb	Zn
406840	LSW	4.99	11.09759	0.565894	78.10935	865.7397	41.25722	20.2264	61.48472	39.94452	16.5673	32.30038	0.030175	1.40913	0.179699	1.731281
406850	LSW	0.594	1.281864	0.549114	9.29917	80.01548	5.726805	1.355919	7.082724	0.998026	0.556766	2.275753	0.003485	0.061708	0.01399	0.089664
406855	LSW	31.152	64.57557	0.52746	471.4712	4305.591	285.8961	83.12987	369.0448	142.2016	62.99217	293.9686	0.175582	5.915652	0.943892	10.60389
406870	LSW	19.542	43.04041	0.560422	256.5291	2207.33	156.5755	48.50169	200.8713	110.8703	52.79708	114.6617	0.117028	4.37013	0.534448	4.605558
406885	LSW	9.176	19.80287	0.549139	137.0939	1116.639	86.93394	18.69696	104.4229	14.61902	8.534307	35.19075	0.053844	0.928406	0.203943	1.276945
406900	LSW	5.547	11.96804	0.549	72.63318	486.5033	50.24713	7.701348	55.30846	7.222772	4.900079	21.15188	0.032541	0.511257	0.103552	0.592282
406910	LSW	10.103	29.76729	0.749715	286.7294	2570.6	135.855	30.60496	164.5266	20.61748	13.09825	51.65859	0.229299	1.699034	3.941009	3.352667
406915	LSW	11.627	25.35155	0.55481	146.2613	891.2754	104.6896	13.68826	111.3669	14.29808	10.26658	44.81515	0.069166	1.052455	0.205111	1.126757
406935	LSW	0.671	1.773971	0.672715	12.78727	108.9943	7.915146	1.8377	9.737208	1.33475	0.756046	3.135251	0.004823	0.084066	0.019136	0.121591
406940	LSW	11.7	35.42666	0.770463	1075.725	9146.906	211.0265	48.8797	255.5365	16.75022	21.15266	50.80616	1.938002	5.200857	36.65349	15.12574
406950	LSW	5.919	14.44909	0.621154	108.6369	741.8803	76.00505	9.227823	84.79716	13.17267	7.360382	108.633	0.040536	0.888814	0.226533	2.942284
407000	LSW	13.861	43.57723	0.799968	2164.199	17977.3	274.9968	96.50768	372.1147	12.08299	28.58053	42.8105	3.62951	9.398522	63.56626	28.38449
407100	LSW	17.418	46.95496	0.685947	2433.484	21055.53	334.372	118.1857	454.4102	17.98693	33.87672	59.95094	3.976235	10.73016	72.18668	32.74562
407200	LSW	191.296	353.8515	0.470677	5959.29	46392.89	1798.165	432.9381	2199.988	170.3612	162.4309	622.5204	8.553344	34.15411	124.6618	66.48727
407400	LSW	239.005	485.1536	0.516511	4368.787	35886.82	1774.138	624.6533	2390.933	1001.667	474.821	1067.601	4.224007	47.872	42.01243	62.3689
407600	LSW	68.065	60.50315	0.226184	373.646	907.5981	224.736	39.66722	255.4559	4.732369	14.21803	101.745	0.79135	4.257795	0.567884	0.349145
407700	LSW	22.278	46.28277	0.528628	760.8152	5675.958	232.3904	45.52825	272.0754	26.41683	22.794	74.92174	1.225304	4.133133	19.6886	9.089469
407800	LSW	23.07	52.19879	0.575732	484.888	4157.221	217.9227	63.18099	276.5335	99.90513	49.03428	119.0847	0.477284	4.92182	6.795344	7.156024



Subbasin Loads for BOD5 (lb/yr/acre) in the Lower Sweetwater Creek Watershed

Figure 10-A

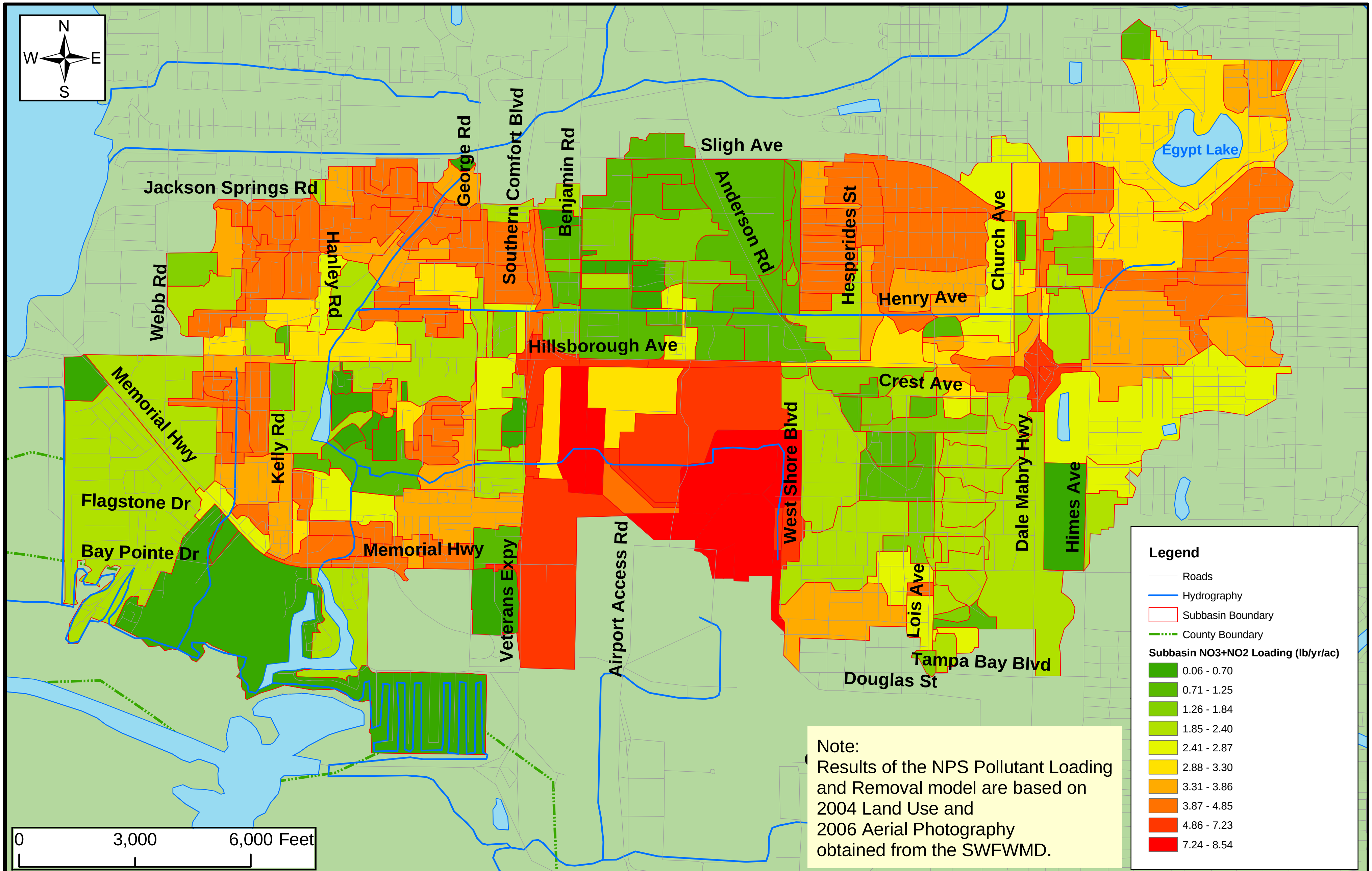
AYRES ASSOCIATES



Subbasin Loads for TKN (lb/yr/acre) in the Lower Sweetwater Creek Watershed

Figure 10-B

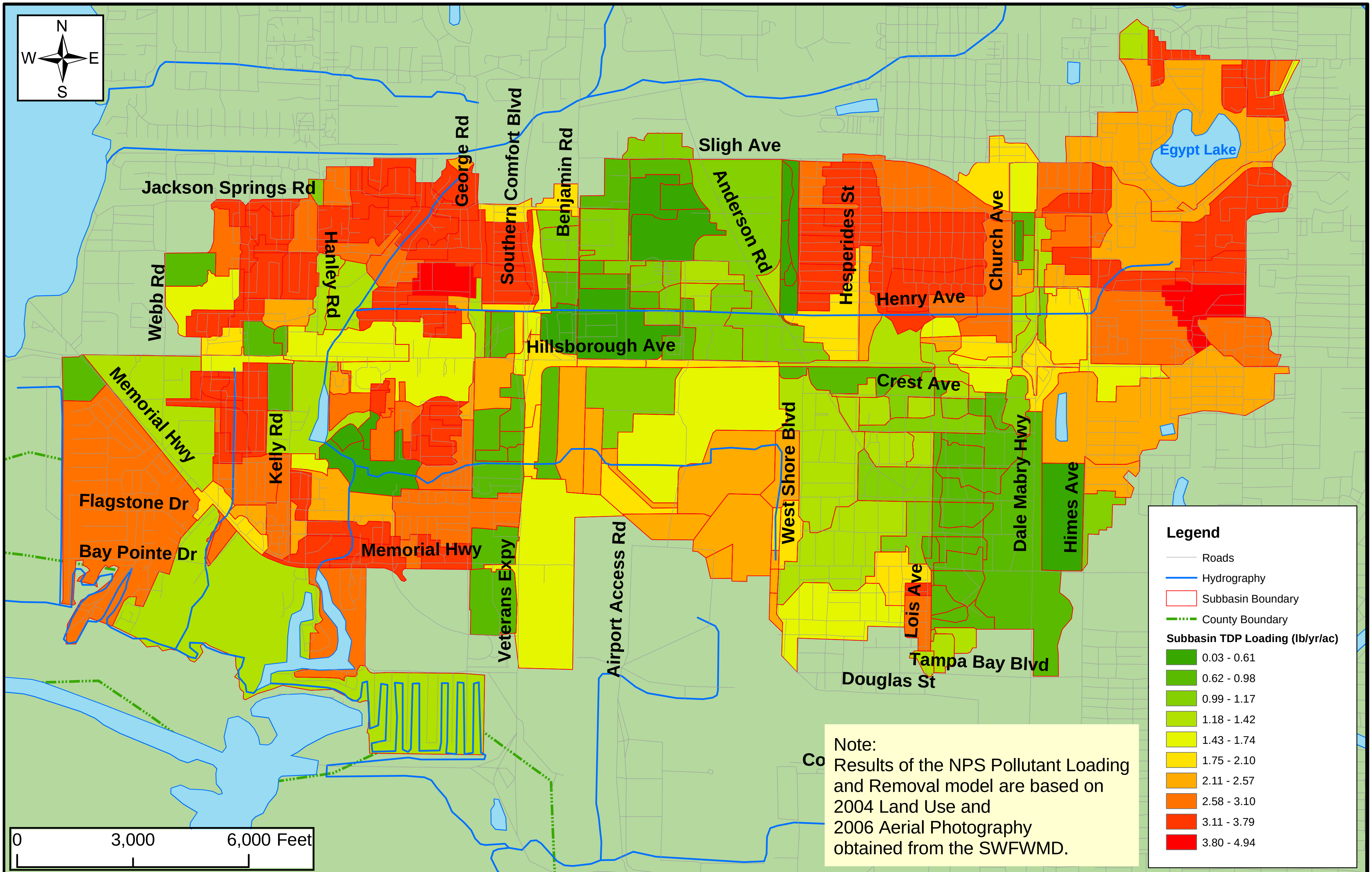
AYRES ASSOCIATES



Subbasin Loads for Nitrate+Nitrite (lb/yr/acre) in the Lower Sweetwater Creek Watershed

Figure 10-C

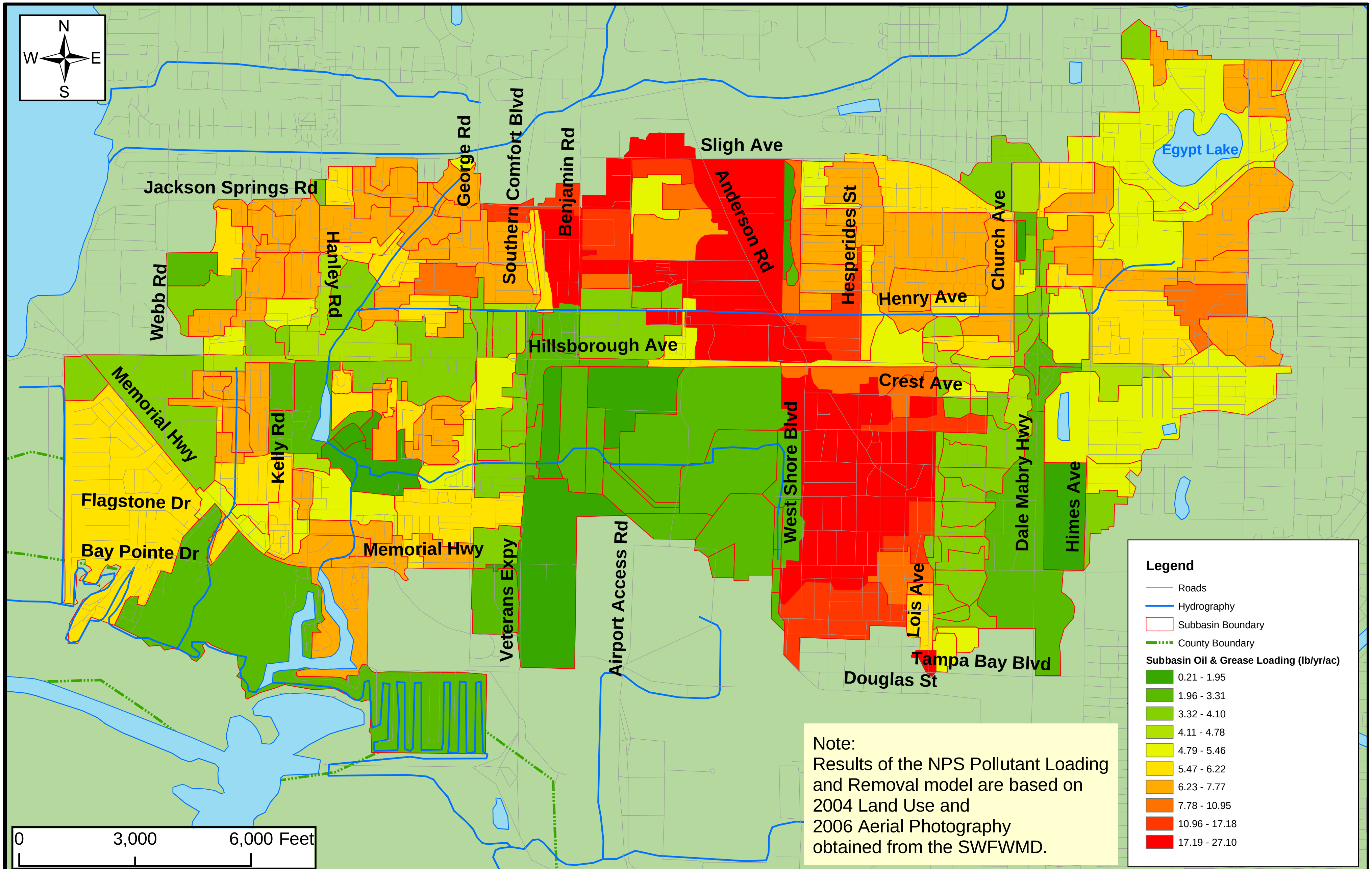
AYRES ASSOCIATES



Subbasin Loads for TDP (lb/yr/acre) in the Lower Sweetwater Creek Watershed

Figure 10-D

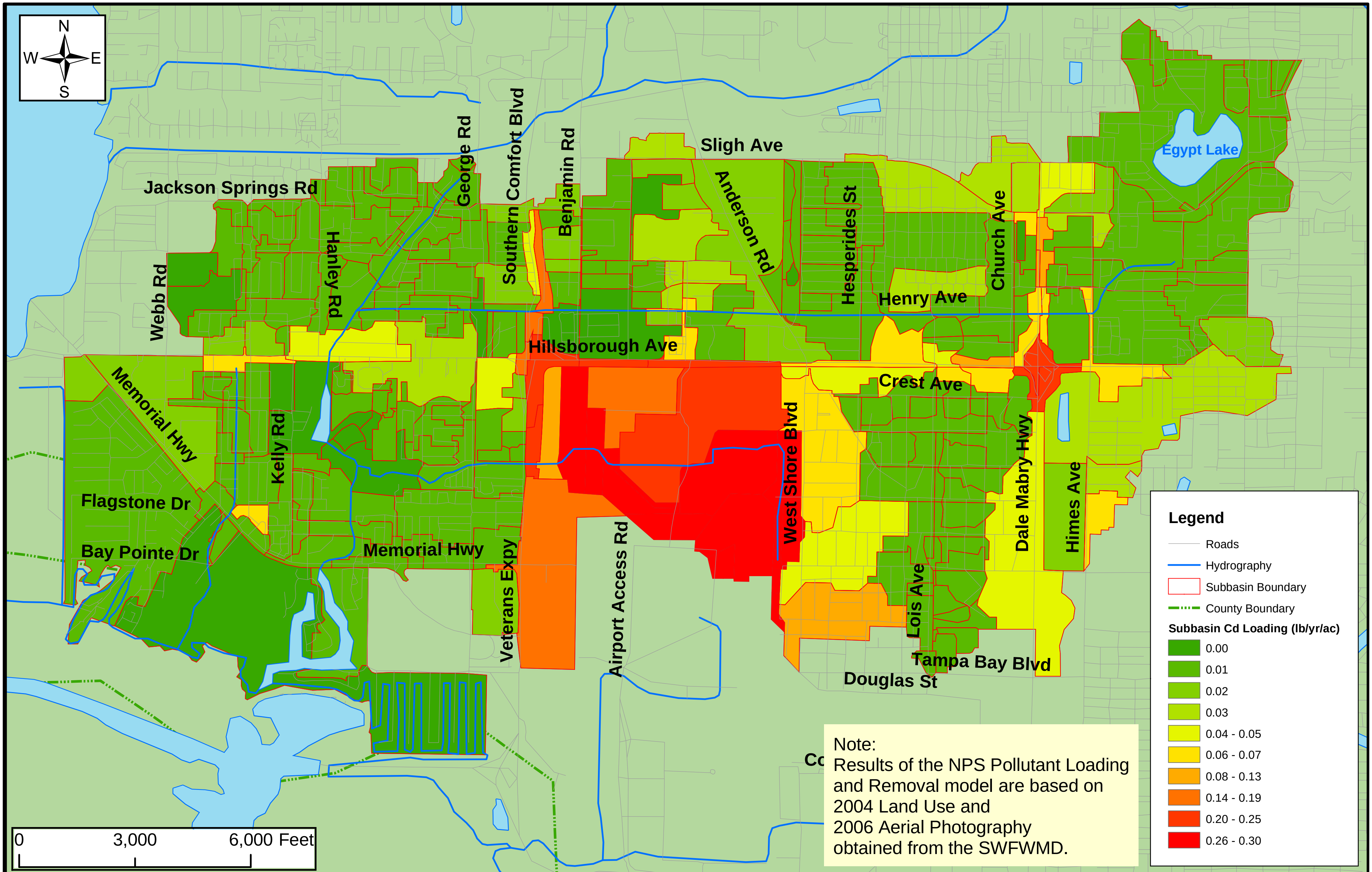
AYRES ASSOCIATES



Subbasin Loads for Oil & Grease (lb/yr/acre) in the Lower Sweetwater Creek Watershed

Figure 10-E

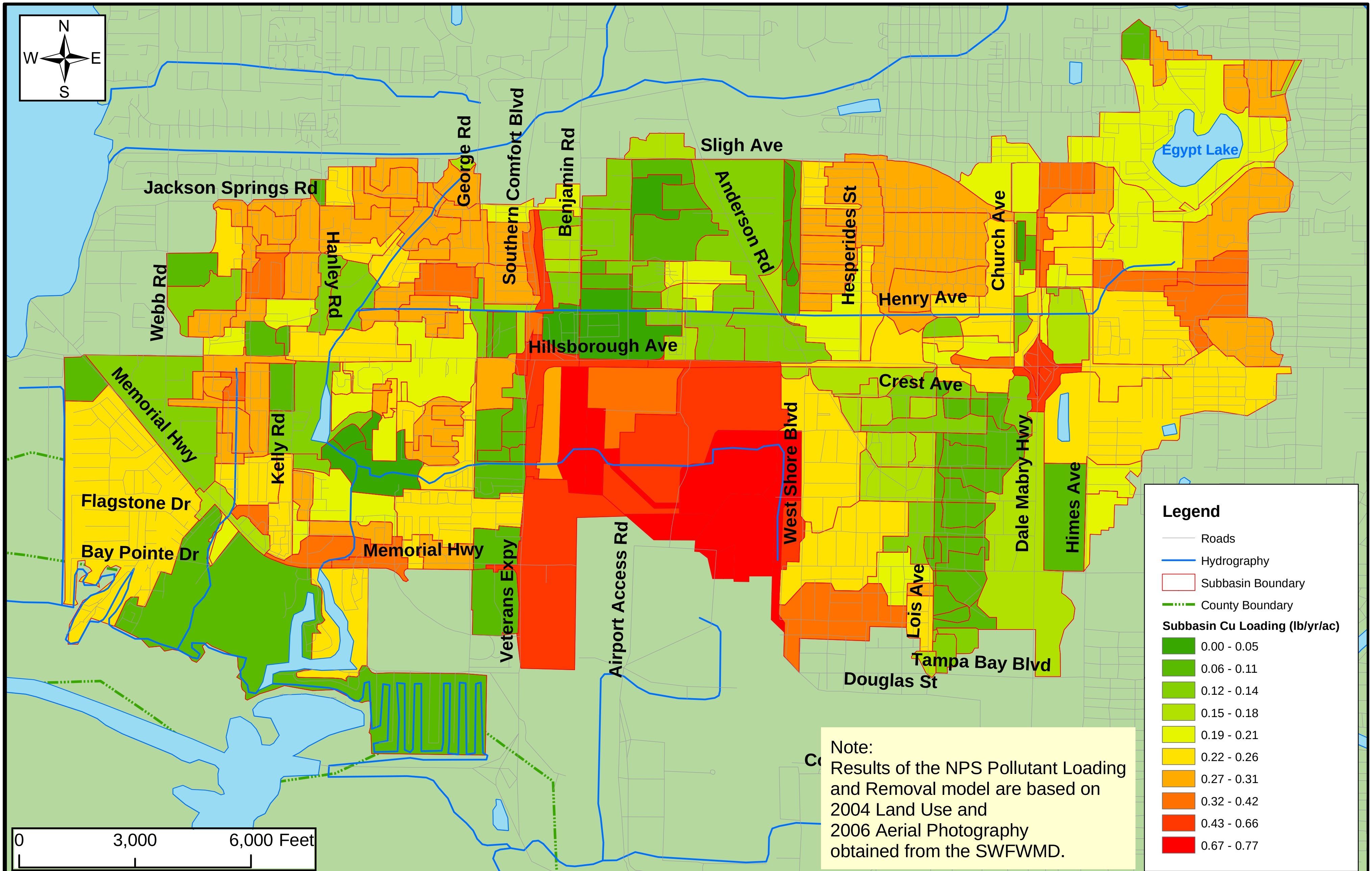
AYRES ASSOCIATES



Subbasin Loads for Cadmium (lb/yr/acre) in the Lower Sweetwater Creek Watershed

Figure 10-F

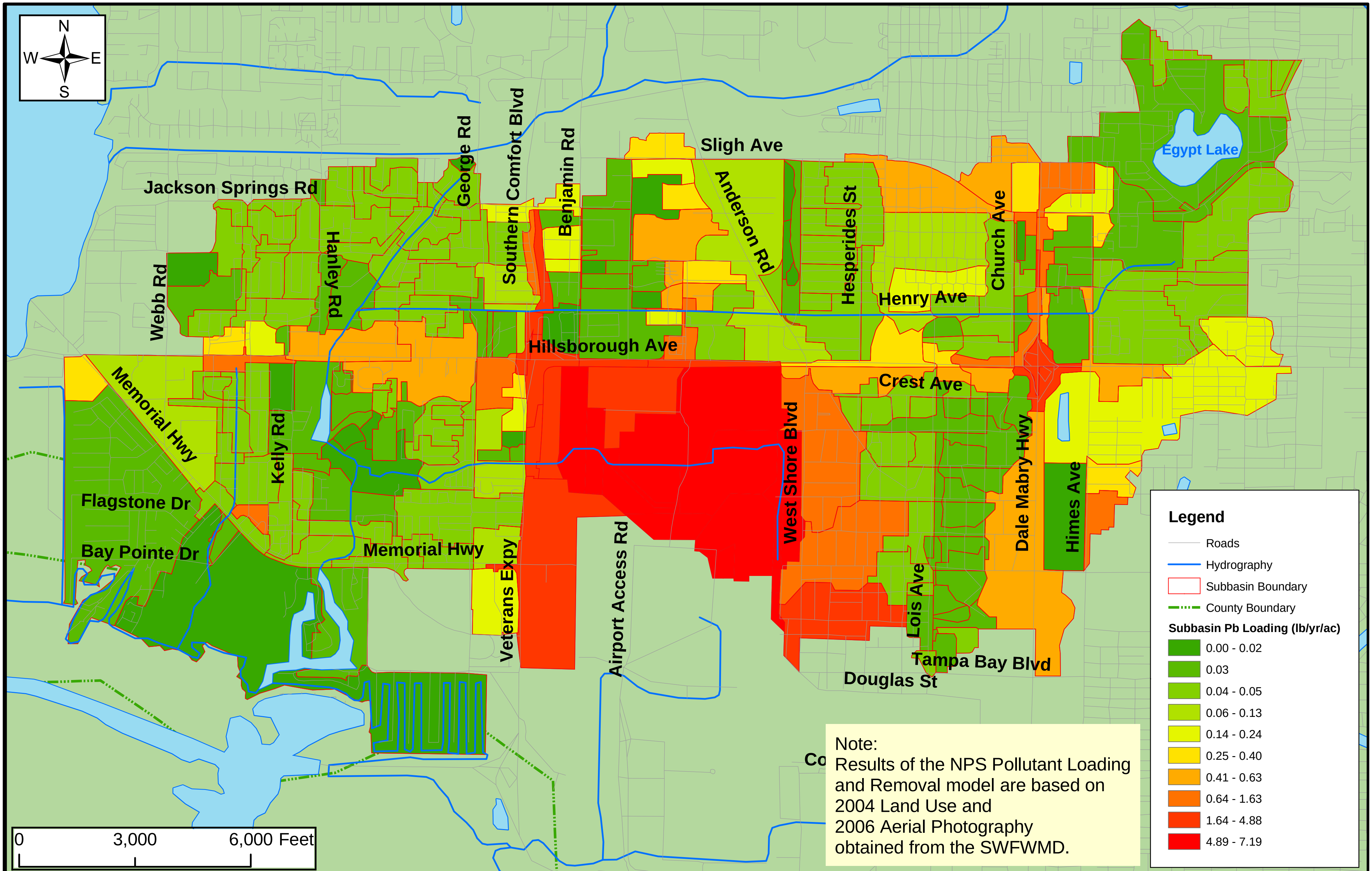
AYRES ASSOCIATES



Subbasin Loads for Copper (lb/yr/acre) in the Lower Sweetwater Creek Watershed

Figure 10-G

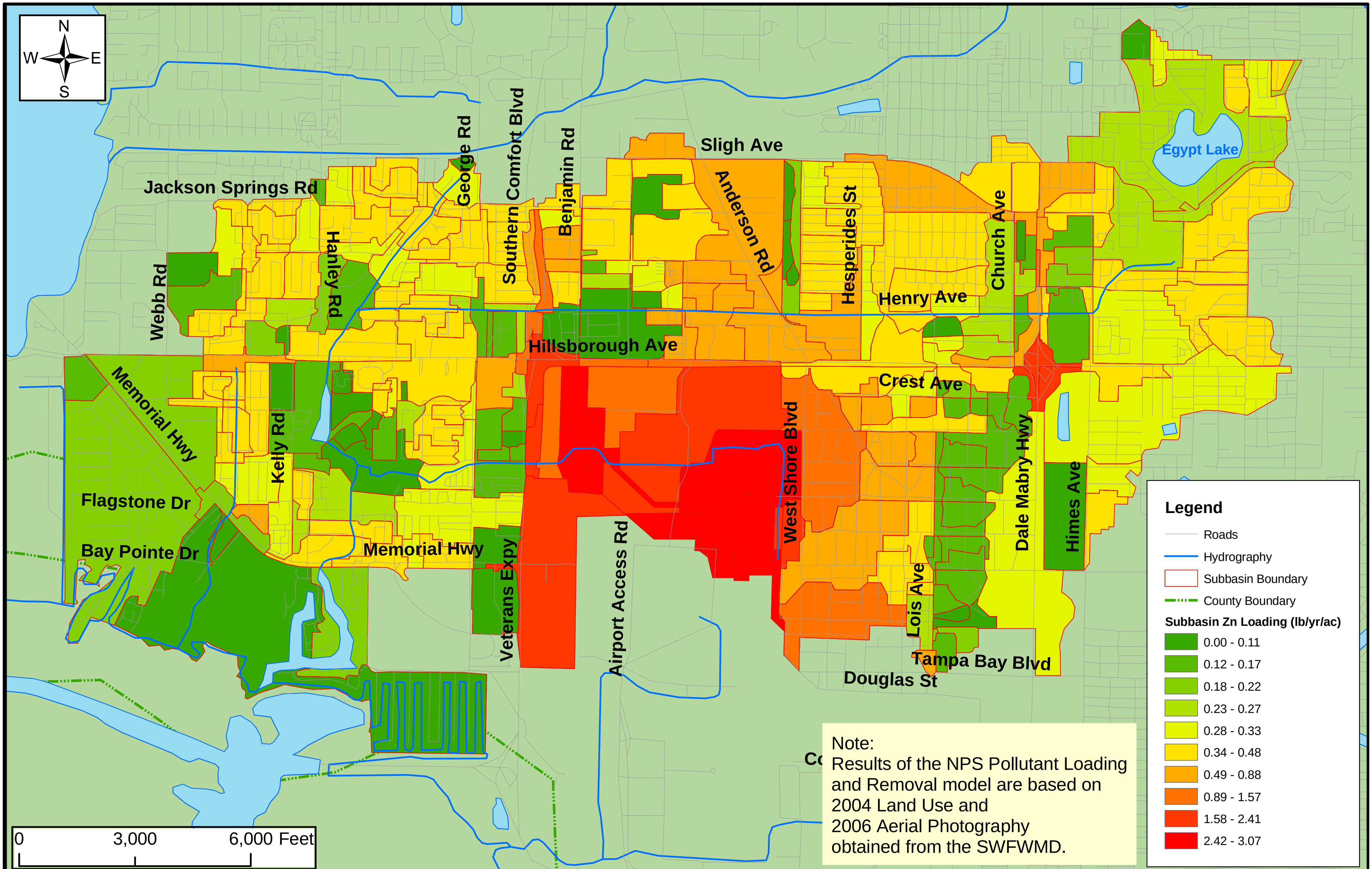
AYRES ASSOCIATES



Subbasin Loads for Lead (lb/yr/acre) in the Lower Sweetwater Creek Watershed

Figure 10-H

AYRES ASSOCIATES



Subbasin Loads for Zinc (lb/yr/acre) in the Lower Sweetwater Creek Watershed

Figure 10-I

AYRES ASSOCIATES

CHAPTER 11: WATER QUALITY TREATMENT LEVEL OF SERVICE

11.1 Overview

This chapter describes the results of the pollutant loading analysis performed in Chapter 10. Based on these results, a water quality treatment level of service was determined at the subbasin and watershed levels within the Lower Sweetwater Creek watershed. This type of analysis will facilitate prioritization of water quality improvement alternatives (projects) for the Lower Sweetwater Creek watershed.

Water quality treatment levels-of-service (LOS) criteria were used as part of this watershed study to allow comparisons of existing and proposed stormwater treatment conditions to pollutant loading goals and to help prioritize alternatives throughout the watershed.

Excess nitrogen can stimulate algal growth resulting in reduced light penetration through the water column and subsequent shading and loss of seagrass. The nitrogen reduction goal is based on loads generated by several potential inputs including point sources, atmospheric deposition, and non-point source runoff from various land uses. The intent of this management effort is to protect water quality and, ultimately, valuable natural resources in the Lower Sweetwater Creek watershed. Other factors that affect light availability in the bay are also of concern, including excess total suspended solids (TSS) loads.

11.2 Water Quality Treatment Level of Service

The identification of problem areas and pollutant load reduction goals is an important step in protecting the river, reservoir, lakes, and groundwater within the watershed, as well as the downstream estuary. For this analysis, three specific pollutants were identified and discussed in greater detail due to their importance in local water (quality) management programs. These parameters include total suspended solids (TSS), total phosphorus, and total nitrogen. In addition, based on specific concerns, some subbasins required assessment of other parameters, including heavy metals and bacteria. The results of this modeling effort and the implementation of alternatives proposed in later chapters of this report will be an important step in restoring and protecting the surface water within the Lower Sweetwater Creek watershed.

The modeling effort in this plan focuses on land use and soil conditions as a basis for evaluating sources of pollutant loads and does not include any routing of pollutants. For comparison purposes, pollutant loads based on stormwater runoff from single family (low to medium density) residential land use were selected as the standard (benchmark). In this manner, the calculation of pollutant loads is consistent with the concept of standard residential unit (SRU) sometimes used for stormwater utility assessments.

The procedure to identify a treatment LOS designation for each subbasin consisted of the following steps:

1. Net pollutant loads were calculated for each pollutant of interest based on 2004 land uses, soils, and existing stormwater treatment best management practices (BMPs) (completed in Chapter 10);

2. Benchmark pollutant loads were calculated for each pollutant based on the assumption that 100% of the watershed area was developed for low/medium residential land uses and there is no existing stormwater treatment;

3. Ratios of net load/gross load were calculated; and

4. Criteria described below were applied to each subbasin for each pollutant to determine the LOS for the subbasin.

Based on the following ranges, water quality LOS criteria were defined as a score from A through F:

- **LOS A**, net load equivalent to 20% or less of untreated single family residential. A LOS equal to A for a subbasin would indicate the presence of a high percentage of undisturbed natural systems, or high percentages of developed areas treated with BMPs capable of removing pollution levels to those representing natural systems. Areas where typical land uses (residential) exhibit stormwater treatment levels above the minimum required per 62-40.432(5) F.A.C. (Water Policy) would also receive LOS A.

- **LOS B**, net load equivalent to between 20 and 40% of untreated single family residential areas. A LOS equal to B would indicate the presence of BMPs with removal efficiencies consistent with those representing adequately designed and maintained conditions and a relatively even mix of developed and natural land uses.

- **LOS C**, net load equivalent to between 40 and 70% of untreated single family residential areas. A LOS equal to C would indicate the presence of treatment systems showing removal efficiencies consistent with those representing average to poorly maintained conditions and a greater percentage of developed versus natural land uses.

- **LOS D**, net load equivalent to between 70 and 100% of untreated single family residential areas. A LOS equal to D would indicate minimal treatment of subbasin discharges and relatively high percentage of developed land uses.

- **LOS F**, net load equal to or greater than 100% of untreated single family residential areas. A LOS equal to F would indicate no treatment for subbasin discharges, or the presence of extensive areas of land uses producing larger pollution loads per unit area than typical residential land uses.

11.2.1 Water Quality Level-of-Service Pollutant Load Calculations

Benchmark pollutant loads were calculated for each pollutant based on the assumption that 100% of the watershed area was developed for low/medium residential land uses and no existing stormwater treatment existed in any of the subbasins. Appendix 11-1 provides a summary of the benchmark loads by subbasin for Lower Sweetwater Creek watershed.

11.2.2 Water Quality Level-of-Service Scores

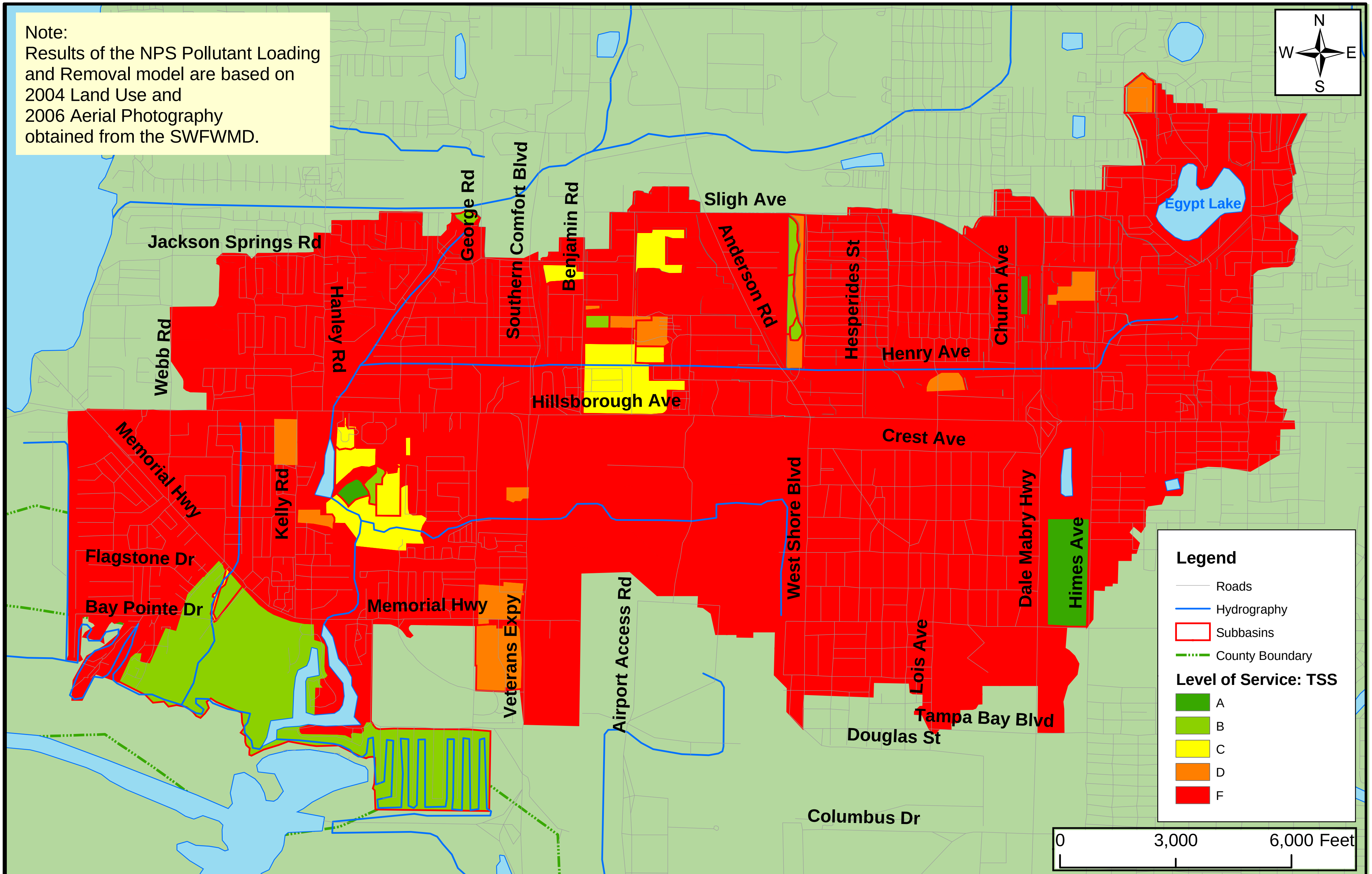
Based on the criteria described above, the treatment level of service designation were developed for each parameter for each subbasin, which are summarized in the Appendix 11-2.

As mentioned earlier, the three most important parameters of concern in this watershed are total suspended solids, total nitrogen, and total phosphorus. The observations on these three parameters are discussed in detail in the following section.

Total Suspended Solids

Total suspended solids (TSS) LOS values tend to be the highest in areas dominated by existing natural systems, such as wetlands, upland forests, and rangeland (Figure 11-1). These land uses do not contribute any loads based on the model's EMC value input dataset. However, Lower Sweetwater Creek watershed is characterized by densely developed areas. The majority of the watershed area includes such land uses as high density residential, commercial and services, industrial, and transportation. On an areal basis, there are a small number of randomly distributed subbasins with LOS scores higher than F. These subbasins generally include small areas of undeveloped land, such as wetlands, small forested areas, or ponds. A relatively large subbasin to the east of the watershed contains Al Lopez Park, located along the North Himes Avenue, and therefore scored the highest on the LOS scale. Overall, the proportion of subbasins with high TSS LOS scores in the Lower Sweetwater Creek watershed is insignificant when compared to the proportion of similar subbasins within other watersheds in the Old Tampa Bay region. The Lower Sweetwater Creek watershed is more polluted than other watersheds in the northwest Hillsborough County region.

The remaining subwatersheds were dominated by the score of F and were primarily characterized by high density residential, transportation and utilities, commercial and services, and industrial land uses. Developed land uses are characterized by relatively large impervious surface area (such as roads, buildings, parking lots, etc.), which have relatively high runoff coefficients and TSS loads. As was indicated in Chapter 10, EMC values for highway/utility land use category are the highest out of all other land uses.



Water Quality Treatment Level of Service by Subbasin for Lower Sweetwater Creek Watershed: TSS

Figure 11-1

AYRES ASSOCIATES

According to the Hillsborough County NPS Pollutant Loading and Removal Model, this land use contributes approximately 261 milligrams (mg) of total suspended solids per every liter of runoff.

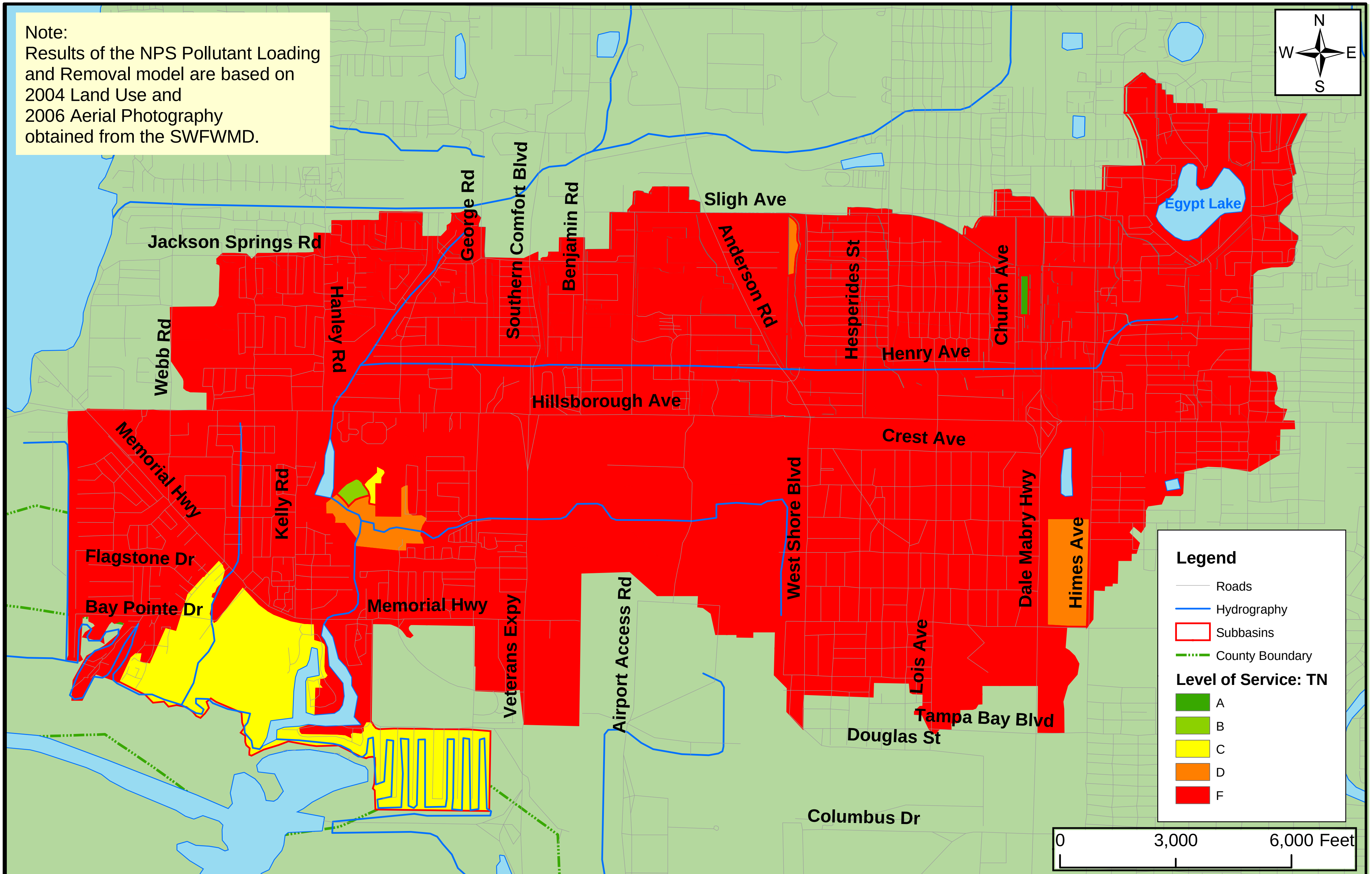
Lower Sweetwater Creek watershed encompasses a number of major roads, including Hillsborough Avenue, Anderson Road, Memorial Highway and Veterans Expressway, as well as a dense network of smaller roads. The watershed is also a home to the Tampa International Airport (TIA). The airport occupies the entire south central portion of the watershed, designating the entire area as highway/utility land use. The watershed also contains several large residential neighborhoods, such as Drew Park, Pine Crest Villa, Town-N-Country Park, and Rocky Point Village, as well as many smaller residential subdivisions. All of these subdivisions are densely populated and contribute substantial amounts of TSS and other pollutants into the watershed every year.

Total Nitrogen

Total nitrogen LOS values were also highest in the few randomly distributed subbasins dominated by existing natural systems (wetlands and uplands) (Figure 11-2). These land uses do not contribute any loads based on the model's EMC value input dataset. Similarly to the distribution of TSS scores, only a couple of scores higher than F occurred throughout the watershed for TN. This is mainly due to additional contributions of total nitrogen from random patches of agricultural land use and large coverage of the residential land use. The remaining areas surrounding the Lower Sweetwater Creek watershed had predominantly F scores. Low scores occur primarily due to extensive high density residential land uses contained within various residential subdivisions that dominate the Lower Sweetwater Creek watershed. Additional TN contribution comes from other types of development that dominate the watershed, such as TIA and various commercial properties. The distribution of poor scores was consistent with total nitrogen loading calculations for representative stations based on actual concentration and discharge data described in Chapter 7.

Total Phosphorus

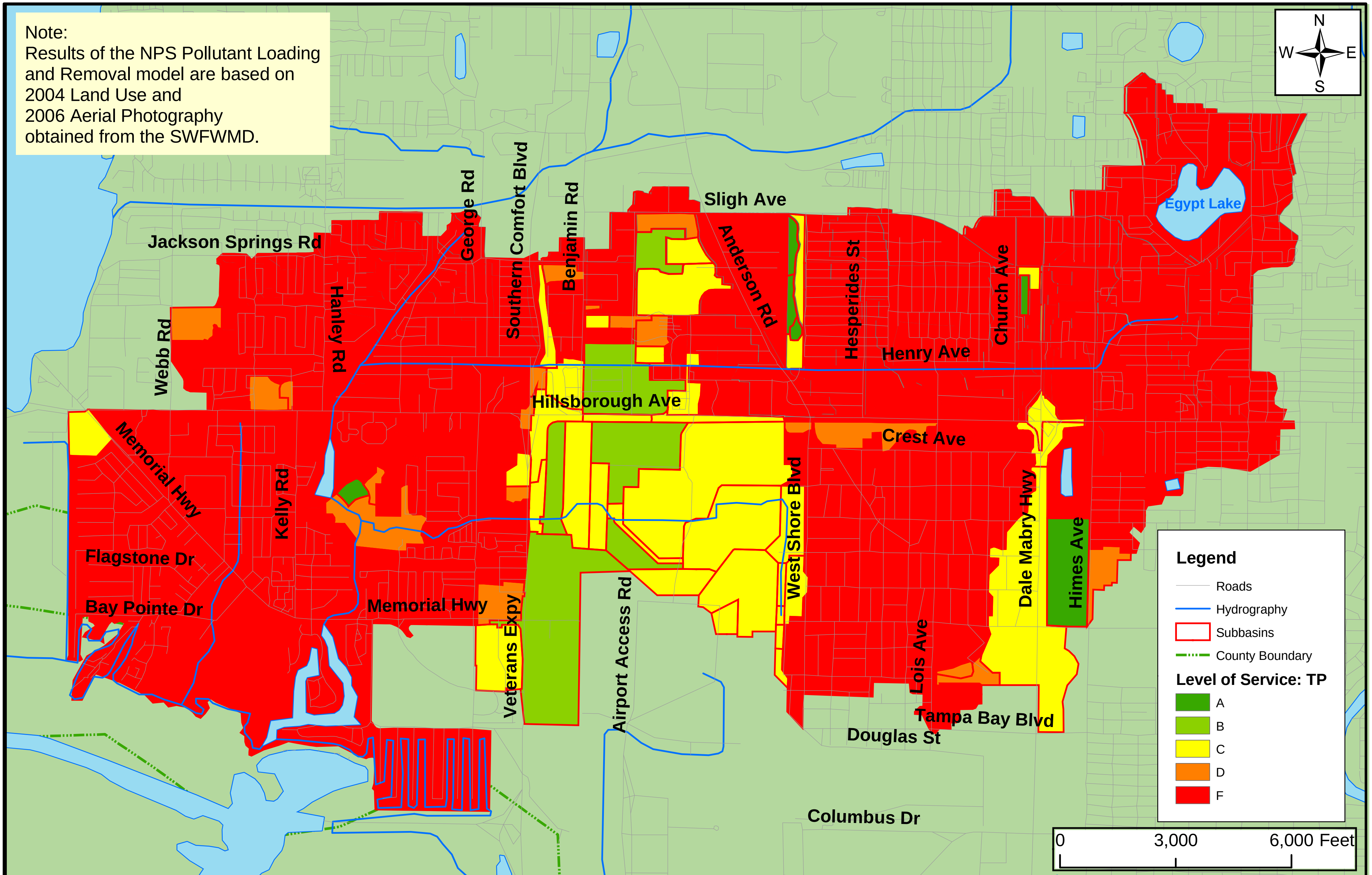
A number of subbasins containing concentration of LOS scores higher than C for total phosphorus are located in the central portion of the watershed (area surrounding the TIA) and the southern portion of the watershed (subbasins including the Al Lopez Park and parts of the Drew Park subdivision) (Figure 11-3). These areas are comprised of a variety of land uses, such as commercial and services, highway/utility, upland forests, recreational, and others. A small group of subbasins with LOS scores of C and higher are located to the south of the watershed, west of Anderson Road. These areas are primarily comprised of open land, industrial, and commercial and services land use types. The remaining areas are dominated by F scores due to the extensive presence of highly developed land uses. Once again, Lower Sweetwater Creek watershed is a home to Tampa International Airport and such major residential subdivisions as Drew Park, parts of Town-n-Country, and Rocky Point Village. Runoff from these areas is affected by the landuse.



Water Quality Treatment Level of Service by Subbasin for Lower Sweetwater Creek Watershed: TN

Figure 11-2

AYRES ASSOCIATES



Water Quality Treatment Level of Service by Subbasin for Lower Sweetwater Creek Watershed: TP

Figure 11-3

AYRES ASSOCIATES

Overall Water Quality

The overall LOS score for the entire Lower Sweetwater Creek watershed is an F (using an average score for all parameters combined). The scores of F for total nitrogen, total phosphorus, and TSS dominated the entire watershed. The Lower Sweetwater Creek watershed is heavily developed and primarily comprised of high density residential, commercial and services, industrial, and highway/utility land uses. These land uses contribute large quantities of various pollutants into surface water bodies. The overall low LOS score for the entire watershed (F) indicates that most subbasins have been developed and extensive contiguous natural systems do not exist in the watershed.

Unless appropriate treatment measures are implemented, continued loading to surface waters in the watershed, eventually, into Old Tampa Bay may result in significant water quality degradation in the future. Efforts to reduce loading of pollutants to the Lower Sweetwater Creek, channels, lakes, sinkholes, and groundwater should be incorporated into future management activities for the watershed. Future efforts to reduce pollutant loading may include implementation of local and regional stormwater best management practices (BMP's - wet detention ponds, baffle boxes, alum treatment, etc.), low impact development, source reduction (e.g., education programs for home and business owners to reduce fertilizers and illicit discharges), improved wastewater treatment practices (extending centralized sewer systems to areas treated by on-site disposal systems or septic tanks), and restoration/conservation of natural lands and riparian buffer areas to reduce current and future pollutant loads.

In order to determine the magnitude of pollutant load reduction needed to achieve an LOS score of A, differences between net loads (from Chapter 10) and benchmark loads that would result in an LOS score of A were calculated (Table 11-1). It was observed that average reductions of pollutants would need to be very high (>94%) for all 12 parameters to achieve A LOS scores. Considering the removal efficiencies of the available stormwater BMPs, achievement of these goals is impossible. For example, the Lower Sweetwater Creek watershed exhibited low LOS scores for total nitrogen. Figure 11-4 compares the percent reduction of TN loading in the Lower Sweetwater Creek watershed necessary to achieve an LOS score of A with the removal efficiencies of various BMPs. The load reduction required to achieve an LOS score of A in this subwatershed is over 92%. Even with the best BMP available in the model for total nitrogen (percolation), such reduction cannot be achieved. This means that if all of the runoff for the watershed is treated through percolation ponds, only 80% reduction in loading would be realized as opposed to the higher percent reduction that would be necessary to achieve an LOS score of A designation.

Table 11-1 Estimated Pollutant Loads (lbs/year/acre) and Percent Reductions needed to equal LOS A loads for Lower Sweetwater Creek Watershed

	BOD5	TSS	TKN	NO3 +NO2	TN	TP	TDP	Oil and Grease	Cd	Cu	Pb	Zn
Benchmark Loads	3.700	70.306	4.004	1.040	5.044	1.484	1.043	3.996	0.004	0.048	0.030	0.081
Allowable Load to Achieve LOS A	0.74	13.99	0.80	0.21	1.00	0.30	0.21	0.80	0.00	0.01	0.01	0.02
Net Loads Based on Existing Land Use and Treatment	35.848	342.126	10.080	3.161	13.194	3.759	1.997	6.546	0.046	0.256	0.913	0.604
Percent Reduction Required to Achieve LOS A	98%	96%	92%	93%	92%	92%	90%	88%	98%	96%	99%	97%
Load Reduction Required to Achieve LOS A	35.11	328.14	9.28	2.95	12.19	3.46	1.79	5.75	0.05	0.25	0.91	0.59

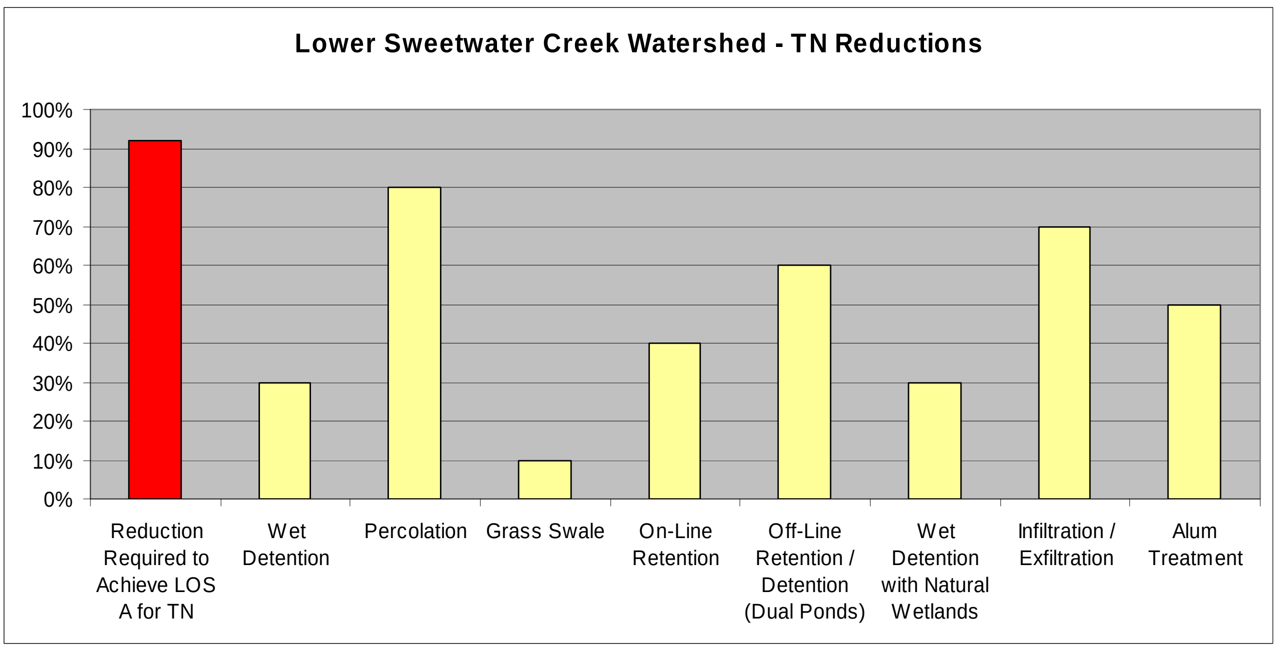


Figure 11-4 Comparison of the Reduction required to achieve an LOS A Designation with the removal efficiencies of various best management practices for TN

Appendix 11-1. Benchmark Pollutant Loads at the Subbasin Level for Lower Sweetwater Creek Watershed

Subbasin ID	Basin ID	Area (acres)	Volume (acre-feet)	Runoff coefficient	BOD5	TSS	TKN	NO3 +NO2	TN	TP	TDP	Oil and Grease	Cd	Cu	Pb	Zn
400001	LSW	137.105	182.365	0.338451	495.8542	9421.23	536.5142	139.335	675.8493	198.8375	139.8309	535.5225	0.495854	6.446105	3.966834	10.90879
400002	LSW	335.69	464.8836	0.352382	1264.028	24016.54	1367.678	355.1919	1722.87	506.8753	356.4559	1365.15	1.264028	16.43237	10.11223	27.80862
400003	LSW	23.601	30.2044	0.325647	82.12639	1560.401	88.86075	23.07751	111.9383	32.93268	23.15964	88.6965	0.082126	1.067643	0.657011	1.80678
400100	LSW	2.644	3.345876	0.322	9.097506	172.8526	9.843502	2.556399	12.3999	3.6481	2.565497	9.825307	0.009098	0.118268	0.07278	0.200145
400150	LSW	8.704	11.01456	0.322	29.94883	569.0277	32.40463	8.41562	40.82025	12.00948	8.445569	32.34473	0.029949	0.389335	0.239591	0.658874
400200	LSW	24.364	30.83167	0.322	83.83194	1592.807	90.70616	23.55677	114.2629	33.61661	23.64061	90.53849	0.083832	1.089815	0.670656	1.844303
400300	LSW	39.833	50.40707	0.322	137.0579	2604.099	148.2966	38.51326	186.8099	54.9602	38.65032	148.0225	0.137058	1.781752	1.096463	3.015273
400350	LSW	10.021	12.68117	0.322	34.48038	655.1271	37.30777	9.688985	46.99675	13.82663	9.723466	37.23881	0.03448	0.448245	0.275843	0.758568
400400	LSW	9.272	11.79319	0.323642	32.06593	609.2527	34.69534	9.010526	43.70586	12.85844	9.042592	34.6312	0.032066	0.416857	0.256527	0.70545
400500	LSW	15.593	19.73232	0.322	53.65258	1019.399	58.05209	15.07637	73.12846	21.51468	15.13003	57.94478	0.053653	0.697484	0.429221	1.180357
400600	LSW	2.676	3.576107	0.340041	9.72351	184.7467	10.52084	2.732306	13.25314	3.899127	2.74203	10.50139	0.009724	0.126406	0.077788	0.213917
400605	LSW	2.197	2.780216	0.322	7.559464	143.6298	8.17934	2.124209	10.30355	3.031345	2.131769	8.164221	0.007559	0.098273	0.060476	0.166308
400610	LSW	7.112	8.999952	0.322	24.47105	464.95	26.47768	6.876366	33.35405	9.812892	6.900837	26.42874	0.024471	0.318124	0.195768	0.538363
400620	LSW	5.957	7.539689	0.322057	20.50057	389.5108	22.18162	5.76066	27.94228	8.220729	5.781161	22.14062	0.020501	0.266507	0.164005	0.451013
400630	LSW	7.267	10.21534	0.357689	27.77573	527.7388	30.05334	7.80498	37.85832	11.13807	7.832756	29.99779	0.027776	0.361084	0.222206	0.611066
400650	LSW	31.763	40.48624	0.324335	110.0829	2091.576	119.1097	30.9333	150.043	44.14325	31.04339	118.8896	0.110083	1.431078	0.880663	2.421824
400660	LSW	18.172	22.99594	0.322	62.52643	1188.002	67.6536	17.56993	85.22353	25.0731	17.63245	67.52855	0.062526	0.812844	0.500211	1.375582
400700	LSW	8.506	12.32154	0.368593	33.50253	636.5481	36.24974	9.414212	45.66395	13.43452	9.447714	36.18274	0.033503	0.435533	0.26802	0.737056
400800	LSW	15.91	20.13347	0.322	54.74332	1040.123	59.23227	15.38287	74.61514	21.95207	15.43762	59.12278	0.054743	0.711663	0.437947	1.204353
401000	LSW	87.914	124.5608	0.360521	338.6833	6434.983	366.4554	95.17001	461.6254	135.812	95.5087	365.778	0.338683	4.402883	2.709467	7.451033
401100	LSW	31.358	44.25116	0.359074	120.3198	2286.076	130.186	33.80986	163.9959	48.24824	33.93018	129.9454	0.12032	1.564157	0.962558	2.647036
401110	LSW	21.026	27.4138	0.331757	74.53868	1416.235	80.65085	20.94537	101.5962	29.89001	21.01991	80.50177	0.074539	0.969003	0.596309	1.639851
401120	LSW	8.164	10.33122	0.322	28.09079	533.725	30.39423	7.893511	38.28774	11.26441	7.921602	30.33805	0.028091	0.36518	0.224726	0.617997
401130	LSW	22.191	28.08182	0.322	76.35505	1450.746	82.61617	21.45577	104.0719	30.61838	21.53213	82.46346	0.076355	0.992616	0.61084	1.679811
401140	LSW	26.676	33.75741	0.322	91.7871	1743.955	99.31364	25.79217	125.1058	36.80663	25.88396	99.13006	0.091787	1.193232	0.734297	2.019316
401190	LSW	46.141	60.20631	0.332019	163.7022	3110.342	177.1258	46.00032	223.1261	65.64458	46.16402	176.7984	0.163702	2.128129	1.309618	3.601448
401191	LSW	178.505	250.1686	0.356607	680.2137	12924.06	735.9912	191.14	927.1312	272.7657	191.8203	734.6308	0.680214	8.842778	5.441709	14.9647
401200	LSW	21.421	27.98673	0.332445	76.09649	1445.833	82.3364	21.38311	103.7195	30.51469	21.45921	82.18421	0.076096	0.989254	0.608772	1.674123
401220	LSW	8.045	10.18063	0.322	27.68133	525.9453	29.9512	7.778454	37.72965	11.10021	7.806135	29.89584	0.027681	0.359857	0.221451	0.608989
401240	LSW	30.588	38.70789	0.322	105.2476	1999.703	113.8779	29.57456	143.4524	42.20427	29.67981	113.6674	0.105248	1.368218	0.84198	2.315446
401300	LSW	50.833	66.1949	0.331349	179.9853	3419.721	194.7441	50.57587	245.32	72.1741	50.75585	194.3841	0.179985	2.339809	1.439882	3.959677
401320	LSW	13.244	16.75975	0.322	45.57011	865.8321	49.30686	12.8052	62.11206	18.27361	12.85077	49.21572	0.04557	0.592411	0.364561	1.002542
401330	LSW	83.295	105.4065	0.322	286.6024	5445.446	310.1038	80.53528	390.6391	114.9276	80.82188	309.5306	0.286602	3.725831	2.292819	6.305253
401400	LSW	54.966	71.28684	0.330007	193.8304	3682.778	209.7245	54.46634	264.1908	77.72599	54.66017	209.3368	0.19383	2.519795	1.550643	4.264269
401430	LSW	32.477	41.09834	0.322	111.7472	2123.198	120.9105	31.40098	152.3115	44.81065	31.51272	120.687	0.111747	1.452714	0.893978	2.458439
401500	LSW	7.372	9.328971	0.322	25.36566	481.9476	27.44565	7.127752	34.5734	10.17163	7.153117	27.39492	0.025366	0.329754	0.202925	0.558045
401600	LSW	75.879	96.59598	0.323925	262.6465	4990.283	284.1835	73.80365	357.9871	105.3212	74.0663	283.6582	0.262646	3.414404	2.101172	5.778222
401604	LSW	8.446	10.68808	0.322	29.0611	552.1608	31.44411	8.166168	39.61027	11.6535	8.195229	31.38598	0.029061	0.377794	0.232489	0.639344
401630	LSW	5.75	7.276395	0.322	19.78467	375.9087	21.40701	5.559492	26.9665	7.933652	5.579276	21.36744	0.019785	0.257201	0.158277	0.435263
401632	LSW	5.417	6.854997	0.322	18.63888	354.1387	20.16727	5.237525	25.40479	7.47419	5.256163	20.12999	0.018639	0.242305	0.149111	0.410055
401640	LSW	4.803	6.078004	0.322	16.52622	313.9982	17.88137	4.643868	22.52524	6.627014	4.660394	17.84832	0.016526	0.214841	0.13221	0.363577
401642	LSW	15.407	19.49694	0.322	53.01259	1007.239	57.35962	14.89654	72.25616	21.25805	14.94955	57.25359	0.053013	0.689164	0.424101	1.166277
401650	LSW	11.25	14.23643	0.322	38.70913	735.4735	41.88328	10.87727	52.76055	15.52236	10.91598	41.80586	0.038709	0.503219	0.309673	0.851601

Appendix 11-1. Benchmark Pollutant Loads at the Subbasin Level for Lower Sweetwater Creek Watershed

Subbasin ID	Basin ID	Area (acres)	Volume (acre-feet)	Runoff coefficient	BOD5	TSS	TKN	NO3 +NO2	TN	TP	TDP	Oil and Grease	Cd	Cu	Pb	Zn
401652	LSW	98.682	124.8781	0.322	339.5462	6451.378	367.389	95.41248	462.8015	136.158	95.75203	366.7099	0.339546	4.4141	2.71637	7.470016
401654	LSW	2.056	2.601786	0.322	7.074309	134.4119	7.654402	1.987881	9.642283	2.836798	1.994955	7.640254	0.007074	0.091966	0.056594	0.155635
401656	LSW	1.756	2.222148	0.322	6.042066	114.7992	6.537515	1.69782	8.235335	2.422868	1.703862	6.525431	0.006042	0.078547	0.048337	0.132925
401660	LSW	21.662	27.41239	0.322	74.53487	1416.162	80.64672	20.9443	101.591	29.88848	21.01883	80.49765	0.074535	0.968953	0.596279	1.639767
401664	LSW	15.517	19.63614	0.322	53.39108	1014.43	57.76915	15.00289	72.77204	21.40982	15.05628	57.66236	0.053391	0.694084	0.427129	1.174604
401670	LSW	8.073	10.21606	0.322	27.77767	527.7758	30.05544	7.805526	37.86097	11.13885	7.833304	29.99989	0.027778	0.36111	0.222221	0.611109
401690	LSW	5.315	6.72592	0.322	18.28791	347.4704	19.78752	5.138904	24.92643	7.333454	5.157192	19.75095	0.018288	0.237743	0.146303	0.402334
401750	LSW	15.997	20.24356	0.322	55.04267	1045.811	59.55617	15.46699	75.02315	22.07211	15.52203	59.44608	0.055043	0.715555	0.440341	1.210939
401850	LSW	6.717	8.500095	0.322	23.11193	439.1267	25.00711	6.494453	31.50156	9.267885	6.517565	24.96089	0.023112	0.300455	0.184895	0.508463
402000	LSW	59.804	76.41343	0.325122	207.7697	3947.624	224.8068	58.38328	283.1901	83.31564	58.59105	224.3913	0.20777	2.701006	1.662157	4.570933
402100	LSW	38.084	48.19378	0.322	131.0399	2489.758	141.7851	36.82221	178.6074	52.54699	36.95325	141.5231	0.13104	1.703518	1.048319	2.882877
402200	LSW	24.913	31.5264	0.322	85.72094	1628.698	92.75006	24.08759	116.8376	34.3741	24.17331	92.57862	0.085721	1.114372	0.685768	1.885861
402210	LSW	16.332	20.66749	0.322	56.19534	1067.711	60.80336	15.79089	76.59425	22.53433	15.84709	60.69097	0.056195	0.730539	0.449563	1.236297
402220	LSW	40.144	52.07182	0.330057	141.5844	2690.103	153.1943	39.78521	192.9795	56.77533	39.92679	152.9111	0.141584	1.840597	1.132675	3.114856
402230	LSW	14.504	18.35423	0.322	49.90553	948.2052	53.99779	14.02346	68.02124	20.01212	14.07336	53.89798	0.049906	0.648772	0.399244	1.097922
402240	LSW	16.014	20.26508	0.322	55.10116	1046.922	59.61946	15.48343	75.10288	22.09557	15.53853	59.50925	0.055101	0.716315	0.440809	1.212226
402250	LSW	5.057	6.399431	0.322	17.40019	330.6035	18.827	4.889452	23.71645	6.977474	4.906852	18.7922	0.0174	0.226202	0.139201	0.382804
402260	LSW	7.017	8.879733	0.322	24.14418	458.7394	26.124	6.784514	32.90851	9.681815	6.808658	26.07571	0.024144	0.313874	0.193153	0.531172
402270	LSW	17.777	22.49608	0.322	61.16731	1162.179	66.18303	17.18801	83.37105	24.52809	17.24918	66.0607	0.061167	0.795175	0.489338	1.345681
402280	LSW	12.601	16.61328	0.335473	45.17185	858.2652	48.87595	12.69329	61.56924	18.11391	12.73846	48.7856	0.045172	0.587234	0.361375	0.993781
402285	LSW	3.635	4.599947	0.322	12.50735	237.6397	13.53295	3.514566	17.04752	5.015448	3.527073	13.50794	0.012507	0.162596	0.100059	0.275162
402300	LSW	26.167	33.11329	0.322	90.03572	1710.679	97.41865	25.30004	122.7187	36.10432	25.39007	97.23858	0.090036	1.170464	0.720286	1.980786
402310	LSW	10.241	12.95958	0.322	35.23735	669.5097	38.12682	9.901696	48.02851	14.13018	9.936934	38.05634	0.035237	0.458086	0.281899	0.775222
402320	LSW	26.912	34.05606	0.322	92.59913	1759.383	100.1923	26.02035	126.2126	37.13225	26.11295	100.0071	0.092599	1.203789	0.740793	2.037181
402330	LSW	28.788	38.98137	0.344551	105.9912	2013.832	114.6824	29.78351	144.4659	42.50245	29.8895	114.4704	0.105991	1.377885	0.847929	2.331805
402340	LSW	5.122	6.481686	0.322	17.62384	334.8529	19.06899	4.952299	24.02129	7.067159	4.969922	19.03375	0.017624	0.22911	0.140991	0.387724
402350	LSW	21.268	26.9138	0.322	73.17919	1390.405	79.17988	20.56335	99.74323	29.34485	20.63653	79.03352	0.073179	0.951329	0.585433	1.609942
402360	LSW	3.86	4.884676	0.322	13.28153	252.3491	14.37062	3.732111	18.10273	5.325895	3.745392	14.34406	0.013282	0.17266	0.106252	0.292194
402370	LSW	9.263	11.72196	0.322	31.87224	605.5726	34.48576	8.956099	43.44186	12.78077	8.987972	34.42202	0.031872	0.414339	0.254978	0.701189
402400	LSW	21.209	27.39088	0.328619	74.47636	1415.051	80.58342	20.92786	101.5113	29.86502	21.00233	80.43447	0.074476	0.968193	0.595811	1.63848
402500	LSW	20.15	26.63161	0.336302	72.41191	1375.826	78.34968	20.34775	98.69743	29.03717	20.42016	78.20486	0.072412	0.941355	0.579295	1.593062
402510	LSW	24.518	31.93804	0.33146	86.8402	1649.964	93.9611	24.4021	118.3632	34.82292	24.48894	93.78742	0.08684	1.128923	0.694722	1.910484
402520	LSW	20.12	25.46106	0.322	69.22913	1315.354	74.90592	19.45339	94.35931	27.76088	19.52262	74.76746	0.069229	0.899979	0.553833	1.523041
402600	LSW	10.358	13.2445	0.325362	36.01208	684.2295	38.96507	10.11939	49.08447	14.44084	10.15541	38.89305	0.036012	0.468157	0.288097	0.792266
402610	LSW	24.096	34.8988	0.36853	94.89056	1802.921	102.6716	26.66425	129.3358	38.05111	26.75914	102.4818	0.094891	1.233577	0.759124	2.087592
402620	LSW	5.326	7.251927	0.346465	19.71814	374.6446	21.33503	5.540797	26.87582	7.906974	5.560515	21.29559	0.019718	0.256336	0.157745	0.433799
402630	LSW	20.528	25.97736	0.322	70.63298	1342.027	76.42489	19.84787	96.27276	28.32383	19.9185	76.28362	0.070633	0.918229	0.565064	1.553926
402640	LSW	9.979	12.62803	0.322	34.33586	652.3814	37.1514	9.648377	46.79978	13.76868	9.682713	37.08273	0.034336	0.446366	0.274687	0.755389
402700	LSW	3.723	5.210626	0.356127	14.1678	269.1882	15.32956	3.981152	19.31071	5.681287	3.995319	15.30122	0.014168	0.184181	0.113342	0.311692
402800	LSW	37.851	54.09606	0.36366	147.0883	2794.678	159.1495	41.33181	200.4813	58.98241	41.4789	158.8554	0.147088	1.912148	1.176706	3.235942
402810	LSW	16.492	20.86997	0.322	56.74587	1078.171	61.39903	15.94559	77.34462	22.75509	16.00233	61.28554	0.056746	0.737696	0.453967	1.248409
402820	LSW	14.82	18.75412	0.322	50.99283	968.8638	55.17424	14.32899	69.50323	20.44813	14.37998	55.07226	0.050993	0.662907	0.407943	1.121842
402830	LSW	17.054	21.58115	0.322	58.6796	1114.912	63.49133	16.48897	79.9803	23.53052	16.54765	63.37397	0.05868	0.762835	0.469437	1.290951

Appendix 11-1. Benchmark Pollutant Loads at the Subbasin Level for Lower Sweetwater Creek Watershed

Subbasin ID	Basin ID	Area (acres)	Volume (acre-feet)	Runoff coefficient	BOD5	TSS	TKN	NO3 +NO2	TN	TP	TDP	Oil and Grease	Cd	Cu	Pb	Zn
402840	LSW	4.408	5.578148	0.322	15.1671	288.1749	16.4108	4.261955	20.67276	6.082006	4.277122	16.38047	0.015167	0.197172	0.121337	0.333676
402850	LSW	23.217	30.61725	0.335558	83.24894	1581.73	90.07535	23.39295	113.4683	33.38282	23.4762	89.90885	0.083249	1.082236	0.665991	1.831477
402860	LSW	24.128	32.98076	0.347814	89.67538	1703.832	97.02876	25.19878	122.2275	35.95983	25.28846	96.84941	0.089675	1.16578	0.717403	1.972858
402870	LSW	8.824	11.91192	0.343498	32.38877	615.3866	35.04465	9.101244	44.14589	12.9879	9.133632	34.97987	0.032389	0.421054	0.25911	0.712553
402880	LSW	8.656	10.95382	0.322	29.78367	565.8897	32.22593	8.36921	40.59514	11.94325	8.398994	32.16636	0.029784	0.387188	0.238269	0.655241
402900	LSW	8.722	11.03734	0.322	30.01076	570.2045	32.47164	8.433024	40.90467	12.03431	8.463034	32.41162	0.030011	0.39014	0.240086	0.660237
402920	LSW	12.852	16.26369	0.322	44.22131	840.205	47.84746	12.42619	60.27365	17.73275	12.47041	47.75902	0.044221	0.574877	0.353771	0.972869
402930	LSW	22.411	28.36022	0.322	77.11203	1465.129	83.43522	21.66848	105.1037	30.92193	21.74559	83.281	0.077112	1.002456	0.616896	1.696465
402940	LSW	8.525	10.78805	0.322	29.33292	557.3255	31.73822	8.242551	39.98077	11.7625	8.271884	31.67955	0.029333	0.381328	0.234663	0.645324
402950	LSW	5.308	6.717062	0.322	18.26383	347.0128	19.76146	5.132136	24.8936	7.323795	5.1504	19.72494	0.018264	0.23743	0.146111	0.401804
403000	LSW	13.1	16.98032	0.329824	46.16984	877.2269	49.95577	12.97372	62.92949	18.51411	13.01989	49.86343	0.04617	0.600208	0.369359	1.015736
403060	LSW	28.377	35.90996	0.322	97.63992	1855.158	105.6464	27.43682	133.0832	39.15361	27.53446	105.4511	0.09764	1.269319	0.781119	2.148078
403070	LSW	5.431	6.872713	0.322	18.68705	355.0539	20.21939	5.251061	25.47045	7.493507	5.269748	20.18201	0.018687	0.242932	0.149496	0.411115
403100	LSW	11.733	14.84764	0.322	40.37104	767.0499	43.68147	11.34426	55.02573	16.18879	11.38463	43.60073	0.040371	0.524824	0.322968	0.888163
403110	LSW	4.065	5.479403	0.342989	14.89861	283.0736	16.12029	4.186509	20.3068	5.974342	4.201408	16.0905	0.014899	0.193682	0.119189	0.327769
403120	LSW	30.424	38.50036	0.322	104.6833	1988.982	113.2673	29.416	142.6833	41.97799	29.52068	113.0579	0.104683	1.360882	0.837466	2.303032
403130	LSW	24.747	31.31634	0.322	85.14977	1617.846	92.13205	23.92709	116.0591	34.14506	24.01224	91.96175	0.08515	1.106947	0.681198	1.873295
403140	LSW	26.618	33.51218	0.320357	91.12029	1731.286	98.59216	25.6048	124.197	36.53924	25.69592	98.40992	0.09112	1.184564	0.728962	2.004646
403170	LSW	16.36	20.70293	0.322	56.29168	1069.542	60.9076	15.81796	76.72556	22.57296	15.87425	60.79502	0.056292	0.731792	0.450333	1.238417
403180	LSW	6.511	8.23941	0.322	22.40313	425.6594	24.24018	6.295278	30.53546	8.983653	6.317681	24.19538	0.022403	0.291241	0.179225	0.492869
403190	LSW	11.77	14.89446	0.322	40.49835	769.4687	43.81922	11.38004	55.19926	16.23984	11.42054	43.73822	0.040498	0.526479	0.323987	0.890964
403200	LSW	14.892	18.84523	0.322	51.24057	973.5708	55.4423	14.3986	69.8409	20.54747	14.44984	55.33982	0.051241	0.666127	0.409925	1.127293
403220	LSW	15.038	19.02999	0.322	51.74293	983.1156	55.98585	14.53976	70.52561	20.74891	14.59151	55.88236	0.051743	0.672658	0.413943	1.138344
403230	LSW	6.87	8.69371	0.322	23.63838	449.1292	25.57672	6.642384	32.21911	9.478989	6.666022	25.52945	0.023638	0.307299	0.189107	0.520044
403250	LSW	19.16	24.24621	0.322	65.92595	1252.593	71.33188	18.52519	89.85708	26.43631	18.59112	71.20003	0.065926	0.857037	0.527408	1.450371
403260	LSW	10.024	12.68497	0.322	34.4907	655.3233	37.31893	9.691886	47.01082	13.83077	9.726377	37.24995	0.034491	0.448379	0.275926	0.758795
403270	LSW	29.23	37.05858	0.322602	100.763	1914.498	109.0256	28.31441	137.34	40.40598	28.41518	108.8241	0.100763	1.30992	0.806104	2.216787
403300	LSW	24.214	30.64185	0.322	83.31582	1583.001	90.14771	23.41174	113.5595	33.40964	23.49506	89.98108	0.083316	1.083106	0.666527	1.832948
403370	LSW	4.974	6.294398	0.322	17.1146	325.1774	18.51799	4.809202	23.3272	6.862954	4.826317	18.48377	0.017115	0.22249	0.136917	0.376521
403400	LSW	80.845	102.3061	0.322	278.1724	5285.276	300.9826	78.16645	379.149	111.5471	78.44463	300.4262	0.278172	3.616242	2.225379	6.119793
403410	LSW	8.118	10.47971	0.328479	28.49454	541.3962	30.83109	8.006965	38.83806	11.42631	8.03546	30.7741	0.028495	0.370429	0.227956	0.62688
403425	LSW	10.928	13.82895	0.322	37.60119	714.4226	40.68449	10.56593	51.25042	15.07808	10.60354	40.60929	0.037601	0.488815	0.30081	0.827226
403435	LSW	7.621	9.644071	0.322	26.22243	498.2261	28.37267	7.368502	35.74117	10.51519	7.394724	28.32022	0.026222	0.340892	0.209779	0.576893
403445	LSW	37.175	47.04348	0.322	127.9122	2430.331	138.401	35.94332	174.3443	51.29278	36.07123	138.1452	0.127912	1.662858	1.023297	2.814068
403450	LSW	1.914	2.42209	0.322	6.585714	125.1286	7.125742	1.850586	8.976328	2.640871	1.857171	7.112571	0.006586	0.085614	0.052686	0.144886
403460	LSW	24.789	33.6517	0.345426	91.49967	1738.494	99.00264	25.71141	124.7141	36.69137	25.80291	98.81964	0.0915	1.189496	0.731997	2.012993
403462	LSW	14.986	18.96418	0.322	51.56401	979.7161	55.79225	14.48949	70.28174	20.67717	14.54105	55.68913	0.051564	0.670332	0.412512	1.134408
403465	LSW	24.526	31.05123	0.322151	84.42894	1604.15	91.35211	23.72453	115.0766	33.85601	23.80896	91.18326	0.084429	1.097576	0.675432	1.857437
403470	LSW	16.987	22.06979	0.330589	60.00821	1140.156	64.92888	16.86231	81.79119	24.06329	16.92231	64.80886	0.060008	0.780107	0.480066	1.320181
403480	LSW	22.745	28.90173	0.32333	78.5844	1493.104	85.02832	22.08222	107.1105	31.51235	22.1608	84.87115	0.078584	1.021597	0.628675	1.728857
403510	LSW	7.731	9.783271	0.322	26.60092	505.4174	28.78219	7.474857	36.25705	10.66697	7.501458	28.72899	0.026601	0.345812	0.212807	0.58522
403520	LSW	7.371	10.63583	0.367158	28.91904	549.4618	31.2904	8.12625	39.41665	11.59654	8.155169	31.23256	0.028919	0.375948	0.231352	0.636219
403530	LSW	7.566	9.57447	0.322	26.03318	494.6305	28.1679	7.315324	35.48323	10.43931	7.341357	28.11584	0.026033	0.338431	0.208265	0.57273

Appendix 11-1. Benchmark Pollutant Loads at the Subbasin Level for Lower Sweetwater Creek Watershed

Subbasin ID	Basin ID	Area (acres)	Volume (acre-feet)	Runoff coefficient	BOD5	TSS	TKN	NO3 +NO2	TN	TP	TDP	Oil and Grease	Cd	Cu	Pb	Zn
403540	LSW	14.209	17.98092	0.322	48.89049	928.9194	52.89952	13.73823	66.63774	19.60509	13.78712	52.80173	0.04889	0.635576	0.391124	1.075591
403550	LSW	18.608	23.98018	0.327914	65.20261	1238.85	70.54923	18.32193	88.87116	26.14625	18.38714	70.41882	0.065203	0.847634	0.521621	1.434458
403560	LSW	10.785	15.37715	0.362797	41.8108	794.4052	45.23929	11.74883	56.98812	16.76613	11.79065	45.15566	0.041811	0.54354	0.334486	0.919838
403570	LSW	18.677	25.39854	0.346026	69.05917	1312.124	74.72202	19.40563	94.12764	27.69273	19.47468	74.5839	0.069059	0.897769	0.552473	1.519302
403580	LSW	6.717	8.502641	0.322096	23.11886	439.2583	25.0146	6.496399	31.511	9.270662	6.519518	24.96837	0.023119	0.300545	0.184951	0.508615
403590	LSW	53.738	72.93231	0.345339	198.3045	3767.785	214.5654	55.72355	270.289	79.52009	55.92186	214.1688	0.198304	2.577958	1.586436	4.362698
403600	LSW	50.943	65.36444	0.326486	177.7273	3376.818	192.3009	49.94136	242.2423	71.26863	50.11909	191.9455	0.177727	2.310455	1.421818	3.91
403610	LSW	13.804	18.52399	0.341458	50.36712	956.9752	54.49722	14.15316	68.65038	20.19721	14.20353	54.39649	0.050367	0.654773	0.402937	1.108077
403650	LSW	200.589	265.0175	0.336182	720.5881	13691.17	779.6763	202.4853	982.1616	288.9558	203.2059	778.2352	0.720588	9.367646	5.764705	15.85294
403700	LSW	8.768	12.41641	0.360332	33.76048	641.449	36.52884	9.486694	46.01553	13.53795	9.520454	36.46131	0.03376	0.438886	0.270084	0.74273
403710	LSW	7.059	9.482956	0.341828	25.78435	489.9027	27.89867	7.245403	35.14407	10.33953	7.271188	27.8471	0.025784	0.335197	0.206275	0.567256
403720	LSW	3.03	4.980756	0.418273	13.54278	257.3128	14.65329	3.805521	18.45881	5.430654	3.819064	14.6262	0.013543	0.176056	0.108342	0.297941
403730	LSW	8.221	10.40335	0.322	28.28691	537.4514	30.60644	7.948623	38.55506	11.34305	7.97691	30.54987	0.028287	0.36773	0.226295	0.622312
403750	LSW	23.739	31.42655	0.336854	85.44944	1623.539	92.4563	24.01129	116.4676	34.26523	24.09674	92.2854	0.085449	1.110843	0.683596	1.879888
403800	LSW	53.362	70.76298	0.337428	192.406	3655.714	208.1833	54.06609	262.2494	77.15481	54.25849	207.7985	0.192406	2.501278	1.539248	4.232932
403810	LSW	8.489	10.74249	0.322	29.20905	554.972	31.60419	8.207743	39.81194	11.71283	8.236953	31.54578	0.029209	0.379718	0.233672	0.642599
403820	LSW	22.586	31.79851	0.358241	86.4608	1642.755	93.55059	24.29549	117.8461	34.67078	24.38195	93.37767	0.086461	1.12399	0.691686	1.902138
403830	LSW	24.736	37.02005	0.380816	100.6583	1912.507	108.9123	28.28498	137.1972	40.36397	28.38563	108.7109	0.100658	1.308558	0.805266	2.214482
403840	LSW	15.15	22.45476	0.377141	61.05496	1160.044	66.06147	17.15644	83.21791	24.48304	17.2175	65.93936	0.061055	0.793714	0.48844	1.343209
403850	LSW	21.355	27.95342	0.333076	76.00593	1444.113	82.23842	21.35767	103.5961	30.47838	21.43367	82.0864	0.076006	0.988077	0.608047	1.67213
403860	LSW	59.045	75.66983	0.326097	205.7478	3909.209	222.6192	57.81514	280.4343	82.50488	58.02089	222.2077	0.205748	2.674722	1.645983	4.526452
403900	LSW	23.629	32.6133	0.351202	88.67624	1684.849	95.94769	24.91802	120.8657	35.55917	25.0067	95.77034	0.088676	1.152791	0.70941	1.950877
404000	LSW	115.657	149.6453	0.329229	406.8887	7730.886	440.2536	114.3357	554.5893	163.1624	114.7426	439.4398	0.406889	5.289553	3.25511	8.951552
404010	LSW	48.254	64.43441	0.339775	175.1985	3328.771	189.5648	49.23077	238.7955	70.25459	49.40597	189.2144	0.175198	2.27758	1.401588	3.854367
404100	LSW	16.633	21.0484	0.322	57.23102	1087.389	61.92397	16.08192	78.00588	22.94964	16.13915	61.8095	0.057231	0.744003	0.457848	1.259083
404200	LSW	60.122	76.20422	0.322517	207.2009	3936.816	224.1913	58.22344	282.4148	83.08754	58.43064	223.7769	0.207201	2.693611	1.657607	4.558419
404300	LSW	9.603	12.15221	0.322	33.04212	627.8002	35.75157	9.284835	45.0364	13.24989	9.317877	35.68549	0.033042	0.429548	0.264337	0.726927
404310	LSW	8.756	11.9838	0.348254	32.5842	619.0998	35.2561	9.15616	44.41226	13.06626	9.188744	35.19094	0.032584	0.423595	0.260674	0.716852
404320	LSW	8.392	11.66231	0.353612	31.71005	602.491	34.31028	8.910524	43.2208	12.71573	8.942235	34.24686	0.03171	0.412231	0.25368	0.697621
404330	LSW	5.583	7.166504	0.326623	19.48587	370.2316	21.08371	5.47553	26.55924	7.813835	5.495016	21.04474	0.019486	0.253316	0.155887	0.428689
404340	LSW	21.353	29.66175	0.353464	80.65091	1532.367	87.26428	22.66291	109.9272	32.34101	22.74356	87.10298	0.080651	1.048462	0.645207	1.77432
404350	LSW	42.442	59.44115	0.356368	161.6217	3070.813	174.8747	45.4157	220.2904	64.81031	45.57732	174.5515	0.161622	2.101082	1.292974	3.555678
404360	LSW	73.332	93.99224	0.326141	255.5668	4855.77	276.5233	71.81428	348.3376	102.4823	72.06985	276.0122	0.255567	3.322369	2.044535	5.62247
404400	LSW	15.179	20.50678	0.343765	55.75836	1059.409	60.33054	15.6681	75.99864	22.3591	15.72386	60.21902	0.055758	0.724859	0.446067	1.226684
404410	LSW	2.14	2.762519	0.328472	7.511346	142.7156	8.127276	2.110688	10.23796	3.01205	2.118199	8.112253	0.007511	0.097647	0.060091	0.16525
404415	LSW	5.274	7.595495	0.366457	20.65231	392.3939	22.3458	5.803299	28.1491	8.281576	5.823951	22.30449	0.020652	0.26848	0.165218	0.454351
404420	LSW	11.085	14.13022	0.324355	38.42036	729.9869	41.57083	10.79612	52.36695	15.40656	10.83454	41.49399	0.03842	0.499465	0.307363	0.845248
404430	LSW	30.661	43.35359	0.359788	117.8793	2239.707	127.5454	33.12408	160.6695	47.2696	33.24196	127.3097	0.117879	1.532431	0.943034	2.593345
404450	LSW	26.076	36.56434	0.356799	99.41919	1888.965	107.5716	27.93679	135.5084	39.8671	28.03621	107.3727	0.099419	1.292449	0.795354	2.187222
404460	LSW	14.768	21.17788	0.364895	57.58309	1094.079	62.3049	16.18085	78.48575	23.09082	16.23843	62.18973	0.057583	0.74858	0.460665	1.266828
404470	LSW	17.669	24.36092	0.350824	66.23784	1258.519	71.66934	18.61283	90.28217	26.56137	18.67907	71.53687	0.066238	0.861092	0.529903	1.457232
404498	LSW	6.326	8.364376	0.336443	22.74291	432.1153	24.60783	6.390758	30.99859	9.119907	6.413501	24.56234	0.022743	0.295658	0.181943	0.500344
404500	LSW	42.762	57.1475	0.340053	155.3852	2952.319	168.1268	43.66325	211.7901	62.30947	43.81863	167.816	0.155385	2.020008	1.243082	3.418475

Appendix 11-1. Benchmark Pollutant Loads at the Subbasin Level for Lower Sweetwater Creek Watershed

Subbasin ID	Basin ID	Area (acres)	Volume (acre-feet)	Runoff coefficient	BOD5	TSS	TKN	NO3 +NO2	TN	TP	TDP	Oil and Grease	Cd	Cu	Pb	Zn
404600	LSW	33.635	47.75253	0.361254	129.8401	2466.962	140.487	36.48507	176.9721	52.06588	36.61491	140.2273	0.12984	1.687921	1.038721	2.856482
404620	LSW	1.896	2.399312	0.322	6.523779	123.9518	7.058729	1.833182	8.891911	2.616035	1.839706	7.045682	0.006524	0.084809	0.05219	0.143523
404630	LSW	11.997	15.51572	0.329084	42.18757	801.5638	45.64695	11.85471	57.50166	16.91722	11.89689	45.56257	0.042188	0.548438	0.337501	0.928127
404650	LSW	14.227	21.04643	0.37642	57.22567	1087.288	61.91817	16.08041	77.99859	22.94749	16.13764	61.80372	0.057226	0.743934	0.457805	1.258965
404698	LSW	101.547	156.2471	0.391519	424.8391	8071.943	459.6759	119.3798	579.0557	170.3605	119.8046	458.8262	0.424839	5.522908	3.398713	9.34646
404710	LSW	28.998	42.75045	0.375128	116.2393	2208.548	125.771	32.66326	158.4342	46.61198	32.77949	125.5385	0.116239	1.511111	0.929915	2.557266
404720	LSW	80.859	120.5022	0.379205	327.6479	6225.31	354.515	92.06906	446.5841	131.3868	92.39671	353.8598	0.327648	4.259423	2.621183	7.208254
404800	LSW	84.991	120.6478	0.361205	328.0438	6232.833	354.9434	92.18031	447.1237	131.5456	92.50836	354.2873	0.328044	4.26457	2.624351	7.216964
404810	LSW	13.971	20.78026	0.37847	56.50197	1073.537	61.13513	15.87705	77.01218	22.65729	15.93355	61.02212	0.056502	0.734526	0.452016	1.243043
404820	LSW	13.293	19.83231	0.379628	53.92447	1024.565	58.34627	15.15278	73.49905	21.62371	15.2067	58.23842	0.053924	0.701018	0.431396	1.186338
404830	LSW	48.39	73.1247	0.384517	198.8276	3777.724	215.1314	55.87055	271.002	79.72986	56.06938	214.7338	0.198828	2.584759	1.590621	4.374207
404840	LSW	43.99	66.32097	0.383623	180.3281	3426.234	195.115	50.67219	245.7872	72.31156	50.85252	194.7543	0.180328	2.344265	1.442625	3.967218
404900	LSW	19.392	25.83498	0.338995	70.24583	1334.671	76.00599	19.73908	95.74507	28.16858	19.80932	75.8655	0.070246	0.913196	0.561967	1.545408
404940	LSW	286.873	404.7658	0.359022	1100.566	20910.76	1190.813	309.2592	1500.072	441.3272	310.3597	1188.612	1.100566	14.30736	8.804532	24.21246
404950	LSW	16.157	22.79664	0.359019	61.98455	1177.706	67.06728	17.41766	84.48494	24.8558	17.47964	66.94331	0.061985	0.805799	0.495876	1.36366
404960	LSW	26.75	37.61959	0.357847	102.2884	1943.48	110.6761	28.74305	139.4191	41.01766	28.84534	110.4715	0.102288	1.32975	0.818307	2.250346
404970	LSW	3.897	5.804465	0.379	15.78246	299.8667	17.07662	4.434871	21.51149	6.328766	4.450653	17.04506	0.015782	0.205172	0.12626	0.347214
404980	LSW	7.684	10.69197	0.354061	29.07168	552.3618	31.45555	8.169141	39.62469	11.65774	8.198212	31.39741	0.029072	0.377932	0.232573	0.639577
404985	LSW	16.867	25.37734	0.382839	69.00152	1311.029	74.65964	19.38943	94.04907	27.66961	19.45843	74.52164	0.069002	0.89702	0.552012	1.518033
404990	LSW	14.884	21.01353	0.359242	57.13623	1085.588	61.8214	16.05528	77.87668	22.91163	16.11242	61.70713	0.057136	0.742771	0.45709	1.256997
405000	LSW	45.01	57.23142	0.323544	155.6134	2956.655	168.3737	43.72737	212.1011	62.40098	43.88298	168.0625	0.155613	2.022974	1.244907	3.423495
405110	LSW	5.904	7.471276	0.322	20.31455	385.9765	21.98035	5.708389	27.68874	8.146136	5.728704	21.93972	0.020315	0.264089	0.162516	0.44692
405130	LSW	3.725	4.721007	0.32249	12.83651	243.8938	13.88911	3.607061	17.49617	5.147442	3.619897	13.86344	0.012837	0.166875	0.102692	0.282403
405150	LSW	5.543	7.014445	0.322	19.07242	362.376	20.63636	5.35935	25.99571	7.64804	5.378422	20.59821	0.019072	0.247941	0.152579	0.419593
405165	LSW	6.414	8.11666	0.322	22.06937	419.318	23.87906	6.201492	30.08055	8.849816	6.223561	23.83492	0.022069	0.286902	0.176555	0.485526
405180	LSW	10.328	13.06967	0.322	35.5367	675.1974	38.45071	9.985814	48.43653	14.25022	10.02135	38.37964	0.035537	0.461977	0.284294	0.781807
405210	LSW	13.297	17.308	0.331208	47.0608	894.1551	50.91978	13.22408	64.14386	18.87138	13.27114	50.82566	0.047061	0.61179	0.376486	1.035337
405220	LSW	32.064	43.78505	0.347469	119.0525	2261.997	128.8148	33.45374	162.2685	47.74004	33.57279	128.5767	0.119052	1.547682	0.95242	2.619154
405235	LSW	49.8	82.25624	0.420288	223.6564	4249.472	241.9962	62.84745	304.8437	89.68622	63.0711	241.5489	0.223656	2.907533	1.789251	4.920441
405270	LSW	23.267	39.3189	0.43	106.9089	2031.269	115.6754	30.0414	145.7168	42.87047	30.14831	115.4616	0.106909	1.389816	0.855271	2.351996
405280	LSW	10.035	16.95815	0.43	46.10955	876.0814	49.89053	12.95678	62.84732	18.48993	13.00289	49.79831	0.04611	0.599424	0.368876	1.01441
405285	LSW	75.817	103.307	0.346713	280.8938	5336.983	303.9271	78.93117	382.8583	112.6384	79.21206	303.3653	0.280894	3.65162	2.247151	6.179664
405292	LSW	22.912	38.71899	0.43	105.2777	2000.277	113.9105	29.58304	143.4935	42.21637	29.68832	113.6999	0.105278	1.36861	0.842222	2.31611
405294	LSW	26.305	44.45282	0.43	120.8681	2296.495	130.7793	33.96395	164.7433	48.46812	34.08481	130.5376	0.120868	1.571286	0.966945	2.659099
405305	LSW	186.745	265.0521	0.361152	720.6821	13692.96	779.7781	202.5117	982.2897	288.9935	203.2324	778.3367	0.720682	9.368868	5.765457	15.85501
405410	LSW	71.764	121.274	0.43	329.7465	6265.183	356.7857	92.65876	449.4444	132.2283	92.9885	356.1262	0.329746	4.286704	2.637972	7.254422
405420	LSW	10.386	17.5513	0.43	47.72235	906.7247	51.63558	13.40998	65.04556	19.13666	13.4577	51.54014	0.047722	0.620391	0.381779	1.049892
405460	LSW	2.935	4.959857	0.43	13.48595	256.2331	14.5918	3.789553	18.38135	5.407867	3.803038	14.56483	0.013486	0.175317	0.107888	0.296691
405480	LSW	4.423	7.474428	0.43	20.32312	386.1393	21.98962	5.710798	27.70042	8.149572	5.731121	21.94897	0.020323	0.264201	0.162585	0.447109
405490	LSW	91.586	119.2505	0.331313	324.2446	6160.647	350.8326	91.11273	441.9454	130.0221	91.43697	350.1841	0.324245	4.21518	2.593957	7.133381
405500	LSW	90.998	153.775	0.429993	418.1173	7944.229	452.4029	117.491	569.8939	167.665	117.9091	451.5667	0.418117	5.435525	3.344939	9.198581
405535	LSW	124.438	167.0674	0.341622	454.2597	8630.933	491.5089	127.647	619.1559	182.1581	128.1012	490.6004	0.45426	5.905375	3.634077	9.993712
405540	LSW	30.369	51.32057	0.43	139.5417	2651.292	150.9841	39.21122	190.1953	55.95622	39.35076	150.705	0.139542	1.814042	1.116334	3.069917

Appendix 11-1. Benchmark Pollutant Loads at the Subbasin Level for Lower Sweetwater Creek Watershed

Subbasin ID	Basin ID	Area (acres)	Volume (acre-feet)	Runoff coefficient	BOD5	TSS	TKN	NO3 +NO2	TN	TP	TDP	Oil and Grease	Cd	Cu	Pb	Zn
405555	LSW	18.924	31.97967	0.43	86.95337	1652.114	94.08355	24.4339	118.5175	34.8683	24.52085	93.90964	0.086953	1.130394	0.695627	1.912974
405560	LSW	5.307	8.968299	0.43	24.38499	463.3148	26.38456	6.852182	33.23674	9.778381	6.876567	26.33579	0.024385	0.317005	0.19508	0.53647
405580	LSW	2.316	3.913808	0.43	10.64173	202.1928	11.51435	2.990325	14.50467	4.267332	3.000967	11.49306	0.010642	0.138342	0.085134	0.234118
405700	LSW	111.526	142.1504	0.324324	386.5098	7343.686	418.2036	108.6092	526.8128	154.9904	108.9958	417.4305	0.38651	5.024627	3.092078	8.503215
406010	LSW	39.979	55.25727	0.351694	150.2457	2854.667	162.5658	42.21903	204.7848	60.24851	42.36927	162.2653	0.150246	1.953194	1.201965	3.305404
406020	LSW	40.777	58.10705	0.362594	157.9943	3001.891	170.9498	44.39639	215.3462	63.35571	44.55439	170.6338	0.157994	2.053926	1.263954	3.475874
406030	LSW	5.75	8.377817	0.370741	22.77946	432.8097	24.64737	6.401027	31.0484	9.134562	6.423807	24.60181	0.022779	0.296133	0.182236	0.501148
406100	LSW	10.38	13.13547	0.322	35.71563	678.5969	38.64431	10.03609	48.6804	14.32197	10.07181	38.57288	0.035716	0.464303	0.285725	0.785744
406120	LSW	6.937	9.259811	0.339655	25.17762	478.3747	27.24218	7.07491	34.31709	10.09622	7.100088	27.19183	0.025178	0.327309	0.201421	0.553908
406150	LSW	8.635	13.26549	0.390902	36.06913	685.3135	39.0268	10.13543	49.16223	14.46372	10.1715	38.95466	0.036069	0.468899	0.288553	0.793521
406170	LSW	6.952	10.92647	0.399924	29.70929	564.4766	32.14546	8.348312	40.49377	11.91343	8.378021	32.08604	0.029709	0.386221	0.237674	0.653604
406180	LSW	2.751	3.515236	0.325141	9.557998	181.602	10.34175	2.685797	13.02755	3.832757	2.695355	10.32264	0.009558	0.124254	0.076464	0.210276
406200	LSW	16.25	24.205	0.379017	65.81388	1250.464	71.21062	18.4937	89.70432	26.39137	18.55951	71.07899	0.065814	0.85558	0.526511	1.447905
406210	LSW	9.59	16.20614	0.43	44.06483	837.2318	47.67815	12.38222	60.06036	17.67	12.42628	47.59002	0.044065	0.572843	0.352519	0.969426
406230	LSW	15.389	26.00587	0.43	70.7105	1343.499	76.50876	19.86965	96.37841	28.35491	19.94036	76.36734	0.07071	0.919236	0.565684	1.555631
406310	LSW	7.784	10.49549	0.343089	28.53745	542.2116	30.87752	8.019024	38.89655	11.44352	8.047561	30.82045	0.028537	0.370987	0.2283	0.627824
406320	LSW	28.475	36.11716	0.322743	98.20331	1865.863	106.256	27.59513	133.8511	39.37953	27.69333	106.0596	0.098203	1.276643	0.785626	2.160473
406330	LSW	8.115	10.26921	0.322	27.92219	530.5216	30.21181	7.846135	38.05794	11.1968	7.874057	30.15596	0.027922	0.362988	0.223378	0.614288
406335	LSW	19.02	26.76509	0.358068	72.77484	1382.722	78.74237	20.44973	99.1921	29.18271	20.5225	78.59682	0.072775	0.946073	0.582199	1.601046
406340	LSW	12.954	18.94408	0.372115	51.50934	978.6774	55.7331	14.47412	70.20723	20.65524	14.52563	55.63008	0.051509	0.669621	0.412075	1.133205
406345	LSW	8.817	11.18982	0.322931	30.42535	578.0816	32.92022	8.549522	41.46975	12.20056	8.579948	32.85937	0.030425	0.39553	0.243403	0.669358
406360	LSW	4.424	5.606035	0.322439	15.24292	289.6156	16.49284	4.283262	20.77611	6.112413	4.298505	16.46236	0.015243	0.198158	0.121943	0.335344
406365	LSW	2.192	3.555707	0.412755	9.66804	183.6928	10.46082	2.716719	13.17754	3.876884	2.726387	10.44148	0.009668	0.125685	0.077344	0.212697
406370	LSW	9.466	12.51237	0.336341	34.02138	646.4062	36.81113	9.560008	46.37114	13.64257	9.594029	36.74309	0.034021	0.442278	0.272171	0.74847
406375	LSW	19.165	27.0322	0.358905	73.5011	1396.521	79.5282	20.65381	100.182	29.47394	20.72731	79.38119	0.073501	0.955514	0.588009	1.617024
406380	LSW	5.954	10.04384	0.429238	27.3094	518.8787	29.54877	7.673942	37.22272	10.95107	7.701252	29.49415	0.027309	0.355022	0.218475	0.600807
406420	LSW	30.913	39.11916	0.322	106.3658	2020.95	115.0878	29.88879	144.9766	42.65269	29.99516	114.8751	0.106366	1.382756	0.850927	2.340048
406450	LSW	11.673	14.77171	0.322	40.1646	763.1273	43.45809	11.28625	54.74434	16.106	11.32642	43.37776	0.040165	0.52214	0.321317	0.883621
406460	LSW	23.567	29.8231	0.322	81.08961	1540.703	87.73896	22.78618	110.5251	32.51693	22.86727	87.57678	0.08109	1.054165	0.648717	1.783971
406500	LSW	3.508	4.439234	0.322	12.07037	229.337	13.06014	3.391773	16.45191	4.840217	3.403844	13.036	0.01207	0.156915	0.096563	0.265548
406520	LSW	16.321	20.65357	0.322	56.15749	1066.992	60.7624	15.78025	76.54266	22.51915	15.83641	60.65009	0.056157	0.730047	0.44926	1.235465
406600	LSW	17.844	24.85332	0.354405	67.57669	1283.957	73.11798	18.98905	92.10703	27.09825	19.05663	72.98282	0.067577	0.878497	0.540614	1.486687
406610	LSW	4.159	5.263048	0.322	14.31034	271.8964	15.48378	4.021205	19.50499	5.738445	4.035515	15.45516	0.01431	0.186034	0.114483	0.314827
406620	LSW	42.82	54.187	0.322	147.3356	2799.376	159.4171	41.40129	200.8184	59.08156	41.54863	159.1224	0.147336	1.915362	1.178684	3.241382
406645	LSW	12.259	15.51327	0.322	42.18091	801.4373	45.63975	11.85284	57.49258	16.91455	11.89502	45.55538	0.042181	0.548352	0.337447	0.92798
406660	LSW	17.43	22.56884	0.329473	61.36515	1165.938	66.39709	17.24361	83.6407	24.60742	17.30497	66.27436	0.061365	0.797747	0.490921	1.350033
406675	LSW	11.283	14.27819	0.322	38.82268	737.6309	42.00614	10.90917	52.91531	15.56789	10.948	41.92849	0.038823	0.504695	0.310581	0.854099
406680	LSW	3.081	3.898882	0.322	10.60114	201.4217	11.47043	2.978921	14.44936	4.251058	2.989522	11.44923	0.010601	0.137815	0.084809	0.233225
406690	LSW	26.417	33.1586	0.319389	90.15893	1713.02	97.55196	25.33466	122.8866	36.15373	25.42482	97.37164	0.090159	1.172066	0.721271	1.983496
406710	LSW	12.644	16.00048	0.322	43.50562	826.6069	47.07309	12.22508	59.29817	17.44576	12.26859	46.98607	0.043506	0.565573	0.348045	0.957124
406800	LSW	3.925	4.966931	0.322	13.50519	256.5985	14.61261	3.794957	18.40757	5.41558	3.808463	14.5856	0.013505	0.175567	0.108041	0.297114
406805	LSW	12.326	15.59806	0.322	42.41145	805.8175	45.88918	11.91762	57.8068	17.00699	11.96003	45.80436	0.042411	0.551349	0.339292	0.933052
406810	LSW	19.126	24.20319	0.322	65.80897	1250.37	71.2053	18.49232	89.69762	26.3894	18.55813	71.07368	0.065809	0.855517	0.526472	1.447797

Appendix 11-1. Benchmark Pollutant Loads at the Subbasin Level for Lower Sweetwater Creek Watershed

Subbasin ID	Basin ID	Area (acres)	Volume (acre-feet)	Runoff coefficient	BOD5	TSS	TKN	NO3 +NO2	TN	TP	TDP	Oil and Grease	Cd	Cu	Pb	Zn
406840	LSW	4.99	6.314645	0.322	17.16965	326.2234	18.57756	4.824672	23.40223	6.88503	4.841842	18.54322	0.01717	0.223205	0.137357	0.377732
406850	LSW	0.594	0.751683	0.322	2.043842	38.833	2.211437	0.57432	2.785757	0.819581	0.576364	2.20735	0.002044	0.02657	0.016351	0.044965
406855	LSW	31.152	35.63056	0.291034	96.88021	1840.724	104.8244	27.22334	132.0477	38.84897	27.32022	104.6306	0.09688	1.259443	0.775042	2.131365
406870	LSW	19.542	24.65526	0.321032	67.03817	1273.725	72.5353	18.83773	91.37303	26.88231	18.90476	72.40122	0.067038	0.871496	0.536305	1.47484
406885	LSW	9.176	11.61186	0.322	31.57289	599.8849	34.16187	8.871982	43.03385	12.66073	8.903555	34.09872	0.031573	0.410448	0.252583	0.694604
406900	LSW	5.547	7.019507	0.322	19.08618	362.6375	20.65125	5.363217	26.01447	7.653559	5.382304	20.61308	0.019086	0.24812	0.152689	0.419896
406910	LSW	10.103	17.02	0.428664	46.27774	879.2771	50.07252	13.00405	63.07656	18.55738	13.05032	49.97996	0.046278	0.601611	0.370222	1.01811
406915	LSW	11.627	14.87394	0.325511	40.44255	768.4085	43.75884	11.36436	55.1232	16.21746	11.4048	43.67796	0.040443	0.525753	0.32354	0.889736
406935	LSW	0.671	1.024417	0.388474	2.785412	52.92283	3.013816	0.782701	3.796517	1.11695	0.785486	3.008245	0.002785	0.03621	0.022283	0.061279
406940	LSW	11.7	19.69416	0.428311	53.54882	1017.428	57.93982	15.04722	72.98704	21.47308	15.10077	57.83273	0.053549	0.696135	0.428391	1.178074
406950	LSW	5.919	7.932949	0.341031	21.56985	409.8272	23.33858	6.061128	29.39971	8.64951	6.082698	23.29544	0.02157	0.280408	0.172559	0.474537
407000	LSW	13.861	22.87363	0.419902	62.19387	1181.684	67.29377	17.47648	84.77025	24.93974	17.53867	67.16938	0.062194	0.80852	0.497551	1.368265
407100	LSW	17.418	27.63802	0.403753	75.14836	1427.819	81.31052	21.11669	102.4272	30.13449	21.19184	81.16022	0.075148	0.976929	0.601187	1.653264
407200	LSW	191.296	280.7728	0.373471	763.427	14505.11	826.028	214.523	1040.551	306.1342	215.2864	824.5011	0.763427	9.924551	6.107416	16.79539
407400	LSW	239.005	325.5954	0.34664	885.3007	16820.71	957.8953	248.7695	1206.665	355.0056	249.6548	956.1247	0.885301	11.50891	7.082406	19.47662
407600	LSW	68.065	92.47934	0.345723	251.4532	4777.611	272.0724	70.65836	342.7307	100.8327	70.90981	271.5695	0.251453	3.268892	2.011626	5.531971
407700	LSW	22.278	28.48608	0.32536	77.45423	1471.63	83.80548	21.76464	105.5701	31.05915	21.84209	83.65057	0.077454	1.006905	0.619634	1.703993
407800	LSW	23.07	31.43874	0.346757	85.48259	1624.169	92.49216	24.02061	116.5128	34.27852	24.10609	92.3212	0.085483	1.111274	0.683861	1.880617

Appendix 11-2. Water Quality Level of Service at the Subbasin Level for Lower Sweetwater Creek Watershed

Subbasin ID	Basin ID	BOD5	TSS	TKN	NO3 +NO2	TN	TP	TDP	Oil and Grease	Cd	Cu	Pb	Zn
400001	LSW	F	F	F	F	F	F	F	F	F	F	F	F
400002	LSW	F	F	F	F	F	F	F	F	F	F	D	F
400003	LSW	F	F	F	C	F	C	D	F	F	F	F	F
400100	LSW	F	C	F	B	F	F	F	F	F	F	C	F
400150	LSW	F	B	F	A	F	F	F	F	F	F	C	F
400200	LSW	F	F	F	F	F	F	F	F	F	F	F	F
400300	LSW	F	F	F	F	F	F	F	F	F	F	F	F
400350	LSW	F	F	F	F	F	F	F	F	F	F	F	F
400400	LSW	F	F	F	F	F	F	F	F	F	F	F	F
400500	LSW	F	F	F	F	F	F	F	F	F	F	F	F
400600	LSW	F	F	F	F	F	F	F	F	F	F	F	F
400605	LSW	F	F	F	F	F	F	F	F	F	F	F	F
400610	LSW	F	F	F	F	F	F	F	F	F	F	F	F
400620	LSW	F	F	F	F	F	F	F	F	F	F	F	F
400630	LSW	F	F	F	F	F	F	F	F	F	F	F	F
400650	LSW	F	F	F	F	F	F	F	F	F	F	F	F
400660	LSW	F	D	D	F	D	F	D	C	C	F	B	F
400700	LSW	F	F	F	F	F	F	F	F	F	F	F	F
400800	LSW	F	F	F	F	F	F	F	F	F	F	F	F
401000	LSW	F	F	F	F	F	F	F	F	F	F	C	F
401100	LSW	F	F	F	F	F	F	F	F	F	F	F	F
401110	LSW	F	F	F	F	F	F	F	F	F	F	F	F
401120	LSW	F	F	F	F	F	F	F	F	F	F	F	F
401130	LSW	F	F	F	F	F	F	F	F	F	F	F	F
401140	LSW	F	F	F	D	F	D	D	F	F	F	F	F
401190	LSW	F	D	F	B	F	C	D	D	F	F	F	F
401191	LSW	F	F	F	F	F	B	F	C	F	F	F	F
401200	LSW	F	F	F	F	F	F	F	F	F	F	F	F
401220	LSW	F	F	F	F	F	F	F	F	F	F	F	F
401240	LSW	F	F	F	F	F	F	F	F	F	F	F	F
401300	LSW	F	F	F	F	F	F	F	F	F	F	D	F
401320	LSW	F	F	F	F	F	F	F	F	F	F	F	F
401330	LSW	F	F	F	F	F	F	F	F	F	F	F	F
401400	LSW	F	C	D	D	D	C	C	B	C	D	B	C

Appendix 11-2. Water Quality Level of Service at the Subbasin Level for Lower Sweetwater Creek Watershed

Subbasin ID	Basin ID	BOD5	TSS	TKN	NO3 +NO2	TN	TP	TDP	Oil and Grease	Cd	Cu	Pb	Zn
401430	LSW	F	F	F	F	F	F	F	F	F	F	F	F
401500	LSW	C	A	B	B	B	A	A	A	A	A	A	A
401600	LSW	F	F	F	F	F	F	F	D	F	F	C	F
401604	LSW	F	D	F	F	F	F	F	F	F	F	C	F
401630	LSW	F	B	C	D	C	D	C	B	B	D	A	C
401632	LSW	F	F	F	F	F	F	F	F	F	F	F	F
401640	LSW	F	F	F	F	F	F	F	F	F	F	F	F
401642	LSW	F	C	F	B	F	F	F	F	F	F	C	F
401650	LSW	F	F	F	F	F	F	F	F	F	F	D	F
401652	LSW	F	F	F	F	F	F	F	D	F	F	F	F
401654	LSW	F	F	F	F	F	F	F	F	F	F	F	F
401656	LSW	F	A	D	A	C	A	B	C	C	A	A	A
401660	LSW	F	F	F	F	F	F	F	F	F	F	F	F
401664	LSW	F	F	F	F	F	F	F	F	F	F	F	F
401670	LSW	F	F	F	F	F	F	F	F	F	F	F	F
401690	LSW	F	F	F	F	F	F	F	F	F	F	F	F
401750	LSW	F	C	F	B	F	F	F	F	F	F	C	F
401850	LSW	F	C	F	B	F	F	F	F	F	F	C	F
402000	LSW	F	F	F	F	F	F	F	F	F	F	F	F
402100	LSW	F	F	F	F	F	F	F	D	F	F	D	F
402200	LSW	F	F	F	F	F	F	F	F	F	F	F	F
402210	LSW	F	F	F	F	F	F	F	F	F	F	F	F
402220	LSW	F	F	F	F	F	F	F	F	F	F	F	F
402230	LSW	F	F	F	F	F	F	F	F	F	F	F	F
402240	LSW	F	F	F	F	F	F	F	F	F	F	F	F
402250	LSW	F	F	F	F	F	F	F	F	F	F	D	F
402260	LSW	F	F	F	F	F	F	F	F	F	F	F	F
402270	LSW	F	F	F	F	F	F	F	F	F	F	F	F
402280	LSW	F	F	F	F	F	F	F	F	F	F	F	F
402285	LSW	F	F	F	F	F	F	F	F	F	F	F	F
402300	LSW	F	F	F	F	F	F	F	F	F	F	F	F
402310	LSW	F	F	F	F	F	F	F	F	F	F	F	F
402320	LSW	F	F	F	F	F	F	F	F	F	F	F	F
402330	LSW	F	F	F	F	F	F	F	F	F	F	D	F

Appendix 11-2. Water Quality Level of Service at the Subbasin Level for Lower Sweetwater Creek Watershed

Subbasin ID	Basin ID	BOD5	TSS	TKN	NO3 +NO2	TN	TP	TDP	Oil and Grease	Cd	Cu	Pb	Zn
402340	LSW	F	F	F	F	F	F	F	F	F	F	F	F
402350	LSW	F	F	F	F	F	F	F	F	F	F	F	F
402360	LSW	F	B	F	A	F	F	F	F	F	F	C	F
402370	LSW	F	F	F	F	F	F	F	F	F	F	F	F
402400	LSW	F	F	F	F	F	F	F	F	F	F	D	F
402500	LSW	F	F	F	F	F	F	F	F	F	F	F	F
402510	LSW	F	F	F	F	F	F	F	F	F	F	F	F
402520	LSW	F	F	F	F	F	F	F	F	F	F	F	F
402600	LSW	F	F	F	F	F	F	F	F	F	F	F	F
402610	LSW	F	F	F	F	F	F	F	F	F	F	F	F
402620	LSW	F	F	F	F	F	F	F	F	F	F	F	F
402630	LSW	F	F	F	F	F	F	F	F	F	F	F	F
402640	LSW	F	F	F	F	F	F	F	F	F	F	F	F
402700	LSW	F	F	F	F	F	F	F	F	F	F	F	F
402800	LSW	F	F	F	F	F	F	F	D	D	F	C	F
402810	LSW	F	F	F	F	F	F	F	F	F	F	F	F
402820	LSW	F	F	F	F	F	F	F	F	F	F	F	F
402830	LSW	F	F	F	F	F	F	F	D	F	F	F	F
402840	LSW	F	F	F	F	F	D	D	F	F	F	D	F
402850	LSW	F	F	F	F	F	F	F	F	F	F	F	F
402860	LSW	F	F	F	F	F	D	C	C	F	F	C	F
402870	LSW	F	F	F	F	F	F	F	F	F	F	F	F
402880	LSW	F	F	F	F	F	F	F	F	F	F	F	F
402900	LSW	F	F	F	F	F	F	F	F	F	F	F	F
402920	LSW	F	F	F	F	F	F	F	F	F	F	F	F
402930	LSW	F	F	F	F	F	F	F	F	F	F	F	F
402940	LSW	F	F	F	F	F	F	F	F	F	F	F	F
402950	LSW	F	F	F	F	F	F	F	F	F	F	D	F
403000	LSW	F	F	F	F	F	F	F	D	F	F	D	F
403060	LSW	F	F	F	F	F	F	F	F	F	F	F	F
403070	LSW	F	F	F	F	F	D	F	D	F	F	F	F
403100	LSW	F	F	F	F	F	F	F	F	F	F	F	F
403110	LSW	F	F	F	F	F	F	F	F	F	F	D	F
403120	LSW	F	F	F	F	F	F	F	F	F	F	F	F

Appendix 11-2. Water Quality Level of Service at the Subbasin Level for Lower Sweetwater Creek Watershed

Subbasin ID	Basin ID	BOD5	TSS	TKN	NO3 +NO2	TN	TP	TDP	Oil and Grease	Cd	Cu	Pb	Zn
403130	LSW	F	F	F	F	F	F	F	F	F	F	F	F
403140	LSW	F	F	F	F	F	F	F	F	F	F	F	F
403170	LSW	F	F	F	F	F	F	F	F	F	F	F	F
403180	LSW	F	F	F	F	F	F	F	D	F	F	F	F
403190	LSW	F	F	F	F	F	F	F	F	F	F	F	F
403200	LSW	F	F	F	F	F	C	F	D	F	F	F	F
403220	LSW	F	F	F	F	F	F	D	D	F	F	D	F
403230	LSW	F	F	F	F	F	F	D	D	F	F	F	F
403250	LSW	F	F	F	F	F	F	D	D	F	F	F	F
403260	LSW	F	D	F	C	F	D	D	F	F	F	C	D
403270	LSW	F	F	F	F	F	C	F	C	F	F	F	F
403300	LSW	F	F	F	F	F	C	C	D	F	F	C	F
403370	LSW	F	B	F	A	F	C	D	D	F	F	B	C
403400	LSW	F	D	F	F	F	C	C	F	F	F	D	F
403410	LSW	F	F	F	F	F	C	F	D	F	F	F	F
403425	LSW	F	F	F	F	F	F	D	D	F	F	D	F
403435	LSW	F	D	F	D	F	C	D	D	F	F	C	D
403445	LSW	F	F	F	F	F	D	D	D	F	F	C	F
403450	LSW	F	D	F	D	F	D	D	F	F	F	C	F
403460	LSW	F	C	F	F	F	B	B	F	D	C	B	F
403462	LSW	F	F	F	F	F	D	D	F	F	F	F	F
403465	LSW	F	F	F	F	F	F	D	F	F	F	D	F
403470	LSW	F	D	F	D	F	D	C	F	F	F	C	F
403480	LSW	F	D	F	C	F	D	D	F	F	F	D	F
403510	LSW	F	F	F	F	F	F	F	F	F	F	F	F
403520	LSW	F	F	F	F	F	F	D	D	F	F	F	F
403530	LSW	F	C	F	B	F	C	D	D	F	F	C	C
403540	LSW	F	D	F	D	F	D	D	D	F	F	C	D
403550	LSW	F	F	F	F	F	D	D	F	F	F	F	F
403560	LSW	F	F	F	F	F	F	F	F	F	F	F	F
403570	LSW	F	F	F	F	F	F	F	F	F	F	F	F
403580	LSW	F	F	F	F	F	F	D	D	F	F	F	F
403590	LSW	F	F	F	F	F	C	C	F	F	F	F	F
403600	LSW	F	F	F	F	F	F	F	F	F	F	F	F

Appendix 11-2. Water Quality Level of Service at the Subbasin Level for Lower Sweetwater Creek Watershed

Subbasin ID	Basin ID	BOD5	TSS	TKN	NO3 +NO2	TN	TP	TDP	Oil and Grease	Cd	Cu	Pb	Zn
403610	LSW	F	F	F	F	F	C	F	F	F	F	F	F
403650	LSW	F	F	F	F	F	F	F	F	F	F	F	F
403700	LSW	F	F	F	F	F	F	F	F	F	F	F	F
403710	LSW	F	B	F	F	F	A	B	C	C	A	A	A
403720	LSW	F	B	F	F	F	A	B	C	C	A	A	A
403730	LSW	F	B	D	D	D	A	B	C	C	A	A	A
403750	LSW	F	D	F	F	F	C	C	F	D	F	C	F
403800	LSW	F	F	F	F	F	F	F	F	F	F	F	F
403810	LSW	F	F	F	F	F	F	F	F	F	F	F	F
403820	LSW	F	F	F	F	F	F	F	F	F	F	F	F
403830	LSW	F	F	F	F	F	F	F	F	F	F	F	F
403840	LSW	F	F	F	F	F	F	F	F	F	F	F	F
403850	LSW	F	F	F	F	F	F	F	F	F	F	F	F
403860	LSW	F	F	F	F	F	F	F	F	F	F	F	F
403900	LSW	F	F	F	F	F	F	F	F	F	F	F	F
404000	LSW	F	F	F	F	F	F	F	F	F	F	F	F
404010	LSW	F	F	F	F	F	F	F	F	F	F	F	F
404100	LSW	F	F	F	F	F	F	F	F	F	F	F	F
404200	LSW	F	F	F	F	F	F	F	F	F	F	F	F
404300	LSW	F	F	F	F	F	F	F	F	F	F	D	F
404310	LSW	F	F	F	F	F	F	F	F	F	F	F	F
404320	LSW	F	F	F	F	F	F	F	D	F	F	C	F
404330	LSW	F	F	F	F	F	C	D	C	F	F	F	F
404340	LSW	F	F	F	F	F	F	F	F	F	F	F	F
404350	LSW	F	F	F	F	F	F	F	D	F	F	F	F
404360	LSW	F	F	F	F	F	F	F	F	F	F	F	F
404400	LSW	F	F	F	F	F	F	F	D	F	F	F	F
404410	LSW	F	F	F	F	F	D	F	D	F	F	F	F
404415	LSW	B	A	A	A	A	A	A	A	A	A	A	A
404420	LSW	F	F	F	F	F	F	F	D	F	F	F	F
404430	LSW	F	F	F	F	F	F	F	F	F	F	F	F
404450	LSW	F	F	F	F	F	F	F	F	F	F	F	F
404460	LSW	F	F	F	F	F	F	F	F	F	F	F	F
404470	LSW	F	D	F	F	F	F	F	F	F	F	D	F

Appendix 11-2. Water Quality Level of Service at the Subbasin Level for Lower Sweetwater Creek Watershed

Subbasin ID	Basin ID	BOD5	TSS	TKN	NO3 +NO2	TN	TP	TDP	Oil and Grease	Cd	Cu	Pb	Zn
404498	LSW	F	F	F	F	F	F	F	D	F	F	F	F
404500	LSW	F	F	F	F	F	F	F	F	F	F	D	F
404600	LSW	F	F	F	F	F	F	F	F	F	F	F	F
404620	LSW	F	F	F	F	F	F	F	F	F	F	D	F
404630	LSW	F	F	F	F	F	F	F	F	F	F	D	F
404650	LSW	F	F	F	F	F	F	F	F	F	F	D	F
404698	LSW	F	F	F	F	F	F	F	F	F	F	F	F
404710	LSW	F	F	F	F	F	F	F	F	F	F	F	F
404720	LSW	F	F	F	F	F	F	F	F	F	F	D	F
404800	LSW	F	F	F	F	F	F	F	F	F	F	F	F
404810	LSW	F	F	F	F	F	F	F	F	F	F	F	F
404820	LSW	F	F	F	F	F	F	F	F	F	F	F	F
404830	LSW	F	F	F	F	F	F	F	F	F	F	F	F
404840	LSW	F	F	F	F	F	F	F	F	F	F	F	F
404900	LSW	F	F	F	F	F	F	F	F	F	F	D	F
404940	LSW	F	F	F	F	F	F	F	F	F	F	D	F
404950	LSW	F	F	F	F	F	F	F	F	F	F	F	F
404960	LSW	F	F	F	F	F	F	F	F	F	F	F	F
404970	LSW	F	F	F	F	F	F	F	F	F	F	D	F
404980	LSW	F	F	F	F	F	F	F	F	F	F	F	F
404985	LSW	F	F	F	F	F	F	F	F	F	F	D	F
404990	LSW	F	D	F	F	F	F	F	D	F	F	D	F
405000	LSW	F	F	F	F	F	F	D	F	F	F	F	F
405110	LSW	F	F	F	F	F	F	D	F	F	F	D	F
405130	LSW	F	F	F	F	F	F	D	F	F	F	D	F
405150	LSW	F	D	F	D	F	D	D	D	F	F	C	D
405165	LSW	F	F	F	F	F	F	D	F	F	F	F	F
405180	LSW	F	F	F	C	F	C	D	D	F	F	F	F
405210	LSW	F	F	F	F	F	C	F	C	F	F	F	F
405220	LSW	F	F	F	F	F	B	D	B	F	F	F	F
405235	LSW	F	F	F	F	F	C	F	C	F	F	F	F
405270	LSW	F	F	F	F	F	C	F	C	F	F	F	F
405280	LSW	F	F	F	F	F	C	F	C	F	F	F	F
405285	LSW	F	F	F	F	F	B	F	B	F	F	F	F

Appendix 11-2. Water Quality Level of Service at the Subbasin Level for Lower Sweetwater Creek Watershed

Subbasin ID	Basin ID	BOD5	TSS	TKN	NO3 +NO2	TN	TP	TDP	Oil and Grease	Cd	Cu	Pb	Zn
405292	LSW	F	F	F	F	F	B	F	C	F	F	F	F
405294	LSW	F	F	F	F	F	C	F	C	F	F	F	F
405305	LSW	F	F	F	F	F	C	F	C	F	F	F	F
405410	LSW	F	F	F	F	F	C	F	C	F	F	F	F
405420	LSW	F	F	F	F	F	C	F	C	F	F	F	F
405460	LSW	F	F	F	F	F	C	F	C	F	F	F	F
405480	LSW	F	F	F	F	F	C	F	C	F	F	F	F
405490	LSW	F	F	F	F	F	F	F	F	F	F	F	F
405500	LSW	F	F	F	F	F	C	F	C	F	F	F	F
405535	LSW	F	F	F	F	F	F	F	F	F	F	F	F
405540	LSW	F	F	F	F	F	C	F	C	F	F	F	F
405555	LSW	F	F	F	F	F	C	F	C	F	F	F	F
405560	LSW	F	F	F	F	F	C	F	C	F	F	F	F
405580	LSW	F	F	F	F	F	C	F	C	F	F	F	F
405700	LSW	F	F	F	F	F	F	F	F	F	F	F	F
406010	LSW	F	F	F	F	F	F	F	F	F	F	F	F
406020	LSW	F	F	F	F	F	D	D	F	F	F	F	F
406030	LSW	F	F	F	F	F	F	F	F	F	F	F	F
406100	LSW	F	D	F	D	F	F	F	F	F	F	C	F
406120	LSW	F	F	F	F	F	F	F	F	F	F	F	F
406150	LSW	F	F	F	F	F	F	F	F	F	F	F	F
406170	LSW	F	F	F	F	F	F	F	D	F	F	F	F
406180	LSW	F	F	F	F	F	F	D	F	F	F	D	F
406200	LSW	F	F	F	F	F	F	F	F	F	F	D	F
406210	LSW	F	F	F	F	F	F	F	D	F	F	F	F
406230	LSW	F	F	F	F	F	F	F	D	F	F	F	F
406310	LSW	F	F	F	F	F	F	D	F	F	F	D	F
406320	LSW	F	F	F	F	F	F	F	F	F	F	F	F
406330	LSW	F	F	F	F	F	F	F	F	F	F	F	F
406335	LSW	F	F	F	F	F	F	D	F	F	F	F	F
406340	LSW	F	F	F	F	F	F	F	F	F	F	F	F
406345	LSW	F	F	F	F	F	F	F	F	F	F	F	F
406360	LSW	F	F	F	F	F	F	D	F	F	F	D	F
406365	LSW	F	F	F	F	F	F	D	F	F	F	D	F

Appendix 11-2. Water Quality Level of Service at the Subbasin Level for Lower Sweetwater Creek Watershed

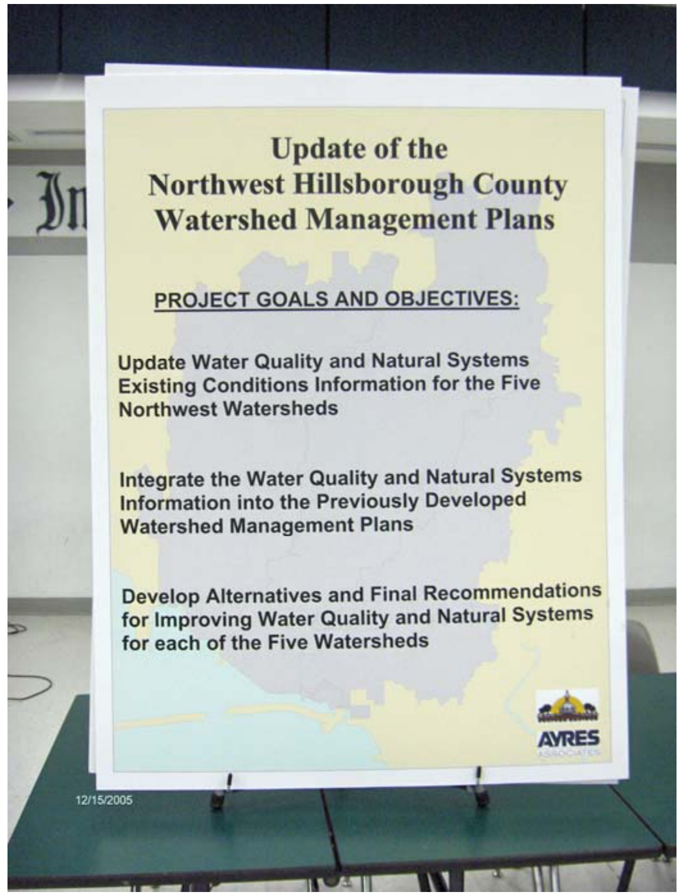
Subbasin ID	Basin ID	BOD5	TSS	TKN	NO3 +NO2	TN	TP	TDP	Oil and Grease	Cd	Cu	Pb	Zn
406370	LSW	F	F	F	F	F	F	D	F	F	F	F	F
406375	LSW	F	F	F	F	F	F	F	F	F	F	F	F
406380	LSW	F	F	F	F	F	F	D	F	F	F	D	F
406420	LSW	F	F	F	F	F	F	D	F	F	F	F	F
406450	LSW	F	F	F	F	F	F	F	F	F	F	F	F
406460	LSW	F	F	F	F	F	F	F	F	F	F	F	F
406500	LSW	F	F	F	F	F	F	D	F	F	F	D	F
406520	LSW	F	F	F	F	F	F	D	F	F	F	D	F
406600	LSW	F	F	F	F	F	F	D	F	F	F	D	F
406610	LSW	F	F	F	F	F	F	D	F	F	F	D	F
406620	LSW	F	F	F	F	F	F	F	F	F	F	F	F
406645	LSW	F	F	F	F	F	F	D	F	F	F	D	F
406660	LSW	F	F	F	F	F	F	D	F	F	F	D	F
406675	LSW	F	F	F	F	F	F	D	F	F	F	D	F
406680	LSW	F	F	F	F	F	F	D	F	F	F	D	F
406690	LSW	F	F	F	F	F	F	F	F	F	F	F	F
406710	LSW	F	F	F	F	F	F	D	F	F	F	D	F
406800	LSW	F	F	F	F	F	F	D	F	F	F	D	F
406805	LSW	F	F	F	F	F	F	D	F	F	F	D	F
406810	LSW	F	F	F	F	F	F	D	F	F	F	D	F
406840	LSW	F	F	F	F	F	F	F	F	F	F	F	F
406850	LSW	F	F	F	F	F	F	D	F	F	F	D	F
406855	LSW	F	F	F	F	F	F	F	F	F	F	F	F
406870	LSW	F	F	F	F	F	F	F	F	F	F	D	F
406885	LSW	F	F	F	F	F	F	D	F	F	F	D	F
406900	LSW	F	F	F	F	F	D	D	F	F	F	C	F
406910	LSW	F	F	F	F	F	F	F	F	F	F	F	F
406915	LSW	F	F	F	F	F	D	D	F	F	F	C	F
406935	LSW	F	F	F	F	F	F	D	F	F	F	D	F
406940	LSW	F	F	F	F	F	D	F	D	F	F	F	F
406950	LSW	F	F	F	F	F	F	F	F	F	F	F	F
407000	LSW	F	F	F	F	F	C	F	C	F	F	F	F
407100	LSW	F	F	F	F	F	C	F	D	F	F	F	F
407200	LSW	F	F	F	F	F	C	D	D	F	F	F	F

Appendix 11-2. Water Quality Level of Service at the Subbasin Level for Lower Sweetwater Creek Watershed

Subbasin ID	Basin ID	BOD5	TSS	TKN	NO3 +NO2	TN	TP	TDP	Oil and Grease	Cd	Cu	Pb	Zn
407400	LSW	F	F	F	F	F	F	F	F	F	F	F	F
407600	LSW	F	A	D	C	D	A	B	B	F	F	B	A
407700	LSW	F	F	F	F	F	D	F	D	F	F	F	F
407800	LSW	F	F	F	F	F	F	F	F	F	F	F	F

CHAPTER 12: PUBLIC MEETING

The first public meeting was held on December 14, 2005 at Sickles High School (Hillsborough County, Florida). The meeting began at approximately 6:30 p.m. and ended at approximately 8:30 p.m. EDT.



A handout containing the project description, project history, and a list of project contacts was made available to the public (Appendix 12-1), along with comment forms.

The format of the public meeting was relatively informal and was conducted for the purposes of sharing information about the project and providing the public with information about the state of water quality in the Brooker Creek, Double Branch, Rocky/Brushy Creek, Sweetwater, and Lower Sweetwater watersheds. The meeting agenda included the following topics:

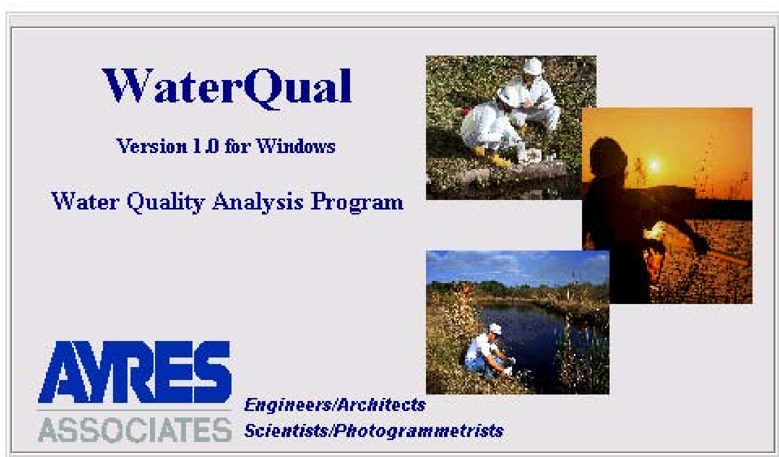
- Introduction
- Goals and objectives of the project
- Description and purpose of the project
- Brief description of other similar projects currently conducted in the area
- Description of the current state of water quality within the project area.
- Questions and answers
- Answering individual questions at the stations.

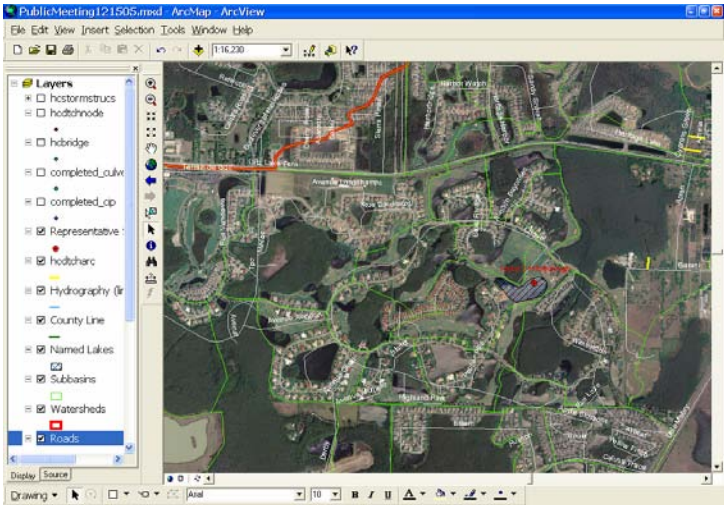
The first portion of the meeting was in the form of a speech, which helped acquaint the local residents with the water quality state of their watersheds and the objectives of the project. A number of poster-sized maps were positioned around the room.

They included:

- Goals and objectives of the project.
- Detailed location map of the project area.
- Aerial photography map of the project area.
- Brooker Creek watershed: location of selected water quality sampling stations and TSI and dissolved oxygen concentration graphs for those locations.
- Double Branch watershed: location of selected water quality sampling stations and TSI and dissolved oxygen concentration graphs for those locations.
- Rocky/Brushy Creek watershed: location of selected water quality sampling stations and TSI and dissolved oxygen concentration graphs for those locations.
- Sweetwater Creek watershed: location of selected water quality sampling stations and TSI and dissolved oxygen concentration graphs for those locations.
- Lower Sweetwater Creek watershed: location of selected water quality sampling stations and TSI and dissolved oxygen concentration graphs for those locations.

Two laptops with GIS capabilities were connected to projectors. One of them contained a GIS database with the following data layers: aerial photography, land use (1999), ELAPP, watershed and subbasin boundary, lakes, water quality stations, CIPs, culverts, and bridge locations. Knowing the name of a lake or a street intersection, an interested resident could obtain a variety of information about a specific area of concern. The second laptop was geared with the WaterQual, a software capable of quickly analyzing and graphically presenting water quality data for different contaminants. By obtaining the name of a water quality station from either the GIS database or one of the posters, an interested resident had an ability to view various historical and recent water quality data trends for a specific location.





Following the Hillsborough County personnel presentation regarding the general description of the project, as well as the state of water quality in the aforementioned watersheds, the floor was opened for questions. The residents of the area asked a number of interesting questions regarding various concerns. One participant asked about the impacts of leaking septic systems on water quality in the watershed. She also requested additional information regarding the preventive maintenance of her septic system that could prevent bacteria from entering ground and surface waters. Another resident requested additional description of the TMDL process. Other questions were pointing at the sufficiency of existing regulations for accidental or deliberate release of chemicals.

After the question and answer session, residents were encouraged to look at the posters and utilize the laptop stations that presented additional information about water quality in the area. Hillsborough County and Ayres Associates staff assumed positions at different stations around the room and spent the next hour answering individual questions of the meeting participants.

For further information about the state of the watershed, the public was encouraged to visit the Hillsborough County Watershed Atlas website at http://www.hillsborough.wateratlas.usf.edu/.

Hillsborough County
Florida

Office of the County Administrator
Patricia G. Bean

Update of the Northwest Hillsborough County Watershed Management Plans CIP 48515

Presented by
Your Stormwater Management Section

December 15, 2005, 6:30 p.m. at Sickles High School

Project Manager:	**David Glicksberg, P.G.**
Project Design Engineer:	**Hamid Bojd, Ph.D., P.E.**
Meeting Secretary:	**Pate Lavacca**
Transportation Maintenance:	**Andy Morris (West Unit)**
Moderator:	**Martin Montalvo**

Introduction:

County staff will be presenting information relative to this project and receiving community input. In order to convey the information in an efficient manner and maximize the use of your time, it is respectfully requested that all questions and comments be held until the end of the presentation. Everyone will have a chance to be heard. We will gladly stay as late as it takes to answer your questions and hear all your comments. Please write down your comments as we go along. At the end of our presentation ample time will be available to answer any questions and receive comments and suggestions

This document, the meeting summary, provides a brief history of the project and what the goals of this meeting are. Included with this handout are two additional documents. These documents are the Glossary and List of Abbreviations and the Proposed Projects Comment Sheet. The Glossary and List of Abbreviations has been provided in order to define and alleviate any confusion that may be involved with the use of technical and scientific terms. If any term should arise that has not been listed within this document, please do not hesitate to ask us to clarify. The Proposed Project Comment Sheet allows you, the citizen, to provide feedback regarding the project that will be presented here this evening.

Project History:

Hillsborough County Stormwater Management Section had previously conducted watershed plans for each of the watersheds within the northwest portion of the county. These watersheds include Brooker Creek, Double Branch, Rocky / Brushy Creek, Sweetwater Creek and Lower Sweetwater Creek. This first generation of watershed plans focused primarily on flooding and stormwater conveyance. Since these first generation plans were completed in 2000, the County has made strides to incorporate both water quality and natural systems into the next generation of watershed plans. These new plans both account for the existing water quality conditions but also account for and inventory any natural areas within each watershed.

Funding Source:

This project is funded as part of the Capital Improvement Program (CIP). This funding is collected with your real estate taxes as a stormwater fee and transferred into the CIP fund. The total budget for this project is $356,000.00 with $150,000 from the Southwest Florida Water Management District.

Project Description:

This project will incorporate the previously completed engineering portions of the watershed plans for Brooker Creek, Double Branch, Rocky / Brushy Creek, Sweetwater Creek and Lower Sweetwater Creek with the existing water quality and natural systems data. These new unified plans will then use the information gathered to develop recommended projects within each of the watersheds to address any deficiencies that are identified.

Important County Phone Numbers:

Community Relations Coordinator:	(813) 272-5275
Planning and Growth Management:	(813) 272-5920
Public Works/Engineering Division:	(813) 272-5912
Transportation Maintenance: West Service Unit:	(813) 554-5006
Stormwater Management Section:	(813) 272-5912
SWFWMD (Brooksville HQ)	(800) 423-1476
SWFWMD (Tampa Regulatory Office)	(813) 985-7481
Water Resource Team:	(813) 301-7206

THANKS FOR HELPING US SERVE YOU BETTER
Your Stormwater Management Section

GLOSSARY AND LIST OF ABBREVIATIONS

Aquifer – An underground source of water that contains enough saturated, permeable material (usually sand or limestone) to allow water to flow through it

Basin - An area in which water collects and pools for an extended period of time during a rain event

Berm - An edge or shoulder running alongside a road, canal, etc.

Bloom - Generally refers to a sudden increase in algae or other micro-organisms due to favorable growth conditions, such as high level of nutrients or suitable temperature.

Box Culvert – A man made structure, typically box shaped and open on two ends, designed to convey stormwater runoff.

Canal – An artificial or natural waterway or improved channel designed for conveying stormwater runoff.

Catch Basin - Inlet structure that is usually built at the curb line of a street which permits surface water runoff to flow into a storm sewer while retaining grit and debris below the invert elevations of the storm sewer pipes.

CCMP - Comprehensive Conservation and Management Plan for Tampa Bay by the National Estuary Program

Closed basin - A water basin which has no outfall

Confining layer - Impervious or low permeability layers generally found above and below an aquifer, these are usually limestone or clay or a mixture of both

Control structure – A structure or device designed to control water elevation by allowing water to released for the system when a designed water elevation is achieved

Cross drain – A pipe running perpendicular beneath a road

Crown - The top end elevation of a pipe or road

Culvert - A strategically placed pipe used to direct water from one point to another

CWA - Clean Water Act (United States)

CWM - Comprehensive Watershed Management Plan; implemented by SWFWMD

DCW - Delaney Creek Watershed

DEP - Department of Environmental Protection (Florida)

Detention area – An area designed to retain water only for a certain level or time, in which provides temporary storage and water quality treatment, i.e. a swale, ditch or pond

Discharge – The volume of water that passes a given location within a given period of time. Usually expressed in cubic feet per second

Ditch - A long narrow excavation made in the ground for the purpose of drainage or irrigation; the sides of a ditch are generally steeper than a swale

DOM - Dissolved Organic Matter

DRI - Development of Regional Impact

Driveway culvert – Driveway culverts or pipes, are normally placed in an open drainage system to gain access to a residence or place of business. In accordance with Ordinance No. 84-05, the property owner is responsible for the repair and replacement of the pipe and the culvert. The county will clean the pipe and maintain flow.

Ecosystem - An inter-related group of plants and animals that are distinct

ELAPP – Environmental Lands Acquisition and Protection Program; a program within Hillsborough County to purchase and restore environmentally sensitive lands.

End treatment – A structure located at one or both ends of a pipe system to provide structural support and prevent erosion

EPA - Environmental Protection Agency of the United States

EPC - Environmental Protection Commission of Hillsborough County

Exotic Species - A plant or animal that does not naturally occur in Hillsborough County and is generally introduced by man either on purpose or inadvertently

FAC - Florida Administrative Codes

Fecal Coliform & Total Coliform Total coliform are a collection of relatively harmless microorganisms that live in large numbers in the intestines of man and warm- and cold-blooded animals. They aid in the digestion of food. A specific subgroup of this collection is the fecal coliform bacteria, the most common member being *Escherichia coli* (*E. coli*). These organisms may be separated from the total coliform group by their ability to grow at elevated temperatures and are associated only with the fecal material of warm-blooded animals. The presence of fecal coliform bacteria in aquatic environments indicates that the water has been contaminated with the fecal material of man or other animals. At the time this occurred, the source water may have been contaminated by pathogens or disease producing bacteria or viruses which can also exist in fecal material.

FEMA- Federal Emergency Management Agency; an independent agency reporting to the President and tasked with responding to, planning for, recovering from and mitigating against disaster

Fragmentation - The carving up of an ecosystem into smaller pieces or fragments that usually can not provide all the advantages of the original larger system

GIS - Geographical Information Systems

Groundwater - Water, below the water table, that fills all the open areas of the underlying material

Headwall – A perpendicular end treatment for a stormwater pipe system

Herbaceous - A plant that contains no woody parts or a plant community that contains no woody trees or shrubs

Hydric soil - A soil that is saturated, flooded or ponded long enough during the growing season to develop conditions that favor the growth of wetland (hydrophytic) vegetation.

Hydrology - The study of the occurrence, distribution, and chemistry of all waters of the earth

Hydroperiod – The duration and time in which an area is inundate with water

Impervious - A material, such as concrete or asphalt, that does not allow water (or air or roots) to naturally penetrate into the soil

Inlet – Entry or collection point of water into a basin

Invert - The bottom end elevation of a pipe

Karst Geology - An area underlain by limestone which has dissolved to some degree and forms a depression, sinkhole or small basin

Lake - Relatively large bodies of natural or man-made standing water in which open water areas predominate over shallow vegetated areas.

Laterals - A pipe that extends from a main trunk line to carry stormwater from adjacent areas

LDC - Land Development Code for Hillsborough County

Listed Species - Plant or animal species that are designated (listed) as endangered, threatened or species of special concern by the federal and/or state government and therefore receive special protection under the law

Littoral Shelf - The ledge, usually in a lake, where the water level is shallow enough to allow the growth of either emergent or submerged plants

LOS - (Level of Service) The flood level designations contained within a Comprehensive Plan with A being the highest level and D being the lowest.

Level	HC Comprehensive Plan Definitions	Master Plan Interpretations
A	No significant street flooding	No flooding
B	No major residential yard flooding	Street flooding is 3" or more above the crown
C	No significant structure flooding	Site flooding is 6" or more
D	No limitation on flooding	Structure flooding

MFL - Minimum Flows and Levels

mg - Milligram or one-thousandth of a gram (1×10^{-4})

Mitigation area – Mitigation is an action or series of actions to offset the adverse impacts that would otherwise cause a regulated to fail to meet the criteria set forth in the Environmental Resource Permit. Mitigation consists of restoration, enhancement, creation, preservation, or a combination thereof of wetlands and upland plantings.

NEP - National Estuary Program of Tampa Bay

NGVD - National Geodetic Vertical Datum; a standardized method of measuring elevation

Non-point source pollution - Diffuse pollution that enters from multiple, rather than single sources and cannot be easily traced, such as acid rain or runoff from paved roads that carry oil and other pollutants

NPDES - National Pollutant Discharge Elimination System; A federal program for improving national water quality

Nuisance Species - Generally referring to plants; a plant that is native or naturally occurring in Hillsborough County but which is highly invasive or otherwise disruptive to natural communities

Nuisance Standing Water – Water that is less than 5 inches that may be an inconvenience to the property owner but not a threat to the property or person. This water may dissipate within 72 hours if the water table is not involved.

Open basin – A water basin which has one or more outfalls

Outfall – The place where a sewer, drain, or stream discharges; the outlet or structure through which reclaimed water or treated effluent is finally discharged to a receiving waterbody.

Percolation – The movement of water through the openings in rock or soil; the entrance of a portion of a stream flow into the channel materials to contribute to ground water replenishment

Permeability - The ability or rate at which water or other liquids can pass through something, such as water passing through various layers of soil

Point source discharge - Pollution originating from a specific area and usually discharged by an outfall pipe as from an industrial area or a stormwater drain from a roadside

Pop-off - a mechanism or device to release excess water from system after it has achieved a specified level or pressure, to pre-designed area or receiving body

Pond – Natural or man made bodies of water having defined boundaries and which can function to control, retain and convey stormwater runoff.

Receiving Body- The downstream waterbody that gets water from another contributing waterbody, i.e. Tampa Bay is the receiving body for the Hillsborough River

Retention area – An area designed to permanently contain stormwater, i.e. pond or lake

Roadside Ditch – A man-made conveyance to provide, during major/minor stormwater runoff events, temporary storage and conveyance of stormwater from associated roadway and adjacent properties.

SCS - United States Soil Conservation Service; now known as the Natural Resource Conservation Service (NRCS)

Seasonal High Groundwater Elevation -The elevation to which the groundwater can be expected to rise during a normal wet season.

Skimmer – A device that skims floating debris and oil from water before it discharges into the receiving water.

Storm Sewer – A collection of inlets, junction boxes and underground culverts or pipes that form a complete system to collect and convey water from several points to an outfall point.

Stormwater Runoff - Water that begins as rain or irrigation that flows over land; as a general rule as the water picks up nutrients, sediments and other chemical during this overland flow.

Swale – A low place in a tract of land; a valley like intersection of two slopes on a piece of land; the sides of swale are generally less steep than a ditch

SWIFTMUD or SWFWMD - Southwest Florida Water Management District; The state designated water management district responsible for regulating this regions water resources

TMDL - Total Maximum Daily Load, the sum of allowable discharges that can enter a water body or water shed area and includes point and non-point sources as well as a margin of safety.

Topography – The detailed mapping or charting of the features of an area (the lay of the land)

Tributaries – A stream contributing its flow to a larger stream or other body of water

TSI - Trophic State Index, a measure of water quality using total phosphorus concentration, chlorophyll concentration, nitrogen concentration and alternately Secchi Disk depth

TSS - Total suspended solids or the amount of particles in a unit of water

ug - Microgram or one millionth of a gram (1×10^{-6} gram)

USGS - United States Geological Service

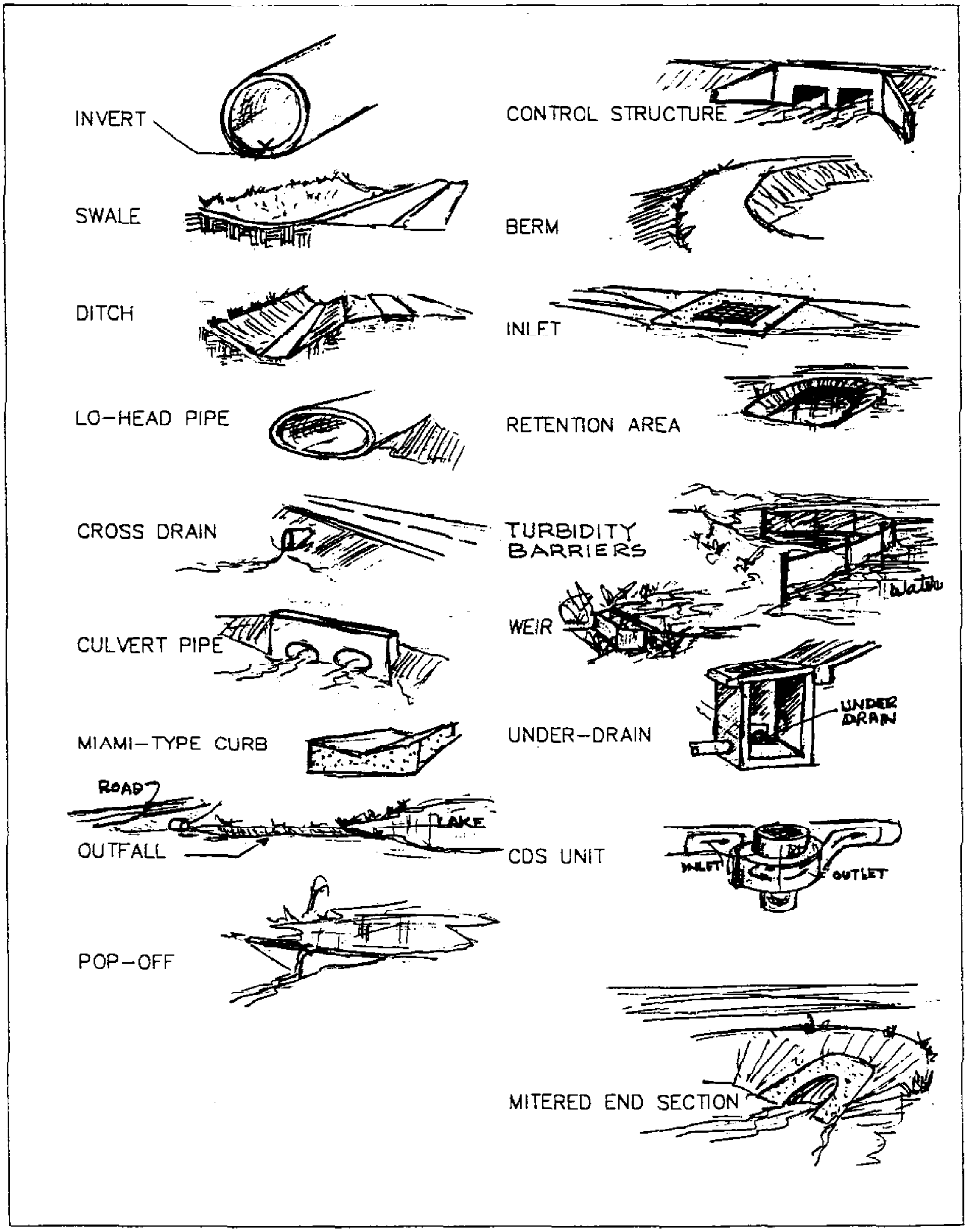
Water Control Structure – A man made device constructed of concrete, steel, earth, etc. Some have weir openings, skimmers, and small orifices for runoff or drain down. Others are much larger with a number of gates that open and close to control water flow.

Watershed – The land area that drains water to a particular stream, river, or lake.

Weir – A small dam in a river or stream; an obstruction placed across a stream to cause the water to pass through a particular opening

Wetland – Those areas that are inundated or saturated by surface water or ground water at a frequency and duration sufficient to support, and under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soils.

WQI - Water Quality Index; a system of summarizing water quality of a stream using the parameters of water clarity, dissolved oxygen, oxygen-demanding substances, bacteria, nutrients and biological diversity


INVERT
CONTROL STRUCTURE
SWALE
BERM
DITCH
INLET
LO-HEAD PIPE
RETENTION AREA
CROSS DRAIN
TURBIDITY BARRIERS
water
CULVERT PIPE
WEIR
MIAMI-TYPE CURB
UNDER-DRAIN
UNDER DRAIN
ROAD
LAKE
OUTFALL
CDS UNIT
INLET
OUTLET
POP-OFF
MITERED END SECTION

CHAPTER 13: IDENTIFICATION OF POTENTIAL SOURCES OF CONTAMINATION

13.1 Overview

This chapter describes the potential sources of contamination within the Lower Sweetwater Creek watershed. Identifying sources of contamination for the area will facilitate prioritization of water quality improvement alternatives for the Lower Sweetwater Creek watershed.

13.1.1 Dairy Farms

Dairy farming is an important part of Florida's agricultural industry. Milk and cattle sales from dairies contributed about $459 million to Florida's economy in 2001, about $45 million more than in 2000 (Geisy et al., 2003). However, some elements of today's agriculture, such as dairy farms tend to contribute large amounts of nutrients (primarily nitrogen and phosphorus) into the environment.

According to the US EPA, agriculture was reported to be the most common pollutant of rivers and streams. Nutrients were identified to be among the five leading pollutants causing water quality impairments in lakes, streams, and estuaries of the U.S. (US EPA, 2002).

While searching for potential sources of nutrients in the Lower Sweetwater Creek watershed, we analyzed the existence and locations of dairy farms in the watershed. Eight dairy farm related facilities have been identified in the vicinity of Hillsborough County; however, none were located within the proximity to Lower Sweetwater Creek watershed.

Figure 13-1 shows a map of the Tampa Bay area designating dairy farms in the area. Table 13-1 shows the corresponding numbers from the map which gives the names and addresses of these dairy farms.

While agriculture may still be a major contributor of nutrient pollution in the watershed and will be discussed in more detail in the next section of this chapter, dairy farms were not identified as major sources of pollution in the Lower Sweetwater Creek watershed.

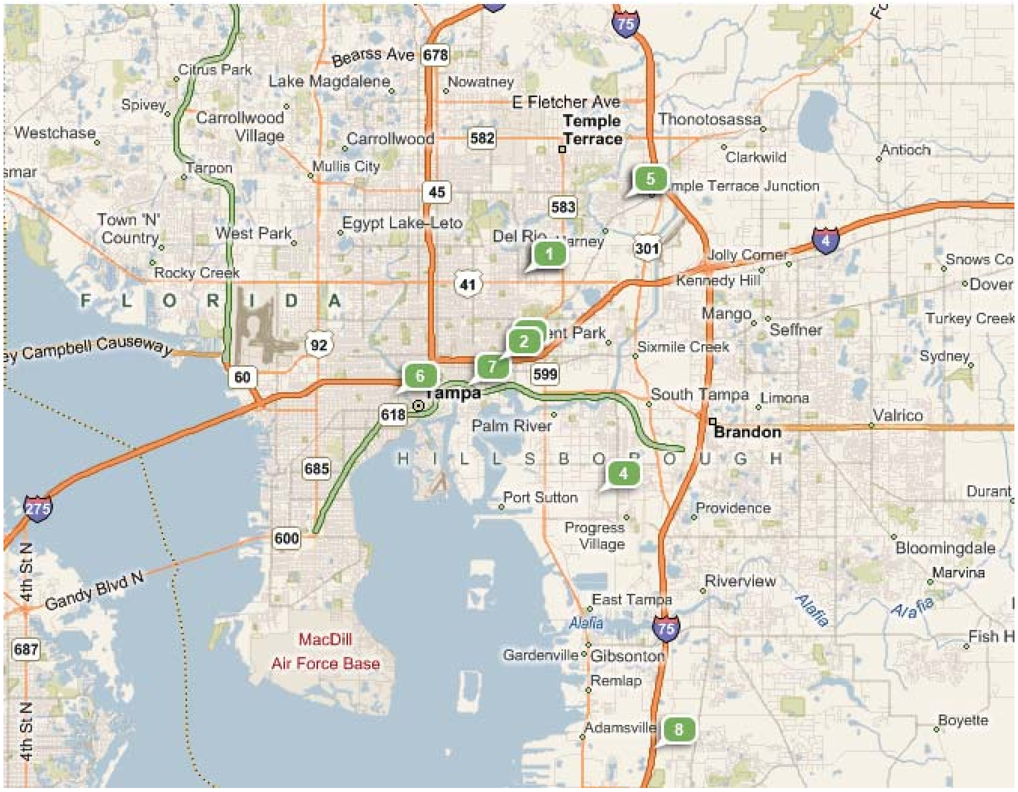


Figure 13-1 Location Map of Dairy Farms Located in the Tampa Bay Area

Table 13-1 Dairy Farm Name and Address from Location Map

1	Sweetheart Dairy & Foods	5610 North 50th Street Tampa, FL 33610
2	Sunny Florida Dairy Inc	2209 North 40th Street Tampa, FL 33605
3	TG Lee Foods	4219 E 19th Avenue Tampa, FL 33605
4	Tower Dairy No 1	4221 78th Street South Tampa, FL 33619
5	Gustafson Dairy	8601 Harney Road Tampa, FL 33637
6	Sunny Florida Dairy	Adamo Drive and N 28th Street Tampa, FL 33605
7	Aprile Farms	11513 Balm Riverview Road Tampa, FL 33602
8	Aprile Farms	9914 Cowley Road Tampa, FL 33602

13.1.2 High Pollutant Contributor Land Use Types

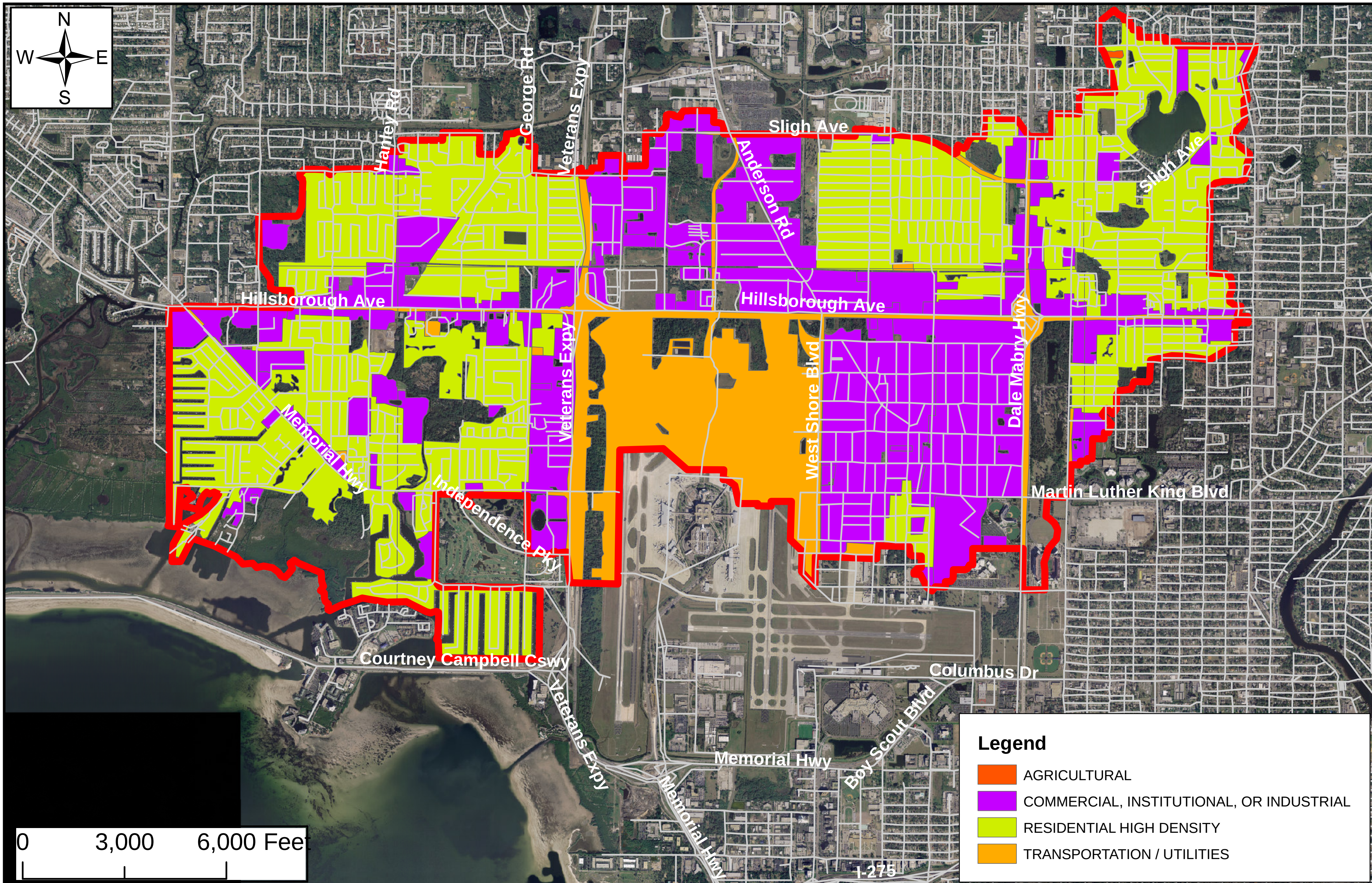
Lower Sweetwater Creek watershed exhibits extremely high concentrations of a number of different pollutants, such as total nitrogen, total phosphorus, and total suspended solids. The highest contributor of total nitrogen appears to be Highway/Utility land use category, followed by Agricultural, Commercial, High Density Residential, Institutional, and Light Industrial land use types.

The highest contributors of total phosphorus are Agricultural and High Density Residential, while contribution of total suspended solids appears to depend largely on the presence of Highway/Utilities land use category. This information is summarized in Table 13-2.

Table 13-2 High Pollutant Contributor Land Use Types per Individual Pollutants

	Total Nitrogen	Total Phosphorus	Total Suspended Solids
Highway/Utility	X		X
Agricultural	X	X	
Commercial	X		
High Den. Residential	X	X	
Institutional	X		
Light Industrial	X		

Figure 13-2 shows the distribution of high pollutant contributor land use types in the Lower Sweetwater Creek watershed. It is evident from Figure 13-2 that the center of the watershed is dominated by the Highway/Utilities land use category, while eastern and western sections contain mostly residential, commercial, institutional, and industrial land use types. This watershed does not contain many wetlands or natural land uses.

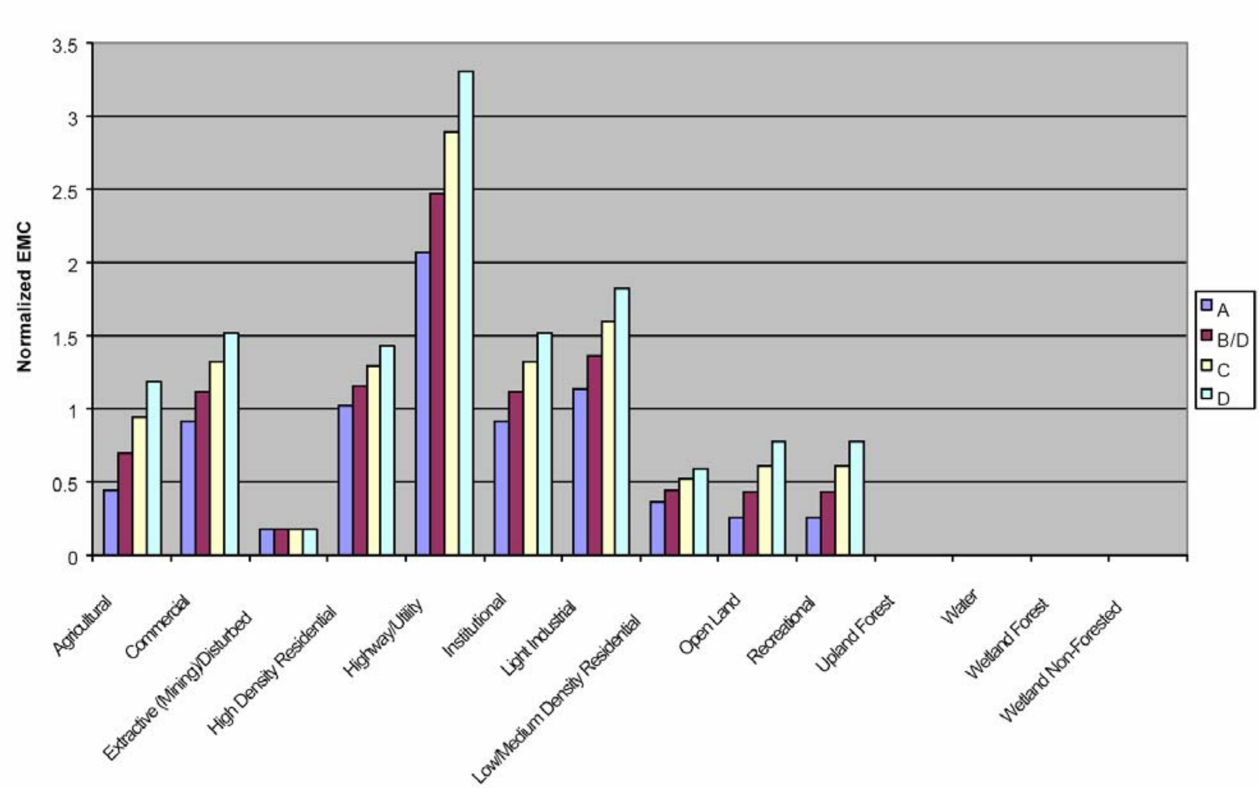


High Pollutant Contributor Land Use Types

Figure 13-2

AYRES ASSOCIATES

Total Nitrogen



Total Nitrogen Loading Potential by Land Use and Hydrologic Group

As evident from the bar graph above, which shows the total nitrogen loading potential by various land use types and hydrologic groups, the majority of total nitrogen is contributed by the Highway/Utilities land use category.

Figure 13-3 shows the visual correlation between land use types and high concentrations of total nitrogen. When comparing the TN LOS map with the land use distribution map, it is evident that high concentrations of total nitrogen almost perfectly correlate with the distribution of Highway/Utilities land use in the watershed. Subbasins encompassing the Tampa International Airport and major highways exhibit the highest concentrations of total nitrogen.

The areas dominated by residential, commercial, and institutional land uses also correlate with high concentrations of total nitrogen load; however, these are not as high as the areas covered with highways and utilities.

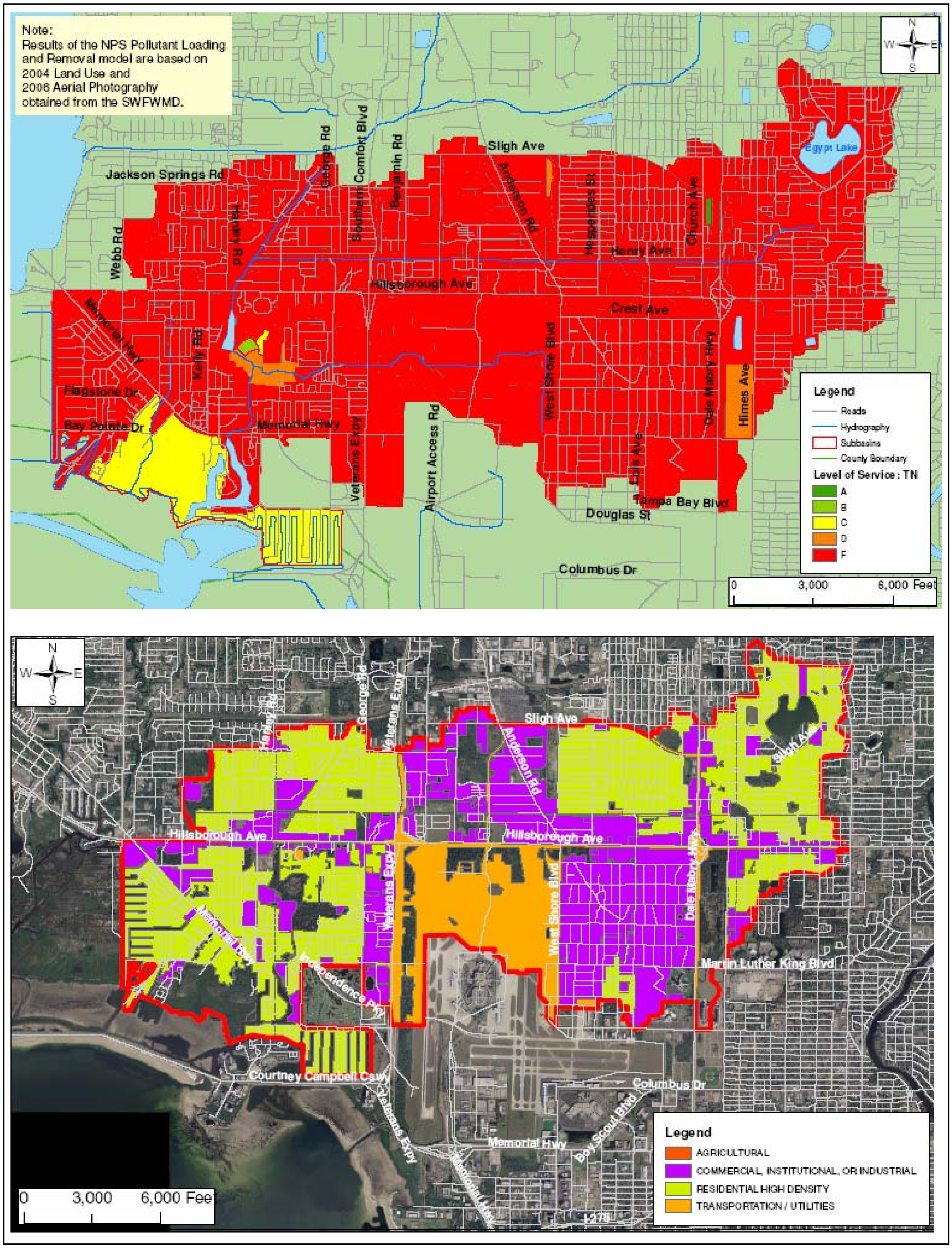
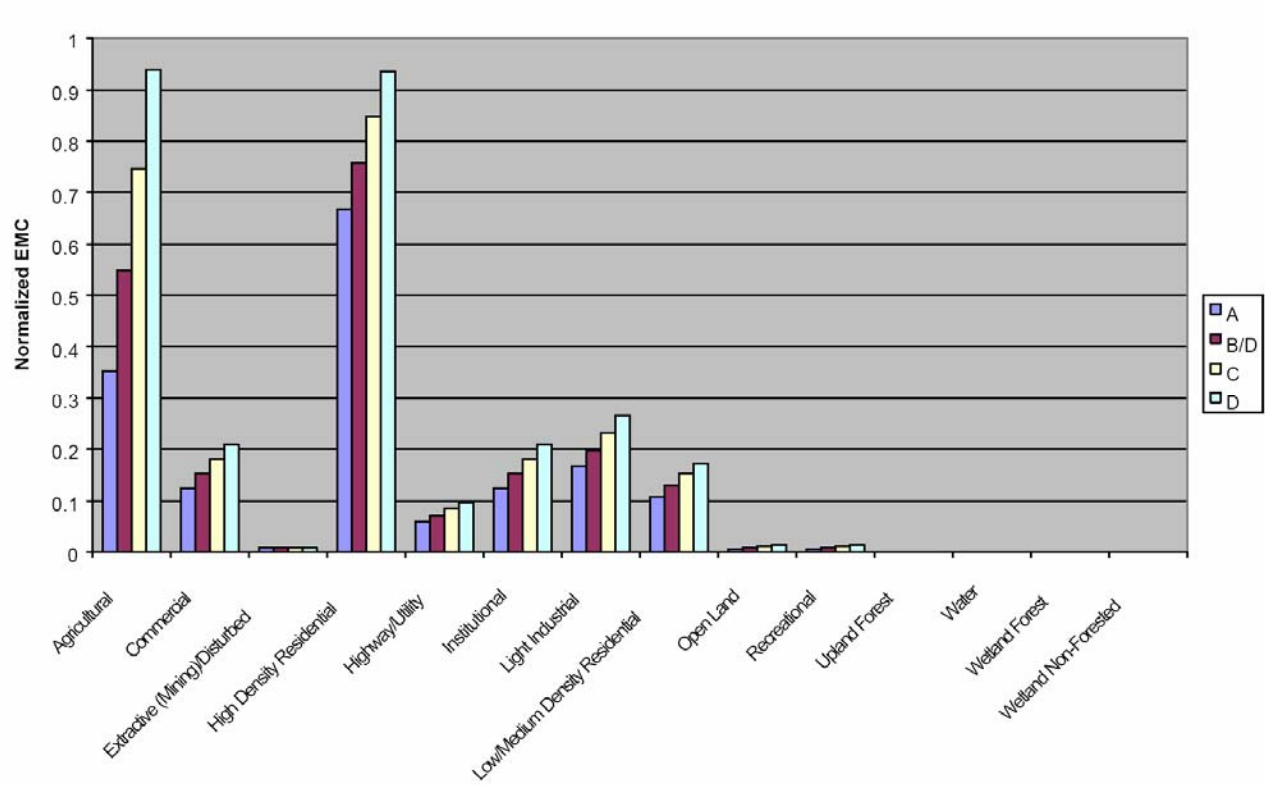


Figure 13-3 Visual Correlation between Land Use and High Concentrations of TN

Total Phosphorus



Total Phosphorus Loading Potential by Land Use and Hydrologic Group

In contrast to total nitrogen, loading of total phosphorus is greatly correlated with agricultural and high density residential land uses. While Lower Sweetwater Creek does not contain much agriculture, it is largely dominated by the residential land use type (Figure 13-2).

When comparing the map of the total phosphorus level of service to the land use distribution map, the pattern is evident (Figure 13-4). Concentrations of total phosphorus are highest in the eastern and western portions of the watershed dominated by the high density residential land uses. The concentrations appear to be lower in the central portion of the watershed. This area contains a portion of the Tampa International Airport and is designated as Transportation/Utilities; therefore, it does not contribute a great amount of total phosphorus to the surface water.

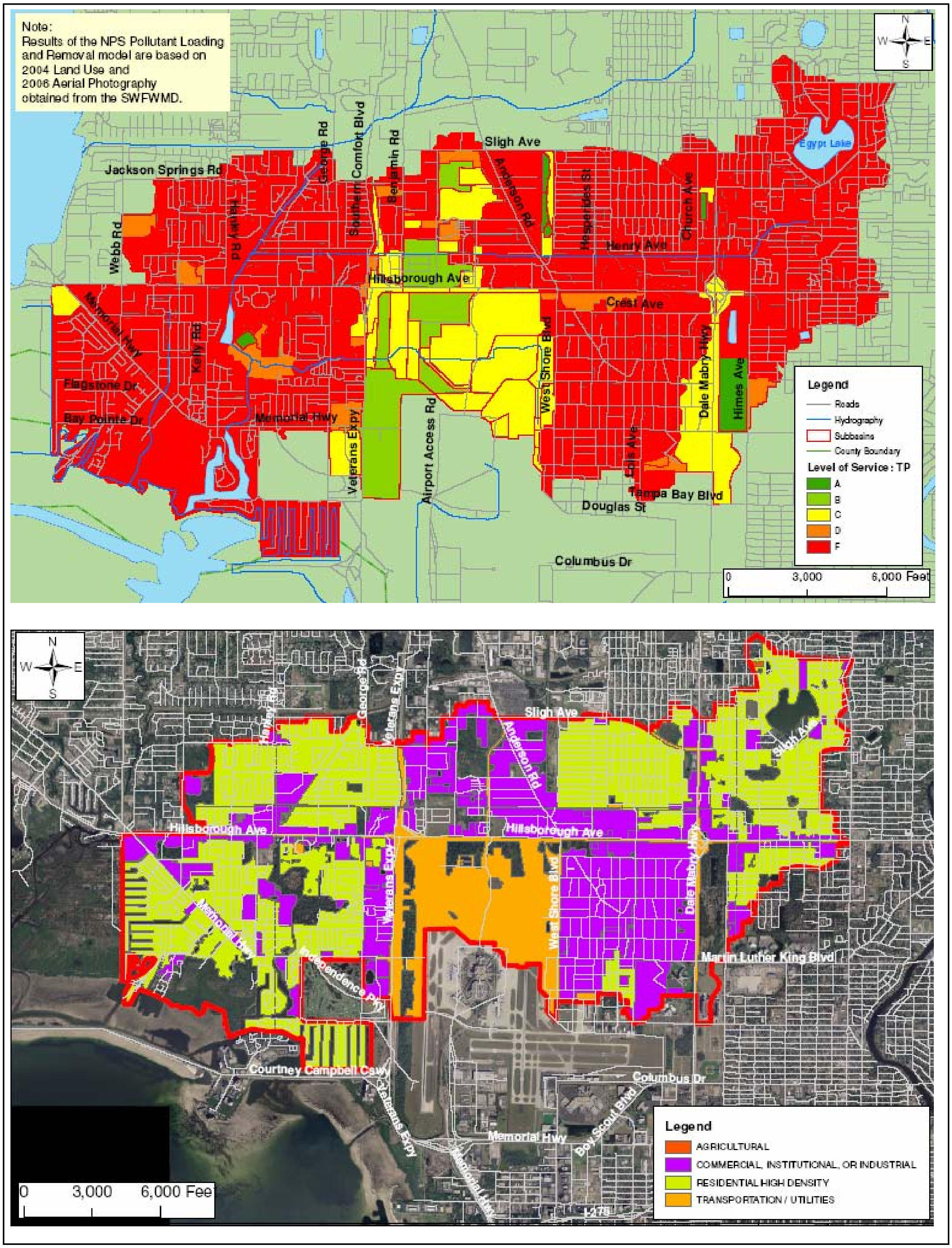
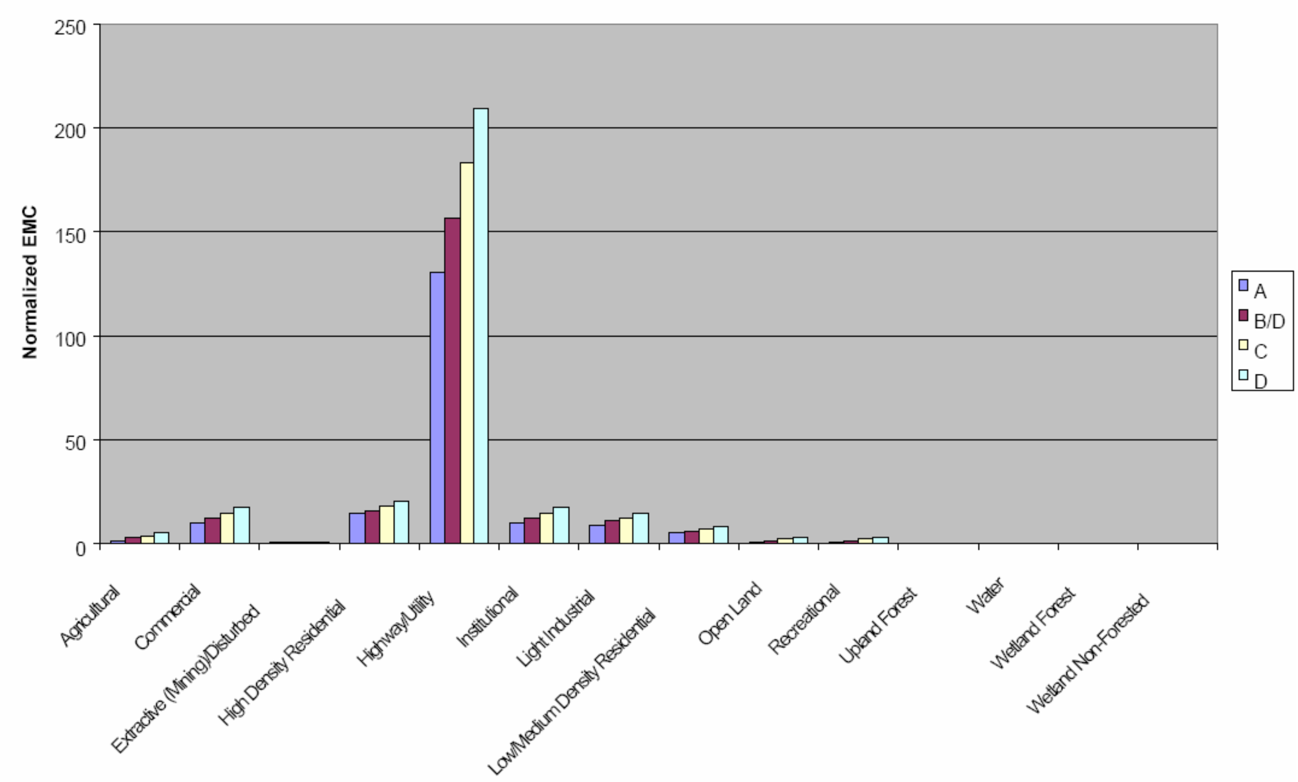


Figure 13-4 Visual Correlation between Land Use and High Concentrations of TP

Total Suspended Solids



Total Suspended Solids Loading Potential by Land Use and Hydrologic Group

Concentrations of total suspended solids appear to be extremely high in the Lower Sweetwater Creek watershed. Not surprisingly, this watershed is dominated by the Highway/Utilities land use type – a major contributor of this pollutant. In addition to dense roadway grid and a number of major highways, the watershed also encompasses a section of the Tampa International Airport. Figure 13-5 shows the visual correlation between land use types and high concentrations of total suspended solids. When comparing the TSS LOS map with the land use distribution map, it is evident that high concentrations of total suspended solids correlate areas of Highway/Utilities land use in the watershed.

Figure 13-6 below shows the boundary of Tampa International Airport, as well as major highways (Veterans Expressway and Hillsborough Avenue) in relation to the Lower Sweetwater Creek. Other areas classified as Highway/Utilities and contributing large amounts of total suspended solids to the surface water include: Dale Mabry Highway, sections of the Anderson Road, Hoover Boulevard, Sligh Avenue, as well as small parcels belonging to Hillsborough County and Tampa Electric Company. Figure 13-7 below depicts location of Highway/Utilities land use types within the Lower Sweetwater Creek watershed.

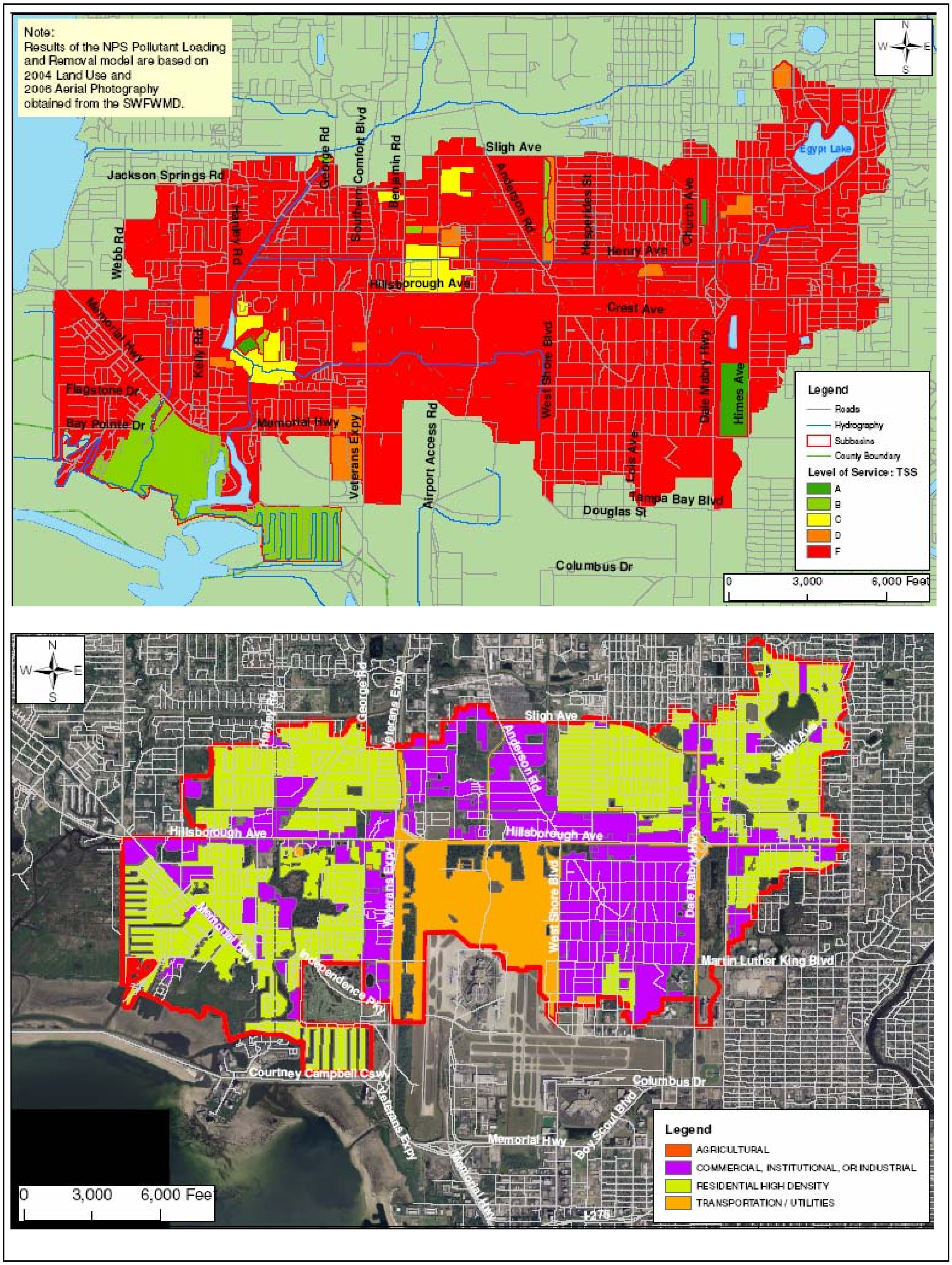
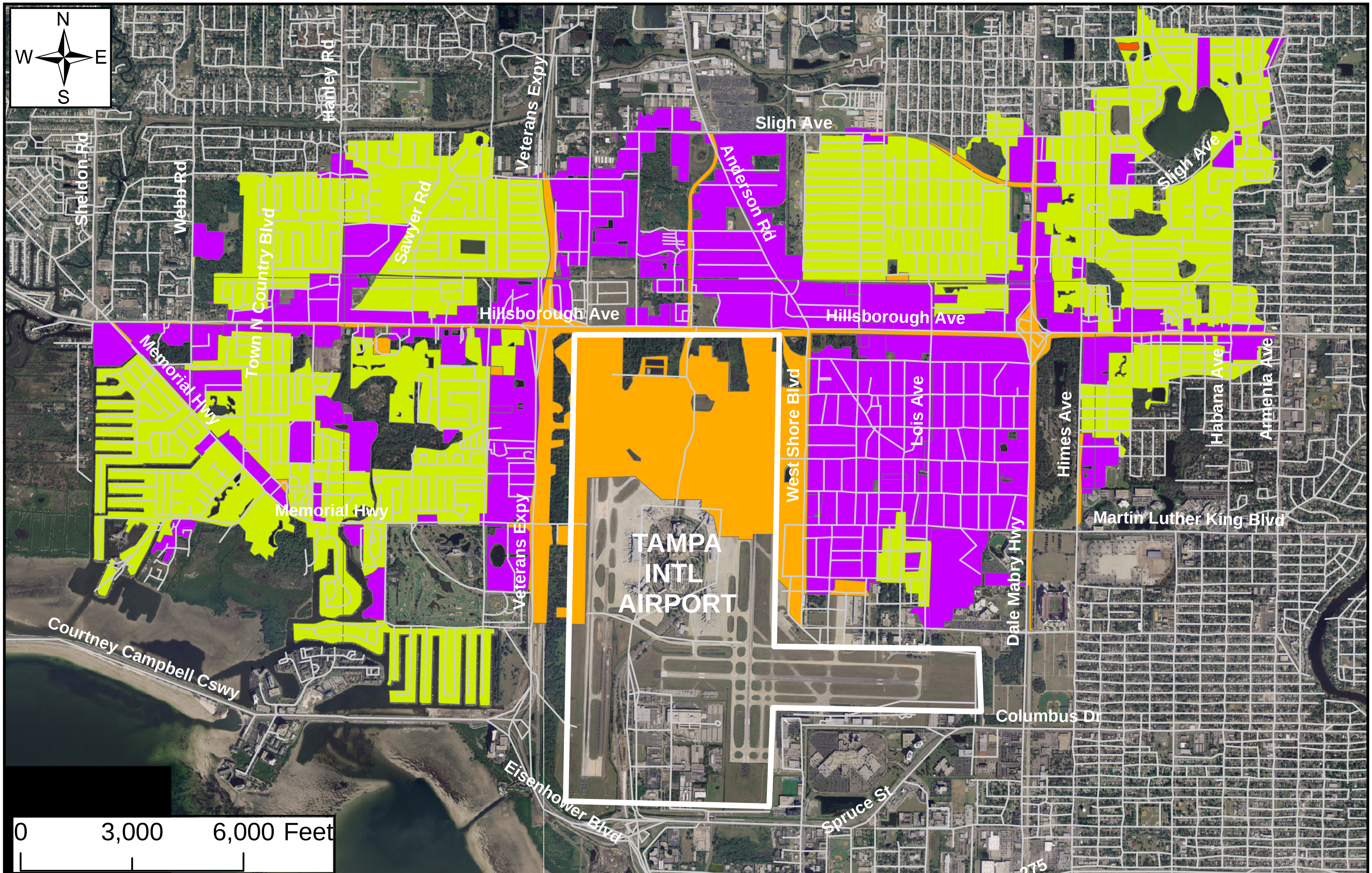


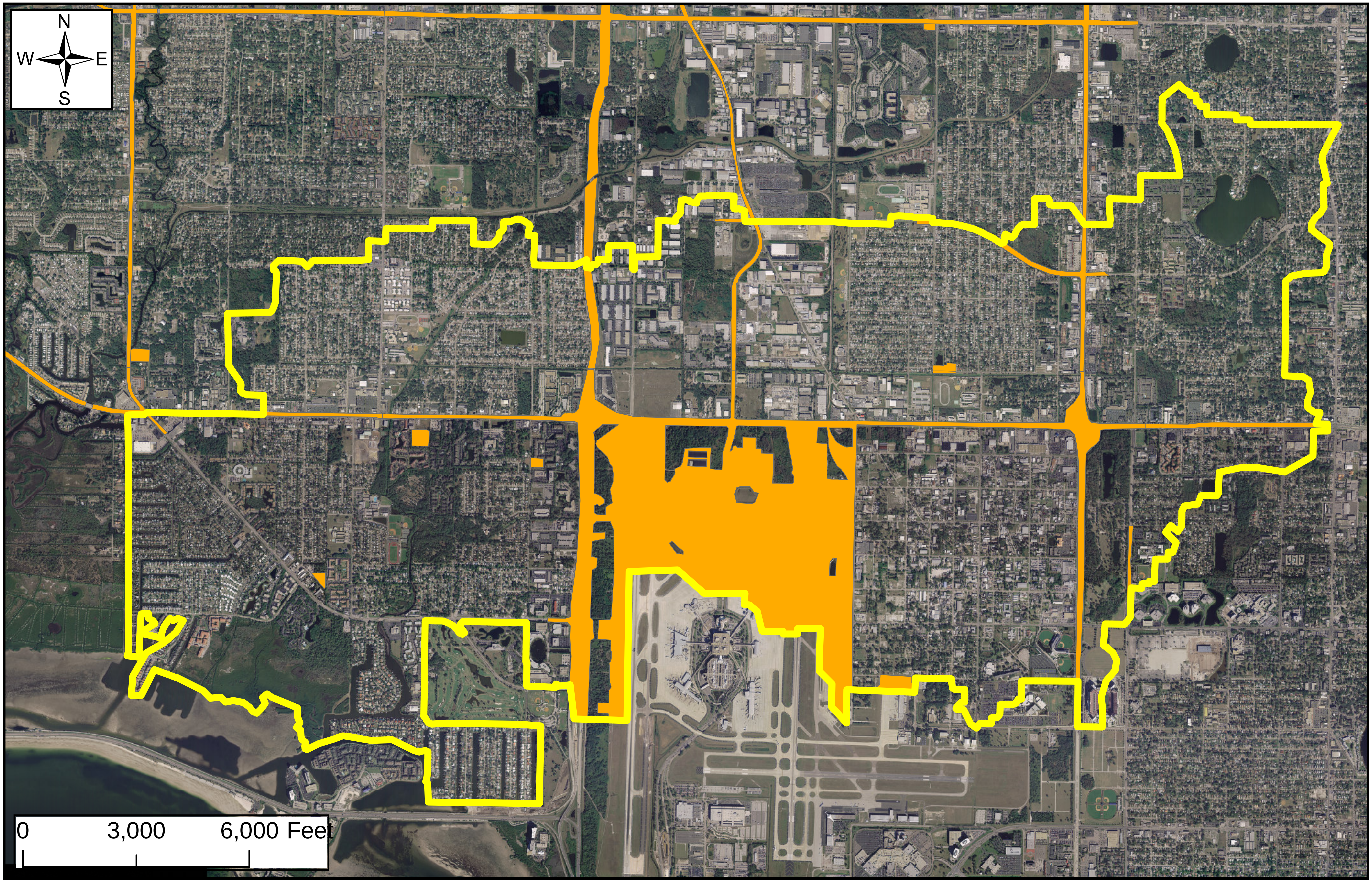
Figure 13-5 Visual Correlation between Land Use and High Concentrations of TSS



Tampa International Airport Boundary in the Lower Sweetwater Creek Watershed

Figure 13-6

AYRES ASSOCIATES



Highway / Utilities Land Use Types in the Lower Sweetwater Creek Watershed

Figure 13-7

AYRES ASSOCIATES

13.1.3 Other Contamination Sources - Brownfield Sites, Superfund sites, Sewage and Solid Waste Treatment Facilities

Figure 13-8 shows there are no Superfund sites, sewage or solid waste treatment facilities located within the Lower Sweetwater Creek watershed.

Two solid waste treatment facilities (one active and one inactive) are located within the close proximity to the watershed boundary. The inactive site is a Class III landfill located near the Veterans Expressway and Benjamin Road. The second site is located at the South Lois Avenue and is a recycled wood products/yard trash composting facility. While these two facilities are located in close proximity to the watershed boundary, they should not influence the water quality within the watershed, for they are not located near the waterways draining into Lower Sweetwater Creek watershed.

Two brownfield sites are located within the watershed boundary. Both brownfield sites are located in the southeastern portion of the watershed (Figure 13-9).

The first brownfield site is located at Martin Luther King Boulevard and North Lois Avenue. It is a 26-acre, W.T. Edwards Facility Brownfields site with a Brownfield Site Rehabilitation Agreement (BSRA) executed on 11/29/2005.

The second brownfield site is located at 4010 North Lois Avenue (former Borden property).

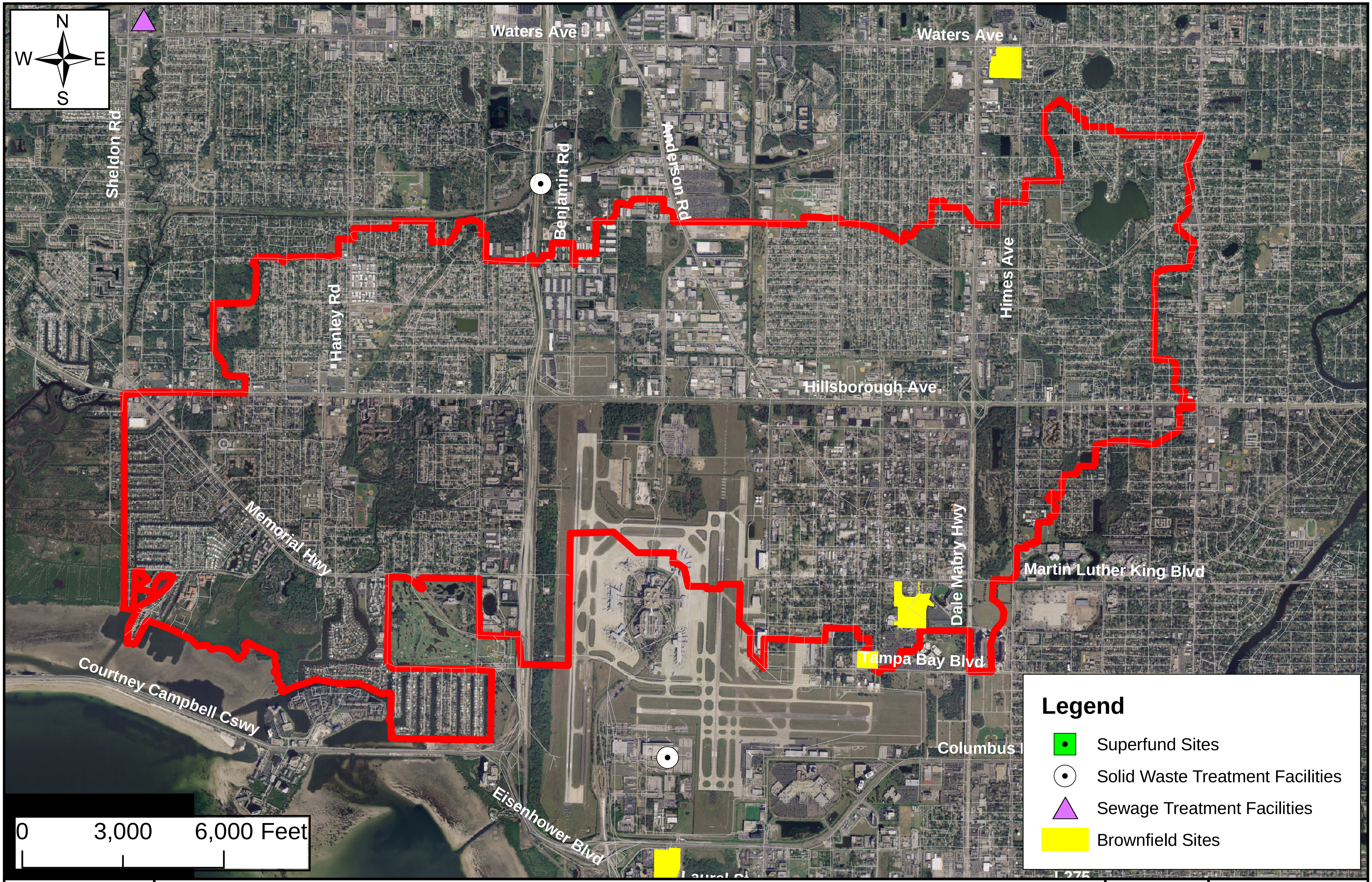
See Appendix 13-1 for more detailed location and site information on these areas.

13.2 Bibliography

The attached bibliography includes a list of references used for this study and additional references that could be cited by readers.

Giesy, R., de Vries, A., Zylstra, M., Kilmer, R., Bray, D., Webb, D. 2003. *Florida Dairy Farm Situation and Outlook 2003*. Department of Animal Sciences, Florida Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida. Document No. AN138. Gainesville, Florida.

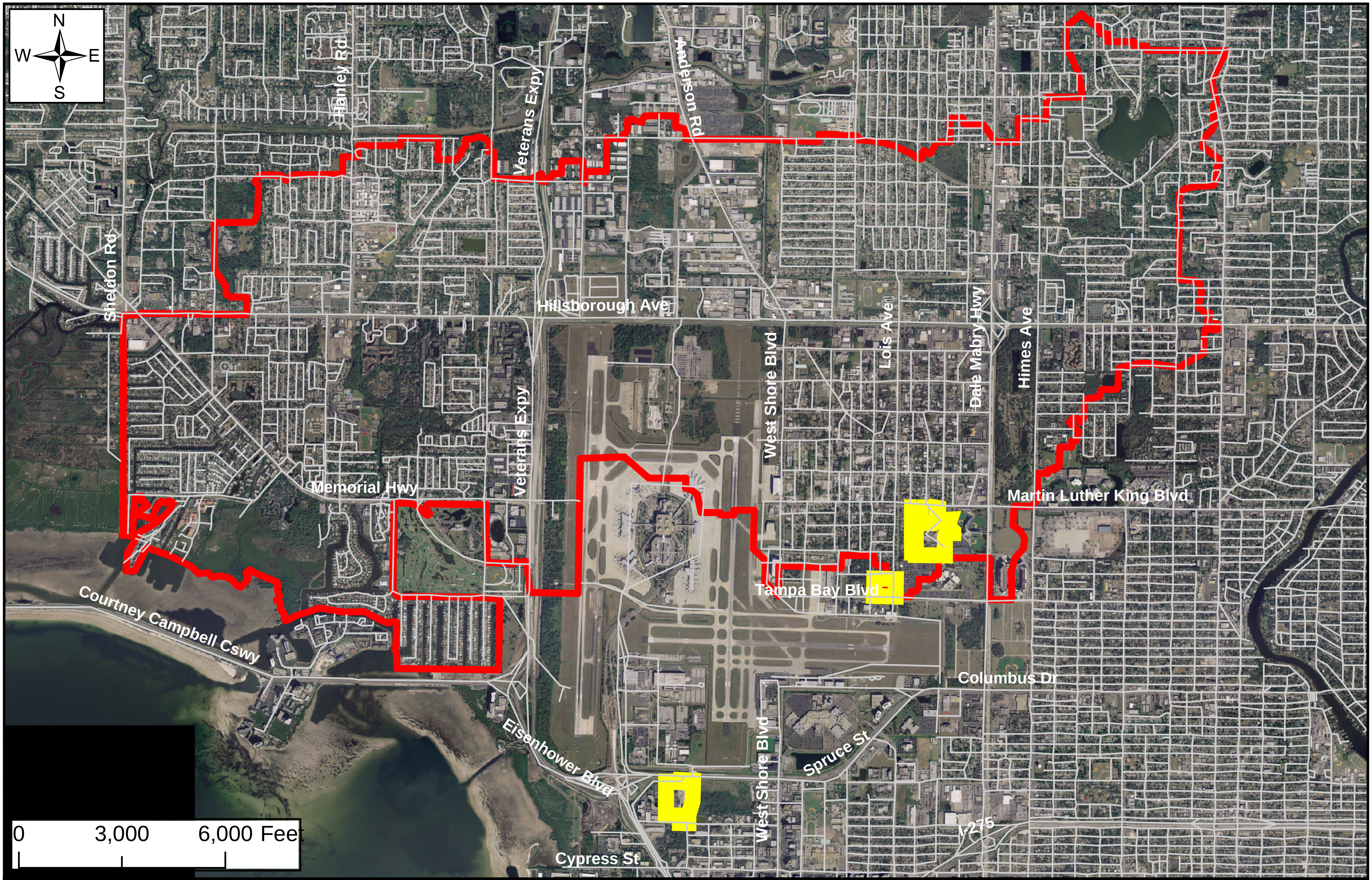
US EPA, 2002. *Agriculture - Dairy Production*. Purdue Research Foundation, West Lafayette, Indiana. (http://www.epa.gov/agriculture/ag101/printdairy.html).



Other Contamination Sources in the Lower Sweetwater Creek Watershed

Figure 13-8

AYRES ASSOCIATES



Brownfield Sites in the Lower Sweetwater Creek Watershed

Figure 13-9

CITY OF TAMPA

Pam Iorio, Mayor

Solid Waste Department

Office of Environmental Coordination

BF290502000

March 8, 2005

Roger B. Register, Brownfields Liaison
Florida Department of Environmental Protection
Bureau of Waste Cleanup
2600 Blair Stone Road, MS 4505
Tallahassee, Florida 32399-2400

Re: former Borden Property Brownfield Area Designation Notification

Dear Mr. Register:

In accordance with Section 376-80(1), Florida Statutes, the City of Tampa is notifying the Department of its decision to designate former Borden Property as a Brownfield Area for the purpose of environmental rehabilitation and economic development.

A copy of Resolution Number 2005-185, approving this designation that was executed by the Tampa City Council on February 10, 2005 is attached. The legal description of the properties included in the designated Brownfield Area is given as an attachment to the resolution labeled "Exhibit A". A diagram showing the parcels included in the designated Brownfield Area is given as an attachment to the resolution labeled "Exhibit B".

The Person Responsible for Brownfield Site Rehabilitation (PRFBSR) at this Designated Brownfield Area is:

Hillsborough Community College
c/o Martha Kaye Koehler
P.O. Box 31127
Tampa, Florida 33631-3127

Phone: (813) 253-7007
Fax: (813) 229-8313
e-mail: mkoehler@hccfl.edu

Please feel free to contact my office, if you have any questions or require any additional information.

Sincerely,

Daniel M. Fahey
Office of Environmental Coordination

cc: Martha Kaye Koehler - HCC
Ron Noble - Fowler White Boggs Banker
John Sego - FDEP
Justin Vaske - City of Tampa
Mary Yeargan - EPC

RESOLUTION NO. 2005-185

A RESOLUTION OF THE CITY OF TAMPA DESIGNATING A BROWNFIELD AREA WITHIN THE CITY OF TAMPA, FLORIDA, UPON APPLICATION OF HILLSBOROUGH COMMUNITY COLLEGE FOR PROPERTY GENERALLY LOCATED AT 4010 NORTH LOIS AVENUE CONSISTING OF APPROXIMATELY SEVEN AND ONE-HALF ACRES FOR THE PURPOSE OF ENVIRONMENTAL REHABILITATION AND ECONOMIC DEVELOPMENT; PROVIDING AN EFFECTIVE DATE.

WHEREAS, the Legislature of the State of Florida, pursuant to Florida Statutes Sections 376.77 – 376.85, adopted the Brownfields Redevelopment Act, the purpose of which is to encourage the redevelopment and the voluntary cleanup of existing commercial and industrial sites; and

WHEREAS, the Brownfields Redevelopment Act created a process whereby a local government with jurisdiction over the brownfield area must by resolution notify the State Department of Environmental Protection of its decision to designate a brownfield area for rehabilitation; and

WHEREAS, a local government shall designate a brownfield area under the provisions of the Brownfields Redevelopment Act provided that:

(1) a person who owns or controls a potential brownfield site is requesting the designation and has agreed to rehabilitate and redevelop the brownfield site;

(2) The rehabilitation and redevelopment of the proposed brownfield site will result in economic productivity of the area, along with the creation of at least ten (10) new permanent jobs, whether full time or part time, which are not associated with the implementation of the rehabilitation agreement or an agreement, between the person responsible for, site rehabilitation and the local government with jurisdiction, which contains terms for the redevelopment of the brownfield site or brownfield areas;

(3) The redevelopment of the proposed brownfield site is consistent with the local comprehensive plan and is a permittable use under the applicable local land development regulations;

(4) Notice of the proposed rehabilitation of the brownfield area has been provided to neighbors and nearby residents of the proposed area to be designated, and the person proposing the area for designation has afforded to those receiving notice the opportunity for comments and suggestions about rehabilitation. Notice

pursuant to this subsection must be made in a newspaper of general circulation in the area, at least sixteen square inches in size, and the notice must be posted in the affected area;

(5) The person proposing the area for designation has provided reasonable assurance that he or she has sufficient financial resources to implement and complete the rehabilitation agreement and redevelopment plan; and

WHEREAS, the City of Tampa, having conducted public hearings on the application, have determined that the above sited conditions have been satisfied; and

WHEREAS, the City of Tampa has considered:

1. Whether the brownfield area warrants economic development and has a reasonable potential for such activities;

2. Whether the proposed area to be designated represents a reasonably focused approach and is not overly large in geographic coverage;

3. Whether the area has potential to interest the private sector in participating in rehabilitation; and

4. Whether the area contains sites or parts of sites suitable for limited recreational open space, cultural, or historical preservation purposes; and

WHEREAS, the property is within a community redevelopment area.

NOW, THEREFORE

BE IT RESOLVED BY THE CITY COUNCIL OF THE CITY OF TAMPA, FLORIDA, THAT:

Section 1. The City Council for the City of Tampa, upon application of Hillsborough Community College hereby designates the property generally located at 4010 North Lois Avenue consisting of and described more particularly in the legal description attached hereto as Exhibit "A" and as depicted by the map attached hereto as Exhibit "B," as a brownfield area for rehabilitation for the purposes of Sections 376.77 – 376.85, Florida Statutes.

Section 2. The proper officers and employees of the City of Tampa are hereby authorized to do all things necessary and proper to make effective the provisions of this Resolution, which shall take effective immediately upon its adoption.

Section 3. This Resolution shall take effect immediately upon its adoption.

PASSED AND ADOPTED BY THE CITY COUNCIL OF THE CITY OF TAMPA, FLORIDA, ON FEB 10 2005.

ATTEST:

Shirley Foxx-Knowles
CITY CLERK/DEPUTY CITY CLERK

Gwendolyn M. Miller
CHAIRMAN/CHAIRMAN PRO-TEM
CITY COUNCIL

PREPARED AND APPROVED
AS TO FORM:

Justin R. Vaske
JUSTIN R. VASKE
ASSISTANT CITY ATTORNEY
F:\USERS\LG40\Brownfields\BROWNFIELD DESIGNATION Borden.doc

DESCRIPTIONS

Parcel Description (New)

BEGIN AT A POINT 40.00 FEET WEST AND 89.80 FEET NORTH OF THE SOUTHEAST CORNER OF THE SOUTHWEST ¼ OF THE NORTHWEST ¼ OF SECTION 9, TOWNSHIP 29 SOUTH, RANGE 18 EAST, HILLSBOROUGH COUNTY, FLORIDA. SAID POINT BEGIN THE INTERSECTION OF THE WESTERLY RIGHT-OF-WAY LINE OF LOIS AVENUE AND THE NORTHERLY RIGHT-OF-WAY LINE OF TAMPA BAY BOULEVARD: RUN THENCE NORTH 0'34'05" EAST 511.15 FEET ALONG THE WESTERLY RIGHT-OF-WAY LINE OF LOIS AVENUE TO THE SOUTHERLY RIGHT-OF-WAY LINE OF WOODLAWN AVENUE; THENCE NORTH 88'17'55" WEST 623.46 FEET ALONG THE SOUTHERLY RIGHT-OF-WAY LINE OF WOODLAND AVENUE; THENCE SOUTH 1'44'05" WEST 510.68 FEET TO THE NORTHERLY RIGHT-OF-WAY LINE OF TAMPA BAY BOULEVARD; THENCE SOUTH 88'15'55" EAST 633.87 FEET ALONG THE NORTHERLY RIGHT-OF-WAY LINE OF TAMPA BAY BOULEVARD TO THE WESTERLY RIGHT-OF-WAY LINE OF LOIS AVENUE AND THE PONT OF BEGINNING.

BASED ON INFORMATION SHOWN ON FLOOD INSURANCE RATE MAP, COMMUNITY PANEL NO. 120114 0013 C, DATED 9-30-82. THE DESCRIBED PROPERTY APPEARS TO LIE WITHIN ZONE C.

Exhibit A

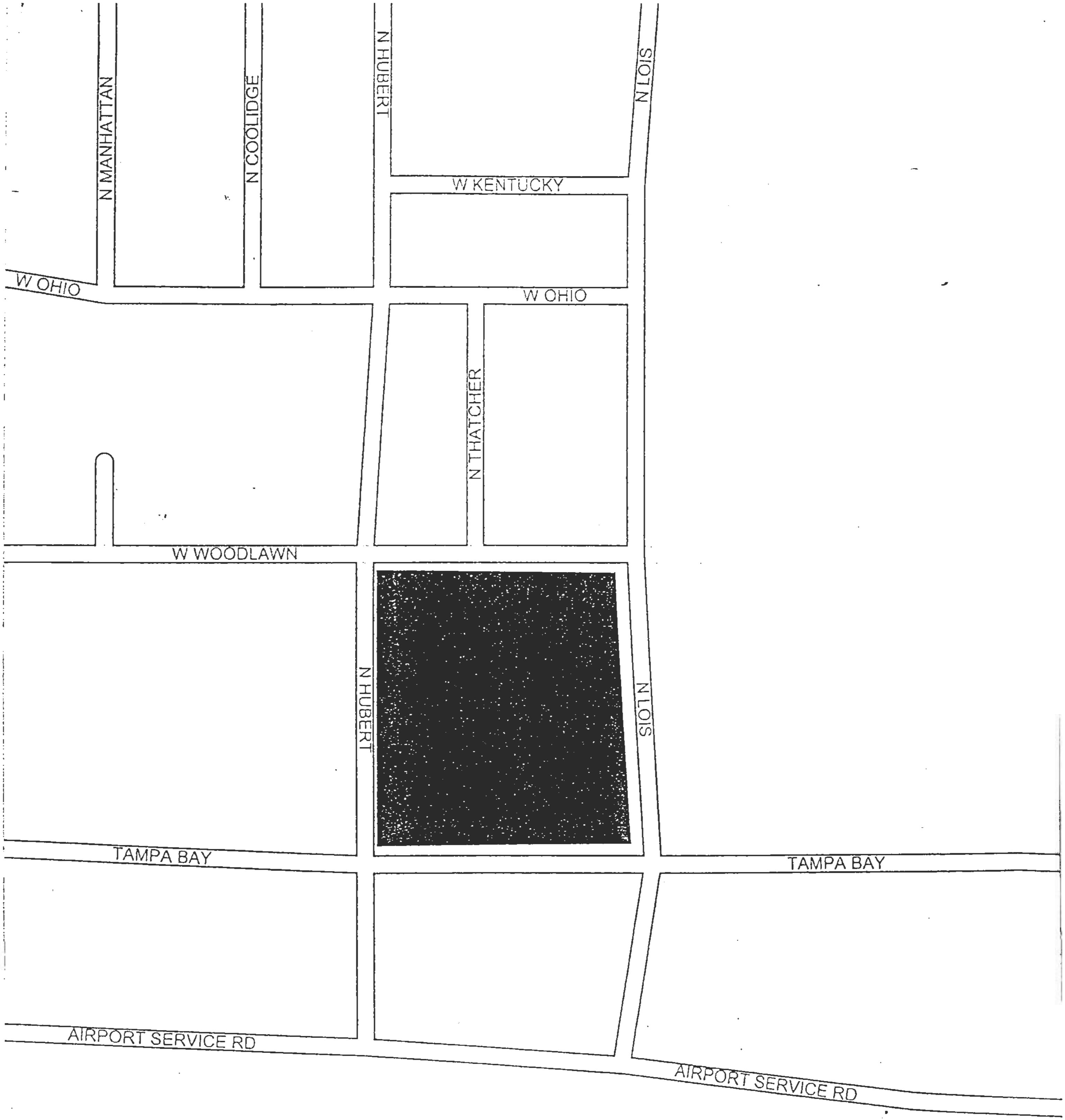

N MANHATTAN
N COOLIDGE
N HUBERT
N LOIS
W KENTUCKY
W OHIO
W OHIO
N THATCHER
W WOODLAWN
N HUBERT
N LOIS
TAMPA BAY
TAMPA BAY
AIRPORT SERVICE RD
AIRPORT SERVICE RD

Exhibit B

Sites with Executed BSRAs

Florida Brownfields Redevelopment Program

Tuesday, September 04, 2007

9:10:59 AM

Total Sites: 92

Area ID	Site ID	Site Name	City	County	District	BSRA Executed Date	SRCO Issue Date	Acreage [1]
BF160001000	BF160001008	Keystone/Wigmore Street	JACKSONVILLE	DUVAL	Northeast	07/11/2007		70.00
BF160001000	BF160001006	Hogan's Creek Site, Parcel 1A	JACKSONVILLE	DUVAL	Northeast	06/19/2007		3.18
BF160001000	BF160001007	Hogan's Creek Site, Parcel 1B	JACKSONVILLE	DUVAL	Northeast	06/19/2007		2.27
BF360501000	BF360501001	Garden Street Iron & Metal, Inc.	FORT MYERS	LEE	South	05/29/2007		9.86
BF160001000	BF160001005	JM Family Enterprises	JACKSONVILLE	DUVAL	Northeast	12/27/2006		3.94
BF290604000	BF290604001	Waters Center Brownfield Site	TAMPA	HILLSBOROUGH	Southwest	12/27/2006		18.88
BF540501000	BF540501001	Bill Ding Avenue Brownfield Site	PALATKA	PUTNAM	Northeast	12/27/2006		8.34
BF180601000	BF180601001	Bunnell Industrial/Former Rayonier Plant Site	BUNNELL	FLAGLER	Northeast	12/21/2006		43.69
BF290606000	BF290606001	Former Tampa Armature Works Site	TAMPA	HILLSBOROUGH	Southwest	12/20/2006		4.27
BF290607000	BF290607001	Avion Park at Westshore Site	TAMPA	HILLSBOROUGH	Southwest	12/20/2006		18.89
BF360301000	BF360301001	Eastwood Village Brownfield Site	FORT MYERS	LEE	South	12/19/2006		608.45
BF370601000	BF370601001	Sunland Hospital Parcel I	TALLAHASSEE	LEON	Northwest	12/12/2006		5.18
BF550601000	BF550601001	Former Ponce de Leon Golf Course	ST AUGUSTINE	ST. JOHNS	Northeast	12/11/2006		284.00
BF529901000	BF529901002	City of St. Petersburg/Former Atherton Oil	ST PETERSBURG	PINELLAS	Southwest	10/10/2006		0.83
BF290603000	BF290603001	Circle Tampa Venture I	TAMPA	HILLSBOROUGH	Southwest	09/20/2006	05/31/2007 #	28.00
BF360302000	BF360302001	2780 South Street	FORT MYERS	LEE	South	06/20/2006		1.68

Special Notes:

- # Site Rehabilitation Completion Order with Conditions Issued
- * PRFBSR chose to voluntarily terminate BSRA and the BSRA was terminated in October by mutual consent
- ** Please note, BSRA BF00101004 has been superseded by BSRAs BF500101005 and BF00101006. Please refer to the new BSRAs for detail regarding responsible parties, site boundaries, etc.

[1] NR = Not Reported

BSRA = Brownfields Site Rehabilitation Agreement (Sites Under Remediation)

SRCO = Site Rehabilitation Completion Order ("No Further Action")

Area ID	Site ID	Site Name	City	County	District	BSRA Executed Date	SRCO Issue Date	Acreage ¹
BF290602000	BF290602001	Former 43rd Street Bay Drum Site	TAMPA	HILLSBOROUGH	Southwest	05/04/2006		4.30
BF290302000	BF290302001	Gerdau Ameristeel Brownfield Site	TAMPA	HILLSBOROUGH	Southwest	04/10/2006		30.00
BF580302000	BF580302002	Lowes Crofut Parcel and Outparcel A Site	SARASOTA	SARASOTA	Southwest	02/27/2006		4.00
BF160501000	BF160501001	Wal-Mart Phillips Highway Brownfields Site	JACKSONVILLE	DUVAL	Northeast	12/21/2005		NR
BF290503000	BF290503001	Channelside Holdings Site	TAMPA	HILLSBOROUGH	Southwest	12/20/2005		8.00
BF500101000	BF500101006	DR Palm Beach Residential Complex Brownfield Site	WEST PALM BEACH	PALM BEACH	Southeast	12/01/2005		14.00
BF290501000	BF290501001	W.T. Edwards Brownfields Site	TAMPA	HILLSBOROUGH	Southwest	11/29/2005		26.00
BF580302000	BF580302001	Lowes DMB Parcel and Outparcels B&C Site	SARASOTA	SARASOTA	Southwest	11/15/2005		19.00
BF050301000	BF050301001	KIP I, L.L.C. Brownfield Site	PALM BAY	BREVARD	Central	10/20/2005		33.00
BF500101000	BF500101005	DR Palm Beach Hotel Complex Brownfield Site	WEST PALM BEACH	PALM BEACH	Southeast	10/20/2005		2.00
BF139801000	BF139801005	McArthur Dairy 7th Avenue	MIAMI	MIAMI-DADE	Southeast	10/07/2005		5.20
BF529701000	BF529701004	Clearwater Automotive Site	CLEARWATER	PINELLAS	Southwest	09/26/2005		3.00
BF130503000	BF130503001	Dedicated Transportation Corporaton HQs	MIAMI	MIAMI-DADE	Southeast	09/08/2005		2.00
BF290204000	BF290204001a	Former Southern Mill Creek Products Site	TAMPA	HILLSBOROUGH	Southwest	07/25/2005		8.00
BF370002000	BF370002001	Tallahassee Residence Inn Brownfield Site	TALLAHASSEE	LEON	Northwest	07/14/2005	03/19/2007 #	2.26
BF520501000	BF520501001	Community Waterfront Park	ST PETERSBURG	PINELLAS	Southwest	05/19/2005		1.93
BF139801000	BF139801004	Los Suenos Multifamily Apartments (Dreamers, LLC)	MIAMI	MIAMI-DADE	Southeast	12/20/2004		1.00
BF060401000	BF060401001	Harbour Cove Associates	HALLANDALE BEACH	BROWARD	Southeast	12/17/2004		7.06

Special Notes:

\# Site Rehabilitation Completion Order with Conditions Issued

* PRFBSR chose to voluntarily terminate BSRA and the BSRA was terminated in October by mutual consent

** Please note, BSRA BF00101004 has been superseded by BSRAs BF500101005 and BF00101006. Please refer to the new BSRAs for detail regarding responsible parties, site boundaries, etc.

¹ NR = Not Reported
BSRA = Brownfields Site Rehabilitation Agreement (Sites Under Remediation)
SRCO = Site Rehabilitation Completion Order ("No Further Action")

Area ID	Site ID	Site Name	City	County	District	BSRA Executed Date	SRCO Issue Date	Acreage ¹
BF139904000	BF139904002	Corinthian Multifamily Apartments (Liberty City Holdings, LLC)	MIAMI	MIAMI-DADE	Southeast	12/17/2004		6.00
BF290304000	BF290304001	12th Street Operations Yard	TAMPA	HILLSBOROUGH	Southwest	12/10/2004		9.66
BF290204000	BF290204001	The Place at Channelside	TAMPA	HILLSBOROUGH	Southwest	11/04/2004		2.00
BF139801000	BF139801003	Wagner Square (Former Civic Center)	MIAMI	MIAMI-DADE	Southeast	08/13/2004		3.00
BF480201000	BF480201001	Former Gray Truck Line Property	WINTER GARDEN	ORANGE	Central	04/19/2004		5.00
BF060301000	BF060301001	Dania Mortorcross	DANIA BEACH	BROWARD	Southeast	04/12/2004	08/01/2006 #	12.00
BF170302000	BF170302001	Sunray Enterprises, Inc. (Keck)	PENSACOLA	ESCAMBIA	Northwest	03/17/2004	03/02/2006	1.00
BF290303000	BF290303001	Centro Asturiano Place	TAMPA	HILLSBOROUGH	Southwest	03/10/2004		7.00
BF139904000	BF139904001	Siegel Gas and Oil Corp	MIAMI	MIAMI-DADE	Southeast	02/11/2004		2.00
BF139801000	BF139801002	FEC Buena Vista	MIAMI	MIAMI-DADE	Southeast	12/18/2003		51.00
BF529901000	BF529901001	Peoples Gas System (Former TECO Complex)	ST PETERSBURG	PINELLAS	Southwest	12/16/2003		5.00
BF130301000	BF130301001	Beacon Lakes (AMB Codina)	MIAMI	MIAMI-DADE	Southeast	11/24/2003		156.00
BF170201000	BF170201001	Pensacola Mainstreet, Inc.	PENSACOLA	ESCAMBIA	Northwest	10/03/2003		3.00
BF290301000	BF290301001	Riverfront (Tampa Heights) Complex	TAMPA	HILLSBOROUGH	Southwest	10/01/2003	11/23/2005	12.00
BF160001000	BF160001004	Ford Assembly Redevelopment	JACKSONVILLE	DUVAL	Northeast	09/17/2003		23.00
BF529701000	BF529701003	Former Clearwater Sun Property	CLEARWATER	PINELLAS	Southwest	09/17/2003	01/18/2007 #	1.00
BF179901000	BF179901002	2500 North Palafox Street	PENSACOLA	ESCAMBIA	Northwest	07/25/2003		0.75
BF060201000	BF060201001	McArthur Dairy Brownfield Site	LAUDERHILL	BROWARD	Southeast	06/11/2003		10.35
BF290101000	BF290101003	Tampa Bay Scrap Processors Site	TAMPA	HILLSBOROUGH	Southwest	05/09/2003		16.00
BF160001000	BF160001003	2100 Dennis Street Remediation Trust	JACKSONVILLE	DUVAL	Northeast	05/01/2003		1.00

Special Notes:

- # Site Rehabilitation Completion Order with Conditions Issued
- * PRFBSR chose to voluntarily terminate BSRA and the BSRA was terminated in October by mutual consent
- ** Please note, BSRA BF00101004 has been superseded by BSRAs BF500101005 and BF00101006. Please refer to the new BSRAs for detail regarding responsible parties, site boundaries, etc.

¹ NR = Not Reported
BSRA = Brownfields Site Rehabilitation Agreement (Sites Under Remediation)
SRCO = Site Rehabilitation Completion Order ("No Further Action")

Area ID	Site ID	Site Name	City	County	District	BSRA Executed Date	SRCO Issue Date	Acreage [1]
BF130201000	BF130201001	Biscayne Commons Brownfields Site	NORTH MIAMI	MIAMI-DADE	Southeast	04/07/2003		12.00
BF160205000	BF160205001	4502 Sunbeam Road	JACKSONVILLE	DUVAL	Northeast	03/13/2003		225.00
BF160202000	BF160202001	Phillips Highway Site	JACKSONVILLE	DUVAL	Northeast	02/24/2003		43.00
BF230201000	BF230201001	Former-St. Joe Site Surface Impoundment	PORT ST JOE	GULF	Northwest	01/28/2003		11.00
BF230201000	BF230201002	Former-Port St. Joe Kraft Papermill	PORT ST JOE	GULF	Northwest	01/27/2003		125.00
BF160001000	BF160001002	The Shipyards	JACKSONVILLE	DUVAL	Northeast	12/31/2002		40.55
BF160201000	BF160201001	St. Johns Center Site	JACKSONVILLE	DUVAL	Northeast	12/31/2002		4.00
BF090201000	BF090201001	Inverness Wal-Mart Site	INVERNESS	CITRUS	Southwest	12/23/2002		40.00
BF010001000	BF010001002	Former-CSX Property	GAINESVILLE	ALACHUA	Northeast	11/14/2002		25.00
BF290202000	BF290202001	Wal-Mart Gunn Highway Site	TAMPA	HILLSBOROUGH	Southwest	11/07/2002		28.00
BF530001000	BF530001001	Auburndale Wal-Mart	AUBURNDALE	POLK	Southwest	11/07/2002		10.00
BF500101000	BF500101004	DR Lakes, Inc. Parcel II	WEST PALM BEACH	PALM BEACH	Southeast	08/30/2002	**	16.00
BF290101000	BF290101002	Tampa Bay Shipbuilding and Repair Company	TAMPA	HILLSBOROUGH	Southwest	07/31/2002		53.00
BF429903000	BF429903001	Former White's Meats Packing Facility	OCALA	MARION	Central	07/26/2002	10/23/2006	6.00
BF290002000	BF290002002	CSX Spur at Old Hopewell Road	TAMPA	HILLSBOROUGH	Southwest	07/22/2002		1.00
BF500101000	BF500101002	DR Lakes Multifamily Northside	WEST PALM BEACH	PALM BEACH	Southeast	07/08/2002		13.00
BF500101000	BF500101003	CFC Multifamily Northwest	WEST PALM BEACH	PALM BEACH	Southeast	07/08/2002		45.00
BF160001000	BF160001001	Ware Family Realty, LLC	JACKSONVILLE	DUVAL	Northeast	06/03/2002	12/08/2003	1.00
BF290202000	BF290202001A	Wal-Mart Buckley-Shuler Parcel A	TAMPA	HILLSBOROUGH	Southwest	04/22/2002	05/15/2002	1.00
BF290202000	BF290202001B	Wal-Mart Buckley-Shuler Parcel B	TAMPA	HILLSBOROUGH	Southwest	04/22/2002	06/04/2002	1.00

Special Notes:

- # Site Rehabilitation Completion Order with Conditions Issued
- * PRFBSR chose to voluntarily terminate BSRA and the BSRA was terminated in October by mutual consent
- ** Please note, BSRA BF00101004 has been superseded by BSRAs BF500101005 and BF00101006. Please refer to the new BSRAs for detail regarding responsible parties, site boundaries, etc.

[1] NR = Not Reported
BSRA = Brownfields Site Rehabilitation Agreement (Sites Under Remediation)
SRCO = Site Rehabilitation Completion Order ("No Further Action")

Area ID	Site ID	Site Name	City	County	District	BSRA Executed Date	SRCO Issue Date	Acreage [1]
BF290202000	BF290202001C	Wal-Mart Buckley-Shuler Parcel C	TAMPA	HILLSBOROUGH	Southwest	04/22/2002	11/23/2004	2.00
BF290202000	BF290202001D	Wal-Mart Buckley-Shuler Parcel D	TAMPA	HILLSBOROUGH	Southwest	04/22/2002	12/16/2002	2.00
BF290202000	BF290202001E	Wal-Mart Buckley-Shuler Parcel E	TAMPA	HILLSBOROUGH	Southwest	04/22/2002	07/22/2002	2.00
BF500101000	BF500101001	BrandsMart	WEST PALM BEACH	PALM BEACH	Southeast	12/27/2001		17.00
BF290101000	BF290101001	Port Ybor	TAMPA	HILLSBOROUGH	Southwest	10/29/2001		59.00
BF179901000	BF179901001	Weatherford McIntyre Property	PENSACOLA	ESCAMBIA	Northwest	10/03/2001	07/01/2002 #	3.00
BF160101000	BF160101001	Southside Generating Station (SGS) Area	JACKSONVILLE	DUVAL	Northeast	08/01/2001		42.00
BF529701000	BF529701002	Dimmit Parcel B	CLEARWATER	PINELLAS	Southwest	07/31/2001		3.00
BF170101000	BF170101001	Strategic Crossing Corp. CSX Property	PENSACOLA	ESCAMBIA	Northwest	06/07/2001	12/15/2006 #	1.00
BF369901000	BF369901001	City of Ft Myers Coal Gasification Site	FORT MYERS	LEE	South	03/09/2001		7.00
BF010001000	BF010001001	Gainesville Regional Utilities/Poole Roofing Site	GAINESVILLE	ALACHUA	Northeast	01/29/2001		2.00
BF130001000	BF130001001	Potamkin Properties	MIAMI BEACH	MIAMI-DADE	Southeast	12/29/2000		7.00
BF290002000	BF290002001	WRB @ Old Hopewell Road	TAMPA	HILLSBOROUGH	Southwest	12/28/2000		10.00
BF050001000	BF050001001	Village Green Shopping Center	ROCKLEDGE	BREVARD	Central	12/22/2000		10.00
BF290001000	BF290001001	Robbins Manufacturing	TAMPA	HILLSBOROUGH	Southwest	08/28/2000	08/14/2002 #	40.00
BF529701000	BF529701001	Community Health Center	CLEARWATER	PINELLAS	Southwest	01/18/2000	07/28/2000	1.00
BF489901000	BF489901001	Sunterra Site	ORLANDO	ORANGE	Central	06/29/1999	11/05/1999	14.00
BF139801000	BF139801001	Wynwood Site	MIAMI	MIAMI-DADE	Southeast	07/27/1998	*	3.00
							Total Approximate Acreage:	**2,534.52**

Special Notes:

- # Site Rehabilitation Completion Order with Conditions Issued
- * PRFBSR chose to voluntarily terminate BSRA and the BSRA was terminated in October by mutual consent
- ** Please note, BSRA BF00101004 has been superseded by BSRAs BF500101005 and BF00101006. Please refer to the new BSRAs for detail regarding responsible parties, site boundaries, etc.

[1] NR = Not Reported
BSRA = Brownfields Site Rehabilitation Agreement (Sites Under Remediation)
SRCO = Site Rehabilitation Completion Order ("No Further Action")

CITY OF TAMPA

Pam Iorio, Mayor

Solid Waste Department

Office of Environmental Coordination

BF290501000

March 8, 2005

Roger B. Register, Brownfields Liaison
Florida Department of Environmental Protection
Bureau of Waste Cleanup
2600 Blair Stone Road, MS 4505
Tallahassee, Florida 32399-2400

Re: former W.T. Edwards Facility Brownfield Area Designation Notification

Dear Mr. Register:

In accordance with Section 376-80(1), Florida Statutes, the City of Tampa is notifying the Department of its decision to designate former W.T. Edwards Facility properties as a Brownfield Area for the purpose of environmental rehabilitation and economic development.

A copy of Resolution Number 2005-184, approving this designation that was executed by the Tampa City Council on February 10, 2005 is attached. The legal description of the properties included in the designated Brownfield Area is given as an attachment to the resolution labeled "Exhibit A". A diagram showing the parcels included in the designated Brownfield Area is given as an attachment to the resolution labeled "Exhibit B".

The Person Responsible for Brownfield Site Rehabilitation (PRFBSR) at this Designated Brownfield Area is:

Hillsborough Community College
c/o Martha Kaye Koehler
P.O. Box 31127
Tampa, Florida 33631-3127

Phone: (813) 253-7007
Fax: (813) 229-8313
e-mail: mkoehler@hccfl.edu

Please feel free to contact my office, if you have any questions or require any additional information.

Sincerely,

Daniel M. Fahey
Office of Environmental Coordination

cc: Martha Kaye Koehler - HCC
Ron Noble - Fowler White Boggs Banker
John Sego - FDEP
Justin Vaske - City of Tampa
Mary Yeargan - EPC

RESOLUTION NO. 2005- 184

A RESOLUTION OF THE CITY OF TAMPA DESIGNATING A BROWNFIELD AREA WITHIN THE CITY OF TAMPA, FLORIDA, UPON APPLICATION OF HILLSBOROUGH COMMUNITY COLLEGE FOR PROPERTY GENERALLY LOCATED AT 4014 DR. MARTIN LUTHER KING BOULEVARD CONSISTING OF APPROXIMATELY 26 ACRES FOR THE PURPOSE OF ENVIRONMENTAL REHABILITATION AND ECONOMIC DEVELOPMENT; PROVIDING AN EFFECTIVE DATE.

WHEREAS, the Legislature of the State of Florida, pursuant to Florida Statutes Sections 376.77 – 376.85, adopted the Brownfields Redevelopment Act, the purpose of which is to encourage the redevelopment and the voluntary cleanup of existing commercial and industrial sites; and

WHEREAS, the Brownfields Redevelopment Act created a process whereby a local government with jurisdiction over the brownfield area must by resolution notify the State Department of Environmental Protection of its decision to designate a brownfield area for rehabilitation; and

WHEREAS, a local government shall designate a brownfield area under the provisions of the Brownfields Redevelopment Act provided that:

(1) a person who owns or controls a potential brownfield site is requesting the designation and has agreed to rehabilitate and redevelop the brownfield site;

(2) The rehabilitation and redevelopment of the proposed brownfield site will result in economic productivity of the area, along with the creation of at least ten (10) new permanent jobs, whether full time or part time, which are not associated with the implementation of the rehabilitation agreement or an agreement, between the person responsible for, site rehabilitation and the local government with jurisdiction, which contains terms for the redevelopment of the brownfield site or brownfield areas;

(3) The redevelopment of the proposed brownfield site is consistent with the local comprehensive plan and is a permittable use under the applicable local land development regulations;

(4) Notice of the proposed rehabilitation of the brownfield area has been provided to neighbors and nearby residents of the proposed area to be designated, and the person proposing the area for designation has afforded to those receiving notice the opportunity for comments and suggestions about rehabilitation. Notice

pursuant to this subsection must be made in a newspaper of general circulation in the area, at least sixteen square inches in size, and the notice must be posted in the affected area;

(5) The person proposing the area for designation has provided reasonable assurance that he or she has sufficient financial resources to implement and complete the rehabilitation agreement and redevelopment plan; and

WHEREAS, the City of Tampa, having conducted public hearings on the application, have determined that the above sited conditions have been satisfied; and

WHEREAS, the City of Tampa has considered:

1. Whether the brownfield area warrants economic development and has a reasonable potential for such activities;

2. Whether the proposed area to be designated represents a reasonably focused approach and is not overly large in geographic coverage;

3. Whether the area has potential to interest the private sector in participating in rehabilitation; and

4. Whether the area contains sites or parts of sites suitable for limited recreational open space, cultural, or historical preservation purposes; and

WHEREAS, the property is within a community redevelopment area.

NOW, THEREFORE

BE IT RESOLVED BY THE CITY COUNCIL OF THE CITY OF TAMPA, FLORIDA, THAT:

Section 1. The City Council for the City of Tampa, upon application of Hillsborough Community College hereby designates the property generally located at 4014 Dr. Martin Luther King Boulevard consisting of and described more particularly in the legal description attached hereto as Exhibit "A" and as depicted by the map attached hereto as Exhibit "B," as a brownfield area for rehabilitation for the purposes of Sections 376.77 – 376.85, Florida Statutes.

Section 2. The proper officers and employees of the City of Tampa are hereby authorized to do all things necessary and proper to make effective the provisions of this Resolution, which shall take effective immediately upon its adoption.

Section 3. This Resolution shall take effect immediately upon its adoption.

PASSED AND ADOPTED BY THE CITY COUNCIL OF THE CITY OF TAMPA, FLORIDA, ON FEB 10 2005.

ATTEST:

Shirley Foxx-Knowles
CITY CLERK/DEPUTY CITY CLERK

Gwendolyn M. Miller
CHAIRMAN/CHAIRMAN PRO-TEM
CITY COUNCIL

PREPARED AND APPROVED
AS TO FORM:

Justin R. Vaske
JUSTIN R. VASKE
ASSISTANT CITY ATTORNEY
F:\USERS\LG40\Brownfields\BROWNFIELD DESIGNATION Edwards.doc

Legal Description Based Upon Boundary Survey for DCF dated 9/27/02.

DESCRIPTIONS

Parcel Description (New)

A parcel of land lying and being in the North 1/2 of Section 9, Township 29 South, Range 18 East, Hillsborough County, Florida, and being more particularly described as follows:

For a Point of Commencement begin at the Northwest corner of the Northeast 1/4 of the Northwest 1/4 of Section 9, Township 29 South, Range 18 East; thence South 00° 34' 05" West along the West line of said Northeast 1/4 of the Northwest 1/4 and along the centerline of North Lois Avenue distance of 18.95 feet to the Southerly Right of Way line of Dr. Martin Luther King, Jr. Boulevard. (formerly West Buffalo Avenue): thence South 89° 44' 12" East along said Southerly Right of Way line a distance 417.00 feet to the Point of Beginning. From the Point of Beginning thence continue South 89° 44' 12 " East a distance of 234.23 feet; thence South 0° 02' 51" West a distance of 378.65 feet; thence South 68° 29' 56" East a distance of 10.53 feet; thence South 47°27' 02" East a distance of 100.00 feet; thence South 88° 37' 24 " East a distance of 293.64 feet; thence North 42° 47' 10" East a distance of 150.29 feet; thence North 00° 36' 00" West a distance of 344.72 feet to a point on the Southerly right of way line of said Dr.Martin Luther King Jr. Boulevard; thence South 89° 44' 12" East along the right of way of said Dr. Martin Luther King Jr. Boulevard. a distance of 36.66 feet; thence South 00° 01' 43" West a distance of 343.95 feet; thence South 88° 19' 40" East a distance of 250.25 feet; thence North 3° 19' 25" East a distance of 9.93 feet; thence South 87° 11' 21" East a distance of 93.44 feet; thence South 16° 59' 36" West a distance of 205.96 feet; thence South 44° 23' 56" East a distance of 216.25 feet; thence South 00° 27' 04" West a distance of 52.88 feet; thence North 89° 45' 08" West a distance of 72.22 feet; thence North 74° 45' 08" West a distance of 130.62 feet; thence South 15° 14' 52" West a distance of 150.02 feet; thence South 00° 12' 48" West a distance of 268.78 feet; thence South 0° 34' 05" West a distance of 354.00 feet; thence North 89°45' 06" West a distance of 833.14 feet; thence North 00° 34' 05" East a distance of 70.00 feet; thence North 89° 45' 06" West a distance of 106.00 feet; thence North 00° 34' 05" East a distance of 115.00 feet; thence South 89° 45' 06" East a distance of 43.00 feet; thence North 00° 34' 05" East a distance of 9.00 feet; thence South 89° 45' 06" East a distance of 63.00 feet; thence North 00°34' 05" East a distance of 432.45 feet; thence North 89° 44' 31" West a distance of 120.00 feet; thence North 00° 34' 05" East a distance of 856.00 feet to the Point of Beginning.

Containing 25.93 acres, more or less.

Exhibit A

LEGAL DESCRIPTION OF PROPERTY (Based upon Quitclaim Deed Recorded in OR Book 12842 PG 0581.)

From the Northwest corner of the Northeast ¼ of the Northwest ¼ of Section 9, Township 29 South, Range 18 East, Hillsborough County, Florida; run thence South 00°34'05" West, 18.95 feet along the West boundary of the Northeast ¼ of the Northwest ¼ of said Section 9; thence South 89°44'12" East, 417.00 feet, along the South right-of-way line of the West Buffalo Avenue, to the Point of Beginning; thence South 89°44'12" East, 1745.61 feet, along the South right-of-way of West Buffalo Avenue; thence South 00°25'41" West, 400.00 feet; thence South 87°44'12" East, 400.00 feet; thence South 00°25'41" West, 1002.90 feet, along the west right-of-way line of Dale Mabry Highway; thence North 89°45'06" West, 420.90 feet, along a

line 1295.00 feet, North and parallel to the South boundary of the Northeast ¼ of said Section 9; thence North 00°34'05" East, 275.00 feet; thence North 89°45'06" West, 775.00 feet; thence South 00°34'05" West, 354.00 feet; thence North 89°45'06" West, 1325.14 feet; thence North 00°34'05" East, 626.58 feet, along the East right-of-way line of North Lois Avenue; thence South 89°44'12" East, 372.00 feet; thence North 00°34'05" East, 856.00 feet, to the Point of Beginning.

LESS AND EXCEPT THE FOLLOWING FIVE (5) PARCELS:

(1) That part Northeast ¼ of the Northwest ¼ of Section 9, Township 29 South, Range 18 East, Hillsborough County, Florida, more particularly described as follows:

Commence at the Northwest corner of the Northeast ¼ of the Northwest ¼ of said Section 9; thence South 00°48'43" West, along the West boundary of the Northeast ¼ of the Northwest ¼ of said Section 9, a distance of 18.95 feet to a point on the South right-of-way line of Dr. Martin Luther King Jr. Boulevard (State Road 574)(formerly Buffalo Avenue); thence South 89°29'27" East, along the South right-of-way line of said Dr. Martin Luther King Jr. Boulevard, a distance of 651.23 feet to the Point of Beginning: thence continue South 89°29'27" East, along the South right-of-way line of said Dr. Martin Luther King Jr. Boulevard, a distance of 475.19 feet; thence leaving the South right-of-way line of said Dr. Martin Luther King Jr. Boulevard South 00°21'18" East, 344.73 feet; thence South 43°01'56" West, 150.29 feet; thence North 88°22'38" West, 293.64 feet; thence North 47°12'16" West, 100.00 feet; thence North 68°15'10" West 10.53 feet; thence North 00°17'35" East, 378.65 feet to the Point of Beginning.

(2) That part of the North ¼ of Section 9, Township 29 South, Range 18 East, Hillsborough County, Florida, more particularly described as follows:

Commence at the Northwest corner of the Northeast ¼ of the Northwest ¼ of said Section 9; thence South 00°48'43" West, along the West boundary of the Northeast ¼ of the Northwest ¼ of said Section 9, a distance of 18.95 feet to a point on the South right-of-way line of Dr. Martin Luther King Jr. Boulevard (State Road 574)(formerly Buffalo Avenue); thence South 89°29'27" East, along the South right-of-way line of said Dr. Martin Luther King Jr. Boulevard, a distance of 1163.08 feet to the Point of Beginning: thence continue South 89°29'27" East, along the South right-of-way line of said Dr. Martin Luther King Jr. Boulevard, a distance of 374.30 feet; thence leaving the South right-of-way line of said Dr. Martin Luther King Jr. Boulevard South 00°40'52" West, 250.88 feet; thence South 17°14'06" West, 97.59 feet; thence North 86°56'35" West, 93.44 feet; thence South 03°34'11" West, 9.93 feet; thence North 88°04'54" West, 250.25 feet; thence North 00°16'27" East, 343.95 feet to the Point of Beginning.

(3) A parcel of land lying in the NW¼ of Section 9, Township 29 South, Range 18 East, Hillsborough County, Florida and being more particularly described as follows:

Exhibit A

Commencing at the NW corner of said Section 9; thence N 00°57'21" E a distance of 8.15 feet to a point on the centerline of West Buffalo Avenue; thence S 89°44'31" E along said centerline a distance of 1327.43 feet to the centerline of North Lois Avenue; thence S 00°34'05" W along said centerline of North Lois Avenue a distance of 896.00 feet; thence S 89°44'31" E a distance of 52.00 feet to the POINT OF BEGINNING, said point being on the easterly right-of-way boundary of North Lois Avenue; thence continue S 89°44'31" E a distance of 485.00 feet; thence S 00°34'05" W a distance of 426.50 feet; thence N 89°45'06" W a distance of 120.00 feet; thence S 00°34'05" W a distance of 200.00 feet; thence N 89°45'06" W a distance of 365.00 feet to a point of the aforesaid easterly right-of-way boundary of North Lois Avenue; thence N 00°34'05" E along said right-of-way, a distance of 626.58 feet to the POINT OF BEGINNING.

(4) A parcel of land lying in Section 9, Township 29 South, Range 18 East, Hillsborough County, Florida, and being more particularly described as follows:

Commence at a found 5/8 Capped Iron Rod LB #33 marking the North Quarter corner of Section 09, Township 29 South, Range 18 East; thence run South 89°12'12" East, along the North line of the Northwest Quarter of the Northeast Quarter, for 1,235.14 feet; thence South 00°24'50" West, for 31.80 feet to the Point of Beginning; thence continue South 00°24'50" West, along the existing West right-of-way line of Dale Mabry Highway (State Road No. 600-200' R/W) for

1,365.62 feet; thence North 89°45'45" West, for 420.95feet; thence North 00°33'30" East, for 275.00 feet; thence North 89°46'52" West, for 775.00 feet; thence North 00°13'08" East, for 268.78 feet; thence North 15°13'08" East, for 150.02 feet; thence South 74°46'52" East, for 130.62 feet; thence South 89°46'52" East, for 72.22 feet; thence North 00°25'20" East, for 52.88 feet; thence North 44°24'21" West, for 216.25 feet; thence North 16°58'34" East, for 303.66 feet; thence North 00°25'20" East, for 251.01 feet to the South right-of-way line of Dr. Martin Luther King, Jr. Boulevard; thence continue along said South right-of-way line of Dr. Martin Luther King, Jr. Boulevard for the following four courses: 1) South 89°43'47" East, for 292.81 feet; 2) South 88°33'21" East, 537.32 feet; 3) South 89°13'05" East, 113.88 feet; 4) South 72°35'36" East, 84.93 feet to the Point of Beginning.

(5) For a Point of Commencement begin at the Northwest corner of the Northeast ¼ of the Northwest ¼ of Section 9, Township 29 South, Range 18 East, Hillsborough County, Florida, thence South 00°34'05" West, along the West line of the Northeast ¼ of the Northwest ¼ of said Section 9 and the centerline of Lois Avenue, a distance of 1501.53 feet; thence South 89°45'06" East a distance of 417.00 feet, to the Point of Beginning; thence North 00°34'05" East a distance of 200.00 feet; thence South 89°45'06" East, a distance of 120.00 feet; thence South 00°34'05" West a distance of 6.00 feet; thence North 89°45'06" West, a distance of 63.00 feet; thence South 00°34'05" West a distance of 9.00 feet; thence North 89°45'06" West a distance of 43.00 feet; thence South 00°34'05" West a distance of 115.00 feet; thence South 89°45'06" East a distance of 106.00 feet; thence South 00°34'05" West a distance of 70.00 feet; thence North 89°45'06" West a distance of 120.00 feet to the Point of Beginning.

Exhibit A

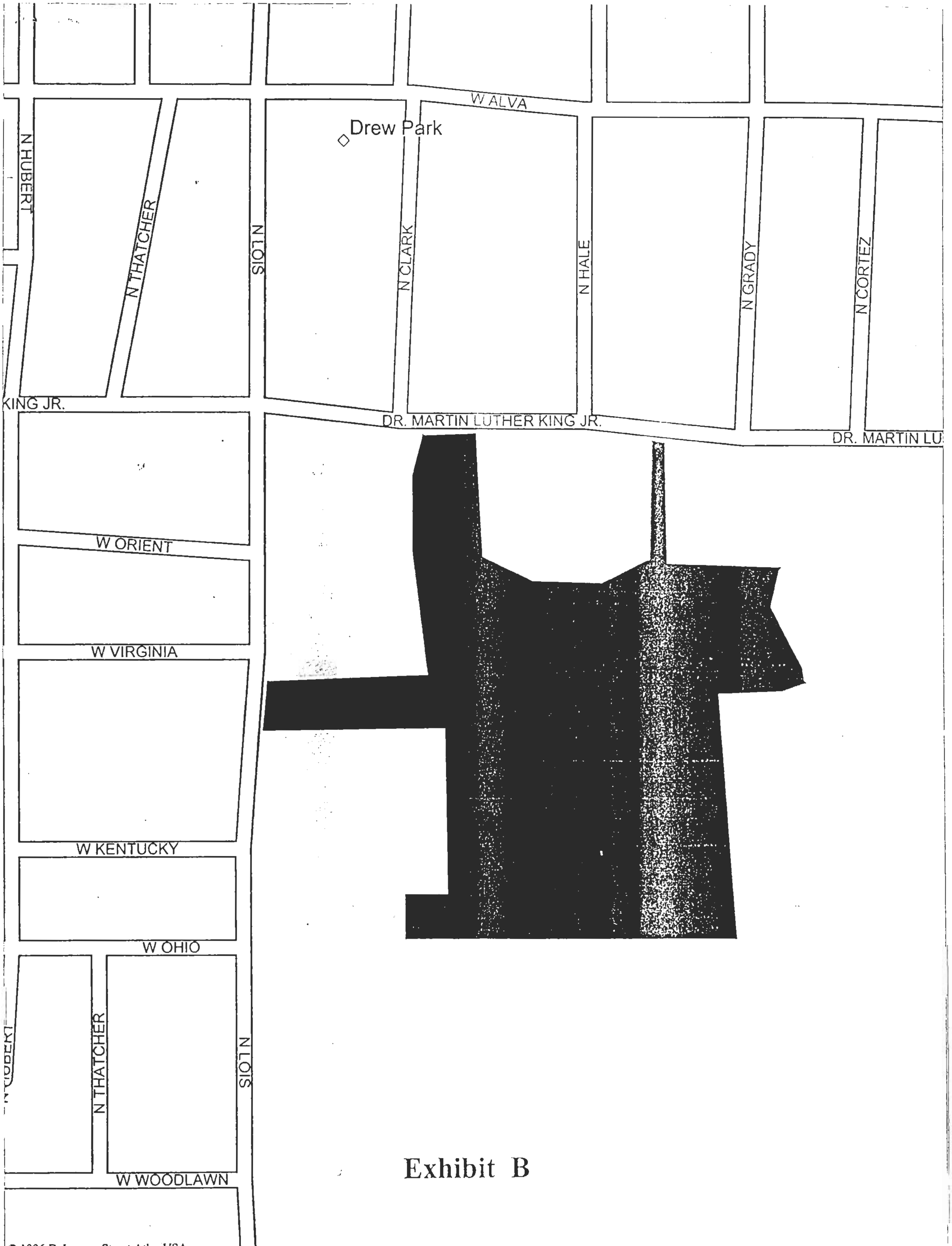

W ALVA
Drew Park
N HUBERT
N THATCHER
N LOIS
N CLARK
N HALE
N GRADY
N CORTEZ
KING JR.
DR. MARTIN LUTHER KING JR.
W ORIENT
W VIRGINIA
W KENTUCKY
W OHIO
N THATCHER
N LOIS
W WOODLAWN

Exhibit B

CHAPTER 14: SITE ANALYSIS FOR POTENTIAL STRUCTURAL ALTERNATIVES

14.1 Overview

This chapter describes a series of structural alternatives that could potentially be used to improve water quality and natural systems for the Lower Sweetwater Creek watershed. A series of analyses were performed using GIS to strategically locate water quality and natural systems alternatives. We also describe the methods used to identify these projects.

Water quality conditions were evaluated using the County's Water Quality Treatment Level of Service criteria and pollutant loading model. The alternatives have been developed to improve water quality and natural systems and address the goals of the county in these areas.

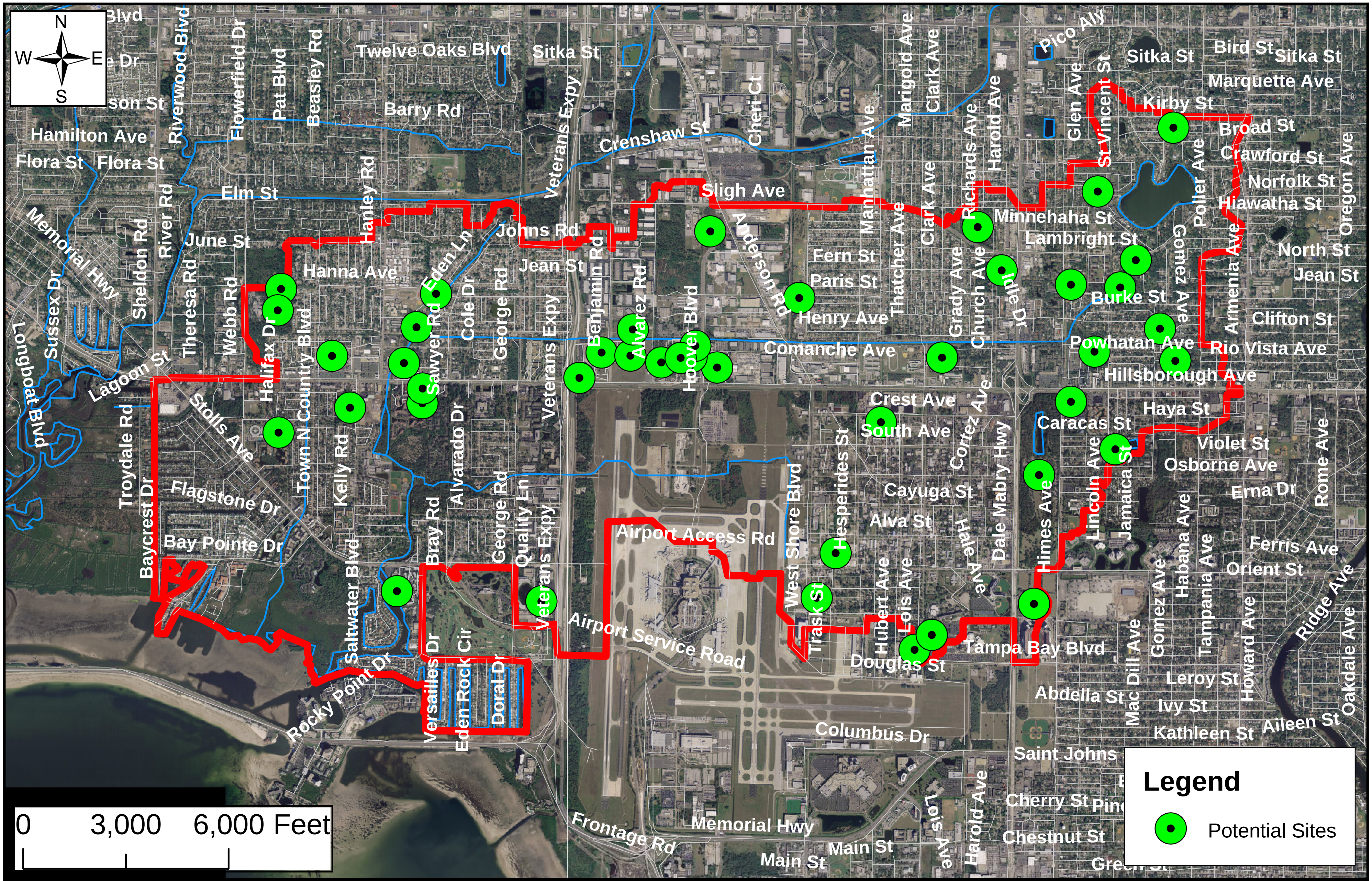
To facilitate locating undeveloped/open lands for construction of water quality treatment ponds, GIS land use data and the most recent aerial photography (2006) were used to identify the most suitable and cost-effective sites within the watershed.

A similar methodology was used to identify potential wetland restoration areas within the Lower Sweetwater Creek watershed.

14.2 Identification and Prioritization of Sites

In order to determine the best possible locations for potential structural alternatives, analysis of the recent aerial photography (2006) of the area was conducted. The first step of the process involved visual identification of areas that could potentially serve as stormwater treatment locations or wetland restoration areas. In order to complete this task, aerial photographs were analyzed for location of areas/lands that appeared to be undeveloped and with sufficient areas suitable for installing a storm water basin. This analysis produced 41 locations for potential structural alternatives (Figure 14-1). This study did not include a comparative analysis for different types of treatment for water quality improvement (e.g., alum treatment, detention ponds).

In order to treat surface water effectively, it is beneficial to position alternatives in close proximity to a major stream network, in order to treat larger quantities of water. For completion of this task, the alternatives were prioritized based on their proximity to the major stream network. Using a variety of ArcView 8.3 spatial analysis functions, a 500-meter buffer was created around the major stream network. Next, locations of potential structural alternatives sites, identified in the previous step of the process, were divided into two categories based on whether they fall within the 500-meter buffer or outside of the major stream network buffer.



Potential Project Locations in the Lower Sweetwater Creek Watershed

Figure 14-1

AYRES ASSOCIATES

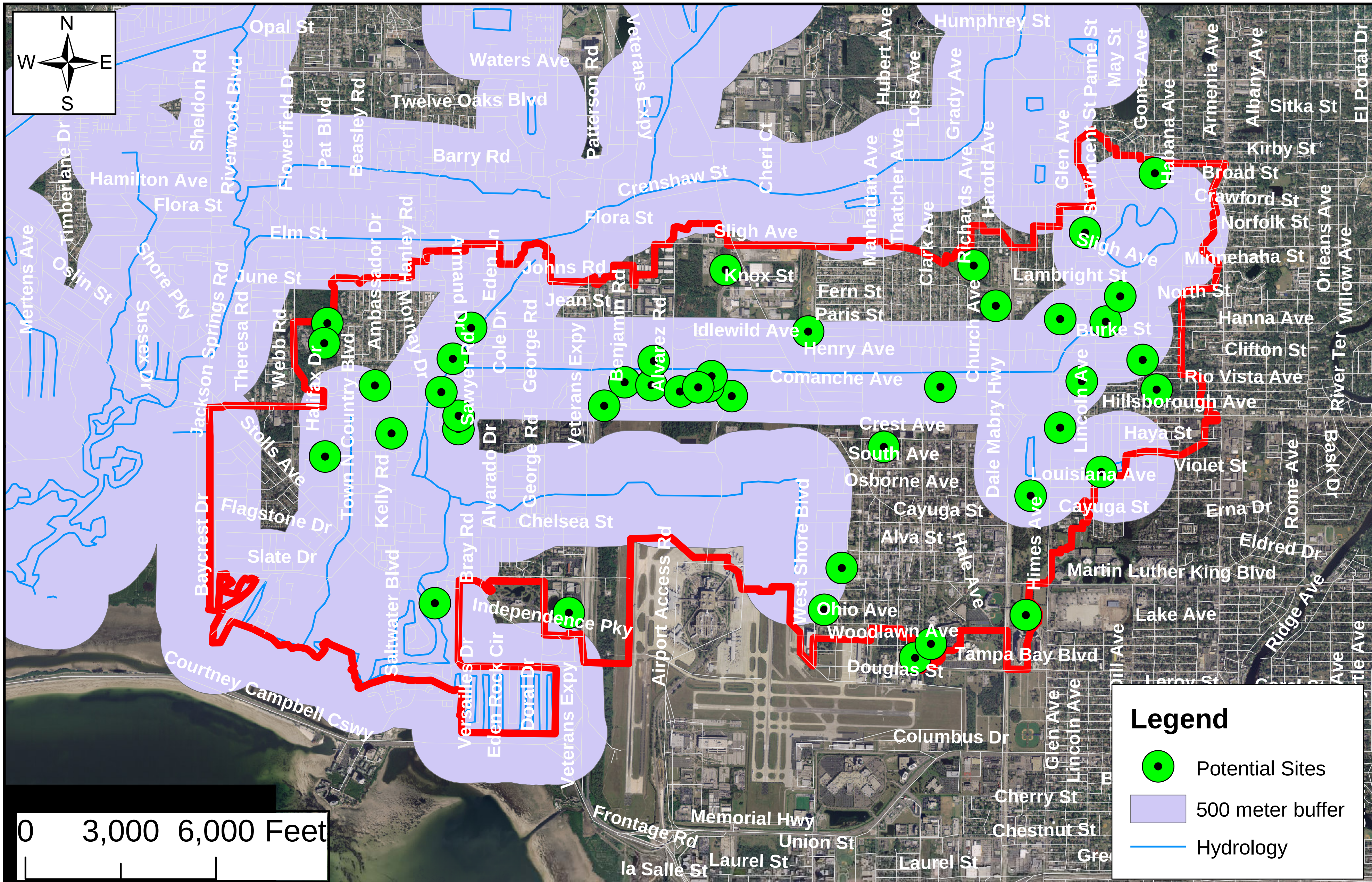
This step yielded 30 locations of potential structural alternatives that fall within 500 meters of the major stream network (Figure 14-2).

In order to verify that the sites we selected have no existing construction, land use information was used to identify locations classified as “open areas.” In order to complete this task, the land use shapefile was analyzed and areas with FLUCFCS codes designating such land use categories as agricultural lands, open land, or upland forest were extracted as a separate layer. Next, 41 potential alternatives identified in the first step of the process were overlaid with the newly created “open areas” layer. Out of these locations, 15 fell within the “open areas” (Figure 14-3).

Whenever identifying a location for a new structural alternative, it is more appropriate to select parcels that are owned by the government and not private entities. Land acquisition process for the purpose of water quality and water quantity improvement is a process that is not only lengthy, but also very costly. Based on this fact, the alternatives were further prioritized based on their ownership. Hillsborough county parcels layer was used to identify lands that belong to governmental entities. In order to complete this task, the Department of Revenue (DOR) Land Use codes were identified that represent lands owned by the government (Governmental DOR Codes range between 80 and 89).

Once a new layer of “Governmentally owned lands” was extracted, the original 41 potential structural alternatives sites were separated based on their ownership (governmentally owned lands vs. all others). This process identified a total of 16 potential parcels under government ownership that could potentially be utilized for stormwater treatment and wetland improvement purposes (Figure 14-4).

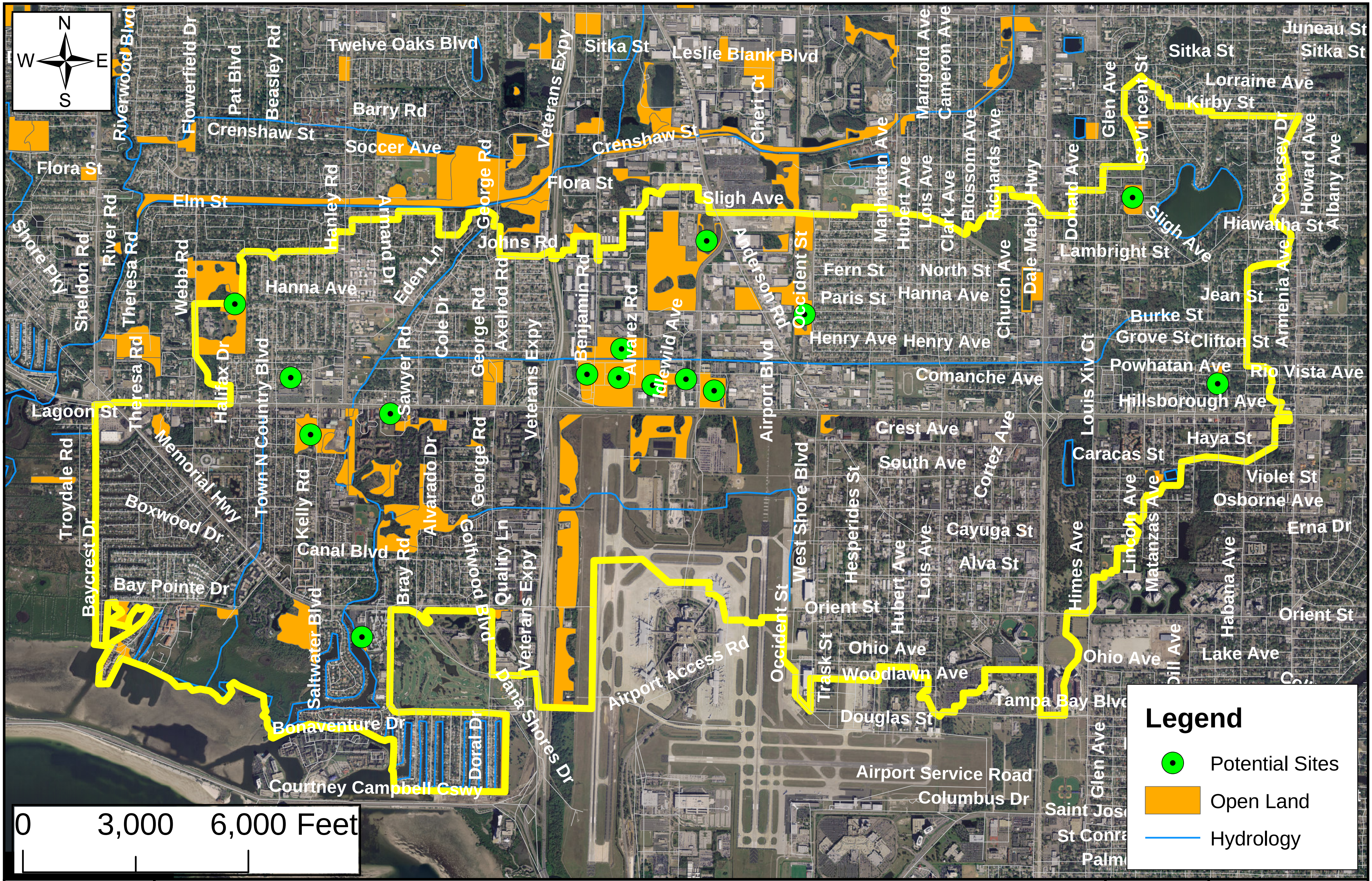
In order to identify the final selections, the results of all the steps of the aforementioned analysis were combined. In other words, while prioritizing the original 41 potential structural alternatives locations, more importance and consideration was given to locations that fell within the 500-meter buffer of the major stream network, that belonged to the “open areas” land use types, and that are owned by the governmental entities. This analysis produced seven higher priority parcels that belonged to all three categories and were further considered for field analysis (Figure 14-5).



Lower Sweetwater Creek Watershed - 500 meter Buffer from Streams

Figure 14-2

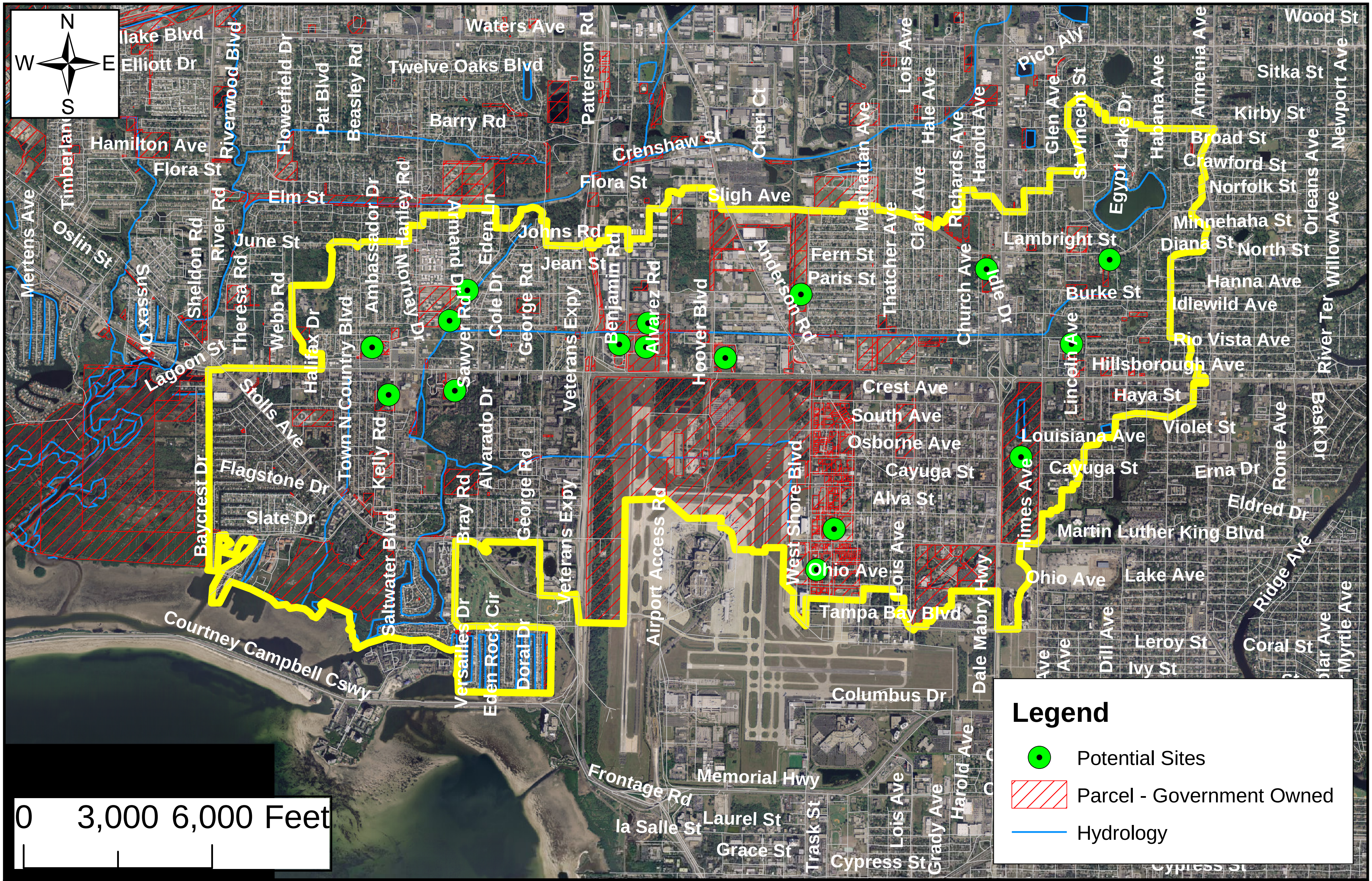
AYRES ASSOCIATES



Lower Sweetwater Creek Watershed - Open Areas

Figure 14-3

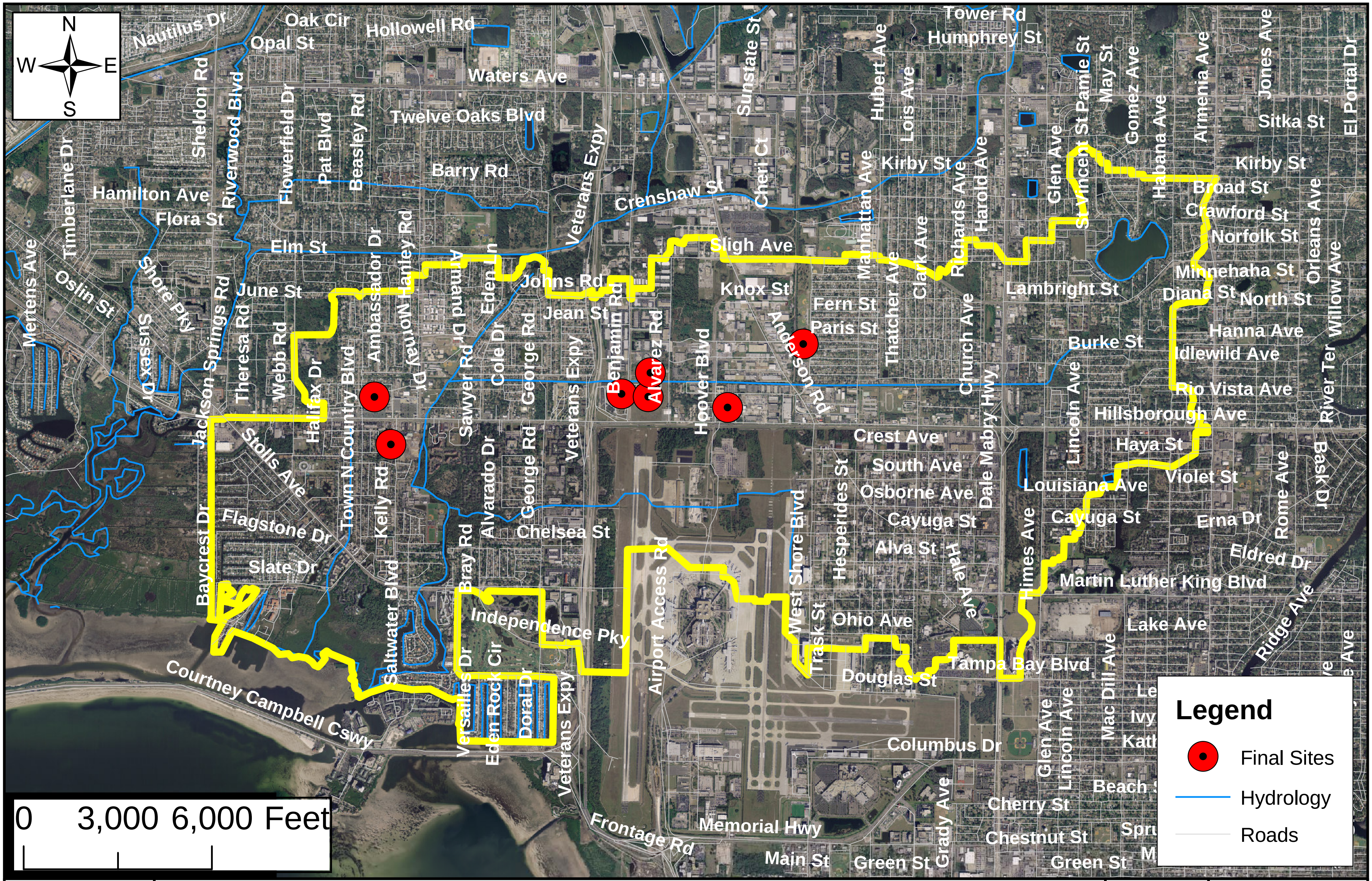
AYRES ASSOCIATES



Lower Sweetwater Creek Watershed - Government Owned Lands

Figure 14-4

AYRES ASSOCIATES



Lower Sweetwater Creek Watershed - Final Selection

Figure 14-5

AYRES ASSOCIATES

14.2.1 Potential Project Site 1: Paula Drive

Potential project site 1 is located in the central western portion of the Lower Sweetwater Creek watershed (Figure 14-6). It is represented by a large parcel approximately 6 acres located along Paula Drive. The closest major intersection to the area is Hillsborough Avenue and Town N Country Boulevard. The parcel is located behind what appears to be a major shopping center and is owned by Hillsborough County.

Based on analysis of the aerial photography and other GIS information, this location exists in the area that contributes large amounts of surface water pollution. Based on its size, ownership and land use classification, this location may be utilized for construction of a stormwater treatment system.

14.2.2 Potential Project Site 2: Kelly Road

Potential project site 2 is located in the central western portion of the Lower Sweetwater Creek watershed (in close proximity to Alternative 1) (Figure 14-7). As aerial image of the area illustrates, this parcel is relatively large in size (approximately 9.12 acres) and could potentially encompass an artificial water body (such as a retention or detention pond). The parcel is located along Kelly Road, just south of Hillsborough Avenue. It is located in close proximity to a major stream (960 feet) and is under Hillsborough County ownership.

In addition to being an open parcel, the western side of this location is occupied by something that may be a small wetland or a depression area. Identification of an existing wetland may provide an additional opportunity for wetland expansion and improvement.

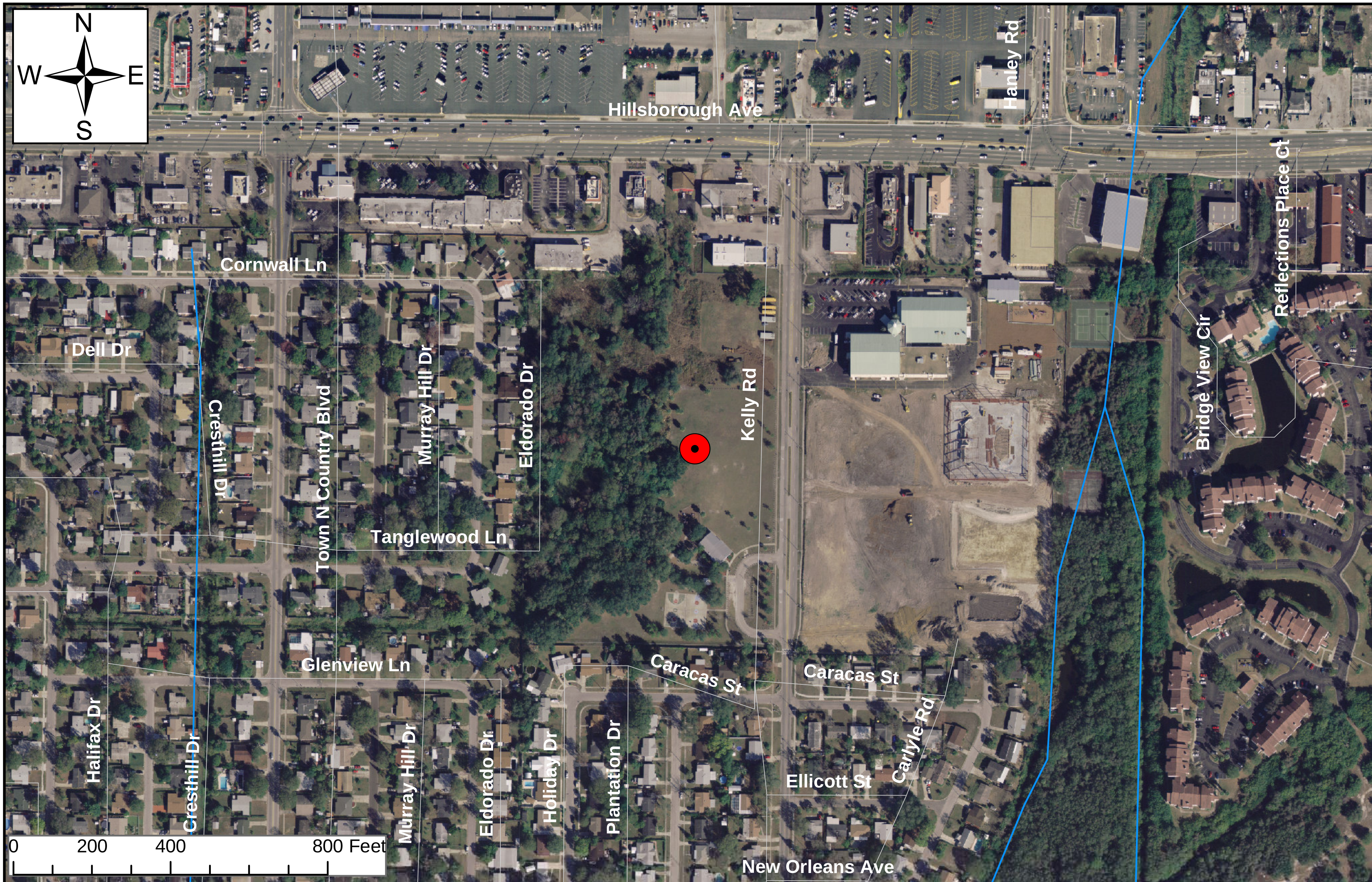
14.2.3 Potential Project Site 3: TIA Area

Potential project site 3 is located in the central portion of the Lower Sweetwater Creek watershed (Figure 14-8). This location is a combination of three parcels located along Hillsborough Avenue in close proximity to the north side of Tampa International Airport. The parcels are large in size (ranging approximately 4 to over 10 acres in size) with a major stream flowing right through them. In addition, a small wetland is identified in the northwestern corner of the area that could potentially be used in a wetland expansion and improvement project. These parcels belong to the Hillsborough County Aviation Authority and therefore land acquisition would not be necessary.

Potential Project Site 1: Paula Drive

Figure 14-6

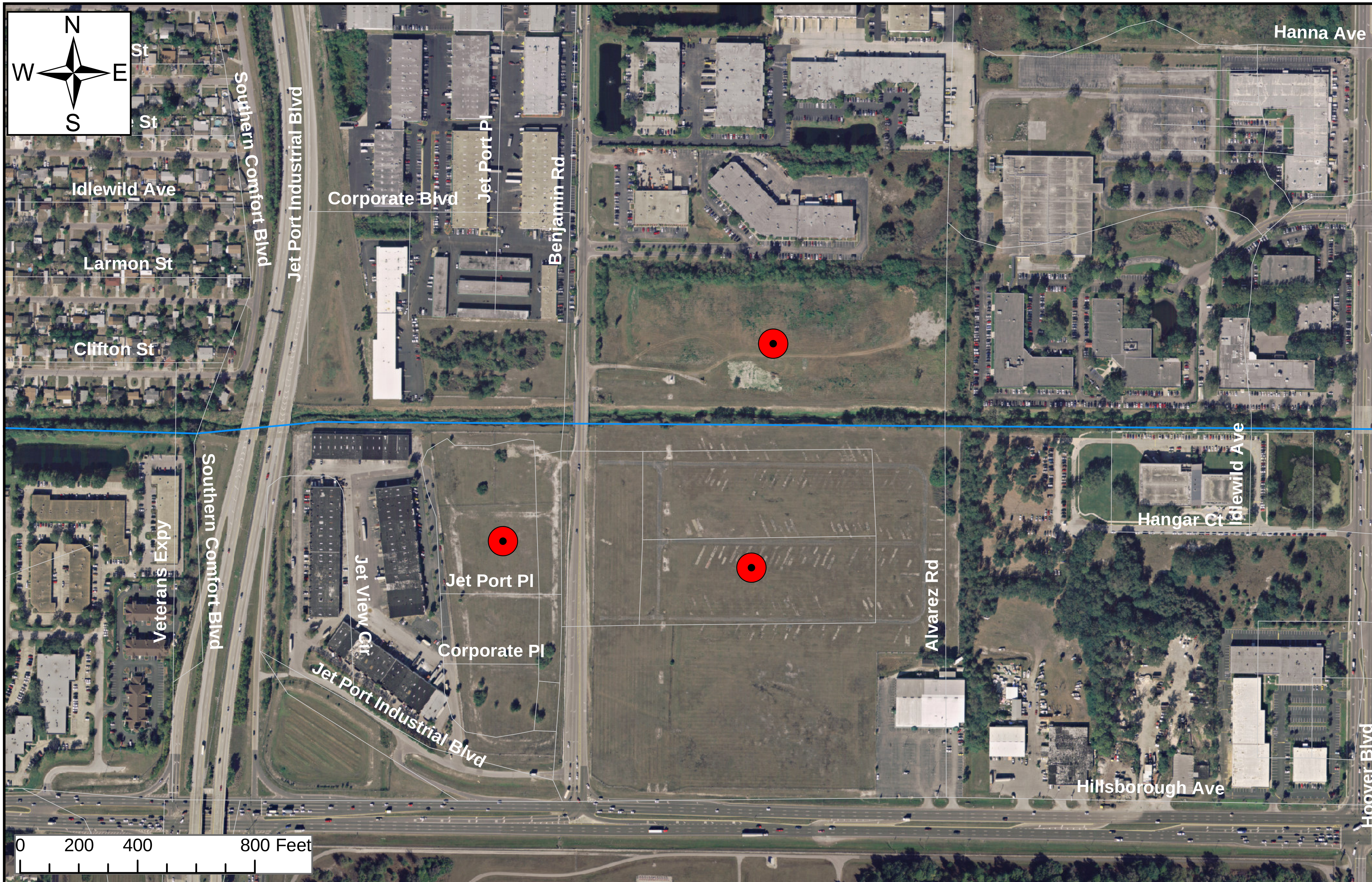
AYRES ASSOCIATES



Potential Project Site 2: Kelly Road

Figure 14-7

AYRES ASSOCIATES



Potential Project Site 3: Tampa International Airport

Figure 14-8

AYRES ASSOCIATES

14.2.4 Potential Project Site 4: Hillsborough and Hoover

Potential project site 4 is located in the central portion of the Lower Sweetwater Creek watershed (Figure 14-9). This parcel is located in the northeastern corner of the intersection of Hillsborough Avenue and Hoover Boulevard, north of the Tampa International Airport. The parcel is about 10 acres in size and is surrounded by a number of small industrial and commercial parks. Much of the industry in the immediate vicinity of the parcel is related to the Tampa International Airport.

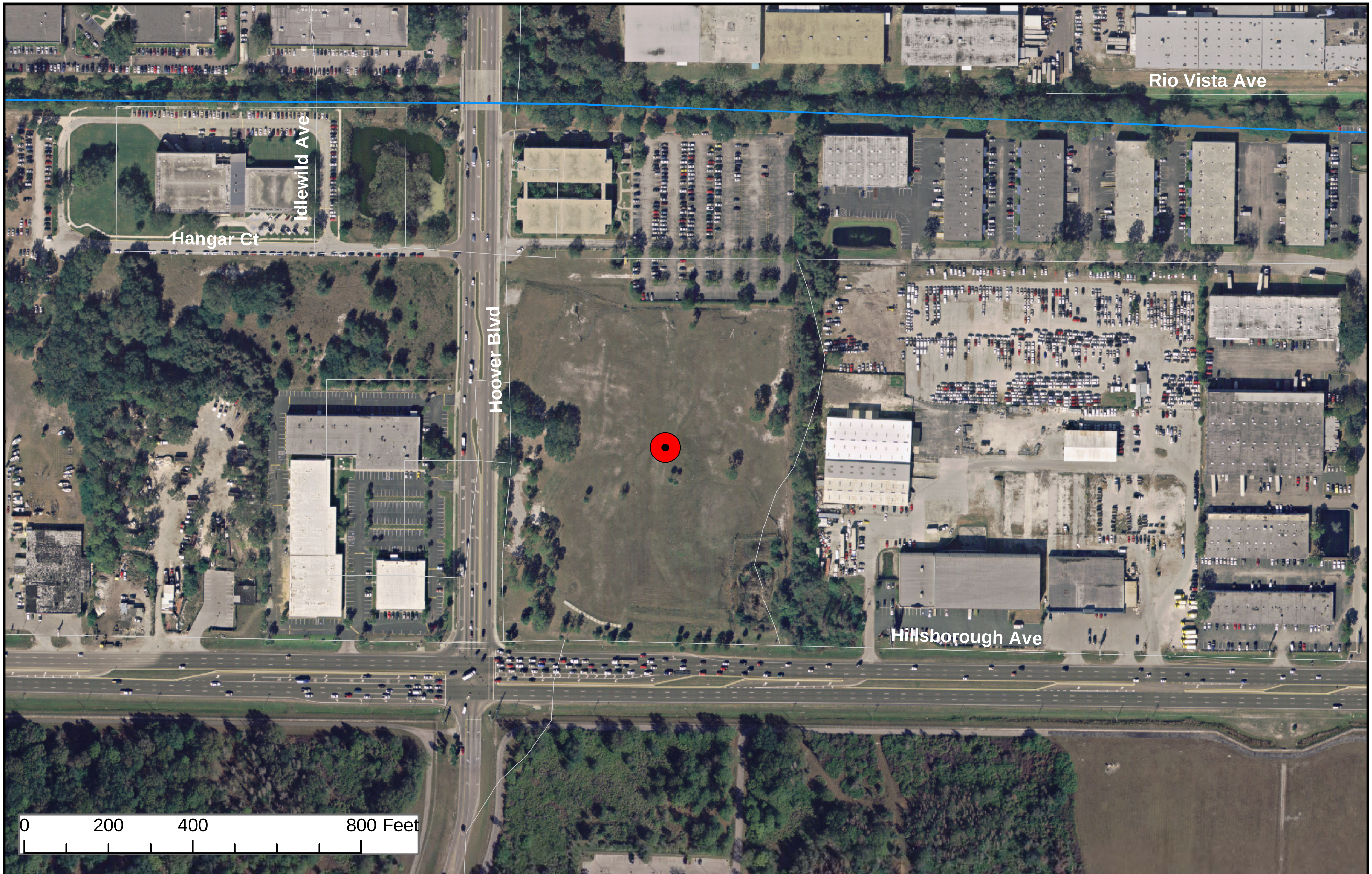
This site is located approximately 400 feet from a major stream network. The land use in this location is classified as Open Land. The parcel belongs to the Hillsborough County Aviation Authority. Because the parcel is open and is under governmental ownership, the acquisition of the parcel would not be necessary. In addition, a small wetland is visible on the aerial photography, which may provide an opportunity for wetland expansion.

14.2.5 Potential Project Site 5: Occident Street

Potential project site 5 is located in the northern-central portion of the Lower Sweetwater Creek watershed (Figure 14-10). It is represented by the elongated parcel located along Occident Street. The parcel is approximately 16 acres and is surrounded by densely populated residential areas and subdivisions. From the aerial photography, such features as a small wetland in the center of a parcel and baseball field can be seen; this parcel is most likely a neighborhood park. It is owned by Hillsborough County and land use is classified as Open Land.

14.2.6 Potential Project Site 6: Hangar Court

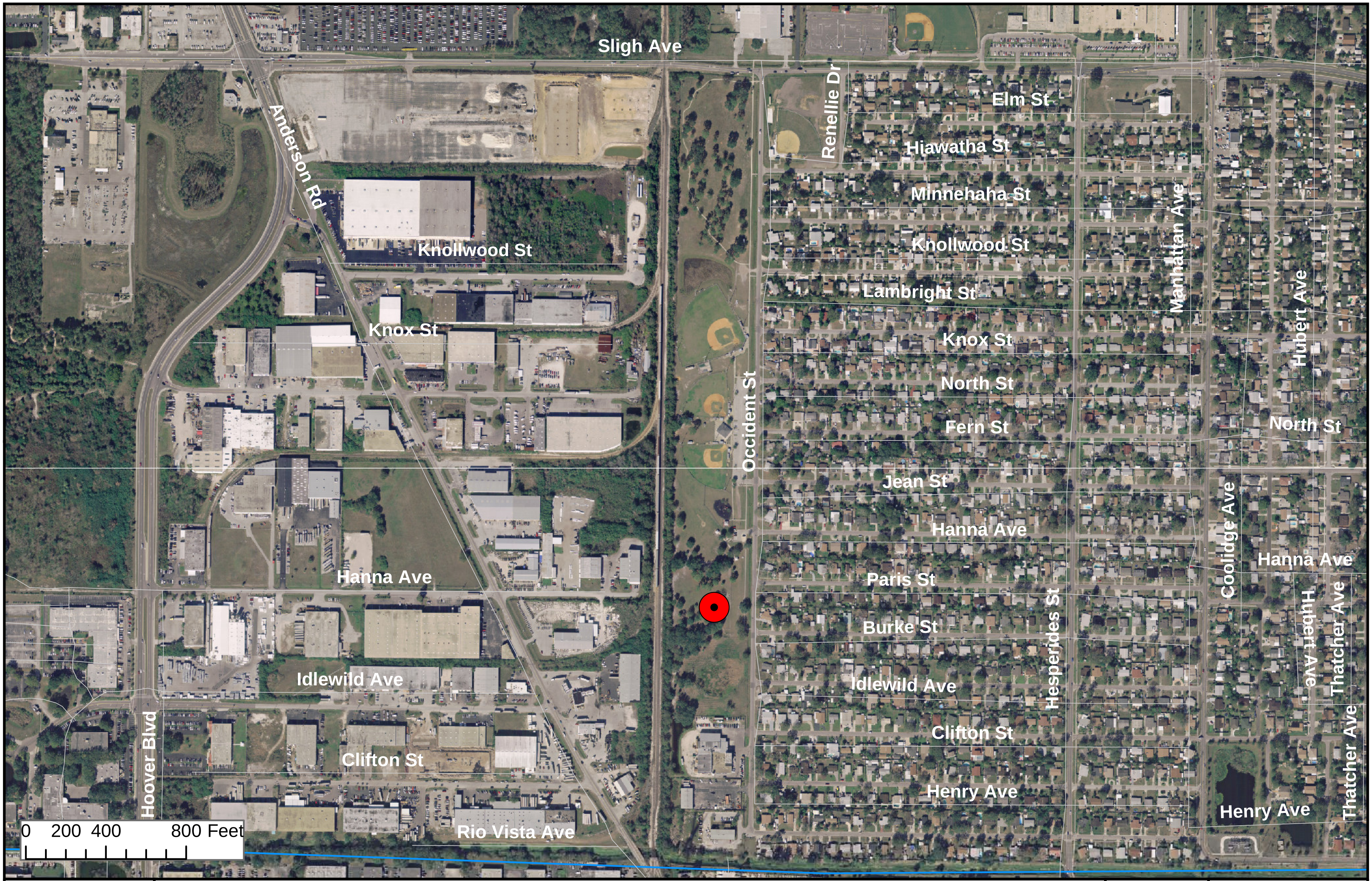
This site was identified during the field visit. It is located west of Hoover Boulevard, near project site 4 (Figure 14-11).



Potential Project Site 4: Hillsborough and Hoover

Figure 14-9

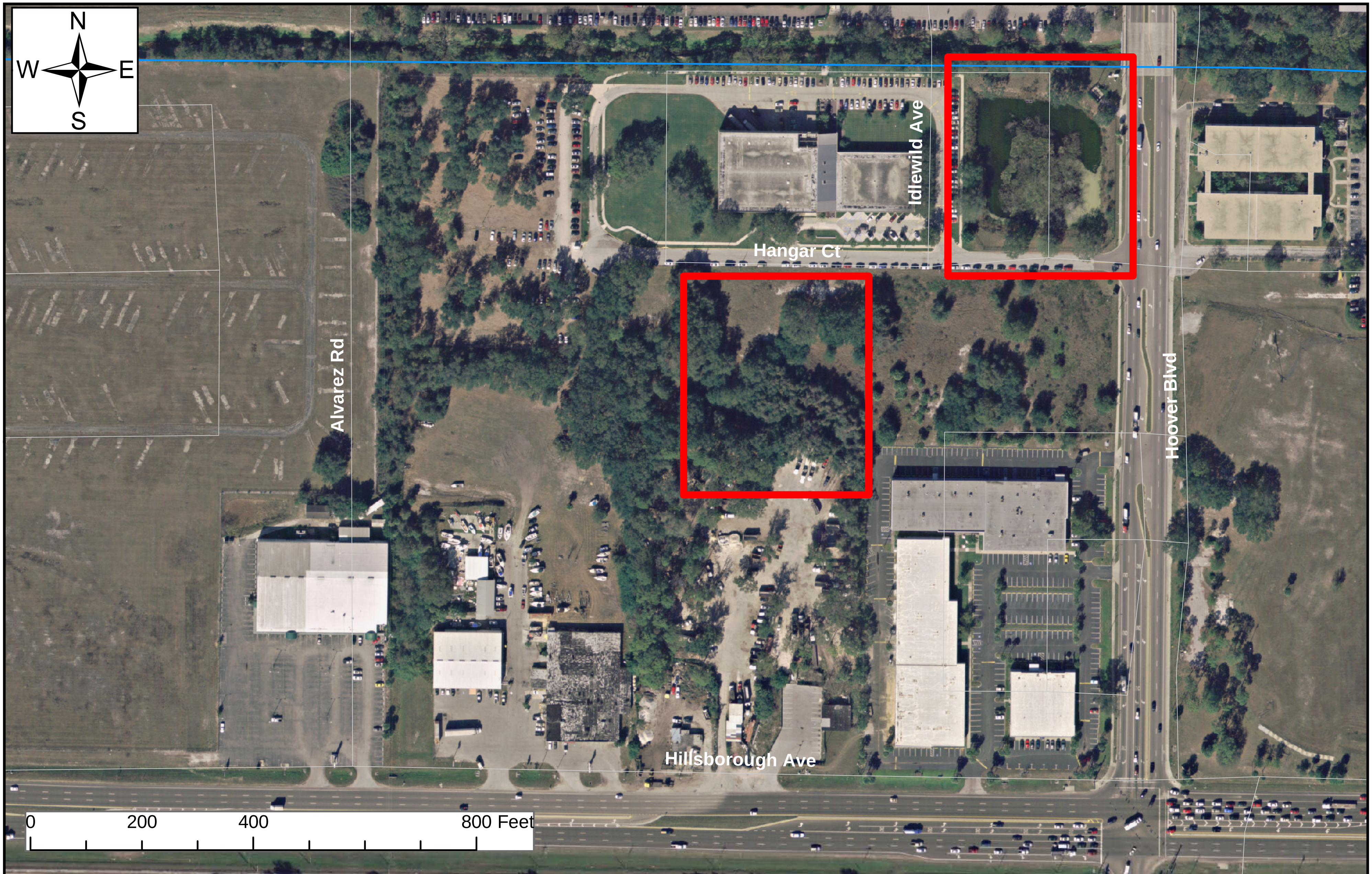
AYRES ASSOCIATES



Potential Project Site 5: Occident Street

Figure 14-10

AYRES ASSOCIATES



Potential Project Site 6: Hangar Court

Figure 14-11

AYRES ASSOCIATES

14.3 Field Inspection of Potential Sites

14.3.1 Potential Project Site 1: Paula Drive

The Paula Drive site presented an ideal location for development of a stormwater treatment system because the area is dominated by residential and built-up lands contributing large amounts of pollutants into the watershed's surface waters. The field visit confirmed that the site is already under development and will be the site of a public library. Based on its size and location, a water quality treatment system would provide much needed water quality improvement to the surrounding areas. This location (LSC-1) will be recommended as a site for a possible structural BMP for this project; see Chapter 15 for more detail.

14.3.2 Potential Project Site 2: Kelly Road

Field inspection of the Kelly Road site has confirmed that it is a home to Sandy Perrone Park. The southeastern corner of the park encompasses a small maintenance building containing restrooms. A playground is located to the west of the maintenance building. The northeastern corner of the parcel is represented by a large field. The western half of the parcel contained a small forested patch. A closer inspection of the western half of the parcel identified a small natural wetland and two shallow basins of water – parts of a natural wetland.

While this wetland certainly provides some treatment to the surface water in the watershed, it could be greatly expanded and improved. This location (LSC-2) will be recommended as a site for a possible structural BMP for this project; see Chapter 15 for more detail.


SANDY PERRONE
PARK
5120

14.3.3 Potential Project Site 3: TIA Area

This site is located in close proximity to the Tampa International Airport and is owned by the Hillsborough County Aviation Authority. Visually, this is an ideal location for a large structural BMP. The size of the parcel, governmental ownership, lack of structures, and proximity to the major stream network make it an ideal candidate for construction of a large treatment pond. Due to the site’s proximity to the airport, permitting the construction may be an issue.

Further investigation should be made regarding the opportunity for BMP construction on this parcel. For the purpose of this project, this location (LSC-3) will be recommended as a site for a possible structural BMP; see Chapter 15 for more detail.




14.3.4 Potential Project Site 4: Hillsborough and Hoover

This site is located at the intersection of Hillsborough Avenue and Hoover Boulevard. This is a very large parcel that could easily encompass a structural BMP. The size and location of the parcel make it a perfect location for a large treatment pond. In addition, a small wetland is located in the southwestern corner of the parcel. There is a fence surrounding the wetland area. The fencing was not maintained and is currently in unacceptable condition (i.e., large holes are located in multiple areas of the fence).

This is another location that will be recommended as a structural alternative during the final recommendation phase of the project. This location may not only provide an opportunity for a wetland improvement/expansion project, but is also suitable for a new treatment pond. This location (LSC-4) will be recommended as a site for a possible structural BMP for this project; see Chapter 15 for more detail.




14.3.5 Potential Project Site 5: Occident Street

South:
While aerial photography inspection identified this location as an ideal site for a structural alternative, field inspection determined that majority of the area is occupied by the West Dog Park. A dark patch in the center of the site, earlier presumed to be a small wetland, turned out to be a round playground located in the center of the park.

Although, at first glance, the site seemed to be an unacceptable location for a structural alternative, further inspection identified an open grassy area located to the south of the park. This area already contains a small pond that is not maintained. The pond is covered with grass and vegetation. While the area is not large enough for construction of an effective retention pond, the existing area may be improved and expended to effectively treat the storm water received from many neighboring residential neighborhoods and the West Dog Park located immediately to the north. This location (LSC-5) will be recommended as a site for a possible structural BMP for this project; see chapter 15 for more detail.

North:

The northern portion of the parcel already contains a large size treatment pond with a weir system. No improvement is needed.

14.3.6 Potential Project Site 6: Hangar Court

This site was identified during the field visit. It is located near Alternative 4, on the west side of Hoover Boulevard. The two locations that were inspected are small governmentally owned (Hillsborough County) parcels. The first parcel is approximately 3 acres in size and is located on the corner of Hangar Court and Hoover Boulevard, located along Channel G.

The second parcel, which looks like an open field, is also approximately 3 acres, and is located on the other side of Hangar Court. Visually, these locations may present an opportunity for construction of a BMP or wetland improvement. This location (LSC-6) will be recommended as a site for a possible structural BMP for this project; see Chapter 15 for more detail.

CHAPTER 15: FINAL RECOMMENDATIONS

15.1 Overview

This chapter describes the final recommendations of the alternatives that were developed for water quality and natural systems for the Lower Sweetwater Creek watershed. Generally, two different sets of BMPs may be applied to reduce stormwater impact and/or improve water quality: (1) non-structural BMPs; and (2) structural BMPs. A combination of these two techniques may also be used. One of the most important elements of non-structural BMPs is public education. It focuses on preventative measures while structural BMPs mostly relies on existing or constructed systems for treating stormwater. Following are two sets of discussions associated with water quality improvement.

The first point of discussion will cover various resources for public education. An important part of a watershed management plan is public support and to help promote a greater awareness within the community regarding the importance of minimizing stormwater impacts by focusing on preventative measures.

The second section will discuss the proposed alternatives based on the series of analyses that were performed using GIS to strategically locate stormwater quality improvement facilities and natural systems alternatives enhancements.

15.2 Public Education

Various toolboxes, documents, programs, and information are available at the national agency level down to local governments regarding information on watersheds, water quality, stormwater runoff, and BMPs, which are designed to educate and inform the general public and students and faculty at educational institutions.

US EPA Watershed Outreach
http://www.epa.gov/owow/watershed/outreach/outreachnonjs.html
The Nonpoint Source (NPS) Outreach Toolbox is intended for use by state and local agencies and other organizations interested in educating the public on nonpoint source pollution or stormwater runoff. The toolbox contains a variety of resources to help develop an effective and targeted outreach campaign.

US EPA - Public Education and Outreach on Stormwater Impacts
Because stormwater runoff is generated from dispersed land surfaces--pavements, yards, driveways, and roofs--efforts to control stormwater pollution must consider individual, household,

and public behaviors and activities that can generate pollution from these surfaces.

Florida Department of Environmental Protection - Best Management Practices, Public Information, and Environmental Education Resources

http://www.dep.state.fl.us/Water/nonpoint/pubs.htm

Reports, brochures, handouts, videos, and training aids are available to governments, teachers, general public with ideas and resources to reduce and educate about non-point source pollution in Florida.

Southwest Florida Water Management District

http://www.swfwmd.state.fl.us/

SWFWMD has various educational and public education programs relating to watersheds and how to improve water quality.

Tampa Bay Water

http://www.tampabaywater.org/conservation/conservation.aspx

The Tampa Bay Water website has links to documents regarding water conservation that will give ideas to member governments and the public in making a difference in conserving the region's water resources.

Pinellas County – Department of Environmental Management

http://www.pinellascounty.org/Environment/default.htm

The Water Resources Management Section is dedicated to public outreach and education. The sites offers outreach activities that range from answering citizens' questions and concern about their aquatic environment to formal presentations.

Hillsborough County Watershed Atlas

http://www.hillsborough.wateratlas.usf.edu/

The education section is geared towards educating the public about water resources and has links to access various documents, citizen based water management organizations, and classroom tools. There is an area for educators regarding watersheds and water quality with student activities and the general education section has documents and links to help citizens understand the data on the Atlas and teach about maintaining the health of area waterbodies.

Hillsborough County Stormwater Public Education Awareness Campaign (SPEAC)

This is an educational outreach program in which volunteers do monitoring, education, and restoration projects such as The Lake Management Program (LaMP), Stream Waterwatch, Adopt-A-Pond, Stormwater Ecologist, and Officer Snook.

Hillsborough County – Public Works- Adopt-A-Pond

http://www.hillsboroughcounty.org/publicworks/engineering/stormwater/adoptapond.cfm

Hillsborough County encourages the local community to take care of area lakes, creeks, and ponds. They feel the restoration or rehabilitation of stormwater ponds is essential to the health of local lakes, creeks, rivers and bays. This program educates the public about aquatic vegetation that can stabilize a pond and remove pollutants in order to help maintain water quality. The Adopt-A-Pond program shows how a properly designed pond may have increased wildlife habitat, recreation areas, and aesthetic views.

15.3 Proposed Alternatives

As is the case for most watershed management plans for water quality improvements and environmental enhancements, a combination of measures consisting of structural and non-structural alternatives are applicable depending on availability of resources and cost-effectiveness. Unless a comprehensive hydraulic and water quality analysis is performed, it will be difficult to determine the effectiveness of BMPs in improving water quality accurately. Nevertheless, these BMPs are expected to improve water quality.

15.3.1 Structural BMPs

In Chapter 14, a number of locations for potential structural BMPs were analyzed based on the following parameters:

- Visual identification
- Proximity to steam network
- Land availability
- Property ownership

After field review of every location described in Chapter 14, six feasible locations for potential alternative sites were recommended for further consideration. This chapter contains a Summary Sheet for the six locations described earlier:

- LSC1 – Paula Drive
- LSC2 – Kelly Road
- LSC3 – TIA
- LSC4 – Hillsborough and Hoover
- LSC5 – Occident
- LSC6 – Hangar Court

Summary sheets, located at the end of the chapter, contain such information as general description of the site based on the field visit, site location map in relationship to the Lower Sweetwater Creek watershed, aerial view of the proposed site, and a cost estimate for pond installation at the proposed site. The cost estimate is based on the following assumptions:

- The costs are limited to the pond installation

- Ponds are assumed to be 5 feet deep, covering the largest possible area in the selected parcels

In addition, the cost estimates include sod covering a buffer of 30 ft around the pond perimeter, an inlet and outlet structure (just a rough market average price), a silt fence around the construction area, and a fence around the pond and gate.

Cost estimates are based on August 16, 2007 Hillsborough County Unit Price (WORCS), and as noted, some unit costs are based on estimated market prices. If a pre-design analysis is required, its associated cost needs to be added to the project cost (approximately 15 to 20 percent of the total project cost).

It should be noted that since a water quality analysis could not be performed as part of this project, it is recommended that such a task be performed during the design process. The results of such analysis may suggest adjustments to sizing of the system, consequently changing the project cost. Furthermore, the availability of recommended sites may change over time. Therefore, prior to initiating any project, a complete investigation is recommended to identify legal, financial, and other constraints that could not be identified under this study.

15.3.2 Non-Structural BMPs/Public Outreach and Education

There are various state and local agencies that provide educational and outreach materials for the public at large and academic institutions. Experience has shown that teaching student populations from early years in elementary school is the most effective way of producing citizens who are respectful of quality of life issues and the environment. It is recommended that the County form a partnership with schools to provide them with educational materials to assist teachers in classroom instruction. The County should also provide volunteer staff to participate in teaching days during the academic year to explain the importance of preventing water pollution and improving water quality to the students and teachers.

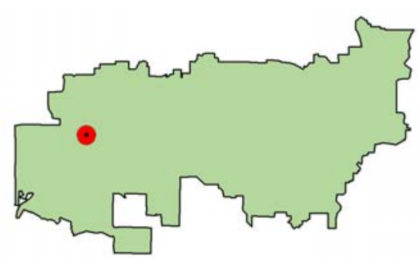
PREFERRED SITES

LSC-1 Paula Drive

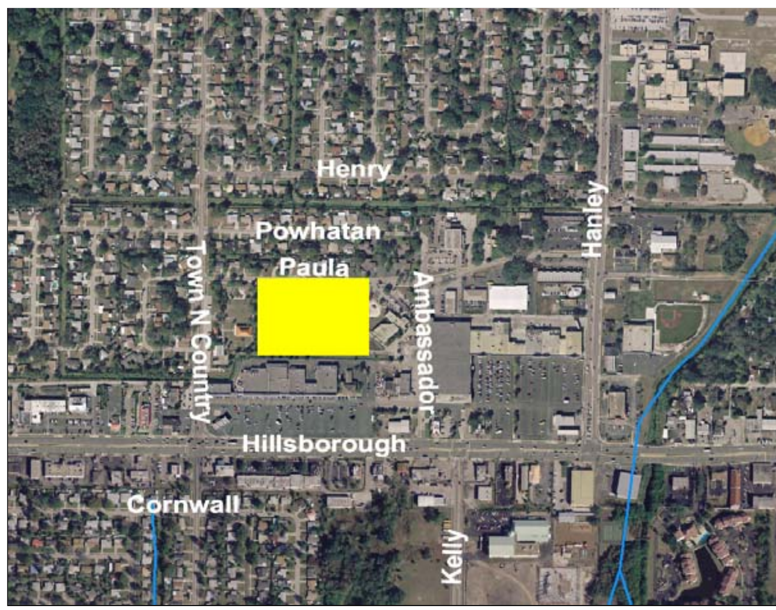
The Paula Drive site presented an ideal location for development of a stormwater treatment system because the area is dominated by residential and built-up lands contributing large amounts of pollutants into the watershed's surface waters.

The field visit confirmed that the site is already under development and will be the site of a public library. Based on its size and location, a water quality treatment system would provide much needed water quality improvement to the surrounding areas.

This location will be recommended as a structural BMP for this project.



Site Photo & Location Map



CONCEPTUAL OPINION OF PROBABLE CONSTRUCTION COST

Cost estimate of this system to be determined when Hillsborough County discusses and finalizes the nature of the treatment system to be installed.

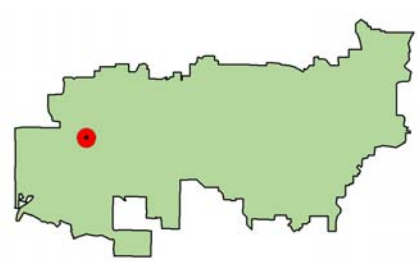
LSC-2 Kelly Road

Field inspection of the Kelly Road site has confirmed that it is a home to Sandy Perrone Park.

The southeastern corner of the park encompasses a small maintenance building containing restrooms. A playground is located to the west of the maintenance building. The northeastern corner of the parcel is represented by a large field. The western half of the parcel contained a small forested patch.

A closer inspection of the western half of the parcel identified a small natural wetland and two shallow basins of water – parts of a natural wetland. While this wetland certainly provides some treatment to the surface water in the watershed, it could be greatly expanded and improved.

This location will be recommended as a structural BMP for this project.



Site Photo & Location Map

CONCEPTUAL OPINION OF PROBABLE CONSTRUCTION COST

ITEM#	DESCRIPTION	UNIT	UNIT COST	QUANTITY	COST	NOTES
101-1	MOBILIZATION	LS	$ 19,000.00	1	$ 19,000.00	(1)
102-1	MAINTENANCE OF TRAFFIC	LS	$ 3,000.00	1	$ 3,000.00	(1)
110-1-1	CLEARING AND GRUBBING	LS	$ 4,000.00	1	$ 4,000.00	(1)
104-13	SILT FENCE STAKED	LF	$ 1.63	900	$ 1,467.00	(1)
120-1	EXCAVATION REGULAR	CY	$ 10.73	8,744	$ 93,825.26	(1)
550-2	FENCING, TYPE B	LF	$ 17.00	1,000	$ 17,000.00	(1)
550-76-162	FENCE GATE (TYPE B) (DOUBLE 8') (16' OPENING)	EA	$ 977.73	1	$ 977.73	(1)
575-1-1	SODDING (BAHIA)	SY	$ 3.43	3,333	$ 11,433.33	(1)
	INLET STRUCTURE	EA	$ 12,000.00	1	$ 12,000.00	(2)
	OUTLET STRUCTURE	EA	$ 15,000.00	1	$ 15,000.00	(2)
				CONSTRUCTION SUBTOTAL	$ 177,703.33	
				CONTINGENCIES (20%)	$ 35,540.67	
				CONSTRUCTION COST	$ 213,243.99	
				ENGINEERING SERVICES (25% OF CONSTRUCTION COST)	$ 53,311.00	
				SURVEY AND GEOTECHNICAL SERVICES (15% OF CONSTRUCTION COST)	$ 31,986.60	
				TOTAL	**$ 298,541.59**	

(1) UNIT COSTS ARE BASED ON THE August 16, 2007 HILLSBOROUGH COUNTY UNIT PRICE (WORCS)
(2) UNIT COSTS ARE BASED ON THE ESTIMATED AVERAGE MARKET PRICE

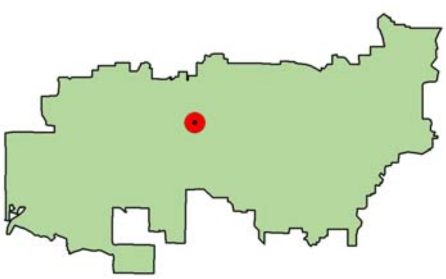
PREFERRED SITES

LSC-3 TIA Area

This alternative is located in close proximity to the Tampa International Airport and is owned by the Hillsborough County Aviation Authority.

Visually, this is an ideal location for a large structural BMP. The size of the parcel, governmental ownership, lack of structures, and proximity to the major stream network make it an ideal candidate for construction of a large treatment pond.

Due to the site's proximity to the airport, to permit the construction may be an issue. Further investigation should be made regarding the opportunity for BMP construction on this parcel.



Site Photo & Location Map

CONCEPTUAL OPINION OF PROBABLE CONSTRUCTION COST

ITEM#	DESCRIPTION	UNIT	UNIT COST	QUANTITY	COST	NOTES
101-1	MOBILIZATION	LS	$ 19,000.00	1	$ 19,000.00	(1)
102-1	MAINTENANCE OF TRAFFIC	LS	$ 3,000.00	1	$ 3,000.00	(1)
110-1-1	CLEARING AND GRUBBING	LS	$ 15,000.00	1	$ 15,000.00	(1)
104-13	SILT FENCE STAKED	LF	$ 1.63	2,400	$ 3,912.00	(1)
120-1	EXCAVATION REGULAR	CY	$ 10.73	65,501	$ 702,823.93	(1)
550-2	FENCING, TYPE B	LF	$ 17.00	2,500	$ 42,500.00	(1)
550-76-162	FENCE GATE (TYPE B) (DOUBLE 8') (16' OPENING)	EA	$ 977.73	1	$ 977.73	(1)
575-1-1	SODDING (BAHIA)	SY	$ 3.43	8,333	$ 28,583.33	(1)
	INLET STRUCTURE	EA	$ 12,000.00	1	$ 12,000.00	(2)
	OUTLET STRUCTURE	EA	$ 15,000.00	1	$ 15,000.00	(2)

CONSTRUCTION SUBTOTAL	$ 842,797.00
CONTINGENCIES (20%)	$ 168,559.40
CONSTRUCTION COST	$ 1,011,356.40
ENGINEERING SERVICES (25% OF CONSTRUCTION COST)	$ 252,839.10
SURVEY AND GEOTECHNICAL SERVICES (15% OF CONSTRUCTION COST)	$ 151,703.46
TOTAL	**$ 1,415,898.96**

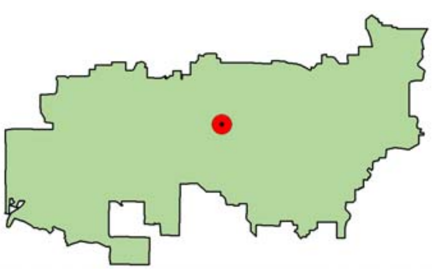
(1) UNIT COSTS ARE BASED ON THE August 16, 2007 HILLSBOROUGH COUNTY UNIT PRICE (WORCS)
(2) UNIT COSTS ARE BASED ON THE ESTIMATED AVERAGE MARKET PRICE

LSC-4 Hillsborough & Hoover

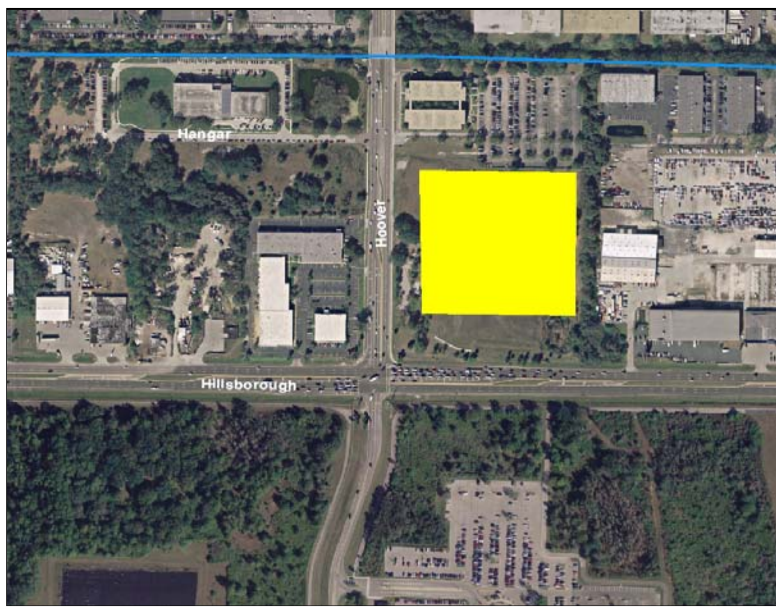
This alternative is located at the intersection of Hillsborough Avenue and Hoover Boulevard. This is a very large parcel that could easily encompass a structural BMP.

The size and location of the parcel make it a perfect location for a large treatment pond. In addition, a small wetland is located in the southwestern corner of the parcel. There is a fence surrounding the wetland area, however the fencing was not maintained and is currently in unacceptable condition (i.e., large holes are located in multiple areas of the fence).

This location that will be recommended as a structural alternative during the final recommendation phase of the project. This location may not only provide an opportunity for a wetland improvement/expansion project, but also be suitable for a new treatment pond.



Site Photo & Location Map



CONCEPTUAL OPINION OF PROBABLE CONSTRUCTION COST						
ITEM#	DESCRIPTION	UNIT	UNIT COST	QUANTITY	COST	NOTES
101-1	MOBILIZATION	LS	$ 19,000.00	1	$ 19,000.00	(1)
102-1	MAINTENANCE OF TRAFFIC	LS	$ 3,000.00	1	$ 3,000.00	(1)
110-1-1	CLEARING AND GRUBBING	LS	$ 15,000.00	1	$ 15,000.00	(1)
104-13	SILT FENCE STAKED	LF	$ 1.63	2,300	$ 3,749.00	(1)
120-1	EXCAVATION REGULAR	CY	$ 10.73	64,000	$ 686,724.76	(1)
550-2	FENCING, TYPE B	LF	$ 17.00	2,400	$ 40,800.00	(1)
550-76-162	FENCE GATE (TYPE B) (DOUBLE 8') (16' OPENING)	EA	$ 977.73	1	$ 977.73	(1)
575-1-1	SODDING (BAHIA)	SY	$ 3.43	8,000	$ 27,440.00	(1)
	INLET STRUCTURE	EA	$ 12,000.00	1	$ 12,000.00	(2)
	OUTLET STRUCTURE	EA	$ 15,000.00	1	$ 15,000.00	(2)

CONSTRUCTION SUBTOTAL	$ 823,691.49
CONTINGENCIES (20%)	$ 164,738.30
CONSTRUCTION COST	$ 988,429.79
ENGINEERING SERVICES (25% OF CONSTRUCTION COST)	$ 247,107.45
SURVEY AND GEOTECHNICAL SERVICES (15% OF CONSTRUCTION COST)	$ 148,264.47
TOTAL	**$ 1,383,801.71**

(1) UNIT COSTS ARE BASED ON THE August 16, 2007 HILLSBOROUGH COUNTY UNIT PRICE (WORCS)
(2) UNIT COSTS ARE BASED ON THE ESTIMATED AVERAGE MARKET PRICE

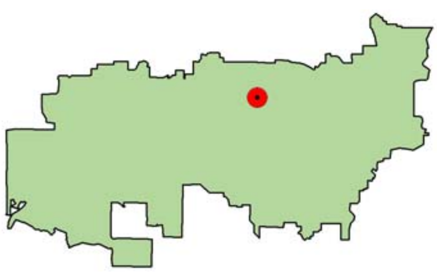
LSC-5 Occident Street

South:

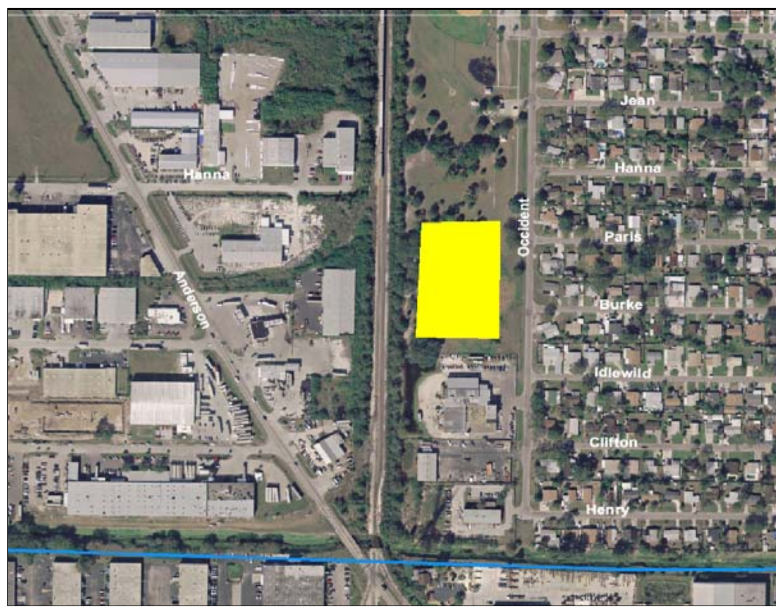
While aerial photography inspection identified this location as an ideal site for a structural alternative, field inspection determined that majority of the area is occupied by the West Dog Park.

Upon further inspection, we identified an open grassy area located to the south of the park. This area already contains a small pond that is not maintained. The pond is covered with grass and vegetation.

While the area is not large enough for construction of an effective retention pond, the existing area may be improved and expanded to effectively treat the stormwater received from many neighboring residential neighborhoods and the West Dog Park located immediately to the north.



Site Photo & Location Map



CONCEPTUAL OPINION OF PROBABLE CONSTRUCTION COST

ITEM#	DESCRIPTION	UNIT	UNIT COST	QUANTITY	COST	NOTES
101-1	MOBILIZATION	LS	$ 19,000.00	1	$ 19,000.00	(1)
102-1	MAINTENANCE OF TRAFFIC	LS	$ 3,000.00	1	$ 3,000.00	(1)
110-1-1	CLEARING AND GRUBBING	LS	$ 8,000.00	1	$ 8,000.00	(1)
104-13	SILT FENCE STAKED	LF	$ 1.63	1,300	$ 2,119.00	(1)
120-1	EXCAVATION REGULAR	CY	$ 10.73	20,207	$ 216,819.45	(1)
550-2	FENCING, TYPE B	LF	$ 17.00	1,400	$ 23,800.00	(1)
550-76-162	FENCE GATE (TYPE B) (DOUBLE 8') (16' OPENING)	EA	$ 977.73	1	$ 977.73	(1)
575-1-1	SODDING (BAHIA)	SY	$ 3.43	4,667	$ 16,006.67	(1)
	INLET STRUCTURE	EA	$ 12,000.00	1	$ 12,000.00	(2)
	OUTLET STRUCTURE	EA	$ 15,000.00	1	$ 15,000.00	(2)

CONSTRUCTION SUBTOTAL	$ 316,722.85
CONTINGENCIES (20%)	$ 63,344.57
CONSTRUCTION COST	$ 380,067.42
ENGINEERING SERVICES (25% OF CONSTRUCTION COST)	$ 95,016.85
SURVEY AND GEOTECHNICAL SERVICES (15% OF CONSTRUCTION COST)	$ 57,010.11
TOTAL	**$ 532,094.39**

(1) UNIT COSTS ARE BASED ON THE August 16, 2007 HILLSBOROUGH COUNTY UNIT PRICE (WORCS)
(2) UNIT COSTS ARE BASED ON THE ESTIMATED AVERAGE MARKET PRICE

PREFERRED SITES

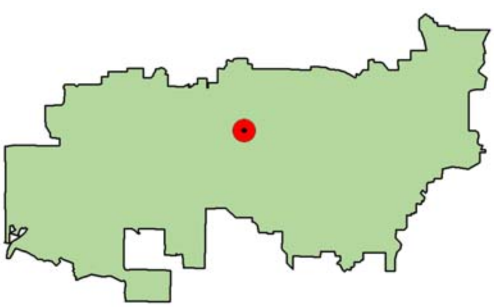
LSC-6 Hangar Court

This site was identified during the field visit. It is located near Alternative 4, on the west side of Hoover Boulevard.

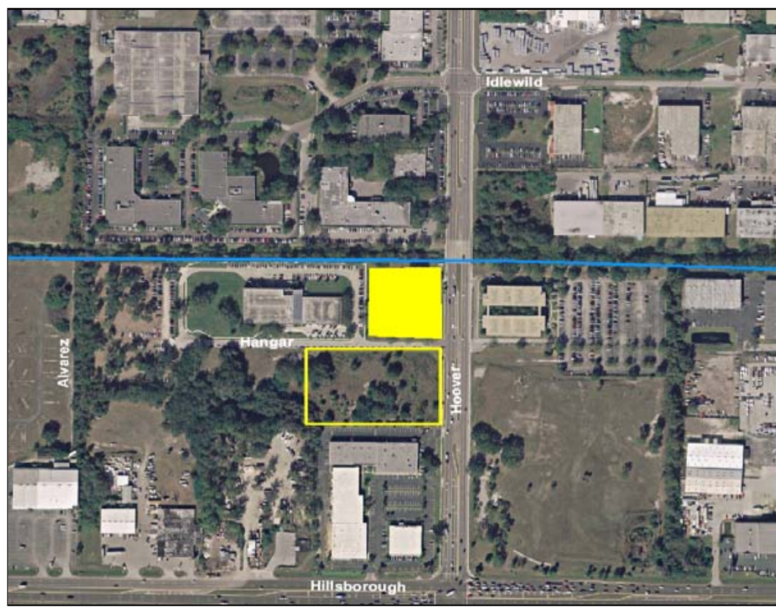
The two locations that were inspected are small governmentally owned (Hillsborough County) parcels.

The first parcel is approximately 3 acres in size and is located on the corner of Hangar Court and Hoover Boulevard, located along Channel G. The second parcel, which looks like an open field, is also approximately 3 acres, and is located on the other side of Hangar Court.

Visually, these locations may present an opportunity for construction of a BMP or wetland improvement.



Site Photo & Location Map



CONCEPTUAL OPINION OF PROBABLE CONSTRUCTION COST

ITEM#	DESCRIPTION	UNIT	UNIT COST	QUANTITY	COST	NOTES
101-1	MOBILIZATION	LS		1	$ -	(1)
102-1	MAINTENANCE OF TRAFFIC	LS		1	$ -	(1)
110-1-1	CLEARING AND GRUBBING	LS	$ 5,000.00	1	$ 5,000.00	(1)
104-13	SILT FENCE STAKED	LF	$ 1.63	900	$ 1,467.00	(1)
120-1	EXCAVATION REGULAR	CY	$ 10.73	10,745	$ 115,290.82	(1)
550-2	FENCING, TYPE B	LF	$ 17.00	1,000	$ 17,000.00	(1)
550-76-162	FENCE GATE (TYPE B) (DOUBLE 8') (16' OPENING)	EA	$ 977.73	1	$ 977.73	(1)
575-1-1	SODDING (BAHIA)	SY	$ 3.43	3,333	$ 11,433.33	(1)
	INLET STRUCTURE	EA	$ 12,000.00	1	$ 12,000.00	(2)
	OUTLET STRUCTURE	EA	$ 15,000.00	1	$ 15,000.00	(2)
				CONSTRUCTION SUBTOTAL	$ 178,168.89	
				CONTINGENCIES (20%)	$ 35,633.78	
				CONSTRUCTION COST	$ 213,802.66	
				ENGINEERING SERVICES (25% OF CONSTRUCTION COST)	$ 53,450.67	
				SURVEY AND GEOTECHNICAL SERVICES (15% OF CONSTRUCTION COST)	$ 32,070.40	
				TOTAL	**$ 299,323.73**	

(1) UNIT COSTS ARE BASED ON THE August 16, 2007 HILLSBOROUGH COUNTY UNIT PRICE (WORCS)
(2) UNIT COSTS ARE BASED ON THE ESTIMATED AVERAGE MARKET PRICE

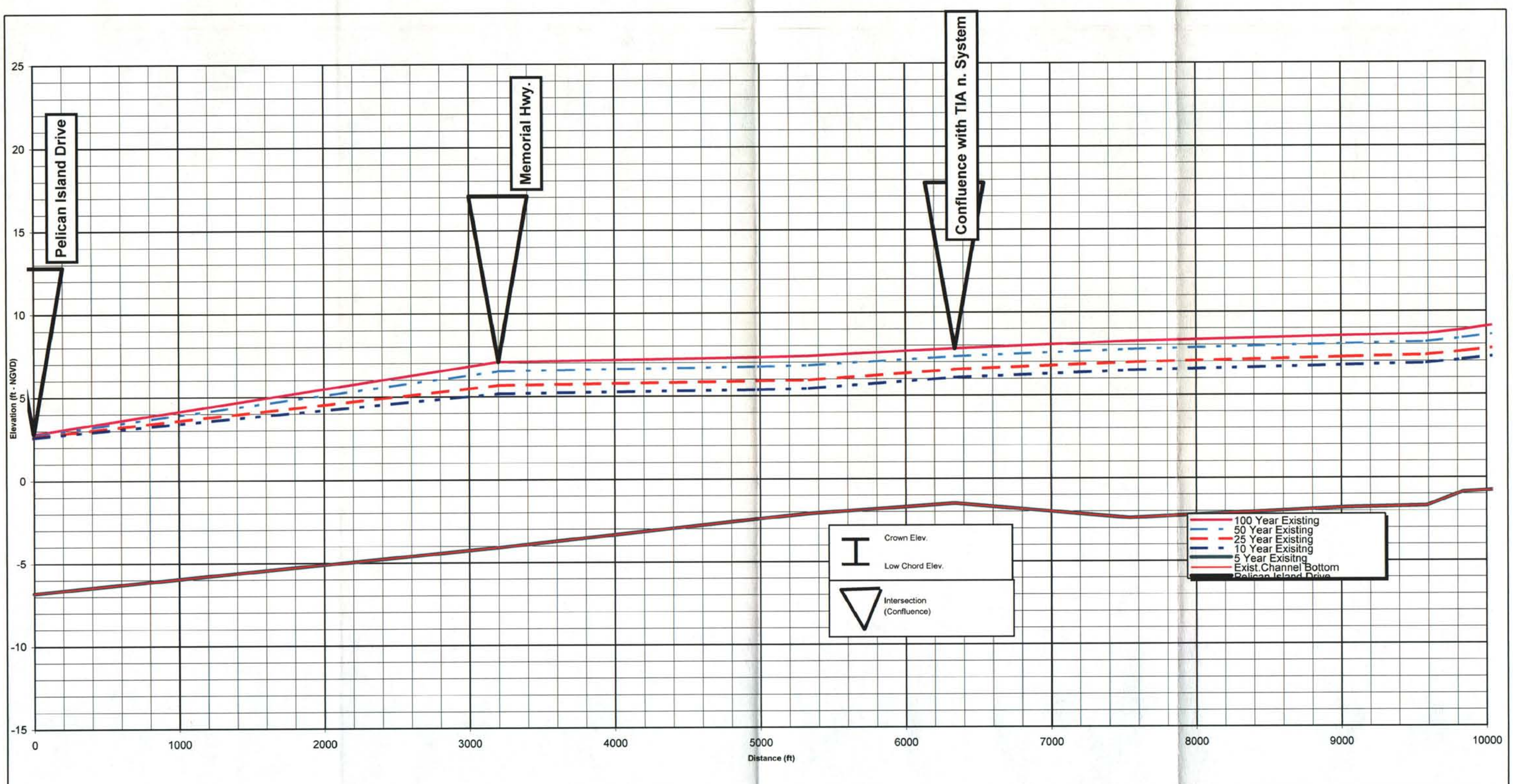
Exhibit 5-1

Existing Conditions Connectivity Diagram

this exhibit is missing

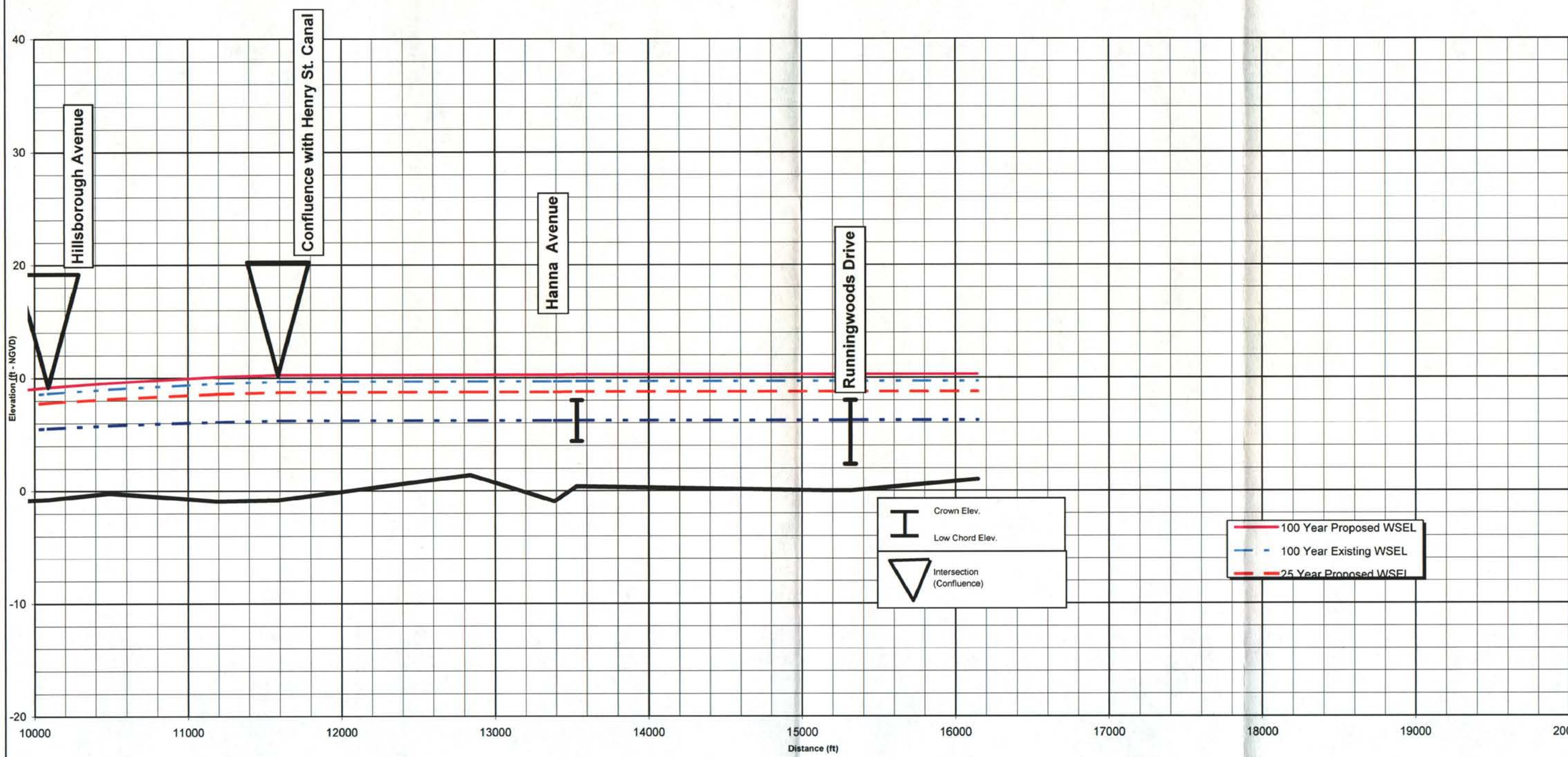
Exhibit 6-1

Existing Conditions Model
Main Channel



Lower Sweetwater Creek
Computed Water Surface Profile
August 2002

Exhibit 6.1
Existing Condition Model - 2002 revision
Main Channel
Sheet 1 of



Lower Sweetwater Creek

Computed Water Surface Profile

August 2002

Exhibit 6.1

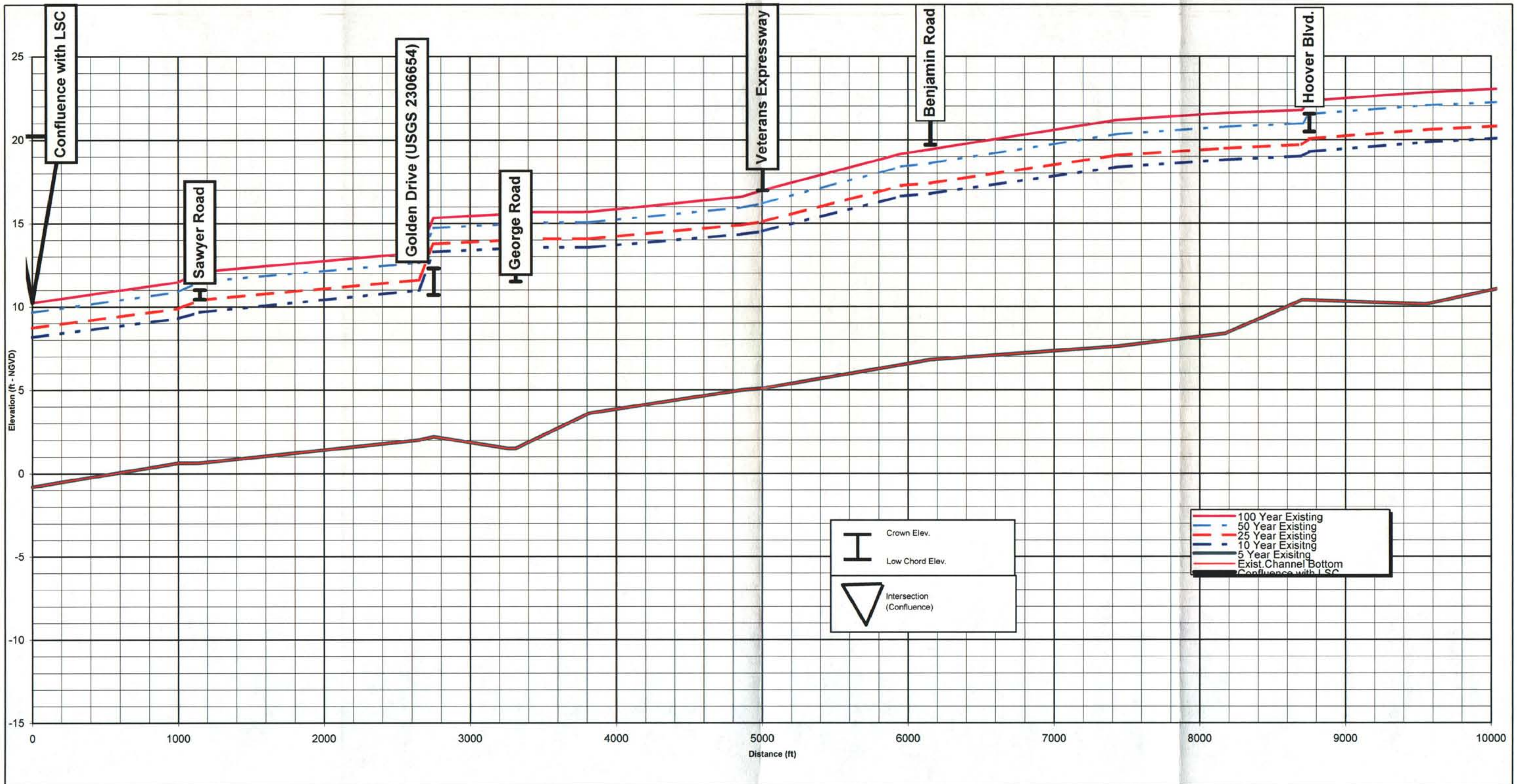
Existing Condition Model - 2002 revision

Main Channel

Sheet 2 of

Exhibit 6-2

Existing Conditions Model
Henry Street Canal



Lower Sweetwater Creek

Computed Water Surface Profile

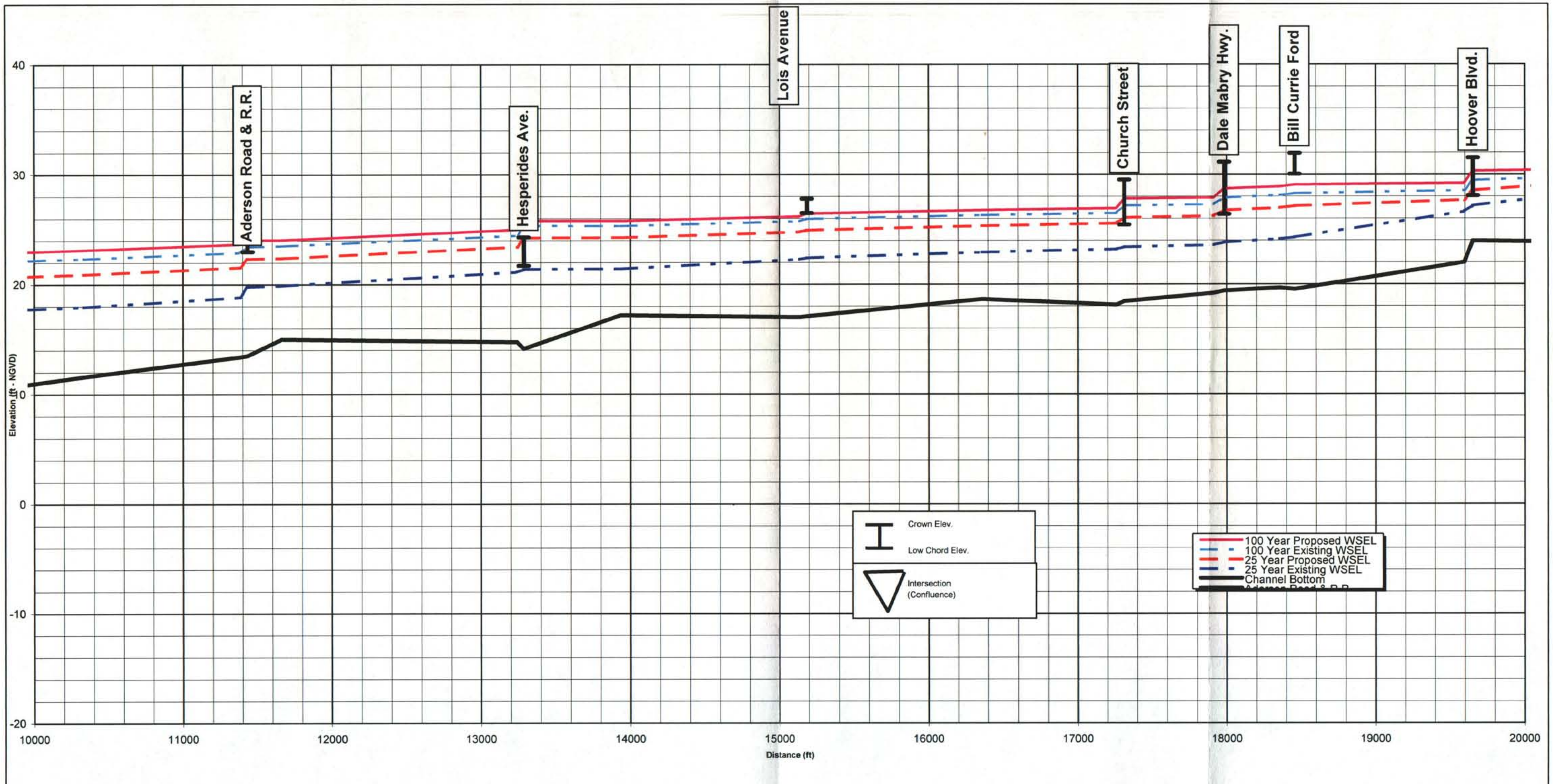
August 2002

Exhibit 6.2

Existing Condition Model - 2002 revision

Henry Street Canal

Sheet 1 of



Lower Sweetwater Creek

Computed Water Surface Profile

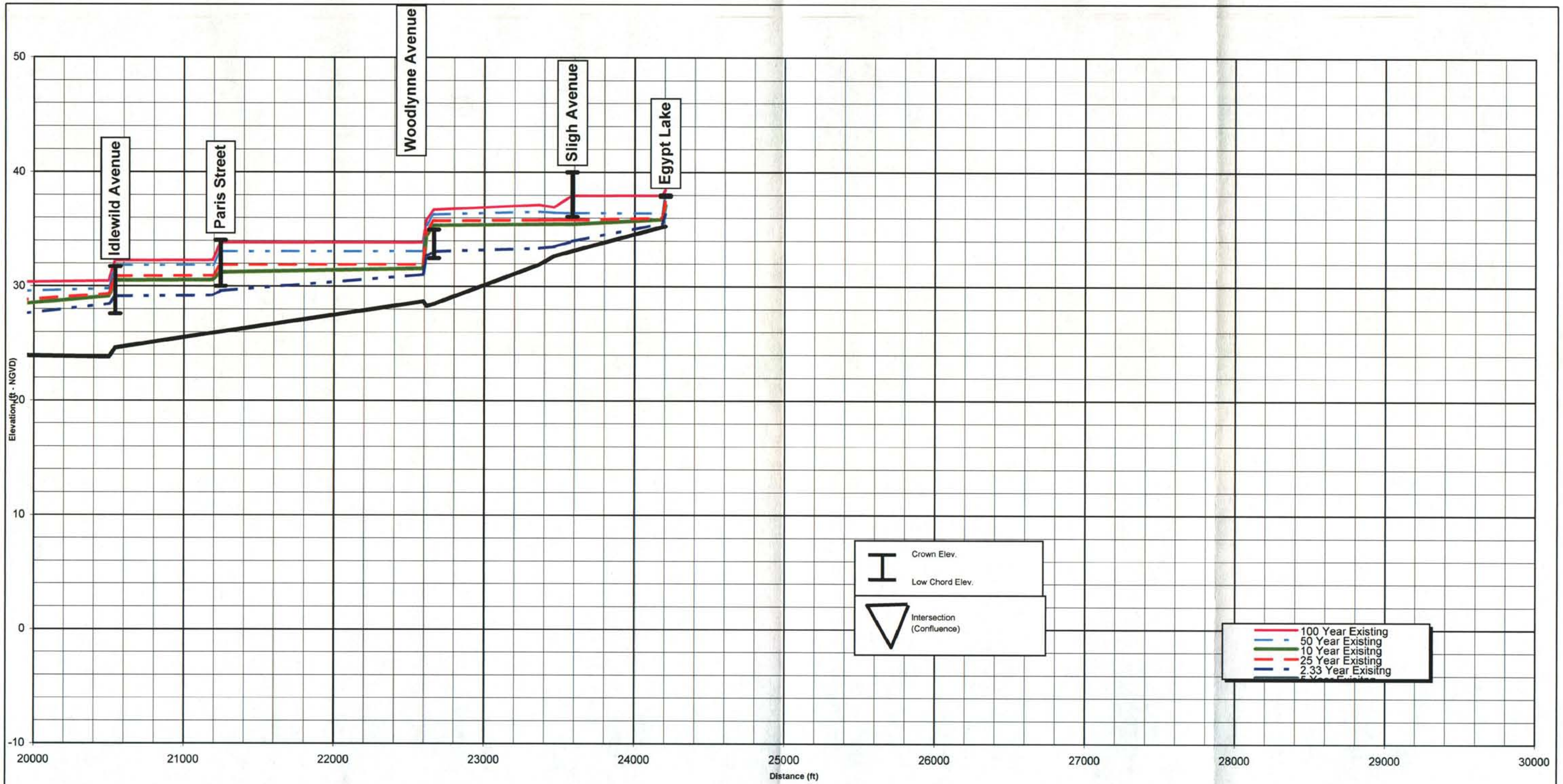
August 2002

Exhibit 6.2

Existing Condition Model - 2002 revision

Henry Street Canal

Sheet 2 of



Lower Sweetwater Creek

Computed Water Surface Profile

August 2002

Exhibit 6.2

Existing Condition Model - 2002 revision

Henry Street Canal

Sheet 3 of