SILVER/TWIN LAKE WATERSHED MANAGEMENT PLAN EXECUTIVE SUMMARY

The Silver / Twin Lakes watershed drains approximately 0.8 square miles of land located in central Hillsborough County. The watershed is generally bordered by Habana Place and White Trout Lake to the north, Armenia Avenue to the east, Kirby Street to the south and Himes Avenue to the west. The watershed can be further divided into 103 smaller subbasins ranging in size from 1.24 to 50.44 acres. The runoff of the entire watershed ultimately discharges into the Hillsborough River through a collection of ditches originating in Kirby Creek. The watershed can be characterized as urban, being dominated by residential land uses throughout the majority of the area with commercial and other non-residential land uses being found along the main roads of Busch Boulevard and Waters Avenue. Of the total 506 + acres in the watershed, residential land uses constitute the majority of the land uses with about 68.94 % or 348.99 acres. There are no light industrial or extractive / mining land uses to be found within the watershed. For the natural systems, there are no upland areas remaining nor are there any forested wetlands. This study has been broken up into two broad categories, flood control / water quantity and natural systems / water quality. They are generally discussed in the section below.

Chapter one provides a short introduction and describes the project's objectives and organization.

The second chapter, Watershed Description, discusses the many facets of the watershed. These include climate, soils, physiography and hydrology, geology and hydrogeology and existing and future land uses. The geology and hydrogeology portion briefly discusses the Floridan and surficial aquifers. Numerous figures depict these many physical features.

Chapter 3 discusses the Major Conveyance Systems. In this chapter, the major conveyance systems of Silver / Twin Lakes watershed are identified. There are three systems: Little Twin Lake system, Twin Lake system and Silver Lake system. Major water features, such as lakes, ponds, and ditches, in each system are described.

Hydrologic and Hydraulic Model Methods are reviewed in the fourth chapter. Major parameters are introduced. Hillsborough County's version of the Storm Water Management Model (HCSWMM) is used. In this model, the rainfall-runoff procedure is simulated by the NRCS-CN method, while the hydraulic part is simulated by St. Venant equations, which are solved by the finite difference method.

In chapter 5, Model Calibration and Verification, the procedure of model calibration and verification is discussed. Since there is no observed history information available, the regression method was used to calibrate the peak discharge.

For the Existing Conditions Flood Level of Service chapter, six storm events (2.33 year, 5 year, 10 year, 25 year, 50 year, and 100 year, respectively) are simulated with the model calibrated and verified in chapter 5. The model results were then compared with Hillsborough County flood level of service requirements to find out the Silver / Twin Lake watershed Level of Service or LOS. The results show that this watershed satisfies the requirements of a LOS B for a 25-year storm event.

Chapter 7 describes the Existing Water Quality Conditions. In it, the existing data from LakeWatch and the Environmental Protection Commission of Hillsborough County is presented. The LakeWatch data for Silver and Twin Lakes is discussed in detail with possible explanations for existing readings given. Both lakes are just barely staying within the "good" range for Trophic State Index (TSI), with a slightly improving trend indicated for water quality. Areas of concern for the watershed include the development of lake management plans for the major lakes, additional protection through regulation and education, achievement of Tampa Bay Estuary program goals and bacteriological studies.

The Existing Natural Systems Conditions are summarized in chapter 8. The chapter discusses the condition of the watershed prior to development (pre-1900) and compares it with the watershed as it exists today. Existing community types are described in detail, including what potential plants, animals and listed species are or could be expected to be found. Natural systems areas of concern are habitat loss due to fragmentation and degradation, the introduction of exotic and nuisance species, the relation between the loss of buffers and water quality, the alteration of historic flows to wetlands and restoration of natural systems.

Chapter 9 covers water supply issues. In it, groundwater use is discussed for each of the Southwest Florida Water Management District permits issued in the watershed. Surface water use is briefly addressed, as well. Water supply areas of concern relate to impacts due to withdrawals, aquifer recharge, minimum flows and levels and water reuse and conservation.

The Pollutant Loading and Removal Model (PLRM) is discussed in chapter 10. The model's several components and use is briefly described. The model takes land uses, hydrologic soil groups and land use information to produce individual "elements" that the model uses further. These elements are then subjected to a rainfall amount and run-off coefficients are used to determine the amount of stormwater run-off generated. An event mean concentration is applied to each of these elements and gross pollutant loads are produced. Conversely, a best management practice or BMP can be applied to the same element to produce the net load. A

BMP is a pollutant-reducing factor such as a stormwater pond or swale system. The model uses the Environmental Protection Agency's Simple Method to determine non-point pollutant loads. Net pollutant loads by subbasin are computed and summarized in Table 10.4.

Chapter 11 addresses the existing water quality treatment level of service for the watershed. This is another function of the PLRM. The WQTLOS is determined by comparing a particular subbasin's existing net pollutant load against the non-treated pollutant load of the same subbasin assuming that it is 100 % low to medium density residential land use. Ratios are obtained that determine the WQTLOS in terms of % load when compared to the benchmark value.

The Alternative Analysis is done in chapter 13. In this chapter, alternatives were proposed to solve the potential flooding and/or safety problems. The flood control alternatives are:

- regular channel maintenance for the outfalls of Silver and Twin Lakes, and
- culvert replacement on Kirby Creek at Humphrey Street

The water quality control alternatives are:

- creation of bioretention areas around each of the watershed's major lakes.

In chapter 15, the improved level of service (LOS) for the Silver / Twin Lake watershed is discussed based on the alternative analysis and recommendations as described in Chapter 13.

Chapter 16 identifies the final recommended projects along with its estimated budget. Again, these projects are regular channel maintenance of Kirby Creek and Silver Lake outfall and the replacement of the culvert at Humphrey Street.

Chapter 18 is the maintenance plan for the watershed.

The list of final recommendations can be found in chapter 19.

Water Quantity / Flood Control Recommendations

One purpose of the flood control portion of the study is to develop a computer simulation model of the Silver / Twin Lakes watershed under current conditions. The calibrated model is also used to develop a Watershed Management Plan (WMP) for the watershed. The objective of the plan is to determine level of service for existing stormwater infrastructure and to develop alternatives and recommendations for improving the conveyance system to eliminate any flooding situations.

There are three target areas for the recommended improvements in this study based on model prediction, verification of field investigation and public input in the way of complaints received by this section during the El Nino event of 1997/98.

- Regular maintenance of the Silver Lake Outfall system between North Habana Avenue and North Saint Peter Avenue

- Regular, environmentally sensitive maintenance of the Twin Lake Outfall (Kirby Creek) for its entire length within the County portion of the watershed.

- In kind replacement of the 54" RCP on Kirby Creek at Humphrey Street, primarily for reasons of safety.

Water Quality / Natural Systems Recommendations

The water quality / natural systems portion of the plan evaluates the existing conditions for both criteria. Water quality data was gathered primarily from the LakeWatch data that has been collected in the watershed since 1996. Other data reviewed is from the Environmental Protection Commission of Hillsborough County. Their data was compiled from the citizen's complaints that have been generated in the watershed. Review of the LakeWatch and EPC data shows that there is a steady and slight improvement of the water quality of Silver and Twin Lakes. The measure of water quality used is the Trophic State Index (TSI). This system is used to directly compare one waterbody to another using the parameters of chlorophyll a, total phosphorus and total nitrogen. A TSI less than 45 indicates good water quality, between 45 and 60 is fair and greater than 60 is considered poor. For years where the TSI could be calculated, it was in the good range, but on a few occasion the TSI fell into the fair range for both lakes. The water quality appears to be continuing on a trend of slightly improving water quality. Water quality areas of concern are the protection of the watershed's lakes and streams through education and regulation. Low impact development measures should be explored. The County should continue in its efforts to "hold the line" on nitrogen loadings to the Bay.

General Recommendations

1. The plan should be updated on no less than a five-year cycle with public input as an intricate part. This continual updating will allow for the incorporation of the latest information and refinement of existing procedures and projects.

2. The plan should be reviewed and approved by regulatory agencies with jurisdiction in Hillsborough County. These agencies should also be approached for assistance with implementation and enforcement.

3. Retrofitting of existing land uses should be explored. As many of the water quality BMP alternatives presented in Chapter 13 should be used as possible. Bioretention areas especially should be investigated.

4. All vegetation maintenance activities should be designed to remove the vegetation from the system. Cutting or herbiciding vegetation merely contributes to muck build up and releases nutrients back into the system. Equipment should be purchased or developed to "bag" cut vegetation when mowing ditches or swales where the cut materials may otherwise be transported downstream to a receiving waterbody. Aquatic vegetation management should likewise focus on removal of the vegetation from the system by mechanical harvesting. This will remove nutrients from the system, minimize muck/sediment buildup, and minimize mosquito problems. Efforts should be made to compost these materials and reuse as fertilizer or mulch.

5. Water flow information should be gathered in conjunction with any sampling information collected in Kirby Creek. This will aid in future pollutant loading calculations.

6. This watershed plan should be continuously updated with "As-Builts" submitted electronically by the developer.

Specific Water Quality Recommendations

1. Use the Stream WATERWATCH program to assist in developing land use specific EMCs that can be used to "calibrate" and verify the pollutant loading and removal model. Emphasis should be put on Kirby Creek. This recommendation should be implemented as soon as possible after acceptance of this watershed plan. A minimum of two sites should be chosen.

2. The LAKEWATCH program should continue to expand its monitoring program in the watershed and provide an important water quality and aquatic plant species baseline for this area.

3. The Adopt-A-Pond program has equipment that should be used to aid in specific small-scale restoration programs using their criteria.

4. An inspection system should be implemented as part of the maintenance plan that will aid in the detection of illicit discharges into the County's stormwater system. This system should be designed to maximize the credits to the County under the Federal Emergency Management Agency's Community Rating System.

5. A watershed specific septic tank study should be completed which identifies the location of septic tanks, assesses their impacts on water quality, and recommends management techniques to improve their efficiency. The Planning and Growth Management Department has proposed such a study countywide, and this study should be completed.

6. Assimilative capacity studies should be conducted on lakes in this watershed in order to determine proper regulatory needs for protection of the lakes. Once the assimilative capacity studies are completed, the information should be used to develop a lake management plan for each lake.

Natural Systems

1. Programs such as the Pepper Busters and County's Adopt-A-Pond should be expanded in the watershed to aid in controlling nuisance vegetation. Plants from the Exotic Plant Pest Council's category one list should be targeted. A program should be instituted for single family homeowners, that has as an incentive, free access to dumpsters or special garbage pick-up for large amounts of nuisance vegetation that they have removed.

2. Upland natural systems have been eliminated from the watershed. The agricultural parcel in the watershed should be purchased by the County and a restoration project should be undertaken within five years of the approval of this plan. This area should be restored to the habitat that was originally on the site.

3. Existing areas of natural buffers such as wetland conservation area setbacks should be identified and preserved. Projects similar to the Delaney Creek Restoration project should be explored for Kirby Creek that will take into account the proposed maintenance schedule.

Water Supply

1. Consideration should be given to the aquifer recharge potential when siting stormwater treatment systems. Care should be taken to avoid moving water from an area of high recharge potential to an area of low potential.

2. Water conservation and the use of reclaimed water should be encouraged through educational programs including LAKEWATCH and Stream WATERWATCH.

Pollutant Loading and Reduction Model

1. **Benchmark** – The appropriateness of low / medium density land use is justified; however, the value used to model the loading may have been somewhat low. Some studies have found loadings almost twice as high as those used in the model, but values used were from direct measurements done in Hillsborough County. Using higher numbers would raise the benchmark and could have the effect of raising some LOSs.

2. **BMPs** – One of the model's shortcomings is that it does not allow the use of multiple BMPs. In addition, literature values for multiple BMPs are extremely difficult to find or extrapolate. Values should be developed for use in the model that can accommodate multiple BMPs.

3. One of the lessons learned in using the PLR model is that impervious surfaces are the main component in the creation of pollutant loads. A method should be developed to track the amount of impervious surface in the watershed. The County has minimal parking requirements for specific land uses that are governed by zoning. The Planning and Growth Management Department should revisit these requirements and do whatever possible to reduce these requirements or amend them to encourage the use of other alternatives where appropriate.

4. Another problem in using the model is in the determination of pollutant loads for future proposed land uses. This drawback is due to the incompatibility in translating the existing land use based on SWFWMD's application of FLUCCS codes into the future land use designations of the Planning Commission, which does not use FLUCCS codes. The Planning Commission should be urged to adopt the FLUCCS code in predicting future land use or develop a system that is directly comparable to FLUCCS. Presently the Planning Commission's system groups diverse land uses such as residential and commercial into mixed urban uses. This should be done prior to the next updating of this portion of the watershed plan.

5. The County should immediately embark on a program to develop as many specific EMC values as possible for land uses to be used in future applications of the model.

Level Of Service

1. To increase the water quality treatment level of service, stormwater ponds built in this watershed should be the Conservation Wet Detention design to maximize pollution load reductions.
2. A project / program should be started within two years of approval of this plan that would create a series of bioretention ponds along the shores of both Silver and Twin Lakes.

These lakes are on the verge of passing from the "good" to "fair" range in terms of trophic state index and it will be easier to stop this drop in water quality at this point in time than it will several more years from now.

Revisit Regulations

1. Land Alteration and Landscaping rules should be revised to include larger buffers around wetlands and waterbodies. Studies have demonstrated that larger setbacks provide better protection by allowing some treatment of stormwater run-off prior to its introduction into the receiving waterbody. Variances should be either eliminated or allowed uses should be curtailed. Activities such as grading should not be allowed. Construction and other related activities should also be limited; no impervious areas should be allowed. It has been shown that as little as 10% impervious area within a watershed can have serious detrimental impacts on aquatic ecosystems.

2. One of the projected land use changes in the watershed is the conversion of the agricultural areas to high-density residential housing (greater than 5 units per acre). These housing densities should be reduced around wetlands and waterbodies for the same reason setback variances should be limited. This will have the effect of reducing impervious areas around these sensitive habitats. Studies have shown a wide range of pollutant loading for this land use category. Some of these loadings can approach those expected for more intensive land uses such as institutional and commercial.

3. The flooding caused by the recent El Nino events, primarily in 1998, demonstrated the damage that can be caused by unchecked building in the 25 and 100-year floodplains. Regulations should seek to avoid encroachment into these natural areas and allow them to function as the flood storage areas. By preserving these naturally occurring areas, "free" stormwater functions are provided that saves the County money.

4. Clearly, wet detention times must be increased. Recent studies show that a residence time of 14 days in conjunction with planted littoral areas may be necessary to provide adequate treatment. The SWFWMD should be encouraged to raise their standards, and failing this, the County should implement stricter standards.

5. Sedimentation and erosion has been identified as a significant source of pollutant load in the watershed. PGMD should reassess the need for mass grading of projects over 2 acres. Developers should be encouraged to grade small areas at a time rather than clearing entire project areas at one time. Erosion control techniques should required in all construction plans and then be inspected during construction in addition to the requirement of inspection prior to construction to ensure their continued maximum

efficiency and to comply with the County's National Pollutant Discharge Elimination System (NPDES) permit.

6. Low Impact Development techniques should be required in this watershed to minimize the volume of runoff and therefore the total pollutant load. As part of this recommendation, a team of representatives from the various County and State regulatory agencies as well as the regulated community should be immediately formed to develop a Hillsborough County Low Impact Development Technical Manual and incentives to carry out its recommendations once it has been developed.

7. All CIP's should include life-cycle costing, a maintenance plan, and mitigation plan if appropriate for the facility. In addition, sediment transport has been a problem in the watershed and sediment control devices, such as sumps, should be incorporated into as many projects as possible.

8. Upon adoption of this plan, all CIP projects should incorporate water quality BMP's into their design. The type of treatment used shall be based on the LOS parameter contributing the greatest load in the subbasin that the project(s) is being constructed. This aspect should be tracked so that a number of parameters can be addressed with subsequent projects and that a single parameter is not addressed by multiple projects. A matrix or flowchart should be developed that will aid the designers in choosing the appropriate parameter to be addressed and using the best BMP(s) to achieve that goal.